

Lower Princeton Area Structure Plan Environmental Assessment

Prepared by:

Makonis Consulting Ltd
Westbank, British Columbia

ARC Environmental Ltd
Kamloops, British Columbia

Submitted To:

Protech Consultants Ltd
Kelowna, British Columbia

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1.0 INTRODUCTION

The following environmental report has been prepared for Protech Consultants Ltd the lead consultant in the Lower Princeton Area Structure Plan. Makonis Consulting Ltd was retained to complete an environmental assessment for the plan area and provide strategies to guide future development in an environmentally responsible manner.

The Lower Princeton Area Structure Plan (LPASP) area is approximately 24.8 hectares consisting of gently to steeply sloped tills and a few small portions of exposed rock. It is situated between Highway 97 and Okanagan Lake to the east, and Peachland residential areas to the south, west, and north. The northern LPASP is bisected by Princeton Avenue. Currently the LPASP is divided into 41 properties with several zoning designations

This report is in response to the Terms of Reference (ToR) issued by the District of Peachland and shall focus towards Environmentally sensitive areas (ESA) and natural features and streams, ponds, wetlands. This would include wildlife, habitat, vegetation and plant communities and associated natural features.

1.1 Framework

Regulatory frameworks which guide the assessments and strategies within this report include, but are not limited to:

1. Terms of Reference: Lower Princeton Area Structure Plan
2. Species at Risk Act (SARA) - Federal
3. Fisheries Act – Federal
4. Migratory Birds Convention Act – Federal
5. Wildlife Act – Provincial
6. Riparian Areas Regulation – Provincial

1.2 Objectives

Based on our review of the plan area and the scope provided, the objectives of this assessment are to:

- Proposed and/or approved future land uses on adjacent lands.
- Biophysical Resources and Topography
- Water features, streams, wetlands, designated stream flood elevations
- Natural drainage patterns
- Wildlife and Fish Habitat issues, if applicable
- Overall ecosystem classification and mapping including tree cover.
- Location of environmentally protected species,
- Key wildlife habitats and corridors, important environmental factors that

development will accommodate.

2.0 SUPPORTING INFORMATION

Several sources were assessed for the purpose of gathering supporting biophysical information for the plan area. Some of these were:

- Central Okanagan TEM (2001)
- Central Okanagan SEI (2001)
- Okanagan Innovative Forest Plan - Surficial Terrain Mapping¹ (2004)

We completed this background environmental inventory, and conducted a review of current information pertaining to the subject property and surrounding areas, including a review of photos and reports. Recent digital orthophotographs were interpreted against the surrounding landscape, existing ecosystem inventories and subsequent site visits were conducted to confirm and identify plant communities and recent changes.

2.1 Conservation Data Centre

British Columbia Conservation Data Centre (CDC) is an extension of Ministry of Sustainable Resource Management (MSRM) and is the provincial coordinator of tracking rare and endangered species (native plants, animals, and natural plant communities) in British Columbia on provincial, national and international levels. Ranking of these sensitive and rare elements (native plants, animals, and natural plant communities) is mandated by the international organization of Nature Conservancy which the CDC is an associate member of this international organization. The CDC defines British Columbia's most vulnerable species in effort to preserve the biodiversity of the province and provides online services to review existing information.

Review of the CDC online BC Species and Ecosystem Explorer data services for the LPASP produced the following results²: (accessed October 7 2008)

1. Nine plant species, two listed by COSEWIC; table 1
2. 54 animal species, 24 listed by COSEWIC; table 2
3. 13 Ecological Communities; table 3

Data parameters for online search was as follows:

Species Group:Plant, Animal
 AND Forest Districts:Okanagan Shuswap Forest District (DOS) (Restricted to Red, Blue, and Legally designated species)
 AND MOE Regions:8- Okanagan (Restricted to Red, Blue, and Legally designated species)
 AND Regional Districts:Central Okanagan (RDCO) (Restricted to Red, Blue, and Legally designated species)
 AND BGC Zone:PP
 Sort Order:Scientific Name Ascending

Ecological Communities
 AND Forest Districts:Okanagan Shuswap Forest District (DOS)

¹
²B.C. Conservation Data Centre. 2008. BC Species and Ecosystems Explorer. B.C. Minist. of Environ. Victoria, BC. Available: <http://a100.gov.bc.ca/pub/eswp/> (accessed [enter date accessed]).

AND MOE Regions:8- Okanagan
AND Regional Districts:Central Okanagan (RDCO)
AND BGC Zone, Subzone, Variant, Phase:PPxh1
AND Ecoregions:NOB
Sort Order:Scientific Name Ascending

Further to the lists above for sensitive features that may occur in the LPASP, the CDC provides an online service for known locations of sensitive features³. CDC mapping service review produced no known sensitive species or ecological communities occurring on the site. However, several records of Lewis' Woodpecker nests from 1996 and 2003 occur south and west of the site, and there is a record from 2003 south of the site of a Western Screech-Owl, Appendix A.

3.0 BIOPHYSICAL RESOURCES

The unique ecosystem of the Okanagan Valley within Canada originates from the most northerly extent of the Dry Ecodomain extending from Mexico north to Canada. The commonly recognized climates are arid desert and semiarid steppe within the Great Basin from Mexico to Canada. The subject area is represented as Semi-Arid Steppe Highland Ecodivision occurring on the leeward side of the Coast and Cascade mountains. Winters are cold and the summers are warm to hot. Coniferous tree species in the upper valleys and basins are typically Ponderosa pine or Douglas-fir; while the lower Okanagan valley is typically vegetated with Bluebunch wheatgrass and sage. Generally, this is a region of relatively low relief characterized by rolling hills. Large portions of the Thompson Plateau, for example, undulate only a few hundred feet over wide areas.

3.1 Physical Resources

3.1.1 Topography

The Lower Princeton Area Structure Plan Area is 24.81 hectares (61.3 acres) located in Peachland, British Columbia. The site is bounded by Highway 97 on the east, Princeton Avenue on the west and north, and Lipset Road to the south, approximately. The site involves 41 parcels of various sizes of various zoning designations.

The site rises from 343 meters above sea level in the east along Highway 97, to an elevation of 436 meters, below Princeton Avenue, elevations are approximate. Dominant slopes are west - south facing associated with lower slopes of Mount Coldham.

Slopes found within the LPASP range from 0 % to greater than 100%, portions along Highway 97. The area of focus is the lower Okanagan Valley, incised heavily by numerous Cordilleran glaciations over time with the most recent the Fraser Glacier.⁴ Where the interactions of bedrock conditions found within the LPASP created various conditions currently seen.

³BC Conservation Data Centre: Conservation Data Centre Mapping Service [web application]. 2008. Victoria, British Columbia, Canada. Available: http://webmaps.gov.bc.ca/imfx/imf.jsp?site=imapbc&savessn=Ministry%20of%20Environment/Conservation_Data_Centre.ssn (date accessed).

⁴Roed, M.A., and Greenough, J.D., editors, 2004, Okanagan Geology, British Columbia. Kelowna. 200pp.

3.1.2 Climate

The site occurs within the central Okanagan Valley, in the rain shadow of the Coast and Cascade Mountains, and contains some of the warmest and driest areas of the province and Canada. The Okanagan is characterized as having a continental climate of long, warm, and dry growing seasons, and cool winters with moderate snowfall⁵.

Air moving into the area has generally already lost most moisture on the west facing slopes of the coastal mountains prior to reaching the Okanagan. There are occasional eruptions of hot dry air from the Great Basin extending from Mexico to Canada from the south, which in the summer, bring clear skies and very warm temperatures. In winter and early spring there are frequently periods with cold, dense, arctic air since no barriers exist from the north.

Records from Environment Canada's Peachland weather station are in close proximity to the site and can be considered directly comparable⁶:

- Daily average temperature is 9.7 °C with average lows in December of – 1.2°C and average highs in July of 21.1°C. The coldest months are December to February where daily average temperatures are below 2 °C.
June to August are typically the months with the highest daily average temperatures (17.7 °C – 21.1 °C), with extremes recorded to 37.8 °C.
- Precipitation falling on the site is 401.3 mm, predominantly as rain, where the average year accumulates 301.7 mm, and 90.5 cm of snow falls. May to July are the wettest months typically, however high rainfalls have also been recorded in November.

3.1.3 Hydrology

No streams are found in the LPASP.

Several wetted areas are seen in the LPASP. These wetted features were seen entering the plan area as part of the storm water - ditch drainage system along Princeton Avenue, Lipsett Avenue and Highway Lane. Water from these culverted sources dissipated quickly into ground water. Surface flows were brief in defined ditches, less than 50 meters, in two areas during site visit late summer. It is expected surface runoff to increase during spring.

Ten water licenses occur in and adjacent to the plan area:

LICENCE	MAP ID	STREAM NAME
PD58662	8495B UU (PD58662)	Neilevans Spring
PD58663	8495B D (PD58663)	Town Spring
PD58664	8495B Z (PD58664)	Williams Spring
PD58665	8495B E (PD58665)	Pope Spring
PD58666	8495B PP (PD58666)	Wing Spring
PD58668	8495B KK (PD58668)	Winger Spring
PD58670	8495B LL (PD58670)	Powell Spring
PD58661	8495B P3 (PD58661)	Okanagan Lake
PD58638	82.E.072.3.1.2 B (PD58638)	Hersey Spring

⁵Lloyd, D, K. Angove, G. Hope and C. Thompson. 1990. A guide to site identification and interpretation for the Kamloops Forest Region. B.C. Min. of Forests, Victoria, B.C.

⁶http://www.climate.weatheroffice.ec.gc.ca/climate_normals/results_e.html

PD58639

8495 M4 (PD58639)

Okanagan Lake

McCall Creek, watershed code: 310-731400, is shown in provincial records entering as ground water above the plan area upslope of Princeton Avenue. McCall Creek originates from McCall Lakes on Mount Coldham near the 950m elevation. McCall Lakes has previously been stocked in the past with rainbow and brook trout. Stream length of McCall Creek is 3.46km and is found to be stream order of one and stream magnitude of one.

Okanagan Lake is adjacent to the plan area across Highway 97 to the east at the 342m elevation. Okanagan Lake is approximately 120 kilometers long and averages 3.5 kilometers wide. Sixteen (16) species of indigenous fish and nine (9) introduced species are found in Okanagan Lake. Those valued by the sport fishery include kokanee salmon (*Oncorhynchus nerka*), cutthroat trout (*Oncorhynchus clarki*), and rainbow trout (*Oncorhynchus mykiss*).

3.2 Biological Resources

In British Columbia, resource managers have advocated Terrestrial Ecosystem Mapping (TEM) as a means to establish natural resource baseline for planning and management purposes. The emphasis of these ecological inventories and mapping initiatives was to not only capture a baseline of existing ecosystems, but also to lay the precursors for a host of interpretive products such as the Sensitive Ecosystem Inventory, Wildlife Habitat Inventories and other planning activities. Furthermore, these databases are to be used by stakeholders and resource planners to provide guidance for the public, private sectors and all levels of government regarding conservation and management at meaningful scales, such as community development plans, in a common language - framework.

Reporting inventories for the subject property followed general provincial guidelines, so the District of Peachland can not only evaluate the merits of this project within its own jurisdiction, but across a regional and provincial context. We followed standard Provincial protocols and standards for sampling methodology according to Describing Ecosystems in the Field⁷, Rare Ecosystem Mapping⁸, Terrestrial Ecosystem Mapping⁹, and District of Peachland Terms of Reference.

Vegetation - ecosystem delineation and assessments were completed by John Grods R.P.Bio of Makonis Consulting Ltd. Wildlife inventory and assessments were undertaken by Katy White M.Sc, BIT of Makonis Consulting Ltd. Fisheries and aquatic assessments was completed by Bill Rublee R.P.Bio of ARC Environmental Ltd.

⁷Anon. 1999. *Manual for Describing Terrestrial Ecosystems in the Field*. BC Ministry of Forests, Research Br., Victoria, BC. (handbook, paginated by section).

⁸Resources Inventory Committee (RIC). 1999. *Methods and standards for rare ecosystem mapping in British Columbia*. Ministry of Environment, Lands and Parks, Victoria, BC.

⁹Resources Inventory Committee. 1998. *Standards for Terrestrial Ecosystems Mapping in British Columbia*. Ecosystems Working Group of the Terrestrial Ecosystems Task Force, Victoria, B.C.

3.2.1 Plants

J. Grods R.P.Bio conducted floristic surveys in the plan area. The aims of these surveys were to complete a plant list for the study area as well investigate the site for CDC and COSEWIC listed rare plant species.

A list of plant species found in the plan area was compiled (Table 1). No CDC or COSEWIC listed species were found during the site visits. However, a spring or early summer survey would be required to survey for rare plants that may have been missed. Many spring species have dried, and are not identifiable, or have become covered by larger plants by the time we completed the survey.

Site conditions, discussed in following section, contained a few notable species.

Rubus discolor, or common blackberry, is an invasive species, however not commonly occurring in the dry Okanagan climate. This invasive weed is infrequent in the Okanagan valley and is found associated with wet seep sites. Typically from over irrigation, although within the plan area has this species associated with the numerous springs. This species out competes nearly all vegetation and prevents establishment of native species. Increasing erosion potential for surface flows preventing establishment of deeper rooted native plants. The large dense mats - thickets inhibit animal movement

Pteridium aquilinum, or bracken fern is not common in the Okanagan and not considered rare, nor endangered. It has taken advantage of the wetter conditions found in the plan area and is considered a unique plant species.

Juglans sp, or walnut trees are throughout the wetter areas. The trees similar to *Rubus discolor* inhibit establishment of native species. The roots, fruit and leaf litter alters soil chemistry by exuding toxins changing native soil processes which are key to native plant species survival.

3.2.2 Ecosystems

John Grods, R.P.Bio of Makonis Consulting Ltd conducted a review of current information pertaining to the subject property and surrounding areas. This review included orthophotos from the District of Peachland, reports and independent studies for the area; Terrestrial Ecosystem Mapping (TEM) undertaken by Regional District of Central Okanagan (2001). Subsequent site visits were made to confirm and identify plant communities (*also referred to as "ecosystems", "site series" and/or sometimes as "habitat" in various projects*), changes to landscape and confirm minor changes to draft mapping, as focus was towards habitat and values for this report.

The LPASP is located in the Okanagan very dry hot Ponderosa Pine biogeoclimatic subzone variant (PPxh1) occurring at lower elevations along the bottom of the Okanagan Valley³. The area is characterized as one of the warmest and driest forested variants for this subzone in British Columbia, due to its' southerly latitude², and the pronounced rain shadow.

Our vegetation assessment utilizes the "Biogeoclimatic Ecosystem Classification" (BEC) used extensively throughout British Columbia to report and describe terrestrial ecosystems. Recent local TEM - SEI inventories have adopted ecosystem delineations of the "blue book", 1991 Ministry of Forest Field Guide for the Kamloops Region, and subsequent TEM mapping codes. However, as these inventories have progressed since 2001, Ministry of Forest, Kamloops Regional Ecologist, Dennis Lloyd in 2005 updated local ecosystem units based on

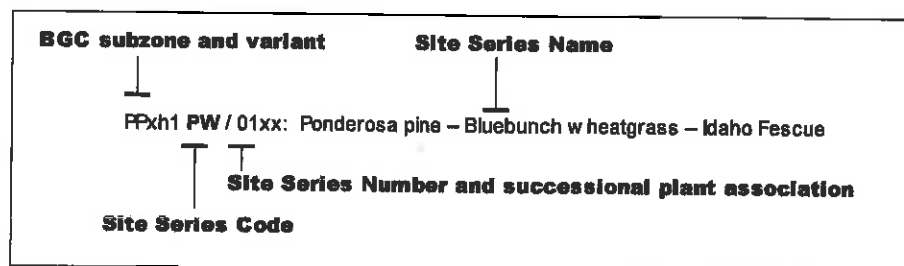
extensive local field sampling. Since our reporting is to be utilized by local stakeholders (property owners, City of Kelowna and others) it was decided to align our inventory with adjacent TEM – SEI inventory from the Westside. Our inventory mapping utilized the delineation of these ecosystems – seral stages, with one exception.

PPxh1 DM / 08 (Douglas-fir – Water birch – Douglas maple) has typically been used in the past inventories to identify a wide variety of ecological conditions. The unit delineates ecological of wetted (hygric) forested soil conditions, as first described in the 1991 “blue book”. Since then local inventories often mapped this unit extending into very moist (subhygric) soil conditions and continued this practise for consistency between inventories. The newer ecosystems – seral delineation from Ministry of Forest, 2005, mentioned above, has in our opinion corrected this delineation of DM / 08 by extending the conditions into the very moist. As well, creating newer units 06ysa and 06ysb describing conditions which often were classified as DM / 08. Our inventory utilized the 06ysa (\$Ep – snowberry – [Douglas] maple) delineation as to distinguished between the wetter DM / 08 and moist upland conditions of wetlands and draws in the LPASP.

In general, ecological communities encountered in the Lower Princeton Plan Area were not typical given conditions of the area. Portions of the LPASP area are seen with ground conditions wetter than normally seen in the lower Okanagan Valley. Combined with various disturbances these situations have created extensive communities of invasive species. Areas of natural vegetation and rural - urbanization are also amongst conditions found.

The inventory produced 7 mappable ecosystems. There were however several other habitats – ecosystems seen in the DMPA too small to acknowledge on the final mapping product. The following section summarizes the ecosystems found in the LPASP:

Okanagan very dry hot Ponderosa Pine biogeoclimatic subzone variant (PPxh1)



1. PPxh1 PW / 01: Ponderosa pine – Bluebunch wheatgrass – Idaho fescue
2. PPxh1 SP / 06: Douglas-fir and ponderosa pine – snowberry – pinegrass
3. PPxh1 SP / 06ysa: Water birch – snowberry - maple
4. PPxh1 SB / 00: Selaginella – bluebunch wheatgrass rock outcrop*
5. PPxh1 UR / 00: Urban
6. PPxh1 CF / 00: Cultivated field

7. PPxh1 RW / 00: Rural Residential

8. PPxh1 RZ / 00: Paved Road

- recognized within the LPASP too small for mapping unit.

Further details for ecosystems can be referenced with the expanded legend of Central Okanagan TEM inventory⁸ and Ministry of Forest Field Guide³.

The following observations were noted during the field surveys:

1. Himalayan blackberry has formed several dense mats. These dense mats impede wildlife passage and have significantly suppressed native species - communities expected for the site.
2. Glacial lacustrine soils were seen throughout most of the LPASP.
3. Shallow bedrock and rock outcrops in the area contribute to shallow ground water conditions and seeps - springs present.
4. Remnant gully of McCall Creek is seen mid property with moist ground conditions. Surface flows were absent during visit, however expected during spring run-off. This feature was not directly connected to Okanagan Lake and has been buried further upslope.
5. Overall forest health conditions varied, as well an increase of Douglas fir in these areas also reflected higher encounters with dwarf mistletoe. Pine beetle was also seen within the LPASP.
6. Disturbance was extremely high in all areas of the LPASP. One exception was the older forest found in the south adjacent to Heighway Lane and Highway 97.
7. Walnut trees were throughout in wetter conditions.
8. Invasive and noxious weed species were found through out.
9. Bracken fern was seen at the upper slopes of LPASP in a wetted area. This native plant is not considered rare or endangered, but unique for the area.

3.2.3 Wildlife

The site was visited on 3 separate days between September 17 and 26, 2008. All vertebrate wildlife and wildlife signs that were observed were recorded.

No Species at Risk (SAR), provincial red- or blue- listed species were noted during the site visits. Although given mobility of wildlife, sensitive species still may occur throughout the plan area in some year(s).

3.2.3.1 Birds

Birds observed on the site included: common crow, spotted towhee, brewers blackbird, town sparrow, quail, and mourning dove. None of these species is Red or Blue listed in B.C.

Few potential cavity trees exist on the site, however those with potential were examined, but no suitable cavities were observed. The several small stands of cottonwood on the site are quite small and unlikely to support screech owls, due to the surrounding urbanization of habitat.

3.2.3.2 *Mammals*

Black Bear scats were found frequently in wooded areas, and quite likely make extensive use of the blackberry bushes seen on site. Claw marks were seen ascending a large maple tree.

Deer pellets and tracks were seen occasionally in the deciduous woods that occur in the upper centre of the site. A small group was seen in the central portion of the plan area, one buck and two doe. No corridor(s) were determined for deer or other large animals given the numerous vegetative barriers posed by the himalayan blackberry and Highway 97.

Raccoon tracks were observed in a muddy areas in an area of deciduous woods in the upper centre of the site as well.

A red squirrel was also heard near the central plan area adjacent to Princeton Avenue.

No other mammals or mammal signs were observed on the site. Proximity to residential area would pose a deterrent with pets such as dogs and cats. It was noted coyotes could utilize the site for refuge and surrounding neighborhoods as forage habitat.

3.2.3.3 *Amphibians and Reptiles*

No amphibians were seen on site, although the time of year did not allow for call surveys. Wetted areas of the LPASP does offer suitable habitat for amphibians throughout the year, in particular tree frogs and garter snakes. The area was not found suitable for breeding of spadefoot toads or salamanders.

No reptiles were seen on the site visits, and no suitable hibernation areas were found. With residential areas and the lake surrounding the site it is unlikely that any of the larger snake species could survive.

3.2.4 *Aquatic*

The subject property was traversed on September 16, 2008 to assess the presence of watercourses within the area and applicability of the Riparian Areas Regulation.

The Riparian Areas Regulation takes place when activity is proposed within 30 metres of the high water mark (natural boundary) of a lake or stream. The default setback for a defined Streamside Protection and Enhancement Area (SPEA) in most properties is 30 meters. However a detailed assessment methodology is in place to provide a site specific evaluation. A detailed assessment is based on three riparian functions, or zones of sensitivity. Provision of

10. Leaf Litter and insect drop

11. Inputs of Large Woody Debris and

12. Shading to control water temperature.

Zones of Sensitivities (ZOS) are determined for each of these three categories. The SPEA is determined using the maximum of the three ZOS's. ZOS are defined as a multiple of channel width with a minimum SPEA of 10 meters.

For Lakes the minimum SPEA width is 15 meters.

Based on the Riparian Regulation a "stream" includes any of the following that provides fish habitat:

- a) a watercourse, whether it contains water or not
- b) a pond, lake, river, creek or brook:
- c) a ditch, spring or wetland that is connected by surface flow to something referred to in paragraph (a) or (b)

The watercourses throughout the site all appear to be influenced by groundwater inputs. All of the watercourses return to ground prior to reaching Okanagan Lake, a fish bearing water. Thus based on this there is no application of the RAR for the watercourses within the site. The RAR does apply to the Okanagan Lake interface, and the SPEA based on the detailed assessment methodology is 15 meters. Most of this existing SPEA is currently covered by Highway 97.

4.0 ENVIRONMENTAL SENSITIVE AREAS

Tied to the inventory phase of the neighbourhood plan is the stratification of environmental sensitive areas (ESA). Makonis Consulting and Okanagan Wildlife Consulting have developed protocols in determining Environmental Sensitive Areas (ESA), including general mitigation and recommendation guidelines. These protocols and definitions have been adopted by several local governments as required reporting. The procedure is threefold and is develop under a multidiscipline approach:

- A. Ecosystem ratings
- B. Wildlife ratings
- C. Cumulative ratings, or reported ESA ratings.

ESA are identified in the area of concern of varying significance ratings, and the general mitigation guidelines are presented below as follows:

Areas delineated as ESA – 1 contain significant ecosystem and/or wildlife characteristics representing a diverse range of sensitive habitat. These features contribute significantly to the overall diversity of habitat in the region. Development should not occur in these areas, including public park features. If development should occur within these areas mitigation will

promote no net loss to the habitat (typically with a 3:1 replacement). Buffers should be a minimum of 30 meters for ESA 1 and can be flexed to a minimum of 10 meters.

Area delineations of ESA – 2, or moderate significance, contribute toward the overall diversity and contiguous nature of the surrounding natural features. These valued areas are to be used for habitat connection, habitat mitigation - compensation and extending of natural green spaces. Park trails are allowed but kept to a minimum footprint. Development is allowed within these areas.

ESA – 3 areas delineated as low significance representing disturbed habitats or fragmented features. These areas contribute to the diversity to the landscape, although based on the condition and adjacency of each habitat the significant function within the landscape is limited. Development should be focused in these areas to offset impacts – development on higher rated sites; including habitat improvements or requirements in other more sensitive natural areas found on property.

ESA – 4 areas contribute little or no value to the overall diversity or vegetation, soils, terrain and wildlife characteristics of the area. These areas are often already influenced under some form of disturbance, historically or currently. Development is encouraged to be focused to these sites before consideration developing higher rated sites of the area. These areas shall not be considered as areas for restoration and enhancement or as recruitment as higher value ESA in offsetting development in other areas.

4.1 Results

ESA for the plan area are illustrated in figure 3. Environmental Sensitive Areas values were determined not significant to moderate. No ESA 1 values were determined for the LPASP area.

Noted disturbances throughout, extensive invasive species, Himalayan blackberry and walnut trees are two significant species, agricultural and built up rural and urbanization sections contributed to low values. Proximity to Okanagan Lake would normally increase sensitivity values in the landscape condition, however bisected by Highway 97 devalued even the adjacency of this high value feature.

Remnant gully of McCall Creek , seep areas and mature forest were noted as the highest values within the LPASP area.

4.2 Corridors

Corridors are generally designated leave-strips allowing connectivity of the landscape for benefit of either plant or animal. Urbanization often fragments the landscape, thus lowering area available for species and reducing the overall diversity of an area. Corridors are meant provide habitat and/or facilitate movement thus increasing the chances of species survivorship and ultimately species diversity. In urban areas these designated strips are areas connecting high value ESA, or maybe ESA themselves providing the necessary connections.

Determination of corridors is difficult for the LPASP area. The extensive blackberry thickets impedes animal passage, exception of birds. Proximity to Highway 97 along the entire eastern boundary would not be ideal in linkages considering animal and public conflicts. Review of surrounding areas show some distances to higher value features. However, the LPASP area is currently used by deer as part of their movement patterns in the Peachland area. A portion of the LPASP should be retained and not fenced to allow continued movement.

5.0 GAP ANALYSIS

We have identified the following gaps in the existing information as a consequence of timing in our field surveys and are not present in previous studies or inventories.

1. Our site assessment did not reveal any rare or endangered vascular plant species occurring on the CDC species list for the LPASP area. However, the timing of our investigation would not preclude the potential occurrence of these species at some other point during the growing season (This would apply to all plant species). We recommend using the TEM base to stratify the ASP area for potential occurrences of CDC listed plants for a field reconnaissance in the spring - summer.
2. The wetted areas in the LPASP area need to be examined for breeding amphibians in the spring.
3. Corridors must take a larger region wide wildlife plan into account since most wildlife is relatively mobile, and not limited to small areas. These connectivity corridors need to tie significant areas of large habitat, once they have been identified, to remaining areas of habitat within and beyond the LPASP area.

6.0 RECOMMENDATIONS FOR DEVELOPMENT

Considerations and recommendations are given to the entire Lower Princeton Area Structure Plan within context of the natural features in the surrounding areas as within the Best Management Practices.

6.1 Environmental Sensitive Areas

No ESA 1 values were present in the LPASP area however sensitive features outside the LPASP must be considered.

1. LPASP will be connected north to south with a corridor minimum 20 meters width. This should touch along Princeton Avenue near the remnant McCall Creek.
 - a) Focus of corridor selection should target higher value ESA where possible.
 - b) larger widths are to be considered if a trail system is to be incorporated
 - Trail system will be restricted to a 2 meter width maximum disturbance.

- Trail will be constructed of pervious materials.

6.2 Ecosystem Recommendations

1. Remove all Walnut trees abandoned
2. Remove all Himalayan Blackberry shrubs. The following exert describes a means of mechanical control:
 - Mowing, including the use of riding mowers and tractor-mounted mowers, can be very effective, but can also harm desirable species. If roots are not manually removed, mowing several times per year over several years is necessary to exhaust root reserves. If mowing or cutting is only done once per year, it should be done when the plants begin to flower. Do not mow where soil is highly susceptible to compaction or erosion, or where soil is very wet.
 - Persistent cultivation (tillage) or cutting in combination with mowing can be very effective. Because mechanical control can stimulate strong regrowth, follow-up with either spot applications of herbicide or hand digging to remove the entire root system.
 - Grazing by goats has proven effective.
 - Monitor controlled infestations throughout growing season.
 - Disposal: If plants are cut, all plant material must be collected in bags or tarps and incinerated or bagged and deeply buried at a landfill. Care should be taken to ensure that plant parts are not distributed during transport.

Chemical control:

- Herbicide recommendations and use must first consider site characteristics and be prescribed based on site goals and objectives. Herbicide labels and other sources of information must be reviewed before selecting and applying herbicides.
 - Effective herbicides include: metsulfuron-methyl, 2,4-D, triclopyr, and glyphosate.
 - Application: The use of a wick, selective spot (foliar) spraying, or stem injection/cut surface applications is recommended to minimize non-target damage. Foliar applications of metsulfuron-methyl are most effective when applied prior to fall leaf discoloration.
3. Maintain - rehabilitate - enhance the remnant McCall Creek drainage. This feature can be incorporated into corridor aspects.
 4. Invasive species controls should be implemented in the area. At the least as part of each development proposal.

6.3 Wildlife Recommendations

1. Retain the older (structural stage 6, >80 year-old) Douglas-fir and Ponderosa

Pine stand on the southern portion of LPASP area as the first choice when setting aside areas. These areas should be managed for the maintenance and development of older veteran trees and snags for cavity-nesting opportunities, and in semi-open states (15-30% canopy closure) to provide wildlife habitat and to more closely mimic the natural state of these low elevation Ponderosa Pine-Douglas-fir forests in the absence of fire exclusion, and to provide potential nesting and feeding opportunities for species-at-risk such as Flammulated Owls, Lewis's Woodpeckers and several bat species.

2. Discourage wildlife corridor - usage towards Okanagan Lake within the LPASP area. Wildlife and public conflicts - safety along Highway 97 will only increase over time.

7.0 MONITORING

A monitor should be retained to assist the developer - contractors in review and understanding of the environmental setting and recommendations and ensure the above mitigation plans are adhered.

8.0 CONCLUSION

We have provided numerous recommendations that should help guide an environmentally responsive development and ensure that potential detrimental impacts to the natural environment will be mitigated.

This report incorporates and is subject to best management practices. If you have any questions or comments, please contact the undersigned at your convenience.

Respectfully Submitted,

John Grods, R.P. Bio
Makonis Consulting Ltd.

Bill Rublee, R.P. Bio
ARC Environmental Ltd

Katy White M.Sc, BIT
Makonis Consulting Ltd.

Plant List:

Species	Common Name
<i>Acer glabrum</i> var. <i>douglasii</i>	Douglas maple
<i>Achillea millefolium</i>	common yarrow
<i>Achnatherum nelsonii</i>	Columbia needlegrass
<i>Achnatherum occidentale</i>	stiff needlegrass
<i>Agropyron cristatum</i>	crested wheatgrass
<i>Amelanchier alnifolia</i>	Saskatoon
<i>Antennaria dimorpha</i>	low pussytoes
<i>Apocynum androsaemifolium</i>	spreading dogbane
<i>Arctium minus</i>	common burdock
<i>Arctostaphylos uva-ursi</i>	kinnikinnick
<i>Asclepias speciosa</i>	showy milkweed
<i>Asparagus officinalis</i>	garden asparagus
<i>Astragalus miser</i>	timber milk-vetch
<i>Atriplex</i> sp.	chenopod species
<i>Balsamorhiza sagittata</i>	arrowleaf balsamroot
<i>Betula occidentalis</i>	water birch
<i>Bromus tectorum</i>	cheatgrass
<i>Calmagrostis rubescens</i>	pinegrass
<i>Carex aquatilis</i> .	water sedge
<i>Ceanothus velutinus</i>	snowbrush
<i>Centaurea biebersteinii</i>	spotted knapweed
<i>Centaurea diffusa</i>	diffuse knapweed
<i>Cerastium arvense</i>	field chickweed
<i>Chenopodium album</i>	Lamb's-quarters
<i>Cichorium intybus</i>	chicory
<i>Cirsium arvense</i>	Canada thistle
<i>Cirsium vulgare</i>	bull thistle
<i>Clematis ligusticifolia</i>	white clematis
<i>Cornus stolonifera</i>	red-osier dogwood
<i>Crepis tectorum</i>	annual hawksbeard*
<i>Cynoglossum officinale</i>	common hound's-tongue*
<i>Dactylis glomerata</i>	orchard-grass*
<i>Echium vulgare</i>	viper's bugloss
<i>Elymus glaucus</i>	blue wildrye
<i>Equisetum arvense</i>	horsetail
<i>Equisetum hyemale</i>	scouring-rush
<i>Eriogonum niveum</i>	snow buckwheat
<i>Festuca campestris</i>	rough fescue
<i>Festuca occidentalis</i>	western fescue
<i>Fragaria virginiana</i>	common strawberry
<i>Galium boreale</i>	northern bedstraw
<i>Geranium bicknellii</i>	Bicknell's geranium
<i>Hieracium</i> sp.	hawkweed
<i>Holodiscus discolor</i>	ocean spray
<i>Hordeum jubatum</i>	foxtail barley

Lower Princeton Area Structure Plan

<i>Hypericum perforatum</i>	St-John's wort*
<i>Kochia scoparia</i>	kochia
<i>Koeleria macrantha</i>	junegrass
<i>Lactuca pulchella</i>	blue lettuce
<i>Lithospermum ruderale</i>	lemonweed
<i>Mahonia aquifolium</i>	tall Oregon-grape
<i>Malva neglecta</i>	mallow
<i>Matricaria discoidea</i>	pineapple weed
<i>Medicago lupulina</i>	black medic
<i>Medicago sativa</i>	alfalfa
<i>Melilotus alba</i>	white sweet-clover
<i>Mentha arvensis</i>	field mint
<i>Opuntia fragilis</i>	prickly-pear cactus
<i>Parnassia fimbriata</i>	grass of parnassus
<i>Pinus ponderosa</i>	ponderosa pine
<i>Plantago lanceolata</i>	ribwort plantain*
<i>Populus balsamifera</i>	cottonwood
<i>Populus tremuloides</i>	trembling aspen
<i>Potentilla recta</i>	sulphur cinquefoil
<i>Prunus virginiana</i>	chokecherry
<i>Pseudoroegneria spicata</i>	bluebunch wheatgrass
<i>Pseudotsuga menziesii</i> var. <i>glauca</i>	Douglas-fir
<i>Pteridium aquilinum</i>	bracken fern
<i>Rhus glabra</i>	smooth sumac
<i>Rosa acicularis</i>	prickly rose
<i>Rosa nutkana</i>	Nootka rose
<i>Rubus discolor</i>	himalayan blackberry
<i>Rubus idaeus</i>	red raspberry
<i>Rumex acetosella</i>	sheep sorrel
<i>Rumex crispus</i>	curled dock
<i>Salsola tragus</i>	Russian thistle
<i>Sambucus caerulea</i>	blue elderberry
<i>Silene noctiflora</i>	night flower catchfly
<i>Solidago canadensis</i>	Canada goldenrod
<i>Sonchus arvensis</i> var. <i>glabrescens</i>	perennial sow-thistle*
<i>Spiraea betulifolia</i> ssp. <i>lucida</i>	birch-leaved spirea
<i>Symphoricarpos albus</i> var. <i>albus</i>	snowberry
<i>Taraxacum officinale</i>	dandelion*
<i>Tragopogon dubius</i>	yellow salsify
<i>Trifolium hybridum</i>	alsike clover
<i>Urtica dioica</i>	stinging nettle
<i>Typha latifolia</i>	cattail
<i>Verbascum thapsus</i>	great mullein
<i>Viburnum edule</i>	high-bush cranberry
<i>Ulmus pumila</i>	Siberian elm
<i>Juglans</i> sp.	Walnut
<i>Salix alba</i>	Weeping Willow

