

The Calgary Airport Authority

Parallel Runway Project
Volume V – Item 2
Vegetation Baseline Report

Report

The Calgary Airport Authority

**Parallel Runway Project
Volume V – Item 2
Vegetation Baseline Report**

Prepared by:

AECOM

2540 Kensington Road NW

403 270 9200

tel

Calgary, AB, Canada T2N 3S3

403 270 0399

fax

www.aecom.com

Project Number:

60114017

Date:

June 2010

March 16, 2010

Project Number: 60114017

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

Dear Peter:

**Re: Baseline Study – Vegetation
Comprehensive Study Environmental Assessment
Parallel Runway Project 16L-34R - Runway Development Program**

This report presents the results of the baseline study for Vegetation 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
ANHIC	Alberta Natural Heritage Information Centre
ANPC	Alberta Native Plant Council
the Authority	The Calgary Airport Authority
CEAA	Canadian Environmental Assessment Act
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CS	Comprehensive Study
EA	Environmental Assessment
ESCC	Endangered Species Conservation Committee
LSA	Local Study Area
PRP	Parallel Runway Project
RSA	Regional Study Area
SARA	Species at Risk Act
VC	Valued Component
YYC	Calgary International Airport

Executive Summary

Vegetation conservation involves the identification of a specific set of management strategies or principles intended to prevent disruption or loss of plant species and community diversity. The Canadian Environmental Assessment Act (CEAA) requires proponents to avoid or mitigate environmental damage. Vegetation health and diversity are vital components in properly functioning ecosystems. Plant species, vegetation communities, and wetlands provide many benefits that cannot be overlooked in a healthy, productive environment, including the provision of wildlife habitat, erosion control, and the maintenance of water quality.

A primary consideration of project pre-planning and design is the potential effect on vegetation, leading to the loss of sensitive species or overall biodiversity and the subsequent loss of the benefits provided by such species and habitats. Development of the Calgary International Airport (YYC) Parallel Runway Project (PRP) implies that vegetation will be disturbed over a large area. The re-establishment of vegetation during reclamation stages of the project will aid in the restoration of a number of the benefits provided by vegetation, in particular, erosion control.

The Local Study Area (LSA) within the proposed development is defined by a highly modified landscape significantly altered by surrounding land-use development. The area is dominated by agricultural lands and/or semi-native prairie environments under private lease, with extensive areas of existing anthropogenic disturbance occurring throughout. Development on these lands has the potential to negatively impact vegetation through alteration, deterioration, or loss of suitable habitat. Additionally, surface disturbance activities resulting in the exposure of large areas of bare soil have the potential to affect productive, nutrient-rich top soils in adjacent, undisturbed landscapes, causing or accelerating a shift to less desirable plant species.

In an effort to be consistent with end land-use objectives, *Species Diversity* and *Community Diversity* were selected as valued ecological components for the purposes of the environmental assessment.

Species diversity included:

- Rare, threatened, or endangered plant species
- Invasive weeds and non-native species of concern as identified in the Alberta Weed Control Act

Community diversity included:

- Native vegetation communities and critical habitat, including remnant populations of native Fescue Grasslands and Aspen Parkland habitats occurring within the LSA
- Rare ecological communities as identified on the Alberta Natural Heritage Information Centre (ANHIC) tracking list of rare, natural ecological plant communities
- Wetlands

Wetlands were selected as a valued component (VC) based on their contribution to biodiversity, water quantity, water quality, provision of critical habitat, and ecosystem functions in the LSA. However, the maintenance of wetlands and wetland habitats on YYC lands conflicts directly with current Calgary Airport Authority (the Authority) safety management objectives, aimed at improving airport safety through the elimination of potential bird strike hazards. As such, the majority of wetlands within the LSA will be eliminated.

Environment Canada has a wetland conservation policy for activities taking place on federal lands. Although not a regulatory document, the outlined strategies within the *Federal Policy on Wetland Conservation* includes developing public awareness, enhancing cooperation, conserving wetlands and committing the federal government to wetland conservation in carrying out federal programs and management of federal lands and waters. This includes a policy of no net loss of wetland functions on all federal lands and waters, and developing guidelines to ensure the mitigation of the impacts of federal government activities affecting wetland functions.

Baseline vegetation data collection for the proposed PRP was evaluated between 14 July – 17 July 2009, while rare vascular plant surveys were conducted By Kestrel Research, Inc. on 23 June and 1 September 2009.

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 12.3% of the LSA
- Wetland landscape unit, occupying 3.98% of the LSA
- Agricultural landscape unit, occupying 51.15% of the LSA
- 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.

The results of the rare plant survey are included in the accompanying report entitled *Rare Vascular Plant Survey of the Calgary Airport Authority – Runway Development Project* (Lancaster 2009).

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.

Table of Contents

Acronyms Executive Summary

	page
1. Introduction	1
2. Regulatory Framework	2
2.1 Federal	2
2.1.1 Canadian Environmental Assessment Act.....	2
2.1.2 Species at Risk Act.....	2
2.1.3 Federal Policy on Wetland Conservation.....	2
2.2 Provincial.....	2
2.2.1 Alberta Wildlife Act/ Species at Risk Program	3
2.2.2 Provincial Wetland Restoration/Compensation Guide.....	3
2.2.3 Alberta Weed Control Act	3
2.3 Municipal	4
2.3.1 Calgary Wetland Conservation Plan	4
3. Methods	4
3.1 Spatial Boundaries.....	4
3.1.1 Local Study Area.....	4
3.1.2 Regional Study Area	4
3.2 Issues Identification.....	6
3.3 Valued Components.....	6
3.3.1 Species Diversity.....	7
3.3.1.1 VC 1 - Rare, Threatened, and Endangered plant species	7
3.3.1.2 VC 2 - Invasive weeds and non-native species of concern.....	7
3.3.2 Community Diversity	8
3.3.2.1 VC 3 - Native vegetation communities and critical habitat	8
3.3.2.2 VC 4 - Rare ecological communities	8
3.3.2.3 VC 5 - Wetlands.....	8
3.4 Literature Review/ Information Gathering	8
3.5 Field Investigations	9
3.5.1 Vegetation Classification.....	9
3.5.1.1 Rare, Threatened, or Endangered Vascular Plant Species and Rare Ecological Communities.....	10
3.5.2 Invasive Weeds and Non-native Species of Concern.....	11
4. Baseline Conditions.....	16
4.1 Local Study Area.....	16
4.1.1 Landscape Units	16
4.1.2 Valued Components	22
4.1.2.1 Rare, Threatened, or Endangered Plant Species	22
4.1.2.2 Non-Native and Invasive Weed Species of Concern	22
4.2 Regional Study Area	27
4.2.1 Regional Context	27
5. References.....	29

Statement of Qualifications and Limitations

Figures

Figure 1	Vegetation Study Area	5
Figure 2a	Vegetation Landscape Units North	19
Figure 2b	Vegetation Landscape Units Centre	20
Figure 2c	Vegetation Landscape Units South.....	21

List of Tables

Table 1	Preliminary Identification of Key Issues for Vegetation VCs.....	6
Table 2	Restricted, Noxious, and Nuisance Weed Species of Concern.....	12
Table 3	Wetland Environmental Significance Assessment.....	15
Table 4	Coarse Scale Vegetation Assemblages	16
Table 5	Noxious and Nuisance Weed Species Observed Within the LSA	22
Table 6	Key Wetland Descriptions and Locations	23

Appendices

Appendix A	Species Ranking and Status
Appendix B	Listing of Rare Plant Potentials Occurring Within the PRP Area
Appendix C	Detailed Listing of Vascular Plant Species Occurring Within the LSA
Appendix D	Rare Vascular Plant Survey
Appendix E	Photographs

1. Introduction

This Baseline Report forms part of the CS for the proposed PRP at the Calgary International Airport (YYC). The CS is being prepared as part of an EA and approval process mounted by the Calgary Airport Authority (the Authority). The process shadows the EA process under the *Canadian Environmental Assessment Act* (CEAA).

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 building
- A field electric centre
- Changes to airside/groundside roads necessitated by construction of the runway
- Closure of Barlow Trail between 48 Avenue and Airport Road
- 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)

Further details regarding the process and project can be found in Volume II, Chapter 5 of the CS.

This report provides a description of the Vegetation in the existing environment associated with the Authority's PRP. A series of baseline studies have been undertaken to describe the biophysical, socio-economic and historical resource baseline conditions. In total, 13 baseline studies have been undertaken:

- Soils and Terrain
- Vegetation
- Surface Water and Aquatic Resources
- Wildlife and Wildlife Habitat
- Groundwater
- Transportation
- Land Use
- Noise
- Climate and Greenhouse Gases
- Air Quality
- Cultural Resources
- Socio-economics
- Human Health

During the CS the results of each of the baseline studies were documented in stand-alone technical reports such as this one. In each case, a draft was prepared and made available for public, stakeholder and government agency comment. The final baseline conditions will be summarized in each individual assessment chapter (Volume III), with each of the stand-alone technical reports becoming an appendix to the CS.

The objective for conducting the vegetation assessment was the retrieval of baseline information for use in the identification of potential interactions between the Project and the vegetation valued components (VCs). Preliminary baseline information is intended for use in the documentation of pre-disturbance conditions, identification of potential project constraints, and development of appropriate site-specific mitigation measures, contributing to a decision-making support tool used to guide project design that will minimize environmental effects, where possible.

Environmental baseline information for the vegetation VC was collected and summarized in an effort to:

- Classify, delineate, and map vegetation assemblages within the LSA
- Determine vascular plant species and community diversity of naturally occurring vegetation types, including wetlands
- Identify, verify, and map the relative abundance of potential rare vascular plant species, rare ecological, and/or sensitive communities and the landscape units in which they are found
- Identify the presence of invasive weed species and non-native species of concern
- Evaluate wildlife habitat within and adjacent to the project area

2. Regulatory Framework

2.1 Federal

2.1.1 Canadian Environmental Assessment Act

The PRP is to be built on lands leased from Transport Canada (TC) by the Authority. Normally this would mean that the PRP would be subject to environmental assessment under CEAA. However, currently CEAA does not apply to airport authorities, although it may do so in the near future. The Authority has elected to subject the PRP to a CS-level EA by means of a process that shadows that which would normally be followed under CEAA. Further detail is provided in Volume II, Chapter 5 of the CS.

2.1.2 Species at Risk Act

The federal *Species at Risk Act (SARA)* provides protection for Canadian indigenous species, subspecies, and distinct populations and their critical habitats on federal lands, but does not apply to lands held by the Province of Alberta or its private citizens unless “the laws of Alberta do not effectively protect the species or the residences of its individuals”. In this case, the Minister may issue an order in council to protect federally listed species that occur on provincial or private lands.

2.1.3 Federal Policy on Wetland Conservation

An unregulated document, the Federal Policy on Wetland Conservation, is applied to ensure “no net loss” of wetland functions on all federal lands, providing guidance to the development of mitigation and/or compensatory measures, where appropriate.

2.2 Provincial

As stated above, the PRP is situated on federal land, so Canadian, rather than Alberta, legislation applies. It is important to note that, where Canadian regulations do not deal specifically with a topic (e.g., soil handling), normal federal regulatory practice is to require that operators comply with the equivalent provincial regulation. Federal legislation does apply to effects of the project that are felt beyond the boundaries of the airport lands.

In addition, the Canada-Alberta Agreement on Harmonization of Environmental Assessment provides for involvement of both governments in environmental assessments of projects in Alberta, regardless of the prime jurisdiction. Several Alberta government departments have informed CEEA of their desire to be kept informed about the PRP.

2.2.1 Alberta Wildlife Act/ Species at Risk Program

The Alberta Species at Risk Program was initiated as a response to the province's commitment to the *Accord for the Protection of Species at Risk in Canada*. The Accord's intent is to prevent species in Canada from becoming extinct as a consequence of human activity. As part of the assessment procedure, all species of concern are generally assessed and are classified as one of the following categories 1) At Risk; 2) May Be at Risk; 3) Sensitive; 4) Undetermined; and 5) Secure. The General Status of Alberta Wild Species 2005 (AENV 2005b) document provides an initial general status determination and acts as an important first step in determining which species May Be at Risk and therefore need detailed status evaluations. Any species that is designated At Risk or May Be at Risk undergoes a detailed status assessment and is formally designated as Endangered, Threatened, Special Concern, Data Deficient, or Not At Risk based on the review of detailed status evaluations and the recommendations by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the recommendations of the Alberta Endangered Species Conservation Committee (ESCC). Any species that is designated as Endangered or Threatened becomes legally protected under Alberta's *Wildlife Act* (R.S.A 2000, c.W-10). This legal designation prohibits the disturbance, killing, or trafficking of these species and provides immediate protection of nests and den sites. Any species that is designated as Sensitive after a general assessment, or as "Special Concern" after a detailed assessment, becomes eligible for special management actions designed to prevent the species from becoming At Risk

SARA was enacted to prevent Canadian indigenous species, subspecies, and distinct populations from becoming extirpated or extinct, to provide for the recovery of endangered or threatened species, and to encourage the management of other species to prevent them from becoming at risk.

Although not linked to any specific legislation, Alberta Natural Heritage Information Centre (ANHIC) tracks and ranks the condition, status, and trends of selected species and plant communities (ANHIC 2008). ANHIC's biological and ecological information provides developers, government agencies, and conservation groups with information relevant to the design and implementation of ecologically sound development projects.

A summary of the ranking systems outlined by SARA, the *Alberta Wildlife Act*, and ANHIC are provided in Appendix B -Explanation of Provincial and Global Species at Risk Rankings.

2.2.2 Provincial Wetland Restoration/Compensation Guide

The Provincial Wetland Restoration/Compensation Guide is designed to ensure "no net loss" of wetland functions on provincial lands, providing guidance to the development of mitigation and/or compensatory measures, where appropriate.

2.2.3 Alberta Weed Control Act

Section 13 of the *Weed Control Act* and its associated regulation requires the occupant or owner of the land to destroy all restricted weeds, control all noxious weeds, and prevent the spread or scattering of nuisance weeds.

2.3 Municipal

2.3.1 Calgary Wetland Conservation Plan

The City of Calgary's *Wetland Conservation Plan* is administered through the *Municipal Government Act*. In short, it was developed to ensure the maintenance or improvement of local water quality and quantity within City boundaries.

3. Methods

3.1 Spatial Boundaries

3.1.1 Local Study Area

The Local Study Area (LSA) is intended to represent the range of vegetation (plants and plant communities) occurring within the PRP footprint and immediate vicinity, and covers an area within which all direct and some indirect effects of project activities (surface disturbance and dewatering) are likely to occur.

The YYC property totals approximately 2,137 ha, comprising 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 the controlled area. The LSA for vegetation 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 to the south, 36 Street NE to the east, and McCall Way to the west. Direct project effects beyond these limits are not anticipated.

The LSA for vegetation is defined by a highly modified landscape, significantly altered by surrounding land-use development. It 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 (Figure 1). Surveys of the LSA were restricted to areas of limited disturbance (agricultural lands), with disturbed or inaccessible areas of YYC lands not considered in the vegetation field survey, including:

- airside lands contained within the security fence
- the airport's stormwater settling ponds situated in the south-eastern part of the LSA
- the Calgary Airport Golf Course located in the south
- existing infrastructure

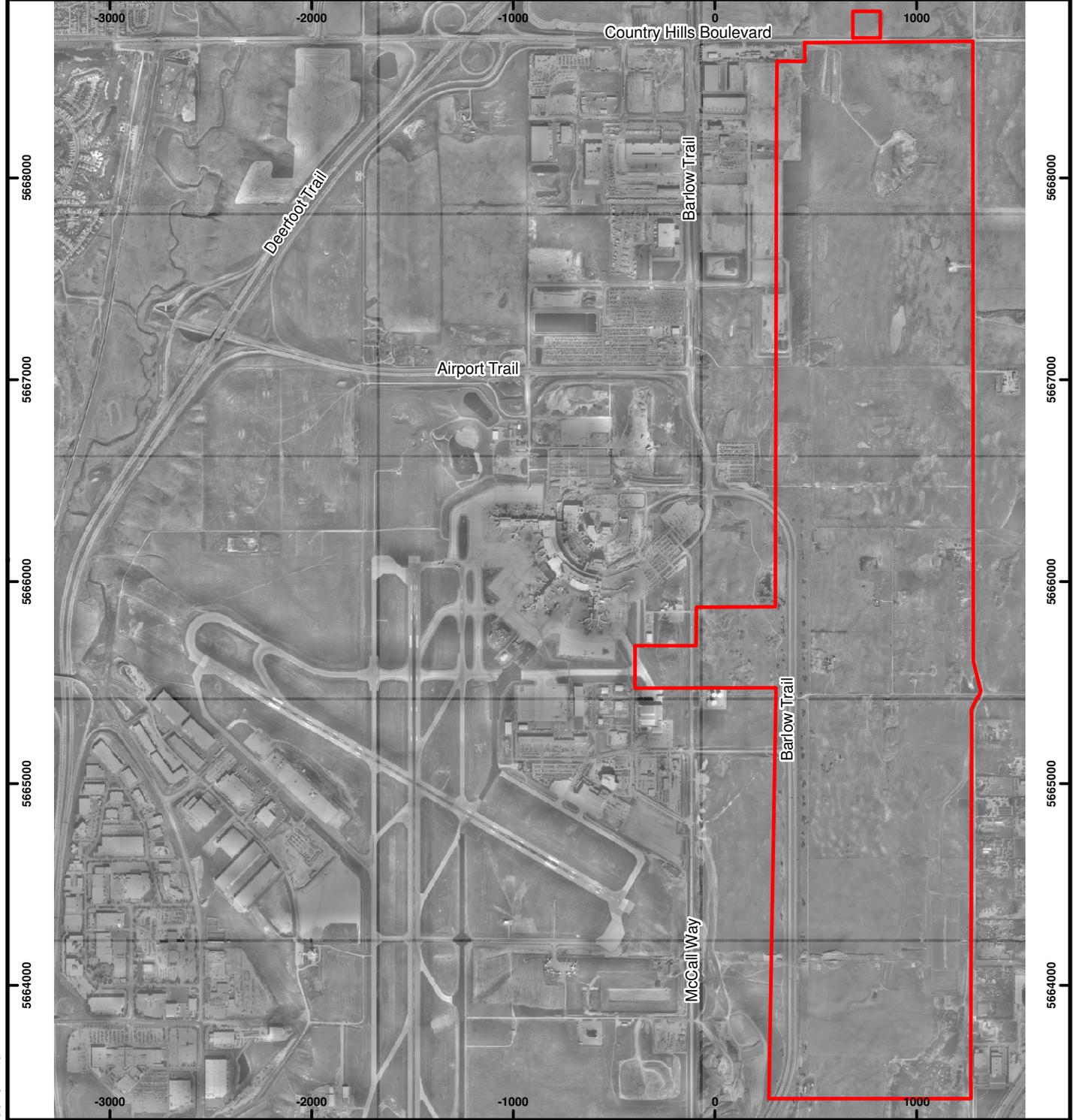
3.1.2 Regional Study Area

The Regional Study Area (RSA) is designed to represent the range of vegetation and vegetation communities existing within a region on a landscape scale, and would contain the area within which any regional effects of PRP activities are predicted to occur. However, as the PRP is located within a highly urbanized, developed landscape, surrounding vegetation communities have been dramatically impaired from their original pre-disturbance condition, rendering the accurate assessment of PRP effects difficult. As such, the RSA for the PRP is restricted to those areas of the YYC lands and an area to the immediate northeast characterized by grasslands in a "near natural" and/or cultivated state.

A SIZE 8.5" x 11"

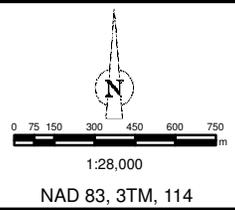
Saved By:MarjerrisonA

ISS/REV: A
YYC FILE NAME:60114017_C1_Fig1_StudyArea_17Feb10.mxd



Base data from NTDB 1:50,000.
Orthophotography from Calgary
Airport Authority.

 Study Area



YYC CALGARY
AIRPORT
AUTHORITY

The Calgary Airport Authority
Runway Development Program
Parallel Runway Project

AECOM

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.

Vegetation Study Area

Figure - 1

3.2 Issues Identification

The primary issue for vegetation is whether project activities will result in measurable effects on vegetation health, diversity, and abundance in proximity to the proposed PRP development, on a spatial and temporal scale. To focus the vegetation assessments, various components of vegetation species and community diversity were identified. Existing and additional VCs may be identified based on a review of existing EA documents, applicable legislation and regulations, perceived public values, airport safety concerns, and professional judgement.

Changes will occur directly through removal or burial of vegetation, and indirectly through changes in substrate composition, moisture, drainage, and temperature. Additionally, the transportation of equipment and vehicles to the Project area and use of reclamation seed have the potential to introduce non-native and invasive weed species of concern to the LSA, and may have an effect on vegetation diversity.

Potential project-related effects and VCs for vegetation are identified in Table 1.

Table 1 Preliminary Identification of Key Issues for Vegetation VCs

Issue/Effect	VC	General Project Component or Activity	Element
Disruption, alteration, or loss of Rare, Threatened, and/or Endangered plant species	Rare Plants (Species Diversity)	Construction and operation of PRP area (e.g., site preparation, topsoil salvage, soil stockpiling, surface grading, excavation, and infilling).	Vegetation removal, site clearing, and/or changes to soil moisture and/or local surface water hydrology
Introduction of invasive weeds and non-native species of concern	Invasive Weeds (Species Diversity)	Construction, operation, and interim reclamation of PRP area (e.g., site preparation, topsoil salvage, soil stockpiling, surface grading, excavation, infilling, interim reclamation, and maintenance).	Exposure of surface and subsurface soils during construction, operation, and interim reclamation, resulting in the establishment and/or dispersal of non-native and invasive weed species of concern
Disruption, alteration, or loss of native vegetation communities or critical habitat as a result of vegetation removal, site clearing, and/or changes to local soil and/or surface water resources	Native Plant Communities (Community Diversity)	Construction of PRP area (e.g., site preparation, topsoil salvage, soil stockpiling, surface grading, excavation, and infilling)	Vegetation removal, site clearing, and/or changes to soil moisture and/or local surface water hydrology
Disruption, alteration, or loss of rare ecological communities	Rare Ecological Communities (Community Diversity)	Construction and operation of PRP area (e.g., site preparation, topsoil salvage, soil stockpiling, surface grading, excavation, and infilling).	Vegetation removal, site clearing, and/or changes to soil moisture and/or local surface water hydrology
Alteration or loss of wetlands and wetland function	Wetlands (Community Diversity)	Construction of PRP area (e.g., dewatering, site preparation, excavation, and infilling).	Dewatering, vegetation removal, excavation, and/or infilling resulting in changes to soil moisture and/or local surface water hydrology

3.3 Valued Components

VCs are used to focus the EA; they include environmental attributes that are unique to an area or valued by the public (stakeholders). VCs are the final recipients of effects from a project activity, which means environmental components must be clearly linked to project activities. For the purpose of the EA, VCs representing the vegetation component have been drawn from the broad categories of *Species Diversity* and *Community Diversity* in an effort to be consistent with end land-use objectives.

VCS were identified from project objectives (consistent with applicable legislation and guiding documents), a review of existing reports, stakeholder input (public information sessions), and the professional judgement of the project team.

The proposed PRP will occupy portions of privately held, productive agricultural lands and/or semi-native prairie environments. Development on these lands has the potential to negatively impact vegetation through alteration, deterioration, or loss of suitable habitat. Additionally, surface disturbance activities resulting in the exposure of large areas of bare soil have the potential to affect productive, nutrient-rich top soils in adjacent, undisturbed landscapes, causing or accelerating a shift to less desirable plant species.

To focus the assessment on relevant issues, the potential PRP effects on vegetation communities and vascular plant species diversity were evaluated.

3.3.1 Species Diversity

Species diversity was selected in the assessment of vegetation due to its contribution to overall biodiversity in the project area. To focus efforts with respect to the environmental assessment, the following quantitative and qualitative components of species diversity were identified as VCs:

- **Rare, Threatened, or Endangered plant species** as listed under Schedule 1 of SARA (Government of Canada 2009) and those ranked as At Risk, May Be at Risk and Sensitive in the General Status of Alberta Wild Species 2005.
- **Invasive weeds and non-native species of concern** as identified in the Alberta Weed Control Act.

A brief description of the rationale used in the determination of VCs and methodology proposed to assess baseline conditions in relation to the evaluation of project effects on identified VCs is outlined below.

3.3.1.1 VC 1 - *Rare, Threatened, and Endangered plant species*

VC1 is directly related to the issue of vegetation abundance and diversity within the project area, and is evaluated based on the presence/ absence of federally (SARA) and/or provincially (ANHIC)-tracked species. Project activities related to construction and operation of the PRP have the potential to result in the disruption, alteration, or loss of Rare, Threatened, or Endangered plant species.

3.3.1.2 VC 2 - *Invasive weeds and non-native species of concern*

VC2 is directly and indirectly related to the issue of vegetation health, both within and adjacent to the LSA. The LSA, though situated historically in a rural setting characterized by native semi-native and cultivated grasslands, is under ever-increasing pressures from expanding urbanization, the results of which may include negative effects on vegetation health resulting from a prevalence of invasive weeds or non-native species of concern. Provincially, the management and control of invasive weeds is completed in accordance with the Alberta *Weed Control Act*, in addition to any applicable, regionally significant municipal acts or bylaws. YYC lands are the property of the Government of Canada, and while not directly legislated by this act, construction activities within the PRP area have the potential to negatively impact remnant patches of native vegetation and agricultural lands across adjacent landscapes and they should therefore be evaluated as a potential VC.

3.3.2 Community Diversity

Community diversity was selected due to its contribution to biodiversity and the provision of critical habitat functions for related disciplines (i.e., wildlife). To focus efforts with respect to the baseline assessment, the following quantitative and qualitative components of community diversity were identified as VCs:

- **Native vegetation communities and critical habitat** including, remnant populations of native Fescue Grasslands and Aspen Parkland habitats occurring within the project area
- **Rare ecological communities** as identified on the ANHIC Tracking List of rare, natural ecological plant communities
- **Wetlands**

3.3.2.1 VC 3 - Native vegetation communities and critical habitat

VC1 is directly and indirectly related to the issue of vegetation community abundance, diversity, and the provision of critical habitat function, within and adjacent to the LSA. The key potential issues for PRP effects on native vegetation communities are change in abundance, distribution, and/or health of plants and plant communities. Potential PRP effects on vegetation include:

- Loss of native vegetation communities due to the direct effects of PRP construction
- Reduction in the health of vegetation due to indirect effects including, but not limited to, erosion, changes in hydrology, and dispersal and establishment of invasive species

3.3.2.2 VC 4 - Rare ecological communities

This component of Community Diversity is directly related to the issue of rare, native plant communities occurring within the LSA. Rare ecological communities are evaluated based on the presence/ absence of vegetation types deemed “unusual or uncommon” by ANHIC and which are included on their Ecological Community Tracking List (e.g., rough fescue grasslands). Project activities related to construction and operation of the PRP have the potential to result in the disruption, alteration, or loss of rare ecological communities.

3.3.2.3 VC 5 - Wetlands

Wetlands were selected as a VC based on their contribution to biodiversity, water quantity, water quality, provision of critical habitat, and ecosystem function in the LSA. Presently, the maintenance of wetlands and wetland habitats on YYC lands conflicts directly with current YYC safety management objectives, as outlined in the Authority's *Wetland Strategy for Reducing Bird Strike Risk* (May 2008), aimed at improving airport safety through the elimination of potential bird strike hazards. These efforts focus primarily on wildlife management techniques (i.e., waterfowl) performed in association with habitat management efforts. These management techniques ultimately result in the alteration or loss of wetland habitat quality and the quantity of these types of habitat usable or selected by wildlife in particular waterfowl.

3.4 Literature Review/ Information Gathering

Information about the proposed project area was obtained through a review of the existing literature. Important information sources reviewed and referenced included:

- Biophysical Assessment of Calgary International Airport: Impacts, Mitigation and Significance of Master Plan Developments (University of Calgary 2004)

- *Calgary Airport Wetland Assessment* (Golder Associates 2003)
- Relevant and applicable legislation, regulations, and guidelines, including: *Federal Policy on Wetland Conservation*; *Provincial Wetland Conservation Restoration Policy*, and the *Calgary Wetland Conservation Plan* related to wetlands and wetland management
- *Alberta Weed Control Act and Regulation*, *City of Calgary Community Standards Bylaw* and *Calgary Airport Authority Vegetation Management Plan*
- Documentation and mapped locations of SARA or ANHIC-listed vascular plant species
- Element occurrences and mapped locations of ANHIC-listed rare ecological communities
- Maps of the proposed project as provided by AECOM Project Engineers (Calgary)
- Reference maps and aerial photographs
- Calgary Airport Authority Soil Management Plan and/or area topsoil conservation practices

3.5 Field Investigations

Existing vegetation databases and field surveys, completed as part of baseline vegetation assessments, were performed with the intent of accurately characterizing and mapping the spatial distribution of existing vegetation communities and vascular plant species diversity across the LSA. The methods used to evaluate community diversity included field surveys to:

- Ground-truth identified vegetation types,
- Assess range community health and more detailed range community classification, and to
- Identify rare ecological communities.

Methods that were used to evaluate species diversity included rare plant surveys and surveys to identify invasive weed and non-native species of concern.

3.5.1 Vegetation Classification

Assessments conducted as part of the vegetation baseline followed methods outlined in applicable standard texts used for classifying native plant communities in the Foothills Fescue Natural Subregion. Pre-existing native plant communities were categorized in accordance with accepted classification standards as outlined in the *Range Plant Communities and Range Health Assessment Guidelines of the Foothills Fescue Natural Subregion of Alberta* (Adams et al. 2003).

Ground-truthing of the LSA was conducted to identify landscape features not delineated during background information gathering, to identify recent changes to site characteristics (e.g., anthropogenic disturbance, etc.), and to note potential operational constraints (i.e., wetlands). Information collected during this process was used to delineate the PRP in relation to naturally occurring environmental features (topographical features, vegetation types, water bodies/wetlands, etc.) and surrounding land-use developments (industrial facilities, roads, powerline/pipeline corridors, etc.).

Non-native, cultivated, or disturbed plant communities were defined as coarse-scale vegetation assemblages (landscape units), which were delineated based on the dominant vegetation observed during on-site field investigations.

Landscape units within the LSA were defined as areas having similar superficial characteristics (topography and soil landscapes), which supported similar vegetation communities/assemblages. Diversity of landscape units may contribute to the provision of important habitat for various wildlife species (i.e., migratory birds). Therefore, impacts resulting in the alteration or loss of specific landscape

units may result in direct or indirect impacts to vegetation, vegetation communities, and/or critical wildlife habitat.

Digital photographs were taken in all cardinal directions whenever a change in vegetation community, topography, land use, or other relevant feature was observed.

3.5.1.1 *Rare, Threatened, or Endangered Vascular Plant Species and Rare Ecological Communities*

The Alberta Native Plant Council (ANPC) defines rare plants as "any native vascular or non-vascular (mosses, liverworts, hornworts) plant that, because of its biological characteristics or for some other reason, exists in low numbers or in very restricted areas of Alberta" (ANPC 2000).

The management of wild species which are considered rare or at risk in Canada is a joint responsibility of the provincial and federal governments. As such, the framework for the protection of rare species in Alberta includes overlapping legislation, regulations, and guidelines. Within this overlapping management framework, the status of plant species is evaluated at three levels:

- Federally, under the *Species At Risk Act* (SARA 2002);
- Provincially, under the *Alberta Wildlife Act* (AENV 2004);
- Outside of the legislative framework, the status of rare plant species is also tracked on a provincial scale by ANHIC.

The Environment Canada Species at Risk Public Registry, ANHIC database, and published reports and literature (i.e., Flora of Alberta, Rare Vascular Plants of Alberta) were reviewed prior to commencing field survey for information related to rare plants, native biodiversity, and elements of special concern within and adjacent to the LSA. No recorded occurrences of federally listed rare plant species or provincially (ANHIC) tracked elements were returned. This, however, does not indicate that occurrences do not exist within the LSA; rather the absence of records could merely indicate that very few inventories/surveys have been done in this part of the province. Results of the ANHIC searches are not intended as a final statement on the presence, absence, or condition of elements within a given area, or as a substitute for on-site surveys that may be required for EAs.

To AECOM's knowledge, prior rare plant surveys of the LSA and/or surrounding landscapes are limited to that of a single assessment conducted during the 2002 field season as part of the *Biophysical Assessment of Calgary International Airport: Impacts, Mitigation and Significance of Master Plan Developments 2004* study. Rare plant surveys conducted as part of the referenced study identified one federally listed plant species Western Blue Flag (*Iris Missouriensis*) and five provincially recognized plant species, including Manitoba Maple (*Acer negundo*), Hood's Sedge (*Carex hoodii*), Pale Blue-eyed Grass (*Sisyrinchium septentrionale*), Wild Tomato (*Solanum triflorum*), and Carpet Vervain (*Verbena bracteata*). Surveys designed for classifying and mapping dominant vegetation associations, however, use different methods and are not designed to survey for rare plant species, instead recording only incidental observations of those species.

The 2002 floristic survey for rare plants within the LSA, complied with the methods outlined in ANPC (2000) and included the documenting of "listed" rare plant species occurrences, each of which were spatially located using a GPS, photographed, marked in the field and documented according to the required Rare Native Plant Report Form.

Detailed methodology for the rare plant survey, as performed during baseline studies of the LSA, is included in the accompanying report entitled *Rare Vascular Plant Survey of the Calgary Airport Authority – Runway Development Project* (Lancaster, 2009) (Appendix D).

3.5.2 Invasive Weeds and Non-native Species of Concern

Surveys for invasive weeds and non-native species of concern conducted as part of the baseline report consisted of visual assessments of the LSA. The objective of the weed survey was to confirm the presence of *restricted*, *noxious*, and *nuisance* weed species as listed in the provincial *Weed Control Act - Weed Regulation* (AR 171/2001). A complete listing of potentially occurring restricted, noxious or nuisance weed species within the LSA Area is found in Table 2 below.

The literature review of relevant documents related to the biophysical resource of the LSA has provided limited spatial information with respect to existing invasive weed and non-native species of concern issues in the study area.

Invasive weeds and non-native species of concern were identified during the surveys used to characterize vegetation communities and wetlands within the LSA. The information collected and recorded regarding these plant types included; species presence, preliminary indications of growth stage and degree of infestation.

Table 2 Restricted, Noxious, and Nuisance Weed Species of Concern

Restricted Weeds		Nuisance Weeds	
Common Name	Scientific Name	Common Name	Scientific Name
Diffuse knapweed	<i>Centaurea diffusa</i>	Annual sow thistle	<i>Sonchus oleraceus</i>
Dodder	<i>Cuscuta spp</i>	Ball mustard	<i>Neslia paniculata</i>
Eurasian Water Milfoil	<i>Myriophyllum spicatum</i>	Biennial campion	<i>Silene cserei</i>
Nodding thistle	<i>Carduus nutans</i>	Bluebur	<i>Lappula echinata</i>
Red bartsia	<i>Odontites serotina</i>	Common chickweed	<i>Stellaria media</i>
Spotted knapweed	<i>Centaurea maculosa</i>	Corn spurry	<i>Spergula arvensis</i>
Yellow Star-thistle	<i>Centaurea solstitialis</i>	Cow cockle	<i>Saponaria vaccaria</i>
		Creeping bellflower	<i>Campanula rapunculoides</i>
Noxious Weeds		Dalmatian toadflax	<i>Linaria dalmatica</i>
Common Name	Scientific Name	Dandelion	<i>Taraxacum officinale</i>
Field Bindweed	<i>Convolvulus arvensis</i>	Dog mustard	<i>Erucastrum gallicum</i>
Blue Weed	<i>Echium vulgare</i>	Downy Brome	<i>Bromus tectorum</i>
Common Buttercup	<i>Ranunculus acris</i>	Field chickweed	<i>Cerastium arvense</i>
Bladder Campion	<i>Silene cucubalus</i>	Flixweed	<i>Descurainia sophia</i>
Cleavers	<i>Galium aparine</i>	Green foxtail	<i>Setaria viridis</i>
White Cockle,	<i>Lychnis alba</i>	Green tansy mustard	<i>Descurainia pinnata</i>
Hoary Cress	<i>Cardaria draba</i>	Hedge bindweed	<i>Convolvulus sepium</i>
Ox-eye Daisy	<i>Chrysanthemum leucanthemum</i>	Hemp nettle	<i>Galeopsis tetrahit</i>
Persian Darnel	<i>Lolium persicum</i>	Henbit	<i>Lamium amplexicaule</i>
Spreading Dogbane	<i>Apocynum androcaemifolium</i>	Lady's-thumb	<i>Polygonum persicaria</i>
Hounds-tongue	<i>Cynoglossum officinale</i>	Mouse-eared chickweed	<i>Cerastium vulgatum</i>
Russian Knapweed	<i>Centuarea repens</i>	Narrow-leaved hawk's-beard	<i>Crepis tectorum</i>
Knawel	<i>Scleranthus annus</i>	Night-flowering catchfly	<i>Silene noctiflora</i>
Purple Loosestrife	<i>Lythrum salicaria</i>	Quack grass	<i>Agropyron repens</i>
Field Scabious	<i>Knautia arvensis</i>	Redroot pigweed	<i>Amaranthus retroflexus</i>
Scentless Chamomile	<i>Matricaria maritima</i>	Rough cinquefoil	<i>Potentilla norvegica</i>
Cypress Spurge	<i>Euphorbia cyparissias</i>	Round-leaved mallow	<i>Malva rotundifolia</i>
Leafy Spurge	<i>Euphorbia esula</i>	Russian thistle	<i>Salsola pestifer</i>
Storksbill	<i>Erodium cicutarium</i>	Shepherd's-purse	<i>Capsella bursa-pastoris</i>
Tansy	<i>Tanacetum vulgare</i>	Stinkweed	<i>Thlaspi arvense</i>
Canada Thistle	<i>Circium arvense</i>	Tartary buckwheat	<i>Fagopyrum tataricum</i>
Perennial Sow Thistle	<i>Sonchus arvensis</i>	Wild buckwheat	<i>Polygonum convolvulus</i>
Yellow (common Toadflax)	<i>Linaria vulgaris</i>	Wild mustard	<i>Sinapis arvensis</i>
		Wild oats	<i>Avena fatua</i>
		Wild radish	<i>Raphanus raphanistrum</i>
		Wormseed mustard	<i>Erysimum cheiranthoides</i>

Wetlands

Preliminary investigations of LSA wetlands were undertaken to meet the requirements of the Alberta *Water Act* and the *Provincial Wetland Restoration/Compensation Guide*. The data collected and methods used relate directly to those recommended in the *Provincial Wetland Restoration/Compensation Guide* (AENV 2007).

For the purposes of this assessment, “wetland” was defined as land saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation, and various kinds of biological activity which are adapted to a wet environment (AENV 2007).

YYC commissioned a detailed wetland assessment which was conducted during the 2003 field season as part of the *Calgary Airport Wetlands Assessment* report (Golder 2003). This report provides good coverage of the wetland resources occurring across the YYC lands, including a description of those potentially affected by the proposed PRP. Wetlands were classified and delineated in accordance with the *Classification of Natural Ponds and Lakes in the Glaciated Prairie Region* (Stewart and Kantrud 1971).

Where possible, information contained within the wetland report (Golder 2003) was used to supplement existing baseline information specifically regarding the identification of wetlands that would potentially be affected by PRP developments. Wetland ground-truthing was performed as part of baseline studies to ensure accuracy with respect to their previous characterization and delineation. Potential impacts to naturally occurring wetlands, measures to avoid wetland impacts, and compensation measures for those impacts deemed unavoidable are included in Volume III, Chapter 5 of the CS.

Wetland Classification

Wetlands classified using the Stewart and Kantrud (1971) system were summarized as follows:

- Class I – ephemeral ponds
- Class II – temporary ponds
- Class III – seasonal ponds and lakes
- Class IV – semi-permanent ponds and lakes
- Class V – permanent ponds and lakes
- Class VI – alkali ponds and lakes
- Class VII – fen (alkaline bog) ponds

Stewart and Kantrud (1971) described vegetative cover class categories to illustrate the spatial relationship between emergent plants and open water. The cover types and the characteristics associated with each following this system ((Stewart and Kantrud, 1971) are summarized as follows:

- Cover Type 1 – closed stands of vegetation with less than 5% of water or bare ground
- Cover Type 2 – vegetation is in dense but scattered patches or is open and diffuse with 5 to 95% water or bare ground
- Cover Type 3 – vegetation is in a peripheral band surrounding open water or bare ground that covers more than 5% of the area of the wetland or water body
- Cover Type 4 – vegetation is in marginal bands, <6 m wide, with >95% water or bare ground

Wetland Significance Assessment

The physical and chemical characteristics of wetlands have not been widely studied. These characteristics are site specific and as a result of the wide natural variation in wetland chemistry, biological indicators are considered a more useful measure of wetland health. Wray and Bayley (2006) suggest that the plant and animal communities that naturally occur in a wetland are considered to provide an accurately reflection of its health. Changes and disturbances to wetland health often are reflected by changes to the biotic community, despite the natural variability caused by their geographical location, the hydrological processes functioning within them and their physical size) (U.S. EPA 2002). The diversity of wetland plant communities can increase or decrease in response to disturbance; thus plant abundance and richness are useful indicators of wetland health.

The baseline assessment of wetlands within the LSA was based on evaluation of the vegetation and wildlife species and communities present and their diversity. Additionally, the presence/abundance of invasive species within the wetland were also assessed. In combination this information was used to provide a measure of wetland health. Using findings taken from the site surveys, as well as desktop information (water quality of associated water bodies, etc.) the wetlands were placed into one of three significance categories (Environmentally Significant Wetland, Major Wetland, Non-functional or Supporting Wetland) based on a biological rating system and attributes gathered during the field assessment (Table 3).

Table 3 Wetland Environmental Significance Assessment

Significance	Disturbance	Flora	Fauna	Flood and Erosion Control	Hydrological (water quality and quantity) Function	Cultural, Recreational & Educational Potential
Environmentally Significant Wetland	<p>Very little to no disturbance is evident</p> <p>Less than 1% of wetland vegetation altered by human activity and/or human-caused bare ground</p>	<p>Dominated by native species that may:</p> <ul style="list-style-type: none"> Exhibit high flora diversity relative to other area wetlands Be unique species including those that are locally, provincially or nationally rare Have more than 95% of wetland area covered by live plant growth Have more than 15% total cover of preferred trees/shrubs as seedlings and/or saplings 	<ul style="list-style-type: none"> Has high species diversity Acts as an important staging area for wildlife movement or Contains unique species. 	<ul style="list-style-type: none"> High contribution to flood and erosion control Wetland is not subjected to artificial water level change 	<ul style="list-style-type: none"> High contribution to the long-term maintenance of the hydrological regime beyond its boundaries 	<ul style="list-style-type: none"> High potential for developing passive recreational, interpretative, and/or educational facilities
Major Wetland	<p>Moderate to very little disturbance is evident</p> <p>1% to 15% of wetland vegetation altered by human activity and/or human-caused bare ground</p>	<p>Predominately native in character with some non-native species and may have:</p> <ul style="list-style-type: none"> Moderate to high flora diversity; 85% to 75% of wetland area is covered by live plant growth; and 5% to 15% total cover of preferred trees/shrubs is seedlings and/or saplings. 	<ul style="list-style-type: none"> Has moderate to high species diversity or Acts as a moderately important to important staging area for wildlife movement. 	<ul style="list-style-type: none"> Moderate to high contribution to flood and erosion control Low to moderate degree of artificial water level change 	<ul style="list-style-type: none"> Moderate to high contribution to the long-term maintenance of the hydrological regime beyond its boundaries 	<ul style="list-style-type: none"> Moderate to high potential for developing passive recreational, interpretative, and/or educational facilities
Non-functional or Supporting Wetland	<p>High to moderate disturbance is evident</p> <p>Greater than 15% of wetland vegetation altered by human activity and/or human-caused bare ground</p>	<p>High to moderate invasion by non-native species and may have:</p> <ul style="list-style-type: none"> Low to moderate diversity of flora; Less than 75% of wetland area covered with live plant growth; Less than 5% total cover of preferred trees/shrubs being seedlings and/or saplings, or preferred tree/shrub seedlings/saplings absent 	<ul style="list-style-type: none"> Has low to moderate species diversity or Has low to moderately important staging area for wildlife movement 	<ul style="list-style-type: none"> Low to moderate contribution to flood and erosion control High degree of artificial water level change 	<ul style="list-style-type: none"> Low to moderate contribution to the long-term maintenance of the hydrological regime beyond its boundaries 	<ul style="list-style-type: none"> Low to moderate potential for developing passive recreational, interpretative, and/or educational facilities.

* Adapted from the *Alberta Lentic Wetland Health Assessment User Manual* and the *Calgary Wetland Conservation Plan*.

4. Baseline Conditions

4.1 Local Study Area

Baseline data related to vegetation and wetlands assessments for the LSA and proposed PRP were collected over the period between 14 July and 17 July 2009. Assessments focused on the evaluation of existing land use, vegetation and vegetation communities, rare vascular plants and ecological communities, invasive weeds, and the preliminary assessment of wetlands in proximity to the proposed development that have the potential of being negatively impacted. In support of the vegetation baseline the rare plant and community surveys were conducted within the LSA between June 23 and September 1, 2009 by Kestrel Research Inc.

Vegetation communities identified as part of baseline investigations are reflective of the dominant land use within and in proximity to the LSA. The area evaluated may be characterized as a highly modified, agricultural (cultivated)/ urban landscape, with extensive areas of existing anthropogenic disturbance. Native vegetation communities were assessed as being uncommon in the LSA. As such, native vegetation communities were not categorized in accordance to the classification standards specified by Adams et al. (2003). Rather coarse-scale classifications based on vegetation assemblages were delineated within the LSA that was based on the observed dominant vegetation.

4.1.1 Landscape Units

The coarse scale vegetation assemblages (landscape units) identified during baseline studies for the LSA are listed in Table 4 below.

Table 4 Coarse Scale Vegetation Assemblages

Landscape Unit	Sub-Units	Extent (ha)	Percent of Project Area
Natural Landscape Unit	Semi-Native Prairie	62.02	11.62
	Semi-Native Aspen Stand	3.69	0.68
Wetland Landscape Unit	Temporary Pond (Class II)	12.00	2.2
	Seasonal Pond (Class III)	2.05	0.38
	Semi-Permanent Pond (Class IV)	7.29	1.4
Agricultural Landscape Unit	Cultivated	129.62	24.16
	Fallow	61.84	11.52
	Tame Pasture	82.99	15.47
Anthropogenic Landscape Unit	Disturbed	50.16	9.35
	Hedgerow	8.31	1.54
	Infill Wetland	49.35	9.20
	Stripped	66.98	12.48
TOTAL		536.32	100

Natural Landscape Units

The natural landscape unit was typically uncommon and limited in extent throughout the LSA.

Semi-Native Prairie: This landscape unit was characterized by a modified grassland community surrounding semi-rural residences (Central Acreages area) and situated between 36 Street to the east and Barlow Trail to the west, in the central portion of the LSA. The unit was generally characterized as underutilized, modified pasture dominated by agronomic graminoid species smooth brome (*Bromus inermis*) and Kentucky bluegrass (*Poa pratensis*), with scattered occurrences of native shrub species

prickly rose (*Rosa acicularis*) occurring throughout. A forb community of pasture sagewort (*Artemisia frigida*) was also discernable. Weed species occurrences associated with this landscape unit are outlined in Table 5 below. The *Semi-Native Prairie* sub unit occupies 62.02 ha (11.62%) of the LSA.

Semi-Native Aspen Stand: This landscape unit was characterized by a relatively small, remnant stand of deciduous forest aspen situated at the west side of Barlow Trail, in the western portion of the LSA. It was composed primarily of young trembling aspen (*Populus tremuloides*), with a mix of balsam poplar (*Populus balsamifera*) observed in low-lying depressions, on imperfectly drained soils. The shrub layer consisted of willow (*Salix* spp.), and ground vegetation was dominated by invasive agronomic species smooth brome (*Bromus inermis*), with native fowl bluegrass (*Poa palustris*) and wire rush (*Juncus balticus*) in limited abundance. The noxious weed Canada thistle (*Cirsium arvense*) was also prevalent throughout the stand. The *Semi-Native Aspen Stand* sub unit occupies 3.69 ha (0.68%) of the LSA.

Wetland Landscape Units

At the time of assessment, fourteen (14) temporary, five (5) seasonal and four (4) semi-permanent wetlands were identified within the LSA. Wetlands were classified in accordance with the *Classification of Natural Ponds and Lakes in the Glaciated Prairie Region* (Stewart and Kantrud 1971), and included:

- *Temporary Ponds: Temporary or Class II wetlands* following Stewart and Kantrud (1971) are dominated by wet meadow vegetation in the deepest part of the wetland basin. Weedy species, including quack grass (*Agropyron repens*), smooth brome, and creeping and Kentucky bluegrass are frequently present, as well as species preferring moist conditions, such as wild mint (*Mentha arvensis*) and yellow avens (*Geum aleppicum*). Temporary ponds are represented by wetlands in various states of soil saturation that decline or increase in aerial extent and coverage of wetland vegetation seasonally or annually, depending on available moisture (Stewart and Kantrud, 1971). Within the LSA, pre-existing Class II Temporary wetlands were typically altered by anthropogenic disturbance (i.e., agriculture) as evidenced by human-caused impacts to traditionally saturated soils during drier years when soil moisture is favourable enough to allow for the cultivation of agronomic species. Fourteen Class II wetlands (Figure 2a, Figure 2b and Figure 2c) were identified within the LSA and will potentially be impacted by the development. Temporary ponds cover approximately 12.0 ha (2.2%) of the LSA.
- *Seasonal Ponds (Class III wetlands): Seasonal marshes, or Class III wetlands* as defined by Stewart and Kantrud (1971), are dominated by shallow marsh vegetation in the deepest part of the wetland basin. Shallow marsh vegetation includes moisture-loving grasses and sedges, including awned sedge (*Carex atherodes*), small bottle sedge, creeping spike-rush (*Eleocharis palustris*), common tall manna grass (*Glyceria grandis*), and other species that prefer moist conditions, including wild mint, yellow avens, and Canada thistle (*Cirsium arvense*). Seasonal ponds are represented by wetlands in various states of soil saturation that decline or increase in aerial extent and coverage of wetland vegetation seasonally or annually, depending on available moisture (Stewart and Kantrud 1971). Two Class III wetlands (Figure 2a, Figure 2b, and Figure 2c) were present within the project area and will be impacted by the development. Seasonal ponds cover approximately 2.05 ha (0.38%) of the LSA.
- *Semi-Permanent Pond / Lake (Class IV Wetland): Semi-permanent ponds, or Class IV wetlands* as defined by Stewart and Kantrud (1971), are dominated by deep-marsh vegetation in the deepest part of the wetland basin. Deep-marsh vegetation includes relatively coarse marsh emergent species such as cattails (*Typha latifolia*) and bulrush (*Scirpus lacustris*). Shallow marsh and wet meadow zones are also generally present in Class IV wetlands, landward of the deep-marsh zone. Water in semi-permanent wetlands generally persists into autumn.

Four Class IV wetlands (Figure 2a, Figure 2b, and Figure 2c) are present within the LSA and will potentially be impacted by the development. Semi-permanent wetlands cover approximately 7.29 ha (1.4%) of the LSA. The individual wetlands within this landscape unit are described in more detail in the wetland section below.

Agricultural Landscape Unit

Cultivated: The Cultivated land sub unit is characterized by arable lands used mainly in the production of forage crops (e.g., alfalfa (*Medicago sativa*), brome grass, timothy, wheat grasses, clover, and wild ryes). Cultivated lands represent one of the most dominant land uses within the LSA. The cultivated land sub unit occupies 129.62 ha (24.16%) of the LSA.

Fallow Fields: Fallow fields are areas that have been historically cultivated but have been purposely not planted for a period generally to restore the natural nutrient values in the soils. If fields are left in this condition for an extended period of time covering several growing seasons they become re-vegetated with non-native and other invasive plant species. Although they are not considered to be managed fields under such conditions they are still characterized as cultivated lands for the purposes of classification. Included in this sub unit are lands modified through the use of domestic plantings for windrows and shelterbelts. The fallow fields sub unit occupies 61.84 ha (11.52%) of the LSA.

Tame Pasture: The tame pasture sub unit includes all lands that are presently, or have been historically, used for pasture. Typically pasture lands are dominated by introduced agronomic forage species, encroachment of natural and grazing induced species (e.g., Kentucky bluegrass, yellow sweet clover) can also be commonly found. Native species found on tame pasture lands include such common species as prairie rose (*Rosa arkansna*), American vetch (*Vicia americana*), common yarrow (*Achillea millefolium*), and small-leaved everlasting (*Antennaria parvifolia*). Non-native, invasive weed species found in tame pasture include smooth brome (*Bromis inermis*), dandelion (*Taraxacum officinale*), and yellow sweet clover. The tame pasture sub unit of the LSA occupies 82.99 ha (15.47%).

Anthropogenic Landscape Unit

Disturbed Land: Disturbed lands include those areas occupied by existing rural residences, municipal road rights-of-way, railway lines, transmission line corridors, and other industrial uses. This unit included much of the Central Acreages area of the LSA, which at the time of assessment, contained occupied rural residences, farmyards, and supporting infrastructure (roads, powerline right of ways, etc.).

The disturbed sub unit occupies 50.16 ha (9.35%) of the LSA.

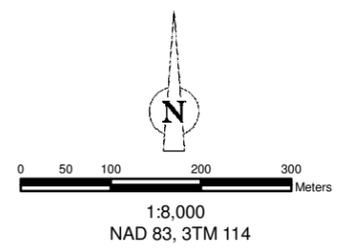
Hedgerow: The Anthropogenic Landscape Unit of the LSA includes a former/ abandoned homestead and associated narrow hedgerow comprising planted plains cottonwood (*Populus deltoides*). These lands were classified as belonging to the hedgerow sub unit. The dominant ground vegetation in this sub unit is comprised of smooth brome and invasive plant species such as; Canada thistle, perennial sow thistle (*Sonchus arvensis*), and dandelion. A high-pressure gas pipeline was also present in this area at the time of assessment. The hedgerow sub unit occurred along the west side of the Northern Agricultural Lands, in the northern portion of the LSA. The hedgerow sub unit occupies 8.31 ha (1.54%) of the LSA.

Infill Wetland: The infill wetland sub units are distributed across the LSA and characterized by areas disturbed as part of the Authority's *Wetland Strategy for Reducing Bird Strike* and development of the Authority's Stormwater Improvement Program. These areas have contributed significantly to the extent of vegetation removal and surface disturbance (infill wetland sub unit) within the LSA. The infill wetland sub unit occupies 49.35 ha (9.20%) of the LSA.



Data Source:
Vegetation landscapes compiled by AECOM.

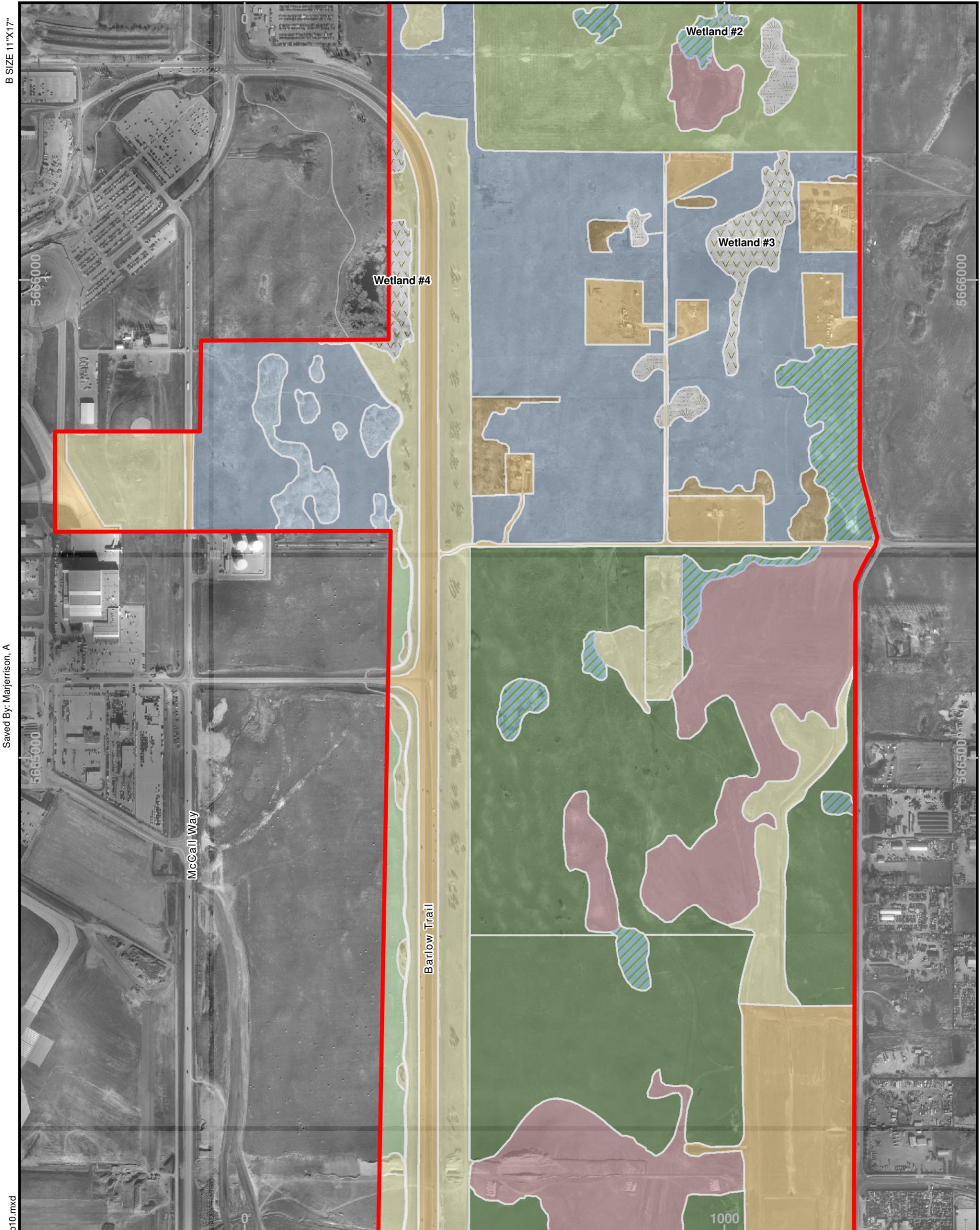
- | | |
|---|-----------------------------------|
| Study Area | Anthropogenic (Hedgerow) |
| Landscape Units | Anthropogenic (Infilled Wetland) |
| Agricultural (Cultivated) | Natural (Semi-Native Aspen Stand) |
| Agricultural (Fallow Field) | Natural (Semi-Native Prairie) |
| Agricultural (Tame Pasture) | Wetland (Seasonal) |
| Anthropogenic (Disturbed) | Wetland (Semi-permanent) |
| Anthropogenic (Existing Infrastructure) | Wetland (Temporary) |



The Calgary Airport Authority
Runway Development Program
Parallel Runway Project



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.



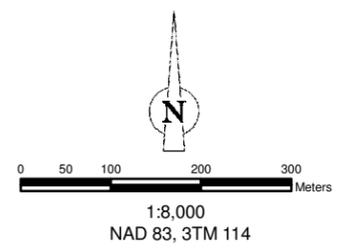
B SIZE 11"X17"

Saved By: Marjerrison, A

ISS/REV: A
 YYC FILE NAME: 60114017_C1_Fig2_VegetationLandscape_2Feb10.mxd

Data Source:
 Vegetation landscapes compiled by AECOM.

- Study Area
- Landscape Units**
- Agricultural (Cultivated)
- Agricultural (Fallow Field)
- Agricultural (Tame Pasture)
- Anthropogenic (Disturbed)
- Anthropogenic (Existing Infrastructure)
- Anthropogenic (Hedgerow)
- Anthropogenic (Infilled Wetland)
- Natural (Semi-Native Aspen Stand)
- Natural (Semi-Native Prairie)
- Wetland (Seasonal)
- Wetland (Semi-permanent)
- Wetland (Temporary)



YYC CALGARY AIRPORT AUTHORITY

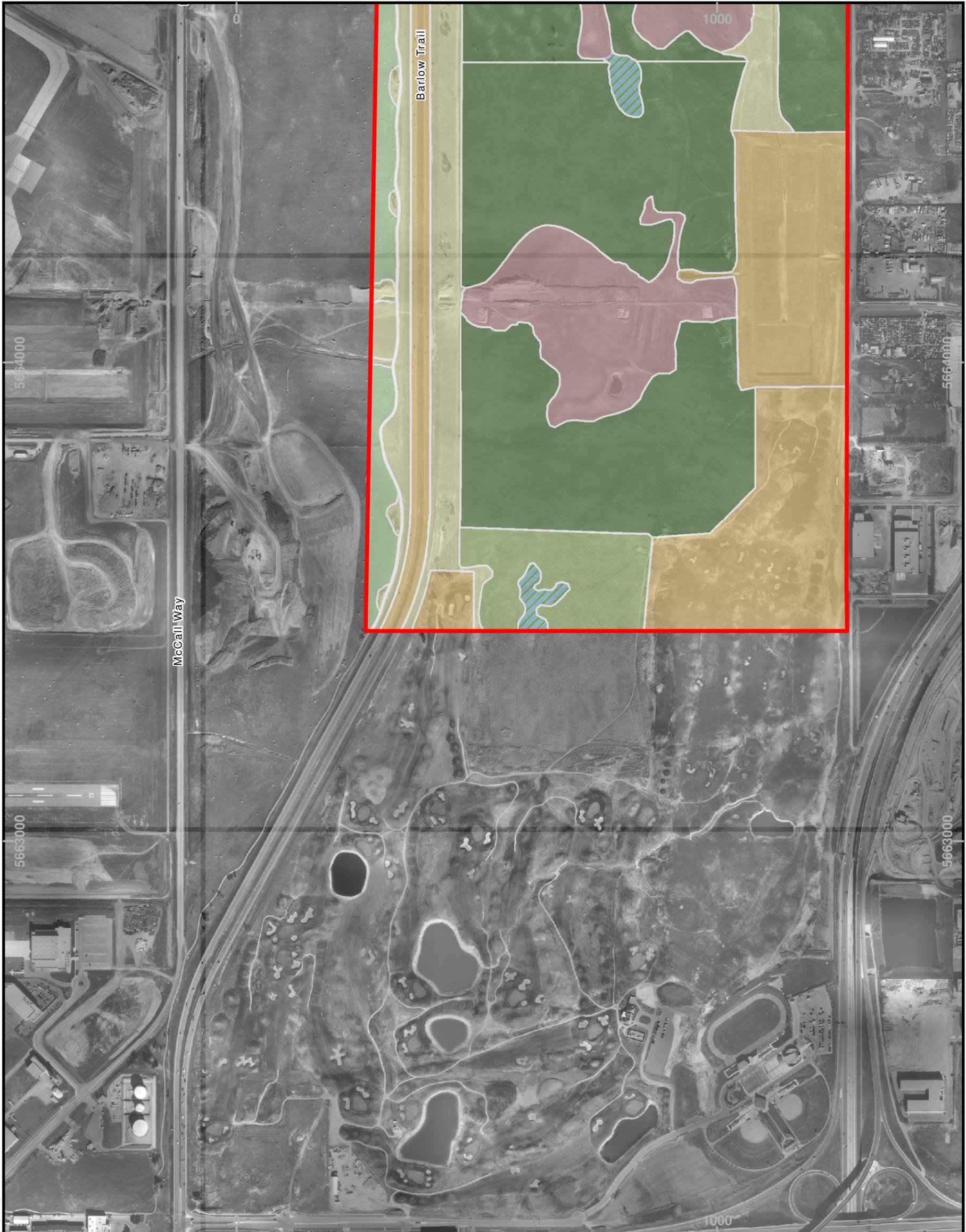
The Calgary Airport Authority
 Runway Development Program
 Parallel Runway Project

AECOM

Vegetation Landscape Units Centre

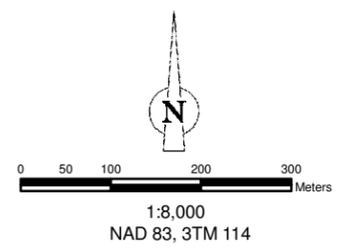
Figure - 2b

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.



Data Source:
Vegetation landscapes compiled by AECOM.

- | | |
|---|-----------------------------------|
| Study Area | Anthropogenic (Hedgerow) |
| Landscape Units | Anthropogenic (Infilled Wetland) |
| Agricultural (Cultivated) | Natural (Semi-Native Aspen Stand) |
| Agricultural (Fallow Field) | Natural (Semi-Native Prairie) |
| Agricultural (Tame Pasture) | Wetland (Seasonal) |
| Anthropogenic (Disturbed) | Wetland (Semi-permanent) |
| Anthropogenic (Existing Infrastructure) | Wetland (Temporary) |



The Calgary Airport Authority
Runway Development Program
Parallel Runway Project



Vegetation Landscape Units South

Figure - 2c

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.

4.1.2 Valued Components

4.1.2.1 Rare, Threatened, or Endangered Plant Species

Rare plant surveys were conducted on 23 June and 1 September 2009. The results of the rare plant survey are included in the accompanying report entitled *Rare Vascular Plant Survey of the Calgary Airport Authority – Runway Development Project* (Lancaster, 2009).

4.1.2.2 Non-Native and Invasive Weed Species of Concern

A complete listing of invasive weeds and non-native species of concern documented as occurring within the LSA was compiled as part of the vegetation program. Those areas which vbased on field observations as experiencing potentially serious infestations of restricted or noxious weeds were noted for inclusion in the Authority's ongoing Vegetation Management Plan. Nineteen species of noxious and nuisance weed species were observed to occur within the LSA during the 2009 on-site assessments. The species identified, the area of the LSA where they were noted to be prevalent and their status are shown in Table 5.

Noxious and nuisance weed species, as defined in Alberta's *Weed Control Act*, were typically observed within or adjacent to previously disturbed areas (i.e., existing road Rights of Way, agricultural fields, tame pasture, former homestead areas) of the PRP footprint.

Table 5 Noxious and Nuisance Weed Species Observed Within the LSA

Scientific Name	Common Name	Status	Components			
			North Agricultural Land	Central Acreages	South Agricultural Land	Taxiway F Extension
<i>Agropyron repens</i>	Quack Grass	Nuisance	•	•	•	
<i>Avena fatua</i>	Wild Oats	Nuisance	•			
<i>Brassica kaber</i>	Wild Mustard	Nuisance	•	•		
<i>Capsella bursa-pastoris</i>	Shepherd's Purse	Nuisance		•		
<i>Cirsium arvense</i>	Canada Thistle	Noxious	•	•	•	•
<i>Crepis tectorum</i>	Narrow-Leaved Hawk's-Beard	Nuisance	•			
<i>Descurainia sophia</i>	Flixweed	Nuisance	•	•	•	
<i>Galeopsis tetrahit</i>	Hemp Nettle	Nuisance	•		•	
<i>Lappula squarrosa</i>	Bluebur	Nuisance		•		
<i>Linaria vulgaris</i>	Toadflax	Noxious			•	•
<i>Matricaria perforata</i>	Scentless Chamomile	Noxious	•			
<i>Polygonum convolvulus</i>	Wild Buckwheat	Nuisance			•	
<i>Potentilla norvegica</i>	Rough Cinquefoil	Nuisance	•	•		•
<i>Salsola kali</i>	Russian Thistle	Nuisance	•			
<i>Setaria viridis</i>	Green Foxtail	Nuisance	•			
<i>Silene alba</i>	White Cockle	Noxious	•			
<i>Sonchus arvensis</i>	Perennial Sow Thistle	Noxious	•	•		•
<i>Taraxacum officinale</i>	Dandelion	Nuisance	•	•	•	
<i>Thlaspi arvense</i>	Stinkweed	Nuisance	•	•		•

¹ Noxious and Nuisance weed species in accordance with Alberta's *Weed Control Act*

Wetlands

All wetlands assessed were located within the LSA which hydro logically is part of the Nose Creek Draigae Basin which is also connected to the Bow River Sub Basin of the South Saskatchewan River Basin. Wetlands were assessed over two days, 14 July and 17 July 2009. Surrounding land use for all wetlands in the LSA at the time of assessment was agricultural. The key wetlands observed and their locations are detailed in Table 6 below.

Table 6 Key Wetland Descriptions and Locations

	Location	Wetland Classification	Area of Wetland	Zones Present	ESA Ranking
Wetland #1	12U 291257 E 5669540 N	Class III – Seasonal Pond	2.84 ha	wet meadow, shallow marsh	Non-functional or Supporting Wetland
Wetland #2	12U 291138 E 5669084 N	Class II – Temporary Pond	1.14	low prairie, wet meadow	Non-functional or Supporting Wetland
Wetland #3	12U 291124 E 5668647 N	Class III – Seasonal Pond	2.88	wet meadow, shallow marsh	Non-functional or Supporting Wetland
Wetland #4	12U 290415 E 5668524 N	Class IV – Semi-Permanent Pond / Lake	1.34 ha (within LSA)	wet meadow, shallow marsh, deep marsh	Major Wetland

Wetland #1

General Description

Wetland #1 (Figure 2a) was classified as a Class III Seasonal Pond; Cover Type 1 (Stewart & Kantrud, 1971). At the time of assessment, two vegetation zones were identified within the wetland: those of the wet meadow and shallow marsh zones (Photo #1). Located along the east boundaries of Wetland#1 is 36 Street NE. The surrounding landscape has been historically altered through the increasing demand for agriculture land (Photo #2). The area directly surrounding Wetland #1 was fallow agricultural land dominated by invasive species.

Soils

A Soils and Terrain Baseline Report (Volume V, Chapter 1) was completed by AECOM in December 2009; it found that the undisturbed wetland soil profiles within the area consisted of Orthic Humic Gleysols. Gleysolic soils are periodically or permanently saturated with water and depleted of oxygen. These types of soils occur commonly in shallow depressions and level areas where, after snowmelt or heavy rains, surface conditions promote flooding.

Vegetation

At the time of assessment, Wetland #1 was dominated by beaked willow (*Carex utriculata*), awnless brome (*Bromus inermis*), fowl bluegrass (*Poa palustris*), and wire rush (*Juncus balticus*) in the wet meadow zone, and awned sedge (*Carex atherodes*), creeping spike-rush (*Eleocharis palustris*), great bulrush (*Scirpus acutus*), and reed canary grass (*Phalaris arundinacea*) within the central shallow marsh zone (Photo #3). Vegetation observed within the shallow marsh zone (hydrophytic plants such as sedge, cattails and rushes) indicate that water levels during the majority of the season are high and this zone is typically saturated with water. Weed species observed during the assessment included Canada thistle and dandelion.

No federally or provincially listed rare vascular plant species were observed within this wetland during rare plant surveys of the LSA.

Wildlife

Wildlife habitat within the LSA was considered poor, owing primarily to the lack of vegetation diversity and cover provided by this highly managed landscape. Habitat, particularly that provided by wetlands, occurs as isolated patches, separated by cultivated fields, fallow fields, and other city and agriculture developments. The lack of vegetated corridors may restrict wildlife movement between habitat patches. The lack of cover and habitat continuity such as movement corridors also increases the potential mortality rate particularly from predation for small mammal species attempting to move between habitats.

No wildlife was observed utilizing Wetland #1 at the time of assessment; however, records by Authority staff identify that semi-permanent wetlands in the LSA do host a wide variety of waterfowl. Waterfowl species that likely frequent this wetland are those with a preference for deep open-water habitats at the centre of semi-permanent and permanent wetlands. These types of wetland sites are also suitable for larger waterfowl, including Canada goose (*Branta canadensis*) and snow geese, which could potentially use the areas as stop-over habitat during migration.

Wetland Functionality

There are a significant number of potential sources for pollution carried in surface water drainage upslope of Wetland #1. Potential contaminated input sources would include ditch line drainage from 36 Street NE and from agricultural runoff of fertilizers used in crop production from adjacent properties. The wetland appears to be healthy based on the presence of various species of emergent vegetation. Healthy wetland vegetation can contribute significantly to sediment and flood control in the area. However, the vegetation present in Wetland #1 exhibits overall low natural plant species diversity. The abundance of invasive plant species along the margin of Wetland #1 and its small size suggests that its functionality is limited.

Wetland #2

General Description

Wetland #2 (Figure 2b) was classified as a Class II Temporary Pond; Cover Type 1 (Stewart & Kantrud, 1971). At the time of assessment, two vegetation zones were identified within the wetland: those of the low prairie and wet meadow zones (Photo #4). A former wetland adjacent and to the south of Wetland #2 had been previously excavated/backfilled at the time of assessment (Photo #5). This former wetland appears to have had a shallow marsh zone. The surrounding upland use was agricultural land, which was mainly fallow, dominated by various weedy species. The recently infilled area to the south was dominated by bare ground with some invasive species beginning to re-vegetate.

Soils

Soils within the low prairie zone were characterized primarily by cultivated soil profiles. Within the wet meadow zone, the soil subgroup naturally occurring in Wetland #2 was Orthic Humic Gleysols (see Volume V, Item 1).

Vegetation

At the time of assessment, Wetland #2 was dominated by foxtail barley (*Hordeum jubatum*), Nuttall's salt-meadow grass (*Puccinellia nuttalliana*), Beckman's slough grass (*Beckmannia syzigachne*), and fowl bluegrass. Tufted hair grass (*Deschampsia caespitose*), creeping spike-rush, reed canary grass, oak-leaved goosefoot (*Chenopodium salinum*), and common plantain (*Plantago major*) were also present within the wetland (Photo #6). Weed species observed during the assessment included the noxious

species Canada thistle and perennial sow-thistle, as well as the nuisance species quack grass and dandelion.

No federally or provincially listed rare vascular plant species were observed within this wetland during rare plant surveys of the LSA.

Wildlife

Although there was no wildlife observed utilizing Wetland #2 at the time of assessment, semi-permanent wetlands in the LSA do host a wide variety of waterfowl, particularly those with a preference for deep open-water habitats at the centre of semi-permanent and permanent wetlands. These sites are also suitable for larger waterfowl, including Canada and snow geese, which could potentially use the areas as stop-over habitat during migration.

Wetland Functionality

The functionality of Wetland #2 has been reduced as a result of the infilling of the wetland to the south. These actions affected the local area hydrology by lowering connectivity to a larger wetland complex. Sediment load from the infilled area is likely to affect Wetland #2. At present, the wetland's ability to protect and/or improve water quality is considered low. Standing water was restricted to a few small areas of the already limited wetland area.

Wetland #3

General Description

Wetland #3 (Figure 2b) was classified as a Class III Seasonal Pond, with Cover Type 4 on the north side of the wetland and Cover Type 1 on the south side (Stewart & Kantrud 1971). At the time of assessment, two vegetation zones were identified within the wetland: those of the Wet Meadow and Shallow Marsh zones. Wetland #3 was located to the south west of an existing rural residence (farmyard) and was dissected by a fence line running east-west (Photo #7). To the south of the fence, the wetland was dominated by various species of emergent vegetation and had a shallow wetted drainage entering from the south (Photo #8). To the north of the fence, the wetland was severely impacted by overgrazing and sedimentation due to livestock usage. Very little vegetation remained on the north side of the fence (Photo #9).

Soils

Within the wet meadow zone along the south portion of the wetland, Orthic Humic Gleysols were found (see Volume V, Chapter 1 of the CS).

Vegetation

Wetland #3 was dominated by western wheatgrass (*Agropyron smithii*), slender wheatgrass (*Elymus trachycaulus var trachycaulus*), and narrow reed grass (*Calamagrostis stricta*) in the outermost zone (wet meadow zone); foxtail barley, Beckman's slough grass and Nuttall's salt-meadow grass in the shallow marsh zone; and creeping spike-rush, cattail (*Typha latifolia*), and awned sedge in the central deep-marsh zone. Weed species observed during the assessment included the noxious species Canada thistle and perennial sow-thistle, as well as one nuisance weed species (quack grass).

No federally or provincially listed rare vascular plant species were observed within this wetland during rare plant surveys of the LSA.

Wildlife

Wildlife habitat within the LSA was generally considered poor; owing primarily to the lack of vegetation diversity and cover provided by this highly managed landscape. Habitat, particularly that provided by wetlands, occur as isolated patches, separated by fairways, trail systems and other golf course developments. The lack of vegetated corridors may restrict wildlife movement between habitat patches, and increases potential mortality for small mammal species attempting to move between habitats.

Wetlands, however, host a wide variety of waterfowl, particularly those with a preference for deep open water habitats at the center of semi-permanent and permanent wetlands; including diving ducks, such as the redhead, ruddy duck and lesser scaup. These sites are also suitable for larger waterfowl, including Canada and snow geese, which could potentially use the areas as stop over habitat during migration. Species observed within Wetland #3 include mallard and other unidentified waterfowl.

Wetland Functionality

The north side of Wetland #3 has little to no remaining functionality as a result of impacts caused by over usage by livestock. These impacts including wetland margin erosion, sedimentation, possible nutrient enrichment and the elimination of emergent and riparian vegetation have caused the wetlands functionality to decrease substantively.

As opposed to the situation noted on the north side the south side of Wetland #3 is considerably healthier, with abundant natural vegetation remaining and little physical degradation of the bed and banks. Due to the connectivity to the degraded north side, however, the wetland's overall ability to protect and/or improve water quality is considered low.

Wetland #4

General Description

Wetland #4 (Figure 2b) was classified as a Class IV Semi-Permanent Wetland; Cover Type 2 (Stewart & Kantrud, 1971). At the time of assessment three vegetation zones were identified within the wetland, the wet meadow, shallow marsh and deep marsh zones (Photo #10). Recent disturbance (rutting) along the wetland margins were the result of earlier groundwater / geotechnical drilling (Photo #11). The east side of the wetland borders Barlow Trail. Swale drainage from this arterial contributes runoff to local hydrological features such as Wetland #4 and contributes to it.. A variety of songbirds and waterfowl were observed during the assessment utilizing the wetland.

Soils

Undisturbed wetland soil profiles within the area of Wetland #4 consisted of Orthic Humic Gleysols (Volume V, Chapter 1 of the CS).

Vegetation

At the time of assessment, Wetland #4 was dominated by common cattail, awned sedge, wire rush, foxtail barley, slough grass, and awnless brome (Photo #12). Golden dock (*Rumex maritimus*), western dock (*Rumex occidentalis*), and wild mint (*Mentha arvensis*) were also prevalent species. A high degree of infestation of Canada thistle and perennial sow thistle was observed adjacent the wetland at the time of assessment.

No federally or provincially listed rare vascular plant species were observed within this wetland during rare plant surveys of the LSA.

Wildlife

Wildlife habitat within the LSA was considered poor; owing primarily to the lack of vegetation diversity and cover provided by this highly managed landscape. Habitat, particularly that provided by wetlands, occur as isolated patches, separated by fairways, trail systems and other golf course developments. The lack of vegetated corridors may restrict wildlife movement between habitat patches, and increases potential mortality for small mammal species attempting to move between habitats.

Wetlands in the LSA do however host a wide variety of waterfowl, particularly those with a preference for deep open water habitats at the center of semi-permanent and permanent wetlands; including diving ducks, such as the redhead, ruddy duck and lesser scaup. These sites are also suitable for larger waterfowl, including Canada and snow geese, which could potentially use the areas as stop over habitat during migration. Species observed within Wetland #4 include mallard and other unidentified waterfowl.

Wetland Functionality

Barlow Trail is located upslope from Wetland #4 and surface drainage from this arterial has the potential to enter the wetland by means of swales used to control and direct runoff. Runoff from this source could pose a potential pollution threat to the wetlands sustainability and health. At the time of assessment, the wetland had also been recently impacted by a groundwater / geotechnical drilling program along its shoreline. Activities associated with the program caused rutting and vegetation loss in some areas of the wetland and subsequently a reduction in its water quality as a result of the increased sediment load.

In general, this wetland provides good habitat for wildlife and is large enough to be an important functional component of the landscape. With an abundance of emergent vegetation and a previously intact shoreline, it likely plays a valuable role in maintaining water quality, aquifer recharge, and flood and erosion control in the LSA.

4.2 Regional Study Area

4.2.1 Regional Context

YYC is located within the Fescue Grasslands Ecoregion of the Prairie Ecozone as described by the Ecological Stratification Working Group (1995). In Alberta, it is classified into the Foothills Fescue Natural Subregion of the Grassland Natural Region as described by the Natural Regions Committee (2006).

The Grassland Natural Region is the warmest and driest Natural Region in Alberta, with the Foothills Fescue Natural Subregion classified as having the highest precipitation, warmest winters, and shortest growing season of any of the Grassland Natural Subregions. The general climate of the Calgary area is one of predominantly short, hot summers and cold winters, with the average daily summer (May to August) temperature being 13.9°C, with a range of 9.8°C to 16.2°C. The mean winter (November to February) temperature is -6.5°C, ranging from -3.1°C to -8.9°C. The mean annual precipitation is 469.6 mm, with 298.1 mm as rainfall and 171.5 mm as snowfall. The majority of rainfall occurs between June and August, while the majority of snowfall occurs between December and March. Climatically, the Grassland Natural Region is more closely linked to the Foothills Parkland and Montane Natural Subregions than that of the Grassland Natural Region (Natural Regions Committee 2006).

General topography of the RSA is characterized as having hummocky to rolling uplands, with undulating plains occurring northeast of the subregion. Parent material across this subregion consists mainly of till with considerable lacustrine deposits. Elevations within the subregion range from 800 m to 1,525 m above sea level. It occurs in an area of moderately fine-textured glacial till and lacustrine deposits that overlie parent materials of sandstone and Cretaceous shale. Small amounts of fluvial and eolian deposits can also be found (Ecological Stratification Working Group 1996). Soil and soil development is reflective of the climatic conditions in which they occur. Surface materials are generally deep and characterized by soils of the Chernozemic order, typically of the Dark Brown and Orthic Black subgroups. Vegetation in its native form is characterized by prairie grasses, with shrublands occurring on north-facing slopes and water receiving areas, and narrow, predominantly deciduous forests along river valleys. Extensive cultivation of the highly productive prairie soils has removed vast areas of native vegetation, with remnant patches providing critical habitat to some 25% of Alberta's rare vascular plant species (Natural Regions Committee 2006).

Remnant parcels of native vegetation within the Foothills Fescue Natural Subregion occur typically on moderately dry, south- and west-facing upland sites characterized by mountain rough fescue (*Festuca campestris*) and Parry oat grass (*Danthonia parryi*), with forbs comprising silvery perennial lupine (*Lupinus argenteus*), pasture sagewort (*Artemisia frigida*), three-flowered avens (*Geum triflorum*), and golden bean (*Thermopsis rhombifolia*). Willow (*Salix* spp.), sedge (*Carex* spp.), and tufted hair grass (*Deschampsia cespitosa*) commonly occur on Humic Gleysols in poorly drained, wetted depressions (Natural Regions Committee 2006). To develop a thorough understanding of regional plant communities potentially occurring within the PRP RSA, a review of *Range Plant Communities and Range Health Assessment Guidelines of the Foothills Fescue Natural Subregion of Alberta* (Adams *et al*, 2003.) was undertaken.

5. References

- Adams, B.W., R.Ehler, D. Moisey and R.L. McNeil. 2003. Rangeland Plant Communities and Range Health Assessment Guidelines for the Foothills Fescue Natural Subregion of Alberta. Rangeland Management Branch, Public Lands Division, Alberta Sustainable Resource Development, Lethbridge, Pub. No. T/038 85pp.
- Alberta Sustainable Resource Development (ASRD). 2005a. *Draft Sensitive Species Inventory Guidelines*. Alberta Sustainable Development - Fish and Wildlife. Edmonton, Alberta.
- Alberta Sustainable Resource Development (ASRD), 2005b. The General Status of Alberta Wild Species 2005. Available online at <http://www.srd.gov.ab.ca/fishwildlife/wildspecies/index.htm>. Last review/update: January 26, 2007
- Alberta Environment, 2007. Provincial Wetland Restoration/Compensation Guide.
- Alberta Sustainable Resource Development (ASRD). 2008. *Draft Sensitive Species Inventory Guidelines for Prairie Raptors*. May 2008 Draft.
- Alberta Sustainable Resource Development (ASRD), 2009. FWMIS observation database. Requesting Fisheries and Wildlife Management Information System (FWMIS) data. Available online at <http://www.srd.alberta.ca/fishwildlife/guidelinesresearch/fwmis.aspx#Request> Last review/update: August, 2009.
- Alberta Tourism, Parks, Recreation and Culture (ANHIC), 2008. Alberta Natural Heritage Information Centre (ANHIC) Available Online at <http://www.tpr.alberta.ca/parks/heritageinfocentre/default.aspx>. Accessed October 25, 2009.
- Archibald, J.H., G.D. Klappstein and I.G.W. Corns. 1996. Field guide to ecosites of southwestern Alberta. Nat. Res. Canada, Can. For. Serv., Northwest Region, Northern Forestry Centre, Edmonton. Spec. Rept. No, 8.
- Calgary Airport Authority. 2008. Wetland Strategy for Reducing Bird Strike Risk. Calgary, AB.
- City of Calgary Parks. 2004. Calgary Wetland Conservation Plan. Calgary, AB.
- City of Calgary. 2009. Community Standards Bylaw. Calgary, AB.
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2009. Status Reports. Available at: http://www.cosewic.gc.ca/eng/sct2/index_e.cfm. Accessed: March 2009
- Department of Fisheries and Oceans (DFO). 1986. Policy for the Management of Fish Habitat. Fish Habitat Branch, Ottawa, Ontario. October 1987. 30 p.
- Ecological Stratification Working Group. 1995. A National Ecological Framework for Canada. Agriculture and Agri-Food Canada, Research Branch, Centre for Land and Biological Resources Research and Environment Canada, State of the Environment Directorate, Ecozone Analysis Branch, Ottawa/Hull. Report and national map at 1:7 500 000 scale.

- Expert Committee on Soil Survey. 1982. *The Canada Soil Information System (CANSIS) Manual for Describing Soils in the Field (Revised)*. Agriculture and Agra-Food Canada
- Environment Canada. 1991. *The Federal Policy on Wetland Conservation*.
- Environment Canada, Canadian Wildlife Service, 2004. *Species at Risk Web Mapping Application* (http://www.sararegistry.gc.ca/sar/index/map_e.cfm). Accessed: March 2009.
- Environment Canada. 2009. *Species at Risk Registry*. Available at: <http://www.sararegistry.gc.ca>. Accessed: March, 2009.
- Folk, S.K. and R. Revel. 2004. *Biophysical Assessment of Calgary International Airport: Impacts, Mitigation and Significance of Master Plan Developments*. Prep. for the Calgary Airport Authority, Calgary International Airport, Calgary, AB.
- Golder Associates Ltd. 2003. *Calgary Airport Authority Wetlands Study: Final Reports*. Prep. for Calgary Airport Authority, Calgary International Airport, Calgary, AB.
- Government of Canada. 2002. *Species at Risk Act*. Vol 25 No.3.
- Johnson, D., L. Kershaw, A. MacKinnon and J. Pojar. 1995. *Plants of the western boreal forest and aspen parkland*. Lone Pine Publishing, Edmonton, AB.
- Kemper, Todd, Alberta Natural Heritage Information Centre (ANHIC), Alberta Tourism, Parks, Recreation and Culture, Edmonton, AB. 2009. Personal communication, ANHIC data search.
- Kershaw, L., J. Gould, D. Johnson and J. Lancaster, 2001. *Rare vascular plants of Alberta*. Univ. of Alberta Press, Edmonton, AB. and *Nat. Resour. Can., Can. For. Serv., North. For. Cent.*, Edmonton, AB. 482 pp.
- Natural Regions Committee, 2006. *Natural Regions and Subregions of Alberta*. Compiled by D.J. Downing and W.W. Pettapiece. Government of Alberta. Pub. No. T/852.
- Soil Classification Working Group. 1998. *The Canadian System of Soil Classification* Third Edition. Agriculture and Agra-Food Canada. Publ. 1646 (Revised). 187 pp.
- Species at Risk Public Registry 2009. <http://www.sararegistry.gc.ca> Accessed May 4, 2009.
- Spray Lake Sawmills. 2006. *Detailed Forest Management Plan 2001 – 2026*. online at: <http://srd.alberta.ca/ManagingPrograms/ForestManagement/ForestTenure/ForestManagementPlans/SprayLakeSawmills.aspx>. Posted June 23, 2009.
- Stewart, R.E. and Kantrud, H.A. 1971. *Classification of natural ponds and lakes in the glaciated prairie region*. U.S. Fish Wildl. Ser., Res. Publ. 92
- Strong, W.L. and K.R. Leggat, 1992. *Ecoregions of Alberta*. Alberta Forest Lands and Wildlife, Edmonton. 59 pp. and map.
- Thomas, J.W., H. Black Jr., R.J. Scherzinger and R.J. Pedersen. 1979. *Deer and Elk*. In J.W. Thomas (ed). *Wildlife habitats in managed forests: the Blue Mountains of Oregon and Washington*. U.S. Dept. Agric. For. Serv. Agric. Handbook No. 553. p. 104-127.

U.S. EPA, 2002. Methods for evaluating wetland condition: Introduction to wetland biological assessment. Office of Water, U.S. Environmental Protection Agency, Washington, DC. EPA-822-R-02-014.

Wray, H.E. and S.E. Bayley, 2006. A Review of Indicators of Wetland Health and Function in Alberta's Prairie, Aspen Parkland and Boreal Dry Mixedwood Regions. Prepared for The Water Research Users Group, Alberta Environment. Prepared by Heather E. Wray and Suzanne E. Bayley, University of Alberta.

Willoughby, M.G. 2007. Range Plant Community Types and Carrying Capacity for the Upper Foothills Subregion. Pub. No. T/138. Alberta Department of Sustainable Resource Development and Alberta Agriculture and Rural Development, Edmonton, AB. Online at: <http://www.assembly.ab.ca/lao/library/egovdocs/2007/alsrd/161648.pdf>

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.

Appendix A

Species Ranking and Status

- Summary of the Ranking Systems
- Explanation of Provincial and Global Species at Risk Rankings

Table A1 Alberta Natural Heritage Information Centre (ANHIC)

Provincial Ranking*	Frequency/Comments*
X	Presumed extirpated or extinct. Not located despite extensive searches and no expectation that it will be rediscovered.
H	Historical. Not located in the last 50 years, but some expectation that it may be rediscovered.
S1	Critically imperiled. 5 or fewer occurrences or only a few remaining individuals. May be especially vulnerable to extirpation due to some factor of its biology.
S2	Imperiled. 6-20 or fewer occurrences or with many individuals in fewer locations. May be especially vulnerable to extirpation due to some factor of its biology.
S3	Vulnerable. 21-100 occurrences, may be rare and local throughout its range, or in a restricted range (may be abundant in some locations). May be susceptible to extirpation because of large-scale disturbances.
S4	Apparently Secure. Typically >100 occurrences, but may be fewer. Apparently secure under present conditions.
S5	Secure. Typically >100 occurrences. Demonstrably secure under present conditions.
SU	Unranked. Status uncertain because of low search effort or cryptic nature of the element, possibly in peril, unrankable; more information needed.
SNA	Not Applicable - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

* (ANHIC 2006)

Explanation of Provincial and Canadian Species at Risk Rankings

Table A2 Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and Canadian Species at Risk Act (SARA) Wildlife Species Status Categories

Rank*	Description*
Extinct	A wildlife species that no longer exists.
Extirpated	A wildlife species that no longer exists in the wild in Canada, but exists elsewhere.
Endangered	A wildlife species that is facing imminent extirpation or extinction in Canada.
Threatened	A wildlife species that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

* COSEWIC 2006; SARA 2006. Excerpt from web site; http://www.speciesatrisk.gc.ca/legislation/default_e.cfm

Wildlife Species – “a species, subspecies, variety, or geographically or genetically distinct population of animal, plant, or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years” (COSEWIC 2006)

Table A3 General Status of Alberta Wild Species (2005) Categories

Rank*	Definitions*
At Risk	Any species known to be At Risk after formal detailed status assessment and designation as “Endangered” or “Threatened” in Alberta.
May be at Risk	Any species that May Be at Risk of extinction or extirpation, and is therefore a candidate for detailed risk assessment.
Sensitive	Any species that is not at risk of extinction or extirpation but may require special attention or protection to prevent it from becoming at risk.
Secure	A species that is not “At Risk,” May Be at Risk or “Sensitive.”
Undetermined	Any species for which insufficient information, knowledge, or data is available to reliably evaluate its general status.
Not assessed	Any species that has not been examined for this report.
Exotic/Alien	Any species that has been introduced as a result of human activities.
Extirpated/Extinct	Any species no longer thought to be present in Alberta (“Extirpated”) or no longer believed to be present anywhere in the world (“Extinct”).
Accidental/Vagrant	Any species occurring infrequently and unpredictably in Alberta, i.e., outside its usual range. (These species may be in Alberta due to unusual weather occurrences, an accident during migration, or unusual breeding behaviour by a small number of individuals. If a species appears in Alberta with increasing predictability and more frequently, it may eventually be given a different rank. Changes in “Accidental/Vagrant” species may be a good indicator of general ecosystem or climatic changes.)

* Excerpt from *General Status of Alberta Wild Species 2005* (AENV 2007)

Appendix B

Listing of Rare Plant Potentials
Occurring Within the PRP Area

Expanded Listing of Regionally Significant Rare Vascular Plants Potentially Occurring Within the PRP Study Area

Table B1 Expanded Listing of Regionally Rare Vascular Plants

Vascular Plants				
Scientific Name	Common Name	S-Rank	General Status of Alberta Wild Species 2005	COSEWIC
<i>Amaranthus californicus</i>	Californian amaranth	S1S2	May Be At Risk	-
<i>Crepis intermedia</i>	intermediate hawk's-beard	S2	May Be At Risk	-
<i>Erigeron radicans</i>	dwarf fleabane	S2	Sensitive	Not at Risk
<i>Hymenopappus filifolius</i>	tufted hymenopappus	S2	May Be At Risk	-
<i>Townsendia exscapa</i>	low townsendia	S2	May Be At Risk	-
<i>Aster campestris</i>	meadow aster	S2	May Be At Risk	-
<i>Aster eatonii</i>	Eaton's aster	S2	May Be At Risk	-
<i>Mertensia lanceolata</i>	lance-leaved lungwort	S2	May Be At Risk	-
<i>Onosmodium molle</i>	western false gromwell	S2	May Be At Risk	-
<i>Rorippa tenerrima</i>	slender cress	S1S2	May Be At Risk	-
<i>Rorippa curvipes var truncata</i>	blunt-leaved yellow cress	S1S2	May Be At Risk	-
<i>Polanisia dodecandra</i>	clammyweed	S2	May Be At Risk	-
<i>Oxytropis lagopus var conjugans</i>	hare-footed locoweed	S1	May Be At Risk	Special Concern
<i>Lomatogonium rotatum</i>	marsh felwort	S2S3	May Be At Risk	-
<i>Ellisia nyctelea</i>	waterpod	S2	May Be At Risk	-
<i>Hydrophyllum capitatum</i>	woollen-breeches	S2S3	Sensitive	-
<i>Nemophila breviflora</i>	small baby-blue-eyes	S1S2	May Be At Risk	-
<i>Phacelia linearis</i>	linear-leaved scorpionweed	S2	May Be At Risk	-
<i>Boisduvalia glabella</i>	smooth boisduvalia	S2	May Be At Risk	-
<i>Calylophus serrulatus</i>	shrubby evening-primrose	S2	May Be At Risk	-
<i>Oenothera flava</i>	low yellow evening-primrose	S2	May Be At Risk	-
<i>Oenothera psammophila</i>		SU	Undetermined	-
<i>Montia linearis</i>	linear-leaved montia	S1	May Be At Risk	-
<i>Ranunculus glaberrimus</i>	early buttercup	S2	May Be At Risk	-
<i>Potentilla finitima</i>	sandhills cinquefoil	S1	May Be At Risk	-
<i>Conimitella williamsii</i>	conimitella	S2	May Be At Risk	-
<i>Lithophragma parviflorum</i>	small-flowered rockstar	S2	May Be At Risk	-
<i>Gratiola neglecta</i>	clammy hedge-hyssop	S2S3	Sensitive	-
<i>Veronica catenata</i>	water speedwell	S2S3	May Be At Risk	-
<i>Carex crawei</i>	Crawe's sedge	S2	May Be At Risk	-
<i>Carex vesicaria</i>	blister sedge	S1	Undetermined	-
<i>Elodea bifoliata</i>	two-leaved waterweed	S1	May Be At Risk	-
<i>Iris missouriensis</i>	western blue flag	S1	At Risk	Threatened
<i>Sisyrinchium septentrionale</i>	pale blue-eyed grass	S2S3	Sensitive	-
<i>Allium geyeri</i>	Geyer's onion	S2	May Be At Risk	-
<i>Camassia quamash var quamash</i>	blue camas	S2	May Be At Risk	-
<i>Triantha occidentalis ssp montana</i>	western false-asphodel	S1	Sensitive	-
<i>Cypripedium montanum</i>	mountain lady's-slipper	S2	May Be At Risk	-
<i>Agrostis exarata</i>	spike redtop	S2	May Be At Risk	-
<i>Alopecurus alpinus</i>	alpine foxtail	S2	-	-
<i>Muhlenbergia racemosa</i>	marsh muhly	S1	May Be At Risk	-
<i>Poa nevadensis</i>	Nevada bluegrass	SU	-	-
<i>Sphenopholis obtusata</i>	prairie wedge grass	S2	May Be At Risk	-
<i>Ruppia cirrhosa</i>	widgeon-grass	S1S2	Sensitive	-
<i>Pellaea glabella</i>	smooth cliff brake	S2	May Be At Risk	-
<i>Pellaea glabella ssp simplex</i>		S2	May Be At Risk	-

Table B2 Expanded Listing of Regionally Rare Mosses and Lichens in the Foothills Fescue Natural Subregion

Mosses and Lichens		
Scientific Name	Common Name	S-Rank
<i>Aulacomnium androgynum</i>		S2
<i>Brachythecium reflexum</i>		S2
<i>Brachythecium rutabulum</i>		S2?
<i>Bryum lonchocaulon</i>		SU
<i>Desmatodon cernuus</i>	narrow-leaved chain-teeth moss	S1
<i>Desmatodon heimii</i>	long-stalked beardless moss	S2
<i>Didymodon fallax</i>	fallacious screw moss	S2
<i>Drepanocladus brevifolius</i>	brown moss	SU
<i>Fissidens grandifrons</i>	narrow-leaved Chinese phoenix moss	S2
<i>Fontinalis antipyretica</i>		S1
<i>Hygroamblystegium tenax</i>		S2
<i>Orthotrichum pallens</i>		S2
<i>Orthotrichum pumilum</i>		S1S2
<i>Phascum cuspidatum</i>	cuspidate earth moss	S2
<i>Physcomitrium hookeri</i>	bladder-cap moss	S1
<i>Rhodobryum ontariense</i>		S2
<i>Seligeria campylopoda</i>		S2
<i>Jaffueliobryum wrightii</i>		S2
<i>Chaenotheca chrysocephala</i>		S2
<i>Umbilicaria lyngei</i>		SNA
<i>Pyrrhospora elabens</i>		S1
<i>Acarospora arenacea</i>		S2
<i>Caloplaca atroalba</i>		S1
<i>Cladonia robbinsii</i>		S2S3
<i>Collema flaccidum</i>		S1
<i>Cyphelium notarisii</i>		S2
<i>Endocarpon pusillum</i>		S2
<i>Flavopunctelia soledica</i>		S2
<i>Lecanora meridionalis</i>		S1
<i>Lepraria lobificans</i>		S1
<i>Phaeospora parasitica</i>		S1
<i>Physconia enteroxantha</i>		S1?
<i>Verrucaria glaucovirens</i>		S2
<i>Dermatocarpon schaechtelinii</i>		SNR
<i>Xanthoria montana</i>		SNR
<i>Psora tuckermanii</i>		S2
<i>Placidium lachneum</i>		S2?

Table B3 Listing of Potential Special Plant Communities of Concern That May Occur Within the Study Area (Foothills Fescue Natural Subregion)

Plant Community		
Scientific Name	Common Name	SRank
<i>Schizachyrium scoparium</i> - <i>Festuca campestris</i>	little bluestem - mountain rough fescue	S1?
<i>Pinus flexilis</i> / <i>Arctostaphylos uva ursi</i> - <i>Juniperus horizontalis</i>	limber pine / common bearberry - creeping juniper	S2S3
<i>Elaeagnus commutata</i> riparian shrubland	silverberry riparian shrubland	SU

Appendix C

Detailed Listing of Vascular
Plant Species Occurring Within
the LSA

Table C1 Detailed Listing of Vascular Plant Species Occurring Within or Adjacent to the Study Area

Scientific Name	Common Name	ANHIC Rating	Global Rating	Components			
				North Agricultural Land	Central Acreages	South Agricultural Land	Taxiway F Extension
<i>Acer negundo</i>	Manitoba maple	S2?	G5	•			
<i>Achillea millefolium</i>	yarrow	S5	G5				•
<i>Agropyron cristatum</i>	crested wheatgrass	SNA	G5	•			
<i>Agropyron repens</i>	quack grass	SNA	GNRTNR	•	•	•	
<i>Agropyron smithii</i>	western wheatgrass	S4	G5		•		•
<i>Alopecurus aequalis</i>	short-awned foxtail	S5	G5		•		
<i>Alopecurus pratensis</i>	meadow foxtail	SNA	GNR			•	
<i>Anemone canadensis</i>	Canada anemone	S5	G5				•
<i>Anemone multifida</i>	cut-leaved anemone	S5	G5				•
<i>Antennaria parviflora</i>	pussytoes	S5	G5				•
<i>Artemisia frigida</i>	pasture sagewort	S5	G5		•		•
<i>Aster brachyactis</i>	rayless aster	S4	G5T5		•		•
<i>Astragalus dasyglottis</i>	purple milk vetch	S5	G5				•
<i>Atriplex hortensis</i>	garden orache	SNA	GNR		•		
<i>Atriplex subspicata</i>	spearscale saltbush	S4	G5				•
<i>Avena fatua</i>	wild oats	SNA	GNR	•			
<i>Axyris amaranthoides</i>	Russian pigweed	SNA	GNR	•			
<i>Beckmannia syzigachne</i>	Beckman's slough grass	S5	G5	•	•		
<i>Brassica campestris</i>	canola	SNA	GNRTNR	•			
<i>Brassica kaber</i>	wild mustard	SNA	GNR	•	•		
<i>Bromus inermis</i>	awnless brome	S5	G5	•	•		•
<i>Bromus inermis</i> ssp. <i>inermis</i>	smooth brome	SNA	G5TNR	•		•	•
<i>Calamagrostis stricta</i>	narrow reed grass	S4	G5		•		•
<i>Capsella bursa-pastoris</i>	shepherd's purse	SNA	GNR		•		
<i>Caragana arborescens</i>	caragana	SNA	GNR				•
<i>Carex aenea</i>	silvery flowered sedge	S4	G5				•
<i>Carex atherodes</i>	awned sedge	S5	G5	•	•		•
<i>Carex lanuginose</i>	woolly sedge	S5	G5		•		•
<i>Carex praegracilis</i>	graceful sedge	S5	G5				•
<i>Chenopodium album</i>	lamb's quarters	SNA	G5	•			•
<i>Chenopodium rubrum</i>	red goosefoot	S4	G5		•		
<i>Chenopodium salinum</i>	oak-leaved goosefoot	S5	G5	•	•		
<i>Cirsium arvense</i>	Canada thistle	SNA	GNR	•	•	•	•
<i>Cotoneaster niger</i>	dark-seed cotoneaster						•
<i>Crepis tectorum</i>	narrow-leaved hawk's-beard	SNA	GNR	•			
<i>Deschampsia caespitosa</i>	tufted hair grass	S5	G5	•	•		
<i>Descurainia sophia</i>	flixweed	SNA	GNR	•	•	•	
<i>Eleocharis palustris</i>	creeping spike-rush	S5	G5	•	•		•
<i>Elymus junceus</i>	Russian wild rye	SNA	GNR			•	
<i>Elymus lanceolatus</i>	northern wheatgrass	S5	G5		•		
<i>Elymus trachycaulus</i> var. <i>trachycaulus</i>	slender wheatgrass	S5	G5T5		•		
<i>Equisetum arvense</i>	common horsetail	S5	G5				•
<i>Erigeron philadelphicus</i>	Philadelphia fleabane	S5	G5				•
<i>Galeopsis tetrahit</i>	hemp nettle	SNA	GNR	•		•	

Scientific Name	Common Name	ANHIC Rating	Global Rating	Components			
				North Agricultural Land	Central Acreages	South Agricultural Land	Taxiway F Extension
<i>Geranium richardsonii</i>	white geranium	S5	G5				•
<i>Glyceria striata</i>	fowl manna grass	S4	G5		•	•	
<i>Gutierrezia sarothrae</i>	broomweed	S4	G5				•
<i>Hedysarum boreale</i>	northern hedysarum	S5	G5				•
<i>Hierochloa odorata</i>	sweetgrass				•		•
<i>Hordeum jubatum</i>	foxtail barley	S5	G5	•	•	•	•
<i>Hyoscyamus niger</i>	black henbane	SNA	GNR	•			
<i>Juncus balticus</i>	wire rush	S5	G5	•	•		•
<i>Kochia scoparia</i>	kochia	SNA	GNR	•			
<i>Lactuca serriola</i>	prickly lettuce	SNA	GNR				•
<i>Lappula squarrosa</i>	bluebur	SNA	GNR		•		
<i>Lepidium densiflorum</i>	pepper grass	S5	G5		•	•	
<i>Lilium philadelphicum</i> var. <i>andinum</i>	wood lily	S5	G5				•
<i>Limosella aquatica</i>	mudwort	S3	G5	•			
<i>Linaria vulgaris</i>	toadflax	SNA	GNR			•	•
<i>Matricaria matricarioides</i>	pineappleweed	SNA	G5	•			
<i>Matricaria perforata</i>	scentless chamomile	SNA	GNR	•			
<i>Medicago lupulina</i>	black medick	SNA	GNR			•	
<i>Medicago sativa</i>	alfalfa	SNA	GNR	•			
<i>Melilotus officinalis</i>	yellow sweet clover	SNA	GNR	•		•	
<i>Mentha arvensis</i>	wild mint	S5	G5	•			•
<i>Monolepis nuttalliana</i>	spear-leaved goosefoot	S5	G5			•	•
<i>Agropyron smithii</i>	western wheatgrass	S4	G5		•		•
<i>Phalaris arundinacea</i>	reed canary grass	S5	G5	•			
<i>Phleum pretense</i>	timothy	SNA	GNR	•			
<i>Plantago major</i>	common plantain	SNA	G5	•			
<i>Poa palustris</i>	fowl bluegrass	S5	G5	•			•
<i>Poa pratensis</i>	Kentucky bluegrass	S5	G5		•	•	•
<i>Polygonum amphibium</i>	water smartweed	S5	G5		•		
<i>Polygonum arenastrum</i>	common knotweed	SNA	G5?	•	•		•
<i>Polygonum convolvulus</i>	wild buckwheat	SNA	GNR			•	
<i>Polygonum lapathifolium</i>	pale smartweed	S5	G5	•			
<i>Populus balsamifera</i>	balsam poplar	S5	G5				•
<i>Populus deltoides</i>	plains cottonwood	S3	G5	•			
<i>Populus tremuloides</i>	trembling aspen	S5	G5				•
<i>Potentilla anserine</i>	silverweed	S5	G5	•	•		•
<i>Potentilla fruticosa</i>	shrubby cinquefoil	S5	G5T5				•
<i>Potentilla norvegica</i>	rough cinquefoil	S5	G5	•	•		•
<i>Potentilla pensylvanica</i>	prairie cinquefoil	S5	G5				•
<i>Puccinellia distans</i>	slender salt-meadow grass	SNA	G5		•		•
<i>Puccinellia nuttalliana</i>	Nuttall's salt-meadow grass	S5	G5	•		•	
<i>Pyrola asarifolia</i>	common pink wintergreen	S5	G5				•
<i>Ranunculus cymbalaria</i>	seaside buttercup	S5	G5		•		
<i>Ranunculus sceleratus</i>	celery-leaved buttercup	S5	G5	•	•		•
<i>Rorippa palustris</i>	marsh yellow cress	S5	G5		•		•
<i>Rosa acicularis</i>	prickly rose	S5	G5				•
<i>Rumex maritimus</i>	golden dock	S5	G5		•	•	•
<i>Rumex occidentalis</i>	western dock	S5	GNR				•

Scientific Name	Common Name	ANHIC Rating	Global Rating	Components			
				North Agricultural Land	Central Acreages	South Agricultural Land	Taxiway F Extension
<i>Rumex triangulivalvis</i>	narrow-leaved dock	S5	G5				•
<i>Salix bebbiana</i>	beaked willow	S5	G5	•			•
<i>Salsola kali</i>	Russian thistle	SNA	GNR	•			
<i>Scirpus acutus</i>	great bulrush			•			
<i>Scirpus microcarpus</i>	small-fruited bulrush	S5	G5				•
<i>Setaria viridis</i>	green foxtail	SNA	GNR	•			
<i>Silene alba</i>	white cockle	SNA	GNRTNR	•			
<i>Sisyrinchium montanum</i>	blue-eyed grass	S5	G5				•
<i>Smilacina stellata</i>	star-flowered Solomon's-seal	S5	G5				•
<i>Solidago missouriensis</i>	low goldenrod	S5	G5	•			•
<i>Sonchus arvensis</i>	perennial sow thistle	SNA	GNR	•	•		•
<i>Symphoricarpos occidentalis</i>	snowberry	S5	G5				•
<i>Taraxacum officinale</i>	dandelion	SNA	G5	•	•	•	
<i>Thermopsis rhombifolia</i>	golden bean	S5	G5	•			
<i>Thlaspi arvense</i>	stinkweed	SNA	GNR	•	•		•
<i>Tragopogon dubius</i>	goat's-beard	SNA	GNR	•			•
<i>Trifolium repens</i>	white clover	SNA	GNR	•			
<i>Typha latifolia</i>	cattail	S5	G5	•	•		•
<i>Urtica dioica</i>	stinging nettle	S5	G5	•			
<i>Vicia americana</i>	wild vetch	S5	G5				•

Appendix D

Rare Vascular Plant Survey

- Rare Vascular Plant Survey of the Calgary Airport Authority – Runway Development Project (Lancaster, 2009)

Rare Vascular Plant Survey of the Calgary Airport Authority - Runway Development Project

Prepared for:

AECOM Canada Ltd.
2540 Kensington Road NW
Calgary, AB, T2N 3S3

November 13, 2009



Prepared by:

Jane Lancaster, P. Biol.
Kestrel Research Inc.
11 Cochrane Lake Place
Cochrane, Alberta, T4C 2A8
janelanc@telusplanet.net

Table of Contents

1	Introduction	1
2	Methods	1
3	Results	1
	3.1 Vegetation Communities	1
	3.2 Rare Plant Species and Rare Ecological Communities.....	3
4	References	3
5	Appendix A	4
	A.1 Alberta Natural Heritage Information Centre Element Status Ranking	5
	A.2 Vascular Plant Species Observed on the Calgary Airport Authority Runway Development Project Area.....	10



1 INTRODUCTION

The Calgary Airport Authority is proposing to develop a new runway and connecting infrastructure east of Barlow Trail and the existing airport development. The expansion area is primarily agricultural land, modified from native prairie by cultivation, introduction of tame forages, grazing, weed invasion, infrastructure and road development. The area is relatively flat and over a dozen lentic (pothole) wetlands are present in the project area.

A survey for rare vascular vegetation species was conducted on June 23, 2009 and September 1st, 2009. The objectives of the survey were to:

- Check existing records held by the Alberta Natural Heritage Information Centre (ANHIC) for known occurrences of rare plants and rare plant communities in the project area;
- Conduct a field survey to assess the presence of rare, threatened or endangered plants and plant communities in the project area;
- Provide an assessment of any valued characteristics of the vegetation observed.

2 METHODS

Project rare plant survey protocols are based on the Alberta Native Plant Council Guidelines for Rare Plant Surveys (Lancaster 2000). Prior to the field survey, the ANHIC rare plant database was queried to determine whether there are existing records for rare plant species and rare ecological communities in the project area. A wider search area centered on the project area, including Township 25-Range 29-West of the 4th Meridian, was also included to give perspective on potential rare species in the area. The complete list of rare vascular plant species documented in the Foothills Fescue and Mixed Grass natural subregions was also reviewed to prepare for the field survey.

A botanist and rare plant specialist with Kestrel Research Inc. surveyed an example of each plant community in the project area, covering as much of the conceptual project area as possible. A brief plant community description and component species list was developed for each dominant terrain feature and associated vegetation community. Observations of non-native plants were also recorded to document the current condition of the area.

3 RESULTS

3.1 Vegetation Communities

The project area is greatly modified from natural plant communities except for a few remnant patches of semi-native pasture and several wetland complexes. Most upland areas consist of bare soils devoid of vegetation except for annual and perennial weeds and modified pastures and road margins composed primarily of smooth brome and Kentucky bluegrass. A number of project activities have already occurred prior to survey including earth moving, construction of a large



storm water retention basin and filling of most of the wetlands with subsoils. Remaining plant communities in the project area are described below. Species observations for each vegetation community are presented in Appendix A.2: Table A2.

Non-native Ungrazed Pasture

Dominant species in seeded pastures are awnless brome, Kentucky bluegrass, yellow sweet-clover and common dandelion. The noxious weed Canada thistle is a common contaminant. Many of these areas have not been grazed recently and litter levels are high.

Semi-native Ungrazed/Mowed Grassland

Dominant species in semi-native ungrazed and mowed grasslands west of Barlow Trail are awnless brome and Kentucky bluegrass, with a number of native forbs and shrubs also present in the community.

Semi-native Aspen Stand

Remnant shelter belts and aspen stands are composed of aspen and occasional balsam poplar in the tree canopy, Bebb's willow, prickly rose, common Caragana and occasionally dark-seed Cotoneaster in the shrub layer and awnless brome, Kentucky bluegrass and a variety of native forbs in the understory.

Disturbed Cultivated Saline Wetlands

Disturbed wetlands and margins of filled in wetlands support foxtail barley, Nuttall's salt-meadow grass and a variety of weedy species such as Canada thistle, perennial sow-thistle, Russian pigweed, oak-leaved goosefoot and common plantain.

Semi-native Class 3 Wetland

Seasonal wetlands modified by agricultural practices support a fringe of beaked willow, awnless brome, fowl bluegrass, wire rush and common dandelion and a wetter interior of awned sedge, creeping spike-rush and reed canary grass.

Native Class 3 Saline Wetland

There is a native seasonal wetland remaining in semi-native grassland near residences on the east side of the project area. This wetland is diverse, with 26 vascular plant species observed. The wetland interior (Zone 3) is dominated by creeping spike rush and awned sedge, zone 2 by foxtail barley and Nuttall's salt-meadow grass, and zone 1 by western wheatgrass, slender wheatgrass and narrow reed grass. Additional species are listed in Appendix A.2: Table A2.

Barlow Class 4 Native Wetland

A large semi-permanent Class 4 wetland exists west of Barlow Trail. The perimeters are modified in species composition by invasion from the surrounding tame pasture. Twenty-seven



vascular plant species were observed during the survey. The interior is characterized by standing water, common cattail, small-fruited bulrush and awned sedge. Zone 3 supports awned sedge, woolly sedge, graceful sedge, silver-flowered sedge and a variety of dock species. Zone 2 supports foxtail barley, wire rush, narrow reed grass, Nuttall's salt meadow grass and fowl bluegrass. Zone 1 supports sweetgrass, Kentucky bluegrass and awnless brome.

3.2 Rare Plant Species and Rare Ecological Communities

There is one record for a rare vascular plant species in the area on the current Alberta Natural Heritage Information Centre (ANHIC) Tracking List, pale blue-eyed grass (*Sisyrinchium septentrionale*). This occurrence is in grassland south of the project area, east of Barlow Trail on airport property. Pale blue-eyed grass is ranked as S3G3G4. Definitions of ANHIC ranks are presented in Appendix A.1. During the 2009 surveys of the project area, 64 vascular plants were identified to species. Observations are presented in Appendix A.2. No rare vascular plant species were observed.

There are no existing records for rare ecological communities in the project area. None were observed during the 2009 surveys.

4 REFERENCES

- Alberta Natural Heritage Information Centre (ANHIC) Database Query. March 18, 2009. Alberta Natural Heritage Information Centre, Parks Division, Alberta Tourism, Parks and Recreation.
- Allen, L. 2009. Alberta Natural Heritage Information Centre Preliminary Ecological Community Tracking List. Alberta Tourism, Parks and Recreation, Edmonton, Alberta.
- Kemper, J.T. 2009. Alberta Natural Heritage Information Centre Vascular and Non-vascular Plant Tracking and Watch Lists. Alberta Tourism, Parks and Recreation, Parks Division, Edmonton, Alberta.
- Lancaster, J. 2000. Guidelines for Rare Plant Surveys. Alberta Native Plant Council. Edmonton, AB. Available at <http://www.anpc.ab.ca/assets/rareplant.pdf>
- Moss, E.H., (Second Ed. revised by J.G. Packer). 1983. Flora of Alberta. University of Toronto Press. Toronto.



5 APPENDIX A



A.1 Alberta Natural Heritage Information Centre Element Status Ranking

Elements are evaluated and ranked on their status (globally and state/provincially) using a system developed by The Nature Conservancy which is in use throughout North America. Ranking is usually based primarily on the number of occurrences, since that is frequently the only information available. Information, such as population size and trend, life history and reproductive strategies, range and current threats is used when available (Gould 2006). The ranks in Alberta are defined in Table A2.

Table A1 Alberta Natural Heritage Information Centre Element Status Ranks *

Rank **	Description
G1 S1	< 5 occurrences or only a few remaining individuals.
G2 S2	6-20 occurrences or with many individuals in fewer occurrences.
G3 S3	21 -100 occurrences may be rare and local throughout its range, or in a restricted range (may be abundant in some locations or may be vulnerable to extirpation because of some factor of its biology).
G4 S4	apparently secure under present conditions, typically >100 occurrences but may be fewer with many large populations; may be rare in parts of its range, especially peripherally.
G5 S5	demonstrably secure under present conditions, > 100 occurrences, may be rare in parts of its range, especially peripherally.
GNR SNR	unranked or under review
GH SH	historically known, may be relocated in the future.
GNA SNA	conservation status not applicable (includes exotic species)
T_	rank for a subspecific taxon
X	believed to be extirpated
G? or S?	not yet ranked
_?	rank questionable

* Source Gould 2006

** G=global; S=Alberta



A.2 Vascular Plant Species Observed on the Calgary Airport Authority Runway Development Project Area

Table A2 Plant Species Observed on the Calgary Airport Authority Runway Development Project Area, September 1, 2009

Scientific Name	Common Name	Form	Status	Disturbed Cultivated Saline Wetland	Semi-native Class 3 Wetland	Native Class 3 Saline Wetland	Barlow Class 4 Native Wetland	Non-native Ungrazed Pasture	Semi-native Ungrazed/Mowed Grassland	Semi-native Aspen Stand
<i>Achillea millefolium</i>	Common yarrow	forb	native						X	
<i>Anemone canadensis</i>	Canada anemone	forb	native							X
<i>Anemone multifida</i>	Cut-leaved anemone	forb	native						X	
<i>Aster brachyactis</i>	rayless aster	forb	native			X	X			
<i>Astragalus dasyglottis</i>	Purple milk vetch	forb	native						X	
<i>Atriplex hortensis</i>	garden orache	forb	exotic			X				
<i>Atriplex subspicata</i>	spearscale saltbush	forb	native				X			
<i>Axyris amaranthoides</i>	Russian pigweed	forb	exotic	X						
<i>Beckmannia syzigachne</i>	Slough grass	grass	native			X				
<i>Bromus inermis</i>	Awnless brome	grass	exotic invasive		X		X	X	X	X
<i>Calamagrostis stricta</i>	narrow reed grass	grass	native			X	X			
<i>Caragana arborescens</i>	common caragana	shrub	exotic invasive							X
<i>Carex aenea</i>	Silvery flowered sedge	sedge	native				X			
<i>Carex atherodes</i>	Awned Sedge	sedge	native		X	X	X			
<i>Carex lanuginosa</i>	Woolly sedge	sedge	native			X	X			
<i>Carex praeegracilis</i>	Graceful sedge	sedge	native				X			
<i>Chenopodium rubrum</i>	Red goosefoot	forb	native			X				
<i>Chenopodium salinum</i>	Oak-leaved goosefoot	forb	native	X		X				
<i>Cirsium arvense</i>	Canada thistle	forb	exotic noxious	X		X	X	X	X	X
<i>Cotoneaster niger</i>	Dark-seed Cotoneaster	shrub	exotic invasive							X
<i>Eleocharis palustris</i>	Creeping spike-rush	graminoid	native		X					
<i>Elymus trachycaulus var.</i>	Slender wheatgrass	grass	native			X				



Rare Plant Survey of the Calgary Airport Authority - Runway Development Project Area

Scientific Name	Common Name	Form	Status	Disturbed Cultivated Saline Wetland	Semi-native Class 3 Wetland	Native Class 3 Saline Wetland	Barlow Class 4 Native Wetland	Non-native Ungrazed Pasture	Semi-native Ungrazed/Mowed Grassland	Semi-native Aspen Stand
<i>trachycaulus</i>										
<i>Equisetum arvense</i>	Common horsetail	horsetail	native						X	
<i>Erigeron philadelphicus</i>	Philadelphia fleabane	forb	native						X	
<i>Hierochloe odorata</i>	Sweetgrass	grass	native				X			
<i>Hordeum jubatum</i>	Foxtail barley	grass	native	X		X	X			
<i>Juncus balticus</i>	Wire rush	graminoid	native		X	X	X			
<i>Lactuca serriola</i>	Prickly lettuce	forb	exotic				X			
<i>Lepidium densiflorum</i>	Common pepper-grass	forb	native			X				
<i>Limosella aquatica</i>	Mudwort	aquatic forb	native		X					
<i>Melilotus officinalis</i>	Yellow sweet-clover	forb	exotic invasive			X		X		
<i>Mentha arvensis</i>	Wild mint	forb	native		X		X			
<i>Pascopyron smithii</i>	Western wheatgrass	grass	native			X				
<i>Phalaris arundinacea</i>	Reed canary grass	grass	native/exotic		X					
<i>Plantago major</i>	Common plantain	forb	exotic	X						
<i>Poa palustris</i>	Fowl bluegrass	grass	native		X		X			
<i>Poa pratensis</i>	Kentucky bluegrass	grass	exotic invasive			X	X	X	X	X
<i>Polygonum amphibium</i>	Water smartweed	forb	native				X			
<i>Polygonum arenastrum</i>	Common knotweed	forb	exotic			X				
<i>Populus balsamifera</i>	Balsam poplar	tree	native							X
<i>Populus tremuloides</i>	Aspen	tree	native							X
<i>Potentilla anserina</i>	Silverweed	forb	native		X	X				
<i>Potentilla fruticosa</i>	Shrubby cinquefoil	forb	native						X	
<i>Potentilla norvegica</i>	Rough cinquefoil	forb	exotic				X		X	
<i>Puccinellia distans</i>	slender salt-meadow grass	grass	exotic			X	X			
<i>Puccinellia nuttalliana</i>	Nuttall's salt-meadow grass	grass	native	X		X				



Rare Plant Survey of the Calgary Airport Authority - Runway Development Project Area

Scientific Name	Common Name	Form	Status	Disturbed Cultivated Saline Wetland	Semi-native Class 3 Wetland	Native Class 3 Saline Wetland	Barlow Class 4 Native Wetland	Non-native Ungrazed Pasture	Semi-native Ungrazed/Mowed Grassland	Semi-native Aspen Stand
<i>Pyrola asarifolia</i>	Common pink wintergreen	forb	native							X
<i>Ranunculus cymbalaria</i>	Seaside buttercup	forb	native			X				
<i>Ranunculus sceleratus</i>	Celery leaved buttercup	forb	native		X	X	X			
<i>Rorippa palustris</i>	Marsh yellow cress	forb	native			X	X			
<i>Rosa acicularis</i>	Prickly rose	shrub	native						X	X
<i>Rumex maritimus</i>	Golden dock	forb	native			X	X			
<i>Rumex occidentalis</i>	Western dock	forb	native				X			
<i>Rumex triangulivalvis</i>	Narrow-leaved dock	forb	native				X			
<i>Salix bebbiana</i>	Beaked willow	shrub	native		X				X	X
<i>Scirpus microcarpus</i>	Small-fruited bulrush	graminoid	native				X			
<i>Sisyrinchium montanum</i>	Common blue-eyed grass	forb	native						X	
<i>Smilacina stellata</i>	Star-flowered Solomon's-seal	forb	native							X
<i>Sonchus arvensis</i>	Perennial sow-thistle	forb	exotic noxious	X			X			
<i>Taraxacum officinale</i>	Common dandelion	forb	exotic nuisance		X	X		X		
<i>Thermopsis rhombifolia</i>	Golden bean	forb	native						X	
<i>Thlaspi arvense</i>	Stinkweed	forb	exotic			X			X	
<i>Typha latifolia</i>	Common cattail	graminoid	native	X			X			
<i>Vicia americana</i>	Wild vetch	forb	native						X	

** Nomenclature follows "Flora of Alberta" Moss & Packer 1983.



Appendix E

Photographs

