

The Calgary Airport Authority

Parallel Runway Project

Volume V – Item 14

**DRAFT Environmental Management System and
ECO Plan**

Report

The Calgary Airport Authority

**Parallel Runway Project
Volume V – Item 14
Environmental Management System and
DRAFT ECO Plan Report**

Prepared by:

AECOM

2540 Kensington Road NW
Calgary, AB, Canada T2N 3S3
www.aecom.com

403 270 9200 tel
403 270 0399 fax

Project Number:

60114017

Date:

June 2010

May 17, 2010

Project Number: 60114017

Peter Rudolf
Director Airfield Development
Calgary Airport Authority
2000 Airport Road N.E.
Calgary, AB
T2E 6WS

Dear Peter:

**Re: DRAFT Environmental Management System and ECO Plan
Comprehensive Study Environmental Assessment
Parallel Runway Project 16L-34R - Runway Development Program**

This report presents the results of the DRAFT Environmental Management System and ECO Plan conducted by AECOM Canada Ltd. for the Parallel Runway Project 16L-34R and connecting taxiways to be constructed at the Calgary International Airport in Alberta.

The report is part of the Comprehensive Study – Environmental Assessment and forms part of Volume V of that study.

If you have any questions concerning this report, please contact the undersigned at (403) 717-3498.

Sincerely,
AECOM Canada Ltd.



Barry Hawkins Project Manager
barry.hawkins@rwy-yyc.com

TJ:
Encl.
cc: File

Acronyms

Abbreviation	Full text
the Authority	Calgary Airport Authority
AAAQOs	Alberta Ambient Air Quality Objectives
ACNCC	Airport Community Noise Consultative Committee
AVPA	Airport Vicinity Protection Area
CAC	Criteria Air Contaminants
CEA	Cumulative Effects Assessment
CO	Carbon Monoxide
CS	Comprehensive Study
DNL	Day Night Noise Level
EA	Environmental Assessment
ECO	Environmental Construction Operations
EMS	Environmental Management Systems
FMA	Fedirchuk McCullough & Associates Ltd.
GHGs	Greenhouse Gases
HRIA	Historical Resources Impact Assessment
LRT	Light Rail Transit
LSA	Local Study Area
NCWMA	Nose Creek Watershed Management Area
NCWMP	Nose Creek Watershed Management Partnership
NCWWMP	Nose Creek Watershed Water Management Plan
NEF	Noise Exposure Forecast
NO ₂	Nitrogen Dioxide
NPRI	National Pollutant Release Inventory
O ₃	Ozone
PRP	Parallel Runway Project
SO ₂	Sulphur Dioxide
SWM	Stormwater management
VOCs	Volatile Organic Carbons
YYC	Calgary International Airport

Symbol	Unit of measure
cm	Centimetres
dBA	A-Weighted Decibel
ft	Feet
ha	Hectares
L/s/ha	Litres per second per hectare
m	Metres
µm	Microns

Table of Contents

	page
1. Environmental Management System.....	1
1.1 Environmental Management System.....	1
1.1.1 Airport Land Use, Planning and Development.....	1
1.1.2 Aircraft Noise Management	2
1.1.3 Water Quality Management	2
1.1.4 Materials Management	2
1.1.5 Wildlife Management	3
1.1.6 Air Quality Management	3
2. DRAFT Environmental Construction Operations Plan	3
2.1 Introduction	3
2.2 Project Description.....	4
2.2.1 Project Schedule and Site Drawing	6
2.2.1.1 Project Schedule	6
2.2.1.2 Site Drawing	6
2.3 Existing Conditions.....	6
2.3.1 Spatial Boundaries.....	6
2.3.2 Soils and Terrain.....	6
2.3.3 Vegetation.....	8
2.3.4 Surface Water and Aquatic Resources.....	8
2.3.5 Wildlife and Wildlife Habitat	8
2.3.6 Groundwater	9
2.3.7 Transportation.....	9
2.3.8 Land Use.....	10
2.3.9 Noise.....	10
2.3.10 Climate and Greenhouse Gases.....	10
2.3.11 Air Quality.....	11
2.3.12 Cultural Resources	11
2.4 Environmental Construction and Operation Plan.....	11
2.4.1 General	11
2.4.2 Soils and Terrain.....	12
2.4.2.1 Soil Handling	12
2.4.2.2 Erosion and Sediment Control	12
2.4.3 Air Quality.....	12
2.4.3.1 Dust Management.....	12
2.4.3.2 Emissions Reduction.....	13
2.4.4 Vegetation.....	13
2.4.4.1 Vegetation Clearing and Removal	13
2.4.4.2 Revegetation	13
2.4.4.3 Weed Control	14
2.4.5 Wetlands.....	14
2.4.6 Surface Water	14
2.4.6.1 Water Supply.....	14
2.4.6.2 Nose Creek.....	14
2.4.6.3 Stormwater	15

2.4.7	Wildlife and Wildlife Habitat	15
2.4.7.1	Migratory Birds	15
2.4.7.2	Schedule 1 SARA Species.....	15
2.4.7.3	Other Species at Risk.....	15
2.4.7.4	General Recommendations for Minimizing Impact of Construction Activity on Sensitive Habitat.....	15
2.4.8	Cultural Resources	16
2.4.9	Groundwater	16
2.4.9.1	Wells.....	16
2.4.9.2	Dewatering	16
2.4.10	Noise	16
2.4.11	Fuel and Contaminant Management	16
2.4.11.1	Handling	16
2.4.11.2	Storage	17
2.4.11.3	Vehicle Maintenance	17
2.4.12	Construction Site Management.....	17
2.4.12.1	Waste Management	17
2.4.13	Equipment Operation	18
2.4.14	Severe Weather	18
2.5	Implementation.....	18
2.5.1	Training and Communication	18
2.5.2	Monitoring and Reporting.....	19
2.5.3	Documentation	19
2.5.4	ECO Plan Update.....	20

Statement of Qualifications and Limitations

Figures

Figure 1	Site Plan.....	5
Figure 2	Study Area	7

1. Environmental Management System

1.1 Environmental Management System

Environmental Policy for the Calgary Airport Authority (the Authority) is developed by the Environmental Services Group in consultation with and accepted by the Board of Directors. The Authority's Environmental Policy reads:

'The Calgary Airport Authority is committed to protecting the environment and operates the Calgary International and Springbank Airports to serve the community in a safe, secure and efficient manner while protecting the quality of the environment. We will:

- *Ensure, as a minimum, that all practices conform to relevant federal, provincial and municipal law;*
- *Promote environmental awareness among Authority employees and all airport service providers;*
- *Provide appropriate environmental training for Authority staff;*
- *Maintain active communication regarding environmental issues;*
- *Subject all new airport construction projects to an environmental review process;*
- *Maintain plans and procedures to deal with environmental emergencies and take immediate corrective action in the event of an incident;*
- *Promote sustainability in the application of our Environmental Policy through continuous improvement;*
- *Conduct regular audits and reviews to assess the environmental condition of the Airports and facilitate preventative and corrective measures; and*
- *Strive to be a leader of sound environmental management for airports.'*

The Authority's draft Environmental Management Systems (EMS) Manual (2010) takes a two pronged approach due to the nature of the Calgary International Airport (YYC). The first objective of the EMS Manual is to provide environmental expectations to the Authority's facility and staff, and second to all airport tenants. The roles and responsibilities of the Authority in addressing the environmental risks associated with operating YYC while recognizing the roles and responsibilities of its tenants are summarized in this chapter and in more detail in the EMS Manual.

The assessment elements that are defined in the EMS are:

- Airport Land Use, Planning and Development;
- Noise Management;
- Water Quality Management;
- Materials Management;
- Wildlife Management; and
- Air Quality Management.

1.1.1 Airport Land Use, Planning and Development

The objective of this assessment element is to achieve effective land use, planning and environmental assessment that minimizes environmental impact of development. This is implemented via a variety of procedures. Although not all projects at YYC are currently required by law to undergo an environmental assessment, all projects are assessed to mitigate a project's impact on the environment and to improve the overall environmental performance of the Authority. In addition, the *Alberta Municipal Government Act*

controls land use in noise sensitive areas around YYC through the Calgary International Airport Vicinity Protection Area (AVPA) Regulation. This provincial regulation links YYC land use planning with that of surrounding jurisdictions.

The Authority has a number of programs to promote awareness of environmental legislative requirements among tenants, including:

- Aircraft De-icing Policy;
- Contaminated Site Remediation Policy;
- Aircraft Engine Run-up Policy;
- Spills and Release Reporting Policy; and
- Tenant Wildlife Control Guidelines.

The Authority has developed a Site Management Plan, which contains information on all known contaminated sites, petroleum facilities and site specific environmental studies.

1.1.2 Aircraft Noise Management

The objective of this assessment element is to minimize impacts of aircraft noise on surrounding communities while simultaneously providing quality airport services and the promotion of economic development. The Authority has a dedicated Environmental Services Specialist who develops and manages the noise management program, which is designed to address noise concerns and is centred on public education and awareness.

The Airport Community Noise Consultative Committee (ACNCC) is an essential component of YYC's noise management program and the main focus is to provide a forum for dialogue and improved understanding between stakeholders and parties affected by noise related operations at YYC.

1.1.3 Water Quality Management

The objective of this assessment element is to minimize the environmental impact of airport operations on water quality with no migration of known contaminants. A wide variety of aviation activities occur on a daily basis at YYC that have the potential to produce pollutants that could cause negative impacts on the region's water quality. Aircraft de-icing operations account for most of the potentially deleterious effluent generated at YYC and the Authority requires the airlines to develop an annual Glycol Mitigation Plan.

The Authority has a dedicated Environmental Services Specialist who develops and manages the water quality management program, which is designed to comply with all applicable environmental regulations and is centred on pollution prevention.

1.1.4 Materials Management

The objective of this assessment element is to prevent harmful materials from entering the environment and to reduce the amount of material entering the waste stream. Materials management includes the purchasing, storage, transfer, and disposal of hazardous materials or materials that may be harmful to the environment.

The Authority has a dedicated Environmental Services Specialist who develops and manages the materials management program. This program has been designed to comply with all applicable environmental regulation and includes such activities as keeping inventories of hazardous materials and promoting recycling plans.

1.1.5 Wildlife Management

The objective of this assessment element is to reduce the risks of wildlife strikes and to provide effective wildlife control. Conflicts between aircraft and wildlife are a major concern to the aviation industry as each year hundreds of millions of dollars are spent in the repair and replacement of damaged aircraft parts as a result of wildlife strikes. In addition, countless delays and inconveniences result from aborted takeoffs and landings.

At YYC, it is the responsibility of the Authority's Airside Operations to coordinate and implement procedures, developed by the Environmental Services Group, which will reduce the potential for bird and wildlife/aircraft conflicts. These procedures not only address bird and wildlife control from a safety and operational point of view, but are also sensitive to bird/wildlife management.

The monitoring program determines what bird activity at different locations poses a significant potential hazard to aircraft operations. This program identifies options, based on the year's observations, on how to reduce bird populations and prevent potential conflicts with aircraft. The program also reinforces the requirement for continued monitoring at key locations to identify potential hazards and to evaluate the effectiveness of the control programs in place.

1.1.6 Air Quality Management

The objective of this assessment element is to minimize impacts of airport operations on air quality through facility design, operation, maintenance, and best management practices. Notable pollutants include carbon monoxide, nitric oxide, nitrogen dioxide, and suspended particulate matter. The Authority has a dedicated Environmental Services Specialist who develops and manages the air quality management program.

2. DRAFT Environmental Construction Operations Plan

2.1 Introduction

In order for the environment to be protected during construction, it is critical that all parties to airport contracts, agreements, permits, and authorizations be aware of the environmental impact of their construction activities and provide measures and due diligence to protect the environment.

The Environmental Construction Operations (ECO) Plan is an integral part of the Comprehensive Study (CS) and development plans for the Parallel Runway Project (PRP), as it lays out the procedures for managing the environmental risks and mitigation throughout the various stages of development.

An ECO Plan consists of written procedures and drawings to identify and mitigate the potential environmental issues that may occur as a direct or indirect result of construction activities being performed on a specific project site (ECO Plan Policy 2009).

The objective of this ECO Plan is to prevent and/or minimize environmental impacts and to enhance the environmental value of the air, land and water affected by the PRP. The plan has been developed to prevent or minimize environmental impacts of construction activities and ensure that the work performed by the contractors takes into consideration the protection of the environment.

This ECO Plan identifies:

- the environmental setting of the project;
- the on-site individual responsible for addressing the environmental issues;
- potential environmental issues on the project;
- mitigation measures to prevent or minimize environmental impacts;
- implementation, monitoring, training, communication, and review of the ECO Plan;
- legislation, guidelines and standards to be met and monitored; and
- environmental emergency response procedures.

This document will be updated during the public review of the CS. It is likely that further detail relating to the implementation of mitigation during the construction and operation of the PRP will be incorporated into the document as it becomes available from the engineers. The Authority and its consultants and contractors will all be involved in the development and improvement of this document.

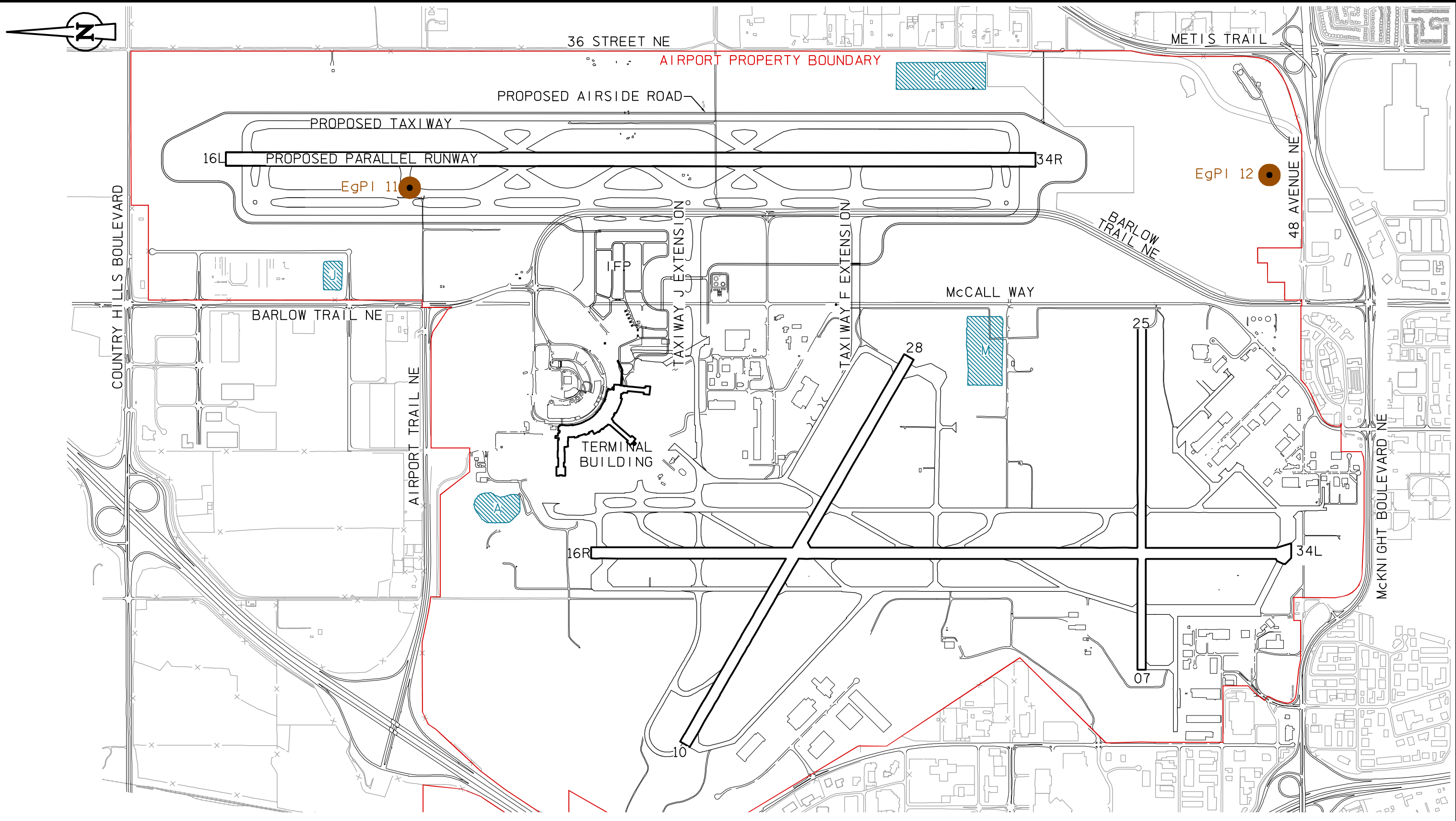
2.2 Project Description

The Authority proposes to construct a new parallel runway to meet demand for passenger and cargo service in southern Alberta. The PRP consists of the following components:

- A 4,267 m x 60 m runway (14,000 ft x 200 ft)
- Associated taxiways
- A perimeter road with security fencing
- Grading of workspace to the east of the proposed runway
- Visual navigation aids
- Electronic navigation aids
- A maintenance facility
- A field electric centre
- Changes to airside/groundside roads necessitated by construction of the runway
- Closure of Barlow Trail between 48 Avenue and Airport Trail
- A taxiway underpass (designated Taxiway J Underpass) servicing the airport's cargo area for airport service vehicles to pass under one of the taxiways
- Utility services to the runway including some changes to the airfield storm drainage system
- A taxiway underpass (designated Taxiway F Underpass)

The proposed runway will be constructed on airport land between the existing terminal, Barlow Trail and 36 Street NE (Figure 1). The project components are described in more detail in Volume II, Chapter 7 of the CS.

ISS/REV: A
 YYC FILE NAME: 09c16c401_RX.dwg
 Saved By: BANE, ALISON
 PLOT: 10/08/04 11:28:18 AM
 B SIZE 17" x 11" (431.8mm x 279.4mm)



YYC CALGARY AIRPORT AUTHORITY

THIS DRAWING, IN ALL FORMS, ELECTRONIC OR HARD COPY, IS THE EXCLUSIVE PROPERTY OF THE CALGARY AIRPORT AUTHORITY AND MUST NOT BE REPRODUCED WITHOUT WRITTEN PERMISSION.

AECOM

LEGEND

- AIRPORT PROPERTY BOUNDARY
- STORM WATER PONDS
- ARCHAEOLOGICAL SITES (FMA 2001)

200 0 200 400 800 METRES
 SCALE: 1:20,000

The Calgary Airport Authority
 Runway Development Program
 Parallel Runway Project

Site Plan **Figure 1**

2.2.1 Project Schedule and Site Drawing

2.2.1.1 Project Schedule

The ECO Plan will include a general schedule and sequence of construction activities. It will identify any time-sensitive environmental considerations, including scheduled shut-downs and restricted work periods. For example, projects scheduled to occur during the nesting season for migratory birds may have activities or areas to be avoided during that time.

The schedule for the construction packages is detailed in Volume II, Chapter 7, Figure 7-24.

2.2.1.2 Site Drawing

Figure 1 shows the PRP site in relation to its surroundings and details the existing facilities and local infrastructure.

2.3 Existing Conditions

2.3.1 Spatial Boundaries

The Local Study Area (LSA) for the ECO Plan will encompass some four sections of undeveloped Federal lands (Groundside) directly east of the existing YYC infrastructure (Airside). This was defined based on the extent of the 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 on the west by McCall Way (Figure 2).

2.3.2 Soils and Terrain

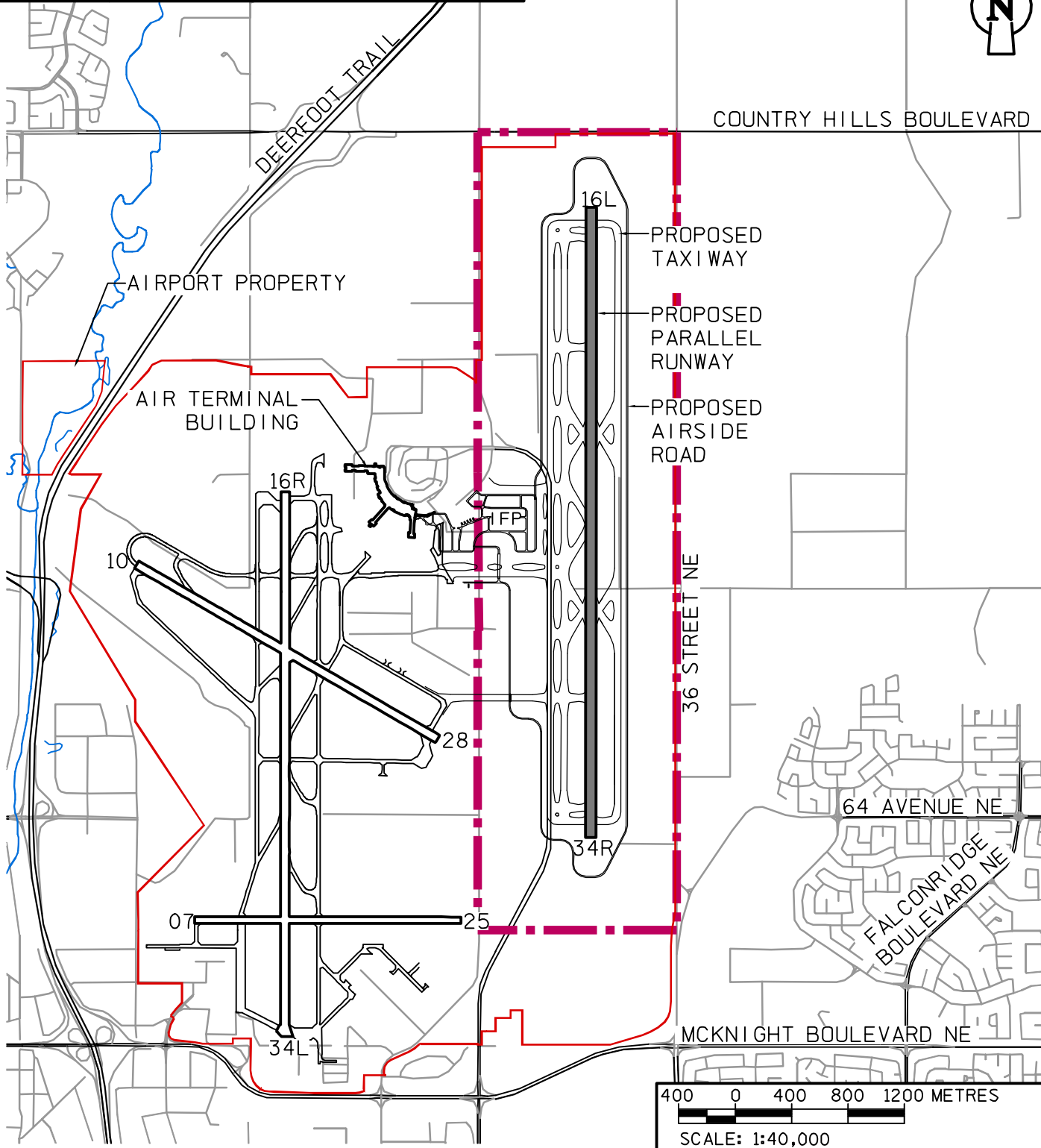
YYC lies in the Thin Black Soil Zone of south-central Alberta. A highly modified landscape significantly altered by surrounding land use development, the LSA is dominated by agricultural (cultivated, fallow and pasture) lands under private lease, with extensive areas of existing anthropogenic disturbance (existing rural residences, municipal development, industrial expansion), and infrastructure (access roads, railway, trails, pipelines, power lines, etc.) occurring throughout. Continued development of YYC lands has the potential to negatively impact soils through alteration, deterioration, or loss of physical (water/wind erosion) and chemical (salinization, soil contamination, etc.) soil characteristics. Soils of Chernozemic and Gleysolic orders occur throughout the LSA. About half of the LSA is covered by Orthic Black, Calcareous Black, and Rego Black Chernozems, with the remaining native and semi-native landscapes occupying areas of low topographic relief and classified as Orthic Humic Gleysols.

The soils within the site are consistent with a moderately disturbed site and are detailed further in Volume V, Item 1 of the CS.

ISS/REV: A
YYC FILE NAME: 09c16c402_RX.dwg
Saved By: BANE, ALISON
PLOT: 10/09/04 11:32:15 AM
A SIZE 8.5" x 11" (215.9mm x 279.4mm)

LEGEND

- LOCAL STUDY AREA (LSA)
- AIRPORT PROPERTY BOUNDARY
- NOSE CREEK



YYC CALGARY AIRPORT AUTHORITY

The Calgary Airport Authority
Runway Development Program
Parallel Runway Project

AECOM

Study Area

Figure 2

THIS DRAWING, IN ALL FORMS, ELECTRONIC OR HARD COPY, IS THE EXCLUSIVE PROPERTY OF THE CALGARY AIRPORT AUTHORITY AND MUST NOT BE REPRODUCED WITHOUT WRITTEN PERMISSION.

2.3.3 Vegetation

Due to the highly modified agricultural/urban landscape and scarcity of native vegetation communities in the LSA, vegetation communities were categorized as coarse-scale vegetation assemblages delineated on the basis of the dominant vegetation observed in the study area, and grouped according to landscape unit. The following landscape units were identified:

- Natural landscape unit, occupying 12.30% of the LSA;
- Wetland landscape unit, occupying 3.98% of the LSA;
- Agricultural landscape unit, occupying 51.15% of the LSA; and
- Anthropogenic landscape unit, occupying 32.57% of the LSA.

Nineteen species of noxious and nuisance weed species, as defined in Alberta's *Weed Control Act*, were observed during on-site assessments of the LSA. Weed species were typically observed within or adjacent to previously disturbed areas of the PRP footprint.

Four wetlands were assessed during the wetland survey. According to the Stewart and Kantrud classification system, two were Class III wetlands (seasonal ponds), one was Class II (temporary pond), and one was Class IV (semi-permanent pond/lake). All except the Class IV wetland were considered non-functional or supporting wetlands, while the Class IV was considered a major wetland.

The vegetation within the LSA is consistent with land historically used for agricultural or grazing purposes. The full details of vegetation present in the LSA are outlined in Volume V, Item 2 of the CS.

2.3.4 Surface Water and Aquatic Resources

There are no lakes or streams within the LSA. All surface runoff exiting YYC property is discharged either directly or via the City's stormwater system into Nose Creek, a fish-bearing watercourse. Nose Creek is considered to be a highly impacted watercourse throughout most of its length. The creek exhibits poor water quality as a direct result of the high loading of contaminants such as suspended solids, and nutrients from the surrounding basin, particularly in upstream and upslope areas outside of the LSA. The surface water and aquatic resources within the LSA are generally considered to be limited in comparison with regional resources; full details are outlined in Volume V, Item 3 of the CS.

2.3.5 Wildlife and Wildlife Habitat

Thirty-seven bird, 11 mammal, and one amphibian species were observed during the surveys as part of the baseline reports for the CS. Five of the species documented during the surveys, the American badger (*Taxidea taxus*), bald eagle (*Haliaeetus leucocephalus*), lesser scaup (*Aythya affinis*), Swainson's hawk (*Buteo swainsoni*), and sora (*Porzana carolina*) are listed provincially as Sensitive. The long-tailed weasel (*Mustela frenata*), documented during the winter tracking survey, is listed provincially as May Be At Risk.

A large number of migratory birds were observed either nesting or roosting within the LSA. These birds and their habitat are protected. In total, 37 species of migratory birds were observed nesting within the LSA. The site provided a number of important habitat features that supported these species including wetlands and aspen stands providing nesting resources.

The three natural areas in the region of the PRP provide a diversity of habitat types and movement corridors for wildlife in the area. These habitat types are also lacking on the regional scale in the Calgary area, with some provincially listed species depending on these habitats for reproduction and survival. Disturbance to these habitats or any listed species associated with these habitats are a concern for development, and efforts should be made to minimize adverse effects.

The full details of the wildlife and wildlife habitat present within or likely to occur within the LSA are outlined in Volume V, Item 4 of the CS.

2.3.6 Groundwater

Groundwater quantity includes the amount of groundwater recharge that occurs in the LSA that flows to deeper bedrock aquifers or to Nose Creek. A layer of low permeability clay glacial till covers the LSA and overlies low permeability claystone. Groundwater moves slowly to the southwest through both of these strata. Groundwater also moves slowly downward in the LSA from the clay till to the claystone bedrock, and likely even deeper to the Paskapoo Formation (sandstone/shale bedrock). Groundwater wells completed in the Paskapoo formation are used as local water supply wells for residences, farms and commercial facilities to the north and east of the LSA. However, there is a low potential that these water supply wells will be affected by the proposed project because groundwater flow direction from the LSA is to the southwest, away from the area that relies on water supply wells.

Groundwater within the clay till in the upper 4 m to 10 m is mineralized, predominantly by sodium and sulphate ions. Water quality in the claystone bedrock below the till is also mineralized, but the level of total dissolved solids generally decreases with depth. At one location, shallow groundwater had elevated nitrate nitrogen concentrations that exceeded the Canadian Drinking Water Criteria, probably due to localized agricultural activities or local organic matter decay. Chloride concentrations were elevated above the Drinking Water Criteria in several monitoring wells screened in more permeable sand lenses within the clay till. These wells are located in close proximity to Barlow Trail and each other, and the elevated chloride levels may be related to use of de-icing salts on the road.

Due to low permeability of the upper clay till soils, it seems unlikely that there would be any risk of movement of contaminated groundwater from potential up-gradient sources into the LSA. Full details are outlined in Volume V, Item 5 of the CS.

2.3.7 Transportation

Ground transportation in Calgary is accommodated mainly on public roads, public transit, and a pathway system that serves active modes of travel – walking, cycling, etc. All these systems exist in the vicinity of YYC and serve travel to and from the airport. Calgary is also served by Canadian Pacific and Canadian National Railways, neither of which provide local service in the vicinity of YYC.

Most travel in Calgary occurs on the roadway system, which accommodates personal vehicles, goods movement, taxis, public transit and commercial bus travel, and active modes. Calgary has an extensive public transit system that includes Light Rail Transit (LRT) and various transit bus services.

Active modes of transportation – walking, cycling, etc. – are accommodated within the roadway system and on purpose-built separate pathways.

The transportation network in Calgary relating to YYC is detailed in full in Volume V, Item 6 of the CS.

2.3.8 Land Use

The Site Area addresses YYC land and land uses within the site area pertain primarily to the operation of an airport. The Calgary International Airport Master Plan (2004) provides a framework for development within this area and addresses the PRP. The majority of land within the Site Area falls within the industrial and commercial land use types.

The LSA for the Environmental Assessment (EA) contains those communities within the cities of Calgary and Airdrie and Rocky View County which lie within or bisect the boundary of the AVPA. For the past 30 years, development within the City of Calgary, the City of Airdrie and Rocky View County has been reviewed with respect to the AVPA regulations. These regulations dictate compatible land uses within the Noise Exposure Forecast (NEF) contours surrounding YYC. For example, residential areas are only allowed outside the 30 NEF contour. There is a definite correlation on the existing land use map for the City of Calgary between the boundary of the 30 NEF contour and the development of residential areas.

The PRP has been planned for 30 years and in response, the federal, provincial and municipal governments have been making appropriate planning decisions mitigating the impact of the operation of the airport and sensitive land uses. In light of the historical land use activities within the AVPA, the baseline information for land use is predictable. The changes in revenue and development activity which have occurred during the past five years in residential, industrial and commercial land uses within the LSA is more indicative of the global recession than the PRP.

In light of the historical land use activities and policies and regulations that have been developed within YYC land, the LSA and the RSA, it is anticipated that the PRP will have a minimal effect on land use surrounding YYC. Full details of how this conclusion was obtained are outlined in Volume V, Item 7 of the CS.

2.3.9 Noise

The ambient noise values measured at different locations within communities around the LSA are considered to be within the typical range found in urban neighbourhoods. YYC operates a network of noise monitoring stations in communities around the airport. The monitors record noise levels continuously and report the results electronically. YYC is considering redesign of the network to reflect construction of the new runway.

The overall results outlined in more detail in Volume V, Item 8 of the CS suggest that the noise levels measured in all of the communities monitored be considered to be “moderately loud”. This is typical for urban areas in a modern city.

2.3.10 Climate and Greenhouse Gases

Calgary has a continental climate with long, cold winters, and short, mild summers. Its dry, sunny, highly variable conditions are a result of the City's high elevation (approximately 1,048 m above sea level), prevailing atmospheric circulation and regional topography. Climate change is an intrinsic property of the climates in Canada. Climate change is a change in the statistical distribution of meteorology over periods of time. The emission of greenhouse gases (GHGs) is one factor that may impact future climate change trends. The PRP will result in emissions of GHGs. As climate change trends may be affected by GHG emissions, it is important to assess the baseline conditions for GHGs. As such, the baseline conditions for GHGs within the region were assessed. For baseline conditions, YYC has a GHG emissions account for 0.07% and 0.02% of the provincial and national emissions, respectively.

The contribution of the YYC operations to the provincial and national GHG emission inventory is considered to be very small and is detailed in Volume V, Item 9 of the CS.

2.3.11 Air Quality

The ambient air quality data measured around the LSA are considered to be within a typical range of emissions for an urban neighbourhood. Monitoring data for carbon monoxide (CO), nitrogen dioxide (NO₂), sulphur dioxide (SO₂), and volatile organic carbons (VOCs) were below Alberta ambient air quality objectives (AAQOs). However, carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), particulate matter with a diameter of less than 2.5 microns (µm) (PM_{2.5}), and particulate matter with a diameter of equal to or less than 10 µm (PM₁₀) occasionally exceeded the AAQOs. Despite these exceedences, the 90th percentile for all data was below the AAQOs.

There are several industrial sources of emissions in the LSA. The impact of these emissions on air quality has been captured in the baseline assessment through the ambient air monitoring programs. In addition to the ambient air monitoring, the National Pollutant Release Inventory (NPRI) provides supplementary information for the baseline assessment. The NPRI emissions inventory for Criteria Air Contaminants (CAC) emissions for all sources in Alberta indicates that particulate matter emissions are largely due to open sources. Open sources include agriculture, construction activities, landfill sites, mine tailings, paved and unpaved roads, forest fires, and prescribed burning. SO₂, NO₂, and VOC emissions are due to industrial sources in Alberta, while CO emissions are due to transportation sources.

The air quality analysis presented in Volume V, Item 10 demonstrates that the existing concentrations for the parameters of concern are generally low in magnitude for the LSA.

2.3.12 Cultural Resources

In 2001, the Authority commissioned Fedirchuk McCullough & Associates Ltd. (FMA) to conduct a Historical Resources Impact Assessment (HRIA) and Cumulative Effects Assessment (CEA) of YYC lands under the guidelines established under the Alberta Historical Resources Act (1980). FMA found that YYC property holds few archaeological sites and that those that were present were not unique historical resources in a regional context. Only a small proportion of the types of sites commonly found were represented. The report found that YYC sites have, for the most part, already been removed or significantly disturbed, or are of low interpretive potential. The report recommended mitigation measures for two of the sites. In 2006, these mitigation measures were implemented by FMA under the Authority's direction.

The details of the reports are outlined in Volume V, Item 11 of the CS.

2.4 Environmental Construction and Operation Plan

2.4.1 General

- PRP activities on YYC lands are federally regulated. Some activities may require consultation with Federal agencies to determine details of how they are carried out. Activities off YYC lands, such as water withdrawal from ponds, or direction of truck traffic, may require consultation and coordination with the Alberta Government or the municipal governments.
- All contractors and subcontractors will comply with applicable environmental laws and regulations, and the environmental protection measures specified in the ECO Plan. The contractor's attention will be drawn to any individual who disregards the ECO Plan.

2.4.2 Soils and Terrain

Prior to any activities in any part of the development footprint, specific soils information for the area (e.g., stripping depths, issues with rutting, erosion risk) should be identified from the Soil Survey Report in 2009 (Volume V, Item 1 of the CS).

2.4.2.1 Soil Handling

- Soils and subsoils should be removed from the PRP footprint and stored away from the development footprint prior to paving.
- Soils should be stripped according to the directions outlined in the Soil Survey Report (Volume 5, Item 1 of the CS).
- Topsoils and subsoils should always be salvaged and stored close to where they were removed.
- The depth of topsoils and subsoils should vary in each location and can be determined by the depth outlined in the Soil Survey Report (Volume 5, Item 1 of the CS) and/or by the change in soil colour.
- A minimum of 10 cm should always be removed for topsoil.
- If snow or loose hay is present at the time of stripping, then a separate pile for snow or hay should be implemented. Snow and hay piles should not include topsoil. Operators should ensure that their equipment blades do not remove topsoil while removing snow and hay.
- No mixing of soils should occur.
- Equipment should never travel across soil piles unless they receive authorization from Alberta Environment.
- Only remove snow and soil within the PRP footprint.
- All soils should be reclaimed as soon as possible.

2.4.2.2 Erosion and Sediment Control

- Soils handling or stripping should not occur during high wind to reduce the risk of wind erosion.
- Soils should not be handled or stripped in extremely wet weather to reduce soil erosion.
- Soil piles should be stabilized to eliminate or reduce wind or water erosion.
- Soil piles should be monitored to ensure no erosion occurs.
- Soils prone to rutting should not be handled or stripped during sensitive conditions (e.g., wet, frozen soils).
- At the first sign of soil rutting, activities on soils should be suspended or altered to eliminate further rutting (e.g., wooden matting).
- Dewatering activities should not occur in between or beside soil piles.

2.4.3 Air Quality

2.4.3.1 Dust Management

- Contain dust and ensure regular clean up of the site.
- Water down loose materials and exposed earth during construction.
- Spray down truck wheel wells and use rumble strips before exiting the construction site where applicable (e.g., areas with topsoil).
- Perform regular street sweeping during construction.
- Install temporary fencing during construction.
- During construction activities: require dust palliatives or penetration asphalt on haul roads.
- During construction activities: require hydroseed or fast growing vegetation on disturbed areas.
- Develop a balanced earthwork management plan and keep as much excavated earth on-site as possible to reduce off-site hauling.

- Use mixed soils for enhanced water retention in landscape areas as fill.
- To prevent erosion, minimize the extent and duration of bare ground surface exposure.
- When using vegetation to stabilize soils, make sure a layer of topsoil and compost is present to support growth.

2.4.3.2 Emissions Reduction

- Require subcontractors and suppliers to submit emissions reduction plans.
- Construction vehicles should have standard noise and emissions control equipment. Consider requiring construction vehicles to meet specific emissions standards.
- Track concrete and asphalt plant emissions (if on YYC property) for National Pollutant Release Inventory (NPRI) reporting requirements.
- Minimize haul roads to borrow areas, stockpiles, cut/fill distances (balanced Earthworks Management Plan).
- Identify and specify materials and material suppliers in order to reduce energy and costs related to their transportation.

2.4.4 Vegetation

2.4.4.1 Vegetation Clearing and Removal

- A qualified environmental inspector will direct vegetation clearing and removal operations, and guide equipment operators.
- Coarse woody debris produced through the clearing of treed areas (semi-native aspen stands, hedgerows and planted species) within the LSA will be mulched and/or utilized on-site, where possible.
- The Authority will avoid vegetation clearing and removal with heavy machinery when soils are wet to prevent rutting and compaction.
- The Authority will avoid vegetation clearing in migratory bird sensitive habitat during the migratory season.
- Minimize vegetation clearing and ground disturbance during construction. Maximize use of previously disturbed areas and areas with limited vegetation values.
- As stripped topsoil contains microbes that are important in nutrient cycling, and seeds and rhizomes that can be viable for years, the Authority will, whenever possible, strip and store the topsoil seed bank until replacement activities can occur.
- Donate healthy plants and trees removed during construction to the community.

2.4.4.2 Revegetation

- Salvage of existing native plant materials, sod and topsoil should be a primary objective.
- Where salvage is not possible, a native plant seed mixture should be used for reclamation of disturbed sites.
- Revegetation seed will be from a locally collected and propagated genetic source of native plant material ensuring that each seed lot is free of restricted and noxious weeds and other species of concern. A Seed Analysis Certificate is available from all seed suppliers; it will indicate any weed species or other species of concern in the mixture. A list of native seed suppliers can be found in Volume V, Item 2, Appendix A of the CS.
- Maintain natural drainage patterns to minimize effects on site moisture and nutrient regimes.

- Any observed communities of western blue flag within the LSA will be mapped and monitored. Where possible, efforts will be made to protect this species from a competitive disadvantage caused by invading noxious plants.
- In the unlikely event this species is encountered, a significant-species management plan will be prepared to ensure that the western blue flag population perseveres.

2.4.4.3 Weed Control

- Actively manage the introduction and expansion of invasive plant species.
- All construction equipment and vehicles used on this project should be clean and free of dirt and vegetative material to control the introduction of weeds within the construction area.
- Dirty equipment should not be allowed on the PRP construction site until it has been properly cleaned.
- Monitor weed growth on topsoil piles.
- Follow landowner specific requests for weed control.
- Equipment should be washed prior to entering private land.
- Ensure that each seed lot used for reclamation is free of restricted and noxious weeds and other species of concern. A Seed Analysis Certificate is available from all seed suppliers which will indicate any weed species or other species of concern in the mixture.

2.4.5 Wetlands

The Authority's Wetland Strategy for reducing bird strike risk is consistent with both the Federal Wetland Strategy and Transport Canada's wildlife regulation. To that end, the Authority has purchased 35 ha of land adjacent to existing airport lands, west of Deerfoot Trail at Airport Trail NE. The land will be used to restore and replace wetland function and to support Alberta's Water for Life Strategy. The Authority has established a stakeholder consultation group as part of their wetland strategy including the City of Calgary, Alberta Environment, Ducks Unlimited, and others to discuss conservation measures that will be implemented on the purchased land.

2.4.6 Surface Water

In establishing a stormwater management system, the airport recognizes both its requirement to provide adequate protection for downstream environments and its mandate to enhance aircraft safety. Overall, the stormwater design will focus on providing stormwater volume controls and water quality enhancement opportunities resulting in a landscape that minimizes future attractions for bird activity.

2.4.6.1 Water Supply

- 80% of water required for construction will come from YYC Ponds A, M and K.
- Other potable water needs will draw from Airport Trail/19 Street, A&V Auto Parts, the pond at 100 Avenue/22 Street, the pond at Métis Trail, and the low lying area at 80 Avenue/36 Street.

2.4.6.2 Nose Creek

- The quantity of water discharged to Nose Creek will comply with the maximum allowable peak level of 2.6 L/s/ha as required under agreement and as specified in the Nose Creek Watershed Water Management Plan (NCWWMP) (2004).
- Any activities with the potential to affect Nose Creek will be done in consultation with regulatory Authorities and the Nose Creek Watershed Management Area? (NCWMA).

2.4.6.3 Stormwater

- The stormwater pollution prevention measures outlined in the Stormwater Management Plan for the PRP will be implemented.
- The site will be inspected frequently to ensure effectiveness of stormwater prevention pollution measures.
- The stormwater management (SWM) system will meet the standards of the Nose Creek Watershed Management Partnership (NCWMP) (2004).

2.4.7 Wildlife and Wildlife Habitat

- Nose Creek is the only fish bearing watercourse identified within the immediate region of YYC. All activities will adhere to the guidelines outlined in the NCWMP.

2.4.7.1 Migratory Birds

- Avoid construction during the critical breeding period of migratory bird species which is from May 1 to July 31 for most migratory birds.
- Any areas to be cleared or graded during this period must be inspected for migratory bird nests. If any are found, they should be avoided until the fledglings leave the nest. Clearing all areas before May 1 in the construction year will avoid this situation from occurring.

2.4.7.2 Schedule 1 SARA Species

- The site will be prepared prior to the initiation of the breeding season for Schedule 1 Threatened or Endangered SARA species that may occur in the LSA.
- The environmental office will monitor the site for the presence of any Schedule 1 SARA species before clearing.
- If any SARA species are observed on site the regulatory Authority (EC) will be contacted and mitigation actions will be prepared. This may include stoppage of work until the animal can be moved or moves on of its own volition.

2.4.7.3 Other Species at Risk

- In the event that a burrowing owl is observed within the development footprint, the environmental advisor should be notified and proper mitigation/contingency procedures followed in cooperation with the Authority's wildlife officer and the relevant regulatory authority.
- If any species at risk are observed or signs are seen along or adjacent to the LSA, the environmental advisor should be notified and proper mitigation/contingency procedures followed.
- Any areas that are identified as sensitive (e.g., species at risk breeding habitat – badger burrowing, wetlands) should be fenced off or flagged prior to construction so that these areas are easily identified and avoided by construction personnel where practicable.
- Construction near Swainson's hawk nests will be done from August 1 to March 14.
- If any construction activities disturb species at risk, then actions will be taken in cooperation with the Authority's wildlife officer and the relevant regulatory authority to relocate the animal.

2.4.7.4 General Recommendations for Minimizing Impact of Construction Activity on Sensitive Habitat

- Restrict traffic to the construction site or roads to be closed. This should reduce the likelihood of disturbing potential sensitive species and habitat in the surrounding area.

- All project related waste (including food wastes and garbage) should be hauled off-site and disposed of properly.
- Minimal disturbance techniques should be employed at all times including limiting the extent of the disturbance area and making use of effective specialized equipment.
- All construction equipment and vehicles brought onto the construction site should be clean and free of dirt and vegetative material to control the introduction of weeds within the construction area which can affect the quality of natural habitat for wildlife species.
- Re-vegetation of recently excavated/exposed areas should be done using appropriate native plant seed. Seeding should take place immediately following construction to take advantage of better moisture conditions for enhanced emergence and survival of plants.

2.4.8 Cultural Resources

- No identified culturally sensitive areas exist within the PRP footprint.
- If human remains are discovered, the Calgary Police Service will be notified immediately.
- The contractors will be directed to report to the environmental inspectors the finding of any evidence of cultural resources anywhere except at the sites (Figure 1) described by FMA.
- The inspectors will examine the evidence and, if appropriate, call in a qualified archaeologist to investigate the site. If it is, in fact, a historical or paleontological site, a report will be made to Alberta Culture and Community Spirit, and the Authority will undertake any mitigation that it recommends.

2.4.9 Groundwater

2.4.9.1 Wells

- All existing water wells, gas wells, and boreholes on the PRP area that cannot be preserved will be identified, inspected and effectively sealed.
- Water wells will be sealed in accordance with the Module 9 - Plugging Abandoned Wells prepared by Government of Alberta Agriculture and Rural Development.

2.4.9.2 Dewatering

- Dewatering should not occur on topsoil or subsoil piles or beside these piles. Dewatering should not occur into animal dens.
- Dewatering should not occur onto private land unless there is permission from the landowner.
- Dewatering should not occur onto access roads.
- Dewatering should not occur on saline soils. A vacuum truck should be used to remove the water.

2.4.10 Noise

- Schedule activities during normal working hours to minimize noise effects.
- Maintain noise suppression devices on vehicles and heavy machinery.

2.4.11 Fuel and Contaminant Management

2.4.11.1 Handling

- The site construction manager should ensure a hazardous material and spill response plan is in place, and the proper equipment and trained employees are available during all phases of construction.

- All equipment should be inspected for fuel leaks, hydraulic leaks and other sources of potential soil contaminants.
- Fuelling, lubricating and oil changes should be conducted at least 100 m from wetlands and watercourses.
- An emergency spill response kit should be on-site at all development locations prior to construction. The containment kit should be large enough to handle twice the maximum spill possible.

2.4.11.2 Storage

- All gasoline powered equipment such as pumps, generators and associated fuel should be stored entirely within a secondary containment structure area located at least 100 m from any watercourse (including open ditches). Containment should have 110% capacity relative to the volume of fuel being stored and be large enough to completely contain all harmful materials should a spill, leak or overflow occur. Trucks carrying large fuel containers (tidy tanks) should be parked within the containment area.
- A designated area should be assigned for hazardous materials storage.
- Oil, fuel, lubricants or any hazardous materials should not be stored within 100 m of a wetland or watercourse. Machinery and equipment should not be located within the riparian zone; maintain an undisturbed buffer of vegetation at least thirty (30) metres along the edge of the watercourse.
- All spoil materials from construction activities should be stockpiled, whether temporarily or permanently, above the high water mark of the water body/wetland and in such a manner that it does not allow entry into the wetland.

2.4.11.3 Vehicle Maintenance

- Prior to entering within 100 m of a water body/wetland, all equipment and machinery scheduled to work in and/or along a wetland should be inspected and found to be clean, free of leaks and in good working condition. As such, all equipment and machinery on-site should have all foreign material removed including dirt, mud, debris, grease, oil, hydraulic fluid or other substances that may impact the water quality. As well, all identified leaks should be repaired and then appropriately cleaned. Any leaks on the ground should be immediately removed and properly disposed.
- Refuelling should be conducted on road shoulders or road ditches whenever possible.
- Any cleaning and/or servicing of equipment and machinery can occur either before the equipment or machinery is transported into the field or at the work site. All such works should occur at least 100 m from the wetland with any runoff controlled to ensure wash materials and/or other substances do not enter the riparian zone or the wetland.
- A spill response plan should be in place to effectively manage and control an emergency spill.

2.4.12 Construction Site Management

2.4.12.1 Waste Management

- All contractors and subcontractors will supply waste minimization plans.
- All personnel on-site should use designated waste management facilities only.
- Construction waste and debris should be continuously collected and disposed of at a government approved facility, as required.
- All waste should be disposed of at an approved waste facility. Solid non-hazardous wastes should be recycled and/or disposed of at the appropriate facility.
- Liquid wastes (mostly spent cooling and lubricating products) should be disposed off-site with approved waste contractors.

- Opportunities for reusing and recycling waste materials for other construction projects should be explored.
- Any excess pavement from Barlow Trail that is not required shall be removed or recycled.
- Excess concrete can be reused for Jersey barriers.
- Buildings being removed will be salvaged not demolished.
- The use of concrete/asphalt crushers will be implemented such that recycling of concrete for construction purposes can be done.

2.4.13 Equipment Operation

- Construction lighting will be used only where absolutely necessary and, where possible, portable LED lighting will be utilized.
- Ensure that spill response equipment (absorbent material) is on-site in the event of accidental spills.
- Service/repair of equipment with the potential for accidental spills should be conducted on paved surfaces or impervious tarps to contain spills.
- Maintain equipment in good operating order.
- Schedule activities during normal working hours to minimize noise effects.
- Ensure that no hazardous waste is deposited at the landfill.
- Maintain noise suppression devices on vehicles and heavy machinery.

2.4.14 Severe Weather

- In order to minimize terrain disturbance and soil structure damage, construction shall be postponed, equipment travel shall be suspended or construction alternatives shall be utilized in the event of severe weather warnings (e.g., high winds, rainfall warnings).
- Contingency measures shall be initiated once one of the following indicators occurs: excessive rutting, wheel slip, build-up of mud on tires and cleats, formation of puddles, and tracking of mud down the road as vehicles leave the PRP construction site.
- The following contingency measures shall be employed progressively or individually as warranted if the above indicators occur:
 - install geotextiles, swamp mats, or employ frost inducement measures such as snow packing or ploughing to increase the load bearing capacity of wet or thawed ground;
 - salvage any excess snow from the spoil side of the construction area and spread, as well as pack the snow on the work side to avoid premature thawing of the upper soils;
 - restrict construction vehicle traffic to equipment with low ground pressure tires or wide pad tracks;
 - salvage topsoil to prevent mixing and rutting (note that stripping cannot be conducted when soils are excessively wet); and
 - shut down construction until conditions improve.

2.5 Implementation

The implementation of the ECO Plan is critical to the success of the measures outlined. It is important to have corporate support and for contractors and their agents to follow the ECO Plan with precision and diligence. The contractor is responsible for the implementation of the ECO Plan for the duration of the project and ensuring that all personnel on-site abide by the plan.

2.5.1 Training and Communication

The contractor is responsible for training staff on project-specific requirements prior to work commencing. Effective communication and environmental awareness training are essential to ensure all staff, including

subcontractors, are aware of their environmental obligations. The ECO Plan must be included as a topic in site orientations, pre-construction meetings and regular site meetings. Minutes of these meetings will be taken and kept on file. Topics for training and awareness sessions should include:

- ECO Plan content and on-site location;
- potential environmental impacts of work activities;
- roles and responsibilities related to the ECO Plan;
- locations of environmentally sensitive areas;
- environmental response procedures including locations of spill kits, contact information, etc.;
- a description of how ECO Plan updates will be communicated on-site; and
- bulletin board and memorandum circulation.

2.5.2 Monitoring and Reporting

The contractor will develop appropriate monitoring procedures that will incorporate information outlined in the CS. This should include monitoring site characteristics, work activities and potential environmental risks associated with the work to be performed. It is the contractor's responsibility to understand and comply with the reporting requirements, and to ensure all of the environmental controls are working. This will include the following project-specific information:

- locations and parameters to be inspected and schedule (where, what and when);
- monitoring frequency;
- monitoring during scheduled shut-downs;
- monitoring after completion of project (e.g., landscaping, restoration);
- regulatory reporting requirements (e.g., reportable release guidelines, frequency of reports and to whom reports will be submitted); and
- deficiencies identified during monitoring activities must be addressed immediately.

2.5.3 Documentation

A master hard copy of all files and monitoring reports relating to the ECO Plan and environmental activities on the project site must be retained at the construction site, be fully updated, and available to all personnel and for inspection at all times. The following is information that should be retained on-site in hard copy for the project:

- ECO Plan (including previously amended versions);
- regulatory permits or approvals;
- construction schedules;
- record of environmental incidents (e.g., spill and release records);
- hazardous and waste materials inventory;
- monitoring documents;
- waste manifests;
- inspection forms;
- equipment inspection and maintenance records;
- site orientation and tailgate meeting minutes;
- fuelling logs; and
- relevant memos relating to environmental matters.

2.5.4 ECO Plan Update

The ECO Plan must be designed to change according to site conditions with a goal of continuous improvement throughout the life of the PRP. Once the ECO Plan is updated, the contractor is responsible for notifying Alberta Transportation and the City of Calgary of the changes (as appropriate) prior to implementation. The contractor shall communicate the changes to employees and relevant subcontractors, and provide the necessary training before implementing the changes. Modifications to the ECO Plan must provide an equal or better level of avoidance or mitigation. All changes to the ECO Plan must be documented.

Statement of Qualifications and Limitations

The attached Report (the “Report”) has been prepared by AECOM Canada Ltd. (“Consultant”) for the benefit of the client (“Client”) in accordance with the agreement between Consultant and Client, including the scope of work detailed therein (the “Agreement”).

The information, data, recommendations and conclusions contained in the Report:

- are subject to the scope, schedule, and other constraints and limitations in the Agreement and the qualifications contained in the Report (the “Limitations”)
- represent Consultant’s professional judgement in light of the Limitations and industry standards for the preparation of similar reports
- may be based on information provided to Consultant which has not been independently verified
- have not been updated since the date of issuance of the Report and their accuracy is limited to the time period and circumstances in which they were collected, processed, made or issued
- must be read as a whole and sections thereof should not be read out of such context
- were prepared for the specific purposes described in the Report and the Agreement
- in the case of subsurface, environmental or geotechnical conditions, may be based on limited testing and on the assumption that such conditions are uniform and not variable either geographically or over time

Unless expressly stated to the contrary in the Report or the Agreement, Consultant:

- shall not be responsible for any events or circumstances that may have occurred since the date on which the Report was prepared or for any inaccuracies contained in information that was provided to Consultant
- agrees that the Report represents its professional judgement as described above for the specific purpose described in the Report and the Agreement, but Consultant makes no other representations with respect to the Report or any part thereof
- in the case of subsurface, environmental or geotechnical conditions, is not responsible for variability in such conditions geographically or over time

The Report is to be treated as confidential and may not be used or relied upon by third parties, except:

- as agreed by Consultant and Client
- as required by law
- for use by governmental reviewing agencies

Any use of this Report is subject to this Statement of Qualifications and Limitations. Any damages arising from improper use of the Report or parts thereof shall be borne by the party making such use.

This Statement of Qualifications and Limitations is attached to and forms part of the Report.