OFFICE of the FIRE COMMISSIONER

# Hazard Analysis and Risk Assessment

Manitoba

# Table of Contents

## Section 1



## Section 2

## Section 3

Appendix B

## Foreword & Synopsis

In 2002, the Security Subcommittee of Cabinet authorized the Manitoba Office of the Fire Commissioner (OFC) and the Manitoba Emergency Measures Organization to conduct a province wide hazard analysis and risk assessment. This information would then be used to establish strategic priorities for improving emergency management and public safety, in addition to creating a valuable resource for public safety practitioners for improving the safety of their community. The intent of this document is to provide a summary of the information found and to form a basis for concentrating emergency planning efforts.

The Manitoba OFC dedicated a staff person to undertake this project by conducting detailed onsite visits to communities. These first-hand inspections of potential hazards and available resources were conducted with the participation of public safety officials and municipal administrators from each community. This process took over one full year. It is also important to note that the hazards and issues presented in this report are those seen by municipal officials as being important in their respective jurisdictions. This report does not include any data or assessments made on present hazards or responding capabilities of the City of Winnipeg or the City of Brandon. It also does not include any assessments made of medical capacity or health issues in any of the areas in question, as this information is the responsibility of the regional health authority having jurisdiction.

Any incident occurrence within a municipality will have an initial response conducted by the local fire department. In many cases, declining community size has resulted in the inability to sustain an effective fire department. It is not the intent of this document to strictly address the operations and capabilities of the fire departments in the assessed communities, however, in most cases municipalities look to their fire departments as their main first responder agency. As a result, many of the findings within this document focus around the fire service.

Once the pertinent information was gathered, OFC staff calculated the resources needed to effectively manage the hazards of the community and the capabilities of the existing resources and determined what gaps, if any, exist. This information was then shared with local first responders, emergency managers and elected officials. This assessment will prove to be an invaluable resource for the strategic and emergency planning conducted by various municipal, regional, and provincial entities in the Province of Manitoba.

## Executive Summary – 1.0

Planning for emergency response in Manitoba is an ongoing and demanding process for both municipal and provincial governments for many reasons. The sheer size of the province incorporates several different geographic regions. This presents problems with the logistical elements of an emergency response as well as access to necessary training. In addition to geographic differences within Manitoba, the province is also home to an ever expanding technological industry. This includes an increased number of chemical production facilities as well as a higher volume of hazardous materials traffic on rail and highways. Industry Canada states that there are presently 110 chemical manufacturing facilities in Manitoba, in accordance with definitions put forth by the North American Industry Classification System (NAICS) Section 325.

Like many regions in Canada, aging infrastructure also affects the realm of emergency response in Manitoba. This is especially true in rural areas where large structures erected long before modern fire and building code enforcement pose an ongoing threat to responders and planners alike. This fact is further exasperated in that many of these structures are located in remote areas where trained response personnel may be several hours away which increases the risk of critical hazards exponentially.

In a time of increasingly changing climatic events, responding agencies in Manitoba must remain aware that this means an increased risk of natural hazards. For example, flooding which can affect a large number of communities and response organizations.

Increased geographic and technological risks in Manitoba must be met with similar advancements in the knowledge and equipment used by the various responding agencies in the province. Manitoba has made many instrumental advancements in emergency response and the analysis of hazards affecting people and property on a provincial, national and international level. To further the improvement on positive trends, there are areas of the Manitoba Response Network that will be addressed in order to ensure the safety of the inhabitants of Manitoba. Some of the key elements determined from the hazard analysis are listed below.

1. **45%** of municipal fire departments are responding with an insufficient number of personnel to carry out an offensive attack or rescue in a fire situation, according to the National Fire Protection Association (NFPA) Standard 1720 Section 4.5. Of these, **65%** respond to communities with a population of less than 1000 people in their municipality.
2. Of the departments responding with sufficient fire fighters, **50%** either do not have the level of training required or lack sufficient protective equipment to safely and effectively proceed with the offensive attack.

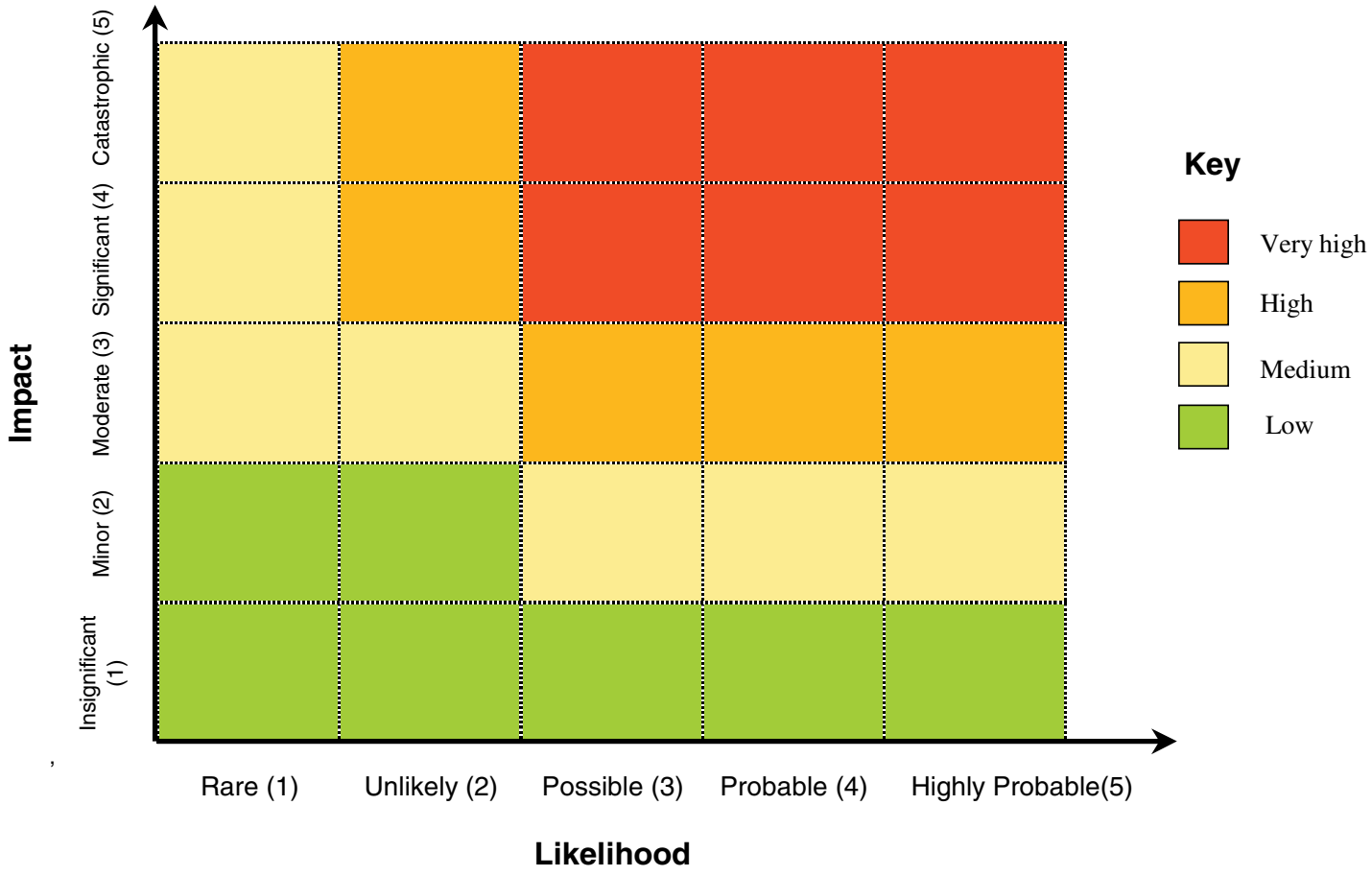
3. At the time of this survey, **4%** of municipalities were able to produce a current emergency plan, however many were in the process of developing plans. In many instances, municipalities had dedicated emergency coordinator positions. This action was the result of recent legislation requiring municipalities to have an approved emergency plan. As of October 2005, Manitoba Emergency Measures Organization reported that **75%** of municipalities have completed emergency plans.
4. More than **50%** of municipal fire departments do not meet the required standard for pumping capacity or have the water supply to sustain the required water flow for 30 minutes of fire fighting on a single-family dwelling as set out by the fire under writers' survey.
5. More than **85%** of fire departments have to rely on relay pumping or a tanker shuttle to provide water at a scene involving a fire at a single family dwelling.
6. **10%** of fire departments are incapable of responding to an incident involving Hazardous Materials.
7. Most fire departments capable of responding to an Operations Level Hazardous Materials incident only have **10% to 30%** of their members trained to this level.
8. On average, only **30%** of fire department personnel have Level 1 Fire Fighter training.
9. Only **30%** of rural fire departments have Incident Management Systems or Incident Command Training.
10. Approximately **20%** of fire departments rely on the mutual aid system on a regular basis to provide services for the day to day emergencies in their community.
11. Based on the level of training and expertise, age of responders, the protective equipment available and the pumping capacity, **15%** of fire departments would be considered a risk to their community.
12. Hazardous Materials incidents, large structure fires and potential building collapses are the highest rated risks within most municipalities.

## Development of a Risk Assessment Plan – 2.0

The NFPA and the Federal Emergency Management Association (FEMA) set out the basic definition of a risk assessment, which details the fact that it is "a quantitative and qualitative tool used for measuring the probability of incident occurrence and impact that a given area may experience if certain criteria are met during an incident". These tools can take many forms, from a simple paper survey to a calibrated set of indicators designed to be applied and manipulated for each analyzed area. Information is then prioritized and ranked to assess the importance and degree of preparation needed for each event. Due to financial restrictions, each event cannot be completely mitigated. By completing a comprehensive risk assessment, agencies may allocate funding and resources towards the most vulnerable aspects in their region.

The main component of risk assessment lies in the construction of a risk rating matrix. The qualitative and quantitative measurements of risk are derived and illustrated by using this tool. Designed in a graphical format, the matrix rates impact on the vertical axis, ranging from insignificant to catastrophic. An event likelihood is rated on the horizontal axis, ranging from rare to highly probable. The graph is further broken down into separate cells which are quantified based on the amount of risk present. The risk matrix utilized in the Manitoba Hazard and Risk Assessment is illustrated below.

## Risk Rating Matrix - 3.0




## Definitions of Risk Ratings – 3.1

- **Very High (VH) Risk** – These risks are classed as primary or critical risks requiring immediate attention. They may have a high or probable likelihood of occurrence and their potential consequences are such that they must be treated as a high priority. This may mean that strategies should be developed to reduce or eliminate the risks and that mitigation in the form of (multi-agency) planning, exercising and training for these hazards should be put in place and monitored on a regular basis. Consideration should be given to *specific* planning to the risk rather than generic.

- **High (H) Risk** – These risks are classed as significant. They may have high or low likelihood of occurrence, however their potential consequences are sufficiently serious to warrant appropriate consideration, after those risks classed as 'very high' are addressed. Consideration should be given to the development of strategies to reduce or eliminate the risks, and that mitigation in the form of (multi-agency) generic planning, exercising and training should be put in place and monitored on a regular basis.
- **Medium (M) Risk** – These risks are less significant, however may cause upset and inconvenience in the short-term. These risks should be monitored to ensure that they are being appropriately managed and consideration given to their management under generic emergency planning arrangements.
- **Low (L) Risk** – These risks are both unlikely to occur and not significant in their impact. They should be managed using normal or generic planning arrangements and require minimal monitoring and control unless subsequent risk assessments show a substantial change, prompting a move to another risk category.

## Likelihood Scoring Scale – Quantitative and Qualitative Measures – 3.2

| Level | Descriptor | Indicative chance of occurrence in a given 5 year period. | Description |
|---|---|---|---|
| 1 | Rare | 1% or less | May occur only in exceptional circumstances; may occur once every five hundred or more years. |
| 2 | Unlikely | 2%-25% | Is not expected to occur; and/or no recorded incidents or anecdotal evidence; and/or no recent incidents in associated organizations, facilities or communities; and/or little opportunity, reason or means to occur; may occur once every one hundred years. |
| 3 | Possible | 26%-50% | Might occur at some time; and/or few, infrequent, random recorded incidents or little anecdotal evidence; and/or very few incidents in associated or comparable organizations, facilities or communities; and/or some opportunity, reason or means to occur; may occur once every twenty years. |
| 4 | Probable | 51%-75% | Likely to or may occur/recur every 5 – 7 years; regular recorded incidents and strong anecdotal evidence and will probably occur in many circumstances. |
| 5 | Highly Probable | 76%-100% | Likely to or may occur/recur every 5 years or less; high level of recorded incidents and/or strong anecdotal evidence. |

## Impact Scoring Scale – Qualitative Measures – 3.3

| Level | Descriptor | Categories of Impact | Description of Impact |
|---|---|---|---|
| 1 | Insignificant | Human Welfare | • No fatalities, injuries or impact on health.<br>• No persons displaced and no personal support required.<br>• No damage to properties.<br>• No disruption to community services or infrastructure. |
| | | Environment | - No impact on environment. |
| 2 | Minor | Human Welfare | • Small number of people affected (<10), no fatalities, and small number of minor injuries with first aid treatment.<br>• Minor displacement of people for <6 hours and minor personal support required.<br>• Minor localized disruption to community services or infrastructure <6 hours. |
| | | Environment | - Minor impact on environment with no lasting effects. |
| 3 | Moderate | Human Welfare | • Limited number of people affected (11 - 50), no fatalities, but some hospitalization and medical treatment required.<br>• Localized displacement of small number of people for 6 - 24 hours. Personal support satisfied through local arrangements.<br>• Localized damage that is rectified by routine arrangements.<br>• Normal community functioning with some inconvenience. |
| | | Environment | - Some impact on environment with short-term effects or small impact on environment with long-term effects. |
| 4 | Significant | Human Welfare | • Significant number of people (51-100) in affected area impacted with multiple fatalities, multiple serious or extensive injuries, significant hospitalization.<br>• Large number of people displaced for 6 - 24 hours or possibly beyond. External resources required for personal support.<br>• Significant damage that requires external resources.<br>• Community only partially functioning, some services unavailable. |
| | | Environment | - Significant impact on environment with medium to long-term effects. |
| 5 | Catastrophic | Human Welfare | • Very large number of people (>100) in affected area(s) impacted with significant numbers of fatalities, large number of people requiring hospitalization with serious injuries with long term effects.<br>• General and widespread displacement for prolonged duration and extensive personal support required.<br>• Extensive damage to properties in affected area requiring major demolition.<br>• Serious damage to infrastructure causing significant disruption to, or loss of, key services for prolonged period. Community unable to function without significant support. |
| | | Environment | - Significant long-term impact on environment and/or permanent damage. |

## Provincial Hazard Identification – 4.0

After an analysis of hazards at a local municipal level, the results were tabulated to reveal a detailed listing of the significant hazards for each community that requires essential mitigation.

It is imperative to note that there are certain circumstances that must be taken into consideration when analyzing hazard classifications made by specific areas. For instance, a hazardous materials release in a remote northern community versus a hazardous materials release in a populated urban region such as Winnipeg or Brandon. In the event of a release in a populated southern region, highly trained individuals with specialized response equipment have the capability to arrive, barring any adverse circumstances, within a reasonable timeframe. In comparison to this, a response to remote regions of the province may be delayed upwards of several hours due to logistical problems such as challenging environments. This one condition would be enough to severely affect the hazard impact brought upon the area. Circumstances such as this cause an increase to the intensity of a specific hazard based solely on geographical and spatial diversity.

There are several other factors that contribute to differences in how specific hazards are perceived throughout the various regions in the province. It is imperative to understand this as the high severity ranking of individual hazards across several regions illustrates the fact that some hazards transcend geographic boundaries and thus become essential to mitigate on a provincial level.

Listed in the following table is a comprehensive breakdown of hazards found to be of importance, though not limited to, municipal or local-level agencies. The first column in the table lists the hazards identified by municipal entities. The second column displays the percentage of municipalities that consider the hazard in question to be significant. The percentage value is calculated by comparing the total number against the number of agencies questioned. The third column illustrates the risk level from the values listed in the risk rating matrix. The hazards are only divided into groups based on risk level, not on a ranked order of possible occurrence. The final column relates the individual hazard back to the specific cell located on the risk rating matrix.

| Identified Hazard | Percentage of total | Risk Level | Likelihood/Impact |
|---|---|---|---|
| Dangerous Goods Incident – Road | 44 | | Highly Probable/ Significant |
| Dangerous Goods Incident Rail | 35 | | Highly Probable/ Significant |
| Large Structure Fires | 100 | | Highly Probable/ Significant |
| Large Structure Collapses | 100 | | Possible/ Significant |
| Chemical Warehouse Fires | 35 | | Possible/ Significant |
| Wildland Urban Interface Fires | 30 | | Probable/ Catastrophic |
| Other Chemical Emergencies | 23 | | Possible/ Significant |
| Grain Elevator Fires | 56 | | Probable/ Significant |
| Major Flood | 9 | | Probable/ Catastrohic |
| Severe Storm | 6 | | Highly Probable/ Significant |
| Large Animal Barn Fires | 15 | | Possible/ Moderate |
| Lumber Yard Fires | 14 | | Possible/ Moderate |
| Pipeline Explosions | 7 | | Possible/ Moderate |
| Small Town Hotel Fires | 29 | | Probable/ Moderate |
| Tire Storage Fires | 3 | | Possible/ Moderate |
| Aircraft Crash at or near Airport | 8 | | Possible/ Moderate |
| Abandoned Structure Fires | 9 | | Highly Probable/ Moderate |
| Wildland Grass & Brush Fires | 14 | | Highly Probable/ Moderate |
| School Fires | 32 | | Possible/ Moderate |
| Electrical Blackout | 2 | | Possible/ Moderate |
| Bulk Fuel Facility Emergencies | 9 | | Possible/ Moderate |
| Hospital Fires/Forced Evacuations | 8 | | Unlikely/ Moderate |
| Hydro Dam Failure | 2 | | Rare/ Catastrophic |
| Community Hall Fire | 36 | | Possible/ Minor |
| Water Related Incidents | 3 | | Highly Probable/ Moderate |

## Provincial Results – 5.0

After careful analysis, the results were then compiled to represent hazards at a regional level. The regional level is defined by using the existing boundaries. Listed below are the hazards found to be significant at the provincial level.

### a) High Risk Hazards

| |
|---|
| Dangerous Goods Incidents – Rail |
| Dangerous Goods Incidents - Road |
| Major Flooding |
| Wildland Urban Interface Fire Incident |
| Wildland Grass & Forest Fire Incident |
| Structural Collapse Incident |
| Large Structure Fire Incident |
| Chemical Warehouse Fire |

### b) Moderate Risk Hazards

| |
|---|
| Severe Storm (tornado, snow, ice and wind) |
| Pipeline Explosion (fuel or gas) |
| Prolonged Electrical Loss |

In addition to this list, there is a grouping of hazards that would not be recognizable at the municipal or at times even regional level. These include the following:

- Province-wide Electrical Blackout
- Disease Outbreak
- Major Dam Failure

The scope and nature of these hazards is such that the entire province would be affected by an incident of this magnitude. It would be futile for municipal entities to plan for these catastrophes as mitigation attempts would be far beyond the capabilities of local responders. It is, however, imperative for provincial entities to be aware of these possible hazards and plan accordingly to ensure proper mitigation of any occurrences.

In conclusion, the information presented in this report provides an excellent base from which to improve on the positive trends that are present in the Province of Manitoba today. Tools such as this assessment are instrumental in providing a heightened sense of the hazards that are present in the province. In addition to this it also allows for a proper allocation of mitigation efforts such as resource allocation and training programs as well as providing direction for agencies such as the Manitoba Office of the Fire Commissioner and Manitoba Emergency Measures Organization. These endeavors are aimed at protecting the citizens of Manitoba.

The additional entries found in this report (Appendix A & B) provide a detailed view of the evidence portrayed and account for the base data used to calculate the values used in this report.

# Appendix A

## Hazard Classification & Definition

(Hazards are classed according to greatest threat presented)

## Technological Hazards

### Dangerous Goods Incident – Road & Rail

Dangerous goods are substances which pose risk to health, safety, property or the environment during operation and/or transportation. All of these substances are divided in classes in accordance to the specific chemical characteristics resulting in a degree of danger. The classification was not attributed in relation to that specific degree of danger but merely for convenience purposes.

Class 1: Explosives

Class 2: Gases

Class 3: Flammable Liquids

Class 4: Flammable Solids

Class 5: Oxidizing Agents & Organic Peroxides

Class 6: Poisonous (Toxic) and Infectious Substances

Class 7: Radioactive Substances

Class 8: Corrosive Substances

Class 9: Miscellaneous Dangerous Substances

### Aircraft Accident

Includes all instances of aircraft being involved with any of the following:

*Declared Emergencies*
*Engine Failure*
*Collision/Crash*
*Risk of Collision*
*Smoke/Fire*
*Other abnormalities*

For the purpose of this assessment the following are considered types of aircraft:

*Airliners*
*Air Taxi*
*Corporate*
*Private Craft*
*Balloons*
*Commuter Aircraft*
*Aerial Work*
*Helicopters*
*Gliders*
*Gyrocopters*

## Industrial Manufacturing / Warehouse Incidents

Includes fires, intentional releases, unintentional releases, and industrial accidents at manufacturing, storage or production facilities which produce products covered under, but not limited to, the definitions put forth by the North American Industry Classification System (NAICS). The following sectors are listed under the NAICS section 3251 (Chemical Manufacturing).

*Basic Chemical Manufacturing (NAICS 3251)*
*Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing (NAICS 3252)*
*Pesticide, Fertilizer and Other Agricultural Chemical Manufacturing (NAICS 3253)*
*Pharmaceutical and Medicine Manufacturing (NAICS 3254)*
*Paint, Coating and Adhesive Manufacturing (NAICS 3255)*
*Soap, Cleaning Compound and Toilet Preparation Manufacturing (NAICS 3256)*
*Other Chemical Product Manufacturing (NAICS 3259)*

## Pipeline Explosion

Refers to a pipeline, valve component, or pumping station that experiences a rupture or release caused by:

*Operator Error*
*Mechanical Failure*
*Corrosion*

The following products represent the majority of products flowing in pipelines across the Province of Manitoba. (*TransCanada Pipelines Inc.):*

*Gasoline*
*Crude Oil*
*Propane*
*Natural Gas*

## Electrical Blackout (Power Outage)

Refers to a regional or municipal area being without electrical power for a period of time exceeding 15 minutes. Power outages may have one or more of the following causes:

*Severe weather (tornado, ice, snow, wind)*
*Mechanical Failure*
*Operator Error (Possible occurrence during maintenance)*
*Intentional Act*

**Hydro Dam Failure**

A breach in the dam itself, its foundations, abutments, or spillway which results in a large or rapidly increasing uncontrollable release of water from the reservoir.

## Climatologic Hazards

**Major Flood**

Refers to the prolonged or excessive inundation of land in Manitoba. The vast majority of incidents stem from spring flooding caused by exceptionally fast snowmelt or large amounts of precipitation coinciding with melting temperatures.

Large inundations occur mainly on the Red River watershed because of its level topography and diminished slope. Flooding also occurs in the Assiniboine and Saskatchewan River watersheds.

Five major flood events in the past 200 years:
*1826* *1852*
*1950* *1979*
*1997*

The flow values of the 1826 and 1997 inundations exceeded the 100 year recurrence interval.

**Severe Weather**

Arranged into the following categories:

*Blizzards*: High winds (90-103 Kph) combined with heavy snowfall and low temperatures intensified by the wind chill factor. This may be accompanied by freezing rain and is most dangerous in relatively open regions of the province.

*Tornadoes*: Funnel clouds of very rapidly rotating air. At the centre is an intense low pressure area of rapidly rising air. The tornado is a secondary formation of vortex activity in a higher cloud layer. The extreme wind velocities has a severe impact on people, property and infrastructure.

*Heat Waves*: Can be characterized by temperatures significantly above the mean for an extended period or by a combination of high temperatures, high humidity and a lack of air motion. Heat waves impact the very young, the elderly and those with cardiovascular conditions.

*Summer Storms*: Comprised of extreme rainfall, large hail, high winds and possibly tornadic activity. Damaging to property, infrastructure and agriculture.

## Fire / Rescue Hazards

### Large Structure Fires

Refers to fires located in large structures erected for community use or commercial enterprise. Includes, but is not limited to the following:

*Schools*
*Lumber Yards*
*Hotels*
*Hospitals*
*Grain Elevators*
*Large Animal Barns*
*Community Halls*

The full involvement of these structures, in most cases, exceeds the capacity of the responding agency, requiring additional assistance.

### Large Structure Collapse

Occurs when a building or structure collapses due to:

- engineering or construction problems
- metal fatigue
- changes to the load bearing capacity of the structure
- human operating error or other causes such as flood, fire, explosions, snow or ice build-up.
- Intentional Act

This is predominantly a problem in rural areas of the province where several large structures predating modern building codes are still in use by the general public, or conversely, abandoned buildings that have not been secured or destroyed.

### Wildland Urban Interface Fires

Generally refers to wildland or forest fires involvement in areas that include at least one, but are not limited to, the following attributes:

*Structures (such as homes) situated in lightly populated agricultural areas which may also contain forests or rangelands;*

*Low-density housing communities or subdivisions located next to or in the forest;*

*Cottages, cabins, and recreational and industrial facilities located in the forest;*

*Small-to-medium-sized communities (often aboriginal settlements or resource-based communities with populations ranging from 500 to 5,000) surrounded by vast expanses of forest.*

**Wildland / Forest Fires**

Forest fires have a propensity to occur in the densely wooded areas of Northern Manitoba. They are broken into three main classifications.

*Surface Fires***:** Fires burning in fuels near to the ground, such as dead leaves and twigs, fallen trees, grass and duff. (Duff is loosely-compacted organic material of moderate depth below the forest floor). These can be spread at a rate of 1-5 metres per minute.

*Intermittent Crown Fires*: Fires consuming the crowns (tops) of some of the trees. These can burn at a rate of 25-50 metres per minute.

*Continuous Crown Fires:* Fires consuming the crowns of all or most of the trees. These can burn at a rate of 25-80 metres per minute.

**Water Related Incidents**

Refers to the specialized rescue of victims from water or water related environments. Responders utilize various specialized equipment based on the type of situation. Many of the responding agencies that compromise the hazardous regions have the necessary training to complete a successful rescue. Additional equipment would be requested through mutual aid if the complexity of the situation rose above the capacity of the local response agency.

# Appendix B

## Incident Characteristics & Description

## Dangerous Goods Incident – Road

| Incident Characteristics | Description |
|---|---|
| **Frequency of Occurrence** | In 2004 there were 38 reports of road transport incidents in Manitoba. Important to note: Not all of these incidents required response from a technical resource. *(Transport Canada, CANUTEC*) |
| **Location** | All areas of the province are susceptible to dangerous goods incidents because of the need to transport products to depots and storage facilities. However, an increased volume of dangerous goods traffic flows on Manitoba's major roadways. (Provincial Highway 1, 16, 75, 6 and 10 are of particular importance.) |
| **Duration** | Span of time ranges from less than 24 hours to several days. |
| **Time Patterns** | Risk is fairly constant throughout the year, although some products such as Anhydrous Ammonia (NH3) provide increased risk based on agricultural demand in spring and fall. |
| **Speed of Onset** | Releases may occur within minutes depending on the type and size of container breached. |
| **Availability of Warning** | There is little to no pre-warning of incident occurrence as releases are usually the fault of operator or mechanical failure. |

## Dangerous Goods Incident – Rail

| Incident Characteristics | Description |
|---|---|
| **Frequency of Occurrence** | From 1994-2003 there have been 136 rail incidents involving Dangerous Goods in Manitoba (*Transport Safety Board of Canada*). This is approximately 14 incidents per year on average. This number refers to all unintentional leakage of dangerous goods while in transport. It is important to note that the vast majority of these incidents involved a small amount of product. |
| **Location** | Incident possibility exists on all major rail lines in the province spanning urban centres or depots. |
| **Duration** | Span of time ranges from less than 24 hours to several days. |
| **Time Patterns** | Risk is fairly constant throughout the year, although some products such as Anhydrous Ammonia (NH3) provide increased risk based on agricultural demand in spring and fall. |
| **Speed of Onset** | Releases may occur within minutes depending on the type and size of container breached. |
| **Availability of Warning** | There is little to no pre-warning of incident occurrence as releases are usually the fault of operator or mechanical failure. |

## Large Structure Fires

(Schools, Hotels, Community Halls, Grain Elevators, Animal Barns, Lumber Yards, Hospitals)

| Incident Characteristics | Description |
|---|---|
| **Frequency of Occurrence** | There are multiple occurrences of large structure fires each year in Manitoba. There is virtually no area of the province where this hazard is not of the utmost importance. |
| **Location** | A higher concentration of structures is located in the south simply because of the increased population. |
| **Duration** | Depending on the size of the structure the fire may last up to several hours. |
| **Time Patterns** | As with any structure fire there is a higher propensity for occurrence during the winter months. |
| **Speed of Onset** | Depending on building conditions and materials, but generally speaking will occur quite rapidly. |
| **Availability of Warning** | Virtually impossible to predict the time and extent of occurrence. |

## Large Structural Collapses

(Large buildings in use or abandoned)

| Incident Characteristics | Description |
|---|---|
| **Frequency of Occurrence** | Rising risk based on the aging of large infrastructure erected prior to Building Code developments in 1976. |
| **Location** | Structures are present in all regions of Manitoba, predominantly rural areas where outdated buildings are still in use. |
| **Duration** | Trapped victims present a savable life 10 days after collapse, this value changes based on environmental conditions. |
| **Time Patterns** | May occur at any time of year but an increased risk is present in winter based on snow load accumulating on the roof of a structure. |
| **Speed of Onset** | Extremely fast, collapse will take place within seconds. |
| **Availability of Warning** | Noticeable signs such as stress cracks in structure or foundation may be present in cases such as snow loading. |

## Industrial Manufacturing / Warehouse Incident

(Chemical Warehouses, Bulk Fuel Facilities, Tire Storage Depots, Miscellaneous Chemical Emergencies)

| Incident Characteristics | Description |
|---|---|
| **Frequency of Occurrence** | High frequency of occurrence. Has happened multiple times in the past 25 years. |
| **Location** | Located throughout the province, higher concentration is found in the southern regions based on more developed industrial regions. |
| **Duration** | Depending on what products are involved and if a fire or chemical release is present, responses do not typically exceed 48 hours. |
| **Time Patterns** | Risk is fairly constant throughout the year, although some products such as Anhydrous Ammonia (NH3) provide increased risk based on agricultural demand in spring and fall. |
| **Speed of Onset** | Releases may occur within minutes depending on the type and size of container breached and products involved. |
| **Availability of Warning** | There is little to no pre-warning of incident occurrence as releases are usually the fault of operator or mechanical failure |

## Wildland Urban Interface Fire Incident

| Incident Characteristics | Description |
|---|---|
| **Frequency of Occurrence** | High risks are present each year for urban interface fires to occur in Manitoba. Responses to these incidents occur every fire season. In 1989, 25 000 residents from 32 communities were evacuated because of wildfires that burned over 3.5 million hectares. (*Natural Resources Canada*) |
| **Location** | Mainly Northern Manitoba because of the propensity of communities to be enclosed by forest. Also at risk are cottage areas in the Whiteshell, Riding and Duck Mountains. |
| **Duration** | The fire itself will only last a matter of hours in one area but recovery may take upwards of several years. |
| **Time Patterns** | Fire season generally ranges from late spring to early fall. |
| **Speed of Onset** | Can be extremely fast, rolling crown fires can spread at rates of up to 80 metres per minute. |
| **Availability of Warning** | Depending on where the initial fire start is located, may range from hours to days. |

## Major Flooding

| Incident Characteristics | Description |
|---|---|
| **Frequency of Occurrence** | Flooding is a common occurrence in Manitoba. Major events have occurred in the following years; 1826, 1852, 1950, 1979, 1997. The return period for the 1997 event was calculated to be 144 years. (*Statistics Canada*) |
| **Location** | Red River Watershed, including the Red River and its tributaries. Assiniboine Watershed, including the Assiniboine River and its tributaries. |
| **Duration** | During large events, timeframes run from early to mid April and last until late May or early June. |
| **Time Patterns** | Snowmelt Flooding: April through June<br>Severe Weather Events: May through September. |
| **Speed of Onset** | Relative to other hazards large events generally progress slowly. During the 1997 event, waters rose to a peak of 34.3 feet (city datum) by May 4 (761.87 feet geodetic.) (*Manitoba Water Stewardship*) |
| **Availability of Warning** | Regarding spring flooding, ample warning time is usually provided in order to properly plan a response. Accurate forecasting can be obtained as early as 2 months prior to an expected event. |

## Severe Weather

(Blizzards, Heavy Rain, Extreme Wind, Extreme Heat/Cold)

| Incident Characteristics | Description |
|---|---|
| **Frequency of Occurrence** | Each year Manitoba experiences weather that causes significant physical or economical damage to the affected region. For the purpose of this assessment all forms of weather phenomena with a recurrence interval of at least 7.5 years is to be considered “Severe Weather”. |
| **Location** | As the topographical and climatic features of Manitoba are rather uniform throughout, severe weather presents a relatively equal threat throughout the province. An exception may be a noticeably colder winter period in the northern reaches of the province. |
| **Duration** | Because of the all encompassing nature of “severe weather”, risk is present throughout all seasons. |
| **Time Patterns** | Winter blizzards may last for several days, while tornadic activity may last for greater than 1 minute. |
| **Speed of Onset** | Rapid onset is typical with many severe weather events, in some cases less than 10 minutes. |
| **Availability of Warning** | There are usually telltale precursors leading to a severe climatic event, these may be present as much as 24 hours in advance. However, the actual event itself is extremely difficult to pinpoint and mitigate against. |

## Pipeline Explosion

| Incident Characteristics | Description |
|---|---|
| **Frequency of Occurrence** | Two major occurrences in the past 10 years. (*Brookdale 2002, Rapid City 1995)* |
| **Location** | Main gas pipelines go from west to east through Miniota to Winnipeg then east to Kenora. In addition to this, a main branch runs from Winnipeg south through Niverville for service to the United States. (*Transcanda Pipelines Ltd.)* |
| **Duration** | Releases may last a varied amount of time depending on where it occurs in relation to the remote shut off valve. |
| **Time Patterns** | Not seasonally effected, may happen at any time. |
| **Speed of Onset** | Extremely fast and volatile, caused by explosive products such as propane or natural gas. |
| **Availability of Warning** | Little to no warning is possible to signify a pipeline breach. |

## Aircraft Accidents

(Occurrence near airport or otherwise)

| Incident Characteristics | Description |
|---|---|
| **Frequency of Occurrence** | In Manitoba there was an average of 24.6 accidents within the period 1998 to 2002, compared to 28 accidents in 2003<br>• Declared emergencies made up 36% of aircraft incidents in 2003.<br>• Risk of collision/loss of separation made up 18% of aircraft incidents in 2003.<br>• Engine failure made up 16% of aircraft incidents in 2003.<br>• Smoke/fire made up 12% of aircraft incidents in 2003.<br>• Collision made up 2% of aircraft incidents in 2003.<br>• Other factors made up the remaining 16% of aircraft incidents in 2003.<br>(*Transportation Safety Board of Canada*) |
| **Location** | The vast majority of incidents occurred at or near an airport. Only 2% of incidents were the result of a downed plane. |
| **Duration** | Response may last several days depending on location of downed aircraft. |
| **Time Patterns** | Risk is persistent throughout the year. |
| **Speed of Onset** | Extremely fast, depending on problem. |
| **Availability of Warning** | Little warning available for mechanical failure. |

## Wildland / Forest Fire Incident

| Incident Characteristics | Description |
|---|---|
| **Frequency of Occurrence** | Hundreds of fires occur throughout the province each year. (*Natural Resources Canada*) |
| **Location** | Predominantly in Northern Manitoba, but may occur in densely wooded areas of Southern Manitoba. |
| **Duration** | Large fires may last upwards of several weeks. |
| **Time Patterns** | Fire season generally ranges from late spring to early fall. |
| **Speed of Onset** | Can be extremely fast, rolling crown fires can spread at rate of up to 100 metres per minute. (*Natural Resources Canada*) |
| **Availability of Warning** | Forest fire conditions are carefully monitored, though it is impossible to tell exactly when a fire will start, likelihood assessments based on ambient conditions are produced each day during fire season. |

## Power Outage

(Described as regional or municipal power loss, not province wide)

| Incident Characteristics | Description |
|---|---|
| **Frequency of Occurrence** | Regional power outages occur multiple times per year based on severe weather or mechanical failure. |
| **Location** | Risk is present in all parts of Manitoba. |
| **Duration** | The vast majority of blackouts last for less then 8 hours. |
| **Time Patterns** | Occur at all times of the year. |
| **Speed of Onset** | Instant power loss occurs once supply is disrupted. |
| **Availability of Warning** | Little warning is possible, however repair is usually timely. |

## Hydro Dam Failure

| Incident Characteristics | Description |
|---|---|
| **Frequency of Occurrence** | A dam release large enough to cause a significant amount of damage has never occurred in Manitoba. |
| **Location** | Most of the important hydroelectricity dams are found on the Nelson River and concentrated in Northern Manitoba. |
| **Duration** | Inundation from a dam burst may last anywhere from several hours to days, depending on terrain and slope. |
| **Time Patterns** | This type of incident would pose various problems at all times of the year. |
| **Speed of Onset** | Residents near the release may see effects in minutes while down stream regions may take hours to be affected. |
| **Availability of Warning** | There would likely be some warning present regarding the lack of structural integrity. |

## Water Related Incidents

(Water rescue situations regarding persons or property)

| Incident Characteristics | Description |
|---|---|
| **Frequency of Occurrence** | Each year there is a need to respond to multiple incidents requiring a water rescue on waterways in Manitoba. |
| **Location** | Risk is present where ever utilized waterways are found. |
| **Duration** | Depending on the complexity of the rescue, may last several hours. |
| **Time Patterns** | Risk is more proficient in warm weather. However unique challenges are presented by winter rescue attempts. |
| **Speed of Onset** | Generally speaking incidents escalate very quickly. |
| **Availability of Warning** | There is no way to predict the time or circumstances of the next incident. |


**1601 Van Horne Avenue East Brandon, Manitoba, Canada R7A 7K2**
**Phone: (204) 726-6855 Fax: (204) 726-6847 Email: firecomm@gov.mb.ca**
**Website: www.firecomm.gov.mb.ca**
**Toll Free: 1-888-253-1488**

Leech Printing 150562