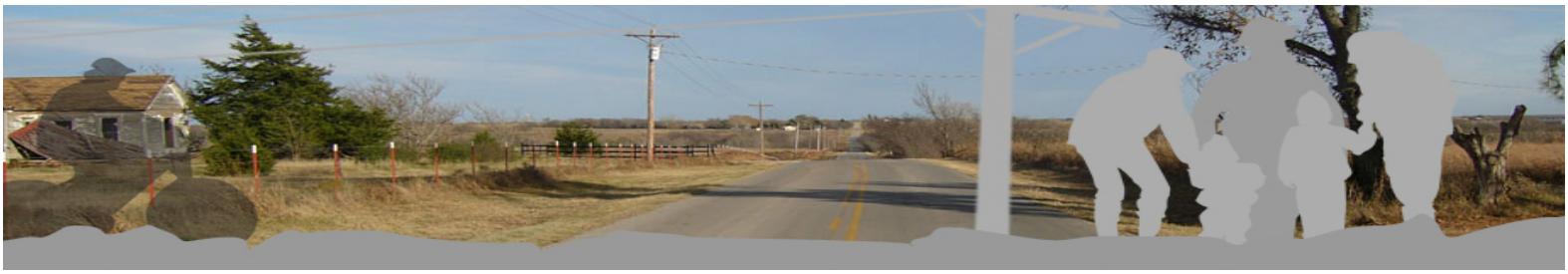

Hazard Risk Assessment

Hazardous Material Spills, Explosions and Leaks

Hazardous Material Spills, Explosions and Leaks

This section discusses explosions and hazardous material spills and leaks both in situ (on a specific site) or during the transportation of hazardous materials. Resources are available to assist you in completing this assessment in the Risk Assessment Resources section. Various explosions and leaks are presented including those involving gas, mines and other causes. Hazardous material spills are discussed both when occurring on a specific site, or in situ, and those occurring during the transportation of hazardous materials.

Explosions and Leaks

Definition

Explosions occur when natural gas, propane, sewer or gasoline pipelines rupture, by accident or because of poor design or corrosion. Explosions can also occur as a result of a build-up of flammable gases (e.g., grain silos or mines) or pressurized liquids and gases (e.g., boilers). One type of unusual explosion is soil-generated, usually created when building on contaminated soils.

Leaks can occur through operator error, structural failure or construction flaws. Leaks can come many different types of containers, reservoirs and pipelines and well as from transportation vehicles, ships and planes.

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Discussion

Explosions by their very nature provide little warning time or chance for people to avoid the situation. They can vary in size, from small explosions which cause damage in one office building, to large explosions which result in the evacuation of hundreds. Often single site gas leaks are caused by construction crews and unfamiliarity with existing gas lines. More serious can be the gas leaks which seep into sewer systems.

Explosions also can set off fires which have the potential to do more damage than the initial cause. Explosions can cause structural collapse of buildings and can release toxic fumes. Those responsible for the explosion are often killed or severely injured, thus finding out additional potential hazards from the explosion can be extremely difficult.

Mine explosions are usually caused by a buildup of explosive gases underground in the mine. These gases can be set off by a spark or by miners entering, working or leaving the area. Errors with the handling of explosives underground can also cause life-threatening explosions. It is difficult, in many cases, to determine the security risk of live ammunition, or explosives, that are carried in military bases or have been used during tests and exercises. Old military field firing ranges always have the potential to have buried explosive ordnance surface or become exposed to the environment.

Gas and oil leaks can occur as a result of a transportation accidents, deteriorating underground tanks and ruptured pipelines. It is obvious to state that an oil spill, no matter how small, will have an immediate impact on the natural environment. Large oil pipeline leaks in Canada have occurred as a result of corroding pipelines from older pipes; however, even new pipelines have had their share of leaks – principally as a result of human error.[1]

It Happened Here…

Gas Explosions and Gas Leaks

On April 14, 2002 100 people within a 4km radius were evacuated from Brookdale, Manitoba (38 households) following a gas explosion at a ruptured pipeline[2].

On January 25, 1999 a series of gas explosions at the Solex Gas Liquids plant sent 60m high flames into the air near Taylor, British Columbia (population 1,143). A state of emergency was declared and the entire town was evacuated. Fifteen injuries were reported, all were firefighters who were inside fighting the blaze when the explosion happened[3].

June 24, 2008, a pipeline rupture leaked up to 200 barrels of sweet crude oil in the Red Deer River, causing a popular recreation destination in Alberta, Gleniffer Lake, the reservoir of Dickson Dam south of Sundre, to close for eight days while efforts were made to contain and clean up the oil leak. The spill forced downstream recreation communities on Gleniffer Reservoir to shut off their drinking water supply intake. Once the David Thompson Health Region determined that the water is safe, it allowed these two raw water intakes to reopen June 27, 2008. Before this date, Pembina Pipelines paid for water to be trucked into the communities.[4]

Mine Explosion

On May 9, 1992 at 5:18am a mixture of methane gas and coal dust exploded at the Westray Mine in Plymouth, Nova Scotia (population unknown)[5]. All 26 people on shift died, 11 bodies were never recovered. Unfortunately, prior to the disaster there were many complaints to the union about poor working conditions.

Other Explosions and Leaks

At 6:18pm on April 15, 2007 990 cubic meters of crude oil were released into a wetland area due to a ruptured pipe near Glenavon, Saskatchewan (population 104)[6]. Damages were kept at a minimum as 912 cubic meters were recovered.

Hazardous Material Spill

Definition

In Canada, hazardous material accidents occur from materials in two distinct contexts: spills, leakage or accidents involving materials in situ, or in fixed locations; and those arising from the transportation of hazardous materials by train, aircraft, truck or ship.

Hazardous materials can involve any materials that are deemed to be dangerous goods by Transport Canada. These involve toxic gases, radioactive material, acids and any number of chemicals and goods. Hazardous materials can also include gas or oil spills, where these products can add to risk of fire, explosion or damage to the environment.

Discussion

CANUTEC is the Canadian Transport Emergency Centre operated by Transport Canada to assist emergency response personnel in handling dangerous goods emergencies. CANUTEC has set up a scientific data bank on over 750,000 chemicals manufactured, stored and transported in Canada and is staffed by professional scientists specialized in emergency response and experienced in interpreting technical information and providing advice. CANUTEC receives around 30,000 calls per year with over 1,000 of those calls required an emergency report.[7]

Approximately half of the annual hazardous spills in Canadian waters are from oil or refined petroleum products; every day, between five and ten oil spills are reported nationally[8]. Dangerous goods include explosives, compressed and liquefied gases, flammable and combustible materials, oxidizing materials and organic peroxides, poisonous and infectious substances, radioactive materials, corrosives, and miscellaneous dangerous goods. The list of materials which are declared hazardous in transport is identical to that for fixed facilities.

Various facilities such as those where hazardous materials are manufactured, processed, stored, treated, and disposed of are considered in situ-hazardous material sites. As such, the potential sites for hazardous materials incidents are many.[9] Many rural sites which produce and process natural resources produce and use hazardous materials. These can include: pulp and paper mills, sawmills, mines, oil and gas drilling sites, refineries, slaughterhouses, and tanning of hides. Industrial sites involved in making of pharmaceuticals, fertilizers, paints are also sources of hazardous material spills. Gas and oil pipelines can rupture and spill their contents into the environment.

It Happened Here…

In Situ Hazardous Material Accidents

On July 16, 2007 sulphur dioxide was mistakenly released into the air from the AV Cell pulp mill when a pipe broke near Atholville/Tide Head, New Brunswick (population 1,317)[10]. The leak lasted for 15 minutes. No evacuations occurred nor were injuries reported.

Marine Hazardous Material Spills

On February 4, 1970 a ship ran aground on Cerberus Rock in Chedabucto Bay, Nova Scotia (population 911) during heavy rain and winds[11]. An oil spill ensued causing catastrophic damage to the coast and the surrounding communities.

Land Hazardous Material Spills

At 5:50am on Oct 2, 2009 a tanker truck carrying sulphuric acid collided with another vehicle causing the contents to spill in Sunnybrook, Alberta (population 68)[12]. The highway remained closed until midnight while crews cleaned up the spill. No one was seriously injured.
Just before 7pm on October 11, 2006 two vehicles collided near Morriston, Ontario (population 267)[13]. Diesel fuel and sulphuric acid leaked from the tractor trailer causing all eastbound lanes to be shut down as clean-up crews contained the spill; one individual was sent to hospital with non-life-threatening injuries.
Rail Hazardous Material Spills

On October 18, 2010 more than a dozen cars of a freight train carrying ammonium nitrate, sulphuric acid and sodium cyanide left the tracks near Glendale, Ontario (population 957)[14]. Toronto-Montreal passenger trains had to be rerouted through Ottawa adding 2 hours to the trip while freight services were halted. Via Rail stopped selling passenger tickets along the route for the duration of the clean-up.

On June 14, 2010 a Canadian Pacific cargo train collided with a garbage truck spilling diesel fuel near St. Adolphe, Manitoba (population 1048)[15]. The truck driver experienced non-life-threatening injuries.

Risk Rating

Various explosions and leaks are presented including those involving gas, mines and other causes. Hazardous material spills are discussed both when occurring on a specific site, or in situ, and those occurring during the transportation of hazardous materials.

Gas Explosions and Gas Leaks16,17,18,19 – Human-caused

Hazard Rating	High Risk ☐	Low Risk ☐	Need More Info ☐	Not Applicable ☐

If your community does not have natural gas and if there are no natural gas pipelines near your community you can safely state that it is “Not Applicable.”

Yes	No	Need More Info	Not Applicable	FACTORS
☐	☐	☐	☐	Power plants, oil sands, propane distribution facilities, and other industrial sites and plants are at risk for gas explosions and leaks. Does your community have any of these facilities located in or around it?
☐	☐	☐	☐	Earthquakes can cause gas explosions. Is your community at risk for earthquakes and do you have gas pipelines to your community (Refer to section on earthquakes)?
☐	☐	☐	☐	Natural gas is the main source of gas leaks and explosions. Do the homes and buildings in your community receive natural gas?
☐	☐	☐	☐	Gray cast iron pipes are the pipe material most utilities are experiencing failure with due to their brittleness. Pipe failure can cause gas explosions. Is your community’s gas supplied through gray cast iron pipes?
☐	☐	☐	☐	Old pipes fail more frequently. Are the pipes that supply your community’s gas old?

Mine Explosions [20] – Human-caused

Hazard Rating	High Risk ☐	Low Risk ☐	Need More Info ☐	Not Applicable ☐

If your community does not have any mines in close proximity to it you can safely state that this is "Not Applicable."

Yes	No	Need More Info	Not Applicable	FACTORS
☐	☐	☐	☐	In order to be at risk from mine explosions a community must be located near a mine. Does your community have a mine located in or near it?
☐	☐	☐	☐	Gas explosions resulting from coal and gas outbursts are the most common disaster at coal mines and most mining explosions seem to occur at coal mines. Does your community have a coal mine located in or around it?
☐	☐	☐	☐	Spontaneous combustion of sulphide ores is a significant risk during mining of sulphide ore deposits. Does your community have a sulphide ore mine located in or around it?
☐	☐	☐	☐	Lightning is the primary cause of premature initiations of explosives in mining. Is your community at risk for lightening (refer to the atmospheric hazards section on lightening)?
☐	☐	☐	☐	In order to be at risk from mine explosions a community must be located near a mine. Does your community have a mine located in or near it?

Oil Pipeline Leaks[21]– Human-caused

Hazard Rating	High Risk ☐	Low Risk ☐	Need More Info ☐	Not Applicable ☐

If your community does not have an oil pipeline near your community you can safely state that this is "Not Applicable."

Yes	No	Need More Info	Not Applicable	FACTORS
☐	☐	☐	☐	In order to be at risk from an oil pipeline leak a community must be located near a pipeline. Does your community have an oil pipeline located in or near it?
☐	☐	☐	☐	Older pipelines have a higher risk of corrosion. Is the pipeline near your community older and is it not frequently inspected for corrosion?
☐	☐	☐	☐	Oil pipelines leaks can be minimized if an Emergency Response Team is located in near proximity. Are Emergency Response Teams capable of dealing with a pipeline burst located more than an hour away?
☐	☐	☐	☐	Pipelines have also been a source of sabotage. Have there been known cases of sabotage of a major pipeline in or near your community?

Other Explosions [22] [23] [24] [25] – Human-caused

Hazard Rating	High Risk ☐	Low Risk ☐	Need More Info ☐	Not Applicable ☐

Yes	No	Need More Info	Not Applicable	FACTORS
☐	☐	☐	☐	Former live-fire military training facilities can be contaminated with unexploded ordnances that can explode if triggered. Does your community have a former live-fire training facility in or around it?
☐	☐	☐	☐	Blasting techniques used on steel can cause explosions. Does your community have steel blasting facilities in or around it?
☐	☐	☐	☐	There are records of explosions at textile plants. Does your community have a textile plant in, or around it?
☐	☐	☐	☐	Dust explosions are associated with industries that produce ignitable dust as a by-product. Do the industries in your community produce ignitable dust as a by-product?
☐	☐	☐	☐	Former live-fire military training facilities can be contaminated with unexploded ordnances that can explode if triggered. Does your community have a former live-fire training facility in or around it?

Hazardous Material Spills – On Site/In Situ[26],[27] – Human-caused

Hazard Rating	High Risk ☐	Low Risk ☐	Need More Info ☐	Not Applicable ☐

Yes	No	Need More Info	Not Applicable	FACTORS
☐	☐	☐	☐	Areas where previous hazardous materials spills have occurred are at greater risk. Has your community experienced a hazardous material spill in the past?
☐	☐	☐	☐	Chemical manufactures and other industrial sites (i.e., active pulp and paper mills, forest mills, nuclear power plants, etc.) are a source of hazardous material. Does your community have a chemical manufacturer and/or other industrial site in or near it?
☐	☐	☐	☐	Other areas where dangerous substances are being handled in quantity are at risk. Does your community have any of these types of areas in or around it?
☐	☐	☐	☐	Chemicals stored under pressure (greater than normal or ambient pressure) pose a greater risk than those not under pressure. Does your community have chemicals stored under pressure in or around it?

☐	☐	☐	☐	Over time storage containers can deteriorate increasing the risk of leaks. Does your community have a long-standing hazardous material storage area?
☐	☐	☐	☐	Discarded waste rock or tailings from mines can contaminate the surrounding areas. Does your community have a mine located in or around it?
☐	☐	☐	☐	Increased patient care produces a growing amount of biomedical or infectious wastes. For a number of years, these wastes were dumped in municipal landfills and often stockpiled for several days between collections. This concentration of wastes presents a threat to regional health. Was your community's dump a site for biomedical and infections wastes in the past?
☐	☐	☐	☐	Extreme natural events (e.g. volcanic eruptions, earthquakes, landslides, hurricanes, tornadoes, blizzards, floods, forest fires) can trigger a material spill. Is your community at risk for any of the listed events (Refer to the relevant sections for these hazards)?
☐	☐	☐	☐	Lack of inspection of sites and an unwillingness to enforce regulations can increase risk. Are the inspections of sites with hazardous materials in your community unregulated and/or irregular?

Hazardous Material Spills – Air Transport – Human-caused

Hazard Rating	High Risk ☐	Low Risk ☐	Need More Info ☐	Not Applicable ☐

Yes	No	Need More Info	Not Applicable	FACTORS
☐	☐	☐	☐	**Is your community located in hazardous material air route?
☐	☐	☐	☐	There is a risk of air transport hazardous material spills if your community is at risk for air crashes. Is your community at risk for air crashes (refer to the section on Accidents)?

Hazardous Material Spills – Marine Transport– Human-caused

Hazard Rating	High Risk ☐	Low Risk ☐	Need More Info ☐	Not Applicable ☐

If you don't have any lakes, rivers or oceans that boats or ships can navigate then you can safely state that this is "Not Applicable."

Yes	No	Need More Info	Not Applicable	FACTORS
☐	☐	☐	☐	**Is your community located in hazardous material air route?
☐	☐	☐	☐	There is a risk of air transport hazardous material spills if your community is at risk for air crashes. Is your community at risk for air crashes (refer to the section on Accidents)?

Hazardous Material Spills – Land Transport[28] – Human-caused

Hazard Rating	High Risk ☐	Low Risk ☐	Need More Info ☐	Not Applicable ☐

Yes	No	Need More Info	Not Applicable	FACTORS
☐	☐	☐	☐	**Is your community located near a land hazardous materials route?
☐	☐	☐	☐	There is a risk of land hazardous material spills if the vehicle carrying the material has an accident. Is your community at risk for motor vehicle accidents (refer to the section on Accidents)?

Hazardous Material Spills – Rail Transport – Human-caused

Hazard Rating	High Risk ☐	Low Risk ☐	Need More Info ☐	Not Applicable ☐

If your community does not have any rail lines running through, or close to, your community you can safely state that this is “Not Applicable.”

Yes	No	Need More Info	Not Applicable	FACTORS
☐	☐	☐	☐	**Is your community located near a rail hazardous materials route?
☐	☐	☐	☐	There is a risk of rail hazardous material spills if there is an accident involving hazardous materials. Is your community at risk for rail accidents (refer to the section on Accidents)?

Risk Assessment Resources

Contamination Related Resources

Accident	Resource
Hazardous Material Spills – Dangerous Goods and Oil Spills	http://www.hc-sc.gc.ca/ewh-semt/occup-travail/whmis-simdut/index-eng.php Health Canada provides details regarding environmental and workplace health, hazardous materials and related warnings and advisories. http://www.tc.gc.ca/eng/tdg/safety-menu.htm Transport Canada provides details regarding the National Oil Spill Preparedness and Response Regime and alerts and advisories related to dangerous goods.
Pipeline Incidents	http://www.tsb.gc.ca/eng/rapports-reports/pipeline/2006/index.asp The Transportation Safety Board of Canada lists all reported pipeline incidents that have occurred

Historical Events – General Information

Please Note: See your Provincial/Territorial Risk and Resilience Information Guides for additional resources, including information regarding your provincial or territorial Emergency Management Organization (EMO). EMO websites generally provide information specific to the hazards in your territory or province.

The "Canadian Disasters - An Historical Survey" website by Robert L. Jones provides a great list of past disasters which have occurred since the 1500s in Canada and have resulted in at least 20 deaths.

http://web.ncf.ca/jonesb/DisasterPaper/disasterpaper.html

The Public Safety Canada "Canadian Disaster Database" contains a list of past disasters in Canada. Note that it has not been updated since 2005.

http://www.publicsafety.gc.ca/prg/em/cdd/srch-eng.aspx

Wikipedia has a list of disasters in Canada and links to various events; however, it does not have a lot of information about British Columbia.

http://en.wikipedia.org/wiki/List_of_disasters_in_Canada

SOS! Canadian Disasters is supported by Library and Archives Canada, and provides some interesting stories on historical events and also has a great website on an education program (Grades 7 to 12) on understanding hazards and disasters in Canada.

http://www.collectionscanada.gc.ca/sos/index-e.html

CBC Archives have a wide variety of news clips on historical and current disasters in Canada as well as educational information on hazards for teachers.

http://archives.cbc.ca/search?q=disasters&RTy=0&RC=1&RP=1&RD=1&RA=0&th=1&x=10&y=14

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