1 Executive Summary

1.1 Communications: A Matter of Survival

The Arctic must have reliable communication networks to establish and maintain Canada's sovereignty, and to meet international obligations for ensuring safe passage for road, sea and air traffic.

Emergency responders must have excellent communications ability to rapidly respond to both natural disasters such as earthquakes, and man-made tragedies that will surely occur as air and ship traffic increases with global warming.

Canadians are becoming more reliant on communication services in every aspect of their lives, and the Arctic is no exception. Arctic residents must have reliable, affordable communications infrastructure to engage in 21st century opportunities -- many communities' long term survival will depend on it.

Canada needs a healthy, educated, prosperous population of Canadians living in the Arctic to properly manage the vast land that contains so much of Canada's natural resources that benefit the entire country. The 100,000 residents living in 75 communities spread over 1/3 of Canada's land mass need affordable communications to improve the distribution of health care, engage in education, participate in the economic opportunities in their region, and continue to ensure the Canadian Arctic is part of a sovereign Canada.

Communications for maintaining sovereignty and emergency response is a fundamental requirement. So too, is the requirement for modern communication services to Arctic communities -- it is a matter of survival.

1.2 Assessment Background

This Arctic Communications Infrastructure Assessment (ACIA) was initiated by the Northern Communications and Information Systems Working Group (NCIS-WG). After a serious breakdown in communications infrastructure during a 2009 exercise, the NCIS-WG was tasked by the Arctic Security Working Group to look into the communication issues evident in the North, and look at ways to help solve the problems. The NCIS-WG decided to cast a wide net - requesting that the Assessment gather input from not only emergency response, security and military organizations, but also government departments across the Arctic that struggle with providing adequate communications services.

There are about 13,000 territorial government employees, and 2000 federal government employees working in the Arctic. Many more federal employees based in the South have direct service responsibilities in the North. Seventy-five government managers from a

wide range of departments in Whitehorse, Yellowknife, Iqaluit and Ottawa participated in this Assessment's workshops, and another 100 responded to detailed surveys.

Participants provided details on their current use of communication technologies, their issues and concerns, and their future plans for improving program delivery that depends on robust communication networks.

The two main service providers providing direct services in the Arctic, NWTel and SSi Micro, provided details of their current capacity. Telesat has also provided details on the satellite space segment capacity available in the Arctic. The Assessment documents the availability of local services such as cell phone and Internet in every community, and the backbone capacity, detailing how much bandwidth is available for purchase into and out of every community in the Arctic. Civilian HF radio details are also provided.

1.3   Arctic Communication Issues and Recommendations

Yukon, Northwest Territories, and Nunavut have vastly different geography, history, demographics, economies and road infrastructure. But these Arctic territories all have serious challenges in accessing affordable, reliable communications services.

There are three realities that have led to the state of the Arctic communications infrastructure:

1. The geographic facts make the entire Arctic region challenging from an economic perspective for building, maintaining and evolving communication services that meet users' needs at an affordable price, without significant public investment;

2. The existing network investment models in the North are not meeting the rapid pace of increasing change and convergence of communication services available in the South.

3. There is currently no comprehensive strategy for connecting all Arctic communities to the level of service required within communities or between communities.

This Assessment further identified specific issues common among all three territories. With each issue identified, the Assessment provides recommendations, summarized below.

No service parity

There is a growing gap between the level of service available in the North versus the South, causing serious challenges to both residents and visitors, even in the capital cities of Yellowknife and Whitehorse. Communities outside of Yellowknife and Whitehorse have even poorer service, threatening the viability of many communities as it becomes increasingly difficult to engage in opportunities that rely on 21st century connectivity.

> Recommendation 1: Commit to service parity among Arctic communities, and set minimum connectivity standards for all Arctic communities that assure service parity to southern urban centres.

Bandwidth shortage and high cost to end user.

There is a severe shortage of affordable bandwidth, both in terrestrial (microwave and fiber) and satellite served communities. While there may be more capacity available for purchase, very few can afford to purchase what they need. Satellite-served communities face additional challenges on older networks that exacerbate the effects of satellite latency, so that many applications on these networks simply won't work.

As the largest single purchaser in the Arctic, government has tried to play the role of using its purchasing power to meet its own needs, and at the same time, hope to stimulate the creation and maintenance of a private communications sector that will meet the needs of the public. Government has also made one-off investments in isolated initiatives that have not yet resulted in stable, affordable access in the long term in any of the three territories.

> Recommendation 2: Develop an Arctic-specific strategy with clearly defined rules, that articulates a sustained, multi-year funding commitment for communications network development to meet connectivity standards set by policy makers.

Reliability and quality of service gap

All territories suffer from frequent network outages. In Whitehorse, where services are arguably the fastest (with 10,000 Mb/s fibre connection to the South), repeated cuts to the only fiber connection connecting it to the Internet ground the modern city to a halt, drastically affecting their local economy, and causing outages and slow downs to all the communities feeding into Whitehorse. Challenges with continuity of service, and a lack of redundant networks across the North leaves communities vulnerable.

> Recommendation 3: Ensure there is a redundant connection into every Arctic community to avoid gaps in the provision of essential communication services.

Geographic coverage inadequate

HF radio services are not ubiquitous across the Arctic. There is no cell phone coverage along the vast majority of roads in NWT and Yukon. There are dead spots in satellite phone reception. It is very difficult to send photos or large amounts of data from the field during an emergency, and challenging to keep workers safe if communications fail. There are, however, many isolated initiatives being conducted by different departments across the Arctic to try to solve connectivity issues on the land.

> Recommendation 4: Create an inventory of Arctic communications technology projects and services that aim to connect people from remote locations outside of communities in order to share experiences, best practices, and lessons learned.

Emergency Response Challenges

Information is key for emergency responders to be prepared - whether the response is local, regional, territorial, or national. Connectivity is the life line for emergency response and recovery, but during an emergency, the local telecommunications system is often

overwhelmed. Military generally deploy their own communications systems when acting in an emergency response role, arriving after civilian responders. All responders need to be able to interconnect and must have reliable systems to connect with people quickly and efficiently using reliable, robust communication networks from wherever they are.

> Recommendation 5: Identify communication services that will be required in a variety of emergency settings, developing protocols with service providers for surge capacity requests and prioritization of public communications networks for emergency responders within communities. Maintain an inventory of what is commercially available in communities.

Cannot Keep Pace with Technological Change

Converging voice, video and data technologies are forcing rapid change, stress and opportunity for communication service providers. Changing consumer expectations, and the government's need to take advantage of potential cost-savings and better ways to reach the public have resulted in calls for policy makers and regulators to change the current regulatory framework and investment strategies to ensure Arctic residents can benefit from new technologies just as other Canadians do.

> Recommendation 6: Investment strategies for Arctic communication networks must include provisions for the increasing rate of change of technology, and the continuous introduction of new consumer services and devices.

Lack of Choice

Accepted economic principles argue competition is necessary for innovation, but in the Arctic, there is limited competition. Few opportunities for innovation, and risk-averse government buyers and service providers will lead to a lack of choice in any market. Procurement practices that define the technical solution rather than define the business outcomes ultimately lead to lack of choice.

> Recommendation 7: Investment models should allow for, and encourage competing services in as many market segments as possible, thereby promoting consumer and government choice, and innovation and improved services.

> Recommendation 8: Government procurement officers should encourage innovation through RFPs that focus on business outcomes requirements and technology neutral RFPs to stimulate innovative solutions from service providers.

Human Resource Gap

Arctic communities outside of Yellowknife and Whitehorse have a dearth of IT professionals to run complex networks and applications. Also, governments are using network connectivity to link people with the necessary expertise to provide better levels of service through videoconferencing and data transfers, increasingly relying on communication networks to help solve shortages in human resources. Many departments

are looking for ways to deliver training to all levels of government staff more efficiently, and are turning to information and communication technologies (ICT) to help.

Recommendation 9: Recognize the reality of community capacity, and design applications and networks that will allow for effective remote service delivery.

Recommendation 10: Take advantage of robust networks to deliver training to government workers using new communication tools.

1.4   Global Economic Insights

The three territories represent a difficult environment in which to operate. They are characterized by a small consumer base located across a vast geographic range. Nevertheless, suppliers of broadband do operate on somewhat of a competitive basis, but the majority of that competition is for government subsidies. It is ironic, then, that Arctic innovation in IT will not be about how to get the services to people, as much as it will be about finding innovative ways to pay for those networks.

Countries around the world are implementing plans to connect citizens in remote regions, using various economic models that work within their value system. The Assessment provides a series of items to consider, highlighting important steps taken in other countries as they developed their innovative system for bringing communications infrastructure to difficult regions.

Step 1: Understand the Market

Step 2: Recognize the importance of competition

Step 3: Establish minimum standards

Step 4: Develop communication infrastructure strategy that will achieve minimum standards

Step 5: Stop relying on cross-subsidization models

Step 6: End market disruption caused by government's muddled approach to the marketplace as owners, regulators, and purchasers of Internet services.

1.5   Strategy Forward

Ensuring appropriate communication services may be one of the few truly affordable infrastructure efforts that address some of the challenges facing northern residents, and the sustainability of communities in the long run.

This Assessment provides baseline information from which initiatives can be developed. There are many ways NCIS-WG members may be involved, from identifying which policy makers should be spearheading the development of an "Arctic Communications Strategy" to creating a new communication protocol to handle surge capacity in emergencies.

NCIS-WG members can play a key role in assisting many other players within government and the private sector to move the agenda forward, working to solve the communication issues they helped to identify in the Canadian Arctic.