Chapter 1

Assessment Methods

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1. Assessment Methods

This chapter provides an overview of the methods used to perform the environmental assessment (EA). Details of the methods used by each discipline are provided in the relevant chapters.

1.1 Approach

The general, high-level organization of this assessment of the potential effects of the Parallel Runway Project (PRP) is as follows:

- Scoping
- Baseline Studies
- Analysis of effects
- Mitigation
- Evaluation of significance
- Follow-up

Both the project-specific assessment and the cumulative effects assessment follow this sequence.

The assessment of the potential effects of the PRP was organized on a discipline-by-discipline basis as follows:

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

1.2 Scoping

Scoping involves the identification of key issues of concern (and valued components, or VCs), thereby ensuring that the assessment remains focused and the analysis remains manageable and practical (Hegmann et al. 1999).

The assessment framework used for the PRP followed four tasks that must be done in scoping: issue identification, selection of VCs, setting of boundaries, and initial identification of potential effects. When performed in this order, the assessor is able to make decisions that will guide decisions for the next step. Although the steps in the assessment proceeded in sequence, an adaptive approach was followed whereby previous steps were revisited and, where necessary, the approach adjusted slightly based on new information, including that provided by key stakeholders. For example, initial study area boundaries were established based on an educated guess, and, where necessary, adjusted later as new information suggested that a different boundary may be more appropriate.

As explained in Volume II, Chapter 5, the CS is issues-focused. All issues raised by the public, stakeholders, and government agencies were recorded and tabulated in Volume IV, Item 1. Analysis of and responses to the issues can be found in the discipline-specific chapters of this CS.

1.2.1 Issue Identification

The potential issues that could be associated with the PRP were identified in general terms by each discipline lead through a knowledge gaps exercise. These issues were then described in a draft Project Description and Scoping Document, which provided a basis for further discussion of potential issues during public consultation meetings. Issues raised through public consultation were added to the scope of the assessment.

1.2.2 Potential Effects

An interaction matrix (Table 1-1) was used to identify the potential effects for the PRP as a whole. The project components and activities are displayed on the left-hand side of the matrix while each of the disciplines and their VCs are shown along the top. The purpose of the matrix is to make sure that potential effects are not overlooked. Where appropriate, disciplines used a more detailed interaction matrix to ensure they did not miss a potentially critical interaction. The cell elements were ranked by marking them with an ‘L’ or an ‘X’, where L = low interaction and X = a potential impact interaction greater than low, i.e., moderate or high. All potential interactions that were moderate or high were screened in for further assessment while low impacts were screened out as no further assessment was necessary. Low impacts are those that are routine, repetitive, well understood, and can be mitigated through best management practices. If there was any doubt, potential effects were screened in with an ‘X’ for further assessment and discussion with regulators and key stakeholders.

At a more detailed level, potential effects were identified by capital examination of the project components and activities in combination with knowledge of environmental and socio-economic components that might be affected. Any potential effects not readily dismissible as trivial were subject to further scrutiny as part of the EA. Potential effects in human health were incorporated in a health risk assessment.

1.3 Baseline Studies

Preparation for baseline studies was initially done by conducting a comprehensive gap analysis. The gap analysis included an initial selection of VCs for each discipline.

The baseline studies were used to describe the environmental conditions prior to the PRP that were relevant to the assessment. The baseline data were relevant if:

- The data were going to appear somewhere in the CS or its supporting documentation in a way that helped to describe some aspect of the existing environment that was relevant to the potential effects of the proposed PRP;
- The data were critical to the analysis of potential effects; or
- The data were specifically requested by a government agency or a stakeholder and could be collected in a timely way with reasonable cost and effort.

Table 1-1 YYC PRP INTERACTION MATRIX

Instructions: Mark cells with a 'L' or 'X', where:
L = Low Impact Interaction
X = Impact Interaction greater than Low (*i.e.,* moderate or high)

Low: impacts that are routine, repetitive, well understood and mitigatable through best management practices. If in doubt, potential effects are screened in for further assessment and discussion with regulators and stakeholders.

			ATMOSPHERIC CONDITIONS			FRESH WATER SYSTEMS			TERRESTRIAL ECOSYSTEMS						
PROJECT PHASES		DISCIPLINES	CLIMATE	AIR	NOISE	SURFACE WATER	GROUND-WATER	AQUATIC ECOSYSTEMS	VEGETATION	WILDLIFE	SOIL	HUMAN HEALTH	SOCIO ECONOMICS	LAND USE	TRANSPORTATION
		PROJECT ACTIVITIES													
Pre-construction		Land acquisition (Socio-ec)											x		
		Decommissioning of abandoned services, for example natural gas lines, etc.	x	x	x	x	x	x	x	x	x				
		Demolition (e.g., buildings and structures, etc.)		x	x										
Construction		Materials management (i.e., gravel, topsoil, subsoil, and bedrock stockpiles)		x	x				x		x				
		Closure of McCall Way (i.e., demolition and salvage of pavement and regrading)	x	x	x								x	x	x
		Closure of Barlow Trail (i.e., demolition and salvage of pavement and regrading)	x	x	x								x	x	x
		Asphalt and concrete batch plants (i.e., aggregate crushing and screening)		x	x										
		Site services (e.g., sub drains pre-installation during grading and installation of new services)				x	x		x		x				
		Vegetation clearing and topsoil stripping and salvage		x	x	x		x	x	x	x				
		Earth moving (e.g., excavation, grading, backfilling, ripping, etc.)		x	x	x	x	x	x	x	x				
		Runway, taxiway, and maintenance centre underground services (e.g., electrical, lighting, storm drain connections, etc.)				x	x	x	x		x				
		Waste management	x								x		x		
		Recycling of concrete and asphalt	x										x		
		Spills and emergency management				x	x	x	x	x	x	x	x		
		Snow clearing	x			x	x	x	x	x	x				
		Dust, noise, erosion and sediment control (mitigation measures)		x	x	x	x	x	x	x	x	x			
		Drainage management (including dewatering if necessary)				x	x	x							
		Heavy equipment including trucking	x	x	x				x						
		Hazardous materials handling and storage (i.e., fuelling of vehicles)				x	x	x				x			
		Blasting (if required)			x										
		Lay down areas (including contractor office(s), etc.)							x	x	x				
		Installation of fencing and gates							x	x	x				
		Construct roads (the grading and stockpiling are completed as part of the runway activities)	x	x	x	x	x	x	x	x	x		x	x	x
		Construct pavement structures for runway and taxiways	x	x	x	x									
		Building construction (e.g., airside maintenance centre, field electric centre)	x	x	x				x	x	x				
		Installation of navigation aids				x	x		x		x				
		Construction of any access/perimeter roads	x	x	x	x	x	x	x	x	x		x	x	x
		Storm water management				x	x	x							

The project components for the PRP are listed on the left hand side of the interaction matrix and are as follows:

- 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)

1.3.1 Effects Hypotheses or Pathways

Effects hypotheses were used to focus the assessments. As previously noted, issues were identified for each discipline, and effects hypotheses were developed that corresponded to those issues. The effects hypotheses describe the kind of effect that could occur as a result of the proposed Project.

An example of an effects hypothesis is as follows:

"Construction and operation activities, including the importation of seed from outside sources, may result in the introduction of weeds and a change in vegetation diversity causing a change in abundance of rare species or rare vegetation communities."

An example of a pathway by which an effect may occur is:

"Heating asphalt required the burning of fuel. The burning of fuel generates greenhouse gasses that can have an adverse impact upon climate and the environment"

1.3.2 VC Selection

The EA focuses on VCs, a general term that refers to both valued ecosystem components (VECs) and valued social (or socio-economic) components (VSCs). VECs are components of the natural and human world that are considered valuable by participants in a public review process (Beanlands and Duinker 1983). VSCs are activities or sites of social and cultural importance or of commercial and economic value, including infrastructure, recreational or aesthetic features, and indicators of community well-being and quality of life. VECs and VSCs represent the focal point of the CS.

1.3.3 Indicators

Indicators or parameters that could either be measured or, failing that, assessed by qualitative means were established for each VC. The selected indicators could be used with confidence to detect changes in the natural or human environment. For example, for the groundwater quality VC, the indicators included turbidity and total suspended solids, pH and hardness, dissolved oxygen concentrations, nutrients, soluble petroleum hydrocarbon constituents, and glycols used in de-icing. In the case of noise, a variety of metrics describing noise exposure at locations near the airport was developed.

1.3.4 Spatial Boundaries

The effects of a project are experienced over spatial areas that can vary significantly depending on the conditions being assessed. Defining spatial boundaries for the purposes of assessment therefore varies with effects and, generally, by discipline. There is a hierarchy of areas over which effects may be experiences, all of which are considered appropriate in this assessment.
The footprint of the PRP is the area disturbed by construction. In the present case, it consists of a large part of the east portion of the airport lands.

The airport lands refer to all lands controlled by the Calgary Airport Authority (the Authority). This includes all groundside and airside lands located with YYC.

Local Study Area (LSA): The LSA is the area over which direct, project-specific effects might occur; thus, it varies by discipline. At a minimum, the LSA encompasses the Calgary International Airport (YYC) lands, under federal jurisdiction, that contain the physical works proposed. This encompasses a land area of 2,136 ha. The outer limit of the LSA, for each discipline, is established as the outward extent to which the influence of a stressor could be reasonably and practically detected.

Regional Study Area (RSA): The RSA is a larger region surrounding the LSA, which serves to place the project-specific effects in a broader regional context. The effects of the PRP on VCs, both during construction and after, cannot be evaluated in most instances without an understanding of influences from other land uses and activities. The RSA boundaries may vary by discipline.

A reasonable understanding of the RSA facilitates the more explicit recognition of either comparative or cumulative effects; thus, the outward extension of the RSA for each issue and VC has been selected so that the project-specific effects can best be placed in their appropriate context.

Some disciplines will look at further increasing the scale of the study area. This may include global climate, species ranges, and national or provincial effects, such as economies or listed species.

The spatial boundaries employed for each effect assessment are defined within the respective chapter, where explanations for their adoption are provided.

1.3.5 Temporal Boundaries

The assessment compared present to predicted future environmental and socio-economic conditions, with and without the proposed runway. The assessment of the potential effects of the PRP used scenarios as follows:

1.3.5.1 Baseline

The baseline scenario was frozen at a point one month before the commencement of construction. This was to allow for other airport project activities ongoing or expected to occur before that date. In the case of disciplines where seasonal variations in conditions are significant, the seasonal cycle for the most recent year for which data are available was used.

Construction
The footprint for the construction of the PRP was frozen for the purposes of assessment as per the Project Description drawings of November 2009. Changes to the footprint after November 2009 were accommodated by adjusting the assessment in the CS.

Operations
The following four scenarios for operations were examined:

1. 2015 Do-Nothing scenario (DN), which describes YYC and the proposed project area without the proposed runway in place in 2015, the proposed opening year;
2. 2015 Do-Something scenario (DS), which describes YYC and the proposed project area with the proposed runway in place in 2015;
3. 2025 Do-Nothing scenario (DN), which describes YYC and the proposed project area without the proposed runway in place in 2025; and
4. 2025 Do-Something scenario (DS), which describes YYC and the proposed project area with the proposed runway in place in 2025.

The “Do-Nothing” scenarios assume that currently planned improvements to the existing airfield will be implemented before operation of the new runway.

1.4 Analysis of Effects

1.4.1 Residual Effects Rating Criteria

The following criteria were used to rate the predicted residual effects of the PRP when applicable:

- Direction: the ultimate long-term trend of the environmental effect (e.g., beneficial, neutral, or adverse);
- Magnitude: the amount of change in a measurable parameter or variable relative to baseline case. Of all of the criteria used to rate potential residual effects after mitigation, magnitude most accurately reflects the degree of an effect. Magnitude refers to the intensity or severity of an effect and is the best indicator of the amount of change in a measurable parameter compared with baseline conditions;
- Geographic extent: the geographic area within which an environmental effect of a defined magnitude occurs (site-specific, local, regional, provincial, national, international);
- Frequency: the number of times during a project or a specific project phase that an environmental effect may occur (i.e., once, sporadically, regular, or continuous);
- Duration: this is typically defined in terms of the period of time that is required until the VC or indicator (measurable parameter) returns to its baseline condition or the environmental effect can no longer be measured or otherwise perceived (i.e., short term, medium term, long term, permanent);
- Reversibility: the likelihood that an indicator (measurable parameter) will recover from an environmental effect (i.e., reversible, irreversible);
- Probability of the effect occurring if the project proceeds; and
- Ecological or Socio-economic context: the general characteristics or the area in which the project is located (i.e., undisturbed, disturbed, urban setting).

1.4.2 Classification of Effects and Evaluation of Significance

The determination of significance began with the application of residual effects rating criteria. Potential effects were defined with respect to their direction, magnitude, extent, frequency, duration, likelihood of occurrence, and reversibility within their ecological or socio-economic context.

A determination of the significance of the potential environmental effects of the PRP was made using standards or thresholds that are specific to the VC or measurable parameter that was used to assess the environmental effect. The detailed method for the determination of significance varied by discipline and is

described in the discipline-specific methods sections. Where thresholds or standards were not available, published information, technical literature, and professional experience were used to determine the significance of potential environmental effects.

1.5 Mitigation-By-Design

The CS for the proposed parallel runway at YYC used a mitigation-by-design approach. This approach systematically considers measures that could be used to reduce the potential effects of the PRP at the earliest possible stage in the assessment. The process of refining the project description and identifying new mitigation measures continued throughout the process of assembling the CS.

1.6 Sustainability-By-Design

The consideration of sustainability goes beyond basic mitigation. While many mitigation measures may also qualify as sustainability measures, there are often additional measures that can be applied that go beyond the intention to simply reduce potential effects. These additional measures stem from an attitude or an approach towards potential development that actively seeks out smarter and better ways to do things that often increase the net sustainability of a project.

As the assessment and design of the PRP has unfolded, such measures have been actively sought and recorded in a sustainability framework. The process and results are described in more detail in Volume III, Chapter 2.

1.7 Follow-up and Monitoring

Under the CEAA, a follow-up program means a program for:

- Verifying the accuracy of the assessment; and
- Determining the effectiveness of any measures taken to mitigate the potential adverse effects of the project.

Monitoring primarily relates to compliance monitoring, which establishes whether or not mitigation measures were implemented, whereas a follow-up program determines whether or not the mitigation measures were effective at reducing potential effects.

1.8 Cumulative Effects Assessment (CEA)

1.8.1 Cumulative Effects

Cumulative effects are “changes in the environment that are caused by an action in combination with other past, present and future human actions” (Hegmann et al. 1999). Cumulative effects are assessed by first determining if a project is likely to have an effect on a VC and then determining if other projects or activities potentially affect the same VC. When the effects of a project act in combination with the effects of other projects or activities, a cumulative effect might result. A cumulative effects assessment (CEA) determines how much of the change is attributable to the project under consideration, how much of the change occurs or has occurred because of other projects or activities, and whether the combined effects are significant for the VC under consideration.

1.8.2 When a CEA is Required

Cumulative effects are assessed separately in each discipline area. The following questions were asked to determine whether a CEA was required in any specific instance;

1. Will the PRP result in a demonstrable residual effect on a VC? A demonstrable effect is one that is likely, observable and/or measurable. To be considered demonstrable, the magnitude of the residual effect must be rated as greater than negligible.
2. If the effect can be demonstrated, will the effect act cumulatively in combination with the effects of other past, existing or future projects or activities (i.e., is there a cumulative effect)?
3. Did the public or regulators raise any cumulative effects issues that should be addressed?

Cumulative effects issues may be cross-disciplinary. Where that is the case, the issue is dealt with in one chapter and referenced in the other(s).

1.8.3 Projects Considered in CEA

In determining the scope of the PRP, the Authority considered other projects and activities that are either in progress at the airport or included in the current version of the master plan. Consideration was given to those related projects and activities that are physically related (i.e., physically connected or linked) or induced (i.e., the other project or activity is inevitable because the core project was developed). The following other projects and activities were determined to be outside the scope of the PRP, but may be considered in the CEA:

- Projects already underway and subject to separate screenings;
- A proposed new Air Traffic Control Tower to be built by NAV CANADA;
- Planned improvements to the road system in the vicinity of the airport but off the airport property itself;
- New fire hall(s) if required;
- A de-icing facility, the need for which is currently under study; and
- The International Facilities Project (IFP): an addition to the terminal already under way.

1.8.4 Analysis of Effects

The approaches to analyzing cumulative effects are identical to those used for analyzing project-specific effects of the PRP and are described in Section 1.4 of this Chapter.

1.8.5 Mitigation

The mitigation of potential cumulative effects that could occur as a result of the proposed parallel runway at YYC began with a comprehensive, system-wide effort to mitigate project-specific effects first as the best way to reduce the need to mitigate potential cumulative effects.

The potential need to mitigate cumulative effects is also reduced by the broad, regional mitigation strategies that are already in effect by virtue of the various regional thresholds established in law (e.g., air quality guidelines, noise limits, and the AVPA) and other land use regulations and bylaws.

1.8.6 Follow-up and Monitoring

A follow-up and monitoring program was established for the PRP. Follow-up refers to the proposed (or ongoing) monitoring work that will be undertaken following PRP approval. Follow-up may be used to verify the following:

- The accuracy of predicted environmental impacts and contribution to cumulative effects (particularly where there is uncertainty as to the probable severity of the predicted effect or there are limited data to support analysis of the effect); and
- The effectiveness of mitigation implemented for the PRP in reducing and managing potential project-specific and cumulative effects

Details are provided in the discipline-specific sections where appropriate.

1.9 Discipline-Specific Methods

The detailed methods that were used by each discipline are provided in the appropriate chapter.