

# Contents

<b>3</b>	<b>INTRODUCTION.....</b>	<b>12</b>
3.1	HAZARD IDENTIFICATION RISK ASSESSMENT.....	12
3.2	SCOPE.....	12
3.3	METHODOLOGY.....	12
3.3.1	<i>Literature Review.....</i>	<b>14</b>
3.3.2	<i>Step #1 - Hazard Identification.....</i>	<b>15</b>
3.3.3	<i>Step #2 - Risk Assessment.....</i>	<b>15</b>
3.3.4	<i>Step #3 - Risk Analysis.....</i>	<b>16</b>
3.3.5	<i>Step #4 - Monitor and Review.....</i>	<b>17</b>

## 3 Introduction

### 3.1 Hazard Identification Risk Assessment

The intent of the NWT HIRA is to provide a research-based foundation from which the NWT, community governments and first responders can create effective response, mitigation and recovery plans where appropriate and justified.

### 3.2 Scope

This project identified, described and ranked hazards and vulnerabilities of the NWT. The risk exposure and hazard history included within this report is limited to the geographic region that is part of the NWT in 2013. The results are based on existing information as of October 1, 2013 and limited to research gathered for this project as outlined in Section 8.6 Information Sources. The analysis used both quantitative and qualitative data to determine hazard evaluations.

Five separate regional documents were also created within the scope of this project which contain a regional perspective on the hazards and risk assessment. They include:

- Dehcho Region Hazard Identification and Risk Assessment;
- Inuvik Region Hazard Identification and Risk Assessment;
- North Slave Region Hazard Identification and Risk Assessment;
- Sahtu Region Hazard Identification and Risk Assessment; and
- South Slave Region Hazard Identification and Risk Assessment.

### 3.3 Methodology

The objectives of the NWT HIRA methodology were:

- To assess different types of hazards, both:
  - natural (i.e. geological, meteorological and biological); and
  - human-induced (i.e. accidental or intentional and technological).
- To determine:
  - how frequently they might occur;
  - how severe their impact may be on communities, critical infrastructure, property and the environment, in the past, now and in the future; and
  - which hazards pose the greatest threat to communities.
- To aid municipal governments in developing local adaptation plans and engaging in similar emergency management planning at a local level.

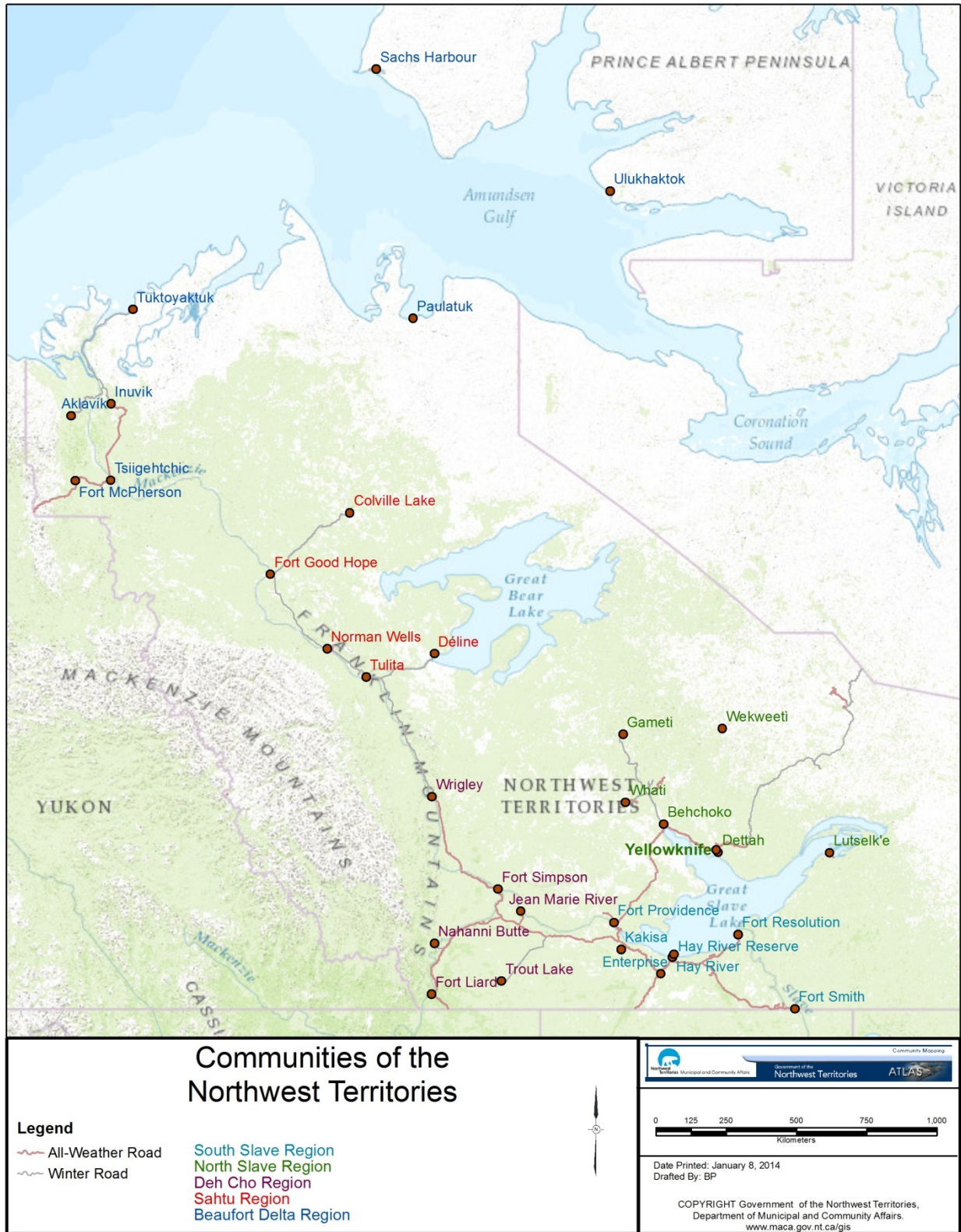


Figure 3: Communities of the NWT by Region (Source: MACA GNWT)

### 3.3.1 Literature Review

A review of the literature was done to ensure that a methodology was chosen which reflected recommended practices and was useful at the territorial level. The review included HIRAs from Canadian provinces, cities and American states as well as federal guidelines on all hazard risk assessment and Canadian and international standards. The review included:

- NISGA'A VILLAGE OF GITWINKSIHLKW Hazard Risk and Vulnerability Assessment 2008;
- REGIONAL DISTRICT OF FRASER-FORT GEORGE Hazard, Risk and Vulnerability Analysis 2005;
- Manitoba Office of the Fire Commissioner (OFC) and the Manitoba Emergency Measures Organization province wide hazard analysis and risk assessment 2002;
- British Columbia Hazard Risk and Vulnerability Analysis Tool Kit 2004;
- Province of British Columbia The All-Hazard Plan, Emergency Management British Columbia, 2012;
- Hazard Identification and Risk Assessment for the Province of Ontario 2012;
- State of Alaska Hazard Mitigation Plan 2010;
- Washington State Hazard Identification and Vulnerability Assessment 2001;
- State of Nebraska Hazard Mitigation Plan Section #3 Risk Assessment 2011;
- Public Safety Canada All Hazards Risk Assessment Methodology Guidelines 2011–2012;
- Federal Emergency Management Agency Comprehensive Preparedness Guide (CPG) 201, Second Edition, Threat and Hazard Identification and Risk Assessment Guide, (2013);
- Office of Critical Infrastructure Protection and Emergency Preparedness - Scoping of Issues Concerning Risk Reduction to All Hazards in Canadian Non-Urban Communities (2000);
- Canadian Standards Association Z1600-8 Standard on Emergency Management and Business Continuity Programs;
- NFPA 1600; and
- CAN/CSA-ISO 31000-10.

The NWT HIRA is an all-hazards approach and it includes the identification of hazards and the analysis of risks. The literature review supported conclusions that “at the core of all risk assessments is the equation Risk = Frequency X Impact” (EMO, 2012 p. 171). The HIRA Process forms the basis of the NWT HIRA methodology.



**Figure 4: HIRA Process**

### 3.3.2 Step #1 - Hazard Identification

The foundation of emergency response planning requires identification of the potential hazards that might affect the NWT. A hazard is a potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation (MACA, 2011 p.5).

The NWT HIRA used the following methods to identify sources of risk in the NWT:

- A series of regional workshops across the NWT consulting the communities (Summary of Stakeholder Meeting Appendix 8.1);
- An online hazard survey on the GNWT MACA website (Online Survey Result Summary Appendix 8.5);
- An academic and historic literature review (Information Sources Appendix 8.6);
- Consultation with other territorial governments, federal and territorial ministries, and other communities; and
- Review of the NWT territorial, regional, and community emergency response plans.

The hazard identification took into account factors such as threats, frequency, history, trends, and probability. The list of hazards was developed by considering the NWT's:

- Demographics;
- Geography and geology;
- Industries and other technologies;
- Transportation modes and routes; and
- Weather and climate.

### 3.3.3 Step #2 - Risk Assessment

During the risk assessment, the level of risk for each hazard was examined. Past occurrences, possible scenarios and the current vulnerability of the society and area to each hazard were reviewed. The risk assessment included gathering data on the impact of the risk on people, property, business and the environment.

As the assessment used both qualitative and quantitative data, it is to some degree subjective. Duplication of this assessment by third parties may not yield exactly the same results.

To determine the past impacts of hazards within the NWT, credible sources were used, such as:

- The Canadian Disaster Database;
- Environment Canada;
- GNWT; and
- Various Ministry Reports and Information (See Information Sources Appendix 8.6).

### 3.3.4 Step #3 - Risk Analysis

The risk analysis determined the frequency and potential impact of hazards on business operations, community, associated stakeholders, related infrastructure, and the environment. Historical occurrences, changing circumstances, outside influences and similar occurrences happening elsewhere are examined when analyzing risks.

#### Frequency

The NWT HIRA is not intended to be a scientific assessment of the frequency of the different hazards, but is a risk assessment which must consider how likely it is that a hazard will occur with enough strength to result in an emergency situation. Hazards are grouped according to the following frequencies:

**Table 1: Frequency Categories**

Frequency	Category	Return Period
1	Rare	>201 years
2	Very Unlikely	101-200 years
3	Unlikely	31-100 years
4	Probable	11-30 years
5	Likely	4-10 years
6	Almost Certain	1-3 years

Some hazards do not have a long historical record and their frequencies can be only estimated based on the best sources available. Ideally, the frequency would be calculated based on the number of times that the event has occurred, rather than in years, however the differing lengths of the historical records in the NWT make this impossible. Some hazards may not have occurred in the NWT (or have occurred before recorded history) but will be classified as 1 or 2 in the Frequency Table depending on the information obtained about the future risk in the NWT.

#### Impact

Different hazards have different potential impacts. The Information Sources in Appendix 8.6 were consulted to determine the impact of historical hazardous events in NWT. Six regional



workshops and a survey were conducted in order to obtain information on events in the NWT that might have not been captured in the literature. The information from this research was gathered and analyzed. Past impacts and current mitigation measures were considered to determine to the extent possible whether comparable damages could be expected in the NWT in the future if similar events were to occur.

Impact was split into five groups:

- Human Impacts - The direct negative effects of an incident on the health of people including; fatalities, injuries or evacuations.
- Property Impact - The direct negative effects of an incident on buildings, structures and other forms of property.
- Business Impact - The negative economic or social losses due to an incident.
- Critical Infrastructure Service Disruptions/Impact - The negative effects of an incident on the networks of institutions, services, systems and processes that meet vital human needs, sustain the economy, protect public safety and security, and maintain continuity of and confidence in government. This category is divided into two; Damage to Critical Facilities and Damage to Lifelines.
- Environmental Damage - The negative effects of an incident on the environment, including the soil, water, air and/or plants and animals.

The following table outlines the rating of the potential impact criteria:

**Table 2: Impact Criteria**

Extent of Death	Extent of Injury	Damage to Critical Facilities	Damage to Lifelines
1 (0-4 people) 2 (5-10 people) 3 (11-25 people) 4 (26 + people )	1 (0-4 people) 2 (5-25 people) 3 (25-50 people) 4 (51 + people)	1 (Temp Relocation) 2 (Closure few days) 3 (Loss 50% Capability) 4 (Permanent Loss)	1 (Temp Interruption) 2 (Interruption days) 3 (Interruption 1 week) 4 (Interruption greater than 1 week)
Evacuation	Damages to Property	Damages to Environment	Business Impact
1 (>10 people) 2 (10-50 people) 3 (51-100 people) 4 (100+ people)	1 (Minimal Damage) 2 (Local Damage) 3 (Local/Severe) 4 (Widespread/Severe)	1 (Minimal Damage) 2 (Local Damage) 3 (Local/Severe) 4 (Widespread/Severe)	1 (Temp Impact) 2 (Temp/ Widespread) 3 (Extended/Widespread)

### 3.3.5 Step #4 - Monitor and Review

A HIRA is part of the emergency management process. The risk assessment will be used to prioritize which risks require further development of treatments to prevent, mitigate, accept, or transfer the risks associated with hazards or threats.

Each HIRA provides information on which hazards should be considered a priority for emergency management programs at a particular point in time. Reduction in hazard frequency or stronger mitigation practices may reduce the risk of a particular hazard and should shift mitigation efforts to another hazard. Hazards and risks should be monitored and reconsidered on a regular basis. At least, a five year review of this HIRA is recommended.