

4.5 WILDLIFE

Wildlife – Summary of Assessment

- Only small, marginal patches of wildlife habitat remain in the highly urbanized and industrialized study area.
- Passerines inhabiting the marginal habitat patches are low in abundance and diversity, and are primarily common species tolerant of human disturbance.
- Low suitability habitat, primarily under the existing Pattullo Bridge, may exist for the common nighthawk, Pacific water shrew, and peregrine falcon, which are species at risk.
- There is no potential breeding habitat for heron species in the study area.
- No breeding raptors were found within 100 m of the Project Boundary.
- There is no suitable breeding habitat for amphibians, including the listed western toads and red-legged frogs in the study area.
- Potential Project-related effects on wildlife can be effectively addressed by applying mitigation and Best Management Practices.
- A nesting platform on the new bridge will offset potential habitat loss for peregrine falcon resulting from removal of the existing bridge.
- No Project-related residual or cumulative effects on wildlife are expected.

4.5.1 Context and Boundaries

4.5.1.1 Valued and Intermediate Component Selection

The quantity and quality of wildlife habitat in the Local Study Area (LSA) is limited due to the fragmented nature of the vegetation, which influences the type and abundance of wildlife inhabiting the LSA. Urban birds (i.e., breeding herons, raptors, and migratory birds), amphibians, small mammals, at-risk wildlife, and wildlife habitat were selected as Wildlife Valued subcomponents. Identified Valued Subcomponents include migratory birds, herons, locally common raptors, and species at risk with ranges that overlap with the Project area (**Table 4.5-1**, **Table 4.5-2**). The Wildlife Valued subcomponents have Aboriginal, regulatory, conservation, and scientific importance and were used on comparable projects in the Lower Mainland, namely the George Massey Tunnel Replacement Project (GMTRP) and the bridge portion of the Port Mann/Highway 1 Project (PMH1).

Table 4.5-1 Valued Wildlife Subcomponents

Subcomponent	Rationale for Selection
Birds	<p>Birds that typically do well in developed areas such as the Lower Mainland are referred to as urban birds; they are typically migratory species and are protected, along with their nestlings, eggs, and active nests, under the <i>Migratory Birds Convention Act</i> (MBCA), S.C. 1994, c.22. Birds that benefit from this law include insectivores and water birds (e.g., waterfowl and their allies, rails, herons, shorebirds). These species are also listed under Section 5(1) of CEAA 2012.</p> <p>Birds not protected under MBCA are protected under Section 34 of the <i>Wildlife Act</i>, R.S.B.C. 1996, c. 488, which prohibits possessing, taking, or destroying (i) a bird or its egg, (ii) the nest of an eagle, peregrine falcon, osprey, or heron, or (iii) the nest of a bird not mentioned in (ii), when the nest is occupied by a bird or its egg(s). Species that benefit from this law, and which have the potential to occur in the Project area, include Bald eagle (<i>Haliaeetus leucocephalus</i>), osprey (<i>Pandion haliaetus</i>), red-tailed hawk (<i>Buteo jamaicensis</i>, <i>ḡəmḡeyməls¹</i>, <i>ḡəmḡiməls²</i>), peregrine falcon (<i>Falco peregrinus anatum</i>), and western screech-owl (<i>Megascops kennicotti kennicottii</i>).</p> <p>The peregrine falcon, western screech-owl, great blue heron (<i>Ardea herodias fannini</i>, <i>sməḡwəḡ^{1,2}</i>), green heron (<i>Butorides virescens</i>), common nighthawk (<i>Chordeiles minor</i>, <i>piḡ¹</i>, <i>pi:ḡ²</i>), and barn swallow (<i>Hirundo rustica</i>) are federally or provincially listed as at-risk and have potential to occur in the LSA or RSA.</p> <p>Birds, particularly waterfowl and raptors, are of cultural value to Aboriginal Groups. They are also of regulatory, conservation, and scientific importance.</p>
Mammals	<p>Pacific water shrew (<i>Sorex bendirii</i>) is a small mammal that is provincially and federally listed, and whose general range overlaps the Project area. The Pacific water shrew is also an identified species under the <i>Forest and Range Practices Act</i> (FRPA), S.B.C. 2002, c.69.</p> <p>Mammals are of cultural value to Aboriginal Groups. They are also of regulatory, conservation, and scientific importance.</p>
Amphibians	<p>The British Columbia <i>Wildlife Act</i> R.S.B.C. 1996, c. 488 protects all wildlife species including amphibians and reptiles. Offences are committed if live wildlife species are imported or exported out of British Columbia (Section 21), captured (Section 29), in one's personal possession, live or dead (Section 33); or wounded/killed, other than a prescribed species, and unreported (Section 75(1)).</p> <p>The northern red-legged frog (<i>Rana aurora aurora</i>) and western toad (<i>Anaxyrus boreus</i>) have the potential to occur in the Project area, and are federally listed as Special Concern. The former is also provincially listed.</p> <p>Amphibians are of value due to their regulatory, conservation, Aboriginal, and scientific importance.</p>

Details of listed wildlife species potentially occurring in the Project area, including their status, habitat associations, phenology, and expected habitat uses, are provided in **Table 4.5-2**.

¹ Tsawwassen First Nation traditional name

² Musqueam Nation traditional name

Table 4.5-2 Details of Potential Wildlife Species at Risk in Project Area

Species	Status*	Potential Local Habitat	Critical Timing of Habitat Use	High Risk Window
Peregrine falcon ssp. <i>anatum</i>	Red list – CDC SC – SARA, COSEWIC	Cliffs, tall edifices, bridges	March to August (Bird Studies Canada 2017)	Nesting
Western screech-owl ssp. <i>kennicottii</i>	Blue list – CDC SC – SARA, T – COSEWIC	Wooded areas	Year-round; breeds mid-February to August (MOE 2013)	Living
Great blue heron ssp. <i>fannini</i>	Blue list – CDC SC – SARA, COSEWIC	Isolated riparian woods with access to shallow (< 0.5 m) water	Year-round; breeds February to mid-August (Davidson et al. 2015)	Nesting, Foraging
Green heron	Blue list – CDC	Riparian woods	May to August (Davidson et al. 2015)	Nesting, Foraging
Common nighthawk	T – SARA, COSEWIC	Isolated clearings	Late May to August; (Davidson et al. 2015)	Nesting
Barn swallow	Blue list – CDC T – COSEWIC	Human structures	Mid-March to end of September (Davidson et al. 2015)	Nesting, Foraging
Pacific water shrew	Red list- CDC E – SARA, COSEWIC	Riparian areas	Year-round; breeds February to August (EC 2014)	Living
Red-legged frog	Blue list – CDC SC – SARA, COSEWIC	Wooded areas with ponds nearby	Year-round; breeds mid-February to early September (Matsuda et al. 2006)	Living, breeding in local ponds
Western toad	SC – SARA, COSEWIC	Various; shallow, warm littoral zones for breeding	Year-round; breeds late March to early September (Corkran and Thoms 1996)	Living, breeding in local ponds

* SC = Special Concern; T = Threatened; E = Endangered

Three of the provincially- and federally-listed species identified in **Table 4.5-2** have the highest potential of occurring in the LSA: the Peregrine falcon, the Pacific water shrew, and the Common nighthawk (**Appendix 18.7**). This was determined based on occurrence information (<20 years old) from the British Columbia (BC) Conservation Data Center (CDC 2016), local documentation and/or recent sightings, and the condition and characteristics of extant vegetation and habitat features.

Indicators used to assess wildlife within the assessment area, and evaluate potential Project-related effects, include habitat availability, sensory disturbance, and direct mortality through collision. **Table 4.5-3** provides the rationale for selecting these indicators.

Table 4.5-3 Indicators for Wildlife Valued Components

Subcomponent	Indicators	Measurable Parameter
Birds, mammals, amphibians (including species at risk)	Presence/absence Habitat suitability (function, quality) and availability within the Project Boundary for living (year-round) purposes (for breeding in the case of migratory species)	Species observed The extent of habitat loss (m ²) Anticipated reductions in habitat quality (e.g., increased shade or lighting, water quality, soil conditions, vegetation characteristics)
Birds, mammals, amphibians (including species at risk)	Sensory disturbance (i.e., light, noise) that can lead to increased vigilance or physical displacement	Species abundance and diversity relative to disturbance levels
Birds, mammals, amphibians (including species at risk)	Direct mortality	Incidental take of nests; collision rates for larger species (raptors)

4.5.1.2 Regulatory Context

Relevant legislation and agency protocols, which offer some protection to wildlife species and that must be complied with are summarized in **Table 4.5-4**.

Federal

The Canadian Wildlife Service (CWS) has jurisdiction over birds listed under the federal *Migratory Bird Convention Act* (MBCA 1994), which in the Project area includes insectivorous birds (warblers, flycatchers, hummingbirds, wrens, thrushes, vireos, goatsuckers, swallows, tanagers, woodpeckers, sparrows, chickadees, and their allies) and water birds (shorebirds, gulls, waterfowl, and their allies). The MBCA protects all life stages and active nests from disturbance or harm on all federal, provincial, and private lands. Some of these species are listed under the SARA.

SARA protects species, subspecies, and distinct populations listed on Schedule 1 of the SARA as Endangered, Threatened, or Extirpated. SARA-listed birds are protected where their critical habitat has been identified, regardless of land ownership. Non-avian SARA-listed wildlife species and their critical habitats are protected on federal lands only, and there are no federal lands within the Project Boundary. Management Plans and Recovery Strategies are federal stewardship initiatives that involve collaboration with provincial governments, and as such it is expected that these protocols are adhered to on provincial lands as a matter of due diligence.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses, designates, and recommends species at risk. The Government in Council decides which species to include on Schedule 1 of the SARA based on initial status designation recommendations by COSEWIC. This Schedule was established as the official federal list of species at risk in Canada (**Table 4.5-5**).

Table 4.5-4 Relevant Regulatory Requirements, Standards, Best Management Practices, and Policies

Description	Relevance to VC/IC Assessment
Federal <i>Migratory Birds Convention Act</i> (MBCA), S.C. 1994, C. 22	Prohibits the harming of migratory birds, and the disturbance or destruction of their nests, eggs, or young
CEAA 2012 Section 5(1)	Birds listed under the MBCA are assessed under this federal act
Federal <i>Species at Risk Act</i> (SARA), S.C. 2002, c. 29	Permit required if the Project involves the salvage and relocation of a SARA-listed bird species during construction; SARA stewardship documents involve provincial collaboration
BC <i>Wildlife Act</i> , R.S.B.C. 1996, c. 488	Protects wildlife species, including birds not covered under the MBCA; a permit is required if the Project involves an amphibian or small mammal salvage, or to remove or relocate a raptor or heron nest
Recovery Strategy for the common nighthawk in Canada	Outlines the short-term (10-year) and long-term recovery goals for the common nighthawk
Management plan for the peregrine falcon (EC 2015)	Describes the broad strategies and conservation measures required to achieve a self-sustaining <i>anatum/tundrius</i> population within the next 10 years
Recovery Strategy for the Pacific Water Shrew in Canada (EC 2014)	Provides an overview of overall recovery goals for the Pacific water shrew, and a timeframe for each goal
Provincial draft BMP guidelines for Pacific water shrew in urban and rural areas (Craig et al. 2010)	Provides information about the Pacific water shrew, guidelines on how to assess environmental impacts, and mitigation measures
Management Plan for the western toad in BC (ECCC 2016a)	Summarizes conservation, research, and monitoring needs for western toads across Canada
Management Plan for the northern red-legged frog (ECCC 2017a)	Outlines management goals and objectives for the red-legged frog, and recommends monitoring and stewardship actions
Provincial BMPs for Amphibian and Reptile conservation in BC. (MOE 2004)	Provides guidance for the protection of amphibians and reptiles, and the management of their habitats; also includes approaches to safe and efficient capture, handling, and relocation techniques/strategies
Provincial Guidelines for Raptor Conservation 2013	Provides region-specific mitigation guidelines for raptors in BC; a companion document to Develop with Care
Provincial Develop with Care guidelines for developments in urban and rural areas (MOE 2014)	For use as a comprehensive guide to maintaining environmental values during the development of urban and rural lands

S. 5(1)(b) of CEAA 2012 applies to changes in the environment occurring on federal land, including effects on migratory birds protected under the MBCA (5(a)(iii)). S. 5(1)(c) applies to effects of changes in environment on Aboriginal peoples, including current use, health, socio-economic conditions, and heritage, some of which may be tied to wildlife habitat.

Provincial

Wildlife in BC is protected from harm under the *Wildlife Act*, except as allowed by regulation for such activities as hunting and trapping. The *Wildlife Act* extends to all vertebrate animals, including mammals, amphibians, reptiles, and the following bird species, which are not protected under the MBCA: raptors, vultures, grouse, kingfishers, cormorants, and corvids (jays, crows, ravens, common blackbirds). Wildlife protection falls under the jurisdiction of FLNRORD.

Although there is no specific provincial legislation for at-risk wildlife species, protection and recovery initiatives are informed by the Conservation Data Centre (CDC). The CDC assesses and designates species at risk provincially, based on the systematic collection and analysis of information on their extent, distribution, and vulnerability to disturbance. Species are Red- or Blue-listed depending on the urgency of their conservation needs (**Table 4.5-5**).

Some habitat protection is offered to these species of concern, or to wildlife in general, under the provincial *Forest & Range Practices Act* (FRPA), S.B.C. 2002, C.69, *Park Act*, *Protected Area Act*, and *Ecological Reserve Act*. These Acts usually have little application in urban environments, and are not relevant to the Project (the LSA does not contain crown forests or provincial protection/management designations).

Table 4.5-5 Status Designations of Elements at Risk (CDC 2016)

Status	Federal Definition (COSEWIC)	Provincial Definition (CDC)
Extinct	No longer exists.	Red-listed
Extirpated	No longer exists in the wild in Canada, but occurs elsewhere.	Red-listed
Endangered	Faces imminent extirpation or extinction.	Red-listed
Threatened	Likely to becoming endangered if limiting factors are not reversed.	Red-listed
Special Concern	Sensitive to human activities or natural events.	Blue-listed
Data Deficient	Insufficient information to support a status designation.	N/A

4.5.1.3 Assessment Boundaries

4.5.1.3.1 Spatial

The boundaries of the LSA (**Figure 4.5-A-1**) were determined based on the management needs of wildlife species with the largest habitat requirements in the Lower Mainland, namely the red-tailed hawk, osprey, and bald eagle. The LSA for the wildlife assessment was thus defined as a 250 m buffer around the Project Boundary (**Table 4.5-6**). It appears to be the standard study area for transportation corridor studies in the Lower Mainland based on the environmental assessment for George Massy Tunnel Replacement Project (MOTI 2016) and Port Mann/Highway 1 (MOTI 2007). The RSA was established at 5 km around the Project Boundary to provide regional context for the assessment of Project effects (**Table 4.5-6**). It includes several parks, which have the potential to serve as local species pools for the LSA.

Table 4.5-6 Spatial Boundary Definitions for Wildlife Assessment

Spatial Boundary	Description of Assessment Area
Local Study Area (LSA)	A 250 m buffer around the Project Boundary, representing an area within which the Project may directly or indirectly affect wildlife.
Regional Study Area (RSA)	A 5 km spatial buffer around the Project Boundary, including Burnaby Lake Regional Park, the edge of Green Timbers Park, Invergarry Park, and forest patches near Byrne Creek.

4.5.1.3.2 Temporal

Temporal boundaries for the assessment of Project effects on wildlife were established based on the potential for interactions during the following phases:

- Pre-construction (existing conditions)
- Construction (from site preparation to the decommissioning of the existing Pattullo bridge; approximately 6 years)
- Operations (approximately 100 years)

Field assessments were conducted during the breeding season to maximize on the rate of species detections and to better describe existing conditions. Temporal characteristics of the Project phases are discussed in further detail in **Section 1.0 Overview of Proposed Project**.

4.5.1.3.3 Administrative

No administrative (political, economic, or social) limitations are imposed on the assessment for of Project-related effects on wildlife.

4.5.1.3.4 Technical

Knowledge regarding wildlife population size and trends tends to be limited. The lack of long-term monitoring data for local wildlife populations is not expected to limit the assessment of Project effects on wildlife, however, given the LSA's high degree of anthropogenic disturbance. Species that live or breed near industrial development, urban centres, and major transportation corridors tend to be adaptive.

Access was limited in some industrial parts of the LSA, but this issue is not expected to alter the Project effects assessment for wildlife species given the lack of habitat in those areas. The LSA was thoroughly assessed for its wildlife and habitat potential.

4.5.2 Existing Conditions

This section provides an overview of the desktop and field procedures for collecting wildlife information, and subsequently describes the natural and human-modified habitat conditions within the LSA/RSA, and the wildlife distribution patterns.

4.5.2.1 Regional Overview and Historical Activities

Aboriginal Groups traditionally made use of the LSA to capture wildlife species for sustenance. For example, Kwikwetlem First Nation Elders regularly used the Surrey Bend to Burns Bog for hunting deer (Kwikwetlem First Nation 2017). Kwantlen First Nation regularly hunted and trapped wildlife in the area at large (Kwantlen First Nation 2017). The spatial extent of Tsawwassen First Nation's traditional hunting area extends to the existing Pattullo Bridge though it is recognized that the right to harvest wildlife in the area has become limited (Tsawwassen First Nation 2017). Musqueam Nation members continue to hunt waterfowl and game birds within the RSA (Musqueam Indian Band 2017). Due to post-contact residential and industrial development in New Westminister and Surrey, however, few areas of intact forests remain within these jurisdictions. The fragmented nature of residual vegetation patches limits the quantity and quality of wildlife habitat and this, in turn, influences the type and abundance of wildlife inhabiting the LSA. Local wildlife is expected to consist primarily of urban birds, including raptors and passerines (most of which are migratory), and resident vertebrates with small home ranges (amphibians, small mammals) as identified in **Section 4.5.1.15**. Some species at risk that may reside in the LSA include swallows, herons, the peregrine falcon, common nighthawk, Pacific water shrew, red-legged frog, and western toad. These species' ranges overlap the RSA, and they can make use of either human structures, small and/or manicured green spaces, or disturbed habitat patches or features.

4.5.2.2 Data Sources

Online data sources used in support of the Project wildlife assessment include:

- Provincial online mapping tool (iMapBC 2016)
- BC CDC Species and Ecosystems Explorer (CDC 2016)
- COSEWIC status reports
- *Species at Risk Act* (SARA) Registry
- EcoCat Ecological Catalogue Reports (Government of BC 2016)
- BC Habitat Wizard Database (MOE 2016)
- eBird real-time, online bird reporting program launched in 2002 by the Cornell Lab of Ornithology and National Audubon Society
- Breeding Bird Atlas published in 2015 and consisting of spring/summer bird observation records compiled from 2008 to 2012
- Wildlife Tree Stewardship Atlas (WITS 2014)
- COSMOS – City of Surrey's Mapping Online System (City of Surrey 2017)
- City of Surrey Biodiversity Conservation Strategy (Diamond Head Consulting 2014)
- CityViews – City of New Westminister Interactive Map Viewer (City of New Westminister 2017)

These data sources provided information on terrestrial ecosystems, habitat features, general wildlife records, species at risk designations and occurrences, habitat management strategies, and protected areas (i.e., municipal parks). Information on these various wildlife components was also sought from the following local Aboriginal Groups, experts, agencies, and organizations:

- Traditional Use Studies, Project-related studies undertaken by Aboriginal Groups, and other sources of Traditional Knowledge (TK)
- Pacific Water Shrew Recovery Team
- Canadian Wildlife Services, Delta Office
- FLNRORD Terrestrial Biologist, Surrey Office
- FLNRORD Aquatic Biologist, Surrey Office
- BC CDC Information Manager
- New Westminster Parks Manager
- Wildlife Tree Stewardship Program

Existing reports were consulted for a more thorough understanding of potential at-risk elements in the LSA/RSA, particularly in relation to bridge projects (**Table 4.5-7**).

Table 4.5-7 Summary of Relevant Studies Related to Wildlife

Study Name	Study Relevance/Purpose
GMTR EAC Application	Includes a wildlife assessment for a crossing of the Fraser River, downstream of the existing Pattullo Bridge.
PMH1 EAC Application	Includes a wildlife assessment for a crossing of the Fraser River, upstream of the existing Pattullo Bridge.
Pattullo Bridge Seismic Retrofit and Rehabilitation Project – Aquatic and Terrestrial Assessment (McElhanney Consulting Services 2015)	Includes local wildlife information and an assessment of potential effects of upgrade works to the existing Pattullo Bridge.
Pattullo Bridge Peregrine Falcon Monitoring (Hatfield 2013, 2016)	Involved peregrine falcon monitoring in 2013 and 2016, prior to Pattullo Bridge upgrades, before the installation of a debris collection net, and during upgrade works.
Musqueam Indian Band Knowledge and Use Study	Conducted for the Project and includes a list of wildlife that was historically common in the vicinity of the existing Pattullo Bridge.
Cowichan Nation Alliance Strength of Claim Report - Pattullo Bridge Replacement Project - October 16, 2017	May include knowledge about wildlife in the project area.
Kwantlen Land Use and Occupation in the Vicinity of Pattullo Bridge	Conducted for the Project and includes reference to wildlife near the existing Pattullo Bridge.

Study Name	Study Relevance/Purpose
Lyackson First Nation Traditional Land Use and Mapping Study for The South Coast British Columbia Transportation Authority's Pattullo Bridge Replacement Project - October 19, 2017	May include knowledge about wildlife in the project area.
Tseil-Waututh Nation Traditional Use Study in Relation to the Pattullo Bridge Replacement Project	Includes knowledge about wildlife in the LSA.
Kwikwetlem First Nation Traditional Knowledge and Cultural Heritage Interests Relating to the Pattullo Bridge Rehabilitation Project	May include knowledge about wildlife in the project area.
Tsawwassen First Nation – Pattullo Bridge Replacement: Project Impact Study	May include knowledge about wildlife in the project area.

Information pertaining to other VC and IC components was cross-referenced to support the assessment of the wildlife VCs, including the following sections of the Application:

- **Section 4.2 Surface Water and Sediment** – Surface runoff can lead to sediment infusions within waterbodies occupied by semi-aquatic wildlife such as amphibians and the Pacific water shrew. Large amounts of sediment can affect survival of aquatic life stages (eggs, tadpoles) and the quality of forage (algae, invertebrates).
- **Section 4.3 Fish and Fish Habitat** – Aquatic resource values, effects, and mitigation measures benefit amphibians and the Pacific water shrew.
- **Section 4.4 Vegetation** – Terrestrial Ecosystem Mapping (TEM) provides a quantitative assessment of ecosystem loss and can thus help inform Project effects to wildlife associated with wetland and at-risk plant communities.
- **Section 4.7 Noise and Vibration** – Ambient noise/vibration is influenced by traffic and human activity. Construction of the new bridge (and decommissioning of the existing bridge) could at times increase local noise levels and potentially displace wildlife or affect species' health temporarily. Future operation of the new bridge has the potential to change existing conditions for noise-sensitive wildlife species.
- **Section 6.6 Shading** – A new bridge may affect the shading of microhabitats used by wildlife.
- **Section 6.7 Lighting** – Additional ambient lighting during construction works and during operation of the new Project bridge has the potential to affect light-sensitive receptors such as nocturnal migrating birds in fall and spring, or aerial, nocturnal insectivores such as the common nighthawk during the breeding season.

4.5.2.3 Field Data Collection

Wildlife survey locations were pre-determined based on the distribution of vegetation. Larger and smaller patches were surveyed across all habitat types (grass-, shrub-, and tree-dominated; gravel bars, banks, and waterbodies). This systematic and stratified approach to sampling allowed for a thorough documentation of local biodiversity. Survey stations were far enough apart to avoid double sampling and took into consideration home range sizes.

Surveys were completed using the provincial protocols established by the Resource Inventory Standards Committee (RIC 1998 a,b; RIC 2001). The surveys coincided with the wildlife breeding season and were undertaken in early and mid-July 2016 for all species. Surveys took place on days with optimal weather conditions to increase the probability of detection. Wildlife surveys are summarized in **Table 4.5-8** and detailed in **Appendix 18.6 Wildlife Report**.

Table 4.5-8 Wildlife Surveys in the Local Study Area

Species/Species Group	Approach	Objective
Diurnal Birds	Point Counts (PC)	Document general bird assemblage in grass-shrub-, and tree-dominated vegetation patches of the LSA, through auditory and visual observations.
Dusk/Nocturnal Birds	Call Playbacks (CPB)	Document cryptic bird species in the LSA. Dusk CPB targeted common nighthawk. Night CPB targeted owls, starting with smaller species to avoid predation by larger ones: northern pygmy owl (<i>Glaucidium gnoma</i>), then western-screech owl, barred owl (<i>Strix varia</i>), and great-horned owl (<i>Bubo virginianus</i>).
Peregrine falcon	Stand-Watches (SW)	Determine if the peregrine falcon is nesting on the current Pattullo Bridge.
Mammals Amphibians Birds Habitat Features	Visual Encounter Surveys (VES)	Document wildlife along transects throughout the LSA through sightings, sounds, and signs (tracks, scat, scratchings, bedding sites). Identify conspicuous heron and raptor stick nests by scanning trees areas, particularly along Fraser River. Document habitat characteristics and features such as small ponds, burrows, coarse woody debris (CWD), slash piles, wildlife trees/snags, prominent perches, hedgerows.
Pacific water shrew	Habitat Suitability	Determine if potential of habitat is present in the LSA, per the draft BMPs for this species (Craig et al. 2010). Five surveys were conducted in areas of greatest habitat quality based on forest structure and connectivity to both stream and terrestrial environments (Appendix 18.6). Special attention was also given to moisture, shrub cover (upland and along banks), CWD availability, and waterbody attributes (channel morphology, bankfull width and depth, bank height and gradient).

4.5.2.4 Habitat Suitability Mapping

Based on a desktop review and field surveys, the presence of common nighthawk in the LSA has been confirmed, and there is potential for the Pacific water shrew to be present as well. Habitat suitability modelling was conducted to rate the suitability of habitats in the LSA in fulfilling the life requisites of these two species (refer to **Appendix 18.7**). Models were developed in accordance with RISC methodology (RIC 1999), considering ecological requirements (life requisites, seasonal habitat use) and limiting factors. Habitat suitability maps were then prepared, using the TEM information provided in **Section 4.4 Vegetation**.

For the Pacific water shrew, vegetation patches were considered habitat if within 100 m of a permanent or ephemeral waterbody (excluding the Fraser River mainstem), and if the habitat was not heavily managed and devoid of cover for the majority (> 75%) of its aerial extent (or length in the case of a channel feature). Vegetation patches were also considered habitat if they had only one of these limiting factors (i.e., were heavily managed or devoid of cover) but had good connectivity to suitable living habitat, and either an abundance of aquatic foraging habitat (> 250 m of linear length), or the banks of a smaller waterbody banks that were largely (> 25%) accessible (i.e., < 1 m tall and < 65° steep) to a small upland mammal. A link to suitable living habitat in the nearby landscape (connectivity) was deemed unavailable if a habitat patch was isolated by a > 30 m culvert or > 100 m of lawn or impervious surface (i.e., had no security cover). There is no high-quality habitat for the Pacific water shrew in the LSA given the absence of unmanicured habitat patches > 1 ha (refer to **Section 4.4 Vegetation**). As such, suitable habitat was rated as low or moderate depending on the availability of cover (shrubs, CWD) and waterbody attributes (size, depth, bank characteristics) per Craig (2007).

The common nighthawk breeds in relatively isolated open habitats including forest clearings, wetlands, grasslands, sparsely vegetated areas, and occasionally on flat, gravel roofs (Brigham et al. 2011). Almost any site will do if it contains shade, an ability to avoid predators (including dogs), and an unobstructed flight path for access from the air (ECCC 2016b). As with most ground nesters in open habitats, this species has a low tolerance for human presence. Moderate- and high-quality habitat would thus include isolated breeding sites with good cover, and an abundance of insects. It is assumed that neither of these characteristics is present in the LSA because of the high level of human activity, development, and landscape fragmentation (presumed availability of aerial insects is low in an urban centre compared to a rural or natural setting). Habitat was thus deemed marginally suitable if there was some vegetation cover (at minimum, a sparse covering of grass or shrubs) and at least a 50 m vegetated buffer from recreational trails (i.e., dogs), roads, residences, and other developments regularly frequented by people.

The support structures on the existing Pattullo bridge represent potential nesting habitat for the peregrine falcon, although no nesting pair has been documented in the LSA since 2004 (McElhanney Consulting Services 2015; Hatfield 2016). There are no other tall structures (bridges or high rises) within the LSA that could serve as urban nesting habitat for this species, and thus a habitat suitability map was not prepared for it. The existing Pattullo Bridge is considered low suitability habitat because of the highly developed nature of the surrounding landscape, the likely correspondingly low availability of suitable prey (mid-sized birds and mammals), and the lack of local breeding by this species in the past 13 years.

4.5.2.5 Current Conditions

Proponents are not required to submit the wildlife information acquired during the certification process for large projects, or when monitoring the effects of their projects. At the RSA level, therefore, information on wildlife populations is obtained through a small number of select programs such as MoTI's monitoring of wildlife collision impacts on highways, and Bird Studies Canada's Christmas Bird Counts. These programs do not provide sufficient information to ascertain population trends; nor do they target many of the VCs potentially occurring in the LSA (small breeding birds, small mammals, amphibians). Despite the lack of long-term data on populations, it is clear from available agency and organization information (e.g., iMapBC, eBird, the Wildlife Tree Stewardship Program) that current conditions in the LSA are most suited to species that are tolerant of urban and industrial development and activity. Less-adaptive species, such as those requiring large home ranges or old forests, have likely become extirpated or are vulnerable to extirpation.

4.5.2.5.1 Birds

More than 250 species of resident, migratory, and over-wintering birds are observed in the Metro Vancouver area each year (Vancouver Bird Advisory Committee 2014). The Fraser River delta is a major stopover along the Pacific Flyway from Alaska to Central and South America, used by a billion migratory birds on their way to and from their nesting grounds (Vancouver Bird Advisory Committee 2014). There are three other important areas in Metro Vancouver that contain productive habitats that serve as refugia for migrating birds: English Bay and Burrard Inlet; Greater Vancouver Watershed; and Pacific Spirit Regional Park (Vancouver Bird Advisory Committee 2014). There are no documented fall, winter, or early spring staging areas for migratory birds in the LSA or the RSA, but habitat patches are available for resident birds year-round, and for migratory birds during late spring and summer (the breeding season). Breeding birds in developed areas of Metro Vancouver, including the LSA, are referred to as urban birds and tend to include corvids (crows and jays), blackbirds, pigeons/doves, some water birds, and passerines adapted to small habitat patches (chickadees and their allies, sparrows and their allies, woodpeckers, and some neotropical species). Passerines are perching birds collectively referred to in this document as songbirds. Migratory birds are those species listed under the MBCA, many of which are resident species (i.e., do not migrate).

Songbirds

Twelve songbird species were observed in the LSA during PC and VES: common raven (*Corvus corax*, spá·í^{1,2}), rock dove (*Columba livia*), northern flicker (*Colaptes auratus*, t̄θiq̄t¹, t̄θiq̄t²), black-capped chickadee (*Poecile atricapillus*, st̄θel̄t̄θé¹), brown creeper (*Certhia americana*), cedar waxwing (*Bombycilla cedrorum*), mourning dove (*Zenaidura macroura*), American robin (*Turdus migratorius*, sk̄wq̄q̄^{1,2}), song sparrow (*Melospiza melodia*), purple finch (*Haemorhous purpureus*), winter wren (*Troglodytes hiemalis*, t̄t̄t̄m̄¹, t̄t̄t̄m̄²), and European starling (*Sturnus vulgaris*). Based on breeding bird data from the 2008 to 2012 provincial atlas, other common species in the part of Greater Vancouver that overlaps the RSA include northwestern crow (*Corvus caurinus*), Steller's jay (*Cyanocitta stelleri*), white-crowned sparrow (*Zonotrichia leucophrys*), spotted towhee (*Pipilo maculatus*, s̄xeʔəs¹), dark-eyed junco (*Junco hyemalis*), house finch (*Haemorhous mexicanus*), pine siskin (*Carduelis pinus*), golden-crowned kinglet (*Regulus satrapa*), chestnut-backed chickadee (*Poecile rufescens*), Swainson's thrush (*Catharus*

ustulatus), western tanager (*Piranga ludoviciana*), American goldfinch (*Spinus tristis*), black-headed grosbeak (*Pheucticus melanocephalus*), brown-headed cowbird (*Molothrus ater*), all forest and shrub warblers species, and several species of swallow including the barn swallow (Davidson et al. 2015).

Barn Swallow

The listed barn swallow was identified as a VC for the Project because it builds mud nests on human structures. Based on 2,563 records obtained by the Royal BC Museum, the height of swallow nests in BC ranges from 0.3 m to 50 m, with the majority (57%) occurring between 2.4 m and 3.5 m above ground (Campbell et al. 1997). Although the existing or future Pattullo Bridge is too high to accommodate barn swallows, they could potentially nest on buildings within the LSA such as storage sheds/warehouses. There was an incidental sighting of barn swallow within Queen's Park in August 2008 (eBird 2017), but the species was not observed in the LSA during Project wildlife surveys. At the regional level, this species has been sighted regularly in Burnaby Lake Park, and on occasion in the Green Timbers Forest and at the New Westminster Quay (eBird 2017). Barn swallows are, however, rare nesters in the urban parts of Metro Vancouver and are typically just passing through (Campbell et al. 1997). They are often detected in flight during migration and/or while aerially foraging for insects over water or in open habitats.

Common Nighthawk

The common nighthawk is a cryptic migratory species that can be detected during crepuscular aerial flight displays and foraging bouts from late May to early fall (Brigham et al. 2011). In the past ten years, one was detected in the RSA in August 2016; it was 1.3 km from the LSA southwest of Tannery Park (eBird 2017). During wildlife surveys for the Project, one common nighthawk was detected in the LSA in response to a CPB. The individual may have been nesting on an isolated, vacant lot within the LSA, or it may have been foraging at large within the RSA. The common nighthawk habitat suitability map (**Figure 2** in **Appendix 18.7**) indicates that there are four areas of low suitability habitat in the LSA that could potentially accommodate a nesting pair if human activity is low in the area:

- A complex of exposed soil and unmanaged vegetation is present between 124 St and 125A St, south of Highway 17. There is some relatively isolated ground vegetation, buffered in all directions by 50 m of shrubs, trees, or areas of apparently low human occupancy.
- A complex of exposed soil and unmanaged vegetation is present in the east quadrant of the Bridgeview Dr intersection with 112B Ave. The parcels of land making up this complex appear to be relatively unoccupied and > 100 m in width and length.
- An approximately 85 m by 200 m lot of exposed soil is present between two large parking lots where 126A St borders BC Pkwy. A tree strip of > 20 m screens the west side of the lot. The east side appears to be bordered by an overflow parking lot for a shopping complex 120 m farther east.
- Two unoccupied private lots on Olsen Road contain unmanaged vegetation. Together, these lots were rated as having moderate biodiversity value (c.f. Diamond Head Consulting 2014). A small (approximately 30 m by 40 m) stand of trees screens the lot from the SkyTrain. Human presence appears to be low in surrounding areas. The adjacent recreational park is separated from the unmanaged vegetation by the CNR corridor.

Smaller unmanaged lots are present throughout the LSA, but these do not provide sufficient security for a ground nester (at least 50 m of vegetation in all directions). Dusk CPB surveys for common nighthawk covered 91% of the LSA, and stations were situated to sample all areas with vegetated clearings and meadows. The terrestrial ecosystem mapping (TEM) product is deemed an accurate representation of the LSA land cover, including the habitat available for nesting common nighthawks. For these reasons, confidence in the habitat suitability model for this species is considered moderately high (i.e., it is possible that a 50-m buffer offers insufficient security).

Diurnal Raptors

Diurnal raptor species that are potentially found in the Lower Mainland are listed in **Table 4.5-9** and include falcons, forest hawks (accipiters), and conspicuous species (large hawks, osprey, and eagles).

Table 4.5-9 Diurnal Raptor Species Commonly Documented in Metro Vancouver

Species	Latin
American kestrel	<i>Falco sparverius</i>
Merlin	<i>Falco columbarius</i>
Peregrine falcon	<i>Falco peregrinus</i>
Sharp-shinned hawk	<i>Accipiter striatus</i>
Cooper's hawk	<i>Accipiter cooperii</i>
Red-tailed hawk	<i>Buteo jamaicensis</i>
Osprey	<i>Pandion haliaetus</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>

Based on the real-time, online eBird checklist program that was launched in 2002, the only conspicuous (large) raptor to have been documented in the LSA is the bald eagle. It was observed along Highway 17 near Old Yale Rd in Surrey, in April 2016 (eBird 2017). A red-tailed hawk was also observed during bird surveys for the Project in July 2017. Several small raptors have been detected in Queen's Park, New Westminster, including Cooper's hawks in March 2011 and February 2013, a sharp-shinned hawk in October 2015, merlins in January and March 2013, and an American kestrel in February 2013 (eBird 2017).

Regionally, accipiters (Cooper's hawk and sharp-shinned hawk) and small falcons (merlin, American kestrel) have been commonly sighted along roads, and likely represent birds in transition. Aside from the American kestrel, potential breeding habitat for these smaller forest raptors may be available in larger, green spaces such as Burnaby Park, Hawthorne Park, and the Byrne Creek Ravine, for which summer records are available. The American kestrel is likely only transient in the RSA because it breeds in open grasslands.

The bald eagle and red-tailed hawk are prominent raptors in the area based on sightings throughout the RSA (eBird 2017). Ospreys have been observed, mainly near the Fraser River (eBird 2017). Based on the WITS program, however, no osprey or red-tailed hawk nests have been identified within the RSA. Two potential bald eagle nest trees were documented towards Tannery Rd and the Port Metro Vancouver-Fraser Surrey grounds (outside of the LSA), but when last observed in 2007, neither tree had any evidence of a nest (WITS 2014).

Peregrine Falcon

The peregrine falcon has suffered declines throughout its range due to use of organochlorine pesticides and toxic chemicals (EC 2015). The peregrine falcon is otherwise adaptable given its use of urban bridges, buildings, or towers as surrogates for cliffs (Cooper and Beauchesne 2004; COSEWIC 2007a). During an assessment for the seismic retrofit and rehabilitation of the existing Pattullo Bridge, McElhanney Consulting Services (2015) noted that a peregrine falcon (ssp. *anatum*) had been observed on the bridge deck in 2000 and 2004; there were no subsequent sightings during the 2005–2010 surveys conducted by the Province. In 2014, TransLink retained Hatfield to monitor for potential peregrine falcon activity before upgrades to the Pattullo Bridge. Prey carcasses and whitewash were observed on the bridge deck, but an active nest was not present. Peregrine falcons forage widely, hunting for birds in flight (White et al. 2002). In 2016, Hatfield was retained again to search for peregrine falcon nesting activity on the bridge before catchment netting was put in place, and during upgrade works, and to monitor any local activity by this species in the spring and summer; no peregrine falcons were observed (Hatfield 2016). The existing Pattullo Bridge is considered low suitability breeding habitat for peregrine falcon because of the highly developed nature of the surrounding landscape and the, presumably, correspondingly low abundance of mid-sized prey (birds and mammals) available to support adults and their offspring. The lack of peregrine falcon observations in the LSA since 2004 supports this supposition.

Nocturnal Raptors (Owls)

Nocturnal raptor species that can potentially occur in the Lower Mainland are summarized in **Table 4.5-10**.

Table 4.5-10 Owls Commonly Observed in Metro Vancouver

Species	Latin
Northern pygmy-owl	<i>Glaucidium californicum</i>
Western screech-owl	<i>Megascops kennicottii</i>
Barred owl	<i>Strix varia</i>
Great horned owl	<i>Bubo virginianus</i>

No owl species have been reported in the LSA; all but the western screech-owl have been observed in the RSA (eBird 2017). The northern pygmy-owl was observed once at Burnaby Lake in November 2015, but it is generally found in the more contiguous forests farther north. The great-horned owl was observed once in the northern part of Queen’s Park and is commonly observed in urban green spaces, as is the barred owl. The barred owl has been observed multiple times in the RSA, including Tannery Park in July 2016, Hawthorne Park in March 2017, Glenbrook Ravine Park in October 2017, and in urban areas of Surrey in May and October 2015 (eBird 2017).

Western Screech-Owl

The western screech-owl is a small owl species that lives in BC year-round, initiating courtship in February and breeding in deciduous or mixed forests from March to August (MOE 2013; Cannings and Angell 2001). Although this species does not appear to frequent highly urbanized areas of the Lower Mainland, based on eBird observations, it is occasionally reported from the small green spaces of more residential areas near the coast, or in less-developed suburbs (eBird 2017). The species was not

detected during summer owl surveys for the Project. Based on eBird record dates for Metro Vancouver, the species seems to breed in large habitat patches such as Pacific Spirit Park on Point Grey, Stanley Park, and the contiguous forests of the North Shore. Based on recent telemetry work for the Interior (c.f. Tripp et al. 2015), habitat patches need to contain large trees with cavities and be large enough to contain a home range in the order of 50 ha; Queen's Park is 30 ha in size.

Hérons

Although herons are considered prey generalists, they will often be seen foraging for fish in a variety of wetland habitats including ditches. During the winter, the great blue heron will roost alone or in small groups as opposed to during the breeding season, when they nest in large colonies (Campbell et al. 1990). The green heron rarely winters in the Lower Mainland. During the breeding season, this species will nest in various habitats that provide secluded nest sites and wetland feeding areas such as swamps, marshes, lakes, or ponds (Campbell et al. 1990).

Although these species have potential to be found in the LSA, neither the great blue heron nor the green heron has been documented there. There are no habitat patches large enough to support a great blue heron breeding colony. The vestigial tree patches along Fraser River are bare of ground and understory vegetation. Riparian vegetation along Lower Pattullo Channel constitutes shrubs and grasses. There is thus no riparian forest with sufficient cover to accommodate a green heron nest. Both heron species may forage along Pattullo Channel, which serves as a fish passage to spawning habitats upstream of the LSA (**Section 4.3 Fish and Fish Habitat**). The nearest great blue heron sighting records in recent years are from Tannery Park (February 2014, July 2016) and the Saint Helen's Park residential neighbourhood (May 2011, fall and winter 2014, summer 2015) in Surrey, and from Sapperton Landing Park (March 2016) and Glenbrook Ravine Park (May 2017) in New Westminster (eBird 2017). The green heron was sighted once in Tannery Park, on July 20, 2016 (eBird). This species appears to be expanding its range northward and is sighted with increasing frequency in the Lower Mainland based on a comparison of early observation rates (Campbell et al. 1990) and more recent ones (Davidson et al. 2015).

Other Water Birds

Aboriginal Groups have observed many water birds in the RSA, including great blue heron, sandhill crane (*Grus canadensis canadensis*, lí-məs¹, sli:m²), belted kingfisher (*Megaceryle alcyon*, t̥əcələ¹, t̥əčələ²), Canada goose (*Branta canadensis*, ʔəx̥e¹, ʔəx̥eʔ²), lesser snow goose (*Chen caerulescens*), Brant (*Branta bernicla*, x̥əl̥x̥əl̥c̥²), mallards (*Anas platyrhynchos*, t̥ənəqsən¹, t̥ənəqsən², Ma'uqw³), gadwall (*Anas strepera*), northern pintail (*Anas acuta*), green-winged teal (*Anas carolinensis*), cinnamon teal (*Anas cyanoptera*), blue-winged teal (*Anas discors*), American wigeon (*Anas americana*), common goldeneye (*Bucephala clangula*), Barrow's goldeneye (*Bucephala islandica*), bufflehead (*Bucephala albeola*), canvasback (*Aythya valisineria*) and gulls (q̥wəl̥it̥əq¹) (Tsleil-Waututh Nation 2016; Musqueam Indian Band 2017; Kwikwetlem First Nation 2017; Kwantlen First Nation 2017; Tsawwassen First Nation 2017). Many of these species may have occurred in the LSA south of Fraser River historically, based on evidence of peat below ground level.

³ Cowichan Tribes traditional name

Though there are no longer waterbodies in the LSA large enough to support nesting or spring/fall staging by these species, they may occur on the Fraser River in passing, during foraging forays or movement to and from important bird areas such as Colony Farms in Coquitlam, and the agricultural fields of Richmond and Delta. The most common and adaptive species, Canada goose and mallard, were observed in the LSA. A pair of mallard was foraging/resting in a widened, exposed ditch section along 120 St south of King George Blvd (the upper section of Pattullo Channel). A Canada goose was seen flying over Surrey west of the Highway 17. These urban species are also transient in the LSA.

4.5.2.5.2 Mammals

Species that were historically observed in the vicinity of the existing Pattullo Bridge by Aboriginal Groups include striped skunk (*Mephitis mephitis*, spə́tʰi·n¹, spə́tʰi:ń²), spotted skunk (*Spilogale gracilis*, spə́tʰi:ń²), beaver (*Castor canadensis*, sqəlélw^{1,2}, Squ'ew³), red fox (*Vulpes vulpes*, sʰewal¹), black-tailed deer (*Odocoileus hemionus*, smáyəθ¹, sməyəθ²), eastern cottontail (*Sylvilagus flordanus*, sqəqəweθ²), coyote (*Canis latrans*, slekʔiyap¹), muskrat (*Ondatra zibethicus*, sʰélqəł^{1,2}, Sq'ulh-q'ulh³), Douglas squirrel (*Tamiasciurus douglasii*), river otter (*Lontra canadensis*, sʰe·ł^{1, 2}), mink (*Neovison vison*, čičiḡən¹, čəciḡəh²), and black bear (*Ursus americanus*) (Tseil-Waututh Nation 2016; Kwikwetlem First Nation 2017; Musqueam Indian Band 2017; Tsawwassen First Nation 2017). Elk (*Cervus canadensis*) used to frequent the LSA as well (Musqueam Indian Band 2017). Currently, approximately 28% of the LSA, is vegetated, mainly in small, isolated patches embedded within a highly developed urban matrix. Habitat patches large enough to support ungulates and carnivores have been eliminated. Only Queen's Park remains, and it is managed as a recreational area with lawns, trails, and a scant understory (**Section 4.4 Vegetation**). Visual encounter surveys targeted all species historically found in the area at large, including river otter and mink along the river shoreline where vegetation is least fragmented, but no potential rearing/denning habitat was found. Smaller mammal species are likely still found in the RSA, and possibly in the LSA, including skunks, squirrels, and other small rodents.

Pacific Water Shrew

Although no Pacific water shrews have been reported within the LSA in the last 20 years (iMapBC 2017), one was observed 4.5 km away at Burnaby Lake. The validity of this record was confirmed by the Pacific water shrew recovery team (Kym Welstead, Pacific Water Shrew Recovery Team; *pers. comm.*). Based on habitat surveys and habitat suitability modelling, three areas of low suitability habitat in the LSA could contain remnant populations of Pacific water shrew (refer to **Figure 1 in Appendix 18.7**):

- At the north end of the LSA along the Fraser River, a habitat patch borders the Canadian National Railway (CNR) ditch system and consists of a series of unoccupied private lots with shrubs and trees. This habitat patch is isolated from other potentially suitable habitats to the south by a > 30 m culvert across Musqueam Dr near King George Blvd, to the north by industry, and to the east by Highway 17.
- In the central part of the LSA between the Fraser River and the 30-m wide CNR railbed, a habitat patch includes the riparian buffers of two short channels abutted by pumphouses (referred to as reservoirs in the TEM): one under the existing Pattullo Bridge (lower Pattullo Channel), and the other immediately south of the LSA under the Skytrain bridge over Fraser River. The reservoirs

have 15 m wide shrub buffers dominated by invasive species, and scant groundcover. The riparian buffers along lower Pattullo Channel are approximately 125 m long, and those along the reservoir south of the LSA are approximately 30 m and 45 m long. These small riparian forest patches are separated from one another by a large manicured green space comprising lawn, a trail, and planted clumps of trees. The riparian patches are isolated from suitable habitats in the rest of the LSA by transportation corridors (CNR and Highway 17) to the east and industry to the north and south (there is some connectivity to ditch vegetation south of the LSA as far as Tannery Rd).

- Just east of these reservoirs, between the 30-m wide CNR railbed and Highway 17, there is a habitat patch consisting of two unoccupied, private lots dominated by shrubs but containing an approximately 30 m by 40 m patch of trees. These lots combined, which border a railway ditch, were rated as having moderate biodiversity value in the Surrey Biodiversity Conservation Strategy; no other patches of high or moderate biodiversity value are found in the LSA south of Fraser River (Diamond Head Consulting 2014). This unmanaged vegetation is isolated in all directions by industry or 30 m wide transportation corridors.

According to habitat definitions for this species (Craig et al. 2010), some limited low suitability habitat is found east of Highway 17, but industrial land cover and the long (>30 m) culverts across Scott Rd and Old Yale Rd represent barriers to the nearest GIN (No. 104) at 128 St, just east of the LSA boundary. An upland natural areas park (Poplar Park; 1.9 ha) with mature deciduous trees is present in this GIN, with some connectivity to a waterbody (Bolivar Creek, approximately 400 m farther east; City of Surrey 2017). Without connectivity to natural areas in the landscape where Pacific water shrews can breed, the ditches east of Highway 17 are likely too small and marginal to sustain a viable population of this species; neither can they serve as foraging or dispersal habitat for Pacific water shrew.

It was determined that additional field assessments would not have altered ratings because vegetation in the LSA is largely manicured and/or bordering ditches along major transportation corridors, industrial areas, and commercial complexes. For this reason, and because the TEM product is deemed an accurate representation of the LSA land cover, confidence in the habitat suitability model for this species is moderately high (the presence/viability of isolated Pacific water shrew populations in identified patches of low suitability habitat remains somewhat uncertain).

4.5.1.1.1 Amphibians and Reptiles

Although frogs, turtles, and snakes were historically present in the Project area at large (Tsawwassen First Nation 2017), there are no currently identifiable wetlands within the LSA based on satellite imagery and iMapBC information. The loss of wetlands in urban areas is linked to local amphibian extirpation and population declines (Canadian Herpetological Society 2017; US National Park Service 2015; Collins and Crump 2009). Also, amphibians have limited dispersal capabilities, a semi-permeable skin that makes them vulnerable to disease, contaminants, and microclimate changes in upland environments, and they frequently breed in small, non-fish-bearing wetlands with temporary hydroperiods (Collins and Crump 2009) that are not protected by fish-related legislation.

The northwestern salamander (*Ambystoma gracile*) remains abundant in some areas of Surrey based on a 2013 fisheries inventory in the headwaters of Pattullo channel (Envirowest 2013) and the presence of an individual in Tannery Park during Project surveys of existing conditions (unpublished data). This species is regularly encountered in developed areas, as it is capable of inhabiting ditches with minimal aquatic and terrestrial cover, and can survive in the water as a neonate (i.e., without metamorphosing into a terrestrial life form) if terrestrial environmental conditions are unfavourable (Matsuda et al. 2006). However, it was not detected in the LSA during electrofishing and fish trapping surveys of Pattullo Channel, which although marginal, had slightly better water quality parameters than the rest of the ditches (**Appendix 18.4 Fish and Fish Habitat Report**).

Red-legged Frog

Project field surveys for the northern red-legged frog yielded no detections. This species breeds in shaded ponds and slow-moving streams with emergent vegetation or submerged branches (Jones et al. 2005). Such structural habitat is essential for egg attachment and tadpole refuge (Maxcy 2004). The red-legged frog is largely terrestrial beyond the egg-laying season (Chan-McLeod 2003; Aubry and Hall 1991; Bury et al. 1991), and important forest habitat components include deciduous trees, abundant CWD (Maxcy 2004), and the presence of saturated soils or open water within several hundred metres (Chan-McLeod 2003). Terrestrial individuals make use of water courses and non-breeding wetlands for travel through the landscape, or to seek thermal refuge during drought periods or areas devoid of cover (Chan-McLeod 2003). No suitable breeding wetlands and riparian zones were identified for this species' in the LSA (**Section 4.4 Vegetation**). The reservoir (lower Pattullo Channel) is inhabited by fish (**Section 4.3 Fish and Fish Habitat**), offers little emergent vegetation or submerged cover, and is bordered by a narrow (5 m) shrub riparian zones with limited cover. The ditches along transportation corridors, industrial sites, and other urban developments do not provide sufficient cover for dispersing or foraging individuals. All waterbodies are too isolated from moist forests with abundant cover and suitable breeding ponds. The nearest record for this species is from Green Timbers Urban Forest in 2005. A single individual was observed in a decommissioned FLNRORD nursery site across Highway 1A, which contained mixed deciduous forest and ditches (iMapBC 2016). As such, the LSA cannot support this species' living or breeding life requisites.

Western Toad

The non-calling population of western toad has suffered declines in localized areas of Canada, including the south coast of BC (ECCC 2016a). This species requires wetlands with shallow margins for breeding (BC Government 2017), but the reservoirs and ditches in the LSA are steep-sided. Post-breeding, this species disperses into various terrestrial habitats and requires non-compacted soils in which to dig burrows, and cover in the form of small mammal burrows and CWD (BC Government 2017). Abandoned lots are presumed to have compacted soils and have no form of ground cover for this species; neither do the recreational parks, or narrow riparian strips along streets and roads. Terrestrial and aquatic habitats can be several kilometres apart (ECCC 2016a), but the LSA is too fragmented to allow for sufficient riparian-upland connectivity to sustain a western toad population. There are no local or regional records for this species (iMapBC 2016), even though it is easily detected in late summer because the newly transformed individuals migrate to terrestrial habitats in mass (Matsuda et al. 2006). The main threat to the western toad is transportation and service corridors, as well as invasive or other problematic species and genes (ECCC 2016a).

4.5.3 Potential Effects

Assessment of potential Project effects on wildlife VCs followed the **Section 3.0 Assessment Methodology**. It considers both the construction period, which is expected to take five years (four years for construction of the new bridge, one year for demolishing the existing one). It also considers the operations/maintenance phase, which will extend 100 years from Project commissioning based on the design life of the replacement bridge. Information on mitigation is provided in **Section 4.5.4**.

Statutory requirements under CEAA 2012 were integrated throughout the assessment and are summarized in **Section 11**.

4.5.3.1 Potential Interactions

There are no wetlands to support breeding amphibians or water birds in the LSA, nor forest habitat for species at risk that could potentially occur in the LSA (i.e., red-legged frog, western toad, or western screech-owl). The Project has potential effects on songbirds, raptors, and small mammals (the Pacific water shrew) as described below and summarized in **Table 4.5-11**.

4.5.3.1.1 Construction

During Project site preparation, geotechnical drilling programs, soil stabilization and preloading, clearing and grubbing, the relocation of existing utilities, and the establishment of temporary components (access roads, laydown areas, offices) may have a direct impact, particularly to undetected bird nests and small mammal burrows. These Project activities may indirectly affect wildlife through the elimination or degradation of habitats within the Project Boundary (e.g., loss of vegetation to nest and forage in, reduced soil burrowing capabilities). Loss of trees could affect raptor perching or nesting potential. Aquatic foraging habitats of the Pacific water shrew could potentially be affected by water contamination from sediment and toxins during machinery works near ditches, and the species' movement patterns could be disrupted in the unlikely event that it is present in the area. Continued ground improvements during construction (e.g., excavation of unsuitable soils in the building of permanent new road bases, interchange structures, pile foundations, and bridge approaches; establishment of drainage structures and settling ponds); and construction of grade separation structures such as retaining walls and embankments could displace small urban species if they are present in such marginal habitats.

Sensory disturbance during Project construction may include elevated noise levels, increased lighting to facilitate work under dark conditions, and increased visual disturbance associated with the presence of Project staff, contractors, and their vehicles and machinery. Increased sensory disturbance may potentially cause increased vigilance in birds within the Project Boundary and neighbouring parts of the LSA, which has the potential to lower their reproductive fitness if they spend less time foraging and feeding their young. Sufficient disturbance could cause habitats to become sub-optimal, potentially leading to nest abandonment, particularly for birds that rely on vocalizations to attract mates and maintain nesting territories. During decommissioning of the existing bridge, the foraging and movement patterns of waterfowl, swallows, and raptors may be disrupted, and herons could potentially be affected if foraging in Pattullo Channel or local ditches. Increased activities and lighting (attractants) during construction could potentially cause an increased impact to wildlife.

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Table 4.5-11 Overview of Potential Project-related Effects on Wildlife

Project Activities	Raptors	Peregrine falcon	Western screech-owl	Hérons	Migratory breeding birds	Barn swallow	Common nighthawk	Migrating birds	Pacific water shrew
Construction Activities (includes pre-construction and site preparation)									
Geotechnical drilling programs, soil investigations	●	●	●	●	●	●	●	●	●
Clearing and grubbing	●	●	●	●	●	●	●	●	●
Ground improvements	●	●	●	●	●	●	●	●	●
Establishment of temporary roads, laydown, and facilities	●	●	●	●	●	●	●	●	●
Temporary barge access structures along the Fraser River	●	●	●	●	●	●	●	●	●
Relocation of existing utilities	●	●	●	●	●	●	●	●	●
Establishment of drainage structures and settling ponds	●	●	●	●	●	●	●	●	●
Construction of new road bases, grade separation structures, interchange structures, and bridge approaches	●	●	●	●	●	●	●	●	●
Decommissioning and removal of existing bridge and structures	●	●	●	●	●	●	●	●	●
Operation and Maintenance									
Traffic	●	●	●	●	●	●	●	●	●
Maintenance works	●	●	●	●	●	●	●	●	●

● = Nil, or negligible effect; no further consideration warranted

● = potential effect requiring mitigation

4.5.3.1.2 Operations

During operations, new traffic circulation patterns may cause a rise in road collision rates. Noise could potentially interfere with the acoustic signals of songbirds, thereby reducing pairing (nesting) success. Insectivores and species with lower-pitched songs are particularly at risk (Canaday 2001; Rheindt 2003). Lighting of the new bridge and bridge deck could confuse nocturnal, migrating birds and cause direct mortality through collision with the bridge or with traffic. Maintenance works involving the removal of vegetation could cause incidental take of birds during the breeding season, if active nests are undetected. Shrubs and trees surrounding Brownsville Park will be less shaded once the existing bridge is removed but the benefit is likely to be negligible as shadows are currently compact throughout the day (**Section 6.6**). Shade from the new bridge will be projected northwards towards industrial lots, and is thus not expected to affect wildlife species.

4.5.3.2 Effects Assessment

4.5.3.2.1 Potential Effect #1 Habitat Loss

Construction

Twenty-eight percent of the LSA is vegetated, 5.05% (16.75 ha) of which overlaps the Project Boundary (**Section 4.4 Vegetation**). Most of this loss will be in the form of mowed grass (7.79 ha), which has no wildlife habitat value. The next largest loss of vegetation is to mixed grass/shrub meadow on currently disturbed but undeveloped lots (3.51 ha) and along ditch borders (2.57 ha). Loss of grassland or shrub habitat could affect sparrows and other songbirds that nest in low-lying or exposed vegetation. This small loss is expected to have a low effect on regional wildlife populations in the RSA because the environment is so highly urbanized. Vegetation is limited to small, remnant, isolated patches of marginal habitat, and much of this sub-optimal habitat is near transportation corridors and industry.

The common nighthawk nests in relatively sheltered, grass/shrub vegetation patches (abandoned lots) and on exposed ground with sparse vegetation. Common nighthawks have a low tolerance for human activity, but 2% of the LSA may be sufficiently isolated from humans (i.e., have ≥ 50 m of vegetation as a visual buffer from roads, trails, and occupied areas) to serve as low suitability breeding habitat for this ground-nesting species. Based on a habitat suitability assessment, the Project Boundary overlaps 9 ha of potential low-quality habitat for this species, primarily next to Pattullo Channel under the existing Pattullo Bridge (**Appendix 18.17**). There will be no loss of habitat at that location (during the demolition of the existing bridge), and the Project Boundary only touches the edge of the other marginally suitable habitat patches. No Project-related habitat loss is expected for the common nighthawk.

The Project Boundary overlaps with 2.56 ha of tree patches (0.8% of LSA), primarily in landscaped areas: the edge of Queen's Park bordering McBride Boulevard (1.52 ha), and along tree boulevards and streets on both side of the Fraser River (1.0 ha); some trees may be lost along ditches in Surrey, but in only a small total area (0.10 ha). Forest hawks (accipiters and merlins) have a moderately high ability to co-exist with humans but require secure forest cover (MOE 2013). These small diurnal raptors are unlikely to breed along edges and/or in narrow strips of exposed trees, and as such are not expected to experience habitat loss. The same is true for the barred owl and great horned owl, which have been observed in

Queen's Park and are highly tolerant of humans. Larger, more conspicuous species (hawks, eagles, osprey) are more likely to breed in consolidated tree patches along the Fraser River, which will not be removed. Project effects on raptor habitat availability are expected to be nil for these reasons and because raptors occupy large home ranges (nesting pairs are found in low densities). Loss of treed habitat will influence some smaller, migratory birds that breed along forest edges, but this effect is expected to be low because treed edges within the Project Boundary are a very minor component of microhabitat for local breeding birds in the RSA. As previously discussed, there are no riparian tree patches in the LSA capable of supporting breeding herons, and no forests are large and structurally diverse enough to support western screech-owls.

No natural wetlands were identified within the Project Boundary that could support amphibian breeding. Potential pond-breeding species in the Lower Mainland include red-legged frog, western toad, Pacific chorus frog (*Pseudachris regilla*), northwestern salamander, and long-toed salamander (*Ambystoma macrodactylum*). The TEM study identified two types of anthropogenic wetlands, including two shallow open water areas associated with ditches, and a reservoir near the existing Pattullo Bridge (all are components of Pattullo Channel). These waterbodies comprise 0.02% of the LSA (**Section 4.4 Vegetation**). They are of poor quality for red-legged frogs and western toads because they lack emergent vegetation for egg attachment and aquatic cover, and contain water of poor quality (**Section 4.3 Fish and Fish Habitat**). Equally important is the lack of terrestrial cover for juveniles and adults, and the lack of connectivity to suitable aquatic and upland habitats in the RSA. As such, no effects to amphibians are expected from the Project. Effects to water birds are expected to be negligible. Mallards and potentially Canada geese could use these waterbodies as temporary rest sites, but there is no potential breeding habitat and the ditches provide limited foraging opportunities.

These anthropogenic waterbodies may be frequented by Pacific water shrew, but TEM indicates that 4.2% of the LSA contains riparian vegetation (defined as within 100 m of water bodies < 20 m wide); 0.7% is dominated by trees (likely suitable for living in and rearing young). These patches, which are in Surrey, bear no resemblance to natural habitats; they are typically manicured and contain mostly invasive and non-native plant species. Habitat of moderate to high suitability for the Pacific water shrew is thus considered absent. Based on the definitions of nil and low suitability habitat for this species, 4% (16 ha) of potential habitat exists in the LSA, 25% (4.0 ha) of which is within the Project Boundary. Most of this habitat consists of the recreational (mowed) green space south of Pattullo Bridge (**Figure 1 in Appendix 18.7**), which is bordered to the north by a 5 m shrub buffer along Pattullo Channel, and to the south by a consolidated tree patch with bare ground, a scant understory, and no CWD cover.

The rest of the low suitability habitat for Pacific water shrew is along Surrey's ditch network and likely is only suitable for dispersal and possibly feeding. However, there is no connectivity between these low suitability habitat patches, or to natural areas beyond the LSA including designated sites (< 2 ha), hubs (> 2 ha), and green infrastructure networks (GINs) as outlined in the Biodiversity Conservation Strategy (BCS). Project activities are expected to have a negligible effect on Pacific water shrews because the most likely patch to contain a vestigial population (the green space next to Pattullo Channel; 2.9 ha) will not be removed.

Operations

The existing Pattullo Bridge has ledges that can and have historically supported nesting by the peregrine falcon. Replacing the existing bridge with a long-span cable-stayed bridge structure could potentially remove nesting opportunities. Project effects are expected to be low, however, as a nesting pair has not been observed in 13 years, and the species occupies home ranges of up to 5.6 km (White et al. 2002). More suitable home ranges likely contain a greater prey abundance than that offered in highly developed urban areas such as the LSA.

Habitat losses during the Project Operations Phase will consist of regular vegetation clearings along ditches or roadsides as part of annual maintenance activities. This minor loss of vegetation is expected to have a negligible effect on birds because species that are capable of breeding on highway verges tend to be adaptive, and common. More suitable habitat exists in local parks, especially larger or less manicured parks such as those that border Burnaby Lake, Green Timbers Park, and Invergarry Park. By replacing invasive plant species in temporary disturbance areas in the Project Boundary with native species, local urban species may ultimately benefit from the Project, especially if these enhanced areas abut green spaces.

4.5.1.1.1 Potential Effect #2 Habitat Degradation

Construction

Cranes used for the demolition of existing bridge piers in the terrestrial environment, and machinery used in temporarily disturbed areas (laydowns, roads, offices), may cause some damage to low-lying vegetation, some of which overlaps with low suitability habitat for the common nighthawk and Pacific water shrew under the existing Pattullo Bridge. Compared to more complex (treed) plant communities, areas subject to temporary machinery activity will be in early seral stages (exposed sites, grass/shrub communities) and can regenerate quickly from damage. Project-related terrestrial habitat degradation is expected to be negligible for this reason and because the Project overlaps primarily with existing disturbances.

Because the waterbodies in the LSA do not support habitat for western toad, red-legged frog breeding habitat, or more common amphibian species, no Project effects are expected on this species group as a result of any potential influence of construction activities on nearby watercourses. Similarly, increased sedimentation or toxin concentrations are not expected to affect the waterfowl species, given that their presence in roadside ditches is temporary (during movements to and from breeding ponds or roosting sites). As a riparian obligate that feeds in aquatic environments, the Pacific water shrew is likely to be negatively affected by works in or near water. Sediment plumes can potentially decrease prey detectability, and toxins have the potential to affect the abundance of benthos (**Section 4.3 Fish and Fish Habitat**). These effects are expected to be low given the marginal nature of the ditch habitats in the Project Boundary and their lack of connectivity to suitable living habitats elsewhere in the LSA.

Operations

Ditches in the Project Boundary are already subject to road salts and other compounds being released by road traffic, industrial lots, and other urban developments. Upgrading feeder-routes and altering the location of the bridge over the Fraser River are not expected to cause a noticeable increase in surface water contamination within the LSA (**Section 4.2 Surface Water and Sediment**). As such, effects to the Pacific water shrew are expected to be negligible during operations.

Shading by the bridge will not influence common songbirds by eliminating the growth of shade-intolerant shrub species, because shade will be cast northward, and the shadows will contract due to the angle of the sun during the breeding season (**Section 6.6 Shading**). No net loss in habitat is expected. There will be increased light in the area of the existing Pattullo Bridge once it is removed, which may benefit songbirds breeding in shrubs.

4.5.3.2.2 Potential Effect #3 Sensory Disturbance

Construction

Construction noise and light may cause wildlife species to spend more than the usual amount of time being alert for danger, or even to abandon a currently used habitat depending on their level of tolerance to disturbance (Bowles 1995). Affected wildlife includes urban raptors, songbirds (migratory birds), and small mammals that are currently nesting or living in vegetated parks, road and railway verges, ditch borders, and the riparian borders of lower Pattullo Channel. The intensity of a wildlife species' response will depend on the duration, frequency, and intensity of the disturbance above and beyond the current noise or light baseline. As such, pile driving will be the most intense source of (noise) disturbance during the construction period, followed by machinery used for such activities as clearing and grubbing, culvert replacements, and the demolition of the existing bridge components (particularly the landward piers between concrete girder spans, where resident or breeding wildlife is concerned).

Similarly, flood lights would have more impact on ambient light levels than directional lights. A temporary increase in ambient noise or light levels during construction within and adjacent to the Project Boundary is expected to have a low effect on the local wildlife species assemblage because the noise and light changes will be incremental over the existing high levels, and will be temporary in nature (refer to **Section 4.7 Noise and Vibration** and **Section 6.5 Lighting**). Local species have habituated to high levels of ambient noise and lighting over several decades, and are generally tolerant of human activities in major transportation corridors. Urban species that are sensitive to abrupt disturbance, such as the great blue heron, are transient and are rarely present in the LSA.

Operations

Noise levels in the LSA are dominated by traffic and are currently high (**Section 4.7 Noise and Vibration**). Lights are abundant along roadways and at industrial and commercial sites (**Section 6.5 Lighting**). Wildlife species using the Project Boundary area are accustomed to this level of sensory disturbance. For this reason, additional light and noise disturbance, above current levels associated with Highway 17 and King George Blvd, are expected to have no effect on local wildlife species during operations and because the Project largely overlaps existing road infrastructure (i.e., songbirds that rely on auditory signals for communication will already have been displaced from the Project Boundary). Also, the number of breeding birds in the LSA is relatively low based on recent field studies for the Project.

4.5.3.2.3 Potential Effect #4 Direct Mortality

Construction

Wildlife species present within the Project Boundary are highly mobile and not generally considered at risk from direct mortality during site preparation except during the breeding season, at which time adults and their young are at risk primarily from clearing and grubbing activities. Affected species include small mammals, nesting migratory birds, and nesting raptors (no nesting habitat for amphibians, western screech-owl, herons, or other water birds) in the Project Boundary.

Small mammals that use underground burrows for nesting, travel, or shelter will also be potentially affected by extensive ground improvement works such as preloading. Effects to Pacific water shrew are expected to be negligible because no ground works will be undertaken in the potentially suitable living habitat along Lower Pattullo Channel; and encroachment into the other two low suitability habitat areas will be minimal (refer to **Figure 1** in **Appendix 18.7**). Also, available data suggest that the Red-listed Pacific water shrew has not been identified within the LSA for the last 20 years (iMap 2014).

Effects to breeding birds and their eggs/young are expected to be low based on the current habitat conditions within the Project Boundary and the low abundance and diversity of bird species. Given the presence of low suitability habitat for the common nighthawk under the existing Pattullo Bridge, the Project could cause harm to this highly camouflaged species' eggs or young. Furthermore, lighting used during night construction works may attract this dusk, aerial forager toward roads, and potentially some nocturnal migrating birds in spring and fall, thereby increasing its risk of collision with traffic. Project effects are expected to be low, however, because the increase in lighting from the Project will be low near the bridge (**Section 6.5 Lighting**), common nighthawks typically occupy large (> 10 ha) home ranges in urban areas (COSEWIC 2007b), and migrants generally fly at height.

Operations

Migratory birds, which travel to northern latitudes in early spring to take advantage of abundant food and warm weather during the breeding season, and return to southern climes in the fall, travel at night and are at risk of colliding with tall structures, particularly during stormy weather when visibility is low. Artificial light can further increase the risk of collision (Greenfieldboyce 2017; Gauthreaux and Belser 2006). The effect of the Project is expected to be low during operations because birds migrating through the area will already have been exposed to the existing Pattullo Bridge and SkyTrain bridge over Fraser River, and to an abundance of tall structures and lights in the Lower Mainland.

Long-term traffic volumes are expected to be higher than current levels due to improved community connections associated with safety and efficiency (**Appendix 18.1**). However, given the highly fragmented, marginal nature of the habitat in the LSA and the low abundance and diversity of wildlife species, a negligible increase in collision rates is expected. The local roads are not currently attracting wildlife (i.e., not generating many carcasses for scavengers).

4.5.3.2.4 Potential Effect #5 Movement Patterns

Construction

Seasonal movement patterns in the LSA primarily involve spring and fall migration. As explained in the previous section on direct mortality, the extensive existing road network and current level of urbanization have disrupted small mammal movement patterns in the area for several decades; there are no longer large mammals, reptiles, or amphibians in the LSA. Any movement by the semi-aquatic Pacific water shrew is along existing ditches and the Fraser River riparian zone. Construction works may temporarily impede movement by this species, but effects are expected to be negligible because of the low density of individuals (if present), the protective setbacks along ditches, and the minimal amount of work expected to take place from dusk to dawn when this species is most active.

Operations

The Project is not expected to influence wildlife movement during operations because local roads do not need to be crossed to access important wildlife habitat. Travel along the Fraser River shoreline will not be further impeded by the new replacement bridge. Migrating birds already fly over the existing Pattullo Bridge, the Port Mann Bridge, and many tall urban structures. Lighting design for the new bridge is not expected to result in a marked increase in light levels from the existing bridge.

4.5.4 Mitigation Measures

Mitigation measures for potential Project effects on wildlife VCs are detailed below and summarized in **Table 4.5-12**.

4.5.4.1 Mitigation Approach and Relevant Management Plans

A hierarchical approach to mitigating potential Project-related effects is recommended, which employs strategies in the following order of priority:

- **Avoidance:** Measures to avoid potential effects to wildlife VCs are implemented during the planning stage of a project, including considerations of overall design, route selection, and scheduling options.
- **Minimization:** Where disturbances cannot be avoided through planning, measures are implemented to minimize or reduce potential effects through the adoption of standard BMPs, Construction Environmental Management Plan (CEMP), Operational Environmental Management Plan (OEMP), and site- and component-specific protection plans.
- **Restoration/enhancement:** Where adverse effects cannot be fully eliminated through standard mitigation measures, affected components are restored to pre-Project conditions or otherwise improved.
- **Compensation:** Where on-site restoration or enhancement is not feasible, appropriate means to compensate for potential Project-related effects on a VC will be identified.

4.5.4.2 Avoidance

The Project has been designed to overlap with existing roadways and intersections (i.e., McBride Blvd and King George Blvd) to reduce the risk of affecting wildlife habitat in the LSA. Habitat will also be avoided by locating and designing temporary facilities, site access roads, and laydown areas away from unmanicured vegetation patches where feasible. Waterbodies (Pattullo Channel, ditches) will also be avoided where feasible, by establishing protective setbacks 5 m upland of HWMs. This habitat avoidance will benefit species nesting in riparian vegetation or travelling along/near the water line.

Temporally, disturbance to breeding migratory birds and raptors will be avoided by conducting Project works outside of critical breeding periods—when adults are attending to their vulnerable young—as much as possible. Migratory birds are particularly at risk of disturbance because they travel long distances to reproduce, and their young need to reach a certain stage of independence to be able to undertake the southbound migration journey in late summer (See timing restraints below).

4.5.4.3 Minimization

Mitigation measures to minimize potential Project effects to wildlife during construction and operations will be outlined in the CEMP and subsequent OEMP (**Section 14.0 Management Plans**) and detailed in the associated Wildlife Management Plan (WMP). Key elements of these plans are discussed below.

4.5.4.3.1 Species Protection

Measures to protect wildlife from direct mortality as a result of site preparation and construction activities involve timing restrictions during the breeding season, pre-clearing or pre-construction surveys to identify nesting sites in need of protective spatial buffers, and wildlife salvages to relocate species within the construction footprint to suitable habitats nearby.

Timing Constraints

To the extent feasible, Project construction activities will coincide with least-risk timing windows for wildlife to avoid incidental take of birds, in accordance with the MBCA and *Wildlife Act*. This is a highly effective mitigation measure, as it ensures that migratory species are protected during the following, documented sensitive periods:

- ECCC (2017b) defines the breeding window for migratory birds in Nesting Zone A for the Lower Mainland as March 15 to August 15.
- MOE (2013) states that raptor nesting sites should be protected during courtship, which occurs up to one month before nesting. According to the provincial breeding bird atlas, courtship begins in January for the great horned owl; early February for bald eagle, red-tailed hawk, and barred owl; mid-February for the western screech-owl; early March for peregrine falcon and merlin; mid-March for Cooper's hawk and osprey; and mid-April for sharp-shinned hawk (Davidson et al. 2015). Breeding for raptors extends until the end of August (Davidson et al. 2015; MOE 2013).

Pre-Construction Surveys

If clearing and grubbing must be done within the migratory bird breeding season, then pre-clearing nest surveys will need to be conducted within the Project Boundary area so that species- and site-specific protective buffers can be established around active migratory bird nests until the young have fledged in late summer (or the nest as been otherwise abandoned). For this mitigation strategy to be highly effective, surveys are to focus not only on nest searches, but also on examining the behaviour of local pairs, so that nest sites can be found especially in more complex environments, even if the actual nest is not found.

Pre-construction forest raptor surveys will be conducted in Queen's Park to determine if new nests are present and in need of mitigation. Highly effective, protective setbacks around the active nests of urban raptors are an equivalent of 1.5 tree lengths (MOE 2013). There is no need for a stick nest survey because it was determined that the vestigial tree patches are too small to support the nest of large, conspicuous raptors.

An environmental DNA (eDNA) survey is recommended for Pacific water shrew in each identified low suitability habitat patch within the Project Boundary (refer to **Appendix 18.7**) to determine if a salvage is needed to relocate individuals, or if exclusion fencing must be erected to keep the species beyond the Project construction footprint. The search for a trace of Pacific water shrew genetic information (mitochondrial DNA) is expected to be highly effective in conjunction with exclusion fencing, because there is very limited usable aquatic habitat for the species within in the Project Boundary due to fragmentation by transportation corridors, industry, and other urban developments. Genetic material can be in the form of fur, feces, urine, or saliva (Hemmera 2015). If properly established (to a depth of 10 cm), exclusion fencing to keep Pacific water shrews from entering the construction footprint is also highly effective.

Prior to the removal of the Pattullo Bridge, a visual encounter survey of the Fraser River shoreline (south side) will be completed to confirm that there is no denning mink or otter pair, and no riverine birds nesting above the HWM.

Wildlife Salvages

Depending on the outcomes of the Pacific water shrew eDNA survey, a wildlife salvage may be undertaken ahead of clearing and grubbing in one or multiple low suitability habitat patches for the Pacific water shrew. According to the draft BMPs for this species (Craig et al. 2010), salvages would involve multiple days of pitfall trapping, which has been found to be moderately effective at catching individuals at other project locations. Local relocation can be highly effective if exclusion fencing is established to prevent re-entry of individuals into the Project Boundary during the construction period. Salvage and relocation approaches would be approved by regulators through the issuance of a *Wildlife Act* permit for the work. There are no amphibian breeding habitats in the LSA, and thus no need to conduct salvages for this species group.

Lighting Management

During construction, it is recommended that cut-off hoods be used to direct light used to facilitate night (dawn to dusk) works downwards, and to reduce light spillage; floodlights are to be avoided as much as possible, and non-essential lights turned off (**Section 6.5 Lighting**). This strategy is highly effective in reducing upward directional lighting (Gauthreaux and Belser 2006). Using narrow spectrum sources with minimal ultra-violet light will help reduce the risk of attracting nocturnal insectivores to active construction areas within the Project Boundary during dusk foraging forays. These measures are expected to be highly effective for the common nighthawk, which could potentially breed in very low densities in the LSA. These are standard recommendations outlined in protocols for minimizing the effect of lighting on wildlife (e.g., Bat Conservation Trust 2014; Gauthreaux and Belser 2006).

The same is true of lighting during operations. Lights are known to attract or confuse birds, which can lead to increased road mortality. By interfering with the ability of birds to navigate via magnetoreception during migration, lights may also cause a risk of collision with tall, lit structures (Gauthreaux and Belser 2006). As during construction, floodlighting is to be avoided on new bridge piers, and cut-off hoods are to be used around new deck lighting. A minimum number of luminaries is recommended for deck lighting as well (**Section 6.5 Lighting**). Bridge lights will be established in accordance with Navigation Canada safety requirements, which will help deter birds from the bridge structure (Gauthreaux and Belser 2006). Light management will to be detailed in a Lighting Plan as per VFPA guidelines (**Section 6.5 Lighting**).

4.5.4.3.2 Habitat Management

Terrestrial habitat management measures will include site restoration following construction (refer to following **Section 4.5.4.4**). As discussed in **Section 4.5.4.2**, riparian habitats will be buffered where feasible, and these will be clearly delineated on construction drawings and in the field to minimize the risk of misunderstanding. Where avoidance is not possible, measures to control the input of sediment and other contaminants will be established as outlined in **Section 4.2 Surface Water and Sediment** and **Section 4.3 Fish and Fish Habitat**. Key procedures include:

- The erection of erosion control measures (sumps, silt fences, check dams) to intercept surface runoff, thereby protecting aquatic habitat from being degraded by sediment infusions.
- The completion of an Emergency Response Plan to be followed in the event that a protective buffer should be encroached upon, a silt fence fail, or a spill occur.

4.5.4.4 Habitat Enhancement or Restoration

Habitat enhancement measures will include invasive species management, which will be addressed in the Vegetation Management Plan (VMP)—a component of the EMPs—and detailed in an invasive species management plan (refer to **Section 14.0 Management Plans**). Basically, invasive species will be removed from the construction footprint during initial clearing and grubbing, and all temporarily disturbed areas will be revegetated as soon as possible with local native plant species (refer to **Section 4.4 Vegetation**). The native species will be at sufficient densities to potentially outcompete undesired species, which often grow in large patches and thereby reduce structural diversity and the associated complexity of foraging, resting, and breeding niches for wildlife use.

The ground under the existing bridge, along Pattullo Channel, will be planted with native herbs, shrub, and tree species. This will ultimately provide a more natural and structurally diverse habitat than is presently available anywhere in the Surrey part of the LSA. Habitat enhancement works will tie in with the Recovery Strategy goal to restore historical or potential habitats for the Pacific water shrew within the next 10 years where opportunities arise (e.g., through local habitat management, or in identified candidate areas for habitat rehabilitation within the species' range)(EC 2014).

4.5.4.5 Habitat Offsetting

Decommissioning and removal of the existing Pattullo Bridge will eliminate a structure that nesting peregrine falcons appear to have used in the past (McElhanney Consulting Services 2015). Nesting platforms will be provided on the new Pattullo Bridge before the existing bridge is decommissioned. Early consultation with biologists and regulators will help determine the most suitable nest platform design for peregrine falcons. Artificial nesting platforms are an effective means of mitigation as evidenced by their successful and continued use in the coastal marshes of New Jersey (White et al. 2002). This habitat offset supports the federal goal of conserving nesting sites for peregrine falcons (EC 2015).

4.5.4.6 Summary of Proposed Mitigation Measures

A summary of proposed mitigation measures for each wildlife VC is provided in **Table 4.5-12**. Wildlife mitigation was informed by federal Management Plans and Recovery Strategies, provincial guidelines for development in urban and rural areas and BMPs for works in and near water (refer to **Section 4.2 Surface Water and Sediment**, **Section 4.3 Fish and Fish Habitat**, **Section 4.7 Noise and Vibration**, and **Section 6.7 Lighting**).

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PART B SECTION 4.5 WILDLIFE

Table 4.5-12 Summary of Proposed Mitigation Measures for Wildlife Valued Component

Valued Component*	Potential Effect	Mitigation Measure	Project Phase	Effectiveness	Certainty	Relevant Management Plan	Residual Effect (Y/N)
Nesting birds (migratory, urban)	Habitat loss Sensory disturbance Direct mortality	Least-risk window Pre-clearing surveys Protective buffers	Construction	High	High	Wildlife Management Plan Vegetation Management Plan	N
Barn swallow	Habitat loss (relocation of structures \leq 30 m)	Pre-mobilization survey Timing of building relocation	Construction	High	High	Wildlife Management Plan	N
Common nighthawk	Sensory disturbance Direct mortality	Least-risk window Pre-construction sweep of low suitability habitat under existing bridge Protective buffers	Construction	High	High	Wildlife Management Plan	N
Raptors (forest-dwelling)	Sensory disturbance	Least-risk windows Pre-construction surveys Protective buffers	Construction	High	High	Wildlife Management Plan	N
Peregrine falcon (ssp. <i>anatum</i>)	Habitat loss Sensory disturbance	Least-risk window Pre-construction surveys Nesting platform	Operations	High	High	Wildlife Management Plan	N
Migrating birds	Lights as attractants or inducing confusion Collision	Directional lighting, shielded from the top	Construction Operations	High	Moderate	Lighting Plan	N
Pacific water shrew	Habitat loss Habitat alteration Wildlife mortality	Presence/absence surveys Possible salvage	Construction	Moderate	High	Wildlife Management Plan Vegetation Management Plan	N

* It was determined that the LSA did not support habitat for herons or amphibians

4.5.5 Residual Effects and their Significance

Once mitigation measures are implemented for the Project, no residual effects on wildlife are expected.

4.5.6 Cumulative Effects and their Significance

Adverse residual effects are not expected, and so no cumulative effects assessment was required for wildlife VCs.

4.5.7 Follow-up Strategy

There is no need for a follow-up wildlife strategy because no residual or cumulative effects apply to migratory birds during the breeding season or migration to breeding raptors, or to small mammal and amphibian species at risk.

4.5.8 Conclusions

The highly disturbed LSA contains marginal, fragmented wildlife habitat in the form of narrow strips along roads and ditches, recreational (manicured) parks, and undeveloped, disturbed lots. Urban species living in these habitats include passerines (many of which are migratory), raptors, and small mammal species that are generally tolerant of noise, artificial lighting, human presence, and other disturbances. Species at risk that have the highest potential to occur in the LSA, based on habitat characteristics, include the common nighthawk and the Pacific water shrew. Although the potential for being present is low, peregrine falcons are known to nest on bridges and made use of the existing Pattullo Bridge 13 years ago. There is no breeding habitat to support herons, amphibians, large raptors, or western screech-owl.

Project effects on wildlife VCs are expected to be negligible with the following exceptions, for which Project effects are deemed low:

- A small number of migratory breeding birds (also known as urban birds), including the common nighthawk, may suffer a minor loss of marginal habitat, and could be subject to direct mortality if not detected during construction.
- There is a possibility that bank swallows build a nest on temporary project construction office buildings.
- Forest raptors could potentially be breeding in Queen's Park or in a vestigial tree patch south of the Fraser River and the existing Pattullo Bridge, and could be subject to sensory disturbances during construction.
- There are three patches of low suitability habitat for the Pacific water shrew within the Project Boundary, which means that this species could be subject to direct mortality during construction, or have its movements along local ditches disrupted.
- Common nighthawks may be attracted to lighting for construction works, and consequently would be at higher risk of road mortality.
- Peregrine falcons could possibly return to nest on the existing Pattullo Bridge during its demolition, or could use the new cable-stayed bridge once it is in place.

A series of mitigation strategies are recommended to minimize and avoid the impact of the Project on local wildlife and wildlife habitats; these consider BMPs for development in urban areas and works, provincial conservation guidelines (for raptors), and Management Plans or Recovery Strategies for species at risk. Habitat avoidance through Project design, timing constraints during the breeding season, protective spatial buffers around active nests identified before construction, salvages, and the management of sensory disturbances are key, effective mitigation measures, that, once implemented, are expected to leave no residual effects.

4.5.9 References

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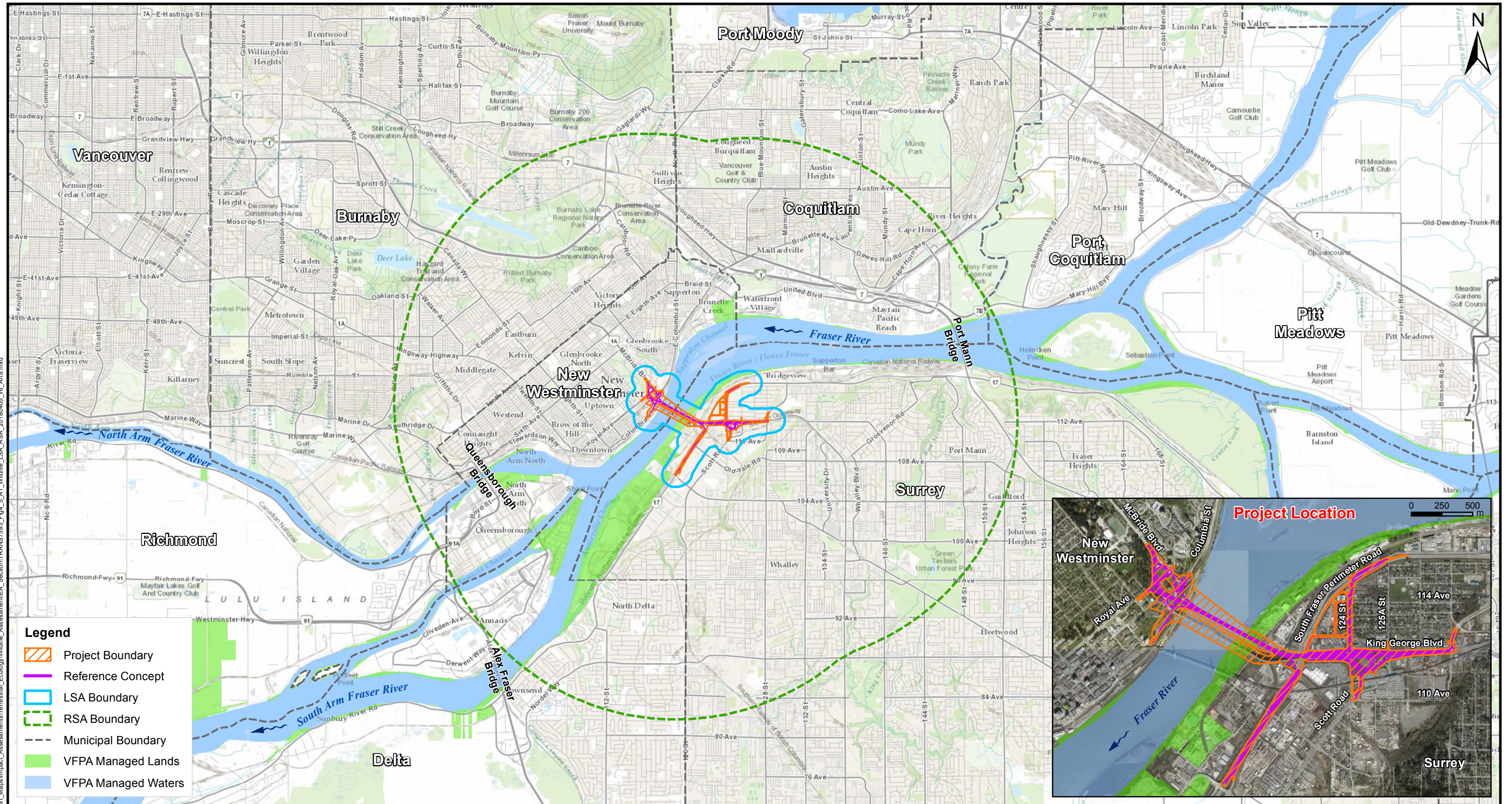
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ATTACHMENTS

Attachment 4.5-A

Figures



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DESIGNED	AS	18 - 04 - 05
DRAWN	AS	18 - 04 - 05
CHECKED		
APPROVAL		

REFERENCE DRAWING	
NO.	DESCRIPTION
1	Reference Concept, Parsons 2018.



Proposed Pattullo Bridge Replacement Project

Spatial Boundaries for the Wildlife Assessment

Contract No. 0906-14/SC001110CA		
SCALE 1:75,000	FIGURE NO.	REV NO.
0 1 2 Km	4.5-A-1	6