# BlackRock Metals Mining Project

## Construction of a New Rail Segment for the BlackRock Metals Inc. Mine Project

## Supplement to the Environmental Impact Assessment Statement

November 2012

GENIVAR

# Project to Build a New Rail Segment for the BlackRock Metals Inc. Mining Project

## Supplement to the Environmental Impact Assessment Statement

### Final Version

Approved by:

_______________________________

Martin Larose, Project Director

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# NOTE TO THE READER

This supplement to the environmental impact assessment statement for the construction of a new rail segment for the BlackRock Metals Inc. mining project comprises the following volumes:

Volume 1: Main report
Volume 2: Appendices
Volume 3: Summary[1]

This document should be read and referred to in conjunction with its associated appendices.

*DISCLAIMER*:

This document is a translated version of the original study published in French. In case of disparity between the two versions, the French document prevails.

[1] The summary will be deposited simultaneously with the answers to the questions and comments from the Ministries.

# PROJECT TEAM

**BlackRock Metals Inc.**

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| Jean Rainville | President, Ing. |
| Jacqueline Leroux | Regional Vice President, Environment |
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**GENIVAR Inc.**

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| Martin Larose | Project Director, Biologist, B.Sc. |

*Specialists and Professionals*

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# APPENDICES

# 1 INTRODUCTION

This document is a supplement to the environmental impact assessment statement (EIS) for the iron-titanium-vanadium open pit mining project on a 4,435-hectare property east of Lac Chibougamau. The mining project involves the construction of crushers, a mineral processing plant, waste piles, tailings facilities, water holding ponds, water intakes, an explosives plant and magazine, access and secondary roads, administrative buildings and housing (if required), as well as borrow pit operation.

This EIS supplement relates to the construction of a rail segment approximately 25 kilometres long. Mineral processing will take place on site, and the rail segment would be used to transport the concentrate to the existing Canadian National (CN) railway line.

Section 31.2 of the Environmental Quality Act (RSQ, c Q-2), hereinafter called the EQA, requires all proponents to comply with *Environmental Impact Assessment and Review Procedure* before undertaking a project to build a railway ore handling facility, railway terminal or railway line. At the federal level, the Canadian Transportation Agency (CTA) is responsible for assessing railway construction projects in accordance with the Canadian Environmental Assessment Act.

# 2 PRESENTATION OF THE PROPONENT, CONSULTANT AND STUDY AREA

## 2.1 Presentation of the Proponent and the Consultant

### 2.1.1 Proponent

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## 2.2 Study Area

Two study areas, one regional and the other local, were defined to locate and identify sensitive elements of the host environment in order to assess the direct and indirect effects of the railway construction project (Figure 2-1).

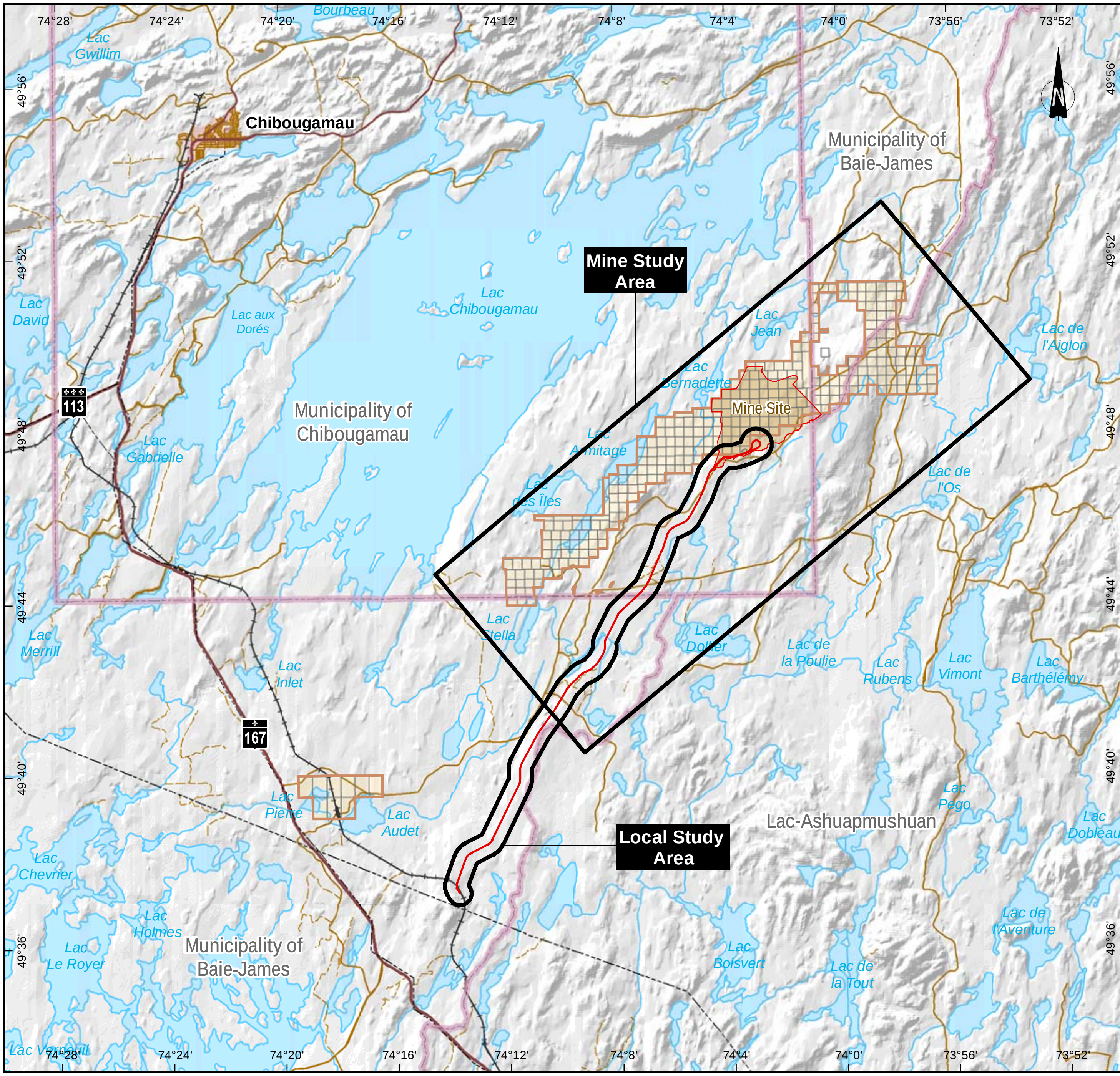
### 2.2.1 Regional Study Area

The regional study area includes the towns of Chibougamau and Chapais, the Municipality of Baie-James and the Cree communities of Oujé-Bougoumou and Mistissini. To a lesser extent, it includes the Lac-Ashuapmushuan unorganised territory in the Saguenay–Lac-Saint-Jean region. However, the latter is not documented in this impact assessment, as the railway corridor does not run through this territory and the impact should not be felt within its jurisdictional boundaries.

The regional study area represents the project's regional socio-economic and geographical setting. It reflects the municipal boundaries and the way of life of the Cree and non-Aboriginal communities in the vicinity of the project. The size of this area allows the larger-scale impact of the project on components of the human environment to be assessed (Figure 2-1).

### 2.2.2 Local Study Area

The local study area comprises the elements of the host environment most likely to be affected by the railway construction project. For the components of the biophysical environment, this area extends 500 m on either side of the railway, covering an area of approximately 2,660 ha. However, for the components of the human environment, such as land use, infrastructure, landscape, etc., the local study area extends up to 1 km on either side of the railway corridor (5,320 ha) so as to include all of the human elements present and likely to be affected by the project. The local study area includes the rail segment from the mining project to the junction with the existing railway line (Figure 2-1).





**BlackRock Metals Project Components**

- Limits of active claims
- Active mining claims
- Extent of proposed mine
- Proposed railway segment

**BLACKROCKMETALS**

Project to Build a New Rail Segment for the BlackRock Metals Inc. Mining Project

- Supplement to the Environmental Impact Assessment Statement -

## Study Area

**Sources :**

*BDGA, 1/1 000 000, MRN Québec, 2002*
*SDA, 1/20 000, MRNF Québec, mai 2010*

*Project data :*
*S06428A-GR-CR-020-PLAN D'ENSEMBLE_ALIGN_V5G*
*CIMA, 14 août 2012*

*Mapping : GENIVAR*
*File : 111-16127-00_EC_Ang_C2-1_ZE_130205.mxd*

Scale 1 : 250,000

0 2.5 5 km

UTM, zone 18, NAD83

**Figure 2-1**

**November 2012**

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# 3 PROJECT DESCRIPTION

## 3.1 Railway

In 2011, Rail Cantech began the process by defining a possible corridor for the new rail segment from the proposed mine to the existing railway line linking the Chibougamau–Chapais region to the Saguenay–Lac-Saint-Jean region.

More recently, in 2012, CIMA+ carried out the preliminary design engineering and optimized railway corridor. Multiple routes were considered for the railway, with the optimised corridor taking the following environmental criteria into consideration:

- avoid certain streams;
- avoid a zone of cedar-black spruce forest;
- cross streams where they are narrowest;
- have a net-zero cut and fill profile.

After several modifications and versions, version 5G was selected based on its lower environmental sensitivity, which also coincided with lower construction costs.

CIMA+ drew up a list of the various environmental changes and versions of the rail segment, which is attached as Appendix A.

### 3.1.1 General Technical Description

The selected corridor starts at the junction with the railway line belonging to the Canadian National Railway Company (CN) at chainage 0+000, and ends at the proposed BlackRock Metals mine site, at chainage 26+600. There would be a wye at the end of the railroad, near the proposed mine.

Plan S06428A-GR-CR-020 (Appendix B) shows the entire proposed corridor and the location of the various intersections with logging roads and snowmobile and all-terrain vehicle (ATV) trails. Crossings would be built at these intersections to enable the logging companies and other users (including snowmobiles, ATVs, etc.) to cross the tracks safely.

The selected corridor runs through the territory of two municipalities: the Municipality of Baie-James from chainage 0+000 to 15+450, and the town of Chibougamau from chainage 15+450 to 26+600.

The railroad right-of-way would be about 18 m wide for a total area of about 48 ha. The corridor crosses 19.1 km of wooded area, 6.4 km of wetland (including 6.1 km of peatland) and 0.8 km of the drainage network, with the remaining 0.3 km on unproductive land.

#### 3.1.1.1 Preliminary Engineering

The preliminary engineering report for the project was prepared by CIMA+ (Appendix C). The main criteria behind the preliminary engineering for the project were as follows:

- the train would do one return trip per day;
- the selected design speed was 48 km/h loaded (outgoing) and 56 km/h when the train is pulling empty wagons (return);
- as the planned annual production for the mining project is 3 million tonnes (Mt) of iron ore concentrate per year, the railway would be designed for 91 cars and four locomotives;
- sizing was 10.4 m for the cars and 25 m for the locomotives;
- the rail segment must meet North American standards and CN requirements. It must also be as straight as possible and have a minimum radius of curvature of 175 m (10 degree radius) and maximum slope of 2%.
- width and height clearance must also be maximized for maximum flexibility for users in terms of freight dimensions;
- the railroad would be built with a standard gauge of 1,435 m;
- preference would be given to new, SS (standard strength) type 115-lb continuous welded rail;
- remote-controlled motorized switches would be used;
- crossings (level crossings) would be built with new No. 1-type lumber and spike and anchor fastening systems;
- crossing design and warning systems would meet the requirements of *Draft RTD10 Road/Railway Grade Crossing Technical Standards and Inspection, Testing and Maintenance Requirements*, Transport Canada (2002).

#### 3.1.1.2 Railway Gradient

The gradient of the proposed railway line generally ranges from 0.00% to 1.40% (Table 3-1).

**Table 3-1: Gradient of the Proposed Railway**

| Chainage | Slope |
|---|---|
| 0+000 to 16+800 | 0.85% |
| 16+800 to 18+300 | 0.25% |
| 18+300 to 19+000 | -0.40% |
| 19+000 to 20+700 | 1.10% |
| 20+700 to 22+000 | 1.40% |
| 22+000 to 26+600 | 0.00% |

The gradient of the proposed railway is based on CN requirements for the development of private sidings, which should have a maximum gradient of 2%. The selected gradient meets the requirements for areas used for rail car parking, where the gradient should ideally be zero but in any event never more than 0.2%.

**Wye**

As recommended by CN, a wye would be installed because of the considerable length of the proposed rail segment (26.6 km) (Plan S06428A-GR-CR-020, Appendix B). This wye would allow the locomotive to enter and leave the mine site in a forward direction, as operating a locomotive in reverse over such a distance is not advisable. Because of the topography of the proposed railway corridor, the wye would be located at the future mine site in order to maximize the wye's surface.

**Grade Crossings**

The proposed railway crosses logging roads, thus requiring the construction of 11 grade crossings, to be located at the following chainages:

1+063, 2+063, 2+343, 5+524, 8+048, 9+855, 16+208, 18+691, 18+744, 20+102 and finally 22+751.

The design of these grade crossings and the warning systems would meet the requirements of *Draft RTD10 Road/Railway Grade Crossing Technical Standards and Inspection, Testing and Maintenance Requirements*, Transport Canada (2002).

These standards for grade crossings cover design considerations, location, crossing surface, logging road geometry and approaches, sightlines, signs and road markings, train illumination, warning systems, gates and flashing light units.

According to the various clauses of this standard, the minimum distance between the nearest rail and any part of a road intersecting the road approach to the crossing must be 30 m when the maximum allowable speed exceeds 25 km/h. However, it is not necessary to install signs or a warning system, because the average annual daily traffic (AADT) on the various logging roads is considered to be less than 250 vehicles. No side illumination system would be required.

### 3.1.2 Design and Construction

The design and construction of the new rail segment would be carried out in two phases. The first phase corresponds to the civil works and the second to the rail works.

The main civil works for the railway are:

- clearing of 48 ha of land for the right-of-way;
- clearing and stripping of plant material;
- class 1 (rock blasting) and Class 2 (soil) excavation;
- class 1 (rock blasting) and Class 2 (soil) fill;

- installation of a 300-mm layer of sub-ballast (MG 56);
- culvert construction;
- construction of the Jules bridge structure. Note that the design of this bridge has not yet been determined. The three options being considered are shown in Appendix D. The final plans would be submitted when applying for a certificate of authorization for construction under Section 22 of the EQA.

The main rail works for the railway are:

- installation of a 300-mm (0.3 m) layer of ballast;
- construction of the railway, with ties and rails including fasteners, welds and switches;
- construction of the 11 grade crossings.

The rail works would be carried out after the civil works. They would start from the junction with the CN rail line (0+000) and make their way to the location of the future proposed mine (26+600).

The construction workers would be supplied with bottled drinking water; no intake would be built at the surface of a lake or river.

### 3.1.2.1 Construction Methods

**Construction Site and Work Site Access**

As the goal is to minimize negative effects, the construction site would be accessed to the greatest extent possible using existing roads that are part of the logging road network. Road vehicles and construction equipment would use the selected railway corridor right-of-way to access the site.

The number of site accesses would be limited, because the site's progress would be directly related to the progress of railway construction from chainage 0+000 to chainage 26+600. Infrastructure work at streams (culverts, bridge, etc.) would start at the beginning of the civil works phase so as to have the least possible impact on the schedule and the progress of railway-building. These works, which are considered critical in the construction schedule, would be accessible by the existing access roads planned to be used for this purpose.

The contractors and their subcontractors would be obliged to use the access roads and would be responsible for maintaining the roads. All access roads and nearby streams are shown on Plan S06428A-GR-CR-020 (Appendix B).

**Cut-and-Fill Balance, Organic Soils and Blasting**

*Balance*

Table 3-2 shows the estimated quantities of cut and fill to be done during railway construction. Note that the planned cut-and-fill balance is net-zero, with the cut material used as fill throughout railway construction, except for the ballast and sub-ballast, which would be sourced from a quarry near the processing plant at the proposed mine site.

**Table 3-2: Cut and Fill Quantity Estimates for the Civil Works**

| Description | Unit | Quantity |
|---|---|---|
| Stripping | $m^3$ | 251,700 |
| Class 1 excavation | $m^3$ | 623,700 |
| Class 2 excavation | $m^3$ | 322,800 |
| Sub-ballast | $m^3$ | 134,200 |
| Ballast | $m^3$ | 46,000 |

*Organic Soils*

Given the stability and load capacity needed for the railway, all the organic soil in the peatlands must be excavated and replaced with stone fill. This so-called staged fill construction method would help control settling. Note that this type of construction only partially changes wetland and peatland drainage, because water can flow in the stone fill. This technique allows for water cycle exchanges and minimizes any impact on these fragile environments. This method has been used before for railway construction, including for a recently-built segment in the Labrador region (Frédérik Bastien, CIMA+, personal communication, October 4, 2012).

A stretch of about 6.1 km of organic soils in peatlands would need to be excavated. The stone to replace the organic soil would come from a range of blasting work and would essentially be hauled along the planned right-of-way using off-highway trucks. The proposed construction method is to start peatland and Class 1 (rock) excavation simultaneously and build the stone embankments. Thus, most of the earthworks materials could be transported using off-highway trucks, which minimizes both project costs and logging road use.

The total planned volume of organic soils to be excavated is approximately 251,700 $m^3$. Much of this lies within the right-of-way for the construction of the embankment and ditches.

*Blasting*

The total volume of Class 1 excavation with blasting would be about 623,700 $m^3$. Most of this material would be used to backfill the gradient profile of the railway infrastructure. Plan S06428A-GR-CR-00301 in Appendix B presents typical sections for the earthworks and rail infrastructure to be built.

Rock blasting areas (Class 1 excavation) are located from chainages 8+800 to 12+000, 21+600 to 21+800, 22+800 to 23+000, 23+900 to 24+000 and finally 24+400 to 26+400. These various blasting areas are shown on Plan S06428A-GR-CR-014-R00 (Appendix B). No blasting would take place near fish habitats.

Protection measures would be taken during blasting to comply with the applicable environmental requirements. Materials would be recovered to be used as fill or for the production of granular materials for the structure of the railway.

**Storage and Cleaning Areas**

The layout of the new rail segment was optimized with the aim of avoiding the use of storage areas for excavated materials. The excavated material and blasted rock produced during construction would be used to backfill the gradient profile of the railway infrastructure or for profiling of embankment slopes.

Plan S06428A-GR-CR-00301 in Appendix B shows a typical section of the earthworks and rail infrastructure to be built.

**Machinery Use**

Construction methods for the various railway civil works are similar to those used in road construction (conventional cut and fill method) using standard machinery.

Initially, the vegetation (trees, shrubs, dead wood, stumps, etc.) found within the railway right-of-way would be removed by manual or mechanical means. Machinery such as chain saws, harvesters, skidders and brush saws would be required for this type of work.

Subsequently, soil stripping for earthmoving and grading operations would be done in order to profile the site of the proposed railway. Work on side and cross ditches and off-take ditches would be done at the same time. The work would also include digging out and cleaning of small ditches and streams to be crossed by the proposed railway. This work would be done using conventional heavy equipment such as backhoes, dump trucks, graders, loaders and rollers.

Once the excavation work is done, the structure of the railway would be put in place (ballast, ties, rails, switches, grade crossings, wye, etc.). Ballast spreading and surfacing would be done using materials from a quarry near the processing plant at the proposed mine site. Machinery such as rollers and specialized track-laying and ballast-leveling machinery would be used for this type of work.

The various construction activities for the railway would be carried out in accordance with the criteria set out in the project plans and specifications.

**Work Method for Stream Crossings (Bridges and Culverts)**

The route of the proposed railway lies within a single watershed. There are only 10 streams to cross, nine of which are intermittent and one permanent. Only 9 culverts are planned under the railway, most of which are for drainage ditches (plan S06428A-GR-CR-00201, Appendix B). Only one bridge (Jules bridge) is needed to cross the river that connects Lac Jules and Lac Pillow.

Plan S06428A-SU-CR-001 in Appendix B presents the design of the culverts to be installed under the railway, and the plans in Appendix D show the design of Jules bridge. Culvert design will comply with the general planning objectives set forth in the document entitled *Lignes directrices pour la conception de traversées de cours d'eau au Québec* (DFO 2012).

During installation of the various culverts and building of the Jules bridge, special precautions would be taken to comply with environmental requirements and the necessary steps would be taken to minimize the environmental impact of the work. These mitigation measures are described in Section 7.2.4.1.

**Runoff and Drainage**

Drainage ditches would be developed to allow surface runoff to be intercepted and directed to the same stream as before, minimising any changes in the receiving environment catchment. A number of measures, such as filters, sediment pits and riprap, would also be taken to minimize sediment transport by runoff. These works would be set up in the drainage ditches, particularly in areas where the sediments are apt to flow into the stream.

**Materials for the Railway**

The railway would be built with new materials in accordance with CN specifications. Ties would be 2.5-m lengths of No. 2 treated lumber. The total number of ties is estimated at approximately 53,500 (including the two switches) or 2,011 ties per kilometre of track. CN basically uses treated lumber and has no maintenance equipment for other types of ties.

The rails would be continuous welded rail (23.8 m in length), "Prime Steel" Carbon Steel, 115 RE in section, with 3HB rail in the tangents and FHH rail in the curves. Switches would be No. 12 type for connections with the main Chibougamau–Chapais and Saguenay–Lac-Saint-Jean railway line and special No. 8 for the new rail segment. Each switch is equipped with a motorized switch controller and a switch blower. The public crossings (logging roads) would be lined with treated softwood planks.

**Site Cleanup at the End of the Project**

The contractor or subcontractor hired to build the railway would be responsible for site cleanup during and after the various stages of construction. This work includes cleanup of surplus materials and rehabilitation of temporary storage areas, as required.

### 3.1.3 Operations and Maintenance

#### 3.1.3.1 Use of the Planned Railway

The railway would be used to transport the iron ore concentrate from the proposed BlackRock Metals mine, at a rate of one round trip per day, year round. Each train would consist of four locomotives and 91 closed cars.

#### 3.1.3.2 Maintenance

The main maintenance work on the proposed railway would consist of periodic lubrication of the rails with vegetable oil using a grease truck travelling on the track, particularly the curves, as well as chemical weeding of the ballast (once every five years), winter snow removal and replacement of damaged ties. These are periodic activities that would take place over short periods. Standard machinery is typically used for this type of maintenance, including a grease truck (vegetable oil), a van adapted to run on rails and a track snow-removal vehicle.

### 3.1.4 Decommissioning

During closure, decommissioning work would be focused around the removal of rails, culverts, ties, etc., which would then be taken to the appropriate management sites. In addition, in-situ soil characterization would be done to test for the presence of contaminated soils. Any such soil would be managed as needed in accordance with regulations. The track bed would also be scarified and levelled.

Ditches would be filled and slopes reduced to reproduce the natural topography of the setting. The culverts would also be removed to promote natural flow. Overburden would be spread to allow for the seeding of native species.

Railway decommissioning would be covered by the rehabilitation plan for the BlackRock Metals mining project.

### 3.1.5 Solid Waste Management

Solid waste such as woody debris and construction residue would be recycled or disposed of at the appropriate certified sites located as close as possible to the work site. It could be sent to the eco-centers in Chapais and Chibougamau for recycling. Only the topsoil within the right-of-way would be stripped, and would all be reused for slope and ditch layout.

### 3.1.6 Project Schedule and Costs

#### 3.1.6.1 Work Schedule

The preliminary project schedule allows about two years for the work. The various stages of construction are as follows:

- final design (final report and conceptual plans) completed and approved by BlackRock Metals;
- detailed engineering for the design and installation (three months);
- building permits obtained prior to the start of work;
- contractor hired for earthworks, drainage and structural work for a period of one year;
- contractor hired for rail works for a period of one year.

#### 3.1.6.2 Cost Estimate

**Quantity Estimates**

Estimates for the railway materials and excavation work are presented in Table 3-3 in the form of a schedule of requirements. The soil study and engineering design for the railway could result in an increase or decrease in the cut-and-fill volumes and the budget estimate.

**Construction Costs**

Costs were determined based on similar projects using comparable methods. More specifically, these prices include mobilization and demobilization of all equipment required for construction, as well as refueling. They include the supply of all the equipment required to carry out the entire range of excavation and specialized rail work.

For calculation purposes, the ballast will come from a quarry located near the processing plant at the future mine site. If other sources of ballast rock are identified near the railway line, they would be preferentially used for construction.

Railway material prices include delivery and unloading on site and all subsequent handling, including installation of the materials.

The cost estimate for the work includes the costs of site organization, excavation and site development up to the top of the sub-ballast of the planned railway, as well as construction costs for the superstructure (ties, rails, ballast rock, warning system, etc.), detailed engineering and construction supervision.

Costs were estimated in 2012 Canadian dollars. Inflation and other time variations are not accounted for, nor were financing costs included in the estimate. An amount equivalent to about 10% of the cost of the work has been included to cover contingencies.

The total project costs are estimated at almost $67 million, or about $2.5 million/km of track. A breakdown of railway construction costs is provided in Table 3-3. Note that the acquisition of rolling stock is not provided for in the calculation of project costs.

**Table 3-3: Budget Estimate, Chainage 0+000 to 26+600**

| | Description of Work | Unit | Quantity | Unit Price | Total |
|---|---|---|---|---|---|
| 1.0 | **Railway structure** | | | | |
| 1.1 | Construction of the welded-rail railway using new materials (ties, tie plates, rails, spikes, anchors, etc.), including ballast, alignment and levelling | lin. m. | 26,600 | $775 | $20,615,000 |
| 1.2 | No.12 motorised switch, 115 lb with remote controller and blower | unit | 1 | $175,000 | $175,000 |
| 1.3 | No.8 special switch, manual, 115 lb | unit | 1 | $100,000 | $100,000 |
| 1.4 | Grade crossing (planks and signs, no signals) | unit | 11 | $10,000 | $110,000 |
| 1.5 | Ballast (4A-type, nearby quarry) | $m^3$ | 43,100 | $45 | $1,939,500 |
| | **Subtotal** | | | | **$22,939,500** |
| 2.0 | **Earthworks and site development** | | | | |
| 2.1 | Clearing | ha | 48 | $7,000 | $336,000 |
| 2.2 | Stripping | $m^3$ | 251,700 | $12.50 | $3,146,250 |
| 2.3 | Class 2 excavation (MG-112) | $m^3$ | 322,800 | $25 | $8,070,000 |
| 2.4 | Class 1 excavation (rock) | $m^3$ | 623,700 | $25 | $15,592,500 |
| 2.5 | Geotextile membrane | $m^2$ | 256,500 | $2.50 | $641,250 |
| 2.6 | Sub-ballast (MG-56 type) | $m^3$ | 134,200 | $35 | $4,697,000 |
| 2.7 | Culvert CSP 900 mm | lin. m. | 1,500 | $1,250 | $1,875,000 |
| 2.8 | Bridge (TPG, ±15 m) | lump | 1 | $1,900,000 | $1,900,000 |
| | **Subtotal** | | | | **$36,258,000** |

| **Cost summary** | | | |
|---|---|---|---|
| Subtotal of items 1.0 and 2.0 | | | $59,197,500 |
| Engineering (design, management, plans and specifications) | | | $1,500,000 |
| Contingency for the subtotal and engineering | 1 | 10 % | $6,055,750 |
| **Total for rehabilitation work** | | | **$66,753,250** |

Source: Rail Cantech Inc. 2011

## 3.2 Port of Saguenay Facilities

Plans S06951A-GR-CR-001-AC and S06951A-GR-CR-002-AC in Appendix E show the location of the proposed facilities at the site of the Saguenay port authority, from the rail access to the marine terminal. These are multi-user facilities that will cover an area of about 47,416 $m^2$ (4.7 ha). These facilities and the marine terminal will normally operate year-round.

### 3.2.1 Rail Service at the Grande-Anse Maritime Terminal

A new 12.5-km section of track will be built in 2013 to connect the Grande-Anse marine terminal to the Quebec railway network via the Roberval–Saguenay railroad, a subsidiary of Rio Tinto Alcan. The project lies entirely within territory of the city of Saguenay. Figure 1 in Appendix E shows the project location and layout.

The rail service is a joint initiative of Promotion Saguenay and the Saguenay port authority, which manages the federally-owned Grande-Anse port facilities.

The proposed railway service facilities would be located approximately 1.5 km south-southwest of the Grande-Anse maritime terminal. They will allow raw materials to be managed, unloaded and shipped to the port facilities. The concentrate handling facilities will consist of a covered circuit designed for zero dust tolerance to maximize environmental protection.

BlackRock Metals would have access to the following planned rail service multi-user facilities:

- automatic car unloader;
- covered tubular conveyor (closed tunnel);
- bucket-wheel reclaimer;
- ore concentrate storage (covered and heated in winter);
- covered tubular conveyor (closed tunnel).

The ore would be transported to an automatic wagon unloader at the Grande-Anse rail service via the new railway line to be built at the Port of Saguenay. The wagon unloader will be located in a closed building with an operator control room 20 m wide by 50 m long, and will have a discharge capacity of 3,500 tonnes per hour. Once unloaded, the ore concentrate would be sent to a warehouse via a covered tubular conveyor. The conveyor will be supported by an arched steel structure 2 m wide by 416 m long, and will also have a planned loading capacity of 3,500 tonnes per hour. It will be equipped with a scale and calibration chain.

The warehouse, consisting of an enclosed space heated in winter to prevent the ore from freezing, will be 300 m long, 60 m wide and 31 m high. It will be able to accommodate up to 420,000 tonnes of iron ore concentrate or other solid material, depending on the client. The building will be equipped with an automatic ventilation and air exchange system.

The concentrate would be reclaimed by bucket-wheel reclaimer and send to the ore carrier (cargo ship) loader via the tubular conveyor. This conveyor will also be supported by an arched structure 2 m wide but this time about 2 km long, with a capacity of 5,000 tonnes per hour. It will also be equipped with a scale and calibration chain.

Figures 4, 5, 6, 7 and Plan S06951A-GR-CR-002-AC in Appendix E show various multi-user facilities that BlackRock Metals can use to handle its iron ore concentrate.

**Service Roads**

Two gravel service roads 5 m wide (including shoulders) and 368 m and 960 m long respectively will be built alongside the conveyors, with a 300 mm layer of crushed granular material (MG-20) compacted to 95% Modified Proctor compaction.

The layout of the two service roads includes a drainage ditch about 1 m deep.

Plan S06951A-GR-CR-002-AC in Appendix E shows the layout and location of the two service roads.

**Drainage**

The entire terminal site will be levelled to direct water from runoff and snowmelt via ditches and culverts to settling ponds built in various locations. These ponds allow suspended solids (SS) to settle out before the runoff water is released into the Saguenay River.

Plan S06951A-GR-CR-002-AC in Appendix E shows the layout and location of the various drainage ditches and settling ponds.

### 3.2.2 Grande-Anse Maritime Terminal

The Grande-Anse wharf is built on the right bank of the Saguenay River. It consists of sheet piling topped with a concrete cope wall. The wharf has a berthing length of 286 m and is equipped with mooring bollards on both sides, allowing it to receive ore carriers with a loading capacity of 120,000 to 130,000 dwt. The usable water depth at low tide is 13.8 m.

The service area at the marine terminal covers 4,600 m$^2$. It connects to the regional roads via a gravel road 8 m wide.

This service area has been outfitted with various facilities, including an administrative building with a parking area, a transshipment warehouse, a storage area for four caustic soda tanks and an existing ore or salt storage area. These facilities have been designed to meet the freight transport needs of the various industries in the Saguenay-Lac-Saint-Jean region.

Figure 10 and Plan S06951A-GR-CR-002-AC in Appendix E show the various existing facilities at the Port of Saguenay Grande-Anse maritime terminal.

**Ship Loader (Freighter with a Capacity of 130,000 dwt)**

A conveyor (cargo loader) will be installed at the Grand-Anse wharf for the various users of the site. It would load the ore carriers using a retractable arm mounted at a height of 13 m, which can be used to load a variety of products, including iron ore concentrate, into the holds of ships through a covered, retractable chute. It will be equipped with a weighing and sampling system, and will have a capacity of 5,000 tonnes per hour. Figures 8 and 9 in Appendix E show a typical ship loader of the sort to be used at the Grande-Anse wharf.

### 3.2.3 Work Schedule and Budget

The rail link to the Port of Saguenay rail access should be ready by December 31, 2013. The multi-user facilities for unloading trains, storing materials, conveying to the port facilities and ship loading should be in place by late summer 2014.

The cost of the facilities at the rail service and the Grande-Anse terminal is estimated at approximately $5 million.

# 4 CONSULTATION WITH THE COMMUNITIES AND SOCIAL ISSUES

The various local stakeholders were met with during the preparation of the Lac Doré Complex EIS. BlackRock Metals and its representatives have had discussions with stakeholders since July 2010, mainly with First Nations, including the tallyman of trapline 059, the *Ministère des Ressources naturelles et de la Faune* (MRNF), the *Ministère du Développement durable, de l'Environnement et des Parcs* (MDDEP), the Canadian Environmental Assessment Agency, the Department of Fisheries and Oceans Canada, Environment Canada, municipal governments, including those for Chibougamau and the Municipality of Baie-James, and local and regional agencies. These meetings involved the mining project and its components, but did not cover the proposed railway.

The goal of such meetings is to take stock of stakeholders' concerns and their knowledge of the environment so as to develop a project that takes these elements into account to the greatest extent possible. BlackRock Metals intends to continue interacting with stakeholders and the general public over the entire life of the project.

A number of communication and consultation meetings have taken place during the time that the railway option has been under study. These were held in the context of ongoing discussion committee meetings, interviews for the documentation of Cree traditional knowledge and open house days.

## 4.1 Discussion Committees

Multiple meetings were held in the spring and summer of 2012 with the discussion committees for the BlackRock Metals mining project. The purpose of the discussion committees is to provide a forum for stakeholders to track the project developments (project, environment, manpower requirements, etc.) and voice their questions, comments and concerns. These meetings were held in Chibougamau (April 5, May 16 and July 10, 2012), Chapais (April 10, May 22 and July 11, 2012) and Oujé-Bougoumou (April 3 and July 13, 2012), as well as with regional employment and training agencies (July 9, 2012).

## 4.2 Interviews for the Documentation of Cree Traditional Knowledge

In 2012, three meetings were held to continue the documentation of traditional knowledge and hear the family's concerns and comments. Three meetings were held in Saint-Félicien between a representative of BlackRock Metals and members of the Wapachee family. The data was collected during the two meetings held in April. A preliminary report and a land use map were produced and given to the tallyman to review. The data was then completed and the final report was agreed to at the July meeting. The summary report for the three meetings is provided in Appendix F.

## 4.3 Open House Days

Four open house days were held in the communities of Chapais, Chibougamau, Mistissini and Oujé-Bougoumou. These sessions are held to provide general information on the project and its impact and the mitigation measures proposed by BlackRock Metals, and take account of participants' questions, comments and concerns.

Information sessions were also held from October 22 to 25. The public was invited through the regional weekly newspaper La Sentinelle and local radio, in French, English and Cree. The local media was also notified of these meetings.

The open house days featured a series of English and French posters and documents illustrating the project's impact and planned mitigation measures, grouped broadly by theme. BlackRock Metals representatives and experts were on hand to answer questions from participants. The five themes discussed at these meetings were:

- sustainable development;
- human resources;
- the mine;
- the mill;
- shipping and delivery.

The meetings and the concerns raised at them will be documented in an independent report and filed with government agencies.

## 4.4 Concerns of Aboriginal Users

The main concern of the tallyman and Wapachee family members is the cumulative effects associated with the development of a new industrial project on the trapline. They note that the land has undergone many changes in recent years. The trapline has been deeply marked by forestry and mining, road and outfitter development, the growth of the town of Chibougamau and the construction of the CN railway. The development of the BlackRock Metals mining project and its components makes family members feel that this encroachment is extending to still-intact areas.

Despite this general observation, the Wapachee family says that it is not opposed to the BlackRock Metals mining project. It simply wants the effects to be well documented and minimized by the application of appropriate mitigation measures. Family members feel they have a good relationship with BlackRock Metals. They recommend that the information provided by BlackRock Metals and by family members themselves be recorded so that it is not lost. They would like the documentation of traditional land use to be extended beyond the affected sites and to include historical information.

Overall, the concerns expressed by the tallyman and Wapachee family members involve the landscape, changes to the natural environment, noise and dust, as well as impact on wildlife. The tallyman is also interested in the possible involvement of

Wapachee family members in the project development in terms of jobs. A report summarizing the three meetings is presented in Appendix F.

The tallyman's parents stress the effects on the landscape and the natural environment, particularly in the area of the mountain at the northern end of the local study area. This mountain is part of the family's collective memory, as hunting activities have taken place in this area for many years.

The tallyman mentioned his concerns regarding increased traffic during the operation phase. The Wapachee family is concerned about the impact of dust on aquatic life, and the impact of noise in general.

The tallyman mentioned the impact of the project and its components on the two feeding grounds used by geese, one of which is near the railway, at chainage 13+000. He is worried about the potential impact of contamination, particularly beaver displacement and damage to other plant and animal species. Any impact on small animals and plants would affect small animal trapping activities.

Finally, the tallyman is aware that the Wapachee family will receive preferential treatment in terms of jobs and business opportunities, and would like to see a large proportion of the jobs on the site go to members of his family. For this to happen, he needs to know the specific qualifications required for the various jobs so that family members can be trained. He mentioned that some people had the skills required to operate machinery or work in administration.

## 4.5 Concerns of Municipal and Socioeconomic Stakeholders

The comments, questions and concerns of the stakeholders met with all focused on the mining project, not the railway project. Nevertheless, comments related to the hiring of local manpower and maximization of local benefits can also apply to the railway project.

# 5 IMPACT IDENTIFICATION AND ASSESSMENT METHOD

The overall objective of the impact assessment is to determine, as objectively and accurately as possible, the significance of the residual impact of the project on the components of the physical, biological and human environment following the application of general or special mitigation measures. This assessment focuses on all types of effects, whether negative, positive or indeterminate.

The approach is to identify and assess the significance of the anticipated impact at the various stages of the project. Regardless of its significance, every effort is then made to develop measures aimed at mitigating the impact. The significance of an impact depends on the intensity of the effect (which in itself incorporates the notions of component value and degree of disturbance), and its extent, duration and probability of occurrence. Each of these aspects is presented below.

## 5.1 Value of the Environmental Component

The value of a component is based on its ecosystem value or its socio-economic value.

### 5.1.1 Ecosystem Value

The ecosystem value is only determined for components of the natural environment. It is not established for some components of the physical environment (air quality and aural environment) or for components of the human environment. The ecosystem value expresses the relative importance of a component, which is determined based on its qualities (sensitivity, integrity, resilience), its role and its function in the ecosystem. It also includes concepts such as representativity, distribution, diversity, sustainability, rarity and uniqueness. Its determination relies on using the judgment of experts. The value can be high, moderate or low.

High: the component plays an important role in the ecosystem, is of major interest in terms of biodiversity and has exceptional qualities whose conservation or protection are the subject of consensus within the scientific community.

Moderate: the component is of strong interest and has recognized qualities whose conservation and protection are of concern but are not the subject of consensus.

Low: the component is of little interest and has qualities whose conservation and protection are of little concern.

### 5.1.2 Socio-economic Value

The socio-economic value of a given environmental component reflects its importance for local or regional residents, interest groups, managers and experts. In particular, it indicates the public or political will or desire to maintain the integrity and original character of an environmental component. This desire is particularly expressed by the legal protection it is given or the interest it receives from stakeholders. Socio-economic value is, however, difficult to assign to components of the physical environment, and was therefore not assessed for such components. The social value can be high, moderate or low.

High: the component is the focus of legal or regulatory protection measures (threatened or vulnerable species, recognized wildlife habitats, conservation areas, etc.) or is essential to human activities (drinking water, classified archaeological or heritage sites, etc.). It can also be the focus of high expectations for improvement or positive benefits or significant concerns regarding degradation or negative consequences.

Moderate: the component has recognized economic, social or cultural value, or is used by a significant proportion of the communities involved, but has not been given legal protection.

Low: the component has little to no recognized value, nor is it used by the communities involved.

When a component has both ecosystem and socio-economic value, its value is considered to be the greater of these two values, as shown in Table 5-1.

**Table 5-1: Component Value Determination Table**

| Socio-economic Value | Ecosystem Value | | |
|---|---|---|---|
| | **High** | **Moderate** | **Low** |
| High | High | High | High |
| Moderate | High | Moderate | Moderate |
| Low | High | Moderate | Low |

## 5.2 Degree of Disturbance of the Environmental Component

The degree of disturbance of a component corresponds to the magnitude of the structural and functional changes that it might sustain. Depending on the nature of the changes, they may cause positive or negative, direct or indirect effects. The degree of disturbance also takes into account cumulative, synergistic or delayed effects that, beyond the straightforward cause and effect relationship, can amplify the disturbance of an element in a particularly sensitive environment. The degree of disturbance can be high, moderate, low or indeterminate.

High: the effect threatens the environmental integrity of the component or strongly and irreversibly changes the component or its use.

Moderate: the effect causes a reduction in the quality or use of the component without compromising its environmental integrity.

Low: the effect does not alter the quality, use or integrity of the component to any significant degree.

Indeterminate: the degree of disturbance of the component or how it would be disturbed is impossible to determine or predict. In this situation, the environmental effect cannot be assessed for this component and thus the significance of the impact cannot be determined for the interrelationship in question.

## 5.3 Intensity of the Effect on the Component

The intensity of the environmental effect corresponds to the relative importance of the consequences of the changes that the project activity causes to a component. The method used to obtain the intensity of the effect thus refers to the degree of disturbance of an environmental component and the overall environmental value of the component.

The intensity of the effect can be high, moderate or low. For some components of the physical environment whose value is difficult to determine, the assessment of intensity reflects only the degree of disturbance. Table 5-2 shows the possible combinations.

**Table 5-2: Effect Intensity Determination Table**

| Degree of Disturbance[1] | Value of the Component | | |
|---|---|---|---|
| | **High** | **Moderate** | **Low** |
| High | High[2] | High | Moderate |
| Moderate | High | Moderate | Low |
| Low | Moderate | Low | Low[2] |

1 For components of the physical environment, intensity of the effect is based solely on the degree of disturbance.

2 Note that intensity corresponding to a combination of high environmental value and a high degree of disturbance could be described as very high. In contrast, the combination of a low environmental value and a low degree of disturbance could be regarded as very low. The reason this has not been done is to limit the number of possible combinations in the later stages of the assessment.

## 5.4 Extent of the Effect

The extent of the effect on the component corresponds to the scale and spatial reach of the effect, as well as the proportion of a population affected. The extent of the effect can be regional, local or limited.

Regional: the extent is regional if the effect on a component is felt over a large area or affects a large portion of its population.

Local: the extent is local if the effect on a component is felt by a limited portion of the area or its population.

Limited: the extent is limited if an effect on a component is felt over a small area or by a few individuals.

## 5.5 Duration of the Effect

The duration of the effect on the component corresponds to the time dimension, i.e., the period of time during which the effect will last. This criterion takes into account the intermittent nature of one or several effects. The duration of an effect can be:

Long: the duration is long when an effect is felt continuously or discontinuously over a period of more than five years. Such effects are often permanent and irreversible.

Moderate: the duration is moderate when an effect is experienced temporarily, whether continuously or intermittently, during the operating phase, that is to say, beyond the end of the construction phase. Such an effect can still be seen several months after the completion of construction, but have a duration of less than five years.

Short: the duration is short when an effect is felt temporarily, whether continuously or intermittently, during the construction phase or for a few months after the start of the operation phase. Such effects last between a few days and the entire construction phase, plus several months into the start of the operation phase.

## 5.6 Probability of Occurrence of the Effect

The probability of occurrence of an effect corresponds to the real probability that an effect will occur. The probability of occurrence of an effect can be high, moderate or low.

High: the effect on the component is certain to occur.

Moderate: the effect on the component may, but is not certain to, occur.

Low: the effect on the component is unlikely to occur or will only occur if there is an accident.

## 5.7 Significance of the Impact

Impact significance incorporates the criteria of intensity, extent, duration and probability of occurrence. The combinations used to determine the significance of the impact are predetermined. The relationship between each of these criteria, as presented in Table 5-3, allows an overall determination of the significance of the impact in five categories: very high, high, moderate, low and very low. The net impact on an environmental component results from the combination of all the effects from previously-identified sources.

## Table 5-3: Combination of Criteria for Determining the Significance of an Effect on an Environmental Component

| Intensity | Extent | Duration | Probability of occurrence | Significance | Intensity | Extent | Duration | Probability of occurrence | Significance | Intensity | Extent | Duration | Probability of occurrence | Significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| High | Regional | Long | High | Very high | Moderate | Regional | Long | High | High | Low | Regional | Long | High | Moderate |
| | | | Moderate | Very high | | | | Moderate | Moderate | | | | Moderate | Low |
| | | | Low | High | | | | Low | Moderate | | | | Low | Low |
| | | Moderate | High | Very high | | | Moderate | High | High | | | Moderate | High | Moderate |
| | | | Moderate | Very high | | | | Moderate | Moderate | | | | Moderate | Low |
| | | | Low | High | | | | Low | Moderate | | | | Low | Low |
| | | Short | High | High | | | Short | High | Moderate | | | Short | High | Moderate |
| | | | Moderate | High | | | | Moderate | Moderate | | | | Moderate | Low |
| | | | Low | High | | | | Low | Moderate | | | | Low | Low |
| | Local | Long | High | High | | Local | Long | High | Moderate | | Local | Long | High | Low |
| | | | Moderate | High | | | | Moderate | Moderate | | | | Moderate | Low |
| | | | Low | High | | | | Low | Moderate | | | | Low | Low |
| | | Moderate | High | High | | | Moderate | High | Moderate | | | Moderate | High | Low |
| | | | Moderate | High | | | | Moderate | Moderate | | | | Moderate | Low |
| | | | Low | Moderate | | | | Low | Moderate | | | | Low | Very Low |
| | | Short | High | High | | | Short | High | Moderate | | | Short | High | Low |
| | | | Moderate | High | | | | Moderate | Moderate | | | | Moderate | Very Low |
| | | | Low | Moderate | | | | Low | Low | | | | Low | Very Low |
| | Point | Long | High | High | | Point | Long | High | Moderate | | Point | Long | High | Low |
| | | | Moderate | High | | | | Moderate | Moderate | | | | Moderate | Low |
| | | | Low | Moderate | | | | Low | Low | | | | Low | Very Low |
| | | Moderate | High | High | | | Moderate | High | Moderate | | | Moderate | High | Low |
| | | | Moderate | Moderate | | | | Moderate | Moderate | | | | Moderate | Very Low |
| | | | Low | Moderate | | | | Low | Low | | | | Low | Very Low |
| | | Short | High | High | | | Short | High | Moderate | | | Short | High | Low |
| | | | Moderate | Moderate | | | | Moderate | Low | | | | Moderate | Very Low |
| | | | Low | Moderate | | | | Low | Low | | | | Low | Very Low |

* Only residual impact with high to very high significance showed a significant effect as defined in the Canadian Environmental Assessment Act.

# 6 EXISTING CONDITIONS AND IMPACT OF THE PROJECT ON THE PHYSICAL ENVIRONMENT

## 6.1 Existing Conditions

### 6.1.1 Climate

The Chibougamau region is located in the climate zone referred to as "continental", and characterized by a subpolar, subhumid climate with large climatic variations between summer and winter.

The meteorological statistics for the study area are from the meteorological station of the Chibougamau-Chapais Airport, located approximately 60 km west of the study area. The Environment Canada data in this report is for the 1971 to 2000 period (Entraco 2011).

Analysis of the climate normals reveals that the prevailing winds are mainly from the west, northwest and southwest (52.7% of the time). Wind speed averaged from 12 to 13 km/h, but gusts can reach speeds of over 100 km/h. Analysis of the wind rose, which covers the period from January 1, 2006, to December 31, 2010, indicates a predominance of winds from the west to northwest and south to southwest. The average wind speed is 10.9 km/h.

The average temperatures recorded are fairly cold, and the average temperature on an annual basis is 0°C. The average maximum temperature is 22.2°C in July, while the average minimum temperature is -24.2°C in January (Table 6-1).

Total annual precipitation is 961.3 mm (Table 6-1), consisting of 659.7 mm from rainfall and 301.7 cm from snowfall. Climate normals for 1971-2000 indicate 182.2 days of rain greater than or equal to 0.2 mm annually.

According to the James Bay Advisory Committee on the Environment (Portrait and Environmental Impacts of Climate Change on the James Bay Territory, 2007), a trend toward increasing temperatures and precipitation in the James Bay is to be expected. The main climate trends observed during the period from 1970 to 2002 show that the average annual temperature increased by 1 to 1.5°C in the boreal forest zone, with warming especially pronounced since the mid-1990s. Recent climate models suggest an increase in temperature of about 4°C for the James Bay territory and an increase in precipitation of 2 to 32% a day by 2050 compared to the period from 1961 to 1990.

### 6.1.2 Ambient Air Quality

There are few human activities in the study area that result in air pollution. Current emission sources are primarily the result of mineral exploration and logging activities and wind erosion. The quality of the ambient air in the vicinity of the proposed railway can therefore be described as good.

A study of the atmospheric dispersion of contaminants was carried out within the scope of the EIS (Entraco 2011), based on the AERMOD atmospheric dispersion model.

This study is currently being revised and will soon be filed with the various levels of government in a supplementary report.

**Greenhouse Gases and Climate Change**

The analysis of greenhouse gas (GHG) emissions and the appropriate mitigation measures is currently underway. Expected sources of GHG and proposed mitigation measures would be described in a supplementary report to be sent to the various governmental agencies.

The railway project involves the daily passage of a train, thus totalling some 365 return trips per year. Good railway usage practices provide for ways to reduce the pollution associated with air emissions from locomotives, such as technologies for idling mode, as it is recognized that idling trains contribute significantly to the emission of airborne contaminants.

### 6.1.3 Noise

#### 6.1.3.1 Noise Regulations

There are a number of regulations for noise emissions. The MDDEP's Guideline 019 for the mining industry (March 2012) contains noise criteria for assessing the degree to which noise can affect well-being. These criteria are used in the review of mining projects that require a certificate of authorization under Section 22 of the Environmental Quality Act (RSQ, c. Q-2).

**Guideline 019 for the Mining Industry**

Guideline 019 for the mining industry (MDDEP) sets the criteria to be respected for zones less than 600 m from fixed noise sources. The acceptable limits for the various zoning categories are similar to the values in memorandum of instruction No. 98-01 (*Note d'instruction 98-01 concernant les niveaux maximum de bruit*) issued by the MDDEP (Table 6-2). However, these values are not applicable to moving noise sources like a passing train.

The latter is categorized as road noise, as it occurs outside the limits of the stationary source, which is the mine site equipment. Road noise is regulated by the *Ministère des Transports du Québec* (MTQ), which calls for a noise level of 55 dB (A) Leq (24 h), generally considered an acceptable level for sensitive areas.

**Table 6-1: Climate Normals – Chapais-Chibougamau Airport (1971-2000)**

| | January | February | March | April | May | June | July | August | September | October | November | December | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Daily maximum (ºC) | -13.4 | -10.6 | -3.3 | 5.0 | 13.7 | 20.0 | 22.2 | 20.4 | 13.9 | 6.6 | -2.0 | -10.2 | 5.2 |
| Daily minimum (ºC) | -24.2 | -22.6 | -15.6 | -5.9 | 2.1 | 8.0 | 10.4 | 9.4 | 4.7 | -0.8 | -8.7 | -19.3 | -5.2 |
| Daily average (ºC) | -18.8 | -16.6 | -9.5 | -0.5 | 7.9 | 14.0 | 16.3 | 14.9 | 9.3 | 2.9 | -5.4 | -14.8 | -0.0 |
| Extreme maximum (ºC) | 8.5 | 9.0 | 16.0 | 28.0 | 31.5 | 34.5 | 35 | 33.3 | 29.0 | 24.4 | 17.8 | 11.0 | |
| Extreme minimum (ºC) | -43.3 | -42.8 | -38 | -27.2 | -16.1 | -5.6 | -0.6 | -2.2 | -6.0 | -13.3 | -30.0 | -42.0 | |
| ≤ 0 ºC | 30.0 | 26.0 | 20.6 | 6.4 | 0.4 | 0.0 | 0.0 | 0.0 | 0.1 | 3.2 | 20.1 | 29.3 | 136.0 |
| > 0 ºC | 1.0 | 2.2 | 10.5 | 23.6 | 30.6 | 30.0 | 31.0 | 31.0 | 29.9 | 27.8 | 9.9 | 1.7 | 229.2 |
| > 10 ºC | 0.0 | 0.0 | 0.7 | 5.5 | 20.0 | 27.8 | 30.9 | 30.5 | 22.0 | 6.8 | 0.4 | 0.0 | 144.7 |
| > 20 ºC | 0.0 | 0.0 | 0.0 | 0.5 | 5.9 | 14.4 | 20.9 | 15.4 | 3.8 | 0.3 | 0.0 | 0.0 | 61.1 |
| > 30 ºC | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.9 | 0.5 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 1.6 |
| > 35 ºC | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Rainfall (mm) | 2.8 | 1.7 | 8.6 | 28.2 | 71.9 | 95.6 | 120.7 | 105.3 | 123.4 | 66.7 | 31.7 | 3.1 | 659.7 |
| Snowfall (cm) | 58.1 | 37.0 | 40.9 | 27.2 | 5.6 | 0.4 | 0.0 | 0.0 | 1.5 | 22.4 | 51.7 | 57.0 | 301.7 |
| Total precipitation (mm) | 60.9 | 38.7 | 49.4 | 55.4 | 77.5 | 95.9 | 120.7 | 105.3 | 125.0 | 89.1 | 83.4 | 60.1 | 961.3 |
| Extreme daily rainfall (mm) | 27.4 | 11.2 | 22.0 | 30.5 | 48.3 | 47.0 | 60.0 | 59.9 | 75.0 | 31.0 | 39.6 | 15.0 | |
| Extreme daily snowfall (cm) | 25.4 | 30.5 | 32.4 | 32.0 | 14.6 | 6.6 | 0.0 | 0.0 | 10.2 | 23.0 | 25.4 | 27.9 | |
| Extreme daily precipitation (mm) | 27.4 | 30.5 | 32.4 | 34.0 | 48.3 | 47.0 | 60.0 | 59.9 | 75.0 | 31.0 | 44.6 | 27.9 | |
| Snow depth at month-end (cm) | 69.9 | 75.7 | 67.6 | 14.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 3.5 | 19.7 | 45.9 | 24.7 |

This study has identified a recreational lease about 400 m northwest of the track (chainage 10+000). According to the MDDEP criteria, this lease meets the definition of a sensitive area. It is located in the Municipality of Baie-James and the uses permitted by municipal zoning correspond to zone III of the MDDEP noise requirements.

**Table 6-2: Noise level requirements by zone (*Note d'instruction 98-01*, MDDEP)**

| Zone | Nighttime (dBA) | Daytime (dBA) |
|---|---|---|
| I | 40 | 45 |
| II | 45 | 50 |
| III | 50 | 55 |
| IV | 70 | 70 |

***Sensitive sites***

I: Land intended for detached or semi-detached single family dwellings, schools, hospitals or other educational, healthcare or convalescence establishments. Land with an existing dwelling in an agricultural zone.

II: Land intended for multiple-unit housing, mobile home parks, institutions or campgrounds.

III: Land intended for commercial uses or recreational parks. However, the level of noise expected at night only applies within the limits of the property of establishments used for residential purposes. In the other cases, the maximum daytime noise level also applies at night.

***Non-sensitive sites***

IV: Land zoned for industrial or agricultural purposes. However, on land of an existing dwelling located in an industrial zone and built in accordance with the municipal regulations at the time of its construction, the criteria are 50 dBA at night and 55 dBA during the day.

#### Municipal Regulations

Municipalities are responsible for nuisance as it pertains to neighbourhoods. There are three municipal entities in the local study area for the railway: Chibougamau, the Municipality of Baie-James (MBJ) and the Domaine-du-Roy RCM. The last entity regulates noise and nuisances in accordance with the regulatory guidelines and standards. The municipal standards for Chibougamau and MBJ do not dictate maximum noise levels, but rather regulate in terms of nuisances likely to disturb the peace, tranquillity, comfort, rest or wellbeing of citizens, or prevent the peaceful use of property in the neighbourhood.

### 6.1.3.2 Current Noise Level

No ambient noise measurements were taken within the framework of this study, given that the study area is in an isolated area, few people use the land and only one sensitive site was identified, about 400 m from the proposed railway (recreational lease).

The potential noise sources in the study area are therefore mainly natural and, to a lesser extent, mechanical (traffic on Road 210, ATV or snowmobile traffic) and human (Aboriginal and non-Aboriginal users).

### 6.1.4 Geology and Geomorphology

#### 6.1.4.1 Geology

The study area straddles two geological provinces, namely the Superior and Grenville structural provinces, dating from the Precambrian era. The stratigraphy of the area includes the Roy Group (mafic to felsic volcanic rocks) and the Opemisca Group (predominantly sedimentary rocks). The mafic and ultramafic intrusions of the Chapais-Chibougamau region are part of the three stratigraphic units associated with the Lac Doré Complex, the Cummings Complex and the Roy Group (Blondeau, Gilman, Waconichi and Obatogamau formations).

Most of the local study area lies within the Roy Group, at the junction of three separate stratigraphic units: the Obatogamau, Gilman and Blondeau formations (Leclerc and Houle, 2010). The study area includes a few areas of outcropping rock along the proposed railway corridor, between chainages 9+000 and 12+000, 21+900 and 22+000, 22+800 and 23+000, 23+900 and 24+000 and finally, 24+400 and 26+400.

**Natural Hazards on Land**

As stated in the EIS (Entraco 2011), earthquakes in the study area are rare and of low magnitude. In addition, the seismic acceleration of the region is very low, with a PGA of 0.036 g according to the National Building Code 2010, or Zone 1 (A = 0.05) according to CAN/CSA-S6-06.

Natural Resources Canada (NRCan) has collected the seismic bulletin data from the National Earthquake Database (NEDB) since 1985. NRCan's website allows you to search recorded earthquakes or other events (NRCan 2012). A search of the database for an area covering a radius of 100 km from the project centre point revealed 13 recorded episodes, including the following three earthquakes:

- magnitude 2.5 earthquake 72 km north of Albanel (January 30, 2010);
- magnitude 2.1 earthquake 49 km south of Chibougamau (November 16, 1997);
- magnitude 2.5 earthquake on November 12, 1996 (Eastern Background Seismic Zone).

The other 10 episodes recorded were associated with blasting (eight) and two certified or probable rockbursts (broken rock masses) recorded between 1994 and 2007.

#### 6.1.4.2 Geomorphology

**Regional Topography**

The study area is located in the Canadian Shield, and more specifically in the James and Laurentian physiographic regions. It straddles two physiographic divisions, namely the Laurentian Highlands to the east and the Abitibi Uplands to the west. Apart from a few hills, the study area has a flattened topography with an average elevation of 420 m above sea level, almost entirely covered by surficial deposits. The region is characterized by the presence of many lakes of varying sizes, streams and wetlands. The rock structures of the area are oriented northeast-southwest, as are the landforms, shapes of the lakes and direction of the streams (Entraco 2011).

**Surficial Deposits**

GENIVAR primarily described and mapped the surficial deposits using photo-interpretation in 2012. The various surficial deposits of the study area were characterized using a stereoscope on 1:15,000-scale black and white aerial photographs in paper format. The interpreted photos were digitized and orthorectified, and an image mosaic was then created. Finally, polygon tracing was automatically vectorized using ArcScan software to optimize data entry. The polygon attributes were entered into an ArcGIS geographic information system database. For areas where aerial photographs were not available, data is from the information presented on ecoforestry maps at a 1:20,000 scale from the *Ministère des Ressources naturelles et de la Faune* (MRNF). The surficial deposits are described in the following paragraphs, based on the data obtained. Figure 6-1 shows the various surficial deposits covering the local study area.

*Glacial Deposits*

Glacial deposits occupy most of the local study area and cover just over 70% of the right-of-way of the proposed railway. These deposits consist of till (lodgment till) made up of compacted, unbedded elements of varying sizes, with a sometimes high proportion of fine particles (silt and clay). Although glacial till has a good bearing capacity, drainage is often poor due to the presence of fine particles and a high level of compaction (Entraco 2011). Thin to very thin undifferentiated till with frequent rocky outcrops is found between chainage 23+500 and 25+500 and represents about 4% of the glacial deposits.

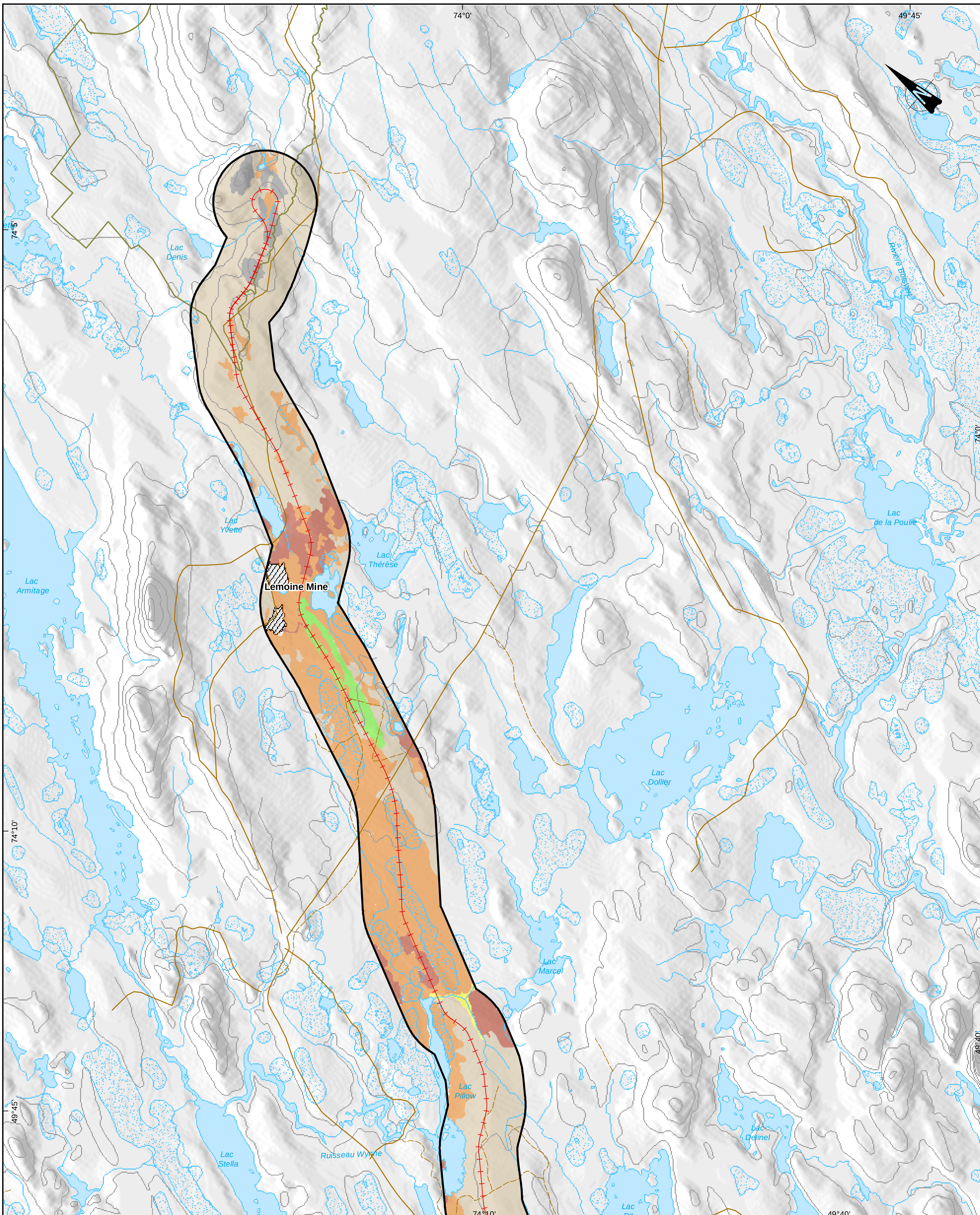
The study area includes drumlin-type reliefs of glacial origin. Drumlins are coarse, moraine-like deposits consisting of boulders, gravel, cobbles and sand, but the material is less compact than lodgment till. They look like straight, elongated, flattened crests with steep slopes (10%).

Drumlin orientation is a function of the direction of glacier flow (Entraco 2011). In the study area, the drumlins are oriented northeast-southwest. Drumlins can be found along the proposed railway between chainages 17+000 and 18+800, and cover about 4% of the glacial deposits within the railway development zone.

Glacial deposits are good sources of borrow material that can be used as basic fill, particularly the till from the drumlins, which due to its composition presents fewer constraints, particularly in terms of drainage and particle size.

*Glaciofluvial Deposits*

Glaciofluvial deposits consist of bedded sand and gravel with the presence of cobbles and small boulders. Such deposits are well drained and not very compact, and have good bearing capacity (Entraco 2011). Such deposits are rare in the local study area, accounting for about 5% of the proposed railway right-of-way. They are found between chainages 8+300 and 8+500, 13+500 and 14+000 and 19+200 and 19+750. They are a good potential source of granular materials.




**Infrastructures**

- Main road (167)
- Secondary or access road
- Existing railway
- Transmission line

**BlackRock Metals Project Components**

- Local study area
- Mine site
- Proposed railway segment

**Surficial Deposits**

- Anthropogenic
- Fluvial deposit
- Glaciofluvial deposit
- Glacial deposit
- Organic deposit
- Drumlins (Glacial deposit)
- Thin to very thin till with frequent rock outcrops

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**Physical Environment**
**Surficial Deposits**

*Sources :*
*CanVec, 1/50 000, RNCan, 2010*

*Mapping and inventory : GENIVAR*
*File :111-16127-00_EC_Ang_C6-1_MPHY_depot_meuble_130205.mxd*

Scale 1 : 50,000
0 500 1,000 1,500 m
UTM, zone 18, NAD83
Contour interval: 20 m

**Figure 6-1**
Sheet 1 of 2

**November 2012**

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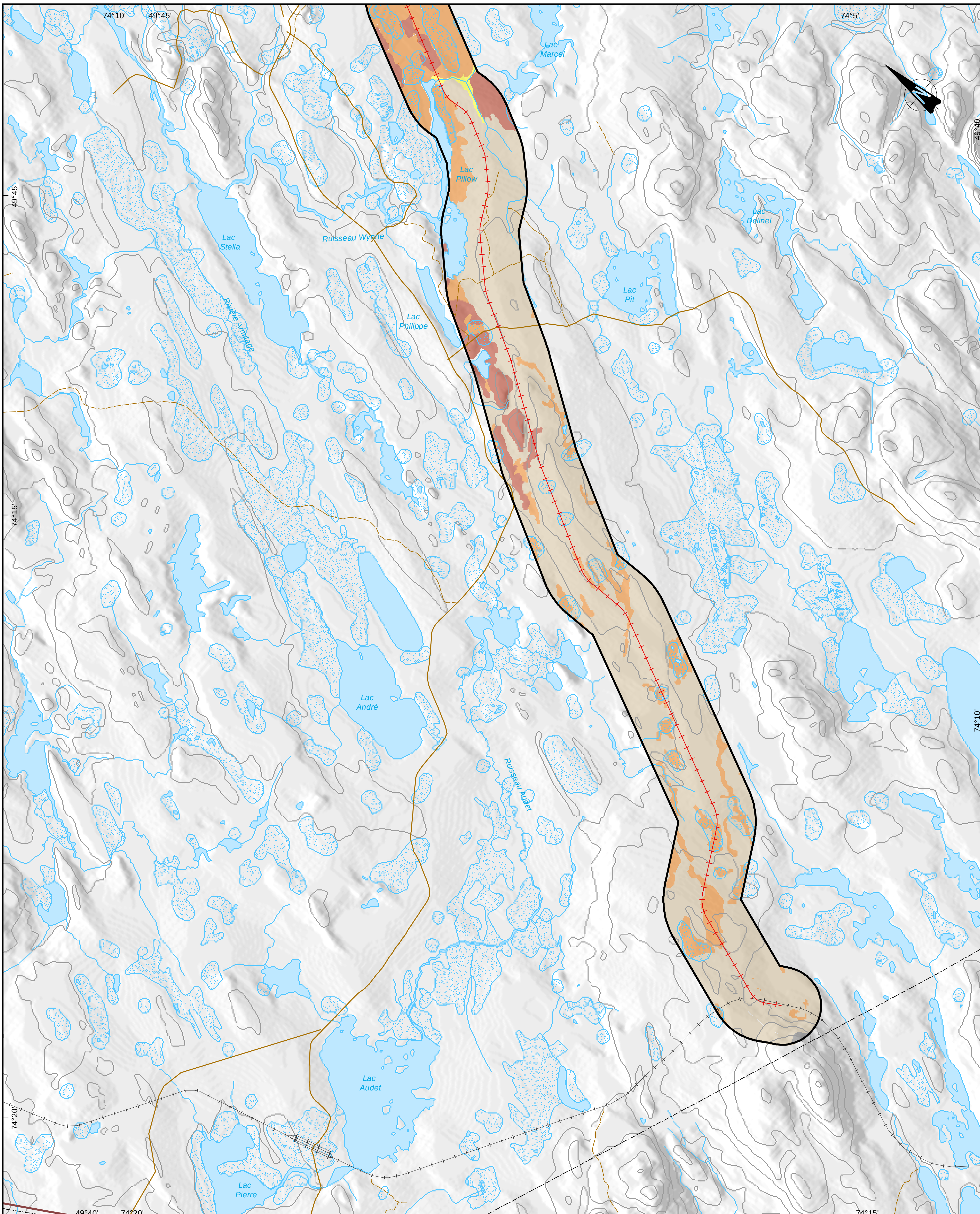


**Infrastructures**

- Main road (167)
- Secondary or access road
- Existing railway
- Transmission line

**BlackRock Metals Project Components**

- Local study area
- Mine site
- Proposed railway segment

**Surficial Deposits**

- Anthropogenic
- Fluvial deposit
- Glaciofluvial deposit
- Glacial deposit
- Organic deposit
- Drumlins (Glacial deposit)
- Thin to very thin till with frequent rock outcrops

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## Physical Environment
## Surficial Deposits

*Sources :*
*CanVec, 1/50 000, RNCan, 2010*

*Mapping and inventory : GENIVAR*
*File :111-16127-00_EC_Ang_C6-1_MPHY_depot_meuble_130205.mxd*

Scale 1 : 50,000
0 500 1,000 1,500 m
UTM, zone 18, NAD83
Contour interval: 20 m

**Figure 6-1**
Sheet 2 of 2

**November 2012**

GENIVAR

*Fluvial Deposits*

Fluvial deposits consist of gravel and sand, and to a lesser extent, of silt, clay and sometimes organic matter. These deposits are virtually absent from the proposed railway right-of-way (0.5%), with the exception of the area at chainage 13+300, on either side of Rivière Jules.

*Organic Deposits*

Organic deposits consist of semi-decomposed organic matter. They are located in fairly flat areas or in poorly drained hollows near streams and lakes. Organic deposits form a layer of variable thickness on the till or alluvial deposits. In the study area, there are organic deposits all along the proposed route, but they are strongly present between chainage 12+000 and 18+000. Wetlands cover about 23% of the railway right-of-way.

### 6.1.5 Hydrography and Hydrology

**Watersheds**

The local study area lies within two major watersheds, namely the James Bay watershed and, to a lesser extent, the St. Lawrence River watershed. It contains six separate sub-watersheds, the two main ones being the Ruisseau Wynne and Ruisseau Audet sub-watersheds. The other four are the Ruisseau Villefagnan, Lac Bernadette, Lac Dufresne and Rivière Boisvert sub-watersheds (Figure 6-2).

In the local study area, the waters of the St. Lawrence River watershed initially drain into Rivière Boisvert and flow to Rivière Ashuapmushuan before reaching Lac Saint-Jean and the St. Lawrence River. Within the James Bay watershed, the waters of the local study area flow towards Lac Chibougamau, Lac Obatogamau or Lac Chevrier and into Rivière Waswanipi before finally flowing into Rivière Nottaway and then James Bay.

**Drainage Network**

The local study area lies in the area of the drainage divide between the James Bay and St. Lawrence River watersheds, which entails a higher incidence of headwater lakes and ponds. However, the projected railway infrastructure is fully contained in the James Bay watershed. The drainage network of the study area is structured, with lakes of various sizes. Overall, the wetlands are much more numerous than the lakes and cover larger areas.

The area north of chainage 24+000 is part of the Ruisseau Villefagnan sub-watershed. Between chainage 20+000 and 24+000, the water drains into the Lac Bernadette sub-watershed. Lac Yvette and Lac Denis are headwater lakes in these catchments, and they drain into Lac Bernadette and Lac Jean, respectively. The water in the area between chainage 10+000 and 20+000 is part of the Ruisseau Wynne sub-watershed and flows into Rivière Armitage. The water from these three sub-basins flows into Lac Chibougamau. Between chainage 3+000 and 10+000, water drains toward Ruisseau Audet and flows into Lac Chevrier. Finally, from chainage 3+000 to chainage 0+000, the water flows either through Lac Tippecanoe or through an unnamed lake and then into Lac Dufresne, and on to Lac Obatogamau (see Figure 6-2).

According to field surveys conducted in 2012 by GENIVAR, Rivière Jules is the only river of any size within the right-of-way. This river is characterized by more than six other intermittent streams and one permanent stream. A more detailed description of these waterways in terms of aquatic habitat is provided in Section 7.4.1.

### 6.1.6 Surface Water Quality

The surface water characterization is from the impact study (Entraco 2011). Three watersheds were characterized, namely Ruisseau Villefagnan, Lac Bernadette and Rivière Armitage (Ruisseau Wynne sub-watershed). These watersheds are all within the boundaries of the local study area for the railway. Only the Ruisseau Audet, Lac Dufresne and Rivière Boisvert watersheds were not covered in the EIS. Note that the route of the railway is, however, outside the Rivière Boisvert catchment, and with the exception of Rivière Jules, all the streams crossed are intermittent.

Although the streams crossed by the proposed railway have not been specifically characterized, it is possible to speculate on the quality of surface waters based on the following general observations: 1) the lakes and streams sampled by Entraco are found in three of the six watersheds of the railway, 2) water quality is strongly influenced by sediments and soils, and the characteristics of the mine site are similar to those of the local study area, and 3) the overall results of Entraco's characterization of the surface water generally reflect the observations for the 30 lakes in the Chapais-Chibougamau area from the study of the physico-chemical quality of 251 Canadian Shield lakes (Langlois *et al*., 1985).

Analyses of the results of the Entraco EIS show that the water quality of lakes and streams in three watersheds broadly corresponds to the observations of Langlois *et al.* (1985).

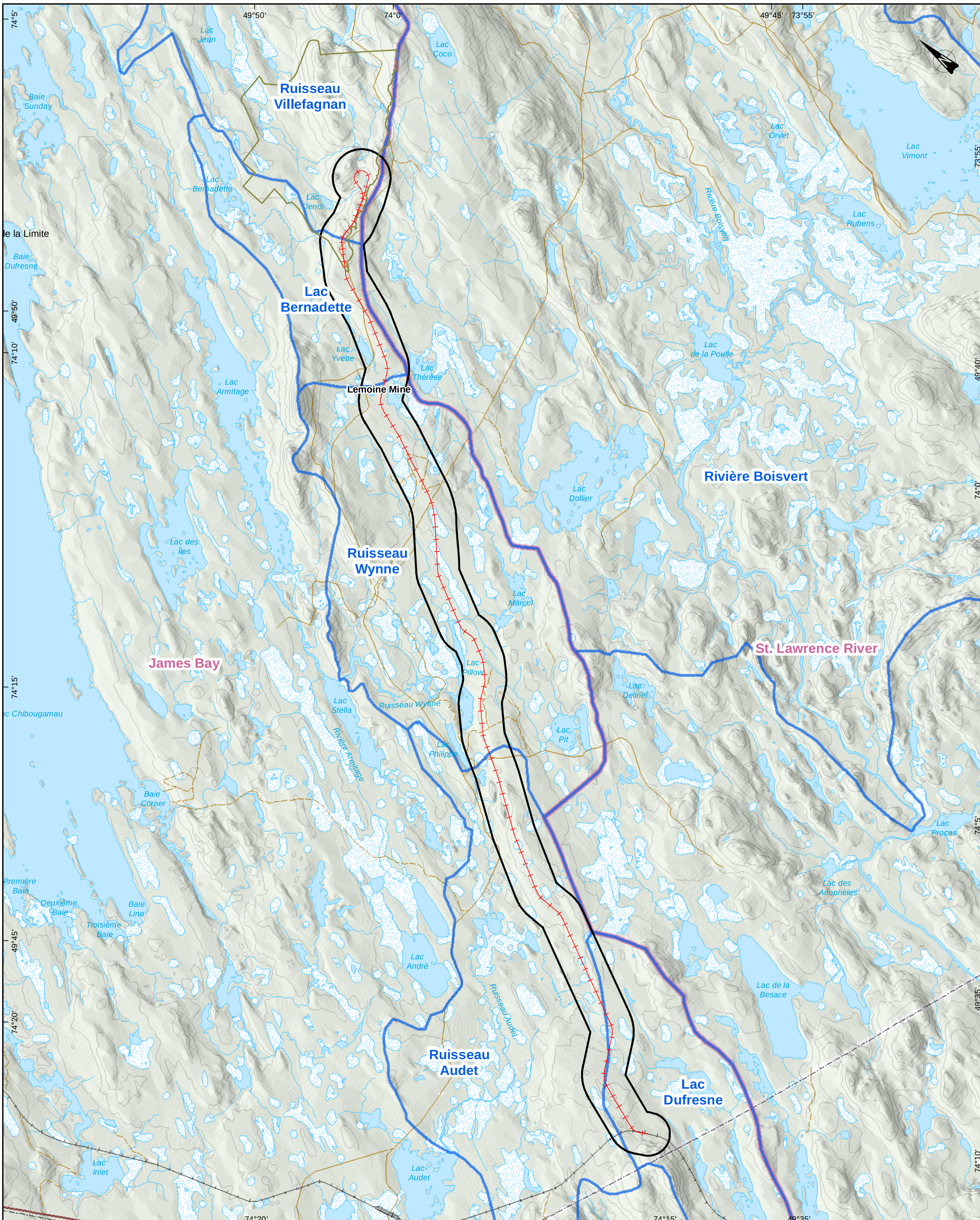
The results of *in situ* physico-chemical parameters in the Entraco study indicate the presence of poorly-mineralised, bicarbonate-calcite-type lakes and streams. In addition, laboratory test results for the lakes and streams in the Ruisseau Villefagnan watershed (six stations) and the Ruisseau Bernadette watershed (two stations) have higher conductivity, alkalinity, total inorganic carbon and calcium, magnesium and sodium concentrations than generally seen in the Canadian Shield (elsewhere in Quebec) (Entraco 2011).

A July 2012 physico-chemical characterization of the surface water of the mining project lakes and streams showed laboratory test results similar to those obtained by Entraco in 2011 (Lamont Inc., 2012).

### 6.1.7 Hydrogeology

#### Hydrogeological Properties

No permeability testing was done on *in situ* materials within the scope of the railway project. However, permeability tests carried out within the scope of the EIS (Entraco 2011) included a series of holes drilled in the area north of chainage 23+600. Some of the hydrogeological properties of the railway area can therefore be estimated from the information collected, given that the study site is in a similar geological and geomorphological setting.




**Infrastructures**

- Main road (167)
- Secondary or access road
- Existing railway
- Transmission line

**BlackRock Metals Project Components**

- Local study area
- Mine site
- Proposed railway segment

**Physical Environment**

- Sub-watershed limit
- Watershed divide

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**Physical Environment**
**Hydrography and Hydrology**

*Sources :*
*CanVec, 1/50 000, RNCan, 2010*

*Mapping and inventory : GENIVAR*
*File :111-16127-00_EC_Ang_C6-2_MPHY_bassin_130205.mxd*

Scale 1 : 90,000
0 900 1,800 2,700 m
UTM, zone 18, NAD83
Contour interval: 20 m

**Figure 6-2**

**November 2012**

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Holes drilled in 2011 identified two hydrostratigraphic units, namely glacial till and bedrock. As the till deposits are generally thin, the aquifer could be created from the network of cracks in the bedrock and result from the infiltration of precipitation, and to a lesser extent by some headwater lakes.

Groundwater flow generally follows the topography and the type of surface material (good to poor drainage). The area north and northeast of the local study area for the railway is relatively rugged. Water therefore flows out radially from the rocky ridges toward the valley floors.

The groundwater flow velocity is a function of the local geological structures and the fine size of the till particles. Given the nature of the bedrock, which consists of fractured igneous rock, rock infiltration takes place in the most fractured horizons. Some of the water should flow on the surface of the rock following the topography. The permeability of the till deposit (good to poor) is highly dependent on the size of the fine particles.

**Groundwater Quality**

The groundwater in the Chibougamau region is generally characterized by a slightly alkaline pH, low total dissolved solids and a low metal content. The conductivity of the water decreases with depth, indicating that the groundwater is not loaded in mineral salts (Entraco 2011).

According to information from the tallyman, the water from the well in the Lac Guy area is good. This well is outside the local study area, more than a kilometre away from the proposed railway. There are no municipal wells or wells serving more than 20 people in the local study area.

## 6.2 Project Impact

### 6.2.1 Ambient Air Quality

#### 6.2.1.1 Construction Phase

**Sources of Impact**

During the construction phase, general railway construction activities are the source of impact on air quality.

Increased traffic on logging roads, cut and fill work, blasting (if required) and crushing will result in an increase in dust concentrations, which will temporarily affect air quality.

**Mitigation Measures**

The air quality mitigation measures proposed for the construction phase are as follows:

- prohibit the burning of waste and wood debris on the construction site;
- use environmentally-friendly dust control methods in problem areas;

- ensure that all trucks delivering materials to the site are equipped with a tarp to prevent aggregate, stone or other materials from spilling onto the ground or into the air during transport;
- ensure that the exhaust system of vehicles and equipment used for the work is in good condition to minimize air emission of contaminants;
- avoid letting motors idle unnecessarily so as to reduce disturbances from exhaust, smoke and other contaminants likely to be emitted by equipment.

**Specific Mitigation Measure**

- Use blasting mats if necessary to prevent flying rock and dust and minimize noise from blasting.

**Detailed Description of the Residual Impact**

The impact on air quality will be negative, as a slight deterioration in current conditions is expected for land users during the construction phase. However, the intensity of the effect is low as few people use the area. The duration is short and the impact would only be noticeable locally, meaning essentially in the immediate vicinity of the railway construction site and on the logging roads used by trucks. The significance of the residual impact is therefore deemed to be very low.

**Assessment of the Residual Impact**

| Impact on Ambient Air Quality during the Construction Phase | | |
|---|---|---|
| Nature | Negative | Significance: Very low |
| Ecosystemic value | N/A | |
| Socioeconomic value | N/A | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Local | |
| Duration | Short | |
| Probability of occurrence | Moderate | |

N/A: not applicable

### 6.2.1.2 Operation Phase

**Sources of Impact**

During the operation phase, train traffic is the source of impact on air quality.

Train trips will result in a slight increase in emissions of GHG and fine airborne particles from the diesel locomotives. However, the use of rail transport is expected to have a lesser effect on air quality and GHG emissions than ongoing truck haulage of the concentrate. In fact, according to the MDDEP's Quebec inventory of greenhouse gas emissions in 2009 and changes in these since 1991, the transportation industry (road, air, marine, rail and off-road) was the highest contributor to GHG emissions in Quebec in 2009, particularly road transportation, which represented 76.1% of transportation-related emissions (MDDEP 2011). Emissions from rail transport in 2009 amounted to 0.8 Mt $CO_2$ eq, or 2% of transportation emissions and less than 1% of Quebec's GHG emissions. In addition, $CO_2$ emissions were estimated using CN's GHG calculator (CN 2012). The results indicated that the use of rail transport compared to ongoing trucking reduced $CO_2$ emissions by approximately 92.3 tonnes annually. Finally, Transport Canada data indicates that the study area is not located in a tropospheric ozone management area (TOMA) where air quality is of concern due to emissions from rail activities (Transport Canada 2012).

**Mitigation Measures**

The proponent is proposing various strategies for reducing air emissions associated with the locomotives. New technologies and advanced operating procedures will help minimize fuel consumption and GHG emissions. Strategies proposed by Transport Canada include the "low-idle" device in locomotives that meet the emission standards of the United States Environmental Protection Agency (EPA), as well as the automatic on/off device.

**Detailed Description of the Residual Impact**

The impact on air quality will be negative, as a slight deterioration in current conditions is expected for land users. However, the intensity of the effect is low, as only one return train trip per day is planned and the GHG emission rate for rail transport is minor in comparison to the quantities of GHG that would have resulted from continuous trucking to the transfer point. The duration is long as the impact would be felt over the 13 years of mining, but its extent is limited to the immediate vicinity of the railway. The significance of the impact is therefore deemed to be low.

**Assessment of the Residual Impact**

| **Impact on Ambient Air Quality during the Operation Phase** | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | N/A | |
| Socioeconomic value | N/A | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Long | |
| Probability of occurrence | High | |

N/A: not applicable

#### 6.2.1.3 Closure Phase

**Sources of Impact**

Due to the use of equipment for rail line decommissioning, the sources of impact on air quality during the closure phase will be the same as during the construction phase.

**Mitigation Measures**

The proposed air quality mitigation measures for the closure phase are the same as those described for the construction phase.

**Detailed Description of the Residual Impact**

The decommissioning of the railway will have a negative impact on air quality, but the impact will be of lower intensity, as the scope of the work is smaller than during construction. The extent of the impact is local and the duration is short, for the same reasons as those given for the construction phase. The significance of the residual impact on air quality is therefore deemed to be very low.

**Assessment of the Residual Impact**

| Impact on Ambient Air Quality during the Closure Phase | | |
|---|---|---|
| Nature | Negative | Significance: Very low |
| Ecosystemic value | N/A | |
| Socioeconomic value | N/A | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Local | |
| Duration | Short | |
| Probability of occurrence | Moderate | |

N/A: not applicable

### 6.2.2 Noise

#### 6.2.2.1 Construction Phase

**Sources of Impact**

During the construction phase, general construction activities are the source of impact on the aural environment.

All of the railway construction activities could potentially disturb the peace and quiet of anyone using the area. Traditional activities and wildlife harvesting activities may be disturbed during the execution of the work.

The impact on the aural environment in the study area is significantly reduced by the absence of permanent residences. However, the recreational lease tenant might be disturbed by the higher noise levels during the construction period.

The higher noise levels from general work and occasional noise from blasting could cause some wildlife species whose home ranges overlap or lie near the railway right-of-way to move out of the area. According to the tallyman, animals are more sensitive to increases in noise levels.

**Mitigation Measures**

The following noise mitigation measures are proposed for the construction phase:

*Before the work starts*:

- consult with the tallyman and his family regarding the appropriate mitigation measures, as requested during the consultations;
- relocate and rebuild Rabbit camp outside the project area of influence, in accordance with the applicable laws and regulations;
- meet with the tallyman and the recreational lease tenant and give them a work schedule that includes a description of the nature of the activities (clearing, blasting, excavation, etc.).

*During the work*:

- maintain communications between BlackRock Metals and the tallyman to avoid any outstanding issues with land users.

**Detailed Description of the Residual Impact**

The impact on the noise environment is negative as general construction activities will entail higher noise levels that could disturb land users, as well as the recreational lease tenant. However, the intensity is considered low due to the moderate scope of the general construction activities. The extent of the impact is considered limited and its duration short, as it will be limited to the construction period. The significance of the residual impact is therefore deemed to be low.

**Assessment of the Residual Impact**

| Impact on the Aural Environment during the Construction Phase | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | N/A | |
| Socioeconomic value | High | |
| Degree of disturbance | Low | |
| Intensity | Moderate | |
| Extent | Limited | |
| Duration | Short | |
| Probability of occurrence | Moderate | |

N/A: not applicable

### 6.2.2.2 Operation Phase

**Sources of Impact**

The sources of impact during the operation phase are the train's daily return trip and the occasional rail line maintenance activities.

The train of four locomotives pulling a convoy of 91 cars will travel at an average speed of 48 km/h. The impact is significantly limited by the frequency of travel, which is set at one return trip per day, combined with the small number of users and the absence of permanent residences in the study area.

Maintenance work such as track snow-removal, switching and repairs will be carried out as needed, which will significantly reduce the intensity of the impact on land users.

In the case of the rail line project, the noise impact seems limited given that the project crosses an isolated forest setting with no permanent residences. Consequently, the assessment of the noise environment in the context of the railway is based on the noise impact study for the establishment of railway service at the Grande-Anse marine terminal (Yockell 2010), as well as the noise assessment done within the scope of the mining project EIS (Entraco 2011).

To determine the impact of the daily train trip, it is important to document the radius of influence of the passage of a train. Yockell's noise impact study for the establishment of railway service establishes the noise levels generated by rail traffic (Appendix A). The Canada Mortgage and Housing Corporation (CMHC) dictates the noise guidelines (Table 6-3). The results of the noise study by Yockell (2010) indicate that the zone within which average noise levels over a period of 24 hours exceed 55 dB(A) is 54 m on either side of the railway line in inhabited agricultural areas and 13 m in rural areas. This difference in noise level is due to the whistling of the train as it approaches crossings.

**Table 6-3: CMHC Noise Guidelines**

| $L_{eq}$ (24 h) | Qualifier |
|---|---|
| $L_{eq}$ (24 h) ≥ 75 dB(A) | Unacceptable |
| 75 dB(A) > $L_{eq}$ (24 h) ≥ 55 dB(A) | Unacceptable without adequate sound-proofing |
| 55 dB(A) > $L_{eq}$ (24 h) ≥ 45 dB(A) | Normally acceptable |
| 45 dB(A) > $L_{eq}$ (24 h) | Acceptable |

The noise environment was assessed within the scope of the mining project EIS (Entraco 2011). The noise impact assessment showed that noise levels will be above the 40 dB(A) threshold within a radius of about 2 km of the proposed mine site.

Although the Entraco EIS (2011) does not identify any sensitive sites, it did locate a recreational lease approximately 400 m northwest of the track (chainage 10+000). Based on MDDEP criteria, the lease meets the definition of a sensitive site. It is located in the Municipality of Baie-James, and the permitted uses in the municipal zoning correspond to zone III of the MDDEP noise limits. The Wapachee family's temporary camp has been slated for relocation outside the area of influence of the mining project and its components, and was therefore not taken into consideration.

Based on the premises of these two studies, the noise of the passage of the BlackRock Metals train near the recreational lease can be estimated to be within MDDEP noise limits, or 55 dB(A) during the day and 50 dB(A) at night. Furthermore, as no nighttime transport is planned, the train will not disturb the recreational lease tenant's sleep.

The results of the Yockell (2010) study show that in the absence of whistling at crossings, the radius of influence within which noise levels are usually not considered acceptable is 13 m. The distance between the recreational lease and the railway seems ample enough to ensure compliance with the MDDEP's noise criteria, even in the worst case scenario (54 m). Based on the results of the Yockell study, we can estimate that the perceived noise levels (Leq (15 h)) at the recreational lease could be between 47 and 41 dB(A), which is under the MDDEP limit. It is obvious however that the design parameters for the BlackRock Metals train differ from those used in the noise simulations in the Yockell (2010) study. In fact, the average speeds, number of trains, number of locomotives and absence of whistling at crossings do not compare in the two cases. It is therefore assumed that the BlackRock Metals train will generate more noise than the train in the Yockell (2010) study. Nevertheless, as the noise simulations are the result of noise levels distributed over a period of at least 16 hours, it appears unlikely that the MDDEP criteria (Table 6-2 in Section 6.1.3.1) cannot be met, given that there will be no whistling at crossings. Note that the noise levels for the Yockell (2010) study worst-case scenario, which is a 100-metre distance from the railway track and four trains per day with whistling at crossing, met the MDDEP noise level requirements. It is therefore assumed that the noise levels perceived at the recreational lease will be in compliance with the MDDEP's memorandum of instruction No. 98-01.

**Mitigation Measures**

No noise mitigation measures are planned for the operation phase.

**Detailed Description of the Residual Impact**

The impact on the noise environment will be negative because the increase in noise levels could be noticeable to some land users, particularly Aboriginal users and the recreational lease tenant. The intensity is deemed to be low as only one daily return train trip is planned. The duration is long as the rail line will be used for the 13-year mine life. The extent of the impact is limited, as noise levels will only increase on the periphery of the rail line. The significance of the residual impact during operation is therefore deemed to be low.

**Assessment of the Residual Impact**

| Impact on the Noise Environment during the Operation Phase | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | N/A | |
| Socioeconomic value | High | |
| Degree of disturbance | Low | |
| Intensity | Moderate | |
| Extent | Limited | |
| Duration | Long | |
| Probability of occurrence | Low | |

N/A: not applicable

### 6.2.2.3 Closure Phase

**Sources of Impact**

The decommissioning of the rail line should have an impact on the aural environment similar to that of the construction phase.

**Mitigation Measures**

The following noise mitigation measures are proposed for the closure phase:

*Before the work starts:*

- meet with the tallyman and the recreational lease tenant and give them a work schedule that includes a description of the nature of the activities (clearing, blasting, excavation, etc.).

*During the work:*

- maintain communications between the contractor and the tallyman to avoid any issues with land users.

**Detailed Description of the Residual Impact**

The impact on the aural environment in the closing phase is comparable to that of the construction phase, but of lower intensity. The extent of the impact is limited and the duration is short for the same reasons given for the construction phase. The significance of the residual impact is therefore deemed to be low.

**Assessment of the Residual Impact**

| Impact on the Noise Environment during the Closure Phase | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | N/A | |
| Socioeconomic value | High | |
| Degree of disturbance | Low | |
| Intensity | Moderate | |
| Extent | Limited | |
| Duration | Short | |
| Probability of occurrence | Moderate | |

N/A: not applicable

### 6.2.3 Geology and Geomorphology (Soil Quality)

#### 6.2.3.1 Construction Phase

**Sources of Impact**

During the construction phase, general construction activities are the source of impact on soils.

Some 48 ha of natural ground will be affected by clearing work, after which the soil in place will be stripped and the ground will be excavated and levelled to make way for construction of the rail line. The nature of the ground will therefore be modified by the introduction of granular materials. In addition, exposure of the ground by stripping activities could lead to erosion issues. Erosion is strongly influenced by soil nature and texture, as well as slope and rainfall intensity. The ground composing the rail line corridor is relatively flat, which limits the risk of soil erosion. Rutting from equipment traffic could modify soil cohesion locally, possibly resulting in transportation of dust and particles.

Finally, oil spills and leaks from broken equipment could cause soil contamination or degradation of quality. It is important to note that the storage, fueling and maintenance areas will be located at the workers' camp.

**Mitigation Measures**

The following soil quality mitigation measures are proposed for the construction phase:

*Before the work starts*:

- identify and delineate areas of clearing, soil stripping and cutting low to the ground.

*During the work*:

- check and clean equipment before use to avoid any leakage of contaminants (oil, gasoline, lubricant, etc.);
- make sure the contractor always has emergency oil spill kits on hand, including confinement socks, absorbent rolls and the various related containers and materials needed to deal with accidental spills, and ensure recovery and storage of soiled material and management of the contaminated soils and materials;
- make sure the relevant staff know where the kit is stored, and the kit is easily accessible at all times to allow rapid response;
- the contractor will report any potentially environmentally-harmful accident to Urgence-Environnement. A sign with the Urgence-Environnement telephone number and the names and telephone numbers of emergency measures officials must be placed in full view of workers on site (Urgence-Environnement: telephone 1 866 694-5454, 24 hours a day);
- implement the emergency response plan in the event of a spill;
- prohibit the washing of equipment at the rail line construction site;
- stabilize the sides of the railway embankment as early as possible;
- manage hazardous waste (oils, lubricants, etc.) in accordance with the applicable regulations.

**Specific Mitigation Measures**

The following specific soil quality mitigation measure is proposed for the construction phase:

- rehabilitate any stream banks disturbed by culvert and bridge installation work to reduce soil erosion.

**Detailed Description of the Residual Impact**

The impact on soil is negative as general construction activities will result in the disturbance of 48 ha of natural ground. The intensity is considered low and the extent limited because the changes are limited to the railway right-of-way. The duration of the impact is long because the change will be permanent. The significance of the residual impact is therefore deemed to be low. Soil quality could also be altered by equipment oil spills and leaks. This impact is considered to be of low intensity and limited extent because the anticipated effects would be limited to the railway right-of-way. The duration of such effects is short, because contaminated soils would be collected quickly. The significance of the residual impact is therefore deemed to be low.

**Assessment of the Residual Impact**

| Impact on Soil Quality during the Construction Phase | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | Low | |
| Socioeconomic value | Low | |
| Degree of disturbance | Moderate | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Short to long | |
| Probability of occurrence | High | |

### 6.2.3.2 Operation Phase

**Sources of Impact**

During the operation phase, the sources of impact on soils are the presence and use of the railway line, as well as maintenance activities.

The presence of wooden ties treated with P3 solution (creosote and petroleum) could cause soil contamination. Although treated wood is commonly used, particularly in railway construction, there is little information available on possible effects on soil.

In May 2011, the Department of Fisheries and Oceans Canada (DFO) issued a literature review on the use of treated wood in port infrastructures (DFO 2011). A number of substances were targeted, among them creosote. What emerged from this literature review is that in 2011, the Health Canada (HC) Pest Management Regulatory Agency (PMRA) re-evaluated the registration status of certain preservatives containing creosote, which was continued. Their decision was based in part on an assessment done by the United States Environmental Protection Agency, which continued the registration of creosote in 2008 (MDDEP 2012a).

Ground-based structures made from pressure-treated wood that is properly treated and fixed or stabilized are unlikely to cause any major environmental hazard (HC 2012). Substances that may leach from treated wood are mainly PAHs. However, given that most are not very soluble, only the soil near the treated structures risks being affected. Furthermore, the leaching rate appears to decrease with time (MDDEP 2012a).

Finally, according to HC, it is difficult to determine whether the leachate from creosote-impregnated structures is entering or may enter the environment in a sufficient quantity or concentration to have a harmful effect on the environment (AECOM - GROUP IBI / DAA 2011).

For the current project, the contamination could be felt in the fill under the railway track or nearby, during the years when the railway is being used.

Locomotives and railway maintenance vehicles could cause oil leaks or spills into the environment and occasionally contaminate the soil (fill). In addition, spillage of iron concentrate could also occur and affect soil quality.

Finally, chemical weed control of the ballast and mechanical activities in the right-of-way and within 30 m of a stream could also lead to a decrease in soil quality over the long term. It should be noted that rail maintenance (rail lubrication) is not likely to have an effect on soil quality, as the product generally used is plant-based, biodegradable and environmentally-friendly.

**Mitigation Measures**

The following soil quality mitigation measures are proposed for the operation phase:

- check and clean equipment before use to avoid any leakage of contaminants (oil, gasoline, grease, etc.);
- make sure each emergency kit contains enough absorbent rolls to allow complete coverage of the affected area, or to contain the petroleum products within the perimeter of the equipment involved. Ensure that the relevant staff know where the kit is stored, and that the kit is easily accessible at all times to allow rapid response;
- implement the emergency response plan in the event of a spill.

**Specific Mitigation Measures**

- If possible, use a plant-based, biodegradable, environmentally-friendly lubricating product for rail maintenance;
- use MDDEP approved pesticide and application methods, in addition to complying with the pesticide management code.

**Detailed Description of the Residual Impact**

The impact on soil would be negative but of low intensity given the proposed mitigation measures and the fact that the potentially affected soil essentially consists of fill. The extent is limited as contamination would be located under and in the immediate vicinity of the tracks. The duration of the impact is long as it could persist throughout the 13 years of operation. However, note that the chemical herbicides used for ballast weed control break down very quickly in the environment. The significance of the residual impact is therefore low to very low. In the case of an accidental spill of iron concentrate, the intensity and extent would vary and are therefore difficult to determine, as it would depend on the circumstances of the spill. However, in the event of a major spill, the material would be recovered.

**Assessment of the Residual Impact**

| Impact on Soil Quality during the Operation Phase | | |
|---|---|---|
| Nature | Negative | Significance: Low to very low |
| Ecosystemic value | Low | |
| Socioeconomic value | Low | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Short to long | |
| Probability of occurrence | Low | |

#### 6.2.3.3 Closure Phase

**Sources of Impact**

The decommissioning of the rail line should have an impact on soil quality similar to that of the construction phase.

Rehabilitation work would restore the forest cover and therefore reduce the sensitivity of the environment to soil erosion. In addition, rehabilitation of contaminated areas, if any, would be carried out in accordance with the applicable regulations. Decommissioning work would therefore have a positive impact on soil quality.

**Mitigation Measures**

The soil quality mitigation measures proposed for the closure phase are the same as for the construction phase.

**Detailed Description of the Residual Impact**

Once closure is completed, the impact on soil can be considered generally positive and of low intensity. The extent of the impact is limited and the duration is long for the same reasons as those given for the operation phase. The significance of the residual impact on soil quality is therefore deemed to be low.

**Assessment of the Residual Impact**

| Impact on Soil Quality during the Closure Phase | | |
|---|---|---|
| Nature | Positive | Significance: Low |
| Ecosystemic value | Low | |
| Socioeconomic value | Low | |
| Degree of disturbance | Moderate | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Long | |
| Probability of occurrence | High | |

## 6.2.4 Hydrological Regime

### 6.2.4.1 Construction Phase

**Sources of Impact**

During the construction phase, general construction activities are the source of impact on the hydrological regime.

Clearing, stripping, grading and excavation work will result in the disturbance of the natural water regime. In fact, the loss of forest cover and changes to the ground (backfill, ditches, etc.) will result in a change in the local drainage (increased runoff). The natural water flow is likely to be changed locally and temporarily.

**Mitigation Measures**

The following mitigation measure is proposed to minimize the impact on the hydrological regime during the construction phase:

- installation of culverts of the appropriate type and size.

**Detailed Description of the Residual Impact**

Rail line construction will have a negative impact on the flow regime. However, the proposed mitigation measures will reduce the intensity of the impact. The scope is local and the duration is long as the impact will be felt beyond the end of the construction phase. The significance of the residual impact on the hydrological regime is therefore deemed to be low.

**Assessment of the Residual Impact**

| Impact on the Hydrological Regime during the Construction Phase | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | Low | |
| Socioeconomic value | N/A | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Local | |
| Duration | Long | |
| Probability of occurrence | High | |

N/A: Not applicable

### 6.2.4.2 Operation Phase

**Sources of Impact**

Rail traffic and maintenance and repair work are unlikely to cause changes to the hydrological regime.

**Mitigation Measures**

No mitigation measures are planned for the hydrological regime during the operation phase.

**Residual Impact**

No residual impact is expected on the hydrological regime during the operation phase.

### 6.2.4.3 Closure Phase

**Sources of Impact**

During the closure phase, rail line decommissioning activities (rails, ties, etc.) will not be a source of impact on the hydrological regime. However, culverts may be removed to promote a more natural flow in streams and thus prevent them from silting up over time.

**Mitigation Measures**

The following mitigation measures are proposed to minimize the impact on the hydrological regime during the closure phase:

- reseed the right-of-way with indigenous species;
- promote natural stream flow by removing culverts.

**Detailed Description of the Residual Impact**

Opening the railway right-of-way next to culverts will reduce the risk of streams silting up over time. However, the impact is neither negative nor positive relative to current conditions, and the impact can therefore be considered negligible.

### 6.2.5 Surface Water and Groundwater Quality

#### 6.2.5.1 Construction Phase

**Sources of Impact**

During the construction phase, general construction activities are the source of impact on water quality.

Stripping of the soil makes the environment more prone to erosion and thus to the transportation of sediments to low-lying areas and into streams during rainfall. Rutting from equipment traffic also adds to the risk of sediments being carried into aquatic environments.

The installation of culverts and a bridge at sites where the rail line crosses streams is another source of impact in terms of increased sediments in streams.

Finally, oil spills could result in the accidental contamination of surface water and groundwater. However, hydrogeological conditions in the area indicate a low level of groundwater vulnerability to potential contamination from surface. The low permeability of glacial till reduces the risk that contaminated water will seep into the groundwater from surface.

**Mitigation Measures**

The following mitigation measures are proposed to minimize the potential effects on water quality during the construction phase:

- keep construction trailers, access roads, parking and storage areas more than 60 m away from a permanent stream and 15 m away from an intermittent stream;
- carry out equipment refuelling, lubrication, cleaning and oil changes in areas provided for this purpose, and more than 15 m away from streams;
- check and clean equipment before use to avoid any leakage of contaminants (oil, gasoline, grease, etc.);
- prohibit washing of equipment at the railway construction site;
- ensure that the contractor always has emergency oil spill kits on hand, including confinement socks, absorbent rolls and the various related containers and materials needed to deal with accidental spills and ensure recovery, storage of soiled material and management of the contaminated soils and materials;
- make sure the relevant staff know where the kit is stored, and the kit is easily accessible at all times to allow rapid response;
- the contractor will report any potentially environmentally-harmful accident to Urgence-Environnement. A sign with the Urgence-Environnement telephone

number and the names and telephone numbers of emergency measures officials must be placed in full view of workers on site (Urgence-Environnement: telephone 1 866 694-5454, 24 hours a day);

- prohibit equipment travel in aquatic environments;
- stabilize eroding ground at the construction site as the work progresses;
- ensure that the contractor takes erosion and sediment control measures (geomembrane barriers, straw bales, filter berms and sediment traps) to capture suspended solids in erosion-prone areas;
- design steep walls of ditches so as to minimize erosion, and stabilize the upper part of the walls.

**Specific Mitigation Measures**

- Wooden ties treated with P3 solution should not be stored in sensitive environments (wetlands, near a stream or lake);
- rehabilitation of any stream banks disturbed by culvert and bridge installation work to reduce soil erosion.

**Detailed Description of the Residual Impact**

Rail line construction will have a negative impact on water quality, but the intensity of the impact will be low. With the exception of Rivière Jules, the streams crossed are small, with an intermittent water regime. In addition, accidental spills during work tend to involve small volumes. The duration of the impact is short, as it will be limited to the construction period. The extent of the impact is limited, as most of the sediments should be deposited near their point of entry into the stream, and spills will be quickly recoverable. The significance of the residual impact on water quality is deemed to be low given the proposed mitigation measures.

**Assessment of the Residual Impact**

| Impact on Surface Water and Groundwater during the Construction Phase | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | High | |
| Socioeconomic value | N/A | |
| Degree of disturbance | Low | |
| Intensity | Moderate | |
| Extent | Limited | |
| Duration | Short | |
| Probability of occurrence | Moderate | |

N/A: Not applicable

### 6.2.5.2 Operation Phase

**Sources of Impact**

During the operation phase, the sources of impact on water quality are the presence and use of the railway line, as well as maintenance activities.

The presence of wooden ties treated with P3 solution could lead to contamination of surface water at stream crossings. However, as specified in Section 6.2.3.2, properly treated wooden structures are unlikely to cause any major environmental hazard (Health Canada 2012). The risks are higher when the treated wood is submerged in water. In the case of the current project, none of the ties will be submerged, which reduces the risk of water contamination.

Substances that can leach from treated wood are mainly PAHs, most of which are not very soluble. Consequently, accumulation is more likely to occur in the soil near the treated structures, which limits the impact on water quality.

Over time, groundwater contamination should prove very low to nil given the abundance of till, whose permeability is not conducive to the seepage of water into the soil, as well as the falling leaching rate for structures treated with P3 solution.

Locomotives and railway maintenance vehicles could cause oil leaks or spills into the environment and thus contaminate the surface water. Iron ore concentrate spills could also occur and affect water quality.

Finally, chemical weed control activities could also lead to a decrease in surface water quality and have an impact on groundwater. The risk of groundwater contamination remains low, however, for the reasons mentioned above.

**Mitigation Measures**

The following water quality mitigation measures are proposed for the operation phase:

- always have emergency oil spill kits on hand, including confinement socks, absorbent rolls and the various related containers and material (gloves, etc.) needed to deal with accidental spills and ensure recovery, storage of soiled material and management of the contaminated soils and materials;
- make sure the relevant staff know where the oil spill kit is stored, and the kit is easily accessible at all times to allow rapid response;
- report any potentially environmentally-harmful accident to Urgence-Environnement. A sign with the Urgence-Environnement telephone number and the names and telephone numbers of emergency measures officials must be placed in full view of workers on site (Urgence-Environnement: telephone 1 866 694-5454, 24 hours a day);
- implement the emergency response plan in the event of a spill.

**Specific Mitigation Measure**

- Use MDDEP approved pesticide and application methods, in addition to complying with the pesticide management code.

**Detailed Description of the Residual Impact**

The use of the rail line will have a negative impact on water quality, but impact intensity is low as contaminants will only be spilled in the event of an accident. The duration of the impact is long, as it could occur during the 13 years of mining operation. However, note that the chemical herbicides used for ballast weed control break down very quickly in the environment. The extent is limited, as any oil leak would be spatially contained. The significance of the residual impact on water quality during the operation phase is therefore deemed to be low to very low. The residual impact in the event of an accidental spill of iron ore concentrate is difficult to determine, as such spills depend on the circumstances of the spill, and can vary in intensity and extent.

**Assessment of the Residual Impact**

| **Impact on Surface Water and Groundwater during the Operation Phase** | | |
|---|---|---|
| Nature | Negative | Significance: Low to very low |
| Ecosystemic value | High | |
| Socioeconomic value | N/A | |
| Degree of disturbance | Low | |
| Intensity | Moderate | |
| Extent | Limited | |
| Duration | Short to long | |
| Probability of occurrence | Low | |

N/A: Not applicable

### 6.2.5.3 Closure Phase

**Sources of Impact**

The decommissioning of the rail line should have an impact on water quality similar to that of the construction phase.

**Mitigation Measures**

The water quality mitigation measures proposed for the closure phase are the same as for the construction phase.

**Detailed Description of the Residual Impact**

The closure of the railway will have a negative impact on water quality, but the impact is of lower intensity as the scope of work is smaller than during the construction period. The extent of the impact is limited and the duration is short for the same reasons as during the construction phase. The significance of the residual impact on surface water and groundwater is therefore deemed to be low.

### Assessment of the Residual Impact

| Impact on Surface Water and Groundwater during the Closure Phase | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | High | |
| Socioeconomic value | N/A | |
| Degree of disturbance | Low | |
| Intensity | Moderate | |
| Extent | Limited | |
| Duration | Short | |
| Probability of occurrence | Moderate | |

N/A: Not applicable

# 7 EXISTING CONDITIONS AND IMPACT OF THE PROJECT ON THE BIOLOGICAL ENVIRONMENT

## 7.1 Existing Conditions

The following sections provide a description of components of the biological environment hosting the BlackRock Metals railway project. Sections dealing with vegetation and birds summarize the results of surveys carried out by GENIVAR in the summer of 2012 as part of the complementary study of the biological environment for the Lac Doré Geological Complex iron ore mining project. The description of the fish fauna is the result of field surveys conducted within the scope of this impact assessment.

### 7.1.1 Vegetation

#### 7.1.1.1 General Description of the Biological Environment Study Area

From a vegetation standpoint, the study area consists of a large area where logging is the primary activity, located approximately 30 km southeast of the town of Chibougamau, just east of Lac Chibougamau. The characterized area extends 500 m on either side of the planned rail segment.

The MRNF hierarchical ecological land classification was used to characterize vegetation in the area. This system includes 11 hierarchical levels with perfectly coincident map boundaries. Levels 1 (vegetation zone) through 6 (land subregion) describe the main ecoforest groupings. Levels 7 (landscape unit) through 11 (forest type) allow characterization of smaller land groupings based on their vegetation and physical environment. Figure 7-1 shows the boundaries of the study area for the new rail segment (local study area) and its features as they relate to the MRNF ecological reference framework. It also shows the study area for the BlackRock Metals mining project (Entraco 2011).

The vegetation in the study areas falls within the continuous boreal forest subzone and the western spruce-moss bioclimatic subdomain. These northern areas are characterized by a cooler, drier climate than domains farther to the south or east. Plant formations are relatively dense and continuous, generally comprising softwood and intolerant hardwood species (MRNF 2004). Black spruce (*Picea mariana*) is the most abundant species. Other conifer species include the jack pine (*Pinus banksiana*) and balsam fir, while the only two hardwood species are the white birch (*Betula papyrifera*) and trembling aspen (*Populus tremuloides*).

The study area falls entirely within land region 6C (Lac Opémisca Plains) and has the same features. This land region differs from its neighbours by its plains topography. Its drainage network is relatively well developed, with six large lakes, including Lac Chibougamau just west of the study area. Its drainage network is part of the Rivière Nottaway watershed, which is in turn part of the James Bay watershed.

From a climate standpoint, land region 6C is characterized by a longer growing season and slightly more abundant annual precipitation than its neighbours. Because the land elevation increases from east to west, it is also one of the lower-lying regions, with a mean elevation of approximately 378 m (MRNF 1999).

Table 7-1 shows climate variables for land region 6C as compared to neighbouring land regions 6D, 6E, 6F and 6G.

**Table 7-1: Climatic Characteristics of Land Region 6C and Neighbouring Regions (MRNF 2004)**

| Land regions | 6c | 6d | 6e | 6f | 6g |
|---|---|---|---|---|---|
| Mean annual temperature (°C) | -2.5-0.0 | 2.5-0.0 | 2.5-0.0 | 2.5-0,0 | 2.5-0.0 |
| Vegetation period (days) | 140-160 | 140-150 | 140-160 | 140-150 | 140 |
| Mean annual precipitation (mm) | 800-1000 | 700-800 | 900-1100 | 700-900 | 800-1000 |
| Snow cover (%) | 25-35 | 30-35 | 30-35 | 35 | 30-35 |
| Mean elevation (m) | 300-400 | 300-400 | 400-500 | 400-500 | 500-600 |

From a geomorphological standpoint, land region 6C is located at the eastern edge of the extension of proglacial Lake Ojibway. It comprises three regional landscape units, including unit 129 (Lac Opémisca), which hosts the entire study area. The Lac Opémisca landscape unit is characterized by a scarcity of silty and sandy glaciolacustrine deposits (less than 10%) and somewhat more abundant organic deposits (about 20%). Most abundant are glacial deposits of variable thickness with no specific morphology. The main codominant deposits are, in order of importance, organic deposits and thin tills.

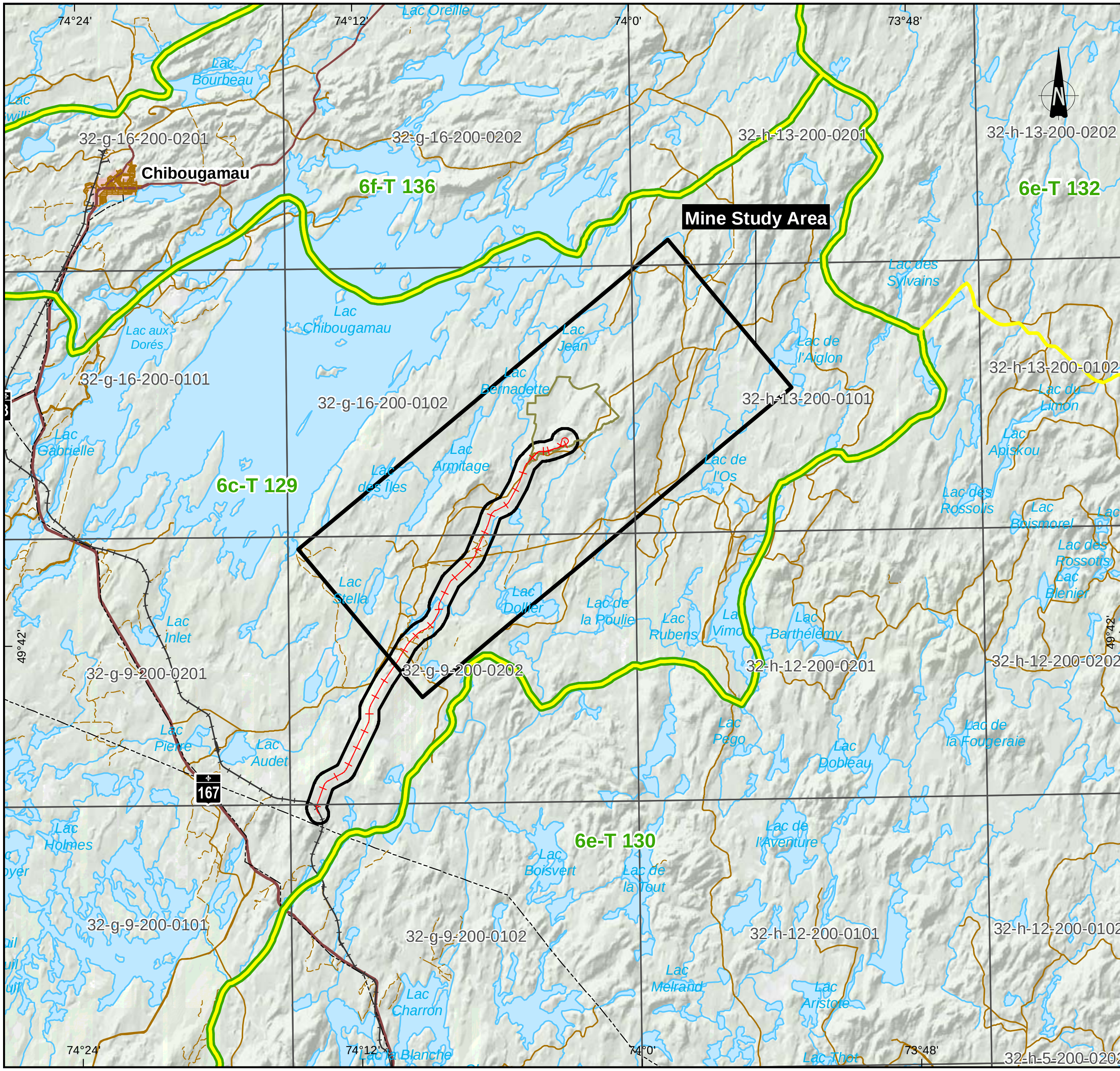
### 7.1.1.2 Forest Habitats

**Habitat Types**

The rail segment project study area covers a total of 2,554 ha, with a little over 3% (76 ha) consisting of the drainage network and islands (Table 7-2). Forest covers more than 1,653 ha or 65% of the total area. Peatlands and wetlands are omnipresent (31%), while only 1% of the area is considered non-productive (no volume of merchantable timber).

**Table 7-2: Breakdown of the Railway Study Area by Habitat Type**

| Land or Habitat Type | Railway Study Area (ha) |
|---|---|
| Non-productive land | 28 |
| Drainage network and islands | 76 |
| Forest | 1,653 |
| Peatlands and wetlands | 798 |
| **Total** | **2,554** |





**BlackRock Metals Project Components**

- Local study area
- Mine site
- Proposed railway segment
- Forestry map sheet index
- Limits of ecological sub-regions
- Limits of landscape units

6c-T 129 — SIEF code for regional landscape units; SIEF code for ecological sub-regions

**BLACKROCKMETALS**

Project to Build a New Rail Segment
for the BlackRock Metals Inc. Mining Project
- Biological Environment Supplementary Studies -

## Location of the Study Area Relative to the MRNF Ecological Reference Framework

*Sources :*
*BDGA, 1/1 000 000, MRN Québec, 2002*
*SDA, 1 : 20 000, MRNF Québec, mai 2010*
*Système hiérarchique de cartographie écologique, MRNF Québec, juillet 2005*

*Project data: S06428A-GR-CR-17.DWG, CIMA, 14 août 2012*

*Mapping : GENIVAR*
*File : 111-16127-00_EC_Ang_C7-1_VEG_cadre_eco_130205.mxd*

Scale 1 : 300,000
0 3 6 km
UTM, zone 18, NAD83

**Figure 7-1**

**November 2012**

GENIVAR

### Natural and Anthropogenic Disturbances

This section deals with significant disturbances to the forest cover aside from land use by communities, such as disturbances resulting from the presence of hunting camps, cabins and ATV and snowmobile trails.

Within the western spruce-moss domain, forest fires are generally the main landscape-shaping factor and are key determinants of the distribution, composition and structure of forest ecosystems. Fire cycles are highly variable and, according to the MRNF database, the study area has not seen a major fire or other significant natural disturbance (blowdown, insect infestation) in the past 40 years. Since 1973, fires and blowdowns have affected 73 ha (Table 7-3) of forest habitats and wetlands.

**Table 7-3: Area Affected by Natural and Anthropogenic Disturbances**

| Disturbances | Area (ha) |
|---|---|
| Burn | 49 |
| Blowdown | 24 |
| Logging | 972 |
| Planting | 35 |
| No natural disturbance | 1,474 |
| **Total** | **2,554** |

Anthropogenic disturbances include logging and planting, which have affected a large portion of the study area and account for 38% and 1% of forest and wetland habitats, respectively. The disturbance-free area represents 58% of these habitats, and includes natural forests that developed in the wake of old fires and have been affected by partial blowdowns of varying intensity over the years.

Logging took place over a period of more than 30 years. Clearcutting started in 1973 and ended around 1989, giving way to regeneration felling. Some 35 ha were planted between 1989 and 2009. Spruce-moss forest environments often show abundant conifer regeneration after logging, which explains why only a small portion of harvested areas was replanted.

The local area harvested annually since 1973 varies, ranging from some 100 ha to 1,000 ha per year. It has been falling since 1993. The average area harvested each year over the 26 years from 1973 to 2009 is therefore in the order of 450 ha/yr. For the 14 years considered since planting started in 1989, approximately 120 ha/year were planted annually in and around the study area.

Today, logging is carried out by Chantier Chibougamau, which holds a Timber Supply and Forest Management Agreement for management unit 026-64.

### Forest Habitat Vegetation

*Current State*

Forest habitat vegetation is defined according to cover type and stand density and age. Table 7-4 presents a summary of such habitats. Habitats comprising mature conifer forests make up 846 ha, or 43% of all habitats; 42% of mature forests are open forests. Regenerating habitats account for 51% of all habitats (1,018 ha) and include mixed-wood covers (6%) and conifer covers (45%).

Mature mixed-wood stands, hardwood stands and planted stands are virtually absent, accounting for only 3%, 0.3% and 2% of all forest habitats, respectively.

**Table 7-4: Forest Habitats and Current Vegetation**

| Forest Habitat Type[1] | Area (ha) |
|---|---|
| Closed mature conifer forest | 456.9 |
| Regenerating conifer forest | 910.8 |
| Open mature conifer forest | 381.8 |
| Regenerating mixed-wood forest | 118.6 |
| Planted stand | 35.1 |
| Mature mixed-wood forest | 52.5 |
| Hardwood forest | 7.49 |
| Non-productive area | 28.2 |
| **Total** | **1,991.39** |

[1] Forest habitat types include forest wetlands.

Figure 7-2 shows the spatial distribution of forest habitat, showing forest cover characteristics and stand age.

The result is a complex mosaic of open and closed forest cover alternating with the wetlands and lakes and streams that make up the drainage network. Conifer forest cover is dominant. Closed stands of mature conifer forests are mainly found along the northern section of the proposed railway, whereas open stands are found in the central section in alternation with wetlands, and in the southern section of the railway. The fact that regenerating conifer stands comprise a large portion of the area indicates that there was logging in this area more than 10 years ago. Planted stands, which account for 2% of the study area, are mainly found in the east-central section, in particular where natural regeneration following logging is low.

*Forest Sites and Potential Vegetation*

Forest habitats are found in a set of forest sites that can be described in terms of potential vegetation and ecological type. Potential vegetation is the classification unit used to summarize the dynamic characteristics of vegetation. Combined with characteristics of the physical environment, indicator species groups and in-situ vegetation, it can be used to predict the end-of-succession vegetation and reflects the productivity of a forest environment. The ecological type is the variable used to characterize these various characteristics (MRNF 2009).

The study area comprises 15 ecological types representing five types of forest sites that each evolved according to specific dynamics reflected in the potential vegetation.

Table 7-5 shows the areal distribution of the various forest habitats as a function of potential vegetation. These can be used to describe habitats in terms of forest dynamics and highlight the relative richness of such habitats.

The ecological types associated with the black spruce-moss or Ericacae potential vegetation (RE2) are the ones most commonly found in the study area, covering 941 ha, or 45% of the area. These are followed by ecological types associated with the balsam fir stand with black spruce potential vegetation (RS2), which covers 656 ha or 31% of the forest habitat in the study area. The study area is therefore best characterized by the natural dynamic of these two potential vegetations.

Ecological types associated with the black spruce-moss or Ericacae potential vegetation (RE2) are RE20, RE21, RE22, RE24 and RE25. RE2 potential vegetation is characterized by a large spectrum of water regimes and by groups of indicator species comprising, in variable proportions, of alder, laurel, Labrador tea (*Rhododendron groenlandicum*), sphagnum moss and Schreber's moss (*Pleurozium schreberi*). The black spruce-moss or Ericacae is primarily linked with Ericacae groups, which are in turn associated with a nutrient-poor regime.

**Table 7-5: Areal Breakdown of the Various Forest Habitats as a Function of Potential Vegetation in the Railway Study Area**

| Type of Forest Site | Ecological Type | Area (ha) |
|---|---|---|
| MS2 - Balsam fir stand with white birch | MS22 | 32 |
| RE2 - Black spruce-lichen stand | RE20 | 8 |
| | RE21 | 118 |
| | RE22 | 295 |
| | RE24 | 46 |
| | RE25 | 474 |
| RE3 - Black spruce stand with sphagnum moss | RE37 | 52 |
| | RE38 | 11 |
| | RE39 | 403 |
| RS2 - Balsam fir stand with black spruce | RS20 | 3 |
| | RS21 | 20 |
| | RS22 | 599 |
| | RS22M | 7 |
| | RS25 | 24 |
| RS3 - Balsam fir stand with black spruce and sphagnum moss | RS37 | 5 |
| **Total** | | **2,097** |

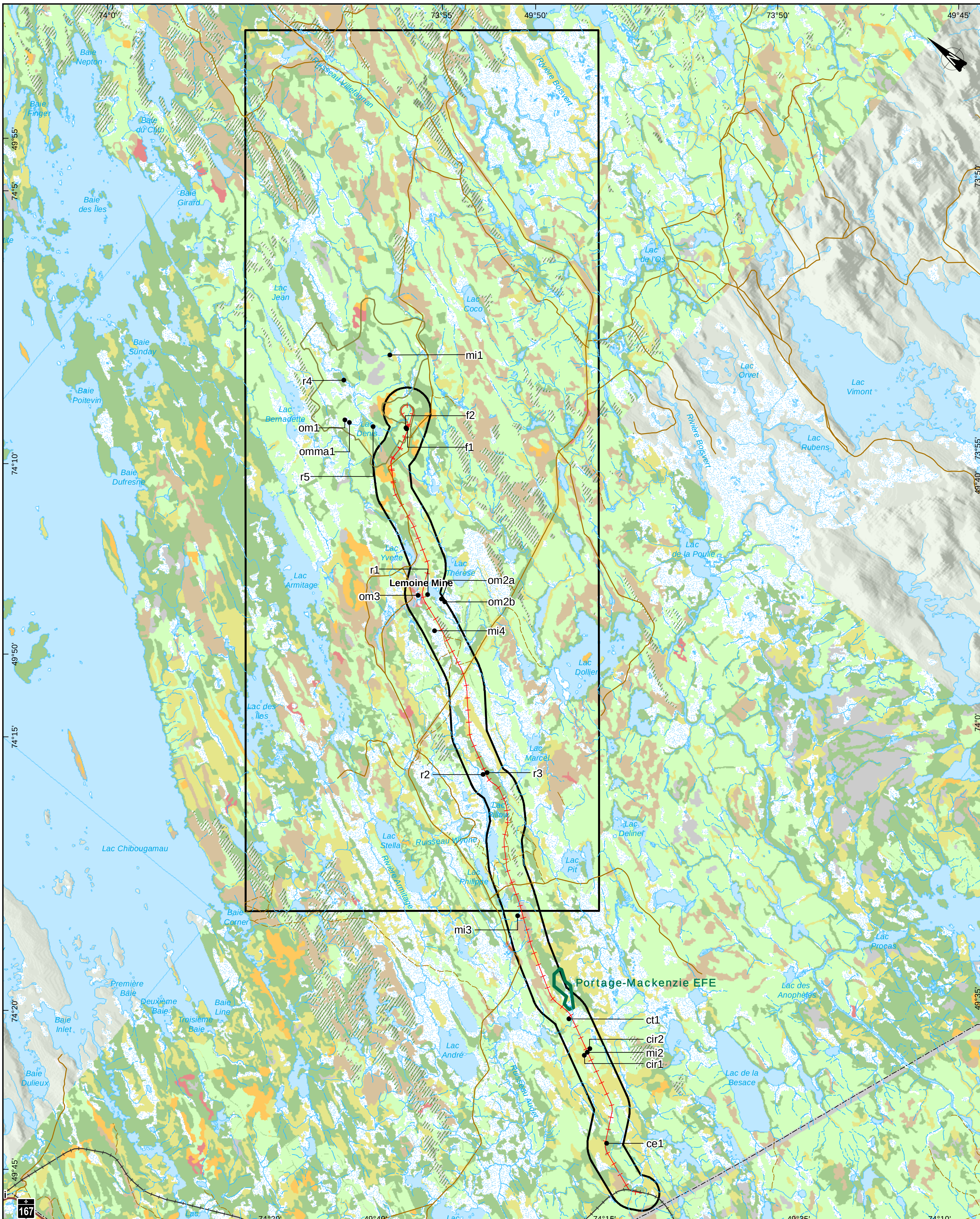
Type RE20 is found on thin soils, whereas type RE21 is found in sites with coarse soil texture. This latter type usually occurs on fluvioglacial deposits and moraine deposits (till). Both forest types are present in the study area, covering a little over 126 ha. These are extremely poor sites often characterized by very sparse forest cover. Reindeer lichen mats sometimes cover the ground.

Other ecological types belonging to the RE2 potential vegetation are found in mesic or subhydric sites, generally on thick soils. They are well adapted to the study area. Type RE22, one of the most common (295 ha) after RE25, colonizes different topographic settings and glacial deposits that are flat to moderately rolling, particularly when set in broad, flat or nearly flat regions, as is the case for the local study area. These sites are generally poor, and characterized by environmental and edaphic conditions preferentially colonized by plant communities dominated by black spruce.

Type RE25 is the most extensive in area and is often found in small sites at the base of slopes. It tends to cover larger areas in gently sloping sites at the edge of peatlands. These sites characterized by subhydric drainage are generally poor. The forest cover is made up of both open and closed stands and dominated by black spruce. Type RE24, not as widespread in the study area, is found in sites with coarse soil texture and subhydric drainage. Where found at the edge of a lake on fairly well-drained glaciolacustrine deposits, it covers larger areas in which jack pine may be present.

Habitats comprising closed and regenerating conifer forests, as well as regenerating mixed-wood forests, are extensively associated with the potential vegetation of the balsam fir stand with black spruce (RS2). In this dynamic, the various plant communities are likely to be found in sites characterized by xeric to subhydric drainage where, at the end of the various plant successions, forest cover primarily consists of balsam fir and black spruce (MRNF 2011). This potential vegetation differs from the black spruce-moss or Ericacae (RE2) vegetation in that balsam fir is codominant with black spruce.

Type RS22 is the most widespread ecological type associated with RS2 potential vegetation in the study area. It is common in land regions 6C and 6E, where it is usually found on gently sloping hills. This ecological type can occur in fairly flat areas in regions otherwise characterized by knolls or hills, which accounts for its preference for specific deposit types such as drumlins. It is gradually replaced by type RE22 going north. Although the presence of balsam fir is a distinctive feature, RS2 sites are generally poor. Regeneration after logging is often weak, and planting can help increase the proportion of black spruce in these sites.




**Infrastructures**

- Main road (167)
- Secondary or access road
- Existing railway
- Transmission line

**BlackRock Metals Project Components**

- Local study area
- Mine site
- Proposed railway segment

**Limit**

- Exceptional forest ecosystem (EFE)

**Vegetation**

Inventory

- Sampling plot

Forest habitats

- Hardwood forest
- Closed mature conifer forest
- Open mature conifer forest
- Regenerating mixed-wood forest
- Mature mixed-wood forest
- Regenerating conifer forest
- Planted stand

Other

- Non-productive area
- Bogs and wetlands

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**Distribution of Forest Habitats in the Regional Vegetation Study Area**

***Sources :***

*Système d'information écoforestière (SIEF), MRNF Québec, 2010*
*CanVec, 1/50 000, RNCan, 2010*

*Mapping and inventory : GENIVAR*
*File :111-16127-00_EC_Ang_C7-2_VEG_vegetation_130205.mxd*

Scale 1 : 110,000
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UTM, zone 18, NAD83

**Figure 7-2**

**November 2012**

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The potential vegetation of the balsam fir stand with black spruce and moss (RS3) differs from the RS2 potential vegetation in that it is only found in hydric sites. In the study area, it is represented by ecological type RS37 and is associated with an open mature conifer forest habitat. Type RS37 is found in thin to thick mineral deposits with ombrotrophic hydric drainage. In the absence of fires, which occur only rarely in such sites, black spruce establishment is by layering. The tamarack (*Larix laricina*), which reproduces sexually, thrives on the abundance of light that characterizes these open settings, where it coexists with black spruce. This ecological type characterized by ombrotrophic drainage is not as rich as ecological type RS38 and its vegetation is characterized by the presence of ericaceous plants. The absence of speckled alder distinguishes it from ecological type RS38. Balsam fir establishment is possible at any time and sporadic establishment of intolerant hardwood species is also possible. Over time, the various species communities evolve toward conifer communities with intolerant hardwood or black spruce stands with tamarack.

Ecological types RE37, RE38, and RE39 are the types associated with the potential vegetation of black spruce stands with sphagnum moss (RE3) on either mineral (RE37) or organic (RE39) deposits. The three ecological types (RE37, RE38 and RE39) are representative of this potential vegetation in the study area, although the vegetation is most often found in ombrotrophic sites characterized by ecological type RE39. Types RE37 and RE39 are poor hydric environments more particularly characterized by the presence of ericaceous plants and sphagnum moss.

At these sites, nutrient availability is controlled by a thick layer of organic matter. Nutrients are only released in the wake of intense fires that also affect these wet areas, albeit less frequently. Environmental and edaphic conditions in these sites account for the omnipresence of black spruce.

Ecological type MS22 develops in mesic sites underlain by thick, well-drained tills. It is representative of the balsam fir with white birch potential vegetation (MS2). This ecological type, which is relatively uncommon in the study area (32 ha), is primarily associated with mixed-wood and deciduous forest habitats. It is also found in association with closed conifer covers within which balsam fir is likely associated with black spruce. Where the habitat consists of regenerating conifers, these sites should show good balsam fir regeneration. However, the abundance of regenerating balsam fir depends on the presence of herbaceous plants which, in the western spruce-moss domain, often dominate the undergrowth at the expense of balsam fir.

*Summary*

Overall, forest habitats in the study area are generally associated with poor settings with low diversity. Ecological types found in these habitats are also found in neighbouring ecological regions, albeit in different proportions, depending on local environmental and edaphic conditions.

The likelihood of finding rare or sensitive habitats among the forest habitats is low. This is consistent with the fact that no special habitats were detected during a helicopter flight over of the forest cover and associated habitats in the study area.

### 7.1.1.3 Wetlands

Wetland types in the study area were identified using photointerpretation, ecoforestry maps and field work. Aside from aquatic environments, the railway study area comprises 797.6 ha of wetlands, representing 31% of its total area. Treed peatlands, bogs and shrub swamps are the main types of wetlands in the study area (Figure 7-3; Table 7-6). A small number of treed peatlands have been disturbed by logging.

**Table 7-6: Number and Areal Extent of Wetlands Surveyed in the Railway Study Area**

| Habitat Type* | Railway Study Area | |
|---|---|---|
| | Number | Area (ha) |
| Forested swamp | 8 | 40.9 |
| Shrub swamp | 59 | 63.4 |
| Treed peatland | 98 | 451.7 |
| Disturbed treed peatland | 44 | 86.2 |
| Fen | 10 | 43.9 |
| Bog | 39 | 111.5 |
| **Total wetlands** | **258** | **797.7** |
| Water | 25 | 75.4 |
| Forest | 368 | 1 681.5 |
| **Total** | **643** | **2 554.6** |

Habitat type refers solely to wetlands in the railway local study area.

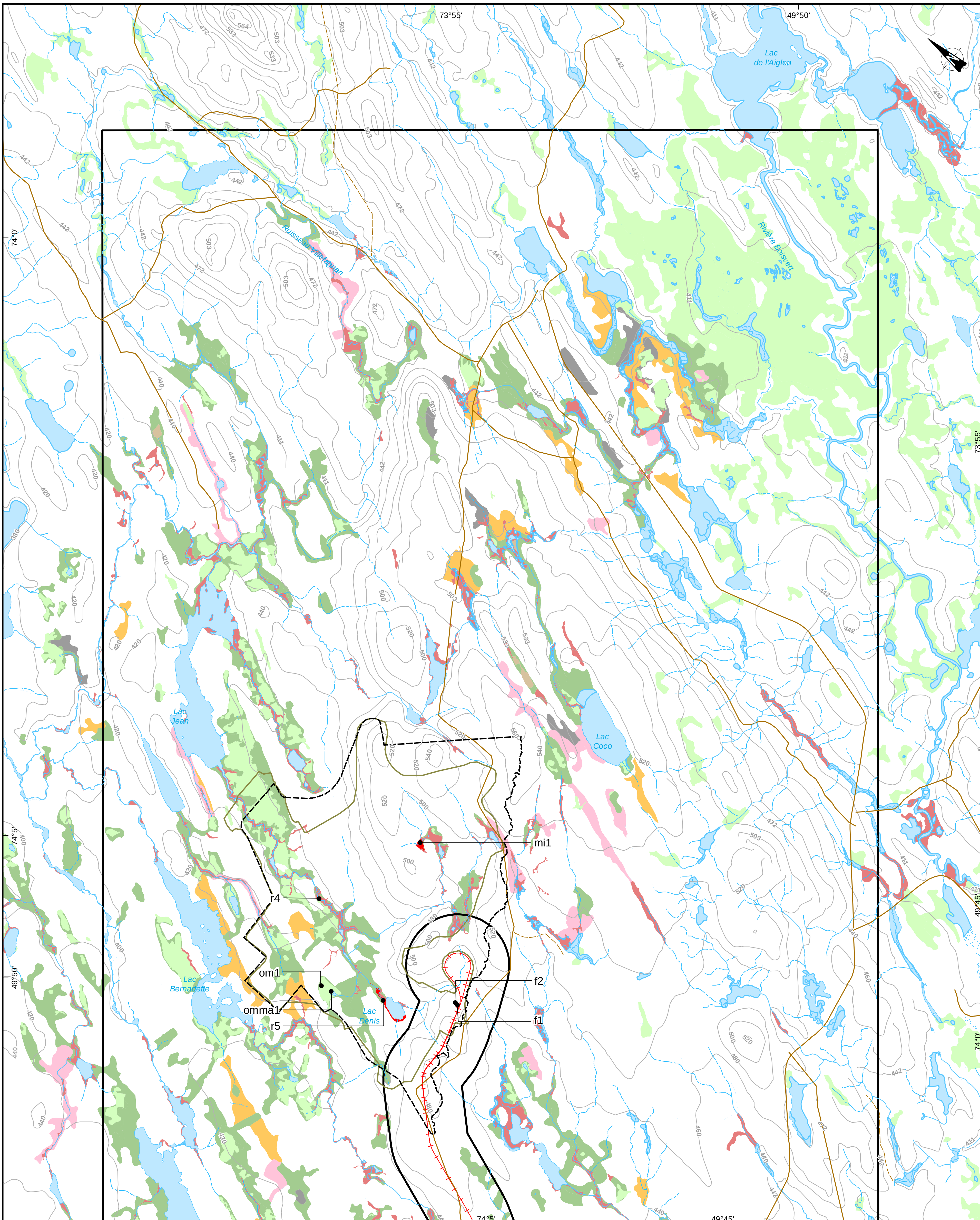
#### Forested Swamps

Forested swamps are very uncommon in the study area, covering 40.9 ha or 1.6% of the railway study area (Table 7-6). They are dominated by trees and a well-developed shrub layer comprising speckled alder and willows (*Salix* spp.) growing on a mineral or organic soil that is prone to seasonal flooding. These wetlands are usually rich in dissolved minerals. They are generally associated with a lake, streams and peatlands, and their precise limits are hard to define.

#### Shrub Swamps

Shrub swamps are closely associated with streams or wet low-lying areas. They are found on the shores of most lakes and streams in the region (Figure 7-3). Shrub swamps are also observed in the immediate vicinity of some fens and bogs. They cover 63.4 ha or 2.4% of the railway study area (Table 7-6).

Two shrub swamps were visited as part of the land survey (Figure 7-3), one on the shore of a lake and the other at the edge of a high-flow stream. The substrate is composed of organic matter or recent alluvium and the shrub layer is well-developed. The main shrub species are speckled alder (*Alnus incana*), broad-leaved meadowsweet (*Spiraea alba* var. *latifolia*), sweet gale (*Myrica gale*) and bog willow (*Salix pedicellaris*). The herbaceous layer is composed of bluejoint (*Calamagrostis canadensis* var. *canadensis*), king-of-the-meadow (*Thalictrum pubescens*), marsh cinquefoil (*Comarum palustre*), *Glyceria* spp. and numerous sedge species. The




**Infrastructures**

- Main road (167)
- Secondary or access road
- Existing railway
- Transmission line

**BlackRock Metals Project Components**

- Local study area
- Mine site
- Proposed railway segment

**Limit**

- Exceptional forest ecosystem (EFE)

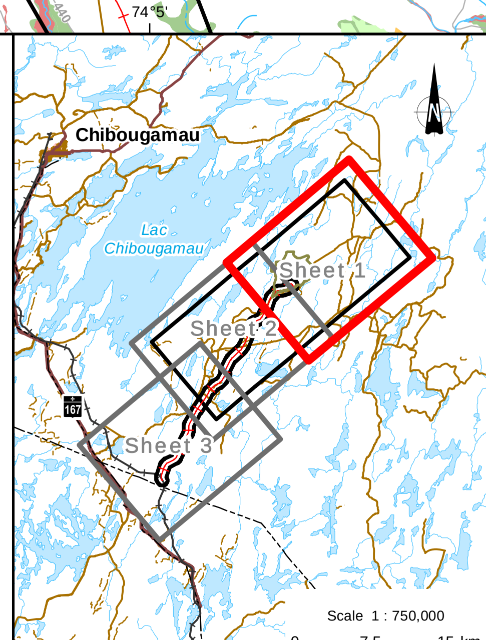
**Wetlands**

Inventory

- Sampling plot

Wetlands

- Swamp
- Forested swamp
- Disturbed forested swamp
- Shrub swamp
- Treed peatland
- Disturbed treed peatland
- Fen
- Bog

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## Distribution of Wetlands in the Study Area

**Sources :**
*Système d'information écoforestière (SIEF), MRNF Québec, 2010*
*CanVec, 1/50 000, RNCan, 2010*

*Mapping and inventory : GENIVAR*
*File :111-16127-00_EC_Ang_C7-3_VEG_Milieu humide_130205.mxd*

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UTM, zone 18, NAD83

**Figure 7-3**
Sheet 1 of 3

**November 2012**

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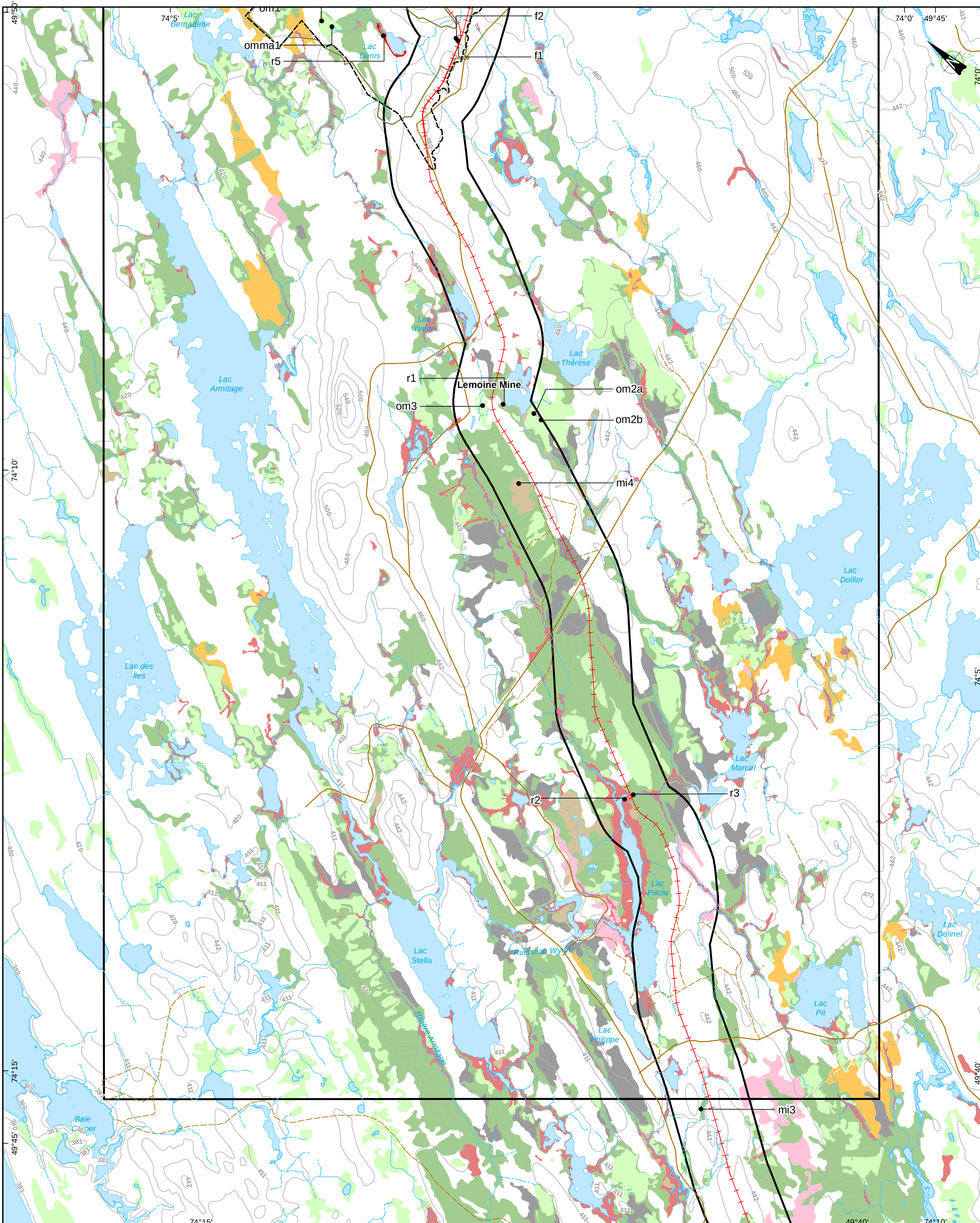


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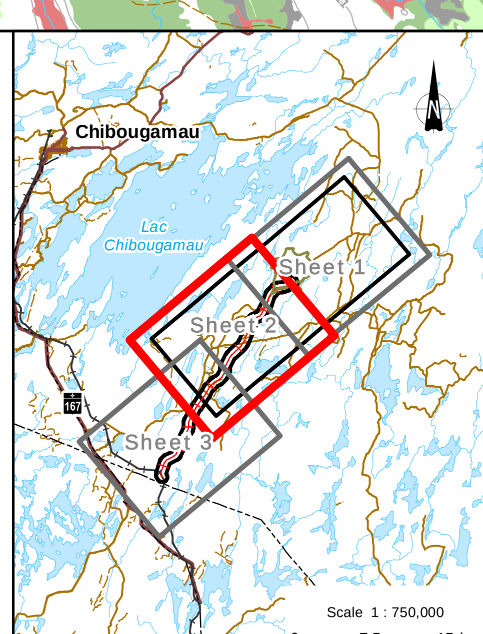
Wetlands

- Swamp
- Forested swamp
- Disturbed forested swamp
- Shrub swamp
- Treed peatland
- Disturbed treed peatland
- Fen
- Bog

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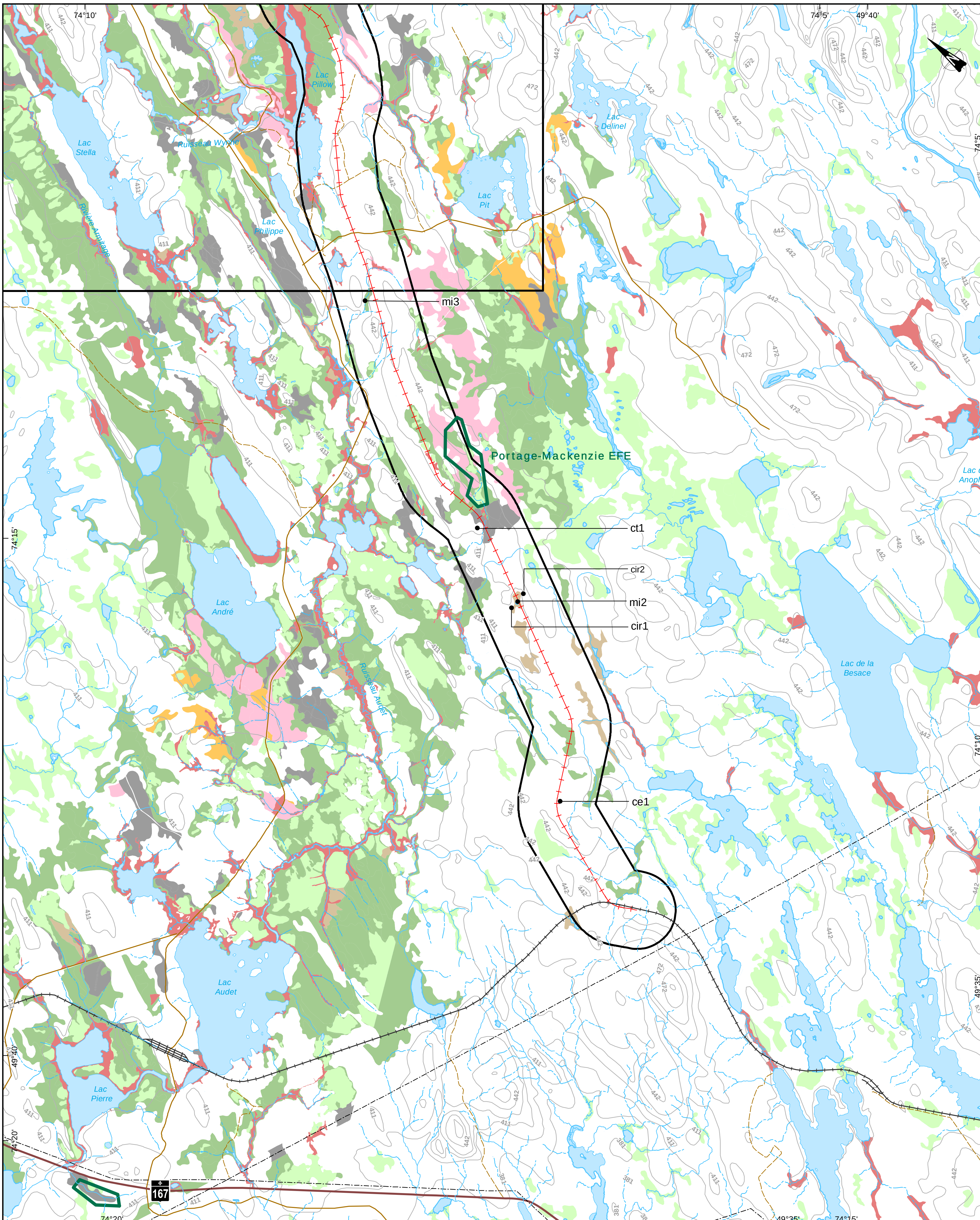
UTM, zone 18, NAD83

**Figure 7-3**
Sheet 2 of 3

**November 2012**

GENIVAR




**Infrastructures**

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**BlackRock Metals Project Components**

- Local study area
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**Wetlands**

Inventory

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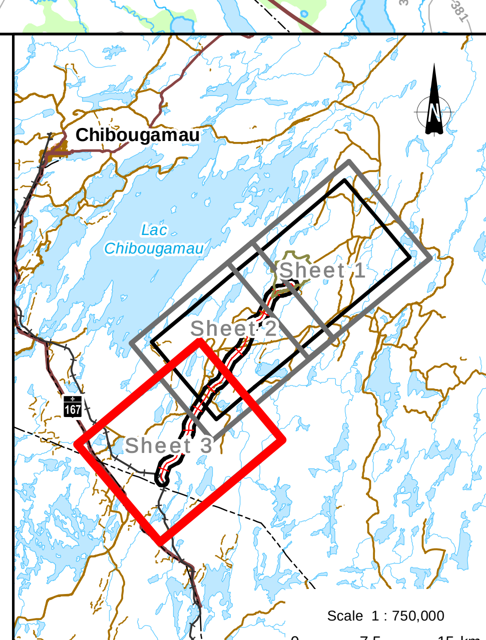
Wetlands

- Swamp
- Forested swamp
- Disturbed forested swamp
- Shrub swamp
- Treed peatland
- Disturbed treed peatland
- Fen
- Bog

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## Distribution of Wetlands in the Study Area

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*File :111-16127-00_EC_Ang_C7-3_VEG_Milieu humide_130205.mxd*

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UTM, zone 18, NAD83

**Figure 7-3**
Sheet 3 of 3

**November 2012**

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composition of the muscinal layer varies from wetland to wetland, sphagnum moss being locally dominant to nearly non-existent in this layer. Sites cir1, mi2, om2a and r1 are representative of many of the wetlands that fall into the shrub swamp category based on their plant life and physionomy.

**Treed Peatlands**

Most treed peatlands were identified using data from the ecoforestry map. They mostly fall within ecological types RE37 to RE39, or black spruce-sphagnum moss stands (Table 7-5). Organic matter is more than 30 cm thick, which is one of the defining criteria for peatlands. Treed peatlands account for 451.7 ha or 17.6%, of the railway study area. This type of peatland is generally found in black spruce with sphagnum communities developed in relatively wet sites often characterized by a significant accumulation of organic matter and undecomposed wood debris. Most treed peatlands in the study area are associated with and adjacent to bogs and fens (Figure 7-2). Black spruce, tamarack and balsam fir are the main tree species found in these wetlands. The shrub layer is dominated by ericaceous plants such as leatherleaf, sheep-laurel and Labrador tea. The herbaceous layer is nearly absent, while the muscinal layer consists primarily of sphagnum moss with a smaller proportion of moss.

*Cedar Groves*

Two forested wetlands corresponding to cedar groves (sites ce1 and cir1) were sampled (Figure 7-3). In these wetlands, the substrate is comprised of well-decomposed organic matter. The two cedar groves have different plant composition. In site ce1, the upper covering of the tree and shrub layers is higher. Eastern white cedar (*Thuja occidentalis*) is the dominant species in the tree layer, along with tamarack. In the shrub layer, speckled alder (*Alnus incana* ssp. *rugosa*) and eastern white cedar are the dominant species, along with less abundant alderleaf buckthorn (*Rhamnus alnifolia*), bog willow (*Salix pedicellaris*) and swamp birch (*Betula pumila*). The herbaceous layer consists of cloudberry, hairy raspberry (*Rubus pubescens*), woodland horsetail (*Equisetum sylvaticum*) and yellow clintonia (*Clintonia borealis*). The cedar grove is split in two by an abandoned railway. In site cir1, tree cover density is lower and the lower shrub layers and herbaceous layer are dominant. The tree layer comprises eastern white cedar along with tamarack and black spruce. The shrub layer is dominated by shrubby cinquefoil (*Dasiphora fruticosa* subsp. *floribunda*), prickly rose (*Rosa acicularis* subsp. *sayi*), bog willow, sweet gale (*Myrica gale*) and fly-honeysuckle (*Lonicera villosa*). The herbaceous layer comprises a mix of several species. The muscinal layer in both sites is composed of the mosses *Rhytidiadelphus triquetrus* and *Sphagnum angustifolium*. Site cir1 is adjacent to and closely associated with a fen (station mi2) and is located near the Portage-Mackenzie exceptional forest ecosystem (Figure 7-3).

**Fens (Minerotrophic Peatlands)**

Fens (Figure 7-3) are characterized by groundwater-derived mineral input. Vegetation is mainly composed of brown mosses and sedges. These wetlands are closely related to extensive peatlands and the shores of lakes and streams from which the mineral influx is often derived. Fens cover 43.9 ha or 1.7% of the railway study area (Table 7-6).

In all, five sampling sites were selected in fens (sites mi2, mi3, mi4, om2a, and r1). Sites mi2, mi3 and mi4 represent string fen-pool systems, whereas site om2a is adjacent to a bog and site r1 is at the edge of a lake. Tree cover is nearly non-existent, as most trees, including tamarack and black spruce, are stunted. Shrubs such as bog willow, bog rosemary, leatherleaf, Labrador tea, speckled alder, shrubby cinquefoil and sweet gale are present. The herbaceous layer is for the most part composed of sedges. The shallow pools are lined with sedges, including creeping sedge (*C. chordorrhiza*) and mud sedge, and are colonized by buckbean (*Menyanthes trifoliata*) as well as cowlily. Green cotton-grass (*E. viridicarinatum*), starved sedge (*C. exilis*), hairy-fruited sedge (*C. lasiocarpa*), alpine bulrush (*Trichophorum alpinum*), low rough aster (*Eurybia radula*) and bog goldenrod (*Solidago uliginosa*) are the common herbaceous species in fens. Sphagnum and brown mosses are representative of the muscinal layer. Small areas with an influx of mineral in forest settings often have the same plant diversity as fens. Sites f1 and cir2 (Figure 7-3) are typical of such environments. The tree layer is composed of black spruce and tamarack, while speckled alder is the dominant species in the shrub layer. The herbaceous layer is similar to that of fens, with species associated with mineral influx, such as sheathed sedge (*C.vaginata*) and false melic (*Schizachne purpurascens*).

The richness of fens is reflected in the trophic status of the plants they contain (Garneau 2001). The following taxa are found to thrive in rich fens: hairy-fruited sedge, bristle-stalked sedge (*C. leptalea*), sparse-flowered sedge (*C. tenuiflora*), seaside arrowgrass (*Triglochin maritima*) and bog willow. The following observed species thrive in fens of intermediate richness: creeping sedge, green cotton-grass, low rough aster, green woodland orchid (*Platanthera clavellata*), bog goldenrod and alpine bulrush.

**Bogs (Ombrotrophic Peatlands)**

In bogs, precipitation is the main source of mineral influx (MDDEP 2006). These are poor, highly acidic wetlands, because soil minerals are usually not accessible for plant growth due to the thickness of the peat. In this type of peatland, sphagnum moss and ericaceous plants are dominant, often with black spruce and tamarack. Such peatlands cover 111.5 ha or 4.3% of the railway study area (Table 7-6).

Two sampling sites were set up in bogs (Figure 7-3; sites omb2 and om3). The substrate comprises organic matter more than 1.30 m thick, and the water table is very close to surface. Species observed at the sites point to a very low-diversity flora. Thus, 45 and 32 vascular plant taxa were observed at sites om2b and om3, respectively (GENIVAR 2012). The tree layer is of low density and includes black spruce and tamarack. The shrub layer is dominant and primarily composed of ericaceous shrubs such as bog rosemary (*Andromeda glaucophylla*), leatherleaf (*Chamaedaphne calyculata*), bog-laurel (*Kalmia polifolia*), sheep-laurel (*K. angustifolia*) and Labrador tea. In some parts of bogs, a shrubby black spruce cover is very extensive. The herbaceous layer can be poorly or well developed, with the most common species being few-seeded sedge (*Carex oligosperma*), cloudberry (*Rubus chamaemorus*), sheathed cottonsedge (*Eriophorum vaginatum*) and three-leaved Solomon's seal (*Maianthemum trifolium*). Peat moss, primarily rusty peat moss (*Sphagnum fuscum*) along with *Sphagnum angustifolium* and *Polytrichum strictum*, make up the muscinal layer that covers nearly all of the ground. In spite of the very low plant diversity generally observed in bogs, it is not uncommon to find small areas here and there more accurately described as fens.

### 7.1.1.4 Vascular Plants at Risk

**Survey of At-Risk Plant Species**

The third edition of the *Plantes vasculaires menacées ou vulnérables du Québec* (CDPNQ 2008) publication and the *Guide de reconnaissance des habitats forestiers des plantes menacées ou vulnérables Côte-Nord et Saguenay – Lac-Saint-Jean* (Dignard *et al*. 2009) make no mention of the presence of rare plants in the immediate vicinity of the study area. In addition, a request for information sent to the CDPNQ (Entraco 2011) did not turn up any species with special status in the study area. A review of these works does, however, point to the potential presence of 14 special status species (Table 7-7). Of these, four are calcicolous plants, several occurrences are well removed from the study area and some have specific habitats that are uncommon in the study area. Of all the habitats encountered, cedar groves, peatlands (treed peatlands, fens and bogs), disturbed sandy sites, rock outcrops and lakes are most likely to host special status plants.

CDPNQ (2010) mentions the presence of two vascular plants with special status within a 100-km radius of the study area, namely dragon's mouth (*Arethusa bulbosa*) and lavender bladderwort (*Utricularia resupinata*). In addition, the range of the ostrich fern (*Matteuccia struthiopteris*) in Quebec suggests that this plant may be present in or around the study area.

No vascular plant species on the list of Canadian Wildlife Species at Risk (COSEWIC 2012) has been observed in the study area.

**At-Risk Plant Species Potentially Present**

*Dragon's Mouth (Arethusa bulbosa)*

Dragon's mouth is a small herbaceous perennial plant of the Orchidacea family. It is characterized by a single, 10 to 35 cm-high stem with a single leaf generally topped by a single pink flower. Dragon's mouth thrives in bogs and, more rarely, fens, and is sometimes found in clearings in black spruce stands, cedar groves and tamarack stands on peat. It is likely to be designated threatened or vulnerable (Table 7-7); approximately 90 occurrences of this plant have been reported in Quebec (Dignard *et al*. 2009).

A request for information from the CDPNQ (Entraco 2011) revealed the historical presence of this plant in a peatland in the Réserve faunique Ashuapmushuan and near Rivière Rock Nord, approximately 100 kilometres from the study area. The species was not seen during the surveys carried out in 2011. Several bogs and fens were visited in the study area in 2012, but no occurrence of this species was noted.

*Ostrich Fern (Matteuccia struthiopteris)*

The ostrich fern is a perennial fern of the Onocleaceae family. It can reach a height of 1.75 m, emerges from a rhizome and produces underground runners. Fronds are

**Table 7-7: List of At-Risk Plant Species Potentially Present in the Study Area with Their Conservation Status Rank and Preferred Habitat**

| Scientific Name | English Name | Status[1] | Conservation Status Rank[2] | Habitat | Likelihood of Presence |
|---|---|---|---|---|---|
| Amerorchis rotundifolia | Round-leaved orchid | LDTV | G5/NNR/S2 | Fens and conifer forests (calcicolous) | Moderate |
| Arethusa bulbosa | Dragon's mouth | LDTV | G4/N4?/S3 | Bogs and fens | High |
| Calypso bulbosa var. americana | Calypso | LDTV | G5T5?/N5?/S3 | Rich forested swamps, conifer and mixed-wood forests (calcicolous) | Moderate |
| Carex petricosa var. misandroides | Rockdwelling sedge | LDTV | G4T1T2/N1N2/S2 | Outcrop, talus and exposed gravel (calcicolous) | Low |
| Drosera linearis | Slenderleaf sundew | LDTV | G4/N4/S2 | Fens (calcicole) | Moderate |
| Hieracium Robinsonii | Robinson's Hawkweed | LDTV | G2G3/N2/S2 | Rocky and gravelly shores | Low |
| Hudsonia tomentosa | Woolly beachheather | LDTV | G5/N4N5/S3 | Conifer forests, dunes, exposed sand, blueberry patches | Low |
| Polygonella articulata | Northern jointweed | LDTV | G5/N3/S2 | Dunes, exposed sand, urban land | Low |
| Matteuccia struthiopteris | Ostrich fern | V | G5/N5/S5 | Deciduous forests, flood plains, swamps | Moderate |
| Salix arbusculoides | Littletree willow | LDTV | G5/NNR/S1 | Outcrop, talus and exposed gravel | Low |
| Salix maccalliana | McCall's willow | LDTV | G5?/N4N5/S2 | Swamps, wooded fens | Moderate |
| Salix pseudomonticola | False mountain willow | LDTV | G4G5/NNR/S1 | Swamps, rocky and gravelly shores | Moderate |
| Utricularia gemminiscapa | Twin-scaped bladderwort | LDTV | G4G5/NNR/S2 | Bog lakes and pools | Moderate |
| Utricularia resupinata | Lavender bladderwort | LDTV | G4/NNR/S2 | Lakes | High |

1 Species status in Quebec: LDTV: likely to be designated threatened or vulnerable; V: vulnerable; T: threatened.

2 Conservation status rank according to NatureServe, corresponding to a combination of letters reflecting scale, and numbers reflecting conservation status rank: G: global; N: national; S: subnational; T: intraspecific taxon (subspecies or variety) criterion; NNR: national or subnational conservation status not yet assessed; 1: critically imperiled, 2: imperiled; 3: vulnerable; 4: apparently secure; 5: secure. A question mark (?) denotes inexact numeric rank.

of two types: sterile oblanceolate fronds forming crowns that surround much shorter fertile fronds that are brown when mature. Ostrich fern prefers rich, wet, shady deciduous forests, treed, shrubby riparian swamps, flood plains and ditches. It is a protected species under the Act respecting threatened or vulnerable species (Table 7-7). However, restrictions concerning this species relate to harvesting of more than five whole specimens or their underground parts in natural settings and the sale of a single specimen.

Ostrich fern was not found during the 2011 and 2012 surveys. Habitats in which it is likely to be found are present in the study area and its presence is to be expected.

*Lavender Bladderwort (Utricularia resupinata)*

Lavender bladderwort is an herbaceous annual or perennial plant of the Lentibulariaceae family. It is a delicate aquatic or palustrine plant without a root system; it is characterized by 5 to 10 cm-long filiform horizontal stems that radiate from the base of the flower stalk. The inflorescence consists of a flower with a white-washed purple corolla. Lavender bladderwort plants crawl in mud or organic matter either exposed or in shallow water in ponds and lakes. It is likely to be designated threatened or vulnerable (Table 7-7); approximately 30 occurrences of the plant have been reported in Quebec (Dignard *et al.* 2008).

A request for information from the CDPNQ (2010) revealed the recent presence of this plant at Lac de la Mule in Balete Township, about 85 km from the study area. The species was not observed during surveys carried out in 2011. Numerous lakes and ponds were visited in the study area in 2012, but no occurrence of this species was noted.

#### 7.1.1.5 Plant Diversity

Field surveys conducted in the summer of 2012, with a main focus on wetlands, led to the identification of 225 species of vascular plants present in the study area. This corresponds to roughly two thirds of all vascular species potentially present in the study area based on known geographic ranges.

The location of the study area, the nature of the different substrates and the presence of certain anthropogenic habitats contribute greatly to the plant diversity of the study area.

The poor, acidic organic substrates in bogs are the least diverse: 24 vascular plant taxa were observed on average in such sites. Ericaceous shrubs and sphagnum moss dominate the landscape in these wetlands. Treed peatlands are considerably more diverse due to their mix of species typical of forest stands and peatlands. Nutrient supply from surface water flow is sufficient to significantly enhance diversity, as evidenced by the fact that shrub swamps around the bogs contain about twice as many species.

Fens have 63 different taxa on average and, like plant covers found in bogs, are characterized by a high diversity of species of the Cyperaceae and Orchidaceae families. The presence of shallow pools and variable water table depths contribute to habitat diversity. A number of species in such peatlands have an intermediate to rich trophic status, which is a clear indicator of the richness of these settings.

Diversity in forested areas is also influenced by local substrate. Black spruce stands generally colonize poorer sites and are characterized by low floristic diversity, whereas mixed-wood and hardwood stands are richer and contain more species. Disturbances such as logging also increase the number of species because there are more sites suitable for new species.

Most cedar groves surveyed during the field programs are on organic deposits and contain the high number of species typical of richer settings. Some orchid species are present in these environments and the likelihood of finding special status plants is high. The northern location of these cedar groves is peculiar, which is why the MRNF has seen fit to confer rare status on the Portage-Mackenzie exceptional forest ecosystem. Similarly, the cedar grove at site ce1 is also exceptional, despite the presence of a logging road running through it.

Habitats that have undergone anthropogenic disturbances add to the floristic diversity of the study area. Summary inventories in these environments have identified a total of 80 taxa, or one third of all species observed in the study area.

In general, habitats in the study area are not characterized by high plant diversity, with most taxa present being common in other areas at similar latitude. However, it is interesting to note the sporadic presence of more-mineralized environments that give rise to more diverse plant communities. Based on compiled information and field inventories, it can reasonably be stated that the potential for rare plants in the study area is low and habitats likely to contain such taxa are not widespread.

### 7.1.2 Aquatic Fauna

#### 7.1.2.1 Crossing Point Characterization

Characterization of the 10 streams in the study area (Tr-1 to Tr-10) in terms of homogeneous stretches is presented in Table 7-8 and shown schematically at Figure 7-4.

According to characterization data from fieldwork conducted in June 2012, the only stream that could potentially be a fish habitat is located under crossing point Tr-7. An electrofishing survey was carried out to test this assumption.

**Crossing Point Tr-1**

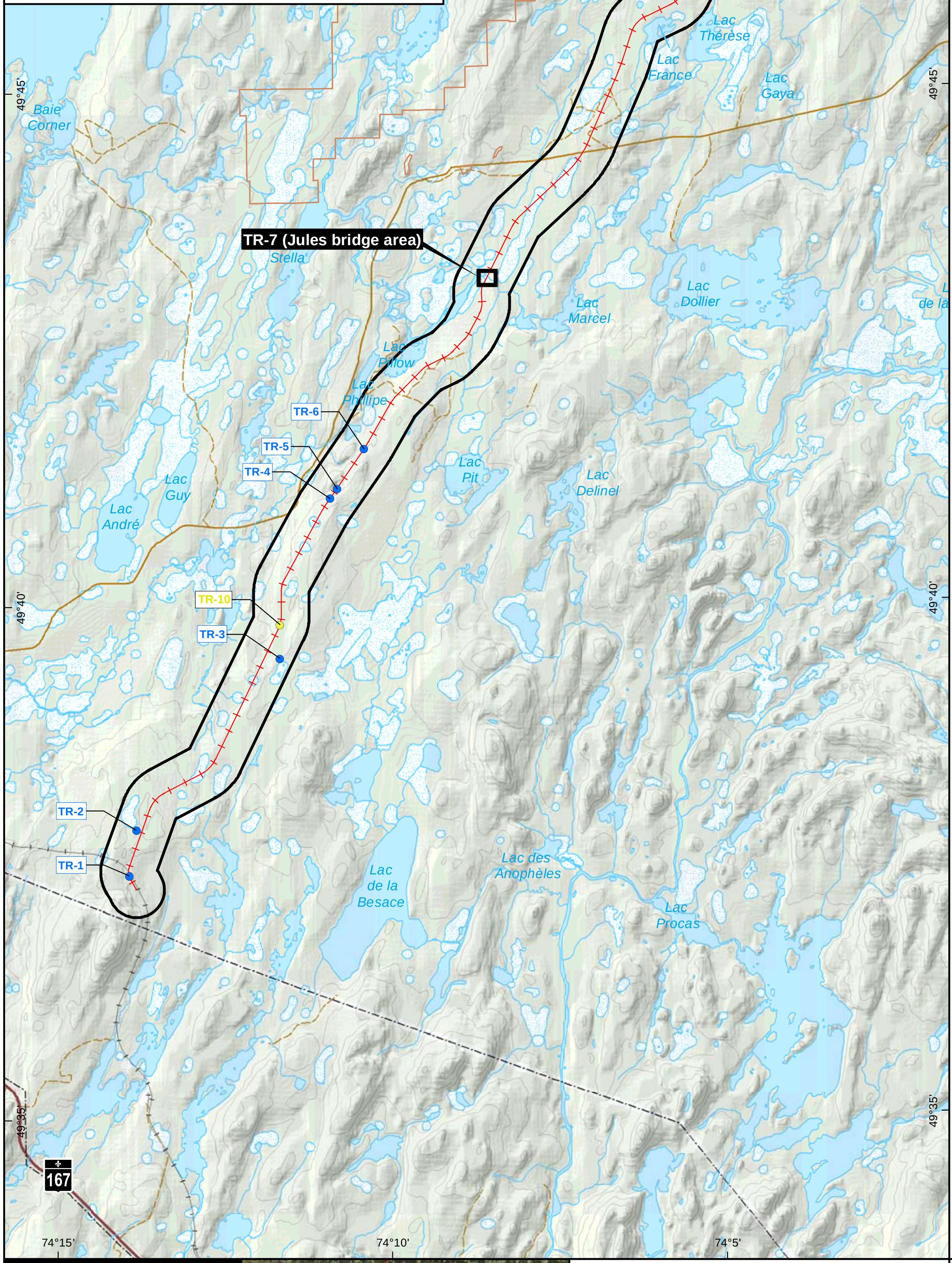
The stream at crossing point Tr-1 is characterized by a fast flow facies over roughly 5 m, with channel-type stretches upstream and downstream. Maximum water depth is 0.08 m, and stream width ranges from 0.4 m (rapids) to 3 m on either side of the planned crossing point. The substrate is primarily composed of organic material in the upstream and downstream sections, and of pebbles, cobbles and boulders in the fast-flowing section. Given heavy rainfall at the time of the survey, it is highly likely that this stream is intermittent during low-water periods. Riparian vegetation in the area is shrubby (alder grove). Several piles of branches form impassable jams on either side of the planned crossing point. Given the presence of numerous impassable jams, the size of the stream (width, depth) and its low flow (even under high runoff conditions), this watercourse is not deemed to be a fish habitat.

## Tableau 7-8: BlackRock, Validation of Stream Crossings

| GENERAL LOCATION | | | | | | | DESCRIPTION | | | | | Natural high water mark | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of watercourse | Reference | Crossing Nb | Elevation | Latitude | Longitude | FISH HABITAT | Segment | Flow | Length | Width | Max depth | Physical Width | Physical Height | Vegetation | Flow facies | Substrate | Obstacle | Vegetation |
| | | | | | | | | | m | m | m | m | m | m | | | | |
| Permanent stream* | Railway junction | 1 | 437 m | 49° 37' 19.9" N | 74° 13' 5.5" W | NO | T1-S1 | Yes | | 3 | 0,05 | | | | Channel | Organic matter | Jams | Alder grove |
| | | | | | | | T1-S2 | Yes | 5 | 0,4 | 0,08 | 0,5 | 0,25 | 7 | Rapid | Pebble-cobble-boulder | | |
| | | | | | | | T1-S3 | Yes | | 3 | 0,05 | | | | Channel | Organic matter | Jams | |
| Intermittent | Approx. Km 1+00 | 2 | 439 m | | | NO | T2-S1 | No | | | | | | | | Organic matter | | |
| Intermittent | Approx. Km 5+160 | 3 | 428 m | 49° 39' 28.0" N | 74° 11' 35.3" W | NO | T3-S1 | No | | | | | | | | Organic matter | | Alder grove |
| Intermittent | Approx. Km 8+300 | 4 | 435 m | | | NO | T4-S1 | No | | 0,2 | 0,02 | | | | Channel | Organic matter | Subsurface flow | Alder grove |
| Intermittent | Approx. Km 8+500 | 5 | 435 m | 49° 41' 7.5" N | 74° 10' 41.1" W | NO | T5-S1 | No | | | | | | | Riffle | | | |
| Intermittent | Approx. Km 9+500 | 6 | 423 m | | | NO | T6-S1 | No | Metal culvert | 2 | 0,02 | | | | Pool | Organic matter | Jam and subsurface flow | Alder grove |
| | | | | | | | T6-S2 | No | PE-HD culvert | 2 | 0,03 | | | | Channel | Organic matter | Jam | |
| | | | | | | | T6-S3 | No | Approx. 600 m upstream from track | 0,3 | 0,04 | | | | Channel | Organic matter and sand | Subsurface flow | |
| Permanent stream | Jules Bridge | 7 | 414 m | 49° 43' 10.5" N | 74° 8' 25.3" W | YES | T7-S1 | 0,1 m/s | 65 | 8 | 0,6 | | | G=15 D=10 | Channel | Organic matter | | Éricacae |
| | | | | | | | T7-S2 | 0,6 m/s | 62 | 4 | 0,25 | | | G=40 D=22 | Riffle | Boulder90- Cobble10 | | Éricacae and snags |
| | | | | | | | T7-S3 (Beginning of lake) | Yes | 80 | 80 | 1,2 | | | G= 120 D=40 | Pool | Organic matter | | Éricacae |
| Intermittent* | Same as crossing 9 | 8 | 434 m | | | | | | | | | | | | | | | |
| Intermittent* | Approx. Km 25+500 | 9 | 434 m | 49° 47' 35.1" N | 74° 3' 17.6" W | NO | T9-S1 | Yes | Upstream | | | | | | Cascade | | Jams | Alder grove |
| | | | | | | | T9-S2 | 0,3 m/s | 5 | 0,4 | 0,12 | 0,5 | 0,25 | 4 | Riffle | Organic matter, sand and cobble | Jams | |
| | | | | | | | T9-S3 | Yes | 12 | | | | | | Subsurface flow | | | |

*Judged to be intermittent in the field



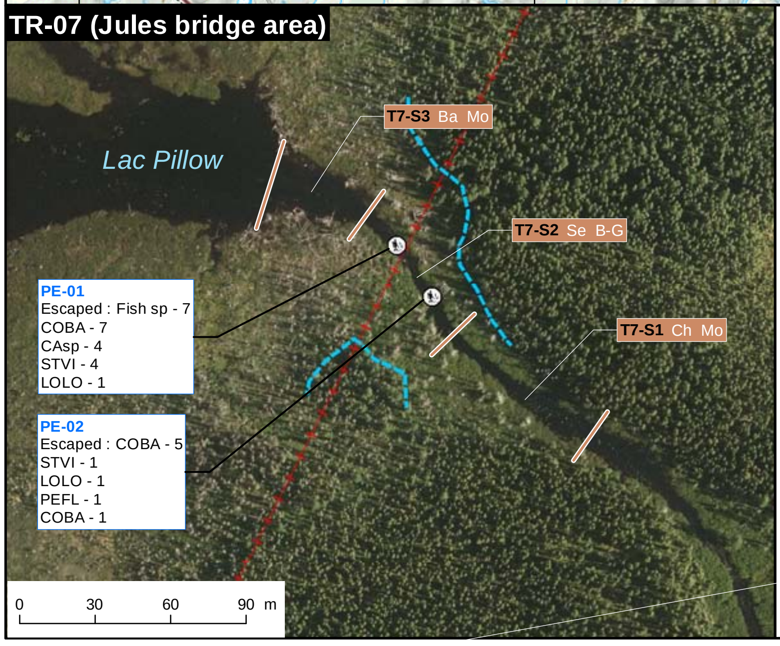













**Infrastructures**

- Main road (167)
- Secondary or access road
- Existing railway
- Transmission line

**BlackRock Metals Project Components**

- Local study area
- Limits of active claims
- Mine site
- Proposed railway segment

**Aquatic Fauna Survey**

- Characterized stream crossings (Does not represent fish habitat)
- Uncharacterized stream crossings (Does not represent fish habitat)
- Electrofishing station
  - Species
    - COBA = Mottled sculpin
    - CAsp = Suckers
    - LOLO = Burbot
    - PEFL = Yellow perch
    - STVI = Walleye
- Natural high water mark (botanical method)
- Limit of characterization segment

T7-S3 Ba Mo — Substrate / Facies / Segment

| Facies | Substrate |
|---|---|
| Ba = Basin | Mo = Organic matter |
| Ch = Channel | B = Boulder |
| Se = Riffle | G = Cobble |

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- Supplement to the Environmental Impact Assessment Statement -

## Stream Crossing Characterization and Electrofishing Results

**Sources :**

*CanVec, 1/50 000, RNCan, 2010*
*Gestion des titres miniers (GESTIM), MRNF Québec, septembre 2012*
*Aires protégées et territoires d'intérêt : MDDEP, 2011*
*Écosystèmes forestiers exceptionnels et Refuges biologiques, MRNF, 2011*

*Mapping and inventory : GENIVAR*
*File : 111-16127-00_EC_Ang_C7-4_FAQ_130205.mxd*

Scale 1 : 120,000

0 1.2 2.4 km

UTM, zone 18, NAD83
Contour interval: 20 m

**Figure 7-4**

**November 2012**

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**Crossing Point Tr-2**

The stream at crossing point Tr-2 is characterized by the presence of several depressions with organic material, with no visible or audible flow. This stream is likely intermittent. Riparian vegetation is mainly shrubby (alder grove). There was no flow in this small stream at the time of its characterization despite abundant rainfall. This watercourse is not deemed to be a fish habitat.

**Crossing Point Tr-3**

The stream at crossing point Tr-3 shows the same features as at crossing point Tr-2. Given the absence of water in this stream, it is not deemed to be a fish habitat.

**Crossing Point Tr-4**

The stream at crossing point Tr-4 is characterized by a channel-type flow facies and substrate material consisting of organic matter. Its measured width was approximately 0.2 m and water depth was 0.02 m where measurements could be taken. Flow in this stream is mainly subsurface in nature and was visible at the crossing point. Riparian vegetation is primarily composed of shrubs (alder grove). This stream is not deemed to be a fish habitat.

**Crossing Point Tr-5**

The stream at crossing point Tr-5 was dry at the time of the survey. It is therefore not deemed to constitute a fish habitat.

**Crossing Point Tr-6**

The stream at crossing point Tr-6 comprises three homogeneous stretches downstream from the planned crossing. The first is a roughly 2 m-wide, 0.2 m-deep pool characterized by a pool-type flow facies. This is followed by alternating channel-type facies and sections with subsurface flow with substrate comprising organic matter and sand. Riparian vegetation consists of shrubs (alder grove). Impassable jams are present, and there is a culvert at the planned crossing point. Given the size of the stream (width, depth), its low flow (even under high runoff conditions) and the subsurface nature of flow, this watercourse is not deemed to be a fish habitat.

**Crossing Point Tr-7**

The stream at crossing point Tr-7, also called the Jules bridge, was divided into three homogeneous stretches (Figure 7-4). In the upstream part there is an 8 m-wide section characterized by channel-type flow, a maximum depth of 0.6 m and low flow velocity (0.1 m/s). The substrate in this section consisted of organic matter. This was followed by a faster-flowing (0.6 m/s) riffle-type section roughly 60 m long. Stream width along this stretch was about 4 m, water depth was 0.25 m, and the substrate consisted mainly of boulders and cobbles. The last segment consisted of a large (80 m x 80 m), 1.2 m-deep pool with substrate consisting of organic matter. This section ends at a lake.

The immediate riparian vegetation comprises shrubs, ericaceous plants and a mix of mature deciduous trees (mostly snags). Given the observed flow conditions, the nature of the substrate and the relative proximity of two lakes, this stream is deemed to be a fish habitat. This zone could be used by fish as feeding grounds as well as for spawning and rearing, depending on the species. For these reasons, electrofishing surveys were conducted at crossing point Tr-7. The results are presented in Section 7.4.2 of this report.

The natural high water mark (NHWM) was determined using the botanical and physical method. It was thus possible to confirm that, along homogenous stretch 3, toward Lac Jules, widths were 120 m for the left bank and 40 m for the right bank. NHWM widths for the left and right banks of homogeneous stretch 2 were 40 m and 22 m, respectively, and for homogeneous stretch 1 (downstream), they were 15 m and 10 m, respectively. The very shallow slope and low height of the banks support the development of a small floodplain. However, the in-situ vegetation indicates that flooding duration and frequency are low.

**Crossing Point Tr-8**

It was not possible to characterize the stream at crossing point Tr-8. However, as it is just upstream from crossing point Tr-9, it was assumed to have similar features.

**Crossing Point Tr-9**

The stream at crossing point Tr-9 is characterized by a riffle-type flow facies (~5 m-long) at the crossing, a cascade-type facies upstream and subsurface flow over a distance of 12 m downstream. The substrate is mainly composed of organic matter, sand and some cobbles. Riparian vegetation in the area is shrubby (alder grove). Flow velocity was approximately 0.3 m/s, with a maximum depth of 0.12 m and a width of 0.4 m. Flow is likely very low or absent at this site during low-water periods. Given its size (width, depth) and low flow (even under high runoff conditions), this watercourse is not deemed to be a fish habitat.

**Crossing Point Tr-10**

Although this crossing point at chainage 5+750 was not characterized in the field, photointerpretation was used to confirm that the size and facies of the stream are similar to those at crossing points Tr-2 and Tr-3. This intermittent stream is not deemed to be a fish habitat.

#### 7.1.2.2 Fish Surveys at Crossing Point Tr-7

The features of two electrofishing stations located upstream (PE-02) and downstream (PE-01) from crossing point Tr-7 on Rivière Jules and the fishing results are presented in Table 7-9 and Appendix G. The locations of the two fishing stations are shown on Figure 7-4.

Electrofishing surveys were conducted on June 29, 2012. Both open stations covered an area about 100 $m^2$. At station PE01, 4 suckers (*Catostomus sp.*), 7 mottled sculpins (*Cottus bairdi*), 1 burbot (*Lota lota*) and 4 walleyes (*Sander vitreus*) were caught; 7 fish escaped before they could be identified. Suckers ranged in length from 22 to 27 mm, mottled sculpins from 56 to 78 mm, walleyes from 36 to 90 mm, and the single burbot was 164 mm-long.

**Table 7-9: Characterization of Electrofishing Stations and Catch Summary**

| Stream | Station | Date | Length (m) | Width (m) | Area ($m^2$) | Average depth (m) | Flow facies | Particle size[1] | Speed (m/s) | Overhang cover (%) | Note | Duration of fishing (seconds) | Captures | | Escaped | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Species[2] | n | Species | n |
| Crossing pt. 7 Jules bridge area | PE01 | 29-06-2012 | 20 | 5 | 100 | 0,25 | Rapid | B5-C90-P5 | 0,65 | 5 | | 450 | ----- | 0 | Und. | 7 |
| | | | | | | | | | | | | | COBA | 7 | | |
| | | | | | | | | | | | | | CAsp | 4 | | |
| | | | | | | | | | | | | | STVI | 4 | | |
| | | | | | | | | | | | | | LOLO | 1 | | |
| Crossing pt. 7 Jules bridge area | PE02 | 29-06-2012 | 20 | 5 | 100 | 0,3 | Riffle | B15-C80-P5 | 0,35 | 5 | | 375 | ----- | 0 | COBA | 5 |
| | | | | | | | | | | | | | STVI | 1 | | |
| | | | | | | | | | | | | | LOLO | 1 | | |
| | | | | | | | | | | | | | PEFL | 1 | | |
| | | | | | | | | | | | | | COBA | 1 | | |
| **Total** | **2** | | **40** | | **200** | | | ----- | ----- | ----- | ----- | **825** | | **20** | | **12** |

[1] B: boulders; C: cobbles; P: pebbles

[2] COBA: Mottled sculpin; CAsp: Suckers; LOLO: burbot; PEFL: yellow perch; STVI: walleye; Und.: undetermined

At station PE02, 1 yellow perch (*Perca flavescens*) (118 mm), 1 mottled sculpin (73 mm), 1 burbot (118 mm) and 1 walleye (89 mm) were caught; 5 mottled sculpins got away before they could be measured.

### 7.1.3 Herpetofauna

Seven species belonging to this group could potentially be found in the study area (Table 7-10). The presence of three of these, the wood frog, American toad and garter snake, was confirmed within or near the project area (Entraco 2011). None of these species is on the list of threatened or vulnerable species or species likely to be designated as such (MRNF 2012a).

**Table 7-10: List of Herpetofaunal Species Likely to Use the Study Area**

| Order | Species[1] | Habitat[2] |
|---|---|---|
| Urodela | Northern two-lined salamander | Streams with rocky substrate, lake shores |
| Anuran | American toad | Various habitats |
| | Northern spring peeper | Various habitats |
| | Wood frog | Forested areas |
| | Northern leopard frog | Open areas: lakes, streams, ponds, peatlands and fields |
| | Green frog | Various aquatic environments |
| Squamata | Common garter snake | Various habitats |

1 According to the *Atlas des amphibiens et des reptiles du Québec* (AARQ 2010)
2 According to Desroches and Rodrigue (2004)

### 7.1.4 Birds

According to the various sources reviewed and field surveys conducted, 145 species of birds are likely to use the study area and surroundings on an annual basis (GENIVAR 2012). The following sections describe the various relevant bird groups. Note that for this section, the study area refers to two different areas, namely the 500 m-wide area on either side of the rail segment and the 10 km x 25 km area around the proposed mine site (see Figures 7-5 and 7-6). The impacts considered, however, are only those affecting the local study area immediately adjacent to the rail segment.

#### 7.1.4.1 Waterfowl and Common Loon

**Richness and Total Abundance**

Surveys of breeding pairs and broods identified the presence of 12 waterfowl species in addition to the Common Loon. A total of 243 individuals were observed, including 227 within survey plots. These observations correspond to a total of 137.5 indicated pairs (IP). The most abundant species in the study area are the American Black Duck (27.5 IP), Common Loon (24 IP), Ring-necked Duck (23 IP) and Common Goldeneye (23 IP). In the second survey, 187 individuals were counted, including 179 within the survey plots.

**Phenological Index (PI)**

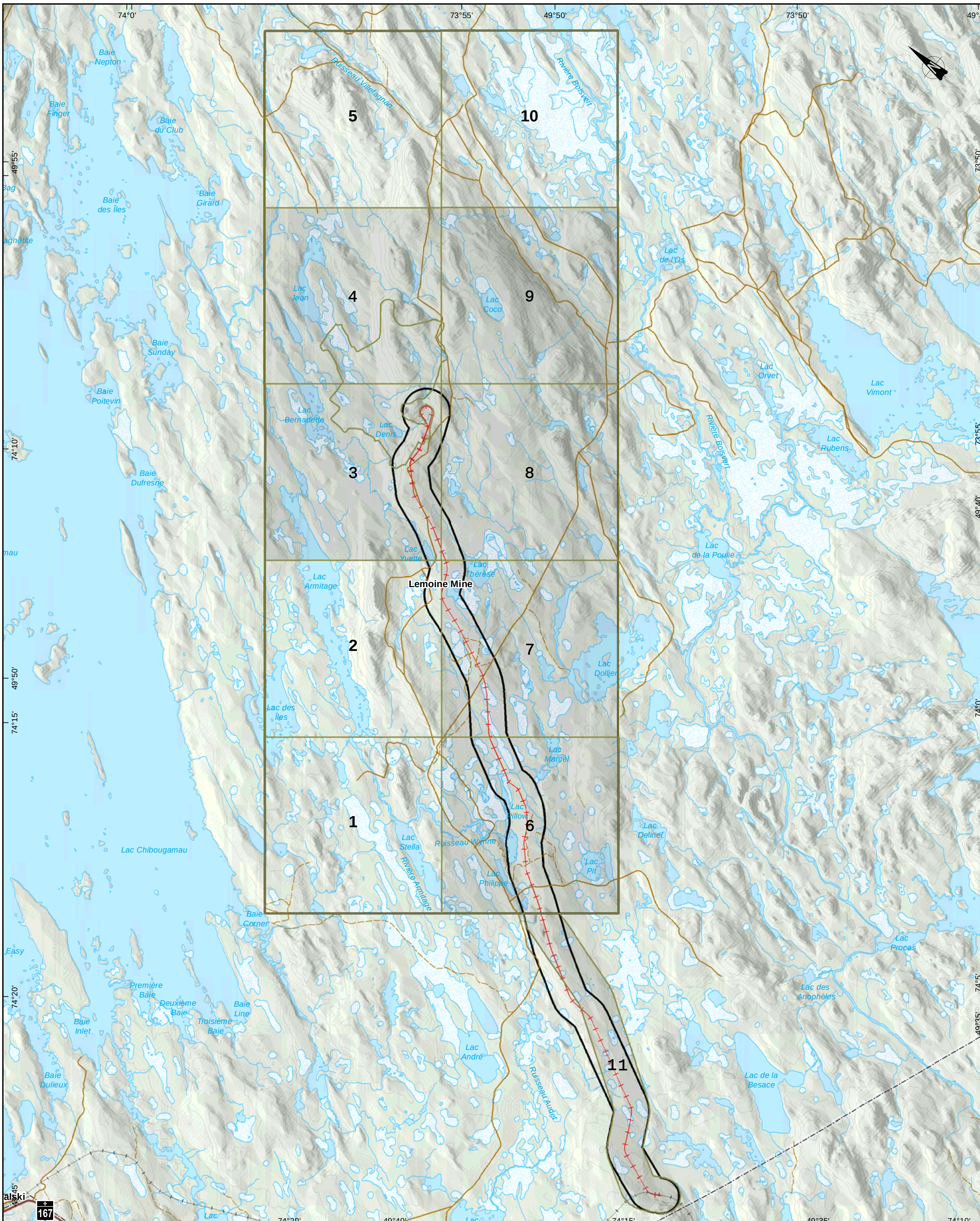
The sizes of waterfowl groups were first analyzed to ascertain that the surveys were done at appropriate stages of the migration, groups of four individuals or fewer being assigned to breeding pairs and larger groups to migrating birds (Curling *et al.* 2003). The data show that the vast majority of observations relate to breeding pairs (Table 7-11). Only three groups of waterfowl surveyed included more than four individuals. These were Ring-necked ducks (4 males, 3 females), Common Goldeneyes (4 males, 4 females) and Northern Shovelers (5 males, 5 females). Thus, the survey seems to have been conducted at a suitable time. All Northern Shovelers observed in the study area appeared be still on migration. Caution should therefore be exercised in interpreting indicated pair data presented in the following sections.

**Table 7-11: Waterfowl and Common Loon Group Size Recorded during the Breeding Pair Survey**

| Species | Group Size (counts) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 7 | 8 | 10 |
| Canada Goose | 9 | 14 | - | - | - | - | - |
| American Black Duck | 16 | 6 | - | 1 | - | - | - |
| Mallard | - | 1 | - | - | - | - | - |
| Northern Shoveler | - | 1 | - | - | - | - | 1 |
| Green-winged Teal | 3 | 2 | - | - | - | - | - |
| Ring-necked Duck | 4 | 17 | 2 | - | 1 | - | - |
| Bufflehead | 3 | 1 | - | - | - | - | - |
| Common Goldeneye | 4 | 18 | - | 1 | - | 1 | - |
| Hooded Merganser[1] | - | 1 | - | - | - | - | - |
| Common Merganser | 3 | 6 | - | - | - | - | - |
| Red-breasted Merganser | - | 1 | - | - | - | - | - |
| Common Loon | 8 | 8 | - | - | - | - | - |

[1] This species was only observed outside the survey plots.

Given the low number of Buffleheads observed, care should be exercised in interpreting phenological index data relating to that species (Table 7-12). Corrected phenological indices show that, for dabbling ducks such as the American Black Duck and green-winged Teal, the timing of the survey was too late. In contrast, for diving ducks such as the Ring-necked Duck and Common Goldeneye, the survey was done too early. This is because the timing of the survey was designed to fall between the optimal timing for dabbling and diving ducks.




**Infrastructures**

Main road (167)

Secondary or access road

Existing railway

Transmission line

**BlackRock Metals Project Components**

Local study area

Mine site

Proposed railway segment

**Waterfowl and Other Aquatic Species**

4 Surveyed plot

1 Unsurveyed plot

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**Sampling Plan Waterfowl and Other Aquatic Bird Species**

***Source :***

*CanVec, 1/50 000, RNCan, 2010*

*Mapping and inventory : GENIVAR*
*File :111-16127-00_EC_Ang_C7-5_FAV_sauvagine_130205.mxd*

Scale 1 : 110,000

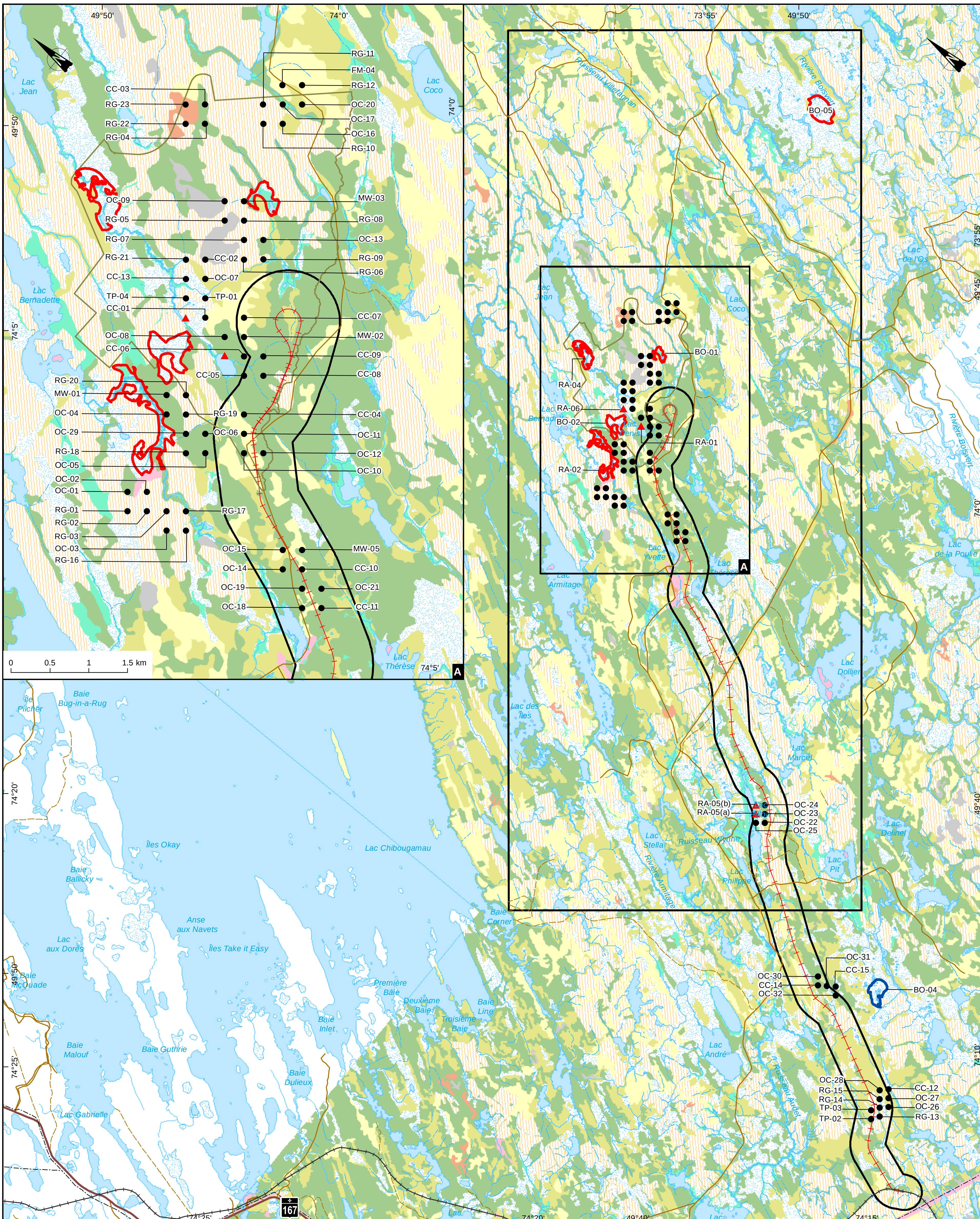
0 1.1 2.2 3.3 km

UTM, zone 18, NAD83
Contour interval : 20 m

**Figure 7-5**

**November 2012**

GENIVAR




**Infrastructures**

- Main road (167)
- Secondary or access road
- Existing railway
- Transmission line

**BlackRock Metals Project Components**

- Local study area
- Mine site
- Proposed railway segment

**Inventory**

CC-15 — Sequential number — Habitat — Sampling type

*Habitat*

| | |
|---|---|
| RG | Regenerating stand |
| MW | Mixed-wood stand |
| OC | Open conifer stand |
| CC | Closed conifer stand |
| TP | Treed peatland |
| BO | Bog |
| RA | Riparian area |

*Sampling, Fixed-radius*

- Point count (FRPC)
- Unlimited-distance point count (UDPC)
- Linear index of abundance (LIA)
- Complete census

**Vegetation**

*Ground Cover*

- Regenerating stand
- Hardwood stand
- Mixed-wood stand
- Open conifer stand
- Closed conifer stand
- Bare dry ground

*Wetland*

- Bog
- Swamp

*Other*

- Unproductive

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- Biological Environment Supplementary Studies -

**Sampling Plan**
**Land Birds and Shorebirds**

**Sources :**
*Système d'information écoforestière (SIEF), MRNF Québec, 2010*
*CanVec, 1/50 000, RNCan, 2010*

*Mapping and inventory : GENIVAR*
*File :111-16127-00_EC_Ang_C7-6_FAV_limicole_130205.mxd*

Scale 1 : 110,000
0 1.1 2.2 3.3 km
UTM, zone 18, NAD83

**Figure 7-6**

**November 2012**

GENIVAR

**Table 7-12: Phenological Indices for the Main Waterfowl Species Observed during the Breeding Pair Survey**

| Species | Correction Factor (CF) | Lone Males (LM) | Paired Males (PM) | Phenological Index (PI = PM/LM) | Corrected Phenological Index (PI x CF) |
|---|---|---|---|---|---|
| American Black Duck[1] | 0.83 | 11 | 6 | 0.55 | 0.55 |
| Green-winged Teal | 0.83 | 4 | 1 | 0.25 | 0.21 |
| Ring-necked Duck | 0.67 | 8 | 19 | 2.38 | 1.59 |
| Common Goldeneye | 0.67 | 6 | 18 | 3.00 | 2.01 |
| Bufflehead | 0.67 | 2 | 1 | 0.50 | 0.34 |
| Common Merganser | 0.56 | 3 | 5 | 1.67 | 0.93 |

[1] For the American Black Duck, the sex of lone individuals of undetermined sex was estimated according to a male to female sex ratio of 122:100 (lone males). Individuals of undetermined sex observed in pairs were also included in the calculation by treating them as part of a pair (paired males). Therefore, in such cases, the correction factor was not applied.

### Timing of Breeding

In the second survey, age classes were determined for 22 broods (Table 7-13). The age of one Bufflehead brood could not be determined because the ducklings kept diving. Species with the most broods observed were the Ring-necked Duck and Common Goldeneye.

**Table 7-13: Brood Counts by Species and Age Class from the Helicopter Survey Conducted on July 12 and 13, 2012**

| Species | Age Classes of Broods (Counts)[1] | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | IA[2] | IB[2] | IC[2] | IIA[2] | IIB[2] | IIC[2] | III[2] | |
| Canada Goose | - | - | - | - | - | 1 | 1 | 2 |
| American Black Duck | - | - | - | - | 1 | 2 | - | 3 |
| Green-winged Teal | - | - | - | 1 | - | - | - | 1 |
| Ring-necked Duck | 2 | 5 | 1 | 1 | - | - | - | 9 |
| Common Goldeneye | - | - | 3 | 2 | - | - | - | 5 |
| Bufflehead | - | - | - | 1 | - | - | - | 1 |
| Common Merganser | - | - | - | 1 | - | - | - | 1 |
| **Total** | **2** | **5** | **4** | **6** | **1** | **3** | **1** | **22** |

[1] According to Gollop and Marshall (1954).

[2] From Bellerose, 1980: IA: 1-7 days; IB: 8-13 days; IC: 14-18 days; IIA: 19-27 days; IIB: 28-36 days; IIC: 37-42 days; III: 43-55 days

Table 7-14 includes various figures relating to the timing of waterfowl breeding in the study area derived from the survey data, including the timing of egg-laying, the start of incubation and hatching. Not surprisingly, the species that bred earliest were the Canada Goose and American Black Duck, while those that bred the latest were the Bufflehead and Green-winged Teal. The optimal time to conduct a survey of breeding pairs to estimate the number of indicated pairs is when half of the females have begun incubating. Therefore, the May 19 and 20 survey was conducted after the start of incubation for early-breeding species (American Black Duck, Canada Goose), but before the start of incubation for late-breeding species (diving ducks).

**Table 7-14: Laying Onset, Incubation Onset and Hatching Dates for Waterfowl Species in the Study Area**

| Species | | Broods (counts) | Date (mm-day) | | |
|---|---|---|---|---|---|
| | | | Earliest | Average | Latest |
| Canada Goose | Laying onset | 2 | Apr 08 | Apr 14 | Apr 20 |
| | Incubation onset | | Apr 16 | Apr 22 | Apr 28 |
| | Hatching | | May 13 | May 19 | May 25 |
| American Black Duck | Laying onset | 3 | Apr 26 | Apr 29 | May 05 |
| | Incubation onset | | May 05 | May 08 | May 14 |
| | Hatching | | June 03 | June 06 | June 12 |
| Green-winged Teal | Laying onset | 1 | | May 24 | |
| | Incubation onset | | | June 02 | |
| | Hatching | | | June 24 | |
| Ring-necked Duck | Laying onset | 9 | May 17 | May 29 | June 04 |
| | Incubation onset | | May 26 | June 07 | June 13 |
| | Hatching | | June 21 | July 03 | July 09 |
| Common Goldeneye | Laying onset | 5 | May 05 | May 09 | May 12 |
| | Incubation onset | | May 20 | May 24 | May 27 |
| | Hatching | | June 19 | June 23 | June 26 |
| Bufflehead | Laying onset | 1 | | May 14 | |
| | Incubation onset | | | May 30 | |
| | Hatching | | | June 29 | |
| Common Merganser | Laying onset | 1 | | May 02 | |
| | Incubation onset | | | May 17 | |
| | Hatching | | | June 18 | |

### Abundance at the Time of the First Survey

More diving ducks were observed than dabbling ducks during the spring helicopter survey (Table 7-15), the most abundant species being Common Goldeneye and Ring-necked Duck. Canada Geese and American Black Ducks were also abundant.

**Table 7-15: Total Individuals Counted (by Sex and Age) in Survey Plots during the Breeding Pair Survey**

| Species | Individuals Observed | | | |
|---|---|---|---|---|
| | Male | Female | Ind. adults[1] | Total |
| Canada Goose | 15 | 15 | 5 | 35 |
| Mallard | 1 | 1 | - | 2 |
| American Black Duck | 5 | 5 | 20 | 30 |
| Northern Shoveler | 6 | 6 | - | 12 |
| Green-winged Teal | 6 | 1 | - | 7 |
| **Total (dabbling ducks)** | **18** | **13** | **20** | **51** |

| Species | Individuals Observed | | | |
|---|---|---|---|---|
| | Male | Female | Ind. Adults[1] | Total |
| Ring-necked Duck | 28 | 19 | - | 47 |
| Common Goldeneye | 28 | 20 | - | 48 |
| Common Merganser | 9 | 6 | - | 15 |
| Red-breasted Merganser | 1 | 1 | - | 2 |
| Bufflehead | 3 | 2 | - | 5 |
| **Total (diving ducks)** | **69** | **48** | **-** | **117** |
| **Total (waterfowl)** | **102** | **76** | **25** | **203** |
| Common Loon | 7 | 7 | 10 | 24 |

[1] Adult individuals for which the sex could not be determined.

During the survey, 18 ducks were counted opportunistically outside survey plots, in the course of moving between plots (Table 7-16). The presence of a pair of Hooded Mergansers, the only ones observed in the study area, was notable.

**Table 7-16: Total Individuals Counted (by Sex and Age) Outside Survey Plots during the Breeding Pair Survey**

| Species | Individuals Observed | | | |
|---|---|---|---|---|
| | Male | Female | Ind. Adults[1] | Total |
| Canada Goose | - | - | 2 | 2 |
| American Black Duck | 1 | 1 | - | 2 |
| Ring-necked Duck | 2 | 2 | - | 4 |
| Common Goldeneye | 2 | 2 | - | 4 |
| Hooded Merganser | 1 | 1 | - | 2 |

[1] Adult individuals for which the sex could not be determined.

Areal and linear densities of all individuals and of indicated pairs obtained from breeding pair survey data are presented in Table 7-17. In general, diving duck densities are higher than dabbling duck densities. However, the ratio of indicated pairs to total individuals counted is lower for diving ducks than for dabblers. For waterfowl as a whole, there are 16.9 indicated pairs/25 km², while for loons this number is of 3.4 IP/25 km². In comparison, an average density of 28.3 IP/25 km² was observed in the area of the future Peribonka River hydroelectric development, east of the study area (Tecsult 2003). Further north, in the area of the proposed Route 167 extension, the observed density was 23.4 IP/25 km² (Roche SNC-Lavalin Consortium 2010). For southern Quebec, the density recorded from 1990 to 2003 was 15.5 IP/25 km² (Bordage *et al.* 2003).

**Table 7-17: Areal Density (per 25 km²) and Linear Density (per 10 km of Shoreline) of Total Individuals and Indicated Pairs Observed in the Breeding Pair Survey**

| Species | Total Individuals | | | | Indicated Pairs | | | |
|---|---|---|---|---|---|---|---|---|
| | AD | | LD | | AD | | LD | |
| | Avg. | SD | Avg. | SD | Avg. | SD | Avg. | SD |
| Canada Goose | 5.5 | 1.1 | 1.5 | 1.0 | 3.2 | 1.4 | 1.0 | 1.2 |
| American Black Duck | 4.3 | 2.5 | 0.8 | 0.4 | 3.9 | 2.5 | 0.8 | 0.4 |
| Mallard | 0.3 | 0.8 | 0.1 | 0.1 | 0.1 | 0.4 | 0.0 | 0.1 |
| Northern Shoveler | 1.7 | 4.5 | 0.3 | 0.8 | 0.1 | 0.4 | 0.0 | 0.1 |
| Green-winged Teal | 1.0 | 1.8 | 0.2 | 0.3 | 1.0 | 1.8 | 0.2 | 0.3 |
| **Total (dabblers)** | **7.3** | **7.6** | **1.4** | **1.4** | **5.2** | **4.1** | **1.0** | **0.7** |
| Ring-necked Duck | 6.9 | 2.7 | 1.6 | 0.6 | 3.5 | 1.6 | 0.9 | 0.5 |
| Common Goldeneye | 6.9 | 5.4 | 1.4 | 1.2 | 3.3 | 2.8 | 0.7 | 0.5 |
| Bufflehead | 0.7 | 1.3 | 0.1 | 0.3 | 0.4 | 0.8 | 0.1 | 0.2 |
| Common Merganser | 2.1 | 2.9 | 0.4 | 0.6 | 1.1 | 1.9 | 0.2 | 0.4 |
| Red-breasted Merganser | 0.3 | 0.8 | 0.1 | 0.1 | 0.1 | 0.4 | 0.0 | 0.1 |
| **Total (divers)** | **16.9** | **9.5** | **3.7** | **1.8** | **8.5** | **5.7** | **1.9** | **1.0** |
| **Total (waterfowl)** | **29.7** | **10.2** | **6.6** | **0.8** | **16.9** | **6.4** | **3.9** | **1.0** |
| Common Loon | 3.4 | 3.4 | 0.7 | 0.6 | 3.4 | 3.4 | 0.7 | 0.6 |

### Abundance at the Time of the Second Survey

During the brood survey, 179 individuals belonging to nine species of waterfowl were counted in addition to the Common Loon (Table 7-18). Breeding was confirmed for seven species. Wood Ducks, which had not been seen during the first survey, were observed. However, these were probably males in moult migration, as this species breeds mainly in southern Quebec. Since mating and egg-laying take place early in the season, males often begin their northward moult migration after egg-laying has occurred.

**Table 7-18: Total Individuals Counted (by Sex and Age) during the Brood Survey**

| Species | Individuals Observed | | | | |
|---|---|---|---|---|---|
| | Male | Female | Ind. Adults[1] | Ducklings | Total |
| Canada Goose | 2 | 2 | 5 | 3 | 12 |
| American Black Duck | - | - | 28 | 7 | 35 |
| Wood Duck | 4 | - | - | - | 4 |
| Green-winged Teal | - | 1 | - | 0 | 1 |
| **Total (dabblers)** | **4** | **1** | **28** | **7** | **40** |
| Ring-necked Duck | 4 | 12 | - | 39 | 55 |
| Common Goldeneye | - | 15 | 1 | 20 | 36 |
| Bufflehead | - | 2 | - | 2 | 4 |
| Common Merganser | - | 7 | 1 | 7 | 15 |

| Species | Number of Individuals Observed | | | | |
|---|---|---|---|---|---|
| | Male | Female | Ind. Adults[1] | Ducklings | Total |
| Hooded Merganser | - | 2 | - | - | 2 |
| Diving duck sp. | - | - | 2 | - | 2 |
| **Total (divers)** | **4** | **38** | **4** | **68** | **114** |
| **Total (waterfowl)** | **10** | **48** | **38** | **78** | **166** |
| Common Loon | 2 | 2 | 8 | 1 | 13 |

[1] Adult individuals for which the sex could not be determined.

As in the breeding pair survey, diving ducks were more abundant than dabbling ducks in terms of total individuals counted, broodless adults and broods (Table 7-19). The most abundant species for total individuals counted were the Ring-necked Duck, Common Goldeneye and American Black Duck. However, most Black Ducks were broodless adults. In terms of broods, the most prolific species were the Ring-necked Duck and Common Goldeneye, with 1.3 and 0.7 broods/25 km², respectively.

**Table 7-19: Areal Density (per 25 km$^2$) and Linear Density (per 10 km of Shoreline) of Total Individuals, Broodless Pairs and Broods Observed in the Breeding Pair Survey**

| Species | Total Individuals | | | | Broodless Adults | | | | Broods | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AD | | LD | | AD | | LD | | AD | | LD | |
| | Avg. | SD | Avg. | SD | Avg. | SD | Avg. | SD | Avg. | SD | Avg. | SD |
| Canada Goose | 1.7 | 3.0 | 0.3 | 0.6 | 0.7 | 1.9 | 0.1 | 0.4 | 0.3 | 0.5 | 0.1 | 0.1 |
| American Black Duck | 5.0 | 4.9 | 1.0 | 1.0 | 3.9 | 4.3 | 0.8 | 0.9 | 0.4 | 0.5 | 0.1 | 0.1 |
| Wood Duck | 0.6 | 1.1 | 0.1 | 0.3 | 0.6 | 1.1 | 0.1 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| Green-winged Teal | 0.1 | 0.4 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.4 | 0.0 | 0.1 |
| **Total (dabblers)** | **6.0** | **4.4** | **1.2** | **0.9** | **4.7** | **4.0** | **1.0** | **0.8** | **0.6** | **0.5** | **0.1** | **0.1** |
| Ring-necked Duck | 7.9 | 6.4 | 1.6 | 1.2 | 1.1 | 2.0 | 0.2 | 0.4 | 1.3 | 1.0 | 0.3 | 0.2 |
| Common Goldeneye | 5.1 | 6.0 | 1.1 | 1.2 | 1.9 | 1.8 | 0.4 | 0.4 | 0.7 | 1.0 | 0.1 | 0.2 |
| Bufflehead | 0.6 | 1.5 | 0.1 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.8 | 0.1 | 0.2 |
| Common Merganser | 2.1 | 3.6 | 0.4 | 0.7 | 1.0 | 1.2 | 0.2 | 0.2 | 0.1 | 0.4 | 0.0 | 0.1 |
| Hooded Merganser | 0.3 | 0.5 | 0.1 | 0.1 | 0.3 | 0.5 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Diving duck sp. | 0.3 | 0.5 | 0.1 | 0.1 | 0.3 | 0.5 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total (divers)** | **16.0** | **13.4** | **3.2** | **2.7** | **4.3** | **3.0** | **0.9** | **0.6** | **2.4** | **2.0** | **0.5** | **0.4** |
| **Total (waterfowl)** | **23.7** | **16.8** | **4.8** | **3.4** | **9.7** | **6.3** | **2.0** | **1.2** | **3.3** | **2.1** | **0.7** | **0.4** |
| Common Loon | 1.9 | 2.1 | 0.4 | 0.4 | 1.4 | 2.1 | 0.3 | 0.4 | 0.1 | 0.4 | 0.0 | 0.1 |

The number of waterfowl broods in the Peribonka River area in 2002 ranged from 0.6 to 1.8 broods/10 km of shoreline (Tecsult 2003), which is slightly higher than in the railway study area. Brood densities ranged from 1.6 to 6.3 broods/25 km² for the same area (Tecsult 2003). In the present study, the Common Goldeneye and Ring-necked Duck broods were the largest, with an average of five ducklings per brood (Table 7-20).

**Table 7-20: Size of Observed Broods**

| Species | Broods | Ducklings/Brood | |
|---|---|---|---|
| | | Avg. | SD |
| Canada Goose | 1 | 3 | - |
| American Black Duck | 2 | 3.5 | 0.7 |
| Ring-necked Duck | 9 | 4.9 | 2.2 |
| Common Goldeneye | 4 | 5 | 3.9 |
| Bufflehead | 2 | 3.8 | 2.5 |
| Common Merganser | 1 | 7 | - |
| Common Loon | 1 | 1 | - |

### Brood/Pair Ratio

The ratio of broods observed in July to breeding pairs counted in May was calculated for three species (Table 7-21). This ratio provides an estimate of breeding success for a given species. The corrected brood/pair ratio for diving ducks is much higher than for dabbling ducks. Thus, 87% of Ring-necked Duck breeding pairs produced a brood, while for Common Goldeneye pairs, this ratio was 49%.

**Table 7-21: Brood/Pair Ratio for the Main Waterfowl Species (n ≥3 Broods)**

| Species | Sex Ratio (male:female) | Indicated Pairs (IP) | Corrected Indicated Pairs ($IP_c$)[1] | Broods | Broods/IP | |
|---|---|---|---|---|---|---|
| | | | | | IP | $IP_c$ |
| American Black Duck | 1.2 | 27.5 | 19.0 | 3 | 0.11 | 0.16 |
| Ring-necked Duck | 1.5 | 23.0 | 10.3 | 9 | 0.39 | 0.87 |
| Common Goldeneye | 1.5 | 23.0 | 10.3 | 5 | 0.22 | 0.49 |

[1] The number of corrected Indicated Pairs is the number of Indicated Pairs divided by the sex ratio.

### Habitat Use

During the breeding pair survey, the most-used habitats were lakes smaller than 10 ha and 10-100 ha lakes (Table 7-22). In contrast, few birds were observed in pools and streams. Canada Geese were mainly observed in peatlands, while Common Loons were mainly observed in large lakes.

**Table 7-22: Distribution of Observed Indicated Pairs by Habitat Type**

| Species | Pool | Lake | | | Brook | River | Peatland |
|---|---|---|---|---|---|---|---|
| | | <10 ha | 10-100 ha | 100-500 ha | | | |
| Canada Goose | - | 5 | 2 | - | 4 | - | 8 |
| American Black Duck | 1 | 7 | 14 | - | 2 | 1 | 2.5 |
| Mallard | - | - | - | - | 1 | - | - |
| Northern Shoveler | - | - | 1 | - | - | - | - |
| Green-winged Teal | 2 | - | 2 | - | 2 | - | 1 |
| Ring-necked Duck | 1 | 11 | 6 | - | 2 | - | 3 |
| Common Goldeneye | - | 10 | 8 | 2 | 3 | - | - |
| Bufflehead | - | 1 | 1 | - | 1 | - | - |
| Common Merganser | - | - | 3 | 2 | 3 | - | - |
| Hooded Merganser | - | - | - | - | - | - | - |
| Red-breasted Merganser | - | - | - | 1 | - | - | - |
| **Total waterfowl** | **4** | **34** | **37** | **5** | **18** | **1** | **14.5** |
| Common Loon | - | 2 | 16 | 4 | - | - | 2 |

Brood distribution as a function of habitat was roughly similar to that of breeding pairs (Table 7-23). However, few Ring-necked Duck and Common Goldeneye broods were observed in lakes smaller than 10 ha compared to the high number of breeding pairs observed in such lakes in May.

**Table 7-23: Distribution of Observed Broods by Habitat Type**

| Species | Pool | Lake | | | Brook | River | Peatland |
|---|---|---|---|---|---|---|---|
| | | <10 ha | 10-100 ha | 100-500 ha | | | |
| Canada Goose | - | 1 | - | - | 1 | - | - |
| American Black Duck | - | 1 | 1 | - | - | - | 1 |
| Green-winged Teal | - | - | - | - | - | 1 | - |
| Ring-necked Duck | 2 | 1 | 4 | - | 2 | - | - |
| Common Goldeneye | - | 1 | 2 | - | - | 1 | 1 |
| Bufflehead | - | 1 | - | - | 1 | - | - |
| Common Merganser | - | 1 | - | - | - | - | - |
| **Total waterfowl** | **2** | **6** | **7** | **-** | **4** | **2** | **2** |
| Common Loon | - | - | - | 1 | - | - | - |

For adults without broods, the most commonly used habitat consisted of 10-100 ha lakes (Table 7-24). Over half of the birds counted in this habitat were American Black Ducks. Many of the broodless adults observed may have been moulting individuals.

**Table 7-24: Distribution of Observed Broodless Adults by Habitat Type**

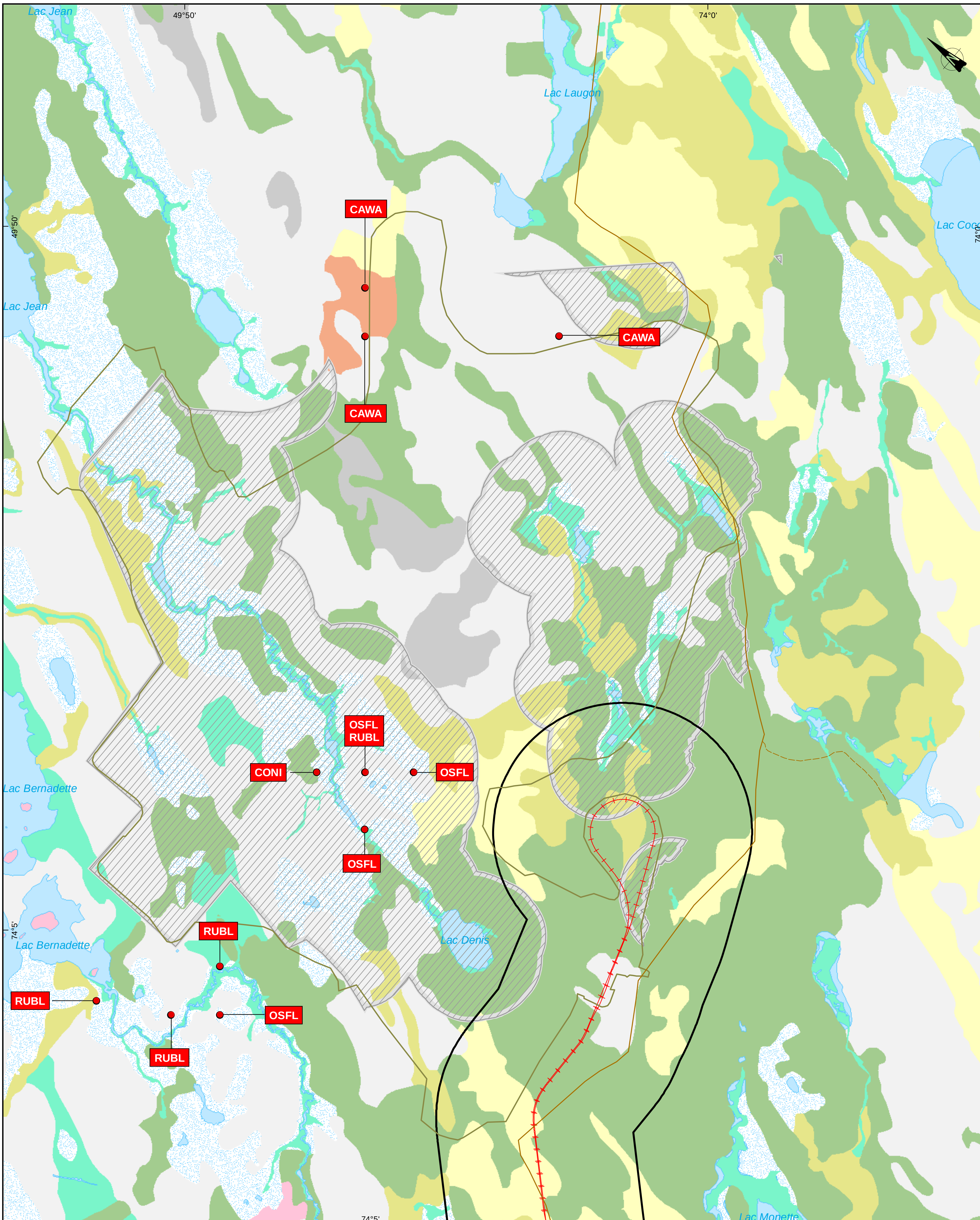
| Species | Pool | Lake | | | Brook | River | Peatland |
|---|---|---|---|---|---|---|---|
| | | <10 ha | 10-100 ha | 100-500 ha | | | |
| Canada Goose | - | - | 5 | - | - | - | - |
| American Black Duck | 2 | 1 | 23 | - | - | - | 1 |
| Wood Duck | - | 2 | 1 | - | 1 | - | - |
| Ring-necked Duck | 2 | - | 3 | - | 3 | - | - |
| Common Goldeneye | - | 2 | 6 | - | 1 | 1 | 3 |
| Common Merganser | - | 4 | 3 | - | - | - | - |
| Hooded Merganser | - | 1 | - | - | - | 1 | - |
| Diving duck sp. | 1 | 1 | - | - | - | - | - |
| **Total waterfowl** | **5** | **11** | **41** | **-** | **5** | **2** | **4** |
| Common Loon | - | 2 | 8 | - | - | - | - |

**Other Aquatic Bird Species**

During the various surveys conducted, three other species of aquatic birds (excluding shorebirds) were observed in the study area, namely the Herring Gull, Great Blue Heron and Belted Kingfisher. A total of five Herring Gulls were counted, including one pair with nest (Figures 7-7 and 7-8). As for Great Blue Herons, a heronry was found on an island in Lac Dollier which contained 15 nests with chicks. These nests were set atop white birches. In addition, three Belted Kingfishers were seen or heard near bodies of water.

### 7.1.4.2 Birds of Prey and Common Raven

Seven species of birds of prey were observed during the surveys in addition to ravens (Table 7-25). At least 16 breeding pairs were identified in the railway study area, along with two raven pairs. The most common species by far was the American Kestrel, with seven breeding pairs. The presence of several logged areas, which provide hunting habitats (regenerating areas) and nesting habitats (snags), likely accounts for the large number of kestrels. One adult Bald Eagle was observed near Lac Stella, while a 3- or 4-year-old individual was observed twice at Lac Jean and Lac Armitage (Figure 7-9). An inactive bird of prey nest was found near the proposed railway corridor. It could be an old Osprey nest, and an adult Osprey in flight was in fact sighted a few kilometres from this nest.




**Infrastructures**

- Main road (167)
- Secondary or access road
- Existing railway
- Transmission line

**BlackRock Metals Project Components**

- Local study area
- Mine site
- Proposed railway segment

**Survey**

- Potential habitat
- OSFL — Acronym
- Point count station

*Acronym*

| | |
|---|---|
| CONI | Common Nighthawk |
| OSFL | Olive-sided Flycatcher |
| CAWA | Canada Warbler |
| RUBL | Rusty Blackbird |

**Vegetation**

*Ground Cover*

- Regenerating stand
- Hardwood stand
- Mixed-wood stand
- Open conifer stand
- Closed conifer stand
- Bare dry ground

*Wetland*

- Bog
- Swamp

*Other*

- Unproductive

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Project to Build a New Rail Segment
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- Biological Environment Supplementary Studies -

## Habitat Use of Land Birds at Risk
## - Mine Area -

**Sources :**
*Système d'information écoforestière (SIEF), MRNF Québec, 2010*
*CanVec, 1/50 000, RNCan, 2010*

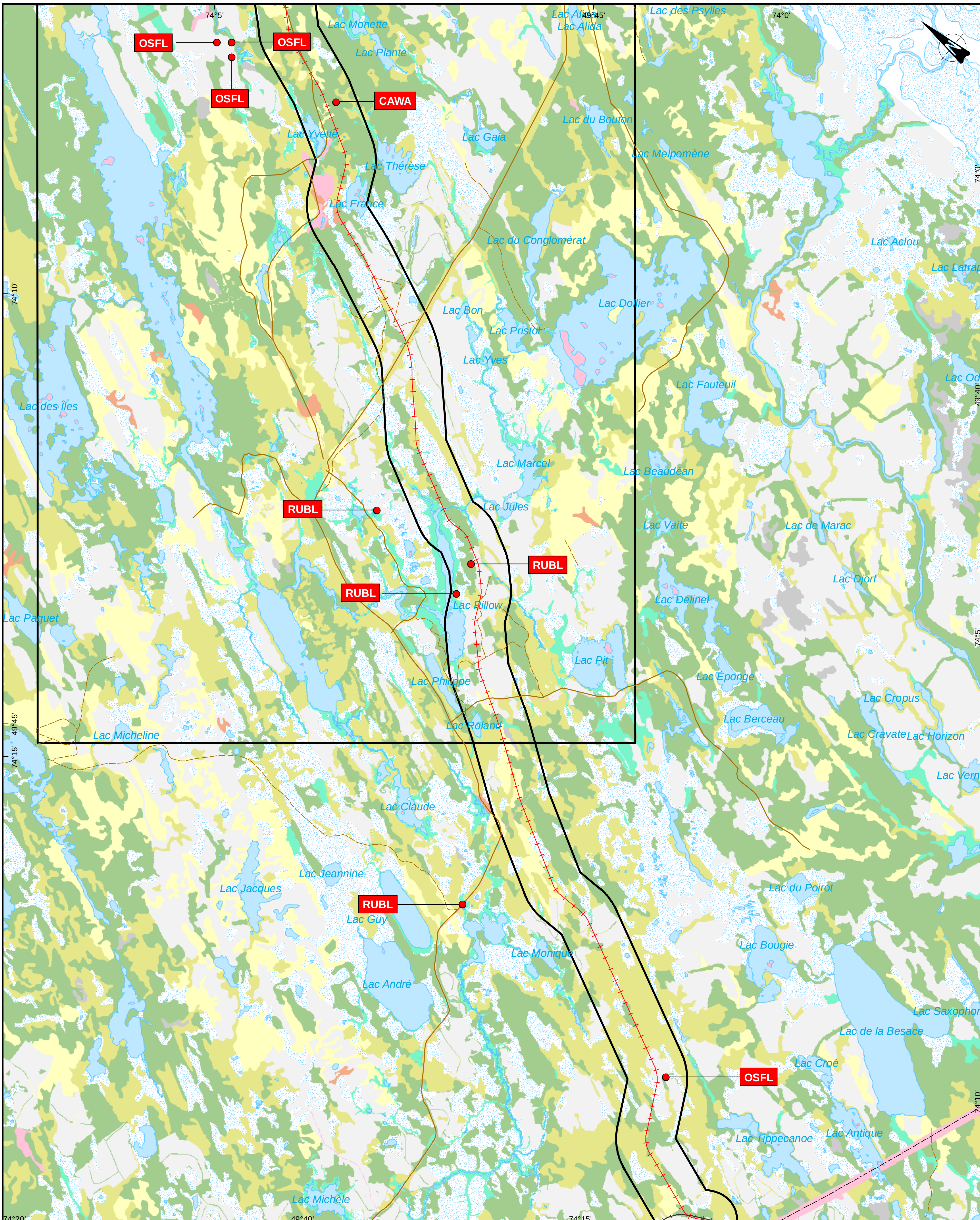
*Mapping and inventory : GENIVAR*
*File :111-16127-00_EC_Ang_C7-7_FAV_hab_oiseau_ter_mine_130205.mxd*

Scale 1 : 20,000
0 200 400 600 m
UTM, zone 18, NAD83

**Figure 7-7**

**November 2012**

GENIVAR




**Infrastructures**

Main road (167)

Secondary or access road

Existing railway

Transmission line

**BlackRock Metals Project Components**

Local study area

Mine site

Proposed railway segment

**Survey**

OSFL — Acronym

Point count station

*Acronym*

| | |
|---|---|
| CONI | Common Nighthawk |
| OSFL | Olive-sided Flycatcher |
| CAWA | Canada Warbler |
| RUBL | Rusty Blackbird |

**Vegetation**

*Ground Cover*

Regenerating stand

Hardwood stand

Mixed-wood stand

Open conifer stand

Closed conifer stand

Bare dry ground

*Wetland*

Bog

Swamp

*Other*

Unproductive

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- Biological Environment Supplementary Studies -

## Habitat Use of Land Birds at Risk
## - Railway Area -

*Sources :*
*Système d'information écoforestière (SIEF), MRNF Québec, 2010*
*CanVec, 1/50 000, RNCan, 2010*

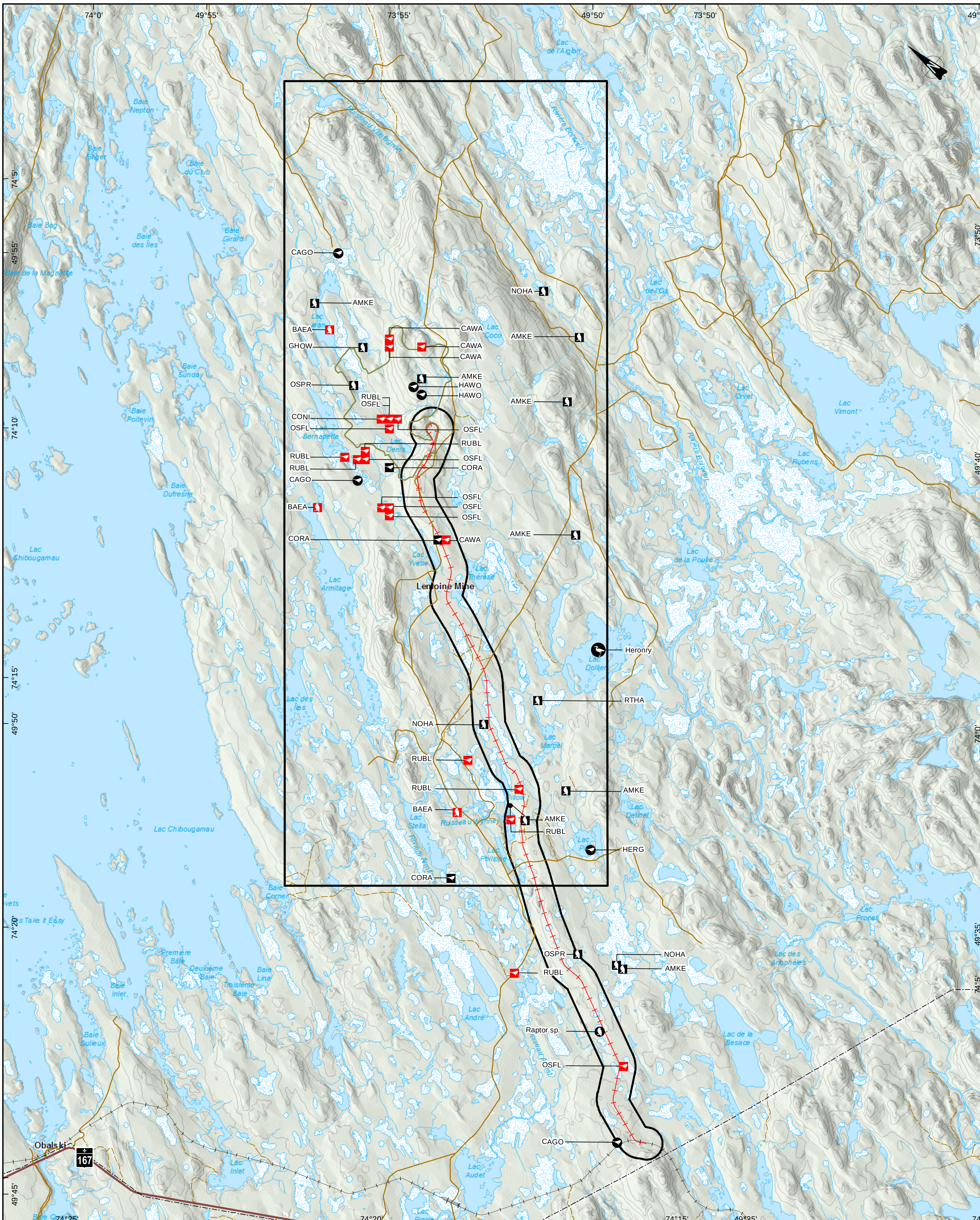
*Mapping and inventory : GENIVAR*
*File :111-16127-00_EC_Ang_C7-8_FAV_hab_oiseau_ter_ChFer_130205.mxd*

Scale 1 : 65,000
0 650 1,300 1,950 m
UTM, zone 18, NAD83

**Figure 7-8**

**November 2012**

GENIVAR




Infrastructures

Main road (167)

Secondary or access road

Existing railway

Transmission line

BlackRock Metals Project Components

Local study area

Mise site

Proposed railway segment

Survey

RUBL — Acronym: species

Pictogram: group

Shape: type of observation

Color: status

Group

Bird of prey

Other species

Heronry

Type of observation

Individual

Nest

Status

At-risk species

*Acronyms*

| | |
|---|---|
| OSPR | Osprey |
| CAGO | Canada Goose |
| NOHA | Northern Harrier |
| RTHA | Red-tailed Hawk |
| AMKE | American Kestrel |
| CONI | Common Nighthawk |
| SSHA | Sharp-shinned Hawk |
| HERG | Herring Gull |
| CORA | Common Raven |
| GHOW | Great Horned Owl |
| OSFL | Olive-sided Flycatcher |
| CAWA | Canada Warbler |
| HAWO | Hairy Woodpecker |
| BAEA | Bald Eagle |
| RUBL | Rusty Blackbird |

BLACKROCKMETALS

Project to Build a New Rail Segment
for the BlackRock Metals Inc. Mining Project
- Biological Environment Supplementary Studies -

**Nest Locations and Records of Species at Risk and of Birds of Prey**

**Source :**
*CanVec, 1/50 000, RNCan, 2010*

*Mapping and inventory : GENIVAR*
*File : 111-16127-00_EC_Ang_C7-9_FAV_oiseau_proie_130205.mxd*

Scale 1 : 110,000

0 1.1 2.2 3.3 km

UTM, zone 18, NAD83
Contour interval : 20 m

**Figure 7-9**

**November 2012**

GENIVAR

**Table 7-25: Adult Birds of Prey and Common Ravens Observed During the Breeding Period and Estimated Number of Breeding Pairs**

| Species | Adults | Pairs | Unoccupied Sites | Occupied Sites | Breeding Pairs | | |
|---|---|---|---|---|---|---|---|
| | | | | | Confirmed | Potential | Total |
| Osprey | 2 | - | - | - | - | 2 | **2** |
| Bald Eagle | 1 | - | - | - | - | 1 | **1** |
| Red-tailed Hawk | 1 | - | - | - | - | 1 | **1** |
| Northern Harrier | 3 | - | - | - | - | 3 | **3** |
| Sharp-shinned Hawk | 1 | - | - | - | - | 1 | **1** |
| American Kestrel | 8 | - | - | - | - | 7 | **7** |
| Great Horned Owl | 1 | - | - | - | - | 1 | **1** |
| Raptor sp. | - | - | 1 | - | - | - | **-** |
| **Total** | **17** | **-** | **1** | **-** | **-** | **16** | **16** |
| Common Raven | 3 | - | - | - | - | 2 | **2** |

### 7.1.4.3 Land Birds

**Richness and Total Abundance**

A total of 54 terrestrial bird species were observed during surveys conducted in June 2012, including four at-risk species: the Common Nighthawk, the Olive-sided Flycatcher, the Canada Warbler and the Rusty Blackbird.

The most abundant species overall are the White-throated Sparrow (21.3% of indicated pairs), Nashville Warbler (9.6%), Ruby-crowned Kinglet (9.6%), Yellow-rumped Warbler (5.7%), Swainson's Thrush (5.4%), Magnolia Warbler (5.1%) and Dark-eyed Junco (4.4%).

**Richness and Abundance by Habitat Type**

The main habitats in the study area were identified based on vegetation composition and structure. Habitats where listening surveys were conducted were grouped into five classes: open conifer stands, closed conifer stands, mixed-wood stands, regenerating forest and treed peatlands. The data relating to survey conditions at listening stations and surrounding habitats is presented (GENIVAR 2012).

The richest habitat consists of open conifer stands, with a total of 43 species counted (Table 7-26). This is followed by regenerating stands (38 species), open conifer stands (33 species), treed peatlands (21 species) and mixed-wood stands (20 species).

Species rank in roughly the same order in terms of diversity (which takes into account the abundance of each species).

**Table 7-26: Species Richness and Diversity Index for Each Habitat Type**

| Habitat | FRPC | | | | | | UDPC | | |
|---|---|---|---|---|---|---|---|---|---|
| | Species Richness | | | Diversity[1] | | | Species Richness | | |
| | Avg. | SD | Cumulative | *H* | $H_{max}$ | *J* | Avg. | SD | Cumulative |
| Open conifer | 5,72 | 1,55 | 41,00 | 2,95 | 3,71 | 0,79 | 8,28 | 2,33 | 43,00 |
| Closed conifer | 5,40 | 1,72 | 22,00 | 2,82 | 3,09 | 0,91 | 8,40 | 2,82 | 33,00 |
| Mixed-wood | 6,25 | 2,22 | 14,00 | 2,47 | 2,64 | 0,94 | 9,50 | 0,58 | 20,00 |
| Regenerating stands | 4,39 | 2,55 | 29,00 | 2,92 | 3,37 | 0,87 | 8,22 | 3,52 | 38,00 |
| Peatlands | 6,25 | 0,96 | 14,00 | 2,32 | 2,64 | 0,88 | 10,75 | 2,99 | 21,00 |

[1]*H:* Shannon diversity index; $H_{max}$: maximum diversity; *J*: regularity coefficient.

### 7.1.4.4 Habitat Use

The White-throated Sparrow was the most frequently observed species across all habitat types. It is also the most abundant species in the study area. Several other species were also commonly observed (i.e. ≥ 25% of stations) both in conifer and mixed-wood stands. These include the Nashville Warbler, Magnolia Warbler, Yellow-rumped Warbler, Ruby-crowned Kinglet, Golden-crowned Kinglet and Dark-eyed Junco.

**Open Conifer Stands**

The four most common (≥ 40% of stations) and most abundant species in open conifer stands (Table 7-27) are the White-throated Sparrow (0.73 IP/ha), Nashville Warbler (0.66 IP/ha), Ruby-crowned Kinglet (0.63 IP/ha) and Yellow-rumped Warbler (0.50 IP/ha). Three other species, the Magnolia Warbler (0.21 IP/ha), Dark-eyed Junco (0.17 IP/ha) and Golden-crowned Kinglet (0.19 IP/ha), were observed at more than 25% of stations.

In addition, some species found in open conifer stands are absent from denser stands. These include the Cedar Waxwing and American Robin. The Red-breasted Nuthatch is also more common and more abundant in open stands than in closed stands.

**Table 7-27: Constancy, Density and Unlimited-Distance Point Counts (UDPC) for Forest Birds in Open Conifer Habitats**

| Species | Open Conifer Habitats (n = 32) | | | | |
|---|---|---|---|---|---|
| | Constancy | FRPC (IP/ha) | | UDPC (IP) | |
| | | Avg. | SD | Avg. | SD |
| White-throated Sparrow | 0.78 | 0.73 | 0.56 | 2.75 | 2.00 |
| Nashville Warbler | 0.66 | 0.60 | 0.57 | 1.69 | 1.45 |
| Ruby-crowned Kinglet | 0.63 | 0.44 | 0.42 | 1.53 | 1.02 |
| Yellow-rumped Warbler | 0.50 | 0.37 | 0.42 | 0.88 | 0.91 |
| Magnolia Warbler | 0.31 | 0.21 | 0.34 | 0.63 | 0.75 |
| Golden-crowned Kinglet | 0.28 | 0.19 | 0.34 | 0.44 | 0.67 |

| Species | Open Conifer Habitats (n = 32) | | | | |
|---|---|---|---|---|---|
| | Constancy | FRPC (IP/ha) | | UDPC (IP) | |
| | | Avg. | SD | Avg. | SD |
| Dark-eyed Junco | 0.28 | 0.17 | 0.30 | 0.45 | 0.84 |
| Swainson's Thrush | 0.16 | 0.11 | 0.27 | 0.66 | 0.90 |
| Common Yellowthroat | 0.16 | 0.09 | 0.21 | 0.28 | 0.46 |
| Red-breasted Nuthatch | 0.19 | 0.08 | 0.18 | 0.17 | 0.35 |
| Cedar Waxwing | 0.09 | 0.06 | 0.20 | 0.11 | 0.35 |
| Gray Jay | 0.16 | 0.06 | 0.16 | 0.11 | 0.28 |
| Alder Flycatcher | 0.09 | 0.05 | 0.17 | 0.25 | 0.44 |
| Yellow-bellied Flycatcher | 0.09 | 0.05 | 0.17 | 0.19 | 0.40 |
| American Redstart | 0.09 | 0.05 | 0.17 | 0.16 | 0.37 |
| American Robin | 0.09 | 0.05 | 0.17 | 0.13 | 0.34 |
| Blue-headed Vireo | 0.09 | 0.05 | 0.17 | 0.13 | 0.34 |
| Hermit Thrush | 0.06 | 0.04 | 0.14 | 0.27 | 0.44 |
| Winter Wren | 0.06 | 0.04 | 0.14 | 0.25 | 0.44 |
| Red-eyed Vireo | 0.06 | 0.04 | 0.14 | 0.16 | 0.57 |
| Lincoln's Sparrow | 0.06 | 0.04 | 0.14 | 0.13 | 0.34 |
| Palm Warbler | 0.06 | 0.04 | 0.14 | 0.13 | 0.34 |
| Least Flycatcher | 0.03 | 0.04 | 0.20 | 0.06 | 0.35 |
| Yellow Warbler | 0.03 | 0.04 | 0.20 | 0.06 | 0.35 |
| Black-and-white Warbler | 0.06 | 0.04 | 0.14 | 0.06 | 0.25 |
| Tennessee Warbler | 0.03 | 0.04 | 0.20 | 0.06 | 0.35 |
| Bay-breasted Warbler | 0.06 | 0.04 | 0.14 | 0.06 | 0.25 |
| Philadelphia Vireo | 0.06 | 0.04 | 0.14 | 0.06 | 0.25 |
| Northern Flicker | 0.06 | 0.03 | 0.11 | 0.09 | 0.27 |
| **Rusty Blackbird** | **0.06** | **0.03** | **0.11** | **0.05** | **0.20** |
| **Olive-sided Flycatcher** | **0.03** | **0.02** | **0.10** | **0.13** | **0.42** |
| Wilson's Warbler | 0.03 | 0.02 | 0.10 | 0.13 | 0.42 |
| Brown Creeper | 0.03 | 0.02 | 0.10 | 0.06 | 0.25 |
| Black-throated Green Warbler | 0.03 | 0.02 | 0.10 | 0.06 | 0.25 |
| Yellow-bellied Sapsucker | 0.03 | 0.02 | 0.10 | 0.06 | 0.25 |
| Swamp Sparrow | 0.03 | 0.02 | 0.10 | 0.03 | 0.18 |
| Hairy Woodpecker | 0.03 | 0.02 | 0.10 | 0.03 | 0.18 |
| Black-backed Woodpecker | 0.03 | 0.02 | 0.10 | 0.03 | 0.18 |
| American Three-toed Woodpecker | 0.03 | 0.02 | 0.10 | 0.03 | 0.18 |
| Pine Siskin | 0.03 | 0.02 | 0.10 | 0.03 | 0.18 |
| Black-capped Chickadee | 0.03 | 0.01 | 0.05 | 0.02 | 0.09 |
| Purple Finch | 0.00 | 0.00 | 0.00 | 0.09 | 0.39 |

**Closed Conifer Stands**

The eight species most commonly observed and most abundant in closed conifer stands (Table 7-28) are the same as in open conifer stands, namely the White-throated Sparrow (0.53 IP/ha), Yellow-rumped Warbler (0.38 IP/ha), Nashville Warbler (0.30 IP/ha), Golden-crowned Kinglet (0.30 IP/ha), Swainson's Thrush

(0.23 IP/ha), Ruby-crowned Kinglet (0.23 IP/ha), Magnolia Warbler (0.23 IP/ha) and Dark-eyed Junco (0.23 IP/ha).

Other species more typical of forest settings are more commonly observed in closed stands, where they are also more abundant than in open stands. These include the Hermit Thrush, Winter Wren, Yellow-bellied Flycatcher, Blue-headed Vireo, Brown Creeper and Gray Jay.

**Table 7-28: Constancy, Density and Unlimited-Distance Point Counts for Forest Birds in Closed Conifer Habitats**

| Species | Closed Conifer Habitats (n = 15) | | | | |
|---|---|---|---|---|---|
| | Constancy | FRPC (IP/ha) | | UDPC (IP) | |
| | | Avg. | SD | Avg. | SD |
| White-throated Sparrow | 0.53 | 0.53 | 0.66 | 1.60 | 1.40 |
| Yellow-rumped Warbler | 0.53 | 0.38 | 0.41 | 1.00 | 1.13 |
| Nashville Warbler | 0.53 | 0.30 | 0.29 | 1.20 | 1.08 |
| Golden-crowned Kinglet | 0.40 | 0.30 | 0.42 | 0.60 | 0.74 |
| Swainson's Thrush | 0.40 | 0.23 | 0.29 | 0.87 | 0.74 |
| Ruby-crowned Kinglet | 0.33 | 0.23 | 0.36 | 0.73 | 0.80 |
| Dark-eyed Junco | 0.33 | 0.23 | 0.36 | 0.60 | 0.91 |
| Magnolia Warbler | 0.33 | 0.23 | 0.36 | 0.53 | 0.74 |
| Hermit Thrush | 0.20 | 0.15 | 0.34 | 0.60 | 0.91 |
| Winter Wren | 0.20 | 0.11 | 0.23 | 0.73 | 0.59 |
| Yellow-bellied Flycatcher | 0.20 | 0.11 | 0.23 | 0.27 | 0.46 |
| Blue-headed Vireo | 0.20 | 0.11 | 0.23 | 0.27 | 0.46 |
| Brown Creeper | 0.20 | 0.11 | 0.23 | 0.20 | 0.41 |
| Gray Jay | 0.27 | 0.11 | 0.21 | 0.20 | 0.37 |
| Common Yellowthroat | 0.13 | 0.08 | 0.20 | 0.47 | 0.92 |
| American Redstart | 0.13 | 0.08 | 0.20 | 0.20 | 0.41 |
| Black-throated Green Warbler | 0.07 | 0.08 | 0.29 | 0.13 | 0.52 |
| Boreal Chickadee | 0.13 | 0.06 | 0.16 | 0.10 | 0.28 |
| Red-breasted Nuthatch | 0.07 | 0.04 | 0.15 | 0.20 | 0.41 |
| Palm Warbler | 0.07 | 0.04 | 0.15 | 0.13 | 0.52 |
| White-winged Crossbill | 0.07 | 0.04 | 0.15 | 0.07 | 0.26 |
| Wilson's Warbler | 0.07 | 0.04 | 0.15 | 0.07 | 0.26 |
| Alder Flycatcher | 0.00 | 0.00 | 0.00 | 0.20 | 0.56 |
| American Robin | 0.00 | 0.00 | 0.00 | 0.07 | 0.26 |
| **Olive-sided Flycatcher** | **0.00** | **0.00** | **0.00** | **0.07** | **0.26** |
| Least Flycatcher | 0.00 | 0.00 | 0.00 | 0.07 | 0.26 |
| Blackburnian Warbler | 0.00 | 0.00 | 0.00 | 0.07 | 0.26 |
| Tennessee Warbler | 0.00 | 0.00 | 0.00 | 0.07 | 0.26 |
| Northern Waterthrush | 0.00 | 0.00 | 0.00 | 0.07 | 0.26 |
| Yellow-bellied Sapsucker | 0.00 | 0.00 | 0.00 | 0.07 | 0.26 |
| Red-eyed Vireo | 0.00 | 0.00 | 0.00 | 0.07 | 0.26 |
| Northern Flicker | 0.00 | 0.00 | 0.00 | 0.03 | 0.13 |

### Mixed-Wood Stands

Aside from the American Redstart (constancy: 75%; abundance: 0.42 IP/ha) and Common Yellowthroat (constancy: 50%; abundance: 0.28 IP/ha), the same species of passerine birds are generally found in mixed-wood stands as in conifer stands (e.g. Nashville Warbler, Magnolia Warbler, Yellow-rumped Warbler and both kinglet species, Table 7-29). Note that only four stations were set up in this habitat type, which generally consisted of smaller stands often found at the edge of more conifer-rich habitats.

**Table 7-29: Constancy, Density and Unlimited-Distance Point Counts for Forest Birds in Mixed-Wood Stands**

| Species | Mixed-Wood Stands (n = 4) | | | | |
|---|---|---|---|---|---|
| | Constancy | FRPC (IP/ha) | | UDPC (IP) | |
| | | Avg. | SD | Avg. | SD |
| White-throated Sparrow | 0.50 | 0.71 | 0.85 | 3.75 | 1.26 |
| Nashville Warbler | 0.75 | 0.42 | 0.28 | 1.75 | 0.50 |
| Ruby-crowned Kinglet | 0.50 | 0.42 | 0.54 | 1.50 | 0.58 |
| Golden-crowned Kinglet | 0.50 | 0.42 | 0.54 | 0.75 | 0.96 |
| Magnolia Warbler | 0.75 | 0.42 | 0.28 | 0.75 | 0.50 |
| American Redstart | 0.75 | 0.42 | 0.28 | 0.75 | 0.50 |
| Yellow-rumped Warbler | 0.50 | 0.28 | 0.33 | 0.50 | 0.58 |
| Common Yellowthroat | 0.50 | 0.28 | 0.33 | 0.50 | 0.58 |
| Yellow-bellied Flycatcher | 0.25 | 0.14 | 0.28 | 0.50 | 1.00 |
| Alder Flycatcher | 0.25 | 0.14 | 0.28 | 0.25 | 0.50 |
| American Robin | 0.25 | 0.14 | 0.28 | 0.25 | 0.50 |
| Red-eyed Vireo | 0.25 | 0.14 | 0.28 | 0.25 | 0.50 |
| Philadelphia Vireo | 0.25 | 0.14 | 0.28 | 0.25 | 0.50 |
| Boreal Chickadee | 0.25 | 0.07 | 0.14 | 0.13 | 0.25 |
| Dark-eyed Junco | 0.00 | 0.00 | 0.00 | 0.75 | 0.50 |
| Swainson’s Thrush | 0.00 | 0.00 | 0.00 | 0.50 | 1.00 |
| Hermit Thrush | 0.00 | 0.00 | 0.00 | 0.25 | 0.50 |
| Winter Wren | 0.00 | 0.00 | 0.00 | 0.25 | 0.50 |
| Palm Warbler | 0.00 | 0.00 | 0.00 | 0.25 | 0.50 |
| Least Flycatcher | 0.00 | 0.00 | 0.00 | 0.25 | 0.50 |

### Regenerating Stands

The most abundant species is the White-throated Sparrow (0.66 IP/ha), followed by the Dark-eyed Junco (0.27 IP/ha), Ruby-crowned Kinglet (0.21 IP/ha) and Magnolia Warbler (0.20 IP/ha; Table 7-30). Three of the most common and abundant species in regenerating areas are associated with the presence of water in younger and more open habitats, namely the Alder Flycatcher, Common Yellowthroat and Palm Warbler. The presence of Olive-sided Flycatchers is also noteworthy, as this species was observed at 17% of stations (all near water).

In regenerating stands, the most common and abundant land birds are Dark-eyed Juncos (constancy: 43%; density: 0.27 IP/ha) and Wilson's Warblers (constancy: 13%; density: 0.10 IP/ha).

**Table 7-30: Constancy, Density and Unlimited-Distance Point Counts for Forest Birds in Regenerating Stands**

| Species | Regenerating Stands (n = 23) | | | | |
|---|---|---|---|---|---|
| | Constancy | FRPC (IP/ha) | | UDPC (IP) | |
| | | Avg. | SD | Avg. | SD |
| White-throated Sparrow | 0.70 | 0.66 | 0.56 | 3.04 | 1.77 |
| Dark-eyed Junco | 0.43 | 0.27 | 0.34 | 0.70 | 0.56 |
| Ruby-crowned Kinglet | 0.30 | 0.21 | 0.34 | 1.07 | 0.77 |
| Magnolia Warbler | 0.30 | 0.20 | 0.32 | 0.70 | 0.88 |
| Alder Flycatcher | 0.26 | 0.17 | 0.32 | 0.61 | 0.84 |
| Common Yellowthroat | 0.30 | 0.17 | 0.27 | 0.57 | 0.79 |
| Palm Warbler | 0.17 | 0.15 | 0.35 | 0.35 | 0.71 |
| Nashville Warbler | 0.17 | 0.12 | 0.29 | 0.52 | 0.85 |
| Yellow-rumped Warbler | 0.13 | 0.12 | 0.38 | 0.48 | 0.90 |
| Wilson’s Warbler | 0.13 | 0.10 | 0.28 | 0.30 | 0.56 |
| **Olive-sided Flycatcher** | **0.17** | **0.10** | **0.22** | **0.30** | **0.63** |
| Yellow-bellied Flycatcher | 0.13 | 0.07 | 0.19 | 0.30 | 0.56 |
| Lincoln’s Sparrow | 0.13 | 0.07 | 0.19 | 0.22 | 0.52 |
| Red-breasted Nuthatch | 0.13 | 0.06 | 0.17 | 0.13 | 0.31 |
| Cedar Waxwing | 0.09 | 0.06 | 0.24 | 0.11 | 0.43 |
| Winter Wren | 0.09 | 0.05 | 0.16 | 0.26 | 0.45 |
| Red-eyed Vireo | 0.09 | 0.05 | 0.16 | 0.13 | 0.34 |
| Philadelphia Vireo | 0.04 | 0.05 | 0.24 | 0.09 | 0.42 |
| **Canada Warbler** | **0.09** | **0.05** | **0.16** | **0.09** | **0.29** |
| Black-and-white Warbler | 0.09 | 0.05 | 0.16 | 0.09 | 0.29 |
| Swainson’s Thrush | 0.04 | 0.02 | 0.12 | 0.65 | 0.83 |
| Hermit Thrush | 0.04 | 0.02 | 0.12 | 0.39 | 0.58 |
| American Redstart | 0.04 | 0.02 | 0.12 | 0.13 | 0.34 |
| Northern Flicker | 0.09 | 0.02 | 0.08 | 0.13 | 0.27 |
| Gray Jay | 0.04 | 0.02 | 0.12 | 0.07 | 0.23 |
| Hairy Woodpecker | 0.04 | 0.02 | 0.12 | 0.04 | 0.21 |
| Purple Finch | 0.04 | 0.02 | 0.12 | 0.04 | 0.21 |
| Yellow-bellied Sapsucker | 0.04 | 0.01 | 0.06 | 0.07 | 0.23 |
| Least Flycatcher | 0.00 | 0.00 | 0.00 | 0.09 | 0.42 |
| Swamp Sparrow | 0.00 | 0.00 | 0.00 | 0.09 | 0.29 |
| Blue-headed Vireo | 0.00 | 0.00 | 0.00 | 0.04 | 0.21 |
| Tennessee Warbler | 0.00 | 0.00 | 0.00 | 0.04 | 0.21 |
| Northern Waterthrush | 0.00 | 0.00 | 0.00 | 0.04 | 0.21 |
| Yellow Warbler | 0.00 | 0.00 | 0.00 | 0.04 | 0.21 |
| Bay-breasted Warbler | 0.00 | 0.00 | 0.00 | 0.04 | 0.21 |
| Boreal Chickadee | 0.00 | 0.00 | 0.00 | 0.02 | 0.10 |

### Treed Peatlands

Aside from the White-throated Sparrow (0.85 IP/ha, Table 7-31), the species composition in treed peatlands is different from that in other forest habitats, as certain species are typically associated with this type of habitat. The Common Yellowthroat (0.99 IP/ha), Alder Flycatcher (0.57 IP/ha), Palm Warbler (0.57 IP/ha) and Lincoln's Sparrow (0.28 IP/ha) are among the most abundant species; the first two were observed at all stations undertaken in treed peatlands (constancy: 1).

The Olive-sided Flycatcher was observed at 25% of stations, with an average abundance of 0.14 IP/ha.

**Table 7-31: Constancy, Density and Unlimited-Distance Point Counts for Forest Birds in Treed Peatlands**

| Species | Treed Peatlands (n = 4) | | | | |
|---|---|---|---|---|---|
| | Constancy | FRPC (IP/ha) | | UDPC (IP) | |
| | | Avg. | SD | Avg. | SD |
| Common Yellowthroat | 1.00 | 0.99 | 0.54 | 2.00 | 1.41 |
| White-throated Sparrow | 0.75 | 0.85 | 0.98 | 3.00 | 1.83 |
| Alder Flycatcher | 1.00 | 0.57 | 0.00 | 1.75 | 0.50 |
| Palm Warbler | 0.75 | 0.57 | 0.46 | 1.00 | 0.82 |
| Lincoln’s Sparrow | 0.50 | 0.28 | 0.33 | 0.50 | 0.58 |
| Swainson’s Thrush | 0.25 | 0.28 | 0.57 | 0.50 | 1.00 |
| Hermit Thrush | 0.25 | 0.14 | 0.28 | 1.25 | 0.96 |
| Ruby-crowned Kinglet | 0.25 | 0.14 | 0.28 | 1.00 | 0.82 |
| **Olive-sided Flycatcher** | **0.25** | **0.14** | **0.28** | **1.00** | **0.82** |
| Magnolia Warbler | 0.25 | 0.14 | 0.28 | 0.75 | 0.96 |
| Cedar Waxwing | 0.25 | 0.14 | 0.28 | 0.25 | 0.50 |
| American Redstart | 0.25 | 0.14 | 0.28 | 0.25 | 0.50 |
| Northern Waterthrush | 0.25 | 0.14 | 0.28 | 0.25 | 0.50 |
| Gray Jay | 0.25 | 0.07 | 0.14 | 0.13 | 0.25 |
| Nashville Warbler | 0.00 | 0.00 | 0.00 | 0.75 | 0.50 |
| Swamp Sparrow | 0.00 | 0.00 | 0.00 | 0.75 | 0.96 |
| Dark-eyed Junco | 0.00 | 0.00 | 0.00 | 0.25 | 0.50 |
| Northern Flicker | 0.00 | 0.00 | 0.00 | 0.25 | 0.50 |
| Tennessee Warbler | 0.00 | 0.00 | 0.00 | 0.25 | 0.50 |
| **Rusty Blackbird** | **0.00** | **0.00** | **0.00** | **0.25** | **0.50** |

### Use of Wetlands

Three species not observed during aural surveys were observed during point counts conducted in wetlands (Table 7-32). These are the Savannah Sparrow, Red-winged Blackbird and Tree Swallow. The Savannah Sparrow was only observed in bogs with pools (0.05 IP/ha), while the Red-winged Blackbird (no calculated density) was only observed in riparian areas. Tree Swallows were observed in both types of environments.

**Bogs with Pools**

The White-throated Sparrow (0.19 IP/ha) is the most common species in bogs with pools, followed by the Palm Warbler (0.07 IP/ha) and Savannah Sparrow (0.05 IP/ha).

**Riparian Areas**

The Common Yellowthroat (0.22 IP/ha) is the most abundant species in riparian areas, followed by the Swamp Sparrow (0.08 IP/ha) and Palm Warbler (0.08 IP/ha).

**Table 7-32: Estimates of Abundance and Mean Density of Land Bird Populations in Wetlands in the Study Area**

| Species | Density (IP/ha) | | | | UDPC (IP) | |
|---|---|---|---|---|---|---|
| | Bogs with pools (n=4) | | Riparian Areas (n=2) | | Riparian Areas (n=4) | |
| | Avg. | SD | Avg. | SD | Avg. | SD |
| White-throated Sparrow | 0.19 | 0.30 | 0.03 | 0.04 | 2.00 | 2.65 |
| Lincoln's Sparrow | 0.02 | 0.03 | 0.03 | 0.04 | 0.33 | 0.58 |
| Swamp Sparrow | 0.00 | 0.00 | 0.08 | 0.04 | 2.67 | 2.52 |
| Savannah Sparrow | 0.05 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| Red-winged Blackbird | 0.00 | 0.00 | 0.00 | 0.00 | 1.33 | 2.31 |
| Tree Swallow | 0.01 | 0.01 | 0.01 | 0.02 | 0.33 | 0.29 |
| Alder Flycatcher | 0.01 | 0.03 | 0.06 | 0.02 | 1.00 | 1.00 |
| **Olive-sided Flycatcher** | **0.00** | **0.00** | **0.02** | **0.03** | **0.67** | **1.15** |
| Palm Warbler | 0.07 | 0.05 | 0.08 | 0.04 | 0.33 | 0.58 |
| Common Yellowthroat | 0.04 | 0.06 | 0.22 | 0.20 | 2.17 | 1.76 |
| **Rusty Blackbird** | **0.00** | **0.00** | **0.02** | **0.03** | **0.00** | **0.00** |

### 7.1.4.5 Shorebirds

**Richness and Total Abundance**

Five species of shorebirds were observed in the study area in total, but only two, the Solitary Sandpiper and Greater Yellowlegs, were found in the wetlands targeted for survey purposes. The other three species were observed opportunistically while moving from point to point within the study area. These are the American Woodcock (two individuals observed at dusk), Wilson's Snipe (heard between two point count stations) and Spotted Sandpiper (one pair seen during a helicopter survey).

**Richness and Abundance by Habitat Type**

Shorebird densities in the study area appear rather low (Table 7-33). Since few individuals were observed for each species, densities could only be measured for two species, the Solitary Sandpiper and Greater Yellowlegs.

**Table 7-33: Estimated Abundance and Mean Density of Shorebird Populations in Wetlands in the Study Area**

| Species | Density (IP/ha) | | | | UDPC (IP) | |
|---|---|---|---|---|---|---|
| | Bogs with Pools | | Riparian Areas | | Riparian Areas | |
| | Avg. | SD | Avg. | SD | Avg. | SD |
| Solitary Sandpiper (n=1) | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Greater Yellowlegs (n=2) | 0.09 | 0.06 | 0.00 | 0.00 | 0.67 | 0.58 |

**Habitat Use**

The Greater Yellowlegs is the most abundant shorebird species in the study area. It is found in both riparian areas and bogs with pools. While only two individuals were observed during point counts in wetlands, at least 12 individuals were observed at 10 different sites during the waterfowl breeding pair survey. The mean areal density for this species is estimated at 1.03 IP/25 $km^2$ (this estimate is undoubtedly low given that the counting approach, by helicopter, is not optimal for this species).

Solitary Sandpipers were relatively uncommon. A single individual was heard in a peatland during surveys in wetlands, while two individuals were heard during point counts near a riparian area.

### 7.1.4.6 Species at Risk

Nine species at risk have been reported from the region surrounding the study area (GENIVAR 2012). Of these, five were observed during surveys conducted by GENIVAR and four potentially breed in the study area (highlighted in bold in Table 7-34). Species at risk that were not observed are unlikely to occur in the zone since their particular nesting habitat is not found in the study area.

The two most common and abundant species at risk in the study area are the Olive-sided Flycatcher and Rusty Blackbird.

**Barrow's Goldeneye**

Barrow's Goldeneyes nest in cavities in trees at the edge of small lakes without fish, often in headwater areas (Robert *et al.* 2000). No individual was observed within the study area during the surveys and there were no suitable breeding habitats for this species. Nesting within the study area is unlikely. Moreover, the SOS-POP database makes no mention of Barrow's Goldeneyes nesting in the study area or surrounding areas.

**Bald Eagle**

Bald Eagles nest at the top of mature trees near large bodies of water from which they obtain food (Lessard 1996). There were two sightings of this species in the study area: one adult was seen on May 19 during the aerial survey of waterfowl pairs and one immature eagle (in its 3rd or 4th year) was sighted twice during the aerial survey of waterfowl broods on July 12. The shores of large bodies of water in six 5 km x 5 km plots covering the whole study area were surveyed from the air and no Bald Eagle nests were found. However, the shores of Lac Chibougamau (outside the study area) are a potential habitat and could account for the presence of individuals in the study area.

**Table 7-34: List of Species at Risk Potentially Present in and around the Study Area**

| Species | Provincial Status | Federal Status | |
|---|---|---|---|
| | ATVS[1] | COSEWIC[2] | SARA[3] |
| Barrow's Goldeneye | Vulnerable | Special concern | Special concern |
| Bald Eagle | Vulnerable | - | - |
| Short-eared Owl | Sensitive[4] | Special concern | Special concern |
| **Common Nighthawk** | **Sensitive[4]** | **Threatened** | **Threatened** |
| **Olive-sided Flycatcher** | **Sensitive[4]** | **Threatened** | **Threatened** |
| Barn Swallow | - | Threatened | - |
| Bicknell's Thrush | Vulnerable | Threatened | Threatened |
| **Canada Warbler** | **Sensitive[4]** | **Threatened** | **Threatened** |
| **Rusty Blackbird** | **Sensitive[4]** | **Special concern** | **Special concern** |

[1] ATVS: Act respecting threatened or vulnerable species in Québec
[2] COSEWIC: Committee on the Status of Endangered Wildlife in Canada
[3] SARA: Species at Risk Act
[4] Sensitive: Likely to be designated vulnerable or threatened

### Short-eared Owl

The Short-eared Owl breeding habitat includes marshes, peatlands, pastures and wet meadows (Nappi 2002). This species nests primarily along the St. Lawrence River estuary and the Gulf of St. Lawrence, the Saguenay–Lac-Saint-Jean region and in western Quebec (Bélanger and Bombardier, 1995). According to SOS-POP, one potential nesting site is present 25 km north of the study area at Lac Waconichi. However, no suitable nesting habitat for this species is present in the study area, and no individuals were observed during the various surveys.

### Common Nighthawk

The Common Nighthawk nests in open areas such as burns and recently logged areas (Poulin *et al.* 1996). This species usually feeds from 30 minutes before dusk up to one hour after sunset and from one hour before dawn up to 15 minutes after sunrise (Brigham and Fenton, 1991). In the study area, one individual was observed once, in flight, on June 15. According to the Quebec Breeding Bird Atlas (QBBA, 2012), this species probably breeds in the study area.

### Olive-sided Flycatcher

The Olive-sided Flycatcher breeding habitat consists of forest edges near wetlands (COSEWIC 2007). The species is primarily found in conifer and mixed-wood forests. At least eight pairs are present in the study area, and several singing males were also observed. Maximum densities are observed in treed peatlands (0.14 IP/ha), followed by regenerating stands (0.14 IP/ha), likely due to the proximity of water (Table 7-35).

**Table 7-35: Olive-sided Flycatcher Density and Abundance in Unlimited-Distance Point Counts in Various Habitats in the Study Area**

| Habitat | Constancy | Density (IP/ha) | | UDPC (IP) | |
|---|---|---|---|---|---|
| | | Avg. | SD | Avg. | SD |
| Open conifer stands | 0.03 | 0.02 | 0.10 | 0.13 | 0.42 |
| Closed conifer stands | 0.00 | 0.00 | 0.00 | 0.07 | 0.26 |
| Regenerating stands | 0.17 | 0.10 | 0.22 | 0.30 | 0.63 |
| Treed peatlands | 0.25 | 0.14 | 0.28 | 1.00 | 0.82 |
| Riparian areas | 0.00 | 0.02 | 0.03 | 0.00 | 0.67 |

### Barn Swallow

The Barn Swallow was recently designated as threatened in Canada by COSEWIC (2011). It is found in open habitats such as clearings and fields and often makes its nest on the walls of barns and other buildings in rural areas (COSEWIC 2011). No individual was observed within the study area during the surveys and there were no suitable breeding habitats for this species.

### Bicknell's Thrush

In Quebec, this species nests in subalpine forests composed of balsam fir, at elevations exceeding 600 m (Rompré *et al.* 1997). This type of habitat is absent from the study area and consulted sources make no mention of this species. It is unlikely that this species nests in the study area.

### Canada Warbler

The Canada Warbler nests in moist deciduous and mixed-wood stands, as well as in coniferous forests with a well-developed shrub layer (Conway, 1999). At least four singing males were heard in the study area, including two at stations RG-10 and RG-22 and two others opportunistically. Observations were all made in relatively young stands characterized by a dense and leafy shrub layer. Density in regenerating stands is estimated at 0.05 IP/ha.

### Rusty Blackbird

Rusty Blackbirds nest in fens, bogs with alders and willows, muskegs, beaver ponds and on the marshy shores of lakes and streams (Avery, 1995). At least eight breeding pairs were recorded in the study area. Rusty Blackbird density in open conifer stands (due to the proximity of water) is estimated at 0.03 IP/ha, and in riparian areas, at 0.02 IP/ha (Table 7-36).

**Table 7-36: Rusty Blackbird Density and Unlimited-Distance Point Counts in Habitats in the Study Area**

| Habitat | Constancy | Density (IP/ha) | | UDPC (IP) | |
|---|---|---|---|---|---|
| | | Avg. | SD | Avg. | SD |
| Open conifer stands | 0.06 | 0.03 | 0.11 | 0.05 | 0.20 |
| Treed peatlands | 0.00 | 0.00 | 0.00 | 0.25 | 0.50 |
| Riparian areas | 0.00 | 0.02 | 0.03 | 0.00 | 0.00 |

#### 7.1.4.7 Bird Habitats of Special Interest

There are no bird habitats of interest in the study area.

### 7.1.5 Mammals

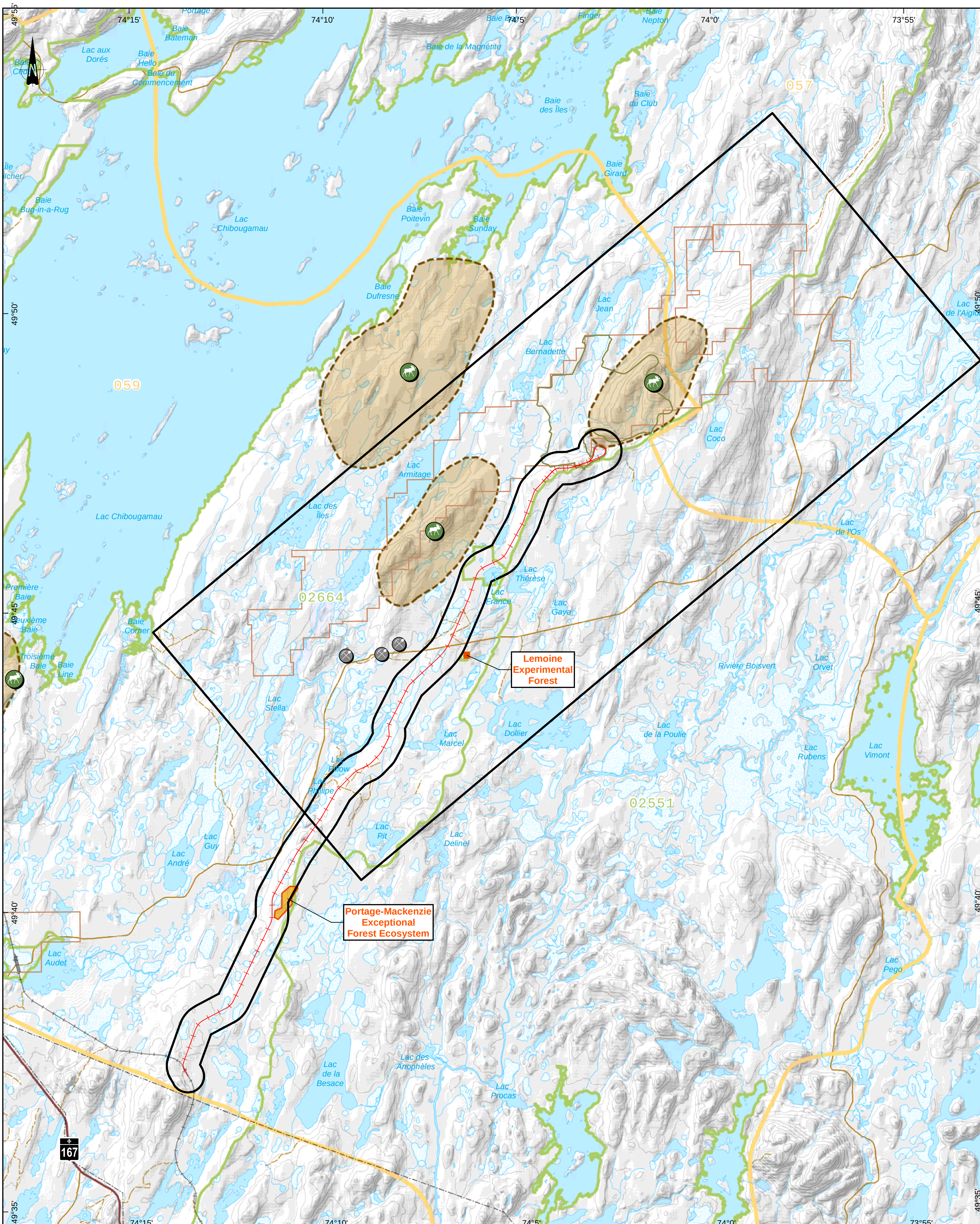
A total of 42 species of mammals either are present in or are likely to use the study area (Figure 7-10). More precisely, these consist of two species of large animals, 20 species of small animals, six bat species and 14 micromammal species. The presence of nine species of mammals in total was confirmed in the field during surveys conducted by Entraco (2011).

#### 7.1.5.1 Large Animals

The two species of large animals likely to be present in the study area are moose and black bear. According to the former tallyman, an old woodland caribou corridor crosses the study area at chainage 3+100. However, the woodland caribou range in Quebec, albeit discontinuous, is generally between the $49^{th}$ and $55^{th}$ parallel. Only three herds, the Charlevoix, Val-d'Or and La Sarre herds, have been reported south of the $49^{th}$ parallel (FAPAQ 2003). Finally, according to a woodland caribou range map produced by the MRNF (2012), the study area is outside of the range of this species. Thus, the presence of woodland caribou in the local study area is deemed unlikely.

**Moose**

Moose are ubiquitous in the Quebec boreal forest. This species mainly inhabits mixed coniferous and deciduous forests, particularly balsam fir-white birch or balsam fir-yellow birch stands. While moose are present throughout the James Bay region, population densities in this region are lower than in southern Quebec (CRRNTBJ 2010).




**Infrastructures**

Main road (167)

Secondary or access road

Existing railway

Transmission line

**BlackRock Metals Project Components**

Local study area

Limits of active claims

Mine site

Proposed railway segment

**Survey of the Human Environment**

Extraction Area

Gravel pit

Aboriginal Environment

Trapline

Hunting

Big game hunting area

Areas of interest

Experimental forest

Exceptional forest ecosystem

Forestry

Forest management unit

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## Wildlife Inventory

*Sources :*
*CanVec, 1/50 000, RNCan, 2010*
*Gestion des titres miniers (GESTIM), MRNF Québec, septembre 2012*
*Aires protégées et territoires d'intérêt : MDDEP, 2011*
*Écosystèmes forestiers exceptionnels et Refuges biologiques, MRNF, 2011*

*Mapping and inventory : GENIVAR*
*File : 111-16127-00_EC_Ang_C7-10_FAT_130205.mxd*

Scale 1 : 120,000

0 1.2 2.4 km

UTM, zone 18, NAD83
Contour interval : 20 m

**Figure 7-10**

**November 2012**

GENIVAR

Moose density observed in the Hunting Area 17 aerial survey conducted in 2003 was of 0.45 moose/10 km$^2$, while the most recent survey conducted in 2009 found 0.78 moose/10 km$^2$, for a 76% increase (CCRNTBJ 2010).

The presence of moose in the region was confirmed. Winter habitats were observed in 2011 in the northern portion of the local study area (deposit hill) and in the area between Lac Denis and Lac Monette (Entraco 2011). In addition, the tallyman identified the area north of chainage 25+000 as a hunting ground, although the former tallyman noted that the area was much more productive before it was logged.

**Black Bear**

The black bear is also a species typically found in the boreal forest. It thrives in young stands, in part due to the abundance of berries in such areas. The state of the black bear population in the James Bay region is poorly known because it is a difficult species to survey. MRNF managers estimate the bear density in Hunting Area 17 at roughly 1.10 bears/km$^2$, or 2,000 black bears in total (CCRNTBJ 2010).

As with moose, the presence of bears was confirmed using MRNF bear kill figures from 2007 to 2012, which totalled five bears in the local study area. The presence of bears appears particularly likely in the area near chainage 15+000 and 18+000, where four of the five bears reported were killed. Finally, the Entraco EIS (2011) also reported the presence of a mother and her two cubs at the intersection of Road 210 and the Lemoine road, about 1.5 km west of the study area.

#### 7.1.5.2 Small Animals

In this section, the term "small animals" refers to fur-bearing animals other than black bears. It also includes other species that may or may not be harvested, but does not include bats and micromammals, which are addressed in separate sections.

According to the Entraco EIS (2011), small animal species likely to occur in the local study area include the muskrat, American marten, American mink, fisher, ermine and striped skunk. Aside from the skunk, these species are particularly sought after by Aboriginal users. However, none were observed during field surveys carried out by Entraco (2011).

According to trapping figures published by the MRNF (2012b) fur-bearing animal management unit (UGAF) 87, the presence of 17 fur-bearing species other than the black bear is likely in the study area (Table 7-37). The weasel group includes the long-tailed weasel, least weasel and ermine. The species most frequently trapped are the American marten, American beaver, muskrat, river otter and Canada lynx. The absence of some species does not mean they are not present in the study area. In fact, according to the *Portrait faunique de la Baie James,* 20 fur-bearing species are likely to use the project area, including the northern flying squirrel and the cougar (CRRNTBJ 2010). The presence of the latter is unlikely in the study area, as its preferred habitats are relatively inaccessible mountainous and hilly areas.

During fieldwork conducted by Entraco (2011), the presence of the snowshoe hare, red squirrel, beaver, eastern chipmunk, wolf, porcupine, groundhog, red fox and river otter was confirmed through individual sightings in or around the study area. Lynx were also sighted by the tallyman in the area west of Lac Armitage.

**Table 7-37: Sales Statistics for Fur Harvested from Registered Traplines in and around the Study Area, for the 2006-2007 to 2010-2011 Seasons**

| Species | Total Furs Sold | | | | | Total by Species |
|---|---|---|---|---|---|---|
| | 2007-2008 | 2008-2009 | 2009-2010 | 2010-2011 | 2011-2012 | |
| Weasel | 0 | 1 | 0 | 0 | 14 | 15 |
| Beaver | 37 | 204 | 173 | 88 | 70 | 572 |
| Coyote | 0 | 0 | 0 | 0 | 3 | 3 |
| Red squirrel | 0 | 4 | 0 | 0 | 0 | 4 |
| Wolf | 0 | 2 | 0 | 2 | 0 | 4 |
| River otter | 1 | 18 | 22 | 14 | 18 | 73 |
| Canada lynx | 0 | 16 | 15 | 22 | 8 | 61 |
| American marten | 7 | 128 | 172 | 107 | 166 | 580 |
| Black bear | 4 | 9 | 1 | 0 | 9 | 23 |
| Polar bear | 0 | 1 | 0 | 0 | 0 | 1 |
| Fisher | 0 | 3 | 3 | 0 | 1 | 7 |
| Muskrat | 5 | 55 | 10 | 1 | 6 | 77 |
| Common raccoon | 0 | 29 | 0 | 0 | 2 | 31 |
| Silver fox | 0 | 0 | 0 | 1 | 0 | 1 |
| Arctic fox | 0 | 1 | 0 | 0 | 0 | 1 |
| Red fox | 0 | 6 | 6 | 5 | 4 | 21 |
| American mink | 1 | 8 | 3 | 3 | 2 | 17 |
| Total | 55 | 485 | 405 | 243 | 303 | 1,491 |

Source: MRNF, 2007-2012

### 7.1.5.3 Bats

Neither the Entraco EIS nor this study included any bat surveys. However, according to the *Portrait faunique de la Baie James* (CRRNTBJ 2010), six bat species are present in the James Bay region, including three migratory species likely to be designated threatened or vulnerable (LDTV). These are the silver-haired bat (LDTV), red bat (LDTV), hoary bat (LDTV), little brown bat, big brown bat and northern long-eared bat (Table 7-38). None of these species were observed during field work conducted by Entraco in the spring and summer of 2011.

In addition, there are three known hibernacula in the James Bay region, two of which are near the railway local study area. These are the old Bruneau mine site (10 km from Chibougamau) and the old Opemisca mine site (Chapais). Both the little brown bat and the northern long-eared bat use the Bruneau mine site and the big brown bat hibernates at the Opemisca site.

**Table 7-38: List of Bat Species Likely to Use the Study Area**

| Species[1] | Habitat |
|---|---|
| **Silver-haired bat** | Wooded areas at the edge of lakes and ponds |
| **Eastern red bat** | Deciduous forests, but also conifer and mixed-wood forests |
| **Hoary bat** | Wooded and semi-wooded areas near clearings and water bodies |
| Big brown bat | Tree-dwelling species preferring high trees near potential hibernacula |
| Little brown bat | Various habitats |
| Northern long-eared bat | Various habitats |

[1] Species highlighted in bold are considered at risk.

According to the Entraco EIS (2011), none of the wildlife species in the study area are reported by the *Centre de données sur le patrimoine naturel du Québec* (CDPNQ) as falling under the Species at Risk Act (SARA). The silver-haired bat, listed as likely to be designated threatened or vulnerable, is the only species reported within 10 km of the Entraco study area. According to surveys conducted over nine years by the MRNF Northern Quebec regional directorate, there has only been one sighting of this species in the James Bay region, which was in 1999.

Finally, the Entraco EIS (2011) states that three species, the silver-haired bat, eastern red bat and hoary bat, have a moderate likelihood of being present in the study area. As these are three species strongly associated with forest environments, it is quite likely that they are present in the railway study area.

#### 7.1.5.4 Micromammals

There are several micromammal species that are likely to be present in the study area (Table 7-39). According to the *Atlas des micromammifères du Québec*, this area falls within the ranges of 14 species (Desrosiers *et al.* 2002). Two of these, the southern bog lemming and rock vole, are likely to be designated threatened or vulnerable (CRRNTBJ 2010).

**Table 7-39: List of Micromammal Species Likely to Use the Study Area**

| Family | Species[1] | Habitat |
|---|---|---|
| Sorcidae | Cinereous shrew | Various habitats |
| | American water shrew | Mixed-wood or conifer forests near streams and bodies of water |
| | Arctic shrew | Various habitats in dry sites |
| | American pygmy shrew | Various habitats near streams and bodies of water |
| Talpidae | Star-nosed mole | Various habitats in mesic sites |
| Cricetidae | Deer mouse | Various habitats with dense plant cover in dry sites |
| | **Southern bog lemming** | Densely vegetated wetlands and peatlands |

| Family | Species[1] | Habitat |
|---|---|---|
| | Southern red-backed vole | Various forest habitats near streams and bodies of water |
| | Meadow vole | Wet and grassy habitats (fields, clearings, prairies and peatlands) |
| | **Rock vole** | Wet habitats characterized by a mix of moss and rock in mixed-wood and conifer forests |
| | Western heather vole | Shrubby habitats, clearings, undergrowth in sparse conifer forests |
| Muridae | Norway rat | Fields, towns, farms |
| Zapodidae | Meadow jumping mouse | Prairies, fields, shrubby areas, marshes, swamps |
| | Woodland jumping mouse | Forested areas near water |

[1] Species highlighted in bold are considered at risk.

According to surveys conducted in the James Bay region by the MRNF since 2002, the southern bog lemming and arctic shrew are the only two species that appear to be scarce in that region (CRRNTBJ 2010).

#### 7.1.5.5 At-Risk Species

Overall, six at-risk species of mammals are likely to be found in or around the study area (Table 7-40). Results of requests for information made in 2011 by Entraco reveal that the rock vole and silver-haired bat have been reported within 10 km of the mine site. Based on habitats present in the study area, the biology of the different species and the Entraco EIS, the species most likely to be present are the eastern red bat, hoary bat, silver-haired bat, southern bog lemming and rock vole.

**Table 7-40: At-Risk Mammal Species Likely to be in the Study Area and Likelihood of Their Presence**

| Species | Status[1] | | | Likelihood |
|---|---|---|---|---|
| | ATVS | COSEWIC | SARA | |
| Least weasel | LDTV | - | - | Unlikely |
| Eastern red bat | LDTV | - | - | Likely |
| Hoary bat | LDTV | - | - | Likely |
| Silver-haired bat | LDTV | - | - | Likely |
| Southern bog lemming | LDTV | - | - | Likely |
| Rock vole | LDTV | - | - | Highly likely |
| Cougar | LDTV | - | - | Unlikely |

[1] Status: NAR: not at risk; LDTV: likely to be designated threatened or vulnerable; SC: of special concern; T: threatened; V: vulnerable; END: endangered.

Sources: Act respecting threatened or vulnerable species (ATVS) (MRNF 2012a), Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2010), Species at Risk Act (SARA) (Government of Canada 2010).

#### 7.1.5.6 Wildlife Habitats of Special Interest

According to information compiled in the Entraco EIS (2011) and by GENIVAR, there are no important wildlife habitats (as defined in the *Act respecting the conservation and development of wildlife*) in the study area.

## 7.2 Project Impact

### 7.2.1 Forest Environments

#### 7.2.1.1 Construction Phase

**Sources of Impact**

During the construction phase, the sources of impact on vegetation are the general clearing and construction activities.

Construction of the new rail segment will result in the loss of 48.89 ha of forest vegetation (Table 7-41). The main habitats affected are regenerating stands and mature open and closed conifer stands. The land habitats affected include 6.71 ha of forested wetlands (treed peatlands).

At the scale of the railway project, losses associated with forest environments represent 1.75% of the land area affected by the project. None of the area designated as an exceptional forest ecosystem by the MRNF or with conservation potential is affected by the project, as the route was designed to avoid the Portage-Mackenzie exceptional forest ecosystem.

**Table 7-41: Land Habitat Losses Associated with the Proposed Railway Project**

| Habitat Type | Area | | |
|---|---|---|---|
| | Total (ha) | Loss (ha) | Loss (%) |
| Regenerating conifer forest | 901.50 | 18.35 | 2.04 |
| Mature open conifer forest | 380.16 | 10.51 | 2.76 |
| Mature closed conifer forest | 465.64 | 9.52 | 2.04 |
| Regenerating mixed-wood forest | 116.48 | 5.95 | 5.11 |
| Plantation | 35.09 | 2.12 | 6.04 |
| Mature mixed-wood forest | 52.48 | 0.19 | 0.00 |
| Deciduous forest | 7.49 | 0.19 | 2.54 |
| Unproductive area | 29.14 | 0.06 | 0.21 |
| **Total** | **1,987.97** | **46.89** | **2.36** |
| Drainage network | 75.42 | 0.03 | 0.00 |

#### 7.2.1.2 Operation Phase

No impact is expected on forest environments during the operation phase. There will not be any additional encroachment on or disturbance of the surrounding vegetation.

### 7.2.1.3 Closure Phase

**Sources of Impact**

During the closure phase, the sources of impact on vegetation are rehabilitation activities.

The rehabilitation of the railway right-of-way and sowing of native species will lead to a gradual return of the original vegetation.

**Mitigation Measures**

The mitigation measures proposed to minimize the impact on forest environments are similar to those proposed for the construction phase.

**Specific Mitigation Measures**

- Restoration of the vegetation in the right-of-way with native species;
- monitoring of the revegetation of the railway right-of-way.

**Detailed Description of the Residual Impact**

Dismantling of the rail segment will have a positive impact on forest environments because it will allow the affected environments to gradually return to their original state. The degree of disturbance of the effect is deemed low given the small size of affected areas and their regional and local abundance. The extent would be limited as it would be limited to the railway right-of-way, and the duration would be long. The significance of the residual impact on forest environments is therefore deemed low.

**Assessment of the Residual Impact**

| **Impact on forest environments during the closure phase** | | |
|---|---|---|
| Nature | Positive | Significance: Low |
| Ecosystemic value | Low | |
| Socioeconomic value | Low | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Long | |
| Probability of occurrence | High | |

### 7.2.2 Wetlands

#### 7.2.2.1 Construction Phase

**Sources of Impact**

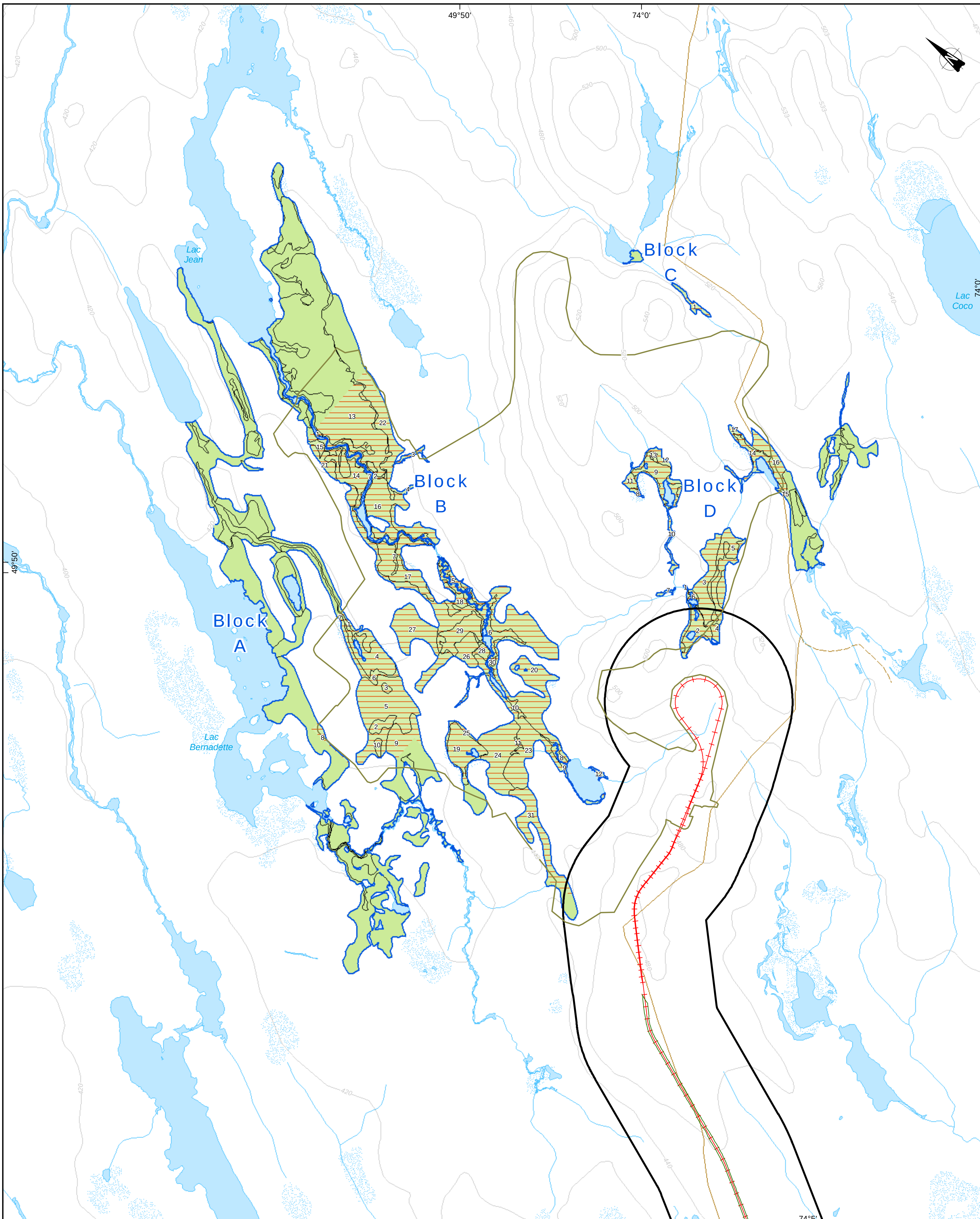
During the construction phase, the sources of impact on wetlands are the general construction activities.

Clearing associated with construction of the new rail segment will result in the loss of 16.44 ha of wetlands (Table 7-11). The affected wetlands are located in nine blocks that cover a total of 677.29 ha (Table 7-42).

While not extensive, treed peatlands and disturbed treed peatlands will suffer the greatest losses. Thus, approximately 12 of 390 ha (2.93%) of treed peatlands and 2 of 90 ha (2.33%) of disturbed treed peatlands would be destroyed during the construction phase. These environments are also stands that support merchantable timber volumes, or did so prior to logging. The rail segment will nevertheless cross a treed peatland complex, leading to its fragmentation. From a vegetation standpoint, forested wetlands have less rich plant life than peatlands.

A small proportion of fens (1.87%) which are characterized by greater plant diversity would be affected by the project. Riparian areas are not abundant in the study area. The only shrub swamp that would be affected by the project is the narrow strip on either side of Jules River.

Overall, total losses associated with wetlands represent less than 1% of land habitats affected by the railway project, while wetlands account for 31% of the study area. These figures highlight the efforts made by the proponent to avoid wetlands in selecting the proposed route for the rail segment. Characteristics of affected wetlands are described in the biological environment complementary study (Appendix 5, GENIVAR 2012)]




**Infrastructures**

- Main road (167)
- Secondary or access road
- Existing railway
- Transmission line

**Limit**

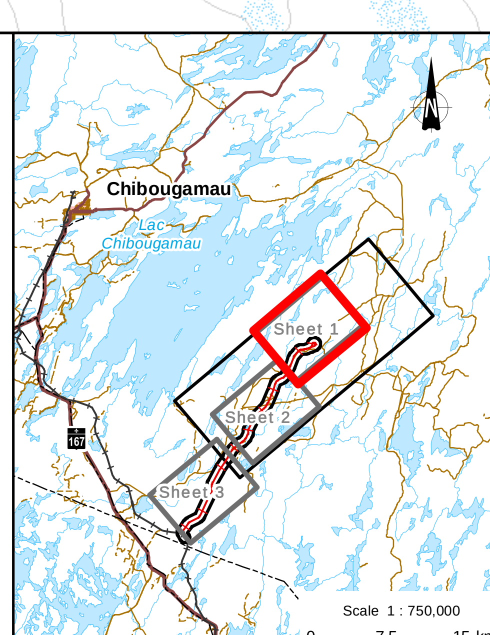
- Clearing zone for the railway right-of-way

**BlackRock Metals Project Components**

- Local study area
- Mine site
- Proposed railway segment

**Wetlands**

- Block of impacted wetlands
- Impacted wetland in the mine site
- Impacted wetland in the clearing zone for the railway right-of-way

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## Location of Affected Wetlands

*Sources :*
*Système d'information écoforestière (SIEF), MRNF Québec, 2010*
*CanVec, 1/50 000, RNCan, 2010*

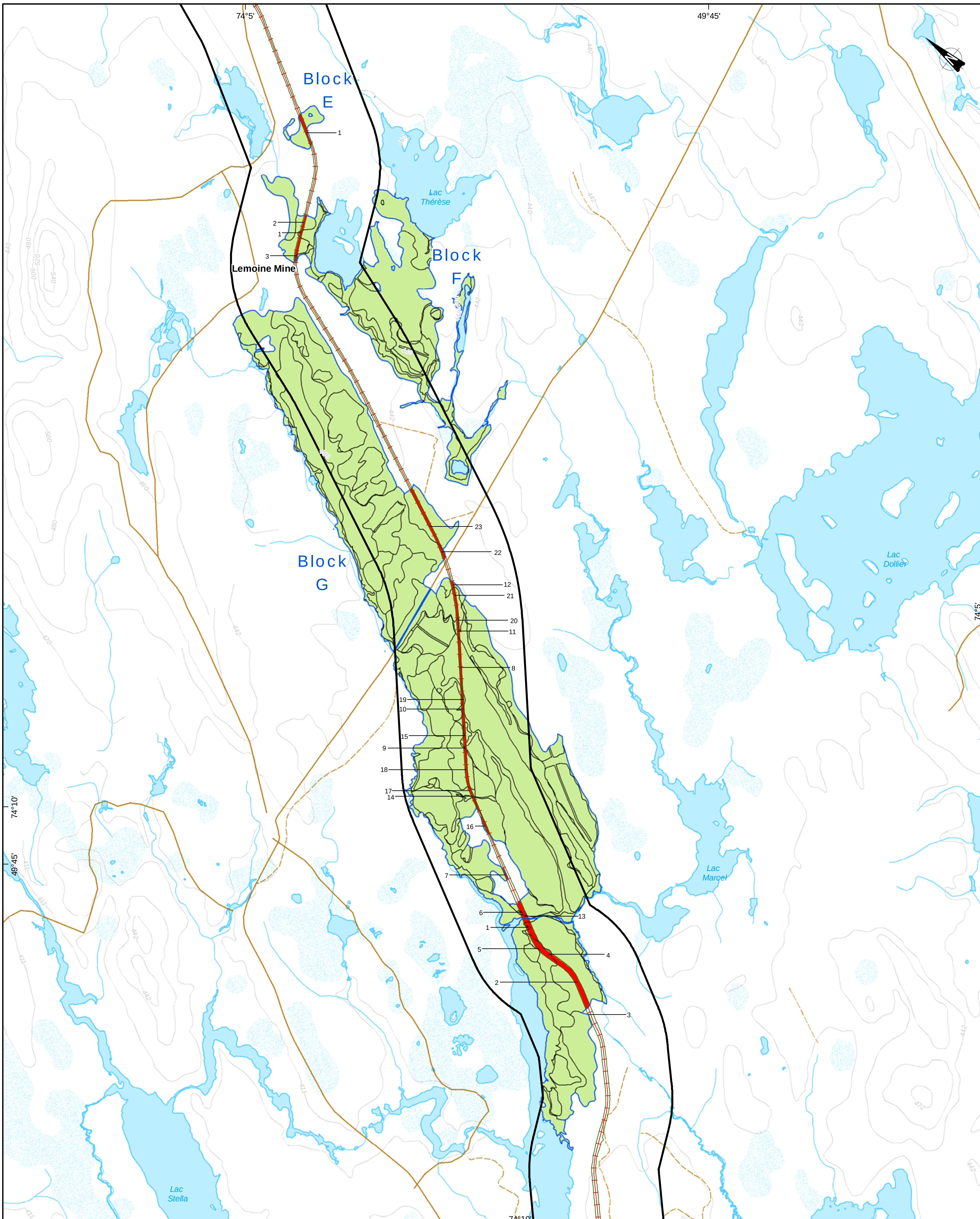
*Mapping and inventory : GENIVAR*
*File :111-16127-00_EC_Ang_C7-11_F1_VEG_Milieu humide_perte_130205.mxd*

Scale 1 : 27,500
0 275 550 825 m
UTM, zone 18, NAD83

**Figure 7-11**
Sheet 1 of 3

**November 2012**

GENIVAR




**Infrastructures**

Main road (167)

Secondary or access road

Existing railway

Transmission line

**Limit**

Clearing zone for the railway right-of-way

**BlackRock Metals Project Components**

Local study area

Mine site

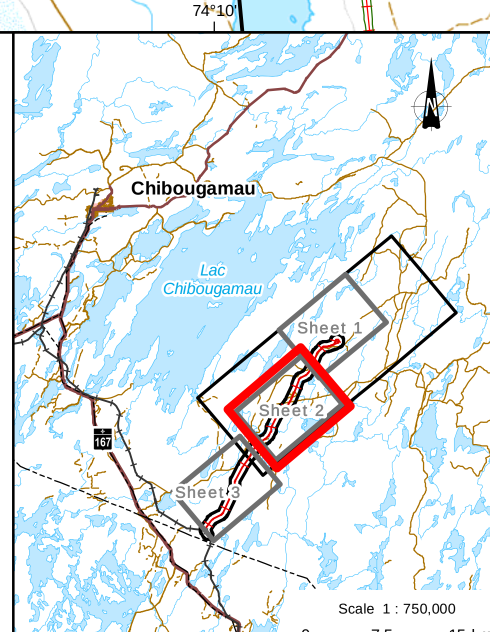
Proposed railway segment

**Wetlands**

Block of impacted wetlands

Impacted wetland in the mine site

Impacted wetland in the clearing zone for the railway right-of-way

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## Location of Affected Wetlands

*Sources :*
*Système d'information écoforestière (SIEF), MRNF Québec, 2010*
*CanVec, 1/50 000, RNCan, 2010*

*Mapping and inventory : GENIVAR*
*File :111-16127-00_EC_Ang_C7-11_F2_VEG_Milieu humide_perte_130205.mxd*

Scale 1 : 30,000
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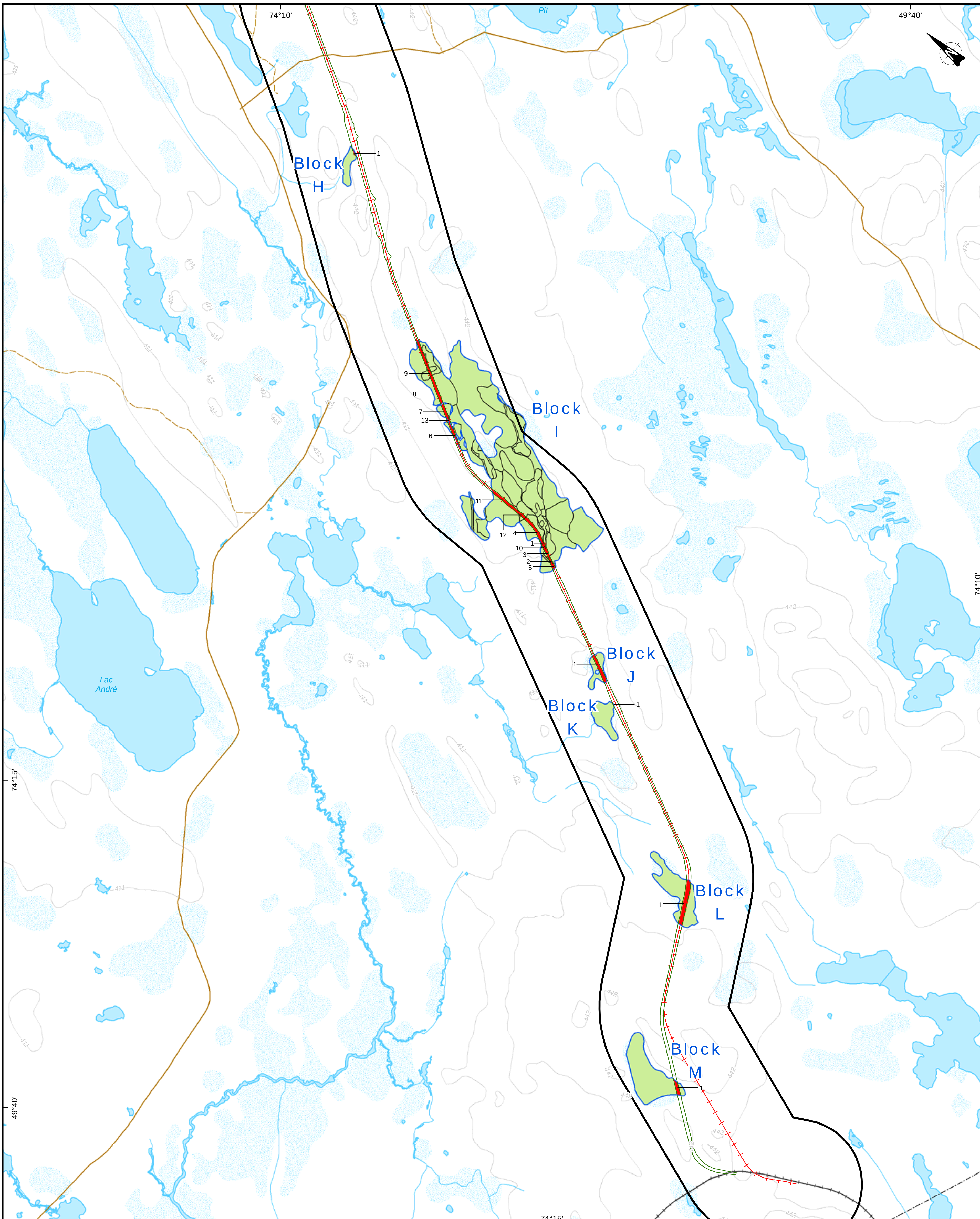
UTM, zone 18, NAD83

**Figure 7-11**
Sheet 2 of 3

**November 2012**

GENIVAR




**Infrastructures**

- Main road (167)
- Secondary or access road
- Existing railway
- Transmission line

**Limit**

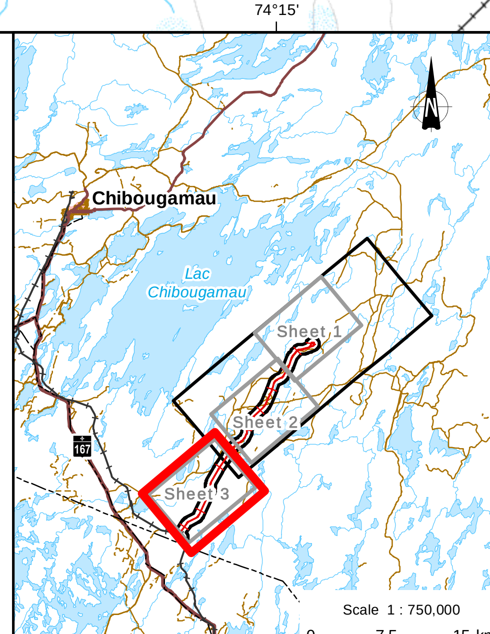
- Clearing zone for the railway right-of-way

**BlackRock Metals Project Components**

- Local study area
- Mine site
- Proposed railway segment

**Wetlands**

- Block of impacted wetlands
- Impacted wetland in the mine site
- Impacted wetland in the clearing zone for the railway right-of-way

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- Biological Environment Supplementary Studies -

## Location of Affected Wetlands

*Sources :*
*Système d'information écoforestière (SIEF), MRNF Québec, 2010*
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*Mapping and inventory : GENIVAR*
*File :111-16127-00_EC_Ang_C7-11_F3_VEG_Milieu humide_perte_130205.mxd*

Scale 1 : 30,000
0 300 600 900 m
UTM, zone 18, NAD83

**Figure 7-11**
Sheet 3 of 3

**November 2012**

GENIVAR

**Table 7-42: Total and Relative Areal Significance of Wetlands Affected by the Railway Construction Project, Taking into Account the Mosaic Effect**

| Block | Type of Environment | Area | | |
|---|---|---|---|---|
| | | Total (ha) | Loss (ha) | Loss (%) |
| E | Shrub swamp | 0.39 | - | - |
| | Treed peatland | 3.82 | 0.48 | 12.55 |
| | **Total** | **4.21** | **0.48** | **11.38** |
| F | Shrub swamp | 0.58 | - | - |
| | Treed peatland | 32.95 | 0.66 | 2.02 |
| | Disturbed treed peatland | 13.28 | - | - |
| | Fen | 16.19 | 0.06 | 0.65 |
| | Bog | 33.64 | - | - |
| | **Total** | **98.52** | **0.72** | **0.79** |
| G | Forested swamp | 0.24 | - | - |
| | Shrub swamp | 30.24 | 0.35 | 1.16 |
| | Treed peatland | 313.27 | 7.32 | 2.34 |
| | Disturbed treed peatland | 54.58 | 1.07 | 1.97 |
| | Fen | 10.88 | 0.02 | 0.17 |
| | Bog | 56.87 | 0.94 | 1.66 |
| | **Total** | **466.07** | **9.71** | **2.08** |
| H | Treed peatland | **1.77** | **0.07** | **3.90** |
| I | Forested swamp | 22.68 | - | - |
| | Shrub swamp | 1.73 | 0.36 | 20.81 |
| | Treed peatland | 29.85 | 1.71 | 5.73 |
| | Disturbed treed peatland | 19.54 | 0.96 | 4.91 |
| | Bog | 9.94 | 0.41 | 4.14 |
| | **Total** | **83.75** | **3.44** | **4.11** |
| J | Fen | 2.27 | **0.52** | **23.01** |
| K | Fen | 3.35 | **0.01** | **0.19** |
| L | Treed peatland | 8.22 | **1.20** | **14.56** |
| M | Bog | 11.02 | **0.29** | **2.67** |
| **Total** | | **677.29** | **16.44** | **2.43** |
| **Summary of Losses** | | | | |
| | Shrub swamp | 32.94 | 0.72 | 2.19 |
| | Forested swamp | 22.92 | - | - |
| | Treed peatland | 389.87 | 11.44 | 2.93 |
| | Disturbed treed peatland | 87.39 | 2.03 | 2.32 |
| | Fen | 32.68 | 0.61 | 1.87 |
| | Bog | 111.48 | 1.65 | 1.48 |

### Mitigation Measures

The mitigation measures proposed to reduce the impact on wetlands are as follows:

- Use of existing logging roads by contractors and subcontractors;

- Drawing of clearing boundaries on construction plans and posting of these boundaries so as to protect adjacent forest areas;
- Location of all construction trailers and equipment storage areas at the temporary workers' camp;
- Restriction of equipment travel to the railway right-of-way.

**Specific Mitigation Measures**

- Disposal of natural waste materials in accordance with the *Politique sur la protection des rives, du littoral et des plaines inondables*. In addition, prohibition of the disposal of any natural waste material in wetlands such as ponds, marshes, swamps and peatlands.
- Prohibition of equipment travel except for crossings required for earthwork activities and construction of railway structures in wetlands.
- Permanent disposal of materials and waste from clearing activities (trees, stumps, shrubs, branches, brush, dead wood and other plant debris) at least 60 m from the shores of lakes or streams or from any flood-prone area, marsh, swamp or peatland.
- Installation of appropriate type and size of culvert to avoid the draining or flooding any wetlands that must be crossed.

**Detailed Description of the Residual Impact**

Construction of the rail segment will result in the loss of 16.44 ha of wetlands. Given the application of the mitigation measures and the relative abundance of this type of environment at the regional and local scale, the degree of disturbance is deemed low. The extent would be limited as the impact would be restricted to the rail segment right-of-way, and the duration would be long, as these losses would be permanent. Thus, the significance of the residual impact on wetlands is deemed low.

**Assessment of the Residual Impact**

| **Impact on Wetlands during the Construction Phase** | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | Moderate | |
| Socioeconomic value | Low | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Long | |
| Probability of occurrence | High | |

### 7.2.2.2 Operation Phase

No impact is expected on wetlands during the operation phase. There will not be any additional encroachment on or disturbance of the surrounding vegetation.

### 7.2.2.3 Closure Phase

**Sources of Impact**

During the closure phase, the sources of impact on wetlands are the rehabilitation activities.

Restoration of natural drainage and sowing of native species, primarily in the peatland system that the rail segment crosses, will lead to a progressive return to more natural conditions.

**Mitigation Measures**

The mitigation measures proposed to limit the impacts on wetlands are similar to those proposed for the construction phase.

**Specific Mitigation Measure**

- Revegetation of the right-of-way using native species once construction is complete.

**Detailed Description of the Residual Impact**

Dismantling of the rail segment will have a positive impact on wetlands because it will lead a gradual return to more natural conditions. The degree of disturbance (improvement) is deemed low because the environments affected are small in size and abundant in the region. The extent of the effect would be limited as it would be restricted to the railway right-of-way, and its duration would be long since the return to original vegetation conditions would be permanent. The significance of the residual impact on wetlands is therefore deemed low.

Assessment of the Residual Impact

| **Impact on Wetlands during the Closure Phase** | | |
|---|---|---|
| Nature | Positive | Significance: Low |
| Ecosystemic value | Moderate | |
| Socioeconomic value | Low | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Long | |
| Probability of occurrence | High | |

### 7.2.3 Vascular Plants at Risk

#### 7.2.3.1 Construction Phase

**Sources of Impact**

During the construction phase, the sources of impact on special-status vascular plants are clearing activities and machinery traffic.

Site preparation work (clearing, grubbing) could affect individual specimens of two at-risk vascular plant species, *Arethusa bulbosa* and *Utricularia resupinata*, which, according to CDPNQ (2010), are present within a 100-km radius of the study area. Based on vascular plant ranges, the ostrich fern (*Matteuccia struthiopteris*) is also likely to be affected by construction work, particularly clearing activities.

**Mitigation Measures**

The mitigation measures proposed are similar to those proposed for wetlands during the construction phase.

**Specific Mitigation Measures**

Specific mitigation measures are similar to those proposed for wetlands during the construction phase.

**Detailed Description of the Residual Impact**

Construction activities could have a negative impact on some at-risk vascular plants likely to be present in the study area. The degree of disturbance is deemed low because none of the species likely to be present in the study area were observed by Entraco (2011) or Genivar (2012). The extent of the effect is limited, as it is restricted to the rail segment right-of-way, and its duration would be long because any resulting loss would be permanent. The significance of the residual impact will therefore be low.

**Assessment of the Residual Impact**

| **Impact on At-Risk Vascular Plants during the Construction Phase** | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | High | |
| Socioeconomic value | Low | |
| Degree of disturbance | Low | |
| Intensity | Moderate | |
| Extent | Limited | |
| Duration | Long | |
| Probability of occurrence | Low | |

#### 7.2.3.2 Operation Phase

No impact is expected on special status vascular plants during the operational phase, because no additional clearing activities are planned.

#### 7.2.3.3 Closure Phase

No impact is expected on at-risk vascular plants during the closure phase, because revegetation work is unlikely to result in the establishment of rare vascular plants.

### 7.2.4 Fish

#### 7.2.4.1 Construction Phase

**Sources of Impact**

During the construction phase, the sources of impact on fish are general construction activities, particularly the construction of stream-crossing structures.

Aside from Rivière Jules at crossing point Tr-7, none of the streams are deemed to be fish habitats.

For crossing point Tr-7, only two general effects on fish arising from construction activities are expected. These negative effects, which are different expressions of a "potential" disturbance to fish habitat, are:

- the transport of fine sediments from work areas to nearby stream beds or lakes by rainfall-derived surface runoff could affect fish habitat (e.g. water turbidity, stream bed substrate aggradation); and
- disturbance to the tranquility of the aquatic environment from noise and vibration during work could lead to reduced fish habitat quality by acting as a stressor to fish. Affected fish would be able to move temporarily to adjacent habitats with the same characteristics.

Once construction is complete, all temporary facilities would be fully dismantled and all materials would be recovered. No construction material or waste would be left on site or thrown into the stream, so that no trace of this encroachment on the local environment will remain.

**Specific Mitigation Measures**

Specific mitigation measures apply to crossing point Tr-7, where the presence of fish and fish habitat has been confirmed. These specific mitigation measures are as follows:

- Work methods would be defined so as to limit the extent of work areas, keep them as far away from the aquatic environment as possible and minimize the associated risk of disturbance to this environment.
- Any temporary encroachment on the aquatic environment would be kept to the bare essential.

- Riverside dikes or, if necessary, coffer dams would be installed along the banks to confine work areas and keep materials (or other construction or natural debris) and fine sediment-rich runoff water from entering the aquatic environment in the stream (geomembranes would be used to ensure that these structures are impermeable).
- Where required, and if possible, stream banks would be restored and revegetated once construction has ended, in accordance with environmental specifications that would be prepared.
- Fishing by construction workers would be prohibited during bridge construction.

**Detailed Description of the Residual Impact**

During the construction phase of the rail segment, the only possible source of impact on fish is work undertaken in or at the edges of streams and lakes. Most potential sources of impact related to the installation of culverts at crossing points Tr-1 to Tr-6, Tr-8, Tr-9 and Tr-10 would be of short duration, low intensity and limited extent during the railway construction phase. As these streams are not fish habitats, this work is not expected to have any particular impact on fish.

As for Rivière Jules, which runs under crossing point Tr-7, the effects could lead to the temporary disturbance of habitat quality for fish, without compromising its use or integrity. Thus, the degree of disturbance produced by such effects is deemed moderate.

In this context, the expected impact of any of the three effects described above is such that its intensity is deemed moderate. However, because the effect would be limited and of short duration (temporary), the overall significance of the impact is deemed low. Implementation of proposed mitigation measures relating to construction activities such as clearing, excavation and other earthworks should, to a large extent, mitigate these effects. In fact, proper implementation of these measures should entirely mitigate the first two effects.

Aside from the general effects mentioned above, the temporary encroachment of coffer dams could constitute a fourth effect. This effect would induce a limited (a few tens of square metres at most) and temporary (short duration) reduction of the fish habitat without compromising its integrity or productivity. Therefore, although the intensity of this effect is deemed moderate, the significance of the impact is deemed low.

Finally, the infrastructure related to bridge construction will lead to encroachment on 1,400 $m^2$ of fish habitat. However, the abutments will be located in the 76 m-wide NHWM, not within the permanent fish habitat (the 6 m-wide stream). Also, the fact that alders line the stream means that this stretch is not very suitable as breeding or rearing grounds.

Overall, the residual impact of the rail segment construction on fish and fish habitat is deemed low.

**Assessment of the Residual Impact**

| Impact on Fish and Fish Habitat during the Construction Phase | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | Moderate | |
| Socioeconomic value | Moderate | |
| Degree of disturbance | Moderate | |
| Intensity | Moderate | |
| Extent | Limited | |
| Duration | Short | |
| Probability of occurrence | Moderate | |

#### 7.2.4.2 Operation Phase

No significant impact on fish or fish habitat is expected during the operational phase.

#### 7.2.4.3 Closure Phase

**Sources of Impact**

During the closure phase, the sources of impact on fish and fish habitat would be similar to those for the construction phase due to the dismantling of the rail segment.

The removal of culverts will allow affected stretches to return to more natural flow conditions.

**Mitigation Measures**

The mitigation measures proposed to minimize the impact on fish and fish habitat are similar to mitigation measures proposed for the construction phase.

**Detailed Description of the Residual Impact**

Closure of the rail segment will have a negative impact for the same reasons as for the construction phase. The degree of disturbance would be low as mitigation measures applied during the construction phase will reduce the negative effects. The effect would be of limited extent and short duration for the same reasons as for the construction phase. The significance of the residual impact on fish will therefore be very low.

**Assessment of the Residual Impact**

| Impact on Fish and Fish Habitat during the Closure Phase | | |
|---|---|---|
| Nature | Negative | Significance: Very low |
| Ecosystemic value | Low | |
| Socioeconomic value | Low | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Short | |
| Probability of occurrence | Moderate | |

### 7.2.5 Herpetofauna

#### 7.2.5.1 Construction Phase

**Sources of Impact**

During the construction phase, the sources of impact on the herpetofauna are the general construction activities.

- The various railway development and construction activities are likely to disturb the herpetofauna.
- Moreover, clearing, stripping, excavation and cutting activities will lead to the permanent loss and disturbance of herpetofaunal habitat, including 17 ha of wetlands and 47 ha of forested areas.

**Mitigation Measures**

The mitigation measures proposed for herpetofauna are as follows:

- installation of culverts of the appropriate type and size;
- drawing of clearing boundaries on construction plans and posting of these boundaries so as to protect adjacent forest areas;
- restriction of equipment travel to set corridors within the work area;
- prohibition of equipment travel in aquatic environments;
- stabilization of eroding ground in work sites throughout the construction phase.

**Specific Mitigation Measure**

- Bank restoration along streams disturbed during culvert and bridge installation.

**Detailed Description of the Residual Impact**

The effect on the herpetofauna is negative as general construction activities will lead to noise as well as the disturbance and permanent loss of habitat. However, the degree of disturbance is deemed low because species at risk are not likely to use the study area and herpetofaunal diversity in the boreal forest is low compared to that of forests in southern Quebec. The extent of the effect is deemed limited and its duration is long, as habitat loss is generally permanent. The significance of the residual impact is therefore low.

**Assessment of the Residual Impact**

| **Impact on Herpetofauna during the Construction Phase** | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | Low | |
| Socioeconomic value | Low | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Long | |
| Probability of occurrence | High | |

### 7.2.5.2 Operation Phase

No significant impact on the herpetofauna is expected during the operational phase.

### 7.2.5.3 Closure Phase

**Sources of Impact**

The sources of impact on the herpetofauna are similar to those for the construction phase and relate to decommissioning work, except that no additional clearing would be required during this phase.

Rehabilitation work will restore forest cover and related habitats, and will thus have a positive impact on herpetofauna.

**Mitigation Measures**

The mitigation measures proposed to minimize the impact on the herpetofauna are similar to those proposed for the construction phase.

**Specific Mitigation Measures**

- Sowing of native species in the right-of-way.
- Removal of culverts to promote the return to natural flow conditions.

**Detailed Description of the Residual Impact**

The effect on herpetofauna after the closure phase can generally be considered positive and of low intensity. The residual impact would be of limited extent and long duration, as it will continue to be felt after closure. The significance of the residual impact on herpetofauna will therefore be low.

**Assessment of the Residual Impact**

| **Impact on Herpetofauna during the Closure Phase** | | |
|---|---|---|
| Nature | Negative/positive | Significance: Low |
| Ecosystemic value | Low | |
| Socioeconomic value | Low | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Long | |
| Probability of occurrence | High | |

## 7.2.6 Birds

### 7.2.6.1 Construction Phase

**Sources of Impact**

The sources of impact on birds during the construction phase are the general construction activities.

Railway site preparation, development and construction could disturb birds due to the noise disturbance.

In addition, clearing and grubbing activities could lead to the loss of approximately 64 ha of bird habitat as well as the loss of nests. Species that nest on the ground in forest environments are most sensitive to clearing.

Based on predicted habitat loss, it is expected that less than one waterfowl or loon breeding pair would be affected by the project (Table 7-43), as the project will not cause any loss of aquatic environments and will have a very limited effect on peatlands.

**Table 7-43: Waterfowl and Common Loon Breeding Pairs Affected by the Railway Project**

| Species | Density (IP/25 km²) | | Loss | | |
|---|---|---|---|---|---|
| | Avg. | SD | Minimum | Moderate | Maximum |
| Canada Goose | 5.5 | 1.1 | 0.10 | 0.12 | 0.15 |
| American Black Duck | 4.3 | 2.5 | 0.04 | 0.10 | 0.15 |
| Mallard | 0.3 | 0.8 | - | 0.01 | 0.02 |
| Northern Shoveler | 1.7 | 4.5 | - | 0.04 | 0.14 |
| Green-winged Teal | 1.0 | 1.8 | - | 0.02 | 0.06 |
| **Total (dabbling ducks)** | **-** | **-** | **0.14** | **0.29** | **0.52** |
| Ring-necked Duck | 6.9 | 2.7 | 0.10 | 0.16 | 0.22 |
| Common Goldeneye | 6.9 | 5.4 | 0.03 | 0.15 | 0.28 |
| Bufflehead | 0.7 | 1.3 | - | 0.02 | 0.04 |
| Common Merganser | 2.1 | 2.9 | - | 0.05 | 0.11 |
| Red-breasted Merganser | 0.3 | 0.8 | - | 0.01 | 0.02 |
| **Total (diving ducks)** | **-** | **-** | **0.13** | **0.39** | **0.67** |
| **Total (Waterfowl)** | **-** | **-** | **0.27** | **0.68** | **1.19** |
| Common Loon | 3.4 | 3.4 | 0.00 | 0.08 | 0.15 |

With regard to birds of prey, the project should not result in the loss of any breeding pairs.

With regard to land birds, habitat loss caused by clearing related to construction of the new rail segment could in theory affect nearly 190 breeding pairs (Table 7-44). GENIVAR 2012 provides loss estimates for breeding pairs by species and habitat. However, these are theoretical losses, as in reality nesting birds can use similar habitats nearby. Such habitats are abundant and current densities allow for the movement of birds to undisturbed habitats without significantly increasing competition between individuals.

**Table 7-44: Theoretical Estimates of Land Birds Affected by the New Rail Segment Construction Project**

| Habitat | Density (IP/25 km²) | | Affected Area (ha) | Estimated IP Affected | | |
|---|---|---|---|---|---|---|
| | Avg. | SD | | Min. | Avg. | Max. |
| Open conifer stand | 4.01 | 1.25 | 14.22 | 39.25 | 57.02 | 74.80 |
| Closed conifer stand | 3.57 | 1.41 | 16.01 | 34.58 | 57.16 | 79.73 |
| Mixed-wood stand | 4.17 | 1.25 | 0.78 | 2.28 | 3.25 | 4.23 |
| Regenerating stand | 2.95 | 1.66 | 12.24 | 15.79 | 36.11 | 56.43 |
| Peatland[1] | 4.60 | 0.81 | 6.85 | 25.96 | 31.51 | 37.06 |
| Peatland[2] | 0.38 | 0.26 | | *0.82* | *2.60* | *4.38* |
| Riparian area | 0.55 | 0.13 | 6.14 | 2.58 | 3.38 | 4.18 |
| **Total** | **-** | **-** | **56.24** | **120.44** | **188.43** | **256.41** |

[1] Data from point count surveys.
[2] Transect data (linear abundance index).
Figures in italic were not in the calculation of the total number of breeding pairs as they are lower than numbers obtained from listening stations.

The new railway construction project will affect less than one shorebird breeding pair (Table 7-45).

**Table 7-45: Estimated Number of Shorebird Pairs Affected by the New Rail Segment Construction Project**

| Habitat | Estimated Loss | | |
|---|---|---|---|
| | Min. | Avg. | Max. |
| Solitary Sandpiper | - | 0.05 | 0.14 |
| Greater Yellowlegs | 0.18 | 0.59 | 0.99 |
| **Total** | **0.18** | **0.64** | **1.13** |

In terms of special-status species, nine at-risk species have been reported from the area around the study area. Of these, four are likely to be found in the study area and only three have actually been observed, including one Canada Warbler, two Rusty Blackbirds and one Olive-sided Flycatcher observed near the proposed railway.

The Canada Warbler was only heard in regenerating stands during listening surveys (one individual). The mean estimated number of affected breeding pairs based on this counting method is between one and three. Note that this species was primarily found in association with young deciduous trees in regenerating habitats, and that these habitats are not representative of regenerating habitats in the impacted zone.

The Olive-sided Flycatcher was mainly observed within or near wetlands such as riparian areas and peatlands. Observations from open conifer and regenerating habitats are from listening stations located at the edge of preferred habitats. Given that this species can also use forest habitats adjacent to wetlands and 20 ha is generally accepted as the approximate size of its territory, a 250 m buffer zone (corresponding to the radius of a 20-ha circular area) was applied to wetlands in the impacted zone to refine the analysis of breeding pair losses. Results of an analysis of potential habitats suggest that approximately two breeding pairs would be affected by the project. Because the quality of the estimated potential habitat was not taken into account, this number is probably high. In fact, only one individual was observed near the study area that would be impacted, despite good coverage of the area. Moreover, since this is a species whose song is audible over large distances, it is unlikely that individuals in or around the surveyed areas were not counted.

Rusty Blackbirds, for their part, were only observed in riparian areas. Breeding pair losses are estimated at one to three pairs; two were observed in the study area.

Finally, there was one report of a Common Nighthawk near the impacted zone. Potential habitats for this species are diverse, ranging from regenerating stands to dry barren stands. It is very difficult to estimate the number of breeding pairs that would be affected by the project.

**Mitigation Measures**

Mitigation measures proposed to limit impacts on birds are as follows:

- drawing of clearing boundaries on construction plans and posting of these boundaries so as to protect adjacent forested areas;
- restriction of equipment travel to set corridors within the work area;
- prohibition of equipment travel in aquatic environments and wetlands.

**Specific Mitigation Measure**

- Bank restoration along streams disturbed during culvert and bridge installation.

**Detailed Description of the Residual Impact**

The effect on birds during the construction phase would be negative since 67 ha of potential bird habitat would be lost as a result of construction activities. The ecosystemic value is deemed moderate given the presence of species at risk. However, the degree of disturbance is deemed low because land birds can use similar habitats near the proposed railway right-of-way. The extent of the effect would be limited, because it would be restricted to the railway right-of-way, and its duration would be long, because habitat loss would be permanent. As a result, the significance of the residual impact would be low.

**Assessment of the Residual Impact**

| Impact on Birds during the Construction Phase | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | Moderate | |
| Socioeconomic value | Low | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Long | |
| Probability of occurrence | High | |

### 7.2.6.2 Operation Phase

**Sources of Impact**

Sources of potential impact on birds during the operation phase are related to the use of the railway.

Daily train trips (return) could disturb individuals in the vicinity of the railway.

**Mitigation Measures**

No mitigation measures for birds are foreseen for the operation phase.

**Detailed Description of the Residual Impact**

The effect on birds would be negative, albeit of low intensity as disruption will result from the single return train trip each day. The extent of the effect would be limited and its duration would be short. The significance of the residual impact will therefore be very low.

**Assessment of the Residual Impact**

| Impact on Birds during the Operation Phase | | |
|---|---|---|
| Nature | Negative | Significance: Very low |
| Ecosystemic value | Moderate | |
| Socioeconomic value | Low | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Short | |
| Probability of occurrence | Low | |

#### 7.2.6.3 Closure Phase

**Sources of Impact**

Sources of impact on birds during the closure phase are activities associated with the rehabilitation of the railway right-of-way.

Rehabilitation and revegetation of the right-of-way will lead to the gradual return of herbaceous plants suitable to open-country species, and then of trees typical of the original environment.

**Mitigation Measures**

Mitigation measures proposed to limit the impact on birds are similar to those for the construction phase.

**Specific Mitigation Measure**

- Restoration of the vegetation in the right-of-way using native species following construction.

**Detailed Description of the Residual Impact**

The effect on birds would be positive, albeit of low intensity, as rehabilitation work will lead to the gradual return of the original vegetation, and the peacefulness of the area would be restored once work has ended. The effect would be of limited extent and long duration. The significance of the residual impact will therefore be low.

**Assessment of the Residual Impact**

| Impact on Birds during the Closure Phase | | |
|---|---|---|
| Nature | Positive | Significance: Low |
| Ecosystemic value | Moderate | |
| Socioeconomic value | Low | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Localized | |
| Duration | Long | |
| Probability of occurrence | Moderate | |

### 7.2.7 Mammals

#### 7.2.7.1 Construction Phase

**Sources of Impact**

The sources of impact on mammals during the construction phase are general construction activities.

Land clearing work will result in the permanent loss of approximately 64 ha of stands of interest for land mammals, including 46.89 ha in land environments and 16.44 ha in wetlands. There are no significant wildlife habitats in the study area.

The impact would be greater on species with smaller home ranges (micromammals). Except for the rock vole and southern bog lemming, micromammals likely to be found in the study area are widespread throughout the province. The southern bog lemming is the only species that appears to be less abundant in the study area, but the railway project will have little impact on suitable habitats for this species (wetlands). The red, hoary and silver-haired bats, three species at risk, are likely to be found in the study area as they are strongly associated with forest environments. However, the presence of the work site will not prevent bats from using the area as a feeding ground.

During the construction phase, the presence of workers and the noise generated by the various activities planned for the construction of the rail segment are likely to disturb land mammals. Thus, depending on when the work is done, the feeding, breeding and rearing habits of some species may be disrupted. Construction work will likely disturb individuals that use residual habitats around the project site. However, the presence of undisturbed habitats in the study area and the high mobility of most of these species will limit the extent to which they would be affected. Restricting vehicular traffic to work areas will limit the extent of the disruption.

Finally, increased vehicular traffic on logging roads resulting from railway construction could lead to collisions between vehicles and wildlife.

**Mitigation Measures**

The mitigation measures proposed for mammals during the construction phase are as follows:

- drawing of clearing boundaries on construction plans and posting of these boundaries so as to protect adjacent forested areas;
- restriction of equipment travel to set corridors within the work area;
- location of all construction trailers and equipment storage areas at the temporary workers' camp;
- rehabilitation of work sites once work is complete to limit the duration of disruptions;
- raising worker awareness on the importance of not feeding animals and of proper waste management at the work site.

**Detailed Description of the Residual Impact**

The effect on mammals is negative as general construction activities will lead to the loss of habitats used by mammals and could disrupt some species. The degree of disturbance is deemed low given the abundance of similar habitats nearby and the high mobility of most of the species. The extent of the effect is limited as it is restricted to the rail segment right-of-way. Its duration is long because habitat loss would be permanent. Therefore, the residual impact is deemed low.

**Assessment of the Residual Impact**

| Impact on Mammals during the Construction Phase | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | Moderate | |
| Socioeconomic value | Moderate | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Long | |
| Probability of occurrence | High | |

### 7.2.7.2 Operation Phase

**Sources of Impact**

During the operation phase, railway use is the source of impact on mammals.

The daily passage of the train could temporarily disturb some of the species present in the vicinity of the railway line.

**Mitigation Measures**

No mitigation measures are planned for mammals for the operation phase.

**Detailed Description of the Residual Impact**

The impact on mammals is negative as the passage of the train will cause a temporary disturbance. The degree of the disturbance is low because trip frequency is negligible (one round trip per day) and the disruption will be short-lived. The extent is limited because it is limited to the railway line, and the duration is long as the impact will be felt over the 13 years of mining. The significance of the residual impact is therefore deemed to be low.

**Assessment of the Residual Impact**

| Impact on Mammals during the Operation Phase | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | Moderate | |
| Socioeconomic value | Moderate | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Long | |
| Probability of occurrence | High | |

### 7.2.7.3 Closure Phase

**Sources of Impact**

Due to decommissioning work, the impact on mammals during the closure phase will be the same as during the construction phase, except that no clearing work will be required.

Rehabilitation and revegetation of the railway right-of-way will result in the gradual return of herbaceous species that favour open areas, followed by the woody vegetation typical the original setting.

Once the construction and use of the rail line has ended, the area will return to its initial state in terms of noise, which will have a positive effect on wildlife.

**Mitigation Measures**

The mitigation measures proposed to minimize the effect on mammals are the same as for the construction phase.

**Specific Mitigation Measure**

- Restoration of the vegetation in the right-of-way using indigenous species following the completion of decommissioning work.

**Detailed Description of the Residual Impact**

Once the closure phase has ended, the impact on mammals can be considered generally positive. The degree of disturbance is considered low given the small area affected and the gradual return to the initial state (noise and vegetation). The extent is limited, as it is limited to the railway right-of-way. The duration is long, as the impact will be felt beyond the closure activities. The significance of the residual impact is therefore deemed to be low.

**Assessment of the Residual Impact**

| **Impact on Mammals during the Closure Phase** | | |
|---|---|---|
| Nature | Negative/Positive | Significance: Low |
| Ecosystemic value | Moderate | |
| Socioeconomic value | Moderate | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Long | |
| Probability of occurrence | High | |

# 8 EXISTING CONDITIONS AND IMPACT OF THE PROJECT ON THE HUMAN ENVIRONMENT

## 8.1 Existing Conditions

### 8.1.1 Land Management and Development

The regional study area is located in the Nord-du-Québec administrative region. This area consists of three equivalent territories (TE): Jamésie, Kativik and Eeyou Istchee. Most of the study area is in the Jamésie[2] equivalent territory (Figure 8-1) and part is in the Domaine-du-Roy regional county municipality (RCM) in the Saguenay-Lac-Saint-Jean region. The study area lies in the territories of the Municipality of Baie-James (MBJ)[3] and Chibougamau and, to a lesser extent, the Lac-Ashuapmushuan unorganised territory (Saguenay–Lac-Saint-Jean).

MBJ is an ex-RCM regional administrative entity created in 1971 by the James Bay Region Development and Municipal Organization Act. In July 2012, the MBJ was replaced by the regional government of Eeyou Istchee James Bay Territory, a new administrative body also governed by the Cities and Towns Act. Among other things, the changes mean that Category III public land would be managed by a mixed government (11 Crees and 11 Jamesians on the board). The regional government has four towns, each with its own plan and town planning regulations and primarily governed by the Cities and Towns Act and the Act respecting Land Use Planning and Development (from Chapter III on). Land development is governed by the town plan and the zoning regulations.

This territorial organization is supplemented by the James Bay and Northern Quebec Agreement (JBNQA). The JBNQA led to the creation of the Cree Regional Authority (CRA), which, among other things, has the mandate to provide and coordinate services for the nine Cree villages, including Oujé-Bougoumou and Mistissini. The JBNQA land regime also provides for the subdivision of the territory into Category I, II and III land, with levels of exclusive hunting, fishing and trapping rights granted to Cree depending on the category. The local study area lies on Category III land, where specific trapping rights are granted to the Crees, with other users also enjoying certain recreational hunting and fishing rights.

### 8.1.2 Municipal Organization

The proposed route for the construction of the new rail segment lies within the administrative boundaries of two municipalities, namely the town of Chibougamau and the Municipality of Baie-James.

[2] The Jamésie equivalent territory contains the following towns: Chibougamau, Chapais, Lebel-sur-Quévillon, Matagami and the Municipality of Baie-James.

[3] The Municipality of James Bay includes the three localities of Villebois, Radisson and Valcanton, as well as two hamlets: Miquelon and Desmaraiville.

Between chainage 0+000 and 15+450, the railway lies on the territory of the Municipality of Baie-James and is fully within the timber allocation. Authorized uses include cottages (scattered), industrial (mining facilities and public utilities), sports and recreation (parks and green spaces), broad uses (hunting and fishing camps), and public and institutional uses, as well as logging. Railway construction is not authorized under current zoning regulations. BlackRock Metals intends to file a request with the MBJ for a change in zoning or authorized use.

From chainage 15+450 to 27+000, the railway route is on the territory of the town of Chibougamau and is fully within the timber allocation. Authorized uses are surface extraction, mining, logging and forest conservation, as well as hunting, fishing and trapping. The town's zoning bylaws do not legislate on railway construction, and this portion of the railway construction project is therefore in compliance with municipal zoning.

### 8.1.3 Regional Population and Economy

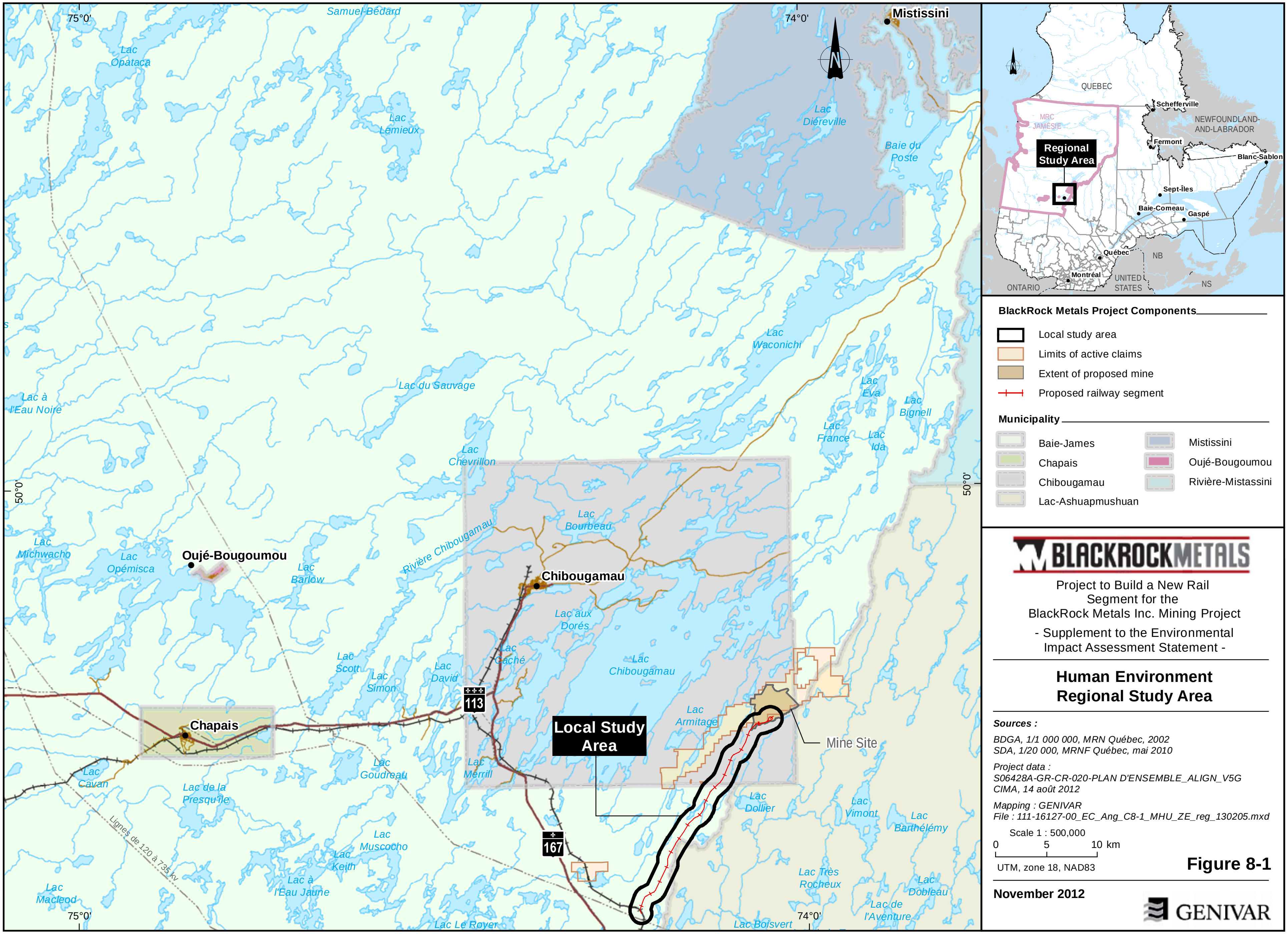
The regional population and economy were described for the Nord-du-Québec region, as well as the territory within the regional study area, which includes the Municipality of Baie-James, Chibougamau and Chapais, as well as the Aboriginal settlements of Oujé-Bougoumou and Mistissini.

#### 8.1.3.1 Socio-Economic Profile

The Nord-du-Québec territory had 42,330 inhabitants in 2011, or 0.5% of Quebec's population. The Jamésie and Eeyou Istchee equivalent territories accounted for nearly 75% of the population of the administrative area. Chibougamau is the main town in the regional study area, with 7,541 inhabitants in 2011. The populations of the other four communities surrounding the local study area ranged from 725 (Oujé-Bougoumou) to 3,427 inhabitants (Mistissini).

Between 2006 and 2011, the population of the James Bay decreased by 2.8%, while the population of Eeyou Istchee grew by 10.7%. The population of the municipalities of Baie-James, Chibougamau and Chapais saw their numbers decline by 6.5%, 0.3% and 1.2%, respectively. Note that Oujé-Bougoumou showed the most significant growth (19.6%). According to Statistics Canada's 2006-2031 population forecasts, the population of the Jamésie equivalent territory (ET) is expected to fall by 25.2%, while that of the Eeyou Istchee ET is expected to grow by 32.8%.

According to 2012 Statistics Canada data, the Nord-du-Québec population is younger than the Quebec population. However, the median age for the population of Chibougamau (39 years), Chapais (41.4 years) and MBJ (44.8 years) is comparable to the median age for Quebec as a whole (41 years). The age structure of the Nord-du-Québec region is below the average for Quebec due to the age structure of the Aboriginal communities (median age: 24 years), which is significantly lower than that seen in the rest of Quebec.

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- Supplement to the Environmental Impact Assessment Statement -

**Human Environment Regional Study Area**

*Sources :*

*BDGA, 1/1 000 000, MRN Québec, 2002*
*SDA, 1/20 000, MRNF Québec, mai 2010*

*Project data :*
*S06428A-GR-CR-020-PLAN D'ENSEMBLE_ALIGN_V5G*
*CIMA, 14 août 2012*

*Mapping : GENIVAR*
*File : 111-16127-00_EC_Ang_C8-1_MHU_ZE_reg_130205.mxd*

**Figure 8-1**

**November 2012**

GENIVAR

The school enrollment rate of the population of Chapais, Chibougamau and MBJ is lower than in the rest of Quebec, with the proportion of people without a high school diploma standing at 38.8%, 28.9% and 36.8%, respectively, compared to 25% for Quebec. However, the proportion of trade school graduates is higher for these three municipalities (Chapais: 23.5%, Chibougamau: 22.6% and MBJ: 25.4%) than for Quebec as a whole (15.3%) (Statistics Canada 2007a, b, c).

The proportion of working-age people (15 years and over) in Chibougamau, Chapais and MBJ is higher than for Quebec as a whole, at 80%, 83% and 87%, respectively (Statistics Canada 2012a, b, c). In 2010, the number of workers aged 25 to 64 increased throughout the Nord-du-Québec region. The Jamésie ET saw a slight rise (0.2%) from 2009, to a rate of 74.5% of workers, which is slightly higher than the rate for Quebec (73.5%) (ISQ 2012 [regional newsletter]). The median family income before tax was higher than for Quebec workers in general, with the exception of MBJ ($71,683 for Chibougamau, $61,949 for Chapais and $53,000 for MBJ compared to $58,678 for Quebec).

In 2006, the unemployment rate[4] for the Nord-du-Québec region stood at 7.8% compared to 7% for the entire province. More specifically, the unemployment rate stood at 9.5% in Chibougamau, 12.2% in MBJ and 14.5% in Chapais. Although higher than for Quebec as a whole, the unemployment rates of the three municipalities have declined by 3.1%, 11.9% and 2.7%, respectively, since 2001, when they stood at 12.6%, 24.1% and 17.2% (Statistics Canada 2012d, e, f; 2007a, b, c).

In 2006, the participation rate[5] and the employment rate[6] for the Chibougamau population (73.1% and 66.2%) were higher than for the province as a whole. From 2001 to 2006, these rates increased by 4.9% and 6.6%, respectively. In 2006, the participation and employment rates for MBJ (64.9% and 57%) were similar to those for Quebec in general (64.9% and 60.4%), while in Chapais they were lower (59.3% and 50.7%) (Statistics Canada 2007a, b, c).

The industrial structure of Nord-du-Québec is dominated by the primary sector. In 2006, a large proportion of workers held jobs in the primary sector: 12.0% in Chibougamau, 21.5% in Chapais and 23.1% in MBJ, compared to 3.7% in Quebec. Secondary and tertiary sector jobs, on the other hand, were less strongly represented than in the rest of Quebec (Entraco 2011, Statistics Canada 2007b).

According to data obtained by the *Table jamésienne de concertation minière*, the housing occupancy rate in Chibougamau was about 95% in June 2011. Chapais has a residential sector that offers all basic installation services (sewers, water, electricity).

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[4] The unemployment rate represents the number of unemployed people as a percentage of the labour force, which consists of people 15 years and over who are working or looking for work (unemployed).

[5] The participation rate represents the labour force expressed as a percentage of the population 15 years of age and over.

[6] Also called the employment/population ratio, the employment rate represents the number of persons employed expressed as a percentage of the population 15 years of age and over.

#### 8.1.3.2 Work Force

The development of Chibougamau and Chapais is mainly based on the exploitation of natural resources. In comparison with the rest of Quebec, the study area has skilled labour specialized in the primary sector. In Nord-du-Québec, 7% of jobs are in the construction, heavy machinery and mining-related trades, compared to 2% for the entire province (Roche SNC-Lavalin Consortium, 2010).

The *Commission Économique et Touristique de Chibougamau* (CETC) has created a directory for mining companies listing all services offered by Chibougamau businesses (Entraco 2011). The directory has more than 20 categories of services and labour available on the town's territory.

Finally, the unemployment and employment rates for Chibougamau and Chapais indicate the presence of a pool of workers available and able to work.

#### 8.1.3.3 Economic Activities

The economy of Nord-du-Québec is based on the exploitation of natural resources, including mining and logging. The municipalities in the study area have a similar economic structure to other Jamésie municipalities. The proportion of jobs related to the primary sector is higher for the three municipalities in the study area than for the province as a whole, up to six times higher in the case of the Municipality of Baie-James (Statistics Canada 2007a, b, c). In contrast, the proportion of jobs in the secondary and tertiary sectors was lower than for the rest of Quebec. Although lower than the provincial average, the tertiary sector nevertheless remains the economic driver for Chibougamau and the Municipality of Baie-James, accounting for 43.7% and 42% of jobs, respectively.

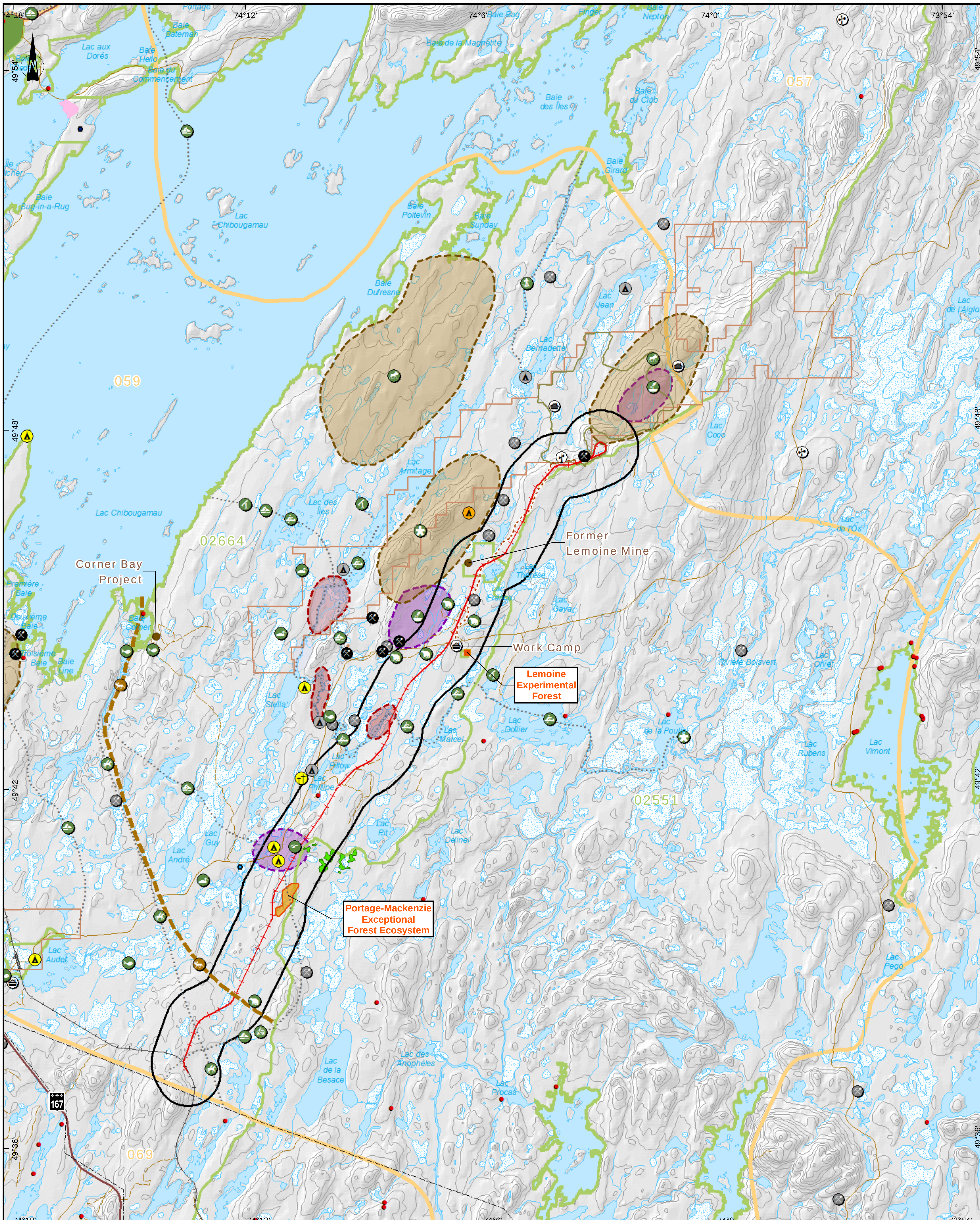
The town of Chibougamau stands out in terms of economic diversity compared to other communities in the Jamésie region. The CETC's directory of businesses and industries reflects a diversity of companies active in the community. According to a report by the Public Health Department, the economic diversity of Chibougamau is comparable to that of Quebec as a whole, at 40% (Roche Ltd., Consulting Group 2011).

### 8.1.4 Land Use

#### 8.1.4.1 Built Environment

There are no permanent residences or commercial or institutional establishments in the local study area. There is recreational lease approximately 400 m west of the proposed railway (Figure 8-2).

The presence of the Wapachee family's main seasonal camp (Rabbit camp) approximately 350 m west of chainage 8+000 should be noted; however, the tallyman has agreed to relocate the camp outside the mining project's area of influence. Thus, the Rabbit camp will not be considered a component of the built environment.




**Infrastructures**

- Main road (167)
- Secondary or access road
- Existing railway
- Transmission line

**BlackRock Metals Project Components**

- Local study area
- Limits of active claims
- Mine site
- Proposed railway segment
- Proposed access road

**Land Use**

Extraction Area

- Sand pit
- Gravel pit

Forestry

- Forest management unit
- Projected logging by 2008-2013 management plan

**Land Use (Continued)**

Camps and Installations

- Permanent cree camp
- Temporary cree camp
- Former cree camp
- Recreational lease
- Telecommunication tower
- Wind monitoring equipment

Hunting, Fishing, Trapping and Harvesting

- Spawning ground
- Black bear kill sites
- Hunting Area
  - Waterfowl
  - Big game
  - Other
- Harvesting Area
  - Small fruit picking
  - Firewood harvesting

Heritage Areas

- Burial site

Limits

- Trapline

Other Elements of Interest

- Waterfowl feeding area
- Caribou trail

Areas of Interest

- Experimental forest
- Exceptional forest ecosystem

Transports-Trails

- Canoeable route
- Snowmobile trail
- Horseback trail
- Pedestrian and snowshoe trail
- ATV trail
- Portage

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for the BlackRock Metals Inc. Mining Project
- Supplement to the Environmental
Impact Assessment Statement -

**Survey of the Human Environment**

*Sources :*
*CanVec, 1/50 000, RNCan, 2010*
*Gestion des titres miniers (GESTIM), MRNF Québec, septembre 2012*
*Aires protégées et territoires d'intérêt : MDDEP, 2011*
*Écosystèmes forestiers exceptionnels et Refuges biologiques, MRNF, 2011*

*Mapping and inventory : GENIVAR*
*File : 111-16127-00_EC_Ang_C8-2_MHU_130205.mxd*

Scale 1 : 120,000
0 1.2 2.4 km
UTM, zone 18, NAD83
Contour interval : 20 m

**Figure 8-2**

**November 2012**

GENIVAR

Finally, there is an industrial lease issued by the *Ministère des Ressources naturelles et de la Faune* (MRNF) approximately 250 m east of the site selected by BlackRock Metals for the temporary workers' camp, near chainage 16+000.

#### 8.1.4.2 Recreation and Tourism

The town of Chibougamau and the Municipality of Baie-James have a number of sites and facilities dedicated to culture, sports and recreational tourism activities where the key attractions are related to hunting, fishing, and outdoor and adventure activities. The available data on tourism for Nord-du-Québec dates back to 2000.

According to information collected in the Lac Doré Geological Complex EIS (Entraco 2011), tourism and vacation-related activities mainly take place north of Lac Chibougamau and along Route 117. In addition, Lac Chibougamau and Lac Armitage, both located outside the local study area, are used for fishing by non-Aboriginals. None of the major lakes or rivers used to a significant degree lie in the railway study area.

The mine study area is also used by sport hunters. In fact, the bear hunters encountered between the mineral deposit and the transfer point proposed in 2011 confirms the use of the area. However, there are not yet any tourist sites or major facilities within the mine study area.

#### 8.1.4.3 Wildlife Harvest

Quebec has 28 sport hunting zones. The land portion of the local study area is located in Zone 17 and partially overlaps Zone 28. The only hunting and trapping data from the MRNF wildlife division is for black bear and moose. The 2007-2011 hunting statistics obtained from the MRNF indicate five black bears killed in the local study area, but no moose. Yearly statistics are shown in Table 8-1.

Note that while caribou hunting is permitted in hunting zone 17, hunters must comply with the Act respecting hunting and fishing rights in the James Bay and Nouveau-Québec territories. However, most caribou hunting takes place farther north, outside of the study area.

According to the consultations with the tallyman of trapline 059, Canada Geese and several species of ducks are hunted in the local study area (Entraco 2011).

**Table 8-1: Big Game Hunting Statistics for the Study Area, 2007 to 2011 Seasons**

| | Number Recorded 2007-2011 | | | | | |
|---|---|---|---|---|---|---|
| **Species** | **2007** | **2008** | **2009** | **2010** | **2011** | **Total** |
| Moose | 0 | 0 | 0 | 0 | 0 | 0 |
| Black bear | 1 | 0 | 1 | 3 | 0 | 5 |

Source : MRNF 2012c

In terms of trapping, traplines in Quebec are divided into furbearer management units (UGAF). The local study area straddles UGAF 87 and partially overlaps UGAF

50. Trapping in these two areas is reserved exclusively for Aboriginal peoples under the Regulation respecting beaver reserves and the Act respecting hunting and fishing rights in the James Bay and Nouveau-Québec territories. The Mistissini beaver reserve is located within the study area. More specifically, traplines 059 and 060 of the community of Oujé-Bougoumou occupy the entire local study area. However, the railway corridor will not affect trapline 060. It is important to mention that the portion of trapline 059 is superimposed on trapline No. 24 of the Innus of Lac-Saint-Jean (Pekuakamiulnuatsh) and is currently the subject of negotiations between the Innu First Nations and the federal and provincial governments.

The MRNF Wildlife Division does not have any trapping data available for fur-bearing animals. According to the EIS (Entraco 2011), the tallyman for trapline 059 favours beaver, otter, muskrat, mink, weasel, fox, marten, lynx and hare.

Most of the fishing in the study area, both by Aboriginal and non-Aboriginal people, takes place in Lac Chibougamau and Lac Armitage, which are outside the local study area (Entraco 2011).

#### 8.1.4.4 Logging

The reform of the forest regime by the passage in April 2010 of the Sustainable Forest Development Act, which replaces the Forest Act, resulted in changes in the management of the forest resource. The main changes introduced by the new act include the conversion of timber supply and forest management agreements (TSFMA) by the granting of timber supply guarantees and implementation of a policy on local forests, which will replace the forest management agreements (FMA) (MRNF 2012d). Changes will not be made to the allowable cut but rather to timber allocations, which will now be available for all of Quebec's logging industry. According to one MRNF representative, the new forest regime will come into effect in 2013.

The local study area is part of the forest management unit (FMU) 026-64 and partly overlaps FMU 025-51, which have five and 14 beneficiaries, respectively (ACC 2007) (Figure 8-2). Barrette Chapais, Bois K.M.S. (GMI), Les Chantiers de Chibougamau, Les entreprises Alain Maltais and Papier de publication Kruger (Trois-Rivières) are the agents in the study area (026-64) (LCC 2010). The local study area is mainly occupied by regenerating stands and open and closed mature conifer stands (GENIVAR 2012). The 2008-2013 five-year forest management plan provides for only a few logging areas; these lie east of the railway line, between chainage 8+000 and 9+000 (Figure 8-2).

In 2005, the MNRF assigned forest protection and development objectives (PDO) to each FMU to promote sustainable forest development. The 2007-2012 General Forest Management Plans contain a total of 11 objectives. An exceptional forest ecosystem (EFE), the Portage-Mackenzie EFE, registered in the *Registre des aires protégées du Québec* (registry of protected areas) (MDDEP 2012b) is found in the railway study area. While this site is a conservation area, the law allows for certain activities in such areas, including research, education and recreational tourism development, as well as work related to the exercise of mineral rights (Figure 8-2). Note that the route of the new railway line has been optimized to avoid this forest.

Finally, the Lemoine research forest is found in the railway study area, east of chainage 16+000 (Figure 8-2). The MNRF recognizes this forest as an area with minor constraints on mining activities; such activities are subject to conditions and obligations determined by the Minister. The route of the new rail segment has been optimized to avoid this forest.

#### 8.1.4.5 Mining

There are no active mines in the local study area, only the old Lemoine mine, which was in operation in the 1970s. The old mine shaft is fenced off and the tailings area was fully rehabilitated in the early 1990s by Westminer (Entraco 2011). The mineral rights in this area now belong to Cogitore Resources, which may carry out mineral exploration.

Exploration by claim holders is the only mining activity taking place in the mine study area. Claims are the only titles granted for mineral exploration in the domain of the state. A claim is a mining right that gives the holder the exclusive two-year right to explore a defined territory for minerals in the public domain (MRNF 2012e). There are active claims covering the entire local study area. Most of these are held by holders other than BlackRock Metals (MRNF 2012f). Only the section of railway between chainage 25+000 and 26+000 is on claims owned by BlackRock Metals. According to the 2010 and 2011 MRNF report on mining in Quebec, no exploration work was done in the local study area, but exploration could still take place in the railway study area in the future.

#### 8.1.4.6 Extraction and Disposal Sites

There are four extraction sites (sand and crushed stone) in the local study area (MRNF 2012g). According to Ms. Bernard of the MRNF (personal communication) the study area includes one beneficiary of an exclusive lease to mine surface mineral substances and three sites that require an application for an MDDEP Certificate of Authorization (CA) for their operation. There are also two sites within 100 m of the local study area (gravel and sand pits), including a beneficiary of an exclusive right and an operation with a CA application. An exclusive lease allows the extraction of specific substances in a defined area, but the right is specifically limited to the permit applicant.

There are no waste disposal sites in the railway study area.

### 8.1.5 Development Projects

There are no development projects in the local study area aside from the BlackRock Metals mining project. There are nevertheless mineral exploration activities in the area, but no new mining projects are currently underway.

### 8.1.6 Infrastructure

#### 8.1.6.1 Roads

Route 167 crosses the regional study area in the southeast-northwest direction. Some 411 km long, it runs from Saint-Félicien to Mistissini via Chibougamau. Route 167 is particularly important in the area because it is part of the road link between northern and southern Quebec. The road is mainly used by industry. In 2011, the government announced the extension (250 km) of Route 167 north to the Otish Mountains in the framework of the Plan Nord.

The regional study area hosts a large network of logging roads. More specifically, the local study area includes logging road 210, which starts about 30 kilometres south of Chibougamau (Km 200 on Route 167). The road is managed by the MNRF and maintained by the users (Entraco 2011).

Finally, the original mine access road to the Lac Doré Complex is in the local study area. The final plans of the road layout are not yet complete. However, the trajectory of the mine access road is expected to run alongside the tracks rather than across them. The impact associated with the construction of this road would be dealt with when the application for the certificate of authorization required by the MDDEP is filed.

#### 8.1.6.2 Railway

The Canadian National Railway Company (CN) operates a rail freight service (wood, paper, minerals and chemicals) in the Municipality of Baie James through its Northern Quebec Internal Short Line (NQISL) division, which oversees the transportation of heavy goods over a distance of about 230 km, between Chibougamau and the Saguenay–Lac-Saint-Jean region. Segments of the Chapais and the Cran subdivisions run through the study area on the southeast-northwest axis (MTQ 2001). According to Mr. Aquinas from CN (personal communication, 2012), a variety of goods are transported, generally consisting of petroleum products or timber products (wood chips, tree-length wood, processed wood, etc.). The transportation schedule varies depending on user shipping forecasts submitted weekly to CN personnel.

#### 8.1.6.3 Power and Telecommunications

In the local study area, there is a 161 kV Hydro-Québec power transmission line that runs parallel to Route 167, which connects the Obalski substation in the north to the Obatogamau substation in the south (Entraco 2011). Hydro-Québec plans to also build a 161 kV power line along logging road 210, to connect the proposed BlackRock Metals plant to the existing grid that runs along Route 167. This new line would cross the proposed railway at chainage 16+200.

BlackRock Metals has built a communications tower for cellular phones and Internet access. This tower is located south of Lac Denis (Figure 8-2).

#### 8.1.6.4 Municipal Infrastructure

There is no municipal infrastructure in the local study area.

### 8.1.7 Heritage and Archaeology

All the known archaeological sites are identified in the EIS for the Lac Doré geological complex. They are all found around Lac Chibougamau and Lac Obatogamau. Arkéos also did a study in 2002 of the archaeological potential in the area of the proposed mine site and along logging road 210, at the site of a proposed 161 kV transmission line. A total of 15 potential areas were identified. Finally, field surveys were done in 2003 and 2011 by Archéo-08 on the potential sites most likely to be affected by the project. Test pits failed to uncover any historical remains (Entraco 2011).

There are no known archaeological areas or areas with archaeological potential in the local study area covered by the archaeological potential study, meaning between chaining 16+000 and 27+570. The potential areas closest to the railway local study area are at the junction of the tributaries of Lac Philippe and Lac Pillow, and at the outlet of Lac Gaya (Figure 8-2).

Although a portion of the local study area for the railway impact study is not covered by the archaeological potential study (KP 0+000 to 16+000), it can be assumed that areas of archaeological potential are unlikely to be found.

In fact, the Arkéos and Archéo-08 studies included a literary review and a field study by photo-interpretation to identify and rank potential areas for the discovery of traces of human occupation using environmental criteria (Entraco 2011). The criteria for determining areas of archaeological potential are essentially based on hydrography, sedimentology and types of in-situ deposits, topography and disturbance, as well as known historical and modern elements (contemporary Native American site, known archaeological site, etc.) (Arkéos 2002). The Arkéos and Archéo-08 studies show that some natural elements, such as a small, sinuous drainage network, small lakes and the presence of wetlands, indicate poor archaeological potential for an area. In line with this premise, the local study area not covered by the archaeological potential studies does not include significantly-sized streams of importance, and the areas between chainage 12+000 and 16+000 are mainly covered by wetlands.

An old canoe route crosses the route of the proposed railway at chainage 13+200 (Rivière Jules) and was used up until the early days of logging. Rivière Jules is completely surrounded by wetlands, which greatly reduces the potential for archaeological discovery. Finally, an old horse track crosses the railway route at chainage 1+400. Before snowmobiles were invented, this track was used to get to the Hudson Bay trading post in the late 1940s. Given the period in which this route was used and the proximity to Route 167, the potential for archaeological discovery is low. The local study area not covered by the archaeological potential studies therefore has few features conducive to the discovery of archaeological remains.

BlackRock Metals has undertaken discussions with the *Ministère de la Culture, des Communications et de la Condition féminine* (MCCCF) and, if necessary, to conduct an archaeological potential study on the railway route. Regardless, in the event of a fortuitous discovery of archaeological evidence, contractors and subcontractors are required to stop work and notify the Regional Directorate of MCCCF.

### 8.1.8 Aboriginal Community

The local study area for the railway is located on traplines 059 and 060, both of which belong to the community of Oujé-Bougoumou. The eastern portion of trapline 059 overlaps trapline No. 24 of the Innus of Lac-Saint-Jean (Pekuakamiulnuatsh). This territory is currently the subject of negotiations between the Innu First Nations and the federal and provincial governments. These negotiations include the right to practice cultural and wildlife activities, as well as the right to participate in the management of the land, natural resources and the environment. The agreement in principle of a general nature signed by the First Nations of Mamuitun (including the First Nation of Mashteuiatsh – the Innus of Lac-Saint-Jean) does not officially grant these groups Aboriginal rights protected under Section 35 of the Constitution Act, 1982. The government therefore does not formally recognize the Aboriginal rights of these groups in the study area. It should also be noted that the railway corridor does not encroach on the disputed territory (SAA 2012). Consequently, only the community of Oujé-Bougoumou is addressed in this section.

#### 8.1.8.1 Location of the Community of Oujé-Bougoumou

The Aboriginal community of Oujé-Bougoumou is located on the northeastern shore of Lac Opemisca, about 30 km north of Chapais and more than 80 km northwest of the local study area. This village was built in 1992 following a series of moves by the community over the past 50 years. In 2011, following the signing of the Complementary Agreement No. 22 incorporating the community of Oujé-Bougoumou into the JBNQA, Oujé-Bougoumou became the ninth Cree band in the Nord-du-Québec territory.

#### 8.1.8.2 Socioeconomic Profile of the Community

The Cree population of the Eeyou Istchee equivalent territory numbered 15,868 in 2011, representing just over 35% of the population of Nord-du-Québec. Oujé-Bougoumou has 725 inhabitants (4.5% of the Cree population). The population of the Cree communities has grown significantly since 2001, by about 23.3%, with population increases of 31.1% and 32% recorded for Oujé-Bougoumou and Mistissini, respectively, during this period.

Recent demographic forecasts from the Institut de la Statistique du Québec (ISQ) indicate that Nord-du-Québec should see population growth of 6.8% between 2006 and 2031, while the growth forecast for Quebec is in the order of 15.8%. The Eeyou Istchee equivalent territory should show stronger growth, estimated at 32.8% (ISQ 2012a).

The median age for the community of Oujé-Bougoumou is 24 years compared to 41 years for the province of Quebec, due to the larger representation of 0-14 year-olds (37%). The age structure of the population of the Eeyou Istchee territory, including Oujé-Bougoumou, reflects what is generally seen in Aboriginal reserves in Quebec.

The enrollment rate for persons 15 years and over in the Aboriginal population is less than for Quebec as a whole. In fact, 42% (Quebec: 36%) of the members of the community of Oujé-Bougoumou do not hold a diploma, certificate or degree. Only 21% (Quebec: 26%) of the members of the community hold a college-level or higher certificate or diploma (Statistics Canada 2012g).

According to data for 2010 from the ISQ, the number of workers aged 25 to 64 is growing in the Nord-du-Québec region, and particularly in the Eeyou Istchee ET (+9.8%), which had the highest growth in Québec (ISQ 2012). Despite this increase, the Eeyou Istchee territory has the lowest employment rate in Nord-du-Québec (70.6%). The community of Oujé-Bougoumou has particularly high unemployment, which at 20.4% is well above the Quebec average (7%). The participation rate for the community (56%) is lower than for Quebec as a whole (65%).

#### 8.1.8.3 Description of the Cree Labour Force

The regional economy has been primarily resource-based for many years, and the Cree have proven skills in construction and major projects. The presence of mining projects like the Troilus mine and the development of the Eastmain-1 and Eastmain-1-A-Sarcelle-Rupert hydroelectric projects have enabled the Cree communities to acquire extensive experience in various fields (contractors, drillers, truck drivers, heavy equipment operators, stevedores, mechanics, labourers) (Entraco 2011).

Each community has an employment centre and training programs tailored to the labour market. The Cree communities, including Oujé-Bougoumou, in partnership with the Grand Council of the Crees of Quebec, are finalizing a document profiling the human resources and contractors in the various communities (Entraco 2011).

#### 8.1.8.4 Economic Activities

In the 1970s, the Cree economy was mainly based on traditional activities (hunting, fishing, trapping) and, to a lesser extent, on employment and transfer payments (Hydro-Québec Production 2004.). The development of mining and logging towns, including Chibougamau, has increased Cree income from paid employment relative to income from traditional activities.

The economic activities of the community of Oujé-Bougoumou are mainly related to mining, trapping, tourism, transport, construction, outfitting and blueberry-growing (AANDC 2012). There are well over a dozen companies in the community.

#### 8.1.8.5 Land Use

**Main Trapline Features**

Trapline 059 lies approximately 20 km south of Chibougamau. It is bordered to the west by Route 167 and covers 994 $km^2$. The municipal territory overlaps 266 $m^2$ of the trapline. Philip Wapachee has been the tallyman since 1974, and recently passed his title to his son, Mathew Wapachee (Entraco 2011).

The trapline is accessible by Route 167. The Wapachee family uses the territory during the main hunting seasons, meaning spring, fall and winter, and stays at their camps in the summer. They access the camps by boat or all-terrain vehicle (ATV) in summer and by snowmobile in winter.

An ATV and snowmobile trail cross the route of the proposed railway in the southern portion, near Rabbit camp (Figure 8-2). Only the main snowmobile trails have been identified by the tallyman, but smaller trails crisscross the entire trapline. In the past, the family travelled the area by canoe on the various rivers. These old waterways and portage sites are still alive in the collective memory, and some of them are still used or usable. An old canoe route crosses the proposed railway at chainage 13+400; this route was used during the era before logging began.

The family has two main camps on their trapline, including one, Rabbit camp, in the local study area. Located east of Lac Guy, this camp has four buildings and an old traditional structure now used for storage. Note that BlackRock Metals will move this camp, but its future location is currently unknown. The family usually stays at this camp in winter, including the Christmas holidays, and gets there via logging road 210. Several "walking out" ceremonies have been held at the camp. This ceremony is part of a series of Cree spiritual rites, and is a time to introduce the child to the community, as well as to his or her traditional role as a male or female within the community.

There is an old camp near Lac Philippe. This camp was used in the late 1970s during the moose hunting period. Several other camps are scattered on the Wapachee family trapline, and could be used again by a family member at any time. Only a few have been identified so as to keep some locations secret and thus avoid vandalism. The family also plans to continue developing new camps but has not specified potential sites.

**Hunting, Fishing and Trapping**

Hunting, fishing, trapping and berry gathering are the main activities of the tallyman and his family. There are two hunting areas, two gathering areas and a feeding ground used by geese in the local study area (Figure 8-2).

The Wapachee family hunts moose both in the fall and winter. There is a moose hunting ground at the north end of the local study area, and a hunting area for big game, excluding moose, in the northwest part of the study area. Family members have mentioned the presence of a caribou route in the southern portion of the study area (Figure 8-2). Discussions would indicate that the caribou is not one of the species hunted by the family.

Goose hunting is practiced in many lakes within the family's trapline. The family members met with mentioned the presence of a feeding ground used by geese during the spring hunting season. These grounds are within the local study area, more precisely in the area northeast of Lac Pillow (Figure 8-2).

Grouse hunting is practiced throughout the territory except in wetlands, and duck hunting is practiced on the various lakes on the trapline, including Lac Guy, which lies within the study area.

Berry picking is a traditional Cree activity. There is a berry-picking area near the proposed railway, southeast of the old mine Lemoine, and the Rabbit camp area (old forest fire or burn) is used to collect firewood.

None of the lakes identified by the family as fishing or spawning grounds are found within the railway local study area.

The tallyman's father and mother still do some trapping, despite the fact that this activity has become much less financially attractive, generating considerably less income than it once did. Target species are: beaver, marten, otter, hare, bear, muskrat, lynx, weasel and fox.

**Valued Areas and Sites of Archaeological or Historical Interest**

Valued sites and sites of historical or archaeological interest are an important part of the Cree culture. The family members met with expressed their interest in certain sites or areas. There are two sites of interest and two historic sites within the local study area.

There is a first moose kill site at the north end of the proposed railway. First moose kill sites have cultural significance for the family, as a man had to prove his ability to provide for his family by killing a moose before he could get married.

Several burial sites have been identified by family members. There is only one site within the railway study area, northwest of Lac Philippe.

The tallyman mentioned an old horse trail south of the future railroad. This trail was used to access the site before the invention of the snowmobile. The trail dates back to the time where the road from Saint-Félicien was being built.

The tallyman did not mention anything about the presence of archaeological sites or sites of archaeological potential, aside from the elements described in this section.

**Projects**

The Wapachee family has agreed to move Rabbit camp due to the anticipated effects of mine development. The new site has not yet been determined.

The former tallyman has restored the old canoe route in the local study area, with the goal of developing teams to take young people with social problems on canoe trips and to facilitate the transmission of cultural knowledge.

### 8.1.9 Landscape

#### 8.1.9.1 Regional Setting

At the regional level, the study area viewshed is part of a typical Laurentian Highland and Abitibi Upland visual landscape. The regional physiography is characterized by rolling, low amplitude terrain with an abundance of lakes, streams and peatlands (Entraco 2011). The natural landscape is characterized by the presence of Lac Chibougamau and a central rocky ridge that juts into the center of the study area landscape.

Human activity has significantly altered the landscape due to the mining and logging that has taken place in the area since the 1950s. The presence of old Lemoine mine and the extensive logging done in the past five years by Les Chantiers Chibougamau shows the footprint of human activity on the natural landscape of the local study area.

#### 8.1.9.2 Landscape Units

The environment hosting the railway project is marked by two distinct landscape units: the forest and the central rocky ridge (Entraco 2011).

**Unit 1: The Forest**

This unit, while the least homogeneous, covers most of the railway study area. The hilly terrain is covered with vegetation composed mainly of conifers and hardwoods (GENIVAR 2012). This canopy helps maintain a natural visual screen for the proposed railway.

The forest landscape has, however, been changed by mine development (old Lemoine mine) and logging roads used for mining and logging activities past and present. The areas cleared during the course of these activities are scattered throughout the entire local study area.

Logging road 210 crosses the unit from the south going east, and is the main access to the forest landscape. The vegetation has been left in place on both sides of the road, creating a visual barrier in the direction of the proposed railway. The many logging roads in this unit create gaps that provide visual access to discrepancies in the landscape, such as borrow pits, forest regeneration sites and the old Lemoine mine (Entraco 2011).

*Observers*

The main observers of this unit are Wapachee family users of Rabbit camp and users of the recreational lease south of Lac Philippe. The vegetation surrounding the buildings and access creates a visual barrier.

Seasonal users (hunters, the tallyman and Wapachee family members) passing through the forest are a second group likely to observe the landscape.

The visual field of these observers is framed by the forest and the rolling terrain that make up the landscape of this unit. Some discordant elements in the landscape are visible from some areas transformed by past and present industrial activities (logged areas, logging roads, borrow pits).

**Unit 2: Rocky Ridge**

The rocky ridge landscape unit is characterized by a line of hills to the north and northwest of the local study area. While several logging roads wind through this landscape unit, it has no formal lookout (Entraco 2011). The rocky ridge has been extensively logged, creating some visual openings out toward the proposed railway.

*Observers*

Route 167 runs outside the southeast part of the study area and is used by many motor vehicles. The forest is on either sides of the road and provides a few points of limited visual access to the proposed railway. The rocky ridge does not have a lookout point for drivers (Entraco 2011).

## 8.2 Project Impact

### 8.2.1 Regional Economy and Population

#### 8.2.1.1 Construction Phase

**Sources of Impact**

During the construction phase, general construction activities are the source of impact on the regional economy and population.

The railway project represents an investment of approximately $52 million, so the economic benefits from this investment total $52 million during the project. There is an additional benefit of $5 million per year during operation (transportation and maintenance). Direct benefits to employees, suppliers and contractors total $48 million, and indirect benefits (engineering, project management, construction) will amount to $4 million.

Preparation and construction work will require the supply of a range of professional and technical services, as well as various materials. In terms of services, various firms and many contractors will be required to initiate and execute preparation and construction work (clearing, excavation, grading, etc.). The project will also require other service providers for machinery and equipment maintenance, as well as construction site maintenance. Construction work will entail the purchase of goods and services, the hiring of manpower and the generation of tax revenues from employee and corporate earnings.

Railway construction will entail the hiring of manpower, the bulk of whom will come from local communities. It is expected that 100 workers will be needed over a six-month period to complete the work.

In addition to the economic benefits from job creation, the salaries paid will result in an increase in local spending. A large number of businesses, retail stores, restaurants and others are likely to enjoy economic benefits and even job creation.

**Mitigation Measures**

The following measures are proposed for the regional economy and population:

- BlackRock Metals and the local community will set up manpower training programs for Aboriginals and non-Aboriginals so as to meet manpower requirements;
- establish a discussion group with members of the Oujé-Bougoumou Cree community, particularly for the discussion of socioeconomic issues. An impact and benefits agreement (IBA) is currently being prepared and will cover subjects such as: training, jobs and business opportunities for the Crees, culture and environment;
- hold consultations between BlackRock Metals and regional employment centers;
- preferentially hire manpower and contractors from Oujé-Bougoumou, Chibougamau and Chapais, followed by the neighbouring regions (Saguenay–Lac-Saint-Jean and Abitibi-Témiscamingue);
- create a round table to develop and monitor the economic benefit optimization strategy.

**Detailed Description of the Residual Impact**

The construction of the railway will have a positive impact on the regional economy and population (jobs). The intensity of the impact is moderate as a hundred jobs will be created. Its extent is regional as it extends beyond the boundaries of the worksite, and its duration is short as the work will be executed over a six-month period. The significance of the residual impact is therefore deemed to be moderate.

**Assessment of the Residual Impact**

| Impact on the Regional Economy and Population during the Construction Phase | | |
|---|---|---|
| Nature | Positive | Significance: Moderate |
| Ecosystemic value | N/A | |
| Socioeconomic value | Moderate | |
| Degree of disturbance | Moderate | |
| Intensity | Moderate | |
| Extent | Regional | |
| Duration | Short | |
| Probability of occurrence | High | |

N/A: Not applicable

### 8.2.1.2 Operation Phase

**Sources of Impact**

In the operation phase, the sources of impact on the regional economy and population are related to track maintenance and repair activities.

Railway operation will not create a significant need for manpower, because maintenance work (periodic rail lubrication, ballast weed control, winter snow removal and replacement of damaged ties) will be ad hoc and short-lived.

**Mitigation Measures**

The following mitigation measure is proposed for the regional economy and population:

- preferentially hire local manpower insofar as they have the required skills at the time of hiring.

**Detailed Description of the Residual Impact**

Commissioning of the railway will have a positive impact on the workforce. The intensity is low as few workers are required to perform maintenance work. The extent is regional and the duration is long. The significance of the residual impact is therefore deemed to be moderate.

**Assessment of the Residual Impact**

| Impact on the Regional Economy and Population during the Operation Phase | | |
|---|---|---|
| Nature | Positive | Significance: Moderate |
| Ecosystemic value | N/A | |
| Socioeconomic value | Moderate | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Regional | |
| Duration | Long | |
| Probability of occurrence | High | |

N/A: Not applicable

### 8.2.1.3 Closure Phase

**Sources of Impact**

During the closure phase, the sources of impact on the regional economy and population are the end of the use of the railway. Railway closure will entail the layoff of employees assigned to maintenance. However, manpower will also be needed for the decommissioning of the railway.

**Mitigation Measures**

No mitigation measures are planned for the closure phase.

**Detailed Description of the Residual Impact**

The end of the use of the railway will have a negative impact on maintenance employees. The intensity is low as few workers will be required for the maintenance and decommissioning work. The scope is regional and the duration is short. The significance of the residual impact is therefore deemed to be moderate.

**Assessment of the Residual Impact**

| Impact on the Regional Economy and Population during the Closure Phase | | |
|---|---|---|
| Nature | Negative | Significance: Moderate |
| Ecosystemic value | N/A | |
| Socioeconomic value | Moderate | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Regional | |
| Duration | Long | |
| Probability of occurrence | High | |

N/A: Not applicable

### 8.2.2 Road and Rail Infrastructure

#### 8.2.2.1 Construction Phase

**Sources of Impact**

During the construction phase, general construction activities are the source of impact on road and rail infrastructure.

Railway construction work will generate heavy machinery and construction equipment traffic on Route 167, logging road 210 and the other logging roads in the area. Construction will also involve daily bus travel of a hundred workers over two 12-hour shifts.

Contractors and subcontractors who carry out the work will use Route 167 and logging road 210 to access the construction site. The increased traffic on these roads could alter or damage the road surface.

The preparation of the sub-ballast requires the haulage of granular material from the borrow pit north of chainage 26+000. A total of five trucks will be required. The material required for the ballast will be sourced from the same borrow pit, but will be transported by train following rail installation.

The work planned at the junction of the CN railway and the BlackRock Metals rail line could cause the temporary suspension of rail traffic on the CN railway track.

**Mitigation Measures**

The following mitigation measures are proposed for the road infrastructure:

- stay within the allowable load limits on public roads;
- use appropriate signage approved by the MTQ to indicate access for site deliveries on Route 167;

- use appropriate signage to indicate the work area on logging roads;
- notify the CDPNDL of the project schedule for work near the CN railway track.

**Detailed Description of the Residual Impact**

Railway construction will have a negative impact on the road infrastructure. The impact is of low intensity as Route 167 and logging road 210 are mainly used by industry. In addition, sub-ballast preparation work will only require five trucks to transport granular materials, and no road transport is planned for ballast development, which reduces the intensity of the impact. The extent of the impact is local as it could be felt beyond the immediate work site. The duration of the impact is short, because disturbances will occur during the construction phase. The significance of the residual impact on infrastructure is therefore deemed to be very low.

**Assessment of the Residual Impact**

| Impact on the Road and Rail Infrastructure during the Construction Phase | | |
|---|---|---|
| Nature | Negative | Significance: Very low |
| Ecosystemic value | N/A | |
| Socioeconomic value | Low | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Local | |
| Duration | Short | |
| Probability of occurrence | Low | |

N/A: Not applicable

#### 8.2.2.2 Operation Phase

**Sources of Impact**

No impact is expected on the road infrastructure during the operation phase.

#### 8.2.2.3 Closure Phase

**Sources of Impact**

The decommissioning of the rail line should have an impact on road and rail infrastructure similar to that of the construction phase.

**Mitigation Measures**

The following mitigation measures are proposed for the road infrastructure:

- use appropriate signage to indicate the work area on logging roads;
- notify the CDPNDL of the project schedule for work near the CN railway track.

**Detailed Description of the Residual Impact**

Decommissioning of the railway will have a negative impact on road and rail infrastructure, but of an even lower intensity as the scope of work is smaller than during the construction period. The extent of the impact is local and the duration is short for the same reasons as during the construction phase. The significance of the residual impact on infrastructure is therefore deemed to be very low.

**Assessment of the Residual Impact**

| Impact on the Road and Rail Infrastructure during the Closure Phase | | |
|---|---|---|
| Nature | Negative | Significance: Very low |
| Ecosystemic value | N/A | |
| Socioeconomic value | Low | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Local | |
| Duration | Short | |
| Probability of occurrence | Low | |

N/A: Not applicable

## 8.2.3 Land Use – Built Environment

### 8.2.3.1 Construction Phase

**Sources of Impact**

During the construction phase, general construction activities are the source of impact on the built environment.

The tenant of the recreational lease south of Lac Philippe could be disturbed by railway excavation, blasting and construction work, and particularly by higher noise levels and airborne dust.

**Mitigation Measures**

The following mitigation measures are proposed for the built environment:

*Before the work starts:*

- meet with the recreational lease tenant and give him a work schedule that includes a description of the nature of the activities (clearing, blasting, excavation, etc.).

*During the work:*

- maintain communications between BlackRock Metals and the recreational lease tenant.

**Detailed Description of the Residual Impact**

Railway construction will have a negative impact on the built environment. The intensity of the impact is low given that the built environment does not comprise a permanent residence. The extent of the impact is limited as only one recreational lease has been identified in the study area. The duration is short, because the impact will be limited to the construction period. The significance of the residual impact on the built environment is therefore deemed to be very low.

**Assessment of the Residual Impact**

| Impact on the Built Environment during the Construction Phase | | |
|---|---|---|
| Nature | Negative | Significance: Very low |
| Ecosystemic value | N/A | |
| Socioeconomic value | Low | |
| Degree of disturbance | Moderate | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Short | |
| Probability of occurrence | Moderate | |

N/A: Not applicable

### 8.2.3.2 Operation Phase

**Sources of Impact**

In the operation phase, the sources of impact on the built environment are the daily outgoing and returning train passages, as well as railway maintenance work.

The noise generated by the daily passage of the train and maintenance and repair activities could disturb anyone staying at the Lac Philippe cottage.

**Mitigation Measures**

No mitigation measures are planned in connection with the recreational lease tenant during the operation phase.

**Detailed Description of the Residual Impact**

Railway operation will have a negative impact on the built environment in terms of peace and quiet. The intensity of the impact is low and the scope is limited for the same reasons as those mentioned for the construction phase. The duration of the impact is long, as railway use is planned throughout the mine operation period. The significance of the residual impact on the built environment is therefore deemed to be low.

**Assessment of the Residual Impact**

| Impact on the Built Environment during the Operation Phase | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | N/A | |
| Socioeconomic value | Low | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Long | |
| Probability of occurrence | High | |

N/A: Not applicable

### 8.2.3.3 Closure Phase

**Sources of Impact**

The decommissioning of the rail line should have an impact on the built environment similar to that of the construction phase.

**Mitigation Measure**

The mitigation measure proposed for the built environment is the following:

- meet with the recreational lease tenant and give him a work schedule that includes a description of the nature of the activities.

**Detailed Description of the Residual Impact**

The impact on the built environment will be negative but of lower intensity, as the scope of work is smaller than during construction, and the area will revert to its original peace and quiet once the work is done. The extent of the impact is limited and the duration is short for the same reasons as during the construction phase. The significance of the residual impact on the built environment is therefore deemed to be very low.

**Assessment of the Residual Impact**

| Impact on the Built Environment during the Closure Phase | | |
|---|---|---|
| Nature | Negative | Significance: Very low |
| Ecosystemic value | N/A | |
| Socioeconomic value | Low | |
| Degree of disturbance | Moderate | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Short | |
| Probability of occurrence | Moderate | |

N/A: Not applicable

## 8.2.4 Land Use – Wildlife Harvesting by Non-Aboriginal Users

### 8.2.4.1 Construction Phase

**Sources of Impact**

During the construction phase, general railway construction activities are the source of impact on wildlife harvesting activities.

While the popular hunting areas are not known, the fact remains that only five bears have been killed in the study area in the past five years. The area between chainages 15+000 and 18+000 seems favourable for bear hunting as four of the five bears were killed there. Clearing, excavation, blasting and railway construction work could disrupt hunting activities by non-Aboriginal users. In terms of fishing, it should be noted that the popular lakes are far away from the work site.

Noise, dust, increased traffic on logging road 210 and potential access restrictions could cause disturbances, particularly for users in the area. However, such disturbances will be minimal as the work will be performed primarily in the railway right-of-way and the workers will be transported by bus.

Finally, increased traffic on all the logging roads in the study area could pose a threat to the safety of land users.

**Mitigation Measures**

The following mitigation measures are proposed for wildlife harvesting activities:

*Before the work starts:*

- inform the population on the nature of the work and when it will start.

*During the work:*

- provide appropriate signage and, if necessary, site restriction measures;
- use environmentally-friendly dust control methods in problem areas.

**Detailed Description of the Residual Impact**

The impact on wildlife harvesting activities by non-Aboriginals will be negative. The intensity of the impact is considered low because the most popular areas are concentrated around Lac Chibougamau and Lac Armitage. The extent of the impact is limited as the disturbances will be felt by a small number of people. The duration of the impact is short, because construction activities will take place over a period of six months. The significance of the residual impact on wildlife harvesting activities is therefore deemed to be low.

**Assessment of the Residual Impact**

| Impact on Wildlife Harvesting during the Construction Phase | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | N/A | |
| Socioeconomic value | Moderate | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Short | |
| Probability of occurrence | High | |

N/A: Not applicable

### 8.2.4.2 Operation Phase

**Sources of Impact**

In the operation phase, railway use and maintenance and repair activities are the sources of impact on wildlife harvesting.

The noise generated by the daily passage of the train and maintenance and repair activities during hunting season could disrupt wildlife harvesting activities.

**Mitigation Measures**

No mitigation measures are planned for wildlife harvesting during the operation phase.

**Detailed Description of the Residual Impact**

Although rail traffic will have a negative impact on the hunting activities, the intensity of the impact is considered low given that there will only be two trains per day (one loaded with iron concentrate and the second empty). The inconvenience caused by the train's passage is therefore deemed to be short and infrequent. The extent of the impact is limited as there are few users in the areas involved. The duration of the impact is long as the railway operation is planned for an initial period of 13 years. The significance of the residual impact is therefore deemed to be very low.

**Assessment of the Residual Impact**

| Impact on Wildlife Harvesting during the Operation Phase | | |
|---|---|---|
| Nature | Negative | Significance: Very low |
| Ecosystemic value | N/A | |
| Socioeconomic value | Moderate | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Long | |
| Probability of occurrence | Low | |

N/A: Not applicable

### 8.2.4.3 Closure Phase

**Sources of Impact**

The decommissioning of the rail line should have an impact on wildlife harvesting similar to that of the construction phase.

**Mitigation Measures**

The following mitigation measures are proposed for wildlife harvesting:

- provide appropriate signage and, if necessary, site restriction measures;
- use environmentally-friendly dust control methods in problem areas.

**Detailed Description of the Residual Impact**

The impact on wildlife harvesting by non-Aboriginals will be negative, but the intensity is low, as the scope of work will be even smaller than during construction, and once the work is done, the area will revert to its original peace and quiet. The extent of the impact is limited and the duration is short for the same reasons as during the construction phase. The significance of the residual impact on wildlife harvesting is therefore deemed to be very low.

**Assessment of the Residual Impact**

| Impact on Wildlife Harvesting during the Closure Phase | | |
|---|---|---|
| Nature | Negative | Significance: Very low |
| Ecosystemic value | N/A | |
| Socioeconomic value | Low | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Short | |
| Probability of occurrence | Low | |

N/A: Not applicable

### 8.2.5 Land Use – Forestry and Mining

#### 8.2.5.1 Construction Phase

**Sources of Impact**

During the construction phase, general construction activities are the source of impact on forestry and mining.

Clearing work will result in the loss of 47 ha of productive forest. However, the fact that large-scale logging activities in the area have ended significantly reduces the impact of clearing on forestry activities in general.

While no forestry work is planned in the railway local study area, increased traffic on logging roads during the construction phase could still hamper the use of roads by logging trucks should logging take place elsewhere in the territory.

No impact is anticipated on mining as no mineral exploration work has been done in the study area. Mineral exploration work could nevertheless still take place in the area as there are many other mining claim holders besides BlackRock Metals in the railway project area.

**Mitigation Measures**

The following mitigation measures are proposed for forestry and mining activities:

- notify the holder of the TSFMA (in 2013, these will convert to timber supply guarantees) of the work period and the impact on road safety;
- salvage commercial trees (DBH of more than 10 cm); the commercial stratum and debris will preferably be made into wood chips;
- no mitigation measures are planned for mining claim holders.

**Detailed Description of the Residual Impact**

The impact on forestry and mining activities will be negative. The intensity of the impact is considered low as no logging in the study area is planned for according to the 2008-2013 PQAF (five-year forest management plan). The extent of the impact is limited, as few productive sectors will be affected by the construction work, which is limited to the work site. The duration of the impact is permanent in terms of the loss of productive forest area. The significance of the residual impact on forestry activities during the construction phase is therefore deemed to be low.

**Assessment of the Residual Impact**

| Impact on Forestry and Mining during the Construction Phase | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | N/A | |
| Socioeconomic value | Moderate | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Long | |
| Probability of occurrence | High | |

N/A: Not applicable

### 8.2.5.2 Operation Phase

**Sources of Impact**

Rail traffic and maintenance and repair work are unlikely to have an impact on mining and forestry activities.

**Mitigation Measures**

No mitigation measures are planned for mining and forestry activities during the operation phase.

**Detailed Description of the Residual Impact**

No residual impact is expected for mining and forestry activities during the operation phase.

### 8.2.5.3 Closure Phase

**Sources of Impact**

The impact on forestry and mining will be the same as during the construction phase, except that no clearing will be required.

**Mitigation Measures**

The following mitigation measures are proposed for forestry activities:

- notify the holder of the TSFMA (in 2013, these will convert to timber supply guarantees) of the work period and the impact on road safety;
- no mitigation measures are planned for mining claim holders.

**Detailed Description of the Residual Impact**

The closure of the railway will have a negative impact on mining and forestry, but at a lower intensity as the scope of work is smaller than in the construction period. The extent of the impact is limited to the right-of-way and the logging roads used to perform the work. The duration of the impact is short, as it is limited to the work period. The significance of the residual impact on forestry and mining during the closure phase is therefore deemed to be very low.

**Assessment of the Residual Impact**

| Impact on Forestry and Mining during the Closure Phase | | |
|---|---|---|
| Nature | Negative | Significance: Very low |
| Ecosystemic value | N/A | |
| Socioeconomic value | Moderate | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Short | |
| Probability of occurrence | Moderate | |

N/A: Not applicable

### 8.2.6 Traditional Land Use

#### 8.2.6.1 Construction Phase

**Sources of Impact**

During the construction phase, general construction activities are the source of impact on traditional land use.

Clearing work will result in the loss of 47 ha of forest setting for users of the trapline. Excavation, blasting and railway construction work will disrupt the users' traditional activities, particularly due to increased noise levels. Four areas are more prone to disruption: the two big-game hunting grounds, the duck hunting area (Lac Guy) and the feeding grounds used by geese. Depending on the construction schedule, the impact on the goose feeding grounds could be highest given its proximity to the work. The disturbances caused by the work could cause certain animals to flee during the construction period and thus disrupt traditional hunting and trapping activities.

Moreover, the very presence of workers on the construction sites could lead to increased wildlife harvesting by workers outside work hours. Although the pressure on the wildlife resource is mainly attributable to fishing activity in nearby lakes, Hydro Quebec's experience indicates that increased hunting pressure could also be felt on small game (Hydro-Québec Production 2004).

Noise, dust, increased traffic on logging road 210 and possible access restrictions could cause disruption, particularly to Cree users in the area. In addition, increased traffic on the various logging roads poses a risk to the safety of Aboriginal users accessing their camps and hunting and gathering sites.

Construction and development will also have impacts on various trails, as the planned railway intersects Aboriginal travel ways, including the snowmobile and ATV trail (chainage 0+300 and 6+000), the canoe trail (chain 13+100) and the old horse track (chainage 1+400). The impact could be felt in terms of both current and future use and cultural heritage.

The impact on cultural heritage will also be felt at the northern end of the railway, where a first moose kill site will be affected by railway construction.

**Mitigation Measures**

*Before the work starts:*

- discuss appropriate mitigation measures with the tallyman and his family, as requested during the consultations;
- move and rebuild Rabbit camp;
- meet with the tallyman and give him a work schedule that includes a description of the nature of the activities (clearing, blasting, excavation, etc.).

*During the work:*

- maintain communications between BlackRock Metals and the tallyman to avoid any outstanding issues with land users;
- provide appropriate signage and, if necessary, site restriction measures;
- confine equipment travel to defined routes within the work area;
- identify specific worker parking areas;
- clean the roads used by construction machinery and equipment regularly;
- use environmentally-friendly dust control methods in problem areas.

**Detailed Description of the Residual Impact**

The impact on traditional land use will be negative. As construction activities could result in a displacement of wildlife and the consequent disruption of traditional activities, the intensity is considered moderate. The Wapachee family consists of 107 people from five generations who use the land year-round, so the extent is considered local. The duration of the impact is short because it is limited to the construction period. The residual impact is therefore deemed to be of moderate significance.

**Assessment of the Residual Impact**

| **Impact on Traditional Land Use during the Construction Phase** | | |
|---|---|---|
| Nature | Negative | Significance: Moderate |
| Ecosystemic value | N/A | |
| Socioeconomic value | Moderate | |
| Degree of disturbance | Moderate | |
| Intensity | Moderate | |
| Extent | Local | |
| Duration | Short | |
| Probability of occurrence | Moderate | |

N/A: Not applicable

### 8.2.6.2 Operation Phase

**Sources of Impact**

During the operation phase, the main source of impact on traditional land use is the use of the railway. To a lesser extent, occasional track maintenance and repair (rail grinding and snow removal) could be a source of noise impact for land users.

The noise generated by the daily passage of the train and maintenance and repair activities could result in the temporary displacement of some wildlife species, which could disrupt certain traditional hunting and trapping activities. In addition to the direct effect on the practice of traditional activities, noise will temporarily disrupt the land users' peace and quiet.

Rail traffic poses a threat to the safety of land users who use the area regularly.

**Mitigation Measures**

*Before operation begins:*

- the tallyman and his family will be consulted to discuss the appropriate mitigation measures.

*During operation:*

- adhering to safety standards, especially in terms of level crossing design (visibility, crossing angle, distance, etc.);
- maintenance vehicles will stay within speed limits on the road;
- no mitigation measures are deemed necessary for the impact on the noise environment and air quality given a negligible impact on these two components.

**Detailed Description of the Residual Impact**

While rail traffic has a negative impact on traditional land use, the intensity of the impact is considered low because there will be fewer effects on the practice of traditional activities compared to the disturbance caused during the construction period. The extent of the impact remains local as it relates to the same group of users. As railway operation is planned for an initial period of 13 years, the duration of the impact is considered long. The significance of the impact is therefore deemed to be low.

**Assessment of the Residual Impact**

| **Impact on Traditional Land Use during the Operation Phase** | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | N/A | |
| Socioeconomic value | Moderate | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Local | |
| Duration | Long | |
| Probability of occurrence | Moderate | |

N/A: Not applicable

### 8.2.6.3 Closure Phase

**Sources of Impact**

During the closure phase, the sources of impact on traditional land use are decommissioning work and the presence of the railway right-of-way.

Disturbances associated with decommissioning work are the same as those mentioned for the construction phase, but of shorter duration, especially in terms of noise, dust, increased traffic on logging road 210 and possible access restrictions. The work will also affect traditional wildlife harvesting activities.

**Mitigation Measures**

*Before the work starts:*

- meet with the tallyman and give him a work schedule that includes a description of the nature of the activities (clearing, blasting, excavation, etc.).

*During the work:*

- maintain communication between BlackRock Metals and the tallyman to avoid any outstanding issues with land users.

**Detailed Description of the Residual Impact**

The impact on traditional land use is the same as in the construction phase, but less intensive. The extent of the impact is local and the duration is short for the same reasons as given for the construction phase. The residual impact is therefore deemed to be of very low significance.

**Assessment of the Residual Impact**

| Impact on Traditional Land Use during the Closure Phase | | |
|---|---|---|
| Nature | Negative | Significance: Very low |
| Ecosystemic value | N/A | |
| Socioeconomic value | Moderate | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Local | |
| Duration | Short | |
| Probability of occurrence | Low | |

N/A: Not applicable

## 8.2.7 Archaeology and Heritage

### 8.2.7.1 Construction Phase

**Sources of Impact**

No impact on archaeology is expected during the construction phase in the area covered by the archaeological study done for the Lac Doré Complex EIS. General activities are nevertheless a potential source of impact for areas not covered by that study, albeit unlikely given the absence of major lakes or rivers, the presence of wetlands along the old canoe route and the proximity of the old horse track to Route 167. In addition, a study of the archaeological potential of the area will be conducted once BlackRock Metals has consulted the MCCCF.

Nevertheless, archaeological remains could be accidentally discovered during site preparation, excavation or grading work. Should this occur, such archaeological sites will be handled in accordance with the provisions of Quebec's Cultural Property Act, through temporary protection measures, the assessment of the findings and, if appropriate, archaeological excavations.

**Mitigation Measures**

No specific mitigation measures will be proposed in relation to archaeology near the study site. The Cultural Property Act requires that construction contractors or the proponent must stop work should they accidentally discover any archaeological evidence.

In addition, if a burial ground is discovered, the contractors will contact the police and the tallyman will be consulted.

**Detailed Description of the Residual Impact**

The archaeological potential study done within the scope of the Lac Doré Complex EIS failed to identify any known archaeological sites, and no remains were found during fieldwork between chainages 16+000 and 27+570. In addition, given the criteria for determining areas of archaeological potential, it appears that the area not covered by the archaeological study is characterized by the presence of natural elements not conducive to the discovery of artifacts. The impact's intensity is therefore considered low. Its duration is short as any discovery will be handled in accordance with the requirements of Quebec's Cultural Property Act. The extent is limited as the site is limited in area. The significance of this impact is therefore deemed to be very low.

**Assessment of the Residual Impact**

| Impact on Archaeology and Heritage during the Construction Phase | | |
|---|---|---|
| Nature | Negative | Significance: Very low |
| Ecosystemic value | N/A | |
| Socioeconomic value | Moderate | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Short | |
| Probability of occurrence | Low | |

N/A: Not applicable

### 8.2.7.2 Operation Phase

**Sources of Impact**

No impact on the archaeological resource is expected during rail line operation.

**Mitigation Measures**

No specific mitigation measures are required for the archaeological resource.

**Detailed Description of the Residual Impact**

No residual impact on the archaeological resource is anticipated during rail line operation.

#### 8.2.7.3 Closure Phase

**Sources of Impact**

The closure phase is not likely to have an impact on the archaeological resource.

**Mitigation Measures**

No mitigation measures are planned for the archaeological resource.

**Detailed Description of the Residual Impact**

No residual impact is expected on the archaeological resource during the closure phase.

### 8.2.8 Landscape

#### 8.2.8.1 Construction Phase

**Sources of Impact**

During the construction phase, general construction activities and the presence of construction sites constitute the sources of impact on the landscape.

In addition to disrupting the view, construction-related components such as equipment, construction trailers and storage sites can also affect the quality of the landscape. However, work will be limited to the planned railway right-of-way, and the construction trailers and storage areas will be located at the construction workers' camp. While the area is limited, land users will likely still notice changes in their field of view. Different land users will notice such changes as the work progresses. The impact will be limited to the construction period.

The clearing, excavation and construction work required to build the railway will permanently change the existing forest landscape. However, clearing will involve conifer stands common to this part of Northern Quebec, consisting mainly of black spruce, jack pine, balsam fir, white birch and aspen. While these changes can affect the visual composition and integrity of the forest landscape unit, the impact will be limited to the railway right-of-way.

Earthworks, which include the cut and fill, rock cuts and drainage work needed to build the railway, will transform the natural contours of the existing landscape. These changes will disrupt the visual quality and composition of the forest landscape unit over the entire route. The nature and height of the cut and fill and rock cuts will affect the intensity of the impact and the visual perception by adding visual discrepancies for land users.

It should be noted that few people will see the work, as the site is located in a remote area and the existing logging roads are bordered by vegetation that creates a visual barrier. The work will only be visible to people using the area, of which there are very few in the local study area.

**Mitigation Measures**

*During construction:*

- make sure contractors and subcontractors use the existing logging roads;
- recover excavated material and material from blasting for use as fill to avoid storing surplus material;
- outline the area to be cleared on the construction plans and put markers in place to protect the woodland screens to be kept;
- locate all construction trailers and equipment storage areas at the temporary workers' camp;
- rehabilitate the construction site as soon as work ends so as to limit the duration of the inconvenience;
- remove all debris and unused materials.

**Detailed Description of the Residual Impact**

The residual impact on the landscape is considered negative as the work will be visible to a number of users. The intensity of the impact is considered low because the existing vegetation will act as a screen, and its extent is limited as few people are likely to have a view of the work. The duration of this impact is long as the loss of vegetation (in the railway right-of-way) will be permanently visible. The significance of the residual impact on the landscape is therefore deemed to be low.

**Assessment of the Residual Impact**

| Impact on Landscape during the Construction Phase | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | N/A | |
| Socioeconomic value | Moderate | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Long | |
| Probability of occurrence | High | |

N/A: Not applicable

### 8.2.8.2 Operation Phase

**Sources of Impact**

The presence of the railway infrastructure will be the main source of impact on the landscape. The railway will transform the existing landscape and field of view of people using the land. It is worth mentioning that few people will see the railway, as the site is in a remote area and the existing logging roads are bordered by vegetation that creates a visual barrier.

**Mitigation Measures**

The following mitigation measure is proposed to minimize the impact on the landscape and users' field of view during the operation phase:

- blend the edge of the rail line into the existing natural landscape by flattening slopes, spreading topsoil as soon as possible and reseeding the embankments as final grading progresses.

**Detailed Description of the Residual Impact**

Given the fact that the existing vegetation is common in the area, the railway will be located in a remote area and few observers will have visual access, the intensity of the impact is considered low. The extent is limited and the duration is long. The significance of the residual impact on the landscape is therefore deemed to be low.

**Assessment of the Residual Impact**

| Impact on Landscape during the Operation Phase | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | N/A | |
| Socioeconomic value | Moderate | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Long | |
| Probability of occurrence | Moderate | |

N/A: Not applicable

### 8.2.8.3 Closure Phase

**Sources of Impact**

The presence of the railway right-of-way will be the main source of impact on the landscape, and the impact on the landscape is therefore much the same as during the operation phase.

**Mitigation Measures**

- Reseed indigenous species over the entire surface of the right-of-way.

**Detailed Description of the Residual Impact**

Given the limited number of observers, the natural visual barrier along the edges of existing logging roads, the fact that the railway right-of-way will be rehabilitated to recreate the natural contours and the planned reseeding of the right-of-way, the significance of the residual impact on the landscape is deemed to be low.

**Assessment of the Residual Impact**

| Impact on Landscape during the Closure Phase | | |
|---|---|---|
| Nature | Negative | Significance: Low |
| Ecosystemic value | N/A | |
| Socioeconomic value | Moderate | |
| Degree of disturbance | Low | |
| Intensity | Low | |
| Extent | Limited | |
| Duration | Long | |
| Probability of occurrence | Moderate | |

N/A: Not applicable

### 8.2.9 Impact of Iron Ore Shipment

From its facilities at the mine, BlackRock Metals will produce three million tonnes of iron ore concentrate per year to be shipped overseas. The EIS (Entraco 2011) allowed for truck haulage to a rail transfer point. After studying various construction scenarios and the related environmental, economic and social impact, BlackRock Metals decided that the best way to transport the iron concentrate from the mine to the final shipment site was as follows:

- train transportation of the iron ore concentrate from the plant via a new 26.6 km rail segment built by BlackRock Metals to the railway line operated by CN;
- use of the existing railway line to reach the new rail access to be built at the Grande-Anse maritime terminal;
- storage and transshipment at the port using multi-user handling facilities;
- shipping from the Grande-Anse multi-user port facilities.

#### 8.2.9.1 Use of the BlackRock Metals Rail Line

BlackRock Metals would be the proponent for the construction of a 26.6 km segment of railway linking to the CN rail line. However, CN would be the operator of the new rail segment, not BlackRock Metals. During the operation phase, BlackRock Metals will assign the responsibility for year-round train operation (one round trip per day), maintenance and repairs to a specialized company. At the end of the mining project, BlackRock Metals would once again be the proponent who would employ contractors for rail line decommissioning. The impact of the use of this rail segment is discussed above.

#### 8.2.9.2 Use of the Existing Railway

After travelling over more than 26.6 kilometres on the new section of track from the BlackRock Metals plant, the train carrying the iron ore concentrate will connect to the existing network operated by CN.

The addition of a daily train trip on this stretch of track is expected to increase traffic and the number of passages through municipalities and level crossings all along the route to the junction with the Grande-Anse rail access. The potential effects of this shipment of BlackRock Metals concentrate are the same as those assessed for the operation phase of the new rail segment described above, although the negative effects on the human environment (noise, vibration, etc.) would be greater given the passage through populated areas. However, it should be recalled that this section of track was extensively used in the past. The impact of the use of this section on the natural and social environments is deemed to be low. Note that the passage of the train convoy (91 cars) will be of short duration.

#### 8.2.9.3 Port of Saguenay Rail Service

The train carrying the iron ore concentrate will then arrive at the Grande-Anse rail access, managed by the Port of Saguenay port authority (Saguenay Port). The project to build a 12.5-km rail link to connect the port facilities to the Quebec railway network via the Roberval-Saguenay railroad, a subsidiary of Rio Tinto Alcan, should be completed by December 31, 2013. This section would be reserved for Saguenay Port clients and will therefore have a limited number of trains. Concentrate shipment on this section of track will have some impact on the area. This impact has already been the subject of detailed analysis in the impact assessment for the Grande-Anse rail service (AECOM, IBI Group/DAA 2011). The impact of the use of this rail segment on the natural and social environments is deemed to be very low.

#### 8.2.9.4 Saguenay Port Multi-User Facilities

The Saguenay Port project includes the development of an intermodal rail yard at the port and proper storage and handling areas. Saguenay Port will provide BlackRock Metals with various multi-user facilities for unloading the iron ore concentrate, storing it and then loading it into the bulk carriers docked at the port. These facilities, which would be available to Saguenay Port clients, include:

- automatic car unloader;
- tubular conveyor (closed tunnel);
- bucket-wheel reclaimer;
- warehouse (closed and heated in winter);
- standard or tubular conveyor;
- ship loader.

These facilities would be managed by Saguenay Port and operated by a specialized company. BlackRock Metals will only be one user of these multi-user facilities and will pay the cost associated with their use and operation, under the terms of a contract yet to be negotiated with Saguenay Port. These facilities will be developed by Saguenay Port in accordance with environmental standards, particularly in terms of releases into the environment and nuisances. Saguenay Port will do an environmental assessment before starting development on its land. For now, the environmental and social impact of the use of such facilities is deemed to be low.

# 9 CUMULATIVE EFFECTS ASSESSMENT

The methodology used for the cumulative effects assessment includes the following broad steps:

- identification of Valued Environmental Components (VECs), determination of the spatial and temporal boundaries considered for each of them, and a description of the indicators used;
- identification of the projects, actions, events, etc. that may have affected the VECs, affect them now or will affect them in the future;
- description of the baseline condition of each VEC and its historical trend;
- identification of the cumulative effects for each VEC.

To be selected as a VEC, an environmental component must:

- be highly valued by the stakeholders or specialists;
- be likely to be disturbed or altered to a significant extent by the project.

Within the framework of the EIS (Entraco 2011), the following VECs were selected for cumulative effect assessment:

- lakes and streams;
- traditional land use;
- use of the area for the exploitation of other resources;
- jobs and the economy.

The following VECs were added to this assessment:

- birds;
- wetlands;
- at-risk species.

Aside from the BlackRock Metals 26-km railway project, the new cumulative effects assessment also covers the 161 kV transmission line (HQ) and the Saguenay Port rail and marine facilities that will receive the iron ore concentrate.

The following description therefore supplements the assessment in the EIS filed in November 2011 (mining project).

**Lakes and Streams**

The mining project will partially or wholly affect many natural lakes and streams. However, the route of the railway line only crosses one permanent stream, with all the other streams crossed being intermittent. There are also other lakes and streams in the region affected by past, present or future mining activities (future project often being the potential reopening of old projects). However, the effect is spread out over both time and space.

Logging activities have little effect as the companies that harvest the timber comply with the Regulation respecting standards of forest management for forests in the domain of the State (RSFM). The same applies to the transmission line planned by Hydro-Québec.

The railway will cross a few streams. However, the surveys conducted suggest that the free movement of fish will only be required at one crossing (Jules bridge), because the others do not have fish habitats. Culverts will also be installed in accordance with best practice.

The multi-user marine terminal will not require work in a body of water. However, the rail access may affect a watercourse. Plans are currently being prepared and the Saguenay Port is responsible for the impact assessment.

The cumulative effect on lakes and streams would be limited as the other past, present or future projects are spread out, both in space and in time. In addition, these projects are controlled by clear regulations that include the implementation of mitigation and compensation measures.

**Traditional Land Use**

Traditional activities (hunting, fishing, trapping and gathering) in the region may be affected in various ways by other users of ancestral land, whether covered by an agreement or still subject to land claims.

All mining and forestry activities in the region (including rail transportation), whether past, present or future, can have an impact on traditional activities of First Nations using the land, although the effect is spread out in both time and space. In addition, a number of forestry or mining projects have or will have rehabilitation plans that provide for the revegetation of the sites used.

Given the small area affected, the transmission line will have what is considered a minor effect on traditional activities in the region. However, the railway would be built on traditional land mainly used for trapping. The anticipated effect is nevertheless low in amplitude as wildlife would be disturbed once a day (when the train passes), the area is vast and harvesting activities can be moved.

Multi-user facilities at the Port of Saguenay will have no direct impact on traditional activities practiced in the region.

While of low intensity, the cumulative effect on these traditional activities practiced in the regional study area would be felt. BlackRock Metals has had numerous meetings with land users to ensure that effects are minimized, and the users have even agreed to move and replace their current hunting camp (Rabbit camp).

**Use of the Area for the Exploitation of Other Resources**

The exploitation of other resources (mining, logging, fishing and hunting) could be affected by regional activities and the current mining project.

The mining of the iron ore deposit of the Lac Doré complex geological by BlackRock Metals will not directly affect other mining operations in the region, whether past, present or future. However, the mineral resource is not renewable, and the mining of BlackRock Metals site will reduce the known resources. The region is nevertheless mineral rich, and some abandoned sites are currently being reassessed with a view to future production.

While at this stage it is not known how much land needs to be cleared for the transmission line, certainly several hundred hectares of clearing is needed, including 47 ha for the railway right-of-way. The study area straddles two forest management units (FMU 026-64 and FMU 025-51). In 2012, the summary of allowances and allocations by forest management unit, in relation to the timber supply and forest management agreements (TSFMA), was 253,500 $m^3$ for FMU 026-64 and 2,087,700 $m^3$ for FMU 025-51. The clearing required for the project will therefore not affect logging activities, given the small area affected compared to the vast territory covered by forests.

In addition, due to the project optimization and dropping of the transfer point, pressure on the roads would be much less, especially for logging road 210.

Other local activities as well as those related to the project will not affect the current hunting and fishing activities in the region.

Daily use of a train (round trip) between the BlackRock Metals plant and the Port of Saguenay will only have a low impact on all municipalities along the route, given that the pressure was also higher in the past.

Activities and multi-user facilities at the Saguenay marine terminal will not affect the exploitation of other resources in the area.

Given the fact that timber is a renewable resource, mines are operated over a vast territory and many decades, mineral mining potential is very high and companies even plan to reuse old areas that have once again become economically viable, the cumulative effect of these projects remains low.

**Jobs and the Economy**

The various activities in the study area, both mining and other, are generally independent, and do not affect each other's economics. If logging activities are eventually planned in the vicinity of the study area, good planning will allow things to be coordinated and any negative effects to be avoided.

Thus, the BlackRock Metals project (mine and railway) will have direct positive effects on jobs and local and regional economic benefits. The cumulative effect is expected to be positive, as it would be for all regional projects, whether past, present or future.

**Birds**

The clearing required for the BlackRock Metals project (mine and railway), combined with other resource exploitation activities in the region could have an impact on nesting birds and their habitats.

According to the various sources consulted and the surveys conducted, the study area and the surrounding region are likely to be frequented by 145 species of birds on an annual basis. Expected losses were assessed based on the various surveys and the habitats found in the railway study area: one breeding pair for waterfowl, none for birds of prey, 190 breeding pairs for land birds and one breeding pair for shorebirds.

*At-Risk Bird Species*

For all areas affected by the BlackRock Metals project (mine and railway), the Olive-sided Flycatcher and Rusty Blackbird are the two most frequent and most abundant at-risk species in the study area.

During field surveys for the proposed railway, a Canada Warbler, two Rusty Blackbirds and Olive-sided Flycatcher were seen nearby. For the Canada Warbler and Rusty Blackbird, it is estimated that between one and three pairs could be affected by the project. In the case of Olive-sided Flycatcher, the loss is estimated at about two pairs.

Considering the vast forest area that hosts the BlackRock Metals project (mine and railway), the cumulative effect for birds would be limited, as other past, present or future projects are spread out from each other in both space and time.

**Wetlands**

Construction of mining facilities will affect approximately 204 ha of wetlands (peatlands, swamps, marshes), representing about 0.03% of the study area chosen for the impact assessment (70,000 ha). For the railway, only 16.4 ha of wetlands would be affected. The main losses are in treed peatlands and disturbed treed peatlands, which are also stands that support volumes of merchantable timber, or at any rate did so prior to logging.

The loss of wetlands may affect certain species of migratory birds. The route of the railway has been optimized to have the least possible impact on the natural environment, including wetlands. Precautionary measures have also been proposed to keep drainage as natural as possible.

Because wetlands are abundant in the Chibougamau area, the cumulative effect for wetlands would be limited because other past, present or future projects are spread out from each other, in both space and in time. The most recent projects have been optimized and take wetlands into consideration. In addition, wetland losses caused by the BlackRock Metals project (mine and railway) will eventually be the focus of an offset project, and an environmental monitoring program will be prepared and submitted to government agencies if necessary.

**At-Risk Plant Species**

The CDPNQ (2010) indicates the presence of two vascular plants with special status within 100 km of the study area, namely the dragon's mouth orchid (*Arethusa bulbosa*) and the northeastern bladderwort (*Utricularia resupinata*). In addition, the range of the ostrich fern (*Matteuccia struthiopteris*) in Quebec would indicate that the plant could potentially be found in or near the study area.

The dragon's mouth orchid was not observed during surveys conducted in 2011. In 2012, several bogs and fens were visited in the study area without the plant being seen. The ostrich fern was not observed during the 2011 and 2012 surveys. However, habitats likely to host it are present in the study area, and the plant could plausibly be present. The northeastern bladderwort was not observed during surveys conducted in 2011, and many lakes and ponds were visited in the study area in 2012 without the plant being identified.

All mining projects in the region, whether existing or in development, can affect various endangered species. Furthermore, given the existing legislation, mine site rehabilitation provides an opportunity to recreate potential habitats for at-risk species.

**Net Cumulative Effect**

Table 9-1 summarizes the net cumulative effect on the selected VECs for the BlackRock Metals project (mine and railway).

**Table 9-1: Net Cumulative Effect on the Selected Valued Environmental Components**

| Valued Environmental Component | Net Effect |
|---|---|
| Lakes and streams | Small negative |
| Traditional land use | Small negative |
| Use of the area for the exploitation of other resources | Small negative |
| Jobs and the economy | Moderate positive |
| Birds | Small negative |
| Wetlands | Small negative |
| At-risk species | Small negative |

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# Appendix A:
# Information on Environmental Changes

| Information sur modification environnemental | | | | | |
|---|---|---|---|---|---|
| | | | | En date du : 18 octobre 2012 | |
| No. Allignement | Nombre de modification | Chainage (Modification) | Type de modification | Nom de l'allignement | Remarque |
| Option AECOM | Chemin initial proposé pas AECOM | | | | |
| | | | | | |
| Géométrie #1 | 1 | 24+600 @ 27+000 | Relocalisation | _GéomCima_v1 | Modification de la boucle d'AECOM pour un rayon de courbure adéquat. |
| | | | | | |
| Géométrie #2 | 1 | 24+600 @ 27+000 | Relocalisation de boucle | _GéomCima_v2 | Aucune Modification. |
| | | | | _GéomCima_v2B | Optimisation de profil |
| | | | | | |
| Géométrie #3 | 1 | 24+600 @ 27+000 | Relocalisation de boucle | _GéomCima_v3 | Aucune Modification. |
| | | | | | |
| Géométrie #4 | 1 | 0+500 @ 5+500 | | _GéomCima_v4 | Relocalisation afin d'éviter les cours d'eau majeur. |
| | 2 | 5+700 @ 6+900 | Environnement | _GéomCima_v4 | Rolocalisation afin de sortir de la zones des cédrière. |
| | 3 | 10+100 @ 11+900 | Environnement | _GéomCima_v4 | Relocalisation afin de s'éloigner des cours d'eau. |
| | 4 | 19+000 @ 24+100 | Environnement | _GéomCima_v4 | Relocalisation afin de s'éloigner des cours d'eau et relocalisation de l'alignement afin de diminuer la longeur total de 711 m . |
| | 5 | 24+500 @ 26+200 | Relocalisation de boucle | _GéomCima_v4 | Optimisation de Quantités en profil. |
| | | | | | |
| Géométrie #5 | 1 | 0+000 @ 4+500 | Environnement | _GéomCima_v5 | Relocalisation de l'aiguillage  et éviter les grands cours d'eau. |
| | 2 | 4+500 @ 8+900 | Environnement | _GéomCima_v5 | Relocalisation afin d'éviter un cours d'eau mineur. |
| | 3 | 10+500 @ 12+800 | Environnement | _GéomCima_v5 | Relocalisation afin d'éviter les cours d'eau mineur. |
| | 4 | 12+800 @16+100 | Environnement | _GéomCima_v5 | Relocalisation afin de traverser le court d'eau a l'endroit le moin large. |
| | 5 | 18+100 @ 21+800 | Relocalisation | _GéomCima_v5 | Optimisation de Quantités. |
| | 6 | 23+800 @ 25+600 | Relocalisation de la boucle | _GéomCima_v5 | Optimisation de Quantités. |
| | | | | | |
| Géométrie #5B | 1 | 6+100 @ 8+200 | Relocalisation | _GéomCima_v5B | Relocalisation afin de contourner la cédrière. |
| | 2 | 14+300 @ 18+100 | Relocalisation | _GéomCima_v5B | Optimisation de Quantités. |
| | | | | | |
| Géométrie #5C | 1 | 20+100 @ 27+500 | Relocalisation | _GéomCima_v5C | Optimisation de Quantités. |
| | 2 | 23+500 @ 25+800 | Relocalisation de boucle | _GéomCima_v5C | Agrandissement de la boucle pour recevoir un train de 285 m. |
| | | | | | |
| Géométrie #5D | 1 | 7+200@9+000 | Relocalisation | _GéomCima_v5D | Optimisation de Quantités en profil. |
| | | | | | |
| Géométrie #5E | 1 | 0+200@1+600 | Relocalisation de boucle | _GéomCima_v5E | Optimisation de Quantités. (modification d'ingénierie) |
| | 2 | 3+000@8+200 | Environnement | _GéomCima_v5E | Relocalisation afin de contourner la cédrière. |
| | 3 | 20+000@22+000 | Relocalisation | _GéomCima_v5E | Optimisation de profil |
| | 4 | 24+000@25+400 | modification d'ingénierie | _GéomCima_v5E | Optimisation de profil |
| | | | | | |
| Géométrie #5F | 1 | 15+000@17+000 | modification d'ingénierie | _GéomCima_v5F | Relocalisation afin d'éviter le campement |
| | 2 | 18+600@19+800 | Environnement | _GéomCima_v5F | Relocalisation afin d'éviter un cours d'eau mineur. |
| | 3 | 19+800@23+200 | Environnement | _GéomCima_v5F | Relocatisation afin de respecter la ligne de partage d'eau |
| | | | | | |
| Géométrie #5G | 1 | 0+000@6+000 | modification d'ingénierie | _GéomCima_v5G | Optimisation de la connexion ferroviaire au CN suite à la réception du LIDAR |
| | | | | | |
| | | | | | |

# Appendix B:
# Rail Link Layout


NOTE:
SELON LES INFORMATIONS DE M.PAUL ROY, ARPENTEUR–GÉOMÈTRE LE TRACÉ EST À 100% SUR LE TERRITOIRE PUBLIC

| no | date | émissions et révisions | par |
|---|---|---|---|
| 00 | 12-10-17 | POUR INFORMATION | G.G. |

BLACKROCK METALS

CIMA+
ISO 9001
740, rue Notre-Dame Ouest, bureau 900
Montréal (Québec) H3C 3X6
Téléphone : (514) 337-2462
Télécopieur : (514) 281-1632
www.cima.ca

sceau

sceau

projet
Black Rock Metal Inc.
LIEN FERROVIAIRE

titre
PLAN D'ENSEMBLE
ALIGNEMENT V5G

| | | | |
|---|---|---|---|
| dessiné | S. Halary | échelle | 1:25 000 |
| projeté | M. Désarmeaux | date | 17 Octobre 2012 |
| vérifié | F. Bastien | référence | |
| approuvé | G. Gagnon | | |

S06428A GR CR 020 00
no. projet / département / série / feuille / rév.

A1 841 x 594 mm

VUE EN PLAN

NOTE:
SELON LES INFORMATIONS DE M.PAUL ROY, ARPENTEUR–GÉOMÈTRE LE TRACÉ EST À 100% SUR LE TERRITOIRE PUBLIC

| no | date | émissions et révisions | par |
|---|---|---|---|
| 0D | 13-01-28 | POUR INFORMATION | G.G. |

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ISO 9001

sceau

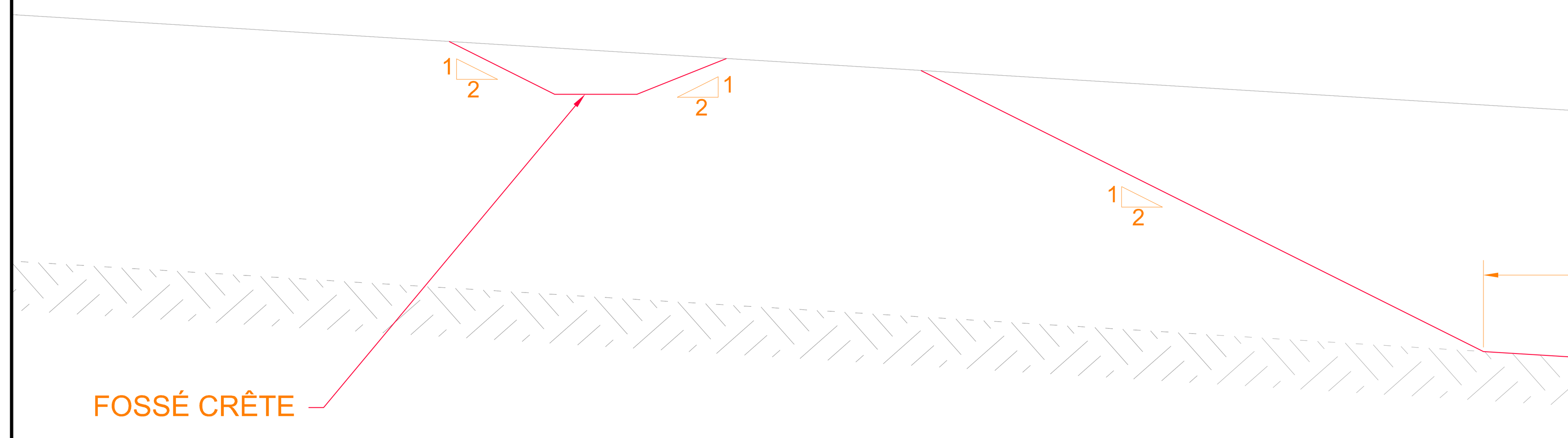
sceau

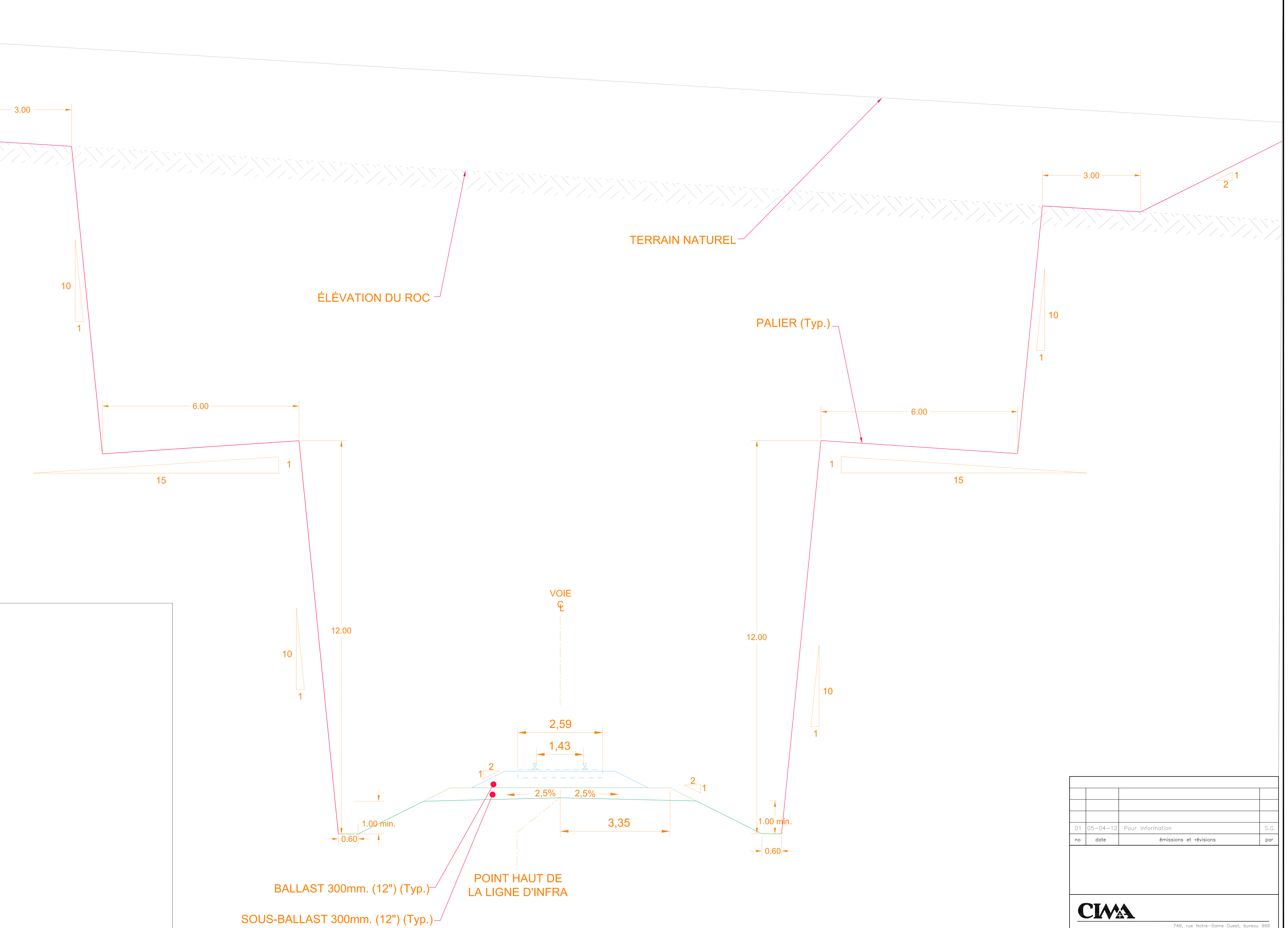
projet
Black Rock Metal Inc.
LIEN FERROVIAIRE

titre
ZONES DE DYNAMITAGE ANTICIPÉES

| | | | |
|---|---|---|---|
| dessiné | Stéphane Halary, dess. | échelle | 1:20000 |
| projeté | Michaël Désormeaux, ing. | date | 28 Janvier 2013 |
| vérifié | Frédérik Bastien, ing. | référence | #### |
| approuvé | Guy Gagnon, ing. | #### | #### |

| no. projet | département | série | feuille | rév. |
|---|---|---|---|---|
| S06428A | GR | CR | 014 | 00 |




# COUPE DANS DU ROC
# SECTION TYPE

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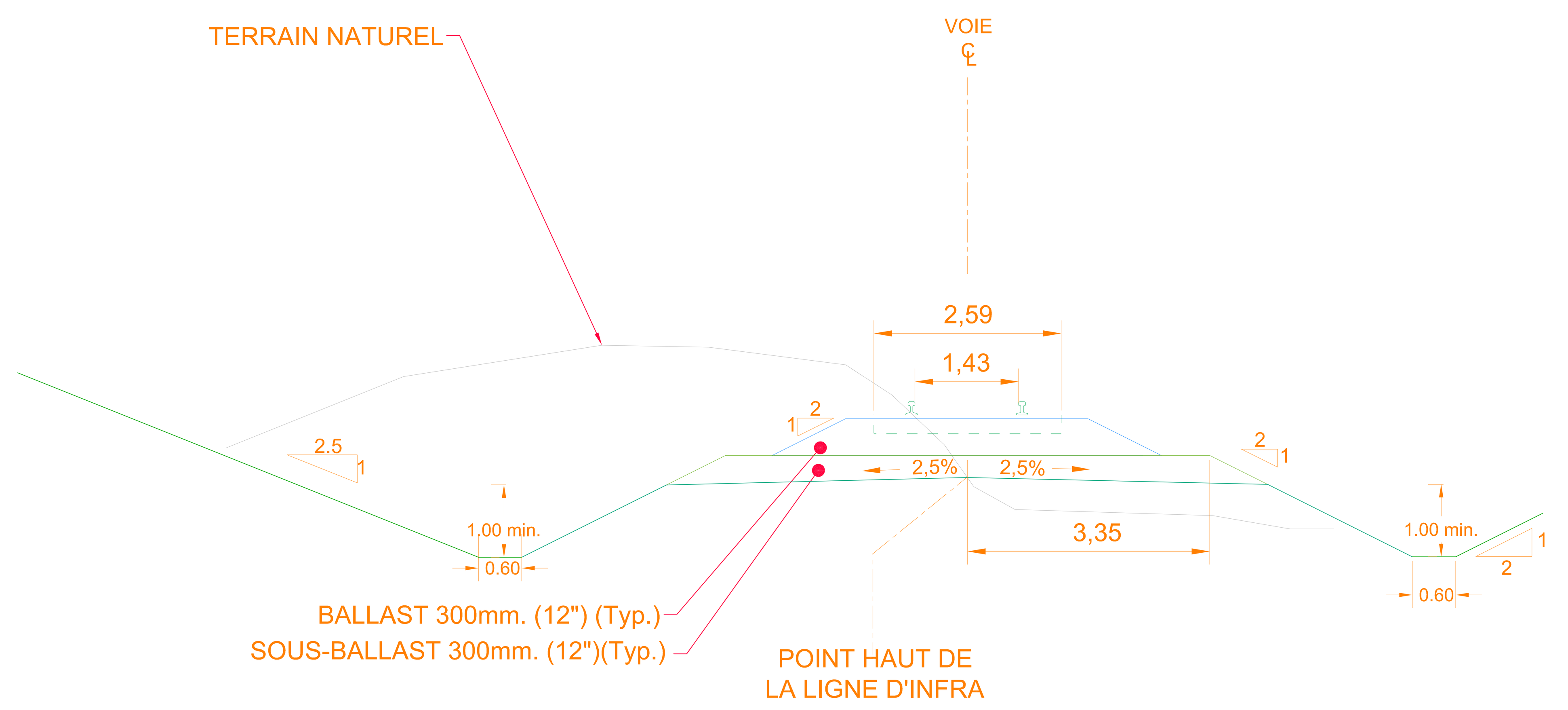


# SECTION TYPE

1:50 0 0.5 1 2.5m

| no | date | émissions et révisions | par |
|---|---|---|---|
| 01 | 05-04-12 | Pour Information | S.G. |

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Téléphone : (514) 337-2462
Télécopieur : (514) 281-1632
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sceau

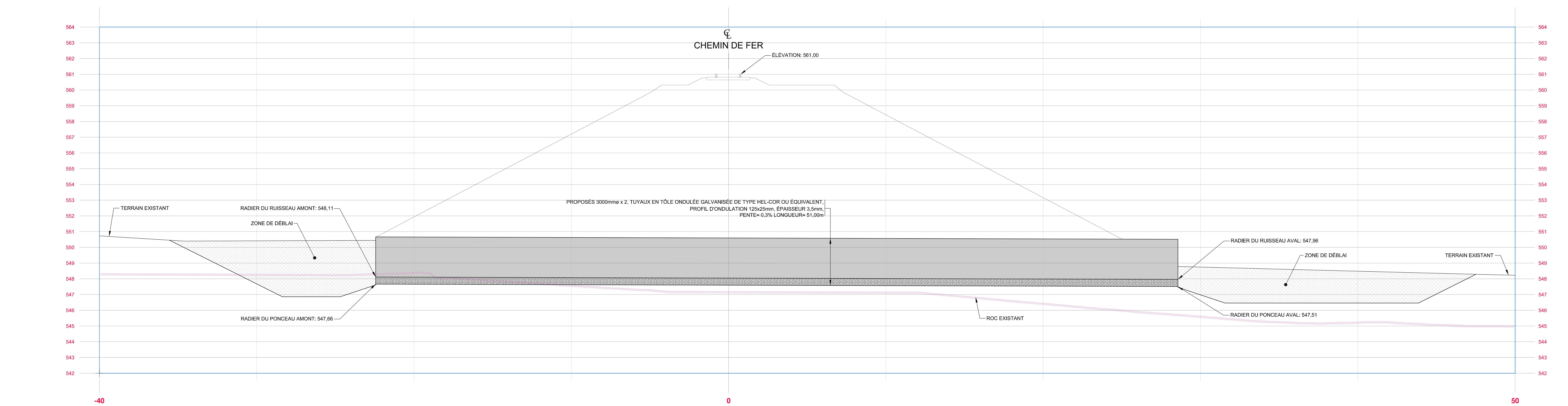
sceau

projet: BLACKROCK METALS INC.

titre: SECTIONS TYPES

| | | | |
|---|---|---|---|
| dessiné | Salvatore Gaetano, ing. | échelle | 1:50 |
| projeté | Salvatore Gaetano, ing. | date | 5 avril 2012 |
| vérifié | Salvatore Gaetano, ing. | référence | BRM 1032 |
| approuvé | Guy Gagnon, ing. | | |

S06428AGRCR00301

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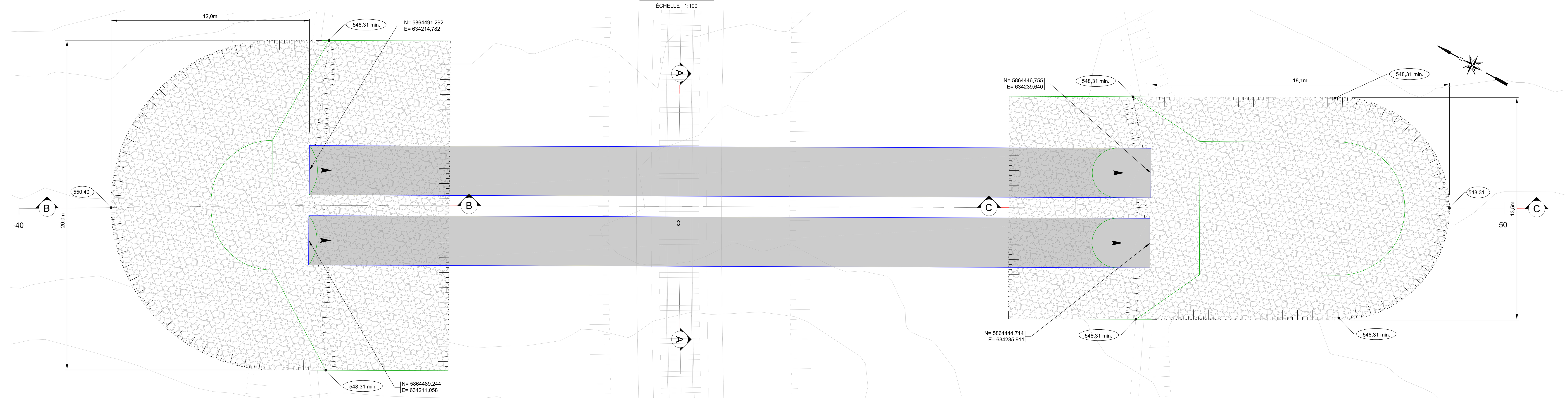


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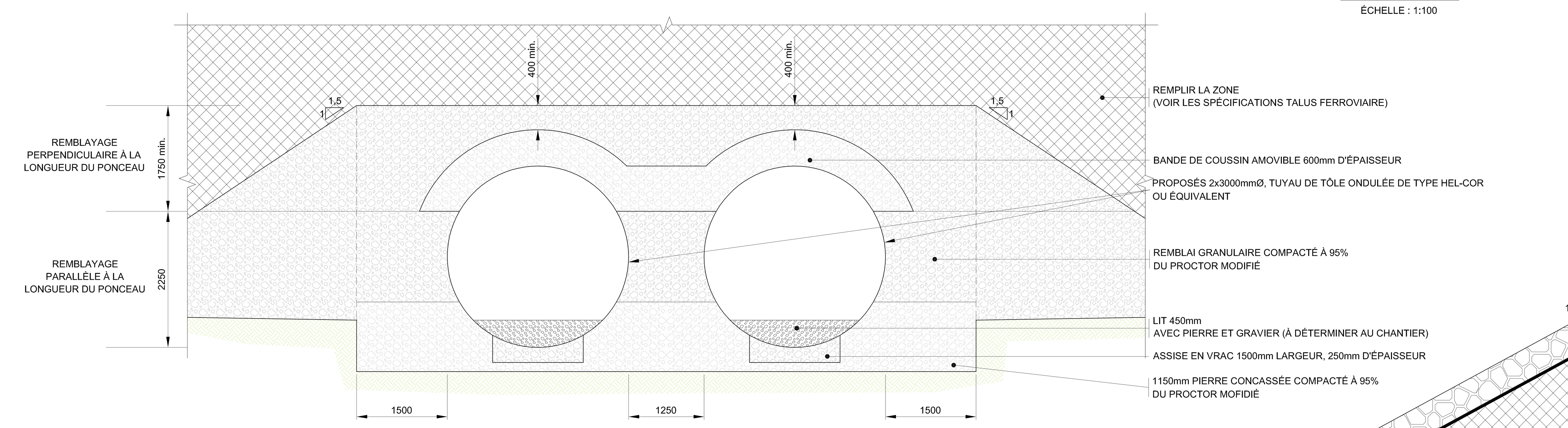
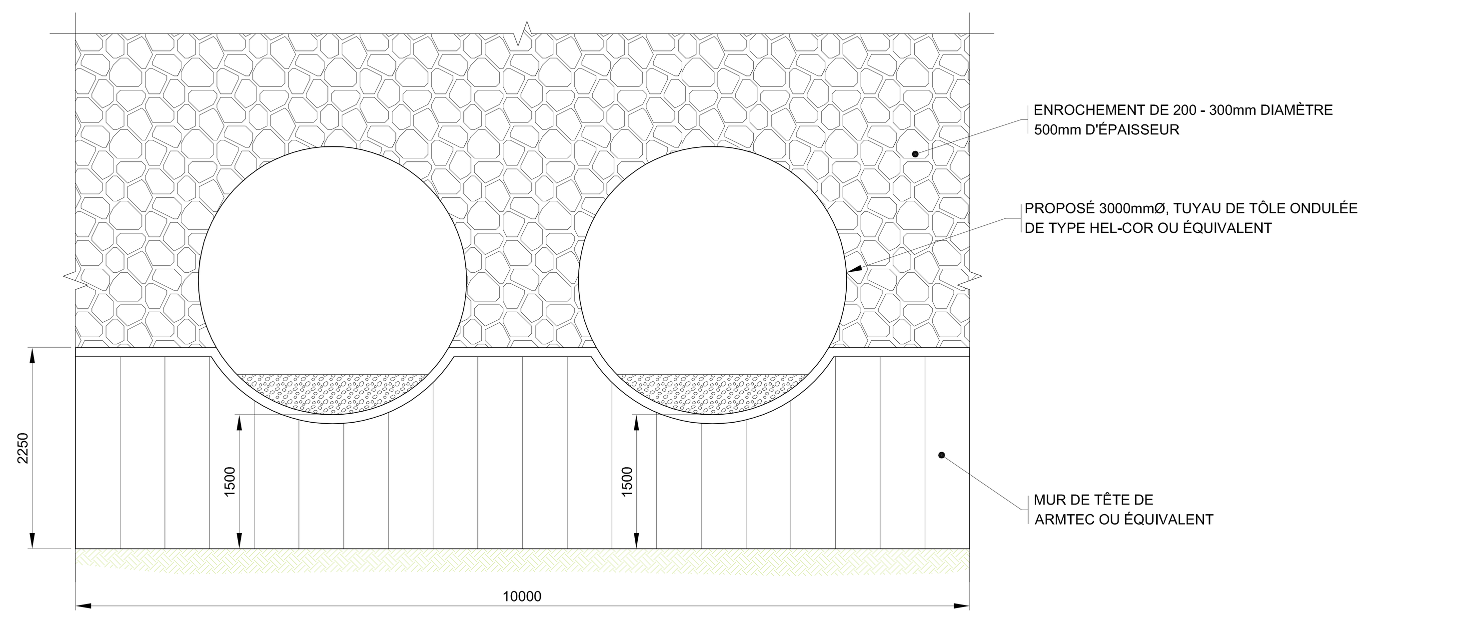



COUPE "A-A"
ÉCHELLE : 1:50

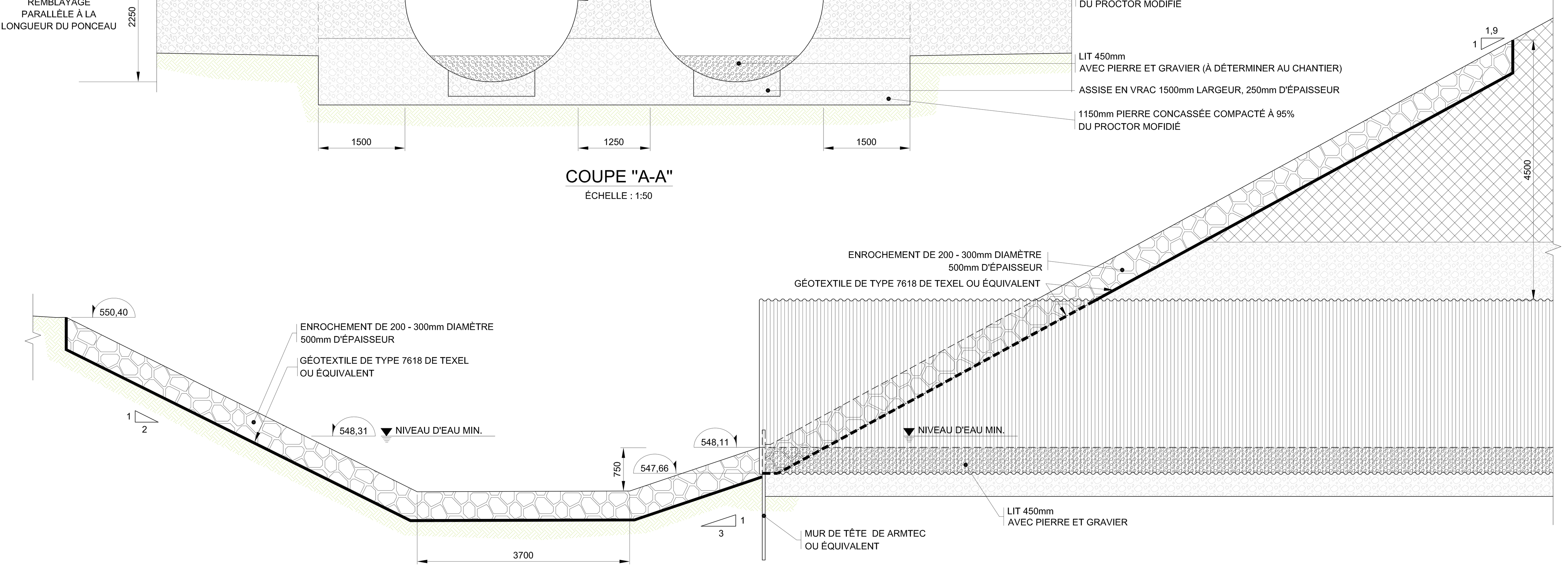
### NOTES POUR LA COUPE "A-A":

L'ASSISE DOIT ÊTRE ÉTABLI SUR UN SOL NON REMANIÉ LIBRE DE MATIÈRE ORGANIQUE.

LORSQUE LE PONCEAU EST INSTALLÉ DANS UNE TRANCHÉE, LA PAROIS DES TRANCHÉES DOIT AVOIR UNE HAUTEUR MAXIMUM DE 1,2 MÈTRE PUIS SUIVRE UNE PENTE DE 1H : 1V JUSQU'AU NIVEAU DU SOL EXISTANT.




DÉTAIL DU PONCEAU DE FACE
ÉCHELLE : 1:50




COUPE "B-B"
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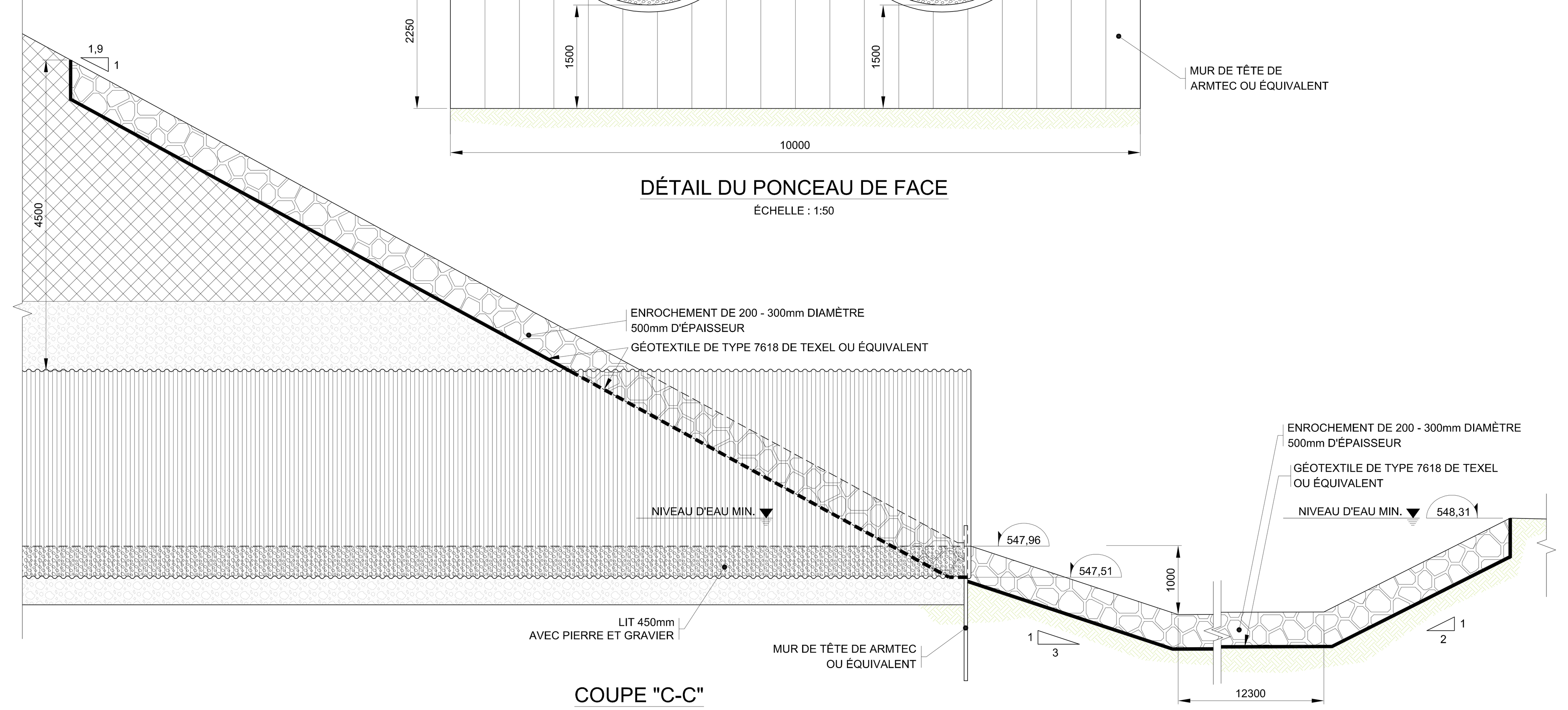


COUPE "C-C"
ÉCHELLE : 1:50

### NOTES GÉNÉRALES:

LE SYSTÈME DE COORDONNÉES INDIQUÉES SUR LE PLAN EST NAD 83.

LA LONGUEUR DU PONCEAU PEUT VARIER SUR LE CHANTIER AFIN DE CORRESPONDRE À L'ÉLÉVATION ET L'EMPLACEMENT EXACTS DES FOSSÉS LONGITUDINAUX.

| no | date | émissions et révisions | par |
|---|---|---|---|
| 00 | 05-04-12 | Pour Information | M.I. |

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sceau

sceau

projet: BLACKROCK METALS INC.

titre: PLAN CONCEPT DES PONCEAUX

| | | | |
|---|---|---|---|
| dessiné | S. Blouin | échelle | 1:100 |
| projeté | F. Bourdua, ing. | date | 5 avril 2012 |
| vérifié | M. Imbeault, ing. | référence | BRM 1032 |
| approuvé | M. Imbeault, ing. | | |

S06428ASUCR00100

# Appendix C:
# Preliminary Engineering Report

# RAIL LINK BETWEEN BLACKROCK METALS MINING PROJECT AND THE EXISTING CN RAIL LINES

**CIMA+ Project N° : S06428A**
**Blackrock metal Project N° : BRM-1032**

# DESIGN CRITERIA
## PRELIMINARY CONCEPTS FOR THE RAIL LINK

**MAY 18, 2012**
**(REVISION 02)**

**Prepared and verified by :**

**Guy Gagnon, Eng. – Project Manager**

# TABLE DES MATIÈRES

# 1. GENERAL

The project consists of a rail link between the Blackrock Metals mining project developed by Blackrock Metals Inc. Located in Chibougamau and the existing CN rail line.

# 2. DRAINAGE

## 2.1 DESCRIPTION OF THE DRAINAGE WORK

The proposed rail line between the mining facilities and the existing CN rail lines will cross several streams of varying magnitudes (0 to 15m). The drainage work aims to install the required infrastructure (culverts) under the new rail line.

## 2.2 DESIGN PARAMETERS

The main applicable design standards and codes are as follows:

- AREMA : American Railway Engineering and Maintenance-of-Way Association – 2011;
- Normes MTQ, ouvrages routiers, Tome II – Construction routière, chapter 3 « Drainage »;
- Normes MTQ, ouvrages routiers, Tome III – Ouvrage d'art, chapter 2 « Conception des ouvrages d'art » et chapter 4 « Ponceau »;
- AREMA Standards , chapter 4 « Culverts »;
- Fisheries and Oceans Canada Guide for the design and installation of permanent culverts;
- Norme BNQ 1809-300 (2007) « Travaux de construction – Clauses techniques générales – Conduites d'eau et d'égout »;
- Directive 004 MENV « Réseaux d'égout ».

The **general** design criteria used in the design of the streams and proposed culverts are as follows:

- Reoccurrence protection : 100 years;
- The flow calculations will be done with using SWMM and SWMHYMO software and verified using the rational method. Dimensioning of the culverts will be done using HY-8 software version 7.2.
- Design rainfall considered : Chicago (3h), SCS (Type II – 24h) and Hogg-Winter + snow melt, Sept-Îles Airport;

- Maximum outlet velocity (100 years) : 4 m3/s
- Culvert galvanized corrugated sheet metal : n=0,024
- Embedment depth : maximum value between 300mm et 15% of the culvert diameter
- Culvert extremities : concrete headwalls or TTOG and rip-rap with geotextile (loss of point load Ke = 0,5);
- Minimum diameter of the culvert is set at 900mm;

The design criteria used in the design of the streams and proposed culverts to ensure viable fish habitat is as follows and at this stage since no fish habitats has been identified these criteria will be applied to stream crossings:

- Maximum outlet velocity (25 years): 3 m3/s or the most restrictive environmental requirements applicable.
- Maximum upstream water depth is less than 90% of the diameter(100 years no overflow)

The design criteria used in the design of the streams **that are not considered fish habitats** are as follows and will be applied in general after the identification of fish habitats is completed:

- Maximum water depth permitted upstream: less that the diameter (25 years – no load) and less than 1.5 times the diameter (50 years) and 800mm minimum below the subgrade (below sub-ballast level) of the rail line and roads.

# 3. RAILWAY ENGINEERING

This section presents the main design criteria for the proposed railway. CN design standards and rail arrangements are used. Any road crossings will be designed following Transport Canada Standards.

## 3.1 CALCULATION DATA

### 3.1.1 Train dimensions used in the calculations

- Length of a wagon : 10,4 m (34.12 feet);
- Length of a locomotive: 25 m (82.02 feet).

## 3.2 STRUCTURE OF THE RAILWAY

- Type of rail used is 115lb ( to be confirmed)
- Hard wood ties #1, 8" x 6" x 8'6" [203mm x 152mm x 2 591mm] with center to center spacing of 20" [508mm]. There is also an option being evaluated to use steel ties. The product being analysed is from Narstco (H10 steel ties).

- Ballast and sub-ballast must be confirmed by a Geotechnical consulting firm. For the preliminary design a depth 12" [305mm] of ballast under the ties and 12" [305mm] of sub-ballast will be used. This infrastructure will be revised in case the steel ties are retained.
- Distance from the center of the tracks to the shoulder of sub-ballast:11' [3.35m]
- Slope of the ballast: 2H:1V

## 3.3 TYPICAL CROSS SECTION

- When an access is required, the width will be 4.572m, if it is located on the edge of the slope and varying between 5.389m to 5.563m if it is between two rail lines.

* *All data is to be revaluated after the geotechnical study.*

## 3.4 PLAN AND ELEVATION GEOMETRY

### 3.4.1 Main line

- Design speed for the freight train : 30mph (loaded) and 35mph (empty)
- Maximum degree of curvature (plan view) : 7°
- Equilibrium superelevation (in.): $E = 0.0007V^2D$ where V is the speed of the freight train(mph) and D the decimal degree of the curve
- Maximum allowable unbalanced superelevation ($E_u$) is 2" [50.8mm]
- Actual superelevation ($E_a$) used for the design:

  Freight train: $\mathbf{E_a = E - E_u}$

- Minimum actual superelevation ($E_a$) is ½" [12.7mm] and the maximum is 5 " [127mm]
- Minimum distance between reversed curves: minimum 100 ft [30.5 m]
- Connecting curve: $\mathbf{L=1.63\ E_u \times V}$ where $E_u$ is the unbalanced superelevation in inches and V is the speed of the freight train in mph. L is the minimum length in feet for full comfort. It must also satisfy an ultimate minimum length of: $\mathbf{L = 62\ E_a}$.
- Maximum slope (elevation) : 0,4 % ( full wagons) et 1,4% (empty wagons)
- Capacity of the rail loop :

  Annual production to transport of 3 MT/year: 96 wagons + 4 locomotives;
  Slack of the coupler 0.457m (1.5 ') per car
  Total length (96X10.4m) + (96X0.457m) + (4X25m) ~ 1 150m

Annual production to transport of 6MT/year: 192 wagons + 8 locomotives;
Slack of the coupler 0.457m (1.5 ') per car
Total length (192X10.4m) + (192X0.457m) + (8X25m) ~2 285m

#### 3.4.2 Vertical curves

The minimum length of a vertical curve (in): **LCV = D x $V^2$ x 21.5** where D is the difference of the slopes in decimals and V is the speed in mph.

### 3.5 SWITCHES

#### 3.5.1 Types of switches

- Main line : #12 switches
- Secondary line to secondary line: # 10 switches.

#### 3.5.2 Minimum distance between two consecutive switches

- #12 switch : 141 ft. [43 m]
- # 10 switch : 119 ft. [36.3 m]

#### 3.5.3 Minimum distance between two face to face switches

- #12 switch: 100 ft. [30.5 m]
- # 10 switch: 100 ft. [30.5 m]

### 3.6 CLEARANCES

#### 3.6.1 Vertical clearances

The required vertical clearance is 23 ft. [7.01 m] and this is measured the top of the rail.

The vertical clearance above the lid of a conveyor is 2.0m.

#### 3.6.2 Horizontal clearance

The minimum horizontal clearance between a main line and a structural element is 25 ft. [7.62 m] where there is a maintenance access road.

## 4. EARTHWORKS

This section presents the key design criteria for the earthworks for the proposed railway, for the drainage infrastructure (bridges, culverts) and the facilities required for the rail link.

Road design standards of the Ministère des Transports du Québec will be applied.

### 4.1 Typical cross section

The typical cross section will have the following characteristics:

- Standard ditch width is 0.6m, except in the rock cuts where width is determined as a function of flow rate.
- The required minimum depth of the ditches is 1.0 m under the sub-grade, the depth will be determined according to the criteria of the high water level in the ditch.
- In cuts, the slope of ditches is 2.5H: 1V, if the cut is less than 3m deep and 3H: 1V if the cut is greater than 3m deep. In the rock cuts the slope is 1H: 10V with benches at every 12m of height.*
- In the rock cuts the slope of the 6 m wide benches is 15H: 1V height. In addition, an interceptor ditch 0.5m depth and a width of 1.0m may be required. If rock cut is greater than 6m in depth, a bench of 3 m is necessary created by the removal of all overburden.
- In fill, the slope of the ditches is 2H: 1V when the embankment is less than 3m in height and 2.5H: 1V when the embankment is greater that 3m in height.
- The sub-ballast is placed on a sub-grade with slope of 2.5% in straight sections and superelevation in the curved sections.
- Any modifications to existing roads will follow the same design criteria except that width and structure of existing road will be used.

* *All data is to be revaluated after the geotechnical study.*

## 5. STRUCTURES

### 5.1 Description

The structures consisting of rail bridges designed to support one rail line crossing over the bodies of water. Structures for vehicular traffic may also be required for maintenance purposes. (To be confirmed)

### 5.2 Calculation data

#### 5.2.1 Design codes and other references

The main applicable design standards and codes are as follows:

- AREMA : American Railway Engineering and Maintenance-of-Way Association Manual for Railway Engineering– 2011/ chapters 8,9 &15;
- Transport Canada TC E-05 – Standards Respecting Railway Clearances

- CN Guidelines for design of railway structures – January 2006 revision
- CSA S6-06 Canadian Highway Bridge Design Code

### 5.2.2 Design Life

The nominal design life of the structures is fixed at 50 years. (To be confirmed)

### 5.2.3 Materials

#### *5.2.3.1 Structural Steel*

In accordance with the standard CSA-G40.21.

| | |
|---|---|
| Fracture-critical members and primary tension members (main girders, stringers, end diaphragms and braces | Grade 350 AT |
| Other elements : | Grade 350 A (or 350 AT) |

Fracture toughness requirements: according to CSA-S6-06 article 10.23.3. Minimum average energy by Charpy test:

| | |
|---|---|
| Fracture-critical members : | 27 J at -30°C |
| Primary tension members : | 27 J at -20°C |

#### *5.2.3.2 Concrete*

Cast in place and precast reinforced concrete (not prestressed nor post-tensioned)(CN, chapter 3, article 10):

Minimum 28 day strength $f'_c$ = 35 MPa.

#### *5.2.3.3 Reinforcing steel*

In accordance with the standard G30.18-M.

Grade 400W (minimum yield stress $f_y$ = 400 MPa).

Anticorrosion protection: none.

#### *5.2.3.4 Cover required for concrete*

(AREMA, chapter8, article 2.6.1)

| Exposure conditions | Minimum cover |
|---|---|
| Concrete cast against and permanently exposed to the earth | 75 mm |
| Concrete submerged, exposed to earth (non-aggressive environment) or exposed to the air: | |

| | |
|---|---|
| - Principal reinforcing bars<br>- Stirrups elsewhere, ties and spirals | 50 mm<br>40 mm |
| Concrete bridge slab:<br>- Top reinforcement<br>- Bottom reinforcement | <br>50 mm<br>40 mm |
| Bored piles (CSA-S6-06 table 8.5)<br>- Caisson with liner<br>- Caisson | <br>60 mm<br>100 mm |

### 5.2.4 Loads

#### *5.2.4.1 Dead loads*

Rail dead loads (AREMA, chapter 15, article 1.3.2) :

| | |
|---|---|
| Steel : | 77 kN/m$^3$ (490 lb/ft$^3$) |
| Reinforced concrete : | 24 kN/m$^3$ (150 lb/ft$^3$) |
| Rails (including inside guard rails and rail fasteners) : | 3 kN/m (200 lb/ft) per Track |
| Ballast : | 19 kN/m$^3$ (120 lb/ft$^3$)<br>For h = (405 + 305) mm : 13,5 kN/m$^2$ |
| Fill : | 21 kN/m$^3$ |

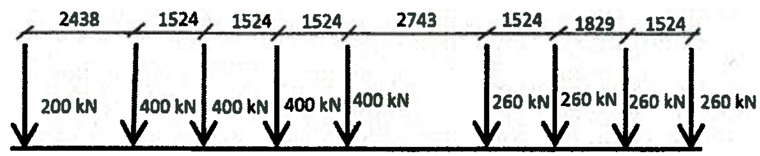
Highway dead loads :

In accordance with the standard CSA-S6-06, chapter 3.

#### *5.2.4.2 Live loads*

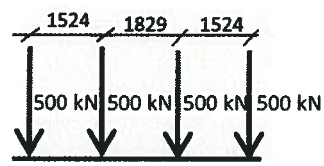
Rail live loads:

| | |
|---|---|
| Train : | Cooper E90 or E90 Alternate Live Load on 4 Axles, the model producing the greatest constraints is the critical model. |




Cooper E90

*Note : a sole locomotive of type Cooper E90 is represented for comparison with the load Cooper E80 AREMA (dimensions in [mm])*




Alternative live load on 4 axles

| | |
|---|---|
| Impact load [% train load] : | 40-3$L^2$/1600 pour L < 80 pi (L in [ft]) (AREMA, chapter 15, article 1.3.5) |

Longitudinal forces for the Cooper E90 model (AREMA, chapter 15, article 1.3.12) :

| | |
|---|---|
| Breaking [kN] : | $(200+17{,}5L)\times{}^{90}\!/_{80}$ acting 2,50 m above the rail (L in [m]) |
| Traction [kN] : | $200\sqrt{L}\times{}^{90}\!/_{80}$ acting 0,90 m above the rail (L in [m]) |

Highway live loads:

In accordance with the standard CSA-S6-06, chapter 3, with CL-625 live loads.

### *5.2.4.3 Seismic loads*

No seismic analysis is required for a single span bridge.

(AREMA, chapter 9, article 1.4.5.2; S6-06, article 4.4.5.2).

### *5.2.4.4 Wind forces*

On the rail bridge (AREMA, chapter 15, article 1.3.7) :

On the loaded bridge:

- Lateral wind force on the train: 4,4 kN/m (300 lb/ft), acting 2,44m above the rail;
- Lateral wind pressure on the bridge : 1,44 kN/m2 (30 lb/ft2);
- Longitudinal wind force: 25 % of the lateral force.

On the unloaded bridge:

- Lateral wind force: 2,4 kN/m2 (50 lb/ft2);
- Longitudinal wind force: 25 % of the lateral force..

On highway structures:

In accordance with the standard CSA-S6-06, chapter 3.

### 5.2.5 Climatic data

In accordance with the standard CSA-S6-06, chapter 3.

| | |
|---|---|
| Maximum mean daily temperature : | + 27°C |
| Minimum mean daily temperature : | - 38°C |
| Annual mean relative humidity : | 72 % |

## 5.3 GEOMETRY

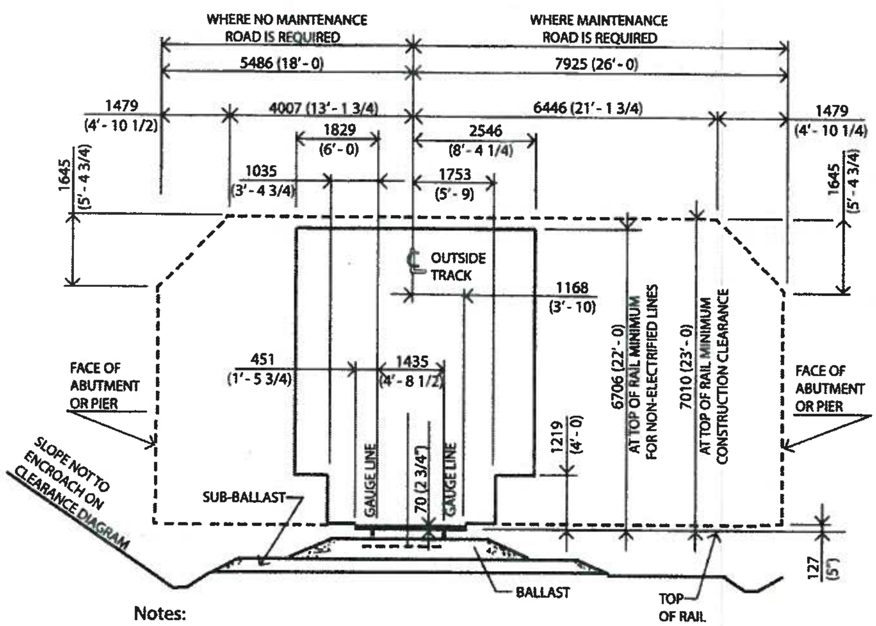
### 5.3.1 Railway

The railway will follow the requirements of Transport Canada Standards Respecting Railway Clearances (TC E-05) or the requirements of railway engineering summarized in section 5, whichever is most critical.

Diagram 1 of the Standard shows the cross-section for work located above or beside the railway and is reproduced in Figure 5 1: Typical cross-section for works off of the bridge.

Diagram 2 of the Standard shows the cross-section for the bridge and is reproduced in Figure 5 2: Typical cross-section for works on the bridge.

Diagram 1: All Structures Over or Beside the Railway Tracks (Scale 1:75)

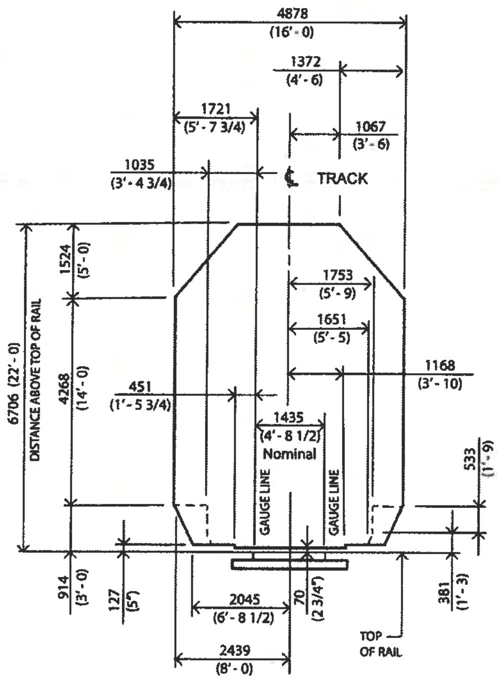



Notes:

- Solid lines indicate minimum standard clearances
- Broken lines indicate required clearances, where approved by the national transportation

**Figure 5-1: Typical cross section for works off of the bridge.**

Diagram 2: All Railway Bridges, Snowsheds and Overhead Timber Bridges (Scale 1:75)




Note: Broken lines indicate minimum clearances that may be used when authorized by the chief engineer.

**Figure 5-2: Typical cross-section for works on the bridge**

## 5.3.2 Clearance above a stream (non-navigable)

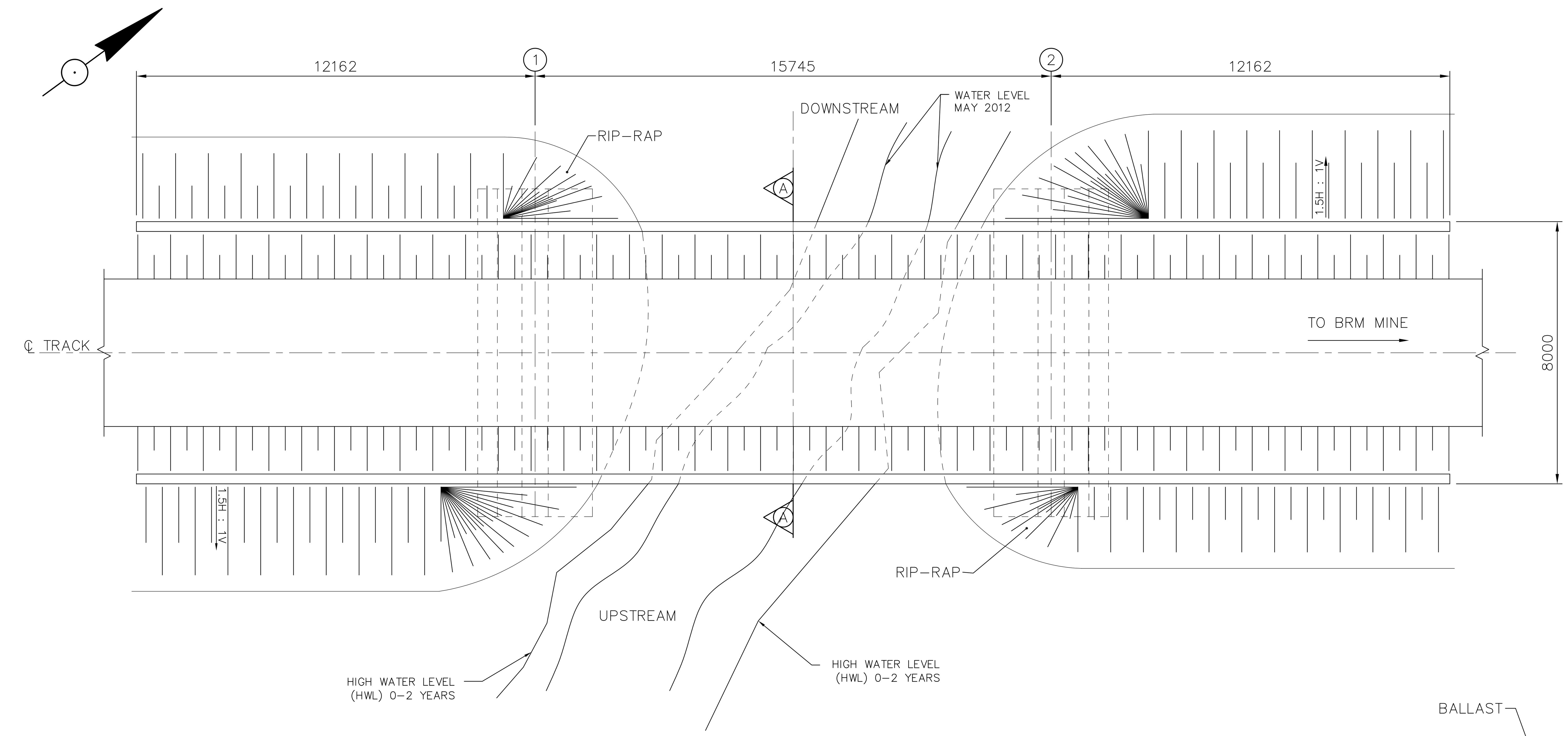
The clearance between the structure and the stream is a fixed function of the high water height and the free span of the bridge required for optimal hydraulic performance.

The clearance between the structure and the stream at high water height is fixed at 0.30m (1') (AREMA, chapter 12, article 4.5.12.3).

The high water height calculations are those of 100 year return flow (AREMA, chapter 12, article 4.5.5.1).

For navigable streams Federal regulations sets the clearance at 5m above the mean flow.

# Appendix D:
# Jules Bridge Layout Options




PLAN

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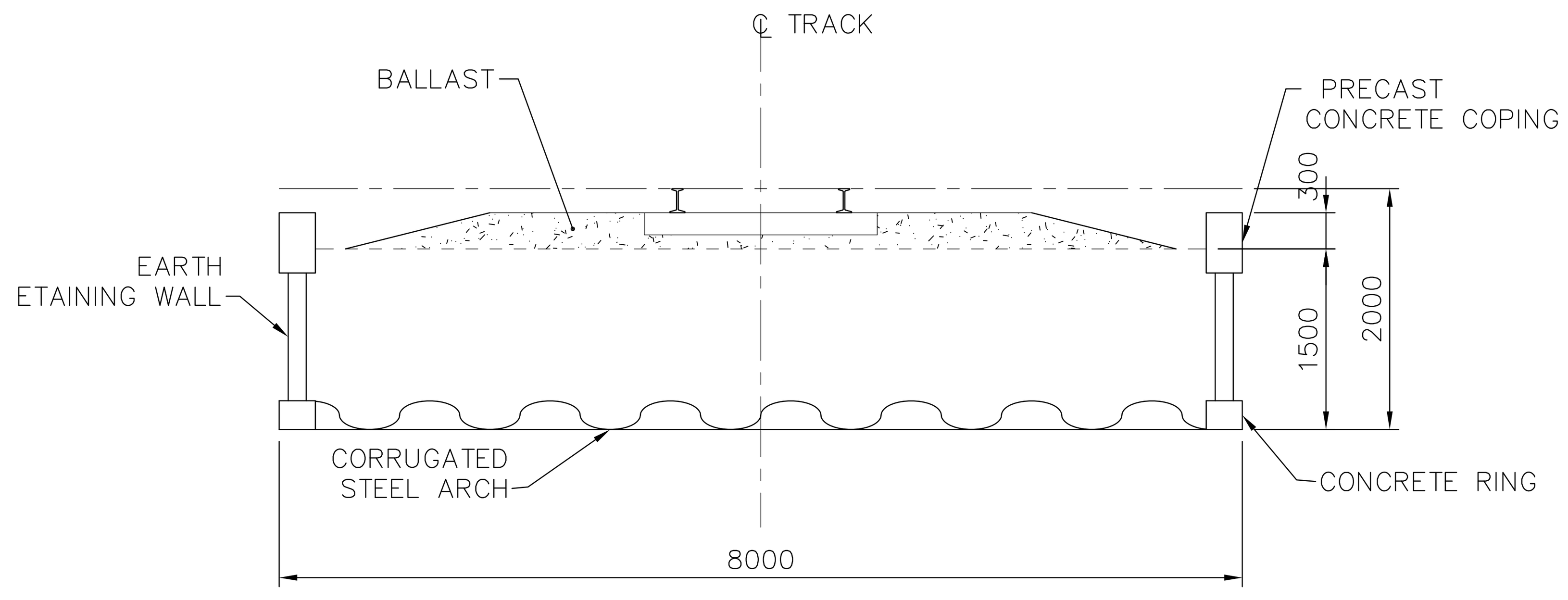


SECTION A–A

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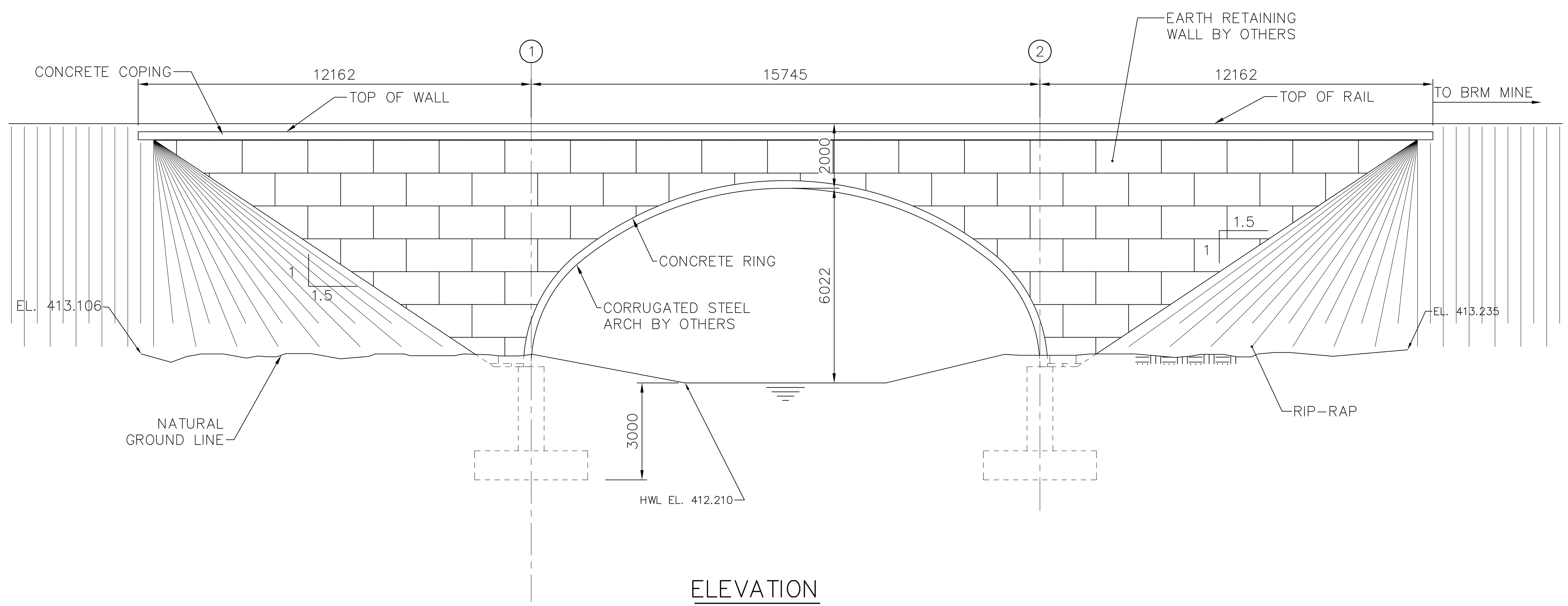


ELEVATION

ÉCH. 1:100

## GENERAL NOTES

–ALL DIMENSIONS TO BE VERIFIED IN THE FIELD BY SURVEY TO CONFIRM THE LOCATION OF THE EXIXTING GROUND AND THE STRUCTURE.

## DESIGN CODES

–DESIGN AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH : AREMA 2009
–LIVE LOAD : COOPER E90 AND IMPACT
–DESIGN SERVICE LIFE : 50 YEARS

## MATERIAL SPECIFICATION

–CORRUGATED STEEL ARCH : ASTM A761
–CONCRETE : CSA/CAN–A23.1 & A23.2
–MINIMUM SPECIFIED COMPRESSIVE STRENGTH f'c = 35MPa AT 28 DAYS
–REINFORCED STEEL : CSA/CAN G30.18, GRADE 400W
–WELDING : CSA/CAN3–W59

PRELIMINARY
NOT FOR CONSTRUCTION PURPOSES

Revision

| n. | date | emissions and revisions | by |
|---|---|---|---|
| AA | 12–08–17 | FOR COMMENT | G.D. |

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www.cima.ca

Seal

Project

BLACKROCKMETALS

Title

OPTION 1:
STEEL ARCH

| | | | |
|---|---|---|---|
| Drawn | Gabriel P.Frigon, dess. | Scale | NONE |
| Projeted | Maxime Leroux, ing. jr. | Date | 17 Août 2012 |
| Verified | Bertrand Voutaz, ing. | Reference | BRM 1032 |
| Approved | Ghislain Dionne, ing. | | |

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## GENERAL NOTES

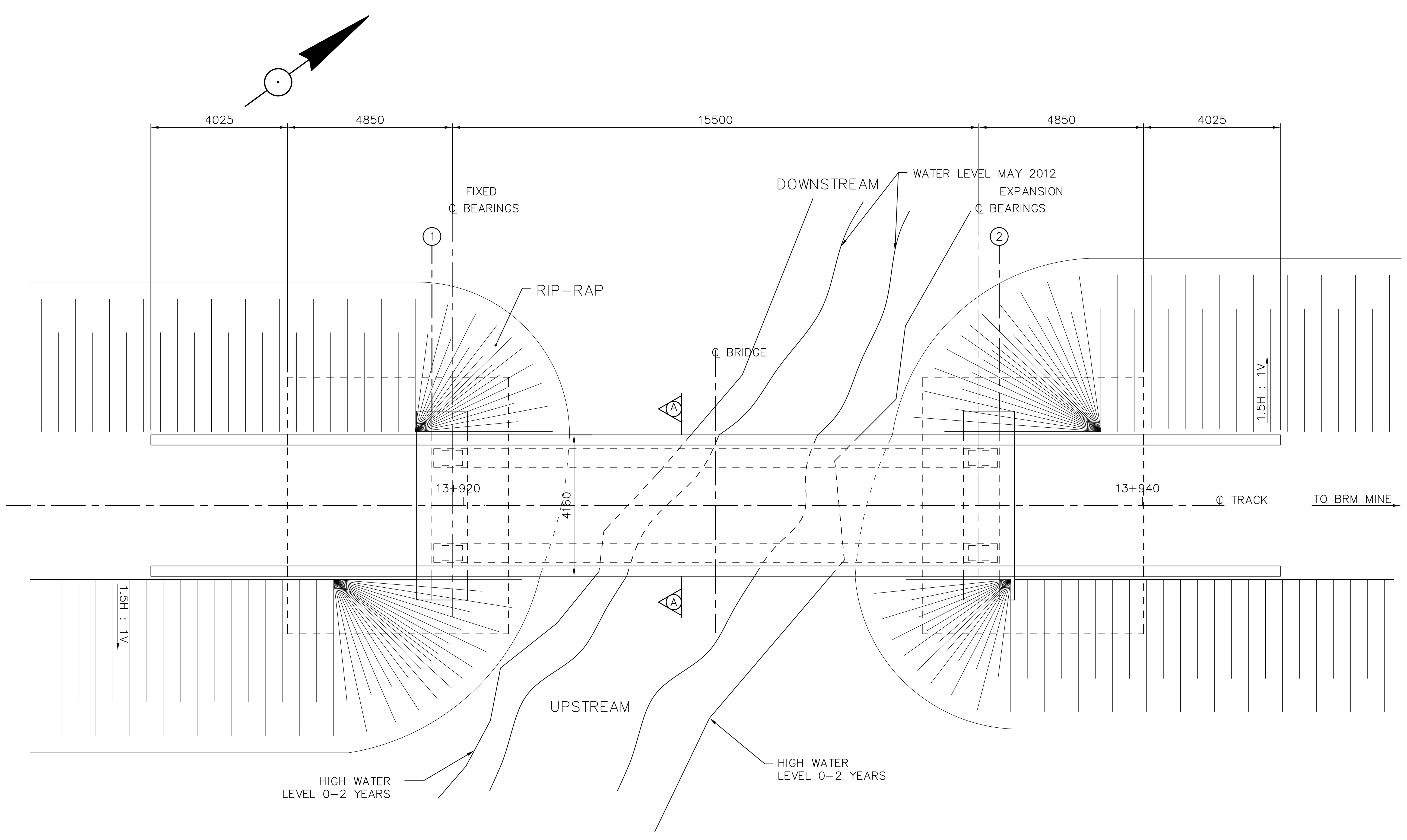
- ALL DIMENSIONS TO BE VERIFIED IN THE FIELD BY SURVEY TO CONFIRM THE LOCATION OF THE EXIXTING GROUND AND THE STRUCTURE.

## DESIGN CODES

- DESIGN AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH : AREMA 2009
- LIVE LOAD : COOPER E90 AND IMPACT
- DESIGN SERVICE LIFE : 50 YEARS

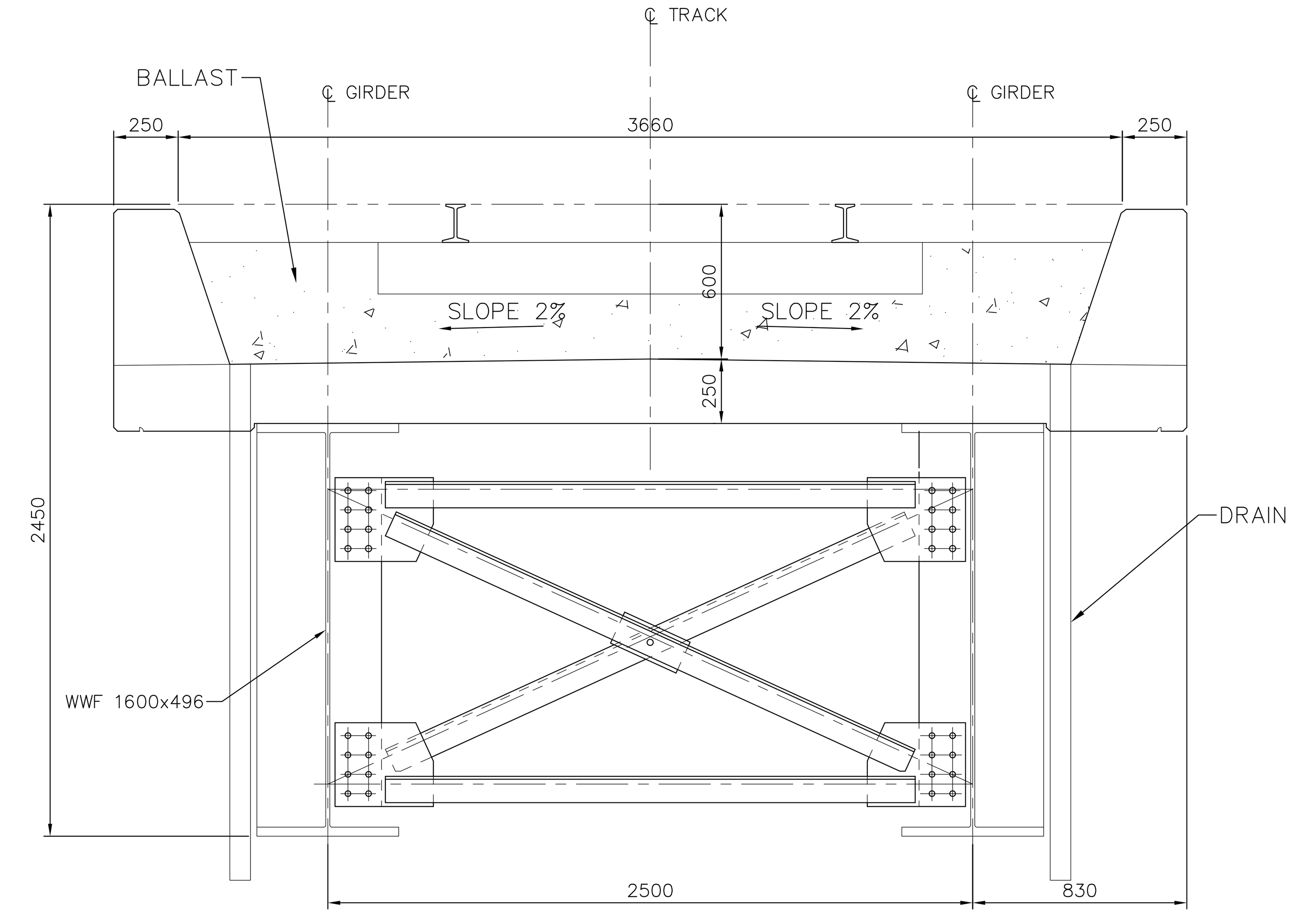
## MATERIAL SPECIFICATION

- STRUCTURAL STEEL : CSA/CAN-G40.21
  - MAIN GIRDER, STIFFENER PLATE 350AT
  - SECONDARY MEMBERS 350A
- CONCRETE : CSA/CAN-A23.1 & A23.2
  - MINIMUM SPECIFIED COMPRESSIVE STRENGTH f'c = 35MPa AT 28 DAYS
- REINFORCED STEEL : CSA/CAN G30.18, GRADE 400W
- WELDING : CSA/CAN3-W59




PLAN

SCALE 1:100




SECTION A-A

ÉCH. 1:20

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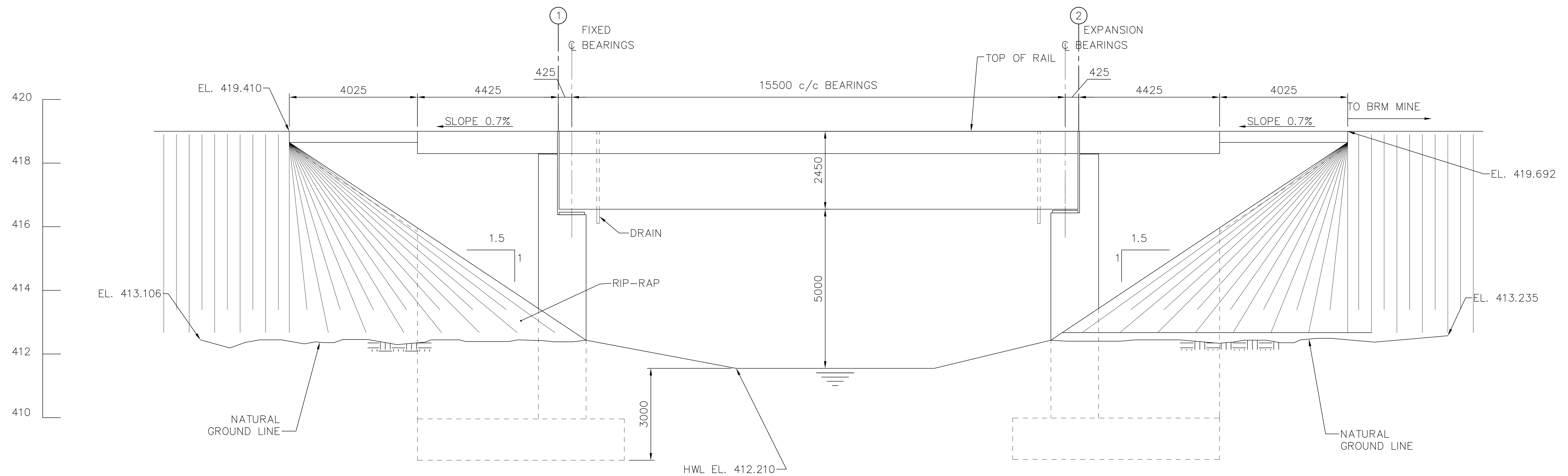


ELEVATION

SCALE 1:75

| Revision | | | |
|---|---|---|---|
| AA | 12-08-17 | FOR COMMENT | G.D. |
| n. | date | emissions and revisions | by |

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Fax number: (514) 281-1632
www.cima.ca

ISO 9001

Seal

Project

BLACKROCK METALS

Title

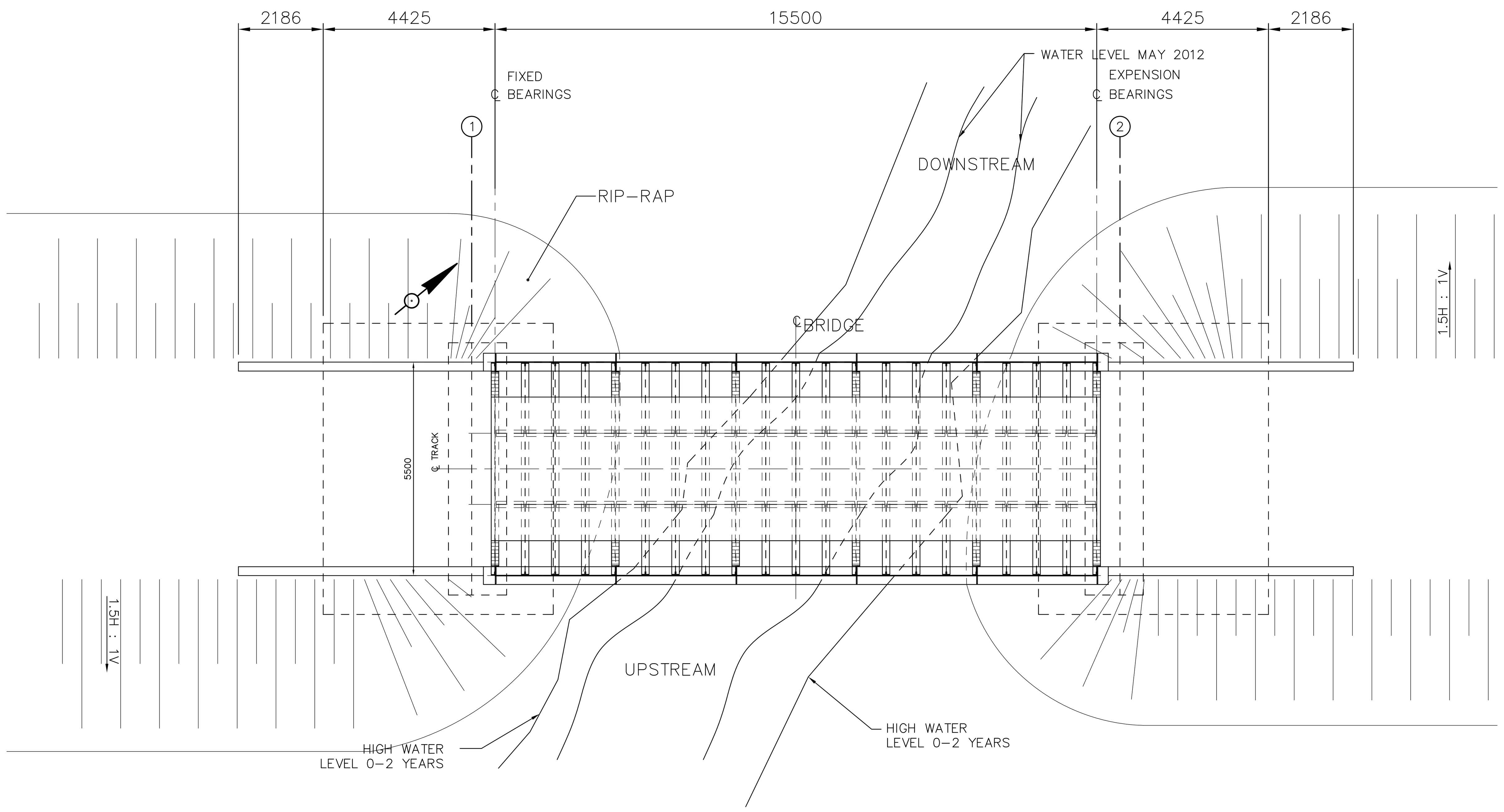
OPTION 2:
DECK PLATE GIRDER

| | | | |
|---|---|---|---|
| Drawn | Gabriel P.Frigon, dess. | Scale | NONE |
| Projeted | Maxime Leroux, ing. jr. | Date | 17 Août 2012 |
| Verified | Bertrand Voutaz, ing. | Reference | BRM 1032 |
| Approved | Ghislain Dionne, ing. | | |

S064 28A | GR | CR | 002 | AA
n. project | departement | serie | sheet | rev.

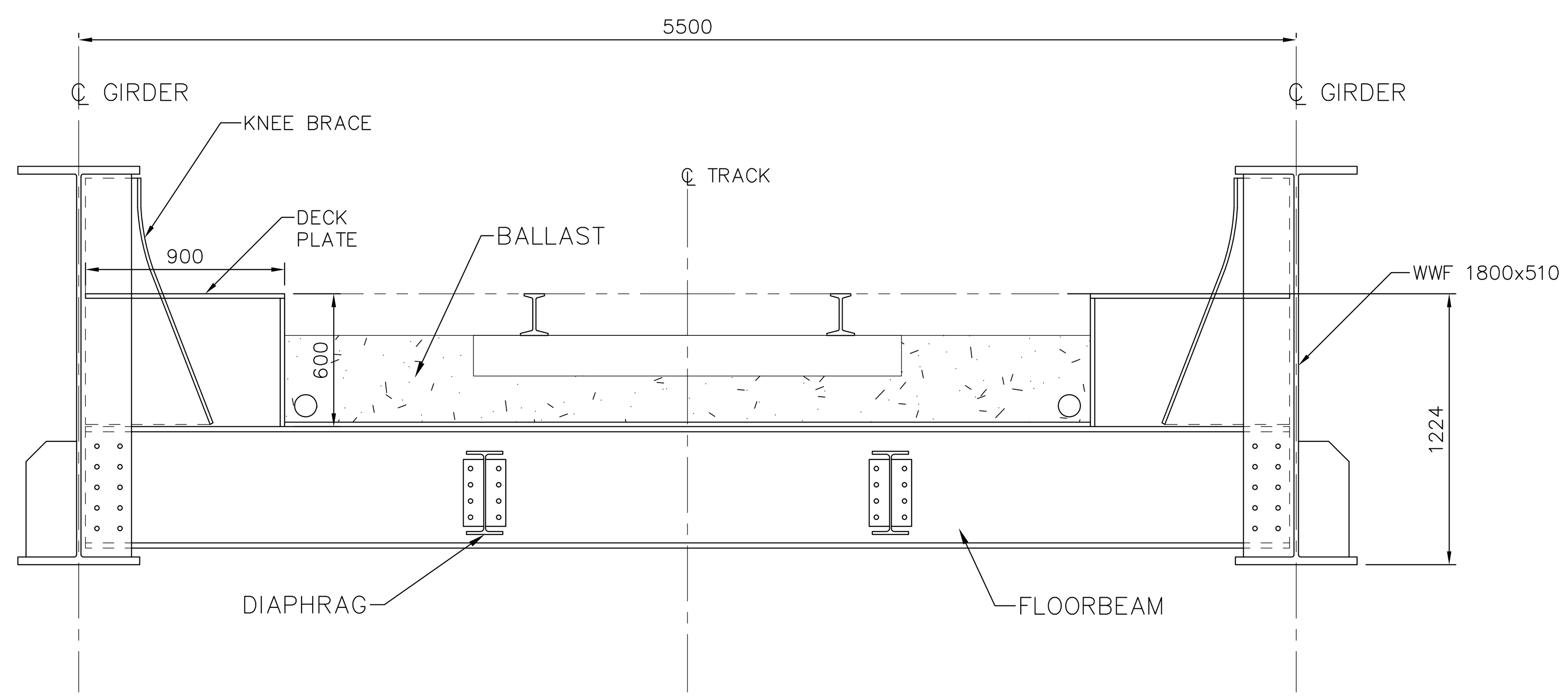
DERNIÈRE SAUVEGARDE 8/16/2012 4:50 , IMPRIMER LE 8/16/2012 4:52 PAR: GABRIEL FRIGON
G:\S_PONT\S06428A - APF BRM 20 KM FERROVIAIRE - BLACK ROCK METAL\400-PLANS\00-TRAVAIL-EN-COURS\PO-2012-1-OPTION 1.DWG

S064 28A | GR | CR | 002 | AA
n. project | departement | serie | sheet | rev.




PLAN

ÉCH. 1:100




SECTION A-A

ÉCH. 1:25

## GENERAL NOTES

- ALL DIMENSIONS TO BE VERIFIED IN THE FIELD BY SURVEY TO CONFIRM THE LOCATION OF THE EXIXTING GROUND AND THE STRUCTURE.

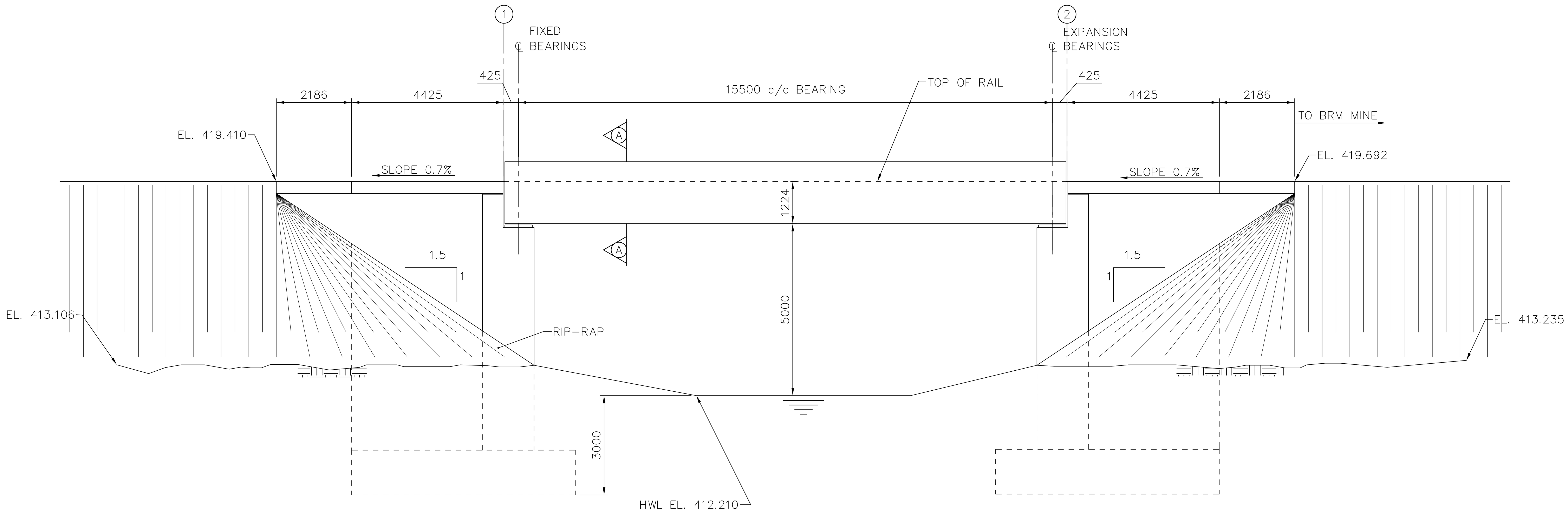
## DESIGN CODES

- DESIGN AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH : AREMA 2009
- LIVE LOAD : COOPER E90 AND IMPACT
- DESIGN SERVICE LIFE : 50 YEARS

## MATERIAL SPECIFICATION

- STRUCTURAL STEEL : CSA/CAN-G40.21
  - MAIN GIRDER, STIFFENER PLATE, K-BRACE PLATES, FLOORBEAM 350AT
  - STIFFENER ANGLES, DECK PLATE, REMAINING MEMBERS 350A
- CONCRETE : CSA/CAN-A23.1 & A23.2
  - MINIMUM SPECIFIED COMPRESSIVE STRENGTH SHALL BE f'c = 35MPa AT 28 DAYS
- REINFORCED STEEL : CSA/CAN G30.18, GRADE 400W
- WELDING : CSA/CAN3-W59

PRELIMINARY
NOT FOR CONSTRUCTION PURPOSES




ELEVATION

ÉCH. 1:75

| Revision | | | |
|---|---|---|---|
| AA | 12-08-17 | FOR INFORMATION | G.D. |
| n. | date | emissions and revisions | by |

Civil

CIMA

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740, Notre-Dame street west, suite 900
Montreal (Quebec) H3C 3X6
Phone number: (514) 337-2462
Fax number: (514) 281-1632
www.cima.ca

Seal

Project: BLACKROCKMETALS

Title: OPTION 3: THROUGH PLATE GIRDER

| | | | |
|---|---|---|---|
| Drawn | Gabriel P.Frigon, dess. | Scale | NONE |
| Projeted | Maxime Leroux, ing. jr. | Date | 17 Août 2012 |
| Verified | Bertrand Voutaz, ing. | Reference | BRM 1032 |
| Approved | Ghislain Dionne, ing. | | |

| S06428A | GR | CR | 003 | AA |
|---|---|---|---|---|
| n. project | departement | serie | sheet | rev. |

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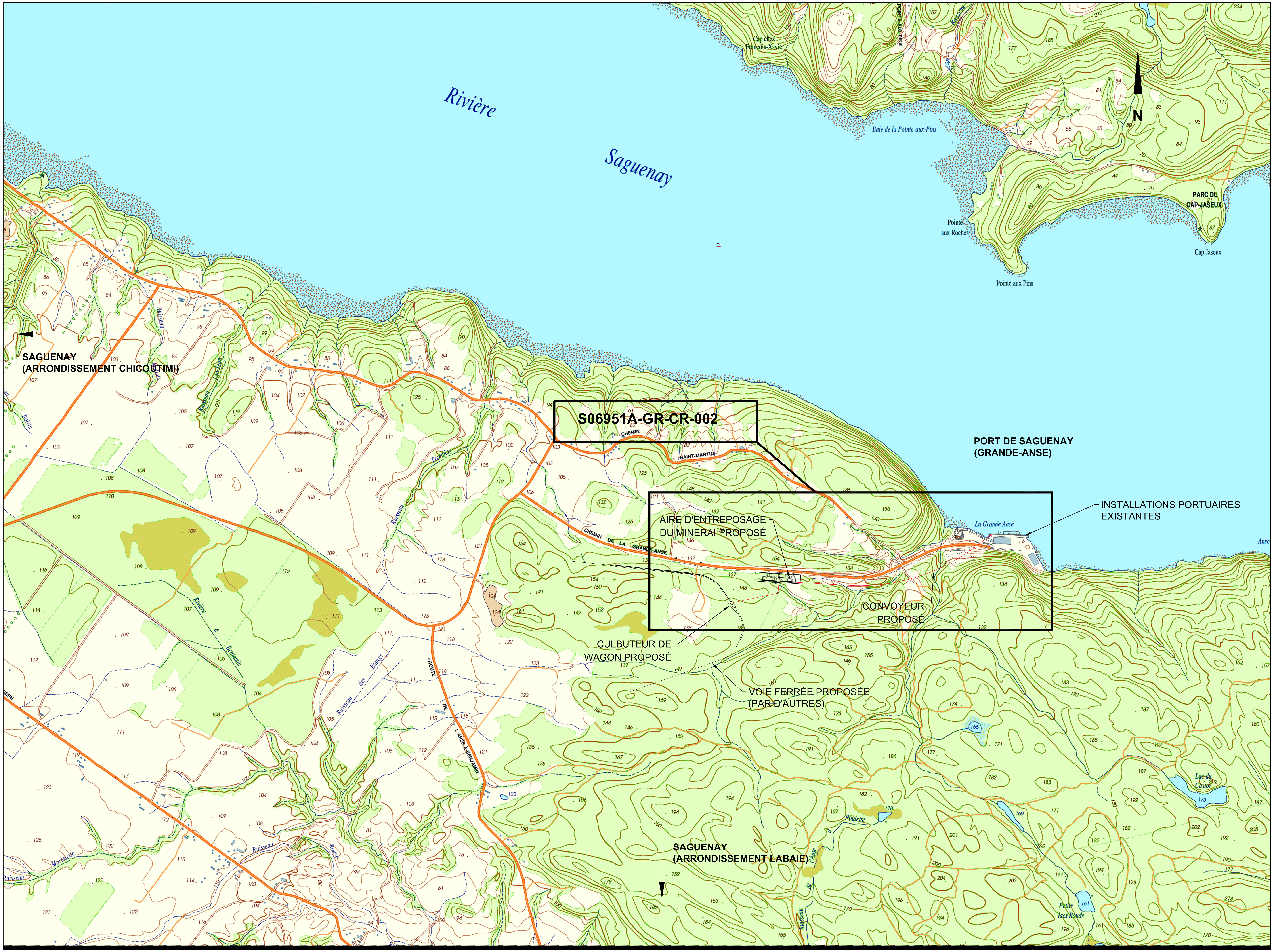
G:\S_PONT\S06428A - APF BRM 20 KM FERROVIAIRE - BLACK ROCK METAL\400-PLANS\00-TRAVAIL-EN-COURS\PO-2012-1-OPTION 1.DWG

S06428A GRCR 003 AA

# Appendix E:
# Planned Facilities - Saguenay Port Authority Site




## LÉGENDE

| | |
|---|---|
| FOSSÉ EXISTANT | |
| FOSSÉ PROPOSÉ | |
| BASSINS DE SÉDIMENTATION | |
| FOSSÉ EXISTANT À ABANDONNER | |
| CONDUITE PLUVIALE PROPOSÉE | P |
| PONCEAU EXISTANT | |

Révision

| no | date | émissions et révisions | par |
|---|---|---|---|
| AC | 12-09-12 | POUR INFORMATION | G.G. |
| AB | 12-09-11 | POUR INFORMATION | G.G. |
| AA | 12-09-07 | POUR INFORMATION | G.G. |

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Sceau

Projet

BLACKROCK METALS

PORT DE SAGUENAY (GRANDE-ANSE)

Titre

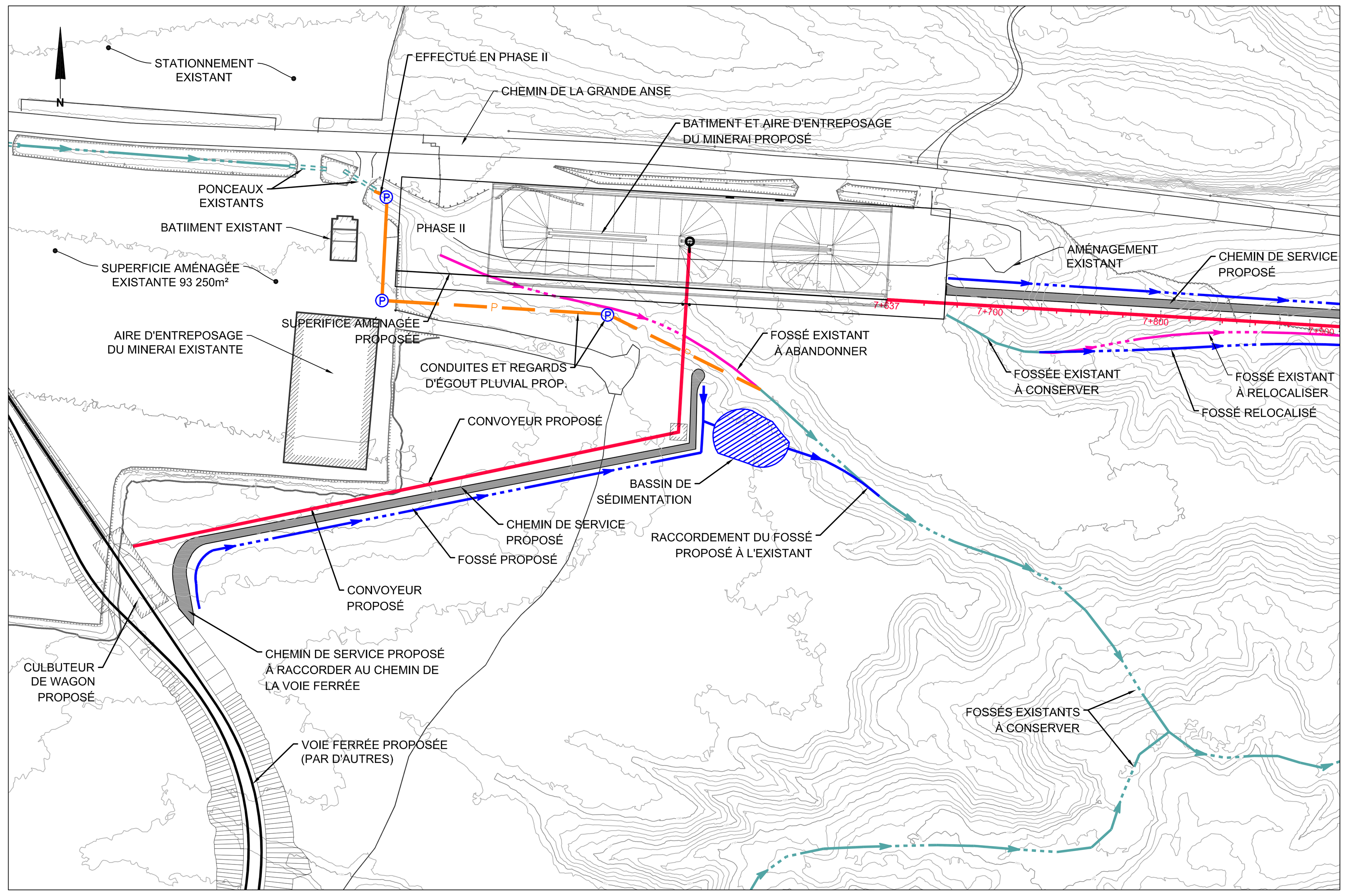
PLAN D'ENSEMBLE

DEMANDE ENVIRONNEMENTALE

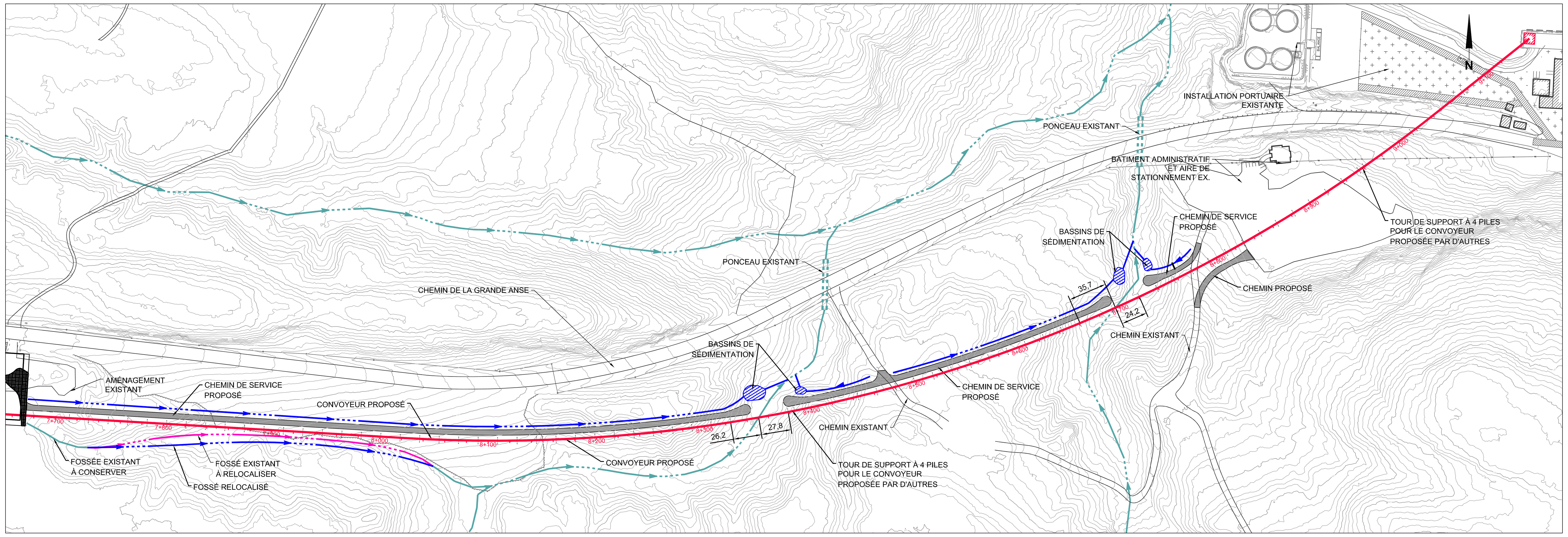
| | | | |
|---|---|---|---|
| Dessiné | Stéphane Halary, dess. | Échelle | 1 : 10 000 |
| Projeté | Michaël Désormeaux, ing. | Date | 7 Septembre 2012 |
| Vérifié | Johanna Gagnon Delisle, ing. | Référence | BRM |
| Approuvé | Guy Gagnon, ing. | | |

| no. projet | département | série | feuille | rév. |
|---|---|---|---|---|
| S06951A | G | R | CR001 | AC |

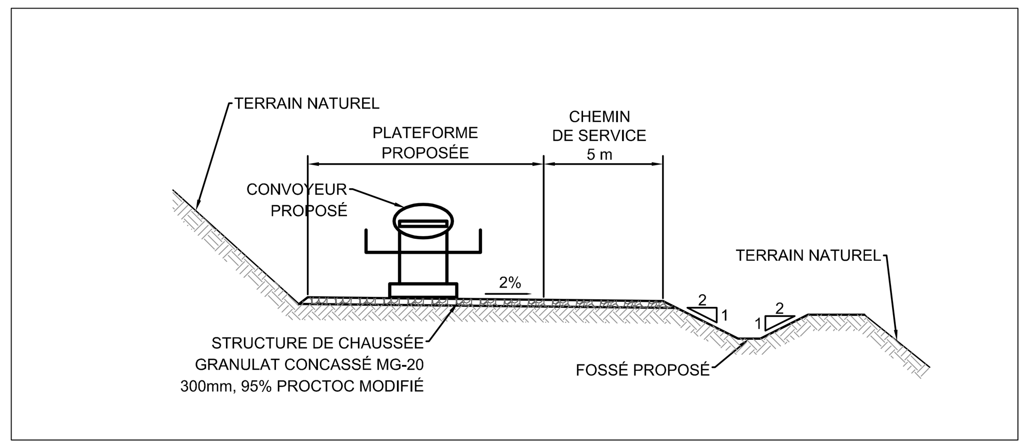
S0 6 9 5 1 A | G R | C R | 0 0 2 | A C



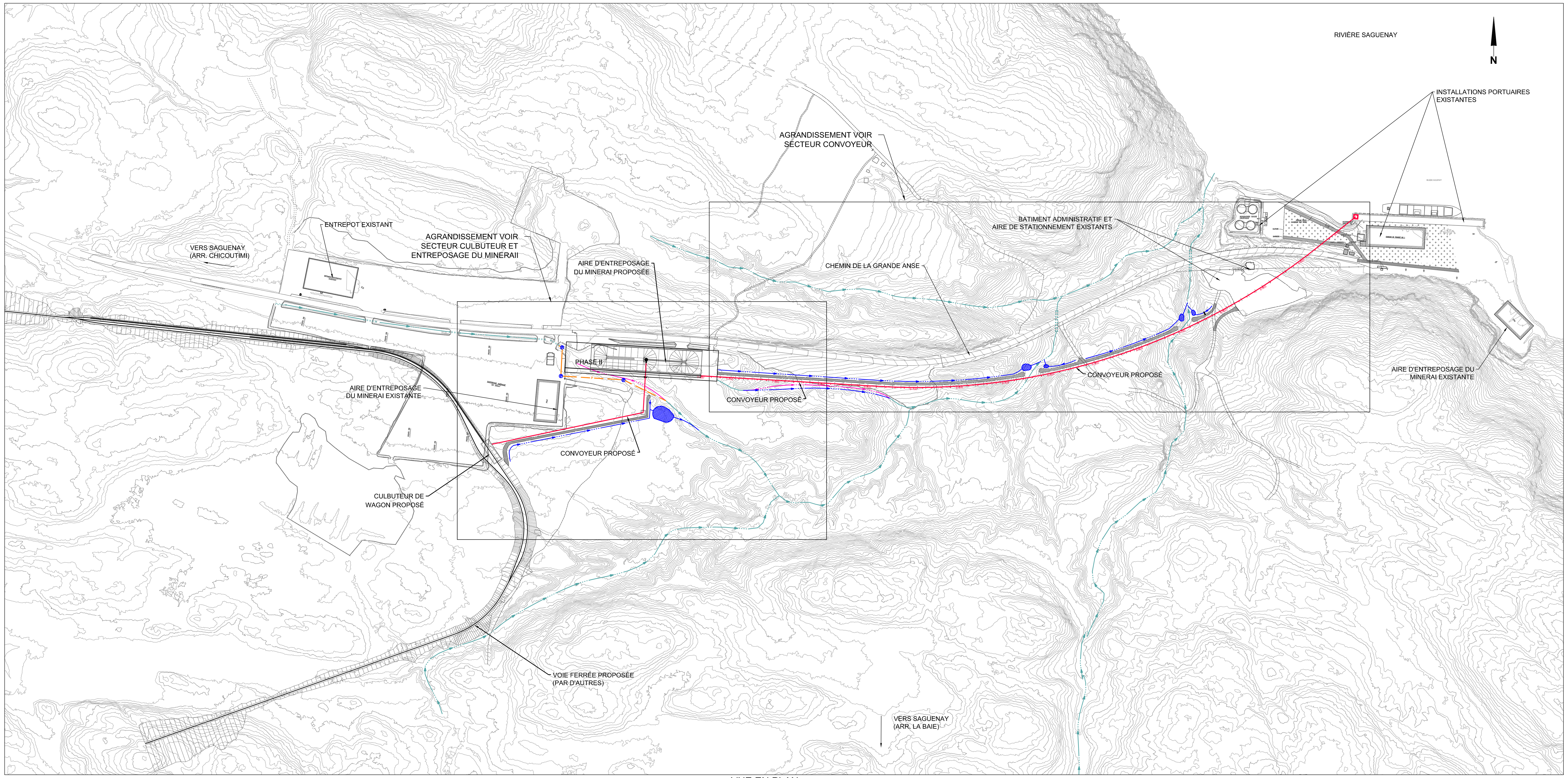

VUE EN PLAN
SECTEUR CULBUTEUR ET ENTREPOSAGE DU MINERAI
ÉCHELLE: 1:2000




VUE EN PLAN
SECTEUR DU CONVOYEUR
ÉCHELLE: 1:2000




VUE EN SECTION
CHEMIN DE SERVICE ET CONVOYEUR
ÉCHELLE: 1:200




VUE EN PLAN
AMÉNAGEMENT GÉNÉRAL
ÉCHELLE: 1:4000

LÉGENDE

| | |
|---|---|
| FOSSÉ EXISTANT | |
| FOSSÉ PROPOSÉ | |
| BASSINS DE SÉDIMENTATION | |
| FOSSÉ EXISTANT À ABANDONNER | |
| CONDUITE PLUVIALE PROPOSÉE | P |
| PONCEAU EXISTANT | |

Révision

| no | date | émissions et révisions | par |
|---|---|---|---|
| AC | 12–09–12 | POUR INFORMATION | G.G. |
| AB | 12–09–11 | POUR INFORMATION | G.G. |
| AA | 12–09–07 | POUR INFORMATION | G.G. |

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www.cima.ca


Sceau

Projet

BLACKROCK METALS

PORT DE SAGUENAY
(GRANDE-ANSE)

Titre

PLAN DE DRAINAGE ET
D'AMÉNAGEMENT PROPOSÉ POUR
DEMANDE ENVIRONNEMENTALE

| | | | |
|---|---|---|---|
| Dessiné | Stéphane Halary, dess. | Échelle | TELLE QU'INDIQUÉE |
| Projeté | Michaël Désormeaux, ing. | Date | 7 Septembre 2012 |
| Vérifié | Johanna Gagnon Delisle, ing. | Référence | BRM |
| Approuvé | Guy Gagnon, ing. | | |

| no. projet | département | série | feuille | rév. |
|---|---|---|---|---|
| S06951A | GR | CR | 002 | AC |

DERNIÈRE SAUVEGARDE 9/13/2012 10:18 - IMPRIMER LE 9/13/2012 10:19 PAR: JOHANNA GAGNON DELISLE

Figure 1 : Desserte ferroviaire de 12.5 km au terminal maritime de Grande-Anse

Figure 2 :   Aménagement type d’un déchargeur de wagon automatique

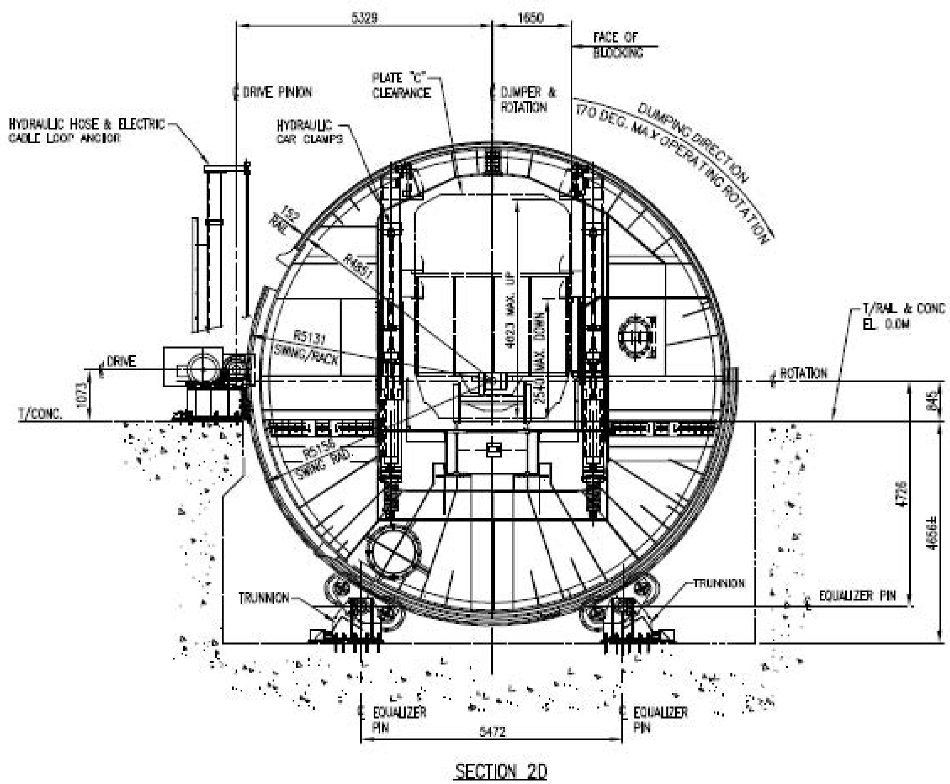


Figure 3 : Photo d’un déchargeur de wagon automatique

Figure 4 : Coupe transversale de l’entrepôt de concentré à minerai de fer

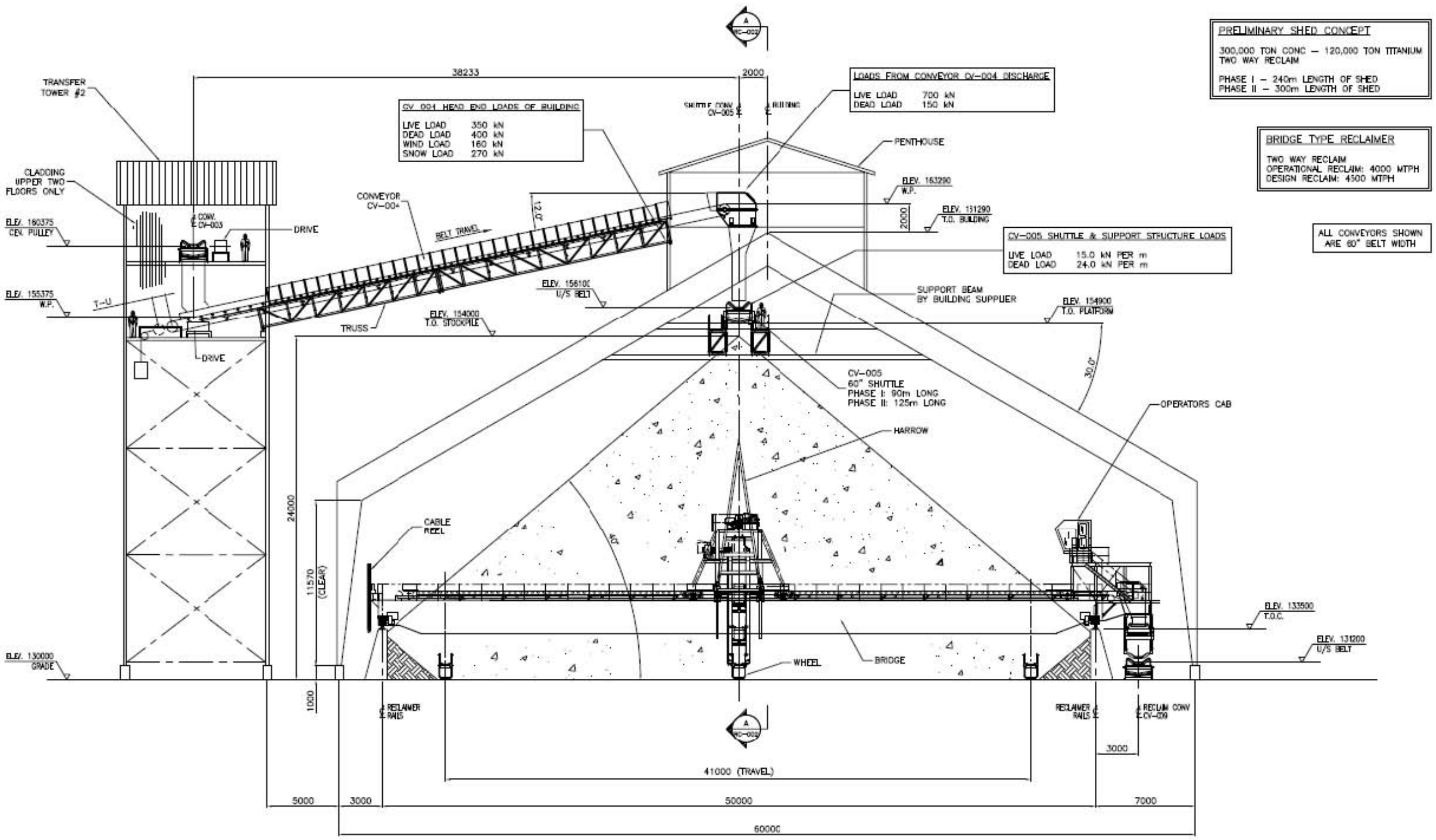


Figure 5 : Coupe longitudinale de l’entrepôt de concentré à minerai de fer

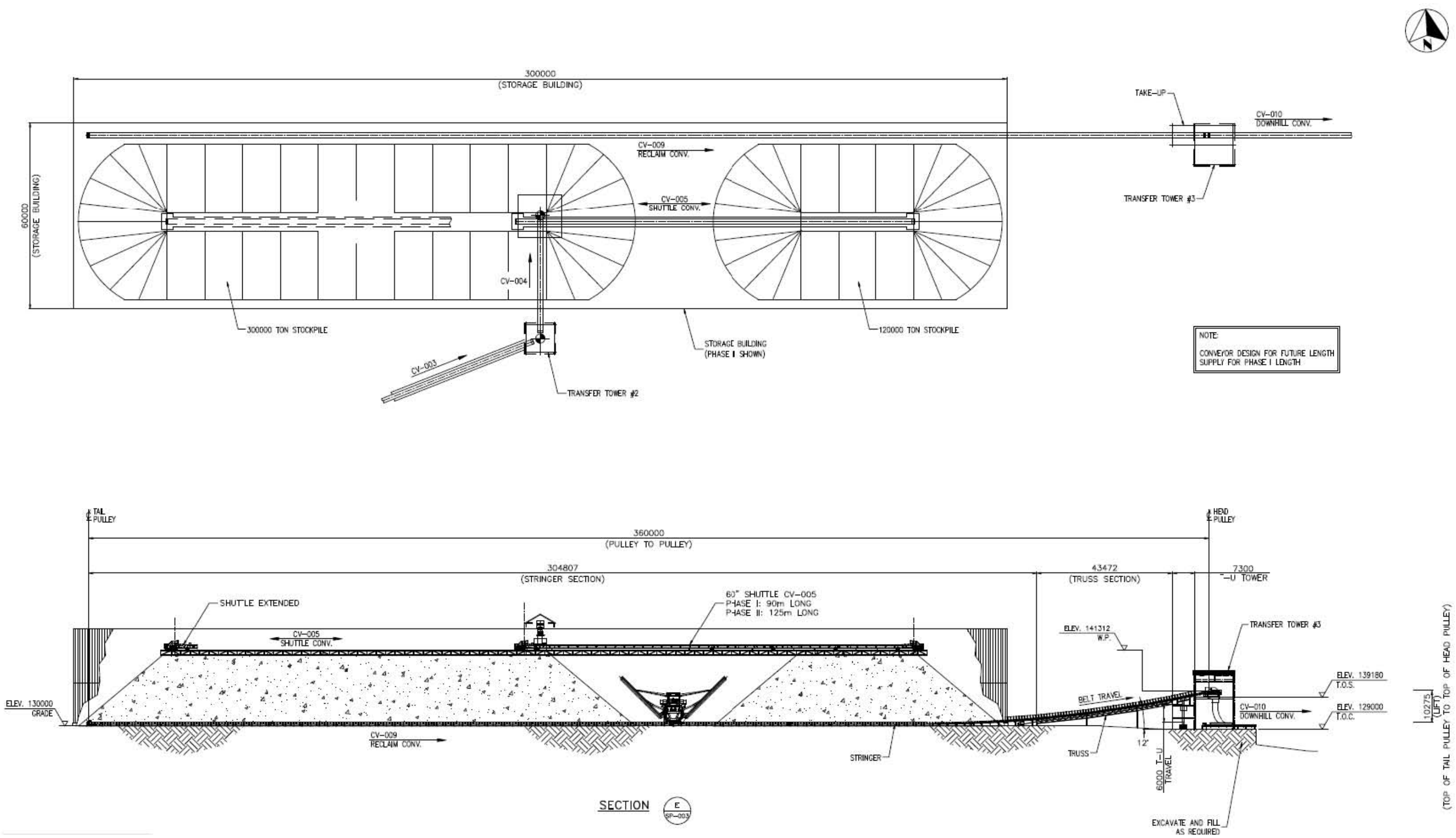
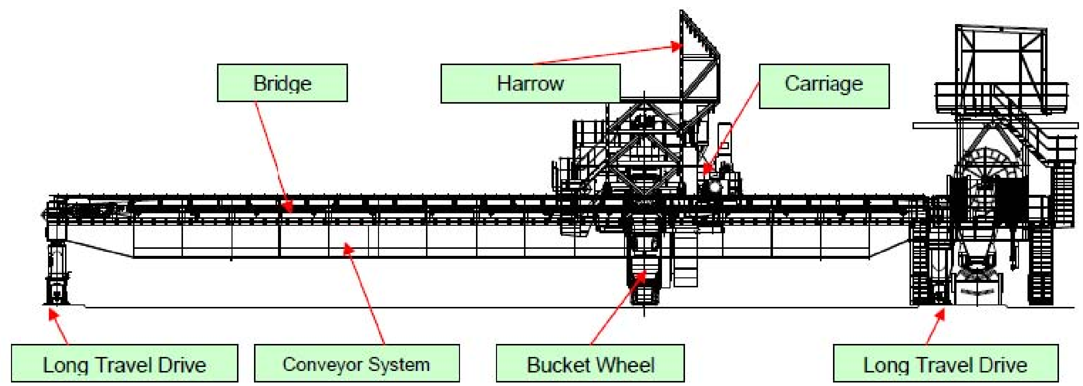


Figure 6 : Récupérateur à roue-pelle




**Picture 4-1: Typical Bridge Reclaimer Overview**

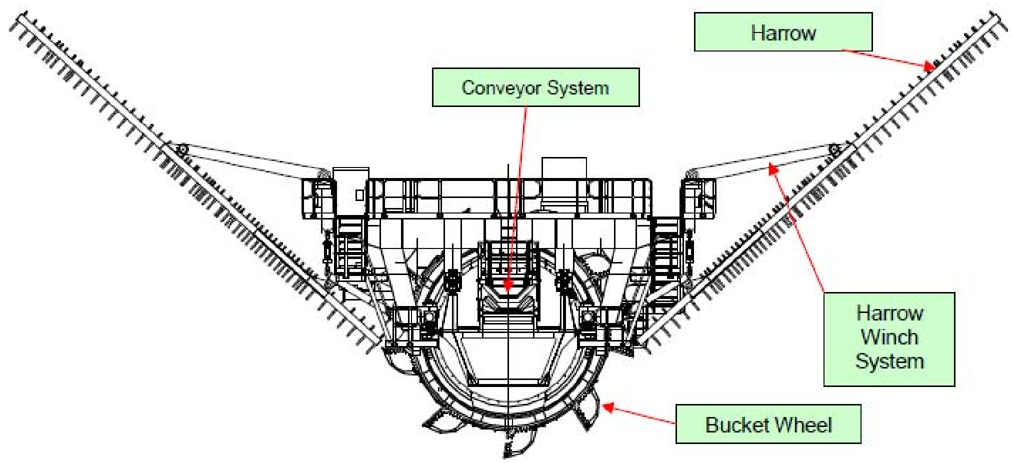


Figure 7 : Convoyeur tubulaire d’une longueur d’environ 2 km

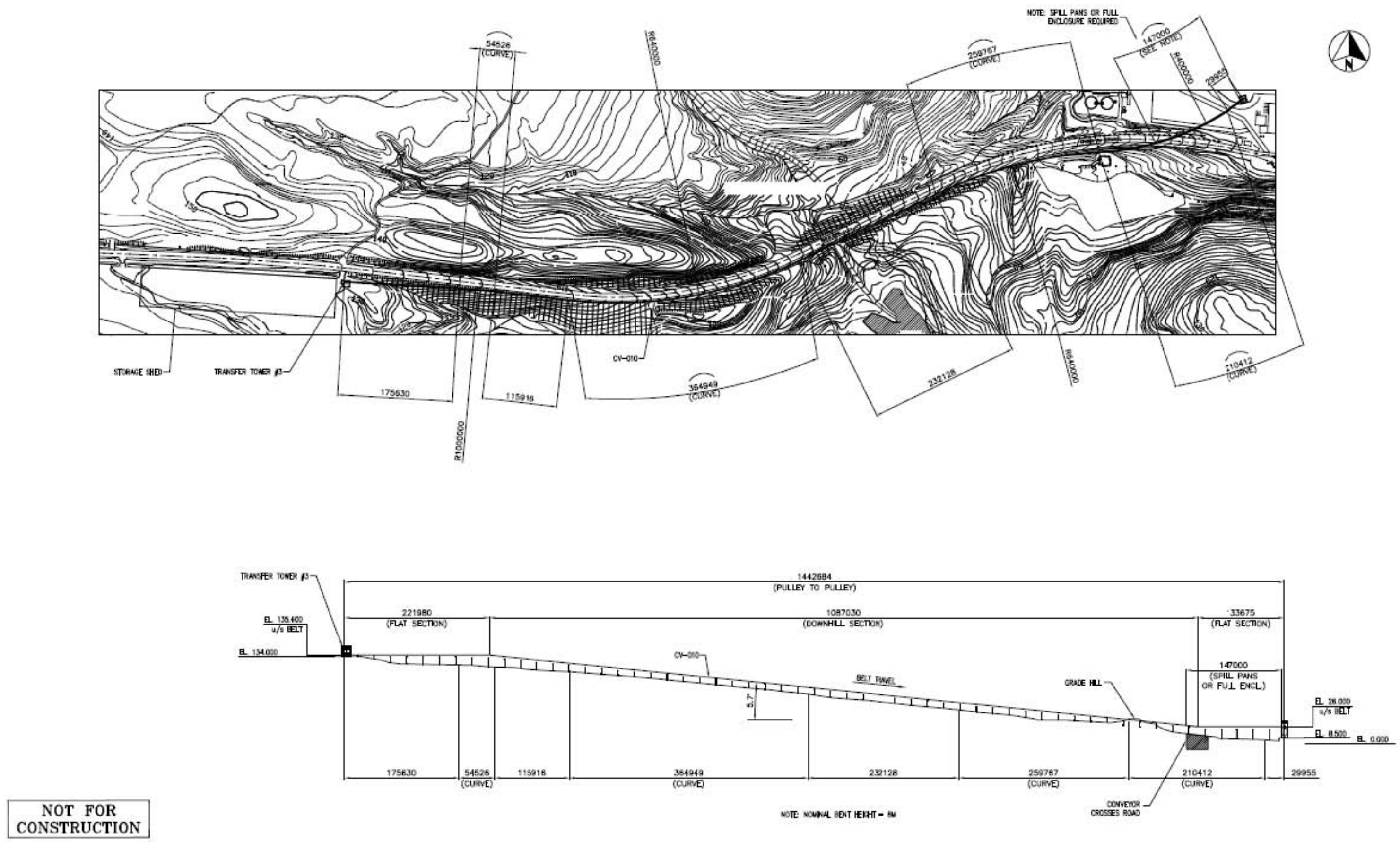


Figure 8 :   Chargeur de minéralier (cargo)

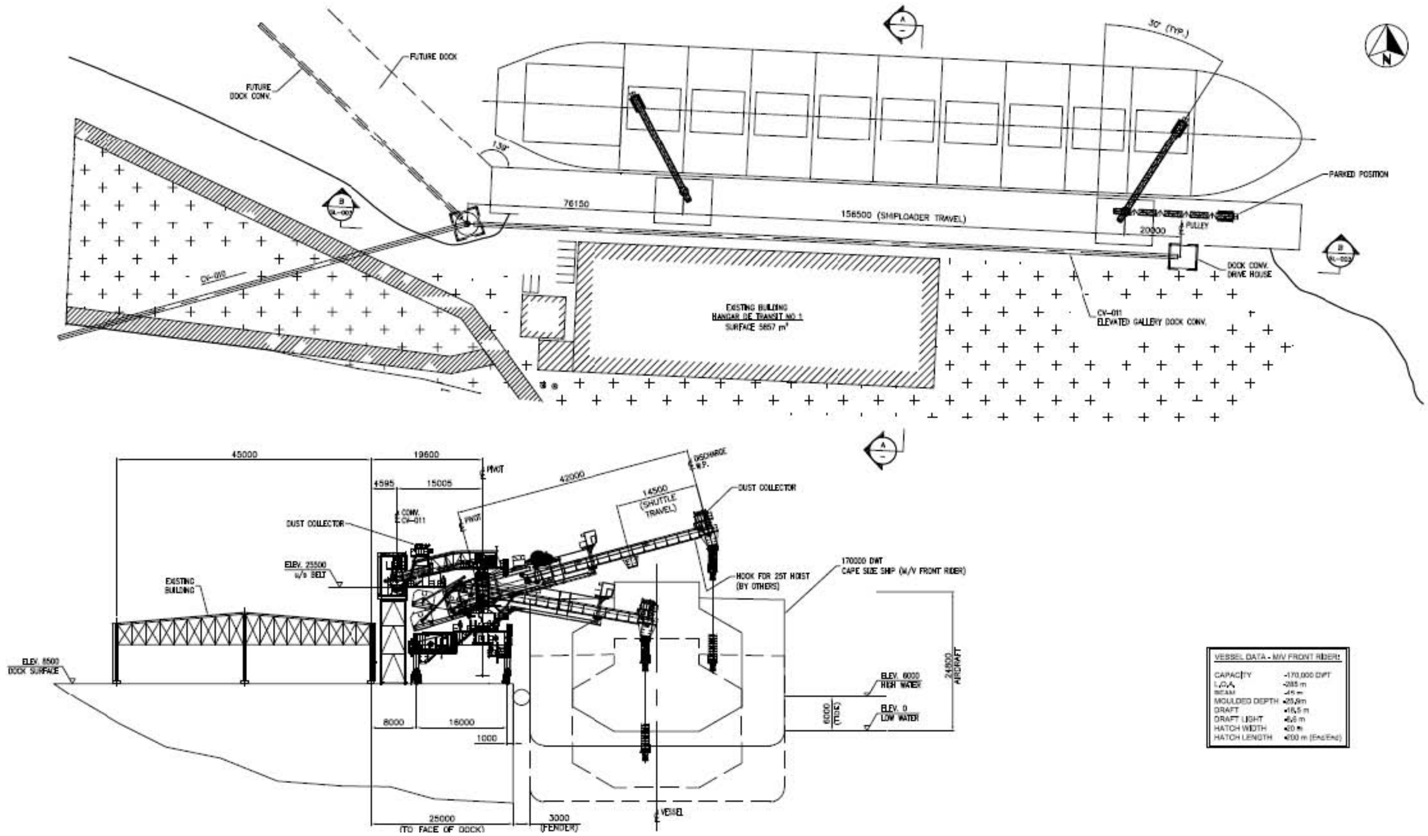
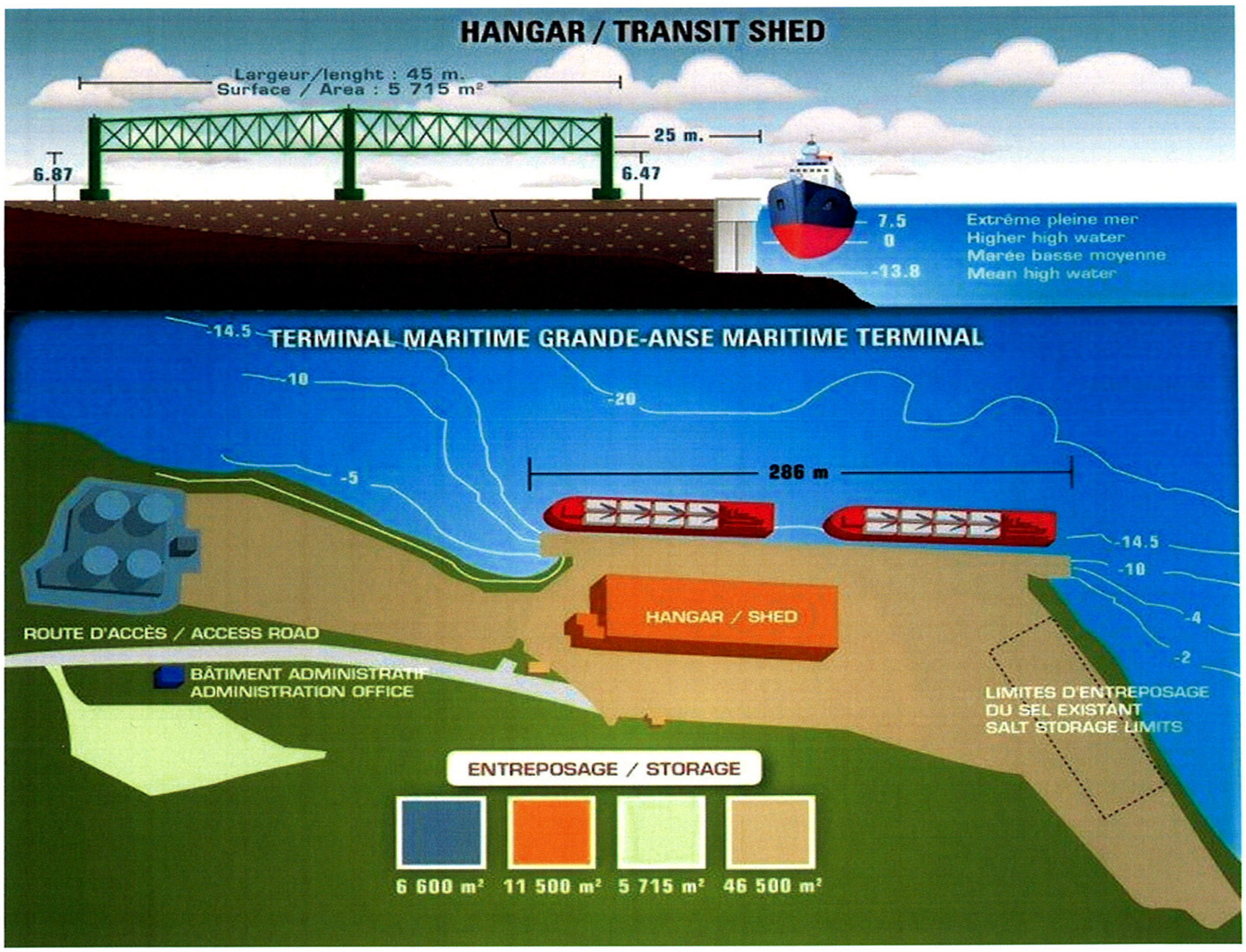


Figure 9 : Photo d'un type de chargeur de minéralier (cargo)

Figure 10 : Aménagement maritime existant à Port Saguenay
(terminal Grande-Anse)





# Appendix F: Summary of Meetings with Cree Users

# Black Rock Metal Mine
# Environmental and Social Impact Assessment _ Additional information
# Cree land use

## SUMMARY TRAPLINE O59

An interview was conducted with the Tallyman of Trapline O59, Mr. Philip Wapachee and other Wapachee family members, on April 1st and 10, 2012, in Saint-Félicien. The objective of the interview was to document land use activities of trapline users, as well as their knowledge of the land relevant to the project environmental assessment, and their concerns, questions and comments in relation to the proposed project. The information collected was gathered in the course of two days on April 1st and April 10, 2012. A draft report and a land use map were then sent to the tallyman, and once they had been reviewed, a third meeting was held on July 22, 2012, to complete the information and finalize the validation.

**Were present at all three interviews:**

- Philip Wapachee (Tallyman)
- Helen Wapachee (spouse)
- Matthew Wapachee sr. (father and former tallyman)
- Maggie Wapachee (mother)
- Norman Wapachee (brother)

**Interviewed by:**
- Catherine Lussier, anthropologist

Note: the information contained in this report comes from the interview conducted with the Wapachee family for the purpose of the social and environmental impact assessment for the Black Rock project. The mapped information comes from three distinct sources:

1) the map produced for the Land use component of the EIS for the Black Rock project;
2) the Family Map produced by the tallyman Philip Wapachee for forestry consultation purposes; and
3) the 2008 interview conducted for the Corner Bay project in 2008.

The tallyman Philip Wapachee granted his authorization to use selected information for this report and the accompanying map. The information contained on the map does not represent the entire range of activities and knowledge of the tallyman and other family members who also carry a great deal of knowledge about it. Information considered confidential or too sensitive to be displayed has been omitted.

### Main characteristics of the trapline

Trapline O-59 is under the responsibility of tallyman Mr. Philip Wapachee since 1976. The trapline is located some 20 kilometers south of Chibougamau and is bordered to the west by highway 167. Its total area covers 994 km2. The municipal territory of Chibougamau overlaps with 266 km2 of the trapline. The trapline is divided into two large sections by the height of land. The section on the east of the dividing line (shown in light grey on the map) is part of Montagnais (Innu) territory and is currently under dispute, while a resolution is sought by the GCC/CRA and the Innu Nation.

The northwestern portion of the trapline overlaps with the southern half of Chibougamau Lake, as well as Dorés and Caché lakes. Several smaller lakes are scattered over the remainder of the territory, among them Des îles, Armitage, and De la besace lakes.

Aside from the town of Chibougamau, and Route 167 which delineates the trapline's western border, main development features include transmission lines along the south, west and north borders, and a railway track that runs east of the road in the southwestern portion of the trapline. Several mines were developed in the northwestern sector of the trapline over the last decade.

## Camps

One of the family's main camps is located at the junction of Chibougamau River and highway 167, approximately 20 kilometers south of the town of Chibougamau. The camp is called *ChibouChibish*, and is presently equipped with 9 cabins. The site has been occupied since 1948 and some of the existing structures date back to the 1970s. The camp site is now equipped with 9 structures: 7 cabins and two houses, one where the tallyman's parents reside, and the other his sister Cynthia. The camp is used all year round.

The Wapachee have another main camp they call *Rabbit camp* in the central part of the trapline East of Guy Lake. It is accessible year round by vehicle through the road that leads to the Corner Bay project site. There are four cabins at the site and older traditional constructions now used as storage. The family spends the whole winter at this camp, including the Christmas holidays. Several walking out ceremony were performed at this camp.

The family has a camp they have occupied for over 45 years at Devlin Point on Chibougamau Lake. It is called *Neu weuhonan* which means "where the four winds meet". The site has historical value: it was a stop point on the lake where people used to wait for the winds to die down. In fall and spring the Wapachee go to this camp for fishing and hunting. It has recently been extended to accommodate three new log cabins. This might be a good spot to relocate the camp in the future. If they build a road all the way up to the site. Forestry companies cannot get there because there is a swamp. It has been used for over 40 years for fishing and for the spring hunt. The whole family goes there. It is accessible by boat and by skidoo.

There is an old camp further up on the road, southeast of Stella Lake, site where Matthew Sr., Maggie, Charlie Coon and his wife Sophie used to hunt together in the area. The camp was bulldozed when the Lemoyne mine started.

The family indicated another old family camp site on a point at the entrance of the Corner Bay project site, facing an old Hudson Bay Trading post that dates back from the time Matthew was a child. The camp has been used for several generations both in winter and summer for fishing and hunting. It is accessible by boat and by skidoo.

There is a moose hunting camp on the shore of De la poulie Lake in the eastern part of the trapline. The whole family has been using it for a long time; it is accessible by vehicle. The site is highly valued by the tallyman and his family.

Two other camps were occupied by the family in the late 1970s close to Philippe Lake in the centre of the trapline. They are old moose hunting camps: the first one is located near Philip Lake; the second one south of Armitage Lake one of the family's navigation routes. The family has another old camp site on the shores of Jean Lake.

For the goose hunting season, the Wapachee gather at their camp on Doré Lake. The camp is equipped with 4 cabins and three tent frames. It is accessible by boat and skidoo.

Further south, former Chief Louise Wapachee, daughter of the tallyman, owns a permanent camp on a point of Doré Lake. The camp is used year round by family members, with more intensity during the spring for fishing and hunting. This camps site is likely to be further developed by the family. A two mile ATV trail was cut by Matthew Sr. in this regard.

Several old camp sites are scattered on the trapline and may be revived at some point in the future. The tallyman indicated only some of them. One such camp is located at the end of a long portage that links the shores of Chibougamau Lake to Des îles Lake. The portage itself has been reopened and is used as a skidoo trail.

Mr. Matthew Wapachee Sr. mentioned an old family camp where his parents used to live, north of the Corner Bay area on the eastern shore of Chibougamau Lake facing the first island.

The tallyman intends to continue developing new camps and building cabins on the trapline, possibly reoccupying old family camp sites. A new camp was recently built on the western shore of Chibougamau Lake, south of Anse aux navets.

There is an old camp site where the family used to stay when the tallyman was about 21 years old. It was the family's main camp, equipped with two winter log cabins attached together. It is no longer used but the structures are still there, although they were vandalized: The tallyman passed by one time as he was hunting geese and he saw a man cutting up the family camp with a chainsaw. He had done a lot of damage already.

***Non-Cree camps***

There are a significant number of non Cree camps on trapline O-59. Interviewees indicated a dozen of non Native camps sites as well as outfitting operations. One of them is located in the south or the Gouin Peninsula on the shores of Chibougamau Lake. The project called "Rustic Development" has been ongoing for some time and the tallyman had been consulted about it. The former chief of Oujé-Bougoumou had a project to build cabins on the site and obtained the previous tallyman's consent based on the promise that only doctors would be coming to the area. The owner went bankrupt, the project was sold and the new owner has been expanding it. The tallyman, as his father before him, is not satisfied with the way things turned out.

Another non Native camp is located on a point of Corner Bay on the site of an old trading post.

The Ministry of Natural Resources owns a cabin on the trapline that they use occasionally.

## Users of the trapline

The tallyman is part of a large family of about 107 people spread over 5 generations. His father, Mr. Matthew Wapachee Sr. was tallyman before him, and has known the trapline all his life. He and his wife Maggie raised a family of 12 children, and adopted two girls. The children now have their own families and all of them come to the trapline. Most of them still engage in traditional pursuits all year round.

***Other Cree Users on O59***

The community of Oujé-Bougoumou has been occupying an old camp site on the trapline, for their traditional summer gatherings (*Chiiwetaw*). The site, called Swampy Point, is where Oujé-Bougoumou People were forced to relocate because of mining contamination. It is on the western shore of Dorés Lake, and includes over a dozen structures, with a kitchen and a *shaputuuwan* (traditional large tent). Historical arte-facts were collected and the locations of old structures were identified at the site.

***Non Cree Users***

There is a significant number of non Cree people coming on to the trapline, in the context of their work for recreational activities. The number of non Cree users is difficult to estimate, but it does have an effect on the land users' activities, in particular during the moose hunting season.

## Access to the trapline

The trapline is accessible by road via the 167 highway. Many of the areas where land users have camps are accessible by boat and by skidoo. Camps located on Chibougamau Lake are reached by boat or skidoo in winter from the landing near the Obalski Bridge.

The Wapachee family travels on the trapline during the main hunting seasons (spring, fall and winter) and also spend time in their camps during the summer, travelling by boat and ATV.

There are old portages and navigation routes all over the trapline. In the past overnight stops were frequently used and many of these sites are still remembered.

Portages currently used or usable are indicated on the map. One of them links Armitage Lake to Des Iles Lake. One is located between two small lakes north of Du Conglomerat Lake.

Another portage links Des Iles Lake and Chibougamau Lake.

An old navigation route that starts in Armitage Lake is marked on the map; it has been affected by forestry. There was an old canoe route that came all the way from Rupert House to Chibougamau Lake the past.

There are skidoo trails all over the trapline. The main ones are used as hunting routes and to link camps. One of them links Armitage and Des Iles lakes. Another one links Armitage Lake to the road. These rails were used in the past to access hunting areas west of the mine property area.

## Trapline resources and activities

Mr. Wapachee and his family have been living and hunting on the trapline for most of their life. Several of the family members have regular employment and they manage to spend time regularly on the trapline. The tallyman's father has seen major changes and disturbances occur on the land since he started walking and hunting on the trapline. There are far less animals and fish than there

used to be. The family spends a significant amount of time on the land conducting traditional activities.
The tallyman used to walk and live off the land with his father. He hunted with him all over the trapline and in other areas of the James Bay territory. They went up near the Eastmain River, Assinica, in Waswanipi territory as well.

Most family members eat traditional food from the trapline harvest. A lot of fish is consumed, as well as bush meat: mostly moose, beaver, hare, geese and waterfowl. The family hunters usually kill five or six moose per year, which represents several thousand pounds of meat a year.

Harvesting activities are organized according to season and availability of resources. The tallyman indicated the blue line representing the height of land on the map and explained that east of this limit no hunting is allowed because it is now part of a park.

***Big game hunting***

Moose hunting is an important fall and winter activity for Mr. Wapachee and his family. One of the family's prime hunting areas is located between the shores of Chibougamau Lake and Des îles Lake. Other hunting areas are found east of Armitage Lake in a sector that was clearcut some 50 years ago, and south of Chibougamau Lake.

The tallyman's father indicated a moose hunting area that used to be very productive before the Corner Bay project started its activities. It is located south of the project area along the river. The Wapachee family ceased to hunt in that sector because of the mining activity.

There is a moose area in the sector of Phase 2 of the Black Rock project. It extends all the way down to Armitage Lake.

Before the road was there, there are areas of the trapline close to the alignment, where the family hunters used to go get the moose when there was no hunting success on the east side close to the lake.

Caribou trails are seen almost every other year. Woodland caribou is seen crossing in a northeast-southwest direction around Km 9 of the road. Two years ago a group of eight of them were seen. The tallyman followed them for a while.

The caribou used to hang in the areas that are now clear-cut on the trapline.

***Waterfowl***

In the spring, when the water breaks, hunters from the Wapachee family go around Chibougamau Lake with several boats, to hunt geese first, and then waterfowl. Several families hunt on the lake at that time and each keeps to their sector of the lake.

The family's other prime waterfowl hunting areas are located southeast of Chibougamau Lake. A fall goose feeding and hunting area is located at the southern end of Armitage Lake. A spring goose hunting area is indicated along the river that connects Armitage and Stella lakes.

Another goose area is shown in the lake located between the road and Monique Lake. The Wapachee still go hunt there if they see geese in the area.

Two very sensitive feeding areas for geese are located stretch along the river that runs out from the north end of Stella Lake, and at the east end of Pillow Lake.

Partridges, are found everywhere on the trapline except in swampy places. Ducks and scooters are found on Chibougamau Lake, André Lake, Guy Lake and Armitage Lake.

***Fishing***

The Wapachee family has been fishing on the trapline for over three generations and has a detailed knowledge of the fish habitats found in its lakes and rivers. Fish populations have changed with development and they are now eager to protect the areas that still yield good catches. During the spring, fishing in done with night lines from the end of April to the end of May.

Chibougamau Lake is well known by the tallyman and his family. The entire area is said to be good for fishing. The main species caught are lake trout, speckle, walleye, pike, suckers and white fish.

One fishing area that has been known and used for several generations is located close to Corner Bay. In the same area, the tallyman indicated a sensitive spawning area for suckers and walleye, two important fish species for the Cree. Bears are known to search for fish at the site in spring. The tallyman's father mentioned a bear trail in the area.

An important white fish spawning area is located in the centre of the trapline close to Pillow Lake.
The site was traditionally used for scooping and spearing the fish.
The whole sector of Doré Lake has been impacted by mining development in 2003-2004. Some fish habitat was lost to contamination, and fish consumption had to be dropped to one meal a week. The family considers it a significant drop considering the importance of fish in their diet, especially in summer and fall. They mentioned a site where they set up a net, and caught suckers that showed signs of disease. Several species of fish spawn in the lake.

A small lake with brook trout is indicated just south of the project's Phase 1 pit. The tallyman asked the company if something could be done about it but it did not seem possible.

There used to be brook trout in the rivers north of Jean Lake. The tallyman is not sure whether they are still there.

A spawning area for whitefish and suckers is indicated at the north end of Stella Lake.

There is no sturgeon in the area.

***Trapping***

The tallyman's father and his wife still conduct trapping and snaring activities around the camps and in areas of the trapline where fur-bearing animals are not affected by forestry. Their income from the furs is no longer what it used to be in the days when fur prices allowed for a decent living. Species trapped or snared on a regular basis are beavers, marten, otters, hares, bears, muskrat, lynx, weasels, and fox.

Marten and mink are hunted along the shores of Chibougamau Lake. Back in the days when the tallyman's brother James was acting as Local CTA[1] officer, he remembers his father coming in to the CTA office with 5000$ worth of mink. Martens can still be found anywhere in forested areas of the trapline.

***Plant gathering***

A large berry picking area is located between Armittage Lake and the road.

***Fresh water sources***

Drinking water sources are getting more difficult to find with time and expanding developments. The family can no longer use their old water sources and have conducted quality tests on the water taken from a well they have been using for a long time at Rabbit camp.

When they are at camp *Chibou-Chibi* on Chibougamau Lake, the family can no longer drink the water, now that there are tailings upstream from the camp. They got help to find good drinking water and now have to travel 50 km to get it. They use a spring water source close to one of their camps on Road 210. This water source is a valued site.

## Valued sites and sites of historical or archaeological interest

***Valued sites***

Valued sites and areas are shown in yellow on the map. They indicate places of interest for the family or for the community, such as prime habitats, memories, birth and burial sites, historical and sacred sites, special events and sectors they would like to protect from further development. These sites and areas provide a sense of how the family relates to the trapline and allows to better grasp the scope of impacts on sectors of the trapline that are still untouched by development. The precise meaning of some of these valued sites is kept confidential.

The area that includes Phase 1 and part of Laugon Lake carries a lot of memories for the family. It comprises the mountain where the tallyman's grand-father used to hunt. It was considered a main source of food and from the top you could see for miles. Before he passed away, he told his son Matthew to take good care of it because it had provided them with food. For this reason, the mountain is held as a legacy and has a great significance. The thought that it will be removed and moved to China is difficult for the family and generates a sense of grief. The tallyman's mother spoke at length in Cree and with deep sadness about this mountain.

Matthew Sr. Tells recalls the time when Oujé-Bougoumou was being built and a forestry company went and clear-cut the mountain. He got really upset because he always remembered the words of his step-father, the tallyman's grand-father. Now with Black Rock that mountain will be removed. The tallyman explains: "When you remove it you remove identity, culture, whatever what Eenou has, it will disappear with that mountain." His mother Maggie has stories to tell about that mountain, about what the grand-father brought back from that mountain. Her son Norman heard these stories from her, and explains it is also where all the brothers in the family killed his first moose. The family has a strong connection to this mountain where the grand-father help raise three of the brothers,

[1] Cree Trappers Association

teaching them hunting and survival skills.

The whole western shoreline of Chibougamau Lake is considered a sensitive and valued area. For a long time, it has been a prime harvesting sector for the family, mainly for fishing and hunting.

The site where the family gets their drinking water is sensitive and highly valued because it is close to their main camp ("Rabbit camp") on the road. The water has been tested in the U.S. and is considered to be of good quality. The area surrounding "Rabbit camp" is also sensitive and valued by the family.

Another valued area that the tallyman would like to see protected from disturbances is the area around the family's camp on De la poulie Lake. They have been using it for a long time.

Among the valued sites of the family are the bear dens associated with specific memories of hunting and celebrations. One such site is indicated west of Paquet Lake.

Two first moose kills are indicated on the map. One is the tallyman's first kill when he was 17, south of Stella Lake. His father's first moose kill is south of Denis Lake in the north-eastern part of the trapline. First moose kill sites are important and remembered because back in the days you had to kill a big game before you got married; to show that you can support a wife and a family.

The entire Devlin peninsula where the family has a camp is highly valued. There is old growth forest and the family is planning to keep spending time there on a regular basis.

A valued site was indicated on the south shore of Jean Lake. It is the old camp site where the tallyman walked from one camp to another when he was 5 years old. In the old days, the Cree would move from one camp to another. And a very important event in the life cycle was the moment when a child walks from one point to another; the child walks around a tree that stays forever as a marker of that moment, and this moment is remembered. Usually there is an elder that walks with the child. John Bosum's father, also called Philip, was the elder that walked with Philip.

There is an area inside the mine property, east of Phase 2, which is a sacred area for the family; it is an area where they always got their moose, beaver, fish, marten, mink, otter, lynx, muskrats, squirrels, bears, rabbits, porcupine... All the animals they hunted were there.

Known burial sites are indicated on the map. There are more towards Chibougamau Lake. Birth sites are also located closer to the lake. Margaret Wapachee was born on a portage near Dore Lake.

The site where the family hunting dog Misty (#28) was buried carries a lot of memories and stories shared by the Coonishish and Wapachee families. Dogs were very important back in the old days and training them was part of the skills Cree hunters had.

There is an old campsite on an island on Bernadette Lake where the family used to live when the tallyman was a child.

***Historical or archaeological sites***

The area surrounding the family's camp at the entrance of Corner Bay is a sensitive area for fishing. It is also considered a historical area, where the Hudson Bay used to have a trading post. The tallyman also indicated a horse trail that was used to reach the site before the snowmobile was introduced. It dates from the times when the road from St-Félicien was being built.

Campsites that were used to relocate Oujé-Bougoumou people are considered to be part of the community's history and are valued as such. One of them is the aforementioned Swampy Point camp nowadays used for the summer gatherings. Another such site is called Doré Lake a little further south. Former Oujé-Bougoumou Chief Jimmy Mianscum used to live at the site.

Two old hunting camp sites for moose hunting were indicated: one is located on the north shore of Armitage Lake. The family used to hunt there in 1954. The second one is on the south shore of Jean Lake a little further to the northeast, where the tallyman indicated a valued site.

An old hunting temporary camp site is located west of Phase 2. It used to be a night stop site where the tallyman and his father would spend time snaring before they got back to their main camp.

## Future land use

The Wapachee family is considering relocating one of their main camps due to the project's expected impacts. The location is not determined yet.

Norman Wapachee signaled that it was important to document the future land use so that the family can plan their activities knowing what development is coming to the trapline. Apart from the mine project, there will be a train track and a power line in the future.

Matthew Sr. spent about 20,000$ on restoring the old canoe route for the youth. There is a plan to have canoe brigades and excursions for the youth that have social issues and also to transmit cultural knowledge.

## Concerns and comments

### *Concerns about project impacts*

The tallyman and family members have concerns regarding expected impacts of the project once it will be in operation. They already experienced losses with mining operations elsewhere on the trapline, and also felt up until recently, the effects of the Corner Bay project.

The tallyman's parents expect changes in the landscape and the natural environment that they know, to constitute an impact. A significant "landscape" impact will result from mining the mountain for the project. The family has a strong collective memory and connection to this mountain. The tallyman says he will miss the rabbits. "We used to live off rabbits and lynx, everything used to be there, from the whole area of the mine property".

The tallyman has a concern that the fish will be damaged by the mine. He also fears that beavers will leave the project area, especially if there is contamination. Contamination can be spread to other species as well, since water goes up into the trees, which could affect small game.

The tallyman has a concern about the increased traffic during operation of the mine, and the impacts on animals that will be deterred from coming in the area. The two sensitive feeding areas for geese indicated above will be affected by the mine activity.

The waste disposal site of the mine may cause a problem because bears will be attracted and will try to feed from there.

The tallyman fears the camp that they are thinking of building in the future close to Stella Lake might be in range of the blasting noise and it might be necessary to move it.

The family has a concern that dust will affect marine life all around the area, and noise as well.

### *Relation with Proponent*

The relation with the proponent is considered to be good, but there is a need for a better management of the information that has been given to the family about the project. Some of the information gets lost and some could be used in the context of the environmental assessment. Informal meetings are good to better understand each others' point of views. But there is a need to keep track of information exchanges.

When the family met with Blackrock they were told to look only at the impacted area. But it is a very small area in relation to the trapline. The tallyman wants the information to include more land use and some historical information. Matthew Wapachee Sr. started hunting in the area in 1942.

### *Cumulative impacts of mining and other developments*

The trapline has undergone a lot of changes due to development over the years. Among past activities that have had impacts on land use for the Wapachee family, are: forestry activity, roads and outfitting; the development of the town and municipality of Chibougamau; the railway; mining activity, etc.

Today the family feels that development is encroaching further more on the areas that were left intact, and the Black Rock project makes no exception. In spite of the fact that they do not oppose the project, the tallyman and family members consider that the impacts will need to be assessed carefully, as well as mitigation measures, as their prime hunting and valued areas are located precisely in the mine property and projected operations.

Thinking about development on the trapline, the tallyman's brother Norman Wapachee, explains that the relationship between land and people, linked with culture, is like a mother-child relation. There are lot of social issues created by development. An elder said that if the state of the forest is bad, you will feel it in your life; you will not be a healthy person. It is important to think about where you will find your place for personal development. Now the family has to find a place where they can rebuild their spiritual life because of the cumulative impacts they have on the land. Maggie Wapachee added that before the road was there, people were at peace with the land. All the developments had an impact.

Norman Wapachee also explained how the trapline can been seen as divided into four major sectors (see Blocs A to D on map), used at different times of year and for different purposes. Each of these sectors has been subject to development at a different rate, and the resulting encroachment on the Wapachee family's land use is quite obvious. The township of Chibougamau, the cabin lease development and the park on one side, have had the effect of significantly restricting the family's activities. The Chibougamau Lake area (Block B) is used in the spring, summer and fall for waterfowl hunting and fishing; Block C is the family's primary big game hunting and trapping area; and Block D is basically closed to Cree land users until a resolution is reached.

In light of this progressive reduction, Matthew Sr. recalled the time way back, before industrial activities came, before the road. He witnessed the animals, the marine life, fish, otter, and moose. There was a lot of good fish and moose. And after the mine came in, he started finding problems in the animals. He now finds that the moose is different. The intestines, for example, have less fat. Or galls stones are found in them. Habitats and the feeding grounds were damaged. Beaver tastes different too. All wildlife was affected.

The tallyman and his father indicated a site where a mine was in operation some years ago in the north-western shore of Chibougamau Lake. Matthew Wapachee Sr. explained that following the mine closure, a marina was developed at the site.

Also, the municipality of Chibougamau expanded their limits in order to facilitate the operation of the Corner Bay project. The family has seen the consequences of this type of expansion when the town of Chibougamau developed a camping site after such an extension, just north of the trapline limit, on trapline O57. There are now 40 to 60 trailers at the camping site.

Now the town of Chibougamau is planning a lot of ATV and skidoo trails, as well as tourism development on the western part of the trapline. These developments will have an added effect of the land use and the intensity of occupation.

When Matthew Wapachee Sr. Was told that vanadium was found in the area west of Laugon Lake, he was concerned about this information, and stated at the time that he did not want any development in the area.

As for the Corner Bay project, Matthew Wapachee Sr. – who was tallyman at the time – was never consulted properly at the beginning of the project. His sons recall that he started building anger as he saw the site growing in size; and he had been told they would only dig a hole and take a minimal amount of trees. When he went to the site again, there were trailers coming in and he saw the whole clearing. He started calling the Mineral Board and they could do nothing at the time. He called the police number in Montreal and was told he could block the road because the work was being done on his hunting ground, and because he had not been consulted.

Mr. Wapachee Sr. used to be upset about the way companies went ahead with their projects without proper consultations. About 10 years ago, he almost went out to block the road, but his son Norman got involved and initiated talks with company representatives and Oudjé-Bougoumou Chief and Council. Somehow they started holding meetings and keeping the Wapachee family up to date and informed.

In the case of Corner Bay, after having met them, Mr. Wapachee decided to develop a positive relation with them. After a few meetings he was told he could look into employment and the Impact and Benefit Agreement.

The tallyman is thinking about protecting areas of the trapline to ensure that some of it is still kept in good health for the future. Ever since he moved back to the trapline, he wants to keep a place as a sanctuary, a place that remains untouched. He was going to bring that issue to the table with the Forestry board, to see if it is possible. The 25% and 1% areas of the trapline provide only one type of protection that does not guarantee that there will be no forestry activity. The companies are currently cutting in the 25% area of the trapline.

## Suggestions for measures

The Wapachee family is beginning to develop a better understanding of the projects potential impacts on their land use and on their quality of life for the future.

They need more time to better understand some of the impacts, notably the noise impact on their camp and activities, and on the wildlife, and they would like to be involved in the designing of mitigation measures on the land. Some suggestions were made to address some of the trapline features that can be improved or protected.

Some of the preliminary mitigation or enhancement measures suggested for the trapline include:

- Camp building (location to be confirmed) with infrastructures that respect new regulations.
- A fish ladder for walleyes. An area was indicated on Armitage River where the fish cannot go downstream due to steep incline.
- Canoe routes for the youth.
- The company told the tallyman to identify a moose area to plant birch. But the tallyman told them it was not possible to do that.
- A remedial fund could be set apart for the family to deal with impacts as they are identified. The money could be used for cabin construction, enhance goose habitat or build goose corridors, trails, canoe routes, or cabin renovations.

The family needs information on what can be expected with respect to qualifications to work on the site. They are aware that the EIS states they will be prioritized for employment and business opportunities, and would like to see that they get a fair proportion of hired family members in the administration and/or direct labor force. This would have to be discussed with family members in more detail.

They are aware that hiring requirements are stricter than they used to be and that former mine workers are now required to undergo training for the same jobs. There are family members who can operate machinery, and have other capabilities for employment in the administrative sector or other aspects of the work. They would be willing to go through training for specific jobs.

The tallyman discussed the issue of the valued spring water source with the Black Rock for them to bypass the area. Their answer was that they have to use that road because it is the access road to the old mine site, and they want to upgrade it. Philip told them they could move the road along the old road from the time when they wanted to do an airport (see suggested realignment on map). The water even in the month of July is very cold and deep. There are pine hills around it and the water comes from underneath. It is clear water and the family uses it all the time. A proper mitigation measure for this water source needs to be discussed further with the company. The area is quite large: 250 feet in diameter.

Mr. Wapachee mentioned the Troilus case as an example of fair mitigation: for every year that the mine was in operation, money was set aside for the impacted family.

Matthew Sr. thinks if they would gather all the tallymen, and let them talk about the impacts they have observed they would learn a lot of things.

In order to choose a proper location for the future camp, the family needs to know precisely the range of the noise impact. They were told that a well would be drilled and that they would be given a solar panel. Another site is considered as second option for a future camp. It is close to the old sawmill and Audet Lake. One advantage of this particular site is that they could get running water and electricity. The camp would have to be built in compliance with the new regulations with sceptic tank and running water.

# Appendix G:
# Methods Used to Describe the Receiving Environment, Fish

# Annexe G : Méthodes employées pour la description du milieu récepteur

## G1. Faune ichtyenne

### G1.1 Caractérisation des habitats

Au total, le chemin de fer doit passer par-dessus 9 ruisseaux, identifiés de TR-1 à TR-9. Les coordonnées des points de traverse sont décrites au tableau G-1.

**Tableau G-1 : Coordonnées GPS des points de traverse dans la zone d'étude**

| No_traverses | Lattitude | Longitude |
|---|---|---|
| Tr-1 | 49° 37' 22.350" N | 74° 13' 52.960" O |
| Tr-2 | 49° 37' 49.034" N | 74° 13' 46.015" O |
| Tr-3 | 49° 39' 28.469" N | 74° 11' 35.579" O |
| Tr-4 | 49° 41' 1.701" N | 74° 10' 49.010" O |
| Tr-5 | 49° 41' 7.466" N | 74° 10' 42.546" O |
| Tr-6 | 49° 41' 30.493" N | 74° 10' 17.998" O |
| Tr-7 | 49° 43' 10.490" N | 74° 8' 25.295" O |
| Tr-8 | 49° 47' 39.424" N | 74° 2' 50.073" O |
| Tr-9 | 49° 47' 35.228" N | 74° 3' 16.723" O |

La combinaison faciès-substrat forme un habitat type du poisson. Chacun est caractérisé par un faciès d'écoulement et un assemblage granulométrique bien précis. Les tableaux G-2 et G-3 définissent la classification des faciès d'écoulement et des classes granulométriques des segments de cours d'eau caractérisés au niveau des points de traverse.

**Tableau G-2 : Classes granulométriques utilisées pour la caractérisation du substrat**

| Classe granulométrique | Code | Diamètre (mm) |
|---|---|---|
| Roc | R | Roche mère |
| Gros bloc | Bx | >1000 |
| Bloc | B | 250 à 1000 |
| Galet | G | 80 à 250 |
| Caillou | C | 40 à 80 |
| Gravier | V | 5 à 40 |
| Sable | S | 0,125 à 5 |
| Limon | L | <0,125 |
| Matière organique | MO | ----- |

**Tableau G-3 : Description des faciès d'écoulement utilisés pour caractériser les cours d'eau**

| Faciès d'écoulement | Description |
|---|---|
| Chute (Ct) | Segment d'un cours d'eau où le lit présente une dénivellation brusque. Ce segment est alors constitué de roches en place avec quelques fois de très gros blocs. Il s'agit d'un obstacle souvent infranchissable pour les poissons qui se déplacent pour s'alimenter ou migrent pour se reproduire. |
| Cascade (Ca) | Rupture de pente en forme d'escalier où dominent les blocs et le roc comme composantes du lit. Ce type d'obstacle est habituellement franchissable quoiqu'il puisse être, à certains endroits, insurmontable par les poissons. |
| Rapide (Ra) | Légère rupture de pente où le courant est rapide et la surface de l'eau est brisée par la présence de matériaux grossiers qui affleurent. La granulométrie du lit s'échelonne généralement des galets aux gros blocs. |
| Seuil (Se) | Secteur peu profond constituant un haut-fond ou une légère rupture de pente du lit du cours d'eau. L'écoulement y est assez rapide et la granulométrie se situe habituellement dans la gamme des graviers, cailloux et galets. |
| Chenal (Ch) | Segment où la profondeur d'eau, d'environ 1 m et plus, est constante. Le courant varie de modéré à lent et la surface de l'eau demeure lisse. La granulométrie des matériaux varie du sable au galet. |
| Bassin (Ba) | Zone d'eau profonde localisée souvent au pied d'un obstacle et correspondant la plupart du temps à un élargissement du cours d'eau. Le courant y est lent, favorisant ainsi la sédimentation. Les bassins intercalés dans des sections de chutes et cascades font cependant exception à cette définition : de dimensions plus restreintes, ils sont constitués principalement de roc et de matériaux grossiers. |
| Lac (La) | Section lentique (eaux calmes) correspondant à un élargissement du cours d'eau. |
| Estuaire (Es) | Embouchure d'un cours d'eau, dessinant dans le rivage une sorte de golfe évasé et profond. |

Source : Adapté de Boudreault (1984).

Une campagne de terrain a eu lieu du 27 au 30 juin 2012 pour effectuer la validation des critères physique et biologiques des neuf points de traverse. Pour chacune des stations, les types de faciès d'écoulement et de substrat étaient notés, ainsi que la largeur à la ligne naturelle des hautes eaux (LNHE). La LNHE a été positionnée en se basant sur des indices botaniques (transition entre la végétation riveraine et terrestre) et géomorphologiques (marques d'érosion hydrique). Aussi, la composition de la végétation dominante sur la berge des cours d'eau, en amont et en aval du point de traverse, était prise en note. Toute autre caractéristique de l'habitat (obstacle à la circulation des poissons, marques d'érosion, etc.) a été notée. Pour chaque segment homogène, la longueur et la largeur ont été mesurées.

En plus des faciès d'écoulement et des substrats, les obstacles au passage du poisson ont été identifiés et cartographiés. Tous les obstacles à la libre circulation du poisson ont fait l’objet d’une évaluation de leur franchissabilité, selon les classes suivantes :

- franchissable sans réserve: franchissable en tout temps par les espèces présentes;
- franchissable avec réserve: franchissable par les espèces présentes, sauf au cours d’évènements hydrologiques extrêmes (débit trop faible ou trop fort);
- infranchissable sans réserve: infranchissable en tout temps par les espèces présentes.

## G1.2 Inventaires de poissons

Les stations de pêche ont été sélectionnées suite à la caractérisation des points de traverse. Cette sélection visait à brosser un portrait des milieux aquatiques potentiellement exposés aux impacts du projet et obtenir une bonne représentation des divers types d’habitats.

La campagne d’inventaire des communautés de poisson s’est déroulée le 29 juin 2012, au point de traverse TR-7, qui a été jugé le seul à présenter un habitat du poisson.

Tous les poissons capturés lors des pêches expérimentales ont été identifiés à l’espèce, et leur masse et longueur prises en note. Les poissons ont ensuite été retournés dans leur milieu lorsque leur état le permettait.

De plus, un sous-objectif était de vérifier la présence, et si oui l’importance, des habitats du poisson dans un ruisseau du point de traverse Tr-7 (ruisseau Jules) passant sous l’emplacement de la future voie ferrée.

### G1.2.1 Engins de pêche

La pêche électrique a été utilisée à deux stations situées dans le ruisseau Jules. L’utilisation d’un dispositif de pêche à l’électricité portatif permet d’échantillonner les milieux de faible profondeur tels les petits chenaux, les seuils et les cascades. Ce dispositif génère un champ électrique momentané dans le milieu afin d’induire une paralysie temporaire des poissons, qui sont ensuite récupérés à l’aide d’une épuisette. L’engin utilisé est le modèle LR-24 du fabricant Smith-Root inc. La pêche électrique a été effectuée sur deux stations À chaque station de pêche électrique, la profondeur, la composition du substrat, la vitesse d’écoulement, la présence de végétation aquatique et riveraine en surplomb, le faciès d’écoulement et les coordonnées géographiques ont été notées. Chaque spécimen capturé a été identifié à l’espèce et chacun a fait l’objet d’une mesure de longueur totale et de masse.

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