Associated Environmental

REPORT

Ministry of Transportation and Infrastructure

Highway 97 Skaha Hills Intersection Upgrade
Environmental Assessment

November 2016

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November 24, 2016
File: 2016-8177.000

Kirk Densmore
Environmental Services Coordinator
Ministry of Transportation and Infrastructure
231-447 Columbia Street
Kamloops, BC
V2C 2T3

Re: SKAHA HILLS INTERSECTION UPGRADE - ENVIRONMENTAL ASSESSMENT

Dear Mr. Densmore:

Associated Environmental Consultants Inc. (Associated) is pleased to provide this environmental assessment report for the Skaha Hills Intersection upgrade project at the south end of Penticton, BC. The project is located in an area that has already been disturbed by residential, commercial, and existing highway infrastructure. This report summarizes aquatic and terrestrial resources, soils, terrain, and land use values associated with the project, and presents the methods, results, and discussion of an environmental assessment of the area.

The report and its findings is based on the 100% preliminary design provided to Associated, and mitigation measures are presented in the report to avoid or reduce potential effects of the project on the environment.

Because of the extent of existing disturbance and relatively small new footprint of the project, there is not expected to be any residual or long term effects to the environmental values identified for the project, if mitigations outlined in the report are implemented.

We trust that this report provides you with the information needed to move the project forward. If you have any questions or comments about this report please contact the undersigned.

Yours truly,

Keenan Rudichuk, P.Biol.
Biologist

Reviewed by:

Corinna Hoodicoff, M.Sc., R.P.Bio.
Senior Biologist, Manager Environmental Assessment and Planning

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1 Introduction

1.1 PROJECT BACKGROUND

The BC Ministry of Transportation and Infrastructure (MOTI) is improving highway safety south of Penticton by upgrading the intersection where the Old Penticton-Oliver Highway meets Highway 97. Associated Environmental Consultants Inc. (Associated) was retained by MOTI to conduct an environmental assessment to characterize the existing biophysical condition and determine the potential effects of the Project on environmental values.

The objective of this environmental assessment is to assess the potential effects of the Project on the environment and develop strategies to avoid, reduce, or mitigate potential effects. Specific objectives of the environmental assessment are as follows:

- Describe the baseline environment and wildlife habitat quality in the Project Area.
- Identify potential environmental effects of construction and operation of the Project.
- Determine mitigation strategies and procedures to avoid or reduce any potential effects.
- Determine if there are any residual environmental effects that cannot be reasonably mitigated, and develop a compensation strategy for those effects.

This environmental assessment included a comprehensive review of information relevant to the Project. Field surveys were conducted to confirm the findings of the review and describe the environment. Results of the background review and field surveys were used to evaluate the potential effects on the environment and develop mitigation strategies for the construction and operation phases of the Project.

This environmental assessment focussed on the natural environment, and did not assess the effects of the Project on archaeological, cultural, or socio-economic values.

1.2 PROJECT DESCRIPTION

The Project is located at the north western end of Skaha Lake, amongst existing residential and commercial developments (Figure 1-1). The Project is located within the existing MOTI right-of-way, and is surrounded by the Penticton Indian Band Reserve (Penticton IR #1). The Project is expected to include the following activities:

- decommissioning of the existing intersection and construction of a new intersection;
- terrain re-shaping through cut-and-fill activities;
- highway widening to accommodate new lane configurations;
- property access upgrades, where required;
- stormwater infiltration basin construction along the Kettle Valley Railway right-of-way; and
- removal and upgrade of culverts on Skaha Creek to improve flow capacity.

The effects of the Project were assessed at the following spatial scales:

- **Project Area** – A 200 m buffer on either side of the proposed alignment centreline. This area is 33.7 ha and includes the Project Footprint and Project Right-of-Way. The Project Area will be subjected to direct and indirect effects of the Project on the environment.
- **Project Footprint** – The area that will be subjected to direct Project-related effects, including vegetation clearing to accommodate roadway infrastructure, road surface placement, shoulders and fill slopes. Based on the 100% preliminary designs, this area is 1.9 ha.
- **Project Right-of-Way** – The 1.7 ha area cleared of vegetation outside toe of fill that may be intermittently modified by mowing or brushing during long-term maintenance of Highway 97 and the Old Penticton-Oliver Highway. This area does not include the Project Footprint.

Figure 1 BC.mxd / 11/23/2016 / 4:26:55 PM

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FIGURE 1-1: PROJECT LOCATION

Ministry of Transportation and Infrastructure

Skaha Hills Intersection Upgrade

2 Regulatory Context

Legislation and regulations relevant to the Project are provided in the following subsections.

2.1 FISHERIES ACT

The federal *Fisheries Act* is designed to protect fish and fish habitat (RSC 1985, c. F-14). According to subsection 35 (1) of the *Fisheries Act*, "No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery."

The *Fisheries Act* could apply to the Project if there is potential for serious harm to fish or fish habitat. If serious harm to fish or fish habitat is possible, mitigation measures may be recommended to eliminate these effects. Based on the 100% preliminary design, a project review is not required under the *Fisheries Act*.

2.2 SPECIES AT RISK ACT

The *Species at Risk Act* (SARA) provides legal protection for species at risk designated under Schedule 1 of SARA (SC 2002, c. 29). The purpose of SARA is to prevent Canadian indigenous species, subspecies, and distinct populations from becoming extirpated or extinct; to provide for the recovery of endangered or threatened species; and to encourage the management of other species to prevent them from becoming at risk.

Based on 100% preliminary designs, the Project does not encroach on federal lands; however, the Project Area occurs on Penticton IR #1. Implementing protection measures for federally listed species and their habitat is considered good environmental stewardship, and recommendations to comply with SARA are presented in Section 6.

2.3 MIGRATORY BIRDS CONVENTION ACT

The *Migratory Birds Convention Act* protects migratory birds and nests from indiscriminate harvesting and destruction (SC 1994, c. 22). The *Migratory Birds Regulations* stipulate that "no person shall disturb, destroy, or take a nest, egg, nest shelter, eider duck shelter, or duck box of a migratory bird" (C.R.C., c. 1035). In addition, restrictions apply during the migratory bird breeding season (March 25 to August 15) (MOE 2015).

There is potential to contravene the *Migratory Birds Convention Act* especially if the timing of Project construction occurs during the migratory bird breeding season (between March 15 and August 15).

2.4 WATER SUSTAINABILITY ACT

The *Water Sustainability Act* is provincial legislation that protects the quality of water, fish, and wildlife habitat, and the rights of licensed water users (SBC 2014, c. 15). Any activities that result in changes occurring in or about a stream require Notification or Approval under Section 11 of the Act. This includes "any modification to the nature of a stream, including any modification to the land, vegetation, and natural environment of a stream or the flow of water in a stream," and "any activity or construction within a stream channel that has or may have an impact on a stream or a stream channel."

Culvert installation, maintenance or removal along Skaha Creek will require a Notification under Section 11 of the Act. A Notification must be submitted a minimum of 45 days prior to construction, and design specifications should be consistent with the Ministry of Forests, Lands, and Natural Resource Operations criteria for culvert replacement (Section 3:39(1) of SBC 2014, c.15).

2.5 WILDLIFE ACT AND WILDLIFE AMENDMENT ACT

The provincial *Wildlife Act* protects species from direct harm, except as allowed by regulation (e.g., hunting) (RSBC 1996, c. 488). Permits under the *Wildlife Act* that authorize certain activities, such as beaver dam removal or wildlife salvage, are issued by the Minister of Environment. In 2004, the *Wildlife Amendment Act* was passed to protect and recover species at risk as identified by the Lieutenant Governor in Council, making it an offense to kill, harm, harass, capture, or take a species at risk (Bill 51-2004).

The *Wildlife Act* could apply to the Project if vertebrate species are present during construction or if species at risk are identified within the Project Area at the time of construction. If any wildlife or their residences are found within the Project Area, a General *Wildlife Act* Permit and/or Animal Care Permit will be required if capture, salvage, or relocation of individuals is required. The specific requirements will depend on the species found.

2.6 WEED CONTROL ACT

The *Weed Control Act* designates provincially and regionally noxious or invasive weeds (RSBC 1996, c. 487). This Act provides guidelines for noxious or invasive weed prevention and management, and imposes a duty on all land occupiers to control designated noxious or invasive plants.

The *Weed Control Act* will apply to the Project because noxious or invasive plants occur within the proposed area of disturbance. If vegetation will be stripped and result in exposed soils, a Weed Management Plan may be required to manage the transport and germination of invasive plant species.

3 Methods

Two methods were followed to collect information for the Project: 1) a background information review of relevant documents and online resources, and 2) a field assessment that verified the findings of the background review and filled any gaps in information from the background review. The following subsections outline the methods followed for each.

3.1 BACKGROUND INFORMATION REVIEW

Background information was gathered to describe the existing environmental conditions and generate a list of rare or endangered fish, ecosystems, vegetation, or wildlife that have potential to be affected by the Project.

Associated reviewed the following information sources during the background information review:

- relevant technical reports that discuss existing conditions near the Project;
- recent orthophotographic imagery and Google Earth© online imagery[1];
- BC Conservation Data Centre (CDC) database for rare element occurrences[2];
- DataBC search using iMapBC online resource identification tool[2];
- BC Water Resources Atlas for ground and surface water information (MOE 2016a); and
- vascular and non-vascular plant identification handbooks and reference material.

The BC Conservation Data Centre (CDC) Species and Ecosystems Explorer (CDC 2016) was used to prepare lists of known and potential occurrences of species that are endangered, threatened, or of special concern within the Project Area. Vegetation and wildlife species that are confirmed to occur within a 5-km radius of the Project Area were compiled using iMapBC, and potential occurrences of vegetation and wildlife were compiled in the Okanagan Shuswap Forest District, Okanagan-Similkameen Regional District (CDC 2016). Results of the database query were then refined by removing those species that did not use habitats that occur in the Project Area. Results of the refined search for vegetation and wildlife occurrences are available in Appendix B and Appendix C, respectively.

Additional site-specific information about land use, fish and fish habitat, vegetation and ecosystems, and wildlife and wildlife habitat was provided by Elliott Tonasket of the Penticton Indian Band (PIB).

3.2 FIELD ASSESSMENT

Keenan Rudichuk, P.Biol. and Heather Hansen, P.Ag. of Associated conducted a field assessment with Elliott Tonasket (PIB) on October 25, 2016. The field assessment verified information gathered during the background review, confirmed mapped stream presence, and assessed the fish-bearing status of Skaha

[1] Google Earth© available online at: http://www.google.ca/earth/explore/products/

[2] BC CDC and iMapBC tool available online at: http://www.env.gov.bc.ca/cdc/

Creek. The creek was assessed at two sites: Site 1, from Skaha Lake to Highway 97, measured 225 m in length; and Site 2, from Highway 97 west to the Riva Ridge Mobile Home Park, measured 100 m in length.

A detailed stream card was completed at several locations along the assessed areas. Electrofishing was used to determine the presence or non-detection of fish in Skaha Creek. Data were collected and 1: 20,000 Fish and Fish Habitat Inventory Site Cards were completed to document aquatic habitat (RISC 2006).

The terrestrial assessment focussed on the Project Footprint and lands adjacent that may be affected by construction or operation of the Project. Terrestrial ecosystems were assessed for their condition and value to wildlife, and data were collected. Information collected during the terrestrial assessment included the following:

- physical site description (e.g., slope, aspect, elevation);
- vegetation composition and condition;
- existing disturbance (e.g., type and relative amount);
- ecosystem connectivity;
- wildlife sign (e.g., type, age, distribution, and abundance);
- potential for rare plants and wildlife to occur; and
- wildlife habitat features (e.g., type and location).

Data were compiled and used to determine direct and indirect Project-related effects on the environment. Mitigation measures were developed to avoid, reduce, or compensate for the potential effects of the Project.

3.3 EFFECTS ASSESSMENT

Information gathered during the background information review was used to describe the climate, biogeoclimatic zone, soil condition, and groundwater information. Information collected during the field assessment was used to describe existing environmental values, such as:

- surface water condition and location;
- fish and fish habitat potential in Skaha Creek;
- vegetation and ecosystems condition; and
- wildlife potential and wildlife habitat suitability.

To quantify effects, the Project Area was stratified into ecosystem classes mapped during the field assessment. Project effects were quantified based on the amount of area of each ecosystem class affected by the Project Footprint and Right-of-Way. The magnitude of the effects was qualified based on the condition of the existing environment relative to the proposed Project plan (e.g., if existing manicured lawns would remain following construction, then effects were considered temporary).

Project design was assessed to determine if effects could be avoided or reduced by altering design. Project effects on environmental values were assessed for the construction and operations phases of the Project.

4 Baseline Assessment

4.1 CLIMATE AND BIOGEOCLIMATIC CONDITION

The Project is located entirely within the Okanagan Very Dry, Hot Ponderosa Pine biogeoclimatic zone variant (PPxh1) (Meidinger and Pojar 1991). This zone occurs at low elevations in south-central B.C. (typically between 335 and 900 metres above sea level [masl]) and is often associated with the Interior Douglas fir and Bunchgrass biogeoclimatic zones. The mean elevation at the Project site was measured at 360 masl.

The climate of the area is characterized by warm, dry summers and cool winters with light snow (Meidinger and Pojar 1991). Annual average precipitation at the Penticton A climate station (Station ID: 1126150) is 53 mm, with approximately 17% (9 mm) falling as snow. The mean annual temperature for the area is 9.5ºC (Government of Canada 2016). Thirty-year climate normals data recorded at the Penticton A station indicate a mean summer temperature of 18ºC, and a mean winter temperature of 1ºC (Government of Canada 2016).

The Project is not expected to have an effect on climate or biogeoclimatic condition because the Project is relatively small in scale, short in duration, and effects of the operation phase will be similar to those already incurred by the existing road alignment.

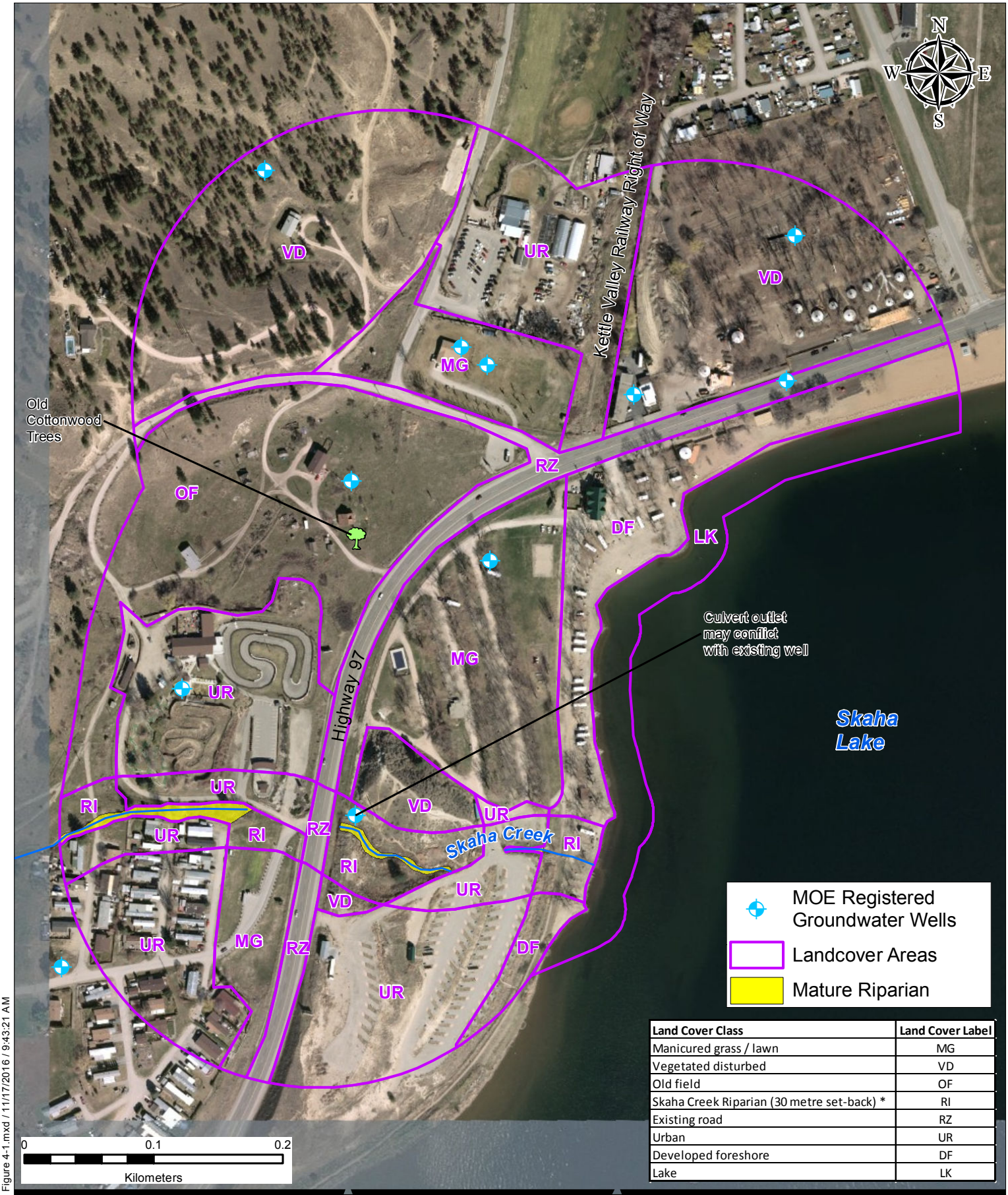
4.2 LOCAL AND REGIONAL LAND USE

Land outside of the Project Right-of-Way is entirely within the Penticton Indian Reserve #1, and has been developed into residential, business, and recreational properties (Figure 4-1). Skaha Hills community information center has been constructed with temporary buildings near the existing highway intersection, within the Project Footprint. The Skaha Meadows golf course parking lot is located at the north-western extent of the Project Area. The Barefoot Beach Resort is located just east of the golf course parking lot, and is accessed directly off Highway 97.

Land east of the Project Footprint between Highway 97 and Skaha Lake is managed by the Wright's Beach Camp RV Park. Land west of the Project Footprint has been developed into the Riva Ridge mobile home park in the south, rural residential housing north of Riva Ridge, and commercial businesses at the north western extent of the Project Area (Figure 4-1). A small parcel of land that was formerly known as Okanagan Amusements was being decommissioned at the time of the field assessment, and is currently exposed soils and stockpiled infrastructure. The Kettle Valley Railway right-of-way is oriented north-south through the Project Area. The railway is no longer in use, the rails and ties have been removed, and the rail bed has been re-graded. Approximately 10 power poles are located along the existing alignment, and will have to be relocated during the construction phase.

Penticton and the land surrounding Skaha Lake experience a high volume of seasonal tourism and recreational visitation over the summer months. Highway 97 south is a popular highway corridor for travellers seeking to visit the south Okanagan. Secondary highway routes such as the Old Penticton-Oliver

highway function as regular travel corridors for residents commuting to-and-from Penticton, and are popular scenic recreation routes.



Land Cover Class	Land Cover Label
Manicured grass / lawn	MG
Vegetated disturbed	VD
Old field	OF
Skaha Creek Riparian (30 metre set-back) *	RI
Existing road	RZ
Urban	UR
Developed foreshore	DF
Lake	LK

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FIGURE 4-1: LAND COVER CLASSIFICATION IN THE PROJECT

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Skaha Hills Intersection Upgrade

4.3 SOILS AND TERRAIN

Soils within the Project Footprint are already disturbed by existing road infrastructure (e.g., paved or gravel surface or road fill), or by commercial and residential developments. Terrain throughout the Project Area is low gradient, gradually sloping towards Skaha Lake. Terrain gradient steepens to the west, with a predominantly east-facing aspect in the hills above the Project Area. A natural mound located within the south extent of the Project Area was identified by Elliott Tonasket of the PIB as culturally significant; this mound has been disturbed by human influences (e.g., road construction, hiking trails). This mound is not expected to be disturbed by the Project.

The Kettle Valley Railway is oriented north-south through the Project Area. Soils within the right-of-way may be contaminated by hydrocarbons or leachates originating from the rail ties that once existed along the alignment. No soil contamination assessment was conducted for this EA, and the condition of these soils is unknown.

4.4 WATER RESOURCES

4.4.1 Groundwater

The Project Area is located on a single mapped aquifer (Aquifer Name 266 IIIC [8]) that is comprised of sand and gravel, has high productivity, low vulnerability, and low demand (Government of British Columbia 2016). Thirty (30) water wells are registered within the mapped aquifer associated with the Project Area (Habitat Wizard 2016). Five of the water wells registered are downgradient of the Project (Table 4-1). It should be noted that not all water wells are registered, and other water wells may occur downgradient of the Project Footprint.

A single registered water well (Well Tag Number 27421) is located in the south eastern extent of the Project Footprint, and may conflict with the location of a proposed culvert upgrade for Skaha Creek.

No specific groundwater survey was conducted for the Project.

Table 4-1 Water wells assumed to be downgradient to the Project

Well Tag Number	Depth to Water (m)	Reported Well Yield (U.S. Gal/min)
16070	39	10
25073	74	30
27421*	68	75
47813	5	30
98718	3	56

Source: iMapBC 2016
*Well head may conflict with design location of new culvert on Skaha Creek.

4.4.2 Surface Water

Skaha Creek occurs at the southern extent of the Project Footprint, which is located 225 m above its confluence with Skaha Lake (Figure 4-1). This second order stream flows west for approximately 5.6 km from its headwaters, which is located in the hills southwest of Penticton. Skaha Creek has a mapped, unnamed tributary approximately 2.5 km upstream of the Project Area. Source water for Skaha Creek comes from ponded meltwater that is non-fish bearing (Elliott Tonasket, personal communication). Skaha Creek flows through Penticton IR #1, passing under Highway 97 at the existing Riva Ridge intersection through a culvert under the highway. Drainage from the highway flows into Skaha Creek through two culverts upstream of the highway, before entering into a 600 mm corrugated steel culvert beneath the highway. In the Project Area, the creek flows through five culverts in total: three between Highway 97 and Skaha Lake (Site 1), and two directly above (west) of the highway (Site 2) (Figure 4-1).

A mapped unnamed creek (Habitat Wizard 2016) on the north end of the Project Area was found to be dry and have no defined channel during the field assessment. This unnamed creek is not considered a surface water source for the Project.

4.5 FISH AND FISH HABITAT

Skaha Creek was assessed for its habitat value for fish during the field assessment. Multiple fish barriers occur along the assessed section of Skaha Creek, below the highway (Figure 4-1); the stream gradient at Site 1 ranges from 6% to 12%, with two culverts having drops at their outlets of 10 cm and 28 cm (Appendix A, Photo 4-1). The channel has a man-made cascade with a rocky, stepped drop of approximately 1.5 m between the two culverts. While these barriers would be lessened during freshet, the high water mark of the

creek is below the bottom of each of these culverts, and they are therefore considered to be year-round fish barriers. These culverts will not be disturbed by construction; therefore, the existing barriers to fish passage will remain following construction. Site 2 has a gradient ranging from 9% to 12%, and also had a 30 cm drop in the channel bed. Construction adjacent (north) to the creek at Site 2 appears to have disturbed the natural channel, and slumping has occurred (Appendix A, Photo 4-2).

Overall, Skaha Creek has low habitat value for fish based on the stream's value for spawning, rearing, or overwintering habitat for species known to occur in Skaha Lake. While there is a high percentage of crown closure at the top of Site 1 and the top of Site 2, overall quality of the stream is low. Large woody debris and instream cover is absent at both Sites. The streambed consisted primarily of fines, with little gravels or cobbles (Appendix A, Photo 4-3). At the time of the assessment (October), the wetted area of the creek was narrow and shallow, with an average wetted width and depth of 0.7 m and 7.0 cm, respectively for Site 1, and 0.8 m and 8.0 cm, respectively, for Site 2. The channel widths were 1.0 m for Site 1, and 1.2 m for Site 2.

Electrofishing was conducted at Site 1 and Site 2 to determine fish presence in Skaha Creek, for a combined total of 304 seconds. Electrofishing produced no captures, and there were no visual signs of fish during electrofishing or the habitat assessment. Based on the results of the electrofishing, presence of significant fish barriers at the mouth of the creek, poor habitat value for fish, and lack of source population upstream, Skaha Creek is determined to be non-fish bearing.

4.6 VEGETATION AND ECOSYSTEMS

Vegetation and ecosystems in the Project Area are highly disturbed by existing residential, business, and roadway developments. Land that will be directly affected by the Project is within the MOTI right-of-way, and is comprised of grass seeded and regularly mowed areas, and areas dominated by non-native vegetation. Invasive species are common in the Project Area, and provincially noxious plants observed include diffuse knapweed (*Centaurea diffusa*) and Dalmatian toadflax (*Linaria genistifolia*). Land cover classifications in the Project Area is presented in Table 4-2.

Table 4-2 Land Cover Classification in the Project Area

Land Cover Class	Description	Area in m^2 (ha)**
Manicured grass / lawn	• Existing Right-of-Way or other manicured lawn • Native plants absent • Permeable surface	48,533 (4.9)
Vegetated disturbed	• Areas with some native vegetation • Moderate amount of disturbance • Permeable surface	78,598 (7.9)
Old field	• Old field, grazed land • Native plants common • Invasive plants prominent • Permeable surface	45,558 (4.6)
Riparian (30 metre set-back) *	• Shrubby, sparse tree cover • Manicured grass in places • Native plants prominent • Invasive plants common • Permeable surface	12,772 (1.3)
Existing road	• Existing paved surface, gravel road base, and shoulders visible from imagery • Impermeable surface	17,721 (1.8)
Urban	• Commercial or residential development • Highly disturbed • Impermeable surface	89,550 (9.0)
Developed foreshore	• Disturbed beachfront • Some permanent buildings, recreational vehicle pads, sparsely vegetated, sand and hard pack soils • Permeable surface	24,704 (2.5)
Lake	• Skaha Lake surface area within 200 m of Project Footprint centreline	18,915 (1.9)
Total Area		**33.6**

*30 metre set-back from Skaha Creek includes only permeable surfaces (e.g., manicured grass / lawn)
**m^2 equals square metres; ha = hectares.

Land east of the Project Footprint is classified as manicured grass and lawn, and is managed by the Wright's Beach Camp RV Park. Vegetation on the property is comprised of cultivated, mature deciduous trees, manicured grasses, and gravel access roads (Figure 4-1). Beach front land cover in this area is classified as developed foreshore, and is sparsely vegetated with recreational vehicle pads located just above the shoreline of Skaha Lake. Beyond the shoreline of the lake, a 30 m buffer into Skaha Lake was included in the assessment to assess potential effects of surface runoff on the foreshore and littoral zones of the lake.

Riparian habitat adjacent to Skaha Creek is affected by urban encroachment and vegetation clearing, and only a small component (0.2 ha) remains mature riparian ecosystem (Figure 4-1). Much of the area along Skaha Creek that has been cleared of native vegetation has been replaced with manicured grass. Land cover within 30 m of Skaha Creek, whether it is native or manicured, has been classified as riparian, except where urban land cover encroaches on the 30 m setback. A total of 1.3 ha of riparian area exists in the Project Area, and is comprised of black cottonwood (*Populus trichocarpa*), trembling aspen (*Populus tremuloides*), tall Oregon grape (*Mahonia aquifolium*), willow (*Salix* sp.), and Douglas maple (Figure 4-1).

Land cover west of the Project Footprint is classified as an old field ecosystem, and is vegetated with a mix of native and invasive plant species (Figure 4-1). Two residential houses exist in this area, and the area appears to have been cleared for grazing or other agricultural activity at one time. This area is predominantly vegetated with non-native species such as tall tumble mustard (*Sisymbrium altissimum*), Dalmatian toadflax (noxious), and Russian thistle (*Salsola tragus*). Native vegetation in this area is comprised of grasses (e.g., sand dropseed [*Sporobolus cryptandrus*] and rough fescue [*Festuca campestris*]), shrubs (e.g., tall Oregon grape and saskatoon [*Amelanchier alnifolia*]). The few trees that do occur on the property consist of cultivated fruit trees and three old, decaying black cottonwood trees that have been topped at approximately 2.5 m height. The black cottonwood trees closest to the Project Footprint have a number of cavities excavated in their boles (Figure 4-1).

Vegetated disturbed land cover in the Project Area is defined as areas that are vegetated with native species, or are dominated by a tree canopy, yet still have a relatively moderate amount of disturbance. These areas differ from old field ecosystems in that vegetated disturbed lands do not appear to have been cleared in the past, and the native plant community is largely intact.

Urban land cover is found throughout the Project Area, and is predominantly comprised of impermeable surfaces (e.g., housing, paved surface). The Riva Ridge mobile home park, the site of the old Okanagan Amusements Park, and the Skaha Meadows golf course parking lot are all classified as urban land cover (Figure 4-1).

The only rare plant listed to occur within 5 kilometers of the Project Area is flat-topped broomrape (*Orobanche corymbosa ssp. mutabilis*; provincially Blue-listed). Based on habitats found in the Project Area, it is unlikely that flat-topped broomrape exists in the area. No other rare plants were observed, and no rare plants are expected to be affected by the Project due to the extent of existing disturbance.

Appendix B presents a list of rare plants with potential to occur in the Project Area based on habitat suitability for each plant. Table 4-2 presents the amount of each mapped land cover class observed in the Project Area.

4.7 WILDLIFE AND WILDLIFE HABITAT

The Project Area provides suitable habitat for a number of wildlife species. Because of the existing disturbance, small mammals such as mice, voles, or shrews are likely the most common habitat users in the Project Area, relying on the old field, riparian, and vegetated disturbed habitat for forage, cover, nesting or rearing. Birds such as raptors, woodpeckers, or small passerine birds are likely the next most common users of habitat in the Project Area, and may be found using trees or shrubs throughout the area. Raptors may use the large trees east of the highway for perching, and use the open areas for hunting, woodpeckers may use the cavities in the old cottonwood trees in the old field for nesting, and passerines will use trees and shrubs in all habitats for forage, cover, or nesting.

Reptiles such as Great Basin gopher snakes (*Pituophis catenifer deserticola;* listed under Schedule 1 of SARA as Threatened[3]), common garter snakes (*Thamnophis elegans*), or lizards are likely to be found in the old field land cover the Project Area, using habitats north of the highway for forage, cover, or denning (Figure 4-1).

Larger wildlife like deer (*Odocoileus* sp.), California bighorn sheep (*Ovis canadensis*), and black bear (*Ursus americanus*) may be found using habitats in the old field, riparian, or vegetated disturbed areas for forage, cover, or general living; however, habitats found in the Project Area only provide marginal habitat value for these species because of the extent of existing disturbance and lack of forage and overhead canopy.

Appendix C presents a list of rare wildlife with potential to occur within the Project Area based on habitat suitability for the wildlife. Table 4-3 presents a list of provincially or federally listed wildlife species that are known to occur within 5 km of the Project Area. None of the species listed were observed, and no critical habitat features (e.g., nests, dens, or burrows) were identified during the field assessment.

[3] Species listed as Threatened under the *Species at Risk Act* (SARA) are likely to become endangered if limiting factors are not reversed.

Table 4-3 Rare Species Reported within 5 km of the Project Area

Group	Common Name	Scientific Name	BC List	SARA Schedule	Probability of Occurrence
Birds	Canyon Wren	*Catherpes mexicanus*	Blue		Low*
Birds	Lewis's Woodpecker	*Melanerpes lewis*	Blue	1-T (2012)	Moderate**
Birds	Western Screech-owl, Macfarlanei Subspecies	*Megascops kennicottii macfarlanei*	Red	1-E (2005)	Low*
Birds	White-throated Swift	*Aeronautes saxatalis*	Blue		Low*
Mammals	Pallid Bat	*Antrozous pallidus*	Red	1-T (2003)	Low*
Reptiles	Western Skink	*Plestiodon skiltonianus*	Blue	1-SC (2005)	High***
Reptiles	Desert Nightsnake	*Hypsiglena chlorophaea*	Red	1-E (2011)	Low*
Reptiles	Great Basin gopher snake	*Pituophis catenifer deserticola*	Blue	1-T (2005)	High***
Reptiles	North American Racer	*Coluber constrictor*	Blue	1-SC (2006)	High***

Source: CDC 2016

*Habitat does not exist in the Project Area

**Some marginal habitat exists in the Project Area.

***Suitable habitat exists, and there is a high likelihood that this species uses habitats in the Project Area.

[1]B.C. Status: Red-listed: indigenous species or subspecies (taxa) considered Extirpated, Endangered, or Threatened in B.C.; Blue-listed: indigenous taxa considered vulnerable in B.C.

[2]*Species at Risk Act* (SARA): E = Endangered: A species at risk of extirpation or extinction as a result of habitat loss or other factors. T = Threatened: A species that is likely to become endangered if limiting factors are not reversed. SC = Special Concern: A species of special concern because of characteristics that make it is particularly sensitive to human activities or natural events.

5 Effects Assessment

5.1 DESIGN PHASE

The design follows the existing alignment along Highway 97 and requires minimal encroachment into undisturbed lands. The new intersection approach from the Old Penticton-Oliver Highway (i.e., from the west) will be constructed on relatively level, vegetated terrain south of the existing approach to the highway. The proposed 100% preliminary design affects already disturbed land and improves safety for motorists and pedestrians.

The design includes the upgrade of three culverts above Highway 97, on Skaha Creek. The upgrade will replace the existing 600 mm diameter culverts with new 1,400 mm diameter culverts to accommodate flows associated with changes to the regional climate, and will benefit Skaha Creek and Skaha Lake by increasing flood water capacity, thereby reducing the potential for backwatering, erosion, and sediment transport during high flow events.

The upgrade of the culvert beneath Highway 97 has potential to conflict with an existing well head (Figure 5-1). Future design and construction activities should avoid this well head by aligning the new culvert south of the well head, along the natural course of Skaha Creek.

5.2 CONSTRUCTION PHASE

The following sections describe potential effects of the Project on the environment during the construction phase. Activities associated with the construction phase include vegetation stripping and temporary storage on-site (until it is trucked off-site), and soil grubbing and storage on-site. Potential effects of the Project can be avoided or reduced by implementing mitigation measures proposed in Section 6.

5.2.1 Local and Regional Land Use

The Project will require the decommissioning and relocation of the Skaha Hills community information center to accommodate the new western approach to the intersection. However, the buildings at this site are mobile (i.e., temporary construction) and can be moved with little effort. Consultation with this business owner well in advance of construction will reduce the effect of relocation on the business.

Temporary disruption to local and regional land use is anticipated during the construction phase of the Project. Construction activities will result in slowed traffic, road closure, and temporary detour in the area. Road closures may result in decreased access to local businesses or travellers using the Old Penticton-Oliver Highway, but effects are considered temporary. Following construction, the Project will result in safer pedestrian routes across the highway, and improve safety access for motorists entering and exiting Highway 97 from the Old Penticton-Oliver Highway.

Potential effects of construction can be mitigated through the development and implementation of a Traffic Control and Safety Plan that considers pedestrian traffic and any concerns raised by the local community through consultation.

5.2.2 Water Resources and Fish Habitat

The upgrade of culverts on Skaha Creek will require the removal of three existing culverts, and the installation of three new culverts beneath Highway 97. This and other construction activities (e.g., terrain filling) near Skaha Creek may cause reduced water quality if sediments are introduced into the creek. Reduced water quality may result in reduced habitat quality for fish where the creek discharges into Skaha Lake. Based on mapping provided in the Okanagan Large Lakes Foreshore Protocol, critical kokanee spawning habitat exists approximately 250 m south of the discharge point of the creek into Skaha Lake, and sediment suspended in Skaha Creek may affect this spawning area (MOE 2009).

The installation of a new culvert on Skaha Creek beneath Highway 97 has potential to conflict with a single water well (Well Tag Number 27421, located at UTM 310740E, 5480590N) (Figure 5-1). Depending on the final alignment of the new culvert, the well may need to be decommissioned, or the alignment of the culvert adjusted. Construction activities near the well head have potential to result in changes to water quality; however, these effects are considered temporary and can be avoided through mitigations presented in Section 6.

The Project is expected to affect approximately 924 m^2 of the Kettle Valley Railway right-of-way to accommodate a new stormwater retention pond. The placement of soils excavated for the stormwater retention pond and surface water runoff into the pond may have an effect on subsurface water quality. The construction of a stormwater retention pond will concentrate surface runoff and encourage it to go to ground (i.e., infiltrate the soil). If soils beneath the right-of-way have been contaminated by operations in the past, the concentration of stormwater may promote leaching of contaminants into the groundwater, affecting groundwater quality. Depending on the location of soil storage excavated from the stormwater retention pond, the local aquifer and existing groundwater wells located within the aquifer may be affected by changes to water quality if contaminants in the soil leach into the groundwater.

There are no anticipated direct effects on fish or fish habitat if mitigations presented in Section 6 are implemented.

5.2.3 Vegetation and Ecosystems

The Project Footprint will alter an estimated 1.1 ha of previously disturbed ground cover, comprised of invasive plant species and grassy right-of-way, to allow for new paved surface, road shoulder, and road fill (Figure 5-1). The rest of the Project Footprint (0.8 ha) is existing paved surface that will be repaved. No large trees, native vegetation, or undisturbed ecosystems are expected to be affected by the Project. Table 5-1 summarizes the area of each land cover class that will be affected by the Project.

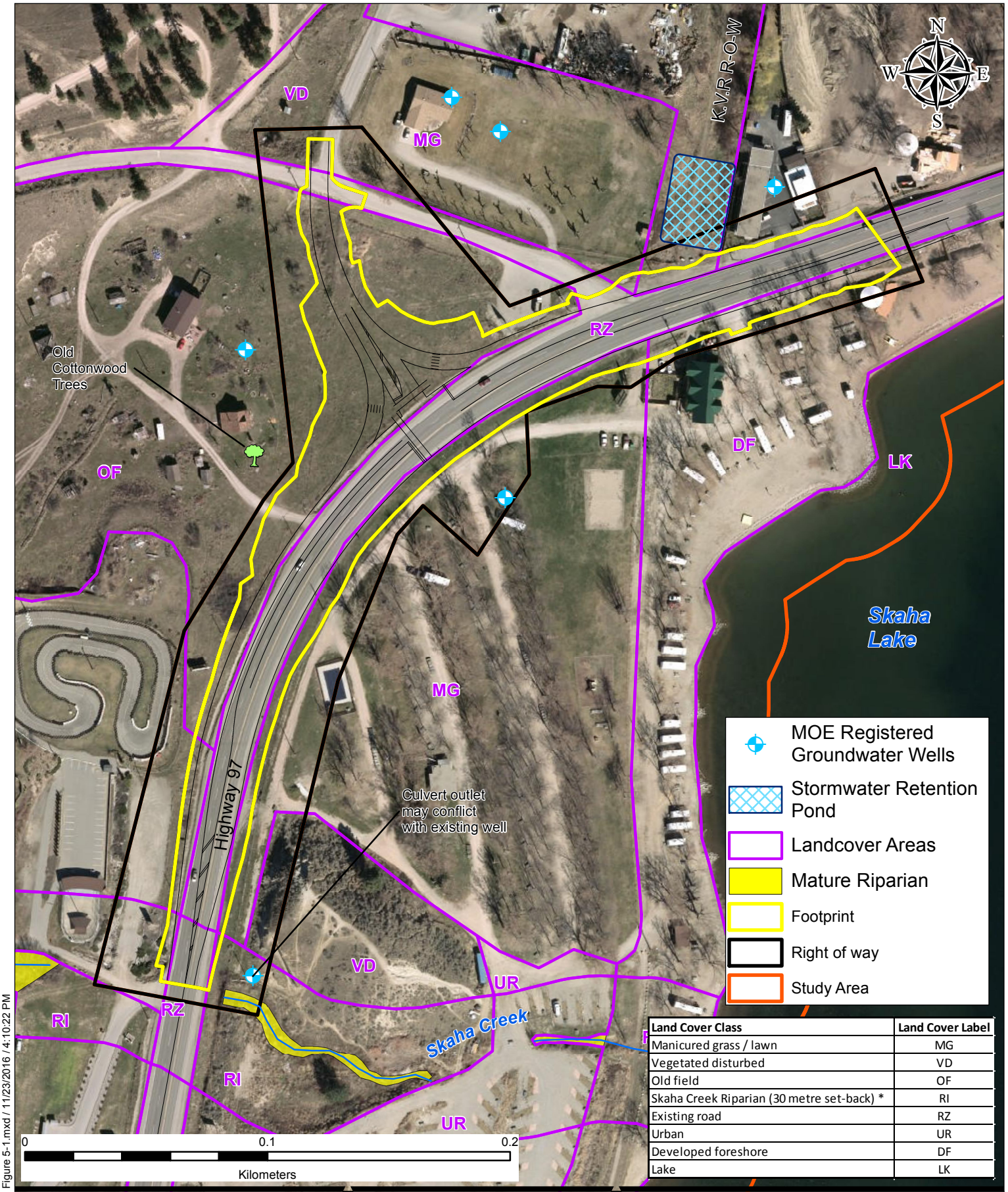
The Project Footprint will encroach on approximately 33 m^2 of the 30 m riparian setback on Skaha Creek to accommodate the culvert replacements; however, the area that will be affected is highly disturbed and is comprised of paved surface, invasive plants, and access road infrastructure for the Riva Ridge mobile home park. Effects to the riparian area along Skaha Creek will benefit the flow capacity of the creek, and is not expected to reduce the amount or quality of riparian vegetation that currently exists. Mitigations to avoid or reduce effects on riparian values are presented in Section 6.

Invasive plants are common in the Project Area, and vegetation clearing, soil grubbing, and soil stockpiling increases the potential for spread of these plants or their seeds. Seeds from stripped vegetation, or those stored in the soil, may be distributed to areas where they did not previously exist. Equipment movement on-site (i.e., within the Project Footprint) has potential to spread invasive plants, and equipment movement off site (e.g., outside the Project Area) has potential for invasive plant spread off-site to new ecosystems. The spread of invasive plants will reduce the overall quality of any ecosystems they germinate in.

Table 5-1 Land Cover Class Affected by the Project

Land Cover Class	Project Area in m^2 (ha)*	Project Footprint in m^2 (% of Project Area)	Project Right-of-Way** in m^2 (% of Project Area)
Manicured grass / lawn	48,533 (4.9)	2,051	5,407
Vegetated disturbed	78,598 (7.9)	298	1,687
Old field	45,558 (4.6)	6,050	4,855
Riparian (30 metre set-back) ***	12,772 (1.3 ha)	33	583
Existing road	17,721 (1.8)	8,270	915
Urban	89,550 (9.0)	1,828	2,761
Developed foreshore	24,704 (2.5)	931	678
Lake	18,915 (1.9)	-	-
Total Area	**336,361 (33.7)**	**19,461 (6%)**	**16,886 (5%)**

Note:
**Project Right-of-Way is in addition to Project Footprint.
***30 metre set-back from Skaha Creek includes only permeable surfaces (e.g., manicured grass / lawn)



Land Cover Class	Land Cover Label
Manicured grass / lawn	MG
Vegetated disturbed	VD
Old field	OF
Skaha Creek Riparian (30 metre set-back) *	RI
Existing road	RZ
Urban	UR
Developed foreshore	DF
Lake	LK

Figure 5-1.mxd / 11/23/2016 / 4:10:22 PM

Associated Environmental

PROJECT NO.: 2016-8122.000.002
DATE: November 2016
DRAWN BY: DA

FIGURE 5-1 LAND COVER CLASSES AFFECTED BY THE PROJECT

Ministry of Transportation and Infrastructure

Skaha Hills Intersection Upgrade

5.2.4 Wildlife and Wildlife Habitat

The construction of the new western approach from the Old Penticton-Oliver Highway will fragment existing habitat that small mammals and reptiles may use, creating a small, isolated island of habitat between the new alignment and the existing alignment (Figure 5-1). Decommissioning the existing alignment will remove barriers to movement and provide habitat for small wildlife, especially if the area is re-planted and invasive species management is implemented.

The western approach is aligned near an historic building that is situated next to three old, decaying black cottonwood trees that have multiple cavities in their bole, which are suitable cavity nests for woodpeckers or other small birds (Figure 5-1). The Project is not anticipated to affect the historic building, but may result in the disturbance or removal of the trees and nesting habitat. Occupied nests are protected under the *Migratory Birds Convention Act.* If construction occurs during the breeding bird window (approximately March 15 and August 15), these features cannot be disturbed unless the nests are not occupied, which is defined as a 72-hour period where no adult bird has visited the nest.

Large ranging wildlife, such as deer, may avoid habitats near the Project or alter their movement patterns as a result of construction activities; however, these effects are considered temporary, lasting for the duration of construction. Small ranging wildlife, such as mice and voles, using habitats within the Project Footprint may be affected during construction because their home ranges and daily dispersals may not be large enough to avoid construction. Vegetation clearing and soil grubbing may disturb or kill small ranging wildlife using habitats in these areas.

Potential effects of the Project on wildlife and wildlife habitat can be avoided or reduced by implementing mitigation measures presented in Section 6.

5.3 OPERATION PHASE

The following sections describe potential effects of the Project on the environment during the operation phase. Activities associated with the operation phase include regular mowing or side-casting of materials (e.g., snow or gravel) within the Right-of-Way. Potential effects of the Project can be avoided or reduced by implementing mitigation measures proposed in Section 6.

5.3.1 Local and Regional Land Use

The Project will increase safety for pedestrians crossing the highway and vehicles entering or exiting Highway 97 at the Old Penticton-Oliver highway intersection. The operation phase will improve traffic flow through Penticton during all seasons, especially during the summer when traffic is at its peak from tourism and recreation.

5.3.2 Water Resources and Fish Habitat

Operational effects on water resources and fish habitat in the Project Area are largely restricted to seasonal maintenance. Winter snow plowing and the application of salt, sands, or gravels could increase sedimentation and temporarily reduce the quality of surface water flowing to Skaha Lake, which may affect fish habitat in the lake. Patching and sealing of pavement surfaces may result in runoff of chemical compounds into surface water or leaching into groundwater resources. Since all of these applications are followed under current practice, none of these activities are expected to result in changes to water resources or fish habitat in the Project Area, and effects to water resources are anticipated to be minimal if standard environmental best practices and recommended mitigation measures are implemented (MOTI 2011)

5.3.3 Vegetation and Ecosystems

Regular maintenance (e.g., mowing, brushing) of the Right-of-Way will affect approximately 1.7 ha of previously disturbed, grass-dominated ecosystems. Regular maintenance, such as mowing, will affect vegetation in the Project Right-of-Way by reducing vegetation height and percent cover, and may promote the growth of invasive plants. Winter road salting and snow plowing may affect vegetation growth and health, or result in the salinization of soils, which will affect the success of native vegetation growth. Operation phase effects on vegetation and ecosystems are anticipated to be minimal if standard environmental best practices (e.g., MOTI 2011), and recommended mitigation measures are implemented.

5.3.4 Wildlife and Wildlife Habitat

Effects of the highway on wildlife and wildlife habitat will not change from current conditions during the operational phase. Currently, the highway poses the risk of mortality to wildlife trying to cross the highway to access Skaha Lake, and the upgrades are not expected to increase or decrease that risk.

Small ranging wildlife movement may change as a result of the new west approach; however, a culvert proposed beneath the west approach may increase wildlife permeability across this section, reducing the potential for wildlife mortality from vehicles.

6 Mitigations and Recommendations

Construction activities should follow the recommendations set out in the 2012 Standard Specifications for Highway Construction, Section 165: Protection of the Environment (MOTI 2011) in addition to developing a Project-specific Construction Environmental Management Plan (CEMP) that incorporates the findings and mitigations presented in this report. The following preliminary mitigation measures will assist MOTI in planning and executing the proposed intersection upgrade.

Before work begins, a Section 11 Notification for works planned on Skaha Creek should be submitted to FrontCounter BC. Notifications can take up to 45 days to process and should be submitted as soon as possible to prevent Project delays or additional costs.

Before work begins, the soil within the footprint of the proposed stormwater retention pond should be tested for contamination exceedance under the Contaminated Sites Regulation. If contaminated, the soils should be appropriately remediated. If it is not considered contaminated, then the soil can be stockpiled in a location that is at least 30 m from any watercourse, including drainage ditches along roads and highways, unless completely isolated from the watercourse with silt fence.

6.1 DESIGN

Before ground work begins, identify locations for stockpile of soils and vegetation to prevent the spread of invasive plants or introduction of deleterious substances into the groundwater.

Design the culvert replacement on Skaha Creek to avoid Well Tag Number 27421 by aligning the new culvert south of the creek well head, along the natural course of Skaha Creek.

6.2 CONSTRUCTION

Construction contractors should retain a Qualified Environment Professional (QEP) to advise on construction practices to mitigate the overall environmental effects of the Project. An Environmental Monitor (EM), under guidance from the QEP, should be on-site to monitor works around Skaha Creek to ensure mitigations are in place to prevent sedimentation of the creek, and around the historic building to ensure the wildlife trees near the new west approach are protected from direct disturbance (e.g., cutting or felling).

Prior to construction, develop a comprehensive and site-specific Construction Environmental Management Plan (CEMP) that addresses erosion and sediment control and wildlife management, and complies with least-risk timing windows for breeding birds. Ensure that the CEMP incorporates the following recommendations to mitigate effects of the Project on the environment during road construction.

- **Prevent the spread of invasive plants.**
  - The Project Area is a source for invasive plant translocation outside of the Project Area, and spread of invasive plants off-site should be strictly controlled. Develop and implement

a Weed Management Plan that considers construction personnel, soil stockpiling, equipment and machinery use entering or exiting the site.
  - Ensure that all equipment, including vehicles, clothing, and footwear, is free of invasive plant material before entering or exiting the work site.
  - Re-vegetate disturbed soils immediately following construction with a native grass seed mix to promote grass-dominated vegetation over invasive plants germination.

- **Protect vegetation and ecosystems and wildlife and wildlife habitat.**
  - Complete a site reconnaissance with the EM and contractor to determine the extent of site clearing activities and ensure that the Project Footprint and Right-of-Way are clearly defined, and the historic building and wildlife trees nearby are not disturbed.
  - Avoid clearing vegetation between **March 15 and August 15** during the breeding bird window. If construction is scheduled between March 15 and August 15, have an EM familiar with nesting bird surveys conduct a survey immediately prior to construction throughout the entire Project Footprint to ensure no birds are nesting during construction. If the nests are occupied, avoid disturbing the trees, birds, or nests until the chicks have fledged and the nests abandoned, which can be defined as a 72-hour period where no adult has visited the nest.
  - Construction work may need to be temporarily delayed if wildlife are observed using habitats scheduled for construction. A General *Wildlife Act* Permit or Animal Care Permit will need to be obtained to disturb any wildlife using habitats in the Project Area.
  - To minimize human-wildlife conflicts, the construction site and site facilities must remain free of wildlife attractants.

- **Isolate Skaha Creek from construction activities.**
  - Conduct work in the dry during removal and installation of culverts on Skaha Creek, to the extent possible. Install silt fence in any locations where sediment generated from culvert works may enter the creek and be transported downstream.
  - Prior to clearing or disturbance, have the EM survey the site with the contractor and install silt fence in areas where overland water flow may reach Skaha Creek or Skaha Lake. Isolate works from Skaha Creek using silt fence buried at least 10 cm below the existing surface area, and of sufficient length that sediment will not breach the fence during intense rain events.
  - Cover or regularly wet areas that have been cleared of vegetation to reduce erosion potential and fugitive dust disturbance.

- **Protect ground water resources.**
  - Prepare a staging area that is at least 30 m away from any water receiving areas or Skaha Lake before ground clearing work begins. Isolate the area with silt fencing to prevent overland flow of deleterious materials during large rain events.
  - Protect the well head of Well Tag Number 27421 (located near Skaha Creek). Communicate the potential for increased turbidity of well water during construction to the licenced users of the well.

- Immediately address spills of hazardous materials (e.g., fuels or oils) in accordance with MOE operational guidelines for spill response (MOE 2014).

- **Maintain local and regional land use and traffic flow, to the extent possible.**
  - Where feasible, schedule construction activities at times when traffic volumes are lower, and implement strategies to maintain local and regional traffic flow by consulting with land users and developing and implementing a Traffic Control and Safety Plan that considers pedestrian flow, business traffic, and motorists traveling through the Project Area.

6.3 OPERATIONS

The following mitigation measures are intended to offset the effects of the operation and routine maintenance of the highway:

- **Protect ground water resources and fish habitat**
  - Conduct maintenance works during dry weather periods to minimize surface runoff of deleterious substances into adjacent habitat. When this is not possible, implement adequate site isolation (e.g., silt fencing) measures to keep contaminants contained.
  - For patching, sealing, seasonal surface cleaning, or salt application on Highway 97 or the Old Penticton-Oliver Highway, ensure that activities are completed with adequate environmental protection measures in place particularly when working in close proximity to water receiving areas. Silt fencing and spill response kits to prevent the release of toxic substances into the habitat may be required.
  - During culvert maintenance, ensure adequate site isolation and protection measures are implemented to prevent sediment from travelling downslope, as necessary.

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Appendix A – Photographs

Photo 4-1: Location of fish barriers along Skaha Creek. Blue arrow indicates outlet with 28 cm drop.

Photo 4-2: Construction alteration of Skaha Creek above Highway 97 at Site 2. Slumping, erosion, and sediment transport has occurred, indicated by the blue arrow.

Photo 4-3: Skaha Creek is comprised of cobbles, gravels, and fines.

Appendix B - Rare Plants with Potential to Occur

Common Name	Scientific Name	BC List	SARA List
Thurber's needlegrass	*Achnatherum thurberianum*	Red	
nettle-leaved giant-hyssop	*Agastache urticifolia*	Blue	
cut-leaved water-parsnip	*Berula erecta*	Blue	
narrow-leaved brickellia	*Brickellia oblongifolia var. oblongifolia*	Blue	
Columbian carpet moss	*Bryoerythrophyllum columbianum*	Blue	1-SC (Jul 2005)
porcupine sedge	*Carex hystericina*	Blue	
tiny tassel	*Crossidium seriatum*	Blue	
red-rooted cyperus	*Cyperus erythrorhizos*	Blue	
Didymodon sp.	*Didymodon brachyphyllus*	Red	
ovate spike-rush	*Eleocharis ovata*	Blue	
Encalypta sp.	*Encalypta intermedia*	Blue	
rusty cord-moss	*Entosthodon rubiginosus*	Blue	1-E (Aug 2006)
Grimmia sp.	*Grimmia plagiopodia*	Red	
sulphur lupine	*Lupinus sulphureus*	Red	

Common Name	Scientific Name	BC List	SARA List
hairy water-clover	*Marsilea vestita*	Red	
oniongrass	*Melica bulbosa*	Blue	
nugget moss	*Microbryum vlassovii*	Red	1-E (Mar 2009)
Snake River cryptantha	*Oreocarya sheldonii*	Red	
Grand Coulee owl-clover	*Orthocarpus barbatus*	Red	1-E (Aug 2006)
Orthotrichum sp.	*Orthotrichum hallii*	Red	
winged combseed	*Pectocarya penicillata*	Red	
branched phacelia	*Phacelia ramosissima var. ramosissima*	Red	1-E (Aug 2006)
showy phlox	*Phlox speciosa ssp. occidentalis*	Red	1-T (Aug 2006)
alkaline wing-nerved moss	*Pterygoneurum kozlovii*	Blue	1-T (Aug 2006)
Pterygoneurum sp.	*Pterygoneurum lamellatum*	Red	
Schistidium cp.	*Schistidium heterophyllum*	Blue	
Ute lady's tresses	*Spiranthes diluvialis*	Red	

Source: CDC 2016; species list truncated based on the availability of suitable habitat in the Project Area.
Note: Bold species reported by Elliott Tonasket, Penticton Indian Band.
[1]B.C. Status: Red-listed: indigenous species or subspecies (taxa) considered Extirpated, Endangered, or Threatened in B.C.; Blue-listed: indigenous taxa considered vulnerable in B.C.
[2]Species at Risk Act (SARA): E = Endangered: A species at risk of extirpation or extinction as a result of habitat loss or other factors. T = Threatened: A species that is likely to become endangered if limiting factors are not reversed. SC = Special Concern: A species of special concern because of characteristics that make it is particularly sensitive to human activities or natural events.

Appendix C - Rare Wildlife with Potential to Occur

Class	Common Name	Scientific Name	BC List	SARA List	Likelihood of Occurrence
Amphibian	Blotched Tiger Salamander	*Ambystoma mavortium*	Red	1 (Jun 2003)	Moderate
Amphibian	Western Toad	*Anaxyrus boreas*	Blue	1-SC (Jan 2005)	Moderate
Amphibian	Great Basin Spadefoot	*Spea intermontana*	Blue	1-T (Jun 2003)	Moderate
Bird	Grasshopper Sparrow	*Ammodramus savannarum*	Red		Moderate
Bird	Swainson's Hawk	*Buteo swainsoni*	Red		Low
Bird	Lewis's Woodpecker	*Melanerpes lewis*	Blue	1-T (Jul 2012)	High
Bird	Williamson’s sapsucker	*Sphyrapicus thyroideus*			
Invertebrate	Rocky Mountain Ridged Mussel	*Gonidea angulata*	Red	1-SC (Jul 2005)	Moderate
Mammal	Western Small-footed Myotis	*Myotis ciliolabrum*	Blue		Low
Mammal	Fringed Myotis	*Myotis thysanodes*	Blue	3 (Mar 2005)	Low
Mammal	Columbia Plateau Pocket Mouse	*Perognathus parvus*	Blue		High

Class	Common Name	Scientific Name	BC List	SARA List	Likelihood of Occurrence
Mammal	Western Harvest Mouse	*Reithrodontomys megalotis*	Blue	1-SC (Mar 2009)	High
Mammal	Merriam's Shrew	*Sorex merriami*	Red		High
Mammal	Preble's Shrew	*Sorex preblei*	Red		High
Reptile	North American Racer	*Coluber constrictor*	Blue	1-SC (Aug 2006)	High
Reptile	Western Rattlesnake	*Crotalus oreganus*	Blue	1-T (Jul 2005)	Moderate
Reptile	Gopher Snake, *deserticola* subspecies	*Pituophis catenifer deserticola*	Blue	1-T (Jan 2005)	High
Reptile	Western Skink	*Plestiodon skiltonianus*	Blue	1-SC (Jan 2005)	High

Source: CDC 2016

[1]B.C. Status: Red-listed: indigenous species or subspecies (taxa) considered Extirpated, Endangered, or Threatened in B.C.; Blue-listed: indigenous taxa considered vulnerable in B.C.

[2]*Species at Risk Act* (SARA): E = Endangered: A species at risk of extirpation or extinction as a result of habitat loss or other factors. T = Threatened: A species that is likely to become endangered if limiting factors are not reversed. SC = Special Concern: A species of special concern because of characteristics that make it is particularly sensitive to human activities or natural events.

Appendix D - Drawings

BRITISH COLUMBIA

Ministry of Transportation and Infrastructure

PROJECT NO. 5523990

HIGHWAY 97
SKAHA HILLS DRIVE
INTERSECTION IMPROVEMENT

100% PRELIMINARY DESIGN

JUNE 30, 2016

McElhanney
McElhanney Consulting Services Ltd.

HALFSIZE

DRAWING INDEX	
R2-XXX-001	KEY PLAN, LOCATION MAP AND DRAWING INDEX
R2-XXX-002	LEGEND
R2-XXX-101B	PLAN
R2-XXX-201 - 202	PROFILE
R2-XXX-301	TYPICAL SECTIONS AND DETAILS
R2-XXX-401B	LANING AND GEOMETRICS

BRITISH COLUMBIA | Ministry of Transportation and Infrastructure

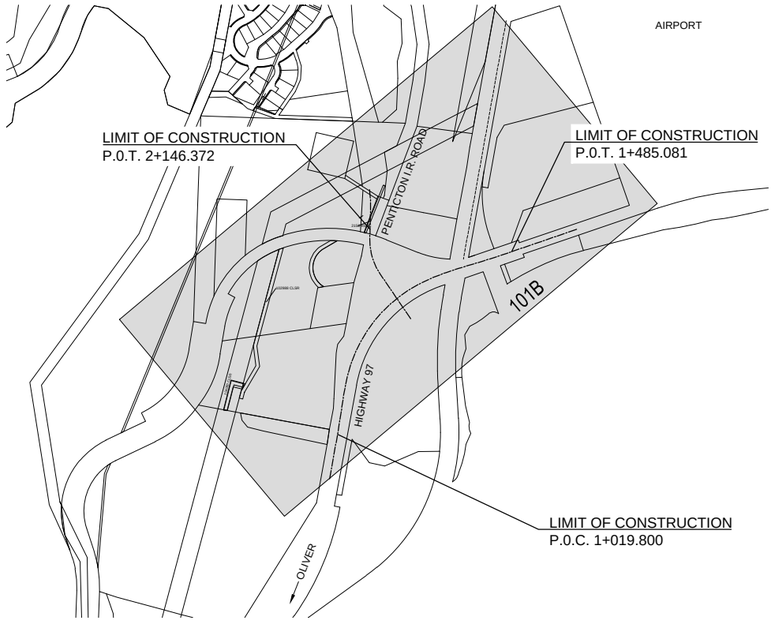
PROJECT No. 5523990

HIGHWAY 97
SKAHA HILLS DRIVE INTERSECTION IMPROVEMENT

HIGHWAY 97 SKAHA HILLS DRIVE

STA 1+019.88 - STA 1+478.66

0.459 km



KEY PLAN

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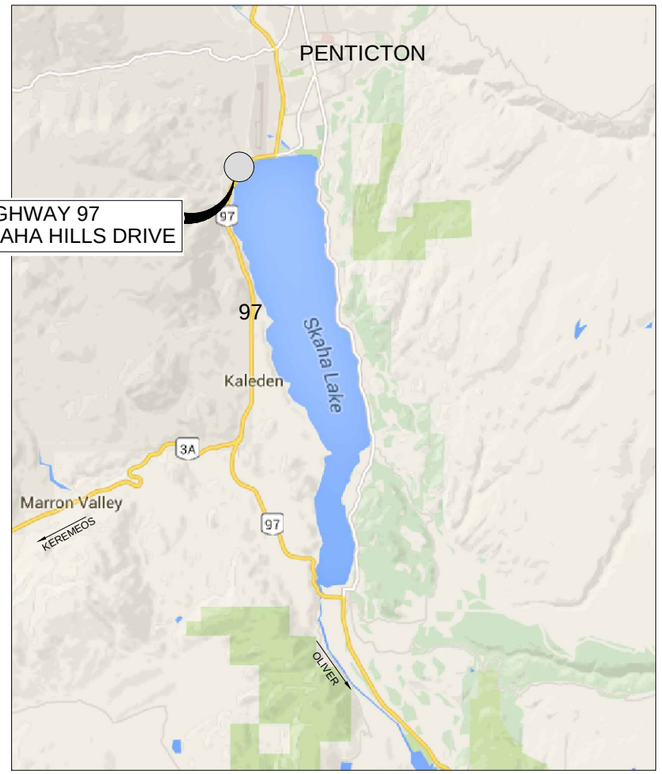

LOCATION MAP

N.T.S

HALFSIZE

FOR DISCUSSION ONLY

Professional Seal

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Tel 604 683 8521

BRITISH COLUMBIA | MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE

SCALE

CAD FILENAME R2-XXX-000.dwg

DATE 16/06/30

REV	DATE	REVISIONS	SIGNATURE
B	16/06/30	100% PRELIMINARY RE-SUBMISSION	
A	16/02/12	90% PRELIMINARY DESIGN	

KEY PLAN, LOCATION MAP AND DRAWING INDEX

HIGHWAY 97

SKAHA HILLS DRIVE INTERSECTION IMPROVEMENT

SENIOR DESIGNER

DATE

DESIGNED DATE 16/06/30

QUALITY CONTROL DATE 16/06/30

QUALITY ASSURANCE DATE 16/06/30

DRAWN DATE 16/06/30

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
2121-00159-00	5523990	2	R2-XXX-001	B

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LEGEND

EXISTING

LINETYPES

- SUBDIVISION BOUNDARY
- SECTION BOUNDARY
- SHOULDER
- FENCE
- SIDEWALK (CONC., WOOD, ASPH.)
- CURBS
- EDGE OF PAVEMENT
- RETAINING WALL
- TRAIL
- CONCRETE BARRIER
- BUSH LINE
- YELLOW LINE
- WHITE LINE
- BROKEN WHITE LINE
- TOP OF ROCK
- EDGE OF GRAVEL
- TREELINE
- DITCH
- TOP OF BANK
- BOTTOM OF BANK
- STORM MAIN PIPE
- SANITARY SEWER PIPE (SAN)
- WATER MAIN (W)

SURVEY SYMBOLS

- CONTROL MONUMENT
- TRAVERSE HUB
- IRON PIN (OIP)
- SQUARE IRON POST
- SPOT ELEVATION (+)

UTILITY SYMBOLS

- POWER POLE W/TRANSFORMER (PPW/TRANS)
- POWER POLE (PP)
- POWER AND TELEPHONE POLE (PT)
- POWER POLE WITH LIGHT
- GUY POLE W/ANCHOR

ELECTRICAL SYMBOLS

- LAMP, TRAFFIC LIGHT STANDARD (LS., T.L.S.)
- JUNCTION BOX, ELECTRICAL/TEL. (JB, TJB.)
- TRAFFIC SIGNAL LIGHT

EXISTING

DETAIL SYMBOLS

- ROAD SIGN
- BOARD SIGN
- STD. DAVIT POLE WITH SIGN
- POST (POST)
- UTILITY POLE (UP)
- TREE
- WELL

DRAINAGE SYMBOLS

- MANHOLE (MH)
- CATCH BASIN (CB)
- CULVERT IN (CI)
- CULVERT OUT (CO)

METER & VALVE SYMBOLS

- FIRE HYDRANT, STAND PIPE (FH, SP)
- WATER VALVE (WV)
- WATER METER (WM)
- IRRIGATION VALVE (IV)

SANITARY SYMBOLS

- SANITARY MANHOLE (MH San)

PROPOSED

LINETYPES

- RIGHT OF WAY
- RETAINING WALL
- FENCE
- SIDEWALK
- CURB & GUTTER
- CONCRETE BARRIER
- ISLAND CURBING
- DITCH
- LIMIT OF CUT / FILL (T.O.C., C / F, B.O.F.)
- HIGHWAY CONTROL LINE (160)
- PAVEMENT EDGE
- SHOULDER EDGE
- PAINTED DASHED
- PAINTED DECEL/ACCEL
- PAINTLINE URBAN
- DOUBLE YELLOW LINE
- SAWCUT
- STORM MAIN PIPE
- CROSSWALK
- STOP BAR
- CLEARING AND GRUBBING (CL & GR)

DETAIL SYMBOLS

- INTEGRAL ASPHALT CURB
- SIDEWALK RAMP (MoT DWG. SP582-07.03)
- LAMP STANDARD (LS)
- SINGLE POST SIGN (MoT DWG. No. SP635-3.6.1)
- ASPHALT PAVEMENT (FULL-DEPTH PAVEMENT)
- ASPHALT PAVEMENT (MILL & FILL)
- ASPHALT PAVEMENT (REMOVAL)
- CATCH BASIN
- CONCRETE ISLAND INFILL

- ADVANCE WARNING FLASHER
- SIGNAL POLE WITH LUMINAIRE
- SECONDARY SIGNAL POLES
- LUMINAIRE
- CONTROL CABINET

HALFSIZE

FOR DISCUSSION ONLY

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Tel 604 683 8521

BRITISH COLUMBIA
MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE

SCALE

CAD FILENAME R2-XXX-000.dwg
DATE 16/06/30

REV	DATE	REVISIONS	SIGNATURE
C	16/06/30	100% PRELIMINARY RE-SUBMISSION	
B	16/03/24	100% PRELIMINARY DESIGN	
A	16/02/12	90% PRELIMINARY DESIGN	

Professional Seal

LEGEND
HIGHWAY 97
SKAHA HILLS DRIVE INTERSECTION IMPROVEMENT

SENIOR DESIGNER
DATE

DESIGNED DATE 16/06/30
QUALITY CONTROL DATE 16/06/30
QUALITY ASSURANCE DATE 16/06/30
DRAWN DATE 16/06/30

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
2121-00159-00	5523990	2	R2-XXX-002	C

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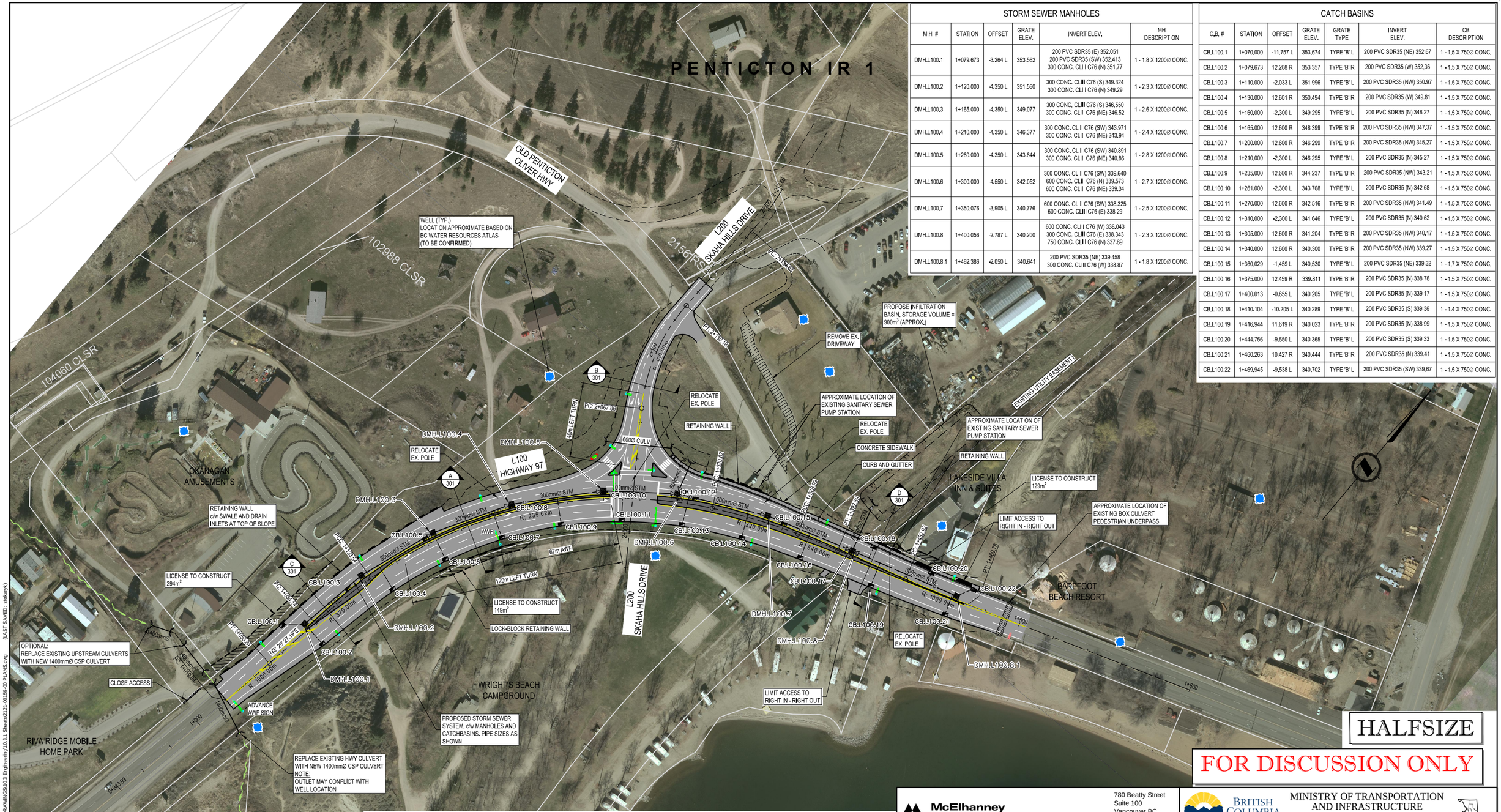
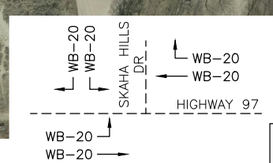


STORM SEWER MANHOLES

M.H. #	STATION	OFFSET	GRATE ELEV.	INVERT ELEV.	MH DESCRIPTION
DMH:L100.1	1+079.673	-3.264 L	353.562	200 PVC SDR35 (E) 352.051 200 PVC SDR35 (SW) 352.413 300 CONC. CLIII C76 (N) 351.77	1 - 1.8 X 1200Ø CONC.
DMH:L100.2	1+120.000	-4.350 L	351.560	300 CONC. CLIII C76 (S) 349.324 300 CONC. CLIII C76 (N) 349.29	1 - 2.3 X 1200Ø CONC.
DMH:L100.3	1+165.000	-4.350 L	349.077	300 CONC. CLIII C76 (S) 346.550 300 CONC. CLIII C76 (NE) 346.52	1 - 2.6 X 1200Ø CONC.
DMH:L100.4	1+210.000	-4.350 L	346.377	300 CONC. CLIII C76 (SW) 343.971 300 CONC. CLIII C76 (NE) 343.94	1 - 2.4 X 1200Ø CONC.
DMH:L100.5	1+260.000	-4.350 L	343.644	300 CONC. CLIII C76 (SW) 340.891 300 CONC. CLIII C76 (NE) 340.86	1 - 2.8 X 1200Ø CONC.
DMH:L100.6	1+300.000	-4.550 L	342.052	300 CONC. CLIII C76 (SW) 339.640 600 CONC. CLIII C76 (N) 339.573 600 CONC. CLIII C76 (NE) 339.34	1 - 2.7 X 1200Ø CONC.
DMH:L100.7	1+350.076	-3.905 L	340.776	600 CONC. CLIII C76 (SW) 338.325 600 CONC. CLIII C76 (E) 338.29	1 - 2.5 X 1200Ø CONC.
DMH:L100.8	1+400.056	-2.787 L	340.200	600 CONC. CLIII C76 (W) 338.043 300 CONC. CLIII C76 (E) 338.343 750 CONC. CLIII C76 (N) 337.89	1 - 2.3 X 1200Ø CONC.
DMH:L100.8.1	1+462.386	-2.050 L	340.641	200 PVC SDR35 (NE) 339.458 300 CONC. CLIII C76 (W) 338.87	1 - 1.8 X 1200Ø CONC.

CATCH BASINS

C.B. #	STATION	OFFSET	GRATE ELEV.	GRATE TYPE	INVERT ELEV.	CB DESCRIPTION
CB:L100.1	1+070.000	-11.757 L	353.674	TYPE 'B' L	200 PVC SDR35 (NE) 352.67	1 - 1.5 X 750Ø CONC.
CB:L100.2	1+079.673	12.208 R	353.357	TYPE 'B' R	200 PVC SDR35 (W) 352.36	1 - 1.5 X 750Ø CONC.
CB:L100.3	1+110.000	-2.033 L	351.996	TYPE 'B' L	200 PVC SDR35 (NW) 350.97	1 - 1.5 X 750Ø CONC.
CB:L100.4	1+130.000	12.601 R	350.494	TYPE 'B' R	200 PVC SDR35 (W) 349.81	1 - 1.5 X 750Ø CONC.
CB:L100.5	1+160.000	-2.300 L	349.295	TYPE 'B' L	200 PVC SDR35 (N) 348.27	1 - 1.5 X 750Ø CONC.
CB:L100.6	1+165.000	12.600 R	348.399	TYPE 'B' R	200 PVC SDR35 (NW) 347.37	1 - 1.5 X 750Ø CONC.
CB:L100.7	1+200.000	12.600 R	346.299	TYPE 'B' R	200 PVC SDR35 (NW) 345.27	1 - 1.5 X 750Ø CONC.
CB:L100.8	1+210.000	-2.300 L	346.295	TYPE 'B' L	200 PVC SDR35 (N) 345.27	1 - 1.5 X 750Ø CONC.
CB:L100.9	1+235.000	12.600 R	344.237	TYPE 'B' R	200 PVC SDR35 (NW) 343.21	1 - 1.5 X 750Ø CONC.
CB:L100.10	1+261.000	-2.300 L	343.708	TYPE 'B' L	200 PVC SDR35 (N) 342.68	1 - 1.5 X 750Ø CONC.
CB:L100.11	1+270.000	12.600 R	342.516	TYPE 'B' R	200 PVC SDR35 (NW) 341.49	1 - 1.5 X 750Ø CONC.
CB:L100.12	1+310.000	-2.300 L	341.646	TYPE 'B' L	200 PVC SDR35 (N) 340.62	1 - 1.5 X 750Ø CONC.
CB:L100.13	1+305.000	12.600 R	341.204	TYPE 'B' R	200 PVC SDR35 (NW) 340.17	1 - 1.5 X 750Ø CONC.
CB:L100.14	1+340.000	12.600 R	340.300	TYPE 'B' R	200 PVC SDR35 (NW) 339.27	1 - 1.5 X 750Ø CONC.
CB:L100.15	1+360.029	-1.459 L	340.530	TYPE 'B' L	200 PVC SDR35 (NE) 339.32	1 - 1.7 X 750Ø CONC.
CB:L100.16	1+375.000	12.459 R	339.811	TYPE 'B' R	200 PVC SDR35 (N) 338.78	1 - 1.5 X 750Ø CONC.
CB:L100.17	1+400.013	-0.655 L	340.205	TYPE 'B' L	200 PVC SDR35 (N) 339.17	1 - 1.5 X 750Ø CONC.
CB:L100.18	1+410.104	-10.205 L	340.289	TYPE 'B' L	200 PVC SDR35 (S) 339.36	1 - 1.4 X 750Ø CONC.
CB:L100.19	1+416.944	11.619 R	340.023	TYPE 'B' R	200 PVC SDR35 (N) 338.99	1 - 1.5 X 750Ø CONC.
CB:L100.20	1+444.756	-9.550 L	340.365	TYPE 'B' L	200 PVC SDR35 (S) 339.33	1 - 1.5 X 750Ø CONC.
CB:L100.21	1+460.263	10.427 R	340.444	TYPE 'B' R	200 PVC SDR35 (N) 339.41	1 - 1.5 X 750Ø CONC.
CB:L100.22	1+469.945	-9.538 L	340.702	TYPE 'B' L	200 PVC SDR35 (SW) 339.67	1 - 1.5 X 750Ø CONC.



ALIGNMENT	DESIGN SPEED
L100 (HIGHWAY No. 97)	60 km/h
L200 (SKAHA HILLS DRIVE)	50 km/h

INFORMATION SHOWN ON THIS DRAWING REGARDING EXISTING UTILITIES IS COMPILED FROM SOME RECORD DRAWINGS AND SOME SURVEYS, AND MAY NOT BE COMPLETE. CONTRACTOR SHALL EXPOSE AND CONFIRM THE LOCATIONS AND ELEVATIONS OF ALL EXISTING UTILITIES AND ADVISE THE ENGINEER OF ANY POTENTIAL CONFLICT.

NOTE:
PRELIMINARY DESIGN BASED ON LIDAR;
CUT/FILL ENCROACHMENTS AND AREAS FOR LICENCE TO CONSTRUCT APPROXIMATE

Professional Seal

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BRITISH COLUMBIA
MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE

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CAD FILENAME 2121-00159-00 PLANS.dwg
DATE 16/06/30

REV	DATE	REVISIONS	SIGNATURE
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C	16/03/24	100% PRELIMINARY DESIGN SUBMISSION	
B	16/02/12	90% PRELIMINARY DESIGN SUBMISSION	
A	15/12/01	50% SUBMISSION	

PLAN
HIGHWAY 97
SKAHA HILLS DRIVE INTERSECTION IMPROVEMENT
OPTION B

SENIOR DESIGNER
DATE

DESIGNED DATE 16/06/30
QUALITY CONTROL DATE 16/06/30
QUALITY ASSURANCE DATE 16/06/30
DRAWN DATE 16/06/30

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
2121-00159-00	5523990	2	R2-XXX-101B	D

HALFSIZE

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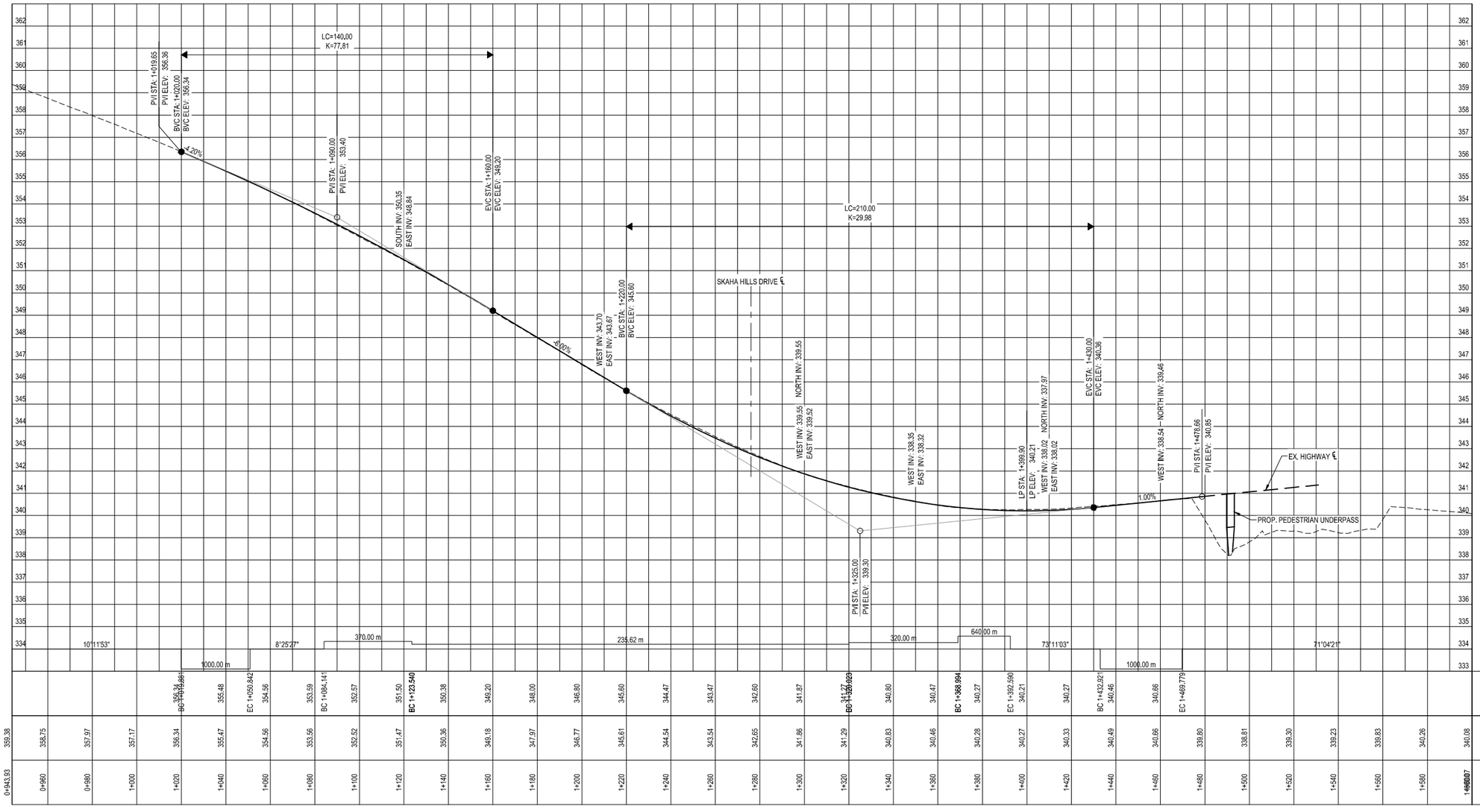

HALFSIZE

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MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE

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DATE 16/06/30

REV	DATE	REVISIONS	SIGNATURE
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C	16/02/12	90% PRELIMINARY DESIGN SUBMISSION	
B	15/12/01	50% SUBMISSION	
A	15/10/24	PRELIMINARY DESIGN REVIEW	

PROFILE
HIGHWAY 97
SKAHA HILLS DRIVE INTERSECTION IMPROVEMENT
L100 - HIGHWAY 97

SENIOR DESIGNER
DATE

DESIGNED DATE 16/06/30
QUALITY CONTROL DATE 16/06/30
QUALITY ASSURANCE DATE 16/06/30
DRAWN DATE 16/06/30

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
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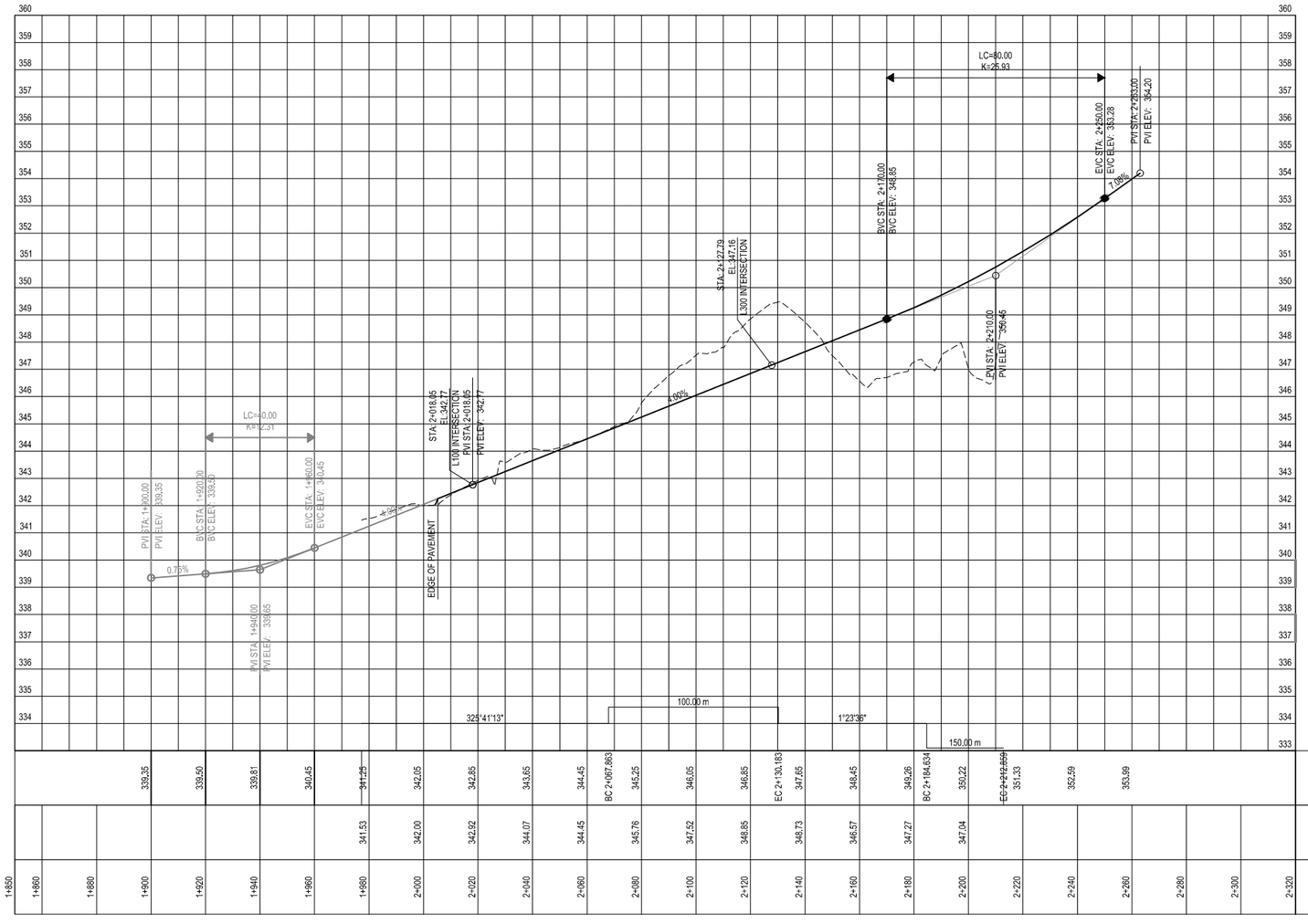

HALFSIZE

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MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE

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DATE 16/06/30

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B	15/12/01	50% SUBMISSION	
A	15/10/24	PRELIMINARY DESIGN REVIEW	

PROFILE

HIGHWAY 97

SKAHA HILLS DRIVE INTERSECTION IMPROVEMENT

L200 - SKAHA HILLS DRIVE

SENIOR DESIGNER

DATE

DESIGNED DATE 16/06/30
QUALITY CONTROL DATE 16/06/30
QUALITY ASSURANCE DATE 16/06/30
DRAWN DATE 16/06/30

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
2121-00159-00	5523990	2	R2-XXX-202	D

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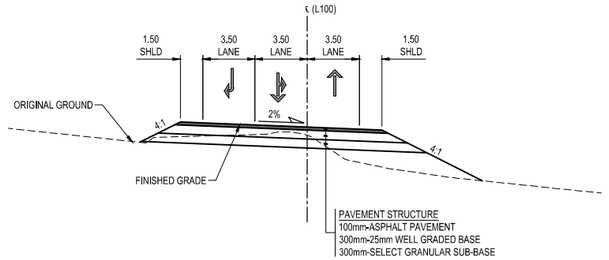

B 101 SECTION
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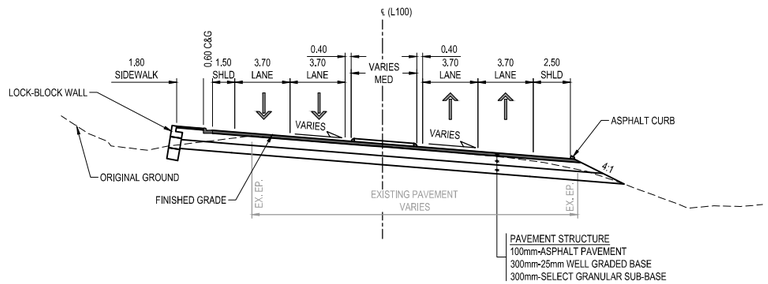

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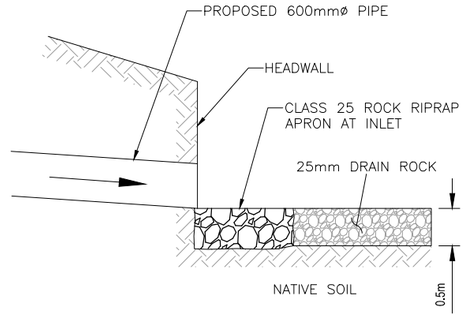
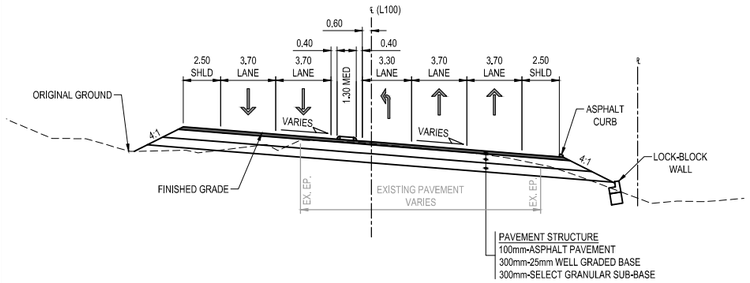


INFILTRATION BASIN

NTS

* SIZE OF INFILTRATION BASIN ESTIMATED TO BE 900m^2. A SITE SPECIFIC GEOTECHNICAL INVESTIGATION SHOULD BE COMPLETED WITH INFILTRATION TESTING, AND MEASUREMENT OF GROUNDWATER LEVELS BE COMPLETED TO CONFIRM THE ADEQUACY AND SIZING OF THE INFILTRATION MEASURES RECOMMENDED.



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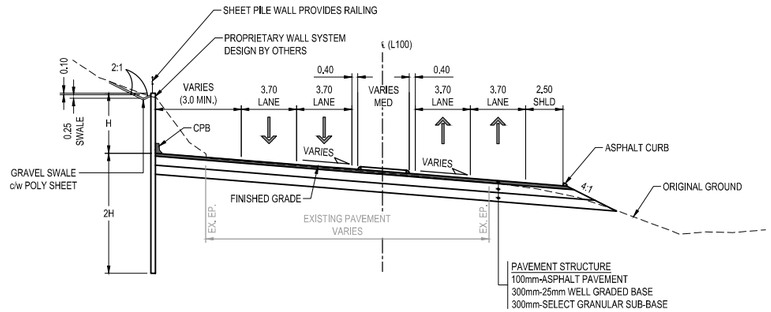
SCALE H 1:200 V 1:100



C 101 WALL SECTION
SCALE H 1:200 V 1:100

NOTE:
PAVEMENT STRUCTURE
TO BE CONFIRMED

HALFSIZE

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Professional Seal

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CAD FILENAME 2121-00159-00 TYPSEC.dwg
DATE 16/06/30

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C	16/02/12	90% PRELIMINARY DESIGN SUBMISSION	
B	15/12/01	50% SUBMISSION	
A	15/10/24	PRELIMINARY DESIGN REVIEW	

BRITISH COLUMBIA
MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE

TYPICAL SECTIONS AND DETAILS

HIGHWAY 97
SKAHA HILLS DRIVE INTERSECTION IMPROVEMENT
OPTION B

SENIOR DESIGNER
DATE

DESIGNED DATE 16/06/30
QUALITY CONTROL DATE 16/06/30
QUALITY ASSURANCE DATE 16/06/30
DRAWN DATE 16/06/30

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
2121-00159-00	5523990	2	R2-XXX-301	D

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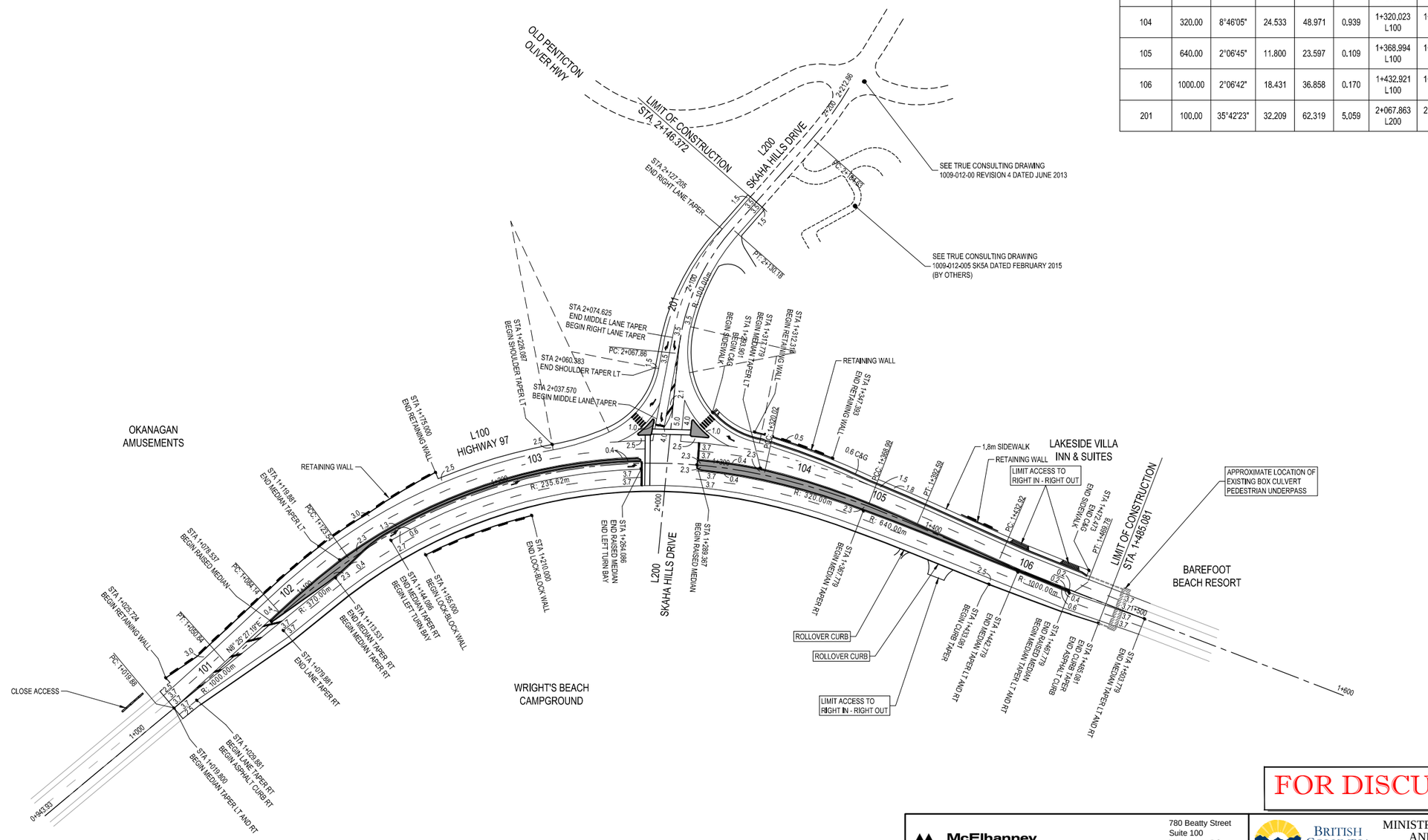
CAD FILE: O:\Proj\2121-00159-00 MoTI Hwy 97 Skaha Hills Dev\10.0 DRAWINGS\10.3 Engineering\10.3.1 Sheets\2121-00159-00 TYPSEC.dwg (LAST SAVED: sskaviyk)

PENTICTON IR 1

CURVE DATA										
CURVE No.	R	Δ	Tc	Arc	Ec	B.C. STA	E.C. STA	C.C. COORD.	P.I. STA	P.I. COORD.
101	1000.00	1°46'26"	15.482	30.961	0.120	1+019.881 L100	1+050.842 L100	N 480768.131 E 309730.885	1+035.363 L100	N 480606.315 E 310717.828
102	370.00	6°06'04"	19.718	39.399	0.525	1+084.141 L100	1+123.540 L100	N 480600.364 E 311090.982	1+103.859 L100	N 480674.074 E 310727.863
103	235.62	47°46'42"	104.360	196.483	22.077	1+123.540 L100	1+320.023 L100	N 480634.066 E 310960.900	1+227.900 L100	N 480794.187 E 310758.982
104	320.00	8°46'05"	24.533	48.971	0.939	1+320.023 L100	1+368.994 L100	N 480559.357 E 311000.117	1+344.556 L100	N 480854.095 E 310873.108
105	640.00	2°06'45"	11.800	23.597	0.109	1+368.994 L100	1+392.590 L100	N 480256.661 E 311103.920	1+380.793 L100	N 480865.881 E 310907.476
106	1000.00	2°06'42"	18.431	36.858	0.170	1+432.921 L100	1+469.779 L100	N 481838.202 E 310668.082	1+451.352 L100	N 480886.294 E 310975.020
201	100.00	35°42'23"	32.209	62.319	5.059	2+067.863 L200	2+130.183 L200	N 480916.178 E 310869.059	2+100.072 L200	N 480886.410 E 310768.305



ALIGNMENT	DESIGN SPEED
L100 (HIGHWAY No. 97)	60 km/h
L200 (SKAHA HILLS DRIVE)	50 km/h

HALFSIZE

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Professional Seal

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SCALE 0 10 1:1000 50m

CAD FILENAME 2121-00159-00 GEOMETRICS.dwg

DATE 16/06/30

REV	DATE	REVISIONS	SIGNATURE
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C	16/03/24	100% PRELIMINARY DESIGN SUBMISSION	
B	16/02/12	90% PRELIMINARY DESIGN SUBMISSION	
A	15/12/01	50% SUBMISSION	

BRITISH COLUMBIA
MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE

LANING AND GEOMETRICS

HIGHWAY 97

SKAHA HILLS DRIVE INTERSECTION IMPROVEMENT

OPTION B

SENIOR DESIGNER

DATE

DESIGNED _____ DATE 16/06/30

QUALITY CONTROL _____ DATE 16/06/30

QUALITY ASSURANCE _____ DATE 16/06/30

DRAWN _____ DATE 16/06/30

FILE NUMBER	PROJECT NUMBER	REG	DRAWING NUMBER	REV
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