Kiggavik Project
Final Environmental Impact Statement

Tier 3 Technical Appendix 6B:
Vegetation and Soils Baseline

September 2014

History of Revisions

Revision Number	Date	Details of Revisions
01	December 2011	Initial release Draft Environmental Impact Statement (DEIS)
02	April 2012	Revised DEIS – to address comments received from the Nunavut Impact Review Board as part of their conformity determination released on January 18, 2012
03	September 2014	FINAL Environmental Impact Statement

Non-Technical Overview

Plant and soil resources provide habitat for wildlife. Geological history, lay of the land, weather patterns, and other factors result in the development of different soil types, and together all of these physical features create different plant communities. Plants are a food source for important species such as caribou and muskoxen, as well as for small mammals and birds. All of these wildlife species can be prey for larger predators such as wolves, bears and wolverines. Humans are a part of this food web. Local communities have traditional and modern-day uses for many plant species, and are still closely tied to caribou and many other mammals and birds supported by terrestrial habitat. The terrestrial habitat upon which wildlife populations and local communities depend must be well understood and documented because of its important role in the human and environmental setting.

By describing and mapping the terrestrial habitat in and around the Kiggavik Project, a better tool is created for monitoring development. Changes measured in habitat can sometimes help predict and avoid change or potential impact in the wildlife species using that habitat. If changes are observed or measured around the mine, the baseline habitat information will allow comparisons to the larger region to determine whether or not these changes are related to the mine project. If a particular habitat is of high value to caribou or other wildlife species, choices can be made in development plans to lessen or eliminate potential loss of this habitat type. Similarly, if sensitive plant or soil resources are known to be present, and their locations are known, then they can be protected during development. Measuring the amount of chemicals in plants and soils provides a tool for monitoring whether or not chemicals are entering the food chain after the project begins. All of these tools created from the baseline data on plants and soils will help monitor, manage and protect wildlife resources as the Project moves forward.

Table of Contents

List of Tables

List of Figures

Attachments

1 Introduction

1.1 Overview

AREVA Resources Canada Inc. (AREVA) has proposed a uranium mine project (the 'Kiggavik Project', or the Project) in the Kivalliq region of Nunavut, in the area around the community of Baker Lake (Figure 1.1-1 and 1.1-2). The Project proposal is for development of a uranium mine and mill complex within the Kiggavik and Sissons Lease areas, and includes open pits, an underground mine, mill facilities, access roads, and other supporting infrastructure. The Kiggavik and Sissons lease area is located approximately 80 km west of Baker Lake

The area around the Kiggavik and Sissons leases has been the subject of exploration and study since the late 1970s by various parties. Following initial feasibility and baseline studies, review of existing information, and the submission of a formal Project Proposal in 2008, AREVA initiated the procedural requirements towards completing the Environmental Impact Statement (EIS). Baseline investigations that began in 2007 in support of the Project Proposal were advanced in 2008, 2009 and 2010 in support of the DEIS.

The objective of this Vegetation and Soils Baseline Report (VSBR) is to provide applicable information on the existing vegetation and soil resources in the immediate and regional areas around AREVA's Kiggavik and Sissons leases, in support of the EIS. The baseline information will be used to assess effects of the Project on the terrestrial environment.

The VSBR summarizes all vegetation and soil data collected during field investigations from 2007 to 2010, and integrates information from historical studies completed in the 1970s and 1980s, as applicable. In doing so and wherever possible, the report presents the current situation for vegetation and soil resources for the local and regional area surrounding the Kiggavik Project. The information presented in this report also provides the basis for ranking wildlife habitat suitability, which is discussed in the Terrestrial Wildlife Baseline Report (see Technical Appendix 6B of this EIS).

This report is organized as follows:

- Section 1 – Introduction;
- Section 2 – Setting;
- Section 3 – Study areas;
- Section 4 – Methods and results for vegetation studies;
- Section 5 – Methods and results for soil studies;
- Section 6 – Summary of key baseline results;

- Section 7 – References cited;
- Section 8 – Glossary of terms; and
- Attachments, including a complete vegetation species list.

1.2 Purpose

The purpose of this baseline report is to describe the existing terrestrial vegetation and soil resources that may be affected directly or indirectly by the Project, to provide sufficient information to support the environmental assessment, prepare future resource mitigation and management plans, and develop measures for ongoing environmental monitoring of potential Project-related change.

1.3 Scope

In 2007, AREVA began comprehensive surveys to prepare for the environmental assessment and permitting process. The baseline program, which is also part of a long-term monitoring strategy, continued in 2008 through September 2010, and studies are ongoing. Baseline data collection targeted areas around proposed Project facilities (e.g., mine site, road alignments, etc.), and extended to the larger regional area (see Section 3). As outlined in Section 4 and 5, the baseline studies included map analysis, field studies, and review of historical data. Map analyses were completed prior to field surveys, which were completed from June to August, in 2008 and 2009. Field data were collected on terrain, soil types, plant species presence, and vegetative cover. Soil and plant tissues were also collected for metal and radionuclide analyses in 2007, 2008 and 2009.

Historical data were reviewed and included in the VSBR wherever they provided an additional level of detail to baseline survey data. Historical data were largely from previous feasibility and environmental assessment studies in support of a mine development project proposed by Urangesellschaft Canada Ltd. (from the 1970s through to the 1990s). All references are referred to in relevant sections of this report and are listed in Section 8.

Analysis of vegetation and soil baseline conditions focused on the identification and description of Ecological Land Classification (ELC) units to quantify the habitat types that occur within the study areas. The ELC units are the basis for the description of vegetation and soil characteristics, and habitat suitability for key wildlife resources (see Technical Appendix 6C).

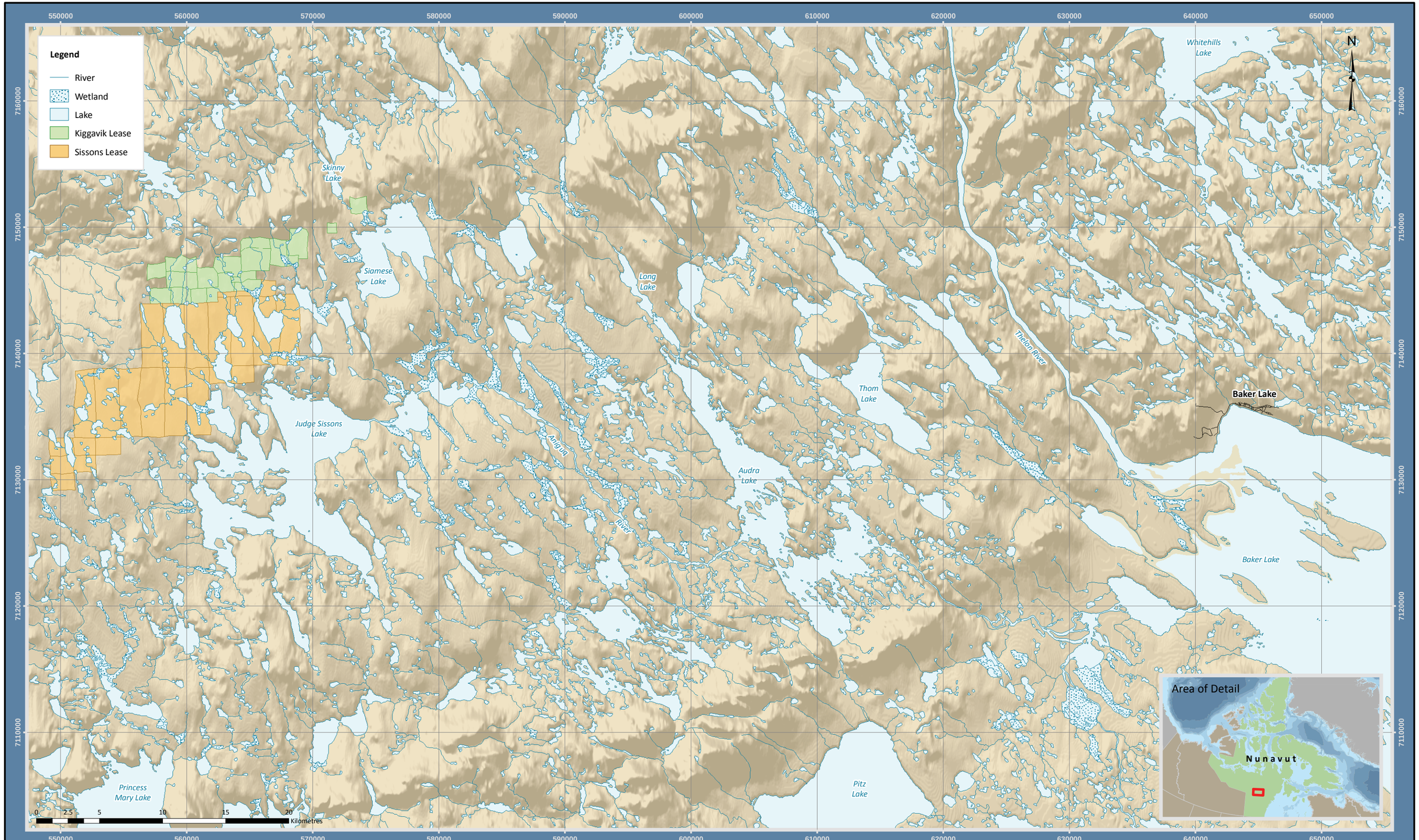
Projection: NAD 1983 UTM Zone 14N
Creator: Caslys Consulting Ltd.
Date: 1/13/2011 Scale: 1:16,000,000
File: 1.1-1_Project_Location_Figure
Data Sources: Natural Resources Canada, GeoBase®, National Topographic Database, Geological Survey of Canada, and Caslys Consulting Ltd.

FIGURE 1.1-1
PROJECT LOCATION MAP

KIGGAVIK PROJECT - EIS

Gebauer & Associates Environmental Consultants
Caslys Consulting
AREVA

AREVA Resources Canada Inc - P.O. Box 9204 - 817 - 45th Street West - Saskatoon, SK - S7K 3X5



Projection: NAD 1983 UTM Zone 14N
Creator: CASLYS CONSULTING LTD.
Date: 1/13/2011 Scale: 1:275,000
File: 1.1-2_Location_Kiggavik_Sissons_Lease_Areas.mxd
Data Sources: Natural Resources Canada, GeoBase®, National Topographic Database, AREVA Resources Canada Inc., and Gebauer & Associates.

FIGURE 1.1-2
LOCATION OF KIGGAVIK AND SISSONS LEASE AREAS

KIGGAVIK PROJECT - EIS

Gebauer & Associates ENVIRONMENTAL CONSULTANTS
CASLYS CONSULTING
AREVA

AREVA Resources Canada Inc - P.O. Box 9204 - 817 - 45th Street West - Saskatoon, SK - S7K 3X5

2 Setting

2.1 Terrestrial Biophysical Setting

The Kiggavik Project is situated in an area characterized by low, rolling hills with minimal topographic relief. Elevation ranges from approximately 130 to 170 m above sea level at lakeshores to 250 m on ridge crests north of Pointer Lake. The general topography of the project area is southern aspect sloping downwards towards Judge Sissons Lake.

Regional surficial geology is characterized by ground moraine and glaciofluvial deposits, and minimal organic/peat deposits, as well as exposed bedrock and water (Wickware 1990). In general, the area around the Kiggavik Project is characterized by a one to four metre thick layer of granular glacial till overlying bedrock, except in areas where till has eroded and bedrock is exposed. Near surface bedrock is observed to be shattered in some areas as a result of frost action and fractures are ice-filled (AREVA 2008). Most areas are covered predominantly in heath tundra vegetation interspersed with lichen-dominated bedrock outcroppings and boulder fields.

The regional biophysical setting can be further characterized according to the characteristics of the represented terrestrial ecoregions. The main ecoregions around the Kiggavik Project include (see Figure 2.1-1):

- Dubawnt Lake Plain/Upland Ecoregion;
- Back River Plain Ecoregion; and
- Maguse River Upland Ecoregion.

Typical characteristics of ecoregions are provided below for context, but details can be found in other documents (e.g., Wiken et al. 1987). A summary of existing biophysical conditions is also provided in the Kiggavik Project Proposal (AREVA 2008).

The Dubawnt Lake Plain/Upland Ecoregion, in which the Kiggavik Project is centred, is dominated by a low-lying, rolling plain comprised primarily of deep to shallow morainal deposits in elongated to fluted northwesterly trending ridges. Soils are young and slightly weathered, typically frost churned. Permafrost is continuous with a shallow depth of thaw (less than 100 cm). Rocky outcrops, wetlands and eskers are found infrequently. Dominant soils are Turbic and Static Cryosols developed on level to undulating, discontinuous veneers of sandy morainal and fluvioglacial deposits. The ecoregion has a nearly continuous cover of shrub tundra vegetation, consisting of dwarf birch (*Betula nana*), willow (*Salix* sp.), northern Labrador tea (*Rhododendron tomentosum*), avens (*Dryas* sp.), blueberry (*Vaccinium* sp.) and heath species. Tall dwarf birch, willow, and alder (*Alnus* sp.) occur on warm sites while willows, sedges, and moss dominate wet sites.

The Back River Plain Ecoregion, to the north of the Kiggavik Project, is dominated by level-to-hilly plains consisting primarily of deep to shallow morainal deposits. Many areas within the ecoregion are mantled by fine deposits of glaciomarine or glaciolacustrine origin. Soils are young and slightly weathered, typically frost churned. Permafrost is continuous with a shallow depth of thaw (less than 100 cm). Dominant soils are Turbic Cryosols developed on level to undulating, discontinuous veneers of sandy morainal and fluvioglacial material. Wetlands have Organic Cryosols. Back River Plain Ecoregion vegetation is generally characterized as a shrub tundra community, consisting of dwarf birch, willows, northern Labrador tea, avens, and blueberry. Well-drained upper slopes tend to have a discontinuous vegetative cover. Tall dwarf birch, willow, and alder occur on warm sites while wet sites are dominated by willow, moss, and sedge tussocks. Clumps of dwarf black (*Picea mariana*) and white spruce (*Picea glauca*) and tamarack (*Larix laricina*) occur at lower elevations along the Thelon River in the southwest portion.

The Maguse River Upland Ecoregion to the south is dominated by a gently rolling morainal plain, partly modified by marine submergence. The coastal portion consists of deep silt and sand deposits, whereas the inland portion is characterized by extensive areas of marine and alluvial deposits, which have been reworked by marine action. The ecoregion is characterized by broadly sloping lowlands and plateaus consisting of massive rock, glacial moraine and marine sediments. Soils are young, slightly weathered and frost-churned, and permafrost is continuous. Hummocky bedrock outcrops covered with discontinuous acidic, sandy, granitic tills are dominant. Prominent fluvioglacial ridges (eskers) also occur. Shrub tundra vegetation also characterizes this ecoregion with dwarf birch, willow, and alder occurring on warm, dry sites and willow, sphagnum moss (*Sphagnum* spp.), and sedge dominating poorly drained sites.

2.2 Human Setting

The Hamlet of Baker Lake, with a population of approximately 1,728 (Statistics Canada 2006, internet site), is the nearest community to the proposed Kiggavik Project (Figure 1.1-1). The community is situated on the northwest shore of Baker Lake near the mouth of the Thelon River. Baker Lake is Nunavut's only inland, non-marine Inuit community. Traditionally, the Inuit of this area were almost entirely dependent on caribou for subsistence, and moved seasonally with migrating caribou. It was not until the 1950s that the community along the shores of Baker Lake was permanently established.

Historically, the predominant human activity on the land around the Kiggavik Project was subsistence hunting and gathering. Hunting and trapping activity in this area has been described as relatively limited in the past (i.e., 1960s and 1970s), for reasons including distance from Baker Lake, absence of road access, and the relatively low abundance of target species (IDS 1978). Many Inuit in Baker Lake depend heavily on caribou for food, particularly since interest in 'southern foods' is still low and income levels limit food purchases from grocery stores (see Technical Appendix 9A of the EIS). Inuit Quajimajatuqangit (IQ) studies completed as part of the AREVA baseline program provide evidence

of historical and present day hunting, trapping, and gathering activities around the Kiggavik Project and in the area between the Project and Baker Lake. Residents of coastal communities such as Chesterfield Inlet are also known to travel to the Baker Lake area for hunting opportunities. Caribou is the most important wildlife species for local communities, both traditionally and presently. Important caribou hunting areas occur throughout the region. Other species harvested and used include fox, wolf, muskox, and various waterfowl, birds and eggs. All of these species depend directly on the terrestrial habitat, namely the vegetation and soil resources. Various plant species have also been identified as having historical and present day human uses, including plants used for medicine, bedding, fire starting, and as food sources, particularly edible berries.

Industrial land use in the region has focused on mining and exploration activities. The first mine in Kivalliq, the North Rankin Nickel Mine, operated from the 1950s until its closure in 1962. Uranium exploration in the area around the Kiggavik Project began in the 1970s. Currently, only one active mine is operating in the Kivalliq region, the Agnico-Eagle Mines Ltd. (AEM) Meadowbank Project located 75 km north of Baker Lake, which began operations in early 2010. The only other mines nearby are not currently active; the Doris North Gold Project located approximately 580 km northwest of the Kiggavik Project, the Tahera Jericho mine located approximately 670 km away, and the Cullaton Lake/Shear Lake Gold Mine located approximately 360 km southwest of Baker Lake. However, in 2008, 45 active exploration projects, which were focused on uranium, gold, nickel and diamonds, were recorded in the Kivalliq region (Nunavut Geoscience 2010, internet site).