7.0 EFFECTS ASSESSMENT AND MITIGATION

7.1 Methodology

7.1.1 Valued Ecosystem and Socio-Economic Components

Natural environment valued ecosystem components (VECs) and valued socio-economic components (VSECs) are those aspects of the natural and human environment that are particularly notable or valued because of their ecological, scientific, resource, socio-economic, cultural, health, aesthetic, or spiritual importance, and that have a potential to be adversely affected by the Rainy River Project (RRP) development. The identification of VECs and VSECs provides focus to the assessment of potential environmental or socio-economic effects, including the application of avoidance and mitigation measures to reduce or eliminate potential effects.

7.1.1.1 Valued Ecosystem Components

A VEC can be a particular habitat, an environmental feature, a particular assemblage of plants or animals, a particular species of plant or animal, or an indicator of environmental health. Data from extensive environmental and socio-economic baseline studies, including personal interviews and literature sources, have been used to identify VECs and VSECs for the RRP that meet one or more of the following criteria:

- Area of notable biological diversity;
- Significant habitat for locally important species;
- Significant habitat for uncommon, rare or unusual species;
- Species at Risk (SAR);
- Important corridor or linkage for fish and/or wildlife movement;
- Sensitive receiving water environment;
- Other notable species or species groups;
- Indicator of environmental health;
- Important component to the function of other ecosystem elements or functions;
- Aboriginal cultural significance;
- Economic, social or cultural significance, such as identified through Traditional Knowledge and Traditional Land Use (TK / TLU) studies;
- Educational, scientific, or aesthetic interest;
- Provincial, Federal or International significance; and
- Administrative significance.

The final criterion, administrative significance, is specifically included to address Metal Mining Effluent Regulation Schedule 2 aspects, where other criteria might not otherwise apply.

Selected VECs were defined from a consideration of the natural environment and the criteria listed above and are expected to comply with the following generalized framework:

- Atmospheric systems;
- Surface water (aquatic) systems;
- Groundwater systems;
- Terrestrial environment; and
- Natural Heritage Systems.

Natural heritage systems include such items as formally designated National Parks, Provincial Parks, Candidate Provincial Parks, Conservation Reserves, Crown Game Preserves, Areas of Natural and Scientific Interest, and other similarly designated areas,

The above framework allows for an integration of both physical and biological environmental components of the natural environment, and therefore better accommodates an ecosystem-based approach to the definition and assessment of VECs. In general, the designation of VECs is focused on habitats, features, and specific species groups and related system interactions, rather than on individual species, with a few notable exceptions such as SAR.

7.1.1.2 Valued Socio-economic Components

VSECs are typically defined as components of the socio-economic environment that are significant in terms of people's values and quality of life. VSECs were selected based on whether or not the human environment component is:

- Identified or valued by the public, stakeholders and Aboriginal groups who will potentially be affected by the RRP and are therefore consulted in project planning and implementation or;

- Identified or valued by government agencies as determined through the Environmental Assessment (EA) process; or

- Identified as potentially affected by the RRP based on assessed level of interaction.

VSECs were selected for inclusion within the following framework:

- Land and resource use;

- Community and regional population and demographics;

- Community and regional infrastructure and social services;

- Regional economy, labour and business;
- Human health;
- Cultural heritage resources (including archaeological resources, built heritage resources and cultural heritage landscapes); and
- Aboriginal (First Nation and Métis) traditional land use.

7.1.2 Effects Analysis

For each VEC or VSEC, the analysis of effects is structured for each project phase according to:

- **Environmental effects:** RRP-related environmental effects (including social) on a given VEC / VSEC that could reasonably be expected to occur;
- **Mitigation:** measures that are proposed to prevent, eliminate, or reduce negative effects, and includes elements inherent in the RRP design to prevent the effect from developing. Mitigation also includes compensation (habitat offsets), as in the case of potential adverse effects to fish habitat where the provision of alternative fish habitat can be used to offset adverse effects. If the RRP-related effect is positive, the actions that could be taken to enhance the effect will be indicated; and
- **Significance:** of negative environmental effects is determined for effects after the application of mitigation measures, and was evaluated on the basis of identified criteria.

Best professional judgement was used in carrying out the effects analysis, incorporating information from the available sources, including opinions and perspectives expressed by the various government agencies, Aboriginal communities and stakeholders through the EA process. Where appropriate, specific analytical methods and tools have been used to support the effects analysis, including: laboratory tests, mass balance calculations, statistical analyses and various types of computer modelling.

Attributes used to evaluate significance include:

- **Context / value:** a qualitative measure for environmental impacts identified as being meaningful based on professional judgement and/or consultation;
- **Magnitude:** a quantitative or qualitative measure of a given key indicator representing the potential effect after mitigation relative to the baseline condition;
- **Extent:** the geographic area over which an effect will occur;

- **Duration:** the period of time over which an effect will occur;

- **Frequency:** how often an effect will occur within a given time period;

- **Reversibility:** the degree to which the effect can or will be reversed; and

- **Likelihood:** the probability of the effect occurring.

The direction of the effect (positive or negative) is also considered for socio-economic effects.

Associated with each attribute is a set of criteria used to evaluate the attribute (Tables 7-1 and 7-2). Criteria are categorized into three levels (Levels I, II and III), where Level I is indicative of a negligible or limited potential to contribute to an overall significant environmental effect, and Level III is indicative of a high potential to contribute to an overall significant environmental effect. Level II represents an intermediate condition.

For an effect to be defined as significant, the overall effect must be such that both of the following criteria are satisfied:

- A Level II or III rating is attained for natural environment and/or socio-economic environment context; and

- A Level II or III rating is attained for all of the attributes involving magnitude / geographic extent, duration and frequency.

Conversely, if a Level I rating is achieved for any of the attributes involving magnitude / geographic extent, duration, or frequency; or, if a Level I rating is achieved for both natural environment and socio-economic environment contexts (where applicable), then the effect is considered to be not significant.

Effects are also assessed although a level is not provided, as to their likelihood of occurrence, recognizing that there is some overlap in the concepts of duration, frequency and likelihood.

The logic in the above methodology is that a predicted environmental effect is not likely to be significant, if:

- It is of low magnitude and/or geographic extent or;

- Of short term duration including residual effects (i.e., the effect itself is of short term duration); or

- Is likely to occur very infrequently (or not at all) with little potential for long-lasting effects.

Similarly, the effect is not likely to be significant, if the effect has low, or limited, importance to the natural environment or socio-economic environment, for whatever reason.

Sufficient data are provided in the accompanying text, relating to the significance evaluations, to allow the reader to fully understand and appreciate the rationale and professional judgment associated with the significance rankings.

The effects assessments presented in this section are for the expected maximum effect expected to occur during any stage of the RRP life. Maximum effects for virtually all VECs and VSECs are typically associated with the operation phase, when the RRP footprint, employment levels, and associated levels of environmental disturbance generally reach their peak expression. For example, peak activity levels at the RRP will occur when both the open pit and underground operations are being carried out simultaneously. This phase is expected to occur during the period of 2019 to 2026. Towards the end of this period, overburden and mine rock stockpiles will be at maximum height and extent, and the tailings management area dams will have been fully constructed. Discharges from the tailings management area will be at a maximum during the operation phase, as will air, sound and vibration emissions. Once open pit operations cease, there will be a reduction in heavy equipment operation that will reduce emissions such as those related to air and sound effects.

During the RRP construction phase, most activity will be focused on:

- Constructing the process plant and other buildings;
- Stripping overburden from the pit to expose the ore;
- Starting construction on the various dams and berms;
- Developing infrastructure (roads, pipelines and transmission line); and
- Hiring permanent staff.

Most of the construction work will be completed by contractors. The only environmental effect that will be greater during the construction phase, compared with the mine operation phase, is the possible flow effect reductions to the Pinewood River while an initial water inventory is being built to support process plant start-up operations. Once a sufficient water inventory is established and ore processing commences, the process plant will operated mainly on recycled water.

Similarly, during the decommissioning and closure, and post closure phases, environmental effects are expected to diminish as the site becomes reclaimed. The only effects that could potentially increase at that time are potential acid rock drainage (ARD) effects and socio-economic effects linked to declining employment.

Despite this, the assessment of effects has been detailed for each phase of the project as dictated by the environmental impact statement guidelines. Summary tables of significance are presented at the end of this section (Tables 7-47 to 7-56).

7.2 Selected Valued Ecosystem and Value Socio-economic Components

7.2.1 Selected Valued Ecosystem Components

The VECs and VSECs selected for this EA Report have been selected as a result of the extensive environmental and socio-economic baseline programs combined with the community consultation efforts in support of the RRP.

In the case of TK / TLU, data collected thus far indicate little if any, current natural resource use (fish, wildlife and plants) by Aboriginal peoples within the natural environment local study area (NLSA) and natural environment regional study area (NRSA), such that there was little direct TK to inform the selection of VECs. It was clear from various discussions with Aboriginal peoples potentially affected by the RRP that the natural environment is highly valued and that RRR should be respectful of the environment and take reasonable measures to minimize adverse effects to the environment. In particular, water quality, downstream fisheries resources and wildlife were identified as being highly valued components by several First Nations community members during meetings and consultations leading to the development of the draft EA Report.

RRR selected VECs from a wholistic perspective of assessing broad ecosystem components and species groups, rather than focusing on more specific ecosystem components and species, with the exception of SAR and other rare species where individual species were assessed. Using this approach the entire natural environment is assessed. For example, rather than defining water quality and fisheries resources as VECs for a system like the Pinewood River, the Pinewood River itself was defined as the VEC with the analysis of this VEC including integrated discussions of water flows, water quality and fisheries resources. Similarly, rather than carrying White-tailed Deer, Moose and Elk forward as individual VECs, an ungulate VEC was defined which includes all three species.

VECs selected for assessment within the context of this EA Report include:

- Air quality and greenhouse gases (GHGs);
- Sound and vibration;
- Minor creek systems;
- Pinewood River;
- Groundwater;
- Vegetation communities and rare plants;
- Ungulates;
- Furbearers;
- Bats;
- Migratory birds;
- Raptors and Ravens;
- Amphibians;

- Species protected under the *Endangered Species Act*; and
- Species of Special Concern and Provincially Rare Species.

Air quality is selected as a VEC since adverse air quality parameters such as excess dust, and SO_2 emissions from fuel combustion, can have a detrimental effect on sensitive plant species. Dust can provide a means for heavy metals associated with the dust to enter the environment. Greenhouse gas emissions linked to fuel combustion are of concern from an overall climate change perspective. Excessive sound can be disturbing to local residents and potentially to sensitive wildlife species.

Local creek systems are important components of the Pinewood River system providing water discharge to the Pinewood River, direct fisheries habitat for forage fish species and corridors for wildlife movement. The forage fish communities of the local creeks help to sustain piscivorous fish that inhabit the Pinewood River including Northern Pike. The Pinewood River supports a variety of fish species including Walleye, and at least a few Lake Sturgeon in its lower reaches. The use of the lower reaches of the Pinewood River by Lake Sturgeon was recently confirmed as a result of the baseline studies completed and MNR investigations. The mainstem Pinewood River corridor is important with respect to fish and wildlife movement. The Pinewood River watershed comprises a small portion (slightly greater than 1%) of the larger Canadian and United States, Rainy River watershed.

These aquatic systems (minor local creeks and the Pinewood River) have the potential to be influenced by one or more of the following:

- Controlled discharge of RRP treated effluent;
- Runoff and seepage flow interception;
- Open pit dewatering;
- Changes to watershed catchment characteristics; and
- Dust from road traffic and work on mineral stockpiles.

Three of the four local creek systems (Loslo Creek / Cowser Drain, Marr Creek and Clark Creek / Teeple Drain) will be substantively overprinted by proposed RRP developments (Figure 4-1). West Creek will be impounded just north of the open pit (to create the West Creek pond), and the creek below this point will be diverted to Loslo Creek.

The local groundwater system is regarded as a VEC principally within the context of local (domestic) well use. The local groundwater system also provides very limited base flow to the local creek system and the Pinewood River.

Vegetation communities and associated terrestrial habitat provide or potentially provide:

- Areas of notable biological diversity;
- Significant habitat for locally important species;
- Important corridors or linkages for fish and/or wildlife movement;
- Significant habitat for SAR (migratory birds and bat species);
- Important component to the function of other ecosystem elements or functions;
- Economic, social or cultural significance (such as hunting); and
- Educational, scientific or aesthetic significance.

There are no rare or unusual plant communities in the NLSA but the area contains a reasonable measure of biological diversity as a result of the mix of wetlands, forested areas and exposed rocklands. The former proglacial Lake Agassiz shoreline is an important local physiographic feature that provides an abrupt transition between low lying clay plain terrain and adjacent upland bedrock dominated terrain. The NLSA and NRSA are also of note geographically because they are located near to the intersection of three principal ecoregions: the Boreal Forest Region to the north, the Great Lakes – St. Lawrence Forest Region to the southeast and the Prairie Grasslands Region to the west. The RRP site itself is located within Great Lakes – St. Lawrence Forest Region. It should be noted that the landscape has been extensively altered throughout much of its area by agriculture and forestry activities. The associated avian community is particularly diverse, owing in part to the convergence of the three above noted principal ecoregions and also because of effect of Lake Superior on avian migration routes that helps to funnel birds through this area.

Ungulates present in the NLSA and NRSA include White-tailed Deer and Moose, and potentially Elk in the NRSA. Of these, White-tailed Deer are by far the most common. Moose are much less common than deer, and according to local residents Moose are more likely to be encountered in the northeast portion of the NLSA. Elk have been reintroduced to the Lake of the Woods area, where a small number of animals continue to exist. As far as is known, this species has not been confirmed in the NLSA. White-tailed Deer and Moose are important in their own right, and also provide the principal food source for Wolves and provide for sport hunting. They are thus an important component to function of other ecosystem elements (Wolves and possibly Black Bear) and socio-economic aspects. As ungulates are hunted by visiting hunters, they are therefore of economic and social interest.

Large predators, furbearers, amphibians and migratory birds are important in their own right, comprise important elements in the function of other ecosystem components, and are of economic and cultural significance. Migratory birds, including raptors as a separate VEC, are also of interest from an educational, scientific and aesthetic perspective because of the aforementioned proximity of the NLSA to the intersection of the Boreal Forest Region, the Great Lakes – St. Lawrence Forest Region and the Prairie Grasslands Region; and also because of the effect of Lake Superior on bird migration routes. The diversity of migratory birds in the area is consequently quite high and includes a number of SAR.

Four SAR VECs have been defined: Eastern Whip-poor-will, Bobolink, Barn Swallow and other SAR. Eastern Whip-poor-will, Bobolink and Barn Swallow have been singled out because these three species are listed in the Provincial Threatened category and are therefore considered to be more sensitive. SAR Net Benefit permits for adverse effects to these species will be required in accordance with the Ontario *Endangered Species Act*. Whip-poor-will in particular are considered to be sensitive, and considerable study and discussions have taken place between Rainy River Resources (RRR) and the Ministry of Resources (MNR) on how best to accommodate this species; and where adverse effects are unavoidable, how best to develop a compensation strategy to support this species. There are several known whip-poor-will territories both within the regional area as well as within the proposed RRP development zone. Whip-poor-will tend to be associated with various types of forest edge habitat that can result from natural or human built (anthropogenic) influences. Bobolink are primarily associated with larger expanses of open grassland, in this case agricultural fields; and Barn Swallows tend to nest in, or on, man-made structures such as barns and bridges. The RRP has the potential to displace individuals of both species.

VEC selection criteria met by the above elements are provided in Table 7-3.

7.2.2 Selected Valued Socio-economic Components

VSECs selected within the context of this EA are subdivided into three principal categories: namely land and resource use, economic interests and social interests.

Selected land and resource use VSECs include the following, some of which are related to both traditional and non-traditional use:

- Land use plans and policies;
- Mineral exploration;
- Forestry;
- Agriculture and adjacent residents;
- Hunting;
- Trapping;
- Fishing; and
- Other outdoor recreational uses.

Selected economic VSECs include:

- Direct, indirect and induced employment opportunities;
- Business opportunities;
- Income growth;
- Economic diversification;
- Human capital; and

- Government revenues.

Selected social VSECs include:

- Demographics and populations;
- Housing and accommodations;
- Public utilities;
- Community and social services;
- Highway traffic;
- Human health; and
- Cultural heritage resources.

Most of the VSECs listed above relate directly or indirectly to Aboriginal peoples and their interests.

The various land and resource use VSECs were selected because the RRP has the potential to affect:

- Land use as set out in provincial and municipal land use planning policy documents;

- The ability of other commercial or industrial operators to access and use other natural resources in the Project area such as forest resources, minerals and aggregates;

- The ability of local residents and farmers to continue to safely use and enjoy their surroundings, to retain value in their properties, to access their properties, and to generate an income from agriculture, forestry and other local activities;

- The ability of residents and visitors to harvest animals (hunting, fishing, trapping) as a result of effects to wildlife and fisheries resources from Project activities (such as air emissions, sound, effluent discharges, traffic and reduction in wildlife habitat); and

- The ability of residents and visitors to access public lands for non-consumptive purposes such as all-terrain travel, viewing wildlife and landscape, and general physical activities such as walking and hiking.

The potential for effects to local residents is particularly important in the case of the RRP, because the RRP is located in a rural area, within reasonably close proximity to a number of surrounding off property residences and farmsteads. To move forward with development plans for the RRP, RRR has purchased or established an option to purchase, a number of properties in the local area, in addition to developing mitigation strategies so as not to unduly affect any remaining peripheral residences that have not been acquired.

With respect to economic VSECs, the RRP has the potential through the generation of employment and business opportunities to change or influence the population and demographics of the local and regional communities, principally in a positive manner, especially considering recent downturns in the forestry and tourism economies that have plagued the region and generated a net out migration of people. Improvements to the employment and business economies will also significantly improve the local and regional tax base.

Project activities also have the potential to affect: housing stock; community services (such as health care and general community services); traffic patterns, traffic volumes and the state of existing road infrastructure; the sustainability of local communities; human health; and cultural heritage resources.

The quality and availability of health care and general community services are a function of local population demographics and the ability to attract qualified personnel to provide these services, as well as the ability of the local and provincial tax base to support the necessary infrastructure to sustain or improve these services. Traffic volumes on local roads and highways will increase with proposed RRP activities during construction and to a lesser extent during operations and decommissioning. There is also the requirement to re-align Highway 600 and to provide alternate access to Marr Road (east access road). These changes can affect local and regional access by others, and may lead to possible health and safety risks if not properly managed.

Human health can potentially be affected by air and sound emissions, and by residual elements in treated effluents discharged to surface waters or groundwater where excess concentrations are present. Where certain parameters are released to the environment in sufficient quantities, there may be a potential for certain of these constituents to bioaccumulate in the food chain, and to be consumed by hunters and fishermen.

Aboriginal values and traditional land use (TLU) are also potentially affected by the RRP activities. Any changes in wildlife, fish and plant populations that are used or harvested by Aboriginal people in the region may infringe on their Treaty and Aboriginal rights protected by the Canadian *Constitution Act*. The proposed RRP may overlap areas that have cultural values such as burial or ceremonial sites, although none have been identified to date.

The potential to affect Aboriginal values and TLU are considered where appropriate in the aforementioned list of VSECs. Aboriginal values and TLU are also potentially affected by the RRP activities. Any changes in wildlife, fish and plant populations that are used or harvested by Aboriginal people in the region may infringe on their Treaty and Aboriginal rights protected by Section 35 of the Canadian *Constitution Act, 1982*.

With respect to VSECs, the RRP has the potential to affect certain Aboriginal activities on public lands:

- The ability of Aboriginal people to continue to exercise their Aboriginal and treaty rights, specifically with respect to hunting, fishing and plant harvesting as a result of potential effects to wildlife and fisheries resources from RRP activities such as air emissions, sound, effluent discharges, traffic, and reduction in wildlife habitat;

- The ability of Aboriginal people to access lands to engage in traditional activities as a results of changes in roads, and/or trails used to access resources that are blocked or rerouted by RRP components;

- Aboriginal people to rely on or supplementing their diet through hunting and fishing and affecting ceremonial or community sharing of these resources;

- The ability of Aboriginal people to continue to harvest plants that may have traditional or ceremonial significance (such as sweetgrass) medicinal uses, or be used to supplement the diet (such as berries or wild rice);

- The ability of Aboriginal people to engage in licensed commercial fishing, specifically at Lake of the Woods, sturgeon fishing, or bait fishing where licensed near the RRP; and

- The proposed RRP may also overlap with areas that have cultural values such as burial or ceremonial sites, or other sites of cultural significance.

Selected traditional VSECs include:

- Traditional hunting;
- Traditional fishing; and
- Traditional plant harvesting.

7.3 Air Quality and Greenhouse Gases

7.3.1 Air Quality

7.3.1.1 Environmental Effects

In undertaking the assessment of air quality effects the following parameters were considered:

- Suspended particulate matter (dust) as total particulate matter (PM_{tot}) and fine particulate matter ($PM_{2.5}$);

- Sulphur oxides (SO_x), mainly as sulphur dioxide (SO_2);

- Nitrogen oxides (NO_x);

- Key metals (such as arsenic, cadmium, lead and mercury); and

- Hydrogen cyanide (HCN).

Air quality emissions were modelled using the United States Environmental Protection Agency (US EPA) AERMOD air dispersion model to predict RRP site area air quality. The model calculated emission rates for each parameter, utilizing background air quality estimates, local terrain data and a regional, five year meteorological data set (1996 to 2000).

The modelled emission sources included:

- Emissions from blasting;
- Material handling in the open pit;
- Dust from crushing;
- Road dust emissions (re-entrained dust);
- Dust from managing mine rock, ore and overburden; and
- Exhaust from back-up power generation.

In addition, air emissions from gold processing (for example HCN and SO_2) were also assessed and modelled. NO_x emissions occur from blasting, the combustion of propane for underground mine heating and process plant heating, and from the testing of back-up generators. The AERMOD model predicted the maximum ground level air concentrations off property of the RRP lands (fence line), after the application of mitigation measures. The predicted maximum ground level concentration at any specific location is the maximum concentration obtained from modelling the maximum potential emissions for every hour of a complete five year meteorological data set.

For the operation phase of the mine, air emissions from ore processing and from mining activities, ore, mine rock, overburden handling and ore processing, were calculated and the potential offsite effects assessed by dispersion modelling (AERMOD). The results are described below and detailed in Appendix Q.

Fugitive dusts have the highest potential for causing adverse, offsite effects, unless RRR implements rigorous and effective mitigation at the various sources. Without dust mitigation, it is probable that the air concentrations will exceed the Ontario local air quality standards for PM_{tot}, (standard of 120 µg/m^3; MOE 2012a) as well as the criteria for the fine particle size ($PM_{2.5}$) (ambient of 30 µg/m^3 guidance for a 24-hour averaging time and 25 µg/m^3 for a 24-hour averaging time for a single facility; both MOE 2012b).

Figures 7-1 to 7-4 show predicted isopleths (lines of equal concentration) for PM_{tot}, HCN and NO_x (24 and 1 hour). The shapes of the isopleths indicating the location of effects vary with direction and distance, as a result of source locations, meteorological conditions and also receptor elevation. The model assesses the effects of topography on dispersion. Nearby receptors at elevated heights typically have higher concentrations than receptors at the same distance at lower elevations. This is shown on the isopleths as higher concentrations closer to the site.

The predicted maximum concentrations of NO_x, HCN, key metals, PM_{tot}, PM_{10} and $PM_{2.5}$ at the property line or near the site not currently under the control of RRR were below the respective Ministry of the Environment (MOE) local air quality standards for the site specific emissions (MOE 2012a).

Using the Dorset MOE air quality station (Table 8 in AMEC 2013d) as representative of typical rural background conditions (note that most other MOE sites are influenced either by specific sources or by urban environments), the 90th percentile background $PM_{2.5}$ is about 10 µg/m^3. Historic monitoring data from a variety of studies and MOE sites have demonstrated that $PM_{2.5}$ is typically 25% of the total particulate. Background levels for the site are therefore considered to be:

- PM_{tot} - 40 µg/m^3 ; and
- $PM_{2.5}$ - 10 µg/m^3.

Adding these background levels to the site only impacts (Table 7-4) shows that $PM_{2.5}$ are below ambient air quality standards at all locations outside the RRR property area even with the conservative emission estimates and worst-case model results. At the internal boundary (property not controlled by RRR), modelled levels up to 24 µg/m^3 are found. Even though these are below the MOE single facility criteria of 25 µg/m^3 adding a background of 10 µg/m^3 indicates a potential for an occasional exceedance of the $PM_{2.5}$ criteria. A frequency assessment indicates this may occur less than one day per year. Total particulate could also occasionally exceed the MOE 120 µg/m^3 ambient air quality criteria. These predicted levels for particulate matter should be considered in the context of the conservative nature of the estimates (for example all sources active at maximum all the time, activity levels for all years at the maximum year of operations) and the modelling (for example maximum meteorological day over five years of meteorological data) The modelled concentrations for particulate are at a level that is typical of many sites in Ontario. The potential area of exceedance is located at the boundary with a property that is completely surrounded by the RRP site (internal to the site), where there are no human receptors. Modeled particulate concentrations at all other locations outside the RRP site, including at all sensitive receptors, are all well below single facility criteria and even with inclusion of the background are well below MOE ambient air quality criteria.

The dominant source of SO_2 emissions is the cyanide destruction system located within the process plant. The 24-hour average concentrations were predicted to be below MOE criteria at all off property locations. Even with the inclusion of background levels of SO_2 (Table 8 in AMEC 2013d), SO_2 is still significantly below ambient air quality criteria.

In the leaching process, the pH is maintained above 10.5 to minimize hydrogen cyanide (HCN) releases; however, some HCN emissions will still occur. These HCN emissions were calculated, and it was found that the local air quality standard for HCN (8 µg/m^3 for the 24-hour averaging time; MOE 2012a) was achieved at all off property locations.

There were no exceedances of CO or NO_x predicted off property, as all ground level air concentrations were determined to be lower than the respective standards for all averaging times. Even with the inclusion of background levels of NO_x (Table 8 in AMEC 2013d), NO_x is still significantly below ambient air quality criteria.

Earth crustal levels of certain metals will be present in the particulate matter that is generated as fugitive dust on the site and dispersed offsite. The dust is assumed to have the same metals composition as the mine rock used in road construction and the unprocessed ore. Trace metals are also likely to be released from various ore processing activities such as crushing, conveying and ore handling. The measures that are designed to control fugitive dust releases and effects will also serve to control the emission and deposition of metals that are components of the dust.

For the key metals identified (for example arsenic, cadmium, lead and mercury), the maximum offsite effects were estimated through speciation of the particulate matter (fugitive dust), assuming that the dust is of the same composition as the ore or mine rock. Using the maximum of the 90th percentile concentration of these metals in the mine rock and ore, the predicted offsite concentrations for the key metals were all less than their respective local air quality standards (MOE 2012a).

7.3.1.2 Government, Aboriginal and Public Comments and Concerns

No specific concerns have as yet been expressed by government agencies, Aboriginal groups or other stakeholders in relation to air quality, other than to state that these aspects should be considered in the EA. One local resident expressed concern about possible air quality (and sound) effects on his honey farm operation; RRR is working with this resident. RRR acknowledges these concerns and that other concerns might be expressed through the EA consultation phase, and has taken measures in the RRP plan to mitigate air emissions, particularly dust through best management practices.

7.3.1.3 Mitigation

The principal air quality parameters of concern emitted from the RRP site will be dust and metals associated with the following sources:

- Road dust associated with haul trucks transporting mine rock and ore from the pit;
- Dust from overburden, ore and mine rock stockpiles;

- Dust from the primary crusher; and

- Dust from mining activities within the open pit (drilling, blasting and loading of haul trucks)

A fugitive dust best management practices plan will be prepared to identify all potential sources of fugitive dusts, outline mitigative measures that will be employed to control dust generation, and detail the inspection and recordkeeping required to demonstrate that fugitive dusts are being effectively managed.

Dust emissions from roads and mineral stockpiles will be controlled through the application of water sprays. At full production, two water trucks with water sprays and cannons will be at site for this purpose. Alternatively, surfactants, such as calcium chloride, will be used to control dust, particularly on roads, provided that such applications are acceptable to the MOE. Water cannon sprays discharged by mobile trucks will be employed to control dust emissions from stockpiles and aggregate handling activities. If the operations and fugitive dust best management practices plan require further mitigation, dedicated water sprays at active stockpile areas will be employed. At mine closure, all exposed dust sources will be revegetated and progressive reclamation will be used wherever practicable to better control dust emissions from the mineral waste stockpiles and tailings management area.

All site roadways will be maintained in good condition, with regular inspections and timely repairs to minimize the silt loading on the roads. The road maintenance procedures will be incorporated into the RRP fugitive dust best management practices plan.

The facility and emission points will be designed to allow for good atmospheric dispersion, and dust control equipment such as bag houses, bin vents, and water sprays, will be utilized where necessary to prevent excessive emissions at the crusher and process plant.

A preventive maintenance program will be employed that encompasses all pollution control equipment, diesel-fired engines (vehicle, equipment, and standby power generating), and all processes with the potential for significant environmental effects.

Air emissions from diesel consumption associated with mobile heavy equipment operations will be controlled through use of:

- Low sulphur diesel;
- Equipment meeting Transport Canada off road vehicle emission requirements; and
- By means of effective equipment maintenance.

The proposed dust control measures are based on current industry best management practices; are known to be effective and are not prone to failure. The fugitive dust best management practices plan includes opportunities for adaptive management, in which the intensity of the control measures may need to be increased if site inspections and monitoring indicate that current measures are insufficient to prevent offsite dust effects. Use of low sulphur diesel is also predictably effective for reducing sulphur emissions from on site diesel fuel consumption.

7.3.1.4 Residual Environmental Effects

With application of mitigation measures as proposed, including development and application of a fugitive dust best management practices plan and follow-up monitoring, maximum concentrations of NOx, HCN, key metals, PMtot, PM10 and PM2.5 at the property line, or near the site not currently under the control of RRR, were all predicted to be below their respective MOE local air quality standards for site specific emissions (MOE 2012a). Air emissions during other project phases, such as construction and decommissioning phases would be at lower low levels than those predicted for the operations phase.

7.3.1.5 Significance

The potential effect associated with air emissions is an increase in the airborne concentrations of the key pollutants in the vicinity of the RRP site, has the potential to adversely affect air quality.

Air emissions from the mining activities and the ore processing facility will increase the airborne concentrations beyond the baseline levels. Provided that the RRP site is operated using current best management practices for fugitive dust control, and the other design and mitigation measures are implemented to minimize air emissions of the other key parameters as proposed herein, the RRP site activities are not expected to cause significant air quality effects.

With the appropriate mitigation measures, the magnitude and geographic extent of any effects on air quality are considered to be low (Level I) at all locations outside the RRP site area. The duration of the effect on air quality is medium-term (Level II), as there will be emissions to the atmosphere throughout the operational life of the RRP site; and the effects are readily reversible, as the air quality effects will cease once the mining and ore processing activities cease and on reclamation.

The overall effect of air emissions, including fugitive dusts, is therefore considered to be not significant, as the effects are limited in geographic extent, limited in magnitude, and reversible.

7.3.2 Greenhouse Gases

7.3.2.1 Environmental Effects

Greenhouse gases are considered a large-scale global environmental concern as opposed to a project-scale airshed concern. There are no health based or local environmental impact based standards that could be used to assess the acceptability of the proposed emissions for the RRP.

Consequently, the RRP has been designed according to industry standards and best operating practices to minimize the potential for the emission of GHGs to the extent practical.

Project-related greenhouse gas emissions (principally CO_2) will mainly derive from on site mobile heavy equipment fuel combustion, explosive detonation, and from offsite power generation. It is understood that the coal power plant in Atikokan is being converted for wood pellets (Foresttalk 2013). Additional fuel consumption and CO_2 emissions will derive from transporting persons and materials to the RRP site, particularly during the construction phase.

The nature of the RRP implies a relatively low carbon-footprint. GHG emissions from combustion (principally mobile heavy equipment operation) are currently best minimized through the use of efficient equipment. No practical methods of capturing and sequestering GHGs from mobile heavy equipment combustion emissions currently exist. GHG emissions for power production have been reduced to the extent practicable by using grid power, as opposed to onsite diesel power generation.

An emissions forecast for the first complete year of operation at the facility was prepared, using the methodologies outlined in the Ontario Guidance Document to accompany Regulation 455/09 (MOE 2009a,b), and the Intergovernmental Panel on Climate Change Guidelines for National Greenhouse Gas Inventories Volume 2: Energy (IPCC 2006).

The emissions forecast included direct GHG emissions from the proposed facility, specifically the combustion of diesel fuel in the stand-by diesel generators and the heavy construction equipment. The annual forecast diesel fuel consumption was used to estimate the maximum annual GHG emission of the project. There is currently no standard quantification method for GHG emissions from explosives detonation but this is considered a relatively small contributor. Indirect emissions for offsite purchased power and transportation of material were not considered.

The estimated maximum annual GHG emission occurs during year 8 of the RRP operations (0.145 CO_2 equivalent Mt). This is equivalent to 0.06% of Canada’s 240 Mt/a target for GHG reduction; or approximately 0.02% of Canada's 2010 GHG emission (692 CO_2 equivalent Mt; EC 2013b). Other operational years range from 0.13 to 0.05 Mt of CO_2equivalent Mt.

The peak projected year for diesel fuel usage is year 8, with an estimated 43 ML of fuel consumed.

7.3.2.2 Government, Aboriginal and Public Comments and Concerns

Except as described below, no specific concerns have as yet been expressed by government agencies, Aboriginal groups or other stakeholders in relation to greenhouse gas concerns, other than to state that these aspects should be considered in the EA. One stakeholder expressed that greenhouse gas emissions should be assessed within the context of climate change, including any potential for carbon sequestration. RRR recognizes these concerns, and that other concerns might be expressed through the EA consultation phase, and has taken measures in the Project plan to limit greenhouse gas emissions.

7.3.2.3 Mitigation

Planning measures aimed at reducing fuel and power consumption for the RRP site include the following:

- Use of existing Ontario power generation and grid network power as opposed to onsite diesel generated power for the operation phase;
- Reducing transportation needs, and hence fuel consumption, through development of a compact site, and minimizing equipment movement;
- Using larger, more fuel efficient trucks for material transport;
- Using optimum insulation in buildings to reduce heat loss and heat recovery from equipment where practical; and
- Maintaining site equipment and vehicles in good working order through regular preventative maintenance.

Fuel consumption will be minimized because of the high cost of fuel for site use.

7.3.2.4 Residual Environmental Effects

With application of mitigation measures as proposed, the estimated annual GHG emissions during the project operations phase are expected to range from 0.05 to 0.145 CO_2 equivalent Mt, representing a maximum of 0.06% of Canada’s 240 Mt/a target for GHG reduction; and approximately 0.02% of Canada's 2010 GHG emissions (692 CO2 equivalent Mt; EC 2013b). GHG emissions during other project phases, such as construction and decommissioning phases, would be at lower low levels than those predicted for the operations phase.

7.3.2.5 Significance

Project-related greenhouse gas emissions (principally CO_2) will result from onsite fuel combustion and other mining and ore processing activities.

In terms of magnitude and geographic extent, the GHG emissions are considered to be of Level I significance, as they are less than 0.06% of the target CO_2 emission reduction for Canada. The effects will be continuous throughout the operation phase of the mine, as there will be emissions to atmosphere throughout the life of the project. The duration of the effect on air quality is therefore medium-term (Level II).

7.4 Sound and Vibration

7.4.1 Sound

7.4.1.1 Environmental Effects

The RRP site area is considered a Class 3 Area for sound reception (rural area with an acoustical environment dominated by natural sounds having little or no road traffic). The applicable MOE NPC-232 Guidelines (MOE 1995) for sound state that one hour sound exposures (L_{eq}) from stationary sound sources in Class 3 areas shall not exceed that of the background, where the background is considered to be the higher of:

- 45 dBA or background sound during daytime hours (7:00 to 19:00); and
- 40 dBA or background sound during the early evening (19:00 to 23:00) and nighttime (23:00 to 7:00).

Measured baseline sound levels were below the MOE exclusionary sound limits for a Class 3 Area. Applicable sound level limits are therefore the MOE exclusionary limits of 45 dBA for daytime and 40 dBA for evening and nighttime.

Sound emissions will vary over the life of the RRP from lower levels during construction and early phase operations, and increasing gradually to the projected peak in 2020. Beyond 2020 as the open pit continues to deepen and as the stockpiles produce increased sound shielding, sound levels will begin to decrease, and will decline further once open pit operations cease in about 2026. Sound modelling presented herein, is for the projected peak sound emission year of 2020. Extensive efforts have been made through an iterative process to reduce site generated sound emissions, including equipment optimization, equipment placement and controlling hours of operation for certain equipment types.

Construction activities for the RRP will include:

- Overburden stripping from the open pit;
- Construction of the process plant, ancillary buildings, transmission line and associated substation;
- Construction of the initial phase tailings management area dams and water ponds, other water ponds on site, site access and haul roads, pipelines and other such facilities; and
- Re-alignment of Highway 600 and construction of the east access road.

Construction activities are regarded by the MOE as temporary activities that are exempt from application of NPC-232 Guidelines (MOE 1995). These activities have consequently not been modelled, and in any event will be less intrusive to surrounding residences compared with operations level sound emissions which have been modelled. Nevertheless, RRR is sensitive to the potential effects of sound emissions on its neighbours during construction, and will undertake reasonable measures to manage sound emissions during this period.

Sound from mining operations at the RRP will derive primarily from open pit operations, and from associated mineral waste and ore, haulage and stockpiling operations. Contributing sound sources from these operations include primarily associated with blasthole drills and mobile heavy equipment operation (excavators, track bulldozers, front-end loaders, motor graders and onsite haul trucks). Underground ventilation fans will also contribute to site sound emissions. Sound emissions from the process plant and primary crusher are more limited and less important as contributing sound sources, as most of the plant equipment is enclosed within the plant buildings.

The sound assessment for the RRP site was conducted using Cadna/A produced by Datakustik GmbH, a computerized version of the International Standards Organization 9613 environmental sound propagation algorithms accepted by the MOE. In order to model the worst case, Year 2020 scenario for offsite exposures, all applicable sound sources were assumed to be operating simultaneously. The sound propagation model is in accordance with ISO Standard 9613, Part 1: Calculation of the absorption of sound by the atmosphere (ISO 1993); and Part 2: General method of calculation (ISO 1996).

In order to provide an accurate prediction of sound levels at particular receptors resulting from a specific source(s), the modelling took into account the following factors:

- Source sound power level and direction;
- Distance attenuation;
- Source-receptor geometry including heights and elevations;
- Barrier effects of the buildings and surrounding topography;
- Ground and air (atmospheric) attenuation; and
- Meteorological effects on sound propagation.

The significant sound sources considered in the model for the peak year (2020) included:

- Three blasthole drills;
- Two reverse circulation drills;
- Four excavators (two diesel powered and two electric powered);
- One wheel loader;
- Two graders;
- Six track bulldozers;

- Five truck routes;
- Three underground ventilation fans for the mining operations;
- One crusher;
- Two dust collectors;
- Four emergency generators (one, 2.5 MW; two, 1.5 MW; and one, 250 kW units); and
- Two substation transformers for the process plant and other auxiliary operations.

A continuous operating hour was assumed in the sound impact assessment. The site is expected to operate 24 hours per day, 7 days per week. The emergency generators will only be tested during daytime period (7:00 to 19:00). Hourly truck traffic counts for the line sources (the haul route) for the peak year were calculated based on the material movement required as per the RRP Preliminary Economic Assessment (BBA 2012).

Where preliminary equipment selections have been made, source sound levels were obtained from the equipment manufacturers. Where the design has not progressed sufficiently to provide equipment types or sizes, reasonable sound emission specifications were estimated and/or taken from databases for similar equipment. The sound sources considered in the assessment are presented in Table 7-5 and are shown in Figure 7-5. The sound model provides sound level contours that are expected at the site and in the surrounding areas.

A total of 18 representative sensitive points of reception (PORs) were identified and considered in the acoustic assessment. The PORs considered in the assessment are presented in Table 7-6 and shown in Figures 7-6 and 7-7. The receptor locations considered for all PORs were positioned at 4.5 m above grade as this elevation represents the most sensitive condition (the highest window level for a two storey house).

Resulting modelled sound contours, generated for the worst-case operation (Year 2020) for daytime and nighttime operations, are shown in Figures 7-6 and 7-7, and are summarized in Table 7-7 for specific PORs. The results indicate that the modelled sound levels are not expected to exceed the criteria limits, and the RRP operation is expected to be in compliance with the MOE NPC-232 sound guidelines.

7.4.1.2 Government, Aboriginal and Public Comments and Concerns

To date very limited concerns have as yet been expressed by government agencies, Aboriginal groups or other stakeholders in relation to sound at the RRP. Representatives from the Métis Nation of Ontario (MNO) asked about the potential effects of sound from blasting and haul truck operation, indicating that these aspects needed to be considered in the EA. A small number of local residents in the general vicinity of the proposed RRP expressed concern about the potential adverse effect that sound from the RRP may have on their enjoyment and use of their properties. As an example a couple of local residents stated that they experienced sound disturbance associated with mineral exploration activities at the RRP site. Another local resident expressed concern about the possible sound (and air quality) effects on his honey farm operation. RRR recognizes these concerns and that other concerns might be expressed through the EA consultation phase, is working closely with residents, and has taken measures in the RRP design to reduce sound and vibration emissions that will allow compliance with applicable MOE standards and guidelines.

7.4.1.3 Mitigation

Sound mitigation measures such as selection of quieter equipment are inherent to the current design of the RRP site and are reflected in the sound model predictions. The following mitigation measures are inherent in the modelling:

- Quiet mining trucks (CAT 793F XQ) will be used for material movement (sound power levels 112 dBA);
- Two of the three excavators proposed for the open pit are electric drive (8 dB quieter than the equivalent diesel units);
- Mitigated emergency diesel generators (85 dBA @ 15 m for 1.5 MW and 2.5 MW units and 65 dBA @ 15 m for 250 kW unit) with enclosures / silencers / mufflers are proposed, and the testing and maintenance operations of those units will be limited to daytime hours only (7:00 to 19:00); and
- RC drills will operate during daytime hours only.

Should the final equipment selections determine through detailed engineering and sound level assumptions made herein vary materially from those presented in Table 7-5, an updated assessment with the new information will be prepared as part of the detailed design and approvals application(s) for the RRP.

7.4.1.4 Residual Environmental Effects

The modelled sound contours for RRP site and surrounding receptors for most affected year (2020), shown in Figures 7-6 and 7-7, demonstrate compliance with applicable MOE NPC-232 Guidelines.

7.4.1.5 Significance Determination

The magnitude / geographic extent of predicted sound levels is considered a Level I effect: hourly A-weighted sound levels consistent with MOE Class 3 guidelines for rural areas at offsite receptors. The effect is medium term (Level II); is expected to occur regularly or continuously (Level III) for frequency, and is reversible at closure (Level I). The overall effect to offsite receptors is therefore considered to be not significant.

7.4.2 Vibration

7.4.2.1 Environmental Effects

The main source of vibration (ground borne) from mining operations at the RRP site is from blasting (explosives usage). Blasting is also associated with overpressure that is a shock wave generated during blasting. The maximum charge size per delay will be restricted to 1,000 kg to manage blast vibration and blast overpressure.

Vibration and overpressure levels from RRP open pit blasting were predicted using the MOE Blasting Sound and Vibration Prediction Model NPC-119 (MOE 1995). Using charge size per delay (explosive used in kg) and the separation distance between the blast location and assessment receptor, the absolute ground borne vibration and overpressure levels expected at the PORs were determined. The predictions are based on generic environmental and topographical conditions and no adjustments were made for site specific conditions. For the purpose of this assessment, the entire pit area was considered as the blasting location, and the distance from the outer perimeter of the open pit to the receptor was conservatively considered as the distance to the receptor. Since the blasting design is in the preliminary stage, a maximum charge size of 1,000 kg was used for this assessment. This approach was considered conservative for assessing vibration and overpressure from open pit blasting operations.

Blasting from underground operations was not assessed, as explosives use for underground will be a small fraction of that used in the open pit, and because blasting in the open pit and underground will not occur simultaneously.

For the blasting vibration and overpressure assessment, the same set of receptors was used as in the sound assessment. There are two sets of criteria provided in the MOE NPC-119 Guideline: cautionary limits and standard limits (MOE 1982). The cautionary limits are used in the assessment where no vibration and/or overpressure monitoring is expected; the standard limits are used where regular monitoring is expected during blasting operations. The blasting vibration and overpressure assessment for the RRP site was completed using cautionary limits of 10 mm/sec for ground borne vibration and 120 dBL for overpressure, as regular vibration and overpressure monitoring are not expected at the RRP site.

The equation for the overpressure calculation is governed by two conditions: in front of the working face (no screening), and behind the working face (with screening). In both cases, additional screening beyond the working face is not accounted for in the base equation. There are no such conditions applicable to ground borne vibration calculations.

Model predicted ground borne vibration and overpressure levels for the maximum charge size per delay (1,000 kg) planned for use at the RRP site are summarized in Table 7-8. The predicted vibration and overpressure levels are not expected to exceed the MOE NPC-119 cautionary limits of 10 mm/sec for ground borne vibration and 120 dBL for overpressure.

Therefore, the RRP is expected to be in compliance with applicable MOE guidelines. The vibration and overpressure setback contours for the maximum charge size to meet the guideline limits are presented in Figure 7-8.

7.4.2.2 Government, Aboriginal and Public Comments and Concerns

To date very limited concerns have as yet been expressed by government agency, Aboriginal groups or other stakeholders in relation to vibration at the RRP. RRR recognizes however, that concerns might be expressed through the EA consultation phase, and has taken measures in the RRP design to reduce vibration emissions that will allow compliance with applicable MOE standards and guidelines.

7.4.2.3 Mitigation

Blasting vibration and overpressure mitigation measures such as selection of open pit location and charge size have already been integrated in the modelling. These measures are reflected in the model predictions. As such the maximum charge size per delay for blasting is limited to 1,000 kg as the vibration and overpressure mitigation option. If the charge size is larger than 1,000 kg per delay, the vibration and overpressure levels emanating from RRP blasting operations will be reassessed in a detailed study to confirm that the predicted levels are within guideline limits.

7.4.2.4 Residual Environmental Effects

The predicted vibration and overpressure levels from blasting operations are expected to meet the Provincial criteria limits at the POR.

7.4.2.5 Significance Determination

The magnitude / geographic extent of predicted vibration and overpressure levels from blasting are considered a Level I effect. Predicted vibration and overpressure levels are not expected to exceed the MOE NPC-119 cautionary limits at offsite receptors. The effect is medium term (Level II); is expected to occur intermittently, possibly with some degree of regularity (Level II) for frequency, and is reversible at closure (Level I). The overall effect to offsite receptors is therefore considered to be not significant.

7.5 Minor Creek Systems

Local Creek systems within the NLSA are all tributaries of the Pinewood River including Westra Creek, Gallinger Creek, Blackhawk Creek, Clark Creek / Teeple Drain, West Creek, Marr Creek, Loslo Creek / Cowser Drain, Tait Creek, McCallum Creek and several other unnamed tributaries.

The creeks in general are small, typically less than 5 m in average width, less than 1 m in average depth and with flows of zero during dry periods. Subwatershed areas of these contributing creeks range from less than 5 km^2 for unnamed tributaries to 76 km^2 as in the case of Tait Creek (Figure 5-6). Habitat features of the local creeks are described as habitat types 3, 4 and 5 (Section 5.8.1), generally low gradient, low energy systems characterized by single to braided diffuse channels with wide, densely vegetated grass and sedge dominated floodplains, with frequent naturally impounded waterbodies such as beaver ponds. Fish communities within the affected creek habitats are typically warm water and cool water baitfish and other small bodied species (Table 5-24) considered common and widespread within the region.

Potential project effects are restricted to the NLSA Creeks in the immediate vicinity of the site, including the subcatchments of Loslo Creek / Cowser Drain, Marr Creek, West Creek and Clark Creek / Teeple Drain. There are no direct or indirect effects expected to local creek systems outside of this immediate catchment area.

7.5.1 Environmental Effects

Development of the RRP will result in potential impacts to local creeks and rivers due to direct habitat displacement (overprinting) and habitat modifications such as channel re-alignment; and more indirect pathways such as water taking and treated effluent discharge or a combination of the above. In general, the potential impacts to the aquatic environment and fish habitat that may require mitigation are as follows:

- Direct loss of habitat resulting from the infilling and loss of portions of creeks in the immediate footprint of the mine due to development of the tailings management area, the open pit and overburden and mine rock stockpiles, as well as other infrastructure elements associated with mine development (road crossings, pipeline crossings and outlets);

- Alteration of habitats due to the re-alignment or interception of some site watercourses to accommodate project infrastructure or to collect water for process plant and other usage;

- Potential water quality changes due to tailings management area and stockpile management and treated effluent discharge; and

- Potential indirect effects to habitat due to flow reductions in the Pinewood River resulting from creek runoff collection on site, groundwater interception by the mine workings (open pit and underground) and/or direct water taking from the Pinewood River (construction phase).

Local creeks and agricultural drains expected to be directly overprinted by the mine features in whole or in part, include from east to west, Clark Creek (Teeple Drain), West Creek, Marr Creek and Loslo Creek (Cowser Drain), for a combined aquatic habitat displacement or alteration of approximately 26 ha. The remaining upstream portions of these creeks not overprinted directly by mine facilities or infrastructure, will require flow diversion or interception to prevent the upstream flows from interacting with the developed mine areas. As a result a large proportion of the four creeks listed above will be directly impacted by the site footprint as shown in Figure 7-9 and summarized in Tables 7-9 and 7-10. The figure and table are based on the current project design, and it is acknowledged that the areas may be modified as the project design progresses.

Potential effects on creek flows and water quality will vary from system to system. The tailings management area and all stockpiles will incorporate perimeter ditching to intercept runoff and seepage to enable redirection of the drainage to the RRP water treatment systems and ensure appropriate water quality standards are met prior to discharge to the environment. It should be noted that the underlying low permeability clay will provide for both enhanced containment as well as more effective collection of any seepage.

A description of the individual creek areas and potential effects associated with the mine are provided below.

7.5.1.1 Loslo Creek / Cowser Drain

Fish Habitat Displacement or Alterations

Loslo Creek which becomes the Cowser Drain in its lower reaches (in the vicinity of the constructed wetland) accounts for the single largest area of impact (19 ha over 12.5 km of channel length), as almost the entire drainage area of the watercourse will be collected by either the tailings management area, or the constructed wetland. The remaining length of creek (approximately 1.2 km) downstream of the wetland feature will consist of a remnant section of the Loslo Creek / Cowser Drain. Although large wetted areas will remain in the system, within the tailings management area and more specifically in the wetland feature, the existing habitat will be considered completely displaced for the purpose of this assessment. The use of the constructed wetland area by fish during operation will be discouraged by placing entrance barrier(s), as it will be part of the RRP water treatment system.

Water Flow Effects

Approximately 1.2 km of Loslo Creek / Cowser Drain will remain downstream of the constructed wetland to its confluence with the Pinewood River. This channel will experience an altered flow regime due to the capture of all Loslo Creek flows upstream. The channel is however, expected to remain active during the majority of the year, due to flow augmentation from the wetland discharge and a diversion of West Creek flows into the drain channel downstream of the wetland (Figure 4-1). The amount of water directed to the West Creek diversion from the West Creek Pond during the year will vary depending on annual precipitation conditions and the water take needs of the RRP. The only water taking from West Creek currently proposed would be for fresh potable water (estimated at 150 m^3/day) and as such the flows of West creek are considered essentially unchanged. Except during very low runoff years, the discharge of treated excess water through the constructed wetland will be maintained at a proposed nominal rate of 10,000 m^3/day during all months other than February and March, in order to provide a sustained and sufficient flow within the channel to maintain all resident fish life stages. Although wetland discharge is proposed for December and the first half of January in most years depending on climate limitations, the amount will be somewhat reduced from the 10,000 m^3 per day to account for naturally lower flows during those months. Further details are provided in Appendix W-1.

Water Quality Effects

The remaining Loslo Creek / Cowser Drain channel downstream of the constructed wetland will receive effluent discharge from the tailings management area through the constructed wetland, as well as collected runoff and seepage from the overburden and west mine rock stockpile. The wetland will receive both treated water from the water discharge pond, as well as seepage from the south tailings management area dam.

In most years, the majority of the clarified, water management pond effluent will be discharged to the Pinewood River by way of the constructed wetland, reporting through Loslo Creek / Cowser Drain. Water from the water management pond will be delivered to the wetland at a nominal rate of approximately 10,000 m^3 per day to help maintain downstream channel and Pinewood River flows, as well as to ensure that the water treatment capacity of the constructed wetland is not exceeded.

Treated effluent passing through the constructed wetland is expected to meet limits based on Provincial Water Quality Objectives (PWQO) equivalent values for the protection of aquatic life, prior to mixing with the Pinewood River (Section 7.6.1.2). Effluent discharged from ditching / ponds(s) associated with the overburden and west mine rock stockpiles is also expected to meet limits based on equivalent PWQO values, as the function of the ditching / pond(s) will be primarily for suspended solids control.

Further details are provided in Appendix W-1.

7.5.1.2 Marr Creek

Fish Habitat Displacement or Alterations

Marr Creek will be entirely overprinted and encompassed by the tailings management area and the overburden and west mine rock stockpile. In all approximately 6 km of channel will be displaced with an approximate habitat area of 2.7 ha. Although there will be a small remnant section of channel between the overburden stockpile and the Pinewood River, the habitat function of this area will be impaired due to the loss of the upstream watershed, and as such has been included in the calculation of displaced habitat.

Water Flow Effects

RRP development will effectively result all of the Marr Creek flows being collected and managed within the tailings management area and stockpile drainage collection systems. The effect of this flow capture on the Pinewood River is described in Section 7.6.

Water Quality Effects

The RRP site development will result in all of the Marr Creek flows being collected and managed within the tailings management area and stockpile drainage collection ditches.

7.5.1.3 West Creek

Fish Habitat Displacement or Alterations

West Creek currently drains through the footprint of the proposed open pit and plant site. The creek will be impounded at the north end of the open pit to establish the West Creek pond. The pond will be used to intercept and divert water through the West Creek diversion channel with the exception of a small quantity (approximately 100 to 200 m^3/day) which will be used as a fresh potable water source for the RRP. The impoundment of the channel at mid reach will effectively terminate flows to the downstream section of the creek that will be displaced by the open pit. A tributary to West Creek (Tributary 1) will be similarly impounded upstream of the open pit and flows diverted into the West Creek pond (Figure 4-1), with the remainder of the tributary displaced by the pit footprint. In total, the effect to the West Creek channel will be the loss of approximately 4.5 km of channel length having a habitat area of approximately 2 ha.

An east access road will also cross one of the headwater tributaries of West Creek (West Creek and Tributary 3) to provide local access between Highway 71, Gallinger Road and Roen Road north of the mine site. The West Creek diversion channel will also be crossed by the main haul road south of the tailings management area. The road crossings will be constructed using best management practices such as embedded culverts and appropriately sized structures, to maintain hydraulic capacity and fish passage that will mitigate potential negative effects.

The West Creek Pond will collect and divert flows to the west around the site. All water with the exception of the minor potable water taking will flow through the West Creek pond and into the West Creek diversion channel. Although the West Creek pond water level will fluctuate due to periods of low flow considered typical of the system, the diversion channel and the pond will be designed to enhance fish refuge during dry periods, and to maintain connectivity and fish passage between the Pinewood River and the upper reaches of West Creek.

Water Flow Effects

Other than a small water taking of approximately 100 to 200 m^3/day for potable water, all of the flow intercepted by the West Creek Pond will be diverted westerly through the West Creek diversion channel into Loslo Creek / Cowser Drain downstream of the constructed wetland.

Water Quality Effects

Effluent discharges to the West Creek diversion channel will be limited to treated runoff from sediment pond #1. This sediment pond will collect and treat runoff from the northern portion of the overburden and west mine rock stockpile. Otherwise, the West Creek diversion channel will be kept separate from the constructed wetland and the overburden stockpile / west mine rock stockpile, to ensure that creek waters do not mix with site contact water, other than that discharged in a controlled manner from sediment pond #1. The general ground topography slopes towards the wetland feature, so there is no concern for seepage or runoff from the wetland treatment area entering the diversion channel. As a conservative measure, the excavated material from the diversion channel will be used to construct a berm between the constructed wetland and the diversion channel. Similarly, a berm will be constructed between the overburden / west mine rock stockpile ditch and the diversion channel.

7.5.1.4 Clark Creek / Teeple Drain

Fish Habitat Displacement or Alterations

The upper portion of Clark Creek (upstream of the East Mine rock stockpile) will be intercepted and diverted through the Clark Creek diversion channel to a tributary of the Pinewood River (Figure 4-1). An impoundment (Clark Creek pond) will be developed to create sufficient water elevation to redirect flows into the diversion channel. The channel downstream of the diversion will be displaced by the east mine rock stockpile and the mine rock pond. This represents a channel length of approximately 3.8 km and approximately 2.2 ha of displaced habitat. Although there will be a small remnant section of channel between the stockpile and the Pinewood River, the habitat function of this area will be impaired due to the loss of the upstream watershed, and as such has been included in the calculation of displaced habitat.

Water Flow Effects

There will be no changes to the flow in the existing channel upstream of the Clark Creek diversion channel. The entire channel below the diversion will be displaced by the east mine rock stockpile and the mine rock pond, and all drainage from this area will be captured by the stockpile drainage collection ditches and directed to the mine rock pond. The effect of this flow capture on the Pinewood River is described in Section 7.6.

Water Quality Effects

There will be no proposed discharge of excess site runoff or treated excess waters to the Clark Creek channel upstream of the site. The entire remaining channel and drainage downstream of the diversion channel will be collected and managed through the RRP water management system prior to controlled release.

7.5.2 Government, Aboriginal and Public Comments and Concerns

The MNR has provided comments regarding baseline data collected to date and its application to support habitat compensation planning, as led by Fisheries and Oceans Canada (DFO), including future environmental effects monitoring. Having developed a technical working group approach to baseline and project planning, RRR and AMEC have met with the MNR, DFO and MOE on numerous occasions to discuss how to best minimize negative impacts.

Government agencies, Aboriginal groups and the public have all expressed concerns regarding RRP effects on water quality and quantity, and fish populations. Concerns were related to water treatment processes, outlet locations for water returned back to the environment as well as expected minimum / maximum flow rates. The public has requested access to water quality and quantity information during the monitoring program. RRR recognizes these concerns and has been transparent with both the level of baseline assessment as well as the program results. RRR has taken measures in the RRP plan to reduce adverse environmental effects to creeks and fish communities through the development of effective mitigation and contingency strategies.

7.5.3 Mitigation

The principal mitigation measures proposed to limit short and long term adverse effects to local creeks include the following:

- Development of a compact site to limit the areal extent of disturbance to creeks, and to limit the overall areas of site contact water that requires management;
- Avoidance of more sensitive habitats of the Pinewood River to the extent practicable;
- Collection and diversion of creek flows around the mine and related facilities and infrastructure where possible, using channels designed to provide fish habitat and fish passage;
- Design infrastructure including pipeline crossings and outfalls, and road crossings using best management practices to minimize disturbance to the existing creeks;

- Implementation of collection ditches and water management systems designed to collect, monitor and treat as necessary, runoff and seepage from the site that may result in water quality degradation in accordance with Metal Mining Effluent Regulation and anticipated Provincial approval requirements; and

- Active revegetation and encouragement of natural revegetation / recolonization of disturbed areas as part of progressive reclamation during operation and at mine closure, to minimize the length of time areas are exposed to erosion and sediment transport.

A Fisheries Working group consisting of the RRP team, DFO and MNR was formed in mid-2012 to develop a No Net Loss Plan and compensation strategy to offset unavoidable effects to fish habitat. Through a collaborative process initiated in mid-2012 with First Nations, Township of Chapple, as well as the DFO and the MNR a fish habitat offset framework was developed. A blended offset strategy of watershed restoration with like for like habitat compensation is proposed. The No Net Loss Plan and compensation strategy uses a habitat conversion methodology to convert the square meters of habitat loss into habitat units, based on the character and condition of the affected habitats and the fish species present. These habitat units as shown in Tables 7-9 to 7-11 will be used to balance the value of habitat improvements against the habitats affected or lost due to the development of the RRP. Further detail is provided in Appendix X-1. Draft No Net Loss Plans are provided in Appendices X-2 and X-3.

The principal means of mitigating receiving water flow effects is the proposed high rate of site water reclamation to provide water for process plant and other needs. This includes recycling the treated process plant effluent discharged to the tailings management area, and re-use of the contact water collected from the various stockpile and seepage collection systems.

The high rate of recycle reduces RRP freshwater demands to the extent that the only fresh water source proposed is from the West Creek pond for potable water supply. All other water demands are expected to be met by capturing and reusing the effluents and contact water within the site footprint. The effects on the Pinewood River are described in Section 7.6.

Water quality effects will be managed by diverting all RRP site contact water, directly or indirectly, to the tailings management area. Operation of this facility and its expected resulting treated excess water discharges are described in Sections 7.6. The only exception to this will be runoff collected by sediment ponds #1 and #2, that will be discharged directly to the West Creek diversion (sediment pond #1) or lower Loslo Creek / Cowser Drain (sediment pond #2).

7.5.4 Residual Environmental Effects

Development and operation of the RRP site will result in the net loss or alteration of approximately 27 ha of local creek and agricultural drain habitat. A strategy to offset the expected losses and alterations has been developed in cooperation with DFO and MNR to achieve a No Net Loss condition. The offset strategy consists of both offsite watershed restoration, and onsite like for like habitat replacement. Watershed restoration initiatives involve offsite stream restoration projects within the overall Pinewood River watershed, focused on improving the overall water quality and productivity of the watershed as a whole. Like for like habitat creation is the development of similar habitat on site that mimics or improves upon habitat conditions that have been displaced or otherwise lost due to the RRP. Some like for like habitat creation is possible during site development, through naturalizing creek diversion channels and pond areas associated with the West Creek and Clark Creek diversions, that may result in a significant portion of the fish habitat offset requirements.

The final No Net Loss Plan developed for the RRP will ensure that an appropriate level of habitat restoration is implemented to offset the unavoidable effects of the RRP on fish habitat and achieve a condition of no net loss to fisheries.

7.5.5 Significance Determination

While there are no lakes within the RRP footprint, the disturbance to RRP area creek systems is considered to be high in the immediate site footprint, with approximately 72% of the available creek habitat in the four affected creeks being displaced or altered. On a larger scale the area of disturbed watershed area associated with the four creeks (approximately 25 km^2) accounts for 9.3% of the NLSA (270 km^2 area) and only 3.6% of the 690 km^2 NRSA. Although the effects will be permanent for much of the displaced creek habitats, the effects will be offset during the life of the RRP through the implementation of the ultimate No Net Loss Plan.

The magnitude / geographic extent of adverse effects to the Pinewood River aquatic environment is therefore considered to be a Level I effect: effect considered to be minor, and/or solely confined to RRP lands (and not having a significant effect on sport or commercial fisheries), and will be compensated in accordance with *Fisheries Act* requirements. The effect is long term (Level III); and is expected to occur regularly or continuously (Level III) for frequency. The effect is not reversible at closure (Level III), but it will be compensated for, to offset the effect. As such, RRP-related effects on local creek systems and their habitats are considered to be not significant.

7.6 Pinewood River

7.6.1 Environmental Effects

7.6.1.1 Water Flow Effects

Once fully operational, a collective watershed area of approximately 21 km^2 will flow directly or indirectly to the tailings management area (Section 4.8). This collective 21 km^2 watershed area will consist of the following catchments:

- Upper Loslo Creek;

- Most of Marr Creek;
- Lower Clark Creek (including the Teeple Drain); and
- Portions of the West Creek catchment that will drain to the process plant area and to the open pit area.

System water losses, beyond those that currently occur in the natural state will include water stored permanently in the tailings voids (2.59 Mm^3/a), evaporative water lost in the process plant (0.15 Mm^3/a), and water used for dust suppression (0.26 Mm^3/a; Table 7-12). Additional water added to the system will be limited to groundwater intercepted by the open pit and underground workings (1.24 Mm^3/a).

Collected waters that are not lost or added to the integrated tailings management area water management system as described above, will be returned to the Pinewood River either as seasonal water management pond discharge to the Pinewood River just downstream of the McCallum Creek outflow, or as seasonal water management pond discharge to the Pinewood River at the Loslo Creek outflow, by way of the constructed wetland.

The effects of the RRP integrated water management system including water capture and discharge on the Pinewood River flows, will depend on river flow regimes (average flow year; low flow year, 5th percentile condition; high flow year, 95th percentile condition), and on the RRP development phase (represented by early phase, Year 2; mid phase, Year 7; and late phase, Year 15). It is expected that there will be a surplus of treated water in the system requiring controlled discharge to the Pinewood River under all conditions, per Table 7-12 (Operating tailings management area Discharge values). This surplus is expected to occur despite considerable recycling and water losses to storage in the system, because of added water intercepted by the mine workings, and the development of enhanced site runoff conditions. Relative to the latter, as the RRP site is developed, the general site area is expected to shed runoff more effectively, resulting in less water lost to natural evapotranspiration processes. For example, total annual runoff during average and 5th percentile low flow years is expected to increase from 195 mm and 66 mm in the baseline condition respectively, to 285 mm and 117 mm respectively at full development. Runoff in the current baseline condition is influenced by the low gradient, micro topographic conditions and associated wetlands that act to enhance evapotranspiration.

The volume of discharge during high runoff years will be constrained by system pump and water quality treatment capacity (residence time). This will result in additional water be temporarily stored in the tailings management area pond during high runoff years. This will result in a proportionately higher volume of treated effluent being released to the Pinewood River during low flow years than in higher flow. Percentage flow reductions in the Pinewood River will therefore be lowest during low runoff years and highest during high runoff years. The net effect will be to better maintain Pinewood River flows during low flow years when water is needed to maintain fish habitat, and to proportionately reduce Pinewood River flows during high flow years when water to maintain fish habitat is less critical (Table 7-13).

The Pinewood River has limited baseflow due to the prevalence of clay substrates in the area. Consequently, the river can experience extreme low to zero flow conditions in the late summer and early fall during drought years, and during the mid to late winter (Section 5.6). During these drought periods, the flow contribution of local minor creeks / RRP site catchments (Loslo, Marr, West and Clark Creeks) is negligible. By purposefully adding treated water to the Pinewood River through the constructed wetland during these periods as proposed, it is possible to improve river flows during drought periods compared with the base condition, by holding back water in the tailings management area system during higher flow conditions. The only months where it will not be practical to add water to the Pinewood River through the constructed wetland during low flow periods, will be in mid to late winter. Water added to the constructed wetland during such periods would simply accumulate as ice build-up. The flow contribution of local RRP catchments to the Pinewood River during the mid to late winter is effectively zero in any event, such that integrated water management proposed, will not materially change Pinewood River flows at such times.

Flow effects to the Pinewood River are assessed below for four locations (Pinewood River above Loslo Creek, Pinewood River below Loslo Creek, Pinewood River below McCallum Creek and Pinewood River below the Kishkakoesis River); for three flow regimes (average flow, 5th percentile low flow and 95th percentile high flow); and for three project time periods (years 2, 7 and 15 of operations).

Pinewood River above Loslo Creek

The Pinewood River above the existing Clark Creek and Loslo Creek has a watershed area of 53 km^2 and 90 km^2, respectively. During operations approximately 9.3 km^2 of this watershed area will be intercepted by mine development features (open pit, east mine rock stockpile and the plant site area), the runoff from all of which will be routed directly or indirectly to the tailings management area. In addition, West Creek, which enters the Pinewood River upstream of Loslo Creek and Marr Creek, will be diverted such that in future it will enter the Pinewood River at Loslo Creek. Portions of the original Marr Creek drainage will also be directed further downstream to the Loslo Creek outflow area. As a result, an estimated approximately 8.1% to 34.2% of the Pinewood River watershed between the current Clark Creek and Loslo Creek outflows will essentially be permanently removed from the Pinewood River (Appendix X-1). This removal is directly proportional to watershed areas. The effect will therefore be independent of the RRP development phase and runoff regime. An assessment of the monthly effects of the flow changes on wetted width and depth between Loslo Creek and Marr Creek (where the impact is greatest) is provided in Appendix X-1. Fish habitat compensation may or may not be required to offset this flow loss (Appendix X-1) and will be determined by DFO during the course of the RRP assessment.

Pinewood River below Loslo Creek

Flow reduction effects to the Pinewood River below Loslo Creek / Cowser Drain are shown in Table 7-13. Flow loss effects are directly related to watershed area changes, and to the rate of water return to the Pinewood River through the constructed wetland, estimated at 2.4 Mm^3 annually during average annual and 95th percentile high runoff conditions, and at lesser rates during low flow conditions.

The resultant annualized reduction in Pinewood River flows at this location are calculated at 8.01% and 13.97% for the average and 95th percentile high flow conditions, respectively; and from 9.93% to a net increase of 4.59% for the 5th percentile low flow condition, depending on the year of operation.

Expected monthly changes to Pinewood River flows for this location under average, 5th percentile and 95th percentile flow conditions are provided in Appendix W-1, relative to the base zero condition. An assessment of the monthly effects of the flow changes on wetted width and depth for an average flow year in Year 2 of operations is provided in Appendix X-1.

Pinewood River below McCallum Creek

Pinewood River flows increase substantively below the McCallum Creek outflow, as McCallum Creek and Tait Creek enter the river near this location, expanding the natural watershed to 207 km2. Pinewood River flows at this location will be influenced negatively by runoff losses at the RRP site due to runoff capture and site operations; and positively by water released back to the Pinewood River through the constructed wetland and by direct pipeline discharge from the water management pond.

Predicted monthly and annual flow changes to the Pinewood River are provided in Appendix W-1 for operations years 2, 7 and 15, including graphical presentations. An assessment of the monthly effects of the flow changes on wetted width and depth for an average flow year in Year 2 of operations is provided in Appendix X-1. The amount of water returned to the Pinewood River increases as the RRP footprint develops, because of increasing runoff coefficients as the landscape changes. Over the life of the mine, annual river flows are expected to change from -3.45% to +0.30% for the average flow condition; from -5.09% to +2.35% for the 5th percentile low flow condition; and from -4.62% to -2.25% for the 95th percentile high flow condition (Table 7-13). The greatest net positive effect occurs in low flow years in later mine life because the annual water return through the constructed wetland has a greater proportional effect during these conditions.

Pinewood River below Kishkakoesis River

The Pinewood River watershed has an area of 460 km^2 below the Kishkakoesis River outflow. Flow percentage changes for the Pinewood River at this point follow a similar pattern to that described above for the McCallum Creek outflow location, except that the flow changes are proportionately smaller at the Kishkakoesis River outflow location because of the expanded Pinewood River watershed at this location.

A monthly assessment of predicted flow conditions is provided in Appendix W-1. Overall flow changes at the Kishkakoesis River on an annual basis are shown in Table 7-13, with the effects (flow increases and decreases) being less than 2.5% in all scenarios. An assessment of the monthly effects of the flow changes on wetted width and depth for an average flow year in Year 2 of operations is provided in Appendix X-1.

7.6.1.2 Water Quality Effects

The effluent discharge strategy for the RRP is based on achieving the PWQO for the protection of aquatic life or other scientifically defensible criteria, in the receiving water (the Pinewood River) under all flow conditions, while minimizing flow reduction effects on the Pinewood River to maintain fish habitat (Section 4.12.6). To achieve this discharge strategy, two final effluent discharge points are proposed for tailings management area discharges:

- Through the constructed wetland to the Pinewood River at the Loslo Creek outflow (via lower Loslo Creek / Cowser Drain); and

- Directly to the Pinewood River just downstream of the McCallum Creek outflow, by pipeline.

Under typical operating conditions, the majority of the treated effluent will be released higher up in the Pinewood River watershed through the constructed wetland, with the remainder being discharged by pipeline further downstream in the system to the Pinewood River downstream of the McCallum Creek outflow. Figure 7-10 shows a schematic of the flow arrangements and typical annual average discharge rates at the two locations.

Aged water management pond effluent will be discharged through the constructed wetland during all months of the year, except February and March (Table 7-14). The logic behind the discharge regime is as follows:

- Effluent discharged during April and May will occur when the biological reactivity of the wetland is low, but the effluent being released to wetland from the water management pond will be of very high quality as it will have normally been aging without new effluent input from the tailings management area pond since the end of August of the previous year. Pinewood River assimilative capacity is also at its maximum during April and May when flows are highest.

- Effluent discharged to the constructed wetland in the summer months (June through August) will be of lesser quality, as discharge from the water management pond to the wetland will occur when aged effluent from the tailings management area pond is being actively discharged to the water management pond. The wetland assimilative processes are greatest in the summer months which will offset this limitation.

- Effluent discharge through the constructed wetland in the fall months and into the early winter will have undergone more extensive aging in the water management pond, without new input from the tailings management area pond, such that reduced levels of biological activity in the constructed wetland at this time will be acceptable as the influent water quality will be better.

In deep winter, discharge through the constructed wetland will be discontinued, as any such discharge will freeze in the wetland and not provide benefit.

It is proposed that final effluent from the constructed wetland meet the water quality objectives and limits shown in Table 7-14. The proposed effluent objectives, for Ontario Regulation 560/94 and related parameters, are based on the development of scientifically-based protection of aquatic criteria developed from application of US EPA hardness equations in the case of copper, lead, nickel and zinc; and on the absence of salmonid (trout) species for free cyanide. The toxicity of copper, lead, nickel and zinc to aquatic life is a function of hardness, where hardness reduces metal toxicity by inhibiting metal uptake by aquatic organisms.

Proposed final effluent objectives (as monthly averages) for the constructed wetland discharge to the environment shown in Table 7-14 are rounded modified receiver targets. It is proposed that final effluent limits (as monthly averages) be set at twice the objective values, recognizing that the receiver will generally provide some level of assimilation even under low flow conditions, and that hardness effects become more pronounced at lower receiver flows.

The release of water management pond effluent to Pinewood River downstream of the McCallum Creek outflow would occur during the spring and fall, to take advantage of extended aging in the tailings management area pond and water management pond, and higher receiver assimilative capacity. On average mixing ratios in excess of 5:1 (receiver to effluent flows) are expected for this discharge, including provision for effluent loading released upstream through the constructed wetland (Table 7-15).

Proposed effluent objectives / limits for the pipeline discharge to the Pinewood River at McCallum Creek are the following:

- Final effluent meets modified receiver target objectives defined in Table 7-14 for all Provincial Environmental Compliance Approval (ECA) parameters, allowing discharge without restriction to a maximum limit of 50,000 m^3/d; or

- Undertake loading calculations for final effluent parameters which do not meet modified receiver target objectives.

If one or more Provincial ECA parameters do not meet the first criterion (all parameters consistent with modified receiver targets), then critical receiver to effluent mixing ratios would need to be attained as per the second criterion, to ensure that modified receiver target objectives were attained in the Pinewood River (Section 4.12.6; Appendix W-1).

The critical aspect of using the loading-based approach is the achievement of rapid mixing in the receiver, as the loading-based approach assumes instantaneous mixing. Various means are available for achieving rapid mixing, including: in-channel structures positioned to generate turbulence within focused mixing zones and various types of diffuser arrangements. Details of a preferred mixing arrangement are still under development and will be proposed at the environmental approvals stage. The achievement of rapid and efficient mixing will also be important for that portion of the final effluent discharged to the Pinewood River by way of the constructed wetland.

Consequently, irrespective of whether the final effluent is discharged from the water management pond through the constructed wetland or by pipeline downstream of McCallum Creek, it is fully expected that protection of aquatic life equivalent values will be maintained in the Pinewood River at all times. There will consequently be no expected adverse water quality effects to aquatic life in the Pinewood River, or to aquatic life in the Rainy River or further downstream. Further details are provided in Appendix W-1.

7.6.1.3 Fish Habitat Displacement or Alterations

Potential physical effects associated with the Pinewood River are minor and relate primarily to the development of a new crossing of the re-aligned Highway 600, and a flood protection berm to be constructed to protect the open pit from flooding during a 100 year and greater storm event.

The RRP will require a new crossing of the Pinewood River to facilitate the re-alignment of Provincial Highway 600. Investigations of the crossing location were undertaken in accordance with the Environmental Guide for Fish and Fish Habitat (MTO 2009).

The crossing will consist of a multi-cell culvert or spanning structure, designed in accordance with the Provincial, Highway Drainage Design Standards (MTO 2008). The standards will ensure that the structure will be sized to the appropriate storm event and will not impede fish passage by maintaining existing velocities, depths and gradients. Spanning structures are typically clear spans designed to limit works in the water. If culvert structures are selected, they are embedded with natural substrates within the culvert to maintain a natural corridor through the crossing.

Providing that typical mitigation measures are incorporated into the crossing design and construction plan, these crossings do not usually result in a harmful alteration, disruption or destruction of fish habitat and do not require an authorization from DFO. The final assessment of the design and confirmation that the works will not be harmful will be completed following the principles of the Ministry of Transportation (MTO) / DFO / MNR Fisheries Protocol.

Adverse effects to fish habitat relating to site runoff capture, management and discharge per discussions above, are not expected. Some flow reductions are expected to the Pinewood River both at the site, between Clark Creek and Loslo Creek, and further downstream at the McCallum Creek inflow (Table 7-13). The expected flow reductions are modest downstream of the site, and with the proposed dynamic water management system, Pinewood River flows may be enhanced compared with the baseline condition during extreme low flow conditions when aquatic life is most stressed. If necessary, discharge through the constructed wetland can likely be further optimized to better maintain low flows in the Pinewood River.

Following mine closure, it will be possible to direct a major portion of the RRP site catchment flows directly to the Pinewood River. This will include runoff from the reclaimed tailings management area, as well as from major portions of the reclaimed stockpiles, with the exception of seepage from the east mine rock stockpile. Discussions will be held with the various government agencies to determine the optimal balance between maintaining Pinewood River flows and filling the open pit on an expedited basis.

7.6.2 Government, Aboriginal and Public Comments and Concerns

Government agencies, Aboriginal groups and the public have all expressed concerns regarding RRP effects on water quality and quantity, and fish populations. Concerns were related to water treatment processes, outlet locations for water returned back to the environments as well as expected minimum / maximum flow rates. The public requested access to water quality and quantity information during the monitoring program. RRR recognizes these concerns and has been transparent with both the level of baseline assessment as well as the program results. RRR has taken measures in the RRP plan to reduce adverse environmental effects to the Pinewood River and fish communities through the development of effective mitigation and contingency strategies.

The MNR has provided comments regarding baseline data collected to date and its application to support habitat compensation planning, as led by DFO, including future environmental effects monitoring. A fisheries working group consisting of the RRP team, DFO and MNR was formed in mid-2012 to develop the RRP No Net Loss Plan to address potentially impacts resulting from the Project. Having developed a technical working group approach to baseline and project planning, RRR and AMEC have met with the MNR, DFO and MOE on numerous occasions to discuss how to best minimize negative impacts. Comments from MNR and DFO regarding the Pinewood River flows and potential effects on habitat have been addressed during the working group meetings with the understanding that a summary of the existing and predicted flows within the river would be provided in the EA Report, along with a description of predicted water quality impacts.

RRR has taken measures to reduce adverse environmental effects to the Pinewood river through the development of a compact mine site and effective mitigation and contingency strategies. Development of various mine components will result in the unavoidable harm to fish and fish habitat, and the infilling of waters frequented by fish which requires the development and implementation of offsets (compensation) pursuant to the *Fisheries Act* (Appendix X-1). Further detail is provided in Section 15.2 and Appendices X-1 to X-3.

7.6.3 Mitigation

Mitigation measures that will be used to reduce potential adverse effects to the Pinewood River aquatic system will include the following:

- Extensive contact water recycling for process plant needs to reduce overall water demands and to minimize final effluent discharge volumes to the Pinewood River;
- Use of SO_2/Air treatment for cyanide destruction and heavy metal precipitation in the process plant followed by extended effluent aging in the tailings management area pond and in the water management pond;
- Use of a constructed wetland system for final effluent polishing of a portion of the discharge, to optimize final effluent quality, and to maintain receiving water flows during the summer, late fall, and early winter months;
- Optimization of water management discharge to minimize adverse effects to receiving water flows, to the extent practicable;
- Management of the site for ARD control during operations and following closure to prevent adverse water quality impacts to the Pinewood River;
- The DFO Freshwater Intake End-of-Pipe Guidelines will be followed as mitigation for potential fisheries effects associated with water intakes;
- Construction of the Pinewood River Highway 600 re-alignment crossing (bridge or culverts) in a manner that does not restrict fish passage;
- Maintaining current fish habitat productivity; and

- Implementation of an extensive monitoring plan for water quality and flow discharges, and receiving water aquatic life and habitat (Section 13).

These mitigation measures described are expected to be effective for their intended purposes and in many instances can be further optimized in response to monitoring data.

7.6.4 Residual Environmental Effects

Implementation of water flow and final effluent quality management, as described above, is expected to be fully protective of aquatic life in the Pinewood River. The system is also sufficiently adaptable, so that should unexpected concerns arise during mine operations or following closure, water management at the site can be further optimized.

7.6.5 Significance Determination

The magnitude / geographic extent of adverse effects to the Pinewood River aquatic environment is considered to be a Level I effect: effect considered to be minor, and/or solely confined to Project lands. The effect is long term (Level III); is expected to occur regularly or continuously (Level III) for frequency, and is reversible at closure (Level II). Project-related effects on the Pinewood River system are therefore considered to be not significant.

7.7 Groundwater

7.7.1 Environmental Effects

Modelling of the proposed open pit anticipates that the zone of influence, defined by 1 m of drawdown that will eventually develop in the Pleistocene lower granular deposit (PLGD) aquifer from the dewatered open pit, is expected to extend approximately 2.5 to 3.5 km from the edge of the pit depending on direction from the pit limits, by the end of mining (Figure 7-11; Appendix S). Through completed land acquisitions and binding agreements, RRR effectively owns all the identified water supply wells within the predicted zone of influence, and no measurable effects are expected on water supply wells not owned by RRR, that all lie outside this area.

The long term reduction in the average groundwater flow contribution to flow the Pinewood River is predicted to vary between 3,000 and 4,000 m^3/d, depending on the parameters used in the groundwater model. The anticipated effect of this reduction in groundwater contribution to the Pinewood River is discussed in Section 7.6, however given the creek frequently goes dry in the summer / late fall and winter, it is not anticipated that the decrease will be measurable within the Pinewood River or its tributaries. Furthermore, during mine operations, a similar volume of water will be returned to the Pinewood River as part of the treated final effluent discharge to the river throughout the year.

Following mine closure, water from the mine workings will no longer be pumped to the tailings management area and subsequently discharged to the river so there could be a related a localized reduction in baseflow to the Pinewood River after closure until the open pit is substantively filled. To minimize this period, it is anticipated that water will be taken from the West Creek during the spring freshet and directed to the open pit to reduce the period of pit infilling. Steps will also be taken to direct water from the east mine rock stockpile area to the open pit to further decrease the infilling period. As described in Section 5.6, the Pinewood River occasionally experiences periods of no or little flow during the late summer / early fall low flow periods. Should unusually dry conditions occur, a mitigation plan could be developed to release water to the Pinewood River from either the former tailings management area water management pond or the pit lake for the short periods when creek flows might be decrease to zero sooner than expected if not for residual effects of mine dewatering.

The groundwater model was also used to predict the travel paths of water emanating from the tailings management area and the east mine rock stockpile. In both cases, small quantities were predicted to bypass the perimeter drains and eventually discharge to the either the open pit, Loslo Creek (Cowser Drain), or to the Pinewood River. Water discharged to the tailings management area will be treated to reduce concentrations of metals and cyanide, with additional passive treatment expected within the tailings management area as discussed previously. Groundwater emanating from the east mine rock stockpile may contain some metals; however placement of an engineered cover is expected to minimize these concentrations. Overall the volumes of water are extremely small (approximately 25 m^3/d). In both cases, no detectable changes in the water quality of the receiving water are expected. If necessary, water captured by the perimeter drains will be treated before discharge.

7.7.2 Government, Aboriginal and Public Comments and Concerns

During completion of the baseline work, government agencies, Aboriginal Groups and the public, through discussions and correspondence with RRR, identified several areas of concern with respect to groundwater, including the potential for reductions in baseflow to local creeks, pumping rates from the proposed mine, potential changes in groundwater quality and the potential effects of dewatering on local wells. Most of these concerns were in line with normal hydrogeological investigation methods and are addressed within the Environmental Assessment. Others were addressed through discussions with individuals or land purchases of potentially affected properties.

RRR recognizes these concerns and has taken measures in the Project plan to reduce adverse environmental effects through development of effective mitigation and contingency strategies. Further details are provided below.

7.7.3 Mitigation

Mitigation measures that will be used to reduce potential effects on groundwater include the following:

- Returning captured groundwater to the Pinewood River during the period of mine operations to minimize potential flow effects to the river, especially during naturally occurring, low flow conditions;

- Using in-plant SO_2/Air treatment for cyanide destruction and heavy metal precipitation to optimize the quality of groundwater seepage associated with the tailings management area during operations and following mine closure;

- Managing the site for ARD control, both during operations and following closure to prevent adverse water quality impacts to the Pinewood River, including that associated with any groundwater seepage;

- Accelerating open pit inflow following mine closure, to the extent practicable, balancing the need for managing water quality and maintaining Pinewood River flows over the interim period until the pit can be completely flooded (Section 6.18.1); and

- Implementing a monitoring plan for water levels, water quality and flow discharges, and receiving water aquatic life and habitat maintenance.

Mitigation measures described in this section are expected to be effective for their intended purposes and in many instances can be further optimized in response to monitoring data.

7.7.4 Residual Environmental Effects

Implementation of the mitigation measures described above is expected to offset any appreciable adverse effects to Pinewood River baseflows and water quality.

7.7.5 Significance Determination

The magnitude / geographic extent of adverse groundwater effects are considered to be a Level I effect: effect considered to be minor, and/or solely confined to Project lands. The effect is long term (Level III); is expected to occur regularly or continuously (Level III) for frequency, and is reversible at closure (Level II) albeit over an extended time period. Project-related effects on the groundwater system are therefore considered to be not significant.

7.8 Vegetation Communities and Rare Plants

7.8.1 Environmental Effects

The primary forest cover types within the NLSA in terms of areal extent are:

- Hardwood forest (47.6% coverage); and
- Coniferous swamp (18.3% coverage); and coniferous forest (9.9% coverage).

Many of these areas have been harvested in the past and were in a state of regeneration during baseline studies (see Section 5.12.2). The remaining vegetation community types include:

- Cattle rangelands and agricultural land (7.7%);
- Meadow marsh and shallow marsh (4.6%);
- Fen (3.6%);
- Thicket swamp (3.2%);
- Cultural meadow (2.1%);
- Bog (less than 0.01%);
- Rock and mineral barren (less than 1%); and
- Open water (2.7%).

No locally significant plant communities have been identified within the NLSA.

Baseline surveys identified individual plant species and classified plant community types. Two Provincially rare plant species, New England Violet and Field Sedge (provincially ranked as S3: rare to uncommon in Ontario; Appendix J-1), were identified within the NLSA but no rare community types were located.

Figures 7-12a and 7-12b show the footprint of proposed mine development areas in relation to existing vegetation community types. Environmental effects to vegetation communities within the footprint are direct and localized. Displaced vegetation community types are listed in Table 7-16. All of the vegetation community types that will be displaced are common throughout both the NLSA and NRSA.

The majority of the RRP footprint overlaps with the hardwood forest community type (mainly aspen-birch); with an anticipated direct displacement of 1,087 ha of this community type, corresponding to approximately 8.4% of the availability of this community type within the NLSA. Most of the affected hardwood forests are of relatively young in age in the NLSA due to historical and more recent area harvesting. This type of forest provides good deer browse, as well as habitat for area sensitive woodland breeding birds such as Eastern Whip-poor-will and Golden-winged Warbler. The RRP footprint largely avoids more mature hardwood forests which are the best candidate habitats for bat roosting colonies.

The RRP footprint overlaps with approximately 5.8% of the existing coniferous forest communities in the NLSA. These vegetation community types within the NLSA may provide late winter Moose habitat, habitat for furbearers and may contribute to woodlands supporting area sensitive woodland breeding bird species.

The RRP footprint overlaps with approximately 6.8% of the existing wetland communities in the NLSA (4.7% of coniferous swamp, 12.7% of meadow and shallow marsh, 3.5% of thicket swamp and 13.2% of fen). No bog communities will be directly impacted. Wetlands in the NLSA provide habitat for furbearers as well as Beavers, for Snapping Turtles and some waterfowl, including Trumpeter Swans.

The RRP footprint overlaps with approximately 14.2% of the existing rock and mineral barren communities in the NLSA. This vegetation community may provide habitat for Eastern Whip-poor-wills.

The RRP footprint overlaps with approximately 13.5% of the existing agricultural communities and approximately 19.0% of the existing cultural meadow communities in the NLSA. These open country habitats may support area sensitive breeding bird communities most notably Bobolink, provide foraging habitat for the Barn Swallow, and serve as Sharp-tailed Grouse lekking sites. These open country habitats are also typically artificial, created by human activity, and tend to continue to be habitually disturbed by human activity.

Environmental effects and mitigation measures specific to wildlife are described in Sections 7.9 to 7.16.

Woodlands 11, 31, 33, 83, 121, 156 and 173 are forest tracts that were identified to support important wildlife habitat and area sensitive woodland breeding birds. No habitat will be removed from Woodlands 11 and 83. Respectively, <1.0%, 30.0%, 8.7%, <1.0% and 6.6% of Woodlands 31, 33, 121, 156 and 173 will be removed be removed during construction of the RRP. All of these woodlands are either dominated by, or contain a significant proportion of hardwood forest (the most common vegetation type within the NLSA). Woodland 31 is co-dominated by coniferous forest. Some woodlands contain small pockets of coniferous swamp. All of the aforementioned woodlands will retain their important ecological functions and interior forest spaces following RRP construction and throughout the life of the RRP.

Two of three habitat locations supporting New England Violet and one of two habitat locations supporting Field Sedge will be directly impacted by RRP activities. Although the New England Violet is listed as Provincially rare in Ontario, it is known to be locally common in northern Minnesota (Ballard and Gawler 1994), which is directly adjacent to the Rainy River District. Therefore, it is likely that this plant is also locally common in the Rainy River District as well. Two of three occurrences of New England Violet were identified in ecosite B012 (Very Shallow, Dry to Fresh: Pine-Black Spruce Conifer), an ecosite type that is common within the NLSA, particularly within the northern and northeastern portions of the NLSA. The third occurrence of New England Violet was identified within ecosite B049 (Dry to Fresh, Coarse: Jack Pine-Black Spruce Dominated) which occasionally occurs in the northeastern portion of the NLSA. Both occurrences of Field Sedge were identified in ecosite B088 (Fresh, Clayey: Aspen-Birch Hardwood) that is abundant and widespread within the NLSA.

Without mitigation, an increase in vehicle traffic at the RRP site will result in increased dust generation and deposition on vegetation. Dust can affect photosynthesis, respiration and transpiration in plants and allow the penetration of phytotoxic gaseous pollutants (Farmer 1993). Overall, dust deposition on plants results in some visible injury symptoms and a general decrease in plant productivity. The structure of vegetation communities may also be affected. Those vegetation communities that are dominated by epiphytic lichen and Sphagnum moss species are typically the most sensitive of those studied (Farmer 1993).

The vegetation communities in the RRP site that would be most affected by dust deposition are those located alongside the roads on which mine haul trucks will be travelling (between the pit, process plant and the stock pile areas). The roads connecting these RRP components will generally occur are located where Roen Road and Highway 600 currently exist, so that these vegetation communities are already subject to some degree of dust deposition. As discussed previously, a dust suppression program will be implemented at the start of mine construction.

7.8.2 Government, Aboriginal and Public Comments and Concerns

Except as mentioned below, no specific concerns have been expressed by government agencies, Aboriginal groups or other stakeholders in relation to vegetation and plant life other than generalized statements and expressions of concern that all reasonable efforts should be taken to minimize adverse effects to plants and associated wildlife in the area. MNR has commented that all reasonable efforts should be made to protect forested habitats on any lands that RRR may be considering as compensation for lost whip-poor-will territories. There are reports of some historic Aboriginal harvest of medicinal plants within the NLSA.

RRR recognizes these concerns and has taken measures in the RRP plan to reduce adverse environmental effects to vegetation and plant life through the development of a compact mine site and effective mitigation and contingency strategies. This has included extensive avoidance of potential habitat disruption through a habitat management program already in place.

7.8.3 Mitigation

The principal mitigation measures that are proposed to limit short and long term adverse effects to local vegetation communities include:

- Development of a compact site to limit not only the areal extent of new disturbance, but also to limit the overall spread of new disturbance;

- Avoidance of more sensitive habitats to the extent practicable;

- Minimizing dust production along primary mine rock and overburden transportation routes by implementing dust suppression methods and thereby minimizing the zone of influence. Primary dust suppression methods will include road watering. Details of dust suppression strategies are discussed previously in Section 7.3.1.3;

- Annual monitoring of dust deposition on vegetation adjacent to mine roads;

- Separate stockpiling of removed organic rich material during open pit and tailings dam stripping for use as topsoil during progressive revegetation and at closure; and

- Active revegetation and encouragement of natural revegetation / recolonization of disturbed areas as part of progressive reclamation during operation and active reclamation at mine closure.

Site planning efforts have developed a compact mine site, focused where practical on lands that have been previously disturbed by past anthropogenic (human) disturbance such as logging or agricultural development. Developing a compact mine site is advantageous to both environmental protection (reduced overall area of disturbance) and mining operations (reduced infrastructure needs and shorter haul distances). Sensitive habitats including riparian areas were avoided where reasonably practical. These riparian habitats are particularly productive for a number of wildlife species and provide an important function in water quality protection.

Monitoring of dust deposition on vegetation will be conducted in areas where mine haul trucks will be travelling in the RRP site (between the open pit, process plant and stockpile areas). Annual monitoring is proposed for the first five years of RRP operation to determine the zone of influence of dust generation and deposition on plants so that mitigation measures may be tailored to these effects. Should traffic volumes increase at any time during the life of the RRP following the initial determination of appropriate mitigation measures, monitoring will resume in order to ensure their continued efficacy. Strategies for dust deposition monitoring will be discussed with the MNR prior to implementation.

RRR is committed to encouraging and, as practical, restoring the RRP site to productive, naturalized vegetation communities on cessation of mining. This will involve the active revegetation of peripheral tailings management area areas, the mine rock stockpiles and the remaining portions of the overburden stockpile, as well as the general mine site area. Commitments have been made to the MNR and other stakeholders, that RRP revegetation efforts at closure will include providing suitable habitat for SAR species, most notably whip-poor-will, and other species of interest, if practical.

Revegetation of the stockpiles will be undertaken using a combination of hydroseeding and hand planting of tree seedlings. Native seed mixes, where reasonably available commercially, will be used for hydroseeding, together with a nurse crop of oats, or equivalent (if necessary).

General revegetation of the RRP site is readily achievable with current technologies, as demonstrated by revegetation efforts previously employed at other mine sites in Ontario. Wildlife and vegetation recovery times will vary depending on the species / communities involved. With active revegetation programs as planned, early successional plant and wildlife communities would be expected to become established within three to five years of mine closure. The development of semi-mature poplar / spruce woodlands (the most common forest community type in the area) would be expected to occur over a period of approximately 40 to 60 years. Intermediate community types would develop during the intervening period. Mitigation measures described in this section are expected to be effective for their intended purposes.

7.8.4 Residual Environmental Effects

Vegetation clearing will result in the removal of 1,352 ha of forested communities (includes treed swamp communities considered wetlands), 507 ha of wetland communities (including areas of coniferous swamp areas), 95 ha of treed and open rock, and mineral barren communities, and 385 ha of agricultural and meadow communities. Overall, 2,192 ha representing 8.5% of the overall NLSA of the vegetation communities will be directly disturbed. Revegetation of the RRP site following decommissioning will restore many of these communities. Two of three habitat locations supporting New England Violet and one of two habitat locations supporting Field Sedge will be directly impacted by RRP activities; however, it is anticipated that these species although Provincially rare, are locally common in the NRSA. With the implementation of mitigation measures and follow up monitoring, no significant adverse impacts to plants due to dust generation are expected.

7.8.5 Significance Determination

The magnitude of disturbance to RRP area vegetation communities is considered to be a significance Level I effect: effect considered to be minor, and/or solely confined to RRP lands. (8.5% of the NLSA will be directly impacted). This includes two of three habitat locations supporting New England Violet and one of two habitat locations supporting Field Sedge, listed as Provincially rare plant species. The effects to vegetation communities will last continuously (Level III) beyond the life of the RRP (Level III; beyond the active mine closure phase) in terms of the time required to restore forested and other communities, but habitats are restorable and hence the effects are reversible (Level I). All of the vegetation community types that will be displaced during RRP activities are common throughout both the NLSA and NRSA.

As such, RRP-related effects on local or regional vegetation communities and the habitat types which they support are therefore considered to be not significant.

7.9 Ungulates

7.9.1 Environmental Effects

Both White-tailed Deer and Moose occur within the NLSA, although White-tailed Deer are locally far more numerous than Moose. Local ungulate populations appear to have benefitted from anthropogenic activities such as agriculture and forest harvesting which create early successional foraging habitat, as well as from trail cutting which provides movement corridors (Section 5.12 provides a description of local land use activities including agriculture, forestry and outdoor recreation). Many of the lands within the NLSA are hunted on during the hunting season for both White-tailed Deer and Moose. The results of the site investigation (Section 5.10.2.1) concluded that three critical, significant wildlife habitat types for ungulates were likely present in the NLSA which included: winter deer yards, Moose late winter habitat and cervid (ungulate) movement corridor.

White-tailed Deer are ubiquitous across the NLSA and are observed most frequently on the edges of hardwood forest. MNR mapping (MNR 2006) shows 15,016 ha of winter deer yards are present (Figure 5-22a,b,c). This habitat consists mainly of Aspen-Birch hardwood forest, Intolerant Hardwood Swamp, Black Spruce Conifer forest, Red Pine-White Pine Conifer forest and Coniferous Swamp Ecological Land Classification communities (B35, B048, B054, B055, B088, B104, B119, B127, B128, B129 and B130).

Moose have been declining in the Lake of the Woods area in Ontario and Minnesota for several decades due to overhunting, increased predation by wolves and bears, parasites and increased competition for food with White-tailed Deer (Murray et al. 2009). The RRP is located within Ontario's Wildlife Management Unit (WMU) 10 and there is currently no open season for Moose in WMU 10. Hunting seasons for Moose do exist to the north (WMU 7B) and to the east (WMU 9B) of WMU 10, but these are closely controlled. Therefore, the impacts of hunting on Moose in WMU 10 may not be as high as those in surrounding areas such as the Lake of the Woods and northern Minnesota areas discussed in Murray et al. (2009).

Potential late winter habitat for Moose (dense, mature conifer forest) in the area consists mainly of the Moist, Fine Black Spruce-Pine Conifer Ecological Land Classification community (B114). A total of 214 ha of this habitat is located within the NLSA (Figures 5-22a,b,c).

Vegetation clearing for the construction of RRP components and the re-alignment of Highway 600 will result in the removal of 1,265 ha of woodlands providing deer yarding habitat, as well as the removal of bordering agricultural and shrub lands (277 ha and 79 ha, respectively) which provide foraging habitat. In addition, 10.2 ha of Moose late winter habitat will be lost.

RRP construction, operation and decommissioning will likely result in increased traffic both within the RRP site, the NLSA and along Highway 71 which is expected to provide the primary access route of local workers to the mine. Given the high density of White-tailed Deer occurring within the NLSA and their desensitization to road traffic, collisions with deer may affect both local deer as well as humans. During construction, increased traffic may increase the risk of vehicle collisions with deer. As the operation phase begins and traffic between the mine site and local communities reduces, the risk of collisions is likely to decrease compared to that during the construction phase.

RRP development and increased local traffic are expected to result in some decreased connectivity between local ungulate habitat areas; particularly between areas to the north and south of the RRP site. This will force ungulates to move around the site either to the east or to the west. Re-alignment of Highway 600 (a two-lane gravel road) around the site is not expected to have an appreciable adverse effect on local ungulate movements, as the re-aligned section of highway will be positioned further away from developed rural habitats compared with its current position. Local traffic levels on Highway 600 are expected to continue to be low. Re-alignment of Highway 600 will require the construction of a new crossing over the Pinewood River. This crossing is not expected to have an appreciable adverse effect on local ungulate movements along the Pinewood River valley, as habitats surrounding the crossing area will remain in a natural state.

Sound from mine construction, operation and decommissioning may impact ungulate behaviour. Ungulates in the area appear to show a high tolerance to sound disturbance (in that they are less likely to flee or show agitated or defensive behaviours). This adaptation to higher threshold levels of human disturbance allows deer to spend more time in fitness-enhancing activities such as grazing (since deer are less likely to be scared away from the food source by sound disturbance) but may also decrease their ability to detect predators and/or other environmental cues (Brown et al. 2012). Conversely, sound and other disturbances caused by the RRP may reduce natural predation of the local deer population by displacing local predators such as wolves.

Tailings containing cyanide from gold extraction could be of potential concern to wildlife if cyanide levels are elevated. Weak acid dissociable cyanide concentrations of <50 mg/L are considered safe for wildlife exposure (Donato et al. 2007). Cyanide used for ore processing will be destroyed in the process plant before being discharged to the tailings management area (Section 4.7), resulting in tailings management area weak acid dissociable cyanide levels of generally <1 mg/L. Cyanide will therefore not pose a threat to wildlife. In additional, the tailings management area will be fenced to reduce access to the area.

Dust will be generated by increased traffic levels along mine roads connecting the open pit, mine rock piles and the process plant. Although a dust suppression program will be implemented, some dust will settle on vegetation in proximity to high traffic routes may in turn, be ingested by grazing ungulates. Although mine rock dust will contain low levels of heavy metals such as cadmium, copper and zinc, long term accumulation of such materials within the tissues of mammals may cause harmful effects to both ungulates and their predators.

7.9.2 Government, Aboriginal and Public Comments and Concerns

No specific concerns have thus far been expressed by government agencies, Aboriginal groups and other stakeholders in relation to ungulates, other than generalized statements and expressions of concern that all reasonable efforts should be taken to minimize adverse effects to Moose and White-tailed Deer in the area; and concern from one local landowner that the tailings management area should be setback sufficiently far from Highway 600 in the west to allow deer passage around the tailings management area. Traditional Knowledge information sessions indicated that Aboriginal hunting in proximity to the NLSA is limited. Deer hunting by local residents is however, a common activity and part of the local culture.

RRR recognizes these concerns and has taken measures in the RRP plan to reduce adverse environmental effects to wildlife through development of effective mitigation and contingency strategies.

7.9.3 Mitigation

The primary mitigation strategies for limiting adverse effects to ungulates occurring within the NLSA will include:

- Development of a compact RRP site to reduce overall habitat loss and to limit the potential adverse effects related to interference with wildlife of movement, and sound effects, to the extent practicable;

- Preventing hunting from occurring on all lands owned by RRR (required for the safety of workers; this is currently ongoing during exploration as well);

- Restoration of disturbed habitats at closure, including the development of habitats capable of supporting a diversity of wildlife species, including ungulates;

- Enforcement of speed limits along proposed mine access roads to reduce the potential for collisions with ungulates. Signs warning drivers of the possibility of wildlife encounters will be posted in areas of high wildlife activity. A log of collisions will be kept to monitor the effectiveness of the proposed mitigation and additional mitigation measures will be implemented if necessary;

- Inclusion of wildlife awareness information into regular safety and environmental inductions performed by the mine. Workers and contractors will be made aware of seasonal changes in local deer or large mammal behaviour or presence in proximity to the mine;

- Treatment of the tailings slurry to levels equal to or less than 1 mg/L weak acid dissociable cyanide before deposition in the tailings management area (which is well below the 50 mg/L weak acid dissociable cyanide threshold criteria outlined by the International Cyanide Management Code);

- Fencing the tailings management area to prevent access;

- Covering the exposed tailings beach at closure with a layer of overburden and flooding the remaining tailings with a layer of water to prevent the tailings from oxidizing over the longer term. This will ensure that the tailings pond waters remain of high quality, such that they will not pose a threat to wildlife. The margins of the tailings pond will develop as wetland habitat;

- Minimizing dust production along primary haulage routes by implementing dust suppression methods and thereby minimizing the RRP zone of influence (Section 7.3); and

- Disposing of food wastes generated on site in a manner that limit the attraction of wildlife, such as Black Bear (a potential predator to ungulates).

7.9.4 Residual Environmental Effects

Vegetation clearing for the construction or implementation of RRP components and the re-alignment of Highway 600 will result in the removal of 1,352 ha of woodland habitat and 1,265 ha of deer yarding habitat. An additional 277 ha of agricultural lands and 79 ha of shrub lands providing foraging habitat will be cleared or substantively modified. It has been observed that White-tailed Deer within the NLSA have been desensitized to human presence and have been observed grazing at roadsides. This indicates that local deer are tolerant of human activities and may not abandon habitat adjacent to the RRP because of sound or other disturbances.

An additional 10.2 ha of Moose late winter habitat (consisting of numerous fragmented patches) will be lost. It is not anticipated that this loss of Moose late winter habitat will impact the local Moose population due to the currently low density of Moose in the region.

Possible vehicle collisions with ungulates along the main site access road, and to a lesser extent along mine site roads, pose a potential threat to both ungulates and humans. Local tolerance of deer to human activity may increase this risk. It is anticipated that enforced speed limits, road signs warning of wildlife and inclusion of wildlife safety into mine safety training inductions will greatly reduce the risk for collisions between ungulates and vehicles on local mine site roads.

Treatment of the tailings slurry at the process plant using SO_2/Air for cyanide destruction, prior to tailings discharge to the tailings management area and fencing of the tailings management area to restrict access, will preclude any risk of cyanide toxicity.

No adverse impacts to ungulates due to dust generation are expected.

7.9.5 Significance Determination

Deer displaced by the RRP are likely to find critical habitat adjacent to the RRP. The adverse effects of deer mortality resulting from vehicular collision due to increased traffic are expected to be very minor in comparison to the impacts of predation, natural death and hunting. It is not anticipated that the loss of Moose late winter habitat will impact the local Moose population given the low density of Moose in the region.

The magnitude / geographic extent of adverse effects to ungulate populations is therefore considered to be a Level I effect: effect considered to be minor, and/or solely confined to RRP lands. The effect is long term (Level III); is expected to occur regularly or continuously (Level III) for frequency, and is readily reversible at closure (Level I).

As such, RRP-related effects on local or regional White-tailed Deer and Moose populations are therefore considered to be not significant.

7.10 Furbearers

7.10.1 Environmental Effects

Field observations between 2009 and 2012 and trapline data between 1993 and 2008 recorded 16 species of large predators and furbearing mammals within the NLSA.

Wolf distributions tend to be associated with the distributions of their principal prey species such as deer, and to a lesser extent Moose and Beaver. A number of furbearers are associated with watercourses (Beaver, Muskrat, American Mink and River Otter) while some are more closely associated with forested habitats (American Marten, Lynx and Fisher), or with both forested and open habitats (Red Fox and Short-tailed Weasel). Black Bear tend to prefer mixed forest habitats, well-drained coniferous forests that support blueberry species (an important late summer and fall food source) and riparian-successional forests. Coyote, Grey Fox, Raccoon, Bobcat and Long-tailed Weasel are also present.

Vegetation clearing for development of the RRP, including the transmission line corridor and the re-alignment of Highway 600 will result in removal of approximately 1,352 ha of woodland habitat, 507 ha of wetland habitat and 28 km of river shoreline habitat. No lake shoreline will be impacted. Forest and wetland dependant species will be displaced from areas required for mine development, until such time as site rehabilitation is completed following mine closure.

Typical densities for large predators and furbearers that occupy forest and wetland habitats, as determined from the literature, and the potential number of displaced individuals based on expected habitat losses during construction and operation of the RRP are shown in Table 7-17.

There is also the potential for site activities to attract wildlife that tend to scavenge on domestic waste such as Red Fox, American Marten and Black Bears. This behaviour is undesired as it causes the animals to deviate from their usual foraging habits and puts them at risk of injury through consumption of non-edible items such as plastics or from vehicle collisions. It also can become necessary to relocate or destroy nuisance animals (and particularly bears) if they become a safety concern for humans.

RRP construction, operation and decommissioning will result in increased traffic both within the RRP site, the NLSA and along Highway 71 which will is expected to provide the primary access route for local workers to the mine. Studies have shown that roads and traffic can have negative effects on the abundance of some furbearing mammals such as Red Fox and wolf, although effects on American Marten are expected to be neutral (Fahrig and Rytwinski 2009). There is potential for vehicle collisions with furbearers along the main site access road and to a lesser extent, along mine site roads. During construction, increased traffic coupled with continuous construction throughout the night may increase the risk of vehicle collisions with furbearers. As the operation phase begins and traffic between the mine site and local towns is reduced, the risk of collisions is likely to decrease.

Vegetation clearing and increased local traffic may result in decreased connectivity between local woodland habitat areas. Although the current Highway 600 has resulted in a habitat break, movement of wildlife persists with relatively little risk due to low traffic levels in the area.

Sound disturbance caused by mine construction, operation and decommissioning may impact wildlife abundance and has the potential to mask the sounds of nearby predators or prey thereby impacting defensive responses and hunting success (Blickley and Patricelli 2010).

7.10.2 Government, Aboriginal and Public Comments and Concerns

The MNR have identified a concern regarding the protection of furbearer dens and beaver dams and indicated that these features are protected by the *Fish and Wildlife Conservation Act*. No specific concerns have as yet been expressed by Aboriginal groups or other stakeholders in relation to furbearing mammals other than generalized statements and expressions of concern that all reasonable efforts should be taken to minimize adverse effects to wildlife populations. Although three traplines are known to occur in part, within the NLSA, no additional information regarding trapping was presented during Aboriginal consultations.

RRR recognizes these concerns and has taken measures in the RRP plan to both develop as small as practical RRP footprint and to manage wastes so as to avoid unnecessarily attracting wildlife.

Although no actual concerns have been raised, Aboriginal and public comments have included general statements that Eastern Cougars are an animal occurring within the region. No cougars or sign of cougars were observed during extensive baseline field studies associated with the RRP (2,000+ person hours) conducted between 2009 and 2012. MNR acknowledges that Eastern Cougars do exist in Ontario and the Ontario Puma Foundation estimates that a population of 550 cougars are present in Ontario. This species is listed as Endangered under the *Endangered Species Act*. The Natural Heritage Information Centre and Ontario Puma Foundation (2012) indicate that a small number of cougar observations (animals, tracks and scat) have been made in proximity to Lake of the Woods in the last ten years, although no recent observations have been made between Lake of the Woods and Fort Frances. Cougars are wide ranging animals and home territories average between 140 km^2 and 280 km^2 (Naughton 2012). This species is highly sensitive to human presence and inhabits remote areas with dense vegetative cover. Due to the relatively small area of impact resulting from the development of the RRP and the lack of evidence that cougars occur regularly within the NRSA, no impacts by the RRP on Eastern Cougar are anticipated.

7.10.3 Mitigation

The primary mitigation strategies for limiting adverse effects to furbearers occurring within the NLSA will include:

- Development of a compact RRP site to reduce overall habitat loss and to limit potential adverse effects related to sound emissions, to the extent practicable;
- Preventing hunting from occurring on all lands owned by RRR (required to ensure worker safety and currently ongoing);
- Restoration of disturbed habitats at closure or encouraging development of habitats, capable of supporting a diversity of wildlife species, including large predators and furbearers;
- Enforcement of speed limits along proposed mine access roads to reduce the potential adverse effects of increased vehicular traffic associated with the RRP. Signs warning drivers of the possibility of wildlife encounters will be posted in areas of high wildlife activity. A log of collisions will be kept to monitor the effectiveness of the proposed mitigation and additional measures will be implemented if necessary;
- Inclusion of wildlife awareness information into regular safety and environmental inductions performed by the mine. Wildlife sighting logs or information boards will be

installed to notify workers of local bear, wolf or other large mammal or furbearer observations. Workers and contractors will be made aware of seasonal changes in local mammal behaviour or presence in proximity to the mine;

- Treatment of the tailings slurry containing cyanide and associated heavy metals from the ore leaching process in the process plant using the SO_2/Air process before being discharged to the tailings management area;

- Fencing the tailings management area to prevent access;

- Covering the exposed tailings beach at closure with a layer of overburden and flooding the remaining tailings with a layer of water to prevent the tailings from oxidizing over the longer term. This will ensure that the tailings pond waters remain of high quality, such that they will not pose a threat to wildlife. Margins of the tailings pond will develop as wetland habitat; and

- Disposal of food wastes generated on site will be by a means that limits the attraction of wildlife to the mine site, especially potentially nuisance or dangerous species such as Black Bear and wolves.

Mitigation measures described in this section are expected to be effective for their intended purposes and in many instances can be further optimized in response to monitoring data.

7.10.4 Residual Environmental Effects

Vegetation clearing associated with RRP development and the re-alignment of Highway 600 will result in a total loss of 1,352 ha of woodland habitat and 507 ha wetland habitat. This accounts for a 7.9% loss of the furbearer denning habitat within the NLSA. Additionally, 28 km of river shoreline will be impacted. Some furbearer species (American Marten, Red Fox, Short-tailed Weasel and Beaver), as well as Black Bear, are not expected to be overly sensitive to human presence. Lynx and wolf tend to avoid human presence, at least to some degree.

Vehicle collisions causing injuries or death of furbearers due to RRP-related traffic is a threat along the main site access road and to a lesser extent along mine site roads. It is anticipated that enforced speed limits, road signs warning of wildlife and inclusion of wildlife safety into mine safety training inductions will greatly reduce the risk for furbearer-vehicle collisions on local mine site roads.

Treatment of the tailings slurry within the process plant to destroy cyanide before tailings are discharged to the tailings management area and fencing the tailings management area to restrict access, will eliminate any potential concerns regarding possible cyanide toxicity to wildlife.

7.10.5 Significance Determination

Furbearers displaced by the RRP will likely find equally suitable habitat adjacent to the RRP footprint. The adverse effects of furbearer mortality resulting from vehicular collision due to increased traffic is expected to be minimal with the implementation of mitigation measures. The magnitude / geographic extent of adverse effects to large predators and furbearers is therefore considered to be a Level I effect: effect considered to be minor, and/or solely confined to RRP lands. The effect is long term (Level III); is expected to occur regularly or continuously (Level III) for frequency, and is reversible at closure (Level I).

As such, RRP-related effects on local or regional furbearer populations are therefore considered to be not significant.

7.11 Bats

7.11.1 Environmental Effects

Six species of bats were recorded within the NLSA. These included two tree-roosting species (Hoary Bat and Red Bat), and four cavity-roosting species (Northern Myotis, Little Brown Myotis, Silver-haired Bat and Big Brown Bat). Hoary Bat, Red Bat and Silver-haired Bat are migrant species, while Northern Myotis, Little Brown Myotis and Big Brown Bat occur year round in Ontario and use hibernacula during the winter. Northern Myotis and Little Brown Myotis were included on the Species at Risk in Ontario list as Endangered in October 2012 and are protected under the Provincial *Endangered Species Act*. All other Ontario bat species are protected under the *Fish and Wildlife Conservation Act*.

Northern Myotis and Little Brown Myotis populations are at risk of decline due to their low reproduction rate, communal hibernating behaviour and the recent spread of a fatal fungus known as White Nose Syndrome. White Nose Syndrome is caused by *Geomyces destructans*, a fungal pathogen that has been devastating bat populations across eastern North America. It grows on the muzzle, ears and wings of hibernating bats and spreads quickly between individuals that hibernate in large groups. White Nose Syndrome causes bats to prematurely arouse from torpor (hibernation) in the winter and subsequently leads to death from starvation due to excessive activity without a readily available food source.

As cavity roosters, Northern Myotis, Little Brown Myotis, Silver-haired Bat and Big Brown Bat require a high density of mature cavity trees (large diameter) for use as summer roost sites. Red Bat and Hoary Bat are foliage-roosting bats and prefer deciduous forest stands. While most species forage primarily at woodland edges or over wetlands, Northern Myotis is a gleaning species and forages within woodlands and along woodland edges. RRP development will require the clearing of approximately 1,352 ha of woodland habitat in the NLSA. Forest Resource Inventory data indicates that only 82 ha (6%) of woodland habitat to be removed is hardwood forest older than 80 years and field studies confirmed that none of this habitat represents high quality maternity roost habitat. Cavity-roosting bats are unlikely to be impacted during woodland clearing activities though foliage-roosting bats are still susceptible to habitat disturbance.

RRP activities will create sound that may disturb local wildlife. Increased sound levels reduce the distance and area over which acoustical signals can be perceived by animals (Barber et al. 2009). Unlike other mammals found in the NLSA, bats use echolocation to navigate their environment and to search for prey. Echolocation for bats consists of emitting pulses of high frequency sound and listening for returning echoes. Differences in timing and frequency between the pulses and their echoes provide bats with information about their surroundings (Naughton 2012). Sound pulses used by Ontario bats for echolocation are generally above 18 kHz which is well above the frequency of traffic or construction sound. Unlike some bat species occurring outside of Ontario, no Ontario bats are known to listen for the sounds of prey items. As a result, sound caused by RRP activities is unlikely to cause adverse effects to bat navigation or hunting. Neonates (newborn bats) within a roost site produce isolation calls to communicate with their mother. It is not clear whether anthropogenic sound causes adverse effects on mother-offspring communication.

Research has shown that roads can provide a variety of risks to bats including mortality from collisions, habitat fragmentation and barriers to movement. Research by Bennett and Zurcher (2013) indicates that breaks in community structure of bat commuting routes cause bats to turn back and may prevent bats from accessing critical resources such as traditional feeding grounds. Increased vehicle traffic along local roadways will increase the risk of vehicle-bat collisions.

Bats commonly feed in areas of high insect density such as along woodland edges and above wetlands. The Little Brown Myotis is known to hunt insects over water bodies including wetlands. The removal of 507 ha of wetlands for RRP development eliminates potential feeding grounds for local bats. Removal of wetland habitat in proximity to suitable patches of roosting habitat may reduce the quality of the roosting habitat should alternative foraging areas be absent from the area.

7.11.2 Government, Aboriginal and General Comments and Concerns

No specific concerns have as yet been expressed by government agencies, Aboriginal groups or other stakeholders in relation to bats other than generalized statements and expressions of concern that all reasonable efforts should be taken to minimize adverse effects to wildlife populations and, in particular, SAR.

RRR recognizes these concerns and has taken measures in the RRP plan to reduce potential adverse environmental effects to wildlife through development of effective mitigation and contingency strategies. Further details are provided below.

7.11.3 Mitigation

Mitigation measures that will be used to reduce potential adverse effects to bats will include the following:

- Development of a compact RRP site to reduce overall habitat loss and to limit potential adverse effects related to sound emissions, to the extent practicable;
- Treatment of tailings slurry containing cyanide and associated heavy metals in the process plant using the SO_2/Air process before being discharged to the tailings management area;
- Maintenance to the extent practical of a 120 m buffer zone adjacent to rivers and creeks to protect watercourses and their associated vegetated margins;
- Covering the exposed tailings beach at closure with a layer of overburden and flooding the remaining tailings with a layer of water to prevent the tailings from oxidizing over the longer term. This will ensure that the tailings pond waters remain of high quality, such that they will not pose a threat to wildlife. Margins of the tailings pond will develop into wetland habitat;
- Restoration of disturbed habitats at closure or encouraging development of habitats capable of supporting a diversity of wildlife species, including bats; and
- Enforcement of speed limits along proposed mine access roads to reduce the potential adverse effects of increased vehicular traffic associated with the RRP. A log of collisions will be kept to monitor the effectiveness of the proposed mitigation and additional mitigation measures will be implemented if necessary.

Mitigation measures described in this section are expected to be effective for their intended purposes and in many instances can be further optimized through operations.

7.11.4 Residual Environmental Effects

No suitable bat roosting habitat will be cleared for RRP development. The majority of deciduous forest within the NLSA is Aspen-Birch hardwood forest. Deciduous forest near to the proposed mine site is largely comprised of regeneration or young forest, while more mature forests occur further from the mine site. As a result of a compact RRP site, a greater proportion of forest representing lower quality bat roosting habitat will be cleared. Larger woodland complexes such as Woodlands 31, 33, 83, 121, 156 and 173 are more likely to contain mature trees suitable for bat roosting than small isolated woodlands occurring within the RRP footprint. Larger woodlands impacted by some clearing activities along their outer edges will continue to maintain interior forest habitat, thereby buffering some of the adverse effects caused by RRP activities. Larger forest complexes are also likely to have one or more foraging habitat features within it, including wetlands.

Although increased local vehicular traffic may increase the probability of vehicle-bat collisions, the barrier effect of roadways, the foraging habits of Ontario bat species (woodland edges, over water and above the height of most vehicles) and lowered enforced speed limits at the RRP site will generally keep this risk low.

7.11.5 Significance Determination

Vegetation clearing during construction and operation will result in the loss of 1,352 ha of woodland habitat; however, the majority of the habitat is young, regenerating hardwood stands which are not ideal habitat for bat roosting sites. Some bat roosting and foraging habitat will be affected. Direct bat mortality such as from vehicular collisions can be successfully mitigated. The magnitude / geographic extent of adverse effects to bats is therefore considered to be a Level I effect: effect considered to be minor, and/or solely confined to RRP lands. The effect is long term (Level III); is expected to occur regularly or continuously (Level III) for frequency, and is partially reversible at closure (Level II).

As such, RRP-related effects on local or regional bat populations are therefore considered to be not significant.

7.12 Migratory Birds

7.12.1 Environmental Effects

Baseline studies recorded extensive area sensitive woodland breeding bird habitat and marsh breeding bird habitat within the NLSA. These studies also indicated that lands within the NLSA provided breeding habitat for 45 area sensitive bird species and 12 avian SAR.

Potential RRP-induced adverse effects to local bird communities may include: direct loss of habitat, habitat abandonment, mortality and decreased reproduction. These effects may be incurred directly or indirectly through mine activities by means of: vehicle collisions, land clearing, modification of waterways and increased human presence; potentially coupled with changes to habitat suitability related to sound, light and dust emissions.

The effects of dust on birds is expected to be minimal and confined to narrow strips of habitat along roads. Dust will accumulate on roadside plants and this may affect the ability of a plant to produce seeds, potentially decreasing food sources for seed eating birds in the affected areas. If seeds are produced by plants affected by dust and are ingested by birds, the birds would also ingest dust found on the seeds. Considering the availability of various types of bird habitat located throughout the NRSA and the region in general, it is expected that birds will forage in higher quality, undisturbed habitats located away from road noise and away from plants influenced by dust accumulation.

Mitigation strategies during construction, operation and decommissioning are expected to buffer impacts to both common and area sensitive migratory bird species.

Table 7-18 provides a summary of potential impacts to migratory birds from anticipated clearing activities.

Migratory bird SAR are discussed separately (Sections 7.15 and 7.16).

7.12.1.1 Area Sensitive Woodland Breeding Birds

Area sensitive woodland breeding birds are diverse and abundant in the NLSA with a total of 36 species recorded during the 2009 to 2012 breeding bird surveys. Species diversity recorded during RRP investigations mirrored that of North American Breeding Birds Survey results occurring near to the NLSA. This indicates that bird habitat occurring within the NLSA is consistent with habitat occurring elsewhere in the NRSA and the strong diversity recorded in the area reflects the quality of available habitat both in the NLSA and throughout the NRSA. This diversity derives in part from the proximity of the NRSA to the intersection of the Boreal Forest Region, the Great Lakes – St. Lawrence Forest Region, and the Prairie Grasslands Region, as well as the effect of Lake Superior on avian migration routes.

Most area sensitive woodland breeding birds songbird species are protected under the *Migratory Birds Convention Act*, while area sensitive raptor and grouse species are protected under the *Fish and Wildlife Conservation Act* as game birds. Protection afforded to all bird species observed in the NLSA is listed in Appendix J-1.Adverse effects to area sensitive woodland bird populations within the NLSA will largely be associated with direct habitat loss from mine site development (Table 7-19), potentially coupled with changes to habitat suitability related to sound and dust emissions, with lesser impacts from vehicle collisions.

Vegetation clearing for RRP activities during mine construction will remove a total of 1,352 ha of woodland habitat: 592 ha will be cleared for the tailings management area, 272 ha for the low grade ore / east mine rock stockpiles, 259 ha for the overburden / west mine rock stock pile, 90 ha for the open pit, 11 ha for the Highway 600 re-alignment, 8 ha for access roads and 120 ha for various other RRP components. Clearing efforts will impact 42 woodland features including 15 woodland features providing area sensitive woodland breeding bird habitat.

Table 5-26 indicate that Woodlands 31, 33, 121, 156 and 173 have the highest diversity of area sensitive species and this may be a result of their large sizes as these woodlands represent some of the largest woodlands present in the NLSA. The proposed development will affect Woodland 33, where 536 ha are expected to be lost. This woodland is known to host 21 area sensitive bird species. Vegetation removal from Woodlands 156 and 173 will be limited to the transmission line corridor, which will measure approximately 40 m in width and will require the removal of 11 ha from Woodland 156 and 7 ha from Woodland 173. Removals will also included 11 ha of Woodland 31 and 313 ha of Woodland 121.

During operation, sound emissions will be greatest in areas of concentrated heavy equipment operation, most notably in association with the open pit and stockpiling operations, as well as in association with process plant and crusher operations. Sound disturbance will have lesser adverse effects in areas of low traffic such as the proposed transmission line and the tailings management area.

Sound can cause adverse effects on birds in a variety of ways. The most common of which include masking important communication signals. Masking sound can result in a wide array of adverse effects on the way a bird interacts with its environment and with other individual birds. The effects of masking may include the loss of the ability to hear important behavioural triggers such as the songs of territorial males, calls of females, begging calls of nestlings, approaching predators, or the presence of prey items. As a result, masking sound can decrease breeding success or bird density in an overly noisy habitat.

Birds hear best between sound frequencies of 1 to 5 kilohertz (kHz) and generally vocalize between 2 to 5 kHz (USFWS 2012). While traffic sound generally falls below this frequency range, sounds associated with mining activities such as blasting, heavy machinery and construction are audible. Sound masking has been shown to occur at sound emissions levels of 50 to 60 dBA (Dooling and Popper 2007). AMEC sound modelling studies show that 420 ha of forest habitat (additional to that lost to vegetation clearing) will experience mine-related sound levels above 50 dBA. This could potentially result in reductions in habitat suitability for some species affecting 208 ha of interior forest habitat. Core Woodlands 31, 33, 121, and 156 will lose 7 ha, 172 ha, 28 ha and 0.5 ha of interior habitat, respectively.

Collisions of birds with vehicles and anthropogenic structures represent one of the largest sources of human-caused mortality of birds. Grouse are a ground species that prefer to walk or run, rather than fly. This behaviour puts Ruffed Grouse in particular, in danger of collisions with vehicles in areas of increased traffic. RRP biologists often observed Ruffed Grouse walking across or along gravel roadsides. Increased vehicular traffic along Highway 71, the proposed mine access road and the re-alignment of Highway 600 will likely cause an increase in vehicular collisions with forest-dwelling birds in the NLSA during all RRP pre-closure phases.

7.12.1.2 Area Sensitive Marsh Breeding Birds

Waterfowl (wild ducks, geese and swans), cranes, rails, bitterns, wrens, terns and most other marsh breeding birds are protected under the *Migratory Birds Convention Act*. A wide variety of marsh bird species were observed throughout the NLSA, although the density and diversity of indicator species for any single wetland feature did not meet the MNR criteria for significance.

Field investigations determined that Trumpeter Swans nested at four marsh locations within the NLSA (Figures 3a and 3b in Appendix J-4).

Habitat loss of 79 ha will likely be the strongest adverse environmental effect of the RRP on Trumpeter Swan breeding habitat. This species exhibits strong nesting site fidelity, thus displaced swans are likely to return to cleared breeding habitats. Three wetland features hosting nesting Trumpeter Swans will be directly impacted (displaced) by RRP activities as these three features all occur within the proposed tailings management area. AMEC sound modelling studies indicate that an additional 114 ha of wetland habitat may be affected by RRP-related sound.

Although Trumpeter Swans prefer to nest in undisturbed wetlands, they will habituate to human presence and often feed near observation towers or roads (Babineau 2004; Varner 2008). Swans utilizing other intact wetlands in the NLSA will likely remain unaffected provided these sites are left undisturbed.

Data indicates that waterfowl are vulnerable to accumulation of inorganic elements / compounds due to their foraging habits which include frequenting aquatic habitats where these materials may be deposited, such as the tailings management area and mine site runoff RRP seepage collection ponds. As a result, foraging waterfowl could potentially ingest sediments associated with such facilities. The likely use of tailings and runoff RRP seepage collection ponds by waterfowl to any appreciable degree is considered to be low, given that there will are numerous natural ponds in the area that will not experience equipment and personnel interaction and will thus be more attractive to waterfowl. Site geochemical data also indicate that concentrations of most metals associated with the ore and mine rock are not appreciably different from those typical of crustal norms; in contrast to conditions associated with base metal mines for example. Effluents discharged from the RRP to the environment are expected to be such that Provincial protection of aquatic life guidelines, or alternative scientifically defensible values, will be met in local receiving waters. As a result, it is not expected that harmful levels of metals will be released into the tailings or into the local environment that will cause potential harm to waterfowl.

It is also anticipated that there would be little risk to waterfowl associated with increased vehicular traffic.

7.12.1.3 Area Sensitive Open Country Breeding Birds

The majority (58.7%) of open country habitat within the NLSA consists of active agricultural land (cattle rangeland). The MNR does not consider active agricultural land significant wildlife habitat for area sensitive species. Savannah Sparrow is the most abundant and widespread area sensitive open country species throughout the NLSA while Northern Harrier, Bobolink and LeConte's Sparrow are also present. Sharp-tailed Grouse leks are considered significant wildlife habitat and occur within open county habitats used by area sensitive species.

Sharp-tailed Grouse leks consist of open and often upland, habitats. A lekking complex includes the lek site and adjacent lands that provide suitable nesting habitat, usually occurring within 2 km of the lek (Connelly et al. 1998). Nesting habitat is generally composed of shrub habitat with thick residual cover (Connelly et al. 1998). All lek sites recorded within the NLSA occurred in agricultural fields primarily used as hay fields or pasture for cattle. Three Sharp-tailed Grouse leks were found in the NLSA (along James Road, Roen Road and McMillan Road; Figure 12.6 in Appendix N), while individual observations of hens with young were observed at various other locations. One Sharp-tailed Grouse lek (along Roen Road) was found within the proposed RRP footprint, in the proposed tailings management area. Sharp-tailed Grouse are protected under the *Fish and Wildlife Conservation Act* as game birds.

Adverse environmental effects, residual environmental effects and the significance of adverse effects specific to Bobolink, a SAR, are discussed in detail in Section 7.15.

RRP development will result in the loss of 385 ha of agricultural and meadow habitat used by area sensitive open country breeding birds, as well as surrounding regenerating lands used as nesting habitat by Sharp-tailed Grouse. Table 7-20 provides a summary of the potential impacts to open country breeding birds from vegetation removal. RRP development will lead to the removal of one Sharp-tailed Grouse lek. A lack of suitable lekking habitat can impact the reproductive potential for the local grouse population. It is anticipated that grouse displaced by the removal of the Roen Road lek may utilize the James Road lek.

The overprinting of 385 ha of suitable habitat for RRP development may result in further fragmentation of the local Sharp-tailed Grouse population. Grouse known to occur in open country along Barwick Road will be further isolated from grouse using the James Road lek. The location of the mine will also act as an obstacle that blocks contiguous open country habitat between these areas. The re-alignment of Highway 600 may also lead to additional habitat fragmentation though roads do not appear to present a barrier to grouse movements.

The density of grassland birds have been shown to decline at sound thresholds between 45 to 48 dB (USFWS 2012). AMEC sound studies indicate that ambient sound levels within the NLSA currently approach these sound thresholds. Dooling and Popper (2007) suggest that sound masking occurs at 50 to 60 dBA. AMEC sound modelling studies indicate that mine-generated sound greater than 50 dBA will likely disturb 199 ha of open country habitat.

The most common adverse effects of sound include masking important communication signals. Masking sound can result in a wide array of adverse effects on the way a bird interacts with its environment and with other individuals. During lekking, male Sharp-tailed Grouse dance, stomp their feet and make rattling or clucking sounds which are intended to carry a long distance to attract females (Cadman et al. 2007). Sound from increased traffic, construction activities, blasting, earth movement and operation of heavy machinery during the lekking season (late April to early May) could potentially decrease the breeding success of local grouse by decreasing lek attendance or causing lek abandonment. The impacts of sound may be particularly important to the success of the James Road and Teeple Field lek sites (Figure 12.6 in Appendix N). AMEC sound modelling studies indicate that RRP sound may potentially affect the James Road and Teeple Field lekking site.

Due to their tendency to walk through tall grass and flush at the approach of a vehicle, Sharp-tailed Grouse are particularly susceptible to colliding with vehicles in areas of increased traffic. Increased traffic near the RRP site may elevate the risk of mortality of dispersing grouse as they cross roadways near shrub or open country habitats.

Research into the avoidance of transmission lines by prairie grouse species has demonstrated that certain species avoid transmission lines by margins greater than 100 m (Pruett et al. 2009). No impacts of transmission line presence are expected for Sharp-tailed Grouse in the NLSA as transmission lines will traverse forested lands northeast of the mine site and will not occur as a large structure within a flat grassland landscape. Although Sharp-tailed Grouse will utilize dense shrublands and woodlands during the winter, the prairie subspecies generally resides in open habitats until heavy snowfall causes the grouse to retreat into wooded areas. Removal of mid-age or mature forested habitat is therefore expected to have limited, if any, impact on this species.

7.12.2 Government, Aboriginal and Public Comments and Concerns

No specific concerns have as yet been expressed by government agencies, Aboriginal groups or other stakeholders in relation to area sensitive woodland breeding birds, marsh birds, open country birds, other than generalized statements and expressions of concern that all reasonable efforts should be taken to minimize adverse effects to wildlife populations. Aboriginal groups have expressed concern over the welfare of waterfowl using the NLSA, including loons.

RRR recognizes these concerns and has taken measures in the RRP plan to both reduce adverse environmental effects to wildlife through development of effective mitigation and contingency strategies as described below.

7.12.3 Mitigation

The primary mitigation strategies for limiting adverse effects to sensitive breeding birds and habitat within the NLSA will include:

- Development of a compact RRP site to reduce overall habitat loss and to limit potential adverse effects related to sound emissions, to the extent practicable. The development of contingency mine rock and overburden stockpiles are no longer proposed, reducing the overall affect;

- Restriction of tree and woodland clearing to periods outside of the breeding bird season which extends between May 1 and August 15;

- Protection of suitable breeding habitat as a result of the provision of compensatory habitat for species protected under the *Endangered Species Act*;

- Restoration of disturbed habitats at closure to habitats capable of supporting a diversity of wildlife species;

- Implementation of sound abatement strategies; and

- Enforcement of speed limits along proposed mine access roads to reduce the potential adverse effects of increased vehicular traffic associated with the RRP. Signs warning drivers of the possibility of wildlife encounters will be posted in areas of high wildlife activity. A log of collisions will be kept to monitor the effectiveness of the proposed mitigation and additional mitigation measures will be implemented if necessary.

Mitigation measures specific to sensitive marsh breeding birds includes:

- Restrictions to clearing or modification of known Trumpeter Swan breeding habitat to outside the breeding season (March 15 to August 15) to prevent the disturbance of nesting swans or impact the likelihood of cygnet survival;

- Restoration of disturbed habitats at closure or encouraging development of habitats capable of supporting a diversity of wildlife species, including marshland species;

- Treatment of tailings slurry containing cyanide and associated heavy metals from the ore leaching process in the process plant using the SO_2/Air process before being discharged to the tailings management area; and

- Creation of generally abiotic conditions within the fenced tailings management area during operations to limit the interest of the pond to waterfowl.

Additional mitigation strategies for limiting adverse effects to area sensitive open country breeding bird habitat and remaining Sharp-tailed Grouse within the NLSA will include restricting the overprinting or otherwise developing lands that provide known lekking sites to periods outside the lekking, nesting or fledging seasons (April 1 to August 15) for Sharp-tailed Grouse, as possible. Table 1.2.2 of the MNR (2102c) defines the significant wildlife habitat lek site as the Ecological Land Classification ecosite (polygon where lekking activities occurred) plus a 200 m area with shrub or deciduous trees. By developing lands outside of these temporal windows, grouse existing in the NLSA will have time to search out new territories and suitable lekking complexes and young birds will be fledged and able to escape from machinery.

Mitigation measures described in this section are expected to be effective for their intended purposes and in many instances can be further optimized in response to monitoring data.

7.12.4 Residual Environmental Effects

7.12.4.1 Woodland Birds

RRP development will result in the temporary removal of 1,352 ha of woodland habitat by clearing. Vegetation removal will decrease the total interior habitat from Woodlands 31, 33, 121 and 156 by 208 ha which represents 6.7% of their total area. As a result of a compact RRP site, a greater proportion of forest representing lower quality, regenerating woodland habitat will be cleared. Large woodland complexes such as Woodlands 31, 33, 83, 121, 156 and 173 are more likely to contain mature interior forest comprised of a greater diversity of plant species than small isolated regenerating woodlands occurring within the proposed RRP footprint. Larger woodlands impacted by clearing activities will continue to provide relatively large tracts of interior forest habitat, thereby moderating the adverse effects caused by RRP activities. Forest complexes associated with wetlands and barren areas support a greater diversity of species and are more ecologically significant than small isolated patches (MNR 2010a). In a local context, the removal of 1,352 ha of woodland habitat is notable, although the removal of this woodland area is not significant within the regional context.

Sound emissions greater than 50 dBA will account for the disturbance of 413 ha of woodland habitat and will decrease the total interior habitat from Woodlands 31 and 121 by 28 ha of which represents 1.1% of their total area. Although sound emissions may reduce the quality of woodland breeding habitat, they are temporary and more easily reversed than physical habitat destruction.

7.12.4.2 Marsh Birds

Implementation of the RRP will require the removal of three marsh habitats that provide Trumpeter Swan nesting habitat covering 79 ha. A total of 261 ha of wetland habitat providing habitat for marsh birds is expected to be directly displaced as a result of RRP development. There is also some additional potential for sound disturbance in peripheral lands. Extensive wetland habitat is present in lands adjacent to the RRP site. Given that Trumpeter Swans are known to nest atop beaver lodges or muskrat houses (Cadman et al. 2007), suitable habitat is prevalent in the area. Beaver ponds providing marsh bird breeding habitat to a variety of waterfowl and marsh birds are widespread. The suitability for beaver ponds as significant wildlife habitat for nesting Trumpeter Swans is evident based on the widespread presence of Trumpeter Swan pairs in the area. Although three Trumpeter Swan significant wildlife habitat sites will be removed for placement of the tailings management area, no residual environmental effects to marsh birds in the NRSA are anticipated.

7.12.4.3 Open Country Birds

RRP development will result in the loss of 385 ha of open country habitat as well as one known Sharp-tailed Grouse lek. Surrounding open country habitat and the provision of surrogate habitat will likely dampen the long term impacts of development on the displaced grouse population. A loss of lekking habitat may cause a short term decrease in local reproductive success as displaced grouse must search for other or establish new lekking sites.

7.12.5 Significance Determination

Results of breeding bird studies conducted between 2009 and 2012, indicate that woodland area sensitive species are ubiquitous in the NLSA. Area sensitive species were recorded in 81.6% of woodland features larger than 1 ha and containing at least one breeding bird survey station. Given the homogeneous forest cover of the NRSA, these results indicate that abundant breeding habitat for woodland area sensitive songbirds will remain and that birds displaced by mine activities will colonize surrounding lands.

The magnitude / geographic extent of adverse effects to woodland area sensitive migratory bird species is therefore considered to be a Level I effect: effect considered to be minor. The effect is long term (Level III); is expected to occur regularly or continuously (Level III) for frequency, and is readily reversible at closure (Level I). As such, RRP-related effects on local or regional migratory bird populations are therefore considered to be not significant.

Marsh habitat used by Trumpeter Swans and other waterfowl or marsh bird species generally occurred as Beaver ponds, which are abundant throughout the NLSA and surrounding NRSA. The Ontario Breeding Bird Atlas indicates that Rainy Lake and its surroundings is an Ontario hotspot for Trumpeter Swan breeding in Ontario and represents one of four discrete Ontario populations. The magnitude RRP geographic extent of adverse effects to marsh breeding birds is therefore considered to be a Level I effect: effect considered to be minor, and RRP or solely confined to RRP lands. The effect is long term (Level III); is expected to occur regularly or continuously (Level III) for frequency, and is partially reversible at mine closure (Level II). As such, RRP-related effects on local or regional Trumpeter Swan or marsh breeding bird populations are therefore considered to be not significant.

Although the population sizes of prairie Sharp-tailed Grouse in Ontario and in the Rainy River District are unknown, the Ontario Breeding Bird Atlas states that this species is common in suitable habitat, but local in distribution. Christmas Bird Count data between 1993 and 2002 show that this species is regularly observed near Fort Frances; and eBird.org (eBird 2013) data reports grouse occurring around the Town of Rainy River. It is anticipated that this species occurs within agriculturally impacted areas throughout the Rainy River District. The magnitude RRP geographic extent of adverse effects to open country breeding birds is therefore considered to be a Level I effect: effect considered to be minor, and/or solely confined to RRP lands. The effect is long term (Level III); is expected to occur regularly or continuously (Level III) for frequency, and is reversible at closure (Level I). As such, RRP-related effects on local or regional open country breeding bird populations are considered to be not significant.

7.13 Raptors and Ravens

7.13.1 Environmental Effects

Raptors that potentially occur in the NLSA include eagles (including Bald Eagles addressed separately), osprey, hawks, falcons, harriers, vultures and owls. Common Ravens are included in this section because their nests are similar to those of many raptors, and because raven nests are often used by raptors. Few raptor nests were found within the NLSA, although ten species of diurnal raptor, seven species of owl and Common Raven were recorded during field investigations. Field surveys located nests of Common Raven (three), Great Horned Owl (one) and American Kestrel (one). Common Ravens and tree-roosting raptor species are protected under the *Fish and Wildlife Conservation Act*. No protection is afforded to these species under the *Species at Risk Act*, *Endangered Species Act*, or *Migratory Birds Convention Act*. The Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR 2010b) provides direction for conserving Common Raven, Great-horned Owl and American Kestrel habitat.

No known raptor nests will be removed as a result of vegetation clearing for RRP construction. Table 1.2.2 of MNR (2012c) identifies Great Horned Owl nesting significant wildlife habitat as the area occurring within a circle with a radius of 100 m from the nest. The RRP site does not occur within this significant wildlife habitat feature. Table 1.2.2 of MNR (2012c) does not provide a habitat area for active American Kestrel or Common Raven nests. RRP components will be located at least 500 m from all of these nests.

AMEC sound studies have shown that ambient sound levels in undisturbed forest within the NLSA measure between 40 to 43 dBA during the day and between 36 to 40 dBA during the night. Sound modelling studies show that sound levels will not exceed ambient levels at any of the above known nesting sites. There will however, be increased sound levels on and adjacent to the RRP site which could potentially affect sound sensitive raptor species such as owls which depend in part on sound propagation as a means of locating prey.

While no additional raptor nests have been located in the NLSA or within the proposed RRP footprint, it is still possible that unknown nests may be present, especially for smaller raptor species. Also, site development will displace 1,777 ha of forest and wetland habitat and 522 ha of agricultural fields and shrublands, much of which is likely to be used by various raptors as perching and foraging habitat. RRP-induced habitat loss would therefore be expected to adversely affect raptor species to some degree.

With regard to Common Ravens, disturbance to raven nests is of much greater concern than habitat changes (Boarman and Heinrich 1999). Ravens commonly colonize disturbed areas and it is believed that anthropogenic degradation of natural habitat may benefit Common Ravens (Boarman 1993).

Bald Eagles were commonly observed during RRP investigations and nine nest sites have been documented within 20 km of the NLSA. A Bald Eagle nest in Woodland 122 (Figure 10 in Appendix K-3) has been present in the NLSA since RRP environmental studies began in 2009. This nest occurs within 1 km of proposed mine components, and was confirmed to be active in 2012 and produced at least one offspring. Bald Eagles have regularly been recorded during various RRP inventories in proximity to the Pinewood River, along which this nest occurs. It is likely that eagles use the Pinewood River as a feeding area, although likely travel farther distances to other local waterbodies that support fish populations, particularly east of Highway 71. Bald Eagles have also been noted scavenging deer carcases by local roadsides.

Eight other bald eagle nests are known northeast of the mine site. Two of these nests were active in 2012, although neither of these nests occurred within 2 km of the proposed transmission line. Nests observed near the transmission line occurred in a landscape characterized by a mosaic of small lakes, marshes and hilly terrain with rocky outcrops and conifer dominated upland forest which extends northwards from Rainy Lake. Aerial photo interpretation of this landscape indicates a homogeneous swath of suitable Bald Eagle nesting habitat due to the area of lakes and shoreline habitat where large nest trees may be present. Bald Eagles feed mainly on fish and are attracted to lakes and medium to large sized rivers.

Few lakes occur within the NLSA and none occur within the proposed mine site. The small lakes occurring in proximity to the proposed transmission line are known to freeze completely during the winter, thus excluding their inclusion in Bald Eagle wintering habitat. Data indicates that Bald Eagles commonly winter in the Rainy River District in areas where large bodies of water may not completely freeze such as Rainy Lake and Lake of the Woods.

The significant wildlife habitat 3E Ecoregion Criteria Schedules state that Bald Eagle nesting habitat includes a nest that has been used or is suspected of having been used within the past five years, as well as habitat within a radius of 400 to 800 m around the nest. The area of habitat from a 400 to 800 m radius is dependent on sight lines from the nest to the development and the inclusion of perching and foraging habitat.

Bald Eagles are Provincially listed as Special Concern but are not listed Federally under the *Species at Risk Act*. This species is offered protection under the *Fish and Wildlife Conservation Act*, yet is not protected by the *Endangered Species Act*, *Species at Risk Act* or *Migratory Birds Convention Act*.

Studies have shown that Bald Eagles will react differently to human activities depending on the nature of the activity as defined by visibility, duration, sound levels, extent of the area affected, prior experiences with humans and tolerance of the individual nesting pair (USFWS 2007). Potential disturbances to nesting eagles caused by sound and local human activity will occur throughout the lifetime of the RRP until the restoration phase. Disturbance will likely be of greatest intensity during the construction phase. Disturbing activities may be short lived and/or intermittent (for example, sound from blasting) or may be chronic (for example, sound from mine associated traffic).

AMEC sound studies have shown that ambient sound levels in undisturbed forest within the NLSA measure between 40 to 43 dBA during the day and between 36 to 40 dBA during the night. Sound modelling studies show that sound levels of less than 50 dBA and similar to baseline ambient levels will be experienced by Bald Eagles nesting in Woodland 122. Sound levels will not exceed ambient levels at any other known eagle nest sites within the NLSA.

The United States Fish and Wildlife Service indicates that Bald Eagle sensitivity to human disturbance is greatest during nest building as disturbance may cause a breeding pair to abandon the chosen nest location (USFWS 2007). Sensitivity remains high during egg laying, incubation and early nestling periods (up to four weeks) where disturbance may cause agitated adults to fail to provide adequate care to their young. Although sensitivity will drop during the nestling period, it rises greatly during fledging, as startled fledglings may flush from the nest prematurely.

Adverse effects of mine construction, operation and decommissioning activities will be greatest to Bald Eagles nesting in proximity to mine components. The nest located in Woodland 122 is located approximately 1.2 km south of the proposed mine rock stockpile. The United States Fish and Wildlife Service (2007) states:

> *...eagles are unlikely to be disturbed by routine use of roads, homes and other facilities where such use pre-dates the eagles' successful nesting activity in a given area. Therefore, in most cases ongoing existing uses may proceed with the same intensity with little risk of disturbing Bald Eagles.*

The United States Wildlife Service (2007) further expresses that:

> *...some intermittent, occasional, or irregular uses that pre-date eagle nesting in an area may disturb Bald Eagles.*

7.13.2 Government, Aboriginal and Public Comments and Concerns

The MNR have communicated concerns regarding the protection of raptor nests and have indicated that these are protected by the *Fish and Wildlife Conservation Act*. No specific concerns specific to the RRP have as yet been expressed by Aboriginal groups or other stakeholders in relation to raptor nesting habitat other than generalized statements and expressions of concern that all reasonable efforts should be taken to minimize adverse effects on wildlife populations.

RRR recognizes these concerns and has taken measures in the RRP plan to both develop as small as practical RRP footprint, and to implement mitigation and contingency strategies to limit adverse effects to local wildlife populations.

7.13.3 Mitigation

The following mitigation measures will be implemented to minimize potential adverse effects to raptors and ravens:

- Development of a compact RRP site to prevent encroachment of RRP activities on nesting sites and adjacent habitat;
- Inclusion of wildlife awareness information into regular safety and environmental inductions performed by the mine. Wildlife sighting logs or information boards will be installed to notify workers of local observations. Workers will be made aware of seasonal changes in local animal behaviour or presence in proximity to the mine;
- Minimizing the level of potentially disturbing activities near any known or subsequently discovered active nest sites until the nest is vacated;
- Enforcement of speed limits along proposed mine access roads to reduce the potential adverse effects of increased vehicular traffic associated with the RRP. Signs warning drivers of the possibility of wildlife encounters will be posted in areas of high wildlife activity. A log of collisions will be kept to monitor the effectiveness of the proposed mitigation and additional mitigation measures will be implemented if necessary;
- Disposing of food wastes generated on site in an appropriate manner that limits the attraction of wildlife, including Common Ravens, Turkey Vultures and Bald Eagles;
- Timely removal of carcasses of road-killed animals or any other carcasses found onsite to limit the attraction of wildlife, such as Common Ravens and Turkey Vultures; and
- Restoring disturbed habitat at closure or encouraging development of habitats capable of supporting a diversity of wildlife species, including woodland raptors and ravens.

In the event that future raptor nesting is observed within or in proximity to the RRP footprint, an acceptable buffer defined in the significant wildlife habitat Ecoregion 3W Criteria Schedules will be observed until breeding activities have ended and the nesting site has been abandoned. Workers will be made aware of locally nesting raptors to avoid unnecessary disturbance.

Additional mitigation strategies for limiting adverse effects to Bald Eagle nesting habitat within the NLSA will include:

- Annual monitoring of the Bald Eagle nest in Woodland 122 to determine seasonal eagle activity at the nest site which will guide RRP activities occurring in proximity to the nest. Should eagles continue to use the nest site and raise offspring, work will be adjusted appropriately to reduce adverse effects to the breeding success of the local pair;

- Maintenance of a safe distance between RRP activities and the nest as well as maintenance of landscape buffer areas (preferably forested or natural) between the activity and nest trees. To avoid disturbing nesting Bald Eagles, no buffer is necessary around nest sites outside of the breeding season once the juvenile eagles are known to have vacated the defined significant wildlife habitat;

- Limiting less typical activities in proximity to the nest site during the nest building and breeding season. The local eagle pair appears tolerant of agricultural activities and road grading;

- Environmental induction programs and ongoing environmental updates provided to workers will make them aware of Bald Eagle nesting activities prior to the commencement of new or irregular activities in proximity to an active eagle nest (within 500 m), and having them observe proper protocol in order to avoid disturbance during these activities; and

- Restoration of disturbed habitats at closure or encouraging development of habitats capable of supporting a diversity of wildlife species including Bald Eagles.

Mitigation measures described in this section are expected to be effective for their intended purposes and in many instances can be further optimized in response to monitoring data.

7.13.4 Residual Environmental Effects

It is anticipated that RRP activities will have few adverse effects on the Common Raven nest in Woodland 100, or on ravens nesting throughout the NLSA, due to the ability of this resourceful species to tolerate anthropogenic disturbance. It is anticipated that RRP structures, particularly the installation of the proposed transmission line, may provide increased opportunities for raptor nesting in proximity to the RRP. For example, Common Ravens, Osprey and Red-tailed Hawks are known to use transmission line poles as nesting locations. An Osprey nest sits atop a transmission line structure present along Highway 11 approximately 15 km east of Fort Frances. A large body of data shows that Osprey will readily use artificial structures as nesting sites (APLIC 2006).

It is not expected that adverse effects will be experienced by eagles nesting at any locations in proximity to the transmission line as recorded during 2012 aerial surveys. These nest locations are also sufficiently far removed from mine activities that no perceived visible threats, anthropogenic sounds, or novel human activity will reach the nest sites. Aerial surveys conducted by AMEC in 2012 located two Bald Eagle nests occurring within 100 m of human habitations, indicating the likely tolerance of local eagles to moderate levels of human presence appears to be high so long as the eagles are not unduly disturbed.

It is apparent that local traffic using Highway 600 has not deterred eagle nesting at this location as nesting at this location has persisted in recent years. Since this gravel road is regularly graded by heavy machinery and farming occurs locally, one can infer the adult eagles using this nesting site are reasonably tolerant of equipment use. This nest location is sufficiently removed from mine activities that no perceived visible threats, regular loud sounds, or novel human activity will reach the nest site.

As previously discussed, transmission lines have been utilized by a wide variety of raptors including Bald Eagles as nesting sites. In Florida, 46% of Bald Eagle nests on manmade structures occurred on transmission poles (n = 24; APLIC 2006). The construction of transmission line structures may provide suitable nesting sites for both Bald Eagles and Osprey where structures occur in proximity to lakes or rivers, suitable perching, roosting and feeding habitat.

At closure, all disturbed sites will be reclaimed to terrain types that can be utilized by a diversity of wildlife species, including Bald Eagles and other raptors.

7.13.5 Significance Determination

The development of a compact RRP site will help to minimize RRP impacts on raptors and ravens, including consideration of sound effects. The magnitude / geographic extent of adverse effects to raptor and raven populations is therefore considered to be a Level I effect: effect considered to be minor, and/or solely confined to RRP lands. The effect is long term (Level III); is expected to occur regularly or continuously (Level III) for frequency, and is readily reversible at closure (Level I). As such, RRP-related effects on local or regional woodland raptors are therefore considered to be not significant.

The development of a compact RRP site and the implementation of mitigation procedures will minimize the exposure of locally nesting Bald Eagles to RRP activities. The magnitude / geographic extent of adverse effects to Bald Eagles is therefore considered to be a Level I effect: effect considered to be minor, and/or solely confined to RRP lands. Effects, should they occur, would be long term (Level III); but would be expected to occur infrequently, or not at all (Level I) for frequency, and would be readily reversible at mine closure (Level I). Continued annual monitoring of local nest sites will determine the success of mitigation strategies and provide data to devise improved contingency measures if required. As such, RRP-related effects to Bald Eagle nesting habitat or to local or regional Bald Eagle populations are considered to be not significant.

7.14 Amphibians

A total of eight frog species were observed in the NLSA during baseline studies conducted between 2009 and 2012. No salamander species were observed.

7.14.1 Environmental Effects

Amphibians may breed in woodlands containing vernal pools (permanent or ephemeral) and wetland habitats. RRP development during construction will remove 1,352 ha of woodland and 420 ha of wetland amphibian breeding habitat within the NLSA. Habitat removal may reduce suitable breeding habitat or may cause direct mortality to amphibians occurring within wetlands. Beaver ponds and other wetlands features are numerous throughout the NLSA and NRSA. The removal of wetland habitat within the NLSA equates to a loss of 6.8% of wetland habitat in the NRSA.

RRP construction, operation and decommissioning will result in increased traffic within the RRP site. The re-alignment of Highway 600 will run 6.4 km of road through natural habitat. Collisions with vehicles can impact a significant number of amphibians during seasonal movements between breeding and wintering habitats. Given that amphibians are known to attempt to cross roads while travelling between breeding and wintering habitats, increased vehicular traffic will likely cause an increase in frog mortality within the NLSA, particularly in the spring and fall. No precise locations experiencing large movements of frogs across roads were observed within the NLSA.

Site geochemical data also indicate that concentrations of most metals associated with the ore and mine rock are not appreciably different from those typical of crustal norms. Effluents discharged from the RRP to the environment are expected to meet the PWQO for protection of aquatic life or alternative scientifically defensible values, in local receiving waters. As a result, it is not expected that harmful levels of metals will be released into the tailings management area or into the local environment that could cause potential harm to amphibians.

7.14.2 Government, Aboriginal and Public Comments and Concerns

No specific concerns have as yet been expressed by government agencies, Aboriginal groups or other stakeholders in relation to amphibians other than generalized statements and expressions of concern that all reasonable efforts should be taken to minimize adverse effects to wildlife populations.

RRR recognizes these concerns and has taken measures in the RRP plan to reduce adverse environmental effects to wildlife through development of effective mitigation and contingency strategies. Further details are provided below.

7.14.3 Mitigation

Mitigation measures that will be used to reduce potential adverse effects to amphibians will include the following:

- Development of a compact RRP site to reduce overall habitat loss and to limit potential adverse effects related to sound emissions to the extent practical;

- Restricting the clearing of terrestrial amphibian breeding habitats to periods outside the amphibian breeding season as directed by the MNR;

- Implementation of sound abatement strategies to dampen sound infiltrating habitats surrounding high traffic areas of the mine;

- Other options may be discussed with the MNR to lessen the impacts of clearing wetland habitat where frogs are likely to overwinter. Potential protective strategies for discussion may modifying the timing of draining of wetlands to encourage frogs to move to other wetlands;

- Restoration of disturbed habitats at mine closure or encouraging the development of habitats capable of supporting a diversity of wildlife species, including amphibians;

- Enforcement of speed limits along proposed mine access roads to reduce the potential adverse effects of increased vehicular traffic associated with the RRP. Signs warning drivers of the possibility of wildlife encounters will be posted in areas of high wildlife activity. A log of collisions will be kept to monitor the effectiveness of the proposed mitigation and additional mitigation measures will be implemented if necessary;

- If frog mortality on roadways is found to be a problem along mine access roads or the re-aligned Highway 600, silt fencing may be installed to prevent frogs from crossing the road and may direct them to the nearest culvert(s);

- Inclusion of wildlife awareness information into regular safety and environmental inductions performed by the mine. Workers and contractors should continually be made aware of seasonal changes in local wildlife behaviour or presence in proximity to the mine;

- Treatment of tailings slurry containing cyanide and associated heavy metals from the ore leaching process in the process plant using the SO_2/Air process before being discharged to the tailings management area;

- Discharge of effluent that will result in protection of aquatic life standards in the Pinewood River so that no adverse water quality affects to amphibians are anticipated;
- Maintenance of generally abiotic conditions within the tailings management area to discourage wildlife presence; and
- Covering the exposed tailings beach at closure with a layer of overburden and flooding the remaining tailings with a layer of water to prevent the tailings from oxidizing over the longer term. This will ensure that the tailings pond waters remain of high quality such that they will not pose a threat to wildlife. Margins of the tailings pond will be developed into wetland habitat.

Mitigation measures described in this section are expected to be effective for their intended purposes and in many instances can be further optimized in response to monitoring data.

7.14.4 Residual Environmental Effects

Implementation of the RRP will result in the clearing of 1,352 ha of potential woodland amphibian breeding habitat and 420 ha of wetland amphibian breeding habitat. Environmental mitigation measures will largely limit the extent of mortality experienced by local amphibians during RRP construction and operation. Adherence to MOE effluent discharge regulations will result in protection of aquatic life standards in the Pinewood River so that no adverse water quality affects to amphibians are anticipated.

7.14.5 Significance Determination

All amphibians observed in the NLSA are regionally common species and suitable frog habitat is widespread across the Rainy River District. The magnitude / geographic extent of adverse effects to amphibians is considered to be a Level I effect: effect considered to be minor, and/or solely confined to RRP lands. The effect is long term (Level III); is expected to occur regularly or continuously (Level III) for frequency, and is partially reversible at closure (Level II). RRP-related effects on local or regional amphibian populations are therefore considered to be not significant. All amphibians observed in the NLSA are regionally common species and suitable frog habitat is widespread across the Rainy River District.

7.15 *Endangered Species Act* Species

Between 2009 and 2012, seven species listed as Endangered or Threatened under the *Endangered Species Act* have been recorded within the NLSA. Endangered species included Little Brown Myotis and Northern Myotis and Threatened species included Grey Fox, American White Pelican, Eastern Whip-poor-will, Bobolink and Barn Swallow.

Trapping records have indicated the presence of Grey Foxes within or in proximity to the NLSA, although this species has not been recently confirmed within the NLSA. Cumulative trapping records for three area traplines for the period of 2003 through 2008 showed two individuals of this species taken, compared with 129 Red Foxes taken during the same period. Individuals observed in northwestern Ontario are expected to originate from populations in the United States (Naughton 2012) as the only known breeding of this species elsewhere in Ontario occurs on Pelee Island. Given the unlikely chance that an established breeding population of Grey Foxes occurs within the NLSA, no adverse environmental effects caused by the RRP are anticipated to impact this species. No significant impacts to this species are anticipated.

As described in Section 5.10.1.2, American White Pelicans breed on the Three Sisters Islands and the Lake of the Woods Sand Spit Archipelago Islands within Lake of the Woods. This species does not breed within the NLSA due to a lack of suitable shoreline habitat, yet has occasionally been observed feeding in wetlands within the NLSA. Adverse environmental effects, mitigation, residual environmental effects to wetlands and marsh birds are described in Sections 7.12.1.2 and addresses protective measures for pelicans utilizing the NLSA.

The Little Brown Myotis was listed as Endangered in February 2012 by Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and was subsequently listed as Endangered in October 2012 by Committee on the Status of Species at Risk in Ontario (COSSARO) thereby receiving protection as a SAR under the *Endangered Species Act*. Little Brown Myotis was the second most abundant bat species recorded at bat detector locations within the NLSA and shares similar habitat features with other cavity-roosting bat species observed in the NLSA. Adverse environmental effects, mitigation and significant residual effects of the RRP for this species will be representative of all bats occurring within the NLSA and are addressed in Section 7.11.

Similar to Little Brown Myotis, Northern Myotis was listed as Endangered in February 2012 by COSEWIC. This species was listed as Endangered in October 2012 by COSSARO thereby receiving protection as a SAR under the *Endangered Species Act*. Northern Myotis passes were identified twice at bat detector Station 5 (Figure 5-15). Adverse environmental effects, mitigation, and significant residual effects of the RRP for this species will be representative of all bats occurring within the NLSA and are addressed in Section 7.11.

With regards to aquatic species at risk, no Federally or Provincially listed aquatic Species at Risk have been captured during baseline studies within the NLSA. Three Lake Sturgeon were captured in the lower Pinewood River by AMEC and the MNR, approximately 27 km downstream of the RRP open pit and within the NRSA. COSEWIC has proposed six population Designatable Units (DU) for Lake Sturgeon within the Province of Ontario, but the Lake of the Woods – Rainy River populations currently have no schedule of status under *Species at Risk Act* (Appendix I).

At the Provincial level, COSSARO has assigned population status to the northwestern Ontario population which encompasses COSEWIC DU4-6. The northwestern Ontario population is included in the Species at Risk Ontario list as Threatened and afforded protection under the *Endangered Species Act* (2007; Appendix J-1). A recovery strategy for Lake Sturgeon in Ontario has been developed in accordance with the requirements of the *Endangered Species Act* (Golder 2011). A final government response statement summarizing the Government of Ontario's intended actions and priorities in response to the recovery strategy is currently not available. As Lake Sturgeon were not found within the NLSA and water quality / flow in the lower reaches of the Pinewood River will not be appreciably affected by the RRP, further assessment of Lake Sturgeon has not been made herein.

Further assessment is provided regarding Eastern Whip-poor-will, Bobolink and Barn Swallow which are known to be present in the NLSA.

7.15.1 Eastern Whip-poor-will

Eastern Whip-poor-will is listed as Threatened under both the *Endangered Species Act* and *Species at Risk Act*. This species is also protected under the *Migratory Birds Convention Act*. These birds tend to nest in semi-open habitats such as open woodlands, woodlands associated with rock outcrop areas and along forest edges. Individuals of this species have been noted at several locations at and adjacent to the RRP site. Along with baseline studies conducted by KCB and AMEC between 2009 to 2012, RRR also funded a two year collaborative research study (2011 to 2012) with the MNR and Trent University to study whip-poor-will in the RRP area in support of both species conservation and mine permitting requirements.

7.15.1.1 Environmental Effects

The Eastern Whip-poor-will is listed Federally and Provincially as a Threatened species. It is anticipated that local Eastern Whip-poor-wills, whose territories occur adjacent to and within the proposed mine location, may be impacted through habitat loss, sound and increased local traffic.

Clearing of land for RRP development will remove 1,352 ha of woodland habitat and 95 ha of treed and open rock barren habitat from the NLSA, vegetation communities which may be used as nesting habitat by Eastern Whip-poor-wills. Based on locations of proposed RRP facilities, development of the open pit, gravel pit, process plant and east mine rock stockpile will displace a number of known whip-poor-will breeding territories. The transmission line will also pass through a tract of land inhabited by whip-poor-will. Vegetation clearing will impact both nesting and foraging habitat for this species. Unlike most aerial insectivores who hunt while in flight, whip-poor-wills stay perched until a prospective prey flies past. As such, whip-poor-wills must perch within foraging habitat instead of foraging overtop of it. Based on the results of whip-poor-will surveys between 2009 to 2012, 17 territories may be lost as a result of mine site development and up to 2 territories may be lost along the transmission line.

As nocturnal birds, Eastern Whip-poor-wills depend on auditory cues for much of their intraspecific interactions during nightly forays. Male whip-poor-wills may sing continuously through much of the night to establish and defend their territories. Sound produced at night by RRP activities during construction, operation and decommissioning could therefore potentially decrease the reproductive success of birds whose territories are in close proximity to the mine. Although this species hunts by sight in low light conditions, increases in ambient sound levels may cause distractions or reduced foraging time. Eastern Whip-poor-wills may avoid the mine site and surrounding lands and seek quieter habitat areas. Sound disturbance at the proposed transmission line will be limited to the construction and decommissioning phases.

AMEC sound studies have shown that ambient sound levels in undisturbed forest within the NLSA measure between 40 to 43 dBA during the day and between 36 to 40 dBA during the night. RRP-generated sound above these threshold ranges, nominally defined at a 50 BA threshold (Section 7.4.1), will likely have an influence on whip-poor-will behaviour within affected areas. Sound modelling studies show that 454 ha of woodland and treed / open rock barren, beyond that which would otherwise be displaced by RRP facilities, could potentially be affected by mine related sound levels above 50 dBA.

Mine construction and operation is anticipated to occur both night and day so that additional artificial lighting will be required. Since whip-poor-wills hunt by use of eyesight, bright lighting may cause them to avoid habitat adjacent to the mine site which may in turn decrease their foraging efficiency or the reproductive success of birds nesting closest to the mine.

Road mortality could occur with increased traffic as whip-poor-wills are known to roost on gravel roads within their preferred habitat. Foraging individuals or displaying males may also collide with vehicles.

7.15.1.2 Government, Aboriginal and Public Comments and Concerns

The MNR has expressed concerns about the loss of Eastern Whip-poor-will habitat and possibly individuals due to the RRP. RRR and their consultants have met extensively with the MNR starting in 2010 to discuss how to best minimize negative impacts to this species and the results of these discussions are presented in the mitigation measures presented below, as well as in the *Endangered Species Act* permit application that will be submitted for this RRP. An ongoing monitoring plan for this species is also proposed in Section 13 and was developed through consultation with the MNR.

With the exception of two local residents, no specific concerns have as yet been expressed by Aboriginal groups or other stakeholders in relation to Eastern Whip-poor-will other than generalized statements and expressions of concern that all reasonable efforts should be taken to minimize adverse effects to wildlife populations and, in particular, SAR. The two local residents attended a RRP open house in Emo on November 8, 2012. They expressed interest in

SAR and whip-poor-will in particular, including any potential for local people to get involved in SAR study programs where feasible. RRR recognizes these concerns and has taken measures in the RRP plan to reduce adverse environmental effects to wildlife through development of effective mitigation, contingency, and monitoring strategies.

7.15.1.3 Mitigation

Mitigation measures that will be used to reduce potential adverse effects to Eastern Whip-poor-will will include the following:

- Minimizing Eastern Whip-poor-will foraging and nesting habitat loss by developing a compact site to reduce overall habitat loss and to limit potential adverse effects related to sound emissions, to the extent practicable;
- Altering the RRP footprint through consultation with the MNR in order to further avoid known whip-poor-will territories where feasible;
- Provision of compensatory whip-poor-will habitat that protects known territories and other identified suitable habitat;
- Restricting the clearing of habitats to periods outside the breeding bird season which occurs from May 1 to August 15;
- Implementation of sound abatement strategies to dampen sound infiltrating habitats surrounding high traffic areas of the mine;
- Where feasible, management of site lighting fixtures to reduce excess light production near whip-poor-will foraging areas so as to minimize disturbing these nocturnal birds (with all appropriate health and safety issues considered);
- Maintenance of forest buffers between RRP components and whip-poor-will nesting and foraging habitat where practical;
- Management of dust through dust suppression activities (best management practices);
- Enforcement of speed limits along mine-controlled roads to reduce the potential adverse effects of increased vehicular traffic associated with the RRP. Signs warning drivers of the possibility of wildlife encounters will be posted in areas of high wildlife activity. A log of collisions will be kept to monitor the effectiveness of the proposed mitigation and additional mitigation measures will be implemented if necessary;
- Progressive habitat restoration during mine operations and following mine closure;

- Environmental induction of RRP personnel, including SAR identification and sensitivities, and knowledge of *Endangered Species Act* permit conditions;

- Implementation of a monitoring plan for Eastern Whip-poor-will populations and nesting in proximity to the proposed mine and transmission line sites, within compensatory habitat areas and in appropriate control areas; and

- Continue funding external research programs in collaboration with the MNR in order to further our understanding of this poorly studied species, as part of a larger overall benefits compensation package required by the *Endangered Species Act* permit.

Mitigation measures described in this section are expected to be effective for their intended purposes and in many instances can be further optimized in response to monitoring data. Further mitigation details are being developed as part of the overall benefits compensation package required by the *Endangered Species Act*.

7.15.1.4 Residual Environmental Effects

The removal of whip-poor-will breeding habitat will likely result in the displacement of as many as 17 whip-poor-will territories [pending conclusions of discussions with MNR] and decreased local breeding in proximity to the mine site (along Roen Road). Whip-poor-wills may persist at the peripheries of the mine site and displaced birds may colonize nearby tracts of identified suitable breeding habitat, particularly north and northeast of the proposed mine site. Adherence to mitigation and contingency measures will be crucial in assuring that persisting birds and the local population as a whole are not harmed by mining activities. It is anticipated that the construction of the proposed transmission line will have limited residual adverse effects on local whip-poor-wills given the extent of similar habitat nearby. The proposed overall benefits compensation package being developed for this species pursuant to requirements of the *Endangered Species Act* permit will result in a net positive effect on this species.

7.15.1.5 Significance Determination

Through the implementation of mitigation measures and contingency efforts resulting from ongoing monitoring, Eastern Whip-poor-wills are expected to persist at populations levels equal to or higher than prior to construction of the RRP. The magnitude / geographic extent of adverse effects to Eastern Whip-poor-will following mitigation, including provisions of the anticipated overall benefits compensation package, is therefore considered to be a Level I effect: effect considered to be minor and/or solely confined to RRP lands; or in the case of applicable SAR species where no net loss of the productive capacity of habitat is achieved (or anticipated to be achieved) through permits. The effect is long term (Level III); is expected to occur regularly or continuously (Level III) for frequency, and is reversible at closure (Level I).

Through effective impact mitigation, an effective overall benefits compensation package required by the *Endangered Species Act* permit that was designed through consultation with the MNR, the presence of abundant suitable breeding habitat in the NRSA, and the protection of local breeding grounds from future development through the provision of compensatory habitat, RRP-related effects on local or regional Eastern Whip-poor-will populations are considered to be not significant.

7.15.2 Bobolink

Bobolink is an area sensitive open country bird species listed both Federally and Provincially as Threatened and receives protection under the *Endangered Species Act*. This species is also protected under the *Migratory Birds Convention Act*. As the majority (58.7%) of open country habitat within the NLSA consists of active agricultural land, protection of Bobolink breeding habitat within the NLSA will provide habitat protection for a variety of other open country species including Savannah Sparrow, LeConte's Sparrow, Short-eared Owl and Northern Harrier.

7.15.2.1 Environmental Effects

Development of the RRP will result in the loss of 350 ha of open country habitat, of which 134 ha was assessed as high quality Bobolink habitat. Based on the results of baseline studies by AMEC and KCB, habitat removal will likely displace 15 to 20 pairs of Bobolink. Implementation of the proposed RRP is not anticipated to act as a barrier to Bobolink movement.

The density of grassland birds have been shown to decline at sound levels of 48 dB (USFWS 2012). The most common adverse effects of sound include masking important communication signals and causing physiological changes. In rare circumstances, intense loud sounds may result in temporary threshold shift or hearing loss. Masking sound can result in a wide array of adverse effects on the way a bird interacts with its environment and with other individuals. Sound masking has been shown to occur at sound emissions levels of 50 to 60 dBA (Dooling and Popper 2007). The effects of masking may include loss of ability to hear important behavioural triggers such as the songs of territorial males, calls of females, begging calls of nestlings, approaching predators and the presence of prey items. As a result, masking sound can decrease breeding success or density in noisy habitats.

Collisions of birds with vehicles and human-built (anthropogenic) structures represent one of the largest sources of human-caused mortality of songbirds. Male Bobolinks are very active during the breeding season, conducting aerial displays and chasing other males (Martin 1967). This species often perches on fences or small shrubs along roadsides at the edge of open country habitat. These behaviours may put Bobolink at risk to collisions causing mortality due to increased vehicular traffic along roadways within the NLSA during the construction, operation, and closure of the RRP.

7.15.2.2 Government, Aboriginal and Public Comments and Concerns

The MNR has expressed concerns about the loss of Bobolink habitat and possibly individuals due to the RRP. RRR and their consultants have met extensively with the MNR to discuss how to best minimize potential negative impacts to this species and the results of these discussions are presented in the mitigation measures presented below, as well as in the *Endangered Species Act* permit application that will be submitted for this RRP. An ongoing monitoring plan for this species is also proposed in Section 13 and was developed through consultation with the MNR.

No specific concerns have as yet been expressed by government agencies, Aboriginal groups or other stakeholders in relation to Bobolink other than generalized statements and expressions of concern that all reasonable efforts should be taken to minimize adverse effects to wildlife populations. RRR recognizes these concerns and has taken measures in the RRP plan to both develop as small as practical RRP footprint and to implement mitigation and contingency strategies to limit adverse effects to local wildlife populations.

7.15.2.3 Mitigation

The primary mitigation strategies for limiting adverse effects to Bobolink within the NLSA will include:

- Development of a compact RRP site to reduce overall habitat loss and to limit potential adverse effects related to sound emissions, to the extent practicable;
- Restricting the development of open country habitats to periods outside the breeding bird season which occurs from May 1 to July 31;
- Acquiring and protecting compensatory open country breeding bird habitat suitable for Bobolink breeding at a ratio of 1:1 for open-country habitat removed for RRP development;
- Enforcement of speed limits along mine controlled roads to reduce the potential adverse effects of increased vehicular traffic associated with the RRP. Signs warning drivers of the possibility of wildlife encounters will be posted in areas of high wildlife activity. A log of collisions will be kept to monitor the effectiveness of the proposed mitigation and additional mitigation measures will be implemented if necessary;
- Environmental induction of RRP personnel, including SAR identification and sensitivities and knowledge of *Endangered Species Act* permit conditions;
- Implementation of sound abatement strategies to dampen sound infiltrating habitats surrounding high traffic areas of the mine;

- Restoration of disturbed habitats at mine closure or encouraging development of habitats capable of supporting Bobolink and other open country species; and

- Implementation of a monitoring plan for Bobolink populations and nesting in proximity to the proposed mine site within compensatory habitat areas, and in appropriate control areas.

Mitigation measures described in this section are expected to be effective for their intended purposes and in many instances can be further optimized in response to monitoring data. Further mitigation details are being developed as part of the overall benefits compensation package required by the *Endangered Species Act*.

7.15.2.4 Residual Environmental Effects

RRP development will result in the loss of 385 ha of open country habitat which includes known Bobolink breeding habitat. This represents a loss of 14.7% of open country habitat within the NLSA. Open country habitat surrounding the mine site will likely dampen the long term impacts of development on the local Bobolink population. The protection and maintenance of grassland habitat anticipated to be part of an overall benefits compensation package, pursuant to *Endangered Species Act* permitting requirements, will provide habitat where reproductive success is likely improved due to a lack of mowing during breeding season.

Bobolink compensatory habitat will be mowed or burned every 2 to 3 years (outside of Bobolink breeding season) to maintain grassland quality and a high grass to forb ratio will be promoted. The literature indicates that Bobolink territories can be as small as 0.49 ha (Bollinger 1988) or as large as 2.0 ha (Wiens 1969). Compensatory efforts are expected to increase reproductive success and thus offset any RRP-induced decrease in carrying capacity of within the NLSA.

7.15.2.5 Significance Determination

According to eBird.org data (eBird 2013), Bobolink is widely distributed across the Crossroute Forest region wherever open country is present. This species has a widespread distribution, is prevalent in open country habitats as demonstrated within the NLSA, and will be afforded higher quality habitat through compensatory efforts.

Through the implementation of mitigation measures and contingency efforts resulting from ongoing monitoring, Bobolinks are expected to persist at populations levels equal to or higher than prior to construction of the RRP. The magnitude / geographic extent of adverse effects to Bobolinks following mitigation, including provisions of the anticipated overall benefits compensation package, is therefore considered to be a Level I effect: effect considered to be minor and/or solely confined to RRP lands; or in the case of applicable SAR species where no net loss of the productive capacity of habitat is achieved (or anticipated to be achieved) through permits. The effect is long term (Level II); is expected to occur regularly or continuously (Level III) for frequency, and is reversible at closure (Level I).

As such, RRP-related effects on local or regional Bobolink populations are therefore considered to be not significant.

7.15.3 Barn Swallow

Barn Swallow is listed as Threatened both Federally and Provincially and receives protection under the *Endangered Species Act*. This species is also protected under the *Migratory Birds Convention Act*.

A total of 29 Barn Swallows were observed during formal breeding bird surveys at seven general locations in the NLSA and colonies likely occur within farm buildings occurring on rural properties near each of these locations. An additional colony was noted in addition to those identified in the formal surveys.

7.15.3.1 Environmental Effects

Critical habitat for Barn Swallow includes suitable nesting locations which most often include human-built structures such as barns, other farm buildings and bridges and may also include natural rock faces. Two barns providing potential Barn Swallow nesting habitat will be removed for development of the tailings management area. These barns, and mine rock piles and overburden stockpiles likely represent the greatest potential adverse effect of the RRP on this species. Removal of old wooden farm structures in favour of modern buildings appears to have played a significant role in population declines in this species (COSEWIC 2011).

Buildings on six rural properties will be removed for development of the RRP. The removal of these will displace approximately 20 to 26 pairs of Barn Swallows. It is hoped that structures built within the mine site may provide temporary Barn Swallow nesting locations and that efforts to provide surrogate habitat on mine buildings and on new bridges will temporarily maintain or increase the local Barn Swallow population.

Vegetation clearing during for RRP development will likely have a limited adverse environmental effect on Barn Swallows in the NLSA. Development of the RRP will also remove approximately 277 ha of agricultural lands and 261 ha of open wetland habitat that may be used by Barn Swallows as foraging grounds. Barn yards and pasture lands, especially active ones, are important foraging locations for swallows as they attract abundant invertebrate prey (COSEWIC 2011a). Loss of foraging habitat in Ontario has also been attributed to succession of open habitat to woodland following abandonment of agricultural land (COSEWIC 2011a). Changes in invertebrate abundance may also be responsible for the gradual decline of aerial insectivore populations, such as the Barn Swallow, throughout North America. Foraging habitat loss will likely only cause adverse effects to swallows in the NLSA if it diminishes the quality of nesting sites or if local swallow density is saturated and loss of foraging resources reduces carrying capacity.

It is uncertain whether increased ambient sound will cause disturbance to local Barn Swallows given their tendency to colonize anthropogenic structures. Sound can cause adverse effects birds in a variety of ways. The most common of which include masking important communication signals. It is anticipated that sound will have little adverse effects to swallows, yet high levels of human activity may prevent or impair nesting efforts by causing stress to adults or startling fledglings.

Road mortality is a serious direct risk to Barn Swallows whose behaviour is so largely dependent on human activities and infrastructure. Swallows often perch on telephone wires at roadsides and are at high risk of collisions with passing vehicles. As aerial insectivores, swallows are frequently in flight pursuing prey items in proximity to human activities. This behaviour may also contribute to increased collisions with vehicles. Increased traffic in proximity to the mine may thus cause increased vehicle collisions with Barn Swallows.

7.15.3.2 Government, Aboriginal and Public Comments and Concerns

No specific concerns have as yet been expressed by government agencies, Aboriginal groups or other stakeholders in relation Barn Swallows other than generalized statements and expressions of concern that all reasonable efforts should be taken to minimize adverse effects to wildlife populations and, in particular, SAR.

RRR recognizes these concerns and has taken measures in the RRP plan to reduce adverse environmental effects to wildlife through development of effective mitigation and contingency strategies. Further details are provided below.

7.15.3.3 Mitigation

Mitigation measures that will be used to reduce potential adverse effects to Barn Swallows will include the following:

- Development of a compact RRP site to limit the extent of removal of Barn Swallow foraging habitat or nesting structures;
- Identification of Barn Swallow nesting colonies prior to mine construction;
- Restricting habitat displacement for mine infrastructure to periods outside the breeding bird season which occurs from May 1 to August 15;
- Creation of artificial nesting structures to encourage recolonization or new colonization by Barn Swallows in areas where farm structures are removed;

- Restoration of disturbed habitats at closure or encouraging development of habitats capable of proving suitable Barn Swallow foraging habitat;

- Sound abatement strategies will be implemented to dampen sound infiltrating habitats surrounding high traffic areas of the mine;

- Establishment of zones where Barn Swallow colonization is desired, tolerated or not wanted. These measures may be necessary to prevent colonization in areas of high human or vehicular activity that would put swallows and swallow breeding success at risk or where order and cleanliness are desired. In this case, discouraging tactics may be implemented to discourage colonization. Conversely, protection may be provided to swallows nesting in other locations where their presence is encouraged and does not cause problems to mine operations;

- Enforcement of speed limits along mine controlled roads to reduce potential adverse effects of increased vehicular traffic associated with the RRP. Signs warning drivers of the possibility of wildlife encounters will be posted in areas of high wildlife activity. A log of collisions will be kept to monitor the effectiveness of the proposed mitigation and additional mitigation measures will be implemented if necessary; and

- Implementation of a monitoring plan for Barn Swallow populations in proximity to the proposed mine and transmission line sites and in appropriate control areas.

Mitigation measures described in this section are expected to be effective for their intended purposes and in many instances can be further optimized in response to monitoring data. Further mitigation details are being developed as part of the overall benefits compensation package required by the *Endangered Species Act*. Monitoring efforts for Barn Swallow will focus on the effects of changes in agricultural land use surrounding the mine site. Any Project activities that require the removal of structures containing Barn Swallow nests will be registered with the MNR as required by the *Endangered Species Act*.

7.15.3.4 Residual Environmental Effects

It is desired that the RRP will maintain or encourage local colonization by Barn Swallows. Six rural properties providing suitable nesting structures will be removed and replaced by surrogate structures which may be colonized and continue to provide suitable nesting habitat. Removal of 277 ha of agricultural habitat and 261 ha of open wetland habitat will result in an overall loss of foraging habitat. The environmental effects of foraging habitat removal may not be adverse and are dependent on the position of this habitat relative to nesting sites.

Protection of Barn Swallow habitat should be considered in conjunction with protective efforts for other area sensitive open country bird species (for example Bobolink and Savannah

Sparrow) as well as Black-billed Magpies, a Provincially rare species largely associated with farming areas.

7.15.3.5 Significance Determination

Through implementation of mitigation measures, including provisions of the anticipated overall benefits compensation package and contingency efforts resulting from ongoing monitoring, Barn Swallows are expected to persist at populations levels equal to or higher than at pre-construction. The magnitude / geographic extent of adverse effects to Barn Swallows following mitigation is therefore considered to be a Level I effect: effect considered to be minor, and/or solely confined to RRP lands; or in the case of applicable SAR species where no net loss of the productive capacity of habitat is achieved (or anticipated to be achieved) through permits. The effect is long term (Level III); is expected to occur regularly or continuously (Level III) for frequency, and is reversible at closure (Level I).

As such, RRP-related effects on local or regional Barn Swallow populations are therefore considered to be not significant.

7.16 Species of Special Concern and Provincially Rare Species

The Significant Wildlife Habitat Technical Guide (MNR 2000) describes habitat used by species of Special Concern and Provincially rare species as significant wildlife habitat. Table 1.3 of the Criteria Schedules (MNR 2012c), states that the significant wildlife habitat is the area of the habitat, to the finest Ecological Land Classification scale, that protects the habitat form and function. Ontario species of Special Concern are not protected under the *Endangered Species Act* but may receive protection under other legislation including the *Migratory Birds Convention Act* or *Fish and Wildlife Conservation Act*.

Nine species of Special Concern were recorded within the NLSA. Of these, seven species of Special Concern are known or anticipated to breed within the NLSA and include: Bald Eagle, Common Nighthawk, Golden-winged Warbler, Canada Warbler, Olive-sided Flycatcher, Red-headed Woodpecker and Snapping Turtle. Short-eared Owl was identified as an irregular breeder within the NLSA; no species specific mitigation measures additional to those prescribed for other open country breeding and crepuscular birds are necessary for this species (Sections 7.14 and 7.15).

Bald Eagle nesting, foraging and roosting habitat is identified as a unique significant wildlife habitat in the significant wildlife habitat Ecoregion 3E Criteria Schedules. Adverse environmental effects, mitigation strategies and significance of residual environmental effects for Bald Eagles are described in Section 7.13. The remainder of the species of Special Concern are described below.

Three Provincially rare wildlife species are known or anticipated to breed or occur in the NLSA and include Black-billed Magpie, Lilypad Clubtail and Horned Clubtail and are described below. The records review identified three more Provincially rare species (Arrowhead Spiketail, Green-faced Clubtail and Midland Clubtail) as potentially occurring within the NRSA but the habitat requirements for these species were not found in the NLSA, nor were these species recorded during baseline surveys.

Two Provincially rare plant species, New England Violet and Field Sedge, were located within the NLSA and are discussed in Section 7.8. Muskroot and Eastern Swamp Saxifrage are also Provincially rare plant species that may occur within the NLSA but they have not been recorded in the area since 1946 and 1961, respectively. These latter two species are discussed in more detail in Section 5.9.1.2 and Table 5-27.

7.16.1 Environmental Effects

7.16.1.1 Common Nighthawk

Common Nighthawks are currently listed federally as Threatened, Schedule 1 and Provincially as Special Concern. As such, this species and its nests are afforded general habitat protection under *Species at Risk Act* as well as the *Migratory Birds Convention Act*.

Nineteen Common Nighthawks were recorded at 12 locations within the NLSA during baseline inventories conducted between 2009 and 2012. Common Nighthawk observations were rare in areas overlapping with proposed mine facilities and were most common near to the proposed transmission line corridor. Common Nighthawk breeding habitat is likely uncommon within the majority of the NLSA. This statement is supported by the fact that Common Nighthawk observations were largely restricted to the northeastern portion of the proposed tailings management area and to existing roads near to the proposed transmission line corridor.

This species nests in a wide range of open, vegetation free habitats including sand dunes, beaches, recently harvested forests, burnt over areas, logged areas, rocky outcrops, rocky barrens, grasslands, pastures, peat bogs, marshes, lakeshores and river banks and also inhabits mixed and coniferous forests (EC 2012c). Common Nighthawks with territories which occur adjacent to or within the proposed mine site location may be impacted through habitat loss, sound and increased local traffic.

Common Nighthawks are also known to occur in close proximity to humans and have been observed nesting on manmade structures such as rooftops, quarries and pathways and are commonly observed flying over urban environments. AMEC biologists have recorded nighthawks within a variety of urban landscapes such as Fort Frances, Timmins and Toronto and have also recorded high densities of nighthawks persisting in proximity to large mining projects where suitable nesting habitat was available.

Vegetation clearing for RRP construction will remove 1,352 ha of woodland habitat, 95 ha of treed and open rock barren and 79 ha of shrub habitat from the NLSA which may provide suitable nesting habitat for Common Nighthawks. Based on survey results, RRP components will not however, occur in those areas of greatest Common Nighthawk activity.

As crepuscular birds, Common Nighthawks depend on auditory cues for intraspecific interactions and during foraging at night. Individual territories are defined by calling birds as breeding males attract prospective females through breeding displays including diving in the air to produce a booming sound. RRP activities which produce above normal sound levels could decrease the reproductive success of nighthawks whose territories occur in close proximity to the mine which may cause them to avoid these habitat areas. Sound disturbance at the proposed transmission line corridor, where Common Nighthawks are most abundant within the NLSA, will be limited to the construction and decommissioning phases.

AMEC sound studies have shown that ambient sound levels in undisturbed forests within the NLSA measure between 40 to 43 dBA during the day and between 36 to 40 dBA during the night. RRP-generated sound above these threshold ranges may have an influence on nighthawk behaviour within affected areas. Sound modelling studies show that mine induced sound emissions above ambient levels could potentially result in reduction in habitat suitability across 420 ha of woodland and open woodland habitat.

Mine construction and operation is anticipated to occur both day and night and will require artificial lighting. Due their exceptional sight, bright artificial lights may negatively impact Common Nighthawks by causing them to avoid habitat within or adjacent to the mine site, or by decreasing their foraging efficiency or, indirectly, their reproductive success.
Increased road mortality may occur if there is an increase in vehicular traffic within the NLSA as Common Nighthawks commonly roost on gravel roads (Poulin et al. 1998). Foraging individuals or displaying males are also at risk of colliding with vehicles (Stevenson and Anderson 1994).

7.16.1.2 Golden-winged Warbler

The Golden-winged Warbler is federally designated as Threatened and listed as Special Concern in Ontario. As such, this species and its nests are afforded general habitat protection under *Species at Risk Act* as well as the *Migratory Birds Convention Act*. Combined data from the North American Breeding Bird Survey and eBird.org indicates that this species is widely occurring in shrub / early succession habitats in the Rainy River District. Baseline studies recorded 23 individuals between 2011 and 2012. These observations were limited to seven woodland features.

Vegetation clearing for RRP activities includes the removal of 419 ha from Woodlands 31, 47, 65 and 121 where this species has been recorded. No habitat will be lost from Woodland 83. Based on the results of 2011 and 2012 field studies, the removal of vegetation for RRP components will likely displace approximately 15 to 17 Golden-winged Warbler pairs.

Sound emissions generated by RRP activities may negatively impact the way a bird interacts with its environment and with other individuals. Where local population density is low or where a single pair exists, the effects of sound masking can decrease breeding success by impairing the perception of behavioural triggers such as calls of females, begging calls of nestlings and approaching predators.

Collisions of birds with vehicles and anthropogenic structures represent one of the largest sources of human caused mortality of songbirds. Increased vehicular traffic within the NLSA may cause an increase in vehicular collisions with songbirds in the NLSA.

7.16.1.3 Olive-sided Flycatcher

The Olive-sided Flycatcher is Federally listed as Threatened and Provincially listed as Special Concern. As such, this species and its nests are afforded general habitat protection under *Species at Risk Act* as well as the *Migratory Birds Convention Act*. Olive-sided Flycatcher was recorded at seven locations throughout the NLSA.

Olive-sided Flycatchers occur in natural forest openings, wetlands, forest, edges and man-made openings such as clear cuts (Altman and Sallabanks 2000). In boreal Canada, this species commonly occurs in open habitat of muskegs, bogs and swamps dominated by spruce and tamarack (Erskine 1977). Olive-sided Flycatcher was recorded at the edge of thicketed wetlands and within regenerating clear cuts associated with Woodlands 63, 86, 121 and 156.

A relative abundance map for Olive-sided Flycatcher in the Ontario Breeding Bird Atlas supports data that there is a low abundance of this species within the NRSA. Ontario Breeding Bird Atlas data further show that large areas of relatively high Olive-sided Flycatcher abundance occur north of Rainy Lake and north of Kenora, indicating that the southwestern Rainy River District is not an important breeding region for Olive-sided Flycatchers in Ontario. Baseline studies confirm that Olive-sided Flycatcher is a locally uncommon species.

Vegetation clearing for RRP activities will remove a total of 507 ha of wetland habitat and 124 ha of coniferous forest which may provide suitable habitat for Olive-sided Flycatchers. Woodlands 86, 121 and 156, known to support Olive-sided Flycatcher, will also be affected. Woodland 86 which is known to support Olive-sided Flycatchers will be completely removed, however, only partial removal will occur within Woodlands 121 and 156.

Sound generated by RRP activities may negatively impact on the way a bird interacts with its environment and with other individuals. Where local population density is low, or where a single pair exists, the effects of sound masking can decrease breeding success by impairing the perception of behavioural triggers such as calls of females, begging calls of nestlings and approaching predators.

Collisions of birds with vehicles and human-built structures represent one of the largest sources of human caused mortality of songbirds. Increased vehicular traffic within the NLSA may cause an increase in vehicular collisions with songbirds in the NLSA.

7.16.1.4 Eastern Wood-pewee

In November 2012 the Eastern Wood-pewee was designated as Special Concern by COSEWIC and is currently under consideration for listing under *SARA*. This species and its nests are currently afforded protection under the *Migratory Birds Convention Act*. Fourteen Eastern Wood-pewees have been recorded at 14 point count locations in the NLSA.

In Ontario, Eastern Wood-pewee largely inhabits deciduous or mixed forests. This species is not area sensitive and will inhabit both small woodlots and large undisturbed forests. Nests are positioned near forest edges, clearings or water. This species is not known to be sensitive to fragmentation, though no studies have compared reproductive success to habitat size (Blake and Karr 1987; Robbins et al. 1989; Freemark and Collins 1992).

The Ontario Breeding Bird Atlas (Cadman et al. 2007) indicates that the Eastern Wood-pewee abundance is low across the Boreal Hardwood Transition Zone, yet small pockets of increased abundance are present in the Rainy River District and near Dryden. In Ontario, this species is most common south of the Canadian Shield. Results of baseline breeding bird surveys indicate that this species is regularly occurring, yet uncommon in deciduous forests in the NLSA.

Vegetation clearing for RRP activities will remove approximately 1,140 ha of deciduous habitat that may provide suitable habitat for Eastern Wood-pewee. Woodlands 33 and 121 both account for 35.7% of Eastern Wood-pewee observations while observations have also been made in Woodlands 31, 38 and 80. Based on baseline study results, partial or complete removal of Woodlands 31, 33, 38 80 and 121 will likely displace at least five pairs.

Collisions of birds with vehicles and human-built structures represent one of the largest sources of human caused mortality of songbirds. Increased vehicular traffic within the NLSA may cause an increase in collisions with songbirds.

7.16.1.5 Canada Warbler

The Canada Warbler is Federally listed as Threatened and listed as Special Concern in Ontario. As such, this species and its nests are afforded general habitat protection under *Species at Risk Act* as well as the *Migratory Birds Convention Act*.

A variety of forest types are used by this species including wet mixed deciduous-coniferous forest with a well developed shrub layer, shrub marshes, ravines, steep brushy slopes, and upland forests with canopy gaps that promote a well-developed shrub layer (Conway 1999; Lambert and Faccio 2005). Moist mixed forests and slopes representing suitable Canada

Warbler habitat are rare in the study area and likely inhibit this species from occurring in greater numbers.

The Ontario Breeding Bird Atlas provides relative abundance for Canada Warbler across Ontario. Forested lands impacted by the RRP hold a relatively low observation rate while patches of highest Provincial relative abundance occur north of Rainy Lake and Lake of the Woods. Canada Warbler was recorded at three point count stations, two of which were located along the proposed transmission line. Vegetation clearing for the development of the RRP will remove a total of 1,352 ha of woodland habitat. Two of the three Canada Warbler observations were along the proposed transmission line corridor, therefore the 18 ha to be cleared for this RRP component will have a greater impact. In addition to vegetation clearing, increased edge effects may further reduce available habitat for this species.

Sound generated by RRP activities may negatively impact on the way a bird interacts with its environment and with other individuals. Where local population density is low, or where a single pair exists, the effects of sound masking can decrease breeding success by impairing the perception of behavioural triggers such as calls of females, begging calls of nestlings and approaching predators.

Canada Warblers are area sensitive species and thus have an affinity for large tracts of habitat. As a result, this species has a low risk of mortality sue to collisions with vehicles along roadways. Any increase in vehicular traffic due to the RRP is unlikely to affect this species.

7.16.1.6 Red-headed Woodpecker

The Red-headed Woodpecker is both Federally and Provincially listed as Special Concern. This species is protected under the *Migratory Birds Convention Act*, but not under *Species at Risk Act* or the *Endangered Species Act*. The Rainy River Clay Plains population of Red-headed Woodpecker has remained apparently stable between the 1980s and the early 2000s and is expected to number 30 to 50 pairs within those Ontario Breeding Bird Atlas squares which have been adequately surveyed (Cadman et al. 2007). Preferred habitat of this woodpecker includes open woodlands, riparian habitat and, in particular, oak savannah. Oak and American Beech are preferred foraging trees. The presence of this species largely depends on the presence of suitable foraging trees as well as an abundance of cavity trees which are used as nesting sites.

Vegetation clearing for RRP activities will remove a total of 1,352 ha of woodland habitat. It is unclear how much suitable Red-headed Woodpecker habitat exists within the RRP footprint. The vast majority of the NLSA consists of boreal forest types, primarily Aspen-Birch hardwood forest and coniferous forest, which are not likely to be used by Red-headed Woodpeckers. This species is most likely to occur in proximity to human habitations where hedgerows or open forests are present. No clearing will occur in proximity to the single Red-headed Woodpecker sighting location within the NLSA.

Sound generated by RRP activities may negatively impact on the way a bird interacts with its environment and with other individuals. Where local population density is low, or where a single pair exists, the effects of sound masking can decrease breeding success by impairing the perception of behavioural triggers such as calls of females, begging calls of nestlings and approaching predators.

Collisions of birds with vehicles and anthropogenic structures represent one of the largest sources of human-caused mortality of songbirds. Increased vehicular traffic within the NLSA may cause an increase in vehicular collisions with songbirds in the NLSA.

7.16.1.7 Snapping Turtle

The Snapping Turtle is both Federally and Provincially listed as Special Concern, as such this species is not protected under *Species at Risk Act* nor the *Endangered Species Act*. However; the Snapping Turtle is listed as a game reptile under the *Fish and Wildlife Conservation Act* and, as such, can be legally hunted under the authority of a license and in accordance with applicable regulations.

The preferred aquatic habitat for the Snapping Turtle is characterized by soft, muddy bottoms with slow moving shallow water. Overwintering occurs in deep mud under continuously flowing water or in marsh areas. The NLSA includes river, creek, pond and wetland habitat that may provide suitable habitat for these turtles. The largest watercourse within the NLSA is the Pinewood River.

Two Snapping Turtles were observed in the NLSA during studies conducted between 2009 and 2012. One Snapping Turtle was observed in the Pinewood River in 2009 and the other was seen crossing Roen Road in 2010. While no nests were observed, road embankments in the Rainy River area have been noted as being used for turtle nesting (KCB 2011c).

The life strategy of the Snapping Turtle is characterized by extended longevity (long term data from Algonquin Park suggests a maximum age of over 100) and delayed sexual maturity (mature at 15 to 20 years of age; COSEWIC 2008). Therefore, Snapping Turtle populations can be greatly impacted by the premature death of individual turtles and do not recover quickly from declines. Loss of habitat, road mortality, nest predation and environmental contamination are long term threats to the persistence of the Snapping Turtle.

RRP development will remove 507 ha of wetland habitat within the NLSA and will also impact 19 ha of open water habitats (creeks and ponds). However, the Pinewood River and associated wetland habitat will not be removed.

Snapping Turtles are known to cross roads while travelling to or from various habitat features and may use roadsides as nesting sites. RRP activities will increase vehicular traffic within the NLSA and may result in an increase in collisions with Snapping Turtles.

There is also the potential for site activities to attract wildlife that tend to scavenge domestic waste which may lead to increased turtle nest predation, as well as predation of Snapping Turtle hatchlings and adults. Nest predation by Raccoons and other mammals is a long term threat to the persistence of the Snapping Turtle (COSEWIC 2008).

Site geochemical data indicates that concentrations of most metals associated with the ore and mine rock are not appreciably different from those typical of crustal norms; in contrast to conditions associated with base metal mines for example. Effluents discharged from the RRP to the environment are expected to be such that PWQO or alternative scientifically defensible values, would be met in local receiving waters. As a result, it is not expected that harmful levels of metals will be released into the local environment that would cause potential harm to Snapping Turtles.

7.16.1.8 Black-billed Magpie

The Black-billed Magpie is a Provincially rare species. Magpies nest in riparian areas or forest edges near agricultural land, grasslands or meadows (Trost 1999, Cadman et al. 2007). Nests are often positioned in proximity to barnyards or other human habitat where an abundance of ground-dwelling insects, carrion or grains may be found. Black-billed Magpies were commonly observed in agricultural lands close to human-built features within the NLSA.

The Ontario Breeding Bird Atlas indicates that the Ontario magpie population has experienced a tenfold increase since the 1980s and is now estimated at 200 to 250 breeding pairs.

Of seven known magpie habitat areas within the NLSA, one will be removed for RRP activities. This habitat area consists of active agricultural land used for livestock which is bordered by riparian habitat. It is uncertain how many magpies will be displaced as a result of this habitat loss.

Given the association of magpies with barnyards and pastures within the NLSA, the removal of livestock and agricultural practices from neighbouring farms may prove to have a greater impact to the local magpie population than direct habitat loss, similar to the case of Barn Swallows. A decrease in the presence of livestock in the NLSA may lead to decreases in insects upon which magpies feed. Up to three additional magpie habitat areas may experience reduced carrying capacity for magpies (through reduced food supply) during the lifetime of the RRP if livestock is removed from these agricultural properties.

Increased ambient sound is unlikely to cause disturbance to local magpies given their tendency to nest in close proximity to human residences, yet high levels of human activity may prevent or impair nesting efforts by causing stress to adults or by startling fledglings. For example, it has been reported that the disturbance of nesting magpies by researchers may contribute to declines in nesting success in those populations being studied (Trost 1999).

Road mortality is a direct risk to magpies as they occur in close proximity to human activities and infrastructure. Although magpies cross roads at a safe height, this opportunistic species may be drawn to roadside carrion and thus be put at risk to vehicle collisions. Young birds are most susceptible to road mortality (Trost 1999). Increased traffic may thus cause increased magpie mortality.

7.16.1.9 Lilypad Clubtail

The Lilypad Clubtail is a Provincially rare dragonfly associated with marshy ponds, lakes and sluggish streams with mucky bottoms and an abundance of floating vegetation (Jones et al. 2008). Within the NLSA, Lilypad Clubtails were observed along the proposed transmission line corridor north of Boundary Lake within rocky mixed forest. These individuals were outside of typical habitat.

Based on aerial photo interpretation, the southwestern shore of Boundary Lake may provide suitable habitat for this species. This habitat will not be directly impacted by RRP activities.

Dragonflies and other insects are susceptible to vehicle collisions during periods of mass emergence and migration. Lilypad Clubtails are active between late May and mid-July and undertake no major migrations. No suitable habitat for this species occurs in proximity to roadways where RRP activities will cause an increase in vehicle traffic. Vehicular activity in areas adjacent to Lilypad Clubtail habitat will be limited to the construction of the transmission line and is expected to have negligible effects.

7.16.1.10 Horned Clubtail

The Horned Clubtail is a Provincially rare dragonfly associated with ponds, small marshy lakes and sluggish streams with mucky bottoms and often with floating plants such as water lilies (Jones et al. 2008). Within the NLSA, Horned Clubtails are considered to be fairly common both along the Pinewood River and along streams and lakes throughout the Rainy River and Lake of the Woods areas.

The Pinewood River will not be directly impacted by the RRP activities as very limited clearing or changes in river vegetation are anticipated (at new Highway 600 river crossing only). Additionally, no appreciable changes in flow rate of the Pinewood River are anticipated. As such, Horned Clubtail habitat provided by the Pinewood River will remain unchanged due to RRP activities.

Dragonflies and other insects are susceptible to vehicle collisions during periods of mass emergence and migration. Horned Clubtails are active between late May to mid-July and undertake no major migrations. Although a bridge will be constructed over the Pinewood River it is not anticipated the associated vehicular traffic will pose a threat to Horned Clubtails which may be flying above the river due to the raised elevation of the road.

7.16.2 Government, Aboriginal and Public Comments and Concerns

No specific concerns have as yet been expressed by government agencies, Aboriginal groups or other stakeholders in relation to Species of Special Concern or rare species other than generalized statements and expressions of concern that all reasonable efforts should be taken to minimize adverse effects to wildlife populations.

RRR recognizes these concerns and has taken measures in the RRP plan to both reduce adverse environmental effects to wildlife through development of effective mitigation and contingency strategies.

7.16.3 Mitigation

Mitigation measures that will be used to reduce potential adverse effects to all species of Special Concern and Provincially rare species will include the following:

- Development of a compact RRP site to reduce overall habitat loss and to limit potential interference with wildlife of movement, as well as to limit sound emissions, to the extent practicable;

- Restriction of principal habitat displacement for mine infrastructure to periods outside the breeding bird season which MNR has indicated occurs from May 1 to August 15;

- Implementation of sound abatement strategies to dampen sound infiltrating habitats surrounding high traffic areas of the mine;

- Enforcement of speed limits along mine controlled roads to reduce the potential for adverse effects of increased vehicular traffic associated with the RRP. Signs warning drivers of the possibility of wildlife encounters will be posted in areas of high wildlife activity. A log of collisions will be kept to monitor the effectiveness of the proposed mitigation and additional mitigation measures will be implemented if necessary;

- Inclusion of wildlife awareness information into regular safety inductions performed by the mine. Workers will be made aware of seasonal changes in wildlife behaviour or presence in proximity to the mine;

- Treatment of tailings slurry containing cyanide and associated heavy metals in the process plant using the SO_2/Air process before being discharged to the tailings management area; and

- Restoration of disturbed habitats at closure including the development of habitats capable of supporting a diversity of wildlife species, including Species of Special Concern and rare species.

Additional mitigation measures that will be used to reduce potential adverse effects specifically to Common Nighthawk and Short-eared Owl will include the following:

- Where feasible, RRP lighting fixtures will be directed in such a fashion as to reduce excess production of light to the surrounding environment.

Additional mitigation measures that will be used to reduce potential adverse effects specifically to Snapping Turtles will include the following:

- Disposing of food wastes generated on site will be by a means that limits the attraction of wildlife to the mine site.

Additional mitigation measures that will be used to reduce potential adverse effects specifically to Black-billed Magpie will include the following:

- Establishment of zones where Black-billed Magpie colonization is desired, tolerated, or not wanted. These measures may be necessary to prevent colonization in areas of high human vehicular activity that could put magpie and magpie breeding success at risk. Discouraging tactics may be implemented to discourage colonization. Conversely, protection may be provided to magpies nesting in other locations where their presence is encouraged and does not cause problems to mine operations.

Mitigation measures described in this section are expected to be effective for their intended purposes and in many instances can be further optimized in response to monitoring data.

7.16.4 Residual Environmental Effects

RRP development will result in the clearing and temporary removal of 1,352 ha of woodland habitat, 95 ha of tree and open rock barren, and 79 ha of shrub habitat which may be used as nesting habitat by Common Nighthawk; 79 ha of early succession habitat and 419 ha from Woodlands 31, 48, 65 and 121 providing habitat for Golden-winged Warbler; 507 ha of wetland habitat and 124 ha of coniferous forest habitat suitable for Olive-sided Flycatcher; 18 ha of woodland habitat which may provide habitat for Canada Warblers; 526 ha of wetland habitat including several open water habitats (creeks and ponds) which may provide potential habitat to Snapping Turtles; and one known Black-billed Magpie habitat area of active agricultural land used by magpies.

Despite vegetation clearing all species of Special Concern and Provincially rare species are expected to persist in the NLSA. Common Nighthawks are expected to persist in proximity to the mine site and are likely to forage in the airspace above the mine site periphery. Due to the abundance of regenerating woodlands in the area, it is expected that displaced Golden-winged Warbler pairs will find suitable alternate habitat within the NLSA and NRSA. Woodland 86 which is known to support Olive-sided Flycatchers will be completely removed; however, only partial removal will occur within Woodlands 121 and 156 which have large core habitat areas that will likely continue to provide habitat for flycatchers. Vegetation clearing and sound associated with the construction of the proposed transmission line corridor which supports Canada Warbler habitat, will occur largely outside of the breeding season and is thus unlikely to cause mortality or impair reproductive success of this species. Despite the removal of woodland habitat within the NLSA, no habitat which is likely to used by Red-headed Woodpeckers will be removed. Habitat areas known to have been used by Short-eared Owls will not be directly impacted by RRP activities. There is no indication that suitable magpie habitat is limited across the Crossroute Forest Region as rural properties are scattered amongst agricultural land throughout the region. It is expected that displaced magpies will find new areas to colonize.

Although increased local vehicular traffic may increase the probability of wildlife-vehicle collisions, enforced speed limits, road signs warning of wildlife and inclusion of wildlife safety into mine safety training inductions will greatly reduce this risk.

No residual adverse environmental effects from RRP activities on Lilypad Clubtails or Horned Clubtails are anticipated.

7.16.5 Significance Determination

The development of a compact RRP site will help to minimize RRP impacts on species of Special Concern and Provincially rare species, including the effects of sound and artificial lighting. Effective mitigation measures will ensure that indirect effects of RRP activities such as the risk of vehicular collisions with these species or the attraction of scavenging wildlife which may feed on turtle eggs do not result in residual environmental effects.

The magnitude / geographic extent of adverse effects to species of Special Concern and Provincially rare species is therefore considered to be a Level I effect: effect considered to be minor, and/or solely confined to RRP lands. The effect is long term (Level III); is expected to occur regularly or continuously (Level III) for frequency, and is readily reversible at closure (Level I).

As such, RRP-related effects on local or regional population of species of Special Concern and Provincially rare species are therefore considered to be not significant.

7.17 Traditional Land and Resource Use Effects

RRR has been working closely with local and regional Aboriginal partners for over three years which has included the negotiation of several agreements. A formal Traditional Knowledge First

Nation study was initiated in 2012 and has engaged a number of communities, including those closest to the RRP. Discussions and meetings with First Nations peoples over the past 12 months has not indicated a potential for traditional cultural values or harvesting practices to be impacted by the development of the RRP. RRR signed a Memorandum of Understanding with the Métis Nation of Ontario in May of 2013 in which Rainy River Resources is supporting a Métis Traditional Knowledge study to further assess Aboriginal traditional values within the region.

Opportunities for TK / TLU consultations were offered to the following First Nations between July 2012 and February 2013:

- Anishinaabeg of Naongashiing First Nation (Big Island);
- Buffalo Point First Nation;
- Mishkosiminiziibiing (Big Grassy River) First Nation;
- Naicatchewenin First Nation;
- Naotkamegwanning First Nation;
- Ojibways of Onigaming First Nation; and
- Rainy River First Nations.

The following First Nations subsequently worked closely with Rainy River Resources to collect TK / TLU information:

- Big Grassy River First Nation;
- Naicatchewenin First Nation; and
- Rainy River First Nations.

TK / TLU sessions held with several of the notification Aboriginal groups including: Couchiching First Nation, Mitaanjigamiing (Stanjikoming) First Nation and Seine River First Nation.

7.17.1 Overview

RRR has contacted each of the First Nations and the Métis listed below, with respect to collecting TK/TLU information for the purpose of assessing potential effects to traditional activities or sites within the RRP. Effects on traditional land use could potentially include:

- Loss of plants harvested for food or medicines;

- Loss of wildlife and fisheries habitat leading to reduced wildlife abundance / availability for harvesting;

- Any changes to the environment (for example air and sound emissions and water quality) that could negatively impact the health or abundance of wildlife or plant populations leading to reduced abundance and/or the potential to negatively affect human health though consumption (or use) of these animals or plants;

- Loss of culturally significant areas including burial sites, ceremonial sites, camps and cabins;

- Influx of non-Aboriginal people who may be employed at the RRP, accessing peripheral areas for hunting which may lead to reductions in wildlife abundance; and

- Increases in traffic leading to higher wildlife accidents and reduced abundance.

The following sections address these potential effects and the concerns raised thus far with respect to these potential effects raised by Aboriginal communities in TK/TLU discussions, as well as concerns identified during consultation activities.

7.17.2 Information Collection from Potentially Affected Communities

RRR has contacted each of the potential affected First Nation communities and the Métis with respect to providing TK/TLU information. RRR staff conducted interviews and collected information from each participating community. Where provided, information is summarized below. Data Sharing Protocols were developed to initiate these studies. When Aboriginal expressed an interest in conducting TK/TLU studies, RRR provided a copy of the Data Sharing Protocol and requested that it be signed. As of October 1, 2013, the Rainy River First Nations, Naicatchewenin First Nation, Lac La Croix First Nation, Couchiching First Nation, Seine River First Nation Mitaanjigamiing First Nation and Big Grassy River First Nation had signed a Data Sharing Protocol.

For the purpose of TK/TLU data collection, the local study area was broadly defined. Figure 7-13 shows the map that was used to provide context for information gathering.

Anishinaabeg of Naongashiing First Nation

RRR has approached the Anishinaabeg of Naongashiing First Nation about collecting TK/TLU information. They have been provided with a copy of the Data Sharing Protocol, which they have been considering but have not yet signed. RRR has maintained contact with the Anishinaabeg of Naongashiing but as yet, no information about TK/TLU has been provided. At the direction of the community, RRR will continue to work with the Anishinaabeg of Naongashiing First Nation to collect TK/TLU and address potential effects on traditional uses if they are identified at later stages of the Project.

Big Grassy River First Nation

RRR representatives and the Big Grassy River First Nation worked with their community members to identify traditional uses that may still be practised in the RRP area. RRR met with the Mishkosiminiziibiing First Nation on five occasions and further exchanged e-mails and telephone calls to discuss components of the TK/TLU study and collect information.

Big Grassy River First Nation assert that they used the RRP area prior to Confederation. At that time, travel routes traversed the RRP and the region and possibly the RRP area was used seasonally for berry picking and medicine collection. When Big Grassy River First Nation members were moved to reserves after the 1873 signing of Treaty #3 and farmers took up the land in the late 1800s, use of the RRP declined. There are no longer any traditional activities that are practised within the RRP area that have been identified to RRR.

Big Grassy River First Nation believe that there may be archaeological evidence of their activities in the RRP area and are interested in the results of the studies being undertaken to assess these resources. Some community members participate in minnow trapping near the RRP under license from the MNR. Minnows are seasonally caught and sold.

Community members continue to hunt deer, Moose, rabbits and birds, such as pheasant and partridge, and especially duck. A duck dinner is considered a special occasion meal. They gather blueberries, pin cherries, sweet grass and sage for either food, healing and ceremonial use. Animals are hunted for food and their hides. Mishkosiminiziibiing First Nation community people also fish. These activities are carried out in the vicinity of the reserve and not within the RRP area.

Big Grassy River First Nation community members have expressed concern about the decline in wild rice at Lake of the Woods. They recognize that dams built on connecting water systems (not related to the RRP) have resulted in erosion of the shorelines and a reduction in wild rice habitat.

Buffalo Point First Nation

RRR has met with the Buffalo Point First Nation. No TK/TLU studies are planned with the Buffalo Point First Nation, which has requested the opportunity to monitor the RRP, but not actively participate in studies. Nonetheless, RRR resources sent a letter on February 7, 2013 requesting TK/TLU information from the Buffalo Point First Nation to be included in the EA if they wished to provide it. RRR will consider any TK/TLU information provided in ongoing Project planning and management to address potential effects.

Naicatchewenin First Nation

RRR has been discussing TK/TLU with the Naicatchewenin First Nation, and have met with the Naicatchewenin First Nation to discuss TK/TLU on two occasions and have supplemented this information through site tours, follow up phone calls and e-mail.

A Naicatchewenin First Nation member during one of the meetings indicated people from the community did not go in the RRP area. There has been farming in the area in the past, but in terms of the Anishinabe, the member stated he "can't say we were ever there". One individual identified that he hunts in the area.

RRR contacted Naicatchewenin First Nation as a follow up to previous TK/TLU discussions that indicated an individual hunting in the vicinity of the RRP. RRR requested information about hunting activities including species hunted, time of year, areas used in the past for hunting and other aspects that the Naicatchewenin First Nation representative believes to be relevant.

The individual indicated that he hunts deer and Moose and gathers firewood near Split Rock Road in Mathieu Township. Meat from successful hunts is shared with the community. The hunting area identified is not within the RRP human environment local study area (HLSA).

RRR will continue to pursue TK/TLU information with the community and will consider any TK/TLU information provided in ongoing RRP planning and management to address potential effects.

Mitaanjigamiing First Nation

RRR met with the Mitaanjigamiing First Nation on two occasions to introduce and collect TK/TLU information. Community members also participated in site tours and discussed their perspectives on the RRP. Mitaanjigamiing First Nation members have not identified any information. No current use of the RRP area was identified. Should TK/TLU information be provided at a later date, RRR will consider it for ongoing planning and management.

Naotkamegwanning First Nation

RRR has not yet had the opportunity to discuss conducting a TK/TLU study with the Naotkamegwanning First Nation. RRR resources sent a letter on January 25, 2013 requesting TK/TLU information from the Naotkamegwanning First Nation to be included in the EA if they wished to provide it. RRR will consider any TK/TLU information provided in ongoing RRP planning and management to address potential effects.

Ojibways of Onigaming First Nation

RRR has initiated discussions about conducting a TK/TLU study with the Ojibways of Onigaming. No TK/TLU has been provided but RRR will continue to work with the Ojibways of Onigaming to collect TK/TLU information as they desire. RRR resources sent a letter on January 25, 2013 requesting TK/TLU information from the Ojibways of Onigaming First Nation to be included in the EA if they wished to provide it. RRR will consider any TK/TLU information provided in ongoing RRP planning and management to address potential effects.

Rainy River First Nations

RRR met with the Rainy River First Nations on three occasions to collect TK/TLU information. Community members also participated in site tours and discussed their perspectives on the RRP and the requested additional TK/TLU information. RRR followed up with specific community members who were identified as having particular knowledge of the RRP area. The Rainy River First Nations have not identified any information other than that reported in the baseline section of this report (Section 5.11.1). No current use of the RRP area was identified.

Métis Rainy River Lake of the Wood Regional Consultation Committee Region #1

The MNO is in the process of completing a Traditional Land Use Knowledge Study and Technical Review of the RRP EA Report. The Company anticipates that as part of the consultation process with the MNO an addenda outlining any follow-up programs or agreements may need to be submitted in parallel with the EA report review.

7.17.3 Potential Effects on Aboriginal Activities

No traditional activities have as yet been identified within the RRP area by the Aboriginal communities that have participated thus far in TK/TLU studies. Some study participants have stated that the RRP was not an area of intensive use in the distant past, but it is understood that traditional activities may have taken place there. Participants identified the area as an historical travel corridor where plants and berries were likely collected seasonally. Use of the area apparently declined when First Nations people moved to reserves and the land was taken up for homesteading in the 1800s. Not all communities identified as potentially being affected have indicated whether they have TK/TLU information relevant to the RRP.

Traditional activities, which may be considered a traditional practice or an Aboriginal or treaty right, and which may be affected by the RRP include deer, Moose, rabbit and bird hunting, particularly pheasant, grouse and duck. Minnow trapping and commercial fishing are practiced by some Aboriginal people according to the Province. Fishing as an Aboriginal and or treaty right and as a traditional activity for sustenance is likely ongoing in areas peripheral to the RRP. Maintaining wild rice (in the Lake of the Woods area) and berry habitat for potential gathering activities were identified in discussions with First Nations communities.

7.17.4 Hunting

To date, no Aboriginal communities have expressed concerns about hunting or access to hunting any species with respect to the RRP. Hunting is an identified activity that continues to be practiced by Aboriginal community members. Specifically, deer, Moose, rabbits, ducks, grouse and pheasants were mentioned as species that are sought. Potential impacts on deer and Moose populations are detailed in Section 7.9 including potential effects related to habitat loss, mortality due to increased vehicle traffic, sound disturbance, increased predation and from dust. It was determined that with the application of mitigation measures to reduce or avoid negative effects on ungulates that the overall effect of the RRP on ungulates would be not significant.

Access to hunting areas is detailed in Section 7.18. In that section, it is indicated that the RRP will overprint and/or render inaccessible portions of lands currently accessed for non-Aboriginal hunting from portions of Highway 600, Roen Road and Teeple Road. Ungulates are widespread and abundant within the region. Furthermore, the creation of the transmission line corridor may create additional access for hunters in the region. The overall net (negative) effect on hunting deer and moose, pending any further information, is therefore not likely to be significant.

Rabbits are not considered as a species that will be affected by the RRP and are not assessed.

Project development effects on open country breeding birds, such as grouse, are considered in Section 7.12. Potential impacts on sharp-tailed grouse including effects on nesting habitats, loss of habitat, sound effects, mortality from increased vehicle traffic and effects from transmission lines (avoidance) are assessed. It has been determined that with the application of mitigation measures, effects on local or regional open country breeding bird populations are not likely to be significant.

Waterfowl, such as marsh breeding birds (including ducks) were also assessed in Section 7.12. A wide variety of marsh bird species were observed throughout the waterfowl assessment NLSA, but the density and diversity of indicator species at any single wetland feature did not meet the MNR criteria. As such, significant adverse effects on waterfowl (including ducks) are not anticipated.

Hunting is an ongoing activity that supports First Nations and Métis communities in the regions (Level III for context / value). Effects on hunting are considered primarily negative due to loss of access to and overprinting of areas currently used for hunting (direction is negative). Residual negative effects on hunting are the loss of 1.5% of wildlife management unit (WMU) 10 until closure. Treaty #3 signatories and Métis citizens, as entitled by their Aboriginal and treaty rights, are not restricted to hunting within the WMU, although as a measure of impact this is a reasonable quantification since Aboriginal people are most likely to hunt within the WMU. Travelling beyond this region for traditional hunting becomes time and cost prohibitive for

Aboriginal people. At closure, access to the remaining Crown lands will be re-established as practical and will be available for hunting, once habitats capable of supporting wildlife are re-established. The magnitude of the effect on hunting is distinguishable, but is unlikely to pose a serious risk to hunting activities within WMU 10 or in the broader hunting area that is available to Treaty #3 signatories and Métis citizens (Level I). The extent of the residual effect is confined to the TK/TLU study area (Level I); is medium term in duration because the effect lasts until closure (Level II); occurs continuously throughout the life of the RRP (Level III); is reversible at substantial cost, with difficulty or in the long term (Level II); and is likely to occur (Level III). The overall net (negative) effect on hunting is considered not significant.

7.17.5 Fishing

Aboriginal people continue to fish as an Aboriginal or treaty right, or as a commercial activity that may be related to treaty rights. While the Pinewood River is recognized as fish habitat there are no lakes located within, or adjacent to, the main RRP site area. Based on multiple years of aquatics baseline investigations, while limited bait fishing does occur within certain RRP area streams, the area does not support a significant commercial or recreational fishery. Based on TK/TLU information available at this time and a consideration of aquatic habitats and fish availability, it appears unlikely that Aboriginal people fish the Pinewood River. Fishing by recreational users occurs more often in other larger streams and water bodies in the Rainy River District including Rainy River, Rainy Lake and the Lake of the Woods. More extensive fishing opportunities are also available within the lakes approximately 15 km or more northeast and upstream of the RRP site; most notably Off Lake, Beadle Lake, Boundary Lake, Little Pine Lake and Burditt Lake. Aboriginal people are likely to use these areas as well.

The Province has indicated that commercial fishing licenses are held or may be held by some Aboriginal communities on Lake of the Woods. The Rainy River First Nations hold a commercial sturgeon fishery license on Rainy River although they have imposed a moratorium on sturgeon fishing for more than a decade because of the sturgeon's status as a Species at Risk.

The RRP is not expected to have negative effects on the water quality of the Pinewood River, groundwater resources, or other water bodies that receive water from these sources (see Sections 7.5, 7.6 and 7.7) such as Rainy River and the Lake of the Woods. It is therefore not expected that the RRP will have any effect on any potential fishing activities by Aboriginal people. In fact, through the implementation of the watershed restoration program, the RRP is anticipated to have a positive indirect effect on water quality.

There are four baitfish license areas that will be impacted by the RRP (Section 7.18.7). It is unknown whether any of these licenses are held by Aboriginal people. To date, Aboriginal people have not raised a specific concern about effects on this resource, although the Big Grassy River First Nation identified this as an activity in which their community participates, but did not specify where this occurs. Effects on sport and bait fish within downstream water bodies and rivers are detailed in Sections 7.5 and 7.6 and will be mitigated through a No Net Loss Plan coordinated by the DFO.

Given that there is no reported traditional or commercial fishing in the Pinewood River or creeks impacted by the RRP, and there are four bait fishers, some of whom may be Aboriginal, that will have portions of their license areas affected, the magnitude of impact on fishing is considered Level I; that is, no or low level effects; and individuals may be affected. The extent of the residual effect is confined to the TK/TLU study area (Level I); is medium term in duration because the effect lasts until closure (Level II); occurs continuously throughout the life of the RRP (Level III); is reversible in the long term (Level II); and is likely to occur (Level III). The overall net direction of the effect is considered neutral, but pending any further TK/TLU information is not likely to be significant.

7.17.6 Plant Harvesting

In the past, Aboriginal people harvested wild rice in late summer and stored it for winter. Maintaining wild rice habitat has been raised as a concern by some First Nations elders, although there were no statements made in relation to the RRP about currently harvesting wild rice. Wild rice grows at Lake of the Woods but not in the RRP area. Wild rice is affected by fluctuating water levels and potentially by excess aqueous parameters.

The RRP is not expected to have negative effects on the water quality of the Pinewood River and water bodies that receive drainage from the Pinewood River (Section 7.6) such as the Rainy River and Lake of the Woods. Water levels at Lake of the Woods will not be affected by the RRP. No impacts to wild rice or its harvest are therefore anticipated from the RRP.

Berry harvesting within the RRP site area has not as yet been identified, and therefore no impacts to berry harvesting are anticipated from the RRP.

7.18 Non-Traditional Land and Resource Use

The RRP has the potential to affect existing land uses either directly as a result of the Project footprint displacing existing land uses and/or access to existing land uses or resources; or indirectly as a result of other effects from RRP activities, for example, sound emissions that could disturb local residents.

Effects to the following VSECs are assessed in this section:

- Land use plans and policies;
- Mineral exploration;
- Forestry;
- Agriculture and adjacent residences;
- Hunting;

- Trapping;
- Fishing; and
- Other outdoor recreation uses.

7.18.1 Land Use Plans and Policies

The RRP is primarily located within the Rural Area zoning designation of the Final Draft Official Plan, released in December 2012 for the Township of Chapple. Permitted land uses in the Rural Area relative to the RRP include (among others):

- Light Manufacturing;
- Mineral exploration;
- Light industrial use; and
- Wayside pits and quarries.

There is one Mine Site identified in Schedule A of the Official Plan at the location of the RRP, and economic opportunities associated with the RRP are mentioned specifically in the Plan. The Official Plan states that:

> *The intent of Official Plan is to ensure these uses [mine sites] are protected from incompatible uses and to minimize adverse impacts of mineral mining operations on the surrounding natural and social environments.*

The Official Plan further states that the specific location and extent of a Mine Site is to be identified in the Zoning By-law. Until such time as the mine receives approval to operate, following completion of an EA, the underlying land use designation applies. Within the HLSA, the underlying land use designation is Rural Area.

A Statutory Public Meeting attended by RRR representatives was held in February 2013 on the Final Draft Official Plan. The Official Plan was adopted in March 2013 by Township of Chapple Council and has been submitted to Ministry of Municipal Affairs and Housing for approval. Approval was received September 13, 2013.

While the Township of Chapple Official Plan designates the vast majority of the HLSA as a Rural Area, a Conservation – Environmental Protection Area designation runs through the HLSA generally following the Pinewood River. The Conservation - Environmental Protection designation allows shoreline protection works, floodplain protection works, wildlife management, and passive recreation uses. No buildings or placement of fill is permitted (Township of Chapple 2012b). In keeping with this designation, the RRP preliminary site plan avoids overprinting the Pinewood River, although a crossing of the river is required for the Highway 600 re-alignment.

RRR intends to comply with the land use compatibility policies as noted in Section 2.3 in the Official Plan, which include requirements for the development to comply with appropriate separation distances, setbacks, buffering features and transition building height and massing. The potentially relevant policies are summarized as follows:

- Traffic: roads should adequately serve the proposed development;
- Vehicular access: location and orientation of vehicle access and egress to address impact of sound, headlight glare and privacy loss on adjacent development;
- Parking: development should have adequate parking to minimize spill over parking in adjacent areas;
- Outdoor amenity areas: development should respect the privacy of outdoor amenity areas of adjacent residences and minimize undesirable impacts through siting and design of buildings and the use of screening, lighting, buffering and other mitigative design measures;
- Loading areas, services areas and outdoor storage: should be located away from residential areas;
- Lighting: potential for light to affected adjacent light sensitive areas should be avoided or mitigated;
- Sound and air quality: development located and designed to minimize the potential for significant adverse impacts on adjacent sensitive uses related to sound, odours and other emissions;
- Sunlight: development should minimize shadowing on adjacent properties, particularly outdoor amenity areas through siting of buildings and other design measures;
- Microclimate – development designed to minimize adverse impact related to wind, snow drifting and temperature on adjacent properties;
- Supporting neighbourhood services: development should contribute to or be adequately served by existing or proposed services and amenities such as health facilities, schools, parks and leisure areas and should be at a scale that is in keeping with the character of the area;
- Waste disposal sites compatibility with sensitive land uses will be assessed in accordance with the Waste Disposal Site policies of the Official Plan;

- Industrial sites compatibility with sensitive land uses including minimum separation distances between potentially conflicting land uses of up to 1,000 m. Proponents may be required to provide buffering measures to minimize impacts on adjacent land uses; and

- Development in proximity to a Provincial highway shall be subject to applicable transportation policies of the Official Plan.

The above noted compatibility policies are being adhered to and as a result, there are no residual effects on municipal planning policy. As a result an effect rating is not applicable.

The majority of lands in the RRP area are privately held; however, the RRP does overlap Crown land. The Crown (Ontario) Land Use Policy Atlas (MNR 2013c) provides maps and policy reports for much of northern Ontario, supplying land use policy direction consolidated from a number of sources.

The RRP site is located primarily within the General Land Use Areas G-2572 and G-2581 (Agricultural Hinterland). According to the related policy reports, G-2581 is moderately developed and accessible by secondary Provincial highways and Municipal roads. Existing uses in G-2581 include commercial fishing, agriculture, forestry, hunting, trapping and aggregate extraction. A large proportion of the farmlands are unimproved. Crown lands within the area are to be devoted predominantly to resource production purposes. Road access will be managed primarily for resource production and resource management purposes. Mineral exploration and development is deemed acceptable, provided it is in accordance with approved official plans and zoning by-laws. Operating guidelines for the protection of tourism, residential and recreational values are to be reflected in project approvals. New roads are to support access the area for resource management purposes.

General Land Use Area G-2572 includes the Towns of Emo and Rainy River, as well as the Rainy River First Nation, with the majority of the lands being within a municipality. The primary land use is agriculture, but other land uses outside of the towns include forestry, trapping and hunting. Mineral exploration and development is deemed acceptable, provided it is in accordance with approved official plans and zoning by-laws. Operating guidelines for the protection of tourism, residential and recreational values are to be reflected in project approvals. Road access may be allowed for resource extraction, resource management and other purposes.

The eastern portion of the proposed transmission line overlaps the General Land Use Area G-2585 (Nestor Falls / Morson) and a short distance into G-2573 (Pipestone Chain of Lakes). The area includes rural residences, as well as limited farming in Morson Township, and tourist operators and cottages near the lakes in G-2573. A large proportion of the G-2585 area has been harvested or is proposed to be harvest for timber. Hunting for moose, deer, bear and small game occurs. The area is to be managed primarily for resource production; with uses continuing to be tourism, timber harvesting, trapping, hunting and wild rice harvesting. Mineral exploration and development is deemed acceptable, provided it is in accordance with approved official plans and zoning by-laws. Operating guidelines for the protection of tourism, residential and recreational values are to be reflected in project approvals.

Management of area G-2573 is directed towards the protection of existing tourist, recreational and cottaging interests. A number of lakes in the area have been designated as tourism lakes. Mineral exploration and extraction activity will continued with operating guidelines for the protection of tourism, residential and recreational values to be reflected in project approvals.

The proposed RRP appears to be deemed an acceptable land use and/or possible as per the respective Crown land use policy reports.

7.18.2 Mineral Exploration

7.18.2.1 Environmental Effects

Bayfield Ventures Corp. (Bayfield Ventures) holds title to the mineral rights of five parcels located east of the RRR open pit area, as well as an interest in another larger block of unpatented mining claims and title to a mineral parcel located southwest of the tailings management area. No RRP developments have been proposed that would affect the Bayfield Ventures land holdings southwest of the tailings management area.

Bayfield Ventures holds the mineral rights to a single parcel located immediately east of the proposed RRP open pit and adjacent to the current Highway 600 alignment. RRR holds the title to the surface rights of this same parcel. A portion of the proposed east mine rock stockpile, as well as a haul road and water pipeline, are proposed for the surface rights of this specific parcel of land. While title to this mineral rights parcel is independent of the RRR held surface rights, this mineral rights parcel is completely surrounded by RRP surface rights and/or mineral rights claims. Development of this mineral rights parcel by Bayfield Ventures (or others), from either surface or underground cannot occur without an access agreement from RRR. As well, development from surface would be particularly challenging due to the small size of the claim and proposed RRP infrastructure constraints which would cover approximately 50% of the surface area.

The other eastern block of mineral rights parcels held Bayfield Ventures is located immediately east of the proposed RRP process plant site and north of the east mine rock stockpile, and constrains the north and northwestern stockpile boundary. Bayfield Ventures holds mineral rights to these lands while the title to the surface rights are held by third parties (not RRR). Access to this block from surface is open to the north and east, and as such development of the RRP will not constrain development of this property. There are no proposed RRP facilities or infrastructure planned for these lands.

Access to Bayfield Ventures mineral rights properties will not be restricted other than as described above, but Bayfield may be limited by the need to negotiate with RRR if there is a requirement to use or cross RRR properties for access.

7.18.2.2 Government, Aboriginal and Public Comments and Concerns

There have not as yet been any expressions of concern from government agencies, Aboriginal groups, or the general public regarding access to other mineral resource properties.

7.18.2.3 Mitigation

Access to the majority of the Bayfield mineral rights parcels located proximal to the RRP is unencumbered by proposed plans for the RRP, and hence does not require mitigation.

7.18.2.4 Residual Environmental Effects

Access to land where Bayfield Ventures holds mineral rights will need to be negotiated with RRR should Bayfield decide to develop such land in the future and/or if there is a requirement to use or cross RRR properties for access. The development of such land is highly constrained by the restricted nature of the mineral rights holding by Bayfield Ventures.

7.18.2.5 Significance Determination

Mineral exploration is considered an important regional land use as there are multiple companies actively exploring gold claims in the Rainy River District (Level III for value and context). Residual effects on mineral exploration are considered negative in terms of removing potential access to resources, and are low representing adverse effects to a single property held by one mineral exploration company (Level I in magnitude). The extent of the effect is confined to the HLSA (Level I); is medium-term in duration because the effect lasts until the end of decommissioning (Level II); occurs continuously throughout the life of the RRP (Level III); is reversible in the long term, but with difficulty and at high cost (Level II); and is likely to occur (Level III). The overall net effect on mineral exploration is, therefore, considered not significant.

7.18.3 Forestry

7.18.3.1 Environmental Effects

The RRP is within the Crossroute Forest Management Unit for which the sustainable forestry licence is held by Resolute. Portions of the proposed tailings management area and mineral stockpile areas impact areas of Crown and patented land in the Crossroute Forest which Resolute manages.

Development of the RRP has the potential to reduce the amount of productive forest land, which could result in reductions in long term wood supply from the forest. As noted in Section 7.8, approximately 1,441 ha of hardwood forest (dominantly Aspen-Birch hardwood forest) and coniferous forest (dominantly organic intermediately conifer swamp) will be removed by the RRP development. Note that not all of these areas are necessarily appropriate for forestry as this includes a considerably portion of forested swamp. All of the forest habitat types that will be displaced are common throughout the NRSA and human environment regional study area (HRSA).

With respect to changes to access to forestry resources, the proposed Highway 600 re-alignment uses existing road allowances and is designed to mimic the existing Highway 600 connectivity for the general area road network. The mine and associated facilities will occupy most of the existing Highway 600 section affected by the RRP. RRR will work with Resolute to ensure that wood allocations peripheral to the RRP remain accessible.

7.18.3.2 Government, Aboriginal and Public Comments and Concerns

Concerns and suggestions shared by forest industry representatives included:

- Losing productive forest land, which would result in reductions in long term wood supply from the forest;
- Making Crown timber harvested from proposed RRP development areas available to local mills;
- Maintaining or enhancing access for forestry companies as a result of the re-alignment of Highway 600;
- Maintaining access to the area for current and future timber allocations; and
- Progressively rehabilitating and reforesting affected areas to return them to forest production following mine closure.

7.18.3.3 Mitigation

While the effects on the Crossroute Forest Management Area will be very limited in all phases of the RRP (construction, operation and closure), RRR has optimized mine plans to minimize the footprint of the RRP as much as practical. RRR has been in contact with Resolute to discuss access to any Crown timber which is harvested for any of the proposed RRP facilities / uses for use by local mills, as was suggested by Resolute.

At closure, the built infrastructure will be removed and the overall site will be progressively revegetated (Section 4.19). Revegetation methods are anticipated to include hydroseeding,

seeding and hand planting of tree seedlings. Over time, these areas will be potentially available for forestry and wildlife habitat uses. The open pit and tailings management area will be permanently unable to support forestry uses.

7.18.3.4 Residual Environmental Effects

Approximately 1,144 ha of hardwood and coniferous forest types (including coniferous swamp) will be removed as a result of the RRP development. As a proportion of the Crossroute Forest Management Area, this represents 0.03% of Crown land and 0.7% of patented land.

Resolute has confirmed that there are no proposed timber allocations for the 2012 to 2017 term of the current Forest Management Plan that will be affected by the RRP.

7.18.3.5 Significance Determination

Forestry is an important regional land use that supports local mills in both Barwick and Fort Frances (Level III for value and context). Residual effects on forestry are the removal of less than 1% of the Crossroute Forest Management Area for forest production until closure. At that time, the mine site will be revegetated and become available again for forestry uses, albeit over an extended timeframe. The magnitude of the effect on forestry is very low representing less than 1% of the Crossroute Forest Management Area (Level I). The extent of the residual effect is confined to the HLSA (Level I); is long term in duration because the effect lasts beyond closure (Level III); occurs continuously throughout the life of the RRP (Level III); is reversible at substantial cost, with difficulty or in the long term (Level II); and is likely to occur (Level III). The overall net effect on forestry is therefore considered not significant.

7.18.4 Agriculture and Adjacent Residents

7.18.4.1 Environmental Effects

Active cattle ranching and farmland represents is limited in the HLSA. There are 2,697 ha of land used for agriculture (primarily dairy and beef cattle operations) in the HLSA; 277 ha of these agricultural lands will be removed due to the RRP (10.3% of the HLSA) and no cash crops are produced. The farmland that will be directly overprinted by or is immediately adjacent to the RRP has been purchased, and the former owners either plan to, or have, moved. There are nevertheless still active farmsteads and local residents in the surrounding area that are potentially sensitive to disturbance and to possible effects of RRP development on their property values.

The RRP could also potentially have a positive impact on regional agricultural production. RRR worked with the Rainy River Cattleman's Association to replace community pasture that would be overprinted by the TMA. The new pasture lands near Pinewood are considered more useable to the members of the Association. The construction and operation of the RRP will strengthen regional economic diversity and create increased demand for local food products. The RRP will also provide additional opportunities for second incomes for those agricultural producers seeking such opportunities and thus allow producers to continue to live in the region and operate their farms. Further, RRR may consider sourcing directly or encourage / offer incentives to contractors and local accommodation operators to source local agricultural products. RRR is assessing how best to work with regional producers to source seeds for reclamation activities. The RRP in this respect could contribute to sustaining agricultural production in the region. RRR will continue to discuss potential RRP effects and appropriate mitigation (for negative impacts) and enhancement measures (to increase positive impacts) with adjacent agricultural producers in the region. RRR will also provide local agricultural and crop organizations opportunities to comment on the conceptual closure plan.

The RRP could also impact agriculture and adjacent property owners through changes to sound levels. MOE sound guidelines are expected to be met for both daytime and night time periods at all adjacent residents, where the allowable daytime sound limit is 45 dBA and the allowable night time sound limit is 40 dBA. Sound levels are not permitted to exceed MOE sound limits at residential receptors. The RRP will not produce sound levels that will impact remaining receptors peripheral to the project area. RRR will continue to optimize sound impacts through the selection, positioning and scheduling of heavy equipment operation, including the use of equipment-specific silencing packages where applicable. Nevertheless, given the variations in personal sensitivity to sound, there could be some residual sound impacts that will change the current rural sound level of the area.

Effects of the RRP on air quality off property are detailed in Section 7.3. Modelling results show that applicable MOE air quality standards will be met at the property boundary.

While the RRP is not expected to have negative effects on the water quality of the Pinewood River and groundwater resources (Sections 7.6 and 7.7) which are used for agriculture, planned mitigation measures to offset the impact of overprinting local creeks are expected to improve the overall water quality of the Pinewood River (Section 7.6). These measures include such initiatives as fencing livestock from creeks and off channel livestock watering, which will also help to improve livestock health.

7.18.4.2 Government, Aboriginal and Public Comments and Concerns

No concerns have as yet been expressed by government agencies or Aboriginal groups regarding agricultural lands and adjacent residents, apart from the general recognition that adjacent residents are likely to have concerns related to potential disturbances such as sensitivity to sound, traffic and aesthetics.

Concerns expressed by local residents and agricultural producers and organizations have thus far included:

- Potential for impacts of the RRP on adjacent residents and farm operations from sound, air quality, and water quality / supply impacts;
- Decreased availability of agricultural land;
- Loss of quiet rural lifestyle and related historic significance of farming in this region; and
- Potential suitability of the reclaimed mine footprint for agricultural uses upon closure of the RRP.

Agricultural producers also noted that the RRP could:

- Provide potential for off farm income opportunities and thus sustain agricultural use in the region; and
- Provide additional demand for locally produced food, specifically from the local abattoir.

7.18.4.3 Mitigation

RRR has negotiated land settlements with local agricultural producers that will be directly impacted by the RRP. RRR has worked diligently to optimize the mine footprint to minimize the amount of land required. These efforts have resulted in reducing the size of the mine rock stockpile, and removing the proposed contingency overburden and mine rock stockpiles that were considered earlier. RRR has also worked with the Rainy River Cattleman's Association to provide community pasture lands that will offset pasture lands that will be displaced by the RRP and in particular the north portion of the proposed tailings management area.

Planned mitigation measures to control air and sound emissions are documented in Sections 7.3 and 7.4, respectively. Mitigation measures to manage potential impacts to surface and groundwater flows, supplies and quality are documented in Sections 7.5, 7.6 and 7.7. RRR will continue to work actively with local residents throughout the period of mine construction, operation and active closure to further manage and reduce any such disturbances to the extent possible.

7.18.4.4 Residual Environmental Effects

Despite the proposed use of progressive measures to manage air and sound emissions and to control traffic and aesthetics, there will still be some level of disturbance to local residents and farmsteads in the general vicinity of the RRP. RRR will continue to work actively with these residents throughout mine construction, operation and active closure to further manage and reduce any such disturbances to the extent possible. There will be 10.3% of agricultural land removed in the HLSA as a result of the RRP.

7.18.4.5 Significance Determination

Agriculture is and has been an important regional land use in the region (Level III for value and context). Effects on agricultural land use are considered both negative and positive. RRR will work to enhance positive effects to offset any negative impacts experienced to agricultural producers and adjacent residents. Residual negative effects on agriculture are expected to include the removal land currently used for agriculture at least until closure and for some portions permanently. At closure, portions of the reclaimed site may become available again for selected agricultural uses such as livestock grazing. The magnitude of the effect on agriculture is moderate (Level II), but low when taken in the context of the Rainy River District and that it affects only a few adjacent land owners which may be able to clearly distinguish an effect over current conditions. The extent of the residual effect will be: confined to the HLSA (Level I); be of long term in duration because the effect lasts beyond closure (Level III); occurs continuously throughout the life of the RRP (Level III); is reversible at substantial cost, and with difficulty or in the long term (Level II); and is likely to occur (Level III). The overall net (negative) effect on agriculture is considered not significant.

7.18.5 Hunting

7.18.5.1 Environmental Effects

Hunting is a popular activity in the Rainy River District and along with fishing is a focus of the tourism sector. The area is noted by the Fort Frances Sportsman's Club as coveted for its trophy White Tailed Deer attracting some Americans to buy properties for hunt camps in the region. The RRP will displace approximately 1.5% of WMU 10 located on private land.

Potential impacts to ungulates including White-tailed Deer and Moose populations are described in Section 7.9 including potential effects related to habitat loss, mortality due to increased vehicle traffic, sound disturbance and increased predation. It was determined that with the application of mitigation measures to reduce or avoid negative effects on ungulates, overall effects to deer and Moose would not be significant.

Bear management areas FF-10-007, FF-10-008, FF-10-010 and FF-10-005 overlap the HLSA (Figure 7 in Appendix I-2). These areas are designated to manage tourist licences for bear hunting (MNR 2012d).

The RRP will overprint and/or render inaccessible portions of primarily private land previously accessed for hunting from portions of Highway 600, Roen Road and Teeple Road and now owned by RRR. It is recognized that this area is valued and has been used regularly by several hunters with the voluntary agreement of the then landowners, but for the safety of workers, RRR cannot allow hunting on RRR-owned lands. The Fort Frances Sportsman's Club estimated that there could be at least 10 hunters who have used this area consistently for the last 20 years. The RRP will remove a very small proportion of the WMU 10 from hunting (1.5%). Ungulates are considered widespread and abundant within the region. Furthermore, the creation of the transmission line corridor and the re-aligned Highway 600 may create additional access for hunters in the region.

7.18.5.2 Government, Aboriginal and Public Comments and Concerns

No specific concerns have as yet been expressed by government agencies regarding Project effects on hunting. Aboriginal concerns regarding hunting are addressed in Section 7.17.4. Comments and concerns expressed about hunting by local residents have thus far included the following:

- Potential impact on big game animals and specifically the quality of the meat if animals (Moose) wander into the tailings management area (note that the facility is proposed to be fenced);

- Displacement of areas used regularly for hunting and specifically the area where the mineral stockpiles will be developed in the vicinity of Roen Road, Highway 600 and Teeple Road;

- Displacement of wildlife into WMU 9a and 9b which have an open season for Moose; and

- Loss of access to hunting areas.

In addition, local residents and stakeholders indicated that wildlife populations were abundant (particularly deer and wolves) and that they are healthy. Animals hunted in the region include: White Tailed Deer, Black Bear, Timber Wolves, Moose and Ruffed Grouse.

7.18.5.3 Mitigation

Planned mitigation measures to limit adverse effects to White Tailed Deer, Moose, Black Bear, Timber Wolves and Ruffed Grouse, and hence effects to the hunting of these species, are documented in Sections 7.9, 7.10 and 7.12, and include such measures as minimizing the RRP footprint to the extent practical, controlling sound and other disturbances, fencing of the tailings management area and reclaiming the site to productive wildlife habitat following closure.

7.18.5.4 Residual Environmental Effects

Despite the measures proposed to minimize adverse effects to wildlife including effects to species of wildlife that are hunted by local residents, there will be some displacement of these species as a result of RRP development (approximately 1.5% of WMU 10 would be temporarily removed from hunting use). RRR holds surface rights and/or owns the land that will be developed, and hunting is only permitted on such lands at the discretion of the landowner; in this case RRR. No such hunting will be allowed to protect worker safety. RRR would also like to work with local hunters to ensure that hunting activities on lands peripheral to the RRP lands do not endanger mine workers. Following mine closure lands suitable for use by wildlife and local hunters would be restored.

7.18.5.5 Significance Determination

Hunting is an important current land use that helps to support the tourism industry in the region (Level III for value and context). Effects on hunting are considered primarily negative due to loss of access to and overprinting of areas currently used for hunting. Residual negative effects on hunting will include the loss of 1.5% of WMU 10 at least until the cessation of closure activities. At that time, RRR will consider allowing access to the all or portions of the RRP site once habitats are restored. The magnitude of the effect on hunting is clearly distinguishable but is unlikely to pose a serious limitation to hunting activities within WMU 10 (Level I). The extent of the residual effect is confined to the HLSA (Level I); is medium-term in duration because the effect lasts until closure (Level II); occurs continuously throughout the life of the RRP (Level III); is reversible at substantial cost in the longer term (Level II); and is likely to occur (Level III). The overall net (negative) effect on hunting is considered not significant.

7.18.6 Trapping

7.18.6.1 Environmental Effects

The HLSA overlaps with nine traplines and the RRP footprint (excluding the transmission line corridor) overlaps with four traplines. A registered trapper is contracted by RRR for managing nuisance animals (rather than strictly for fur harvesting / profit) on the RRR properties. The area west of Fort Frances is primarily privately held land where any registered trapper can trap with the landowner’s permission. Table 7-21 shows the proportion of each trapline within the HLSA and that will be overprinted by the RRP. The RRP footprint overlaps with four of the nine trapline areas, including most notably 38% of trapline FF021755 and 13.9% of trapline FF021318. Persons previously trapping lands required for development of the RRP will no longer be granted access to these lands, as it is not considered a safe practice given the level of heavy equipment operation, for such persons to wander about the RRP site; or to set traps where mine workers may access.

Potential impacts to furbearers are detailed in Section 7.10 including potential effects related to habitat loss, mortality due to increased vehicle traffic, decreased connectivity between local woodland habitat areas, and sound disturbance. It was determined that furbearers displaced by the RRP will likely find equally suitable habitat adjacent to the RRP footprint. The adverse effects of furbearer mortality resulting from vehicular collision due to increased traffic are expected to be minimal with the implementation of mitigation measures. At closure, all disturbed sites will be rehabilitated to pre-existing conditions including furbearer habitat. As such, RRP-related effects on local or regional furbearer populations were considered to be not significant (Section 7.10).

7.18.6.2 Government, Aboriginal and Public Comments and Concerns

No specific concerns have as yet been expressed by government agencies, Aboriginal groups or other stakeholders in relation to furbearing mammals, or to trapping other than generalized statements and expressions of concern that all reasonable efforts should be taken to minimize adverse effects to wildlife populations. No information regarding trapping has as yet been presented during Aboriginal consultation, discussions and meetings.

7.18.6.3 Mitigation

Planned mitigation measures to limit adverse effects to furbearing mammals and hence also effects to trapping are documented in Section 7.10, and include such measures as minimizing the RRP footprint to the smallest extent practicable, controlling sound and other disturbances, managing site effluent quality, fencing of the tailings management area and reclaiming the site to productive wildlife habitat following closure.

7.18.6.4 Residual Environmental Effects

Despite the measures to minimize adverse effects to wildlife including species of wildlife that are trapped, there will be some displacement of these species as a result of RRP development, as described in Section 7.10. Trapping on RRP lands will not be permitted during mine construction, operation and active closure to protect both trapper and worker safety. Following closure, lands suitable for use by wildlife and local trappers will be restored.

7.18.6.5 Significance Determination

The value / context of trapping in the HLSA is considered Level II that is; important from an ecosystem or socio-economic context, but not identified by stakeholders as valuable. Effects on trapping are considered primarily negative due to the overprinting of trapline areas, and restricted access for trappers. Residual negative effects on trapping are the loss of 13.9% and 38% of two traplines and a minimal proportion of the remaining two trapline areas overlapping the RRP footprint at least until closure. At that time, the site will be reclaimed and will become available for other land uses including trapping. The magnitude of the effect on trapping is low: clearly distinguishable but is limited to two traplines (Level I). The extent of the residual effect is confined to the HLSA (Level I); is of medium term in duration because the effect lasts until closure (Level II); occurs continuously throughout the life of the RRP (Level III); is reversible in the long term (Level II); and is likely to occur (Level III). The overall net (negative) effect on trapping is considered not significant.

7.18.7 Fishing

7.18.7.1 Environmental Effects

The HLSA overlaps with the very large, provincially managed Fish Management Zone 5. While The Pinewood River is recognized as fish habitat and overlaps the HLSA, there are no lakes located within, or adjacent to the main RRP footprint. Based on multiple years of aquatics baseline investigations, while limited bait fishing does occur within certain RRP area streams, the area does not support a significant commercial or recreational fishery. The only sport fish available locally are Northern Pike and Brown Bullhead in the Pinewood River, which receives very limited, if any, recreational fishing pressure in the general vicinity of the RRP.

There are two baitfish license areas that will be impacted by the RRP: FF0095 (from impacts to West Creek) and to a lesser degree FF0096 (from overprinting of Clark Creek / Teeple Drain; as well as two (baitfish licence FF0060 and FF0061) which are linked to the proposed Highway 600 crossing of the Pinewood River). For these latter two license areas, there could be possible temporary interruption to harvesting in a localized area while the new Pinewood River / Highway 600 crossing is constructed. Thereafter there would be a positive benefit provided by improved access to the license area as a result of the Highway 600 re-alignment.

7.18.7.2 Government, Aboriginal and Public Comments and Concerns

Concerns expressed by government agencies in relation to the protection of fisheries resources are documented in Sections 7.5 and 7.6. A Fisheries Working group consisting of the RRP team, DFO and MNR was formed in mid-2012 to develop the RRP No Net Loss Plan to address potential impacts resulting from the RRP. Aboriginal concerns regarding effects to fishing are addressed in Section 7.17 and have been incorporated into the No Net Loss planning.

While sport fishing is the main tourist attraction to the Rainy River District, there have been as yet no specific concerns raised about fishing related to the RRP by local residents, apart from general statements and expressions of concern that all reasonable efforts should be taken to minimize adverse effects to fish and fish habitat. Local residents also indicated that fishing occurs more often in other larger streams and waterbodies in the Rainy River District, including Rainy River, Rainy Lake and the Lake of the Woods. More extensive recreational fishing opportunities are also available within the lakes located approximately 15 km or more northeast and upstream of the RRP site; most notably Off Lake, Beadle Lake, Boundary Lake, Little Pine Lake and Burditt Lake.

7.18.7.3 Mitigation

Effects on sport and bait fish within downstream water bodies and rivers are detailed in Sections 7.5 and 7.6, and will be mitigated through a No Net Loss Plan. In addition, RRR will work with area agricultural producers to implement livestock management measures that should improve water quality in the Pinewood River. Commercial fisheries licences are present on Lake of the Woods a considerable distance downstream of any predicted RRP effects. These licences are held by Aboriginal groups and as such, potential effects are described in Section 7.17.

7.18.7.4 Residual Environmental Effects

Residual effects on fisheries resources and associated fishing activities, following the implementation of mitigation measures described in Sections 7.5 and 7.6, are considered to be limited, particularly with regard to recreational fishing which is extremely limited if indeed active at all, in the upper portion of the Pinewood River near to the proposed RRP.

7.18.7.5 Significance Determination

Sport fishing in the Pinewood River (and creeks impacted by the RRP) is considered Level II in value / context; that is, important from an ecosystem or socio-economic context, but not identified by stakeholders as valuable. A bait fisher indicated the importance of maintaining water quality for his license area on the Pinewood River. For bait fishing the value / context is considered important (Level II). Given that there is limited, if any, sport fishing in the Pinewood River or creeks impacted by the RRP, and there are four bait fishers that will have portions of their license areas affected, the magnitude of impact on fishing is considered Level I; that is, no or low level effects, and individuals may be affected. The extent of the residual effect is confined to the HLSA (Level I); is medium term in duration because the effect lasts until closure (Level II); occurs continuously throughout the life of the RRP (Level III); is reversible with difficulty in the long term (Level II); and is likely to occur (Level III). The overall net (negative) effect on fishing is considered not significant.

7.18.8 Other Outdoor Recreation Uses

Other recreation activities are limited in the HLSA and primarily occur in regional Provincial parks, lakes and other areas that are located outside of the study area, and therefore will not be impacted directly or indirectly by the RRP. The one exception is a portion of local Richardson Trail which will be overprinted by the tailings management area. Other impacts could potentially include changes in enjoyment of natural / wilderness areas due to sound and air emissions or increases in traffic on Highways 11 and 71. Comments from stakeholders about recreation included maintaining access to the Richardson Trail (Richardson Road) which was reportedly well used.

Richardson Trail is located within in the HLSA and a portion of the south part of the trail will be impacted by the RRP footprint (the tailings management area). Access to other portions of the Richardson Trail will not be impacted.

Effects of air and sound emissions are detailed in Sections 7.3 and 7.4 and will be confined to the immediate RRP site area. There will consequently be no expected adverse effects on these other recreational uses from air and sound emissions. Effects of increased traffic are described in Section 7.19 and are expected to be not significant. However, it is reasonable to expect that there would be distinguishably more traffic during an overlapping summer recreation / tourism season and the RRP construction phase.

Given that there is limited outdoor recreation within close proximity to the RRP, the magnitude of impact on other outdoor recreational uses is considered Level I; that is, no or low level effects; individuals may be affected. The extent of the residual effect is confined to the HLSA (Level I); is medium-term in duration because the effects will last until closure (Level II); occurs continuously throughout the life of the RRP (Level III); is reversible in the long term (Level II); and is unlikely to occur (Level I). The overall net (negative) effect on other outdoor recreation is therefore considered not significant.

7.19 Economic Conditions

7.19.1 Economic Effects

The RRP has the potential to positively affect the provincial and regional economies by developing or helping to develop:

- Direct, indirect and induced employment opportunities;
- Business opportunities;
- Income growth;
- Economic diversification;
- Human capital; and
- Government revenues.

The total capital cost of the RRP estimated from the Feasibility Study (BBA 2013a) is approximately $713M including $55M in contingencies (all costs herein are stated in 2013 $CDN) with annual operation phase spending varying between $65M and $225M per year, or $2.3B over the life of the RRP. The sustaining capital costs total $484M over the life of the mine.

For the purpose of understanding the potential socio-economic effects assessment, the project can be described in five phases, with timing as assumed shown consistent with the Feasibility Study (although pending receipt of environmental approvals):

- Construction (2014 to 2016), with construction activity taking place over a 20-month period beginning in 2014 and ending in 2016;

- Operations Phase 1 (2016 to 2018) when the open pit is in production and ore is being processed but underground production has yet to begin;

- Operations Phase 2 (2019 to 2026) when both the open pit and the underground facility are operating and ore from both sources is being processed;

- Operations Phase 3 (2027 to 2031) where open pit mining has ended and been replaced by processing of stockpiled ore. Underground mining operations start to taper off in 2027 and end in 2028; and

- Decommissioning and Early Closure (Early Closure: 2032 to 2041) which describes closure of the site, with the bulk of economic activity occurring in the first two years of the closure phase when active reclamation is occurring.

The economic effects associated with the RRP after active reclamation are considered minor and have not been assessed.

7.19.1.1 Methodology

The estimate of the economic effect of the RRP are based on the Provincial input / output economic multipliers for Ontario as provided by the Industry Accounts Division of Statistics Canada (Catalogue no. 15F0046XDB; Statistics Canada 2013a). These multipliers describe how a change in final demand for the output of one particular industry will affect economic activity in the Province.

The multipliers show the direct, indirect and induced effects on Gross Domestic Product, labour income and jobs that would be associated with a $1 change in economic output. Statistics Canada provides multipliers at four levels of aggregation:

- Detailed level (234 industries);
- Link 1997 level (188 industries);
- Link 1961 level (112 industries); and
- Summary level (35 industries).

This analysis uses multipliers at the industry detailed level. Statistics Canada provides multipliers for 234 different industries.

Separate simulations were completed for construction, operation and early closure phases because of the different outputs (final demand) associated with each phase of the proposed project. For construction and early closure phase, the change in final demand is modelled in terms of the total value of spending in Ontario. The economic impacts were estimated using multipliers for the Statistics Canada 'other engineering construction' industry (Code BS23C500).

For the provincial effects of the RRP operation phase, the change in final demand was modelled in terms of the value of gold and silver that would be produced. For the regional effects, the change in final demand is modelled in terms of the total value of spending in Ontario. Both were calculated using the Statistics Canada multipliers for the 'gold and silver ore mining' industry (Code BS212220).

These multipliers were used to estimate direct, indirect and induced impacts. Direct impacts include the labour, goods and services that needed to actually construct and operate the project; and include workers at the project as well as people working offsite to produce those goods and services. Indirect impacts occur when other industries increase their output in response to the demands of the directly affected industries. For example, companies that directly provide the steel needed for construction will in turn, have increased demands for raw materials like coal and iron ore that will indirectly affect these industries. Induced impacts measure the extents to which spending by workers whose wages are directly or indirectly affected by the project will result in increased production of consumer goods and services.

7.19.1.2 Limitations

This economic assessment is based on Feasibility level economic estimates which are considered accurate to -10%, +15%. Estimates of regional effects are based on current conditions and structural changes in the regional economy that may impact the extent of economic impacts over the life of the project.

7.19.1.3 Effects Overview

Expenditures during construction and operation will stimulate the economy, creating jobs and income in industries throughout Ontario. The potential impact of the RRP on the provincial economy can be best measured in terms of Gross Domestic Product, which represents the sum total of all final goods and services produced annually.

RRP construction expenditures of $713.5M are expected to generate in Ontario about $202.2M in Gross Domestic Product from direct expenditures, $114.5M from indirect expenditures and $95.6M from induced expenditures (Table 7-22). The increased total Gross Domestic Product in Ontario as a result of the RRP construction phase is projected to be about $412.4M. Construction is expected to generate about 2,415 person-years[1] of direct employment, 1,252 person-years of indirect employment and 883 person-years of induced employment. Total increased employment in Ontario as a result of the RRP construction phase is projected to be about 4,550 person-years. Total labour compensation from direct employment is estimated to be $153.4M, while total labour compensation resulting from direct, indirect and induced employment is estimated to be $280.1M. Jobs in the planned construction and pre-production mining workforce are expected to be higher paid than the jobs produced by contractors, suppliers, and through induced economic activity. All of the salary rates used in the economic analysis are industry standards are not explicit to the RRP.

[1] Person-year: equivalent to one person working fulltime for a year or 12 people working fulltime for a month

Over the operational life of the mine from 2016 to 2031, the mine is expected to earn gross revenues of $5.6B. The expansion of the Ontario economy expected from these revenues is shown in Table 7-23. On average during the operation phase, the RRP will generate $196.8M in Gross Domestic Product annually from direct expenditures, $56.9M annually from indirect effects and $62.6M annually from induced effects. The total average annual Gross Domestic Product increase in Ontario as a result of operations is $316.3M. The RRP will create direct employment for approximately 727 people in Ontario on average during each year of operations. Annual indirect and induced employment in Ontario during this phase is expected to total approximately 611 and 578 jobs, respectively. When added to direct employment for the RRP, total operations phase employment is 1,917 jobs per year. Total labour compensation from direct employment is estimated to be $107.4M and total labour compensation from direct, indirect and induced employment is $177.2M.

The effect of the RRP will decline substantively with its closure and decommissioning beginning in 2032, and is shown in Table 7-24. Decommissioning and closure expenditures are expected to total $14.4M over the first ten years of closure and generate $8.0M of economic activity from direct expenses and $16.3M from direct, indirect and induced expenses. These expenditures are expected to create 93 person-years of direct employment. Annual indirect and induced employment in Ontario is expected to amount to 49 and 35 person-years, respectively. 81% of employment effects would happen in the first three years of the closure (2032 to 2034).

7.19.1.4 Direct, Indirect and Induced Employment Opportunities

The employment effects of the RRP are of particular note because they will help to reverse structural changes in the regional economy that have adversely affected employment prospects for many in the HRSA. The categories of employment (defined through the National Occupational Classification for Statistics) which will be directly employed by the RRP are also those which northwestern Ontario has seen the largest losses in employment in recent years according to the Statistics Canada Labour Force Survey (Table 7-25). This is shown in manufacturing employment that has shown an estimated overall decline of 50.8% since 2006; employment in trades which has fallen by an estimated 21.8%; and a decline among transport and equipment operators has decreased by an estimated 40.9%. Primary industry employment fell more slowly with an approximate 8% decline although this includes agricultural employment which was likely close to stable (Statistics Canada 2013b).

During the approximate 20-month construction phase, the RRP is expected to require a peak workforce of 400 construction workers in 2015 and a total of 1,330,000 person-hours. Overall, it will require 528 person-years of employment to construct the RRP. As shown in Figure 7-14, onsite workforce requirements are highly variable over the construction phase. Most of the construction workforce is made up of specialized workers operating on 21 and 7 rotations regardless of domicile. Only 5% of the construction workforce is expected to be drawn from the

HRSA and an additional 40% of the workforce from other areas in northern Ontario (BBA 2013b). The remainder will come from other regions of Canada.

These are only estimates rather than targets, which are dependent on the availability of skilled labour in the region meeting the following workforce requirements for construction in the trades of earthworks, civil, concrete, structural / architectural, mechanical / platework, piping, electrical / instrumentation:

- Working foremen: 7.3%;
- Lead hands: 11%;
- Certified journeymen: 25%;
- Uncertified journeymen: 12%;
- Apprentices: 10%; and
- Skilled labourers: 8%.

The remainder of the construction workforce will be professional-level managers and supervisors. The HRSA is expected to provide 4% of the goods and services associated with construction with the rest of Ontario providing another 54% (BBA 2013b).

An additional 400 person-years of employment during the construction phase are planned from pre-production mine workers. Based on assessments of the regional capacity to provide services and labour, it is predicted that 46% of the pre-production mining workforce is expected to be hired from the HRSA and 26% from the rest of Ontario (BBA 2013b).

Based on the estimates of hiring and purchasing from the HRSA, construction of the RRP is expected to generate economic effects in the HRSA of about 326 person-years of direct employment, 134 person-years of indirect employment and 82 person-years of induced employment (Table 7-26). Total employment in the HRSA as a result of the RRP construction phase is projected to be about 542 person-years. Total labour compensation from direct employment within the HRSA is estimated to be $24.0M, while total labour compensation resulting from direct, indirect and induced employment is estimated to be $36.8M.

Based on the estimates of hiring and purchasing from the HRSA, construction of the RRP is expected to generate economic effects in the HRSA of about 326 person-years of direct employment, 134 person-years of indirect employment and 82 person-years of induced employment (Table 7-26). Total employment in the HRSA as a result of the RRP construction phase is projected to be about 542 person-years. Total labour compensation from direct employment within the HRSA is estimated to be $24.0M, while total labour compensation resulting from direct, indirect and induced employment is estimated to be $36.8M.

Most of the job opportunities within the direct onsite workforce for HRSA residents will be in operation phase starting in 2014. Based on the current estimates (BBA 2013b), the expected operation workforce is as follows:

- Unskilled (for example, labourers): 8 to 10%;
- Semi-skilled (for example, heavy equipment operators): 45 to 55%;
- Skilled (for example, millwrights, mechanics, electricians, technicians): 30 to 35%;
- Professional (for example, geologists and engineers): 3 to 10%; and
- Management (for example, foremen and managers): 5 to 10%.

Based on skill requirements and the regional availability of labour, it is expected that 46% of the operational workforce will be from the HRSA and 26% from elsewhere in Ontario (BBA 2013b). Only because of the limited exposure of the HRSA labour force to the mining industry, it is expected that HRSA workers will dominantly take positions in lower-skilled job categories initially, but are anticipated to advance as their expertise in the sector grows.

The mine is expected to be in operation from 2016 to 2031, a period of 16 years. The share of workers and purchases originating from the HRSA is expected to be larger in the operations phase than in the construction phase (BBA 2013b). Project operations are expected to directly employ 187 people originating from the HRSA in new fulltime jobs. On average during the operation phase, the RRP will support an annual total of 318 direct, indirect and induced jobs in the region. Regional labour income generated by the RRP is expected to be about $27.2M per year.

Over the operations phase, the level of activity will vary considerably. Figure 7-15 shows the onsite workforce requirements for each operational area of the RRP over the operational life of the mine. The socio-economic effects resulting from the RRP operations phase are shown in Table 7-27 and were assessed as follows:

- **Operation Phase 1 (2016 to 2018):** During the initial phase of open pit operations before underground production begins, the onsite workforce will climb from the pre-production level of 191 in 2015 to 353 in 2016, and then to 482 in 2018. At a regional level, RRP operations during this phase are expected to directly employ 228 people originating from the HRSA in new fulltime jobs. On average during the phase, the RRP will support an annual total of 387 direct, indirect and induced jobs in the region. Regional labour income generated by the project is expected to be about $32.4M per year.

- **Operation Phase 2 (2019 to 2026):** At full production when both the open pit and underground operations are operating, the onsite workforce will average 520 employees, peaking at 601 in 2022. Total labour compensation from direct employment is estimated to be $148.4M and total labour compensation from direct, indirect and induced employment is $244.8M. At a regional level, RRP operations will directly employ an estimated 231 people originating from the HRSA in fulltime jobs. On average during the phase, the RRP will support an annual total of 393 direct, indirect and induced jobs in the region. Regional labour income generated by the project is expected to be about $33.8M per year.

- **Operation Phase 3 (2027 to 2034):** After the end of open pit production when underground operations are reducing off and the mill is increasingly being fed by ore from surface stockpiles derived from earlier production, the onsite workforce will average 173 employees.

Employment and income effects will decline substantially with decommissioning and closure of the mine beginning in 2032 (Table 7-24). Decommissioning and closure expenditures are expected to total $14.4M over the first five years of closure, creating 93 person-years of direct employment. No projection is made as to the share of this work that would be done by HRSA workers since capacity estimates would be speculative. As much of the work is less specialized and procurement policies are expected to show preference to HRSA contractors a high share of the work is expected to be performed by HRSA companies. Expenditures after the first five years average $0.5M annually and are not expected to have a noticeable effect on the regional or provincial economies.

Assuming that HRSA employment trends follow regional trends identified in the Labour Force Survey results in an estimated unemployment rate within the HRSA of 8.0% (which would be a decline from 8.8% in 2006), achieved in part through a fall in the participation rate from 64.4% to 63.6%. In addition, the working-age population in the region is expected to decline further over the next 20 years in a trend documented by the census (Section 7.20.1; Statistics Canada 2013b; Ministry of Finance 2012; Statistics Canada 2007a). Figure 7-16 shows the trend of the unemployment rate in the HRSA which, assuming a base unemployment rate of 8.0% combined with the estimated regional employment effects shows a reduction in the unemployment rate to a low of 5.0% in 2022, but rising thereafter. This analysis assumes that while some of the jobs supported by the RRP will be taken by the currently unemployed, some jobs will be filled by current part-time workers that want to work fulltime and by an increase in participation in the labour force. Estimates of the number of involuntary part-time workers filling positions are taken from analysis of Ontario data drawn from the Labour Force Survey (Statistics Canada 2013b). Estimates of the increase in labour force participation rate are drawn from a 2011 cross country estimate of this effect (Ball et al. 2013).

7.19.1.5 Business Opportunities

A wide variety of contract services, supplies and materials are expected to be purchased from local and regional companies (including Aboriginal companies) during construction, operation and closure of the RRP.

Based on current capacity, an estimated $20.4M of goods and services are expected to be purchased from the region over the construction phase, including $6.8M in spare parts and construction material, $5.7M in mining services and $3.2M in fuel (BBA 2013b).

Table 7-28 shows the expected purchases of goods and services from the region based on current regional capacity over the operational life of the mine. The leading opportunities are in construction services (averaging $3.5M annually and peaking at $5.1M in 2019), mining consumables (averaging $2.1M annually and peaking at $3.1M in 2019) and maintenance (averaging $0.8M annually and peaking at $1.2M in 2019).

Estimates of business opportunities are based on the current capabilities of businesses in the HRSA, which underestimates the potential of regional businesses to participate in the business opportunities offered by the RRP. There is only a limited history of participation in mining sector in the region, but many businesses and individuals have developed capabilities relevant to industrial resource-sector clients from exposure to the forestry industry (RRFDC December 2012). RRR is committed to a fair and competitive approach to procurement favouring all regional businesses equally. As regional businesses invest to develop the capabilities to provide goods and services to the RRP their share of procurement expenditures are expected to increase.

7.19.1.6 Income Growth

The RRP is expected to make a large contribution to incomes in the region (as shown in Tables 7-24, 7-26 and 7-27). During the construction phase regional expenditure and employment effects are expected to produce an estimated $24.0M in labour compensation from direct expenditure and $36.8M in labour compensation from direct, indirect and induced economic activity.

Income effects during the operation phase are expected to be broad-based: 318 direct, indirect and induced jobs during construction created in the HRSA amount to 3.9% of the estimated 2016 HRSA labour force of 8,453 and by 2019 the share of the labour force employed by the RRP, or through indirect and induced effects of RRP expenditure is estimated to rise as high as 5.4%.

7.19.1.7 Economic Diversification

The RRP will noticeably improve diversification of the local economy. Although currently the HRSA economy does have a concentration of employment in resource-based industries (7.8% against an Ontario average of 2.9%) this has been due to a concentration on agriculture and forestry, which collectively employ roughly 80% of the HRSA primary industry workforce (Statistics Canada 2007a, Statistics Canada 2007b). Through expanding mining employment, the RRP will diversify the primary industry workforce and encourage the development of new businesses in mining services while at the same time supporting struggling service industries such as transportation and warehousing, trade, accommodation and food services. According to Labour Force Surveys for the period from 2006 to 2012, these industries combined shed an average of 900 jobs annually from 2006 to 2012; a 16.4% decline over the period (Statistics

Canada 2013b). Table 7-28 details purchases of goods and services from the HRSA. Industry norms for extractive industries in Ontario (Statistics Canada 2013a) applied to RRP would put total expenditures on transportation and related services at $3.7M annually over the lifetime of the Project. Accommodation and food services are expected to participate in particular from the induced economic activity of $3.3M on average annually in the HRSA.

7.19.1.8 Human Capital

The RRP has the potential to improve the educational capital of the region through direct investment by RRR and leveraged investment by other parties in education and training to take full advantage of the economic opportunities offered by the mine. Table 7-29 shows the onsite demand for different levels of skilled labour over the operational life of the project. RRR is working with Confederation College (Rainy River Campus) and Aboriginal groups by providing a list of jobs required for 2016 and beyond, helping to align labour requirements with training programs (BBA 2013b). The staged demand for skilled labour rewards human capital investment and encourages existing employees to leverage the experience and skills gained working at the RRP.

Rising incomes in the HRSA are expected to reduce the outmigration of educated residents and bring back skilled former residents who had left the area because of poor job prospects. These effects are discussed in Section 7.20.1, but can be expected to result in a net gain in human capital within the HRSA.

7.19.1.9 Government Revenues

The RRP is expected to produce substantial revenues for Federal and Provincial governments through corporate taxes and royalties, indirect taxes on products, indirect taxes on production and direct taxes on income earned from economic activity. Taxes paid to municipalities have yet to be determined.

During construction, the RRP is estimated to generate $78.0M in government revenues (as shown in Table 7-30) through direct, indirect and induced economic activity. This includes personal income taxes ($61.9M), indirect taxes on products ($13.5M) and indirect taxes on production ($11.8M). Of these revenues, $51.3M would go to the Federal government and $26.7M to the Ontario government. Municipal taxation levels are under negotiation with the Township of Chapple.

During operations (2016-2031), taxes collected by the Federal government from corporate taxes and royalties as well as direct and indirect taxes on economic activity supported by the RRP are estimated to average $57.9M annually. Taxes collected by the Provincial government from corporate and mining taxes as well as direct and indirect taxes on economic activity supported by the RRP are estimated to average $36.1M annually. These values vary considerably from year to year, as shown in Table 7-31. Operations can be analyzed within three phases:

- **Operations Phase 1 (2016 to 2018):** During the open pit-only phase of operations, annual tax revenues are estimated at $43.7M for the Federal government, of which corporate taxes account for only $3.0M or 7% of overall revenue. Annual taxes for the Provincial government are estimated at $22.9M.

- **Operations Phase 2 (2019 to 2026):** During the combined open pit and underground phase of operations, annual tax revenues for the Federal government are estimated at $87.9M, of which corporate taxes contribute $33.2M annually. Annual taxes for the Provincial government are estimated at $57.0M.

- **Operations Phase 3 (2027 to 2034):** As open pit mining concludes and underground operations taper off, tax revenues from the RRP fall. Annual tax revenues in this period are estimated at $18.4M for the Federal government and $10.6M for the Ontario government annually.

Over the operational life of the mine, the RRP is expected to raise $926.4M for the Federal government and $577.5M for the Provincial government.

During decommissioning and closure, the RRP is not expected to produce a noticeable level of revenue, estimated based on expenditures at $0.4M in government revenues (as shown in Table 7-32) through direct, indirect and induced economic activity. This includes personal income taxes ($0.2M), indirect taxes on products ($0.1M) and indirect taxes on production ($0.1M). Of these revenues, roughly $0.3M would go to the Federal government and $0.1M to the Ontario government.

7.19.2 Government, Aboriginal and Public Comments and Concerns

Stakeholders expressed strong interest in the potential economic effects of the RRP, as summarized below by VSEC.

7.19.2.1 Direct, Indirect and Induced Employment Opportunities

A wide range of stakeholder groups have an interest in the local employment expected to derive from the project. Employment was cited by Municipal governments, First Nations, businesses and landholders as a major positive effect of the project. The Rainy River Future Development Corporation (RRFDC) highlighted the issue of the many qualified employees recently laid off from the Resolute mill in Fort Frances that could be re-trained to work in mining. The magnitude of employment opportunities is of great interest but not well understood. The MNR questioned projections of the share of local employment that have been included in one Municipal plan assuming 90% of RRR mine jobs will be occupied by local residents. Of particular interest is the employment of young people in order to keep them in the region. This sentiment was expressed by individuals in open houses and by representatives of First Nation communities.

Aboriginal groups were concerned about barriers to taking full advantage of the employment opportunities offered by the mine. Members of the Fort Frances Chiefs Secretariat in a meeting on May 15, 2012 related how another developer had trained members but had not employed them due to restrictive hiring protocols. MNO in a November 30, 2012 meeting also asked for minimum standards for accessing employment. First Nations showed concern over logistical barriers as well, suggesting that the company bus workers in from communities to the site. Some First Nations that had successful band-owned businesses were concerned that employment opportunities would draw employees away from current positions, making it difficult for existing businesses and governments to hire or retain good workers. RRR has been responding to these concerns and has supported a First Nation business that provides on the job employee training for Common Core Gold Driller Assistants. Between May and September 2012, 52 local First Nation people were trained as driller assistants.

Employment is seen as integrating with social issues. Regional non-governmental organizations expressed how serious the issue of unemployment is in Fort Frances and the strain it has put on community services. One individual at an open house asked for clarification on employment policies such as drug testing. Several individuals in open houses expressed their concern that economic benefits have to be sustained over the long term in order to counter any environmental costs.

7.19.2.2 Business Opportunities

Interest in local contract and procurement opportunities was voiced by representatives of First Nations, businesses, individuals and Municipal governments. There was a strong desire that procurement policies be structured to facilitate local contract opportunities by local businesses, Municipal governments and the RRFDC, with First Nations placing a particular emphasis on contracts for Aboriginal-owned companies. Some business groups expressed appreciation for enhancements to existing infrastructure that benefits local businesses activities, such as RRR provision of community pasture to members of the Cattlemen’s Association.

Businesses, First Nations and Municipal governments expressed concern; however, over potential negative effects on existing businesses from change in land use or environmental stress that could cause effects on agriculture, commercial fishing, forestry, hunting, tourism and traditional harvesting.

7.19.2.3 Income Growth

Interest in income that can be earned by local residents was expressed by First Nations, businesses, individuals and Municipal governments, typically in the context of discussing employment or business opportunities. In a meeting on October 10, 2012 Buffalo Point First Nation expressed concern that the opportunities presented could potentially not compete with current employers on the United States side of the border.

7.19.2.4 Economic Diversification

The Rainy River District Municipal Association (RRDMA), the RRFDC and many individuals at open houses in Rainy River (May 30, 2012) and Barwick (May 31, 2012) expressed their desire to diversify the local economy stating that: forestry was not viewed as dependable, industry had declined, agriculture was restricted by barriers to trade and as a result young people were leaving the area to work elsewhere.

7.19.2.5 Human Capital

Many individuals attending open houses in HRSA communities, including those in First Nations, expressed an interest in knowing the training that would be available or would be the best to pursue for local people to work at the RRP. As noted earlier, RRR has supported on the job drilling assistant training since 2012. Community non-governmental organizations expressed concern about the high demand already being placed on existing socially-funded education programs and that they might not have enough resources to meet these needs. Members of the Fort Frances Chiefs Secretariat expressed concern that members of First Nations may receive training but not have an equal opportunity to be hired at the mine after that investment had been made. In an e-mail sent on November 26, 2012, RRFDC expressed a desire that RRR work with Municipal governments to retrain workers laid-off from the Resolute mill in Fort Frances.

7.19.2.6 Government Revenues

In an e-mail sent July 6, 2012 the Township of Chapple expressed concern that potential economic impacts will increase administrative costs but not increase revenues for the community. Details of this analysis were provided in a discussion piece about the effects of the RRP on revenue and costs for the community and consequently RRR held a meeting on December 5, 2012 to discuss impacts and benefits. On January 24, 2013 the Township sent a letter requesting that RRR and the Township work together to understand positive economic effects. Municipal taxation levels are under negotiation with the Township of Chapple.

7.19.3 Mitigation (Enhancement)

Since the effects on the provincial and regional economies are considered positive, RRR will enhance these positive effects by:

- Implementing a hiring policy that encourages employment of local workers including members of HRSA First Nations and Métis communities;
- Where feasible, procuring goods and services from local and regional suppliers as well as suppliers that can further demonstrate Aboriginal employee content;

- Providing on the job Common Core training to assist local workers to develop mining-specific skills;

- Partnering with First Nation communities to access additional funding for training;

- Implement career training and development opportunities for employees once hired; and

- Providing continuous, on the job safety training.

During decommissioning, the RRP contribution to the economy will gradually lessen, eventually returning the regional economy to pre-mine, baseline conditions. Implementing strategies to transition the workforce can help to lessen transition effects such as:

- Early communication and consultation with affected communities to develop and implement strategies to buffer the effects of job loss;

- Company services that link workers with local social services that provide job placement assistance; and

- A strong employment community relations program, such as an Adjustment Committee, to keep all parties aware of plans and progress from the beginning to the end of the mine life.

7.19.4 Residual Economic Effects

Residual environmental effects associated with RRP economics are such that the RRP is expected to make a strong and positive contribution to:

- Direct, indirect and induced employment;
- Business opportunities;
- Income growth;
- Economic diversification;
- Human capital; and
- Government revenues.

7.19.5 Significance Determination

The overall effect of the Project on the provincial economy is positive since expenditures during construction and operation will stimulate the economy, creating jobs and income in industries throughout Ontario (Level III in socio-economic context). Considering that total Gross Domestic Product of Ontario in 2011 was $654.5B (Ministry of Finance 2013), the annual effects of the Project on Gross Domestic Product ($247.4M during construction and $316.3M per year during operation) are relatively low in magnitude at a provincial level. However, over the 16 year operational life of the Project, the total effects of Gross Domestic Product (direct, indirect and induced) will total $5.1B. (Level II in magnitude).

The effects of the RRP on the regional economy will be large and highly valued in the socio-economic context in an area facing prolonged economic difficulties (Level III in socio-economic context). According to the Ontario Mining Association, in 2011 northwestern Ontario employed 19.2% of the Ontario mining workforce and contributed $294.1M of the total $1.7B in mining payroll (or 17.3%) in Ontario (Dungan and Murphy 2012). The RRP is expected to contribute $107.4M in direct labour compensation annually during the operations phase and this would be equivalent to about 36.5% of Northwestern Ontario's total existing mining-related labour compensation. Within the HRSA, the RRP is expected to annually contribute $27.2M in labour compensation or 11.8% of the 2006 combined median earnings of communities in the HRSA (Statistics Canada 2007a; Level III in magnitude). Thus, the RRP will make a very sizeable positive long term (Level III in duration) contribution to the mining sector in northwestern Ontario. This effect to both Provincial and regional economies is sustained, continuous (Level III in duration and frequency) and reversible with the closure of the mine (Level I reversibility) and is highly likely to occur (Level III in likelihood). Therefore the effect on Provincial and regional economies is considered positive and significant.

7.20 Social Environment

7.20.1 Demographics and Population

7.20.1.1 Environmental Effects

The RRP will create employment during the construction, operation and closure phases. This has the potential to positively affect, directly and indirectly, the population and demographics of HRSA communities. Beneficial effects could reasonably be expected to include:

- Reversal of population decline in HRSA communities; and
- Discouraging youth out-migration from HRSA communities.

The HRSA has seen population decline over the last decade (with the exception of on First Nation reserves), with the HRSA population falling by 5.8% from 2001 to 2011. Population declines have been driven by rising out-migration of working age residents, with the share of the population between the ages of 19 and 65 being 57.3%, which is almost 5% less than the Ontario average.

Conversely, First Nation reserves in the HRSA have grown in population. This was achieved largely through higher birth rates; the share of the population below the age of 15 averages 33.8%, twice the Ontario average of 17%. As a result, First Nation reserves have a share of their population of working age (between the ages of 20 and 64) averaging 52.5%, almost

5% less than other HRSA communities and 10% less than the Ontario average (Statistics Canada 2007a). Communities across the HRSA have a lower proportion of residents in their prime earning years than the Provincial average, placing a strain on HRSA community economic health and sustainability.

The mining sector is growing across northwestern Ontario and provides considerable career opportunities for young people. Two to five new mines are expected to potentially open in the region over the next five years, and the industry consensus is that from five to eight of the more than 300 exploration and development projects currently underway might move into operation before the end of the decade. This would result in an estimated hiring requirement of between 1,100 and 4,150 persons in northwestern Ontario over the next decade (MIHR 2012). Mining development spurs development in the linked industries of construction, manufacturing, specialty trade contracting, and professional services as well as benefitting a wider range of service industries (Knafelc 2012).

The strength of the mining sector is particularly welcome given the challenges that have been faced by the region's traditional major industry; forestry. The collapse of the forestry sector in the late 1990s and early 2000s has devastated the economy of northwestern Ontario, causing both employment and gross domestic product to plummet 10% (Di Matteo 2009). Within the HRSA, the major pulp and paper mill owned by Resolute shut down indefinitely in November 2012 and laid off 230 employees (CBC 2012). This was the culmination of a multi-year set of progressive layoffs at a mill that had 780 employees as late as 2010 (KCB 2011a). The company has not yet announced if the mill will re-open in the future, although the forestry sector has shown modest resurgence tied to more recent construction industry initiatives in the United States (RRFDC 2012). There has been a structural change in the economy of northwestern Ontario that has seen manufacturing employment more than halve and has resulted in large declines in employment in trades and, to a lesser degree, primary industries (Statistics Canada 2013b). These forces have accelerated outmigration of working age residents and the population declines seen in the region over the past decade.

The RRP construction workforce peaks at approximately 400 people (Figure 7-14). With respect to operations (Figure 7-15), the RRP will hire 271 employees in the pre-production period and continue hiring until the workforce peaks at 601 employees in 2022. The workforce will decrease to 249 employees in 2027 with the completion of open pit operations; and then to 135 in 2029 with the conclusion of underground operations. Decommissioning and active closure would begin in 2032. This presumes that additional ore resources are not identified, which could potentially extend the mine production period.

RRP expenditures are expected to create 1,917 direct, indirect and induced jobs over the productive life of the mine. Demand for labour is expected to increase the size of the workforce through higher participation rates and lower rates of unemployment and underemployment. This will not be sufficient to meet increased demand. The need for specialized labour is expected to attract workers to move into the area and is expected to increase the regional population.

Population increases for each community based on the economic stimulus expected to be generated by the RRP are provided in Table 7-33. The values shown in the table assume that a disproportionate share (75.0%) of the incoming population will go to the communities of Fort Frances (60.0%), Emo (15.0%) and Chapple (5.5%) based on their housing markets, proximity to the site, and the availability of services (these values are estimated only). The effect of the RRP will be to reverse the trend of population decline in the HRSA, and cause an increase of 0.3% per year in the period from 2014 to 2019 (or 780 people), with decline similar to existing regional trends (-0.21% per year) seen thereafter as the demand for new workers subsides. The projected population growth is distributed unevenly since migration effects need to be considered against the baseline estimate of a shrinking population across the HRSA. As a result, a 3.6% total growth rate is predicted in Fort Frances (288 people) between 2014 and 2019, while population in Rainy River is expected to decline by a total of 2.3% (or 19 people) over the same period on account of its distance from the RRP site.

The construction and operation phases are expected to have the positive effect of reversing the current fall in population in HRSA communities and encouraging modest population growth in the region. Employment opportunities arising from the RRP may also encourage youth to stay in the region and attract new working age migrants to the HRSA. Sustaining the youth population may result in a slowing of the ageing population trend seen in HRSA communities (with the exception of First Nation reserves).

While First Nations populations in the study area are increasing, employment opportunities at the RRP may have the effect of encouraging First Nations youth to stay in their communities instead of migrating to urban areas for work. First Nations reserves in the study area present a potential youthful workforce to replace ageing and retiring mine workers in the region. No distinct data was available for local Métis populations.

As per the above, mine employment is eventually expected to decrease as open pit operations cease in 2025, reducing the overall workforce at that time from a peak of 601 employees in 2022 to 365 employees, and declining further in 2029 to 135 employees with the end of underground operations. During decommissioning and active closure period of the RRP in 2032, employment will decrease further over an approximate two year period to a small long term, maintenance and monitoring contingent.

This economic cycle is typical of the mining sector and is not new to a region accustomed to similar cycles in forestry. Expanding the range of commodities produced in a region, helps diversify local risk against fluctuating price shocks that plague both mining and forestry and can build resilience by supporting local investment in initiatives which can work to diversify and sustain the regional economy over the longer term. The phasing in of new projects to replace completed projects is part of the general economic cycle of the region.

A drop in employment at the mine, following mine closure, is an adverse effect that may contribute to population decline and youth out-migration. Whether or not such adverse effects will be experienced is difficult to predict. It will depend on general demographic trends and characteristics of the communities at the time of the decommissioning and other factors such as:

- Public and/or private sector developments in the region that may change demographics and population trends; and
- Commodity prices which may impact production rates and the life time of the RRP and other mining operations in the area, and therefore, increase or decrease employment opportunities and ultimately, local and regional populations.

7.20.1.2 Government, Aboriginal and Public Comments and Concerns

Many individuals in open houses expressed a hope that the project could help reverse the loss of young people from the area. This was also a desire expressed by representatives of Naicatchewenin First Nation in a meeting held on July 5, 2012. This issue was seen as closely related to the issue of employment, since it was felt that many young people were leaving the area because of the lack of jobs in the region.

7.20.1.3 Mitigation (Enhancement)

Since potential effects on the regional population during construction and operations are positive, mitigation is not appropriate. Population effects could potentially be enhanced through:

- Continuing to actively seek employees among those who have left the region previously, of job opportunities through employment agencies, social networks, other media and referrals in cooperation with members of HRSA communities;
- Continuing to encourage Aboriginal training and employment opportunities;
- Implementing a procurement and employment policy that encourages the recruitment and retention of women;
- Facilitating the recruitment and retention of youth through such actions such as:
  - Supporting Mining Matters workshops in the region to promote understanding of the mining industry with youth;
  - Developing partnerships between RRR and education and training institutions in the study area;

- Providing equipment and access to the mine site for post-secondary training or pre-employment mentoring;

- Promoting the safety and environmental focus of the industry; and

- Providing clear career-path planning tools and support on future career options.

During decommissioning loss of employment, and therefore, the potential for loss in population in the region could be mitigated by strategies detailed in the section on Employment (Section 7.19).

7.20.1.4 Residual Environmental Effects

The net expected effect of Project development on HRSA populations will be to help slow or reverse the current overall decline in the regional population, bring specialized workers and their families into the HRSA, and to provide greater opportunities for the retention of young people in the area, including employment aged Aboriginal youth. Following mine closure this trend would be expected to reverse itself, if no other major projects come online to replace the positive demographic effects generated by the RRP.

7.20.1.5 Significance Determination

Adverse effects on population and demographics during the construction and operation phases are not expected. On the contrary, the effect is positive and of moderate magnitude (Level II) during these phases. Effects are considered highly valued (Level III) in context by persons living in the HRSA because the Project will create employment and contribute to the stability of community populations. The RRP is not expected to result in a large change in regional or local population conditions; rather it will contribute to modest growth in the base population. The geographic extent of the effect will be felt in the HRSA; mostly within the commuting distance from the site (estimated 100 km driving distance). This effect will occur continuously throughout the life of the mine and is reasonably expected to occur, notwithstanding the potential for other factors to influence construction and operation of the mine (such as increases or declines in commodity prices). Effects are highly likely, continuous (Level III) and long term, since reversibility depends on long term economic performance in the area (Level II). Overall, these positive effects are of a magnitude to be considered significant, and positive.

7.20.2 Housing and Accommodation

7.20.2.1 Environmental Effects

The RRP through stimulating economic growth within the HRSA and bringing outside workers into the region will stimulate the housing market, producing increased home sales, increased housing starts, and increase house and rental prices. However, the increase in housing demand is expected to be modest in magnitude and occur in an area which has a steady supply of housing inventory over the last three years, which reduces the likelihood of shortages in housing availability and affordability. Anecdotally, newer houses that become available for sale are bought quickly by local residents indicating that there is a demand for larger family homes in the $100,000 to $200,000 price range. An exception to this may be found in some First Nation reserves which have suffered from chronic shortfalls in housing investment, and if improvements in local job prospects encourage the return of First Nation members who currently live off the reserve, they may face difficulty finding accommodation on their reserve.

The RRP is not expecting to have a construction or operations work camp, such that workers from outside the HRSA will be expected to find housing in nearby communities. During construction a nominal 380 workers are expected to originate from outside the HRSA at the labour peak in October 2015 (Figure 7-14). These workers would be expected to be housed in temporary accommodation (defined as accommodation for short periods of time during shifts) in the area (Table 7-34). Currently there are 11 hotels, 13 lodges and one Bed and Breakfast operating in the HRSA with 428 rooms / cabins and 977 beds (Table 7-35). Vacancy rates for northwestern Ontario hotels averaged 44% (PKF Consulting 2013) which could supply an estimated 430 beds, enough on average to fully accommodate the construction workforce from outside of the HRSA. Fifty-two percent of available beds are located in Fort Frances, 19% each in Emo and Sioux Narrows-Nestor Falls. The remaining beds are in Rainy River (5%) and La Vallee (4%). It is expected that the majority of out of town construction workers will stay in Fort Frances, however given the shorter distance to the RRP site from Sioux Narrows-Nestor Falls and Emo and their share of beds in the HRSA, many are also expected to use accommodations in those communities. Demand for rooms is highly seasonal and concentrated on summer months, such that there may be issues with competition for tourist accommodation during peak periods for tourism. Tourism has been decreasing in the area and many resort owners are looking to fill their accommodations with work crews.

Beginning with pre-production operations, workers who live outside the HRSA are expected to move into the region. An estimate of these arrivals is presented in Table 7-36. Each worker is assumed to be part of a household (a household is composed of a person or group of persons who co-reside in, or occupy, a dwelling) which is assumed to average 2.6 people in size (the Ontario average; Statistics Canada 2012a). Pre-production operations are expected to attract 103 new households by 2015 to the HRSA, together with a further 87 households with the beginning of open pit production, and another 113 households by the time underground production begins in 2019. These workers are expected to buy or rent homes in the larger communities that have more services and the capacity for additional residential growth. Sixty percent of incoming employees are assumed to move to Fort Frances (41 households in 2014, 114 households by 2016 and 180 households by 2019); 15.0% to Emo (10 households in 2014, 28 households by 2016 and 45 households by 2019); and 5.5% to Chapple (4 households in 2014, 10 households by 2016 and 17 by 2019).

New arrivals are expected to take up approximately 4.8% of the total dwellings in the HRSA (excluding First Nation reserves). Across the HRSA, the current percentage of occupied dwellings is 76.8%, compared with an Ontario average of 92% (Statistics Canada 2012a). This indicates that there is a supply of cottages and unoccupied housing that can be accessed, thereby reducing the demand for the construction of new housing. High income mine workers may still drive housing demand, however, since they may prefer larger homes than can be found in the existing housing stock. The staged arrival of new workers from outside the HRSA, distributed over the period from 2014 to 2019, is expected to ease the pressure on new construction. No community is expected to see the number of new arrivals occupying more than 4% of the number of total dwellings in a given year. The highest growth rate relative to the existing housing stock is in Emo: 3.7% in 2016 and 3.4% in 2019.

Currently, housing stocks have been characterized by over supply given the persistent decline in population in the region (with the exception of demand for newer housing stock); this has manifested itself in a weak real estate market, with the annual real rise in housing prices of 3.9% from 2001 to 2006 (2011 data is not yet available; Statistics Canada 2007a) and continued weakness expected due to the continuing decline in population. It has also manifested in a high proportion of homes requiring major renovations, as high as 15.1% in Emo and 16.7% in Chapple relative to an Ontario average of 6.6% (Statistics Canada 2007a), which can occur when rental and resale markets do not provide adequate returns to justify spending on repairs. The community of Emo plans two new subdivisions as a result of concerns over a lack of vacancies and in anticipation of population growth in part due to the RRP, but besides some First Nation reserves, there are no other shortages reported in the region.

For First Nation reserves, it is more difficult to draw a relationship between housing demand and market demand. Workers who are members of First Nations may respond to housing shortages within their communities and their increased income by moving to one of the larger HRSA communities in order to secure housing. This may be the case even in communities which allow for private mortgages to fund home construction such as Couchiching First Nation, which still has concerns over crowding and a waiting list for housing (Couchiching First Nation 2012). Home construction in most First Nations reserves is constrained by the fiscal position of the First Nation governments.

The current social housing situation could be positively affected by an increase in employment in the study area. Stable income generated from mining work could also slightly reduce the current demand, or offset potential future demand, for social housing in the study area.

The decommissioning phase of the RRP will result first in a decrease in employment for mine workers and subsequently in a near complete termination of all permanent employment at the Project site. The impact that this will have on the housing market and demand for social housing services is difficult to predict and will depend on various factors at the time, such as housing prices, availability of housing services, labour market trends and general demographic trends and characteristics of the communities in the study area.

7.20.2.2 Government, Aboriginal and Public Comments and Concerns

In the May 30, 2012 open house held in Rainy River individuals wanted to know the housing model of the project, whether RRR intended to build a camp or to pay for the construction of housing in the communities. MNR expressed concern in a June 15, 2012 letter that a camp was being considered by RRP. RRR communicated their plans to not build a work camp and comments were made in support of this decision by MNO in a November 30, 2012 meeting and by regional hotel/resort owners in a December 10, 2012 meeting.

Municipal governments, particularly the Township of Chapple, the Town of Emo and the Town of Fort Frances, were concerned about potential planning impacts and by-law changes necessary to respond to the increased housing demand brought on by the project. In a November 26, 2012 letter the RRFDC made a specific request that RRR develop a mechanism to provide reliable information to regional Municipalities so that they can make decisions about infrastructure, including housing. Individual meetings were held with each of these communities between February 11 and 13, 2013 to discuss options for construction of new homes for RRR employees, vacant or potential lots and zoning considerations. A follow up meeting was held on March 13, 2013 with the Town of Emo Chief Administrative Officer to continue discussions on housing options in the community.

7.20.2.3 Mitigation (Enhancement)

To address potential issues with housing, RRR will:

- Monitor regional housing supply, particularly in the Chapple, Emo, and Fort Frances markets during the planning and construction phase of the Project and in advance of each wave of new operations employment;

- Engage in regular discussions with Municipal planning officials in these communities to understand the anticipated evolution of their resale and new-home markets, and the extent to which each community desires growth or does not. RRR will continue to work with hoteliers and town officials, to help avoid possible construction employment demands that would negatively affect accommodation capacity needed to support the tourist season;

- Research and provide local housing market information to workers as part of their hiring and pre-employment process, to ensure that workers are aware of housing options open to them. RRR has already begun preparing a list of available temporary accommodations available in the region to house the construction workforce; and

- To the extent that housing supply and commuting distances emerge as an issue during the planning, recruitment and hiring process for operations, RRR may explore alternate accommodation strategies to support its employees.

7.20.2.4 Residual Environmental Effects

There is considerable excess accommodations capacity in the HRSA that could be used by RRP construction and operations staff that would serve to reduce demands for new housing construction. The net effect of RRP development therefore would be to more fully utilize and/ or upgrade existing housing stock, which would provide income to local establishments, and generate new construction and/or home renovation activity in the area which would be positive for local contractors and building supply retailers.

7.20.2.5 Significance Determination

After mitigation measures are implemented, particularly with respect to temporary accommodation during the construction period, the effects of the project on housing are expected to be positive (support of the regional housing market), highly valued in socio-economic context (Level III) since it effects the value of assets held by a broad range of the population; geographically restricted to impacting communities within 100 km driving distance of the site (Level II), medium term in duration (Level II, over the lifetime of the project), continuous (Level III); reversible with closure (Level II); highly likely and moderate in magnitude (Level II). The overall effect is considered positive and significant.

7.20.3 Public Utilities

7.20.3.1 Environmental Effects

The RRP site will have its own supply of power and potable water, sewage treatment systems, and will not place any additional demands on existing infrastructure in the study area, other than the expected use of an external existing landfill (Section 4.14). There may; however, be a minor demand on local infrastructure during the early construction phase until the permanent facilities are in place at the site.

It is expected that the HRSA will experience moderate population increases in the construction and operation phases from direct, indirect and induced employment (particularly in the 2014 to 2019 period when there is an expected population increase of 0.3% or 780 people across the HRSA). In a region that has been experiencing population declines (6% in the HRSA since the 2006 Census), there will be some excess capacity in some facilities and services to meet these demands. In addition, some Municipalities are preparing for growth by undergoing infrastructure capacity upgrades (such as Township of Chapple) to address issues related to system inefficiencies, capacity and/or age and to meet future anticipated population growth.

7.20.3.2 Government, Aboriginal and Public Comments and Concerns

The Township of Chapple expressed concern over potential demands on waste management in a December 5, 2012 meeting. At that meeting, the Township expressed appreciation for the RRR cost sharing of a landfill study. Representatives from the community were concerned about financial impacts arising from the RRP.

The Town of Emo met with RRR on July 5, 2012 to discuss the need to expand their water and sewer systems to meet the expected higher demand from the project and received a letter of support for such an expansion from RRR. RRR is working closely with the Township of Chapple to facilitate appropriate infrastructure planning.

Water and sewer capital projects are currently underway in the Township of Emo, involving expanding the Emo water treatment plant to increase capacity and upgrading infrastructure, supported by the Municipal Infrastructure Improvement Initiative.

7.20.3.3 Mitigation

RRR will continue to discuss the RRP and potential additional demands that could be placed on these services with the regional Municipalities. The highest growth in population and thus demand on services is expected to occur in 2014 to 2019 which is followed by a return to a negative growth rate in the HRSA (-0.21%) as demand for workers subsides. Although there will be more demand initially, this would be off-set by the taxes levied by municipalities on new households providing more capacity with which they may upgrade or increase public utilities. The Township of Chapple has recently updated their Official Plan which provides the foundation for growth planning coordinated with RRR.

Ongoing communication during early Project planning and construction stages will help Municipalities address any service shortfalls. For example, RRR has offered to support a landfill capacity study for the Township of Chapple to determine existing capacity and to offset costs that may be incurred if additional landfill capacity is required.

7.20.3.4 Residual Environmental Effects

With advanced planning to make up any shortfalls in potential capacity, regional utilities are expected to be sufficient to accommodate the expected influx of new workers and their families in the HRSA.

7.20.3.5 Significance Determination

Increased demands on public utilities are important in the socio-economic context and have been an ongoing topic of discussion between RRR and the Township of Chapple and other HRSA communities (Level II in context). Overall the effect is considered positive since it sustains demands for existing services or may provide a tax base upon which more service upgrades can be achieved. The magnitude of the effect is considered moderate since it will be distinguishable but manageable within most of the current service capacities and with the lead times for planning for these changes/upgrades. The effects on services will be felt in the HRSA, primarily in communities within 100 km commuting distance to the RRP site (Level II), and will occur continuously (Level III frequency) and long term (Level II duration) throughout the life of the mine and is reasonably expected to occur (Level III likelihood), and are reversible at closure (Level II). The residual effect is therefore considered significant and positive.

7.20.4 Community and Social Services

7.20.4.1 Environmental Effects

Project effects on regional government services, such as education, health care, social and emergency services are driven by several factors, such as:

- Population effects and residency decisions, and the extent to which direct or indirect population growth in certain communities may place pressure on services;
- Direct needs in relation to emergency response and medical services for workers; and
- Potential for increased employment income to increase the propensity for alcohol and drug use and crime in HRSA communities (and thereby increases in the occurrence of issues and cases that require a service response).

Increased pressure on most social services is generally understood to be an adverse or undesirable effect since they indicate more societal dysfunction (depending on the service, such as employment assistance, victims services and shelters, and similar), while reducing pressure on these types of services is seen as a positive effect. In a region that has experienced population declines over the past decade, an increase in demand on community services such as education or health care can be perceived as a positive since it supports (or grows) demands for these services and can contribute to overall community sustainability. For this reason, the construction and operation of the mine are not expected to have adverse effects on community and social services in the study area. Construction workers that reside outside of the HRSA will not likely relocate permanently to the HRSA due to the short timeframe of construction and will be encouraged to access any needed social services in their home communities. There could be increased demands for issues that need immediate resolution (such as medical emergencies). During operations, new residents will help sustain existing service levels, by modest growth in population, which is expected to result in modest increased service demand. In addition, this will help to sustain or grow a tax base upon which services can be supported, and also a volunteer / worker base (through total employment effects) to run these services.

Employment and Counselling Services

There could also be a positive effect on some community services due to increased employment of regional residents. The United Native Friendship Centre in Fort Frances noted growing demands for employment and homelessness assistance that is expected to be exacerbated by layoffs at the Resolute mill in Fort Frances. Unemployed people who may gain employment directly or indirectly from the RRP and who may be currently accessing employment assistance and counselling services could have no need to continue to use these services. Furthermore, a modest growth in population (a positive effect of employment) is expected to have the indirect effect of helping to maintain a population of volunteers and workers (total employment effects) to run current community and social service organizations.

Education and Training Services

Effects to the primary education system are expected to be negligible or slightly positive. During construction, an influx of temporary workers (from direct employment) would not be expected increase demands on the education system. During operations, reversing the current HRSA population decline and creating growth in the initial years of operation will mean that new workers and their families are likely to increase current enrolment trends in regional schools and may help avoid school closures.

Secondary education, training and adult education / upgrading programs may experience increased demands which would be considered a positive effect since it would contribute to the employability and sustainability of the regional population (human capital) and create additional (induced) employment for those providing the training. Confederation College has already taken steps to increase course offerings in mining-related fields such as mechanical techniques, mining techniques, environmental engineering technician and pre-apprentice programs in 2012 / 2013. Specialized Aboriginal and adult education services are also available in the region.

Health and Emergency Services

With the expected population growth, there is also an expected increase in demand for health care and emergency services. Given the challenges with recruitment and retention of medical professionals in the region, this could create a negative effect until these services are augmented. Riverside Health Care has taken proactive measures to address this issue by working collaboratively with other medical service providers in the region and considering other incentives. To reduce the effects of the RRP (direct employment and population effects), RRR will provide onsite emergency response equipment and a nurse at all times to deal with worker injuries or illness, in accordance with regulations. In the event that there are worker injuries or illnesses which extend beyond onsite medical capability, the injured person(s) would be transported to the nearest health centre in the region in Emo or Fort Frances. Non-resident construction workers will be encouraged to continue accessing routine medical services in their home communities rather than place additional demands on local / regional services.

Addictions and Crime Prevention Services

Increases in disposable income levels in the region due to direct and indirect employment related to the RRP can have both positive and negative effects, and depend on choices made at the individual level. People with newly acquired disposable income may make spending choices that improve their quality of life and standard of living, or they may make spending choices that have negative consequences. There is a common correlation between increased disposable income and short term increased use of drugs and alcohol and crimes and/or violence, particularly in areas that experience a large or unprecedented economic boom. This effect is however, usually short term since workers adjust to higher incomes over time and re-occurring dysfunctional behaviours will ultimately lead to job / income losses if adjustments are not made.

Negative behaviours related to drug and alcohol abuse may increase the burden on certain health and social services that deal with drug and alcohol-related issues (such as addictions services and outpatient rehabilitation) as well as on the Ontario Provincial Police and child and family services that deal with the social issues associated with drug and alcohol-related family dysfunction (such as violent crime, children in care referrals).

Potential effects on services associated with lifestyle choices are uncertain and will depend on individual choices. While they cannot be managed solely by RRR, the company will take active steps to influence worker behaviour, monitor the occurrence of social issues in the HRSA that may be attributed in some degree to the RRP (or the perception of such issues), and work collaboratively with local service providers on indentifying and supporting appropriate government-led solutions. Interviews with Riverside Health supported this approach. RRR will discuss with regional health care providers the need to develop a range of policies and programs for employees aimed at influencing workers' behaviour, which may include financial management and work-life balance seminars, behaviour protocols for employees as part of site orientation (including policies respecting off duty illicit drug use, zero tolerance for impaired driving, and interacting with the local and Aboriginal communities). RRR will maintain open communication with local service providers (local Ontario Provincial Police, Treaty 3 Police, Riverside Health and the Rainy River Social Services Administration Board) to monitor both existing social issues as well as those that may emerge or be exacerbated throughout the life of the RRP.

Child Care Services

An increase in employment levels in the study area could also potentially create more demand for childcare. This could be felt by those workers who would move to the region during the operation phase or new local hires (depending on their family structure). Currently child care is available or being planned to address demand for affordable child care in some communities in the study area. Additional child care demands due to expected population growth could be considered a positive induced effect since it creates employment for child care professionals or a negative effect if there are limited child care services hampering the ability for workers to access RRP or contractor jobs. Socio-economic baseline research conducted for the RRP found that childcare service capacities are not noted as an issue of concern in the study area (with the exception of affordable child care which is also a concern Provincially and Canada-wide).

The decommissioning phase of the Project will result first in a drop in employment for mine workers, and subsequently in a near complete termination of all permanent employment at the Project site. This may have a negative effect on community and social services if there is an increased demand for employment assistance or the population base is eroded leaving fewer people to support and volunteer in community service organizations. However, these effects are dependent upon many other factors that may be occurring in the region at the time of mine closure including new employment opportunities and are therefore difficult to predict.

7.20.4.2 Government, Aboriginal and Public Comments and Concerns

The Township of Chapple expressed concern over increased demands for social services, and emergency response (fire, police, medical) in a December 5, 2012 meeting. Representatives from the community were concerned about potential financial impacts arising from the RRP.

In a survey, local health care providers in the Town of Emo noted that the Emo Health Centre no longer has an emergency department and will require resources to re-open one to accommodate the increase in population.

The Rainy River District School Board contacted RRR for input regarding the issue of how the project would affect enrolment in regional schools.

Non-governmental organizations expressed concern in surveys distributed by RRR over the high levels of drug addiction, racism and homelessness in Fort Frances and noted demand for resources to deal with these issues are already over stretched.

7.20.4.3 Mitigation (Enhancement)

RRR will continue to support government-led initiatives that support social sustainability during all project phases. RRR will maintain communications with local and regional service providers to monitor and work collaboratively to address any Project-related changes that may be experienced.

An adverse effect on social services and community service clubs may be avoided or minimized by:

- Regular drug and alcohol testing as part of site health and safety planning for the RRP;

- Working with local service agencies to gather information about social issues or service capacity issues so that they may be addressed in a collaborative manner; and

- At closure, negative effects could be managed by strategies detailed earlier (Section 7.19.3).

7.20.4.4 Residual Environmental Effects

A modest increase in population growth for the region, attributable to mine development, particularly for the initial years of operation, is expected to increase demands on a variety of community and social services. Given the recent declines in population for the region resulting from prolonged economic weakness, particularly in the forestry sector, there is some over capacity in some services that would help to absorb any increases in service demands. Increased service demands supported by an increase in the tax base will grow community and social services thereby providing additional employment opportunities in the fields of community and social services. Persons and families currently on social assistance because of regional employment shortfalls will have an opportunity to regain employment and therefore move away from the need for such services.

7.20.4.5 Significance Determination

Project effects on community services in the HRSA are considered an important socio-economic variable particularly given challenges to maintaining services levels in a region with poor employment prospects resulting in a declining population and related social issues (Level III for context). Residual effects are low with the application of mitigation measures (Level I magnitude), and could be considered both negative (higher incomes that could contribute to substance abuse) and positive (sustaining populations that maintain enrolment levels for schools). The geographic extent of the residual effect is confined to the socio-economic HRSA (Level II); is long term in duration (Level II) occurring over the life of the mine. It is recognized that duration of these effects can be difficult to predict given the complexity of factors that can change the duration of the effect such as a resurgence in the forestry sector or new programs or funding to attract medical professionals or augment other community service programs. The effects (on education for example) are expected to occur regularly (Level III), and are reversible (Level I) as community service providers adjust services to match demands. Due to the low magnitude of the residual effect, the overall net effect on community services is, therefore, considered not significant.

7.20.5 Highway Traffic

7.20.5.1 Environmental Effects

Construction Phase

This section examines potential effects of the RRP on traffic volumes and highway vehicle safety. The analysis focuses on highway traffic volumes since vehicular traffic will be the main mode of transportation used to transport goods, services and workers to and from the RRP site. It is recognized that rail may also be used during the construction phase to transport some project materials to Barwick, to be offloaded there and transported by truck to the RRP site. Further, there will be some workers (direct or contract) that will travel to the region by air (through Fort Frances). These two latter modes of transportation are not expected to experience substantial increases in use, and therefore are not assessed further.

The assessment is for traffic generated by direct employment at the RRP and not by indirect or induced employment, as the traffic generated by these latter forms of employment cannot be determined with enough precision to allow a reasonable assessment.

This assessment is intended as an analysis of potential effects against a theoretical highway volume capacity. RRR has commissioned a Construction Traffic Mitigation Study for Highway 600 to address specific management issues related to the re-alignment of Highway 600 and construction of the East Access Road.

During construction of the mine site, large project components such as equipment, process plant components, and other building materials will be transported by truck to the RRP site. Employees will be responsible for their own transportation to the RRP site and are assumed for the purpose of this analysis to drive their own vehicles.

Vehicles accessing the RRP site will be from Highway 600 until the east access road has been constructed. During construction, Barwick Road may be used occasionally to haul materials that would be offloaded from the rail station at Barwick and could be used during the operation phase by workers and contractors travelling to the project site from Barwick and other communities west of Barwick.

Table 7-37 shows that during the construction phase, it is expected that there will be an average of 329 personnel vehicles (658 vehicle trips) travelling to and from the mine site per day related to construction activities. This includes construction traffic (averaging 174 personnel vehicles) and overlapping operations workforce traffic. The traffic related to the operations workforce overlapping the construction period contributes 96 personnel vehicles (192 vehicle trips) in 2014; 143 personnel vehicles (286 vehicle trips) in 2015, and 265 (or 530 vehicle trips) in 2016. A vehicle trip is equivalent to one trip to and one trip from the mine site. This includes personal commuter vehicles and contractor service vehicles. On average, the number of daily personnel vehicles over the construction phase is 329 (or 658 vehicle trips).

There is also expected to be 1,918 heavy / bulk material trucks delivering construction materials and supplies to the mine site over the 21 month construction period. This is averaged to six heavy vehicle trips daily.

Using the same assumptions for residency as for the housing and accommodation, workers are expected to reside in temporary accommodations located primarily south and east of the RRP site in Fort Frances and Emo and therefore contribute to traffic volumes on Highway 71/11. It is recognized that there are many temporary accommodations available throughout the HRSA and that actual living patterns may differ to that which is predicted.

The assumed proportion of construction workers travelling to/from HRSA communities is as follows:

- 80% of personnel vehicles are expected to originate from workers temporarily residing in or near HRSA communities located south and east of the RRP site, and therefore, would use Highway 71/11 to access the RRP site; and

- 20% of personnel vehicles are expected to originate from workers temporarily residing in or near HRSA communities north of the RRP site and therefore would use Highway 71 to access the RRP site.

Other traffic pattern assumptions include:

- There would be an average of three heavy truck loads per day (six vehicle trips) to and from the site originating equally from the north (Kenora / Winnipeg) and south (Fort Frances, Thunder Bay); and

- There is a 25% ride share for personnel vehicles.

Project personnel that will derive from the HRSA are not currently using highways in the HRSA to travel to and from their current employment (assumes all are currently unemployed), and will therefore represent new traffic on these highways that is not factored into the most recent average annual daily traffic count.

These numbers are averaged over the construction phase. Actual project-related traffic will be higher than average during the busier months of construction (summer / fall 2014 and 2015).

Table 7-38 outlines some key points within the HRSA with annual average daily traffic counts and shows anticipated incremental Project-related traffic volumes during the construction phase compared to most recent annual average daily traffic utilization data based on the above assumptions. The proportional increases in daily traffic volumes over 2009 annual average daily traffic would vary at different road points, from a low of 13.9% on Highway 71 from the Highway 600 intersection to the Rainy River / Kenora District boundary, to a high of 42.5% on Highway 71 south of the Highway 600 junction.

While these volumes could be distinguishable at certain times of the day (e.g., shift changes and during peak construction), they are still within the service capacity of the highways. The level of service for Highway 71 is rated C from Highway 11 to the Highway 600 and 615 junctions (and rated A north of these junctions). The level of service is a qualitative measure describing operational conditions within a traffic stream and their perception by the motorist. A level of service definition generally describes these conditions in terms of such factors as speed and travel time, freedom to manoeuvre, traffic interruptions, comfort and convenience, and safety. Six levels of service are defined for each type of facility (highway) for which analysis procedures is available. They are given letter designations from A through F, with Level of Service A representing the best operating conditions and Level of Service F the poorest.

Operation Phase

During operation of the mine site there will be three growth stages of employment:

- **Operations Phase 1 (2016 to 2018)** when the open pit is in production and ore is being processed but underground production has yet to begin;

- **Operations Phase 2 (2019 to 2026)** when both the open pit and the underground facility are operating and ore from both sources is being processed; and

- **Operations Phase 3 (2027 to 2031)** where open pit mining has ended and been replaced by processing of stockpiled ore. Underground mining operations start to taper off in 2027 and end in 2028.

During the first and third phases of operations employment, traffic volumes will be lower than in the second phase operations when both the open pit and underground components are producing. For the purpose of this assessment, only the worst case scenario or the second phase operations is assessed.

During the Operation Phase 2, traffic volumes on regional highways will be associated primarily with worker commuter traffic together with more limited contractor vehicle use. Employees will be responsible for their own transportation to and from the RRP site using their own vehicles, with an assumed 25% ride share.

Similar to the construction phase, vehicles accessing the RRP site will come mainly by means of the East Access Road from Highway 71.

Table 7-39 shows that during second phase operations, there is expected to be an average of 390 personnel vehicles travelling to the mine site daily (assuming 25% ride share) or 780 vehicle trips to and from the mine site per day.

Using the same assumptions for residency as for the housing and accommodation analysis during the operations phase; workers are expected to reside primarily in communities south and east of the RRP site in Fort Frances and Emo and therefore contribute to traffic volumes on Highway 71/11. It is recognized that actual residency patterns may differ to that which is predicted.

The assumed proportion of Operations Phase 2 workers travelling to/from HRSA communities is as follows:

- 84.5% of personnel vehicles are expected to originate from HRSA communities located south and east of the RRP site, and therefore, would use Highway 71/11 to access the RRP site;

- 9.1% of personnel vehicles are expected to originate from HRSA communities north of the RRP site and therefore would use Highway 71 to access the RRP site; and

- 5.5% of personnel vehicles are expected to originate from HRSA communities south and west of the RRP site and therefore contribute to traffic volumes on Highway 11 (west of the Highway 71 intersection).

Other traffic pattern assumptions include:

- There would be an average of one heavy truck load per day (two vehicle trips) to and from the site originating equally from the north (Kenora/Winnipeg) and south (Fort Frances, Thunder Bay);

- There is a 25% ride share for personnel vehicles;

- Project personnel that will derive from the HRSA are not currently using Highways in the HRSA to travel to and from their current employment (assumes all are currently unemployed) and will therefore represent new traffic on these highways that is not factored into the most recent average annual daily traffic count; and

- These numbers are averaged over the Operations Phase 2 period. Actual project-related traffic will be higher than average during the busier years such as in 2022, the peak operations employment year.

Table 7-40 outlines some key points within the HRSA with annual average daily traffic counts and shows anticipated incremental Project-related traffic volumes during the Operations

Phase 2 compared to the most recent annual average daily traffic using the above assumptions. The proportional increases in daily traffic volumes during the second phase of operations over 2009 annual average daily traffic would vary at different road points, from a low of 7.3% for Highway 71 south from Sioux Narrows to the Highway 600 junction; to a high of 53.4% on Highway 71 south of the Highway 600 junction.

While these volumes would be distinguishable at certain times of the day (such as at shift changes), they are well below highway service rating capacity of these highways which range from Level A to C as defined above.

Closure and Decommissioning

During the closure and decommissioning phase of the RRP, the regional road network will be used to remove material and equipment from the site as the mine is decommissioned. There will also continue to be commuter-related traffic, though it will be reduced from the operation phase as the number of workers required during the decommissioning phase will decrease.

Most materials and equipment would be removed from the site by truck. This large equipment would be transported via truck using Highways 71 and 11 and would be done mainly during off peak hours to minimize traffic interruptions.

7.20.5.2 Government, Aboriginal and Public Comments and Concerns

The Township of Chapple expressed concern in e-mails and in a meeting held July 11, 2012 that a possible re-alignment of Highway 600 will impact road maintenance, access to a gravel pit and tourist traffic. The Township of Chapple has indicated a preference for the re-alignment of Highway 600 (Option C) which is proposed by RRR. Additional concerns about these changes about loss of access to timber resources were made by Resolute Forest Products. Individuals in open houses expressed concern about restricting access to recreational hunters. The Township of Rainy River wanted to know if RRR could help extend Highway 600 north to Strachan Road in order to facilitate tourist traffic, and if the company planned an access road to the east from Highway 600 to the northern properties. At a December 5, 2012 meeting the Township of Chapple further expressed appreciation for the RRR contribution towards roads in the region.

In a November 20, 2012 open house held in Mitaanjigamiing First Nation, representatives from the community suggested that the company consider bussing in workers from the First Nation.
Local residents and stakeholders commented that traffic safety is a concern particularly due to speeding, and potentially for wildlife - vehicle collisions. According to the MTO, in Ontario as a whole, one of every 17 motor vehicle collisions involves a wild animal and 86% of those collisions occur on two lane roads outside of urban areas.

The Ontario Provincial Police and Treaty 3 Police indicated that there are concerns with wildlife (deer) - vehicle collisions in this region and also typical safety concerns such as weather-related (snow, ice), driver error and highway construction in the summer months. Treaty 3 Police indicated that they have no concerns with traffic volume related safety issues on Highways 11, 71 or 600. According to Treaty 3 Police, reduced speed limits through the Rainy River First Nations' reserve (at the junction of Highway 71 and 11) have been effective in managing traffic issues.

The MTO requested that RRR undertake a Traffic Impact Study to assess the effects of the RRP development on Highway 600 as well as on the proposed East Access Road to connect to Highway 71 along Korpi Road. This results of this study which has been conducted to meet MTO requirements, is provided in Appendix Y.

7.20.5.3 Mitigation

Road re-alignment and upgrades are detailed in Section 4.15 and include re-alignment of Highway 600 and construction of the East Access Road to maintain local access, and to improve direct Project access from Highway 71. A separate Construction Traffic Mitigation Study was conducted for Highway 600 by TBT Engineering Consulting Group. The study recommends mitigation of traffic volumes on Highway 600 during the re-alignment of Highway 600 by re-routing non-local traffic to Highway 617. Local road users will still be allowed access by means Highway 600 with appropriate construction signage.

Rural highways, such as Highways 71 and 11 are operating within their capacities at levels of service ranging from A (in rural areas) to C between Fort Frances and Emo and thus can accommodate additional traffic.

Although Highways 11 and 71 currently have predicted good service level ratings)and which are predicted to remain generally unchanged), in anticipation of increased Project-related traffic volumes and to better improve safety for drivers on Highway 71, right and left turning lanes are planned to manage traffic access and egress on the East Access road from Highway 71.

RRR has had extensive consultations with the MTO in Thunder Bay related to the RRP highway planning and will continue to discuss issues related to the Highway re-alignment and associated maintenance and safety issues with MTO, the Township of Chapple, Stratton, the Rainy River Valley Safety Coalition, school bus operators, utility companies and emergency response groups.

Traffic effects will also be mitigated by:

- Ensuring that RRR employees and contractors adhere to posted speed limits;

- Implementing training on road safety awareness as part of the Mine Safety and Environmental Induction;
- Ensuring regular maintenance of vehicles owned by or contracted to RRR;
- Scheduling the delivery of major equipment at off peak times where practical;
- Constructing right and left turning lanes to manage traffic access and egress on the East Access road from Highway 71;
- Ensuring that heavy loads are sized appropriately and transported only on highways that have sufficient load capacities while observing half-load seasonal restrictions;
- Transporting oversized loads in parts to the mine site, to limit load stress on highway surfaces and obstruction of other traffic, if possible;
- Encouraging worker carpooling and/or considering worker shuttle bussing to/from the RRP site, particularly to alleviate traffic concerns at the junction of Highway 11 and 71 where volumes are highest; and
- Worker reporting of wildlife sightings on highways to inform workers and identify areas where wildlife is persistently present.

7.20.5.4 Residual Environmental Effects

Local access in the area of the RRP will be maintained by re-aligning Highway 600 to the selected Option C alignment and developing the east access road. Project-related traffic volumes will increase on regional Highways 11 and 71, but overall traffic volumes on these highways will remain well within their respective service capacities.

7.20.5.5 Significance Determination

Construction Phase

Project effects on traffic volumes in the HRSA are considered an important socio-economic variable particularly in relation to increased volumes and vehicle safety (Level II for value and context). Residual effects on traffic volumes and potential for associated traffic accidents are considered predominantly negative and distinguishable but within highway service capacities and can be effectively managed using mitigation measures (Level I in magnitude). The geographic extent of the residual effect is confined to the socio-economic HRSA (Level II); is short-term in duration occurring only during construction and in particular during peak construction months (Level I); occurs intermittently with some degree of regularity during shift changes (Level II); is reversible in the short term (Level I); and is likely to occur (Level III). The overall net effect on traffic volumes is, therefore, considered not significant.

Operation Phase

As in the construction phase, the effects of the RRP operations on traffic volumes and associated safety in the HRSA are considered an important socio-economic variable (Level II context). Residual effects on traffic volumes are considered predominantly negative (increased traffic) and distinguishable but well within the service capacities of the Highways and can be effectively managed using mitigation measures (Level I in magnitude). The extent of the residual effect is primarily on Highways 11 and 71 between Fort Frances and the turn off to the East Access Road from Highway 71 within the HRSA (Level II); is medium-term in duration occurring during the second phase of operations (Level I - II); occurs intermittently with some degree of regularity during shift changes (Level II); is reversible in the long term (Level II); and is likely to occur (Level III). The overall net effect on traffic volumes is, therefore, considered not significant.

7.21 Human Health

7.21.1 Effects Assessment

Potential effects of the RRP on human health are:

- Possible release of contaminants of potential concern (COPC) that could potentially bioaccumulate in the food chain and ultimately affect human consumers;
- Possible spill of controlled materials that could potentially affect human health; and
- Traffic accidents resulting in direct physical injury.

7.21.1.1 Potential Releases of Contaminants of Potential Concern

The RRP is proposed to operate for approximately 15 years. During this period there will be emissions to the atmosphere, and to surface and groundwater compliant with various environmental approvals and authorizations.

Air emissions will be released from the combustion of diesel fuel used for heavy equipment operation; and in association with dust from milling operations (ore crushing and processing), heavy equipment operation along site haul roads and on mineral stockpiles (ore, mine rock and overburden), as well as from windblown dust from exposed mineral stockpiles, including the exposed tailings beach. Treated effluent released to surface waters will include mineral stockpile runoff and seepage (mainly routed to the tailings management area directly or indirectly), and direct tailings management area discharge to the Pinewood River receiver.

Effluent release to groundwater is expected to be negligible due to the present of pervasive, low permeability clay and clay till soils, and the use of extensive runoff and seepage collection systems.

Releases to air or to surface waters have the potential to affect the health of plants, wildlife, fish and people if concentrations exceed prescribed thresholds.

The health and safety of workers will be ensured by adhering to occupational health and safety legislation and other best management practices for industrial hygiene hazard control as appropriate. Health effects covered by occupational health and safety legislation are not addressed herein.

The COPCs for public health at any mine site are anticipated to primarily be metal elements and compounds, but others could conceivably be present (such as from process chemicals, fuels and solvents, and hydrocarbon emissions from vehicle and equipment operation).

A number of heavy metals and related materials are essential micro-elements that organisms, including, humans, require for normal body function. These essential elements include such metals as B, Co, Cu, Fe, Mn, Mo, Se and Zn, all of which are commonly included in vitamin and mineral supplements taken for health benefits. Other metals such as arsenic, chromium and nickel have biochemical roles in humans and other mammals which are either uncertain, or not well documented. Organisms show varying tolerances to these elements, depending on specific needs and the ability of organisms to bioregulate tissue metal levels. So long as exposure levels do not exceed organism specific tolerances, these metals are not toxic. If these thresholds are exceeded, even essential element metals can build up within an organism and potentially cause toxicity responses. There are also some metals which have no known, or suspected, biological function, and as a result show an increased tendency to bioaccumulate even when present in very small concentrations, because organisms generally lack the ability to effectively excrete these metals. The most notable of these are cadmium, lead and mercury. Metals such as cadmium, lead and mercury can be particularly problematic if they build up in the food chain, such as when larger fish predate smaller contaminated fish, and are eventually consumed as country foods by Aboriginal and local resident hunters and fishermen.

The ability of these parameters to cause a health risk to fish, wildlife, and humans is a function of: release rates, exposure pathways, and organism presence and sensitivity. Essentially, for a health risk to occur, the organism must be present and have sufficient exposure to the particular parameter at a concentration which is likely to cause an adverse effect. If exposure concentrations are too low, if there is no exposure pathway or if the organism is not present, then there is no risk. As an example, if there were to be low releases of an element such as mercury to the environment, which then had the potential to bioaccumulate within a top predator fish such as Northern Pike in the Pinewood River, but where humans were not currently fishing the Pinewood River, then there could be no associated risk to human health, because there would be no pathway for exposure.

Air Emissions

The worst case scenario from a health risk perspective is an individual exposed to air emissions at the RRP boundary (point of impingement) as defined by land ownership. Air emissions were modelled with results provided in Section 7.3.1 and Table 7-4. Modelled air quality shows no exceedances of applicable MOE O. Reg. 419 Schedule criteria for health based parameters for the worst case meteorological condition (Table 7-4). The worse case condition is defined as the meteorological condition that will generate the highest point of impingement concentration that will occur on any single day modelled against the most recent applicable five year meteorological period record.

Compounds / elements which approached health based criteria (>50% of health-based point of impingement criteria) were limited to PM (total), $PM_{2.5}$, nitrogen oxides for the 1-hour exposure condition (linked to blasting) and manganese.

The modeled property boundary concentrations of cadmium, mercury and lead (the three heavy metals of particularly high perceived concern) were very low, in keeping with the low concentrations of these metals in the ore and mine rock.

Point of impingement air emissions are expected to be fully compliant with all applicable air quality criteria for health considerations, with concentrations expected to be considerable lower still at the nearest permanent receptors (residences).

Tailings Management Area Discharges

Details of process plant and tailings operations, expected water quality releases and effects are provided in Sections 7.5 and 7.6. The process plant will employ cyanidation for gold recovery; a standard industry practice. Residual cyanide will be destroyed in the process plant using the SO_2/Air process which will also render metals in solid phase such that they can be precipitated within the tailings management area. The SO_2/Air cyanide destruction and heavy metal precipitation process is a standard industry practice that has been in commercial use for gold processing plants since the mid- to late 1980s. The treated tailings slurry after cyanide destruction will be discharged to the tailings management area and subsequently, the water management pond for holding and further effluent aging, with essentially all of the process plant water to be derived from mine rock pond and tailings management area water recycle.

Table 7-41 provides a comparison of process plant effluent cyanide destruction test values with Ontario and Canadian drinking water standards / guidelines, and with PWQO (receiver target) and modified PWQO (modified receiver target) values for the protection of aquatic life. Modified receiver concentrations for free cyanide (for non-salmonid / trout waters) are based on the work of Gensemer et al. (2007), and for aluminum, copper, lead, nickel and zinc on the application of US EPA hardness equations (US EPA 2009; Gensemer 2009). Modified receiver values for cobalt and iron are from Nagpal (2004), and from BC MOE (2008) and US EPA (2009), respectively. Cyanide destruction test values are shown in the table for two conditions: time zero (immediately after cyanide destruction; CND test time 0), and following 60 days of post treatment effluent aging (CND test 60 day aging). In the latter instance, the treated tailings slurry was allowed to settle and stand in a small container, and the quality of the resulting supernatant was tested for a period up to approximately 60 days. Evaporative water losses during the 60 day aging period were made up through the periodic addition of distilled water. Test conditions mimicked outside exposure during warm weather conditions.

Also presented in the table is the Pinewood River (receiver) 75th percentile background water quality concentrations, and projected receiver blended water quality concentrations assuming a minimum one part receiver to one part final effluent mixing ratio, which is viewed as being conservative (Section 4.12). The 1:1 receiver to final effluent mixing ratio value is based on either:

- The average of the receiver 75th percentile value and the post-treatment CND test 60-day aging value; or

- A projected value for un-ionized ammonia, cyanate and thiocyante, where additional treated effluent aging (in holding ponds beyond 60 days) is required to reduce concentrations of these parameters.

Predicted mixed receiver / effluent concentrations for these latter three parameters are based on experience with holding pond operating data from the Barrick Gold, Holt-McDermott Mine located near Kirkland Lake. None of these latter three parameters have associated health based drinking water guidelines; but the parameters are important to the health of aquatic organisms, if concentrations become too high.

Comparisons with Ontario Drinking Water Standard (ODWS) and Canadian Drinking Water Quality Standard (CDWQG) show that only one parameter (antimony), is expected to potentially exceed drinking water guidelines immediately following in-plant cyanide destruction (at time zero). All other parameters are shown to be below drinking water guidelines. Following an additional, post treatment 60 day effluent aging period, the antimony concentration is somewhat reduced (to a value of 0.036 mg/L), but is still above the drinking water standard of 0.006 mg/L.

According to the US EPA "*some people who drink water containing antimony in excess of the MCL [maximum concentration level of 0.006 mg/L) over many years could experience increases in blood cholesterol and decreases in blood sugar*". Toxicity data used to derive the 0.006 mg/L concentration threshold are limited and dated. In a more recent assessment carried out by the World Health Organization (WHO 2003), a recommended drinking water guideline value of 0.02 mg/L was recommended for antimony with a further cautionary note stating "*It should be noted that this value [0.02 mg/L] could be highly conservative because of the nature of the end-*

points and the large uncertainty factor". Antimony taken orally is not known to be carcinogenic (WHO 2003), nor is it known to bioaccumulate (www.hc-sc.gc.ca).

Therefore, in terms of human or wildlife exposure to waters associated with the tailings management area and related ponds, or to the Pinewood River after mixing with treated tailings management area effluent, it is expected that all parameters except possibly antimony will be present at concentrations below Provincial and Federal standards / guidelines for drinking water, and are therefore not expected to pose a direct health hazard. These standards / guidelines are based on the potential for long term exposure risk. Further, it is not expected that people will drink water directly from the tailings management area pond or from the Pinewood River; hence there is no exposure pathway to human receptors, irrespective of Pinewood River parameter concentrations.

Wildlife is however, expected to regularly drink from the Pinewood River. The tailings management area will be fenced to prevent access. Mammals and birds generally show toxicity responses to poor drinking water that are similar to those of humans. Therefore based on expected blended Pinewood River parameter concentrations shown in Table 7-41, it is not expected that Pinewood River water will pose a long term direct toxicity hazard to mammals and birds.

Fish and other aquatic life are typically more sensitive to metals than are mammals and birds, as reflected by the lower concentration values for protection of aquatic life compared with drinking water standards. In terms of projected receiving water concentrations, following effluent mixing, the only parameter projected to potentially exceed actual or modified receiver target concentrations for the protection of aquatic life is cadmium, where a slight potential exceedance is shown.

For the three metals of particular biological interest because of their greater potential to bioaccumulate, lead and mercury are expected to occur in extremely low concentrations compared with applicable protection of aquatic life guideline values. Cadmium concentrations are higher relative to protection of aquatic life values, and will therefore require further consideration. Mercury tends to bioaccumulate in fish muscle tissue, whereas lead and cadmium tend to bioaccumulate in the kidneys and liver.

Mercury occurs as both inorganic mercury, mainly as the $Hg2^+$ ion, and as methyl mercury. In natural waters methyl mercury generally accounts for less than 5% of the total mercury present (Ullrich et al. 2001), and where AMEC has conducted detailed studies in northern Ontario, background methyl mercury values have generally been closer to 2 to 3% of total mercury concentrations. Methyl mercury, however, is by far the more biologically available form of mercury, and is the form taken up most readily by fish. Trudel and Rasmussen (2001) reported that greater than 95% of the mercury found in fish tissue occurs as methyl mercury. Also, while methyl mercury typically occurs in wetland drainage and creek water at very low concentrations, this can change under certain circumstances. For example, a number of water quality parameters are known to affect methyl mercury / total mercury ratios including pH, dissolved organic carbon and sulphate. Sulphate is particularly important as methylating bacteria use sulphate as an energy source, and where elevated sulphate levels are present in wetlands, the ratio of methyl mercury as a proportion of total mercury can increase to as much as 10 to 20% (AMEC data files). The optimal sulphate concentration for mercury methylation is in the range of 20 to 50 mg/L, as sulphate concentrations of <10 mg/L start to become limiting for sulphate reducing bacteria (Ullrich et al. 2001).

Bioaccumulation of metals such as cadmium, lead and mercury is typically most evident in the larger predacious fish such as Northern Pike and Walleye. Northern Pike occur throughout much of the Pinewood River, whereas Walleye are restricted in their distribution to lower portions of the river.

To assess background metal body burdens (concentrations) in Pinewood River fish, a total of 70 Northern Pike and 15 Walleye were sampled for dorsal muscle tissue metal concentrations, including for mercury, cadmium and lead; with 42 and 13 of these specimens also being sampled for liver tissue metal concentrations, respectively. Northern Pike sampled from the Pinewood River ranged in size from 185 to 570 mm (total length) with a mean of 378 mm. Walleye sampled from the Pinewood River ranged in size from 223 to 688 mm (total length) with a mean of 383 mm.

Total mercury body burdens in Northern Pike dorsal muscle tissue ranged from 0.11 to 0.67 µg/g with a mean of 0.34 µg/g; and total mercury body burdens in Walleye dorsal muscle tissue ranged from 0.08 to 1.8 µg/g with a mean of 0.40 µg/g (Table 7-42). The relationship between total mercury concentration in muscle tissue and total fish length for Northern Pike and Walleye are shown in Figure 7-17 and Figure 7-18, respectively. Muscle tissue mercury concentrations in both species exceed selected human consumption guidelines in the baseline condition.

Data presented in Table 7-41 indicate that mercury concentrations in the final tailings management area discharge are likely to be similar to those of background Pinewood River concentrations. Therefore the mercury health risk associated with fish consumption from the Pinewood River is not expected to change as a result of RRP development. The only caveat to this assessment relates to the potential for increased mercury methylation rates within the constructed wetland. Mercury methylating bacteria utilize sulphate as an energy source, and methylation rates are optimal within the range of 20 to 50 mg/L SO_4 (Ullrich et al. 2001). Methyl mercury is the form of mercury preferentially taken up by fish. Sulphate concentrations in the constructed wetland will increase as a result of elevated sulphate levels contained in the tailings management area treated effluent. However, the potential for this effect to occur is extremely limited as the wetland area involved (approximately 0.6 km^2) is too small to provide an appreciable source strength.

Cadmium and lead concentrations in Northern Pike and Walleye muscle tissue were below their respective detection limits of 0.01 and 0.03 µg/g, wet weight. Maximum observed cadmium concentrations in Northern Pike and Walleye liver tissue were measured at 0.19 and 0.20 µg/g wet weight, respectively. Maximum observed lead concentrations in Northern Pike and Walleye liver tissue were all below the detection limit of 0.03 µg/g, with the exception of one likely anomalous sample.

The World Health Organization consumption guidelines for cadmium are set at a Provisional Tolerable Weekly Intake of 7 µg/kg body weight; which for a 70 kg (154 lb) person translates to an allowable intake of 70 µg/day. Similarly for lead, the World Health Organization consumption Provisional Tolerable Weekly Intake guideline is 25 µg/kg body weight, which for a 70 kg person, translates to an allowable intake of 250 µg/day. Therefore to exceed the guideline for cadmium, a person would have to consume >7.0 kg/d of fish muscle tissue for either fish species; >0.37 kg/d of fish livers from Northern Pike; or >0.35 kg/d of fish livers from Walleye. To exceed the guideline for lead, one would have to consume >8.33 kg/d of either fish flesh or fish livers from either species. The comparable numbers for a toddler with a nominal body weight of 16.5 kg (36.3 lb) would be >1.7 kg/day of fish muscle tissue for either fish species; >0.09 kg/day of fish livers from Northern Pike; or >0.08 kg/day of fish livers from Walleye. To exceed the guideline for lead, a toddler would have to consume >2.0 kg/day of either fish flesh or fish livers from either species.

Therefore, presuming that fish body burdens of cadmium and lead did not change as a result of RRP effluent discharges to the Pinewood River, there is little apparent risk of lead or cadmium consumption in excess of World Health Organization guidelines, as the above rates of consumption on a sustained basis for either adults of toddlers, are highly improbable. Moreover, even if cadmium or lead concentrations in Pinewood River fish muscle tissue were to increase by a factor of 10 as a result of RRP operations, the sustained consumption of flesh muscle tissue in excess of World Health Organization guidelines (>0.7 kg/day for an adult, and >0.17 kg/day for a toddler) is still not probable.

Furthermore, there is little if any evidence that fish from the Pinewood River are taken for human consumption, beyond possible occasional taking. The potential human health risk associated with cadmium or lead intake related to tailings management area effluent discharges to the Pinewood River, is therefore considered negligible due to low source strength and lack of an ingestion pathway (fishing of the Pinewood River).

Mine Rock Stockpiles

The quality of seepage from the east mine rock stockpile (containing encapsulated PAG mine rock) was modelled on the basis of humidity cell test results. The non-potentially acid generating (NPAG) mine rock and overburden not used for construction will be stored in the west mine rock stockpile. These materials are nonreactive and are not expected to generate COPC at concentrations above background levels. Potentially acid generating (PAG) mine rock will be encapsulated in the east mine rock stockpile, along with potentially the low grade ore stockpile if it is not processed as planned. These materials are potentially reactive, and could generate runoff and seepage that will contain COPC. The onset of chemical reactivity for PAG materials is not expected to occur for a minimum of five or more years following exposure.

During operations, runoff and seepage from the east mine rock and ore stockpiles will be collected and routed to the mine rock pond and/or stockpile pond. Water from these ponds will be used as the principal water source for process plant operations, with any excess water routed directly to the tailings management area to form part of the overall site water inventory. As such, potential health effects of any COPC contained within runoff and seepage from the east mine rock and ore stockpiles are captured within the above discussion related to tailings management area treated effluent discharges.

Progressively during operations and at closure, east mine rock stockpile PAG rock will be encapsulated (Section 4.19.2). This will allow clean runoff shed from the surface of the reclaimed stockpile to be diverted directly to the environment (or alternatively into the open pit to assist with flooding); and seepage that could contain elevated concentrations of heavy metals to be diverted to the open pit at depth and below the chemocline (see below). All ore is proposed to be processed during operation, with no stockpile remaining at closure. Should a ore stockpile remain, it is expected to be reclaimed in a manner consistent with the east mine rock stockpile.

The time required to fill the open pit following the completion of mining is dependent upon the proportion of RRP site catchments that are diverted to the open pit (Section 6.18.1). Initial modelling suggests that pit flooding times may range from a few decades to approximately 94 years, depending on the aggressiveness of pit flooding (Attachment 1 of Appendix E). During the period that the open pit is flooding, there will be no release of COPC to the environment. During this time the pit water will be managed through periodic pH adjustment to ensure that approximately neutral conditions are maintained in the flooding pit to minimize heavy metal solubility.

By the time that the pit becomes fully flooded to the point where there is expected to be an engineered overflow discharge to the Pinewood River, it is expected that pit lake waters will stratify into an upper cleaner water zone above an approximately 30 m deep chemocline and a lower water zone below the chemocline with elevated metal concentrations (Section 4.19.1). Flooded pit lake chemoclines are quite stable such that there would be very limited mixing of the two layers over time, irrespective of season. Preliminary water quality modeling of the pit lake has been completed for several metals including aluminum, arsenic, cadmium, chromium, copper, iron, molybdenum, nickel, lead, antimony and zinc (Appendix W-1). The data show that pit lake overflow water is expected to contain concentrations of these metals that are below Provincial and Federal drinking water standards / guidelines, and that most metals, except aluminum, copper, iron and lead, will also be below the modified receiver target values (Appendix W-1). At the time of pit lake overflow, the pit lake catchment area is expected to comprise approximately 5 km^2. There will consequently be an approximate 7.2:1 Pinewood

River to flooded pit overflow mixing ratio, which will allow modified receiver target to be met in the Pinewood River for all parameters (Appendix W-1).

Taking all of the above into consideration, runoff and seepage from the RRP stockpiles are not expected to result in treated effluent releases to the environment that could result in Pinewood River exceedances of drinking water or protection of aquatic life guidelines. Consequently there would be no risk to human or environmental health.

7.21.1.2 Country Food Consumption

As informed through local TK/TLU studies to date, there is no harvesting of plants for country foods within the general vicinity of the RRP area. Similarly, there appears to be limited, if any, fishing in the Pinewood River by either local residents or Aboriginal peoples. Hunting is, however, carried out in the area (Section 7.18). Where hunting does occur, the primary target species is White-tailed Deer with the taking of Moose being less common because of lower populations compared with deer. There are no data available on current heavy metal concentrations for deer or Moose tissues in the RRP area. Of interest in this regard are the three principal metals that tend to bioaccumulate, namely cadmium, lead and mercury (Gamberg 2004).

Median concentrations of cadmium, lead and mercury in mine rock at the RRP were all slightly less than average earth crustal rock concentrations (Table 7-43). Median concentrations of lead and mercury were also comparatively low in composite tailings samples, but cadmium showed enrichment in tailings samples relative to average crustal concentrations (Table 7-44). Enrichment is considered to have occurred when concentrations exceed 10 times the crustal average (Section 5.5.3).

Discussions presented above in connection with air, tailings management area and stockpile emissions / releases indicate that concentrations of cadmium, lead and mercury in the local environment during and after development of the RRP are unlikely to be sufficient to cause heavy metal enrichment in local country foods, despite expected higher concentrations of cadmium in the ore (tailings composite samples). The situation for cadmium however, is of sufficient interest so as to warrant monitoring of White-tailed Deer liver tissue if local hunters are willing to provide samples for analysis as a by product of their hunting in the area.

A considerable literature exists with respect to cadmium levels in ungulates (such as Lin and Joseph-Quinn 2003; Brazil and Ferguson 1989; Gamberg 2004), with the consensus being that dietary restrictions on the consumption of ungulate flesh are normally not required, but that consumption of organ tissues (liver and kidneys) should typically be restricted, as cadmium (and to a lesser extent lead and mercury) tend to accumulate in game organ tissues. The World Health Organization cadmium and lead consumption guidelines defined above in connection with fish flesh and livers, will apply equally to deer and Moose organ meats.

7.21.1.3 Risk of Spills

Processing reagents, fuel, explosives manufacturing materials and other materials will be delivered to site and stored under strict regulation, to support mining and milling operations of necessity. A number of these are considered to be hazardous. All such materials where there is a potential health or environmental risk, will be handled and transported by licensed, trained persons; and contingency plans and procedures will be in place to respond to any spills of such materials, either during transport or at the mine site, should such spills occur. These types of materials are routinely transported and handled at all northern Ontario mine sites, are highly regulated, and while the potential for spills exists, the related possible health risks are considered very small.

The principal concern with regard to human health is from a cyanide spill. Cyanide is proposed to be shipped in a solid form which can readily be cleaned up, unless the spill was to occur directly into a creek or river, the probability of which is extremely low. Even then, the solid form is in containers that may not break open during an accident. Cyanide is an unstable chemical which breaks down very rapidly. If a spill were to occur into a creek or river, there would likely be a resulting local fish kill, but there would be no risk to humans eating fish that had been exposed to cyanide, since cyanide is not a persistent chemical and it is ready detoxified in the human body when consumed in small doses (Eisler 1991). Drinking water from a river or creek that received a significant cyanide spill while unlikely in the region, could pose a health hazard, until there was sufficient time for the cyanide to dissipate downstream or otherwise degrade. During the open water period this break down would be in a matter of hours to a few days at most, although in winter cyanide persists much longer under ice cover. The probability of a cyanide spill occurring and entering directly into a watercourse that someone would drink from at that time in sufficient quantities to constitute health risk is extremely remote.

7.21.1.4 Traffic Accidents

There is always the potential for a traffic accident with any roadway traffic, and any such accident has the potential to cause human injury or death. For the RRP, traffic volume increases due to the RRP demands are expected to be well within road design parameters. It is expected that some number of traffic accidents will occur, as they do in association with virtually all industrial operations.

7.21.2 Government, Aboriginal and Public Comments and Concerns

Limited specific concerns have thus far been expressed by government agencies, Aboriginal groups and other stakeholders in relation to human health effects associated with the RRP. There have been generalized statements and expressions of concern related to drinking water, but not the potentially related effects on health. During a meeting sponsored by RRR, the Fort Frances Tribal Area Elders discussed concerns regarding human health impacts potentially resulting from mining activities and impacted drinking water.

7.21.3 Mitigation

The health and safety of workers will be ensured by meeting all applicable occupational health and safety legislation standards, as well as utilizing other best management practices for industrial hygiene hazard control as appropriate.

For potential air quality emissions, design modifications were made as necessary to the RRP to ensure that MOE requirements for air quality could be met at the property boundary.

The tailings management area will be fenced. Runoff and seepage from the tailings management area and stockpiles will be captured, monitored, and either released to the environment if standards are met and/or re-used in the process plant during operations. Cyanide and heavy metal concentrations in the tailings management area seepage and all treated effluent discharges to the environment will be controlled through the use of in-plant cyanide destruction and heavy metal precipitation, augmented by extended effluent aging in the tailings management area ponds, as described in Section 4.12. Receiving water standards for both drinking water and the protection of aquatic life are expected to be maintained in the Pinewood River. Regular monitoring of effluent discharges and receiving water quality will be carried out in accordance with standard practice, as per expected conditions on the MOE Environmental Compliance Approval for tailings management area and general mine site effluent treatment and management. Regular monitoring of fish and fish flesh is also expected to occur at typically three year intervals in accordance with Metal Mining Effluent Regulation and MOE approval conditions. Water quality and fish monitoring will also occur in the post closure condition in accordance with prescribed closure plan monitoring requirements, with any poor water quality to be captured and treated as necessary.

Any chemical spills within the process plant / chemical storage areas will be controlled through provision of secondary containment as appropriate, and will not enter the environment. Spills of potentially hazardous materials during transport, or from onsite material storage and handling facilities, would be managed as described in Section 9.3.

The potential for RRP related traffic accidents will be controlled through employee, contractor and supplier training programs, and through enforced speed limits appropriate to road conditions on site roads.

7.21.4 Residual Environmental Effects

As described above, the source strength of COPC is too low to pose an ecological or health risk. With respect to human receptors, the harvesting and use of country foods is limited except for White-tailed Deer and Moose. In addition, there is no credible transport pathway for COPC uptake from fish consumption in the Pinewood River, as levels of fishing efforts by local residents in the Pinewood River are low to negligible. A credible health risk therefore does not exist, and the need to conduct a more formalized health risk assessment is not supported by the data.

7.21.5 Significance

In summary, the magnitude of contaminant release is expected to be small and well within applicable Provincial and Federal emission and discharge criteria, such that there is no credible health risk to area residents or consumers of fish and wildlife, even if there were to be regular use of fish and wildlife resources (Level I rating for context and magnitude/geographic extent). Utilizing proposed mitigation measures, effects will be Level I for frequency and likelihood of occurrence and Level II for reversibility. The overall effect is considered not significant.

Spills and traffic accidents are possible, and could have adverse effects under certain circumstances, but such events are unplanned and are more appropriately addressed through consideration of accidents and malfunctions (Section 9).

7.22 Archaeology

7.22.1 Effects Assessment

The assessment of archaeological resources is regulated by the Province of Ontario under the *Ontario Heritage Act*. As detailed in Section 5.14, archaeological assessments of the property components have been completed to Stage 2. Stage 2 requires that inspection by a licensed archaeologist be completed for all known resources and areas of potential. The full results of the inspection are detailed in the report submitted to the MTCS (public version is provided in Appendix M-2).

Construction of the RRP may affect archaeological sites through the disturbance and/or removal of soils during construction and/or operation which potentially contain the remains of archaeological sites. The activities that could have the greatest effect on cultural heritage resources include: clearing, grubbing, stripping, excavation and blasting primarily during construction as well as the expansion of stockpiles and the tailings management area during operations which will permanently cover the ground surface.

The archaeological significance of the areas potentially affected by the proposed RRP was determined through Stage 2 archaeological assessments undertaken by Woodland Heritage Services Limited from 2011 to 2013) and Ross Archaeological Research Associates in 2010 to 2011. Stage 2 archaeological assessments within the RRP and the HLSA, located eight pre-contact archaeological sites (Table 7-45) and six historic sites (Table 7-46) for a total of fourteen registered archaeological sites. The *Ontario Heritage Act* and MTCS *Standards and Guidelines for Consultant Archaeologists* (MTCS 2011) prohibit identifying in public documents the specific locations of archaeological sites on maps. This assists to deter the unauthorized collection of artifacts and damage to archaeological sites enhancing protection and preservation

The eight pre-contact archaeological sites, and four historic archaeological sites have been registered with the Province of Ontario and each has been assigned a Borden Number in the provincial database (Table 7.46). As such these sites are afforded protection under the *Ontario Heritage Act* and must not be disturbed until clearance is obtained by the Ministry. All other homestead sites are considered to be built heritage resources and cultural heritage landscapes (Table 7.45; Section 7.23).

Geochronological dating in combination with radiocarbon samples collected during earlier work in the area (Bajc 1991) provide dates for the Norcross, Tintah, Upper Campbell and Lower Campbell shorelines all found within the study area. The Norcross shoreline is dated to 11,500 radio carbon years before present or 13,500 calendar years ago. The Tintah shoreline is dated to 11,000 radio carbon years before present or 13,000 calendar years ago. The Campbell shoreline was established by 9,500 to 10,000 radio carbon years before present or 10,500 to 11,200 calendar years ago. No sites have yet been identified on the Norcross or Lower Campbell shores, and of the eight pre-contact sites identified they are equally divided between the Tintah and Campbell levels. These correspond to Early Paleoindian and Late Paleoindian cultural periods in the Province of Ontario respectively.

Of the eight pre-contact sites located through the Stage 2 work, Tintah 1 and Campbell 1-3 appear, at this time, to be the most well–preserved and productive pre-contact sites, and therefore significant. These sites produced at least five non-diagnostic artifacts from within a 10 m by 10 m test pit survey area. Tintah 4 produced one diagnostic artifact from test pits within a 10 m by 10 m test pit and surface collection area. The artifact recoveries from these sites are significantly greater than the other sites so far, with roughly the same amount of work done. Tintah 1 is outside of the mine footprint area, but Campbell 1 through 3 are within the footprint.

Of the six historic sites located through the Stage 2 work, Homestead DfKm-7 and DfKm-9 require mitigation of development impacts. They are associated with the first generation of settlement of a pioneer group, even though the settlement was after 1870.

7.22.2 Government, Aboriginal and Public Comments and Concerns

The MOE requested that all comments from Aboriginal communities with respect to archaeology be recorded. RRR committed to documenting any comments or concerns about archaeological sites that are raised by Aboriginal communities in the EA.

A meeting was held on December 7, 2012 to discussed archaeological research at the RRP. Representatives were present from the Rainy River First Nations, Naicatchewenin First Nation and Anishinaabeg of Naongashiing First Nation, as well as Pwi-Di-Goo-Zing-Ne-Yaa-Zhing Advisory Services. Big Grassy River First Nation was invited but did not send a representative.

The presentation was well received and the following decisions were made:

- The artifacts need to come back to the area and can be transferred to a facility owned by Rainy River First Nations on behalf of the other three communities that attended the meeting;

- A ceremony will be held once the artifacts are physically returned, at which time RRR will likely receive direction on what curation should be provided;

- The First Nations would like a presentation on the technique of locating these ancient sites for educational purposes. The First Nations were very interested in the use of LIDAR technology to identify the ancient shorelines and viewed it as a very valuable tool for locating sites throughout the district; and

- RRR should ensure they can gather as much information as possible out the sites that have been identified.

Anishinaabeg of Naongashiing met with RRR to discuss an overview of the archaeological studies that have been undertaken. No specific comments or concerns were raised and the community representatives expressed appreciation for the presentation. A member of the Naicatchewenin First Nation asked if the report on sacred areas or burial sites would be made available for the community to review. RRR responded that the report would be made available and that should any sites of this nature be discovered, they would work to preserve or protect them. As yet, no burial or sacred sites have been identified through archaeological or TK / TLU studies.

RRR representatives interviewed landowners as part of the impact assessment to determine if they had any knowledge of archaeological sites or particular landforms that would contribute to the understanding of the potential for archaeological sites on their properties. Landowners contributed their knowledge but did not raise any concerns about the archaeological studies being undertaken.

7.22.3 Mitigation

Avoidance has been possible for several of the archaeological sites identified but is not expected to be practical for the remainder. The RRP layout has been adjusted and three of the pre-contact archaeological sites initially identified as potentially at risk, will no longer be affected by the RRP.

Other sites not currently within the current project development area may be subject to future development disturbances due to modifications of the infrastructure, as such they may require future Stage 3 assessment work.

Regarding the listed sites, eight (four pre-contact and four historic) are either located outside of the project development area or do not meet the standards required for Stage 3 assessment. Six sites do meet the standards and require additional assessment work, as required by the MTCS *2011 Standards and Guidelines.* It is recommended that Stage 3 and if required, Stage 4 work at these sites be undertaken. As the project work is on-going, additional sites may be located and will be assessed in a similar manner as the sites listed.

7.22.4 Residual Environmental Effects

Implementation of the above mitigation measures in association with the Stage 3 and if required Stage 4 investigations, Aboriginal community engagement and other measures will offset any potential adverse effects to archaeological heritage resources.

7.22.5 Significance Determination

In regards to pre-contact sites, the proposed Stage 3 and any required Stage 4 investigation will better determine these values (Level II for value and context). Activities such as land clearing, excavation, and road construction have the potential to effect archaeological sites to the extent that there is data loss or destruction, but that will be mitigated prior to effects occurring (Level II). Sites at this stage are relatively small and occur in less than 1% of the RRP area (Level I) and will not contribute to an overall environmental impact. No effects are expected (Level I); however, if effects occur they will be permanent (Level III for duration and reversibility). As there is a range of mitigation measures available to mitigate archaeological sites, the overall significance of the effects is considered low.

Historic sites provide evidence of the early settlement and land use in northern Ontario and are of interest to the public. A Stage 3 and any required Stage 4 investigations will determine whether there is greater value in scientific or productivity indicators (Level II for value and context). Activities such as land clearing, excavation, and road construction have the potential to effect historic sites to the extent that there is data loss or destruction but that will be mitigated prior to effects occurring (Level II). Sites at this stage are relatively small and occur in less than 1% of the RRP (Level I) and will not contribute to an overall environmental impact. Unless mitigation measures include site avoidance, effects will be permanent (Level III for frequency, duration, and reversibility). There is a range of mitigation measures are available to mitigate historic archaeological sites and therefore the overall significance of the effects is considered low.

7.23 Cultural Heritage Landscapes and Built Heritage Resources

7.23.1 Effects Assessment

Cultural heritage landscapes may be organically evolved landscapes as opposed to designed landscapes. Some are continuing landscapes that maintain the historic use and continue to evolve, while others are relict landscapes where the evolutionary process has come to an end, but important landscape or built heritage resources from its historic use are still visible. Built heritage comprises individual, person-made or modified, parts of a cultural heritage landscape such as buildings or structures of various types including, but not limited to, residences, commercial, religious, institutional, industrial or agricultural buildings, bridges, etc.

Individual properties may be designated to be of cultural heritage value under Part IV of the *Ontario Heritage Act* by a municipality or the Minister of MTCS. In addition, municipalities may designate Heritage Conservation Districts under Part V of the legislation.

The *Ontario Heritage Act* also allows a property that is not designated, but considered to be of cultural heritage interest or value by the municipality to be placed on the register of listed non-designated properties, which may become candidates for protection under the *Ontario Heritage Act*. The listing of non-designated properties does not offer any specific protection under the *Ontario Heritage Act*.

For the most part, the analysis of cultural heritage resources in the study area addresses those above-ground, person-made heritage resources 40 years of age and older. This does not imply that all built heritage resources or cultural heritage landscapes over 40 years old are necessarily worthy of protection or preservation; only that they be considered.

RRR archaeological consultants compiled an initial inventory of built heritage sites through remote sensing, field global positioning system and photographs. Since the built heritage sites were located largely on private property that had not been acquired by RRR until late 2012 (and into winter conditions), the infield built heritage sites baseline study was conducted by Unterman McPhail Associates during the spring of 2013. The results of the survey are summarized in Section 5.16 and detailed in Appendix M-3.

Built heritage resources and/or cultural heritage landscapes may experience displacement, (i.e., removal) if they are located within the development area of the undertaking. There may also be potential for disruption or indirect impacts to cultural heritage resources by the introduction of physical, visual, audible or atmospheric elements that are not in keeping with their character and / or setting. Isolation of cultural heritage resources may occur due to severance of land. Isolation of a built heritage feature often leads to demolition due to neglect and/or vandalism. On a broader scale, mining operations will alter the character of the existing agricultural landscape.

None of the identified cultural heritage resources identified within and adjacent to RRP have been designated under the *Ontario Heritage Act*, or included in a municipal heritage inventory or register.

Unterman McPhail (2013; Appendix M-3) identified 21 cultural heritage landscapes and built heritage resources within and immediately adjacent to the RRP (Section 5.19). Of these

21 areas / features, five will be fully or partially displaced, and five are sufficiently close to proposed developments that they will be indirectly affected.

The five directly affected sites that will be fully or partially displaced are:

- Site #1: Rural Landscape, Agricultural;
- Site #3: Plan of Survey Richardson Township;
- Site #5: Secondary Highway 600;
- Site #10: 10006 Teeple Road; and
- Site #11: 116 Roen Road.

The five proximal, indirectly affected sites are:

- Site #12: 365 Roen Road;
- Site #13: 414 Roen Road;
- Site #14: 614 Roen Road;
- Site #19: 3522 Secondary Highway 600; and
- Site #20: 3221 Secondary Highway 600.

The majority of these ten sites are cultural heritage landscapes which include farmhouses and various outbuildings. Some of these buildings are actively used, and others have fallen into various states of disuse and repair. Sites #12 and #14 are small built heritage structures and Site #5 is Highway 600.

The remaining 11 sites / landscapes would experience lesser indirect effects.

Further details on the five directly affected sites are provided below.

Site #1 is a broad CHL site consisting of a settled rural landscape with both active and abandoned farm complexes, fenced fields, a road network, hamlets and schoolhouses developed in the first part 1900s in the geographic Townships of Tait, Richardson and Sifton. Some farm complexes remain active and continue the historic use. Other farmsteads were abandoned, some up to 50 years ago. Important landscape and built heritage resources related to historic use are still visible. A portion of this rural landscape will be directly displaced by development of the RRP.

Site #3 is also a broad CHL site (Richardson Township) that was originally surveyed in 1903, and laid out in typical Ontario arrangements of lots and concessions, with road allowances provided between concessions and every second lot. Vestiges of the historic road network, farm complexes, fencelines and field patterns remain visible in the landscape. A portion of this rural landscape will be directly displaced by development of the RRP.

Site #5 is Highway 600 which was designated in 1956, absorbing a number of earlier township roads into the provincial highway system. The highway extends approximately 87 km from Highway 71 through Black Hawk, Dearlock, North Bend and Bergand to Highway 11 at Rainy River. It has retained a gravel surface throughout its history. At the RRP site, the two lane roadway is a gravel-surfaced, with a posted speed limit of 80 km/h. It provides both local land access and through traffic. The section of Highway 600 that currently passes through the RRP site area (including the proposed open pit) will be re-aligned as described in Section 4.15).

Site #10 is a farmstead that was used as part of a cattle operation until its acquisition by RRR. Buildings remaining onsite include a contemporary farmhouse and approximately five outbuildings, of which three appear to be older structures. Fields with wood post and wire fencing extend to the north and west. Clark Creek runs through the property. Site #10 will be physically displaced.

Site #11 is a former farmstead set back a distance from the road on a knoll overlooking Clark Creek. Stones collected from the fields border Roen Road. The property retains a one and-a-half storey frame residence with shiplap siding, side gable roof and a one storey rear wing. The front elevation faces south and contains a centre entranceway with a window to either side. Six outbuildings, which include three collapsed log structures, are located in proximity to the house. A log building at the road may relate to the property. Site #11 will be physically displaced by the RRP.

Effects to cultural heritage landscapes and built heritage resources that will be fully or partially displaced by development of the RRP will occur during the construction and operations phases. Indirect effects to peripheral heritage resources would also occur during these phases, and possibly also at or following mine closure if structures present a safety hazard.

7.23.2 Government, Aboriginal and Public Comments and Concerns

Local residents and the Township of Chapple have expressed an interest in having RRR document the local history and character of the area through development of an illustrated history of the study area, as part of its overall mitigation strategy to help preserve the local heritage.

7.23.3 Mitigation

The principal project mitigation strategy to limit adverse effects to potentially affected cultural heritage landscapes and built heritage resources is to develop as compact a site footprint as reasonably practicable. Structures on properties that have been acquired by RRR to provide buffers, such as those relating to sound propagation and to aesthetic effects, will be protected as reasonable, considering the safety of persons that might enter any properties. Where it is desirable to protect potentially unsafe structures for heritage values, any such structures will be fenced or otherwise secured. Where unsafe structures are deemed to have limited if any cultural heritage value, such structures may be demolished.

In addition, RRR has committed to developing an illustrated history of the study area, as part of its overall mitigation strategy to help preserve the local heritage. Through further discussion with local citizens and the Township of Chapple, and through the undertaking of the illustrated history project, RRR will determine which, if any, of the structures on lands acquired by RRR for buffer purposes, should be considered for some form of preservation.

7.23.4 Residual Environmental Effects

The RRP development will wholly or partially displace five identified cultural heritage landscapes and built heritage resources. Five additional cultural heritage landscapes / built heritage resources are sufficiently close to proposed developments that they will be indirectly affected. The remaining eleven sites / landscapes would experience lesser indirect effects. Where heritage features and values cannot reasonably be protected, they will be documented through development of an illustrated history of the study area.

None of the identified cultural heritage resources identified within and adjacent to RRP have been designated under the *Ontario Heritage Act*, or included in a Municipal heritage inventory or register and are not expected to have any significance outside of the HLSA.

7.23.5 Significance Determination

Cultural heritage landscapes and built heritage resources that will be fully or partially displaced by development of the RRP, or are peripheral to the project footprint, are indicative of the history of settlement in the area, but are otherwise unremarkable. None of these sites / features are designated under the *Ontario Heritage Act*, or included in a municipal heritage inventory or register. The magnitude of the effect is therefore considered to be a low, Level 1 effect. The geographic extent of the effect is also localized, resulting in a Level 1 effect for this attribute. Where direct displacement effects are anticipated, these will be permanent (Level III for frequency, duration, and reversibility). The cultural history of the area will be documented, such that where it is necessary to remove structures or to alter landscapes, the predevelopment condition will be documented. The overall significance of the effect is therefore considered low and not significant.

7.24 Summary

Tables 7-47 to 7-56 summarize the environmental effects as determined through the methodology outlined in Section 7.1 and 7.2. This assessment is contingent on the application of the mitigation measures proposed. These tables show that the RRP will not have an effect on Federal lands or lands outside of Ontario.

Table 7-1: Environmental Effect Attribute Ratings and Criteria

Level	Context		Extent		Frequency	Reversibility	Likelihood of Occurrence
	Ecological	Socio-economic	Magnitude/ Geographic Extent	Duration			
I	No meaningful adverse ecosystem effects	Effect is not considered important or is not considered important to the stability of affected communities in the region.	See Table 7-2 for VEC/VSEC specific criteria	Short-term: Effect not measurable beyond construction period (2 years); or beyond active reclamation period, if directly linked to reclamation phase	Effect expected to occur infrequently, or not at all	Effect is readily reversible	Unlikely to occur
II	Adverse effects involve common species or communities, or resources of limited significance	Effect is considered somewhat important to the stability of affected communities in the region by persons living in potentially affected communities or the region.	See Table 7-2 for VEC/VSEC specific criteria	Medium-term: Effect likely to persist for life of project	Effect expected to occur intermittently, possibly with some degree of regularity	Effect is reversible at substantial cost, or with difficulty	Could reasonably be expected to occur
III	Adverse effects involve locally or regionally important species, communities, or resources	Effect is considered highly important to the stability of communities by persons living in potentially affected communities or the region.	See Table 7-2 for VEC/VSEC specific criteria	Long term: Effect likely to persist beyond life of project	Effect expected to occur regularly or continuously	Effect is not reversible	Will occur, or is likely to occur

Table 7-2: Environmental Effect Rating Criteria - Magnitude and Geographic Extent

Component	Level I	Level II	Level III
Air quality	Emissions consistent with applicable Federal and Provincial regulations and guidelines; or if guidelines exceeded, no, or minor, anticipated adverse environment effects beyond project lands	Emissions have the potential to exceed Federal or Provincial guidelines for areas beyond project lands, resulting in potential for meaningful adverse environmental effects to off property residents, lands or waters (and their biota)	Emissions are likely to exceed Federal or Provincial guidelines for areas beyond project lands, resulting in meaningful, and unacceptable adverse environmental effects to off property residents, lands or waters (and their biota)
Sound	Hourly A-weighted sound levels consistent with MOE Class 3 guidelines for rural areas at offsite receptors	Sound emissions have the potential to exceed MOE Class 3 guidelines for rural areas at offsite receptors	Sound emissions are likely to exceed MOE Class 3 guidelines for rural areas at offsite receptors
Greenhouse gas emissions	Greenhouse gas emissions of <0.1% of Canada's target CO_2 emission rate reduction of 243 Mt/a	Greenhouse gas emissions of 0.1 to 1.0% of Canada's target CO_2 emission rate reduction of 243 Mt/a	Greenhouse gas emissions of >1.0% of Canada's target CO_2 emission rate reduction of 243 Mt/a
Water quantity	Change to creek and river flows is <15% of seasonal norms; or is otherwise such that downstream aquatic habitat would not be meaningfully affected	Change to creek and river flows is 15 to 25% of seasonal norms	Change to creek and river flows is >25% of seasonal norms
Water quality	Water quality effects in receiving waters consistent with applicable Federal and Provincial regulations and guidelines, or other scientifically defensible values; or if guidelines exceeded, no anticipated adverse environment effects[1] beyond any defined mixing zones	Water quality effects in receiving waters have the potential to adversely affect drinking water uses, aquatic life, and/or wildlife, beyond any defined mixing zones	Water quality effects in receiving waters are likely to adversely affect drinking water uses, aquatic life, and/or wildlife, beyond any defined mixing zones, likely resulting in an unacceptable effect
Aquatic habitat and fisheries resources	No net loss of the productive capacity of habitats	Unacceptable loss of the productive capacity of local fish habitat	Unacceptable loss of the productive capacity of regional fish habitat
Groundwater systems	System alteration expected to result in <15% change to creek and river seasonal flow norms	System alteration expected to result in 15 to 25% change to creek and river seasonal flow norms	System alteration expected to result in >25% change to creek and river seasonal flow norms

Component	Level I	Level II	Level III
Terrestrial habitat (including wetlands)	Effect considered to be minor, and/or solely confined to project lands; or in the case of applicable SAR species, where no net loss of the productive capacity of habitat is achieved (or anticipated to be achieved) through permits	Activity has the potential to meaningfully affect off property vegetation communities or species	Activity is likely to meaningfully affect off property vegetation communities or species
Wildlife (including SAR)	Effect considered to be minor, and/or solely confined to project lands; or in the case of applicable SAR species, where no net loss of the productive capacity of habitat is achieved (or anticipated to be achieved) through permits	Activity has the potential to meaningfully affect off property wildlife species	Activity is likely to meaningfully affect off property wildlife species
Natural heritage features	No meaningful change in ecological function of the feature	Meaningful change in ecological function of Area(s) of Natural and Scientific Interest and candidate Area(s) of Natural and Scientific Interest	Meaningful change in ecological function of parks and candidate parks
Socio-economic	No or Low level effects; individuals or local communities are affected. Effect occurs but may or may not be detectable, and is within the normal range of variability. If effect can be measured quantitatively, then Level I effect represents change <10% from baseline conditions within project/local study area.	Effect is clearly distinguishable but is unlikely to pose a serious risk to the VSEC or represent a management challenge. If effect can be measured quantitatively, then Level II effect represents change of 10-20% from baseline conditions within project study area. Effect extends to the regional study area and/or includes effects at a Provincial level.	Effect is likely to pose a serious risk to the VSEC and represents a management challenge. If effect can be measured quantitatively, then Level III effect represents change >20% from baseline conditions within project study area. Effect is expected to extend beyond the regional study area and Provincial to the National or International level.

Table 7-3: VEC Criteria Met by Identified Natural Environment Elements

Selected VEC	Applicable Selection Criteria
Air quality and GHGs	• Indicator of environmental health • Important component to the function of other ecosystem elements or functions
Sound and vibration	• Indicator of environmental health • Important component to the function of other ecosystem elements or functions • Aesthetic interest
Minor creek systems	• Important corridor or linkage for fish and/or wildlife movement • Important component to the function of other ecosystem elements or functions
Pinewood River	• Area of notable biological diversity • Significant habitat for locally important species • Potentially significant habitat for SAR species (Lake Sturgeon) • Important corridor or linkage for fish and/or wildlife movement • Important component to the function of other ecosystem elements or functions • Sensitive receiving water environment
Groundwater	• Indicator of environmental health • Important component to the function of other ecosystem elements or functions • Economic, social or cultural significance
Vegetation communities and rare plants	• Area of notable biological diversity • Significant habitat for locally important species • Important corridor or linkage for fish and/or wildlife movement • Significant habitat for SAR (migratory birds and bat species); • Important component to the function of other ecosystem elements or functions • Economic, social or cultural significance (such as hunting) • Educational, scientific or aesthetic significance
Ungulates	• Indicators of environmental health • Important component to the function of other ecosystem elements or functions • Economic, social or cultural significance • Educational, scientific or aesthetic significance
Furbearers	• Other notable species or species groups • Important component to the function of other ecosystem elements or function • Economic, social or cultural significance • Educational, scientific or aesthetic significance

Selected VEC	Applicable Selection Criteria
Bats	• Other notable species or species groups • Important component to the function of other ecosystem elements or function • Economic, social or cultural significance • Educational, scientific or aesthetic significance
Migratory birds	• Area of notable biological diversity • Significant habitat for locally important species • Significant habitat for SAR (migratory birds) • Other notable species or species groups • Important component to the function of other ecosystem elements or function • Economic, social or cultural significance
Raptors and ravens	• Area of notable biological diversity • Significant habitat for locally important species • Other notable species or species groups • Important component to the function of other ecosystem elements or function • Economic, social or cultural significance
Amphibian	• Other notable species or species groups • Important component to the function of other ecosystem elements or function • Economic, social or cultural significance • Educational, scientific or aesthetic significance
Endangered Species Act Species	• SAR • Notable species or species group • Indicator of environmental health • Educational, scientific or aesthetic significance
Species of Special Concern and Provincially Rare Species	• Notable species or species group • Indicator of environmental health • Educational, scientific or aesthetic significance

Table 7-4: Modeled Air Quality Impacts Compared to MOE Standards and Criteria

Compounds	CAS Number	Facility Emission Rate (g/s)	Model Used	Modelled Concentration (µg/m³)	Averaging Period (hr)	MOE POI Limit (µg/m³)	Limiting Effect	MOE Schedule O.Reg. 419	% of Criteria
PM_{tot}	NA	81.08	AERMOD	86.0	24	120	visibility	3	71.7%
$PM_{2.5}$	NA	4.77	AERMOD	23.9	24	25	health	Guideline*	95.6%
Nitrogen oxides	10102-44-0	6.7	AERMOD	26.7	24	200	health	3	13.4%
		95.2	AERMOD	227	1	400	health	3	56.8%
Carbon monoxide	630-08-0	27.0	AERMOD	2,632	0.5	6,000	health	3	43.9%
		453	AERMOD	2,193	1	36,200	health	3	6.1%
		27.0	AERMOD	366	8	15,700	health	3	2.3%
Sulphur dioxide	7446-09-5	2.87	AERMOD	9.3	24	275	health and vegetation	3	3.4%
		29.7	AERMOD	138	1	690	health and vegetation	3	20.0%
Hydrogen cyanide	74-90-8	0.15	AERMOD	1.4	24	8	health	3	17.5%
CaO **	1305-78-8	0.09	AERMOD	0.80	24	13.5	corrosion	3	5.9%
$CuSO_4$	7758-99-8	0.09	AERMOD	0.79	24	20	health	no MOE limit***	4.0%
As	7440-38-2	1.12E-02	AERMOD	1.19E-02	24	0.3	health	Guideline	4.0%
Cd	7440-43-9	1.46E-02	AERMOD	1.55E-02	24	0.025	health	3	6.2%
Cr	7440-47-3	1.60E-02	AERMOD	1.69E-02	24	1.5	health	Guideline	1.1%
Hg	7439-97-6	8.11E-06	AERMOD	8.60E-06	24	0.5	health	3	0.002%
Mg	1309-48-4	2.18E+00	AERMOD	2.32	24	120	particulate	3	1.9%
Mn	1336-36.3	1.18E-01	AERMOD	1.25E-01	24	0.15	health	Guideline	83.6%
Ni	7440-02-0	6.42-03	AERMOD	6.81E-03	24	2	vegetation	3	0.3%
Pb	10099-74-8	0.018	AERMOD	1.87E-02	24	0.5	health	3	3.7%
Zn	7440-66-6	2.07E-01	AERMOD	2.19E-01	24	120	particulate	3	0.18%

Modelled concentrations account for anomalies as per MOE Modelling Guidance. POI: point of impingement
* $PM_{2.5}$: the Canada Wide Standard is 30 µg/m³. MOE has provided a 25 µg/m³ single facility guideline to account for cumulative impacts (i.e., background levels)
** process plant modelled as 1 g/s with all particulate assumed to be compound and scaled by emission rate
***all limits are MOE limits, except for $CuSO_4$. Limit derived by a certified toxicologist

Table 7-5: Sound Source Summary

Source ID [1]	Source Description	Sound Power Level (dBA)
BD1	Blast Hole Drill 1	119
BD2	Blast Hole Drill 2	119
BD3	Blast Hole Drill 3	119
C	Crusher	124
E1	Excavator 1	110
E2	Excavator 2	110
E3	Excavator 3	109
E4	Excavator 4	118
DC1	Dust Collector1	101
DC2	Dust Collector 2	101
G1	Generator 1_ 1.5MW	117
G2	Generator 2_ 2.5MW	117
G3	Generator 1_ 1.5MW	117
G4	Generator 4 _ 250 KW	96
L1	Wheel Loader 1	119
MG1	Motor Grader 1	111
MG2	Motor Grader 2	111
RD1	RC Drill 1	128
RD2	RC Drill 2	128
SF1	West Raise Heater	120
SF2	East Raise Heater (160,000 cfm)	116
SF3	Portal Heater 290,000 cfm	119
T1	Transformer 1	113 [1]
T2	Transformer 2	113 [1]
TD1	Track Bulldozer 1	114
TD2	Track Bulldozer 2	114
TD3	Track Bulldozer 3	114
TD4	Track Bulldozer 4	114
TD5	Track Bulldozer 5	114
TD6	Track Bulldozer 6	114
TR_PAG	Truck Route PAG	118
TR_NPAG	Truck Route NPAG	114
TR_OB	Truck Route Overburden	113
TR_SP	Truck Route Stockpile	111
TR_Mill	Truck Route Mill	111

Note: [1] Includes a 5 dB penalty for tonality

Table 7-6: Points of Reception Summary

Point of Reception ID	Point of Reception Description	UTM Coordinates		Height (m)
		Easting	Northing	
POR01	House 01 - North	424437	5415498	4.5
POR02	House 02 - East	431274	5412538	4.5
POR03	House 03 - East	431587	5411870	4.5
POR04	House 04 - East	431496	5411644	4.5
POR05	House 05 - East	431095	5410519	4.5
POR06	House 06 - East	431264	5410420	4.5
POR07	House 07 -Southeast	431077	5408660	4.5
POR08	House 08 - South	431034	5406873	4.5
POR09	House 09 - South	430117	5406700	4.5
POR10	House 10 - South	429796	5406515	4.5
POR11	House 11 - South	429116	5406626	4.5
POR12	House 12 - South	428590	5406620	4.5
POR13	House 13 - South	428175	5406947	4.5
POR14	House 14 - South	427715	5406736	4.5
POR15	House 15 - South	427450	5406952	4.5
POR16	House 16 - West	419623	5410178	4.5
POR17	House 17 - West	419645	5410314	4.5
POR18	House 18 - Northwest	419827	5413577	4.5

Table 7-7: Predicted Sound Level Summary (Year 2020)

Point of Reception ID	Point of Reception Description	Time Period	Total Sound Level at POR (dBA)	Performance Limit (dBA)	Compliance with Performance Limit (Yes / No)
POR01	House 01 - North	Day Time	38	45	Yes
		Evening	33	40	Yes
		Night Time	33	40	Yes
POR02	House 02 - East	Day Time	38	45	Yes
		Evening	34	40	Yes
		Night Time	34	40	Yes
POR03	House 03 - East	Day Time	38	45	Yes
		Evening	34	40	Yes
		Night Time	34	40	Yes
POR04	House 04 - East	Day Time	38	45	Yes
		Evening	35	40	Yes
		Night Time	35	40	Yes
POR05	House 05 - East	Day Time	40	45	Yes
		Evening	36	40	Yes
		Night Time	36	40	Yes
POR06	House 06 - East	Day Time	39	45	Yes
		Evening	36	40	Yes
		Night Time	36	40	Yes
POR07	House 07 -Southeast	Day Time	39	45	Yes
		Evening	36	40	Yes
		Night Time	36	40	Yes
POR08	House 08 - South	Day Time	38	45	Yes
		Evening	34	40	Yes
		Night Time	34	40	Yes
POR09	House 09 - South	Day Time	39	45	Yes
		Evening	35	40	Yes
		Night Time	35	40	Yes
POR10	House 10 - South	Day Time	40	45	Yes
		Evening	36	40	Yes
		Night Time	36	40	Yes
POR11	House 11 - South	Day Time	41	45	Yes
		Evening	37	40	Yes
		Night Time	37	40	Yes
POR12	House 12 - South	Day Time	42	45	Yes
		Evening	38	40	Yes
		Night Time	38	40	Yes
POR13	House 13 - South	Day Time	42	45	Yes
		Evening	38	40	Yes
		Night Time	38	40	Yes
POR14	House 14 - South	Day Time	44	45	Yes
		Evening	39	40	Yes
		Night Time	39	40	Yes
POR15	House 15 - South	Day Time	45	45	Yes
		Evening	40	40	Yes
		Night Time	40	40	Yes
POR16	House 16 - West	Day Time	39	45	Yes
		Evening	35	40	Yes
		Night Time	35	40	Yes
POR17	House 17 - West	Day Time	39	45	Yes
		Evening	35	40	Yes
		Night Time	35	40	Yes
POR18	House 18 - Northwest	Day Time	37	45	Yes
		Evening	32	40	Yes
		Night Time	32	40	Yes

POR: Point of Reception

Table 7-8: Predicted Vibration and Overpressure Level Summary (Blasting)

POR ID	POR Description	Distance (m)	Charge Size (W) (kg)	Ground Borne Vibration in Peak Particle Velocity (mm/sec)	Overpressure - Peak Sound Pressure Level	
					In Front of Working Face (dBL)	Behind Working Face (dBL)
POR 01	House 01 - North	5,213	1,000	0.3	112	113
POR 02	House 02 - East	5,680	1,000	0.3	111	113
POR 03	House 03 - East	5,744	1,000	0.3	111	113
POR 04	House 04 - East	5,486	1,000	0.3	111	113
POR 05	House 05 - East	4,816	1,000	0.4	112	114
POR 06	House 06 - East	4,974	1,000	0.4	112	113
POR 07	House 07 -Southeast	4,875	1,000	0.4	112	114
POR 08	House 08 - South	5,390	1,000	0.3	111	113
POR 09	House 09 - South	4,709	1,000	0.4	113	114
POR 10	House 10 - South	4,549	1,000	0.4	113	114
POR 11	House 11 - South	3,956	1,000	0.5	114	114
POR 12	House 12 - South	3,592	1,000	0.6	115	115
POR 13	House 13 - South	3,057	1,000	0.8	116	116
POR 14	House 14 - South	2,921	1,000	0.8	117	116
POR 15	House 15 - South	2,609	1,000	1.0	118	116
POR 16	House 16 - West	5,053	1,000	0.4	112	113
POR 17	House 17 - West	5,051	1,000	0.4	112	113
POR 18	House 18 - Northwest	6,095	1,000	0.3	110	113

Table 7-9: Local Creek Habitat Impacts by Mine Feature

Regulation	Mine Feature	Watercourse Length (m)				Total Area Overprinted (m^2)				Weighted Usable Area (WUA) Overprinted			
		Loslo Creek (Cowser Drain)	Marr Creek	West Creek	Clark Creek (Teeple Drain)	Loslo Creek (Cowser Drain)	Marr Creek	West Creek	Clark Creek	Loslo Creek (Cowser Drain)	Marr Creek	West Creek	Clark Creek (Teeple Drain)
Schedule 2	Tailing Management Area (including TMA Pond and Water Management Pond)	10,160	2,350			143,344	14,949			32,895	3,434		
	Constructed Wetland / Water Discharge Pond	2,379				47,437				10,941			
	West Mine Rock Stockpile		1,583				5,514				1,230		
	Overburden Stockpile		851				1,945				428		
	Total	**12,539**	**4,784**			**190,781**	**22,408**			**43,836**	**5,092**		
Section 35 (2)	East Mine Rock Stockpile and Mine rock Pond				3,753				21,355				4,828
	Open Pit			3,826				17, 412				3,768	
	Dam structures		316		103		196		227		41		47
	Plant Site / Ancillary Facilities			718				2,139				447	
	Remnant Channels		1,023				4,214				1,017		
	Total	**0**	**1,339**	**4,544**	**3,856**	**0**	**4,410**	**19,551**	**21,582**	**0**	**1,058**	**4,215**	**4,875**
	Grand Total	**12,539**	**6,209**	**4,544**	**3,856**	**190,781**	**26,818**	**19,551**	**21,582**	**43,836**	**6,150**	**4,215**	**4,875**

Table 7-10: Summary by Watercourse of Fish Habitat Overprinted

Watercourse	Watercourse Length (m)	Total Area Overprinted (m^2)	Weighted Usable Area
Clark Creek	3,856	21,582	4,875
Loslo Creek	12,539	190,781	43,836
Marr Creek	6,209	26,818	6,150
West Creek	4,544	19,551	4,215
Total	**27,148**	**258,732**	**59,076**

[1] Habitat units are standardized units, calculated based on the quality of the habitat and its suitability to support the resident species of fish present in the specific watercourse

Table 7-11: Summary of Creek Habitat Disturbance

Creek Name	Total Available Habitat (m^2)	Habitat Disturbed by Project (m^2)	Percent Habitat Disturbed
Clark Creek	53,159.24	21,582	40.6%
Loslo Creek	197,652.29	190,781	96.5%
Marr Creek	27,133.53	26,818	98.8%
West Creek	94,852.15	19,551	20.6%
Total	**372,797.21**	**258,732**	**69.4%**

Table 7-12: Annual Water Balance Data and Calculations Relating to Waters Reporting to the Water Management Pond

Component	Average Condition (m^3/a)	5th Percentile Condition (m^3/a)	95th Percentile Condition (m^3/a)
Pre-development Runoff[1]	4,095,000	1,386,000	8,274,000
Runoff Equivalent (mm)	195	66	394
Operating Water Losses			
Tailings Voids	2,590,000	2,590,000	2,590,000
Process Plant Evaporation	150,000	150,000	150,000
Dust Suppression	260,000	260,000	260,000
Operating Additions			
Mine Water (groundwater only)	1,241,000	1,241,000	1,241,000
Water Management Pond Discharges			
Year 2	2,703,543	186,877	5,012,742
Year 7	3,658,848	650,346	6,419,337
Year 15	4,217,233	696,208	7,447,994
Developed Site Net Water Production[2]			
Year 2	4,462,543	1,945,877	6,771,742
Year 7	5,417,848	2,409,346	8,178,337
Year 15	5,976,233	2,455,208	9,206,994
Developed Site Net Runoff Equivalent (mm)			
Year 2	213	93	322
Year 7	258	115	389
Year 15	285	117	438
Discharge through the Constructed Wetland[3]			
Year 2	2,440,000	686,877	2,440,000
Year 7	2,440,000	1,150,346	2,440,000
Year 15	2,440,000	1,696,208	2,440,000
Direct Pipeline Discharge			
Year 2	263,543	0	2,072,742
Year 7	1,218,848	0	3,479,337
Year 15	1,777,233	0	4,007,994
Predevelopment Runoff			
Pinewood River Runoff at Loslo Creek (106.2 km^2)	20,709,000	7,009,200	41,842,800
Pinewood River Runoff at McCallum Creek (207.1 km^2)	40,384,500	13,668,600	81,597,400

Notes:
1. Values apply to RRP site capture area directed to the tailings management area / water management pond (21 km^2)
2. Values calculated as water management pond discharge - mine water + (water lost to tailings voids, mill evaporation and dust suppression)
3. Values for the 5th and 95th percentiles include a storage transfer of 0.5 Mm^3 to the 5th percentile condition during years 2 and 7, and 1 Mm^3 during Year 15, from the 95th percentile condition

Table 7-13: Calculated Pinewood River Flow Effects for Different Mine Stages

Location	Watershed Area (km^2)	Mean Flow (195 mm/a) Percent Annualized Flow Reduction			5th Percentile Low Flow (66 mm/a) Percent Annualized Flow Reduction			95th Percentile High Flow (394 mm/a) Percent Annualized Flow Reduction		
		Year 2	Year 7	Year 15	Year 2	Year 7	Year 15	Year 2	Year 7	Year 15
Pinewood River at Loslo Creek Outflow	106.2	-8.01	-8.01	-8.01	-9.93	-3.26	4.59	-13.97	-13.97	-13.97
Pinewood River at McCallum Creek Outflow	207.1	-3.45	-1.08	0.30	-5.09	-1.67	2.35	-4.62	-2.89	-2.25
Pinewood River at Kishkakoesis River	460	-1.55	-0.49	0.14	-2.29	-0.75	1.06	-2.08	-1.30	-1.01

Table 7-14: Constructed Wetland Operation and Proposed Effluent Objectives and Limits - V1

Table 7-14a: Receiver to Effluent Mixing Ratio Calculations

Month	Calculated Flows Pinewood River at Loslo Creek - Effective Watershed 85 km² (m³/month)			Proposed Discharge through Constructed Wetland – Year 15 (m³/month)			Typical Ratio of Receiver to Effluent Flows (m³/month)		
	Average Runoff	5th Percentile Low Runoff	95th Percentile High Runoff	Average Runoff	5th Percentile Low Runoff	95th Percentile High Runoff	Average Runoff	5th Percentile Low Runoff	95th Percentile High Runoff
Jan	107,514	36,167	217,479	50,000	34,758	50,000	2.15	1.04	4.35
Feb	64,344	21,645	130,156	0	0	0	-	-	-
Mar	265,456	89,297	536,965	0	0	0	-	-	-
Apr	4,585,546	1,542,535	9,275,671	300,000	208,550	300,000	15.29	7.40	30.92
May	3,523,449	1,185,255	7,127,254	310,000	215,502	310,000	11.37	5.50	22.99
Jun	2,586,303	870,008	5,231,589	150,000	104,275	150,000	17.24	8.34	34.88
Jul	1,562,063	525,463	3,159,751	310,000	215,502	310,000	5.04	2.44	10.19
Aug	758,572	255,177	1,534,445	310,000	215,502	310,000	2.45	1.18	4.95
Sep	854,143	287,326	1,727,765	300,000	208,550	300,000	2.85	1.38	5.76
Oct	1,161,713	390,790	2,349,921	310,000	215,502	310,000	3.75	1.81	7.58
Nov	914,301	307,562	1,849,455	300,000	208,550	300,000	3.05	1.47	6.16
Dec	189,381	63,706	383,080	100,000	69,517	100,000	1.89	0.92	3.83
Total / Average		-	-	2,440,000	1,696,208	2,440,000	6.51	3.15	13.16

Table 7-14b: Effluent Treatability Test Work Results, Receiver Standards, and Suggested Final Effluent Objectives / Limits

Parameter	Receiver Target (mg/L)	Modified Receiver Target (mg/L)	CND Test Time 0 (mg/L)	CND Test 60-day Aging (mg/L)	Additional Treatment	Receiver 75th Percentile (mg/L)	Wetland Monthly Average Objective (mg/L)	Wetland Monthly Average Limit (mg/L)	Comments on Objective Concentration
CNt	-	-	0.19	0.02	no	0.000	0.05	0.1	5 x CNf
CNf	0.005	0.01	0.07	<0.01	no	0.000	0.01	0.02	mod receiver
As	0.005	0.01	0.004	0.003	no	0.003	0.01	0.02	double IPWQO
Cu	0.005	0.017	0.055	0.012	no	0.002	0.02	0.04	mod receiver rounded
Pb	0.005	0.008	0.0002	0.0005	no	0.001	0.01	0.02	mod receiver rounded
Ni	0.025	0.094	0.003	0.003	no	0.003	0.1	0.2	mod receiver rounded
Zn	0.02	0.215	0.004	0.086	no	0.006	0.2	0.4	mod receiver rounded
NH3-U	0.02	0.02	0.07	0.153	yes	-	0.02	0.04	PWQO
Hardness	-	-	510	486	-	195 / 209			

Notes: Modified receiver targets for Cu, Pb, Ni and Zn based on application of US EPA hardness equations for a hardness value of 200 mg/L
Modified receiver target for CNf free based on non-salmonid recommended continuous chronic criterion of 0.01 mg/L from Gensemer et al. 2007
Modified receiver target for As based on a consideration of MOE PWQO and interim PWQO values, the CEQG value and US EPA value for this parameter

Table 7-14c: Metal Values based on Application of US EPA Hardness Equations

Parameter	Cu	PB	Ni	Zn
Hardness	200	200	200	200
Ln hardness	5.298	5.298	5.298	5.298
Factor	2.825	2.040	4.541	5.372
Concentration (µg/L)	16.868	7.689	93.763	215.222
Concentration (mg/L)	0.017	0.008	0.094	0.215
PWQO	0.005	0.005	0.025	0.02

Table 7-14d: Pinewood River Station S3 Hardness Data (mg/L)

Statistic	Value
Minimum	83
Maximum	450
Median	195
Standard Deviation	75.7
75th percentile	208.5
Number of samples	23

Table 7-15: Pinewood River Annualized Monthly Discharge Potential and Mixing Ratios at McCallum Creek for Year 15 (m^3)

Condition	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total / Mean
Pinewood River Flows													
Mean	230,206	137,772	568,388	9,818,464	7,544,326	5,537,731	3,344,653	1,624,237	1,828,870	2,487,433	1,957,681	405,497	35,485,257
5th Percentile	77,439	46,345	191,200	3,302,840	2,537,841	1,862,841	1,125,110	546,378	615,215	836,749	658,546	136,405	11,936,910
95th Percentile	465,662	278,686	1,149,738	19,860,849	15,260,709	11,201,756	6,765,585	3,285,517	3,699,450	5,031,595	3,960,009	820,242	71,779,797
Proposed Discharge[1]													
Mean	50,000	-	-	998,617	998,617	150,000	310,000	310,000	300,000	500,000	500,000	100,000	4,217,234
5th Percentile	34758	-	-	208,550	215,502	104,275	215,502	215,502	208,550	215,502	208,550	69517	1,696,208
95th Percentile	50,000	-	-	1,741,860	1,741,860	150,000	310,000	310,000	300,000	872,137	872,137	100,000	6,447,994
Mixing Ratios[2]													
Mean	4.6	-	-	9.8	7.6	36.9	10.8	5.2	6.1	5.0	3.9	4.1	8.4
5th Percentile[3]		-	-	-	-	17.9	5.2	2.5	2.9	3.9	3.2	-	7.0
95th Percentile[3]	9.3	-	-	11.4	8.8	74.7	21.8	10.6	12.3	5.8	4.5	8.2	11.1

Notes:
1. Discharge to occur to the Pinewood River downstream of McCallum Creek (effective watershed 207 - 21 km^2)
2. Mixing ratios assume that the discharge condition water storage (e.g., mean annual condition) matches with the discharge condition river flow, which is not necessarily the case, as wetter accumulation conditions could be followed by drier receiver conditions, and vice versa
3. Mixing ratios for 5th percentile and 95th percentile conditions are based on annualized monthly values

Table 7-16: Anticipated Displaced Vegetation Community Types

Boreal ELC Community Type	ELC Code	Area Removed (ha)
Active Mineral Barren	B007	5.3
Very Shallow, Dry to Fresh: Red Pine - White Pine Conifer	B011	9.8
Very Shallow, Dry to Fresh: Pine - Black Spruce Conifer	B012	74.0
Dry, Sandy: Red Pine - White Pine Dominated	B040	0.1
Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated	B049	25.2
Dry to Fresh, Coarse: Spruce - Fir Conifer	B052	4.7
Dry to Fresh, Coarse: Aspen - Birch Hardwood	B055	49.6
Fresh, Clayey: Aspen - Birch Hardwood	B088	1,086.6
Fresh, Clayey : Elm - Ash Hardwood	B089	4.1
Fresh, Silty-Fine Loamy: Spruce - Fir Conifer	B101	10.0
Moist, Fine: Black Spruce - Pine Conifer	B114	0.2
Moist, Fine: Spruce - Fir Conifer	B116	0.0
Moist, Fine: Aspen - Birch Hardwood	B119	4.0
Organic Poor Conifer Swamp	B127	13.8
Organic Intermediate Conifer Swamp	B128	164.9
Organic Rich Conifer Swamp	B129	36.5
Intolerant Hardwood Swamp	B130	1.8
Mineral Thicket Swamp	B134	25.2
Organic Thicket Swamp	B135	5.2
Sparse Treed Fen	B136	48.4
Poor Fen	B139	26.8
Mineral Meadow Marsh	B142	86.4
Shrub Shore Fen	B147	48.7
Organic Shallow Marsh	B149	51.5
Rock Barren	B164	5.6
Agriculture	Agriculture	277
Cultural Meadow	CUM	108.0
Open Water	Open Water	19.1

Table 7-17: Potential Habitat Loss Effects on Selected Furbearers

Species	Typical Density (Individuals per km^2)	Potential Number of Displaced Individuals due to RRP (Individuals per km^2)	Reference
American Marten[1]	0.4 – 1.2	5.1 – 15.2	Watt el al. (1996)
Fisher[1]	0.05 – 0.38	0.6 – 4.8	Powell and Zielinski (1994)
Ermine[1]	4 – 11	50.8 – 139.7	Simms (1979)
Long-tailed Weasel[1]	0.38 – 38.5	4.8 – 489.0	Nowak (2005)
Lynx[1]	0.03 – 0.3	0.38 – 3.9	Poole (1994)
Bobcat[1]	0.06 – 0.08	0.8 – 1.0	Lovallo and Anderson (1996)
Red Fox[1]	0.1 – 1	1.3 – 12.7	Voigt (1987)
Wolf[1]	0.02 – 0.04	0.3 – 0.5	MNR (2005)
Black Bear[1]	0.4 – 0.6	5.1 – 7.6	MNR (2009)
Beaver[2]	0.11 – 0.38	0.56 – 1.9	Broschart et al.(1989)
American Mink[3]	0.01 – 0.07	0.3 – 2.0	Halter and Beal (2003)
River Otter[4]	0.0006 – 0.0025	NA	Melquist and Dronkert (1987)

[1] In woodland habitat
[2] In wetland habitat
[3] Per km of river shoreline
[4] Per km of lake shoreline
NA - Not applicable - no lake shoreline habitat will be directly impacted by the RRP

Table 7-18: Potential Impact to Breeding Bird Species

Species	Number of Birds Counted	Density of Breeding Birds/ha	Projected Number of Birds Displaced by Vegetation Removal	Projected Number of Birds Displaced by Sound Emissions
Nashville Warbler	170	0.264	578.8	200.4
White-throated Sparrow	158	0.245	537.1	186.0
Ovenbird	145	0.225	493.3	170.8
Red-eyed Vireo	134	0.208	456.0	157.9
Common Yellowthroat	88	0.137	300.3	104.0
Black-and-white Warbler	83	0.129	282.8	97.9
American Robin	79	0.123	269.6	93.4
Veery	79	0.123	269.6	93.4
Chestnut-sided Warbler	74	0.115	252.1	87.3
Hermit Thrush	69	0.107	234.6	81.2
Red-breasted Nuthatch	61	0.095	208.3	72.1
Savannah Sparrow	49	0.076	166.6	57.7
Swamp Sparrow	46	0.071	155.6	53.9
Black-throated Green Warbler	43	0.067	146.9	50.9
Clay-colored Sparrow	42	0.065	142.5	49.3
Mourning Warbler	41	0.064	140.3	48.6
Black-capped Chickadee	39	0.061	133.7	46.3
Least Flycatcher	39	0.061	133.7	46.3
Song Sparrow	39	0.061	133.7	46.3
Magnolia Warbler	38	0.059	129.3	44.8
Northern Flicker	38	0.059	129.3	44.8
Blue Jay	35	0.054	118.4	41.0
Winter Wren	34	0.053	116.2	40.2
Cedar Waxwing	30	0.047	103.0	35.7
Alder Flycatcher	26	0.040	87.7	30.4
American Goldfinch	24	0.037	81.1	28.1
Red-winged Blackbird	22	0.034	74.5	25.8
Yellow-bellied Sapsucker	21	0.033	72.3	25.1
Rose-breasted Grosbeak	19	0.030	65.8	22.8
Northern Parula	18	0.028	61.4	21.3
Golden-crowned Kinglet	14	0.022	48.2	16.7
American Redstart	13	0.020	43.8	15.2
Eastern Kingbird	13	0.020	43.8	15.2
Golden-winged Warbler	13	0.020	43.8	15.2
Yellow-rumped Warbler	13	0.020	43.8	15.2
Blue-headed Vireo	12	0.019	41.7	14.4
House Wren	11	0.017	37.3	12.9
Common Raven	10	0.016	35.1	12.1
Wilson's Snipe	10	0.016	35.1	12.1
Brown-headed Cowbird	9	0.014	30.7	10.6
Philadelphia Vireo	9	0.014	30.7	10.6
Eastern Wood-Peewee	8	0.012	26.3	9.1

Species	Number of Birds Counted	Density of Breeding Birds/ha	Projected Number of Birds Displaced by Vegetation Removal	Projected Number of Birds Displaced by Sound Emissions
Yellow Warbler	8	0.012	26.3	9.1
American Crow	7	0.011	24.1	8.4
Bobolink	7	0.011	24.1	8.4
Chipping Sparrow	7	0.011	24.1	8.4
Great Crested Flycatcher	7	0.011	24.1	8.4
LeConte's Sparrow	7	0.011	24.1	8.4
Palm Warbler	7	0.011	24.1	8.4
Swainson's Thrush	7	0.011	24.1	8.4
Black-billed Cuckoo	6	0.009	19.7	6.8
Brewer's Blackbird	6	0.009	19.7	6.8
Downy Woodpecker	6	0.009	19.7	6.8
European Starling	6	0.009	19.7	6.8
Northern Waterthrush	6	0.009	19.7	6.8
Sandhill Crane	6	0.009	19.7	6.8
Black-billed Magpie	5	0.008	17.5	6.1
Canada Goose	5	0.008	17.5	6.1
Gray Catbird	5	0.008	17.5	6.1
Scarlet Tanager	5	0.008	17.5	6.1
Sedge Wren	5	0.008	17.5	6.1
Trumpeter Swan	5	0.008	17.5	6.1
Blackburnian Warbler	4	0.006	13.2	4.6
Brown Thrasher	4	0.006	13.2	4.6
Common Grackle	4	0.006	13.2	4.6
Connecticut Warbler	4	0.006	13.2	4.6
Red Crossbill	4	0.006	13.2	4.6
Yellow-bellied Flycatcher	4	0.006	13.2	4.6
Black-throated Blue Warbler	3	0.005	11.0	3.8
Brown Creeper	3	0.005	11.0	3.8
Canada Warbler	3	0.005	11.0	3.8
Woodpecker sp.	3	0.005	11.0	3.8
Barn Swallow	2	0.003	6.6	2.3
Belted Kingfisher	2	0.003	6.6	2.3
Common Goldeneye	2	0.003	6.6	2.3
Dark-eyed Junco	2	0.003	6.6	2.3
Mallard	2	0.003	6.6	2.3
Purple Finch	2	0.003	6.6	2.3
Ruby-crowned Kinglet	2	0.003	6.6	2.3
Ruby-throated Hummingbird	2	0.003	6.6	2.3
Ruffed Grouse	2	0.003	6.6	2.3
Tennessee Warbler	2	0.003	6.6	2.3
Warbling Vireo	2	0.003	6.6	2.3
Wilson's Warbler	2	0.003	6.6	2.3
Wood Thrush	2	0.003	6.6	2.3
Yellow-throated Vireo	2	0.003	6.6	2.3

Species	Number of Birds Counted	Density of Breeding Birds/ha	Projected Number of Birds Displaced by Vegetation Removal	Projected Number of Birds Displaced by Sound Emissions
American White Pelican	1	0.002	4.4	1.5
Baltimore Oriole	1	0.002	4.4	1.5
Barred Owl	1	0.002	4.4	1.5
Black-backed Woodpecker	1	0.002	4.4	1.5
Boreal Chickadee	1	0.002	4.4	1.5
Broad-winged Hawk	1	0.002	4.4	1.5
Cape May Warbler	1	0.002	4.4	1.5
Eastern Phoebe	1	0.002	4.4	1.5
Gray Jay	1	0.002	4.4	1.5
Hairy Woodpecker	1	0.002	4.4	1.5
Killdeer	1	0.002	4.4	1.5
Olive-sided Flycatcher	1	0.002	4.4	1.5
Sharp-tailed Grouse	1	0.002	4.4	1.5
Wood Duck	1	0.002	4.4	1.5

Table 7-19: Potential Impact to Woodland Breeding Birds

Species	Breeding Bird Density (birds/ha)	Projected Total Number of Birds Displaced through Woodland Vegetation Removal (# birds)	Projected Number of Birds Displaced by Sound Emissions (# birds)
Nashville Warbler	0.288	365.8	119.8
Ovenbird	0.265	336.6	110.2
White-throated Sparrow	0.235	298.5	97.8
Red-eyed Vireo	0.212	269.3	88.2
Veery	0.162	205.8	67.4
Chestnut-sided Warbler	0.133	168.9	55.3
Hermit Thrush	0.129	163.8	53.7
Black-and-white Warbler	0.119	151.1	49.5
Common Yellowthroat	0.119	151.1	49.5
American Robin	0.106	134.6	44.1
Red-breasted Nuthatch	0.096	121.9	39.9
Black-capped Chickadee	0.073	92.7	30.4
Mourning Warbler	0.073	92.7	30.4
Black-throated Green Warbler	0.063	80.0	26.2
Least Flycatcher	0.060	76.2	25.0
Blue Jay	0.056	71.1	23.3
Northern Flicker	0.053	67.3	22.0
Cedar Waxwing	0.040	50.8	16.6
Alder Flycatcher	0.036	45.7	15.0
Golden-crowned Kinglet	0.036	45.7	15.0
Magnolia Warbler	0.036	45.7	15.0
Northern Parula	0.036	45.7	15.0
Winter Wren	0.036	45.7	15.0
American Goldfinch	0.033	41.9	13.7
Golden-winged Warbler	0.030	38.1	12.5
American Redstart	0.027	34.3	11.2
Eastern Wood-Pewee	0.027	34.3	11.2
Yellow-rumped Warbler	0.027	34.3	11.2
American Crow*	0.020	25.4	8.3
Brown-headed Cowbird*	0.020	25.4	8.3
Eastern Kingbird*	0.020	25.4	8.3
Chipping Sparrow	0.017	21.6	7.1
Great Crested Flycatcher	0.017	21.6	7.1
House Wren	0.017	21.6	7.1
Palm Warbler	0.017	21.6	7.1
Philadelphia Vireo	0.017	21.6	7.1
Yellow-bellied Sapsucker	0.017	21.6	7.1
Blue-headed Vireo	0.013	16.5	5.4
Downy Woodpecker	0.013	16.5	5.4
Northern Waterthrush	0.013	16.5	5.4
Rose-breasted Grosbeak	0.013	16.5	5.4
Swainson's Thrush	0.013	16.5	5.4

Species	Breeding Bird Density (birds/ha)	Projected Total Number of Birds Displaced through Woodland Vegetation Removal (# birds)	Projected Number of Birds Displaced by Sound Emissions (# birds)
Black-billed Cuckoo	0.010	12.7	4.2
Scarlet Tanager	0.010	12.7	4.2
Yellow-bellied Flycatcher	0.010	12.7	4.2
Barn Swallow*	0.007	8.9	2.9
Blackburnian Warbler	0.007	8.9	2.9
Brown Thrasher	0.007	8.9	2.9
Wood Thrush	0.007	8.9	2.9
Yellow-throated Vireo	0.007	8.9	2.9
Baltimore Oriole	0.003	3.8	1.2
Black-throated Blue Warbler	0.003	3.8	1.2
Boreal Chickadee	0.003	3.8	1.2
Dark-eyed Junco	0.003	3.8	1.2
Gray Catbird	0.003	3.8	1.2
Ruby-crowned Kinglet	0.003	3.8	1.2
Wood Duck	0.003	3.8	1.2

* Listed in Appendix G of MNR (2000) as utilizing both forested and grassland habitats

Table 7-20: Potential Impact to Open Country Breeding Birds

Species	Breeding Bird Density (birds/ha)	Projected Total Number of Birds Displaced through Open Country Vegetation Removal (# birds)	Projected Number of Birds Displaced by Sound Emissions (# birds)
Savannah Sparrow	0.644	247.8	115.9844
Clay-colored Sparrow	0.254	97.7	45.7454
Song Sparrow	0.234	90.0	42.1434
Bobolink	0.137	52.7	24.6737
LeConte's Sparrow	0.137	52.7	24.6737
Sandhill Crane	0.117	45.0	21.0717
Black-billed Magpie	0.078	30.0	14.0478
Red-winged Blackbird	0.059	22.7	10.6259
Barn Swallow*	0.039	15.0	7.0239
Eastern Kingbird*	0.039	15.0	7.0239
Sedge Wren	0.039	15.0	7.0239
Yellow Warbler	0.039	15.0	7.0239
American Crow*	0.020	7.7	3.602
Common Raven	0.020	7.7	3.602
Wilson's Snipe	0.020	7.7	3.602

* Listed in Appendix G of MNR (2000) as utilizing both forested and grassland habitats

Table 7-21: Trapline Effects

Trapline	Total Area of Trapline (ha)	Total Area of Trapline within the HLSA (%)	Total Area of Trapline Overprinted by RRP Footprint (%)
FF021890	13,982	55	0
FF020571	4,713	5.8	0
FF006	12,002	10.6	0
FF021755	4,991	100	38
FF021318	14,310	71	13.9
FF022000	9,617	70.2	0.3
FF031698	9,644	68	3.7
FF007	13,838	1.5	0
FF021475	7,832	0.2	0

Table 7-22: Estimated Effects of the RRP Construction on the Ontario Economy

Economic Indicator		Direct	Indirect	Induced	Total
Gross Domestic Product at factor cost ($M)	Project Expenditure	30.6	17.3	14.5	62.4
	Supplier Industry Effects	171.6	97.1	81.2	349.9
	Total	202.2	114.5	95.6	412.4
Employment (person-years)	Project Expenditure	525	190	134	848
	Supplier Industry Effects	1,890	1,062	750	3,702
	Total	2415	1252	883	4550
Household Income ($M)	Project Expenditure	64.0	12.3	6.9	83.2
	Supplier Industry Effects	89	69	39	197
	Total	153.4	81.0	45.7	280.1

Table 7-23: Estimated Annual Effects of RRP Operation on the Ontario Economy

Phase	Year	Gross Domestic Product ($M)				Employment (person-years)				Labour Income ($M)			
		Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Phase One	2016	86.3	24.9	27.5	138.7	319	268	254	841	47.1	17.5	13.1	77.7
	2017	254.5	73.6	81.0	409.1	940	791	748	2,479	138.9	51.6	38.7	229.1
	2018	265.2	76.6	84.4	426.2	980	824	779	2,583	144.7	53.8	40.3	238.7
Phase Two	2019	343.0	99.1	109.2	551.3	1,267	1,066	1008	3,340	187.1	69.5	52.1	308.8
	2020	326.6	94.4	103.9	524.9	1,206	1,015	960	3,180	178.2	66.2	49.6	294.0
	2021	299.1	86.4	95.2	480.7	1,105	929	879	2,913	163.2	60.6	45.4	269.3
	2022	257.9	74.5	82.1	414.5	953	801	758	2,512	140.7	52.3	39.2	232.2
	2023	257.6	74.5	82.0	414.1	952	800	757	2,509	140.6	52.2	39.1	231.9
	2024	264.5	76.4	84.2	425.0	977	822	777	2,575	144.3	53.6	40.2	238.1
	2025	306.7	88.6	97.6	493.0	1,133	953	901	2,987	167.4	62.2	46.6	276.2
	2026	119.7	34.6	38.1	192.4	442	372	352	1,166	65.3	24.3	18.2	107.8
Phase Three	2027	99.2	28.7	31.6	159.5	366	308	292	966	54.1	20.1	15.1	89.3
	2028	89.0	25.7	28.3	143.1	329	277	262	867	48.6	18.1	13.5	80.2
	2029	57.4	16.6	18.3	92.3	212	178	169	559	31.3	11.6	8.7	51.7
	2030	53.5	15.4	17.0	85.9	197	166	157	521	29.2	10.8	8.1	48.1
	2031	68.8	19.9	21.9	110.6	254	214	202	670	37.6	14.0	10.5	62.0
Overall Total		3,149	910	1,002	5,061	11,632	9,784	9,255	30,668	1,718	638	478	2,835
Overall Average		196.8	56.9	62.6	316.3	727	611	578	1917	107.4	39.9	29.9	177.2
Phase One Average		202.0	58.4	64.3	324.7	746	628	594	1967	110.2	41.0	30.7	181.9
Phase Two Average		271.9	78.6	86.5	437.0	1004	845	799	2648	148.4	55.1	41.3	244.8
Phase Three Average		73.6	21.3	23.4	118.3	272	229	216	717	40.2	14.9	11.2	66.3

Table 7-24: Estimated Effects of RRP Decommissioning and Closure Activities on the Ontario Economy

Economic Indicator		Direct	Indirect	Induced	Total
Gross Domestic Product at factor cost ($M)	Project Expenditure	0.0	0.0	0.0	0.0
	Supplier Industry Effects	8.0	4.5	3.8	16.3
	Total	8.0	4.5	3.8	16.3
Employment (person-years)	Project Expenditure	0	0	0	0
	Supplier Industry Effects	93	49	35	177
	Total	93	49	35	177
Household Income ($M)	Project Expenditure	0.0	0.0	0.0	0.0
	Supplier Industry Effects	5.8	3.2	1.8	10.8
	Total	5.8	3.2	1.8	10.8

Table 7-25: Estimated HRSA Workforce by NOC-S Category

	HRSA Labour Force (not including First Nation Reserves)		
	2006	2012 (estimated)	Change (%)
Total Labour Force	8,880	8,380	-5.6
C Natural and applied sciences and related occupations	215	264	23.0
C0 Professional occupations in natural and applied sciences	95	112	17.5
C1 Technical occupations related to natural and applied sciences	130	153	17.5
H Trades, transport and equipment operators and related occupations	1,665	1,324	-20.5
H0 Contractors and supervisors in trades and transportation	50	53	6.6
H1 Construction trades	245	313	27.6
H2 Stationary engineers, power station operators and electrical trades and telecommunications occupations	140	114	-18.4
H3 Machinists, metal forming, shaping and erecting occupations	80	65	-18.4
H4 Mechanics	295	241	-18.4
H5 Other trades, n.e.c.	35	29	-18.4
H6 Heavy equipment and crane operators, including drillers	150	93	-38.2
H7 Transportation equipment operators and related workers, excluding labourers	335	207	-38.2
H8 Trades helpers, construction, and transportation labourers and related occupations	275	209	-23.9
I Occupations unique to primary industry	495	463	-6.5
I0 Occupations unique to agriculture, excluding labourers	195	192	-1.5
I1 Occupations unique to forestry operations, mining, oil and gas extraction, and fishing, excluding labourers	180	177	-1.5
I2 Primary production labourers	95	94	-1.5
J Occupations unique to processing, manufacturing and utilities	580	290	-50.0
J0 Supervisors in manufacturing	55	30	-46.2
J1 Machine operators in manufacturing	320	172	-46.2
J2 Assemblers in manufacturing	45	24	-46.2
J3 Labourers in processing, manufacturing and utilities	180	64	-64.2

Source: Statistics Canada 2007a; Statistics Canada 2013b

Table 7-26: Estimated Effects of RRP Construction on the HRSA Economy

Economic Indicator		Direct	Indirect	Induced	Total
Gross Domestic Product at factor cost ($M)	Project Expenditure	10.3	4.7	4.5	19.5
	Supplier Industry Effects	10.2	6.9	5.1	22.2
	Total	20.5	11.6	9.7	41.7
Employment (person-years)	Project Expenditure	211	69	32	312
	Supplier Industry Effects	115	64	51	230
	Total	326	134	82	542
Household Income ($M)	Project Expenditure	20.0	3.8	2.2	26.0
	Supplier Industry Effects	4.0	4.4	2.5	10.8
	Total	24.0	8.2	4.6	36.8

Table 7-27: Estimated Annual Effects of the RRP Operations on the HRSA Economy

	Year	Gross Domestic Product ($M)				Employment (person-years)				Labour Income ($M)			
		Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Phase One	2016	20.7	4.1	6.6	31.4	194	74	59	326	17.8	4.7	3.1	25.6
	2017	34.7	2.7	9.2	46.7	251	90	85	426	26.3	5.9	4.4	36.6
	2018	33.3	2.6	8.9	44.7	240	86	82	408	25.2	5.6	4.2	35.1
Phase Two	2019	37.0	2.9	9.9	49.8	267	96	91	455	28.1	6.3	4.7	39.1
	2020	37.2	2.9	9.9	50.0	269	97	91	457	28.2	6.3	4.7	39.3
	2021	37.3	2.9	9.9	50.1	269	97	92	458	28.3	6.3	4.7	39.3
	2022	37.5	2.9	10.0	50.4	271	97	92	460	28.4	6.4	4.8	39.6
	2023	36.3	2.8	9.7	48.8	262	94	89	445	27.5	6.2	4.6	38.3
	2024	32.2	2.5	8.6	43.3	232	84	79	395	24.4	5.5	4.1	34.0
	2025	22.5	1.8	6.0	30.3	162	58	55	276	17.1	3.8	2.9	23.7
	2026	16.0	1.3	4.3	21.6	116	42	39	197	12.2	2.7	2.0	16.9
Phase Three	2027	15.8	1.2	4.2	21.2	114	41	39	194	12.0	2.7	2.0	16.7
	2028	14.7	1.2	3.9	19.8	106	38	36	180	11.1	2.5	1.9	15.5
	2029	12.1	0.9	3.2	16.2	87	31	30	148	9.2	2.0	1.5	12.7
	2030	12.0	0.9	3.2	16.1	87	31	29	147	9.1	2.0	1.5	12.7
	2031	9.6	0.8	2.6	12.9	69	25	24	118	7.3	1.6	1.2	10.2
Average		25.6	2.2	6.9	34.6	187	68	63	318	19.5	4.4	3.3	27.2
Phase One Average		29.6	3.1	8.2	40.9	228	83	75	387	23.1	5.4	3.9	32.4
Phase Two Average		32.0	2.5	8.5	43.0	231	83	79	393	24.3	5.4	4.1	33.8
Phase Three Average		12.8	1.0	3.4	17.3	93	33	32	158	9.7	2.2	1.6	13.5

Table 7-28: Projected RRP Purchases of Goods and Services during Operations from the HRSA

Phase	Year	Goods ($M)					Services ($M)				Total
		Machinery	Maintenance	Fuel	Mining Consumables	Other	Construction	Technical	Mining-related	Other	
Phase One	2016	0.2	0.4	1.1	1.2	0.1	2.0	0.0	0.2	0.2	5.5
	2017	0.5	1.1	2.9	3.1	0.2	5.0	0.1	0.4	0.6	14.0
	2018	0.5	1.1	2.7	2.9	0.1	4.7	0.1	0.4	0.6	13.1
Phase Two	2019	0.5	1.2	3.0	3.1	0.2	5.1	0.1	0.4	0.6	14.2
	2020	0.5	1.2	3.0	3.1	0.2	5.1	0.1	0.4	0.6	14.2
	2021	0.5	1.2	2.9	3.1	0.2	5.1	0.1	0.4	0.6	14.1
	2022	0.5	1.2	3.0	3.1	0.2	5.1	0.1	0.4	0.6	14.1
	2023	0.5	1.1	2.8	3.0	0.2	4.9	0.1	0.4	0.6	13.6
	2024	0.5	1.0	2.5	2.7	0.1	4.4	0.1	0.4	0.5	12.1
	2025	0.3	0.7	1.8	1.9	0.1	3.0	0.0	0.2	0.4	8.4
	2026	0.2	0.4	1.1	1.2	0.1	1.9	0.0	0.2	0.2	5.4
Phase Three	2027	0.2	0.5	1.2	1.3	0.1	2.1	0.0	0.2	0.3	5.9
	2028	0.2	0.5	1.2	1.2	0.1	2.0	0.0	0.2	0.2	5.6
	2029	0.2	0.4	1.0	1.1	0.1	1.8	0.0	0.1	0.2	4.9
	2030	0.2	0.4	1.0	1.1	0.1	1.8	0.0	0.1	0.2	4.9
	2031	0.1	0.3	0.8	0.8	0.0	1.4	0.0	0.1	0.2	3.8

Table 7-29: Estimated Skill Demand (Jobs) for Onsite Operations Workforce

Year	Personnel	Unskilled	Semi-skilled	Skilled	Professional	Management
2014	128	11	62	39	8	8
2015	191	16	93	58	11	12
2016	353	30	171	108	21	23
2017	451	38	219	138	27	29
2018	482	41	234	147	29	31
2019	562	48	273	171	34	37
2020	578	49	280	176	35	38
2021	587	50	285	179	35	38
2022	601	51	291	183	36	39
2023	592	50	287	181	36	38
2024	516	44	250	157	31	34
2025	365	31	177	111	22	24
2026	355	30	172	108	21	23
2027	249	21	121	76	15	16
2028	219	19	106	67	13	14
2029	135	11	65	41	8	9
2030	131	11	64	40	8	9
2031	131	11	64	40	8	9

Table 7-30: Estimated Tax Revenue Generated over the RRP Construction Phase

Economic Indicator		Direct	Indirect	Induced	Total
Tax Revenue ($M)	Personal income tax	34.3	18.3	9.3	61.9
	Indirect taxes on products	11.4	2.1	1.5	13.5
	Indirect taxes on production	5.8	6.1	4.3	11.8
	Total	51.5	26.5	15.1	78.0
Allocation by Level of Government ($M)					
Federal		33.6	17.7	10.0	51.3
Provincial		17.9	8.8	5.1	26.7

Table 7-31: Estimated Tax Revenue Generated over the RRP Operations Phase

Phase	Year	Federal Taxes ($M)					Provincial Taxes ($M)				
		Corporate	Direct	Indirect	Induced	Total	Corporate	Direct	Indirect	Induced	Total
Phase One	2016	0	11	3	2	17	0	5	2	1	9
	2017	4	34	10	7	55	4	16	5	4	29
	2018	5	35	11	8	58	5	17	6	4	31
Phase Two	2019	15	45	14	10	84	14	22	7	5	48
	2020	44	43	13	9	110	40	21	7	5	72
	2021	35	40	12	9	95	32	19	6	5	62
	2022	30	34	10	7	81	27	16	5	4	52
	2023	33	34	10	7	85	30	16	5	4	56
	2024	40	35	11	8	93	36	17	6	4	62
	2025	57	41	12	9	119	51	19	6	5	82
	2026	12	16	5	3	36	10	8	3	2	22
Phase Three	2027	7	13	4	3	27	6	6	2	2	16
	2028	6	12	4	3	24	5	6	2	1	14
	2029	0	8	2	2	12	0	4	1	1	6
	2030	0	7	2	2	11	0	3	1	1	5
	2031	5	9	3	2	19	4	4	1	1	11
Average		18	26	8	6	58	16	12	4	3	36
Phase One Average		3	27	8	6	44	3	13	4	3	23
Phase Two Average		33	36	11	8	88	30	17	6	4	57
Phase Three Average		4	10	3	2	18	3	5	2	1	11

Table 7-32: Estimated Tax Revenue Generated from RRP Decommissioning and Active Closure Activities

Economic Indicator		Direct	Indirect	Induced	Total
Tax Revenue ($M)	Personal income tax	0.1	0.1	0.0	0.2
	Indirect taxes on products	0.0	0.0	0.0	0.1
	Indirect taxes on production	0.0	0.0	0.0	0.1
	Total	0.2	0.1	0.1	0.4
Allocation by Level of Government ($M)					
Federal		0.1	0.1	0.0	0.3
Ontario		0.1	0.0	0.0	0.1

Table 7-33: Predicted Population Change for HRSA Communities

Community	Alberton	Chapple	Dawson	Emo	Fort Frances	La Vallee	Morley	Rainy River	Sioux Narrows – Nestor Falls	First Nation Reserves	Non-First Nation Communities	HRSA
% of Incoming Workers	4.9	5.5	0.0	15.0	60.0	5.5	0.0	0.0	9.1	0.0	100.0	100.0
2011	864	741	563	1,252	7,952	988	474	842	720	3,522	14,396	17,918
2014	865	744	558	1,268	7,990	989	470	835	730	3,491	14,449	17,940
2015	867	747	556	1,277	8,019	991	468	832	736	3,481	14,494	17,975
2016	876	757	555	1,308	8,132	1,001	467	830	754	3,471	14,679	18,149
2017	880	763	553	1,325	8,192	1,005	466	827	765	3,460	14,773	18,233
2018	880	763	552	1,328	8,195	1,005	465	825	767	3,451	14,776	18,227
2019	883	767	550	1,341	8,240	1,009	463	823	775	3,441	14,847	18,289
2020	881	766	549	1,340	8,231	1,007	462	821	775	3,432	14,829	18,261
2021	880	765	548	1,339	8,221	1,006	461	819	774	3,423	14,801	18,224
2022	879	765	546	1,339	8,215	1,005	460	817	774	3,415	14,790	18,205
2023	877	763	545	1,337	8,198	1,002	459	815	773	3,408	14,758	18,167
2024	875	762	544	1,334	8,181	1,000	458	814	771	3,401	14,727	18,128
2025	874	760	543	1,331	8,163	998	457	812	769	3,394	14,696	18,090
2026	872	758	542	1,328	8,145	996	456	810	768	3,387	14,665	18,052
2027	870	756	540	1,325	8,126	994	455	808	766	3,379	14,631	18,010
2028	868	755	539	1,322	8,107	991	454	806	764	3,371	14,597	17,968
2029	866	753	538	1,319	8,088	989	453	805	762	3,363	14,563	17,926
2030	864	751	537	1,316	8,069	987	452	803	760	3,355	14,529	17,884
2031	861	749	535	1,312	8,045	984	451	800	758	3,347	14,495	17,843

Source: Statistics Canada (2012c); Ministry of Finance (2012); BBA (2013b)

Table 7-34: Potential Dwelling Change for HRSA Communities

Community	Total Population (2011)	Number of Dwellings (2011)	Potential New Households			New residents as Share of Current Dwellings (%)			Number of Dwellings Occupied by Usual Residents (2011)	New Residents as Share of Current Occupied Dwellings (%)
			2014	2016	2019	2014	2016	2019		
Alberton	864	354	3	6	5	1.0	1.7	1.5	309	4.8
Chapple	741	376	4	7	6	1.0	1.8	1.6	270	6.1
Dawson	563	307	0	0	0	0.0	0.0	0.0	223	0.0
Emo	1,252	483	10	18	17	2.1	3.7	3.4	446	10.1
Fort Frances	7,952	3,774	41	72	66	1.1	1.9	1.8	3,500	5.1
La Vallee	988	383	4	7	6	1.0	1.7	1.6	359	4.6
Morley	474	227	0	0	0	0.0	0.0	0.0	175	0.0
Rainy River	842	457	0	0	0	0.0	0.0	0.0	108	0.0
Sioux Narrows-Nestor Falls	720	1,044	6	11	10	0.6	1.1	1.0	301	9.1
HRSA (Non-Reserve)	14,396	7,405	63	110	101	0.8	1.5	1.4	5,691	4.8

Table 7-35: Temporary Accommodation in the HRSA

Community	Hotel / Motel / Inn			Lodge / Resort / Cottage			Bed and Breakfast			Campground	
	Operators	Rooms	Beds	Operators	Cabins	Beds	Operators	Rooms	Beds	Operators	Lots
Alberton	0	0	0	0	0	0	0	0	0	0	0
Chapple	0	0	0	0	0	0	1	2	3	0	0
Dawson	0	0	0	0	0	0	0	0	0	0	0
Emo	1	20	38	4	24	147	0	0	0	0	0
Fort Frances	7	282	500	1	2	9	0	0	0	0	0
La Vallee	0	0	0	2	8	40	0	0	0	0	0
Rainy River	1	18	30	2	5	25	0	0	0	1	11
Sioux Narrows-Nestor Falls	2	24	43	4	43	142	0	0	0	1	32
HRSA	11	344	611	13	82	363	1	2	3	2	43

Source: AMEC (2013e)

Table 7-36: Change in Households in HRSA Communities

Area	Total Population (2011)	Number of Dwellings (2011)	Potential New Households			New Residents as Share of Current Dwellings (%)		
			2014	2016	2019	2014	2016	2019
Alberton	864	354	3	11	10	0.7	3.1	2.8
Chapple	741	376	4	13	12	1.0	3.5	3.2
Dawson	563	307	2	7	7	0.5	2.4	2.1
Emo	1,252	483	6	23	21	1.3	4.7	4.3
Fort Frances	7,952	3,774	40	143	131	1.1	3.8	3.5
La Vallee	988	383	3	13	11	0.8	3.3	3.0
Morley	474	227	1	6	6	0.6	2.7	2.4
Rainy River	842	457	2	11	10	0.5	2.4	2.1
Sioux Narrows-Nestor Falls	720	1,044	2	9	8	0.2	0.9	0.8
HRSA (excluding First Nation Reserves)	14,396	7,405	63	236	215	0.9	3.2	2.9

Source: Statistics Canada (2012c)

Table 7-37: Traffic during Construction Phase

Highway/Route	Average Personnel Vehicle Trips per Day	Average Heavy Trucks Trips per Day	Total Vehicles Trips per Day
Highway 71/11 - west from Fort Frances and north on Highway 71 to Highway 600 junction	525	3	528
Highway 71- south from Sioux Narrows to Highway 600 junction	133	3	136
Total	658	6	664

Table 7-38: Daily RRP Traffic at Select Locations - Construction Phase

Highway Section	2009 AADT	Daily Heavy Load Traffic	Daily Personnel Vehicle Trips	Daily Total AADT with Project Traffic	% Increase in AADT over 2009 AADT	Highway Level of Service Rating (A – F)
Highway 71 - south of Highway 600 junction	1,250	6	525	1,781	42.5	C
Highway 71 - south from Sioux Narrows to Highway 600 junction	1,000	6	133	1,139	13.9	A
Highway 11 from Fort Frances to Emo	3,100*	6	525	3,631	17.1	C
Highway 11 from Emo to Highway 71 junction	1,600	6	525	2,131	33.2	B, C

Source: MTO (2009, 2010)
AADT = average annual daily traffic
*Average AADT
Level of Service Ratings range from A (best operating conditions) to F (poorest operating conditions)

Table 7-39: Traffic during Operation Phase 2 (Average)

Highway/Route	Average Total Personnel Vehicle Trips per Day	Average Heavy Trucks Trips per Day	Average Vehicles Trips per Day
Highway 71/11 - east from Fort Frances	666	2	668
Highway 71 - south from Sioux Narrows to Highway 600 junction	71	2	73
Highway 11 - between Rainy River and Highway 71 junction	43	0	43
Total	780	4	784

Table 7-40: Daily RRP Traffic at Select Locations - Operation Phase 2 (Average)

Highway Section	2009 AADT	Daily Heavy Load Traffic	Daily Commuter Trips	Daily Total AADT with Project Traffic	% Increase in Daily Traffic over 2009 AADT	Highway Level of Service Rating (A – F)
Highway 71- south of Highway 600 junction	1,250	2	666	1,918	53.4	C
Highway 71- south from Sioux Narrows to Highway 600 junction	1,000	2	71	1,073	7.3	A
Highway 11 from Fort Frances to Emo	3,100	2	666	3,768	21.6	C
Highway 11 from Emo to Highway 71 junction	1,600	2	666	2,268	41.8	B, C
Highway 11 from junction with Highway 71 to Rainy River	1,225	0	43	1,268	3.5	A

Source: MTO (2009, 2010)
AADT = average annual daily traffic
Level of Service Ratings range from A (best operating conditions) to F (poorest operating conditions)

Table 7-41: Calculated Pinewood River Water Quality following Treated Effluent Discharge (Downstream of McCallum Creek)

Parameter	ODWS (mg/L)	CDWQG (mg/L)	Receiver[1] Target (mg/L)	Modified[1] Receiver Target[1] (mg/L)	Canadian Environmental Quality Guideline (CEQG)	CND Test Time 0 (mg/L)	CND Test 60-day Aging Test Results (mg/L)	Additional Treatment Required	Receiver 75th Percentile Values (mg/L)	Resulting Receiver Blended 1:1 Concentration (mg/L)
Free cyanide	-	-	0.005	0.01[1]	0.005	0.07	<0.01	no	0.0	<0.005
Total cyanide	0.2	0.2*	-	-	-	0.2	<0.01		0.0	<0.005
Aluminum	0.1	0.1	0.075	3.54[3]	0.1	0.1	<0.1	no	0.015	0.06
Antimony	0.006*	0.006*	0.02	-	-	0.07	0.036		0.00053	0.018
Arsenic	0.025	0.01*	0.005	-	0.005	0.004	0.003	no	0.003	0.003
Barium	1.0*	1.0*	-	-		0.023	0.029		-	-
Boron	5.0*	5.0*	0.2	-	1.5	0.04	0.05		0.037	0.044
Cadmium	0.005*	0.005*	0.0005	-	Equation[6]	0.00002	0.0015		0.0001	0.0008
Chromium	0.05*	0.05*	0.0089	-	0.0089	0.0008	<0.0005		0.005	0.0028
Cobalt	-	-	0.0009	0.004[4]		0.0089	0.0016	no	0.0007	0.0012
Copper	1.0	1.0	0.005	0.017	Equation[6]	0.055	0.012	no	0.002	0.007
Iron	0.3	0.3	0.3	1.0[5]	0.3	0.038	<0.003	no	0.93	0.47
Lead	0.01	0.01*	0.005	0.008	Equation[6]	0.0002	0.0005	no	0.001	0.00075
Mercury	0.001*	0.001*	0.0002	-	0.000026	<0.00001	0.00001		0.0001	<0.00006
Molybdenum	-	-	0.04	-	0.073	0.046	0.049	no	0.001	0.025
Nickel	-	-	0.025	0.094	0.025[6]	0.003	0.003	no	0.003	0.003
Selenium	0.01*	0.01*	0.1	-	0.001	0.009	0.002		0.002	0.002
Vanadium	-	-	0.006	-	-	0.0004	0.0003	no	0.002	0.0012
Zinc	5.0	5.0	0.020	0.215	0.03	0.004	0.086	no	0.006	0.046
Un-ionized Ammonia	-	-	0.02	-	19	0.044	0.153	yes[2]	0.0	<0.02
Cyanate	-	-	-	-	-	130	85	yes[2]	0.0	<1
Thiocyanate	-	-	-	-	-	24	25	yes[2]	0.0	<1

Notes:
- * Health-based drinking water standard / guideline
- 1 Value for free cyanide derived from Gensemer et al. (2007); values for applicable metals derived from application of US EPA hardness equations assuming a blended river / effluent hardness of 200 mg/L as $CaCO_3$
- 2 Effluent aging data from Barrick Gold Holt-McDermott Mine near Kirkland
- 3 Value for aluminum derived from Gensemer 2009
- 4 Value for cobalt derived from Nagpal 2004
- 5 Value for iron derived from BC MOE 2008 and US EPA 2009
- 6 CEQG Notes: Cadmium = 10^0.86[log10(hardness)]-3.2 µg/L
  CEQG for hexavalent chromium is 1 µg/L, CEQG for trivalent chromium is 8.9 µg/L
  Copper = e0.8545[ln(hardness)]-1.465 * 0.2µg/L; Minimum of 2 µg/L
  Lead = e1.273[ln(hardness)]-4.705; Minimum of 1 µg/L
  Nickel is a minimum of 25 µg/L regardless of water hardness

ODWS: Ontario Drinking Water Standard
CDWQG: Canadian Drinking Water Quality Guideline
CND: cyanide destruction

Table 7-42: Pinewood River Northern Pike and Walleye Data and Tissue Body Burden Levels

Species	Tissue Type	Descriptive Statistic	Total Length (mm)	Weight (g)	Age (years)	Mercury (µg/g)	Cadmium (µg/g)	Lead (µg/g)
Northern Pike	Dorsal Muscle	Sample Size	70	70	67	70	70	70
		Minimum	185	11	0	0.110	<0.01	<0.03
		Maximum	570	970	5	0.670	<0.01	0.03
		Mean	377.8	267.6	2.0	0.342	—	—
		Median	376.0	215.0	2.0	0.325	—	—
		Standard Deviation	85.5	230.6	1.3	0.112	—	—
		Standard Error	10.2	27.6	0.2	0.013	—	—
	Liver	Sample Size	42	42	—	42	42	42
		Minimum	185	19	—	0.063	0.010	<0.03
		Maximum	570	970	—	0.300	0.190	0.09
		Mean	407.6	302.3	—	0.148	0.047	—
		Median	391.0	260.0	—	0.145	0.030	—
		Standard Deviation	72.1	247.3	—	0.050	0.037	—
		Standard Error	11.1	38.2	—	0.008	0.006	—
Walleye	Dorsal Muscle	Sample Size	15	15	15	15	15	15
		Minimum	223	79.29	1	0.078	<0.1	<0.03
		Maximum	688	3640	15	1.800	<0.1	<0.03
		Mean	383.3	794.6	4.3	0.399	—	—
		Median	346.0	350.0	3.0	0.340	—	—
		Standard Deviation	148.6	1066.0	4.9	0.262	—	—
		Standard Error	38.4	275.2	1.3	0.068	—	—
	Liver	Sample Size	13	13	—	10	13	13
		Minimum	261	140	—	0.078	0.030	<0.03
		Maximum	688	3640	—	1.100	0.200	<0.03
		Mean	421.0	948.5	—	0.326	0.112	—
		Median	390.0	510.0	—	0.185	0.130	—
		Standard Deviation	139.2	1091.9	—	0.318	0.055	—
		Standard Error	38.6	302.8	—	0.101	0.015	—

Table 7-43: Mine Rock Concentrations of Cadmium, Lead and Mercury

Condition	Cadmium (ppm)	Lead (ppm)	Mercury (ppm)
Average Crustal Abundance	0.15	14	0.085
Ten times Crustal Abundance	1.5	140	0.85
Median	0.11	3.80	0.05
90th Percentile	1.19	22.1	0.10

Note: Analysis of RRP mine rock samples based on a sample size of 362

Table 7-44: Composite Tailings Sample Concentrations of Select Metals

Parameter	Ten Times Crustal Abundance	ODM Zone Master Composite A (ppm)	ODM Zone Master Composite B (ppm)	ROM Sample A (ppm)	ROM Sample B (ppm)	Starter Pit Sample A (ppm)	Starter Pit Sample B (ppm)
Cadmium	1.5	4.4	4.8	2.8	2.6	5.5	5.7
Lead	140	110	120	49	50	130	130
Mercury	0.85	0.20	0.30	0.20	0.20	0.20	0.20

Table 7-45: Summary of Pre-contact Archaeology Sites

Site Name	Borden Number	Site Type	Age and Cultural Preliminary Determination	Impacts Expected	Mitigation
Tintah 1	DfKm 1	High density lithic scatter	Early Palaeoindian	None	None required
Tintah 2	DfKm 2	Lithic scatter	Early Palaeoindian	Tailings Management Area	None required
Tintah 3	DfKm 3	Lithic scatter	Early Palaeoindian	Tailings Management Area	None required
Tintah 4	DfKl 1	Lithic scatter	Early Palaeoindian	None	Stage 3 Investigation
Campbell 1	DfKm 4	High density lithic scatter	Late Palaeoindian	Overburden and Mine Rock Stockpiles	Stage 3 Investigation
Campbell 2	DfKm 5	Lithic scatter	Late Palaeoindian	Overburden and Mine Rock Stockpiles	Stage 3 Investigation
Campbell 3	DfKm 6	Lithic scatter	Late Palaeoindian	Overburden and Mine Rock Stockpiles	Stage 3 Investigation
Campbell 4	DeKm 2	Lithic scatter	Late Palaeoindian	None	Not required

Table 7-46: Summary of Historic Sites

Site Name	Borden Number	Site Type	Age and Cultural Determination	Impacts Expected	Mitigation
Teeple Lands Homestead 4	DeKm 3	Foundation ruins and associated landscape	Historic – early pioneer	None	None required
Wilson Homestead 1	DfKm 7	Foundation ruins and associated landscape	Historic – early pioneer	Aggregate Pit	Stage 3 Investigation
Unnamed Homestead 2	DfKm 8	Foundation ruins and associated landscape	Historic – early pioneer	Plant Site and Ancillary Facilities	Stage 3 Investigation
Dutchmen Homestead 3	DfKm 9	Foundation ruins and associated landscape	Historic – early pioneer	Overburden / Mine Rock Stockpiles	Stage 3 Investigation
Homestead	DfKm 11	Foundation ruins and associated landscape	Historic – early pioneer	None	None required
Logging Camp 1	DfKm 12	Foundation ruins and associated landscape	Historic – early pioneer	None	None required

Table 7-47: Significance Determinations of Residual Effects after Mitigation, Construction Phase – Natural Environment

System / Component / Feature	Potential Effect	Section 5 Link	Proposed Mitigation	Residual Effect	Residual Significance After Mitigation					Overall Significance	Likelihood
					Value of System, Component, Feature or Situation	Magnitude / Geographic Extent	Duration	Frequency	Reversibility		
Air Quality	Principal air quality constituents emitted from the site will be dust and associated metals from the following sources: road dust emissions; open pit overburden stripping and stockpiling; and site preparation for construction.	No	Dust emissions from roads and stockpiles will be controlled through use of water sprays; water cannon sprays will be employed to control dust emissions from stockpiles and handling activities; site roadways will be maintained in good condition; a fugitive dust best management practices plan will be prepared to identify all sources and outline all measures of mitigation.	Air quality modeling shows that with mitigation, as proposed, concentrations of NOx, HCN, key metals, PMtot, PM10 and PM2.5 are expected to meet MOE air quality standards for the site specific emissions, at the property line.	Adverse effects potentially involve human health, and locally and regionally important plant and wildlife species and communities. Level III	With the appropriate mitigation, effects are considered to be minor and confined to the immediate mine site area. Level I	Short-term: Effects will occur throughout the construction period (2 years). Level I	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Greenhouse Gases	Project-related greenhouse gas emissions will mainly derive from on site mobile heavy equipment fuel combustion, explosive detonation, and from diesel power generation (limited use, construction phase only).	No	Efforts were made to develop a compact site, thereby reducing transportation needs and minimizing equipment movement, and in turn reducing fuel consumption; onsite diesel power generation will be required until the transmission line has been commissioned; utilizing more fuel efficient trucks for transport; and, maintaining site equipment in good working order.	With mitigation measures proposed, CO_2 emissions are expected to be less than 0.06% of the target CO_2 emission reduction for Canada and confined to the immediate RRP site area.	Climate change has the potential to positively and negatively affect species and habitats on a local scale; effects of any single Project and local scale effects are too small to distinguish from background conditions. Level III	Effects are considered to be minor (less than 0.06% of the target CO_2 emission reduction for Canada) and confined to the immediate mine site area. Level I	Short-term: Construction phase effects will occur throughout the construction period (2 years). Level I	Effect is expected to be continuous through construction and operation of the mine. Level III	Emissions will cease at mine closure. Level I	Magnitude of effect too small to be measured; emissions will cease at closure. Not significant	Effect will occur
Sound	Sound will result from equipment movement, periodic blasting at the plant site and road realignments, construction activities, haulage and stockpiling operations.	No	The selection of quieter equipment, including but not limited to the following items: quiet mining trucks, electric drive excavators, and emergency diesel generators with silencers/mufflers; also the favourable positioning of equipment, and time constraints on operations.	With mitigation as proposed, sound levels at adjacent properties are expected to meet MOE guidelines for day-time and night-time effects.	Adverse effects potentially include disturbance to local residents and to sensitive wildlife species. Level III	Effects are considered to be minor and confined to the immediate mine site area. Level I	Short-term: Construction phase effects will occur throughout the construction period (2 years). Level I	Effect is expected to be continuous through construction and operation of the mine. Blasting during construction phase is expected to be infrequent. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Vibration	Mine site development will exhibit vibration from blasting (explosive usage) and from overpressure which is a shock wave generated from blasting.	No	The maximum charge size per delay will be restricted to 1,000 kg to manage blast vibration and blast overpressure.	With the control of charge sizes, as proposed, vibration and overpressure levels are predicted to be below the MOE NPC-119 cautionary limits at offsite receptors and confined to the immediate mine site area.	Adverse effects will generate ground borne vibration and overpressure levels at points of reception. Level II	Effects are considered to be minor (predicted vibration and overpressure levels are not expected to exceed the MOE NPC-119 cautionary limits at offsite receptors) and confined to the immediate mine site area. Level I	Short-term: Construction phase effects will occur throughout the construction period (2 years). Level I	Effect is expected to occur infrequently. Level I	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur

System / Component / Feature	Potential Effect	Section 5 Link	Proposed Mitigation	Residual Effect	Residual Significance After Mitigation					Overall Significance	Likelihood
					Value of System, Component, Feature or Situation	Magnitude / Geographic Extent	Duration	Frequency	Reversibility		
Minor Creek Systems	Mine site development will impact local creeks and rivers from direct habitat displacement (overprinting); habitat modifications (channel re-alignment); potential water quality changes; and, potential indirect effects from flow reductions in the Pinewood River.	Yes	Efforts made to develop a compact site to limit the areal extent of disturbance to creeks; design of infrastructure using best management practices; and, implement water management systems to collect, monitor and treat as required. Active revegetation at closure will minimize length of time that areas are exposed to erosion and sediment transport. Fish habitat compensation will be provided to offset losses that cannot be otherwise mitigated.	With implementation of mitigation measures, as proposed, including re-routing portions of West Creek and Clark Creek, and providing fish habitat compensation through No Net Loss Plans, equivalent and/or compensatory ecological functions for these creek systems will be maintained.	Adverse effects to local creek systems would involve commonplace and widespread ecological communities, typical of small headwater creek systems in the area. Level II	Effects are considered to be minor (4% of the NRSA), confined to the immediate mine site area and compensated in accordance with the *Fisheries Act*. Level I	Long-term: impacts to local creek systems will extend beyond the life of the project. Level III	Effect is expected to be continuous through construction and operation and decommissioning of the mine. Level III	Effects are not reversible following closure but the minor creek systems will be compensated to offset the effects. Level III	Overall effects are considered to be generally minor, localized and not reversible (effects will be compensated for to offset the non reversibility component). Not significant	Effect will occur
Pinewood River	Impacts to the Pinewood River during the construction phase will be minor and may consist of treated effluent release, and diminished flows from creeks reporting to the Pinewood River and direct water taking from the Pinewood River. These impacts will begin to be felt in the second half of the construction period or beginning of the operational period.	Yes	Effluent treatment designed to produce a high quality effluent consistent with protection of aquatic life. Water taking from the Pinewood River will be restricted to thresholds that will not adversely affect aquatic life.	Runoff and seepage discharges to the Pinewood River expected to be consistent with attainment of protection of aquatic life guidelines, or scientifically defensible equivalents. Direct and indirect water taking from the river intended to minimize adverse flow effects.	Dominant local river system which supports commonplace and widespread ecological communities. Level II	Flow effects are considered to be minor (<20% during average and high flow years; with flow enhancement during low flow periods); water quality to be maintained at levels suitable for protection of aquatic life. Level I	Long-term: Construction phase effects will occur starting in the construction period and persist through the mine closure phase. Adverse water quality effects are not expected to occur. Level III	Effect is not expected to be felt until the second half of the construction period. Level II	Effects are reversible following mine closure (over a very long time period). Level II	Flow effects considered to be minor; adverse water quality effects are not anticipated. Not significant	Effect will occur
Groundwater	There are no anticipated effects of any significance on the groundwater system as a result of construction activities.	No	None proposed.	There are no anticipated effects of any significance on the groundwater system as a result of construction activities.	No meaningful adverse effects anticipated. Level I	No meaningful adverse effects anticipated. Level I	Short-term: Any minor impacts from construction would be limited to the construction period (2 years). Level I	No meaningful adverse effects anticipated. Level I	Any effects are readily reversible. Level I	No anticipated adverse effects. Not significant	Effect will not likely occur
Vegetation Communities and Rare Plants	Completed mine site development will displace an estimated 2,192 ha including habitat supporting two rare plant species.	No	Efforts were made to develop a compact site with avoidance of riparian and other sensitive habitats to the extent practical; water spraying to manage dust; and, transplantation of rare plant species. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of commonplace and widespread plant communities and species, concentrated within the immediate mine site area.	Adverse effects will generally involve commonplace and widespread plant species. Level II	Effects are considered to be minor (8.5% of the NLSA) and confined to the immediate mine site area. Level I	Long-term: Effects will persist for the life of the project, and will take several years for forest habitats to re-establish following active reclamation at closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor (effected vegetation communities are common in the NLSA), localized and reversible. Not significant	Effect will occur

System / Component / Feature	Potential Effect	Section 5 Link	Proposed Mitigation	Residual Effect	Residual Significance After Mitigation					Overall Significance	Likelihood
					Value of System, Component, Feature or Situation	Magnitude / Geographic Extent	Duration	Frequency	Reversibility		
Ungulates	Mine site development will displace an estimated 1,720 ha of woodlands and adjacent areas providing deer habitat. Additional effects are potentially associated with general disturbance and vehicular collisions. Minor disruption to wildlife habitat linkage is possible.	No	Efforts made to develop a compact site with avoidance of riparian and other sensitive habitats to the extent practical; Tailings management area will be fenced; speed limits and wildlife warning signs; pre-treatment of tailings slurry. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of ungulate habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	White-tailed Deer are ubiquitous within the NLSA. Winter deer yard habitat is common throughout the NRSA. Low density of moose within the NRSA. Level II	Effects are considered to be minor (6.4% of the NLSA) and confined to the immediate mine site area. Level I	Long-term: Effects will persist for the life of the project, and will take several years for forest habitats to re-establish following active reclamation at closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Furbearers	Mine site development will displace an estimated 1,777 ha of habitat. Additional effects are potentially associated with general disturbance, vehicular collisions and attraction to food wastes. Minor disruption to wildlife habitat linkage is possible.	No	Efforts made to develop a compact site with avoidance of riparian and other sensitive habitats to the extent practical; speed limits and wildlife warning signs; pre-treatment of tailings slurry. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of furbearer habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will generally involve commonplace and widespread furbearer species. Level II	Effects are considered to be minor (6.7% of the NLSA) and confined to the immediate mine site area. Level I	Long-term: Effects will persist for the life of the project, and will take several years for forest habitats to re-establish following active reclamation at closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Bats	Mine site development will displace an estimated 82 ha of woodland habitat. Additional effects are potentially associated with general disturbance, vehicular collisions.	No	Efforts made to develop a compact site with avoidance of riparian and other sensitive habitats to the extent practical; speed limits and wildlife warning signs; and, pre-treatment and monitoring of tailings. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of habitat potentially used by bats, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Northern Myotis and Little Brown Myotis are recognized as SAR in Ontario. Level III	Effects are considered to be minor (<0.1% of the NLSA) and confined to the immediate mine site area. Level I	Long-term: Effects will persist for the life of the project, and will take several years for forest habitats to re-establish following active reclamation at closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Migratory Birds	Mine site development will displace woodland, wetland, and open country habitat (1,352, 261 and 522 ha, respectively). Additional effects are potentially associated with general disturbance, vehicular collisions.	Yes	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; protection of compensatory habitat; sound abatement; speed limits. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of migratory bird habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will generally involve commonplace and widespread species, together with some SAR and regionally rare species. Level III	Effects are considered to be minor (7.7% of the NLSA) and confined to the immediate mine site area. Level I	Long-term: Effects will persist for the life of the project, and will take several years for forest habitats to re-establish following active reclamation at closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Raptors and Ravens (including Bald Eagle)	Mine site development will not displace raptor nests. Effects are associated with general disturbance, potential vehicular collisions and attraction to food wastes by scavenging birds.	No	Efforts made to develop a compact site with avoidance sensitive habitats to the extent practical; avoidance of nesting habitat until nests are vacant; monitoring of Bald Eagle nests; speed limits; wildlife warning signs; and, proper waste disposal. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of raptor and raven habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will generally involve commonplace raptor species and one species Provincially listed as Special Concern. Level III	Effects are considered to be minor as no nests raptor nests will be removed and disturbance will be minimized during the active nesting period. Level I	Long-term: Effects will persist for the life of the project, and will take several years for forest habitats to re-establish following active reclamation at closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur

System / Component / Feature	Potential Effect	Section 5 Link	Proposed Mitigation	Residual Effect	Residual Significance After Mitigation: Value of System, Component, Feature or Situation	Magnitude / Geographic Extent	Duration	Frequency	Reversibility	Overall Significance	Likelihood
Amphibians	Mine site development will displace woodland and wetland habitat (1,352 and 420 ha, respectively). Additional effects are potentially associated with vehicular collisions and water quality.	No	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; speed limits and wildlife warning signs; pre-treatment of tailings slurry to ensure TMA ponds are not toxic to wildlife. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of amphibian habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will generally involve commonplace and widespread species. Level II	Effects are considered to be minor (6.3% of the NLSA) and confined to the immediate mine site area. Level I	Long-term: Effects will persist for the life of the project, and will take several years for forest habitats to re-establish following active reclamation at closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not Significant	Effect will occur
SAR – Little Brown Myotis	Addressed above under the heading Bats										
SAR – Northern Myotis	Addressed above under the heading Bats										
SAR – Eastern Whip-poor-will	Mine site development will displace 1,352 ha of woodland habitat and 95 ha of rock barren habitat, and a number of known breeding territories. Additional effects are potentially associated with general disturbance, potential vehicular collisions.	Yes	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; protection of compensatory habitat; continued research; sound abatement; and speed limits. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Eastern Whip-poor-will breeding territories and habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. Short-term effects offset by compensatory habitat as part of anticipated overall net benefit agreement.	Adverse effects will involve a species which is designated as Threatened under both the *Endangered Species Act* and *Species at Risk Act*. Level III	Effects are considered to be minor (5.1% of the NLSA), and from 13 to 17 breeding territories; and confined to the immediate mine site area; adverse effects to be compensated for through the *Endangered Species Act*. Level I	Long-term: Effects will persist for the life of the project, and will take several years for forest habitats to re-establish following active reclamation at closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible; provision of overall benefits compensation. Not significant	Effect will occur
SAR – Bobolink	Mine site development will displace 385 ha of open country habitat, and a number of known breeding territories. Additional effects are potentially associated with general disturbance and vehicular collisions.	Yes	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; protection of compensatory habitat; sound abatement; and, speed limits. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Bobolink breeding territories and habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. Short-term effects offset by compensatory habitat as part of anticipated overall net benefit agreement.	Adverse effects will involve a species which is designated as Threatened under both *Endangered Species Act* and *Species at Risk Act*. Level III	Effects are considered to be minor (2.0% of the NLSA); and confined to the immediate mine site area; adverse effects to be compensated for through the *Endangered Species Act*. Level I	Long-term: Effects will persist for the life of the project, and will take several years for forest habitats to re-establish following active reclamation at closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible; provision of overall benefits compensation. Not significant	Effect will occur

System / Component / Feature	Potential Effect	Section 5 Link	Proposed Mitigation	Residual Effect	Residual Significance After Mitigation: Value of System, Component, Feature or Situation	Magnitude / Geographic Extent	Duration	Frequency	Reversibility	Overall Significance	Likelihood
SAR – Barn Swallow	Mine site development will displace 2 barn structures used for nesting and open country and wetland habitat used for foraging (277 and 262 ha, respectively. Additional effects are potentially associated with general disturbance, vehicular collisions.	Yes	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; provision of surrogate nesting structures; sound abatement; and speed limits. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Barn Swallow nesting sites and habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. Short-term effects offset by compensatory habitat as part of anticipated overall net benefit agreement.	Adverse effects will involve a species which is designated as Threatened under both the *Endangered Species Act* and *Species at Risk Act*. Level III	Effects are considered to be minor (2.0% of the NLSA) and confined to the immediate mine site area; adverse effects to be compensated for through the *Endangered Species Act* if required. Level I	Long-term: Effects will persist for the life of the project, and will take several years for forest habitats to re-establish following active reclamation at closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible; provision of overall benefits compensation. Not significant	Effect will occur
Special Concern Species – Common Nighthawk	Mine site development will displace woodland, rock barren, and shrub habitat (1,352, 11 and 79 ha, respectively). Additional effects are potentially associated with general disturbance, vehicular collisions.	Yes	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; provision of compensatory habitat; sound abatement; light pollution reduction; and speed limits. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Common Nighthawk habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will involve a species which is designated as Special Concern under the *Endangered Species Act* and as Threatened under *Species at Risk Act*. Level III	Effects are considered to be minor (5.1% of the NLSA) and confined to the immediate mine site area. Level I	Long-term: Effects will persist for the life of the project, and will take several years for forest habitats to re-establish following active reclamation at closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Special Concern Species – Golden Winged Warbler	Mine site development will displace 79 ha of shrub land and 419 ha of suitable woodland habitat. Additional effects are potentially associated with general disturbance and vehicular collisions.	Yes	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; indirect provision of compensatory habitat; sound abatement; and, speed limits. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Golden Winged Warbler habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will involve a species which is designated as Special Concern under the *Endangered Species Act* and as Threatened under *Species at Risk Act*. Level III	Effects are considered to be minor (1.9% of the NLSA) and confined to the immediate mine site area. Level I	Long-term: Effects will persist for the life of the project, and will take several years for forest habitats to re-establish following active reclamation at closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Special Concern Species – Olive-sided Flycatcher	Mine site development will displace 507 ha of wetland and 124 ha of coniferous woodland habitat. Additional effects are potentially associated with general disturbance and vehicular collisions.	Yes	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; indirect provision of compensatory habitat; sound abatement; and, speed limits. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Olive-sided Flycatcher habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will involve a species which is designated as Special Concern under the *Endangered Species Act* and as Threatened under *Species at Risk Act*. Level III	Effects are considered to be minor (2.4% of the NLSA) and confined to the immediate mine site area. Level I	Long-term: Effects will persist for the life of the project, and will take several years for forest habitats to re-establish following active reclamation at closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur

System / Component / Feature	Potential Effect	Section 5 Link	Proposed Mitigation	Residual Effect	Residual Significance After Mitigation: Value of System, Component, Feature or Situation	Magnitude / Geographic Extent	Duration	Frequency	Reversibility	Overall Significance	Likelihood
Special Concern Species – Canada Warbler	Mine site development will displace 1,352 ha of woodland habitat and, specifically, just 18 ha in areas where this species was observed. Additional effects are potentially associated with general disturbance and vehicular collisions.	Yes	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; indirect provision of compensatory habitat; sound abatement; and, speed limits. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Canada Warbler habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will involve a species which is designated as Special Concern under the *Endangered Species Act* and as Threatened under *Species at Risk Act*.	Effects are considered to be minor (4.8% of the NLSA) and confined to the immediate mine site area.	Long-term: Effects will persist for the life of the project, and will take several years for forest habitats to re-establish following active reclamation at closure.	Effect is expected to be continuous through construction and operation of the mine.	Effects are reversible following mine closure.	Overall effects are considered to be generally minor, localized and reversible.	Effect will occur
					Level III	Level I	Level III	Level III	Level I	Not significant	
Special Concern Species – Red-headed Woodpecker	Mine site development will displace 1,352 ha of woodland habitat. Additional effects are potentially associated with general disturbance and vehicular collisions.	No	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; sound abatement; and, speed limits. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Red-headed Woodpecker habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will involve a species which is designated as Special Concern under the *Endangered Species Act* and *Species at Risk Act*.	Effects are considered to be minor (4.8% of the NLSA) and confined to the immediate mine site area.	Long-term: Effects will persist for the life of the project, and will take several years for forest habitats to re-establish following active reclamation at closure.	Effect is expected to be continuous through construction and operation of the mine.	Effects are reversible following mine closure.	Overall effects are considered to be generally minor, localized and reversible.	Effect will occur
					Level III	Level I	Level III	Level III	Level I	Not significant	
Special Concern Species – Short-eared Owl	Mine site development will displace 522 ha of open country and meadow march habitat. Additional effects are potentially associated with general disturbance and vehicular collisions.	Yes	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; indirect provision of compensatory habitat sound abatement; and, speed limits. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Short-eared Owl habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will involve a species which is designated as Special Concern under the *Endangered Species Act* and *Species at Risk Act*.	Effects are considered to be minor (2.0% of the NLSA) and confined to the immediate mine site area.	Long-term: Effects will persist for the life of the project, and will take several years for forest habitats to re-establish following active reclamation at closure.	Effect is expected to be continuous through construction and operation of the mine.	Effects are reversible following mine closure.	Overall effects are considered to be generally minor, localized and reversible.	Effect will occur
					Level III	Level I	Level III	Level III	Level I	Not significant	
Special Concern Species – Snapping Turtle	Mine site development will displace 507 ha of wetland habitat. Additional effects are potentially associated with general disturbance, vehicular collisions.	No	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; speed limits and wildlife warning signs; pre-treatment of tailings slurry to ensure TMA ponds are not toxic to wildlife. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Snapping Turtle habitat, centred on the mine site area. Reduced potential exposure to vehicular traffic and site effluents, etc.	Adverse effects will involve a species which is designated as Special Concern under the *Endangered Species Act* and *Species at Risk Act*.	Effects are considered to be minor (1.9% of the NLSA) and confined to the immediate mine site area.	Long-term: Effects will persist for the life of the project, and will take several years for forest habitats to re-establish following active reclamation at closure.	Effect is expected to be continuous through construction and operation of the mine.	Effects are reversible following mine closure.	Overall effects are considered to be generally minor, localized and reversible.	Effect will occur
					Level III	Level I	Level III	Level III	Level I	Not significant	
Provincially Rare Species – Black-billed Magpie	Mine site development will displace 385 ha of agricultural and cultural meadow habitat. Additional effects are potentially associated with general disturbance, vehicular collisions.	No	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; sound abatement; speed limits; pre-treatment of tailings. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Black-billed Magpie habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will involve Provincially rare species.	Effects are considered to be minor (2.0% of the NLSA) and confined to the immediate mine site area.	Long-term: Effects will persist for the life of the project, and will take several years for forest habitats to re-establish following active reclamation at closure.	Effect is expected to be continuous through construction and operation of the mine.	Effects are reversible following mine closure.	Overall effects are considered to be generally minor, localized and reversible.	Effect will occur
					Level III	Level I	Level III	Level III	Level I	Not significant	

System / Component / Feature	Potential Effect	Section 5 Link	Proposed Mitigation	Residual Effect	Residual Significance After Mitigation					Overall Significance	Likelihood
					Value of System, Component, Feature or Situation	Magnitude / Geographic Extent	Duration	Frequency	Reversibility		
Provincially Rare Species – Lilypad Clubtail	Mine site development will not displace any habitat which is typical for this species. No roads will be established in areas where this species was observed.	No	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; and, speed limits. Active revegetation and at closure will restore habitats.	No anticipated displacement of habitat for this species.	Adverse effects will involve Provincially rare species. Level III	Mine site development will not displace any habitat which is typical for this species. Level I	Long-term: Effects will persist for the life of the project, and will take several years for forest habitats to re-establish following active reclamation at closure. Level III	Overall effects are considered to be negligible. Level I	Overall effects are considered to be negligible. Level I	Overall effects are considered to be negligible. Not significant	Unlikely
Provincially Rare Species – Horned Clubtail	Mine site development will not displace any habitat which is typical for this species. Roads which will be established in areas where this species was observed will have negligible effects.	No	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; and, speed limits. Active revegetation and at closure will restore habitats.	No anticipated displacement of habitat for this species.	Adverse effects will involve Provincially rare species. Level III	Mine site development will not displace any habitat which is typical for this species. Level I	Medium-term: Effects will persist for the life of the project. Level II	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur

Notes: NA: not applicable; NR: not rated

Tables 7-47 to 7-56 were revised per the CEA Agency comment on the draft EA Report (Version 2) that a column be added to identify whether the VEC/VSEC is linked (Yes or No) to any of the following five criteria per Section 5 of CEAA (2012):

- changes to components of the environment within Federal jurisdiction;
- changes to the environment that would occur on Federal or transboundary lands;
- changes to the environment that are directly linked or necessarily incidental to Federal decisions;
- effects of changes to the environment on Aboriginal peoples; or
- effect of changes to the environment that are directly linked or necessarily incidental.

Level I	Level II	Level III

newgold Rainy River Project

Table 7-48: Significance Determinations of Residual Effects after Mitigation, Construction Phase - Human Environment

VSEC	Potential Effect (and direction)	Section 5 Link	Proposed Mitigation or Enhancement	Residual Effect	Residual Significance After Mitigation or Enhancement						Overall Significance	Likelihood
					Socio-economic Context	Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Land Use Planning	Mining is consistent with current land use planning for the area. No discernable effect.	No	None proposed.	None anticipated.	NA	NA	NA	NA	NA	NA		NA
					NR	NR	NR	NR	NR	NR	NR	
Mineral Exploration	May limit access to resources held by other mineral exploration interests (negative).	No	None proposed.	Limited access to portions of a few properties held by one mineral exploration company.	Multiple companies actively exploring gold claims in the Rainy River District.	Effects to a few properties held by one mineral exploration company.	Effect is confined to the HLSA.	Effects will last until the end of decommissioning (persist throughout the construction and operation stages).	Effect occurs continuously.	Reversible at closure (albeit with difficulty and at a high cost).		Likely
					Level III	Level I	Level I	Level II	Level III	Level II	Not significant	
Forestry	Removal of areas of potential forest harvesting and management activities (negative).	No	Efforts were made to develop a compact site to the extent practical; and, any commercial timber harvested from areas developed in association with the RRP site will be made available to current licence holders.	Removal of areas of potential forest harvesting comprising less than 1% of the Crossroute Forest Management Area.	Important regional land use that supports mills in both Barwick and Fort Frances.	Removal of less than 1% of the Crossroute Forest Management Area for forest production.	Effect is confined to the HLSA.	Effect lasts beyond closure.	Effect occurs continuously.	Reversible at closure (albeit with difficulty and at a high cost).		Likely
					Level III	Level I	Level I	Level III	Level III	Level II	Not significant	
Agriculture and Adjacent Residents	Potential for impacts on adjacent residents and farm operations from sound, air quality, and water quality/supply; decreased availability of agricultural land; however, may sustain agricultural use in the region with off farm income opportunities (predominantly negative).	No	Efforts were made to optimize the mine footprint; provide pasture and to offset pasture lands that will be displaced by the RRP; continuing land settlement negotiations with local agricultural producers directly impacted by the RRP.	Removal of 16.4% of land currently used for agriculture in the HLSA; will affect a few adjacent land owners, with such lands having been purchased. Sound, vibration and air quality affects to adjacent residences will be consistent with MOE guidelines for receptor protection.	Agriculture is and has been an important regional land use and economic driver in the region.	Removal of 16.4% of land currently used for agriculture in the HLSA; affects a few adjacent land owners.	Effect is confined to the HLSA.	Effect lasts beyond closure.	Effect will occur continuously.	Effect is reversible in the long term.		Likely
					Level III	Level II	Level I	Level III	Level III	Level II	Not significant	
Hunting	Loss or displacement of land used for hunting and impacts to species hunted (negative).	No	Minimize mine footprint; see also wildlife mitigation measures.	Long-term, reversible or largely reversible, loss of 1.5% of WMU 10 supporting ungulates (mainly deer) that are considered widespread and abundant. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Hunting is an important current land use that helps to support the tourism industry in the region.	Loss of 1.5% of WMU 10; ungulates are considered widespread and abundant; creation of the TL corridor may create additional access for hunters in the region.	Effect is confined to the HLSA.	Effect lasts until closure.	Effect will occur continuously.	Effect is reversible in the long term.		Likely
					Level III	Level I	Level I	Level II	Level III	Level II	Not significant	

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VSEC	Potential Effect (and direction)	Section 5 Link	Proposed Mitigation or Enhancement	Residual Effect	Residual Significance After Mitigation or Enhancement						Overall Significance	Likelihood
					Socio-economic Context	Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Trapping	Overprinting of private land traplines and impacts to species trapped (negative).	Unknown Yes	Minimize mine footprint; see also wildlife mitigation measures.	Long-term, reversible or largely reversible, loss of 13.9% and 38% of the area of two traplines.	No information regarding trapping was presented during Aboriginal consultation, discussions and meetings. The trapper contracted by RRR operates additional licensed traplines in the Rainy River District outside of the HLSA.	Loss of 13.9% and 38% of two traplines.	Effect is confined to the HLSA.	Effect lasts until closure.	Effect will occur continuously.	Effect is reversible in the long term.		Likely
					Level II	Level I	Level I	Level II	Level III	Level II	Not significant	
Fishing	Loss of waterbodies used for fishing; effects to sport fish in these water bodies (negative).		Effects will be mitigated through formation of a Fisheries Working group to develop a RRP No Net Loss Plan; see also fisheries and water resources mitigation measures.	Limited, if any, effects to sport fishing in the Pinewood River or creeks impacted by the RRP; four bait fishers will have portions of their license areas affected. Fisheries effects to be offset by No Net Loss Plan.	Noted by one bait fisher as important; local residents fish in larger, more productive water bodies located outside of the HLSA.	Limited, if any, sport fishing in the Pinewood River or creeks impacted by the RRP; four bait fishers will have portions of their license areas affected.	Effect is confined to the HLSA.	Effect lasts until closure.	Effect will occur continuously.	Effect is reversible with difficulty in the long term.		Likely
					Level II	Level I	Level I	Level II	Level III	Level II	Not significant	
Other Outdoor Recreation Uses	Overprinting a portion of Richardson Trail (south part of the trail); changes in enjoyment of natural / wilderness areas due to sound and air emissions; and, increases in traffic on Highways.	No	Refer to mitigations for air and sound emissions and traffic. Working with local land owners to enhance Richardson Trail components.	A portion of Richardson Trail will be overprinted by the TMA. Reduced potential exposure to noise and air emissions, consistent with MOE guidelines.	Other recreation activities are limited in the HLSA; Richardson Trail is an important recreation use trail for local residents.	A portion of Richardson Trail will be overprinted by the TMA.	Effect is confined to the HLSA.	Effect lasts until closure.	Effect will occur continuously.	Effect is reversible in the long term.		Unlikely
					Level II	Level I	Level I	Level II	Level III	Level II	Not significant	
Economics	Expenditures during construction and operation will stimulate the economy, creating jobs and income in industries in the region and throughout Ontario (positive).	No	Enhancement measures involve those directed at trying to optimize regional participation in employment, training and procurement.	Expenditures during construction and operation will stimulate the economy, creating jobs and income in industries in the region and throughout Ontario, with potential for enhancement of effects (positive).	Employment and income effects highly-valued in an area facing prolonged economic difficulties.	Low in comparison to the Provincial economy; large in comparison to the regional economy.	Effect is experienced across the region; low magnitude effects across Ontario.	Effect lasts until closure is completed.	Effect will occur continuously.	Effect is reversible with closure, although long-term effects may persist.	Effect is expected to help promote significant economic growth in the region.	Effect will occur
					Level III	Level III	Level II	Level II	Level III	Level II	Significant	
Demographics and Population	Project development would be expected to provide economic opportunities that would help to slow the current out-migration of people from the region, the populations of most areas (other than First Nation reserves) are in decline.(Net effect is positive.)	No	Enhancement measures involve those directed at trying to optimize local participation in the Project, including opportunities for Aboriginal communities.	Project development is expected to reverse the current population decline and contribute to low levels of population growth, but will not result in a large population change.	The Project will create employment and contribute to the stability of community populations.	Project development is expected to reverse decline and contribute to low levels of growth, but will not result in a large population change.	Effects will be experienced across the region.	Effects will occur for the life of the Project.	Effect will occur continuously during the life of the Project.	Reversibility depends on long-term economic performance in the area.	Effect is expected to help sustain or promote modest growth in population.	Effect will occur
					Level III	Level II	Level II	Level II	Level III	Level II	Significant	

newgold Rainy River Project

VSEC	Potential Effect (and direction)	Section 5 Link	Proposed Mitigation or Enhancement	Residual Effect	Residual Significance After Mitigation or Enhancement						Overall Significance	Likelihood
					Socio-economic Context	Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Housing and Accommodation	Project development would help with maintaining regional incomes in a stressed market place, thereby contributing to improved housing stability. (Net effect is positive.)	No	Enhancement measures involve those directed at trying to optimize local participation in the Project, including opportunities for Aboriginal communities which will improve housing stability.	Effects will reverse shrinkage of housing stock and support prices, particularly in communities close to the site.	Housing stability contributes to the regional economy and to the stability of families. Level III	Effects will reverse shrinkage of housing stock and support prices, particularly in communities close to the site. Level II	Effects limited to communities within 100 km of site. Level II	Effects will occur for the life of the Project. Level II	Effect will occur continuously during the life of the Project. Level III	Reversibility depends on long-term economic performance of region. Level II	Effect will help to maintain current housing market viability. Significant	Effect will occur
Public Utilities	Additional demands expected due to population increases which is positive in a region where there is decline in demands.	No	Ongoing discussions about potential additional demands with municipalities and service providers.	Additional demands expected due to population increases which is positive in a region where there is decline in demands.	Subject of ongoing discussion between RRR and municipalities and service providers. Level II	Low to moderate in the context of declining population (capacity in most systems). Level II	Effects will occur in some HRSA communities. Level II	Effect will occur for the life of the Project. Level II	Effect will occur continuously during the life of the Project. Level III	Effect is reversible at closure. Level II	Effect will sustain demands for existing services or provide a tax base upon which more service upgrades can be achieved. Significant	Effect will occur
Community and Social Services	Most workers are expected to derive from the local population, which will help to sustain community services. These services are currently not over-taxed. (Net effect has both positive and negative aspects associated.)	No	Enhancement measures involve worker and multi-stakeholder consultation, linking workers with services, and training programs.	Most workers expected to derive from the local population, such that the effect is mainly one of sustaining demand for existing services.	Regional community services are critical to overall community health and well-being. Level III	Effect is mainly one of sustaining demand for existing services. Level I	Effects will be experienced across the region. Level II	Effect will occur for the life of the Project. Level II	Effect will occur continuously during the life of the Project. Level III	Reversible. Level I	Effect is expected to help to maintain the current status of community and social services. Not significant	Effect will occur
Highway Traffic – Construction Phase	Project development will increase traffic volumes on local roads and highways.	No	Enforcement of speed limits, driver training, scheduling of major equipment deliveries in off hours, roadway design (turning lanes), general road maintenance and other measures.	Project development will increase traffic volumes on local roads and highways.	Traffic volumes and vehicle safety are critical to the region. Level II	Existing road and highway systems are readily capable of sustaining increased traffic volumes and loads; and, effects can be managed using mitigation measures. Level I	Effects will be experienced in only certain portions of Highway 11 between Fort Frances and the intersection with Highway 71. Level II	Effects will occur only during peak construction months. Level I	Effect will occur intermittently with some degree of regularity during shift changes. Level II	Effect is reversible in the short term. Level I	Existing road and highway systems are readily capable of sustaining the projected increased traffic volumes and loads. Not significant	Effect will occur
Human Health	Dust, noise and vibration generation arising from construction activities. Dust may contain contaminants of potential concern, particularly heavy metals that could potentially bioaccumulate; release of spilled materials that could affect human health; and, traffic accidents resulting in direct physical injury.	No	Ensure all applicable occupational health and safety legislation standards are met; provision of legislated secondary containment; utilize best management practices for industrial hygiene hazard control; operate the RRP so as to meet applicable health and environmental standards; prevent any chemical spills from entering the environment.	With mitigation, as proposed, the magnitude of contaminant release is expected to be small and within applicable Provincial and Federal emission and discharge criteria. No credible health risk to residents or consumers of fish and wildlife. Occupational health and safety legislation standards to be met.	The health and safety of RRR employees, neighbours and the general public is a priority for RRR. Level III	The magnitude of contaminant release is expected to be small and within applicable Provincial and Federal emission and discharge criteria. No credible health risk to residents or consumers of fish and wildlife. Level I	No credible health effects anticipated for area residents. Level I	Effect is confined to the HLSA. Level I	Effect is expected to occur infrequently/not at all. Level I	Effect is reversible at closure. Level II	Overall effects are considered not significant. Not significant	Unlikely

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VSEC	Potential Effect (and direction)	Section 5 Link	Proposed Mitigation or Enhancement	Residual Effect	Residual Significance After Mitigation or Enhancement						Overall Significance	Likelihood
					Socio-economic Context	Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Archaeological Resources	Construction of the RRP may affect archaeological sites through disturbance and/or removal of soils during construction and/or operation which potentially contain remains of archaeological sites. Activities that could have the greatest affect on cultural heritage resources include: clearing, grubbing, stripping, excavation and basting during construction and expansion of stockpiles and TMA during operations.	No	The RRP layout has been adjusted so that three pre-contact archaeological sites initially identified as at risk will no longer be affected by the RRP.	Land clearing, excavation, and road construction have the potential to effect archaeological sites, but will be mitigated prior to effects occurring; currently no known sites within the RRP footprint.	Cultural heritage resources are of high importance, particularly to Aboriginal peoples.	Land clearing, excavation, and road construction have the potential to effect archaeological site (i.e., data loss or destruction), but will be mitigated prior to effects occurring; currently no known sites within the RRP footprint.	Sites are relatively small and occur in less than 1% of the RRP and will not contribute to overall environmental impact.	Effects will be permanent unless mitigation measures (i.e., site avoidance or protective measures) are possible.	Effect is expected to occur infrequently/not at all.	Effects will be permanent unless mitigation measures (i.e., site avoidance or protective measures) are possible.	Range of mitigation measures available for archaeological site.	Unlikely
					Level III	Level II	Level I	Level III	Level I	Level III	Not significant	
Built Heritage Resources and Cultural Heritage Landscapes	Construction and operation of the RRP may impact, either directly or indirectly, a variety of built heritage resource and cultural heritage landscape features.	No	Efforts made to develop a compact site with avoidance of sensitive areas to the extent practical; RRR has committed to undertaking a mitigation program consisting of an illustrated history of the study area.	A total of 4 built heritage resources / cultural heritage landscapes will be directly impacted by project components.	Built heritage resources and cultural heritage landscapes contribute to the character, history and sense of place of an area and are of high importance.	None of these sites / features are designated under the OHA, or included in a municipal heritage inventory or register.	Direct effects are localized and restricted to the HLSA.	Effects to the directly affected sites are permanent, with mitigation undertaken by documenting them before removal.	Direct effects are infrequent; indirect effects will be continuous.	Effects will be permanent unless mitigation measures (i.e., site avoidance or protective measures) are possible.	Overall effects are considered not significant.	Effect will occur
					Level III	Level I	Level I	Level III	Level III	Level III	Not significant	

Notes: NA: not applicable; NR: not rated

Tables 7-47 to 7-56 were revised per the CEA Agency comment on the draft EA Report (Version 2) that a column be added to identify whether the VEC/VSEC is linked (Yes or No) to any of the following five criteria per Section 5 of CEAA (2012):

- changes to components of the environment within Federal jurisdiction;
- changes to the environment that would occur on Federal or transboundary lands;
- changes to the environment that are directly linked or necessarily incidental to Federal decisions;
- effects of changes to the environment on Aboriginal peoples; or
- effect of changes to the environment that are directly linked or necessarily incidental.

Level I	Level II	Level III

Table 7-49: Significance Determinations of Residual Effects after Mitigation, Operation Phase – Natural Environment

System / Component / Feature	Potential Effect	Section 5 Link	Proposed Mitigation	Residual Effect	Residual Significance After Mitigation					Overall Significance	Likelihood
					Value of System, Component, Feature or Situation	Magnitude / Geographic Extent	Duration	Frequency	Reversibility		
Air Quality	Principal air quality constituents emitted from the site will be dust and associated metals from the following sources: road dust emissions; dust from managing mine rock, ore and overburden stockpiles; dust from the primary crusher; and, dust from mining activities within the open pit (i.e., drilling and blasting).	No	Dust emissions from roads and stockpiles will be controlled through use of water sprays; water cannon sprays will be employed to control dust emissions from stockpiles and handling activities; site roadways will be maintained in good condition; a fugitive dust best management practices plan will be prepared to identify all sources and outline all measures of mitigation.	Air quality modeling shows that with mitigation, as proposed, concentrations of NOx, HCN, key metals, PMtot, PM10 and PM2.5 are expected to meet MOE air quality standards for the site specific emissions, at the property line.	Adverse effects potentially involve human health, and locally and regionally important plant and wildlife species and communities. Level III	With the appropriate mitigation, effects are considered to be minor and confined to the immediate mine site area. Level I	Effects will persist throughout the period of the mine development (construction and operation). Effects will not persist beyond the life of the Project. Level II	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Greenhouse Gases	Project-related greenhouse gas emissions will mainly derive from on site mobile heavy equipment fuel combustion, explosive detonation, and from offsite power generation (limited use, construction phase only).	No	Efforts were made to develop a compact site, thereby reducing transportation needs and minimizing equipment movement, and in turn reducing fuel consumption; use of a transmission power line instead of onsite diesel power during operations; utilizing more fuel efficient trucks for transport; and, maintaining site equipment in	CO_2 emissions are expected to be less than 0.06% of the target CO_2 emission reduction for Canada and confined to the immediate RRP site area.	Climate change has the potential to positively and negatively affect species and habitats on a local scale; effects of any single Project and local scale effects are too small to distinguish from background conditions. Level III	Effects are considered to be minor (less than 0.06% of the target CO_2 emission reduction for Canada) and confined to the immediate mine site area. Level I	Effects will persist throughout the period of the mine development (construction and operation). Effects will not persist beyond the life of the Project. Level II	Effect is expected to be continuous through construction and operation of the mine. Level III	Emissions will cease at mine closure. Level I	Magnitude of effect too small to be measured; emissions will cease at closure. Not significant	Effect will occur
Sound	Sound will result from open pit operations, and from associated mineral waste and ore, haulage and stockpiling operations.	No	The selection of quieter equipment, including but not limited to the following items: quiet mining trucks, electric drive excavators, and emergency diesel generators with silencers/mufflers; also the favourable positioning of equipment, and time constraints on operations.	With mitigation, as proposed, sound levels at adjacent properties are expected to meet MOE guidelines for day-time and night-time effects.	Adverse effects potentially include disturbance to local residents and to sensitive wildlife species. Level III	Effects are considered to be minor and confined to the immediate mine site area. Level I	Effects will persist throughout the period of the mine development (construction and operation). Effects will not persist beyond the life of the Project. Level II	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Vibration	Mine site development will exhibit vibration from blasting (explosive usage) and from overpressure which is a shock wave generated from blasting.	No	The maximum charge size per delay will be restricted to 1,000 kg to manage blast vibration and blast overpressure.	With the control of charge sizes, as proposed, vibration and overpressure levels are predicted to be below the MOE NPC-119 cautionary limits at offsite receptors and confined to the immediate mine site area.	Adverse effects will generate ground borne vibration and overpressure levels at points of reception. Level II	Effects are considered to be minor (predicted vibration and overpressure levels are not expected to exceed the MOE NPC-119 cautionary limits at offsite receptors) and confined to the immediate mine site area. Level I	Effects will persist throughout the period of the mine development (construction and operation). Effects will not persist beyond the life of the Project, and substantively decrease once open pit operations are completed. Level II	Effect is expected to occur intermittently, possibly with some degree of regularity. Level II	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur

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Minor Creek Systems	Mine site development will impact local creeks and rivers from direct habitat displacement (overprinting); habitat modifications (channel re-alignment); potential water quality changes; and, potential indirect effects from flow reductions in the Pinewood River.	Yes	Efforts made to develop a compact site to limit the areal extent of disturbance to creeks; design of infrastructure using best management practices; and, implement water management systems to collect, monitor and treat as required. Active revegetation at closure will minimize length of time that areas are exposed to erosion and sediment transport. Implementation of No Net Loss Plans to offset adverse effects.	With implementation of mitigation measures, as proposed, including re-routing portions of West Creek and Clark Creek, and providing fish habitat compensation through No Net Loss Plans, equivalent and/or compensatory ecological functions for these creek systems will be maintained.	Adverse effects to local creek systems would involve commonplace and widespread ecological communities, typical of small headwater creek systems in the area.	Effects are considered to be minor (4% of the NRSA), confined to the immediate mine site area and compensated in accordance with the *Fisheries Act*.	Effects will persist throughout the period of the mine development (construction and operation) and beyond the life of project.	Effect is expected to be continuous through construction and operation and decommissioning of the mine.	Effects are not reversible following closure but the minor creek systems will be compensated to offset the effects.	Overall effects are considered to be generally minor, localized and not reversible (effects will be compensated for to offset the non reversibility component).	Effect will occur
					Level II	Level I	Level III	Level III	Level III	Not significant	
Pinewood River	Once fully operational, a collective watershed of approximately 21 km^2 will report directly/indirectly to the TMA, thereby diminishing flows in the river; TMA effluent discharges have the potential to affect river water quality.	Yes	Extensive water recycle to minimize discharge volumes; timing of TMA effluent discharges designed to minimize adverse flow effects to river, especially during low flow conditions; effluent treatment designed to produce a high quality effluent consistent with protection of aquatic life.	Final effluent expected to be consistent with attainment of protection of aquatic life guidelines, or scientifically defensible equivalents, in the Pinewood River. Water return to the river intended to minimize adverse flow effects to low levels.	Dominant local river system which supports commonplace and widespread ecological communities.	Flow effects are considered to be minor (<20% during average and high flow years; with flow enhancement during low flow periods); water quality to be maintained at levels suitable for protection of aquatic life.	Effects will persist throughout the period of the mine development (construction, operation, and well into the mine closure phase). Adverse water quality effects are not expected to occur.	Effect is expected to be continuous through construction and operation of the mine, and well into closure for flow effects.	Effects are reversible following mine closure (over a very long time period).	Flow effects considered to be minor; adverse water quality effects are not anticipated.	Effect will occur
					Level II	Level I	Level III	Level III	Level II	Not significant	
Groundwater	Groundwater drawdown of 1 m, extending approximately 4 km to the east and west and 3.5 km to the north and south (from the pit at the end of mine operations) and long term reduction of groundwater contribution to Pinewood River.	No	Return groundwater to Pinewood River during operations, especially during low flow conditions; optimize groundwater seepage quality through SO_2/air treatment; manage site for ARD control; accelerate open pit inflow following mine closure to the extent practical; and, implement a water quality and flow monitoring program.	Proposed mitigation measures will ensure that adjacent well users are not adversely affected; and that groundwater discharged directly or indirectly to the Pinewood River will be such that protection of aquatic life guidelines, or defensible equivalents, can be met or maintained in the Pinewood River.	Groundwater helps to maintain Pinewood River base flow conditions, but effect is constrained by low permeability soils; local residents draw their water supply from both shallow and deeper wells.	Effects are considered to be minor (the net effect on percentage flow reductions to the Pinewood River is limited because of low permeability soils.	Effects will persist throughout the period of the mine development (construction and operation), and it will take several years for regional waters to re-establish following active reclamation at mine closure.	Effect is expected to be continuous through construction and operation of the mine.	Effects are reversible following mine closure (over a very long time period).		Effect will occur
					Level II	Level I	Level III	Level III	Level II	Not significant	
Vegetation Communities and Rare Plants	Mine site development will displace an estimated 2,192 ha including habitat supporting two rare plant species.	No	Efforts were made to develop a compact site with avoidance of riparian and other sensitive habitats to the extent practical; water spraying to manage dust; and, transplantation of rare plant species. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of commonplace and widespread plant communities and species, concentrated within the immediate mine site area.	Adverse effects will generally involve commonplace and widespread plant species.	Effects are considered to be minor (8.5% of the NLSA) and confined to the immediate mine site area.	Effects will persist throughout the period of the mine development (construction and operation), and it will take several years for forest habitats to re-establish following active reclamation at mine closure.	Effect is expected to be continuous through construction and operation of the mine.	Effects are reversible following mine closure (over a very long time period).	Overall effects are considered to be generally minor (effected vegetation communities are common in the NLSA), localized and reversible.	Effect will occur
					Level II	Level I	Level III	Level III	Level I	Not significant	

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Ungulates	Mine site development will displace an estimated 1,720 ha of woodlands and adjacent areas providing deer habitat. Additional effects are potentially associated with general disturbance and vehicular collisions. Minor disruption to wildlife habitat linkage is possible.	No	Efforts made to develop a compact site with avoidance of riparian and other sensitive habitats to the extent practical; Tailings management area will be fenced; speed limits and wildlife warning signs; pre-treatment of tailings slurry. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of ungulate habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	White-tailed Deer are ubiquitous within the NLSA. Winter deer yard habitat is common throughout the NRSA. Low density of moose within the NRSA. Level II	Effects are considered to be minor (6.4% of the NLSA) and confined to the immediate mine site area. Level I	Effects will persist throughout the period of the mine development (construction and operation), and it will take several years for forest habitats to re-establish following active reclamation at mine closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Furbearers	Mine site development will displace an estimated 1,777 ha of habitat. Additional effects are potentially associated with general disturbance, vehicular collisions and attraction to food wastes. Minor disruption to wildlife habitat linkage is possible.	No	Efforts made to develop a compact site with avoidance of riparian and other sensitive habitats to the extent practical; speed limits and wildlife warning signs; pre-treatment of tailings slurry. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of furbearer habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will generally involve commonplace and widespread furbearer species. Level II	Effects are considered to be minor (6.7% of the NLSA) and confined to the immediate mine site area. Level I	Effects will persist throughout the period of the mine development (construction and operation), and it will take several years for forest habitats to re-establish following active reclamation at mine closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Bats	Mine site development will displace an estimated 82 ha of woodland habitat. Additional effects are potentially associated with general disturbance, vehicular collisions.	No	Efforts made to develop a compact site with avoidance of riparian and other sensitive habitats to the extent practical; speed limits and wildlife warning signs; and, pre-treatment and monitoring of tailings. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of habitat potentially used by bats, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Northern Myotis and Little Brown Myotis are recognized as SAR in Ontario. Level III	Effects are considered to be minor (<0.1% of the NLSA) and confined to the immediate mine site area. Level I	Effects will persist throughout the period of the mine development (construction and operation), and it will take several years for forest habitats to re-establish following active reclamation at mine closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Migratory Birds	Mine site development will displace woodland, wetland, and open country habitat (1,352, 261 and 522 ha, respectively). Additional effects are potentially associated with general disturbance, vehicular collisions.	Yes	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; protection of compensatory habitat; sound abatement; speed limits; pre-treatment of tailings slurry to ensure TMA ponds are not toxic to wildlife. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of migratory bird habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will generally involve commonplace and widespread species, together with some SAR and regionally rare species. Level III	Effects are considered to be minor (7.7% of the NLSA) and confined to the immediate mine site area. Level I	Effects will persist throughout the period of the mine development (construction and operation), and it will take several years for forest habitats to re-establish following active reclamation at mine closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Raptors and Ravens (including Bald Eagle)	Mine site development will not displace raptor nests. Effects are associated with general disturbance, potential vehicular collisions and attraction to food wastes by scavenging birds.	No	Efforts made to develop a compact site with avoidance sensitive habitats to the extent practical; avoidance of nesting habitat until nests are vacant; monitoring of Bald Eagle nests; speed limits; wildlife warning signs; and, proper waste disposal. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of raptor and raven habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will generally involve commonplace raptor species and one species Provincially listed as Special Concern. Level III	Effects are considered to be minor as no nests raptor nests will be removed and disturbance will be minimized during the active nesting period. Level I	Effects will persist throughout the period of the mine development (construction and operation). Effects will not persist beyond the life of the Project. Level II	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur

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Amphibians	Mine site development will displace woodland and wetland habitat (1,352 and 420 ha, respectively). Additional effects are potentially associated with vehicular collisions and water quality.	No	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; speed limits and wildlife warning signs; pre-treatment of tailings slurry to ensure TMA ponds are not toxic to wildlife. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of amphibian habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will generally involve commonplace and widespread species.	Effects are considered to be minor (6.3% of the NLSA) and confined to the immediate mine site area.	Effects will persist throughout the period of the mine development (construction and operation), and it will take several years for habitats to re-establish following active reclamation at mine closure.	Effect is expected to be continuous through construction and operation of the mine.	Effects are reversible following mine closure.	Overall effects are considered to be generally minor, localized and reversible.	Effect will occur
					Level II	Level I	Level III	Level III	Level I	Not Significant	
SAR – Little Brown Myotis	Addressed above under the heading Bats										
SAR – Northern Myotis	Addressed above under the heading Bats										
SAR – Eastern Whip-poor-will	Mine site development will displace 1,352 ha of woodland habitat and 95 ha of rock barren habitat, and a number of known breeding territories. Additional effects are potentially associated with general disturbance, potential vehicular collisions.	Yes	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; protection of compensatory habitat; continued research; sound abatement; speed limits; and, pre-treatment of tailings. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Eastern Whip-poor-will breeding territories and habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. Short-term effects offset by compensatory habitat as part of anticipated overall net benefit agreement.	Adverse effects will involve a species which is listed as Threatened under both the *Endangered Species Act* and *Species at Risk Act.*	Effects are considered to be minor (5.1% of the NLSA), and from 13 to 17 breeding territories; and confined to the immediate mine site area; adverse effects to be compensated for through the *Endangered Species Act.*	Effects will persist throughout the period of the mine development (construction and operation), and it will take several years for forest habitats to re-establish following active reclamation at mine closure.	Effect is expected to be continuous through construction and operation of the mine.	Effects are reversible following mine closure.	Overall effects are considered to be generally minor, localized and reversible; provision of overall benefits compensation.	Effect will occur
					Level III	Level I	Level III	Level III	Level I	Not significant	
SAR – Bobolink	Mine site development will displace 385 ha of open country habitat, and a number of known breeding territories. Additional effects are potentially associated with general disturbance and vehicular collisions.	Yes	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; protection of compensatory habitat; sound abatement; and, speed limits . Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Bobolink breeding territories and habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. Short-term effects offset by compensatory habitat as part of anticipated overall net benefit agreement.	Adverse effects will involve a species which is listed as Threatened under both *Endangered Species Act* and *Species at Risk Act.*	Effects are considered to be minor (2.0% of the NLSA); and confined to the immediate mine site area; adverse effects to be compensated for through the *Endangered Species Act.*	Effects will persist throughout the period of the mine development (construction and operation), and it will take only a few years for open country habitats to re-establish following active reclamation at mine closure.	Effect is expected to be continuous through construction and operation of the mine.	Effects are reversible following mine closure.	Overall effects are considered to be generally minor, localized and reversible; provision of overall benefits compensation.	Effect will occur
					Level III	Level I	Level II	Level III	Level I	Not significant	
SAR – Barn Swallow	Mine site development will displace 2 barn structures used for nesting and open country and wetland habitat used for foraging (277 and 262 ha, respectively. Additional effects are potentially associated with general disturbance, vehicular collisions.	Yes	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; provision of surrogate nesting structures; sound abatement; speed limits; and, pre-treatment of tailings. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Barn Swallow nesting sites and habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. Short-term effects offset by compensatory habitat as part of anticipated overall net benefit agreement.	Adverse effects will involve a species which is listed as Threatened under both the *Endangered Species Act* and *Species at Risk Act.*	Effects are considered to be minor (2.0% of the NLSA) and confined to the immediate mine site area; adverse effects to be compensated for through the *Endangered Species Act* if required.	Effects will persist throughout the period of the mine development (construction and operation), and it will take only a few years for open country habitats for foraging to re-establish following active reclamation at mine closure.	Effect is expected to be continuous through construction and operation of the mine.	Effects are reversible following mine closure.	Overall effects are considered to be generally minor, localized and reversible; provision of overall benefits compensation.	Effect will occur
					Level III	Level I	Level II	Level III	Level I	Not significant	

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Special Concern Species – Common Nighthawk	Mine site development will displace woodland, rock barren, and shrub habitat (1,352, 11 and 79 ha, respectively). Additional effects are potentially associated with general disturbance, vehicular collisions.	Yes	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; provision of compensatory habitat; sound abatement; light pollution reduction; speed limits; and, pre-treatment of tailings. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Common Nighthawk habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will involve a species which is listed as Special Concern under the *Endangered Species Act* and as Threatened under *Species at Risk Act*. Level III	Effects are considered to be minor (5.1% of the NLSA) and confined to the immediate mine site area. Level I	Effects will persist throughout the period of the mine development (construction and operation), and it will take several years for forest habitats to re-establish following active reclamation at mine closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Special Concern Species – Golden Winged Warbler	Mine site development will displace 79 ha of shrub land and 419 ha of suitable woodland habitat. Additional effects are potentially associated with general disturbance and vehicular collisions.	Yes	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; indirect provision of compensatory habitat; sound abatement; and, speed limits. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Golden Winged Warbler habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will involve a species which is listed as Special Concern under the *Endangered Species Act* and as Threatened under *Species at Risk Act*. Level III	Effects are considered to be minor (1.9% of the NLSA) and confined to the immediate mine site area. Level I	Effects will persist throughout the period of the mine development (construction and operation), and it will take several years for forest habitats to re-establish following active reclamation at mine closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Special Concern Species – Olive-sided Flycatcher	Mine site development will displace 507 ha of wetland and 124 ha of coniferous woodland habitat. Additional effects are potentially associated with general disturbance and vehicular collisions.	Yes	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; indirect provision of compensatory habitat; sound abatement; and, speed limits. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Olive-sided Flycatcher habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will involve a species which is listed as Special Concern under the *Endangered Species Act* and as Threatened under *Species at Risk Act*. Level III	Effects are considered to be minor (2.4% of the NLSA) and confined to the immediate mine site area. Level I	Effects will persist throughout the period of the mine development (construction and operation), and it will take several years for forest habitats to re-establish following active reclamation at mine closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Special Concern Species – Canada Warbler	Mine site development will displace 1,352 ha of woodland habitat and, specifically, just 18 ha in areas where this species was observed. Additional effects are potentially associated with general disturbance and vehicular collisions.	Yes	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; indirect provision of compensatory habitat; sound abatement; and, speed limits. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Canada Warbler habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will involve a species which is listed as Special Concern under the *Endangered Species Act* and as Threatened under *Species at Risk Act*. Level III	Effects are considered to be minor (4.8% of the NLSA) and confined to the immediate mine site area. Level I	Effects will persist throughout the period of the mine development (construction and operation), and it will take several years for forest habitats to re-establish following active reclamation at mine closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Special Concern Species – Red-headed Woodpecker	Mine site development will displace 1,352 ha of woodland habitat. Additional effects are potentially associated with general disturbance and vehicular collisions.	No	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; sound abatement; and, speed limits. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Red-headed Woodpecker habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will involve a species which is listed as Special Concern under the *Endangered Species Act* and *Species at Risk Act*. Level III	Effects are considered to be minor (4.8% of the NLSA) and confined to the immediate mine site area. Level I	Effects will persist throughout the period of the mine development (construction and operation), and it will take several years for forest habitats to re-establish following active reclamation at mine closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur

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Special Concern Species – Short-eared Owl	Mine site development will displace 522 ha of open country and meadow march habitat. Additional effects are potentially associated with general disturbance and vehicular collisions.	Yes	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; indirect provision of compensatory habitat sound abatement; and, speed limits. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Short-eared Owl habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will involve a species which is listed as Special Concern under the *Endangered Species Act* and *Species at Risk Act*. Level III	Effects are considered to be minor (2.0% of the NLSA) and confined to the immediate mine site area. Level I	Effects will persist throughout the period of the mine development (construction and operation), and it will take several years for forest habitats to re-establish following active reclamation at mine closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Special Concern Species – Snapping Turtle	Mine site development will displace 507 ha of wetland habitat. Additional effects are potentially associated with general disturbance, vehicular collisions.	No	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; speed limits and wildlife warning signs; pre-treatment of tailings slurry to ensure TMA ponds are not toxic to wildlife. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Snapping Turtle habitat, centred on the mine site area. Reduced potential exposure to vehicular traffic and site effluents, etc.	Adverse effects will involve a species which is designated as Special Concern under the *Endangered Species Act* and *Species at Risk Act*. Level III	Effects are considered to be minor (1.9% of the NLSA) and confined to the immediate mine site area. Level I	Effects will persist throughout the period of the mine development (construction and operation), and it will take several years for habitats to re-establish following active reclamation at mine closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Provincially Rare Species – Black-billed Magpie	Mine site development will displace 385 ha of agricultural and cultural meadow habitat. Additional effects are potentially associated with general disturbance, vehicular collisions.	No	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season; sound abatement; speed limits; and, pre-treatment of tailings. Active revegetation and at closure will restore habitats.	Long-term, reversible or largely reversible, residual displacement of Black-billed Magpie habitat, centred on the mine site area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Adverse effects will involve Provincially rare species. Level III	Effects are considered to be minor (2.0% of the NLSA) and confined to the immediate mine site area. Level I	Effects will persist throughout the period of the mine development (construction and operation), and it will take several years for forest habitats to re-establish following active reclamation at mine closure. Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Provincially Rare Species – Lilypad Clubtail	Mine site development will not displace any habitat which is typical for this species. No roads will be established in areas where this species was observed.	No	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; and, speed limits. Active revegetation and at closure will restore habitats.	No anticipated displacement of habitat for this species.	Adverse effects will involve Provincially rare species. Level III	Mine site development will not displace any habitat which is typical for this species. Level I	Overall effects are considered to be negligible. Level I	Overall effects are considered to be negligible. Level I	Overall effects are considered to be negligible. Level I	Overall effects are considered to be negligible. Not significant	Unlikely
Provincially Rare Species – Horned Clubtail	Mine site development will not displace any habitat which is typical for this species. Roads which will be established in areas where this species was observed will have negligible effects.	No	Efforts made to develop a compact site with avoidance of sensitive habitats to the extent practical; and, speed limits. Active revegetation and at closure will restore habitats.	No anticipated displacement of habitat for this species.	Adverse effects will involve Provincially rare species. Level III	Mine site development will not displace any habitat which is typical for this species. Level I	Effects will persist throughout the period of the mine development (construction and operation). Level III	Effect is expected to be continuous through construction and operation of the mine. Level III	Effects are reversible following mine closure. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur

Notes: NA: not applicable; NR: not rated

Tables 7-47 to 7-56 were revised per the CEA Agency comment on the draft EA Report (Version 2) that a column be added to identify whether the VEC/VSEC is linked (Yes or No) to any of the following five criteria per Section 5 of CEAA (2012):

- changes to components of the environment within Federal jurisdiction;
- changes to the environment that would occur on Federal or transboundary lands;
- changes to the environment that are directly linked or necessarily incidental to Federal decisions;
- effects of changes to the environment on Aboriginal peoples; or
- effect of changes to the environment that are directly linked or necessarily incidental

Level I	Level II	Level III

Table 7-50: Significance Determinations of Residual Effects after Mitigation, Operation Phase - Human Environment

VSEC	Potential Effect (and direction)	Section 5 Link	Proposed Mitigation or Enhancement	Residual Effect	Residual Significance After Mitigation or Enhancement: Socio-economic Context	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Overall Significance	Likelihood
Land Use Planning	Mining is consistent with current land use planning for the area. No discernable effect.	No	None proposed.	None anticipated.	NA	NA	NA	NA	NA	NA		NA
					NR	NR	NR	NR	NR	NR	NR	
Mineral Exploration	May limit access to resources held by other mineral exploration interests (negative).	No	None proposed.	Limited access to portions of a few properties held by one mineral exploration company.	Multiple companies actively exploring gold claims in the Rainy River District.	Effects to a few properties held by one mineral exploration company.	Effect is confined to the HLSA.	Effects will last until the end of decommissioning (persist throughout construction and operation stages).	Effect occurs continuously.	Reversible at closure (albeit with difficulty and at a high cost).		Likely
					Level III	Level I	Level I	Level II	Level III	Level II	Not significant	
Forestry	Removal of areas of potential forest harvesting and management activities (negative).	No	Efforts were made to develop a compact site to the extent practical; and, any commercial timber harvested from areas developed in association with the RRP site will be made available to current licence holders.	Removal of areas of potential forest harvesting comprising less than 1% of the Crossroute Forest Management Area.	Important regional land use that supports mills in both Barwick and Fort Frances.	Removal of less than 1% of the Crossroute Forest Management Area for forest production.	Effect is confined to the HLSA.	Effect lasts beyond closure.	Effect occurs continuously.	Reversible at closure (albeit with difficulty and at a high cost).		Likely
					Level III	Level I	Level I	Level III	Level III	Level II	Not significant	
Agriculture and Adjacent Residents	Potential for impacts on adjacent residents and farm operations from sound, air quality, and water quality/supply; decreased availability of agricultural land; however, may sustain agricultural use in the region with off farm income opportunities (predominantly negative).	No	Efforts were made to optimize the mine footprint; provide pasture and to offset pasture lands that will be displaced by the RRP; continuing land settlement negotiations with local agricultural producers directly impacted by the RRP.	Removal of 16.4% of land currently used for agriculture in the HLSA; will affect a few adjacent land owners, with such lands having been purchased. Sound, vibration and air quality affects to adjacent residences will be consistent with MOE guidelines for receptor protection.	Agriculture is and has been an important regional land use and economic driver in the region.	Removal of 16.4% of land currently used for agriculture in the HLSA; affects a few adjacent land owners.	Effect is confined to the HLSA.	Effect lasts beyond closure.	Effect will occur continuously.	Effect is reversible in the long term.		Likely
					Level III	Level II	Level I	Level III	Level III	Level II	Not significant	
Hunting	Loss or displacement of land used for hunting and impacts to species hunted (negative).	No	Minimize mine footprint; see also wildlife mitigation measures.	Long-term, reversible or largely reversible, loss of 1.5% of WMU 10 supporting ungulates (mainly deer) that are considered widespread and abundant. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc.	Hunting is an important current land use that helps to support the tourism industry in the region.	Loss of 1.5% of WMU 10; ungulates are considered widespread and abundant; creation of the TL corridor may create additional access for hunters in the region.	Effect is confined to the HLSA.	Effect lasts until closure.	Effect will occur continuously.	Effect is reversible in the long term.		Likely
					Level III	Level I	Level I	Level II	Level III	Level II	Not significant	

VSEC	Potential Effect (and direction)	Section 5 Link	Proposed Mitigation or Enhancement	Residual Effect	Residual Significance After Mitigation or Enhancement						Overall Significance	Likelihood
					Socio-economic Context	Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Trapping	Overprinting of private land traplines and impacts to species trapped (negative).	Unknown	Minimize mine footprint; see also wildlife mitigation measures.	Long-term, reversible or largely reversible, loss of 13.9% and 38% of the area of two traplines.	No information regarding trapping was presented during Aboriginal consultation, discussions and meetings. The trapper contracted by RRR operates additional licensed traplines in the Rainy River District outside of the HLSA.	Loss of 13.9% and 38% of two traplines.	Effect is confined to the HLSA.	Effect lasts until closure.	Effect will occur continuously.	Effect is reversible in the long term.		Likely
					Level II	Level I	Level I	Level II	Level III	Level II	Not significant	
Fishing	Loss of waterbodies used for fishing; effects to sport fish in these water bodies (negative).	Yes	Effects will be mitigated through formation of a Fisheries Working group to develop a RRP No Net Loss Plan; see also fisheries and water resources mitigation measures.	Limited, if any, effects to sport fishing in the Pinewood River or creeks impacted by the RRP; four bait fishers will have portions of their license areas affected. Fisheries effects to be offset by No Net Loss Plan.	Noted by one bait fisher as important; local residents fish in larger, more productive water bodies located outside of the HLSA.	Limited, if any, sport fishing in the Pinewood River or creeks impacted by the RRP; four bait fishers will have portions of their license areas affected.	Effect is confined to the HLSA.	Effect lasts until closure.	Effect will occur continuously.	Effect is reversible with difficulty in the long term.		Likely
					Level II	Level I	Level I	Level II	Level III	Level II	Not significant	
Other Outdoor Recreation Uses	Overprinting a portion of Richardson Trail (south part of the trail); changes in enjoyment of natural / wilderness areas due to sound and air emissions; and, increases in traffic on Highways.	No	Refer to mitigations for air and sound emissions and traffic. Working with local land owners to enhance Richardson Trail components.	A portion of Richardson Trail will be overprinted by the TMA. Reduced potential exposure to noise and air emissions, consistent with MOE guidelines.	Other recreation activities are limited in the HLSA; Richardson Trail is an important recreation use trail for local residents.	A portion of Richardson Trail will be overprinted by the TMA.	Effect is confined to the HLSA.	Effect lasts until closure.	Effect will occur continuously.	Effect is reversible in the long term.		Unlikely
					Level II	Level I	Level I	Level II	Level III	Level II	Not significant	
Economics	Expenditures during construction and operation will stimulate the economy, creating jobs and income in industries in the region and throughout Ontario (positive).	No	Enhancement measures involve those directed at trying to optimize regional participation in employment, training and procurement.	Expenditures during construction and operation will stimulate the economy, creating jobs and income in industries in the region and throughout Ontario, with potential for enhancement of effects	Employment and income effects highly-valued in an area facing prolonged economic difficulties.	Low in comparison to the Provincial economy; large in comparison to the regional economy.	Effect is experienced across the region; low magnitude effects across Ontario.	Effect lasts until closure is completed.	Effect will occur continuously.	Effect is reversible with closure, although long-term effects may persist.	Effect is expected to help promote significant economic growth in the region.	Effect will occur
					Level III	Level III	Level II	Level II	Level III	Level II	Significant	
Demographics and Population	Project development would be expected to provide economic opportunities that would help to slow the current out-migration of people from the region, the populations of most areas (other than First Nation reserves) are in decline.(Net effect is positive.)	No	Enhancement measures involve those directed at trying to optimize local participation in the Project, including opportunities for Aboriginal communities.	Project development is expected to reverse the current population decline and contribute to low levels of population growth, but will not result in a large population change.	The Project will create employment and contribute to the stability of community populations.	Project development is expected to reverse the decline and contribute to low levels of growth, but will not result in a large population change.	Effects will be experienced across the region.	Effects will occur for the life of the Project.	Effect will occur continuously during the life of the Project.	Reversibility depends on long-term economic performance in the area.	Effect is expected to help sustain or promote modest growth in population.	Effect will occur
					Level III	Level II	Level II	Level II	Level III	Level II	Significant	

VSEC	Potential Effect (and direction)	Section 5 Link	Proposed Mitigation or Enhancement	Residual Effect	Residual Significance After Mitigation or Enhancement						Overall Significance	Likelihood
					Socio-economic Context	Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Housing and Accommodation	Project development would help with maintaining regional incomes in a stressed market place, thereby contributing to improved housing stability. (Net effect is positive.)	No	Enhancement measures involve those directed at trying to optimize local participation in the Project, including opportunities for Aboriginal communities which will improve housing stability.	Effects will reverse shrinkage of housing stock and support prices, particularly in communities close to the site.	Housing stability contributes to the regional economy and to the stability of families. Level III	Effects will reverse shrinkage of housing stock and support prices, particularly in communities close to the site. Level II	Effects limited to communities within 100 km of site. Level II	Effects will occur for the life of the Project. Level II	Effect will occur continuously during the life of the Project. Level III	Reversibility depends on long-term economic performance of region. Level II	Effect will help to maintain current housing market viability. Significant	Effect will occur
Public Utilities	Additional demands expected due to population increases which is positive in a region where there is decline in demands.	No	Ongoing discussions about potential additional demands with municipalities and service providers.	Additional demands expected due to population increases which is positive in a region where there is decline in demands.	Subject of ongoing discussion between RRR and municipalities and service providers. Level II	Low to moderate in the context of declining population (capacity in most systems). Level II	Effects will occur in some HRSA communities. Level II	Effect will occur for the life of the Project. Level II	Effect will occur continuously during the life of the Project. Level III	Effect is reversible at closure. Level II	Effect will sustain demands for existing services or provide a tax base upon which more service upgrades can be achieved. Significant	Effect will occur
Community and Social Services	Most workers are expected to derive from the local population, which will help to sustain community services. These services are currently not over-taxed. (Net effect has both positive and negative aspects associated.)	No	Enhancement measures involve worker and multi-stakeholder consultation, linking workers with services, and training programs.	Most workers expected to derive from the local population, such that the effect is mainly one of sustaining demand for existing services.	Regional community services are critical to overall community health and well-being. Level III	Effect is mainly one of sustaining demand for existing services. Level I	Effects will be experienced across the region. Level II	Effect will occur for the life of the Project. Level II	Effect will occur continuously during the life of the Project. Level III	Reversible Level I	Effect is expected to help to maintain the current status of community and social services. Not significant	Effect will occur
Highway Traffic – Construction Phase	Project development will increase traffic volumes on local roads and highways.	No	Enforcement of speed limits, driver training, scheduling of major equipment deliveries in off hours, roadway design (turning lanes), general road maintenance and other measures.	Project development will increase traffic volumes on local roads and highways.	Traffic volumes and vehicle safety are critical to the region. Level II	Existing road and highway systems are readily capable of sustaining increased traffic volumes and loads; and, effects can be managed using mitigation measures. Level I	Effects will be experienced in only certain portions of Highway 11 between Fort Frances and the intersection with Highway 71. Level II	Effects will occur only during peak construction months. Level I	Effect will occur intermittently with some degree of regularity during shift changes. Level II	Effect is reversible in the short term. Level I	Existing road and highway systems are readily capable of sustaining the projected increased traffic volumes and loads. Not significant	Effect will occur
Highway Traffic – Operations Phase	Project development will increase traffic volumes on local roads and highways.	No	Request enforcement of speed limits, driver training, scheduling of major equipment deliveries in off hours, roadway design (turning lanes), general road maintenance and other measures.	Project development will increase traffic volumes on local roads and highways.	Traffic volumes and vehicle safety are critical to the region. Level II	Existing road and highway systems are readily capable of sustaining increased traffic volumes and loads; and, effects can be managed using mitigation measures. Level I	Effects will be experienced in only certain portions of Highway 11 between Fort Frances and the intersection with Highway 71. Level II	Effects will occur during the operations of the Project. Level II	Effect will occur intermittently with some degree of regularity during shift changes. Level II	Effect is reversible in the long term. Level II	Existing road and highway systems are readily capable of sustaining the projected increased traffic volumes and loads. Not significant	Effect will occur

VSEC	Potential Effect (and direction)	Section 5 Link	Proposed Mitigation or Enhancement	Residual Effect	Residual Significance After Mitigation or Enhancement						Overall Significance	Likelihood
					Socio-economic Context	Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Human Health	Possible release of contaminants of potential concern, particularly heavy metals that could potentially bioaccumulate; release of spilled materials that could affect human health; and, traffic accidents resulting in direct physical injury.	No	Ensure all applicable occupational health and safety legislation standards are met; provision of legislated secondary containment; utilize best management practices for industrial hygiene hazard control; operate the RRP so as to meet applicable health and environmental standards; prevent any chemical spills from entering the environment.	With mitigation, as proposed, the magnitude of contaminant release is expected to be small and within applicable Provincial and Federal emission and discharge criteria. No credible health risk to residents or consumers of fish and wildlife. Occupational health and safety legislation standards to be met.	The health and safety of RRR employees, neighbours and the general public is a priority for RRR. Level III	The magnitude of contaminant release is expected to be small and within applicable Provincial and Federal emission and discharge criteria. No credible health risk to residents or consumers of fish and wildlife. Level I	No credible health effects anticipated for area residents. Level I	Effect is confined to the HLSA. Level I	Effect is expected to occur infrequently/not at all. Level I	Effect is reversible at closure. Level II	Overall effects are considered not significant. Not significant	Unlikely
Archaeological Resources	Construction of the RRP may affect archaeological sites through disturbance and/or removal of soils during construction and/or operation which potentially contain remains of archaeological sites. Activities that could have the greatest affect on cultural heritage resources include: clearing, grubbing, stripping, excavation and basting during construction and expansion of stockpiles and TMA during operations.	No	The RRP layout has been adjusted so that three pre-contact archaeological sites initially identified as at risk will no longer be affected by the RRP.	Land clearing, excavation, and road construction have the potential to effect archaeological sites, but will be mitigated prior to effects occurring; currently no known sites within the RRP footprint.	Cultural heritage resources are of high importance, particularly to Aboriginal peoples. Level III	Land clearing, excavation, and road construction have the potential to effect archaeological sites (i.e., data loss or destruction), but will be mitigated prior to effects occurring; currently no known sites within the RRP footprint. Level II	Sites are relatively small and occur in less than 1% of the RRP and will not contribute to overall environmental impact. Level I	Effects will be permanent unless mitigation measures (i.e., site avoidance or protective measures) are possible. Level III	Effect is expected to occur infrequently/not at all. Level I	Effects will be permanent unless mitigation measures (i.e., site avoidance or protective measures) are possible. Level III	Range of mitigation measures available for archaeological site. Not significant	Unlikely
Built Heritage Resources and Cultural Heritage Landscapes	Construction and operation of the RRP may impact, either directly or indirectly, a variety of built heritage resource and cultural heritage landscape features.	No	Efforts made to develop a compact site with avoidance of sensitive areas to the extent practical; RRR has committed to undertaking a mitigation program consisting of an illustrated history of the study area.	Additional buildings beyond those 4 affected during the construction phase may require demolition as a public safety measure.	Built heritage resources and cultural heritage landscapes contribute to the character, history and sense of place of an area and are of high importance. Level III	None of these sites / features are designated under the OHA, or included in a municipal heritage inventory or register. Level I	Direct effects are localized and restricted to the HLSA. Level I	Effects to the directly affected sites are permanent, with mitigation undertaken by documenting them before removal. Level III	Direct effects are infrequent; indirect effects will be continuous. Level III	Effects will be permanent unless mitigation measures (i.e., site avoidance or protective measures) are possible. Level III	Overall effects are considered not significant. Not significant	Effect may occur

Notes: NA: not applicable; NR: not rated

Tables 7-47 to 7-56 were revised per the CEA Agency comment on the draft EA Report (Version 2) that a column be added to identify whether the VEC/VSEC is linked (Yes or No) to any of the following five criteria per Section 5 of CEAA (2012):

- changes to components of the environment within Federal jurisdiction;
- changes to the environment that would occur on Federal or transboundary lands;
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- effects of changes to the environment on Aboriginal peoples; or
- effect of changes to the environment that are directly linked or necessarily incidental

Level I	Level II	Level III

Table 7-51: Significance Determinations of Residual Effects after Mitigation, Maintenance Phase – Natural Environment

System / Component / Feature	Potential Effect	Section 5 Link	Proposed Mitigation	Residual Effect	Residual Significance After Mitigation					Overall Significance	Likelihood
					Value of System, Component, Feature or Situation	Magnitude / Geographic Extent	Duration	Frequency	Reversibility		
Air Quality	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NA
Greenhouse Gases	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NA
Sound	Additional sound may be generated as part of aggregate operations for maintenance of roads.	No	Time constraints on some operations; use of quieter equipment.	Additional sound may be generated as part of aggregate operations for maintenance of roads.	No meaningful adverse ecosystem effects; activities will occur in conjunction with ongoing mine operations. Level I	Effects are considered to be minor and confined to the immediate mine site area. Level I	Medium-term: maintenance activities will occur throughout the life of the project. Level II	Activities will take place intermittently, on an as-required basis. Level II	Effect is readily reversible at mine closure. Level I	Magnitude of effect is too small to be distinguished from regular operational activities. Not significant.	Effect will occur.
Vibration	Additional vibration may be generated as part of aggregate operations for maintenance of roads.	No	Time constraints on some operations; use of quieter equipment.	NA	No meaningful adverse ecosystem effects; activities will occur in conjunction with ongoing mine operations. Level I	Effects are considered to be minor and confined to the immediate mine site area. Level I	Medium-term: maintenance activities will occur throughout the life of the project. Level II	Activities will take place intermittently, on an as-required basis. Level II	Effect is readily reversible at mine closure. Level I	Magnitude of effect is too small to be distinguished from regular operational activities. Not significant.	Effect will occur.
Minor Creek Systems	No effects related to maintenance activities beyond those assessed as part of construction or operations.	Yes	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NA
Pinewood River	No effects related to maintenance activities beyond those assessed as part of construction or operations.	Yes	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NA
Groundwater	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NA

System / Component / Feature	Potential Effect	Section 5 Link	Proposed Mitigation	Residual Effect	Residual Significance After Mitigation: Value of System, Component, Feature or Situation	Magnitude / Geographic Extent	Duration	Frequency	Reversibility	Overall Significance	Likelihood
Vegetation Communities and Rare Plants	Maintenance of the transmission line will require ongoing regular clearing of vegetation.	No	Clearing of vegetation will be carried out using mechanical means only – no herbicides are proposed.	Inhibited growth of vegetation along the transmission line corridor, which will begin to reverse immediately upon cessation of clearing at closure.	Adverse effects will generally involve commonplace and widespread plant species.	Effects are considered to be minor and confined to the immediate transmission line area.	Effects will persist throughout the period of the mine development (construction and operation), but will re-establish following mine closure.	Effect is expected to be continuous through construction and operation of the mine.	Effects are reversible following mine closure.	Overall effects are considered to be generally minor (affected vegetation communities are common in the NLSA), localized and reversible.	Effect will occur
					Level II	Level I	Level III	Level III	Level I	Not significant	
Ungulates	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA	NA	NA	NA	NA	NA	NA
					NR	NR	NR	NR	NR	NR	
Furbearers	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA	NA	NA	NA	NA	NA	NA
					NR	NR	NR	NR	NR	NR	
Bats	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA	NA	NA	NA	NA	NA	NA
					NR	NR	NR	NR	NR	NR	
Migratory Birds	No effects related to maintenance activities beyond those assessed as part of construction or operations.	Yes	None proposed.	NA	NA	NA	NA	NA	NA	NA	NA
					NR	NR	NR	NR	NR	NR	
Raptors and Ravens (including Bald Eagle)	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA	NA	NA	NA	NA	NA	NA
					NR	NR	NR	NR	NR	NR	
Amphibians	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA	NA	NA	NA	NA	NA	NA
					NR	NR	NR	NR	NR	NR	
SAR – Little Brown Myotis	Addressed above under the heading Bats										
SAR – Northern Myotis	Addressed above under the heading Bats										

System / Component / Feature	Potential Effect	Section 5 Link	Proposed Mitigation	Residual Effect	Residual Significance After Mitigation					Overall Significance	Likelihood
					Value of System, Component, Feature or Situation	Magnitude / Geographic Extent	Duration	Frequency	Reversibility		
SAR – Eastern Whip-poor-will	No effects related to maintenance activities beyond those assessed as part of construction or operations.	Yes	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NA
SAR – Bobolink	No effects related to maintenance activities beyond those assessed as part of construction or operations.	Yes	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NA
SAR – Barn Swallow	No effects related to maintenance activities beyond those assessed as part of construction or operations.	Yes	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NA
Special Concern Species – Common Nighthawk	No effects related to maintenance activities beyond those assessed as part of construction or operations.	Yes	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NA
Special Concern Species – Golden Winged Warbler	No effects related to maintenance activities beyond those assessed as part of construction or operations.	Yes	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NA
Special Concern Species – Olive-sided Flycatcher	No effects related to maintenance activities beyond those assessed as part of construction or operations.	Yes	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NA
Special Concern Species – Canada Warbler	No effects related to maintenance activities beyond those assessed as part of construction or operations.	Yes	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NA
Special Concern Species – Red-headed Woodpecker	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NA

System / Component / Feature	Potential Effect	Section 5 Link	Proposed Mitigation	Residual Effect	Residual Significance After Mitigation					Overall Significance	Likelihood
					Value of System, Component, Feature or Situation	Magnitude / Geographic Extent	Duration	Frequency	Reversibility		
Special Concern Species – Short-eared Owl	No effects related to maintenance activities beyond those assessed as part of construction or operations.	Yes	None proposed.	NA	NA	NA	NA	NA	NA	NA	NA
					NR	NR	NR	NR	NR	NR	
Special Concern Species – Snapping Turtle	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA	NA	NA	NA	NA	NA	NA
					NR	NR	NR	NR	NR	NR	
Provincially Rare Species – Black-billed Magpie	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA	NA	NA	NA	NA	NA	NA
					NR	NR	NR	NR	NR	NR	
Provincially Rare Species – Lilypad Clubtail	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA	NA	NA	NA	NA	NA	NA
					NR	NR	NR	NR	NR	NR	
Provincially Rare Species – Horned Clubtail	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA	NA	NA	NA	NA	NA	NA
					NR	NR	NR	NR	NR	NR	

Notes: NA: not applicable; NR: not rated
Tables 7-47 to 7-56 were revised per the CEA Agency comment on the draft EA Report (Version 2) that a column be added to identify whether the VEC/VSEC is linked (Yes or No) to any of the following five criteria per Section 5 of CEAA (2012):

- changes to components of the environment within Federal jurisdiction;
- changes to the environment that would occur on Federal or transboundary lands;
- changes to the environment that are directly linked or necessarily incidental to Federal decisions;
- effects of changes to the environment on Aboriginal peoples; or
- effect of changes to the environment that are directly linked or necessarily incidental.

Level I	Level II	Level III

Table 7-52: Significance Determinations of Residual Effects after Mitigation, Maintenance Phase - Human Environment

VSEC	Potential Effect (and direction)	Section 5 Link	Proposed Mitigation or Enhancement	Residual Effect	Residual Significance After Mitigation or Enhancement						Overall Significance	Likelihood
					Socio-economic Context	Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Land Use Planning	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NR	NA
Mineral Exploration	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NR	NA
Forestry	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NR	NA
Agriculture and Adjacent Residents	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NR	NA
Hunting	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NR	NA
Trapping	No effects related to maintenance activities beyond those assessed as part of construction or operations.	Unknown	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NR	NA
Fishing	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NR	NA
Other Outdoor Recreation Uses	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NR	NA
Economics	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NR	NA
Demographics and Population	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NR	NA

VSEC	Potential Effect (and direction)	Section 5 Link	Proposed Mitigation or Enhancement	Residual Effect	Residual Significance After Mitigation or Enhancement						Overall Significance	Likelihood
					Socio-economic Context	Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Housing and Accommodation	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NR	NA
Public Utilities	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NR	NA
Community and Social Services	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NR	NA
Highway Traffic – Construction Phase	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NR	NA
Highway Traffic – Operations Phase	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NR	NA
Human Health	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NR	NA
Archaeological Resources	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NR	NA
Built Heritage Resources and Cultural Heritage Landscapes	No effects related to maintenance activities beyond those assessed as part of construction or operations.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NR	NA

Notes: NA: not applicable; NR: not rated

Tables 7-47 to 7-56 were revised per the CEA Agency comment on the draft EA Report (Version 2) that a column be added to identify whether the VEC/VSEC is linked (Yes or No) to any of the following five criteria per Section 5 of CEAA (2012):

- changes to components of the environment within Federal jurisdiction;
- changes to the environment that would occur on Federal or transboundary lands;
- changes to the environment that are directly linked or necessarily incidental to Federal decisions;
- effects of changes to the environment on Aboriginal peoples; or
- effect of changes to the environment that are directly linked or necessarily incidental.

Level I	Level II	Level III

Table 7-53: Significance Determinations of Residual Effects after Mitigation, Closure / Decommissioning Phase – Natural Environment

System / Component / Feature	Potential Effect	Section 5 Link	Proposed Mitigation	Residual Effect	Residual Significance After Mitigation					Overall Significance	Likelihood
					Value of System, Component, Feature or Situation	Magnitude / Geographic Extent	Duration	Frequency	Reversibility		
Air Quality	Most air quality emissions from the operation of the mine will be greatly reduced compared to the operations phase. Emissions during closure and decommissioning may derive from demolition of buildings and infrastructure, vehicle traffic on roadways, and construction activities related to closure of various site facilities, including stockpile reclamation.	No	Dust emissions from roads and stockpiles will be controlled through use of water sprays; water cannon sprays will be employed to control dust emissions from stockpiles and handling activities; site roadways will be maintained in good condition; a fugitive dust best management practices plan will be prepared to identify all sources and outline all measures of mitigation.	Air quality modeling shows that with mitigation, as proposed, concentrations of NOx, HCN, key metals, PMtot, PM10 and PM2.5 are expected to meet MOE air quality standards for the site specific emissions, at the property line.	Adverse effects potentially involve human health, and locally and regionally important plant and wildlife species and communities. Level III	With the appropriate mitigation, effects are considered to be minor and confined to the immediate mine site area. Effects will be consistent with the regulatory standards of O.Reg. 419/05. Level I	Short-term: Effects will occur in the active closure phase. Level I	Effect expected to occur continuously. Level III	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Greenhouse Gases	Project-related greenhouse gas emissions will be greatly reduced compared to the operations phase. GHG emissions will arise from limited use of heavy equipment for construction activities related to closure of various site facilities, as well as passenger vehicle traffic.	No	Efforts were made to develop a compact site, thereby reducing transportation needs and minimizing equipment movement, and in turn reducing fuel consumption; use of a transmission power line instead of onsite diesel power during operations; utilizing more fuel efficient trucks for transport; and, maintaining site equipment in good working order.	Project-related greenhouse gas emissions will be greatly reduced compared to the operation phase.	Climate change has the potential to positively and negatively affect species and habitats on a local scale; effects of any single Project and local scale effects are too small to distinguish from background conditions. Level III	Effects are considered to be minor (less than 0.06% of the target CO_2 emission reduction for Canada) and confined to the immediate mine site area. Level I	Short-term: Effects will occur in the active closure phase. Level I	Effect expected to occur continuously. Level II	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Sound	Project-related sound levels will be greatly reduced compared to the operations phase. Sound will result from limited use of heavy equipment for construction activities related to closure of various site facilities, as well as passenger vehicle traffic.	No	The selection of quieter equipment, including but not limited to the following items: quiet mining trucks, electric drive excavators, and emergency diesel generators with silencers/mufflers; also the favourable positioning of equipment, and time constraints on operations.	With mitigation, as proposed, sound levels at adjacent properties are expected to meet MOE guidelines for day-time and night-time effects.	Adverse effects potentially include disturbance to local residents and to sensitive wildlife species. Level III	Effects are considered to be minor and confined to the immediate mine site area. Level I	Short-term: Effects will occur in the active closure phase. Level I	Effect expected to occur continuously. Level II	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Vibration	None expected. All blasting will have been completed during operations phase.	No	None proposed.	None expected.	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	Effect will not occur
Minor Creek Systems	Pre-development water bodies will be permanently impacted; no effects anticipated to water bodies established as compensation under the No Net Loss plan.	Yes	None proposed beyond establishing compensating habitat during operations phase.	None expected.	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	No effects expected.

System / Component / Feature	Potential Effect	Section 5 Link	Proposed Mitigation	Residual Effect	Residual Significance After Mitigation					Overall Significance	Likelihood
					Value of System, Component, Feature or Situation	Magnitude / Geographic Extent	Duration	Frequency	Reversibility		
Pinewood River	Water taking of up to 20% of spring flows and up to 15% of remaining open water period flows to allow for rapid flooding of the TMA to manage ARD potentials and stabilize the TMA to allow for passive outflow to the environment. Longer term capture of up to approximately 5% of the Pinewood River watershed (at Loslo Creek) will be diverted to allow for filling of the open pit.	Yes	Monitoring Pinewood River flows to ensure that that stated amounts are not exceeded. Possible reductions in water taking during extreme low flow conditions (5-10 percentile years). Rapid stabilization of the TMA pond allows for more rapid return of TMA watershed contribution to the Pinewood River.	Rapid stabilization of the TMA, at up to 20% of spring flows and up to 15% of remaining open water period flows, will facilitate a quicker return to near normal river flows, as the TMA represents approximately 45% of captured site sub-watershed area reporting to the integrated water inventory system.	Dominant local river system which supports commonplace and widespread ecological communities. Level II	Flow effects are considered to be minor (<20% during average and high flow years; with flow enhancement during low flow periods); water quality to be maintained at levels suitable for protection of aquatic life. Level I	Long-term: Water taking and TMA flooding and related effects are expected to persist for 4-5 years under average Pinewood River flow conditions. Diversions to the open pit will continue for several tens of years beyond the closure phase. Level III	Effect is expected to have seasonal regularity; water taking will be continuous during the open water period. Level II	Effects of water taking are readily reversible upon cessation of water taking. Level I	Flow effects considered to be minor; adverse water quality effects are not anticipated. Not significant	Effect will occur
Groundwater	At closure, pumping from the open pit will cease and recovery of the water table will begin, which will include infilling of the open pit.	No	None proposed.	At closure, pumping from the open pit will cease and recovery of the water table will begin.	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	No effects expected.
Vegetation Communities and Rare Plants	At closure, revegetation and other reclamation activities will allow for vegetation communities to re-establish themselves at the site.	No	None proposed.	At closure, revegetation and other reclamation activities will allow for vegetation communities to re-establish themselves at the site.	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	No effects expected.
Ungulates	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Minor effects are potentially associated with general disturbance (noise effects) and vehicular collisions during the active closure phase.	No	Speed limits and wildlife warning signs; Active revegetation and at closure will restore habitats.	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. will continue from the operation phase.	White-tailed deer are ubiquitous within the NLSA. Winter deer-yard habitat is common throughout the NRSA. Low density of moose within the NRSA. Level II	Effects are considered to be minor (6.4% of the NLSA) and confined to the immediate mine site area. Level I	Short-term: effects will last through period of active closure before natural recovery of the area begins. Level I	Effect expected to occur continuously through the closure phase. Level III	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Furbearers	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Minor effects are potentially associated with general disturbance (noise effects) and vehicular collisions during the active closure phase.	No	Speed limits and wildlife warning signs; Active revegetation and at closure will restore habitats.	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. will continue from the operation phase.	Adverse effects will generally involve commonplace and widespread furbearer species. Level II	Effects are considered to be minor (6.7% of the NLSA) and confined to the immediate mine site area. Level I	Short-term: effects will last through period of active closure before natural recovery of the area begins. Level I	Effect expected to occur continuously through the closure phase. Level III	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Bats	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Minor effects are potentially associated with general disturbance (noise effects) and vehicular collisions during the active closure phase.	No	Speed limits and wildlife warning signs; Active revegetation and at closure will restore habitats.	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. will continue from the operation phase.	Northern Myotis and Little Brown Myotis are recognized as SAR in Ontario. Level III	Effects are considered to be minor (<0.1% of the NLSA) and confined to the immediate mine site area. Level I	Short-term: effects will last through period of active closure before natural recovery of the area begins. Level I	Effect expected to occur continuously through the closure phase. Level III	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur

System / Component / Feature	Potential Effect	Section 5 Link	Proposed Mitigation	Residual Effect	Residual Significance After Mitigation					Overall Significance	Likelihood
					Value of System, Component, Feature or Situation	Magnitude / Geographic Extent	Duration	Frequency	Reversibility		
Migratory Birds	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Minor effects are potentially associated with general disturbance (noise effects) and vehicular collisions during the active closure phase.	Yes	Avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season if and where applicable; protection of compensatory habitat; sound abatement; speed limits; active revegetation and at closure will restore habitats.	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. will continue from the operation phase.	Adverse effects will generally involve commonplace and widespread species, together with some SAR and regionally rare species. Level III	Effects are considered to be minor (7.7% of the NLSA) and confined to the immediate mine site area. Level I	Short-term: effects will last through period of active closure before natural recovery of the area begins. Level I	Effect expected to occur continuously through the closure phase. Level III	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Raptors and Ravens (including Bald Eagle)	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Minor effects are potentially associated with general disturbance (noise effects) and vehicular collisions during the active closure phase.	No	Avoidance of sensitive habitats to the extent practical; avoidance of nesting habitat until nests are vacant; speed limits; wildlife warning signs; and, proper waste disposal. Active revegetation and at closure will restore habitats.	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. will continue from the operation phase.	Adverse effects will generally involve commonplace raptor species and one species Provincially listed as Special Concern. Level III	Effects are considered to be minor as no nests raptor nests will be removed and disturbance will be minimized during the active nesting period. Level I	Short-term: effects will last through period of active closure before natural recovery of the area begins. Level I	Effect expected to occur continuously through the closure phase. Level III	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Amphibians	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Minor effects are potentially associated with general disturbance (noise effects) and vehicular collisions during the active closure phase.	No	Avoidance of sensitive habitats to the extent practical; speed limits and wildlife warning signs; active revegetation and at closure will restore habitats.	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. will continue from the operation phase.	Adverse effects will generally involve commonplace and widespread species. Level II	Effects are considered to be minor (6.3% of the NLSA) and confined to the immediate mine site area. Level I	Short-term: effects will last through period of active closure before natural recovery of the area begins. Level I	Effect expected to occur continuously through the closure phase. Level III	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
SAR – Little Brown Myotis	Addressed above under the heading Bats										
SAR – Northern Myotis	Addressed above under the heading Bats										
SAR – Eastern Whip-poor-will	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Minor effects are potentially associated with general disturbance and vehicular collisions during the initial active closure phase.	Yes	Avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season if and where applicable; development and protection of compensatory habitat; continued research; sound abatement; speed limits; active revegetation and at closure will restore habitats.	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area, with focused habitat reclamation efforts to support Whip-poor-will. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. will continue from the operation phase.	Adverse effects will involve a species which is designated as Threatened under both the *Endangered Species Act* and *Species at Risk Act*. Level III	Effects are considered to be minor (5.1% of the NLSA), and from 13 to 17 breeding territories; and confined to the immediate mine site area; adverse effects to be compensated for through the *Endangered Species Act*. Level I	Short-term: effects will last through period of active closure before natural recovery of the area begins. Level I	Effect expected to occur continuously through the closure phase. Level III	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible; provision of overall benefits compensation. Not significant	Effect will occur

System / Component / Feature	Potential Effect	Section 5 Link	Proposed Mitigation	Residual Effect	Residual Significance After Mitigation					Overall Significance	Likelihood
					Value of System, Component, Feature or Situation	Magnitude / Geographic Extent	Duration	Frequency	Reversibility		
SAR – Bobolink	During active closure and decommissioning grassland / early succession communities suitable for Bobolink will be present, and compensatory habitat will continue to be maintained, expanding habitats suitable to Bobolink at this stage. Minor effects are potentially associated with general disturbance and vehicular collisions during the initial active closure phase.	Yes	Avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season if and where applicable; protection of compensatory habitat; sound abatement; and, speed limits. Active revegetation and at closure will restore habitats.	During active closure and decommissioning grassland / early succession communities suitable for Bobolink will be present, and compensatory habitat will continue to be maintained, expanding habitats suitable to Bobolink at this stage. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. will continue from the operation phase.	Adverse effects will involve a species which is designated as Threatened under both *Endangered Species Act* and *Species at Risk Act*. Level III	Effects are considered to be minor (2.0% of the NLSA); and confined to the immediate mine site area; adverse effects to be compensated for through the *Endangered Species Act*. Level I	Short-term: effects will last through period of active closure before natural recovery of the area begins. Level I	Effect expected to occur continuously through the closure phase. Level III	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible; provision of overall benefits compensation. Not significant	Effect will occur
SAR – Barn Swallow	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Minor effects are potentially associated with general disturbance and vehicular collisions during the initial active closure phase.	Yes	Avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season if and where applicable; sound abatement; speed limits; active revegetation and at closure will restore habitats.	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area, including the reclaimed TMA which will provide foraging over-water habitat for this species. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. will continue from the operation phase.	Adverse effects will involve a species which is designated as Threatened under both the *Endangered Species Act* and *Species at Risk Act*. Level III	Effects are considered to be minor (2.0% of the NLSA) and confined to the immediate mine site area; adverse effects to be compensated for through the *Endangered Species Act* if required. Level I	Short-term: effects will last through period of active closure before natural recovery of the area begins. Level I	Effect expected to occur continuously through the closure phase. Level III	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible; provision of overall benefits compensation. Not significant	Effect will occur
Special Concern Species – Common Nighthawk	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Minor effects are potentially associated with general disturbance and vehicular collisions during the initial active closure phase.	Yes	Avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season if and where applicable; provision of compensatory habitat; sound abatement; light pollution reduction; speed limits; active revegetation and at closure will restore habitats.	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area, with focused habitat reclamation efforts to support Common Nighthawk. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. will continue from the operation phase.	Adverse effects will involve a species which is designated as Special Concern under the *Endangered Species Act* and as Threatened under *Species at Risk Act*. Level III	Effects are considered to be minor (5.1% of the NLSA) and confined to the immediate mine site area. Level I	Short-term: effects will last through period of active closure before natural recovery of the area begins. Level I	Effect expected to occur continuously through the closure phase. Level III	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Special Concern Species – Golden Winged Warbler	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Minor effects are potentially associated with general disturbance and vehicular collisions during the initial active closure phase.	Yes	Avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season if and where applicable; indirect provision of compensatory habitat; sound abatement; and, speed limits. Active revegetation and at closure will restore habitats.	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. will continue from the operation phase.	Adverse effects will involve a species which is designated as Special Concern under the *Endangered Species Act* and as Threatened under *Species at Risk Act*. Level III	Effects are considered to be minor (1.9% of the NLSA) and confined to the immediate mine site area. Level I	Short-term: effects will last through period of active closure before natural recovery of the area begins. Level I	Effect expected to occur continuously through the closure phase. Level III	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur

System / Component / Feature	Potential Effect	Section 5 Link	Proposed Mitigation	Residual Effect	Residual Significance After Mitigation: Value of System, Component, Feature or Situation	Magnitude / Geographic Extent	Duration	Frequency	Reversibility	Overall Significance	Likelihood
Special Concern Species – Olive-sided Flycatcher	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Minor effects are potentially associated with general disturbance and vehicular collisions during the initial active closure phase.	Yes	Avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season if and where applicable; indirect provision of compensatory habitat; sound abatement; and, speed limits. Active revegetation and at closure will restore habitats.	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. will continue from the operation phase.	Adverse effects will involve a species which is designated as Special Concern under the *Endangered Species Act* and as Threatened under *Species at Risk Act*. Level III	Effects are considered to be minor (2.4% of the NLSA) and confined to the immediate mine site area. Level I	Short-term: effects will last through period of active closure before natural recovery of the area begins. Level I	Effect expected to occur continuously through the closure phase. Level III	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Special Concern Species – Canada Warbler	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Minor effects are potentially associated with general disturbance and vehicular collisions during the initial active closure phase.	Yes	Avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season if and where applicable; indirect provision of compensatory habitat; sound abatement; and, speed limits. Active revegetation and at closure will restore habitats.	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. will continue from the operation phase.	Adverse effects will involve a species which is designated as Special Concern under the *Endangered Species Act* and as Threatened under *Species at Risk Act*. Level III	Effects are considered to be minor (4.8% of the NLSA) and confined to the immediate mine site area. Level I	Short-term: effects will last through period of active closure before natural recovery of the area begins. Level I	Effect expected to occur continuously through the closure phase. Level III	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Special Concern Species – Red-headed Woodpecker	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Minor effects are potentially associated with general disturbance and vehicular collisions during the initial active closure phase.	No	Avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season if and where applicable; sound abatement; and, speed limits. Active revegetation and at closure will restore habitats.	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. will continue from the operation phase.	Adverse effects will involve a species which is designated as Special Concern under the *Endangered Species Act* and *Species at Risk Act*. Level III	Effects are considered to be minor (4.8% of the NLSA) and confined to the immediate mine site area. Level I	Short-term: effects will last through period of active closure before natural recovery of the area begins. Level I	Effect expected to occur continuously through the closure phase. Level III	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Special Concern Species – Short-eared Owl	During active closure and decommissioning grassland / early succession communities suitable for Short-eared Owl will be in the development stage, and will approach their maximum extent shortly thereafter, expanding habitats suitable to Short-eared Owls at and subsequent to this stage. Minor effects are potentially associated with general disturbance and vehicular collisions during the initial active closure phase.	Yes	Avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season if and where applicable; indirect provision of compensatory habitat sound abatement; and, speed limits. Active revegetation and at closure will restore habitats.	During active closure and decommissioning grassland / early succession communities suitable for Short-eared Owl will be in the development stage, and will approach their maximum extent shortly thereafter, expanding habitats suitable to Short-eared Owls at and subsequent to this stage. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. will continue from the operation phase.	Adverse effects will involve a species which is designated as Special Concern under the *Endangered Species Act* and *Species at Risk Act*. Level III	Effects are considered to be minor (2.0% of the NLSA) and confined to the immediate mine site area. Level I	Short-term: effects will last through period of active closure before natural recovery of the area begins. Level I	Effect expected to occur continuously through the closure phase. Level III	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Special Concern Species – Snapping Turtle	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Minor effects are potentially associated with general disturbance and vehicular collisions during the initial active closure phase.	No	Avoidance of sensitive habitats to the extent practical; speed limits and wildlife warning signs. Active revegetation and at closure will restore habitats.	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. will continue from the operation phase.	Adverse effects will involve a species which is designated as Special Concern under the *Endangered Species Act* and *Species at Risk Act*. Level III	Effects are considered to be minor (1.9% of the NLSA) and confined to the immediate mine site area. Level I	Short-term: effects will last through period of active closure before natural recovery of the area begins. Level I	Effect expected to occur continuously through the closure phase. Level III	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur

System / Component / Feature	Potential Effect	Section 5 Link	Proposed Mitigation	Residual Effect	Residual Significance After Mitigation: Value of System, Component, Feature or Situation	Magnitude / Geographic Extent	Duration	Frequency	Reversibility	Overall Significance	Likelihood
Provincially Rare Species – Black-billed Magpie	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Minor effects are potentially associated with general disturbance and vehicular collisions during the initial active closure phase.	No	Avoidance of sensitive habitats to the extent practical; avoidance of the breeding bird season if and where applicable; sound abatement; speed limits; active revegetation and at closure will restore habitats.	At closure, cessation of project activities will allow for eventual natural re-establishment of use of the area. Reduced potential exposure to noise, vehicular traffic, and site effluents, etc. will continue from the operation phase.	Adverse effects will involve Provincially rare species. Level III	Effects are considered to be minor (2.0% of the NLSA) and confined to the immediate mine site area. Level I	Short-term: effects will last through period of active closure before natural recovery of the area begins. Level I	Effect expected to occur continuously through the closure phase. Level III	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Provincially Rare Species – Lilypad Clubtail	Area habitats generally unsuitable for this species in the baseline condition, and as such no anticipated effect at closure as habitats start to be re-established.	No	Avoidance of sensitive habitats to the extent practical; and, speed limits. Active revegetation and at closure will restore habitats.	None anticipated.	Adverse effects will involve Provincially rare species. Level III	Mine site development will not displace any habitat which is typical for this species. Level I	Short-term: effects will last through period of active closure before natural recovery of the area begins. Level I	Effect expected to occur continuously through the closure phase. Level III	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur
Provincially Rare Species – Horned Clubtail	Area habitats generally unsuitable for this species in the baseline condition, and as such no anticipated effect at closure as habitats start to be re-established.	No	Avoidance of sensitive habitats to the extent practical; and, speed limits. Active revegetation and at closure will restore habitats.	None anticipated.	Adverse effects will involve Provincially rare species. Level III	Mine site development will not displace any habitat which is typical for this species. Level I	Short-term: effects will last through period of active closure before natural recovery of the area begins. Level I	Effect expected to occur continuously through the closure phase. Level III	Effects are readily reversible at the end of the active closure phase. Level I	Overall effects are considered to be generally minor, localized and reversible. Not significant	Effect will occur

Notes: NA: not applicable; NR: not rated
Tables 7-47 to 7-56 were revised per the CEA Agency comment on the draft EA Report (Version 2) that a column be added to identify whether the VEC/VSEC is linked (Yes or No) to any of the following five criteria per Section 5 of CEAA (2012):

- changes to components of the environment within Federal jurisdiction;
- changes to the environment that would occur on Federal or transboundary lands;
- changes to the environment that are directly linked or necessarily incidental to Federal decisions;
- effects of changes to the environment on Aboriginal peoples; or
- effect of changes to the environment that are directly linked or necessarily incidental

Level I	Level II	Level III

Table 7-54: Significance Determinations of Residual Effects after Mitigation, Closure / Decommissioning Phase - Human Environment

VSEC	Potential Effect (and direction)	Section 5 Link	Proposed Mitigation or Enhancement	Residual Effects	Residual Significance After Mitigation or Enhancement						Overall Significance	Likelihood
					Socio-economic Context	Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Land Use Planning	Mining is consistent with current land use planning for the area. No discernable effect.	No	None proposed	None anticipated.	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	NR	NA
Mineral Exploration	Closure and reclamation of the site may allow some areas to be re-opened to prospecting or exploration activities (positive).	No	None proposed	Closure and reclamation of the site may allow some areas to be re-opened to prospecting or exploration activities (positive).	Multiple companies actively exploring gold claims in the Rainy River District. Level III	Effects to a few properties held by one mineral exploration company. Level I	Effect is confined to the HLSA. Level I	Effects of returning areas to exploration use will last beyond closure. Level III	Effect occurs continuously. Level III	NA; effect is positive. NR	Not significant	Likely
Forestry	Closure and reclamation of the site may allow some areas to be re-opened to forestry activities (positive).	No	Active replanting of trees and vegetation.	Closure and reclamation of the site may allow some areas to be re-opened to forestry activities (positive).	Important regional land use that supports mills in both Barwick and Fort Frances. Level III	Portions of previously disturbed areas may be returned to other uses. Level I	Effect is confined to the HLSA. Level I	Effects of returning areas to forestry use will last beyond closure; will take many years for trees to regrow. Level III	Effect occurs continuously. Level III	NA; effect is positive. NR	Not significant	Likely
Agriculture and Adjacent Residents	Operational effects to adjacent agricultural properties will be largely reduced or eliminated; closure and reclamation may allow some areas to be re-opened to agricultural activities (positive).	No	None proposed.	Operational effects to adjacent agricultural properties will be largely reduced or eliminated; closure and reclamation may allow some areas to be re-opened to agricultural activities (positive).	Agriculture is and has been an important regional land use and economic driver in the region. Level III	Portions of previously disturbed areas may be returned to other uses. Level I	Effect is confined to the HLSA. Level I	Effects of returning areas to agricultural use will last beyond closure. Level III	Effect will occur continuously. Level III	NA; effect is positive. NR	Not significant	Likely
Hunting	Closure and reclamation of the site may allow some areas to be re-opened to hunting activities and allow for re-establishment of game populations (positive).	No	None proposed.	Closure and reclamation of the site may allow some areas to be re-opened to hunting activities and allow for re-establishment of game populations (positive).	Hunting is an important current land use that helps to support the tourism industry in the region. Level III	Portions of previously disturbed areas may be returned to other uses. Level I	Effect is confined to the HLSA. Level I	Effects of returning areas to hunting use will last beyond closure. Level III	Effect will occur continuously. Level III	NA; effect is positive. NR	Not significant	Likely
Trapping	Closure and reclamation of the site may allow some areas to be re-opened to trapping activities and allow for re-establishment of furbearer populations (positive).	Unknown	None proposed.	Closure and reclamation of the site may allow some areas to be re-opened to trapping activities and allow for re-establishment of furbearer populations (positive).	No information regarding trapping was presented during Aboriginal consultation, discussions and meetings. The trapper contracted by RRR operates additional licensed traplines in the Rainy River District outside of the HLSA. Level II	Portions of previously disturbed areas may be returned to other uses. Level I	Effect is confined to the HLSA. Level I	Effects of returning areas to trapping use will last beyond closure. Level III	Effect will occur continuously. Level III	NA; effect is positive. NR	Not significant	Likely

VSEC	Potential Effect (and direction)	Section 5 Link	Proposed Mitigation or Enhancement	Residual Effects	Residual Significance After Mitigation or Enhancement						Overall Significance	Likelihood
					Socio-economic Context	Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Fishing	Pre-development water bodies will be permanently impacted; no effects anticipated to water bodies established as compensation under the No Net Loss Plan.	No	None proposed.	Pre-development water bodies will be permanently impacted; no effects anticipated to water bodies established as compensation under the No Net Loss Plan.	Local residents fish in larger, more productive water bodies located outside of the HLSA.	Limited, if any, sport fishing in the Pinewood River or creeks impacted by the RRP.	Effect is confined to the HLSA.	Effects of returning areas to fishing use will last beyond closure.	Effect will occur continuously.	NA; effect is positive.		Likely
					Level II	Level I	Level I	Level III	Level III	NR	Not significant	
Other Outdoor Recreation Uses	Closure and reclamation of the site may allow some areas to be re-opened to recreational uses (positive).	No	Working with local land owners to enhance Richardson Trail components.	Closure and reclamation of the site may allow some areas to be re-opened to recreational uses (positive).	Other recreation activities are limited in the HLSA; Richardson Trail is an important recreation use trail for local residents.	A portion of Richardson Trail will be overprinted by the TMA.	Effect is confined to the HLSA.	Effects of returning areas to other use will last beyond closure.	Effect will occur continuously.	NA; effect is positive.		Likely
					Level II	Level I	Level I	Level II	Level III	NR	Not significant	
Economics	Closure of the project will result in a reduction of available direct employment opportunities, with the potential for indirect employment and economic reductions as well.	No	Employees are trained with marketable skills which can be transferred to other projects or industries.	Closure of the project will result in a reduction of available direct employment opportunities, with the potential for indirect employment and economic reductions as well.	Employment and income effects highly-valued in an area facing prolonged economic difficulties.	Low in comparison to the Provincial economy; large in comparison to the regional economy. These local effects are mitigated by the training and transferable skills provided by the RRP.	Effect is experienced across the region; low magnitude effects across Ontario.	Effect will last beyond life of project.	Effect will occur continuously.	Effect is reversible at substantial cost or with difficulty; dependent on factors outside of RRR control.		Effect will occur
					Level III	Level I	Level II	Level III	Level III	Level II	Significant (-ve)	
Demographics and Population	Decommissioning of the project and the resultant reduction in economic opportunities may result in a net out-migration of people from the region (other than First Nation reserves).	No	Employees are trained with marketable skills which can be transferred to other projects or industries within the region.	Decommissioning of the project and the resultant reduction in economic opportunities may result in a net out-migration of people from the region (other than First Nation reserves).	Reduction of employment opportunities may result in net negative population stability.	Project closure may contribute to low or negative levels of growth, but will not result in a large population change.	Effects will be experienced across the region.	Effects will occur beyond the life of the Project.	Effect will occur continuously.	Reversibility depends on long-term economic performance in the area.		Effect may occur
					Level III	Level I	Level II	Level III	Level III	Level II	Not significant	
Housing and Accommodation	Decommissioning of the project and the resultant reduction of economic opportunities may result in a surplus of housing stock and an overall reduction in the costs for housing / accommodation.	No	Enhancement measures involve those directed at trying to optimize local participation in the Project, including opportunities for Aboriginal communities which will improve housing stability.	Decommissioning of the project and the resultant reduction of economic opportunities may result in a surplus of housing stock and an overall reduction in the costs for housing / accommodation.	Housing stability contributes to the regional economy and to the stability of families.	Effect may be both positive and negative, with a localized net negative economic effect due to the potential reductions in property values.	Effects limited to communities within 100 km of site.	Effects will occur beyond the life of the project.	Effect will occur continuously.	Reversibility depends on long-term economic performance of region.		Effect may occur
					Level III	Level I	Level II	Level III	Level III	Level II	Not significant	
Public Utilities	Decommissioning of the project may result in a reduction in demand for public utilities.	No	Ongoing discussions about effects with municipalities and service providers.	Decommissioning of the project may result in a reduction in demand for public utilities.	Subject of ongoing discussion between RRR and municipalities and service providers.	Low to moderate in the context of declining population (available capacity in most systems).	Effects will occur in some HRSA communities.	Effect will occur beyond the life of the Project.	Effect will occur continuously.	Reversibility depends on long-term economic performance of region.		Effect may occur
					Level II	Level I	Level II	Level III	Level III	Level II	Not significant	

VSEC	Potential Effect (and direction)	Section 5 Link	Proposed Mitigation or Enhancement	Residual Effects	Residual Significance After Mitigation or Enhancement						Overall Significance	Likelihood
					Socio-economic Context	Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Community and Social Services	Most workers are expected to derive from the local population, which will help to sustain community services even after project closure. These services are currently not over-taxed. (Net effect has both positive and negative aspects associated)	No	Enhancement measures involve worker and multi-stakeholder consultation, linking workers with services, and training programs.	Most workers are expected to derive from the local population, which will help to sustain community services even after project closure. These services are currently not over-taxed. (Net effect has both positive and negative aspects associated.)	Regional community services are critical to overall community health and well-being.	Effect is mainly one of sustaining demand for existing services.	Effects will be experienced across the region.	Effect will occur beyond the life of the Project.	Effect will occur continuously.	Reversible.	Effect is expected to help to maintain the current status of community and social services.	Effect may occur
					Level III	Level I	Level II	Level III	Level III	Level I	Not significant	
Highway Traffic – Construction Phase	None.	No	None proposed.	None anticipated	NA	NA	NA	NA	NA	NA		NA
					NR	NR	NR	NR	NR	NR	NR	
Highway Traffic – Operations Phase	Project-related traffic volume on local roadways will decrease at the end of the operations phase.	No	None proposed.	Project-related traffic volume on local roadways will decrease at the end of the operations phase.	NA	NA	NA	NA	NA	NA		NA
					NR	NR	NR	NR	NR	NR	NR	
Human Health	Air quality emissions from the operation of the mine will be greatly reduced or eliminated. Emissions during closure may derive from demolition of buildings and infrastructure, vehicle traffic on roadways, and potential light construction activities related to closure of various site facilities. Additional effects may arise from traffic accidents resulting in personal injury.	No	Ensure all applicable occupational health and safety legislation standards are met; provision of legislated secondary containment; utilize best management practices for industrial hygiene hazard control; operate the RRP so as to meet applicable health and environmental standards; prevent any chemical spills from entering the environment; contain and manage seepage to protect receiving waters and adjacent land use.	Generally reduced air quality effects and sound emissions compared with operations phase. Water quality of effluents would continue to be managed. Occupational health and safety standards would be maintained.	Adverse effects potentially involve human health and is considered highly important.	The magnitude of contaminant release is expected to be small and within applicable Provincial and Federal emission and discharge criteria. No credible health risk to residents or consumers of fish and wildlife.	No credible health effects anticipated for area residents.	Long-term: Air quality and emissions effects will be short-term, occurring in the closure phase. Water quality effects may persist beyond the life of the project.	Effect is expected to occur infrequently/not at all with proper site management / monitoring.	Effects are generally readily reversible at the end of the active closure phase; some seepage effects may be reversible with some difficulty or great expense.	Overall effects are considered not significant.	Unlikely
					Level III	Level I	Level I	Level III	Level I	Level II	Not significant	
Archaeological Resources	No effects anticipated from closure and reclamation.	No	None proposed.	None anticipated.	NA	NA	NA	NA	NA	NA		NA
					NR	NR	NR	NR	NR	NR	NR	
Built Heritage Resources and Cultural Heritage Landscapes	Closure and decommissioning of the RRP may require the demolition of built heritage resource and cultural heritage landscape features as a measure of public safety.	No	Discussions will be held with appropriate regulatory agencies to determine the most suitable course of action for those features which remain on RRR property at closure. Alternatively, some properties may be sold, with buyers assuming responsibility	Built heritage resource and cultural heritage landscape features which remain on RRR property at closure may be required to be demolished for public safety.	Built heritage resources and cultural heritage landscapes contribute to the character, history and sense of place of an area and are of high importance.	None of these sites / features are designated under the OHA, or included in a municipal heritage inventory or register.	Direct effects are localized and restricted to the HLSA.	Effects to the directly affected sites are permanent, with mitigation undertaken by documenting them before removal.	Effect is expected to occur infrequently/not at all.	Effects will be permanent unless mitigation measures (i.e., site avoidance or protective measures) are possible.	Overall effects are considered not significant.	Effect may occur.
					Level III	Level I	Level I	Level III	Level I	Level III	Not significant	

Notes: NA: not applicable; NR: not rated

Tables 7-47 to 7-56 were revised per the CEA Agency comment on the draft EA Report (Version 2) that a column be added to identify whether the VEC/VSEC is linked (Yes or No) to any of the following five criteria per Section 5 of CEAA (2012):

- changes to components of the environment within Federal jurisdiction;
- changes to the environment that would occur on Federal or transboundary lands;
- changes to the environment that are directly linked or necessarily incidental to Federal decisions;
- effects of changes to the environment on Aboriginal peoples; or
- effect of changes to the environment that are directly linked or necessarily incidental

Level I	Level II	Level III

Table 7-55: Significance Determinations of Residual Effects after Mitigation, Post Reclamation Phase – Natural Environment

System / Component / Feature	Potential Effect	Section 5 Link	Proposed Mitigation or Enhancement	Residual Effect	Residual Significance After Mitigation					Overall Significance	Likelihood
					Value of System, Component, Feature or Situation	Magnitude / Geographic Extent	Duration	Frequency	Reversibility		
Air Quality	None expected.	No	None proposed.	NA	NA	NA	NA	NA	NA	NA	
					NR	NR	NR	NR	NR	NR	
Greenhouse Gases	None expected.	No	None proposed.	NA	NA	NA	NA	NA	NA	NA	
					NR	NR	NR	NR	NR	NR	
Sound	None expected.	No	None proposed.	NA	NA	NA	NA	NA	NA	NA	
					NR	NR	NR	NR	NR	NR	
Vibration	None expected.	No	None proposed.	NA	NA	NA	NA	NA	NA	NA	
					NR	NR	NR	NR	NR	NR	
Minor Creek Systems	Creek diversions and compensation / NNL areas will become naturalized.	Yes	Monitoring.	NA	NA	NA	NA	NA	NA	NA	
					NR	NR	NR	NR	NR	NR	
Pinewood River	Water taking for TMA and open pit flooding will continue for several years into the restoration phase. After about 3 to 4 years, water taking for the TMA will cease and flows formerly captured by the TMA basin will be returned to the Pinewood River.	Yes	Monitoring Pinewood River flows to ensure that that stated amounts are not exceeded. Possible reductions in water taking during extreme low flow conditions (5-10 percentile years). Rapid stabilization of the TMA pond allows for more rapid return of TMA watershed contribution to the Pinewood River.	Water taking for TMA and open pit flooding will continue for several years into the restoration phase. After about 3 to 4 years, water taking for the TMA will cease and flows formerly captured by the TMA basin will be returned to the Pinewood River. Diversions to the open pit will continue for several tens of years beyond the closure phase.	Dominant local river system which supports commonplace and widespread ecological communities.	Flow effects are considered to be minor (<20% during average and high flow years; with flow enhancement during low flow periods); water quality to be maintained at levels suitable for protection of aquatic life.	Long-term: Water taking and TMA flooding and related effects are expected to persist for 4-5 years under average Pinewood River flow conditions. Diversions to the open pit will continue for several tens of years beyond the closure phase.	Effect is expected to have seasonal regularity; water taking will be continuous during the open water period.	Effects of water taking are readily reversible upon cessation of water taking.	Flow effects considered to be minor and greatly reduced compared to the operations phase once TMA water takings are completed; adverse water quality effects are not anticipated.	
					Level II	Level I	Level III	Level II	Level I	Not significant	
Groundwater	None expected.	No	None proposed.	NA	NA	NA	NA	NA	NA	NA	
					NR	NR	NR	NR	NR	NR	
Vegetation Communities and Rare Plants	Areas reclaimed during closure will become naturalized and plant communities will become established.	No	Monitoring.	NA	NA	NA	NA	NA	NA	NA	
					NR	NR	NR	NR	NR	NR	
Ungulates	Populations will naturally re-establish themselves in the area.	No	None proposed.	NA	NA	NA	NA	NA	NA	NA	
					NR	NR	NR	NR	NR	NR	
Furbearers	Populations will naturally re-establish themselves in the area.	No	None proposed.	NA	NA	NA	NA	NA	NA	NA	
					NR	NR	NR	NR	NR	NR	
Bats	Populations will naturally re-establish themselves in the area.	No	None proposed.	NA	NA	NA	NA	NA	NA	NA	
					NR	NR	NR	NR	NR	NR	
Migratory Birds	Populations will naturally re-establish themselves in the area.	Yes	None proposed.	NA	NA	NA	NA	NA	NA	NA	
					NR	NR	NR	NR	NR	NR	
Raptors and Ravens (including Bald	Populations will naturally re-establish themselves in the area.	No	None proposed.	NA	NA	NA	NA	NA	NA	NA	
					NR	NR	NR	NR	NR	NR	
Amphibians	Populations will naturally re-establish themselves in the area.	No	None proposed.	NA	NA	NA	NA	NA	NA	NA	
					NR	NR	NR	NR	NR	NR	
SAR – Little Brown Myotis	Addressed above under the heading Bats										
SAR – Northern Myotis	Addressed above under the heading Bats										

System / Component / Feature	Potential Effect	Section 5 Link	Proposed Mitigation or Enhancement	Residual Effect	Residual Significance After Mitigation					Overall Significance	Likelihood
					Value of System, Component, Feature or Situation	Magnitude / Geographic Extent	Duration	Frequency	Reversibility		
SAR – Eastern Whip-poor-will	Populations will naturally re-establish themselves in the area.	Yes	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	
SAR – Bobolink	Populations will naturally re-establish themselves in the area.	Yes	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	
SAR – Barn Swallow	Populations may naturally re-establish themselves in the area.	Yes	Structures may be left in place to provide suitable nesting habitat.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	
Special Concern Species – Common Nighthawk	Populations will naturally re-establish themselves in the area.	Yes	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	
Special Concern Species – Golden Winged Warbler	Populations will naturally re-establish themselves in the area.	Yes	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	
Special Concern Species – Olive-sided Flycatcher	Populations will naturally re-establish themselves in the area.	Yes	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	
Special Concern Species – Canada Warbler	Populations will naturally re-establish themselves in the area.	Yes	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	
Special Concern Species – Red-headed	Populations will naturally re-establish themselves in the area.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	
Special Concern Species – Short-eared Owl	Populations will naturally re-establish themselves in the area.	Yes	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	
Special Concern Species – Snapping Turtle	Populations will naturally re-establish themselves in the area.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	
Provincially Rare Species – Black-billed Magpie	Populations will naturally re-establish themselves in the area.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	
Provincially Rare Species – Lilypad Clubtail	Populations will naturally re-establish themselves in the area.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	
Provincially Rare Species – Horned Clubtail	Populations will naturally re-establish themselves in the area.	No	None proposed.	NA	NA NR	NA NR	NA NR	NA NR	NA NR	NA NR	

Notes: NA: not applicable; NR: not rated
Tables 7-47 to 7-56 were revised per the CEA Agency comment on the draft EA Report (Version 2) that a column be added to identify whether the VEC/VSEC is linked (Yes or No) to any of the following five criteria per Section 5 of CEAA (2012):

- changes to components of the environment within Federal jurisdiction;
- changes to the environment that would occur on Federal or transboundary lands;
- changes to the environment that are directly linked or necessarily incidental to Federal decisions;
- effects of changes to the environment on Aboriginal peoples; or
- effect of changes to the environment that are directly linked or necessarily incidental

Level I	Level II	Level III

Table 7-56: Significance Determinations of Residual Effects after Mitigation, Post Reclamation Phase - Human Environment

VSEC	Potential Effect (and direction)	Section 5 Link	Proposed Mitigation or Enhancement	Residual Effect	Residual Significance After Mitigation or Enhancement						Overall Significance	Likelihood
					Socio-economic Context	Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Land Use Planning	None expected.	No	None proposed	None expected.	NA	NA	NA	NA	NA	NA		NA
					NR	NR	NR	NR	NR	NR	NR	
Mineral Exploration	None expected.	No	None proposed	None expected.	NA	NA	NA	NA	NA	NA		NA
					NR	NR	NR	NR	NR	NR	NR	
Forestry	Areas of potential forest harvesting and management activities will begin to re-establish (positive).	No	None proposed.	Areas of potential forest harvesting and management activities will begin to re-establish (positive).	Important regional land use that supports mills in both Barwick and Fort Frances.	Portions of previously disturbed areas may be returned to other uses.	Effect is confined to the HLSA.	Effect lasts beyond closure.	Effect occurs continuously.	NA		Likely
					Level III	Level I	Level I	Level III	Level III	NR	Not significant	
Agriculture and Adjacent Residents	Some areas may be made available for agricultural activities as they become restored (positive).	No	None proposed.	Some areas may be made available for agricultural activities as they become restored (positive).	Agriculture is and has been an important regional land use and economic driver in the region.	Portions of previously disturbed areas may be returned to other uses.	Effect is confined to the HLSA.	Effect lasts beyond closure.	Effect will occur continuously.	NA		Likely
					Level III	Level I	Level I	Level III	Level III	NR	Not significant	
Hunting	Closure and reclamation of the site may allow some areas to be re-opened to hunting activities and will allow for re-establishment of game populations (positive).	No	None proposed.	Closure and reclamation of the site may allow some areas to be re-opened to hunting activities and will allow for re-establishment of game populations (positive).	Hunting is an important current land use that helps to support the tourism industry in the region.	Portions of previously disturbed areas may be returned to other uses.	Effect is confined to the HLSA.	Effect lasts beyond closure.	Effect will occur continuously.	NA		Likely
					Level III	Level I	Level I	Level III	Level III	NR	Not significant	
Trapping	Closure and reclamation of the site may allow some areas to be re-opened to trapping activities and will allow for re-establishment of furbearer populations (positive).	Unknown	None proposed.	Closure and reclamation of the site may allow some areas to be re-opened to trapping activities and will allow for re-establishment of furbearer populations (positive).	No information regarding trapping was presented during Aboriginal consultation, discussions and meetings. The trapper contracted by RRR operates additional licensed traplines in the Rainy River District outside of the HLSA.	Portions of previously disturbed areas may be returned to other uses.	Effect is confined to the HLSA.	Effect lasts beyond closure.	Effect will occur continuously.	NA		Likely
					Level II	Level I	Level I	Level III	Level III	NR	Not significant	
Fishing	Pre-development water bodies will be permanently impacted; no effects anticipated to water bodies established as compensation under the No Net Loss Plan.	No	None proposed.	Pre-development water bodies will be permanently impacted; no effects anticipated to water bodies established as compensation under the No Net Loss Plan.	Local residents fish in larger, more productive water bodies located outside of the HLSA.	Limited, if any, sport fishing in the Pinewood River or creeks impacted by the RRP.	Effect is confined to the HLSA.	Effect lasts beyond closure.	Effect will occur continuously.	NA		Likely
					Level II	Level I	Level I	Level III	Level III	NR	Not significant	

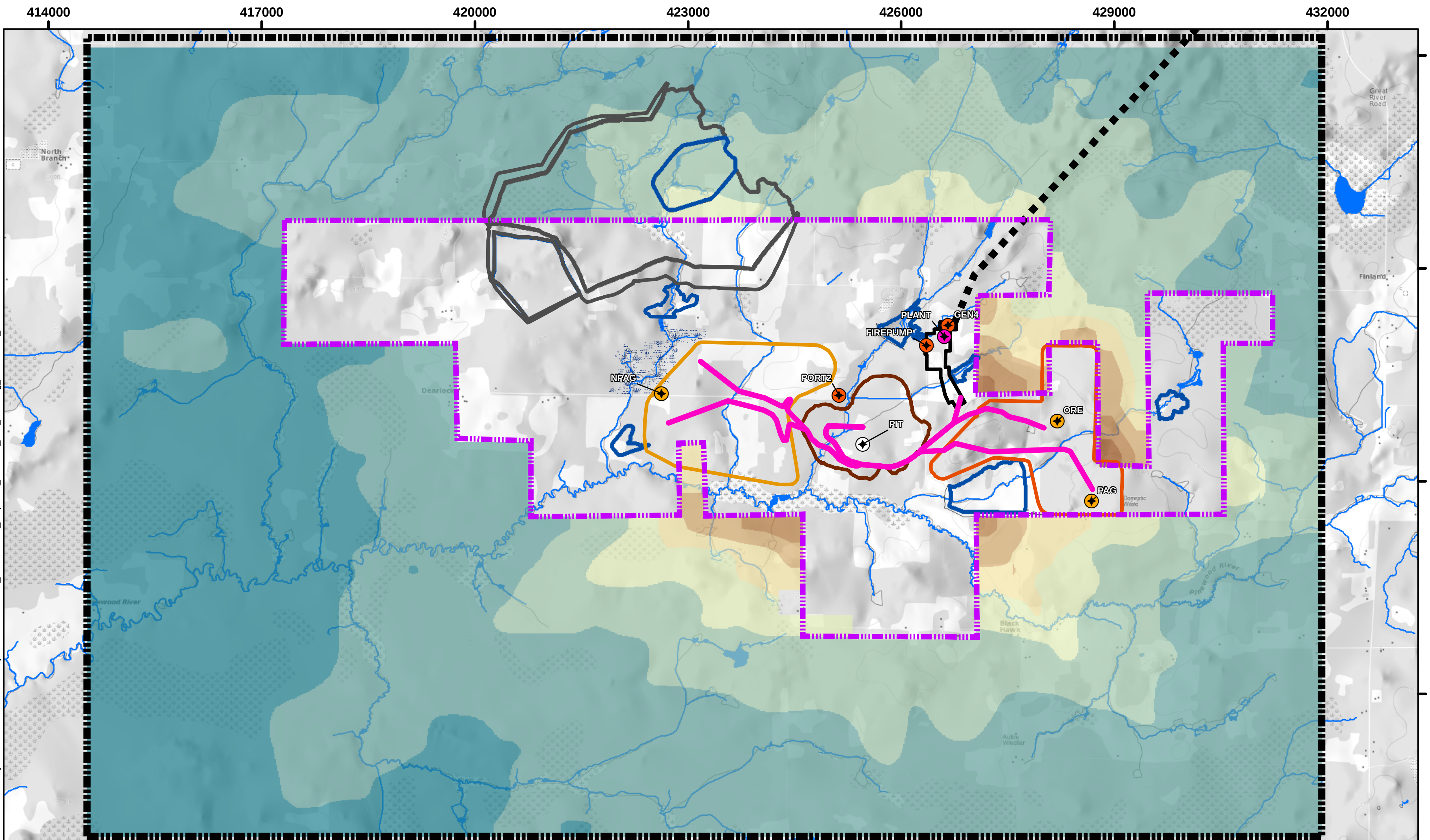
VSEC	Potential Effect (and direction)	Section 5 Link	Proposed Mitigation or Enhancement	Residual Effect	Residual Significance After Mitigation or Enhancement						Overall Significance	Likelihood
					Socio-economic Context	Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Other Outdoor Recreation Uses	Habitat restoration will allow some potential for outdoor recreational uses on portions of the property, provided that these are compatible with overall restoration objectives, and general public safety.	No	Working with local land owners to enhance Richardson Trail components where practicable.	Habitat restoration will allow some potential for outdoor recreational uses on portions of the property, provided that these are compatible with overall restoration objectives, and general public safety.	Other recreation activities are limited in the HLSA; Richardson Trail is an important recreation use trail for local residents.	A portion of Richardson Trail will be overprinted by the TMA.	Effect is confined to the HLSA.	Effect lasts beyond closure.	Effect will occur continuously.	NA		Likely
					Level II	Level I	Level I	Level III	Level III	NR	Not significant	
Economics	Effects evaluated as part of project closure and decommissioning. See Tables 7-53 and 7-54.	No	None proposed.	See closure and decommission phase residual effects.	NA	NA	NA	NA	NA	NA		NA
					NR	NR	NR	NR	NR	NR	NR	
Demographics and Population	Effects evaluated as part of project closure and decommissioning. See Tables 7-53 and 7-54.	No	None proposed.	See closure and decommission phase residual effects.	NA	NA	NA	NA	NA	NA		NA
					NR	NR	NR	NR	NR	NR	NR	
Housing and Accommodation	Effects evaluated as part of project closure and decommissioning. See Tables 7-53 and 7-54.	No	None proposed.	See closure and decommission phase residual effects.	NA	NA	NA	NA	NA	NA		NA
					NR	NR	NR	NR	NR	NR	NR	
Public Utilities	Effects evaluated as part of project closure and decommissioning. See Tables 7-53 and 7-54.	No	None proposed.	See closure and decommission phase residual effects.	NA	NA	NA	NA	NA	NA		NA
					NR	NR	NR	NR	NR	NR	NR	
Community and Social Services	Effects evaluated as part of project closure and decommissioning. See Tables 7-53 and 7-54.	No	None proposed.	See closure and decommission phase residual effects.	NA	NA	NA	NA	NA	NA		NA
					NR	NR	NR	NR	NR	NR	NR	
Highway Traffic – Construction Phase	Effects evaluated as part of project closure and decommissioning. See Tables 7-53 and 7-54.	No	None proposed.	See closure and decommission phase residual effects.	NA	NA	NA	NA	NA	NA		NA
					NR	NR	NR	NR	NR	NR	NR	
Highway Traffic – Operations Phase	Effects evaluated as part of project closure and decommissioning. See Tables 7-53 and 7-54.	No	None proposed.	See closure and decommission phase residual effects.	NA	NA	NA	NA	NA	NA		NA
					NR	NR	NR	NR	NR	NR	NR	
Human Health	Effects evaluated as part of project closure and decommissioning. See Tables 7-53 and 7-54.	No	None proposed.	See closure and decommission phase residual effects.	NA	NA	NA	NA	NA	NA		NA
					NR	NR	NR	NR	NR	NR	NR	
Archaeological Resources	Effects evaluated as part of project closure and decommissioning. See Tables 7-53 and 7-54.	No	None proposed.	See closure and decommission phase residual effects.	NA	NA	NA	NA	NA	NA		NA
					NR	NR	NR	NR	NR	NR	NR	
Built Heritage Resources and Cultural Heritage Landscapes	Effects evaluated as part of project closure and decommissioning. See Tables 7-53 and 7-54.	No	None proposed.	See closure and decommission phase residual effects.	NA	NA	NA	NA	NA	NA		NA
					NR	NR	NR	NR	NR	NR	NR	

Notes: NA: not applicable; NR: not rated

Tables 7-47 to 7-56 were revised per the CEA Agency comment on the draft EA Report (Version 2) that a column be added to identify whether the VEC/VSEC is linked (Yes or No) to any of the following five criteria per Section 5 of CEAA (2012):

- changes to components of the environment within Federal jurisdiction;
- changes to the environment that would occur on Federal or transboundary lands;
- changes to the environment that are directly linked or necessarily incidental to Federal decisions;
- effects of changes to the environment on Aboriginal peoples; or
- effect of changes to the environment that are directly linked or necessarily incidental

Level I	Level II	Level III



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LEGEND

Modelling Property Extent

Sources (labelled with ID)

- Area
- Open Pit
- Point
- Volume
- Line Source (haul roads)

Proposed Site Features

- Open Pit (Feb. 2013)
- Tailings Management Area
- Overburden / West Mine Rock Stockpile (Feb. 2013)
- Ore / East Mine Rock Stockpile (Feb. 2013)
- Plant Site / Ancillary Facilities
- Ponds
- Transmission Line

Total Particulate – 24 hour average *
Concentrations in ug/m^3

- 5 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80

NOTES:
* Standard is 120 ug/m^3

Datum: NAD83
Projection: UTM Zone 15N

N E S W

0 1.25 2.5 5 7.5 10 Kilometres

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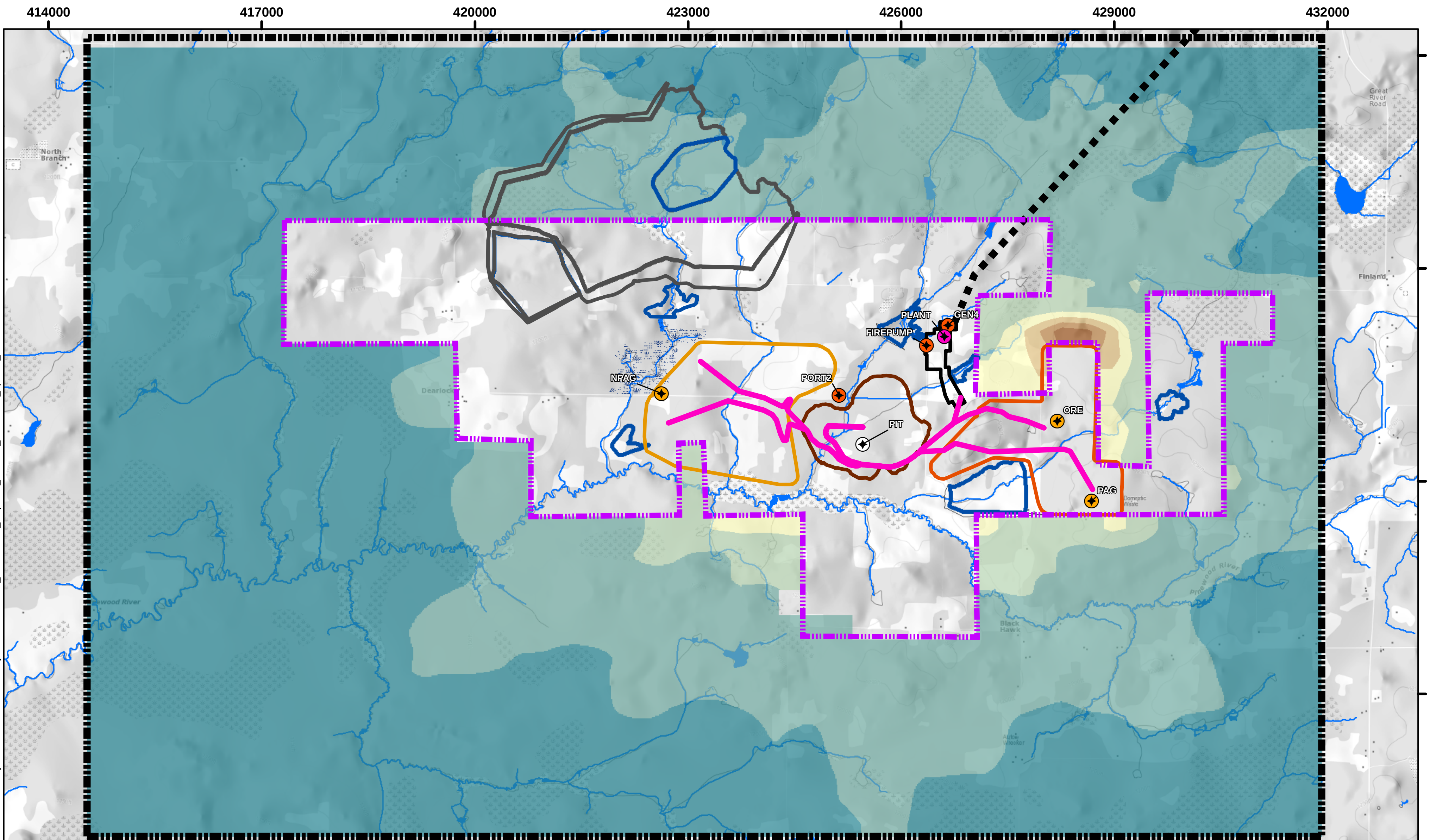
RAINY RIVER PROJECT

Modelled Total Particulate Emissions

PROJECT N^o: TC111504	FIGURE: 7-1a
SCALE: 1:75,000	DATE: October 2013



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LEGEND

Modelling Property Extent

Sources (labelled with ID)

- Area
- Open Pit
- Point
- Volume
- Line Source (haul roads)

Proposed Site Features

- Open Pit (Feb. 2013)
- Tailings Management Area
- Overburden / West Mine Rock Stockpile (Feb. 2013)
- Ore / East Mine Rock Stockpile (Feb. 2013)
- Plant Site / Ancillary Facilities
- Ponds
- Transmission Line

$PM_{2.5}$ – 24 hour average *
Concentrations in ug/m^3

- 1.06 - 3
- 3 - 6
- 6 - 9
- 9 - 12
- 12 - 15
- 15 - 18
- 18 - 21

NOTES:
* Ambient air quality criterion is 25 ug/m^3

Datum: NAD83
Projection: UTM Zone 15N

0 1.25 2.5 5 7.5 10 Kilometres

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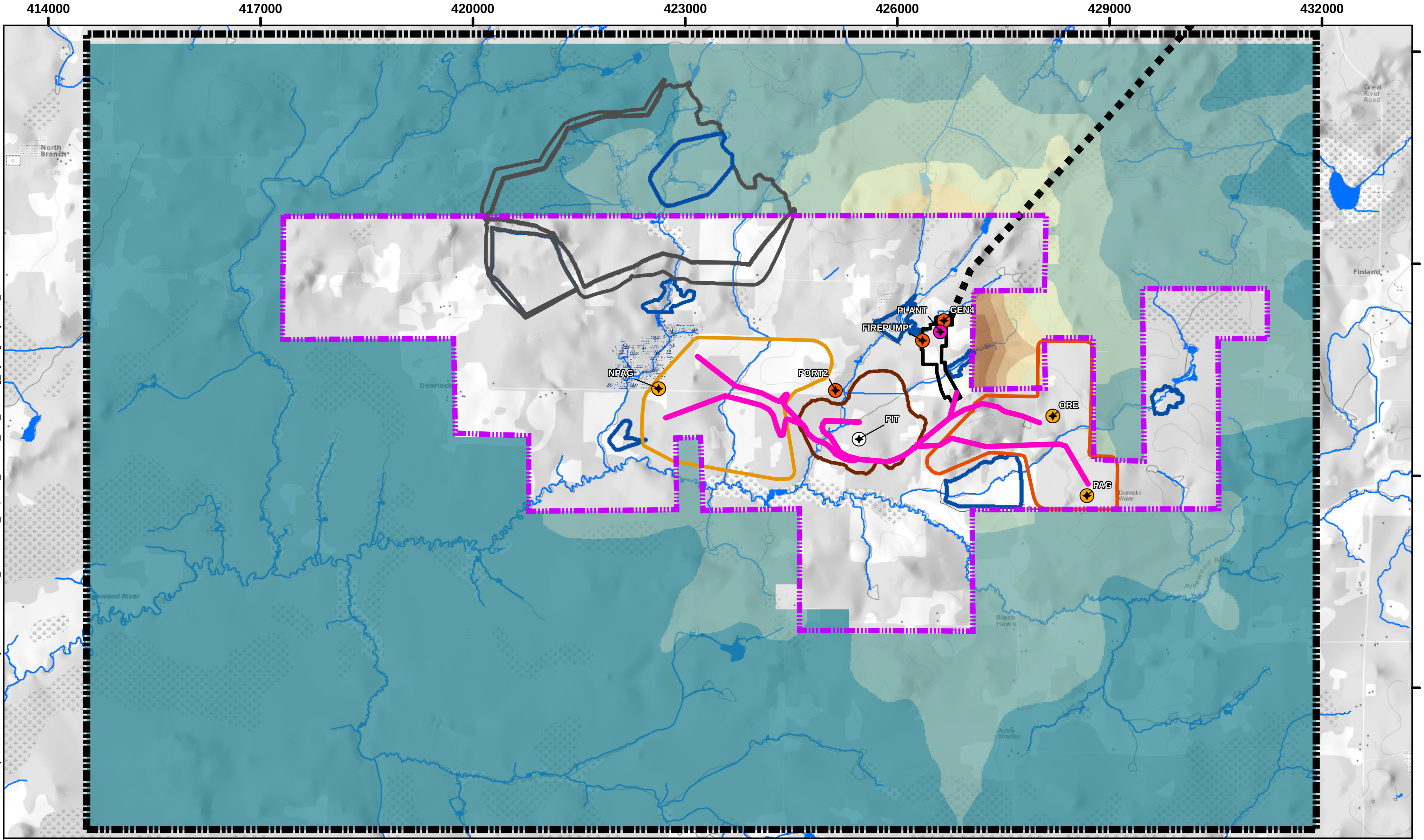
RAINY RIVER PROJECT

Modelled $PM_{2.5}$ Emissions

PROJECT N^o: TC111504	**FIGURE: 7-1b**
SCALE: 1:75,000	DATE: October 2013



LEGEND

Modelling Property Extent

Sources (labelled with ID)

- Area
- Open Pit
- Point
- Volume
- Line Source (haul roads)

Proposed Site Features

- Open Pit (Feb. 2013)
- Tailings Management Area
- Overburden / West Mine Rock Stockpile (Feb. 2013)
- Ore / East Mine Rock Stockpile (Feb. 2013)
- Plant Site / Ancillary Facilities
- Ponds
- Transmission Line

Hydrogen Cyanide – 24 hour average*
Concentrations in ug/m³

- 0.04 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1
- 1 - 1.2
- 1.2 - 1.4
- 1.4 - 1.6

NOTES:
* Standard is 8 ug/m³

Datum: NAD83
Projection: UTM Zone 15N

N / E / S / W

0 | 1.25 | 2.5 | 5 | 7.5 | 10 Kilometres

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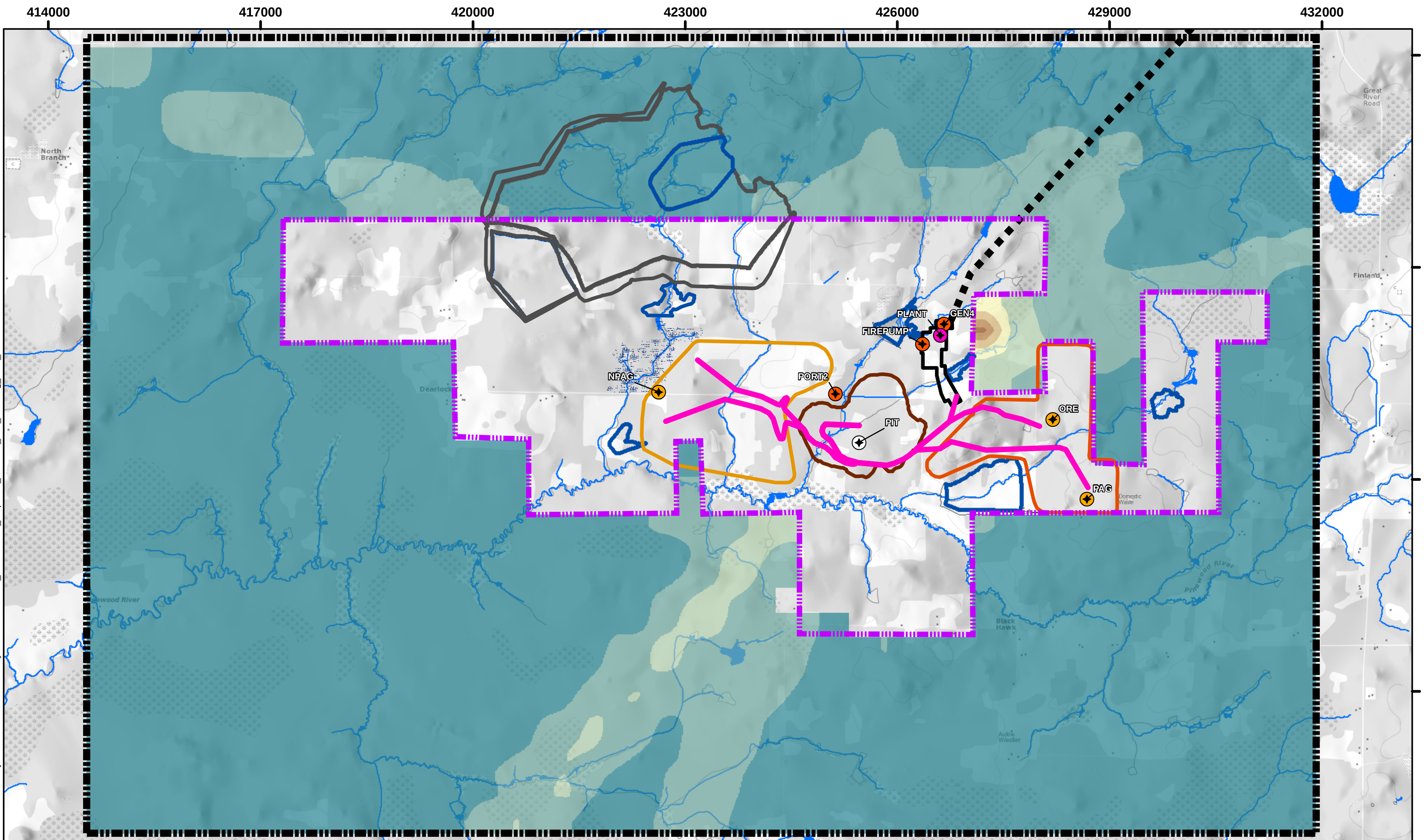
RAINY RIVER PROJECT

Modelled Hydrogen Cyanide Emissions

PROJECT Nº: TC111504	**FIGURE: 7-2**
SCALE: 1:75,000	DATE: October 2013



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LEGEND

Modelling Property Extent

Sources (labelled with ID)

- Area
- Open Pit
- Point
- Volume

Line Source (haul roads)

Proposed Site Features

- Open Pit (Feb. 2013)
- Tailings Management Area
- Overburden / West Mine Rock Stockpile (Feb. 2013)
- Ore / East Mine Rock Stockpile (Feb. 2013)
- Plant Site / Ancillary Facilities
- Ponds
- Transmission Line

Nitrogen Oxides – 24 hour average*
Concentrations in ug/m^3

- 0.59 - 4
- 4 - 8
- 8 - 12
- 12 - 16
- 16 - 20
- 20 - 24
- 24 - 28

NOTES:
* Standard is 200 ug/m^3

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RAINY RIVER PROJECT

Modelled Nitrogen Oxides Emissions - 24 Hour Average

Datum: NAD83
Projection: UTM Zone 15N

N W E S

PROJECT N^o: TC111504

FIGURE: 7-3

SCALE: 1:75,000

DATE: October 2013

0 1.25 2.5 5 7.5 10 Kilometres

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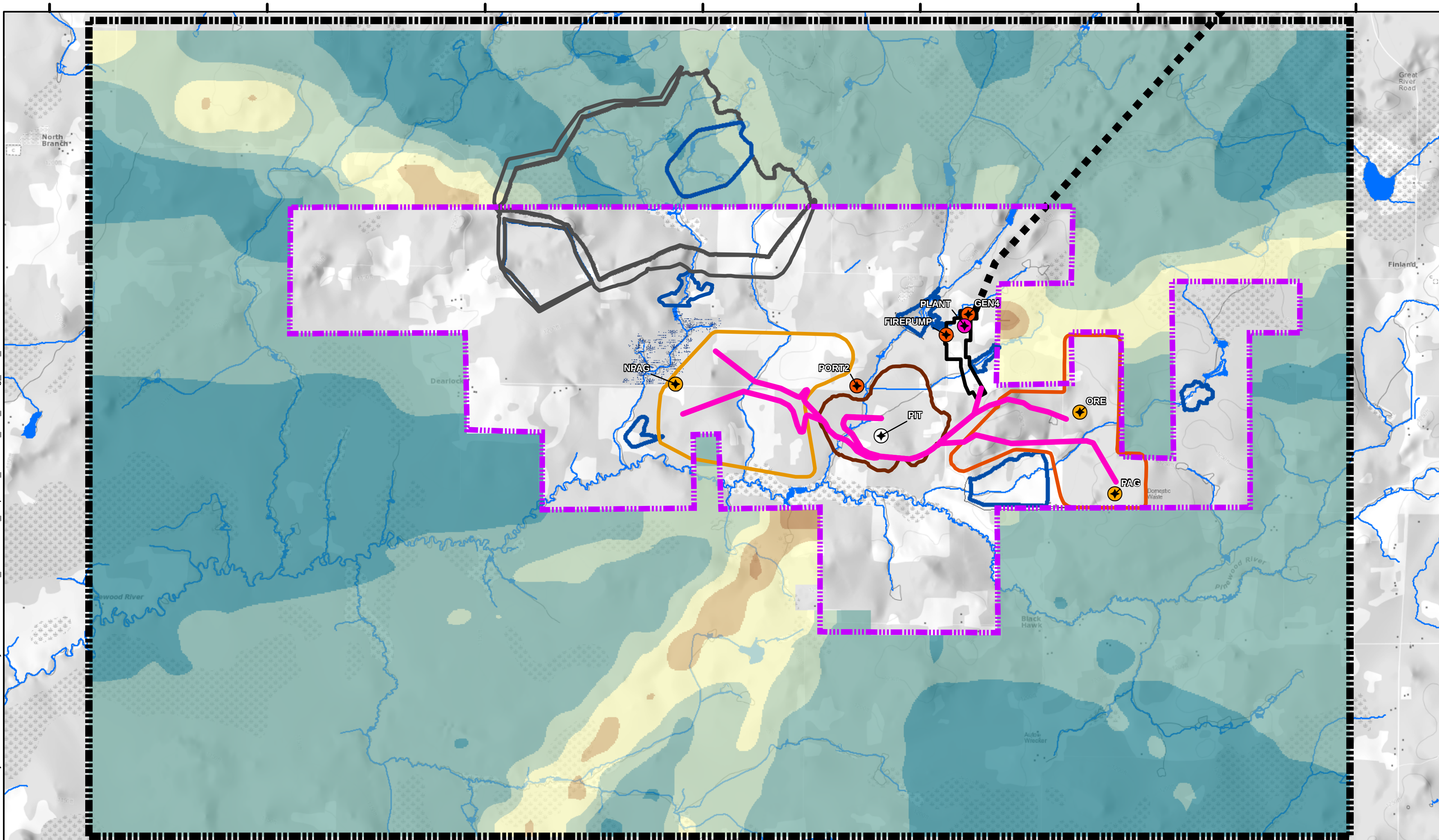

LEGEND

Modelling Property Extent

Sources (labelled with ID)

- Area
- Open Pit
- Point
- Volume
- Line Source (haul roads)

Proposed Site Features

- Open Pit (Feb. 2013)
- Tailings Management Area
- Overburden / West Mine Rock Stockpile (Feb. 2013)
- Ore / East Mine Rock Stockpile (Feb. 2013)
- Plant Site / Ancillary Facilities
- Ponds
- Transmission Line

Nitrogen Oxides – 1 hour average*
Concentrations in ug/m^3

- 9.4 - 35
- 35 - 70
- 70 - 105
- 105 - 140
- 140 - 175
- 175 - 210
- 210 - 245

NOTES:
* Standard is 400 ug/m^3

0 1.25 2.5 5 7.5 10 Kilometres

Datum: NAD83
Projection: UTM Zone 15N

N E S W

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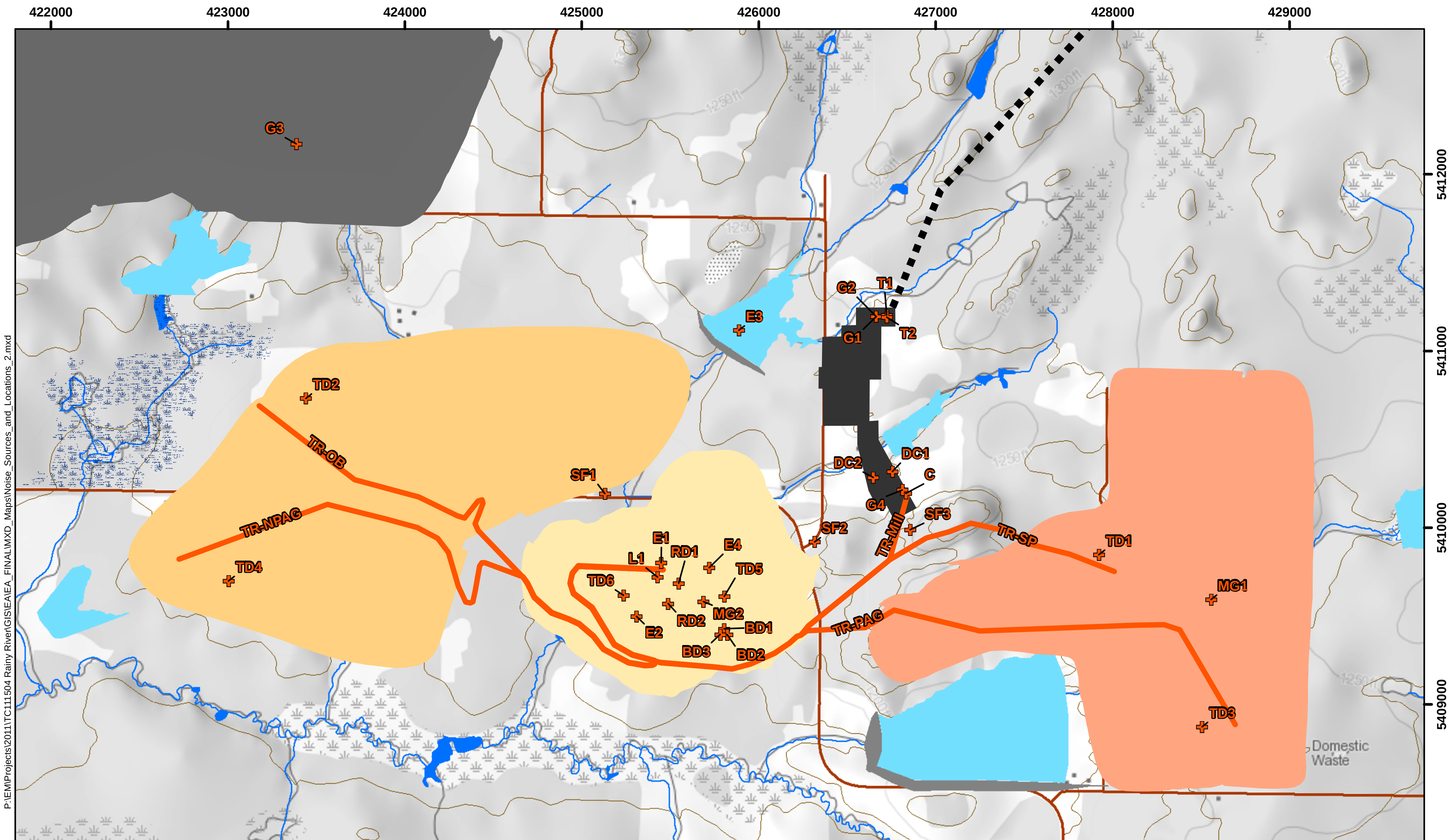
RAINY RIVER PROJECT

Modelled Nitrogen Oxides Emissions - 1 Hour Average

PROJECT N^o: TC111504	**FIGURE: 7-4**
SCALE: 1:75,000	DATE: October 2013



LEGEND

- Point Source (labelled with ID)
- Line Source (labelled with ID)
- Existing Roads
- Contours, 10 m interval (LIO-MNR)

Proposed Site Features

- Open Pit
- Tailings Management Area
- Overburden / West Mine Rock Stockpile
- Ore / East Mine Rock Stockpile
- Plant Site / Ancillary Facilities
- Ponds
- Transmission Line

NOTES:
- Not all water management features are shown for simplicity

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RAINY RIVER PROJECT

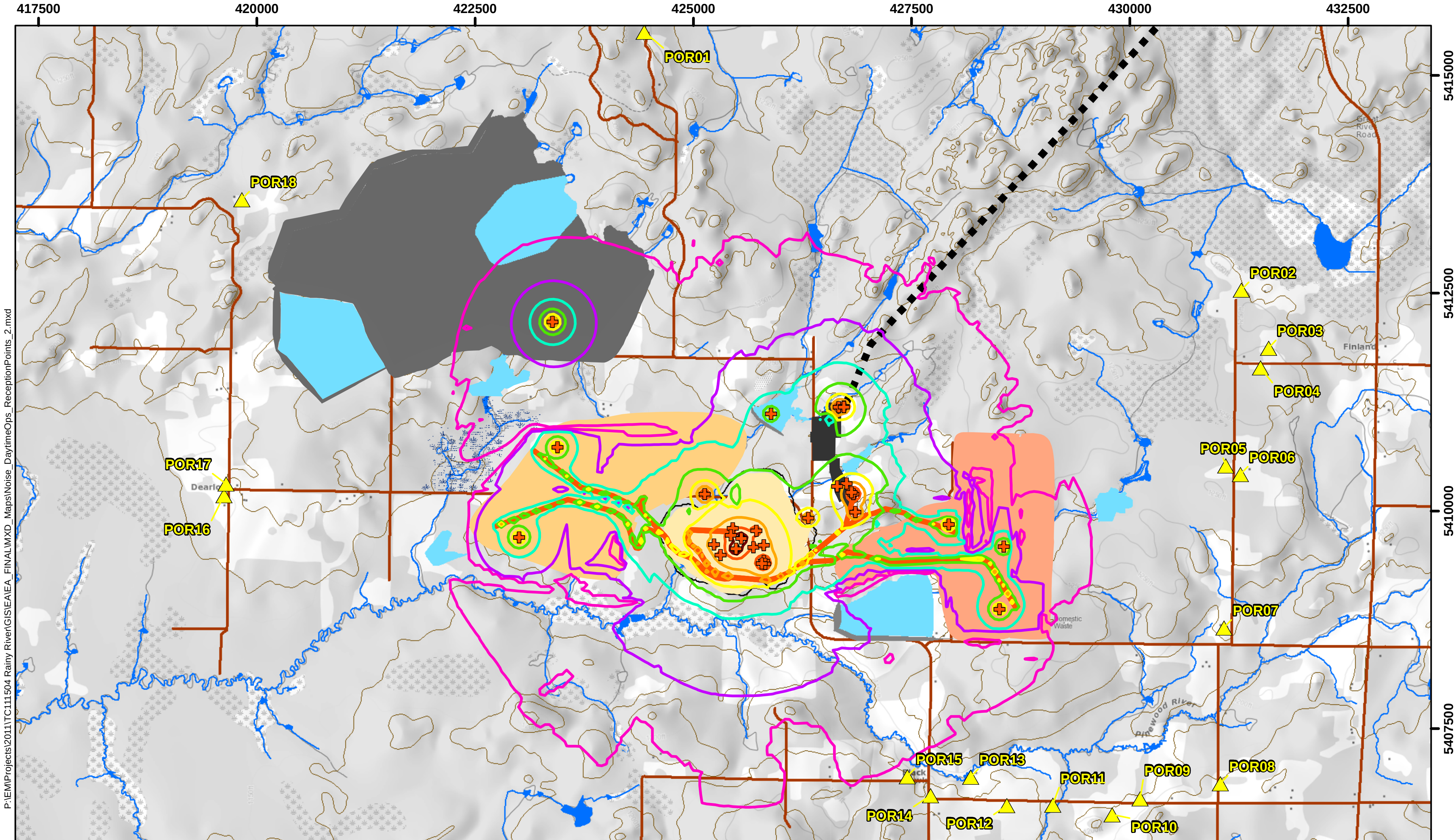
Sound Sources

Datum: NAD83
Projection: UTM Zone 15N

N W E S

0 0.5 1 2 3 4 Kilometres

PROJECT Nº: TC111504	**FIGURE: 7-5**
SCALE: 1:30,000	DATE: October 2013



LEGEND

- Receptor (labelled with ID)
- Point Source
- Line Source
- Existing Roads
- Contours, 10 m interval

Proposed Site Features

- Open Pit
- Tailings Management Area
- Overburden / West Mine Rock Stockpile
- Ore / East Mine Rock Stockpile
- Plant Site / Ancillary Facilities
- Ponds
- Transmission Line

Daytime Operations, dBA Contours

- >=45
- >=50
- >=55
- >=60
- >=65
- >=70
- >=75
- >=80
- >=85

NOTES:
- Not all water management features are shown for simplicity

Datum: NAD83
Projection: UTM Zone 15N

0 1 2 4 6 8 Kilometres

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RAINY RIVER PROJECT

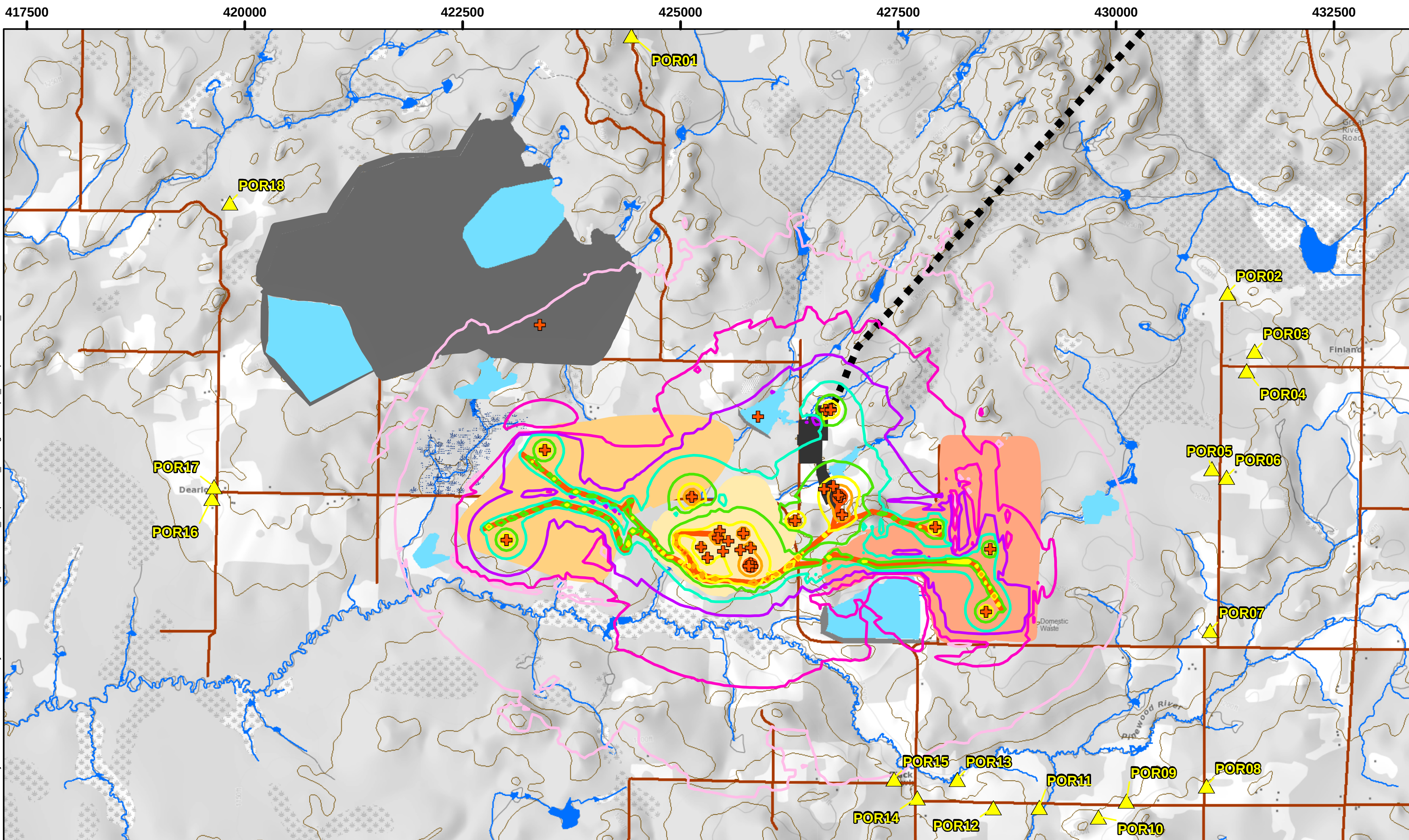
Points of Reception and Sound Contours - Daytime Operations

PROJECT Nº: TC111504

FIGURE: 7-6

SCALE: 1:61,100

DATE: October 2013



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LEGEND

- Receptor (labelled with ID)
- Point Source
- Line Source
- Existing Roads
- Contours, 10 m interval

Proposed Site Features

- Open Pit
- Tailings Management Area
- Overburden / West Mine Rock Stockpile
- Ore / East Mine Rock Stockpile
- Plant Site / Ancillary Facilities
- Ponds
- Transmission Line

Evening and Night-time Operations, dBA Contours

- >=40
- >=45
- >=50
- >=55
- >=60
- >=65
- >=70
- >=75
- >=80
- >=85

NOTES:
- Not all water management features are shown for simplicity

0 1 2 4 6 8 Kilometres

Datum: NAD83
Projection: UTM Zone 15N

N W E S

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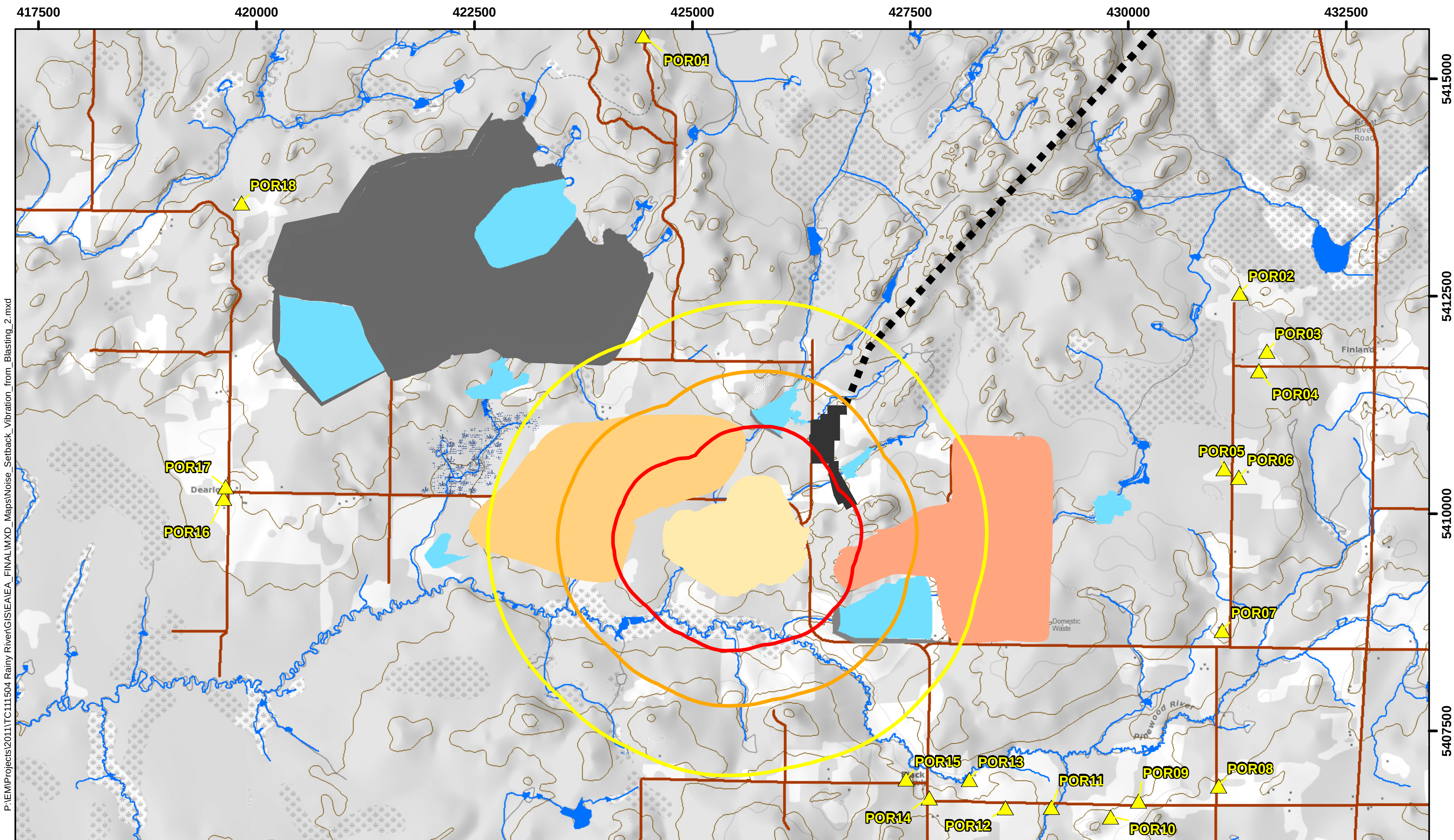
RAINY RIVER PROJECT

Points of Reception and Sound Contours - Evening and Night Time Operations

PROJECT N°: TC111504	**FIGURE: 7-7**
SCALE: 1:61,100	DATE: October 2013



LEGEND

- Receptor (labelled with ID)
- Existing Roads
- Contours, 10 m interval

Proposed Site Features

- Open Pit
- Tailings Management Area
- Overburden / West Mine Rock Stockpile
- Ore / East Mine Rock Stockpile
- Plant Site / Ancillary Facilities
- Ponds
- Transmission Line

Setback Vibration and Overpressure Contours for Blasting

- Ground borne vibration setback contour to meet the criteria limit (i.e., 10 mm/s at 565 m away from the pit perimeter)
- Overpressure setback contour to meet the criteria limit - behind the working face (i.e., 120 dBL at 1,200 m away from the pit perimeter),
- Overpressure setback contour to meet the criteria limit – infront of the working face (i.e., 120 dBL at 2,000 m away from the pit perimeter)

NOTES:
- Not all water management features are shown for simplicity

Datum: NAD83
Projection: UTM Zone 15N

0 1 2 4 6 8 Kilometres

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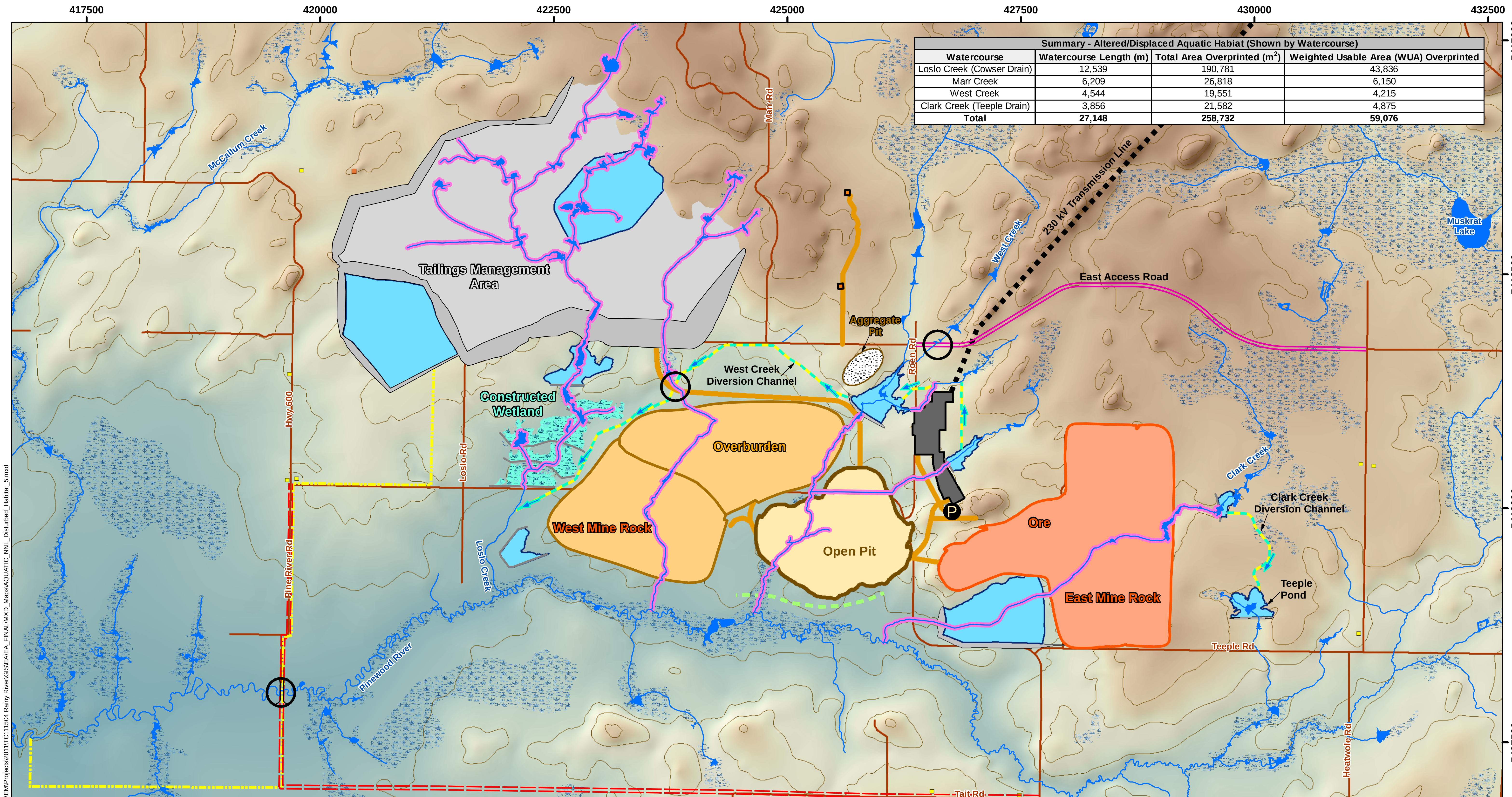
RAINY RIVER PROJECT

Points of Reception and Setback Vibration and Overpressure Contours for Blasting

PROJECT Nº: TC111504	FIGURE: 7-8
SCALE: 1:61,100	DATE: October 2013



Summary - Altered/Displaced Aquatic Habiat (Shown by Watercourse)			
Watercourse	**Watercourse Length (m)**	**Total Area Overprinted (m^2)**	**Weighted Usable Area (WUA) Overprinted**
Loslo Creek (Cowser Drain)	12,539	190,781	43,836
Marr Creek	6,209	26,818	6,150
West Creek	4,544	19,551	4,215
Clark Creek (Teeple Drain)	3,856	21,582	4,875
Total	**27,148**	**258,732**	**59,076**

LEGEND

- Residence-House
- Lodging Cabin-Occasional Use
- Roads
- Contours, 10 m interval (LIO-MNR)
- Water Course
- Altered/Displaced Aquatic Habitat
- Low Lying Area
- New Road Crossings

Elevation Colour Ramp

- High ground
- Low ground

Proposed Site Features

- Underground Portal
- Explosives Facilities
- Water Management Pipelines
- Plant Site / Ancillary Facilities
- Open Pit
- Major Watercourse Crossing
- Overburden / West Mine Rock Stockpile
- Ore / East Mine Rock Stockpile
- Aggregate Pit
- Site Roads
- Pond
- Tailings Management Area
- Pit Protection Berm
- Highway Re-alignment
- East Access Road
- 230 kV Transmission Line
- Watercourse Diversion
- Constructed Wetland
- Dams

Source / Notes:
- Road data extracted from Land Information Ontario, Ontario Road Network, MNR
- Background topographic and elevation data extracted from MNR Land Information Ontario
- Only major facilities are shown. Connecting infrastructure and supporting facilities are generally not shown.

Datum: NAD83
Projection: UTM Zone 15N

N W E S

0 1 2 4 6 8 10 Kilometres

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RAINY RIVER PROJECT

Altered / Displaced Aquatic Habitat

PROJECT N°: TC111504 | **FIGURE: 7-9**

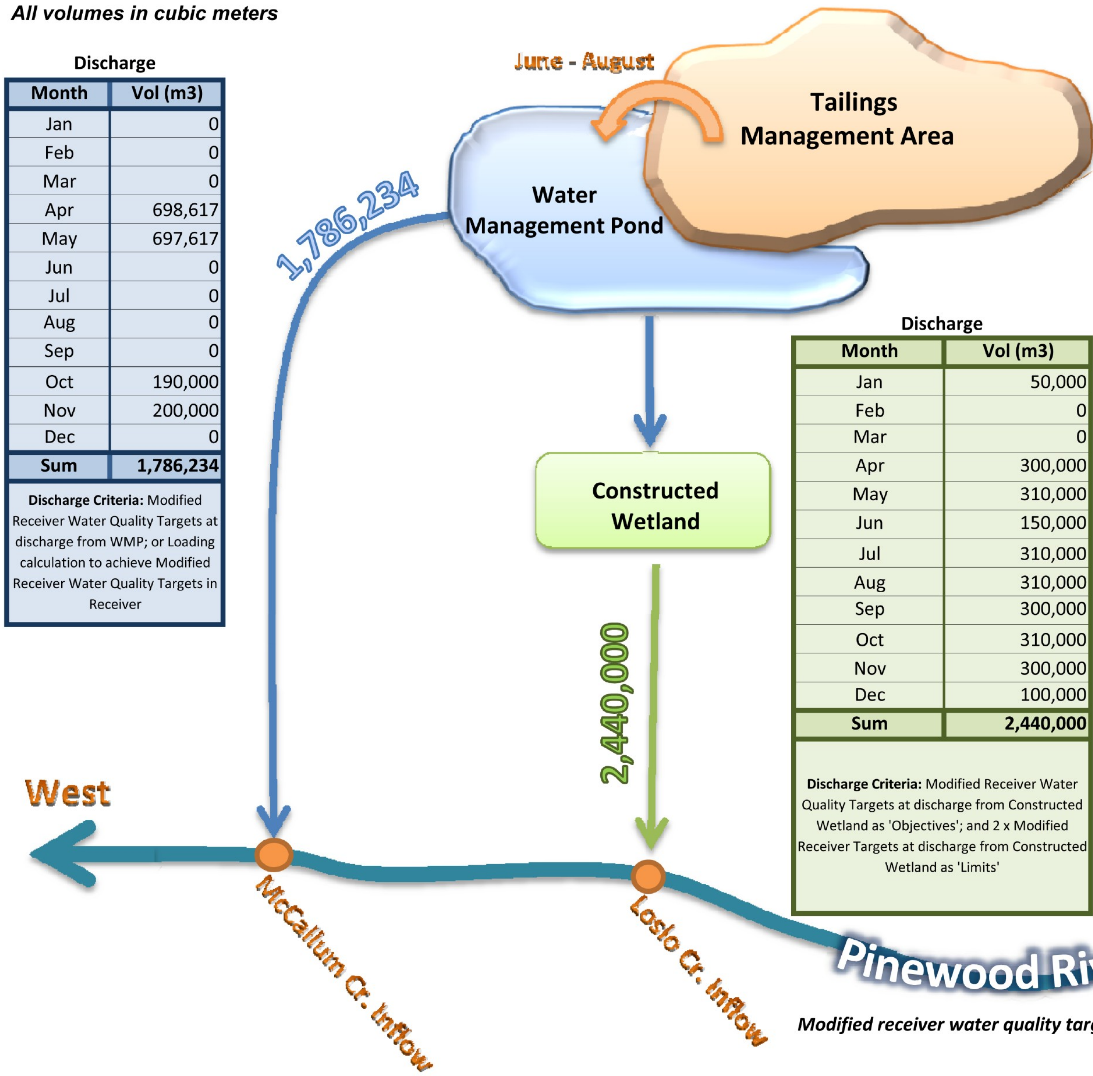
SCALE: 1:37,000 | DATE: October 2013

All volumes in cubic meters

Discharge

Month	Vol (m3)
Jan	0
Feb	0
Mar	0
Apr	698,617
May	697,617
Jun	0
Jul	0
Aug	0
Sep	0
Oct	190,000
Nov	200,000
Dec	0
Sum	**1,786,234**

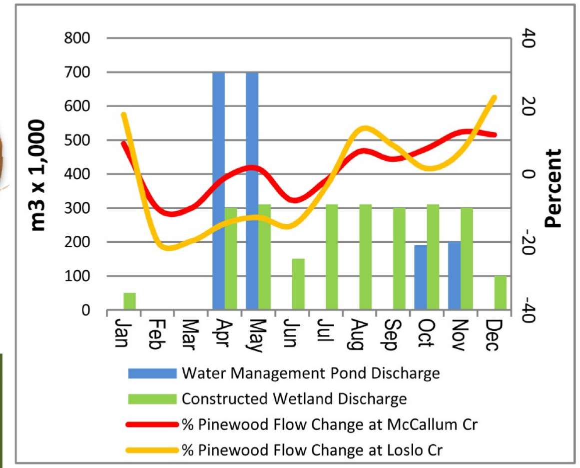
Discharge Criteria: Modified Receiver Water Quality Targets at discharge from WMP; or Loading calculation to achieve Modified Receiver Water Quality Targets in Receiver



Discharge

Month	Vol (m3)
Jan	50,000
Feb	0
Mar	0
Apr	300,000
May	310,000
Jun	150,000
Jul	310,000
Aug	310,000
Sep	300,000
Oct	310,000
Nov	300,000
Dec	100,000
Sum	**2,440,000**

Discharge Criteria: Modified Receiver Water Quality Targets at discharge from Constructed Wetland as 'Objectives'; and 2 x Modified Receiver Targets at discharge from Constructed Wetland as 'Limits'



Pinewood Flow Change at McCallum Creek

Month	%
Jan	8.9
Feb	-10.1
Mar	-10.1
Apr	-1.2
May	1.5
Jun	-7.8
Jul	-2
Aug	6.6
Sep	4.3
Oct	7.5
Nov	12.3
Dec	11.5
Average	**0.30**

Pinewood Flow Change at Loslo Creek

Month	%
Jan	17.5
Feb	-19.8
Mar	-19.8
Apr	-14.6
May	-12.8
Jun	-15.2
Jul	-3.9
Aug	13
Sep	8.4
Oct	1.6
Nov	6.5
Dec	22.5
Average	**-8.01**

Modified receiver water quality targets maintained in Pinewood River at all times

NOTES:

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RAINY RIVER PROJECT

Water Management Schematic
Average Annual Balance - Year 15

PROJECT N°: TC111504 | **FIGURE: 7-10**

SCALE: | DATE: October 2013

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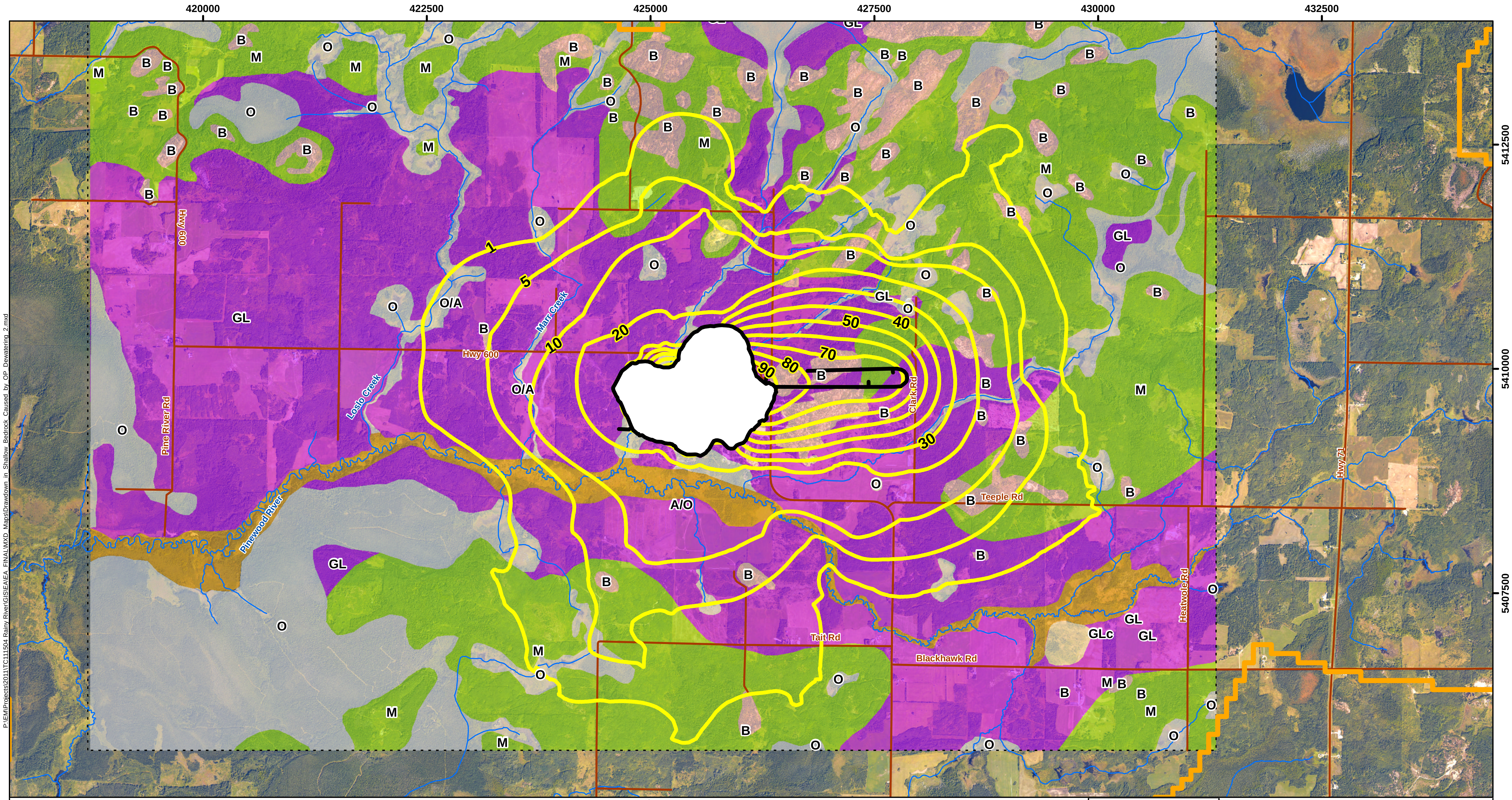

LEGEND

- Approximate Open Pit Outline and Underground Ramp
- 20 Drawdown Contours (m) (Base Case)
- Model Domain Boundary
- Roads
- Watercourses corresponding to current conditions

Quaternary Geology

O	Organic: peat and organic clay; includes bogs, fens, marsh, ponds and standing water along poorly defined creeks.
A	Alluvium: fine sand, silt, and clay; deposits of Pinewood River and tributaries
B	Bedrock: exposures or with very thin cover
GL	Glaciolacustrine: clay, silt, and minor sand; glacial lake bottom
GLc	Glaciolacustrine Coarse Grained: sand and gravel; beach, bar and, near-shore deposits
GF	Glaciofluvial: sand, gravel, and boulders, minor till; deposited from glacial meltwater in ice-contact environment.
M	Moraine: glacial till with some interbedded glaciolacustrine clay and silt; inferred to mostly Whitemouth Lake Till, clay rich with carbonate rocks and matrix.

For the fully developed and dewatered mine (Year 12, Base Case)

0 1 2 4 6 8 10 Kilometres

NOTES:
- Road data extracted from Land Information Ontario, Ontario Road Network, MNR Queen's Printer for Ontario, 2011-2012
- Surficial geology based on air photo analysis and review of published geology maps. Surficial materials may vary from those indicated

Datum: NAD83
Projection: UTM Zone 15N

N E S W

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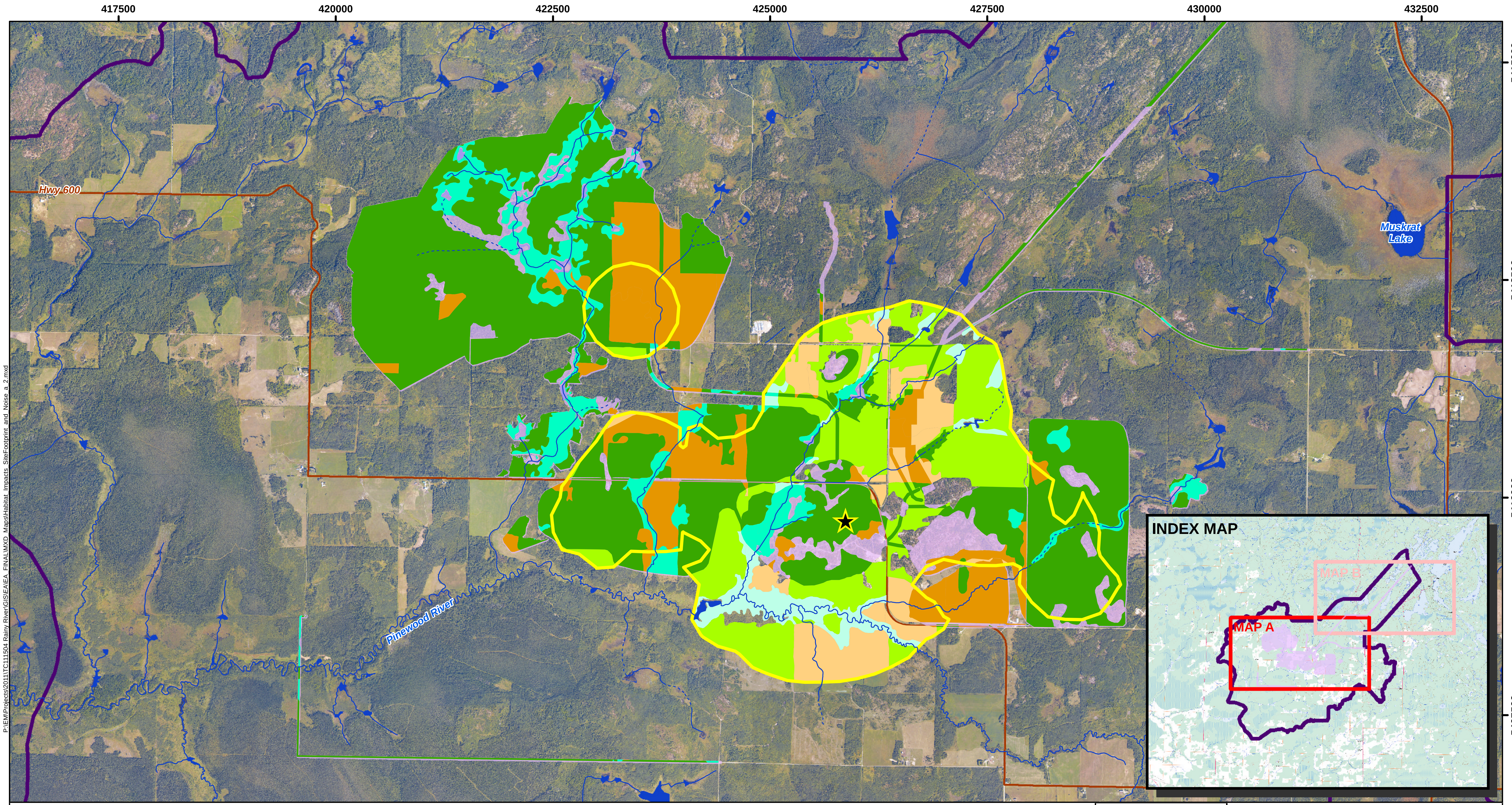
RAINY RIVER PROJECT

Model Predicted Drawdown in the PLGD/Shallow Bedrock

PROJECT N°: TC111504	FIGURE: 7-11
SCALE: 1:40,500	DATE: October 2013



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LEGEND

- RRP Site
- Approximate Principal RRP Facilities Footprint
- 50 dBA Contour for Daytime Operation
- Natural Environment Local Study Area (NLSA)
- Regional Road / Highway
- Existing Transmission Line
- Permanent Watercourse
- Intermittent Watercourse
- Waterbody
- First Nation Reserve Lands
- Conservation Reserve (Regulated)
- Provincial Park

Altered / Displaced Terrestrial Habitat

- Marsh Bird Habitat affected by Clearing
- Marsh Bird Habitat affected by Site Sounds
- Open Country Breeding Bird Habitat affected by Clearing
- Open Country Breeding Bird Habitat affected by Site Sounds
- Woodland Habitat affected by Clearing
- Woodland Habitat affected by Site Sounds

0 1.25 2.5 5 7.5 10 Kilometres

NOTES:
- Road data extracted from Land Information Ontario, Ontario Road Network, MNR Queen's Printer for Ontario, 2011-2012
- Base map data from Geogratis NRCan Toporama DRG 1:50,000 NTS sheets

Datum: NAD83
Projection: UTM Zone 15N

N W E S

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RAINY RIVER PROJECT

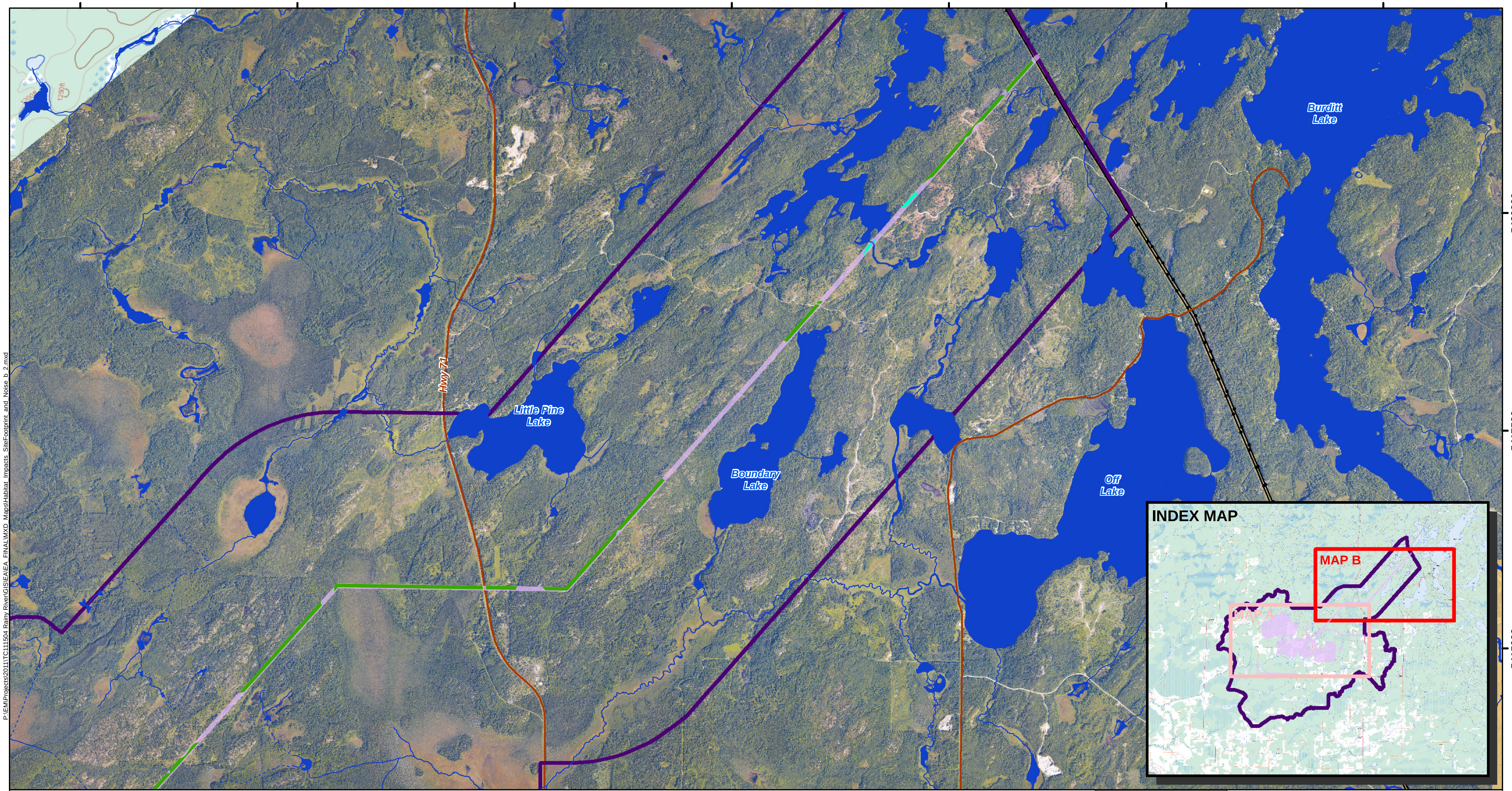
Altered / Displaced Terrestrial Habitat Map A

PROJECT N°: TC111504

FIGURE: 7-12a

SCALE: 1:42,000

DATE: October 2013



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LEGEND

- RRP Site
- Approximate Principal RRP Facilities Footprint
- 50 dBA Contour for Daytime Operation
- Natural Environment Local Study Area (NLSA)
- Regional Road / Highway
- Existing Transmission Line
- Permanent Watercourse
- Intermittent Watercourse
- Waterbody
- First Nation Reserve Lands
- Conservation Reserve (Regulated)
- Provincial Park

Altered / Displaced Terrestrial Habitat

- Marsh Bird Habitat affected by Site Sounds
- Marsh Bird Habitat affected by Clearing
- Open Country Breeding Bird Habitat affected by Site Sounds
- Open Country Breeding Bird Habitat affected by Clearing
- Woodland Habitat affected by Site Sounds
- Woodland Habitat affected by Clearing

0 1.25 2.5 5 7.5 10 Kilometres

NOTES:
- Road data extracted from Land Information Ontario, Ontario Road Network, MNR Queen's Printer for Ontario, 2011-2012
- Base map data from Geogratis NRCan Toporama DRG 1:50,000 NTS sheets

Datum: NAD83
Projection: UTM Zone 15N

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RAINY RIVER PROJECT

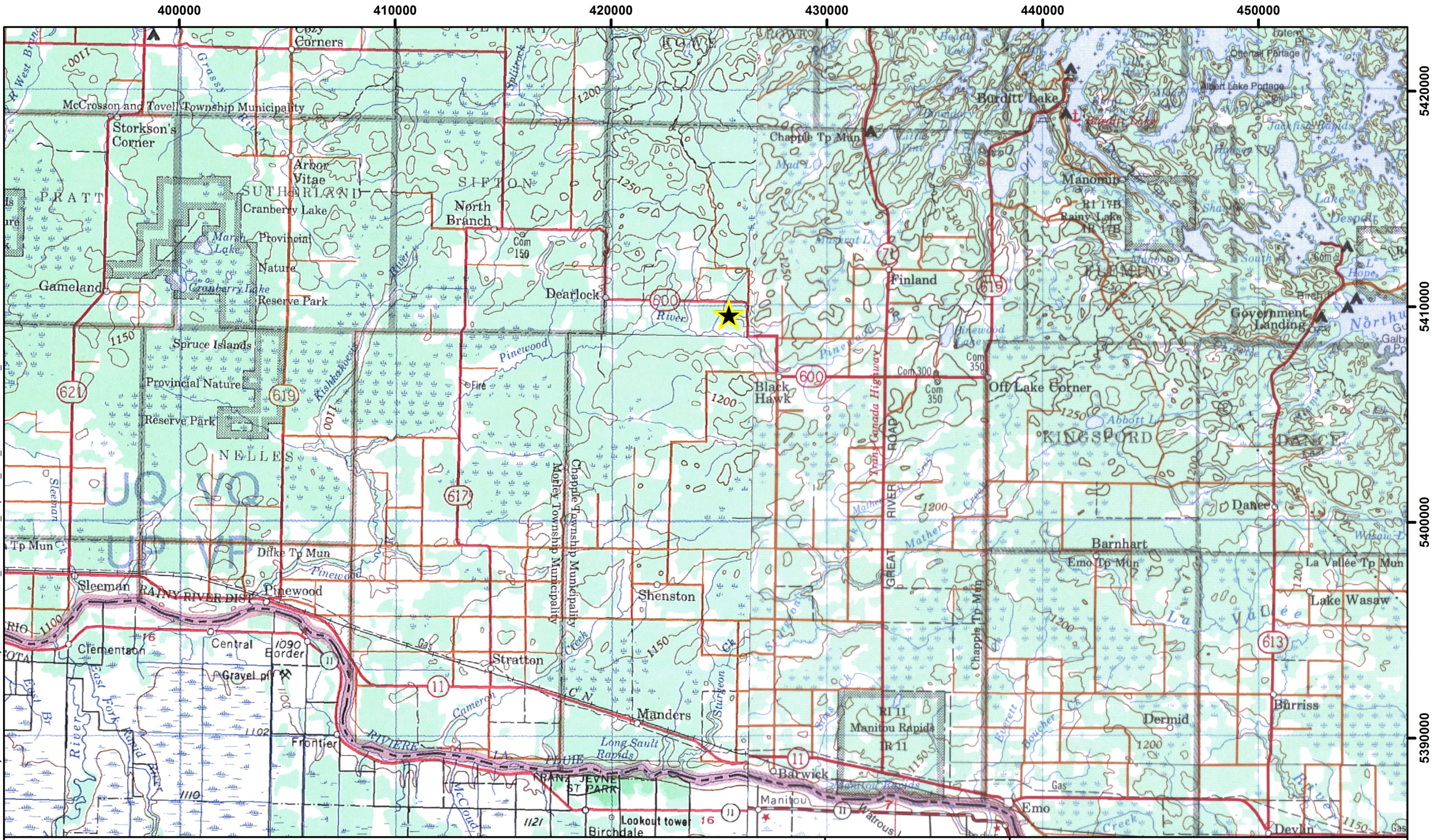
Altered / Displaced Terrestrial Habitat Map B

PROJECT N°: TC111504

FIGURE: 7-12b

SCALE: 1:42,000

DATE: October 2013



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LEGEND

★ RRP Site

Note: For the purpose of TK/TLU data collection, the study area was purposefully broadly defined. This map was used to provide context for information gathering and define area of greatest interest.

0 2.75 5.5 11 16.5 22 27.5 Kilometres

SOURCE:
- NTS 1:50,000 topographic maps extracted from Geogratis.ca

Datum: NAD83
Projection: UTM Zone 15N

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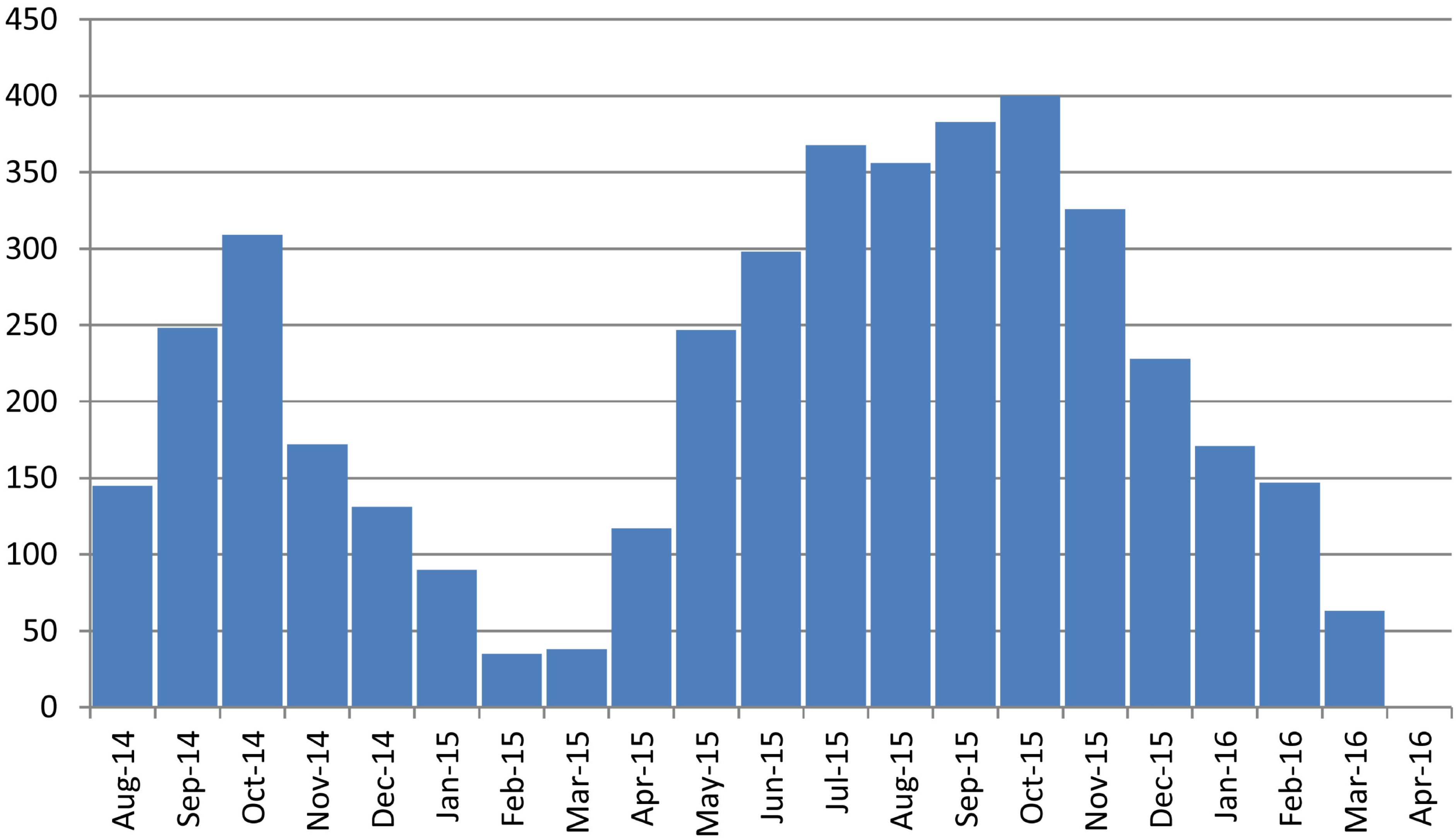
RAINY RIVER PROJECT

Traditional Knowledge / Traditional Land Use Data Collection Area

PROJECT N°: TC111504	**FIGURE: 7-13**
SCALE: 1:245,000	DATE: October 2013



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NOTES:
- Source: BBA 2012

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RAINY RIVER PROJECT

Construction Phase Workforce Requirements

PROJECT N°: TC111504	**FIGURE: 7-14**
SCALE:	DATE: October 2013

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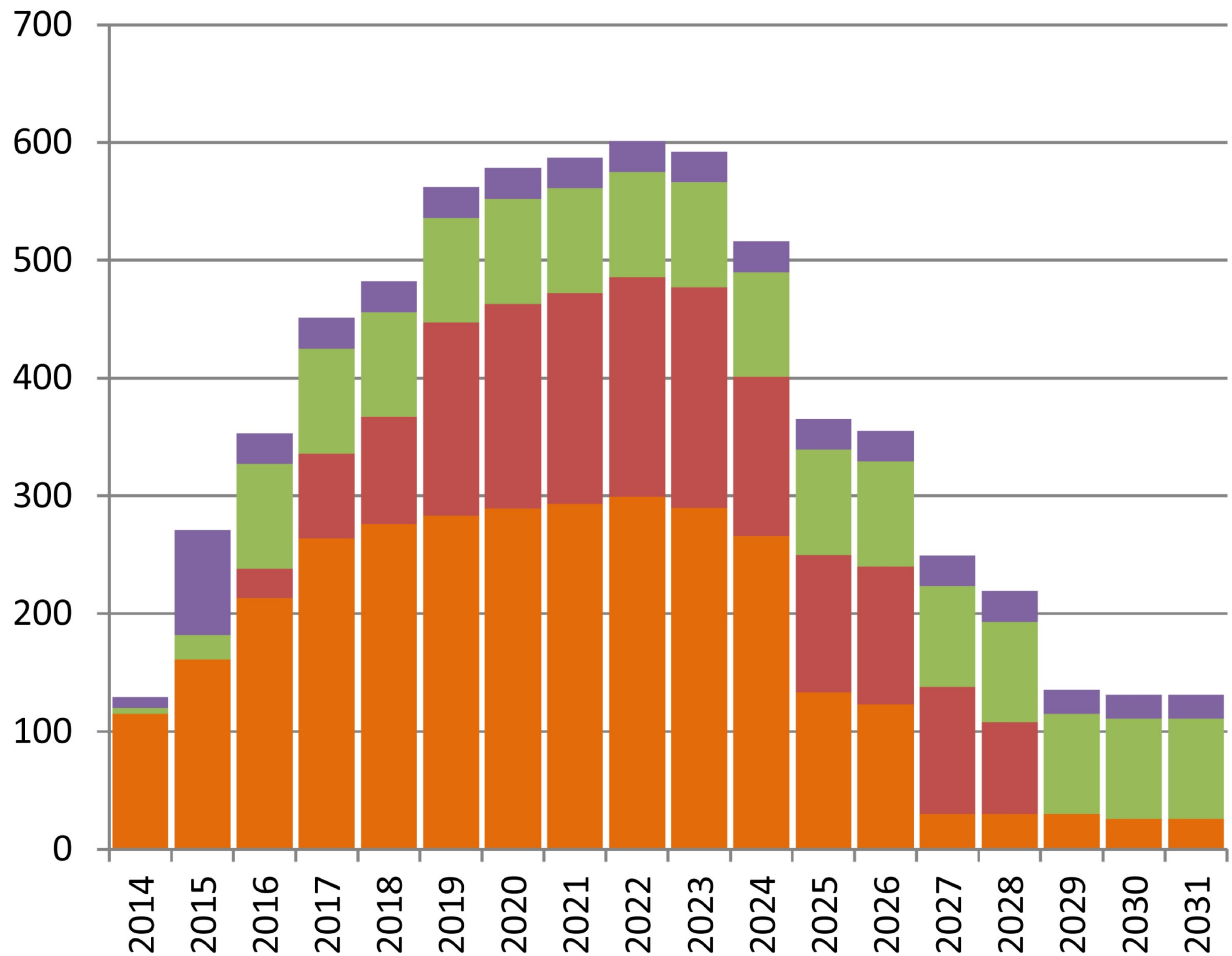

LEGEND

- G&A
- Process Plant
- Underground Mining
- Open Pit Mining

NOTES:
- Source: BBA 2012

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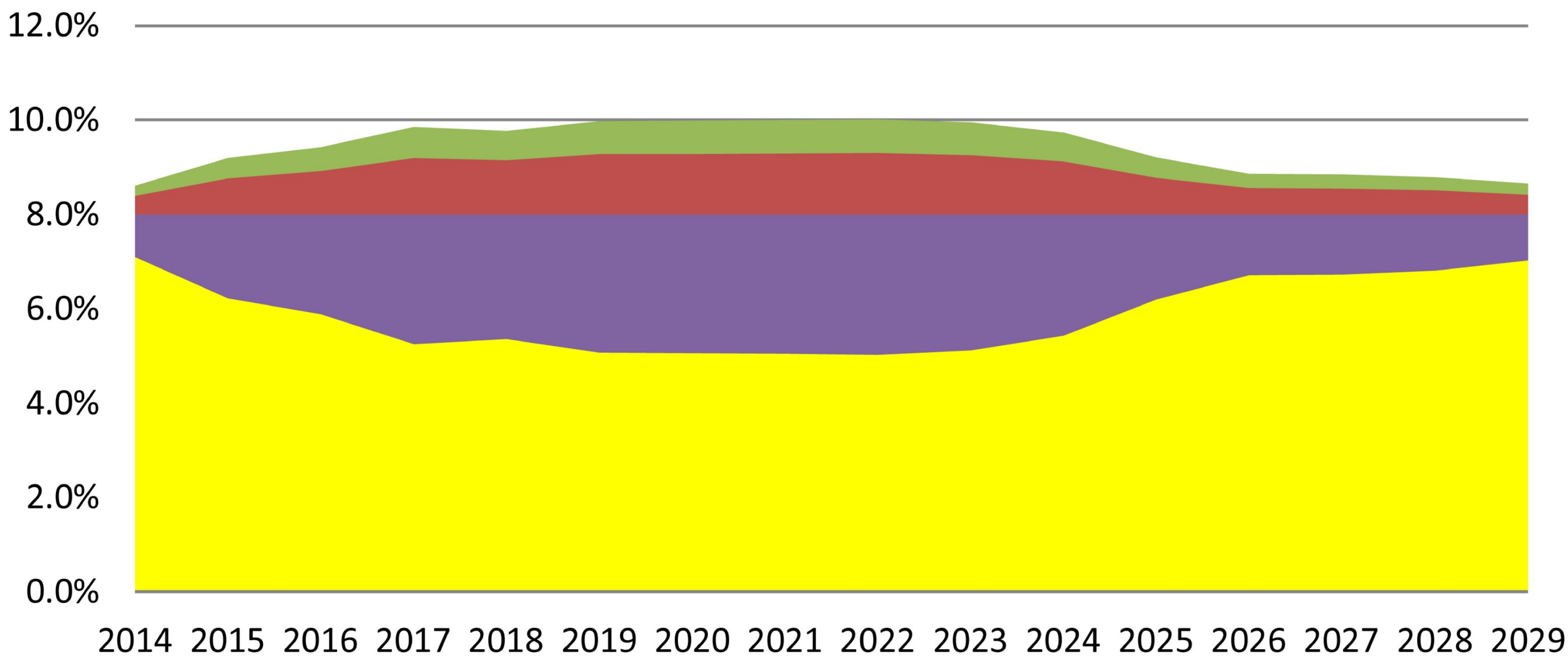
RAINY RIVER PROJECT

Operations Phase Workforce Requirements

PROJECT N°: TC111504	**FIGURE: 7-15**
SCALE:	DATE: October 2013



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LEGEND

- Unemployment Rate
- Increase in labour participation
- Reduction in unemployment rate
- Reduction in involuntary part-time workers

NOTES:
- Source: BBA 2013

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RAINY RIVER PROJECT

Unemployment Rates in the HRSA

PROJECT N°: TC111504	**FIGURE: 7-16**
SCALE:	DATE: October 2013

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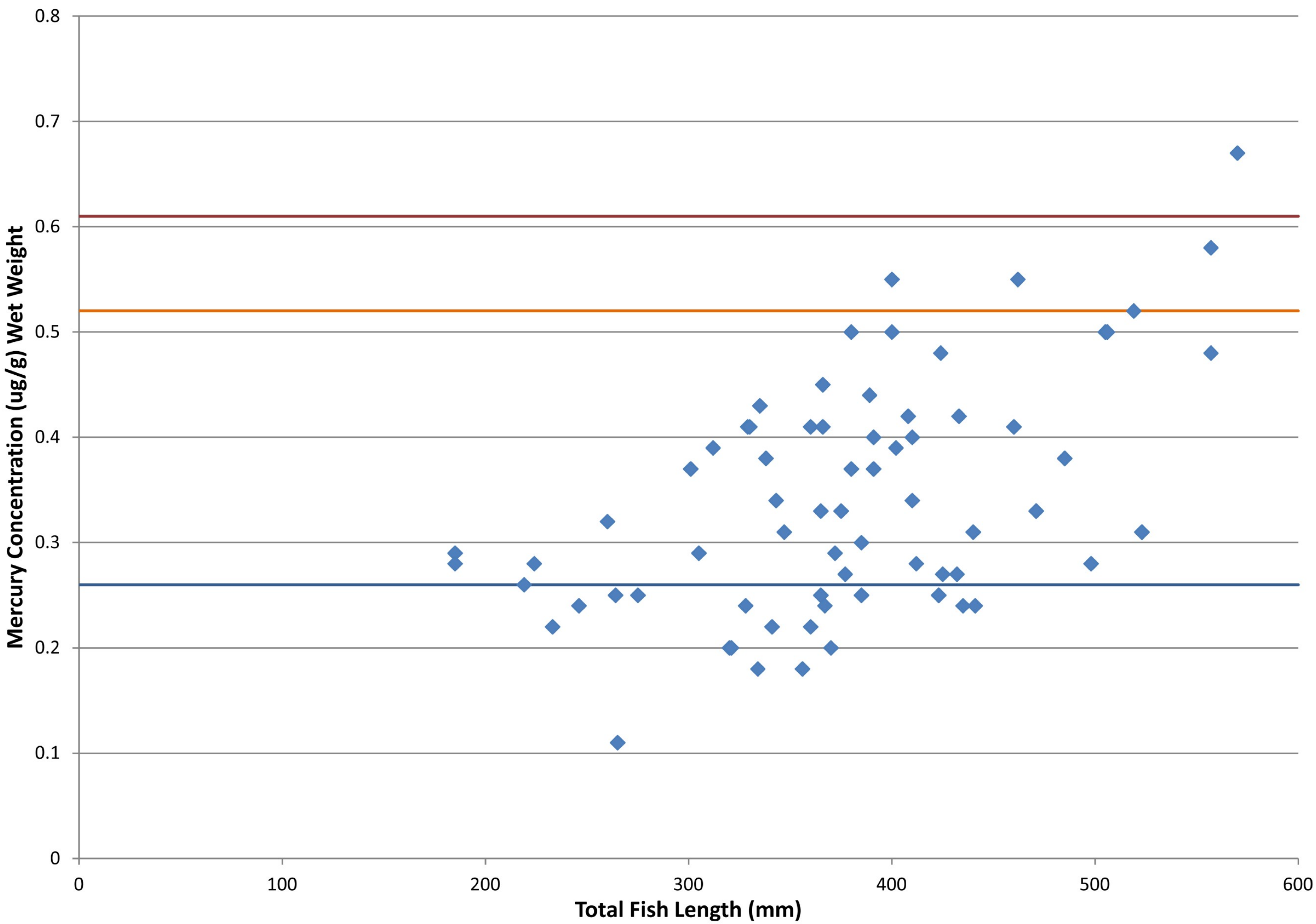

LEGEND

- Concentration
- Women of Child-bearing Age and Children - Start Advisory (0.26 ug/g)
- Women of Child-bearing Age and Children - Total Restriction (0.52 ug/g)
- General Population - Start Advisory (0.61 ug/g)

NOTES:
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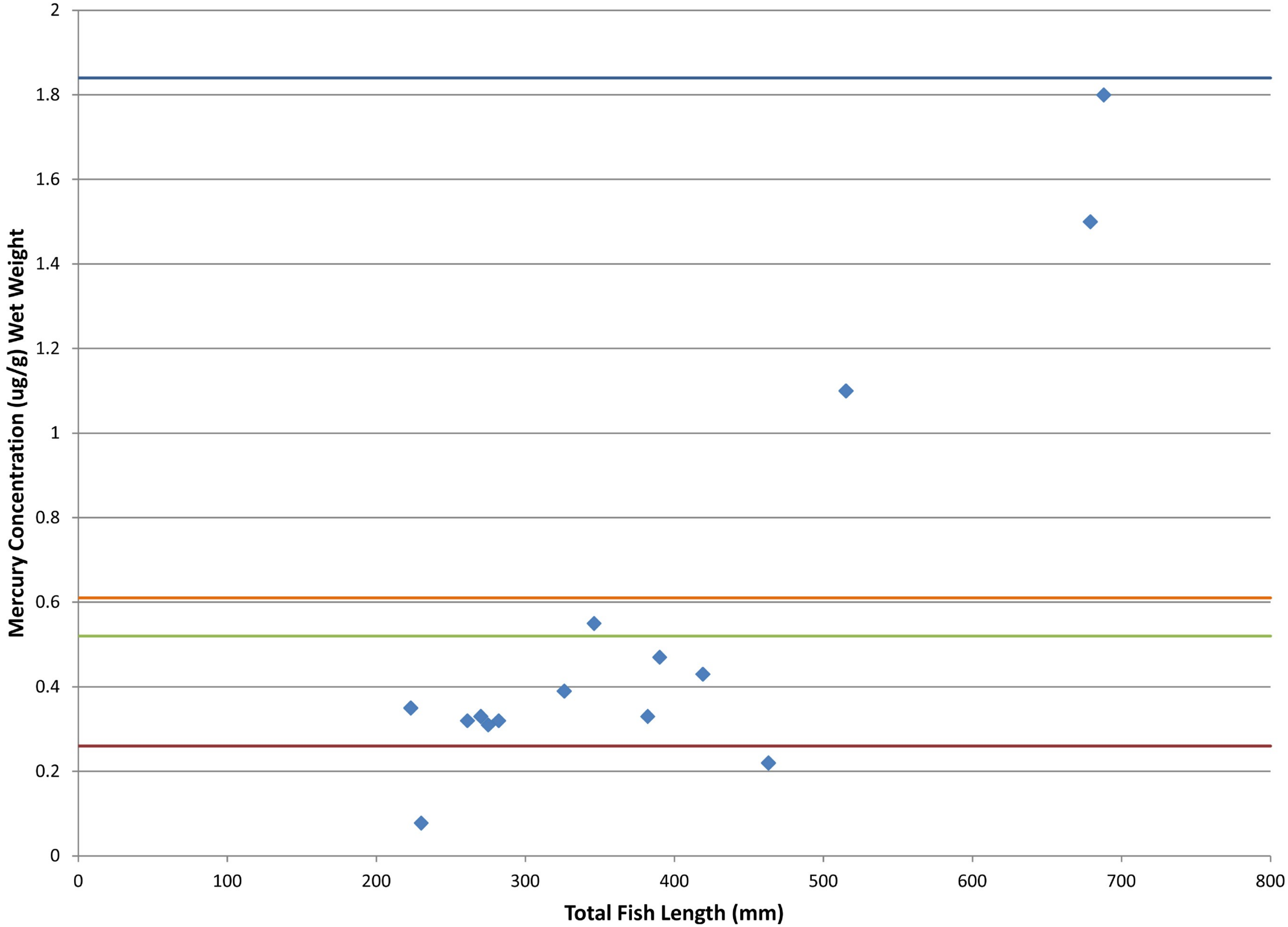
RAINY RIVER PROJECT

Mercury Concentrations in Northern Pike Muscle Tissue

PROJECT N^{o}: TC111504	**FIGURE: 7-17**
SCALE:	DATE: October 2013



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LEGEND

- Concentration
- Women of Child-bearing Age and Children - Start Advisory (0.26 ug/g)
- Women of Child-bearing Age and Children - Total Restriction (0.52 ug/g)
- General Population - Start Advisory (0.61 ug/g)
- General Population - Total Restriction (1.84 ug/g)

NOTES:
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RAINY RIVER PROJECT

Mercury Concentrations in Walleye Muscle Tissue

PROJECT N°: TC111504	**FIGURE: 7-18**
SCALE:	DATE: October 2013