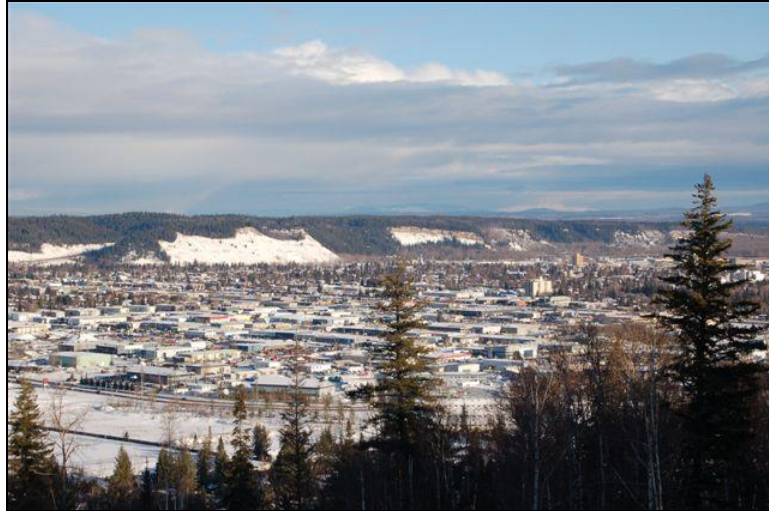


Community Risk Assessment



Hazards, Vulnerabilities and Risks in the City of Prince George

Prepared for:
City of Prince George
Emergency Program



CITY OF
PRINCE GEORGE

Originally prepared by:
Smart Risk Control, Inc.
Victoria, BC
December 31, 2009

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Note: This Document is Designed for Double-Sided Printing

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Community Risk Assessment

Hazards, Vulnerabilities, and Risks in the City of Prince George

1.0 Introduction

This report addresses hazards that could affect the residents, institutions, and businesses of the City of Prince George and lead to a major emergency or disaster. The purpose of a community risk assessment is to guide preparedness and mitigation activities that reduce both the likelihood of emergencies and the consequences when disaster cannot be avoided.

Hazards and vulnerabilities are important community elements to understand in preparing emergency response, business continuity, and recovery plans. The term “hazard” refers to a situation or event that can adversely affect human health, property, the environment, or other elements of value to the community. Hazards may be natural in origin, such as a flood or severe winter storm, or caused by human activity, as in a structural fire or hazardous material spill.

The term “vulnerability” indicates those characteristics of a community that are particularly susceptible to the effects of hazards. Among the Prince George population, factors that increase vulnerability include economic status, age, and physical disabilities that influence the ability of individuals to adequately respond to and recover from emergencies. Vulnerabilities may also include infrastructure that is critical to community functionality, such as the water supply system.

The ultimate objective of this project is to identify practical actions that will reduce risks associated with major emergencies. The Prince George Emergency Planning Committee intends for this report to carry forward, from one generation to the next, an understanding of threats so thoughtful and effective actions may be undertaken with confidence.

A number of sources and knowledgeable persons contributed information to this Community Risk Assessment. Municipal managers in the Fire / Rescue Department, Emergency Programs Division, Risk & Benefits Division, Development Services and Operations, Community Services & Public Safety and other departments provided essential information on the hazards and vulnerabilities in the community. A complete list of references may be found at the back of this report.

Legal Requirement to Assess Risks

As a local authority Under the British Columbia *Local Authority Emergency Management Regulation*, the City of Prince George is required to reflect...

The potential emergencies and disasters that could affect all or any part of the jurisdictional area for which the local authority has responsibility, and

The local authority's assessment of the relative risk of occurrence and the potential impact on people and property of the emergencies or disasters.

1.1 The Community

In many respects, the City of Prince George denotes the crossroads of Northern British Columbia. As of the 2016 census, about 86,000 residents lived where the Nechako River joins the Fraser River, where Highway 97 crosses Highway 16, and where the largest rail and air transportation hubs serve the north.¹ As shown in Figure 1, the City serves as the heart of BC's northern region, serving a number of distant and rural communities from the Pacific Ocean to the Alberta border.

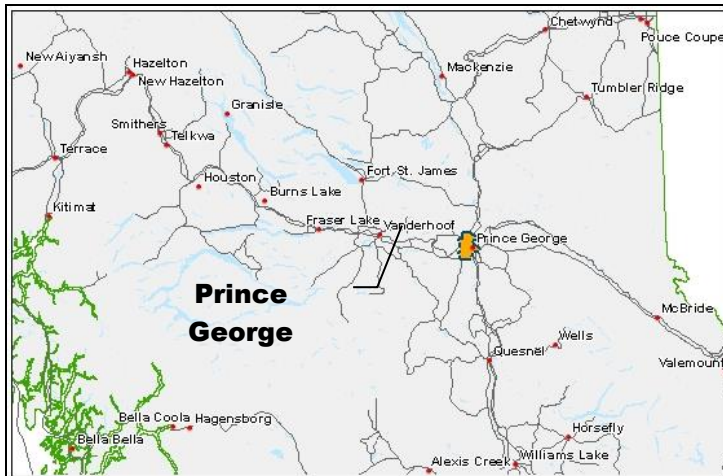


Figure 1. Location of Prince George in the North Region

The City's design, and many of its hazards, can be traced to its natural features, especially the two major rivers. From the early use of the Fort George site in 1807 as a fur trading post to its current role as regional commercial and industrial centre, the City capitalizes on its access to transportation.

When the Grand Trunk Pacific Railway announced plans in 1903 to construct a line near Fort George, rival land speculators built the communities of South Fort George on the Fraser River and Central Fort George on the Nechako River over the ensuing years. This development formed the foundation for

the existing community.

In 1912, the Grand Trunk Pacific Railway commissioned an architectural firm to prepare the town plan, which was based on a topographic map and a brief visit to the site by the architects. Early development plans for PG indicated that no roads or buildings were to be constructed between the Nechako River and the rail line. By 1914, a number of buildings were erected, and the town was chartered and named as Prince George in March, 1915.

In 1953 and 1958, the City boundaries expanded, mostly to the west and south. The first pulp mill, Prince George Pulp and Paper, was built in 1964, followed by two more in 1966, Northwood Pulp and Intercontinental Pulp. The new mills increased demand for schools and housing, leading to construction of new subdivisions at Spruceland, Lakeland, Perry, and Highglen.

City expansion continued in 1970 and 1975, with the addition of the industrial areas across the Nechako and Fraser Rivers, and the Hart community to the north and Pineview to the south.² By 1981, Prince George was the second largest city in British Columbia with a population of 67,559. The Official Community Plan forecasts a population in excess of 90,000 by 2025.

Implications of Location: Prince George's location in the north-central region of BC places the community among a number of natural hazards, including river flooding, air pollution, wildfire and severe weather events. As the hub of the region's transportation networks, road and rail accidents and possible hazardous material releases are among the concerns for major emergencies. Prince George's location in the north-central region of BC places the community among a number of natural hazards, including river flooding, air pollution, wildfire, and severe weather events. As the hub of the region's transportation network, road and rail accidents and possible hazardous material releases are among the concerns for major emergencies.

¹ City Website, Today's Prince George, <http://www.city.pg.bc.ca>

² Canadian Federation of University Women – Prince George Edition. Papyrus Printing, Prince George, BC

1.2 Physical Setting

Many of the natural hazards that confront the City reflect the geographic location of Prince George. The community is situated west of the transition between the northern and southern portions of the Rocky Mountain Trench and encompasses an area of 318.26 km².³

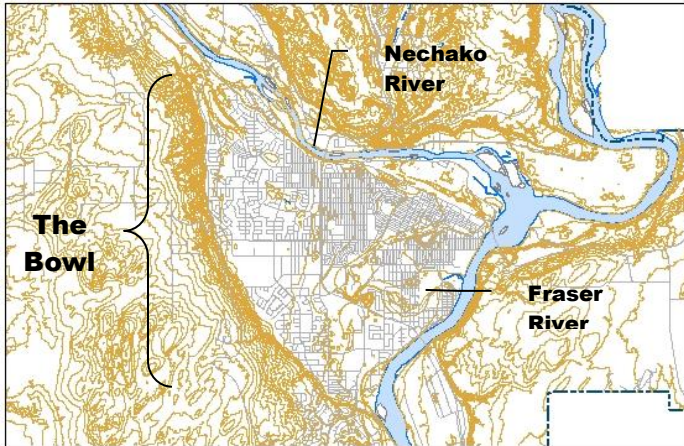


Figure 2. Geographic Landscape of Prince George

Figure 2 orients the City in the geographic landscape. Because of its location at the confluence of two major rivers, Prince George has experienced flooding on a regular basis. Both rivers often freeze and are subject to spring thaw freshets.

The Fraser River at Prince George drains an area of 32,400 square kms. The Nechako River basin at the City is considerably larger than the Fraser, covering 47,100 square kms. Nevertheless, the freshet peak flow of the Nechako River reaches only about 25 percent of the Fraser flows. The Nechako river flows are regulated at the Kenney Dam, which was constructed in

1952. Generally, reservoir operation delays the Nechako freshet until after the Fraser River has crested. The Stuart River also drains into the Nechako.

The City's airshed includes a remnant of a once glacial lake, a low area known as "the Bowl" that comprises the bulk of the city centre. Because the area is lower than the surrounding elevations, the Bowl does not receive much wind and tends to suffer from temperature inversions that prevent the escape of air pollution emissions.⁴ The pulp mill and chemical plants on the north side of the Nechako River fall within this airshed.

Prince George is located in Seismic Zone 2 for BC, a moderate earthquake potential region. Although there is less chance of a major earthquake here than along the West Coast, even a minor earthquake could cause severe shaking, leading to significant property damage. The largest recent quake in the area occurred in 1987, registering 5.7 on the Richter scale at the epicentre near Pacific Lake, BC.

Implications of Physical Setting: Proximity to both the Nechako and Fraser Rivers subject residents, industrial operations, and commercial businesses to the threat of flooding caused by both ice jams and freshet river events.

A major fire or chemical release of emissions into the Bowl airshed could adversely impact the health of hundreds of residents.

About one-fourth of the City is devoted to Agriculture Land Reserve (ALR), but the land is not very fertile. Some greenhouse operations serve the community by growing cucumbers and berries. The community is very dependent on transported food supplies, with only about 2½ days of food supply at any one time.

³ Statistics Canada. 2016. Census Profile 2016. Prince George City, British Columbia and Fraser Fort George.

⁴ A Report on the Quality of Life in Prince George. 1997. A joint project sponsored by the Healthy Community Committee, the Community Planning Council, the Child Welfare Research Centre, and the Fraser Basin Management Program.

1.3 Climate

Although Prince George enjoys a relatively moderate climate, the City can encounter severe weather at times. In the summer, the daily temperature reaches an average maximum at 22 degrees Celsius, and an average minimum at 8 degrees Celsius. The warmest day on record was May 29, 1983, at 37.5°C.

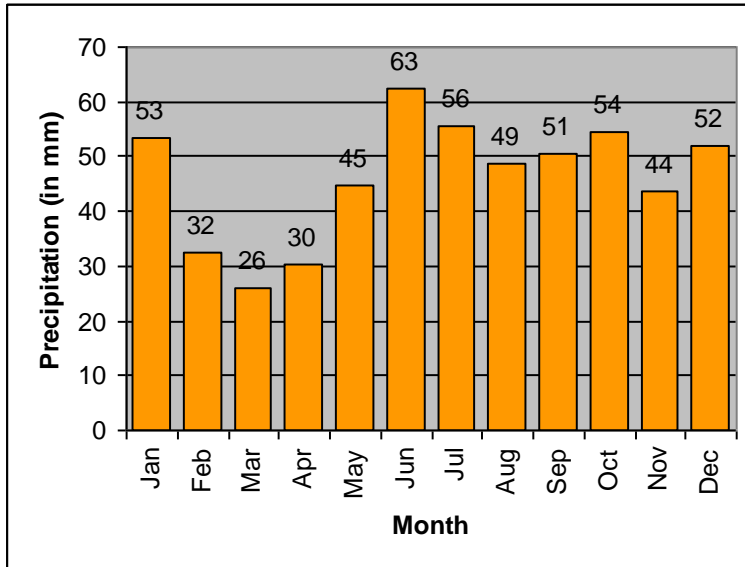


Figure 3. Average Precipitation by Month – Prince George⁵

On average, it rains about 41 cm per year. While June and July are the wettest months, precipitation levels remain relatively high from May through January, as illustrated in Figure 3 at left. The heaviest rainfall on record occurred on July 26, 1980, at 38.2 mm.

During the winter months, the daily temperature reaches an average maximum of -7.5°C, and an average minimum of -17°C. The Prince George region can be exposed to very low temperatures as cold fronts descend from the Arctic without warning. Temperatures on the coldest day reached -44.4°C on January 15, 2020.

Prince George receives about 242 cm of snow each year. The heaviest single day snowfall on record was 32 cm on December 29, 1990. January, February and March tend to see heavy snow accumulations on the ground. The record snow depth of 122 cm was set on February 13, 1982. In 2006, Chinook-like weather caused the temperatures in Prince George to swing from -30°C to +13°C, causing flooding where water channels were blocked with ice. Although prevailing winds are generally light and from the south, severe wind storms have occurred in the past.

Like the rest of the world, the City will experience the effects of global climate change. Records show that temperatures at Prince George have been rising since 1943, particularly in the spring.⁶ Although the exact impacts are difficult to forecast, City consequences by 2050 will likely include:

- Challenges to local water supplies in summer months
- Wetter winters and springs, with increased frequency of localized water intrusion and landslides⁷
- Wildland fires
- Extreme weather events, including flooding, and transportation interruptions. Snow storms may become ice storms and cause prolonged power outages due to broken infrastructure.

Implications of Climate: Events of severe weather may occur each year, and may demand unexpected response from municipal staff, residents and businesses.

Global warming may result in more intense storms, with stronger winds and higher rates of precipitation in spring, and more summers with drought conditions.

⁵ Environment Canada

⁶ Bocking, Richard C. 1997. *Mighty River: A Portrait of the Fraser*. Douglas and McIntyre, Vancouver, BC.

⁷ Pacific Climate Impacts Consortium, 2007

2.0 Community Profile

2.1 Demographics

According to the 2016 census, the population of the City of Prince George numbered 86,622 residents in about 35,095 occupied private dwellings.⁸ Of these, 26.7 percent were one-person households, slightly below the 29 percent average province wide. About 27 percent of the residents are married couples with children, slightly below BC's average of 28.4 percent. The population of the Prince George area increased nearly 3 percent between 2011 and 2016, compared with a population growth of almost 6 percent for the province overall.⁹

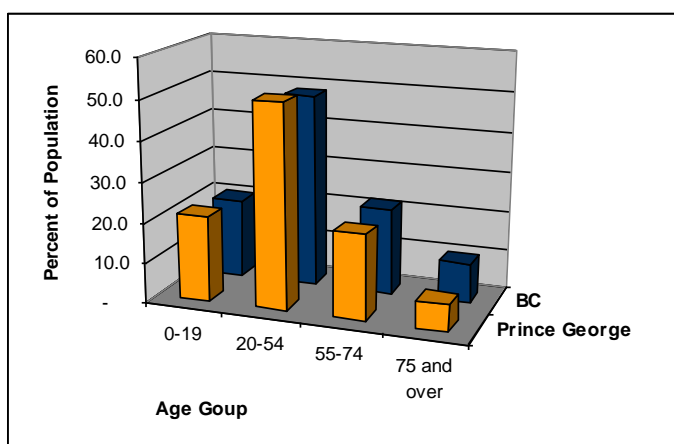


Figure 4. Age Distribution in Prince George, 2016
(source: Statistics Canada)

Age – The age distribution of Prince George residents, shown in Figure 4, suggests that a smaller percentage of the population comprises the older age groups than for the Province as a whole. Census information identified 1.3 percent of Prince George's residents of age 85 or older, as compared with 2.3 percent for BC.

Income Levels – City residents earned an average of \$93,755 in family income in 2015, 4 percent above the average for families throughout the province. About 5.9 percent of the population rely on BC basic income assistance and employment insurance benefits.

Vulnerable Populations – In addition to the elderly, the City's population includes a number of vulnerable persons who may require assistance in preparing for emergencies and in receiving special care during some events. A federal government survey identified about 250 chronic homeless persons in the City.

English continues to be the home language for Prince George residents. In 2006, only about 375 residents did not understand English.

However, 11.4 percent identified themselves as Aboriginal, much higher than the 4.8 percent province-wide. At present in Prince George, there are more than 30 ethnic, cultural and religious groups.¹⁰ Among the visible minorities in the City, 1,785 are South Asian, followed by Chinese residents at 810 and Filipino at 505 residents.

Implications of Demographics: There are about 35,000 households in the community. Each requires the capability to sustain themselves for up to seven days without assistance. Special measures should be prepared to assist vulnerable populations, such as transportation during an evacuation.

Response plans and emergency notification should account for the language needs of residents in cultural neighbourhoods.

⁸ Statistics Canada. 2016. 2016 Census Profiles. 2016 Census.

⁹ Statistics Canada. 2016. 2016 Census Profiles. 2016 Census.

¹⁰ A Report on the Quality of Life in Prince George. 1997. A joint project sponsored by the Healthy Community Committee, Community Planning Council, Child Welfare Research Centre, and Fraser Basin Management Program.

Land Use

Residential – The Bowl area and the western part of the City is used mostly for residences, with additional homes in the Austin and Hart areas north of the Nechako River. At present, the City as a whole has a housing mix with approximately 75 percent low density residential, with the remainder comprising multiple family housing.¹¹ Of the 35,095 occupied private dwellings in the municipality, more than half (63%) represent detached single family dwellings. Apartments in buildings with fewer than five storeys comprise an additional 15 percent of private dwellings. More than 75 percent of all dwellings were constructed before 1986, and 8 percent require major repair.¹²

The City contains 14 distinct neighbourhoods:¹³

- | | |
|--------------------|---------------------|
| 1. Chief Lake | 8. Cranbrook Hill |
| 2. Austin West | 9. Southwest |
| 3. Austin East | 10. College Heights |
| 4. Old Summit Lake | 11. City Bowl |
| 5. North Nechako | 12. Airport |
| 6. Hart Highlands | 13. Blackburn |
| 7. Central Hart | 14. BCR Industrial |

Commercial – The City Bowl contains a number of downtown retailers, while regional and arterial commercial operations are mostly located on Highways 16 and 97. Several shopping centres serve residential neighbourhoods, and more are anticipated in the future.¹⁴

Industrial – Heavy industrial operations are located at the Prince George Pulpmill Road on the Nechako River, Northwood Pulpmill Road on the Fraser River, and at the BC Rail Industrial area along Pacific Street east of the Fraser River. Pulp mill and chemical plants on the north side of the Nechako River are within “the Bowl” or the Prince George air shed. Light industrial areas in Prince George include the Carter Industrial Area, the River Road and First Avenue area, the Queensway East, Hartway Industrial Area, Danson Industrial Area, and Airport Light Industrial Area.¹⁵ A new developing industrial area, Boundary road, is a connector between Highway 97 and Highway 16, which travels through 2500 acres of light industrial land.

Implications of Land Use: A substantial number of older dwellings may be subject to structural fire and extreme weather events. The location of suburban neighbourhoods near forested areas exposes residents to the risk of wildfire. Industrial operations require the transport of hazardous materials by road, rail, and pipeline through some residential and commercial areas.

Currently, the Official Community Plan ensures that land use planning is coordinated with infrastructure development within the jurisdiction.

¹¹ City of Prince George. 2008. Official Community Plan.

¹² Statistics Canada. 2016. 2016 Census Profiles. 2016 Census.

¹³ City of Prince George PG Map, Neighbourhoods

¹⁴ City of Prince George. 2008. Official Community Plan.

¹⁵ City of Prince George. 2008. Final Report of the Mayor’s Task Force on Air Quality Improvement. January.

Special Occupancies

A number of special occupancies deserve attention as facilities of particular vulnerability in major emergencies. Each of these special occupancies represents a distinctly vulnerable property. The consequences of emergencies at special occupancies tend to be more extreme than at other locations in the municipality.

Highly vulnerable occupancies include retirement homes and assisted living facilities, such as those listed in Figure 5. Most residents in such facilities have limited physical ability to protect themselves during times of emergency. Some may be more prone to mental confusion and tend to rely on others in stressful situations.

High-density occupancies, if subjected to a sudden emergency such as a structural fire, explosion, or release of hazardous materials, can quickly result in multiple casualties.

Existing retirement homes, seniors housing, and residential care facilities require advanced emergency planning.

Figure 5. Vulnerable Housing Facilities

Name of Facility	Units / Beds
Retirement Residences	
Prince George Chateau	83
Country Acres	37
Fort George Manor	35
Seniors Housing and Assisted Living	
Alward Place Seniors Housing	120
Liard Seniors Housing	50
Aspen 1 and 2 Cottages	50
Laurier Manor Seniors Housing	26
Residential Care, Licensed Facilities	
Gateway Residential Care	175
Simon Fraser Lodge	131
Jubilee Lodge	66
Parkside Care Home	61

Figure 6. High-Density Accommodations

Example of larger accommodations	Maximum Occupancy
UNBC Housing	542 students
University Hospital of Northern British Columbia	318 beds
Adult Regional Corrections	302 inmates
Ramada Hotel Downtown	193 rooms
Courtyard Marriot	174 rooms
Coast Inn of the North	155 rooms
Sandman Inn & Suites	144 rooms
Super 8 by Wyndham	118 rooms
North Star Inn & Suites	100 rooms

Other vulnerable populations are evident in high-density temporary housing units and businesses that serve travelers, students, and the confined, such as those listed in Figure 6. The schools listed in Section 2.3 also qualify as occupancies with high-density and vulnerable populations.

Special occupancies within the City include 22 trailer parks, such as those near Paddlewheel Park and Farrell Street. Several recreational vehicle parks serve tourists in the rural areas, including the Hartway RV Park with 40 sites, and the Sintich RV Park with 60 sites.

On any given summer day, when wildfire risks are greatest, several hundred visitors to the City could be exposed to the need for rapid evacuation.

Most facilities with vulnerable populations currently lack the detailed plans needed to coordinate evacuations with City emergency response teams.

Implications of Special Occupancies: High density occupancies may allow ready transmission of respiratory diseases, such as influenza. Owners of special occupancies are responsible for devising emergency plans that protect occupants, including provisions for alerting them to such threats as structural fire, and evacuating them to safety.

2.2 Local Government

The City of Prince George was incorporated in 1915, with the primary purposes of providing for:

- Good government for the community
- Services, laws and other matters for the community benefit
- The economic, social, and environmental well-being of the community
- Stewardship of the public assets

The City is governed by a mayor and an eight-member council; these positions are subject to at-large elections every four years. The City provides public services through the City Manager's Office and seven departments:

- Administrative Services
- Corporate Management
- Community Services & Public Safety
- Finance
- Human Resources
- Infrastructure & Public Works
- Planning & Development

The City contracts with the RCMP to provide police services. Like all other local governments in BC, the City has authority under the Local Government Act to regulate land use and development within its boundaries through two main mechanisms, the Official Community Plan and the Zoning Bylaw.¹⁶



Prince George City Hall

In addition to providing targeted public services, many of the municipal functions provide internal support services for all departments. Information Technology Services, for example, manages the municipal network on which most City services depend. Such interdependencies are important to note when considering the potential for municipal business interruption.

The City's fundamental mission as a responsible public institution includes the continuation of essential services following an emergency. Under the Community Charter legislation in British Columbia, the City has the authority to provide effective management and delivery of services in a manner that is responsive to community needs.

Prince George is located within the Regional District of Fraser-Fort George, and holds 4 of the 14 seats on the Regional Board.

Implications of Local Government: Floods, severe storms, structure fires, and a wide range of other incidents are capable of unpredictably interrupting the City's business and impairing the delivery of government services. Impacts may range from short-term interruption of one department to a major and long-term loss of several functions. The City should prepare a Business Continuity Plan that will enable Council and staff to continue effective governance and maintain essential services whenever resources are limited.

¹⁶ City of Prince George. 2008. Final Report of The Prince George Mayor's Task Force on Air Quality Improvement. January.

2.3 Infrastructure

Most of the utilities that serve BC's northern region pass through Prince George. The City serves as a gateway to the region for major infrastructure of electrical power lines, road systems, rail service, and natural gas.

Electrical Power

Electrical power service in Prince George is provided by BC Hydro, using high-voltage lines managed by the British Columbia Transmission Corporation (BCTC). Power may arrive from two directions, as illustrated in Figure 7.¹⁷

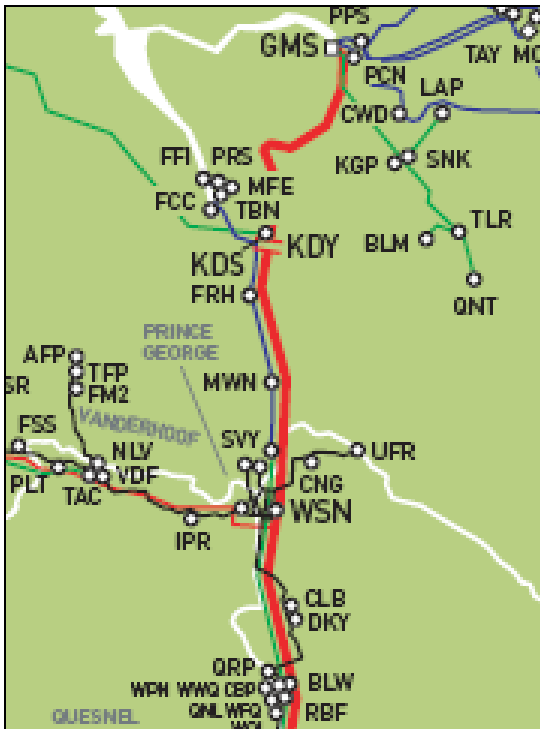


Figure 7. Power Line Routes to Prince George
(BC Transmission Corporation)

The City is participating with *Smart Growth on the Ground*, an innovative program to develop sustainable neighbourhoods. The provincial buildings in Prince George are beginning to use geothermal energy.¹⁸ The City has a District Energy System, focussed more on heat in public buildings than electrical power. A biomass plant has also been developed at the University of Northern BC.

From the north, power to Prince George is generated at the GM Shrum and Peace Canyon generating stations on the Peace River, which meet about 29 percent of the province's total electricity requirements. Power is transmitted by way of three 500 kV circuits.

From the south, power could also come from the Columbia River Basin, where the Mica and Revelstoke hydroelectric plants contribute 25 percent of British Columbia's power.

Critical power users in the City include the Prince George Regional Hospital, pulp and saw mills, the Husky Refinery, and the City of Prince George. Total residential consumption of electricity has increased 6 percent in the Prince George area in the last year due to the rising consumption per account. The Utilities building has UPS and an inverter, and City Hall has backup power generators for computer room servers. The main Fire Hall also has backup power.

Implications of Electrical Power: Severe weather events pose the primary threat to sustained electrical power delivery to the community, but interruption events are likely to be relatively short-term, lasting a matter of days at most.

Although long-term power disruption is possible, it would require either multiple simultaneous failures among BC Hydro or BC Transmission Corporation facilities, or in specific equipment near Prince George.

¹⁷ British Columbia Transmission Corporation

¹⁸ Interview, December 5, 2008, Dan Milburn, Manager of Long Range Planning, City of Prince George

Water Systems

The City obtains its water supply from seven groundwater wells located along the Nechako River and Fraser Rivers. Figure 8 shows the main city wells, as listed below:¹⁹

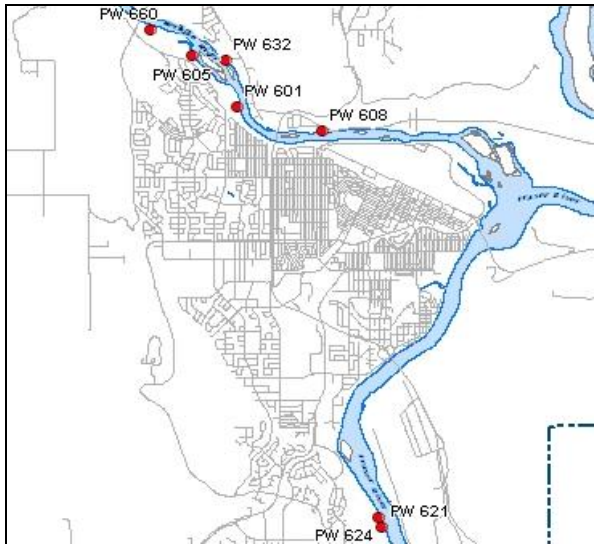


Figure 8. Water Supply Wells in Prince George

- **PW601** – South bank of Nechako, at Wilson Park, serving east side of Bowl, Blackburn and Airport
- **PW605** – Edge of town, south bank of Nechako, serving the west side of Bowl, University Heights, Southwest, UNBC
- **PW608** – East of John Hart bridge (standby only)
- **PW624/PW621** – West bank of Fraser River, serving College Heights during summer months, standby in winter
- **PW627** – East bank of Fraser River serving the BCR/Danson industrial lands (not shown)
- **PW632** – North shore of Nechako (standby only)
- **PW660** (Fishtrap Island) Collector Well – Westernmost on Nechako, serving the Hart subdivisions

Of these wells, PW601 and 605 supply more than two-thirds of the City's total storage capacity, and serve as the primary supply for the Bowl, Southwest, UNBC, Blackburn and University Heights. Water supplies depend on access to electrical power to pump water throughout the municipality. Some pumps lack back up power, including Blackburn and UNBC, and this could lead to shortages. Ice-related flooding may present a threat to some groundwater wells.

The water system also includes 14 reservoirs. Water is collected from the wells along the rivers and must be pumped uphill to reservoirs, either directly or through booster pumps in the water supply network, in areas like the Southwest, University, Hart, and Blackburn. While there is sufficient capacity in the overall water system network to meet current demands, water pressure is an issue in some of the outlying subdivisions. Some sections of the water delivery system stand alone and are not networked to allow service by alternative sources. For example, the Hart subdivisions are served by well PW660, but there is no optional connection to provide water if that source is impaired.

Maintaining a high standard of water quality is a concern for some of the wells, and local capacity and a lack of redundancy are issues that need to be addressed to accommodate future development. Although upstream pollution sources may impact the water quality, it is unlikely because the wells are 30 metres deep. A derailment of a dangerous goods rail car could lead to temporary closure of the water system. The CN rail line runs within approximately 100 m of three collector wells (PW601, PW605, and PW660).²⁰

Implications of Water Systems: A sudden chemical release into the Nechako River at a location upstream of a well could impact water quality in some situations.

The City should examine options for networking the water supply system in places. Add backup power capabilities to all water delivery systems.

¹⁹ Golder Associates, Burnaby, BC. 2002. Current Municipal Zoning. Project Map 022-1784

²⁰ Interview, December 8, 2008, Marco Fornari, Utilities Manager, City of Prince George, Prince George, BC.

Sewer and Storm-water Systems

Sewage collection, conveyance, and treatment are municipal responsibilities. Sewage disposal is accommodated by way of an extensive collection system, with multiple lift stations and five treatment facilities. Most residences connect to the municipal sanitary sewer, although many rural residential properties are not connected to the system. Wastewater conveyance lines tend to follow Highway 16 and Highway 97 for delivery to the main treatment plant.²¹

Most sewage receives secondary treatment at the Lansdowne Wastewater Treatment Centre, located at 4055 Lansdowne Road, which currently has ample capacity for growth in the short-to medium-term.²² The system includes two wetland areas and two lagoon areas; biosolids are returned to the land.

A prolonged power outage in the sewer system would interrupt this public service. Although 6 of the 31 pumping stations have backup power, and some of the remaining could be pumped by mobile power supply, not all stations could be pumped without electrical power. The stations with backup power include: 101, 102, 103, 106, 117, and 127. In the event of prolonged power outage, the Lansdowne Wastewater Treatment Centre could still provide primary treatment services, but not secondary treatment.²³

The City sewer system is monitored continually by a state-of-the-art electronic system located at the Utilities Building and at City Hall.

The Prince George community includes more than 256 kms of storm-water drainage, with both closed piping systems and open ditches. The City's Utilities Division maintains the closed systems, while the City's Transportation Division is responsible for maintaining open ditches and culverts.

Although the Prince George storm water runoff collection and removal system is designed for 1-in-5-year storms, they have been challenged frequently in recent years by severe precipitation events, including rainfall and melting ice and snow. New developments are now required to design storm-water systems to 1-in-10 year events.²⁴

Storm-water drainage is increasingly significant as a factor in community development. The City has completed watershed drainage plans for the Hudson Bay Slough, Trent, Varsity and Gladstone watersheds and is in the process of preparing watershed drainage plans for the University Heights/Peden Hill and Blackburn/Airport/BCR watersheds, which will affect development in those areas.²⁵

Implications of Sewer and Storm-water Systems:

Failure of the sewer system, such as during a prolonged power outage event, can lead to high economic losses in the community. Multiple points of failure are possible in the collection system, pumps, and treatment plant. Backup electrical power is needed for pumps in case of long-term power interruption.

The City should perform a risk and vulnerability assessment for sewer and storm-water lines to identify priorities for investment.

²¹ Golder Associates, Burnaby, BC. 2002. Extent of City Sanitary Sewer System. Project Map 022-1784. December 9.

²² City of Prince George. 2008. Official Community Plan.

²³ Interview, December 8, 2008, Marco Fornari, Utilities Manager, City of Prince George, Prince George, BC.

²⁴ Dave Dyer, Chief Engineer, City of Prince George.

²⁵ Dave Dyer, Chief Engineer, City of Prince George.

Road Transportation

Prince George serves as the road transportation hub of northern British Columbia. Two provincial highways divide the City into quadrants, separating the community's neighbourhoods, as illustrated in Figure 9.

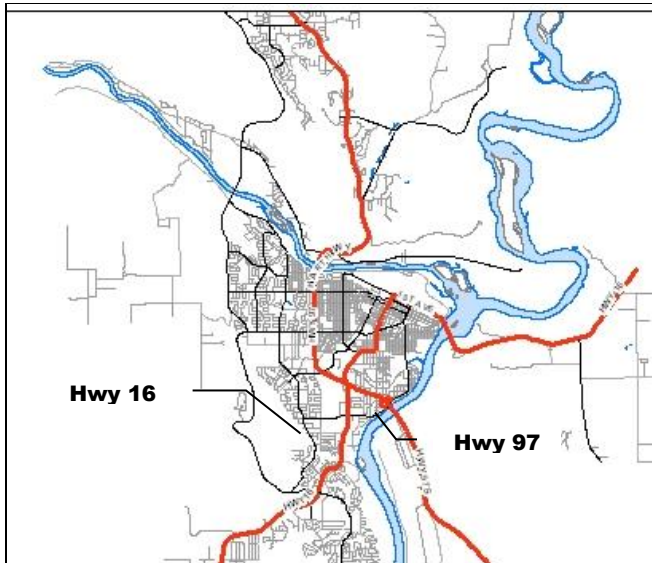


Figure 9. Principal Roadways in Prince George

Highway 16 (Yellowhead Hwy) separates neighbourhoods to the west of the highway (Peden Hill, UNBC) from those to the east (South Fort George, College Heights). **Highway 97** divides the neighbourhoods of Quinson and Spruceland on the west from Central Fort George to the east.

The BC Ministry of Transportation and Infrastructure maintains the provincial highways and bridges in Prince George. These routes carry a significant amount of through traffic while also facilitating local vehicles. Heavy traffic volumes at rush hour suggest that difficulties may arise if wide-area evacuations are needed.

Some of the significant road average annual daily traffic volumes are shown in Figure 10. Highways are heavily used by commuting traffic and commercial trucks, including haulers of dangerous goods. Heavy trucks constitute 5-10 percent of the traffic volume in Prince George during peak hours.²⁷

Figure 10. 2006 Average Annual Daily Traffic²⁶

Route	Vehicles per Day
Route 16 at Route 97, West Side	23,189
Route 16 at Route 97, East Side	13,197
Route 97 at Route 16, North Side	20,722
Route 97 at Simon Fraser Bridge	15,202
Route 97 at Chief Lake Road	9,761

The City is responsible for maintaining the other 575 km network of paved roads and another 102 km of gravel roads, including design and construction of roads, sidewalks, and traffic control measures. The Prince George Transportation Division maintains road surfaces, street lighting, traffic signals and signs, and snow clearing. Five bridges allow traffic to flow across the Nechako and Fraser Rivers: 1) Foothills Blvd, 2) John Hart Bridge, 3) Yellowhead Bridge, 4) Simon Fraser Bridge 5), and Cameron Street Bridge.²⁸

Greyhound Bus Lines formerly provided bus service in the Region but has discontinued service. Local public transportation consists of the Prince George Transit bus service, with support from private transit services that may be considered in evacuations of special-needs residents.

Implications of Road Transportation: Roads are subject to impact from severe weather, flooding, and congestion, such as during a wildfire evacuation. Maintenance and repair of other critical utilities, such as electrical power, water systems, and sewer systems, depend on road access. A chemical release due to a truck accident could lead to large-scale evacuations and may impact the City's sources of potable water.

²⁶ Min. Transportation and Infrastructure Traffic Volumes (2006), www.th.gov.bc.ca/trafficData/tradas/tradas.asp

²⁷ City of Prince George. 2008. Official Community Plan

²⁸ City of Prince George. 2008. Official Community Plan

Rail Transportation

The Canadian National Railway (CN Rail) operates freight lines out of Prince George, as well as VIA rail passenger service. The existing CN Rail main line was established in 1914, before the incorporation of the City. The CN main route follows the natural contours of the landscape along the Nechako River linking Jasper, Alberta, to the east with Prince Rupert to the west. The British Columbia Rail line, now operated by CN Rail, connects Vancouver to the south with Fort Nelson to the north, as shown in Figure 11.

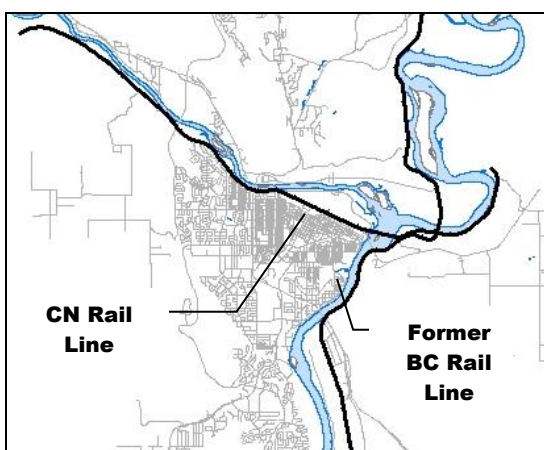


Figure 11. Rail Lines Through Prince George

VIA Rail operates regional passenger services in the west, between Jasper and Prince Rupert. Passenger travel requires an overnight layover in Prince George. Economy class cars carry a maximum of 56 passengers. The VIA Panorama car carries as many as 79 passengers.²⁹ The Rocky Mountaineer operates over the CN Rail-operated BC Rail line from Prince George to Whistler.³⁰

Current rail shipments through the City primarily carry freight. CN Rail operates the major 4 train yards and depots within the city. From a new \$20-million freight-loading facility in the River Road area, CN's delivers daily container shipments through the port of Prince Rupert. The CN Intermodal and Distribution Centre

includes about 8,400 square-metres of warehouse space. Rail freight through Prince George includes the transportation of dangerous goods. Figure 12 lists the approximate quantities for the high-volume hazardous materials carried by rail through the City on either the CN Rail main line or the former BC Rail line.³¹

Figure 12. Examples of Common Dangerous Goods Carried by Rail Through City

Commodity
Methyl Tertiary Butyl Ether
Fuel Oil
Fuel Oil
Gasoline
LPG (Propane)
Methyl Alcohol
Ammonia, Anhydrous (Liquid)

Goods Regulations to prepare for major emergencies involving dangerous goods. CN Rail utilizes the Incident Command System, including Unified Command with City first responders.³²

CN Rail transports a wide range of dangerous goods on the main line, including handling at the rail yards at River Road next to the City centre. The former BC Rail line is also used to move dangerous goods along the Fraser River. Rail cars are moved to and from the industrial zones serving the pulp mills and chemical plants north of the Nechako, and to the BCR Industrial area east of the Fraser River.

CN Rail is required by the Canadian Transportation of Dangerous

Implications of Rail Transportation: Mass casualty incidents involving passenger rail traffic could require coordinated emergency response, including evacuations. A derailment and spill of chemicals upstream from the City's water supply intake wells could lead to closure of the water system.

²⁹ <http://www.viarail.ca/en/about-via-rail/our-company>

³⁰ http://en.wikipedia.org/wiki/Rocky_Mountaineer

³¹ Sample of data only, representing BCR reports from 2001.

³² Canadian National Railway. 2007 Emergency Response Plan. January.

Air Transportation

The Prince George Airport, located about 7 km from the City centre, serves as a primary air connection in northern BC. There are three paved runways which measure 3,500 m, 1,700 m and 1000m in length. Several air carriers operate multiple daily flights to Vancouver and to regional and smaller centres in BC. International flights to Mexico are also offered in the winter month. Carriers include Air Canada, WestJet, Hawk Air, Central Mountain Air, Northern Thunderbird, and Williston Lake Air. Charter services provide small aircraft, floatplane, and helicopter flights from the airport.

The Prince George Airport Authority (PGAA) processed over half a million passengers in 2019. The largest scheduled passenger aircraft currently using the Prince George Airport is Westjet's Boeing 737-700, with a maximum capacity of 136 passengers. WestJet currently operates three flights a day from Prince George.

The airport also handles cargo 747s, some with 20 to 30 passengers on the upper deck, 757s, Antonov 124, and DC10s.



Prince George Airport

Prince George Airport is subject to the federal Airport Zoning Regulation controlling obstacles within the airport boundaries.

Emergency fire vehicles for the airport include 5 trucks, with the largest carrying 16,400-litres of water, 1800 litres of AFFF foam and 225 kg of Purple K. Emergency procedures for the PGAA include procedures for Airport Operations Specialists and firefighters with the objective of responding with at the front line engine within 3 minutes of alert and a second truck within 4 minutes. The PGAA plan utilizes the Incident Command System.

Implications of Air Transportation: If the likelihood of aircraft accident reflects the number of flights, Prince George would more likely experience a crash of a relatively light aircraft.

However, a crash of a large aircraft carrying more than 130 passengers is possible and should be addressed in specific plans.

Other Infrastructure

Prince George is served by a number of other community facilities and services that may be vulnerable to major hazardous events.

Natural Gas – Fortis BC, Inc., a company incorporated under the laws of the Province of British Columbia, is a wholly owned subsidiary of Fortis BC, Inc. Fortis BC Gas provides natural gas to individual properties in Prince George. The company manages a gas trunk system, distribution services, gas service lines, and regular facilities. In a natural gas emergency, Fortis BC's responsibilities include providing information on the location of gas facilities and plants, detection equipment to determine the presence or absence of natural gas, and response teams on a 24/7 basis to halt gas leaks.

Solid Waste – The community sanitary landfill is operated by the Regional District of Fraser-Fort George (RDFFG). Four Landfills in RDFFG receive municipal wastes:

- Foothills Boulevard Regional Landfill
- Mackenzie Landfill
- Dome Creek Landfill
- Sinclair Mills Landfill

The areas devoted to landfills in the region are sufficient to accommodate projected future population growth. The landfill site is situated above the Nechako aquifer, and the RDFFG conducts regular monitoring to identify any leachate problems. The City provides solid waste collection services to most residents and some businesses.

Telecommunications Systems – Telus, Bell, Shaw, Rogers and other telecommunications service operators provide commercial telephone, cellular telephone, and high-speed Internet services in Prince George. These systems are important to residents, businesses, and institutions.

Radio stations that can be accessed in Prince George include:

- FM 88.7 – CFUR, University of Northern British Columbia campus radio
- FM 90.3 – CBUX, CBC Radio Two
- FM 91.5 – CBYG, CBC Radio One
- FM 93.1 – CFIS, Prince George Community Radio Society
- FM 94.3 – CIRX ("The Goat"), modern rock
- FM 97.3 – CJCI ("Country 97"), country music
- FM 99.3 – CKDV ("The Drive"), classic rock
- FM 101.3 – CKKN ("The River"), adult contemporary

Local television programming is offered through the following stations:

- Channel 2 – CKPG, CBC
- Channel 4 – CBUFT, SRC
- Channel 11 – CIFG, Global

Implications of Other Infrastructure: Community infrastructure represents vulnerable elements in Prince George. All commercial operations should have emergency response and business continuity plans. In addition, the City should develop plans with RDFFG for handling large quantities of debris and hazardous wastes following a disaster with significant property damage, such as a major flood.

2.4 Community Services

Schools in Prince George

Prince George includes the catchment area of School District No. 57 (Prince George). The boundaries of the School District are co-terminus with those of the Regional District of Fraser-Fort George, including sparsely populated areas to the east and north that fall outside City boundaries. With a current enrolment of 15,260 students, SD 57 employs more than 2,200 teachers and support staff. The City encompasses 30 public elementary schools, one middle school, two junior secondary schools, and five secondary schools, as listed in Figure 13.

Figure 13. Public Schools in the City of Prince George³³

<p>Hart Area</p> <ul style="list-style-type: none"> • Austin Road Elementary • Glenview Elementary • Hart Highlands Elementary • Heather Park Middle • Shas Ti Kelly Road Secondary • Nukko Lake Elementary • Salmon Valley Elementary • Shady Valley Elementary • Springwood Elementary <p>College Heights Area</p> <ul style="list-style-type: none"> • Beverly Elementary • College Heights Elementary • College Heights Secondary • Malaspina Elementary • Polaris Montessori Elementary • Southridge Elementary • Vanway Elementary <p>Francophone</p> <ul style="list-style-type: none"> • École Franco-Nord • Duchess Park Secondary Lac Des Bois 	<p>Bowl Area</p> <ul style="list-style-type: none"> • Nusdeh Yoh Elementary • Central Fort George Elementary • DP Todd Secondary • Duchess Park Secondary • Edgewood Elementary • Foothills Elementary • Harwin Elementary • Heritage Elementary • Highglen Elementary • John McInnis Junior Secondary • Lakewood Junior Secondary • Peden Hill Elementary • Pinewood Elementary • Prince George Secondary 11-12 • Prince George Secondary 8-10 • Quinson Elementary • Ron Brent Elementary • Spruceland Traditional Elementary • Van Bien Elementary • Westwood Elementary <p>South- East Area</p> <ul style="list-style-type: none"> • Blackburn Elementary • Giscome Elementary
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Each day of the school year, approximately 4,500 students ride school busses to and from school, for a total of about 11,500 kms a day. District bussing is contracted to Diversified Transportation, Ltd., which operates 64 regular and 13 custom routes.

The City also hosts public Francophone elementary and secondary schools, both of which are part of School District 93, as well as several private schools.

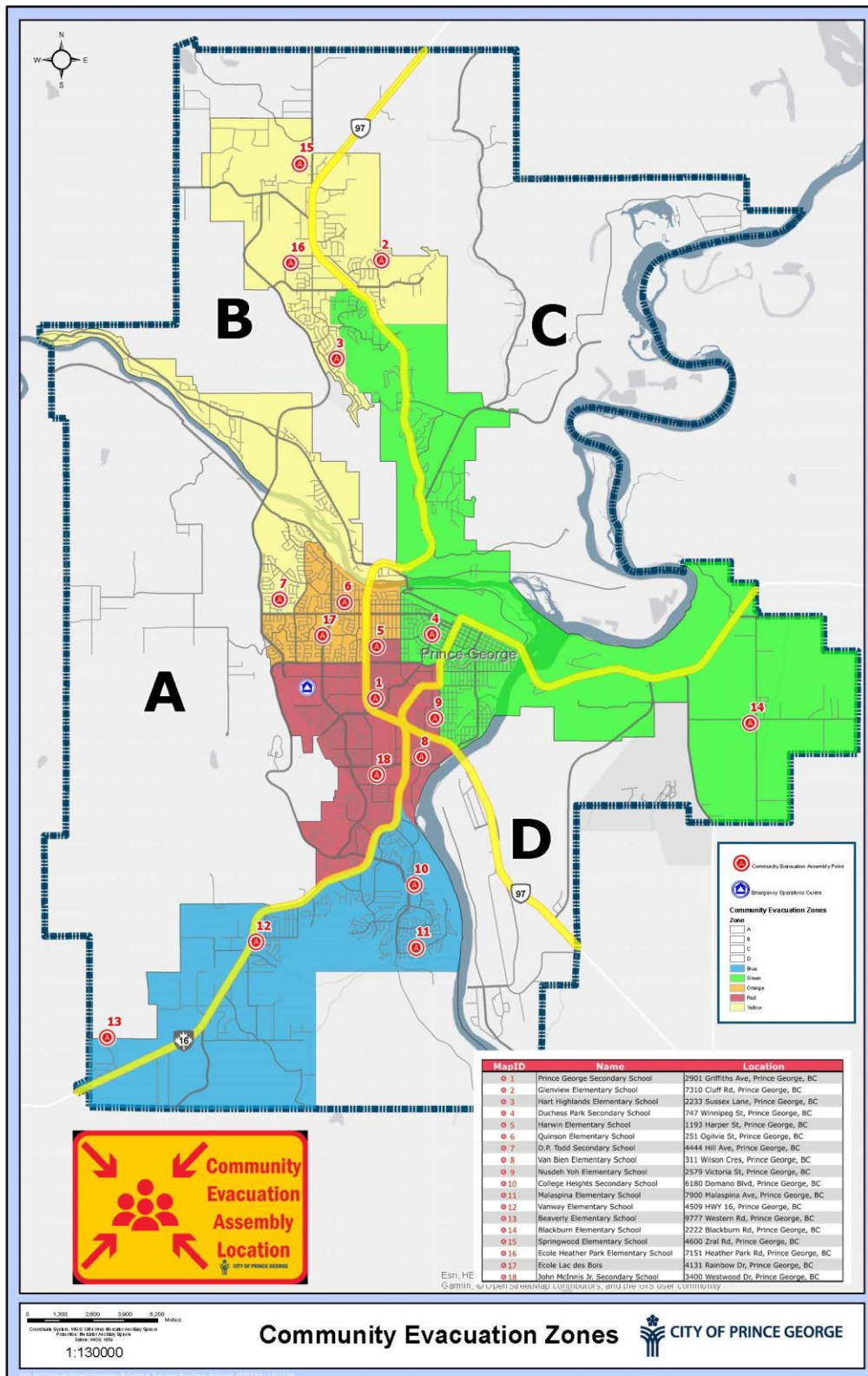
Several BC post secondary students call Prince George home, including the University of Northern British Columbia with about 4,200 students. As many as 542 students may live on campus. The College of New Caledonia serves about 5,000 students and offers 92 rooms for on-campus residence. British Columbia Institute of Technology

(BCIT) and the Open Learning Agency have integrated their local programs with CNC.

In addition to these public schools, Prince George contains dozens of day care centres, serving children ranging in age from infants to school-age youth. Responsibility for emergency preparedness and response rests with the School District, with each school Principals, and with the post-secondary institutions.

³³ <http://www.sd57.bc.ca/index.php?id=574>

Fig 14. City of Prince George Evacuation Zones



Health Care Facilities

Health care facilities in Prince George are managed by the Northern Health Authority, and the City falls within the Northern Interior Health Service Delivery Area. Facilities include the largest regional referral hospital in BC's north region, as well as a number of long-term care facilities and medical clinics.³⁴

Northern Health is divided into three operational areas called Health Service Delivery Areas (HSDAs): The Northeast, the Northern Interior (with Prince George), and the Northwest.

University Hospital of Northern BC (UHNBC) provides emergency, general surgery and medical treatment services in the North Region.

With 219 acute/rehab beds and 72 extended care beds, the hospital hosts a wide range of diagnostic and therapeutic facilities.

Services include a regional laboratory, CT scanner and MRI, a rehabilitation program, and renal dialysis.



Prince George Regional Hospital

Figure 15. Northern Health Facilities in Prince George

Institution Name	Address
University Hospital of Northern BC	1475 Edmonton St.
Northern Interior Health Unit	1444 Edmonton St.
Northern Health Centre for Healthy Living	1788 Diefenbaker Dr.
Parkside Care Facility	788 Ospika Blvd.
Rainbow Adult Day Centre	1000 Liard Dr.
Kordyban Lodge	1100 Alward St.
Prince George Family Resource Centre	1200 La Salle Ave.
Iris House	1111 Lethbridge St.

UHNBC is supported by two diesel generators to provide backup power. The generators energize two-thirds of the building.

The hospital serves as the primary centre for the surrounding area, approaching a population of 100,000, and serves a regional population of about 250,000 for subspecialty health services.

In addition to UHNBC, Northern Health operates six other health facilities in Prince George, as listed in Figure 15.

These include residential care facilities at the Regional Hospital (Jubilee Lodge) and Parkside Care Facility.

All health care centres have emergency plans and participate in annual exercises.

Implications of Health Care Facilities: Health care facilities must be functional during major emergencies and after disaster to provide emergency care and ongoing public health services.

³⁴ Within the region, only the Royal Jubilee Hospital is larger, with 425 beds.

First Responder Services

The residents of Prince George are served by professional fire, police, ambulance, and search and rescue organizations.

Fire / Rescue Department –

The Prince George Fire / Rescue Department (PGFD) provides fire prevention and protection services to the community with a full time department members. At present, there are 113 career firefighters on staff. The Department includes the Inspections Branch, administrative and management personnel, Training Division and the Dispatch Centre.



Prince George Fire Hall #1

Fire and rescue services are offered from four fire halls located throughout the City. Hall #1 responds to over 1,000 calls each year, and serves as the administrative center for the Fire Department. Hall #1 was built in 1956 and presently houses Engine 11, Rescue 11 and Engine 12. A replacement hall is currently being built in an area where it is closer to the majority of call volume. The new hall has an EOC and dispatch centre. The Fire Department has no mutual aid agreements with any public or private structural fire department. If more resources are required, they would be requested through Emergency Management BC (EMBC). Prince George fire crews work with Ministry of Forests, Land and Natural Resource Operations personnel to control wildfires, if they are beyond Fire Department capacity or access.

The PGFD provides the community with emergency medical aid, fire prevention, auto extrication, limited hazardous materials response, swift water, ice rescue, confined space and disaster response.



Prince George RCMP Detachment

RCMP – The City of Prince George is served by the Royal Canadian Mounted Police (RCMP) detachment located at 455 Victoria Street.

This RCMP detachment has about 153 regular members and 70 support staff, and provides 24-hour police services to the City. The RCMP includes several specialized units such as the Police Dog Service Unit. In addition to the regular policing services provided by the RCMP, the detachment also participates in disaster response, including the coordination of evacuation services when life-threatening situations arise, such as

wildfire and flooding incidents. The RCMP City detachment building includes an RCMP Emergency Operations Centre, located at the corner of Fourth Avenue and Victoria Street.³⁵

The RCMP also operates its North District headquarters from facilities in Prince George. With more than 1,100 employees, the North District serves the northern two-thirds of the province. About 200 RCMP employees serve at two facilities in Prince George.

³⁵ Staff Report to Council from Director of Community Services "RCMP Facility Project Update," dated August 29, 2008. September 8, 2008 Open Council Agenda.

Ambulance Services – Emergency ambulance services are offered through the British Columbia Ambulance Service (BCAS). The main BCAS station (531) is located at 1488 Edmonton Street.



Ambulance Station at Hospital

Prince George paramedics serve an area of over 11,600 sq kms and respond to approximately 7,400 pre-hospital events each year. All ambulance personnel are notified through the regional dispatch centre in Prince George via 9-1-1. BC Ambulance Service calls are routed through Kamloops prior to reaching the Prince George dispatch centre.

The BC Ambulance Service applies the Incident Command System under BCERMS, which may include set up of casualty assembly, triage, and treatment areas. BC Ambulance Service paramedics also notify

the University Hospital of Northern BC of victim numbers and types of injuries expected and arrange for patient transport.

Search and Rescue – Prince George Search and Rescue (PGSAR) is responsible for searching for lost individuals, and the recovery of injured persons in the Prince George area. PGSAR may assist with other types of emergencies as they arise, such as evacuations during heavy flooding.

The Prince George Search and Rescue Team services include search and rescue operations in wilderness, aquatic, and urban settings.

Emergency Program Services

The Prince George Emergency Program utilizes the BCERMS site and site-support system for its organizational structure. An Incident Commander is always present to oversee activities at the site of an emergency, and an Emergency Operations Centre is activated, if required, to support the site and to coordinate off-site activities. Dispatch offers initial site support for most incidents.

The Emergency Program is guided by an Emergency Management Committee, who represents key municipal departments.

The City has prepared an Emergency Response and Recovery Plan, based on an understanding of hazards and potential emergencies in the community. Prince George participates in the Emergency Preparedness Week in early May of each year.

Implications of First Responders: All first responders, including RCMP and the City's Utilities Department, should be trained in the Incident Command System and BCERMS, and understand the role of the EOC in providing site support.

In a major disaster, a limited number of trained response personnel will be available for the City. It is vital to the emergency response effort that fire, RCMP, and ambulance services be available in the event of major emergency. This suggests that all first responder personnel must have home emergency kits and plans for protecting their families, and that mutual aid resources are readily available.

Emergency Support Services – Emergency Support Services (ESS) are currently provided to Prince George residents through a program of volunteers coordinated through the City’s Emergency Management Division. The Emergency Social Services Program currently includes an ESS Director and a core group of about 20 trained city staff and volunteers. The Program welcomes and trains new volunteers on a continual basis.

Emergency Support Services assists people during a disaster by establishing reception centres, and registering and referring those who are unable to return to their homes due to an evacuation or damage to their homes. ESS ensures the availability of basic needs, such as food, clothing, and lodging, and family reunification through a network of businesses in the community.

The Prince George ESS Program includes personal disaster assistance (Level 1) to people forced from their homes by relatively small scale events, such as an apartment building fire or flood. ESS volunteers also provide support to local emergency services during extended operations, participate in public education for emergency preparedness, and assist in the maintenance of emergency supplies for reception centres.

Reception Centres identified in the City of Prince George include the following:

1. City Hall when few clients need assistance
2. Prince George Civic Centre for larger activations
3. CN Centre (arena) if additional space is required

ESS teams carry their own “Level 1 ESS First Responder” kits to ensure they can offer emergency services as quickly as possible. In addition to these provisions, the ESS Program has formal written agreements with local businesses to provide food and accommodation during emergency response.

The Prince George ESS Program works closely with the Emergency Management BC, and utilizes the Evacuee Registration and Assistance (ERA) online digital tool for registration and issuing service referrals. If required, ESS resources from throughout the province could be re-allocated or deployed remotely to support emergency response in the Prince George.

Emergency Communications – The City of Prince George has an email alert notification system and an App along with the city webpage that are primarily relied upon to deliver emergency information.

The volunteer members of the Prince George Amateur Radio Club (PGARC) provide additional emergency communications services. The Club is an active participant with both the City of Prince George and the Canadian Red Cross to provide emergency radio communications for the City during an emergency or disaster. Club members have designed and helped to equip the City’s emergency operations centre (EOC) communications room.

The radio club owns and maintains an extensive VHF and UHF radio network using mountain repeaters equipped with backup power. Club members also work with and assist other clubs in the region to expand the radio network. The Prince George Amateur Radio club partners with the Provincial Emergency Program through their Provincial Emergency Radio Communication Service (PERCS).

2.5 Economy

Although the forest industry has for decades led the employment base in Prince George region, other industry sectors contribute to the local economy. Figure 16 compares the industry sector employment percentages in the region in 2017.³⁶

Trade accounts for the largest sector at 16 percent. The Health and Social Assistance employs about 14 percent of the workforce, followed by manufacturing. Major employers include the Northern Health Authority, School District 57, the University of Northern BC, and the Canfor Mill.

The diversity of employers operating in Prince George offers some protection against single-sector declines, such as the forestry industry has experienced in recent years.

In addition to the three pulp mills and five sawmills as major employers, other industry includes two chemical plants, the Tidewater refinery, a brewery, dairy, machine shops, aluminum boat building, log home construction, as well as value-added forestry product and specialty equipment manufacturing. Several mining and prospecting corporations use Prince George as a staging centre.³⁷ The Chamber of Commerce includes about 1,000 members, representing 5,000 businesses in the community.³⁸

Figure 16. Employment by Industry Sector – 2017

Industry Sector in Prince George	Percent Employment
Trade (Wholesale & Retail)	16
Health Care and Social Assistance	14.2
Manufacturing	11.3
Construction	7.6
Education Services	6.7
Forestry, Fishing, Mining, & Oil/Gas	6.5
Accommodation and Food Services	6.5
Transportation and Warehousing	6.2
Public Administration	4.6
Other Services	4.4
Professional, Scientific/ Technical Services	3.9
Business, Building and Support Services	3.5
Information, Culture, recreation	3.5
Finance, Insurance, Real estate	3.1

Industrial Areas

Industrial areas continue to play a major role in the well being of the City. CNR operations in the area of First Avenue and River Road include a mix of inter-modal shipment operations, fuel storage, forest product manufacturing, and other industrial facilities.



Canfor Mill

Vital industrial areas include the BC Railway and Danson industrial zone located along Highway 97 east of the Fraser River in the southeast sector of the City.

The Northwood Pulp Mill west of the Fraser River and the heavily industrialized area containing the Canfor Mill, FMC Plant, and Tidewater Refinery are expected to continue operations.

Figure 17 lists the relative throughput capacity of these businesses in Prince George.

³⁶ Initiatives Prince George. 2019. Business Investment Guide.

³⁷ City Website, Today's Prince George, <http://www.city.pg.bc.ca/pages/ourcity/>

³⁸ Interview, December 5, 2008, Dan Milburn, Manager of Long Range Planning, City of Prince George

A number of warehousing and distribution businesses occupy facilities in the Carter Industrial Area and the Queensway East area in the bowl.



Tidewater Oil Refinery (formerly Husky)

Tidewater Midstream Ltd. (Formally Husky oil) operates a light oil refinery in the City to serve markets in the central and northern regions of the province. The Tidewater plant, located west of the Fraser River and north of the Nechako, was constructed in 1967 and has been operated by Husky since 1976 till 2019 when it was purchased by Tidewater.

Feedstock delivered by pipeline from northeastern BC is processed into unleaded gasoline, seasonal diesel fuels, mixed propane and butane, and heavy fuel oil.

Implications of Economy: The sudden loss of key commercial or industrial businesses in the community, due to a major structural fire or other reason, could have a wide-ranging impact on the economic health of Prince George. Leaders of each core business should have a clear understanding of the hazards they face, as well as up-to-date emergency response and business continuity plans.

2.6 Hazards

The Emergency Management Committee has identified the top 10 hazard types that could affect Prince George to an extent that might require site support through the Emergency Operations Centre. These are listed on the left column of Figure 17. The right-hand column lists additional hazards that, although possible, would not likely trigger activation of the Prince George Emergency Operations Centre

Figure 17. Hazards in Prince George

May Require Significant Site Support	Not Likely to Require Significant Site Support
<ol style="list-style-type: none">1. Atmospheric Hazards2. Disease - Human3. Fire, Major Urban4. Flooding5. Hazardous Materials6. Terrorism7. Transportation Accident – Air8. Transportation Accident – Road9. Utility Failure10. Wildland / Urban Interface Fire	<ol style="list-style-type: none">1. Bomb Threat2. Disease, Animal or Plant3. Earthquake4. Food Contamination5. Landslide, Debris Flow6. Lost Persons7. Social Disturbance, School Violence8. Structure Collapse9. Volcanic Eruption

In selecting these events for consideration, the Prince George Emergency Planning Committee acknowledges the potential, however small, that other types of emergency may demand site support in the future.

The following sections examine each of the ten hazards that may require site support alphabetically to assess the relative risks to the community and to highlight opportunities for mitigation, preparedness, emergency response, and coordinated recovery.

1. Atmospheric Hazards

Risk: High

A. Description

Atmospheric hazards may cause a variety of community damage, depending on the weather type. The term “atmospheric hazard” includes the following conditions:

- Fog
- Hail
- Heavy Snowfall and Blizzard
- Heavy Rain
- High Winds
- Ice Storm
- Lightning
- Temperature Extremes

Impacts may range from temporary power and utility outages due to thunderstorm and high wind activity to the sometimes, although rare, destructive force of a major snow storm or ice storm. Extreme weather events can lead to long-term economic repercussions. Snowstorms, for example, can result in serious impact to roadways, power transmission facilities, and communication networks, shutting down schools and businesses. Heavy snowfalls can also lead to collapse of public and private structures. Heavy rains can cause banks to slide on roads and infrastructure rendering them unusable.

Prince George regularly experiences weather events, mostly as winter storms bringing heavy snow and strong winds. Environment Canada records and publishes weather records. Some highlights of past events include the following.

B. Past Events

December 1949 – Severe Snowstorm

In the middle of December, the City experienced the heaviest snowfall in 20 years. Traffic in the city and region was paralysed. The snow started falling at 4 pm on December 13 and continued for 44 hours. On December 14, 28.75 cm of snow fell in 24 hours. By 9 am the next day, an additional 22.5 cm had fallen. Summit Lake reported 65 cm of snow, blocking the Hart Highway and isolating residents.

May 1997 – Rain Storm

Extreme rain led to isolated flooding around the City, including the overflow of the banks of the Nechako River. Losses were estimated at \$14 million, and many were not insurable.

July 2000 – Extreme Winds

Long-time residents of Prince George called it the most severe wind storm they had ever seen. The storm on July 31 uprooted trees and downed power lines. Wind gusts were clocked at 95 km/h. Broken tops of trees swirled around in the sky; they headed west, then abruptly headed east and dropped down into playgrounds and backyards.

April, 2002 – Flooding from Rainfall and Snow

About 32 mm of precipitation in one day caused havoc both inside and outside the Prince George city limits. Two homes on Johnson Road near the airport flooded. A mud, rock and debris slide covered a 35-metre section of the Trans-Canada Highway, and water eroded a section on the south side of Highway 16. The weather caused power outages in College Heights, North Nechako, Giscome, and Willow River.

October 2003 – Wind Storm in Southern BC

Fierce winds swept through parts of southern and central British Columbia uprooting trees and causing widespread power outages. About 108,000 BC Hydro customers lost power. At Prince George, winds peaked above 75 km/h, prompting authorities to close schools.



Prince George

1. Atmospheric Hazards

C. Hazard Areas

The Prince George region can be exposed to very low temperatures as cold fronts descend from the Arctic. Temperatures below -40°C are not uncommon in the winter, and major snowstorms sometimes arrive without warning. In 2006, Chinook-like weather went from -30°C to $+13^{\circ}\text{C}$ in the City; flood channels were blocked with ice.



Ice Jam Flooding in Dec 2007

The City's older storm-water drainage systems are not up to modern standards. Blockage points include Princeton Cr., Brock Dr., Selkirk Cr., and Simon Fraser Ave.

D. Vulnerabilities

Highways 16 and 97 and all arterial highways could be temporarily closed due to the effects of severe weather, including heavy snowfall, ice accumulation, or fallen trees and other debris. Other vulnerable roads include 1st Ave, 5th Ave, 15th Ave, and Ospika Blvd. Major disruptions of principal corridors could lead to shortages of food, fuel, and other essential commodities.

Neighbourhoods throughout the municipality could be isolated by severe weather events, forcing residents to rely on each other. Populations vulnerable to prolonged power outage in winter include many seniors with limited mobility.

Schools and commercial buildings with flat roofs may be threatened by heavy snowfall. Atmospheric hazards may also result in power outages that could interrupt business in this area. Business collaboration can also be a strength in severe weather events, where adjacent business work together to clear snow and debris.

Some critical infrastructure may be affected by weather, e.g., rail service, airport, sewage treatment, power supply, and telephone services.

E. Implications

Mitigation

- Develop a plan to address utility failures caused by tree blowdowns and road closures due to severe weather.

Response

- The municipality has set priorities for street clearing through its Snow and Ice Control Policy.
- Warn occupants/owners of flat-top buildings of snowfall amounts that should trigger monitoring.
- Remove snow from municipal roofs, if warranted.
- Assist residents with heat, power, food, water. Warn residents of dangers of indoor heating.

Municipal Business Continuity

- Identify transportation (e.g., snowmobiles, 4x4s) to help municipal staff reach their workplaces.

Community Recovery

- Organize local businesses to share snow-clearing efforts to quickly return business to normal.

2. Disease - Human

Risk: High

A. Description

Human diseases include a large array of parasitic, bacterial, and viral agents that can cause illness and death. A great variety of events can lead to disease outbreaks and epidemics among Prince George residents and visitors. The most notable disasters associated with human diseases include respiratory viruses, such as high-mortality H1N1 influenza and Severe Acute Respiratory Syndrome (SARS).

Drinking contaminated water has also affected tens of thousands of North Americans in the last decade alone. However, the Prince George water system relies on groundwater sources that are largely free of water-borne pathogens. Food-borne disease outbreaks, such as *Salmonella* or *Escherichia coli*, could reach disaster levels where large numbers of consumers are affected. The West Nile virus disease does not occur in British Columbia, although it is found in neighbouring provinces and states.

A significant impact of a large-scale and sudden human disease outbreak, such as pandemic influenza, will be the limited capability of health care services to deal with number of expected patients.

B. Past Events

November 1918 – Influenza Pandemic

Influenza in 1918 hit Canadians hard, affecting more than one quarter of the population. The “Spanish Flu” rapidly spread across Canada along the railway lines, arriving in Prince George in October of 1918. By mid-October, all Prince George schools, theatres, and poolrooms were closed. A second wave arrived in 1919. This pandemic resulted in 50,000 fatalities in Canada, and more than 2,000,000 Canadians became ill.



May 2000 – Walkerton, Ontario

The small community of Walkerton, Ontario, was hit by an outbreak of *E. coli* in the public water supply. Seven persons died from this disease, and more than 2,300 people suffered problems.

April 2003 – SARS Outbreak in Canada

In April, 2003, an outbreak of the SARS virus spread from China to Canada, affecting residents in Toronto and Vancouver. The resulting number of cases in BC was low, with only 4 probable and 46 suspect cases, and all cases recovered. While 43 people died in Ontario, no deaths occurred in BC. Almost all BC cases were among returning travelers, and were identified in all parts of the province.

Oct 2005 – Legionnaires Disease, Toronto

At least 21 people died and more than 100 fell ill during an outbreak of legionnaire’s disease at the Seven Oaks Home for the Aged in Toronto, Ontario. This particular outbreak may be related to a new strain of the bacteria.

2009 – H1N1 Influenza Pandemic

The H1N1 pandemic reached Prince George in 2009, and is expected to continue in 2010. To date, the BC Centre for Disease Control has confirmed 1,044 severe cases in BC since April, with 53 deaths among laboratory-confirmed H1N1 cases in the province.

2019 – COVID 19 Pandemic

The COVID 19 pandemic led to the deaths of 200 people within British Columbia. Over 5000 people were confirmed positive within BC, with over 170 confirmed positive cases in the Northern Health Authority region.

C. Hazard Areas

For respiratory diseases, high-hazard areas are those with dense concentrations of people. In Prince George, these include all schools and universities, and the Prince George Regional Hospital.

Most residents draw daily potable water from the Prince George water system and, therefore, would be affected by contamination.



Ron Brent Elementary School

D. Vulnerabilities

Populations of special concern in Prince George include the frail elderly in the community for the transmission of human diseases. Nearly 2,700 residents in Prince George are age 75 or older. Children may also suffer more from illness than adults because of under-developed immune systems.

The Prince George population includes more than 17500 children under the age of 19. Schools can be particularly vulnerable during outbreaks of communicable diseases.

Municipal staff members are also vulnerable members of the community, where they deliver specialized services. For example, the Prince George Fire / Rescue Department includes approximately 113 firefighters. If a substantial percentage became ill, fire services in the community could be affected. The same holds true for utilities, Information Technology, and other municipal personnel.

E. Implications

Mitigation

- Promote annual influenza vaccinations among municipal staff, residents and businesses.
- Work with Northern Health to ensure inspection of food preparation for major events.
- Prepare for possibility of novel airborne viruses and track BC Centre for Disease Control Health Alert recommendations.
- Practice social distancing, and enhanced hygiene and safety measures when required.

Response

- Prepare a City of Prince George Pandemic Influenza Plan.
- Work with Prince George Regional Hospital and schools to develop Pandemic Influenza Plans.
- Develop roles and responsibilities among faith-based organizations and others to support health and emergency care within the community during a disease outbreak.

Municipal Business Continuity

- Develop a Business Continuity Plan given a shortage of human resources, such as during an influenza epidemic.

Community Recovery

- Identify and engage community resources, such as service clubs, that could contribute to recovery.

3. Fire, Major Urban

Risk: Moderate

A. Description

The threat of fire to buildings in Prince George ranks among the most likely and dangerous types of emergencies. Although severe fires are rare due to today's fire prevention measures, fire in a residential, commercial, or institutional building could result in catastrophic impacts, especially among high-density occupancies, such as schools, homes for seniors, and the hospital.

Major urban fires can be ignited by a number of causes, such as faulty electrical wiring, improper use of smoking materials, and arson. Damage to residential units can render occupants homeless for weeks or more, and in need of immediate care and shelter, depending on their insurance coverage.

In addition to the threat from heat and direct fire contact, City occupants face the hazard of toxic smoke from urban fires, especially when commercial buildings holding paints or pesticides are involved. A fire in such a structure could result in evacuation of several square kilometres as a precaution.

B. Past Events

December 1913 – Alamo Theatre Fire

Fire destroyed the Alamo Theatre and Nechako General Stores at the corner of Central Ave and Hammond Street in Prince George.

August 1914 – St. Regis Hotel Fire

A fire broke out in the Prince George Restaurant and spread to the adjoining St. Regis Hotel on George Street. Both buildings burned to the ground.

January 1916 – George Street Fire

A fire broke out in the basement of Hood's Ltd., a general merchandise store in Prince George, and destroyed all the buildings on the east side of George Street between Third and Fourth Avenues.

January 1996 – Fire in Care Home, Duncan

In January 1996, about 120 bed-ridden residents were rescued from a burning extended care home in Duncan on Vancouver Island.

November 2001 – Calgary School Evacuation

A fire burning in a nearby industrial area forced an evacuation of a 7-block radius, including Fairview Junior High School and Royi Daniels Elementary in Calgary. More than 800 students and staff members moved to safety within 30 minutes to a pre-designated reception school.



Black Monday, May 26, 2008

May 2008 – Black Monday, Prince George

Fire engulfed the North Central Plywood mill that produced plywood in the Canfor chain. Several other major fires occurred that night.

November 2011 – Victoria Towers, Prince George

The fifth floor of Victoria Towers ignites evacuating over 80 people from their homes, many of them elderly.

April 2012 – Lakeland Mill Fire, Prince George

Fire engulfed the Lakeland mills killing 2 workers and injuring 22 others.

July 2020 – EconoLodge Fire, Prince George

Fire overtook a hotel in the downtown. Crews were able to stop the fire before it engulfed the entire building. 3 residents of the hotel were deceased.

C. Hazard Areas

Fire is most likely to occur in older built-up neighbourhoods located within the City Bowl, including Downtown, Central Fort George, and South Fort George or in new construction.

A fire at a commercial building with hazardous materials would likely generate the release of highly toxic smoke and gases, and may require the evacuation of the surrounding neighbourhood and temporary closure of a major highway depending on wind direction.



Toxic Smoke from Major Urban Fire

D. Vulnerabilities

Some elements of Prince George development are more vulnerable to fire than others. A major hotel would be particularly difficult to both evacuate and fight fire. Evacuees would require assistance with transportation and shelter if they could not access their vehicles.

A fire at City Hall would result in serious challenges to the continuity of services.

A fire at the University Hospital of Northern British Columbia requiring evacuation of patients would be especially. Nearby regional hospitals would not be equipped to accept significant patient loads from Prince George. Other buildings of fire concern include the any housing facilities servicing vulnerable populations, student housing at UNBC, the Regional Correction Centre, and the Youth Custody Centre.

Structural fires in commercial buildings, such as the major shopping centres, would not only present life-safety challenges, but may also result in long-term economic losses felt throughout the community.

E. Implications

Mitigation

- Fire prevention measures receive priority attention among municipal safety efforts.
- All new developments are required to meet the BC Building Code and fire safety standards. The City ensures all vulnerable occupancies, including apartments, institutions and high-density commercial operations, have fire safety plans, evacuation plans, and regularly practice fire drills.
- The Fire Department conducts pre-incident action plans on commercial properties annually or bi-annually.

Response

- Four Fire Halls located through out the community respond to fire emergencies.
- Apparatus consists of four front line engines, two ladder trucks and two tenders.

Municipal Business Continuity

- Prepare alternate measures for continuing essential municipal services in the event of fire in City hall, including backup storage of essential records off site.

Community Recovery

- ESS teams deliver Emergency Support Service to families that cannot return home.

4. Flooding

Risk: High

A. Description

Due to its location at the confluence of the Fraser and Nechako Rivers, Prince George is subject to major flooding through several mechanisms. Freshet floods generally occur as the result of snowmelt and usually occur in the spring or early summer, and are predictable to some extent. Ice jam floods occur when the normal flow of river water is impeded by ice, which may occur without warning. In addition, localized flooding may result from excessive rainfall or rapid snowmelt. Storm drains, drainage ditches, or natural drainage channels can become blocked by sediment, debris or snow to aggravate local flooding. Heavy rain can also lead to soil erosion, mudslides and other slope failures.

On average, the Fraser River peaks around June 10.³⁹ Nechako flooding due to ice effects occurs typically during freeze-up. In most years, the Nechako ice-cover forms due to the accumulation of frazil floes against the ice-cover on the Fraser River. The freshet and ice jam conditions give rise not only to high surface water levels but also to high groundwater levels and local flooding in different areas of the floodplain.

B. Past Events

May 1894 – 200 Year Flood

Spring freshet caused the largest flood on record, termed “The 80-Mile Long Valley of Misery.” The area of the Cottonwood Island was inundated along with the River Road industrial area, and a portion of the downtown area.

June 1972 – Cottonwood Island Flooded

Significantly high spring runoff caused widespread flooding in the Cache in Prince George, parts of South Fort George, Foreman Flats, and low lying land in the Giscome and Shelley area.

May 1997 – Spring Runoff Flooding

Unseasonable hot weather melted snow at higher elevations faster than normal causing heavy runoff and flooding in Prince George. Increased groundwater levels flooded some small businesses at 2nd and 3rd Avenues. Damage was estimated at \$1 million.

June 2007 – Freshet Flooding

A swelling Fraser River led to evacuation of Farrell Street; water reached under the porches of homes in the area. Residents of Regents Crescent, Hazelton Street and Pulp mill Road were placed on evacuation alert.

December 2007 – Ice Jam, Prince George

For more than two months, major flooding caused by ice jams on the Fraser and Nechako Rivers. The City declared a State of Local Emergency, and ordered evacuations, while simultaneously undertaking a number of flood control measures. Flooding disrupted businesses and damaged about 20 homes.



May 2008, 2012 & 2020 – Spring Freshet Floods

The City declares a state of local emergency for low-lying residential areas when rising water levels on the Fraser River threaten residences.

The City delivers notifications and alerts to residents on Farrell street as water hit 9.5 metres. Flood conditions have persisted well into August with flow exceeding averages for more than 5 consecutive months.

³⁹ McElhanney Consulting Services Ltd. 2008. Flood Risk Evaluation and Flood Control Solutions. November.

C. Hazard Areas

Flood prone areas include:

Nechako River

- South Bank of Nechako River at Confluence
- North Bank east of John Hart Bridge
- North Bank near Confluence
- North Bank west of John Hart Bridge
- Morning Place
- South Bank at Foot Hills Bridge
- South Bank between Hart / Foothills Bridges

Fraser River

- West bank at Yellowhead Highway
- South Fort George
- SFG west of Queensway
- Lansdowne South End
- Northwood Pulpmill Road
- Across River from Shelley

Groundwater flooding due to ice jams tends to affect properties along the west end of 1st Ave.⁴⁰

D. Vulnerabilities

Residential dwellings, retail stores, and industrial operations are most susceptible to damage from river flooding. Serious damage can occur quickly and require residents to relocate to temporary housing. Flood events are generally not covered by insurance.

Municipal infrastructure, such as City Hall, Civic Centre, Aquatic Centre, Rolling Mix Concrete Area, and some sewer and water pumping stations may be at risk to flooding. As they are all located within the hundred year flood plain.



E. Implications

Mitigation

- Flood protection work completed in 2008 and 2009 include the raising of 1.6 km of River Road to the current 200-year flood level, and installation of a sub-drain and pump chamber system.
- The construction of the River Road offset dike is the City's top priority for flood protection, pending senior government assistance.

Response

- Educate local residents and business owners on options available to them for property protection.
- Deliver early notifications to potentially impacted residents.
- Daily review of the area by city fire crews once water heights hit 8 m at the Fraser Paddlewheel park water station.

Municipal Business Continuity

- Identify municipal infrastructure that could be damaged by flooding and find alternative options during time of impact.

Community Recovery

- Community recovery should address the needs of local businesses for rapid cleanup from flooding.
- Identify local NGOs able to assist with business and personal recovery plans

⁴⁰ McElhanney Consulting Services Ltd. 2008. Flood Risk Evaluation and Flood Control Solutions. Draft - Phase 1. November.

5. Hazardous Materials

Risk: Low

A. Description

Hazardous materials (also known as dangerous goods) are substances that may be explosive, flammable, poisonous, corrosive, reactive, or radioactive because of their characteristics. A hazardous materials incident involves the uncontrolled release of a hazardous substance during transportation, storage or use. Possible effects from hazardous materials range from straightforward road obstruction to widespread evacuation, injury and possibly death.

The most dangerous types of hazardous materials include toxic gases, such as ammonia and chlorine, that are heavier than air, can travel with the wind, and can cause harm at very low concentrations. Flammable gases, such as propane and natural gas, can cause “fireball” situations if ignited in large volumes. Spilled petroleum products, such as bunker fuel, can result in widespread damage to the marine shoreline.

B. Past Events

January 1989 – Toxic Leak from Tanker Truck

In January, 1989, families in Quesnel were evacuated from their homes when sodium hydrosulphide leaked from a tanker-truck carrying the chemical from Prince George to Logan Lake. This chemical is extremely toxic and can cause respiratory paralysis.

July 2000 – Propane Tanker Leak, Langford

On July 18, 2000, a propane tanker released 35,000 litres of propane after overturning on the Malahat section of the Trans-Canada Highway. Langford declared a state of local emergency and established an evacuation zone within a 300 m radius of the site.

January 2005 – Carbon Monoxide Release

On January 29, high carbon monoxide levels in the Ridge Meadows Arena in Maple Ridge poisoned nearly 100 people, many of them children. A number of the victims fell sick after leaving the arena and sought treatment at area hospitals.

August 2005 – Derailment, Wabamun Lk, AB

On August 3, 2005, there was a major CN Rail accident at Lake Wabamun. Forty-three rail cars derailed, spilling over 700,000 litres of tarry fuel oil and about 80,000 litres of carcinogenic pole treatment oil into the lake. The Government of Alberta demanded that CN Rail immediately take all necessary steps to clean up the spill.

August 2007 – Train Collision, Prince George

Two CN trains collided on the banks of the Fraser River near the City. Several cars carrying gasoline, diesel and lumber burst into flames. Water bombers were used to help suppress the fires. Some fuel seeped into the Fraser River.

October 2008 – Natural Gas Line, View Royal

On October 31, a Terasen Gas line was breached by a construction company excavator and natural gas was released in the Viewcrest area of View Royal on Vancouver Island. Residents from seven homes voluntarily evacuated. RCMP temporarily closed road access to the area. Terasen closed the gas line and initiated repairs, allowing residents to return to the homes later in the day.

June 2009 – Natural Gas Leak, Prince George

A handful of businesses in the Carter light industrial area, including a veterinary clinic, were evacuated in response to a gas line break.

October 2018 – Pipeline Explosion, Prince George

October 9, 2018 a 91 cm Enbridge pipeline ruptured and exploded just northeast of the city boundary.

More than 100 people living in a 2 km radius were evacuated.

C. Hazard Areas

Road – Trucks carrying hazardous materials use provincial highways 16 and 97, and the designated dangerous goods routes, including Boundary Road, First Avenue, Noranda, Old Cariboo Highway Northwood Pulpmill Road, and PG Pulpmill Road. Carriers are allowed to deviate from these designated routes in order to pick up and deliver dangerous goods within the City, by the shortest course possible.

Rail – CN Rail has three significant rail yards in and around the city with rail lines carrying a wide variety of hazardous materials. This serves the local industry base and supports through-traffic to other regional destinations. Throughout the province 11 percent of loads shipped contain hazardous materials.

Pipeline – FortisBC operates numerous natural gas transmission and delivery pipelines in the community. The greatest threat to pipeline safety involves excavation and construction activities at or near pipeline right-of-ways.

Fixed Facilities – Several dozen facilities in Prince George contain hazardous materials, including the Tidewater refineries, pulp mills, chemical manufacturers, industrial parks, UNBC, and the hospital. Additionally, civic facilities, such as ice rink-s utilize hazardous materials such ammonia.

D. Vulnerabilities

The roadways with the greatest vulnerability are those with close proximity to built-up areas. The Intersection of Hwy 16 and Hwy 97, and the CN Rail Intermodal facility north of 1st Avenue represent vulnerable locations that could result in area evacuations. Hazardous materials carried by truck include gasoline, diesel fuel, various industrial chemicals, and radioactive hospital supplies.

High density occupancies are more vulnerable to toxic and flammable hazardous materials due to the potential number of people exposed. In Prince George, these include the residential, commercial, and institutional land uses adjacent to Highways 16 and 97.

Occupants of the central business district could suddenly face the threat of a chemical release involving rail operations at the CNR Yard at River Road.

Groundwater intake wells along the Nechako River are especially vulnerable to chemical spills along the CNR line.

The bowl shaped geology of Prince George can further compound the impact of an incident.

E. Implications

Mitigation

- The City has assessed the risks of hazardous materials transportation by road in the community, in cooperation with shippers and transportation companies.
- Prince George has implemented a bylaw for Dangerous Goods Routes for the City.
- Prince George has developed some routes to avoid the community with by pass roads like Boundary Road.
- Mutual aid cooperation between industrial and public stakeholders PGIMAC. Promotes cooperation, familiarity, collaborated response, resource sharing and training opportunities

Response

- Track the quantities of hazardous materials by product type in fixed facilities, road transport, rail transport, to protect firefighters and help plan for evacuations.
- Ensure high density occupancies, such as schools and health centres near fixed facilities and roadways carrying hazardous materials have plans for both immediate evacuation and sheltering in place, e.g., homes and businesses adjacent to the CN Rail yard and River Road.

- Initiate Prince George Evacuation Plan for the zones affected.
- CN Rail's Emergency Response Plan anticipates Unified Command at the site, working with City representatives as partners in response to rail emergencies.

Community Recovery

- Prepare plans for environmental rehabilitation, including ground-water monitoring.

6. Terrorism

Risk: Low

A. Description

Even with international terrorism events common in today's news, it is difficult to imagine an attack in Prince George. Yet, there have been past incidents in BC that, if repeated, could affect local residents and businesses.

Terrorism uses violence or the threat of harm to put the public, or any section of a community, in fear. The intent of terrorists typically is to draw widespread attention to a specific cause and, therefore attempt to gain the greatest public pressure to meet their demands.

A wide variety of actions could be taken by terrorists to disrupt society, including the use of chemicals, biological agents, radioactive and nuclear materials, and explosive devices. Typical targets of terrorism include political, religious, or economic symbols in communities.

B. Past Events

1960 to 1963 – Sons of Freedom

Dozens of arson and bomb attacks were carried out by the Sons of Freedom. Their targets were railways, utility poles and power lines belonging to the Kootenay Power and Light Company, and the homes of orthodox Doukhobors. One person was killed during this time, by his own bomb.

June 1985 – Bombing of Air India Flight 182

Air India Flight 182 was a Boeing 747 that exploded on June 23, 1985 while at an altitude of 9,500 metres above the Atlantic Ocean, south of Ireland. At 07:15 GMT, Air India Flight 182, which had departed Mirabel Airport in Montreal bound for London, England, disappeared from radar. All 329 on board were killed, of whom 82 were children and 280 were Canadian citizens.

December 1999 – Bomb Ferried from Victoria

On December 14, 1999, Ahmed Ressam drove his rental car onto the Washington State ferry from Victoria to Port Angeles, Washington. Ressam planned to detonate a bomb on or around January 1, 2000, at the Los Angeles International Airport. Customs Inspectors examining Ressam's rental car found explosives concealed in the spare tire well.

July 2001 – Water Contamination, Ladysmith

In July, 2001, tampering of the Ladysmith water supply was suspected after a cloudy film appeared on the water. The reservoir was drained, but lab tests failed to determine exactly what caused the film on the water.

May 2004 – Chemicals on Vancouver City Bus

On May 25, 2004, passengers on a Vancouver city bus began to feel ill. The substance that made people sick aboard a Vancouver bus was methyl chloride, a gas commonly used in the chemical industry and industrial laboratories. A male suspect is believed to have released the gas on the bus. About 50 people, including police, news reporters and firefighters, were later quarantined in and around Waterfront station in downtown Vancouver while hazardous materials crews and the Vancouver police department's drug section tried to determine what had caused the reactions.

Oct 2008 – Pipeline Bombings, NW BC

Pipelines carrying sour gas in northwestern BC were bombed on a number of separate occasions in apparent cases of eco-terrorism. The gas contains hydrogen sulphide, which can be lethal if breathed even in small amounts. The targeted company, EnCana, operates natural gas wells and transportation near Dawson Creek. No public were injured in the blasts, but pipeline infrastructure were damaged and there was a small leak of toxic sour gas at a wellhead.

C. Hazard Areas

It is difficult to predict which specific elements of the Prince George community may attract terrorist activity. Overall, past attacks elsewhere have targeted critical infrastructure, government buildings, and religious symbols.

Examples of critical infrastructure include:

- Energy and utilities (e.g., electrical power transmission and natural gas systems)
- Communications and information technology (e.g., telephone and broadcasting systems)
- Finance (e.g., banking institutions)
- Health care (e.g., hospitals and health care facilities)
- Food (e.g., distribution and food industry)
- Water (e.g., drinking water and wastewater management)
- Transportation (e.g., air, rail, marine and road)
- Government (e.g., facilities and key national sites)
- Manufacturing (e.g., chemical industry)

D. Vulnerabilities

Virtually every member of the Prince George community could be affected by terrorist action against critical infrastructure. As with atmospheric hazards or human disease, the most vulnerable populations are the very young and elderly.

Disruption of transportation and communications could directly affect commercial and industrial operations in Prince George, particularly the pulp mills and chemical production plants.

Terrorist actions could have a direct impact on tourism in the community, as evident following the attacks in the USA on September 11, 2001.

The Canadian Security Intelligence Service (CSIS) operates the Integrated Threat Assessment Centre, which evaluates the probability and potential consequences of terrorist activities in Canada and works with first responder organizations, such as local RCMP.

E. Implications**Mitigation**

- Assess critical infrastructure in and affecting Prince George for appropriate security measures.
- Restrict access to critical infrastructure.

Response

- Ensure response plans include the requirement to treat emergencies that may have been caused by terrorist action as potential crime scenes, and to preserve evidence.

Municipal Business Continuity

- Develop plans to continue critical municipal services in the event of terrorist action.

Community Recovery

- Ensure recovery plans include measures for keeping the public informed on the details of a terrorist attack, the potential for further attacks, and how members of the public can protect themselves.

7. Transportation - Air

Risk: Low

A. Description

An aircraft crash creates the potential for multiple explosions, intense fire, and injuries, fatalities, and the destruction of property at and adjacent to the impact point. The location of the crash has a significant effect on the number of dead and injured among people on the ground.

Due to the emotional trauma associated with such a sudden catastrophe, the survivors, family members and friends, nearby residents, and emergency responders will likely require mental health support.

In addition to the risk of aircraft damage and injury to passengers, an aircraft crash may have other effects on Prince George residents. A major fire may be started by an aircraft crash, causing damage to property and resources, and possible evacuation of residents.

B. Past Events

March 1989 – Crash of Air Ontario Flight 1363

An Air Ontario flight crashed near Dryden, Ontario on March 10, 1989, immediately after take-off. The aircraft crashed after only 15 seconds because it was not able to achieve enough altitude to clear the trees beyond the end of the runway due to ice and snow on the wings, causing the death of 21 of 65 passengers and 3 of 4 crew members.

August 1995 – Plane Crash in Richmond

On August 19, 1995, a DC-3 cargo plane passed between two apartment buildings and crashed and burst into flames. Three people were pulled to safety by a jogger. The plane was full of fuel and came dangerously close to a residential area. Pilot error contributed to the crash.

October 1995 – Aircraft Overshoots Vancouver Runway

On October 19, 1995, a Canadian Airlines DC-10 skidded off the end of the runway at the Vancouver International Airport when the pilot aborted his take-off for Taiwan with 242 passengers on board. Passengers were evacuated using inflatable chutes. The runway remained closed for two days.

September 1998 – Crash of Swiss Air 111

On September 2, 1998, the aircraft crashed into the Atlantic Ocean southwest of Halifax International Airport, Nova Scotia. The crash site was 8 km from shore, roughly equidistant between the tiny fishing and tourist communities of Peggy's Cove and Bayswater. All 229 people on board were killed.

December 2005 – 737 Crash in Chicago

On December 8, a Southwest Airlines Flight 1248, a 737-700, slid off the runway during a heavy snowstorm while landing with minimum runway visibility at Chicago's Midway Airport. The aircraft left the airport boundaries and slid into a nearby intersection, hitting two cars, killing one passenger, and injuring eleven others, including three jet passengers.



C. Hazard Areas

Due to the proximity of the Prince George Regional Airport, the eastern portion of the City is more exposed to the risk of crash involving large aircraft. The rural residential areas near Sintich and Ellis Road are more likely to experience an aircraft crash.

Aircraft crashes are more likely along the landing and take-off paths at an airport, and on the airport grounds itself.

D. Vulnerabilities

Highly vulnerable areas include the neighbourhoods adjacent to and in the path of the runways at the Prince George Airport.

Motorists on Highway 16 and the Old Cariboo Highway could also be directly affected by aircraft crash, or indirectly by traffic congestion for extended periods.

E. Implications**Mitigation**

- All development proposals adjacent to the Airport include a review of potential obstacles to aircraft.

Response

- Response should anticipate the need to control vehicle traffic near the site of an aircraft crash, and to support access by emergency vehicles from adjacent communities.
- Utilize boundary and other roads to re-route traffic.

Community Recovery

- Anticipate the arrival of family and friends, and accommodate their needs. Provide opportunities for family members to grieve, as in Peggy's Cove following the crash of Swiss Air Flight 111.
- Prince George Airport officials should identify measures for returning the airport to full operations while long-term investigations may continue, such as identifying a hangar nearby where accident debris can be collected for an extended investigation.

8. Transportation - Road

Risk: Moderate

A. Description

Motor vehicle crashes can require emergency site support activities when accidents involve large numbers of casualties. Most occurrences result in property damages that require site clean up. Some crashes lead to major injuries or fatalities that require specialized response.

High-occupancy vehicles cause the greatest concern from the perspective of emergency response. Bus accidents can result in dozens of injuries, simultaneously requiring on-site emergency care and overloading nearby medical facilities. Consequences can be severe if fire is involved or the incident causes a release of hazardous materials.

Motor vehicle crashes typically require localized response to fuel spills, and may result in traffic congestion and detours.

B. Past Events

1977 – Nanaimo Multi-Vehicle Accident

A three-vehicle crash near Nanaimo involving a transport truck, a bus, and a pickup truck resulted in 11 fatalities.

January 1989 – Bus Accident, Squamish

In January, 1989, a bus loaded with 30 passengers, lost control after being hit by a car on the icy Sea-to-Sky Highway. Fortunately the bus stopped with 10 metres hanging over a 10-m cliff. Seven passengers were injured.

July 1990 – Bus and Truck Collision

On July 26, 1990, a pipe laden truck slammed into a tour bus of young dancers and 5 adults, about 7 kilometres east of Golden, at Kicking Horse pass. One person was killed and 27 were injured, some severely.

November 1991 – Bus Crash, Princeton

A passenger vehicle struck a Greyhound bus on the Princeton Highway, in November 1991, killing three people.

March 1992 – Bus Accident, Richmond

On March 12, 1992, a bus traveling south on Highway 99 toward Richmond crashed into a parked tractor-trailer that had broken down in the bus lane. Two people were killed and many were injured.

March 2003 – School Bus Crash, Langley

On March 9, 2003, a bus carrying Pacific Christian School's senior ~~boys~~ basketball team crashed on the Trans-Canada Highway in Langley. In very poor, snowing winter conditions, the bus went into a ditch and rolled on its right side. There were no serious injuries.

November 2014 – Tour Bus Accident near Merritt

On August 28, 2014, a bus carrying tourists rolled over and off the highway, injuring everyone on board including 6 critically and 15 seriously. At least 25 ground ambulances rushed the injured to hospitals in Kamloops and Kelowna. Parts of the Coquihalla Highway near Merritt were closed for several hours.



Tour Bus Accident near Merritt, BC, 2014

C. Hazard Areas

Prince George is served by more than 575 kms of paved roads. Some of the more significant local roads include:

- Highway 16
- Highway 97
- 1st Avenue
- 15th Avenue
- Queensway Street

Highway 16 is the busiest provincial roadway, carrying an annual average of 23,189 vehicles daily. Highway 97 is second busiest with 20,722 vehicles per day on an annual average basis.

High speeds on the provincial highways are common occurrences, contributing to the likelihood of road accident.

Known school and public bus routes in the community include 5th Avenue, which also accommodates large trucks carrying hazardous materials.

D. Vulnerabilities

School-age children using bus transportation are among the most vulnerable groups affected by road accidents.

Tourist buses can carry dozens of visitors who lack English as their first language, which could challenge first-responders and site support efforts to inform family members.

Closure of Highways 16 and 97 for a substantial time period due to a mass-casualty vehicle accident would challenge residents and business owners in the community.

First responders are increasingly exposed to threats from alternate fuel vehicles, such as the high voltage associated with hybrid transit buses.

E. Implications

Mitigation

- Ensure routes in Prince George frequently used by buses are assessed for safety hazards and the potential for risk reduction measures.
- Alternative routes around major intersections.

Response

- First responders have been trained on bus rescue. Ensure personnel receive updated training.
- Ensure practice exercises in mass casualty bus accidents include fire, police, and ambulance organizations utilizing the Incident Command System.
- Ensure response plans anticipate the need for emergency translation capabilities.

Community Recovery

- Consider the use of reception centres as information outlets for families and friends of transportation accident victims.

9. Utility Failure

Risk: Moderate

A. Description

Utilities include a variety of infrastructure-based services that support community standards of living. Because of the reliance of Prince George residents and business-owners on public and private utilities, any interruption in service could result in an emergency situation. Possible utility failures include:

Power Failure – Prolonged outages or when power is lost during times when ambient temperatures are very low can result in emergency requirements. Electricity is considered an essential service to maintain heat and cooking facilities, and to support other critical utilities.

Communications Failure – The telephone, fax, computer networks, data lines, and wireless radio and cellular phone systems are subject to failure through a number hazards, including windstorms, ice storms, and floods.

Fuel Shortage – According a recent survey of residential heating fuels, most City residents (89.8%) rely on natural gas as their primary source of residential heat. Disruption of gas supply systems in winter could result in a city-wide need for emergency shelter.

Water System Failure – Interruption of potable water can occur due to insufficient potable water access or contamination, or both. Prolonged incidents of either can affect the health of Prince George residents and lead to economic impacts for local businesses.

Sewer System Failure – As with potable water, most of Prince George citizens depend on the City's sewer system. Prolonged outages could lead to health impacts among residents and the interruption of business activity in some sectors.

Solid Waste System Failure – Solid waste disposal services managed through the Regional District are subject to failure due to strike, earthquake, fire, and other causes.

B. Past Events

July 1996 – Power Outage, Western Canada

A major power outage in western USA and Canada began when a 345,000-volt transmission line failed in Idaho. More than two million customers were affected.

January 1998 – North East Power Outage

A prolonged power outage in severe weather was blamed for 30 deaths and for leaving more than 3.5 million people in the dark.

December 2000 – Natural Gas Failure, Dawson Creek

On December 21, a 15-cm gas line supplying Dawson Creek with natural gas froze and had to be shut down. Gas supply to all major industries was shut off, all schools were closed, and about 4,000 homes and users were impacted.

August 2006 – Tofino Water Shortage

On August 29, Tofino's Mayor declared that all local food service and lodging businesses were to shut down due to a severe water shortage.

July 2000 – Power Outage, Prince George

An early-morning power outage blanketed the entire Prince George area, shutting down Canfor's pulp mills and Husky Oil's refinery. Power was lost when a transformer at a main substation shut down. Power was out in an area stretching east to Purden Lake, south to Hixon, west to Isle Pierre, and north to Salmon Valley.

Sept 10, 2019 – Power Outage, Prince George

A massive power outage left Prince George, and surrounding communities without power impacting 124,000 customers. The suspected cause of power loss was a lightning strike. Power was returned within hours.

C. Hazard Areas

Prince George receives transmitted power via a number of lines managed by the British Columbia Transmission Corporation. Power outages can be caused by heavy winds, ice storms, snowstorms, falling trees or other debris, vehicle impacts, and wildfires.

The Prince George community receives natural gas via FortisBC, Ltd., the only pipeline gas system available in the community. Interruptions of piped natural gas are most frequently caused by digging during building or road construction.

Water supply depends on City collection, treatment, and delivery. The water system in Prince George is particularly exposed to risk from chemical contamination of the Nechako River. Similarly, sewer sanitation systems are underground and may be affected by shaking, subsidence, and liquefaction caused by even moderate earthquakes.

D. Vulnerabilities

Institutions are among the community features most likely to be affected by utility failure. Schools will likely to be closed without access to power and water.

Hospital, medical clinics, and elderly care facilities rely on water, sewer, power, and communications systems for safe operation.

In addition, a number of senior citizens rely on steady electrical power to support oxygen supplies and other medical equipment.

Power and water interruptions can cause businesses to close temporarily, and result in economic hardships for business owners and employees.

Prolonged communications failures are likely to have devastating impacts on Prince George businesses, including home-based business sector. As a result, economic impacts are likely to be immediate and widely spread.

E. Implications

Mitigation

- The City should perform a risk and vulnerability assessment for sewer and storm-water lines to identify priorities for investment.
- Work with utility companies and the RDFFG to assess the option of burying vulnerable transmission lines in the region.
- Back up power source to be considered for vulnerable infrastructure.

Response

- Arrange for access to portable power generators for assisting Reception Centres.
- Consider preparing a list of residents who require oxygen for emergency support.

Municipal Business Continuity

- The Emergency Operations Centre, located at City Hall, is equipped with a power generator.
- The Utilities building has UPS and an inverter to keep essential functions working.
- Arrange for water trucks to provide potable water, working with PEP.
- Generators for pumping stations are available.

Community Recovery

- Assist business organizations in organizing emergency water supplies for temporary operations.

10. Wildland Fire

Risk: Moderate

A. Description

Wildland fire ranks among the hazards of greatest concern for the City of Prince George, especially in neighbourhoods that border forested areas. Much of the 318 km² area within the city limits is provincial heavily forested Crown land. The potential safety challenges of wildland fires in rural and urban areas have been emphasized by the loss of structures and lives in other similar communities in BC and elsewhere.

From May to October of most years, the community faces a significant threat from wildland-urban interface fires. Occasional periods of high temperatures, low humidity, and high winds that follow times of drought may exacerbate the risk. Spring and fall seasons have the potential to have cured grass add to the potential fuel load. More than any other hazard, wildfires can require immediate evacuation of persons and animals to preserve safety. Response requires careful planning to be effective in responding to the event and evacuating citizens from harm.

B. Past Events

July 1998 – Silver Creek Interface Wildfire

On July 26, 1998, lightning struck a tree on a steep slope in the mountains above Silver Creek, just southwest of Salmon Arm, BC. Steep slopes hampered attempts to contain the blaze, and high winds forced the fire across Silver Creek valley, destroying more than 40 structures. Continued high winds lead to the evacuation of 7,000 people from Salmon Arm, the largest evacuation in BC history to that date.

July 2003 – Summer Wildfires, Okanagan

High winds and temperatures in the 35-40 C range transformed a carelessly tossed cigarette into a fire storm within a few hours, forcing thousands to flee the rampaging fire. Residents from Barriere were evacuated from their homes as the 178-square-kilometre fire raged.

The Okanagan Mountain Park Fire was the most significant interface wildfire event in BC history. The fire's size was 25,600 hectares. Naramata and Kelowna suffered significant effects when the blaze caused the evacuation of 33,050 and 238 homes were lost or damaged



Barriere wildfire, 2003

July 2009 – Glenrosa West Kelowna Fire

Dry conditions and steep terrain added to the risks of a persistent wildfire in West Kelowna, where more than 6,000 residents were forced from their homes. The fire reached more than 300 hectares before weather conditions allowed fire crews to contain the blaze.



Williams Lake wildfire, 2017

July 2017- 2018 – Northern BC Wildfires

Two consecutive hot dry fire seasons led to the evacuation of 15000 people from neighboring communities. This season led to 1.25 million hectares burned. Numerous fires impacted communities all over the central northern interior and evacuees descended upon Prince George taxing Emergency Support Services response capacity.

C. Hazard Areas

Virtually the entire City outside the Bowl is subject to wildland-urban interface fire risks to some degree, and periodically experiences high fire danger during the months of summer and early fall. Generations of effective fire suppression in the region has created dense ground cover and ladder fuels in some areas.

The mountain pine beetle epidemic hit the City hard, affecting more than 45% of the natural forest cover within city boundaries. Parks and residential back yards were cleared to remove dead pine trees before they became a hazard. Fir and Spruce beetle infestation areas are also on the rise. This provides dry dead timber as a fuel source.

A Wildfire Management Plan completed for the City in 2005 identified six priority areas:

- Northern Hart Highlands
- Eastern Hart Highlands
- Southern Hart Highlands
- Otway
- Moores Meadow Park
- Southeastern College Heights

D. Vulnerabilities

The more prominent isolated neighbourhoods in Prince George include those listed in the table below.

Name of Road	Planning Area
North Kelly Road	Austin North
Old Summit Lake Road	Summit Lake
East Austin Road	Austin East
Landooz Road	Shelley
Hoferkamp Road	N. Nechako
Blackwater / Leslie Roads	Southwest
Western / Corral	Southwest
Cranbrook Hill	Foothills
Tabor Blvd.	Heritage
Ridgeview Drive	Hart Highlands

There are currently no methods for alerting outdoor users to the imminent threat of wildfire.

E. Implications

Mitigation

- The City supports a program to remove pine beetle affected trees from public and private lands.
- Plant and replant broadleaved tree species that are more fire resistant.
- The City has hosted a series of Fire Smart public information sessions to promote homeowner fire risk mitigation.
- Followed the strategies outlined in the 2019 Community Wildfire Protection Plan
- Conducted wildfire simulation tabletop with various stakeholders to develop evacuation planning.

Response

- Develop public alert mechanisms including municipal website, email alert and app.
- Rapid effective communication plan for residents and responding agencies.
- Provide multiple and varied routes out of high population areas.
- Reception centre deployment.

Community Recovery

- Identify community elements to bring together in coordinated disaster recovery and list contacts.

Other Hazards

A number of hazards could threaten Prince George without requiring the site support efforts available through the emergency program. The following paragraphs summarize other hazards that may require specific emergency response procedures.

Bomb Threat – While specific buildings or infrastructure in the City may fall victim to the threat of bombing, it is unlikely that such an event would require the activation of an Emergency Operation Centre. The RCMP has procedures in place for responding to bomb threats.

Disease – ~~Animal~~ Animal or Plant – Although the RDFFG contains substantial agriculture areas, the City of Prince George is not subject to significant impacts from animal and plant diseases. In the event of a disease outbreak, the RDFFG has prepared plans for activating their EOC and utilizing a Mass Carcass Disposal Plan, if required.

Dam Failure – Prince George has 2 potential dam infrastructure components that could cause an impact to the community. The closest is a small dam above the community intended to act as a fail safe for an existing beaver dam on Shane Lake. Collapse of this dam would affect evacuation zone A. Likelihood is low but impact would be immediate. The second potential hazard is Kenney dam, a rock filled embankment located on the Nechako river. Dam failure in this infrastructure would cause an impact to Prince George roughly 48 hrs later.

Earthquake – Prince George lies in a moderate earthquake potential region in British Columbia. The chance of a major earthquake is less here than along the West Coast, although even a minor earthquake could cause some property damage. The largest recent quake in the area occurred in 1987, registering 5.7 on the Richter scale with an epicentre near Pacific Lake, BC. Recently to the north of Prince George in Fort St John numerous smaller earthquakes have been detected. The BC Oil and Gas Commission suspects that the earthquakes are connected to the oil and gas industry.

Food Contamination – Although large numbers of people receive food services in Prince George, such as at the Hospital, it is unlikely that municipal emergency program will be called on for response. The Northern Health Authority deals with threats of and responses to food contamination at health facilities.

Host Community – During the 2017-2018 wildfire evacuations, the City of Prince George acted as a host city for evacuees. The costs of this to the community were significant. Increased population of vulnerable populations, fatigued employees, unrecoverable fiscal costs and damage to organizational branding are a few of the impacts to the community. The likelihood of Prince George acting as a host community is low however, other communities may host their own reception centre at our facilities which would impact available service providers, but would allow business continuity for the City of Prince George.

Landslide - Debris Flow – Although there are several areas in the City where the slope exceeds 30 percent, the City does not allow development on lands with slope greater than 20%. Some sections of Nechako River bluffs are subject to steep slopes and erosion. One area of concern for debris flow is located at Shane Creek near UNBC. However, mitigation is in place including retention structures. There is a small lake in the Ferguson area, but it presents no risk.

Lost Persons – There are few outdoor areas within the City limits that attract large numbers of visitors, hikers, bicyclists, or outdoor enthusiasts. Recreational opportunities and work requirements draw many people to the backcountry in distinct seasons. Summer visitors who are not familiar with the region would be most at risk. Search and rescue services, however, would not likely trigger support from an Emergency Operations Centre.

Social Disturbance - School Violence – Events of social disturbance are considered rare in Prince George, although not impossible. Violent incidents in schools, such as shootings, are not expected to require site

support from the Prince George Emergency Operations Centre. The RCMP has appropriate response procedures in place.

Structure Collapse – It is unlikely that a major structure in Prince George would collapse, considering the building standards at the local, provincial, and federal levels. A collapse of a bridge, such as the John Hart Bridge crossing the Nechako River, could lead to isolation of northern neighbourhoods.

Volcanic Eruption – Volcanoes pose serious hazards to human populations in many parts of the world. In addition to destruction caused by ash fall and mudslides in the immediate vicinity of an erupting volcano, ash plumes injected into the atmosphere pose dangers to aircraft flying through them. A major eruption might generate volcanic ash that could affect the region. 18 volcanos exist within British Columbia. The closest one to Prince George is 160 km away in Nazko BC.

3.0 Priority Concerns

One purpose of this Community Risk Assessment is to identify priorities for action. The Prince George Emergency Planning Committee considered the risk information presented in this report in identifying events that are most likely to result in large losses for the community.

Risk is considered the potential for loss and is made up of two components: Probability and consequence. The greater the probability of an adverse event, the greater the risk. Also, the greater the potential consequences of an incident, the greater the risk.

Considering both components of risk becomes important when allocating time and effort for emergency management. The highest priority is given to events that are both probable and can lead to severe consequences. Low priority events represent low probability occurrences of little consequence.

With these considerations in mind, a review of the primary hazards presented above yields the hazards and priorities identified in Figure 18.

Figure 18. Priority Concerns for Prince George

		1 Very Low	2 Low	3 High	4 Very High
Likelihood	6 Highly Likely		Flooding		Atmospheric Hazards
	5 Moderate or Likely			Fire, Major Urban	Disease - Human Hazardous Materials
	4 Occasional, slight chance		Utility Failure	Wildland / Urban Interface Fire	
	3 Unlikely Improbable		Transportation Accident – Air	Transportation Accident – Road	
	2 Highly Unlikely			Terrorism	
	1 Very Rare				
Consequence (Impact and Vulnerability)					

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