Kiggavik Project
Final Environmental Impact Statement

Tier 1 Volume 1:
Main Document

September 2014

APPROVAL FOR USE

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History of Revisions

	Date	Details of Revisions
	December 2011	Initial release Draft Environmental Impact Statement (DEIS)
	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
	September 2014	FINAL Environmental Impact Statement

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Project Fact Sheet

Location	• Kivalliq Region of Nunavut, approximately 80 km west of Baker Lake. • The Project includes two sites: Kiggavik and Sissons (collectively called the Kiggavik Project). • The Kiggavik site is located at approximately 64°26'36.14"N and 97°38'16.27"W. • The Sissons site is located approximately 17 km southwest of Kiggavik at 64°20'17.61"N and 97°53'14.03"W. • The Kiggavik and Sissons sites are composed of 37 mineral leases, covering 45,639 acres.
Resources	• The total quantity of resources is currently estimated at approximately 51,000 tonnes uranium (133 million lbs U3O8) at an average grade of 0.46% uranium.
Life of Mine	• Approximately 12 years of production, based on studies to date. It is anticipated that pre-operational construction will require three years while remaining post-operational decommissioning activities will require five years. • Date of Project construction will be influenced by favorable market conditions, completion of detailed engineering, and successful completion of licensing and other Project approvals.
Mining	• There are five individual mines proposed for the Project: East Zone, Center Zone and Main Zone at the Kiggavik site; End Grid and Andrew Lake at the Sissons site. • The three Kiggavik deposits and the Andrew Lake deposit will be mined by truck-shovel open pit, while End Grid will be an underground mine.
Mine Rock	• Mine rock will be segregated into material suitable for use in construction (Type 1), non-acid generating (Type 2), and potentially problematic material (Type 3). • Type 1, Type 2 and Type 3 rock will be managed in surface stockpiles during operation. • Upon completion of mining, Type 3 mine rock will be backfilled into mined-out pits.
Mill	• The ore will be processed in a mill at the Kiggavik site to produce 3,200 to 3,800 tonnes uranium (8.3 to 9.9 million lbs U3O8) per year as a uranium concentrate, commonly referred to as yellowcake.
Tailings	• The mill tailings will be managed at in-pit tailings management facilities constructed using the mined-out East Zone, Centre Zone and Main Zone open pits at the Kiggavik site. • Administrative and action levels will be used to control and optimize tailings preparation performance for key parameters.
Water Management	• A purpose-built-pit will be constructed at the Kiggavik site to optimize water management, storage, and recycling. • All mill effluent, tailings reclaim, and site drainage will be treated prior to discharge to meet the Metals Mining Effluent Regulations and site-specific derived effluent release targets. • Administrative and action levels will be used to control and optimize water treatment plant performance for key elements.
Site Infrastructure	• Power will be supplied by on-site diesel generators. • The operation will be fly-in/fly-out on a 7 to 14 day schedule with on-site employees housed in a permanent accommodations complex.
Access	• Access to the site will be provided by a winter road between Baker Lake and Kiggavik. An all-season road is assessed as an option should the winter road be unable to adequately support the Project. Supplies will be shipped to a dock facility at Baker Lake during the summer barge season and trucked to Kiggavik via the road. • An airstrip will be constructed and operated at site for transportation of personnel and yellowcake.
Environment	• Site-specific environmental studies have been on-going since 2007. • Public engagement and collection of Inuit Qaujimajatuqangit has been on-going since 2006; this information is integrated into the environmental effects assessment reports. • AREVA's approach has been to integrate environmental assessment and decommissioning requirements into the Project design cycle to enhance mitigation of effects by design and to support the development of management, mitigation, and contingency plans to protect the environment.
Benefits	• AREVA is negotiating an Inuit Impact Benefit Agreement with the Kivalliq Inuit Association. • The total taxes and royalties to be paid on the Kiggavik project would be approximately $1 billion, payable to Nunavut Tunngavik Inc., Government of Nunavut, and Government of Canada. • The Project is expected to employ up to 750 people during construction and 400 to 600 people during operation.

Foreword

The enclosed document forms part of the Kiggavik Project Final Environmental Impact Statement (FEIS) submission, presenting potential environmental and social impacts to determine if the Project should proceed and if so, under what terms and conditions. The submission has been prepared for the Nunavut Impact Review Board by AREVA Resources Canada Inc. to fulfill the requirements of the “Guidelines for the Preparation of an Environmental Impact Statement for AREVA Resources Canada Inc.’s Kiggavik Project (NIRB File No. 09MN003)”, to include new material or clarity provided during the review of the Draft Environmental Impact Statement, and to address company commitments and direction from the Nunavut Impact Review Board as outlined in the “Preliminary Hearing Conference Decision Concerning the Kiggavik Project (NIRB File No. 09MN003)”.

The FEIS submission consists of a number of documents, as shown in the attached road map. These documents have been categorized into tiers, as follows:

- **Tier 1** document (Volume 1) provides a plain language summary of the Final Environmental Impact Statement.

- **Tier 2** documents (Volumes 2 to 10) contain technical information and provide the details of the assessments of potential Project environmental effects for each environmental compartment. Tier 2 Volume 11 contains executive, popular, and volume summaries in Inuktitut.

- The Tier 2 documents each have a number of technical appendices, which comprise the **Tier 3** supporting documents. These include the environmental baseline reports, design reports, modelling reports and details of other studies undertaken to support the assessments of environmental effects. Management plans are provided as Tier 3 documents.

Volume 1
Main Document

Volume 2
Project Description and Assessment Basis

- Governance and Regulatory Oversight
- Project Description
- Assessment Basis

2A Alternatives Assessment
2B Drilling and Blasting Design
2C Explosives Management Plan
2D Design of Ore and Mine Rock Pads and Ponds
2E Water Diversion and Collection Design
2F Design of Andrew Lake Dewatering Structure
2G Kiggavik-Sissons Road Report
2H Ore Storage Management Plan
2I Water Management Plan
2J Marine Transportation
2K Winter Road Report
2L All-Season Road Report
2M Roads Management Plan
2N Borrow Pits and Quarry Management Plan
2O Mine Site Airstrip Report
2P Occupational Health and Safety Plan
2Q Radiation Protection Plan
2R Preliminary Decommissioning Plan
2S Waste Management Plan
2T Environmental Management Plan
2U Hazardous Materials Management Plan
2V Mine Geotechnical Reports

Volume 3
Public Engagement and Inuit Qaujimajatuqangit

Part 1
- Public Engagement

Part 2
- Inuit Qaujimajatuqangit

3A Public Engagement Documentation
3B Inuit Qaujimajatuqngit Documentation
3C Community Involvement Plan

Volume 4
Atmospheric Environment

Part 1
- Air Quality and Climate Change

Part 2
- Noise and Vibration

4A Climate Baseline
4B Air Dispersion Assessment
4C Air Quality Monitoring Plan
4D Baker Lake Long-Term Climate Scenario
4E Noise and Vibration Assessment
4F Noise Abatement Plan

Volume 5
Aquatic Environment

- Surface Hydrology
- Hydrogeology
- Water and Sediment Quality
- Aquatic Organisms
- Fish and Fish Habitat

5A Hydrology Baseline
5B Geology and Hydrogeology Baseline
5C Aquatics Baseline
5D Groundwater Flow Model
5E Prediction of Water Inflows to Kiggavik Project Mines
5F Mine Rock Characterization and Management
5G Thermal and Water Transport Modelling for the Waste Rock Piles and Tailings Management Facilities
5H Waste Rock Water Balance
5I Hydrology of Waste Rock Piles in Cold Climates
5J Tailings Characterization and Management
5K Historical and Climate Change Water Balance
5L Kiggavik Conceptual Fisheries Offsetting Plan
5M Aquatics Effects Monitoring Plan
5N Hydrology Assessments
5O Sediment and Erosion Control Plan
5P Technical Assessments of Water Withdrawal Locations and Baker Lake Dock Site

Volume 6
Terrestrial Environment

- Terrain
- Soils
- Vegetation
- Terrestrial Wildlife

6A Surficial Geology and Terrain Baseline
6B Vegetation and Soils Baseline
6C Wildlife Baseline
6D Wildlife Mitigation and Monitoring Plan

Volume 7
Marine Environment

- Marine Water and Sediment Quality
- Marine Mammals
- Marine Fish

7A Marine Environment Baseline
7B Underwater Acoustic Modelling

Volume 8
Human Health

- Occupational Dose Assessments
- Human Health Risk Assessment

8A Ecological and Human Health Risk Assessment
8B Radiation Protection Supporting Document

Volume 9
Socio-Economic Environment and Community

Part 1
- Socio-Economic Environment

Part 2
- Heritage Resources

9A Socio-Economic Baseline
9B Archaeology Baseline
9C Human Resources Development Plan
9D Archaeological Resource Management Plan

Volume 10
Accidents, Malfunctions and Effects of the Environment on the Project

- Risk Assessments
- Effects of the Environment on the Project

10A Transportation Risk Assessment
10B Spill Contingency and Landfarm Management Plan
10C Emergency Response Plan

Volume 11
Executive, Popular and Volume Summaries Translated into Inuktitut

KEY:

Tier 1 Document
Main Documents

Tier 2 Document
Environmental Effects Assessment Report

Tier 3 Document
Technical Appendices, Baseline Reports, Technical Development and Management Plans

Executive Summary

AREVA Resources Canada Inc. (AREVA) is proposing to construct, operate and decommission a uranium mine, called the Kiggavik Project (Project), in the Kivalliq Region of Nunavut. The Project is located approximately 80 km west of the community of Baker Lake. Four uranium ore deposits will be mined using open pit methods and one deposit will be mined using underground methods. All extracted ore from the mine sites will be processed through a mill. Some of the mined out pits will be used as tailings management facilities. The uranium product will then be packaged and transported using aircraft to southern transportation networks. The Project will be serviced by ship and barge and a winter access road. An all-season road between Baker Lake and the Project is a secondary option under consideration in case the winter road cannot adequately support the Project.

Based on existing resources mine life is estimated at 14 years of operation with additional years for construction and decommissioning. Decommissioning plans and financial security are required for the Project. Financial assurance provides certainty that decommissioning and reclamation work will take place with available and adequate resources.

Direct job estimates are up to 750 and 600 workers for construction and operations stages, respectively. Indirect and induced jobs may be as high as 400 during construction and 1,300 during operations. The total taxes and royalties to be paid on the Project would be approximately $1 billion payable to Nunavut Tunngavik Inc., the Government of Nunavut, and the Government of Canada.

The final environmental impact statement (EIS) reflects six years of recent engineering, environmental and engagement studies by AREVA, in addition to historical work conducted for the Project. Community engagement and Inuit Qaujimajatuqangit (IQ) have influenced Project design and the environmental assessment.

Understanding caribou were of primary concern to residents in the Kivalliq, AREVA used IQ and engagement information to modify baseline studies and has worked collaboratively with other interested stakeholders to better understand caribou at the herd and regional levels. AREVA will continue working collaboratively on caribou issues during the environmental assessment and when the Project proceeds.

Hearing public concerns that Nunavut experiences extreme winds and permafrost conditions, the Project has been designed to capitalize on the modern Saskatchewan uranium mining experience but still be Nunavut specific. AREVA conducted detailed assessments on air quality and permafrost conditions and incorporated the findings into the project design.

Public concern over uranium development led to increased engagement efforts to inform communities of the industry and radiation protection. Detailed studies on health, using comparisons to international standards, demonstrates that modern uranium development does not compromise worker or public safety.

Valuing community preferences, AREVA has removed an earlier contemplated access road alternative (south all-season access road) from consideration in Project development moving forward.

The need and desire for increased employment opportunities was consistently raised in AREVA meetings, particularly during open houses. AREVA works hard to maximize its Aboriginal employment in Saskatchewan operations and hopes to improve on its performance for this Project.

The EIS concludes that the Project will have effects but there will be no significant adverse Project, cumulative or transboundary effects on the biophysical environment. Ecosystem integrity is not compromised. Worker and public health are also not compromised. Socioeconomic effects are positive overall and many benefits will last beyond Project life.

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ᐊᕇᕙᒃᑯᑦ ᐱᓪᓕᕆᔪᓪᓕᕆᔨᑦ ᑳᓇᑕᒥ ᐊᕿᓯᐃᔪᒪᔪᑦ ᑲᓐᑐᖅᑕᐅᔪᒃᓴᒥᒃ, ᐱᓕᕆᐊᖑᓗᓃ ᐊᒪᓘ ᐅᑯᐊᖅᓯᕙᓪᓕᐊᑦᔪᑕᐅᓇᔭᖅᑐᓃᒃ ᔪᕇᓂᐊᒻ ᐅᔭᕋᑕᕆᐊᒍᔪᒧᑦ, ᑕᐃᔭᐅᔪᖅ ᑭᒃᒐᕕᒃ ᐱᓕᕆᐊᖑᔪᒪᔪᖅ (ᐃᓕᕆᐊᖑᔪᒪᔪᖅ) ᑕᒪᓃ ᑭᕙᓪᓕᕐᒥ ᓄᓇᕗᒥ. ᑕᑉᓇ ᐱᓕᕆᐊᖑᔪᒪᔪᖅ ᑕᒪᓃᑐᑦ ᐃᒪᓇᓪᓗᐊᖅ ᐅᖓᓯᒃᓂᖅᑐᖅ 80 ᑭᓛᒥᑐᔅ ᓄᓇᓕᕐᓂᑦ ᖃᒪᓂᑐᐊᖅᒥᑦ. ᓯᑕᒪᑦ ᔪᕆᓂᐊᒻ ᐅᔭᕋᑕᕆᐊᖅᑕᐅᓂᐊᖅᑐᑦ ᓄᓇᐅᑉ ᖃᖓᒍᑦ ᐅᔭᕋᑕᕆᐊᖅᑕᐅᓗᑎᒃ ᐊᑕᐅᓯᖅ ᐅᔭᕋᑕᕆᐊᖅᑕᐅᓂᐊᖅᑐᖅ ᐊᑦᓯᒃᑐᑯᑦ. ᑕᒪᕐᒥᒃ ᑕᒪᑯᐊ ᐅᔭᕋᐃᑦ ᐅᔭᕋᑕᕆᐊᖅᑕᐅᕙᓕᐊᔪᑦ ᓯᖃᓕᑎᕆᕕᑯᑦ ᐱᓕᕆᐊᖑᕙᓕᐊᓗᑎᒃ. ᐃᓚᖏᑦ ᑕᒪᑯᐊ ᐅᔭᕋᑕᕆᐊᖅᕕᐅᔪᑦ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᑦ ᑕᒪᑐᒧᖓ ᐊᑐᕈᓂᖅᐸᓕᐊᔪᒧᑦ ᓴᓪᓗᒪᓴᐅᒧᑦ ᑲᑎᖅᓱᐃᕕᐅᓗᑎᒃ ᑕᒫ ᔪᕇᓂᐊᒻᖑᔪᖅ ᐳᖅᑐᖅᑕᐅᓗᓂ ᐊᐅᓚᖅᑎᑕᐅᕙᓕᐊᑕᕐᑐᓂ ᑎᒃᒥᓱᑯᑦ ᖃᑉᓗᓈᑦ ᓄᓇᖓᓄᑦ. ᑕᒪᓇᓘ ᐅᔭᕋᑕᕆᐊᖅᕕᐅᔪᖅ ᐊᒃᔪᒃᑐᐃᕕᐅᒪᖅᐸᒃᓂᐊᖅᑐᖅ ᐅᒥᐊᖅᔪᑯᑦ ᐊᒪᓘ ᓯᑲᐅᕐᑯᑦ ᐊᒪᓘ ᐅᑭᐅᑯᑦ ᐊᑉᕐᑯᑎᑯᑦ. ᐅᑭᐅᓗᒃᑕᖅ ᐊᑐᕋᔭᕐᑐᒥᒃ ᐊᑉᑯᕐᓯᐅᓯᒪᓂᐊᖅᑐᖅ ᖃᒪᓂᑐᐊᖅᒥᑦ ᑭᒃᒐᕕᒃᒧᑦ. ᑕᒫ ᐃᓯᒪᓐᖏᔭᐅᓯᒪᔪᓄᑦ ᑐᒃᓕᕆᔭᐅᔪᖅ ᐊᑐᖅᑕᐅᓇᔭᕐᓂᖓ ᑕᒪᓇ ᐅᑭᐅᑯᑦ ᐊᑉᓯᐅᖅᓯᒪᔪᖅ ᓇᒪᓂᒃᑕᓚᒥᓂᖅᐸᑦ ᑕᒪᑐᖓ ᐱᓕᕆᐊᖑᔪᒪᔪᒧᑦ.

ᑕᒻᒪᒃᑯᓄᖓ ᒪᓇᐅᔪᖅ ᐊᑐᕈᓇᖅᑐᓄᑦ ᐅᕙᑕᕆᐊᖑᓇᔭᖅᑐᖅ ᐊᑯᓂᐅᑎᒋᓗᐊᖅᑐᒥᒃ ᑕᒪᓃ ᕐᑯᓪᓖᓗ ᓯᑕᒪᑦᑐᓂᒃ ᐅᑭᐅᓂᒃ ᐱᓕᕆᐊᖑᓇᔭᖅᑐᖅ ᐃᓚᖃᕋᔭᖅᑐᖅ ᐅᑭᐅᓂᒃ ᓴᓇᕙᓕᐊᓂᐅᔪᒧᑦ ᐊᒪᓘ ᐅᑯᐊᖅᓯᕙᓕᐊᓂᐅᔪᓄᑦ. ᐅᑯᐊᖅᓯᕙᓕᐊᓂᖅᒧᑦ ᐊᕿᓯᒪᓂᖏᑦ ᐊᒪᓘ ᑭᓇᐅᔭᑎᒍᑦ ᐱᔭᕆᐊᖃᓂᑦ ᑕᒪᑐᒧᖓ ᑭᒃᒐᕕᒧᑦ ᐱᓕᕆᐊᖑᔪᒪᔪᒧᑦ. ᑭᓇᐅᔭᑎᓐᒍᑦ ᐃᑲᔪᕈᑕᐅᓇᔭᖅᑐᑦ ᑕᒪᑐᒧᖓ ᐅᑯᐊᖅᓯᕙᓕᐊᓂᖅᒧᑦ ᐊᒪᓗ ᐊᕿᓯᐃᓂᖅᒧᑦ ᐱᓕᕆᐊᖑᔪᒪᖅᑐᓄᑦ ᑕᒪᑯᓂᖓ ᐊᑐᐃᓇᐅᑎᑦᓯᓗᑎᒃ ᐊᑐᕆᐊᖅᑐᓂᒃ.

ᐱᓕᕆᐊᒃᓴᐅᓇᔭᖅᑐᑦ ᐃᓯᒪᓐᖏᔭᐅᓯᒪᕗᑦ ᑕᒪᓂᑦᓘᐊᖅ 750 ᐊᒪᓘ 600 ᐱᓕᕆᓇᔭᖅᑐᑦ ᑕᒪᑐᒧᖓ ᓴᓇᕙᓕᐊᑎᑦᑐᒥᑦ ᐊᒪᓘ ᐱᓕᕆᒪᕆᕐᓕᒃᑎᑦᑐᓐᒥᑦ. ᑕᒪᑯᓄᖓ ᐱᓕᕆᓂᐅᓇᔭᖅᑐᑦᑕᐅᖅ ᐃᒪᓇᓗᐊᖅ ᐊᒥᓱᑎᖏᓇᔭᖅᑐᑦ 400 ᓴᓇᕙᓕᐊᓂᖕᒥᓃ ᐊᒪᓘ 1,300 ᐱᓕᕆᓇᔭᖅᑐᑦ ᐱᓕᕆᒪᕆᓕᖅᐸᑕ. ᑕᒪᒃᑯᐊ ᐊᑭᓕᐅᑕᐅᓇᔭᖅᑐᑦ ᑕᒃᓯᔭᕐᓂᑯᑦ ᐊᓯᖏᑎᒍᓗ ᑕᒪᑐᒧᖓ ᑭᒃᒐᕕᒃ ᐱᓕᕆᐊᖑᔪᒪᔪᒧᑦ ᑕᒪᓂᑦᑐᖓᖅ 1 ᐱᓪᓖᔭᓐᑕᓚᔅ ᐊᑭᓕᐅᑕᐅᓇᔭᖅᑐᑦ ᑕᑉᑯᓄᖓ ᓄᓇᕗᑦ ᑐᖓᕕᑯᑦᓄᑦ. ᓄᓇᕗᑦ ᑲᕙᒪᖏᓄᑦ ᐊᒪᓘ ᑳᓇᑕᐅᑉ ᑲᕙᒪᑯᖏᓄᑦ.

ᑕᒫ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᐊᒃᑐᐃᓂᖃᓂᐅᓇᔭᖅᑐᒧᑦ ᓇᓗᓇᐃᔭᕐᓯᒪᓂᖅ ᐅᒃᑎᖃᓗᓂ ᐅᑭᐅᓄᑦ ᑕᑦᓕᒪᓄᑦ ᑕᒪᑯᓄᖓ ᐱᓕᕆᐊᖑᓯᒪᓕᖅᑐᓄᑦ ᐊᕙᑎᓕᕆᓂᑯᑦ ᐊᒪᓗ ᐃᓚᐅᑎᑦᓯᑕᖅᓂᑯᑦ ᖃᐅᔨᓴᖅᓂᑯᑦ ᑕᒻᑯᓄᖓ ᐊᕆᕙᑯᓄᑦ, ᐊᒪᓗ ᐱᓕᕆᐊᖑᓂᑯᓄᑦ ᖃᖕᖓᓴᖅᓂᑕᓕᕆᓂᑯᑦ ᑕᒪᑐᒧᖓ ᐱᓕᕆᐊᖑᔪᒪᔪᒧᑦ ᐱᓕᕆᐊᖑᓂᑯᑦ. ᓄᓇᓕᒃᓂᒃ ᐃᓚᐅᖃᑕᖅᑎᑦᓯᓂᖅ ᐊᒪᓘ ᐃᓄᐃᑦ ᖃᐅᔨᒪᔭᑐᖃᖕᒪᑦ ᑕᒪᑯᓄᖓ ᐊᑐᖅᓂᖃᓯᒪᔪᖅ ᐱᓕᕆᐊᖑᔪᒪᔪᑉ ᖃᓄᐃᑐᓇᔭᖅᓂᖓᓘ ᐊᒪᓘ ᑕᒫ ᐊᕙᑎᓕᕆᓂᑯᑦ ᖃᐅᔨᓴᖅᓂᑯᑦ.

ᑐᑭᓯᐅᒪᑦᓯᐊᖅᓂᖅ ᑕᒪᑯᓂᖓ ᑐᒃᑐᓂᒃ ᐱᔭᕆᐊᖃᓂᐸᒍᖃᑕᐅᓯᒪᔪᖅ ᐃᓯᒪᓗᒍᑕᐅᓂᒥᓄᑦ ᑕᒪᑯᓇᖕᒪᑦ ᐃᓄᒃᓂᑦ ᑕᒪᓂ ᑭᕙᓪᓕᕐᒥ, ᐊᕆᕙ ᐊᑐᖅᓚᐅᖅᐳᑦ ᑕᒪᑐᒥᖓ ᐃᓄᐃᑦ ᖃᐅᔨᒪᔭᑐᖃᖓᓂᒃ ᐊᒪᓗ ᐃᓚᐅᑎᑦᓯᓂᑲᓗᑎᒃ ᑐᓴᐸᓕᕈᑕᐅᔪᒃᓴᓄᑦ ᑕᒪᑯᓄᖓ ᐊᑐᒐᓴᐅᓴᖅᑐᓄᑦ ᐃᑲᔪᕈᑕᐅᓂᖏ. ᐊᕇᕙᒃᑯᑦ ᐱᓕᕆᖃᑎᖃᓯᒪᔪᑦ ᐊᓯᖏᓄᑦ ᐅᑦᕈᓇᔭᖃᓯᐊᖅᑐᓄᑦ ᑕᒪᑯᓂᖓ ᑐᒃᑐᓂᒃ ᑕᒪᓇ ᑐᑭᓯᐸᓕᓯᐊᕈᒪᓪᓗᖕᒍ ᑐᒃᑐᓄᑦ ᐊᒥᓴᓄᑦ ᓄᓇᓕᒃᓂᓗ ᐊᕿᓯᐃᓃᑦ ᑕᒪᑯᐊ ᑲᔪᓯᓇᖅᓂᐊᖅᑐᑦ ᐱᓕᕆᖃᑎᒥᒃᓂᑦ ᑕᒪᑯᓄᖓ ᑐᒃᑐᓄᑦ.

ᑐᓴᕋᓯᐊᓂᑯᑦ ᐃᓄᒃᓂᑦ ᐃᓯᒪᓗᒍᑎᒋᔭᐅᔪᓂᒃ ᑕᒫ ᓄᓇᕗᑦ ᖃᐅᔨᓯᒪᔭᒥᓂᒃ ᑕᒪᑯᐊ ᐊᓄᓇᖅᓗᐊᔪᓂᖅ ᑕᒪᓇᓘ ᓄᓇᐅᑉ ᐊᑕᓃ ᕿᕿᓂᖅ ᖃᓄᐃᐸᓕᐊᓂᖓᓄᑦ ᐊᒪᓘ ᑕᒻᓇ ᑭᒃᒐᕕᒃ ᐱᓕᕆᐊᖑᔪᒪᔪᖅ ᐊᕿᓯᒪᔭᕆᐊᖃᓂᖓ ᑕᒪᑐᒧᖓ ᑕᐃᑲᓂ ᓴᔅᑲᑦᓯᕗᐊᓐᒥ ᔪᕇᓂᐊᒻ ᐅᔭᕋᑕᕆᐊᖅᑕᐅᔪᑉ ᖃᐅᔨᓯᒪᓕᖅᑕᖏᓂᒃ ᑭᓯᐊᓂ ᑕᒪᑐᒧᖓ ᓄᓇᕗᑦ ᐊᕿᓯᒪᓗᖏᑦ. ᐊᕇᕙᒃᑯᑦ ᖃᐅᔨᓴᓂᖃᓚᐅᖅᐳᑦ ᑕᒪᑐᒥᖓ ᓯᓛᑯᑦ ᐊᓂᖅᑐᕐᐸᑕᑉᑎᒃᓂᒃ ᐊᒪᓘ ᑕᒪᑐᒥᖓ ᓄᓇᐅᑉ ᐊᑕᓐᓃ ᕿᕿᓂᐅᔪᒥᒃ.

ᐃᓄᒃᓄᑦ ᐃᓱᒪᓗᒍᑕᐅᔪᖅ ᑕᒪᑐᒧᖓ ᔪᓈᓂᐊᒻ ᐱᕙᓕᐊᓂᒃᓴᖓᓄᑦ ᐱᔭᓇᕐᑎᑦᓯᕙᓕᓚᐅᖅᐳᑦ ᑕᒪᑐᒥᖓ ᐃᓚᐅᖅᑲᑕᐅᑎᑦᓯᑕᖅᓂᕐᒥᒃ ᑕᒪᒃᑯᐊ ᓄᓇᓕᐅᔪᑦ ᑐᓴᖅᑎᑕᐅᕙᓕᕐᑯᑉᓗᖏᑦ ᑕᒪᑯᓂᖓ ᐱᓕᕆᓂᐅᓇᔭᖅᑐᓂᒃ ᐱᓕᕆᐊᖑᓇᔭᖅᑐᓂᒃ. ᖃᐅᔨᓴᕐᑕᐅᓂᑯᑦ ᑕᒪᑐᒧᖓ ᐊᓐᓂᐊᖅᑲᓇᖏᑐᓕᕆᓂᕐᒧᑦ, ᑕᒪᑯᓂᖓ ᐊᑐᖅᓘᑎᒃ ᓯᖅᔪᐊᓗᒃᑕᒥ ᐊᑐᖅᑕᐅᔪᓂᒃ, ᖃᐅᔨᑎᑦᓯᔪᑕᐅᓚᐅᖅᐳᖅ ᑕᒪ ᔪᓇᓂᐊᒻ ᐱᕙᓕᐊᓂᐅᓇᔭᖅᑐᖅ ᐅᓗᕆᐊᓇᖅᑐᖅᑲᑎᑦᓇᔭᕆᑐᖅ ᐱᓕᕆᔨᐅᔪᓄᑦ ᑭᓇᑯᐃᓇᖅᓄᑦᓗ ᐊᕿᐅᒪᑎᑦᓯᓂᑯᑦ.

ᐅᐱᒍᓱᓐᓂᒃᑯᑦ ᓄᓇᓕᒃᓄᑦ ᐱᓴᓯᐊᖅᑕᐅᓂᑯᑦ, ᐊᓅᕙᒃᑯᑦ ᐱᕐᓯᓚᐅᖅᐳᑦ ᑕᒪᑯᐊ ᐊᑉᑯᕐᓯᐅᖅᑕᐅᔪᒪᔪᑉ ᐃᓚᖕᒐᓂᒃ ᐃᓱᒪᖕᒋᔭᐅᓯᒪᔪᒥᒃ (ᑭᕙᒧᐊᑐᖅ ᐅᑭᐅᓗᒃᑕᖅ ᐊᑐᕋᔭᑐᖅ ᐊᑉᕐᑯᑦ) ᑕᒪᑯᓇᖕᒐᑦ ᐃᓱᒪᖕᒋᔭᐅᓯᒪᔪᓂᑦ. ᑕᒫ ᐱᓕᕆᐊᖑᔪᒪᒧᖅ ᑲᔪᓯᕙᓕᐊᓂᖅᑲᓂᖕᒐᓄᑦ.

ᑕᒫ ᐱᔭᕆᐊᖅᑲᓂᖅ ᐊᒪᓘ ᐱᔭᐅᔪᒪᓂᖅᑲᖅᑐᖅ ᐱᑕᖅᑲᐸᓕᕆᐊᖅᑲᓂᖕᒐ ᑕᒪᑯᓂᖕᒐ ᐱᓕᕆᐊᒃᓴᓂᒃ ᐅᖃᐅᓯᖅᑲᑕᐅᓚᔪᓚᐅᖅᑐᖅ ᑕᒪᑯᓇᓃ ᐊᓅᕙᒃᑯᑦ ᑲᑎᒪᑎᑦᓯᓂᖅᑫᖕᒐᑕ. ᐱᓪᓗᐊᖅᑐᒥᒃᓘ ᑕᒪᑯᓇᓃ ᐅᑯᐃᖕᒐᑎᑦᓯᓂᐅᔪᓃ. ᐊᓅᕙᒃᑯᑦ ᐱᓕᕆᐊᖅᑲᓯᐊᓂᖅᐸᖕᒍᓯᒪᔪᑦ ᑕᒪᑯᓂᖕᒐ ᓄᓇᖅᑲᖅᑐᓂᒃ ᐱᓕᕆᐊᒃᓴᖅᑲᑎᑦᓯᓂᖅᒥᒃ ᑕᐃᑲᓂ ᓴᓪᑲᑦᓱᖃᐊᖕᒥ ᐱᓕᕆᕕᖕᒋᔭᐅᔪᒥ ᑕᒪᓐᑕᐅᖅ ᑕᐃᒪᓇᐃᑎᑕᐅᔪᒪᒧᖅ ᑕᒪᑐᒧᖓ ᑭᒃᑲᕕᒥ ᐱᓕᕆᐊᖑᔪᒪᔪᒧᑦ.

ᑕᒫ ᑭᒃᑲᕕᒃ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᑎᑎᖅᑫᑕᐅᓯᒪᔪᖅ ᐱᐊᓂᕆᐊᕈᑎᖅᑲᓚᐅᖅᐳᑦ ᑕᒫ ᐱᓕᕆᐊᖑᔪᒪᔪᖅ ᐊᒃᑐᐃᓂᖅᑲᓂᐊᖅᓂᖕᒐᓂᒃ ᑭᓯᐊᓂ ᐊᖕᒋᔪᒥ ᐱᑕᖅᑲᖅᑫᔭᕆᑐᖅ ᑕᒪᑐᒪᖕᒐᑦ ᐱᓕᕆᐊᖑᔪᒪᔪᒥᑦ,ᑕᒪᑯᓄᖕᒐ ᐊᐅᓚᕙᓕᐊᓂᐅᔪᓄᑦ ᐱᓕᕆᕙᓕᐊᓂᐅᔪᓄᑦ ᐊᒃᑐᐃᓂᖅᑲᓂᐅᓇᔭᖅᓂᖕᒐ ᑕᒪᑐᒧᖓ ᐊᕙᑎᓕᕆᓂᑯᑦ ᑕᒪᑯᐊ ᐅᓗᕆᐊᓇᑐᖅᑲᓕᖅᑐᑦ.ᐱᓕᕆᔨᐅᔪᒧᑦ ᐊᒪᓗ ᑭᓈᑯᐃᓇᐃᑦ ᐊᓐᓂᐊᖅᑲᓕᖅᑐᓕᕆᓂᑯᑦ ᐅᓗᕆᐊᓇᖅᑐᖅᑲᖕᒋᖅᑐᑦ. ᐃᓅᓯᓕᕆᓃᖅᑯ ᐱᔭᓕᐊᓂᓕᕆᓂᑯᑦ ᐊᒃᑐᐃᓂᖅᑲᓂᖅ ᑕᒪᐃᓄᑦ ᓇᓗᓇᖕᒋᖅᑐᖅ ᐊᒥᓱᓂᒃᓗ ᐃᑲᔪᖅᑕᐅᓂᖅᑲᓂᐊᖅᑐᑦ ᑕᒪᑎᒃᒍᓇᖅ ᑕᒫ ᐱᓕᕆᐊᖑᔪᒪᔪᖅ ᐱᐊᓂᒃᑲᓗᖅᑎᑦᓗᒍ.

Popular Summary

AREVA Resources Canada Inc. (AREVA) is proposing to construct, operate and decommission a uranium mine, called the Kiggavik Project (Project), in the Kivalliq Region of Nunavut. The development of the Kiggavik Project can contribute to the overall well-being of Beneficiaries and other Nunavummiut without a compromise to ecosystem integrity.

Nunavummiut and the Inuit Organizations, Institutions of Public Government and territorial and federal governments that represent them want a healthy environment and vibrant communities both now and in the future. Development can bring positive economic opportunities and proponents must demonstrate that project designs, mitigation and monitoring plans, company performance, and decommissioning plans meet the requirements for development in Nunavut. The following Tier 1 Final Environment Impact Statement (FEIS) for the Kiggavik Project and all supporting documents were prepared to demonstrate the soundness of the proposed Kiggavik Project and the ability of the company to implement the Project.

The FEIS reflects six years of recent engineering, environmental and engagement studies by AREVA, in addition to historical work conducted for the Project. The integrated engineering and environmental work allowed for potential environmental impacts to be assessed as the Project is designed allowing for informed alternative selection, optimizations and design based mitigation to reduce potential adverse effects. Community engagement also influences Project design and management preferences and Inuit Qaujimajatuqangit (IQ) provides valuable knowledge of the land.

This FEIS will be reviewed by the Nunavut Impact Review Board (NIRB) to determine conformity with the Pre-Hearing Conference Decision (NIRB File No. 09MN003); the intent is to advance the resolution of outstanding issues and confirm presence of information sufficient to provide a development recommendation and decision. Given a positive conformity determination the FEIS will be made publicly available for review. There will be a number of opportunities for participation in the review including the Final Hearing to be held in Baker Lake, Nunavut.

Proponent

AREVA is a Canadian company, headquartered in Saskatoon, Saskatchewan. The company is a 100% subsidiary of the AREVA Group of companies headquartered in Paris, France. The AREVA Group is a world leader in supplying electrical energy systems with low CO2 production including nuclear and renewable energy systems for electricity production. AREVA would be the operator of the Kiggavik Project with minority interests owned by Japan-Canada Uranium Company Limited and Daewoo International Corporation.

Project

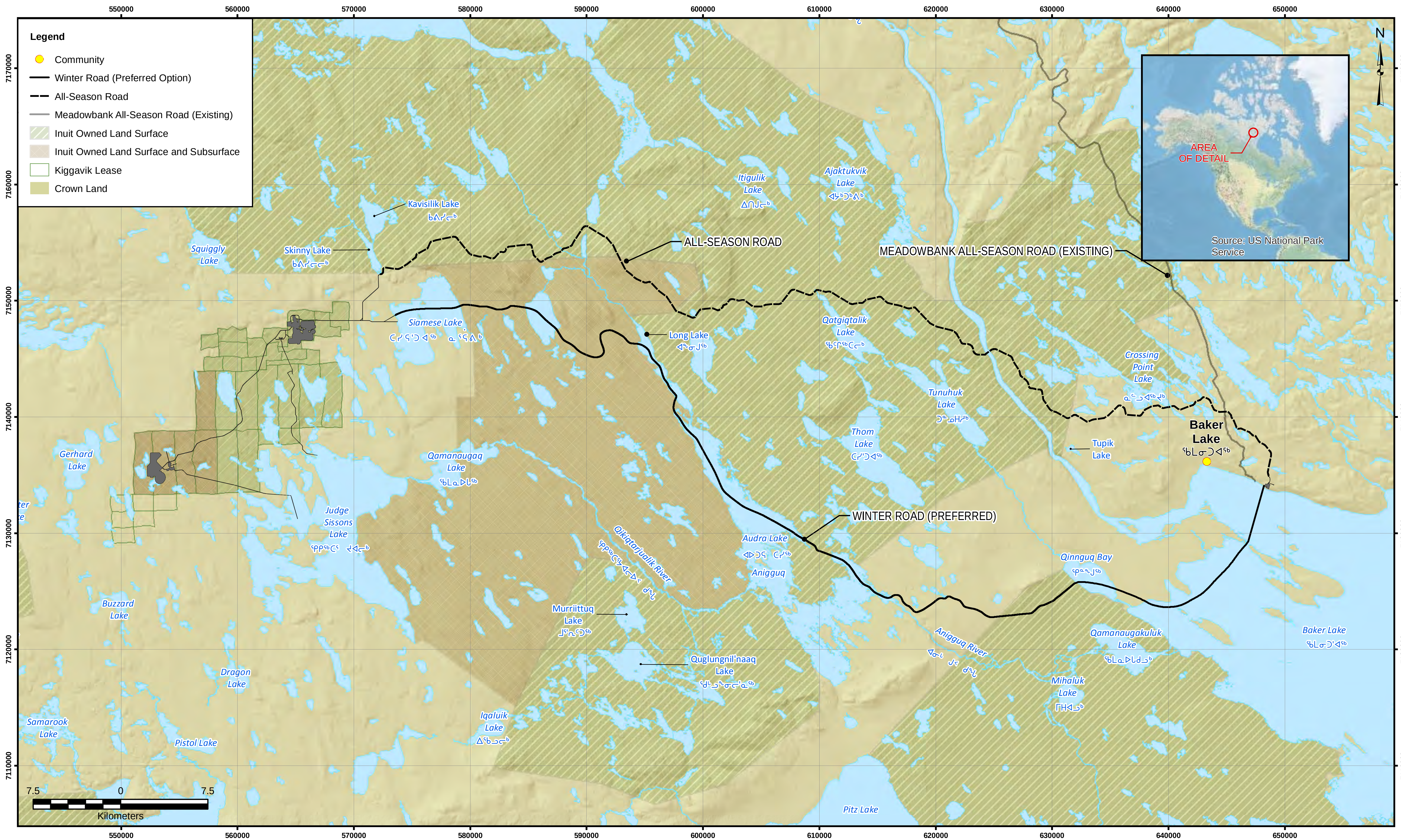
The Kiggavik Project is a proposed uranium ore mining and milling operation located in the Kivalliq region of Nunavut approximately 80 km west of the community of Baker Lake.

The Kiggavik Project is comprised of three main areas referred to as the Kiggavik site, the Sissons site and Baker Lake Dock Site. AREVA will mine three uranium ore deposits at the Kiggavik site: East Zone, Centre Zone and Main Zone, and the Sissons site has two uranium ore deposits to be mined: Andrew Lake and End Grid. Open pit mining will be used to extract the three Kiggavik deposits as well as the Andrew Lake deposit. Mining of End Grid will require underground mining methods. Mineral resources are estimated at approximately 51,000 tonnes uranium (133 million lbs U3O8) at an average grade of 0.46% uranium.

All extracted ore from the mine sites will be processed through a mill located at the Kiggavik site using hydrometallurgical processes. Mined out pits at the Kiggavik site will be used as tailings management facilities (TMF). The uranium product will then be packaged and transported using aircraft to southern transportation networks. Mill reagents, fuel and other supplies will be transported by ship and barge to Baker Lake and then by truck to the Kiggavik Project over a winter access road. An all-season road between Baker Lake and the Kiggavik Site is a secondary option under consideration in case the winter road cannot adequately support the Project. Figure 1.0-1 shows the major Project components including the access road alternatives and Figure 1.0-2 shows potential shipping and barging routes.

Based on existing resources, project operating life is estimated at 14 years of operation after three to four years pre-operational construction. It is expected that additional resources will be found. Decommissioning is anticipated to last ten years with post decommissioning monitoring lasting an additional five years. Decommissioning of the Project will include demolition of the site and reclamation of disturbed areas. Closure of the TMFs will consist of covering and then blending the final cover in with the existing topography. Mine rock piles will be covered and re-contoured to promote vegetative growth and to provide wildlife access. Decommissioning plans and financial assurance are required for the Kiggavik Project. Financial assurance is required to ensure neither the government, nor the landowner, are burdened with the cost of decommissioning a mining facility and provides certainty that decommissioning and reclamation work will take place with available and adequate resources.

Direct job estimate averages are up to 750 and 600 workers for construction and operations respectively. Indirect and induced jobs may be as high as 400 during construction and 1,300 during operations. The total taxes and royalties to be paid on the Kiggavik Project would be approximately $1 billion payable to Nunavut Tunngavik Inc. (NTI), the Government of Nunavut (GN), and the Government of Canada.



Projection: NAD 1983 UTM Zone 14N
Creator: CDC Revised: TL
Date:8/30/2014 Scale: 1:300,000
Data Sources: *Natural Resources Canada, Geobase®, Nation Topographic Database, AREVA Resources Canada Inc.*

FIGURE 1.0-1
MAJOR PROJECT COMPONENTS

ENVIRONMENTAL IMPACT STATEMENT
VOLUME 1

KIGGAVIK PROJECT

AREVA

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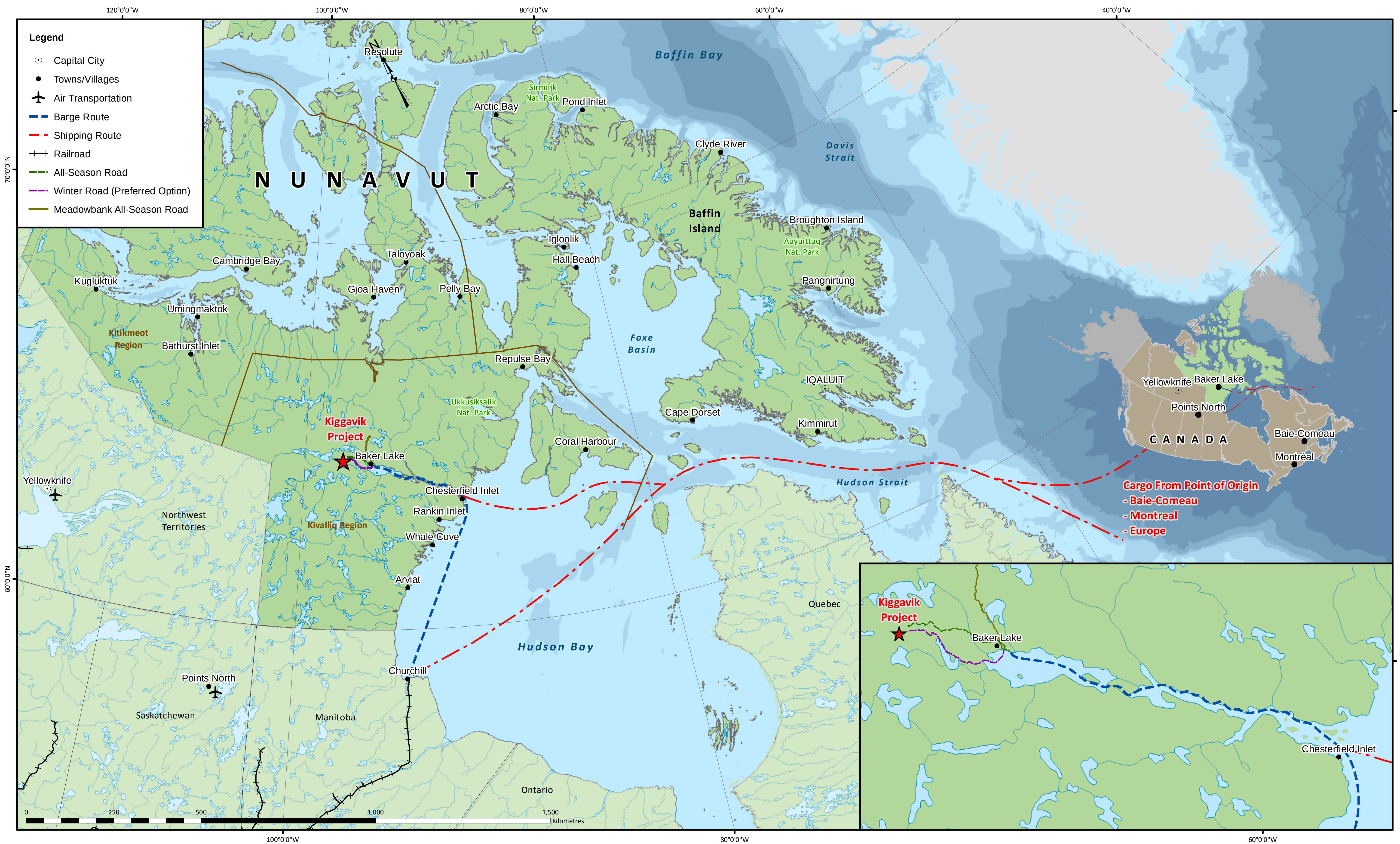

Projection: NAD 1983 UTM Zone 14N
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Revised: TL
Date: 03/28/2012
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Data Sources: *Natural Resources Canada, Geobase®, Nation Topographic Database, AREVA Resources Canada Inc.*

FIGURE 1.0-2
MAJOR PROJECT COMPONENTS - SHIPPING ROUTES

ENVIRONMENTAL IMPACT STATEMENT
VOLUME 1

Kiggavik Project
AREVA

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Project Need and Purpose

The purpose of the proposed Kiggavik Project is development that will:

- Realize a return on investment by the owner - The capital cost of the Project is currently estimated at $2.1 billion with operating costs estimated at $240 million per year. The market price for uranium concentrate over the last five years has been within the range needed for reasonable return on investment to owners and future opportunities are strong enough to encourage Project advancement with the intent of development that will coincide with viable future markets.
- Benefit Nunavut communities and contribute to sustainable development - The Kiggavik Project would benefit communities through employment, business opportunities and procurement. Benefits will be preferentially targeted to and realized by the seven communities of the Kivalliq Region. The Project can contribute to the goals of economic self-sufficiency and balanced economic development.
- Help meet global energy demands and future needs for nuclear power - World uranium production currently falls short of projected future annual requirements for generation of clean electricity using nuclear power (as an alternative to electricity generated by fossil fuel consumption). Uranium from the Kiggavik Project would help to meet the future needs for nuclear power, which will help reduce, on a global scale, greenhouse gas emissions.

No-Go Alternative

Abandoning the Project, other than for significant environmental impacts or cultural concerns that are determined to be unacceptable, would be inconsistent with the economic strategies and development policies established for the area. Should the NIRB environmental review find the Kiggavik Project to protect ecosystem integrity and human health, the potential economic benefits would not be realized with a decision to abandon the Project.

Uranium Development in Nunavut

The Nunavut Territory has given special consideration and planning to uranium development as evidenced in the consideration of uranium development in the broad principles, objectives and conditions for uranium exploration and mining outlined in the NTI Uranium Policy and the six guiding principles for uranium developed by the GN. AREVA's values and sustainable development commitments along with existing Canadian law and international agreements ensure consistency between the NTI uranium policy and GN guiding principles and the proposed Kiggavik Project. AREVA is committed to sustainable development that does not compromise the land or people of Nunavut.

AREVA's Integrated Approach to Environmental Protection

Environmental assessment (EA) is used to identify all possible Project-environment interactions and their potential to result in an environmental effect(s). Mitigation to reduce potential effects is then considered and the significance of the remaining residual effects determined. AREVA believes this process should be iterative so that a good understanding of the local environment and site-specific constraints can influence design and mitigation and the subsequent evaluation of potential environmental effects. This iterative process leads to a selection or narrowing of Project alternatives and further refinement of Project design.

Key features of the alternatives analysis for the Project included environmental performance, economic viability and project operability. Project design considered environmental performance from the perspective of minimizing water and reagent use, optimizing water recycle, minimizing the Project footprint, capturing and treating water that may have come in contact with operational areas and minimizing release of atmospheric and treated effluent emissions.

Mitigation measures identified in this iterative EA-design can be identified in a variety of forms. Design-based mitigation can allow for the avoidance of potentially significant effects by changing spatial or temporal aspects of the Project. Specialized mitigation, environmental protection measures and protocols, and offsetting are all categories of effective mitigation that minimize or avoid residual environmental effects of the Project.

During facility operation, compliance monitoring maintains operational performance standards. Environmental effects monitoring programs determine operational effects.

Adaptive management decisions are made on the results of monitoring when results are beyond the level anticipated and additional design, mitigation or other modifications are required. Continual improvement drives forward thinking, minimal impact management decisions even when operations are performing as predicted. Both adaptive management and continual improvement are integral parts of AREVA's approach to environmental protection.

The approach builds on the outcomes of EA predictions and on operational monitoring and follow-up programs to provide a robust defense against the development of significant adverse effects. Optimization of performance, of monitoring, and follow-up programs is achieved through continual improvement based on experience.

Community Engagement

AREVA's commitment to broad public engagement is evidenced in our sustainable development commitments, values charter, on-going corporate social responsibility initiatives and presence in Nunavut. Although AREVA has used a variety of communication tools, time spent in Kivalliq communities was a priority. In addition to formal and informal meetings with various stakeholder groups and open houses, AREVA has hosted tours of northern Saskatchewan uranium operations so that people can see first hand what an operating uranium mine and mill look like as well as decommissioned uranium mine.

Figure 1.0-3 shows the locations of potentially affected communities. Potentially affected communities identified prior to and within the final environmental impact statement includes the seven Kivalliq communities and six communities outside the Nunavut Settlement Area that have communicated an interest in the Kiggavik Project.

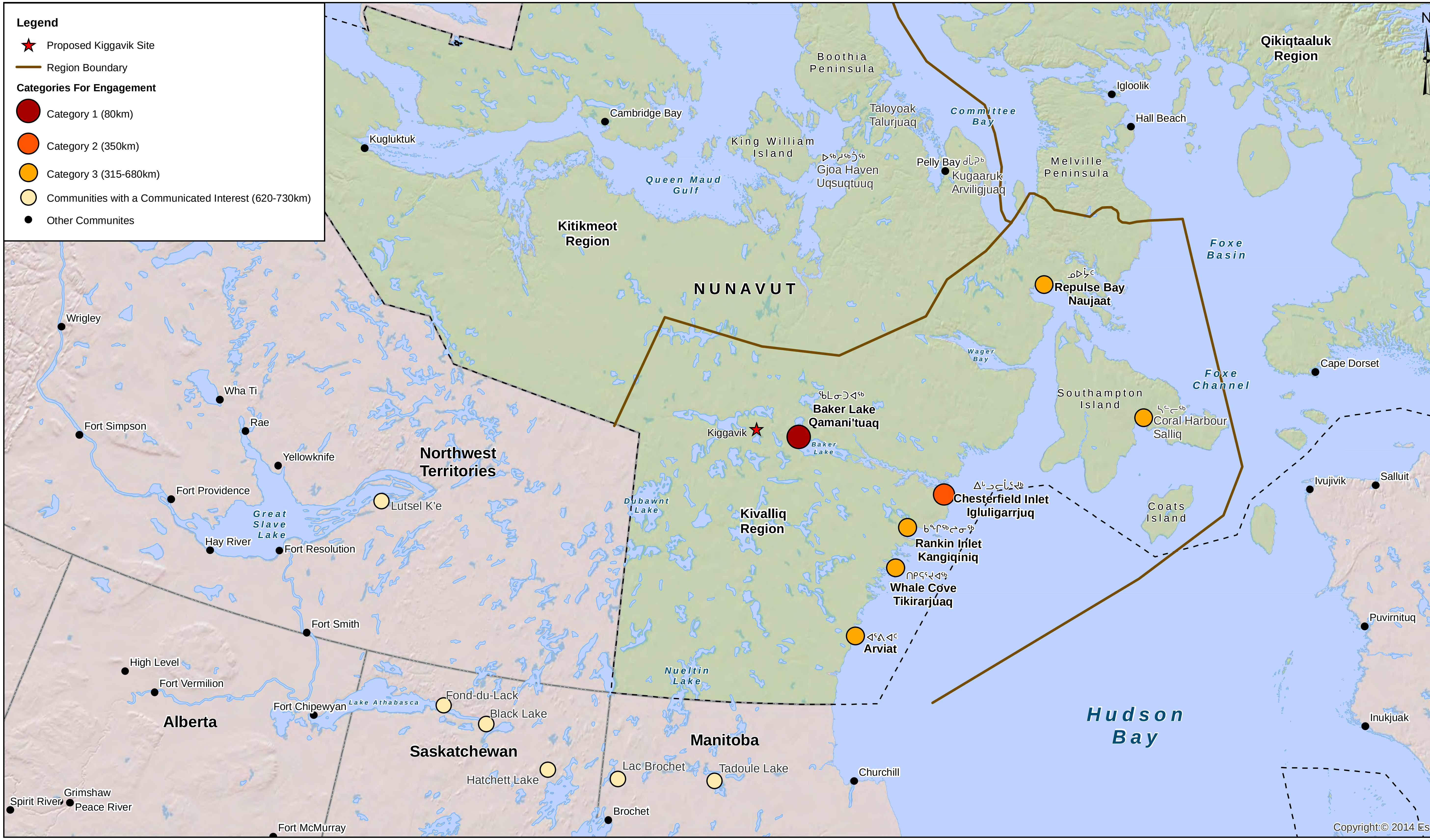
Understanding that language is essential to communication and strongly tied to culture, AREVA makes efforts to translate print material and videos and use an English-Inuktitut translator when possible.

Looking at comments, questions and concerns raised regarding nuclear energy and/or the Kiggavik Project in Nunavut over the last seven years, caribou were raised as a topic of discussion the most frequently. The land/wildlife habitat, marine mammals and clean water all generated considerable discussion.

Similar levels of interest were generated for community engagement, including the need and desire to better engage the youth while also respecting the elders; respect for, use of, and value attributed to IQ; employment opportunities and other benefits; and health and safety – both general and uranium specific.

With respect to the Project description, the access road alternatives and potential Thelon crossing were topics of most interest followed by general questions regarding the mine site and then tailings.

Comments received during engagement events have been considered and used to shape future engagement activities, the Project design and aspects of the EIS. Key influences of engagement include removal of the south all-season access road alternative, addition of youth specific engagement activities, radiation education initiatives including radiation protection demonstrations in all seven Kivalliq communities during open houses and creation of two videos related to radiation education, modifications to baseline field programs for caribou and marine mammals to better incorporate local knowledge and preferences.



Projection: Lambert Conformal Conic
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Date: 9/25/2014 Scale: 1:6,500,000
Data Sources: Natural Resources Canada, Geobase®, National Topographic Database, AREVA Resources Canada Inc.

FIGURE 1.0-3
POTENTIALLY AFFECTED COMMUNITIES

ENVIRONMENTAL IMPACT STATEMENT
VOLUME 1

KIGGAVIK PROJECT

AREVA

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

File: Q:\SHEQ\GIS\KIGGAVIK\2014\EIS\Volume 1 - Main Document\Maps\Volume 1 - Tier 1\MXD\Popular Summary\Figure 1.0-3 Potentially Affected Communities_Replacement.mxd

Inuit Qaujimajatuqangit

IQ interviews and workshops focused on elder groups and Hunter and Trapper Organizations in the seven Kivalliq Communities. Each community provided information on the following topics: wildlife landscape use, harvesting of both land and sea mammals, bird and egg harvesting, fishing, plants, travel routes and cultural sites, ice formation, water, changes in weather, and Project-specific questions and concerns.

Information related to socio-economic concerns was obtained through interviews and focus groups that included rotational workers, rotational workers' spouses, young adults, and women. Topics discussed included women's roles, dependency on country foods, and traditional activities.

IQ was used to inform Project design, contribute to baseline information and influence company collection of baseline field information, select valued components for assessment, identify issues of importance and identification of appropriate mitigation and monitoring to reduce potential adverse effects to both the biophysical environment and communities.

Existing Biophysical Environment

The Project area experiences a continental climate characterized by cold temperatures, low precipitation and high winds. The winters are long and cold and the summers are short and warm; transitional seasons are very short. Extreme temperatures in Baker Lake have ranged between -50.6°C in January and 33.6°C in July with a mean annual air temperature of -11.9°C. The most frequent wind direction and speed at Baker Lake are north-northwest at 20.5 km/h to 31.7 km/h. Wind speeds greater than 39.6 km/h (11 m/s) are most frequent over the period of January to March. Wind speeds exceeding 100 km/h are expected to occur only once in 30 years.

Air quality, noise and vibration are all typical of a remote, relatively undisturbed environment.

Streams average less than 1 m deep and most streams in the area are frozen to the bottom throughout the winter. Lakes are typically shallow with maximum depths of less than 3 m and they are ice covered from October through June with ice thicknesses of approximately 2 m. Over wintering habitat is found in a few lakes deeper than 3 m. Streams become active at spring snowmelt in mid-June with flows gradually receding over the remainder of the open water season. Lakes reach their level and volume peaks during the spring freshet in mid-June.

The most widely distributed fish species found in lakes in the area is Arctic grayling. Other commonly identified fish species include burbot, cisco, lake trout, ninespine stickleback, round whitefish and slimy sculpin. Arctic char, fourhorn sculpin, lake whitefish and longnose sucker are additionally found in Baker Lake. Arctic grayling, lake trout, ninespine stickleback, and slimy sculpin are common to streams in the area and burbot, cisco, lake whitefish and round whitefish are also observed. Arctic char and longnose sucker use the Thelon River.

Some parameters (pH, ammonia, aluminum, cadmium, chromium, cobalt, copper, iron, lead, silver, and zinc) of baseline water quality levels in some lakes and some metal concentrations (arsenic, cadmium, chromium, copper, mercury, and zinc) in sediment samples were higher than Canadian Council of Ministers of the Environment guidelines. This indicates that background levels of these elements are naturally elevated.

Thickness of active layer is highly variable, ranging from 1 to 2 m in surficial sediments to 5 m in bedrock outcrops. Permafrost depth is estimated to range from about 210 m depth in the Kiggavik area to about 250 m depth in the Sissons area. There is little to no connection between the deep (beneath permafrost) and shallow (active layer) groundwater flow systems. Rock within and below the permafrost has little water movement and is not used as a drinking water source.

The area is dominated by flat lying or gently sloping terrain with rolling and hummocky topography, frequent bedrock outcrops, and a few low escarpments. Eskers are rare. Surficial deposits consist of a thin organic layer underlain by mainly glacial till, which varies in texture and composition. Some soil samples showed trace element concentrations (arsenic, molybdenum, boron) higher than the Canadian Council of Ministers of the Environment guidelines indicating that background levels of these elements are naturally elevated. Average depth of topsoil available to salvage for later use in reclamation is approximately 11 cm, with a minimum of 2 cm in upland lichen tundra, heath upland and heath tundra areas, and a maximum of 31 cm in low-lying wet graminoid and graminoid tundra areas with thick peats.

The Project area is dominated by tundra vegetation interspersed with lichen-dominated bedrock outcroppings and boulder fields. Tundra vegetation is characterized by short shrubs such as dwarf birch, willows and heath species, as well as sedges and grasses, herbs, mosses and lichens.

The Project area is not within caribou calving grounds. The historical Beverly caribou calving ground is located approximately 70 km away and

the Qamanirjuaq calving ground approximately 200 km away. The Qamanirjuaq, and Beverly herds are migratory and they move into the Kivalliq Region during the spring and summer months. Field observations and satellite collar locations show that the migratory herds use of the area is transient. Three tundra-wintering caribou herds, Lorillard, Wager Bay and Ahiak, may use the area during winters but move further north for calving.

Muskox occupy the region year-round.

Large predatory species, including grizzly bear, wolverine and wolf, are present throughout the area but are observed infrequently. Smaller predatory species, such as Arctic fox and ermine, are also present with Arctic foxes seen as relatively common in the region. Small mammals such as voles, lemmings and ground squirrels are widespread.

Waterfowl, shorebirds, jaegers, raptors and upland birds annually migrate from southern wintering grounds to breed in the region during the summer. Only ptarmigan, gyrfalcon and common raven are residents throughout the year; they are scattered throughout the region and present in relatively small numbers. The most common species of waterfowl observed in the Baker Lake and Chesterfield Inlet area are Canada goose, long-tailed duck and common loon. Red-throated, arctic and yellow-billed loons, and tundra swans also use the area.

Chesterfield Narrows drains Baker Lake and empties into Chesterfield Inlet. Chesterfield Inlet is a 200 km, salt-water tidal corridor that joins Baker Lake with Hudson Bay. Arctic cod, Arctic sculpin, Arctic char, fourhorn sculpin, banded gunnel, and whitefish are found around the mouth of Chesterfield Inlet. In Hudson Bay ice generally starts to form in late October and the bay usually becomes ice free in early August. Capelin and starry flounder are abundant near-shore species in Hudson Bay and fourhorn sculpin are abundant in shallow waters (below 45 m) throughout Nunavut. Greenland halibut and Arctic cod are abundant offshore marine fish species in Hudson Bay.

Marine mammals occurring in the regional marine shipping area are polar bear, beluga whales, and ringed seals. Walrus, bowhead whales and bearded seals are common in other locations throughout Hudson Bay, Hudson Strait or Foxe Basin but are considered rare or uncommon near the local shipping route.

There are no Schedule 1 or 2 listed aquatic, plant or terrestrial wildlife species listed under the *Species at Risk Act* (SARA) that occur in the Project area. Three marine fish species, the Northern, Atlantic, and spotted wolffish, are listed on Schedule 1 of SARA; however, Hudson Strait is designated as ‘probable’ range. Ross’s gull is also listed on Schedule 1 of SARA and is known to breed and use coastal habitat in southwest Hudson Bay. Ross’s gull are most commonly seen in the Churchill area than anywhere else in Canada and the last observation of Ross’s gull in the Churchill area was four individuals in 2005.

There are no Important Bird Areas (IBA), as identified by Bird Studies Canada, Nature Canada and BirdLife International through the IBA Program, within the marine local assessment area. The Harry Gibbons and McConnell River migratory bird sanctuaries include coastal habitat in the region.

Existing Socio-Economic Environment

Nunavut's economy and people have unique characteristics including 1) the importance of the mixed economy; 2) a requirement to use renewable and non-renewable resources in sustainable ways that benefit Inuit; 3) the value of IQ to economic and social development decision making; 4) decentralization to give communities control of their own development; 5) a need to develop self-reliance in face of overdependence on federal transfers; and 6) a very young and rapidly growing population with important socio-economic challenges.

Nunavut's mixed economy has both wage and land based parts. The wage based economy provides cash income. The land based economy provides food, but also important social and cultural benefits to Inuit. Most people try to be active in both the wage and land based parts of the economy. The unemployment rate in Nunavut was about 19% in 2011 and 15% in late 2013, but for young people it was almost 40%. Most of the unemployed are young Inuit men. In 2006, Kivalliq unemployment rates were worse than the rest of Nunavut and much worse than Canada. Since 2006 many new jobs for Kivalliq people became available with the development of Meadowbank, exploration companies and businesses supplying mining companies.

Very few people hunt full time or almost full time anymore but most people continue to go out on the land. The importance of harvesting to Kivalliq households is demonstrated by country food substituting for about half of what total food costs would be if all food was bought in stores. The practice of harvesting also confirms identity, social relations, values and knowledge.

The Kivalliq population grew from 7,944 to 10,266 people between 2001 and 2013, an average growth of close to 2% per year. Dated information on education levels shows that less than 40% of adults have completed high school. On average, younger people are less educated than older people. The Kivalliq has lower crime rates than Nunavut as a whole but rates are still much higher than in the rest of Canada. Housing is an ongoing problem in all of Nunavut, but is worse in most Kivalliq communities. More than half of houses are overcrowded or in need of major repairs.

People have maintained their language over the last decade with a strong commitment to Inuktitut. Most people feel they speak Inuktitut well but they note many children are using English more now than they did in the past. It has been hard for some people to adjust as a new culture, with different values, has come in. Inuit no longer live on the land and the culture has changed. Everybody knows this and most people are focused on how to manage the change.

Radiation

Regardless of where people live or work, they are exposed to radiation from natural sources; it is present in the air we breathe, the food we eat, the water we drink, and in the construction materials used to build our homes. Levels of natural or background radiation can vary greatly from one location to the next. Consumption of caribou by people living in the Project area, and across northern Canada, has been shown to add some exposure, primarily due to the natural background levels of Polonium-210.

Residual Biophysical Effects

The Kiggavik Project has the potential to impact the biophysical environment throughout all phases of Project life.

Climate

Greenhouse gas emissions (GHGs) will be generated. Energy efficient and emissions minimization features will be incorporated into building design and in the operation of any equipment and ancillary facilities. Use and management of heavy equipment operation, vehicles and marine vessels will be optimized. Maximum annual GHG emissions are estimated to result in an increase to the baseline GHG emissions for Nunavut and Canada, but are assessed as not significant.

Air

Ambient air concentrations of contaminants of potential concern (COPCs; dust, metals, gaseous compounds and radionuclides) within the local and regional environments will increase. Dispersion modeling studies were used to select preferred locations of several Project facilities including the acid plant, power plant, storage piles and accommodation complex to minimize effects to air quality. Exhaust emissions controls will be used, dust minimized and suppressed and permanent mine rock stockpiles will be compacted to encourage growth of vegetation and suppress the release of dust emissions. All predicted residual effects resulting from the Project are not expected to extend beyond the local area, will only occur a few times per year and are reversible. Therefore, the increased concentrations of COPCs are assessed as not significant.

Noise and Vibration

Noise and vibration will increase. Noise levels are expected to be low, with the exception of some short term construction activities, and not anticipated to result in any community annoyance. Vibration levels are expected to be negligible during all phases of the Project. The predicted increase in noise and vibration are assessed as not significant.

Surface Hydrology

Ponds will be dewatered, a section of Andrew Lake will be dewatered and pumped into the remainder of Andrew Lake, Andrew Lake pit will be re-flooded, contact water will be collected, treated and released, treated effluents and greywater will be released and freshwater will be used for industrial and domestic purposes and flooding of the winter road. The Project has been designed to most effectively minimize effects to surface hydrology by selecting large water bodies for withdrawal and discharge, water will be recycled where possible and the effective use of diversion channels and sedimentation ponds. Changes in flow rates, lake levels (with the exception of Andrew Lake) and under-ice volumes will remain below appropriate thresholds. Effects to surface hydrology are assessed as not significant.

Hydrogeology

Groundwater levels will be affected by dewatering activities in the vicinity of open pit and underground mines. Limited groundwater will flow into mines and tailings management facilities during operation or post closure. Similarly there will be limited interaction between mines, tailings management facilities and receiving surface water bodies. Given the project design features and the slow groundwater movement, all project effects on hydrogeology are assessed as not significant, for both current permafrost conditions and potential no-permafrost conditions that would result from dramatic warming conditions.

Water and Sediment Quality

Treated effluent will be released. Dust and air emissions can also affect water quality. The water treatment plant has been designed so that effluent quality will meet or exceed applicable regulations. Dust control measures will be in place and emissions controlled and reduced as possible. Diversion channels will be used to re-route fresh water around the development areas. Modeling data indicate that changes to receiving water quality due to effluent discharge will occur during operation and final closure but will return to baseline levels post closure. Changes in water quality due to dust deposition are predicted to be minor with annual minor increases in metals, radionuclides and total suspended solids not measurable above natural background variation. Any change to lake pH will be small and likely brief, due to the short residence times of the lakes. Sediment concentrations of all constituents of potential concern are predicted to be below Canadian Council of Ministers of the Environment guidelines in all segments of Judge Sissons Lake with the exception of arsenic, copper and nickel. However, the predicted concentrations of arsenic, copper and nickel are similar to existing sediment concentrations. Effects to water and sediment quality are assessed as not significant.

Aquatic Organisms and Fish Habitat

Changes to water quality can affect aquatic organisms such as plankton, aquatic plants, and benthic invertebrates. Cadmium and sulphate concentrations in select areas of Judge Sissons Lake will be elevated compared to baseline conditions but no appreciable adverse effects on the abundance and distribution of aquatic biota are expected. For fish habitat, implementation of measures to avoid or mitigate effects to fish habitat is expected to minimize serious harm to fish and negate the requirement for fisheries offsetting. None of the changes to fish habitat resulting from the Kiggavik Project will affect the sustainability or productivity of commercial, recreational and Aboriginal (CRA) fisheries.

Fish

Changes in water quality can affect fish health. Detonation of explosives in or near water results in pressure change and vibration that can affect fish abundance and distribution. It is expected that copper and zinc concentrations will exceed toxicity benchmarks for fish in Judge Sissons Lake; however, the predicted changes are related to elevated baseline or existing conditions and as such, no appreciable adverse effects on fish health are expected. Blasting setback distances, charge sizes and timing will be used to provide adequate protection for fish populations. Given the mitigation measures, there will be no residual effects to fish from blasting. Effects to fish populations are assessed as not significant.

Topography, Landforms, Surficial Geology and Permafrost

Construction and operation will change the local active layer depths and terrain stability. Project footprint including mine and mill areas, the access road, quarry sites and others will be disturbed. The Project layout considered sittings that would minimize footprint area and avoid permafrost sensitive and uncommon landforms. Padding and platforms will be used to maintain existing permafrost conditions and drainage will minimize water pooling during spring thaw. Effects on permafrost and landforms will be confined to the Project footprint. The effects on permafrost and terrain are determined to be not significant.

Soils

Soil quality will be affected by dust, contaminants and emissions. Soil quality can also be affected by compaction and erosion. Soil quantity can be affected by burying of soils where topsoil stripping will likely not occur (soils saved for reclamation where possible) and erosion. Where possible soil will be salvaged and stored away from dust and emissions to use for reclamation and standard mitigation to reduce dust, contaminants and emissions will be in place. Potential acid inputs and emissions will only occur around the Kiggavik mine site. Changes in concentrations of constituents of potential concern are predicted to be below Canadian Council of Ministers of the Environment guidelines. Admixing, compaction, and erosion effects will be negligible. Effects on soils are assessed as not significant.

Vegetation

Vegetation will be lost to clearing during construction. Dust, air emissions, and changes to soils can affect vegetation. The mine footprint will be minimized and winter road alignments have maximized use of water bodies and watercourses. Dust and emissions will be minimized and controlled. Heath tundra vegetation will be the primary habitat type affected by the Project. Disturbance to vegetation abundance and community diversity are anticipated to be negligible. Potential acid inputs are below the critical load value and exposure to NO2 or SO2 are below benchmark guidelines. Effects to vegetation are assessed as not significant.

Terrestrial Wildlife and Habitat

Mortality is likely to result from vehicle collisions or through problem animal kills. Previously available habitat will be temporarily unavailable due to mine infrastructure. Dust and sensory disturbance will reduce the quality of near-by habitat. Changes to air, soil and vegetation quality could affect wildlife. Sensory disturbance and/or avoidance may result in changes to movement or reduced local raptor and migratory bird nest success.

Road alignments will minimize blind spots and road profile and snow management will allow animals to get off the road to avoid traffic. Temporary road closures, speed limits and reduced traffic will all also help reduce mortality. Dust and sensory disturbance will be minimized when possible. AREVA will not construct a road within 10 km of a designated caribou water crossing and will give caribou the right-of-way where possible and safe.

Mortality effects will be undetectable at the local scale. Direct and indirect loss of available habitat will be small at the scale of the caribou herd ranges (0.2-0.3% of habitat units). Other mammals, raptors and migratory birds will also have some previously available habitat become unavailable. Caribou will be unable to move through some areas (e.g. mine site, airstrips) that were previously available but few satellite collared caribou from migratory herds have been documented within or crossing the mine and access road areas. Uranium exposure to caribou and muskox will not exceed exposure levels associated with adverse effects and the level of exposure to all other constituents of potential concern are not predicted to change from baseline. Exposure to raptors and migratory birds are also not predicted to change from baseline. Any reduction in nest productivity will be local. Therefore, effects to wildlife and habitat are assessed as not significant.

Marine Fish

Underwater noise from marine vessels can harm, disrupt, and/or displace fish from habitat in Hudson Bay and Chesterfield Inlet. Operating procedures to reduce underwater noise will include maintaining a constant course and speed whenever possible, avoidance of unnecessary acceleration, and maintenance of propellers. Fish response is anticipated to be minor, short-term and reversible. Effects on marine fish are assessed as not significant.

Marine Mammals

Polar bears will not interact with the Project as all marine shipping will occur in the open-water season when the bears are seasonally forced onto land in the Hudson Bay region waiting for new ice to form. The ringed seal and beluga whale, common marine species in the area, may be disrupted or disturbed from vessel noise or experience a vessel-mammal collision. Marine mammal observers can be onboard vessels to monitor marine activities when transiting sensitive areas along the proposed barge route from Churchill to Baker Lake. A constant course will be maintained whenever possible, vessel speed will be limited in sensitive areas, and unnecessary acceleration will be avoided. Noise levels will be almost half the sound required to cause a behavioural response in marine mammals. There is potential that a vessel-mammal collision could occur over the life of the Project but with proposed mitigation, collisions are less likely to result in mortality. The effect on marine mammals is assessed as not significant.

Worker Health

Exposure to Hazardous Substances and Constituents of Potential Concern (COPCs)

Workers in the construction, milling, mining, decommissioning and reclamation process for the Kiggavik Project may be exposed to hazardous substances or COPCs. Guidance to ensure worker health is established by the American Conference of Governmental Industrial Hygienists (ACGIH). An evaluation of potential exposures to hazardous materials and COPCs was conducted to confirm exposures would be less than guidance values. Operational experience gained from the mining and milling processes at AREVA's northern Saskatchewan operations, which use many of the same chemicals that will be used at the Kiggavik mine and mill, provided a basis for the Kiggavik Project evaluation.

The greatest opportunity to implement controls for exposure to hazardous substances and COPCs is at the design stage. This opportunity is being taken for the Kiggavik Project. Standard work practices, together with practices implemented as part of a radiation protection program, in uranium mining and milling are effective at minimizing exposures to hazardous substances and COPCs found in the mine rock and ore. Important mitigation measures include ventilation, maintenance and housekeeping, education and training and personal protective equipment. With effective design features and proposed mitigation measures in place, there are no exposures to workplace hazardous substances or COPCs expected to exceed the threshold limit values established by the ACGIH.

Exposure to Radiation

A precautionary approach is applied to the control of radiation exposures so they are As Low As Reasonably Achievable (ALARA), social and economic factors considered. Exposure to radiation is measured in terms of radiation dose, typically in units of millisieverts (mSv). Dose limits for individuals have been developed by the international scientific community to protect against the radiation risk.

In Canada, the Canadian Nuclear Safety Commission (CNSC) regulates the nuclear industry and regulations under the Nuclear Safety and Control Act specify the limits on exposure to radiation for workers and for members of the general public. Like hazardous substances and COPCs, the greatest opportunity to implement controls for exposure to radiation is at the design stage. This approach was adopted for the Kiggavik Project. Dose and dose rate constraints below the regulated dose limits are established as objectives to be achieved during operations. Radiation protection objectives were used when designing facilities, processes, equipment, and work practices in order to minimize exposure to workers and the public. A Radiation Protection Plan is implemented at uranium mine sites.

Base case and upper bound radiation doses were estimated for open pit and underground miners, mill personnel and personnel transporting yellowcake. No workers are expected to receive radiation doses higher than the dose limits set by the Canadian Nuclear Safety Commission.

Public Health

Atmospheric and aquatic emissions from the Project may enter the environment and then subsequently expose members of the public. To better understand possible pathways for contaminants to reach the public near the Project IQ for Baker Lake was used to identify caribou and fish as primary food sources, with ptarmigan, arctic hare and squirrel also consumed. Differences in the consumption of water, fish, vegetables, berries, and wildlife for permanent residents of the Baker Lake community (adult, child and toddler family members), hunters at Judge Sissons Lake that take game back to their families and non-nuclear workers (non-NEW) at the Project site (e.g. camp cook, security guard), were all considered in the human health assessment.

Design of the water treatment plant to have appropriate and environmentally safe effluent discharge quality and design and mitigation to minimize air emissions and/or their potential effects are primary items to reduce potential effects to all environments, including the human environment.

Air Contaminants, particulate matter, non-radionuclide COPCs and radioactivity were evaluated. Findings showed all concentrations well within applicable limits or criteria with the exception of infrequent, short-term NO_2 and fine particulate matter concentrations at the Kiggavik camp. Although infrequent short-term concentrations of NO_2 elevated above World Health Organization (WHO) health-based criterion occur at the Kiggavik camp, they remain well below WHO levels of concern for healthy adults. Levels at Baker Lake are well below any level of concern. As with NO_2, fine particulate matter concentrations are predicted to infrequently exceed values designed to be protective of sensitive individuals at site but remain below levels of concern in healthy adults and levels at Baker Lake will remain well below any level of concern.

The highest exposure predicted is for the non-NEW worker at the Kiggavik site who receives some incremental dose from radon and inhalation of dust at the site. None of the doses to members of the public are expected to exceed Health Canada dose constraints or the Canadian Nuclear Safety Commission allowable dose for members of the public. In fact, the incremental dose to the public is expected to be less than 1/10th of the dose limit and less than 1/20th of the average natural background dose to Canadians.

Residual Socio-Economic Effects

The Project will create employment and business opportunities. Employment and contracting opportunities will be maximized with preferential hiring; preferential contracting; education, training and scholarship programs; considerations for Inuit culture in the workplace and contractor benefit enhancements. Education and training will include pre-employment, life skills, high school completion, postsecondary, on the job, and mentoring programs for workers and prospective workers. Effects on community economies will be positive with incomes increasing for many people. Economic opportunities will have ripple effects beyond direct employment and business opportunities and community economies will grow. Job experience, education and training, and contracting experience will enhance the capacity of the labour force.

Growing economic opportunities can encourage traditional culture by providing an income that can be used towards harvesting expenses. Economic opportunities may conversely contribute to the cultural shift away from the traditional culture as people adapt to expectations and requirements in a cross cultural working environment. Any reduction of harvesting, or sharing of harvest, has potential for effect on food security (particularly of the more vulnerable), nutrition and therefore health. Ongoing government support for traditional culture is expected to assist in the retention of traditional skills, language, values and knowledge. Effects on traditional culture are expected to be negative overall. The Project will not force or require changes to traditional culture but some drift away from harvesting, use of Inuktitut, and traditional values and knowledge is expected, particularly in the context of other forces of cultural change.

Increased incomes and cultural shifts have implications for wellbeing at the individual, family and community levels. Many people thrive with expanded economic opportunity but some do not. Individual, family and community wellbeing support will include a confidential employee and family assistance program; availability of peer or elder counsellors; communication systems for people to stay in touch with families; and supporting community initiatives to address community priorities towards enhanced wellbeing. Effects on well-being are expected to be positive overall. Although negative effects on traditional culture have potential to erode wellbeing for some, broadening choices and opportunities for livelihoods are counteracting factors and standards of living and household economic security will improve.

With expectation for overall increase in community wellbeing, the need for some social services, particularly social assistance, is expected to decrease. The demand for health, housing, municipal services and potentially police are expected to increase with increased incomes. Improved economic opportunities are expected to motivate more demand for education. Revenues to GN (taxes) and NTI (royalties) will allow the addition of public infrastructure and services to meet a potential increased demand and this is a benefit to the people. An increased demand for services would be a negative effect if the government were unable to meet that demand.

Economic and fiscal effects at the territorial level are positive. There will be very large jumps in gross domestic product, employment, labour income, own source GN revenues and payments to NTI. Subsequently Kiggavik will represent a sustained contribution to the economy and revenues until closure.

Overall, as people adjust to change with time, most negative effects are expected to be moderate and positive effects are expected to gain momentum. A Community Involvement Plan and a Human Resource Development Plan will be in place and updated throughout the Project. AREVA will continue to engage, including with elders to capture IQ, for input on socioeconomic management, collaborative monitoring and any needed adjustments.

Different individuals can respond differently to an effect but the overall effect to socioeconomics is positive and significant. It is important to note that although the Project will end, the life-long benefits of job experience and learning are not reversed. Further commitments to enhance benefits will be negotiated with the Kivalliq Inuit Association through an Inuit Impact Benefit Agreement.

Heritage Resources

Archeological resources need to be protected from disturbance or appropriately mitigated. Archaeological studies were conducted and four small sites, including three stone markers and one cache, were recorded in the mine site area. The significance of these sites was assigned as low. The locations of additional sites have been and will continue to be incorporated into the Project design so they can be avoided if possible and an Archaeological Mitigation Plan will be implemented over the Project life. Documentation of each site is kept on file with the Canadian Museum of Civilization as well as with the Government of Nunavut and records are available for interested persons and future researchers.

Cumulative Effects

Project effects are generally limited to the Project area with no potential interaction with other environmental effects from other human activities. Only air quality, terrestrial wildlife, health and socioeconomics had potential to act cumulatively.

Air Quality - No other projects or activities are located close enough to interact spatially with the air quality effects from the Kiggavik Project mine site. Given the proximity of the preferred dock site to the Meadowbank dock site, emissions from equipment and vehicle use may act cumulatively. Emission concentrations increase in the immediate dock area but are limited to within 2 km of the dock and are assessed as not significant.

Terrestrial Wildlife and Habitat - The alternate option of an all-season access road (winter road preferred option) may act in combination with local hunter harvest resulting in a cumulative mortality effect on caribou. Use of the road for harvesting may affect the distribution of harvest or the total harvest taken. Should the all-season access road be required and approved, AREVA will work with caribou stakeholders in determining how to control and manage public access on a potential Kiggavik access road in ways that respect safety, the environment and company use of the road.

Worker Health - Exposures to radioactivity, hazardous substances, and constituents of potential concern were assessed for workers and members of the public, including residents of Baker Lake. All exposures remained well below acceptable limits.

Socioeconomics - Additional projects in the Kivalliq and/or throughout Nunavut are expected to have the same types of socio-economic effects as Kiggavik. If the combined demand for labour and goods outstrips supply capacity, mining proponents may be forced to meet the supply from the south and benefits that could have been retained by Inuit would not be. Nunavut's labour force is growing so quickly this is a short term versus a longer term concern. Rapidly growing capacity in the Kivalliq Region to supply the mining sector suggests there could be spill-over effects into the Kivalliq Region even when projects are located elsewhere in Nunavut. Mining projects eventually close and the availability of new projects to take the place of older ones provides alternative jobs and markets for labour and business so the effect is positive.

Transboundary Effects

A transboundary effect may occur when a residual effect occurs outside the Nunavut Settlement Area. The Qamanirjuaq and Beverly caribou herds migrate across jurisdictional boundaries. The absence of significant Project and cumulative effects on caribou removes the potential for significant transboundary effects.

Effects of Environment on Project and Accidents and Malfunctions

The natural environment has the potential to affect the Project through a number of mechanismswhich include: extreme weather, such as blizzards, high winds, extreme precipitation, storm surges, fog; climate factors, such as thaw susceptible soils; seismic activity; wildlife encounters; and fires. Resulting potential impacts include: increased risk to personnel safety; damage to infrastructure; upsets to the site water balance; and difficulties with logistics and transportation.

Accidents and Malfunctions, including those caused or compounded by environmental hazards, were identified and assessed. Key Project components assessed include marine transport, activities at the Baker Lake dock facility, transportation on the Baker Lake to Kiggavik access road, open pit mining, underground mining and the milling operation.

Mitigation measures consider personnel, local communities, the environment, and the operation and include 1) measures to reduce the risk of an occurrence (design features such as site containment, management programs and routine monitoring); 2) measures to minimize the consequences if the event occurs (emergency response, spill contingency, management and monitoring programs); and 3) measures to ensure control is regained before activities re-commence. A preliminary Emergency Response Plan has been prepared for the Project.

Sustainability

Strong Project design, implementation of effective mitigation and comprehensive monitoring, continuing two-way communication and partnership with communities and a commitment to adaptive management and continual improvement ensure adverse effects are minimized and benefits maximized throughout Project life as identified within the balance of environment, people and economics.

During the Bruntland Commission, the World Commission on Environment and Development defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” As identified in the socioeconomic assessment, the life-long benefits of job experience and learning will extend beyond Project life. Project benefits help to meet the needs of the present generation but many benefits and investments can also assist future generations in meeting their needs.

Acknowledging residual effects associated with development, the development of the Kiggavik Project will not compromise ecosystem integrity. Socioeconomic impacts will be positive overall with existing and future well-being of Nunavut residents protected and promoted.

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ᐊᕆᕙᒃᑯᑦ ᐱᓕᕆᔪᓪᓕᕆᔨᖏᑦ ᑲᓇᑖᒥ ᑎᒥᖓᑦ. (ᐋᕆᕚ) ᑐᒃᓯᕋᖅᑐᑦ ᓴᓐᓇᔭᐅᓐᓂᐊᕐᑐᓐᓂᒃ, ᐱᓖᕆᐊᖑᔪᑎᒃ ᐊᒻᒪ ᐅᒃᑯᐊᖅᓯᒃᑭᐊᕐᐸᑕ ᔫᕌᓂᐊᒻ ᐅᔭᕋᒃᑕᖅᓂᖅᒥᒃ, ᑕᐃᔭᐅᔪᖅ ᑕᒻᓇ ᑭᒡᒐᕕᒃ (ᐱᓕᕆᐊᖑᔪᒪᔪᖅ) ᑕᒪᓐᓂ ᑭᕙᓪᓕᕐᒥ ᓄᓇᕗᒥ. ᑕᒪᑐᒪ ᐱᕙᓪᓕᐊᓂᒃᓴᖓ ᑭᒡᒐᕕᒃ ᐱᓕᕆᐊᖑᔪᒪᔪᖅ ᐃᑲᔪᓂᖃᕈᓐᓇᖅᑐᖅ ᑕᒪᐃᓄᑦ ᖃᓄᐃᓕᓯᐊᖅᓂᒃᓴᒥᒃ ᑕᒪᑯᐊ ᓄᓇᕗᒃᑲᖅᑐᒃᑕᓄᑦ ᐊᒻᒪ ᐊᓯᖏᓄᑦ ᓄᓇᕗᒥᐅᓄᑦ ᑕᒪᑯᓄᖓ ᑐᓗᕐᑕᐅᖅᑎᖃᖕᒋᓗᖕᒍ ᖃᓄᐃᓯᐊᓂᐅᓂᖅᑯᑦ.

ᓄᓇᕗᒥᐅᑦ ᐊᒻᒪ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖃᑎᖏᔪᑦ, ᐱᓕᕆᓂᖅᑲᑐᑦ ᑕᒪᑯᓄᖓ ᑲᕙᒪᒋᔭᐅᔪᓄᑦ ᐅᑭᐅᖅᑕᖅᑐᒥ ᐊᒻᒪ ᑲᓇᑕᐅᑉ ᑲᕙᒪᑯᖏᓄᑦ ᑭᒡᒐᑐᐃᔨᐅᔪᓄᑦ ᐱᔪᒪᓂᖅᑐᐃᓇᐅᓚᑕ ᖃᓄᐃᖕᒋᓯᐊᖅᑐᒥᒃ ᐊᕙᑎᓕᕆᓂᖅᒥᒃ ᐊᒻᒪ ᑕᒪᑯᐊ ᓄᓇᓕᐅᔪᑦ ᒪᓇᐅᔪᖅ ᐊᒻᒪ ᓯᕗᓂᒃᓴᒥ. ᐱᕙᓕᐊᓂᖅᑲᓂᖅ ᓇᒃᓴᕈᓐᓇᖅᑐᖅ ᓴᖅᑭᑎᑦᓯᔪᓐᓇᖅᑐᖅ ᖁᓚᓇᕆᑐᒥᒃ ᐱᖁᓕᐊᓂᒃᓴᒥᒃ ᐱᕙᓕᐊᔪᑎᒃᓴᓂᒃ ᑕᒪᑯᓄᖓ ᑕᒪᑯᐊ ᑲᑎᑦᓯᔪᒃᓴᐅᓚᑕ ᐱᓕᕆᐊᖑᔪᒪᓂᐊᖅᑐᑦ ᐊᖅᑭᓱᖅᑕᐅᓯᒪᓂᖕᒋᑦ, ᖃᐅᓇᓯᐊᕈᑎᑦ ᐊᒻᒪ ᖃᐅᔨᓴᕈᑕᐅᓂᐊᖅᑐᑦ ᐊᖅᑭᓯᒪᓂᖕᒋᑦ, ᐱᔪᒪᔭᐅᓂᐅᔪᓄᑦ, ᐊᒻᒪ ᑕᒪᑐᒧᖓ ᐅᑯᐊᖅᓯᕙᓕᐊᔪᑕᐅᔪᒪᖅᑐᓄᑦ ᐊᖅᑭᓯᒪᔪᑦ ᐱᔭᕆᐊᖅᑐᑦ ᑕᒪᑯᓂᖓ ᐱᖁᔭᐅᓯᒪᔪᓂᒃ ᑕᒪᑯᓄᖓ ᐱᕙᓕᐊᓂᒃᓴᐅᔪᓄᑦ ᑕᒪᓂ ᓄᓇᕗᒥ. ᑕᒪᑯᐊ ᓇᓗᓇᐃᔭᖅᓯᒪᔪᑦ ᐱᖕᒋᐊᕈᑎᓕᐅᖅᓯᒪᔪᑦ ᐊᕙᑎᓕᕆᓂᖅᒧᑦ ᐊᒃᑐᓂᖅᓂᕐᒧᑦ ᑎᑎᕋᒃᓯᒪᔪᑦ ᑕᑲᒪᑐᒻᒪ ᑭᒡᒐᕕᒃ ᐱᓕᕆᐊᖑᔪᒪᔪᒧᑦ ᑕᒪᐃᓄᑦᑐ ᐃᑲᔪᓂᖅᑲᓂᐊᖅᑐᓄᑦ ᑎᑎᕋᒃᑕᐅᓯᒪᔪᓄᑦ ᑕᒪᕐᒥᒃ ᐊᖅᑭᓱᖅᑕᐅᓚᐅᖅᑐᑦ ᑕᑯᑎᑦᓯᔪᒪᓂᖅᒧᑦ ᑕᒪᑐᒪ ᐅᐊᑦᑕᓚᐃᓂᓗᓄᑦ ᑕᒪᑐᒪ ᐱᓕᕆᐊᖑᔪᒪᔪᑉ ᑭᒡᒐᕕᒃ ᐱᓕᕆᐊᖑᔪᒪᔪᖅ ᑕᒪᑐᒧᖓᓗ ᑕᑉᑯᐊ ᑲᑉᐸᓂᐅᔪᑦ ᑕᒪᑯᓂᖓ ᐱᒋᐊᖅᑎᑦᓯᔪᓇᖅᓂᓗᓄᑦ.

ᑕᒪᑐᒧᖓ ᑕᒪᓇ ᐊᑐᑎᖅᑲᓯᒪᓕᖅᑐᖅ ᐅᑭᐅᓄᑦ ᑕᑦᑕᓕᒪᓄᑦ ᐱᓕᕆᐊᖑᔨᒪᓕᖅᓂᐅᔪᓄᑦ, ᐊᕙᑎᓕᕆᓂᑯᑦ ᐊᒻᒪ ᐃᓚᐅᖅᑲᑕᐅᑎᑦᓯᑕᑦᓂᑯᑦ ᖃᐅᔨᓇᓯᐊᖅᓂᑦ ᑕᑉᑯᓇᖓᑦ ᐊᕆᕙᑯᓂᑦ. ᑕᒪᑯᓄᖓᓗ ᖃᖕᖓᓴᓂᑕᓕᕆᓂᖅᑎᒍᑦ ᐱᓕᕆᐊᖑᓚᐅᖅᑐᑎᒍᑦ ᑕᒪᑐᒧᖓ ᐱᓕᕆᐊᒍᔪᒪᔪᒧᑦ. ᑕᒪᑯᖅ ᐊᖅᑭᓱᐃᓂᐅᓚᐅᖅᑐᑦ ᐊᒻᒪ ᐊᕙᑎᓕᕆᓂᑯᑦ ᐱᓕᕆᓂᐅᓚᐅᖅᑐᑦ ᐱᔪᓇᖅᑎᑦᓯᓂᖅᑲᓚᐅᖅᐳᑦ ᐊᕙᑎᓕᕆᓂᑯᑦ ᐊᒃᑐᐃᓂᖅᓂᐅᓇᔭᖅᑐᖅᒧᑦ ᖃᐅᔨᒋᐊᕈᑕᐅᓂᑯᑦ ᑕᒪᓇ ᐱᓕᕆᐊᖑᔪᒪᔪᖅ ᐊᖅᑭᓯᒪᓂᖓ ᑕᒪᑯᓄᖓ ᐊᓯᒋᑎᒍᓗ ᓂᕈᐊᑕᐅᔪᓇᓂᖅᑲᓂᑦ ᐱᓕᕆᐊᖑᔪᒪᓂᐅᔪᓄᑦ ᐱᒍᒪᓂᖅᓯᐊᖅᓂᖅ ᐊᒻᒪ ᐊᖅᑭᓱᖅᓯᒪᓂᖕᒋᑦ ᑕᒪᑯᓄᖓ ᐊᒃᑐᖅᑕᐅᓂᖅᑲᓂᐅᓇᔭᖅᑐᑦ ᐊᒋᔪᓕᖑᐊᖅᑯᓇᒋᑦ. ᓄᓇᓕᒃᓂᒃ ᐃᓚᐅᖅᑲᑕᐅᑎᑦᓯᓂᑯᑦ ᑕᒪᓇ ᐃᑲᔪᕈᑕᐅᓂᑲᖅᐳᖅ ᐱᓕᕆᐊᖑᔪᒪᔪᒧᑦ ᐊᖅᑭᓯᐃᓂᑦ ᐊᒻᒪ ᐊᐅᓚᑦᓯᔪᑕᐅᓂᒃᓴᓄᑦ ᐊᑐᖕᒐᓴᐅᓂᐊᖅᑐᑦ ᐊᒻᒪ ᐃᓄᐃᑦ ᖃᐅᔨᒪᔭᑐᖅᑲᖏᑦ ᐃᑲᔪᖅᓂᖅᑲᒪᕆᐳᖅ ᖃᐅᔨᒪᓂᕆᔭᐅᔪᓂᒃ ᑕᒪᑐᒧᖓ ᓄᓇᒧᑦ

ᑕᒪᓇ ᖃᐅᔨᖕᒋᐊᖅᑕᐅᔪᒪᕐᑐᖅ ᑕᑉᑯᓄᖓ ᓄᓇᕗᒥ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᑲᑎᒪᔨᑦ (ᑲᑎᒪᔨᑦ) ᑕᒪᑯᐊ ᐱᑕᖅᑲᑦᑕᓯᐊᖅᒪᖔᑕ ᑕᒪᐃᓂᒃ ᑐᓴᐅᒪᔭᐅᔪᒃᓴᓂᒃ ᑕᒪᑯᓇᓂ ᐱᖁᔭᐅᓯᒪᔪᓂ ᐊᑐᐊᖓᓴᓄᑦ ᑕᒪᑐᒧᖓ ᐊᖅᑭᓯᐃᓂᖅᒧᑦ ᑕᒪᑐᒧᖓ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᐊᒃᑐᐃᓂᖅᓂᖅᒧᑦ ᑎᑎᕋᒃᓯᒪᔪᑦ ᑕᑉᑯᓄᖓ ᐊᕆᕙᑯᓄᑦ ᓇᓯᐊᔅ ᑲᓇᑕᒥ ᑭᒡᒐᕕᒃ ᐱᓕᕆᐊᖑᔪᒪᔪᖅ (ᑲᑎᒪᔨᑦ ᑎᑎᖅᑲᖓ ᓇᓴᐅᑕ 09ᓚᓇ003) ᐊᒻᒪ ᑭᓇᑐᐃᓇᑯᓄᑦ ᐅᑯᐃᖕᒐᓕᓂᐊᖅᑯᓂ ᐊᑐᐃᓇᐅᓕᖅᑯᓂ ᑕᑯᔭᐅᔪᒃᓴᐅᓂᐊᕐᑯᓂ. ᑕᒪᑯᓄᖓ ᐊᒥᓱᐃᓂᒃ ᐃᓚᐅᖅᑲᑕᐅᑎᑦᓯᓂᑕᖅᑲᐅᓂᐊᖅᑐᖅ.

ᑭᑐᓂᖕᒋᓄᑦ

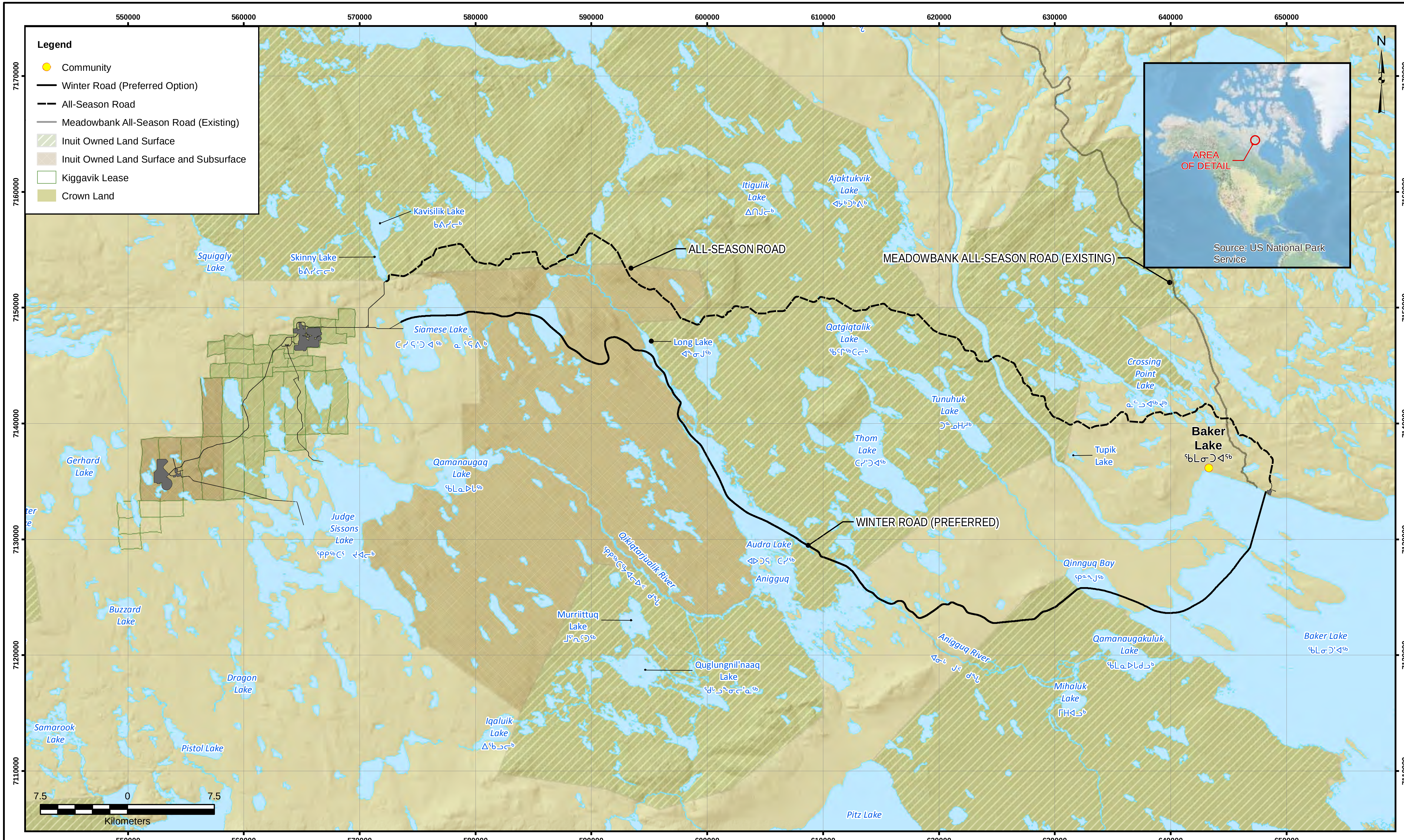
ᐋᕆᕙᑯᑦ ᑲᓇᑕᒥᐅᑕᖅ ᑲᑉᐸᓂᐅᔪᖅ, ᑎᑎᕋᒃᕕᒃᔪᐊᖅᑐᑦ ᑕᐃᑲᓂ ᓴᔅᑲᑐᓐ, ᓴᔅᓴᑦᓯᕗᐊᓐ. ᑕᑉᓇ ᑲᑉᐸᓂᐅᔪᖅ 100 ᐳᓴᓐ ᐃᓚᒋᔭᐅᔪᓂ ᑕᑉᑯᓄᖓ ᐊᕆᕙᑯᑦ ᐃᓚᖕᒋᑐᓄᑦ ᑲᑉᐸᓂᐅᔪᓄᑦ ᑎᑎᕋᒃᕕᔪᐊᖅᑲᓗᑎᒃ ᑕᕆᐅᑉ ᐊᑭᐊᓂ ᐱᐅᕿᔅ ᕙᖅᔅ. ᑕᑉᑯᐊ ᐊᕆᕙᑯᑦ ᐃᓚᖕᒋᑐᑦ ᓯᓚᖅᔪᐊᓗᒃᑕᒥ ᓯᕗᓕᐸᒍᔪᑦ ᑕᒪᑯᓂᖓ ᐱᖃᑎᑦᓯᓂᖅᒥᒃ ᐅᖃᓕᐅᕈᑎᓂᒃ ᐅᖃᓕᕆᔨᑦ ᑕᒪᑐᒪ ᒥᑭᔪᒧᑦ ᓯᐅ2 ᓴᓇᔭᐅᔪᒧᑦ ᑕᒪᑯᓄᖓᓗ ᓴᓗᒪᔪᓄᑦ ᓄᑕᖕᒍᐸᓕᐊᔪᓇᖅᓂᐅᔪᓐᓄᑦ ᐅᑲᓕᕆᓂᑯᑦ ᑕᒪᑯᓄᖓ ᐅᑲᓕᕆᓂᐅᔪᓄᑦ ᐊᑐᓚᐅᔪᓂᒃ. ᐋᕆᕙ ᐊᐅᓚᑦᓯᔨᐅᓇᔭᖅᑐᖅ ᑕᒪᑐᒧᖓ ᑭᒡᒐᕕᒃᒧᑦ ᐱᓕᕆᐊᖑᔪᒪᔪᒧᑦ ᒥᑭᓂᖅᓴᐅᔪᒥᒃ ᓇᒥᓂᖅᑲᖅᑲᑕᐅᔪᓄᑦ ᔭᐸᓐ ᑲᓇᑕᒥ ᔫᕌᓂᐊᒻ ᑲᑉᐸᓂᐅᔪᑦ ᑕᑉᑯᐊᓗ ᐊᓯᖕᒋᑦ ᑯᐊᐳᕌᓴᓐ.

ᐱᓪᓕᕆᐊᕐᕗᑦ

ᑕᑉᑯᐊ ᑭᒡᒐᕙᒃᑯᐅᑉ ᐱᓪᓕᕆᐊᖑᕆᑦ ᑐᒃᓯᕋᖅᒪᑕ ᔪᕋᓐᓂᐊᒻᒥᒃ ᐅᔭᕋᖓᓐᓂᒃ ᐅᔭᕋᒃᑕᕈᐊᖁᑎᒃ ᓯᖅᑲᓪᓚᑎᑦᑐᑎᒃ ᑕᐃᑲᖕᓂ ᑭᒡᒐᕙᖕᒥ ᓄᓇᖓᓂ ᓄᓇᕗᖅᒥᐅᖅ 80 ᑭᓪᓖᒥᑐᕐᒃ ᐅᐊᓇᖅᐸᓐᓃ ᖃᒪᓂᑐᑉ.

ᑭᒡᒐᕕᒃ ᐱᓕᕆᐊᖑᔪᒪᔪᖅ ᐊᕕᒃᓯᒪᒡᒐᔭᖅᑐᖅ ᐱᖓᓱᓪᓕᖅᖃᖓᑉᓗᓐᓂ ᑕᐃᔭᐅᔪᖅ ᑭᒡᒐᕙᐅᑉ ᓄᓇᖒᑦ,ᕿᑭᖅᑕᓪᓕᒃ ᓄᓇ ᐊᒻᒪ ᖃᒪᓂᑐᐊᖅ ᐃᒃᓴᖅᕙᒃ. ᐊᕆᕙᒃᑯᑦ ᐅᔭᕋᒃᑕᖅᕙᖅᑲᖅᓂᐊᑦ ᔪᕋᓐᓃᐊᒻᒥᒃ ᑭᒡᒐᕙᐅᑉ ᓄᓇᖓᓂ: ᕿᑎᐊᓐᓃᑐᖅ, ᐊᒻᒪ ᑕᐃᑲᓐᓂᒪᕆᒃ,ᐊᒻᒪ ᕿᑭᖅᑕᓪᓕᒃ ᒪᕋᓐᓂᒃ ᐅᔭᕋᒃᓯᐅᖅᐸᐅᓗᓐᓂ ᔪᕋᓐᓃᐊᒻᒥᒃ ᐊᒻᒨᖃᐃᕙᐅᓗᓂ: ᐊᓐᑎᕈᓯ ᑕᓯᖅ ᐊᒻᒪ ᐃᓱᒃᑲᖅ, ᓴᓪᓕᕕᐅᓗᓐᓂ ᐅᔭᕋᒃᑕᖅᕕᐅᓐᓂᐊᖅ ᐱᖓᓱᑦ ᑭᒡᒐᕙᖕᒥ ᐅᔭᕋᒃᑕᖅᕙᑦ ᐱᖃᑕᐅᑉᓗᑎᒃ ᐊᓐᑎᕈᓯ ᑕᓯᖅ.ᐅᔭᕋᒃᑕᖅᕕᒃ ᐃᓱᒃᑲᖅ ᓄᓇᐅᑉ ᐃᓪᓗᐊᓐᓂᑦ ᐅᔭᕋᒃᓯᐅᖅᕕᒃ ᐃᓘᒻᒧᑦ. ᐅᔭᕋᒃᓯᐅᓪᓚᒃᓴᑦ ᐱᑕᖅᑯᖅ 51,000 ᑕᓐᓴᓂᒃ ᔪᕋᓐᓃᐊᒻᒥᒃ (133 ᒥᓪᓖᐊᑉ8ᓴ ᐅᖁᒪᐅᓐᓂᖕᒋᑦ ᔫ3ᐅ3) ᐊᑐᖅᑕᐅᕙᒃᑐᑦ 0.46ᐳᓭᓐᓭ ᔪᕋᓐᓃᐊᒻᖃᖅᑐᖅ.

ᐅᔭᕋᒃᑕᖅᑕᐅᔪᓪᓘᒃᑕᑦ ᐅᔭᖅᑲᑦ ᑕᐃᑲᖕᓚᑦ ᓯᖅᑲᓪᓚᕕᓐᓄᑦ ᐊᓪᓚᖅᑐᖅᑕᐅᔫᓪᑦ ᑭᒡᒐᕕᓐᒥᑐᓄᑦ ᓄᓇᖕᓚᓄᑦ ᐊᑐᖅᑐᑎᒃ ᐅᔭᕋᒃᓯᐅᑎᓐᓂᒃ ᓯᖅᑲᓪᓚᑎᑎᕕᓄᑦ. ᐅᔭᕋᒃᑕᖅᕙᒃ ᓴᓪᓚᖅᕙᒃ ᑭᒡᒐᕙᖕᒥ ᐊᑐᖅᑕᐅᓐᓂᐊᖅ ᐊᒃᑕᒃᖅᓂᖅᒥᒃ ᒪᕋᕕᓐᓂᖅᓂᒃ. ᑕᒻᒪᓇ ᔪᕋᓐᓃᐊᒻ ᐱᔭᖅᑕᐅᔪᖅ ᐳᖅᑐᖅᑕᐅᓘᓐᓂ ᐊᐅᓪᓚᖅᑎᑕᐅᓗᓐᓂ ᑎᖕᒥᓱᑯᑦ ᖃᑉᓘᓈᑦ ᓄᓇᖕᓚᓄᑦ ᓴᓐᓇᕕᖕᕆᓐᓄᑦ. ᓯᖅᑲᓪᓚᑎᓇᐳᑦ, ᐅᖅᓱᐊᓪᓘᐃᑦ ᐊᓱᖕᒋᓗ, ᐅᒻᒥᐊᖅᔪᐊᒃᑯᑦ ᐊᓪᓚᖅᑐᖅᑕᐅᓐᓂᐊᑦ ᓯᒃᑲᐅᑯᓪᓘ ᖃᒪᓂᑐᐊᖅᒧᑦ ᐊᒻᒪ ᓄᓇᒃᑯᕈᑎᑯᑦ ᑭᒡᒐᕙᖕᒧᑦ ᐊᓪᓚᖅᑐᖅᑕᐅᓚᖅᒥᓗᑎᒃ ᐅᑭᐅᑯᑦ ᐊᕿᑯᑎᒃᑯᑦ. ᖃᖕᓘᓪᑕᒃᑯᓖ ᐊᕿᑯᑎᒃᑯᑦ ᖃᒪᓂᑐᐊᖅᒥᑦ ᑭᒡᒐᕙᖕᒧᑦ ᓄᓇᖕᓚᓄᑦ ᐊᑐᖅᑕᐅᑐᐃᖕᓇᓐᓂᐊᓚᒃ ᐃᓱᒪᓖᐅᑕᐅᓯᐊᕐᓗᓐᓂ ᑭᓯᐊᓐᓂᒃ ᐱᔪᑎᓪᓖᑦ ᐅᑭᐅᑯᑦ ᓄᓇᒥᐊᑯᑦ ᐊᔪᓈᑐᐃᓐᓈᓐᐊᖅᑲᒪᑦ ᐱᓪᓕᕆᐊᓇᓗᒍ.



Projection: NAD 1983 UTM Zone 14N
Creator: CDC Revised: TL
Date:8/30/2014 Scale: 1:300,000
Data Sources: *Natural Resources Canada, Geobase®, Nation Topographic Database, AREVA Resources Canada Inc.*

FIGURE 1.0-1
MAJOR PROJECT COMPONENTS

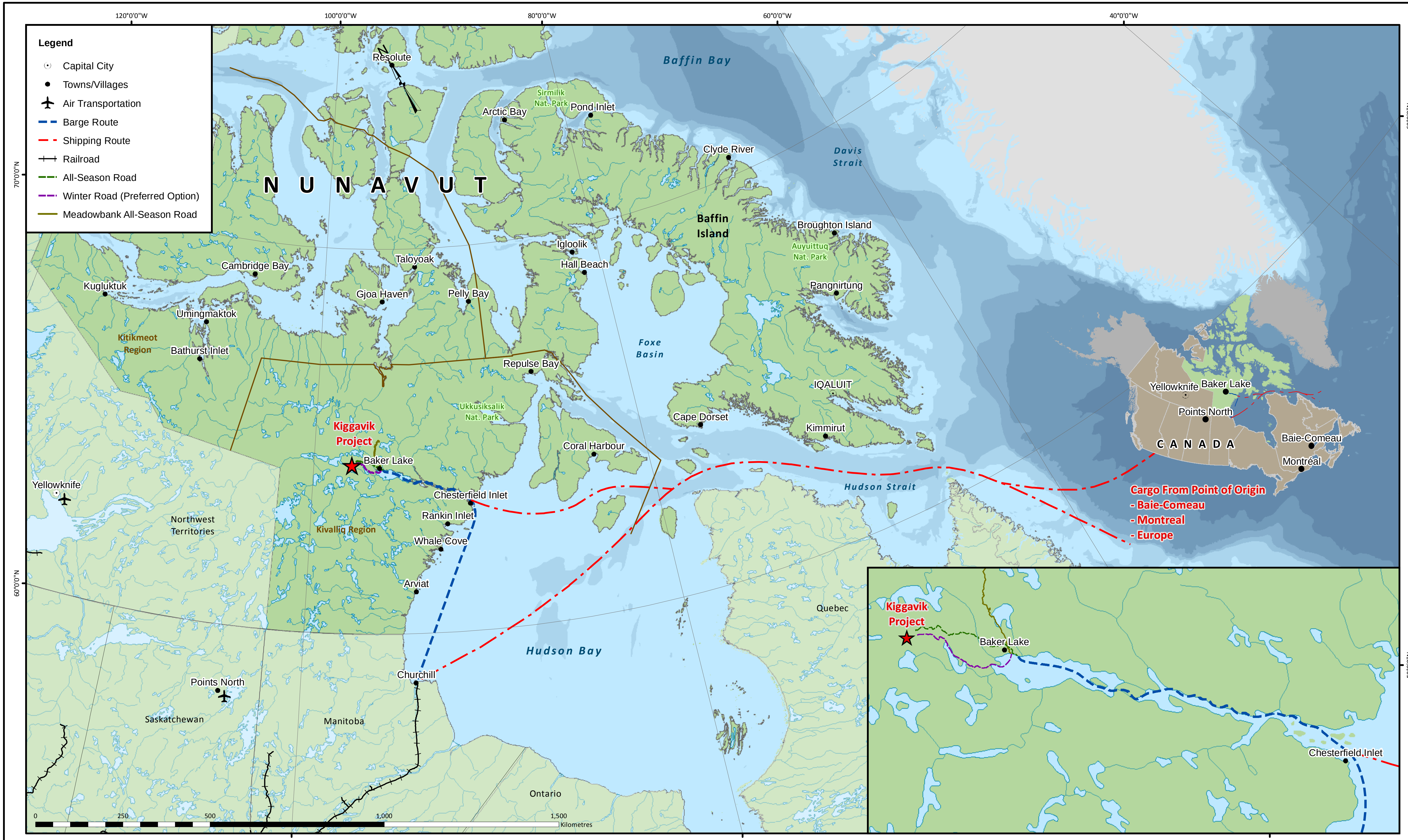
ENVIRONMENTAL IMPACT STATEMENT
VOLUME 1

KIGGAVIK PROJECT

AREVA

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

File: Q:\SHEQ\GIS\KIGGAVIK\2014\EIS\Volume 1 - Main Document\Maps\Volume 1 - Tier 1\MXD\Figure_2.1.1-project_components_on_IOL_Revised_06_24_2014.mxd



Projection: NAD 1983 UTM Zone 14N
Creator: CDC Revised: TL
Date: 03/28/2012 Scale: 1:10,000,000
File:
Data Sources: *Natural Resources Canada, Geobase®, Nation Topographic Database, AREVA Resources Canada Inc.*

FIGURE 1.0-2
MAJOR PROJECT COMPONENTS - SHIPPING ROUTES

ENVIRONMENTAL IMPACT STATEMENT
VOLUME 1

Kiggavik Project
AREVA

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

ᐅᓯᕋᒃᑕᖅᕕᒃ ᐊᐅᓪᓚᕋᓯᖅᑐᖅ ᐅᑭᐅᓐᓄᑦ 14ᓐᓄᑦ ᐱᓪᓕᕆᐊᖃᓐᓂᒃᐸᑕ ᐃᓪᓗᓕᐅᖅᑐᒃᓴᑦ ᐅᑭᐅᓐᓄᑦ ᐱᖓᓱᓐᓄᑦ ᐅᕙᓃᓐᓂᑦ ᓯᑕᒻᒪᓐᓄᑦ ᐃᒡᓘᓪᓕᐅᖅᐸᒡᒋᖅᓱᑎᒃ ᓯᕗᓪᓕᖓᒍᑦ. ᐅᓯᕋᒃᓯᐅᖅᕕᒃ ᐅᒃᑯᐊᖅᐸᑦ ᓴᓪᓗᒪᖅᓵᖅᑕᐅᓇᓱᖅᑐᖅ ᐅᑭᐅᓐᓄᑦ ᑕᓪᓕᒪᓐᓄᑦ ᐃᖃᑕᐅᔪᒡᒋᑦ ᖃᐅᔨᓴᖅᑎᑦ ᐱᐊᓂᓐᓂᑯᓐᓂᒃ ᐅᑭᐅᓐᓄᑦ ᖁᓪᓘᓐᓄᑦ. ᐅᒃᑯᐊᖅᑕᐅᓯᒪᓪᓕᖅᐸᑦ ᐱᓪᓕᕆᕕᐅᕙᕕᓐᓂᖅ ᐱᖃᑕᐅᔪᒡᒍ ᓯᖁᐸᑎᖅᑕᐅᓂᖏᑦ ᓄᓇᖓᓂ ᐊᒻᒪ ᐱᖁᓯᑐᖃᓐᓄᑦ ᐅᑎᖅᑎᑕᐅᒃᐸᑦ ᐊᓯᕗᖅᓇᖅᑐᑦ ᐊᕗᕙᑕᓅᑐᑦ. ᐅᒃᑯᐊᖅᑕᐅᓂᖓ ᐱᑕᖃᐅᖅᓂᐊᖅ ᓴᓪᓗᒪᖅᓴᖅᓱᒋᑦ ᐃᕚᖅᓴᖅᓱᒋᑦ ᑭᖑᓕᖅᐸᖅᒥᐅᑎᓐᓂᒃ ᑕᒃᑯᒃᓴᐅᔪᑦ ᑕᐃᒻᒪᐃᑐᓐᓂᖓ.

ᐅᓯᕋᒃᑕᖅᓂᑯᑦ ᐅᓯᖃᑦ ᑲᑎᖅᓱᖅᓱᒋᑦ ᓯᑎᓪᓕᖅᑎᑕᐅᓱᑎᒃ, ᓴᐅᓴᐅᓱᑎᒃ, ᐊᕿᒃᑕᐅᓱᑎᒃ ᐊᒻᒪ ᓄᓇᕋᖅᑕᖅᑑᐊᓕᖅᓱᒍ ᐊᒻᒪ ᓂᖅᔪᑎᑦ ᐊᑉᕐᑯᑎᒡᒋᔫᓪᓘᐊᓕᖅᓱᒍ. ᓴᓪᓗᒪᖅᓴᐃᓕᖅᐸᑕ ᐅᒃᑯᐊᖅᐸᑦ ᐸᖅᓇᒃᓯᒪᔪᑦ ᑭᖕᓈᐅᓯᖃᖅᑎᑦᓯᓪᓘᑎᒃ ᐊᑐᖅᑕᐅᔫᒃᓴᓐᓂᒃ ᑭᒡᓕᖁᑯᐅᑉ ᓄᓇᖓᓄᑦ ᐱᓪᓕᕆᐊᕕᓪᓂᖓᓄᑦ. ᑭᓈᐅᓯᖃᖅᑎᑕᐅᓯᐊᖅᓇᓂᐊᑦ ᐱᑕᖃᑦᓯᐊᑯᐸᓗᑦ ᓴᓪᓗᒻᒪᖅᓴᐃᓕᓐᓄᑦ ᐊᒻᒫ ᓄᓇᐅᑉ ᐅᑎᖅᑎᑕᐅᓂᖓᓄᑦ ᐊᔪᖅᓇᖏᑎᑕᐅᓂᐊᑦ ᐱᓪᓕᕆᔾᖃᐅᓯᐊᕐᓱᑎᒃᓱ.. ᑲᑎᓱᑦᑕᓪᓗᒋᑦ ᐅᖃᐅᓯᕆᓱᒡᒋᑦ ᖃᐸᐅᓐᓂᐊᖅᓂᖏᑦ ᐊᑐᐊᖅᑕᐅᓐᓂᐊᑦ 750ᒥᑦ ᐊᒻᒪ 600ᒧᑦ ᐱᓪᓕᕆᔾᔪᖓᓂᐊᑦ ᓴᓇᔾᑦ ᐊᒻᒪ ᐊᐅᓚᖅᑎᑕᐅᓐᓂᖓᓄᑦ ᐅᐱᒡᒋᔭᐅᓪᓗᓐᓂ. ᐊᓯᐊᒍᑦ ᓴᓇᓐᓂᐊᑦ ᓴᓈᔾᑦ ᐊᒻᒪ 1,300 ᖑᓐᓂᐊᑦ ᐱᓪᓕᕆᓘᐊᕐᑯᓕᖅᐸᑕ. ᑕᒻᒪᓪᓘᒃᑕᖏᑦ ᑲᑎᓪᓗᒋᑦ ᑕᒃᔪᓴᐅᑎᑦ ᐊᒻᒪ ᓂᓐᖏᖅᑕᖅᓈᓂᑦ ᐊᑭᓪᓕᐅᑕᐅᓐᓇᐊᑦ ᑭᒡᓕᕚᖕᒥᖓᑐᑦ ᑲᑎᓪᓘᒃᑕᖅᓗᒋᑦ 1 ᐸᓪᓕᐊᓐᓴ ᐊᑭᓪᓕᐅᑕᐅᓐᓂᐊᑦ ᓄᓇᕗᑦ ᑐᓐᖓᕚᒃᑯᓐᓄᑦ ᑎᒥᖁᑎᖓᓄᑦ. (ᑐᖓᕕᒃ), ᓄᓇᕗᑦ ᑲᕙᒻᒪᑯᓐᓄᑦ, (ᓄᓇᕘᒧᑦ) ᐊᒻᒪ ᑕᑯᓐᓄᖓ ᑲᓈᑕᐅ ᑲᕙᒪᒃᑯᖏᓐᓄᑦ

ᐱᓪᓕᕆᐊᖏᓐᓄᑦ ᐊᑐᖅᑕᐅᔫᒃᓴᑦ ᐊᒻᒫ ᐱᑦᔪᑎᖏᑦ

ᐱᑦᔪᑕᐅᔫᑦ ᑐᓯᕋᕈᑎᖏᑦ ᑭᒡᓕᕚᐅ ᐱᓕᕆᐊᖓᓄᑦ ᐱᕈᖅᓴᐅᔪᓴᓴᑕ:

1) ᖃᐅᔨᓇᒪᑕ ᐅᑎᖅᑎᑎᕚᐅᔫᐊᕐᒪᑕ ᓇᖕᒥᓂᒃᖃᖅᑐᑦ ᐊᖏᔪᑎᑦ ᐊᑯᑐᖅᔪᐊᑦ 2.1 ᐸᓪᓖᐊᓐ ᑕᓪᓖᔅ ᐊᒻᒪ ᐊᐅᓚᖅᓂᖓᓄᑦ ᐊᖏᔪᑎᑦ ᐊᑭᖏᑦ 240 ᒥᓪᓖᐊᓐᔅ ᐅᑭᐅᖅ ᐊᑕᐅᓯᖅ. ᓂᐅᕕᖅᑕᐅᒃᐸᑦ ᓯᓪᓚᖅᔪᐊᕐᒧᑦ ᔪᕼᓐᓃᐊᒻ ᐃᓱᓴᒡᕆᔭᐅᔪᖅ ᐅᑭᐅᓐᓄᑦ ᑕᓪᓕᒪᓐᓄᑦ ᐊᑭᒡᕆᕗᒃᑕᒻᒥᓐᓂᑐᖅ ᐅᑎᖅᕕᐅᓂᖅᒧᑦ ᓈᒻᒥᒻᒥᐊᑐᖅ ᐱᕈᖅᑎᑕᐅᒃᐸᑕ ᓇᖕᒥᓂᖃᖅᑐᒧᑦ ᐊᒻᒪ ᓯᕗᓂᖅᒧᑦ ᓴᖏᔪᑐᐃᖕᓇᕐᑐᑦ ᐱᔫᒥᓇᖅᑐᖅ ᐱᓪᓕᕆᐊᓂᓴᐅᒃᐸᑦ ᐱᖃᑕᐅᓱᒍ ᐱᓪᓕᕆᐊᖑᒥᐊᕐᐸᑦ ᐱᖃᑕᐅᓱᒋᑦ ᑕᐅᑐᒃᑕᑎᒡᒍᑦ ᓯᕗᓂᖅᒥ ᓂᐅᕕᖅᑕᐅᒃᐸᑦ.

2). ᐱᕙᓪᓕᖅᔪᐊᕐᓂᐊᕐᑐᑦ ᓄᓇᕗᒥᐅᑦ ᐊᒻᒪ ᑐᖕᓂᐅᖃᖅᑕᐅᖕᓂᖏᑦ ᐃᑯᐱᒃᑐᓪᓕᕆᐸᓗᑎᒃ ᐱᕙᓪᓕᖅᓂᖏᑦ ᑕᒻᓈ ᑭᓪᓚᕕᒃ ᐱᓕᕆᐊᖓ ᐱᕙᓪᓕᕈᑎᖃᖅᖃᖅᓂᐊᕐᑐᖅ ᓄᓇᓪᓕᓐᓄᑦ ᐱᓪᓕᕆᓂᖏᓄᑦ, ᐱᓕᕆᐊᒃᓴᑦ ᓴᕿᐅᒪᓂᐊᕐᑐᑦ ᐊᒻᒪ ᐊᔪᖅᓇᖏᐸᓪᓕᖅᓱᓂ. ᐃᑲᔪᑎᑦ ᑕᐅᑐᒃᑕᐅᓂᐊᑦ ᐊᒻᒪ ᖃᐅᔨᒪᓯᐅᔪᑦ ᐊᖅᕕᓐᓂᓖᑦ ᓄᓇᓖᑦ ᑭᕙᓪᓕᖅᒥ. ᐱᓪᓕᕆᕖᕗᑦ ᑐᓐᓂᓯᕙᒃᓇᓂᐊᑦ ᑕᐅᑐᒃᑕᐅᓗᓂ ᐱᓪᓕᕆᐊᒃᓴᓐᓄᑦ ᐱᕈᖅᑎᑎᓂᖅᒧᑦ.

3). ᐃᑲᔪᖅᓂᖃᖅᓂᐊᕐᑐᖅ ᓯᓪᓚᖅᔪᐊᕐᒧᑦ ᖃᐅᒪᖅᑯᑎᓪᓘᖅᓂᖅᒥᒃ ᐊᒻᒪ ᐱᔪᒪᓴᐅᔪᖅ ᔪᕼᓐᓃᐊᒻᓚᕆᒃ ᐅᖅᓱᕆᓴᐅᒃᐸᑦ ᓯᓪᓚᖅᔪᐊᕐᒥ ᔪᕼᓐᓃᐊᒻ ᖃᑦᓯᒪᓐᒪᑦ ᐊᑭᒡᕆᕗᒃᑕᖓ ᓯᕗᓅᖅ ᑕᑯᐸᓗᒍ ᐅᑭᐅᓗᒃᑖᕐᒧᑦ ᐊᑐᖅᑕᐅᓴᕆᐊᓖᑦ ᓴᓪᓗᒪᔪᒥᒃ ᐃᒃᑭᑕᖅᑐᓪᓖᐅᖅᓂᖅᒥᒃ (ᐊᑐᖅᑕᐅᔪᓐᓇᕋᓯᖅᓂᖓ ᐃᑭᑕᖅᑐᒪᒧᑦ ᐅᖅᓱᕆᓴᐅᓇᓱᖅᐸᑦ ᐊᑭᒃᓖᒡᒋᐊᓗᒍ) ᔪᕼᓐᓃᐊᒻ ᑭᒡᓕᕕᖏᑦ ᐃᑲᔪᖅᓂᖃᕈᓐᓇᖅᑐᖅ ᓯᕗᓂᖅᒥ ᔪᕼᓐᓂᐊᒻ ᐅᖅᓱᕆᓗᒍ, ᒥᑭᓪᓕᖅᑎᑦᓯᔪᓇᕐᑐᖅ, ᖕᖑᓪᓚᖅᔪᐊᖅᒥᐅᓂᒃ, ᐳᔪᖅᓪᓗᓐᓂᒃ ᐊᓐᓃᐊᑎᑦᓯᓂᖅᒥᒃ.

ᐱᑕᖃᖅᑐᖅ ᐃᓐᓇᖅᒋᐅᑎᔪᒃᓴᒥᒃ

ᕿᒪᐃᑐᐃᓐᓇᖅᓂᖅ ᐱᓕᕆᐊᖑᔪᒥᒃ, ᐊᓯᓐᓂᒃ ᐱᔪᑕᐅᖏᓗᓐᓂ ᐊᕙᑎᐅᑉ ᐊᒃᑐᖅᑕᐅᓘᐊᖅᓂᖕᒐᓄᑦ ᐅᕝᕙᓪᓘᓐᓃᑦ ᐃᓪᓕᕐᑯᓯᐅᔪᑦ ᐃᓱᒪᓪᓘᑕᐅᓗᐊᕐᐸᑦ ᐱᓐᓇᓱᓕᖅᐸᑕ ᐱᔭᐅᕐᑯᕐᖏᓕᖅᓗᑎᒃ, ᐸᖅᓇᐅᑕᐅᔪᑦ ᐱᓕᕆᐊᒃᓴᓐᓄᑦ ᓈᒪᒡᒍᓐᓇᐃᕈᑕᐅᓇᔭᖅᑐᖅ ᒪᓪᓕᒃᓴᖏᓄᑦ ᐃᖕᓂᓚᒃᑎᑦᑕᐅᓯᒪᓐᓂᖕᒐᓄᑦ ᐊᕙᑕᓐᓅ. ᐊᕙᑎᓪᓕᕆᔨᑦ ᑲᑎᒪᔨᖏᑦ ᐊᕙᑎᒥᒃ ᓇᒃᕙᖅᕕᒡᒋᖏᐸᒍ ᓱᓇᒥᒃ ᐅᓪᓗᓇᐊᓐᓇᖅᑐᓐᓂᒃ ᐱᓕᕆᐊᒃᓴᖅᔪᐊᑦ ᐊᒪᓗ ᐊᓐᓂᐊᖅᖃᓐᖏᑐᖅ, ᐱᑕᖃᐅᖅᓂᖕᒐᓄᑦ ᐱᓪᓕᕆᐊᒃᓴᖅᑲᖅᑎᑦᓯᓐᓂᖕᒐᓄᑦ ᐃᓱᒪᓪᓕᐅᖁᔭᖅᑐᑦ ᐱᓪᓕᕆᐊᒥᓐᓂᒃ ᕿᒪᐃᑐᐃᓈᖅᓂᖅᒥᒃ.

ᔪᕌᓐᓃᐊᒻᒥᒃ ᐱᖑᖅᑎᑦᓯᓐᓂᖅ ᓄᓈᕗᒻᒥ

ᓄᓇᕗᑦ ᐊᕕᒃᓯᒪᓐᓂᖓ ᐃᓱᒻᒪᒡᒋᔭᒃᓴᒥᒃ ᐊᑦᔨᐅᖅᑐᒥᒃ ᐊᒪᓘ ᐸᖅᓈᐅᑎᑦ ᔪᕌᓐᓃᐊᒻᒥᒃ ᐱᖑᖅᑎᑦᓯᓐᓂᖅ ᑕᑯᒃᓴᐅᑎᑕᐅᔪᖅ ᐃᓱᒪᒃᓴᖅᓯᐅᕈᑕᐅᑉᓗᓂ ᔪᕌᓐᓃᐊᒻ ᐱᕈᖅᑎᑕᐅᖕᓂᖓ ᑕᒃᑯᔭᐅᓐᓂᖅᑎᒍ ᑕᒪᐃᑎᒍᑦ, ᐅᖃᐅᓯᖃᕈᓐᓇᖅᓂᖏᑦ ᐊᒪᓗ ᐊᑐᓪᓕᕐᑯᔭᐅᔪᑦ ᔪᕌᓐᓃᐊᒻᒧᑦ ᕿᓐᓂᖅᓴᖅᓂᖅ ᐊᒪᓗ ᐅᔭᕋᒃᑕᓇᐊᖅᓃᖅ ᓇᓪᓘᓇᐃᖅᑕᐅᓯᒪᕗᖅ ᑐᓐᖓᕕᒃᑯᓐᓄᑦ ᔪᕌᓐᓃᐊᒻᒧᑦ ᒪᓪᓕᒐᐃᑦ ᐊᒪᓗ ᐊᖅᕕᓐᓂᓪᓖᑦ ᐱᑦᔪᑎᑦ ᔪᕌᓐᓂᐊᒻᒧᑦ ᐱᕈᖅᑕᐅᒃᐸᑦ ᓄᓇᕗᑦ ᑲᕙᒪᑯᖏᑦᓂᑦ. ᐊᕿᕝᕙᒃᑯᑦ ᐱᒻᒪᕆᐊᑎᑦᓯᓐᓇᒪᑕ ᐊᒪᓗ ᐃᒃᑯᐱᖕᓂᖅᒥᒃ ᐱᕈᖅᑎᑦᓯᓐᓂᖅᒥᒃ ᐊᑐᐊᖅᑕᐅᑉᓗᒋᑦ ᑲᓈᑕᒥ ᒪᓪᓕᒐᖅᔪᐃᑦ ᐊᒪᓗ ᓯᓪᓖᖅᔪᐊᖅᒥ ᐊᖏᖅᑲᑎᒡᒋᓐᓃᑦ ᖃᓐᓄᐃᑐᖅᑲᖅᑲᓇᓗᒍ ᐅᒃᑯᐋ ᑐᖓᕕᒃᑯᑦ ᔪᕌᓐᓃᐊᒻ ᒪᓪᓕᒐᖏᑦ ᐊᒪᓗ ᓄᓇᕗᑦ ᑲᕙᒪᑯᑦ ᐊᑐᐊᖅᑕᐅᕐᑯᔭᖏᑦ ᐊᒪᓗ ᑐᒃᓯᕋᐅᑎᖏᑦ ᑭᒡᓕᖃᕕᐅᑉ ᐱᓪᓕᕆᐊᖑᓄᑦ. ᐊᕿᕝᕙᒃᑯᑦ ᐱᔪᒪᓂᖅᑲᑦᓯᐊᕐᑐᑦ ᐃᒃᑯᐱᒃᑐᓪᓕᕆᓂᖅ ᐱᕈᖅᐸᓪᓕᐊᕐᑯᑉᓗᒍ ᐊᓯᐅᕐᑯᔨᓂᑯᖑᖅᑐᖅᑕᓪᓕ ᓄᓇᒥᒃ ᐊᒪᓗ ᐃᓅᕐᑯᑎᖏᓐᓂᒃ ᓄᓇᕗᒻᒥᐅᓐᓂᒃ.

ᐊᕇᕝᕙᒃᑯᑦ ᑲᔪᓯᓈᑐᑦ ᖃᐅᔨᓴᕐᓂᐊᖅᑐᖅᓱᑎᒃ ᐊᕙᑎᕗᑦ ᒥᐊᓐᓂᕆᐅᓯᐊᖅᑯᑉᓗᒍ

ᐊᕙᑎᓪᓕᕆᓂᖅᒥ ᖃᐅᔨᓴᖅᓃᑦ (ᐊᕙᑎ) ᐊᑐᖅᑕᐅᓐᓂᖓ ᓇᓪᓗᓇᐃᔭᐃᔪᖅ ᐱᑦᑕᖅᑐᐃᓇᓇᐊᓕᒃ ᐱᓪᓕᕆᓂᖅᒧᑦ ᐊᕙᑎᒪᒧᑦ ᐱᔪᑎᒃᓴᓐᓂᒃ ᐊᒪᓗ ᐱᑕᖃᕈᓐᓇᖅᓂᖕᒐᓂᒃ ᐊᒃᑐᖅᑕᐅᓂᒃᓴᖕᒐᓂᒃ ᐊᕙᑎᐅᑉ (ᓃᑦ) ᖃᐅᔨᓴᖅᑕᐅᓐᓃᑦ ᒥᒃᓵᓂᐊᕐᓗᒋᑦ ᐱᑕᖅᓂᖕᒐᓄᑦ ᐊᒃᑐᐃᔭᓈᖅᓂᖏᓄᑦ ᐃᓱᒪᒋᔭᐅᔪᖅ ᐊᒪᓗ ᐊᖏᓂᖅᓴᑯᑦ ᐱᓐᓇᓱᐊᖅᑕᐅᖅᑯᑉᓗᒋᑦ. ᐊᕇᕝᕙᒃᑯᑦ ᐅᒃᐱᕈᓱᒃᑐᑦ ᐱᓕᕆᐊᕈᑎᑦ ᑕᐃᒪᐃᓴᓇᐊᓛᑦ ᑐᑭᓯᐅᒪᔭᐊᕐᒥᒃ ᐊᕙᑎᒥᒃ ᑕᒪᓂᑐᒥᒃ ᐊᒪᓗ ᐱᑦᑐᐊᕐᑐᒥᒃ ᐱᓇᓱᕕᐅᓂᖓ ᐊᕿᒃᑕᐅᓯᒪᓂᖓ ᐊᒪᓗ ᖃᐅᔨᓴᖅᑕᐅᓐᓂᖏᑦ ᐊᒪᓗ ᐊᕙᑎᐅᑉ ᐊᒃᑐᖅᑕᐅᑐᖕᐃᓇᓇᐊᖅᖃᓂᖓ. ᐱᒋᐊᖅᑕᐅᕙᓪᓕᐊᖕᓂᖓ ᓂᕈᐊᖅᑕᐅᓯᒪᓂᖓ ᐱᓪᓕᕆᐊᖑᔫᑉ ᐊᕿᒃᑕᐅᓯᒪᓂᖓ ᒥᒃᓵᓂᐊᖅᑕᐅᒃᐸᑦ.

ᑕᐅᑐᒃᓪᓗᒋᑦ ᐊᑐᐊᖅᑕᐅᓇᔭᖅᓂᖏᑦ ᐱᓪᓕᕆᐊᖕᒐᑦ ᐃᓪᓚᓪᓚᐅᑎᑉᓗᒍ ᐊᕙᑎᓪᓕᕆᓐᓂᖅᒥᒃ ᐊᑐᔨᐊᖅᓂᖏᑦ, ᐱᓪᓕᕆᐊᒃᓴᑦ ᐊᑐᖅᓗᒋᑦ ᐊᒪᓗ ᐱᓪᓕᕆᐊᖓᑦ ᐊᐅᓪᓚᖅᓂᖏᑦ. ᐱᓪᓕᕆᕕᖏᑦ ᐊᕿᐅᒪᓂᖏᑦ ᐃᓱᒪᒡᒋᓗᒋᑦ ᐊᕙᑎᒥᒃ ᐱᓪᓕᕆᐊᖃᖅᓂᖏᑦ ᑕᐅᑐᒃᑕᐅᓗᑎᒃ ᐊᑐᓗᐊᖅᑕᐃᓪᓕᓗᒋᑦ ᐃᒻᒪᖅᒥᒃ ᐊᒪᓗ ᐊᑐᑲᓐᓂᖅᓂᖅᒥᒃ, ᐊᕿᐅᒪᑎᑦᓯᓐᓂᖅ ᐃᒻᒪᖅᒥᒃ ᐊᑐᖅᑕᐅᑲᖅᓂᖅᓂᖅᓗᓂᒃ, ᒥᒃᓵᓂᐊᓇᓂᖅ ᑐᒻᒥᖏᑦ, ᑎᒍᓯᑲᖅᓂᖅᓂᖅ ᐃᒪᓐᒪᖅᒥᒃ ᒪᓪᓗᒻᒪᖅᓴᐃᑲᖅᓂᖅᓂᖅ ᐊᑐᐃᖁᓇᒡᒋᑦ ᐱᓪᓕᕆᕕᐅᔫᑉ ᐊᕙᑎᓪᓗᑲᐅᓂᒃ ᐊᒪᓗ ᒥᒃᓵᓂᐊᕐᓗᒍ ᐊᖕᓂᐊᑎᑦᓯᓐᓃᑦ ᐊᒪᓗ ᐊᕿᒃᓯᖅᑕᐅᔪᑦ ᐊᖕᓂᐊᖕᓂᖏᑦ.

ᐅᒃᑐᕋᕈᑎᑦ ᓇᓗᓇᐃᖅᓯᔪᑕᐅᕗᑦ ᑕᒪᑯᓄᖓ ᐊᕿᓱᖅᑕᐅᓯᒪᔪᓄᑦ ᓇᓗᓇᐃᖅᓯᔪᑕᐅᓗᑎᒃ ᐊᓕᒋᓄᑦ. ᐊᕿᓱᕐᓯᒪᓂᒋᑦ ᑕᒪᑯᐊ ᐱᑦᔪᑕᐅᓂᖅᑲᕐᓇᖅᑐᑦ ᐊᑐᕆᐸᓕᑭᑕᐅᓂᕐᒧᑦ ᑕᒪᑯᓄᖓ ᐊᒃᑐᐃᓂᖅᑯᐅᔭᓇᖅᑐᓄᑦ ᐊᓯᖑᐸᓪᓚᐊᓂᐅᔭᓄᑦ ᐅᕙᓗᓂᑦ ᑕᒪᑐᒧᖓ ᐊᑐᓚᐅᖅᓂᖅᑲᖅᓴᖅᑦᓄᑦ ᑕᒪᑐᒧᖓ ᐱᓂᐊᖑᔪᓕᔪᒧᑦ. ᑕᒪᑐᒧᖓ ᐊᕙᑎᓂᓂᑯᑦ ᒥᐊᓂᖅᓯᔪᑎᒃᓴᓄᑦ ᐅᒃᑐᕋᓯᒪᓂᖅᑎᒍᑦ ᐊᑐᑎᖅᑲᖅᓴᓂᖅᑐᓄᑦ, ᐱᕙᓕᐊᑎᑕᐅᓂᒃᓴᖅᑐᓄᑦ (ᓱᖅᑯ ᐃᖅᑯᖅᑲᓂᐅᐸᒃᑐᑦ ᒥᐊᓂᓴᐅᔪᑎᒃᓴᖅᑐᓄᑦ) ᑕᒪᑯᐊᒍᑦ ᐊᕿᓯᒪᓂᐊᑐᑦ ᐱᕙᓕᐊᕈᑎᖅᑲᖅᑐᑦ ᐅᕙᓗᓂᑦ ᑕᒪᑐᒧᖓ ᐊᓕᒍᑕᖅᓱᓂᖅᑯᓂᑦ ᐊᑐᐃᓂᐅᓇᔭᖅᑐᒥᒃ ᑕᒪᑐᒧᖓ ᐱᓂᐊᖑᔪᓕᔪᒧᑦ.

ᑕᒪᑐᒪᓃ ᐱᓕᕆᓂᖃᑎᑦᑐᒋᑦ, ᖃᐅᔨᓴᖅᓂᑕᖅᓂᐊᖅᑐᖅ ᐊᑐᐃᓇᕐᓂᐊᖅᑐᓂᒃ ᑕᒪᑯᓄᖓ ᐱᓕᕆᔪᑕᐅᔪᓄᑦ ᖃᓄᐃᐸᓕᐊᓂᖏᓄᑦ. ᐊᕙᑎᓕᕆᓂᑯᑦ ᐊᒃᑐᒃᑕᐅᓂᑦ ᖃᐅᔨᓴᖅᑕᐅᓂᐊᖅᑐᑦ ᓇᓗᓇᐃᔭᐅᑕᐅᓗᑎᒃ ᑕᒪᑐᒧᖓ ᐱᓕᕆᓂᐅᔪᒧᑦ.

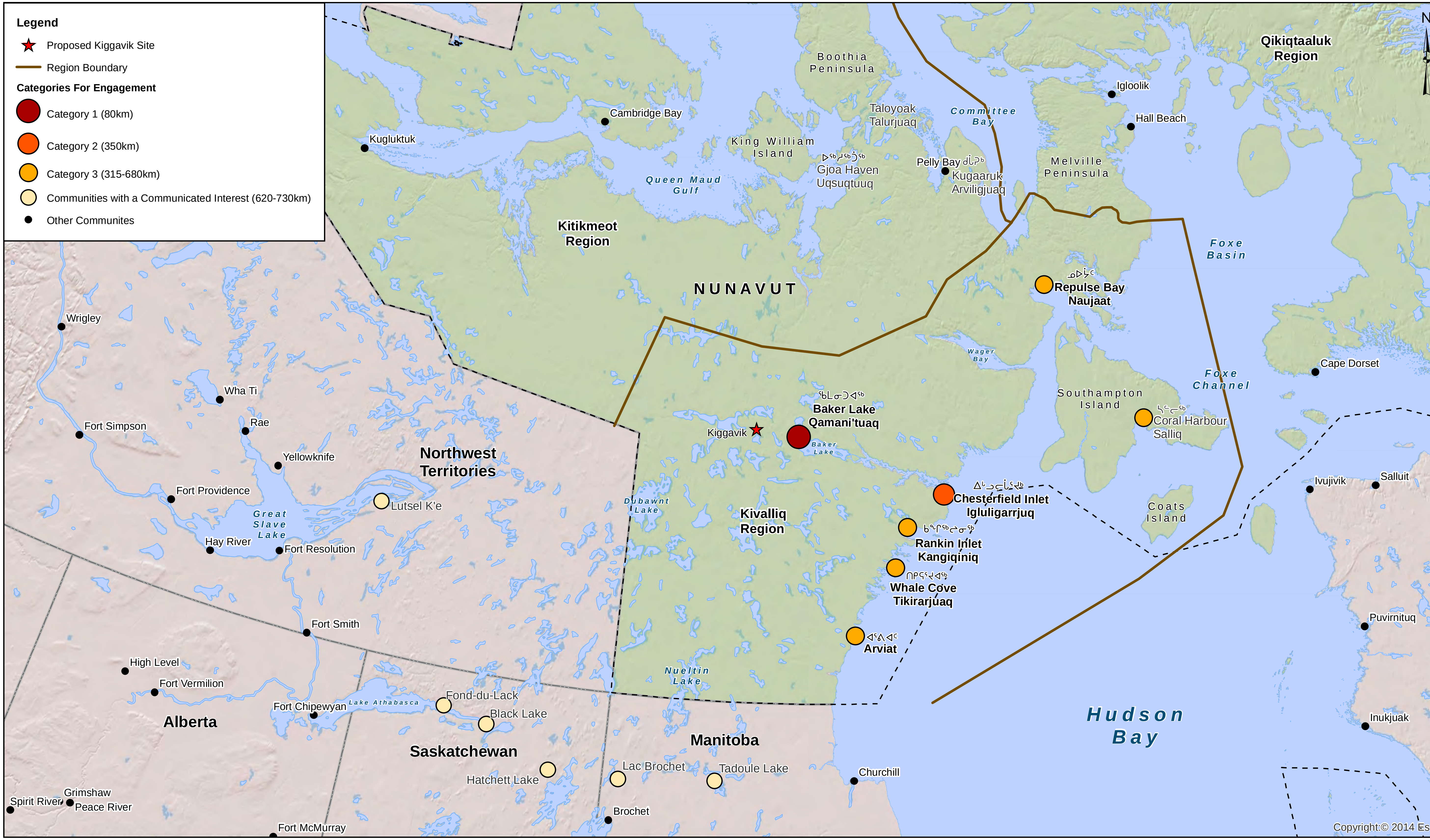
ᐊᑐᒐᒃᓴᐅᓂᐊᖅᑐᓂᒃ ᐊᐅᓚᑦᓯᔪᑕᐅᓂᐊᖅᑐᓄᑦ ᐃᓱᒪᓕᐅᕈᑎᒃᓴᑦ ᐊᕿᑕᐅᕙᒃᑐᑦ ᑕᒪᑯᓂᖓ ᑐᖓᕕᖃᕈᑎᒃ ᖃᐅᔨᓴᖅᑕᐅᓂᑯᓚᐅᖅᑐᓄᑦ ᑕᒪᑯᐊ ᖃᐅᔨᓴᓂᑯᓚᐅᖅᑐᑦ ᐊᖏᓂᖅᓴᐅᓂᖃᕋᖓᑕ ᑕᒪᑯᓇᖓᑦ ᐃᓱᒪᖏᔭᐅᓯᒪᔪᓂᑦ ᐊᕿᓱᐃᓂᖃᑲᓂᕆᐊᖃᕋᖓᑕᓗ, ᐅᕙᓗᓂᑦ ᐊᓯᖏᑎᖑᑦ ᐊᕿᓱᐃᑲᓂᕆᐊᖃᕋᖓᑕ ᑕᒪᓇ ᐱᔭᕆᐊᖃᕋᖓᑦ.ᑲᔪᓯᓂᖃᐸᓐᓂᐋᖅᑐᑦ ᑕᒪᑯᓂᖓ ᐊᕿᒋᐊᐸᓕᕈᑎᒃᓴᐅᔪᓂᒃ ᓯᕗᓂᒃᓴᒧᑦ ᐊᕿᓱᑕᐅᓂᐊᖅᑐᓂᒃ, ᐊᒃᑐᐃᓂᖃᓂᐅᔪᓄᑦ ᐊᐅᓚᑦᓯᓂᒃᓴᐅᔪᓂᒃ ᐃᓱᒪᓕᐅᕈᑕᐅᓂᑯᑦ ᑕᒪᑯᐊ ᐱᓕᕆᓂᐅᔪᑦ ᐱᓕᕆᐊᖑᓂᖏᑦ ᐱᑦᓯᐊᕋᓗᐊᖅᑎᑦᓗᖏᑦ. ᑕᒪᕐᒥᒃ ᐊᐅᓚᑦᓯᒥᓂᑯᑦ ᐊᑐᖅᑕᐅᓂᒥᑦ ᑲᔪᓯᑎᑦᓯᓂᖃᓂᖅᓗ ᐊᕿᒋᐊᐸᓕᕈᑎᒃᓴᓄᑦ ᑕᒪᑯᐊ ᐊᑐᒐᐅᓂᐊᖅᑐᑦ ᑕᑉᑯᓄᖓ ᐊᕇᕙᑯᓐᓄᑦ ᐱᕙᓕᐊᓂᕆᔭᖓᓄᑦ ᑕᒪᑐᒧᖓ ᐊᕙᑎᓕᕆᓂᑯᑦ ᒥᐊᓂᕐᓯᕙᓕᕈᑎᒃᓴᓄᑦ.

ᑕᒫ ᐱᕙᓕᐊᓂᒃᓴᒧᑦ ᐱᕈᐸᓕᐊᓂᖅ ᑕᒪᑯᓄᖓ ᐱᓂᐊᕋᓱᒋᔭᐅᓂᖅᓄᑦ ᑕᒪᑐᒧᖓᓗ ᐱᓕᕆᓂᐅᔪᓄᑦ ᖃᐅᔨᓴᖅᕈᑎᑦ ᐊᒪᓗ ᖃᐅᔨᒋᐊᑲᓂᖅᑕᕈᑎᑦ ᑕᒪᑯᐊ ᒥᐊᓂᖅᓯᕙᓕᕈᑕᐅᑯᑉᓗᒋᑦ ᑕᒪᑐᒧᖓ ᐱᕙᓕᐊᓂᐅᓇᔭᖅᑐᒧᑦ ᐊᒃᑐᐃᓂᖃᓂᐅᓇᔭᖅᑐᒧᑦ. ᐱᔪᒪᓂᖃᖅᓂᖏᓄᑦ ᑕᒪᑐᒪ ᐱᓕᕆᓂᐅᔪᒧᑦ, ᖃᐅᔨᓴᕐᓂᐅᔪᓄᑦ, ᐊᒪᓗ ᖃᐅᔨᒋᐊᑲᓂᑕᕐᓂᑯᑦ ᑕᒪᑯᐊ ᑲᔪᓯᓂᖅᑐᑦ ᑕᒪᑯᑎᖑᓇᖅ ᑲᔪᓯᑎᑦᓯᓂᐅᔪᑎᒍᑦ ᐱᕙᓕᕈᑎᒃᓴᓂᒃ ᑐᖓᕕᑲᕐᓗᑎᒃ ᑕᒪᑯᓂᖓ ᖃᐅᔨᒪᓂᐅᔪᓂᒃ ᐊᑐᖅᑕᐅᓯᒪᓕᖅᑐᓂᒃ.

ᓄᓇᓕᓐᓂᒃ ᐃᓚᐅᖃᑕᐅᑎᑦᓯᓂᖅ

ᐊᕇᕙᒃᑯᑦ ᐱᔪᒪᓂᖅᑐᑦ ᑕᒪᑯᓂᖓ ᑭᓇᑯᑐᐃᓇᖅᓂᒃ ᐃᓚᐅᖃᑕᐅᑎᑦᓯᓂᕐᒥᒃ ᑕᒪᓇ ᑕᑯᓇᖅᓯᐊᖅᑐᖅ ᑕᒪᑯᑎᖑᓇᖅ ᐱᕙᓕᐊᓂᐅᕙᑎᖑᑦ ᐱᕙᒪᓂᕆᔭᕐᑎᒍᑦᓗ, ᑕᒪᑯᓄᖓ ᐱᕙᓕᐊᒋᓴᖅᑕᐅᕙᑎᖑᑦ ᐱᔭᕆᐊᖃᕐᓂᐅᕙᑎᒍᑦᓗ ᑕᒪᓂᓗ ᓄᓇᕗᒥᖅᑕᐅᓂᑯᑦ. ᑕᑉᑯᐊ ᐊᕇᕙᑯᑦ ᐊᑐᖅᓯᒪᓕᖅᑐᑦ ᐊᓚᒥᓂᒃ, ᑕᒪᓂᓗ ᓄᓇᓕᒃᓂᓯᒪᓕᖅᑐᑦ ᑭᕙᓪᓕᖅ ᑕᒫ ᐱᔭᕆᐊᖃᓂᕐᓴᖑᓕᐅᖅᒪᑦ. ᑕᒪᒃᑯᓄᖓᓗ ᑲᑎᒪᖅᑎᓕᑕᖅᓂᖅᑯᑦ ᑲᑎᒪᑕᖅᓂᑯᑦᓗ ᑕᒪᑯᐊ ᐊᓕᖏᑐᑦ ᐱᓕᕆᐊᖑᑐᑦ ᐊᒪᓗ ᑕᒪᑐᒧᓇ ᐅᑯᐃᓪᓕᑎᑕᖅᓂᑯᑦ, ᐊᕇᕙ ᑕᑯᔭᖅᑐᐃᑎᑦᓯᑕᖅᓯᒪᓕᕐᐊᑦ ᑕᐃᑲᓃ ᐅᑭᐅᖅᑕᖅᑐᒥ ᓴᖅᑭᔮᖅᑐᒥ ᔪᕇᓂᐊᒻᒥᒃ ᐱᓕᕆᕕᐅᕙᒥ ᑕᒪᑯᐊ ᐃᓄᐃᑦ ᑕᑯᑦᓯᒪᐸᑐᖏᑦ ᑕᒪᑯᓂᖓ ᖃᓄᐃᑐᒪᖓᑕ ᑕᒪᑯᐊ ᔪᕇᓂᐊᒻᒥᒃ ᐅᔭᕋᑦᑕᕐᓂᐅᕙᑦ ᐊᒪᓗ ᑕᒪᑯᐊ ᓯᖃᓕᑎᕆᕕᐅᕙᑦ ᖃᓄᐃᑐᒪᖓᑕ ᑕᒪᑯᐊᓗ ᐅᑯᐊᖅᑕᐅᕋᓂᒃᓯᒪᓕᖅᑐᕕᓂᑦ ᐅᔭᕋᑦᑕᕐᕕᐅᓂᑯᑦ.

ᑐᑭᓯᒪᑉᓗᒍ ᑕᒫ ᐅᖃᐅᓯᖃᓂᖅ ᐊᑐᖅᓂᖃᕆᓂᕐᒪ ᑐᓴᐅᒪᑎᑦᓯᑕᐅᓂᑯᑦ ᑕᒪᑯᓄᒪᓗ ᐃᓕᖅᑯᓯᑐᖃᓂᓄᑦ ᐊᑐᖅᓗᐊᓂᖃᓂᒪᓗ, ᐊᓖ ᐱᓇᓯᐊᕐᓂᖅᑐᖅ ᑕᒪᑯᓂᖓ ᐃᓄᒃᑐᓕᖅᑎᓂᖅᒥᒃ ᑕᒪᑯᓂᖓ ᑎᑎᖅᓯᒪᔪᓂᒃ ᐊᒪᓗ ᑕᕆᔭᐅᓯᒪᓯᒪᓕᐊᓄᑦ ᐊᒪᓗ ᐊᑐᖅᐸᒃᒥᐊᑦ ᖃᐸᓗᓄᑦ ᐃᓄᒃᑐᑕᓗ ᑐᓴᐅᑦᑲᐸᒃᑐᑎᒃ ᐱᔭᕆᐊᖃᕋᐸᒥᒃ.



Projection: Lambert Conformal Conic
Compiled: TL Drawn: TL
Date: 9/25/2014 Scale: 1:6,500,000
Data Sources: Natural Resources Canada, Geobase®, National Topographic Database, AREVA Resources Canada Inc.

FIGURE 1.0-3
POTENTIALLY AFFECTED COMMUNITIES

ENVIRONMENTAL IMPACT STATEMENT
VOLUME 1

200 0 200
Kilometers

KIGGAVIK PROJECT

AREVA

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

File: Q:\SHEQ\GIS\KIGGAVIK\2014\EIS\Volume 1 - Main Document\Maps\Volume 1 - Tier 1\MXD\Popular Summary\Figure 1.0-3 Potentially Affected Communities_Replacement.mxd

ᑕᒪᒃᑯᓂᖓ ᑕᐅᑦᓱᓂ ᐅᖃᐅᓯᐅᓂᑯᓂᒃ, ᐊᐱᑦᑯᓯᐅᖅᓂᑯᓂᒃᓗ ᐊᒻᒪᓗ ᐃᓱᒪᓗᕆᔭᐅᓂᑯᓂᒃ ᐅᖃᐅᓯᐅᓂᑯᓂᒃ ᑕᒪᑯᓇᖓ ᐅᖃᓕᐅᕈᑕᐅᓂᖏᓐᓄᑦ ᐊᒻᒪᓗ/ᐅᕙᓗᓂᑦ ᑕᒪᑐᒨᖓ ᑭᒐᕕᒃᒥ ᐱᓕᕆᐊᖑᔪᒪᔪᒧᑦ ᑕᒪᓂ ᓄᓇᕗᒥ ᐅᑭᐅᓂ ᑕᒪᑯᓇᓂ ᐊᖅᑲᓂᓕᒃᓂ ᖃᖏᑐᓃ. ᑐᒃᑐᑦ ᐅᖃᐅᓯᐅᓚᔪᒃᓂᐸᖑᔪᑦ. ᑕᒫ ᓄᓇ/ᐅᒪᔪᑦ ᓇᔪᖅᑕᐅᖓᔪᓂᐅᒧᑦ ᑕᒪᑯᓇᖓ ᑕᕆᐅᖅᒥᐅᑕᑦ ᐃᒪᖅᒥᐅᑕᑦ ᐊᒻᒪᓗ ᓴᓗᒪᔪᒥᒃ ᐃᒪᑲᖅᓂᖅ ᑕᒪᑯᐊᓗᒃᑕᑦ ᐅᖃᐅᓯᐅᖓᔪᓂᒃᐊᖑᓚᐅᖅᑐᑦ.

ᑕᒪᒃᑯᐊᓗ ᐃᓱᒪᒋᔭᐅᖃᑕᐅᖅᑕᖅᓯᒪᔪᑦ ᐅᖃᐅᓯᐅᖃᑕᐅᖅᑕᖅᓯᒪᕗᑦ ᓄᓇᓕᒃᓂ ᑲᑎᒪᖃᑎᒋᓂᐅᔪᓂ, ᒪᑯᐊᖑᔪᑦ ᑕᒪᑯᐊ ᐱᔭᕿᐊᖃᓂᖏᑦ ᐊᒻᒪᓗ ᐃᓚᐅᖃᑕᐅᕙᓕᕐᑎᑕᐅᖁᔪᓗᒋᑦ ᒪᑯᒃᑐᑦ ᑕᒪᑯᐊᓗ ᐅᑦᔨᙵᔭᐅᑦᓯᐊᖅᑯᔪᓗᖏᑦ ᐃᓄᑐᖃᐃᑦ, ᐅᑦᔨᕈᓱᑦᓯᐊᖅᓂᖅᒪᑯᓄᖓ, ᐊᑐᖅᑕᐅᓂᒋᓄᑦ. ᐅᐱᒻᒋᔭᐅᓂᖏᓄᑦᓗ ᑕᒪᑯᐊ ᐃᓄᐃᑦ ᖃᐅᔨᒪᔪᑐᖃᖏᑦ ᐱᓕᕆᐊᓴᖃᑎᑦᓯᓂᖅ ᐊᒻᒪᓗ ᐊᓯᖏᓗ ᐃᑲᔪᕈᑕᐅᔪᒃᓴᑦ; ᐊᓐᓂᖃᓇᒥᑎᑦᔨᓂᖅ ᐊᒻᒪᓗ ᐊᕿᐅᒪᑎᑦᓯᓂᖅ ᑕᒪᐃᓄᑦ ᐊᒻᒪᓗ ᑕᒪᑐᒧᖓ ᔫᓂᐊᓪᓕᕆᓂᖅᒧᑦ.

ᑕᒪᑐᒧᖓ ᐱᓕᕆᐊᖑᔪᒪᔪᑉ ᐊᕿᓱᖅᓯᓴᓂᖓᓄᑦ, ᑕᒫ ᐊᑦᑯᓯᐅᖅᑕᐅᔪᒪᔪᒧᑦ ᐃᓱᒪᖏᔭᐅᓯᒪᓂᖓ ᑕᒪᐅᓇᓗ ᑯᒃᑯᑦ ᐃᑲᕕᓕᐅᕋᔭᖅᐸᑕ ᑕᒪᑯᐊ ᐅᖃᐅᓯᐅᓗᐊᓂᖃᓚᐅᖅᑐᑦ ᑕᒪᑯᓄᖓ ᐊᐱᕐᑯᓯᖅᓴᑕᖃᐅᓗᓂ ᑕᒪᑐᒧᖓ ᐅᔭᕋᑕᓇᐊᖅᕕᐅᔪᒪᔪᒧᑦ ᑕᒪᑯᓄᖓᓗ ᓯᖃᓕᑎᓇᕕᐅᓇᔭᕐᑐᓄᑦ.

ᑕᒪᒃᑯᐊ ᐅᖃᐅᓯᐅᑕᕐᓂᑯᑦ ᑲᑎᒪᑎᑦᓯᑕᖅᓂᑯᑦ ᐃᓱᒪᒋᔭᐅᓯᒪᔪᑦ ᐊᒻᒪᓗ ᐊᑐᖅᑕᐅᓗᑎᒃ ᓯᕗᓂᒃᓴᒥ ᑕᒪᑯᓂᖓ ᐃᓚᐅᖃᑕᐅᑎᑦᓯᓂᖅᒧᑦ ᐱᓕᕆᐊᖑᔪᒃᓴᓄᑦ. ᑕᒪᓇ ᐊᕿᓱᖅᑕᐅᓯᒪᓂᖓ ᑕᒪᑐᒪ ᐱᓕᕆᐊᖑᔪᒪᔪᑉ ᑕᒪᑯᐊᓗ ᑎᑎᕋᑕᐅᓯᒪᔪᑦ ᐱᒋᐊᕈᑕᐅᓇᔭᕐᑐᑦ ᑕᒪᑯᓇᖓ ᐃᓚᐅᖃᑕᐅᑎᑦᓯᑕᖅᓂᑯᑦ ᐱᔭᐅᔪᒪᓂᖃᓂᑦ ᑕᒪᑯᐊ ᑕᒪᓇ ᐊᑦᑯᓯᐅᖅᑕᐅᓇᔭᕐᑐᑦ ᐃᓱᒪᖏᔭᐅᓯᒪᓂᖓ ᐃᓚᖓᑦ ᐃᖅᑕᐅᕐᑯᓗᖕᒍ, ᐱᒋᐊᐸᓕᕐᑎᑦᓯᓂᖃᓂᖅᓗ ᑕᒪᑯᓂᖓ ᐃᓚᐅᖃᑕᐅᑎᑦᓯᕙᓕᕐᓂᖅᒥᒃ ᒪᑯᒃᑐᓂᒃ, ᐊᓯᕈᔪᐃᑐᖅ ᐃᓕᓐᓂᐊᖅᑕᐅᓂᓴᖕᖓᓂᒃ ᑕᒪᑯᐊ ᑕᒪᑐᒧᖓ ᐊᓯᕈᔪᐃᑐᒧᑦ ᒥᐊᓂᖅᓯᔪᑕᐅᓂᑦ ᑕᑯᑎᑕᐅᕐᑯᓗᕆᑦ ᑕᒪᐃᓂ ᑕᑦᑯᓇᓂ ᒪᕈᓂᒃ ᐊᖅᕕᓂᓕᐅᔪᓂ ᓄᓇᓕᒃᓂ ᑭᕙᓪᓕᕐᒥ ᑕᒪᑯᑎᖑᒍᓇᖅ ᐅᑯᐃᐊᑎᑦᓯᓂᐅᔪᑎᖑᒧᑦ ᐊᒻᒪᓗ ᓴᕿᑎᑦᓯᓂᖅᒥᒃ ᑕᓇᔭᐅᓯᐅᖅᓯᒪᔪᓂᒃ ᑕᒪᑐᒧᖓ ᐊᓯᕈᔪᐃᑐᒧᑦ, ᑕᒪᑯᐊᓗ ᐱᓕᕿᐊᖑᔪᑦ ᐊᕿᖕᒋᐊᐸᓕᕈᑎᒃᓴᕆᓂᒃ ᑕᒪᑯᓇᖓ ᑐᒃᑐᑦ ᐊᒻᒪᓗ ᐃᒪᖅᒥᐅᑕᐃᑦ ᑕᕆᐅᖅᒥᐅᑕᐃᑦ ᐃᒪᖃᓯᐊᐸᓕᑲᓂᕐᑯᓗᖏᑦ ᑕᒪᑯᓂᖓ ᓄᓇᓕᒃᓂ ᖃᐅᔨᒪᔭᐅᓂᐅᔪᓂᒃ ᐊᑐᑎᖃᓯᐊᑲᓂᑯᓗᒋᑦ.

ᐃᓄᐃᑦ ᖃᐅᔨᒪᔭᑐᖃᖏᑦ

ᐃᓄᐃᑦ ᖃᐅᔨᒪᔭᑐᖃᖏᑦ ᐊᐱᕐᓱᖅᑕᕐᓂᑯᑦ ᐃᓕᓐᓂᐊᖅᑎᑦᓯᑕᖅᓂᑯᑦᓗ ᐱᔪᑎᖃᕈᐊᖅᓱᑎᒃ ᑕᒪᑯᓇᖓ ᐃᓄᑐᖃᐅᔪᓄᑦ ᐊᒻᒪᓗ ᑕᒪᑯᓇᖓ ᐊᖑᓇᓱᒃᑎᑦ ᑲᑎᒪᔨᖏᓐᓄᑦ ᑕᒪᑯᓇᓂ ᒪᕐᕉᒃ ᐊᖅᕕᓂᓕᐅᔪᓂ ᑭᕙᓪᓕᕐᒥ ᓄᓇᓕᒃᓂ. ᑕᒪᕐᒥᒃ ᓄᓇᓕᐅᒪᐃᑦ ᐱᔪᓇᕐᑎᑦᓯᓕᐅᖅᐳᑦ ᑐᑭᓯᕙᓖᕈᑎᒃᓴᓂᒃ ᑕᒪᑯᓇᖓ ᐅᖃᐅᓯᐅᓂᑯᓄᑦ: ᓂᖅᔪᑎᑦ ᐊᒻᒪᓗ ᐊᖑᓇᓱᒃᑕᐅᕙᓂᖏ ᑕᒪᐃᓃ ᓄᓇᒥ ᐃᒪᖅᒥᐅᑕᑦᓗ ᐅᒪᔪᑦ, ᑎᒃᒥᐊᕈᓯᑦ ᐊᒻᒪᓗ ᒪᓂᓐᓂᒃ ᐱᕿᐅᑕᖅᐸᓃᑦ, ᐃᖃᓗᒃᓯᐅᖅᓂᑦ, ᐱᕈᖅᑐᑦ, ᐊᑦᑯᑎᑦᓯᕗᕐᒃᑐᑦᓗ ᐊᐅᓚᖅᑐᓄᑦ ᐃᓕᑯᓯᑐᖃᓂᕐᓗ ᐱᑕᖃᐅᓂᑦ ᓄᓇᑦ ᓯᑯᑉ ᖃᓄᐃᐸᓕᐊᕙᒃᓂᖓ, ᐃᒻᒪᐅᑉ, ᐊᓯᖕᒍᐸᓕᐊᓂᖓᑕ ᓯᓚᐅᑉ, ᐊᒻᒪᓗ ᑕᒪᑯᐊ ᐃᓱᒪᖏᔭᐅᓯᒪᔪᑦ ᑕᒪᑐᒧᖓ ᐱᓕᕆᐊᖑᔪᒪᔪᒧᑦ ᐊᐱᕐᑯᓯᑦ ᐃᓱᒪᖏᔭᐅᓯᒪᓂᑦᓗ.

ᑐᓴᕋᓴᐅᔪᑦ ᑕᒪᑯᓇᖓ ᐃᓄᓯᓕᕆᓂᒧᑦ ᐱᕙᓕᐊᓂᒃᓴᓄᑦᓗ ᐃᓱᒪᖏᔭᐅᓯᒪᔪᑦ ᑕᒪᑯᑎᒎᓇᖅ ᐱᔭᐅᔪᓇᓚᐅᖅᑐᑦ ᐊᐱᖅᓱᖅᑕᓂᑯᑦ ᐊᒻᒪᓗ ᐊᒥᓱᐃᖑᒍᑎᑦ ᐅᖃᓚᖅᑎᒋᓂᑯᑦ ᑕᒪᑯᐊᓗ ᐱᓕᕆᐅᕙᒃᑐᑦ, ᐱᓕᕆᕙᒃᑐᑦᓗ ᐃᒡᓗᒥᐅᖅᑎᒋᑦ

ᐃᓚᖏᑦ, ᒪᑯᑦ ᐃᓐᓇᐃᑦ, ᐊᒪᓗ ᐊᖅᓇᐃᑦ. ᐅᖃᐅᓯᐅᓚᐅᖅᑐᑦ ᒪᑯᐊ ᐊᖅᓇᐃᑦ ᐱᔭᒃᓴᖏᑦ ᐊᑐᑕᐅᖅᑮᓂᒋᑦ ᓂᖅᔪᑎᑦ ᓂᕿᒋᔭᖏᑦ ᐃᓕᖅᑯᓯᑐᖃᑎᒎᑦ ᐊᑐᖅᑕᐅᑲᒃᑐᑦ.

ᐃᓄᐃᑦ ᖃᐅᔨᒪᔭᑐᖃᖓᑦ ᐊᑐᖅᑕᐅᓚᐅᖅᐳᖅ ᑕᒪᑯᓄᖓ ᐃᑲᔪᖅᑕᐅᕙᓕᕐᓂᖅᒧᑦ ᐱᓕᕆᐊᖑᔪᒪᒧᑉ ᖃᓄᐃᑐᓂᐊᕐᓂᖓᓄᑦ, ᑕᒪᑯᓄᖓ ᖃᐅᔨᕙᓕᖅᑕᐅᔪᑎᒍᑦ ᑕᒪᑯᓄᖓᓗ ᑲᑎᖅᓱᖅᑕᐅᓂᑯᓄᑦ ᑕᒪᑐᒧᖓ ᖃᐅᔨᕙᓕᖅᑎᒃᓴᓄᑦ, ᓂᕈᐊᖅᑕᐅᓯᒪᓂᖏᓄᑦ ᑕᒪᑐᒧᖓ ᐱᓇᕈᑎᑕᐅᓂᑦ ᖃᐅᔨᓴᖅᑕᐅᓂᖏᓄᑦ, ᓇᓗᓇᐃᖅᑕᐅᓗᑎᒃ ᑕᒪᑯᐊ ᐱᓚᓇᐅᓂᑦ ᐊᒪᓃ; ᑕᒪᑯᐊ ᓇᓗᓇᐃᓇᔭᖅᓱᒋᑦ ᐊᑐᑎᖅᓯᐊᕋᔭᖅᓂᑦ ᐊᒪᓗ ᖃᐅᔨᓴᖅᓂᑦ ᑕᒫ ᒥᑭᓪᓕᕆᑎᒃᓴᖓᓄᑦ ᐊᒃᑐᓂᖅᓂᐅᓇᔭᖅᑐᑉ ᑕᒪᐃᓄᑦ ᐊᕙᑎᓕᕆᓂᑯᑦ ᐊᒪᓗ ᓄᓇᓕᒃᓄᑦ.

ᒪᓇᐅᔪᖅ ᐊᓯᙵᐊᓕᐋᑦ ᐊᕙᑎᓪᓕᕆᓂᑯᑦ

ᑦᒪᑐᒪᓃ ᐱᓕᕆᐊᖑᔪᒪᔪᒥ ᐊᕙᑕᓂ ᖃᐅᔨᑕᖅᓯᒪᕗᑦ ᑕᒪᑐᒥᖓ ᐊᓯᙵᐸᓕᐊᓂᐅᔪᓂᒃ ᑕᒪᑐᒧᖓ ᐱᔪᑎᖃᑐᓂᒃ ᐃᑭᓇᓗᐊᖅᓂᖅᒧᑦ, ᐅᓇᕐᓂᖃᓗᐊᖏᓂᖓᓄᑦᓗ ᐊᒪᓘ ᐊᓄᓇᑐᓚᔪᓗᐊᖅᓂᓚᓄᑦ. ᑕᒃᑯᐊ ᐅᑭᐅᑦ ᐅᑭᐅᖑᖃᑕᒍᔪᖅ ᐊᒪᓗ ᐃᑭᓇᖅᑐᖅ ᐊᒪᓘ ᑕᒪᑯᐊ ᐊᐅᔭᐅᓂᑦ ᓇᐃᑐᑦ ᐊᒪᓗ ᐅᓇᖅᑐᑦ. ᐊᓚᕆᓂᐅᔪᑦ ᓇᐃᑐᑕᐅᒪᑕ. ᐃᑭᓇᕐᔪᐊᓂᐅᕙᓂᖏ ᑕᒪᓂ ᖃᒪᓂᑦᑐᐊᖅᒥ ᑕᒪᓂᓗᐊᖅ ᐃᑭᖅᓇᓂᖅᑲᓂ □50.6 ᑕᒪᓂ ᔭᓐᓄᐊᕆᒥ ᐊᒪᓗ ᐅᓇᕐᓂᖅᑲᓂ ᑕᒪᓂ 33.6 ᔪᓕᖑᓕᕋᖓᑦ ᑕᒪᑐᒪᓗ ᐊᕋᒍᑕᒪᑦ ᐅᓇᖅᓂᖅᑲᓗᐊᖅᑲᓂ ᓯᓚᐅᑉ ᐅᓇᖅᓂᖓᖑᑦ ᓂᒃᓕᓇᓂᖅᑲᓂ □11.9 ᑕᒫ ᐊᓄᓇᖅᑲᓂᐸᖑᕙᒃᑐᖅ ᑕᒪᖓᑦ ᓇᕿᓂᖓᓗ ᐊᓅᓂᑉ ᑕᒥ ᖃᒪᓂᑐᐊᖅᒥ ᐅᐊᒃᓇᑯᑦ ᑕᒪᓂ 20.5 ᑭᓚᒥᑐᔅ ᓇᕿᓂᑲᖅᑐᓂ ᑕᒪᐅᖓ ᑎᑭᑕᖅᑲᓂ 31.7 ᑮᓚᒥᑐᔅ. ᐊᓄᓇᐅᑉ ᓇᑭᖅᓂᖓ ᐊᖏᓂᖅᓴᐅᔪᖅ ᑕᒪᖓᑦ 39.6 (11 ᓴᑭᓂᖓ ᐃᖅᑲᒧᑦ) ᑕᒪᑯᐊ ᐱᑕᖅᑲᔪᓂᐅᔪᑦ ᑕᒪᑐᒧᖓ ᐊᓄᓇᖅᑲᓂᖅᒧᑦ ᑕᒪᖓᑦ ᔭᓐᓄᐊᕆᒥᑦ ᒫᔾᔪᑦ. ᐊᓄᓇᐅᑉ ᓇᕿᓂᖓ ᖃᖏᐅᑎᑕᖅᓂᖓ ᑕᒪᑐᒥᖓ 100 ᑭᓇᒥᑐᔅ ᐃᖅᑲᒧᑦ ᐱᑕᖅᔪᒥᓚᐅᖅᐸᒃᑐᖅ ᐃᒪᑲᖅ ᐅᑭᐅᑦ ᐱᖓᓱᑦ ᐊᒡᒐᐃᑦ ᐱᐊᓂᒃᑲᖓᑕ.

ᓯᓚᐅᑉ ᐊᓂᖅᓴᖅᑐᖅᑕᐅᕙᒃᑐᑉ ᐊᓄᓇᓃᖓ, ᐱᖅᐸᓗᙵᓂᑦ ᐊᒪᓃ ᓴᒃᔪᐱᓚᖅᓂᑦ ᑕᒪᑯᐊ ᐱᖁᓯᑐᖃᐅᔪᑦ ᑕᒪᑯᓇᓂ ᒥᑭᔪᑕᐅᔪᓂ ᐊᒃᑐᖅᑕᐅᓚᐅᖅᓯᒪᙱᑐᓂᒃ ᑕᒪᑐᒧᖓ ᐊᕙᑎᓕᕆᓂᑯᑦ.

ᑕᒃᑯᐊ ᑯᒃᑲᑦ ᕿᑎᖅᑲᓂᖏᑦ ᐃᒪᓇᓗᐊᖅ 1 ᒥᑐᔅ ᐃᑎᖅᑲᐅᖅᑐᒃᑕᑦ ᑕᐃᒪᓇᓗᐊᖅ ᐊᒪᓗ ᑕᒪᑯᐊ ᑕᒪᕐᒥᒃᓴᒃ ᑯᒃᑲᑦ ᖁᓯᒪᔪᒃᑕᖑᔪᖅᑐᑦ ᐅᑭᐅᒃᑕᖅ. ᑕᓯᑦ ᐃᑎᓗᐊᐸᖏᑐᑦ ᐃᒪᑲᖅ ᑕᒥ ᐃᑎᓂᖅᑲᓗᐊᖅᑲᔭᖅᑐᑦ ᐃᑲᓂᖅᓴᐅᓗᓂ 3 ᒥᑐᔅ ᐊᒪᓃ ᓯᑯᓯᒪᓗᒃᑕᖅᐸᑦᑐᑦ ᐅᒃᑐᐱᓇᒥᑦ ᑕᒪᐅᖓ ᑦᔪᓐᓃᒧᑦ ᑕᒪᓇᓗ ᓯᑯ ᐃᐸᔪᓂᖅᑲᓗᐊᖅᐸᒃᑐᖅ ᑕᒪᓂ ᐃᒪᑲᖅ 2 ᒥᑐᔅ ᐃᓚᖏᓂ ᐊᒥᓱᖏᑐᓃ ᑕᒪᑯᐊ ᐅᑭᐅᑯᑦ ᐃᐸᔪᓂᖅᐸᓂᒋᑦ ᖃᐅᔨᔭᐅᓯᒪᔪᑦ ᑕᒪᓂᓗᐊᖅ 3 ᒥᑐᔅ ᑕᒪᑯᐊ ᑯᒃᑲᑦ ᑯᒃᐸᓕᐊᓕᖅᐸᒥᔪᑦ ᐅᐱᕚᓴᑯᑦᑲ ᑕᒪᓇ ᐊᐳᑦ ᐊᐅᐸᒃᓕᐊᓕᕋᖓᑦ ᑕᒪᓂᓗᐊᖅ ᑕᕿ ᔪᓂ ᓇᐸᕈᐸᓕᐊᑎᑦᑐᖑᒍ. ᑯᒃᐸᓕᐊᓕᖅᑲᓗᑎᒃ ᐅᐱᖓᓱᒃᑕᖅᑲᓗ ᑯᓐᓅᐊᓕᕐᑲᓗᑎᒃ. ᑕᓯᑦ ᐃᑎᓂᖅᑲᓂᒋᑦ ᐊᐅᐸᓕᐊᓂᒋᑦ ᑕᒪᓂ ᐅᐱᖓᖑᕙᓕᐊᓕᕋᖓᑦ ᓯᑯᐃᕈᑎᕙᒃᓗᑎᑦ ᑕᕿ ᑦᔪᓐᓃ ᕿᑎᖓᓂ.

ᑕᒃᑯᐊ ᐊᒥᓱᓚᖑᔪᖅᑐᑦ ᑕᒪᑯᓇᖓᑦ ᐃᖅᑲᓗᒃᓂ ᖃᐅᔨᒪᔭᐅᔪᑦ ᑕᒪᑯᓇᓂᓕ ᑕᓯᖅᓂ ᑕᒫ ᒪᑯᐊ ᑯᓗᒃᐸᐅᖓᐃᑦ. ᐊᓯᖏᓪᓗ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᑦ ᐃᖅᑲᓗᐃᑦ ᐊᑕᖑᒍᑦ ᖃᓂᓕᑦ, ᐃᕕᑕᕈᐃᑦ, ᑎᒃᑕᓕᑦ ᑲᑭᕙᐊᖅᑐᑦ ᐊᓇᒃᓕᑦ ᐃᖅᑲᓗᒃᐱᑦ ᑳᓇᔪᐃᑦ ᑕᓯᖅᒥᐅᑕᐃᑦ ᑲᑭᕙᐊᖅᑐᑦ ᑕᒪᑯᐊᓖ ᓇᓂᔭᐅᓯᒪᔪᑦ ᖃᒪᓂᑐᐊᖅᒥ. ᑯᓗᒃᐸᐅᒡᒐᐃᑦ, ᐃᕕᑕᕈᐃᑦ, ᑎᒃᑖᓕᑦ ᐊᓯᖏᓗ ᑕᒪᑯᐊ ᑕᒪᑯᓇᓂ ᑕᓯᖃᓂ ᐱᑕᖅᑲᔪᒃᑐᑦ ᑕᓯᒥᐅᑕᑦ ᑲᑭᕙᐊᖅᑐᑦ ᐊᒪᓗ ᐊᒪᓗᖅᑐᑦ ᑲᑭᕙᐊᖅᑐᑦ ᖃᐅᔨᒪᔭᐅᔪᑦᑕᐅᖅ. ᐃᖅᑲᓗᒃᐱᑦ ᐊᒪᓗ ᐊᓇᒃᓛᑦ ᐱᑕᖅᑭᔪᒃᑐᑦ ᑕᒪᓂ ᑲᒥᖅᔪᑉ ᑯᖓᓂ.

ᑕᒪᑯᐊ ᐃᓚᖏᑦ ᐱᑕᐊᓂᐅᕙᒃᑐᑦ (ᐊᕿᑐᑦ ᓴᕕᖃᔭᐃᑦ, ᓯᑎᔪᑦ ᓴᕕᖃᔭᐃᑦ ᐊᐅᐸᔭᖅᑐᑦ ᑲᓐᓄᔭᐃᑦ ᓴᕕᑦᓗ ᐊᕿᒋᐃᑦᓗ) ᑕᒪᑯᓇᓂ ᐃᒪᑲᖅᓂᐅᔪᓂ ᐱᑕᖅᑲᐅᐸᕐᑐᑦ ᐃᓚᖏᓂ ᑕᒪᑯᐊ ᑕᓯᑦ ᓴᕕᖅᑲᓂᖅᑲᐅᓗᑎᒃᓗ (ᑕᒪᑯᓂᖓᓴᐃᓇᖅ ᐊᐅᐸᔭᖅᑐᓂᒃ ᑭᑉᐸᓕᖅᑐᓂᒃ ᐊᒪᓗ ᐊᕿᒋᐃᑦᓗ) ᑕᒪᑯᐊ ᑕᒪᑯᓄᖓ ᖃᐅᔨᓴᕈᑕᐅᓂᐅᕙᒃᑐᓄᑦ ᐊᖏᓂᖅᓴᐅᓚᐅᖅᑐᑦ ᑲᓇᑕᒥ ᑲᑎᒪᔨᑦ

ᒥᓂᔅᑕᐅᔪ ᑕᒪᑯᓄᖓ ᐊᕙᑎᓕᕆᓂᖅᒧᑦ ᐊᑐᐊᖓᓴᓕᐅᖅᓯᒪᔪᓄᑦ ᑕᒪᑯᐊ ᐃᓕᖅᑯᓯᖏᑦ ᐃᓕᖅᑯᓯᑐᖃᒥᒃᓂᒃ ᐊᖏᓯᒪᔪᑦ ᐱᖅᑯᓯᑐᖃᒥᒃᓂᒃ.

ᐃᐸᔾᔪᓂᖓ ᑕᒪᑐᒨᖓ ᐊᑐᑎᖃᓯᐊᖅᓂᖅᐳᔪᒧᑦ ᐱᑕᖃᓐᓇᐊᖃᑐᖅ, ᑕᒪᖓᓄᐊᖅ 1 ᐅᕙᓄᓂᑦ 2 ᒥᑐᔅᒥᒃ ᑕᐅᖓᓄᐊᖅ 5 ᒥᑐᔅ ᑕᒪᓂ ᐅᔭᕋᖅᐳᓂᐅᔪᒥ ᖃᐃᑐᖃᓂᐅᔪᒥ. ᑕᒪᑐᒨᖓ ᐃᑎᓂᖃᓂᖓ ᑕᒪᓂᓄᐊᖅ ᐃᓕᖅᑯᓯᑐᖃᖓ 210 ᒥᑐᔅ ᐃᑎᓂᖓ ᑖᓂ ᑭᒪᕖᒃ ᖃᓂᑕᖓᓂ ᑕᐅᖓᓄᐊᖅ 250 ᒥᑐᔅ ᐃᑎᓂᖃᓄᓂ ᑕᐃᑲᓂ ᕿᒃᕿᑕᓕᒃᒥ ᐊᕙᑕᓂᓄ. ᐱᑕᖃᓯᐊᖏᑐᖅ ᐱᑕᖃᖏᑐᖅᓅᓂᑦ ᐊᑦᑎᒥᓂᖃᐅᓂᖏᑦ ᑕᐸᑯᐊ ᐃᑎᓂᖏᑦ (ᒪᓂᕋᐅᑉ ᖁᖁᓂᖓᑕ ᐊᑕᓂ) ᐊᒪᓅ ᐃᑲᓂᑦ (ᐃᓕᖅᑯᓯᑐᖃᒥ ᐊᖏᓯᒪᔪᑦ) ᒪᓂᕋᐅᑉᓄ ᐃᒪᖃᓂᖏᑦ ᐃᒋᕋᓂᖃᓂᖏᑦ. ᐅᔭᕋᐃᑦ ᑕᒪᑯᐊ ᑕᒪᑐᒪ ᓄᓇᐅᑉ ᖁᖁᓂᖓᓂᑐᑦ ᐃᒪᖃᑐᖃᓂᖃᓯᐊᖏᑐᑦ.

ᑕᒪᓈ ᒪᓂᕋ ᓄᓇ ᐱᑕᖃᓄᐊᖅᓂᖃᑐᖅ ᒪᓂᒃᑐᑉᓄᓂ ᒪᓂᑦᓂᖃᓄᓂ ᓄᓇ ᒪᓂᕋᖅ ᑕᒪᓅ ᐅᔭᕋᖃᓄᓂ ᖃᐃᑐᖃᓂᖃᐅᓄᓂ ᑐᐊᐸᓂᖃᐅᓄᓂ, ᐊᒥᓱᖏᑐᓂᒃᓄ ᐊᑦᓯᓂᖃᓄᓂ. ᖃᖓᐅᖓᖃᓂᑦ ᐱᑕᖃᕋᔪᓄᐊᖏᑐᑦ ᑕᒪᓇ ᒪᓂᕋ ᓄᓇᐅᑉ ᖃᖓ ᑐᐊᐸᓂᖃᐅᑐᖅ ᐊᖅᑯᑉᐸᓕᓇᑐᒥᒃ ᑕᒪᑯᐊᓄ ᐊᓚᒋᓂᖃᓄᑎᒃ ᖃᓄᐃᑐᓂᖃᐅᓂᖏᑦ, ᐃᓚᖏᑦ ᐃᐸᔾ ᒪᓂᕋᐅᑉ ᐱᑕᖃᐅᓂᖃᑦ ᐃᓚᖓ ᑕᒪᑯᓂᖓ (ᓴᕕᒃᓴᖃᓂᖃᑐᑦ, ᖃᐸᓕᖅᑐᖃᐅᑐᑦ, ᐅᔭᕋᖃᓂᖃᐅᑐᑦ) ᑕᒪᑯᓇᖓᑦ ᐊᖏᓂᖅᕙᓴᐅᔪᑦ ᑲᓈᑕᒥ ᑲᑎᒪᔩᑦ ᒥᓂᔅᑕᐅᔪᑦ ᑕᒪᑐᒨᖓ ᐊᕙᑎᓕᕆᓂᖅᒧᑦ ᐊᑐᐊᖓᓴᓕᐅᖅᓯᒪᔪᑦ ᑕᒪᑯᐊ ᖃᓄᐃᑐᓂᑦ ᐃᓕᖅᑯᓯᖏᑦ ᐱᖅᑯᓯᑐᖃᒥᒃᓂᒃ ᓴᓇᓯᒪᓂᖃᑐᑦ. ᑕᒪᑯᐊ ᐊᑦᓯᓂᖃᓂᖏᑦ ᑕᒪᑐᒪ ᒪᓂᕋᐅᑉ ᓄᓇᐅᑉ ᖃᖓᒪᓂᑐᑦ ᐊᑐᑲᓂᖅᑕᐅᔭᖅᑐᑦ ᐊᖅᑯᖅᑕᐅᖃᓂᓄᑎᑦ ᐃᓕᖅᑯᓯᑐᖃᒥᓄᑦ ᑕᒪᓂᓄᐊᖅ 11 ᓴᓐᑕᒥᑐᔅ ᐊᖏᓂᖅᐸᖓᓄᓂ 2 ᓯᓐᑕᒥᑐᔅ ᑕᒪᑯᓇᓃ ᐳᖅᑐᓂᐅᔪᓂ ᓄᓇᓂ ᒪᓂᕋᓂ ᓄᓇᓂ ᒪᓂᕋᓂ ᐃᓕᖅᑯᓯᑐᖃᖏᓂ ᑕᒪᓂᑦᓄᐊᖅᓄ 31 ᓯᓐᑕᒥᑐᔅ ᑕᒪᑯᓇᓃ ᒪᓂᕋᐅᓂᖅᓂ ᐊᑦᓯᓂᐅᔪᓂ ᐃᒪᖃᓂᐅᔪᓂ ᓄᓇᖃᓂᐅᔪᓂᓄ ᐃᐸᔪᓂᖃᐅᑐᓂ ᒪᓂᕋᒥ.

ᑕᒪᑐᒪᓂ ᐱᓕᕆᕖᑉᐅᔪᒪᔪᑉ ᐊᕙᑕᓂ ᑕᒪᑐᒥᖓ ᓄᓇᒥᒃ ᓄᓇᖃᓂᖃᐅᖅᑐᖅ ᐱᖅᑯᑐᖃᐅᓄᓂᓄ ᐊᒪᓄ ᐅᔭᕋᖃᓂᖃᐅᓄᓂ ᖃᐅᑐᖃᐅᓄᓂᓄ. ᓄᓇᒥ ᐱᕈᖅᑐᑦ ᑕᒪᑯᐊ ᓇᐃᑐᑦ ᐱᕈᑐ ᐊᕙᓚᖁᐊᑦ ᐅᖅᐱᓚᐃᑦ ᐊᓯᖏᓄ ᑕᒪᑯᐊᓄ ᐃᕖᑉᓯᖓᐃ ᐃᕕᑦ ᐱᑐᑦᓄ, ᐃᐸᔪᖃᐅᓂᑦ ᒪᓐᓂᑦ.

ᕼᒪᓈ ᐱᓕᕆᐊᖑᔪᖅ ᐊᕙᑕ ᓄᓇᐅᕕᐅᕙᒃᓂᐅᕆᑐᖅ. ᑕᒪᒃᑯᐊ ᑎᑉᓴᓕᐅᑉ ᑐᒃᑐᖁᑎᕆᑦ ᓄᓇᐅᕕᕆᕙᒃᑕᖓᑦ ᑕᒪᓂ ᐅᖓᓯᒃᓂᖃᑦᓄᐊᖅᑐᖅ 70 ᑭᓛᒥᑐᔅ ᐊᒪᓅ ᑕᒪᑯᐊ ᖃᒪᓂᔪᑉ ᑐᒃᑐᖁᑎᖏᑕ ᓄᓇᐅᕕᕆᕙᒃᑕᖓᑦ ᑕᒪᓂ 200 ᖃᓚᒥᑐᔅ ᐅᖓᓯᒃᓂᖃᓄᐊᖅᑐᖅ. ᑕᒪᑯᐊ ᖃᒪᓂᖅᔪᑉ ᑎᑉᓴᓕᐅᑉ ᐊᒪᓄ ᐊᕼᐊᖅᒥᐅᑦ ᑐᒃᑐᖁᑎᖏᑦ ᐱᓱᒃᐸᒪᑕ ᑕᒪᐅᓇᖅᐸᒪᑕᓄ ᑭᕙᓪᓚᖁᑦ ᐅᐱᖓᓴᖑᔪᓕᕋᖓᑦ ᐅᐱᖓᖑᔪᓕᕋᖓᓪᓄ ᖃᐅᔨᓴᖅᑕᐅᓂᑯᑦ ᑕᒪᑯᐊ ᐊᒪᓄ ᑕᒪᑯᑎᒍᓇᖅ ᖃᖓᑕᖅᑎᑕᐅᓯᒪᔪᑯᑦ ᕿᒥᐅᓯᖅᑕᐅᓯᒪᓂᖏᑎᒍᑦ ᑕᒪᑯᐊ ᐱᓱᒃᐸᓚᐊᓚᕋᓚᒥᒃ ᐃᖏᕋᕙᓚᐊᓚᕋᖓᓚᒥᒃ ᐊᒥᓯᒪᓇᐅᕙᒃᑐᑦ. ᐱᖓᓯᐃᖑᔪᑦ ᓄᓇᒥ ᐅᑭᐅᖅᓯᐅᐸᒃᑐᑦ ᑐᒃᑐᑦ ᐅᒃᑯᓯᒃᓴᓕᒥ ᐊᒪᓅ ᖃᒪᓂᑐᐊᖅᒥ ᑕᒪᑐᒥᖓ ᐅᑭᐅᑯᑦ ᐊᑕᐅᓯᓴᐃᓇᖅᒥᑦ ᓇᔪᓚᖃᕈᓇᖅᑐᑦ ᑭᓯᐊᓂ ᐱᓱᒃᐸᓚᐊᓚᔪᒥᔪᑦ ᑳᖏᒧᐊᒃᐸᓚᐊᑉᓄᑎᒃ ᓄᓇᐅᖅᓇᑦᖅᓯᔭᕋᖓᑦ.

ᐅᒥᒃᒪᐃᓖ ᑕᒪᓂᐸᒃᑐᑦ ᐅᑭᐅᓗᒃᑕᖅ

ᐊᒻᒥᓲᕙᒃᒥᔪᑦ ᐊᓚᒡᒋᑦ ᑕᒪᑯᓂᖕᒐ ᓂᕿᓭᖅᓯᐅᖅᐸᒃᑐᑦ ᒪᑯᐊᖕᒍᔪᑦ ᐊᒃᓚᑦ, ᖃᐱᑦ ᐊᒪᓘ ᐊᒪᕈᐃᑦ ᑕᒪᓂᖕᒋᓇᖅᐸᒥᔪᑦ ᖃᐅᔨᓴᖅᑕᐅᕙᒥᔪᑕᐅᖅ ᐃᓚᓂᑯᑦ. ᒥᕿᓂᖅᓴᐅᔪᒧ ᓂᕿᓭᕐᓯᐅᖅᐸᒃᑐᑦ ᓱᖅᑯ ᒪᑯᐊ, ᑎᓯᕋᖕᒐᓂᐊᑦ, ᑕᒪᑯᐊ ᐱᑕᖃᐅᖃᐸᒃᑐᑦ ᑎᓅᖕᒐᓂᐊᑦᑐ ᑕᒪᑯᐊ ᑕᑯᓇᕋᔪᒃᑐᑦ ᑕᒪᓃ ᒥᑭᔪᑯᑎᑦᑐ ᑕᒪᓂᐸᒃᑐᑦ ᑕᒪᑯᐊ ᐊᕕᖕᒐᐃᑦ ᓯᒃᓯᑦᑐ ᐊᒥᓱᔪᑦ ᑕᒪᓃ.

ᑎᒃᒥᐊᕈᓯᑦ, ᓯᒃᔭᖅᒥᐅᑕᑦ ᑎᒃᒥᐊᕈᓯᑦ, ᓯᒃᔭᓇᐊᑦ, ᐅᒪᔪᐊᕈᓯᑦ ᐊᒪᓘ ᓄᓇᒥᐅᑕᐃᑦ ᑎᒃᒥᐊᕈᓯᑦ ᐊᕋᒍᑕᒪᑦ ᑎᒃᐸᒃᑐᑦ ᖃᑉᓗᓈᑦ ᓄᓇᖕᒐᓂᑦ ᐅᑭᐅᖅᓯᐅᖅᕿᕆᕙᒃᑕᒥᒃᓂᑦ ᒪᓐᓂᓕᐅᓇᐊᖅᑐᖅᓱᑎᒃ ᑕᒪᓂ ᐅᐱᖕᒐᒍᓕᖅᑲᖕᒐᑦ. ᑭᒃᒐᐱᑦ ᐊᕿᖕᒋᑦ, ᑭᒐᐱᑦᑐ ᑐᒐᑐᐃᑦᑐ ᑕᒪᓂᐸᒃᑐᑦ ᐅᑭᐅᓗᒃᑕᖅ. ᑕᒪᓃ ᓄᓇᓕᒃᓂᓗᒃᑕᖅᐸᒃᑐᑦ ᐱᑕᖃᐅᖕᒋᓇᖅᐸᒃᑐᑦ ᐊᒥᓱᖕᒋᑐᒐᓗᐃᑦ. ᑕᒪᒃᑯᐊ ᑕᑯᒃᓴᐅᖕᒐᔪᒃᓂᖅᐸᑦ ᑎᒃᒥᐊᕈᓯᖅᓂ ᑕᒪᓂ ᖃᒪᓂᑐᐊᖅᒥ ᐊᒪᓗ ᐃᒡᓗᓕᒑᕐᔪᖅᒥ ᑎᒃᒥᐊᑦ, ᒥᑎᑦ ᐊᒪᓗ ᖃᓇᐅᑦ. ᖁᐸᓄᐊᑦ, ᖁᓯᖅᑐᑦ ᖃᓴᐅᑦ ᐊᒪᓗ ᑕᒪᒃᑯᐊ ᑯᔪᐃᑦ ᑕᒪᓂ ᓄᓇᒥᐸᒃᒥᔪᑦ.

ᐃᒡᓗᓕᒑᕐᔪᒃᒍᑦ ᑯᒃ ᑯᒃᑐᖅ ᖃᒪᓂᑐᐊᖅᒥᑦ ᑯᒃᓱᓂ ᑕᑲᓄᖓ ᐃᒡᓗᓕᒑᕐᔪᖅᒍᑦ ᐃᒡᓗᓕᒑᕐᔪᖅ ᐅᖓᓯᒃᓂᑲᖅᑐᖅ 200 ᑭᓕᒥᑐᔅ ᑕᓇᐅᖃᓂᐅᒧᖅ ᑕᒪᓇ ᖃᒪᓂᑐᐊᖅᒧᑦ ᐊᑕᑉᓗᓂ ᑕᒪᐅᖓ ᑕᓇᐅᒧᑦ Hᑦᓴᓐᐱᒧᑦ. ᐅᒐᐃᑦ ᑲᓇᔪᐃᑦ ᐃᖃᓗᒃᐱᑦ ᑲᓇᔪᐃᑦᑐ ᐊᒪᓗ ᑲᑭᕙᐊᖅᑐᑦ ᓇᓂᔭᐅᔪᓇᖅᑐᑦ ᑕᒪᓂ ᐃᒡᓗᓕᒑᕐᔪᑉ ᐊᕙᑕᓂ. ᑕᒪᓂ ᑕᑦᓴᓐᐱᒥ ᑕᒪᑯᐊ ᑲᓇᔪᐃᑦ ᐊᒥᓱᓂᖅᐸᖕᒍᔪᑦ ᐱᑕᖅᑲᓂᖅᐸᖕᒍᔪᑦ ᑕᒪᑯᓇᓂ ᐃᑦᑲᓂᖅᓂᖅ (ᒥᒃᓴᓂ 45ᒥᑐᔅ) ᑕᒪᓂᓗᒃᑕᖅ ᓄᓇᖏᓗᒃᑕᒥ. ᐊᑯᑭᑐᒥ ᐅᖕᒐᐃᕐ ᐊᒪᓗ ᑕᓇᐅᑉ ᐊᓇᒃᓕᖕᒋᑦ ᑕᒪᑯᐊ ᐱᑕᖃᔪᒃᑐᖅᑕᑦ ᐊᒥᓱᓂᖅᐸᑦ ᑕᓇᐅᖅᒥᐅᑕᓂ ᐃᖃᓗᒃᓂ ᑕᒪᓂ ᑕᑦᓴᓐᐱ ᑕᓇᐅᖕᒐᓂ.

ᐃᒪᖅᒥᐅᑕᐃᑦ ᓂᖅᔪᑎᑦ ᑕᓇᐅᒥ ᑕᒪᑯᓇᓂ ᐱᑕᖃᐅᓂᖕᒋᑦ ᐅᒥᐊᖅᔪᐃᑦ ᓯᑲᐅᑦ ᐊᑉᖁᑎᕆᕙᒃᑕᖕᒋᓃ ᑕᒪᑯᐊᖕᒍᔪᑦ ᓇᓄᐃᑦ, ᕿᓇᓗᖕᒐᐃᑦ, ᐊᒪᓘ ᐅᒃᔪᐃᑦ, ᑭᓇᓗᒐᐃᑦ, ᐊᖅᕕᑦ ᐊᒪᓘ ᓇᑦᓯᑦ ᐱᑕᖃᐅᖅᒥᔪᑦ ᑕᒪᓂ ᑕᑦᓴᓐᐱ ᑕᓇᐅᖕᒐᓂ, ᕿᕿᒃᑕᓗᒃᒥ ᑕᓇᐅᖕᒐᓂ ᐱᑕᖃᓗᐊᖅᐸᖕᒋᒪᑕ ᑕᒪᑯᐊ ᑕᓇᐅᖅᒥᐅᑕᐃᑦ ᑕᒪᑐᒪᓂ ᐅᒥᐊᖅᔪᐊᖃᕕᐅᕙᒃᑐᒥ.

ᑕᒪᒃᑯᓄᖕᒐ ᓇᓗᓇᐃᔭᖅᓯᒪᔪᓂᒃ ᑎᑎᕋᖅᓯᒪᔪᓂᑦ 1 ᐅᕙᓘᓂᑦ 2 ᐱᑕᖃᖕᒋᑐᖅ ᑕᓅᐅᖅᒥᐅᑕᓕᕆᓂᖅᒧᑦ. ᐱᕈᑐᑦ ᐅᕙᓗᓃᑦ ᒪᓂᕋᐃᑦ ᓄᓇᐃᑦ ᐅᒪᔪᑦ ᓂᖅᔪᑎᑦ ᓇᓗᓇᐃᔭᖅᑕᐅᓯᒪᔪᑦ ᑕᒪᑐᒧᖕᒐ ᐅᒪᔪᐃᑦ ᐅᓗᕆᐊᓇᖅᑐᒥᓂᖕᒋᓄᑦ ᐱᖁᔭᖅᔪᐊᖅ. ᑕᒪᑯᐊ ᐱᑕᖃᐅᓂᖕᒋᑦ ᑕᒪᑐᒪᓂ ᐱᓕᕆᐊᖕᒍᔪᒪᔪᒥ. ᐱᖕᒐᓯᐃᑦ ᑕᓄᐅᖅᒥᐅᑕᐃᑦ ᐃᖃᓗᐃᑦ ᐅᑭᐅᖅᑕᖅᑐᒥᐅᑕᑦ ᐃᖃᓗᐃᑦ ᐊᒪᓗ ᑕᓯᓕᑦ ᐃᖃᓗᐃᑦ ᑎᑎᕋᖅᓯᒪᔪᑦ ᑎᑎᖃᒥ 1 ᑕᒪᑯᓇᓂ ᑎᑎᕋᖅᓯᒪᔪᓂ ᑭᓯᐊᓂᓗ, ᕿᕿᒃᑕᓗᒥ ᑕᓄᐅᖁᑎᖕᒐᓂ ᓇᓗᓇᐃᖅᑕᐅᓯᔪᖅ ᐱᑕᖃᐅᐸᓂᒐᓂᒃ ᑕᒪᑯᐊᓗ ᐊᓚᓇᓂᖅᑕᐃᑦ ᓇᐅᔭᑦᑐᐃᑦ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᑦ ᑎᑎᖃᒥ 1 ᖃᐅᔨᒪᔭᐅᔪᑦ ᑕᒪᓂ ᐱᐊᓕᓕᐅᖅᐸᒃᑐᑦ ᑕᓄᐅᖅᒥᐅᑦ ᑕᓄᐅᖕᒐᓂ ᑕᒪᑐᒪ Hᖅᓴᓐᐱ ᐃᓚᖕᒐᓂ. ᑕᒪᒃᑯᐊ ᐊᒪᓇᓂᖅᑕᐃᑦ ᓇᐅᔭᑦᑐᐃᑦ ᑕᑯᓇᕋᔪᒃᑐᑦ ᑕᑯᓇᕋᔪᒃᓂᖅᐸᑦ ᑕᑲᓐᓃ ᑯᒃᔪᐊᖅᒥ ᓇᓂᓗᒃᑕᖅ ᑲᓇᑕᓗᒃᑕᒥᑦ ᑕᒪᑯᓂᖕᒐᓗ ᖃᐅᔨᓴᓂᐅᓕᐅᖅᑐᖅ ᑕᒪᓂ ᑯᒃᔪᐊᖅᒥ ᓯᑕᐅᒪᐃᑦ ᑕᒪᓂ 2005.

ᑕᒪᑯᓂᖕᒐ ᓇᓕᐊᓂᒃ ᐱᓕᕆᐅᓂᑕᖃᖕᒋᑐᖅ ᑕᒪᑯᓄᖕᒐ ᑎᒃᒥᐊᕈᓯᖅᓄᑦ ᓇᔪᒐᐅᒐᔪᓂᐅᔪᓂᒃ ᑕᒪᑯᑎᒍᓇᖅ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᑎᒍᑦ ᑕᑉᑯᓇᖕᒐᑦ ᑎᒃᒥᐊᕈᓯᖅᓄᑦ ᖃᐅᔨᓴᓂᑯᓄᑦ ᑲᓐᓈᑕᒥ, ᑲᓇᑕᒥ ᑎᒃᒥᐊᕈᓯᖅᓄᑦ ᓯᓕᖅᔪᐊᓗᒃᑕᒥ ᑕᒪᑯᑎᒍᓇᖅ ᖃᐅᔨᓴᓂᐅᕙᒃᑐᑎᖕᒍᑦ ᑕᒪᑐᒪᒥ ᑕᓅᐅᑯᑦ ᐊᐅᓚᑕᕕᐅᔪᒥ. ᑐᓐᓇᓖᖅ ᐊᒪᓘ ᒪᑲᓐᓄ· ᑯᒃᖕᒐᓂ ᑕᑉᓯᐊ ᑎᒃᒥᐊᕈᓯᖅᓄᑦ ᐱᑕᖅᑕᐃᓕᕕᒃ ᑕᒪᓇ ᐃᓚᐅᖃᑕᐅᓗᓂ ᑕᓇᐅᖕᒐ ᑕᒪᑐᒧᖕᒐ.

ᒪᓇᐅᔪᑯᑦ ᐃᓄᓯᓕᕆᓂᑯ ᐱᕙᓕᐊᓂᓕᕆᓂᑯᑦ ᐊᕙᑎᓕᕆᓂᖅ

ᓄᓇᕗᑦ ᐱᕙᓪᓕᐊᓂᖓ ᐊᒪᓘ ᐃᓅᐃᑦ ᐱᐅᔪᒥᒃ ᐃᓕᖅᑯᓯᑲᖅᑐᑦ ᒪᑯᓂᖓ 1) ᐱᓕᕆᐅᓂᖃᓂᖓᓄ ᑕᒪᑐᒪ ᐊᓕᒥᓂᐅᔪᓂᒃ, 2) ᑕᒪᑯᓂᖓ ᐊᑐᕆᐊᖃᓂᖅ ᐱᕈᐸᓕᐊᑲᓂᕈᓇᖅᑐᓂᒃ ᓂᖅᔪᑎᓂᒃ ᐱᕈᐸᓕᐊᑲᓂᕈᓇᕆᑐᓂᒃ ᑕᒪᑯᑎᒍᓇ6 ᐃᓄᐃᑦ ᐱᕙᓕᓂᖅᑲᑎᐅᔪᑦ, 3) ᑕᒪᑐᒪ ᐱᒪᕆᐅᓂᖓ ᐃᓄᐃᑦ ᖃᐅᔨᒪᔭᑐᖅᑲᑦ ᑕᒪᑯᓄᖓ ᐱᕙᓪᓕᐊᓂᐅᔪᓄᑦ ᐃᓄᓯᖅᒍᑦᑐ ᐃᓯᒪᓕᐅᕈᑕᐅᓂᑯᑦᑐ; 4) ᓯᐊᒪᒃᑎᖅᓯᒪᓂᖅᑎᒍᑦ ᑕᒪᑯᐊ ᓄᓇᓕᐅᔪᑦ ᓇᒥᓂᖅ ᐊᐅᓚᑦᓯᓂᖅᑲᕈᓇᑯᑉᑐᖏᑦ ᑕᒪᑯᓂᖓ ᐱᕙᓪᓕᐊᔪᓂᒃ,5) ᐱᑕᖅᑲᓇᐊᖅᑲᓂᖓ ᓇᒥᓂᖅ ᐱᕈᐸᓕᐊᔪᓇᖅᓯᓂᒃᓴᒥᒃ ᑕᒪᑯᓄᖓ ᐊᑐᖅᓂᖅᑲᓗᐊᖅᓂᖅᑲᑎᑦᑐᒥᑦ ᐃᑲᔪᖅᑕᐅᓂᖅᒥᒃ ᑲᕙᒪᑯᑦᓄᑦ ᑐᓂᕈᑕᐅᔪᓯᒍᑦ ᐊᒪᓗ 6) ᐱᒥᐊᓕᓴᖅᑐᖅ ᓄᑕᒪᕆᐅᔪᖅ ᐱᕈᐸᓕᐊᓂᖅᑲᖅᑐᖅ ᐃᓄᒥᐊᖅᓯᕙᓪᓕᐊᑉᓗᓂ ᑕᒪᑯᓂᖓ ᐱᓕᕆᐅᔪᓂᒃ ᐃᓄᓯᓕᕆᓂᑯᑦ ᐱᔭᓕᐊᓂᑯᑦᓗ ᐊᒃᓱᕈᑎᒃᓴᖃᖅᑐᑦ.

ᓄᓇᕗᑦ ᐊᓕᒃᒥᓂᖅᑲᐅᓂᑯᑦ ᐱᕙᓪᓕᐊᓂᖅᑲᓂᖓ ᑕᐃᓐᓂᒃ ᐱᑕᖅᑲᓂᖓ ᑭᓇᐅᔭᓕᐅᖅᑭᑎᓂᒃ ᐊᒪᓘ ᓄᓇᒥᐅᑕᐅᔪᓇᖅᓂᖅᒥᒃ. ᑕᒪᓈ ᑭᓇᐅᔭᓕᐅᕈᓇᖅᓂᖅ ᐱᔪᓇᖅᑎᑦᓯᔪᑕᐅᕗᖅ ᑭᓇᐅᔭᓕᐅᖅᓂᖅᑲᕈᓇᖅᑎᑦᓯᓂᖅᒥᒃ. ᓄᓇᒥᐅᑕᐅᓂᖅ ᐱᔪᓇᖅᑎᑦᓯᓂᖅᑲᐳᖅ ᑕᒪᑐᒥᖓ ᓂᖅᑭᖅᑭᑲᖅᕈᓇᖅᑎᑦᓯᓂᖅᒥᒃ ᐊᒪᓘ ᐱᓕᕆᐅᓂᖅᑲᓗᓂ ᑕᒪᑯᓄᖓ ᐃᓄᒃᓄᑦ ᐃᓄᓯᓕᕆᓂᑯᑦ ᐊᒪᓗ ᐃᓕᖅᑯᓯᑐᖅᑲᓕᕆᓂᑯᑦ ᐃᑲᔪᑎᖅᑲᑎᑦᓯᕗᖅ ᐃᓄᒃᓄᑦ. ᐃᓚᖏᑦ ᐃᓄᐃᑦ ᑕᐃᓂᒃ ᐱᓇᓱᐊᖅᓂᑲᐸᒃᑐᑦ ᑭᓇᐅᔭᓕᐅᖅᓱᑎᒃ ᐊᒪᓘ ᓄᓇᒍᐊᕈᓇᖅᓱᑎᒃ ᑕᒪᓇ ᐱᓕᕆᐊᖅᑲᖏᓂᖅ ᑕᒪᓃ ᓄᓇᕗᒥ ᑕᒪᓂᓗᐊᖅ 19 ᐳᓴᓐ ᔪᓕ 2011 ᑭᓯᐊᓂᓕ ᑕᒪᖅᑯᓄᖓ ᒪᑯᒃᑐᓄᑦ ᑕᒪᓂᑲᓴᓗᐊᖅ ᐃᓕᐅᖅᑐᖅ 40 ᐳᓴᓐ. ᑕᒪᑯᐊ ᐊᒥᓱᓂᖅᓴᐅᔪᑦ ᐱᓕᕆᐊᖅᑲᖏᑐᑦ ᑕᒪᑯᐊ ᒪᑯᒃᑐᑦ ᐃᓄᐃᑦ ᐊᖑᑎᑦ. ᑕᒪᓃ 2006, ᑭᕙᓪᓕᖅᒥ ᐱᓕᕆᖏᑐᑦ ᐊᒥᓱᓂᖅᓴᐅᓕᐅᖅᑐᑦ ᑕᒪᖕᒪᑦ ᓄᓇᕗᒍᒃᑕᒥᑦ ᐊᒥᓱᓂᖅᓴᐅᒍᐊᖅᑲᓂᖅᒍᑎᒃ ᑲᓐᓈᑕᓗᒃᑕᒥ. ᑕᐃᒪᖕᒪᑦ 2006 ᐊᒥᓱᓂᒃ ᓄᑕᓃᒃ ᐱᓕᖅᑭᐊᒃᓴᓂᒃ ᑕᒪᑯᓄᖓ ᑭᕙᓪᓕᖅᒥᐅᓄᑦ ᐃᓄᒃᓄᑦ ᐱᑕᖅᑲᓕᓕᐅᖅᑐᖅ ᑕᒪᑯᓄᖓ ᐱᕙᓪᓕᐊᓂᐅᔪᓄᑦ ᐊᐳᖅᑎᑦᓇᖅᑐᒍᑦ, ᐅᔭᕋᑕᓇᐊᖅᑐᓄᑦ ᐊᒪᓘ ᑕᒪᑯᓄᖓ ᓇᒥᓂᖅ ᐱᓕᕆᕕᐅᔪᓄᑦ ᐅᔭᕋᑕᕆᐊᓄᑦ ᐊᒃᔭᖅᑐᖅᑎᐅᔪᓄᑦ.

ᐊᒥᓱᖏᑐᒪᕆᑦ ᐱᓕᕆᐊᕆᓇᖅᑐᖑ ᒪᖅᑲᐃᑎᐅᓖᖅᑐᑦ ᐃᓄᐃᑦ ᐅᕙᓗᓃᑦ ᒪᖅᑲᐃᖏᓇᐸᖑᓂᖅᑐᖅ ᑭᓯᐊᓃ ᐊᒥᓯᑦ ᓄᓇᒍᐊᖅᐸᒃᑐᑦ ᓯᓕ. HLᓈ ᐱᓕᕆᐅᓂᖓ ᐊᖑᓇᓯᒃᓂᐅᑉ ᑕᒪᑯᓄᖓ ᐃᒡᓗᒥᐅᖅᑲᑎᒋᓄᑦ ᑭᕙᓪᓕᖅ ᑕᑯᓴᐅᔪᖅ ᑕᒪᑯᑎᖑᓇᖅ ᓂᖅᑭᑎᒍᑦ ᓂᖅᔪᑎᑦ ᓂᖅᑭᖏᑎᒍᑦ ᐊᒪᓘ ᐱᕙᓕᕈᑕᐅᑉᓗᑎᒃ ᑕᒪᑯᐊ ᓂᖅᑭᑦ ᓂᐅᕕᐊᒃᓴᑦ ᑕᐅᑐᒃᑯᖏᑦ ᑕᒪᖅᒥᒃ ᓂᐅᕕᐊᖏᓇᖅᓂᒃ ᓂᖅᑭᑲᖅᑯᔭᖅᐸᑕ. ᑕᒪᓇ ᐊᖑᓇᓯᒃᓂᖅ ᑕᒪᑯᓄᖓ ᓇᓗᓇᐃᔭᐅᑕᐅᒪᖅᑐᖅ ᐃᓕᖅᑯᓯᑐᖅᑲᓇᔭᐅᓂᖅᒍᑦ ᐅᐱᒥᔭᐅᓂᖅᓄᑦ ᐊᒪᓗ ᖃᐅᔨᒪᓂᐅᔪᓄᑦ.

ᑕᒪᓐᓂ ᑭᕙᓪᓕᖅᒥ ᐃᓄᐃᑦ ᐊᒥᓱᓂᖏᑦ ᐱᕈᐸᓕᐊᔪᖅ ᑕᒪᖕᒪᑦ 7,944 ᐅᕗᖓ 9,479 ᐃᓄᐃᑦ ᑕᒪᖕᒪᑦ 2001 ᐸᒪᓗ 2009, ᐊᖓᕈᑕᒪᑦ ᐃᓪᓕᕙᓕᓂᖅᑲᐸᒃᑐᑦ ᑕᒪᓂᓗᐊᖅ 2 ᐳᓴᓐ ᐊᕋᒍᑕᒪᑦ. ᑕᒪᑯᐊ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᑦ ᑕᒪᑐᒧᖓ ᐃᓕᓐᓂᐊᖅᑐᓕᕆᓂᖅᒍᑦ ᓇᓗᓇᐃᓂᖅᑲᐳᖅ ᑕᒪᑯᐊ ᐊᒥᓱᖏᓂᖅᓴᐃᑦ ᑕᒪᑐᒪᖓᑦ 40 ᐳᓴᓐ ᐃᓇᐅᔪᑦ ᐃᓕᓐᓂᐊᖅᕕᒃᔪᐊᖅᓂ ᐃᓕᓐᓂᐊᕋᓂᒃᓂᖅᑲᑐᑦ. ᑕᐃᒪᓐᓄᑦ, ᒪᑯᒃᓂᖅᓴᐅᔪᑦ ᐃᓄᐃᑦ ᐃᓕᓐᓂᐊᖅᓂᖅᑲᓯᐊᖏᓂᖅᓴᐅᔪᑦ ᑕᒪᑯᓇᖓᑦ ᐊᖓᔪᒃᓕᐅᔪᓃᑦ. ᑕᒪᓃ ᑭᕙᓪᓕᖅ ᒥᑭᓂᖅᓴᐅᔪᒥᑦ ᑕᒪᑯᓂᖓ ᐱᕋᔭᒃᓂᐅᔪᓂᒃ ᐱᑕᖅᑐᖅ ᑕᒪᑐᒪᖓᑦ ᓄᓇᕗᒥᑦ ᑕᒪᐃᓄᑦ ᑭᓯᐊᓂ ᑕᒪᑯᐊ ᖁᓯᒃᓂᖅᓴᐅᑐᐃᓇᖅᑐᑦ ᑲᓇᑕᒥᐅᓂᑦ. ᐃᒡᓗᖅᑲᓂᖅ ᑕᒪᓇ ᑲᔪᓯᓇᖅᑐᖅ ᐊᔪᓇᖅᑭᑕᐅᔪᖅ ᐃᒡᓗᐃᓕᐅᕈᑕᐅᓂᖅ ᑕᒪᓂ ᓄᓇᕗᒥ. ᑭᓯᐊᓂ ᑕᒪᓇ ᐱᐅᖏᓪᓕᖑᔪᖅ ᑕᒪᑯᓇᓂ ᐃᓕᒥᓂ ᑭᕙᓪᓕᖅᒥ ᓄᓇᓕᒃᓂ. ᓇᐸᓗᐊᒥ ᖃᒥᖅᑯᒥᑦ ᐃᓂᑭᒃᓴᖅᑐᑦ ᐅᕙᓗᓃᑦ ᓄᑦᑐᖑᑎᖅᑕᐅᔭᓇᐊᖅᑲᑐᑦ.

ᐃᓄᐃᑦ ᐅᖅᑲᐅᓯᖅᒥᒃᓂᒃ ᐊᑐᐃᓇᖅᓂᖅᑲᑐᑦ ᑕᒪᑯᓇᓂ ᐅᑭᐅᓃ ᐊᒥᓱᓃ ᖃᖏᖅᑐᓂ ᐱᔪᒪᓂᖅᑲᓯᐊᖅᓂᖅᑯᑦ ᐊᑐᕈᒪᓂᑯᑦ ᑕᒪᑐᒥᖓ ᐃᓄᒃᑎᑐᖅᓂᖅᒥᒃ. ᐊᒥᓯᑦ ᐃᓄᐃᑦ ᐃᓯᒪᔪᑦ ᐊᔪᖏᓯᐊᖅᓂᖅᒥᒃ ᐅᖅᑲᓚᓂᒃᒥᖅ ᐃᓄᒃᑎᑐᑦ ᑭᓯᐊᓂᓗ ᖃᐅᔨᕙᒃᑐᑦ ᐊᒥᓯᑦ ᓄᑕᕋᐃᑦ ᐊᑉᓄᓇᑐᑦ ᐅᖅᑲᓕᓂᖅᓴᐅᓕᓂᒥᓂᒃ ᑕᐃᒪᖓᐅᓕᐅᖅᑐᒥᑦ ᐊᔪᖅᓇᖅᓂᖅᑲᓕᐅᖅᒪᑦ ᑕᒪᑯᓄᖓ ᓄᑕᖑᕙᓕᐊᓂᐅᔪᓄᑦ ᐊᔪᓇᓴᖅᓂᖅᒥᒃ ᓄᑕᒍᕙᓕᐊᔪᒍᑦ ᐃᓕᖅᑯᓯᖅᒍᑦ, ᐱᔭᓕᐊᓕᖅᓴᖅᑐᒍᑦ. ᐃᓅᐃᑦ ᓄᓇᒥᐅᑕᐅᕙᒍᓂᖅᑐᑦ ᐃᓕᖅᑯᓯᑐᖅᑲᓗ ᐊᓯᒍᐸᓕᐊᔪᖅ. ᑕᒪᖅᒥᒃ ᑕᒪᓈ ᖃᐅᔨᒪᓕᖅᑕᖓᑦ ᐃᓕᒥᓄᑦᑐ ᐃᓯᒪᒥᔭᐅᓂᖅᑲᐸᒃᑐᖅ ᖃᓄᐃᓕᐅᕆᐊᖅᑲᓂᖅᒥᒃ ᑕᒪᑯᐊ ᐊᓯᖑᐸᓕᐊᓂᐅᔪᑦ ᐱᕙᓪᓕᐊᑎᒃᓗᒋᑦ.

ᐊᓯᕈᔪᐃᑐᖅ

ᓱᓇᖁᑕᐅᖕᒋᑐᖅ ᓇᓂ ᐃᓄᐃᑦ ᓄᓇᖅᑲᕿᓱᐊᖅᐸᑕ ᐅᐸᓗᓂᑦ ᐱᓕᕆᖕᒐᓱᐊᖅᐸᑕ, ᑕᒪᑐᒧᖓ ᐊᓯᕈᔪᐃᑐᖅᑐᖅ ᐊᒃᑕᖅᔪᐃᓇᐅᔪᑦ ᑕᒪᑯᓇᖕᒐᑦ ᓱᓇᑐᐃᓇᖅᓂᑦ ᑕᒪᓂᑐᖅ ᓯᓘᑯᑦ ᐊᓂᖅᓴᖅᑐᕐᐸᑕᑉᑎᒍᑦ, ᓂᕿᑎᒍᑦ ᓂᕆᕙᑲᑉᑎᖕᒍᑦ ᐃᒪᖅᒥ ᐃᒥᖅᐸᒃᑕᑉᑎᒃᓂ ᑕᒪᑯᓇᓂᒍ ᐱᖁᑎᓂ ᓴᓇᔪᓄᑦ ᓴᓇᕈᑕᐅᕙᒃᑐᓂ ᑕᒪᑯᓂᖕᒐ ᐃᓪᓗᕐᔪᐊᓕᐅᖅᑐᓂ. ᑕᒪᑯᓄᖕᒐ ᑕᒪᓈ ᐊᓯᕈᔪᐃᑐᖅᑲᓂᖅ ᐊᓚᓪᕆᓂᖅᑲᐅᑐᖅ ᑕᒪᑯᓇᓂ ᐊᓚᓪᕆᓃ ᓄᓇᓕᐅᒪᐅᔪᓂ ᑕᒪᑯᓄᖕᒐ ᓂᕉᔪᐅᕙᒃᑐᓄᑦ ᑐᒃᑐᓄᑦ ᑕᒪᓂ ᖃᓂᖕᒐᓂᑐᑦ ᑕᒪᑐᒪ ᐱᓕᕆᐊᖑᔪᒪᔪᖅ ᐊᒪᓗ ᑕᒪᓂᒍᒃᑕᖅ ᑲᓇᑕᐅᑉ ᐅᑭᐅᖅᑕᖅᑐᖕᒐᓂ ᐱᔪᕆᓂᖅᑲᓂᐅᓂᖅᑲᑦ ᑕᒪᑐᒧᖓ ᐊᒃᑐᐊᔪᐅᓂᖅᒧᑦ, ᑕᒪᑯᓄᖕᒐᓱᐊᖅ ᐊᓯᕈᓇᖅᑐᓂᕋᑕᐅᔪᒧᑦ ᓇᓱᓇᐃᔪᐅᑎᖅᑐᒧᑦ ᕝᕆ□ᑉᖕᔾ.

ᓯᓚᑯᑦ ᐃᖕᒋᕿᓃᐅᔪᑎᖕᒍᑦ ᐊᒃᑐᐃᓂᖅ

ᑕᓪᓇ ᑭᒐᕕᒃ ᐱᓕᕆᐊᖑᔪᒪᔪᖅ ᐱᑕᖅᑲᓂᐊᖅᑐᖅ ᑕᒪᑐᒥᖓ ᐊᒃᑐᐃᓂᖅᑲᓂᖅᒥᒃ ᑕᒪᑐᒧᓈ ᓯᓪᓚᑯᑦ ᐃᖕᒋᕿᓂᑯᑦ ᐊᕙᑎᓕᕆᓂᑯᑦ ᑕᒪᓈ ᐱᓕᕆᕕᐅᑎᑦᓱᖕᒍ ᐱᓕᕆᓂᓱᒃᑕᖕᒐᓂ.

ᓯᓪᓛ

ᑕᒃᑯᐊ ᐅᕐᓱᐊᓗᖅᑲᓂᑦ ᓯᓚᑯᑦ ᐱᕙᓕᐊᓂᐊᖅᑐᖅ. ᑕᒃᑯᐊ ᐊᕿᒪᕙᓕᕈᑕᐅᔪᒃᓴᑦ ᑕᒪᑯᓄᖕᒐ ᐊᑐᖅᑕᐅᑎᑕᐅᓂᐊᖅᑐᑦ ᑕᒪᑯᓄᖕᒐ ᐊᕿᓱᖅᑕᐅᓯᒪᔪᓄᑦ ᐊᒪᓗ ᑕᒪᑯᓄᖕᒐ ᐊᐅᔭᒃᓯᐅᑎᓄᑦ ᐱᓕᕆᑐᑕᐅᔪᓄᑦᓗ ᐊᑐᖕᒐᐅᔪᓗᒃᑕᓄᑦ. ᐊᑐᖅᑕᐅᓂᖕᒋᑦ ᐊᒪᓗ ᐊᐅᓚᑕᐅᓂᖕᒋᑦᓗ ᑕᒪᑯᐊ ᐅᖁᒪᐃᑐᑦ ᐱᓕᕆᓂᐅᑎᑦ,ᓄᓇᖁᑭᑎᑦ ᐊᒪᓗ ᑕᒪᑯᐊ ᐅᒥᐊᕐᔪᐊᑦ ᐊᕿᓱᖅᑕᐅᓯᒪᓂᐊᖅᑐᑦ.ᐊᕋᒍᑕᒪᒧᑦ ᑕᓇ ᐃᓯᖅᑲᓱᐊᖅᓂᖅ ᖃᐅᔨᓴᕐᑕᐅᓂᖅᑲᓂᐊᖅᑐᖅ ᑕᒪᑯᓄᖕᒐ ᖃᓄᐃᓂᒥᓄᑦ ᑕᒪᑯᐊ ᐊᖕᒋᓕᕙᓕᐊᓂᖕᒋᓂ ᑕᒪᑐᒧᖓ ᓄᓇᕗᒧᑦ ᐊᒪᓗ ᖃᓐᓈᑕᒧᑦ, ᑭᓯᐊᓃ ᖃᐅᔨᓴᓂᑯᑦ ᑕᒪᑯᐊ ᐊᖕᒋᔪᓚᖕᒋᑐᑦ.

ᓯᓛ

ᑕᒪᓈ ᓯᓪᓚᑯᑦ ᐊᓂᖅᓱᑐᖅᐸᑕᕗᑦ ᐊᓯᕈᓇᑐᖅᑲᓂᖕᒐ ᐃᓱᒪᖕᒋᔪᐅᖅᑲᑕᐅᓯᒪᔪᖅ (ᐳᔪᖅᑕᖅᑲᓂᑯᑦ, ᓴᕕᒃᓄᑦ, ᓴᕈᑎᓄᑦ ᐊᑐᖅᑕᐅᔪᓄᑦ) ᑕᒪᑯᓇᓂ ᓄᓇᓕᒃᓂ ᐊᒪᓗ ᓄᓇᓕᐅᔪᓂ ᐊᕙᑎᓕᕆᓂᖅᑯᑦ ᑕᒪᑯᐊ ᐊᖕᒋᓕᕐᓂᖅᑲᓂᐊᖅᑐᑦ. ᑕᒪᑯᓄᖕᒐ ᖃᐅᔨᓴᖅᓂᑦ ᐊᑐᖅᑕᐅᓚᐅᖅᑐᑦ ᓂᕈᐊᖅᓯᕈᑕᐅᓗᑎᒃ ᑕᒪᑯᐊ ᐃᓂᒋᓇᔪᖅᑕᖕᒋᓄᑦ ᐊᓚᒋᑐᓄᑦ ᑕᒪᑯᓄᖕᒐ ᐱᓕᕆᕕᐅᓂᐊᖅᑐᓄᑦ ᑕᒪᓇ ᐃᓚᐅᖅᑕᐅᓗᓂ ᐅᓗᕆᐊᓇᖅᓂᖅᑐᓄᑦ ᐱᓕᕆᕕᒃ, ᐅᑲᓕᐅᕕ, ᑕᒪᑯᐊᓗ ᑲᑎᖅᓱᖅᑕᐅᓯᒪᔪᑦ ᐊᒪᓗ ᑕᒪᑯᐊ ᐅᕙᖕᒍᒋᔪᐅᓂᐊᖅᑐᑦ ᐃᒡᓗᒋᔪᐅᓂᐊᖅᑐᑦ ᑕᒪᓇ ᐊᒃᑐᐃᓂᖅᑲᓂᖕᒐ ᓯᓚᒧᑦ ᐊᖕᒋᓕᓗᐊᖁᓇᖕᒍ. ᑕᒪᑯᓄᖕᒐ ᐃᖕᒐᓕᖅᓄᑦ ᐃᕙᕋᖁᑕᐅᕙᒃᑐᑦ ᐃᓕᐅᖅᑕᐅᓯᒪᓂᐊᖅᑐᑦ ᐳᔪᖅᑕᖅᑲᓗᐊᕆᔪᑎᒃᓴᑦ ᐊᒪᓗ ᑕᒪᑯᐊ ᐅᔭᕿᐃᑦ ᑲᑎᖅᓱᖅᑕᐅᕙᓕᐊᔪᑦ ᐅᔭᕋᑕᓇᐊᖅᕕᐅᔪᒥᑦ ᐅᓕᒃᑐᖅᓯᒪᕙᒃᓂᐊᖅᑐᑦ ᑕᒪᑯᓂᖕᒐ ᑐᐊᐸᒃᓂᒃ ᐅᔭᕋᑕᓇᐊᑕᐅᓂᑯᓂᒃ ᑕᒪᑯᓄᖕᒐᓗ ᐱᕈᐸᓕᐊᔪᓄᑦ ᐱᕈᐸᓕᐊᓂᖅᑯᖅᓇᒍ ᑕᒪᓇᓗ ᐳᔪᖅᑕᖅᑲᓂᖅ ᐱᕙᓕᐊᓗᐊᖁᓇᒍ. ᑕᒪᕐᒥᒃ ᑕᒪᑯᐊ ᑕᒪᑐᒪᖕᒐᑦ ᐱᓕᕆᐊᖑᔪᒪᔪᒥᑦ ᐱᕙᓕᐊᔪᑦ ᑕᒪᑯᓄᖕᒐ ᐊᕙᑎᒥᓄᑦ ᐊᒃᑐᐃᓂᖅᑲᕋᔭᖕᒋᑐᑦ ᐊᖕᒋᓗᖕᒋᓗᑎᒃᓗ ᐅᑭᐅᓗᒃᑕᖅ ᑕᐃᒪᓇᐃᐸᓂᐊᖅᒪᑕ ᐊᒪᓘ ᐅᑎᖅᑎᑕᐅᔪᓇᖅᑐᑦ ᐃᓕᖁᓯᑐᖅᑲᖕᒋᓄᑦ. ᑕᐃᒪᓕ, ᑕᒪᑯᐊ ᐊᒃᑐᐃᓂᖅᑲᓂᐅᓇᔪᕐᓂᒥᑦ ᐊᖕᒋᔪᖕᒋᑐᑦ.

ᐱᖅᐸᓗᒃᓃᑦ ᐊᒪᓘ ᓴᔪᓃᑦ

ᑕᒃᑯᐊ ᐱᖅᐸᓗᒃᓂᑦ ᐊᒪᓗ ᓴᔪᐸᓗᓃᑦ ᐱᕙᓂᐊᖅᑐᑦ ᐱᑕᖅᐸᓂᐊᖅᑐᑦ. ᐱᖅᐸᓗᒃᓃᑦ ᐊᖕᒋᔪᓚᖕᒋᑐᑦ ᑕᓇ ᐱᖅᐸᓘᓂᖅᑲᓂᖕᒐ. ᐃᓚᖕᒋᓄᑦ ᐊᑯᓂᐅᖕᒋᑐᖅ ᐱᖅᐸᓗᒃᓗᐊᓂᖅᑲᓚᐅᕈᒪᖅᑐᖅ ᑕᒪᑯᓇᖕᒐᑦ ᓴᔪᓃᑦ ᐊᑐᖅᑕᐅᔪᓂᑦ. ᑕᒃᑯᐊᓘ ᑕᒪᑯᓄᖕᒐ ᓄᓇᓕᒃᓄᑦ ᐃᔅᓗᐃᓴᕈᑕᐅᓂᖅᑲᓚᕆᑐᑦ. ᑕᓇ ᓴᔪᓂᖅᑲᓂᐅᔪᖅ ᐱᑕᖅᑲᓗᐊᓚᕆᑐᖅ ᑕᓇ ᐱᓕᕆᐊᖑᔪᒪᔪᖅ ᐱᓕᕆᓂᖅᑲᓗᒃᑕᖕᒐᓂ. ᑕᒪᑯᐊ ᑕᒪᕐᒥᒃ ᐊᖕᒋᔪᒪᕆᑐᑦ.

ᒪᓂᕋᑯᑦ ᐃᒪᓕᕆᓂᖅ

ᐃᒪᖅᑐᒃᓴᐃᑦ ᐃᒪᐃᔭᒐᐅᕙᓂᐊᖅᑐᑦ ᐃᓚᖓᒍᑦ ᑕᒻᓇ ᐊᓐᑎᕈᓯ ᑕᓯᖓ ᐃᒪᐃᔭᖓᐅᓂᐊᖅᑐᖅ ᐃᓚᖓᒍᑦ ᑕᒪᑐᒧᖓ ᐃᓚᖓᓄᑦ ᐃᒥᖅᑐᑕᐅᑐᓂ, ᑕᒻᓇ ᑕᓯᖅ ᐃᒥᖅᑐᖅᑕᐅᑲᓂᓕᖅᒥᑐᓂ, ᐃᒪᐃᑦ ᑲᑎᖅᓱᖅᑕᐅᓂᐊᖅᑐᑦ ᓴᑐᒪᖅᓴᑕᐅᑐᓂ ᑲᑎᑕᐅᓂᑯ ᐊᒪᓘ ᑯᕕᔭᐅᓕᖅᒥᑐᓂ, ᑕᒪᑯᐊ ᑳᑭᑐᑦ ᐃᒪᐃᑦ ᐱᔭᖅᑕᐅᓂᖅᓴᐅᑐᑎᒃ ᐃᒪᖅᒥᒃ ᓴᑐᒪᔪᒥᒃ ᐃᓕᐅᖅᑲᐃᑐᑎᒃ ᐱᓕᕆᑐᑕᐅᔪᓄᑦ ᐊᑐᖓᐅᓂᐊᖅᑐᓂᒃ ᑕᒪᓇᑐ ᐃᒪᖅ ᐊᑐᖓᐅᓂᐊᖅᑐᑦ ᑕᒪᑯᓄᖓ ᐊᑉᖅᑯᑎᓄᑦ ᑭᓂᑎᕈᑕᐅᑐᓂ. ᑕᒫ ᐱᓕᕆᐊᖑᔪᒪᔪᖅ ᐊᕿᑕᐅᓯᒪᔪᖅ ᑕᒪᑐᒧᖓ ᒪᓂᕋᐅᖅ ᖃᖓᓄᑦ ᐊᓯᐅᑐᐊᓇᐊᖅᑲᖏᓂᖅᒧᑦ ᑕᒪᑯᓂᖓ ᐊᑐᖅᓂᐊᖅᒪᑕ ᐃᒪᖅᑲᓂᐅᔪᓂᒃ ᐊᖏᔪᓂᒃ ᐃᒥᖅᑕᖅᕖᐅᕙᓂᐊᖅᑐᓂᒃ ᐃᒪᐃᔭᐃᕕᐅᕙᒃᓂᐊᖅᑐᓂᒃ, ᑕᒪᑯᐊ ᐃᒪᐃᑦ ᐊᑐᑲᓂᐸᓂᐊᖅᑐᑦ ᐃᒪᐃᔭᐃᓂᑯᑦ ᐊᔪᖅᓇᒋᓴᕋᖕᑦ ᑕᒪᑯᓄᖓ ᑯᕕᖅᑕᖅᕕᓕᐅᖅᓯᒪᔪᓄᑦ ᑯᒃᕕᓕᐅᖅᓯᒪᔪᓄᑦᑐ ᐃᓕᐅᖅᑕᐅᕙᓕᐊᑐᑎᒃ ᐃᒪᖅᑐᓴᐅᓂᒃᓄᑦᑐ. ᐊᓯᖑᐊᓕᐊᓂᖏᑦ ᐃᒪᖅᑲᓂᑦ ᐃᖏᕋᓂᖏᑕ ᑕᓯᖅᑲᓂ (ᑕᒻᓇ ᐱᖅᑕᐅᒋᑐᖅ ᐊᓐᑎᕈᓯ ᑕᓯᖓ) ᐊᒪᑐ ᓯᑯᑉ ᐊᑕᓂᓂᐅᔪᖅ ᐃᒪᖅ ᑕᒪᑯᐊ ᓱᖅᑯᓯᖅᓂᖅᑲᓚᖏᑐᑦ ᐃᓕᖅᑯᓯᖏᑦ ᑕᒪᑯᐊ ᐃᓱᒪᖏᔭᐅᓯᒪᔪᑦ ᐊᖏᔪᓚᖏᑐᑦ

ᐃᒪᓕᕆᓂᑦ ᐃᑎᓂᖅᓯᐅᖅᑎᑦ

ᓄᓇᒥ ᒪᓂᒃᖃᒥ ᐃᒪᖅᑲᓂᑦ ᐊᒃᑐᖅᑕᐅᓂᖅᑲᓂᐊᖅᑐᑦ ᑕᒪᑯᓄᖓ ᐃᒪᓕᕆᓂᖅᓄᑦ ᑕᒪᑐᒪ ᖃᓂᒋᔭᖓᓃ ᓄᓇᐅᑉ ᖃᖓᒍᑦ ᐅᔭᕋᑕᕆᐊᖅᕖᐅᔪᒥ ᐊᒪᑐ ᐊᑦᓯᒃᑐᑯᑦ ᐅᔭᕋᕿᐊᖅᕖᐅᔪᒥ. ᐊᖏᔪᖏᑐᖅ ᒪᓂᕋᑯᑦ ᓄᓇᑯᑦ ᐃᒪᖅ ᑕᒪᑐᒧᖓ ᐅᔭᕋᑕᕆᐊᖅᕖᐅᔪᒧᑦ ᐊᒪᓘ ᓯᖅᑲᓕᑎᕆᕖᐅᔪᒧᑦ ᐊᒃᑐᐃᓂᖅᑲᓂᐊᖅᑐᖅ ᑕᒪᑯᐊ ᐊᐅᓚᑦᓯᓂᑯᑦ ᐱᓕᕆᐊᖑᐃᓇᖅᓂᐊᖅᑐᑦ ᑕᒫ ᐱᓕᕆᕖᐅᔪᖅ ᐱᓕᕆᓂᑐᒃᑕᒐᓂ ᐊᒪᓘ ᐅᑯᐊᖅᑕᐅᕙᓕᐊᓕᖅᐸᑦ. ᑕᒃᑯᐊᑐ ᑕᐸᑯᐊ ᐅᔭᕋᑕᕆᐊᖅᕖᐅᔪᑦ ᐊᑯᓂᖓ ᑕᒪᑯᓂᖓ ᐱᑕᖅᑲᑐᐊᓚᕆᑐᖅ ᓯᖅᑲᓕᑎᕆᔪᑎᓄᑦ ᐊᐅᓚᑦᓯᓂᑯᑦ

ᐃᒪᖅ ᐊᒪᑐ ᖃᓄᐃᓂᕆᓇᔭᖅᑕᖓ

ᑕᒪᑐᐊ ᓴᑐᒪᖅᓴᖅᑕᐅᓯᒪᔪᑦ ᑯᕕᐅᖅᑲᑕᐅᕙᒃᓂᐊᖅᑐᑦ. ᐳᔪᖅᑲᑕᒍᓃᑦ ᐊᒪ ᓯᓚᑯᑦ ᓴᑦᑐᒪᐃᓚᑦ ᐊᒃᑐᐃᓂᖅᑲᕈᓇᖅᒪᑕᐸᑕᐅᖅ ᐃᒪᖅᒥᒃ ᑕᒻᓇ ᐃᒥᖅᑕᖅᕕᒃ ᐊᕿᓱᖅᑕᐅᓚᐅᖅᑐᖅ ᑕᒪᑯᓂᖓ ᐊᕿᐅᒪᔪᓂᒃ ᐊᑐᓇᐊᖅᑲᑕᒋᓂᒃ ᐱᑕᖅᑯᐸᑐᖑ ᐱᖅᑯᔭᓕᐅᖅᓯᒪᔪᓂᒃ.ᐳᔪᖅᑲᑕᖅᑳᐊᖅᓂᖅᒧᑦ ᒥᐊᓂᖅᔪᑎᒃᓴᑦ ᐃᓕᐅᖅᑲᑕᐅᓯᒪᓂᐊᖅᑐᑦ ᑕᒪᑯᐊᑐ ᓴᑐᒪᐃᓕᓇᖅᑐᑦ ᐊᖏᓕᑐᐊᖅᑯᓇᒋᑦ.ᑕᒪᑯᐊ ᑯᒃᕕᓕᐅᖅᓯᒪᕙᒃᓂᐊᖅᑐᑦ ᑕᒪᓇ ᐃᒪᖅ ᐃᒪᑦᓴᐅᔪᖅ ᓴᑐᒪᔪᖅ ᑕᒪᑐᒪᓂ ᐱᓕᕆᕖᐅᔪᒥ. ᑕᒪᒃᑯᓄᖓ ᖃᐅᔾᔭᓱᕈᑎᓕᐅᖅᓯᒪᔪᑦ ᓇᑐᓇᐃᖅᓯᓄ ᑕᒪᑯᓄᖓ ᐃᒪᖅᑲᕖᐅᔪᓄᑦ ᐃᒪᑦᓯᐊᖅᓂᒃ ᐃᒪᐃᔭᑕᐅᕙᓃᐊᓂᑯᑦ ᑕᒫ ᐊᒃᑐᑕᐅᓂᖅᑲᐃᓇᖅᓂᐊᖅᑐᖅ ᐱᓕᕆᓂᐅᔪᑦ ᐱᓕᕆᓂᖅᑲᑎᑦᑐᒋᑦ ᐊᒪᑐ ᐅᑯᐊᖅᓯᕙᓕᐊᓂᖅᑲᓕᖅᐸᑕ ᐅᑎᖅᑎᑕᐅᓂᐊᖅᑐᑦ ᐃᓕᖅᑯᓯᑐᖅᑲᖏᓄᑦ. ᐊᓯᖑᐸᓕᐊᓂᑦ ᐃᒪᐅᑉ ᖃᓄᐃᐸᓕᐊᓂᖓᓄᑦ ᑕᒪᑐᒧᖓ ᐳᔪᖅᑲᑕᖅᑲᓂᖅᒧᑦ ᑕᒪᑯᐊ ᐊᖏᔪᓚᖏᑐᑦ ᐊᖅᑯᒍᑕᒪᑦ ᐊᖏᖅᓃᐸᑦᓕᓂᖅᑲᐸᓂᐊᖅᑐᒡᒐᓗᐃᑦ ᒥᑭᔪᒥᒃ. ᐊᓯᕈᔪᐃᑐᖅᑲᓂᑦ ᑕᒫᓃ ᓯᑎᖅᑲᓃ ᐅᒃᑐᑕᖅᑯᑎᑯᑦ ᐅᒃᑐᖅᑕᐅᔪᓇᖏᑐᖅ ᑕᒪᑐᒧᖓ ᒫᖅᑯᐸ ᓄᓇᐅᑉ ᐃᓕᖅᑯᓯᖓᓄᑦ ᐊᓚᒋᓂᖓᓄᑦᑐ. ᐊᓯᖑᓂᖅᑲᖅᑯᔭᖅᐸᑕ ᑕᒪᑯᐊ ᑕᓲᑦ ᑕᒫ ᒥᑭᔪᒪᕆᐅᓂᐊᖅᑐᖅ ᐊᑯᓂᐅᖏᑐᖅᑐ ᐱᓇᔭᖅᑐᖅ. ᑕᒪᑐᒧᖓ ᐊᑯᓂᐅᖏᑐᖅ ᐱᓇᔭᖅᓂᕆᓄᑦ ᑕᒪᑯᐊ ᑕᓯᑦ. ᑕᒪᑯᓄᖓ ᑕᒪᑯᐊ ᐊᑦᑐᐃᓂᖅᑲᖅᑯᔭᖅᑐᑦ ᐃᓱᒪᖏᔭᐅᓯᒪᔪᑦ ᒥᑭᓂᖅᓴᐅᓂᐊᖅᑐᑦ ᑕᒪᑐᒪᖓᑦ ᑲᓐᓈᑕᒥ ᒥᓂᔅᑕᐅᔪᑦ ᑲᑎᒪᔨᖏᑦ ᐊᕙᑎᓕᕆᓂᖅᒧᑦ ᒪᓕᖓᓴᖅᑯᑎᒋᓂᑦ. ᑕᒪᑐᒃᑕᖓᓄᑦ ᑕᐸᓯᒧᖓ ᕿᕿᒃᑕᓕᒃᒧᑦ ᑕᒫ ᐃᓚᐅᖏᑐᓃ ᓂᑯᖅᓂᐅᔪᖅ. ᑕᒪᑯᐊ ᓂᑯᖅᑲᖅᓃᑦ ᐃᒻᒪᖅᑯᖅᑐᓐᓂᖏᑦ ᑕᐃᒻᒪᐃᓐᓂᐊᖅᑲᓯᒻᒋᔭᐅᔪᑦ. ᐃᒪᖅᒥᒃ ᐊᑦᑐᐃᓅᑦ ᐊᒪᑐ ᑕᒻᒪᓪᓗᒃᑕᖏᑦ ᖃᓐᓄᐃᑐᓂᖓ ᖃᐅᔾᔭᖅᑕᐅᓐᓂᖏᑦ ᐊᖏᓪᓕᓘᐊᓚᖏᑐᑦ.

ᐃᒻᒪᖅᒥᐅᑕᐃᑦ ᖃᓄᐃᑐᓅᖏᑦ ᐊᒪᑐ ᐃᖃᓪᓘᖅᑲᖅᓃᑦ

ᐃᒻᒪᐅᑉ ᐊᓯᐊᖑᖅᑕᖅᓂᖏᓄᑦ ᐊᑦᑐᖅᓯᑕᖅᓂᐊᑦ ᐃᖅᑲᓗᓐᓂᒃ ᐅᑉᓗᖏᓂᒃ ᖃᓄᐃᑐᓂᖏᓂᒃ, ᐃᖃᓗᐃᑦ ᐃᓅᖏᑦ ᐊᓯᐅᓐᓂᐊᑦ ᐊᓐᑎᕈᓯᐅᑉ ᑕᓯᖃᖕᒐᓃ ᐃᒻᒪᐃᔭᐃᓅᑦ ᐊᒪᑐ ᑐᓐᓇᖕᓇᑯᑎᐅᑉ ᑯᓪᓚᖏᑦ ᐃᖏᖃᓐᓂᖏᑦ. ᐃᖃᓪᓗᐃᑦ ᐊᑐᖅᐸᒃᑕᖏᑦ ᐊᑦᑐᖅᑕᐅᖕᓂᐊᑦ ᐃᖏᖃᓐᓂᖏᑦ ᓴᖕᓂᒻᒧᓪᓗᓐᓃᑦ ᐊᖅᑯᑎᑦ ᓴᓐᓂᐊᓐᓂᑐᑦ ᐊᕙᑕᓃ ᐊᖅᑯᑎᑦ.

ᐃᖏᕋᓐᓂᖏᑦ ᓱᓐᓇᖏᑐᑦ ᐊᔪᓐᓇᖏᐸᑦ. ᐅᔭᕋᕕᓐᓃᑦ ᐊᒻᒪ ᐅᔭᖅᑲᑦ ᓴᓪᐅᕕᑦ ᑕᐅᑐᒃᑕᐅᖕᓂᐊᑦ ᐊᕙᑕᓐᓃᑐᑦ ᖅᑭᑭᒃᑕᓪᐅᑉ ᑕᓯᐊᓃ ᐊᖅᑭᒃᓱᖅᑕᐅᓗᑎᒃ ᐅᒃᑐᑎᒡᒋᓗᒋᑦᖃᐅᔨᓴᖅᑕᐅᓐᓂᖏᑦ ᖃᖑᐃᓐᓂᖏᑦ ᑭᓯᐊᓐᓂᒃ ᖃᐅᔨᓴᖅᑕᐅᓂᖏᑦ ᐊᒃᑐᐃᖕᓂᖏᑦ ᐊᖏᔪᓐᓂᖏᑦ ᐊᒻᒪ ᐱᑎᑕᐅᓐᓃᑦ ᐃᒻᒪᖅᒥᐅᑕᐃᑦ ᖃᐅᔨᔭᐅᓯᒪᔪᑦ ᓂᕈᐅᓇᖅᐳᑦ. ᐱᓪᓕᕆᕕᑦ ᐊᒃᑐᖅᓯᓐᓂᖏᑦ ᐊᓯᐳᐃᑐᓐᓈᓅᐊᓖᑦ, ᒪᖓᑎᓇᓐᓃᑦ ᐊᒻᒪ ᐊᓯᐳᐃᖕᓃᑦ ᐃᖅᑲᓪᓘᐃᑦ ᐃᓐᓅᖏᓂᒃ ᐊᑭᓪᓖᖅᑕᐅᓐᓂᐊᑦ ᐱᖅᑯᔭᖅᔪᐊᖅᑯᑎᖏᑦ ᒪᓪᓕᒃᓗᒡᒋᑦ ᐊᕕᒃᑐᖅᓯᒪᓐᓂᖏᑕ ᐃᒻᒪᖅᒻᒥᐅᑕᐃᑦ ᑕᓅᐅᖅᒥᐅᑕᓕᓇᕐᑦ ᑕᒪᒥᒃ ᐊᓯᐅᖏᑐᑦ ᐊᑐᐊᓪᓚᐃ. ᐊᒃᑐᖅᑕᐅᓐᓂᖏᑦ ᐃᒻᒪᖅᒥᐅᑕᐃᑦ ᖃᓐᓄᐃᑐᑐᐃᓐᓈᐃᑦ ᐃᖅᑲᓪᓘᖅᑲᖅᓃᑦ ᖃᐅᔨᓴᖅᑕᐃᓐᓂᖏᑎᓪᓗᒋᑦ ᐊᖏᓗᐊᓚᖏᑐᑦ.

ᐃᖅᑲᓪᓘᐃᑦ

ᐃᒻᒪᐅᑉ ᐊᒃᑐᖅᑕᐅᓐᓂᖓᓄᑦ ᐃᒻᒪᑦᓴᐅᓐᓂᖓ ᐊᒻᒪ ᐃᖅᑲᓪᓘᐃᑦ ᐊᒃᑐᖅᑕᐅᖃᑕᐅᔪᓐᖅᑐᑦ, ᖃᖅᐸᓪᓘᓐᓂᖏᓄᑦ ᖃᖅᑎᑕᐅᔪᑦ ᐃᒻᒪᖅᒥ ᐅᕝᓘᓐᓂᑦ ᖃᖕᓂᑕᖏᓐᓂ ᐅᖅᑯᒪᐃᓐᓂᖓᓄᑦ ᓴᔪᐱᓪᓖᓐᓃᑦ ᐊᒃᑐᖅᑕᐅᓐᓂᐊᑦ ᐃᖅᑲᓗᐃᑦ. ᐃᒻᒪᓐᓈᐃᓐᓂᐊᕈᓪᒋᔭᐅᔪᖅ ᓴᕕᕋᔭᒃᓴᑦ ᐊᒻᒪ ᑲᓐᓄᓴᐃᑦ ᐃᓯᒪᓪᒋᔭᐅᔪᑦ ᖅᑭᑭᖅᑕᓪᓕᓐᒥ ᐃᒃᑲᕈᐃᓐᓂ ᐊᖅᑭᒃᓱᖅᑕᐅᔭᓇᐊᖅᑲᓂᐊᑦ ᖃᐅᔨᓴᖅᑕᐅᓐᓂᖏᑦ ᒪᓪᓕᒃᓗᒡᒋᑦ ᑭᓯᐊᓐᓂᒃ ᐱᓪᓗᐊᓚᖏᓇᓱᓪᒋᔭᐅᔪᑦ ᐊᒃᑐᖅᑕᐅᖕᓂᖏᑦ ᐊᒻᒪ ᓂᖅᑭᑐᔪᔪᑦ ᓂᖅᑭᖅᓴᖅᓯᐅᖅᓂᐊᑦ ᐊᒻᒪᓘ ᐃᖅᑲᓗᕕᓐᓂᖅᓂᒃ ᑕᐃᒪᐅᓐᓂᐊᕈᓪᒋᔭᐅᔪᑦ. ᐅᖓᓯᒃᓪᓘᓐᓅ ᖃᖅᑎᓇᕕᖏᓃ, ᐊᖏᑎᓪᒋᓐᓂᖏᑦ ᖃᖅᑎᕈᑎᑦ ᐊᒻᒪ ᖃᔨᓴᐅᑎᖏᑦ ᓇᒻᒪᒃᑐᓐᓂᑦ ᒥᐊᓐᓂᕆᓗᒋᑦ ᐃᖅᑲᓗᖏᑦ ᐊᒥᓱᓐᓂᖏᑦ. ᖃᐅᔨᓴᖅᑕᐅᖅᔪᐊᖅᓯᒪᓐᓂᖏᑦ, ᐃᖅᑲᓗᖅᑲᓗᐊᖅᓃᑦ ᐊᒃᑐᖅᑕᐅᓪᓚᖏᑐᑦ ᖃᖅᑎᓇᔪᓐᓂᑦ. ᐊᒃᑐᖅᑕᐅᖕᓂᖏᑦ ᐊᖏᓗᐊᓚᖏᑐᑦ ᖃᖕᓂᓪᒋᔭᖏᓃ ᐊᖏᓗᐊᓚᖏᑐᑦ.

ᓄᓐᓇᖓ, ᖃᖑᐃᑐᓂᖏᑦ, ᖃᖓᓪᓘ ᓄᓇᖓᑕ ᐊᒻᒪᓘ ᖅᑭᖅᑭᓐᓂᖓ

ᓴᓐᓇᓕᖅᐸᑕ ᐊᒻᒪᓘ ᐊᐅᓪᓖᓕᖅᐸᑕ ᐊᓯᖑᖅᑎᑦᓯᓐᓃᐊᑦ ᑕᒻᒪᓐᓃ ᒪᓐᓂᕋᖅᒥᒃ ᐃᑎᓐᓃᖓᓂᒃ ᐊᒻᒪ ᓄᓐᓈᒻᒥᐊᖅᒥᒃ ᓴᓚᖅᕕᖏᑦᓐᓃ. ᐱᓪᓕᕆᕕᖏᓐᓂ ᑐᒻᒪᖅᑕᖏᓂ ᐱᖅᑲᑕᐅᑉᓗᒡᒋᑦ ᐅᔭᕋᒃᑕᓇᐊᖅᕕᑦ ᐊᕙᑎᖏᑦ, ᐊᑉᖅᑯᓯᐅᖅᓈᑦ, ᐅᔭᕋᒃᑕᖅᑰᑦ ᖃᖅᑎᓇᕕᑦ ᐊᒻᒪ ᐊᓯᖏᑦ ᐅᓪᓚᐱᓴᖅᑕᐅᓐᓂᐊᑦ. ᓄᓇᑦ ᓴᖕᓇᔭᐅᕙᓪᓖᐊᔪᑦ ᐃᓯᒪᓪᒋᔭᐅᓐᓂᐊᑦ ᐊᖏᓕᓗᐊᖅᑕᐃᓪᓕᓗᒡᒋᑦ ᐊᕙᑕᓃᑐᑦ ᐊᒻᒪ ᖅᑭᖅᑭᓐᓂᖓ ᐊᒃᑐᖅᑕᐅᑕᐃᓪᓕᓗᑎᒃ ᐊᒻᒪ ᐊᑦᓵᐅᖏᑐᑦ ᖃᖑᐃᑐᓂᖏᑦ. ᑐᓐᖓᕕᒃᓴᓪᓖᐅᖅᓃᑦ ᐊᒻᒪ ᑐᖅᑲᕝᕕᖏᑦ ᐊᑐᖅᑕᐅᓐᓂᐊᑦ ᖁᐊᖑᓂᖏᑦ ᓄᓇᐅᑉ ᐊᒻᒪ ᑯᓪᕕᑦᐅᑉᓂᖓᓄᑦᑦ ᐃᒻᒪᖅᓂᒃ ᑲᑎᖅᓯᐃᓕᖅᑯᓇᓪᒋᑦ ᐊᐅᒃᐸᓕᐊᓂᖕᓚᓂ. ᐊᒃᑐᖅᑕᖅᑕᐅᓂᖏᑦ ᖁᐊᖅᓯᒪᓐᓂᖏᑦ ᓄᓇᐅᑉᓗ ᖃᖑᐃᑐᓂᖏᑦ ᑕᐃᒻᒪᐃᑐᑐᖅᑲᐃᑦ ᐱᓪᓕᕆᕕᖕᒥ ᑐᒻᒥᕋᖅᑕᐅᓂᖓ. ᐊᓯᖏᑎᓪᓗᒡᒋᑦ ᖁᐊᖅᓯᒪᓐᓃᑦ ᐊᒻᒪ ᓄᓇᒥᐊᖅ ᓱᓐᓂᖅᓗᐊᓚᖏᑐᖅ ᐊᒃᑐᖅᑕᐅᓗᐊᓚᖏᑐᑦ.

ᐃᓕᓯᐃᑦ

ᐃᓕᓐᓂᓐ ᐊᒃᑐᖅᑕᐅᓂᐊᑦ ᐳᔪᖃᑕᓄᑦ, ᐊᓯᕈᖅᓇᖅᑐᒧᑦ ᐊᒻᒪ ᐊᓐᓂᐊᓂᖓᓄᑦ. ᐃᓕᖃᐅᖅᓂᖏᑦ ᐊᒃᑐᖅᑕᐅᓂᐊᑦ ᐅᖁᒪᐃᖕᓂᖓᓄᑦ ᐊᒻᒪ ᐅᖁᒃᐸᓪᓚᐊᓂᖓᓄᑦ. ᐃᓕᖏᑦ ᐊᒃᑐᖅᑕᐅᓂᐊᑦ ᓴᐅᔭᐅᓂᖏᓄᑦ ᐳᐊᕆᑕᑕᐅᓂᖓᓄᑦ ᖃᖓᓐᓂᑐᓂᒃ ᐱᓪᓘᐊᓚᖏᑐᑦ (ᐃᓕᖅ ᐊᑐᖅᑕᐅᑲᓂᕈᒪᑦ ᐊᑐᑎᖃᖅᕕᖏᓄᑦ) ᐊᒻᒪ ᐅᖁᒡᒐᖅᓂᖅ. ᐃᓕᖅ ᑐᖁᖅᑎᖅᑕᐅᓐᓂᐊᖅ ᐅᔭᕋᒃᑕᕆᐊᒡᒐᓂᒃᐸᑕ ᐅᑎᖅᑎᑕᐅᔪᒪᕐᒪᑦ ᐊᒻᒪ ᖃᐅᔾᓴᖅᔪᐊᓂᖅᒧᑦ ᐳᔪᖃᑕᖅᑕᐅᖏᓗᓐᓂ, (ᓱᕈᖅᓇᖅᑐᖅ ᐊᒻᒪ ᐊᓐᓂᐊᓂᖏᑦ ᐊᕿᐅᒪᑎᑕᐅᓐᓂᐊᑦ. ᐊᓯᕈᖅᓇᖅᑐᖃᖅᓂᖏᑦ ᐊᒻᒪ ᐊᓐᓂᐊᓂᖏᑦ ᑭᒡᒐᕕᐅᑉ ᖃᓂᖓᓂ ᑭᓯᐊᓐᓂ. ᐊᓯᐊᖑᖅᓂᖏᑦ ᑕᐅᑐᒃᑕᐅᔪᑦ ᐊᒻᒪ ᓄᓇᖁᑎᓖᑦ ᐃᓱᒪᓪᓗᑎᓪᓖᑦ ᑕᐅᑐᒃᑕᐅᔪᑦ ᐊᑦᑕᓐᓂᖏᓇᖅᓂᐊᕈᓪᓕᕐᔭᐅᔪᑦ ᑲᓈᑕᒻᒥᐅ ᑲᑎᒻᒪᔨᖅᔪᐊᖏᑕ ᒥᓐᓂᔅᑐᕐᖓ ᐊᕙᑎᓪᓚᕆᓐᓂᖅᒧᑦ ᒪᓪᓚᒡᖁᑎᖏᑎᒍᑦ. ᐊᓯᖑᖅᓯᓐᓂᑦ, ᓇᕿᑎᕆᓐᓂᑦ, ᐊᒻᒪ ᐅᖁᒃᑎᑦᓯᓐᓂᑦ ᐊᒃᑐᖅᑕᐅᓂᖏᑦ ᐊᕿᐅᒪᑎᑕᐅᔪᓐᓇᖏᑐᖏᑐᑦ. ᐊᒃᑐᖅᑕᐅᓂᖏᑦ ᐃᓕᔪᐃᑦ ᑲᐅᔨᓴᖅᓂᒃᑯᑦ ᐊᖏᔪᓪᓚᖏᑐᑦ.

ᓈᑎᖅᓇᐃᑦ

ᓇᑎᖅᓇᖓ ᐊᓯᐅᓂᐊᕐᑐᖅ ᐳᐊᕆᔭᖅᑕᐅᓪᓚᖅᐸᑦ ᓴᓇᓚᖅᐸᑕ. ᐳᔪᖃᑦᑕᖅ, ᓯᓪᓚ ᐊᓐᓂᐊᓂᖓ, ᐊᒻᒪ ᐊᓯᐊᖑᖅᓅᑦ ᐃᓕᖅᒧᑦ ᐊᒃᑕᖅᑕᐅᓂᖅᖅᓂᐊᖅ ᓇᑦᑎᖅᓇᒻᒧᑦ. ᐅᔭᕋᒃᑖᓂᐊᑦ ᑐᒻᒥᖃᓪᓚᐅᖅᑕᐃᓪᓚᓐᓂᐊᑦ ᐊᒻᒪ ᐅᑭᐅᑯᑦ ᐃᖏᕋᔾᔭᑦ ᐃᒪᒃᑯᑦ ᑕᓯᑦ ᐊᒻᒪ ᑕᓯᕋᐅᔾᔭᑦ. ᐳᔪᖃᑦᑦ ᐊᒻᒪ ᐊᓯᕈᖅᓇᖅᑐᑦ ᒥᒃᓵᓯᒪᑎᑕᐅᓗᑎᒃ ᐊᐅᓚᑕᐅᓗᑎᒃ.ᓄᓇᓗᐃᓇᖅ ᓇᑦᑎᖅᓈᐃᓗ ᐊᑐᖅᑕᐅᓂᖏᑦ ᓇᔪᖅᑕᖏᑦ ᐊᒃᑐᖅᑕᐅᓂᖅᖅᓂᐊᑦ ᐱᓪᓚᖓᔪᓂᑦ. ᐊᕿᐅᒪᔪᓐᓂᖅᑎᑦᓯᓐᓂᑦ ᓇᑎᖅᓇᖅᓂᒃ ᐊᒻᒪ ᐊᖏᔪᐊᓗᓐᓂᖏᓄᑦᑦ ᕿᒪᒃᑕᐅᑐᐃᓇᓗᑎᒃ.ᐱᑕᖃᐅᖅᓂᖏᑦ ᐃᖅᒥᒡᒎᑦ ᐊᑕᓐᓂᖏᖅᓇᖅᓂᐊᑦ ᐅᓪᓗᓇᐊᓪᓕᕐᔭᐅᔪᑦ ᐅᓯᒡᓕᕐᔭᐅᔪᓈᕐᑐᑦ ᐊᒻᒪ ᓇᔾᔪᑎᓐᓂᑦ ᐅᕗᖓ ᓇᓕᐸ ᐅᑦᑰᓐᓂᑦ ᐳᓕᐸ ᐊᑐᖅᑕᐅᖁᔭᐅᔪᑦ ᐊᑦᑕᓐᓂᓂᐊᑦ ᒪᓪᓕᒡᒐᐃᑦ. ᐊᒃᑐᖅᑕᐅᓂᖏᑦ ᓇᑦᑎᖅᓇᐃᑦ ᖃᐅᔾᓴᖅᑕᐅᓂᖏᑎᒡᒍᑦ ᐊᖏᔪᐊᓪᓗᓐᓂᐊᓯᒡᒋᔭᐅᖏᑐᑦ.

ᓄᓇᒥᐅᑕᑦ ᓂᖅᔪᑏᑦ ᐊᒻᒪ ᓇᔪᖅᐸᒃᑕᖏᑦ

ᐱᖓᖅᓪᓘᓐᓂᑦ ᐱᑕᖃᓗᐊᓚᖏᓯᒡᒋᔭᐅᔪᑦ ᓂᖅᔪᑎᓂᒃ ᑐᓪᓕᖅᓯᓐᓂᑦ ᐅᓕᕇᓐᓂᑦ ᓂᖅᔪᑏᑦ ᑐᖁᑕᐅᓂᖏᑦ. ᖃᖓᐅᓗᐊᖏᑐᖅ ᓇᔪᖅᑕᐅᓯᒪᔪᑦ ᑕᒃᑯᔭᒃᓴᐅᓪᓚᖏᑐᑦ ᐃᓪᓗᖅᔪᐊᓕᐅᖅᓚᒃᓴᓄᑦ ᐸᖅᓈᐃᑎᓗᒋᑦ. ᐳᔪᖃᖅᓂᑦ ᐊᒻᒪ ᒪᖓᑎᕕᓐᓂᑦ ᒥᑭᔪᑎᑕᐅᓗᑎᒃ ᓂᖅᔪᑎᖃᖅᓂᑦ ᑲᓂᑕᖏᓐ. ᓯᓪᓛ ᐊᓪᓚᖑᖅᓂᖏᑦ, ᐃᓕᔪᐃᑦ ᐊᒻᒪ ᓇᑎᖅᓇᐃᑦ ᐱᑕᖃᖅᓂᖏᑦ ᐊᓯᖑᖅᑎᑦᓯᔫᐊᑦ ᓂᖅᔪᑎᓂᒃ. ᒪᖓᑎᑦᓯᓐᓂᑦ ᐊᒻᒪᔭ ᐅᓕᕇᓐᓂᑦ ᑐᓪᓗᖅᓯᑕᐅᓪᓚᓐᓂᑦ ᐱᑐᐃᖓᕿᐊᖅᑐᑦᑕᐅᖅ ᐊᓯᐊᓄᑦ ᓄᑦᑐᖅᓵᒃᐸᑦ ᓯᕗᓂᖅᒧᑦ ᑕᒃᐸᓂ ᑎᑭᐅᑎᐋᓚᒃᐸᑦ ᐊᒻᒪ ᑎᖕᒥᐊᖅ ᐅᐸᖅᓪᓚᐊᓚᖖᓂᖅᐸᑦ. ᐊᐸᖁᓯᐅᖅᑕᐅᔪᑦ ᐊᑦᓯᒃᑐᖁᓪᓗᐊᕐᑕᐃᓪᓚᓐᓂᐊᑦ ᐊᒻᒪ ᐊᐸᖁᒋᑦ ᓴᓪᓗᒪᖅᓴᐅᓐᓂᑦ ᐊᒻᒪ ᐊᑉᐳᑕᐃᔭᓐᓂᑦ ᐊᐅᓪᓚᓯᓐᓂᑦ ᓂᖅᔪᑏᑦ ᖃᖏᖅᑎᑕᐅᖃᖅᓗᑎᒃ ᐊᐸᖁᑎᒃᑯᑦ ᑐᓪᓗᖅᑕᐅᔪᖃᖁᓈᓕᑦ ᐃᖏᕋᔪᓐᓂᑦ.ᐅᒃᑯᐊᖅᓯᒪᓪᓛᓚᐅᖅᑕᖅᓐᓂᐊᑦ ᐊᐸᖁᒋᑦ, ᐊᒻᒪ ᓄᓇᑯᕈᑎᑕᖅᓗᐊᖅᑕᐃᓚᓗᓐᓂ ᐱᓐᓂᖅᓗᒃᑐᖅᖁᓇᒍ. ᐳᔪᖃᑕᖅᓂᑦ ᐊᒻᒪ ᒪᖓᒥᓐᓂᑦ ᒥᒃᑭᓕᖅᑎᑕᐅᓗᑎᒃ ᐊᔪᓇᖏᐸᑦ. ᐊᕆᕝᕙᒃᑯᑦ ᐊᐸᖁᓯᐅᓚᖏᑐᑦ 10ᑭᓪᓘᒥᑐᔅ ᑐᖓᓂ ᓇᓗᖅᓃ ᑐᒃᑐᓄᑦ ᐊᒻᒪ ᑐᒃᑐᐃᑦ ᐊᐸᖁᓯᓂᖏᓐᓂ ᑎᑭᐅᑎᓪᓚᐊᖅᑕᐃᓚᓗᑎᒃ ᐊᓂᖅᑐᖅᖁᓇᒡᒍ.

ᐱᓂᖅᓗᒃᑐᖅᖁᓇᒡᒋᑦ ᐊᒃᑐᐃᖁᓇᒡᒋᑦ ᖃᐅᔨᔭᐅᖏᑐᓂᒃ ᑕᐃᑲᓂ ᓄᓇᒋᔭᐅᔪᒥᑦ. ᑕᐃᑲᖕᓂᓴᐃᓇᖅ ᐊᒻᒪ ᐊᓯᐅᔨᖁᓇᒡᒋᑦ ᓇᔪᖅᑕᐅᔪᑦ ᖃᒪᓂᖅᔪᐊᑉ (ᐃᖏᕋᓂᖏᑦ) ᐊᒻᒪ ᖃᒪᓂᑐᐊᖅ (ᒥᐅᑦ) ᑐᒃᑐᐃᑦ ᐊᒥᕋᐃᑦ (ᒪᕈᐃᖑᔪᑦ ᑕᕝᕙᓈᖅᐸᒃᑐᑦ ᐱᑕᖃᕐᖓᑕ ᐊᒃᑐᖅᑕᐅᖁᓇᒡᒋᑦ) ᐅᖓᓯᓐᓂᖏᑦ 0.5 ᐳᓴᓐᓴ ᖃᒪᓂᑐᐊᖅᒥᑦ

ᐅᖓᓯᓐᓂᖏᑦ, ᐊᒻᒪ 0.2 ᐳᕐᓴᓐᔅ ᑕᑉᑯᐊ ᖃᒻᒪᓂᖅᔪᑉ ᐊᖏᓕᖅᐸᓪᓕᐊᔪᑦ ᐅᑭᐅᒧᒃᑕᒧᑦ ᐊᒻᒪ ᐅᖓᓯᓐᓂᖏᑦ ᐃᓱᒪᒡᒋᔭᐅᓯᒪᕗᑦ ᒥᑭᓐᓂᖅᓴᒥᒃ ᓇᔪᑎᓐᓂᖏᑦ ᐅᑭᐅᒧᒃᑖᖅ ᐅᖅᓂᒃᓯᒪᕚᒃᑕᖏᑦ. ᐊᓯᖏᑦ ᓂᖅᔪᑎᑦ, ᐊᒻᒪ ᑎᖕᒥᐊᑦ ᑎᑭᓐᓂᖏᑦ ᐊᒪᑕᐅᖅ ᖃᖓᑐᖃᐅᓗᐊᖏᑐᖅ ᓄᓇᖅᖃᐸᓐᒪᑕ ᓇᓪᓗᓐᓇᐃᖅᓯᒪᓗᐊᖏᑐᑦ. ᑐᒃᑐᐃᑦ ᓄᑦᓱᐊᓪᓚᖏᑐᖅ ᓐᓄᓇᐃᑦ ᐃᓪᓚᖏᓐᓃ (ᓴᓪᓚᖅᕕᓐᓂᑦ,ᒪᒥᑦᑕᖅᕕᖕᒥᑦ) ᖃᖓᐅᓗᐊᖏᑐᖅ ᑕᐃᒻᒪᐃᓪᓛᐅᕋᒥᒃ ᑭᓯᐊᓐᓃᒃ ᖃᒪᓂᖅᔫᑉ ᑐᒃᑐᖏᑦ ᖁᖑᓯᕈᑎᓕᓐᓂᒃ ᑎᑭᑐᖅᓪᓛᐅᖏᑐᑦ, ᑎᑉᔭᓪᓛᐅᑉ ᐊᒻᒪᓘ ᐊᕼᐃᐊᖅᒥᐅᑦ ᐊᒻᒥᕋᖏᑦ ᑎᑎᕋᖅᑕᐅᓯᒪᔪᑦ ᐃᓪᓗᐊᓐᓃ ᓇᓪᓗᖏᑕ ᐊᖕᓂᒍᖅᑕᒃᓗᑎᒃ ᐊᖁᑎᓐᓂᒃ ᐅᔭᕋᒃᑕᖅᕕᓐᓂᑦ ᐊᓐᓂᒡᒍᖅᑕᖅᓗᑎᒃ ᐊᑉᖁᑎᖃᐅᔭᑎᓪᓗᒋᑦ ᐊᕙᑕᓐᓃ. ᑕᒪᓐᓂᓕ ᐅᖃᐅᓯᐅᓯᒪᔪᑦ ᑐᒃᑐᑦ ᐊᓐᓂᒡᒍᖅᑕᒪᒥᐊᑐᑦ ᐅᔭᕋᒃᑕᓇᐊᑦ ᐊᑉᖁᑎᖁᑎᖏᓐᓂᒃ ᐊᕙᑕᒡᒍᓗ ᐱᖃᑕᐅᑉᓗᒡᒋᑦ ᖃᒻᒪᓂᑐᐊᖅᒥ ᐅᑉᐱᖓᑯᑦ ᐱᓱᒃᑐᑦ ᐊᒻᒪᓘ ᐊᑕᐅᓯᖅ ᓪᓘᓈᓚᑦ ᑐᒃᑐ ᐅᑭᐊᒃᓴᖅ ᐱᓱᒃᑐᖅ. ᐊᓯᕈᖅᓇᖅᑐᑦ ᐊᒻᒪᓘ ᔫᓐᓂᐊᓪ ᓇᔪᑎᓐᓂᖏᑦ ᑐᒃᑐᓄᑦ ᐊᒻᒪ˙ ᐅᒻᒥᖕᒪᓄᑦ ᐅᖓᑕᓄᖅᑕᐅᓪᓕᔭᐅᓗᑎᒃ ᐊᓯᕈᐃᖁᓇᒃᑭᑦ ᐊᒃᑐᑎᓐᓂᖏᑦ ᐊᒻᒪᓘ ᓇᔪᑎᓐᓂᖏᓐᓂᒃ ᓄᓇᖁᑎᖏᓐᓃ ᐱᑕᖃᐅᖅᑐᓐᓂ ᐃᓱᒪᓘᑎᒃᑭᔭᐅᔪᓐᓂ ᐊᓯᖑᓗᐊᓚᖏᑐᑦ ᖃᐅᔨᓴᖅᕕᖏᓄᑦ ᖃᐅᔨᓴᖅᑎᓐᓄᑦ. ᓇᔪᑎᓐᓃᑦ ᑎᖕᒥᐊᓐᓄᑦ ᐊᒻᒪᓘ ᑎᓐᖏᔪᑦ ᐊᐅᓪᓚᖅᑐᑦ ᑎᖕᒥᐊᑦ ᐊᒪᑕᐅᖅ ᐊᓯᐊᖑᓚᖏᑐᑦ ᖃᐅᔨᓴᖅᑕᐅᓐᓂᖏᑦ.ᐊᓯᖏᑦ ᐱᕈᖅᓴᔪᑦ ᐅᑉᐸᓗᖃᖅᕕᑦ ᑕᒪᓐᓂᖅᒥᐅᑦ. ᑕᐃᒻᒪᐃᓐᒪᑦ, ᐊᑐᖅᑕᐅᓐᓂᖏᑦ ᓂᖅᔪᑎᑦ ᐊᒻᒪ ᓇᔪᖅᐸᒃᑕᖏᑦ ᖃᐅᔨᓴᖅᓂᒃᑯᑦ ᐊᖏᓕᐅᓐᓇᐊᑲᓪᓕᕆᔭᐅᖏᑐᑦ.

ᐃᒻᒪᖅᒥᐅᑕᐃᑦ ᐃᖃᓪᓘᐃᑦ

ᐃᒻᒪᐅᑉ ᐊᑦᑕᓐᓂᑐᑦ ᓂᐱᖃᓪᓘᐊᕐᑐᒥᒃ ᐅᒥᐊᖅᔪᐊᖅᓂᒃ ᐊᓯᕈᐃᔪᓈᖅᑐᑦ, ᖁᒃᓗᐊᓇᓗᑎᒃ, ᐊᒻᒪᓘᔭ ᐅᕙᓘ ᐃᖕᓂᓪᒋᖏᑕᖏᓐᓄᑦ ᕼᐊᑦᓴᓐ ᑉᐱᒥᑦ ᐊᒻᒪ ᐃᓪᓗᓕᓪᓚᖅᔪᖕᒥᑦ. ᐅᐊᔭᖅᑐᑦ ᐃᖏᕋᔪᑦ ᓂᑉᐱᖃᖅᓂᖏᑦ ᐃᒻᒪᐅᑉ ᐊᑦᑕᓪᒍᑦ ᑕᐃᒪᐃᑐᐃᖕᓇᖅᓂᐊᑦ ᐊᑐᖅᐸᒃᑕᒪᒥᑎᓪᒍᑦ ᐊᒻᒪᓘ ᓇᑭᖅᓂᖏᑦ ᖃᖓᒥᐊᑯᑦ ᐊᔪᖅᓇᖏᐸᑦ, ᐊᓯᐊᒡᒍᖅᕕᖅᓪᓛᖏᑐᑦ ᐱᔭᓇᐊᖃᖏᓂᓇᔭᖏᑎᒡᒍᑦ ᐃᒃᑯᒪᖅᐸᓪᓛᓐᓃᑦ, ᐊᒻᒪᓘ ᓴᖕᓇᔭᐅᓯᒪᓐᓂᖏᑦ ᐊᖑᑎᖏᑦ. ᐃᖃᓗᐃᑦ ᖁᒃᓗᐊᓗᐊᖏᑐᑦ ᐊᒃᑐᖅᑕᐅᓗᐊᖏᑐᑦ, ᐊᒃᑯᖕᓂᐅᖏᑐᖅ ᐊᒻᒪ ᑭᖑᓂᖕᒐᒡᒍᑦ.ᖃᐅᔨᓴᖅᑕᐅᓂᖏᑎᒡᒍᑦ ᐃᒻᒪᖅᒥᐅᑕᐃᑦ ᐃᖃᓪᓘᐃᑦ ᐊᖏᓗᐊᖅᓂᐊᕋᓱᒡᒋᔭᐅᖏᑐᑦ.

ᓂᖅᔪᑎᑦ ᐃᒻᒪᖅᒥᐅᑕᐃᑦ

ᓐᓇᓐᓄᐃᑦ ᑕᐃᑲᖕᓂᓚᖏᑐᑦ ᐱᓪᓕᓇᓕᖅᐸᑕ ᐅᒻᒥᐊᖅᔪᐊᖅᓐᓂ ᐊᑉᖁᑎᖏᓐᓂ ᑕᓃᐅᑯᑦ ᐃᖏᕋᓪᓕᖅᐸᑕ ᐅᔭᒃᑯᑦ ᓐᓇᓐᓄᐃᑦ ᐊᐅᔭᖅᓯᐅᖅᓂᐊᓪᓚᑕ ᓯᒃᔭᖅᐸᓐᓂ ᕼᐊᑦᓴᓐ ᑉᐱ ᑕᓇᐅᓚᓃ ᓯᒃᑯᑎᓐᓂᐊᕐᒪᑕ ᐊᐅᔭᖅᓯᐅᓗᑎᒃ. ᓇᑦᓯᓘ ᐊᒻᒪ ᕿᓐᓈᓪᓗᓪᓚᐃᑦ, ᕼᓈᐅᖅᒥᐅᑕᐃᑦ ᐊᕚᓪᒋᖏᑐᑦ ᑕᕗᕙᓐᓃ, ᐃᒻᒪᖅ ᖁᒃᓗᐃᔭᐅᓐᓂᐊᑦ ᐅᕗᓪᓘᓐᓃᑦ ᐅᒻᒥᐊᖅᔪᐊᖅᓂᒃ ᑐᓴᓪᓕᖅᐸᑕ ᐊᐅᕗᓪᓘᓐᓂᑦ ᐱᔪᖃᑐᐃᓐᓇᐊᓕᑦ ᑕᓇᐅᖅᒥᐅᑕᖅᒥᒃ ᐊᒃᑐᖅᑕᐅᓗᓐᓂ. ᑖᓇᐅᖅᒥᐅᑕᖅᓂᒃ ᓂᖅᔪᑎᓐᓄᑦ ᖃᐅᔨᓴᖅᑎᑕᖅᖃᓂᐊᖅ ᐃᒃᑭᒪᔪᓐᓂᒃ ᐅᒻᒥᐊᖅᔪᐊᖅᓃ ᓂᖅᔪᑎᑕᖅᓗᐊᖅᓂᖏᓄᑦ ᑎᑭᐅᑎᓕᕋᖓᑕ ᐃᖏᕋᔪᑦ ᑯᒃᔪᐊᕋᓲᓐᒥᑦ ᖃᒪᓂᑐᐊᖅᒧᑦ. ᐊᑉᖁᑎᒋᔭᐅᕙᒃᑐᑦ ᐊᑉᖁᑎᒋᔭᐅᖏᓐᓇᖅᓂᐊᑦ ᐃᒃᑯᒪᖏᑦ ᐊᐅᓪᓚᕿᐊᖃᖏᑐᑦ ᐊᐅᓪᓚᖅᑎᑕᐅᑕᖏᓗᑎᒃ. ᐱᖅᐸᓗᓗᐊᖏᓗᑎᒃ. ᓇᑉᐸᓪᓛᓇᔭᖏᓐᓂᒃ ᐃᒃᑯᒪᖅᐸᓗᒃᓗᑎᒃ ᖃᖕᓄᐃᑐᓂᖏᑦ ᐃᒪᖅᒥᐊᑕᐃᑦ. ᐱᑦᑕᖅᑐᐃᖕᓇᕿᐊᓕᒃ ᓂᖅᔪᑎᓐᓂᒃ ᐃᒻᒪᖅᒥᐅᑕᖅᓂᑦ ᑐᓪᓗᖅᑕᐅᔪᖅᑐᐃᖕᓇᕿᐊᓕᒃ ᑕᐃᒻᒪᖕᒐᑦ ᐱᓪᓕᓇᓂᓗᒃᑕᖏᓐᓂᑦ ᑭᓯᐊᓂᒃ ᐱᖁᔭᐅᒃᐸᑕ ᖃᐅᔨᓴᖅᓂᖅᔪᐊᕐᓂᒃ.ᑐᓪᓗᖅᑕᐅᒧᖅᓗᐊᕐᓴᖏᑐᖅ ᐱᖕᓂᖅᓗᒃᑐᖅᓗᐊᕐᓴᖏᑐᖅ.ᐊᒃᑐᖅᑕᐅᓂᖏᑦ ᐃᒻᒪᖅᒥᐅᑕᐃᑦ ᖃᐅᔨᓴᖅᑕᐅᓐᓂᖏᑦ ᐊᖏᓗᐊᖅᓴᖏᑐᖅ.

ᐱᓪᓕᕆᔩᑦ ᐊᓐᓃᐊᖅᑕᐃᓪᓕᓂᖅᒧᑦ

ᓐᓈᔪᑎᓐᓂᖏᑦ ᐊᓯᕈᖅᓇᖅᑐᓐᓄᑦ ᐅᓪᓗᓂᐊᓴᖅᑐᓐᓄᑦ ᐊᒻᒪ ᓄᓇᕐᑯᑎᖓᓂ ᐱᑕᖅᑲᐅᖅᑐᑉ ᐃᓯᒪᓘᑎᑦ (ᓱᕈᖅᓇᖅᑐᑦᓖ)

ᐱᓪᓕᕆᔩᑦ ᓴᓐᓈᔩᑦ, ᓯᖃᓕᑎᕆᔩᑦ,ᐅᔭᕋᒃᑕᖅᑏᑦ, ᐱᐊᓂᒃᑐᓪᓕᕆᔩᑦ ᐊᒻᒪ ᓄᓇᒥᒃ ᐅᑎᖅᑎᑎᔩᑦ ᐱᓪᓕᕆᔩᑦ ᑭᒃᑯᐃᓐᓂᒃ ᐱᓪᓕᕆᕙᖕᓄᑦ ᓈᔪᑎᑐᐃᖕᓇᓃᐊᓪᓘᑦ ᐅᓪᓗᓂᐊᓐᓇᖅᑐᓐᓄᑦ ᐅᕙᓘᓐᓂᑦ ᐊᓯᕈᖅᓇᖅᑐᓕᓐᓄᑦ. ᐊᑦᑐᐊᖅᑕᐅᔭᕆᐊᓘᑦ ᐊᑐᖅᑕᐅᓗᑎᒃ ᐊᕿᒃᑕᐅᓯᒪᔪᑦ ᑕᑯᓐᓇᖕᒐᑦ ᐊᒻᒥᓃᑲᓐ ᑲᑎᒪᕐᓗᑎᒃ ᑲᕙᒪᓕᕆᔩᑦ ᐱᓪᓕᕆᕝᔪᐊᓕᕆᔩᑦ ᖃᓄᐃᖕᓂᖅᒥᒃ (ᓇᐃᓇᖅᑐᖅ). ᖃᐅᔨᒋᐊᖅᑕᐅᔪᑦ ᐱᑕᖃᑐᐃᖕᓇᕆᐊᖃᖅᑐᓄᑦ ᓴᓇᑎᓐᓂᖅᒥᒃ ᐅᓪᓗᕆᐊᓇᖅᑐᓐᓄᑦ ᐱᕐᑯᑎᓐᓄᑦ ᐊᒻᒫ ᓱᕋᓇᖅᑐᓐᓄᑦ ᐱᓪᓕᕆᐊᖑᓯᒪᔪᑦ ᓇᓪᓗᓇᐃᖅᑕᐅᔪᑦ ᓈᔪᑎᓐᓂᖅᒥᒃ ᒪᓪᓕᕐᑯᔭᐅᔪᑦ ᐊᑦᑕᓐᓂᖏᓇᖅᓂᐊᑦ. ᐱᓪᓕᕆᓯᒪᓐᓂᒃᑯᑦ ᐊᔪᖏᒪᑕ ᐊᖏᓐᓂᖅᓴᓂᒃ ᐅᔭᕋᒃᑕᖅᓂᖅᒥᒃ ᐊᒻᒪ ᓯᖃᓪᓕᑎᕆᓂᖅᒥᒃ ᐊᕿᐅᒪᑎᑦᓯᓂᖅᒥᒃ ᐸᓃᕝᕙᒃᑯᓐᓂᑦ ᐅᑭᐅᖅᑕᖅᑐᖓᓂ ᓴᔅᑲᑦᓱᕙᓐᒥ ᐱᓪᓕᕆᕝᕕᖏᓐᓂᑦ, ᐊᑐᖅᐸᒃᑕᖏᑕ ᐊᑦᔨᑦᓯᐊᖏᓐᓂᒃ ᐃᖅᒥᒍᑎᖏᓐᓂᒃ ᐊᑐᖅᑕᖅᓂᐊᑦ ᑕᒃᐱᑲᖖᓃ ᑭᒡᒐᕝᕕᖕᒥ ᐅᔭᕋᒃᑕᖅᕝᕕᖕᒑᓃ ᖃᐅᔨᒋᐊᖅᑕᐅᕙᓗᓐᓂ.

ᐊᖏᓂᖅᐸᖕᒍᔪᖅ ᐱᓪᓕᕆᓕᖅᐸᑕ ᐊᐅᓪᓚᑦᓯᓂᖅᒥᒃ ᐱᓪᓕᕆᓐᓂᐅᑎᓐᓂᒃ ᓇᔪᑎᓐᓂᖅᒥᒃ ᐊᓯᕈᖅᓇᖅᑐᓐᓄᑦ ᐊᒻᒪ ᓱᕈᖅᓇᖅᑐᓪᓕᓐᓄᑦ ᐊᕿᒡᒋᐊᖅᑕᐅᓯᒪᔪᑦ. ᑲᑎᖅᓱᖅᓱᒡᒋᑦ ᐱᓪᓕᕆᔪᓴᐅᑏᑦ ᐊᑐᓪᓕᖅᑎᑕᐅᕙᓗᑎᒃ ᐃᓪᓚᒥᐊᕆᒪᒋᑦ ᐅᑕᖅᓇᖅᑐᒻᒧᑦ ᒥᐊᓂᕆᔭᐅᓂᖅᒥᒃ ᐱᓪᓕᕆᐊᑦ, ᔪᓐᓈᓐᓂᐊᒥᒍᓐᓂ ᐅᔭᓐᓂᐊᖅᑎᓐᓄᑦ ᐊᒻᒪ ᓯᖃᓪᓕᑎᕆᓐᓂᖅᒧᑦ ᐊᑐᖅᑕᐅᔭᕆᐊᖃᕈᐊᕝᕕᒃᑐᖅ ᒥᑭᓪᓕᖅᓯᒪᓗᒍ ᓇᔪᑎᓂᖅ ᐅᓪᓗᓂᐊᓐᓇᖅᑐᓐᓄᑦ ᐊᒻᒫ ᐊᓯᕈᖅᓇᖅᑐᓪᓕᓐᓄᑦ ᓇᓂᔭᐅᓯᒪᓂᖏᓐᓄᑦ ᐅᔭᖃᓃ ᐊᒻᒫ ᐅᔭᕋᒃᑲᖑᔪᑦᓃ. ᐱᓪᓚᕿᐅᑎᑕᐅᔪᖅ ᖃᐅᔨᓴᖅᓂᖅᔪᐊᑦ ᐱᖃᑕᐅᓗᒍ ᐊᓐᓂᖅᓴᖅᑐᖅᕝᕕᖃᓐᓇᐊᖅᑲᖅᑐᑦ, ᐊᕿᐅᒪᑎᑦᓯᓐᓂᖅ ᐊᒻᒪ ᐃᓗᓐᓂᒃ ᓴᓪᓗᒪᖅᓴᐃᔩᑦ, ᐃᓪᓚᓐᓂᐊᖅᑐᓪᓕᓃᑦ ᐊᒻᒪ ᐱᓪᓕᕆᔪᓴᐃᓐᓂᖅ ᐊᒻᒪ ᑭᑐᑐᐃᓐᓇᐃᑦ ᒥᐊᓐᓂᕆᔭᐅᓗᑎᑦ ᒥᐊᓐᓂᕆᔭᐅᖕᓂᐅᑎᓐᓄᑦ. ᐊᕿᐅᒪᑦᓯᐊᓗᑎᒃ ᐊᑐᖅᑕᐅᔪᑦ ᐊᒻᒪ ᖃᐅᔨᓴᖅᑕᐅᓯᒪᓯᐊᓗᑎᒃ ᐊᑐᖅᑐᓗᒃᑖᑦ, ᓇᔾᔪᑎᔪᖅᑯᓇᒋᑦ ᐅᓪᓗᓂᐊᓇᓘᐊᕐᑐᓐᓄᑦ ᐃᕈᖅᑐᑎᓐᓄᑦ ᐅᕙᓘᓃᑦ ᐊᓯᕈᖅᓇᖅᑐᓪᓕᓐᓄᑦ ᓂᕆᐅᒋᔭᐅᔪᖅ ᐃᓐᓂᓚᐅᒪᑦᓯᐊᓗᑎᒃ ᑕᒪᐃᑎᒍᑦ ᐱᕐᑯᔭᐅᒍᑦ ᐅᑯᐊ.

ᓐᓈᔪᑎᓐᓃᖅ ᐅᑕᖅᑎᑕᐅᓐᓇᖅᑐᓄᑦ

ᐅᑦᔨᖅᑐᓯᐊᓴᐊᖅᖃᖅᓃᑦ ᖃᐅᔨᒪᔭᐅᓗᑎᒃ ᐊᑐᑎᖅᖃᖅᓂᖏᑦ ᐊᐅᓪᓚᓯᐅᓄ ᐅᑕᖅᑕᐅᓇᖅᑐᓪᓕᓐᓄᑦ ᓇᔪᑎᐅᓐᓄᑦ ᕐᑯᑦᓯᒃᓯᑎᑕᐅᕐᑯᓇᒍ ᖃᓄᐃᖏᑐᖅ ᐊᑐᖅᑕᐅᒃᐸᑦ (ᐊᓪᓛᐅᕋ), ᐃᓄᓕᕆᓐᓃᑦ ᐊᒻᒪ ᐱᓪᓕᕆᔩᓄᑦ ᐱᔪᑎᑦ ᐃᓯᒪᒋᔭᐅᔪᑦ. ᓇᔪᑎᓐᓂᖅ ᐅᑕᖅᑕᐅᖅᑐᒪᒧᑦ ᖃᐅᔨᓴᑕᐅᕙᒃᑐᖅ ᑕᒪᓐᓇ ᐅᑕᖅᑕᐅᓇᖅᑐᖅ ᓐᓂᐅᖅᑕᐅᓂᖕᒐ, ᐃᒪᐃᑐᑦ ᐅᒃᑐᕋᐅᑦ (ᒥᔅᓯᕗᑦᓴ). ᑭᒃᓪᓕᖃᖅᑎᑕᐅᔪᖅ ᓐᓂᐅᖅᑕᐅᓐᓂᖕᒐ ᐱᓕᕆᔩᒪᒧᑦ ᐊᕿᒃᑕᐅᓯᒪᓐᒪᑦ ᓯᓪᓚᖅᔪᐊᖅᒥᐅᓐᓄᑦ ᖃᐅᔨᒪᔪᓐᓄᑦ ᓄᓇᓕᓐᓄᑦ ᒥᐊᓐᓂᕆᔭᐅᓂᖏᓐᓄᑦ ᒥᐊᓂᕐᑯᐸᓗᒋᑦ ᐅᑕᖅᑕᐅᒪᒥᑦ.

ᑲᓈᑕᒥ, ᑕᐸᑯᐊ ᑲᓈᑎᐊᓐ ᖃᔪᔪᓕᕆᔩᑦ ᐊᓐᓂᖅᑕᐃᓕᓂᖅᒧᑦ ᑲᒥᒋᓐᓄᓴ (ᕋᓇ>ᕋ0 ᒪᓪᓚᒡᓚᐅᖅᑐᑦ ᖃᖅᑕᔪᓐᓄᑦ ᐱᓪᓕᐊᒥᓐᓂᒃ ᐊᒻᒪ ᒪᓪᓚᒡᖅᔪᐊᑎᒡᒍᑦ ᐊᑐᕐᑯᔭᐅᔪᑦ ᐅᕝᕙᖕᒐ ᖃᖅᑕᔫᓐᓄᑦ ᐊᓐᓂᖅᑕᐃᓪᓚᒪᓂᖅ ᐊᒻᒪ· ᐊᐅᓚᑕᐅᓐᓂᖕᒐᓄᑦ ᒪᓪᓚᒡᒐᖅᔪᐊᑦ ᓇᓪᓘᓇᐃᑐᖅ ᑭᒃᓪᓕᖅᑐᑦ ᓇᔪᑎᓐᓂᖅᒥᒃ ᐅᑕᖅᓇᖅᑐᒧᑦ ᐱᓪᓕᕆᔩᓐᓄᑦ ᐊᒻᒫ ᐃᓪᓚᓪᓕᐅᑎᓯᒪᔪᑦ ᑭᑐᓪᓗᒃᑕᓐᓄᑦ ᐃᓐᓄᖃᑎᒡᒋᓐᓄᑦ. ᓱᕈᖅᓇᖅᑐᑎᑐᑦ ᐊᒻᒫ ᐊᓯᕈᖅᓇᖅᑐᓪᓘᑦ, ᐊᖏᓂᖅᐸᑎᒡᒍᑦ ᐱᔪᓇᖅᑕᓂᑎᒍᑦ ᐊᑐᓪᓕᑎᑦᓯᔪᑦ ᐊᐅᓪᓚᓯᓐᓂᖅᒥᒃ ᓇᔪᑎᔪᓐᓄᑦ ᐅᑕᖅᓇᖅᑐᒧᑦ ᐊᕿᐅᒪᑎᑕᐅᓂᐊᖅ. ᑕᒪᓐᓇ ᐊᑐᖅᑕᐅᓂᐊᖅ ᑕᒃᑯᖕᒐ ᑭᒪᕝᕕᐅᐸ ᐱᓪᓕᕆᕙᖕᓄᑦ. ᓐᓅᐅᖅᓯᓐᓅᑦ ᐊᒻᒪ ᓂᐅᖃᖅᓐᓅᑦ ᐊᖏᓂᖏᑦ ᐊᑕᓐᓂᖏᓐᓇᖅᓂᐊᑦ ᒪᓪᓚᒡᒐᓚᐊᖑᔪᑦ ᓐᓅᐅᖅᓯᓅᑦ ᑭᒃᓪᓕᖏᑦ ᐊᕿᒃᓯᒪᔪᑦ ᐅᖃᐅᓯᐅᒪᑕ ᐱᓪᓕᕆᓕᖅᐸᑕ.

ᐅᑕᖅᓇᖅᑐᒧᑦ ᒥᐊᓂᕆᔭᐅᓃᑦ ᐊᑐᖅᑕᐅᓐᓂᐊᑦ ᖃᑯᒡᒍ ᐱᓪᓕᕆᓕᖅᐸᑕ ᐱᓪᓕᕆᕝᕕᓐᓂ,ᐱᒡᒋᐊᖅᕕᖓᑦ, ᐱᓪᓕᕐᔪᑎᑦ, ᐊᒻᒪ ᐱᓪᓕᕆᔪᓵᖅᑕᐅᔪᑦ ᒥᕆᓯᒪᐃᓇᕐᑯᐸᒍ ᐅᑕᖅᓇᖅᑐᖅ ᓇᔪᑎᓐᓂᖓ ᐱᓪᓕᕆᔨᓐᓄᑦ ᐊᒻᒪ ᑭᑐᑐᐃᓐᓇᖅᓄᑦ. ᐅᑕᖅᑕᐅᓐᓇᖅᑐᓪᓗᒃ ᒥᐊᓐᓂᔭᐅᓂᖅ ᐸᖅᓇᐅᑎ ᐊᑐᓪᓗᖅᑎᑕᐅᕗᖅ ᔪᓂᓐᓂᐊᒻᒥᒃ ᐅᔭᖁᑕᖅᕕᓄᑦ ᓄᓇᖏᓄᑦ.

ᑐᖓᕕᒡᒋᐸᓗᒍ ᐊᒻᒪ ᖁᓪᓛᓃ ᐅᑕᖅᓇᖅᑐᓪᓗᒃ ᓐᓃᐅᖅᑕᐅᒃᐸᑦ ᐃᒪᐃᓐᓃᐊᕈᒡᒋᔭᖓᑦ ᓴᒡᒐᖅᕕᖕᓂ ᐊᒻᒪ ᓐᓅᓇᐅᐸ ᐊᑕᒡᒍᖅᑐᒥ ᐅᔭᖁᒃᑕᖅᕕᓃ, ᓯᖃᓪᓗᑎᓇᔾᑦ ᐊᒻᒪ ᐊᒃᔭᖅᑐᖅᑎᑦ ᔭᓪᓘᑭᒃᒥᒃ. ᓂᓇᐅᓇᖏᑐᖅ ᐱᓪᓗᔾᓇᔾᑦ ᐅᑕᖅᓇᖅᑐᓐᓂᒃ ᓐᓃᐅᖅᓯᔪᒪᖅᒪᖓᑕ ᑭᒃᓗᒡᒋᑎᑕᐅᔪᖅ ᖃᖏᖅᑕᐅᓚᖏᑐᖅ ᐊᕿᒃᑕᖓᑦ ᑲᓐᓈᑦᑎᐊᓐ ᖃᖅᑕᖅᑐᓗᓇᔾᑦ ᖃᖕᒍᐃᖏᑎᑦᓯᓐᓂᒧᑦ ᑲᒥᓴᓐ.

ᑭᑦᑐᓪᓗᒃᑕᓐᓄᑦ ᐊᖏᐊᖅᑕᐃᓪᓗᑎᑦᓯᓂᖅ

ᓯᓪᓚᓪᓗᓇᓂᖅᒧᑦ ᐊᒻᒪ ᐃᒻᒪᖅᒥᐊᑕᓪᓗᓇᓂᖅᒧᑦ ᐊᓐᓂᐊᕕᐅᔾᑦ ᐱᓪᓗᓇᐊᖑᔾᒻᒥᑦ ᑎᑭᐅᑎᑐᐃᖕᓇᕿᐊᓪᓗᒃ ᐊᒻᒪ ᓇᔪᑎᓗᓐᓂ ᑕᐃᑲᓐᓂᑐᓐᓄᑦ ᐃᓪᓚᒡᒋᒃᑐᓐᓄᑦ ᑭᑐᑐᐃᓐᓇᖅᓄᑦ. ᑐᑭᓯᐊᓯᐊᕈᒪᔪᖅᖅᐸᑦ ᐊᔪᖅᓴᖏᑐᖅ ᓯᕗᓪᓗᐅᖅᓂᖅᒥᒃ ᐊᓯᕈᖅᓇᖅᑐᑦ ᖃᐅᔨᒡᒋᐊᖅᓗᒋᑦ ᐃᓄᓗᒃᑕᑦ ᐱᓪᓗᓇᕕᐅᑉ ᖃᖕᓂᖓᓂᑐᑦ ᐃᓄᐃᓗ ᖃᐅᔨᒪᔪᖅᖃᖏᑦ ᖃᒪᓂᑐᐊᖅᒥᐅᑦ ᐊᑐᐊᖅᓯᐸᓗᑎᒃ ᑐᒃᑐᓐᓂᒃ ᐊᒻᒪ ᐃᖃᓪᓗᓐᓂᒃ ᐊᑐᖅᒪᑕ ᐊᖏᔪᒥᒃ ᓂᕿᒋᐸᓗᒋᑦ. ᐊᕿᒋᑎᒍᓗᒍ, ᐅᒃᑲᓪᓕᖅᑎᒍᒃ, ᐊᒻᒪ ᓯᒃᓯᒃᑎᒍᒃ ᐊᒪᑕᐅᖅ. ᐊᑦᔨᐅᖏᑐᑯᑦᑕᐅᖅ ᐊᑐᖅᑕᐅᕙᒃᑐᑎᒍᑦ ᐃᒪᖅᒥᒃ,ᐃᖃᓗᓐᓂᒃ, ᓄᓇᕋᖅᑐᖅᓂᖅᒥᒃ,ᐸᐅᖓᑎᒍᑦ, ᐊᒻᒪ ᓂᖅᔪᑎᑐᖃᐃ ᖃᒪᓂᑐᐸ ᖃᓐᓂᖓᓂᑐᑦ ᓄᓇᖓᑕ (ᐃᖕᓇᐃᑦ,ᓄᑕᖃᑦ, ᐊᒻᒪ ᓄᑕᕋᓛᑦ ᕿᑐᖓᓛᑦ ᐃᓪᓚᕆᑦ), ᒪᖃᐃᑎᑦ ᕿᑭᑦᑕᓪᓇᒧᑦ ᐊᖏᕋᐅᑎᕙᒃᑐᑦ ᐃᓪᓚᒻᒥᓐᓄᑦ ᐊᒻᒪ ᖃᔪᓪᓕᓂᕐᑕᖃᖏᑐᑦ ᐱᓪᓕᓂᔪᓐᓂᒃ (ᓄᑦᑕᖅᑕᖃᖏ) ᐱᓪᓕᓂᕕᑎᓐᓂ (ᐅᕙ ᐃᓕᕐᑦ, ᒥᐊᓐᓂᖅᓯᕐᑦ), ᐃᓱᒪᒋᔭᐅᔪᑦ ᐃᓄᓂᖏᑦ ᖃᐅᕐᓴᖅᑕᐅᓯᒪᔪᑦ.

ᐊᕿᒃᓱᖅᑕᐅᓯᒪᓂᖓ ᐃᒻᒪᖅᒧᑦ ᐊᕿᖅᓱᑎᖏᑦ ᐅᒃᑳᓐᓄᖅᑐᑦ ᐊᕿᐅᒪᑎᑦᓯᔪᑦ ᓈᒪᓈᖅᑐᒥᒃ ᐊᒻᒪ ᐊᕙᑎᒧᑦ ᖃᖕᓄᐃᖏᑎᑦᓯᓐᓃᑦ ᑯᕕᕕᑦ ᐊᒻᒪ ᓴᓇᔭᐅᓯᒪᓂᖏᑦ ᐊᒻᒪ ᖃᐅᔨᓴᖅᑕᐅᓐᓂᖏᑦ ᐊᓐᓃᐊᓂᖏᑦ ᒥᒃᑭᔪᑎᑕᐅᓗᑎᒃ ᓯᓪᓛᐃᓐᓇᖅᒧᐊᕐᑯᓇᓕᖏᑦ ᐊᒻᒪ ᔭ ᐅᕙᑰᓐᓃᑦ ᐱᑕᖃᖅᓂᖓᓄᑦ ᐊᒃᑐᖅᓯᔪᓇᖅᓃᑦ ᓯᕗᓪᓕᐅᑎᑕᕗᑦ ᒥᑭᔪᑎᓈᕈᑦ ᐊᒃᑐᐃᔪᓇᖅᓂᖏᑦ ᐊᕙᑎᓪᓘᒃᑕᓪᒧᑦ, ᐱᖃᑕᐅᓗᒋᑦ ᐃᓐᓄᖑᖅᑎᑕᐅᓯᒪᔪᑦ ᐊᕙᑎᖏᑦ.

ᓯᓚᒧᑦ ᐊᓯᕈᖅᓇᖅᑐᑦ, ᒥᑭᔪᑕᐅᓗᒋᑦ, ᐊᓯᕈᖅᓇᖅᑐᖃᖏᑐᑦ ᓱᕈᖅᓇᖅᑐᓛᓗ ᐊᒻᒪ ᓈᓛᐅᑎᓐᓄᑦ ᐃᒥᐊᖕᓇᖅᑐᑦ ᖃᐅᔨᓴᖅᑕᐅᓯᒪᕗᑦ. ᓐᓇᓐᓂᔭᐅᓯᒪᓐᓂᖏᑦ ᑕᒃᑯᑎᑦᓯᕗᑦ ᐃᓱᒪᓪᓕᕆᔭᐅᓯᒪᔫᒃᑖᑦ ᐃᓪᓗᐊᓐᓂᓗᒃᑖᖅᑐᑦ ᑭᒃᑳᓕᖅᑯᔭᐅᔪᑦ ᐅᕙᓗᓐᓃᑦ ᐊᑐᐊᖅᑕᐅᔪᑦ ᓈᒻᒪᓕᖅᔭᐅᔪᑦ ᖃᓄᐃᖕᖏᑐᑦ, ᓇᐃᓐᓇᖅᓗᖅᑦ ᓇᓂᐸ ᐊᒻᒪ ᒥᒃᑭᑦᑐᑎᒍᑦ ᐃᓱᒪᒋᔭᐅᓂᖏᑦ ᑕᒃᐸᓐᓂ ᑭᓪᓕᕝᕕᖕᒥ ᓄᓇᖕᓕᓂ. ᑕᐃᒻᒪᐅᑐᐃᓐᓇᕐᑑᐊᓗᑕ ᓇᐃᓐᓇᖅᓗᒍ ᑕᐅᑐᒃᑕᐅᓂᖕᓕ ᐅᕗᖕᓕ ᓇᓂᐸ ᐊᖑᑎᓯᓚᔪᖅ ᓯᓚᖅᔪᐊᖅᒥᐅᑦ ᑎᒥᖁᑎᖏᓄᑦ (ᐱ)ᓂ0 ᐊᖕᓂᐊᖅᑕᓂᓐᓂᖅᒧᑦ ᒪᓪᓕᒡᒋᐊᓃᑦ ᑕᒃᑯᐸᓗᒋᑦ ᑭᓪᓕᕝᕕᐅᐸ ᓄᓇᖕᓕᓃ. ᓱᓖ ᐊᑦᑕᓐᓂᖕᒋᓇᖅᑐᖅ ᓯᓛᖅᔪᐊᕐᒥᐅᑦ ᒪᓪᓕᒡᒋᐊᖅᖅᑕᖕᒋᑦ ᐊᖕᓂᐊᖅᑕᐃᓪᓕᓂᖅᒧᑦ ᐊᒃᑐᓐᓄᑦ. ᐊᖕᒋᓂᖕᒋᑦ ᖃᒪᓂᑐᐊᖅᒥ ᐊᑦᑕᓐᓂᓯᐊᖅᑐᑦ ᓱᓖ ᐃᓱᒪᓪᑑᑎᑦ. ᒪᒃᑯᑎᒡᒍᓇᖅ ᓇᓕᐸ, ᓇᒻᒪᖕᓈᖅᓂᖕᒋᑦ ᒥᒃᑭᔪᑎᑦ ᐃᓱᒪᓪᓕᕐᐸᓗᒋᑦ ᐃᓱᒪᓪᓕᕆᔭᐅᔪᑦ ᖃᑯᑎᒃᑯᑦ ᐅᖓᑕᐅᕐᑯᕐᑯᔭᐅᖕᒋᑐᑦ ᐊᕿᒃᑕᐅᓯᒪᔪᑦ ᑭᑐᒥᐊᓐᓄᑦ ᑕᒃᐸᓃ ᓄᓇᖓᓂ ᓱᓖ ᐊᑦᑕᓐᓃᖕᒋᓇᖅᑐᑦ ᐃᓱᒪᓗᑕᐅᔪᓐᓃᑦ ᐊᖕᓂᐊᖅᖅᑕᐅᓕᓂᖅᒧᑦ ᐊᒃᑐᓐᓄᑦ ᐊᒻᒪ ᖁᑦᓯᖕᒋᑐᑦ ᖃᒪᓂᑐᐊᖅᒥ ᓱᖕᓂᖕᒋᑐᑦ ᐃᓱᒪᓘᑎᓪᓕᔭᐅᓛᐅᖅᑐᑦ.

ᖁᓯᓐᓂᖅᐸᑦ ᐱᑕᖃᕈᒪᕈᒡᓯᔭᐅᔪᑦ ᐱᓪᓚᕆᐅᖏᑐᓐᓄᑦ ᓄᑕᖑᖏᑐᖅ ᐱᓪᓚᕆᓄᑦ ᑭᒡᒐᕕᖕᒥ ᓄᓇᖓᓂ ᑕᐃᑯᐊ ᓂᐅᖅᓯᓯᒪᔪᑦ ᓈᑦᑕᓐᒥᒃ ᐊᒪᓗ ᐃᓪᓗᒻᒧᑦ ᐊᓂᖅᓴᖅᓯᒪᔭᖕᖓ ᐳᒍᖅᑕᖕᖓᓂᒃ ᓄᓇᖓᓂ. ᓂᐅᖅᓯᔪᖅᑲᖅᓯᒪᖏᑐᖅ ᐃᓪᓚᒋᓐᓂᒃ ᑭᑐᐃᓐᓇᖅᓂᒃ ᑎᑭᐅᑎᓯᒪᔪᒥᒃ ᐊᖕᓂᐊᖅᑕᐅᓂᖅᒧᑦ ᑳᓈᑕᒻᒥ ᓂᐅᖅᓯᓐᓂᖅᒧᑦ ᐅᕙᓂᓐᓂᑦ ᑳᓈᐃᑦᑎᐊᓐ ᖃᖕᓄᐃᑦᑕᓂᖅᒧᑦ ᑲᒥᓴᓐᑯᑦ ᒪᓕᒃᑕᐅᖁᔭᖏᓐᓂᒃ ᓂᐅᖅᓯᓐᓂᖅᒧᑦ ᐃᓪᓚᒋᓄᑦ ᑭᑐᐃᓐᓇᖅᓄᑦ. ᐱᑦᔪᑎᑦ, ᐱᑕᖃᕋᔭᕋᓲᐊᕐᐸᑦ ᓂᐅᖅᑕᐅᔪᖅ ᑭᑐᐃᖕᓇᖅᓄᑦ ᒥᑭᓂᖅᓴᐅᑐᐃᖕᓇᖃᔭᖅᑐᖅ 1ᔭᖕᔭ ᓂᐅᖅᓯᔪᖅ ᐊᖏᑎᒋᔪᖅ ᑭᒃᑐᖓᓪᓚ ᐊᒪᓗ ᒥᑭᓐᓂᖅᓴᐅᓇᔭᖅ ᐅᕙᖓᑦ ᖕᔭᑉᔭ ᒥᑦ ᐱᖁᓯᐅᕙᒃᑐᖅ ᐱᖁᓯᑐᖕᓇᖓ ᐅᖓᑕᓐᓂᑐᖅ ᓂᐅᖅᑕᐅᕙᒃᑐᖅ ᑳᓈᑕᒻᒥᐅᓄᑦ.

ᐃᖏᖃᔪᑎᑎᒍᑦ ᐱᓪᓚᓇᐊᒃᓴᖅᔪᐊᖅᓄᑦ ᐊᒃᑐᖅᑕᐅᖕᓂᖏᑦ

ᐱᓪᓚᓇᕈᕗᑦ ᐊᕿᓯᒪᓂᐊᕐᑐᖅ ᐱᓪᓚᓇᐊᒃᓴᓂᒃ ᐊᒪᓃ ᐱᓪᓚᓇᕕᓪᓖᑦ ᐱᕕᒃᓴᖅᖅᓗᑎᒃ. ᐊ□ᓯᐊᓂᖓᖏᑦᑐᑦ ᐱᖅᑕᐅᓗᑎᒃ ᖃᒪᓂᑐᐊᖅᒥᐅᑦ ᐊᒪᓗ ᑲᖏᖅᕆᓂᖅᒥᐅᑦ (ᐱᓗᒋᑦ ᐊᐃᔭᐅᑕᖅᓗᑎᒃ ᕿᕙᓪᓕᖅᒥᐅᑦ ᓄᓇᖏᓐᓃᑦ). ᐱᓪᓚᓇᐊᒃᓴᓪᓗ ᐊᒪᓃ ᑲᓇᑐᖃᑐᖅ ᐱᕕᒃᓴᖅᖅᓂᐊᑦ ᓯᕗᓪᓕᖅᐸᐅᓗᒋᑦ ᐱᓪᓚᓇᑎᑕᐅᓗᑎᒃ; ᐊᑐᖅᑕᐅᓇᔭᖅᑐᑦ ᑲᓇᑐᖃᒃᓯᒪᓂᐊᑦ;ᐃᓪᓚᓂᐊᖅᓯᒪᔪᑦ,ᐱᓪᓚᓇᔪᖅᓯᒪᔪᑦ ᐊᒪᓃ ᓯᓪᓚᑐᖅᓴᖅᕕᒥᖓᑐᑦ; ᐊᒪᓃ ᐃᓱᒪᒋᔭᐅᓇᓂᐊᑦ ᐃᓅᐃᑦ ᐃᓪᓚᖁᓯᖏᑦ ᐱᓪᓚᓇᕕᑉᑎᓇᓂ ᐊᒪᓃ ᑲᓇᑐᖃᒃᑐᖅ ᖁᓴᓯᐊᒃᓴᖏᑦ ᐱᔭᐅᔪᓇᓇᓗᑎᒃ. ᐃᓪᓚᓂᐊᖅᓯᒪᓂᖅ ᐊᒪᓃ ᐱᓪᓚᓇᔪᓴᖅᓯᒪᓇᓅᑦ ᐃᓪᓚᓚᐅᑎᔭᐅᓗᑎᒃ ᐱᖅᑕᐅᓗᒋᑦ ᐱᓪᓚᓇᓪᓘᖅᓯᒪᔪᑦ, ᓇᒥᓂᖅ ᐃᓄᔪᓇᖅᓅᑦ, ᖁᓯᓐᓂᖅᓴᓄᑦ ᐃᓪᓚᓂᐊᒡᒐᓂᖕᓂᑯᑦ, ᐃᓪᓚᓂᐊᖅᕕᒥᑐᑦ, ᐱᓚᓇᐊᖅᖅᑐᓪᓗ, ᐊᒪᓃ ᐱᔪᒪᔪᑦ ᐊᔪᖏᓪᓂᓪᓖᑦ ᐊᒪᓗ ᐱᓪᓚᓇᖅᔪᐊᖅᓯᒪᔪᑦ. ᐊᒃᑐᖅᑕᐅᓂᐊᑦ ᓄᓇᓪᓚᒥᖓᑐᑦ ᐱᓪᓚᓇᐊᒃᑕᖅᓯᒪᔪᑦ ᑭᓇᐅᔭᖏᖅ ᐊᖏᒃᓚᒡᒋᐊᖅᑕᐅᕙᒃᐳᑎᒃ ᐃᓄᐃᑦ ᐊᒥᓱᑦ. ᐱᓪᓚᓇᐊᒃᓴᒥᐊᑐᐃᑦ ᓴᕿᓐᓂᐊᑦ ᐊᒃᑐᐃᓐᖃᖅᐳᑎᒃ ᐅᖓᑎᒃᑲᓐᓂᐊᓐᓄᑦ ᐱᓪᓚᓇᕕᓪᓖᑦ ᓄᓇᓪᓚᑦ ᐊᖏᓚᖅᐳᑎᒃ.ᐱᓪᓚᓇᓂᖅᖅᓯᒪᔪᑦ, ᐃᓪᓚᓂᐊᖅᓯᒪᔪᑦ ᐊᒪᓗ ᐱᓪᓚᓇᔪᖅᓯᒪᔪᑦ, ᐊᒪᓃ ᑲᓇᑐᖃᒃᓯᒪᕙᒃᑐᕝᑯᓈᓃᑦ ᐊᔪᖅᓴᖏᑐᑦ ᐊᒥᓱᓪᓗᑎᒃ ᐱᓪᓚᓇᐃᑦ ᐱᓪᓚᓇᒋᐊᖅᓂᐊᑦ.

ᐱᕈᖅᐸᓪᓚᐊᓚᖅᐸᑕ ᐱᓪᓚᓇᔭᒃᓴᑦ ᑕᒪᑯᐊᑕᐅᖅ ᐃᑲᔪᖅᑐᖅᑕᐅᓇᓂᐊᑦ ᐃᓄᐃᑦ ᐃᓪᓚᑯᓯᖏᑦ ᐱᖁᓯᖏᑦ ᑭᓈᐅᔭᓪᓖᐅᕈᑕᐅᓗᑎᒃ ᐊᑐᖅᑕᐅᓗᑎᒃ ᓯᕗᓪᒧᑦ ᒪᒃᐃᑦᖅᓂᖅᒧᑦ ᐊᒃᑭᑐᔪᓐᓄᑦ. ᐱᓪᓚᓇᐊᒃᓴᑦ ᐊᒥᒐᖏᓪᓚᖅᐸᑕ ᑐᓐᓂᐅᖅᑲᐃᓈᓃᑦ ᐃᓪᓚᖁᓯᑐᖅᖅᓄᒃ ᐱᕙᓪᓚᖅᐳᑎᒃ ᑭᐸᔭᓪᓚᖅᐳᑎᒃ ᐱᖁᓯᑐᖅᖅᓂᑦ ᐃᓪᓚᖁᓯᑐᖅᖅᓂᑦ ᐃᓪᓚᓯᕙᓪᓚᐊᓚᖅᐸᑕ ᓄᑕᖑᓂᖅᓴᓐᓂᒃ ᐃᓄᐃᑦ ᐊᑐᐊᖅᓯᓪᓚᖅᐸᑕ ᐱᓪᓚᓇᕕᖏᑦ ᐊᒃᑐᐊᓂᖃᓪᓚᖅᐸᑕ. ᐊᓯᖏᑦ ᒥᒃᓴᒋᐊᖅᑕᐅᒃᐸᑕ ᒪᖃᐃᑦᖅᓈᓃᑦ, ᐱᑕᖃᐅᖅᓂᖓᓄᑦ ᐊᒃᑐᖅᑕᐅᒃᐸᑕ ᓂᕿᑎᒍᑦ ᒥᐊᓂᖅᓯᓂᒃᑯᑦ (ᐱᓗᐊᖅᑐᒥᒃ ᐊᔪᓇᕈᓈᖅᓂᖏᓄᑦ ᐊᓯᕈᖅᓯᒪᖏᑐᑦ) ᓂᕿᑦᓯᐊᑦ ᐊᒪᓃ ᐃᓄᓯᐊᖅᓇᖅᑐᑦ. ᑲᔪᓯᓗᑎᒃ ᑲᕗᒪᑯᑦ ᐃᑲᔪᖅᑐᐃᓂᖏᑦ ᐃᓄᐃᑦ ᐱᖁᓯᖏᓐᓂᒃ ᐃᓪᓚᑯᓯᖏᓐᓂᒃ ᓂᕆᐅᒋᔭᐅᔪᖅ ᐃᑲᔪᖅᑕᐅᓂᖏᓐᓂᒃ ᐱᒋᐊᑲᓐᓂᖅᑕᐅᑉᐸᑕ ᐃᓄᐃᑦ ᐃᓪᓚᖁᓯᖏᑦ ᐊᔪᖏᓐᓂᖏᑦ, ᐅᖅᑲᐅᓯᖏᑦ, ᐃᑉᐸᖅᓇᖅᑐᑦ ᐊᒪᓃ ᖃᐅᔨᒪᔭᑐᖃᖏᑦ. ᐊᒃᑐᖅᑕᐅᓂᖏᑦ ᐃᓪᓚᖁᓯᑐᖃᖏᑦ ᓂᕆᐅᒋᔭᐅᔪᑦ ᐊᓯᕈᖅᑕᐅᒃᑕᓪᓚᖏᑦᑐᑦ. ᐱᓪᓚᓇᐊᕗᑦ ᐊᓯᐊᖑᖁᔨᖏᑦᑐᑦ ᑭᓯᐊᖏᒃ ᐃᓪᓚᖁᓯᑐᖃᒥᓂᑦ ᐊᓯᖑᖅᓂᐊᑦ ᐅᖓᓯᒃᓯᕙᓪᓚᖅᐳᑎᒃᑲᓗ ᒪᒃᐃᑦᖅᓂᖅᒥᒃ. ᐊᒪᓪᓃ ᐃᓪᓚᖁᓯᑐᖃᐃᑦ ᐃᑉᐸᓪᓚᖅᓇᖅᑐᓗ ᐊᒪᓃ ᖃᐅᔨᒪᓂᖏᑦ ᐊᓯᖏᓄᑦ ᓴᖑᑎᑕᐅᑐᐃᖕᓇᖅᑭᐊᓪᓖᑦ ᐃᓪᓚᖁᓯᖅᓄᑦ ᐊᓯᖏᓄᑦ.

ᑭᓈᐅᔭᓪᓚᐅᖅᓃᑦ ᐊᖏᒃᓚᒡᒋᐊᖅᐸᑕ ᐊᒪᓃ ᐱᖁᓯᑦ ᑭᐸᔭᒃᓯᒪᓪᓚᖅᐸᑕ ᐃᓅᓯᐊᖅᓂᖅᒧᑦ ᐃᓄᑐᐃᓐᓇᖅᒧᑦ, ᐃᓪᓚᒋᓐᓄᑦ ᐊᒪᓃ ᓄᓇᓪᓚᓐᓄᑦ. ᐊᒥᓱᑦ ᐃᓄᐃᑦ ᐱᒋᐊᒃᓂᕈᒪᓗᑎᒃ ᐱᓪᓚᓇᐊᒃᓴᒃᖏᖅᓂᒃ ᑭᓯᐊᓂᒃ ᐃᓪᓚᖏᑦ ᐊᒪᓃ ᓄᓇᖅᖅᑐᑦ ᐱᐅᓯᖏᓐᓂᐊᑦ. ᐃᓄᑐᐊᕐᒧᑦ, ᐃᓪᓚᒋᓐᓄᑦ ᐊᒪᓃ ᓄᓇᓕᖏᓄᑦ ᖃᓄᐃᖏᓯᐊᖅᓂᖅᓄᑦ ᐃᑲᔪᖅᑐᖅᑕᐅᓂᑦ ᐱᖅᑕᐅᑉᓗᒋᑦ ᑐᓴᖅᑕᐅᔭᓇᐊᖅᖏᑐᑦ ᐱᓪᓚᓇᐃᑦ ᐊᒪᓗ ᐃᓪᓚᒋᑦ ᖃᑐᖕᓇᖓᑦ ᐃᑲᔪᖅᑕᐅᓂᒃᑐᑦ ᐱᓚᓇᐊᖑᓈᓃᑦ; ᑕᒃᑯᒃᓴᐅᓂᒃᑯᑦ ᐃᓄᖅᑎᒋᑦ ᐊᒪᓃ ᐃᓄᑐᖅᐃᑦ ᐃᓅᓯᐊᖁᔨᔪᑦ; ᑐᓴᕈᑎᓂᒃᓗ ᐊᑐᖅᑐᑦ ᐃᓪᓚᒥᓄᑦ ᐅᖅᑲᓗᒃᑐᑦ; ᐊᒪᓃ ᐃᒃᑲᔪᖅᑐᐃᔨᑦ ᓄᓇᓪᓚᓄᑦ ᓄᓇᓪᓚᓂᒃ ᐅᖅᑲᑎᖅᑲᖅᑐᑦ ᓱᓇᓇᓂᒃ ᓯᕗᓪᓚᐅᖁᔨᖓᓚᑕ ᐱᑦᔪᑎᖅᑲᖅᑐᑦ ᐃᓄᓯᐊᓇᐊᖅᑲᖅᓂᖅᒧᑦ. ᐃᓄᓯᐊᖁᔭᐅᓈᖏᑦ ᓂᓇᐅᑉᐱᔭᐅᔪᑦ ᐱᕚᓪᓚᖅᔪᐊᖅᓂᐊᕈᑉᐱᔭᐅᔪᑦ. ᐅᖅᑲᐅᓯᐅᑕᖃᓗᐊᖅᑎᓗᑉᐱᑦ ᐃᓪᓚᖑᐱᓄᑦ ᐱᕙᓪᓚᖓᐱᑐᖑᒍᖅ ᐃᓪᓚᖑᐱᑦ ᐃᓄᓯᐊᓚᖅᐸᓪᓚᓇᓂᐊᑦ, ᐊᖏᓚᕚᓪᓚᖅᐳᑎᒃ ᐱᔪᒪᔭᐅᔪᑦ ᓂᕈᐊᖅᑕᐅᔪᑦ ᐊᒪᓃ ᐱᑕᖃᐅᓯᐊᓚᖅᓗᓇᓂ

ᐅᒻᒪᓇᓐᓂᖅᓴᐅᓕᖅᑐᑎᒃ ᓯᕗᒻᒧᑦ ᐱᑦᔪᑕᐅᔪᑦ ᐊᒪᓘ ᐱᖁᓯᐅᕚᒃᑐᖅ ᐃᓄᓂᖅᒧᑦ ᐊᒪᓘ ᐃᒡᓗᒥᐅᖃᑎᒡᒌᑦ ᐱᑦᓕᓇᐊᖅᓯᐊᓕᖅᑐᑎᒃ ᖃᓅᐃᓴᓇᐊᖃᖅᓂᕐᒋᑦ ᐱᐅᓐᓂᖅᓴᐅᓕᖅᑐᑎᒃ.

ᓴᓈᐅᒡᒋᔭᐅᔪᑦ ᑕᒻᒪᐃᑎᒡᒍᑦ ᐊᖏᓂᖅᓴᐅᓪᓕᖅᑐᑎᒃ ᓄᓇᓕᓗᒃᑕᒻᒧᑦ ᖃᖕᓄᐃᖏᓯᐊᕐᓃᑦ, ᐊᑐᖅᑕᐅᔭᓇᐊᓪᓛᓗ ᐊᔪᖅᓴᖅᑐᓪᓕᓇᕐᓄᑦ, ᐱᓪᓗᐊᖅᑐᒻᒥᒃ ᓂᖃᐃᑐᖅᑎᑦ ᐃᑲᔪᖅᑕᐅᓴᓇᐊᖃᖅᓂᕐᒋᑦ, ᒥᒃᓴᓪᒋᐊᐸᓕᖅᓗᓐᓂᓗ ᓂᖃᐃᑐᖅᓂᖅ. ᐊᖕᓂᐊᖃᕐᒋᐸᓪᓕᕈᒪᓐᓂᖅ, ᐃᓪᓗᖃᓇᐊᖃᖅᓂᖅ, Hᐊᒻᓚᑯᑦ ᐊᒪᓗ ᐳᑭᖅᑕᓪᓕᖃᓇᐊᖃᖅᓂᖅ ᐱᕋᓯᕿᖅᑕᐅᓐᓃᑦ ᓂᕆᐅᒡᒋᔭᐅᔪᑦ ᐊᖏᓪᓕᖅᐸᓪᓕᖅᓂᐊᕐᑐᑦ ᑭᖕᓴᐅᔭᓕᐅᖅᐸᓕᓕᖅᐸᑕ. ᑭᖕᓇᐅᔭᓪᓕᐅᖅᓂᕐᒋᑦ ᑲᕙᒪᒃᑯᑦ ᓄᓇᕗᒻᒥ ᐊᒪᓗ ᑐᖔᕕᒃᑯᑦ ᐊᖏᓂᖅᓴᐅᓕᖅᑐᑎᒃ ᐃᓪᓗᖅᔪᐊᓪᓕᐅᑲᖕᓂᓇᐊᖃᖅᖓᓐᓃᑦ ᐊᒪᓗ ᐱᕋᓯᕿᖅᑕᐅᓐᓂᑦ ᐊᒪᓗ ᑐᓐᓂᕈᑎᑦ ᐃᓄᓐᓄᑦ. ᐊᖏᓂᖅᓴᐅᓕᖅᐸᑕ ᐱᕋᓯᕿᖅᑕᐅᔪᒪᔪᑦ ᑲᕙᒪᒃᑯᑦ ᐊᔪᓕᕿᓘᐊᖅᐸᑕ ᐊᔪᖅᓇᖅᓯᕙᓪᓕᓚᖕᒋᑐᖅ.

ᐱᓪᓕᓇᐊᒃᓴᑦ ᐊᒪᓘ ᐊᕿᒡᒍᑦᑕᒻᒪᖅᓯᐅᑎᑦ ᐊᒃᑐᖅᑕᐅᖕᓂᕐᒋᑦ ᓄᓇᕗᒻᒥ ᐊᔪᖅᓇᓗᐊᖕᒋᑐᑦ. ᐱᕚᓕᖅᓂᖅᑯᖅᔪᐊᕐᓂᐊᑦ ᐱᓪᓕᓇᓐᓃᐅᑎᓐᓂᒃ, ᐱᓪᓕᓇᐊᒃᓴᓐᓂᒃ, ᐊᓪᓚᓐᒥᓂᑦ ᐊᑐᖅᓗᑎᒃ ᐱᕋᓯᖅᑐᑦ, ᓇᖕᒥᓐᓂᖅᒥᓂᒃ ᓄᓇᕗᑦ ᑭᓐᓴᐅᔭᓪᓕᐅᖅᑐᑦ ᐊᒪᓗ ᐊᑭᓪᓕᖅᑐᐃᔪᑦ ᑐᖕᕕᑯᓐᓄᑦ. ᐱᓪᓗᓇᓐᓇᖅᑐᒥᒃ ᑭᓪᓚᕚᒃ ᐅᖃᖅᑎᐅᓗᓐᓂ ᐃᒃᑯᐱᒃᑐᑎᒃ ᑐᖕᓂᕈᑎᑦ ᐱᓕᕆᐊᒃᓴᓐᓄᑦ ᐊᒪᓘ ᑭᖕᓇᐅᔭᓪᓕᐅᖅᔪᐊᓗᑎᒃ ᐅᒃᑯᐊᖅᕕᒃᓴᖕᓚ ᑎᑭᑦᑕᖅᓗᒡᒍ.

ᑕᒻᒪᐃᑎᒡᒍᑦ, ᐃᓄᐃᑦ ᐃᑉᐱᓇᒃᑎᓯᒪᓪᓕᖅᐸᑕ ᐊᓯᐊᖑᖅᓂᐅᑉ ᖃᐅᔨᓴᐅᑎᖁᑎᖓᒍᑦ, ᓱᓇᐅᖏᓂᕋᐃᔪᑦ ᒥᒃᑭᓪᓕᖅᑐᑎᒃ ᐊᒪᓗ ᓱᓪᓕᓐᓂᕋᐃᔪᑦ ᐊᒃᑐᐃᓗᑎᒃ ᓂᕆᐅᒋᔭᐅᔪᑦ ᑕᐃᒪᒻᒪᐅᓕᖅᐸᑦ. ᓄᓇᓪᓖᑦ ᐅᖃᖃᑕᐅᓕᖅᑐᑎᒃ ᐸᖅᓇᖃᑕᐅᓕᖅᑐᑎᒃ ᐊᒪᓗ ᐱᑦᓕᓇᔪᓕᓇᕐᑦ ᐱᕈᖅᑎᑦᓯᓗᑎᒃ ᐊᒪᓗ ᐊᖑᒪᑎᓗᑎᒃ ᑕᒪᐃᑎᒡᒍᑦ ᐱᓕᕆᐊᖑᔪᑎᒡᒍᑦ. ᐊᓅᕚᒥᐅᑦ ᑲᔪᓯᔪᒪᒥᒃ ᐱᑦᓕᓇᓐᓂᐊᑦ, ᐱᖅᑕᐅᓗᒻᒋᑦ ᐃᓐᓄᖅᑲᐃᑦ ᑎᒡᒍᓯᒪᔭᖕᒋᑦ ᖃᐅᔨᒪᔭᖕᒋᑦ, ᐃᑲᔪᖅᓇᓃᑦ ᐱᑦᓕᓇᐊᒃᓴᑦᓕᓇᖅᔪᐊᖅᓇᓃᑦ ᐊᐅᓪᓚᑦᓯᓇᓃᑦ, ᑲᑎᖅᓱᐃᓇᓃᑦ ᖃᐅᔨᓴᖅᓃᑦ ᐱᔭᐅᖁᔭᐅᔪᑦ ᐊᕿᒡᒋᐊᖅᑕᐅᕙᒃᑐᑎᒃ.

ᐊᑦᔨᒡᒋᖕᒋᑐᑦ ᐃᓄᑐᐃᓐᓇᐃᑦ ᑭᐅᔪᓈᖅᑐᑦ ᐊᑦᔨᐅᖕᒋᑐᓐᓂᒃ ᐊᒃᑐᖅᑕᐅᓐᓂᖅᒥᓐᓂᒃ ᑭᓯᐊᓐᓂᒃ ᐱᑦᓕᓇᐊᒃᓴᖅᔪᐊᖅᓄᑦ ᐱᑦᓚᕿᐅᕗᖅ ᐊᒪᓘ ᐊᖏᓂᖅᓴᐅᔪᖅ. ᐱᑦᓚᓇᐅᕗᖅ ᑕᐅᑐᒃᑕᐅᒃᐸᑦ ᑕᒃᑯᓈ ᐱᑦᓕᓇᐊᑉᑎᒍᑦ ᐃᓱᖅᖃᖅᓂᐊᖅ, ᐱᓕᓇᖅᑕᖅᓂᖅᒧᑦ ᑐᖕᓂᕈᓯᐊᑦ ᐱᓕᓇᓂᖕᒋᓄᑦ ᐊᑐᖅᓯᒪᔭᖕᒋᑎᒡᒍᑦ ᐊᒪᓗ ᐃᓪᓕᓯᕚᓪᓕᐊᓂᖕᒐᒡᒍᑦ ᑭᖑᒻᒧᖕᒋᑐᖅᓕ. ᐅᖓᑎᒃᑲᓂᖕᒐᓄᑦ ᐱᔪᒪᔭᐅᓯᐊᖅᑐᑦ ᑐᖕᓂᕈᓯᐊᑦ ᐊᐃᕙᐅᑕᐅᓗᑎᒃ ᐊᖕᒋᖅᑎᒡᒋᓐᓂᒃᑯᑦ ᑭᕚᓪᓕᖅᒥ ᐃᓄᐃᑦ ᑲᑐᔨᖅᑎᒡᒋᖕᒋᓂᑦ ᑕᒃᑯᓈᖅᑐᑎᒃ ᐃᓄᐃᑦ ᐊᒃᑐᖅᑕᐅᓂᖕᒋᓄᑦ ᑐᓂᕈᓯᐊᑦ ᐊᖕᒋᖅᑎᒡᒋᓐᓂᒃᑯᑦ.

ᐃᑦᓴᖅᓂᑕᑐᖅᑲᖅᓂᒃ ᑐᑭᓯᒡᒋᐊᖅᓅᖅ

ᐱᖁᑎᕝᕕᓐᓂᑐᖅᑲᐃᑦ ᐃᑦᓴᖅᓂᑕᑐᖅᑲᐃᑦ ᒥᐊᓂᓴᐅᓴᓇᐊᓪᓃᑦ ᐊᒃᑐᖅᑕᐅᖁᓇᓕᕆᑦ ᐅᕙᓘᓐᓃᑦ ᖃᐅᔨᓴᖅᑎᐅᖕᒋᑐᓄᑦ ᖃᐅᔨᓴᖅᑕᐅᖕᒋᓗᑎᒃ. ᑐᐸᖅᕕᕕᓃᑦ ᐱᖁᑎᕕᓂᑐᖅᑲᐃᑦ ᖃᐅᔨᓴᖅᑕᐅᓪᓛᐅᕐᑐᑦ ᐊᒪᓗ ᒥᒃᑭᔪᓪᓚᔾᔭᑦ ᓄᓇᑦ ᐱᔭᐅᐸᓗᑎᒃ, ᒪᒃᑯᐊᖑᔪᑦ ᐱᖕᒐᓱᑦ ᐅᔭᖅᑦ ᓇᓪᓗᓈᐃᑉᑯᑦᑦ ᐊᑕᐅᓯᖅ ᐱᕈᔭᖅ, ᑎᑎᖅᑎᒡᒍᑦ ᓈᓪᓗᓐᓇᐃᖅᑕᐅᔪᑦ ᐅᔭᕿᒃᑕᖅᐸᑎᓐᓂ. ᐱᑕᖅᐅᖅᓂᖕᒐ ᓄᓇᖕᒐ ᑎᑎᕋᖅᓯᒪᔪᖅ ᒥᑭᔪᓪᓚᔭᖅ. ᓄᓇᑲᖕᓂᑦ ᐃᓪᓚᓪᓕᐅᑎᓯᒪᔪᑦ ᐊᒪᓗ ᑲᔪᓯᓐᓂᖅᑲᖅᑐᑦ ᐃᓪᓚᒋᓐᒪᑕ ᑕᐸᓱᒪᖕᒐᓴᐃᓐᓇᖅ ᐱᓪᓕᓇᖕᒍᔪᒧᑦ ᐊᒃᑐᖅᑕᑕᐃᓪᓕᔪᑦ ᐊᔪᖅᓇᖕᒋᐸᑦ ᐊᒪᓗ ᐱᑐᖅᐱᓐᓄᑦ ᑐᐸᖅᕕᕕᓃᑦ ᐱᓕᓇᓂᐸᑎᓐᓇ ᑲᔪᓯᑎᑕᐅᓐᓂᐊᑦ ᖃᐅᔨᓴᖅᔪᐊᖅᓂᖅᑎᒡᒍᑦ ᑲᔪᓯᑎᑕᐅᓗᑎᒃ ᐱᓕᓇᕕᖃᕐᑦ ᐅᒻᒪᓐᓂᖕᒐ. ᑎᖅᑯᑎᒡᒋᔭᐅᓕᖅᑐᑦ ᑎᑎᖅᑯᑎᖕᒋᓐᓄᑦ ᑲᓈᑦᑎᐊᓐ ᐱᖁᑎᑐᖅᑲᕕᖕᒐᓄᑦ ᐃᓄᖅᑎᒡᒋᓯᐊᖅᓂᒃᑯᑦ ᐊᒪᓗᑕᐅᖅ ᓄᓇᕘᑦ ᑲᕙᒪᑯᖕᒋᑕ ᑎᑎᖅᑯᑎᖕᒋᓂᑐᑦ ᑕᑯᔭᐅᑐᐃᓐᓇᓇᐊᓃᑦ ᓇᖕᒐᕆᔅᑐᖕᓄᑦ ᐃᓄᓐᓄᑦ ᐊᒪᓗ ᓯᕗᓐᓂᖅᒥ ᖃᐅᔨᓴᕆᒪᔪᓐᓄᑦ.

ᐱᓪᓕᕆᐊᕆᖕᒋᑕᑉᑎᓐᓂᒃ ᐊᒃᑐᐃᓯᒪᔪᑦ

ᐱᓪᓕᕆᐊᕗᑦ ᐊᒃᑐᐃᖕᓂᖕᒋᑦ ᑕᒻᒪᐃᑎᒡᒍᑦ ᑭᒡᓕᖃᖅᐸᒃᑐᑦ ᐱᓪᓕᕆᐊᕆᔭᐅᔪᑦ ᓱᓐᓇᑕᖃᖕᒋᑦᓴᕋᖕᒐᑕ ᐊᓯᖕᒋᓄᑦ ᐊᕙᑎᒻᒧᑦ ᐊᒃᑐᖅᑕᐅᓐᓂᖕᒐᓄᑦ ᐊᓯᑉᑎᓐᓄᑦ ᐃᓄᑐᐃᓐᓇᖅᓄᑦ ᐱᓪᓕᕿᒥᐊᕐᑐᓄᑦ. ᓯᓪᓚᐅᑉ ᓇᒻᒪᓐᓂᖕᒐ, ᓄᓇᖃᐅᖅᓂᖕᒋᑦ ᓂᖅᔪᑏᑦ, ᖃᖕᓄᐃᖕᒋᓯᐊᖅᓃᑦ ᐊᒻᒪᓗ ᐱᓪᓕᕆᐊᒃᓴᖅᔪᐊᖃᖅᑎᑦᓯᓐᓃᑦ ᐱᑕᖃᐅᖅᔪᐊᖅᐸᑦ ᐱᓪᓕᕆᐊᕆᖅᔪᐊᑐᓪᓘᐊᖅᑕᕗᑦ.

ᓰᓪᓚᐅᑉ ᖃᖕᓄᐃᓂᖕᒐ□ ᐊᓯᖕᒋᑦ ᐱᓪᓕᕆᐊᖕᒍᔪᑦ ᐱᑎᖕᒋᑕᕗᑦ ᖃᖕᓂᑐᒡᒐᔭᑦ ᐊᒃᑐᐃᓐᓂᖃᖅᐸᑕ ᓯᓪᓚᒥᒃ ᖃᓐᓄᐃᑐᓐᓂᖕᒐᓄᑦ ᐊᒃᑐᖅᓯᔪᑦ ᑭᒡᒐᕝᕕᖕᒥᖕᒐᑐᑦ ᐱᓪᓕᕆᕕᑉᑎᓐᓂᑦ ᐅᔭᕋᒃᑕᖅᕕᑉᑎᓐᓄᑦ. ᐅᖃᐅᓯᕆᓗᒍ ᐊᑐᕈᒪᔭᕗᑦ ᐃᒃᓴᖅᕕᑦ ᐅᑯᖕᓄᖕᒐ ᐊᑉᐳᖅᑎᓐᓈᖅᑐᖅᒥᐅᓐᓄᑦ ᑐᓪᓚᒃᑕᖅᕕᒃ ᐃᒃᓴᖅᕕᒃ, ᐊᓐᓃᐊᑎᑦᓯᒃᐸᑕ ᐱᓪᓕᕆᓐᓃᐅᑎᒻᒥᓐᓂᑦ ᐊᒻᒪᓗ ᓄᓇᑯᕈᑎᖕᒐᑦ ᐱᐅᖕᒋᑐᒃᐸᑦ ᐃᓗᐊᖕᒋᐸᑦ. ᐊᖕᓂᐊᑎᑦᓯᓗᓐᓂ ᐱᐅᖕᒋᑐᒻᒥᒃ ᐃᓯᒪᒡᒋᔭᐅᓗᓐᓂ ᐊᖕᒋᓕᖅᐸᑦ ᑕᐃᑲᓐᓂ ᐃᒃᓴᖅᕕᖕᒥ ᑐᓪᓚᒃᕕᖕᒧᑦ ᐊᕙᑕᓐᓂ ᑭᒡᓕᖃᖅᑐᖅ 2 ᑭᓪᓚᒥᑐᖅᓴ ᐃᒃᓴᖅᕕᒧᑦ ᐊᒻᒪᓘ ᑲᐅᔮᓴᖅᑕᐅᖕᒋᐸᑦ ᑕᐃᒪᐃᓐᓂᖕᒐ ᓇᒻᒪᒡᒐᔭᖕᒋᑐᖅ.

ᓄᓇᒡᒋᔭᖕᒐᑦ ᓂᖅᔪᑏᑦ ᐊᒻᒪᓘ ᓇᔪᖅᑕᐅᔪᖅ□ ᓴᓪᓛᐊᑯᑐᐃᖕᓇᖅ ᐊᑐᖅᑕᐅᖅᑯᔭᐅᒃᐸᑦ ᐊᖅᑯᑕᐅᔪᖅ ᖃᖕᒐᓗᒃᑕᖅ ᐊᖅᑯᑎᒋᔭᖕᒐᓗ (ᐅᑭᐅᑯᐃᓐᓇᖅ ᐊᑉᖅᑯᑦ ᐊᑐᖅᑕᐅᒃᐸᑦ) ᓇᓪᓕᐊᖕᓄᑐᐃᓐᓇᖅ ᑕᒻᒪᓐᓂᖅᒥᐅᑦ ᐊᖕᒍᓇᓱᒃᑏᑦ ᒪᖃᐃᑕᖅᑐᑦ ᐱᔪᑕᐅᑐᐃᖕᓇᕿᐊᓪᓛᑕᐅᖅ ᑐᒃᑐᓐᓄᑦ ᐊᒃᑐᐃᖕᓂᖅᒥᒃ. ᐊᑐᖅᑕᖅᑎᓗᒋᑦ ᐊᑉᖅᑯᒻᒥᒃ ᒪᖃᐃᓐᓂᖅᒥᓐᓄᑦ ᐊᒃᑐᐃᑐᐃᖕᓇᕿᐊᓪᓛᑦ ᐊᐃᑐᖅᑕᐅᓂᖕᒋᑎᒍᑦ ᒪᖃᐃᑎᓪᓗᒡᒋᑦ ᐅᕙᓘᓐᓂᑦ ᑕᒻᒪᐃᑎᒡᒍᑦ ᑎᒍᔭᒻᒥᑎᒡᒍᑦ. ᐊᖕᒋᖅᑕᐅᔭᓇᐊᖃᖅᓂᐊᖅᐸ ᖃᖕᒐᓗᒃᑕᒻᒧᑦ ᐊᑉᖅᑯᑦ ᐊᑐᖅᑕᕗᑦ, ᐊᓅᕙᒃᑯᑦ ᐱᓪᓕᕆᖅᑎᖃᖅᓂᐊᑦ ᑐᒃᑐᓯᐅᖅᐸᒃᑐᓐᓂᒃ ᐊᖕᒋᖃᑎᒡᒋᓐᓂᐊᓗᑎᒃ ᖃᓐᓄᖅ ᐊᐅᓪᓚᑕᐅᓐᓂᐊᖅᒪᖕᒐᑦ ᐃᓐᓄᓗᒃᑕᓐᓄᑦ ᐊᑐᖅᑕᐅᒃᐸᑦ ᐱᑕᖃᓪᓕᖅᐸᑦ ᑭᒡᒐᕝᕕᖕᒧᐊᖅᑐᖅ ᐊᑐᐃᓐᓇᐅᓕᖅᐸᑦ ᐊᑉᖅᑯᑦ ᒪᓪᓕᑦᓯᐊᖅᓂᐊᖅᐸᑕ ᐊᑉᖅᑯᑎᐅᑉ ᒪᓪᓕᒡᒐᖕᒋᓐᓂᒃ ᖃᖕᓄᐃᑐᖅᑯᓇᒡᒍ, ᐊᕙᑎᒻᒧᑦ ᐊᒻᒪᓗ ᐱᓪᓕᕆᔨᑦ ᐊᑐᖅᑕᖕᒐᓂᒃ ᐊᑉᖅᑯᒻᒥᒃ.

ᐱᓪᓕᕆᔨᑦ ᐊᖕᓂᐊᓂᖅᑯᓇᒡᒋᑦ□ ᓇᔾᔪᑎᓐᓂᖕᒋᑦ ᓈᓪᓛᐅᑎᓄᑦ ᐃᒻᒥᐊᓐᓇᖅᑐᓄᑦ, ᐅᓪᓗᓇᐊᓐᓇᖅᑐᓐᓄᑦ ᐃᕈᖅᑐᑎᓐᓅᑦ, ᐊᒻᒪᓗ ᓄᓇᖅᑯᑎᖕᒐᓄᑦ ᐱᑕᖃᐅᖅᑐᒧᑦ ᐃᓯᒪᓗᑎᒡᒋᔭᐅᔪᑦ ᐊᑐᖅᑕᐅᓂᖕᒋᑦ ᐊᑉᑯᑏᑦ ᐱᓪᓕᕆᔩᓐᓄᑦ ᐊᒻᒪᓗ ᐃᓄᑐᐃᓐᓇᐃᑦ ᐃᓪᓚᐅᖃᑕᐅᔪᑦ, ᐱᖃᑕᐅᑉᓗᒡᒋᑦ ᑕᒪᓐᓃ ᖃᒪᓂᑐᐊᖅᒥᐅᑦ. ᑕᒻᒪᓗᒃᑕᒥᒃ ᓇᔪᖅᑕᐅᔪᑦ ᒥᑭᔪᑎᑕᐅᖕᓂᐊᑦ ᒪᓪᓕᒃᑕᐅᖅᑯᔭᐅᔪᑦ ᐊᖕᒋᖅᑕᐅᓯᒪᔪᑦ ᐊᑦᑕᓐᓃ.

ᐱᓪᓕᕆᐊᒃᓴᖅᔪᐊᖃᖅᑎᑦᓯᓐᓂᖅ□ ᐱᖃᑕᐅᓗᒡᒋᑦ ᑭᒡᒐᕝᕕᓐᒧᑦ ᐊᒻᒪᓗᔭ ᐅᕚᓘᓐᓂᑦ ᑕᒻᒪᐃᑎᒡᒍᑦ ᓐᓅᓇᕗᒻᒥ ᓂᓇᐅᒡᒋᔭᐅᔪᑦ ᐊᑦᔨᒡᒋᒃᑐᓂᒃ ᐱᓪᓕᕆᐊᒃᓴᖅᔪᐊᖅᓂᒃ ᐊᒃᑐᖅᓯᓐᓂᐊᖅᒪᑦ ᑭᒡᒐᕝᕕᒃ. ᓇᓪᓕᖅᓇᒃᑎᑕᐅᒃᐸᑕ ᐱᔭᐅᔪᒪᔪᑦ ᐱᓪᓕᕆᔨᒃᓴᑦ ᐊᒻᒪᓗ ᐊᑐᖅᑕᐅᔪᒃᓴᑦ ᐱᐅᔪᒃᐸᑕ ᐊᒻᒥᒡᒐᖕᒋᓐᓂᖕᒋᓄᑦ, ᐅᔭᕋᒃᑕᓇᐊᖅᓂᖅᒧᑦ ᐊᑐᖅᑕᐅᔪᒃᓴᑦ ᐃᒻᒪᖃ ᓐᓈᒪᓯᐊᖅᓐᓂᐊᖅᐸᑕ ᖃᑉᓘᓈᓐᓂᑦ ᑭᓯᐊᓐᓂᒃ ᑎᑭᓴᖅᑕᐅᑕᖅᓗᑎᒃ ᐊᒻᒪᓗ ᑐᖕᓂᕈᑕᐅᔪᑦ ᐃᓄᓐᓄᑦ ᐱᔭᐅᓐᓇᔭᓚᐅᕐᑐᑦ ᐱᖕᒋᓗᒡᒋᑦ. ᓄᓇᕗᑦ ᐱᓪᓕᕆᔨᒃᓴᖕᓂᒃ ᐱᕈᐊᓪᓚᓴᖅᒪᑦ ᐃᓪᓚᓐᓂᑯᑦ ᐊᒻᒪᓗ ᐊᑯᓐᓂᐅᓂᖅᓴᑦ ᐱᓪᓕᕆᔨᑦ ᐃᓯᒪᓗᑎᖕᒋᑦ. ᐱᐊᓪᓚᓴᖅᑐᒻᒥᒃ ᐱᕈᖅᓂᖕᒋᑦ ᑭᕙᓪᓕᖅᒥᐅᑦ ᐱᖅᑯᑎᑕᓇᐊᖃᖅᓃᑦ ᐅᔭᕋᒃᑕᓇᐊᓪᓕᓇᔪᑦ ᐱᖅᑯᔨᔪᑦ ᑯᕙᔪᖃᑐᐃᖕᓇᕿᐊᖃᖅᓕᑦ□ ᑕᒻᒪᐅᖕᒐ ᑭᕙᓪᓕᖅᒥᐅᑦ ᐊᒃᑐᖅᑕᐅᓗᑎᒃ ᐊᒃᓚᓪᓗᓃᑦ ᐱᓪᓕᕆᐊᖕᒍᔪᑦ ᑕᒻᒪᖕᒐᖕᒋᑲᓪᓗᐊᖅᐸᑕ ᐊᓯᐊᖕᓂ ᓄᓇᖅᑯᑦ. ᐅᔭᕋᓐᓃᐊᖅᓂᖅ ᐱᓪᓕᕆᐊᖕᒍᔪᖅ ᐅᒃᑯᐊᖅᓯᒪᓪᓕᕋᓗᐊᖅᐸᑦ ᐊᒻᒪᓗ ᐊᓯᖕᒋᓂᒃ ᓴᕿᑐᖃᖅᓗᓐᓂ ᓄᑕᖕᒍᔪᓐᓂᒃ ᐱᓪᓕᕆᐊᒃᓴᓐᓂᒃ ᐃᖕᓇᖕᒋᐅᑎᓪᓗᑎᒃᓗ ᐱᕕᓐᓂᑐᖃᖅᓂᒃ ᐊᑕᐅᖅ ᐱᔭᒃᓴᖃᓪᓕᖅᑎᑦᓯᓗᓂ ᐱᓪᓕᕆᐊᒃᓴᒃᑲᖕᓂᖅᓂᒃ ᐊᒻᒪᓗ ᓯᓪᓕᖅᔪᐊᖅᒧᑦ ᓂᐅᕕᖅᑕᐅᓗᑎᒃ ᐊᒻᒪᓗ ᐱᓪᓕᕆᐊᒃᓴᖅᑕᖃᓕᖅᒥᓗᓐᓃ ᐊᒃᑐᖅᓯᓐᓂᖅ ᓇᓪᓗᓇᖕᒋᓕᖅᐳᖅ.

ᓄᓈᕐᑯᑎᒡᒋᖏᑦᑕᕗᑦ ᐊᒃᑐᕐᑕᐅᒃᐸᑦ

ᓄᓇᕐᑯᑎᒡᒋᖏᑦᑕᕗᑦ ᐊᒃᑐᕐᑕᐅᒃᐸᑦ ᐱᔪᕐᑲᕋᔾᔪᕐᐸᑦ ᖃᖓᒥᐊᖅ ᓄᓇᒡᒋᔭᐅᔪᒧᑦ ᐊᒃᑐᖅᓯᓗᓂ ᓄᓇᕗᑦ ᓯᓪᓚᑕᓃ ᓄᓇᕗᑦᑕᖅᓯᒪᓂᐸᑕ ᓯᓪᓚᑕᓃ ᐅᒻᒥᐊᔪᑯᑦ ᐅᒃᑐᑎᒡᒋᓗᒡᒍ ᐅᕚᓘᓐᓂᑦ ᓂᔪᑎᑦ ᓴᓐᓂᕙᑎᑕᐅᒃᐸᑕ ᓄᓇᕐᑯᑎᒡᒋᖏᑦᑕᑎᓐᓄᑦ ᐱᔪᑕᐅᓗᑎᒃ ᖃᒻᒪᓂᖅᔫᐸ ᑐᒃᑐᖏᑦ, ᑎᑉᔭᓪᓘᐅᐸᓗ ᐊᒪᓘ ᐊᕼᐃᐊᖅᒥᐅᑦ ᑐᒃᑐᖏᑦ ᐊᒻᒥᕋᕐᑯᑎᖏᑦ ᐱᓱᒃᑐᑦ ᐃᑲᖅᓗᑎᒃ ᐅᖃᒡᒍᔪᑦ ᓄᓇᕐᑯᑎᖏᓄᑦ. ᑕᒪᐃᑎᒡᒍᑦ ᖃᓐᓄᐃᓕᓂᖏᓄᑦ ᐊᖏᔪᒃᐸᑦ ᐱᓪᓕᕆᐊᒃᓴᖅ ᐊᒪᓗ ᐱᑎᖏᑦᑕᕗᑦ ᐊᒃᑐᐃᒃᐸᑕ ᐊᓯᐊᖕᓄᐊᖅᓗᑎᒃᓗ ᐱᑕᖅᖅᑐᒻᒧᑦ ᐊᖏᔫᒥᒃ ᓄᓇᕐᑯᑎᒡᒋᖏᑦᑕᐸᑎᓐᓂᒃ ᐊᒃᑐᐃᓗᓐᓂ.

ᐊᒃᑐᕐᑕᐅᓂᖏᑦ ᐊᕙᑎᐅᑉ ᐱᓪᓕᕆᐊᖑᔪᑎᒡᒍᑦ ᐊᒪᓗ ᐱᓐᓂᖅᓱᒃᑐᖃᖅᐸᑦ ᐊᒪᓗ ᐊᐅᓪᓚᓯᐊᖏᑐᖃᖅᐸᑦ

ᐊᕝᕙᑎᑐᐃᓐᓇᖅ ᐱᑕᖃᐅᖅᒪᑦ ᐊᑐᖅᓯᔪᓇᖅᑐᓐᓂᒃ ᑕᒪᑯᑎᒡᒍᓐᓇᖅ ᐊᒥᓱᑎᒡᒍᑦ ᐱᔪᑕᐅᓇᔭᖅᑐᑎᒡᒍᑦ, ᐱᖃᑕᐅᕐᓘᖏᑦ: ᓯᓪᓚᓴᐅᖏᖅᔪᐊᖅᑐᖅ, ᐊᓄᓇᖅᔪᐊᖅᓈᑦ, ᐊᐅᑎᑲᓪᓘᐊᖅᓈᑦ, ᐱᖅᓯᖅᔪᐊᖅᑳᑦ, ᑕᒃᓯᖅᓈᑦ, ᓯᓪᒪᐅᑉ ᐊᓯᐊᖑᐊᓪᐆᓐᓂᖏᑦ, ᐱᕝᔪᑉᓗ ᐊᐅᑎᐊᓪᓚᓐᓂᖏᑦ, ᓯᓪᓚᒥᖓᑦᑐᑦ ᖃᖕᓄᐃᓪᓕᐅᖅᓂᖏᑦ, ᓂᖅᔪᑎᑦ ᑎᑭᐅᑎᑕᖅᓂᖏᑦ, ᐊᒪᓗ ᓄᓇᐅ ᐃᒃᑯᐊᓪᓚᓐᓂᖏᑦ. ᖃᓐᓄᐃᓪᓕᐅᓂᖏᑦ ᐊᒃᑐᖅᑕᐅᓂᖏᑦ. ᐊᖏᓕᓗᐊᖅᐸᑦ ᐅᓪᓗᓇᐊᖕᓇᖅᑐᖅ ᐱᓪᓕᕆᔨᓐᓄᑦ ᐊᓐᓂᖅᑕᐃᓪᓕᓂᖅᒧᑦ, ᐊᓯᕈᖅᐸᑕ ᐃᓪᓗᓪᓕᐅᖅᑕᐅᔪᑦ; ᓈᒻᒪᖏᓕᖅᐸᑦ ᐃᒻᒪᕆᔭᐅᔪᖅ; ᐊᒪᓗ ᐊᔪᖅᓴᕈᑕᐅᓪᓕᖅᐸᑕ ᐊᒃᔭᖅᑐᑎᑦ ᐊᒪᓗ ᐃᖏᕋᑦᔪᑎᑦ.

ᐱᓐᓂᖅᓱᒃᔪᐊᖅᑐᖃᖅᐸᑦ ᐊᒪᓗ ᐊᐅᓚᓯᐊᖏᑐᖃᓪᓕᖅᐸᑦ, ᐱᖃᐅᑉᓗᒋᑦ ᐱᓐᓂᖅᓱᒃᑎᑕᖏᑦ ᐊᕙᑎᑉᑕ ᐅᓪᓗᓇᐊᖕᓇᖅᑐᑦ, ᓇᓪᓗᓇᐃᔭᖅᑕᐅᔪᑦ ᐊᒪᓗ ᖃᐅᔨᒋᐊᖅᑕᐅᔪᑦ. ᐱᓪᓕᕆᕝᖑᒧᑦ ᐊᑐᖅᑕᐅᔪᑦ ᐊᑉᕐᑯᑎᒡᒋᔭᐅᔪᑦ ᐅᒥᐊᖅᒧᐊᑦ ᐃᖏᕋᑦᔪᑎᑦ, ᐱᓪᓕᕆᔪᑦ ᖃᒻᒪᓂᑐᐊᖅᒥᐅᑦ ᐃᒃᓴᖅᕝᕕᖕᒥ ᐱᓪᓕᕆᕝᖓᓂ, ᐊᐅᓪᓘᕈᕐᑎᑦ ᖃᒻᒪᓂᑐᐊᖅᒥᑦ ᑭᒡᒐᕝᕕᖑᒧᑦ ᐊᑉᕐᑯᑎᑦ, ᓴᒡᒐᖅᓯᒪᔪᑦ ᐅᔭᕋᑦᑕᖅᕕᑦ, ᓄᓴᐅᑉ ᐊᑦᑕᓐᓃ ᐅᔭᕋᑦᑕᖅᕕᒃ ᐊᒪᓗ ᓯᖃᓪᓕᑎᕙᕝᕕᖕᒥ ᐱᓪᓕᕆᕝᑦ.

ᖃᐅᔨᓴᖅᑕᐅᖅᔪᐊᖅᓂᖏᑦ ᐅᒃᑐᖅᓯᒪᓗᒋᑦ ᐃᓱᒪᒋᓗᒋᑦ ᐱᓪᓕᕆᔨᑦ, ᑕᒪᓐᓂ ᓄᓇᓪᓖᑦ, ᐊᕝᕙᑎᑉᑎᓐᓂ, ᐊᒪᓗ ᐊᐅᓪᓚᖅᓂᖏᑦ ᐊᒪᓗ ᐱᖃᑕᐅᑉᓗᒋᑦ ᖅ) ᖃᐅᔨᓴᖅᓗᒋᑦ ᙯᒐᑭᓪᓕᒡᒋᐊᖅᓗᒋᑦ ᐅᓪᓗᓇᐊᓴᕋᔭᖅᑐᑦ ᐱᓐᓂᖅᓱᒃᑎᑦᓯᓇᔭᖅᑐᑦ (ᐊᕿᒃᓯᒪᔪᑦ ᑕᑯᒃᓴᐅᓂᖏᑦ ᐊᓯᕈᖅᓇᖅᑐᑦ, ᐊᐅᓪᓚᑎᓐᓈᑦ ᐱᓪᓕᕆᐊᓐᓂᒃ ᐊᒪᓗ ᐊᑉᕐᑯᑎᒡᒋᔭᖏᑦ ᖃᐅᔨᓴᖅᓗᒋᑦ), 2) ᖃᐅᔨᒡᒋᐊᖅᓗᒋᑦ ᒥᑭᓪᓕᒡᒋᐊᕐᓗᒡᒋᒋᑦ ᖃᖕᓄᐃᓪᓕᕐᑯᓇᒡᒋᑦ ᓴᕿᑐᕐᑲᕋᔭᖅᐸᑦ (ᑐᐊᕝᕕᖅᓇᖅᑐᓐᓂᒃ ᑭᐅᔪᒃᓴᓐᓂᒃ, ᑯᕝᕕᔪᕐᑲᖅᐸᑦ ᐱᒃᑲᓐᓂᖅᕕᒃᓴᓐᓂᒃ, ᐊᐅᓪᓚᓯᔪᒃᓴᓐᓂᒃ ᐊᒪᓗ ᖃᐅᔨᓴᖅᑎᒃᓴᓐᓂᒃ ᐱᓪᓕᕆᔾᔪᒃᓴᓐᓂᒃ); ᐊᒪᓘ 3) ᐅᒃᑐᕋᖅᑐᒍ ᓇᒪᕐᑯᑉᓗᒋᑦ ᐊᐅᓪᓚᓯᓈᑦ ᐱᕝᕚᓪᓕᖅᓈᑦ ᓯᕗᓇᓂᐊᒡᒍᑦ ᐱᓪᓗᕿᓕᖅᐸᑕ ᐱᒡᒋᐊᕈᓇᖅᑐᓐᓂᒃ ᑐᐊᕝᕕᖅᓇᖅᑐᖅᐸᑦ ᑭᐅᔪᒃᓴᑦ ᐸᖅᓇᒃᓯᒪᔪᑦ ᐊᕿᒃᑕᐅᓯᓚᓗᑎᒃ ᐱᓪᓕᕆᐊᑎᓐᓄᑦ.

ᐱᓪᓕᕆᖃᑎᒡᒋᓯᐊᕈᖕᓇᖅᓈᑦ

ᓴᖏᔪᓐᓂᐊᕐᑐᖅ ᐱᓪᓕᕆᐊᖓᑕ ᐊᕿᐅᒪᓐᓂᖓ, ᑲᔪᓯᑎᑕᐅᓐᖓ ᐊᕿᒃᓯᒪᓯᐊᖅᓂᐊᕐᑐᖅ ᖃᐅᔨᓴᖅᑕᐃᓯᒪᓯᐊᕐᑐᑦ ᐊᒪᓗ ᖃᐅᔨᓴᖅᑎᖃᐅᓯᐊᕐᓗᓐᓂ, ᑲᔪᓯᔪᓪᒥᒃ ᑐᓴᐅᒪᖃᑎᒡᒋᑦᓯᖅᓂᐊᑦ ᐊᒪᓘ ᐱᓪᓕᕆᖃᑎᖃᖅᓂᐊᑦ ᓄᓇᓪᓕᐅᔪᓐᓂᒃ ᐊᒪᓗ ᐱᔪᒪᓂᖃᖅᑦᓯᐊᕐᑐᑦ ᐊᐅᓪᓚᑎᑦᓯᐊᓂᖅᒥᒃ ᐊᒪᓘ ᑲᔪᓯᐊᓂᖅᖃᖅᓗᑎᒃ ᐊᕿᒡᒋᐊᖅᓯᓂᖅᒥᒃ ᐊᕿᐅᒪᓯᐊᕐᓗᓐᓂ ᐊᒃᑐᖅᑕᐅᓂᖏᑦ ᐊᖏᑐᒃᑐᒃᓗᑎᒃ ᐊᒪᓘ ᐱᑕᖅᑎᑕᐅᓐᓂᖏᑦ ᐊᖏᔪᑎᑕᐅᓐᓇᐊᑦ ᐱᓪᓕᕆᓂᓗᒃᑕᖏᓐᓂᑦ ᐱᓪᓕᕆᐊᖓᑕ ᑲᔪᓯᓐᓂᓗᒃᑕᖓᓂ ᓇᓗᓇᐃᔭᖅᑕᐅᓗᓂ ᑕᒪᓐᓂ ᐊᕙᑎᓪᓕᕇᑦ,

ᐃᓄᖏᓘ ᐊᒪᓗ· ᐱᓪᓕᕆᐊᖃᖅᑎᑦᓯᓂᖅ. ᑕᐃᑉᓱᒪᓂᐅᓚᐅᕐᑐᖅ ᐸᐸᕐᑦᓚᓐᑦ ᑲᒥᓴᓐᑯᑦ, ᓯᓪᓚᖅᔪᐊᖅᒧᑦ ᑲᒥᓴᓐᑯᑦ ᐊᕝᕙᑎᓪᓕᕆᓂᖅᒧᑦ ᐊᒪᓘ ᐊᕝᕕᒃᑐᖅᓯᒪᓂᖓ ᐊᕿᐅᒪᓯᐊᕐᑐᖅ ᐱᕈᖅᐸᓪᓕᐊᓂᖅᒧᑦ ᐱᖑᖅᐸᓪᓕᐊᑎᑦᓯᓂᖅ ᐱᖑᖅᑎᑦᓯᓂᖅᒥᒃ ᑲᑎᑕᐅᔪᓐᓇᖅᓂᖏᑦ ᐱᔪᒪᔾᔨᑎᒡᒍᑦ ᐅᓪᓗᒥᓯᐅᑎᓐᓂᒃ ᐊᕿᓯᒪᖏᓗᑎᒃ ᐱᒧᒪᓂᕋᖅᑐᓐᓂᒃ ᓯᕗᓂᖅᒧᑦ ᑭᖑᕙᖑᔪᓐᓄᑦ ᐱᔪᒪᔾᔨᖏᓂᒃᑕᐅᖅ ᐱᔪᒪᓂᕋᖅᑕᐅᖏᑐᑦ ᓇᓪᓘᓇᐃᔭᖅᓯᒪᔪᑦ ᐱᓪᓕᕆᐊᒃᓴᖅᔪᐊᖅᓂᒃ ᖃᐅᔨᓴᐃᓐᓂᖅ, ᐊᒃᑯᓐᓂᐅᔪᒥᒃ ᐃᑲᔪᕈᙱᑦ ᑕᐱᑕᖅᑎᑕᐅᓐᓅᑦ ᐱᓪᓕᕆᐊᖃᖅᑎᑕᐅᓐᓅᑦ ᐱᓪᓕᕆᓯᒪᓐᓂᑦ ᐊᒪᓗ ᐃᓪᓕᓯᕙᓪᓕᐊᖕᓅᑦ ᐅᖓᑎᒃᑲᓐᓂᐊᓐᓄᑦ ᐱᓪᓕᕆᐊᖑᔪᑉ ᐅᒻᒪᓐᓂᖓᓄᑦ. ᐱᓪᓕᕆᓪᓂᖏᓄᑦ ᐱᑎᑕᐅᓐᓂᑦ ᐊᐃᑐᕇᑦ ᐃᑲᔪᖅᓂᐊᕐᑐᑦ ᐱᔭᐅᔪᒪᓐᓂᖏᓄᑦ ᑭᖑᕙᖏᓐᓄᓪᓗ ᑭᓯᐊᓐᓃᒃ ᐊᒥᓱᑦ ᐱᑎᑕᐅᓐᓅᑦ ᐊᒪᓗ ᐱᕈᖅᓴᐃᓐᓅᑦ ᑕᒻᒪᒃᑯᐊᑕᐅᖅ ᐃᑲᔪᖅᓂᖃᖅᓂᐊᑦ ᓯᕗᓂᖓᓂᒃᓴᖏᓃ ᑭᖑᕙᖏᓐᓄᑦ ᐱᔪᒪᖏᓄᑦ.

ᓇᓪᓗᓐᓈᐃᖅᓯᓐᓃᑦ ᑕᒪᓂᖅᒥᐅᑕᐅᓂᖅᒥᒃ ᐊᒃᑐᐃᓂᖅᖃᖅᓂᐊᑦ ᐱᕈᑎᑦᓯᓂᖅᒥᒃ ᓴᕿᑎᓇᓐᓂᖅᓂᒃ, ᐱᕈᖅᑎᑦᓯᓐᓃᑦ ᑭᒡᒐᕝᕕᖕᒥ ᐱᓪᓕᕆᓐᓂᖏᓐᓃᑦ ᐊᒃᑐᐃᖏᓂᖅᓂᒃ ᓯᓪᓚᒥᒃ. ᐱᓪᓕᕆᐊᒃᓴᖅᔪᐊᖅᓂᓪᓘ ᐊᒃᑐᖅᓯᓐᓂᖅᓂᒃ ᓇᓪᓗᓇᓪᓚᖏᑐᖅ ᑕᒻᒪᐃᑎᒡᒍᑦ ᓴᕿᐅᒻᒪᓂᖅᑎᒡᒍᑦ ᐊᒪᓘ ᓯᕗᓂᒃᓴᒻᒧᑦ ᐊᒪᓘ ᖃᖑᓇᐃᖏᑦᓯᐊᖅᓂᖅᒧᑦ ᓄᓇᕗᒻᒥᐅᓂᒃ ᒥᐊᓂᖅᓯᓂᖅᒥᒃ ᐊᒪᓗ ᐊᔪᕈᓐᓃᖅᑎᑦᓯᓂᖅᒥᒃ.

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Abbreviations

%HA....Percent Highly Annoyed
°C....Degrees Celsius
°N....Degrees North
AANDC ....Aboriginal Affairs and Northern Development Canada
ACGIH ....American Conference of Governmental Industrial Hygienists
AECB....Atomic Energy Control Board (replaced by CNSC)
AECL ....Atomic Energy of Canada Limited
ALARA....As Low As Reasonably Achievable
ALI ....Annual Limit on Intake
ANFO....Ammonia Nitrate Fuel Oil
APR ....Air-Purifying Respirators
AQG....Air Quality Guideline
ARC ....AREVA Resources Canada Inc.
ARCAL....Aircraft Control of Aerodrome Lighting
asl ....Above Sea Level
ATB....Air Terminal Building
ATV....All Terrain Vehicle
AWG ....Athabasca Working Group
BDL....Below Detection Limit
BEI....Biological Exposure Indices
CAC ....Criteria Air Contaminants
CaO ....Calcium Oxide
CCME ....Canadian Council of Ministers of the Environment
CDN....Canadian
CDOH ....Colorado Department of Health
CED ....Collective Effective Dose
CEMP ....Community Environmental Monitoring Program
CEPA....Canadian Environmental Protection Act

CESCC .... Canadian Endangered Species Conservation Council
CLC..Community Liaison Committee
CLEY .... Department of Culture, Language, Elders and Youth
cm.. Centimeter(s)
cm s-1 .... Centimetres Per Second
CMR... Carcinogens, Mutagens and Reproductive (CMR) Toxins
CNSC... Canadian Nuclear Safety Commission
CO ....Carbon Monoxide
CO2 .... Carbon Dioxide
CO2-eq ....Carbon Dioxide Equivalent
COPC .... Constituents of Potential Concern
COPCs..Contaminants/ constituents of potential concern
COSEWIC...............................Committee on the Status of Endangered Wildlife in Canada defined
CRA ....Commercial, Recreational, and Aboriginal
CSA ....Canadian Standards Association
CVMPP .... Community Vitality Monitoring Partnership Process
CWQG ....Canadian Water Quality Guidelines
CWS .... Canada Wide Standards
DAC .... Derived Air Concentration
dB ....Decibel
dBA .... A-weighted Decibel
DDP ....Detailed Decommissioning Plan
DEIS ....Draft Environmental Impact Statement
DFO .... Fisheries and Oceans Canada
DMS.. Dosimetry Monitoring Strategy
DNL.. Day-night Sound Level
DoE...Department of Environment
DPM .... Diesel Particulate Matter
DR ....Dose Rate

DRD .... Direct Reading Dosimeters

DWT .... Deadweight Tonnage

e.g. .... Example

EA .... Environmental Assessment

EC .... Environment Canada

EEM .... Environmental Effects Monitoring

EIS .... Environmental Impact Statement

ELC .... Ecological Land Classifications

EMS .... Environmental Management System

EPCM .... Engineering, Project and Construction Management

ERAP .... Emergency Response Assistance Plan

ERP .... Emergency Response Plan

FA .... Financial Assurance

FAR .... Fresh Air Raises

Fe .... Iron

FEARO .... Federal Environmental Assessment and Review Office

g/m2/year .... Grams Per Metre Squared Per Year

GDP .... Gross Domestic Product

GHG .... Greenhouse Gas

GN .... Government of Nunavut

H2O2 .... Hydrogen Peroxide

ha .... Hectares

HC .... Health Canada

HCl .... Hydrogen Chloride

HEO .... Heavy Equipment Operators

HEPA .... High-Efficiency Particulate Air

HHRA .... Human Health Risk Assessment

Hi-Vol .... High Volume Air Sampler

HS .... Hydrogen Sulphide

HTO ... Hunter(s) and Trapper(s) Organization
Hz ... Hertz
i.e. ... That Is
IAEA ... International Atomic Energy Agency
IARC ... International Agency for Research on Cancer
IBA ... Important Bird Areas
ICRP ... International Committee on Radiation Protection
IFS ... Initial Feasibility Study
IIBA ... Inuit Impact Benefit Agreement
IOL ... Inuit Owned Lands
IP ... Industrial Package Type
IPC ... Instantaneous Pressure Change
IQ ... Inuit Qaujimajatuqangit
IQMS ... Integrated Quality Management System
ISO ... International Organization for Standardization
ISQG ... Interim Sediment Quality Guidelines
IUCN ... International Union for Conservation of Nature
JCU ... Japan-Canada Uranium Company Limited
Keq/ha/yr ... Kilo Equivalents Per Hectare Per Year
kg ... Kilogram
KI ... Key Indicator
KIA ... Kivalliq Inuit Association
KIs ... Key Indicators
km ... Kilometre
km/h ... Kilometers Per Hour
kPa ... Kilo Pascals
kt ... Kilo Tonnes
L ... Litre
LAA ... Local Assessment Area

lbs ..... Pounds

Leq..... Energy Equivalent Sound Level

LHD..... Load Haul Dump

LLRD..... Long-Lived Radioactive Dust

LNT ..... Linear No Threshold

LSA ..... Low Specific Activity

LSA ..... Local Study Area

m..... Metre

m/s..... Metres Per Second

m2..... Metres Squared

m3..... Metres Cubed

masl ..... Metres Above Sea Level

mg Chl m-2..... Milligrams Chlorophyll Per Metres Squared

ML..... Million Litre

mm..... Millimeters

mm/s ..... Millimetres Per Second

MMER..... Metal Mining and Effluent Regulations

MOE..... Ontario Ministry of the Environment

MOVP ..... Mine Rock Optimization and Validation Program

MPTA..... Multi-Party Training Agreement

MSDS ..... Material Safety Data Sheets

mSv..... Milliseiverts

mSv/y..... Millliseiverts Per Year

Na2(SO4)..... Sodium Sulfate

NAAQOS ..... National Ambient Air Quality Objectives

NaOH..... Sodium Hydroxide

NaSO4 ..... Sodium Sulphate

NAtChem ..... National Atmospheric Chemistry Precipitation Database

NCGIH ..... National Conference of Governmental Industrial Hygienists (former name of ACGIH)

NEW .... Nuclear Energy Worker

NIOSH .... National Institute for Occupational Safety and Health

NIRB .... Nunavut Impact Review Board

NLCA .... Nunavut Land Claim Agreement

NO .... Nitric Oxide

NO2 .... Nitrogen Dioxide

NO3- .... Nitrate

NORM .... Naturally Occurring Radioactive Material

NOx .... Nitrogen Oxides

NPC .... Nunavut Planning Commission

NSA .... Nunavut Settlement Area

NSW .... North South Wales

NTI .... Nunavut Tunngavik Inc.

NU .... Nunavut

NWB .... Nunavut Water Board

NWT .... North West Territories

O2 .... Oxygen

OHSAS .... Occupational Health and Safety Assessment Series

OLD .... Optically Stimulated Luminescent Dosimeters

OMOE .... Ontario Ministry of the Environment

OSHA .... Occupational Safety and Health Administration

PAD .... Personal Alpha Dosimeters

PAE .... Potential Alpha Energy

PAI .... Potential Acid Input

PAPR .... Powered Air-Purifying Respirators

PBP .... Purpose Built Pit

PDP .... Preliminary Decommissioning Plan

PEL .... Probable Effects Level

PIL .... Project Inclusion List

PM	Particulate Matter
PM10	Particulate Matter <10 µm
PM2.5	Particulate Matter <2.5 µm
PMP	Probable Maximum Precipitation
Po-210	Polonium-210
POR	Points of Reception
PPE	Personal Protective Equipment
PPV	Peak Particle Velocity (mm/s)
PSL	Priority Substance List
RAA	regional assessment area
RAR	Return Air Raises
RCOP	Radiation Code of Practice
RLC	Regional Liaison Committee
Rn	Radon
RnP	Radon and Radon Progeny
RP	Radiation Protection
RPM	Revolutions Per Minute
RPP	Radiation Protection Plan
RSA	Regional Study Area
SAG	Semi-autogenous Grinding Mill
SAR	Supplied-Air Respirator
SARA	Species at Risk Act
SCBA	Self-Contained Breathing Apparatus
SI	International System of Units (abbreviated from French: Système international d'unités)
SIAST	Saskatchewan Institute of Applied Science and Technology
SO2	Sulphur Dioxide
SO42-	Sulfate
SOx	Sulphur oxides
SQG	Sediment Quality Guidelines

SSWQO .... Saskatchewan Surface Water Quality Objectives

SV .... Seiverts

TDG .... Transportation of Dangerous Goods

TED... Total Effective Dose

TEU... 20-foot Equivalent Unit

TI .... Transportation Index

TLV .... Threshold Limit Value

TLV-C .... Threshold Limit Value - Ceiling

TLV-CS .... Threshold Limit Value for Chemical Substances

TLV-STEL .... Threshold Limit Value – Short Term Exposure Limit

TLV-TWA .... Threshold Limit Value – Time Weighted Average

TMF .... Tailings Management Facility

TOVP .... Tailings Optimization and Validation Program

TRV... Toxicity Reference Value

TSP... Total Suspended Particulate Matter

TSS.. Total Suspended Solids

U .... Uranium

U/G .... Underground

U3O8 .... Triuranium Octaoxide

UG & UGC .... Urangesellschaft Canada Limited

UNSCEAR .... United Nations Scientific Committee on the Effects of Atomic Radiation

US EPA... United States Environmental Protection Agency

UTM .... Universal Transverse Mercator

VC... Valued Component

VEC .... Valued Environmental Component

VOC .... Volatile Organic Compound

VPSA .... Vacuum Pressure Swing Adsorption

VSEC .... Valued Socio-Economic Component

WHMIS .... Workplace Hazardous Materials Information System

WHO .... World Health Organization

WL .... Working Level

WLM ....Working Level Month

WRAP .... Western Regional Air Partnership

WSCC...Workers' Safety and Compensation Commission

WTP.. Water Treatment Plant

μSv/year...Micro Seiverts Per Year

1 Introduction

1.1 Project Overview

Operated by AREVA Resources Canada Inc. (AREVA), the Kiggavik Project (the ‘Kiggavik Project’ or the ‘Project’) is a proposed uranium ore mining and milling operation located in the Kivalliq region of Nunavut approximately 80 km west of the community of Baker Lake (Figure 1.1-1).

The Kiggavik Project will mine three ore deposits at the Kiggavik site: East Zone, Centre Zone and Main Zone. The Sissons site has two uranium ore deposits to be mined: Andrew Lake and End Grid. The two sites are located approximately 17 km apart. Open pit mining will be used to extract the three Kiggavik deposits as well as the Andrew Lake deposit. Mining of End Grid will require underground mining methods. A purpose-built pit will also be constructed at the Kiggavik site for use as a water reservoir and to provide aggregate materials for construction.

All extracted ore from the mine sites will be processed through a mill located at the Kiggavik site using hydrometallurgical processes. Ore from the mines will allow for an operating life of approximately 14 years with potential resources extending the life. The 14 years encompasses the mining and milling of the ore but not the pre-operational construction or decommissioning. Mined out pits at the Kiggavik site will be used as tailings management facilities (TMFs) with East Zone being the first of the three TMFs to be used. The uranium product will then be packaged and transported using aircraft to southern transportation networks. Mill reagents, fuel and other supplies will be transported by ship and barge to Baker Lake and then by truck to the mine site over a winter access road. An all-season road between Baker Lake and the Kiggavik site is a secondary option under consideration in case the winter road cannot adequately support the Project.

Decommissioning of the Project will include demolition of all infrastructure at the Kiggavik and Sissons sites and reclamation of disturbed areas. Closure of the TMFs will consist of covering and then blending the final cover in with the existing topography. Remaining mine rock piles will be re-graded to promote vegetative growth and to provide wildlife access.

1.2 Project Location and Setting

The Kiggavik Project is located in the Kivalliq region of Nunavut. The closest community to the Project site is Baker Lake, approximately 80 km to the east. Chesterfield Inlet is a further 190 km east and it is located on the Project’s marine transportation route.

The Kiggavik Project is located in the Southern Arctic ecozone. Major lakes in the region include Baker Lake to the east, Pitz and Princess Mary lakes to the south, Aberdeen Lake to the west, and Schultz Lake to the north.

The Thelon River, which enters Baker Lake just west of the community of Baker Lake, is one of the major watercourses in the Kivalliq Region. The Thelon has been a designated Heritage River since 1990 and is used for recreational and tourism purposes. The Kazan River, which flows into Baker Lake from the south, is also a designated Heritage River.

The Thelon Wildlife Sanctuary, located approximately 100 km west of the Kiggavik site, is the largest wildlife refuge in Canada. The Queen Maud Migratory Bird Sanctuary is approximately 200 km to the north of the site, while the Ukkusiksalik National Park is located approximately 300 km to the northeast. No Project activities are proposed in these areas. The location of the Kiggavik site, associated transportation satellite sites, major lakes, Heritage Rivers and wildlife and bird sanctuaries are shown in Figure 1.2-1.

Projection: Canada_Lambert_Conformal_Conic
Creator: CDC Revised: TL
Date: 8/21/2014 Scale: 1:16,000,000
File:
Data Sources: *Natural Resources Canada, Geobase®, Nation Topographic Database, Geological Survey of Canada, AREVA Resources Canada Inc.*

FIGURE 1.2-1
PROJECT LOCATION AND PROXIMITY TO SANTUARIES AND UKKUSIKSALIK NATIONAL PARK

ENVIRONMENTAL IMPACT STATEMENT VOLUME 1

Kiggavik Project

AREVA

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

1.3 Project Purpose and Need

The purpose of the proposed Kiggavik Project is to mine five uranium ore deposits, process the ore to produce uranium concentrate and ship the concentrate for refining and subsequent use in producing nuclear energy. The Project will:

- Realize a return on investment by the owner (economic feasibility);
- Contribute to the vision and goals of Nunavummiut in terms of sustainable development (benefit to Nunavummiut); and
- Help meet global energy demands and future needs for nuclear power (global energy).

1.3.1 Analysis of Project Need and Purpose

In addressing the Project need and purpose, the benefits listed above will be discussed in addition to consideration for possible strategic implications and the past, current and potential future users of the Project area.

Economic Feasibility - The economic feasibility of the Kiggavik Project depends on 1) the production cost for the uranium concentrate including construction, operation and decommissioning costs and 2) the market value of the final product. An Initial Feasibility Study (IFS) for the Kiggavik Project was completed in November 2011. The study assessed the technical and economic viability of developing and operating a uranium mine and mill site in the Kiggavik area and estimated the capital cost of the Project at $2.1 billion and the operating cost at $240 million per year. This initial feasibility study will be updated and refined prior to a development decision. The market price for uranium concentrate over the last years has been within the range needed for a reasonable return on investment to its owners, however at the time of FEIS preparation was below the threshold needed for Project advancement. AREVA believes future opportunities are strong enough to encourage Project advancement with the intent of development that will coincide with viable future markets.

Benefit to Nunavut Communities - The Kiggavik Project will benefit communities through employment opportunities with estimates of up to 750 and 600 positions for construction and operations, respectively. Indirect and induced jobs may be as high as 400 during construction and 1,300 during operations. The Inuit Impact and Benefit Agreement (IIBA) negotiations will define further details on the benefits of employment, business opportunities and procurement will be preferentially targeted to and realized by the seven communities of the Kivalliq Region.

Further details of community benefits including training, business development and procurement, can be found in Volume 9 and additional benefits negotiated in the IIBA with the Kivalliq Inuit Association may be available at the Final Hearing.

Total taxes and royalties to be paid on the Kiggavik Project are estimated at $1 billion. Table 1.3-1 outlines the different entities payable and portion of the total taxes and royalties.

Table 1.3-1 Taxes and Royalties

	Nunavut Tunngavik Inc. (millions)	Government of Nunavut (millions)	Federal Government (millions)	TOTAL (millions)
Corporate Income Taxes	-	$267	$334	$601
Resource Royalties, Crown Land	$16	-	$136	$152
Resource Royalties, Inuit-Owned Land – Subsurface (Mineral) Rights	$248	-	-	$248
TOTAL	**$264**	**$267**	**$470**	**$1,001**

Strategic Implications - Sustainable development of the Kiggavik Project will contribute to the economic development of the north in ways that support self-reliant communities with reduced dependence on government without a compromise to the health of the people or the land. Developing the Kiggavik Project according to the principles of sustainable development will set a high bar for uranium mining performance and serve as a benchmark for other uranium developments in Nunavut.

The Kiggavik Project will not affect or lend to Nunavut's ground transportation networks as any access road built between the community of Baker Lake and the Kiggavik site is outside contemplated Nunavut transportation networks and any access road constructed must be decommissioned at the end of mine life or transitioned to a new owner with proper review and authorizations. Contemplation of federal investment in a deep sea port for Nunavut has led to some initial discussion on the most strategic location. Operating and proposed developments may influence the location of government infrastructure, particularly a port, as interests in economic opportunities for the territory and northern sovereignty compete.

Past, Current and Potential Future Users of Kiggavik Area - Past and current land use around the Project identified through Inuit Qaujimajatuqangit (IQ) interviews, archaeological studies and community engagement noted sites of spiritual significance, grave sites and fishing locations north of the proposed site primarily in the vicinity of Schultz and Qamanaajuk lakes. Camping areas were noted to the west of the Kiggavik Project near Aberdeen Lake as well as other camping areas to the south and southeast of the Kiggavik site. Past and current land uses are further detailed in Volumes 3 (IQ) and 9 (Archaeology) and Appendix 1F (Social and Ecological Context). AREVA commits that the Project site will be available for potential future land uses and further details can be found in the preliminary decommissioning plan (Technical Appendix 2R).

Any other potential future use of Project infrastructure must be approved through an independent environmental assessment and other required authorizations.

Overall Net Benefit of Kiggavik Project to Greenhouse Gas Reduction - From a broader perspective, world uranium production currently falls short of projected future annual requirements for generation of clean electricity using nuclear power (as an alternative to electricity generated by fossil fuel consumption). Uranium from the Kiggavik Project would help to meet the future needs for nuclear power, which will help reduce, on a global scale, greenhouse gas (GHG) emissions.

On a life cycle basis, the GHG emission intensity (that is, the amount of $C0_2$ equivalent released per unit of electricity production) for nuclear energy is about 7% of the emission intensity of natural gas, and only about 3% of the emission intensity of coal-fired electricity production (WNA 2011). The life cycle GHG emission intensity of nuclear power generation is also consistent with renewable energy sources, including biomass, hydroelectric and wind power. Thus, over the Project lifetime, the uranium ore concentrate from the Kiggavik Project will lead to a reduction in GHG emissions of some 1000 to 2000 megatonnes compared to the GHG emissions from producing the same amount of electricity from fossil fuels.

Overall Net Benefit of Kiggavik Project to Sustainable Development in Nunavut - Developing the Kiggavik Project within the framework of sustainable development principles applied by AREVA to all its activities, the Project will support the vision and contribute to the goals of beneficiaries, Nunavummiut and Canadians as outlined in Inuit, territorial and federal policies and strategies. AREVA's sustainable development approach is consistent with the existing framework.

The Nunavut Tunngavik Incorporated (NTI) Mining Policy (NTI 1997) and NTI Policy Concerning Uranium Mining in Nunavut (NTI 2007) state the potential for significant long-term social and economic benefits for the Inuit of Nunavut made possible from mineral development, including uranium development, when advanced with protection of ecosystem integrity and human health. Goals of the Nunavut Planning Commission (NPC) Broad Planning Principles, Policies and Goals included encouragement for sustainable economic development (NPC 2007) and it was recognized within the Keewatin Regional Land Use Plan that "[while the vagaries of international markets tend to make the mining industry volatile, there are few other sources of income on the horizon" and considering that significant growth in the wage employment will depend on mineral development "[t]he NPC therefore encourages further mineral exploration and the growth of a healthy mining industry in the Keewatin."

The *Nunavut Land Claims Agreement* (NLCA) states that the purpose of Inuit-Owned Land (IOL) is to "…promote economic self-sufficiency of Inuit through time, in a manner consistent with Inuit societal and cultural needs and aspirations." (NLCA 17.1.1) and this economic self-sufficiently will be obtained through balanced economic development and selection of IOL that holds value both for renewable resource and the development of non-renewable resources (NLCA 17.1.2, 17.1.3). Approximately 90% of all IOL identified in the NLCA is IOL–Surface in which Inuit Organizations administer rights for the surface only. The remaining IOL is designated to have both surface and subsurface (mineral) rights administered by Inuit Organizations. Two of five deposits assessed for the Kiggavik Project, Andrew Lake and End Grid, are located on IOL-surface and subsurface (mineral).

The guiding document for the Nunavut Government (GN) is Tampata 2009 to 2013. The document describes the vision for Nunavut to the year 2030 and lists an improved standard of living; active, healthy and happy individuals and families; self-reliant communities with strong Inuit societal values and recognition for Nunavut's unique culture. Nunavut's economic (and social) development plans focus on the economic sectors that can provide the most growth and employment, without harming the environment. These sectors are mining, tourism (and arts and crafts) and commercial fishing. The Government of Nunavut Exploration and Mining Strategy: Parnautit – A Foundation for the Future (GN 2007) recognized the importance of mining to Nunavut's economic development with hopeful expectation of four operating mines by 2013.

Canada's Northern Strategy highlights the four objectives of 1) strengthened Canadian sovereignty, 2) environmental protection, 3) economic and social development and 4) Governance. Exploration and the development of mineral resources are included in the strategy to achieve economic and social development. (Indian and Northern Affairs Canada 2008)

Many of the policies and strategies for Nunavut speak to self-reliance and improved quality of life as drivers for balanced economic development that requires both the protection and use of renewable resources with the development of non-renewable resources. Project benefits to Kivalliq communities and all Nunavummiut are outlined in Volume 9 – Socio-Economic Environment.

1.3.2 Alternatives to the Project

The only alternative to proceeding with development is Project abandonment. Abandoning the Project, other than for significant environmental impacts or cultural concerns that are determined to be unacceptable, would be inconsistent with the economic strategies and development policies established for the area. Should the Nunavut Impact Review Board (NIRB) environmental review find the Kiggavik Project is consistent with the protection of ecosystem integrity and human health, the potential economic benefits would not be realized with a decision to abandon the Project. Alternative means to carry out the Project are detailed in Appendix 2A – Alternatives Assessment and within Volume 2.

1.4 Project History

Uranium in the area of the Kiggavik Project was identified during systematic coverage with an airborne radiometric survey in 1974 and drilling in the late 1970s led to the discovery of potentially economic mineralization. The Sissons site was prospected in 1986 using airborne geophysics. Ground gravity surveys and drilling at the resulting anomalies led to the discovery of uranium mineralization at End Grid and Andrew Lake in the late 1980s.

Following a feasibility study, the Project owner at the time, Urangesellschaft Canada Ltd. (UG), proposed a mine development for the Kiggavik Project in 1989. The Federal Environmental Assessment and Review Office (FEARO) set up an Environmental Assessment Review Panel to review the Project Proposal but in July 1990 UG asked FEARO to delay the public hearings for an indefinite period of time. The Project was opposed by a number of organizations and a plebiscite in Baker Lake showed the majority of the local population also opposed the Project.

In 1993, AREVA (formerly COGEMA Resources Inc.) became the operator of the Kiggavik Project with the acquisition of UG, which is now a wholly owned subsidiary of AREVA. Exploration was carried out between 1993 and 1997 and the focus of community engagement at that time was local employment. A pre-feasibility study completed in 1997 concluded that the deposits were not economic given the market conditions at that time and the Project was put into care and maintenance from 1998 until 2002. Meetings and site visits with Baker Lake elders in 2003 and 2004 were important in advising the company on site clean-up activities and rehabilitation work conducted during those years.

AREVA re-established a number of community and territory contacts in Baker Lake and throughout Nunavut in 2005 with the objective of establishing the company and understanding community concerns, culture and issues related to the potential acceptability of uranium development. Community engagement continued in 2006 with a new AREVA office opening in Baker Lake.

A preliminary re-assessment of the viability of the Kiggavik Project was conducted in 2006. Drilling and fieldwork activities were reinitiated in summer 2007 and an updated pre-feasibility study was presented to the Joint Venture partners later that year. Following completion of the study, AREVA and the Project joint venture partners elected to initiate a Feasibility Study and the formal environmental review process.

Applications for authorization and a Project Proposal were submitted in November 2008 to formally initiate the environmental review process. The Project proposal subsequently passed a conformity determination with the Keewatin Regional Land Use Plan by the NPC on January 19, 2009 and a screening determination was forwarded from the NIRB to the Minister of Aboriginal Affairs and Northern Development Canada (AANDC) on March 13, 2009. The Minister determined on February 23, 2010 that an Article 12 Part 5 NIRB-led review would be carried out. The NIRB released the final guidelines for the preparation of the Kiggavik Environmental Impact Statement on May 3, 2011.

A draft environmental impact statement was submitted by AREVA on December 21, 2011, was reviewed by the NIRB, and found not to conform to the guidelines for the preparation of the EIS. AREVA subsequently provided an addendum to the EIS in April 2012. The NIRB accepted AREVA's submission and commenced the technical review process on May 4, 2012 with a call for information requests. Information requests were received by AREVA on July 13, 2012 and AREVA provided written responses January 31, 2013. AREVA subsequently received technical comments on the draft EIS on April 8, 2013 and provided written responses on May 8, 2013. Technical meetings were held in Rankin Inlet May 28 to 31, 2013 and were followed by a community roundtable in the community of Baker Lake and pre-hearing conference on June 4 to 6, 2013. The NIRB provided the Preliminary Hearing Conference Decision on July 5, 2013. AREVA committed to submitting the final environmental impact statement by September 30, 2014.

1.5 Project Ownership

The Kiggavik Project is owned by: AREVA Resources Canada Inc. and Urangesellschaft Canada Limited (collectively "AREVA"); Japan-Canada Uranium Company Limited ("JCU") and; Daewoo International Corporation ("Daewoo"). AREVA is the operator of this Project. The participating interests of the parties are as follows:

AREVA	64.8% (UGC - 41.3%; AREVA - 23.5%)
JCU	33.5%
Daewoo	1.7%

Project funding is provided by the owners in proportion to their ownership shares.

1.6 The Proponent

AREVA Resources Canada Inc. is the proponent for this Project. AREVA is a Canadian company, headquartered in Saskatoon, Saskatchewan. The company is a 100% subsidiary of the AREVA Group of companies headquartered in Paris, France. The AREVA Group is a world leader in supplying electrical energy systems with low CO2 production through its longstanding supply of nuclear energy systems and services and increasingly, through the supply of renewable energy systems for electricity production. The Group has manufacturing facilities in over 40 countries and a sales network in over 100 countries. Approximately 48,000 people are employed by the AREVA Group worldwide.

The AREVA Values Charter (Appendix 1C) expresses the group's commitment that economic performance is inseparable from ethics and that compliance with international treaties is an absolute condition. The public and the planet are considered important stakeholders in addition to customers, shareowners, employees, and suppliers and contractors. The seven core values guiding AREVA activities are customer satisfaction, profitability, responsibility, integrity, acute sense of professionalism, sincerity and partnership.

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1.6.1 AREVA's Approach to Sustainable Development

AREVA is committed to sustainable development. This means integrating economic, environmental and social considerations in the decision-making process across all business units and activities. AREVA follows commitments in 10 key areas spanning all aspects of sustainable development (Appendix 1C).

AREVA's 10 commitments to sustainable development are bounded by 1) economic success that ensures the group's longevity and supports environmental and social initiatives, 2) respect for the environment by limiting our impact and 3) our social responsibility that requires participation in community development and establishing relationships of trust. The commitments of Governance, Innovation and Continuous Improvement support and build all aspects of sustainable development through accurate reporting, developing and managing the most advanced technologies and going beyond adaptive management to capitalize on opportunities to enhance operations and activities.

AREVA's Sustainable Development Commitments (and Values Charter) and demonstrated performance in Saskatchewan fully meet the policy requirements and conditions for uranium mining in Nunavut as outlined in the NTI Uranium Policy, the Mining Policy, the Water Policy, the Reclamation Policy; the GN Nunavut Exploration and Mining Strategy; and the AANDC Northern Strategy. The 40 years of modern uranium mining in Saskatchewan has demonstrated that the economic benefits of uranium mining can be enjoyed without compromising worker safety or environmental integrity. Through the proposed Kiggavik Project approach, AREVA is committed to maintaining and enhancing this balance between environmental, social, and economic performance.

1.6.2 AREVA's Integrated Approach to Environmental Protection

The framework for AREVA's integrated approach to environmental protection is based on continual improvement, incorporating the concepts of both a precautionary principle approach and adaptive management. The AREVA Environment Policy is in Appendix 1C. Continual improvement in facility processes and operational practices are identified based on analyses of performance data. Operational performance is continually monitored to confirm acceptability of the operations, identify additional mitigation measures where needed, and to update predictions of environmental effects based on analysis of operational and environmental data. As well, environmental monitoring and follow-up programs are continually reviewed for improvement opportunities. This integrated approach allows a conservative, or precautionary approach to decision making when uncertainties are higher, as may be the case prior to the start of a new operation.

As time progresses, uncertainties are reduced through demonstration of the physical performance of the facility, its mitigative features, and confirmation or revision of the predictions supporting the environmental assessment and licensing approvals. The focus then shifts from the precautionary approach initially required in the face of uncertainties to the validation of predictions and adaptive management, if necessary. Optimization of performance, and of monitoring, and follow-up programs, is achieved through continual improvement based on experience. If necessary, additional mitigation measures can be implemented from the contingency measures identified at the time of original regulatory approvals.

1.6.3 AREVA Approach to Worker and Public Health and Safety

AREVA is committed to providing a healthy and safe work environment for employees and contractors, and to ensuring that all work is performed in a safe and responsible manner that meets regulatory and company standards. To fulfill this commitment, AREVA has implemented a health and safety management system designed to mitigate risks through occupational health and safety program activities including: hazard identification and risk assessment, workplace inspections and monitoring, safety awareness and training, health evaluation and surveillance, radiation protection, incident investigations, and emergency preparedness and response. Within the safety management system, efficacy of safety programs and performance are evaluated and objectives developed for continual improvement. The safety management system is certified to meet the Occupational Health and Safety Assessment Series (OHSAS) 18001:2007 standard. The standard requires comprehensive evaluation of risks to health and safety and the implementation of appropriate risk mitigation measures; it also requires monitoring of compliance to regulations and other requirements established for occupational health and safety.

As a result of AREVA's commitment to the health and safety of its workers, contractors and the public, AREVA is a leader in health and safety performance in its exploration, mining, milling and decommissioning activities. AREVA has experienced a decreasing trend in incident frequencies over the past decade. Incident frequencies at AREVA and in uranium mining in general, are amongst the lowest industrial incident frequency rates.

Radiation exposure is a hazard associated with uranium mining and processing. Radiation protection programs are in place throughout the exploration, mining, milling and decommissioning phases of a project lifecycle to maintain doses to workers and to the general public as low as reasonably achievable (ALARA), social and economic factors considered. Radiation protection program are designed to meet the regulatory requirements of the Canadian Nuclear Safety Commission (CNSC) and the corporate commitments of AREVA. The radiation protection program monitors the effectiveness of design features and operational practices, and educates workers on radiation safety. Program elements consist of operational practices and procedures employed to monitor workplace radiological levels, worker exposure, and radioactive contamination, to control radiation exposure of workers, the public, and the environment. Worker radiation doses from uranium mining in Canada are well within regulatory dose limits established by the CNSC.

During the design phase of a project, predictions of worker and public exposures to radiation, hazardous materials, and other contaminants of potential concern are conducted in order to design mitigative measures to eliminate or reduce exposures, and to assess potential human health effects. Projects are then developed and operated to ensure that worker and public health is protected.

Hazard identification and risk assessment activities identify circumstances that may lead to incidents or emergency situations. These situations are evaluated and emergency response plans are put into place to address them. Designated emergency response personnel are trained in plans to adequately respond to incidents of potential personal injury, releases of hazardous materials, fire, rescue, and environmental spills. Emergency preparedness and response planning is an integral part of the safety management system which ensure that effects of incidents and emergency situations are minimized.

The success of these programs is evident in McClean Lake Operation's exemplary performance with respect to worker exposure and safety records. The successful policies and programs currently in place at the McClean Lake Operation will be adapted and applied for use at the Kiggavik Project.

1.6.4 Corporate Experience and Operational Record

1.6.4.1 Operational Experience

Exploration, Mining and Milling - AREVA, and its predecessor companies, have been involved in uranium exploration and project development, operation and decommissioning in the Athabasca Basin of northern Saskatchewan for over 40 years. AREVA activities can be broadly grouped into projects where it is the operator, those it does not operate but holds an equity interest, and exploration activities. Projects operated by AREVA include Cluff Lake (decommissioning substantially complete), McClean Lake operation and the proposed Midwest Project. Cluff Lake produced over 60 million pounds of uranium concentrate from four open pit and two underground mines over its project life. Physical decommissioning of the Cluff Lake facilities was largely completed by 2006, with remaining infrastructure to support post-decommissioning monitoring and exploration at a nearby site. The remaining infrastructure was decommissioned in 2013, with on-going post-decommissioning monitoring now performed on a campaign basis during site visits. More than 50 million pounds of uranium concentrate has been produced at McClean Lake to date. Production at McClean Lake is expected to increase and continue with additional ore reserves identified for processing. AREVA also has significant minority interests in the Cigar Lake, McArthur River and Key Lake projects. The company also maintains an active exploration program which has expanded to northern Quebec, Nunavut and Labrador.

Transportation Networks - AREVA has extensive experience with transporting personnel and materials to remote mine sites. The Cluff Lake and McClean Lake sites are both about 800 km from Saskatoon with small company operated airports and all-season gravel roads forming part of the provincial highway network. Personnel are transported to and from camp by chartered aircraft serving pick-up points at small communities in the Athabasca Basin and some larger centers. Materials and suppliers are transported by truck from warehousing facilities in Saskatoon. Experience has also been gained transporting personnel and materials to support Kiggavik Project exploration activities.

Transportation of Radioactive Material - To date, AREVA has shipped over 42000 tonnes of uranium (over 110 million pounds of yellowcake) from its production sites in northern Saskatchewan to refineries in North America and Europe for further processing. These shipments have experienced no major accidents or spills. North American shipments are by sole use truck transport for the drums of yellowcake, while shipments to Europe involve loading the drums into shipping containers at the production site and then using a combination of truck, rail and ocean going cargo vessels to transport the shipping containers to the refinery.

1.6.4.2 Quality Management

AREVA has an extensive Integrated Quality Management System (IQMS). This system is designed to meet three specific objectives: 1) activities are conducted in a safe and efficient manner meeting applicable regulatory requirements; 2) requirements of external standards, specifically ISO 14001:2004 and OHSAS 18001:2007, are met as applicable to its activities; and 3) the corporate commitment to sustainable development is implemented throughout the organization.

The top level document is the Corporate IQMS Manual. It describes the corporate vision and commitment to quality, and provides core policies for health and safety, radiation protection, environmental, social, risk management, human resources, training, social (corporate social responsibility) and economic viability. The Corporate IQMS Manual also describes the company organization, the roles and responsibilities of staff, and outlines the progress which each organizational unit is to put in place to implement the core policies. Supporting the corporate vision outlined in the IQMS manual there are hundreds of procedures, work instructions and forms.

1.6.4.3 Compliance with Government Policies and Regulations

AREVA has consistently complied with federal, provincial and territorial regulatory requirements pertaining to environmental stewardship as well as health and safety matters. AREVA's network of policies, procedures and monitoring programs, regularly reported to the regulators, ensures that environmental impacts and workplace health and safety are well managed. AREVA strives to reduce effects on the environment and use of resources and ensure and promote the health and safety of our employees and neighbouring communities.

Key actions ensuring AREVA's regulatory compliance include, but are not limited, to the following:

- Submission of comprehensive annual reports on operational, environmental and health and safety performance to the federal and provincial regulators;
- Frequent reporting to regulators on safety performance, including incident reporting;
- Routine internal audits of compliance to regulations, licence and permit conditions, best practices and documented program;
- Periodically third party audits of compliance to regulations and expectations;
- Establishment of a working group to monitor regulatory change; and
- Notices of reportable spills sent to regulators when spills occur, immediate clean-up and remediation actions and preventative measures to avoid reoccurrence.

AREVA applies company environmental, health and safety policies that exceed regulatory expectations. Voluntary International Organization for Standardization (ISO) certification demonstrates this commitment to high performance. AREVA ISO certifications include ISO 14001 and OHSAS 18001 for all AREVA's operations and exploration activities, including the Kiggavik Project.

AREVA has consistently complied with and participated in formal provincial and federal regulatory public consultation processes through public hearings.

Engagement, information sharing and company transparency is evidenced in working group participation and reporting, for example participation in the Athabasca Working Group's (AWG) Community Environmental Monitoring Program (CEMP). The CEMP includes training community representatives to collect samples to monitor the air, water, sediment, wildlife and fish. The data collected are analyzed and reported on by a third party consultant selected by the CEMP.

AREVA reports to the public, particularly northern Saskatchewan residents and various provincial ministries. On an annual basis, AREVA reports in its performance in environmental protection, health and safety, as well as northern employees' recruitment and training, preferred northern supplier use, and donations and scholarships awards.

Nunavut - In Nunavut all terms and conditions appended to all land use permits and other exploration approvals have been strictly followed. Spills have been promptly and accurately reported to responsible authorities.

Monthly Wildlife Monitoring and Mitigation reports during the exploration field season are submitted to the GN-Department of Environment (DoE), NTI, Kivalliq Inuit Association (KIA) and Baker Lake Hunter and Trapper Organization (HTO). Annual reports on exploration activities are submitted to the NIRB, Nunavut Water Board (NWB), AANDC and the KIA.

1.6.4.4 Incorporating Environmental and Socioeconomic Considerations

AREVA has a sound record in incorporating environmental and socioeconomic considerations into all phases of uranium project activities. AREVA's approach to environmental protection with a focus on 1) integrated environmental assessment and project design and 2) adaptive management and continual improvement (see section 3) demonstrates AREVA's commitment to incorporating environmental considerations into mine development and operation, respectively. Consideration of decommissioning at the environmental assessment stage allows for long-term environmental concerns to be incorporated and integrated up front when the greatest influences can be made.

AREVA incorporates socioeconomic considerations into all its activities and actions as evidenced in its human resource, health and safety and community involvement performance. Community needs change and AREVA is committed to evolve with communities and use two-way communication to continue defining and growing mutual beneficial relationships.

1.6.4.5 Relations with Aboriginal Peoples and Community Engagement

Saskatchewan - In addition to information sharing initiatives and two-way communication between AREVA and communities, the implementation of ongoing employment, economic and community support programs are central to company engagement initiatives and these programs are in compliance with surface leases and impact management agreements entered into with the province of Saskatchewan and some of the northern Saskatchewan communities, respectively.

Workforce hiring practices ensure that qualified applicants are considered without discrimination to race, skin color, religion, age, gender, sexual orientation, political opinions, nationality or social origin. AREVA develops programs and policies to ensure the population closest to our operations realize project benefits and AREVA strives to employ as many residents from the "priority communities" as possible. In 2010, 46% of McClean Lake site employees were residents of northern Saskatchewan. These residents accounted for $11 million in salaries and benefits.

AREVA has participated in the Human Resources and Skills Development Canada Employment Equity Program since its inception in 1986 and has consistently improved its standing in the annual reporting structure. The 2009 Ministry of Labour report indicated that AREVA is "a leader within the mining sector" with regard to the representation of Aboriginal people, which is higher than the labour market availability estimates.

AREVA is a partner in the joint provincial Saskatchewan government and Saskatchewan uranium mining companies (AREVA and Cameco Corporation) Multi-Party Training Agreement (MPTA) for its northern Saskatchewan operations. As part of the MPTA, in 2010 alone AREVA spent over $493,000 on work placements, apprenticeships and training programs, which is in addition to the training provided to its employees.

Committed to working with northern businesses to provide opportunities for northern procurement through its preferred suppliers program, AREVA purchased close to $21 million in goods and services from northern Saskatchewan businesses in 2010. In 2010, there were an average of 50 contractor employees at the McClean Lake mine site and 65% of them were Aboriginal residents of northern Saskatchewan.

AREVA is committed to participate in the life of the communities in which our employees live and that are closest to our operations and/or offices. In 2010 AREVA's donations totaled $719,000 and scholarships totaled $134,650. Direct northern Saskatchewan scholarships totaled $112,000 accounting for over 83% of AREVA's total support to students.

Since the beginning of its operations AREVA has partnered with educational organizations, particularly trades schools such as the Saskatchewan Institute of Applied Science and Technology (SIAST) and the Saskatchewan Indian Institute of Technology. In 1998 AREVA partnered with Cameco Corporation to fund the Community Vitality Monitoring Partnership Process (CVMPP) that works with the provincial Northern Mines Monitoring Secretariat and the northern Regional Health Authorities and other northern organizations to assess community vitality. A number of projects have been undertaken in consultation with northern stakeholders and studies performed to date focused on youth, social impacts of the mine site 7d in/7d out work rotation system and challenges to post-secondary education for residents of the Athabasca Basin.

Nunavut - Relations with Aboriginal people and community engagement work in Nunavut are detailed extensively in Volume 3 – Public Engagement and Inuit Qaujimajatuqangit.

1.6.4.6 Temporary and Permanent Mine Closure

As is inherent to mining life cycles, temporary and permanent mine closures have required AREVA to lay-off employees over the course of Saskatchewan mining operations. When confronted by this issue, AREVA has notified regulators and advised employees, contractors, local labour related organizations and community representatives (Aboriginal and Métis leadership, municipalities, etc.) well in advance of both temporary and permanent lay-offs.

Employees of the Cluff Lake mine in Saskatchewan were advised of mine closure plans several years in advance as the company was looking to permanent closure and decommissioning work. Unfortunately lay-offs in Saskatchewan has occurred as recently as the second quarter of 2010 when delays in construction of the Cigar lake mine resulted in a shortage of ore at the McClean Lake mill. These employees were advised approximately six months in advance of the impending lay-offs. Company lay-off plans include severance packages, specialized third party tools and assistance to help cope with the lay-off and planning to find other employment if desired. With the restart of operations at McClean Lake in 2014, in accordance with our union collective agreement and company policy, AREVA has recalled former employees for hiring.

AREVA has worked with other mining companies and human resources associations to connect recently laid-off employees with potential employers and communicate the type of skills offered in order to facilitate and encourage re-hiring within the industry. Whenever possible with temporary lay-offs, AREVA has helped employees remain within the AREVA group by seconding them to sister-companies in other regions and sometimes provided assistance to further education and develop new skills during the temporary lay-off period.

Environmental commitments remain unchanged regardless of planned or premature closures, temporary or permanent.

1.6.4.7 Northern Experience

AREVA's Cluff Lake and McClean Lake sites are at a latitude of approximately 58°N. AREVA's direct Arctic experience comes from its exploration and site characterization activities at the Kiggavik Project. To supplement this exposure, AREVA has looked closely at winter road transportation in the NWT and has visited operating mines in both the NWT and Nunavut in order to capitalize on any lessons learned. Literature related to both the Polaris and Nanisivik mines has also been considered.

1.7 Land Tenure

The Kiggavik and Sissons sites are composed of 37 leases covering 45,638.5 acres located within the Kivalliq Region of Nunavut. Since submission of the Kiggavik DEIS, a surface land exchange between the Government of Canada and the Kivalliq Inuit Association was finalized. Land Parcel RE-32 was obtained by the Government of Canada to facilitate the creation of Ukkusiksalik National Park and Land Parcels RE-EX32 and RE-RE32 were obtained by the Kivalliq Inuit Association based on the potential development of non-renewable resources. Land Parcel RE-EX32 coincides with the proposed Kiggavik Project. At the writing of the FEIS, Thirty one of the 37 leases have surface rights administered by the Kivalliq Inuit Association with the remaining six held by the Crown with surface rights administered by AANDC.

In addition to the mining leases described above, AREVA holds 18 claims covering 41,222.26 acres referred to as the St. Tropez exploration site. All 18 claims were recorded on September 15, 2005 with an expiry of September 1, 2015 and these claims are eligible for conversion to lease in September 2015. The proposed development outlined in the environmental assessment is located on Kiggavik and Sissons leases. The only activities on the St. Tropez claims are related to exploration.

1.8 Regulatory Context

NTI and the Government of Canada signed the *Nunavut Comprehensive Land Claim Agreement* (NLCA) in 1993. The agreement included the establishment of five Institutions of Public Government and is the prominent legislation directing the regulatory process in Nunavut. Additional federal and territorial legislation and federal, territorial and Inuit guidelines also apply to the proposed Kiggavik Project.

The Kiggavik Project has regulatory obligations to numerous departments within federal and territorial governments, Inuit Organizations and Inuit Institutions of Public Government. To proceed, the Kiggavik Project must be consistent with any applicable uranium policies and land use plans, successfully obtain a NIRB project certificate with a successful environmental assessment and, finally, obtain required permits and licences.

1.8.1 Conformance with Applicable Policies and Land Use Plans

Since the NLCA, a number of policy developments have provided clarity and direction for the development of uranium in Nunavut. The Nunavut Territory has given special consideration and planning to uranium development as evidenced in the consideration of uranium development in the broad principles, objectives and conditions for uranium exploration and mining outlined in the NTI Uranium Policy (NTI 2007) and the six guiding principles for uranium developed by the Government of Nunavut. AREVA's values and sustainable development commitments (Appendix 1C) along with existing Canadian law and international agreements ensure consistency between the NTI uranium policy and GN guiding principles and the proposed Kiggavik Project. AREVA is committed to sustainable development that does not compromise the land or people of Nunavut.

Pursuant to Article 11 of the NLCA, all applications for project proposals must be forwarded to and reviewed by the NPC for conformity with any applicable land use plan. The Kiggavik Project received a positive conformity determination against the Keewatin Regional Land Use Plan and NPC forwarded the project proposal and their conformity determination to the NIRB on January 16, 2009.

1.8.2 Environmental Assessment

Pursuant to Article 12 of the NLCA, the NIRB then screened the Project proposal and forwarded a recommendation for a review to the Minister of AANDC on March 13, 2009. The Minister issued a decision for a NLCA Article 12 Part 5 NIRB-led review on February 23, 2010. After commenting opportunities the final scope of the Project for review was released by the NIRB on February 9, 2011 and the final guidelines for the preparation of the Kiggavik Draft EIS were issued on May 3, 2011. A draft environmental impact statement submitted by AREVA on December 21, 2011, as addended in April 2012, was accepted by the NIRB and commenced the technical review process on May 4, 2012. Technical meetings were held in Rankin Inlet followed by a community roundtable in the community of Baker Lake and pre-hearing conference between May 28 and June 6, 2013. The NIRB provided the Preliminary Hearing Conference Decision on July 5, 2013.

1.8.3 Permits, Licences and Authorizations Required to Undertake Proposal

Following a positive environmental assessment decision, AREVA will require a number of major permits, licences and authorizations from a variety of Inuit and Land Claim Organizations, Federal government departments, and the territorial government prior to commencement of construction. None of the approvals can be issued prior to a NIRB project certificate. The major authorizations are summarized in Table 1.8-1.

Table 1.8-1 Licensing Process – Summary of Major Authorizations

Permit/License	Agency/Legislation	Activity
Project Certificate	Nunavut Impact Review Board	Required to Proceed with Project Development
Licence to Prepare Site and Construct and Operate	Canadian Nuclear Safety Commission	Required to Proceed with Project Development
Inuit Impact and Benefit Agreement, Water and Wildlife Compensation	Kivalliq Inuit Association	Required to Proceed with Project Development
Type A Water Licence	Nunavut Water Board	Water use and waste disposal; discharge limits to the receiving environment
Class A Land Use Permit and Surface Lease	Indian and Northern Affairs Canada	Development of mine and roads on Crown Land
Land Use Licence and Surface Lease	Kivalliq Inuit Association	Development of mine and roads on Inuit Owned Land
Fisheries Authorization	Department of Fisheries and Oceans	Any development that may result in a harmful alteration, disruption or destruction of fish habitat
Navigable Water Permit	Transport Canada	Required if parts of the development interfere with navigation i.e. bridges or culverts

Other licences and permits, such as archaeology, quarry and explosives, will also be required for the Project.

1.9 Document Concordance and Organization

Concordance - The Kiggavik Draft EIS and supporting documents, as addended, were found to fulfill the requirements as outlined in the “Guidelines for the Preparation of an Environmental Impact Statement for AREVA Resources Canada Inc.’s Kiggavik Project (NIRB 2011 File No. 09MN003) as well as the intent of the guidelines - to identify all likely significant environmental effects. The Final EIS has been developed to fulfill commitments made by AREVA during the pre-hearing conference and to meet the requirements of the NIRB as described in the “Preliminary Hearing Conference Decision” issued July 5, 2013. To facilitate review of the EIS, a table is included as Appendix 1A to demonstrate conformity of the EIS with the expectations described in project guidelines, commitments and requirements.

Tier 1 Organization and Content

This document is organized to provide an overview of the entire assessment with a focus on the company, the proposed Project and the assessment of potentially significant environmental and socioeconomic effects. It also includes a discussion of AREVA's approach to environmental protection and an overview of the methods used to conduct the Kiggavik environmental assessment. Highlights of efforts to engage communities and efforts to integrate both engagement information and Inuit Qaujimajatuqangit into the Kiggavik Project design and environmental review are summarized.

The sections are as follows:

- **Section 1**: Provides a general introduction to the proposed Kiggavik Project, a description of AREVA including the company's business approach and experience and finally the regulatory context.
- **Section 2**: Provides an overview of the proposed Kiggavik Project.
- **Section 3**: Describes AREVA's approach to environmental management and mitigation.
- **Section 4**: Describes the framework for how the assessment of potential effects from the Project were assessed in Volumes 4 to 9.
- **Section 5**: Summarizes major findings and influences of community engagement in the EIS.
- **Section 6**: Summarizes major findings and influences of Inuit Quajimajatuqangit in the EIS.
- **Section 7**: Provides a description of the existing environment to use as the baseline to assess potential changes to the environment.
- **Section 8**: Addresses Project-environment interactions with the potential to result in a significant ecosystemic or socio-economic effect and/or interactions identified through engagement as being of particular concern. Significance of each effect is determined and potential cumulative and transboundary effects are addressed.
- **Section 9**: Summarizes potential effects of the environment on the Project.
- **Section 10**: Presents an analysis of potential accidents and malfunctions.
- **Section 11**: In light of the significance determinations, acknowledgement of accidents and malfunctions and the framework of monitoring and management in place, the sustainability of the proposed Project is discussed.

2 Project Description

2.1 Project Scope, Location and Configuration

The Kiggavik Project includes three sites (Figure 2.1-1): the Kiggavik mine and mill site (Kiggavik site; Figure 2.1-2), the Sissons mine site (Sissons site; Figure 2.1-3), and the Baker Lake dock site (Figure 2.6-2). The Project also includes the roads connecting these sites and associated marine, ground, and air transportation activities. Table 2.1-1 lists the key infrastructure proposed for each site.

Table 2.1-1 Key Infrastructure at Kiggavik, Sissons and Baker Lake Dock Site

Site	Key Components
Kiggavik site	• Open pit mines • Mine rock stockpiles • Ore stockpile • Purpose-built pit • Mill and acid plant • Tailings management facilities • Water treatment plant • Powerhouse • Waste management facilities • Explosives storage • Accommodations complex • Pointer Lake airstrip • Fuel tank farm
Sissons site	• Open pit mine • Underground mine • Mine rock stockpiles • Ore stockpile • Water treatment plant • Powerhouse • Fuel tank farm
Baker Lake	• Wharf • Storage yard • Storage buildings • Fuel tank farm • Explosives storage

2.2 Project Phases and Schedule

Given a positive environmental assessment decision and Project Certificate from the NIRB, subsequent licensing and approvals are anticipated to last two years. Final feasibility and detailed design are required are required to support licensing and inform a development decision for start of construction. Construction would begin with preparation of the Baker Lake dock facility in time for the first shipping season. Construction at the Kiggavik site is expected to begin early the following year in concert with the winter haul season. Construction is expected to last three to four years. The minimum Project life, based on existing reserves, is estimated at 14 years of operation followed by approximately 15 years of combined decommissioning and post-decommissioning activities (Figure 2.2-1). However, it is considered likely that additional reserves will be identified and the Project life extended. Operation of the mill and the associated interactions with the environment have been assessed on the basis of 25 year operational life. The anticipated key Project phases consist of the activities shown in Table 2.2-1.

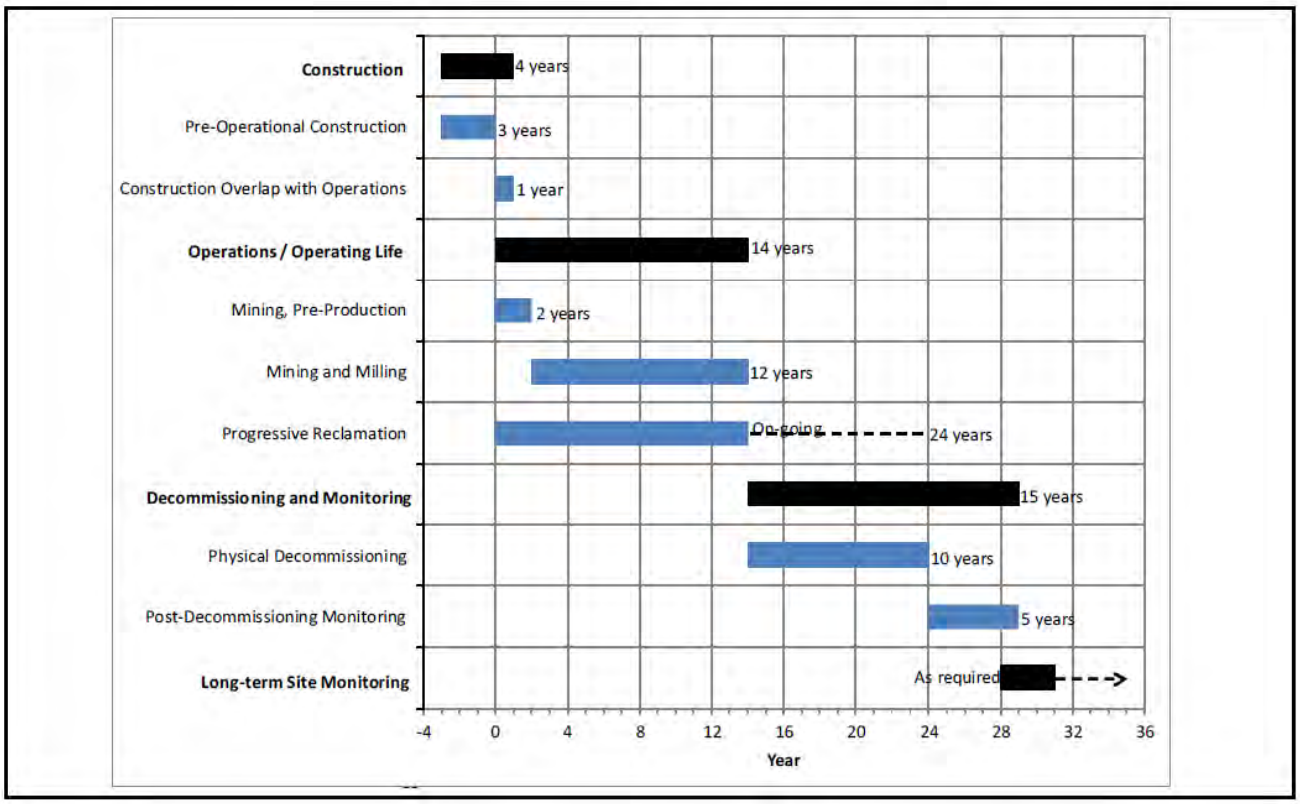

Figure 2.2-1 Anticipated Project Schedule

Table 2.2-1 Key Project Phases

Phase	Activities
Pre-development	• Begins upon issuance of NIRB Project Certificate • Feasibility study and engineering activities • Completion of licensing documentation; issuance of licences and authorizations • Contracting and procurement for long-lead items
Construction	• Preparation of Baker Lake dock site • Shipment of construction materials and operating supplies • Construction of winter road • Construction of Kiggavik site facilities • Construction of surface Sissons facilities • Dewatering of Andrew Lake
Operations	• Mining • Mine rock management • Milling • Tailings management • Water and waste management • Support activities (power generation, logistics) • Progressive reclamation • Develop and obtain regulatory approval for Detailed Decommissioning Plan
Decommissioning and Reclamation	• Demolition and removal of site buildings and other infrastructure • Disposal of Type 3 mine rock and contaminated materials into TMF or pit • Re-establish natural drainage • Reclamation of Type 1 / 2 and overburden permanent stockpiles • Refill Andrew Lake pit and remove dewatering berm from Andrew Lake • Treatment of tailings porewater and closure of TMFs • Re-vegetation of reclaimed areas • Closure of waste management facilities • Contouring and re-vegetation of disturbed areas
Post-decommissioning	• Monitoring and follow-up • Radiological clearance • Transition to long-term campaign monitoring program conducted until site transfer to institutional control

2.3 Geology and Mineral Resources

Kiggavik - The Kiggavik deposits (Main Zone, Centre Zone and East Zone) are located in basement host rocks. The Main and Center Zones are located 600 m apart and the East Zone is located approximately 500 m further to the east of Center Zone. Mineralization within the Kiggavik area deposits occurs between ground surface and approximately 350 m below ground surface.

Andrew Lake - The Andrew Lake deposit is located in metasediments. These formations have been strongly metamorphosed and altered, tectonized, and intruded. Three main mineralized lenses have been identified at the Andrew Lake deposit. Mineralization within the Andrew Lake area occurs between approximately 70 m and 300 m below ground surface.

End Grid - Two main mineralized pods (North Pod and South Pod) have been identified at the End Grid deposit. These are located in strongly altered metasediment that are tectonized, with steeply dipping tension faults and hydraulic breccias. Mineralization at the End Grid deposit occurs between approximately 75m and 475 m below ground surface.

Resources - Using a 1,000 ppm U cut-off for the open pit mines, and a 2,000 ppm U cut-off for the End Grid underground mine, mineral resources are estimated at approximately 133 million pounds U_3O_8 (51,000 tonnes uranium) at an average grade of 0.462% uranium.

2.4 Alternative Means of Carrying Out the Project

The following items have been considered in the Project design and selection of viable options:

- The sensitivity of the tundra environment, including permafrost, wind, extreme temperatures, wildlife, and the extended ice covered season;
- Potential effects, both negative and positive, on socio-economics and communities;
- Project economics;
- Operational flexibility;
- Potential for long term liabilities / ease of decommissioning;
- Comments, suggestions and concerns from communities and regulators; and
- Uncertainty and risk, including climate change.

Comments, concerns, and input from the public have been gathered by AREVA since 2006. This information has been used to optimize Project design, incorporate community input into alternatives assessment, and focus the assessment of effects on issues of concern to regulators and communities.

Technical Appendix 2A – Alternatives Assessment describes Project alternatives, selection of preferred options, and identification of options carried forward for full assessment and approval consideration.

2.5 Construction Infrastructure and Activities

A number of construction challenges and key parameters have been considered in the planning of the construction phase. These parameters include:

- Remoteness of the site;
- Long and potentially complex supply chain; including ocean going vessels, barges, winter road, air transport;
- Seasonal supply windows; including a short open water season;
- Harsh environmental stresses; including poor visibility conditions, high winds and cold temperatures;
- Measures to protect permafrost and sensitive landforms during construction;
- Measures to protect wildlife during construction;
- Specialty capacity; including snow drifting and construction in permafrost;
- Material availability; and
- Amount and skill of the available labour force at the time of construction.

Key construction activities include:

- Site grading and excavation work for the site, stockpile and pond pads;
- Grading and excavation work for the freshwater diversion channels;
- Road and airstrip construction;
- Aggregate sourcing and crushing;
- Foundation installation;
- Building erection for the mill, acid plant, powerhouse, mine shops, accommodation complex;
- Tank farm construction;
- Temporary construction power generation;
- Installation of pipelines and power distribution lines to Judge Sissons Lake, Siamese Lake, and Mushroom Lake;
- Purpose built pit;
- Equipment installation and commissioning; and
- Transportation of fuel and construction supplies.

Temporary infrastructure on-site during the construction phase will include a temporary water treatment plant, skid-mounted diesel generators, construction camp trailers, construction offices, batch plant, crusher, and an ice airstrip on Pointer Lake.

Primary construction of the Project is expected to be carried out over a three to four year period. Additional construction activities at the Sissons site will be on-going after operations begin at Kiggavik.

2.5.1 Foundations and Pads

Common engineering practice for work in permafrost environments is to found heavily loaded and sensitive mine site building foundations on competent bedrock, and to found at-grade structures on engineered granular backfill.

Relatively good quality bedrock exists close to the ground surface in the area chosen for the mill building. Overburden soils and weathered bedrock will be excavated with footings constructed on the surface of the competent bedrock. The excavation will be backfilled around the footings with engineered structural fill that will support floor slabs. Outside of the main mill site, the structures will likely be located on variable foundation conditions – on bedrock, thin overburden, or thick ice-rich overburden soils underlain by bedrock. Therefore, the design of these foundations will be highly location and structure specific.

Pads surrounding the various facilities at the mine site will be constructed using blast rock in a similar manner to the approach used in the construction of access and haul roads. The minimum thickness of the pad will be about 1.7 m in order to provide thermal protection to the underlying permafrost overburden soils and rock.

2.5.2 Aggregate Sources

Aggregate sources will be required for rock embankment, road surfacing, pads and fill materials. These materials will be produced from Type 1 mine rock from the purpose built-pit and from quarried rock obtained from suitable sources in the vicinity of the mine site and the access roads. These materials will be crushed and processed to produce select fill as required. Later in the Project, materials for the Kiggavik-Sissons access road will also be derived from Type 1 mine rock (i.e. non acid generating rock with no potential for metal leaching) from open pit mine operations.

2.5.3 Site Dewatering

Most Project infrastructure will be located on relatively dry ground. Freshwater diversion channels will be constructed as early in the schedule as possible in order to redirect runoff and maintain dry construction conditions. The diversion channels are designed to ensure fish passage. Best practices during construction will be used to prevent sediment transport and permafrost degradation (Technical Appendix 5O).

Construction of a dewatering structure is required at the Sissons site in order to access the southwest portion of the Andrew Lake deposit. The dewatering structure will extend through shallow water expected to be less than 1 m deep. Aquatic studies have indicated that small fish frequent the lake so the dyked area will be fished-out prior to dewatering. The fish-out will be done in consultation with the local communities and regulators. Approximately 135,000 m^2 of lake area, or approximately 30,000 m^3 of volume, will need to be dewatered to provide adequate buffer between the pit edge and the dewatering structure.

2.6 Operating Infrastructure and Activities

2.6.1 Mining Activities

The three Kiggavik deposits (East Zone, Centre Zone, and Main Zone) and the Andrew Lake deposit are proposed open pit mines while underground mining methods are proposed for the End Grid deposit.

The mining plan has been integrated with the tailings management strategy to ensure that there is sufficient mined-out pit volume available for tailings storage. The Kiggavik open pits will be sequentially converted into Tailings Management Facilities (TMFs). Mining and stockpiling at Kiggavik would begin as early as possible in the Project schedule. Mill start-up would be delayed until the first tailings management facility (prepared mined out pit) is available.

Ore mined from the Andrew Lake and End Grid deposits will be hauled to the Kiggavik mill for processing. Ore will be hauled using dedicated trailers that can be transported using standard tractors, or mine trucks. Ore pads at Kiggavik and Sissons will be constructed to high standard specifications, including installation of a synthetic membrane, berms, and ditches for drainage control and water management.

Dust generation from the mines, ore pads and site roads will be monitored. Proposed dust suppression consists of water spray; however, approved chemical dust suppressants may be applied if dusting is higher than anticipated. Operational practices, such as minimizing the amount of vehicle traffic in ore zones and ore stockpiles, may also assist in reduction of dust.

A central mine shop will be located at the Kiggavik site. The Sissons maintenance buildings will be for small and light duty functions such as oil changes and small repairs. Major repairs will be completed at the Kiggavik facility. Equipment from Sissons will be driven or transported by heavy-duty low-bed trailer to Kiggavik.

2.6.1.1 Open Pit Mining

The proposed open pits (East Zone, Centre Zone, Main Zone, and Andrew Lake) will be mined using conventional drilling and blasting techniques, with ore and mine rock removal using mechanical excavators and trucks. Rock will be excavated using hydraulic shovels that will load a fleet of haul trucks. The general characteristics of the open pits are shown in Table 2.6-1.

Table 2.6-1 Proposed Open Pit Characteristics

Deposit	Surface Area (ha)	Depth (m)
East Zone	8	100
Centre Zone	15	110
Main Zone	39	235
Andrew Lake	44	275

While mining ore the haul trucks will be weighed and radiometrically scanned using an overhead truck scanner located near the pit entrance. The overhead scanner will be used to assign the truck destination, based on the uranium grade. Ore will be assigned to the ore stockpile while sub-economic mine rock will be assigned to one of the mine rock stockpiles (Section 2.6.2).

2.6.1.2 Underground Mining

Underground mining at End Grid will start with the main part of the deposit, where mineralization is located from 200 m to 420 m below surface. Due to the distribution of rock types and rock mass quality within the proposed underground mining areas a Drift and Fill mining method is proposed. Material from the mining operation will be separated into mine rock and ore. An average ore production rate of 840 tonnes per day is anticipated for the End Grid Mine.

A portal and single ramp driven from surface will provide access to the deposit. This ramp will accommodate all access for personnel, mobile equipment and truck haulage and also acts as one of the fresh air sources for the mine.

Ventilation is a critical factor in any underground mining operation. The ventilation air flow requirements are based on operating diesel engine requirements and ensuring adequate radon dilution. Single pass ventilation will be practised in all ore headings. It is proposed to heat the mine air to maintain an air temperature slightly above freezing to 2º C.

During the development of the decline in permafrost, pressure heads beneath the permafrost will not be reduced; therefore, if prior depressurization is not undertaken, pressure heads will initially be 250 m or more when the mine first penetrates beneath the permafrost. If these pressures are determined to be high, based on stability concerns, or the inflow volumes are considered to be difficult to manage, then a depressurization program will need to be implemented. An effective depressurization system would likely consist of vertical or sub-vertical boreholes drilled from a development excavation. The water would then be pumped to surface for treatment.

2.6.2 Mine Rock Management

The proposed mine rock management plan for the Kiggavik Project has been designed according to the following principles:

- To avoid interaction between mine rock and natural water bodies;
- To maximize the use of mine workings for long-term management of mine rock;
- To maximize the use of mine rock as construction material; and
- To ensure the long-term protection of Kiggavik Project's terrestrial, aquatic and human environment.

Type 1 mine rock, determined by acceptable levels of uranium content, acid-generating potential and metals leaching, will be used for construction. Type 2 mine rock, as determined by acceptable acid rock drainage and metal leaching, will not be utilized for construction but will be permanently stockpiled and managed on surface. Type 3 mine rock (potentially acid generating rock) requires specific management and will be segregated during mining and managed in separate temporary stockpiles with ultimate disposal within a mined out pit.

2.6.2.1 Temporary Stockpiles

At the Kiggavik site, Type 3 mine rock will be segregated and temporarily stockpiled adjacent to the Main Zone pit. Runoff and water percolating through the temporary stockpile will be collected using ditches and a holding pond to enable water recycling for use in the mill and to ensure treatment before release. During decommissioning, Type 3 mine rock from the Kiggavik site will be backfilled into the Main Zone TMF.

The estimated volume (after excavation) of Type 3 mine rock is conservatively estimated to be 0.8 million m^3 at the Kiggavik site, and 1 million m^3 at the Sissons site.

The design concept for the Sissons temporary stockpile is similar to the Kiggavik temporary stockpiles. During operation, Type 3 mine rock from the Andrew Lake pit will be managed in a temporary surface stockpile with drainage collection and treatment. Sissons Type 3 mine rock will be placed at the bottom of the Andrew Lake pit during decommissioning.

2.6.2.2 *Permanent Stockpiles*

Two permanent stockpiles will be constructed with Kiggavik site Type 1/2 mine rock (Figure 2.1-2).). Approximately 29 million m^3 (volume after excavation) of Type 2 mine rock will be generated from the Kiggavik open pits, together with approximately 7 million m^3 (volume after excavation) of Type 1 mine rock, some of which will be used for construction purposes. An additional quantity of Type 1/2 mine rock will be used during closure of the TMFs. Both stockpiles will be surrounded by perimeter ditches designed to collect runoff water from the stockpiles. Berms will be constructed along the outer edge of each ditch and will prevent surface runoff from surrounding undeveloped areas from flowing into the perimeter ditch and mixing with runoff water from the stockpiles.

The stockpiles will be constructed in order to meet appropriate physical stability criteria. Stockpiles will be 30 m to 40 m high and constructed in approximately 10 m lifts with catchments remaining at the completion of each lift.

At Andrew Lake it is proposed to manage the Type 1/2 mine rock in one stockpile. This stockpile is designed similar to the Kiggavik stockpiles. Based on the open pit mine plan, the volume of the Sissons mine rock stockpile is estimated to be approximately 43 million m^3 (volume after excavation), since very little of the excavated Type 1 and Type 2 mine rock will be used for construction purposes, or during decommissioning.

It is proposed to stockpile End Grid Type 2 mine rock from the ramp extraction with the Andrew Lake mine rock (Figure 2.1-3). Some mine rock from End Grid will be stockpiled separately and crushed to be used in mine backfill.

Overburden till will be stockpiled separately from mine rock at each site.. The thin layer of organic topsoil will be separately stripped during construction activities, and stockpiled for later use in reclamation.

2.6.3 Milling Activities

The Kiggavik Project will include the construction, operation and decommissioning of a mill facility in order to extract uranium concentrate from ore. Most modern uranium mills are based on hydrometallurgical processing and are comprised of a series of circuits that separate the uranium from the other materials in the rock and then produce the packaged uranium concentrate commonly referred to as yellowcake. Uranium concentrate is an intermediate product that requires further processing before it is suitable for use as nuclear fuel. Uranium concentrate is the only product that will be produced at the Kiggavik Project.

The milling design approach has been focused upon a number of considerations in order to tailor the process to the site, as both the environment and location of the Kiggavik Project present several unique challenges and opportunities. Primary mill design considerations included: production requirements; water management considerations including fresh water consumption and required effluent treatment; tailings characteristics; reagent use and the associated mill effluent quality, required water treatment, and logistical considerations for transport of reagent quantities; and also radiation protection.

The nominal capacity of the current mill design is 3,190 tonnes of ore at 0.4% U per day, to produce up to 4,000 tonnes of U per year. The key circuits included in the proposed Kiggavik mill are:

- Crushing and grinding where the rock is mixed with water and reduced in size to increase the surface area off the ore particles relative to their mass[1];
- Leaching where the ore is mixed with reagents to dissolve the uranium, along with other metals and elements, from the rock into solution;
- Solid-liquid separation where the particles, which no longer contain uranium, are separated from the solution;
- Extraction and purification where the dissolved uranium is separated from any other metals and elements that were solubilised; and
- Precipitation, drying and packaging of the uranium as a granular uranium concentrate.

In the mill process all the residual rock particles and process solution waste streams will be treated in a Tailings Neutralization circuit. Solution streams will be recycled where possible, with bleed streams treated in Tailings Neutralization.

The mill complex will consist of a central mill building housing the milling process equipment and services with main ancillary buildings joined by arctic corridors. The four key ancillary buildings supporting mill operations will be the acid plant, oxygen plant, hydrogen peroxide storage, and powerhouse. A plan view of the mill and ancillary facilities is shown in Figure 2.1-2.

Each circuit of the mill will be contained using sloped floors to area sumps and pumps and berms. Exterior doorways will also be bermed to provide additional contingency containment.

2.6.4 Tailings Management

The tailings management plan for the Kiggavik Project is designed to avoid interaction between tailings and surface water bodies, maximize the use of mine workings for long-term management of tailings, and ensure the long-term protection of Kiggavik's terrestrial, aquatic and human environments. In-pit disposal of tailings in mined pits is considered the best tailings management option at Kiggavik for minimizing the potential operating and closure impacts to the receiving environment. In-pit disposal will also reduce the footprint of the tailings management facility (TMF), and provide the most secure long-term facility for tailings.

Tailings will be deposited in three open pits at the Kiggavik site. Based on the current mine schedule, tailings will be deposited first into the East Zone Pit, followed by the Centre Zone and Main Zone pits.

Tailings will be neutralized and treated to control uranium, radium-226 and trace metal concentrations, then thickened. The thickened tailings will be deposited subaqueously to prevent freezing, eliminate dusting and enhance radiation protection. Based on thermal modeling analysis and observation of arctic lake temperature profiles, a minimum 5 m deep water cover will be maintained throughout deposition and early consolidation. The Kiggavik TMFs have been designed to rely on consolidation by expulsion to the water cover only. Once significant consolidation is observed, the water cover will be replaced with a mine rock surcharge load to further enhance consolidation and prevent wind and water erosion of the tailings mass. At closure, the residual water resulting from consolidation will be pumped out and treated and a final cover system will be installed for re-vegetation and integration in the local topography.

The performance of the TMFs will not rely on permafrost.

Approximately 11.5 million tonnes of tailings solids are expected to be generated from processing of existing Kiggavik Project ore sources based on the expected mill production schedule. For design purposes the containment volume was conservatively based on an average solids content of 38% (by weight) while the average solids content of the tailings in pit is predicted to increase from 38% to 70%. Under this conservative assumption the containment requirement was estimated at approximately 21 million m^3.

2.6.5 Water Management

The overall objective of the water management strategy is to minimize both the intake of fresh water from lakes and the release of treated effluents to the environment.

For the purpose of water management, contact water is defined as any water or snow that may have been physically or chemically affected by site activities and includes:

- Surface runoff from the mil terrace and mining areas;
- Surface runoff from ore stockpiles;
- Surface runoff from Type 3 mine rock stockpiles;
- Water used in the mill process;
- Water expulsed during tailings consolidation;
- Groundwater inflows into mines; and
- Surface runoff and shallow drainage from clean rock piles.

All contact water will be intercepted, contained, analyzed and treated when required. All water released to the environment will meet the Metal Mining Effluent Regulations and site-specific discharge quality criteria to be defined during the licensing process.

Non-contact water includes runoff originating from areas unaffected by site activities that does not come into contact with mining or milling areas. Non-contact water will be diverted away from site activities to the surrounding surface water system using freshwater diversion channels and snow fences.

Freshwater diversion channels have been designed to isolate clean runoff that drains toward site facilities through interception and re-direction around the core facilities area and ultimately a return to the channels which previously carried the flow.

Snow fences will be installed to limit snow accumulation on site and reduce water runoff from snow melt through site. The snow fences will be located north of site infrastructure to reduce wind speeds from the prevailing winds. The collected snow melt will be diverted during spring runoff.

Freshwater for the Kiggavik site will be drawn from Siamese Lake, located approximately 8 km east of the site. Freshwater for the Sissons site will be drawn from Mushroom Lake, located approximately 2 km to the north.

2.6.5.1 Kiggavik Site Contact Water

Destinations for contact water in the contact water management strategy for the Kiggavik site are as follows:

- Mine water - recycle to mill or direct to water treatment;
- Tails Thickener Overflow - TMF or direct to water treatment;
- TMF Reclaim - water treatment;
- Site drainage - recycle to mill or direct to water treatment;
- Ore stockpile drainage - recycle to mill or direct to water treatment;
- Type 3 mine rock stockpile drainage - recycle to mill or direct to water treatment; and
- Type 1/2 mine rock stockpile drainage - sedimentation ponds, then release to environment.

A purpose built pit will be used to manage spring freshet. This pit is located to reduce pumping distances to the mill, take advantage of gradients and provide contingency containment in case of failure of the primary site containment structures. During normal operation, recyclable water will be diverted to this pit for storage prior to use in the mill. The pit will be about 130 m long from east-to-west, about 160 m wide north-to-south and about 30 m deep.

The Kiggavik Water Treatment Plant (WTP) will treat effluent for dissolved metals, radium and total suspended solids. The treated effluent will be pumped to monitoring ponds that serve as the final treated water quality checkpoint. A composite sample of the water pumped to each monitoring pond is analyzed to confirm effluent quality before discharge. The treated effluent from the Kiggavik WTP will be discharged to Judge Sissons Lake on a year-round basis. The water will be transported via an insulated, single-walled, heat-traced pipeline approximately 12 km in length. The pipeline berm will be constructed such that the pipeline can be easily crossed by wildlife.

2.6.5.2 *Sissons Site Contact Water*

Destinations for contact water in the water management strategy for the Sissons site are depicted as follows:

- Mine water - recycle to technical use or direct to water treatment;
- Technical water - direct to water treatment;
- Site drainage - recycle to technical use or direct to water treatment;
- Ore stockpile drainage - direct to water treatment;
- Type 3 mine rock stockpile drainage - direct to water treatment; and
- Type 1/2 mine rock stockpile drainage - sedimentation ponds, then release to environment.

The Sissons WTP will treat effluent for dissolved metals, radium and total suspended solids. The treated effluent will be pumped to monitoring ponds, which serve as the final treated water quality checkpoint. A composite sample of the water pumped to each monitoring pond is analyzed to confirm effluent quality before discharge.

If additional recycling is desired at the Project, Sissons water may be piped or trucked to Kiggavik and treated in the Kiggavik WTP. If this is done, expansion of the Kiggavik WTP may be required and a water treatment plant at Sissons would not be required.

2.6.6 Transportation and Shipping

The majority of goods required for the Project will be shipped via marine transportation during the open water season. The Marine Shipping Plan has been based on a conservative operating season estimate of 60 days. No ice breaking activity is planned.

Dry cargo and fuel will be off-loaded at a dock facility along the north shore of Baker Lake. Transportation then continues by winter road, and/or all-season road if necessary, to the Kiggavik Site. An airstrip will be constructed at the Kiggavik Site to facilitate transportation of yellowcake and delivery of perishable goods, emergency supplies, and personnel.

The annual estimated quantities of supplies for the Project are summarized in Table 2.6-2. The total diesel fuel requirement will be approximately 55,400 tonnes (peak consumption year) while the dry goods and reagents total approximately 91,000 tonnes (peak consumption year). The largest tonnages will be for diesel fuel, cement (for underground mine backfill), and lime and sulphur (mill reagents). Lime and sulphur requirements are expected to be reduced as a result of on-going testing and refinement of the milling process.

A number of site supplies listed are hazardous goods and these will be shipped in accordance with international, federal, and territorial regulations. Fuel will be shipped in bulk.

Approximately 4,800 tonnes of yellowcake will be shipped by air from Kiggavik to the south annually.

Table 2.6-2 Estimated Annual Supplies

Supplies	Maximum Annual Shipping			TEUs
	Value	Units	Packaging	
Blasting materials	10,000	tonnes	tote bags	556
Cement	15,000	tonnes	tote bags	833
Flocculant	101	tonnes	tote bags	6
Flocculant "B"	3	tonnes	drums	0.1
Lime CaO	33,914	tonnes	tote bags	1,884
SAG Mill Grinding Balls (3" & 4")	300	tonnes	bulk	17
Ball Mill Grinding Balls (2")	400	tonnes	bulk	22
Sulphur	23,451	tonnes	tote bags	1,303
Barium chloride	303	tonnes	tote bags	17
Ferric sulphate	239	tonnes	tote bags	13
NaOH	1,442	tonnes	tote bags	80
Na2(SO4)	632	tonnes	tote bags	35
H2O2 (50%) - U	1,716	tonnes	ISO containers	95
Resins Ambersep 920U - U	1,125	tonnes	tote bags	62
Product drums - U*	256	tonnes	drums	14
RO Chemicals	49	tonnes	Drums	3
Ferrous Sulphate	16	tonnes	Totes	1
Sodium Bisulfide	0.2	tonnes	Totes	0.01
Spare Parts / Consumables	2,000	tonnes	bulk	111
Total Dry Cargo	90,947	tonnes		5,053
Diesel Fuel	55,244	tonnes		

NOTES:
* represents 12,800 drums.
TEU = Twenty-foot container equivalent unit

2.6.6.1 Marine Transport

The preferred marine transport strategy is the strategy currently in use by Agnico-Eagle and the Hamlet of Baker Lake. Given the rate of development of the mineral industry in the north, the desire of communities and governments for infrastructure development and seasonal variations, it is anticipated that the following options may be used in combination within a single shipping season or over the life of the Project.

Primary proposed marine routes for consideration are shown in Figure 2.6-1 and listed below.

- Marine shipment of fuel and dry cargo via ocean going vessels through Hudson Strait to Chesterfield Inlet. The cargo would then be lightered into barges near Chesterfield Inlet and delivered to the dock site at Baker Lake.
- Marine shipment via ocean going tug/barges from southern ports direct to Baker Lake.
- Marine shipment via ocean-going vessels through Hudson Strait and Hudson Bay to Churchill. The cargo would be transhipped from Churchill to Baker Lake via tug and barge. A rail link connecting to major southern railways is also available for shipping fuel and dry cargo to Churchill.

To maximize utilization of existing infrastructure, transfer of goods from ocean-going vessel to barge will be performed at either Churchill or via lightering near Chesterfield Inlet. Therefore, no construction of Project-specific infrastructure is anticipated.

Ocean-going double-hull vessels that are considered for shipment of fuel vary in size from 18,300 deadweight tonnage (DWT) to 30,000 DWT. Ocean-going vessels that are considered for shipment of dry goods vary in size from 660 TEU geared cargo ships to 1,000 TEU container ships. The tug-barge arrangements that are considered vary in size from 5,000 DWT to 7,500 DWT. The Baker Lake dock site will receive barges, offload goods, and store goods prior to transport by road to the Kiggavik site. Since the preferred transportation option includes a winter road only, the current design considers storage of all goods required for one year of operation.

The preferred location of the dock facility is identified as Site #1 in Figure 2.6-2. The dock will consist of a floating barge placed from the shore out to sufficient depth to permit barge-docking. No dredging of the lake bottom is anticipated and the floating dock may be removed during winter.

2.6.6.2 Ground Transport

Access Road - There is currently a winter trail connecting Baker Lake to the Project site; however construction and maintenance of a more substantial access road by AREVA is required. A number of road alternatives have been considered, including all-season and winter road options. Access road options are shown in Figures 2.6-3 and 2.6-4.

The preferred option is a winter road originating from the north shore of Baker Lake. The route is the one identified as the preferred during community consultations. The winter road will be used during all phases of the Project.

The estimated operating period of the winter road based on the winter freezing index values would be about 110 days at Baker Lake compared to 75 days for the Tibitt to Contwoyto Winter Road (TCWR) that is constructed each year from near Yellowknife to Lac de Gras, NWT. A conservative 90-day operating window has been considered for the Kiggavik Project to account for potential climate warming, blizzard conditions, high winds and snow drifting management.

Winter road truck operations will be conducted on a 24 hour-7 day/week basis. Trucks will travel in pairs or groups of three to provide a heated back-up in case of engine failure. Total truck-trips per season will range between 2500 and 3300, depending on the truck and trailer configuration. Trips include 850 to 1,200 tanker-truck loads of fuel and 1,350 to 2,100 truck-loads of dry goods.

An all-season road option is included in this EIS in the unlikely event that a winter road cannot adequately support the Project through to decommissioning and closure. The all-season road would start on the north shore of Baker Lake and would include a cable ferry across the Thelon River as opposed to a bridge as initially considered in the November 2008 Project Proposal.

The proposed all-season road would be 114 km in length crossing many minor diffuse drainage paths, many of them dry for most of the year. Minor stream crossings would be accommodated using culverts. Streams larger than 2 m in width would be spanned with bridges. There would be 12 bridges proposed along the route all less than 50 m in length. The Thelon River would be crossed in the summer with a cable ferry and an ice bridge in winter. The ferry cable lies on the river bottom after the ferry passes so small craft would be able to pass the crossing area without interference. The road would be built with run-of-quarry rock embankment (fill) sourced from quarries developed along the road. There would be no earth cuts along the alignment and the only cut sections would be through rock, which would serve as quarry material.

The route is generally located on higher ground. Around the Hamlet of Baker Lake, the route generally follows alongside the existing ATV trail north of Baker Lake.

Site Roads - A 19.6 km access road will connect mining operations at Sissons site to the Kiggavik site. The primary vehicles using the road will be ore trailers transported with tractors (highway trucks). Bus, emergency vehicles and pick-ups will also use the road. Occasionally for maintenance or repair purposes, mine haul trucks will also use the road.

The site road will be 10 m wide, built with run-of-quarry and Type 1 mine rock embankment (fill). Twelve water crossings are identified along the road alignment requiring two single-span bridges (less than 50 m in length) with the remainder of water crossings accommodated with culverts and coarse rock fills.

Other site roads required include:

- Kiggavik site to Judge Sissons Lake, along treated effluent pipe alignment. This road also provides airstrip access;
- Sissons site to Judge Sissons Lake, along treated effluent pipe alignment;
- Sissons site to Mushroom Lake; and
- Access from Kiggavik to Siamese Lake is along the final portage along the winter road route.

2.6.6.3 Air Transport

Under normal operation, only personnel, perishable goods, drilling equipment and yellowcake will be transported by air. Air transport may also be used to transport construction or operating supplies if unforeseen difficulties are encountered with the marine-road transportation system.

Airstrip Design and Operation - Pointer Lake is the preferred location for the Kiggavik airstrip Figure 2.6-5. The runway will be 2,000 m in length and 45 m in width.

Transportation of Yellowcake - Yellowcake will be packaged and sealed in 55 gallon (206-L) steel drums. Each drum will hold approximately 430 kg of yellowcake. With a maximum of 35 drums able to load in a sea container, approximately 310 to 355 sea containers of yellowcake drums will be flown to the south annually.

Hercules aircraft will transport yellowcake approximately 800 km from the Kiggavik airstrip to Points North, Saskatchewan. On arrival in Points North, yellowcake will be transferred from aircraft to truck-trailer and then transported to a North American refinery or to the Port of Montreal for shipment to a European destination.

2.6.7 Support Infrastructure

Power Generation - Due to unavailability of electrical power service from a public utility, Project site power will be generated locally using on-site diesel-fueled powerhouses. It is anticipated that all equipment on site will be operated using a common arctic grade diesel eliminating shipping and storage needs for an alternate fuel.

Two power generation systems will be used to generate power at both the Kiggavik and Sissons sites. Depending upon the final selection of generator size, four to six internal combustion diesel engine generators with heat recovery steam generators will be required at the Kiggavik site.

Fuel Storage and Distribution - Diesel fuel tank farms will be located at the Baker Lake, Kiggavik, and Sissons sites. The Kiggavik Project total peak annual fuel consumption is estimated at 65 million L with an average of 49 million L over the production period. The current design conservatively considers seven 10,000,000 L tanks at Baker Lake, six 10ML tanks at Kiggavik and two 10ML tanks at Sissons. Secondary containment at all sites will meet all regulatory requirements.

Accommodation Camp - An accommodation complex will house personnel during operations. The proposed complex will be located predominantly upwind approximately 300 m north of the mill site. The complex will include kitchen and recreational areas and buildings will be connected by an arctic corridor.

2.7 Decommissioning and Reclamation Activities

A Preliminary Decommissioning Plan (PDP)[1] and Financial Assurance (FA) will be required as a condition of approval by regulatory agencies for construction and operation of the Kiggavik Project[2].

Decommissioning involves the removal or stabilization of all constructed structures and the reclamation of disturbed areas such that:

- The environment is safe for non-human biota and human use;
- Long-term adverse effects are minimized;
- The reclaimed landscape is stable and self-sustaining; and
- Restrictions on future land use are minimized.

In particular, any restrictions on future land use should not prevent traditional land use including casual access with trapping, hunting or fishing as the primary site activities. . It is important that decommissioning planning be incorporated from the start of planning and design for mining projects[3] and that financial assurance provides certainty that decommissioning and reclamation work will take place with available and adequate resources.

A PDP has been developed to ensure that decommissioning planning is considered during environmental assessment of the Kiggavik Project (see Tier 3, Technical Appendix 2R). In developing the PDP, AREVA has considered both actual experience from developing and decommissioning its Saskatchewan uranium mining projects, and factors unique to the Kiggavik Project and/or the Arctic environment. The PDP includes sufficient detail to ensure that the proposed decommissioning activities are technically feasible, and appropriate for the protection of health, safety and the environment both in the short term during the performance of the decommissioning work, and in the long term following decommissioning.

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[1] an alternate term is Mine Closure and Reclamation Plan

[2] an existing PDP and FA are in place for the current exploration stage which are outside the scope of this EIS

[3] see Section 3.1 for a description of AREVA's integrated approach to environmental protection

A progressive reclamation approach will be implemented for the Kiggavik Project. Removal or stabilization of structures and reclamation of disturbed areas will commence soon after the associated operations are complete. Examples are reclamation and revegetation of completed borrow pits and quarries, and decommissioning of the initial Tailings Management Facilities (the East and Centre Zone TMFs) as soon as each has been filled with tailings. Progressive reclamation will result in a significant portion of decommissioning work being complete, or substantially advanced, prior to the end of operations.

The schedule for decommissioning beyond the end of project mining/milling operations is based on 10 years of decommissioning activities, followed by 5 years of post-decommissioning monitoring, as shown in Figure 2.2-1.Completion of the majority of physical decommissioning activities in the first few years, followed by revegetation of the disturbed areas, will maximize the time to assess revegetation success. A brief outline of the remaining activities that will control the completion of physical decommissioning at the Kiggavik and Sissons sites is provided in following sections.

The PDP is summarized in Tier 2, Volume 2, Section 13, with additional details provided in Tier 3, Technical Appendix 2R, Preliminary Decommissioning Plan.

2.7.1 Tailings Management Facilities

Decommissioning will be implemented on a progressive basis once tailings deposition is completed at each TMF, so that final consolidation of the tailings can be initiated. For East Zone and Centre Zone TMFs the decommissioning plan is to fully backfill the TMFs above the tailings mass with stockpiled mine rock, install a compacted till cover, and revegetate the area. Decommissioning of the Main Zone TMF will be similar, except that the Type 3 mine rock temporarily stored during mining will be backfilled first, prior to fully backfilling the TMF with other stockpiled mine rock. Since the Main Zone TMF will be in service until the end of milling operations, the time to complete tailings consolidation and install the final cover at this TMF will control the schedule for completion of decommissioning activities at the Kiggavik site.

2.7.2 Andrew Lake Open Pit

The series of sequential activities required to decommission the Andrew Lake open pit will control the schedule for completion of decommissioning activities at the Sissons site. These activities are to backfill the Type 3 mine rock temporarily stored during mining into the mined out pit, place a cover layer of other mine rock, and then refill the pit with water by diverting a substantial fraction of the spring freshet flow through Andrew Lake into the pit, for an estimated six seasons. Following completion of refilling, water quality in the refilled pit will be monitored and, once acceptable water quality has been achieved, the berm isolating Andrew Lake from the refilled pit can be removed.

2.7.3 Water Treatment and Waste Management

Water treatment and discharge of treated effluent will be needed, at least on an intermittent basis, at both sites until contaminated tailings porewater is no longer being generated. At the Kiggavik site, this will be controlled by the need to treat contaminated water until completion of tailings consolidation at the Main Zone TMF. Other waste management facilities will also need to be maintained operational until generation of each type of waste ceases. These facilities can then be closed in accordance with their decommissioning plans.

2.7.4 Post-Decommissioning Monitoring

A monitoring program will be implemented upon completion of the physical decommissioning activities, in order to:

- monitor designated environmental parameters on an ongoing basis to ensure that they conform to licence requirements with respect to environmental protection;
- verify the success of the decommissioning activities;
- demonstrate compliance with regulatory requirements and decommissioning objectives; and,
- quantify any residual environmental effects.

The program will focus on key environmental indicators from the potential contaminant sources through to the atmospheric, terrestrial and aquatic environment.

In addition to the above monitoring program, a Follow-Up Program (FUP) will be implemented to address specific mitigative measures and processes. This will confirm that the specific mitigative measures are adequate and effective in achieving decommissioning objectives.

Radiological clearance surveys will be performed after reclamation of all disturbed areas. These will confirm that the decommissioned site is safe for ongoing traditional land use, including casual access for trapping, hunting and fishing. Equipment and survey protocols for this purpose have been developed and successfully implemented by AREVA during decommissioning of the Cluff Lake Project. These will be adapted for use at the Kiggavik Project, in consultation with local stakeholders and regulatory agencies.

Five years of extensive monitoring after completion of all physical decommissioning activities is considered a reasonable estimate, but the actual period will be as long as required for AREVA to demonstrate satisfactory performance of the decommissioned site.

Transition from the follow-up program and routine environmental monitoring to a long-term monitoring program is expected to be gradual. Site activities will continue to be regulated until AREVA has advanced the site sufficiently to apply for release from the decommissioning, reclamation and transitional-phase monitoring and a transfer of the site back to the landholders. It is anticipated that a regulatory framework for a transfer back to landholders will be established and a transfer will be considered once the area meets conditions required for termination or exemption of any further licences issued by Inuit Organizations or the Government of Canada or any of their agencies or commissions.

2.8 Hazardous Materials and Waste management

During all phases of the Project wastes will be identified, handled and disposed of according to a waste management program that outlines strategies specific to each particular waste. Mine waste material including mine rock, tailings and treated effluent are integral components of the Project design. Waste management facilities will be routinely inspected and scanned for radioactivity to ensure proper disposal and handling of waste. Recycling of wastes will be encouraged wherever feasible and all waste will be managed in accordance with regulatory requirements.

Domestic waste will be sorted into recyclables (paper and cans) and non-recyclables and the recyclables transported off site to a recycling facility. Non-recyclable domestic waste will be incinerated or disposed in landfills located in specified areas of the Kiggavik and Sissons Type 1/2 waste rock piles, respectively. Food and other appropriate wastes will be incinerated. Incinerator ash will be tested for metals and either disposed in a landfill or within the TMFs.

Industrial waste, non-combustible and non-contaminated, will be landfilled in designated areas of the Kiggavik and Sissons Type 1/2 mine rock stockpiles.

Hazardous waste materials will be collected in designated containers and transported for recycling or disposal at an off-site registered facility. A hazardous materials storage building and designated storage pad will be used to store the containers until there is sufficient quantity for shipment. Dedicated waste oil burners will handle waste oil originating from oil changes on the mining equipment and light vehicles.

Contaminated waste materials that originate from mining, milling and water treatment areas, may be chemically or radiologically contaminated. These materials will be collected in designated areas and then transported to a landfill on the brow of a TMF, and eventually disposed in the TMF.

Sewage at both Kiggavik and Sissons sites will be treated in a vendor packaged plant, located on the site terrace. Sewage effluent that does not meet the discharge criteria will be recycled to the front-end of the sewage treatment plant. Treated sewage effluent will be combined with the WTP discharge (after monitoring) and discharged to Judge Sissons Lake. Sewage at the Baker Lake dock and storage facility will be contained in an above-ground tank and hauled as needed to the Baker Lake community sewage lagoon.

Landfarm - In the event of a petroleum hydrocarbon spill, the contaminated soil or ice/snow will be excavated and transported to a landfarm constructed on the Type 1/2 mine rock stockpile at the Kiggavik site. Due to the long winters and extreme temperature at the Kiggavik Project, the remediation process will be slow and likely require an extended period of time. Nutrient addition may be required to sustain microbial growth. Remediated soil will be used for reclamation purposes, with the final inventory of soil and rocks which are not fully remediated disposed in a TMF during decommissioning.

2.9 Socio-Economics and Community

Direct job estimate averages are up to 750 and 500 for construction and operations respectively. Indirect and induced jobs may be as high as 400 during construction and 1,300 during operations.

Workforce Schedule and Mobilization - Construction crews are expected to work a blend of schedules with potentially longer work shifts then expected for operations. The construction schedule is expected to average 4 weeks in and 2 weeks out compared to the expected 7 days in/7 days out or 14 days in/14 days out operations schedule. Most of the workforce from Nunavut and Saskatchewan would be flown by charter from their community to the Kiggavik site. The remainder of the workforce will likely take commercial flights to Baker Lake and then take a charter between Baker Lake and the Kiggavik site.

Workforce Opportunities and Qualifications - During operations the Kiggavik workforce will be organized into the following eight main departments, supported by allocated services from AREVA (AREVA Mining Business Group and AREVA Resources Canada Head Office).

- Surface Mining;
- Underground Mining;
- Mill;
- Safety, Health, Environment, and Quality;
- Human Resources and Training;
- Camp Services and Security;
- Logistics and Materials Management; and
- Corporate Social Responsibility Kivalliq Region.

The Kiggavik Project will be a licensed nuclear facility and as such, requires extensive management, technical trades and operator capabilities. The target qualifications for entry-level trainees/employees are:

- Competency in the English language;
- Grade 12 education or equivalent experience; and
- A commitment to a culture of safety.

Inuit Hiring Preference - Project workers will preferentially be drawn from the Kivalliq Region. It will be necessary for some of the workforce to come from other geographic regions given limitations in recruitment and training. Subject to IIBA negotiations, AREVA anticipates to mobilize, in order of priority, the workforce from the following geographic regions: Kivalliq communities; the rest of Nunavut; Saskatchewan; and the rest of Canada.

All jobs will be open to Inuit, and all other things being equal, qualified Inuit candidates for employment will be given preference. Based on over 30 years' experience working with First Nations and Métis candidates from remote communities in Saskatchewan and being mindful of the expectations of the proposed IIBA, the potential Inuit workforce content is expected to reach 50% after six years of operations.

Workforce Wages and Benefits - Given the Project's remote location, dispersed labour pool, and the wide-ranging skill set required to engineer, construct and operate the Kiggavik Project, competitive/generous compensation and benefits will be appropriate. Conventional benefit programs for comparable operations may require some flexibility and innovation to respond to Inuit needs.

Inuit Business Preference - It is assumed that the IIBA to be negotiated will confirm AREVA's commitment to Inuit preference and capacity growth from the onset of the pre-construction phase, throughout the Project life. Activities that could likely be conducted by contractors during operation include catering, air, marine and land transportation. Steps to Optimize Project Benefits

AREVA's expectations for the Kiggavik Project's workforce and business and procurement outlined above and strategies to optimize benefits listed below are influenced by company experience in Northern Saskatchewan and ongoing feedback from Agnico Eagle's Meadowbank Project. It is expected that the IIBA negotiations will address and set forward expectations for Inuit content in the workforce and with business and procurement as well as other benefits.

Workforce - Inuit will be given opportunities to grow on the job, through mentoring, on-site training, academic and trades training. AREVA anticipates commencing off-site training at Nunavut Institutions and the McClean Lake site up to 18 months prior to production for trade and technical roles and two to four years prior to production for operational trainees. The number of trainees anticipated is expected to reach 120 during the first year of operation.

AREVA is committed to working with governments and other stakeholders towards maximizing Inuit content and accepts that a substantial training commitment is part of its Corporate Social Responsibility. Inuit training will continue throughout the life of the Project as additional needs are identified.

Contracting and Procurement - AREVA's ability to promote Inuit Firms, participation of Inuit in these businesses, and facilitate increased capacity and competitiveness leading to long-term firm viability is based on experience in the Athabasca Basin in Saskatchewan and our growing experience in Nunavut with our exploration activities. Assessment Basis and Potential for Future Exploration and Development

The current environmental assessment applies to:

- Mining of the Kiggavik, Andrew Lake and End Grid deposits;
- Milling, effluent discharge and tailings deposition for a maximum operating life of 25 years, or until the proposed East, Centre and Main Zones TMFs are full; and
- Access and transportation activities associated with marine transport and both winter and all-season road with cable ferry crossing the Thelon River.

Prior to mining any additional deposits, an environmental assessment approval and licensing process would likely be required. Reasonably foreseeable and far future development scenarios are addressed in cumulative effects Sections 4.4 and 8.7 of this volume and Technical Appendix 1E.

3 Environmental Management, Mitigation and Monitoring

3.1 AREVA's Integrated Environmental Protection Approach

The achievement of long-term sustainable development goals requires a framework which is precautionary, adaptable and identifies opportunities to continually improve performance. To ensure long-term environmental performance in support of sustainable development, AREVA has adopted a framework that embraces the principles of environmental assessment as a fundamental sustainable development tool. The framework, which is described below, ensures that the outcomes of the environmental assessment process are implemented, and that the environmental commitments and performance outlined in the environmental assessment are achieved. The framework consists of three main components: environmental assessment, continual improvement and adaptive management. Within the approach, assumptions and decisions are conservative, providing a precautionary approach which reflects the level of information available at the time decisions are made.

Environmental Assessment - The top half of Figure 3.1-1 provides a simplified flow diagram of the integrated design and environmental assessment process. The environmental assessment process is a primary regulatory tool to promote sustainable development through the identification of project environment interactions and their potential to result in an adverse environmental effect(s), to gauge the significance of the effects, and to identify mitigation measures if significant adverse effects are determined to be likely. The process is iterative, incorporating mitigation measures and the re-evaluation of the facility design and the potential effects of the proposed activities.

As outlined in the project description (Volume 2), an iterative evaluation of design alternatives was undertaken in consideration of the site-specific constraints imposed upon activities in the arctic. Key features of the alternatives analysis included environmental performance, economic viability and project operability. Project design considered environmental performance from the perspective of minimizing water and reagent use, optimizing water recycle, minimizing the project footprint, capturing and treating water that may have come in contact with operational areas, minimizing atmospheric and treated effluent emissions, and facilitating future decommissioning. The iterative evaluation process identified and optimized robust processes and infrastructure configurations which, within the context of operational and economic constraints, would minimize the residual environmental effects of the Project.

Mitigation Measures - Mitigation measures identified in this iterative environmental assessment (EA)-design can be identified in a variety of forms. Design-based mitigation can allow for the avoidance of potentially significant effects by changing spatial or temporal aspects of the Project. Specialized mitigation, environmental protection measures and protocols, and offsetting (e.g. fisheries offsetting plan) are all also categories of effective mitigation that minimize or avoid residual environmental effects of the Project. The assessment of effect significance is determined after considering mitigation and this is a major component of assessments found in Volumes 4 to 9.

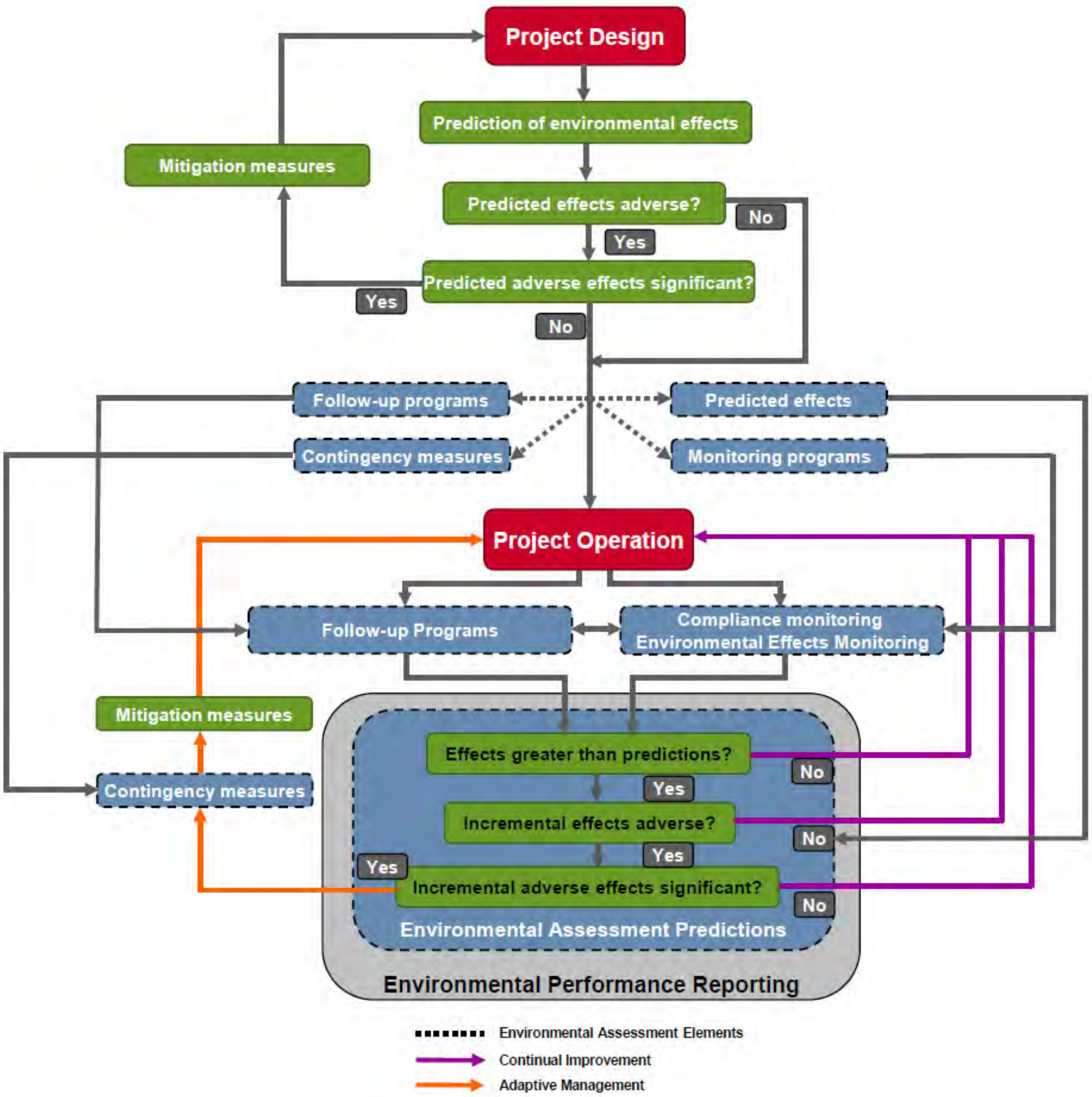

Figure 3.1-1 Environmental Protection and Management Framework

Several key outcomes flow from the environmental assessment process. These elements include:

- an outline of predicted effects of the project;
- the framework for a monitoring program incorporating regulatory compliance regimes and receiving environmental effects monitoring requirements;
- a framework for a follow-up program to verify the effectiveness of mitigation measures and the accuracy of the environmental predictions; and
- possible contingency measures proposed for potential unforeseen effects.

Each of these elements developed during the EA process need to be integrated into the operation of the facility.

Continual Improvement and Adaptive Management through Compliance and Effects Monitoring and Follow-Up Programs - The bottom half of Figure 3.1-1 illustrates how each of the elements developed during the EA process are integrated into the construction and operation of the facility. During facility operation, compliance monitoring maintains operational performance standards. Environmental Effects Monitoring programs, completed in the receiving environment with robust study designs, provide the information necessary to determine operational effects, their geographical extent, and magnitude. The monitoring program incorporates monitoring endpoints that represent key ecosystem features, and as such, effective at identifying unanticipated effects.

These monitoring systems provide the opportunity to examine actual effects and refine model predictions and compare these results to the effects anticipated in the EA. The evaluation is iterative through time, which allows the identification, tracking and comparison of actual effects to the predicted effects anticipated at the time of the EA. The data and tracking of actual effects provides the necessary feedback, impetus, and information to the operation to identify and implement opportunities for continual improvement in systems performance. Results which indicate unforeseen or incremental effects beyond those predicted in the EA provide a basis to determine if a trend would, over time, lead to significant adverse effects. If so, the monitoring information also provides information upon which to develop adaptive management plans, and to facilitate detailed design of alternative mitigation measures or contingency measures to mitigate the significance of the incremental adverse effects.

Follow-up programs are tailored to verify the accuracy of EA predictions and to determine the effectiveness of mitigation practices. The nature of the information generated by the follow-up program relates to refining and verifying the assumptions of the assessment methodology and thereby both validating the predicted effects and reducing uncertainties in predictions made in future EAs. The feedback from the follow-up program in refining and verifying the assumptions of the assessment methodology also provides the basis for continual improvement in both the facility operation and the monitoring and follow-up programs themselves. Unforeseen or incremental effects beyond those predicted, which indicate the future development of significantly adverse effects, provide the information necessary to implement contingency practices to mitigate the development of these effects.

This integrated environmental protection approach which has been adopted by AREVA, features an iterative, systematic process for continual improvement of practices. The approach builds on the outcomes of EA predictions and on operational monitoring and follow-up programs to provide a robust defense against the development of significant adverse effects.

AREVA produces Environmental Performance reports to communicate this iterative assessment and on-going improvements in Saskatchewan. The reports are issued at regular intervals throughout the operational period and a similar approach is expected for the Kiggavik Project in Nunavut.

This integrated approach allows a conservative, or precautionary approach to decision making when uncertainties are higher, as may be the case prior to the start of the operation. As time progresses, uncertainties are reduced through demonstration of the physical performance of the facility, its mitigative features, and confirmation or revision of the predictions supporting the environmental assessment and licensing approvals. The focus then shifts from the precautionary approach initially required in the face of uncertainties to continual improvement and refinement. Optimization of performance, of monitoring, and follow-up programs is achieved through continual improvement based on experience. If necessary, additional mitigation measures can be implemented from amongst the contingency measures identified at the time of original regulatory approvals.

Table 3.1-1 Environmental Management and Monitoring Plans

Plan	Location in DEIS
Ecosystemic Environment	
Explosives Management Plan	Appendix 2C
Ore Storage Management Plan	Appendix 2H
Water Management Plan	Appendix 2I
Roads Management Plan	Appendix 2M
Borrow Pits and Quarry Management Plan	Appendix 2N
Preliminary Decommissioning Plan	Appendix 2R
Waste Management Plan	Appendix 2S
Environmental Management Plan	Appendix 2T
Hazardous Materials Management Plan	Appendix 2U
Air Quality Monitoring Plan	Appendix 4C
Noise Abatement Plan	Appendix 4F
Kiggavik Conceptual Fisheries Offsetting Plan	Appendix 5L
Aquatics Effects Monitoring Plan	Appendix 5M
Wildlife Mitigation and Monitoring Plan	Appendix 6D
Spill Contingency and Landform Management Plan	Appendix 10B
Emergency Response Plan	Appendix 10C
Human Environment	
Occupational Health and Safety plan	Appendix 2P
Radiation Protection Plan	Appendix 2Q
Community Involvement Plan	Appendix 3C
Human Resources Development Plan	Appendix 9C
Archaeological Resource Management Plan	Appendix 9D

3.2 Environmental Management System Framework

The Kiggavik Project's Environmental Management System (EMS) is designed to meet the requirements of certification to the ISO 14001 standard for EMS. The EMS currently in place for exploration activities meets this standard and will be updated to reflect the needs of each future Project phase.

The EMS for the McClean Lake Operation, which is integrated within the overall site management system, is designed to meet all regulatory obligations, industry best practices and AREVA expectations. It is certified to the ISO 14001:2004 standard. It is the objective of the Kiggavik Project to attain this certification as well. The EMS provides the structure for operational control of environmental issues, both current and future. Establishment of the EMS is similar to, and follows from, the EA process in that it involves an examination of possible environmental effects as a result of interactions between the operation and the environment. Once the significant interactions are identified and grouped, appropriate environmental protection objectives are established, consistent with initially meeting, and then continuously improving on, EA predictions.

As part of the ISO 14001 certification process, a comprehensive review is undertaken of all potential environmental effects from site activities. This allows establishment of broad objectives which can then be broken down into individual measurable targets. At McClean Lake, these cover everything from internal guidelines on minimizing land disturbance and optimizing fuel usage, to meeting or surpassing all regulatory requirements.

4 Assessment Approach

4.1 Introduction

This section describes the methods used in the assessment of environmental and socio-economic effects associated with the Kiggavik Project. The methods used are designed to meet the applicable regulatory requirements while focusing the assessment on the matters of greatest environmental, social, cultural, economic and scientific importance. The methodological approach also recognizes the iterative nature of Project-level environmental assessment, considering the integration of engineering design and mitigation and monitoring programs in a comprehensive environmental management planning for the life of the Project. Volumes 4 to 10 of the EIS contain the detailed assessment with Volume 3 containing the engagement and IQ information that has influenced the Kiggavik assessment.

The environmental assessment approach used in this assessment involves the following steps:

- Scoping;
- Assessment of Project-related environmental effects;
- Evaluation of cumulative environmental effects;
- Determination of significance;
- Monitoring; and
- Summary.

4.2 Scope of the Assessment

4.2.1 Valued Components, Indicators and Measurable Parameters

The environmental assessment focuses on Valued Components (VCs), which are broad aspects of the biophysical and socio-economic environments, which if negatively altered by the Project, would be of concern to regulators, Inuit, resource managers, scientists, and public stakeholders. Specific Valued Environmental Components (VECs) or Valued Socio-economic Components (VSECs) are selected for the assessment based on the following criteria:

- Do they represent a broad environmental, ecological or human environment component that may be altered by the Project?
- Are they vulnerable to the environmental effects of the Project and other activities in the region?
- Have they been identified as important issues of concerns to Inuit or other stakeholders, or in other effects assessments in the region?
- Were they identified by the NIRB, Inuit Organizations or departments within the territorial or federal government?

Where a VC has various sub-components that may interact in different manners with the Project, the environmental assessment may consider the environmental effects on individual Key Indicators (KIs). KIs are species, species groups, resources or ecosystem functions that represent components of the broader VCs, and for which there is sufficient information to assess the potential Project residual environmental effects and cumulative effects.

For each VC or KI, one or more measurable parameters are selected to quantitatively or qualitatively measure the Project environmental effects and cumulative environmental effects. Measurable parameters provide the means of determining the level or amount of change to a VC or KI.

4.2.2 Key Issues

Issues identification focuses the assessment on matters of greatest importance related to the Project, and assists in determining which factors and the scope of those factors that will be considered in the assessment. Issues and concern about the possible biophysical or socio-economic effects of the Project have been identified from a variety of sources, including: 1) the regulatory requirements applicable to the Project, discussions with technical experts from various territorial and federal government agencies; 2) input from Inuit and public stakeholders during engagement activities in relation to the Project; 3) existing regional information and documentation regarding environmental components found near the Project; 4) baseline and assessment studies conducted in the area of the Project; and 5) professional judgment of the assessment team based on experience with similar projects elsewhere and other mining projects and activities in Nunavut.

4.2.3 Project - Environment Interactions and Effects

Key Project-related activities that are likely to result in environmental effects are considered for each VC. A matrix is provided in the scoping section for each discipline to identify where interactions are likely to occur based on the spatial and temporal overlap between Project activities and the VC. Each interaction is ranked according to the potential for an activity to cause an environmental effect. Justification for ranking the Project-environmental effect interactions considered is provided in the scoping section for each discipline.

4.2.4 Assessment Boundaries

Boundaries of the assessment are defined for each VC to allow for a meaningful analysis of the significance of environmental effects. The assessment boundaries are described in terms of spatial, administrative and technical, and temporal boundaries.

Spatial boundaries are established for the assessment of potential Project-related environmental effects and cumulative environmental effects for each VC. The primary consideration used in the establishment of the boundaries of these assessment areas is the probable geographical extent of the environmental effects (i.e., the zone of influence) to the VC.

For this assessment, the spatial boundaries are referred to as 'assessment areas' to differentiate the areas from the local and regional study areas referred to in many baseline studies. Three assessment areas (Project Footprint, Local Assessment Area, and Regional Assessment Area) are defined for each VC.

- ***Project Footprint*** - is the most immediate area of the Project, and includes the area of direct physical disturbance associated with the construction or operation of the Project.
- ***Local Assessment Area (LAA)*** - is the maximum area within which Project-related environmental effects can be predicted or measured with a reasonable degree of accuracy and confidence, and includes the Project Footprint and any adjacent areas where Project-related environmental effects may reasonably be expected to occur.
- ***Regional Assessment Area (RAA)*** - is a broader area within which cumulative environmental effects on the VC may potentially occur. It is also the area where, depending on conditions (e.g., seasonal conditions, habitat use, more intermittent and dispersed Project activities), Project environmental effects may be more wide reaching.

The temporal boundaries for the assessment are defined based on the timing and duration of Project activities, and the nature of the interactions with each VC. Temporal boundaries encompass those periods during which the VCs and KIs are likely to be affected by Project activities. In some cases, temporal boundaries are refined to a specific period of time beyond simply limiting them to a specific phase of the Project to reflect seasonal variations or life cycle requirements of biological VCs, long-term population cycles for some biological VECs, or forecasted trends for socio-economic VSECs.

Administrative and technical boundaries are identified and justified for each VC or KI, as appropriate. Administrative boundaries include specific aspects of provincial and federal regulatory requirements, standards, objectives, or guidelines, as well as regional planning initiatives that are relevant to the assessment of the Project's environmental effects on the VC. Technical boundaries reflect technical limitations in evaluating potential environmental effects of the Project, and may include limitations in scientific and social information, data analyses, and data interpretation.

4.2.5 Environmental Effects Criteria

Where possible, residual environmental effects are described quantitatively for each VC. Where an effect cannot be defined quantitatively, they are described using qualitative terms. If qualitative descriptions are used, definitions are provided for each VC or KI, as appropriate.

- ***Direction:*** the ultimate long-term trend of the environmental effect (e.g., positive, neutral or adverse);
- ***Magnitude:*** the amount of change in a measurable parameter or variable relative to the baseline case (i.e., low, moderate, high);
- ***Geographical Extent:*** the geographic area within which an environmental effect of a defined magnitude occurs (site-specific, local, regional, provincial, national, international);
- ***Frequency:*** the number of times during the Project or a specific Project phase that an environmental effect may occur (i.e., once, sporadically, regular, continuous);

- ***Duration:*** this is typically defined in terms of the period of time that is required until the VC returns to its baseline condition or the environmental effect can no longer be measured or otherwise perceived (i.e., short term, medium term, long term, permanent);
- ***Reversibility:*** the likelihood that a measurable parameter for the VC will recover from an environmental effect (i.e., reversible, irreversible); and
- ***Ecological or socio-economic context:*** the general characteristics of the area in which the Kiggavik Project is located (i.e., undisturbed, disturbed, urban setting). AREVA has further expanded this attribute for greater consideration of IQ and land use[4].

4.2.6 Standards or Thresholds for Determining Significance

Where possible, threshold criteria or standards for determining the significance of environmental effects are defined for each VC or KI to represent that limit beyond which a residual environmental effect would be considered significant. Standards are recognized federal and territorial regulatory requirements or industry objectives that are applicable to the VC and that reflect the limits of an acceptable state for that component. Where standards, guidelines or regulatory requirements do not exist, thresholds are defined for the measurable parameters for an environmental effect for a VC based on resource management objectives, community standards, scientific literature, or ecological processes (e.g., desired states for fish or wildlife habitats or populations).

Potential changes in a measurable parameter or VC resulting from Project or cumulative environmental effects are evaluated against these standards or thresholds. Environmental effects are rated as either *significant* or *not significant*.

4.3 Assessment of Project Effects

4.3.1 Baseline Conditions and Project Effect Linkages

Baseline conditions for the selected VC and KI are described to provide the basis for assessing the environmental effects. This is followed by a description of the effect mechanisms through which the Project components and activities will result in the effects, and the spatial and temporal extent of the interactions causing the effect. Because the assessment focuses only on residual effects, effects prior to mitigation are not characterized or quantified.

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[4] Refer to Techncial Appendix 1F Social and Ecological Context.

4.3.2 Mitigation Measures for Project Effects

Where Project activities are likely to cause an environmental effect on a VC, mitigation measures are identified to minimize or avoid residual environmental effects of the Project. This includes measures or strategies that are technically and economically feasible, and that would reduce the extent, duration or magnitude of the environmental effect. Mitigation includes Project design features to change the spatial or temporal aspect of the Project, specialized mitigation, environmental protection measures and protocols, and compensation (habitat compensation, replacement or financial compensation). Where mitigation is recommended, a brief discussion of how the measure(s) will help to minimize the residual effect on the VC is provided. Where possible, this includes a description of how effective the proposed measure is expected to be in minimizing the change in the measurable parameters for the environmental effect.

4.3.3 Residual Project Effects Analysis

Taking into account the proposed mitigation and expected effectiveness of the measure(s), the residual environmental effects of the Project are described according to their probable magnitude, geographic scope, duration, frequency, reversibility and ecological context, where appropriate. The residual effect is characterized in the context of the existing condition for the measureable parameter(s) and how it is likely to change as a result of the Project environmental effect. For some residual environmental effects, the change in the measurable parameter is described relative to each Project phase.

4.3.4 Determination of Significance of Residual Project Effect

The significance of a residual Project environmental effect is determined based on standards or thresholds that are specific to the VEC, KI and/or the measurable parameters used to assess the environmental effect. Determination of whether the residual environmental effect is considered to be significant or not significant is based on a comparison of the predicted change in the VC or measurable parameter to the defined threshold or standard. This includes an indication of the likelihood that a residual environmental effect on a VC will occur based on probability of occurrence (i.e., based on past experience) and level of scientific uncertainty. Determination of significance also includes a discussion of the confidence of the prediction with respect to the characterization of environmental effects, and the expected success of Project design features, mitigation measures, and environmental protection measures in effectively reducing the environmental effect.

4.3.5 Monitoring of Residual Project Effects

After analysis of the residual Project environmental effect, it may be necessary to consider the need for monitoring programs. Two types of programs are considered: compliance and follow-up environmental monitoring. Compliance monitoring programs are undertaken to ensure that proposed Project design features, mitigation measures, environmental protection measures, or benefit agreements are being implemented as proposed. Environmental monitoring programs are used to:

- verify predictions of environmental effects;
- determine the effectiveness of mitigation measures, environmental protection measures or benefits agreements in order to modify or implement new measures where required;
- support the implementation of adaptive management measures to address previously unanticipated adverse environmental effects; and
- support environmental management systems used to manage the environmental effects of projects.

4.4 Assessment of Cumulative Effects

4.4.1 Screening for Potential Cumulative Effects

A Project Inclusion List was developed to identify all past, present and reasonable foreseeable projects, activities and actions in the region of the Kiggavik Project. In addition, a potential far future scenario was also contemplated. Both the Project Inclusion List (PIL) and far future scenario are presented in Technical Appendix 1E. Only those projects and activities that overlap with the Kiggavik Project residual environmental effects both spatially and temporally are considered in the assessment of potential cumulative environmental effects.

Cumulative environmental effects are only assessed if the following criteria are met for the residual Project effect under consideration:

- The Project will result in a measurable, demonstrable or reasonably-expected residual environmental effect on a component of the biophysical or socio-economic environment,
- The Project-specific residual environmental effect on the component will likely act in a cumulative fashion with the environmental effects of other past, current or future projects or activities that are likely to occur (i.e., Is there overlap of environmental effects?), and
- There is a reasonable expectation that the Project's contribution to cumulative environmental effects will be substantive, measurable or discernible such as that it will affect the viability or sustainability of the resource.

If, based on these criteria, there is potential for cumulative environmental effects, the effect is assessed further to determine if it is likely to shift the component to an unacceptable state. Where there is no potential for the environmental effect of the Project to spatially or temporally overlap with similar effects of other projects and activities, there is no cumulative effects assessment provided as that cumulative effect does not exist.

4.4.2 Assessment of Cumulative Effects

The first step in the assessment of cumulative effects involves the identification of other projects and activities in RAA (from the Project Inclusion List) that will act cumulatively with the residual Project effect under consideration. This is followed by a description of the mechanisms by which the Project effect may interact with the other projects and activities in the RAA, and the geographic and temporal scope of the cumulative environmental effect.

For this assessment, cumulative environmental effects are described for four cases:

- ***Base Case***: the current status of the measurable parameters for the environmental effects at baseline (i.e., prior to the Project). Baseline includes all past and present projects and activities in the RAA that may result in similar environmental effects to the Project environmental effect. Existing projects include projects that have received environmental approval and are in some form of planning, construction and/or commissioning.
- ***Project Case***: the status of the measurable parameters for the environmental effect with the Project in place, over and above the Base Case. This is usually assessed using the peak environmental effect of the Project or maximum active footprint for the Project.
- ***Future Case***: the status of the measurable parameters for the environmental effect because of the Project Case, in combination with all reasonable foreseeable projects, activities and actions. Reasonably foreseeable projects are defined as future projects, activities and actions that will occur with some certainty, including projects that are in some form of regulatory approval or have made a public announcement to seek regulatory approval.
- ***Far Future Case:*** the status of the measurable parameters for the environmental effect because of the Future Case, in combination with possible far future developments in the Kiggavik region. Due to the lack of information regarding the specific details of potential far future development (i.e., footprint of projects and activities), the assessment of cumulative environmental effects under this Case is by definition qualitative and is limited to a description of how these projects, activities and actions could affect the magnitude, duration and extent of cumulative environmental effects.

4.4.3 Mitigation of Cumulative Environmental Effects

Mitigation measures that would reduce the Project's environmental effects are described for cumulative environmental effects, with emphasis on measures that should limit the interaction of environmental effects of the Project with similar environmental effects from other projects. Three types of mitigation measures are considered, where appropriate:

- measures that can be implemented solely by AREVA;
- measures that can be implemented by AREVA, in cooperation with other project proponents, government, Aboriginal organizations and/or public stakeholders; and
- measures that can be implemented independently by other project proponents, government, Aboriginal Organizations and/or public stakeholders.

For the latter two types of mitigation, the degree to which AREVA can or cannot influence the implementation of these measures is noted.

4.4.4 Residual Cumulative Effects Analysis

Residual cumulative environmental effects are described, taking into account how the proposed mitigation will change the environmental effect. Cumulative environmental effects are characterized quantitatively or qualitatively in terms of the direction, magnitude, duration, geographic extent, frequency and reversibility. This includes characterization of the total residual cumulative environmental effects based on the Future Case, and the contribution of the Project to the total residual cumulative effects.

4.4.5 Determination of Significance of Residual Cumulative Effects

The significance of cumulative environmental effects is determined using standards or thresholds that are specific to the VC, KI and/or measurable parameters used to assess the Project environmental effect. Determinations of significance are made for the total residual cumulative environmental effect and the contribution of the Project to the total residual cumulative environmental effect. The determination of residual cumulative environmental effects includes a discussion of the confidence of the prediction based on scientific certainty relative to quantifying or estimating the environmental effect (i.e., quality and/or quantity of data, understanding of the effects mechanisms), and scientific certainty relative to the effectiveness of the proposed mitigation measures.

4.4.6 Monitoring of Residual Cumulative Environmental Effects

Based on the evaluation of residual cumulative effects, it may be necessary to conduct monitoring programs. Two types of monitoring are considered: compliance and follow-up environmental monitoring. Compliance monitoring is conducted to ensure that proposed Project design features, mitigation measures, environmental protection measures, or benefit agreements are being implemented as proposed. Biophysical and socio-economic monitoring is conducted to confirm the environmental effect prediction and/or effectiveness of a recommended Project design feature, mitigation measure, environmental protection measure, or benefit agreement.

5 Community Engagement

5.1 Overview

AREVA's commitment to broad public engagement is evidenced in our sustainable development commitments, values charter and also in our ongoing corporate social responsibility initiatives.

AREVA's public engagement strategy has been to begin early, to focus on the community of Baker Lake and other Kivalliq communities while making Project information broadly available to any interested party, to engage multiple stakeholder organizations with consideration for all age groups and use of multiple communication mediums. The goal was to not only provide and make project information accessible but also to listen, learn, consider and integrate community feedback into the environmental assessment, Project design and the way AREVA conducts business in Nunavut. AREVA began public participation initiatives for the Kiggavik Project in 2005, two years prior to the resumption of activity on the site demonstrating the company commitment to meaningful and early engagement. Since 2005 AREVA has attended, participated in or led over 428 meetings, presentations, workshops, and public meetings regarding the proposed Kiggavik Project.

5.2 Approach to and History of Engagement

The approach to engagement has primarily been to create relationships through time spent in communities in order to gain a better understanding and appreciation for both the land and the people and to facilitate numerous face-to-face meetings. With an emphasis on maintaining a consistent presence on the community of Baker Lake, AREVA hired a Community Liaison Officer in May 2006 and an information office was opened in Baker Lake in August 2006.

AREVA and the Baker Lake Hamlet Council cooperated to establish a community liaison committee (CLC) to further facilitate dialogue between the community of Baker Lake and AREVA. In addition, as the Project has the potential to impact the Kivalliq region, primarily through socioeconomic opportunities, a regional liaison committee (RLC) that includes members from all seven Kivalliq communities has been in place since 2007.

Additional engagement activities have also included open houses, both formal and informal meetings and workshops with various organizations throughout the Kivalliq, tours of the Kiggavik exploration site and northern Saskatchewan uranium operations, a Project specific blog, radio shows, and the use of informational videos available on company websites and on YouTube.

AREVA often travels with or hires a local translator to facilitate communication during public meetings and efforts have been made to translate presentations, informational print material and videos. Understanding the concern that translation is essential for the participation of unilingual Inuktitut speakers in this review, AREVA is committed to assist in the continued efforts of the Inuit Language Authority in creating a translated glossary of uranium specific terms.

Over a ten year period from 2005 to 2014 AREVA has held or participated in over 428 engagement activities related to the Kiggavik Project ranging from high school presentations to Saskatchewan mine site tours to meetings with elders groups. Correspondence and some community and/or leadership meetings have also been held in communities outside Nunavut that have communicated interest and concern with the proposed Kiggavik Project.

5.3 Issues and Concerns

AREVA looked at comments received through company-led engagement activities and those comments publicly available from consultation and other engagement activities led by others and categorized comments in order to identify the main issues and concerns regarding uranium mining in general and the Kiggavik Project in particular. The distribution of comments by Kivalliq community is presented in Figure 5.3-1.

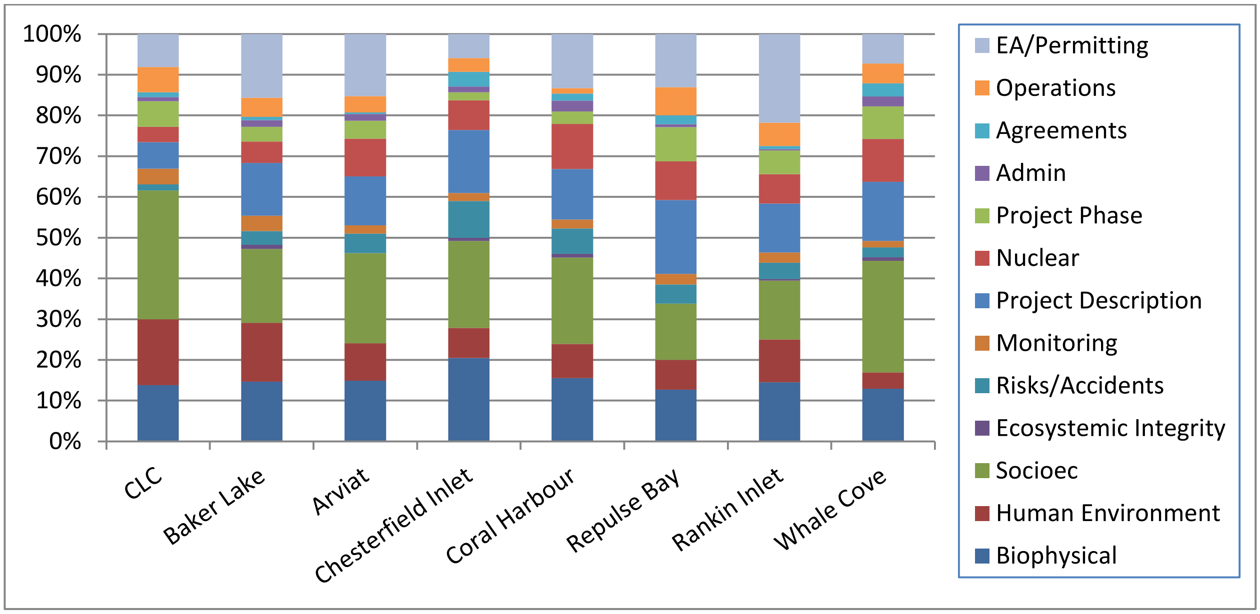

Figure 5.3-1 Shows the Relative Importance of Each Broad Category by Kivalliq Community

The highest numbers of comments are in the general category of Socioeconomic Environment with twice as many comments as the next highest three topics of Biophysical Environment, Project Description and Human Environment. Together, these four topics generated 60% of the comments discussed at engagement events overall.

Under Socioeconomic Environment, the most common topics raised were:

- Employment Training and Business (28%)
- Community Engagement (24%) Community and Individual Well-being (12%)
- Culture and Tradition (10%)

Under Biophysical Environment, most of the topics discussed were about:

- Wildlife (35%)
- Water Resources, Marine (17%)
- Air Quality (14%) Water Quality, Surface and Hydrogeology (14%)

Under Project Description, the most frequent topic discussed was:

- Access, Road, Marine, Air (38%)
- Mining (10%) and Tailings (10%)

Under Human Environment, the topics discussed most were:

- Traditional Knowledge/Inuit Qaujimajatuqangit (29%) Land & Resource Use (23%)

Comments have been recorded at community engagement events beginning in 2006. In addition to the analysis by community provided above, the comments were also analyzed to look for changes in the distribution over time. Although there were some variations within, and between categories, the distribution remained overall consistent over time. Results of this analysis are detailed in Tier 2 Volume 3 Part 1 Section 4.2.3. Briefly, it can be seen that the categories of Biophysical, Human Environment and Socio-Economics are consistently high interest topics over the environmental assessment process with EA/Permitting of higher interest in 2010. Socio-economics was of higher interest in 2011 and again in 2014.

5.4 How AREVA Addressed Community Concerns

Comments received during engagement events have been considered and used to shape future engagement activities, the Project design and aspects of the EIS.

includes key concerns raised and AREVA response including how they influenced the Project was influenced. A detailed table including engagement references is provided in Volume 3 and integration of community feedback into Project design is outlined in Volume 3 with engagement feedback influencing the assessment found throughout Volumes 4 to 9.

Table 5.4-1 Key Community Concerns and AREVA Response

Key Issue/ Concern	AREVA Response	
	AREVA Actions to Address Concern	**AREVA Commitments Moving Forward**
Interest in the access road type (winter or all-season), alignment, preferred Thelon crossing location, management and public access.	A number of engagement activities specifically addressed the access road to better understand community preferences and concerns, environmental, engineering, IQ and archaeological studies conducted to support assessment. Alternatives analysis conducted and one option removed from consideration with winter road selected as preferred option.	AREVA commits to continue working with interested stakeholders to manage any approved access road in ways that respect and protect the environment, people of Baker Lake, Project requirements and public and worker safety. Implement an Access Road Management Plan.
Interest in determining the best Thelon River crossing should consider the Thelon and the arctic environment.	Elders, CLC and HTO visits to proposed crossing sites, consultant studies and time lapse photography to examine the spring ice break up.	Continue to value the Thelon River as a Heritage River by respecting GN-CLEY archaeological requirements and the Thelon River Management Plan.
Kivalliq residents stressed the importance of engaging all age groups in the project including elders and youth. Preferences were stated for a wide variety of communication means.	The CLC consists of members appointed by a variety of community organizations including an elder and youth representative. Saskatchewan mine site and Kiggavik exploration site tours were offered to a variety of Baker Lake and Kivalliq residents. Numerous groups and methods of communication were used.	Implementation of a Community Involvement Plan and adjustments to the plan to accommodate community preferences for communication and engagement.
Respect for wildlife, caribou in particular, was identified early as a requirement to industrial development in Nunavut.	Terrestrial and IQ baseline studies were conducted to support the EIS. Methods for collection of caribou baseline information changed based on consultation with the Baker HTO and government departments. AREVA has made contributions to cooperative caribou research. A Wildlife Monitoring and Mitigation Plan is implemented during exploration activities.	AREVA will continue to work collaboratively with caribou stakeholders including the Baker Lake HTO, the Kivalliq Wildlife Board, the Nunavut Wildlife Management Board, the Government of Nunavut and other mining companies. A Wildlife Monitoring and Management Plan will be implemented.
Throughout the region, the message has been that residents want employment opportunities and the training required to obtain more than entry level employment.	Current exploration activities hire 20-30 local staff/season and locals were hired to assist in baseline studies for the EIS. A full socio-economic assessment is included in Volume 9 of this EIS and mitigation to maximize local socioeconomic benefits are considered. AREVA is a member of the Nunavut Mine Training Roundtable and the Kivalliq Mine Training Society Training Committee.	AREVA has started negotiations on an IIBA with the KIA that will include sections to maximize benefits for beneficiaries. A Human Resources Development Plan will be implemented and monitoring will occur to inform and guide continued improvements over Project life.
The sea transport of materials in Hudson Bay and barging up Chesterfield Inlet is of interest to communities, particularly Chesterfield Inlet.	Meetings have been held with HTOs in the coastal Kivalliq communities and marine baseline studies were conducted with local knowledge and local assistants.	Emergency response plans will be in place and implemented. Spill training and supplies will be provided to the community of Chesterfield Inlet.
Questions and concerns over the uses of uranium and concern over radiation.	Radiation protection demonstrations were part of open house tours since 2010. Two videos related to radiation protection have been produced. Radiation addressed in detail in Volume 8 of the EIS.	Commitment to follow all international treaties, federal legislation and the NTI uranium policy related to peaceful uranium uses. Continued communication on the nuclear industry.

5.5 Community Involvement Plan

AREVA's Community Involvement Plan is a key document in achieving greater community benefits as it outlines the methods to maintain and grow two-way communication between the company and community.

The community engagement plan encompasses engagement for the purposes of regular communication with the general public and Inuit groups that recognizes their interest in AREVA business, to meet regulatory requirements of the EA and licensing processes throughout the life of the Project and to assist the Crown in fulfilling their duty to consult as appropriate. The plan will be regularly updated to reflect the needs and priorities of the community and Project through the various Project stages should the project be approved.

AREVA's commitment to engagement and community involvement is throughout the life of the Project and continues throughout construction, operations, decommissioning and reclamation. The Community Involvement Plan is included an Technical Appendix 3C.

6 Inuit Qaujimajatuqangit

Inuit Qaujimajatuqangit (IQ) is considered an important component of the environmental assessment process in Nunavut. The term Inuit Qaujimajatuqangit translates into English as "that which Inuit have always known to be true." The (NIRB) defines IQ as follows:

> *[Traditional Knowledge is the] [c]umulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission. Specific Inuit Traditional Knowledge is referred to as Inuit Qaujimajatuqangit (NIRB 2007).*

The review board further elaborates that traditional knowledge, practice and beliefs include the following:

> *[Inuit Qaujimajatuqangit (IQ) represents the] [guiding principles of Inuit social values including: respecting other, relationships, and caring for people; development of skills through practice, effort and action; working together for a common cause; fostering good spirit by being open, welcoming, and inclusive; serving and providing for family and/or community; decision making through discussion and consensus; being innovative and resourceful; and respect and care for the land, animals and the environment (NIRB 2007).*

IQ Principles have been adopted by AREVA in some aspects of doing business within Nunavut and they are highlighted throughout the EIS to show areas of particular consistency.

Baseline studies were undertaken to collect IQ as it relates to the environment and people's use of the land and water in relation to the Kiggavik Project to have a deeper understanding of the land, its resources, and the potential effects of the Project on Nunavummiut and Inuit in particular. IQ studies were also undertaken as they generally relate to the social aspects of Kivalliq communities. IQ information was obtained from the seven Kivalliq communities of Baker Lake, Chesterfield Inlet, Rankin Inlet, Arviat, Whale Cove, Repulse Bay and Coral Harbour. Additional IQ information was gathered from a variety of literature review and datasets including the Nunavut Atlas and the IQ data on wildlife provided by the KIA.

6.1 Field Studies

The methodology used to collect IQ data consisted of a combination of individual interviews and focus groups. Initial studies were undertaken in 2008 and subsequent studies and validation work followed in 2009 and 2011, and IQ meaning workshop in 2013, and focused workshops on similarities and differences within and between IQ and western science in Baker Lake and Chesterfield Inlet in 2014.

As a result of discussions with the Community Liaison Committee eighteen interviews were conducted with Baker Lake Elders in 2008 by a local researcher[5]. In 2009 AREVA undertook a series of interviews and focus groups with traditional land-users in the seven Kivalliq communities. Information about environmental IQ was obtained through individual interviews in Chesterfield Inlet; and focus groups with HTO representatives, other hunters, and Elders in the Kivalliq communities. Elders meetings took place in all seven communities and HTO meetings were held in six[6]. A semi-structured interview format was used so that participants could focus on their particular areas of knowledge as well as have the opportunity to provide additional information they believed to be important[7].

Information related to socio-economic concerns was obtained through interviews with individuals in Arviat, Baker Lake and Repulse Bay; and through focus groups with rotational workers in Baker Lake, rotational workers' spouses in Baker Lake, young adults in Baker Lake, Chesterfield Inlet, Repulse Bay, Rankin Inlet and Whale Cove, and women in Coral Harbour and Rankin Inlet. Interviews and focus groups discussed topics such as women's roles, dependency on country foods, and traditional activities. During the interviews and focus group discussions, participants also provided information on topics related to wildlife and harvesting activities.

In 2011, community review and validation meetings were held to ensure accuracy of AREVA's understanding of previous work and also provide an opportunity to add additional IQ information related to the Project area and the region generally. A total of nine meetings with HTO members and elders were held to review IQ in 2011 where participants supplied the interviewers with narrative information as well as mapped information on various wildlife and Inuit land use topics.

[5] These interviews focused on the following topics: cultural and spiritual sites, water, wildlife and other natural resources, changes in weather, project relted concerns, the experience of moving to Baker Lake, and memories of local people.

[6] Eleven of the 13 meetings had participation from both men and women. The Rankin HTO and Whale Cove Elders meeting consisted of only men.

[7] These interviews focused on land and marine mammals and game birds (including harvest areas, health, and important habitat), fish (species, harvesting, health, spawning areas), new wildlife species observed, culturally important areas, changes in weather patterns, changes in water quality or qualtity, and potential effects of the Project.

A focus group meeting with Elders from Baker Lake was held in 2013 to discuss the meaning of IQ (BL EL Sept 2013). Additional meetings with the Baker Lake and Chesterfield Inlet HTOs in 2014 were an opportunity to discuss the similarities and differences with IQ and between IQ and western science where participants once again supplied narrative and mapped information. The following figures summarise the IQ information collected during the field studies:

- Figure 6.1-1 Inuit Qaujimajatuqangit Study Area
- Figure 6.1-2 Caribou Information Gathered During Interviews and Focus Group Discussions Held in Baker Lake
- Figure 6.1-3 Identified Wildlife Habitat Areas from IQ
- Figure 6.1-4 Identified Hunting and Caching Areas from IQ
- Figure 6.1-5 Identified Fishing Areas from IQ
- Figure 6.1-6 Identified Camping, Human Travel Routes & Spiritual Significance from IQ
- Figure 6.1-7 Identified Land Use from Chesterfield Inlet
- Figure 6.1-8 Marine Hunting and Harvesting
- Figure 6.1-9 Marine and Land Wildlife Information from Repulse Bay and Rankin Inlet Interviews
- Figure 6.1-10 Marine and Land Wildlife Information from Chesterfield Inlet to Churchill
- Figure 6.1-11 Marine Mammal Information from Coral Harbour Interviews

6.1.1 Summary of Project-Related Questions and Concerns Raised During IQ Events

During interviews and focus group discussions, participants identified a variety of issues and concerns related to the Project. These generally related to the following:

- a potential bridge over the Thelon River;
- potential effects of the proposed access road on caribou;
- potential contamination of lakes, vegetation, wildlife, and people;
- potential effects of increased marine transportation on marine wildlife;
- potential effects of Project wage employment on traditional activities; and
- recommendations for monitoring by Elders.

The majority of Baker Lake participants said they would support a bridge over the Thelon River, and either Anaqtalik or Kinngarjuit were suggested as possible locations. Most participants in Baker Lake do not want to see any development near Hagliq or south of Baker Lake, as these were areas identified as important fishing areas, or caribou travel routes. Some participants were concerned that a bridge over the Thelon River may prevent boat travel upriver to harvesting areas, or that the bridge might cause ice to be pushed further onto the land, potentially damaging the bridge itself.

Participants in other communities voiced concerns over the potential construction of an all-season road to the Kiggavik mine site, specifically, the potential for habitat fragmentation, noise, animal-vehicle collisions, and dust from the road. Participants in Baker Lake, Arviat, and Rankin Inlet were concerned that caribou migrations may be negatively affected by the proposed access road, and recommended that use of the access road and mining activities be reduced or curtailed during the initial stages of the caribou migrations.

Concerns over dust generated by the Project and possible travel with prevailing winds to Rankin Inlet and Arviat were raised. Baker Lake talked about the importance of clean water and concerns over water being contaminated in the Project area. Chesterfield Inlet was interested in the details of marine shipping and potential effects on fish and marine mammals with a focus on potential spills in the Inlet.

6.2 Use and Influence of IQ in Project Design and Environmental Review

Figure 6.2-1 demonstrates the three primary integration paths for IQ, engagement, and land use into the environmental assessment and ultimately to significance determinations and conclusions.

The first path occurs in parallel with the use of western science primarily in the understanding of traditional ecological knowledge and baseline conditions. An example is the identification of caribou water crossings by both IQ and other means and consideration of both sources of information in the assessment and planned mitigation for potential changes in caribou movement (see Volume 6). Consistent with the IQ principles of Pilimmaksarniq and Piliriqatigiingniq, the involvement of local people in baseline studies not only contributed to the knowledge collected but how to best collect that information. The marine mammal surveys supporting the marine assessment in Volume 7 and associated Technical Appendices were conducted with advice from the Chesterfield Inlet HTO on timing and location. This broad path of integration can be further broken down into categories as presented with examples in Figure 6.2-2. The integration of IQ follows the assessment methodology starting with the identification of potential issues and concerns including project-environment interactions through to monitoring. Some examples include:

Modifications in the terrestrial, marine and archaeological data collection (Tier 3, Volume 9, Appendix 9B, Section 3.4), identification of Valued Components and an understanding of the value attached to potentially impacted valued ecosystem and socio-economic components (Tier 2, Volume 9, Part 1, Section 4.3), adjustments to the screening level assessments (i.e. Tier 2, Volume 8, Section 6.1.1), and suggested mitigation and management. One example of IQ informed mitigation is the effort to not disturb lead caribou during a migration that can be applied to road management.

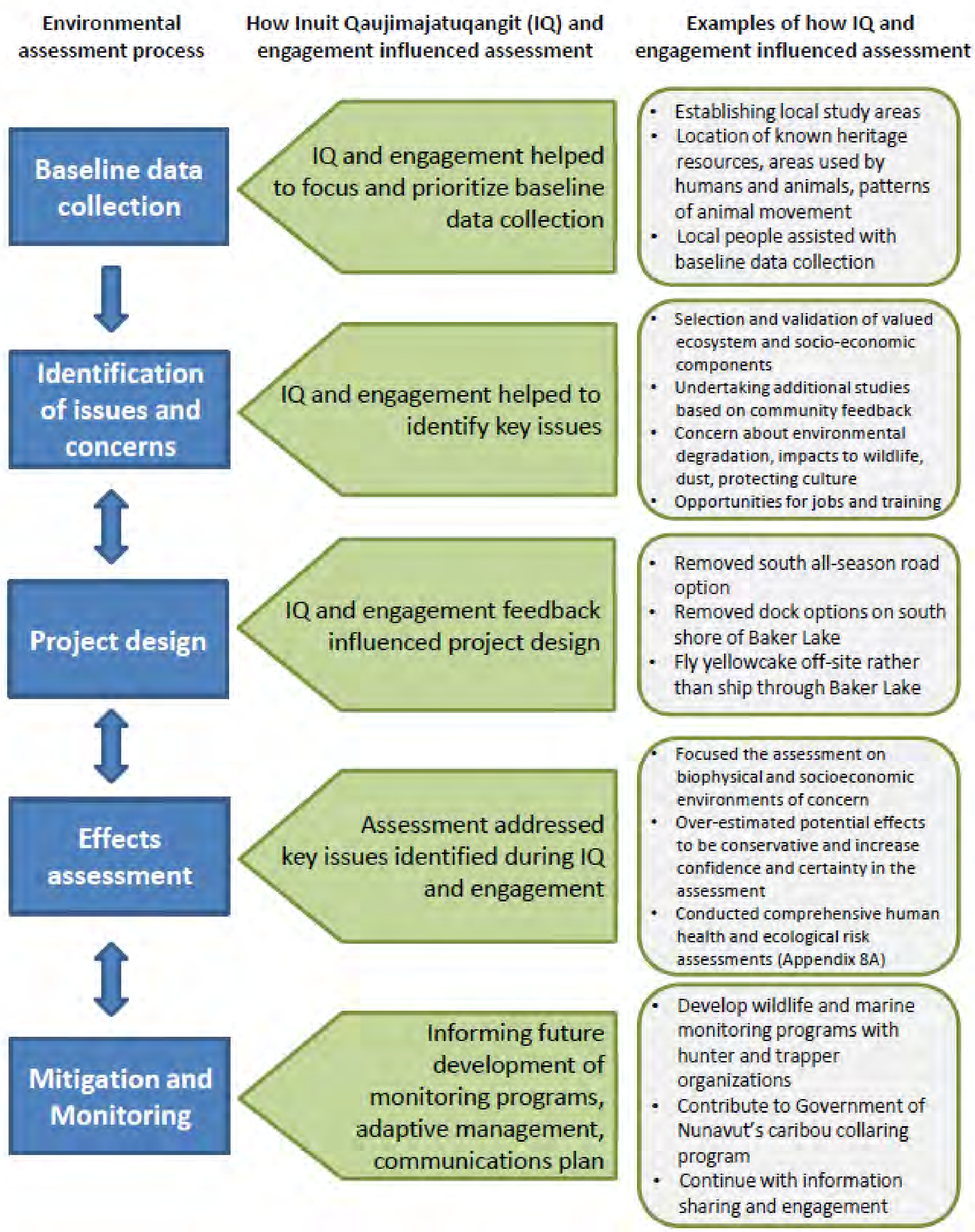

Figure 6.2-1 Incorporation of IQ Engagement

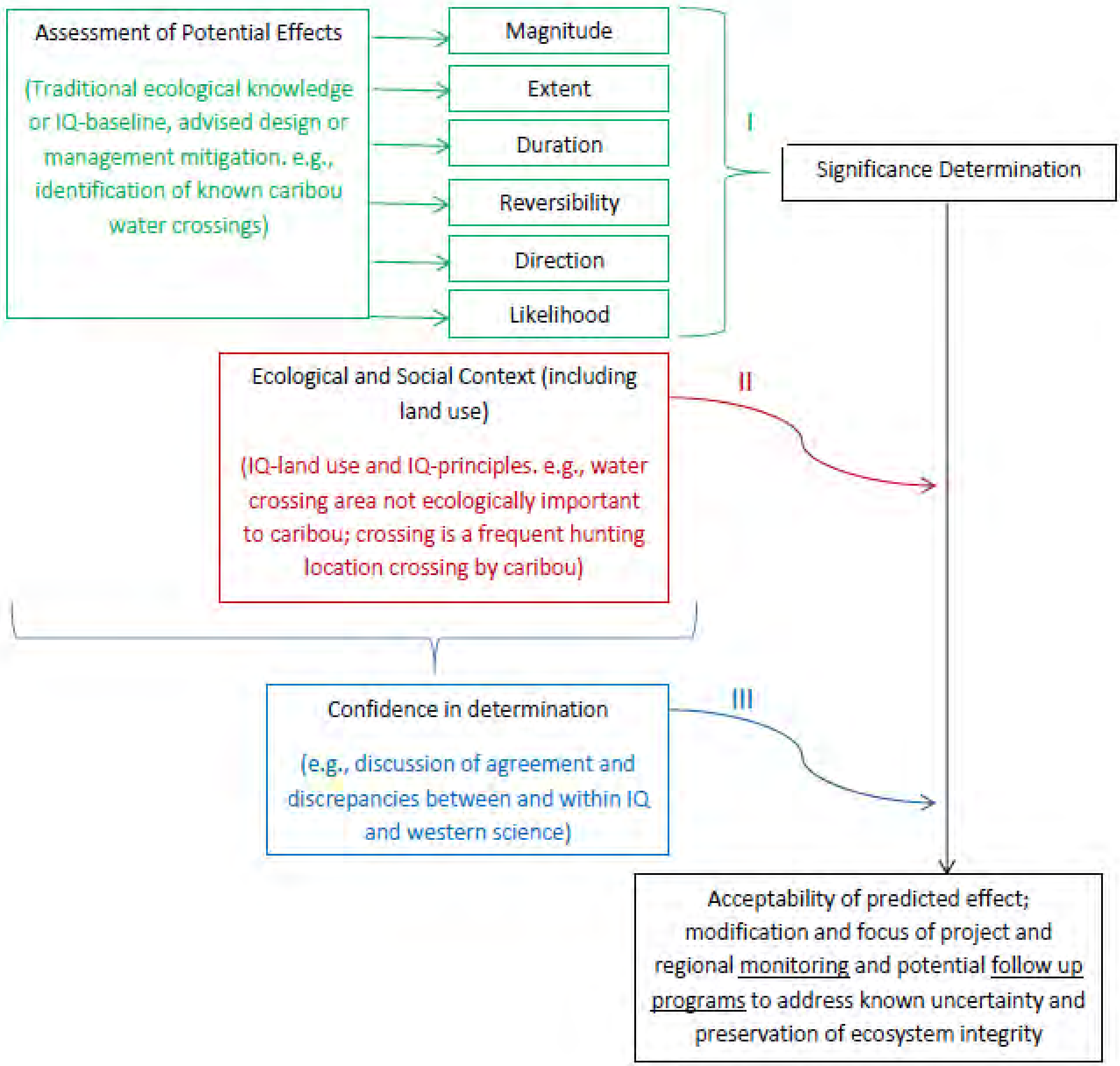

Figure 6.2-2 Three Primary Pathways for IQ and Land Use to Contribute Environmental Assessment Conclusions

Land use informed by IQ was important in the socio-economic effects assessment (Tier 2 Volume 9) and also to provide context to the ecosystem based assessments and the Project as a whole, the second broad path of integration in Figure 6.2-2. A presentation on land use is provided as Technical Appendix 1F to this volume. It provides a focused summary on traditional and contemporary land use, Inuit views and values as well as information on protected, recognized, special and disturbed areas.

An evaluation of similarities and discrepancies within and between knowledge bases informed confidence in assessment determinations. Confidence determinations lead into the development of proposed monitoring to evaluate the accuracy of predictions and the effectiveness of mitigation so that adaptive management can ensure the protection of ecosystem integrity.

In an effort to further increase the transparency of IQ integration beyond the summary sections titled 'Influence of Inuit on the Assessment' in EIS Volumes 4 to 9, AREVA also created an IQ and engagement roadmap (Attachment A to Tier 2 Volume 3 Part 2) that lists locations throughout the assessment where IQ and engagement has been considered.

7 Description of the Existing Environment

This section provides a summary of the existing environmental conditions in the Kiggavik Project area. Baseline information on the atmospheric, aquatic, terrestrial, marine and human environments are summarized in this section.

For most components, recent baseline data from 2007 to 2011 and historical baseline data gathered during the 1980s and early 1990s has been incorporated in the baseline reports prepared for the Final Environmental Impact Statement. Baseline reports for the atmospheric, aquatic, terrestrial, marine and human environments are appended to their associated tier 2 documents. For more detailed information please refer to:

- Appendix 4A – Climate Baseline
- Appendix 5A – Hydrology Baseline
- Appendix 5B – Geology and Hydrogeology Baseline
- Appendix 5C – Aquatics Baseline
- Appendix 6A – Surficial Geology and Terrain Baseline
- Appendix 6B – Vegetation and Soils Baseline
- Appendix 6C – Wildlife Baseline
- Appendix 7A – Marine Environment Baseline
- Appendix 9A - Socio-Economic Baseline and
- Appendix 9B – Archaeology Baseline

7.1 Regional Context

Lying predominantly within the Dubawnt Lake Plain/Upland Ecoregion, the Kiggavik Project area is located in a low Arctic region characterized by minimal topography, predominantly shrub tundra habitat with low structural habitat heterogeneity, an extreme northern climate, and relatively few terrestrial vertebrates.

7.2 Atmospheric Environment

7.2.1 Climate (Meteorological Conditions)

The Project area experiences a continental climate characterized by cold temperatures, low precipitation and high winds. The winters are long and cold and the summers are short and warm; transitional seasons are very short.

Meteorological data sets include historical climatic parameters derived from the region and local weather data.

7.2.1.1 Baker Lake Weather Data

Regional historical weather data for Baker Lake airport were collected by Environment Canada from 1949 to 2008. The climatic parameters include precipitation, temperature, wind speed and direction, and atmospheric pressure. Net radiation data was also available for Baker Lake the years 1969 to 2003. Extreme rainfall statistics for Baker Lake were estimated by Environment Canada 2010 while wind statistics and Probable Maximum Precipitation (PMP) were derived by Golder (2011).

Temperature - Mean air temperatures for Baker Lake during the period of record ranged between -32.4°C in January and 11.2°C in July with a mean annual air temperature of -11.9°C. Extreme temperatures have ranged between -50.6°C in January and 33.6°C in July.

Precipitation - The mean annual historical precipitation recorded at Baker Lake over the period 1949 to 2008 was 344 mm, approximately 49% of which fell as rain (169 mm). Most rain falls over the period July to October. Mean annual adjusted snowfall was 175.5mm.

The Probable Maximum Precipitation (PMP) is 183.3mm in a 24-hour period. The PMP and extreme rainfall statistics for Baker Lake and are presented below in Table 7.2-1.

Table 7.2-1 Intensity Duration and Frequency Rainfall for Baker Lake

	Return Period (years)						
Duration	**2**	**5**	**10**	**20**	**50**	**100**	**PMP**
24 hours (mm)	27.3	40.0	48.4	59.0	66.9	74.7	183.3
12 hours (mm)	22.4	32.4	39.1	47.5	53.8	60.0	
6 hours (mm)	16.7	22.8	26.8	32.0	35.8	39.5	
1 hour (mm)	6.3	8.7	10.2	12.2	13.6	15.1	
15 minutes (mm)	2.8	3.8	4.5	5.3	6.0	6.6	

Wind Speed and Direction - The historical mean monthly wind strength varies between 16.9 km/h in July and 23.9 km/h in January. Maximum mean daily wind speeds range between 22.4 km/h in August and 37.1 km/h in February. Wind speeds greater than 39.6 km/h (11 m/s) were most frequent over the period of January to March. Similarly, minimum mean daily wind speeds have ranged between 11.0 km/h in July and 16.7 km/h in October. One hour wind speeds of 78 km/h can be expected to occur once every two years, on average. Wind speeds exceeding 100 km/h are expected to occur only once in 30 years (Table 7.2-2). The mean annual wind speed is 5.9 m/s.

Table 7.2-2 Extreme Wind Statistics for Baker Lake

Duration	Return Period (years)					
	2	5	10	30	50	100
1 hour (km/h)	77.7	86.2	91.8	100.2	104.0	109.2

The most frequent wind direction at the Baker Lake climate station for the years 1953 to 2009 was north-northwest. Similarly, the most frequent wind speed in this direction was of the range 20.5 km/h to 31.7 km/h (5.7 m/s to 8.8 m/s). On a seasonal basis, the wind was predominantly from the north during the second and third quarters of the year, and from the northwest during the first and fourth quarters. On an annual basis, the wind rarely blows from the southwest or the northeast (Figure 7.2-1).

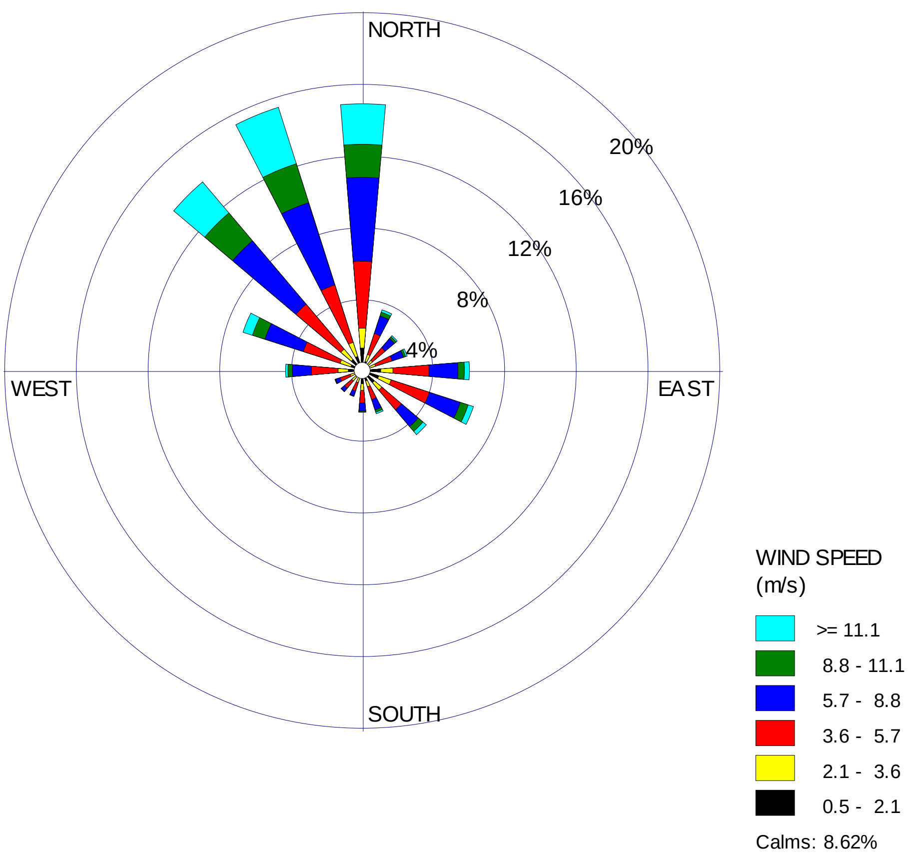

Figure 7.2-1 Baker Lake Annual Wind Rose, 1953 - 2009

7.2.1.2 Kiggavik Site Weather Data

Kiggavik site weather data was collected in 1982 to 1983 (Roulet and Woo, 1986) and 1990 to 1991 (Senes, 1992). Weather stations constructed at the Kiggavik site provide data for 2009 and 2010. A summary of results for 2009 and 2010 are presented in Table 7.2-3.

Table 7.2-3 Kiggavik Site Local Weather Data

		Rainfall (mm)	Mean temperature (°C)	Mean relative humidity (%)	Mean atmospheric pressure (kPa)
2009	May	0	-9.6	87.4	101.5
	June	14.4	4.6	80.4	101.2
	July	23.6	11.7	71.7	101.2
	August	78.8	9.8	79.4	100.8
	September	6.2	-	89.7	98.8
	October	4.4	-7.8	91.8	101.5
	November	0	-15.8	88.9	100.6
	December	0	-23.4	84.4	101.3
2010	January	0	-25.2	78.9	101.5
	February	0	-25.1	79.1	101.8
	March	0	-18.2	82.1	100.7
	April	1.4	-7.9	85.0	101.5
	May	0.4	-7.7	80.4	101.8
	June	23.4	4.4	40.9	101.0
	July	56	12.9	45.9	100.5
	August	9.6	10.4	42.9	100.6

NOTES:
a = May data was collected from May 7 to May 31, 2009
b = September data is limited to September 1, 2009
c = August 2010 data was collected from August 1 to August 24, 2010

The presence of Baker Lake and elevation differences may result in climate differences between the community of Baker Lake and the Kiggavik site. The Baker Lake climate station is positioned at the west end of Baker Lake where lake presence may modify local climate measurements during the ice-free period. Baker Lake is 18 masl whereas the Kiggavik site is at a 180 masl. The data collected thus far suggest that temperatures at Baker Lake and the Kiggavik site are similar and the coincident wind magnitude data were between 10% and 58% different at the Kiggavik and Baker Lake sites. Despite the difference in wind magnitudes, Baker Lake climate station provides the most reasonable climate data for use at the Kiggavik site.

7.2.2 Air Quality

In an effort to characterize the existing local air quality within the Project area, air quality monitoring programs were carried out during summer field seasons. Contaminants monitored include particulate matter, metals and radionuclides. Particulate and metals were monitored during the 2010 season, whereas radionuclides were monitored in the 2008, 2009 and 2010 summer field seasons. All data is provided in Volume 4, Atmospheric Environment.

Measured background levels of various metals and radionuclides were found to be low compared to more developed or urbanized areas in Canada, particularly in southern regions. To characterize regional air quality, data was obtained from a literature review of Environmental Impact Statements for other projects located in Nunavut. Measured baseline concentrations were found to be comparable to background levels in the region.

A limited amount of long-term monitoring data was available to characterize existing air quality; however, available short-term measurements suggest that ambient air concentrations are quite low within the Project area. Measurements at such low levels could be considered to be at the lower sensitivity range of the sampling equipment. This is not unreasonable given the remote nature of the Project and the relatively undisturbed environment of the area. As such, the current atmospheric environment was characterized as pristine.

Greenhouse Gases - Environment Canada's National Inventory Report identified that 2008 greenhouse gas emissions (GHG) in Nunavut were 361 kilotonnes (kt) of CO_2-equivalent. Emissions from the Meadowbank Gold Mine were not included in this total as the mine was not yet commissioned in 2008. Given that the Meadowbank Mine is now operating and will continue to operate during the lifetime of the Kiggavik Project, the Meadowbank GHG emissions estimate of 191 kt of CO_2-equivalent was added to the reported 2008 Nunavut total to provide the baseline GHG emissions for the purposes of the Kiggavik EA. Considering Meadowbank emissions estimates, the baseline level of GHG emissions in Nunavut are considered to be 552 kt of CO_2-equivalent.

7.2.3 Noise and Vibration

Noise - AREVA took a conservative approach to establishing background sound levels for the Project. A noise monitoring program was completed at AREVA's McClean Lake Operation in September 2009. The monitoring station at the McClean Lake operation was located on a waste rock pile to both simulate an undisturbed tundra environment and provide a conservative value. Noise effects assessments submitted to the NIRB were reviewed to identify noise levels in similar Arctic environments. The background sound levels measured at AREVA's McClean Lake Operation were comparable to the sound levels identified in the NIRB literature search.

Given the findings, an Leq (energy equivalent sound level) of 35 dBA was selected for daytime (16-hour), night-time (eight-hour) and 24-hour sound levels. The Leq of 35 dBA was used as the baseline value for assessing the relevance of potential changes in sound levels as a result of Project activities. The relative contribution of the Agnico-Eagle Meadowbank Mine all-weather road and wharf and the Baker Lake Airport are assumed captured in the baseline noise level.

Vibration - No information was available to establish baseline vibration within the Project area. It is expected that vibration levels are not perceptible (i.e., less than 0.1 mm/s) (Bender 1996; Wiss 1981). With the exception of some limited exploration activities, there are no substantial sources of vibration at the Mine Development Area. There are existing vibration sources in the vicinity of Baker Lake, including activities at the Agnico-Eagle Meadowbank Mine all-weather road and wharf and the Baker Lake Airport. These existing vibration sources, however, are not expected to generate any substantive vibration impact at the nearest sensitive human receptor.

7.3 Aquatic Environment

7.3.1 Surface Hydrology

The hydrological environment near the Kiggavik Project is characterized by an arctic nival regime. Most streams are frozen to the bed throughout the winter and become active at spring snowmelt in mid-June. During the early stages of spring melt, stream discharge increases rapidly, reaching a peak flow level that is largely a function of the upstream watershed size. Flows gradually recede over the remainder of the open water season. Rainfall events throughout the summer may temporarily reactivate the channels or cause secondary peaks. Lakes in the region are typically ice covered from October through June, with ice thicknesses of approximately 2 m. Lake levels and volumes reflect inflow and outflow characteristics and thus reach their peaks during the spring freshet in mid-June with levels and volumes typically decreasing throughout the remainder of the open-water season.

7.3.2 Hydrogeology

Permafrost depth is estimated to range from about 210 m depth in the area of the Main Zone, Centre Zone, and East Zone deposits to about 250 m depth in the area of the Andrew Lake deposit and End Grid deposit. In areas of continuous permafrost, there are generally two groundwater flow regimes: a deep groundwater flow regime beneath permafrost and a shallow groundwater flow regime located in the active (seasonally thawed) layer near the ground surface. Because of the thick, low permeability permafrost, there is little to no hydraulic connection between the two groundwater flow systems.

The deep groundwater regime is connected by taliks (unfrozen ground) located beneath large lakes. Groundwater flow in the area of the Main Zone, Centre Zone and East Zone deposits on the Kiggavik site is inferred to be south towards Fox Lake, Pointer Lake, Jaeger Lake, and Judge Sissons Lake. Groundwater in this area may also discharge to Sleek Lake, located to the southwest, and Scotch Lake, located to the southeast. In the area of the Andrew Lake, and End Grid deposits at the Sissons site, the predominant groundwater flow direction is inferred to be southeast towards Boulder Lake, and Judge Sissons Lake.

Relatively competent rock comprises the majority of the rock domain both within and below the layer of permafrost. The hydraulic conductivity of the deep bedrock in the Project area is low.

7.3.3 Water Quality

Lakes and streams in the mine site LAA were similar to each other in respect to their water chemistry. Lakes were characterized by low ionic strength; neutral to basic pH; and low to high sensitivity to acid. Total hardness concentrations indicated that the waters had very soft to soft water hardness, while measured nutrient concentrations (particularly nitrogen and phosphorus) were typical of nutrient poor (oligotrophic) waterbodies in subarctic regions. Baseline water quality parameter levels were less than Saskatchewan Surface Water Quality Objectives (SSWQO) and Canadian Water Quality Guidelines (CWQG) with the exception of some parameters (i.e., field and laboratory measured pH, ammonia, aluminum, cadmium, chromium, cobalt, copper, iron, lead, silver, and zinc) in some lakes. Radionuclides were generally not detected or were detected near the analytical detection limits

7.3.4 Sediment Quality

Kiggavik area lake bottom substrates varied from rock, boulder, and sand in shallow areas to organic-rich sediments in deeper depositional areas. The surficial sediments are typically 2 to 10 cm deep and the dominant particle size category in most sampled lakes was silt. Notable exceptions included Pointer Lake and Judge Sissons Lake which have appreciable clay, sand and/or rock components to the sediment.

Overall, total metal concentrations in sediment were similar among the lakes in the mine site LAA and the site access LAA. Baseline sediment quality parameters were generally less than the sediment quality guidelines (SQGs) established by the Canadian Council of Ministers of the Environment (CCME; Interim Sediment Quality Guidelines, ISQG; and probable effect levels, PEL). These guidelines are considered to be benchmarks for the potential for toxicity to aquatic organisms. By design, these are conservative guidelines and are generally considered intentionally overprotective of the aquatic environment (O'Connor 2004). Thus, if concentrations are below SQGs that predict minimal effects (i.e., ISQGs), then there is likely negligible ecological risk. Some sediment samples collected during the baseline program had metal concentrations (arsenic, cadmium, chromium, copper, mercury, and zinc) that were higher than one or both of these guidelines. Exceedances of arsenic, cadmium, chromium, copper, mercury, and zinc ISQGs, and mercury and zinc PELs were observed in some samples, but there were no trends evident. This indicates that background levels of these elements are naturally elevated in these sediments, and at baseline levels likely do not cause toxicity to the local aquatic biota.

7.3.5 Aquatic Organisms and Fish Habitat

Plankton and Benthic Invertebrate Community Characteristics - Phytoplankton species richness varied across the sampled lakes, with green algae and golden algae exhibiting the greatest diversity. Blue green algae biomass was typically low in lakes sampled within the Project area. Diatoms were likewise consistently low in abundance and biomass in all lakes. Chlorophyll *a* (a pigment which can be used to estimate phytoplankton biomass) concentrations were within the range specified for nutrient poor (oligotrophic) lakes. Zooplankton species richness was also variable among the sampled lakes. In general, rotifers exhibited the highest relative density and biomass in all lakes sampled. Cladoceran and calanoid copepod species were also observed in variable densities. Overall, benthic invertebrate communities in lakes in the LAA were characterized by low to moderate density and diversity, with chironomids typically being the dominant taxa, followed by fingernail clams in most lakes. Stream benthic invertebrate communities generally had higher taxa richness than found in lakes of the LAA.

Aquatic Habitat - Habitat assessment of lakes and streams in the mine site and site access LAAs was completed between 2007 and 2010. Lakes in the mine site LAA are typically shallow (many with maximum depths less than 3 m) and the water is generally well mixed with similar temperature and oxygen levels at all sampled depths. Water clarity (i.e., secchi depth) was usually greater than 2 m and was often equal to total depth. Shoreline substrate in all lakes consisted primarily of boulder, cobble, sand and silt substrates. The shoreline slope was predominantly flat or varied from flat to moderately steep. Shoreline vegetation was primarily grasses and low shrubs. In-lake habitat consisted of inundated vegetation, and/or interstitial spaces in the coarse substrate, as well as some lakes containing areas of emergent and/or submergent aquatic vegetation.

Since ice thickness ranged from 1.8 m to 2.1 m by the end of the winter; it is expected that many of the shallow lakes freeze to the bottom during winter. Smaller lakes generally start to become ice free in early June, with larger lakes becoming ice free in late June or early July. Because most lakes and ponds in the Mine Site LAA are shallow, they provide only seasonal foraging and rearing habitat for fish. Overwintering habitat is found in a few lakes deeper than 3 m in the area.

Streams in the mine site and site access LAAs were typically dominated by run and flat habitats, while pool, pond, riffle and backwater habitats were observed less frequently. Some areas of high flow (i.e., cascades, rapids), and nearly dry or standing water conditions were also observed later in the open water season. On average, streams were less than 1 m deep, however, depths ranged from a few cm to deeper than 7 m in the Thelon River. Wetted width generally ranged from 0.1 m to about 100 m. Stream substrate consisted primarily of gravel, cobble, boulder and silt. Overhead cover consisted of undercut banks, overhanging vegetation, and ledges. In-stream cover consisted of inundated vegetation and interstitial spaces between coarse substrates, with some streams containing areas of emergent and/or submergent vegetation, and cover associated with areas of depth, turbulence, and/or turbidity. Many of the larger stream systems in the mine site LAA support Arctic grayling spawning runs, as well as other fish species that move into the streams during the open water period to forage, or to escape predatory fish in the deep over-wintering lakes.

7.3.6 Fish

Lakes - Results of the fish surveys completed in the Kiggavik mine site LAA indicate that the fish community assemblages of Project area lakes are typical of those described for subarctic region lakes. The most widely distributed fish species captured in mine site LAA lakes was Arctic grayling, which were captured in more than 70% of the 35 sampled lakes. Other commonly identified fish species included burbot, cisco, lake trout, ninespine stickleback, round whitefish and slimy sculpin. An additional four species were captured only in Baker Lake; Arctic char, fourhorn sculpin, lake whitefish and longnose sucker.

Streams - Commonly observed fish species in mine site LAA streams and at proposed stream crossings in the site access LAA included Arctic grayling, lake trout, ninespine stickleback, and slimy sculpin. Burbot, cisco, lake whitefish and round whitefish were also captured in a smaller number of streams, while Arctic char and longnose sucker were captured only in the Thelon River. Stream width and proximity to over wintering lakes appeared to influence the distribution of fish species in Project area streams. The diversity of fish species in streams is highest close to over-wintering lakes, and decreases in the upper reaches of the watershed (unless a deep, over-wintering lake exists in the headwaters of a drainage system). Large-bodied fish species including Arctic grayling and lake trout were usually found in streams with bankfull widths of approximately 3 m or more, while ninespine stickleback and slimy sculpin were present in streams greater than 2 m wide.

7.3.7 Species at Risk

There were no aquatic *Species at Risk Act* (SARA) or Committee on the Status of Endangered Wildlife in Canada (COSEWIC) listed fish species identified within the mine site or mine access Local Assessment Areas.

7.4 Terrestrial Environment

7.4.1 Topography, Landforms, Surficial Geology and Permafrost

Topography - The Kiggavik Project area consists of vast treeless plains and is dominated by flat lying or gently sloping terrain with rolling and hummocky topography, frequent bedrock outcrops, and a few low escarpments. Elevation ranges from sea level at the proposed Baker Lake docking facility to as high as 140 m above sea level (asl) near Pointer Lake, 265 m asl at the peak of the hill northeast of the proposed site for the accommodation complex and up to 215 m asl in the Sissons area at the peak of the hill northeast of End Grid.

Landforms - The general trend of glacial landforms is from the north-northwest to the south-southeast. The most common landforms within the LAA are morainal. Eskers are rare, isolated topographic features, but three esker related landforms have been identified within the LAA. A number of glacial landforms and those influenced by permafrost are characterized by patterned ground and periglacial processes observed at or around the Kiggavik and Sissons mine sites including frost wedging, frost shattering, thaw subsidence, and solifluction.

Surficial Geology - Surficial deposits in the LAA consist of a thin organic layer underlain by mainly glacial till, which varies in texture and composition. Lower elevations towards Baker Lake are partly covered by marine, glaciomarine and lacustrine deposits, with fine-grained marine sediments confined to low-lying areas that are often rich in ground-ice. Glacial deposits, particularly till veneer and till blanket, are the most common and widespread surficial deposits in the proposed dock site area. The surficial deposits along the Northern All Weather Access Road and the north shore of the Baker Lake comprise mainly glacial till overlying Precambrian intrusive igneous and metamorphic bedrock.

Permafrost - The Project area is located within continuous permafrost. Thickness of active layer (also known as thaw depth) is highly variable, ranging from 1 to 2 m in surficial sediments to 5 m in bedrock outcrops. The ground-ice content of permafrost soil and rock in the Project area is expected to be less than 10% (Brown et al. 1998). However, lowland areas can contain higher ground-ice content locally, which is characterized by poorly drained conditions and other pereglacial processes.

7.4.2 Soils

Soils consist mainly of a shallow organic veneer overlying fine to coarse textured glacial till blankets that vary in thickness from less than 1 m on bedrock ridges to more than 4 m in depressions. The average depth of topsoil available for reclamation salvage (organic layers plus organic enriched mineral soil, or A horizon) is approximately 11 cm, with a minimum of 2 cm in upland lichen tundra, heath upland and heath tundra areas, and a maximum of 31 cm in low-lying wet graminoid and graminoid tundra areas with thick peats. Approximately 54 percent of the topsoil depth in any given area is peat organic material. The till-derived mineral fraction of the soils is medium textured, with coarse fragment size typically ranging from gravel to cobble. Coarse fragment content is typically low at the surface and increases with depth.

Three soil samples collected from the Kiggavik lease area had elevated trace element concentrations relative to the CCME industrial soil guidelines; one soil sample had an elevated arsenic concentration, and two samples had elevated molybdenum concentrations. Four out of the five peat samples collected from the Kiggavik lease area had elevated concentrations of boron relative to the industrial soil guidelines. None of the samples from the Sissons lease area had elevated trace element concentrations. No sample locations within the Kiggavik or Sissons lease areas had elevated concentrations of radionuclides.

7.4.3 Vegetation

The Project area is dominated by tundra vegetation interspersed with lichen-dominated bedrock outcroppings and boulder fields. Tundra vegetation is continuously underlain by permafrost and characterized by short shrubs such as dwarf birch, willows and heath species, as well as sedges and grasses, herbs, mosses and lichens. An ecological classification scheme containing 15 ecological land classifications (ELC) map units were identified within the LAAs and RAA.

Wetlands (including all waterbodies and watercourses) were identified within the RAA using the Wet Graminoid ELC map unit to identify areas with wetland vegetation assumed to be waterlogged throughout the year. Approximately 20.5% (9,205 ha) of the mine LAA consists of wetlands, compared to 32.8% (322,287 ha) of the RAA.

IQ studies indicate that certain plant species have particular value to Inuit for food, medicine, shelter and other human uses. The most commonly mentioned plant species valued by during engagement and IQ sessions include black berries, cloudberries, blueberries, and cowberries. Eleven of the fifteen ELC map units identified contain these species.

7.4.4 Terrestrial Wildlife and Habitat

The terrestrial environment is used by caribou, muskox, large predators, small mammals and upland birds. The extensive water and wetland features across the landscape provide habitat for various species of waterbirds. Engagement, IQ and regulatory meetings identified caribou as the most valued terrestrial wildlife species in the region.

Caribou herds seasonally range in or near the RAA. Knowledge of seasonal occurrence of caribou herds in the RAA is based on local knowledge, regional surveys conducted since the late 1940s, land use studies, data from caribou collaring programs, and Project-specific surveys conducted in 1979 and 1980, and as part of the current baseline program beginning in 2007. The five caribou herds identified in Nunavut's mainland region are the Beverly, Ahiak, Wager Bay, Lorillard, and Qamanirjuaq herds. All of these herds are known to occur within the Kiggavik RAA, although at different frequencies and seasons depending on their herd ranges. The analysis of the telemetry data used to delineate ranges assigned each collared animal to a herd based on the calving area it returns to on a yearly basis. Nagy et al. (2011) and Campbell et al (2012) consider the Ahiak, Wager Bay, and Lorillard herds as part of a tundra-wintering barren-ground caribou herd.

All caribou herds near the Kiggavik RAA show variation in movements and habitat use among years. Mapping of caribou movement to their calving and wintering grounds during the migratory seasons incorporated government data, Project data, and current and older sources of IQ. The resulting maps showed that caribou movement in the region is well documented. The information sources are complementary. The mapped IQ highlights the variation in caribou movement. Generally, animals from the tundra-wintering herds are present during the winter months, and summer and calve north and east of the RAA. During the spring migration, individuals of the Beverly/Ahiak and resident herds may be present, but herd numbers are generally low. In summer, very few caribou are present within the RAA and calving has not been documented. During the post-calving period and summer dispersal period, moderate numbers of Qamanirjuaq and possibly Beverly/Ahiak animals move through the area on their way to wintering areas. Later in the fall, caribou from the tundra winter herds return to the Kiggavik RAA and broader surrounding area.

Caribou need extensive space to undertake traditional movements, presumably, as a strategy to minimize predation, exploit seasonal habitats and avoid deep snow. The RAA was divided into Ecological Land Classification (ELC) units that are recognizably different in vegetation content and geographic features. Caribou generally feed on lichen during winters, and fresh shrubs (leaves and stems) and graminoids during the growing season; therefore, habitat that contains these features is of higher value to caribou in the appropriate season.

During the growing season, there is a roughly equal amount of High, Moderate and Low quality habitat distributed throughout the RAA. Most of the High quality habitat in the growing season is found in southern portions of the Kiggavik RAA, corresponding with the distribution of post-calving aggregations of caribou in 2009 and 2010. In winter, the distribution of most moderate quality habitat corresponds with the distribution of collared caribou in the northwestern portion of the Kiggavik RAA in the winters of 2009 and 2010.

Based on previous land use studies, most of the Kiggavik RAA was identified as a hunting area in the past. More recent harvest location statistics collected as part of the Nunavut Wildlife Harvest and the ongoing AREVA/AEM Hunter Harvest Study (HHS) indicate that relatively few caribou have been harvested by residents of Baker Lake west of the Thelon River in the last decade.

Muskox occupy the region year-round.

Large predatory species, including grizzly bear, wolverine and wolf, are present throughout the Kiggavik RAA but are observed infrequently. Smaller predatory species, such as Arctic fox and ermine, are also present with Arctic foxes seen as relatively common in the region. Small mammals such as voles, lemmings and ground squirrels are widespread.

Waterfowl, shorebirds, jaegers, raptors and upland birds annually migrate from southern wintering grounds to breed in the region during the summer. Only ptarmigan, gyrfalcon and common raven are residents throughout the year; they are scattered throughout the region and present in relatively small numbers. Several raptor species occur including the bald eagle, gyrfalcon, northern harrier, peregrine falcon, rough-legged hawk, short-eared owl and the snowy owl. The most common waterbird species are Canada goose, semipalmated sandpiper and long-tailed duck. During the spring and fall migration large flocks of Canada and snow geese migrate through the RAA.

7.4.5 Species at Risk

***Species at Risk Act* Schedule Listings** - There are no Schedule 1, 2 or 3 plant species or Schedule 1 or Schedule 2 wildlife species listed under the *SARA* known to occur within the Project's assessment area. Two Schedule 3 species are known to occur within the RAA. The peregrine falcon (*Falco peregrinus*) and short-eared owl (*Asio flammeus*) are listed as 'Special Concern' under Schedule 3. Both of these species are also listed as 'Special Concern' by the COSEWIC. The Canadian Endangered Species Conservation Council (CESCC) lists the peregrine falcon as 'Secure' in Nunavut and the short-eared owl as 'Sensitive' in Nunavut. Peregrine falcons are known to nest within the RAA and the short-eared owl was observed within the RAA during 2008 to 2010.

Other Listings - Two plant species considered rare in Nunavut (classified as “May be at Risk”) were found during 1991 surveys by Geomatics International Ltd (CESCC 2006). These include spear-leaf stonecrop which was found approximately 25 km north of the RAA, and russet buffaloberry, for which location data are unavailable. Spear-leaf stonecrop is new to Nunavut, with no other verified observations (Catling et al. 2008). Russet buffaloberry is known from two other locations in continental Nunavut (Cody et al. 2003; Cody and Reading 2005).

Wolverine and grizzly bear are listed as ‘Special Concern’ by COSEWIC. Within Nunavut the wolverine is listed as ‘Secure’ by the CESCC and the grizzly bear is listed as ‘Sensitive’ within Nunavut. Both are observed infrequently within the RAA.

7.5 Marine Environment

7.5.1 Physical Oceanography

Chesterfield Narrows drains Baker Lake and empties into Chesterfield Inlet. A 200 km, salt-water tidal corridor, Chesterfield Inlet joins Hudson Bay with Baker Lake. Chesterfield Inlet experiences large semi-diurnal tides, which ranged in 2007 from 1.0 to 4.0 m (Government of Canada 2010). Northern coastal areas and estuaries in the vicinity of Chesterfield Inlet are characterized by clear waters and deep euphotic zones[8] that permit extensive growth of macroalgae (Schneider-Vieira *et al.* 1993).

7.5.2 Ice Cover, Sea Currents and Circulation

Experiencing a full cryogenic cycle, ice generally starts to form in Hudson Bay in late October and the bay usually becomes ice free in early August. The closest survey stations to Chesterfield Inlet recording ice freeze-up and breakup experienced mean freeze-up on November 14 and breakup on July 9. Ice breakup in northwestern Hudson Bay is marginally earlier than that experienced further south in western Hudson Bay due to ice removal by strong prevailing northwesterly winds and ocean currents (Saucier *et al.* 2004; Gagnon and Gough 2005).

In accordance with the cyclonic circulation pattern in western Hudson Bay, monthly mean currents are generally to the south and east (Prinsenberg 1987; Saucier *et al.* 2004). Barotropic, semidiurnal currents, up to 28 cm s^{-1} in amplitude, represent the majority of observable currents in the area. The presence of sea ice in western Hudson Bay, typically between November and July, causes a decrease in the heights and amplitudes of tidal currents, and an advance in their arrival when compared to open water (ice-free) conditions. Storm-driven, clockwise flowing, inertial currents may be as strong as tidal currents but are typically absent during the ice-covered season.

[8] The part of the near-surface body of an ocean or lake that receives enough sunlight for photosynthesis to be possible.

7.5.3 Marine Phytoplankton, Ice Algae, Zooplankton and Invertebrates

Phytoplankton are photosynthesizing microscopic organisms typically abundant in the euphotic zone and form the basis for the vast majority of marine food webs. Phytoplankton are grazed on by zooplankton and benthic invertebrates, which in turn are consumed by fish and larger predators. Despite relatively low primary productivity compared with that of more temperate waters, the Hudson Bay-James Bay system has a diverse microalgal community, comprising of over 495 taxa (Roff and Legendre 1986). Assemblages of phytoplankton found in Hudson Bay, comprising primarily of marine diatoms and dinoflagellates, are reported to not differ significantly in species composition from those identified in Arctic and North Atlantic waters. From marine water sampled from the plume at the mouth of Chesterfield Inlet, the most common species of dinoflagellates were *Massartia rotundata*, *Peridinium pallidum* and *Peridinium pellucidum* (Anderson 1979; Anderson *et al.* 1981).

Ice Algae - During spring, the bottom 1 to 5 cm of sea ice is typically colonized by dense populations of ice algae. Ice algal biomass below first-year sea ice can be predicted for much of the Arctic based on cumulative surface light and snow depth with biomass negatively associated with snow depth at any given date or location and reaching a maximum of approximately 170 mg Chl m^{-2} in thin ice over deep water (Welch *et al.* 1991).

Zooplankton are heterotrophic organisms ranging in size from microscopic, single-celled protozoa to large, multicellular metazoans. Typically, zooplankton are found in the surface waters where there is an abundance of phytoplankton and other zooplankton.

Invertebrates - Limited information is available on the occurrence and abundance of marine invertebrates in Hudson Bay and much about their ecology, abundance and distribution is still unknown. Invertebrates characterizing the pelagic zone are comb jellies, arrow worms, copepods and amphipods, euphausiids, and pelagic sea butterflies (Stewart and Lockhart 2005).

7.5.4 Marine and Anadromous Fish

Arctic cod, Arctic sculpin, Arctic char, fourhorn sculpin, banded gunnel, and whitefish use sand and boulder benthic habitats around the mouth of Chesterfield Inlet. Arctic char typically migrate into Chesterfield Inlet in the first weeks of July when the ice has cleared (Nunami Jacques Whitford Limited 2008). Capelin and starry flounder are abundant nearshore species in Hudson Bay. Starry flounder occasionally enter river mouths where they are believed to spawn during the winter months (Percy et al. 1985). Capelin spawn inshore during the summer months (Scott and Scott 1988). Fourhorn sculpin are abundant in shallow waters (below 45 m) throughout Nunavut and are often associated with brackish waters of river mouths (Coad and Reist 2004).

Greenland halibut and Arctic cod are abundant offshore marine fish species in Hudson Bay (Coad and Reist 2004). Arctic cod are found mainly in the upper part of the water column over deep water, and are often associated with drifting pack ice where they spawn in winter (Bradstreet et al. 1986).

7.5.5 Marine Birds

The most common species of waterbirds observed in the Baker Lake and Chesterfield Inlet area are Canada goose, long-tailed duck and common loon (Höhn 1969). Red-throated, Arctic and yellow-billed loons, and tundra swans have also been observed in the area (Höhn 1969).

There are no Important Bird Areas (IBA), as identified by Bird Studies Canada, Nature Canada and BirdLife International through the IBA Program, within the marine LAA.

Additional Parks Canada has identified key areas in Nunavut as part of an International Biological Program (IBP) (Nettleship and Smith 1975). These areas have been selected because they represent a diverse community. Six of these IBP sites occur along the Hudson Strait shipping route (Hantzsch Island, Button Islands, Akpatok Island, Digges Sound, Coats Island and Boas River) and one site is located south of Arviat (McConnell River). These IBP areas are identified as sensitive habitat. Many of the areas identified as important habitat by different agencies (including IBA, Migratory Bird Sanctuaries (MBS), and key migratory bird habitat sites) are overlapping or identical areas.

7.5.6 Marine Mammals

Mammals from each of the major marine taxonomic groups are present in the marine RAA. Representatives from these groups include Polar bear, beluga whales, and ringed seals. Walrus, bowhead whales and bearded seals are common in other locations throughout Hudson Bay, Hudson Strait or Foxe Basin but are considered rare or uncommon in the LAA.

7.5.7 Species at Risk

Species at Risk Act Schedule Listings - There are three marine fish species in the marine RAA listed under Schedule 1 or Schedule 2 of SARA. The Northern, Atlantic, and spotted wolffish are listed on Schedule 1 of SARA; however, Hudson Strait is designated as 'probable' range. There is currently limited information on the distribution, habitat use and abundance of these wolffish populations in the RAA.

Ross's gull is known to breed and use coastal habitat in southwest Hudson Bay and is listed in Schedule 1 of SARA and nationally designated as Threatened by COSEWIC. Ross's gull are more commonly seen in the Churchill area than anywhere else in Canada (COSEWIC 2007). The last observation of Ross's gull in the Churchill area was four individuals in 2005 (COSEWIC 2007).

Additionally, two Schedule 3 listed bird species potentially occur in Hudson Strait: the Harlequin duck and Peregrine falcon. The distribution range of the Peregrine falcon has a northern limit of the southern coast of the Hudson Strait and has a low likelihood of occurring in the Strait. While the range of the Harlequin duck includes the northern coast of the Hudson Strait, it is the northern edge of their distribution range.

Other Listings - Arctic char, fourhorn sculpin and whitefish are listed under the International Union for Conservation of Nature (IUCN) red list as species of least concern. The king eider is given special designation by the Government of Nunavut and ranked as ‘Sensitive’ in Nunavut by CESCC. Under COSEWIC, the Western Hudson Bay population of beluga whale and polar bear are designated as species of ‘Special Concern’.

7.6 Human Health

Regardless of where people live or work, they are exposed to radiation from natural sources; it is present in the air we breathe, the food we eat, the water we drink, and in the construction materials used to build our homes. In Canada, natural background radiation ranges from about 1,300 to 21,000 μSv/year. It comes from outer space (cosmic), the ground (terrestrial), radionuclides in the body from air, water and food (internal) and exposure to radon. Figure 7.6-1 shows the exposure to radiation to some of the common sources of naturally occurring radiation for those living in Canada (AECB 1995). An additional source of radiation to some individuals is through diagnostic medical procedures.

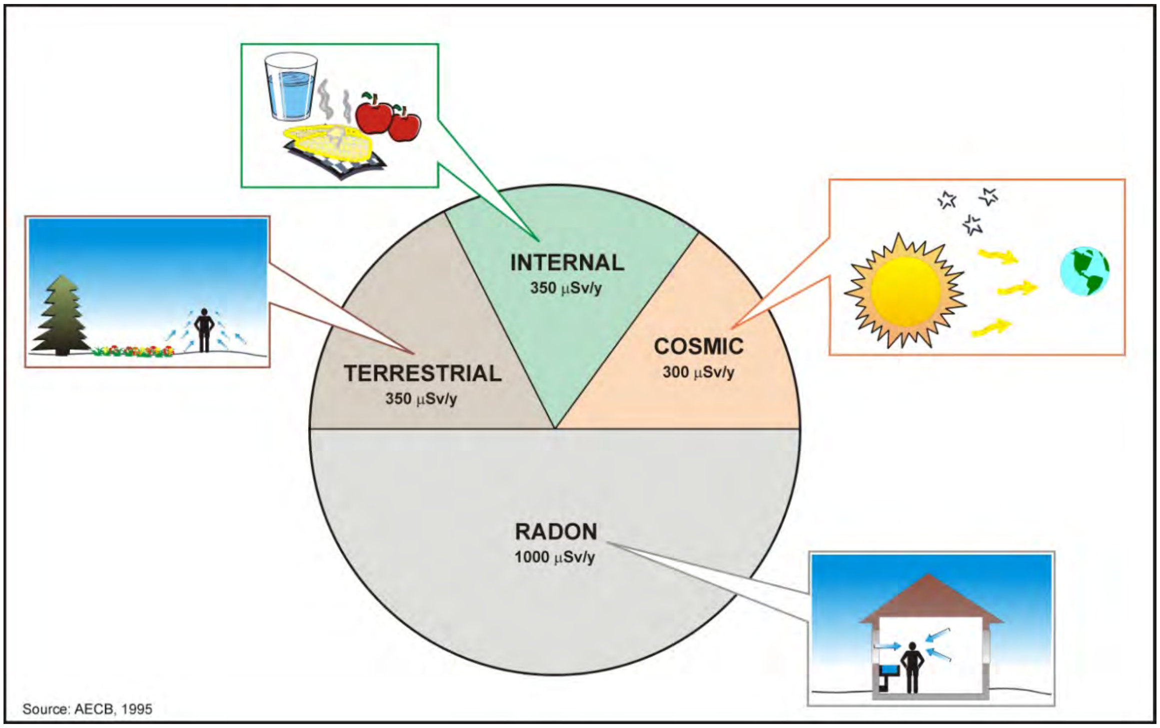

Figure 7.6-1 Typical Distribution of Annual Dose from Natural Radiation

Levels of natural or background radiation can vary greatly from one location to the next. For example, due to consumption of caribou, the internal dose for people currently living in the Project area is likely higher than that shown above. Ingestion of caribou in northern Canada has been shown to add 1 to 4 mSv/y of internal exposure for an adult, primarily due to the natural elevated background levels of Po-210 (Thomas et al. 2001).

People are also exposed to the other COPC (arsenic, cadmium, cobalt, copper, lead, molybdenum, nickel, selenium, uranium and zinc) through air, water, soil and food.

7.7 Socio-Economic Environment

7.7.1 Nunavut Economy

Nunavut's economy and people have unique characteristics including i) the importance of the mixed economy; ii) a requirement to use renewable and non-renewable resources in sustainable ways that benefit Inuit; iii) the value of IQ to economic and social development decision making; iv) decentralization to give communities control of their own development; v) a need to develop self-reliance in face of overdependence on federal transfers; and vi) a very young and rapidly growing population with important socio-economic challenges.

Nunavut's economic development plans focus on the economic sectors that can provide the most growth and employment, without harming the environment. These sectors are mining, tourism and commercial fishing. To achieve growth in these sectors, investments are needed in education, small business development, transportation, energy and telecommunications.

Nunavut's mixed economy has both wage and land based components. The wage based economy provides cash income. The land based economy provides food and materials, but also important social and cultural benefits to Inuit. Most people try to be active in both the wage and land based parts of the economy. The wage based part of Nunavut's economy has been growing, however not as quickly as needed to provide enough jobs. The land based component is growing slower still. Constraints include the high cost of travel on the land, less harvesting by the young, poor markets for animal pelts and climate change.

Unemployment rates have been rising. The unemployment rate in Nunavut was about 19% in July 2011, but for young people it was almost 40%. Most of the unemployed are young Inuit men. Jobs will need to be created faster than in the recent past to reduce unemployment rates as more individuals in this growing population reach working age. The GN expects that mining will bring more economic growth and wage employment over the coming decade than any other sector. Nunavut is rich in mineral resources, there are large mining projects undergoing environmental assessments for development (Meliadine, Mary River recently completed an EA, and Kiggavik) and exploration interest is very high.

7.7.2 Kivalliq Economy

The Kivalliq Region has an approved land use plan and recognition of the mining sector as having the best potential for economic development is consistent with the GN message for the territories economic development. The plan sets out conditions for mining, indicating that mining projects should cause no environmental damages and that benefits of mining should go to Kivalliq communities and people. The Kivalliq land use plan also states that people in the Kivalliq value employment opportunities for youth.

Activity on the land provides food, clothing and arts and crafts materials but it is also very important to maintaining Inuit culture. Very few people hunt full time or almost full time anymore but most people continue to go out on the land. The importance of harvesting to Kivalliq households is demonstrated by country food substituting for about half of what total food costs would be if all food was bought in stores. The practice of harvesting also confirms identity, social relations, values and knowledge.

7.7.3 Kivalliq Social Context

The Kivalliq **population** grew from 7,944 to 9,479 people between 2001 and 2009, an average growth of close to 2% per year. The population in 2013 was 10,266, an average growth of 2.4% from 2007 to 2013. From 2007 to 2013 all Kivalliq communities experienced some population growth with Repulse Bay and Whale Cove experiencing the highest population increase percentages and Chesterfield Inlet and Rankin Inlet the lowest.

The most complete information on **education** is from 2006 showing that less than 40% of adults have completed high school. On average, younger people are less educated than older people. The problem of not finishing high school is particularly common with males but there are some very recent signs that this may be changing. In the Kivalliq there were twice as many high school graduates in 2010 than there were in 1999. Most high school principals believe up to half of their students will graduate over the coming years.

People in the Kivalliq feel better about their **health** than people do in Nunavut as a whole but they also feel that their health has declined recently despite more frequent visits to health professionals. Flu and respiratory problems are the most common health issues in the region. Infectious disease outbreaks are frequent, mostly because of overcrowding and shortages of water. Sexually transmitted infection rates are high. Health care workers are seeing more instances of diabetes and low blood iron, both of which are attributed to reduced activity on the land and eating less country food. Nunavut has the highest smoking rates among the Canadian provinces and territories and correspondingly, has the highest lung cancer incidence. Health workers say it is hard for them to diagnose psychological problems, including suicidal intentions and other mental illnesses, and that these are important health problems. Smoking, alcohol and drug abuse and uncontrolled gambling are also problems.

The maintenance of **traditional culture** is a very important component of people's wellbeing. Traditional culture gives people identity and protects more vulnerable people by providing food and other assistance as family and community ties are maintained through sharing of country food. Traditional celebrations demonstrate recognition and emotional support for people's achievements. Activity on the land keeps skills alive and reinforces Inuit values of environmental protection, cooperation, resourcefulness and providing for others.

It has been hard for some people to adjust as a **new culture**, with different values, has come in. What is expected by employers of people doing work for wages and what is expected of people in Inuit culture can cause some conflict. Some people may feel that their social obligations interfere with their goals for advancing in the new economic environment. People also speak about the misunderstanding between generations that has come with the introduction of southern people's values and material goods. Some elders feel that traditional culture is losing strength in the young. Most of the young say that they are close to their families, respect their elders and respect their culture. But some also say that traditional skills and values are not as useful now as elders seem to think they are. Traditional life also meant people had clear gender roles. Men find it hard now to provide for their families if they don't have work or money to go on the land. It may be easier for women, who still have and take care of children. Inuit no longer live on the land and the culture has changed. Everybody knows this and most people are focused on how to manage change.

People have maintained their **language** over the last decade with a strong commitment to Inuktitut. Most people feel they speak Inuktitut well but they note many children are using English more now than they did in the past.

The Kivalliq has lower **crime** rates than Nunavut as a whole but rates are still much higher than in the rest of Canada. People in communities say that the smaller and more traditional communities have less crime than Arviat, Baker Lake and Rankin Inlet. Poverty and substance abuse are important factors in high crime rates but it is likely that cultural change is also part of the explanation.

Housing is an ongoing problem in all of Nunavut, but is worse in most Kivalliq communities. More than half of houses are overcrowded or in need of major repairs. Poor housing has negative effects on health, on the way family members get along and on children's school work. About 40% of people in the Kivalliq say they would move if they could. This high demand for housing will continue to increase as the young population grows older possibly deciding they want to live in their own houses rather than with their families.

Numbers on **employment** in Kivalliq communities are out of date and do not describe the employment changes that have come with the Meadowbank mine. In 2006, Kivalliq unemployment rates were worse than the rest of Nunavut and much worse than Canada. The numbers show that some people in the Kivalliq had become so discouraged that they were not looking for work. Women's unemployment rates were lower than men's. Most jobs were with government or in retail stores. Since 2006 many new jobs for Kivalliq people became available with the development of Meadowbank, exploration companies and businesses supplying mining companies. People believe that unemployment rates have gone down, particularly in Baker Lake.

7.7.4 Heritage Resources

Archaeological Sites - Fieldwork studies have documented 373 archaeology sites within the ARSA. Of these, 28A occur within the LSA. Given the extensive geographic extent of the proposed road corridors, the majority of known sites are found within these Project areas. Archaeological sites most often consist of surface features such as tent outlines, caches, hunting blinds, inuksuit, and kayak stands. However, Precontact lithic scatters resulting from stone tool production are also common. Table 7.7-1 provides a summary of the known sites as they relate to each Project component.

Table 7.7-1 Documented Archaeology Sites in Local Study Area

Project Component	Archaeology sites in LAA
All-Season Access Road	18
Winter Access Road	1
Kiggavik Site	4
Sisson Site	0
Airstrips	0
Kiggavik - Sissons Access Road	4
Dock	1
Total	28

Four small sites (LcLe-19, 20, 21, 22) were recorded in the Kiggavik Mine site (Table 7.7-2). As these four sites would be impacted by the proposed Kiggavik Mine, an assessment was carried out in 2009 to determine the significance of each site. These sites were assigned low significance and no additional archaeological was recommended at these locations. Additional detail is found in Volume 9 and Appendix 9B.

Table 7.7-2 Archaeology sites in Kiggavik Site Local Study Area

Borden No.	Permit/Year Recorded	Site Type	Feature/Artifact Description	Significance
LcLe-19	2007-015A	Lookout	stone feature (marker)	low
LcLe-20	2007-015A	Lookout	stone feature (marker)	low
LcLe-21	2007-015A	Hunting	Cache	low
LcLe-22	2007-015A	Lookout	stone feature (marker)	low

8 Residual Effects

The Kiggavik Project has the potential to impact the biophysical and human environments throughout all phases of Project life, including the construction, operation, decommissioning, and post-decommissioning periods. All potential Project-environment interactions were systematically identified using interaction matrices (Appendix 1D). Interactions were then screened into two categories: 1) Common, well understood interactions for which proven mitigation would result in no effect or a minimal effect. These interactions are addressed briefly in Volumes 4 to 9 in order to focus the assessment on those interactions with the greatest potential to result in an impact. 2) Interactions that could potentially affect measurable changes to the environment and/or those interactions identified by the public as being of considerable concern. The potential for environmental change remains after mitigation is applied so the effects resulting from these Project-environment interactions are referred to as residual effects. These interactions and residual effects are assessed in detail in Volumes 4 to 9.

Only residual effects are presented within this section. For each discipline this section describes 1) potential effects including the Project-environment interaction and the Project phase the effect will occur, 2) Project design features and mitigation measures that will be implemented to minimize the effect, 3) description of the residual effect and its significance, and 4) monitoring. Tables summarizing all residual effects and the criteria used for determination of significance is provided in Appendix 1D.

Possible cumulative and transboundary effects are discussed for the Project following the description of residual effects for the atmospheric, aquatic, terrestrial, marine, human and socioeconomic environments.

For detailed assessments please refer to:

- Volume 4 – Atmospheric Environment
- Volume 5 – Aquatic Environment
- Volume 6 – Terrestrial Environment
- Volume 7 – Marine Environment
- Volume 8 – Human Health
- Volume 9 – Socio-Economic Environment and Community

8.1 Atmospheric Environment

8.1.1 Climate – Greenhouse Gas Emissions

Issues and Effects - During the construction, operation and final closure phases of the Project, activities will occur which have the potential to generate greenhouse gas emissions (GHGs) and therefore also have the potential to affect the climate.

Construction, open pit and underground mining, power generation, general or supporting services, transportation, and closure activities will result in increased concentrations of greenhouse gases due to fuel consumption from heavy-duty equipment operation at both the mine and at the Baker Lake dock and storage facility, vehicular transport along mine roads and access roads, power generation and marine vessel transport.

Project Design and Mitigation

General Mitigation - In order to reduce greenhouse gas emissions, energy efficient and emissions minimization features will be incorporated into building design and in the operation of equipment and ancillary facilities. Standard operating procedures for use of equipment and machinery will be employed and regular maintenance on equipment/machinery will be performed in accordance with good engineering practices or as recommended by suppliers so the equipment is kept in good operating condition (i.e., effective fuel combustion).

Activity-Specific Mitigation - Reductions in greenhouse gas emissions will come from optimization and management of heavy equipment operation, vehicles and marine vessels. Where available, diesel-powered equipment/machinery meeting US EPA Tier 4 emissions standards will be used. The number of heavy equipment/vehicle movements will be optimized and travel distances minimized. Number of barge shipments and off-loading activities will be minimized.

Residual Project Effects - There are no specific climate thresholds or criteria that define whether an effect is expected to occur so potential effects on the climate are assessed quantitatively through comparison of Project-related emissions of greenhouse gases to total federal and provincial/territorial GHG emission levels.

It is estimated that during the Project's peak or maximum production year, fuel usage will be about 65 million L annually. The resulting estimate of maximum annual GHG emissions based on this level of fuel consumption is 181 tonnes of CO_2-equivalent. On an annual basis, this represents a 25% increase in the baseline GHG emissions for Nunavut and a 0.02% increase in the baseline GHG emissions for Canada.

It is expected that the Project will noticeably contribute to Nunavut's overall GHG emissions total. The percent increase in baseline GHG emissions for Nunavut is partly due to the absence of major industry in Nunavut, with the exception of the operating Meadowbank mine. It is also expected that other proposed projects will become operational after the Project operations commence, therefore, the contribution to Nunavut GHG emissions will likely be a smaller fraction relative to the total emissions.

8.1.2 Air Quality

Issues and Effects - During each Project phase activities will occur that have the potential to increase ambient air concentrations of contaminants of potential concern (COPCs) within the local and regional environments. Dust, metals, gaseous compounds and radionuclides will be released during the following Project activities:

- Construction activities: dust generating activities may include land clearing, excavating, material handling and the construction of mine infrastructure such as the mill, dust from quarry activities and fuel combustion;
- Operation activities: drilling and blasting, ore and mine rock handling, stockpile and road maintenance (i.e., dozing and grading), wind erosion of stockpiles, fuel combustion, vehicular traffic along the access roads and milling operations;
- Final closure activities: backfilling Type 3 mine rock, closure of the TMFs and fuel combustion; and
- Post-closure activities: radon emissions from the remaining permanent Type 2 mine rock stockpiles and closed TMFs.

Project Design and Mitigation

Project Design - Dispersion modeling studies were used to inform design-based mitigation. Several focused dispersion modeling studies were conducted to examine the potential effect(s) of alternate locations of several Project facilities including the acid plant, power plant, storage piles and accommodation complex. The locations utilized in the air dispersion assessment (Appendix 4B) reflect the outcome of these studies where the potential impacts to air quality have been minimized.

General Mitigation - Standard operating procedures for the use of equipment and machinery will be developed and followed and regular maintenance will be performed on equipment and machinery in accordance with good engineering practices or as recommended by suppliers so the equipment is kept in good operating condition.

Activity-Specific Mitigation - When available, heavy equipment, vehicles and marine vessels will be equipped with exhaust emissions controls. Shipments, offloading activities, number of equipment and vehicle movements and distances will be minimized where possible. The Canada-wide diesel fuel sulphur content standard of 15 ppm for off-road engines will be met.

In order to minimize dust resulting from unpaved road (including pit ramps) transportation, speed limits will be considered and enforced, water or another approved dust suppressant will be applied on mine site roads when/where possible and road surfaces will be maintained with grading or other maintenance practices to minimize the amount of silt (i.e., fine particles) present in the roadbed material. AREVA will also develop a community complaint/response procedure(s) to ensure community concerns are considered and appropriately addressed.

In order to reduce NO_2 and particulate matter emissions, blasting will be performed to minimize the number of charges per day and the use of ammonium nitrate-fuel oil (ANFO) will be optimized/minimized.

Appropriate air pollution controls will be installed on the exhaust stacks of the mill complex and acid plant. Tailings management will include release to the TMFs as a slurry below a water surface to avoid dust emissions and the release of radon.

Permanent mine rock stockpiles will be re-graded to encourage growth of vegetation and suppress the release of dust emissions.

Residual Project Effects - All predicted residual effects resulting from the Project are not expected to extend beyond the LAA, and are reversible. Therefore, the increased concentrations of COPCs are assessed as not significant.

Monitoring - Ambient air monitoring programs will be developed for the Project. Monitoring will include soils and vegetation (including lichen) and COPCs such as TSP, PM_{10}, $PM_{2.5}$, NO_2, and metals and radionuclides.

8.1.3 Noise

Issues and Effects - Project activities will increase noise levels that may generate human health effects in the residential areas of Baker Lake and at semi-permanent hunting camps in the vicinity of the mine. Potential human health effects include increased annoyance and sleep disturbance. Effects of noise on human health are assessed by determining the predicted sound pressure levels from Project activities.

Resource exploration, extraction, processing and transportation activities associated with the Project have the potential to affect ambient noise levels.

Project Design and Mitigation - There are no predicted human health effects associated with Project-generated noise. As such, no specific noise mitigation measures are recommended at this time but the following general mitigation measures will be considered in order to reduce construction and operation noise at the source. Given the potential community disturbance aspect of noise the development of a community complaint/response procedure to address noise concerns will be considered basic mitigation. Construction and operation noise will be reduced at the source through the consideration of equipment selection, use and maintenance, the phasing and/or scheduling of high noise potential activities and use of intake (if appropriate) and exhaust silencers (e.g. mufflers).

Residual Project Effects -.Noise levels are expected to be low, with the exception of some short term construction activities. In all cases, the overall predicted noise levels are below the Project effects criteria of 50 dBA daytime and 45 dBA nighttime (Health and Welfare Canada 1989; WHO 1999), and in many cases they are below the threshold of perception. The predicted change in community annoyance (percent highly annoyed) was also well below the 6.5% criteria (Michaud 2008) at all sensitive receptors evaluated and was considered negligible during all phases of the Project. The predicted ground-borne noise levels from blasting were below Project effects criteria of 120 dB (OMOE 1996). The predicted increase in noise is assessed as not significant.

Monitoring - Given that noise effects are considered low to moderate and would not generate a human health effect, no specific noise monitoring programs are recommended at this time. If the community raises any specific noise concerns the need for a noise monitoring program will be reassessed. Noise effects will be monitored using a complaints/response procedure.

8.1.4 Vibration

Issues and Effects - Resource exploration, extraction, processing and transportation activities associated with the Project have the potential to affect ambient vibration levels. Vibrations from Project activities have the potential to generate human health effects in the residential areas of Baker Lake and at semi-permanent hunting camps in the vicinity of the mine. Potential human health effects include changes in annoyance and sleep disturbance.

The measurable parameters used to assess Project effects from increased vibration levels include peak particle velocity levels, change in community annoyance, and sleep disturbance.

Project Design and Mitigation - Given the community disturbance aspect of vibration the development of a community complaint/response procedure to address vibration concerns will be considered basic mitigation. Construction and operation vibration will be reduced at the source through the consideration of equipment selection, use and maintenance, the phasing and/or scheduling of high vibration potential activities, and distancing activities with the potential to generate excess vibration from sensitive receptors as reasonable.

Residual Project Effects - Vibration levels are expected to be negligible during all phases of the Project. In all cases, the overall predicted vibration levels are well below the Project effects criteria and are below the threshold of perception at all receptor locations. The predicted residual vibration effects are assessed as not significant.

Monitoring - Given that vibration effects are considered negligible and would not generate a human health effect, no specific vibration monitoring programs are recommended at this time. Vibration effects will be monitored using a complaints/response procedure. If the community raises any specific vibration concerns the need for a vibration monitoring program will be reassessed.

8.2 Aquatic Environment

8.2.1 Surface Hydrology

Issues and Effects - Surface hydrology has the potential to be effected from a variety of Project activities during construction and operation. Site clearing and pad construction will require some pond dewatering during construction that may affect the surface hydrology of the receiving environment. The construction of the Andrew Lake pit requires that a section of Andrew Lake be dewatered and pumped into the remainder of Andrew Lake, which will affect water levels and outflow rates during the dewatering period. Collection, treatment and release of site and stockpile drainage will affect the temporal distribution of water and alter the upstream effective drainage areas as it will be transferred via pipeline after treatment. Discharge of treated effluents and greywater may affect local and downstream surface hydrology. Freshwater withdrawal for industrial and domestic purposes, flooding of the winter road and the temporary airstrip, and the re-flooding of the Andrew Lake pit may affect local and downstream surface hydrology.

Project Design and Mitigation - The Project has been designed to most effectively minimize effects to surface hydrology. Large waterbodies have been selected for withdrawal and discharge locations so that changes to surface hydrology are minimized. The site water management system has been designed to recycle water where possible to limit withdrawal requirements and discharge quantities. Activities associated with water withdrawal follow Fisheries and Oceans Canada (DFO) procedures that recommend no more than 10% of the under-ice volume of a lake is withdrawn during one ice-covered season. Diversion channels and sedimentation ponds minimize affects to surface hydrology and their construction will follow standard protocols. Best management practices will be adopted for erosion control and sediment transport on all disturbed sites including the core facilities areas and access roads.

Residual Project Effects - Mitigation measures and Project designs are predicted to effectively minimize effects to surface hydrology. Effects to flow rates are predicted to remain below 3% of the baseline peak flow. Changes in lake levels are predicted to be highest at Andrew Lake, with a short-term increase of approximately 24 cm during dewatering of the Andrew Lake pit area, however this will occur after the spring freshet when water levels are naturally declining. All other potential changes in lake level are estimated to remain below 8 cm during the active flow season and 20 cm during the inactive flow season. Changes to under-ice volumes will follow Fisheries and Oceans Canada guidelines and will remain below 10% during an ice-covered season. Runoff contributing drainage areas for Pointer Lake outflow and Andrew Lake outflow (the receiving environments for the Kiggavik and Sissons sites, respectively) are predicted to decrease by less than 1% and 3%. Changes in surface hydrology are assessed as not significant.

Monitoring - Staff gauges can be installed on Andrew Lake, Siamese Lake, Mushroom Lake, Judge Sissons Lake, and their outflow discharges and levels will be manually recorded on a regular basis during construction and through to decommissioning. Continuous water levels sensors will also be installed in these lakes and streams during the open water season to obtain detailed water level data. Waterbody volumes at waterbodies potentially affected by the Project will be estimated and under-ice volumes will be confirmed by annual ice thickness measurements at Siamese Lake, Mushroom Lake, and lakes along the winter road. Water withdrawal and treated effluent and greywater release rates will be continually documented.

8.2.2 Hydrogeology

Issues and Effects - Open pit and underground mine dewatering activities may result in depressed groundwater levels in the vicinity of the mines and have the potential to impact lake levels in the study area. Ground water quality may also be affected when receiving surface water bodies connect hydraulically to the deep groundwater system. Groundwater represents a pathway for potential interactions between dissolved constituents in water originating from the mining activities and the surface water where the groundwater discharges. Because groundwater is not used in the Kiggavik Project area, surface water quality is considered to be the main measurable parameter of the potential long-term effects of the Project on the aquatic environment.

Residual Project Effects - Effects of mine dewatering activities on groundwater levels below permafrost are predicted to be continuous during the mining period, but reversible in the medium-term, and are anticipated to have negligible ecological and socio-economic implications. The low hydraulic conductivity of the rock mass and the permafrost conditions will result in limited groundwater inflows to the proposed mines and lake levels will not be affected by mine dewatering activities. Therefore, the residual adverse effects from the Project on groundwater quantity are assessed as not significant.

The assessment of potential long-term effects of groundwater and COPC to surface waters from the Kiggavik and Sissons sites indicates minimal effects on background concentrations of constituents of concern in local lakes, with predicted concentrations well below water quality guidelines or comparable to baseline concentrations. Potential effects to surface waters are expected to fall within the range of background concentrations. Given the Project design features and the low hydraulic conductivity of the rock mass, all Project effects on hydrogeology are assessed as not significant, for both current permafrost conditions and potential no-permafrost conditions that would result from dramatic warming conditions.

Monitoring - Monitoring of water quality in lakes and streams adjacent to and downstream of the Kiggavik and Sissons mine sites will be completed during the spring freshet each year during the operational life of the Project to confirm that COPC do not increase in area lakes and streams as a result of tailings management or mine rock management activities.

Groundwater monitoring will be carried out in the rock mass surrounding the proposed TMF to track chemistry, pressures and ground temperature as the excavation base penetrates the permafrost base and as the pit is filled with tailings material. This will allow changes in ground temperature and pressure gradients (i.e., flow direction) as well as water quality in the deep, sub-permafrost groundwater to be tracked over the construction, use and closure of the TMF.

Investigations into the chemical and physical properties of tailings and mine rock will be continued as part of a Tailings Optimization and Validation Program (TOVP) and a Mine Rock Optimization and Validation Program (MOVP). These programs will provide further insight into the geochemical and physical characteristics of the materials to validate the proposed long-term management plans.

8.2.3 Water Quality

Issues and Effects - Project activities can interact with surface water quality by affecting its physical or chemical makeup. Treated effluent discharge from the Kiggavik and Sissons Water Treatment Plants (WTP) may affect surface water quality in the receiving environment. Increased dust generated during mine construction and operation could increase particulate and metals deposition in the Project area. The release of air emissions that result in increased deposition rates of sulphate (SO_4^{2-}) and nitrate (NO_3^-) can lead to a reduction in pH in acid-sensitive lakes, which in turn might alter other aspects of water chemistry.

Project Design and Mitigation - In order to reduce the potential effects of effluent release in the receiving environment, reverse osmosis permeate will be recycled to the mill for use in mill processes. The WTP has been designed so that effluent quality will meet or exceed applicable regulations. Best management practices for dust control on roads and during the open pit mining operation will be implemented in order to reduce particulate and metals deposition in the Project area. Efforts to control and reduce emissions from the sulphuric acid plant, power generators and/or driers will be taken to mitigate the release of acid generating materials to the atmosphere.

Layout and site footprint considered natural drainage areas and watershed boundaries so they could be maintained when possible. Diversion channels will be designed to re-route fresh water around the development areas with outlets returning diverted flow back to the natural drainage path. The ground surface will be re-contoured at decommissioning to restore natural flow patterns. Water use throughout operations will be minimized and water recycled wherever possible to limit withdrawal requirements and discharge quantities and water will be sourced and discharged into large waterbodies. The timing and rate of Andrew Lake dewatering will minimize potential effects to water quality.

Residual Project Effects - Modelling data indicate that changes to the receiving water quality due to effluent discharge from the Kiggavik and Sissons WTPs are expected to occur during the operation and final closure stages of the Project, but return to baseline levels post closure. For COPCs with an established threshold, the concentrations are predicted to be below the guideline values with the exception of cadmium and selenium. It is expected that cadmium concentrations in Judge Sissons Lake would be elevated compared to baseline and may exceed guidelines in the winter months. Selenium concentrations in one segment of Judge Sissons Lake are expected to exceed guidelines during the operation and final closure phases of the Project; however, these exceedances are largely due to baseline conditions and seasonal fluctuations. Mitigation measures and Project design features are predicted to effectively minimize effects to surface water quality.

Changes in water quality due to dust deposition are predicted to be minor and will occur primarily during the period of spring freshet flows. The annual minor increases in metals, radionuclides and total suspended solids (TSS) will occur over the operational life of the mine, but are not predicted to exceed applicable water quality guidelines or objectives, or be measurable above natural background variation.

Inter-annual and seasonal variations in lake pH (acidity/alkalinity) are expected to occur naturally over the operational life of the Project. These changes are in response to deposition of atmospheric acids by precipitation and the effects of seasonal freeze-thaw cycles on lake chemistry. Potential changes to lake pH due to increased atmospheric acid deposition as a result of the Project are predicted to occur primarily during the summer open water period. Any potential changes would be small (i.e. below the critical load value) and likely brief, due to the short residence times of the lakes.

In conclusion, no significant adverse effects on water quality are predicted, and no long-term trend towards increasing lake acidification as a result of the Project is expected to occur.

Monitoring - Wastewater and effluent water quality will be analysed and documented regularly according to Nunavut and federal regulatory requirements throughout mine operations, decommissioning, and after mine closure as part of compliance and follow-up monitoring. Water quality in each section of Judge Sissons Lake receiving treated effluent, as well as at the outlet of Judge Sissons Lake, will be monitored on a regular basis during operations and the post-closure phase. Water withdrawal and wastewater/effluent discharge rates will be continually documented during the construction, operations, and closure phases of the Project.

Air and dust emission levels, and dust deposition will be monitored on a regular basis near both the mining operations at the Kiggavik and Sissons sites, and adjacent to the ore haul road between the two sites to determine whether observed levels are similar to predicted levels. Water quality will be monitored in appropriate lakes and streams to confirm results are within predicted or acceptable levels due to dust deposition and air emissions from Project activities. This monitoring will occur during the spring freshet throughout the operational life of the Project

8.2.4 Sediment Quality

Issues and Effects - Project activities have potential to result in changes to sediment quality by affecting its physical or chemical makeup. The release of treated effluent from the Kiggavik and Sissons WTPs can affect water quality in the receiving environment. Changes in surface water can subsequently affect the sediment through processes such as deposition of settling solids, adsorption, and diffusion.

Project Design and Mitigation - The mitigation and Project design features implemented to limit potential effects to sediment quality in the Project area are similar to those described for water quality.

Residual Project Effects - Modelling data indicate that sediment concentrations of all COPCs with sediment quality guidelines are predicted to be below threshold concentrations in all segments of Judge Sissons Lake with the exception of arsenic, copper, and nickel. Concentrations of these COPCs are predicted to be slightly elevated above average baseline levels in Judge Sissons sediment. However, the Project is not expected to substantially increase these levels and concentrations remain within the natural variation in baseline sediments. It is expected that Project-related residual effects to sediment quality will occur within Judge Sissons Lake, but will diminish to background levels before reaching the outlet of Judge Sissons Lake. Predicting no substantial effect on the levels of arsenic, copper, and nickel and all other sediment concentrations of COPCs below threshold, changes to sediment quality are assessed as not significant.

Monitoring - Monitoring efforts planned in relation to sediment quality include periodic sampling of sediment from Judge Sissons Lake to confirm that metals and radionuclide concentrations are not increasing above predicted levels. Sediment quality monitoring will occur during the operational and closure phases of the Project.

8.2.5 Aquatic Organisms and Fish Habitat

Issues and Effects - Project activities have potential to result in changes to the abundance or distributions of aquatic organisms, or to the quality or distribution of fish habitat. Treated effluent discharge from the Kiggavik and Sissons WTPs may affect surface water quality. These changes can affect the concentration of COPC in aquatic biota (e.g., aquatic plants, benthic invertebrates, plankton).

A number of Project development activities have the potential to permanently alter or destroy fish habitat. These include diversion of streams away from their current locations, drainage of lakes or portions of lakes, installation of stream crossing structures on all-season ore haul roads and other roads related to constructing and maintaining Project infrastructure (e.g., roads to water intake and effluent discharge structures and the airstrip).

Project Design and Mitigation - Potential toxicity to aquatic biota from treated effluent release will be mitigated by environmental control features incorporated into the design of the WTP. Operational measures and other mitigation measures have also been incorporated into the current Project plans that will minimize project-associated air emissions.

The all-season roads (sites roads and all-season access road should one be required and approved) that will be constructed in association with the Project will be designed so that natural flow paths intercepted by the routes will be preserved and appropriate cross-drainage structures (i.e., culverts) installed. Construction of stream crossings will be completed in such a way that potential effects to fish and fish habitat are mitigated. Best management practices for sediment and erosion control will be utilized during activities in and around water.

Residual Project Effects - The assessment of change to the distribution and abundance of aquatic organisms identified potential issues with cadmium and sulphate exposure to zooplankton. It is expected that cadmium concentrations in select areas of Judge Sissons Lake will be elevated compared to baseline conditions. It is possible that in certain areas of the lake some of the more sensitive zooplankton species will be affected; however considering the low to moderate toxicity values predicted for zooplankton and the limited geographic extent of the effect, the zooplankton population of Judge Sisson Lake is predicted to continue to function. Although there are residual effects, no appreciable adverse effects on the abundance and distribution of aquatic biota are predicted due to changes in COPC concentrations in the receiving environment.

Implementation of measures to avoid or mitigate effects to fish habitat is expected to minimize serious harm to fish and negate the requirement for fisheries offsetting. None of the changes to fish habitat resulting from the Kiggavik Project will affect the sustainability or productivity of commercial, recreational and Aboriginal (CRA) fisheries.

The effects to aquatic organisms and fish habitat are assessed as not significant.

Monitoring - Benthic invertebrate populations and diversity will be monitored regularly during mine operation, closure, and post-closure to determine whether effluent discharge from the WTP is having measurable effects on benthic invertebrate populations. This monitoring program will be combined with a similar water quality monitoring program in each section of Judge Sissons Lake receiving treated effluent, as well as at the outlet of Judge Sissons Lake.

Under the *Metal Mining and Effluent Regulations* (MMER), AREVA is also required to conduct Environmental Effects Monitoring (EEM) to determine if effluent release is having an effect on the receiving environment.

Because any permanent alteration or destruction of fish habitat resulting from the Project is not expected to adversely affect CRA fisheries, it is anticipated that fisheries offsetting will not be required. However, monitoring may be required to confirm that avoidance and mitigation measures, standards, and protocols have been implemented as planned.

8.2.6 Fish

Issues and Effects - Project activities have potential to result in changes to the abundance or distributions of fish populations, or to fish health. The detonation of explosives in or near water results in pressure change and vibration which can result in physical injuries to fish at various life stages, and can disturb adult fish during spawning or migration activities. The release of COPC from the WTPs can affect water quality in the receiving environment. The quality of the water is critical for evaluating the potential effect on fish health.

Project Design and Mitigation - Blasting setback distances are used to ensure the instantaneous pressure change (IPC) produced by blasting is not greater than 50 kPa (DFO guideline) in order to provide adequate protection for fish populations and the vibration does not exceed 13 mm/s peak particle velocity in a spawning bed during the period of egg incubation. Additional mitigation measures available for blasting near Andrew Lake and Andrew Lake outlet stream include: adhering to DFO's guidelines related to use of explosives near Canadian fisheries waters, installing a fish exclusion barrier in Andrew Lake near the dyke, using smaller charge sizes during the open water and/or incubation season to reduce the blasting setback distance; plan to complete the blasting program during the frozen water period to protect Andrew Lake fish populations, and outside of the incubation period to protect Arctic grayling egg development in the Andrew Lake outlet stream.

Potential toxicity to fish from effluent release will be mitigated by environmental control features incorporated into the design of the WTP. The design of the WTP will focus on the production of effluent which meets or exceeds appropriate water quality guidelines. Operational measures and other mitigation measures have also been incorporated into the current Project plans which will minimize Project-associated air emissions.

Residual Project Effects - Given effective mitigation measures, neither the IPC of 50 kPa, nor the vibration threshold of 13mm/s peak particle velocity should be exceeded so no residual effect to fish populations is predicted from the blasting program.

Toxicity benchmarks for copper and zinc will be exceeded for predator and forage fish in one area of Judge Sissons Lake; however, the predicted changes are related to elevated baseline conditions (natural or existing conditions) and as such, no appreciable adverse effects on fish health are expected. Predicted concentrations of COPCs in fish flesh are not predicted to be high enough to result in adverse effects or cause serious harm to fish that are part of, or support a fishery. No residual effects on fish health were identified in relation to treated effluent release.

Monitoring - Monitoring programs for blasting effects will be developed and carried out on site at locations away from fish-bearing waterbodies to calibrate and refine the ground vibration and IPC predictive models. This will provide site-tested ground vibration and IPC setback distance thresholds, prior to commencing blasting programs near fish sensitive waterbodies.

Fish populations will be monitored throughout the life of the Project to determine whether effluent discharges from the WTPs are having measurable effects on fish health. Under MMER, AREVA is required to conduct an EEM program to determine if effluent release is having an effect on the receiving environment. Effects on the use of fisheries resources by wildlife and people are examined in the ecological and human health risk assessment.

8.3 Terrestrial Environment

8.3.1 Topography, Landforms, Surficial Geology and Permafrost

Issues and Effects - Project construction and operation activities that require surface or subsurface disturbance such as vegetation clearing, change in terrain slope, modification of surface water body and drainage pattern or changes in subsurface flow have the potential to change permafrost conditions, terrain stability and change or loss of landforms. Most noted disturbances will occur during Project construction but some will continue into operation.

Removal of vegetation cover, organic soil insulation and snow cover generally leads to change in permafrost conditions due to warming and thawing of the active layer and changes the shallow thermal regime and drainage condition. The change in permafrost conditions will have a linkage with the stability of terrain and those landforms influenced by permafrost.

Surface disturbance due to construction and operation can affect the abundance and distribution of landforms. Project activities such as excavation, the construction of the site camp, mill and infrastructure will result in the stripping or burial of surficial deposits, and can have effects on the various landforms. Surface disturbance will be required to level construction sites of camp, mill, infrastructure and roads, areas associated with storage, and excavate surface of the proposed mines and quarries. Gravel or fill pads will be used. Overburden, ore and mine rock stockpiles will also temporarily and permanently sit on the landscape.

Project Design and Mitigation - The Project layout considered sitings that would minimize footprint area and avoid permafrost sensitive and uncommon landforms. Other design-based mitigation includes padding of surface horizons to maintain existing permafrost conditions, use of platforms for equipment in order to reduce any heat transfer into frozen ground and use of thermal stabilization methods (such as convection air embankment, heat drains, grass-covered embankments, snow fences, and reflecting surfaces).

Discipline specific mitigation will include the consideration of Project activities such as construction in permafrost sensitive areas during the winter time when reasonable, restriction of vehicular traffic to approved access road, maintenance and monitoring of roads. Drainage and diversion structures will be built to prevent unnecessary pooling of water.

Residual Project Effects - The residual effects from the Project on permafrost conditions and terrain stability will be confined to the Project footprint. Surface disturbance will occur through stripping and burial. These effects will mostly occur once during the construction phase, while activities through the life of the Project will continue to change the permafrost conditions and terrain stability. The effects on permafrost and terrain are assessed as not significant.

Any surface disturbed by stripping, levelling or burial of surficial materials will result in a loss of landforms surface. Physical loss or change in common landforms will be confined to the Project footprint.

Glaciofluvial landforms are important in terms of soils, vegetation, sensitivity to permafrost conditions and terrain stability. This type of landform supports warmer soils and valued vegetation communities. No glaciofluvial landforms will be disturbed at the mine site and approximately 0.35 ha (<0.01% of the road LAA) could be disturbed with the north all-season access road alternative.

With effects all local and sensitive landforms generally avoided, effects to alluvial, glaciofluvial, glaciomarine, bedrock and morainal (glacial till) landforms will be low to negligible. Terrain effects are assessed as not significant.

Monitoring - The progression of thaw depth due to Project activities and changes in moisture and ground ice content will be monitored during the construction, operation, final closure and post closure phases of the Project.

8.3.2 Soils

Issues and Effects - The two key Project related issues for soils are change in soil quality and change in soil quantity. The majority of effects to soils occur during site clearing, mine construction, soil stripping, waste rock and soil stockpiling, vehicle traffic use, and diesel emissions during construction and operations.

Soil quality can be affected through deposition of fugitive dust and contaminants from mining, and acidification from airborne emissions from diesel generation during operations. Soil quality can also be affected by admixing with unsuitable overburden or waste rock, compaction from road construction and traffic, and erosion of disturbed soils during construction and storage of salvaged soil in the overburden pile.

Soil quantity can be affected during topsoil stripping and soil storage within the Project Footprint, as well as the burying of soils where topsoil stripping will likely not occur (e.g., access roads). The movement of disturbed materials, as well as erosion of soils from disturbed sites associated with construction activities' may also affect soil quantity.

Project Design and Mitigation - Measures to prevent soil contamination include: drainage and catchment that separate clean water and contact water, containment berms for waste, separation of acid generating waste rock from clean overburden, location of soil storage areas a sufficient distant from dust and acidifying emissions to maintain soil quality. Low-sulphur diesel will be used to reduce acidifying emissions. Dust suppression techniques will be implemented to control dust created by the Project, and speed limits will be enforced to prevent creating excessive dust.

The main mitigation for ground disturbance is soil salvage and storage. Erosion and compaction control measures will mitigate potential effects on soil quantity.

Residual Project Effects - The residual effects of potential acid input (PAI), based on the air quality modelling, estimates that measurable PAI would only occur around the Kiggavik mine site. The predicted PAI values were estimated to occur below 0.5 keq/ha/yr, and emissions would cover a total area of approximately 1,299 ha outside of the disturbed area associated with the Kiggavik mine site. This represents a total vegetated area to be impacted by PAI of approximately 2.92 % of the mine LAA. Changes in concentrations of COPC in soils within the mine LAA were predicted to be below the CCME soil quality guidelines in all phases of the assessment. The residual effects caused by soil admixing, compaction, and erosion are anticipated to be negligible with the appropriate mitigation measures implemented.

Between 953 ha to 1,212 ha of area will be disturbed, which represents less than 1% of the LAA. Of this area, approximately 645 ha are anticipated to have the topsoil stripped and stored for reclamation purposes, while soil burial would range between 208 ha and 567 ha. Effects on soils is assessed as not significant.

Monitoring - An environmental monitor will be on-site during Project development to assist AREVA personnel and contractors with mitigation strategies to reduce the effects of the Project on soil quantity, such as topsoil stripping and soil storage.

Soil quality will be monitored throughout the duration of the Project. Soil quality monitoring will involve collecting soil samples from permanent exposure and reference sample plots. Chemical analyses of the soil samples will be completed and comparisons will be made between the reference and exposure site values, as well as to the baseline values and CCME guidelines.

8.3.3 Vegetation

Issues and Effects - The Project can effect vegetation abundance, community diversity and vegetation quality. Clearing during construction has the greatest potential for creating Project effects on vegetation. During construction, operations and decommissioning there is potential for effects to vegetation from Project-related dusting, air emissions, and changes to soils.

Vegetation abundance and community diversity can be reduced through direct loss due to clearing during construction. Vegetation quality can be deteriorated through air emissions from diesel generation and heavy equipment and industrial machinery during operations, as well as dust generation from road construction, traffic, and mining activities.

Project Design and Mitigation - The Project footprint will be minimized where possible to reduce the amount of site clearing and vegetation burial required. The winter road alignment was determined with consideration for maximum use of waterbodies and watercourses to reduce impacts on upland vegetation and rugged microtopography will be avoided as practical to reduce the amount of granular material required to create a level travel surface. Mitigation related to dust will include preference for non-calcareous materials from quarry sites, dust suppression and enforcement of speed limits on roads. Low sulphur diesel fuel will be used and efforts made to reduce emissions from machinery, equipment and mill associated plants.

Residual Project Effects - Heath tundra vegetation will have the largest decrease in area by the Project, with a decrease of up to 2.8% of the total area affected. Approximately 0.5% of the wetland area within the LAA is anticipated to be effected. Effects of the Project on disturbance to vegetation abundance and community diversity are anticipated to be negligible.

Air quality modelling estimated the anticipated PAI values below the critical load value of 0.5 keq/ha/yr. Dust deposition will be primarily confined to the disturbed mine site area and area adjacent to the mine site. No effects on vegetation are expected as a result of exposure to NO_2 or SO_2, as the incremental annual maximum concentrations are below the benchmark guidelines established by the World Health Organization (WHO).

Air quality modeling for dust deposition (i.e., total suspended particulates) predicted nuisance dust (i.e., 55 g/m^2/year) only generated at the Kiggavik mine site and the dust would remain local. Dust deposition of 25 g/m^2/year is expected to be predominately confined at both the Kiggavik and Sissons mine sites; however, approximately 20 ha and 16 ha of vegetation located outside of the Project footprint at each mine site will likely receive dust deposition at this level, respectively.

Predicted browse and forage concentrations of COPCs are below the minimum available phytotoxic concentrations, with the exception of zinc in browse and cobalt and copper in forage. These species are not predicted to have a substantial change in the concentration on COPC relative to baseline and concentrations will not exceed upper thresholds. There is potential for a measurable change in concentration of several COPC in lichen at the mine site; however there are no appropriate benchmarks for assessing effects on lichen. Because the biological mean residence time for most elements in lichen ranges between two to five years, any effects on lichen are not predicted to extend far beyond Project life Project.

No significant residual effects are predicted for changes to vegetation abundance and community diversity, or vegetation quality with implementation of mitigation and Project design measures.

Monitoring - Vegetation sampling plots will be established to monitor changes in vegetation community structure over time. Vegetation quality monitoring will include collection of vegetation samples for chemical analysis. Vegetation quality results will be compared to reference and exposure site values, as well as to baseline values and CCME guidelines.

A dust deposition monitoring program will be designed to determine the amount of dust created by the Project and its dispersal. The dust deposition monitoring program will help verify the conservatism of the atmospheric dispersion model predictions.

Decommissioning vegetation monitoring requirements will be determined during the mine decommissioning effects assessment. This monitoring will ensure that the goals of the reclamation plan are achieved.

8.3.4 Wildlife and Wildlife Habitat

8.3.4.1 Terrestrial Wildlife and Habitat

Issues and Effects - Caribou , muskox and wolves are the key indicators of environmental effects for terrestrial wildlife and habitat. The Project has the potential to adversely affect caribou and muskox through changes to mortality risk, habitat availability, health and potentially caribou movement to and from calving grounds. Wolves were assessed for potential Project effects on denning habitat

Mortality - Project-related activities could directly cause wildlife mortality through vehicle collisions or through problem animal kills.

Habitat availability - The Project footprint and human activity will reduce habitat availability and effectiveness for caribou, muskox and wolf denning. Indirect, or functional, habitat loss will occur because of sensory disturbance and/or dust associated with human activities that cause reduced use of habitat around the Project footprint.

Health - As a result of emissions from the Project to the atmosphere and water there is the potential for caribou, muskox and wolves to be exposed to COPCs.

Movement - Project infrastructure and activities could change caribou movement by blocking or altering movement routes used for seasonal migrations to and from calving areas. Changes to seasonal migrations could have implications on reproductive success and survival.

Project Design and Mitigation

Mortality - Design-based mitigation to reduce mortality includes selection of road alignments that minimize blind spots for drivers and construction so that road profile specifications and snow bank treatments allow animals to get off the road to avoid traffic. Increased mortality risk will also be mitigated by road shutdowns when caribou migrations are crossing the road corridor, controlling road speed and traffic to reduce the potential for collisions and coordinating radio communication among mine personnel to alert mine staff of wildlife presence near Project infrastructure. Other mitigation includes worker awareness of potential wildlife mortality risks.

Habitat Availability - Design-based mitigation to reduce loss of habitat availability and quality includes a site layout that minimizes the footprint as much as reasonable and mine site dust minimization and control measures. Loss of habitat quality can be mitigated with reductions in road activity during important seasonal caribou migrations and during the post-calving period to reduce sensory disturbance. AREVA will progressively reclaim disturbed sites.

Movement - Design-based mitigation to minimize disturbance to caribou movement include a reduction of road embankments as much as reasonable and construction of roads to facilitate caribou crossings. AREVA will not construct a road within 10 km of a designated caribou water crossing.

Temporary access road shutdowns in the presence of large groups of caribou will help to reduce disturbance that may alter caribou movements. Snow will be managed along roadways to prevent long continuous cuts or piles of snow that could restrict spring migration.

Residual Project Effects

Although difficult to quantify due to several technical limitations, the residual Project effects on caribou mortality risk, caribou, muskox and wolf denning habitat, caribou movement, and caribou, muskox and wolf health are assessed as not significant. IQ, baseline data, and collar data from the local and regional herds shows that few caribou are expected to interact with the Project. Caribou from the Qamanirjuaq and Ahiak caribou herds are the most likely to occur within the RAA during the growing and winter seasons, respectively.

Mortality - The Projects potential to affect mortality is low and readily mitigated by controlling human access and by speed limits on the proposed roadways.

Habitat availability - The effect of the Project on habitat will be small at the scale of the caribou herd ranges (0.2-0.3% of habitat units). Muskox are expected to experience a reduction in habitat availability of 3.1-3.7% at the scale of the GN's wildlife management unit MX/21. Project effects on wolf denning habitat was evaluated to be about 1.0%.

Movement – Although difficult to quantify, the Project is not anticipated to result in significant adverse effects to caribou movement because the Project is not located on any major migratory routes, is not within 10 km of any designated water crossing, and mitigations will reduce potential Project effects on caribou movement.

Health – There are not expected to be any decernable change from baseline exposure of COPC to caribou, muskox or wolf because of the Project. No residual effects on caribou, muskox and wolf health are anticipated from exposure to COPC.

Monitoring - Caribou and muskox mortality will be monitored through mandatory reporting of known wildlife mortality by mine personnel and implementation of a hunter-harvest monitoring study (potential coordination with other caribou stakeholders). On-going satellite collar data may provide insight into caribou habitat use and possible avoidance of habitats due to sensory disturbance. Caribou and muskox exposure to COPC can be monitored in coordination with a hunter-harvest study. Hunters will be asked to voluntarily provide caribou, muskox and wolf tissue samples and body condition measurements to monitor species' health. Understanding that caribou are a shared resource and a shared responsibility, AREVA will continue to work collaboratively with other organizations with wildlife responsibilities in Nunavut. Localized monitoring of caribou will be shared with other organizations for integration with long-term population level research on caribou herds and the company support of government-led population monitoring will be defined.

8.3.4.2 Raptors and Habitat

Issues and Effects - Peregrine Falcon is the key indicator species of environmental effects for raptors and habitat. The Project has the potential to adversely affect raptors through changes to habitat availability through direct loss due to the Project footprint and indirect habitat loss due to reduction in quality from disturbance. Nest productivity may be reduced due to disturbance and potential increased exposure to emissions and dust may impact health.

Project Design and Mitigation - Design-based mitigation to reduce loss of habitat availability and quality includes a site layout that minimizes the footprint as much as reasonable, minimizing Project activities that will occur outside the footprint and dust minimization and control measures. AREVA will progressively reclaim disturbed sites.

Reduced nest productivity will be mitigated by increasing worker awareness of nests near mining activity and minimizing construction activity near active nests. During construction, blasting required within proximity of a known nest location will occur outside the raptor territory occupancy and nesting season (mid-May through to end of August), land-based activities within a defined radius of active nest sites will be restricted, and a nest-site-specific construction mitigation plan will be developed if necessary and will include territory activity monitoring when construction is occurring within the defined radius of a known nest site.

Reduced health will be mitigated by design aspects, operational measures and other mitigation measures which have been incorporated into the current Project plans which will minimize Project-associated emissions and/or the potential effect of Project-related emissions.

Residual Project Effects

Habitat availability - The Project is anticipated to cause an overall reduction of 5.9% of suitable peregrine falcon habitat units within the RAA and a much smaller loss of suitable habitat across the peregrine falcon range.

Nest productivity - Project residual effects on peregrine falcon productivity will be limited to those nests closest to the all-season road (winter road the preferred option) with disturbance primarily limited to the construction period. The Project footprint does not interact with known raptor nest sites.

Health - No residual Project effects on health are expected after mitigation. Project emissions will not result in a discernible change in raptor exposure to COPC. Exposure to the peregrine falcon will not exceed exposure levels associated with adverse effects. As the level of exposure for falcon is not expected to change from baseline and the exposure will remain below exposure levels associated with adverse effects, no residual effects are expected on the health of raptors.

Changes to raptor habitat availability, nest productivity and health are assessed as not significant.

Monitoring - A nest monitoring program will be conducted during early stages of Project construction and operation to monitor nest productivity. There are several nest sites that are located near the proposed all-season road. These will be the key nest sites for follow-up monitoring if the all-season road becomes the final option for the Project. No specific monitoring requirements are recommended based on the assessment for change in health of raptors.

8.3.4.3 Migratory Birds and Habitat

Issues and Effects - Long-tailed duck, lapland longspur and shorebirds are the indicators of environmental effects for migratory birds and habitat. The Project has the potential to adversely affect migratory birds through changes to availability and quality of habitat affected by Project sitting and disturbance and potential increased exposure to emissions and dust may impact health.

Project Design and Mitigation - Reduced habitat availability will be mitigated by minimizing the Project footprint, progressively reclaiming disturbed areas, actions to reduce dust generation and dust suppression.

Reduced health will be mitigated by design aspects, operational measures and other mitigation measures which have been incorporated into the current Project plans which will minimize project-associated emissions and/or the potential effect of project-related emissions.

Residual Project Effects - The Kiggavik mine site and all-season road (conservative estimate as preferred winter road will result in less habitat loss) will result in a direct loss of 1,704 hectares of previously usable habitat. The Kiggavik Project is expected to result in an overall reduction of 4.0%, 2.7%, 2.3% and 4.0% of habitat units within the RAA for lapland longspur long-tailed duck, wetland-associated shorebirds, and upland-associated shorebirds, respectively.

Emissions from the Project are not expected to result in a discernable change in exposure to COPC for lapland longspur, long-tailed duck, or semipalmated sandpiper (as a representative shorebird), Results show that exposure thresholds associated with adverse effects will not be exceeded.

Effects on migratory birds are assessed as not significant.

Monitoring - No specific monitoring requirements are recommended based on the assessment for change in health of migratory birds. The monitoring of other environmental media (e.g. water, fish) will provide valuable information for confirming the results of the assessment.

8.3.5 Species at Risk

Issues and Effects - Short-eared owl, grizzly bear and wolverine are terrestrial wildlife of conservation concern that are known to occur in the RAA; peregrine falcon are also a species at risk but are assessed as an indicator of raptors. The Project has the potential to adversely affect species at risk through changes to habitat availability and health. The Project will both reduce the availability of habitat due to the Project footprint and reduce the use of habitat close to Project infrastructure because of disturbance effects. The Project could affect health by increasing exposure to Project emissions.

The Project area does not contain any identified high quality or critical habitat for grizzly bears and wolverine. Few grizzly bears and wolverine were observed during baseline field studies suggesting the area is marginal habitat for these species. The Project will have minimal potential to interact with grizzly bears and wolverine. Short-eared owl were observed during 2008 to 2010 field studies in the RAA but no nests were located.

Project Design and Mitigation - Standard mitigations to manage potential attractants and avoid grizzly bear and wolverine den sites are expected to mitigate the potential for the Kiggavik Project to interact with these animals.

Prior to clearing activities during the breeding bird season, all areas within the clearing footprint will be searched for nests. Active nests will be identified and for short-eared owl, a no-disturbance buffer will be applied until nesting is complete and chicks have fledged. All on-site observations of short-eared owl will be investigated to determine presence of nests sites.

Reduced health will be mitigated by design aspects, operational measures and other mitigation measures which have been incorporated into the current Project plans which will minimize project-associated emissions and/or the potential effect of project-related emissions.

Residual Project Effects - Similar effects to these species are anticipated as with those indicators assessed in the remainder of the terrestrial assessment. A small proportion of available habitat within the RAA and across species range will be affected and no change to health is predicted due to strong Project design and effective mitigation.

Monitoring - Grizzly bear and wolverine health will be monitored in coordination with a caribou and muskox hunter-harvest study. Hunters will be asked to voluntarily provide grizzly bear and wolverine tissue samples and body condition measurements to monitor species' health.

8.4 Marine Environment

Interactions are expected to occur between the marine environment and Project activities during construction, operations and decommissioning. The components of the marine environment considered in the EIS include marine wildlife (marine mammals, marine fish, marine birds, and marine benthos) and physical features of the marine environment (sediment and water quality, and marine vegetation). Routine operations of marine transportation (including construction and decommissioning related activities) associated with the Project are not expected to affect marine birds, benthic invertebrates, marine vegetation, sediment quality, water quality, or species at risk.

8.4.1 Marine Fish

Issues and Effects - Key issues concerning Project-related marine transportation and marine fish relate predominantly to underwater noise from marine vessels transporting fuel and dry cargo to the Baker Lake dock and its potential to physically harm, disrupt, and/or displace fish from habitat in Hudson Bay and Chesterfield Inlet. Noise disturbance can elicit a change in behaviour and cause fish to temporarily move away from suitable habitat (displacement) or change their natural movements (diversion from a migratory path). IQ comments support these key issues and extend to include concerns regarding disruption of marine fishing, which occurs at fish camps along Chesterfield Inlet.

Project Design and Mitigation - Operating procedures to reduce underwater noise will include maintaining a constant course and speed whenever possible, avoidance of unnecessary acceleration, and routine maintenance of propellers.

Residual Project Effects - Potential effects on marine fish resulting from marine transportation activities are limited to change in behaviour due to underwater noise. Although acoustic modelling determined that underwater noise from transiting vessels will be audible to marine fish and may elicit a behavioural reaction, the short-term nature of the response and the low magnitude of the effect will not result in any long term or irreversible effects on the distribution or abundance of fish populations in the RAA. Effects on marine fish from Project activities associated with marine transportation are assessed as not significant.

Monitoring - There are no monitoring programs recommended for marine fish.

8.4.2 Marine Mammals

Three taxonomic groups of marine mammals are present within the LAA and RAA during the open-water season: whales (e.g., belugas from the Western Hudson Bay population), seals (e.g., ringed), and polar bears. While various other marine mammal species are known to occur in the area (e.g., walrus, killer whale, harp seal, narwhal), these species are considered uncommon and are unlikely to interact with the Project.

Marine transportation is not expected to result in environmental effects on polar bears since shipping and barging will only occur during the open-water season when the bears are forced onto land in the Hudson Bay region for several months to wait for new ice to form. Although polar bears use coastal habitats during the summer months, vessels will typically be in the range of 30-60 km offshore when transiting past shorelines in Hudson Bay and Hudson Strait. As a result, transiting vessels are not expected to result in effects on polar bears from acoustic or vessel wake disturbance.

Project effects are assessed with respect to the common marine mammal species in the area; ringed seal and beluga whale.

Issues and Effects - Key issues for marine mammals relate predominantly to marine vessel traffic and its potential to physically harm, disrupt, and/or displace the animals from summer habitat in Hudson Bay and Chesterfield Inlet. Potential effects to marine mammals associated with the Project relate primarily to the presence of marine shipping vessels and associated underwater noise. IQ supports these as key concerns related to the Project and includes the potential for disruption of marine mammal harvesting, in particular beluga whale and ringed seal.

Project Design and Mitigation - A variety of strategies will be employed to reduce the potential of a Project-related vessel-mammal strike from occurring and to reduce behavioural changes such as avoidance of underwater noise and changes in migration routes or herding due to vessel presence.

Specific vessel transit routes will be used taking into account navigational safety, so that acoustical inputs are limited to similar and predictable areas during marine transportation. When individual or groupings of marine mammals are observed within specific radii of the vessel, operating protocols will be implemented by the vessel captain in consultation with a local monitor or in advance with the Hunter and Trapper organization. For example, the vessels will stop if marine mammals appear to be inadvertently herded by an approaching vessel, and it is navigationally safe to do so.

Operating procedures to reduce noise and strikes will include maintaining a constant course whenever possible and avoidance of unnecessary acceleration and maintenance of propellers. Vessel speed will be limited to 8 to 10 knots in Chesterfield Inlet and in important beluga whale habitat near Churchill and to less than 13 knots throughout the rest of the RAA, unless otherwise required for safe navigation.

AREVA is prepared to cooperate with other current and future project operators, participating Inuit communities in the NSA (Baker Lake, Repulse Bay, Coral Harbour, Chesterfield Inlet, Arviat, Whale Cove and Rankin Inlet), government and other stakeholders to reduce effects of vessel presence and increased mortality risk due to vessel collisions with marine mammals.

Residual Project Effects - Over the life of the Project, between 7 and 31 vessel transits are expected to be required annually to deliver fuel and dry cargo to the Baker Lake dock and storage facility. Vessels will only be traveling during the open-water season. Given the duration of marine vessel operations and the frequency of transiting vessels, there is potential that a vessel-mammal collision could occur over the life of the Project. With the proposed mitigation in place, collisions are more likely to result in non-lethal incisions from propellers and non-lethal blunt force trauma, except in the case of collisions involving calves and young animals, where injuries may be more severe.

Potential residual environmental effects of increased mortality risk to marine mammals populations are expected to be site specific and low in frequency. Larger, faster vessels have the potential to strike whales with greater force, causing greater physical injury and trauma. The probability of a lethal or severe vessel strike is expected to be low. The effect of a collision with a marine mammal is potentially fatal (i.e., irreversible), but effects on marine mammal populations are expected to be reversible through natural recruitment.

Results of the acoustic modelling indicate that beluga whales and ringed seals will be exposed to almost half of the required level of sound required to elicit a behavioural response in marine mammals. Noise levels generated by the marine traffic are not expected to cause changes in behaviour of beluga whales and ringed seals.

The effect on marine mammals is assessed as not significant.

Monitoring - All incidents of vessel collisions with marine mammals, near-misses, and mammal sightings will be recorded by the MMO or maritime crew. Ship logs will record course adjustments, vessel speed, and speed reductions in important areas.

8.4.3 Species at Risk

The Northern, Atlantic, and spotted wolffish which are listed on Schedule 1 of SARA occur in the marine RAA. However, there is insufficient information on the distribution, habitat use and abundance of these wolffish populations in the RAA to consider these species specifically in the assessment. It is therefore assumed that effects will be similar to those described in the effects assessment for marine fish. Given the distribution range of the two listed marine bird species, the harlequin duck and peregrine falcon, there is very limited potential for spatial overlap with the Project. Consequently, they are not considered further in the assessment.

8.5 Human Health

8.5.1 Exposure to Hazardous Substances and COPCs

Issues and Effects - Workers in the construction, milling, mining, decommissioning and reclamation process for the Kiggavik Project may be exposed to hazardous substances. A thorough review of the proposed activities for the Kiggavik project was conducted. The reagents used in the process were evaluated to determine whether they pose a human health risk. Similarly, workplace exposure assessments were conducted of constituents of potential concern (COPCs) contained in the ore, including arsenic, cadmium, cobalt, copper, lead, molybdenum, nickel, selenium, uranium, zinc. Workers are exposed to these COPCs primarily through inhalation of dust during mining operations.

The American Conference of Governmental Industrial Hygienists (ACGIH) is a well-respected, non-governmental organization by those in the field of industrial hygiene and worker health and safety. The best known of ACGIH's activities is the development of Threshold Limit Values (TLVs) for Chemical Substances. The TLVs refer to airborne concentrations of chemical substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed to daily over a working lifetime without adverse health effects.

The mining and milling processes at AREVA’s northern Saskatchewan operations use many of the same chemicals that will be used at the Kiggavik mine and mill and therefore the operational experience provides a basis for the Kiggavik Project evaluation. The TLV or other applicable guideline for each substance or COPC was identified to evaluate exposures. The controls for each chemical identified were reviewed and evaluated for adequacy to determine if they were sufficient to control exposures below the occupational exposure values.

Project Design and Mitigation - Standard work practices, together with practices implemented for the protection of workers from particulate matter, radon and long-lived radioactive dusts as part of a radiation protection program, in uranium mining and milling are effective at minimizing exposures to hazardous substances and COPCs found in the mine rock and ore. These include:

- Control Through Design;
- Ventilation;
- Maintenance and Housekeeping;
- Education and Training; and
- Personal Protective Equipment (PPE).

The primary and most effective method to control of exposure to nearly all the chemicals is at the design stage and this approach was adopted for the Kiggavik Project.

Residual Project Effects - Worker exposures to hazardous substances and COPCs have been evaluated for the Kiggavik project. With the proposed mitigation measures in place, there are no exposures to workplace hazardous substances or COPCs expected to exceed the TLV established by the ACGIH.

Monitoring - For the Kiggavik project, workplace baseline monitoring will be performed during the post-construction, pre-operation period. Periodic air sampling will be conducted to verify the adequacy of engineering controls.

8.5.2 Exposure to Radiation

Issues and Effects - The amount of radiation which a worker is exposed to is measured in terms of radiation dose, typically in units of millisieverts (mSv). Exposure to radiation has been found to increase the likelihood of detrimental effects occurring, in those exposed. For the purposes of radiation protection, a precautionary approach is applied (i.e., it is assumed that the likelihood of detrimental effects is proportional to the dose received, even at low doses below the levels where statistical effects can be observed). Dose limits for individuals have been developed to protect against the radiation risk.

In Canada, the Canadian Nuclear Safety Commission (CNSC) regulates the nuclear industry. General regulations under the Nuclear Safety and Control Act governing work with uranium mines and mills may be found in the Uranium Mines and Mills Regulations (CNSC 2000a) and regulations regarding radiation protection are outlined in the Radiation Protection Regulations (CNSC 2000b). These regulations specify the limits on exposure to radiation for workers and for members of the general public. Doses to Nuclear Energy Workers (NEWs) must be below 50 mSv per year and 100 mSv per 5 years. Effectively, this means the annual exposure of a NEW should be less than 20 mSv/y on average. In addition, pregnant NEWs must not exceed 4 mSv during the balance of a pregnancy. Further to the requirements established by the Radiation Protection Regulations, the CNSC has provided the document, Regulatory Guide G-129 Rev.1 Keeping Radiation Exposures and Doses As low as Reasonably Achievable (ALARA), which is instrumental in the design and operation of facilities and the development of radiation protection programs.

In uranium mining and milling, effective dose is determined from evaluation of radiation exposure from three dose components:

- Gamma radiation;
- Radon and radon progeny; and
- Long-lived radioactive dust (LLRD)s: These are aerosols (fine materials that can become airborne as dry dust as well as mist) that contain radioactive materials, and may be inhaled or ingested, resulting in an internal exposure.

Exposure to each of these three dose components are converted to units of effective dose, in seiverts (Sv), and then summed to form a worker’s total effective dose for comparison to dose limits.

Mitigation and Project Design - The operating principle of radiation protection is "As Low As Reasonably Achievable (ALARA), social and economic factors considered". The process of radiation dose optimization involves assessing the sources of radiation exposure and designing facilities, processes, equipment, and work practices to minimize radiation doses to workers and the public. Dose rate constraints are established as objectives, below the dose limit, to be achieved during operations. They are useful in the design of facilities and are a practical implementation of the ALARA principle. AREVA has established workplace exposure rate design objectives for the Kiggavik mill, open pit and underground mines for each dose component.

A Radiation Protection Plan (RPP) is implemented at uranium mine sites to effectively mitigate risks from radiation exposure to workers, the public and the environment. The RPP is a multi-faceted approach consisting of a combination of: design features of equipment (e.g. sealed and lead-lined mobile equipment cabs, ventilation), operational practices (e.g. minimize time spent in areas with significant radiation levels, dust suppression) and worker awareness. The Radiation Code of Practice (RCOP) is a document, required by the CNSC under the Uranium Mines and Mills regulations, which describes a set of workplace radiological levels and worker exposure levels used for operational control of radiation doses, referred to as administrative and action levels.

Residual Project Effects - Radiation dose rates to workers were estimated based on experience gained from mining of uranium ores in northern Saskatchewan, particularly the mining of the open pits at AREVA's McClean Lake Operation, as well as through the use of computer programs. The base case and upper bound case radiation doses estimated for routine operations in the underground mine, surface mines, mill and transport sections are presented inTable 8.5-1.

Table 8.5-1 Summary of Potential Radiological Exposure to Workers During Operation

	Base Case	**Upper Bound Case**
Project Activities/Physical Works	Average Worker Radiation Dose (mSv/y)	Maximum Worker Radiation Dose (mSv/y)
Mining - Underground	5.2	10.5
Mining - Open Pit	0.76	5.9
Milling	0.66	4.2
Transportation – Air transport of yellowcake	1.5	4.1

From the above table it can be seen that there are no workers expected to receive radiation doses higher than the dose limits set by the Canadian Nuclear Safety Commission of 50 mSv in a single year or 100 mSv in a 5 year period (an effective annualized dose limit of 20 mSv/year).

Monitoring - Gamma radiation, radon/radon progeny (RnP), and long-lived radioactive dust (LLRD) will be monitored routinely throughout the Kiggavik Project in order to promptly detect potentially abnormal radiological conditions, to estimate worker doses, and to document radiological conditions. A network of monitoring locations, parameters and frequencies will be established for each of the Kiggavik Mill, Open Pit Mines, Underground Mine, and Associated Facilities in the Routine Radiological Monitoring Schedule procedure. The radiological monitoring program is developed to comply with applicable federal and territorial regulations; describes instrument requirements and sampling methods; refer to Administrative Levels and mitigative measures; and identify reporting responsibilities and methods.

Dosimetry monitoring is conducted to document worker exposures to radiological components. The goal of radiation protection is to keep all worker doses below regulatory limits and to maintain worker doses As Low As Reasonable Achievable (ALARA). For the Kiggavik Project, a procedure has been designed to ensure worker doses from each radiological component are determined (or estimated), recorded, evaluated and monitored in an appropriate manner.

8.5.3 Members of the Public

A critical step in the overall assessment is the evaluation of potential human health effects associated with releases from the Project. To cover a variety of potential exposure situations a number of different representative individuals were incorporated in the assessment. These include permanent residents of the Baker Lake community (adult, child and toddler family members), hunters at Judge Sissons Lake that take game back to their families and non-nuclear workers (non-NEW) at the project site (e.g. camp cook, security guard).

Based on IQ for Baker Lake, caribou and fish were consistently named the primary food sources, with ptarmigan, arctic hare and squirrel also mentioned. These food items were accounted for in the human health assessment.

Issues and Effects - Atmospheric and aquatic emissions from the Kiggavik Project were used to predict the levels of COPC in the environment. The pathways framework used in this assessment involves consideration of various pathways, or routes of exposure, by which humans may be exposed (Figure 8.5-1). Thus, the pathways model or framework assesses the integrated contribution of emissions to the atmospheric and aquatic environments from all sources (Figure 8.5-2). The pathways model comprises inhalation and ingestion models; airborne dust and radon account for the inhalation dose while consumption of water, fish, vegetables, berries, and wildlife account for the ingestion dose. In addition, an external dose is evaluated from gamma radiation associated with the radionuclide content of dust deposited on the ground.

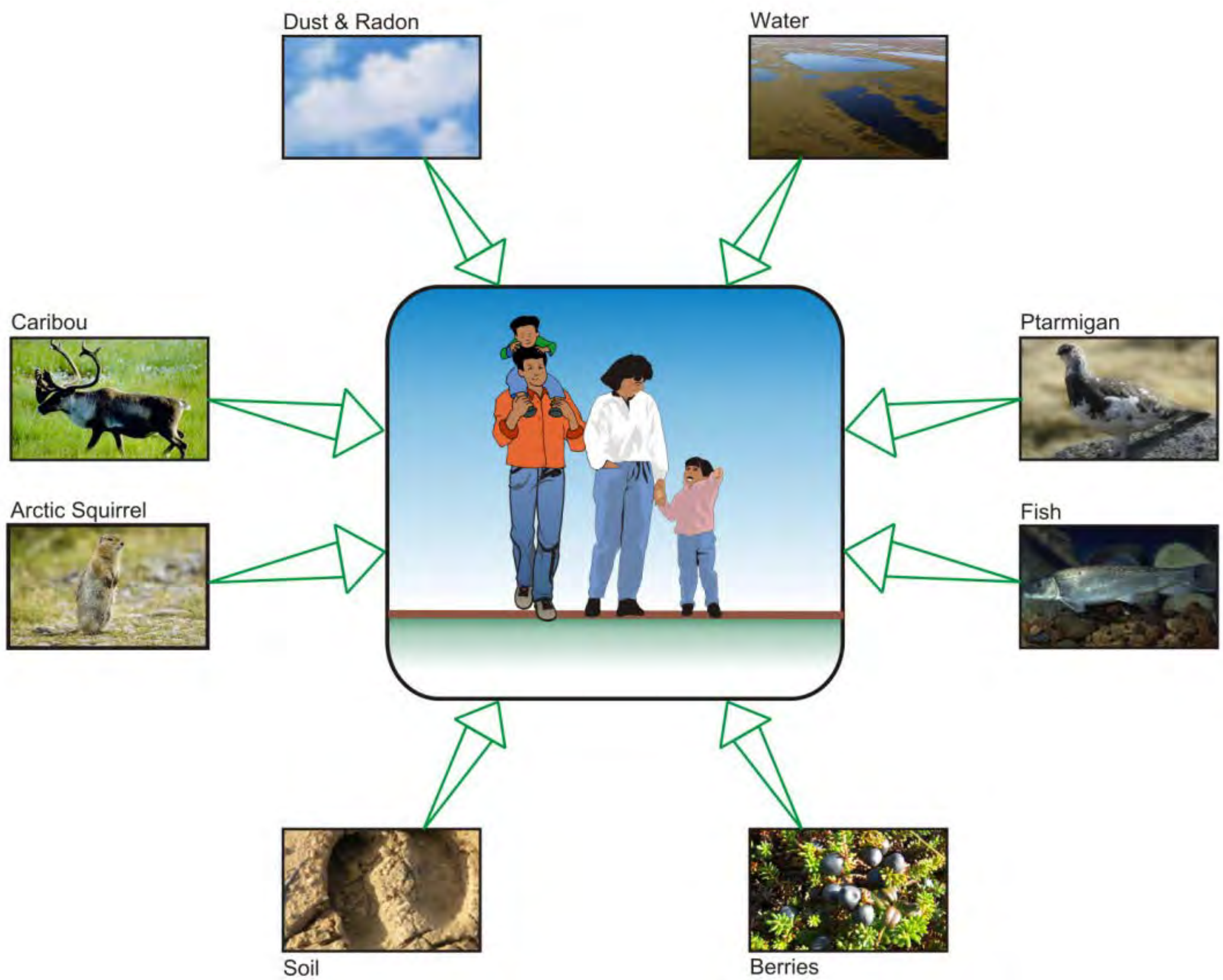

Figure 8.5-1 Representation of Exposure Pathways for Human Receptors

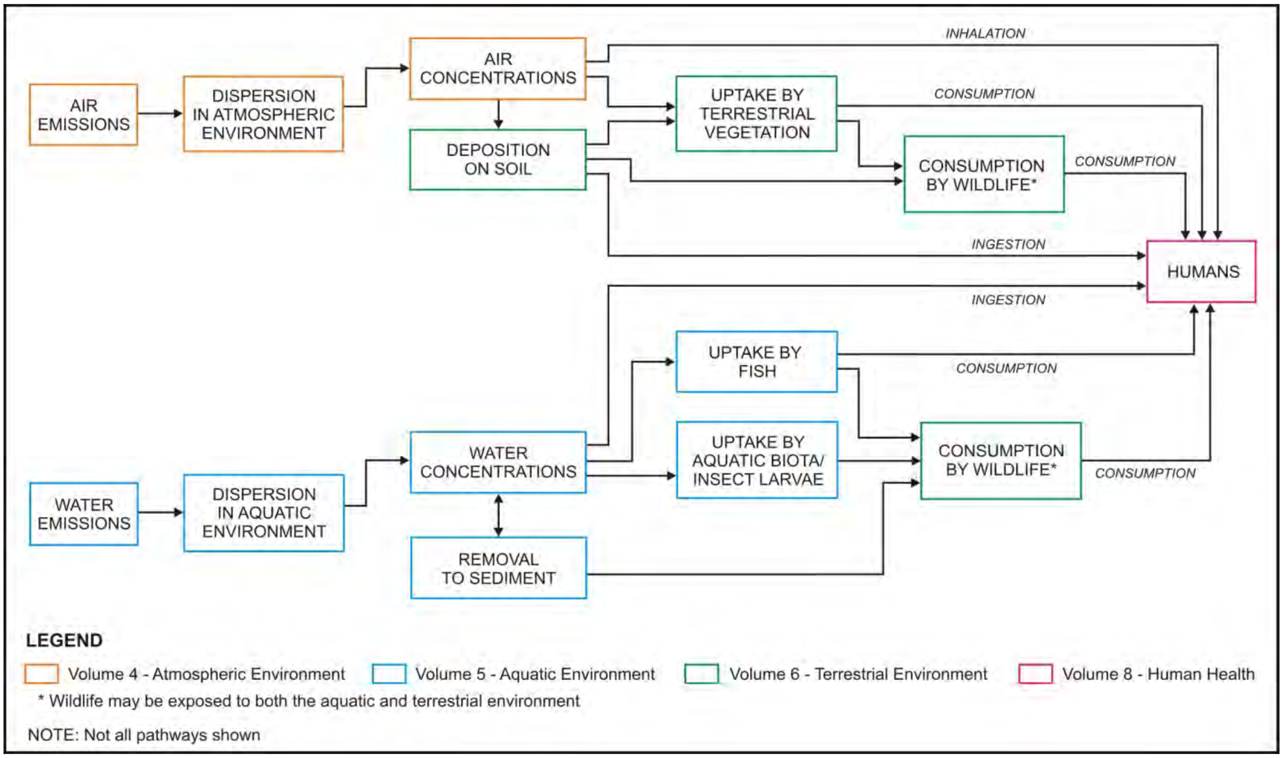

Figure 8.5-2 Linkages Between Human Health and other Environmental Components

Project Design and Mitigation - The design of the Kiggavik and Sissons WTPs ensures that the effluent will meet all appropriate regulations such as the Metal Mining Effluent Regulation (MMER) as well as site-specific discharge limits. Environmental considerations were paramount in the selection of the appropriate technology for the WTP. Further detail on the design of the water treatment plant can be found in Volume 2. Similarly, design aspects, operational measures and other mitigation measures have been incorporated into the current Project plans which will minimize project-associated air emissions and/or the potential effect of project-related emissions. These have been discussed in Volume 4 (atmospheric environment).

Residual Project Effects - Three general groups of COPC were evaluated: Criteria Air Contaminants such as NO_x, SO_x and particulate matter (PM) which have respiratory effects; non-radionuclide COPC (including arsenic, cadmium, cobalt, copper, lead, molybdenum, nickel, selenium, uranium, zinc); and, radioactivity. The findings are as follows:

- Maximum concentrations of SO_2 are well within the health-based limits. Similarly, annual NO_2 concentrations meet applicable criteria;
- There may be infrequent, short-term NO_2 concentrations above the WHO health-based criterion at the Kiggavik camp; however, the levels at Baker Lake are well below any level of concern. Exceedances at the camp can be attributed to potential emissions of NO_x from open pit mining activities, including diesel-powered mining equipment and blasting. Short-term elevated concentrations are well below levels that WHO indicates may be a concern in healthy adults. NO_2 concentrations at the Kiggavik Camp do not exceed ambient air quality guidelines nor do they exceed Threshold Limit Values (TLVs) established by American Conference of Governmental Industrial Hygienists, which were developed to be protective of repeated exposure in a working environment;
- In terms of exposure to fine particulate matter (PM), the levels at Baker Lake are well below any levels of concern. There may be some short-term concentrations at the Kiggavik camp which exceed the health-based value designed to be protective of sensitive individuals (e.g. children, older adults, pre-existing respiratory disease). The probability of adverse effects related to fine PM exposure is likely to be low;
- Exposures to non-radionuclides were evaluated. The predicted intakes are below levels identified by regulatory agencies such as Health Canada and the US EPA as being safe for individuals. Fish and caribou ingestion are the biggest contributors for most COPC, along with berries; and
- Figure 8.5-3 presents the predicted average incremental dose to people from radiation for the Project activities. The majority of the incremental radiation dose for all receptors except for the non-NEW worker is from Po-210 in caribou. As seen from the figure, the highest exposure is for the on-site non-NEW who is expected to receive most of his/her incremental dose from radon and inhalation of dust. None of the doses estimated are expected to exceed the Health Canada dose constraint value of 0.3 mSv or the CNSC allowable dose for members of the public of 1 mSv. Many cautious assumptions were used in the assessment; for example it was assumed that caribou would typically spend 2% of their time in the LAA, which is near Judge Sisson Lake, and 4% of their time in the Regional Assessment Area which is over 10 times higher than that suggested by telemetry data.

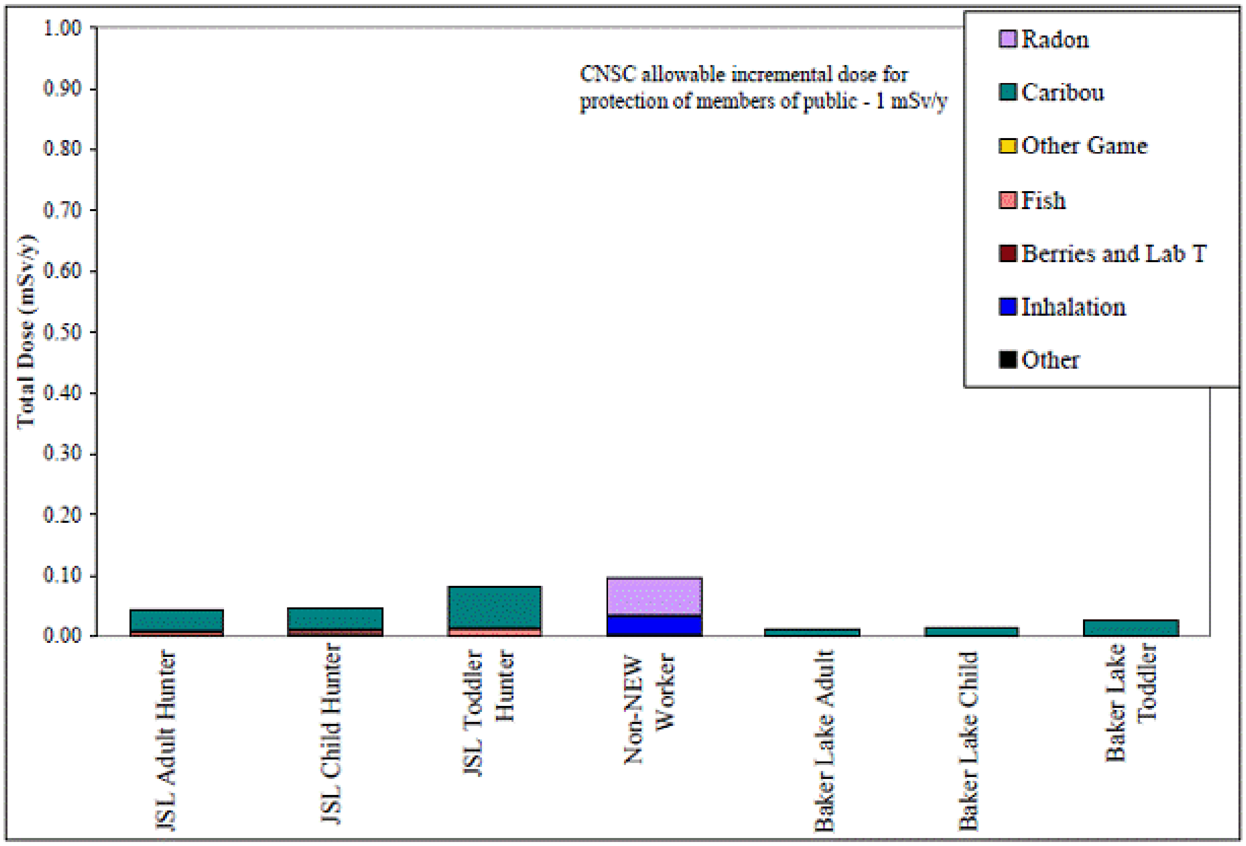

Figure 8.5-3 Breakdown of Incremental Annual Radiation Dose to Members of the Public from the Kiggavik Project

To help place the dose in perspective Figure 8.5-4 provides a summary of the doses associated with some typical activities (e.g. dental x-rays, airplane flights) as well as those associated with emissions from the Kiggavik Project.

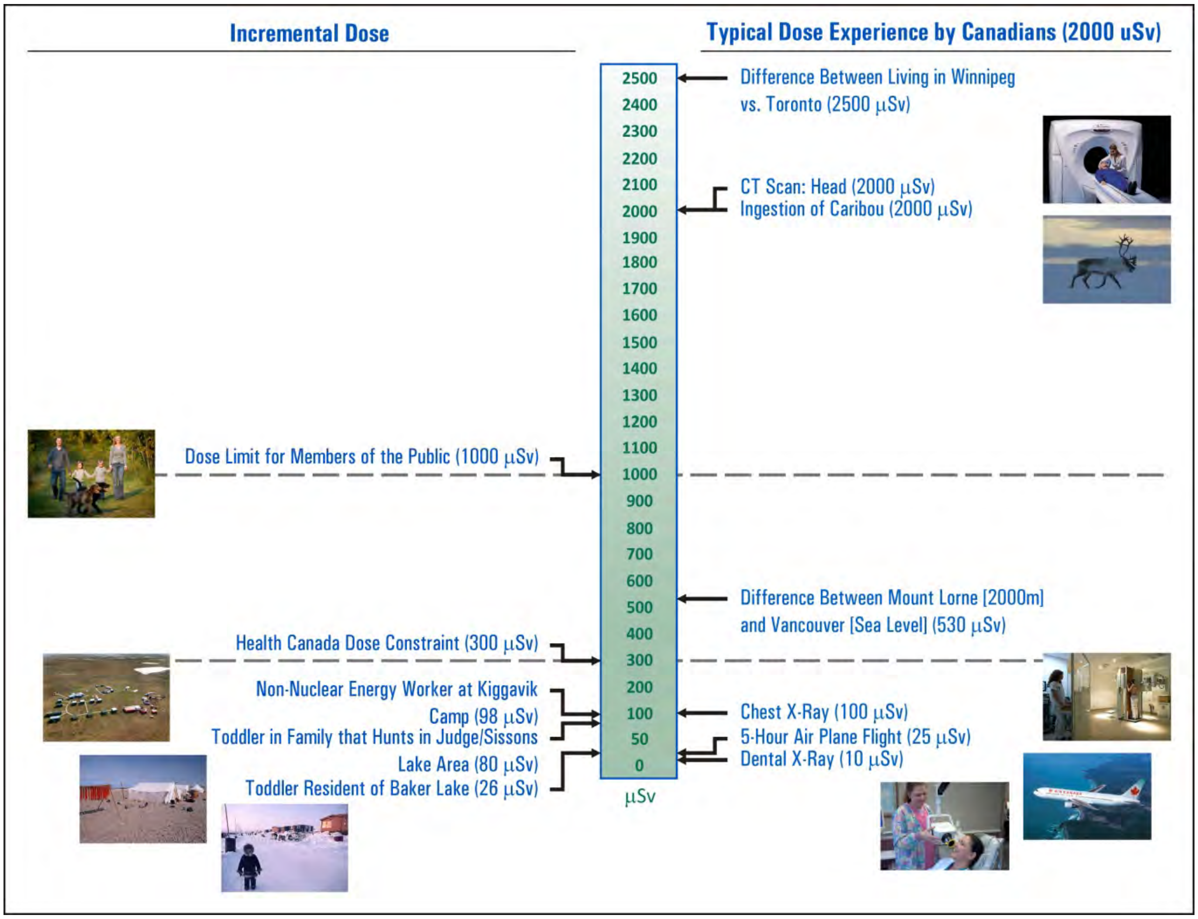

Figure 8.5-4 Comparison of Radiation Dose to Members of the Public from the Kiggavik Project to Dose from Other Sources

Monitoring - No specific monitoring plans have been developed to directly assess human health; rather the monitoring programs for the other environmental components (air, water, vegetation) are used to evaluate the affect the Project has on exposure to people from emissions from the Project.

Significance of Residual Effects - No residual effects on human health for workers were identified. No residual effects on human health were identified for residents of Baker Lake.

The assessment for members of the public included individuals that would reside half-time at the Kiggavik camp. A residual effect was identified with respect to NO_2 and fine particulate matter for people at the camp attributed to potential emissions of NO_x from open pit mining activities, including diesel-powered mining equipment and blasting. Short-term elevated concentrations are well below levels that the World Health Organization indicates may be a concern in healthy adults. NO_2 concentrations at the Kiggavik Camp do not exceed ambient air quality guidelines nor do they exceed Threshold Limit Values (TLVs) established by American Conference of Governmental Industrial Hygienists, which were developed to be protective of repeated exposure in a working environment.

A residual effect was also identified for radiation exposure to toddlers in families of hunters in the Judge Sissons Lake area due the presence of radionuclides in caribou. As a very cautious approach was taken to estimate the exposure and the exposure is expected to remain well below the CNSC allowable incremental dose, this is not considered to be a significant effect.

8.6 Socio-Economic Environment

8.6.1 Socio-Economics

With thousands of engagement, IQ and socio-economic comments from people in Kivalliq and governments, there are very many issues that people have said are important to assess. For purposes of the EIS, these have been grouped into six major socio-economic components: i) community economies; ii) traditional culture; iii) community wellbeing; iv) public infrastructure and services; v) non-traditional land use and land use planning; and vi) the economy of Nunavut. Each of these major socio-economic components has been further broken down into VSECs, including such things as employment, harvesting levels, language, health, family function, savings, demand for housing, policing, tourism, land use in Baker Lake and revenues to GN and NTI.

Issues and Effects

Community Economies - There are many interactions not just between VSECs and the Project, but between one VSEC and another. For example, the Project will create jobs, which in turn can affect the practice of traditional culture, which in turn can affect wellbeing. Different individuals or groups of people can respond differently to an effect. For example, some individuals can respond badly to rotational work with poor personal choices, and a rotational job will have a different effect on the worker than on the spouse, who is more likely to be a woman. Generalizing about effects quickly becomes unsatisfactory to many people, but is necessary.

Very broadly the Project's primary effect is the creation of economic opportunities for Kivalliq labour and businesses, during both construction and operations. Because such direct benefits have ripple effects throughout economies, more people that just Kiggavik workers and suppliers will see new economic opportunities. Community economies will grow, and job experience, education and training, and contracting experience will enhance the capacity of the labour force. The benefits of economic opportunities to Kivalliq residents are expected to gain momentum with time.

Rotational work does not require people to move, but enables them to, and most jobs created in community economies are expected to be in Baker Lake and Rankin Inlet as these two hamlets have the competitive advantages of geography and experience to date.

Traditional Culture - Taking up these new economic opportunities has implications for traditional culture, as more people transition into the wage based economy and adapt to the expectations and requirements of operating in cross cultural working environment. Particularly in concert with ongoing cultural change in Kivalliq, this process is expected to contribute to a cultural shift.

Income and rotational work provide resources and opportunities for harvesting. But a cultural shift can result in less practice of traditional activity, more use of English, and less commitment to the application of traditional values and knowledge. Any reduction of harvesting, or sharing of harvest, has potential for effect on food security (particularly of the more vulnerable), nutrition and thus health.

Ongoing government support for traditional culture is expected to ensure that at least some proportion of the population retains traditional skills, language, values and knowledge. The effect, again not only of Kiggavik but also of other factors, is expected to one of reduced practice rather than loss.

Wellbeing - Both increased incomes and cultural shifts have implications for wellbeing at the individual, family and community levels. Many people thrive with expanded economic opportunity, securing their roles as providers within families and having the incomes and savings to increase their standards of living and household economic security. But some people do not. In failing to personally manage stresses, they can harm their families. As well, any erosion of traditional culture can have negative effects on some individuals' sense of wellbeing and also sets up potential for discord within families, including between genders and between generations.

Individual challenges with new economic opportunities are not expected to manifest in reduced individual, family or community wellbeing overall. Unemployment and poverty also are causes of negative social behaviours, and many people will respond well to new economic opportunities. To the extent that people do struggle with transitioning to the wage economy, this is likely to be most often seen during the construction phase and early years of operations, until such time as adjustments and adaptations can be made.

Not everybody will have access to new economic opportunities. Some of these will be the more vulnerable segments of the population, such as single female parents of young children and the more unemployable. Any erosion of traditional culture, particularly of harvesting and sharing – a safety net for the less fortunate – has potential for harm, including to elders no longer able to harvest. Inuit values of sharing, consensus decision making and equity have some potential to give some way to the more individualistic ethic of southern culture, with consequent effects on, for example, crime levels and social cohesion.

Public Infrastructure and Services - In the expectation that overall, community wellbeing will increase, need for some social services should also decrease, particularly social assistance. There is however a correlation between increased income and increased demand for health, housing and municipal services. Increased incomes also imply more need for police, as people are out and about more. Improving economic opportunities are expected to motivate more demand for education.

These are benefits to the extent that government is able to deliver in a timely way, but where there is some disconnect between new demand and supply response, the more vulnerable are expected to disbenefit disproportionately. There are also some cost implications where capacity constraints are identified, however AREVA's payments of royalties and taxes will provide significant additional revenues to GN (as well as NTI). As with most other potential negative effects of the Project, any disconnects between supply and demand are expected to be resolved with time.

Non-Traditional Land Use - The Project, if approved, is expected to be a stimulus to mining development, including uranium mining development, in western Kivalliq. Mining development is a stated goal of both territorial and regional governing agencies, and would bring more of the same effects described above for Kiggavik. The Nunavut Planning Commission is advancing a territory-wide land use plan that will designate land uses or considerations for land uses that promote and facilitate the health of both land and wage based economies.

Economy of Nunavut - As the Meadowbank Project has demonstrated, large mining projects can be expected to have enormous effects on Nunavut's economic indicators. GDP, employment, labour income and investment levels will change dramatically for the better in response to both the construction and operations phases of Kiggavik. As noted above, revenues of GN (taxes) and NTI (royalties) will also increase.

Project Design and Mitigation - Socio-Economic Management

To manage socio-economic effects, AREVA has developed a Community Involvement Plan (Technical Appendix 3C) and a Human Resource Development Plan (Technical Appendix 9C). Project design has been adjusted in response to community input and to protect environmental resources (and consequences on harvesting). Socio-economic management however is primarily effected through the implementation of measures to mitigate the potential for negative effects and more importantly to enhance benefits for Inuit. Socio-economic management also includes extensive opportunities for community engagement and participation in Project decision making, and collaborative monitoring.

It is noted that proposed socio-economic mitigation focused on benefit enhancement is anticipated to be further detailed in the IIBA negotiated with KIA. The measures are derived from lessons learned elsewhere in Nunavut and northern Canada and suggestions during engagement. AREVA's corporate experience in Saskatchewan will also be drawn upon.

AREVA intends to maximize employment and contracting opportunities for people in Kivalliq communities. The major elements of this are i) preferential hiring, including points of hire in each of the Kivalliq communities; ii) preferential contracting, and helping businesses to overcome barriers to accessing Project contracting; iii) education, training and scholarship programs; iv) accommodating Inuit culture in the workplace as practical for improved job satisfaction; and v) wide dissemination of information on available employment and business opportunities.

It is noted that education and training will include a range of programming, for example pre-employment, life skills, high school completion, postsecondary, on-the-job, and mentoring programs for workers and prospective workers are anticipated. AREVA will also collaborate with Kivalliq education authorities on school based programs for children, to contribute to their ability over the longer term to successfully participate in both the wage and land based economic activity.

Work force management policies are largely intended to ensure that Inuit employees are equitably compensated, have the opportunity to engage in traditional activity and are provided workplace conditions that accommodate Inuit culture. There is also the expectation that all workers will conduct themselves appropriately both at the mine site and when in communities. Workforce management measures emphasize; i) rotational work schedules to enable trips on the land in weeks off work; ii) respectful workplace policies and worker codes of conduct (including expectations of respect for difference) iii) facilitating, where appropriate, use of Inuktitut and traditional practices at the mine site. AREVA's initiatives to support individual, family and community wellbeing include: i) providing a confidential employee and family assistance program; ii) making available at the mine site and community offices with peer or elder counselors; iii) providing communication systems for people to stay in touch with families; and iv) supporting community initiatives to address community priorities towards enhanced wellbeing, including as potential examples, assistance to elder and child care and recreational opportunities for youth.

Risks to worker and public health and safety are managed through i) the application of best health and safety practice; ii) emergency response planning; and iii) avoiding and minimizing any environmental effects that have potential to affect livelihood resources and/or public health. Nevertheless heightened perception of risk is expected. This will be addressed through continuing education on uranium mining, and its environmental and socio-economic effects.

AREVA will continue to engage, including with elders to capture IQ, for input on socio-economic management measures and needed adjustments (adaptive management). AREVA will also continue to provide the information people need to engage and participate in the Project effectively. AREVA fully acknowledges the importance of conducting meetings and providing information in English and Inuktitut.

Residual Project Effects

It is fully acknowledged that the detail of effects on different individuals, genders, age groups, vulnerable groups and communities in Kivalliq, many of which can be negative in a context of overall benefit are not captured by single conclusions on each of the VSECs identified. Further, many actual effects will depend on the socio-economic conditions of the Kivalliq Region at time of construction and beyond. The effects of the Project will be additional to those of Meliadine, which is fully expected to be in construction, and perhaps operation, by the time the Kiggavik Project moves to construction. Overall, as people adjust to change with time, most negative effects are expected to be moderate and positive effects are expected to gain momentum. At closure, the same processes may reverse, however in 2035, or 2046, the socio-economic conditions in Kivalliq will again be quite different.

Effects on community economies are positive and significant. The Project will preferentially employ, educate and train and contract in Kivalliq. Incomes will increase for many people and community economies will grow. A small net in migration is anticipated to continue in the Kivalliq Region with most new comers expected to settle in Rankin Inlet or Baker Lake. Although the Project will come to an end, the life-long benefits of job experience and learning are not reversed.

Effects on traditional culture are overall expected to be negative and substantial. The Project will not force or require changes to traditional culture– AREVA's mitigation measures are intended to support and facilitate people's choices. However some drift away from harvesting, use of Inuktitut, and traditional values and knowledge may be expected, particularly in the context of other forces of cultural change. Climate change is also a factor.

Effects on individual, family and community wellbeing are overall expected to be positive and significant. Although negative effects on traditional culture have the potential to erode wellbeing for some, broadening choices and opportunities for livelihoods are counteracting factors. There will be individual exceptions to improved wellbeing, and there is some expectation that crime, or awareness of crime, could increase in response to, for example, any developing inequities.

Increased demand for public infrastructure and services would be a negative effect if the government is unable to meet that demand. However, the assessment shows the effect of the Project is positive and significant. Revenues to GN and NTI will allow the provision of additional services, to the benefit of people. In this regard it is noted that the Project itself is not expected to be a source of increased demand.

The Project is expected to stimulate exploration and mining interest in western Kivalliq. This is a benefit, and significant, insofar as the ongoing land use planning process determines that this is the path forward Nunavut and Kivalliq choose. The consequent negative effect on tourism is considered of low magnitude because of little current use of the area by tourists. Land use effects in Baker Lake (including use of the shipping channel) are considered highly manageable, and therefore not significant.

Economic and fiscal effects at the territorial level are positive and significant. There will be very large jumps in gross domestic product, employment, labour income, own source GN revenues and payments to NTI. Subsequently the Kiggavik Project will represent a sustained contribution to the economy and revenues until closure.

Monitoring and Closure - Monitoring will include reporting on the uptake of economic opportunities, but AREVA also expects to collaborate with communities, KIA, GN and AANDC to develop a framework for collaborative monitoring of community wellbeing, primarily through participation with the Kivalliq SEMC. Details remain to be worked out as the Project moves towards construction.

Closure (premature or final) effects are most keenly felt in the coming to an end of employment and business opportunities and the consequent negative social effects of an economic downturn. The measures described above include a number of elements that are intended to enhance the economic and social resiliency in communities, which will go some way to attenuating the potential for negative closure effects. Work and business experience will give people a competitive edge in competing elsewhere in the economy. The emphasis on education and training will enhance workforce and business capacity to offer services. As well, at closure retrenchment programs and alternative livelihood training will be offered where necessary.

It is noted that many of the residual effects are contributions of Kiggavik to the ongoing socio-economic dynamic and trends in Kivalliq. As such, governments already have in place a large number of legal instruments and programs that have been developed to address the same kinds of socio-economic change, positive and negative, that has potential to result from the Project. Examples include language preservation, support to traditional harvesting, expansion of postsecondary education and public health programs.

8.6.2 Heritage Resources

Issues and Effects - Direct impacts to archaeological resources can occur during the Construction, Operation and Decommissioning Stages of the Project. This applies to both the mine site and site access. Direct impacts are primarily related to activities that involve surface disturbance of sediments. Indirect impacts to archaeological resources can also occur as a result of unanticipated activities resulting from one of the stages of the project. For example, increased access to the landscape from an access may result in an archaeological site being vandalized by people who otherwise may not have had access to that location.

Project Design and Mitigation - A number of mitigation measures can be implemented to manage potential effects to archaeological resources including avoidance, protection, systematic data recovery, education and an archaeological mitigation plan.

During the course of archaeological surveys conducted in advance of the Project, many archaeological sites are observed and documented. Most of these archaeological resources are documented for the first time and provide additional data on the past occupation of the region. Documentation for each site is kept on file with the Canadian Museum of Civilization as well as with the Government of Nunavut. The direction is positive and given the large number of sites that have been documented during baseline surveys, the magnitude is considered moderate. The records are kept on file indefinitely and are available for future researchers and regulators.

Residual Effects - Although direct impacts to sites will have an adverse impact to archaeological sites, it is anticipated that all project components will have been assessed by a qualified archaeologist and appropriate mitigation measures would be applied prior to the actual ground disturbance occurring. Therefore, the magnitude is considered low. Impacts to archaeological sites are directly related to the actual ground disturbance and are local in nature. Archaeological sites are non-renewable resources and any disturbance is permanent and irreversible.

Indirect impacts are adverse in nature but because they are unanticipated, they considered being moderate in magnitude. The geographic extent of an indirect impact to an archaeological resource is considered to be regional as some sites outside of the LSA or in areas that haven't been surveyed by an archaeologist may be impacted. All archaeological sites are non-renewable and any impact is irreversible.

Monitoring - Implementation of an archaeological mitigation plan for the fortuitous discovery of archaeological resource.

8.7 Cumulative Effects

Those project-environment interactions resulting in a residual effect were screened for potential cumulative effects by determining if the effect could act in combination with effects with past, present and reasonably foreseeable projects and/or activities. This section presents a summary of cumulative effects considering projects and/or activities in some form of regulatory approval. A far future scenario is also considered in the cumulative effects assessment (see Technical Appendix 1E).

Residual effects identified for the disciplines of noise, vibration, surface hydrology, hydrogeology, water quality, sediment quality, aquatic organisms and fish habitat, fish, terrain, soils, vegetation, raptors, migratory birds, marine fish or mammals and archaeology were determined to not have potential to act in a cumulative way. Terrestrial wildlife, health and socioeconomics were assessed for cumulative effects.

Air Quality Cumulative Effects - No other projects or activities are located close enough to interact spatially with the air quality effects from the Kiggavik Project mine site. With the preferred Kiggavik Project dock site located approximately 1 km away from the Meadowbank dock and storage facility operations, the Project effects may act cumulatively potentially resulting in an increase in ambient NO_2 concentrations.

Mitigation Measures - NO_2 emissions from the dock and storage facilities can be reduced through use of appropriate exhaust emissions controls, optimization of the number of heavy equipment movements, and overall minimization of travel distances, the number of barge shipments and offloading activities, as well as the extent and duration of barge or tug-barge engine idling at each dock.

Residual Cumulative Effect - Identical operations and emissions were assumed to be occurring simultaneously at both the Project dock and the Meadowbank dock location for modeling and assessment of potential effects. The maximum predicted incremental 1- and 24-hour NO2 concentrations at the receptor representing the Community of Baker Lake were below applicable Indicator Thresholds, but exceed them in the area immediately surrounding dock facilities. However, exceedances were limited to within 2 km from the Project footprint, and occurred infrequently. As a result, with proposed mitigation and environmental protection measures, the cumulative residual effect of increased ambient NO_2 concentrations from the Project and Meadowbank dock operations is assessed as not significant.

Monitoring - Short-term local monitoring can be undertaken at Baker Lake for NO_2 during one shipping season to confirm the model predictions.

Terrestrial Wildlife and Habitat Cumulative Effects - The alternate option of an all-season access road (winter road preferred option) may act in combination with hunter harvest resulting in a cumulative mortality effect on caribou. Higher caribou mortality rates may result from increased hunter harvest due to improved access to hunting areas through use of the all-season road or greater knowledge about caribou in the area. An access road may shift current harvest locations and therefore proportional take of different herds and/or increase future hunting rates. Without compromising safety, and providing the all-season access road is required and approved, some controlled public access would be anticipated. The details of this use have not yet been defined.

The Project also has the potential to act cumulatively with activities and regional communities to reduce habitat availability for caribou and muskox through additional direct and indirect habitat loss.

A conservative assessment based on the Qamanirjuaq herd of combined effects (i.e., disturbances to mortality, habitat, movement and health are considered), indicated that overall, the Project will have little effect on caribou energetics, and no measurable effect on population projections through to 2040. The number of Qamanirjuaq caribou is predicted to increase through that time period with or without the presence of the Project. The confidence in this prediction is moderate because all data used in the modelling were not specific to the caribou herd, because of possible errors in assumptions, and because predictive population models are subject to errors that may be due to changing environmental features that may be beyond the capability of the model to address.

The Project removes a very small amount of habitat (0.001%) from within the combined ranges. Within individual ranges, the loss ranges from 0.004% to 0.007%. The loss is so small within each herd's range as to be not significant. Total cumulative loss due to all disturbances within the cumulative effects assessment area amounts to, at most, 0.4%, and is consider not significant. The maximum loss of muskox habitat, using an assessment process that errs on the side of precaution, is ~3% of MX/21. These numbers likely represent an over-estimate of loss of habitat to footprints. Mitigating cumulative loss of habitat, should it increase to be of concern, requires management by responsible authorities for actions and activities beyond the control or responsibility of AREVA. Mitigation of cumulative loss of habitat, and cumulative effects in general lies in collaboration with government, management partners, and the land use planning process.*Mitigation* – Caribou are a shared responsibility with proponents, communities, Inuit and Land Claim Organizations and the Territorial Government all playing a role to ensure caribou remain abundant, healthy and available for harvest. The Baker Lake Hunters and Trappers Organization (HTO) currently co-manages community access to the Meadowbank road with Agnico-Eagle and they have expressed interest to work with AREVA in determining how to control and manage public access on a potential Kiggavik access road in ways that respect safety, the environment and company use of the road. AREVA plans to further engage the HTO and other caribou stakeholders in determining acceptable management of public access including use of temporary road closure, no-shooting corridors along the road for safety reasons and possibly providing support to the HTO in order for them to promote IQ principles in the community or other agreed initiatives.

Cumulative effects to terrestrial wildlife are assessed as not significant.

Monitoring – No monitoring is currently planned as the winter road in the preferred option for development negating this potential cumulative effect. Should the all-season alternative be approved, required monitoring programs (e.g. participation in hunter harvest studies) deemed acceptable would be developed and implemented in coordination and collaboration with caribou stakeholders.

Worker Health - As the future projects considered in the cumulative effects assessment are located a significant distance from the Project site, there is not expected to be any interactions that would have a measurable effect on human health. A cumulative effect that was considered is that a non-NEW worker at the Kiggavik site may also reside in Baker Lake. The total dose for a person living in Baker Lake and working at the site (as a non-NEW) is estimated to be 0.1 mSv/y, well below the CNSC allowable dose for members of the public and the Health Canada dose constraint.

Human Health - The only cumulative effect that was considered to be relevant for the occupational worker exposure is a worker at the Kiggavik Project that may also reside in Baker Lake. The additional dose to this worker who would be present for half of their time at Baker Lake is estimated to be 0.04 mSv/y. Even with the consideration of this additional exposure, all workers are expected to remain well below the CNSC dose limit.

Socio-Economic Cumulative Effects - For purposes of assessing cumulative socio-economic effects, the scenario is construction and operations of a total of nine large mining projects in Nunavut over the period to 2028. The projects are Meadowbank, Kiggavik, Meliadine, Mary River, Doris North phases 1 and 2, Hackett River, Izok Lake and Back River. Most of these projects are not in the Kivalliq Region. However their very high demands for labour and goods, the imperative to maximize Project benefits to Inuit and rapidly growing capacity in the Kivalliq Region to supply the mining sector suggest that there will be spill-over effects into the Kivalliq Region even where projects are located elsewhere in Nunavut.

These projects are expected to have the same types of socio-economic effects as the Kiggavik Project. Most of these effects will be additive, for example more people will be employed, economies will grow more quickly, and the wellbeing of more people will be improved. However there is some potential that the total effects of all these projects together could be more, or less, than additive.

In the shorter term, if the combined demand for labour and goods outstrips supply capacity (simply on account of shortages of people in the labour force), mining proponents may be forced to meet the supply from the south and benefits that notionally could have been retained by Inuit will not be. Nunavut's labour force is growing so quickly this is a short term versus a longer term concern.

The integrity of traditional culture will in the longer term depend on a significant proportion of people maintaining its practice. The Project alone will not create economic opportunities for everyone but the potential for much fuller employment, particularly of the young, may have long term negative implications for traditional culture.

Government programs in support of traditional culture and ongoing importance given by people to maintaining cultural integrity will mitigate the potential for this to some extent, and Inuit do accept that culture evolves.

Finally, the cumulative effects of multiple projects will be a significant benefit to the economy of Nunavut. Mining projects eventually close, with potential to cause severe economic and consequent social dislocation for both individuals and the territorial economy. The availability of new projects to take the place of older ones provides alternative jobs and markets for labour and business.

As stated in Socioeconomic Project effects section, effects on different individuals, genders, age groups, vulnerable groups and communities in the Kivalliq Region can be negative in a context of overall benefit.

8.8 Transboundary Effects

A transboundary effect may occur when a residual effect occurs outside the Nunavut Settlement Area or when animals move across jurisdictional boundaries.

Terrestrial Transboundary Effects - The Qamanirjuaq, Beverly and Ahiak caribou herds migrate across political boundaries into the provinces of Manitoba and Saskatchewan and the Northwest Territories. Aboriginal harvesters of these herds outside the Nunavut Settlement Area have raised concerns that any impact to these caribou herds will subsequently impact their harvest rights in addition to their Aboriginal culture and identity, which is closely tied to caribou. Predicted Project effects on caribou include direct mortality (collisions), direct and indirect habitat loss (Project footprint, dust and sensory disturbance), possible avoidance of Project area but no alteration to migration patterns and no change to health. Predicted cumulative effects to caribou include a possible shift in proportional caribou herd take or an overall increase in harvest to the Qamanirjuaq herd given the development of the alternative all-season access road option and changes in harvest patterns. Considering that neither the Project nor cumulative effects to caribou are significant, no significant adverse transboundary effects are predicted for caribou.

Transportation – All resource development projects require the transport of goods to the project site and the transport of product to market. There are existing, charted shipping lanes and flight routes throughout Canada and internationally. The assessment has included an assessment of marine transport in Hudson Bay and Strait and a risk assessment for transport of uranium ore concentrate (UOC) that considers the flight path from the Kiggavik site to the airstrip at Points North, Saskatchewan. Transport of UOC will be in accordance with regulations governing the safe transport of radioactive materials including the *Transportation of Dangerous Goods Regulations* and the *Packaging and Transport of Nuclear Substances Regulations.* Development of an Emergency Response Assistance plan (ERAP) is a post-environmental assessment requirement that must be accepted by Transport Canada prior to shipment. AREVA currently maintains an ERAP for UOC transport in Canada.

9 Effects of the Environment on the Project

The natural environment has the potential to affect the Project through a number of mechanisms, these include: extreme weather, such as blizzards, high winds, extreme precipitation, storm surges, fog; climate factors, such as thaw susceptible soils; seismic activity; wildlife encounters; and fires. The potential for these occurrences to cause accidents and malfunctions was assessed as part of the screening risk assessment.

Extreme weather conditions could potentially have the following impacts on the Project:

- Increased risk to personnel safety;
- Damage to infrastructure and process stream containment;
- Upsets to the site water balance resulting in excess effluent or lack of sufficient fresh water; and
- Difficulties in transporting personnel, supplies and perishable goods to site due to decreased time to ship materials.

The effects of extreme weather conditions and proposed mitigation measures are summarized in Table 9-1.

Table 9-1 Potential Effects of Extreme Weather on the Project

Hazard	Potential Effects on the Project	Mitigation Measures
Extended drought	• Need for increased freshwater withdrawals • Potential mill operational difficulties if sufficient water is not available • Additional dust control measures (i.e. watering of roads)	• Monitoring of effects on fresh water withdrawal lake (Siamese Lake) • Increased monitoring frequency • Robust water management system; use of TMFs and Purpose Built Pit (PBP) to store site drainage for recycle. • Increased use of TMF reclaim for processing • Use of a secondary water source with regulatory approval
Extreme precipitation and flooding	• Increase in treated effluent discharge • Potential loss of pond containment • Over-topping site diversion and dewatering structures • Flooding open pits • Back-up of drainage at culverts; over-topping roads • Bridge wash-out • Ferry capsize • Damage to ferry infrastructure • Damage to dock site	• Containment ponds and diversion structures designed to handle PMP • Conservative WTP design • Contingency containment in PBP and TMFs • Monitoring and maintenance of bridges, roads and culverts
Extended blizzard	• Personnel injury or fatality • Spill / loss of containment • Increased snow loading on infrastructure	• Design to building codes for snow loads • Emergency shelters • Arctic corridors • Curtailment of outdoor work • Emergency Response and Spill Contingency procedures
Severe wind	• Personnel injury or fatality • Damage to infrastructure and potential loss of containment	• Design to building code • Ultimate containment within mill terrace, open pits • Curtail outdoor work, particularly work at heights • Work shelters to minimize wind • Emergency Response procedures
Extreme temperature lows	• Personnel injury or fatality • Damage to mobile equipment	• Design to building code • Curtail outdoor work, work shelters where possible to minimize effects of cold temperatures • Emergency Response procedures to ensure personnel safety

Table 9-2 Potential Effects of Climate Change on the Project

Hazard	Potential Effects on the Project	Mitigation Measures
Reduction in Permafrost and ice-rich soils	• Creep settlement or thermal degradation of roads, stockpiles, buildings • Failure of road embankments • Slumping or failure of pit slopes • Instabilities in underground openings • Slumping or landslide on large landforms • Increase in artesian pressures underneath pits, TMFs, underground	• Geotechnical investigations in areas of critical infrastructure • Appropriate design in potential problem areas • Appropriate design of bridges and foundations • Inspections and repair of roads and foundations • Pit slope stability monitoring • Underground ground control monitoring
Increase in run-off	• Loss of site containment • Increase in treated effluent discharge • Over-topping site diversion and dewatering structures • Flooding open pits • Back-up of drainage at culverts; over-topping roads	• Containment ponds and diversion structures designed to handle PMP • Conservative WTP design • Contingency containment in PBP and TMFs
Decrease in winter-road operating window	• Logistics challenges and associated costs • Spill / loss of containment • Loss of power • Fire and/or explosion	• All-season road option
Change in open water season	• Logistical challenges and associated costs	• Multiple marine transport options

Accidents and malfunctions, including those caused or compounded by environmental hazards, are predicted to have no residual effects on the environment. Preventative measures, including design features, inspections and checks, containment systems, management plans, preventative maintenance, routine operational and environmental monitoring, safe work plans, and training programs will be in place to reduce the probability of the incident occurring. Response measures, including trained emergency response teams, an emergency response plan, a spill contingency plan, spill kits, monitoring programs and trained first responders, will be in place to reduce the consequences of an incident should an incident occur.

10 Accidents and Malfunctions

The objective of the Accidents and Malfunctions section is to identify and qualitatively assess potential accidents and malfunctions associated with the Kiggavik Project. The key Project components that were assessed include marine transport, activities at the Baker Lake dock facility, transportation on the Baker Lake - Kiggavik site access road, open pit mining, underground mining and the milling operation.

Early risk identification enabled mitigation by design and focused assessment and further risk specific mitigation on those potential accidents and malfunctions of concern. Mitigation measures consider personnel, local communities, the environment, and the operation and include: 1) measures to reduce the risk of an occurrence (design features such as site containment, management programs and routine monitoring); 2) measures to minimize the consequences if the event occurs (emergency response, spill contingency, management and monitoring programs); and 3) measures to ensure control is regained before activities re-commence.

To fully characterize and evaluate the potential accidents and malfunctions associated with the Project, a number of risk assessments using varying methodologies have been conducted. A broad range of potential accidents and malfunctions were identified using a screening level assessment for the entire Project. Risks were then characterized based on the likelihood of the incident occurring and the potential consequences to the environment, radiation exposure or health and safety. These risks were further evaluated to identify preventative measures, response measures, and mitigation measures to minimize potential effects to health, safety and the environment.

The screening-level assessment of accidents and malfunctions identified most on-site environmental risks as low, while some health and safety risks, such as the risk of fire or explosion, as moderate. Spills of fuel and other hazardous materials, including uranium concentrate, outside of site containment boundaries, were generally identified as moderate risk. Based on these results, coupled with concerns expressed by local communities, additional assessments were conducted on potential transportation accidents and malfunctions through the general and marine-specific transportation risk assessments. These were assessed in more detail.

The transportation risk assessment identified some moderate risk if a release of yellowcake were to occur. The risk of a rollover is highly unlikely and the consequences minor. For an air plane crash, the likelihood is unlikely while the consequences would be higher as some aquatic species may be affected if the crash occurred in a waterbody with complete loss of containment. There would be minimal risk to human receptors if a yellowcake release were to occur as doses are expected to be well below the accepted limits. Similarly, an assessment of the transportation of uranium ore concentrates by road and rail throughout Canada was evaluated and concluded that risks were low to moderate if a release were to occur as a result of an accident. There will be stringent protocols, emergency response plans and preventative measures to ensure yellowcake release does not occur. Similar protocols will be in place to ensure fuel and reagents spills do not occur.

The marine risk assessment identified moderate risk activities that are considered acceptable with stringent controls. A number of these generally involve the potential for tug/barge grounding in Chesterfield Narrows. A moderate risk of a fuel spill in Baker Lake was identified. Further moderate risks were identified to occupational health and safety during anchoring operations in Chesterfield Inlet and barge docking activities at the Baker Lake dock site. Stringent protocols, emergency response capability, preventative measures such as double-hulled fuel barges, appropriate personal protective equipment, and pre-installed anchor systems will be implemented to mitigate these risks.

The results of the marine transportation risk assessment indicate that there is an unacceptable risk of a tug/barge grounding in Chesterfield Narrows due to navigational or maneuvering error during passage of a tug towing two barges. Therefore, the marine transportation plan includes passage of only one barge per tug while transiting the Narrows.

A preliminary Emergency Response Plan (ERP) has been prepared for the Project. The ERP provides general guidance for all emergencies related to the Project; describes the responsibilities, tasks and reporting requirements involved in an emergency; and details various emergency response situations including necessities of life emergencies, personnel emergencies, natural environment-related emergencies and operational emergencies. There will be additional procedures and work instructions to ensure tasks are completed safely for high risk activities. There will also be an additional Underground Emergency Response Plan for underground mining operations.

Preventative and emergency response measures will be in place to minimize the occurrence and extent of potential accidents and malfunctions.

11 Sustainability

The Minerals and Metals Policy of the Government of Canada: Partnerships for Sustainable Development (NRCan 1996) defines sustainable development in the context of minerals and metals as incorporating the following elements:

- "finding, extracting, producing, adding value to, using, re-using, recycling and, when necessary, disposing of mineral and metal products in the most efficient, competitive and environmentally responsible manner possible, utilizing best practices;
- respecting the needs and values of all resource users, and considering those needs and values in government decision-making;
- maintaining or enhancing the quality of life and the environment for present and future generations; and
- securing the involvement and participation of stakeholders, individuals and communities in decision-making."

Strong Project design, implementation of effective mitigation and comprehensive monitoring, continuing two-way communication and partnership with communities and a commitment to adaptive management and continual improvement ensure adverse effects are minimized and benefits maximized throughout Project life as identified within the balance of environment, people and economics.

During the Bruntland Commission, the World Commission on Environment and Development defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs (UN 1987)." NRCan (2006) recognized "that the economic and social benefits of mineral development are not all consumed by the present generation [but rather, current investments in human and physical capital benefit future as well as present generations."

Acknowledging residual effects associated with development, the development of the Kiggavik Project will not compromise ecosystem integrity. Socioeconomic impacts will be positive overall with existing and future well-being of Nunavut residents protected and promoted.

12 Literature Cited

AANDC (Aboriginal Affairs and Northern Development Canada). 2008. Fact Sheet: Northern Strategy, Internet site. Accessed: December 19, 2011. Available at http://www.aadnc-aandc.gc.ca/eng/1100100016431

AANDC 2005 INAC and the Nunavut Water Board (NWB). 2005. Glossary of Water Management Terms. 18 pp. ISBN: 0-662-41620-1

AANDC 2007. Indian and Northern Affairs Canada (INAC). 2007. Glossary of Mining Terminology. Ottawa, ON. 23 pp. ISBN: 978-0-662-45463-2

AECB (Atomic Energy Control Board). 1995. Canada: Living with Radiation.

Anderson, J.T. 1979. Seston and phytoplankton data from Hudson Bay, 1975 (No. Technical Report Series No. 80-2). Department of Fisheries and Oceans. xii + 76 pp

Anderson, J.T., J.C. Roff and J. Gerrath. 1981. The diatoms and dinoflagellates of Hudson Bay. Canadian Journal of Botany 59:1793-1810.

AREVA. Definition and translation provided by AREVA Resources Canada Inc.

Baffinland 2010 Baffinland (Baffinland Iron Mines Corporation). 2010. Mary River Environmental Impact Statement. Appendix 1E Glossary. Submitted to Nunavut Impact Review Board, December 2010. Cambridge Bay, NU.

Bender, W. L. 1996. Report on Estimated Airblast and Blast-Related Vibration at the Lincoln Project, Placer County, California. Green Valley, AZ.

Bradstreet, M.S.W., K.J. Finley, A.D. Sekerak, W.B. Griffiths, C.R. Evans, M.F. Fabijan, et al. 1986. Aspects of the feeding biology of Arctic cod (Boreogadus saida) and its importance in arctic marine food chains. (No. Canadian Technical Report of Fisheries and Aquatic Sciences No. 1491). 193 pp

Brown, J., O.J. Ferrians Jr., J.A. Heginbottom, and E.S. Melnikov. 1998, revised Feb. 2001. Circum-Arctic map of permafrost and ground ice conditions, Boulder, CO: National Snow and Ice Data Center/World Data Center for Glaciology.

Campbell, M. W., J.G. Shaw, C.A. Blyth. 2012. Kivalliq Ecological Land Classification Map Atlas: A Wildlife Perspective. Government of Nunavut, Department of Environment. Technical Report Series #1-2012. 274 pp.

Catling P.M., G. Mitrow, and B.A. Bennet. 2008. A compilation of additions to the Flora of the Continental Portions of Northwest Territories and Nunavut – No. 2. Internet site. Accessed: June 23, 2011. Available at: http://www.ou.edu/cas/botany-micro/ben/ben400.html

CLEY 2005. Government of Nunavut, Department of Culture, Language, Elders and Youth (GN-CLEY) and Nunavut Tunngavik Incorporated (NTI). 2005. Terminology on Climate Change. Iqaluit, NU. 148 pp. ISBN: 1-55325-082-6.

CNSC (Canadian Nuclear Safety Commission). 2000a. Uranium Mines and Mills Regulations, May 2000.

CNSC (Canadian Nuclear Safety Commission). 2000b. Radiation Protection Regulations, May 2000.

Coad, B.W. and J.D. Reist. 2004. Annotated List of the Arctic Marine Fishes of Canada. Canadian Manuscript Report of Fisheries and Aquatic Sciences 2674: iv + 112 pp.

Cody, W.J., K.L. Reading and J.M. Line, 2003. Additions and range extensions to the vascular plant flora of the continental Northwest Territories and Nunavut, Canada, II. Canadian Field Naturalist 117(3):448-465.

Cody, W.J. and K.L. Reading. 2005. Additions and range extensions to the vascular plant flora of the continental Northwest Territories and Nunavut, Canada, III. Canadian Field Naturalist 119(2):276-290.

EC (Environment Canada). 2011. Nunavut Migratory Bird Sanctuary Facts. Internet site. Accessed: August 2011. Available at: http://www.ec.gc.ca/ap-pa/default.asp?lang=En&n=74BC888B-1

Gagnon, A.S. and W.A. Gough. 2005. Trends in the dates of ice freeze-up and breakup over Hudson Bay, Canada. Arctic 58(4):370-382.

Government of Canada. 2010. Canadian Hydrographic Service. Internet site. Available at: http://www.tides.gc.ca

GN (Government of Nunavut) – Department of Economic Development and Transportation. 2007. Parnautit: A Foundation for the Future – Mineral Exploration and Mining Strategy.

GN-ILA 2011. GN, Inuit Language Authority. 2011. Uranium Terminology. Unpublished Manuscript.

Health and Welfare Canada. 1989. National Guidelines for Environmental Noise Control. Prepared by Working Group on Environmental Noise of Federal/Provincial Advisory Committee on Environmental and Occupational Health. Ottawa, ON.

Höhn, E.O. 1969. Eskimo bird names at Chesterfield Inlet and Baker Lake, Keewatin, Northwest Territories. Arctic 22(1):72-76.

IBA Canada. 2009. Important Bird Area. Internet site. Accessed: July, 2010. Available at: http://www.ibacanada.com/

Michaud, D.S., S.H.P. Bly and S.E. Keith. 2008. Using a change in percentage highly annoyed with noise as a potential health effect measure for projects under the Canadian Environmental Assessment Act. Canadian Acoustics. Vol. 36: 13-30.

Nagy, J. A., D. L. Johnson, N. C. Larter, M. W. Campbell, A. D. Derocher, A. Kelly, M. Dumond, D. Allaire, and B. Croft. 2011. Subpopulation structure of caribou (*Rangifer tarandus* L.) in arctic and subarctic Canada. *Ecological Applications* 21:2334–2348.

NPC (Nunavut Planning Commission). 2007. Nunavut Planning Commission Broad Planning Principles, Policies and Goals

NRCan (Natural Resources Canada). 2006. The Minerals and Metals Policy of the Government of Canada: Partnerships for Sustainable Development. Ottawa, ON

Nunami Jacques Whitford Limited. 2008. Nearshore Fish and Fish Habitat Assessment Related to Marine Terminal Structure Developments. Prepared for Government of Nunavut Transportation, Policy and Planning Department of Economic Development and Transportation.

NIRB 2007. Nunavut Impact Review Board (NIRB). 2007. Guide 2: Guide to Terminology and Definitions. Cambridge Bay. NU. 8 pp.

NIRB. 2011. Guidelines for the Preparation of an Environmental Impact Statement for AREVA Resources Canada Inc.'s Kiggavik Project (NIRB File No. 09MN003). Cambridge Bay, NU.

NIRB. 2013. Preliminary Hearing Conference Decision concerning the Kiggavik Project Proposed by AREVA Resources Canada Inc. (NIRB File No. 09MN003). Cambridge Bay, NU. July 5, 2013.

NTI (Nunavut Tunngavik Incorporated). 1997. Mining Policy

NTI. 2007. Policy Concerning Uranium Mining in Nunavut.

OMOE (Ontario Ministry of the Environment). 1978. Model Municipal Noise Control By-Law: Final Report. NPC-119: Blasting. Toronto, ON.

Prinsenberg, S.J. 1987. Seasonal current variations observed in western Hudson Bay. Journal of Geophysical Research 92(C10):10,756-710,766.

Roff, J.C. and L. Legendre. 1986. Physio-chemical and biological oceanography of Hudson Bay. Elsevier Oceanography Series 44:265-292.

Saucier, F.J., S. Senneville, S.J. Prinsenberg, F. Roy, G. Smith, P. Gachon, et al. 2004. Modelling the sea ice-ocean seasonal cycle in Hudson Bay, Foxe Basin and Hudson Strait, Canada. Climate Dynamics 23:303-326.

Scott, W.B. and M.G. Scott. 1988. Atlantic fishes of Canada. Vol. 730. University of Toronto Press and Ministry of Fisheries and Oceans.

Stewart, D.B. and W.L. Lockhart. 2005. An Overview of the Hudson Bay Marine Ecosystem. Canadian Technical Report of Fisheries & Aquatic Sciences 2586:vi + 487.

Thomas, P.A. I. Fisenne, D. Chorney, A.S. Baweja and B.L. Tracy 2001. Human Absorption and Retention of Polonium-210 from Caribou Meat. Radiation Protection Dosimetry 97(3) pp241-250.

United Nations. 1987. Report of the World Commission on Environment and Development. General Assemblt Resolution 42/187, 11 December 1987.

Walther, D.A., Ramelow, G.J., Beck, J.N., Young, J.C., Callahan, J.D. and M.F. Maroon. 1990. Temporal changes in metal levels of the lichens Parmotrema praesorediosum and Ramalina stenospora, Southwest Louisiana. Water, Air, & Soil Pollution 53 (1–2): 189–200.

Welch, H.E., M.A. Bergmann, T.D. Siferd and P.S. Amarualik. 1991. Seasonal development of ice algae near Chesterfield Inlet, N.W.T., Canada. Canadian Journal of Fisheries & Aquatic Sciences 48(12):2395-2402.

Wiss, J.F. 1981. Construction Vibations: State-of-the-Art. Journal of the Geotechnical Division. ASCE. V. 107, no. GT2. Porc. Paper 16030. pp. 167-181

WNA (World Nuclear Association) 2011. Comparison of Lifecycle Greenhouse Gas Emissions of Various Electricity Sources, World Nuclear Association, July 2011.

World Health Organization (WHO). 1999. *Guidelines for Community Noise*. World Health Organization, Geneva. Geneva, Switzerland.

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3	2K	Winter Road Report	Graham Wilkins and Kevin Jones (EBA)	EBA Engineering Consultants Ltd. Oceanic Plaza, 9th Floor 1066 West Hastings Street Vancouver, BC V6E 3X2 p. 604.685.0275		
3	2L	All-Season Road Report	Graham Wilkins and Kevin Jones (EBA)	EBA Engineering Consultants Ltd. Oceanic Plaza, 9th Floor 1066 West Hastings Street Vancouver, BC V6E 3X2 p. 604.685.0275		

Table 13- 2 Draft Environmental Assessment Authors

Tier	Volume	Document Name	Main Author(s)	Contact		
3	2M	Roads Management Plan	Nathan Drake (AREVA)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500		
3	2N	Borrow Pits and Quarry Management Plan	Frederic Guerin and Naomi Stumborg (AREVA)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500		
3	2O	Airstrip Report	Graham Wilkins and Kevin Jones (EBA)	EBA Engineering Consultants Ltd. Oceanic Plaza, 9th Floor 1066 West Hastings Street Vancouver, BC V6E 3X2 p. 604.685.0275		
3	2P	Occupational Health and Safety Plan	Mary Lo (AREVA)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500		
3	2Q	Radiation Protection Plan	Kristine Stewart and Dale Huffman (AREVA)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500		
3	2R	Preliminary Decommissioning Plan	Dave Hiller (AREVA)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500		
3	2S	Waste Management Plan	Kim Jackson and Naomi Stumborg (AREVA)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500		
3	2T	Environmental Management Plan	Patti Simpson (AREVA)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500		

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Tier	Volume	Document Name	Main Author(s)	Contact		
3	2U	Hazardous Materials Management Plan	Nathan Drake (AREVA)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500		
3	3A	Public Engagement Documentation	Barry McCallum (AREVA)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500		
3	3B	IQ Documentation	Barry McCallum (AREVA), Mitch Goodjohn (Golder)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500	Golder Associates Ltd. 2535 3 Avenue Southeast Calgary, AB T2A 7W5 (403) 299-5600	
3	3C	Community Involvement Plan	Barry McCallum (AREVA)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500		
3	4A	Climate Baseline	Brent Topp (Golder)	Golder Associates Ltd. 1721 8th Street East, Saskatoon, SK S7H 0T4 (306) 665 7989		
3	4B	Air Dispersion Assessment	Abby Salb (SENES)	SENES Consultants Limited 121 Granton Drive Richmond Hill, ON L4B 3N4 (905) 764-9380		
3	4C	Air Quality Monitoring Plan	Abby Salb (SENES)	SENES Consultants Limited 121 Granton Drive Richmond Hill, ON L4B 3N4 (905) 764-9380		
3	4D	Long-term Climate Scenario	Mark Vendrig (Consult5)	Consult 5 Inc. 4-1576 Tatlow Avenue North Vancouver, BC V7P 2Z7 (778) 338-3743		
3	4E	Noise and Vibration Assessment	Paul Kirkby (SENES)	SENES Consultants Limited 121 Granton Drive Richmond Hill, ON L4B 3N4 (905) 764-9380		

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Tier	Volume	Document Name	Main Author(s)	Contact		
3	4F	Noise Abatement Plan	Naomi Stumborg (AREVA)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500		
3	5A	Hydrology Baseline	Brent Topp (Golder)	Golder Associates Ltd. 1721 8th Street East Saskatoon, SK S7H 0T4 (306) 665 7989		
3	5B	Geology and Hydrogeology Baseline	Frederic Guerin (AREVA)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500		
3	5C	Aquatic Baseline	Brian Christensen (Golder)	Golder Associates Ltd. 2535 3 Avenue Southeast Calgary, AB T2A 7W5 (403) 299-5600		
3	5D	Groundwater Flow Model	Frederic Guerin and Alda Behie (AREVA), Michael Royle and Gregory Fagerlund (SRK)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500	SRK Consulting (Canada) Inc. Suite 2200 – 1066 West Hastings St. Vancouver, BC V6E 3X2 Tel: (604) 681-4196	
3	5E	Prediction Water Inflows to Kiggavik Project mines	Frederic Guerin (AREVA) and Michael Royle (SRK)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500	SRK Consulting (Canada) Inc. Suite 2200 – 1066 West Hastings St. Vancouver, BC V6E 3X2 Tel: (604) 681-4196	
3	5F	Mine Rock Characterization and Management	Frederic Guerin (AREVA), Ron Nicholson, Mike Venhuis (Ecometrix)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500	Ecometrix Incorporated 6800 Campobello Road Mississauga, ON L5N 2L8 (905) 794-2325	
3	5G	Thermal and Water Transport Modeling	Michel Noel (SRK)	SRK Consulting (Canada) Inc. Suite 2200 – 1066 West Hastings St. Vancouver, BC V6E 3X2 Tel: (604) 681-4196 Fax: (604) 687-5532		

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Tier	Volume	Document Name	Main Author(s)	Contact		
3	5H	Waste Rock Water Balance	Saul Marin, Brent Topp, Tracy McArthur (Golder)	Golder Associates Ltd. 1721 8th Street East Saskatoon, SK S7H 0T4 (306) 665 7989		
3	5I	Hydrology of Waste Rock Piles in Cold Climates	Matthew Neuner (Golder - Calgary) and Brent Topp (Golder - Saskatoon)	Golder Associates Ltd. 2535 3 Avenue Southeast Calgary, AB T2A 7W5 (403) 299-5600	Golder Associates Ltd. 1721 8th Street East Saskatoon, SK S7H 0T4 (306) 665 7989	
3	5J	Tailings Characterization and Management	Frederic Guerin (AREVA), Greg Newman (Golder), John Mahoney (MGC)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500	Golder Associates Ltd. 2535 3 Avenue Southeast Calgary, AB T2A 7W5 (403) 299-5600	Mahoney Geochemical Consulting LLC 892 S. Newcombe Way Lakewood, CO 80226 (303) 986 7643
3	5K	Historical and Climate Change Water Balance for Pointer Lake & Judge Sissons Lake	Ashley Dubnick and Brent Topp (Golder)	Golder Associates Ltd. 1721 8th Street East Saskatoon, SK S7H 0T4 (306) 665 7989		
3	5L	Fisheries Offset Plan	Brian Christensen (Golder)	Golder Associates Ltd. 2535 3 Avenue Southeast Calgary, AB T2A 7W5 (403) 299-5600		
3	5M	Aquatics Effects Monitoring Plan	Brian Christensen (Golder)	Golder Associates Ltd. 2535 3 Avenue Southeast Calgary, AB T2A 7W5 (403) 299-5600		
3	5N	Hydrology Assessments	Ashley Dubnick and Brent Topp (Golder)	Golder Associates Ltd. 1721 8th Street East Saskatoon, SK S7H 0T4 (306) 665 7989		
3	6A	Surficial Geology, Terrain & Shallow Geotech Cond	Bibek Shrestha (AREVA)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500		
3	6B	Soils and Vegetation Baseline	Martin Gebauer (Gebauer & Associates)	Gebauer & Associates 403 - 1529 W 6th Avenue 6th & Granville, Vancouver, BC V6J 1R1 Tel: 604 261 2716		
3	6C	Wildlife Baseline	Martin Gebauer	Gebauer & Associates	Environmental	

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Tier	Volume	Document Name	Main Author(s)	Contact		
			(Gebauer and Associates) and Mike Setterington (EDI)	403 - 1529 W 6th Avenue 6th & Granville, Vancouver, BC V6J 1R1 Tel: 604 261 2716	Dynamics Inc. (EDI) 3-478 Range Road Whitehorse YT (867) 393-4882	
3	6D	Wildlife Mitigation and Monitoring	Denis Dean (AREVA)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500		
3	7A	Marine Baseline	Janine Beckett and Michelle Marcotte (Stantec)	Stantec 4370 Dominion Street - 5th Floor Burnaby, British Columbia V5G 4L7 (604) 436 - 3014		
3	7B	Acoustics Modelling	Zizheng Li, Alexander MacGillivray, and Jennifer Wladichuk (JASCO)	JASCO Research Suite 2305 – 4464 Markham Street Victoria, British Columbia V8Z 7X8 Tel: (250) 483 3300		
3	8A	ERA, HRA	Stacey Fernandes and Abby Salb (SENES)	SENES Consultants Limited 121 Granton Drive Richmond Hill, ON L4B 3N4 (905) 764-9380		
3	8B	Radiological Study	Dale Huffman (AREVA)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500		
3	9A	Socio-Economics Baseline	Susan Ross (1421356 Alberta Ltd.), Linda Havers (Golder)	1421356 Alberta Ltd. P.O. Box 1485 Antigonish, NS B2G 2M5 (902) 870 - 7152	Golder Associates Ltd. 2535 3 Avenue Southeast Calgary, AB T2A 7W5 (403) 299-5600	
3	9B	Archaeology Baseline	Brad Novecosky (Golder)	Golder Associates Ltd. 1721 8th Street East Saskatoon, SK S7H 0T4 (306) 665 7989		
3	9C	Human Resources Plan	Rebecca Parry and Carolanne Inglis-Mcquay (AREVA)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500		

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Tier	Volume	Document Name	Main Author(s)	Contact		
3	9D	Archaeological Mitigation Plan	Brad Novecosky (Golder)	Golder Associates Ltd. 1721 8th Street East Saskatoon, SK S7H 0T4 (306) 665 7989		
3	10A	Transportation Risk Assessment	Mehran Monabbati (SENES)	SENES Consultants Limited 121 Granton Drive Richmond Hill, ON L4B 3N4 (905) 764-9380		
3	10B	Spill Contingency and Landfarm Management Plan	Nathan Drake (AREVA)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500		
3	10C	Emergency Response Plan	Mary Lo (AREVA)	AREVA Resources Canada Inc. 817 – 45th St. W. Saskatoon, SK S7L 5X2 (306) 343-4500		

14 List of Organizations Engaged

Aboriginal Affairs and Northern Development Canada

Arctic College

Arviat Hamlet Council

Arviat High School

Arviat Hunter and Trappers Organization

Baker Lake Concerned Citizen's Committee

Baker Lake Elders

Baker Lake High School

Baker Lake Hunter and Trappers Organization

Canadian Nuclear Safety Commission

Chesterfield Hamlet Council

Chesterfield High School

Chesterfield Hunter and Trappers Organization

Community Lands and Resources Committee

Community Liaison Committee

Coral Harbour Hamlet Council

Coral Harbour High School

Coral Harbour Hunter and trappers Organization

District Education Authority

Environment Canada

Fisheries and Oceans Canada

Government of Nunavut – Economic Development and Transportation

Government of Nunavut – Environment

Government of Nunavut – Health

Kivalliq Chamber of Commerce

Kivalliq Inuit Association

Kivalliq Mayors

Kivalliq Partners Outreach

Kivalliq Socioeconomic Monitoring Committee

Kivalliq Wildlife Board

Lands Policy Advisory Committee

Nunavut Cabinet

Nunavut Impact Review Board

Nunavut Planning Commission

Nunavut Tunngavik Inc.

Rankin Inlet Hamlet Council

Rankin Inlet High School

Rankin Inlet Hunter and Trappers Organization

Regional Liaison Committee

Repulse Bay Elders

Repulse Bay Hamlet Council

Repulse Bay Hunter and Trappers Organization

Refer to Tier 2, Volume 3-Part1, Section 3 for more detail regarding organizations engaged including dates and purpose of engagement. Volume also contains details on public meetings.