

Annex A

South Slave Region Hazard Identification Risk Assessment



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1 Executive Summary

The 2014 South Slave Region Hazard Identification Risk Assessment (HIRA) identifies the hazards and examines the risks that pose a threat to the people, property, environment and economy of the South Slave Region. This type of assessment is a critical part of any emergency management program. Identified hazards can be used in preparedness programs, emergency response plan exercises, and training and awareness programs.

Governments have limited resources and planning for every possible hazard is not a realistic approach. However, an informed ranking of hazards provides a cost-effective approach to hazard mitigation, emergency planning and response. This assessment identified and rated twenty hazards that could affect the South Slave Region, and then ranked them in order of emergency planning priority. Each region of the Northwest Territories (NWT) has some unique features that were taken into consideration in rating and ranking their hazards.

The South Slave Region Hazard Summary (insert) provides a list of the hazards ranked into three categories of high, medium and low. These rankings are supported by the South Slave Region risk matrix (page 6) and the information outlined in the hazard narratives in Section 2, "Hazard Narratives." Each hazard narrative contains risk mitigation strategies to help emergency planners improve their preparedness and response plans. The rankings were determined using best practices methodology combined with insight from communities and local experts and therefore, may not be identical to risks assigned using other methods or criteria.

The South Slave Region is located south of Great Slave Lake, and borders the Provinces of Alberta and Saskatchewan to the south and Nunavut to the east. The region possesses 17% of the NWT population and

South Slave Region Hazard Summary

High

1. Flood
2. Fire/Explosion
3. Transportation Accidents

Medium

4. Critical Infrastructure Failure – Other
5. Snow Load Hazard
6. Critical Infrastructure Failure - Water Contamination
7. Industrial Emergency
8. Critical Infrastructure Failure - Energy Crisis
9. Human Disease
10. Earth Movement – Other
11. Weather - Winter Storm

Low

12. Weather - Wind Storm
13. Ice Hazard
14. Earth Movement - Permafrost Degradation
15. Weather - Other Extreme
16. Food and Agricultural Emergency
17. Civil Unrest
18. War/ International Incident
19. Earth Movement - Earthquake/ Tsunami
20. Falling Debris

17% of its income. Hay River and Fort Smith, respectively, are the second and fourth largest communities in the NWT. Fort Smith provides many public services to the South Slave Region. It is home to Aurora College Thebacha Campus and Wood Buffalo National Park, one of the largest national parks in Canada.

Floods are the highest ranked hazard in the South Slave Region due to the frequency and impact of Hay River floods.

Fire/Explosion was ranked as a high risk in the South Slave Region. Lightning is the main cause of forest fires in the NWT. However, many of the industrial activities in the NWT also have a high or moderate forest fire risk classification. Development areas in Enterprise, Fort Providence, Fort Resolution, Fort Smith, and Hay River have a high to extreme wildfire Firesmart rating.

Transportation accidents ranked as a high hazard due to the history and exposure in the area. Most communities in the South Slave have well-developed air and road connections. Fort Smith has direct air connection to Edmonton. Hay River is a major transportation hub for the Territories and is one of Canada's largest inland ports. The barges, which service the communities of the Sahtu Region, originate in Hay River. South Slave is also home to the only rail connection in the NWT. Shipments of fuel travel along the rail line to Hay River and are pumped onto barges to be taken to the communities in the north.

1.1 South Slave Region Risk Matrix

FREQUENCY	Likely	<ul style="list-style-type: none"> ✓ Weather-wind storm ✓ Weather-other extreme 	<ul style="list-style-type: none"> ✓ Critical Infrastructure Failure-other ✓ Snow load hazard ✓ Critical Infrastructure Failure-energy crisis 	<ul style="list-style-type: none"> ✓ Flood ✓ Fire/Explosion ✓ Transportation accident
	Unlikely	<ul style="list-style-type: none"> ✓ Earth movement-permafrost degradation ✓ Food and agriculture emergency 	<ul style="list-style-type: none"> ✓ Human disease ✓ Weather - winter storm 	<ul style="list-style-type: none"> ✓ Earth movement – other ✓ Critical Infrastructure failure-water contamination ✓ Industrial emergency
	Rare		<ul style="list-style-type: none"> ✓ Ice hazard ✓ Civil unrest ✓ Falling debris 	<ul style="list-style-type: none"> ✓ War/International incident ✓ Earth movement-earthquake & tsunami
		Low	Medium	High
		IMPACT		

1.2 Emerging Issues

Parts of the South Slave Region are within the Western Canada Sedimentary Basin. Oil and gas development potential is significant. One of Canada's largest lead zinc mines was located at Pine Point and is currently being evaluated for redevelopment.

Development plans are being considered to expand the region's hydro capacity to supply the diamond mines.

Changes in transportation infrastructure can also lead to new incident patterns. For example, the construction of the Dehcho Bridge has caused changes in driving patterns. Previously, drivers would be forced to rest after the final midnight run of the "Merv Hardie" Ferry. Now the bridge can be used at any time, increasing night time travel and its inherent risk. Changes in transportation infrastructure could impact the hazard ranking presented in this document.

1.3 Climate Change

Climate change strongly affects the hazards of the NWT. Temperatures have already increased by 3 to 4 degree Celsius over the past 50 years in the NWT and this rate will continue or increase. Climate change shifts the wind and cloud patterns and changes how many storms and lightning strikes impact the region. Northern climate change has been hard to predict but these are some of the effects that could increase the frequency or impact of hazards in the future:


- Rapidly rising temperatures (Fire/Explosion Hazard, Transportation Accidents Hazard, Critical Infrastructure Hazards, Earth Movement Hazards, Human Disease Hazard);
- Shorter, warmer winters (Transportation Accidents Hazard, Critical Infrastructure Hazards);
- Increased rain and snowfall in many regions (Flood Hazard, Snow Load Hazard, Weather Hazards, Earth Movement Hazards);
- More extreme fall and winter storms (Weather Hazards);
- Less predictable weather (Weather Hazards);
- Increased winds in some areas (Weather Hazards);
- Thinner ice (Ice Hazard);
- Lower water levels in some lakes and rivers (Critical Infrastructure Hazards, Water Contamination Hazard, Transportation Accidents Hazard);
- More forest fires in some areas (Fire/Explosion Hazard); and
- Rising sea levels (Flood Hazard, Earth Movement Hazards).

A more extensive discussion on climate change can be found in the 2014 NWT HIRA Section 8.3 Specific Climate Change Report.

2 Hazard Narratives

2.1 High

2.1.1 Flood

		Definition An overflow or surge of water which causes or threatens loss of life and property and environmental damage	Class Natural Hazard
Figure 1: Flooding Hay River 1951 (Source: Canada. Dept. of Indian and Northern Affairs / Library and Archives Canada / PA-144785)		NWT greatest impacts to date 1800 Evacuated Estimated Total Cost \$3,500,000	
		Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies	<ul style="list-style-type: none">✓ Outline a water management and community development policy.✓ Develop and exercise plans/programs for:<ul style="list-style-type: none">○ watershed management;○ river/lake/ocean modeling/prediction and monitoring,○ erosion control; and○ flood response.✓ In the face of rapid snowmelt and intense rains in spring and summer, communities susceptible to flash flooding should review and improve their drainage facilities and protect vulnerable buildings and facilities .		
Vulnerability		Description	
People		Evacuation of communities due to flood events is common. Deaths and injury due to flooding can occur during heavy rainstorm events which can interfere with evacuation attempts. Deaths in the NWT due to flooding are rare.	
Infrastructure		Personal property damage can be extensive. Contamination by floodwaters, structural damage, and mold can destroy buildings. Roads can be damaged or washed away. Damage to infrastructure can be extensive. Flooding can also negatively affect utilities and critical infrastructure. Utilities such as wastewater treatment, electricity and gas may be disrupted in the event of a flood. Emergency ground vehicles may be unable to respond if roads and bridges are flooded, washed out or covered by debris.	
Communications		Communication towers can be damaged by flooding events.	

South Slave Exposure/History


Ice jam flooding is the main type of flooding in South Slave. Rivers break up much earlier than lakes. Bottlenecks can cause ice jams. Ice jams have caused flooding in Hay River, as it nears the shores of Great Slave Lake. Hay River is the only community designated as a flood risk area in the South Slave Region.

When	Where	Impact
1951	Hay River	Flooding
May 3, 1963	Hay River Township	The CBC Mackenzie network went off the air as did the telegraph, telephone and microwave communication. The airstrip was under water and the causeway link to the Mackenzie Highway had been washed out in two places. Major flooding caused by ice jamming required evacuation of the community of Hay River. Evacuated: 1800 Estimated Total Cost: \$ 615,000
May 2, 1974	Hay River Township	Flooding caused by ice jamming required evacuation of West Channel residents.
Jan 1, 1982	Hay River	Estimated Total Cost: \$572,824
May 3, 1985	Hay River Township	Record high flows of the Hay River and ice jams caused serious flooding, requiring the evacuation of West Channel residents. Ice jams, spring runoff, minor damages, one injury. Estimated Total Cost: \$1.1 million
April 25, 1992	Hay River	Approximately 100 residents were evacuated due to Hay River flooding caused by a 10-kilometre-deep ice jam.
2003	Hay River	An ice blockage at the mouth of the Hay River where it enters Great Slave Lake caused localized flooding in the community of Hay River and Hay River Reserve. A number of residences in both communities had to be evacuated due to the floodwaters. Estimated Total Cost: \$100,000.
May 5 and 6, 2008	Hay River	Overland flooding due to snow melt and the spring backup of Hay River resulted in damages to public and private property. Estimated Total Cost: \$460,000

Community Meeting Feedback

Local knowledge during the workshop supported the analysis of flood being a high risk factor for the South Slave Region.

2.1.2 Fire/Explosion

		Definition Uncontrolled burning and/or a sudden, violent release of gas under pressure which causes or threatens loss of life and property and environmental damage	Class Natural and Human-induced
Figure 2: Fort Smith – Wood Buffalo Fire 1982 (Source: GNWT, MACA)		NWT greatest impacts to date 950 Evacuated Estimated Total Cost \$12,044,118	
		Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies	<ul style="list-style-type: none">✓ Consider implementing FireSmart programs for the community and include the response capabilities for urban/rural/wildland fires.✓ Create fire education training and awareness sessions for first responders and the public.✓ Enforce fire prevention practices.		
Vulnerability		Description	
People		High injury and fatality potential from the immediate threat of the fire and the blast as well as an increased mortality rate and respiratory symptoms due to smoke.	
Infrastructure		Total loss or damage to most infrastructure including public buildings, roadways, rail-lines, power facilities and water treatment plants. Smoke can impede evacuation of remote communities by air.	
Communications		Any existing power lines can be damaged and destroyed by fire/explosion cutting off communication links. The same holds true for microwave towers in regions without in-place power lines.	

South Slave Exposure/History

Table 1: Wildfires and Urban Fires with Losses of \$500,000 and Over

Where	When	Impact
Fort Smith, Pine Point, and Hay River	1982	Wildfire - Highway closed, Hay River prepared for evacuation.
Fort Resolution	March 1997	Urban fire. Injured: 1 Estimated Total Cost: \$700,000
Fort Providence	2002	Urban fire - Big River Service Restaurant. Estimated Total Cost: \$500,000

Wildfire

Lightning causes up to 80% of the forest fires in the NWT. The following communities throughout the South Slave Region have a wildfire FireSmart hazard of high or extreme:

Table 2 FireSmart Hazard Areas of High or Extreme in South Slave According to Community CWPP

Community	Development Area	FireSmart Hazard
Enterprise	High risk of wild fires.	
Fort Providence	Very low to High risk of wildfires.	
Fort Resolution	Fort Resolution South-End	High Extreme
	Little Buffalo River Village Area East-end	High Extreme
	Little Buffalo River Village Area Det'an Cho (Eagle) Tourist Camp	High
Fort Smith	Town East	High - Extreme
	Town West	High - Extreme
	Towering Pines	High - Extreme
	Bell Rock	Extreme
Hay River	Smith's Road	Moderate - High
	Delancy Estates	Extreme
	Kelly's Lane	Extreme
	West Point	Low - Extreme
	Hay River Indian Reserve Rural Developments	High - Extreme
	Hay River Indian Reserve Main Townsite	Moderate - High
	Riverwoods CR Subdivision	Extreme

Lightning is the main cause of forest fires in the NWT. However, many of the industrial activities in the NWT also have a high or moderate forest fire risk classification. These activities include land clearing, timber harvesting, timber processing, mechanical site preparations and other silviculture treatments, gas or oil well operations, mining, highway maintenance and construction, engineering operations, plant harvesting, manufacturing, milling, railroad operations, trenching, the use of explosives.

Explosion

Many communities have large fuel tanks needed to prepare for the winter months. This large fuel load can result in an explosion if an ignition source is introduced. Nearby forests increase the fire load and the risks to the communities.


Peat Fire

The NWT has the largest deposit of peat in Canada with 250,000 km² of peat.

Community Meeting Feedback

Summers are becoming hotter and drier. This coupled with the lack of adequate fire-fighting resources has many residents concerned for the future in terms of possible fire damage. Bulk storage areas are another primary concern for community residents. Bulk storage of fuels could lead to explosions which would have disastrous effects on many communities throughout the NWT. In many cases, bulk fuel storage containers are very close to, or within the community.

2.1.3 Transportation Accidents

 <p>Figure 3: Highway 3 Accident - February 2013 (Source: GNWT, MACA)</p>		Definition All vehicle accidents which involve large loss of life and property damage	Class Human-induced Hazard
		NWT greatest impacts to date <ul style="list-style-type: none"> Fatalities 32 Infrastructure damage (power failure, airport damage) Property damage 	
		Climate Change Projected to increase both frequency and consequence	
		Mitigation Strategies <ul style="list-style-type: none"> ✓ Enforce safety and prevention programs. ✓ Ensure Dangerous Goods practices/regulations are followed. ✓ Implement transportation route monitoring programs. ✓ Confirm that emergency response plans in place for all areas to allow for prompt response to transportation accidents. 	
Vulnerability		Description	
People		Accidents, specifically motor vehicle accidents, are one of the highest causes of death and injury to Canadians every year. Amongst young Canadians (below age 25) vehicular accidents are the number one cause of death in the country. Largest loss of life in one accident usually occurs on passenger flight accidents.	
Infrastructure		Any accident which occurs on a roadway has the ability to damage the roadway and therefore leave already isolated areas without any road access. The same holds true for aircraft accidents which may close down an airport making it virtually impossible to gain access to several communities in the NWT.	
Communications		Given that communication hubs are serviced by a single communication line, especially in the southern NWT, any accident may cut these lines leading to loss of communications.	

South Slave Exposure/History

When	Where	Impact
Jan 12, 2000	Near Fort Providence	A Northbound Super-B-Train truck hauling diesel fuel crashed through the Mackenzie River ice crossing. Driver was treated for hypothermia.
Dec 8, 2010	20 kilometres north of Enterprise	Two transport trucks collided head-on near McNally Creek. The highway was closed for four (4) hours until the accident site could be cleaned up and traffic allowed to safely pass. Fatalities: 1 Injured: 2

NWT transportation infrastructure includes a network of roads, ports and airports, including a rail connection to Hay River. There is also a well-developed marine freight route along the Mackenzie River

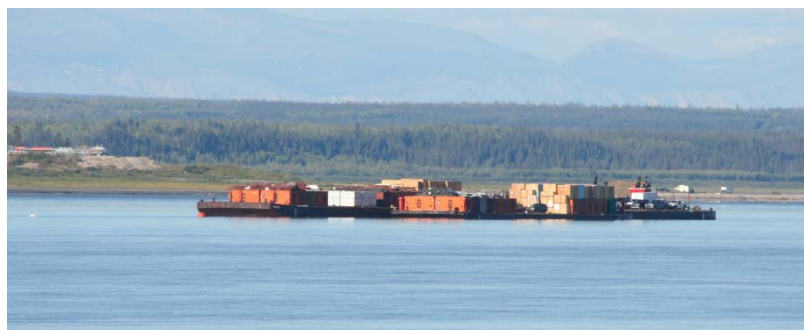


Figure 4: NCTL Tug and Barge on Mackenzie River (Source: NCTL website)

to the Arctic Ocean. Navigation problems on the Mackenzie River from Hay River to Tuktoyaktuk, including the Peel River include a short shipping season (beginning of June to mid-October), ice conditions, low water levels (especially in the fall), four sets of rapids and decreasing daylight in the fall.

As may be expected, the areas with the heaviest traffic and the largest populations have the highest number of accidents. Highway Rescue units are only available in the North and South Slave Region. This is most likely the reason that they have a lower percentage of accidents that end in injury or death.

Each year, collisions with wildlife, particularly bison, cause vehicle damage and injuries on NWT highways. Most incidents occur along Highways 3 and 5. Bison can also be found on and alongside Highway 7.

Statistically, approximately 30% of aviation accidents are weather related and up to 75% of delays are due to weather. (NAV 2005) The NWT experiences a number of aviation weather hazards including icing, poor visibility, wind shear and turbulence, weather fronts and thunderstorms.

Table 3: South Slave Transportation Risk Exposure

Community	Air	Road	Water/Rail
Enterprise		Hwy 2 – Hay River Highway (Great Slave Route) - paved - total length is 48.6 kilometres.	
Fort Providence	The airport lies 3 km east of the community and was built in 1972. It has a gravel runway (3000' x 100'). There is no scheduled air service.	Fort Providence is accessible by road year-round. Dehcho Toll Bridge spans the Mackenzie River at km 24 on Highway #3. Two emergency telephones installed on the Bridge in 2013. Each one is located approximately one-third of the way along the Bridge.	
Fort Resolution	The airport has a gravel runway (4000' x 100') and an air terminal building. There is no scheduled air service.	NWT Highway 6 ends at Fort Resolution.	Boat along the Slave River and via Great Bear Lake.


Community	Air	Road	Water/Rail
Fort Smith	Located 4 km NW of the community, the airport was built in 1938/39. There are two runways, one asphalt (6000' x 200') and one asphalt/gravel (1800' x 100', summer only), and an air terminal building. Scheduled air services operate daily.	Accessible by the Mackenzie Highway year-round. A winter road connects the community to Fort Chipewyan and Fort McMurray.	
Hay River	This full-service airport lies 4 km NE of Hay River and was built in 1942/43. It has two runways, one asphalt (6000' x 150') and one asphalt/gravel (4000' x 150'). Scheduled flights operate daily.	Mackenzie Highway year-round.	The north end of the CN Northern Railway Line from Edmonton. Large barge terminal for receiving, loading and offloading barges.
Hay River Reserve		In winter a short ice crossing is used to travel between the town and reserve. In summer the Hay River Reserve is accessed on a side road from Highway 5.	
Kakisa	No airport, only floatplane.	Connected to the Mackenzie highway by a 13 kilometre all-weather road less than 200 kilometres west of the Alberta/NWT border.	Boat

Community Meeting Feedback

At the South Slave Region meeting, residents expressed concern over potential transportation accidents impacting their communities. Hazardous materials are transported through many of the communities.

2.2 Medium

2.2.1 Critical Infrastructure Failure – Other

 <p>Figure 5: Thebacha Campus Fort Smith (Source: Aurora College website)</p>	<table border="1"> <tr> <td data-bbox="889 323 1295 533"> Definition Failure of services that meet basic human needs, sustain the economy, and protect public safety and security </td><td data-bbox="1295 323 1442 533"> Class Human-induced Hazard </td></tr> <tr> <td colspan="2" data-bbox="889 533 1442 688"> NWT greatest impacts to date <ul style="list-style-type: none"> • Communications failure • Road Damages </td></tr> <tr> <td colspan="2" data-bbox="889 688 1442 793"> Climate Change Projected to increase both frequency and consequence </td></tr> </table>	Definition Failure of services that meet basic human needs, sustain the economy, and protect public safety and security	Class Human-induced Hazard	NWT greatest impacts to date <ul style="list-style-type: none"> • Communications failure • Road Damages 		Climate Change Projected to increase both frequency and consequence	
Definition Failure of services that meet basic human needs, sustain the economy, and protect public safety and security	Class Human-induced Hazard						
NWT greatest impacts to date <ul style="list-style-type: none"> • Communications failure • Road Damages 							
Climate Change Projected to increase both frequency and consequence							
Mitigation Strategies	<ul style="list-style-type: none"> ✓ Understand the potential risks associated with Critical Infrastructure Failure – Other. ✓ Build partnerships between stakeholders. ✓ Ensure back up/alternate systems in place for life safety. ✓ Ensure emergency response plans are in place. 						
Vulnerability	Description						
People	People in the NWT rely on infrastructure to keep them supplied and in touch with other communities. Any infrastructure collapse could be catastrophic given the harsh nature of most areas where people live.						
Infrastructure	Airports are subject to closure regularly in the winter, ice roads rely on a consistent pattern of cold weather and all weather roads are also subject to closure during winter season. Any infrastructure collapse is also exacerbated by the fact that the isolated nature of these communities makes it extremely difficult to repair failed infrastructure. Given the isolated nature of most of the communities within the NWT, any incident which closes down an airport could be severe.						
Communications	Communications break downs are common throughout the north as severe weather can shut down facilities and “power bumps” often hamper effective communications. Again, given the isolated nature of the area, repair of these systems is often extremely difficult.						


South Slave Exposure/History

When	Where	Impact
January, 2003	NWT	Mid-winter temperatures ranging from -1°C in Yellowknife to an incredible 7°C in Fort Smith. The mild El Nino weather put winter road and ice bridge construction behind schedule by a few weeks.
October 6, 2011	10 communities	Telesat's Anik F2 satellite suddenly ceased operating. Remote northern locations were the most affected, with 10 of 33 NWT communities served by NorthwesTel seeing disruptions from the outage. First Air airline cancelled 48 flights, stranding about 1,000 passengers just before the Thanksgiving long weekend.

Community Meeting Feedback

The biggest concern commented upon at the South Slave regional meeting was the present state of the highways and roads throughout the NWT and the reliance on seasonal roads. The span of time these seasonal roads could be accessed was believed to be directly affected by climate change according to many residents. There was also mention that any infrastructure failure in Alberta, be it road or airport, would have an immediate impact on the NWT as the Territory relies on Alberta for supplies and emergency response. In Hay River, the rail lines used to transport fuel have deteriorated to the point where the speed limit on them has been reviewed and lowered.

2.2.2 Snow Load Hazard

 <p>Figure 6: Municipal Garage Roof Collapse in Enterprise, January 28, 2013 (Source: Paul Bickford/NNSL Photo)</p>	Definition Potential collapse of buildings due to the weight of build-up or drifting of snow	Class Natural Class
	NWT greatest impacts to date Property Damage (Roofs)	
	Climate Change Projected to increase both frequency and consequence. Structures are built using historical snow load standards. When the snow load exceeds the standards, due to wetter, heavier, more frequent or drifting snow, structures can collapse.	
Mitigation Strategies	<ul style="list-style-type: none"> ✓ Include snow load hazards in community response plans. ✓ Clear snow from public building rooftops. ✓ Perform a Roof Risk Assessment on key community structures such as schools and community centers. 	
Vulnerability		Description
People	High numbers of injuries or deaths could occur if an occupied community building or school were to collapse.	
Infrastructure	Loss of the building and contents plus loss of the use of this building until repairs or a new structure can occur.	
Communications	Potential collapse of microwave towers due to snow load could impact the community's communications.	

South Slave Exposure/History

When	Where	Impact
Jan 28, 2013	Enterprise	The roof of an Enterprise municipal garage collapsed under the weight of snow.

Community Snow Load Risk Factors

Community	Community Snow Load Risk Factor
Enterprise	Moderate
Fort Providence	Moderate
Fort Resolution	Moderate
Fort Smith	Moderate
Hay River	Moderate
Hay River Reserve	Moderate
Kakisa	Moderate


Studies show that approximately one fifth of public buildings (22%) in the NWT are at risk of collapse due to changing/increasing snow loads. Public buildings at risk include schools, hospitals, community centers and medical centres. Of those buildings at

risk, about 10% have been retrofitted since 2004, and another 12% are under a snow load watch status.

Community Meeting Feedback

Residents of the South Slave spoke of the increased amount of snow they were seeing and the fact that it was heavier and wetter than in the past.

2.2.3 Critical Infrastructure Failure - Water Contamination

		Definition Serious contamination of drinking water or loss of supply, that presents a danger to the general health of the public	Class Human-induced Hazard
Figure 7: Fort Resolution Water Treatment Plant (Source: 2011 GNWT Report on drinking water)		NWT greatest impacts to date Boil water advisories	
		Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies	<ul style="list-style-type: none">✓ Understand the potential risks associated with Critical Infrastructure Failure – Water Contamination.✓ Plan for identification and reduction of contaminants into ground and surface water.✓ Ensure water sampling and monitoring program in place.✓ Ensure emergency response plans are in place.		
Vulnerability	Description		
People	The levels of contaminants in drinking water are seldom high enough to cause acute (immediate) health effects. Examples of acute health effects are nausea, lung irritation, skin rash, vomiting, dizziness, and even death.		
Infrastructure	Disasters that destroy infrastructure may result in water contamination by sewage. Chloride ions, usually found in seawater or acid rain, increase the conductivity of water and accelerate corrosion. Chloride can penetrate and deteriorate concrete on bridge decking and parking garage structures, and damage reinforcing rods, compromising structural integrity. It damages vehicle parts such as brake linings, frames, bumpers, and other areas of body corrosion. It impacts railroad crossing warning equipment and power line utilities by conducting electrical current leaks across the insulator that may lead to loss of current, shorting of transmission lines, and wooden pole fires.		
Communications	Chloride ions from acid rain significantly aggravate the conditions for pitting corrosion of most metals by enhancing the formation and growth of the pits through a process which weakens them over time.		

South Slave Exposure/History

The responsibility for ensuring safe drinking water is vested with the Government of the NWT, which has passed specific public health legislation designed to ensure the safety of drinking water supplies. The Department of Health is the regulator and is responsible for enforcing the *Public Health Act*, *Water Supply System Regulations*, and *General Sanitation Regulations*, as well as ensuring the *Guidelines for Canadian Drinking Water Quality* are met.

Community governments have the authority and responsibility to provide safe potable water to their residents. In communities where the community government is the owner and operator of the water treatment facilities, the community government is responsible for the treatment and safety of the water

supply in those operations. Responsibilities include treatment of water to meet the Guidelines for Canadian Drinking Water Quality, the submitting of water samples to a laboratory for bacteriological and chemical analysis, and maintaining records of raw water quality, finished water quality and the amounts of chemicals used in treatment.


When	Where	Impact
2007	Hay River	Boil water advisory during spring break up due to high turbidity.
2008	Hay River	Boil water advisory during spring break up due to high turbidity.
2009	Hay River	Boil water advisory during spring break up due to high turbidity.
May 2009	Most of the NWT communities	Oil sands development in the Wood Buffalo Region threatens the water supply to most of the NWT 33 cities, towns and hamlets which are located on water directly downstream from the oil sands. The main area of concern is that contaminants may be getting into the water system which would directly affect the drinking water of virtually all residents of the NWT.

Community	Public Water Source	Water treatment system classification
Enterprise	see Hay River	N/A
Fort Providence	Mackenzie River	Class II
Fort Resolution	Great Slave Lake	Class II
Fort Smith	Slave Lake	Class III
Hay River	Great Slave Lake	Class II
Hay River Reserve	see Hay River	Small System
Kakisa	see Hay River	N/A

Community Meeting Feedback

South Slave residents are concerned with possible contaminants from industry in Northern Alberta since these waters feed the rivers of the South Slave Region. Also raised was the contamination of water in the Hay River area by waste from the NTCL yard as well as a chicken bar which is located south of town directly on the Hay River. Throughout the South Slave issues were raised over how the placement of sewage lagoons and poor sewage infrastructure could affect the quality of drinking water. In some cases, such as Fort Resolution, the sewage lagoon was built above the water supply which meant that any seepage could directly impact the community's water supply.

2.2.4 Industrial Emergency

		Definition Emergencies involving businesses that handle dangerous goods, hazardous wastes or chemicals or engage in potentially hazardous activities	Class Human-induced Hazard
Figure 8: Hay River (Source: GNWT, Bureau of Statistics)		NWT greatest impacts to date Environmental Damage	
		Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies	<ul style="list-style-type: none">✓ Identify the industries in each community and rank according to risk.✓ Ensure back-ups are in place for the industries ranked as critical.✓ Ensure appropriate safety and emergency plans are in place.		
Vulnerability	Description		
People	Industrial accidents have an enormous impact on the health of workers and on the economy in general, which is reflected in the death, disability and personal suffering of workers on one hand, and in absence from work, loss of productivity and health costs on the other.		
Infrastructure	Industrial accidents can have a dramatic negative affect on physical and virtual systems which are considered critical. This would include fires or explosions, oil spills which could impact water treatment and dam failure which could impact power supply.		
Communications	Communications hubs in small communities could be damaged by an industrial accident in the community.		

South Slave Exposure/History

Mining and oil and gas industries are the most common hazardous industries in the NWT. In mining, common causes of fatal injury include: rock fall, fires, explosions, mobile equipment accidents, falls from height, entrapment and electrocution. Less common but recognized causes of fatal injury include flooding of underground workings, wet-fill release from collapsed bulkheads and air blast from block caving failure.

Community Meeting Feedback

Community members in the South Slave Region discussed the need for clean-up at the Northern Transportation Company Ltd. (NTCL) yard in Hay River, the transportation of dangerous goods throughout the region and the lack of knowledge among residents as to what was actually being transported through their community.

2.2.5 Critical Infrastructure Failure - Energy Crisis

 <p>Figure 9: Taltson Dam Hay River (Source: Meco Taltson Dam Safety Review)</p>		Definition Failure to provide energy required to meet basic human needs, sustain the economy, and protect public safety and security	Class Human-induced Hazard
		NWT greatest impacts to date Declared state of emergency	
		Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies	<ul style="list-style-type: none">✓ Understand the potential risks associated with Critical Infrastructure Failure – Energy Crisis.✓ Build partnerships between stakeholders.✓ Ensure back up/alternate systems in place for life safety.✓ Ensure emergency response plans in place.		
Vulnerability	Description		
People	Given the severe weather in the north; the population relies on a steady and safe supply of energy to provide heating in the winter. Most areas of the NWT are extremely isolated and the health hazards of being left without energy/power are both physical and mental.		
Infrastructure	Water lines and sewage lines can freeze and break in severe winter weather without heat or flowing water. Loss of power can cause a situation where pipes burst in the colder temperatures.		
Communications	Loss of electrical power can cause disruption to communication systems such as radio and television which people rely on for information.		

South Slave Exposure/History

When	Where	Impact
January, 2003	NWT	Mid-winter temperatures ranging from -1°C in Yellowknife to 7°C in Fort Smith. The mild El Nino weather put winter road and ice bridge construction behind schedule by a few weeks and created problems for mining and oil and gas industries, which rely on the frozen roadways to transport yearly supplies.

In the South Slave, there are two main energy sources used to generate electricity, diesel fuel and hydro resources. Hydroelectric generation is used in five communities. The remaining two communities have electricity provided by diesel-fired power plants. Alternative Energy Programs are being put in place such as a Solar Wall in Fort Smith. Fuel must be shipped into the communities by pipeline, barge, ice road or air. A shortened ice road season, barge or pipeline disruption, or prolonged extreme weather events can lead to shortages of fuel in communities.

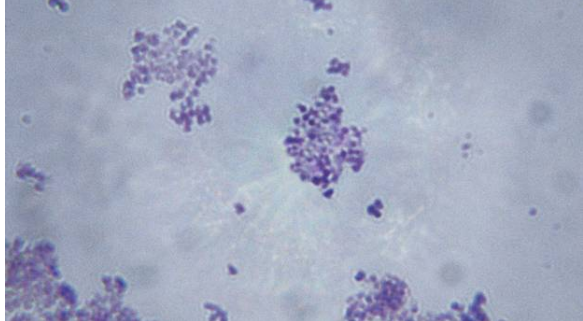
Community	Power Source (NWT Power Corporation website)
Enterprise	Taltson Hydro plant.
Fort Providence	Diesel generator plant for electricity.

Community	Power Source (NWT Power Corporation website)
Fort Resolution	Taltson Hydro plant plus a diesel plant with one diesel generator with a capacity of 600 kW. There is also a standby 100 kW diesel generator located at Buffalo Junction which is approximately 77 km west of Fort Resolution on Highway 5 to Hay River.
Fort Smith	Hydro electricity from the Taltson Hydro Facility. A standby diesel plant consists of three diesel generators with a total connected generating capacity of 6 MW.
Hay River	Taltson Hydro plant.
Hay River Reserve	Taltson Hydro plant.
Kakisa	Diesel power to generate electricity.

Community Meeting Feedback

This issue was addressed at each community meeting. Residents in the South Slave are concerned that having only one power line into a community leaves them vulnerable to power loss caused by an accident, fire or storm.

2.2.6 Human Disease

 <p>Figure 10 Staphylococcus aureus (Source: Canadian Press, 12 Oct 2012)</p>	Definition A grave or widespread illness that presents a danger to people's health	Class Natural Hazard
	NWT greatest impacts to date Fatalities 600	
	Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies	<ul style="list-style-type: none">✓ Ensure disease monitoring plans are in place between all levels of government and private sector.✓ Ensure preparedness plans are in place.✓ Ensure response plans are in place and are exercised, including containment and quarantine procedures.✓ Human vaccination against anthrax is available for personnel likely to be involved in investigating or responding to anthrax outbreaks.	
Vulnerability	Description	
People	Injury and death from human disease can severely impact an isolated community where continual medical care is limited.	
Infrastructure	While human diseases do not impact infrastructure directly, some disruption in critical services could occur when enough of the population is affected. Support services to remote communities could be cut off during a pandemic or severe epidemic.	
Communications	N/A	

South Slave Exposure/History

When	Where	Impact
1902	Fort Resolution	Measles epidemic killed 66 in Fort Resolution.
1928	Mackenzie District	Influenza epidemic sweeps through the Mackenzie District, killing about 600 people, approximately 10 to 15% of the population of each village.
1952	Wood Buffalo National Park	Cutaneous anthrax was retrospectively diagnosed in two wardens who developed skin lesions after they had handled a bison carcass. Both responded without incident to antibiotic therapy.
Summer of 1962	Hook Lake	Two people working with infected bison carcasses during the Hook Lake outbreak were exposed and contracted anthrax. One was exposed while performing a necropsy of one of the first detected cases without the use of appropriate safety precautions, and the second was exposed while working on heavy equipment that had been used in the outbreak response. Both individuals received prompt medical attention.
Since 2008	NWT wide	Methicillin-Resistant Staphylococcus Aureus (MRSA) infections. 55 hospitalizations (5 of them had to be flown south for treatment). Fatalities: 2

When	Where	Impact
Nov 2009	NWT wide	H1N1 - 45 hospitalizations. Fatalities: 1

Pandemic

Worst case scenario in the GNWT Pandemic plan—each community may be completely isolated and little or no extra resources (human or material) will be available from the Region, Territory, or Nation during the Pandemic period.

Other Hazard Specific Information

Human vaccination against anthrax is available for personnel likely to be involved in investigating or responding to anthrax outbreaks.


Table 4 Health Care Facilities in South Slave Region

Community	Health Care Facilities
Enterprise	Patients drive to Hay River for their medical needs
Fort Providence	Fort Providence Health Centre
Fort Resolution	Fort Resolution Health Centre Fort Resolution “Our Great Elders” Facility- Homecare and Administration
Fort Smith	Northern Lights Special Care Home Fort Smith Health and Social Services Centre Polar Crescent Group Home – Child welfare Trailcross Treatment Centre – Child welfare
Hay River	H.H. Williams Memorial Hospital Woodland Manor Long Term Care Residence South Slave Medical Clinic
Hay River Reserve	Patients drive to Hay River for their medical needs
Kakisa	Patients drive to Fort Providence or Hay River for their medical needs

Community Meeting Feedback

This hazard was not mentioned as a concern at the South Slave Region meeting.

2.2.7 Earth Movement – Other

	Definition Movement of the ground causing wide spread damage not involving permafrost degradation or earthquake	Class Natural Hazard
Figure 11: 2012 Sinkhole near Fort Resolution (Source: CBC News/Carol Collins)	NWT greatest impacts to date <ul style="list-style-type: none"> • Fatalities 1 • Property damage \$1,000,000 • Infrastructure 	
Mitigation Strategies	<ul style="list-style-type: none"> ✓ Develop and enforce building standards. ✓ Develop/distribute and facilitate public awareness programs. ✓ Ensure that emergency plans are in place. ✓ Ensure “safe areas” are available and known to community members. 	
Vulnerability	Description	
People	Injuries or even death could occur from riverbank collapse or sinkholes.	
Infrastructure	Damage to buildings, roads and other infrastructure has and is being caused by these earth movements including erosion, riverbank collapse and sinkholes. Also increase in maintenance costs associated with landslides and avalanches, even where no infrastructure damage occurs.	
Communications	Interruption can occur if earth movement impacts communication towers.	

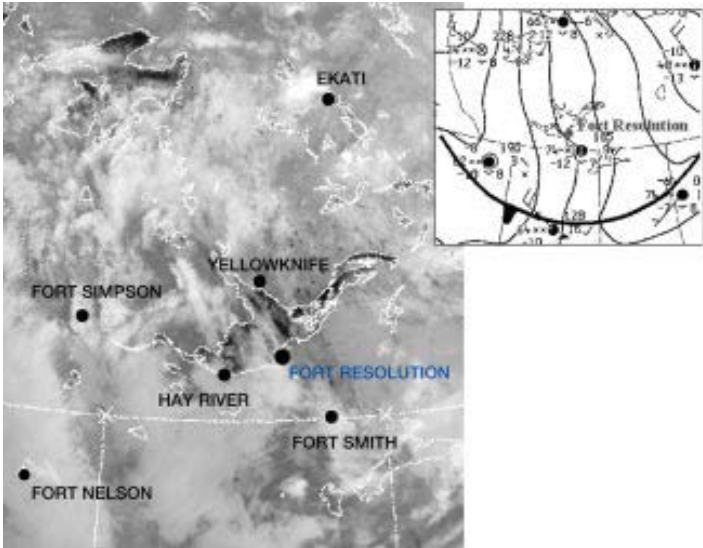
South Slave Exposure/History

When	Where	Impact
1908	Fort Smith	A riverbank collapse caused many of the oldest buildings to be dragged down in the mud. Riverside docking facilities were battered and a warehouse burned to the ground.
August 9, 1968	Fort Smith	A landslide some 3,300 by 990 ft (1,000 by 300 m) broke away from the riverbank causing property damage and killing one person. It destroyed four homes. Estimated Cost: \$1,000,000
May 11, 2008	164 kilometres from Fort Smith, near the Nyarling River	A large section of the road collapsed. Officials with the Transportation Department described the collapsed area as a "crater-like" hole about six metres wide and six metres deep — large enough to swallow a car. No injuries.
Jul 24, 2012	Fort Resolution	An entire cabin vanished into a massive sinkhole. No injuries.

Community Meeting Feedback

Residents spoke of sink holes and slumping affecting roads.

2.2.8 Weather - Winter Storm

 <p>Figure 12: About 40 centimetres of snow fell on Fort Resolution overnight in November 1998. (Source: NAV CANADA, Satellite photo 1229 UTC 10 November 1998)</p>		Definition Strong weather characterized by ice, snow and freezing rain	Class Natural Hazard
		NWT greatest impacts to date <ul style="list-style-type: none">• Infrastructure damage (power failure, airport damage)• Property damage	
		Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies	<ul style="list-style-type: none">✓ Develop and enforce snow load standards.✓ Ensure that plans are in place for severe winter storms.✓ Develop/distribute and facilitate a public awareness program around how to prepare for and what to do in a severe winter storm.✓ Identify and communicate available “safe areas” for community members.		
Vulnerability	Description		
People	Heavy winds and cold temperatures can combine with power loss to cause injury and death that could be extensive. Blowing snow creates hazardous driving and working conditions (see Transportation Hazard).		
Infrastructure	Heavy winds and snow can cause damage to buildings, loss of power and water and sewage systems. Snow build-up on roofs can cause collapse (see Snow-Load Hazard).		
Communications	Snow and heavy winds can knock out communications systems.		

South Slave Exposure/History


Winter storms cause millions of dollars of lost revenue due to shut down of operations and slow transportation of goods and services every year. The increased frequency of snowstorms has had an impact on roadway safety. More snow removal is necessary to allow for safe travel, and the transportation of goods.

Community Meeting Feedback

This hazard was not mentioned as a concern at the South Slave Region meeting.

2.3 Low

2.3.1 Weather - Wind Storm

 <p>Figure 13: Microburst Damage to Trees in Fort Smith, September 2012 (Source: Northern News Services)</p>	Definition Strong weather characterized by damaging movement of air	Class Natural Hazard
Mitigation Strategies	NWT greatest impacts to date <ul style="list-style-type: none"> • Property Damage (drill rig) • Infrastructure (transmission tower) 	
	Climate Change Projected to increase both frequency and consequence	
	<ul style="list-style-type: none"> ✓ Develop and enforce building standards for severe winds. ✓ Develop/distribute and facilitate public awareness programs. ✓ Ensure emergency plans include response to wind storms. ✓ Ensure “safe areas” are available and known to community members. 	
Vulnerability	Description	
People	All wind storms have the potential to cause injury or death due to structural damage, flying debris or storm surges. Hurricanes also can cause flooding (see Flood Hazard). Tornadoes can cause many injuries and death but are very rare across the NWT.	
Infrastructure	Heavy winds can cause great damage to buildings and infrastructure, and knock out power across large areas. Tornadoes can cause heavy damages but are very rare across the NWT.	
Communications	Heavy winds are often responsible for damage to communications towers.	


South Slave Exposure/History

When	Where	Impact
Sept. 14, 2012	South of Fort Smith	Thunderstorm was accompanied by both windshear and microbursts, the wind event affected a vast area, including Pine Lake 60 km in Wood Buffalo National Park, where thousands of trees were downed, with a few damaging cottages

Community Meeting Feedback

This hazard was not mentioned as a concern at the South Slave Region meeting.

2.3.2 Ice Hazard

<div>APR 24, 2014 15:49</div>  <p>Figure 14: Hay River Pine Point Bridge Webcam, 24 April 2014 (Source: Town of Hay River website)</p>		Definition Formations or movements of ice which cause loss of life, property and/or environmental damage	Class Natural Hazard
		NWT greatest impacts to date <ul style="list-style-type: none">Property Damage	
		Climate Change Projected to decline	
Mitigation Strategies	<ul style="list-style-type: none">✓ Develop and enforce building standards for ice accumulations.✓ Develop/distribute and facilitate public awareness programs.✓ Confirm that ice storm emergency plans in place.✓ Ensure “safe areas” are available and known to community members.		
Vulnerability		Description	
People		Injury and loss of life can occur when oil rigs, boats or ships are damaged or sunk by ice (see Transportation Hazards).	
Infrastructure		Icebergs still threaten offshore oil rigs, fishing boats and ships. Ice shoves can damage buildings that are near to a body of water. Seabed gouging or strudel scour can damage off shore oil rigs or pipelines (see Industrial Hazards).	
Communications		None	


South Slave Exposure/History

When	Where	Impact
Jan 12, 2000	Near Fort Providence	A Northbound Super-B-Train truck hauling diesel fuel crashed through the Mackenzie River ice crossing. Driver was treated for hypothermia.

Community Meeting Feedback

Discussions indicated that there have been incidents where ice has damaged pipes along the shore of the river, which are intended to off-load fuel from barges.

2.3.3 Earth Movement - Permafrost Degradation

		Definition Movement of the ground causing wide spread damage caused by loss of permafrost	Class Natural Hazard
<p>Figure 15: Permafrost degradation of highway (Source: NWT Climate Change Impacts and Adaptation Report, 2008)</p>		NWT greatest impacts to date <ul style="list-style-type: none">• Power failures• Road Damages	
		Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies	<ul style="list-style-type: none">✓ Develop and enforce building standards for building slumping and/or collapse.✓ Develop/distribute and facilitate public awareness programs.✓ Include permafrost degradation risk actions in emergency plans.		
Vulnerability		Description	
People		Injury and death could result from the unexpected collapse of land or a building.	
Infrastructure		Permafrost has always figured heavily into Arctic infrastructure design, construction, and maintenance (NRTEE, 2009; CSA, 2010). Infrastructure systems in permafrost have depended on the stability of permafrost as a foundation material. Permafrost erosion along streams and rivers is threatening dikes, bridges and culverts.	
Communications		Some damage to communication towers possible.	

South Slave Exposure/History

Portions of the Canadian northern highway from Yellowknife to Fort Providence have been abandoned and rebuilt over more stable permafrost. Ground movement caused by melting permafrost has resulted in the cracking or sloping of building walls and foundations. It has also resulted in heaving, slope failure, sinkholes and potholes, affecting all forms of infrastructure. Permafrost degradation causes erosion along streams and rivers which is threatening dikes, bridges and culverts.

A mixture of different types of permafrost is found under all of the NWT including: continuous, extensive discontinuous and sporadic discontinuous permafrost. Communities in the sporadic permafrost zone of South Slave Region are the least vulnerable as most buildings are not founded on permafrost.

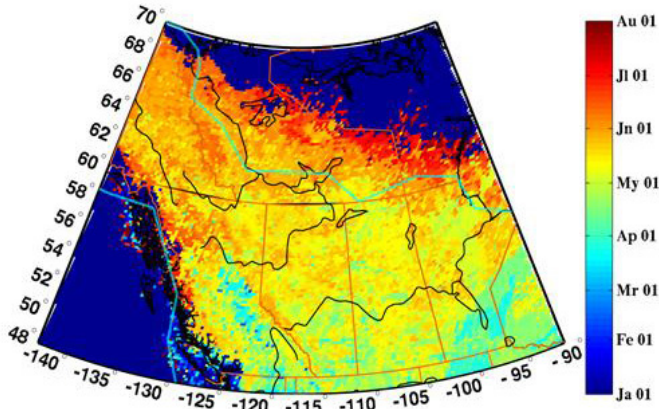


Figure 16: Permafrost Zones (Source: Atlas of Canada Permafrost Map)

Community Meeting Feedback

Residents of the South Slave spoke of the degradation of the permafrost from the point of view that trees and grass were drier during the summer possibly leading to increase fire risk.

2.3.4 Weather - Other Extreme

 <p>Figure 17: Map of lightning season for western Canada, 1999-2008 (Source: Environment Canada Weather and Meteorology website)</p>		<table><tr><td>Definition</td><td>All weather related hazards excluding wind storm and cold weather storms</td><td>Class</td><td>Natural Hazard</td></tr><tr><td colspan="4">NWT greatest impacts to date<ul style="list-style-type: none">• Power failures• Road Damages</td></tr><tr><td colspan="4">Climate Change Projected to increase both frequency and consequence</td></tr></table>	Definition	All weather related hazards excluding wind storm and cold weather storms	Class	Natural Hazard	NWT greatest impacts to date <ul style="list-style-type: none">• Power failures• Road Damages				Climate Change Projected to increase both frequency and consequence			
Definition	All weather related hazards excluding wind storm and cold weather storms	Class	Natural Hazard											
NWT greatest impacts to date <ul style="list-style-type: none">• Power failures• Road Damages														
Climate Change Projected to increase both frequency and consequence														
Mitigation Strategies	<ul style="list-style-type: none">✓ Develop and enforce building standards for identified extreme weather hazards.✓ Develop/distribute and facilitate public awareness programs.✓ Ensure that emergency plans are in place.✓ Ensure “safe areas” are available and known to community members.													
Vulnerability	Description													
People	<p>Extreme cold temperatures can cause injury and death. Temperatures of -55 and colder have an extremely high risk of causing injury as exposed skin can freeze in less than 2 minutes. Temperatures of -48 to -54 have a very high risk of causing injury as exposed skin can freeze in 2 to 5 minutes. Temperatures -40 to -47 have a high risk of causing injury as exposed skin can freeze in 5 to 10 minutes.</p> <p>Under foggy conditions, visibility is reduced to less than 1 kilometre and vehicle accidents can result (see Transportation Accidents Hazard).</p> <p>Ocean and lakes areas, and in particular the large lakes such as Great Bear Lake and Great Slave Lake, are cloud and fog prone through the fall until they freeze over completely (see Transportation Accidents Hazard).</p>													
Infrastructure	<p>Extreme cold temperatures can cause significant property damage, mechanical malfunctions and burst pipes.</p> <p>Drought can cause crop failure, depletion of municipal water sources, increase in forest fire risk (see Fire/Explosion Hazard) and insufficient water flow through waterways.</p> <p>Lighting storms can lead to fires (see Fire/Explosion Hazard).</p> <p>Combining heat wave with the dry climate of the Arctic creates ideal conditions for wildfires (see Fire/Explosion Hazard).</p>													

Vulnerability	Description
Communications	A geomagnetic storm can knock out communications and have a variety of effects on technology. Radio waves used for satellite communications or GPS navigation are affected by the increased ionization with disruption of the communication or navigation systems. The high energy particles affect satellites causing failure or equipment damage. The magnetic disturbances directly affect operations that use the magnetic field, such as magnetic surveys, directional drilling, or compass use. Magnetic disturbances also induce electric currents in long conductors such as power lines and pipelines causing power system outages or pipeline corrosion.


South Slave Exposure/History

Research did not reveal any exposure or history of this hazard in the South Slave Region. Please review the 2014 NWT HIRA for further information.

Community Meeting Feedback

There was much discussion among residents at all meetings regarding the increase in extreme weather. This primarily included higher temperatures in the summer months and a shifting in seasons. Whereas in the past, summer weather deteriorated in late August, recent years have seen warmer weather lasting into late September. There was also a general agreement that, although the NWT is not as consistently cold as it has been in the past, there are wilder swings and more extreme storms.

2.3.5 Food and Agricultural Emergency

		Definition Any emergency which affects food security, food quality or food safety for many people	Class Natural Hazard
<p>Figure 18: Bison (Source: GNWT, Industry Tourism and Investment)</p>		NWT greatest impacts to date <ul style="list-style-type: none">Food recall	
		Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies	<ul style="list-style-type: none">✓ Ensure disease and recall monitoring plans are in place between all levels of government and private sector.✓ Ensure public awareness information and programs are available from the Federal Government and industry associations.✓ Ensure that response plans include containment and quarantine procedures.		
Vulnerability	Description		
People	Humans are reliant on a well regulated safe supply of food and agricultural processes. Any emergency caused by a failure of this system can impact on the immediate and long term health of anyone affected.		
Infrastructure	N/A		
Communications	N/A		


South Slave Exposure/History

When	Where	Impact
February 12, 2012	All Co-op grocery Stores in the NWT	A brand of frozen hamburgers manufactured in Ontario was recalled as it may have been contaminated with E. coli. Consumption of food which contains this strain of virus can cause life-threatening illness.

Community Meeting Feedback

This hazard was not mentioned as a concern at the South Slave Region meeting.

2.3.6 Civil Unrest

		Definition People breaking the law in order to bring attention to their cause	Class Human-induced Hazard
<p>Figure 19: Idle No More protesters at the Deh Cho Bridge, January 5, 2013. (Source: Randall McKenzie/CBC)</p>		NWT greatest impacts to date <ul style="list-style-type: none">Fatalities 9Property Damage (Mine)	
		Climate Change Projected to increase both frequency and consequence	
Mitigation Strategies	<ul style="list-style-type: none">✓ Have intelligence and monitoring plans in place with law enforcement and stakeholders.✓ Coordinate integrated response plans with stakeholders.		
Vulnerability	Description		
People	Civil unrest can directly impact the safety and security of individuals or groups of persons whether or not they are targeted by the unrest. There is also a threat of injury to public responders and those persons involved in the unrest.		
Infrastructure	Damage to public and private property is almost always a staple of civil unrest. There is also an increase in cyber terrorism which targets computer systems which control defense establishments as well as public utilities.		
Communications	Acts of civil unrest or terrorism can impact communications which disrupt public authorities' ability to deal with the unrest.		


South Slave Exposure/History

When	Where	Impact
Jan 05, 2013	Fort Providence	About 150 Idle No More activists blocked traffic across the NWT's Deh Cho Bridge Saturday afternoon for about 40 minutes.

Community Meeting Feedback

This hazard was not mentioned as a concern at the South Slave Region meeting.

2.3.7 War/ International Incident

		Definition An action or clash that results in a wider dispute between two or more nation-states.	Class Human-induced Hazard
<p>Figure 20: Joint Task Force (North) Headquarters Yellowknife (Source: Wikipedia)</p>		NWT greatest impacts to date N/A	
		Climate Change Projected to increase in frequency	
Mitigation Strategies	<ul style="list-style-type: none">✓ Ensure notification and information/communication protocols are in place with Federal Government Departments.✓ Ensure appropriate emergency plans are in place based on the perceived or real risk of war and potential casualty threats.		
Vulnerability	Description		
People	The main effects of war on people are poverty due to destruction of properties and business, death and property destruction. War can also cause a dramatic impact on civilian health, because of the weapons which may be highly radioactive.		
Infrastructure	The most commonly held thoughts on war's effect on infrastructure is the destruction of roadways, railways and bridges to hamper an enemy's ability to move freely and accumulate forces at a given point. In recent wars there have been specific examples of water and power plants being targeted in order to dramatically impact the ability of a populace to survive in a given area.		
Communications	Communication facilities are likely the first to be targeted in any war or act of war or terrorism. Without communications authorities will be unable to respond to threats coherently and the loss of information can lead to a general state of panic amongst a population.		


South Slave Exposure/History

Research did not reveal any exposure or history of this hazard in the South Slave Region. Please review the 2014 NWT HIRA for further information.

Community Meeting Feedback

This hazard was not mentioned as a concern at the South Slave Region meeting.

2.3.8 Earth Movement - Earthquake/ Tsunami

 <p>Figure 21: Immediate effect of the October 5, 1985 earthquake in Fort Smith; split and downed trees and opening of a 50cm wide crack. (Source: WDA Consulting Inc. 1986)</p>	Definition A slip along a fault in the earth causing the ground to shake and/or the large wave caused by it	Class Natural Hazard
	NWT greatest impacts to date Minor Property damage 1985	
	Climate Change Could increase impact	
Mitigation Strategies	<ul style="list-style-type: none"> ✓ Develop or adopt and enforce building standards for earthquakes. ✓ Develop/distribute and facilitate public awareness programs for what to do in the case of an earthquake or tsunami. ✓ Ensure that emergency plans are in place. ✓ Develop tsunami inundation mapping and hazard zones for at risk communities. ✓ Plan and communicate “safe areas” for community members to go to in the event of an earthquake or tsunami. 	
Vulnerability	Description	
People	Some injury and possible death may occur due to landslide or structural collapse caused by a major earthquake in the western part of the territory.	
Infrastructure	Structural damage to buildings and infrastructure could be caused by a major earthquake in the western part of the territory.	
Communications	Communications could be disrupted by a major earthquake.	


South Slave Exposure/History

When	Where	Impact
Oct 5, 1985	Mountains west of Fort Simpson	A magnitude 6.6 earthquake unexpectedly exerted an effect on the landslide area in Fort Smith causing cracks to open and accelerated creeping movements in portions of the slide area. The landslide area is the discharge point of local and regional groundwater flow systems.

Community Meeting Feedback

This hazard was not mentioned as a concern at the South Slave Region meeting.

2.3.9 Falling Debris

		Definition Any object (such as a satellite) which survives its passage through the Earth's atmosphere and impacts Earth	Class Natural Hazard
<p>Figure 22: First piece of debris found from the crashed Cosmos-954 Soviet satellite, 1978. (Source: Wikipedia)</p>		NWT greatest impacts to date Environmental	
		Climate Change N/A	
Mitigation Strategies	<ul style="list-style-type: none">✓ Have monitoring and notification protocols in place with appropriate agencies (i.e. CSA, NASA, NAV CANADA).✓ Ensure emergency plans are in place for potential risks associated with falling debris.		
Vulnerability		Description	
People		Any object falling to earth from space will be of concern in terms of public safety and there will always be a worry of people being injured or killed by falling debris. Given the low population of the NWT and rare occurrence of these events there is a low likelihood of this happening.	
Infrastructure		Damage to buildings, roads and other infrastructure would be a concern in the event of falling debris.	
Communications		An object which falls from space may impact a communications satellite or microwave tower which could directly impact communications in a region.	

South Slave Exposure/History

When	Where	Impact
445 million yrs	Near Fort Smith	Pilot Crater an impact crater 6 kilometres in diameter.
January 24, 1978	Near Great Slave Lake	A Soviet satellite, Cosmos 954, crashed to earth scattering radioactive waste across 124,000 square kilometres of the NWT, Alberta and Saskatchewan. The clean-up operation continued into October 1978.

Community Meeting Feedback

This hazard was not mentioned as a concern at the South Slave Region meeting.

3 Existing Response Capabilities

This section provides a summary of the South Slave Region's response capabilities that were considered when assessing the regions overall risk to the hazards discussed in Section 2.

3.1 Emergency Response and Preparedness Organizations

Under overall management of the MACA Regional Superintendent, the GNWT is responsible for assisting Local Authorities within the South Slave Region when requested, or assuming operational control when the Local Authority's capacity or jurisdiction is exceeded. In fulfilling these regional responsibilities the GNWT shall:

- Establish a committee to plan for and respond to emergencies;
- Develop and maintain the South Slave Regional Emergency Response Plan;
- Implement plans and procedures for an integrated response to emergencies within the Region affected;
- Provide prompt and coordinated response to specific requests for assistance from the Local Authority and/or when the capacity of the Local Authority is exceeded;

The response to most emergencies is managed by the Local Authority, as the community government of the affected community. The Regional Emergency Response Committee is established as the body responsible for the planning and coordination of the area response to emergencies within each region. The Regional Emergency Response Committee provides support and assistance in specific areas as requested by the Local Authority. Should the emergency exceed the capabilities of the Local Authority to respond, or should its jurisdiction be surpassed, the GNWT may assume control of emergency operations in an effort to return conditions to normal under the authority of the Emergency Measures Officer, as the senior territorial emergency official appointed by the Minister Responsible for Civil Emergency Measures.

The GNWT, through the Emergency Measures Organization, is responsible for providing assistance to support regional emergency operations, or assuming operational control when the incident is a matter of GNWT jurisdiction. In fulfilling its headquarters responsibilities the GNWT shall:

- Establish committees, comprised of various designated emergency agencies, to plan for and respond to emergencies;
- Develop and maintain the NWT Emergency Plan;
- Implement procedures for an integrated response to emergencies within any part of the NWT;
- Provide prompt and coordinated response to emergencies to assist regional emergency operations;
- Coordinate the provision of specialized assistance of agencies from the Federal Government and other provinces and territories not provided for in the Plan, and
- Assume direction and control of GNWT emergency operations when the emergency is a matter of Territorial Government jurisdiction.

In accordance with established Government of Canada emergency arrangements, Public Safety Canada (PSC) will assist the GNWT in responding to emergencies in the Northwest Territories. To fulfill its emergency responsibilities PSC has agreed to:

- Appoint a senior representative to TERC; and
- Coordinate the required assistance of federal departments and agencies not resident in the NWT during any GNWT response to emergencies.

Joint Task Force North (JTFN) - in accordance with Canadian Forces (CF) Directive "Provision of Essential Services to Civilian Authorities", JTFN may assist the GNWT in:

- Search and rescue;
- Communications;
- Emergency transportation;
- Provision of manpower and other resources;
- Disposal of hazardous materials; and
- Specialized training within the CF area of expertise.

3.2 Fire

The Fire Chief/Local Assistant is responsible for directing the activities of the Fire Department to ensure that loss of life, property or injury as a result of fire is prevented and/or minimized within each community. The Fire Chief/Local Assistant is the sole authority and command at the scene of a fire.

MACA delivers training to community government fire departments through its School of Community Government.

The Office of the Fire Marshal (OFM) protects the public from loss of life and property as a result of fire. The OFM has direct contact with fire departments and the public across the NWT. The OFM plays a regulatory role by enforcing the *Fire Prevention Act* and its associated regulations, namely, the *Fire Prevention Regulations*, *Fireworks Regulations*, and *Propane Cylinder Storage Regulations*. NWT has adopted Firesmart principles to identify, mitigate and document hazards.

Fire departments in the South Slave are largely composed of volunteers and only Hay River employs a full-time fire chief. It is estimated that approximately 340 volunteer firefighters support the NWT's community fire service which is an average of 10.3 per community, well below the national average of 28.

Wildfire

The Department of Environment and Natural Resources directs the GNWT Forest Fire protection and suppression initiatives to provide:

- Assistance in the provision of and support to mobile/portable radio systems;
- Assistance in the procurement of radio communications equipment;

- Monitoring of weather, forest and fire conditions, forecasting fire behaviour and conditions to guide preparedness arrangements, and managing NWT forest fire suppression operations;
- Advice to the Emergency Management Office and communities on forest fire conditions and behaviour, and recommending appropriate courses of action (seasonal); and
- The requisition of special firefighting and safety equipment, and other specialized materials and supplies which are available (seasonal).

Environment and Natural Resources is working with communities in the NWT to develop and implement Community Wildfire Protection Plans (CWPP). These plans are designed to identify and reduce wildland fire risk in communities. CWPP's are becoming a national standard for agencies and communities responsible for wildland fire management. The process is recognized as a crucial first step in better preparing homeowners and communities to reduce the risk of loss.

Community Wildfire Protection Plans (CWPP) South Slave

Enterprise CWPP 2010

Fort Providence CWPP 2010

Fort Resolution CWPP 2011

Fort Smith CWPP 2010

Hay River CWPP 2011

Kakisa CWPP 2010

3.3 Police

Police servicing in the NWT is designated as G Division and is split into a North and South District. There are currently 4 RCMP Detachments in the South Slave Region:

- Fort Providence Detachment – also services the community of Kakisa;
- Fort Resolution Detachment;
- Fort Smith Detachment; and
- Hay River Detachment – also services the communities of Enterprise and Hay River Reserve.

3.4 Medical and Health Authorities

The South Slave Region spans four Health and Social Services Authorities.

Fort Smith Health and Social Services Authority

Community	Health Care	Health Resources
Fort Smith	Health and Social Services Centre	Acute care beds, offices and clinic examination rooms - nurse practitioner is on staff. Compliment of 4 physicians and two practicing midwives.

Hay River Health and Social Services Authority

Community	Health Care	Health Resources
Hay River	H.H. Williams Memorial Hospital	H.H. Williams Memorial Hospital is a 29 bed accredited Hospital which includes: a 15 bed long term care facility; a supportive living program consisting of three residential homes and a day program building; a medical clinic (including Specialists) and a variety of social, mental health, community and home care services.

Yellowknife Health and Social Services Authority

Community	Health Care	Health Resources
Fort Resolution	Health Centre	1 nurse practitioner, 1 community health nurse, 1 Community Health Representative and bi-weekly physician visits.
	Our Great Elders Facility	Home nursing care services (Homecare and Administration).

Dehcho Health and Social Services

Community	Health Care	Health Resources
Fort Providence	Health Centre	Nurse in Charge, Community Health Nurses, Nurse Practitioner, Community Health Worker, Home Support Worker, Physician from Fort Simpson makes monthly visits to the community, for 3-5 days.
Hay River Reserve	Patients drive to Hay River for their medical needs.	
Kakisa	Patients drive to Fort Providence or Hay River for their medical needs.	

Ground Ambulance and Highway Rescue Services

The communities of Fort Smith and Hay River operate a community-based ground ambulance service which is operated predominantly by volunteers. In light of the necessary resources, capacity, equipment and training, Health and Social Services Authorities generally do not provide support for ground ambulance services within communities or on NWT highways. Fort Smith and Hay River also provide both highway ambulance and rescue services within a prescribed distance of their municipal boundaries.

The GNWT utilizes a Highway Emergency Alerting Protocol (HEAP) to assist the RCMP and community Fire Departments in responding to vehicular accidents on territorial highways and winter roads. The Protocol describes a uniform plan for emergency response to highway accidents in various zones designated across the NWT. It guides the following activity:

- Establishing command authority;
- Dispatching resources;
- Accident reporting;
- Emergency landing procedures; and
- Clarifying medevac coverage areas.

The Stanton Territory Health Authority coordinates inter-facility and medevac services for the territory, including the South Slave region.

3.5 Search and Rescue

SAR response to	Primary	Secondary
Aircraft incidents	Canadian Forces	RCMP Civil Air Search and Rescue Association (CASARA) Search and Rescue Volunteer Association of Canada (SARVAC) Any multi-tasked Federal aircraft or vessel
Marine incidents in tidal and international waters	Canadian Coast Guard	Canadian Forces Canadian Coast Guard Auxiliary (CCGA) Search and Rescue Volunteer Association of Canada (SARVAC) Any multi-tasked Federal aircraft or vessel Police force of jurisdiction Vessel of opportunity
Ground and inland water incidents	Parks Canada within National Parks, Crown owned land – military bases and training areas Territorial responsibility delegated to RCMP	Canadian Forces Canadian Coast Guard Any multi-tasked Federal aircraft or vessel Civil Air Search and Rescue Association (CASARA) Canadian Coast Guard Auxiliary (CCGA) Search and Rescue Volunteer Association of Canada (SARVAC)

Organization	SAR Responsibility
Royal Canadian Mounted Police	Coordination of public ground search and rescue (including inland waters).
Canadian Forces	Humanitarian assistance including air and marine search and rescue.
Fisheries and Oceans (Coast Guard)	Marine emergency alerting including ship spills and marine search and rescue under coordination of the National Search and Rescue Program and support of marine search and rescue volunteer training under the coordination of the National Search and Rescue Program.
Transportation Canada	Air search and rescue alerting and support of air search and rescue volunteer training under the coordination of the National Search and Rescue Program.
Park Canada Agency	Available to provide professional advice and support on search and rescue.

3.6 Canadian Forces

Headquartered in Yellowknife, JTFN is responsible for Canadian Joint Operations Command's single largest region by far. In fact, JTFN's area of responsibility encompasses approximately four million square kilometers, or 40 per cent of Canada's land mass, and 75 per cent of its coastal regions.

Created as part of a broader transformation of the Canadian Forces in 2006, JTFN is one of 6 regional Joint Task Forces across Canada, and reports directly to Canadian Joint Operations Command, located in Ottawa, Ontario.

In addition to its headquarters located in Yellowknife, NWT, JTFN maintains detachments in Whitehorse, Yukon, and Iqaluit, Nunavut.

JTFN is responsible for the command of the Canadian Rangers in the North through the 1st Canadian Ranger Patrol Group and supports the Cadet program and the Junior Canadian Rangers program in the three territories.

In total, there are approximately 250 Regular Force, Reserve Force and civilian personnel who are working north of the 60th parallel within one of the following units:

- JTFN Headquarters and its two detachments in Iqaluit and Whitehorse;
- Area Support Unit (North);
- 1st Canadian Ranger Patrol Group;
- 440 (Transport) Squadron;
- 1 Field Ambulance Detachment; and
- C Company of the Loyal Edmonton Regiment.



Figure 23: 1st Canadian Ranger Patrol Group in NWT
(Source: Government of Canada, Canadian Army website)

South Slave Region Communities with a Ranger Patrol

Fort Providence
Fort Resolution
Fort Smith
Hay River

4 HIRA Conclusions

This type of assessment is a critical part of any emergency management program. Identified hazards can be used in preparedness programs, emergency response plan exercises, and training and awareness programs.

Qualitative data, definitions and more extensive analysis of each hazard is provided in 2014 NWT HIRA Section 5 Hazard Narratives. Other regional summaries are contained in Appendix 8.7, which provides communities with a more locally focused risk assessment.

Hazards are interconnected, fluid, not subject to regional and territorial boundaries and may have unique outcomes. The South Slave Region HIRA should be updated routinely when new information about hazards that could impact the South Slave Region becomes available.