APPENDIX B
Environmental Assessment Report

Keystone Environmental
Knowledge-Driven Results

January 20, 2017

Mr. Tim Sackmann
Manager, Environmental Quality & Sustainability
PSPC Environmental Services
219 – 800 Burrard Street
Vancouver, BC V6Z 0B9

Dear Mr. Sackmann:

Re: Environmental Assessment
Pacific Agri-Food Research Centre Slope Stabilization Project
4200 Highway 97, Summerland, BC
PSPC Project No. R.0803303.001
KEL Project No. 13244 – 103

We have enclosed the report titled *Environmental Assessment – Pacific Agri-Food Research Centre Slope Stabilization Project* (PSPC Project Number R.0803303.001). We are pleased to submit this report to PSPC Environmental Services and appreciate the opportunity in providing the service regarding this project.

If you have any questions, please do not hesitate to contact us.

Sincerely,

Keystone Environmental Ltd.

Warren Appleton, R.P.Bio
Project Manager

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encl.

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Keystone Environmental
Knowledge-Driven Results

ENVIRONMENTAL ASSESSMENT

Pacific Agri-Food Research Centre
Slope Stabilization Project

Prepared for:

PUBLIC SERVICES AND PROCUREMENT CANADA
219 – 800 Burrard Street
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Prepared by:

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PSPC Project No. R.0803303.001
Keystone Project No. 13244

January 2017

EXECUTIVE SUMMARY

In October 2015, a buried water pipe broke adjacent to an apple orchard at the Pacific Agri-Food Research Center at 4200 Highway 97 in Summerland, British Columbia (the Site). As a result of the pipe break, water eroded the bluff slope creating an irregular gully leading to a sinkhole. The gully extends approximately 30 m from the scarp edge to the sinkhole, and is up to 15 m wide and between 4 and 6 m deep.

To address the slope stability issues, Agriculture and Agri-Food Canada and Public Services and Procurement Canada (PSPC) are investigating slope stabilization options for protecting the scarp area (the Project) to reduce risks to personnel and resources and mitigate potential impacts to environmentally sensitive areas on Site. The scarp area and an extended portion of a gulley will likely be filled with sand. Culvert maintenance to remove accumulated sediment may be performed in the future, but is not currently in the project design plans.

Keystone Environmental Ltd. was retained by PSPC to complete an Environmental Assessment that evaluates the proposed works for potential significant adverse effects. The desktop review and field survey completed in November 2016 included in this assessment identified valued ecosystem components that could be impacted by the proposed works, including physical and biological resources, the potential presence of rare and endangered wildlife and plant species at and adjacent to the Site, as well as socio-cultural resources. The desktop review confirmed that 21 rare and endangered species could potentially occur at the Site, and at least 25 rare and endangered species have been documented in similar habitats in adjacent areas. Rare and endangered species were not observed within the project footprint during the biophysical survey, however, two potential constrains were identified:

- Sagebrush vegetation is present within the project footprint below the scarp and on either side of the scarp. This vegetation has a moderate potential for meeting nesting habitat requirements for wildlife and rare and endangered species that are known to nest in the spring and summer (typically between May and September); and,
- The scarp and the eroded gully have a moderate potential to support hibernating (winter only), nocturnal and breeding wildlife.

The potential effects of the proposed slope stabilization works on these valued ecosystem components were identified and evaluated. Mitigation measures were prescribed to reduce or avoid potential adverse effects on the identified valued ecosystem components. For example:

- Planning work to avoid adverse weather conditions (wind and rain);
- Environmental monitor to conduct detailed pre-construction survey of project footprint within one week prior to work; isolate unoccupied wildlife features as necessary;
- Establish species specific buffers for active nests, if found during pre-construction survey. Conduct work within buffer areas after nests become inactive (typically weeks to months for song birds, mammals and herptiles);
- Hold kick-off meeting to go over environmental requirements;
- Conduct environmental monitoring to confirm environmental requirements are met;

- Have a spill management plan and implement immediately if spill occurs;
- Install erosion and sediment control measures (e.g., silt fencing, tarping piles) as necessary to meet water quality standards; and
- Stop works if a risk of adverse effects to sensitive wildlife arises.

Residual and cumulative effects were included in the assessment. The assessment found that considering the successful implementation of the mitigation measures provided, residual effects were assessed as being low to nil on a temporal and spatial scale. Cumulative effects are expected to be minor given that the slope stabilization works involve restoring the Site to its original condition.

This Environmental Assessment has concluded that impacts associated with the proposed works are minimal and the potential adverse effects are anticipated to be not significant, considering the successful implementation of the mitigation measures provided in this assessment. No environmental permits are anticipated to be required based on the information available. It is our recommendation that Project works be allowed to proceed, pending the implementation of mitigation measures identified in this report. This assessment does not constitute an approval under any Act or Regulation.

This Executive Summary is subject to the same general limitations as contained in the report and must be read in conjunction with the entire report.

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LIST OF ACRONYMS

BC	British Columbia
BMP	Best Management Practice
CDC	Conservation Data Centre
CMN	Community Mapping Network
DFO	Fisheries and Oceans Canada
FISS	Fisheries Information Summary System
MFLNRO	BC Ministry of Forests, Lands and Natural Resource Operations
MOE	BC Ministry of Environment
PSPC	Public Services and Procurement Canada
SARA	*Species at Risk Act*
SHIM	Sensitive Habitat Inventory Mapping
VEC	Valued Ecosystem Component
WMA	Wildlife Management Area

1. INTRODUCTION

In October 2015, a buried water pipe broke adjacent to an apple orchard at the Pacific Agri-Food Research Center at 4200 Highway 97 in Summerland, British Columbia (the Site). As a result of the pipe break, water eroded a 31.5 m by 7.5 m scarp area on the downhill slope east of the orchard on the Site. The water created a sub-surface cavity in the gully. Evidence of sub-surface flows emerging from the hillside are present at the toe of the hill, where sediment has accumulated on a vegetated low lying lakeside plain on the west side of Highway 97. The culvert that drains the lakeside plain under Highway 97 is partially blocked with sediment, which is adjacent Okanagan Lake.

To address these issues, Agriculture and Agri-Food Canada and Public Services and Procurement Canada (PSPC) are investigating slope stabilization options for protecting the scarp area (the Project) to reduce risks to personnel / resources and mitigate potential impacts to environmentally sensitive areas on Site. The scarp area and an extended portion of a gulley will likely be filled with sand. Culvert maintenance to remove accumulated sediment may be performed in the future, but is not the immediate focus.

Keystone Environmental Ltd. (Keystone Environmental) was retained by PSPC to complete an environmental assessment of the Project to evaluate existing environmentally sensitive areas, determine the potential for significant adverse environmental effects and provide recommendations on mitigation measures and environmental regulatory requirements that may inform the Project design and specifications. This environmental assessment is required by PSPC to evaluate the Project for compliance with federal legislation such as the *Canadian Environmental Assessment Act* 2012 (CEAA 2012) and *Species at Risk Act* (*SARA*). This assessment incorporates the findings from a desktop review of environmental conditions in the Project area and a field survey of the Site completed in November 2016.

1.1 Site Description and Land Use

The Site (Figure 1) is a 320 hectare area of land, with approximately 90 irrigated hectares planted to various tree fruits and wine grapes. The Site has been in operation since 1914, when it began existence as the Dominion Experimental Farm to support the province's young agricultural industry. Research was undertaken on crops, poultry, swine, and cattle farming. In 1959 the farm was renamed as the Summerland Research Station as it also investigated plant pathology and entomology. Facilities at the Site include the following:

- Isolated virus orchard
- Food research, extraction and fractionation laboratory pilot plant
- Sensory evaluation laboratory
- Microscopy facility with scanning, transmission and confocal capability
- Small lot winery
- Canadian plant virus collection
- Insect rearing rooms
- Ornamental gardens, orchards and a museum

1.2 Environmental Regulatory Framework

The Site is federally owned under the jurisdiction of Agriculture and Agri-foods Canada, and therefore the following environmental regulatory considerations apply to the Project.

1.2.1 Federal Legislation

- ***Canadian Environmental Assessment Act*, 2012**: Section 67 of CEAA 2012, states an authority must not carry out a project on federal lands, or exercise any power or perform any duty or function conferred on it under any Act of Parliament other than this Act that could permit a project to be carried out, in whole or in part, on federal lands, unless:
  a. the authority determines that the carrying out of the project is not likely to cause significant adverse environmental effects; or
  b. the authority determines that the carrying out of the project is likely to cause significant adverse environmental effects and the Governor in Council decides that those effects are justified in the circumstances under subsection 69(3).

  "Environmental effects" as defined by *CEAA* include both biophysical effects and socio-economic effects.

  This Environmental Assessment has been prepared for PSPC to assist in meeting the requirements of *CEAA 2012*. This Project does not constitute a "Designated Project" under *CEAA 2012*, and therefore does not require approval from the Canadian Environmental Assessment Agency. Sensitive species have been documented on Site and around the Site, and therefore PSPC requires an environmental assessment (Environmental Effects Evaluation) to determine if adverse environmental effects are anticipated under CEAA 2012.

- ***Species at Risk Act*, 2002:** The *SARA* protects species that are Extirpated, Endangered, Threatened or are of Special Concern in Canada identified in Schedule 1 of the Act. These species at risk and their habitats require protection under *SARA*. Several species at risk have been found on Site and on nearby Sites. No *SARA* permits are expected to be required based on the implementation of mitigation strategies outlined in Section 5.3
- ***Fisheries Act*, 2013:** Section 35 states no serious harm to fish shall occur, which is defined as the death of fish or any permanent alteration to, or destruction of, fish habitat. Fish habitat is located downhill of the scarp and gulley. No harm to fish or fish habitat is proposed, therefore, no *Fisheries Act* Authorization or Request for Review is expected to be required. Measures to protect downhill fish habitat were considered as part of this environmental assessment.
- ***Migratory Birds Convention Act*, 1994:** Regulates all activities that are harmful to migratory birds, their eggs or their nests. Vegetation clearing conducted during the bird breeding season of March 15 to August 15 requires an inspection by a Qualified Environmental Professional to confirm no active song bird nests will be disturbed. No permits are required.
- ***Department of Agriculture and Agri-Food Act*, 1985**: The *Department of Agriculture and Agri-Food Act* appoints a department to oversee agriculture and agricultural research. The Project must not adversely affect agricultural resources at the Site. No permit is required.

1.2.2 Provincial Legislation

It is understood that federal agencies are not bound by the requirements of constitutionally subservient legislation. The following provincial legislation was considered where federal standards do not exist, and where works have the potential to affect provincially-managed lands adjacent to the Site:

- ***Water Sustainability Act*, 2016:** The *Water Sustainability Act* (*WSA*) regulates freshwater resources in the province of British Columbia. Ephemeral drainages located in the bottom of the gullies on Site discharge both above and below the surface to the vegetated lakeside plateau located on the west side of Highway 97, which drains via a culvert under Highway 97 into Okanagan Lake. Changes in and about a stream on provincially managed land are not proposed as part of this Project, however, future culvert cleaning works under Highway 97 would require a notification to meet the aquatic ecosystem protection requirements in Section 44 of the WSA. This environmental assessment incorporates mitigation measures to protect water quality on downhill aquatic resources.
- ***Heritage Conservation Act*, 1996:** The *Heritage Conservation Act* protects Archaeological Sites in BC. No Archaeological Overview Assessment was found for the Site during the desktop review. No archaeologically important resources (e.g., remnants of historical fire pits or middens) were observed during the biophysical survey of the proposed work area. Works are not expected to require excavation activities, reducing the likelihood of affecting any buried artifacts if they are present. Chance find procedures may be implemented if potential archeological or human remains are found at the Site.
- ***Wildlife Act, 1996:*** The *Wildlife Act* protects provincial wildlife and habitats from harm, including active breeding bird nests and any raptor nests. No permit is required.
- ***Noxious Weeds Act*, 1996**: The *Weed Control Acts* prohibits noxious weeds through inspection and enforcement. Noxious weeds could be transported to Site with imported fill materials and equipment, and newly exposed soils could be quickly colonized by noxious weeds. While no permits are required, this environmental assessment has considered measures to prevent the spread of noxious weeds.
- ***Agricultural Land Commission Act*, 2002**. The *Agricultural Land Commission Act* preserves agricultural land and promotes farming activities. No permit is required.
- ***Environmental Management Act, 2016.*** The Contaminated Sites Regulation (CSR) and Hazardous Waste Regulation of the Environmental Management Act regulate relocation of contaminated soils and hazardous waste, respectively. On federal lands, soil quality is compared to the Canadian Council of Ministers of the Environment (CCME) rather than the CSR standards unless material will be taken off-Site to provincial lands. Future culvert cleaning works located on provincial land (e.g., Highway 97) will need to comply with the CSR. This may involve sampling of the material to assess soil and sediment quality. The quality of the material may affect how the material may be used and may require offsite disposal. Scope of the Environmental Assessment.

The scope of this Environmental Assessment is to characterize the environmental resources in the area of the Project, identify and assess Project-related environmental risks and prescribe environmental protection and mitigation measures for the proposed works to reduce the

potential for significant adverse environmental effects. The Environmental Assessment included the following tasks:

- Conduct a review of available on-line databases and background information to describe existing environmental values, potential ecological sensitivities, local fisheries, wildlife habitat and potential species at risk that may be present at the Project Site and surrounding areas.
- Conduct a field survey in November 2016 at the Site and in the Project area to identify environmental sensitives, existing species, classification of habitat zones, and typical environmental features.
- Identify potential environmental effects from the Project, propose appropriate mitigation measures and assess the potential for, and the significance of, residual adverse effects from the Project.
- Provide an opinion on whether or not the Project is likely to cause significant adverse effects.

1.3 Approach and Methods

1.3.1 Desktop Review

The Environmental Assessment involved a search of online databases, reference manuals, mapping tools and available environmental reports was completed to document habitat values and ecological sensitivities of the Site and surrounding area. The following federal, provincial and municipal online resources were utilized:

- Environment Canada *Species at Risk Act* public species registry and Species at Risk BC
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC)
- BC Ministry of Forests, Lands and Natural Resource Operations (MFLNRO), British Columbia Conservation Data Centre (BC CDC) Species List, Element Occurrence Reports, and Species and Ecosystem Explorer.
- BC Biogeoclimatic Ecosystem Classification Program BECweb
- BC iMAP
- BC Habitat Wizard
- DFO and BC Ministry of Environment's (MoE), Fisheries Information Summary System (FISS) and Habitat Wizard BC iMAP
- Community Mapping Network (CMN)
  - Sensitive Habitat and Inventory Mapping (SHIM) Atlas
  - Okanagan Habitat Atlas
  - Sensitive Ecosystem Inventory
  - Species at Risk: A primer for British Columbia
  - Wildlife Observations Mapping

- BC EcoCat Ecological Reports Catalogue
- BC Species Inventory Web Explorer

Studies and relevant documentation pertaining to the Site were reviewed and included:

- WSP Canada Inc. (WSP) 2016. Geotechnical Engineering Assessment – Phase 1. File No: 161-02415-00.

1.3.2 Field Survey

A terrestrial field survey of the Site was completed on Nov 22, 2016. The objectives of the survey were to:

- Confirm environmental information collected during the background review
- Document the environmental (biophysical and socio-economic) resources that could be adversely impacted by the proposed Project. The survey included field identification of flora and fauna on the Site and adjacent areas, photo documentation of existing conditions, and collection of geospatial data pertaining to environmental resources within the immediate and surrounding areas.

Over the course of one day a biologist performed a biophysical survey throughout the Survey Area shown in Figure 1. Utilizing species lists from the background searches, the biologist identified plants, animals and habitat units. Methods for the survey followed adapted BC Resource Inventory Standards Committee protocols such as the Species Inventory Fundamentals, Inventory Methods for Forest and Grassland Songbirds (BC MELP 1999), Inventory Methods for Nighthawk and Poorwill (BC MELP 1998a), and Inventory Methods for Snakes (BC MELP 1998b), among others. Modified transects were located in the field by the biologist to capture and represent different habitat zones. Each transect was walked, and data included collected one square metre quadrat, digital photography, and GPS data collection. Qualitative and quantitative biophysical data was collected and recorded in detailed field notebooks.

1.3.3 Valued Ecosystem Components

A Valued Ecosystem Component (VEC) is an element of the environment that has scientific, economic, social or cultural significance. Those VECs that may be affected by the project's activities and are relevant, representative and responsive to potential effects are included in the environmental assessment (Table 1). VECs were identified through background information, database searches and additional Project technical studies. VECs were identified based on the following elements:

- Rarity or uniqueness of a species or habitat that supports such species or is restricted in range
- Vulnerability of a species or habitat to disturbances
- Ecosystem function, areas of high productivity, areas of critical function
- Social or cultural importance
- Compliance with legal requirements (Section 1.2)

Ecosystem components identified as having the potential to be impacted by the Project include air quality, noise and vibration, soil type and quality, soil and terrain stability, surface and ground water quality, vegetation communities, wildlife and wildlife habitat, fish and fish habitat, and rare and endangered species. These ecosystem components are important for sustaining regional biodiversity, and to stakeholders including local First Nations and other landowners, and Agriculture and Agri-foods Canada. Some ecosystem components may be more sensitive seasonally, such as during wildlife breeding or hibernating seasons. Table 1 provides a summary of the VECs assessed for the Project.

Table 1 Valued Ecosystem Components Identified for the Project

Valued Ecosystem Component	Justification
Air Quality	Biological components (e.g., fish, wildlife and plants) could be affected by increased dust levels from project activities during Site preparation and slope stabilization works
Noise & Vibration	The use of heavy machinery has the potential to generate noise and cause vibration
Soil Type and Quality	Imported materials and accidental spills from machinery have the potential to affect soil type and quality
Soil and Terrain Stability	Works along a slope that has eroded and failed historically warrants consideration for soil and terrain stability during project planning
Surface and Ground Water Quality	Imported materials and accidental spills have the potential to affect surface and ground water quality
Vegetation	Plant biota could be lost during Site preparation and slope stabilization works
Wildlife	Wildlife could be disturbed or harmed during Site preparation and slope stabilization works
Fish and Fish Habitat	Poor water quality could adversely affect fish and fish habitat downhill of the Site
Rare and Endangered Species	Wildlife species at risk potentially occurring at or near the Site could be disturbed or harmed during Site preparation and slope stabilization works
Socio-Cultural Resources	Cultural resources have the potential to be present on Site

1.3.4 Evaluation of Significance

General evaluation criteria for significance (FEARO, 1994) include the Direction, Magnitude, Geographic Extent, Duration, Frequency, Reversibility, and Likelihood of the effect (FEARO, 1994). These evaluation criteria shown in Table 2 were used to determine the significance of residual environmental effects of the Project.

Table 2 Evaluation Criteria for Assessment of Effects

Parameter	Characterization
Direction	(A) **Adverse** (P) **Positive** (N) **Neutral**
Magnitude	(L) **Low:** minimal or no impairment of VEC (M) **Moderate:** measurable change in VEC (H) **High:** serious impairment to VEC
Geographic Extent	(S) **Site-specific:** environmental effects restricted to Project site (L) **Local:** environmental effects extend beyond the Project footprint but remain within the Local Assessment Area (LAA) (R) **Regional:** environmental effects extend to the regional level outside the LAA
Duration	(ST) **Short-term:** effects are measurable for less than two (2) years (MT) **Medium-term:** effects are measurable for between 2 and 20 years (LT) **Long-term:** effects are measurable for greater than 20 years (P) **Permanent:** effects are permanent
Frequency	(O) **Occurs *once*** (S) **Occurs *sporadically*** (R) **Occurs on a *regular* basis and/or at *regular* intervals** (C) **Continuous**
Reversibility	(R) **Reversible** (I) **Irreversible**
Likelihood:	(L) ***Low* probability of occurrence** (M) ***Moderate* probability of occurrence** (H) ***High* probability of occurrence**
Significance	(N) **Not Significant** (S) **Significant**

Table 2 Notes:
Magnitude: refers to the expected size or severity of the residual effect. The proportion of the VC affected is considered within the spatial boundaries and the relative effect (e.g., relative to natural annual variation in the magnitude of the VC or other relevant characteristic).
Geographic Extent: refers to the spatial scale over which the residual effect is expected to occur.
Duration: refers to the length of time the residual effect persists (which may be longer than the duration of the activity that gave rise to the residual effect).
Frequency: refers to how often the residual effect occurs and is usually closely related to the frequency of the activity causing the residual effect.
Reversibility: pertains to whether or not the residual effect on the VC can be reversed once the activity causing the disturbance ceases.
Likelihood: refers to whether or not a residual effect is likely to occur influenced by a variety of factors, such as the likelihood of a causal disturbance occurring or the likelihood of mitigation being successful.
Significance: a quantitative or qualitative threshold depending on the nature of the VEC. Residual effects characteristics are taken into consideration along with background information and relevant literature for each VEC.

1.3.5 Boundaries

Based on the proposed project schedule, this environmental assessment assumes works may be conducted at any time of year, but could likely occur in the spring or summer of 2017 and take less than a week to complete.

The spatial boundaries include the Local Assessment Area (LAA) shown as the Survey Boundary in Figure 1 (Appendix A), for evaluating of direct and indirect effects on the selected VECs, and a Regional Assessment Area (RAA) that evaluates the potential for cumulative effects at a landscape or watershed level. The LAA encompasses the zone of influence of the project, including the direct footprint of the Site preparation and slope stabilization works, and adjacent areas that could potentially be affected by these works. The RAA is evaluated at a scale that provides relevant context for useful and meaningful data on past, present and future projects which would reasonably be expected to interact with this Project, considered in the evaluation of cumulative effects. The RAA for this Project is considered to include a 50 km radius from the Site.

Technical boundaries refer to the constraints imposed on an environmental assessment by the limitations in accurately predicting the effects of a project. For this assessment, technical boundaries include the timing of the Site survey (November 2016), which could limit the extent of the biological community available for observation due to variable growth habits and migration or hibernation patterns.

2. PROJECT DESCRIPTION

In October 2015 a water pipe break occurred next to the plateau orchard at the southern end of the Site, which caused a flow slide that extended to the base of the silt bluff through gullies and sinkholes, leaving steep side slopes within the failure scarp and gulley (WSP, 2016). The slope failure location in the Site is shown in Figure 1 in Appendix A, and Photographs 1 to 3 in Appendix B. To reduce the risk of the scarp retrogressing towards the orchard, WSP has recommended infilling of the scarp area and an extended portion of the gulley.

In addition to slope stabilization works, WSP recommended removing accumulated sediment out from a culvert located under Highway 97. The culvert provides drainage from the lakeside plateau, which collects surface and subsurface flows from the Site during storm events and discharges into Okanagan Lake. The culvert cleaning works are located on BC Ministry of Transportation and Infrastructure regulated property between the Site and Okanagan Lake. These works are not currently included as part of this Project, but may be performed in the future.

2.1 Justification

The scarp represents a safety hazard to Site users and, if left unattended, further retrogression of the scarp could jeopardize operations at the Site. In addition, additional slope failures could occur including localized piping, sinkholes, and mud flow gulley erosion (WSP, 2016). Drainage issues may arise from sediment eroded from the scarp and gully, potentially plugging the culvert under Highway 97 or passing through the culvert and discharging into Okanagan Lake (fish habitat) or smothering environmentally sensitive habitat on Site used by federally listed Species at Risk.

Two options have been explored by a geotechnical engineering firm (WSP 2016). The first option proposed involves temporarily leaving the failure scarp area as is and establishing a reasonable setback from the edge of the scarp (e.g., 20 m) to reduce the safety risk of hazards to Site personnel and resources. This option does not address the environmental issues that could result from further erosion of the scarp. A second alternative involves completing local stabilization infilling works within the failure scarp including a portion of the gully. This option would provide improved safety for Site users, protection of Site operations, and protection from additional erosion from the scarp which could affect environmentally sensitive areas.

2.2 Summary of Project Works

In order to evaluate the effects of the Project on existing environmental resources, the following summary of Project works was prepared by Keystone Environmental. The Project is currently in the planning phase with several treatment options being considered by the design team. This environmental assessment will inform the design team of environmental challenges and recommendations for the protection of the environment, which will be considered in the final design.

This environmental assessment considers the Work being conducted in three phases: Site preparation and mobilization, slope stabilization works, and demobilization. Culvert maintenance work under Highway 97 may be performed at a later date but is not the focus of this assessment.

2.2.1 Phase 1: Site Preparation and Mobilization

Equipment and materials will be mobilized to the Site (e.g., excavator, dump truck) along Highway 97. Access roads to the slope failure location on Site may need to be improved or new access points created. Vegetation may need to be cleared and existing soils along the access route may need to be graded and compacted for transportation of equipment, and staging, laydown and fill stockpile areas (locations to be determined).

2.2.2 Phase 2: Slope Stabilization Works

The Project footprint shown in Figure 2 (Appendix A) is approximately 30 m long and up to 15 m wide (WSP, 2016), with an area of approximately 250 m^2 The scarp and an extended portion of the gulley will be in-filled with imported free-draining sand fill. Sand will likely be placed by an excavator or similar machinery and compacted in the upper 600 mm within the scarp zone. A conceptual cross-section is provided in Appendix C.

2.2.3 Phase 3: Demobilization

Upon completion of slope stabilization works, areas that were disturbed during the Project will be re-instated to their pre-construction condition. The amount of restoration required (if any) will depend upon the final design and Contractors methodology. This phase also includes the demobilizing of equipment off-Site.

2.3 Future Works

Future works may involve the removal of sediment from the partially-filled culvert running beneath Highway 97 (Figure 2, Appendix A) that resulted from the slope failure and related erosion. As the culvert is approximately 600 mm in diameter, works are expected to be conducted with hand augers and shovels, a vacuum truck, or possibly a land-based excavator.

2.4 Timeline

A timeline for the Project has not been provided by the design team. This environmental assessment assumes works may be conducted at any time of year, but could likely occur in the spring or summer of 2017 and take less than a week to complete. Species-specific timing windows that affect the work are described in Section 4.2 and include:

- Songbird nesting period: March 15 to August 15
- Fish spawning and juvenile fish migration period for Okanagan Lake: no restriction

3. ENVIRONMENTAL CONDITIONS

The following sections outline existing environmental conditions based on the results of the desktop review and Site observations collected in November 2016. Environmental resources include both biophysical and socio-economic resources.

3.1 Location

The Site is located approximately 5.5 km south of the town of Summerland within the civic boundaries of the District of Summerland, and within the Regional District of Okanagan-Similkameen. The civic address of the Site is 4200 Highway 97, Summerland, BC, and the coordinates are 49° 33' 37" N, and 119° 38' 28" W

3.2 Climate

The Site is located within the Ponderosa Pine – very dry hot (PPxh1) biogeoclimatic ecosystem zone. According to Environment and Climate Change Canada (2016a) Canadian Climate Normals data between 1981 and 2010, the average annual temperature in Summerland is 9.6°C, with highs up to 38.5°C and lows to -26.8°C. Summers are long and hot, while winters are short and mild, with precipitation averaging 327 mm per year.

3.3 Physical Conditions

The Site can broadly be characterized into four biophysical zones, consisting of the flat upper plateau, the gullies leading from the upper plateau to lower elevations, the steep bluff slopes, and the lakeside plain beneath the bluffs adjacent to Highway 97. Each of the zones has different biophysical conditions due to drainage and exposure to sun and wind. Sediment was mostly uniform across the four zones. Figure 2 in Appendix A provides a Physical Plan of the LAA.

Plateau: The plateau has a relatively flat surface and contains most of the farm infrastructure for the Pacific Agri-food Research Centre (Photograph 4). Immediately upslope of the slope failure is a mature apple orchard (Photograph 5). A water pipe in the south-east corner of this orchard failed in 2015 and caused the wash-out. The plateau above the failure location has an elevation of approximately 418 m (District of Summerland, 2016).

Gully: The gully downslope of the failure is part of a system of eroded gullies which flow off the plateau and down to Okanagan Lake below (Photograph 6). The gully into which the ground failed is approximately 130 m long, with widths of 5 m to 30 m, measured from top-of-bank to top-of-bank.

Steep Bluffs: The bluffs are steep, with aspects ranging from 30% to vertical with a primarily eastern exposure facing Okanagan Lake (Photograph 7). Much of the material of the bluffs is lacustrine silt. Open cavities with widths of up to 1.5 m and depths of up to 2 m were present on the slopes. Scouring in sediments in the bottom of these cavities indicate sub-surface water flow. In addition, tension cracks running vertically and horizontally across the slope were noted.

Lakeside plain: The Lakeside Plain is bounded to the east by Highway 97 and the west by the steep bluffs. The area is approximately 30 m from Okanagan Lake and is located primarily on provincial land immediately downhill of the Site. The elevation at the bottom of the bluff is 346 m (District of Summerland, 2016). This area is partially covered with eroded sediments from the steep bluff areas above (Photograph 9).

3.3.1 Air Quality

The Site is located adjacent Highway 97, which generates dust and greenhouse gas emissions from vehicles. Exposed soils, dry conditions, and wind produce dust.

3.3.2 Noise

The Site is located adjacent Highway 97, which generates noise from vehicles. The noise level decreases with increasing distance from the Highway.

3.3.3 Soil Type and Quality

The Site is underlain with glaciofluvial deposits with inclusions of silty glacial lacustrine soils. Investigations of the slope failure location by WSP (2016) indicate side slopes are mostly silt with occasional layers of sand and/or small gravel. WSP assessed the remaining silt on the scarp wall as generally stiff to very stiff and blocky on the surface. Limited small gravels were noted within the soils in proximity to the steep bluffs.

The lakeside plain has a build-up of eroded materials which appear to be constantly mobilizing off (or through) the steep bluffs (Photograph 10). It appears a recent event has deposited a large amount of silt at the toe of the slope beneath the gullies above, as a thick (up to approximately 50 cm) layer of silt has very little plant growth on it (Photograph 11), compared to 2015 photos of the same area accessed with Google Street View.

3.3.4 Soil and Terrain Stability

WSP (2016) reported that remaining soils at the failure site adjacent to the orchard have high strength. Field observations of the slope during this EA showed the steep slopes beneath the gully exhibited multiple signs of mass wasting including horizontal and vertical tension cracks up to 10 cm wide, actively eroding silt bank faces, and slumping vegetative mats of grasses and sagebrush (Photograph 12).

3.3.5 Surface and Ground Water Quality

No surficial aquatic resources were identified above the lakeside plain. Surface water on the upper plateau and gullies infiltrates and flows subsurface through seams within the lacustrine silts (WSP, 2016). No evidence of overland flow was observed on the plateau, in the gullies, nor on the steep slopes. Where water had emerged from the base of the slope (Photograph 13), a small channel (up to 0.4 m wide and 0.3 m deep) had eroded through deposited sediment. Within 40 m of the emergence point the channel had dissipated and it appears any water either infiltrated or turned to sheet flow before entering the half-plugged culvert (Photograph 14), which runs under Highway 97 and discharges into Okanagan Lake.

3.4 Biological Conditions

During field observations on November 22, 2016, an inventory of flora and fauna on the Site was undertaken. Results of the survey are presented in Table 3 and are described below. Figure 3 in Appendix A shows a Habitat Plan for the LAA based on the species and landscapes observed.

Table 3 Flora and fauna Observed on Site, November 22, 2016

Scientific Name	Common Name	Abundance (at Location)	Potential Habitat Uses
Vegetation			
Pinus ponderosa	Ponderosa Pine	Rare (Plateau)	LI
Pseudotsuga menziesii	Interior Douglas Fir	Rare (Plateau)	LI
Artemisia sp.	Sagebrush	Abundant (Plateau, gully)	LI
Mahonia nervosa	Dull Oregon Grape	Few (Gully), Sparse (Plateau)	LI
Rosa gymnocarpa	Baldhip Rose	Sparse (Gully, Plateau)	LI
Symphoricarpos alba	Snowberry	Sparse (Gully)	LI
Populus balsamifera ssp. *trichocarpa*	Black Cottonwood	Common (Lakeside Plain)	LI
Populus tremuloides	Trembling Aspen	Few (Lakeside Plain)	LI
Elaeagnus angustifolia	Russian Olive	Common (Lakeside Plain), Rare (Plateau)	LI
Festuca idahoensis	Idaho Fescue	Common (plateau, gully)	LI
Class: Briopsida	Moss	Sparse (Plateau, Gully)	LI
Achillea millefolium	Yarrow	Rare (Gully, Plateau)	LI
Solanum nigrum	Common nightshade	Rare (Lakeside plain)	LI
Juncus effusus	Common Rush	Common (Lakeside plain)	LI
Ilex aquifolium	English Holly	Rare (Lakeside plain)	LI
Oemleria cerasiformis	Indian Plum	Rare (Lakeside plain)	LI
Ranunculus spp.	Buttercup	Rare (Plateau)	LI
Equisetum arvense	Horsetail	Common (Lakeside Plain)	LI
Family *Agaricaceae*	Mushroom 1	Plateau (rare)	LI
Family *Agaricaceae*	Mushroom 2	Plateau (few)	LI
Birds			
Junco hyemalis	Dark-eyed Junco	Few (Plateau)	FD, SH, CO, RE
Pica hudsonia	Black-billed Magpie	Few (Steep bluffs)	MS, FD
Corvus brachyrhynchos	American Crow	Plateau (unknown)	FD, CO, MS
Colaptes auratus	Northern Flicker	Plateau (unknown)	FD, SH, CO, RE

Scientific Name	Common Name	Abundance (at Location)	Potential Habitat Uses
Mammals			
Ursus americanus	Black bear	Plateau (unknown)	FD
Class: Mammalia	Small omnivorous mammal	Plateau (unknown)	FD, SH, HI, RB
Equus sp.	Horses (feral)	Plateau, gully (common)	FD, LI

Potential Habitat Uses: LI=living, HI=hibernating, FD=food, MS=migrating (seasonally), SH=security, RE=reproducing (eggs), RB=reproducing (birthing), CO=courtship/mating

3.4.1 Vegetation

A list of all vegetation and cover observed on the Site, including their abundance, is found in Table 3. Vegetation at and around the Site (Photograph 15) was dominated by Big Sagebrush (*Artemisia tridentate*) with subdominant grass species including (but not limited to) Bluebunch Wheatgrass (*Pseudoroegneria spicata*), Idaho Fescue (*Festuca idahoensis*) and Rough Fescue (*Festuca scabrella*). Much of the grass exhibited heavy grazing (e.g., horses or other large mammals), and the survey was conducted during winter, therefore, there were neither flowering bodies nor seeds to assist in identification.

The Big Sagebrush was most dense along the slope break, with densities ranging from 1 to 3 per m^2. On the upper plateau, a mature apple orchard is located immediately adjacent to the failure location, while trees on the plateau include a sparse distribution of Ponderosa Pine (*Pinus ponderosa*; Photograph 16) and a single Russian Olive (*Elaeagnus angustifolia*) which was growing against the orchard fence approximately 40 m west of the failure. Ponderosa Pine trees within the survey area average 0.20 m diameter at breast height (dbh) (range of 0.10 to 0.40 m dbh), and were typically 10 m tall (range of 2 m to 15 m). In addition, there was a sparse distribution of shrubs including Baldhip Rose (*Rosa gymnocarpa*; Photograph 17) and Dull Oregon Grape (*Mahonia nervosa)*. Two species of mushroom were noted on the upper plateau. One species was mainly orange with a cap up to 10 cm in diameter, gills free from the stem, and was found in exposed areas (Photograph 18). The other species was grey with a small cap less than 5 cm diameter (Photograph 19), and grew within sparse stands of Big Sagebrush approximately 15 m from a Ponderosa Pine.

Within the gullies, vegetation was most dense on shaded, north facing slopes. At the gully bottom near the depressions/sinkholes, vegetation was dominated by Dull Oregon Grape, with additional shrubs including Snowberry (*Symphoricarpos albus*), Baldhip Rose, and Red-osier Dogwood (*Cornus sericea*), as shown in Photograph 20. No large trees were observed growing at the gully floors, but Ponderosa Pine and Interior Douglas Fir (*Pseudotsuga menziesii* var. *glauca*) were observed growing just below the tops of the north facing gully walls (Photograph 21). Yarrow (*Achillea millefolium*) was observed at the east end of the gully system before the steep bluffs (Photograph 22). A species of moss was noted in shaded area of north and east facing slopes.

The steep bluff vegetation consists of primarily grasses, with limited Big Sagebrush. Tumbleweed (wind-uprooted and mobilized Big Sagebrush) was noted on the slope. Forb species noted included Yarrow.

The lakeside plain was dominated by trees including Russian Olive (Photograph 23), Black Cottonwood (*Populus balsamifera* ssp. *trichocarpa*), and Trembling Aspen (*Populus tremuloides*). Shrubs include Red Osier Dogwood, Climbing Nightshade (*Solanum dulcamara*; Photograph 24), Horsetail (*Equisetum* sp.), English Holly (*Ilex* aquifolium), and Common Rush (*Juncus effusus*).

3.4.2 Wildlife

A list of all wildlife observed on the Site, including their potential habitat uses and abundance, is found in Table 3. A list of species with the potential to be on Site is found in Appendix D.

Small and Large Mammals

Mammalian wildlife was only identified by spoor. Feral horses (E. Helfenbein, pers. comm) were identified by abundant dung and hoof prints on the upper plateau and on game trails traversing along and across the gullies. Bears were identified through large scat containing apple debris (Photograph 25) west of the failure on the upper plateau adjacent to the orchard. There was also an excavation dug beneath the orchard fence (Photograph 26) which likely was created by bears to access the apples. The bears are likely Black Bears (*Ursus americanus*). Small scat containing seeds and hair, likely to be from a small omnivorous mammal species (e.g., skunk, racoon, etc.), was noted to the east of the failure (Photograph 27). Small unidentified faecal pellets containing seeds were clustered near a mushroom on the upper plateau.

Mammals which have been documented at the Site during previous species at risk assessments (BC MOE, 2016) include Spotted Bat (*Euderma Maculatum*), American Badger (*Taxidea taxus*), Western Harvest Mouse (*Reithrodontomys megalotis*), and Nuttall's Cottontail (*Sylvilagus nuttalli*).

Anecdotal reports of other mammals using the area include Mule Deer, White-tailed Deer, Cougar, and Coyote.

Birds

Birds observed visually on Site included Black-billed Magpie and Dark-eyed Junco. A flock of approximately ten Magpies were seen flying over the Site from south to north above the steep bluffs. A flock of approximately eight Juncos were foraging in refuse garden material (soil, vegetation debris) which had been deposited in the top of the failure next to the orchard. The Juncos also sought cover in and amongst the Sagebrush due to presence of the observer. Northern Flicker, and American Crow, were both observed aurally to the north-west and south-west of the Site, respectively.

No nests were observed on the Site. Locations inspected were: ground, shrub, tree, and cliff face. Raptors that have the potential to use the Site for foraging include various owls and hawks, including the rare and endangered Barn Owl, Peregrine Falcon and Common Nighthawk. Raptors are unlikely to nest on Site due to the lack of mature trees, although Barn Owls have been known to create nests in cliff faces.

Song bird and migratory bird nests are typically not found until between March 15 and August 15. Vegetation that could potentially be used for songbird nesting was observed (Section 3.4.1), but not within the scarp or the gulley immediately below it where slope stabilization works will occur. There are many different song birds that may nest in Big Sagebrush habitats including the rare and endangered Sage Thrasher (Section 3.5.2).

Herptiles

No herptile species (amphibians or reptiles) were observed during the field visit. Many herptile species enter a dormant state during the winter, with snakes and lizards seeking cover within existing cavities (e.g., under loose rocks on scree slopes, within abandoned burrows from mammals, within caves or sinkholes). Amphibians often burrow into soft substrates or loose organic debris such as leaf litter or forest detritus.

Herptile species noted in the area within a 2.5 km radius, or within similar habitats in the Okanagan Valley include Great Basin Gophersnake, North American Racer, Northern Alligator Lizard, Western Rattlesnake, Desert Nightsnake, Western Skink, Blotched Tiger Salamander, Western Toad, Northern Leopard Frog, and Great Basin Spadefoot.

Herptiles are unlikely to be present within the footprint of the failure, as there was limited suitable habitat (e.g., crevices). Within the gully between the sinkhole where the bulk of the material went subsurface and the steep bluffs, herptiles could be present in three observed holes and/or cavities (Figure 2, Appendix A). One excavated burrow was observed (Photograph 28), a large vertical opening with limited small woody debris was observed just downslope from the failure (Photograph 29), and a more natural small cave beneath a rocky outcrop was noted downslope (Photograph 30). On the lakeside plain, sediments are unconsolidated eroded silt and sand with layers of organic detritus from deciduous leaf deposition, which could be used as overwintering habitat by amphibians. This area is also in close proximity to Okanagan Lake.

Invertebrates

No invertebrates were noted during the field visit. A number of insect species at risk have the potential to occur at the Site. Habitat would be suitable for foraging and/or breeding (depending on the species life history patterns and requirements). Invertebrate species can be found in Table 3.

3.4.3 Fish and Fish Habitat

Okanagan Lake contains many fish species including regionally important fish such as Kokanee (*Oncorhynchus nerka*) and Mountain Whitefish (*Prospium williamsoni*). The lakeside plain is located 30 m from Okanagan Lake, and approximately 1.2 km from the nearest Kokanee and Mountain Whitefish spawning creek to the north (Trout Creek), but the Site is located approximately 15 km from the nearest known Kokanee shore spawning areas of Okanagan lake (located north of the Site across from Peachland).

3.5 Rare and Endangered Species

The BC CDC (2016) online rare element occurrence databases were accessed to obtain records of at-risk wildlife, plants, and ecosystems potentially present in the area of the Project. Search parameters included: Okanagan Ministry of Environment Region, Okanagan Shuswap Forest District designations, Okanagan-Similkameen Regional District, within the Ponderosa Pine Biogeoclimatic Subzone within sagebrush-steppe habitat subtype, or within 5 km of the Site.

Additionally, the Public Registry of the *SARA* was accessed to collect information on species at risk that may occur in the area of the Site and to determine their current status under the *SARA*. Species listed in Schedule 1 of the federal *SARA* and their critical habitats are protected in Canada. Federally listed species are designated as:

- Endangered: facing imminent extirpation or extinction;
- Threatened: likely to become endangered if limiting factors are not reversed; and
- Special Concern: may become threatened or endangered because of a combination of biological characteristics and identified threats.

The following ecological communities at risk were identified in the Project area (Table 4):

Table 4 Rare and Endangered Ecological Communities Identified near the Site

Scientific Name	English Name	BC List	Ecosystem Group
Purshia tridentata / Hesperostipa comata	antelope-brush / needle-and-thread grass	Red	Terrestrial - Grassland: Grassland Shrub Steppe
Artemisia tridentata / Pseudoroegneria spicata	big sagebrush / bluebunch wheatgrass	Red	Terrestrial - Grassland: Grassland Shrub Steppe
Artemisia tridentata / Pseudoroegneria spicata - Balsamorhiza sagittata	big sagebrush / bluebunch wheatgrass - arrowleaf balsamroot	Red	Terrestrial - Grassland: Grassland Shrub Steppe

In addition to these ecological communities at risk, the following *SARA* Schedule 1 listed species were identified as potentially occurring at or adjacent to the Site based their biological requirements, and the habitat present at the Site and surrounding areas of the RAA. These rare and endangered species include various small and large mammals, birds, herptiles (e.g., snakes and amphibians), insects and other invertebrates, and plants. Table 5 provides a summary of these species at risk that have the potential to occur at the Site.

Table 5 *SARA* Schedule 1-Listed Species with Potential to Occur near the Project

Scientific Name	English Name	BC List	*SARA*
Mammals			
Antrozous pallidus	Pallid Bat	Red	1-T (2003)
Euderma maculatum	Spotted Bat	Blue	1-SC (2005)
Reithrodontomys megalotis megalotis	Western Harvest Mouse	Blue	1-SC (2009)
Sylvilagus nuttallii nuttalli	Nuttall's Cottontail	Blue	1-SC (2007)
Taxidea taxus jeffersonii	American Badger	Red	1-E (2003)
Birds			
Chordeiles minor	Common Nighthawk	Yellow	1-T (2010)
Falco peregrinus anatum	Peregrine Falcon, *anatum* subspecies	Red	1-SC (2012)
Melanerpes lewis	Lewis's Woodpecker	Blue	1-T (2012)
Oreoscoptes montanus	Sage Thrasher	Red	1-E (2003)
Tyto alba	Barn Owl	Red	1-SC (2003)
Herptiles			
Ambystoma tigrinum	Blotched (Western) Tiger Salamander	Red	1-E (2003)
Charina bottae	Northern Rubber Boa	Yellow	1-SC (2005)
Coluber constrictor mormon	North American Racer	Blue	1-SC (2006)
Crotalus oreganus	Western Rattlesnake	Blue	1-T (2005)
Hypsiglena chlorophaea	Desert Nightsnake	Red	1-E (2003)
Pituophis catenifer deserticola	Great Basin Gophersnake	Blue	1-T (2005)
Plestiodon skiltonianus	Western Skink	Blue	1-SC (2005)
Spea intermontana	Great Basin Spadefoot	Blue	1-T (2003)
Invertebrates			
Danaus plexippus	Monarch	Blue	1-SC (2003)
Apodemia mormo	Mormon Metalmark	Red	1-E (2005)
Satyrium semiluna	Half-moon Hairstreak	Red	1-E (2007)

Scientific Name	English Name	BC List	*SARA*
Plants			
Orthocarpus barbatus	Grand Coulee Owl-clover	Red	1-E (2006)
Phlox speciosa ssp. *occidentalis*	Showy Phlox	Red	1-T (2006)
Bryoerythrophyllum columbianum	Columbian Carpet Moss	Blue	1-SC (2005)
Microbryum vlassovii	Nugget Moss		1-E (2009)

3.5.1 Mammals

Spotted Bat: Occurs in various habitats from desert to montane coniferous stands, including open ponderosa pine, canyon bottoms, riparian corridors, meadows, and open pasture. Active foraging may be mostly in open terrain, including forest clearings, and meadows, and sometimes in open areas near buildings or even golf courses. Roosts, including maternity roosts, generally are in cracks and crevices in cliffs, sometimes in caves or in buildings near cliffs. Has been identified in large gully north of the Site.

Pallid Bat: Within British Columbia, these bats are typically restricted to arid environments. They forage in sparsely vegetated areas, most often dominated by Antelope Brush, Big Sagebrush, or Ponderosa Pine. Roosting typically occurs in crevices on cliffs but solitary roosting individuals can also be found in rubble piles. Pallid bats are known to use crevices within mine works for hibernacula.

Western Harvest Mouse: Prefers dense vegetative cover and may be found in shrubby arid regions. Ideal habitat includes dry gullies with dense shrub cover bordering grassland and shrub-steppe rangeland. Spherical nests usually are constructed on the ground under heavy vegetation or in shrubs. The Western Harvest Mouse has been documented on the Site.

Nuttall's Cottontail: Associated with shrub-steppe habitats dominated by Antelope-Bush, Big Sagebrush, Rabbit-Brush, and Western Juniper. The most important habitat attributes are the presence of sagebrush with a cover of 30% or more and rocky outcrops. Documented on the Site.

American Badger: Habitat preferences include grasslands/fields or open-canopied forests and may also frequent brushlands with little groundcover. When inactive, occupies underground burrow. Occurrences have been documented on the Site.

3.5.2 Birds

Barn owl: Prefer low elevation open country; especially agricultural areas, such as open fields, grasslands, farmsteads and orchards. Use of suitable foraging habitat is limited by nest cavity requirements. Most often nests are located in human-made structures such as in wooden barns, concrete silos, church spires, airport hangers, water towers, bridges and nest boxes. Natural sites include hollow tree cavities, cliffs, river banks and disused hawk nests. May forage on Site but nesting is unlikely. May nest in other areas of the Site.

Burrowing Owl: Burrowing Owls are habitat and prey generalists, relying on primary excavators to create burrows (e.g., Badgers, Marmots, Ground Squirrels, etc.), and foraging for insects, mice, voles and other vertebrates (Environment Canada, 2012a). This species was extirpated from the Okanagan in the early 1980s, and following reintroduction attempts, only nine individuals were observed in intensive surveys completed in 2004; these individuals are reported to use man-made burrows (Environment Canada, 2012a). Based on the extremely low population numbers in the Okanagan that is not yet self-sustaining (i.e., requires captive breeding), and their reliance on man-made burrows numbers, it is highly unlikely that the Burrowing Owl could occupy an abandoned burrow on-Site.

Lewis's Woodpecker: Important habitat features include an open tree canopy, a brushy understory with ground cover, dead trees for nest cavities; dead or downed woody debris, perch sites, and abundant insects. Uses open ponderosa pine forests, open riparian woodlands dominated by cottonwood such as those found on the lakeside plain. In late summer can tend to move toward nut and fruit orchards. May forage on Site.

Sage Thrasher: associated with shrub-steppe habitats, and requires large (greater that 1 m tall) sagebrush for nesting. Sagebrush used for nesting in the south Okanagan were larger in height and width than surrounding vegetation and sagebrush canopy closure averaged 70%. May nest and forage for insects, seeds and fruits on Site.

Common Nighthawk: Habitat includes open and semi-open areas: savanna, grasslands, fields, and vicinity of cities and towns. Nesting occurs on the ground on a bare site in an open area. In some areas, this species also nests on flat gravel roofs of buildings. Has shown preference for areas with sandy soil. May nest and forage for insects on Site.

Peregrine Falcon (anatum subspecies): Typically nest on rock cliffs above lakes or river valleys where abundant prey (e.g., shorebirds, waterfowl, bats, rodents) is nearby. Interior populations are typically associated with wetland habitats that support a sufficient prey base. In the Okanagan valley, aeries (nests) have been reported as low as 6 m above a lake and high on cliffs that towered >260 m above the valley floor. Nesting unlikely in silty/sandy steep bluffs on Site, but may forage nearby.

3.5.3 Herptiles

Northern Rubber Boa: Occupy a variety of habitats including grasslands and thickets, and they require rocky outcrops and lots of coarse woody debris to take refuge from predators and thermoregulate. Due to the limited suitable breeding, thermoregulating and foraging habitat at the Site, it is unlikely that the Northern Rubber Boa will be present on Site or be impacted by the Project works.

North American Racer: Typically hibernate in fractured rock outcroppings and talus slopes on warm aspects. Forage in open habitats (e.g., grasslands, shrub-steppe) where vision is unobstructed and high body temperatures can be maintained. The North American Racer may be present at the Site for foraging.

Great Basin Gophersnake: Potential habitat is present throughout the Site, with the three most important areas being the lacustrine terraces and gullies, dominated by sagebrush and bunchgrass; the riparian areas; and abandoned or fallow agricultural lands.

Western Rattlesnake: Primarily terrestrial but sometimes climbs into trees or shrubs. When inactive, it occupies mammal burrows, crevices, caves, or similar secluded sites. Most dens are located in the Bunchgrass and Ponderosa Pine biogeoclimatic zones. Communal hibernacula are typically located on warm aspects in fractured bedrock or deep colluvium, although dens have also been found on cool aspects and some individuals have used bank swallow burrows and earthen den features. Summer foraging occurs within 3.5 km of the den. Vegetated gullies may serve as important movement corridors and refuge during the heat of summer. Possible feeding, hibernating, and migrating on Site.

Desert Nightsnake: Known to den in talus slopes and crevices in rock outcroppings. Most of active time is thought to be spent in rugged areas where thermal gradients occur and prey (e.g., Western Skink, reptile eggs) is abundant. There is some evidence that they also use creek corridors and the margins of lakes where amphibians and cooler temperatures are available. Little is known about breeding or egg-laying in the wild. Considering their preference for rocky substrate for temperature regulation, it is possible but unlikely they are present on the Site or in adjacent areas.

Western Skink: Their preferred habitat includes open woodlands, grasslands and warm dry hillsides with loose soils and abundant cover objects, and they typically burrow eggs on open south-facing slopes between June and September, and hibernate through the winter in talus slopes and rock outcrops. Eggs are laid in burrows or areas excavated by the female under rocks and stones. It is possible but unlikely that the Western Skink may occur at or in the vicinity of the Site.

Great Basin Spadefoot: Mainly found in sagebrush flats, semi-desert shrub lands, and pinyon-juniper woodland. Digs its own burrow in loose soil or uses those of small mammals. Breeds in temporary or permanent water, including rain pools, pools in intermittent streams, and flooded areas along streams. Eggs are attached to vegetation in water or placed on bottom of pool. Due to a lack of pool habitat on the Site, breeding is unlikely, but they may use the Site for foraging.

Blotched (Western) Tiger Salamander (Southern Mountain Population): These salamanders refuge or overwinter in burrows within sandy or friable soils in a variety of open habitats with located around water features, and breed in fishless water features that hold water between 3 and 7 months (COSEWIC, 2012). The Site is located within the extent of breeding occurrence for Western Tiger Salamander, with two breeding Sites identified approximately 3 and 4 km to the northeast and north of the Site, respectively (COSEWIC, 2012). Due to the lack of suitable breeding habitat at the Site and in adjacent Okanagan Lake (due to the presence of fish), these organisms are not expected to be found at the Site.

3.5.4 Invertebrates

Monarch: Breeding habitat includes patches of Showy Milkweed (*Asclepias speciosa*) located in the dry areas of the Southern Interior of BC (Environment and Climate Change Canada, 2016b). Adults feed on nectar of a wide variety of wildflowers. Monarchs on the west coast of Canada migrate south in the winter to coastal California. No Showy Milkweed was identified during the visit, although it is possible that Showy Milkweed could exist at the Site since this deciduous perennial is known to typically flower between late spring and the end of summer (Borders & Lee-Mäder, 2014).

Half-moon Hairstreak: Uses Lupines (*Lupinus* sp.) year round for all life history stages, and observations have been recorded in the southern Okanagan Valley around Oliver, Keremeos and Osoyoos (Environment and Climate Change Canada, 2016c). As no lupines were observed on Site, and the nearest critical and potential habitats are located approximately 25 km south of the Site, it is unlikely this species will occur at the Site.

Behr's Hairstreak: Range extends north into southern Okanagan Valley to Penticton, and the species is dependent on Antelope Brush as its larval food source. They are known to occur on steep hillsides and dry riparian areas and have not been observed north of Skaha Lake in over 50 years (Environment and Climate Change Canada, 2016d). As no Antelope Brush was observed at the Site, and the nearest documented occurrences are located at least 15 km south of the Site, the Behr's Hairstreak is not expected to be found at the Site or adjacent areas.

3.5.5 Plants

Grand Coulee Owl-clover: Restricted to the Bunchgrass, Ponderosa Pine and Interior Douglas-fir biogeoclimatic zones, which have a semi-arid steppe climate with warm to hot summers and moderately cold winters. Sites often have sandy to gravelly soils, are extremely dry, and have open vegetation dominated by Big Sagebrush.

Showy Phlox: Occurs where summers are hot and very dry and the species seems to favour areas that are relatively cool due to the orientation of the Site (possibly, for example, the north-facing slopes in gullies on Site). This herb typically grows in dry soil that occasionally shows signs of moderate erosion. It occurs in open areas such as grasslands dotted very sparsely with sagebrush and open Ponderosa Pine and Douglas-fir forests.

Columbian Carpet Moss: The Columbian Carpet Moss is listed under Schedule 1 of the *SARA* as Special Concern (2005) and is provincially blue-listed. This moss is restricted to semi-arid shrub-steppe and grassland habitats including Bluebunch Wheatgrass and Big Sagebrush, with dispersal mainly through leaf fragmentation as opposed to sporophyte production (Environment Canada 2012c), which can restrict dispersal extent. Columbian Carpet Moss was not observed within the surveyed area of the Site. It is possible but unlikely that it could occur at the Site and be impacted by soil disturbances associated with Site preparation and slope stabilization works. The introduction of invasive plant species at the Site (or dispersal from the Site) could also impact critical habitats of Columbian Carpet Moss with increased competition for resources and changing microclimate conditions.

Nugget Moss: The Nugget Moss is listed under Schedule 1 of the *SARA* as Endangered (2009) and is provincially red-listed. This small moss is known to occur on compact mineral soil on steep lacustrine banks and shaded bases of cliffs in the Penticton area approximately 5 to 7 km south of the Site (British Columbia Bryophyte Recovery Team, 2009). Dispersal mechanisms are poorly understood but may be water- or insect-dispersed (British Columbia Bryophyte Recovery Team, 2009). It is possible that Nugget Moss could occur at the Site and be impacted by soil disturbances associated with Site preparation and slope stabilization works. The introduction of invasive plant species at the Site (or dispersal from the Site) could also impact critical habitats of Nugget Moss with increased competition for resources and changing microclimate conditions.

3.6 Socio-Cultural Resources

Due to the proximity to Okanagan Lake and the Penticton First Nation (described below), location within a transportation corridor (Okanagan Valley), and presence of a number of species (e.g., vegetation [root gathering], birds, reptiles, small and large mammals), the Site has a moderate (in valleys and platforms) to high (lower plateau / areas closest to Okanagan Lake) archaeological potential. In addition, culturally modified trees, talus slope burials, petroforms, rock art, trails and historic sites have been documented near Okanagan Lake on other Sites (I.R. Wilson Consultants Ltd., 2007).

No Archaeological Overview Assessment was found for the Site during the desktop review. However, several archaeological investigations were conducted around Okanagan Lake and along Highway 97 (Wilson & Thompson, 1985; Zacharias, 1990). The Remote Access to Archaeological Data Application was not queried as part of this assessment as it is outside of the scope of work for this Project.

During the biophysical survey, no heritage buildings were noted near the proposed works and no archaeologically important resources (e.g., remnants of historical fire pits or middens) were observed where works are being proposed. Horses from the Penticton First Nation reserves or other landowners may use the Site for foraging (evidence of horse scat was observed on Site). Okanagan Lake (located downhill of the Site) contains a number of fish (e.g., Kokanee salmon, Rainbow Trout, Lake Trout, Burbot, Northern Pike Minnow, Mountain Whitefish, Lake Whitefish, Carp, Sucker, Bass and Pumpkin Seed) and is important to the Okanagan nation Alliance.

The Okanagan Nation Alliance consists of eight member communities including Okanagan Indian Band, Upper Nicola Band, Westbank First Nation, Penticton Indian Band, Osoyoos Indian Band and Lower and Upper Similkameen Indian Bands and the Colville Confederated Tribes. The Penticton First Nation No. 1 and No. 3A reserves are located approximately 625 m to the west-south-west of the failure site. The Site is located 29 km south of the Westbank First Nation and 45 km north of the Osoyoos First Nation. The Okanagan Indian Bank is located 91 km away at the north end of Okanagan Lake.

4. POTENTIAL EFFECTS OF THE PROJECT ON THE ENVIRONMENT

The following potential environmental effects have been identified during the completion of the Project works, which includes site preparation and mobilization, slope stabilization, and demobilization.

4.1 Potential Effects on Physical Conditions

4.1.1 Air Quality

The Project will require use of heavy machinery (to create access points, import and place sand, compact sand, and restore the Site to its pre-construction condition). Soils at the Site contain fine material (silt and clay) which can mobilize if exposed to wind during dry conditions which are common in the Okanagan. Sources of fugitive dust that may be generated on this Project include:

- Soil on access roads and roadways being mobilized by machinery into the air column;
- Exposed soil areas from excavation activities;
- Newly placed soils to stabilize the Site; and,
- Final surfaces of any decommissioned access roads and laydown areas.

Effects related to the use of machinery are expected to be temporary and limited to the duration of construction works that occurs in dry or windy conditions. If exposed soils are present after construction is complete, they would have the potential to affect air quality over a longer period.

Heavy machinery also produces greenhouse gasses which contribute to poor air quality. These effects are temporary and have the potential to occur over a very short duration (during construction).

4.1.2 Noise and Vibration

The Project will generate noise associated with the use of heavy machinery (excavators and trucks) and material placement (sand). The effects will be temporary and only occur during construction. Sources of vibration will be limited to the effects of driving heavy machinery across the Site and moving materials, which is expected to be minimal.

4.1.3 Soil Type and Quality

Existing soil type and quality has the potential to be effected by the Project. Soil can be affected by:

- Importing materials of a different grain size and organic content, while soil quality can be altered by importing materials that contain elevated levels of contaminants above CCME standards;

- Use of heavy machinery, which has the potential to spill hydrocarbons into soils from burst or leaky hydraulic lines, maintenance and refuelling activities.

If a spill occurred, the magnitude would be low because the works can be completed with only a few machines, but the duration of effects on soil has the potential to be long term.

4.1.4 Soil and Terrain Stability

The works will occur in an area that potentially is unstable, and, is located along steep terrain. Potential effects on the Project include:

- The use of heavy machinery has the potential to cause slope failures or mobilization of soils down into a gulley. The use of machinery has the potential to reveal or trigger additional sink holes. These effects would be permanent. Machinery has the potential to slide down the slope if the ground under the machinery gives out.
- Labourers assisting with the work have the potential to step into uncovered sink holes or fall down steep slopes.

4.1.5 Surface and Ground Water Quality

No surface streams are present at the Site, but sheet flow during storm events carries freshwater underground through several sink holes to lower plateau located downhill of the Site, which discharges through a culvert under Highway 97 into Okanagan Lake. Therefore, the works have the potential to affect surface and ground water through:

- Use of machinery, which has the potential to spill hydrocarbons into water from burst or leaky hydraulic lines, maintenance and refuelling activities;
- Leaching of contaminates from imported fill materials if they are contaminated;
- Alterations to the volume of ground infiltration through compaction activities and change in substrate type;
- Temporary mobilization of sediments from construction activities (e.g., erosion of uncovered stock piles, access roads, washing of equipment) and permanent changes to the Site (e.g., placement of new imported material) which have the potential to generate sediment-laden waters.

4.2 Potential Effects on Biological Conditions

4.2.1 Vegetation

Vegetation, and the ecological communicates that they support, are present on Site. The work has the potential to adversely affect vegetation through physical disturbances during construction and permanent alterations to the Site. The scarp contains minimal vegetation (some grasses and only a few sagebrush plants), as it was eroded away during the slope failure in 2015. Areas immediately on either side of the scarp and the gully located downhill of the scarp that will need to be infilled consists of the Big Sagebrush communities described in Section 3.4.1.

Estimated losses and gains of vegetation that will occur include:

- Loss of existing sagebrush and bunchgrass vegetation to construct access roads needed to supply sand to the lower portions of the scarp and gully. The estimated area of vegetation removal for Site access anticipated to be less than 100 m^2. Recolonization of these disturbed areas by sagebrush and bunchgrass vegetation over a 10 year period or more through natural propagation.
- Loss of existing sagebrush and bunchgrass vegetation of up to approximately 75 m^2 within the gully and a strip of vegetation on either side of the scarp; and reestablishment of sagebrush and bunchgrass vegetation in the slope stabilization area (gully, scarp and strip along scarp edges) of up to approximately 250 m^2 over 10 year period or more through natural colonization.

The removal of vegetation will be temporal in nature and reestablishment could take 10 years or more to reach full functionality. Sagebrush and bunchgrass are abundant near the Site, with over 1,000,000 m^2 of similar habitat located immediately south of the Site, therefore, the area of temporal vegetation loss is quite small in scale.

There is also a potential for invasive plant species to colonize the Site after construction has been completed. Invasive species can be tracked on Site by heavy machinery, be unearthed from the existing seed bank of disturbed soils, or can disperse on to the Site through natural processes.

4.2.2 Wildlife

Wildlife including insects, birds, and a variety of mammals may be temporarily disturbed by the Project works. The Project has the potential to:

- Removal of vegetation could remove active song bird nests from sagebrush and similar vegetation. Active songbird nests are typically present between March 15 and August 15 (Environment and Climate Change Canada, 2016e);
- Infilling the scarp has a low potential to trap bats, small mammals, and snakes that may have entered the scarp during the day to take shelter. During the winter, species may be hibernating. During the hot summer, nocturnal wildlife takes shelter in burrows, caves, or deep depressions. Use of the scarp or sinkhole by wildlife is unlikely, as exposure due to lack of vegetative cover, any flowing water, and soft unstable substrates provide less desirable habitat;
- Compression of soils could affect various insects living in those soils, including beetles;
- The noise and vibrations associated with the use of heavy machinery could affect behaviour of birds. Birds may leave active nests if works occur in close proximity during the breeding season (March to August), leaving eggs vulnerable to predation;
- The noise and vibrations also may affect small and large mammals typically accessing the Site may alter their foraging efforts and avoid the area of works, which may decrease their success of foraging and/or change the potential for predation.

4.2.3 Fish and Fish Habitat

No fish or fish habitat is located on the Site, but downhill of the Site fish and fish habitat are present in Okanagan Lake. Fish and fish habitat off-site has the potential to be affected by water quality. Potential sources of poor water quality that could be generated on the Project are discussed in Section 4.1.5. Effects of poor water quality on fish and fish habitat include:

- Abrasion to gills from suspended solids in the water column;
- Habitat loss through deposition of fines over pebble and cobble substrates;
- Bioaccumulation and deleterious effects from contaminants in the water column;
- Eutrophication and oxygen depletion from excessive nutrient deposition;

Trout Creek is the closest known spawning creek for Kokanee and Mountain Whitefish, located approximately 1.2 km north of the southern boundary of the Site along Highway 97.

4.3 Potential Effects on Rare and Endangered Species

Potential effects of the Project on species identified as occurring or potentially occurring on Site are discussed below.

4.3.1 Mammals

Spotted Bat: The Spotted Bat is listed under Schedule 1 of the *SARA* as Special Concern (2005) and is provincially blue-listed. During June and July, the females give birth and may be present in the roost all day and night. While the Spotted Bad typically roosts in crevices on cliff faces near water, they have been observed in gullies similar to the gullies on Site, and therefore could roost or hibernate in the scarp, cracks and sinkholes on Site. Use of the scarp is unlikely as there are no suitable crevices on the walls to provide habitat, and the sinkhole is unlikely to be used due to the presence of soft substrates and intermittent sub-surface flow. They are nocturnal and construction activities are typically performed during daylight hours when bats are roosting. They also hibernate and breed in voids like caves between October and July (Environment and Climate Change Canada, 2015a). Therefore infilling of the scarp has low potential of disturbing or trapping bats roosting, hibernating, or raising young inside between October and July.

Pallid Bat: The Pallid Bat is listed under Schedule 1 of the *SARA* as Threatened (2003) and is provincially red-listed. They are found in similar environments as the Spotted Bat. Use of the scarp is unlikely as there are no suitable crevices on the walls to provide habitat, and the sinkhole is unlikely to be used due to the presence of soft substrates and intermittent sub-surface flow. Pallid Bats are believed to hibernate from late October to late April, and the females give birth in early June and will not start flying for 4-5 weeks (Pallid Bat Recovery Team, 2008). Therefore infilling of the scarp has low potential of trapping bats roosting, hibernating, or raising young inside, and especially between October and July. They are sensitive to noise disturbance when roosting, therefore noise produced by heavy machinery has the potential to affect these species if roosting nearby during construction.

Western Harvest Mouse: The Western Harvest Mouse is listed under Schedule 1 of the *SARA* as Special Concern (2009) and is provincially blue-listed. These mice are nocturnal, and their nests could be present in vegetated areas of the gulley, or along temporary access routes that require vegetation removal. Nests are typically constructed from grass on the ground or up to 1 m off the ground. Breeding season runs from late spring to late summer and can include five litters per season. Removal of vegetation and placement of fill over vegetated areas during these periods has the potential to cover these mice when they are asleep or have young that cannot exhibit avoidance behaviour.

Nuttall's Cottontail: The Nuttall's Cottontail is listed under Schedule 1 of the *SARA* as Special Concern (2007) and is provincially blue-listed. The Site is within the range of this species (COSEWIC, 2006) and these rabbits have been documented adjacent to the Site. Breeding season occurs from March to July and females can produce two to three litters per year. They create cup-like nests lined and covered with grass and fur. While adults can exhibit avoidance behaviour, active nests that could be present in vegetated areas during the breeding season have the potential to be infilled by the Project.

American Badger: The American Badger is listed under Schedule 1 of the *SARA* as Endangered (2003) and is provincially red-listed. This badger has been observed on Site, and is generally nocturnal and occupies underground cavities when it is inactive. American badgers require cover for sleep, concealment, protection from weather, and natal denning. Young are born in late March or early April and don't emerge from the den for five to six weeks. While no Badger dens were observed within the Project footprint during the biophysical survey, there is low potential for new burrows to be constructed within the fill footprint prior to construction. Furthermore, badgers could seek refuge in the scarp itself during the day. Mobile badgers would likely exhibit avoidance behaviour during the works due to noise but could become trapped in the scarp if present during the work.

4.3.2 Birds

Barn Owl: The Barn Owl is listed under Schedule 1 of the *SARA* as Special Concern (2003) and is provincially red-listed. These owls are typically tree-cavity nesters and the few pine trees dbh that are located within a 100 m radius of the work were typically 0.20 m dbh and 10 m tall, and did not contain cavities or other wildlife features. They occasionally occupy crevices on steep bluff walls, and therefore may be present near the Project works. Based on the low amount of potential breeding habitat at the Site, the works are not expected to affect Barn Owl nesting behaviour. These owls are nocturnal and forage during the night when works will not be occurring, but could potentially be impacted if prey populations decline due to the Project works.

Lewis's Woodpecker: The Lewis's Woodpecker is listed under Schedule 1 of the *SARA* as Threatened (2012) and is provincially blue-listed. These primary cavity excavators rely on dry open Ponderosa Pine or Douglas-fir forests, and open grasslands with fire-maintained features, wildlife trees and rich herb and shrub layers, and mature to old riparian cottonwood stands near open areas (Environment and Climate Change Canada, 2016f). The Site is located within the northern end of their breeding range, and there are several protected areas identified by Gyug (2013) within 25 km of the Site (Environment and Climate Change Canada, 2016e). The nearest Ponderosa Pine or Douglas-fir forests are located at least 1 km from the Site, and the

Cottonwood trees located at the base of the bluff slope along Highway 97 are generally younger with no wildlife features. Therefore, the works are not expected to impact Lewis's Woodpecker nesting or foraging behaviour.

Sage Thrasher: The Sage Thrasher is listed under Schedule 1 of the *SARA* as Endangered (2003) and is provincially red-listed. They are dependent on large sagebrush habitats for nesting (within one meter of the ground) and foraging. Critical habitat areas have been identified in the South Okanagan Valley between Penticton and Osoyoos (Environment and Climate Change Canada, 2014). Due to the significant presence of Big Sagebrush at the Site and in the area of the Project works, there is potential for the works to affect foraging and/or breeding behaviour. Vegetation removal could disrupt nesting thrashers that are known to occur in the region between May to early September (Environment and Climate Change Canada, 2014).

Common Nighthawk: The Common Nighthawk is listed under Schedule 1 of the *SARA* as Threatened (2010) and is provincially yellow-listed. They are known to nest on the ground during the summer months in a variety of open habitats that include the sagebrush, grasslands and cultivated habitats or on forest clearings throughout British Columbia, and forages for beetles and flying insects in a wide range of open habitats including open water (Environment and Climate Change Canada, 2016g). Based on their preference for ground nesting in similar open habitats present on Site, it is possible that the breeding behaviour of a Common Nighthawk could be affected by the Site preparation and slope stabilization works proposed, (e.g., ground clearing, road building, infilling, etc.).

Peregrine Falcon (*anatum* subspecies): The *anatum* subspecies of the Peregrine Falcon is listed under Schedule 1 of the *SARA* as Special Concern (2012) and is provincially red-listed. This falcon is found in wide variety of habitats throughout the Northern Hemisphere, typically nesting on cliff ledges or crevices preferably 50 to 200 m in height, tall buildings or bridges, located near good foraging areas (Environment Canada, 2015b). They generally breed in April through August (Cooper & Beauchesne, 2004), and feed on other birds and bats in flight, rodents and other small mammals (Environment Canada, 2015b). Since the Okanagan Valley is within their breeding range and there are small cliffs located on the bluff above Highway 97 on the Site, it is possible that Peregrine Falcon breeding behaviour could be impacted by the Project works. Foraging behaviour could also be affected by impacts to passerines and bats at the Site.

4.3.3 Herptiles

North American Racer: The North American (or Yellow-Bellied Racer) is listed under Schedule 1 of the *SARA* as Special Concern (2006) and is provincially blue-listed. The Site is shown in Environment Canada (2015c) to be within one of the core Bunchgrass, Ponderosa Pine, Douglas-fir and Cedar-Hemlock ecosystems they are found in within BC. They can have overlapping nesting requirements as the Great Basin Gophersnake, Western Rattlesnake and other snakes, including sparsely vegetated slopes and abandoned rodent or other mammal burrows. Although no hibernacula were observed on-Site, it is possible the North American Racer could occur on the south facing slopes at the Site and be impacted by infilling and slope stabilization works.

Great Basin Gophersnake: The Great Basin Gophersnake (*deserticola* ssp.) is listed under Schedule 1 of the *SARA* as Threatened (2005) and is provincially blue-listed. The Site is located within the northern extent of the species range. As with the North American Racer and Western Rattlesnake it occasionally shares hibernacula with, the Great Basin Gophersnake generally breeds between May and October, and they prefer open habitats including grasslands, edges of cultivated fields and thickets, and burrows may be placed on south-facing grassy slopes (COSEWIC, 2013), such as those present at the Site. As with other snakes in the area, the Great Basin Gophersnake could occur at the Site and be impacted by infilling and slope stabilization works.

Western Rattlesnake: The Western Rattlesnake is listed under Schedule 1 of the *SARA* as Threatened (2005) and is provincially blue-listed. The Site is located within the northern extent of the species range. Occasionally hibernating with Great Basin Gophersnake, Racer and other snakes, they prefer grassland areas with suitable prey, basking and retreat sites, and riparian area to escape summer heat (COSEWIC, 2015). It is possible that Western Rattlesnake could occur at the Site and their breeding and foraging behaviour could be impacted by the Site preparation, infilling and slope stabilization works.

Desert Nightsnake: The Desert Nightsnake is listed under Schedule 1 of the *SARA* as Endangered (2003) and is provincially red-listed. They are known to occur south of Penticton, preferring areas with rock, shrub and grass cover within shrub-steppe habitat (COSEWIC, 2011). Based on the lack of preferred habitat available for this species at the Site, it is possible but unlikely that the Nightsnake could occur at the Site and be impacted by ground preparation, infilling and slope stabilization works.

Western Skink: The Western Skink is listed under Schedule 1 of the *SARA* as Special Concern (2005) and is provincially blue-listed. From Environment Canada (2015d), the Western Skink is known to occur along the east side of Okanagan Lake across from the Site, and can co-occur with North American Racer, Desert Nightsnake, Great Basin Gophersnake, and Rattlesnake, among others. Their preferred habitat includes open woodlands, grasslands and warm dry hillsides with loose soils and abundant cover objects, and they typically burrow eggs on open south-facing slopes between June and September and hibernate in talus slopes and rock outcrops (Environment Canada, 2015). Based on the recorded species occurrences in the area and south-facing slopes with limited cover features at the Site, it is possible that the infilling and stabilization works could disrupt Western Skink egg burrows.

Great Basin Spadefoot: The Great Basin Spadefoot is listed under Schedule 1 of the *SARA* as Threatened (2003) and is provincially blue-listed. These toads require arid grasslands and open forests for foraging and ephemeral to permanent aquatic habitats for breeding, and are known to occur in the Okanagan Valley around Osoyoos, Penticton and Vernon (COSEWIC, 2007). It is possible but unlikely that the Great Basin Spadefoot could burrow in loose and friable soils near the base of the bluff slope and they could be disturbed by slope stabilization works.

4.3.4 Invertebrates

Monarch: The Monarch is listed under Schedule 1 of the *SARA* as Special Concern (2003) and is provincially blue-listed. They are dependent on Showy Milkweed for breeding, and use a

variety of wildflowers for nectaring (Environment and Climate Change Canada, 2016b). It is possible that ground clearing works for roadbuilding could potentially disturb Showy Milkweed, consequently impacting their breeding and nectaring habitat.

4.3.5 Plants

Grand Coulee Owl-clover: The Grand Coulee Owl-clover is listed under Schedule 1 of the *SARA* as Endangered (2006) and is provincially red-listed. It has a limited distribution in the Southern Okanagan Basin on gently sloping areas with moderate- to well-drained soils within Bunchgrass and Ponderosa Pine ecosystems, with critical habitat areas identified as close to the Site as the Osoyoos area over 50 km south of the Site (Environment Canada, 2012b). It is unlikely but possible that Grand Coulee Owl-clover could exist at the Site and be impacted by Site preparation and slope stabilization works.

Showy Phlox: The Showy Phlox is listed under Schedule 1 of the *SARA* as Threatened (2006) and is provincially red-listed. This perennial plant requires cooler locations of hot, dry and open habitats including Big Sagebrush shrub-steppe lands (COSEWIC, 2004). Showy Phlox has two historic occurrences in Summerland at the northern extent and south of Penticton, with a current extent of occurrence in the Twin Lakes area located between Skaha Lake south of Penticton and Keremeos, approximately 25 km southwest of the Site (COSEWIC, 2004). Based on the available data, it is possible but unlikely that Showy Phlox may be present at Site and could be impacted by Site preparation and slope stabilization works. The introduction of invasive plant species at the Site (or dispersal from the Site) could also impact critical habitats of Showy Phlox with increased competition for resources and changing microclimate conditions.

Columbian Carpet Moss: The Columbian Carpet Moss is listed under Schedule 1 of the *SARA* as Special Concern (2005) and is provincially blue-listed. This moss is restricted to semi-arid shrub-steppe and grassland habitats including Bluebunch Wheatgrass and Big Sagebrush, with dispersal mainly through leaf fragmentation as opposed to sporophyte production (Environment Canada 2012c), which can restrict dispersal extent. Columbian Carpet Moss was not observed within the surveyed area of the Site. It is possible but unlikely that it could occur at the Site and be impacted by soil disturbances associated with Site preparation and slope stabilization works. The introduction of invasive plant species at the Site (or dispersal from the Site) could also impact critical habitats of Columbian Carpet Moss with increased competition for resources and changing microclimate conditions.

Nugget Moss: The Nugget Moss is listed under Schedule 1 of the *SARA* as Endangered (2009) and is provincially red-listed. This small moss is known to occur on compact mineral soil on steep lacustrine banks and shaded bases of cliffs in the Penticton area approximately 5 to 7 km south of the Site (British Columbia Bryophyte Recovery Team, 2009). Dispersal mechanisms are poorly understood but may be water- or insect-dispersed (British Columbia Bryophyte Recovery Team, 2009). It is possible that Nugget Moss could occur at the Site and be impacted by soil disturbances associated with Site preparation and slope stabilization works. The introduction of invasive plant species at the Site (or dispersal from the Site) could also

impact critical habitats of Nugget Moss with increased competition for resources and changing microclimate conditions.

4.4 Socio-Cultural Resources

The following potential effects of the Project on socio-cultural resources have been identified:

- Earthworks have the potential for archeological materials to be disturbed.
- Noxious plant species (native, introduced and/or invasives) that could potentially be established on the Site as a result of the works could impact horses and other working animals with toxic compounds if foraged upon, or by outcompeting native plants used for foraging.
- It is possible but highly unlikely that human remains could be unearthed during road development works.

5. MITIGATION MEASURES FOR POTENTIAL PROJECT EFFECTS

5.1 Physical

5.1.1 Air Quality

In order to mitigate physical effects on air quality, the following mitigation measures shall be developed and implemented by the Contractor:

- Trucks will be required to have their loads covered during transport;
- Trucks will keep their speed below 15 km/h when travelling on gravel or dirt roads at the Site;
- Machinery must be in good condition;
- Diesel vehicles should consider using ultra-low sulphur diesel fuel;
- Time is of the essence – once soil surfaces are exposed by machinery, the work should proceed quickly to minimize the amount of time a soil surface is exposed to wind;
- Works should be planned to avoid excessively windy days if construction practices are unable to control the amount of dust being mobilized from construction;
- Exposed soil piles should be covered to prevent erosion during windy days;
- Dust suppression agents (e.g., water) may be required on areas that cannot be covered during windy days.

5.1.2 Noise

In order to mitigate physical effects on noise, the following mitigation measures shall be developed and implemented by the Contractor:

- Machinery should be in good condition prior to construction and contractors will not utilize excessively noisy equipment. Regular maintenance will be undertaken on all equipment, including lubrication and replacement of worn parts, especially exhaust systems;
- If only one piece of equipment can conduct the task and it has elevated noise levels, its use should be limited;
- The machinery should be operated in a manner that minimizes noise produced by back-up beepers (e.g., minimizing backing up), particularly near or during twilight and dark hours;
- Idling equipment should be turned off when not in use;
- Avoid banging materials together that generate noise;
- Lower hard materials in place instead of dropping them, where possible.

5.1.3 Soil Type and Quality

In order to mitigate physical effects on soil type and quality, the following mitigation measures shall be developed and implemented by the Contractor:

- Plan work to avoid adverse weather conditions (wind and rain).
- Machinery shall be inspected to identify and repair hydraulic leaks before they occur.
- If debris is produced, it shall be carefully collected and disposed off-Site at an appropriate facility capable of receiving that debris.
- The Contractor should have their own spill management plan in place throughout the Project to quickly clean a spill as fast as possible before it is absorbed into the soil, should one occur.
- A spill kit shall be onsite at all times.
- If suspect soils are discovered, which appear to be contaminated (e.g., stained soils, odors, sheens), a qualified environmental professional will need to be consulted to determine if the soil is contaminated and if measures need to be applied. The Contractor will be responsible for isolating any potentially contaminated soils, if found, such that they do not mix with clean soil.

5.1.4 Soil and Terrain Stability

In order to mitigate physical effects on soil stability and steep terrain, the following mitigation measures shall be developed and implemented by the Contractor:

- Machinery to operate on stable slopes wherever possible.
- Machinery to construct assess points and perform the work in a manner that prevents mobilization of soils downhill, except for placed material required as part of the Project.
- Work to be planned during periods of stable weather (e.g., not during heavy rainfall events) to reduce likelihood of slope instability.
- Machinery to be operated efficiently to minimize disturbance.

5.1.5 Surface and Ground Water Quality

In order to mitigate physical effects on surface and ground water, the following mitigation measures shall be developed and implemented by the Contractor:

- Surface water runoff that leaves the Site (e.g., during storm event) shall comply with the following Water Quality Standard:
  - Change from background of 8 NTU at any one time for a duration of 24 hours in all waters during clear flows or in clear waters.
  - Change from background of 2 NTU at any one time for a duration of 30 days in all waters during clear flows or in clear waters.

  - Change from background of 5 NTU at any time when background is 8–50 NTU during high flows or in turbid waters.
  - Change from background of 10% when background is >50 NTU at any time during high flows or in turbid waters.
- Works shall be planned to avoid storm events (e.g., during rainfall warning issued by Environment Canada), where possible, to comply with the above Water Quality Standard.
- Machinery shall be inspected to identify and repair hydraulic leaks before they occur.
- The Contractor should have their own spill management plan in place throughout the Project to quickly clean a spill as fast as possible before it is absorbed into the soil, should one occur.
- A spill kit shall be onsite at all times.
- If works must occur during periods of rainfall, the Contractor will be responsible for designing and implementing erosion and sediment control measures to prevent mobilization of sediments beyond the Project footprint that exceed quality criteria above. Measures must be designed to avoid impacting habitat adjacent to the Project footprint (e.g., silt fence placement not to require removal of additional vegetation).

5.2 Biological

5.2.1 Vegetation

In order to mitigate biological effects on vegetation, the following mitigation measures shall be developed and implemented by the Contractor:

- The Project footprint will be marked in the field by the Contractor in advance of Site preparation works to visually identify work areas (including temporary access locations and staging areas) from environmental sensitive areas that are not to be disturbed during the Project.
- Environmental monitor to conduct detailed pre-construction survey of project footprint within one week prior to work; and make recommendations to isolate unoccupied wildlife features.
- An environmental monitor will confirm that the Contractor has delineated the Project footprint in the correct locations.
- Equipment shall not remove or otherwise disturb vegetation outside of the delineated Project footprint described above.
- Staging areas and stockpiling areas should be located in already disturbed or non-natural areas approved by the Owner.
- In the unlikely event that vegetation outside of the delineated Project footprint is disturbed, the Contractor will re-instate those vegetated areas to their pre-disturbance condition immediately.
- The Contractor must not track or otherwise introduce invasive species into the Site from use of machinery or other means.

- If invasive species are introduced to the Site by the Contractor, the Contractor will immediately remove and dispose of those invasive species in a manner that does not disturb existing environmentally sensitive areas, and disposes of invasive material at a disposal site that is able to receive those materials.
- An environmental monitor will be present on Site during the works to verify that environmental requirements are being executed by the Contractor.
- The environmental monitor will conduct a pre-construction survey of the delineated Project footprint prior to construction for:
  - song bird nests as discussed in Section 5.2.2 (Wildlife) and Section 5.3 (Rare and Endangered Species);
  - deciduous perennial species as discussed in Section 5.3 (Rare and Endangered Species);
  - mammal nests as discussed in Section 5.3 (Rare and Endangered Species).
- If wildlife is found nesting in vegetation that is within the delineated Project footprint, the environmental monitor will provide recommendations based on the species identified on the need for a buffer required around the nest to protect those species during construction, and, the buffer will remain in place until the environmental monitor has confirmed those species have fledged from the nest.
- The environmental monitor hill hold a kick-off meeting with the Contractor to go over the environmental requirements for the Project.
- Removal of vegetation must comply with mitigation measures identified in Section 5.2.2 (Wildlife) and Section 5.3 (Rare and Endangered Species).

5.2.2 Wildlife

In order to mitigate biological effects on wildlife, the following mitigation measures shall be developed and implemented by the Contractor:

- Delineate, confirm and prevent disturbance within environmentally sensitive areas as described in Section 5.2.1.
- Retain an environmental monitor and conduct duties as described in Section 5.2.1.
- The construction activities must be conducted in a manner that does not harm wildlife; and activities that show evidence of harming wildlife will be stopped until a solution can be developed that does not harm wildlife.
- If works are conducted during the bird nesting window of March 15 to August 15, the environmental monitor must conduct a pre-construction survey of nesting birds that potentially could be present in vegetation like sagebrush.
- If wildlife is found nesting in vegetation that is within the delineated Project footprint, the environmental monitor will provide recommendations based on the species identified on the need for a buffer required around the nest to protect those species during construction, and, the buffer will remain in place until the environmental monitor has confirmed those species have fledged from the nest.

- Comply with mitigation measures for rare and endangered wildlife listed in Section 5.3 (Rare and Endangered Species).
- Food and garbage associated with the Project will be contained and disposed off-Site to prevent wildlife attractions.

5.2.3 Fish and Fish Habitat

In order to mitigate biological effects on fish and fish habitat, the following mitigation measures shall be developed and implemented by the Contractor (note – no fish habitat is located on Site; primary concern is the offsite migration of sediment laden waters and deleterious substances):

- The Contractor must maintain compliance with water quality mitigation measures identified in Section 5.1.5 – Surface and Groundwater to prevent harm to fish in Okanagan Lake.
- An environmental monitor will test water quality for compliance with the Water Quality Criteria in Section 5.1.5. Testing will be performed during Construction if there is enough rainfall to collect a water sample at, or downhill, of the Site prior to discharge into Okanagan Lake.
- If the works are not compliant with the Water Quality Criteria, the works shall be halted and will resume once mitigation measures are implemented and working effectively.
- If the Project results in deposition of fines to downhill fish and fish habitat, the Fisheries Protection Program may be notified by PSPC, or their representative, to determine if further action is required.
- The Contractor must leave the Site in a stable condition (as designed) to prevent long-term issues that could result in additional scour and downhill deposition of fines in Okanagan Lake.

5.3 Rare and Endangered Species

5.3.1 Mammals

In order to protect rare and endangered mammal species, the following mitigation measures will be implemented:

- A pre-construction survey will be performed by the environmental monitor to confirm if any rare and endangered mammals are hibernating and nesting within the Project footprint, including within the scarp. The following species may be nesting and/or hibernating during the following times:
  - Spotted Bat – hibernating and nesting October through July
  - Pallid Bat – hibernating and nesting October through July
  - Western Harvest Mouse – breeding May through September
  - Nuttall's Cottontail – breeding March through July
  - American Badger – hibernating and breeding October through July

- If a mammal species at risk is confirmed to be hibernating or nesting on-Site, works will be postponed until the environmental monitor has confirmed those mammals have vacated the Site, or, works will be performed within a buffer suitable for protection of those species that is determined by the environmental monitor.
- Works conducted the rest of the year where mammals are nocturnal may require flushing techniques prior to construction. This could involve isolating the scarp during the night when nocturnal mammals (e.g., bats) and/or reptiles (i.e., snakes) are active, as well as placing deterrents (e.g., light, noise, etc.) into the scarp to prevent re-entry.

5.3.2 Birds

In order to protect rare and endangered bird species, the following mitigation measures will be implemented:

- If works occur between March and September, a pre-construction survey will be conducted by the environmental monitor to identify if Sage Thrasher, Common Nighthawk and/or Peregrine Falcon are nesting within the Project footprint and adjacent areas.
- If any of these birds are present, these areas will be isolated from the Project and protected from infilling or related disturbances until the environmental monitor has confirmed those birds have vacated the Site, or, works will be performed such that they comply with a buffer determine by the environmental monitor that is suitable for protection of those species.

5.3.3 Herptiles

In order to protect rare and endangered herptile species, the following mitigation measures will be implemented:

- A pre-construction survey will be conducted by the environmental monitor to identify if Great Basin Gophersnake, North American Racer, or Western Rattlesnake may be nesting within the delineated Project area since the biophysical survey was conducted.
- If the above herptiles are present, these areas will be isolated from the Project and protected from infilling or related disturbances until the environmental monitor has confirmed those herptiles have vacated the Site, or, works will be performed such that they comply with a buffer determine by the environmental monitor that is suitable for protection of those species.

5.3.4 Invertebrates

In order to protect rare and endangered invertebrate species, the following mitigation measures will be implemented:

- A pre-construction survey will be conducted by the environmental monitor to identify if Showy Phlox (that could support Monarch butterflies) has sprouted up within the delineated Project footprint.

- If Showy Phlox is observed in the pre-disturbance survey, these areas will be isolated from the Project and protected from infilling or related disturbances. If work must be conducted at these locations, a species at risk permit will be required to relocate those species.

5.3.5 Plants

In order to protect rare and endangered plant species, the following mitigation measures will be implemented:

- A pre-construction survey will be conducted by the environmental monitor to identify if Showy Phlox, Showy Milkweed or Grand Coulee Owl-clover have sprouted up within the delineated Project footprint since the biophysical survey was conducted, and confirm that Columbian Carpet Moss and Nugget Moss are not present near the area of works;
- If the above plants are present, these areas will be isolated from the Project and protected from infilling or related disturbances. If work must be conducted at these locations, a species at risk permit will be required to relocate those species.
- To prevent the potential off-Site dispersal of invasive plant species as described in Section 4.3.5, equipment and machinery must be free of any invasive plant material before mobilizing and demobilizing from the Site.
- Following completion of works, the area of disturbed soil will be maintained free of invasive plants that could impact sensitive habitat for rare and endangered species, or socio-cultural resources (i.e., horses and work animals, etc.).

5.4 Socio-Cultural Resources

In order to protect socio-cultural resources at the Site and in adjacent areas, the following mitigation measures will be implemented:

- If any potential archeological materials are found during the Site preparation or slope stabilization works, chance find procedures will be implemented (Front Counter BC, 2016), including:
  - All construction activity in the vicinity of the remains is to cease immediately.
  - The find location will be recorded, and all remains will be left in place.
  - The project archaeologist and Archaeology Branch will be contacted.
  - Potential significance of the remains will be assessed and mitigative options will be identified.
  - If the significance of the remains is judged to be sufficient to warrant further action and they cannot be avoided, then the project archaeologist in consultation with the Archaeology Branch and representatives of local First Nation communities will determine the appropriate course of action.

  - In the case of human remains, if the remains are assessed to be archaeological, then the Archaeology Branch and local First Nations will be consulted to determine how to handle them. Options could include avoidance or respectful removal and reburial. The RCMP and/or coroner will also be notified of find.
  - If human remains are encountered and they are potentially not archaeological, then the RCMP will be contacted immediately.
- The Project footprint will be maintained free of invasive and/or noxious weeds that could pose a threat to animals and humans using the Site.

6. RESIDUAL AND CUMULATIVE EFFECTS

Considering the implementation of the mitigation measures and environmental monitoring discussed above, the following residual effects have been identified for the Project.

6.1 Residual Effects

The residual environmental effects of the Project provided in this environmental assessment have been determined, in general, to be low in magnitude, Site-specific, short-term and reversible. Overall, there is not anticipated to be significant environmental effects from the Project on the environment.

An analysis has been performed comparing each VEC to the direction (positive or negative), magnitude, geographic extent, duration, frequency, reversibility, significance and likelihood of constituting adverse environmental effects:

- All VECs identified were determined to be adverse because they are not a benefit to the environment, with the exception of an increase in sagebrush habitat in the long term due to colonization of the stabilization area with native vegetation;
- The majority of VECs were low in magnitude with the exception of residual effects to vegetation which had a moderate residual magnitude. Plants take time a long time to re-establish.
- The geographic extent of the majority of VECs were local (extending beyond the Project footprint) with the exception of soil type and quality, soil stability and steep terrain, and vegetation which were site specific only. Most of the VECs extend beyond the Project footprint but are a reasonable distance from the site.
- The duration of most VECs is short term with the exception of soil type and quality, soil stability and steep terrain, and vegetation which were medium-term. Vegetation can take a long time to grow back, changes to soil occur over a longer time frame, soil can take a while to stabilize on steep slopes, and cultural items are long term.
- The frequency of most VECs was assessed as being once (minimal), with the exception of air quality, noise and vibration, and surface and ground water, which will occur sporadically throughout the Project, depending on when equipment is being used, amount of wind or rainfall during construction and mitigation measure effectiveness.
- It is our opinion that the potential residual effects from the Project on VECs will not be permanent, nor is the Project likely to cause adverse environmental effects that are significant, assuming mitigation measures, such as a pre-construction survey, are conducted appropriately.

Table 6 provides a summary of the residual effects identified for the Project, an assessment of their significance and likelihood of occurrence, and monitoring recommendations.

Table 6 Summary of Project Residual Effects on VECs

VEC Residual Effect	Characterization of Residual Effects								Monitoring Recommendations
	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Significance	Likelihood	
Air Quality	A	L	L	ST	S	R	N	L	Ensure equipment is maintained.
Noise and Vibration	A	L	L	ST	S	R	N	L	Minimize reversing of equipment.
Soil Type and Quality	A	L	S	MT	O	R	N	L	Ensure equipment is inspected.
Soil and Terrain Stability	A	L	S	MT	O	R	N	L	Conduct works in safe manner
Surface and Groundwater Quality	A	L	L	ST	S	R	N	L	Follow erosion and sediment control procedures
Vegetation	A	M	S	LT	O	R	N	L	Perform pre-construction survey. Avoid or reduce clearing
Wildlife	A	L	L	ST	O	R	N	L	Perform pre-construction survey to confirm wildlife are not present at time of works
Fish and Fish Habitat	A	L	L	ST	O	R	N	L	Test water quality for compliance with water quality criteria
Rare and Endangered Species	A	L	L	ST	O	R	N	L	Conduct pre-construction survey to confirm works will avoid areas where species at risk are growing, hibernating, nesting or rooting.
Cultural Heritage	A	L	L	LT	O	I	N	L	No excavation to be performed.

Table 6 Notes:
Refer to Table 1 for definitions
Direction: P=Positive; N=Neutral; A=Adverse
Magnitude: L=Low; M=Moderate; H-High
Geographic Extent: S=Site-specific; L=Local; R=Regional
Frequency: O=Once; S = Socratic; R=Regular; C=Continuous
Duration: ST=Short-term; MT=Medium-term; LT=Long-term
Reversibility: R=Reversible; I=Irreversible
Significant: Y=Yes, N=No
Likelihood: L=Low; M=Moderate; H=High

6.2 Cumulative Effects

Cumulative effects are changes to the environment that are caused by an action in combination with past, present and/or future physical activities (CEAA, 2014). The approach to evaluating cumulative effects is determined by the nature of the proposed works, the risks associated with potential cumulative effects, the condition of valued ecosystem components that could be impacted, the potential for mitigation measures to address potential cumulative effects, and the level of concern for stakeholders (CEAA, 2015).

It is unlikely that there are cumulative effects to the habitats on the Site from past projects such as the development of Highway 97 at the base of the bluff slope or routine culvert maintenance works to address consistent accumulation of eroded material from the bluff slope. There are no historic slope stabilization projects known to have occurred at the Site.

Present human actions that may contribute cumulative effects to the environment include agricultural operations at the Site and adjacent lands, including grazing by horses and/or other large mammals and a variety of crops. Off-road recreational activities may also contribute cumulative effects although it is unlikely to occur in the vicinity of the slope stabilization works.

Future culvert cleaning operations may be conducted to clear out the culvert under Highway 97. Further slope stabilization projects could occur over the long term to address potential or future slope failures in other locations along the slope on Site. No projects are currently planned. While such projects would be conducted in sensitive areas, the long term net benefits would include reduced erosion of the bank and more stable vegetation. Therefore, cumulative effects associated with the Project are anticipated to be not significant.

7. POTENTIAL EFFECTS OF THE ENVIRONMENT ON THE PROJECT

7.1 Potential Effects of the Environment

In addition to the potential effects of the Project works on the environment, it is also necessary to evaluate the potential effects of the environment on the Project. These potential effects include extreme weather events, additional slope failures, seismic activity and climate change.

7.1.1 Extreme Weather Events

Extreme weather events including heavy rain and/or snow, freeze/thaw cycles and high winds can affect the stability of the bluff slopes containing the Project including the area of sand fill within the failure scarp and gully.

7.1.2 Additional Slope Failures

As discussed in the WSP (2016) report and reported in the local news (Patton, 2016), the steep silt bluff slopes along Highway 97 between Summerland and Princeton are subject to erosion features including piping, gullies, sinkholes and landslides. It is expected that the processes developing these features may continue to affect the Project works after completion, depending on soil and weather conditions.

7.1.3 Seismic Activity

Seismic activity could negatively impact the Project works and threaten the biophysical and socio-economic resources at the Site, depending on the magnitude of the event.

7.1.4 Climate Change

Climate change could alter precipitation and weather patterns, which could result in fewer or greater numbers of extreme weather events (discussed above), and potentially affect the stability of the Project works and bluff slopes.

8. MITIGATION FOR POTENTIAL EFFECTS OF THE ENVIRONMENT

To address the potential effects of the environment on the Project, the following mitigation measures are proposed:

8.1.1 Extreme Weather Events

- Conducting works during stable weather patterns to avoid issues with erosion and sediment control, including dust and turbid surface runoff.

8.1.2 Additional Slope Failures

- The engineer preparing the detailed design will identify and delineate any area of instability with respect to equipment access and working along the crest of the steep bluff slope at the slope failure location;
- Construction personnel will be alert for signs of instability (e.g., sloughing, cracking, etc.) and reassess equipment placement and activities as necessary to prevent injury or damage to equipment.

8.1.3 Seismic Activity

- A muster point will be delineated in a safe location near the Project footprint (e.g., further back on the plateau above the slope failure location) for construction personnel to meet if seismic activity is observed.

8.1.4 Climate Change

- Due to the short temporal nature of the proposed slope stability works, climate change is not expected to have a measurable impact on the Project. No mitigation measures are proposed.

9. PROFESSIONAL OPINION AND RECOMMENDATION

Based on the information reviewed during the desktop review and conducting a biophysical survey of the Site, the following conclusions are made:

- A number of potential impacts have been identified throughout this assessment. These conditions may change based on the passage of time since the biophysical survey was conducted.
- The implementation of proven best management practices and mitigation measures is critical to complying with this environmental assessment, and relevant Acts and Regulations that apply to these works. Non-compliance with the mitigation measures prescribed may result in residual effects that are significant to rare and endangered species observed on Site.
- From the required mitigation measures provided in Section 5 of this assessment, critical strategies include the following:
  - Plan work to avoid adverse weather conditions (wind and rain);
  - Environmental monitor to conduct detailed pre-construction survey of project footprint within one week prior to work; isolate unoccupied wildlife features as necessary;
  - Establish species specific buffers for active nests, if found during pre-construction survey. Conduct work within buffer areas after nests become inactive (typically weeks to months for song birds, mammals and herptiles);
  - Hold kick-off meeting to go over environmental requirements;
  - Install erosion and sediment control measures (e.g., silt fencing, tarping piles) as necessary to meet water quality standards;
  - Conduct environmental monitoring to confirm environmental requirements are met;
  - Have a spill management plan with sufficient supplies, implement immediately if spill occurs; and
  - Stop works if a risk of adverse effects to sensitive wildlife arises.
- Provided mitigation measures are implemented successfully, residual effects were assessed as being low to nil on a temporal and spatial scale.
- Cumulative effects are minor given that the Project involves restoring the Site to its original condition.

Statement of Significant Effects

With the implementation of the recommended Best Management Practices and mitigation measures, it is our opinion that:

X Works can be completed without significant adverse environmental effects, provided all mitigation measures are successfully implemented.

___ Works cannot be completed without significant adverse environmental effects, even with the successful implementation of all mitigation measures.

It is our recommendation that works be allowed to proceed, pending the implementation of mitigation measures identified in this report. This assessment does not constitute an approval under any Act or Regulation.

10. CLOSURE

This report has been prepared and reviewed by Keystone Environmental Ltd. approved personnel who have the credentials and knowledge of the applicable public laws, regulations and/or policies which apply to this report.

This report has been prepared solely for the internal use of and Public Services and Procurement Canada pursuant to the agreement between Keystone Environmental Ltd. and Public Services and Procurement Canada. By using this report Public Services and Procurement Canada agrees that they will review and use the report in its entirety. Any use which other parties make of this report, or any reliance on or decisions made based on it, are the responsibility of such parties. Keystone Environmental Ltd. accepts no responsibility for damages, if any, suffered by other parties as a result of decisions made or actions based on this report.

January 20, 2017
Date

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Biologist

Dave Langill, B.Sc.
Biologist

Warren Appleton, R.P.Bio.
Project Manger

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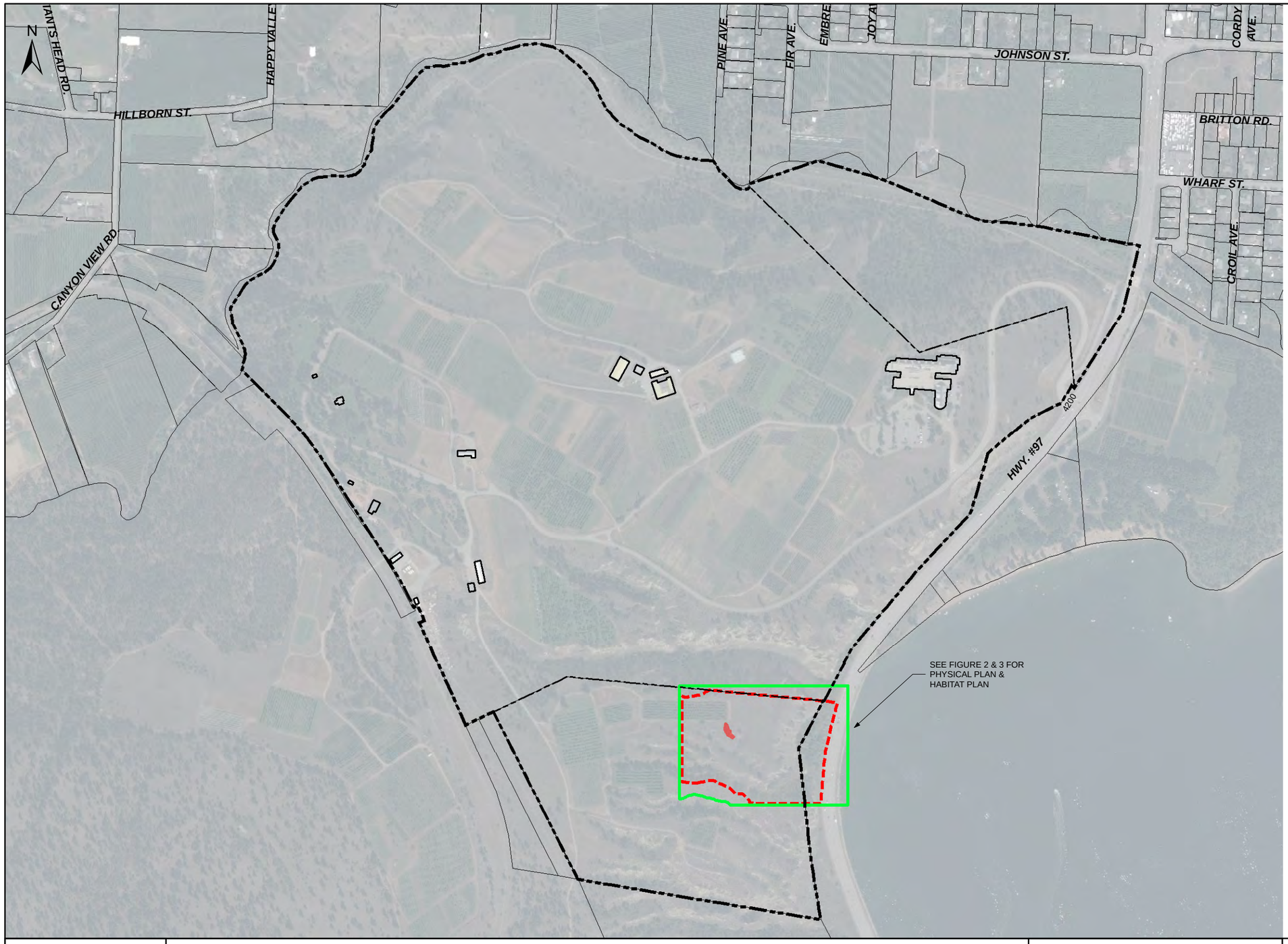
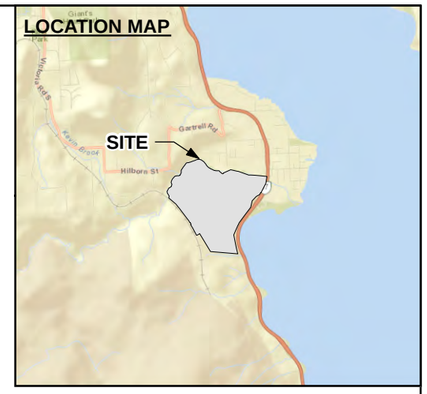
APPENDIX A

FIGURES





LEGEND

- SITE
- PROPERTY LINE
- LOT LINES
- SURVEY BOUNDARY
- BUILDING OUTLINE
- APPROXIMATE FAILURE

Keystone Environmental

NOTES:
1. *THIS DRAWING IS FOR GENERAL INFORMATION ONLY. LOT BOUNDARIES AND FEATURES ARE APPROXIMATE.*
2. *DATE OF ORTHO PHOTO IS 2013.*

50 0 250 m

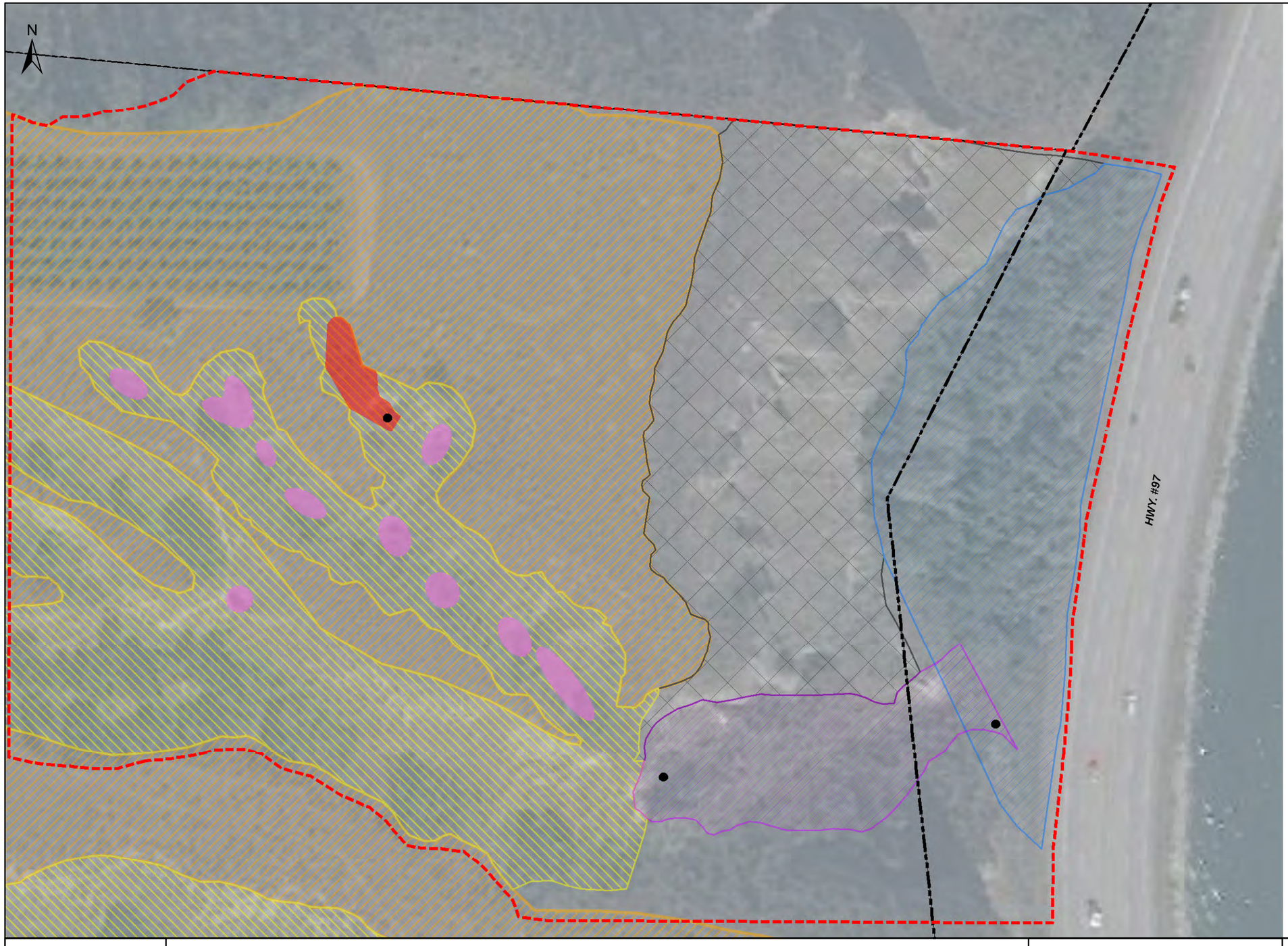
SCALE: 1:7,500 (approx.)

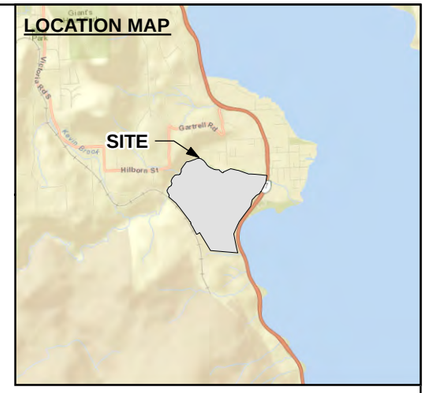
4200 Highway 97
Summerland, B C
Public Works and Government Services Canada

REVISION No.	DATE	PROJECT No.
00	Jan. 2017	13244-103

Figure 1
Location Plan

DRAWN BY: CY Document Path: I:\13200-13299\13244 PWGSC Summerland\Figs\Fig1-LocationPlan-R0.mxd





LEGEND

- SITE
- PROPERTY LINE
- SURVEY BOUNDARY
- SINKHOLE
- ERODED AREA
- APPROXIMATE FAILURE
- DEPRESSION
- GULLY
- LAKESIDE PLAIN
- PLATEAU
- STEEP BLUFFS

Keystone Environmental

NOTES:
1. THIS DRAWING IS FOR GENERAL INFORMATION ONLY. LOT BOUNDARIES AND FEATURES ARE APPROXIMATE.
2. DATE OF ORTHO PHOTO IS 2013.

10 0 50 m

SCALE: 1:1,000 (approx.)

4200 Highway 97
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Public Works and Government Services Canada

REVISION No.	DATE	PROJECT No.
00	Jan. 2017	13244-103

Figure 2
Physical Plan

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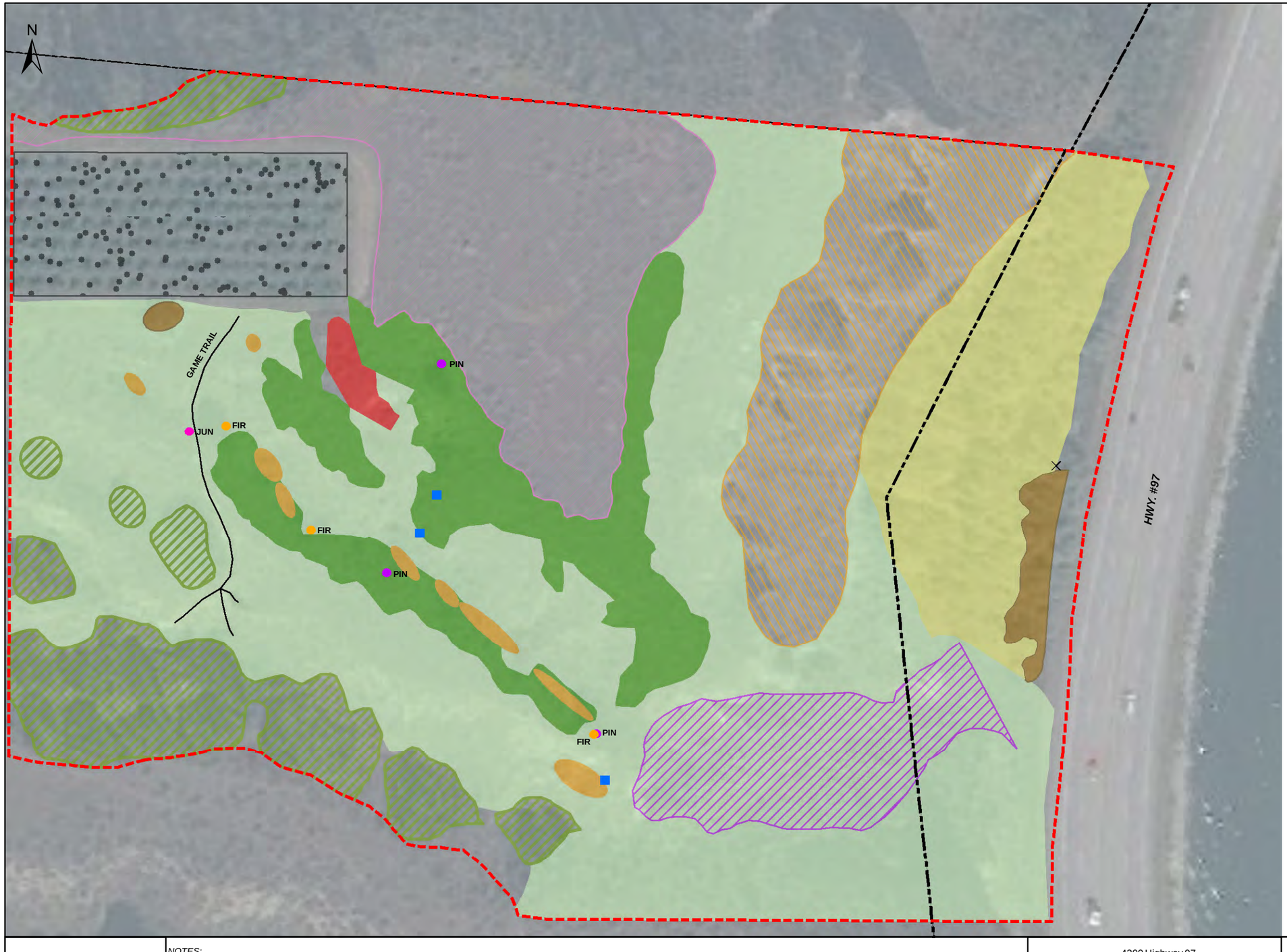

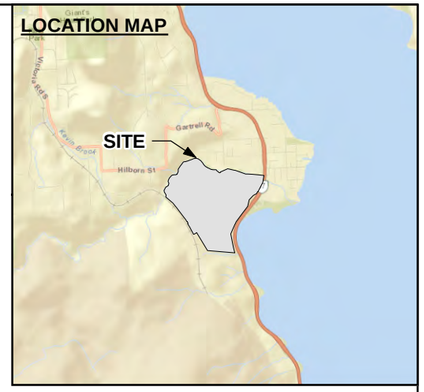

LEGEND

- SITE
- PROPERTY LINE
- GAME TRAIL
- SURVEY BOUNDARY
- CULVERT
- POTENTIAL ANIMAL BURROW
- DOUGLAS FIR (FIR)
- JUNIPER (JUN)
- PONDEROSA PINE (PIN)
- APPROXIMATE FAILURE
- ERODED AREA
- EXPOSED SOILS
- HIGH DENSITY SAGEBRUSH
- LOW DENSITY SAGEBRUSH (LDS/G)
- MIXED DECIDUOUS (COTTONWOOD ASPEU)
- MIXED TREES (PIN/FIR)
- ORCHARD
- OREGAN GRAPE
- POSTURE
- RUSSIAN OLIVE

Keystone Environmental

NOTES:
1. THIS DRAWING IS FOR GENERAL INFORMATION ONLY. LOT BOUNDARIES AND FEATURES ARE APPROXIMATE.
2. DATE OF ORTHO PHOTO IS 2013.

10 0 50 m

SCALE: 1:1,000 (approx.)

4200 Highway 97
Summerland, B C
Public Works and Government Services Canada

REVISION No.	DATE	PROJECT No.
00	Jan. 2017	13244-103

Figure 3
Habitat Plan

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APPENDIX B

PHOTOGRAPHS

Photograph 1: South facing view of the failure taken from within the orchard.

Photograph 2: South south-east view of the failure taken from the plateau

Photograph 3: South-east view looking into the downslope end of the failure where sediment flowed into a sinkhole.

Photograph 4: West view of the Upland Plateau zone, showing typical Sagebrush density and grazed-upon grasses. The failure is behind the Ponderosa Pine in the centre of the photograph.

Photograph 5: North-west view of the failure showing proximity of the apple orchard behind.

Photograph 6: North facing view up gully toward the failure (visible in the centre of the photo).

Photograph 7: East facing view down the steep bluffs where erosion has caused bank failures. Highway 97 and Okanagan Lake are in the distance.

Photograph 8: View looking down into sinkhole at top of steep bluff where water has emerged from sub-surface flow.

Photograph 9: North facing view of the lakeside plain adjacent to Highway 97. Note sediment accumulation in foreground, steep bluffs above, and mixed deciduous trees.

Photograph 10: Looking east from top of slope at sediment deposition on lakeside plain.

Photograph 11: Sediment deposited at base of steep slope on lakeside plain. Field book placed for size reference.

Photograph 12: View looking north-west up failing slopes of the steep bank below the gully.

Photograph 13: Cavity at base of steep slope from which water has emerged.

Photograph 14: North facing view toward culvert which runs toward Okanagan Lake beneath Highway 97.

Photograph 15: Typical Big Sagebrush with grass understory which dominated vegetation around the site. These specimens were over 2 m tall.

Photograph 16: East facing view of single Ponderosa Pine located on Plateau adjacent to the failure.

Photograph 17: Baldhip rose growing west of the failure, adjacent to the orchard.

Photograph 18: Numerous mushrooms growing on the upper plateau in mixed low-density sagebrush and heavily grazed grasses.

Photograph 19: Second species of mushroom observed growing on the upper plateau.

Photograph 20: South-facing view of Dull Oregon Grape dominated shrubs growing on north-facing slopes of gully above one of the low gully-floor depressions.

Photograph 21: Ponderosa Pine and Interior Douglas Fir growing on north-facing walls of gullies.

Photograph 22: Common Yarrow, Oregon Grape and moss sp. growing at east end of gully system.

Photograph 23: Russian Olive trees were dominant vegetation immediately adjacent to Highway 97 on the lakeside plain.

Photograph 24: Common nightshade (an invasive plant) growing on the lakeside plain.

Photograph 25: Isolated bear scat seen adjacent to the orchard, west of the failure

Photograph 26: Animal excavation beneath the southern orchard fence.

Photograph 27: Small omnivorous mammal scat noted east of the failure.

Photograph 28: Excavated burrow noted on south-facing slope of the gully which could provide habitat for small mammals or herptiles (reptiles/amphibians).

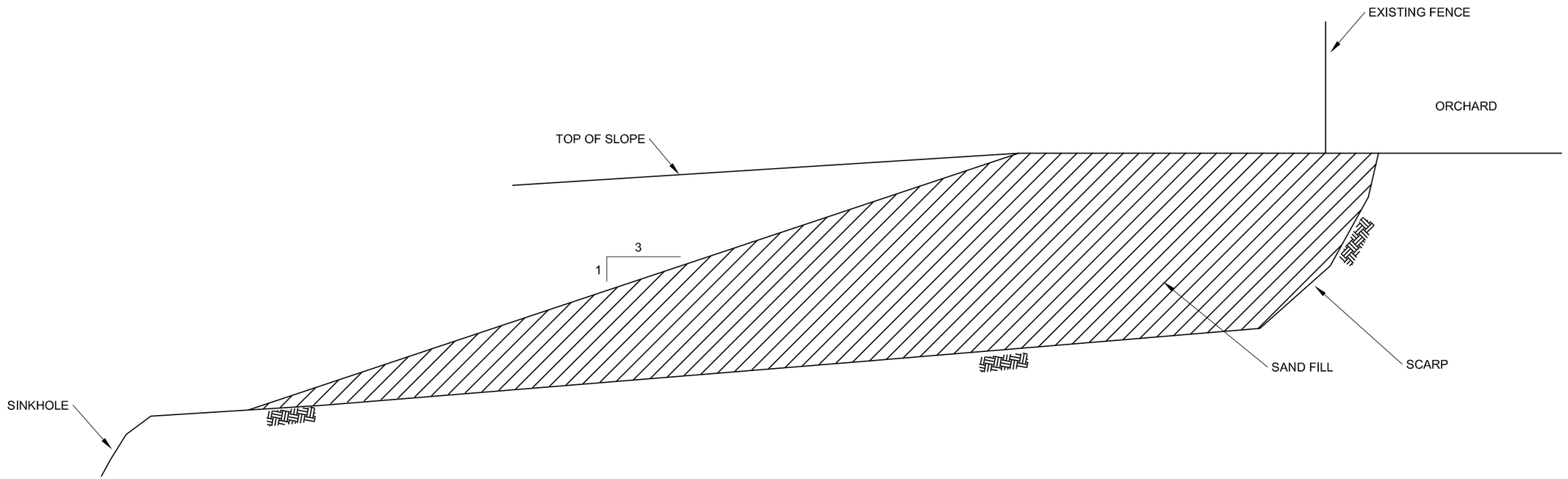
Photograph 29: Vertical opening in the gully which could provide herptile habitat.

Photograph 30: Small cave (approximately 0.3 m diameter) near top of steep bluffs which could provide habitat for herptiles or small mammals.

APPENDIX C

CONCEPTUAL DESIGN PLAN

1 FIG.2 CROSS-SECTION
SCALE: NTS



REVISIONS					ADAPTED FROM: N/A	TITLE: CONCEPTUAL CROSS-SECTION	SEAL:	WSP	DESIGN: N/A	DATE: APR. 2016
					PROJECT/DWG. NO: N/A				CHECK: HD	SCALE: NTS
					DATE: N/A	PROJECT: SLOPE STABILIZATION			DRAWN: DJ	FILE NO: 161-02415-00
					This drawing is the sole property of WSP Canada Inc. and cannot be used or duplicated in any way without the expressed written consent of WSP. The general contractor shall verify all dimensions and report any discrepancies to WSP.	ADDRESS: SUMMERLAND			FIGURE NO: 3	
REV	Date	Issue/Revision Description	Drawn	Check		CLIENT: PUBLIC WORKS				

APPENDIX C
Sensitive and Species at Risk Report

Keystone Environmental
Knowledge-Driven Results

June 6, 2017

Mr. Tom Dunphy
Senior Project Manager
PSPC Environmental Services
Public Works and Government Services Canada
219 – 800 Burrard Street
Vancouver, BC V6Z 0B9

Dear Mr. Dunphy:

Re: Sensitive and Species at Risk Report
Pacific Agricultural and Food Research Centre, 4200 Highway 97, Summerland, BC
PSPC Project No. R.080303.001
Order No. 700367447, Task Authorization #EZ897-161533/003/PWY
Keystone Project No. 13244-108B

Keystone Environmental Ltd. (Keystone Environmental) is pleased to provide this Sensitive and Species at Risk Survey report at the Pacific Agriculture and Food Research Centre at 4200 Highway 97, Summerland, BC (the Site).

1. BACKGROUND

In October 2015, a buried water pipe broke adjacent to an orchard at the Pacific Agriculture and Food Research Centre in Summerland. As a result of the pipe break, water eroded a 31.5 m by 7.5 m scarp within a pre-existing gully south of the orchard, and into a sub-surface cavity within the gully area. The scarp is threatening loss of a portion of the orchard, with the current top of bank at the new fence line on the access lane.

To prevent the loss of operations within a portion of the orchard, remedial works have been designed for Public Services and Procurement Canada (PSPC) by WSP, including the placement of sand fill within the scarp and sinkhole in a series of lifts. The tender package requesting contractor bids for the project designs and specifications will be released shortly, and works are expected to occur in August 2017.

Keystone Environmental was retained by PSPC to complete a current conditions survey to update the risk potential for organisms protected under the *Species at Risk Act*, and other wildlife or sensitive species that may use the site.

Suite 320
4400 Dominion Street
Burnaby, British Columbia
Canada V5G 4G3

Telephone: 604 430 0671
Facsimile: 604 430 0672
info@KeystoneEnviro.com
KeystoneEnviro.com

2. METHODS

In preparation for the species at risk survey, Keystone Environmental reviewed online databases from the Ministry of Environment to confirm the current locations of known occurrences in and around the project location. Available aerial imagery was also reviewed to consider the landscape context of these occurrences and prepare field maps.

The area within and around the project footprint was surveyed on June 5, 2017 by two biologists from Keystone Environmental. The survey area was evaluated for vegetation and wildlife species. The survey was performed without entering the scarp or gully portion of the project footprint and remaining at least two metres back from the scarp/gully edge or more for overhangs.

Using the updated results for species at risk occurrences and habitat requirements for these species, the vegetation survey used a targeted approach to survey the project footprint and adjacent areas. A 10 m by 10 m plot was also established on a shallow slope above the western bank of the scarp and gully. A ground inspection form was completed using updated procedures[1] to characterize the typical conditions of the top of bank and upper slopes above the gully.

A targeted survey for wildlife species at risk and sensitive species was also performed through the survey area using the results of the species at risk occurrence database review and their habitat requirements. Potential habitat components in the survey area were evaluated for indications of wildlife usage including overhangs, crevices and burrows in the gully wall and adjacent slopes, within and at the base of dense sagebrush plants, along the fence line of the access lane and in nearby fir and pine trees. Songbird activity was evaluated using modified inventory protocols.

Using the results of the vegetation and wildlife survey together with the habitat requirements for each species, an assessment of the potential risk for species to be present within the Project footprint during works was completed. A rating was assigned for each of the species at risk with the potential to occur at or near the Site.

- **Low**: no historical occurrence records at or near the Site (i.e., within three kilometres), not observed during the survey, and a low probability of occurrence based on habitat requirements;
- **Moderate**: historical occurrence records at or near the Site, not observed during survey, low to moderate probability of occurrence based on habitat requirements;, and
- **High**: historical occurrence records at or near the Site, observed during survey.

3. RESULTS

The results from the review of online databases for organisms protected under the *Species at Risk Act* that could occur at or around the Site are included in Table 1. The species highlighted in bold were identified in the background review as having been observed at or within 3 km of the Site.

[1] Vegetation Resources Inventory – Ground Sampling Procedures. Version 5.4 (March 2017).

Table 1 Risk Rating for Potential Impact from Infilling Works

Common Name *(Scientific Name)*	Comment on Potential Risk	Rating
Pallid Bat *(Antrozous pallidus)*	No records within 3 km.	Low
Spotted Bat (*Euderma maculatum*)[2]	Observed at the Site (2004)	Moderate
Western Harvest Mouse (*Reithrodontomys megalotis megalotis*)	No records within 3 km, no dense groundcover	Low
Nuttall's Cottontail (*Sylvilagus nuttallii nuttalli*)	Observed at the Site (2004)	Moderate
American Badger *(Taxidea taxus jeffersonii)*	Observed at the Site (2012)	Moderate
Common Nighthawk *(Chordeiles minor)*	No records within 3 km, low potential for forage use of Site	Low
Peregrine Falcon, *anatum* subspecies *(Falco peregrinus anatum)*	No records within 3 km, low potential for forage use of Site	Low
Lewis's Woodpecker *(Melanerpes lewis)*	Observed adjacent to the Site (2006)	Moderate
Sage Thrasher *(Oreoscoptes montanus)*	No records within 3 km but dependent on big sagebrush	Moderate
Barn Owl *(Tyto alba)*	No records within 3 km, low potential	Low
Blotched (Western) Tiger Salamander *(Ambystoma tigrinum)*	No records within 3 km	Low
Northern Rubber Boa *(Charina bottae)*	No records within 3 km	Low
North American Racer *(Coluber constrictor mormon)*	Observed at the Site (2014)	Moderate
Western Rattlesnake *(Crotalus oreganus)*	No records within 3 km	Low
Desert Nightsnake *(Hypsiglena chlorophaea)*	No records within 3 km	Low
Great Basin Gophersnake *(Pituophis catenifer deserticola)*	Observed at the Site (2006), north (2011) and west (2006) of the Site.	Moderate
Western Skink *(Plestiodon skiltonianus)*	No records within 3 km, low potential	Low
Great Basin Spadefoot *(Spea intermontana)*	No records within 3 km, low potential	Low
Monarch *(Danaus plexippus)*	No records within 3 km, low potential	Low
Mormon Metalmark (*Apodemia mormo)*	No records within 3 km, low potential	Low
Half-moon Hairstreak *(Satyrium semilunar)*	No records within 3 km, low potential	Low
Grand Coulee Owl-clover *(Orthocarpus barbatus)*	No records within 3 km, low potential	Low
Showy Phlox *(Phlox speciosa* ssp. *Occidentalis)*	No records within 3 km, low potential	Low

[2] Bold indicates species has been observed within three kilometres of the Site.

Common Name *(Scientific Name)*	Comment on Potential Risk	Rating
Columbian Carpet Moss *(Bryoerythrophyllum columbianum)*	No records within 3 km, low potential	Low
Nugget Moss *(Microbryum vlassovii)*	No records within 3 km, low potential	Low

None of the species at risk included in Table 1 were encountered during the vegetation or wildlife surveys within the survey area (Figure 1). Vegetation within the survey area was dominated by big sagebrush (*Artemisia tridentata*), with a mix of agronomic grasses including crested wheat grass (*Agropyron cristatum*) and ryegrass (*Lolium perenne*), and native grasses such as fescue (*Festuca* sp.) and bluebunch wheat grass (*Pseudoroegneria spicata*). There were many common weeds such as cheatgrass (*Bromus tectorum*), yellow salsify (*Tragopogon dubiu*) and knapweed (*Centaurea* sp.). Typical ground and vegetation conditions in the project footprint are shown in Photographs 1 and 2. Numerous longleaf phlox (*Phlox longifolia*) plants were observed (Photograph 3); no showy phlox (*Phlox speciosa* ssp. *occidentalis*) plants were observed. Wildlife observed at the Site included a yellow-bellied marmot (*Marmota flaviventris*), coyote (*Canis latrans*), California quail (*Callipepla californica*), tree swallow (*Tachycineta bicolor*), Northern flicker (*Colaptes auratus*), black-billed magpie (*Pica hudsonia*), and a red-tailed hawk (*Buteo jamaicensis*). Pellet-type ungulate scat was also observed throughout the survey area, likely from deer and/or elk.

A tree swallow nest (protected under the *Migratory Bird Convention Act*) was observed to be in construction by a pair of adults within a broken pipe extending from the west wall near the top of the scarp (Photograph 4), shown on Figure 1. An inactive/unoccupied burrow was also observed just south of the scarp (Figure 1).

No snakes or other herpetiles were observed during the survey. No rock outcrops, talus slopes, or small rocky crevices or caves ideal for herpetile hibernation were observed in the survey area.

Based on the results of the background review and recent survey, and the habitat requirements for the species at risk with the potential to occur at the Site, the relative risk of impact to these organisms the project works is provided in Table 1. Six species were assigned a moderate potential for being present, including the spotted bat, Nuttall's cottontail, American badger, North American racer and the Great Basin gophersnake. The remainder of species were assigned a low risk of impact to species at risk. No species were rated with a high risk of impact to species at risk.

A tree swallow nest was observed to be in construction by a pair of adults in a broken pipe extending from the west wall near the top of the scarp (Figure 1).

4. SUMMARY AND RECOMMENDATIONS

Based on the results of this sensitive and species at risk survey, we recommend the following:

- There were no sensitive or species at risk observed in the project area;

- Based on historic observations within three kilometres of the Site and the survey conducted on June 5, 2017, we believe there is a low to moderate risk for a few species to potentially be present during Project works; and
- Perform a pre-clearing survey of the project footprint within three days of commencing infilling works to confirm there are no active nests, species at risk or potential environmental risk.

5. CLOSURE

This report has been prepared and reviewed by Keystone Environmental Ltd. approved personnel who have the credentials and knowledge of the applicable public laws, regulations and/or policies which apply to this report.

This report has been prepared solely for the internal use of and Public Services and Procurement Canada pursuant to the agreement between Keystone Environmental Ltd. and Public Services and Procurement Canada. By using this report Public Services and Procurement Canada agrees that they will review and use the report in its entirety. Any use which other parties make of this report, or any reliance on or decisions made based on it, are the responsibility of such parties. Keystone Environmental Ltd. accepts no responsibility for damages, if any, suffered by other parties as a result of decisions made or actions based on this report.

We trust this report provides the information you require. Should you require clarification, please do not hesitate to contact the undersigned at 604-430-0671.

Sincerely,

Keystone Environmental Ltd.

Dave Langill B.Sc..
Biologist

Jamie Slogan, Ph.D., R.P.Bio.
Department Head, Biological Services

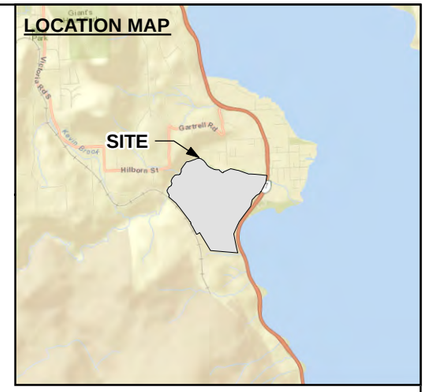
I:\13200-13299\13244 PWGSC Summerland\Phase 108B SAR Survey\Report\13244-108B 170606 Species at Risk Survey.docx

ATTACHMENTS:

- Attachment 1: Figure
- Attachment 2: Photographs

FIGURE

LOCATION MAP



LEGEND

- SITE
- PROPERTY LINE
- SURVEY BOUNDARY
- APPROXIMATE FAILURE
- GAME TRAIL
- NEST (TRSW)
- BURROW (INACTIVE)

Keystone Environmental

NOTES:
1. THIS DRAWING IS FOR GENERAL INFORMATION ONLY. LOT BOUNDARIES AND FEATURES ARE APPROXIMATE.
2. DATE OF ORTHO PHOTO IS 2013.

10 0 50 m

SCALE: 1:1,000 (approx.)

4200 Highway 97
Summerland, B C
Public Works and Government Services Canada

REVISION No.	DATE	PROJECT No.
00	June 2017	13244-108B

Figure 1
Species At Risk Map

DRAWN BY: CY Document Path: I:\13200-13299\13244 PWGSC Summerland\Phase 108B SAR Survey\Figs\Fig1-SpeciesAtRisk-R0.mxd

PHOTOGRAPHS

Photograph 1: View looking south at typical ground conditions within the project footprint.

Photograph 2: View looking west at typical vegetation along the top of gully bank.

Photograph 3: Introduced Phlox observed throughout survey area.

Photograph 4: View looking west at the small metal pipe with active nest construction by a tree swallow.

APPENDIX D
Pre-construction Hazard Assessment Form

Public Works and Government Services Canada | Travaux publics et Services gouvernementaux Canada

PARC Summerland, B.C. PRELIMINARY HAZARD ASSESSMENT FORM

Project Number:	R.080303.001
Location:	Pacific Agri-food Research Centre, Summerland, B.C.
Date:	June 16, 2017

Site Specific Orientation Provided at Project Location ☐ Yes

Notice of Project Required ☐ Yes

NOTE:
PWGSC REQUIRES A Notice of Project FOR ALL CONSTRUCTION WORK RELATED ACTIVITIES

NOTE:
OHS law is made up of many municipal, provincial, and federal acts, regulations, bylaws and codes. There are also many other pieces of legislation in British Columbia that impose OHS obligations.

Important Notice: This hazard assessment has been prepared by PSPC for its own project planning process, and to inform the service provider of actual and potential hazards that may be encountered in performance of the work. PSPC does not warrant the completeness or adequacy of this hazard assessment for the project and the paramount responsibility for project hazard assessment rests with the service provider.

TYPES OF HAZARDS TO CONSIDER	Potential Risk for:				COMMENTS
Examples: Chemical, Biological, Natural, Physical, and Ergonomic Listed below are common construction related hazards. Your project may include pre-existing hazards that are not listed. Contact the Regional Construction Safety Coordinator for assistance should this issue arise.	PWGSC, OGD's, or tenants		General Public or other contractors		Note: When thinking about this pre-construction hazard assessment, remember a **hazard** is anything that may cause harm, such as chemicals, electricity, working from heights, etc; the **risk** is the chance, high or low, that somebody could be harmed by these and other hazards, together with an indication of how serious the harm could be.
	Yes	No	Yes	No	
Typical Construction Hazards					
Concealed/Buried Services (electrical, gas, water, sewer etc)	Yes		Yes		
Slip Hazards or Unsound Footing	Yes		Yes		
Working at Heights	Yes		Yes		
Working Over or Around Water		No		No	
Heavy overhead lifting operations, mobile cranes etc.	Yes		Yes		
Marine and/or Vehicular Traffic (site vehicles, public vehicles, etc.	Yes		Yes		
Fire and Explosion Hazards	Yes		Yes		

Canada

High Noise Levels		No		No	
Excavations	Yes		Yes		
Blasting		No		No	
Construction Equipment	Yes		Yes		
Pedestrian Traffic (site personnel, tenants, visitors, public)	Yes		Yes		
Multiple Employer Worksite	Yes		Yes		Example: Contractor working in an occupied Federal Employee space.

Electrical Hazards					**Comments**
Contact With Overhead Wires	Yes		Yes		
Live Electrical Systems or Equipment	Yes		Yes		
Other:					
Equipment Slippage Due To Slopes/Ground Conditions	Yes		Yes		
Earthquake	Yes		Yes		
Tsunami		No		No	
Avalanche		No		No	
Forest Fires	Yes		Yes		
Fire and Explosion Hazards	Yes		Yes		
Working in Isolation	Yes		Yes		
Working Alone	Yes		Yes		
Violence in the Workplace	Yes		Yes		
High Noise Levels		No		No	
Inclement weather	Yes		Yes		
High Pressure Systems		No		No	
Other:					
Hazardous Work Environments					
Confined Spaces / Restricted Spaces PSPC employees do not enter confined space.	Yes		Yes		If available, provide the contractor with the existing confined space assessment(s) for information only. Contractor must perform their own confined space assessment as per provincial regulations." Scarp Area"
Suspended / Mobile Work Platforms	Yes		Yes		
Other:					
Mould Proliferations		No		No	
Accumulation of Bird or Bat Guano	Yes		Yes		
Bacteria / Legionella in Cooling Towers / Process Water		No		No	
Rodent / Insect Infestation		No		No	
Poisonous Plants		No		No	
Sharp or Potentially Infectious Objects in Wastes					
Wildlife	Yes		Yes		
Asbestos Materials on Site	No		No		If "yes" a pre-project asbestos survey

					report is required. Provide Contractor with ELF Form 16 "Contractor Notification and Acknowledgement"
Designated Substance Present		No		No	If "yes" a pre-project designated substance survey report is required.
Chemicals Used in work	Yes		Yes		Hydroseeding / Fertilizer
Lead in paint		No		No	If "yes" a pre-project lead survey report is required.
Mercury in Thermostats or Switches		No		No	If "yes" a pre-project mercury survey report is required.
Application of Chemicals or Pesticides	Yes		Yes		Hydroseeding / Fertilizer
PCB Liquids in Electrical Equipment		No		No	
Radioactive Materials in Equipment	Yes		Yes		
Other:					
Contaminated Sites Hazards					
Hazardous Waste		No		No	
Hydrocarbons		No		No	
Metals		No		No	
Other:					

Security Hazards					**Comments**
Risk of Assault		No		No	
Other:					
Other Hazards					

Other Compliance and Permit Requirements[1]	YES	NO	**Notes / Comments**[2]
Is a Building Permit required?		X	
Is an Electrical permit required?		X	
Is a Plumbing Permit required?		X	
Is a Sewage Permit required?		X	
Is a Dumping Permit required?		X	
Is a Hot Work Permit required?		X	
Is a Permit to Work required?		X	Mandatory for ALL AFD managed work sites.
Is a Confined Space Entry Permit required?	X		Mandatory
Is a Confined Space Entry Log required	X		Mandatory for all Confined Spaces
Discharge Approval for treated water required		X	

Notes:

(1) Does not relieve Service Provider from complying with all applicable federal, provincial, and municipal laws and regulations.

(2) TBD means To Be Determined by Service Provider.

Service Provider Acknowledgement: We confirm receipt and review of this Pre-Project Hazard Assessment and acknowledge our responsibility for conducting our own assessment of project hazards, and taking all necessary

protective measures (which may exceed those cited herein) for performance of the work.			
Service Provider Name			
Signatory for Service Provider		**Date Signed**	
RETURN EXECUTED DOCUMENT TO PSPC DEPARTMENTAL REPRESENTATIVE PRIOR TO ANY WORK COMMENCING			