Chapter 19

Accidents and Malfunctions

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19. Accidents and Malfunctions

19.1 Introduction

This chapter considers effects on the environment that may result from potential accidental events and malfunctions. Events that may occur during the construction and operation of the Parallel Runway Project (PRP), the likelihood and circumstances of these events, and the potential environmental effects that may result from any occurrence are addressed below. This chapter will look at the mitigation strategies that will be employed as part of the PRP in response to the potential accidents or malfunctions, and will provide a conclusion on the significance of each issue.

19.2 Scoping the Assessment

19.2.1 Issues Identification

Calgary International Airport (YYC) is Canada's fourth busiest airport. International airports of this size involve a large variety of resources and infrastructure to ensure efficient operations. Airport infrastructure and vehicles have the potential to cause serious accidents or malfunctions that may have adverse economic, social, or environmental effects. During construction, this includes the transport and movement of dangerous fluids, various construction activities, and an increase in vehicle traffic. During operation, there may be an increase in aircraft traffic (including runway crossings by aircraft and maintenance vehicles), an increase in the use of hazardous substances and fluids, and a general increase in the risk of incidents that result from the increase in operations.

Accidents that could occur, and which are considered to have sufficient consequence and likelihood to be addressed within this risk assessment, include:

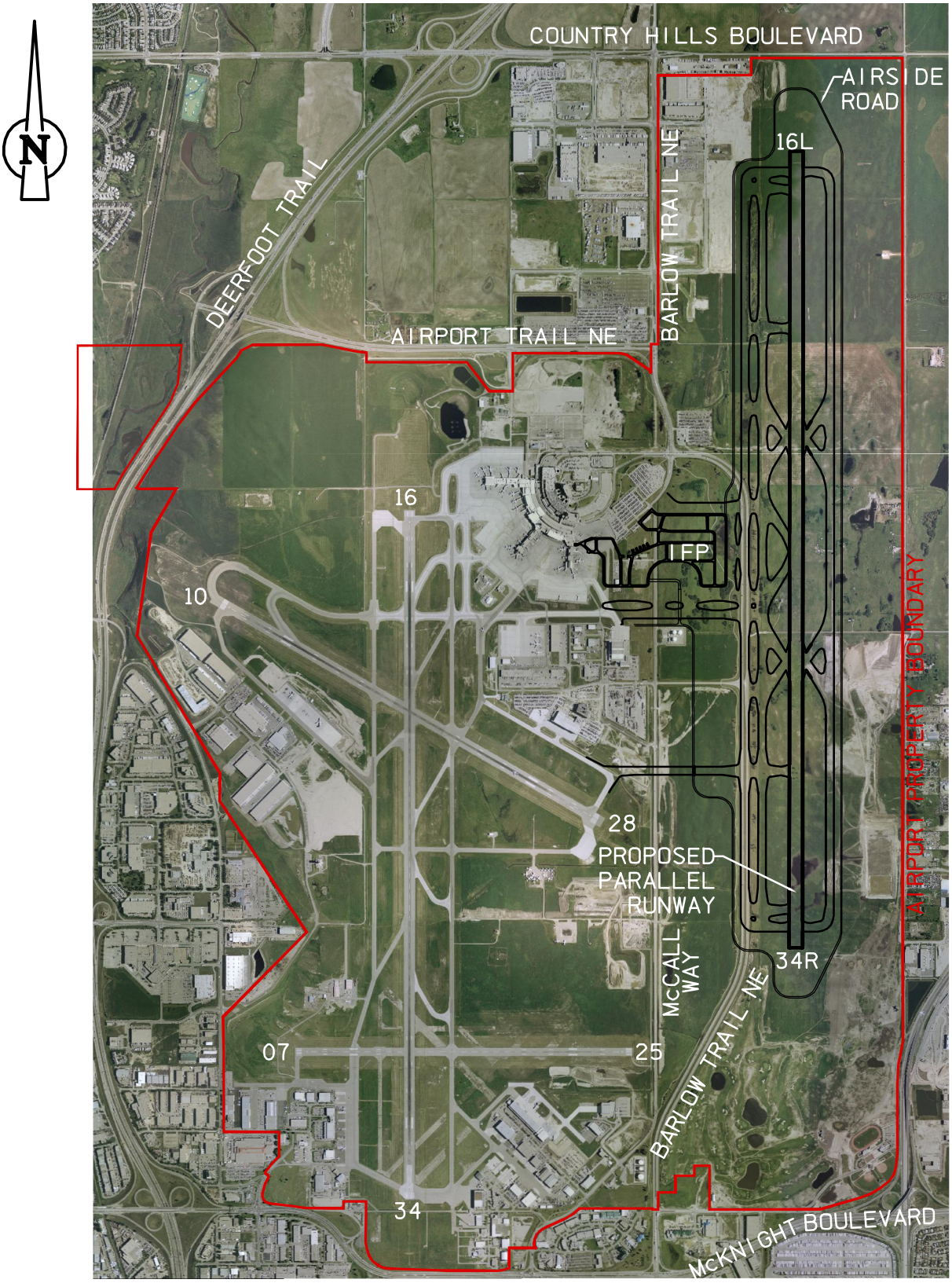
- aircraft accidents in the air or on the ground;
- aircraft-wildlife collisions;
- vehicle accidents;
- vehicle-wildlife collisions;
- major leaks or spills of hazardous substances; and
- accidental fires.

19.2.2 Spatial and Temporal Boundaries

19.2.2.1 Local Study Area

The Local Study Area (LSA) for the purpose of this chapter represents the PRP footprint and immediate vicinity, and covers an area within which all direct and some indirect effects of project activities are likely to occur.

YYC property totals approximately 2,137 ha and comprises two areas: airside, or the controlled area of the airfield, which includes the terminal building, runway, and taxiway; and groundside, or the remaining Government of Canada lands outside that of the controlled area. The LSA for this assessment will encompass some four sections of undeveloped federal lands (groundside) directly east of the existing YYC infrastructure (airside); it was defined based on the extent of the proposed PRP footprint to include an area bounded by Country Hills Boulevard to the north, Calgary Airport Park on the south, 36 Street NE to the east, and McCall Way to the west (Figure 19.1). Direct project effects beyond these limits are not anticipated.



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YYC CALGARY AIRPORT AUTHORITY

The Calgary Airport Authority
Runway Development Program
Parallel Runway Project

AECOM

Calgary International Airport

Figure 19-1

A highly modified landscape, significantly altered by surrounding land use development, the LSA is dominated by agricultural lands (cultivated, fallow, and pasture) under private lease, with extensive areas of existing anthropogenic disturbance, such as rural residences, municipal development, industrial expansion, and infrastructure (e.g., access roads, railway, trails, pipelines, power lines) occurring throughout.

19.2.2.2 Regional Study Area

The Regional Study Area (RSA) extends 5 km from the LSA and includes agricultural crop and pasture fields, as well as a few natural areas surrounded by urban development. The boundary of the RSA was established to examine alternative wildlife habitat in the vicinity of the PRP area, particularly remnant patches of natural ecosystems available for wildlife. The RSA includes three large natural areas: Nose Hill, Bowmont and 12 Mile Coulee. Although there is the potential for some accidents and malfunctions to have indirect adverse effects at a regional scale, most effects will be experienced only within the LSA.

19.2.2.3 Temporal Boundaries

The Calgary Airport Authority (the Authority) completed the Calgary International Airport Master Plan in 2004 to provide the framework for development of the facility for 20 years. It details how construction of the PRP is proposed to begin by 2011 and to be completed by the end of 2014, with little likelihood that it will be decommissioned within the foreseeable future. Thus, for the purposes of this assessment, accidents and malfunctions will be assessed simply during the construction and operation phases of the PRP. It is not anticipated that decommissioning of the PRP will occur in the foreseeable future; as such, it is anticipated operations will continue well into the late part of the 21st century.

19.3 Effects Assessment

19.3.1 Aircraft Accidents

19.3.1.1 Background

The most high profile accident or malfunction that can occur with the operation of an airport is that of an aircraft incident or accident. According to Transport Canada (TC), aircraft incidents that must be reported include:

- risk of collision, or a loss of separation, between two aircraft;
- declared emergency;
- engine failure;
- smoke or fire; and
- difficulty in controlling the aircraft.

TC defines aircraft accidents that must be reported to include:

- A person, other than a stowaway, sustains a serious injury or fatal injury, that is not self-inflicted or inflicted by another person or caused by natural causes, as a result of that person:
  - being in the aircraft,
  - coming into direct contact with any part of the aircraft, including any part that may have become detached from the aircraft, or
  - being directly exposed to the jet blast/propeller wash of the aircraft;

- The aircraft sustains damage or structural failure adversely affecting the structural strength, performance or flight characteristics of the aircraft normally requiring major repair or replacement of any affected component part, other than damage or failure that is limited to:
  - the engine, its cowlings or its accessories,
  - the propellers, wing tips, antennae, tires, brakes or fairings, or
  - small dents or puncture holes in the aircraft skin;
- The aircraft is missing or is completely inaccessible.

Statistics Canada records aircraft movements by class of operation, airports, and routes. In 2007, 4,853,463 domestic and international flights moved through Canadian airports. Of these, 248,548 were through Calgary (Statistics Canada 2007). Between 1997 and 2003, modern aeroplanes have been recorded as losing approximately 0.4 hulls per million movements in North America (Mathews 2005). This includes all types of failures, such as terrorist attacks, engine failure, bird strikes, and pilot error.

Historically, only one serious emergency resulting in the loss of an aircraft hull has occurred at YYC. That was a Pacific Western Airlines Boeing 737-275 C-GQPW in March of 1984 (ICAO 1988). The plane suffered catastrophic engine failure on take-off, aborted the take-off, and was able to evacuate all on board with no injuries by following best practice aviation safety procedures directed by the airport tower.

Aircraft crashes can result in casualties, which includes serious injuries and deaths. The nature of YYC functioning as an international airport means that large commercial airliners with many passengers on board are one of the major forms of traffic. An increase in traffic through the development of the PRP will increase this traffic and thus increase the risk of possible aircraft incidents or accidents.

An aircraft crash can also result in contamination through spills of hazardous substances or generating accidental fires. The potential effects and mitigation of such incidents are discussed in further detail in Sections 19.3.5 and 19.3.6 of this chapter.

19.3.1.2 Effects and Mitigation

The scope of effects from an air incident or accident would cover both the LSA and RSA; it can be broken down into two broad areas:

- human casualties associated with aircraft crashes or malfunctions; and
- economic effects—both spatially (on industry surrounding the PRP) and temporally (from a delay of operations).

The land use designations surrounding the site (Volume V, Chapter 7, Table 2) are primarily commercial and light industrial, with minimal recreational areas to south of the LSA. Thus, an aircraft accident could result in significant damage to the industrial or commercial areas surrounding the airport, leading to indirect adverse effects on the local economy.

Rather than mitigation, the primary focus for aircraft crashes generally deals in prevention. Modern aircraft design and safety procedures have reduced the occurrence of aircraft crashes substantially over the last 30 years. There has been a steady reduction in events resulting in hull loss and with continued technological advances, it is anticipated that this will continue to be the trend. In the Emergency Procedures Manual, the Authority has in place a variety of emergency contingency plans to deal with the possible event of an aircraft crash in a timely and effective manner. These procedures continue to be updated to ensure they are current with best practice response and management.

The Authority takes action to reduce the risk of aircraft crashes that may be caused by bird strike or airside incidents. This is also done in accordance with best practice procedures in Canada and is continually updated to maintain the highest level of risk prevention. Taxiway Juliet and Taxiway Foxtrot underpasses are being built and will reduce congestion and the conflict between aircraft and ground vehicles. This will reduce the risk of collisions.

19.3.1.3 Conclusion of Significance

Aircraft incidents and accidents have the potential to cause significant environmental, economic, or social harm; however, the likelihood of their occurrence is considered low. Safety features in modern aircraft, coupled with airline, NAV CANADA, and the Authority's operational procedures, have limited major incidents at YYC to just one hull loss to date, with no resulting casualties. The Authority also has in place practices and procedures to respond quickly and effectively to spills, fires, emergencies, and health situations that may result from an aircraft crash. These have been successful in mitigating any serious environmental effects occurring as a result of aircraft failure or accidents. Moreover, several international airports around the world that support substantially more traffic than that anticipated at YYC have successfully used the same best practice procedures to effectively mitigate the risk of aircraft accidents having serious effects on the environment and the economy.

As the existing practices and procedures are revised to accommodate the increase in traffic and site area of the PRP, the PRP will not have any significant adverse effects on the environment in the LSA or RSA. It is even possible that, by distributing traffic between the two individual runways, thereby reducing holding patterns and traffic interaction on the existing intersecting runways, the risk of aircraft crash may be reduced. In summary, the PRP has the potential to reduce the risk of aircraft accidents with no increase in the occurrence of aircraft incidents. The measures in place will effectively mitigate adverse effects associated with aircraft incidents.

19.3.2 Aircraft-Wildlife Collisions

19.3.2.1 Background

Collisions between wildlife and aircraft occur at airports around the world. Although aircraft do occasionally collide with mammals, the more common wildlife collisions occur with birds, either single individual or larger flocks. This type of collision is referred to as *bird strike*.

Aircraft-wildlife collisions have the potential to cause social, economic, and environmental effects. Several of the environmental effects (risk of contamination and accidental fire) and the primary social effect (risk to human health) is associated with the possibility of bird strikes causing aircraft to crash. Those issues are addressed as separate aircraft accidents or malfunctions (see Section 19.3.1). Effects and mitigation measures are discussed in further detail in Section 19.3.1.2.

The most significant environmental effect of bird strike is on the bird populations themselves. Thus, the primary effect within the LSA is bird strikes may result in the bird's death. Nonetheless, bird strikes cause millions of dollars of damage each year, and Courts in several jurisdictions have indicated that failure to exercise due diligence in managing bird strike can result in civil and criminal liability for the respective airport. To address this potential risk to aviation safety, TC has developed a regulation under the *Aeronautics Act* that requires airport operators to develop wildlife management plans incorporating proactive and reactive control techniques to minimize wildlife activity in the vicinity of airports. Consequently, the Authority has had and implements a wildlife management plan for over a decade.

Bird strike incidents in Canada are recorded and reported to TC. Since 1998, there has been an average of 1,020 incidents in Canada each year (TC 2009). Bird species that are generally involved in collisions include shorebirds, hawks, owls, wetland species, and perching species. Table 19-1 outlines the number of reported strikes by bird group in 2007. The frequency of incidents is higher during the warmer months between May and October for Canada.

In Calgary, TC has recorded approximately 40 incidents each year; however, the Authority's more precise data finds that, since 1991, there has been an average of 59 recorded strikes per year. At YYC, the birds that are most at risk of being involved in bird strike include:

- large flocks of shorebirds;
- large flocks of waterfowl;
- large birds of prey; and
- flocks of perching birds, such as starlings.

Table 19-1 Reported Bird Strikes (2007) for all of Canada According to Group (TC 2008)

Group Name	Number of Strikes
Shorebirds – gulls	258
Perching birds	225
Hawks, Eagles, Vultures	80
Ducks, Geese, Swans	50
Pigeons, Doves	13
Owls	8
Cranes, Rails	4
Herons, Storks, Ibis	2
Nightjars	2

Species of regulatory concern are most vulnerable to having long term adverse effects upon them as a result of the PRP. (They are those species that are officially designated as either of federal or provincial concern by ASRD [Alberta *Wildlife Act*] or by the federal government through the Committee on the Status of Endangered Wildlife in Canada [COSEWIC] and the *Species at Risk Act* [SARA)].) These are often referred to as "At Risk" species. The Wildlife Baseline Report prepared by AECOM in October 2009 (Volume V, Chapter 4), recorded a number of At Risk species on the PRP site: bald eagle, Swainson's Hawk, Lesser Scaup, and Sora, all of which are listed provincially as Sensitive. Birds of prey and waterfowl species have a notable risk of being struck by aircraft and contribute approximately 25% of annual strikes in Canada (TC 2009). Large and small perching birds and shorebirds are also known to occur in the site, but no individual species that are At Risk or Sensitive are known to occur. These families of birds contribute 80% of total bird strikes recorded in 2007 by TC where the species was identifiable.

19.3.2.2 Effects and Mitigation

As stated in Section 19.3.2.1, the economic effect of a bird strike is considerable. It is, therefore, considered acceptable to implement measures such as habitat modification, use of repellents, harassment of birds, or in extreme cases, wildlife removal to mitigate the effect of bird strike.

To address its regulatory requirement, the Authority has developed The Calgary International Airport Wildlife Management Plan to minimize wildlife activity in the vicinity of the airport, both in the LSA and the RSA. Part of this plan includes the Tenant Wildlife Control Guidelines (TWCG), which forms the basis for

mitigation of bird strike through design. It outlines three basic items that reduce the risk of bird strike by reducing the level of attraction that the airport would provide toward those species that are most at risk of strike. Those design elements are land development considerations, building design, and landscaping design. The TWCG measures will be carried over to the PRP to provide adequate mitigation for any increase in strike occurrence.

In regards to construction practices that will occur as part of the development, it is outlined in the TWCG that exposed topsoil should be limited to prevent gulls and other large birds from seeking to take advantage of the exposed invertebrates. Where topsoil does become exposed, monitoring will ensure that flocks of birds do not loiter. Any bird activity that may pose an increased risk of an incident will be reported to the Authority duty manager immediately, and corrective action will be taken to disperse the wildlife. In addition, it is important that appropriate drainage be made available at construction areas. Ponding of water can attract waterfowl and shorebirds, increasing the risk of bird strike. The final strategy during construction is to ensure that refuse, such as food waste, is stored in areas that wildlife cannot access because refuse can attract many species of birds that cause bird strike.

Any buildings that may be located within the PRP in the future will be designed to incorporate the recommendations outlined in the TWCG which are intended to reduce perching or roosting sites, and to reduce nesting opportunities within the building. They also provide advice on building design and on acceptable vegetation for landscaped areas. TC provides a list of plants from the guidelines that provide food resources or roosting opportunities for birds. Those species of plants will be excluded from any landscaped areas in or around the PRP site.

The Wetland Strategy for Reducing Bird Strike Risk (WSRBSR) is another part of The Calgary International Airport Wildlife Management Plan; it provides an active strategy for reducing bird strike risk by reducing the activity of waterfowl at the site through habitat modification and exclusion, use of repellents, and wildlife harassment and removal. The strategy is designed to provide mitigation options that are sensitive to those wetlands identified in the Golder & Associates (2003) wetland study. That study identified a number of wetlands in and adjacent to YYC lands that provide biological value. The Authority's primary concern is aviation safety, so any wetlands that are a high risk of increasing bird strike will be removed. However, the Authority is taking steps to replace wetland function elsewhere in the RSA. Further details can be found in Volume III Chapter 4.

19.3.2.3 Conclusion of Significance

In summary, the implementation of habitat control techniques from the Wildlife Management Plan and the extension of the TWCG to include the PRP will enable the management of bird hazards on and around YYC while mitigating the potential effects on the birds. The highest risk is to species that utilize niche habitats and that breed and nest on the site, or to those that are considered to be significant provincially or nationally. Existing practices have not reduced the occurrence of significant birds of prey and waterfowl in the area; thus it is fair to state that expansion of these practices would not reduce the occurrence at a local level. While there may occasionally be individual aircraft-wildlife collisions, and any loss of wildlife is undesirable, it is accepted that the low number of incidents at YYC and the low likelihood of their involving an At Risk species is low. The design guidelines that will be implemented will reduce the number of nesting and roosting opportunities on the site. On this basis, the effect of collisions between aircraft and wildlife would not have any long term effects on the viability of wildlife populations in the LSA or RSA.

19.3.3 Vehicle Accidents

19.3.3.1 Background

According to the Transportation Baseline Report prepared by AECOM (Volume V, Chapter 6), there are over 100,000 vehicle movements daily through the major intersections in the RSA. Vehicle accidents can occur due to a variety of causes, including:

- driver error;
- vehicle malfunction; and
- weather conditions.

In southern Alberta, there are historically more vehicle accidents in winter, associated with icy and snowy weather conditions.

Vehicles will also operate on airside lands and the PRP during construction and operation. The dynamic and fast paced atmosphere and environment of airport operations results in the risk of vehicle crashes.

19.3.3.2 Effects and Mitigation

The major effects of a vehicle crash occurring outside YYC lands will be during construction of the PRP. During this period, there will be an increase in traffic from large construction vehicles and worker vehicles, increasing the potential risk of vehicle crashes on the roads within the RSA.

In regards to airside lands, there are risks associated with vehicle-aircraft interactions and construction vehicles on the lands during operation and construction.

During operation, any incidents that may occur outside YYC lands are considered the responsibility of the City of Calgary.

During construction, an ECO Plan will be in place to provide Best Management Practices (BMPs) for vehicles travelling within the LSA. The ECO Plan outlines the practices for vehicles being used in construction including guidelines for maintaining road entries and exits to the construction site, traffic management practices, and other important mitigation and management practices that will maintain the construction site in a safe way.

The design of the PRP includes infrastructure to reduce the interactions of vehicles and aircraft. As mentioned in Section 19.3.1.2, an example is the underpasses for Taxiway Juliet and Taxiway Foxtrot. This infrastructure is being built to reduce the risk of vehicle crashes. In addition, the existing, very effective management practices will continue and ongoing vigilance in enforcing these procedures by the Authority will continue. It should be noted that the closure of Barlow Trail will reduce the traffic within the LSA and thus the risk of vehicle crash external to the PRP.

19.3.3.3 Conclusion of Significance

The construction phase of the PRP has the potential to increase traffic on local roads within the RSA. This could possibly lead to an increase in vehicle crashes. However, the ECO Plan outlines BMPs for on-site and off-site vehicle activities to ensure that all risks are minimized. In addition, the traffic within the RSA during operation is the responsibility of the City rather than the Authority.

Existing best practice is considered adequate. During operation, several key infrastructure items have been put in place to reduce aircraft and vehicle interactions. Also, existing procedures are strict in controlling vehicle movements within the site.

Taking into account the management that is mandatory on construction sites and on airport lands as part of their operations, it is clear that the PRP would not have a significant effect on increasing vehicle crashes within the RSA. With consideration of the closure of Barlow Trail reducing traffic within the LSA it is clear that the PRP would not have any significant adverse effects on vehicle crash in the LSA.

19.3.4 Vehicle-Wildlife Collisions

19.3.4.1 Background

Urban landscapes possess unique characteristics, such as high human and vehicle densities and concentrated road networks; they may also contain greenbelt areas that serve as excellent shelter, foraging areas, and protection from predators for wildlife such as deer and moose (Nielsen et al 2003). Roadside forage and application of salt attracts wildlife, and open areas of high quality forage and treed patches for cover provide ideal habitat for deer. In winter, ploughed roads offer easier movement. Wildlife collisions are most pronounced on sections of roads that intersect a movement corridor or an important habitat patch. The availability of forage and water close to the road is likely to increase the presence of animals. Locally abundant small mammal populations living in these fenced areas become targets for avian and terrestrial predators, such as owls, hawks, coyotes, and foxes.

Time of day: Most literature suggests that dusk and dawn are traditional times of high wildlife vehicle collisions. Light levels are low and animals are active at these times. From 2002 to 2006, an average of 13,000 animal-vehicle related collisions per year was reported on Alberta roads, with up to 35% occurring between 7:00 p.m. and 11:00 p.m. (Alberta Transportation 2008).

Time of year: There are two distinct high risk times for deer crashes: May and November (Fraser and Pall 1982). The early green-up of vegetation in the ditches along the side of the road is an attractive source of forage for many wildlife species and is a major factor in the springtime. Also, at that time, the birthing season means that there are many inexperienced animals near the roads (Ng et al 2008), resulting in about half of deer fatalities at that time of year. In the fall, many animal species are on the move during the mating season, causing an increased hazard. Animals "in the rut" may exhibit erratic or aggressive behaviour. Furthermore, the November peak overlaps with the fall hunting season, when hunters could potentially cause deer to move to local refuge (Conover 2001).

Speed: is one of the most common factors in vehicle-wildlife collisions. Speed reduces the driver’s ability to steer away from objects in the roadway, extends the distance required to stop, and increases the force of effects, in the event of a collision. By maintaining the posted speed and/or reducing speed, drivers can compensate for increased risk.

19.3.4.2 Effects and Mitigation

Vehicle-wildlife collision can affect local and regional populations of at-risk species. The risk of collision may increase as a result of changed traffic conditions resulting from redirection of roads associated with the construction and operation of the PRP. The closure of Barlow Trail will result in a reduction in the quantity of traffic in the LSA; however the opening of a construction site and subsequent runway will increase the area in which vehicles are present and capable of colliding with wildlife.

During construction, there will be a decrease in the number of vehicles that may potentially collide with animals but an increase in the area in which vehicles move resulting in no net change in the risk attributed to animals being struck by vehicles within the LSA. During operation; an expected increase in air traffic and activity at YYC will result in increased road traffic in the RSA that, in turn, increases the potential for collisions. During both construction and operation, there are risks of wildlife encroaching on the YYC airside, which may result in effects on flight operation schedules and on the wildlife themselves. On this basis it is anticipated that during the construction and operation of the PRP there will be little change in the risk associated for wildlife in terms of vehicle collision.

The primary form of mitigation for the PRP during construction and operation is the use of animal exclusion fences around the airside grounds. These are used extensively along Highway 1 in Banff National Park (BNP), on the TransCanada Highway from west of Canmore to Deadman's Flats, and along Anthony Henday Drive in Edmonton (Clevenger et al 2001, Preston et al 2006, Clevenger 2007, Alberta Transportation 2008). The positive effect of fences, especially for large mammals, is that they greatly reduce vehicle-animal collisions (Clevenger et al 2001). The existing groundside and airside fencing is considered to be adequate in providing this function and will be extended to encompass the PRP.

19.3.4.3 Conclusion of Significance

The ongoing management of YYC lands is such that the incidence of vehicle-animal collisions is generally low. The loss to populations is not significant for the regional wildlife populations (see Chapter 6 of this Volume). There are unlikely to be any vehicle collisions with wildlife that would have significant adverse effects on the construction or operation of the PRP. Existing City and YYC guidelines and management plans provide best management practices (BMPs) to control and reduce collisions.

19.3.5 Major Leaks or Spills of Hazardous Substances

19.3.5.1 Background

The construction of the PRP will provide the potential for spills to occur. The most likely contaminant in use during the construction of the PRP is diesel fuel for vehicles.

The operation of the existing runway involves numerous activities that present risks of leaking or spilling of hazardous materials. Substances that are commonly used in the construction and operation of airports and have a classification under the Workplace Hazardous Materials Information System (WHMIS) are listed in Table 19-2.

Table 19-2 Hazardous Materials and Quantities Used for Current YYC Activities (YYC 2009)

Material	WHIMS Classification	Quantity used Annually at YYC (L)
Jet Fuel	Class B Flammable/Combustible	487 million
AvGas	Class B Flammable/Combustible	400,000
Aqueous Film Forming Foam (AFFF)	Class D2C Toxic material – irritant	2500
Ethylene Glycol	Class D1B – Inhalation Toxicity	1.3 million
Hydraulic Oil	Not a controlled product	>1000
Diesel	Class B-3 Combustible Liquid Class D-2B (Toxic by other means)	Unknown

These substances have the capability to cause significant environmental harm and present a risk to human health.

The most common causes of fuel spills include:

- personnel error;
- accidents to apron vehicles, resulting in a rupture of fuel and/or oil systems;
- malfunction of ground service fuelling equipment; and
- leakage from above or below fuelling systems and associate dipping.

Any spill, release or emergency that may cause, is causing or has caused an adverse effect on the environment must be immediately reported to Alberta Environment. It is critical to report any spills that enter a storm sewer system, soil, or water body. Since 2003, an average of 69 reportable spills have occurred at YYC, spilling on average 4,935 L of fluids each year, out of an estimated 1.8 million L of aviation fuel and other fluids that YYC pumps each day. This is considered an exceptional record and is indicative of good preventive practices in place.

The Authority has developed stringent guidelines in the management of spills at YYC. Volume II, Section 10 of the Environmental Emergency Contingency Plan deals with the management of spills at YYC.

The proposed PRP will include activities that also have the potential for spill or leak of the materials listed in Table 19.2. The effects and proposed mitigation of the potential effects are outlined below.

19.3.5.2 Effects and Mitigation

The spill or contamination of hazardous substances can cause risks to human health and the environment. Many hazardous wastes can contaminate waterways, leading to direct injury to individuals or contamination of a water or food resource. The handling and storage of these substances is stringently regulated by existing policies and procedures utilized by the Authority including:

- aircraft de-icing policy;
- spills and release reporting procedures; and
- environmental emergency contingency plan.

Both hydrocarbon and glycol spills present risks of causing harm to human health if released into a major water source that is either used directly by the population or may be used to irrigate food crops. The release of deleterious substances into watercourses is a *Fisheries Act* violation.

Ethylene glycol tends to partition to the aquatic environment, with only minor transfer to soil or air. The majority of ethylene glycol in the PRP would be released to the aquatic environment from aircraft de-icing and anti-icing. Therefore, the potential for effects is greatest for aquatic organisms. The primary adverse effects on populations of aquatic organisms by the contamination of glycol are on amphibians and algae. Indirect effects can include oxygen depletion.

Hydrocarbons float on fresh and salt water. The effects of hydrocarbon spills are well documented, although most studies have been done for heavy oil spills. Notwithstanding, the general effects are consistent for most hydrocarbons. The primary concern in regards to spills for YYC is if a discharge of a spill or leak were occur or flow outside of the LSA. Hydrocarbons have the potential to adversely affect freshwater mammals and aquatic and migratory birds. Hydrocarbons can reduce the insulating properties of aquatic mammals' fur and can affect the water-repelling qualities of migratory and aquatic birds.

There is a high risk of accidental fire where hydrocarbon spills occur near ignition sources. This is discussed in more detail in Section 19.3.5.3.

The Authority's policies first look toward preventing spills by having designated areas and methods for which hazardous substances are handled and transported. In reducing the risk to human health and environment where spills would occur, the policies direct action to achieve rapid reporting and control. They provide best practice strategies for reporting, assessment, and remediation.

During the construction phase of the PRP, BMP strategies will be employed. This will include the development of an ECO Plan, which will provide appropriate training/information for all contractors, delineation of areas where refuelling and handling of hazardous material can occur, and a rapid response and remediation action plan.

During operation of the PRP, it is proposed to adopt the existing Environmental Emergency Contingency Plan that the Authority has developed. These stringent guidelines in the management of spills are found in Volume II, Section 10 of that document.

Where a spill occurs, the first instance of protection is to secure the site to prevent further contamination, evacuate all or part of the area, and supply appropriate protective equipment to allow spill responders to control it, remove any sources of ignition, and implement monitoring to ensure further contamination does not occur. The second priority is to prevent the spill from being released into the environment (including water, soil). This is done through the use of dykes, trenching, or sorbent materials with the objective of minimizing the migration of spilled material.

Once a spill is controlled, a spill report is completed. A spill report includes information on the following:

- time of the spill;
- present location and anticipated migration of the spill;
- potential hazards to health or the environment;
- weather conditions;
- personnel responding and what equipment is being used;
- action already taken;
- type of spilled material;
- probable source of spill;
- estimated volume and duration; and
- plan of corrective action.

Specific responses for chemical and petroleum spills are outlined in further detail in Volume II, Section 10 of the Environmental Emergency Contingency Plan.

19.3.5.3 Conclusion of Significance

During the construction phase of the PRP, BMP strategies will be used. This will include the development of an ECO Plan that will provide appropriate training/information for all contractors, delineation of areas where refuelling and handling of hazardous material can occur, and a rapid response and remediation action plan. BMPs following the provincial and federal regulations will ensure that there are low risks to health and the environment from spills during construction. On this basis, the effects of spills on the environment during construction of the PRP are not significant.

The Authority's existing policies adhere to the national regulations and guidelines for the handling, storage, and management of hazardous substances. The PRP will not result in large increases in aircraft activity, but rather dilute the traffic between the existing runway and the parallel runway. It is not expected that there will be substantial change to refuelling procedures or other activities that may result in the release or spilling of hazardous materials. De-icing may increase; however, the policy in place can be easily adapted to ensure ongoing management of this activity occurs on the basis that the practice of de-icing at the gate is continued. If there is to be a central de-icing facility established, it is assumed that existing BMPs will be adopted as at other airports using this system. Should a spill occur, the response procedures will be continued as per the existing operation of the airport. Spill records show that only a small percentage of fuel and hazardous material used on the site is lost in reportable spills. On this basis, it is considered unlikely that there will be an increase in the frequency or quantity of spills or releases of hazardous substances, and there will be no significant effect on the environment or increased risk to human health.

19.3.6 Accidental Fires

19.3.6.1 Background

Activities that will occur during the construction and operation of the PRP carry a risk of causing accidental fires. This may include accidental explosions or the accidental ignition of spills or flammable substances.

The major source of potential fires occurs during the refuelling of vehicles and aircraft during construction and operation. This will occur in designated areas and will be stringently regulated within the ECO Plan for YYC. Accidental fires can lead to environmental harm and human risk. In responding to a fire, priority is given to personnel and patron safety, and then to protection of the environment.

19.3.6.2 Effects and Mitigation

The primary risk of fire at an airport is the risk to human health. The secondary priority is that of effects on the environment. Effects on health can result from exposure to the fire or inhalation of smoke. This can result in illness or death. Other effects can include the ignition of a wildfire or prairie fire. This can result in direct population effects through habitat destruction. Other effects can include economic effects that may result from delays at the airfield due to accidental fire or effects on surrounding industry. All of the adverse effects of accidental fire have the potential to be serious. As a result, the primary objective of mitigation is prevention. During construction, this is achieved through designated areas where flammable materials are handled and through detailed training and induction for personnel on the site. During operation, plans are in place to reduce the risk of fire occurring; detailed response and monitoring plans are outlined in Volume II, Section 10 of the Environmental Emergency Contingency Plan.

Control measures for possible fires during the PRP construction and operations will be designed and implemented in compliance with federal and provincial regulatory requirements, including applicable fire codes. Fire controls will also conform to current industry accepted BMPs and standards. Fire control procedures for operation and construction will be integrated into the existing YYC fire control systems.

To reduce the extent of fire, the source of the fuel must be sought. If this is a leak or spill, the flow should be arrested. This can be done by closing a valve or by plugging or crimping a broken line or tank. After fire and explosion suppression have been completed, the containment and/or clean-up operations can commence.

Extinguishers will be readily available during construction and operation, and personnel will be suitably trained according to an ECO Plan during the construction phase and according to the improved existing policies during operation.

The existing airport has considerable fire management facilities that can be used to control any fire within the PRP area during construction or operation. Should a fire spread outside the PRP grounds, municipal fire fighters can be contacted to provide support in controlling the fire. Municipal fire services would be able to respond quickly to any fire threat given the accessible conditions and location of YYC.
Regular fire and emergency drills are undertaken at YYC to assist in the preparedness of employees and response personnel.

19.3.6.3 Conclusion of Significance

The existing policies and the construction management plan to be prepared will adhere to the national regulations and guidelines for management of fire risks and occurrences on construction sites and during the operation of an airport. The PRP will result in an increase in aircraft traffic. There may be substantial change to airport procedures or other activities that may result in accidental fire. The existing practices and procedures will be adapted accordingly to ensure the likelihood and frequency of a spill or release of hazardous substances will not occur. On this basis, there will be no increase in environmental harm or risk to any human health resulting from the PRP.

19.4 Conclusion

The environmental effects of any potential PRP malfunctions or accidents that may occur in connection with construction and operation of the PRP can be addressed with appropriate construction and operations environmental management plans and contingency plans. Such plans exist for the operation of YYC and will be updated for the PRP, and will be prepared for the construction phase of the development. On this basis, no significant environmental effects to the environment or increase in human risk are likely to occur.

19.4.1 Issues Raised By Stakeholders

Issue: People living on 36 Street are concerned about aircraft in trouble dumping their fuel.

Response: Aircraft will dump fuel if their landing weight in an emergency exceeds their "maximum allowable landing weight". If dumping of fuel is necessary for a safe emergency landing then it will be done at an altitude 8,000 to 10,000 feet above the local terrain so that the fuel will have totally dissipated in the atmosphere before it reaches the ground.

Issue: Don’t overlook the need for fire hydrants for the fire fighting on the airfield/2nd firehall. Water hydrants along runway for emergency response?

Response: Foam, rather than water is used to fight aircraft fires. The foam is supplied through emergency response vehicles. The requirement for the amount of extinguishing agent and the speed of response are defined in the Canadian Civil Aviation Regulations (CARS 303).

Issue: Cut down weekly fire suppression to reduce environmental impact on community to the east.

Response: Exercises in fire suppression are necessary to train fire personnel.