ECOLOGICAL LAND CLASSIFICATION SURVEYS FOR IOC PROPERTIES REGIONAL, PROPOSED WABUSH 3 PROJECT AND POTENTIAL SKI HILL SITES AT WABUSH 4 AND WALSH RIVER

Submitted to:

Iron Ore Company of Canada
2 Avalon Drive
Labrador City, NL
Canada A2V 2Y6

Submitted by:

AMEC Environment & Infrastructure
a Division of AMEC Americas Limited
133 Crosbie Road, PO Box 13216
St. John's, Newfoundland and Labrador
Canada A1B 4A5

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EXECUTIVE SUMMARY

IOC is proposing to develop a new open pit mine, at its Labrador West mine site, Wabush 3. A potential impact of the Wabush 3 mine development may be the closure of the existing Smokey Mountain ski hill and the development of a new ski hill. As a prerequisite for the Project's Environmental Assessment (EA), this Ecological Land Classification (ELC) was prepared to provide information on vegetation communities, soils, topographic features and other relevant environmental characteristics. This report presents the results of an ELC for four Study Areas; first an ecological land classification for a regional area of 40 km x 40 km that is centered on IOC's high activity mining areas, and subsequently a further detailed ecological land classification for Wabush 3, Wabush 4, and Walsh River. By identifying, analyzing, and mapping vegetation communities in the ELC study areas, the information can be used to plan and design any additional field studies that may be required by the EA, as well as help identify and evaluate any environmentally sensitive areas within the study areas. The ELC is therefore intended to serve as a key and integral component of the EA and its associated studies and analyses.

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1.0 INTRODUCTION

The Iron Ore Company of Canada (IOC) has been operating in Labrador West since the early 1960s. The company's current mining operations consist of open pit mines, mineral processing (concentrator and pellet plant) and tailings management facilities, as well as transportation infrastructure and other associated components and activities. The operations cover an area of approximately 11,000 hectares.

IOC is proposing to develop the Wabush 3 open pit mine (the Project), at its Labrador West mine site. The Wabush 3 mine will occupy an area of 443hectares. A potential impact of the Wabush 3 mine development may be the closure of the existing Smokey Mountain ski hill and the development of a new ski hill. The location for the potential new ski hill was initially narrowed to two sites – Wabush 4 (110 hectares) and Walsh River (320hectares). However, at some point during project planning, the decision was made to remove Walsh River as a potential location for the replacement ski hill location.

As a prerequisite for the Project's Environmental Assessment, this Ecological Land Classification (ELC) was prepared to provide information on vegetation communities, soils, topographic features and other relevant environmental characteristics.

This report presents the results of an ELC for the Study Areas shown in Figure 1-1 and Figure 1-2. Figure 1-1 illustrates a Regional Area with a land cover of 40 km x 40 km that is centered on IOC's mining and milling areas. The Regional Area is the area included in a caribou baseline survey (see Figure 1-1). All other planned biological baseline survey areas are smaller and are contained within the Regional Area. Figure 1-2 illustrates the Study Areas for the detailed ecological classification for three sites - Wabush 3, Wabush 4 and Walsh River. Although the Walsh River site was later eliminated as a potential ski hill location, the ELC had been completed for the site and the results for the site are presented.

The report:

- Using satellite imagery, aerial photography and field studies, identifies and describes the major vegetation classes for the 40 km x 40 km Regional Area, and the vegetation communities and surficial geology characteristics for the smaller Study Areas;

- Displays those features on maps.

1.1. Project Overview

The proposed Project involves the development and operation of an open pit mine, Wabush 3, to support the existing iron ore concentrator and pelletizing plant. Wabush 3 will supplement the iron ore produced from the existing operating mines. The Wabush 3 development could start as early as 2015.

The proposed Project, as currently planned, will include:

- an open pit mine, located just southeast of the existing Luce Pit, which contains an estimated 900 Million tonnes of iron ore and has a planned operating life of 25 years;
- waste rock disposal sites, to be located to the west of the open pit; and
- a haulage road to the northeast of the open pit, linking the open pit with existing ore conveyor and concentrator facilities;

Not connected to the Project, but possibly required as a consequence of it, will be

- a new ski hill and associated facilities to replace Smokey Mountain, if determined to be needed.

1.2. Study Purpose and Objectives

The purpose of this ELC is to provide information on vegetation and associated components of the biophysical environment in the area within and surrounding the proposed Project site and potential ski hill sites, as environmental baseline information for use in on-going Project planning and design and to support the eventual EA of the Project.

The primary, specific objectives of this ELC were to:

- identify, analyse and map vegetation communities, soils, topographic features and other relevant environmental characteristics within the ELC study areas;
- utilize this information in the planning and design of any additional environmental field studies which may be required for the EA; and
- help identify and evaluate any environmentally sensitive areas or features within the study areas, as well as to complete habitat suitability mapping for key wildlife species (as required).

The ELC is therefore intended to serve as a key and integral component of the EA and its associated studies and analyses.

1.3. Study Area

The Study Area for this ELC survey is illustrated in Figure 1-1 and Figure 1-2. A regional satellite-based land cover classification was completed for an area 40 km x 40 km (Figure 1-1). Detailed ELC mapping was then completed for 3 sites - Wabush 3, Wabush 4 Ski site, and Walsh River (labeled as 'WR Ski') (Figure 1-2).

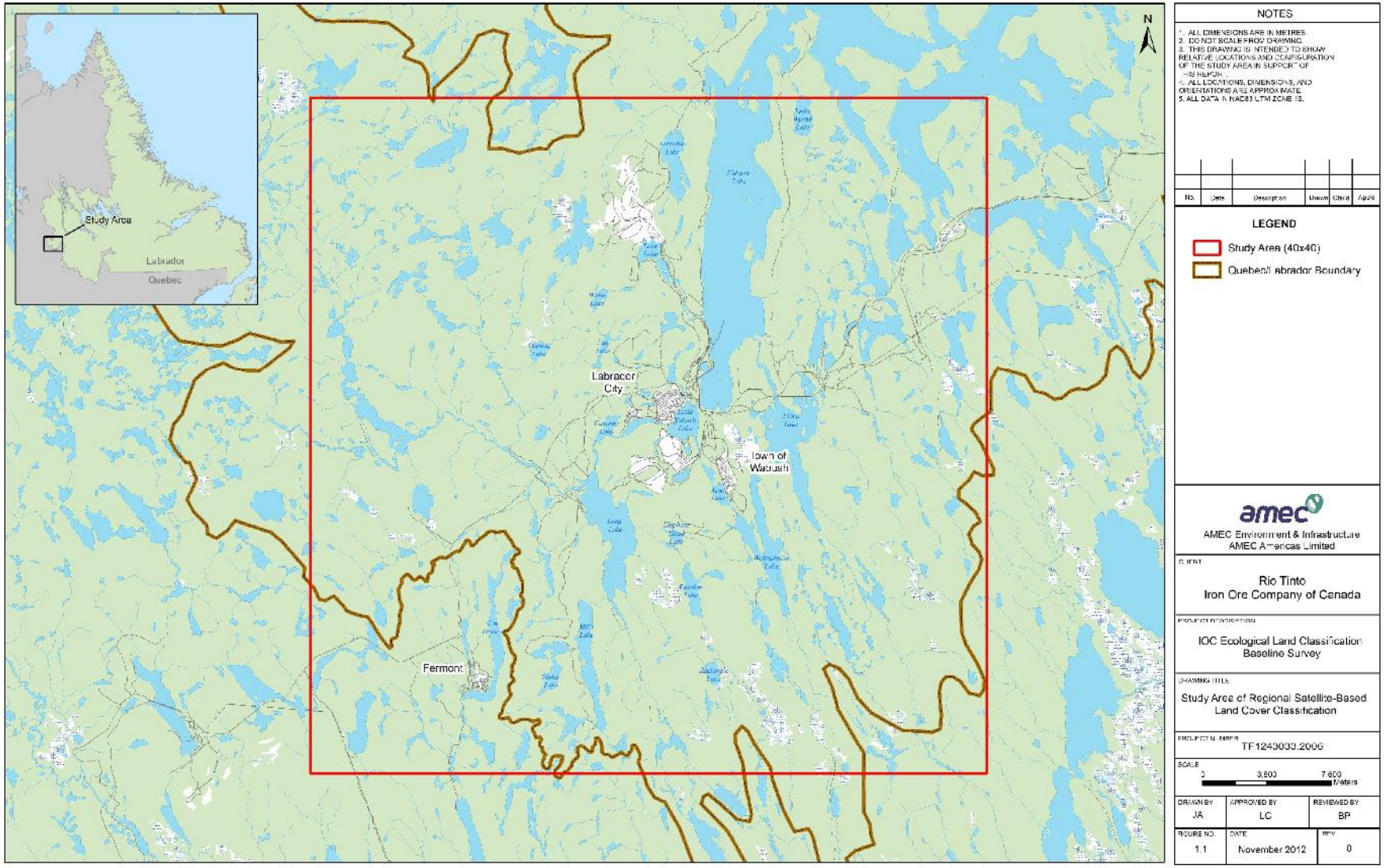

Figure 1-1: Study Area of Regional Satellite-Based Land Cover Classification.

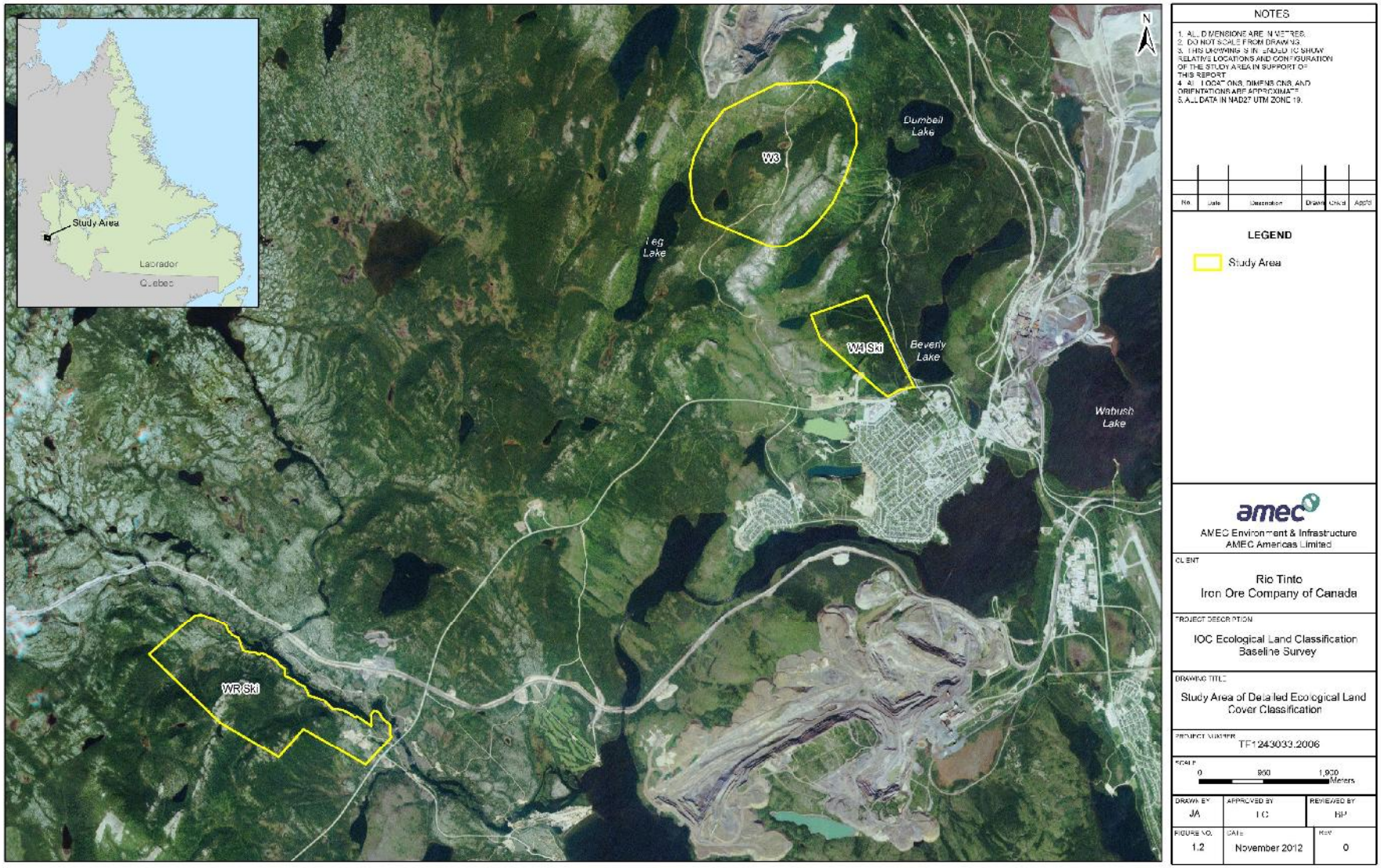

Figure 1-2: Study Area of Detailed Ecological Land Classification.

2.0 APPROACH AND METHODS

A comprehensive approach using a variety of data formats including satellite imagery, air photos, as well as field survey data serves as the foundation for the ELC survey. A field survey program was designed to support systematic ground-truth mapping. The resultant maps were designed to provide an accurate representation of the regional landscape.

2.1. Ecological Land Classification in Canada

There is a hierarchical framework for ELC in Canada (Marshall and Schutt, 1999) that provides the backdrop for this study. This framework provides a consistent, national spatial context within which ecosystems can be classified and described. By using this framework, this study incorporates a well-validated methodology for describing ecological units.

The national ecological framework for Canada is a nested hierarchy that describes regional ecological units at multiple scales, in which larger ecological units encompass successfully smaller ones. At the top of the hierarchy, Ecozones are defined on the basis of generalized characteristics and global continental climate. An ecozone, like any ecosystem, is an area where organisms and their physical environment endure as a system (Wiken, 1986). There are 15 Ecozones in Canada (Natural Resources Canada, 2007). This project encompasses one Ecozone, Boreal Shield. The Boreal Shield covers the majority of southern Labrador before the region transitions into the Taiga Shield to the north. The largest of Canada's 15 terrestrial ecozones, the Boreal Shield encompasses over 20% of Canada's landmass and 10% of its fresh water, extending from Newfoundland and Labrador to Alberta.

The Boreal Shield is a massive plain of ancient bedrock, covered with gravel, sand, and other glacial deposits, its topography comprised of rolling uplands that form poorly drained depressions blanketed with lakes, ponds, and wetlands. With a mostly continental climate, the Boreal Shield experiences long, cold winters and short warm summers with abundant precipitation. A short growing season paired with acidic soils reduces vegetation productivity in this Ecozone, although most of the area is forested, primarily coniferous species, intermixed with hardwoods, intermixed bogs, and wetlands. Additionally, lichens and shrubs are common on areas of exposed rock (Wilkin, 1986).

The national ELC system further divides Ecozones into Ecoregions, and subsequently, Ecodistricts (Marshall and Schutt, 1999). This study is located on the northern edge of the Central Laurentians Ecoregion, which is surrounded by the upland plateaus of central and western Labrador. This Ecoregion is classified as having a high to mid-boreal ecoclimate and forms part of the larger boreal coniferous forest that occurs in the Laurentians of south-central Quebec (Natural Resources Canada, 2007).

The national ELC system described by Marshall and Schutt (1999) does not map ELC units smaller than Ecodistricts. However, in order to identify and map vegetation communities and surficial geology characteristics at a project level, often further more detailed analysis is required.

For this study, a Regional Area of 40 km x 40 km centred on IOC's mining and milling areas, was delineated into major land classes at a scale of 1:60,000. A further detailed ELC survey of study sites Wabush 3, Wabush 4 Ski, and Walsh River was conducted delineating ecotypes at a scale of 1:10,000 (Wabush 3) and 1:5,000 (Wabush 4 Ski and Walsh River). Focusing the ELC survey at this scale will help identify and evaluate any environmentally sensitive areas or features within the study areas, as well as assist with completing habitat suitability mapping for key wildlife species (as required).

2.2. Satellite-Based Land Classification

2.2.1. Background and Technical Information

The approach employed for the regional land cover classification is consistent with typical remote sensing based vegetation classification practices and is closely aligned with recent projects completed in Newfoundland and Labrador including Nalcor Energy's Labrador-Island Transmission Link Project. The focus of the study is to utilize remote sensing software along with vegetation training areas derived from desktop and field verification to model land cover classes over the regional study area. The resulting land cover classification is verified through the field program and accuracy assessments completed to determine the validity of the modeling exercise. The final classification is used for environmental assessment focused studies such as wildlife modeling and project impact assessment.

2.2.2. Data Specifications and Sources

Four SPOT satellite imagery scenes were required to completely cover the study area. SPOT is an unmanned high-resolution remote sensing satellite system. It is primarily used to explore Earth resources. The four SPOT satellite imagery scenes were obtained from the Geobase website (www.geobase.ca). Each of the scenes is comprised of five individual GeoTiff raster files each covering the same geographical extent but containing different electromagnetic radiation information captured by the satellite sensors. The SPOT satellite was specifically designed for vegetation classification as it is optimized to promote differentiation between typical vegetation communities.

The SPOT scenes were captured between 2008 and 2010 between the months of July and September. The scenes were selected based on a qualitative assessment to ensure that they were cloud free, they were acquired during the appropriate season to maximize vegetation differentiation (June to September) and that the years of capture were relatively close.

For each scene both the raw (non-orthorectified) and rectified image sets were downloaded. The raw dataset contains metadata information, such as the time of capture, gain for each camera and sun angle which are required parameters for the atmospheric correction process.

Elevation data used to generate the Digital Elevation Model (DEM) was also acquired from Geobase for use in the post classification process. The DEM was used to assist in differentiating between the Alpine Vegetated and classes that share similar spectral characteristics.

Road network data was also acquired from Geobase for use in the post processing as an overlay of anthropogenic impact. The road data is a 1:50,000 scale product that is well suited for this scale of mapping.

2.2.3. Study Area

The detailed regional land cover study area is based on a 40 km by 40 km region that is centred on IOC's mining and milling areas. This region is large enough to allow for the assessment of migratory wildlife such as caribou and to account for future short-term expansion of exploration and mining activities. Each of the SPOT scenes extends well beyond the study area and were independently classified, merged into one product and then clipped to the extents of the study area. The training area capture and field verification was focussed within this study area only.

2.2.4. Image Pre-Processing

Image pre-processing is the process of applying mathematical transformation to the scenes prior to training area development and classification. This is a typical process and is performed in order to enhance the imagery and normalize the independent scenes. For this project two separate and consecutive pre-processing operations were completed.

First, an atmospheric and radiometric correction was applied to each raster in order to remove the effects of atmospheric haze (atmospheric scattering). The resulting images appeared clearer with increased contrast. This was beneficial to the training area development undertaken by the vegetation specialist as well as in the classification process. In addition, the increased contrast maximized the likelihood of a correct classification via classification algorithms.

The Idrisi (Version: Selva) remote sensing software package was used to execute the image pre-processing and the supervised classification. Idrisi is one of the leading software products in the remote sensing industry and its developers, Clark Labs, are based at the Graduate School of Geography at Clark University.

2.2.5. Desktop Training Area Development

ArcMap was used to create the training area polygons based on the interpretation of IOC's large scale and SPOT imagery. Training areas are defined as user-generated polygons that define areas of similar terrain coverage representing the target classes. These areas are then used to train the supervised classification software. The vegetation specialist defined the training polygons based on the visual characteristics of each land cover class.

The following guidelines were followed when creating the training areas:

- Training areas were defined one class at a time; the specialist avoided jumping from class to class. This method assisted with maintaining consistency and quality related to the training area development process;

- When possible, large training areas where created. The goal was to capture as many pixels as possible within an area representing the particular class while still maintaining a high level of homogeneity within the region with respect to the SPOT imagery;

- Large-scale imagery was used for verification only. Training areas were typed using the SPOT imagery;

- The SPOT false color composite was used for creating training areas. This band combination provided the best visual representation with which to work for training area development. The band combination that showed the greatest differentiation between target and adjacent classes was used;

- The digitized polygons were created to be as contiguous as possible avoiding taking in other classes within the training area. This rule helped to create clear and distinguishable end classes and helped to form separation between the classes.

2.2.6. Preliminary Classification

The Idrisi module MAXLIKE was used to run the maximum likelihood classification using the spectral signatures derived from the training areas. The maximum likelihood tool employs a supervised classification approach that considers both the variances and covariance of the

class signatures when assigning each cell to one of the classes represented in the signature file. With the assumption that the distribution of a class sample is normal, a class can be characterized by the mean vector and the covariance matrix. Given these two characteristics for each cell value, the statistical probability is computed for each class to determine the membership of the cells to the class.

Before running the classification the user can assign a probability to each class thus increasing or decreasing the prior likelihood of a cell belonging to a class. However, since we have little prior knowledge of the study area a uniform equal likelihood probability was assigned to each class.

The resulting preliminary classification was derived based solely on desktop interpretation completed by the vegetation specialist. The purpose of the preliminary classification was to feed into the field planning process to identify areas of interest for the wildlife study team and to give the vegetation specialist insight into which areas to focus on for the field survey in support of model refinement and accuracy assessment.

2.2.7. Field Program

The remote sensing team worked closely with the vegetation specialist to pre-plan the field survey activities with the goal of maximizing the field time and a focus on acquiring the appropriate number and geographic distribution of sample points. A field survey program was carried out to provide field-verified information necessary for the classification refinement and assessment to compliment the satellite-based land classification. Helicopter surveys were conducted within the study area by AMEC Biologist, Scott Burley and AMEC Environmental Scientist, Cheryl Tucker. These surveys consisted of low level flying over predetermined points in order to assess the accuracy of the classification model. A random selection of locations within the 1600 km^2 Regional Area were selected which consisted of three components:

- ground truth of training points;
- ground truth of known classifications points; and
- ground truth of unknown classification points.

The preliminary classification was an important tool in identifying target sample points. The desktop training area process was focused on the area covered by IOC's large scale imagery and, therefore, more sampling effort was required near the periphery of the regional study area than the area covered by the imagery.

2.2.8. Final Classification

Based on aerial and ground sample GPS data and other information gathered by the vegetation specialist the preliminary land cover classification was refined. The refinements to the preliminary classification were not significant as the field verification of the preliminary assessment was favourable. The refinements that were employed consisted of grouping certain classes that were too similar to differentiate based on the satellite imagery approach utilized. With input from the vegetation specialist and with consideration of the future uses of the land cover classification (*e.g.* wildlife modeling) the following classes were merged.

Conifer Scrub and Open Conifer Forest were combined to create a single class. The top down view of the satellite sensor provided similar spectral characteristics for each class and, therefore, to improve the overall effectiveness and accuracy of the final classification these two classes were merged.

Exposed Earth and Anthropogenic were merged into one class. The visual properties and associated reflective energy returned to the satellite sensor are too similar to automatically differentiate. By combining the classes and accounting for the anthropogenic effects in the post-processing stage the final classification was improved.

Hardwood Forest and Mixed Wood Forest were combined. There is limited Hardwood Forest within the study region and where present it is often intermixed with conifer forest. Therefore the two classes were combined to better represent the transitional nature of this combined class considering the true distribution across the landscape.

The Kalmia Lichen Heathland and Rocky Barren classes were merged. It was discovered through the field survey that the Rocky Barrens within the study region contained an abundance of Lichen. This caused confusion in the classification between the two classes that could not be resolved through the addition of training areas or through other remote sensing processes. The merging of these classes improved the overall usefulness and accuracy of the classification.

2.2.9. Post-Processing

With all classifications, some degree of post-processing is required. To correct confusions/errors in the output the classification was reviewed and any such confusion was isolated and corrected accordingly. Following the refinement of the classification process in Idrisi, a series of post-processing steps were executed in ArcMap to create the final classification raster from the four independently classified SPOT scenes.

Anthropogenic Class

Isolating the areas of anthropogenic land cover using the Maximum Likelihood classification algorithm was successful but there was some expected confusion with the Rocky Barren class. The surface characteristics are very similar for both classes, each having high reflectivity due to their dry nature and lack of vegetation. As a result, some anthropogenic areas were incorrectly classified as Rocky Barren. To address this issue, the road network data as well as disturbance information, such as trail/cutline areas, from IOC CAD data was incorporated into the final classification.

The following steps were applied to create a final anthropogenic classification raster:

- the line road feature class was clipped to the study area;
- a buffer area of 20 meters was created around the road line features;
- road areas were then rasterised and assigned the DN (digital number) value for the Anthropogenic class; and
- the resulting raster was overlain on the composite classification raster replacing the previously classified pixels.

Alpine Vegetated Class

The Alpine Vegetated class required further refinement to separate it from classes with similar spectral characteristics. With input from the vegetation specialist it was determined that Alpine Vegetated within the study region occurred mainly within a specific elevation range. The DEM assembled for the regional study region was used to create elevation breaks that could be used to reclassify the highly correlated classes into Alpine Vegetated. At an elevation of 700 m or greater those cells classified as Kalmia Lichen Heathland and Rocky Barren were re-classed to Alpine Vegetated. The result was an improvement in overall accuracy of the classification.

Study Area Clipping

The final step for this study was to clip the composite raster to the study area using the ArcMap clip tool. The final result is a GeoTiFF raster with a spatial resolution of 20 m representing the land cover classification.

2.2.10. Accuracy Assessment

The output classification was analyzed and an accuracy assessment performed. Classification error matrices were generated to quantify the results of the assessment and to provide an overall accuracy for the classification. Based on aerial and ground field sampling the data validation points were overlaid with the final classification and presented in the form of a confusion matrix. Table 2-1 depicts the confusion matrix prepared based on field verification observations by the vegetation specialist.

Table 2-1: Confusion Matrix for Data Accuracy.

	Classified as Alpine Vegetated	Classified as Black Spruce Lichen Forest	Classified as Conifer Forest	Classified as Conifer Scrub, Open Conifer Forest	Exposed Earth Anthropogenic	Classified Hardwood Forest, Mixedwood Forest	Classified as Kalmia Lichen Heathland, Rocky Barrens	Classified as Water	Classified as Wetland
Observed as Alpine Vegetated	5			1					
Observed as Black Spruce Lichen Forest		12							
Observed as Conifer Forest		1	17	1					
Observed as Conifer Scrub, Open Conifer Forest	1		2	21					
Observed as Exposed Earth Anthropogenic					N/A		1		
Observed as Hardwood Forest, Mixedwood Forest			1	1		15			
Observed as Kalmia Lichen Heathland, Rocky Barrens	2						9		
Observed as Water								3	
Observed as Wetland	1			1			1		13
Total number of points per class	9	13	20	25	N/A	15	11	3	13
% points correctly classified	55.56	92.31	85.00	84.00	N/A	100.00	81.82	100.00	100.00
Overall % Correct	87.34								

2.3. Detailed Ecological Land Classification

2.3.1. Background and Technical Information

The approach and methodology adopted for this project models ELC mapping projects completed in support of Environmental Assessments in Labrador and across Canada. The foundation of the methods employed originates from the Province of British Columbia's Terrestrial Ecosystem Mapping (TEM) standards and has been refined based on other more recent work in Labrador including but not limited to Nalcor Energy's Lower Churchill Hydroelectric Generation Project and New Millennium's Elross Lake Area Iron Ore Mine.

Although the vegetation and geology units differ slightly from these two projects, the methods employed were very similar. The end product scale of this project (1:5,000) is much larger than these two referenced ELC projects as the areas to be mapped were relatively small in size and the high resolution imagery acquired by IOC could support this level of detail.

The ELC data and associated mapping products will be useful for future studies involving wildlife modeling and direct assessment of project impacts.

2.3.2. Data Specifications and Sources

The approach defined for the detailed ELC mapping was focussed on utilizing the high resolution colour imagery acquired by IOC in July of 2011. The imagery dataset is comprised of 116 digital colour images captured in stereo directly from the sensor on board a fixed wing aircraft. The imagery was captured at a flying height of approximately 10,000 feet resulting in a ground resolution of 14 cm. Using the stereo imagery and associated Inertial Measurement Unit (IMU) data provided by the client, Integrated Informatics Inc. setup the project data in ArcGIS for use with the PurView extension. PurView enables a digital stereo viewing experience within ArcGIS to allow the interpreter to digitize polygon information directly into the GIS related to vegetation cover and geology/terrain characteristics achieved from the interpretation of the large scale imagery. This stereo mapping workstation was used for pre-typing and refinement of the vegetation and geology mapping.

Digital terrain models were developed based on DEM data derived from detailed CAD drawings as provided by IOC. The terrain models were used by the interpreters to determine slope and other terrain characteristics and assisted in determining orthographic vegetation breaks.

2.3.3. Study Area

The detailed ELC mapping was initially focussed on three study areas entitled Wabush 3, Wabush 4 Ski Site, and Walsh River, as depicted in Figure 1-2. Vegetation and geology pre-typing was completed for all three regions. Based on recommendation from the client, it was decided that field sampling and refinement of the ELC pre-typing for Walsh River would not be completed as this was no longer an alternate ski hill location. The remaining areas were revisited as part of the field study program and the mapping was refined based on the information gathered. Wabush 3 and Wabush 4 Ski Site were mapped for vegetation and geology at a scale of 1:5,000 and each covers an area of 4.4 km² and 1.1 km², respectively.

2.3.4. Vegetation Pre-typing

Vegetation pre-typing was completed by an experienced vegetation specialist using the PurVIEW system via ArcGIS to derive vegetation cover polygons within the focused study areas. Vegetation line work was captured at a scale of 1:5,000 and was completed prior to the field program. Typing was completed based on expert opinion and with direct interpretation of the high resolution digital imagery in a stereo environment. Information was captured consistently based on a static zoom level (1:5,000) with the interpreter defining homogeneous regions for each targeted vegetation class.

The pre-typing line work was supplemented by a point file within ArcGIS that housed the attribute information related to each vegetation polygon. This centroid point data was entered to the best of the interpreter's knowledge and captured information related to the ecotype, structural stage and general comments. The pre-typing was used in field program planning as comments were tagged in the centroid attribute table to make note of areas for ground truthing and verification. The pre-typing was also used as input into the regional land cover classification in the form of training areas.

2.3.5. Geology Pre-typing

Using the same general mapping methods as the vegetation specialist, the surficial geologist made use of the PurView mapping system via ArcGIS to delineate surficial geology / terrain polygons based on expert knowledge. The polygon line work was captured at a consistent scale of 1:5,000 to blend with the vegetation mapping.

The pre-typing geology lines were created based on surficial terrain characteristics as well as terrain breaks, drainage properties and slope. The geologist populated the attributes of a centroid point file within the polygons based on the interpretations derived from the high resolution imagery interpretation and contained information related to landform, material,

topography-local relief, topography-variety, drainage and comments. The pre-typing product was used in the field planning exercise to determine ground truth areas and for identification of visual inspection sites. The number of inspection sites was determined and the preliminary mapping was used to target areas of interest.

2.3.6. Field Program

A field survey program was carried out to provide field-verified information necessary to compliment the detailed ecological land classification for the three Study Areas: the Wabush 3 mine site, and the two potential ski hills (Wabush 4 Ski Site and Walsh River). Field surveys for the vegetation study were conducted by AMEC Biologist, Scott Burley and AMEC Environmental Scientist, Cheryl Tucker. Field surveys for surficial geology were conducted by AMEC Geologist, Calvin Miles.

For the vegetation component of the detailed classification, maps of each of the Study Areas were generated depicting the ecotype polygons developed during the remote classifications. Each polygon in the Wabush 3 and Wabush 4 Ski Study Areas was visited in order to confirm the classification was correct as well as to collect additional information on species composition and structure from the field. The vegetation inventory was conducted for the tree, shrub, and ground layers. All vascular plant species encountered in the field were identified. Dominant species in each identified vegetation community were also determined based on a visual estimate of cover within an approximate 20 meter x 20 meter area. If there was a discrepancy between the classification and the actual habitat as determined during the field surveys, the area was reclassified with the correct ecotype and adjusted in the model.

A number of areas at the Walsh River site required ground truthing in order to resolve uncertainties with the classification. These points were surveyed in the field in order to verify the ecological land classifications. However prior to conducting the field component of this program, IOC made a decision to remove Walsh River as a possible candidate for the replacement ski hill location. Therefore the field work at Walsh River was not as detailed as at the other two sites and was only restricted to ground truthing select areas in order to adjust the ecological classifications. Detailed vegetation surveys were not conducted at this site. Should this site be selected for further development it is suggested that additional field work be conducted.

To obtain surficial terrain data for the detailed classification, preliminary maps were created and sited visits were conducted, assessing examples of all soil or rock units developed during the remote classifications. Road cuts and other man made features, such as borrow pits, were also examined. Supplemental information was also obtained from the casing depths used during an exploration program performed by Rio Tinto in 2011. This information was used with caution as

the provided data was the actual length of casing used which also included a short length drilled into bedrock. Most of these boreholes were also drilled at an inclined angle to the horizon. Photographs were also taken at each location. A select number of photos of typical surficial terrain units are included in the report.

2.3.7. Final ELC Mapping and Refinement

Integrated Informatics Inc's GIS team worked closely with the geologist and vegetation specialist to revise the pre-typing based on the field verification exercise. Detailed notes on species, percent cover, and other relevant attributes appropriate for the scale of the project were used to refine the classification and boundaries of vegetation cover and geology types. With information gathered from the site surveys, the geologist and vegetation specialist revisited the line work completed as part of the pre-typing exercise. Sample points collected in the field were overlaid within the GIS and the line work and attributes were adjusted accordingly (using PurView). The resulting polygons and attributes were cleaned by the GIS team and packaged into a final ELC dataset. The final classes defined were dependent on class occurrence within the focused study areas.

2.4. Study Team

Integrated Informatics Inc

Stephen Rowe, BSc – Senior GIS Consultant and Project Manager

Sharon Parsons, BSc – Geomatics Data Manager

Pierre Garigue, B. Eng – GIS Consultant and Senior Software Quality Assurance Specialist

AMEC Environment & Infrastructure

Calvin Miles, P.Geo – Senior Associate Geologist

Scott Burley, BSc – Biologist

Cheryl Tucker, BSc – Environmental Scientist

3.0 RESULTS

Results of the satellite-based land classification for the 40 km by 40 km Regional Area are presented in a series of Maps in Appendix A.

3.1. Satellite-Based Land Classification

3.1.1. Description of Land Classes

A total of nine land classes were noted to occur within the 40 km by 40 km Regional Area. These include:

- Black Spruce / Lichen Forest;
- Conifer Forest;
- Conifer Scrub/Open Conifer Forest;
- Deciduous /Mixed Wood Forest;
- Exposed Earth/Anthropogenic;
- Low Alpine Herb;
- Rock Outcrop;
- Water; and
- Wetland.

The following section provides a brief description and photograph of the major land classes encountered in the Regional Area.

Black Spruce/Lichen Forest

Black Spruce/Lichen Forest ecotype occurs throughout the Study Area (Figure 3-1). This habitat type is dominated by Black Spruce (*Picea mariana*) and Larch (*Larix laricina*) in the canopy. The understorey varies between lichen (*Cladonia* sp.) dominated ground cover with Alpine Bilberry (*Vaccinium uliginosum*) and Black Crowberry (*Empetrum nigrum*) intermixed with patches of Feathermoss ground cover (*Ptilium crista-castrensis* and *Pleurozium schreberi*) with Labrador tea (*Rhododendron groenlandicum*).

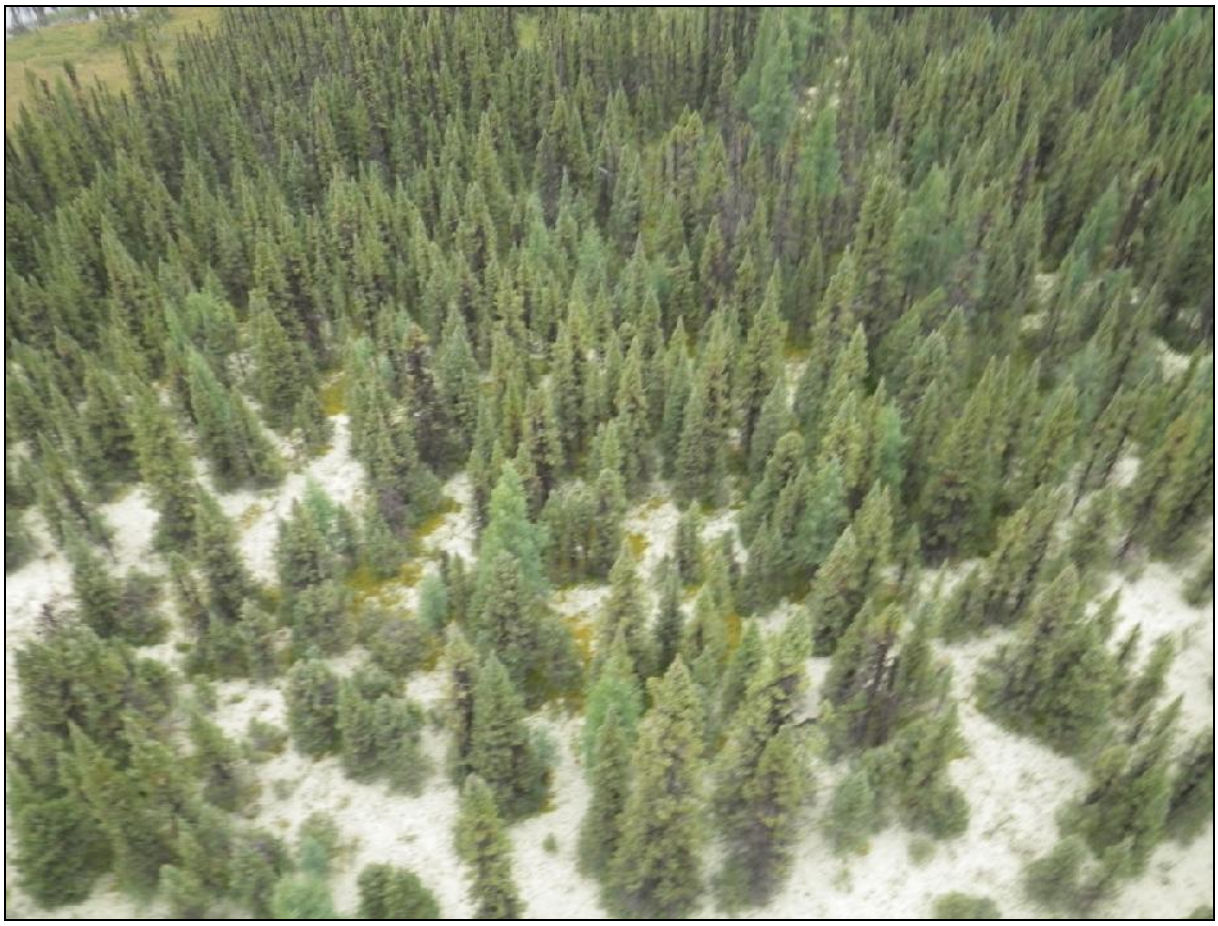

Figure 3-1: Black Spruce/Lichen Forest Land Class in Regional Area.

Conifer Forest

Mature Conifer Forest is a dominant ecotype occurring within the Regional Area (Figure 3-2). This is characterized by Black Spruce, Balsam Fir (*Abies balsamea*) and White Spruce (*Picea glauca*) dominating the relatively closed canopy. The understorey in this habitat type included areas consisting of dense Balsam Fir regeneration interspersed with less dense patches where species such as Bunch Berry (*Cornus canadensis*), Twin Flower (*Linnea borealis*), Labrador Tea and Creeping Snowberry (*Gaultheria hispidula*) dominate. Feathermoss was found to make up a large portion of the ground cover along with small patches of Sphagnum moss in wetter depressions.

Figure 3-2: Conifer Forest Land Class in Regional Area.

Conifer Scrub/Open Conifer Forest

Open Conifer habitat was also found to be a dominant ecotype within the Regional Area (Figure 3-3). The dominant species in this habitat type is very similar to the Conifer Forest where Black Spruce, Balsam Fir and White Spruce dominate the canopy with Labrador Tea, Bunch Berry, Twin Flower and Creeping Snowberry dominating the understorey. The difference in this habitat is that the canopy is slightly more open with forest gaps either dominated by regenerating Balsam Fir or shrub species such as willows (*Salix bebbiana*, *S. discolor*, and *S. petiolaris*) and Glandular Birch (*Betula glandulosa*).

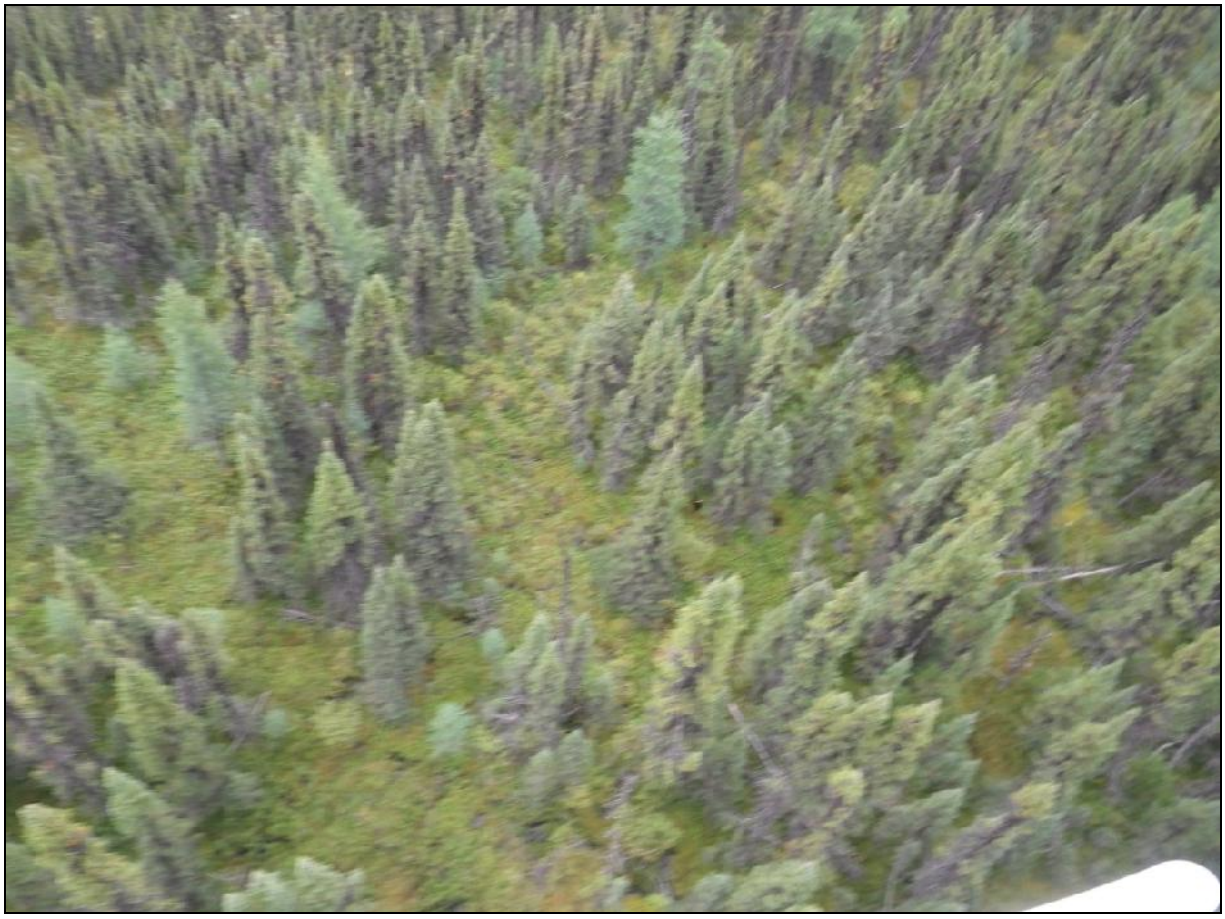

Figure 3-3: Open Conifer/Conifer Scrub Land Class in Regional Area.

Deciduous/Mixed Wood Forest

Mixed Wood Forests occurring within the study area typically represent a range in successional stages from young regenerating communities to more mature forest communities (Figure 3-4). Where Deciduous Forests encountered in the Regional Area typically represent a community at a young successional stage following a disturbance. These areas are dominated by Paper Birch (*Betula papyrifera*) and Heart-leaved Paper Birch (*Betula papyrifera* var. *cordifolia*) as well as willows.

Mixed Wood Forests are located throughout the Study Area and typically represent a more mature community. Dominant species in the canopy consist of a mix of coniferous trees (Black Spruce, White Spruce and Balsam Fir) and deciduous trees (Paper Birch and Heart-leaved Paper Birch). The understorey in these areas consists of forest understorey species such as Bunch Berry, Clinton Lily and Northern Oak Fern (*Gymnocarpium dryopteris*).

Figure 3-4: Deciduous/Mixed Wood Forest Land Class in Regional Area

Exposed Earth/Anthropogenic

This land cover class was assigned to all areas representing current human disturbance such as roads, exposed soil for mining and quarry activities, buildings and parking lots, etc (Figure 3-5). These areas are typically devoid of vegetation or very sparsely vegetated.

Figure 3-5: Exposed Earth/Anthropogenic Land Class in Regional Area.

Low Alpine Herb

Alpine Vegetated ecotype was found to occur within the Study Area typically at higher elevations at the tops of hills where soils are very shallow or lacking (Figure 3-6). This ecotype is closely connected to Rock Barren (see below) where these habitat types tend to occur together as a mosaic in many areas. Low Alpine Herb vegetation is dominated by low growing herbaceous and shrub species such as Black Crowberry, Labrador Tea, Partridge Berry (*Vaccinium vitis-idaea*), Alpine Bilberry (*Vaccinium uliginosum*) and lichens (*Cladonia* sp).

Figure 3-6: Low Alpine Herb Forest Land Class in Regional Area.

Rock Outcrop

Rock Barren ecotype is typically located at high elevations on crests of hills where bedrock and glacier erratics are exposed (Figure 3-7). This ecotype is characterized by sparse vegetation cover consisting of a mosaic of exposed rock with lichens (*Umbilicaria* sp) intermixed with low growing shrubs such as Alpine Bearberry (*Arctostaphylos alpina*), Alpine Bilberry, Black Crowberry, Labrador Tea, Glandular Birch and Partridge Berry.

Figure 3-7: Rock Outcrop Land Class in Regional Area.

Water

Water cover class consists of all lakes, ponds and major rivers occurring within the Regional Area (Figure 3-8).

Figure 3-8: Water Land Class in Regional Area.

Wetlands

A number of wetlands have been identified within the Regional Area (Figure 3-9). Wetlands occurring within the Study Area typically consist of Fen and Bog or a combination of both. According to the Canadian Wetland Classification System (NWWG 1997), Fens are classified as a peatland with a fluctuating water table. This periodic influx of ground water contributes to increased nutrient and mineral content creating minetrophic conditions. Fen wetlands occurring within the Study Area include Herb Fens, Shrub Fens or a combination of the two. In many cases these wetlands contain areas dominated by emergent species such as Inflated Sedge (*Carex vesicaria*), Thread Rush (*Juncus filiformis*) and Canada Burnet (Sanguisorba canadensis) interspersed with shrub dominated patches with alder, Meadow Willow (*Salix petiolaris*), Pussy Willow and Bebbs Willow. Sphagnum generally makes up the ground cover within these areas.

Bogs are characterized as a peat landform which is typically raised or level with the surrounding terrain (NWWG 1997). Water sources of bogs typically consist of rain water which creates acidic conditions, low in mineral and nutrient content (NWWG 1997). These areas are typically dominated by low compact shrub species such as Leather Leaf (*Chamaedaphne calyculata*), Labrador Tea, and Willows. Sphagnum also creates the ground cover in these areas.

Figure 3-9: Wetland (Fen) Land Class in Regional Area.

3.2. Detailed Ecological Land Classification

The results of the detailed ELC survey of Study Areas - Wabush 3, Wabush 4 Ski site, and Walsh River are presented in Figure 3-10, Figure 3-11, Figure 3-12, Figure 3-13, Figure 3-14, and Figure 3-15.

Study Areas Wabush 3 and Wabush 4 Ski site were field surveyed for data verification. However prior to conducting the field component of this program, the Walsh River site was removed as a possible candidate for the replacement ski hill location and, as such, complete vegetation and surficial geology surveys were not conducted in this area. Therefore, the data presented for the Walsh River site is largely desktop analysis using aerial photo interpretation.

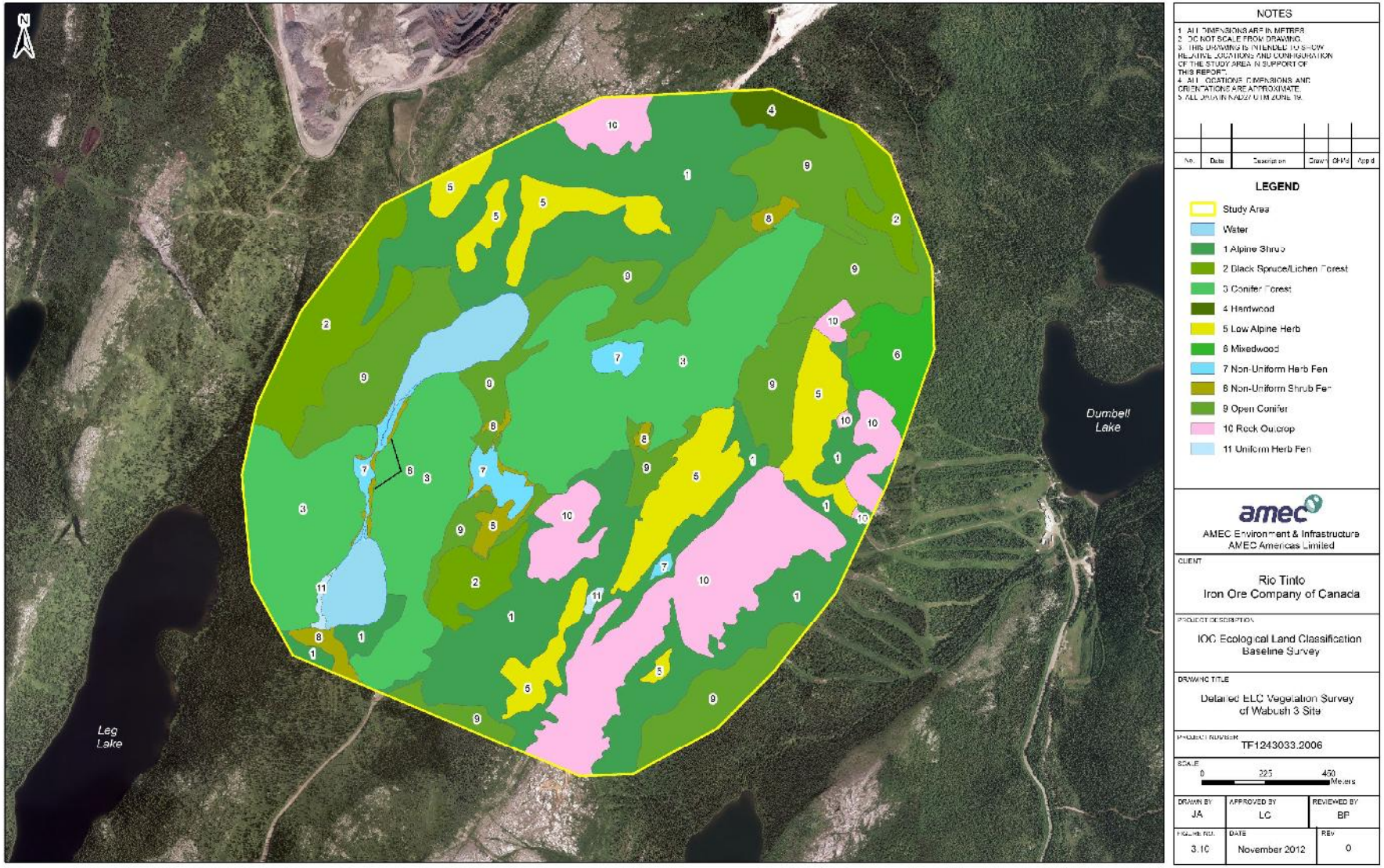

Figure 3-10: Detailed ELC Vegetation Survey of Wabush 3 Study Area.

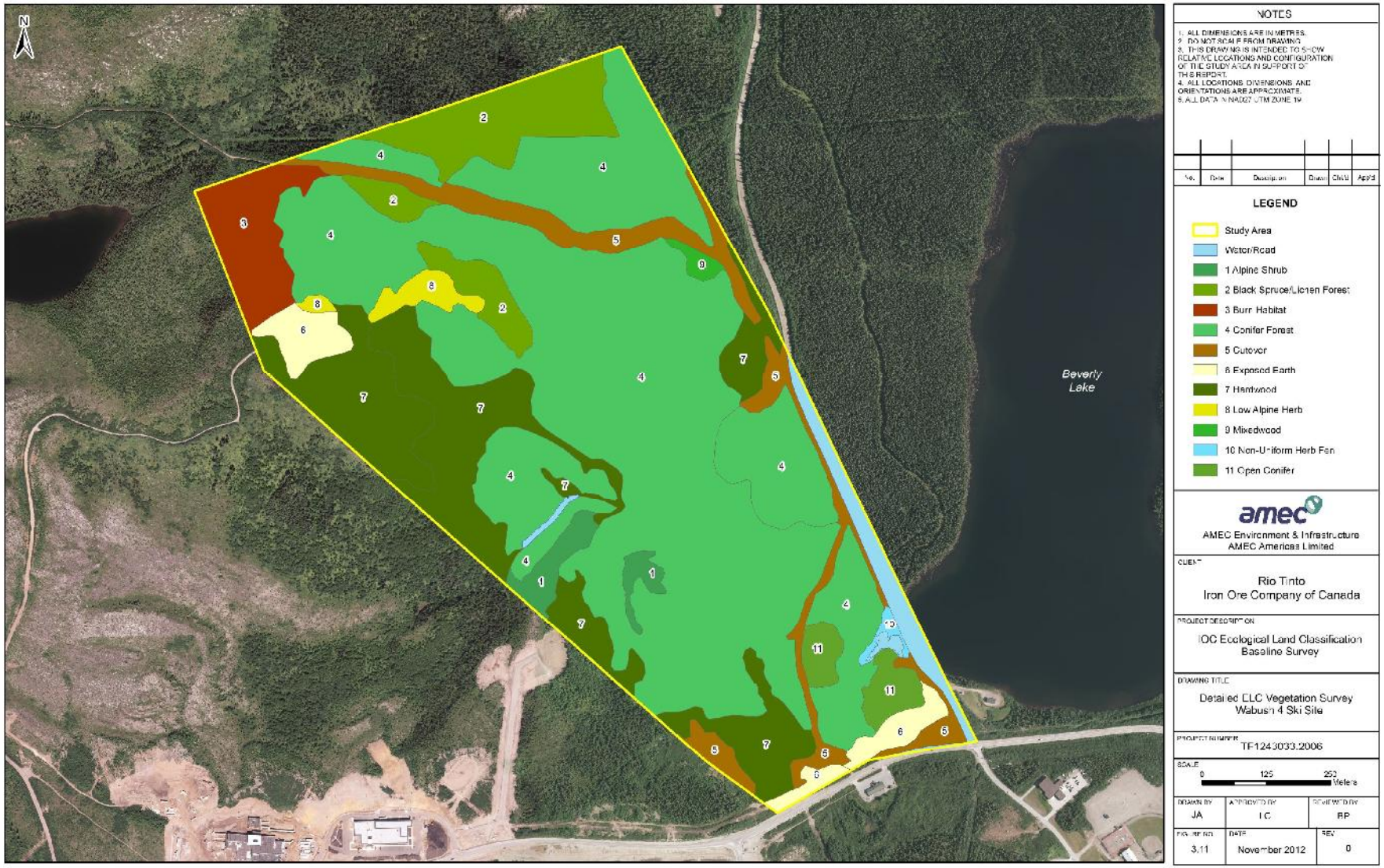

Figure 3-11: Detailed ELC Vegetation Survey of Wabush 4 Ski Study Area.

Figure 3-12: Detailed ELC Vegetation Survey of Walsh River Study Area.

Figure 3-13: Detailed ELC Surficial Geology Survey of Wabush 3 Study Area.

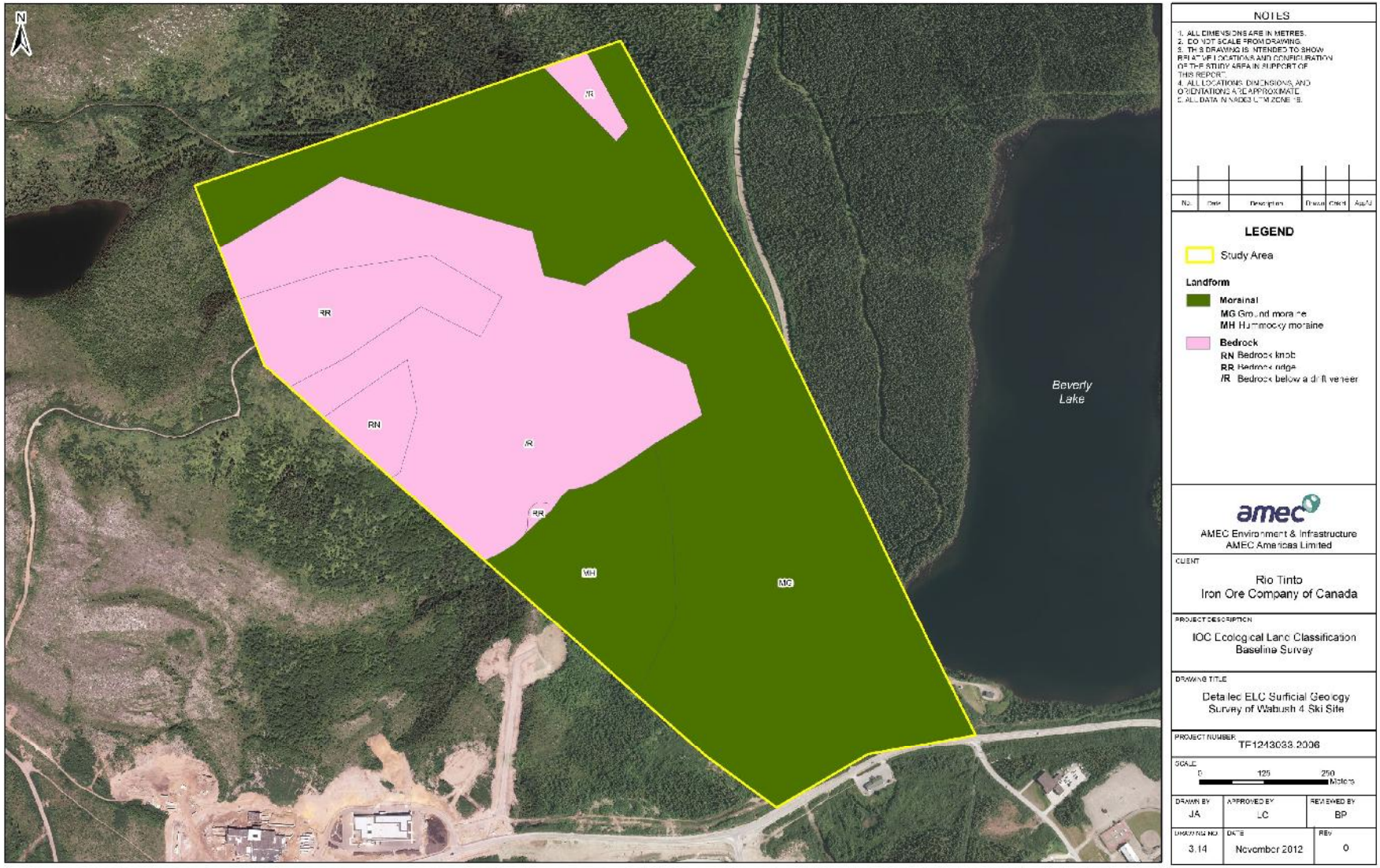

Figure 3-14: Detailed ELC Surficial Geology Survey of Wabush 4 Ski Study Area.

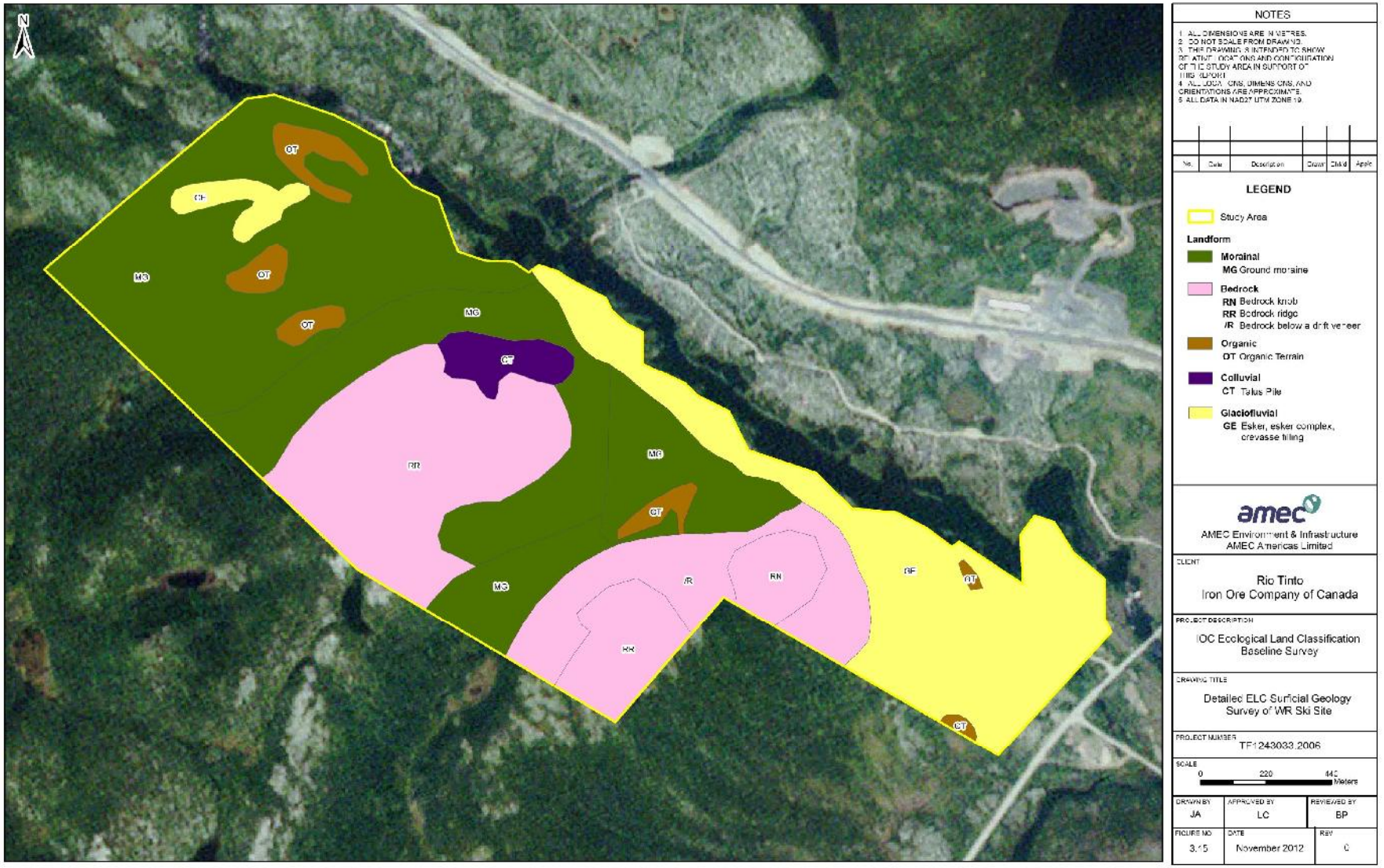

Figure 3-15: Detailed ELC Surficial Geology Survey of Walsh River Study Area.

3.2.1. Description of Vegetation Classes

Figure 3-10, Figure 3-11 and Figure 3-12 illustrate the vegetation results of the detailed ELC surveys for the Wabush 3, Wabush 4 Ski, and Walsh River Study Areas. A total of 17 major ecotypes were encountered during the detailed ELC surveys of the three Study Areas. These include:

- Alpine Shrub;
- Black Spruce/Lichen Forest;
- Burn Habitat;
- Conifer Forest;
- Cut Over
- Exposed Earth
- Hardwood;
- Low Alpine Herb;
- Mixed Wood;
- Open Conifer;
- Open Treed bog;
- Wetland:
    - Non-uniform Herb Fen;
    - Non-uniform Shrub Fen;
    - Uniform Herb Fen;
    - Uniform Shrub Fen.
- Rock Outcrop; and
- Water.

The following sections provide a description and photograph of each ecotype encountered in the study.

Alpine Shrub

Alpine Shrub ecotype was noted at all three Study Areas, in particular at higher elevations (Figure 3-16). This ecotype is characterized by a dominance of short to intermediate shrub species such as Glandular Birch, and willows (*S. bebbiana, S. discolor* and *S. vestita*), and in many cases represents a transition area between forest and rock outcrop. Species typically occurring in these ecotypes also include Large-leaved Goldenrod, Northern Oak Fern, Twin Flower and Bunch Berry.

Figure 3-16: Alpine Shrub Ecotype in Detailed ELC Vegetation Survey.

Black Spruce/Lichen Forest

Black Spruce/Lichen Forest habitat type was encountered at all three Study Areas (Figure 3-17) This ecotype is dominated by Black Spruce (*Picea mariana*) and Larch (*Larix laricina*) in the canopy. The understorey varies between lichen (*Cladonia sp*.) dominated ground cover with Alpine Bilberry (*Vaccinium uliginosum*) and Black Crowberry (*Empetrum nigrum)*, intermixed with patches of Feathermoss ground cover (*Ptilium crista-castrensis* and *Pleurozium schreberi*) with Labrador tea (*Rhododendron groenlandicum*).

Figure 3-17: Black Spruce/Lichen Forest Ecotype in Detailed ELC Vegetation Survey.

Burn Habitat

An area previously burned was recorded in the Wabush 4 Ski Study Area (Figure 3-18). This area currently consists of regenerating White Birch (*Betula papyrifera*) with Twin Flower (*Linnea borealis*), Bunch Berry (*Cornus canadensis*), and Creeping Snowberry (*Gaultheria hispidula*) as dominants in the understorey.

Figure 3-18: Burn Habitat Ecotype in Detailed ELC Vegetation Survey.

Conifer Forest

Mature Conifer Forest is a dominant habitat type occurring at all three Study Areas (Figure 3-19). This ecotype is characterized by Black Spruce, Balsam Fir (*Abies balsamea*) and White Spruce (*Picea glauca*) dominating the relatively closed canopy. The understorey in this habitat type included areas consisting of dense Balsam Fir regeneration interspersed with less dense patches where species such as Bunch Berry (*Cornus canadensis*), Twin Flower (*Linnea borealis*), Labrador Tea and Creeping Snowberry (*Gaultheria hispidula*) dominate. Feathermoss was found to make up a large portion of the ground cover along with small patches of *Sphagnum* moss in wetter depressions.

Figure 3-19: Conifer Forest Ecotype in Detailed ELC Vegetation Survey.

Cut Over

A number of areas in the Wabush 4 Ski Study Area were recently cleared and are currently maintained as dirt trails or have been left to regenerate naturally (Figure 3-20). Vegetation in these areas typically consists of tall shrubs including Alder, Pussy Willow, and Bebb's Willow. Twin Flower (*Linnea borealis*), Large-leaved Goldenrod (*Solidago macrophylla*), and Bunch Berry (*Cornus canadensis*), dominate the ground cover.

Figure 3-20: Cut Over Ecotype in Detailed ELC Vegetation Survey.

Exposed Earth

This ecotype was assigned to all areas representing current human disturbance such as roads, exposed soil for mining and quarry activities, buildings and parking lots, etc. (Figure 3-21). These areas are typically devoid of vegetation or very sparsely vegetated.

Figure 3-21: Exposed Earth Ecotype in Detailed ELC Vegetation Survey.

Hardwood

Deciduous Forest ecotype was encountered at all three Study Areas and in most cases it represented an ecotype at a young successional stage following a disturbance (Figure 3-22). These areas are dominated by Paper Birch (*Betula papyrifera*), Heart-leaved Paper Birch (*Betula papyrifera var. cordifolia*) and willows in the canopy with Large-leaved Goldenrod (*Solidago macrophylla*), Bunch Berry, Twin Flower and Clinton Lily (*Clintonia borealis*) dominating the understorey. Ground cover in these areas consists of mosses associated with disturbance such as *Polytrichum commune*.

Figure 3-22: Hardwood Forest Ecotype in Detailed ELC Vegetation Survey.

Low Alpine Herb

Low Alpine Herb ecotype was encountered at all three Study Areas typically at higher elevations at the tops of hills where soils are very shallow or lacking (Figure 3-23). This ecotype is closely connected to Rock Outcrops where these habitat types tend to occur together as a mosaic in many areas. Low Alpine Herb vegetation is dominated by low growing herbaceous and shrub species such as Black Crowberry, Labrador Tea, Partridge Berry (*Vaccinium vitis-idaea*), Alpine Bilberry (*Vaccinium uliginosum*) and lichens (*Cladonia sp*).

Figure 3-23: Low Alpine Herb Ecotype in Detailed ELC Vegetation Survey.

Mixed Wood

Mixed Wood Forests were recorded at all three Study Areas. Dominant species in the canopy consist of a mix of coniferous trees (Black Spruce, White Spruce and Balsam Fir) and deciduous trees (Paper Birch and Heart-leaved Paper Birch) (Figure 3-24). The understorey in this ecotype consists of forest understorey species such as Bunch Berry, Clinton Lily and Northern Oak Fern (*Gymnocarpium dryopteris*).

Figure 3-24: Mixed Wood Forest Ecotype in Detailed ELC Vegetation Survey.

Open Conifer Forest

Open Conifer habitat is also present at all three Study Areas (Figure 3-25). The dominant species in this habitat type is very similar to the Conifer Forest where Black Spruce, Balsam Fir and White Spruce dominate the canopy with Labrador Tea, Bunch Berry, Twin Flower and Creeping Snowberry dominating the understorey. The difference in this habitat is that the canopy is slightly more open with forest gaps either dominated by regenerating Balsam Fir or shrub species such as willows (*Salix bebbiana, S. discolor,* and *S. petiolaris*) and Glandular Birch (*Betula glandulosa*).

Figure 3-25: Open Conifer Forest Ecotype in Detailed ELC Vegetation Survey.

Open Treed Bog

The open treed bog habitat type was only recorded at the Walsh River Study Area. This habitat is characterized by scattered Black Spruce and Larch trees intermixed with shrub species including Labrador Tea and Leather Leaf. Sphagnum moss constitutes the ground cover in this habitat type.

There is no photograph available for this ecotype for the reason that a compete vegetation survey was not conducted for the Walsh River Study Area.

Wetlands

A number of wetlands have been identified within the three Study Areas including Non-uniform Herb Fen, Non-Uniform Shrub Fen, Uniform Herb Fen, and Uniform Shrub Fen (Figure 3-26).

The Non-uniform Herb fen is characterized by a dominance of herbaceous species organized in a patches or clumps within the wetland such that the distribution of species is heterogeneous throughout the wetland. In many cases these wetlands contained emergent species such as Inflated Sedge (*Carex vesicaria*), Thread Rush (*Juncus filiformis*) and Canada Burnet (*Sanguisorba canadensis*)

Non-uniform shrub fens consist of a heterogeneous distribution of shrub species intermixed with herbaceous species. Species typically encountered in this wetland type include Meadow Willow (*Salix petiolaris*), Pussy Willow and Bebb's Willow.

The uniform Herb Fen is characterized by a homogeneous coverage of herbaceous species such as Inflated Sedge, Blue-Joint Reedgrass and Thread Rush.

Figure 3-26: Wetland (Fen) Ecotype in Detailed ELC Vegetation Survey.

Rock Outcrop

Rock Outcrop ecotype was identified at both the Wabush 3 Study Area and Wabusy 4 Ski Study Area and is typically located at high elevations (Figure 3-27). This ecotype is characterized by sparse vegetation cover consisting of a mosaic of exposed rock with lichens (*Umbilicaria sp*) intermixed with low growing shrubs such as Alpine Bearberry (*Arctostaphylos alpina*), Alpine Bilberry, Black Crowberry, Labrador Tea, Glandular Birch and Partridge Berry.

Figure 3-27: Rock Outcrop Ecotype in Detailed ELC Vegetation Survey.

Water

Water consists of all lakes, ponds and major rivers occurring within the three Study Areas (Figure 3-28).

Figure 3-28: Water Ecotype in Detailed ELC Vegetation Survey.

3.2.2. Description of Geology Classes

Figure 3-13, Figure 3-14, and Figure 3-15 illustrate the surficial geology results of the detailed ELC surveys for the Wabush 3, Wabush 4 Ski, and Walsh River Study Areas.

A total of 3 geology classes with 5 subcategories were encountered during the detailed ELC of the Wabush 3 and Wabush 4 Ski Study Areas. These include:

- Bedrock;
  - Bedrock Ridge (RR)
  - Bedrock Knob (RN)
  - Bedrock below a Drift Veneer (/R)
- Morainal;
  - Ground Moraine (MG)
  - Hummocky Moraine (MH); and
- Organic.

The surficial geology at the Wabush 3 Study Area is at a higher elevation than the surrounding countryside. The dominant surficial geology comprises bedrock ridges and bedrock with a thin (one to two metres) layer of till in the high valleys between the ridges. Occasional weathered bands of bedrock were noted at this site. Occasional bogs (O) have developed on low hillsides and shallow ponds.

The surficial geology at the Wabush 4 Ski Study Area is dominated by a thin (three to four metres thick) blanket of till in the lower elevations and bedrock (with less than one metre thick till veneer) in the higher elevations. At the southeast boundary of this Study Area thick till, about 15 m deep, exists. Elevation differential across the site is approximately 90 m.

An additional two geology classes were identified at the Walsh River Study Area (Figure 3-15):

- Colluvial;
  - Talus pile (CT); and
- Glaciofluvial;
  - Esker, esker complex, crevasse filling (GE).

However, given that the Walsh River Study Area was only analyzed through aerial photo interpretation and not ground truthed for accuracy, descriptions and photographs are not available for these classes.

The following sections provide a description and photograph of each geology class encountered.

Bedrock

Bedrock, in the form of elongated Bedrock Ridges (RR) (Figure 3-29) and pointed Bedrock Knobs (RN) (Figure 3-30) was exposed at all of the higher elevations in the Study Area. It comprised hard massive outcrop with little or no sediment. Occasional patches of till may exist in hollows in the bedrock surface. Occasional outcrops of somewhat weathered, iron rich amphibolite were noted in the high valley on the Wabush 3 Study Area. Bedrock below a Drift Veneer (/R) (Figure 3-31) of till exists in all the higher valleys and around the slopes of most of hills in the Study Area.

Figure 3-29: Bedrock Ridge (RR) in Detailed ELC Surficial Geology Survey

Figure 3-30: Bedrock Knob (RN) in Detailed ELC Surficial Geology Survey.

Figure 3-31: Bedrock Below a Drift Veneer (/R) in Detailed ELC Surficial Geology Survey.

Morainal (Till)

The till in the Study Area comprises a poorly sorted diamicton generally comprising sand and gravel with varying amounts of fines (silt and clay), cobbles and boulders. This soil unit thickness may range from a Ground Moraine (MG) (Figure 3-32) veneer on the higher elevations to many metres thick in the low lying valleys to the east of the Study Areas at Labrador City. Till may exist as Hummocky moraine (MH) (Figure 3-33) or be dissected by melt water channels.

Figure 3-32: Ground Morraine (MG) in Detailed ELC Surfical Geology Survey.

Figure 3-33: Hummocky Moraine (MH) in Detailed ELC Surfical Geology Survey

Organic

Several areas of Organic (O) terrain were noted in the Study Area (Figure 3-34). These are accumulations of peat and other organic material that develop in wet areas such as on the sides of low hillsides and surrounding shallow areas of ponds.

Figure 3-34: Organic (O) in Detailed ELC Surfical Geology Survey.

4.0 SUMMARY AND CONCLUSIONS

This report presents the results of the ELC, which was completed for a Regional Area of 40 km x 40 km, centred on IOC's mining and milling areas, using satellite-based land classification, and for three Study Areas at a detailed ELC survey level. The ELC is based on information gathered from a variety of data formats including high resolution satellite imagery, aerial photographs, as well as field survey data. The combination of desktop analysis and a field survey program designed to support systematic ground-truth mapping were used to delineate land classes, ecotypes, and surficial geology for the study areas.

A total of nine land classes within the Regional Area of 40 km x 40 km were identified, mapped and analyzed using satellite-based land classification. A further detailed ELC for the three smaller Study Areas of Wabush 3, Wabush 4 Ski and Walsh River identified and mapped for analysis a total of 11 ecotypes and 8 surficial geology classes. An important factor to consider while analyzing the Walsh River ELC results is that the data presented is largely desktop analysis using aerial photo interpretation. Due to a change in project design prior to the field data collection, vegetation and surficial geology surveys are not as complete as with other Study Areas. Should the Walsh River Study Area be selected for further development it is suggested that additional field work be conducted.

This ELC will serve as an essential and integral planning tool for IOC. It will not only help identify and evaluate any environmentally sensitive areas or features within the study areas, it will provide key information that will assist in qualifying the Project's interaction with the terrestrial environment.

5.0 REFERENCES

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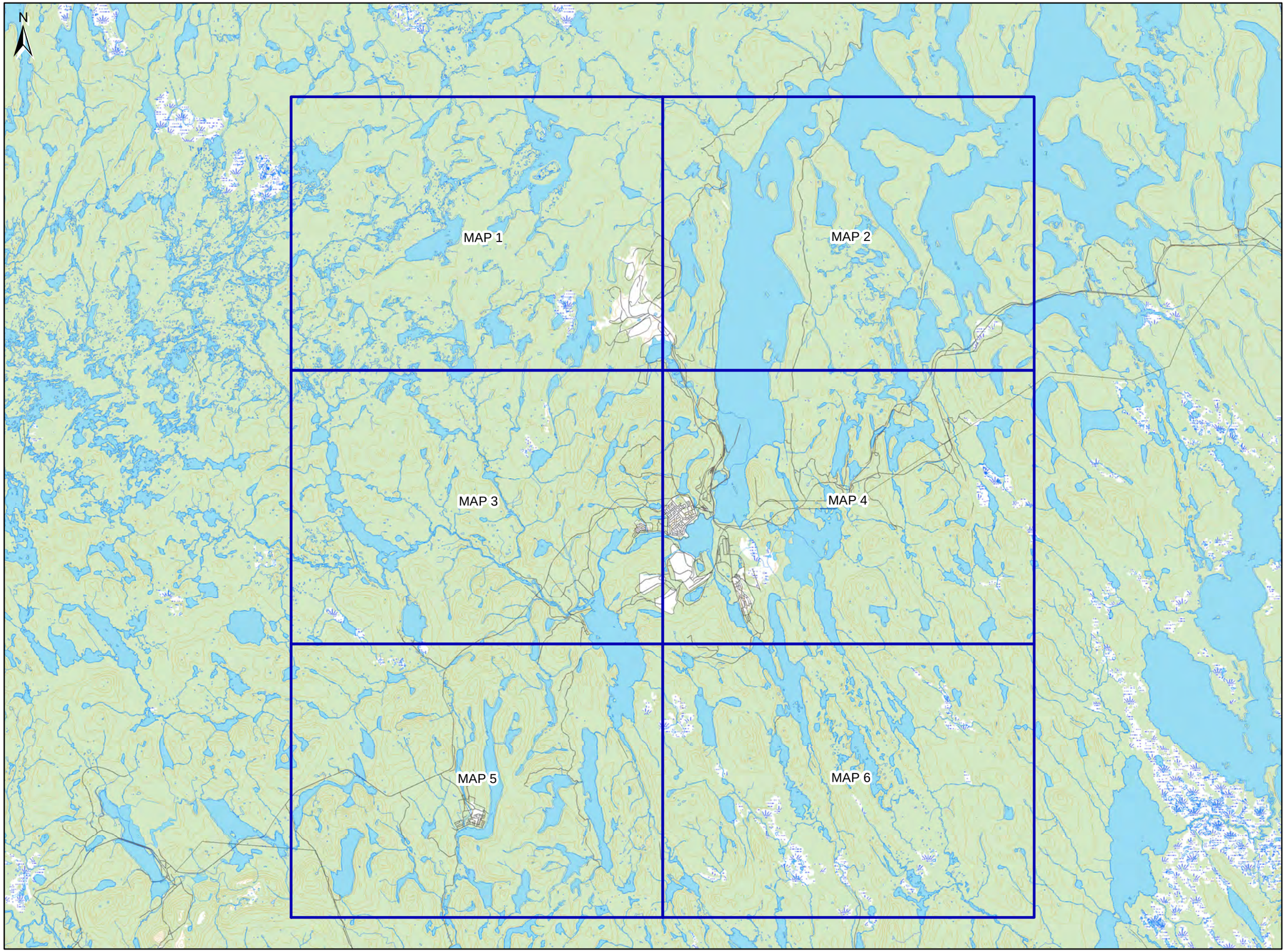
APPENDIX A:

RESULTS OF SATELLITE-BASED LAND CLASSIFICATION ON REGIONAL STUDY AREA



NOTES

1. ALL DIMENSIONS ARE IN METRES.
2. DO NOT SCALE FROM DRAWING.
3. THIS DRAWING IS INTENDED TO SHOW RELATIVE LOCATIONS AND CONFIGURATION OF THE STUDY AREA IN SUPPORT OF THIS REPORT.
4. ALL LOCATIONS, DIMENSIONS, AND ORIENTATIONS ARE APPROXIMATE.
5. ALL DATA IN NAD27 UTM ZONE 19.

No.	Date	Description	Drawn	Chk'd	App'd

LEGEND

Index Grid

AMEC Environment & Infrastructure
AMEC Americas Limited

CLIENT

Rio Tinto
Iron Ore Company of Canada

PROJECT DESCRIPTION

2012 Ecological Land Classification
Baseline Survey

DRAWING TITLE

Regional Classification
Index Map

PROJECT NUMBER

TF1243033.2006

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JA	LC	BP

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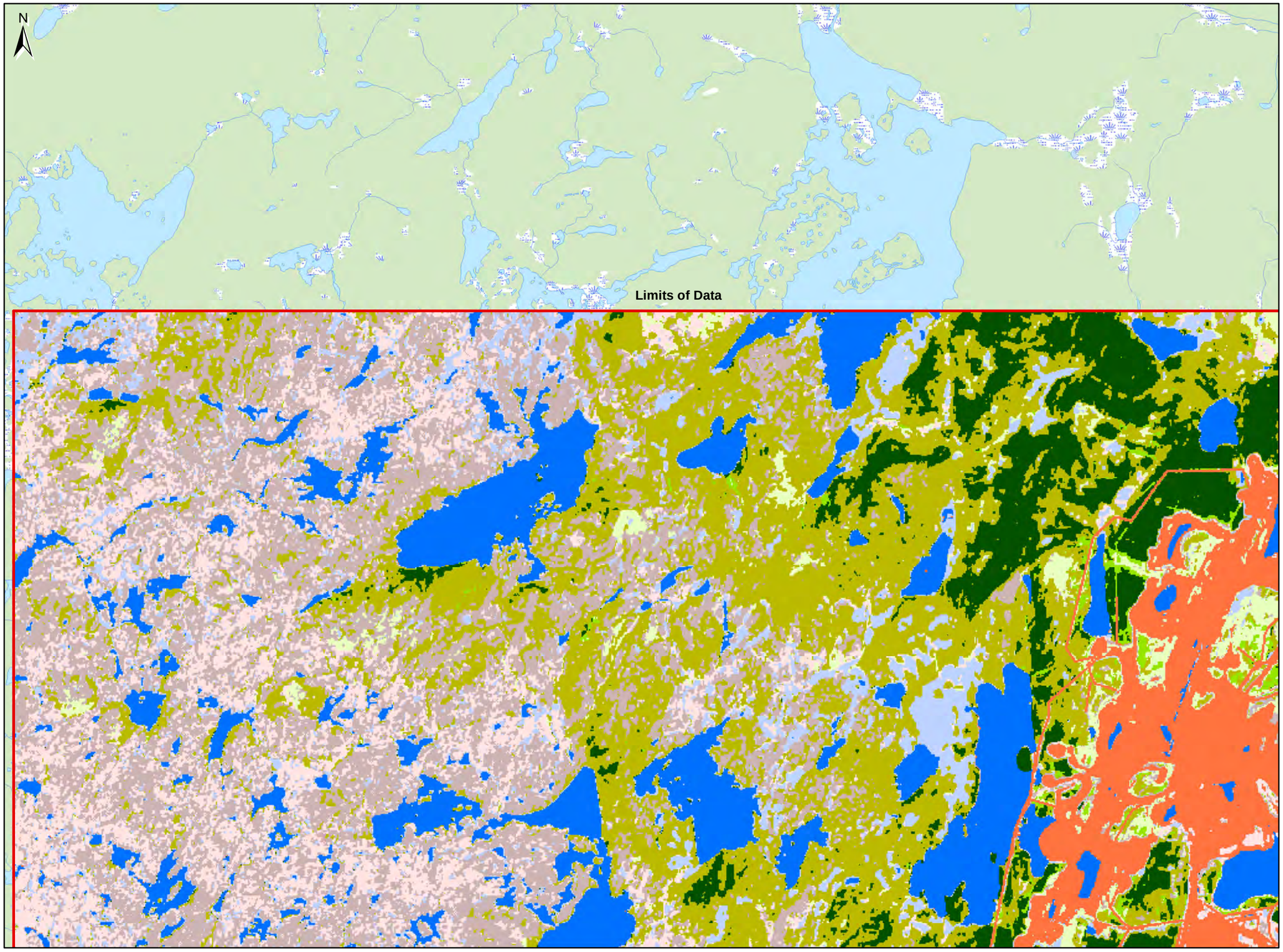

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No.	Date	Description	Drawn	Chk'd	App'd

LEGEND

- Study Area (40 x 40)
- Alpine Vegetated
- Black Spruce Lichen Forest
- Conifer Forest
- Conifer Scrub, Open Conifer Forest
- Exposed Earth, Anthropogenic
- Hardwood Forest, Mixedwood Forest
- Kalmia Lichen, Heathland, Rocky Barren
- Water
- Wetlands

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PROJECT DESCRIPTION

2012 Ecological Land Classification
Baseline Survey

DRAWING TITLE

Regional Classification
Map 1

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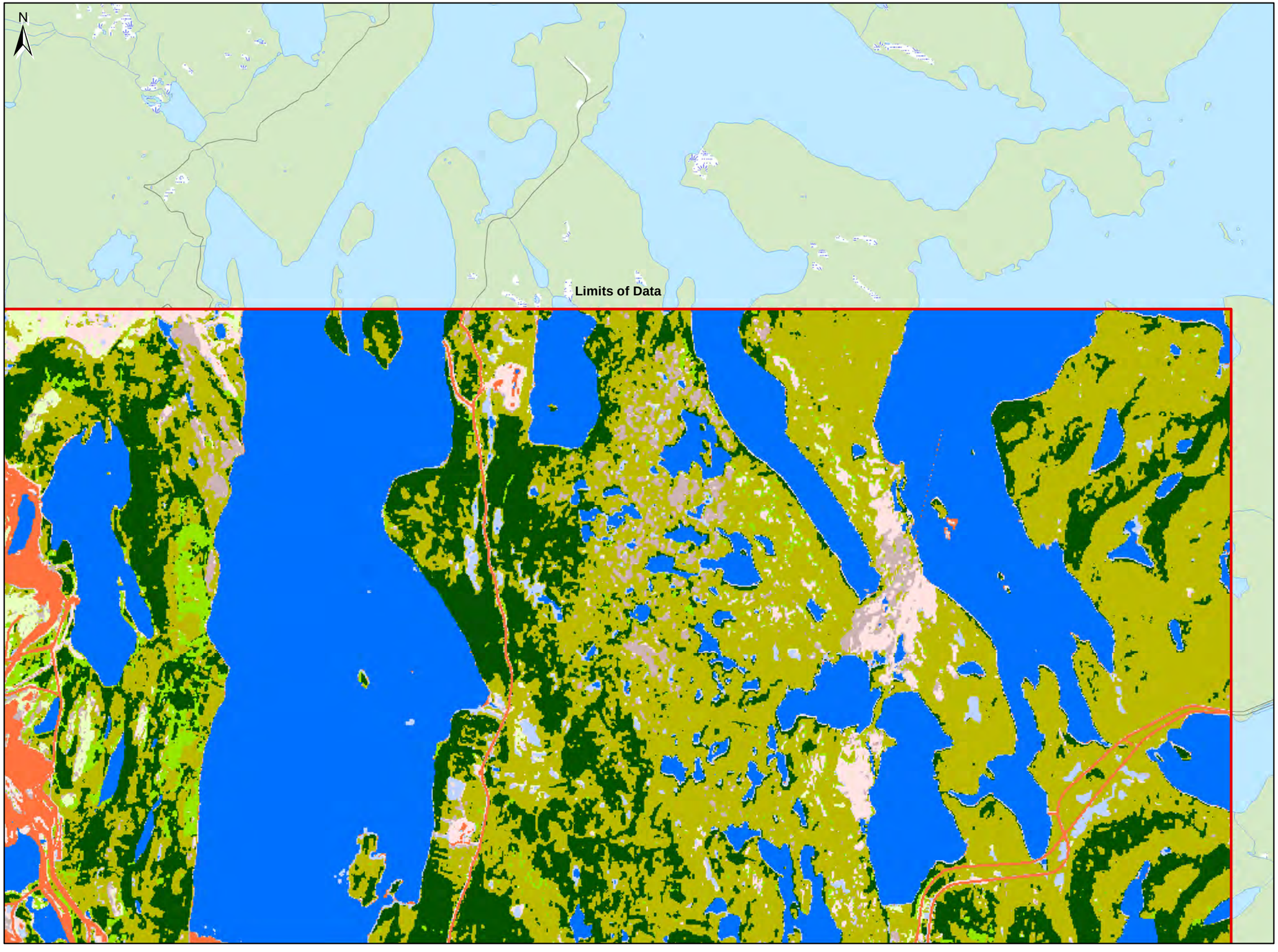

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No.	Date	Description	Drawn	Chk'd	App'd

LEGEND

- Study Area (40 x 40)
- Alpine Vegetated
- Black Spruce Lichen Forest
- Conifer Forest
- Conifer Scrub, Open Conifer Forest
- Exposed Earth, Anthropogenic
- Hardwood Forest, Mixedwood Forest
- Kalmia Lichen, Heathland, Rocky Barren
- Water
- Wetlands

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PROJECT DESCRIPTION

2012 Ecological Land Classification Baseline Survey

DRAWING TITLE

Regional Classification Map 2

PROJECT NUMBER

TF1243033.2006

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No.	Date	Description	Drawn	Chk'd	App'd

LEGEND

- Study Area (40 x 40)
- Alpine Vegetated
- Black Spruce Lichen Forest
- Conifer Forest
- Conifer Scrub, Open Conifer Forest
- Exposed Earth, Anthropogenic
- Hardwood Forest, Mixedwood Forest
- Kalmia Lichen, Heathland, Rocky Barren
- Water
- Wetlands

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CLIENT

Rio Tinto
Iron Ore Company of Canada

PROJECT DESCRIPTION

2012 Ecological Land Classification Baseline Survey

DRAWING TITLE

Regional Classification Map 3

PROJECT NUMBER

TF1243033.2006

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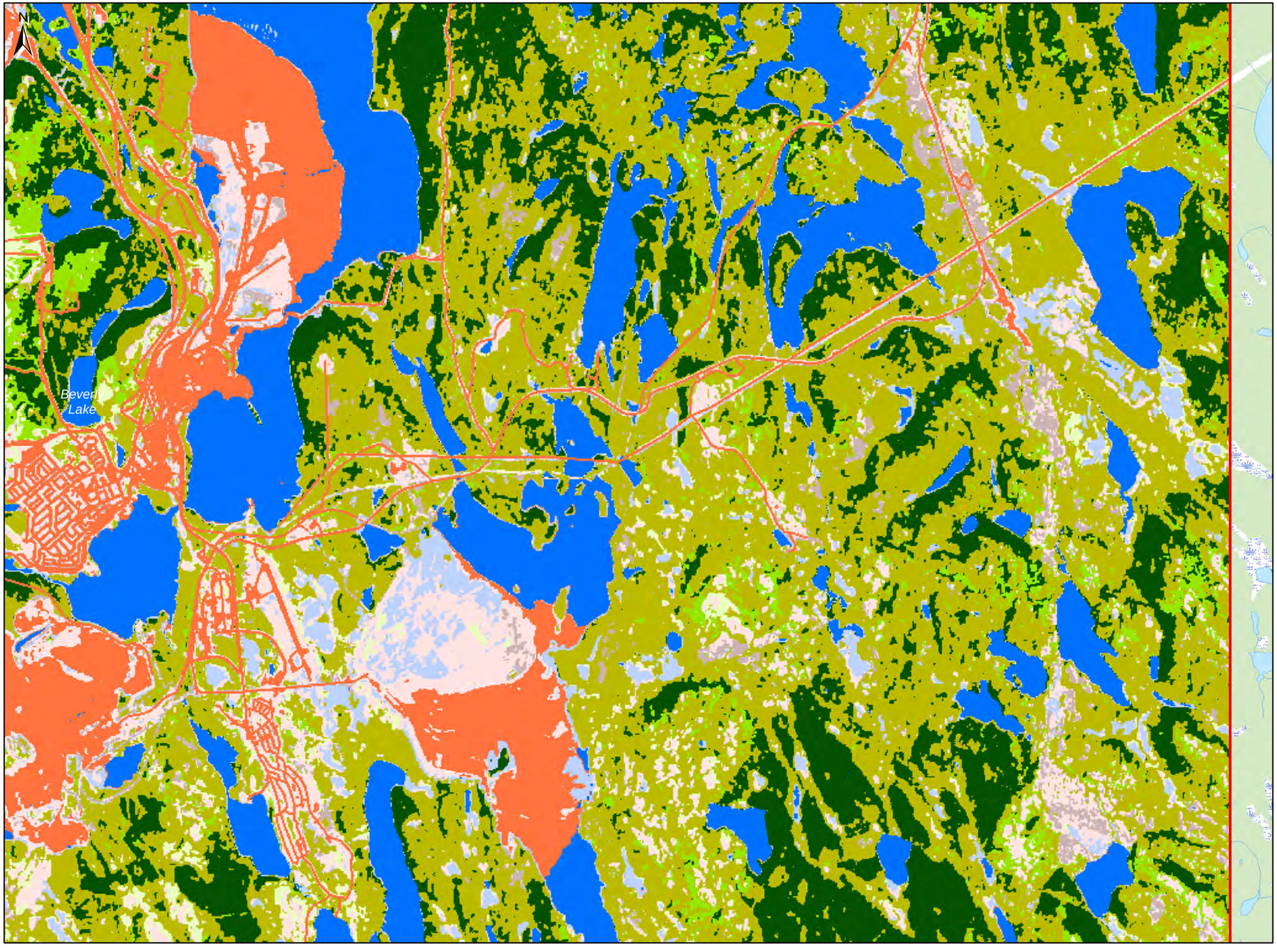

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No.	Date	Description	Drawn	Chk'd	App'd

LEGEND

- Study Area (40 x 40)
- Alpine Vegetated
- Black Spruce Lichen Forest
- Conifer Forest
- Conifer Scrub, Open Conifer Forest
- Exposed Earth, Anthropogenic
- Hardwood Forest, Mixedwood Forest
- Kalmia Lichen, Heathland, Rocky Barren
- Water
- Wetlands

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CLIENT

Rio Tinto
Iron Ore Company of Canada

PROJECT DESCRIPTION

2012 Ecological Land Classification
Baseline Survey

DRAWING TITLE

Regional Classification
Map 4

PROJECT NUMBER

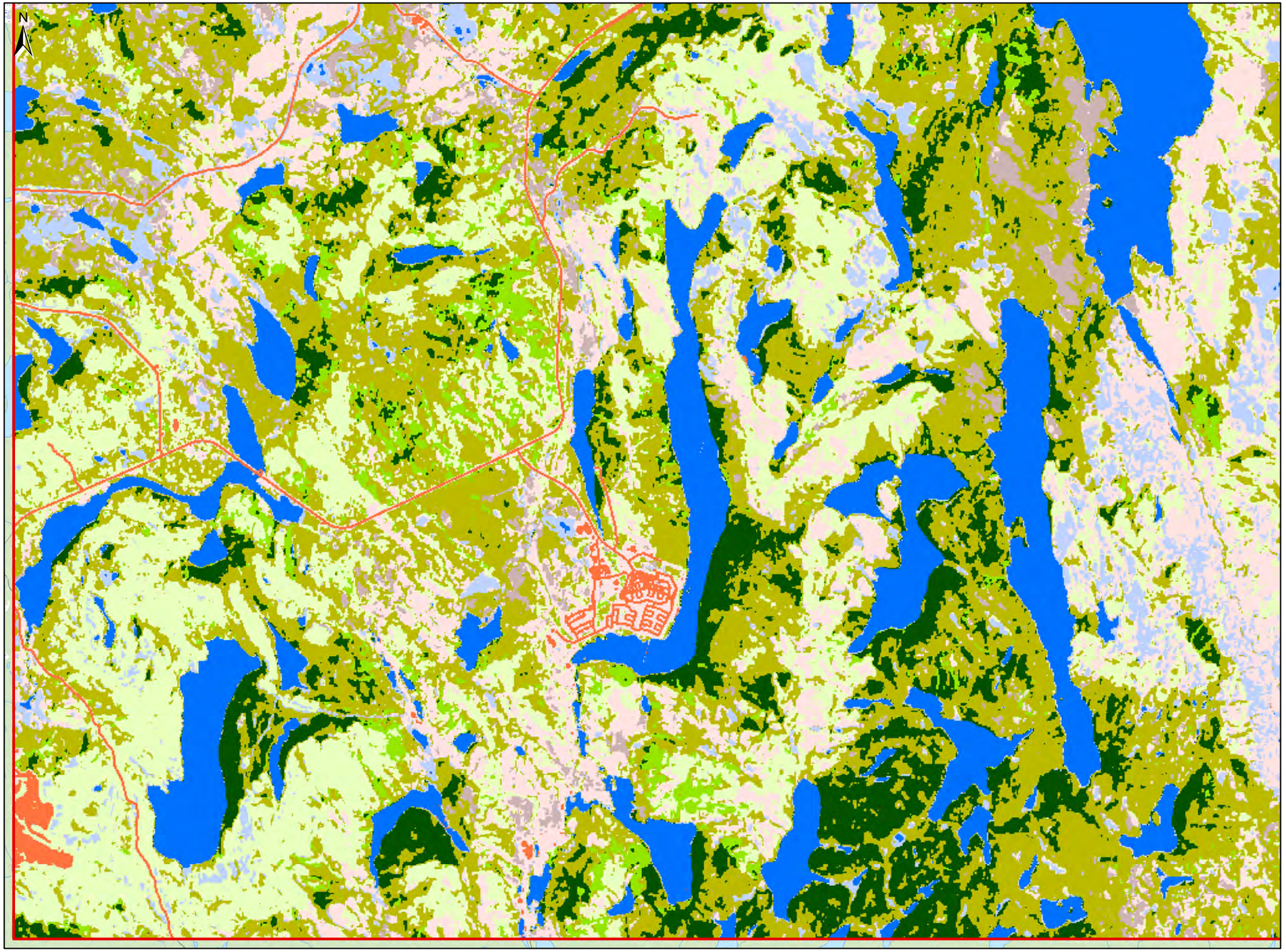
TF1243033.2006

SCALE

0 1,100 2,200 Meters

DRAWN BY	APPROVED BY	REVIEWED BY
JA	LC	BP

FIGURE NO.	DATE	REV
1	November 2012	0



NOTES

1. ALL DIMENSIONS ARE IN METRES.
2. DO NOT SCALE FROM DRAWING.
3. THIS DRAWING IS INTENDED TO SHOW RELATIVE LOCATIONS AND CONFIGURATION OF THE STUDY AREA IN SUPPORT OF THIS REPORT.
4. ALL LOCATIONS, DIMENSIONS, AND ORIENTATIONS ARE APPROXIMATE.
5. ALL DATA IN NAD27 UTM ZONE 19.

No.	Date	Description	Drawn	Chk'd	App'd

LEGEND

- Study Area (40 x 40)
- Alpine Vegetated
- Black Spruce Lichen Forest
- Conifer Forest
- Conifer Scrub, Open Conifer Forest
- Exposed Earth, Anthropogenic
- Hardwood Forest, Mixedwood Forest
- Kalmia Lichen, Heathland, Rocky Barren
- Water
- Wetlands

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AMEC Americas Limited

CLIENT
Rio Tinto
Iron Ore Company of Canada

PROJECT DESCRIPTION
2012 Ecological Land Classification
Baseline Survey

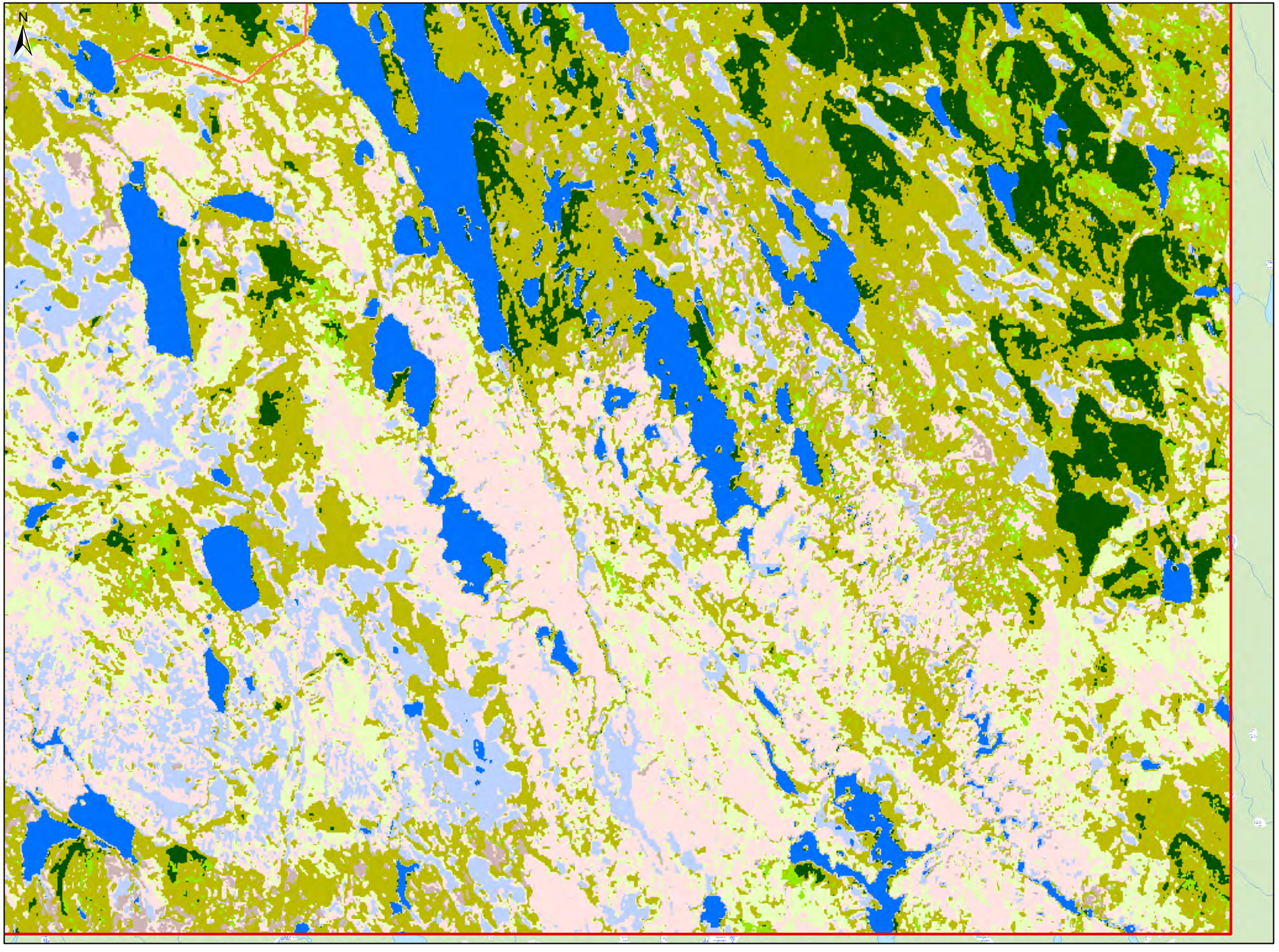
DRAWING TITLE
Regional Classification
Map 5

PROJECT NUMBER
TF1243033.2006

SCALE
0 1,100 2,200
Meters

DRAWN BY	APPROVED BY	REVIEWED BY
JA	LC	BP

FIGURE NO.	DATE	REV
1	November 2012	0



NOTES

1. ALL DIMENSIONS ARE IN METRES.
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3. THIS DRAWING IS INTENDED TO SHOW RELATIVE LOCATIONS AND CONFIGURATION OF THE STUDY AREA IN SUPPORT OF THIS REPORT.
4. ALL LOCATIONS, DIMENSIONS, AND ORIENTATIONS ARE APPROXIMATE.
5. ALL DATA IN NAD27 UTM ZONE 19.

No.	Date	Description	Drawn	Chk'd	App'd

LEGEND

- Study Area (40 x 40)
- Alpine Vegetated
- Black Spruce Lichen Forest
- Conifer Forest
- Conifer Scrub, Open Conifer Forest
- Exposed Earth, Anthropogenic
- Hardwood Forest, Mixedwood Forest
- Kalmia Lichen, Heathland, Rocky Barren
- Water
- Wetlands

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Rio Tinto
Iron Ore Company of Canada

PROJECT DESCRIPTION

2012 Ecological Land Classification
Baseline Survey

DRAWING TITLE

Regional Classification
Map 6

PROJECT NUMBER

TF1243033.2006

SCALE

0 1,100 2,200 Meters

DRAWN BY	APPROVED BY	REVIEWED BY
JA	LC	BP

FIGURE NO.	DATE	REV
1	November 2012	0