MARTEN FALLS FIRST NATION
**ALL SEASON COMMUNITY ACCESS ROAD**

FINAL

# Climate Adaptation and Resiliency Study Plan

***May 2021***

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## Revision History

| Rev # | Date | Revision Description |
|---|---|---|
| Draft | May 2020 | Submitted “Study Plan- Climate Change DRAFT FOR DISCUSSION” to the Agency. |
| Final | May 2021 | Revised to address federal and provincial agency comments. |

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*AECOM: 2015-04-13*

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## Acronyms

Agency, the ... Impact Assessment Agency of Canada (IAAC)
AR5 ..... Fifth Assessment Report, IPCC
BAU ..... Business as Usual
CADE ..... Dillon's Climate Analytics Data Engine
CAR ..... Community Access Road
CCRA ..... Climate Change Resilience Assessment
CCHIP ..... Risk Sciences International's Climate Change Hazards Information Portal
EA ..... Environmental Assessment
ECCC ..... Environment and Climate Change Canada
GCM ..... Global Climate Model
IA ..... Impact Assessment
IAA ..... *Impact Assessment Act*
IAAC ..... Impact Assessment Agency of Canada
IPCC ..... Intergovernmental Panel on Climate Change
IS ..... Impact Statement
ISO ..... International Standards Organisation
km ..... kilometre
LSA ..... Local Study Area
MECP ..... Ontario Ministry of the Environment, Conservation and Parks
MFFN ..... Marten Falls First Nation
NBCC ..... National Building Code of Canada
NRCan ..... Natural Resources of Canada
PIEVC ..... Public Infrastructure Engineering Vulnerability Committee Protocol
PDA ..... Project Development Area
RSA ..... Regional Study Area
SAR ..... Species at Risk
TISG ..... Tailored Impact Statement Guidelines
ToR ..... Terms of Reference
VC ..... Valued Component

# 1. Introduction

The Proponent of the Community Access Road (CAR or the Project) is Marten Falls First Nation (MFFN), a remote First Nation community in northern Ontario located at the junction of the Albany and Ogoki rivers, approximately 430 kilometres (km) from Thunder Bay, Ontario. The MFFN community is proposing an all-season Community Access Road that will connect the MFFN community to the Ontario's provincial highway network (Highway 643) to the south via the existing Painter Lake Road. MFFN, as the Proponent of the Project, has formed a MFFN CAR Project Team that includes MFFN CAR Community Member Advisors and MFFN CAR Project Consultants who act with input, guidance and direction from the MFFN Chief and Council.

This document outlines the Study Plan for the Climate Adaptation and Resiliency Assessment. Note that this effects assessment focuses on climate impacts on the CAR. Assessment of impacts of the project on climate change are described in the Atmospheric Environment and Greenhouses Gases Study Plan. The study plan supports a co-ordinated Impact Assessment (IA) required for Project review by the Impact Assessment Agency of Canada (the Agency) under the federal *Impact Assessment Act* (IAA) and Environmental Assessment (EA) required for Project review by the Ontario Ministry of the Environment, Conservation and Parks (MECP) under the Ontario *Environmental Assessment Act*.

## 1.1 Federal and Provincial Terminology

The study plans have been prepared using federal terminology, however, the respective provincial terminology has been provided in **Table 1-1** for reference. The terms can be used interchangeably.

**Table 1-1: Equivalent Federal and Provincial Terms**

| Provincial Term | Federal Term |
|---|---|
| Criteria | Valued Component |
| Impact Management Measure | Mitigation Measure |
| Net Effects | Residual Effects |
| Record of Consultation | Record of Engagement |

## 1.2 Project Study Plans

This Study Plan is one of a group of study plans created for the Project. **Table 1-2** includes the study plans for each environmental[1] discipline currently planned for the Project and the valued components (VCs) covered by the study plans where applicable.

**Table 1-2: Project Study Plans and Valued Components**

| Environmental Discipline | Study Plan Name | Valued Component(s) |
|---|---|---|
| **Aboriginal and Treaty Rights and Interests** | ■ Aboriginal and Treaty Rights and Interests Study Plan | ■ Indigenous Current Use of Lands and Resources for Traditional Purposes<br>■ Cultural Continuity (ability to practice and transmit cultural traditions) |
| **Atmospheric Environment** | ■ Atmospheric Environment and Greenhouse Gases Study Plan | ■ Air Quality<br>■ Greenhouse Gas Emissions |
| **Climate Change** | ■ Climate Adaptation and Resiliency Study Plan | ■ Climate Change |
| **Acoustic and Vibration Environment** | ■ Acoustic and Vibration Environment Study Plan | ■ Noise<br>■ Vibration |
| **Physiography, Geology, Terrain and Soils** | ■ Physiography, Terrain and Soils Study Plan | ■ Physiography, Terrain and Soils |
| **Surface Water** | ■ Surface Water Study Plan | ■ Surface Water |
| **Groundwater and Geochemistry** | ■ Groundwater and Geochemistry Study Plan | ■ Groundwater |
| **Vegetation** | ■ Vegetation Study Plan | ■ Wetland and Riparian Ecosystems<br>■ Upland Ecosystems<br>■ Designated Areas (Areas of Natural and Scientific Interest, Environmentally Significant Areas, Significant Woodlands, Critical Landform / Vegetation Associations)<br>■ Traditional Use Plants and SAR Plant Populations (including species with special conservation status or rarity in the province) |
| | ■ Peatlands Study Plan | ■ Peatland Ecosystems (bogs and fens) |
| **Wildlife** | ■ Wildlife Study Plan | ■ Bats (including SAR-bats such as: Little Brown Myotis [*Myotis lucifugus*], Northern Myotis [*Myotis septentrionalis*] and Tricolored Bat [*Perimyotis subflavus*]) |

1. *The use of the term environment in this document is inclusive of the components of the environment that are included in the Ontario Environmental Assessment Act definition, which includes a general description of the social, cultural, built and natural environments.*

| Environmental Discipline | Study Plan Name | Valued Component(s) |
|---|---|---|
| | | ■ Fur Bearers (proxy VC[2] American Marten [*Martes americana*], Beaver [*Castor canadensis*] and Wolverine [*Gulo gulo*])<br>■ Amphibians and Reptiles<br>■ Pollinating Insects |
| | ■ Ungulates (Moose and Caribou) Study Plan | ■ Moose (*Alces alces*)<br>■ Caribou, boreal population (*Rangifer tarandus*) |
| | ■ Bird Study Plan | ■ Forest Birds (proxy VC of Red-eyed Vireo [*Vireo olivaceus*] for deciduous forest, Ovenbird [*Seirus aurocapilla*] for mixedwood forest, Dark-eyed Junco [*Junco hyemalis*] for coniferous forest and disturbed forest<br>■ Raptors (proxy VC of Osprey [*Pandion haliaetus*] for diurnal raptors and Boreal Owl [*Aegolius funereus*] for nocturnal raptors<br>■ Shorebirds (proxy VC of Wilson's Snipe [*Gallingo delicata*])<br>■ Waterfowl (proxy VC of Mallard [*Anas platyrhynchos*])<br>■ Bog / Fen Birds and Other Wetland Birds (proxy VC of Palm Warbler [*Setophaga palmarum*] for bogs, Common Yellowthroat [*Geothlypis trichas*] for fens; and Northern Waterthrush [*Parkesia noveboracensis*] for swamps.<br>■ SAR birds: Canada Warbler (*Cardellina canadensis*), Chimney Swift (*Chaetura pelagica*), Common Nighthawk (*Chordeiles minor*), Eastern Whip-poor-will (*Antrostomus vociferous*), Eastern Wood-Pewee (*Contopus virens*), Evening Grosbeak (*Coccothraustes vespertinus*), Olive-sided Flycatcher (*Contopus cooperi*), Bald Eagle (*Haliaeetus leucocephalus)*, Peregrine Falcon (*Falco peregrinus*), Short-eared Owl (*Asio flammeus)*, Bank Swallow (*Riparia riparia*), Barn Swallow (*Hirundo rustica*), Black Tern (*Childonias niger*), Rusty Blackbird (*Euphagus carolinus*), Yellow Rail (*Coturnicops noveboracensis*). |
| **Fish and Fish Habitat** | ■ Fish and Fish Habitat Study Plan | ■ Lake Sturgeon (*Acipenser fulvescens*)<br>■ Walleye (*Sander vitreus*)<br>■ Brook Trout (*Salvelinus fontinalis*)<br>■ Northern Pike (*Esox lucius*)<br>■ Lake Whitefish (*Coregonus clupeaformis*)<br>■ Chain Pickerel (*Esox niger*)<br>■ Yellow Perch (*Perca flavescens*)<br>■ Cisco (*Coregonus artedii*) |

2. *A proxy VC is used when looking at the effects of one species that represents many others.*

| Environmental Discipline | Study Plan Name | Valued Component(s) |
|---|---|---|
| | | ■ Burbot (*Lota lota*)<br>■ Longnose Sucker (*Catostomus catostomus*)<br>■ White Sucker (*Catostomus commersonii*)<br>■ Forage / Prey Species (including species such as Lake Chub [*Couesius plumbeus*])<br>■ Lower Trophic Organisms (e.g., benthic invertebrates) |
| **Social** | ■ Social Study Plan | ■ Housing and Accommodation<br>■ Community Service and Infrastructure<br>■ Transportation<br>■ Community Well-being<br>■ Populations and Demographics |
| **Economy** | ■ Economic Study Plan | ■ Regional Economy<br>■ Labour Force and Employment<br>■ Government Finances |
| **Land and Resource Use** | ■ Land and Resource Use Study Plan | ■ Land Use Compatibility<br>■ Parks and Protected Areas<br>■ Extractive Industry<br>■ Forestry Industry<br>■ Energy and Linear Infrastructure<br>■ Recreation and Tourism |
| **Human Health and Community Safety** | ■ Human Health and Community Safety Study Plan | ■ Public Safety<br>■ Public Health<br>■ Diet<br>■ Environmental Factors Influencing Health |
| **Visual Aesthetics** | ■ Visual Aesthetics Study Plan | ■ Visual Contrast / Character<br>■ Visibility<br>■ Visual Sensitivity |
| **Archaeological and Cultural Heritage** | ■ Cultural Heritage Study Plan | ■ Archaeological Sites and Resources<br>■ Built Heritage Resources and Cultural Heritage Landscapes |

It should be noted that while there is not a consultation study plan, the Project has developed the *Consultation and Engagement Plan to Support the Environmental Assessment / Impact Statement* (AECOM 2020) (referred to as the Impact Statement [IS] / EA Consultation Plan).

# 2. Purpose and Objectives

The key objectives of conducting an IA / EA are to describe the existing environment, gather sufficient information to predict Project-related effects (positive and negative, direct and indirect) of the Project and alternatives on the environment, determine measures needed to avoid or minimize adverse Project effects, and enhance beneficial Project effects where feasible, and to undertake consultation and engagement throughout. The purpose of this Study Plan is to explain:

- A baseline[3] study methodology that will result in a comprehensive description of the existing environment potentially impacted by the Project;
- How efficient and transparent data management and analysis will be undertaken;
- Effects assessment scoping specific to the Climate Adaptation and Resiliency discipline that will identify potential impacts of climate change on the Project and assess the risks they represent for the Project. Note, impacts of the Project on climate change (i.e., project contribution to GHG emissions) are addressed in the Atmospheric Environment and Greenhouse Gasses Study Plan; and,
- How the Study Plan aligns with federal and provincial requirements and guidance, including the Agency's Tailored Impact Statement Guidelines (TISG), dated February 24, 2020 (the Agency 2020c), for this Project and applicable provincial agency comments on the Draft Terms of Reference (ToR)[4].

As required by the IAA and referenced in TISG Section 7.3, work plans will also be developed for disciplines as required. It is anticipated the work plans will include further details on how to action the study plans; for example they would contain such information as location of sampling sites, scheduling, and sequencing.

For the purposes of establishing appropriate context, the study plan begins with background and relevant information on:

- Study plan related discussions with the Agency, the MECP and applicable agencies to date (**Section 3**);
- The approach to Project consultation and engagement (**Section 4**);
- How Indigenous Knowledge will be collected and used in the IA / EA (**Section 5**); and
- The spatial and temporal boundaries that will be used for the IA / EA (**Section 6**).

3. *Baseline refers to the current conditions of the environment potentially impacted by the Project. Baseline conditions serve as a reference against which changes due the Project are measured.*
4. *If necessary, the Study Plan will be updated to reflect the approved ToR if approval is obtained.*

# 2.1 Approach to Handling Confidential Information

## 2.1.1 Indigenous Knowledge

Permission from the Indigenous community will be sought before including Indigenous Knowledge in the IS / EA Report, regardless of the source of the Indigenous Knowledge. Sensitive and / or confidential information will be specifically collected through the Indigenous Knowledge Program to inform the IS / EA Report, and its use and publication will be governed by Indigenous community-specific Indigenous Knowledge Sharing Agreements. Sensitive and / or confidential information collected through Indigenous Knowledge Sharing Agreements will be protected from public or third-party disclosure and will be established between the Proponent and Indigenous communities participating in the Indigenous Knowledge Program prior to the sharing and use of any sensitive information. Instances where Indigenous Knowledge sharing has taken place during consultation activities (e.g., meetings) will be recorded in the Record of Engagement, including where Indigenous Knowledge was incorporated into Project decisions and into the IS / EA Report (i.e., specifics will not be included in the Record of Engagement given the potential sensitivity and / or confidentiality of the information shared).

# 3. Study Plan Technical Discussions

To facilitate the development of satisfactory study plans and eventually a satisfactory IS / EA Report, MFFN previously submitted draft study plans in an effort to hold technical discussions with the Agency, the MECP and applicable agencies. To date, no technical discussions have taken place regarding the Climate Adaptation and Resiliency Study Plan. The MFFN CAR Project Consultants commit to including the results from any future technical discussions related to the Study Plan in the IS / EA Report.

# 4. IS / EA Report Consultation and Engagement Process

## 4.1 Interested Persons and Government Agencies

The Proponent will provide Project notices and advise of opportunities for consultation and engagement with interested persons[5] which includes, at a minimum, members of the public outlined in the *Public Participation Plan for the Marten Falls Community Access Road Project Impact Assessment* (IAAC 2020) (referred to as the Public Participation Plan). This will include the opportunity to provide input on the existing environment, VCs, effects assessment methods, effects assessment results, and mitigation and follow-up program measures as applicable. A variety of activities will be offered so that members of the public are informed of the IS / EA Report as it progresses and are aware of the opportunities and means to provide their input. The study plans have recognized public and agency input received on the Project to date. Government agencies and interested persons will have the opportunity to comment on components of the study plans throughout the IS / EA Report consultation and engagement process. The Project's approach to handling confidential and sensitive information is outlined in **Section 2.1**.

## 4.2 Indigenous Communities

The Proponent will provide Project notices and opportunities for consultation and engagement with Indigenous communities identified in **Table 4-1**, which is inclusive of all Indigenous communities identified in the *Indigenous Partnership and Engagement Plan for the Marten Falls Community Access Road Project Impact Assessment* (The Agency 2020a) (referred to as the Indigenous Engagement and Partnership Plan).

Indigenous communities will be provided the opportunity to be involved at critical decision-making points throughout the IS / EA Report so that the Proponent can consider and incorporate, where appropriate, Indigenous Knowledge and Indigenous land and resource use information into the Project as it pertains to the existing environment, VCs, effects assessment methods, effects assessment results, and mitigation and follow-up program measures. A variety of activities will be offered so that Indigenous communities are informed of the IS / EA Report as it progresses and are aware of the opportunities, means and timelines to

5. *Interested persons, as defined in the IS / EA Consultation Plan, are individuals and groups (e.g., associations, non-governmental organizations, industry and academia) who could have an interest in the Project, including but not limited to communities in the region, those with commercial interests (e.g., forestry, trappers, outfitters, other mineral tenure holders in the area) and recreational users or those with recreational interest (e.g., campers, hunters and environmental groups).*

provide their input. The study plans have recognized Indigenous community input received on the Project to date. Indigenous communities will have the opportunity to comment on components of the study plans throughout the IS / EA Report consultation and engagement process.

### Table 4-1: Identified Neighbouring Indigenous Communities, including their Provincial Territorial Organizations and / or Tribal Council Affiliations

| Tribal Council Affiliation | Indigenous Community or Organization |
|---|---|
| **Matawa First Nations Management** (Nishnawbe Aski Nation) | ■ **Marten Falls First Nation** (Proponent and potentially affected Indigenous community)<br>■ Aroland First Nation<br>■ Constance Lake First Nation<br>■ Eabametoong First Nation<br>■ Ginoogaming First Nation<br>■ Neskantaga First Nation<br>■ Nibinamik First Nation<br>■ Webequie First Nation |
| **Matawa First Nations Management and the Union of Ontario Indians / Nishnawbe Aski Nation** | ■ Long Lake #58 First Nation** |
| **Mushkegowuk Council** (Nishnawbe Aski Nation) | ■ Attawapiskat First Nation<br>■ Fort Albany First Nation<br>■ Kashechewan First Nation |
| **Shibogama First Nations Council** (Nishnawbe Aski Nation) | ■ Kasabonika Lake First Nation<br>■ Kingfisher Lake First Nation<br>■ Wapekeka First Nation<br>■ Wawakapewin First Nation<br>■ Wunnumin Lake First Nation |
| **Independent First Nations Alliance** (Nishnawbe Aski Nation) | ■ Kitchenuhmaykoosib Inninuwug First Nation |
| **Independent First Nations** (Nishnawbe Aski Nation) | ■ Mishkeegogamang First Nation<br>■ Weenusk First Nation |
| **Nokiiwin Tribal Council** | ■ Animbiigoo Zaagi'igan Anishinaabek First Nation* |
| **Métis Nation of Ontario** | ■ Métis Nation of Ontario; Region 2* |
| **Independent Métis Nation** | ■ Red Sky Independent Métis Nation* |

*Notes: * Indigenous communities or organizations identified by MECP who should be consulted on the basis that they may be interested in the Community Access Road.*
*** MECP indicated in a letter to MFFN that Long Lake #58 First Nation was moved from interest-based to rights-based.*

## 4.3 Consideration of Identity and Gender-Based Analysis Plus in Engagement

To fulfill requirements of the IAA, the Consultation and Engagement Program will consider a diverse range of perspectives from interested persons and interested Indigenous communities and their members identified in the Agency's Indigenous Engagement and Partnership Plan and the Public Participation Plan. This will include at a minimum providing ongoing opportunities for engagement to:

- **Neighbouring Indigenous communities, including relevant subpopulations:**
  - Women;
  - Youth; and
  - Elders.
- **Non-Indigenous communities including:**
  - Women;
  - Youth; and
  - Activity-based subgroups (e.g., recreationalists, snowmobilers, tourism establishment operators).

The Proponent will also consult and engage with other subpopulations identified by communities during consultation and engagement. The information from these activities and any additional identity groups identified by communities through consultation and engagement will be considered by applicable environmental disciplines for the purposes of data collection and considering disproportionate effects.

During consultation and engagement, these aforementioned groups will be consulted and engaged with on targeted input**.** Specialized knowledge will be gathered through other disciplines such as Social, Economic, Land and Resource Use and Aboriginal and Treaty Rights and Interests. The Socio-economic Data Collection Program is expected to include targeted interviews, focus groups, questionnaires and other niche tools to gather information from diverse populations to resolve gaps in socio-economic secondary data. These diverse populations include the identity groups referenced in the IS / EA Consultation Plan and those identified by communities during consultation and engagement. Subject to interest, community-led primary data collection and secondary data sharing for Indigenous Knowledge and Indigenous land and resource use will be completed through the Indigenous Knowledge Program.

When feedback is received from interested persons and Indigenous communities, issues, comments and questions will be tracked, which is consistent with the process described in the IS / EA Consultation Plan. Specific to Gender-Based Analysis Plus objectives, this will include efforts to engage with diverse populations. It is expected this will include activities specific to subgroups and tabulation of consultation and engagement participation with respect to identity factors. This will provide summary statistics to demonstrate the diversity achieved in consultation and engagement.

# 5. Consideration of Indigenous Knowledge in the IS / EA Report

The following provides a general description of how Indigenous Knowledge will be considered in the IA / EA process. The extent to which Indigenous Knowledge is considered by each specific VC will vary depending on the nature of the VC, the potential for Project effects on the VC and whether Indigenous knowledge that relates to a VC is provided / obtained. As such, not all aspects of the general approach described below may apply to all VCs / study plans.

There are two concurrent and complementary avenues for Indigenous communities and groups to be engaged with and provide input on the Project: the Indigenous Knowledge Program and the Consultation and Engagement Program. Both programs serve to support the collection of Indigenous perspectives, values, and input on the Project, including Aboriginal and Treaty Rights and how they may be impacted by the Project, to be integrated throughout the IA / EA process. However, the Indigenous Knowledge Program specifically aims to solicit and incorporate information that is considered sensitive and may have confidentiality requirements, including Indigenous Knowledge and information on Indigenous land and resource use . Indigenous Knowledge Sharing Agreements will be established between the Proponent and Indigenous communities participating in the Indigenous Knowledge Program prior to the sharing and use of any sensitive information.

All Indigenous communities and groups identified by MECP and the Agency through the Indigenous Engagement and Partnership Plan have the opportunity to participate in the Indigenous Knowledge Program. The Indigenous Knowledge Program provides interested Indigenous communities an opportunity to: share existing Indigenous Knowledge and information on Indigenous land and resource use and cultural values that may be relevant to the Project, and / or complete Project-specific studies to collect and share Indigenous Knowledge and information on Indigenous land and resource use and cultural values. The Indigenous Knowledge Program includes opportunities for Indigenous communities and groups to meet with the Proponent to discuss the program, ask questions, and share concerns and interests. In support of this, the Proponent has created an Indigenous Knowledge Program Guidance Document (the Guidance Document) that provides:

- An overview of the Indigenous Knowledge Program and information on how Indigenous Knowledge and Indigenous land and resource use and cultural values and practices can be collected and / or shared;

- Information on how Indigenous Knowledge and information on Indigenous land and resource use and cultural values and practices may be used in the planning and design processes; and
- A suite of guidance materials that were developed based on the information requirements of both the federal and provincial assessment processes, including question guides to support the collection of information on historical and current community context, Indigenous Knowledge that may be relevant to the various technical disciplines , information on Indigenous land and resource use, cultural values and practices and associated spatial data, and perspective on potential Project-related effects and associated mitigation and / or enhancement measures.

The Guidance Document will also support participating Indigenous communities in providing Project-specific information in a manner that facilitates meaningful incorporation into the IS / EA Report.

The IS / EA Consultation Plan outlines the process for obtaining information and feedback about the Project from Indigenous communities (i.e., the Consultation and Engagement Program). All Indigenous communities identified by the MECP and the Agency have the opportunity to participate in the Consultation and Engagement Program through community-specific meetings, Public Information Centres, web conferences, and other formats. All Indigenous communities identified by MECP and the Agency will be provided information related to the Project and invited to participate at various points throughout the IA / EA process.

There are also opportunities for technical teams to engage with Indigenous communities to solicit perspectives and information relevant to the Project, including information related to collection of existing information and the development of the IS / EA Report. The Proponent also invites feedback and inputs throughout the Project via the Project website and ongoing communications with the Proponent.

The Indigenous Knowledge and Consultation and Engagement programs are designed to be complementary and provide multiple opportunities for communities to offer feedback and information, including perspectives on Aboriginal and Treaty Rights and interests and how these may be impacted by the proposed Project. Relevant information collected through both the Indigenous Knowledge and Consultation and Engagement programs, including potential effect pathways on Aboriginal and Treaty Rights and interests, will be shared with each of the relevant disciplines throughout the IA / EA to: guide and inform VCs; support characterization of the existing environment; identify the potential effects of the Project on VCs; help identify mitigation measures and potential monitoring programs; and ultimately guide Project planning. The nature of how the Indigenous Knowledge becomes integrated into the IS / EA Report will be dictated by the specific information provided by each Indigenous community and the parameters set out in

the Indigenous Knowledge Sharing Agreements. A description of how Indigenous Knowledge was considered in the IA / EA and in each of the technical discipline areas will be included in the IS / EA Report.

It is also important to note that information collected through the various activities (e.g., field studies and programs, effects assessments) of each discipline area (e.g., wildlife, vegetation, cultural heritage) will be shared with the Indigenous Knowledge Program leads. This will support the establishment of the existing environment and the effects assessment for the Aboriginal and Treaty Rights and Interests environmental discipline, as well as the identification of potential mitigation measures and monitoring programs, given the interrelated nature of Indigenous peoples and other environmental disciplines.

The Proponent will strive to respectfully collaborate with Indigenous communities on how Indigenous Knowledge and information on Indigenous land and resource use and cultural values will become part of the IS / EA Report, and how potential effects to Aboriginal and Treaty Rights and interests will be assessed. It is expected that measures to support this may include but are not limited to: engaging Indigenous communities to solicit information on Indigenous Knowledge and Indigenous land and resource use and cultural values to inform baseline conditions, providing Indigenous communities with draft sections of the IS / EA Report to illustrate how Indigenous Knowledge and information on Indigenous land and resource use and cultural values has been integrated and to confirm it has been presented appropriately, and completing collaborative working sessions with Indigenous communities for the effects assessment on Aboriginal and Treaty Rights and Interests. Further information on how potential effects on Indigenous rights will be assessed is provided in the Aboriginal and Treaty Rights and Interests Study Plan.

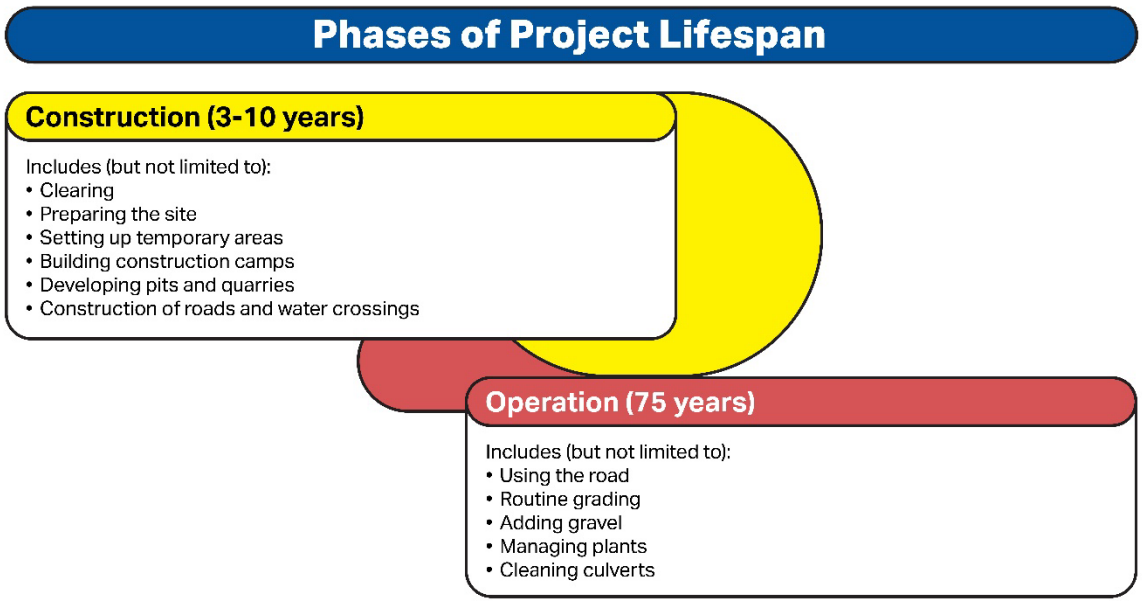
# 6. Assessment Boundaries

## 6.1 Temporal Boundaries: Project Phases

Project phases, which are temporal boundaries, are developed to establish the timeframes within which potential effects of the Project will be considered in the IS / EA Report. The Project is planned to occur in two phases, which are briefly described below and shown in **Figure 6-1**.

- **Construction Phase:**
  The time from start of construction, including site preparation activities, to the start of operations and maintenance of the CAR. Decommissioning of construction works is included in the construction phase. The construction phase is anticipated to take approximately 3 to 10 years to complete.
- **Operations and Maintenance Phase:**
  The operations and maintenance phase starts once construction activities are complete and lasts for the life of the Project. The operations and maintenance phase of the Project is considered to be 75 years based on the expected timeline for when major refurbishment of road components (e.g., bridges), is anticipated.

**Figure 6-1: Project Schedule**



There are currently no plans to decommission the CAR as there is no expected / known end date for its need. Therefore, future suspension, decommissioning and eventual abandonment of the CAR will not be considered in the IS / EA Report. It will be considered if and when a decommissioning or abandonment application is made for the road.

In determining the temporal boundaries, in particular the long operations and maintenance phase, consideration was given to the long-term effects on the well-being of present and future generations (Sustainability Principle #2[6]). The final temporal boundaries to be used in the IS / EA Report will be based on regulatory agency guidance, professional judgement and input received through the Project consultation process.

### 6.1.1 Climate Adaptation and Resiliency Assessment Temporal Boundary

Specific to the climate change impact assessment of the CAR and supporting infrastructure, two 30-year periods were defined as future time horizons to represent future climate conditions in the region for climate impact assessment during the operation phase of the CAR. One 30-year baseline historical record will be applied to the construction phase of the project and two 30-year periods centred on the 2050s (2041 – 2070) and the 2080s (2071 – 2100) will be used to assess anticipated future climate change impacts on operation and maintenance phases for the CAR.

Thirty-year periods are most often selected for climate change investigations since they represent a length of time which has been shown to adequately ‘average’ day to day weather conditions.(WMO, 2019). The 30-year period represents a balance between a long enough period to average short-term climate fluctuations, while not so long so as to include very different climate at the beginning of the period versus the end. As climate change modelling typically extends to the end of the century (year 2100), this dictates application of 30-year projection periods of 2041-2070 (aka 2050s) and 2071-2100 (aka 2080s).

6. *Sustainability Principles #2 is one of four sustainability principles included in Section 25 of the Project’s TISG as further elaborated on Section 9.7.*

# 6.2 Spatial Boundaries: Study Areas

## 6.2.1 General Information

Study areas identify the geographic extents within which potential effects of the Project are likely to occur and will be considered in the IS / EA Report. The existing conditions and potential effects are documented for three study areas selected for the Project:

- **Project Development Area (PDA):** area of direct disturbance;
- **Local Study Area (LSA):** the area where most of the direct effects of the Project are likely to occur; and
- **Regional Study Area (RSA):** the area where indirect effects of the Project are likely to occur.

The PDA encompasses the 100 metre wide CAR right-of-way (ROW), temporary construction access roads, work areas, worker camps, and pits, quarries and associated access roads. The preliminary LSA currently being considered within the scope of the ongoing provincial regulatory review process generally includes the area within 2.5 km of the centreline of Alternative 1 and Alternative 4. The preliminary study area generally allows for the documentation of existing conditions and prediction of potential environmental effects for the Project. A 5 km wide study area also allows for route refinements during development of Project design (e.g., adjustment of the alignment to avoid sensitive features).

The specific location of Project components, including the roadway, quarries, pits and temporary infrastructure, are not yet known and will be included in the IS / EA Report. While most of the Project components are expected to be located within the preliminary 5 km wide study area, benefits (e.g., reduced environmental disturbance, avoidance of sensitive features, technical considerations, concerns received through consultation) for locating Project components on lands outside of the 5 km wide study area may become known during the IA / EA process. If the need to locate Project components outside the 5 km wide study area is determined to be required or of benefit to the Project, the study area would be adjusted.

The study area for each environmental discipline may vary from the above-described general study area based on the potential for the Project to directly or indirectly affect each environmental discipline; therefore, discipline-specific LSAs and RSAs have been defined for the Project. In defining the final LSAs and RSAs, each environmental discipline will consider:

- Location and other characteristics of the environmental discipline relative to the Project;
- The anticipated extent of the potential Project effects;

- Federal, provincial, regional, and local government administrative boundaries;
- Indigenous groups listed in **Table 4-1**;
- Community knowledge and Indigenous Knowledge;
- Current or traditional land and resource use by Indigenous communities;
- Exercise of Aboriginal and Treaty Rights of Indigenous peoples, including cultural and spiritual practices; and
- Physical, ecological, technical, social, health, economic and cultural considerations.

The study areas included in this document are preliminary, covering the extent to which readily available information suggests the Project may have noticeable effects on the environment. The size, nature and location of past, present and reasonably foreseeable projects will be taken into consideration in the development of the cumulative effects assessment study area(s). The appropriate study area(s) to assess cumulative effects are dependent on the VCs predicted to have direct residual adverse effects as a result of the Project, and therefore, cannot to defined until the IS / EA Report has sufficiently advanced.

As further detailed in **Section 4**, the Proponent will continue to provide opportunities for neighbouring Indigenous communities and interested persons to provide input and inform the effects assessment, including the LSAs and RSAs.

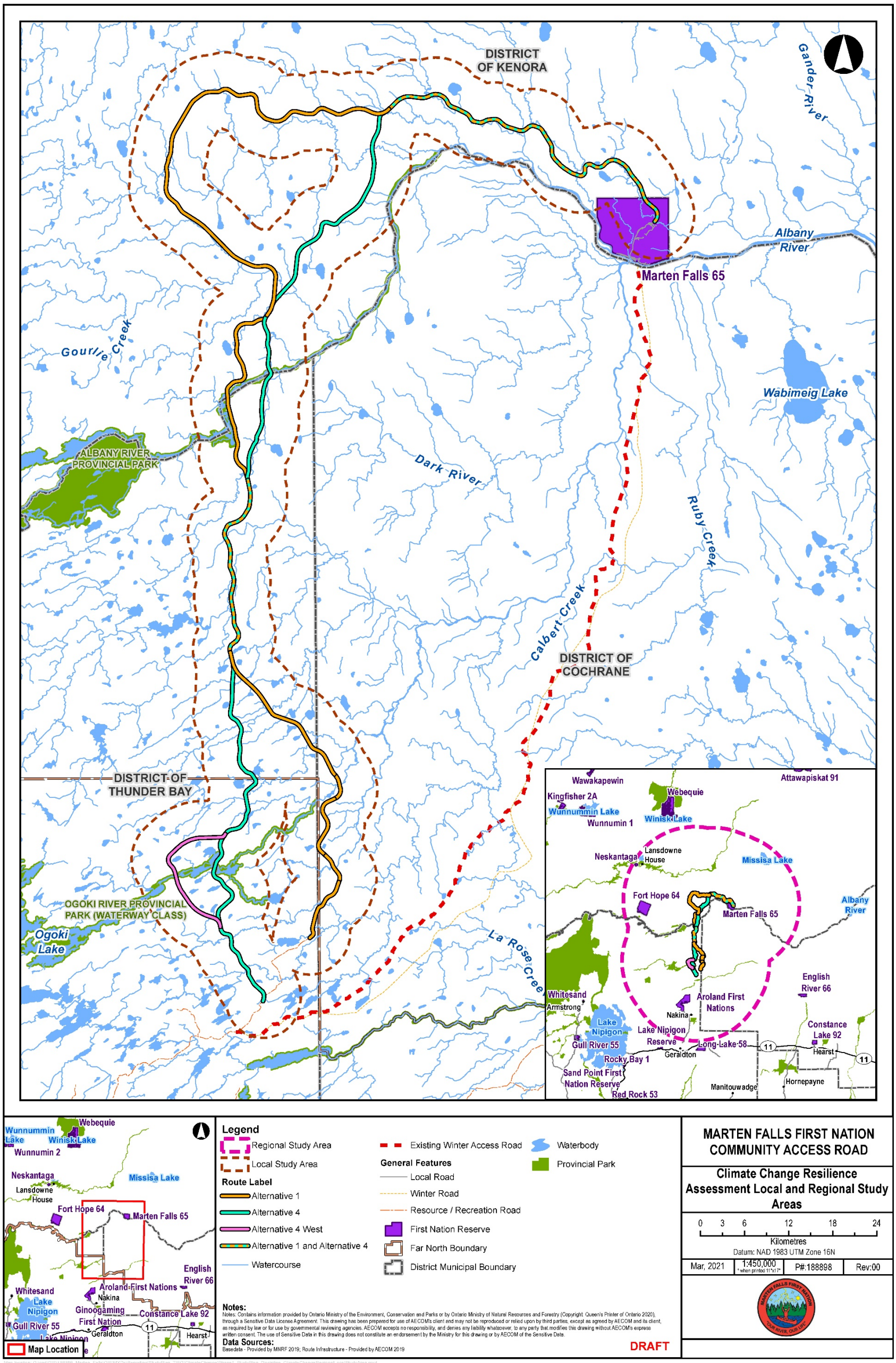
### 6.2.2 Climate Adaptation and Resiliency Study Areas

The LSA and RSA boundaries for the Climate Adaptation and Resiliency discipline are detailed in **Table 6-1** and shown on **Figure 6-2**.

**Table 6-1: Climate Adaptation and Resiliency Impact Assessment Study Areas**

| Study Area | Geographic Extent | Rationale |
|---|---|---|
| **Local Study Area** | ■ PDA plus a 5.0 km buffer on either side of the centreline of Alternative 1 and Alternative 4. | ■ Area in which climate change effects on the Project are expected. |
| **Regional Study Area** | ■ 100 km northwest of the northernmost extent of the PDA to 100 km south of southernmost point of the PDA, as shown in Figure 6-2. | ■ Climate change effects on the Project are constrained to the LSA, therefore the RSA is defined based on the geographic extents from available regional climate data. |

## Figure 6-2: Climate Change Impacts Local and Regional Study Areas



# 7. Baseline Study Design

A desktop review of existing information sources will be completed to identify information gaps that will need to be addressed by further study through application of supplementary datasets. A preliminary list of applicable information sources has been included in **Appendix A** and reflects federal and provincial guidance received to date. This Study Plan focuses on the additional studies that are anticipated to be required to gather information beyond what is currently available through existing information sources, including those as described in Section 7.2 'Sources of baseline information' in the Agency's TISG for this Project.

The baseline climate conditions study will characterize the historical climate conditions resulting from analysis of the 30-year period of record from 1981 to 2010 which is the most recently vetted climate normals period. Data sufficiency will be reviewed for this period and supplementary data (described below) will be required to address identified gaps in Environment and Climate Change Canada (ECCC) weather station records. Baseline climate conditions will be defined through desktop analyses conducted on regional weather station datasets from ECCC, supplemented with CANGRD data from NRCan / ECCC.

The most recently vetted climate normals period remains defined as 1981-2010. Data for the next climate normals period beyond 1981 to 2010 (i.e. 1991 to 2020) has not yet been computed by ECCC, nor has an updated gridded dataset for Canada been initiated yet which allows for full spatial coverage between stations. Although this period is 10 years out of date, climate conditions averaged between a 30-year block of 1981 to 2010 versus 1991 to 2020 would not be expected to be significantly different. Twenty of the 30 years in the 1981 to 2010 period would be included in the newer 1991 to 2020 normals period. Depending upon the timing of the Project, it may be possible to use the new normals period for baseline conditions.

As is the case with many remote locations in Canada, the available historical record for ECCC station meteorological observations is not complete at all regional ECCC stations, with some station locations providing longer periods of data record than others. For the Climate Adaptation and Resiliency Study Area, meteorological station coverage is available from the OGOKI POST Airport station (with data from 2014 to present), the Lansdowne House station (with data record from 1942 to 1989, and 1992 to current) and the GERALDTON A station (with data record 1981 to current). The locations of these ECCC meteorological stations s are shown in **Figure 7-1**.

The climate data record at the OGOKI POST Airport station, extending from 2014 to present, is not sufficient for assessing long-term climatology. Several criteria are considered when evaluating a meteorological station for application in a regional assessment, including: completeness of data record, quality of data record, extents of missing data periods within a met station, analysis to determine if extreme values were captured in the record.

These data will require supplementation using the GERALDTON A or LANSDOWNE HOUSE station data after determining sufficient correlation between the locations.

Dillon's climate analytics tool will be applied, which is an updated and enhanced analytics engine developed to leverage ECCC climate data and the Intergovernmental Panel on Climate Change (IPCC) AR5 datasets (IPCC 2013), by the same personnel who developed the Climate Change Hazards Information Portal (CCHIP) at Risk Sciences International. Dillon's Climate Analytics Data Engine (CADE) is an engineering and climate data analytics processing engine tailored to specific sectors, infrastructure considerations and their climate impact thresholds. The CADE tools also obtain historical data from ECCC and Natural Resources Canada (gridded data). Daily data are available for analysis within Dillon's CADE system, but full availability varies among stations depending on what data was originally collected at station locations.

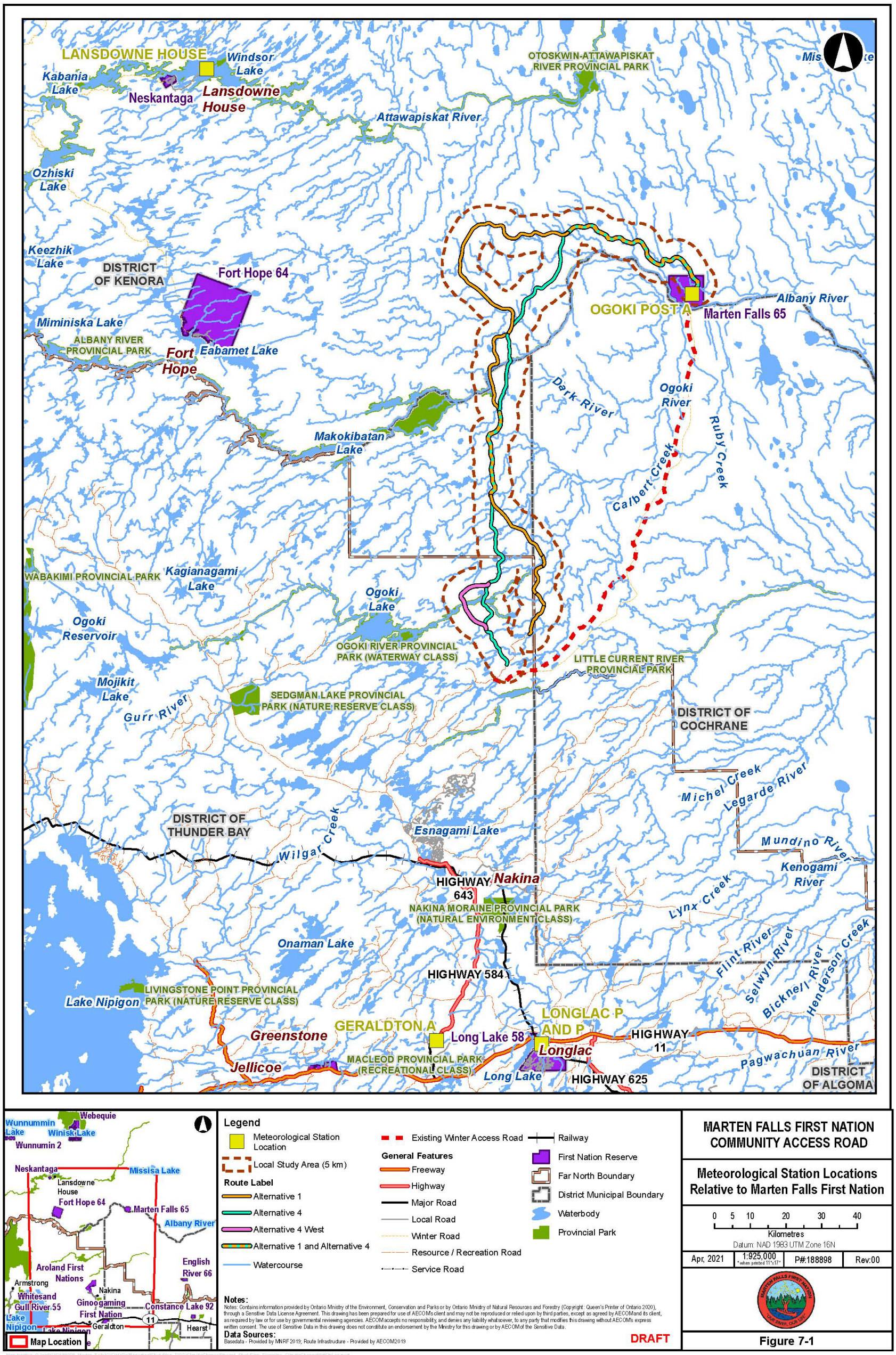
CADE currently contains daily historical data up to the end of 2018. Its analytics engine relies on the ECCC Climate Data Archive for its historical dataset, consisting of hundreds of stations over various periods of record. For regions with poor ECCC station coverage or incomplete data periods of record, data from CADE based on high-resolution (10 km by 10 km) peer-reviewed and vetted gridded observed data will be used that covers the entire Canadian landmass. This gridded dataset, known as CANGRD, was developed in a collaboration between Natural Resources Canada and ECCC. In locations where datasets are constrained, such as remote locations, CANGRD can provide an acceptable data source for climate change assessments.

Interpolated daily ECCC weather station observations and CANGRD data can be used to obtain data at 10 km x 10 km resolution and will provide historical average and climate normal conditions for the Climate Adaptation and Resiliency study area. Data collected in the ECCC archive includes variables such as:

- Temperature max / min / mean;
- Dewpoint;
- Relative Humidity;
- Humidex;
- Windchill;
- Visibility;
- Precipitation (total);
- Atmospheric Pressure;
- Wind Direction;
- Wind Speed; and,
- Wind Gusts (daily).

The results of the baseline climate assessment will be documented in a summary chapter in the Baseline Study Report which will support the development of the IS / EA Report. Within this chapter, historical climate variable values and statistical trends will be provided for the 30-year baseline record (1981-2010) specific to the RSA. Note that the effects assessment of the Marten Falls Community Access Road focuses on climate impacts on the CAR and its supporting infrastructure which are constrained to the LSA.

## Figure 7-1: Meteorological Station Locations Relative to Marten Falls First Nation



# 8. Data Management and Analysis

Data management including quality assurance / quality control (QA / QC) will be employed to minimize potential for data entry and analysis errors, to prepare data sets for analysis, while limiting sensitive data distribution in accordance to established agreements. Climate scientists apply QA / QC routines and algorithms to identify potentially non-valid data points, and complete additional measures to confirm if outliers (i.e. data far outside the expected range) represent instrumentation errors or actual extreme values in the data sets. When data gaps require data supplementation from other sources, those sources will be identified, with the relevant methods and rationale described for their application in this study.

One 30-year baseline historical record and two 30-year periods centred on the 2050s (2041 – 2070) and the 2080s (2071 – 2100) will be used to align the assessment of climate change impacts on the Project with the design life expectations for the CAR.

Future climate projections relative to the assessment time horizons will be reviewed and historical and projected climate information will be compiled for climate factors relevant to the CAR from locations in proximity to the preferred CAR route. We will apply Dillon's Climate Analytics Data Engine (CADE) to efficiently and rapidly access credible, quality-checked (by ECCC) historical and projected climate data on relevant climate factors. The Dillon CADE Tool develops climate analytics through leveraging a large collection of datasets, including:

- Dataset of available ECCC observation stations (of various record lengths) dating back to 1900 for some stations (daily with major airport hourly);
- Dataset of observed historical gridded data for Canada (CANGRD) developed by ECCC and Natural Resources Canada (NRCan) at 10 km resolution;
- For climate projections, the full dataset of officially available IPCC AR5 (IPCC 2013) Global Climate Models (GCMs), this includes simulations from almost 40 IPCC GCMs;
- Dataset of available ECCC Intensity-Duration-Frequency (IDF) datasets from across Canada;
- Dataset of ECCC historical Canadian tornadoes; and,
- Dataset of National Building Code of Canada (NBCC) meteorological code standards from across Canada.

Descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed for each baseline environmental condition will be provided in the IS / EA Report.

# 9. Effects Assessment

The following sections provide discipline-specific input and considerations as they pertain to the methodology for effects assessment. The Project is in the early stage of the IS / EA Report preparation and it is expected that the effects assessment methodology will be refined iteratively based on regulatory agency guidance, professional judgment and input received through the Project consultation and engagement process.

The Climate Adaptation and Resiliency Effects Assessment will be conducted in accordance with Version 1.2 of Infrastructure Canada's *Climate Lens General Guidance* (September, 2019). For consistency with *Annex G - Methodologies and Resilience Assessment Steps* from the *Climate Lens General Guidance*, the effects assessment will assess climate change resilience of the Project using methodologies accepted by the *Climate Lens Guidance* and consistent with ISO 31000 (ISO, 2018). The *Climate Lens General Guidance* lists the Public Infrastructure Engineering Vulnerability Committee (PIEVC) Protocol (pievc.ca) as the first of several methodologies accepted as consistent with ISO 31000.

In accordance with the *Climate Lens General Guidance* we will apply a methodology that is aligned with the principles of Engineers Canada's PIEVC Protocol, ISO 31000 and Ontario's Guide for Considering Climate Change in the Environmental Assessment Process (MOECC 2017). With the proposed approach, we will conduct a Climate Change Resilience Assessment (CCRA) adhering to the *Climate Lens General Guidance* Requirements to deliver a high-level assessment that will fit with the Project impact assessment requirements. Our reporting for this assessment will include coverage of the steps typically included in Risk Assessment (Annex G: *Methodologies and Resilience Assessment Steps*, *Climate Lens General Guidance*), including: establishing context, identification of risk, analysis of identified risks, risk evaluation, and identification of recommended feasible risk treatment options. The IS / EA Report will include a description of the methodology of the effects assessment, some of which is also summarized in this Study Plan.

## 9.1 Valued Components and Indicators

VCs are the environmental, health, social, economic or additional elements or conditions of the natural and human environment that may be impacted by a proposed project and are of concern or value to the public, Indigenous peoples, federal authorities and interested parties (the Agency 2020b). Indicators represent the resource, feature, or issue related to the VC that, if changed, may demonstrate an effect on the environment. The indicators and rationale for selection and measurement of potential effects, to be used to assess and evaluate the alternative routes in the IS / EA Report are provided in **Table 9-1**. The table

includes both quantitative and qualitative indicators. The final list of VCs and indicators to be used in the IS / EA Report will be based on regulatory agency guidance, professional judgement and input received through the Project consultation and engagement process.

The indicators were determined for this assessment of climate change effects on the Project through consideration of the CAR development's major infrastructure components, specific sub-components, environmental features and operations / maintenance considerations. The CAR Project elements and characteristics with potential sensitivity to shifts in climate and extreme weather events include:

- Road surface, shoulders, subgrade for preferred route and temporary access roads;
- Barriers, poles and signage;
- Road embankments and / or cuts;
- Slopes and natural hillsides;
- Drainage: ditches, sub-drains and culverts;
- Structures crossing streams;
- Erosion controls and river training works;
- In stream or off-channel habitat works;
- Worker camps and supporting infrastructure / services;
- Pits and quarries;
- Vegetation management;
- Invasive species: pests and plants;
- Maintenance programs;
- Works and maintenance yards;
- Communications;
- Emergency response; and,
- Staff serviceability, administration and engineering.

A final list of indicators for application in the assessment will be confirmed through:

- Consultations with government agencies, Indigenous communities and interested persons;
- Preliminary design data;
- Best Practice in climate risk assessment of road and supporting infrastructure designs; and
- Databases and climate risk assessment reporting on climate hazards, extreme weather events and impacts on transport system infrastructure.

Inputs received to date from Indigenous communities, agencies and interested persons through the Consultation and Engagement Program, including inputs received on the Draft ToR, have also been used to inform the selection of the VCs and indicators for the climate adaptation and resiliency assessment.

### Table 9-1: Climate Adaptation and Resiliency Indicators

| Valued Components | Indicators | Rationale for Selection |
|---|---|---|
| **Climate Indices** | ■ High Temperature events: Number of days with max. temperature exceeding 30°C<br>■ Low Temperature events: Number of days with min. temperature below -30°C<br>■ Temperature Variability: Daily temperature variation exceeding a set maximum value<br>■ Freeze / Thaw: # days where max. temp >0°C and min. temp. <0°C<br>■ Frost Penetration: empirical analysis of climate conditions<br>■ Frost: X days where min. temperature <0°C<br>■ Extreme 24-hour Rainfall Intensity<br>■ Magnitude of severe storm-driven peak flows: determined empirically through consideration of wind speed, temp, precipitation.<br>■ Rain on snow events: X days or more where rain falls on snowpack<br>■ Freezing Rain: 1 or more days where precipitation falls as rain and freezes on contact.<br>■ Snowstorms / Blizzards<br>■ Snow frequency<br>■ Snow Accumulations<br>■ High Wind events<br>■ Visibility due to Fog | ■ Parameters selected are variables and indices for assessment of changes to climate that are relevant to road infrastructure design and corridor routing considerations. Additional guidance: *Adapting to Climate Change – Canada's First National Engineering Vulnerability Assessment of Public Infrastructure, (*Canadian Council of Professional Engineers , 2008). |
| **Climate Events** | ■ Flooding events<br>■ Drought<br>■ Wildfire<br>■ Pests, Invasive Species, Vegetation and Vegetation Control<br>■ Shifts in seasonal extents and timing | ■ Climate change-driven events with potential to induce impacts to the Project and surrounding environment. Additional guidance: *Adapting to Climate Change – Canada's First National Engineering Vulnerability Assessment of Public Infrastructure"; (*Canadian Council of Professional Engineers , 2008) |

## 9.2 Methods for Predicting Future Conditions

With respect to quantitative models and predictions, the IS / EA Report must detail the model assumptions, parameters, the quality of the data and the degree of certainty of the predictions obtained.

Climate indicators were selected on the basis of design code considerations applicable to climate conditions, supplemented by anticipated climate impact interactions for road and supporting infrastructure components in their operating environment for the Project.

Not all projected climate variables have the same certainty or reliability. One of the largest low confidence variables is extreme precipitation which is both spatially and temporally challenging even for the highest resolution regional climate models (RCMs). Some suggestions for addressing this issue are described below in the discussion on Intensity Duration Frequency (IDF). For other variables (e.g., temperature and temperature-based), there is sufficient certainty directly from modelled output, provided adequate ~~enough~~ bias-removal processes are applied. The delta approach employed using a large ensemble of model projections effectively removes any such individual model bias and provides a pure climate change signal. This signal, when applied to a reliable baseline period climate is a proven efficient and straightforward technique which requires no advanced statistical manipulation of the model output data. The key to this technique is the use of a large ensemble of model outcomes which can provide information on model sensitivities and ranges of possible projection outcomes that a single or few higher resolution models cannot. Although higher resolution RCMs are available, they are much fewer in number limiting any possible ensemble, and would carry forward any inherent bias from their driving GCM. The MFFN CAR Consultant team acknowledges that the restrictions of future climate projections are dependent on the variable being considered.

On IDF considerations, the confidence in projections for different parameters is not uniform, with greater veracity in temperature than precipitation. As a result, different approaches may be required depending upon the parameter in question. For example, a regional large-scale approach can be adequate for a climate change 'signal', whereas for short-durations, high intensity rainfall point measurements from representative locations can be more appropriate. In fact, the future projection of extremes of rainfall is an active research area with previous demonstrations of very disparate results depending upon the selection of models and methodologies. Current practice should involve the consideration of historical trends, projected 'extreme indicators' such as changes in ninety-ninth percentile precipitation, the 'Clausius-Clapeyron[7]'

7. *The Clausius-Clapeyron equation pertains to the relationship between vapor pressure and temperature of a substance (e.g., the atmosphere). By applying the equation, it can be determined that the atmosphere will hold about 7% of additional atmospheric moisture for every degree Celsius of increased temperature,*

temperature correlation which has been applied successfully, and the possible development of extreme precipitation station combinations into 'superstations'. ECCC has demonstrated in their own analyses that there are no clear trends in historical IDF station amounts even within close proximity due to the nature of these extreme events (infrequent and falling between measurement locations, short station record lengths). The MFFN CAR Project Consultant team is aware of the limitations of extreme precipitation projections in such an actively changing research field and staff have participated in writing CSA guidance on this issue. Multiple approaches for the identification of extreme precipitation and their careful interpretation versus the acceptance of a single methodology is required.

Climate change projections of temperature and precipitation for this Project will be derived from an ensemble of 40 GCMs from the most recent IPCC fifth assessment report (i.e. AR5; IPCC 2013) for the RSA. These values will be calculated from the AR5 datasets (IPCC 2013) using Dillon's Climate Analytics Data Engine (CADE) tools. Within the CADE system, projected values are generated using the "Delta Method" (IPCC-TGICA 2007), which consists of applying the average projected difference (the "delta") for a given climate parameter to the historical average or baseline value. Projections will be developed for two 30-year periods (time horizons), centred on the 2050s (2041–2070) and the 2080s (2071–2100).

An initial investigation of available point-source meteorological stations was performed for this project. In the north, station densities are quite low. Therefore, we propose to use a gridded historical temperature and precipitation dataset for continuous spatial coverage. In this case 'CANGRD' will be used which is computed by ECCC and NRCAN scientists. These datasets are available at 10 km resolution and available for all of Canada for the period of 1981 to 2010 normals period discussed above.

The ensemble of models from the most recent IPCC assessment (AR5; IPCC 2013) was downloaded directly from one of the IPCC official data warehouse websites, the US Lawrence Livermore National Laboratory (https://esgf-node.llnl.gov/search/cmip5/), which is a member of the World Climate Research Program. For the computation process, raw data are required (unprocessed) which is not the case at the Ontario Climate Data Portal (OCDP) where different baseline periods and different model assemblages were used. Therefore, the MFFN CAR Project Consultant's independent calculations using raw data will provide consistency for the Project's projected climate output.

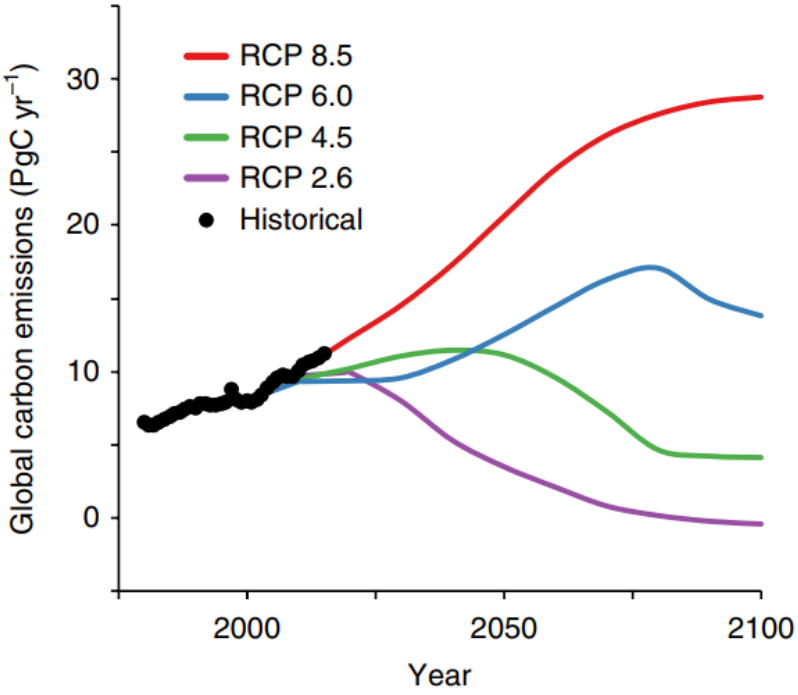
Four future global GHG concentration scenarios have been established by the IPCC (American Meteorological Society, 2012). Each of these scenarios is defined by different Representative Concentration Pathways (RCPs). The RCPs are:

1. RCP 8.5: considered the global "Business As Usual" (BAU) GHG global emissions regime. This is the current global trajectory based on current global GHG emissions;

2. RCP 6.0: GHG emissions double by 2060 and then decrease dramatically but remain above current GHG levels;
3. RCP 4.5: a medium GHG scenario derived from assumptions that global GHG emission reduction efforts result in approximately half of the emissions observed under RCP 8.5; and,
4. RCP 2.6: a scenario that aligns with global GHG emission reductions that maintain global warming below 2°C above pre-industrial global temperatures.

The IPCC's Special Report on Global Warming (IPCC 2018) confirms that global GHG emissions continue to track along the RCP 8.5 pathway. For infrastructure impact assessment, a precautionary approach is required to manage climate risks. The current trajectory of global GHG emissions corresponds with RCP 8.5. Using other RCPs would represent a scenario indicating higher reductions of global GHG emissions that current trends indicate. This assessment will accordingly apply the RCP 8.5 scenario for the projections used to anticipate future conditions. **Figure 9-1** shows a plot comparing the scenario categories and how current global GHG emissions track in comparison to the four concentration pathways.

**Figure 9-1: Comparison of Historical GHG Emissions to the Four Representative Concentration Pathways (Smith and Meyers 2018)**



### 9.2.1 Route Option Assessment for Anticipated Climate Change Impacts

Climate change impacts (construction and operations) anticipated for each of the two project alternative routes will be qualitatively assessed and compared through the application of design, routing and operational setting-based criteria.

This qualitative assessment will look at the characteristics for each of the two proposed routing alternatives and will assign a rating between 1 (poor) and 5 (excellent) to indicate the extent to which each routing option satisfies the routing option criteria.

The route evaluation criteria will be based on considerations focusing on climate-induced hazard potential along each route option. The qualitative assessment will evaluate each route and assign scored ratings for specific route criteria, as follows:

- Historical evidence of natural hazards and extreme weather events (e.g., flash flooding, prolonged flooding, ice breakup / jamming, wildfires, and drought);
- Geotechnical indicators (e.g., extent of geological hazards, problematic soil conditions, slumps and slope stabilities, collapsible silts);
- Routing characteristics and potentials for accidents and malfunctions in route construction, operation, maintenance; and
- Routing and access to lands and resources.

### 9.2.2 Climate Change Assessment of Two Alternative Routes

Following the route option assessment for the two alternative routes, the impact of climate change on the Project's two alternative routes will be assessed through a Climate Change Resilience Assessment (CCRA) in accordance with Infrastructure Canada's Climate Lens General Guidance v1.2 (Infrastructure Canada 2019). This CCRA will apply a blended methodology that is aligned with Engineers Canada's PIEVC assessment protocol and ISO 31000. In this CCRA methodology, a detailed, quantitative analyses will not be undertaken within this scope. The methodology proposed for this scope will be a blended, higher level, ISO 31000-consistent climate change assessment, in alignment with the principles of a PIEVC process and conforming to the guidance for proponents provided in Section 5.3.1 of Environment and Climate Change Canada's (ECCC) *DRAFT Strategic Assessment of Climate Change* (ECCC, 2019) and Ontario's Guide for Considering Climate Change in the Environmental Assessment Process (MOECC 2017). In the *Strategic*

*Assessment of Climate Change* document, Infrastructure Canada's Climate Lens - General Guidance (a.k.a. the *Climate Lens*; Infrastructure Canada 2019) is referenced for requirements of climate change resilience assessments. The *Climate Lens* document contains guidance indicating PIEVC as an appropriate approach in climate resilience assessment of public infrastructure. Applying this approach means the assessment will entail a blend of quantitative and qualitative methods.

PIEVC-based approaches are consistent with Infrastructure Canada's *Climate Lens Requirements for Climate Change Resilience Assessments* (), which requires consistency with the principles of the ISO 31000 Risk Management Standard and consideration of future climate conditions and impacts in the process. ISO 31000 provides a generic risk management model and is an internationally recognized standard designed to accommodate any kind of risk to an organization but has been effectively customised to reflect climate risks for infrastructure developments.

This general approach will be deployed, guided by Infrastructure Canada's *Climate Lens Requirements for Climate Change Resilience Assessments* (Infrastructure Canada 2019), ISO 31000 and Ontario's Guide for Considering Climate Change in the Environmental Assessment Process (MOECC, 2017).

Indigenous Knowledge compiled through the Project Indigenous Knowledge program (**Section 5**) will be used to guide and inform the climate analytics development and the selection of project elements / considerations for the climate change risk assessment.

#### 9.2.2.1 Component Identification

Selection and definition of preferred road route components will be guided by their importance in the CAR route design, construction, management, operation and maintenance. A CAR infrastructure component listing will be developed for the CAR corridor and its major systems including:

- Above-ground road infrastructure (road surface, bridge crossings, erosion controls, engineered stabilization works, shoulders, embankments / slopes, road signage, guardrails);
- Water crossings;
- Culverts, drainage infrastructure;
- Bridge crossing piers and abutments;
- Environmental elements (valued or designated habitats / ecosystems, vegetation management, wildlife management, in-stream habitat protection works, off-channel habitat works, sensitive species habitat and migrations) within the Climate Adaptation and Resiliency LSA; and,
- Miscellaneous Operations (seasonal maintenance, maintenance crew access, support facilities / works yards, weight restriction considerations, emergency response).

#### 9.2.2.2 Design Code Review

A review of applicable codes, standards, criteria, including best practices and procedures for each of the identified components as available through design and operational specifications, and technical preliminary design drawings where such information is available will be undertaken. Site-specific operation requirements will also be indicated. The focus of design code review will be restricted to relevant climate parameters for the components selected for risk assessment.

#### 9.2.2.3 Climate Data Review and Selection of Relevant Climate Parameters

Baseline historical climate (1980 to 2010) and future climate projections will be reviewed and assessed for two future time horizons. The future time horizons are selected to align with design life expectations for the CAR development and are centred on the 2050s (2041 to 2070) and the 2080s (2071 to 2100).

The Climate Analytics Data Engine (CADE) will be applied to develop historical and projected climate analytics for climate parameters relevant to the CAR and its supporting infrastructure.

Upon completion of the climate data review and assessment, a list of selected climate parameters and infrastructure indicators will be developed, and probability scores will be established for each climate change event anticipated to affect the infrastructure and its related components through adverse impacts to the functionality of the CAR system. Probability scoring will be determined in accordance with the guidance documented within the PIEVC Protocol and will be informed by output from the Dillon CADE Tools. (Dillon Climate Analytics Data Engine Tools, 2020, leveraging datasets from IPCC AR5, AR6 datasets and Environment Climate Change Canada's Observational Meteorological Station network.)

#### 9.2.2.4 Climate Impacts Assessment

Climate impacts on the CAR system will be determined by application of climate analytics datasets, information describing the environmental setting from the biophysical assessment teams, preliminary design information and applied professional judgment and experience, informed by climate vulnerability characteristics developed for infrastructure assessments related to transportation infrastructure, drainage infrastructure, and road system operational / maintenance requirements. This information will be applied to identify interactions between climate conditions and key infrastructure components of the CAR development. Climate impacts will be determined using ISO 31000-compatible processes in alignment with the principles of PIEVC Version 10.

Climate change vulnerability assessment will be conducted using a developed set of climate analytics describing meteorological trends anticipated to result from climate change. Methods and selection of relevant climate change analytics will be documented for application in the climate vulnerability assessment and included in the climate vulnerability assessment reporting. Discussion of mitigation measures to reduce frequency, severity and consequences of projected effects will be included in the Climate change vulnerability assessment.

#### 9.2.2.5 Risk Assessment Workshop

A one-day facilitated technical workshop will be convened to assess the magnitude of potential climate change impacts to the CAR infrastructure and key subcomponents. The workshop will include participants from teams including engineering design, biophysical specialists as well as outreach to Indigenous communities to seek their participation. The MFFN CAR Project Team will work with Indigenous communities to determine community members who would participate in this facilitated workshop.

The workshop structure will align with the principles of Step 3 (Risk Assessment) of PIEVC and will be guided by materials prepared in advance detailing climate factors and infrastructure systems with key subcomponents for the CAR development.

The workshop will start with a review and confirmation of likely climate / infrastructure component interactions as informed by the MFFN CAR Project Team. Information will be presented to workshop participants using a structured Risk Assessment Worksheet. Once potential climate interactions are verified, the workshop participants will be asked to consider and assign a Consequence Severity rating, using rating severity scales developed prior to the workshop with input from MFFN CAR Project Team specialists, for each confirmed climate / project component interaction. A Likelihood Score Rating will also be assigned using a probability (i.e. likelihood) scale defined and confirmed prior to the workshop. The default PIEVC probability / likelihood scale factor scoring is provided below in **Figure 9-2**. PIEVC allows for the use of either of these scale factor scoring methods, and PIEVC also allow for flexibility that permits assessors to develop scale factors across custom scales (e.g., 5-point scale) on the condition that such custom scales are applied consistently across the assessment.

## Figure 9-2: Default PIEVC Probability / Likelihood Scale Factor Scoring

| Score | Probability | |
|---|---|---|
| | Method A | Method B |
| 0 | Negligible<br>Not Applicable | < 0.1 %<br>< 1 in 1,000 |
| 1 | Highly Unlikely<br>Improbable | 1 %<br>1 in 100 |
| 2 | Remotely Possible | 5 %<br>1 in 20 |
| 3 | Possible<br>Occasional | 10 %<br>1 in 10 |
| 4 | Somewhat Likely<br>Normal | 20 %<br>1 in 5 |
| 5 | Likely<br>Frequent | 40 %<br>1 in 2.5 |
| 6 | Probable<br>Often | 70 %<br>1 in 1.4 |
| 7 | Highly Probable<br>Approaching Certainty | > 99 %<br>> 1 in 1.01 |

| Score | Severity of Consequences and Effects | |
|---|---|---|
| | Method D | Method E |
| 0 | No Effect | Negligible<br>Not Applicable |
| 1 | Measurable | Very Low<br>Some Measurable Change |
| 2 | Minor | Low<br>Slight Loss of Serviceability |
| 3 | Moderate | Moderate Loss of Serviceability |
| 4 | Major | Major Loss of Serviceability<br>Some Loss of Capacity |
| 5 | Serious | Loss of Capacity<br>Some Loss of Function |
| 6 | Hazardous | Major<br>Loss of Function |
| 7 | Catastrophic | Extreme<br>Loss of Asset |

**Probability X Severity = Risk**

| Risk Range | Threshold | Response |
|---|---|---|
| < 12 | Low Risk | ▪ No action necessary |
| 12 – 36 | Medium Risk | ▪ Action may be required<br>▪ Engineering analysis may be required |
| > 36 | High Risk | ▪ Action required |

*Source: PIEVC © Engineers Canada*

Risk Levels will be established for each climate / infrastructure interaction, based on the Likelihood and Severity scores confirmed by workshop participants. Identified risks will then be prioritised for development of climate change risk reduction actions.

At the conclusion of the workshop session, the MFFN CAR Project Team will have developed a full listing of climate / infrastructure interactions for the CAR development and will develop a prioritized list of risks to be included in the final reporting and recommendations resulting from the assessment.

#### 9.2.2.6 Final Reporting: Conclusions and Recommendations

Final reporting of the climate change assessment will be prepared. The final reporting will include the development of recommendations to reduce climate vulnerabilities identified from the Risk Assessment Workshop. Risk reduction measures will be prioritized to correspond with the risk levels determined through the work completed prior to and through the completion of the Risk Assessment Workshop.

Results will be summarised in worksheets developed from the Risk Assessment Workshop. Documented discussion points on climate impact severities and potential risk reduction measures (adaptation options) will be gathered from the Workshop for processing, with details provided within a CCRA Final Report for the assessment of the CAR.

The format of the final reporting will adhere to the requirements stated in Climate Lens General Guidance Document Annex D. (Infrastructure Canada, 2019) The final reporting will also include: sections documenting the engineering vulnerabilities identified from the CCRA; recommended remedial measures to reduce these risks; and a climate overview section for the study region. Reporting will align with the suggested guidance stated in Annex D for “Table of Contents for Resilience Assessments” from the Climate Lens Guidance document issued September, 2019 (Infrastructure Canada, 2019).

## 9.3 Mitigation and Enhancement Measures

Residual effects, which are the effects remaining after the application of mitigation measures, will be assessed in the EA / IA process. Once potential effects have been identified, the effects assessment will explore technically and economically feasible mitigation measures to avoid or minimize the identified negative effects and enhancement measures to increase positive effects beyond those that are already inherent to the design. These measures will consist of industry-standard practices, federal and provincial standard specifications, regulator-mandated measures, best management practices, Indigenous and community recommendations and recommendations from industry and environmental professionals based on expertise, scientific publications, experience and judgement. The identification of and the assessment of the effectiveness of mitigation measures will be done as a discipline or VC-specific exercise, and will be done as part of the EA / IA.

It is important that mitigation and enhancement measures are achievable, measurable and verifiable, and monitored for compliance and effectiveness during all temporal phases as part of the Project monitoring plan. Required environmental monitoring will verify the potential environmental effects predicted in the IS /

EA Report, evaluate the effectiveness of mitigation and enhancement measures, and identify the process the Proponent will follow if mitigation and enhancement measures are not effective.

## 9.4 Consideration of Sustainability Principles

The sustainability assessment for the Project will be undertaken on the preferred alternative and will characterize the Project's contribution to sustainability incorporating the requirements set out in Section 25 of the TISG.

One aspect of the sustainability assessment is describing the process in selecting the preferred alternative to the Project and how the sustainability principles were considered. The effects assessment approach for the Project has included the consideration of the sustainability principles outlined in the Project TISG and the Agency's guidance on sustainability. The sustainability principles that have been considered include:

1. Consider the interconnectedness and interdependence of human-ecological systems;
2. Consider the well-being of present and future generations;
3. Consider positive effects and reduce adverse effects of the Project; and
4. Apply the precautionary principle by considering uncertainty and risk of irreversible harm.

The interconnectedness and interdependence of human-ecological systems will be considered through the assessment of potential indirect effects of each alternative. An indirect effect occurs when a change to one environmental discipline resulting from a Project activity causes a change to another environmental discipline (e.g., changes in vegetation could indirectly affect wildlife).

The well-being of present and future generations will be considered in the effects assessment through the application of the long-term operations phase temporal boundary of 75 years (**Section 7.1.1**) and through the effects characteristics description of duration and reversibility for each residual effect predicted.

The consideration of positive effects and reducing adverse effects of the Project is fundamental to the effects assessment methodology through the identification of mitigation measures to reduce potential adverse effects and the identification of the preferred alternative through the evaluation of advantages (e.g., positive effects) and disadvantages (e.g., adverse effects).

The effects assessment will apply the precautionary principle by clearly describing and documenting all uncertainties and assumptions underpinning the analysis and identifying information sources. The effects assessment will consider risk of irreversible harm through the effects characteristics description of

reversibility for each residual effect predicted and will describe any uncertainty in the assessment of residual effects.

The scope of the sustainability assessment will be defined by issues of importance identified by Indigenous communities and interested persons through consultation and engagement activities, while also ensuring to be inclusive of the diversity of views expressed. The selection of VCs that will be the focus of the sustainability assessment will be aligned with the issues of importance identified by Indigenous communities and interested persons, as well as residual effects identified through the effects assessment process. The sustainability assessment will describe how the planning and design of the Project, in all phases including follow-up monitoring, considered the sustainability principles.

## 9.5 Consideration of Identity and Gender-Based Analysis Plus in Effects Assessment

The Proponent recognizes that communities and sub-populations within those communities may be impacted differently by the Project with respect to VCs and indicators. As such, the Project aims to collect baseline information for the purpose of assessing differential effects and establishing relevant mitigation measures, as further elaborated on in **Section 4.3**. Gender-Based Analysis Plus will not be limited to community feedback, when offered or discussed in secondary texts, additional sub-population information as is applicable to the relevant assessment will be incorporated.

## 9.6 Follow-up Programs

A follow-up program verifies the accuracy of the effects assessment and evaluates the effectiveness of mitigation measures. Identification of follow-up programs for the Project are not described in this study plan as the information needed to determine environmental monitoring requirements is dependent on the outcome of the effects assessment and consultation with Indigenous communities, agencies and interested persons. Therefore, the Proponent will include information on follow-up programs, that address the requirements outlined in Section 26 of the TISG, in the IS / EA Report and will identify the compliance and effects monitoring activities to be undertaken during all phases of the Project, as required.

# 10. Assumptions

Any assumption used in the effects assessment, for example the assumed average daily traffic on the CAR, will be clearly identified and a rationale provided in the IS / EA Report.

Assumptions used in the effects assessment are summarized below:

- Traffic counts and other data will be derived from preliminary design data and the Project's formal project description document.
- Indigenous knowledge collected through the engagement with traditional territories in the vicinity of the Project will be available for consideration alongside background data collected and used to inform the effects assessment, where available.
- Construction Phase of the CAR project, including decommissioning of construction works will be conducted over a period of 3-10 years.
- Operations and Maintenance Phase of the CAR project begins once construction activities are complete and lasts for the life of the Project. The operations and maintenance phase of this project is assumed to be 75 years, based on the expected timeline for when major refurbishment of road components is anticipated.
- Assumption that no decommissioning is planned for the constructed CAR, therefore decommissioning is not considered in the IS / EA report.
- 30-year periods are selected for climate change investigations and this assessment will apply the 30-year "climate normal" period established by the World Meteorological Association. This dictates application of 30-year projection periods of 2041 to 2070 ("the 2050s") and 2017 to 2100 ("the 2080s"). Historical 30-year baseline will be defined by the most recently vetted climate normals period remains defined as 1981 to 2010. Data for the next climate normals period of 1991 to 2020 has not yet been computed by ECCC, nor has an updated gridded dataset for Canada been initiated yet which allows for full spatial coverage between stations.
- Development of climate analytics will be based upon ECCC climate data archive and the Intergovernmental Panel on Climate Change (IPCC 2013) AR5 datasets (IPCC 2013). For regions with poor ECCC station coverage or incomplete data periods of record, data from CADE based on high-resolution (10 km by 10 km) peer-reviewed and vetted gridded observed data that covers the entire Canadian landmass will be used. This gridded dataset, known as CANGRD, was developed in a collaboration between Natural Resources Canada and ECCC. In locations

where datasets are constrained, such as remote locations, CANGRD can provide an acceptable data source for climate change assessments.

- Historical climate variable values and statistical trends will be provided for the 30-year baseline record (1981-2010) specific to the RSA.
- Quantitative and qualitative indicators have been established for the resilience assessment of the Project, these indicators were established through consideration of the CAR's major infrastructure components and sub-components, environmental features and operations/maintenance considerations. A final list of indicators for application in the climate risk assessment will be confirmed through consultation with government agencies, and indigenous community stakeholders.
- Climate indicators were selected through assumption of design code considerations applicable to climate conditions, supplemented by anticipated climate impact interactions for road and supporting infrastructure components in their operating environment for the Project.
- Climate change projections of temperature and precipitation for this project will be derived from an ensemble of 40 GCMs from the most recent IPCC Fifth assessment report (AR5; IPCC 2013).
- RCP selection assumptions: For infrastructure impact assessment, a precautionary approach is required to manage climate risks. The current trajectory of global GHG emissions corresponds with RCP 8.5 and accordingly, this assessment considers impacts anticipated from selecting an RCP in alignment with current global GHG global trends. Using other RCPs would represent a scenario indicating higher reductions of global GHG emissions that current trends indicate.
- Climate data assumptions: baseline historical climate (1980-2010) and future climate projections will be reviewed and assessed for two future time horizons. The future time horizons are selected to align with design life expectations for the CAR development and are centred on the 2050s (2041-2070) and the 2080s (2071-2100).

# 11. Concordance with Federal and Provincial Guidance

This section provides the best information currently available on how federal and provincial requirements identified for the Project to date will be addressed. The final concordance with federal and provincial requirements will be included in the IS / EA Report, and will be based on regulatory agency guidance, professional judgement and input received through the Project consultation and engagement process.

## Table 11-1: Study Plan Federal Concordance – Conformance with Requirements

| ID # | Federal TISG Reference[8] | Requirement / Comment / Concern | Response | Study Plan Reference |
|---|---|---|---|---|
| **1** | TISG Section 1.1, page 4 | ■ The Guidelines correspond to factors to be considered in the impact assessment. These factors are listed in subsection 22(1) of IAAC and prescribe that the impact assessment of a designated project must take into account any change to the designated project that may be caused by the environment; | ■ The potential effects of the project on the Climate and the potential effects of the environment on the project will be assessed in accordance with applicable standards and guidance. | ■ Section 9<br>■ Atmospheric Environment and Greenhouse Gasses Study Plan |
| **2** | TISG Section 13, pages 80-83 | ■ This section of the TISG describes the methodology for the effects assessment, including definitions of scope, severity, and irreversibility. | ■ The IS / EA Report will include a description of the methodology of the effects assessment, some of which is also summarized in this Study Plan. | ■ Section 9 |
| **3** | TISG Section 15.4, page 96 | ■ Use population-level modelling to assess the effects of proposed disturbance on caribou at the scale of federal range boundaries and provincial range boundaries. Increases in predation caused mortality rates need to be considered as do the anticipated exacerbating effects of climate change | ■ Climate analytics will be used in the assessment of impacts to caribou populations, including impacts on caribou resulting from climate change. | ■ Ungulates Study Plan |
| **4** | TISG Section 2.3, pages 6-7 | ■ The description should focus on aspects of the Project and its setting that are important in order to understand the potential environmental, health, social and economic effects and impacts of the Project. The following information must be included and, where appropriate, located on map(s):<br>– geographic co-ordinates (i.e., longitude/latitude using international standard representation in degrees, minutes, seconds) for the beginning and end points of the proposed road;<br>– current land and/or aquatic uses within the study areas;<br>– distance of the project components to any federal lands and the location of any federal lands within the study areas;<br>– all waterbodies and their location on a map;<br>– navigable waterways;<br>– the environmental significance and value of the geographical setting in which the Project will take place and the study areas;<br>– environmentally sensitive areas, such as national, provincial, territorial and regional parks, UNESCO World Heritage Sites, geological heritage sites, ecological reserves, ecologically and biologically sensitive areas, wetlands, and habitats of federally or provincially listed species at risk and other sensitive areas;<br>– Dedicated Protected Areas3 and any other areas of ecological and social significance identified by the community during the community-based land use planning processes with the Province of Ontario (e.g., Enhanced Management Areas; see Section 6.1 for requirements related to confidentiality);<br>– lands subject to conservation agreements;<br>– current mineral development proposals, and areas of early and advanced mineral exploration in the study areas;<br>– current areas of aggregate extraction;<br>– description and locations of all potable drinking water sources (i.e., municipal or private), including spring water sources ;<br>– description of local communities and Indigenous groups that is culturally relevant and gender sensitive;<br>– if the information is not confidential, provide a description and location of Indigenous traditional territories and/or consultation areas, Treaty and/or Title lands, Indian Reserve lands, Indigenous harvesting regions (with permission of Indigenous groups), Métis settlements; and<br>– culturally important features of the landscape. | ■ The information related to landscape features, sensitive or protected areas and select others listed in the TISG will be illustrated on maps and / or described within the IS / EA Report, where appropriate. | ■ Section 6.2.1 |
| **5** | TISG Section 20, page 119-128 | ■ Section 20 of the TISG describes the requirements around mitigation and enhancement measures that must be considered in the Impact Statement. | ■ Identification of and assessment of effectiveness of impact management measures will be done as a discipline or VC-specific exercise, and will be done as part of the IA / EA. | ■ Section 9.4 |

8. *Federal TISG Reference should be the Section or subsection, page etc. that clearly identifies where comment/issue we are addressing can be found (ex. Section 8.1 of TISG)*

| ID # | Federal TISG Reference[8] | Requirement / Comment / Concern | Response | Study Plan Reference |
|---|---|---|---|---|
| **6** | TISG Section 21, pages 129-130 | ■ Section 21 of the TISG describes the requirements and guidance associated with determining residual effects. | ■ Residual effects will be assessed in the IA / EA. | ■ Section 9.4 |
| **7** | TISG Section 22, pages 131-133 | ■ Section 22 of the TISG describes the guidance around conducting cumulative effects assessment for the project. | ■ Cumulative effects assessment will be conducted as part of the IA / EA. | ■ Section 6.2.1 |
| **8** | TISG Section 23.2, page 136 | ■ Identify the Project's sensitivities/vulnerabilities to change in climate (both in mean conditions and extremes such as short-duration heavy precipitation events), describe climate resilience of the Project and how climate change effects have been incorporated into the Project design (e.g., water crossings) and planning over the lifetime of the Project and describe the climate data, projections used, and related information used to evaluate these sensitivities (i.e., risks) over the full project lifetime; | ■ A climate vulnerability assessment will be conducted on the Project using climate analytics describing historical (baseline) and projected (future) climate. Analytics will include consideration of means and extremes. Assessment of climate change will include descriptions of how climate change effects have been incorporated into Project design and planning over the life cycle of the Project. Descriptions of the climate data, projections used and methods to evaluate risks will be documented. | ■ Section 9.2.2.4 |
| **9** | TISG Section 23.2, page 136 | ■ Describe any identified trends in meteorological events, weather patterns, or physical changes to the environment that are anticipated to result from climate change (for example, changes to annual freeze-thaw cycles, water levels, break-up season and spring freshet), and incorporate this information in a risk assessment as contributing and complicating factors for possible accidents and malfunctions. Provide mitigation measures (both passive and active) that the proponent is prepared to undertake in order to minimize the frequency, severity and consequences of such projected effects; | ■ A climate change vulnerability assessment will be conducted using a developed set of climate analytics describing meteorological trends anticipated to result from climate change. Methods and selection of relevant climate change analytics will be documented for application in the climate vulnerability assessment and included in the climate vulnerability assessment reporting of findings. Discussion of mitigation measures to reduce frequency, severity and consequences of projected effects will be included in the climate change vulnerability assessment. | ■ Section 9.2.2.4 |
| **10** | TISG Section 23.2, page 136 | ■ When describing possible effects from climate change on the Project, describe how considerations from Indigenous peoples on climate change may impact the Project were considered | ■ Indigenous knowledge collected through engagement with traditional territories in the vicinity of the Project will be considered alongside background data collected and used to inform the effects assessment where applicable. | ■ Section 2.1.1 |
| **11** | TISG Section 26, Page 141 | ■ Section 26 of the TISG includes a description of the considerations for developing a follow-up program for environmental, health, social or economic effects, as applicable. | ■ The IS / EA Report will include descriptions of follow-up programs, as required by VC. | ■ Section 9.5 |
| **12** | TISG Section 5.1, page 22 | ■ Any proposed mitigation measures are to be clearly linked, to the extent possible, to valued components in the Impact Statement as well as to specific project components or activities, as well as comments raised during engagement activities | ■ Measures to reduce climate impact (adaptations) in design will be assessed for potential impacts to valued components and linkages to VCs will be documented in the IS / EA Report. Mitigation measures related to GHG emissions will be addressed in the Atmospherics Environment and Greenhouse Gasses Study Plan. | ■ Atmospherics Environment and Greenhouse Gasses Study Plan |
| **13** | TISG Section 7.1, page 30 | ■ If the baseline data have been extrapolated or otherwise manipulated to depict environmental, health, social and/or economic conditions within the study area, modelling methods must be described and must include assumptions, calculations of margins of error and other relevant statistical information. Models that are developed should be validated using field data from the appropriate local and regional study areas. Ensure baseline data are representative of project site conditions. If surrogate data from reference sites are used rather than site-specific surveys, the proponent should demonstrate that the data are representative of project site conditions. | ■ Methods for collecting, validating and analyzing data are described in this Study Plan. | ■ Section 8 |
| **14** | TISG Section 7.2, page 32 | ■ The Impact Statement must provide detailed descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed for each baseline environmental, health, social and economic condition that is described, in order to corroborate the validity and accuracy of the baseline information collected. | ■ Descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed for each baseline environmental condition will be provided in the IS / EA Report and are summarized in this Study Plan. | ■ Section 8 |

| ID # | Federal TISG Reference[8] | Requirement / Comment / Concern | Response | Study Plan Reference |
|---|---|---|---|---|
| **15** | TISG Section 7.2, page 33 | ■ Baseline data must be collected in a manner that enables reliable analysis, extrapolations and predictions. Resulting data should be suitable for analyses to estimate pre-project baseline conditions, derive predictions of impacts, and evaluate and compare post-project conditions and at scales of within and across the Project, Local and Regional Assessment areas. Modelling methods, error estimates and assumptions should be reported (as per section 7.1). Modelling and simulations should be used early in the planning phase to estimate the necessary sampling intensity and to quantitatively evaluate the effectiveness of design options. Ethical guidelines and relevant cultural protocols governing research, data collection and confidentiality must be adhered to. | ■ Descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed for each baseline environmental condition will be provided in the IS / EA Report and are summarized in this Study Plan. | ■ Section 8 |
| **16** | TISG Section 7.2, page 33 | ■ If using existing data sources, the Impact Statement must provide justification to show that the data sources are relevant in spatial and temporal coverage to the Project. Some data sources may have good coverage in Southern Ontario or existing road networks but be unsuitable as a baseline for these northern areas where there are not roads. | ■ Justification for using existing data sources will be provided in the IS / EA Report. | ■ Section 8 |
| **17** | TISG Section 7.2, pages 31-33 | ■ Information sources and data collection methods used for describing the baseline environmental, health, social and economic setting may consist of the following sources of information. For specific sources of baseline information, see Appendix 1.<br>– Federal government (e.g., Environment and Climate Change Canada, Health Canada, Indigenous Services Canada, Statistics Canada, Women and Gender Equality Canada);<br>– Ontario provincial government (e.g., Ministry of Environment, Conservation, and Parks, Ministry of Natural Resources and Forestry;<br>– Bird Conservation Region plans21;<br>– academic institutions;<br>– field studies, including site-specific survey methods;<br>– database searches, including:<br>– federal, provincial, territorial, municipal and local data banks;<br>– Breeding Bird Atlas - Ontario (2001-2005)<br>– monitoring program databases protected areas, watershed or coastal management plans;<br>– natural resource management plans;<br>– species recovery and restoration plans;<br>– field measurements to gather data on ambient or background levels for air, water, soil and sediment quality, light levels or acoustic environment (soundscape);<br>– land cover data, including:<br>• terrestrial ecosystem mapping products;<br>• forest cover maps;<br>• remote sensing resources;<br>• important habitats and features to include:<br>▪ water bodies, wetlands, watercourses;<br>▪ riparian habitat;<br>▪ river banks or other eroded habitats;<br>▪ artificial water sources;<br>▪ forest, tree patches, solitary trees (especially old decaying trees);<br>▪ forest edges and tree rows;<br>▪ ridges, including eskers;<br>▪ caves and mines;<br>▪ cliffs, rock outcrops, exposed bedrock, talus, and other karst topography;<br>▪ buildings, bridges, and other anthropogenic features, including linear features;<br>▪ sources of artificial lighting attracting insects;<br>▪ critical habitat; and<br>▪ any other habitat features known to be important in the area. | ■ Information sources, relevant to the Project and area, will be examined as part of the desktop review, as summarized in the Study Plan. | ■ Section 7.1 |

| ID # | Federal TISG Reference[8] | Requirement / Comment / Concern | Response | Study Plan Reference |
|---|---|---|---|---|
| | | – Published literature, such as peer reviewed journals, reports by think tanks, non-government organizations and government reports;<br>– environmental assessment documentation, including monitoring reports, from prior projects in the area and similar projects outside the area;<br>– regional studies, project assessments and strategic assessments;<br>– renewable harvest data;<br>– Indigenous knowledge, including oral histories and knowledge gathered by spending time on the land with knowledge holders;<br>– community based monitoring and studies conducted by Indigenous communities;<br>– expert, community, public and Indigenous engagement and consultation activities, including workshops, meetings, open houses, surveys;<br>– qualitative information gathered from interviews, focus groups or observation;<br>– census data;<br>– baseline human health risk assessments;<br>– community and regional economic profiles;<br>– community well-being studies; and<br>– statistical surveys, as applicable. | | |
| **18** | TISG Section 7.4.1, page 36 | ■ For valued components establish three study area spatial boundaries to assess impacts to each valued component:<br>1) Project Study Area: defined as the project footprint for each alternative route;<br>2) Local Study Area: defined for each valued component – see below;<br>3) Regional Study Area: defined for each valued component – see below<br>■ Provide a rationale for boundaries of the project study area, local study area, and regional study area for each valued component and indicate how the above objectives were met in establishing the boundaries. | ■ Geographic extent, and the extent rationale, of the Project, Local, and Regional Study Areas for this VC are provided in this Study Plan. | ■ Section 6.2.1 |
| **19** | TISG Section 7.4.1, pages 35-36 | ■ The Impact Statement must describe the spatial boundaries, including project, local and regional study areas, for each valued component included in assessing the potential adverse and positive environmental, health, social and economic effects of the Project and provide a rationale for each boundary. Spatial boundaries are defined taking into account the appropriate scale and spatial extent of potential effects and impacts of the Project; community knowledge and Indigenous knowledge; current or traditional land and resource use by Indigenous groups; exercise of Aboriginal and Treaty rights of Indigenous peoples, including cultural and spiritual practices; and physical, ecological, technical, social, health, economic and cultural considerations. The size, nature and location of past, present and foreseeable future projects and activities are factors that should be included in the definition of spatial boundaries. It should be noted that in some cases, spatial boundaries might extend to areas outside of Canada. These transboundary spatial boundaries should be identified where transboundary effects are expected. | ■ Geographic extent, and the extent rationale, of the Project, Local, and Regional Study Areas for this VC are provided in this Study Plan. | ■ Section 6.2.1 |
| **20** | TISG Section 7.4.2, page 37 | ■ The temporal boundaries of the impact assessment span all phases of the Project determined to be within the impact assessment. If potential effects are predicted after project decommissioning or abandonment, this should be taken into consideration in defining specific boundaries. In order to assess a project's contribution to sustainability, consideration should be given to the long-term effects on the well-being of present and future generations. When defining temporal boundaries, the proponent should consider how elements of environmental, health, social and economic well-being that local communities, including municipalities, and Indigenous groups identify as being valuable could change over time. | ■ Temporal boundaries for the climate adaptation and resiliency assessment for the CAR infrastructure will be used to align the assessment of climate change impacts on the project with the design life expectations for the CAR route. | ■ Section 8 |

## Table 11-2: Study Plan Provincial Concordance – Conformance with Requirements

| ID | Comment From Regulatory Agency | Comment Type | Requirement / Comment / Concern | Response | Study Plan Reference |
|---|---|---|---|---|---|
| **1** | MECP | ■ Email from Agni Papageorgiou & Sasha McLeod, Special Project Officer Environmental Assessment Services Section, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR | ■ Ontario has a Guide for Consideration of Climate Change in EA, 2017, which should be used in the proponent's climate change-related assessment. Please add to these sections (of the Draft TOR) that the climate change guide will be used in the preparation of climate change-related assessments for the EA, including both climate change risk assessment and mitigation of climate change. | ■ Climate change risk assessment of impacts on the project will be based on ISO 31000 principles and consistent with Infrastructure Canada's Climate Lens Requirements Guidance (2019) and Ontario Provincial Guidance on Climate Change (2017). | ■ Section 9 |
| **2** | MECP | ■ Email from Agni Papageorgiou & Sasha McLeod, Special Project Officer Environmental Assessment Services Section, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR | ■ #17 Section 8 Page 54<br>– Consultation on Assessment Methodology - MFFN acknowledges that the proposed methodology will be open to input during the draft ToR review, but also says a more detailed method will be presented in the EA. Page 47 indicates the effects assessment criteria will be developed during the EA. While it is appropriate to defer some detailed work planning to the EA phase, the ToR should include commitments for how technical reviewers, and other interested persons, will be consulted during the development of specific evaluation methodologies or technical work plans. It is strongly recommended that those opportunities for review occur prior to the completion of studies (e.g., prior to the submission of a draft or final EA document).It is not clear whether MFFN plans to consult on the more detailed methodology and criteria during the EA phase or if the ToR phase is the main opportunity to provide input.<br>– Please indicate how consultation on the ToR has informed the preliminary criteria and indicators. Please clarify when MFFN will consult and provide opportunity for input on the detailed assessment method, including criteria and indicators (and work plans as MECP has proposed), with agencies, communities and stakeholders during the EA phase in order to finalize the methodologies before EA studies get advanced. | ■ This Study Plan will be reviewed by relevant federal and provincial agencies. Engagement will occur to confirm criteria applied in the climate impacts assessment, and will take place prior to execution of the climate vulnerability assessment methodology. | ■ Section 4.4 |
| **3** | MECP | ■ Email from Agni Papageorgiou & Sasha McLeod, Special Project Officer Environmental, MECP Assessment Services Section, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR | ■ Assessment Methods<br>– For the most part, section 7.2 provides a description of potential environmental effects for each discipline. However this section also includes assessment methodologies for some subsections (7.2.1 and 7.2.2 AERMOD modelling, quantitative noise assessment) while the majority do not (7.2.3 – 12). The level of detail in the ToR about assessment methods should be consistent for all environmental components. It is strongly recommended to include commitments to develop work plans at the outset of the EA phase, including opportunities for technical review by agencies and others. The work plans should include assessment methodology appropriate for each environmental component. The ToR could include a high level summary table for each environmental discipline listing data collection and assessment methods, with a commitment to develop the work plans at the outset of the EA phase to provide more details. Consider where the information about air and noise modelling is best placed. | ■ Methodology concerning data collection (including desktop and field-based, where appropriate) are summarized in this Study Plan. | ■ Section 7, Section 8 |
| **4** | MECP | ■ Email from Agni Papageorgiou & Sasha McLeod, Special Project Officer Environmental, MECP Assessment Services Section, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR | ■ #16 Section 8 Page 54<br>– Work Plans - Section 8 describes the approach that will be taken to evaluate alternative methods during the EA, including proposed criteria and indicators (presented in Appendix A). The information presented is high level and does not provide an opportunity for technical review of the methodologies that will be applied to evaluate those specific criteria and indicators.<br>– It is strongly recommended to include commitments to develop work plans at the outset of the EA phase, including opportunities for technical review by agencies and others. | ■ The Study Plan meets this requirement | ■ Section 9 |

| ID | Comment From Regulatory Agency | Comment Type | Requirement / Comment / Concern | Response | Study Plan Reference |
|---|---|---|---|---|---|
| **5** | MNRF | ■ Letter received from Dave Barker, Resources Management Supervisor, Nipigon District, MNRF on the Draft Terms of Reference | ■ Sec. 14 - References 85+ Additional resources from:<br>– Catalogue of natural resource scientific and technical publications. Search a list of the scientific and technical publications issued since 2004 see Catalogue-natural-resource-scientific-and-technical-publications<br>– To request a publication issued by the Ministry of Natural Resources and Forestry, or if you have a question related to MNRF scientific and technical publications, please contact us by email with the title of the publication. For journal articles, please contact the journal publisher directly.<br>– For MNRF climate change publications see MNRF_Climate_Change_Publications<br>– Information about Ontario's species of conservation concern, plant communities, wildlife concentration areas and natural areas see https://www.ontario.ca/page/get-natural-heritage-information<br>– Ontario Geohub https://geohub.lio.gov.on.ca/ provides spatial data and mapping applications such as OFAT (Ontario Flow Assessment Tool) that is used to better understand water flow in Ontario. https://www.ontario.ca/page/watershed-flow-assessment-tool<br>– Some selected publications that may be of interest:<br>• Wester, M.C. et al. 2018. The Ecosystems of Ontario, Part 2: Ecodistricts. Ontario Ministry of Natural Resources and Forestry, Science and Research Branch, Peterborough, ON. Science and Research Technical Report TR-26. 474 p. + appendices Catalogue-natural-resource-scientific-and-technical-publications<br>• Ontario Ministry of Natural Resources and Forestry. 2019. Far North Information Knowledge Management Plan Progress Report 2008-2018. Ontario Ministry of Natural Resources and Forestry, Far North Branch, Peterborough, ON. 80p. contact: farnorthfeedback@ontario.ca<br>• Riley, J. 2011. Wetlands of the Hudson Bay Lowland: An Ontario Overview. Nature Conservancy of Canada, Toronto ON 156 pp. ISBN 978-1-897386-27-9 link<br>• Marshall, T.R. and Jones, N.E. 2011. Aquatic ecosystems of the Far North of Ontario state of knowledge. Ontario Ministry of Natural Resources.43 p.+ appends. ISBN 978-1-4435-6512-7 Catalogue-natural-resource-scientific-and-technical-publications<br>• Metcalfe, R.A. et al., 2013. Aquatic Ecosystem Assessments for Rivers. Science and Research Branch, Ministry of Natural Resources, Peterborough, Ontario. 210 pp.link | ■ Descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed for each baseline environmental condition will be provided in the IS / EA Report and are summarized in this Study Plan. | ■ Section 7<br>■ Section 8<br>■ Appendix A |
| **6** | MNRF | ■ Letter received from Dave Barker, Resources Management Supervisor, Nipigon District, MNRF on the Draft Terms of Reference | ■ Draft Criteria and Indicators for Alternatives Evaluation Appendix A<br>– Available resources to help inform the draft criteria and indicators include research publications and expert knowledge on topics such as stressor-effects pathways, cumulative effects, and associated environmental components and indicators.<br>– Contacting researchers such as Rob Mackereth (MNRF) who has published research on these topics and related subjects is encouraged.<br>– Rempel, R.S., et al. 2016. Support for development of a long term environmental monitoring strategy for the Ring of Fire area. Ontario Ministry of Natural Resources and Forestry, Science and Research Branch, Peterborough, ON. Science and Research Information Report IR-08. 34 p. + append. Catalogue-natural-resource-scientific-and-technical-publications<br>– While no specifics are provided in this submission, MNRF welcomes a discussion with MECP and ENDM to explore what (if any) role this project could play in advancing baseline information and long-term environmental monitoring for the Ring of Fire in partnership with First Nations communities. | ■ Data sources are being reviewed for their appropriateness and will be included in Study Plans where applicable. Information on specific data sources and their relevance to the Project will be included in the IS / EA Report. | ■ Section 7<br>■ Appendix A |
| **7** | MNRF | ■ Letter received from Dave Barker, Resources Management Supervisor, Nipigon District, MNRF on the Draft Terms of Reference | ■ A climate change risk assessment is proposed along with estimating greenhouse gas emissions and sampling peatlands. Referencing available literature and contacting researchers such as Jim McLaughlin and Maara Packalen (MNRF) who have published research on these topics and related subjects is encouraged. Suggest contacting researchers such as Jim McLaughlin (MNRF) and Maara Packalen (MNRF) who have published research on climate change - vulnerability assessment, peatland carbon modelling and hydrology. | ■ This information will be incorporated into the climate change assessment component for the Project. There is limited soil investigation, which includes peat probing, as part of our field investigations described in the Peatlands Study Plan to support the baseline characterization of the Project area. | ■ Section 9.2 |

| ID | Comment From Regulatory Agency | Comment Type | Requirement / Comment / Concern | Response | Study Plan Reference |
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| 8 | MECP | ■ Completeness Review Memorandum compiled from MECP emails and August 2019 meetings with MECP and ENDM | ■ Study areas are missing and lack clarity – maps show study area for 4 routes even though only 2 (or 1?) routes are proposed to be assessed; no indication of local and regional study areas for each environmental component (e.g., groundwater, surface water, caribou, etc.). | ■ A preliminary study area for the IA / EA is identified in Section 7.1.1 of the Draft ToR. The study area maps have been revised to include the area within 2.5 km of the centre line of Alternative 1 and Alternative 4 only. Although the Draft ToR identifies one preliminary study area for the IA / EA, it is understood that the study area for each environmental component may vary to capture the area within which environmental effects are anticipated to occur. Therefore, the ToR indicates that the study area will be refined in the IA / EA through identification of discipline-specific local and regional study areas. The local and regional study areas will be consulted on with MFFN community members, neighbouring Indigenous communities and other interested persons. Study areas are included in the EA Consultation Plan under the key milestone “Evaluation Criteria and Development of Alternatives”.<br>■ Section 9.2.1 describes the detailed climate vulnerability assessment for two proposed route options. | ■ Section 9.2.1 |

# 12. References

AECOM Canada Ltd., 2020:

Marten Falls First Nation Proposed Terms of Reference Marten Falls Community Access Road – Environmental Assessment, Appendix B: Consultation & Engagement Plan to Support the Environmental Assessment / Impact Statement.

Bulletin of the American Meteorological Society, 2012:

An Overview of CMIP5 and the Experiment Design, Bulletin of the American Meteorological Society, 93, 485-498. Taylor, K.E., Stouffer, R.J., Meehl, G.A. (2012).

Canadian Council of Professional Engineers, 2008:

Adapting to Climate Change – Canada's First National Engineering Vulnerability Assessment of Public Infrastructure. https://pievc.ca/wp-content/uploads/2020/12/adapting_to_climate_change_report_final.pdf

Environment and Climate Change Canada (ECCC), 2019:

DRAFT Strategic Assessment of Climate Change. https://www.strategicassessmentclimatechange.ca/9529/documents/17911

Impact Assessment Agency of Canada (The Agency), 2019:

*Impact Assessment Act*. https://laws-lois.justice.gc.ca/eng/acts/I-2.75/

Impact Assessment Agency of Canada (The Agency), 2020:

Public Participation Plan for the Marten Falls Community Access Road Project Impact Assessment. https://iaac-aeic.gc.ca/050/documents/p80184/133934E.pdf

Impact Assessment Agency of Canada (The Agency), 2020a:

Indigenous Partnership and Engagement Plan for the Marten Falls Community Access Road Project Impact Assessment. https://iaac-aeic.gc.ca/050/documents/p80184/133936E.pdf

Impact Assessment Agency of Canada (They Agency), 2020b:

Glossary of Terms for the impact assessment of designated projects under the IAA. https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/glossary-of-terms.html

Impact Assessment Agency of Canada (The Agency), 2020c:
Tailored Impact Statement Guidelines for the Marten Falls Community Access Road Project. https://iaac-aeic.gc.ca/050/documents/p80184/133937E.pdf

Infrastructure Canada, 2019:
Climate Lens General Guidance, Version 1.2. https://www.infrastructure.gc.ca/pub/other-autre/cl-occ-eng.htmln

Intergovernmental Panel on Climate Change (IPCC), 2013:
IPCC Fifth Assessment Report (AR5). https://www.ipcc.ch/report/ar5/syr/

International Standards Association, 2018:
ISO 31000 – Risk Management Guidelines

IPCC-TGCIA, 2007:
General Guidelines on the use of scenario data for climate impact and adaptation assessment. Version 2. Prepared by T.R. Carter on behalf of the Intergovernmental Panel on Climate Change, Task Group on Data and Scenario Support for Impact and Climate Assessment.

IPCC, 2018:
Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp.

McKenney, D.W. et al., 2011:
Customized Spatial Climate Models for North America. Bull. American Meteorological Soc. V 92 (12). Pp 1611-1622.

Ministry of Environment and Climate Change (MOECC), 2017:
Ontario Guide for Considering Climate Change in the Environmental Assessment Process. https://www.ontario.ca/page/considering-climate-change-environmental-assessment-process

Smith, M. and. Myers, S, 2018:
Impact Of Anthropogenic CO2 Emissions On Global Human Nutrition. Nature Climate Change. Vol. 8. pp 834-839. https://doi.org/10.1038/s41558-018-0253-3

Taylor, K.E., R.J. Stouffer and G.A. Meehl, 2012:
An Overview of CMIP5 and the experiment design." Bull. Amer. Meteor. Soc., 93, 485-498, doi:10.1175/BAMS-D-11-00094.1.

World Meteorological Association, 2019:
https://www.wmo.int/pages/prog/wcp/wcdmp/GCDS_1.php

# Appendix A

## Preliminary List of Data Sources

- Environment and Climate Change Canada, Draft Strategic Assessment of Climate Change, 2019
- Dillon Climate Analytics Data Engine, 2020, leveraging datasets from IPCC AR5 and AR6.
- Taylor, K.E., R.J. Stouffer, G.A. Meehl: An Overview of CMIP5 and the experiment design.” Bull. Amer. Meteor. Soc., 93, 485-498, doi:10.1175/BAMS-D-11-00094.1, 2012.
- Environment and Climate Change Canada (online). Historical Data Access. https://climate.weather.gc.ca/historical_data/search_historic_data_e.html
- McKenney, D. W. et al. 2011. Customized Spatial Climate Models for North America. Bull. American Meteorological Soc. V 92 (12). Pp 1611-1622.
- IPCC Fifth Assessment Report (AR5; IPCC 2013).
- Climate Lens General Guidance Version 1.2, Infrastructure Canada, 2019
- PIEVC Protocol, Version PG-10.1, Engineers Canada, 2016
- ISO 31 000 Risk Management, 2018
- Dillon Climate Analytics Data Engine (Software tools), 2020

# Appendix B

## Agency Comments on Draft Study Plan

# Draft Study Plan Comments – Federal

| Comment # / Ref # | Study Plan Section | TISG Section | Comment / Context | Action Item | Response | Study Plan Reference |
|---|---|---|---|---|---|---|
| CC-01 | ■ **General Comment** | ■ Sections 5, 6, 7, 13, 19.2 and 25 | ■ In addition to the required actions detailed below, other required actions to be addressed in the update to this study plan are detailed in a separate table titled "2020-07-02 - IAAC to MFFN-General Comments on MFCAR Draft Study Plans". The Agency has provided these other required actions to highlight common sections of the Guidelines where requirements were not met in the draft study plans submitted to the Agency. These additional actions must be addressed in the updated study plans. | ■ Please see Comment / Context | ■ We have reviewed the relevant comments and incorporated where appropriate. Please refer to the General Comments Table Response submitted separately to the Agency for specific responses. | ■ Various Sections |
| CC-02 | ■ **Section 3: Spatial Boundaries**<br>– "The LSA and RSA boundaries for climate change are detailed in Error! Reference source not found. and the LSA is shown in Error! Reference source not found."<br>■ **Section 6.1: Indicators and Expression of Change**<br>– "The indicators and rationale for selection and measurement of potential effects proposed to assess and evaluate the selected preferred route option in the IA/EA are provided in Error! Reference source not found." | ■ Editorial Comment | ■ Error messages are shown in the study plan rather then the correct reference | ■ Revise the study plan to eliminate any error messages and provide the correct reference. | ■ Changes Made. | ■ No Reference |
| CC-03 | ■ **Section 6.2: Methods for Predicting Future Conditions**<br>– "With respect to quantitative models and predictions, the EA/IA will detail the model assumptions, parameters, the quality of the data and the degree of certainty of the predictions obtained.<br>– Climate change projections of temperature and precipitation for this project will be derived from an ensemble of 40 GCMs from the most recent IPCC 5th assessment report (AR5), published in 2013. These values will be calculated from the AR5 datasets using the Dillon CADE | ■ **Section 23.2**<br>– "…The Impact Statement must: …<br>- Identify the Project's sensitivities/ vulnerabilities to change in climate (both in mean conditions and extremes such as short-duration heavy precipitation events), describe climate resilience of the Project and how climate change effects have been incorporated into the Project design (e.g., water crossings) and planning over the lifetime of the Project and describe the climate data, projections used, and related information used to evaluate these sensitivities (i.e., risks) over the full project lifetime;…" | ■ Additional details are required to ensure the study plan meets the requirements of the Guidelines with respect to the climate change projections, indicators and variables.<br>■ In Section 6.2, the study plan indicates that "climate change projections of temperature and precipitation for this project will be derived from an ensemble of 40 GCMs from the most recent IPCC 5th assessment report (AR5), published in 2013." The delta method will be used to evaluate projected changes from baseline conditions for a number of climate variables over two future time periods for the RCP 8.5 scenario. A | ■ Provide details to demonstrate the rationale for the selected climate indicators.<br>■ Describe more robust alternative approaches to assessing future climate projections that are being considered and how they inform the project design, as per the guidance provided in the context column. | ■ Climate Indicators: Climate indicators were selected on the basis of design code considerations applicable to climate conditions, supplemented by anticipated climate impact interactions for road and supporting infrastructure components in their operating environment for the Project.<br>■ Alternative Approaches to Assessing Future Climate Projections: Not all projected climate variables have the same certainty or reliability. One of the largest 'low confidence' variables is extreme precipitation which is both spatially and temporally challenging even for the highest resolution regional | ■ Section 9.1 |

| Comment # / Ref # | Study Plan Section | TISG Section | Comment / Context | Action Item | Response | Study Plan Reference |
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| | tools. Within the CADE system, projected values are generated using the “Delta Method” (IPCC-TGICA, 2007), which consists of applying the average projected difference (the “delta”) for a given climate parameter to the historical average or baseline value. Projections will be developed for two 30-year periods (time horizons), centred on the 2050s (2041–2070) and the 2080s (2071–2100). Four future global GHG concentration scenarios have been established by the IPCC. Each of these scenarios is defined by different Representative Concentration Pathways (RCPs). The RCPs are:<br>1. RCP 8.5: considered the global “Business As Usual” (BAU) GHG global emissions regime. This is the current global trajectory based on current global GHG emissions;<br>2. RCP 6.0: GHG emissions double by 2060 and then decrease dramatically but remain above current GHG levels;<br>3. RCP 4.5: a medium GHG scenario derived from assumptions that global GHG emission reduction efforts result in approximately half of the emissions observed under RCP 8.5; and,<br>4. RCP 2.6: a scenario that aligns with global GHG emission reductions that maintain global warming below 2°C above pre-industrial global temperatures.<br>– The IPCC’s Special Report on Global Warming (2018) confirms that global GHG emissions continue to track along the RCP 8.5 pathway. This assessment will accordingly apply the RCP 8.5 scenario for the | | number of different climate indicators for potential consideration in the assessment are provided in Table 6-1. The rationale on the fitness for purpose for individual indicators (i.e., usefulness of an indicator for assessment of potential impacts on particular aspect of the project) should be clearly provided.<br>■ The confidence in projections for different climate variables (e.g., temperature vs. precipitation-related parameters) and for different spatial scales is not uniform. Regional-scale projections are generally more robust than values at a single grid point or location. Values at a single grid point for some variables may be highly unreliable as future projections. Canada’s Changing Climate Report (2) provides a discussion of the assessment of confidence in historically observed and projected future climate change in Canada for different climate parameters and spatial scales. In particular, ECCC notes that future projections of short-duration extreme precipitation at a point location or small spatial scale (either obtained directly from GCM output or downscaled GCM products) are unlikely to be robust (3). The recent Canadian Standards Association guidance on IDF for Canadian Water Resources practitioners (4) provides an assessment of current scientific understanding and provides some recommendations for considering future extreme precipitation projections at project-relevant scale. (2) Bush, E. and Lemmen, D.S., editors (2019): Canada’s Changing Climate Report; Government of Canada, Ottawa, ON. 444 p. (https://changingclimate.ca/CCCR2019/) (3) Li, C., Zwiers, F., Zhang, X., & Li, G. 2019. How much information is required to well constrain local estimates of future precipitation extremes? Earth’s | | climate models (RCMs). Some suggestions for addressing this issue are described in the following response statement on IDF. For other variables (e.g., temperature and temperature based), there is sufficient certainty directly from modelled output, provided sufficient bias-removal processes are included. The delta approach employed using a large ensemble of model projections effectively removes any such individual model bias and provides a pure climate change signal. This signal, when applied to a reliable baseline period climate is a proven efficient and straightforward technique which requires no advanced statistical manipulation of the model output data. The key to this technique is the use of a large ensemble of model outcomes which can provide information on model sensitivities and ranges of possible projection outcomes that a single or few higher resolution models cannot. Although higher resolution RCMs are available, they are much fewer in number limiting any possible ensemble, and would carry forward any inherent bias from their driving GCM. The MFFN CAR Project Consultants acknowledges the restrictions of future climate projections dependent upon the variable being considered.<br>■ On IDF considerations, we acknowledge that confidence in projections for different parameters is not uniform, with greater veracity in temperature than precipitation. As a result different approaches may be required depending upon the parameter in question. For example, a regional large scale approach can be adequate for a climate change ‘signal’, whereas for short-duration, high intensity rainfall point measurements from representative locations can be more | |

| Comment # / Ref # | Study Plan Section | TISG Section | Comment / Context | Action Item | Response | Study Plan Reference |
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| | projections used to anticipate future conditions. | | Future, 7, 11–24. https://doi.org/10.1029/2018EF001001 (4) Canadian Standards Association. 2019. TECHNICAL GUIDE. CSA PLUS 4013-12: Development, interpretation, and use of rainfall intensity-duration-frequency (IDF) information: Guideline for Canadian water resources practitioners | | appropriate. In fact, the future projection of extremes of rainfall is an active research area with previous demonstrations of very disparate results depending upon the selection of models and methodologies. Current practice should involve the consideration of historical trends, projected 'extreme indicators' such as changes in 99th percentile precipitation, the 'Clausius-Clapeyron' temperature correlation which has been applied successfully, and the possible development of extreme precipitation station combinations into 'superstations'. ECCC has demonstrated in their own analyses that there are no clear trends in historical IDF station amounts even within close proximity due to the nature of these extreme events (infrequent and falling between measurement locations, short station record lengths). The MFFN CAR Project Consultants acknowledge the limitations of extreme precipitation projections in such an actively changing research field and staff have participated in writing CSA guidance on this issue. Multiple approaches for the identification of extreme precipitation and their careful interpretation versus the acceptance of a single methodology is required. | |
| CC-04 | ■ **Section 7: Conformance with Federal and Provincial Guidance**<br>– "Indigenous knowledge collected through engagement with traditional territories in the vicinity of the Project will be considered alongside background data collected and used to inform the effects assessment where applicable." | ■ **Section 6**<br>– "The proponent must engage with all Indigenous groups that may be impacted by the Project…<br>– In addition to the requirements set out in section 6.1, 6.2 and 6.3, the proponent must provide Indigenous groups with an opportunity to:<br>• provide Indigenous knowledge during baseline data collection;<br>• comment on the list of valued components and indicators;…" | ■ The Agency expects the proponent to engage with, at a minimum, the Indigenous groups listed in the Indigenous Engagement and Partnership Plan, as is directed in Section 6 of the Guidelines. The proponent must also provide Indigenous groups with an opportunity to comment on the list of valued components and indicators. | ■ Update the study plan to include the list of all Indigenous groups that will be engaged, at a minimum the Indigenous groups listed in the Indigenous Engagement and Partnership Plan, as part of the baseline data collection, defining the list of criteria and indicators, and effects assessment analysis. The list should be consistent throughout the study plan. | ■ Table 4-1 of the Study Plan, which is inclusive of all indigenous communities identified in Indigenous Partnership and Engagement Plan for the Marten Falls Community Access Road Project Impact Assessment (IAAC 2020a), indicates all indigenous communities that received outreach seeking participation for consultation. Study Plan Section 4 elaborates on how the MFFN CAR Project Team will be working with Indigenous communities to identify Climate Impacts. | ■ Section 4 |

# Draft Study Plan Comments – Provincial

| Comment ID | Study Plan Section | Agency / Regulatory Body Comments Received From | Comment / Context | Action Item | Response | Study Plan Reference |
|---|---|---|---|---|---|---|
| 1 | ■ N/A | ■ MECP, Environmental Assessment Branch | ■ Please review EAB comments on the Wildlife, Ungulates, Vegetation and Groundwater work plans that may apply to this work plan. | ■ Please review EAB comments on the Wildlife, Ungulates, Vegetation and Groundwater work plans that may apply to this work plan. | ■ The Climate Change Study Plan pertains to assessment of the CAR route and its supporting infrastructure systems and subcomponents. Assessment of climate change impacts to Wildlife, Ungulates, Vegetation and Groundwater will be assessed within the Study Plans for those disciplines. | ■ Wildlife Study Plan<br>Ungulates Study Plan<br>Vegetation Study Plan |
| 2 | ■ Page 3, s. 3.0 | ■ MECP, Environmental Assessment Branch | ■ Minor reference error in the paragraph above Table 3-1: “The LSA and RSA boundaries for climate change are detailed in Error! Reference source not found. and the LSA is shown in Error! Reference source not found.” | ■ Correct References | ■ Error in translating reference has been corrected in revised study plan | ■ No Reference |
| 3 | ■ Page 10, s. 6.1 | ■ MECP, Environmental Assessment Branch | ■ Minor reference error in the 1st paragraph of s. 6.1: “The indicators and rationale for selection and measurement of potential effects proposed to assess and evaluate the selected preferred route option in the IA/EA are provided in Error! Reference source not found.” | ■ Correct References | ■ Error in translating reference has been corrected in revised study plan | ■ No reference |
| 4 | ■ Page 14, s. 6.3.1 | ■ MECP, Environmental Assessment Branch | ■ Section 6.3.1 describing how the alternative routes will be assessed and the preferred route selected based on climate hazards is very helpful as it begins to describe the alternatives assessment methodology. It is also helpful to gain some clarity about how the proponent plans to differentiate between the alternatives assessment and the more detailed effects assessment of preferred alternatives. This section should include not just assessment of route alternatives but also supporting infrastructure alternatives. The proponent’s other work should also have a section similar to section 6.3.1 that provides at least a high level methodology for how alternatives will be selected using the criteria/ indicators/ factors from each environmental component. | ■ In section 6.3.1 please include not just assessment of route alternatives but also supporting infrastructure alternatives.<br>The proponent’s other work plans should have a section similar to section 6.3.1 that provides at least a high level methodology for how alternatives will be selected using the criteria/indicators/factors from each environmental component. The other work plans should also begin to explain how the alternatives assessment and the more detailed effects assessment of preferred alternatives may differ, if that is the case. More detail on the alternatives assessment methodology and results will be required of the EA. | ■ Assessment of the CAR routing options will also assess the supporting components of the CAR system. Assessment of CAR route alternatives will also include feasible alternatives in the supporting infrastructure elements for the CAR project. | ■ Section 6<br>■ Section 9 |
| 5 | ■ Page 15, 2. 6.3.2.1 | ■ MECP, Environmental Assessment Branch | ■ The list of CAR infrastructure components should also include aggregate sources. | ■ Please add use of existing aggregate sources and/or development of new aggregate sources and associated access roads. | ■ Long-term pits a quarries and associated access roads has been added to the Study Plan | ■ Section 6.2.1<br>■ Section 9.1 |
| 6 | ■ Page 16, s. 6.3.2.5 | ■ MECP, Environmental Assessment Branch | ■ This section states a Risk Assessment Workshop will be convened to assess climate change impacts on the project, and local Indigenous communities will be invited. This invitation should be extended to all Indigenous communities that the Crown has identified for consultation. The proponent should consider extending the workshop idea (with Indigenous participation) for other environmental components if it is expected to provide a meaningful level of consultation. The workshop idea does not appear in other draft work plans. | ■ Please revise the work plan to indicate outreach to all Indigenous communities that have been identified for consultation to seek their participation. Please consider extending the workshop idea (with Indigenous participation) for other environmental components if this method is expected to provide a meaningful level of consultation. | ■ Table 4-1 of the study plan, which is inclusive of all indigenous communities identified in Indigenous Partnership and Engagement Plan for the Marten Falls Community Access Road Project Impact Assessment (IAAC 2020a), indicates all indigenous communities that received outreach seeking participation for consultation. | ■ Section 4 |

| Comment ID | Study Plan Section | Agency / Regulatory Body Comments Received From | Comment / Context | Action Item | Response | Study Plan Reference |
|---|---|---|---|---|---|---|
| 1 | ■ 5.0 Data Management & Analysis AND 6.2 Methods for Predicting Future Conditions | ■ MECP (Adaptation Unit) | ■ General Comment - it is recommended to use the best available climate data and information, especially when predicting future climate. Using the best available science will narrow the range of uncertainty for each emission scenario that is being used. | ■ We noticed there's a mention of datasets that will be used in Section 5.0 to identify past and future climate conditions. There is no mention in section 6.2 the source of climate data projection that will be used. Has the proponent considered regional/Ontario specific climate data and climate models including the Ontario Climate Data Portal (OCDP: www.ontarioccdp.ca)? | ■ Section 6.2 did provide a statement indicating the source of climate data projection data that will be used. "Climate change projections of temperature and precipitation for this project will be derived from an ensemble of 40 GCMs from the most recent IPCC 5th assessment report (AR5), published in 2013". | ■ Section 9 |
| 2 | ■ 6.3.2 Climate Assessment and other sections referring to identifying climate risks/vulnerabilities at different phases | ■ MECP (Adaptation Unit) | ■ General Comment - When conducting risk assessments, it is recommended to use the best available climate data and information. Using the best available science will narrow the range of uncertainty for each emission scenario that is being used. | ■ It is important to note that there are several different methodologies when undertaking a risk assessment (i.e., qualitative, semi-quantitative or both, etc.). Our ministry position is that we cannot advise on the methodology to use, but it is important that the proponent ensure the methodology to used is robust enough to yield results that will adequately inform this project. In addition to this, it is recommended the proponent document the rationale for choosing the methodology and any assumptions/limitations associated with it. | ■ The methodology proposed for this scope will be a ISO 31000-consistent climate change assessment, in alignment with the principles of a PIEVC process conforming to the guidance for proponents provided in Section 5.3.1 of the Government of Canada's Draft Strategic Assessment of Climate Change and Ontario's Guide for Considering Climate Change in the Environmental Assessment Process (MOECC 2017). | ■ Section 9<br>■ Section 10 |
| 3 | ■ 6.3.2 Climate Change Assessment of preferred alternative route | ■ MECP (Adaptation Unit) | ■ There is mention in section 6.3.2 that Indigenous knowledge will be incorporated throughout the project: "Indigenous Knowledge compiled through the project stakeholder interactions (refer to separate Work Plan) will be used to guide and inform the climate analytics development and the selection of project elements/considerations for the climate change risk assessment". Can this section of the work plan elaborate a bit more and/or provide a summary on how information will be collected and how it will used in combination with the risk assessment - based on this "separate" Work Plan that was created? | ■ Combining TEK with traditional western science may enhance the risk assessment when identifying climate impacts, which will be helpful in planning and decision making. The proponent may want to elaborate on how the Project Team will be working with First Nations communities to identify climate impacts (through TEK, as appropriate and in collaboration with the Indigenous Communities i.e. workshops, survey, etc.). | ■ Study Plan Section 4 elaborates on how the MFFN CAR Project Team will be working with First Nations communities to identify Climate Impacts. | ■ Section 4 |

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