

ENVIRONMENTAL ASSESSMENT 2223 WESTSIDE ROAD, RDCO

Lot 2, Plan KAP14249
PID: 009-053-794

Regional District of Central Okanagan (RDCO)

Prepared For:

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1.0 INTRODUCTION

Ecoscape Environmental Consultants Ltd. (Ecoscape) has been retained by Maloney Construction Ltd. (Maloney) to complete an environmental assessment of a proposed construction of a single-family dwelling at 2223 Westside Road, RDCO, BC (subject property) (**Appendix A**) (**Photos 1-3**). The subject property is legally described as Lot 2, Plan KAP14249, District Lot 3745, within the Regional District of Central Okanagan (RDCO) (**Figure 1**). The subject property is bounded by rural properties to the west, north and south, and Okanagan Lake to the east. Westside Road bisects the subject property, running north/south (**Figure 1**). The subject property is approximately 1.34 ha in size and is zoned as Rural Residential 3 (RU3) under the RDCO Official Community Plan (OCP) which is designated as Residential – Low Density / Rural Residential by RDCO. The subject property is located within a RDCO Sensitive Terrestrial Ecosystem and Aquatic Ecosystem Development Permit Areas (DPAs) and is within Hillside and Wildfire Interface DPAs.

This report has been prepared for the application of a Riparian Areas Protection Regulation (RAPR) hardship and floodplain regulation variance for the proposed works within the subject property. **On February 25, 2021, the RAPR hardship application for the proposed works within the subject property was approved.** A revised February 2021 (original created June 2020) Geotechnical Hazard Assessment report from Beacon Geotechnical Ltd. (**Appendix B**) and a Floodplain Exemption Application Report from Clarke Geoscience Ltd (**Appendix C**) have been attached to this report summarizing the challenges within the subject property and provide technical rationale for the RAPR hardship and floodplain regulation variance for the proposed development within the subject property.

If the floodplain regulation variance is approved, then this report will then be used to meet the requirements set out in the RDCO Terms of Reference (TOR) for Professional Reports for Planning Services (RDCO 2006) for a development permit within the Sensitive Terrestrial Ecosystem and Aquatic Ecosystem DPAs.

2.0 PROPOSED WORKS

The proposed works are limited to construction of a single-family dwelling, garage, deck area, and septic system within the subject property. The septic system is the only portion of the proposed works to occur within the western side of the subject property – where a no disturb covenant (i.e., protection and perpetuity area) is to be designated in areas west of the location for the septic system (**Appendix F**). The septic system has been designed to meet the requirements of Interior Health for onsite sewerage. The septic field for the subject property has been designed for a two-bedroom home with an average daily volume of effluent of 1,000 liters. The proposed septic field will have an independent disposal area – noting, that the field for a future proposed development from an adjacent Lot will also be included in this area. The adjacent Lot plans are currently being formalized, noting that geotechnical constraints (report in progress) do not allow home development on upland portions of the Lot either. Through

consolidation of dispersal fields, upland impacts to sensitive terrestrial development can be reduced. The septic field for the adjacent Lot has been designed for a five-bedroom home with an average daily effluent of 1,900 liters. Construction of the system will not require a significant amount of site grading and cuts into the existing topography within the western side of the subject property (**Appendix B**) (**Appendix F**).

The designs for the dwelling have been developed to ensure the proposed building footprint will be constructed as drawn. Drawings for building permit will be prepared if a variance is granted. Thus, the development areas outlined within the design documents are reflective of the final footprint as we understand. The site plan can be found in **Appendix A**. The final details for the building permit will not result in any change in building footprint and are largely aesthetic or may include other internal design alterations. The work related to the driveway is outside of the SPEA and is to be a part of the proposed construction within the subject property.

The subject property has many different constraints. West of Westside Rd. is very steep and provides high value terrestrial and wildlife habitat. East of the property, there is minimal developable area due to environmental constraints. A RAPR Hardship case was proposed because of the identified geotechnical constraints on the west side of the road combined with the high value terrestrial ecosystems that are present. While development is proposed adjacent to Okanagan Lake, it is generally contained within previously disturbed areas and a restoration plan has been prepared to help mitigate the proposed encroachment. If development were to occur to the west of Westside Rd, the terrestrial impacts to facilitate construction of a home using standard techniques would be large because of the steep grades and need to construct a level building platform (coupled with sewerage servicing, etc.).

As outlined within **Figure 4**, the allowable footprint under the RAPR (i.e., Greenfield Hardship Calculation) for the subject property was determined to be approximately **260.5 m²**. The proposed building footprint and septic will have a footprint of approximately **344 m²** (**209 m²** for proposed dwelling). (**Appendix A**) (**Figure 4**). No portion of the building is within 10 m of Okanagan Lake for both floodplain and environmental reasons. In this case, development on the property either presents risks to the aquatic environment via encroachment into identified setbacks, or to terrestrial areas to construct building platforms. When looked at holistically, it is our opinion that risks to the terrestrial environment outweigh those to the aquatic environment, assuming that the proposed setback restoration plan is implemented. Upon implementation of the plan, the riparian enhancements would create a more functional setback area and actual change from current condition would be relatively small. Further, the western areas of the property are proposed for protection in perpetuity.

3.0 ENVIRONMENTAL ASSESSMENT

A site assessment of the subject property was completed by Scott Layher, M.Sc., R.P.Bio and Carly Simpson, B.Sc, A.Ag, Natural Resource Biologists with Ecoscape, on October

30, 2019. Data collection and reporting standards are pursuant to the RDCO TOR. This report has been developed to address terrestrial environmental and riparian values present within the subject property. The following section describes the conditions of the subject property.

3.1 Terrestrial Resource Values

The subject property occurs within a low-density residential area along Westside Road in the RDCO. Private properties are present to the north and south, and rural properties are present to the west. The subject property meets Okanagan Lake to the east. The subject property is bisected by Westside Road, which runs north/south through the subject property. The portion of the subject property adjacent to Okanagan Lake has been developed, with foreshore modifications including an existing dock structure, rock retaining wall, and wooden staircase (**Photo 3**). Modifications within the subject property include a wooden retaining wall, cement block retaining wall, wooden patio area, campfire pit, and wooden shed (**Photos 4-5**). As per conversation between Jason Schleppe (Ecoscape) and Patrick Tobin (MOFLNRORD), the present natural boundary line - and possible Crown Land encroachments within the foreshore of the subject property, are currently being investigated. Neil Denby (Runnalls Denby) has been retained and will note any encroachment issues within the subject property if identified.

The south eastern portion of the subject property, adjacent to Okanagan Lake is relatively undisturbed, with a pebble beach present below rock outcrops and steep slopes leading to Westside Road. The western portion of the subject property is relatively undisturbed with steep slopes and a gully, with some minor disturbance from storage of large retaining wall blocks at the base of the slope (**Photo 6**). The proposed work area is located within the existing disturbance in the eastern side of the subject property adjacent to Okanagan Lake, and within a small section of the western side of the subject property for the septic system.

The eastern portion of the subject property was primarily a developed yard. Native vegetation observed included black cottonwood (*Populus trichocarpa*), trembling aspen (*Populus tremuloides*), ponderosa pine (*Pinus ponderosa*), juniper (*Juniperus* spp.), spruce (*Picea* spp.), tall-Oregon grape (*Mahonia aquifolium*), and varied grass species. Invasive vegetation observed included tree of heaven (*Ailanthus altissima*), knapweed (*Centaurea* spp.), white clover (*Trifolium repens*), and lambs' quarter (*Chenopodium album*).

Vegetation along the beach on the south end of the subject property, and along the embankment on Westside Road included rose (*Rosa* spp.), willow (*Salix* spp.), ponderosa pine, alder (*Betulaceae* spp.), tall-Oregon grape, common rabbitbrush (*Ericameria nauseosa* spp.), common snowberry (*Symphoricarpos albus*), hawksbeard (*Crepis tectorum*), red osier dogwood (*Cornus sericea*), scouring rush (*Equisetum hyemale*), black cottonwood, interior Douglas-fir, and yarrow (*Achillea millefolium*). Invasive vegetation observed included mustard (*Brassica* spp.), knapweed, alfalfa

(*Medicago sativa*), and dalmation toadflax (*Linaria dalmatica*), white clover, great mullein (*Verbascum thapsus*).

A detailed wildlife assessment was not conducted, and there were no incidental observations of wildlife during the site visit. Trees within the subject property potentially provide perching, foraging, and nesting habitat for a diversity of birds. No dense shrub cover was observed that could provide high value cover, forage, and nesting habitat for avian species and small mammals.

The subject property occurs within Ungulate Winter Range u-8-001, which has been established for the protection of mule deer (*Odocoileus hemionus*) winter habitat. Private properties are exempt from wildlife measures required within Ungulate Winter Ranges, but the site is considered important winter range habitat and the proposed covenant in non-buildable portions of the subject property will help maintain these values in perpetuity.

3.2 Aquatic Resource Values

The shoreline of the subject property occurs along Okanagan Lake Foreshore Inventory and Mapping (FIM) segments 219 and 220. Segment 219 is described as being of Single-Family use with a high level of impact (>40%), with approximately 95% of the 385 m segment is disturbed (Schleppe, 2016). The shoreline is classified as sand, and substrates observed to be 40% gravels and 60% sand. The current and potential Aquatic Habitat Index ratings are moderate, with juvenile rearing rated as moderate.

Segment 220 is described as being rural use, with a high level of impact (>40%), with approximately 85% of the 360 m segment disturbed. The shoreline is classified as rocky shore, and substrates observed were 100% gravels. The current and potential Aquatic Habitat Index ratings are rated as High, with juvenile rearing rated as moderate.

Historical and recent Kokanee (*Oncorhynchus nerka*) shore spawning data, Rocky Mountain Ridged Mussel (*Gonidea angulata*) (RMRM) occurrence data, and foreshore plant species-at-risk data from the BC Ministry of Forests, Lands, Natural Resource Operations, and Rural Development (BC MoFLNRORD, 2018) were reviewed for the subject property. The subject property is located within a No Colour Zone Kokanee shore spawning and is adjacent to a Yellow Zone to the north and south of the subject property. A No Colour Zone for Kokanee shore spawning is an area where no recent or historic shore spawning is known to occur (BC MoFLNRORD, 2018). A Yellow Zone for Kokanee shore spawning is an area where aggregations of ≤50 spawning fish were observed and historical (pre-2001) data were aggregations of <1000 spawning fish were observed.

The subject property is located within a No Colour Zone for freshwater mussels and foreshore plants. No Colour Zones for freshwater mussels and foreshore plant species-at-risk are defined as habitats that have not been assessed for RMRM or foreshore plant SAR presence as of 2017 (BC MoFLNRORD 2018).

There were no shore spawning Kokanee, RMRM or other mollusks, or rare foreshore plants observed within the subject property during the site visit; however, lack of observation does not preclude presence as detailed surveys were not conducted during the site visit.

A *Water Sustainability Act* Notification (R8005520) was approved on July 9, 2020 for four new steel piles for a boat lift adjacent to the existing dock within the subject property.

A comprehensive list of fish and mussel species found in Okanagan Lake which have the potential to occur adjacent the subject property is noted in **Table 1**.

Table 1. Fish Species found in Okanagan Lake (BC MoE, accessed online on July 14, 2020)

Common Name	Scientific Name
Eastern Brook Trout	<i>Salvelinus fontinalis</i>
Bull Trout	<i>Salvelinus confluentus</i>
Burbot	<i>Lota lota</i>
Carp	<i>Cyprinus carpio</i>
Chiselmouth	<i>Acrocheilus alutaceus</i>
Cutthroat Trout	<i>Oncorhynchus clarkii</i>
Floater Mussel (General)	<i>Anodonta</i> spp.
Kokanee	<i>Oncorhynchus nerka</i>
Lake Trout	<i>Salvelinus namaycush</i>
Lake Whitefish	<i>Coregonus clupeaformis</i>
Largescale Sucker	<i>Catostomus macrocheilus</i>
Leopard Dace	<i>Rhinichthys falcatus</i>
Longnose Dace	<i>Rhinichthys cataractae</i>
Longnose Sucker	<i>Catostomus catostomus</i>
Mountain Whitefish	<i>Prosopium williamsoni</i>
Northern Pikeminnow	<i>Ptychocheilus oregonensis</i>
Peamouth Chub	<i>Mylocheilus caurinus</i>
Prickly Sculpin	<i>Cottus asper</i>
Pumpkinseed	<i>Lepomis gibbosus</i>
Pygmy Whitefish	<i>Prosopium coulterii</i>
Rainbow Trout	<i>Oncorhynchus mykiss</i>
Redside Shiner	<i>Richardsonius balteatus</i>
Slimy Sculpin	<i>Cottus cognatus</i>
Smallmouth Bass	<i>Micropterus dolomieu</i>
Yellow Perch	<i>Perca flavescens</i>
Rocky Mountain (Western) Ridged Mussel	<i>Gonidea angulata</i>
Western Floater Mussel	<i>Anodonta kennerlyi</i>
Winged Floater Mussel	<i>Anodonta nuttalliana</i>

The proposed building footprint is within 30 m of Okanagan Lake, and required a Riparian Area Protection Regulation (RAPR) Assessment, as outlined in the *Riparian Area Protection Regulations*. Setbacks had been determined based on the methodology outlined in the Riparian Areas Protection Technical Assessment Manual (MoFLNRORD, 2019). The proposed building footprint encroaches approximately 5 m within the 15 m SPEA setback from the high-water mark and would require a variance to the 15 m

SPEA setback, in turn, altering it to a 10 m SPEA setback. Significant restoration guidelines are proposed and are detailed within this report to account for the proposed change to the SPEA setback.

3.3 Species at Risk

The BC Conservation Data Centre (BC CDC) was queried for species-at-risk observed within close proximity (1km) to the subject property. The data that was queried included Critical Habitat for Federally-Listed Species-at-Risk, Species and Ecosystems at Risk (Publicly Available Occurrences), and Wildlife Species Inventory Survey and Incidental Observation Points.

- Incidental Observation ID 51962, Object ID 666666 representing a 2007 observation of a provincially Yellow-listed Common Poorwill (*Phalaenoptilus nuttallii*), approximately 890 m northwest of the subject property.
- Incidental Observation ID 52006, Object ID 32904258 representing a 2007 observation of a provincially Yellow-listed Great Horned Owl (*Bubo virginianus*), approximately 695 m northwest of the subject property.
- Incidental Observation ID 52005, Object ID 32904257 representing a 2007 observation of a Great Horned Owl, approximately 695 m northwest of the subject property.
- Incidental Observation ID 51956 Object ID 32903313 representing a 2007 observation of a Common Poorwill, approximately 725m north of the subject property.
- Incidental Observation ID 52004, Object ID 32904256 representing a 2007 observation of a Great Horned Owl, approximately 400m north of the subject property.
- Incidental Observation ID 51955, Object ID 32903297 representing a 2007 observation of a Common Poorwill, approximately 280 m north of the subject property.
- Incidental Observation ID 51954, Object ID 32903311 representing a 2007 observation of a Common Poorwill, approximately 700 m south of the subject property.
- Incidental Observation ID 52003, Object ID 32904255 representing a 2007 observation of a Great Horned Owl, approximately 850 m south of the subject property.
- Incidental Observation ID 150783, Object ID 3309520 representing a 2015 observation of a provincially Blue-listed Gopher Snake (*Pituophis catenifer deserticola*), approximately 435 m south of the subject property.
- Incidental Observation ID 151443, Object ID 33008324 representing a 2015 observation of a provincially Red-listed Desert Night Snake (*Hypsiglena chlorophaea*), approximately 880 m west of the subject property.

- Incidental Observation ID 166092, Object ID 33004435 representing a 2016 observation of a provincially Yellow-listed Northern Rubber Boa (*Charina bottae*), approximately 600 m north of the subject property.

The subject property occurs within a 10 km x 10 km grid square identified as critical habitat for Great Basin Gophersnake, provincially Blue-listed Western Rattlesnake, Desert Nightsnake by the recovery strategy recently developed from Environment and Climate Change Canada (ECCC 2019). Due to the similarity in habitat needs between the three species of snakes and the known sharing of hibernacula between the three species, the presence of rock outcrops, mammal burrows, and shrub and grassy cover within the western portion of the subject property provide value as potential snake habitat.

The BC Ministry of Environment's Species and Ecosystem Explorer was queried to identify wildlife species potentially present in the region; search terms used to query this database are provided in the footnotes of **Table 2**, below.

Table 2. Species at risk with the potential to occur within the subject property

Class	Common Name	Scientific Name	Provincial Status	COSEWIC Listing	Likelihood of Occurrence
Birds	Great Blue Heron	<i>Ardea herodias herodias</i>	Blue	-	Moderate
	Short-eared Owl	<i>Asio flammeus</i>	Blue	Special Concern	Low
	Burrowing Owl	<i>Athene cunicularia</i>	Blue	Endangered	Low
	American Bittern	<i>Botaurus lentiginosus</i>	Blue	-	Low
	Swainson's Hawk	<i>Buteo swainsoni</i>	Red	-	Moderate
	Canyon Wren	<i>Catherpes mexicanus</i>	Blue	Not at Risk	Low
	Common Nighthawk	<i>Chordeiles minor</i>	Yellow	Special Concern	Moderate
	Evening Grosbeak	<i>Coccothaustes vespertinus</i>	Yellow	Special Concern	Low
	Olive-sided Flycatcher	<i>Contopus cooperi</i>	Blue	Special Concern	Low
	Horned Lark, merrilli subspecies	<i>Eremophila alpestris merrilli</i>	Blue	-	Low
	Rusty Blackbird	<i>Euphagus carolinus</i>	Blue	Special Concern	Low
	Barn Swallow	<i>Hirundo rustica</i>	Blue	Threatened	Low
	California Gull	<i>Larus californicus</i>	Blue	-	Moderate
	Western Screech-Owl, <i>macfarlanei</i> subspecies	<i>Megascops kennicottii macfarlanei</i>	Blue	Threatened	Low
	Lewis's Woodpecker	<i>Melanerpes lewis</i>	Blue	Threatened	Moderate
Insects	Flammulated Owl	<i>Psiloscoptes flammeolus</i>	Blue	Special Concern	Low
	Monarch	<i>Danaus plexippus</i>	Blue	Endangered	Low
	Pale Jumping-slug	<i>Hemphillia camelus</i>	Blue	-	Moderate
	Nevada Skipper	<i>Hesperia Nevada</i>	Blue	-	Low

Table 2. Species at risk with the potential to occur within the subject property

Class	Common Name	Scientific Name	Provincial Status	COSEWIC Listing	Likelihood of Occurrence
	Lilac-bordered Copper	<i>Lycaena nivalis</i>	Blue	-	Low
	Common Sootywing	<i>Pholisora Catullus</i>	Blue	-	Moderate
Mammals	Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>	Blue	-	Low
	Spotted Bat	<i>Euderma maculatum</i>	Blue	Special concern	Moderate
	White-tailed Jackrabbit	<i>Lepus townsendii</i>	Red	-	Low
	Western Small-footed Myotis	<i>Myotis ciliolabrum</i>	Blue	-	Moderate
	Little Brown Myotis	<i>Myotis lucifugus</i>	Yellow	Endangered	Moderate
	Fringed Myotis	<i>Myotis thysanodes</i>	Blue	Data Deficient	Moderate
	Bighorn Sheep	<i>Ovis canadensis</i>	Blue	-	Low
	Fisher	<i>Pekania pennanti</i>	Blue	-	Low
	Western Harvest Mouse	<i>Reithrodontomys megalotis</i>	Blue	Special Concern	Low
	Merriam's Shrew	<i>Sorex merriami</i>	Red	-	Low
	Nuttall's Cottontail	<i>Sylvilagus nuttallii</i>	Blue	Special Concern	Low
	American Badger	<i>Taxidea taxus</i>	Red	Endangered	Low
Amphibians and Reptiles	Western Toad	<i>Bufo boreas</i>	Yellow	Special Concern	Moderate
	Northern Rubber Boa	<i>Charina bottae</i>	Yellow	Special Concern	Moderate
	Painted Turtle – Intermountain-Rocky Mountain Population	<i>Chrysemys picta</i>	Blue	Special Concern	Low
	North American Racer	<i>Coluber constrictor</i>	Blue	-	Low
	Western Rattlesnake	<i>Crotalus oreganus</i>	Blue	Threatened	Moderate
	Gopher Snake, <i>deserticola</i> subspecies	<i>Pituophis catenifer deserticola</i>	Blue	Threatened	Moderate
	Western Skink	<i>Plestiodon skiltonianus</i>	Blue	Special Concern	Moderate
	Great Basin Spadefoot	<i>Spea intermontana</i>	Blue	Threatened	Low
Plants	Slender hawksbeard	<i>Crepis atriobarba atriobarba</i>	Blue	-	Low

3.4 Ecosystem Communities

The subject property occurs within the Okanagan Very Dry Hot Ponderosa Pine (PPxh1) biogeoclimatic zone that is described by the Biogeoclimatic Ecosystem Classification (BEC) program (Lloyd et al. 1990). Areas of the PP zone are the driest forested ecosystems in B.C., with low snowfall and hot, dry, summers.

Terrestrial Ecosystem Mapping (TEM) was reviewed for the subject property; however, a formal categorization based on the site assessment was not complete for the subject property, and only the existing TEM completed for the central Okanagan (Iverson 2009) was referenced. **Table 3** below presents the ecosystem codes, their associated site modifiers, and provincial status.

Table 3. Ecosystem communities occurring within the project area

Ecosystem Code	Site Modifier	Ecosystem Name	Site Modifier Definition	Provincial Status ¹
PF	k6C	Idaho fescue – Bluebunch wheatgrass	Cool aspect, mature coniferous forest structural stage	Red
PW	s5C	Ponderosa pine/Douglas fir – Bluebunch wheatgrass – Pinegrass	Shallow soils, young forest coniferous forest structural stage	Blue
SP	k	Douglas-fir/Ponderosa Pine – Snowberry – Pinegrass	Cool aspect, mature forest structural stage	N/A
RW	N/A	Rural	N/A	N/A
ES	k1	Exposed soil	Cool aspect, sparse/bryoid structural stage	N/A
RZ	N/A	Road Surface	N/A	N/A

¹ Source: <http://www.env.gov.bc.ca/cdc/>

N/A: Non-listed Blue: Of special concern. Red: Endangered or threatened.

The provincially Red-listed PF ecosystem community is the dominating community throughout the primarily undisturbed west side of the subject property. PF ecosystems are categorized as cool aspect ponderosa pine forests with some interior Douglas-fir with mixed bluebunch wheatgrass (*Pseudoroegneria spicata*) and fescue (*Festuca* spp.) understory (at climax). Understory vegetation is primarily composed of bluebunch wheatgrass, arrow-leaved balsam root (*Balsamorhiza sagittate*), rough fescue (*Festuca scabrella*), Idaho fescue, hawksbeard, junegrass (*Koeleria macrantha*), and timber milk-vetch (*Astragalus canadensis*).

The provincially Blue-listed PW ecosystem community is present throughout the westside of the subject property. PW ecosystems are categorized as mesic and near-mesic ponderosa pine forests on medium-textured soils, on level or gently sloping sites. Understory vegetation is primarily composed of bluebunch wheatgrass, arrow-leaved balsam root (*Balsamorhiza sagittate*), Idaho fescue (*Festuca idahoensis*), timber milk-vetch (*Astragalus canadensis*) and yarrow.

The yet to be classified SP ecosystem community is present throughout the westside of the subject property. SP ecosystems are categorized as moist or sheltered sites with mixed interior Douglas-fir and ponderosa pine overstories and an understory with pinegrass and various shrubs. Understory vegetation is primarily composed of trembling aspen, saskatoon (*Amelanchier alnifolia*), common snowberry, nootka rose (*Rosa nutkana*), tall-Oregon grape, Douglas maple (*Acer glabrum*), and pinegrass (*Calamagrostis rubescens*).

An assortment of anthropogenic subzones had been designated adjacent to Westside Road and within the eastern side of the subject property, and includes RW (Rural), ES (Exposed Soil), and RZ (Road Surface). These subzones account for the rural development within the area of the exist within the eastern side of the subject property.

3.5 Environmentally Sensitive Areas (ESAs)

An Environmental Sensitivity Analysis was undertaken to categorize the defined ecosystem/habitat polygons in the project area based on the degree of environmental sensitivity. Evaluation criteria considered in the analysis include: provincial CDC status (i.e., Red or Blue listed), rare and endangered species occurrence potential, landscape condition (i.e., connectivity, fragmentation), successional stage, regional rarity, relative biodiversity, and level of disturbance.

The four categories of environmental sensitivity are described below based on ESA categories used in the Regional District of Central Okanagan (RDCO) Terms of Reference for Professional Reports for Planning Services (2006), along with relative retention expectations.

- **Very High (ESA-1):** These areas represent rare and/or significant physical features, plants and animals or include ecologically functioning natural systems. ESA-1 areas include vegetation and wildlife characteristics representing a diverse range of sensitive habitat. These features contribute significantly to the overall connectivity of the habitat and ecosystems. Various types of habitat will qualify as ESA-1 on the basis of sensitivity, vulnerability, connectivity and biodiversity. All wetlands, high value foreshore, locally/regionally rare plant communities, animals and habitats will be considered as Very High.
 - **80 – 100% retention:** Areas given an ESA-1 rating are considered the highest priority for protection of ecosystem function and values and therefore avoidance and conservation of ESA-1 designations should be the primary objective. If development is required and justified within these areas mitigation to reduce or eliminate environmental impacts shall be required as well as compensation to promote no net loss to the habitat (typically with a 3:1 replacement of equivalent functioning habitat). Only when residual, permanent loss of habitat is unavoidable and after it proves impossible or impractical to maintain the same level of ecological function, will compensation be considered.
- **High (ESA-2):** Polygons delineated as ESA-2 contain physical features, plants, animals and habitat characteristics which contribute to the overall diversity and contiguous nature of the surrounding natural features. ESA-2 may also include areas used to buffer ecological functions of ESA-1 areas.
 - **40 – 80% retention:** Some degree of development may be considered in ESA-2 areas as long as the development does not have any potential negative impact on ESA-1 areas. If development is pursued in ESA-2 areas, portions of the habitat should be retained (40-80%) and integrated to maintain the

contiguous nature of the landscape. Any loss to the ESA-2 areas shall be offset by habitat improvements to the remaining natural areas found on the property and must ensure habitat function is maintained or improved in the retention areas.

- **Moderate (ESA-3):** Polygons delineated as ESA-3 represent disturbed habitats or fragmented features that are not locally or regionally rare. However, these areas still contribute to the diversity and connectivity of the landscape and may contain natural habitats, and some features of interest (i.e. tree patches, rock outcroppings, drainages and corridors), although based on the condition and adjacency of each habitat the significant function within the landscape is limited. If development is pursued in these areas, the impacts should be offset by habitat improvements in other more sensitive natural areas found on the property. There may also be portions of the area that have significant ecological functions within the landscape (i.e. buffers to ESA 1 and/or ESA 2, or corridors) that should be retained.
 - **20 – 40% retention:** Important features or remnant stands/sites with intrinsic ecological value. Maintain important features within (e.g., tree patches, rock outcroppings, drainages and corridors). If development is pursued in these areas the impacts should be offset by habitat improvements in other more sensitive natural areas found on property.
- **Low (ESA-4):** Polygons delineated as ESA - 4 contribute little or no value to the overall diversity of vegetation, soils, terrain and wildlife characteristics of the area. These areas have generally experienced anthropogenic disturbances (i.e. a driveway or other approved land clearing but does not include land cleared for agriculture) with little or no possibility for recovery or rehabilitation. Development is therefore encouraged to be focused to these sites before consideration of using higher-rated sites within the planning area. These areas shall not be considered as areas for restoration and enhancement or as recruitment as higher value ESA to offset development in other areas.
 - **0 – 20% retention:** Development is encouraged to be focused in these areas.

The ESA composition of the subject property is summarized in **Table 4** and depicted on **Figure 3**.

Table 4. Area and percent composition of ESAs and disturbance within the study area.				
ESA Value	ESA Area (m ²)	Percentage of Study Area (%)	ESA Area Disturbed within study area (m ²)	Percentage of ESA Disturbed (%)
Very High (ESA 1)	0	0	0	0
High (ESA 2)	11,777	90	139	1
Moderate (ESA 3)	1,281	10	578	45
Low (ESA 4)	0	0	0	0
Total	13,058	100	717	5*

*total value is based on disturbance within each ESA area polygon

Based on the existing level of disturbance within the eastern side of the subject property, and if the floodplain regulation variance is approved, the proposed works would be built within predominantly within ESA 3 (Moderate) and a small portion of the ESA 2 (High) valued areas (Table 4). While both variances would allow for an approximate 5 m encroachment within the standard 15 m SPEA setback, significant restoration is proposed to account for this encroachment – and is detailed within Section 5.8 of this report. Approval of the floodplain regulation variance would allow for conservation of the mostly undisturbed ESA 2 (High) valued area within the western sloped area of the subject property (**Photos 7-9**). Thus, this plan would focus the proposed works for the dwelling within the disturbed eastern side of the subject property. Focusing the proposed dwelling within the existing disturbed area mitigates the expected disturbance resulting from slope stabilization structures or grades (i.e., retaining walls) that would be needed for development if the proposed works were to occur within western side of the property.

The extent of earthworks needed to stabilize the western slope would require “chasing” a stable grade up the hill until it “daylights” using a combination of retaining walls and/or grading. This would result in a large disturbance (i.e., of the subject property) of the western area of the subject property because of the retaining walls and grades needed to create a stable building platform. Further, final and temporary slope configurations required for construction of a home on the westside would require significant excavation, slope re-construction, and construction of multiple retaining walls (**Appendix B**). Rationale for designating this area as undevelopable for geotechnical reasons can be found in **Appendix B**.

For the floodplain, a technical memo supporting the proposed development has also been prepared (**Appendix C**). Since the proposed building area is well above Okanagan Lake, flood risks can be mitigated. The flood variance requires some efforts to either reconstruct or provide flood relief for the old retaining wall on the subject property. At this time, the owners wish to obtain the necessary variances and then will prepare detailed plans for addressing the erosion control structure for submission of a Section 11 under the Water Sustainability Act. However, these works are proposed to occur after receipt of the variance to avoid unnecessary costs if the variance application does not proceed.

4.0 IMPACT ASSESSMENT

The proposed development includes the construction of a single-family dwelling, garage, septic system, and covered deck. Ecoscape anticipates that, provided mitigation measures are adhered to, impacts on terrestrial and aquatic resource values as a result of construction will be negligible. However, without appropriate mitigation measures, proposed works could result in the following impacts:

- Potential for release of fine sediments into Okanagan Lake. The release of fine sediments could result in temporary increases in turbidity and deterioration of water quality. *Due to the location of the proposed works in proximity to Okanagan*

Lake, silt fencing must be installed between the development footprint and Okanagan Lake.

- Potential for the release of deleterious substances (e.g., fuel, oil, hydraulic fluid) to the environment as a result of improper storage, equipment re-fueling, and/or poorly maintained equipment. *It is recommended that a spill kit be kept on site at all times during the proposed works and refueling will not take place within 30 m of Okanagan Lake.*
- Potential for encroachment into the wetted area below the HWL could cause impacts to Okanagan Lake and the potential spawning habitat adjacent to the project area. *All works must occur above the high-water mark (343 m above sea level).*
- Disturbance beyond the proposed clearing limits may create conditions favorable for colonization of invasive plant species.
- Potential to directly or indirectly impact wildlife during earthworks, roadworks and tree clearing, including disruption of migration, breeding, or other behavior as a result of noise, impacts to air quality, and alterations to existing wildlife habitat and cover.

Section 5.0 below provides specific recommendations to mitigate these potential impacts. As already indicated, adverse effects associated with construction activities will be negligible if the mitigation measures proposed are implemented.

5.0 MITIGATION MEASURES

Ecoscape provides the following mitigation measures to minimize the risks of impacts during proposed works to fish, wildlife and associated habitats. Best Management Practices (BMPs) have been adapted from BC Ministry of Environment Standards and Best Practices for Instream Works. This document will be made available to the contractor prior to initiating the works and it should be kept onsite during proposed works to demonstrate that the contractor is aware of the recommendations and that they are being followed. The most relevant best management practices that should be adhered to during the proposed works include:

- Standards and Best Management Practices for Instream Works (BC MoWLAP 2004a)
- Develop with Care Environmental Guidelines for Urban and Rural Land Development (BC MoE 2014).

The appropriate Development Permits and approvals must be obtained from the RDCO prior to construction activities within the subject property. The Development Permit must be kept onsite at all times.

5.1 General Recommendations for Construction

- No work can occur below the high-water mark / Present Natural Boundary of the Okanagan Lake without having a Provincial *Water Sustainability Act* Section 11 Notification or Approval application submitted, approved and in the possession of the property owner and contractor prior to any instream work.
- The operation or parking of equipment below the driplines of the trees must be avoided.
- The release of fine sediments, construction debris or other substances deleterious to the environment or aquatic habitat must be prevented at all times.
- Wherever possible, trees with high wildlife value, such as veteran trees and large snags, must be conserved. Hazardous trees with wildlife value within the vicinity of the construction works should be assessed by a certified wildlife/danger trees assessor to determine levels of risk.
- No equipment refueling or servicing is to be undertaken within 30 m of Okanagan Lake whenever possible.
- All road surfaces (i.e., Westside Road) must be kept clean and free of fine materials (i.e., swept or scraped) regularly to prevent the increase of airborne particulate matter.

5.2 Nesting Bird Work Window

Avian nesting timing windows should be considered to protect nesting birds within and adjacent to the proposed work area. The general nesting period of migratory birds in Canada within Zone A1a and A2 is March 31st to August 15th (BC MoFLNRORD 2019).

The following methods should be implemented in relation to nesting bird work windows.

- If vegetation or tree clearing is planned to occur during peak nesting season (March 31 to August 15), a nesting bird survey should be conducted by a qualified environmental professional (QEP) prior to initiating construction and specifically vegetation removal. This is a key mitigation strategy to avoid harm to nesting individuals or species at risk. It is an offence to harm a bird or its eggs during the nesting period, as per the provincial *Wildlife Act* and federal *Migratory Birds Convention Act*.
- If active nests are found within the construction limits, a buffer will be established around the nest until such time that the environmental monitor (EM) can determine that nest has become inactive. The size of the buffer will depend on the species and nature of the surrounding habitat. Buffer sizes will generally follow provincial BMP guidelines or other accepted protocol (e.g.,

Environment Canada). In general, a minimum 20 m buffer will be established around songbird nests or other non-sensitive (i.e., not at risk) species.

- Clearing and other construction activities must be conducted within 72 hours following the completion of any pre-clearing nest surveys. If works are not conducted in that time, the nest surveys are considered to have expired and a follow-up survey will be completed to ensure that no new nests have been constructed.
- Wherever possible, trees with high wildlife value, such as veteran trees and large snags, must be conserved. Hazardous trees with wildlife value within the vicinity of the construction works should be assessed by a certified wildlife/danger trees assessor to determine levels of risk.

5.3 Clearing and Grubbing

Clearing, stripping, and grubbing limits must be clearly marked in the field prior to construction and minimized wherever possible. Unnecessary impacts to native vegetation and soils must always be avoided. No important wildlife habitat, including veteran trees, snags, or other important features, were identified within the development footprint during the site visit, however, should additional workspace be required, the EM should confirm whether sensitive features are present in the amended footprint. Native vegetation, including trees, shrubs, and groundcover, should be retained to the extent possible to mitigate the establishment of invasive plants and to maintain the existing ecological value sustained within the project area.

- Prevention of the spread of non-native and invasive species can be achieved by limiting disturbance to soils and native vegetation where possible. Areas that have previously been disturbed should be restored with native plantings or grass seeding. Infestation areas must be controlled with regular manual removal of weeds (e.g., mowing, pulling).
- Flagging or snow fencing must be used to clearly delineate the construction disturbance limits prior to the commencement of works and must remain in place for the duration of works. Flagging or snow fencing will also be used to clearly identify setbacks and buffers associated with other identified environmentally sensitive areas (e.g., wildlife trees, nests).
- In the event that land and/or natural vegetation is disturbed or damaged beyond the development footprint area, these areas will be restored and/or replanted with plant material indigenous to the area under the direction of the EM.
- Exposed soils must be seeded immediately following any activities that result in disturbance to native vegetation and soils. Grass seed mixes must be comprised of native species, appropriate for the environmental conditions and certified as Canada #1 Grade by Agriculture Canada to minimize the weed seed count. A recommended seed mix can be found in **Table 5**.

Table 5. Restoration Grass Seed mix		
Seed Weight	Botanical Name	Common Name
40%	<i>Pseudoroegneria spicata</i>	bluebunch wheatgrass
25%	<i>Festuca campestris</i>	rough fescue
15%	<i>Festuca idahoensis</i>	Idaho fescue
10%	<i>Lolium perenne</i>	perennial ryegrass
5%	<i>Poa secunda</i>	Sandberg bluegrass
4%	<i>Koeleria macrantha</i>	Junegrass
1%	<i>Poa compressa</i>	Canada bluegrass

5.4 Erosion and Sediment Control

The mitigation strategies described below should be followed as required to provide erosion and sediment control associated with the environmentally sensitive habitats identified in the assessment.

- Stockpile locations, staging and equipment storage areas, concrete washouts, washroom locations and environmentally sensitive areas should be delineated at the start of construction.
- Works involving ground disturbance should not be conducted during heavy rains wherever feasible to reduce the potential for sediment and erosion issues. Exposed soils along slopes must be stabilized and covered where appropriate using erosion control blankets (ECB), poly sheeting, tarps, or other suitable materials to reduce the potential for erosion resulting from rainfall, seepage, or other unexpected causes.
- Silt fencing should be installed as directed by the EM in a field-fit manner. Silt fence must be staked into the ground and trenched a minimum of 15 cm to prevent erosion underneath the fence. Silt fencing will be monitored on a regular basis and any damages or areas where the integrity and function of the fencing has been compromised should be repaired or replaced promptly. Silt fence must remain in place where required until the completion of the project.
- If erosion becomes a problem during construction and there is a risk of siltation to the adjacent naturally vegetated areas and watercourses (i.e., during heavy rain events), silt fence must be installed immediately adjacent to the development footprint to mitigate for potential sediment transport and erosion downslope of the works. Silt fence must be staked into the ground and trenched to prevent flow underneath the fence.
- ESC recommendations by the EM or Engineer on Record must be implemented within 24 hours.

- It is the contractor's responsibility to inspect all mitigation measures daily and additional measures will be installed, maintained, and repaired or replaced as required using a field-fit, adaptive approach.
- The release of silt, sediment, sediment-laden water, or any other deleterious substance into any ditch, watercourse (creek, river, lake), ravine, or other drainage feature must be prevented at all times. Similarly, there is to be no sediment release into areas of vegetation growth or sensitive areas in levels that would adversely alter growing or hydraulic conditions.
- It is the contractor's responsibility to regularly monitor weather forecasts and adjust ESC measures or proposed construction activities as required based upon the existing conditions of the site.
- Adjacent roadways should be kept clean and free of fine materials. Sediment accumulation upon the road surfaces should be removed and disposed of appropriately.

5.5 Dirty Water Management

- If water is encountered during excavations dewatering may be required. Options for dirty water management include the following;
 - Discharging water in small quantities to well-vegetated areas of the site to allow for infiltration and reduction of runoff potential.
 - Discharging to local stormwater will only be an option if prior approval is obtained from the RDCO.
 - Discharge to Okanagan Lake may be an option provided that water discharged is within the allowable limits for turbidity under the ambient water quality guidelines for turbidity, suspended and benthic sediments; see below (BC MoE 2001). Any water discharged to Okanagan Lake must be approved by the EM prior to discharge and the EM would need to be onsite full time.
- Turbidity levels under the Ministry of Environment guidelines for fish and aquatic habitats (BC MoE 2001) are as follows;
 - During clear flow periods, induced turbidity should not exceed 8 NTU above background levels at any given time and no more than an average of 2 NTU above background levels over a 30 day period.
 - During turbid flow periods, induced turbidity should not exceed background levels by more than 5 NTU at any time when background turbidity is between 8 and 50 NTU. When background exceeds 50 NTU, turbidity should not be increased by more than 10% of the measured background level at any one time.

5.6 Emergency Spill Response Plan

Spills of deleterious substances can be prevented through awareness of the potential for negative impacts and with responsible housekeeping practices onsite. Maintenance of a clean site and the proper use, storage and disposal of deleterious liquids and their containers are important to mitigate the potentially harmful effects of spills and/or leaks. The following BMP are adapted from Chilibeck *et al.* (1992) to provide guidance in the control of deleterious substances.

- Ensure that onsite machinery is in good operating condition, clean, and free of leaks, excess oil or grease.
- Equipment and tools used for concrete works must be washed offsite away from any watercourses. Concrete wastewater must not be washed into any watercourse or the storm water system (i.e. must not be poured in a location that drains into municipal catch basins and subsequently into watercourses).
- Spills occurring on dry land will be contained, scraped and disposed of appropriately. Contaminated material will be stored on tarps and covered to prevent mobilization and will be disposed of in accordance with the *Environmental Management Act*.
- Copies of contact phone numbers for notification of all of the required authorities in the event of a spill/emergency response will be kept posted and clearly visible onsite.
- Spill containment kits should be kept readily available on-site during construction in case of the accidental release of a deleterious substance to the environment. Any spills of a reportable amount of a toxic substance must be immediately reported to Ecoscape at **250-491-7337**, as well as Emergency Management BC's 24-hour hotline at **1-800-663-3456**.

5.7 Invasive Species Management

- Ongoing invasive species control will be required within any areas with exposed/disturbed soils and restoration areas in the first few years until vegetation becomes established. Species that are aggressive have the potential to outcompete native species.
- Invasive plant species should be hand pulled or brushed/mowed using mechanical means. Mowing or brushing of invasive plant species should only occur before they have flowered or gone to seed. The use of chemical treatments is not recommended, particularly since herbicides can kill native species and due to plantings associated with stormwater runoff which enters watercourses (i.e., Okanagan Lake) untreated.
- The contractor will ensure that all equipment and vehicles are washed and free of weed seeds prior to mobilization and de-mobilization. Vehicles and equipment should not be stored, parked, or staged within weed infested areas if

possible. Contractor clothing should also be inspected daily for signs of weed seeds. If found, weed seeds should be disposed of in a contained refuse bin for offsite disposal.

- Care must be taken to ensure that invasive species removal does not impact existing or planted native tree and shrub species.
- Invasive plant species must be disposed of in a landfill; however, invasive species material must not be composted in the yard waste section of the landfill. Invasive plant species must not be transported to or deposited in other natural areas.
- Woody debris/wood fiber mulch spread around the base of plantings may help to deter establishment of and competition from invasive plant species.

5.8 Site Cleanup and Restoration

At this stage, it is understood that a formal landscape plan will not be prepared for the subject property. Due to the proposed encroachment within the 15 m SPEA setback for the proposed variances, Ecoscape has prepared a riparian restoration plan that outlines substantial plantings within the proposed 10 m SPEA setback.

The total area proposed for restoration within the SPEA – taking into account the proposed works footprint and space availability within the subject property, is **758 m²**. Due to the opportunity for enhancing the native species regime within the SPEA, a substantial planting list has been included below. If a formal landscape plan is prepared for the subject property (that encompasses the SPEA), it must be reviewed and approved by Ecoscape and reviewed by the RDCO, prior to implementation.

The following recommendations are to be adhered to with completion of riparian restoration activities:

Table 6. Riparian Restoration Plantings			
Common Name	Scientific Name	Size	Quantity
TREES			
Trembling aspen	<i>Populus tremuloides</i>	1-2 gal	
Interior Douglas-fir	<i>Pseudotsuga menziesii var. glauca</i>	1-2 gal	
Ponderosa pine	<i>Pinus Ponderosa</i>	1-2 gal	
Subtotal			35
SHRUBS			
Red-osier dogwood	<i>Cornus sericea</i>	1 gal	
Prickly rose	<i>Rosa acicularis</i>	1 gal	
Common snowberry	<i>Symphoricarpos albus</i>	1 gal	
Tall Oregon-grape	<i>Mahonia aquifolium</i>	1 gal	
Saskatoon	<i>Amelanchier alnifolia</i>	1 gal	
Nootka rose	<i>Rosa nutkana</i>	1 gal	
Common rabbit brush	<i>Chrysothamnus nauseosus</i>	1 gal	
Subtotal			255
Total			290

- With a density of 1 shrub per 2 m², and 1 tree per 7m², a total of **255 shrubs**, and **35 trees** are recommended for planting within the SPEA .
- Changes to the species list is permissible, but must be approved by the EM prior to substitution and plants must be native to the Okanagan. The proposed planting list and layout should be reviewed by the EM prior to planting and all plants should be flagged for review. Only native vegetation from local stock should be planted within the SPEA, unless approved by the EM.
- Upon the completion of the proposed works and installation of the restoration plantings, invasive plant species should be removed from any disturbed areas and the SPEA on a monthly basis, at minimum. Ongoing invasive weed management may continue to be required as necessary within the subject property. Chemical pesticides/herbicides and fertilizers must not be used within the enhancement area due to the close proximity to Okanagan Lake. Furthermore, it is recommended that invasive species are pulled by hand or by mechanical means.
- Watering should occur for the first two growing seasons, until plants are established. Spring and fall watering, if necessary, should be timed to water every 3 or 4 days. In summer, watering should be deep, but infrequent – occurring once per week. Irrigation should be timed to augment rainfall and a rainfall sensor would help to reduce water consumption. Hand watering and drip irrigation are both acceptable methods. Care should be taken during watering to ensure that overland flows do not result in sedimentation to surrounding watercourses.
- A target of 80% plant survival is recommended after two years. If the total number of plants drops below 80% of the original number planted, fill/replacement planting will be required. Replacement trees and shrubs can be 1-gallon size, although the property owners are welcome to use larger plant stock.
- Shrubs should be spaced at about 1.5 m on center and trees should be spaced about 3 m on center.
- Native plantings may need to be protected from beaver and/or deer with wire mesh or suitable fencing.
- While wood fiber or rock mulch may be used around plants, bark mulch in close proximity to Okanagan Lake should be avoided due to the potential for toxic leachates.
- Weed management and erosion control must occur in all areas disturbed during development.
- If additional disturbance occurs outside the development footprint, these areas will need to be addressed by the EM and restored with native plantings.

The following recommendations are to be adhered to with completion of site cleanup:

- Silt fencing and other temporary mitigation features must be removed upon substantial completion of construction works. All equipment, supplies, and non-biodegradable materials must be removed from the site.
- Weed management and erosion control must occur in all areas disturbed during development. At a minimum, hydro-seed or loose grass seed must be applied to re-vegetate areas that have been disturbed.
- Retention of some coarse woody debris within the project area is recommended for the wildlife habitat value and it provides.
- Ongoing weed control through hand removal is recommended to reduce the abundance of weeds already established within the subject property as well as mitigate the future spread of weeds as a result of construction activities as a result of the project. A QEP will follow up with site visits twice per year over 3 years post construction to ensure that weed control measures are effective, and recommend adapted weed management measures if required.

6.0 Environmental Monitoring

Ecoscape has been retained for environmental monitoring during construction activities. The EM will document compliance with BMPs, mitigation measures, and other recommendations and provide guidance for implementation of best practices (e.g., erosion and sediment control, restoration) during construction. In the event that greater disturbance occurs due to unforeseen circumstances, the EM will recommend measures to protect/restore the natural integrity of the site. If RDCO requires monitoring, the following schedule is recommended;

- A pre-construction meeting should be held between the EM and the contractor(s) undertaking the work onsite to ensure a common understanding of the mitigation measures and best practices required for the project. A copy of the development permit and this report must be kept readily available at the site for reference while the work is being conducted. Site delineation must be in place prior to project startup.
- The contractor will provide the EM with an up to date schedule of construction activities, and notify the EM if the schedule changes, or potentially high-risk work (e.g., site clearing) is planned that is not identified on the schedule.
- The EM will be an appropriately qualified environmental professional (QEP) authorized to halt construction activities should an incident arise that is causing undue harm (unforeseen or from lack of due care) to terrestrial resource values.
- Construction activities should be monitored on a monthly basis and more regularly during high risk activities (e.g. clearing and grubbing, concrete pours,

large material excavations) until the completion of the project. At a minimum, environmental monitoring of restoration is recommended to provide substantial completion for the project.

- Regular monitoring reports will be submitted to the primary contractor, client, and RDCO. Once construction and restoration are complete, a substantial completion site visit and report will be undertaken by the EM.

7.0 PERFORMANCE AND MAINTENANCE BONDING

Performance bonding is typically required by the RDCO to ensure that the recommended mitigation measures are adhered to and any restoration is completed as required. Bonding in the amount of 125% of the estimated value of the prescribed works (i.e. monitoring) and is generally required to ensure faithful performance and that all mitigation measures are completed and function as intended. Security deposits shall remain in effect until the RDCO has been notified, in writing by the EM that the objectives have been met and substantial completion of the restoration works has been achieved.

A cost estimate has been prepared to address the RDCO performance bonding requirements. Ecoscape estimates that the total cost for planting, associated environmental monitoring of compensation works and subsequent preparation of a substantial completion report will be approximately **\$14,550**, not including GST (Table 7). The 125% bond amount is therefore estimated to be **\$18,188**.

Table 7. Cost estimate for restoration planting and bonding.					
Item	Location	Quantity	Unit	Material Cost	Installed Cost*
Trees and shrubs	Within SPEA (refer to Figure 4)	290	1 gallon, but larger stock is acceptable	\$2,900 (based on \$15/plant)	\$13,050
Environmental monitoring of enhancement plantings (including substantial completion report)**					\$1,500
Grand Total					\$14,550
125% Bond					\$18,188

*Installed costs are assumed to be based upon 3 x the purchase price of materials. A landscaping company and distributor of native plant stock may be able to provide a more accurate estimate to complete the prescribed works.

**The estimate for environmental monitoring does not include monitoring of proposed works.

8.0 CONCLUSION

This environmental assessment report has been prepared to address the Development Permit requirements as outlined within the RDCO Rural Westside Official Community Plan (RWOCPP), and meet the Terms of Reference (TOR) for Professional Reports for Planning Services.

The proposed development will meet the objectives as outlined within the Appendices of the RWOCF for the RDCO Sensitive Terrestrial Ecosystem, Aquatic Ecosystem, Hillside, and Wildfire DPAs, with key points addressing the objectives of each DP, and is summarized below:

1.) Aquatic Ecosystems Development Permit Objectives:

- a) To protect the ecological attributes and socio-economic values that is common to all Aquatic Ecosystems.
- b) To protect, restore, and enhance Aquatic Ecosystems (water, wetland, riparian and broadleaf woodland).
- c) To protect Aquatic Ecosystems through use of buffers.
- d) To protect water quality and quantity.
- e) To protect vital wildlife functions such as (but not limited to) a travel corridor, a place of refuge, water source, fish habitat, and a breeding habitat to ensure future generations.

The objectives for the Aquatic Ecosystems Development Permit area will be met through compliance with the Provincial Riparian Areas Protection Regulation and the substantial restoration plan proposed for the development. The existing riparian vegetation is limited to a thin band of assorted trees and shrub species, with a high amount of disturbance to the understory. The proposed restoration plan will enhance the existing riparian area, increase bank stability through root regimes of plantings, and increase the ecological attributes within the riparian area by providing increased habitat values for various avian, terrestrial, and aquatic species. No instream works are proposed as part of the development within the subject property.

2.) Terrestrial Ecosystems Development Permit Objectives:

- a) To ensure that sensitive environments are identified and protected in areas that may be subject to future rural subdivision.
- b) To encourage and support the current rural and resort use of land in a way that best conserves important and vanishing environments. The Development Permit Area established to include coniferous woodland, broadleaf woodland, grassland, sparsely vegetated, and mature forest ecosystems identified in the sensitive ecosystem inventory of Central Okanagan.

The objectives for the Terrestrial Ecosystems Development Permit area will be met through establishment of a covenant (or other suitable mechanism determined by RDCO) for protection of the mostly undisturbed western area of the subject property. The only exception to this would-be placement of a septic field in the previously disturbed areas on the western portion. The western portion of the property contains

high habitat value. Conservation of this area will ensure feasible wildlife corridors are maintained including high value habitat for various avian and wildlife species, conservation of snags and standing dead trees (i.e., wildlife trees). Protection of this area will also reduce the potential for introduction of invasive plant species, maintain slope stability, and provide continued successional growth of the existing vegetation regime within the western side of the property.

The eastern side of the subject property will further be enhanced through restoration proposed as a part of this development and is further outlined within the previous section (i.e., 1. Aquatic Ecosystems Development Permit Objectives) of this report.

3.) Hillside Development Permit Area Objectives:

- a) To support rural subdivision, road building and construction on hillsides that protects and enhances the natural characteristics of the hillside which are a significant component of the OCP area.
- b) To support rural subdivision, road building and construction on hillsides in a manner that minimizes damage to property (both the property under application and neighboring property) from erosion, soil instability, rock fall, or other identified hazards.
- c) To support rural subdivision, road building and construction on hillsides in a manner that is sensitive to the natural topography and maximizes the retention of existing landscape vegetation and soils.
- d) To support rural subdivision, road building, and construction on hillsides in a manner that is responsive to the natural environment and drainage patterns.

The objectives for the Terrestrial Ecosystems Development Permit area will be met through retention of the high gradient sloped hillside within the western area of the property. Prevention of erosion, soil instability, rock fall, mass movements, and retention of natural drainage patterns through conservation will mitigate these types of hazards, while protecting the high-valued ecosystems within this area of the property. Rationale for designating this area as undevelopable for geotechnical reasons can be found in **Appendix B**.

4.) Wildfire Interface Construction Development Permit Objectives:

- a) The objective is to reduce the susceptibility to wildfire of new construction or large addition near the provincial forest interface, or the interface with large, forested parks.

As per correspondence between Ecoscape and Brittany Lange of the RDCO during the pre-application meeting completed for the proposed development, a wildfire assessment report was not needed for the Wildfire Interface Construction Development Permit (WICDP) application. At this time, only submission of the designs of the proposed home and registration of a covenant within the western side of the subject property were the only requirements needed to meet the permit guidelines.

The proposed development is not anticipated to have any long-term effects within the subject property, as long as the recommended restoration plan, mitigation measures, and best management practices are followed throughout the course of the construction period within the subject property.

9.0 CLOSURE

This report has been prepared for the exclusive use of Maloney Construction Ltd. Ecoscape has prepared this report with the understanding that all available information on the present and proposed use of the subject property has been disclosed. Maloney Construction Ltd. has acknowledged that in order for Ecoscape to properly provide the professional service, Ecoscape is relying upon full disclosure and accuracy of this information.

If you have any questions or comments, please contact the undersigned at your convenience.

Respectfully Submitted
ECOSCAPE ENVIRONMENTAL
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Attachments: Photographs
 Figures
 Appendix A: Design Documents Provided by Mullins Design Group

Appendix B: Geotechnical Hazard Assessment Report from Beacon Geotechnical Ltd.

Appendix C: Draft Floodplain Exemption Application Report from Clarke Geoscience Ltd.

Appendix D: Site Survey

Appendix E: Cumulative Impacts Memo Created by Ecoscape

Appendix F: Septic System Designs from Franklin Engineering Ltd.

Appendix G: No Build Memo from Beacon Geotechnical Ltd.

10.0 REFERENCES

- British Columbia Ministry of Environment (BC MoE). 2020. Fish Inventories Data Queries (FIDQ). Accessed on July 14, 2020. Available: <https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/fish/fish-and-fish-habitat-data-information/search-fish-fish-habitat-data-information/fisheries-inventory-data-queries>
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Photo 1. View looking north west of the proposed build area and existing modifications within the subject property (All photos taken on October 30, 2019).



Photo 2. View looking north west of the existing deck proposed for removal within the subject property.



Photo 3. View looking north of the riparian area within the subject property.



Photo 4. View looking south west of foreshore modifications (retaining wall and stairs to foreshore) within the subject property.



Photo 5. View looking south west of the wooden retaining wall within the subject property.



Photo 6. View looking west of cement blocks and gully within the west slope adjacent to Westside Road.



Photo 7. View looking east and downslope within the western slope of the subject property.



Photo 8. View looking west and upslope within the western slope of the subject property.



Photo 9. View looking north east of the neighboring properties from the western slope.

FIGURES



FIGURE 1

Site Location and Fisheries Information

Project:

Environmental Assessment

Location:

Regional District of Central Okanagan

Project No.:

19-3064

Prepared for:

Maloney Construction Ltd.

Prepared by:

Ecoscape Environmental Consultants Ltd.
Josh Castanier, GIS Technician

Coordinate System:

NAD83-UTM Zone 11

Imagery:

ESRI World Imagery

Map Date:

July 21, 2020

LEGEND

Regional Location of Subject Property

Places

Subject Property

Cadastre

Municipal Boundary

Lakes

Parks and Protected Lands

Critical Habitat for Species-at-Risk

Okanagan Wetlands

BC Conservation Data Centre Polygons

Highway

Major Roads

Streams

WSI Survey Observations

WSI Incidental Observations

Segment Break

Foreshore Inventory and Mapping (FIM)

Okanagan Large Lakes Foreshore Protocol

Historical Kokanee Spawning Records

Kokanee Spawning Black Zone

Kokanee Spawning Red Zone

Kokanee Spawning Yellow Zone

Mussel Red Zone

Mussel Yellow Zone

Foreshore Plants Black Zone

Foreshore Plants Red Zone

Foreshore Plants Yellow Zone

Regional Location of Subject Properties

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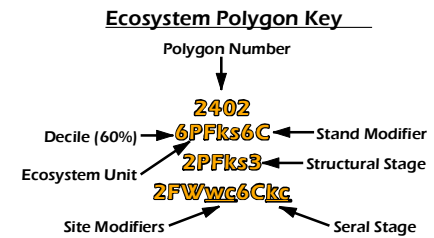


FIGURE 2
Ecosystem Polygons

Project: Environmental Assessment
Location: Regional District of Central Okanagan
Project No.: 19-3064
Prepared for: Maloney Construction Ltd.
Prepared by: Ecoscape Environmental Consultants Ltd.
Josh Castanier, GIS Technician
Coordinate System: NAD83-UTM Zone 11
Imagery: ESRI World Imagery
Map Date: December 4, 2020

LEGEND

- Subject Property
- Cadastre
- Ecosystem Polygons
- Streams and Rivers



Ecosystem Units

RW	Rural
RZ	Road
PF	Ponderosa pine - Bluebunch wheatgrass - Rough fescue
PW	Ponderosa pine - Bluebunch wheatgrass - Idaho fescue
SP	Snowbrush - Pinegrass

Site Modifiers

c	coarse textured soils
k	cool aspect (slope >25%)
s	shallow soils (20-100 cm to bedrock)
v	very shallow (< 20 cm to bedrock)
w	warm aspect (slope > 25%)

Structural Stage

1	Sparse/bryoid
2b	Herb - Graminoid-dominated
3a	Shrub/Herb - Low Shrub
3b	Shrub/Herb - Tall Shrub
4	Pole Sapling
5	Young Forest
6	Mature Forest
7	Old Forest

Seral Stage/Weed Modifiers

kc	knapweed - cheatgrass
wk	bluebunch wheatgrass - knapweed

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FIGURE 3

Environmental Sensitivity Analysis

Project: Environmental Assessment
Location: Regional District of Central Okanagan
Project No.: 19-3064
Prepared for: Maloney Construction Ltd.
Prepared by: Ecoscape Environmental Consultants Ltd.
Josh Castanier, GIS Technician

Coordinate System: NAD83-UTM Zone 11
Imagery: ESRI World Imagery
Map Date: December 4, 2020

LEGEND

"99" Ecosystem Polygon Number

- Subject Property
- Cadastre
- Streams and Rivers

Environmental Sensitivity Rating

- Very High (ESA 1)
- High (ESA 2)
- Moderate (ESA 3)
- Low (ESA 4)

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FIGURE 4
Riparian Areas Regulation Assesment

Project: Environmental Assessment
Location: Regional District of Central Okanagan
Project No.: 19-3064
Prepared for: Maloney Construction Ltd.
Prepared by: Ecoscape Environmental Consultants Ltd.
Josh Castanier, GIS Technician
Coordinate System: NAD83-UTM Zone 11
Imagery: ESRI World Imagery
Map Date: February 22, 2021

- LEGEND**
- Subject Property
 - Cadastre
 - Streamside Protection and Enhancement Area (SPEA)
 - Buildable Area Outside Natural and Legal Restrictions Excluding SPEA
 - Development SPEA Encroachment
 - Proposed Building Footprint
 - Proposed Septic Tanks
 - Proposed Dispersal Bed
 - Developable Area
 - 10 Meter Setback
 - Stream Boundary i.e. Surveyed High Water Level (343 m.a.s.l.)
 - 30 m Riparian Areas Regulation Assessment Area
 - Zone of Sensitivity - Large Woody Debris (15 m)
 - Zone of Sensitivity - Litterfall (15 m)
 - Zone of Sensitivity - Shade (30 m due south)
 - Proposed Front Yard Setback (2.29m)
 - Proposed Septic Piping

Hardship Area Calculation (Greenfield)	
Total Property Area =	13057.4m ²
Total Buildable Area (Outside Municipal Setbacks + Geotech Approved area Western Lot) =	868.4m ²
Developable Area (Outside Natural/Legal Restrictions) =	232.2m ²
Total Proposed Development Area =	343.5m ²
Allowable Footprint (30% of Buildable Area) =	260.5m ²
Allowable Variance Area/Encroachment into SPEA =	28.3m ²

***Caveat**
Under this specific hardship case; a geotechnical assessment of the property has granted a specific area on the western lot safe to engineer for a septic field area. This area is included within the hardship calculations and is added to Buildable Area, Developable Area, and added to the Total Proposed Development Area.

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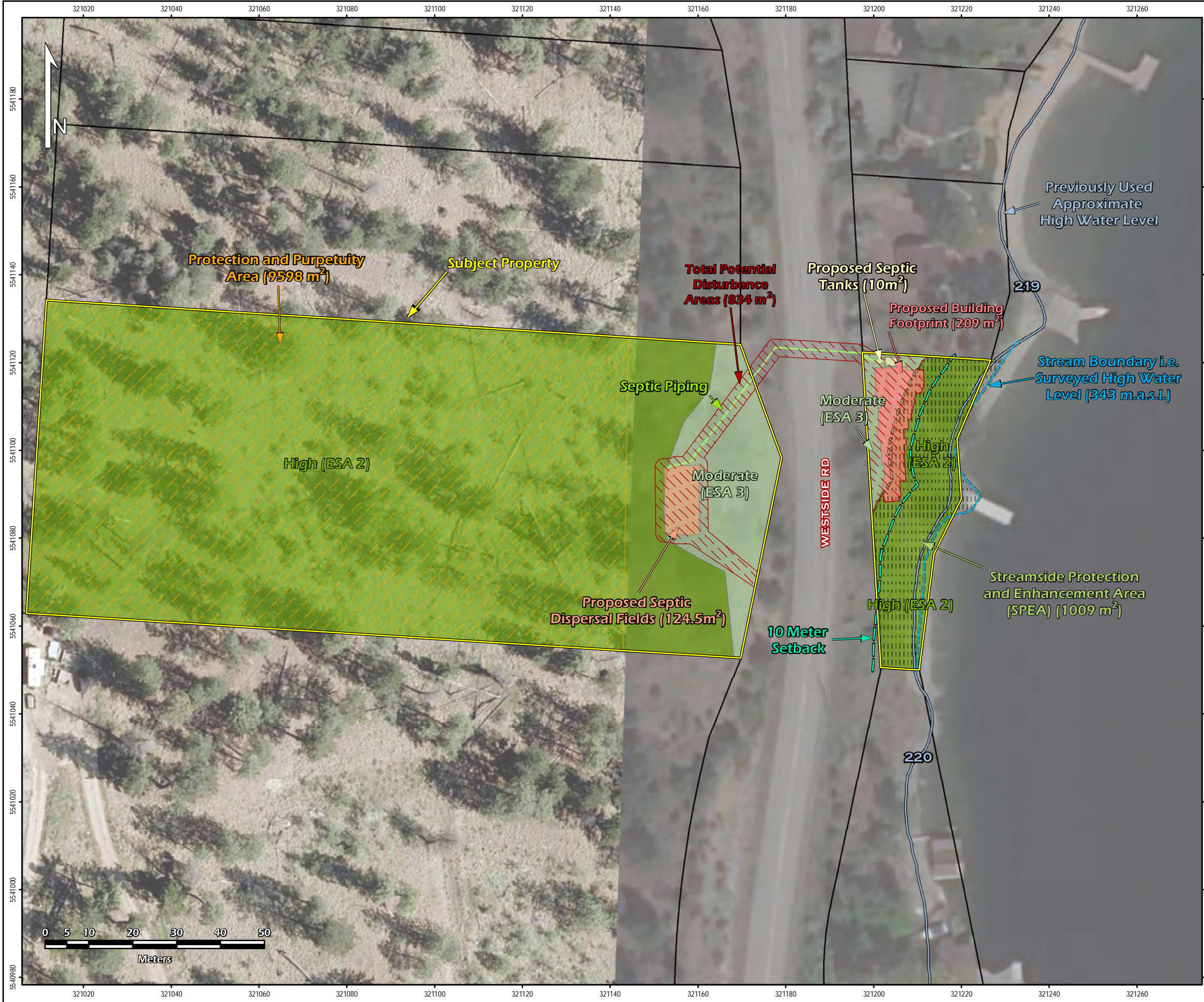


FIGURE 5

Impact Assessment

Project:	Environmental Assessment
Location:	Regional District of Central Okanagan
Project No.:	19-3064
Prepared for:	Maloney Construction Ltd.
Prepared by:	Ecoscope Environmental Consultants Ltd. Josh Castanier, GIS Technician
Coordinate System:	NAD83-UTM Zone 11
Imagery:	ESRI World Imagery
Map Date:	February 22, 2021

LEGEND

	Development Disturbance Area
	Protection and Purpetuity Area
	Proposed Building Footprint
	Proposed Septic Tanks
	Proposed Dispersal Bed
	Subject Property
	Cadastre
	Streamside Protection and Enhancement Area (SPEA)
	Stream Boundary i.e. Surveyed High Water Level (343 m.a.s.l.)
	10 Meter Setback
	Proposed Septic Piping
	Foreshore Inventory and Mapping (FIM)

Environmental Sensivity Rating

	Very High (ESA 1)
	High (ESA 2)
	Moderate (ESA 3)
	Low (ESA 4)

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FIGURE 6

Restoration Plan

Project:	Environmental Assessment
Location:	Regional District of Central Okanagan
Project No.:	19-3064
Prepared for:	Maloney Construction Ltd.
Prepared by:	Ecoscope Environmental Consultants Ltd. Josh Castanier, GIS Technician
Coordinate System:	NAD83-UTM Zone 11
Imagery:	ESRI World Imagery
Map Date:	February 22, 2021

LEGEND

- Stream Boundary i.e. Surveyed High Water Level (343 m.a.s.l.)
- Streams and Rivers
- Subject Property
- Cadastre
- Streamside Protection and Enhancement Area (SPEA)
- Restoration Area
- New Coniferous 'NC'
- New Deciduous 'ND'
- Shrub 'A' Red-osier Dogwood
- Shrub 'B' Prickly Rose
- Shrub 'C' Common Snowberry
- Shrub 'D' Tall Oregon Grape
- Shrub 'E' Saskatoon
- Shrub 'F' Nootka Rose
- Shrub 'G' Common Rabbit Brush
- Proposed Building Footprint

**Note: A total of 255 shrubs and 35 trees for a total restoration area of 758 m² is required*

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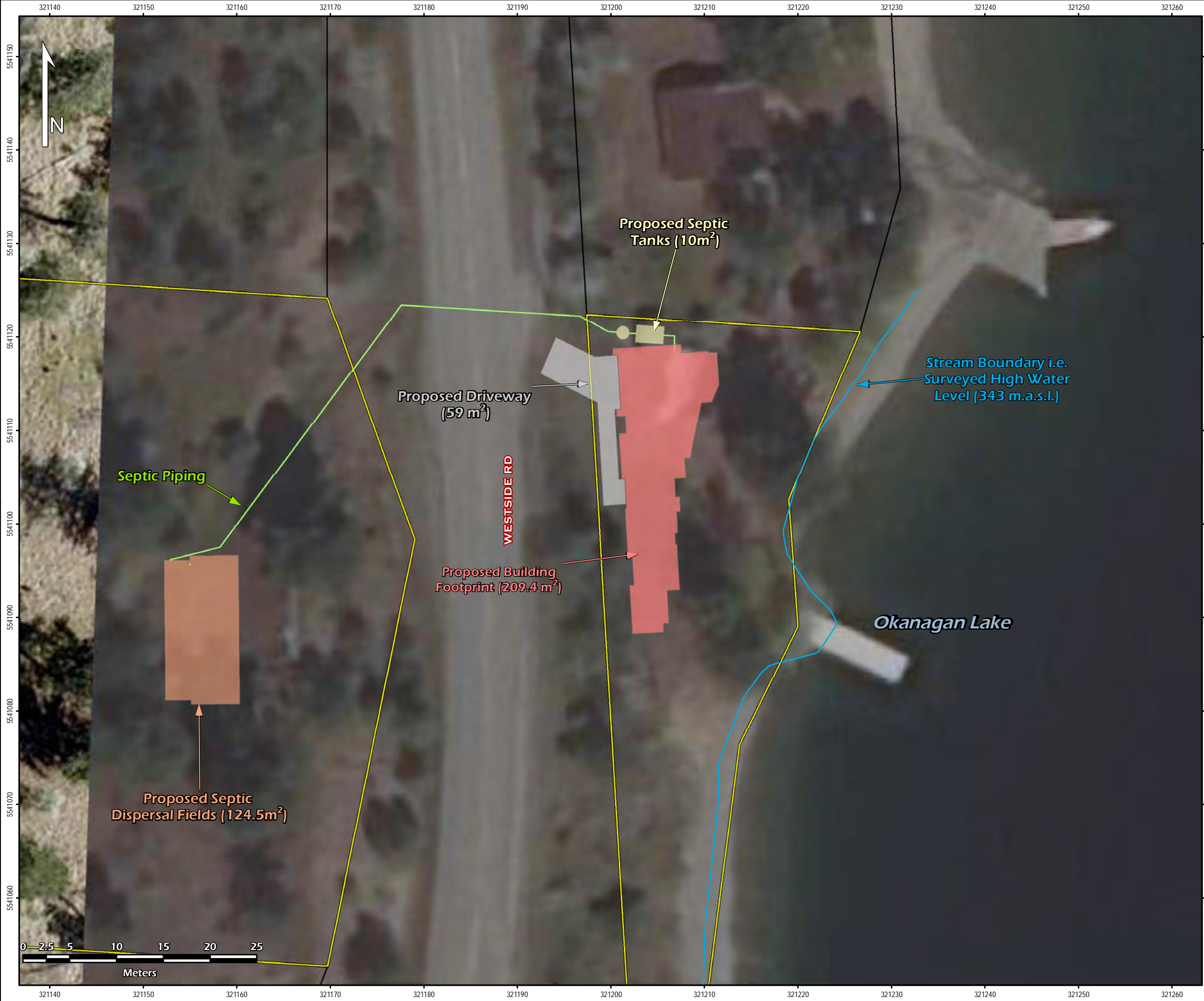


FIGURE 7

Access Road Assessment

Project:	Environmental Assessment
Location:	Regional District of Central Okanagan
Project No.:	19-3064
Prepared for:	Katawa Construction Ltd.
Prepared by:	Ecoscape Environmental Consultants Ltd. Josh Castanier, GIS Technician
Coordinate System:	NAD83-UTM Zone 11
Imagery:	ESRI World Imagery
Map Date:	February 22, 2021

LEGEND

<div></div>	Subject Property
<div></div>	Cadastre
<div></div>	Proposed Driveway
<div></div>	Proposed Development
<div></div>	Proposed Septic Tanks
<div></div>	Proposed Dispersal Bed
<div></div>	Proposed Septic Piping
<div></div>	Stream Boundary i.e. Surveyed High Water Level (343 m.a.s.l.)

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APPENDIX A: DESIGN DOCUMENTS PROVIDED BY MULLINS DESIGN GROUP



SHEET NUMBER

1/5

SCALE: 1/4" = 1'

DATE : JUNE-03-2020

KATAWA CONSTRUCTION

PROPOSED PROJECT FOR

2223 WESTSIDE RD

ECOSCAPES BUILDABLE AREA

UNIT 203 - 1889 SPALL RD.

Kelowna BC V1Y 4R2

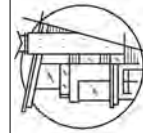
Bus: (250) 717-3415

Cell: (250) 258-7819

E-mail: mullinsdrafting@shaw.ca



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DESIGN GROUP



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UNIT 203 - 1889 SPALL RD.

Kelowna BC V1Y 4R2

Bus: (250) 717-3415

Cell: (250) 258-7819

E-mail: mullinsdrafting@shaw.ca

PROPOSED PROJECT FOR

2223 WESTSIDE RD

ECOSCAPES BUILDABLE AREA

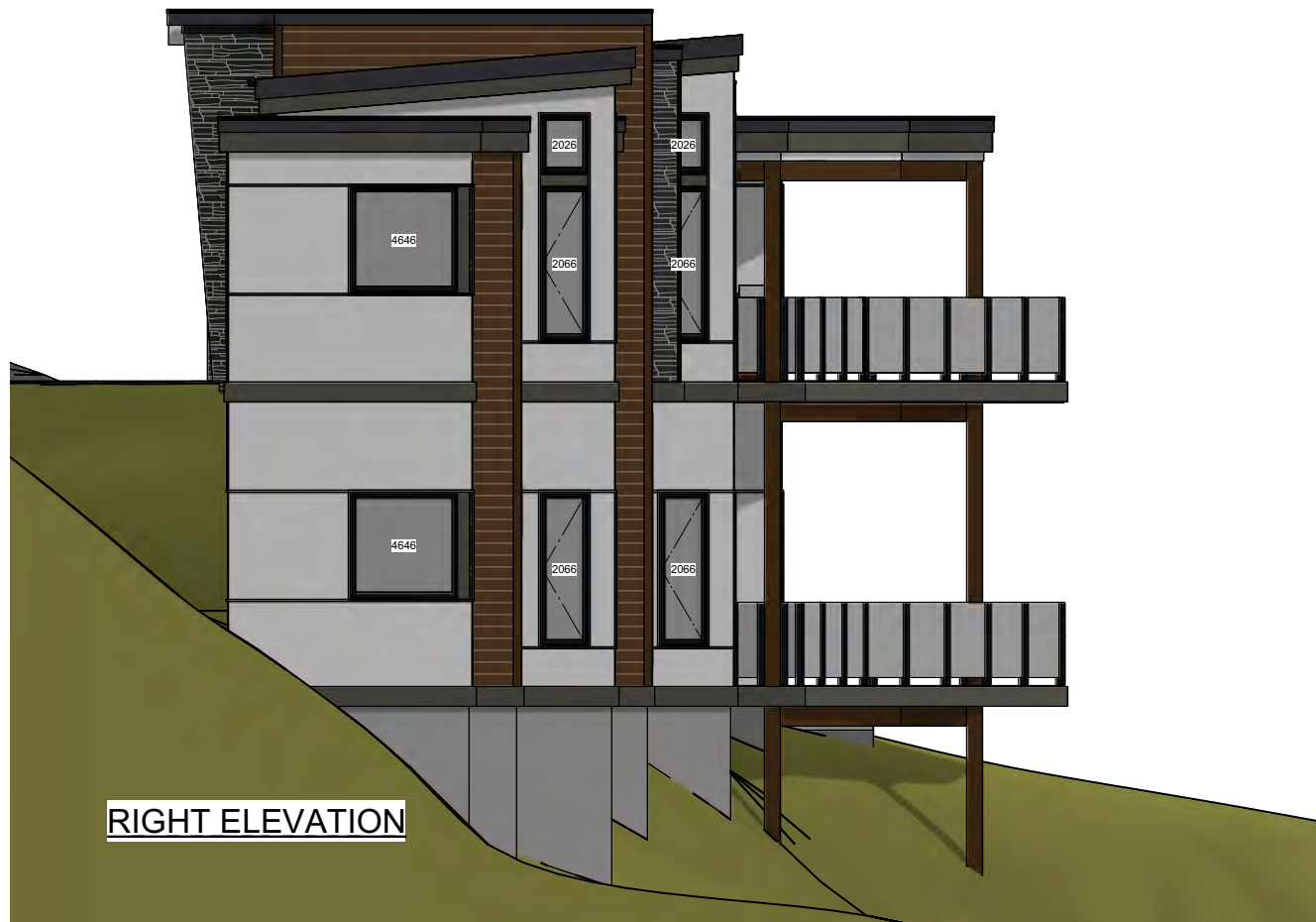
KATAWA CONSTRUCTION

SCALE: 1/4" = 1'

DATE : JUNE-03-2020

SHEET NUMBER

2/5



SHEET NUMBER

3/5

SCALE: 1/4" = 1'

DATE : JUNE-03-2020

KATAWA CONSTRUCTION

PROPOSED PROJECT FOR

2223 WESTSIDE RD

ECOSCAPES BUILDABLE AREA

UNIT 203 - 1889 SPALL RD.

Kelowna BC V1Y 4R2

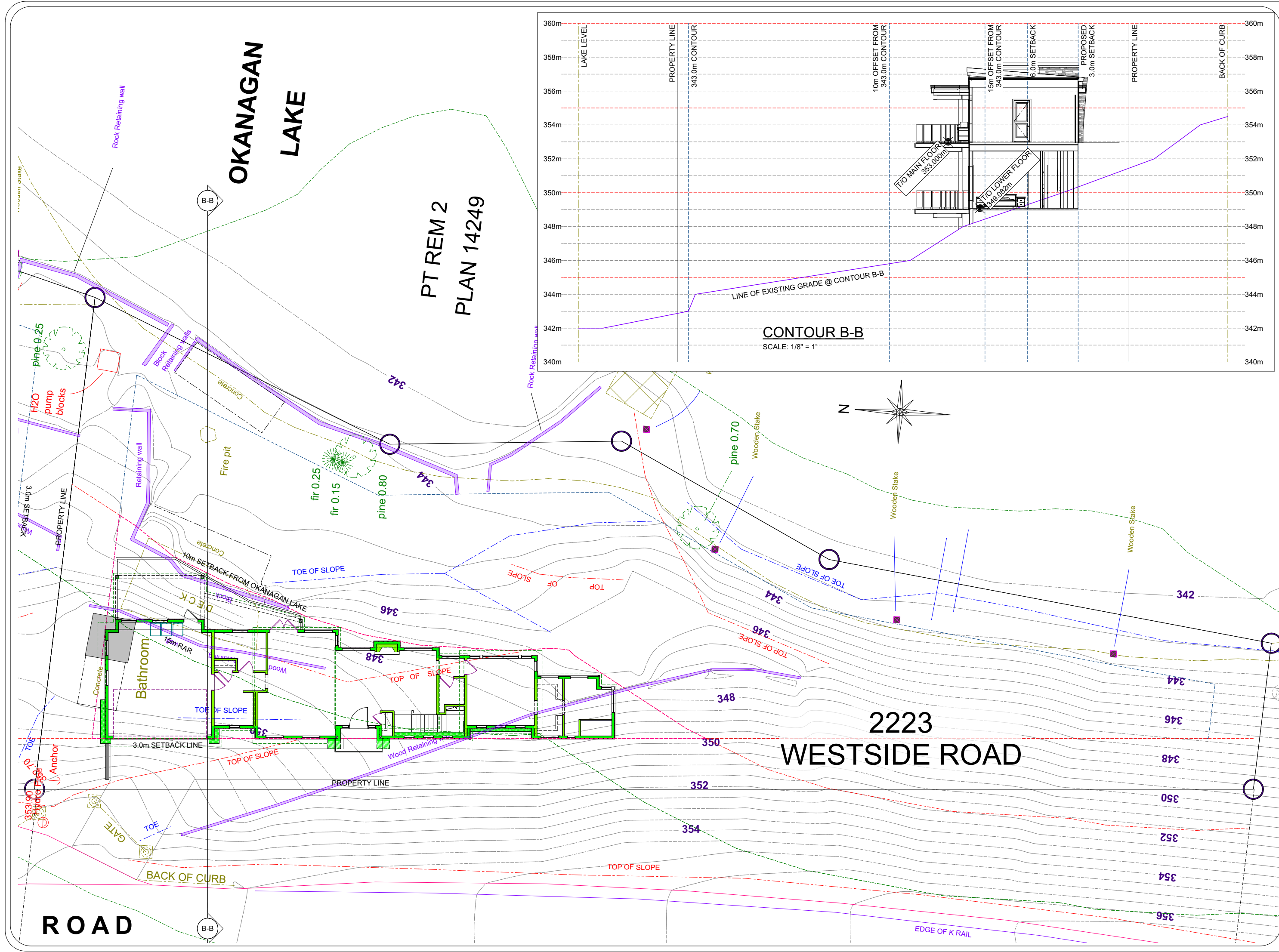
Bus: (250) 717-3415

Cell: (250) 258-7819

E-mail: mullinsdrafting@shaw.ca



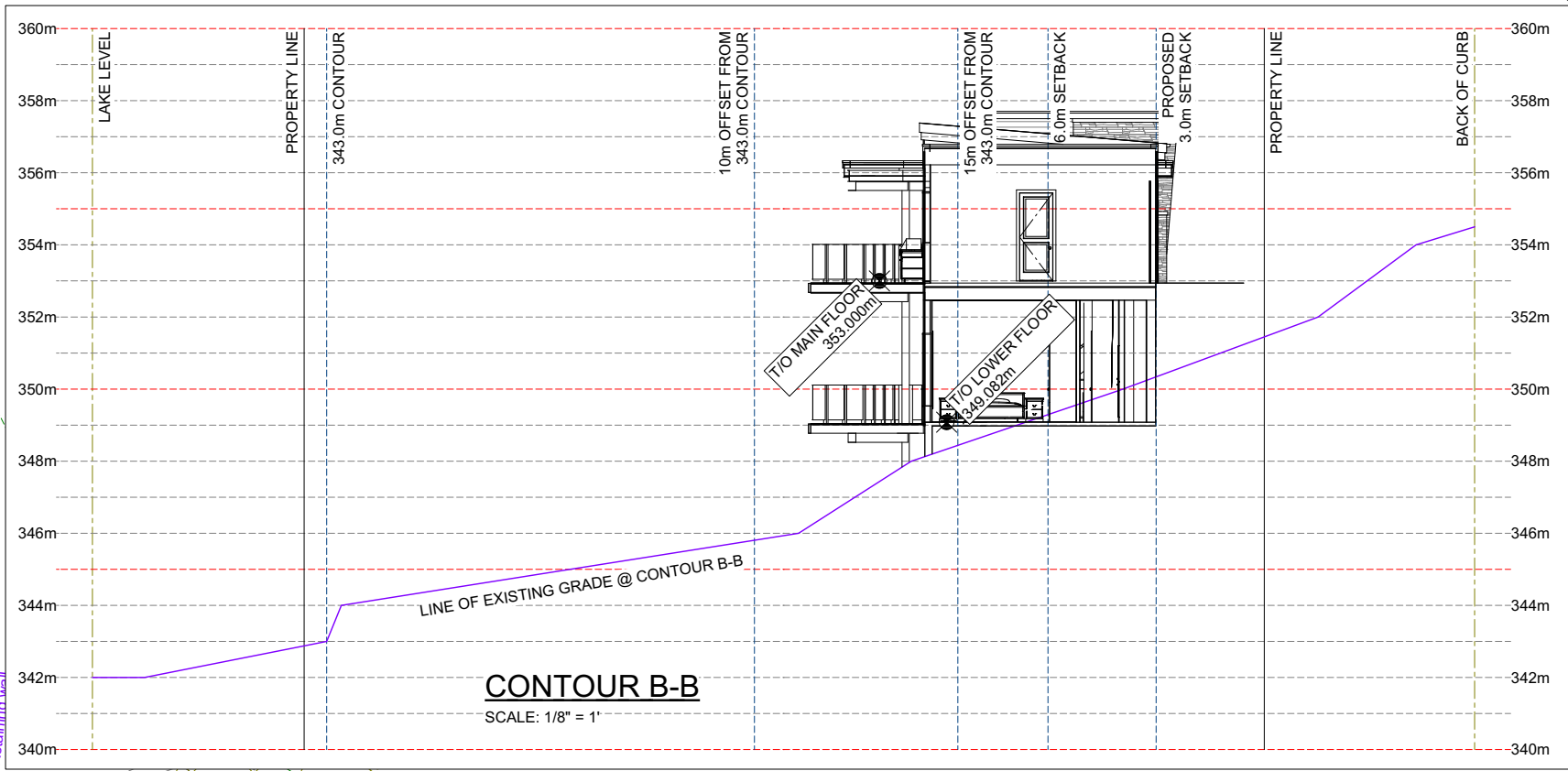
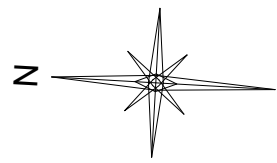
MULLINS
DESIGN GROUP



OKANAGAN LAKE

PT REM 2
PLAN 14249

2223
WESTSIDE ROAD



CONTOUR B-B
SCALE: 1/8" = 1'

SHEET NUMBER

4/5

SCALE: 1/4" = 1'

DATE : JUNE-03-2020

KATAWA CONSTRUCTION

PROPOSED PROJECT FOR

2223 WESTSIDE RD

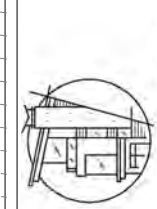
ECOSCAPES BUILDABLE AREA

UNIT 203 - 1889 SPALL RD.
Kelowna BC V1Y 4R2

Bus: (250) 717-3415

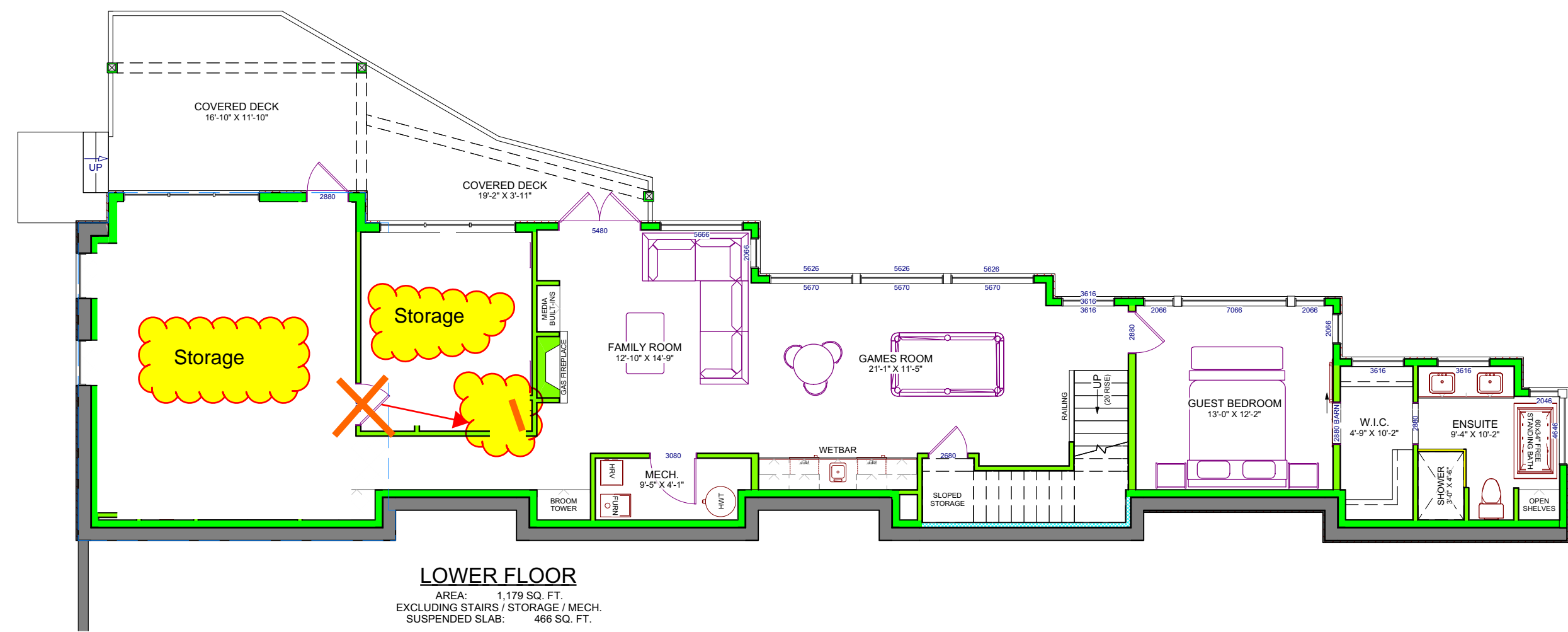
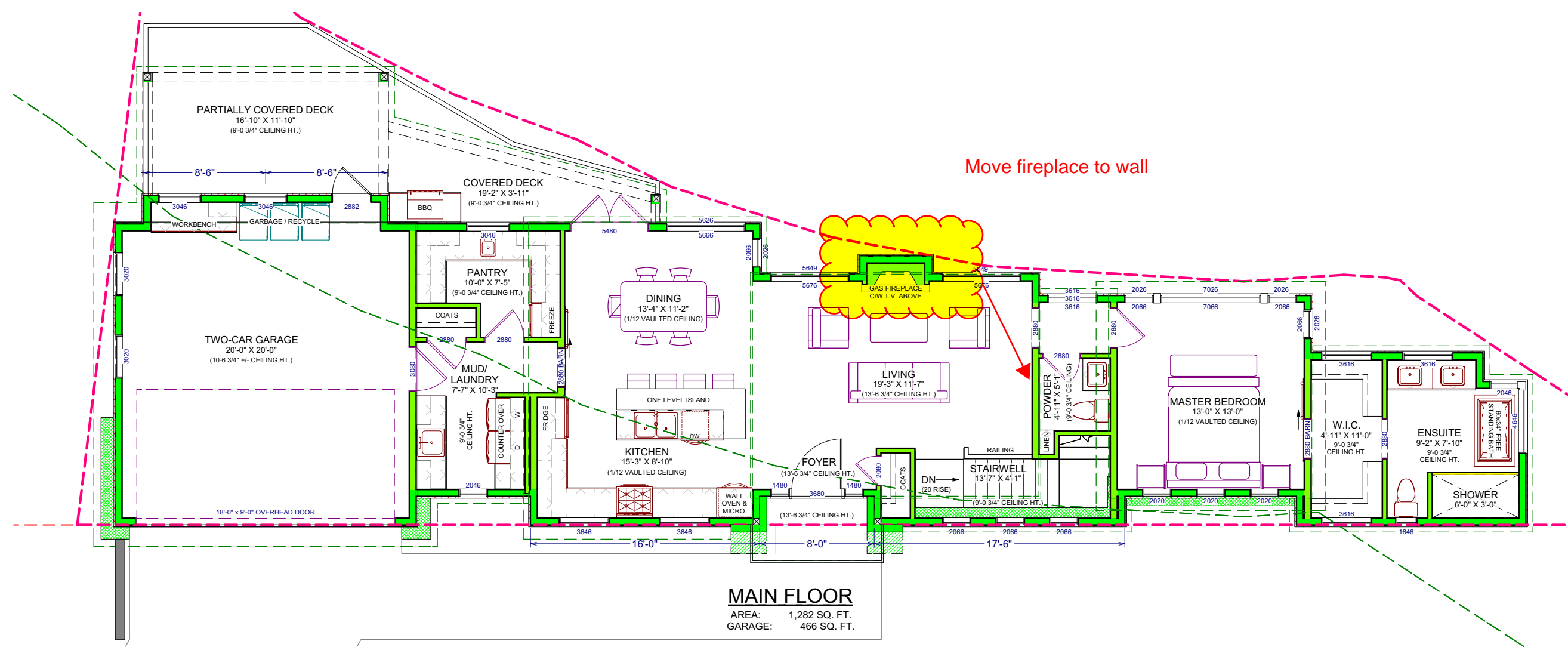
Cell: (250) 258-7819

E-mail: mullinsdrafting@shaw.ca



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ROAD



**APPENDIX B:
GEOTECHNICAL HAZARD ASSESSMENT REPORT FROM
BEACON GEOTECHNICAL LTD.**



BEACON GEOTECHNICAL LTD.

January 30, 2021

Beacon File No: 20-J2645

Maloney Construction Ltd.
c/o Ecoscape Environmental Consultants Ltd.
#102 – 450 Neave Court
Kelowna, B.C.
V1V 2M2

Attention: Mr. Kathy Maloney-Johnson

Re: Geotechnical Hazard Assessment – 2223 Westside Road, RDCO

1.0 Introduction

Beacon Geotechnical Ltd. (Beacon) understands that Maloney Construction Ltd. (Maloney) proposes to construct a single-family home on the property located at 2223 Westside Road, in the Regional District of Central Okanagan (RDCO). As part of the permitting process, Beacon has been retained by Maloney to carry out a geotechnical hazard assessment of the property. The purpose of the assessment was to identify geotechnical hazards that may exist on the site which would impact the proposed development and to provide recommendations for construction of the project. This letter summarizes our observation and presents our comments.

This letter is a revision to our original letter prepared for this project, dated September 8, 2020. This revision supersedes all comments and recommendations presented in the previous letter.

We understand that this letter will form part of an application to reduce the riparian setback on the lot from 15 metres to 10 metres to provide sufficient room to construct the proposed home. A floodplain assessment and a septic field design, prepared by others, will also form part of the application.

The property lies within the area governed by the Rural Westside Official Community Plan Bylaw No. 1274, adopted December 13, 2010 and revised April 28, 2014 (Bylaw). The property is identified in Map 5b (South) of the Bylaw as being within the Hillside Development Permit Area as a portion of the property exceeds a gradient of 30%. As such, a geotechnical hazard report is to form part of the development permit application. The purpose of the report is to ensure sensitive development on affected areas and to minimize risk to the development and to any adjacent properties and the environment. Appendix 4 of the Bylaw presents the Hillside Development Permit Area Objectives and Design Guidelines. Beacon has reviewed these guidelines and this report has been prepared such that the project follows its intent.

This report addresses geotechnical hazards such as mud flows, debris flows, debris torrents, erosion, land slip, rock falls or subsidence. The report does not address wildfires and flooding. It is important to note that the RDCO does not provide a definition for acceptable levels of safety. For this reason, Beacon has assumed the definition of safe as described by the City of Kelowna, an adjacent Municipality, of the probability of occurrence of less than 2% in 50 years or 1:2,475 of a hazard affecting the property.

2.0 Site Description

The property is legally described as Lot 2, Plan KAP14249. It is roughly rectangular in shape and encompasses approximately 1.3 hectares. It is bounded to the north, south and west by residential lots of similar dimensions and to the east by Okanagan Lake. The property is zoned as RU3. The current lot plan is shown as the attached Figure 1.

Westside Road bisects the property in a north-south direction and approximately 85% of the property lies to the west of the road. The topography on the west side of Westside Road slopes up to the west at approximately 50% (Photo 1) and continues to rise beyond the property line at a similar slope for a distance of approximately 1.5 kilometres. The total vertical grade difference on the western side of the lot is approximately 72 metres. A ravine traverses this side of the property in an east-west direction, through the middle of the lot (Photo 2). The ravine is approximately 15 to 20 metres across and up to 5 metres deep. No evidence of recent flow was noted in the ravine and it is likely that it was created as a drainage relic from the retreat of the last glacial event in the valley. However, it is likely that the area is a preferential drainage path for groundwater in the area.

The property on the west side of the road is vegetated with sparse, mature, coniferous trees and indigenous grasses and shrubs. Bedrock outcrops were noted at several locations on the slope (Photo 3), particularly near the ravine area. Isolated, shallow soil exposures were noted on the slope and indicated that the site is underlain by a thin veneer of forest litter overlying granular material (Photo 4).

The remaining 15% of the property, east of Westside Road, encompasses approximately 0.12 hectares. The area is roughly triangular-in-shape and is bounded to the east by Okanagan Lake, the west by Westside Road and to the north by 2235 Westside Road. From Westside Road, the property grades down towards Okanagan Lake a vertical distance of 14 metres. The area is benched, with three retaining walls used to maintain the horizontal spaces between the benched areas. The upper wall is constructed of mortared masonry blocks and is approximately 2 metres in height (Photo 5). The lower wall is constructed of mortared cobble sized rock and is approximately 1.5 metres in height (Photo 6). A third wall is constructed of railway ties and appears to be in the process of failing by decay of the wood. A narrow driveway provides access to the benched sites from Westside Road. A small deck and out-building are located on the benched area.

The property in the area is sparsely vegetated with both coniferous and deciduous trees, lawn and shrubs. Steep bedrock outcrops were observed immediately below the road on the southern end of the triangular area. In other areas, soil exposures were noted to consist of silty sand and gravel. It appears that the granular soils have been disturbed as part of the construction of the retaining walls and benched areas. Beach deposits of sand and gravel were noted to the east of the cobble retaining wall.

3.0 Project Description

We understand that it is proposed to construct a new, single-family residence on the lot at the location shown on Figure 2. The home will be a two-storey, wood -frame structure with a footprint of approximately 175 square metres. The proposed home is situated on the benched topography of the lot east of Westside Road. The building location has been designed to accommodate a 10 metre riparian setback. Preliminary designs indicate that the home will be founded on conventional, shallow strip and pad spread footings. It is intended to maintain the lower cobble retaining wall to provide flooding and erosion protection to the foundations. Recommendations for the erosion protection are provided by others. The home will pump lake water from the lake for domestic use and will pump the sanitary effluent to the septic field located on the west side of Westside Road. No storm service is provided.

It appears the proposed building footprint is situated over the disturbed soils and that some site grading work, including rock removal, may be required to achieve a suitable bearing surface for the foundation. Where required, un-suitable, random fill, placed previously will be removed and replaced with compacted granular structural fill. It is likely that the masonry wall and the timber crib wall will need to be demolished as part of the site grading and foundation works for the new home.

4.0 Desktop and Field Reviews

Beacon carried out a site reconnaissance of the property on March 11, 2020. At that time, photographs were taken, and observations and measurements of the soil, bedrock, general topography and vegetation were recorded. Beacon has also carried out a review of available aerial photographs of the general area. The purpose of the review was to identify geological hazards that may adversely affect development of the property or adjacent properties. Beacon has considered the proposed changes to the site required for the construction of the home as part of our review based on the probability of occurrence of less than 2% in 50 years or 1:2,475.

The following provides a description of the geotechnical hazards associated with the development and of the effect that the hazards may have on the development and recommendations to provide a safe buildable area for the proposed home.

5.0 Geological Hazard Description

East Side of Westside Road: Based on the results of our desktop and field review and our understanding of the project, we are of the opinion that there is little risk to the proposed house location from hazards such as landslip, rock fall or debris torrents on the east side of Westside Road, as shown on Figure 2. However, the uncontrolled fill within the proposed building footprint has the potential to cause excessive total and differential settlement. A detailed subsurface investigation of the existing soil conditions must be carried out prior to construction of the home to determine suitable recommendations for site preparation, including grading the site to support the home.

West Side of Westside Road: From the shoulder of Westside Road, the topography of the lot rises to the west to a plateau at a height of approximately 700 metres above Okanagan Lake at a relatively unbroken grade of approximately 2(H):1(V). Based on existing exposures, the soil profile consists of sand and gravel. The material is likely outwash deposits from the retreat of the last glacial period, 12,000 years ago. Based on published correlations, we estimate the natural sand and gravel to have the following strength parameters:

Angle of Internal Friction:	36°
Unit Weight:	21 kN/m ³
Cohesion:	0 kPa

The extent of the bedrock surface has not been investigated in this area of the site, however, bedrock outcrops were noted on the upper reaches of the property, near the ravine and bedrock is exposed on the east side of Westside Road, immediately south of the site. No evidence of recent slope instability was noted either during our reconnaissance or from on aerial photos of the lot. No evidence of rockfall, such as isolated boulders or talus slopes were noted and the bedrock exposures creating the source of a rockfall were limited in extent.

Beacon has prepared a cross section through the slope representing the natural, undisturbed topography. Using the cross section and the strength parameters above, we carried out a slope stability analysis. The analysis indicates that the slope, in the undisturbed condition, has a factor of safety of 1.52. The standard of practice requires a minimum factor of safety of 1.5 for global stability for residential development.

Development of the west side of the property will require a significant amount of disturbance to the natural slope. Construction of a home at the elevation of Westside Road would require a minimum of a 12-metre horizontal cut into the existing slope to allow for the home and a reasonable setback from the road. Assuming a two-storey walk-up building, a rear yard of 3 metres would require the construction of a 7-metre-tall retaining wall (Figure 4). A temporary slope required for construction of the project would extend up the natural topography a horizontal distance of approximately 58 metres. This is represented as Limit of Disturbance – Option 1 on Figure 1.

A second scenario may include the construction of a home on the level pad proposed for the septic field. The slab on grade would be at an elevation of approximately 360 metres or 4.5 metres above Westside Road. Similar to the first scenario, construction of a home at this elevation would require a minimum of a 9-metre horizontal cut into the existing slope. A similar home with no level front yard and a 3-metre rear yard will require the construction of a 4.2-metre-tall retaining wall (Figure 5). A temporary slope required for construction of the project would extend up the natural topography a horizontal distance of approximately 48 metres. This is represented as Limit of Disturbance – Option 2 on Figure 1. In addition to the disturbance created by the construction of the home, a driveway must also be constructed. According to RDCO bylaws, the driveway must be no steeper than 2% for the first 6 metres from the road and must be near perpendicular to centre line of Westside Road. To achieve the grade, the driveway can be no steeper than 12%. While there is sufficient lineal distance to achieve a driveway to the proposed home, additional retaining wall will be required along the upslope side and potentially on the down slope side. The temporary excavations will extend a similar distance up the slope as for the construction of the home.

It should be noted that the construction of both scenarios would require the removal of all trees in the area of disturbance, likely altering the groundwater flow in the area.

Based on our review of the project, geotechnical hazards associated on the west side of the property include slope instabilities created by disturbance of the natural topography. Final and temporary slope configurations required for construction of a home on the west side of the property require significant excavation and slope re-construction. Provided the retaining walls can be designed to achieve a factor of safety of 1.5, the final slope will be susceptible to erosion, sloughing and may alter the natural groundwater flow paths. The effect of the later may not be realized for many years.

Beacon has considered the construction of the septic disposal field designed by Franklin Engineering Ltd. The proposed field is located on the small bench above Westside Road, along the southern property line. The proposed field area is to be shared with the septic disposal area for the adjacent Lot 1 to the north. The field for Lot 2 has been designed for a two-bedroom home with an average daily volume of effluent of 1,000 litres. The field for Lot 1 has been designed for a five-bedroom home with an average daily effluent of 1,900 litres. The total area of the two fields is 8 metres by 15 metres. Construction of the field will not require a significant amount of site grading and cuts into the existing topography will be negligible.

6.0 Conclusions

Beacon Geotechnical identified the western side of the subject property as mostly undisturbed with the exception of some excavated areas adjacent to Westside Road. The geotechnical constraints on this western portion consist of steep slopes which make construction of a house within the western side of the subject property unsafe. Construction would involve excavation and movement of significant amounts of material, and construction of multiple retaining walls to enable the ability to construct a building pad for a home. An excavation of this magnitude has the potential to create an unstable soil mass within the western slope in the professional opinion of the geotechnical consultant. Thus, the western side of the subject property is “undevelopable”, and if development was to occur within the western side of the subject property, it has the potential to increase the risk of a mass movement event to unacceptable levels. The eastern side of the subject property contains minimal risk for a mass movement event, is mostly disturbed, and contains lower risks for potential geotechnical events (i.e., mass movements).

Based on our review of the project drawings and the site-specific information, it is our professional opinion that the risks from geotechnical hazards associated with construction of a home on the east side of Westside Road are significantly less than a home constructed on the west side of Westside Road for the reasons discussed above. In addition, the extent of the disturbance of the ground required for construction of a home on the west side of Westside Road is not in keeping with the objectives of the RDCO Hillside Development Guidelines presented in Bylaw 1274:

- To support rural subdivision, road building and construction on hillsides that protects and enhances the natural characteristics of the hillsides which are a significant component of the OCP area.
- To support rural subdivision, road building and construction on hillsides in a manner that minimizes damage to property (both the property under application and neighbouring property) from erosion, soil instability, rock fall, or other identified hazard.
- To support rural subdivision, road building and construction on hillsides in a manner that is sensitive to the natural topography and maximizes the retention of existing landscape, vegetation and soils.
- To support rural subdivision, road building and construction on hillsides in a manner that is responsive to the natural environment and drainage patterns

Provided the new home is constructed on the east side of the property, we recommend that a subsurface investigation be carried out within the building footprint to determine the extent of any uncontrolled fill on site and to identify a suitable bearing stratum for design and construction of the house foundation. Construction activities on site should use best practices to limit disturbances, and all disturbed areas should be revegetated or reinstated.

7.0 Closure

The recommendations presented in this report have been prepared for the construction of a single-family home as described above. Should the intended use for the property, at any time, vary from our understanding of the project, Beacon should be given the opportunity to review the project to ensure that our recommendations are both accurate and sufficient.

This report has been prepared for use by Midway Construction Ltd. and has been carried out in accordance with generally accepted engineering practice. Geotechnical engineering judgment has been applied in developing the recommendations in this report. No other warranty is made, either expressed or implied.

Use of this report is subject to the attached Geotechnical Report - General Conditions. The reader's attention is specifically drawn to these conditions as it is essential that they be followed for the proper use and interpretation of this report.

We trust that this report satisfies your present requirements. Should you have any further questions, please feel free to contact our office.

Yours truly,

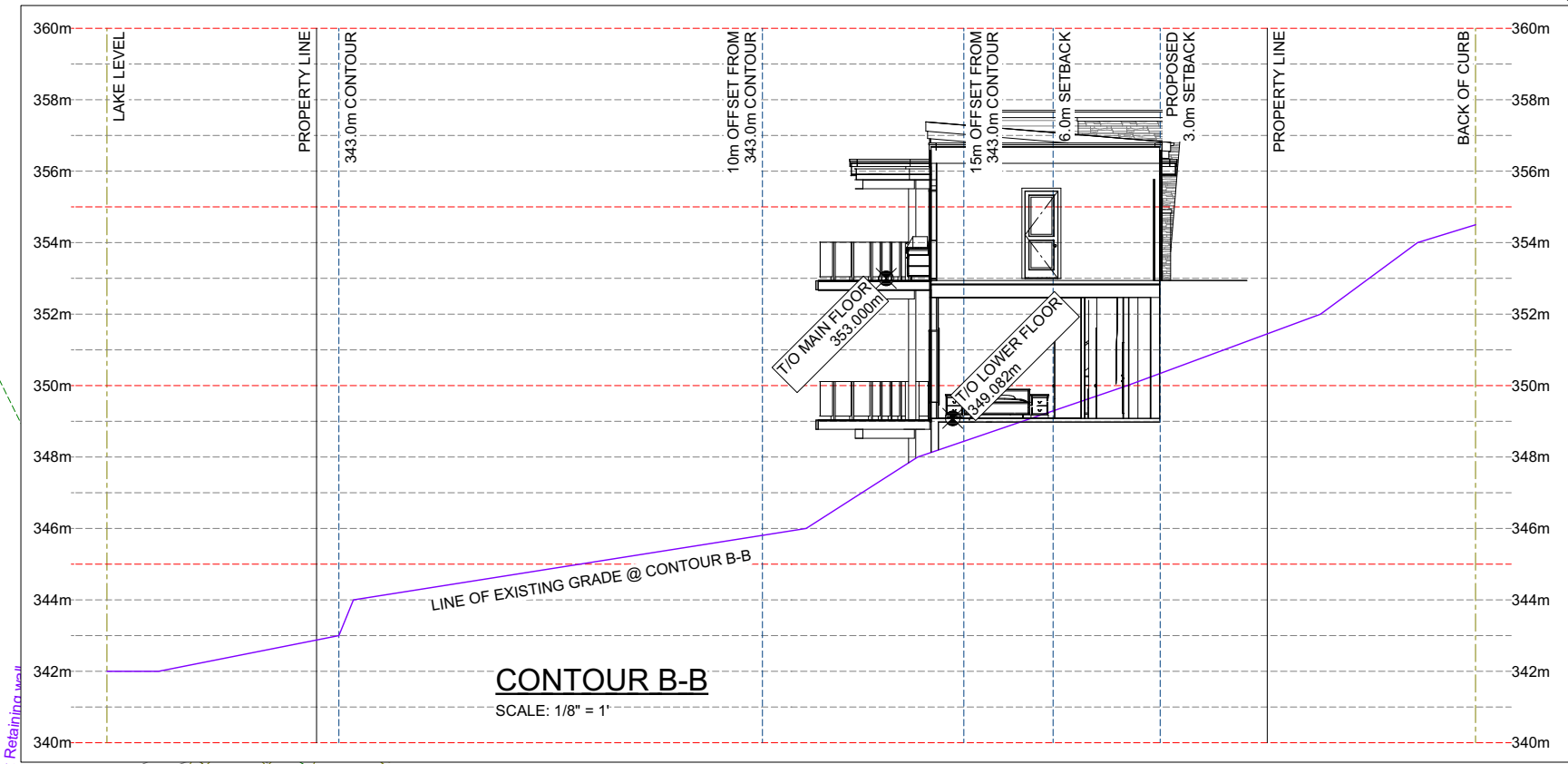
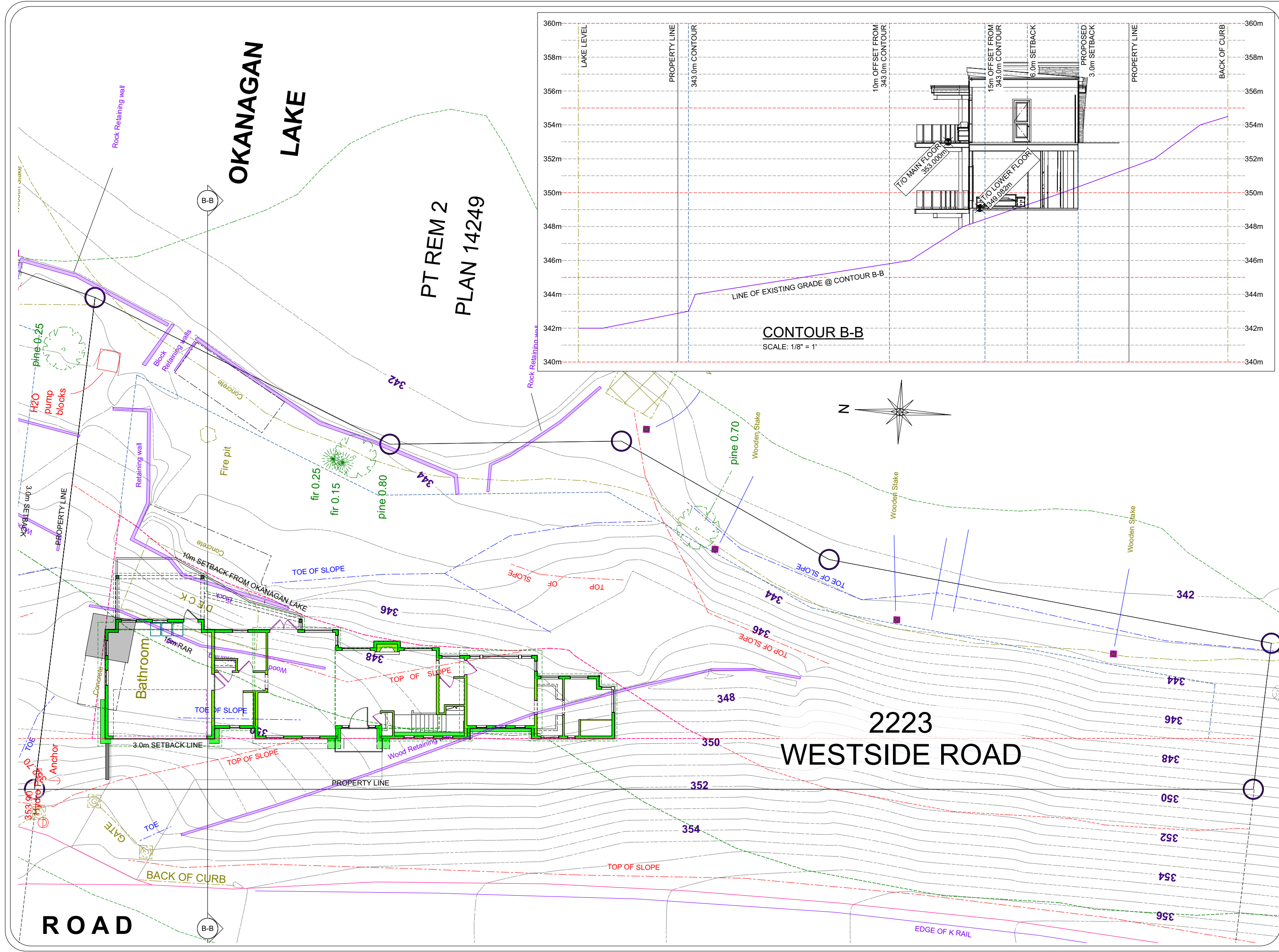
Beacon Geotechnical Ltd.



Chris Wadell, P. Eng.
Geotechnical Engineer

Attachments:

- Figure 1 - Site Plan (1 page)
- Figure 2 - Proposed House Plan (1 page)
- Figure 3 - Cross Section Through Slope (1 page)
- Figure 4 - Section Through Option 1 (1 page)
- Figure 5 - Section Through Option 2 (1 page)
- Figure 6 - Photos (3 pages)
- Geotechnical Report - General Conditions (2 pages)



SHEET NUMBER
4/5

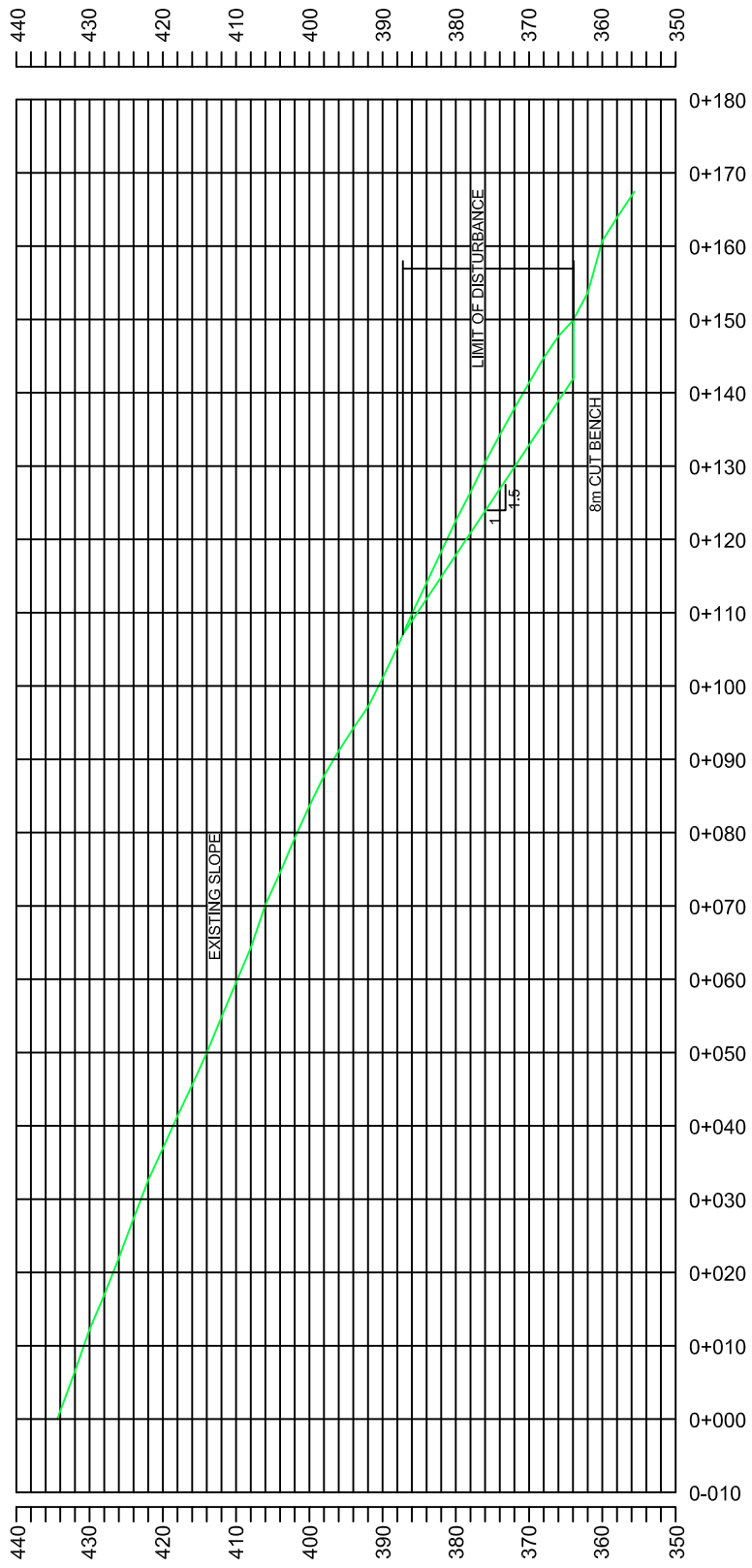
SCALE: 1/4" = 1'
DATE : JUNE-03-2020

KATAWA CONSTRUCTION

PROPOSED PROJECT FOR
2223 WESTSIDE RD
ECOSCAPES BUILDABLE AREA

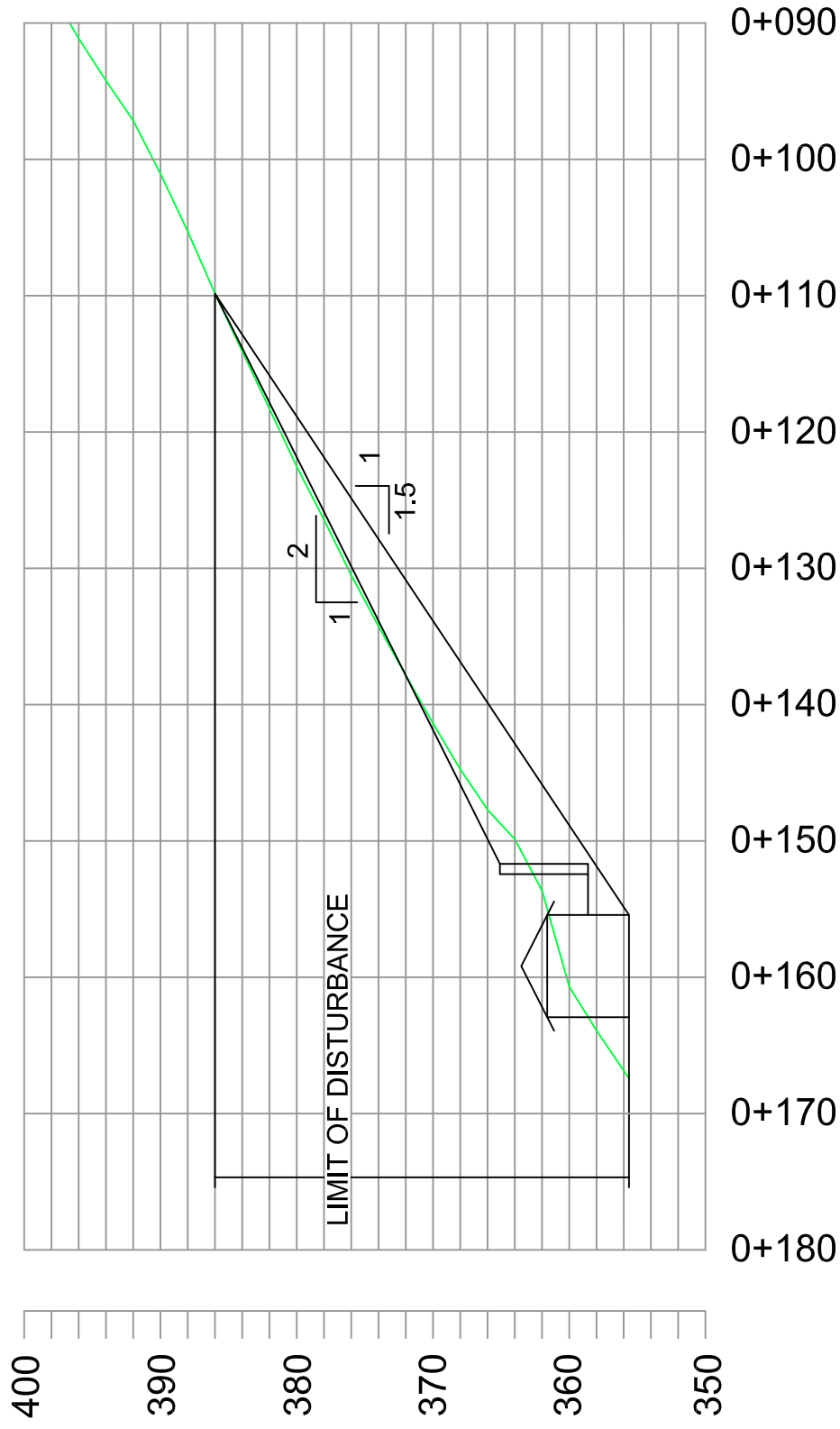
UNIT 203 - 1889 SPALL RD.
Kelowna BC V1Y 4R2
Bus: (250) 717-3415
Cell: (250) 258-7819
E-mail: mullinsdrafting@shaw.ca





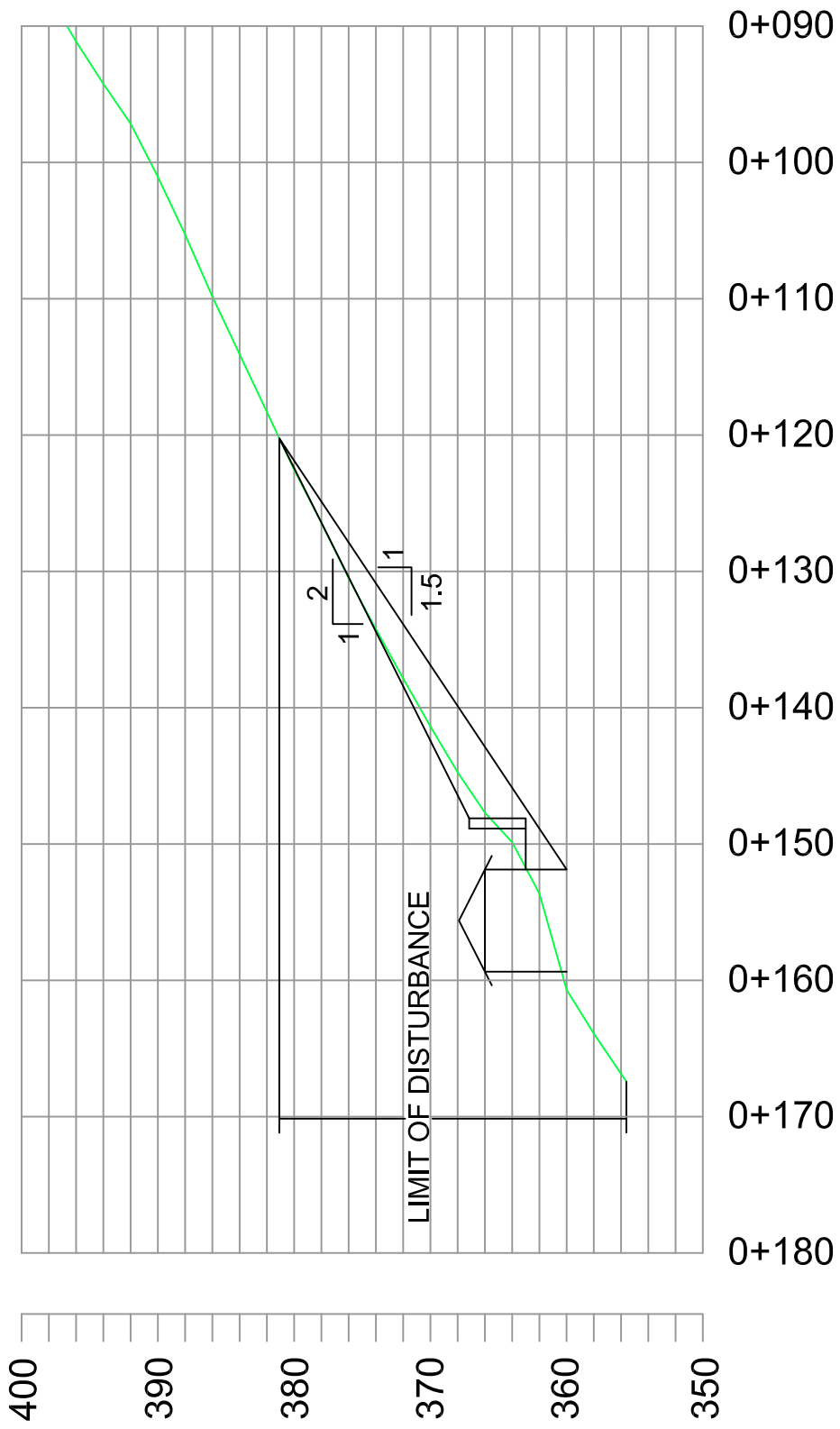
data from RDCO website

	PROJECT: GEOTECHNICAL HAZARD ASSESSMENT		CROSS SECTION	
	CLIENT: KATAWA CONSTRUCTION LTD. LOCATION: 2223 WESTSIDE ROAD RDCO, BC	DATE: JUNE 2020 SCALE: 1:1,000	DRAWN BY: CCW CHECKED BY: CCW	FILE NO: 20-J2645 FIGURE NO: 3



data from RDCO website

	SECTION THROUGH OPTION 1			
	PROJECT: GEOTECHNICAL HAZARD ASSESSMENT	CLIENT: KATAWA CONSTRUCTION LTD. LOCATION: 2223 WESTSIDE ROAD RDCO, BC	DATE: JUNE 2020 SCALE: 1:500	FILE NO: 20-J2645 DRAWN BY: CCW CHECKED BY: CCW FIGURE NO: 4



data from RDCO website

SECTION THROUGH OPTION 2

DATE:	JUNE 2020	DRAWN BY:	CCW	FILE NO:	20-J2645
SCALE:	1:500	CHECKED BY:	CCW	FIGURE NO:	5

GEOTECHNICAL HAZARD ASSESSMENT

CLIENT: KATAWA CONSTRUCTION LTD.
 LOCATION: 2223 WESTSIDE ROAD
 RDCO, BC

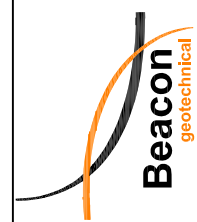




Photo 1 – Slope on West Side of Westside Road



Photo 2 – Ravine on West Side of Westside Road



Photo 3 – Bedrock Outcrop



Photo 4 – Soil Exposure



Photo 5 – Masonry Wall



Photo 6 – Rock Wall

This report incorporates and is subject to these “General Conditions”.

1. USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment. This report and the recommendations contained in it are intended for the sole use of Beacon’s client. Beacon does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than Beacon’s client unless otherwise authorized in writing by Beacon. Any unauthorized use of the report is at the sole risk of the user. This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of Beacon. Additional copies of the report, if required, may be obtained upon request.

2. NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems and methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned. Classification and identification of geological units are judgmental in nature as to both type and condition. Beacon does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice. Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

3. LOGS OF TEST HOLES

The test hole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

4. STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historic environment. Beacon does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional investigation and review may be necessary.

5. SURFACE WATER AND GROUNDWATER CONDITIONS

Surface and groundwater conditions mentioned in this report are those observed at the times recorded in the report. These conditions vary with geological detail between observation sites; annual, seasonal and special meteorologic conditions; and with development activity. Interpretation of water conditions from observations and records is judgmental and constitutes an evaluation of circumstances as influenced by geology, meteorology and development activity. Deviations from these observations may occur during the course of development activities.

6. PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

7. SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

8. INFLUENCE OF CONSTRUCTION ACTIVITY

There is a direct correlation between construction activity and structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques are known.

9. OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, as well as the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

10. DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

11. BEARING CAPACITY

Design bearing capacities, loads and allowable stresses quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition assumed. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions assumed in this report in fact exist at the site.

12. SAMPLES

Beacon will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the client's expense upon written request, otherwise samples will be discarded.

13. STANDARD OF CARE

Services performed by Beacon for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practising under similar conditions in the jurisdiction in which the services are provided. Engineering judgement has been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this report.

14. ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, Beacon has not been retained to investigate, address or consider and has not investigated, addressed or considered any environmental or regulatory issues associated with development on the subject site.

**APPENDIX C:
FLOODPLAIN EXEMPTION APPLICATION REPORT
FROM CLARKE GEOSCIENCE LTD.**

July 1, 2020

CGL Project No.: 19-0114

Wayne and Merina Maloney
c/o Kathy Maloney-Johnson
4049 Westside Road N
Kelowna, BC V1Z 3W8

Attention: Mr. and Mrs. Maloney

**RE: Floodplain Exemption (FEX) Application Report for Building Permit.
2223 Westside Road, Regional District of Central Okanagan, BC**

Clarke Geoscience Ltd. (“CGL”) was retained by Mr. and Mrs. Maloney (“owners”) to complete a floodplain exemption (FEX) application report for proposed residential development. The subject property is located at 2223 Westside Road, in the Regional District of Central Okanagan (“RDCO”), and is legally described as:

- Lot 2, Plan KAP14249, District Lot 3745, Osoyoos Division of Yale District, Except Plan KAP47451 (PID 009-053-794)

1.0 Introduction

The 1.3 ha property is zoned “RU3 (Residential-Low Density; Rural Residential)” within the RDCO. Only a small portion of the property (approx. 0.11 ha) is situated below Westside Road and is bounded on the east by Okanagan Lake (see Figure 1).

The study objectives and proposed approach are documented in a proposal, dated February 18, 2020. The study approach references the *BC Flood Hazard Area Land Use Management Guidelines* (2018) and the EGBC Professional Practice Guidelines for *Legislated Flood Assessments in a Changing Climate in BC* (2018).

The scope and objectives of this floodplain exemption assessment are to:

- comment on the suitability of a proposed building site with respect to the Okanagan Lake flood hazard;
- provide recommendations/strategies to minimize or mitigate flood hazard, if necessary; and,
- provide a signed and sealed Flood Assurance Statement (Appendix B).

2.0 Legal Context

It is understood that the owners wish to construct a single-family residence on the property and that development is subject to RDCO municipal requirements. The proposed dwelling occupies most of the buildable land below Westside Road. The lot also extends west of Westside Road. The scope of this report is to address the floodplain construction requirements as specified in RDCO Zoning By-law No. 871 (2018). The floodplain regulations (*Section 3.28*) relevant to the proposed development state the following:

- *The underside of any floor system, or the top of any pad supporting any space or room, including a manufactured home, that is used for dwelling purposes, business, or the storage of goods, which are susceptible to damage by floodwater must be above 343.66 metres (1,127.49 ft) Geodetic Survey of Canada datum for land adjacent to Okanagan Lake;*
- *Any landfill required to support a floor system or pad must not extend within the floodplain setback of 15.0 metres (49.2 ft.) from the natural boundary of Okanagan Lake¹; and,*
- *The Regional District may exempt types of development from the requirements of flood construction levels and floodplain setbacks in relation to a specific parcel of land or a permitted use, building or other structure on the parcel of land, if the Regional District considers it advisable; and has received a certified report that “the land may be used safely for the use intended”.*

The floodplain exemption report will address the owners request to vary the 15.0 m horizontal setback from the adjacent Okanagan Lake to a 10.0 m horizontal setback, and will confirm that there is no requirement to vary the current Flood Construction Level at 343.66 m.

Flood-related natural hazards are the focus of this investigation. However, other natural hazards such as shoreline erosion by wave action will also be considered. Natural hazards associated with processes occurring upslope, such as geotechnical or drainage hazards, are considered outside the scope of this investigation and are to be addressed by others.

To summarize:

The current legislated FCL @ 343.66 m GSC datum

3.0 New Information Regarding the Okanagan Lake Floodplain

Subsequent to the initiation of this floodplain exemption assessment, the Okanagan Basin Water Board released a report (Northwest Hydraulic Consultants Ltd. (NHC), 2020) and website, with updated floodplain mapping for Okanagan Lake (www.okanaganfloodstory.ca).

¹ The natural boundary, defined as the mean annual high water mark, is the elevation from which setbacks are determined and this is defined at an elevation of 343 m.

New floodplain maps show flood inundation extents, with and without freeboard. The maps also show a revised Flood Construction Level (FCL) that is based on the “design flood” plus freeboard and is based on mid-century climate (2041-2070) for long-term planning².

Updated FCLs use the 2017 peak lake level as the “design flood” and, where there are anticipated wave effects, the FCL is based on a combination of the mid-century water level, storm surge (wind set up), wave effects (wave runoff), and freeboard (0.6 m). The updated FCL for the study site as determined in the NHC (2020) study is 347.26 m and is shown on Figure 2.

To summarize:

The (not yet adopted) updated FCL, from NHC (2020) @ 347.26 m

The updated FCL is 3.6 m higher than previously legislated. Although not yet legislated in the RDCO bylaws, it is considered prudent to consider the updated FCL in the current floodplain exemption assessment, since it incorporates the best available information and considers both climate change and shoreline wave effects.

3.0 Proposed Development

A two-story single-family residence is proposed for the subject property. Design plans showing site elevations and proposed building elevations were obtained from Mullins Design Group (dated May 29, 2020) (see Figure 2). It is assumed that the hot water tank, furnace, and electric panel will be located on the lower floor.

The site plan indicates the following:

- *The lakeside edge of the residence and the landfill required to support the floor system of the residence is setback 10 m (horizontal distance) from the 343 m elevation. This will require a 5 m variance to the horizontal setback; and,*
- *the elevation of the top of the floor system of the lower story of the residence is 348.887 m. Therefore, the underside of the flood system will lie above the current, and the not-yet-adopted FCL.*

There are no details regarding post-construction site grades. Based on the drawings it appears that there may be a requirement for 2 to 2.5 m of fill placement to bring up the grade around the building foundation.

4.0 Site Conditions

A site inspection was completed by Jennifer Clarke, M.Sc., P.Geo. of Clarke Geoscience Ltd. on February 28, 2020. Okanagan Lake was seasonably low at the time of the field assessment (lake elevation measured to be ~341.7 m in Kelowna). Representative photographs taken during the site visit are included as Appendix A.

² Note that water levels on Okanagan Lake are regulated at the Penticton Dam, so FCLs assume that dam operations are able to accommodate higher and more frequent floods in the future (NHC, 2020)

It is understood that the property was originally developed in the late 1960s (Wayne Maloney, pers. comm., 2020). At the time of the assessment there was an unoccupied residence located on the property. It is located on a constructed bench accessed by a steep gravel driveway from Westside Road. To the south, the property narrows to approximately 10 m and lies adjacent to a residential lakefront property (2181 Westside Road). To the north, the property lies adjacent to a residential lakefront property (2225 Westside Road) that is also pursuing a development application.

The property below Westside Road is a steeply sloped and narrow site along Okanagan Lake with a width of ~8.7m at the south end and a width of ~29m at the north end. Existing retaining walls made of timber, concrete block, and mortared rock create a terraced slope profile across the property. These walls are shown on Figure 2. It appears that the terraced site was created from native site material, by recontouring the original slope, rather than from imported fill. However, this would need to be confirmed by the geotechnical investigation.

Along the Okanagan Lake shoreline, extending from the north property boundary to the north edge of a wooden dock, is a 2 m (approx.) high rock wall, comprised of cobbles in concrete mortar sitting on a poured concrete footing (see Photo 1). There are two staircase access points along the wall. The rock wall is in fair condition as it exhibits some cracking and displacement at the north staircase, occasional voids between the rocks, and some scour beneath the footing at the south end adjacent to the dock (see Photos 5 to 8). The footing appears to sit on native beach material and does not have riprap protection to prevent scour from waves.

The beach area in front of the wall is comprised of sand, but the foreshore area substrates are coarse gravels and small cobbles. Since the property lies parallel to the predominant north-south wind direction, the property is not in direct line of attack by waves. Longshore sediment transport is somewhat sheltered by points of land to the south and north of the subject property. It appears that the small rock groyne upon which the dock sits, creates a small area of scour as waves refract around the point. North of the dock is a sheltered zone of sandy deposition (see Photo 9).

The shoreline at the south end of the subject property has scattered rock along the toe of the slope, but is otherwise unprotected from wave action. Bedrock was observed along the toe of the slope at the shoreline. While subject to minor surface raveling down from the edge of Westside Road, the slope is unlikely to be destabilized and undercut by wave action along the toe. A short (est. 10 m long) section of unprotected fill material, and the base of a timber retaining wall, is vulnerable to erosion and instability (see Photos 2-4 and 10).

Above the shoreline rock wall there is a 9 to 11 m wide flat area, with several mature conifer trees, turf grass, areas of concrete patio, and bare soil (see Photos 11-14).

4.1 2017 Okanagan Lake Flood Effects

In the spring of 2017, lake levels on Okanagan Lake peaked at 343.25 m. Still water lake levels did not reach the top of the shoreline rock wall. However, wave action at high lake levels likely overtopped the wall at times.

5.0 Floodplain Hazard Assessment

The following sections provide a qualitative assessment of potential flood hazard to the subject property that is based on professional opinion and judgement. Flood hazard is expressed as the potential for inundation by Okanagan Lake, and the potential for loss of property by shoreline erosion.

Based on a review of historical imagery, recorded past flood events, and site conditions, it is judged that the subject property is exposed to flood hazard on Okanagan Lake. The lot is steep and narrow, and the only buildable area is located at the north end of the lot. The area south of the dock is not suitable for a dwelling due to the narrow lot width. Depending on which FCL is adopted for the site, the property is exposed to at least some degree of flood hazard.

Shoreline erosion protection is offered to the remainder of the property by a rock wall that has been in place since the late 1960s. The rock wall is, however, in fair condition and there is a concern for its long-term integrity. A short (est. 10 m long) section of shoreline at the south end of the property is exposed and subject to inundation and erosion.

Because the toe of the wall lies at the approximate High Water Mark (343 m elevation), should it fail, or be removed, then there is still sufficient width for the 10 m setback. Mature conifer trees behind the wall currently enhance the protective function to the property.

6.0 Conclusions and Recommendations

A flood hazard assessment has been prepared for the subject property, located at 2223 Westside Road in the RDCO. Based on the results the investigation, the following conclusions are made:

- the subject property is situated on steep, artificially terraced ground below Westside Road adjacent to Okanagan Lake;
- the top of a shoreline rock wall lies at 344 m elevation and protects most of the property from inundation by flood waters. If the wall were to fail then there is sufficient horizontal and vertical distance for the flood effects. The potential long-term risk of erosion by waves and storm surge to the toe of the building foundation fill slope is considered to be very low.

- If the wall were to be removed then the site would require regrading back (at min. 2H:1V slope) towards the residence, with the toe of the slope starting on the subject property from the surveyed Present Natural Boundary;
- the proposed two-story residence will require a 5 m variance to the legislated 15 m setback from the 343 m elevation of Okanagan Lake;
- the elevation of the underside of the floor system of the proposed residence will exceed the legislated 343.66 m Flood Construction Level;
- although the habitable area of the residence will also meet the recently revised, but not yet legislated, updated FCL of 347.26 m, the landfill supporting the building footings may require some scour protection at this higher level;
- there is no potential to transfer flood risk from the subject property, nor impact adjacent properties; and,
- measures to enhance the protective function of the shoreline rock wall are recommended below.

Recommended mitigation measures/strategies to enhance the protective function of the rock wall include the following:

- It is recommended that the shoreline rock wall be inspected and that measures to strengthen and enhance the long-term integrity and protective function of the wall against wave action are implemented;
- If the wall remains in place then scour protection in front of, and behind, the rock wall is recommended. In front of the wall, the footing should be protected with riprap rock³. Behind the rock wall, to prevent erosion from overtopping waves, we recommend embedding a ~2 m wide riprap blanket, the cover with soil and plantings. Alternatively, protective function behind the wall may be offered through use of a geosynthetic product. The choice and application of product should be reviewed by a Qualified Professional;
- Secondary flood protection measures between the wall and the residence may include planting deep-rooted riparian shrubs and trees. Experience shows that highly vegetated areas experience less erosion than areas with turf grass or constructed shorelines;
- Shoreline erosion protection is recommended for a 10 m long (est.) section on the south side of the dock. If the toe of the foundation fill slope does not encroach this area then erosion protection may be comprised of shrub and tree planting. Otherwise, rock armour may be required. Protection measures should be designed by a Qualified Professional;
- Scour protection is recommended at the base of the building footings, or the base of the future retaining wall (or fill material) that supports the residence. All scour protection must occur on the subject property, starting at the surveyed Present Natural Boundary. Scour protection shall be designed by a Qualified Professional, and all proposed

³ Work to construct the protective measures below the High Water Mark (343 m elevation) will require a Water Sustainability Act, Section 11 application. Involving the MFLNRORD will trigger a review of the status of the structure. If found to be encroaching on Crown land, it may be ordered to be removed.

6.0 Closure

The flood hazard assessment presents a qualitative assessment based on objective and subjective evidence. The assessment applies to the specific subject property and is based on the location, surveyed topography, and information available at the time of the assessment (spring 2020). The assessment results are not transferrable to other sites in the nearby area. In the event of any notable changes to conditions on site, it is recommended that the assessment be revisited.

This report has been prepared for use by the owner, and for the specific subject property legally known as: *Lot 2, Plan KAP14249, DL 3745, ODYD, Except Plan KAP47451 (PID 009-053-794)*. This includes distribution as required for purposes for which this assessment was commissioned. The assessment has been carried out in accordance with generally accepted practice and incorporates Clarke Geoscience Ltd. terms and conditions.

Conclusions and recommendations presented herein are based on a visual site inspection, and relies upon the topographic survey completed by others. No subsurface investigation has been carried out. Professional judgment has been applied in developing the recommendations of this report. No other warranty is made, either expressed or implied. Clarke Geoscience Ltd. does not in any way accept responsibility for the potential hazards identified above, the consequences of which shall be the sole responsibility of the property owner.

We trust that this report satisfies your present requirements. Should you have any questions or comments, please contact me at your convenience,

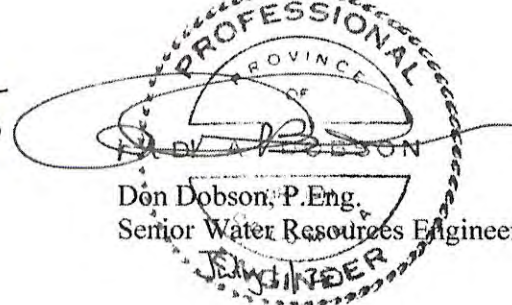
Prepared by:

Reviewed by:

CLARKE GEOSCIENCE LTD.

Jennifer Clarke

Jennifer Clarke, M.Sc., P. Geo.
Geomorphologist



Don Dobson, P. Eng.
Senior Water Resources Engineer

Attachments:

Figure 1 – Subject Property Location

Figure 2 – Topographic Site Plan and Profile

Appendix A - Photos 1 to 14

Appendix B – Signed Flood Assurance Statement

References:

Attachments:

Figure 1 – Subject Property Location

Figure 2 – Topographic Site Plan and Profile

Appendix A - Photos 1 to 14

Appendix B – Signed Flood Assurance Statement

References:

Association of Professional Engineers and Geoscientists. 2010. Guidelines for Legislated Landslide Assessment for Proposed Residential Development. Revised May 2010. Vancouver, BC.

Northwest Hydraulic Consultants Ltd. 2020. Okanagan Mainstem Floodplain Mapping Project. Prepared for Okanagan Basin Water Board. File No 3004430. North Vancouver, BC.

Pacific Climate Impacts Consortium (PCIC) Climate Summary for Thompson/Okanagan Region. Published on website URL: www.pacificclimate.org.

Regional District of Central Okanagan Online Mapping System. 2020.



Source orthophoto imagery (dated 2018) from RDCO (online GIS)

Project: Floodplain Exemption (FEX) Application Report for Building Permit. 2223 Westside Road, Regional District of Central Okanagan, BC	
Title: Subject Property Location	
Date: July1, 2020	Figure No.: 1
CLARKE GEOSCIENCE LTD.	

APPENDIX A – PHOTOS

APPENDIX A – PHOTOS



Photo 1: View of Lakeshore fronting 2223 Westside Road (Okanagan Lake) (line approximates 2017 high water level)



Photo 2: South side of subject property along the lake



Photo 3: South end of subject property along the lake, below Westside Road



Photo 4: Partially armoured section of shoreline at south end of subject property



Photo 5: View of scour along base of rock wall footing (poured concrete)



Photo 6: Rock wall fronting property (1.5-2 m high)



Photo 7: Concrete footing of rock wall



Photo 8: Noted voids in rock wall



Photo 9: View of north end of subject property



Photo 10: Timber retaining wall at south end of subject property below Westside Road



Photo 11: View of subject property from the south



Photo 12: View of existing retaining wall



Photo 13: View (to the north) of upland area between rock wall and retaining wall



Photo 14: View (to the south) of upland area between rock wall and retaining wall

APPENDIX B – FLOOD ASSURANCE STATEMENT

I certify that I am a Qualified Professional as defined below.

July 1, 2020


Date

Clarke Geoscience Ltd.

Prepared by

Jennifer Clarke, P.Geo.

Name (print)


Signature

5217 Benmore Court

Address

Kelowna, BC V1W 4Z3

250-826-4367

Telephone

jen@clarkegeoscience.com


Email

Dobson Engineering Ltd.

Reviewed by

Don Dobson, PEng

Name (print)


Signature



(Affix PROFESSIONAL SEAL here)

If the Qualified Professional is a member of a firm, complete the following:

I am a member of the firm **Clarke Geoscience Ltd.**

and I sign this letter on behalf of the firm.

(Name of firm)

APPENDIX D: SITE SURVEY



<p>LEGEND:</p> <p>Elevations are in metres are based on GNSS Observations.</p> <p>Contour interval – 0.5m</p>	<p>TITLE:</p> <p>SITE PLAN OF LOT 2, DISTRICT LOT 3745, OSOYOOS DIVISION YALE DISTRICT, PLAN 14249, EXCEPT PLAN KAP47451</p>	<p>DRAWN BY:</p> <p>RUNNALLS DENBY <i>british columbia land surveyors</i></p> <p>259A Lawrence Avenue Kelowna, B.C. V1Y 6L2 Phone: (250)763-7322 Fax: (250)763-4413 Email: nel@runnallsdenby.com</p> <p>CLIENT:</p> <p>KATAWA CONSTRUCTION LTD.</p>	<p>SCALE:</p> <p>1:300 (22"x34")</p> <p>DATE:</p> <p>OCT. 8, 2019</p> <p>DWG:</p> <p>15567 SITE</p> <p>FILE No:</p> <p>15567</p> <p>REV.</p> <p>0</p>
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APPENDIX E: CUMULATIVE IMPACTS MEMO CREATED BY ECOSCAPE



Memorandum

Date: February 1, 2021
To: Brittany Lange, Regional District of Central Okanagan (RDCO)
From: Kris Mohoruk, B.Sc.
File: 19-3064

Subject: Memorandum regarding cumulative impacts at 2223 Westside Road, RDCO

The following memorandum relates to the proposed house construction at 2223 Westside Road (proposed works), within the Regional District of Central Okanagan (RDCO), legally described as Lot 2, Plan KAP14249, District Lot 3745 (subject property). In September 2020, an Environmental Assessment Report was created by Ecoscape Environmental Consultants Ltd. (Ecoscape) and submitted to the RDCO as apart of an application for a Development Permit (DP) for the proposed works within the property. This memorandum provides guidance to the RDCO regarding the existing cumulative impacts within the subject property, and acts as a further supplement to the EA Report created by Ecoscape.

1.0 SUMMARY OF CUMULATIVE IMPACTS WITHIN THE SUBJECT PROPERTY

To assess the existing impacts within the riparian and foreshore area of the subject property, Foreshore Inventory Mapping (FIM) was consulted. FIM is the protocol that is used to collect baseline information regarding the current conditions of a shoreline, and inventories information on shore type, substrates, land use, and habitat modifications along the shoreline (Schleppe 2016). This method is often used to describe the cumulative impacts observed along the foreshore of mapped lakes and is used by the Department of Fisheries & Oceans (DFO) in decision making processes in this sense. The eastern side of the subject property is divided between two FIM segments– 219 & 220. FIM data collected in 2016 for Segment 219 (i.e., the northern segment) indicates that the disturbance within the foreshore of the entire 385 m segment is 95% disturbed with only 5% remaining natural in residual patches. FIM Segment 220 (i.e., southern segment) is 85% disturbed and 15% natural, with most natural areas occurring below Westside Road outside of the subject property and most disturbances occurring on the subject property. This level of disturbance was reflective of what was observed during the October 30, 2019 site visit conducted by Ecoscape within the subject property. Existing impacts observed within the eastern side of the property included wooden and cement retaining walls, a wooden patio area and campfire pit, wooden shed, existing dock structure, rock retaining wall, and a wooden staircase.

The riparian values within the eastern side of the property include young to moderately aged coniferous and deciduous trees, and some shrub growth within a narrow band of various native and invasive grass species. In general, the understory has almost been

entirely disturbed from previous developments. A restoration plan with substantial plantings (290 total plantings) within the Streamside Protection and Enhancement Area (SPEA) is proposed and would aid in improving the riparian area within the subject property, helping to return it to a more natural condition, albeit still within a developed area.

The western slope of the subject property, where a no disturb covenant (i.e., long term protection for the area) is proposed, contains relatively undisturbed provincially Blue and Red-listed ponderosa pine (*Pinus ponderosa*) open pine woodland ecosystems. This area has been identified as a high value natural woodland area and is functionally connected with no barriers to Crown Lands above. Further, the western side of the property has many environmental constraints (i.e., steep grade, relatively undisturbed, high value terrestrial and wildlife habitat) making development not overly feasible. This area is relatively undisturbed beyond some cement blocks located adjacent to Westside Road and has minimal cumulative impacts in comparison to the eastern side of the property because most of the western side of Westside Rd has remained undisturbed in this general area.

The above summarizes how the proposed works will generally occur within previously disturbed areas and avoid high value terrestrial habitat in upland areas. When this is combined with the proposed restoration plan, the cumulative impacts of the proposed development will, at minimum, result in no net change in shoreline condition and impacts to the terrestrial areas will be minimal. Further, it is possible that small net gains in riparian condition will occur, *if the restoration plantings achieve maturity and are maintained appropriately*. By directing developments to the previously disturbed areas, and avoiding the higher value wildlife areas, impacts and particularly cumulative impacts would be hard to detect post construction. It should be noted that this cumulative summary has relied upon the FIM inventory and makes reach wide comparisons to consider cumulative impacts. A formalized cumulative impact assessment would require new data collection to better understand other recent changes to shoreline or terrestrial areas.

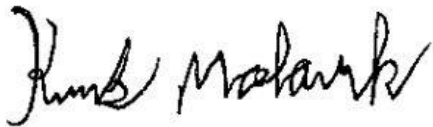
2.0 CONCLUSION

This memo has been prepared to address the cumulative impacts within the subject property. Due to the eastern side of the subject property being moderately disturbed, and risks to the terrestrial environment within the western side of the property outweighing those to the aquatic environment, any proposed development within the property should occur within the eastern side of the property. This assessment assumes that the proposed restoration plan will be implemented, and that all best management practices outlined within the EA Report created by Ecoscape will be followed.

If you have any questions or comments, please contact the undersigned at your convenience.

Respectfully submitted,
ECOSCAPE ENVIRONMENTAL CONSULTANTS LTD.

Prepared by:



Kris Mohoruk, B.Sc.
Natural Resource Biologist
Direct Line: (250) 491-7337 ext. 207
kmohoruk@ecoscapeltd.com

Reviewed by:



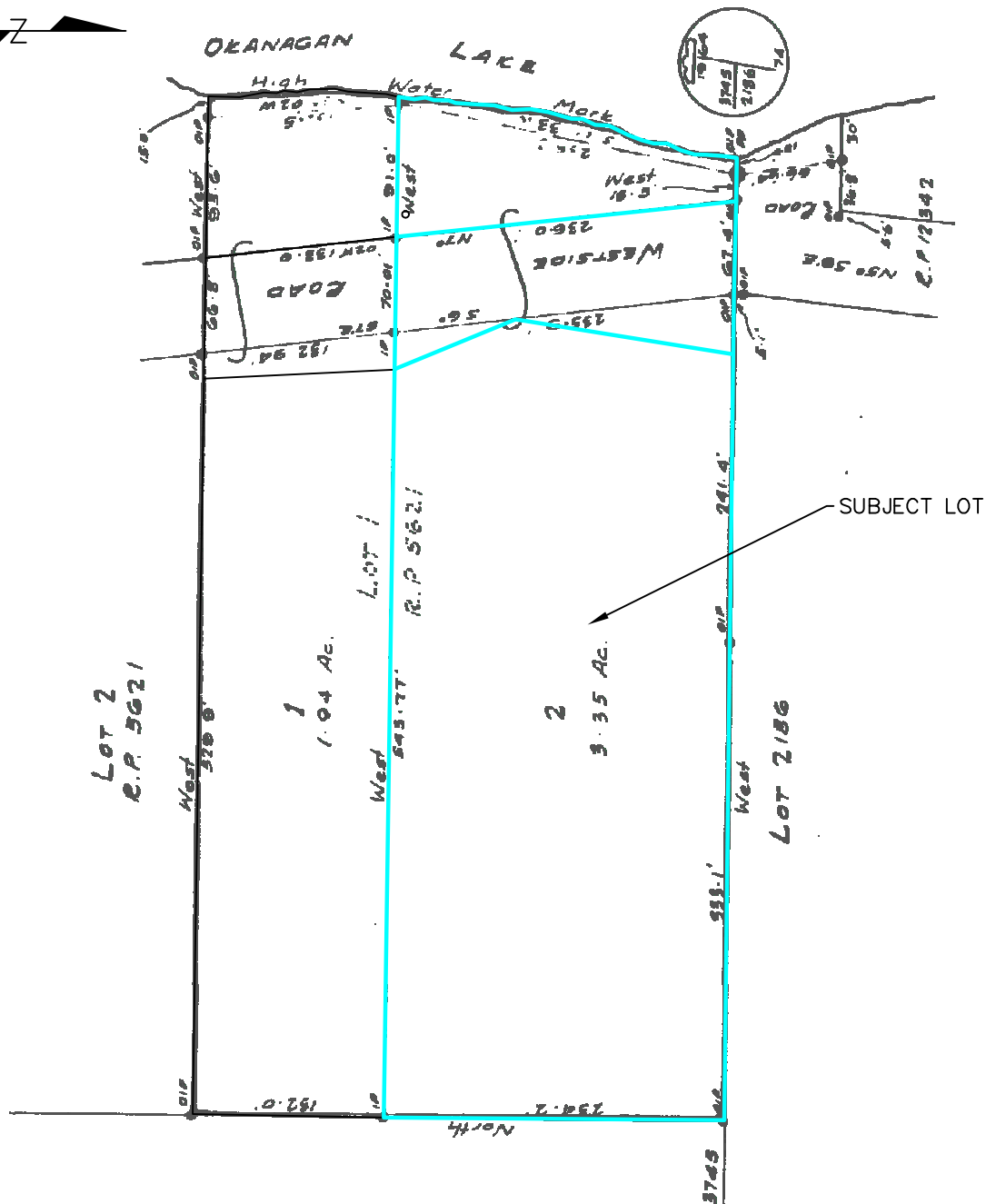
Jason Schleppe, M.Sc., R.P. Bio.
Senior Natural Resource Biologist
Direct Line: (250) 491-7337 ext. 202
jschleppe@ecoscapeltd.com

3.0 REFERENCES

Schleppe, J. 2016. Okanagan Lake Foreshore Inventory and Mapping. Prepared for: Okanagan Collaborative Conservation Program. Prepared by: Ecoscape Environmental Consultants Ltd. Project File:16-1880.

APPENDIX F: SEPTIC SYSTEM DESIGNS FROM FRANKLIN ENGINEERING LTD.

Z



LEGAL PLAN
1:1500

NOTE:

THIS DRAWING IS PRELIMINARY AND NOT FOR CONSTRUCTION
UNLESS SO SEALED AND NOTATED BELOW.

BILL OF MATERIALS*			
	DESCRIPTION	MODEL	QTY
1	Leko Precast concrete dual chamber septic tank	1000 IGAL	1
2	Leko Precast concrete pump chamber assembly	48"	1
3	Eljen GSF Module	A42	16
4	Tuf-Tite Distribution Box, Plastic 7-Hole	7HD2	2
5	100mmØ (4") PVC Pipe	CSA Sewer Grade	12m (40')
6	50mmØ (2") PVC Pipe	CSA Sewer Grade	73m (240')
7	100mmØ (4") Perforated PVC Pipe	CSA Sewer Grade	20m (64')
8	Effluent-filter Assembly 1/16" - Polylok	EF-6	1
9	Valve Boxes (Optional)	6"	2
10	Aquaworx Control Panel	Simplex IPC	1
11	**Effluent pump	**	1
12	Transducer	TRN-XX	1
*	Materials List is a guide only. Actual material amounts may differ.		

**PUMP TO BE CONFIRMED - ELEVATION FROM PUMP CHAMBER TO INDEX VALVE
TO BE DETERMINED PRIOR TO PUMP SELECTION

NOTES:

PLEASE RECORD Z-BIAS NUMBER FROM TRANSDUCER ON
INSIDE OF CONTROL PANEL DOOR

SEWAGE DISPOSAL SYSTEM FOR:

L 2, PLAN KAPI4249, DISTRICT LOT 3745, ODYD, EXCEPT
PLAN KAP4745I

ASSESSMENT ROLL NUMBER:

20-723-14883.000

PID:

009-053-794

GENERAL NOTES:

1. THE TANK SHALL BE LOCATED TO PROVIDE A MIN. OF 2 % FALL FOR ALL GRAVITY SEWER DRAINS.
2. ROOF DRAINAGE SHALL BE DIVERTED AWAY FROM TREATMENT SYSTEM AND THE DISPOSAL AREA.
3. THE DISPOSAL AREA SHALL BE COVERED TO PROVIDE SURFACE DRAINAGE AND BE PROPERLY SEEDDED OR SODDED TO PREVENT EROSION, AND PROPERLY MAINTAINED. HERBACEOUS PLANTS SUCH AS WILDFLOWERS AND GRASSES ARE GOOD CHOICES FOR PLANTING. GRASSES ARE ESPECIALLY DESIRABLE DUE TO THEIR FIBROUS ROOT SYSTEMS WHICH HOLD THE SOIL IN PLACE.
4. SHALLOW ROOTED SHRUBS SUCH AS CEDARS MAY BE PLANTED ON THE SIDE SLOPE OR AT THE TOE OF THE DISPOSAL AREA.
5. EFFLUENT FILTER TO BE CLEANED EVERY SIX MONTHS OF USE.
6. TANKS TO BE PUMPED OUT EVERY 3-5 YEARS OR AS DEEMED NECESSARY BY SERVICE PROVIDER.
7. DISTRIBUTION BOX TO BE INSPECTED ANNUALLY.
8. WATER CONDITIONER, WATER SOFTENER, HOT TUB, OR SWIMMING POOL DISCHARGE CANNOT BE FLUSHED INTO THE SEWAGE TREATMENT SYSTEM.

DESIGN CALCULATIONS:

- A. PEAK DAILY DESIGN FLOW = 1000 L/D (220 IGPD) BASED ON A 2-BEDROOM RESIDENCE.
- B. DISPOSAL AREA CONSISTS OF 2 LATERALS SPACED 3' APART ON A SAND MOUND. EACH LATERAL CONSISTS OF 8 A42 ELJEN GSF MODULES = 32' (10M) TOTALING 80' (24M) FOR THE ENTIRE FIELD.
- C. BASAL AREA PEAK HYDRAULIC LOADING RATE = 65 L/M²

INSPECTION SCHEDULE:

1. PRE-CONSTRUCTION MEETING.
2. AFTER EXCAVATION OF DISPOSAL FIELD AREA- PRIOR TO PLACEMENT OF SAND.
3. UPON PLACEMENT OF TANKS, PRIOR TO BACKFILLING.
4. FIELD INSTALLATION COMPLETE - PIPE INSTALLED (PRIOR TO BACKFILL/LATERAL COVERAGE)

CLIENT:
MALONEY
LOT 2 2223 WESTSIDE RD

PROJECT:
20-102-S
SEWERAGE SYSTEM

TITLE:
PLOT PLAN & GENERAL NOTES

THIS DRAWING IS NOT FOR
CONSTRUCTION UNLESS SO SEALED.

© FRANKLIN ENGINEERING LTD.

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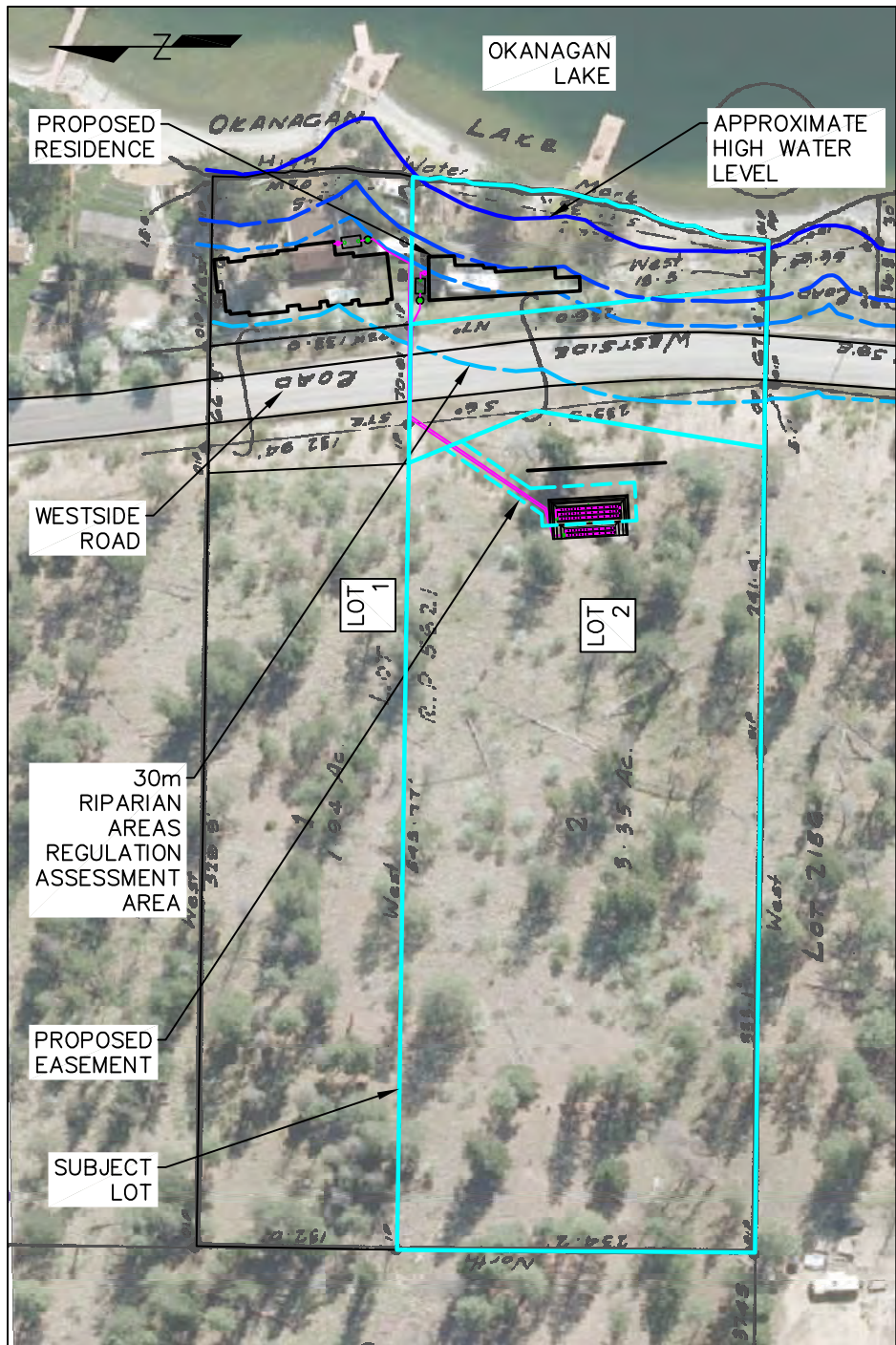
17/SEP/2020

ISSUED FOR INFORMATION

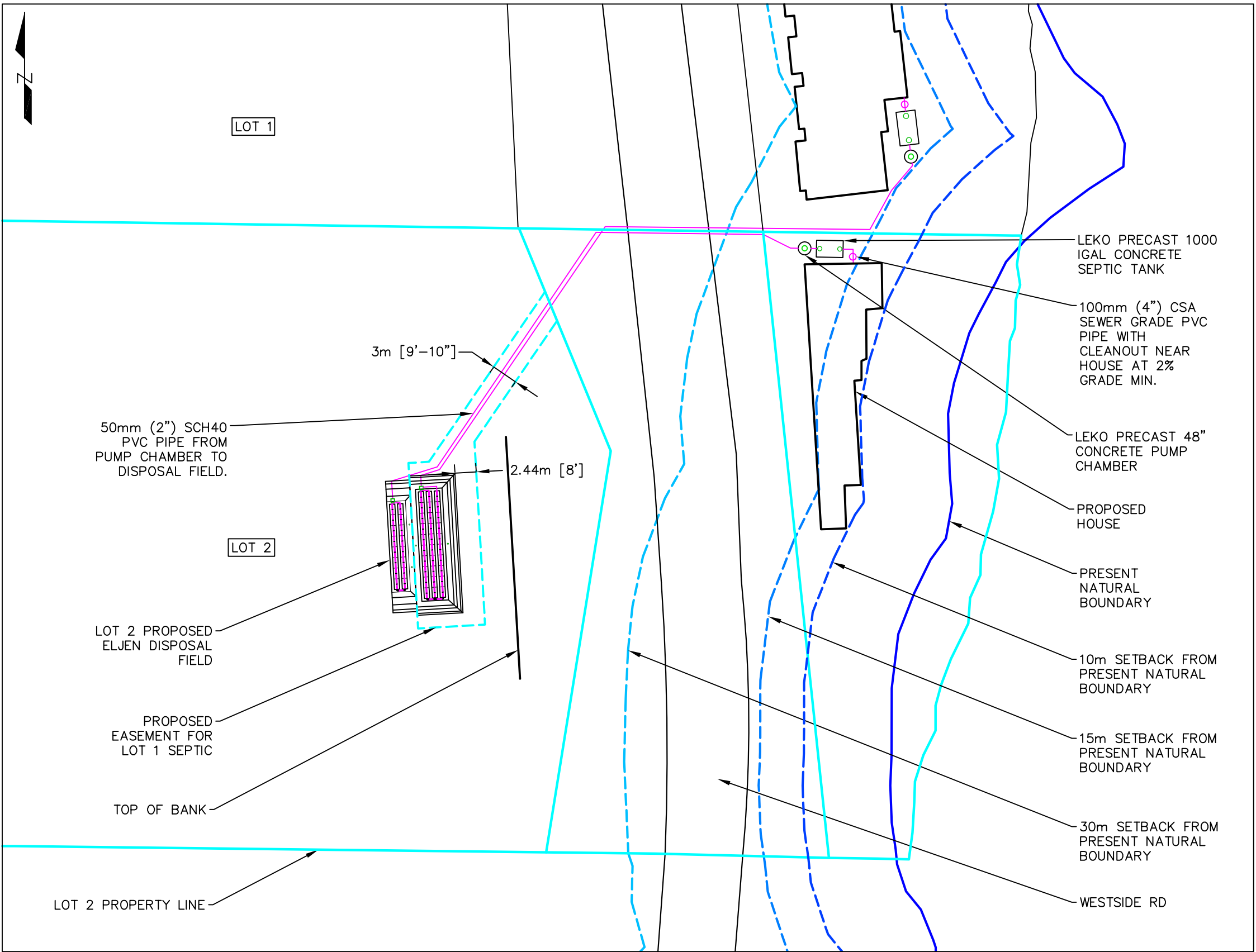


Jayme Franklin, P.Eng.
250.832.8380

DRAWING NO. 20-102-01-L2



SITE PLAN
SCALE: 1:1500



SYSTEM LOCATION
SCALE: 1:500

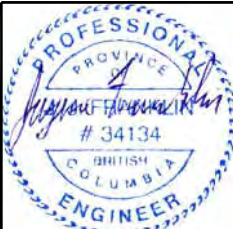
CLIENT:
MALONEY
LOT 2 2223 WESTSIDE RD

PROJECT:
20-102-S
SEWERAGE SYSTEM

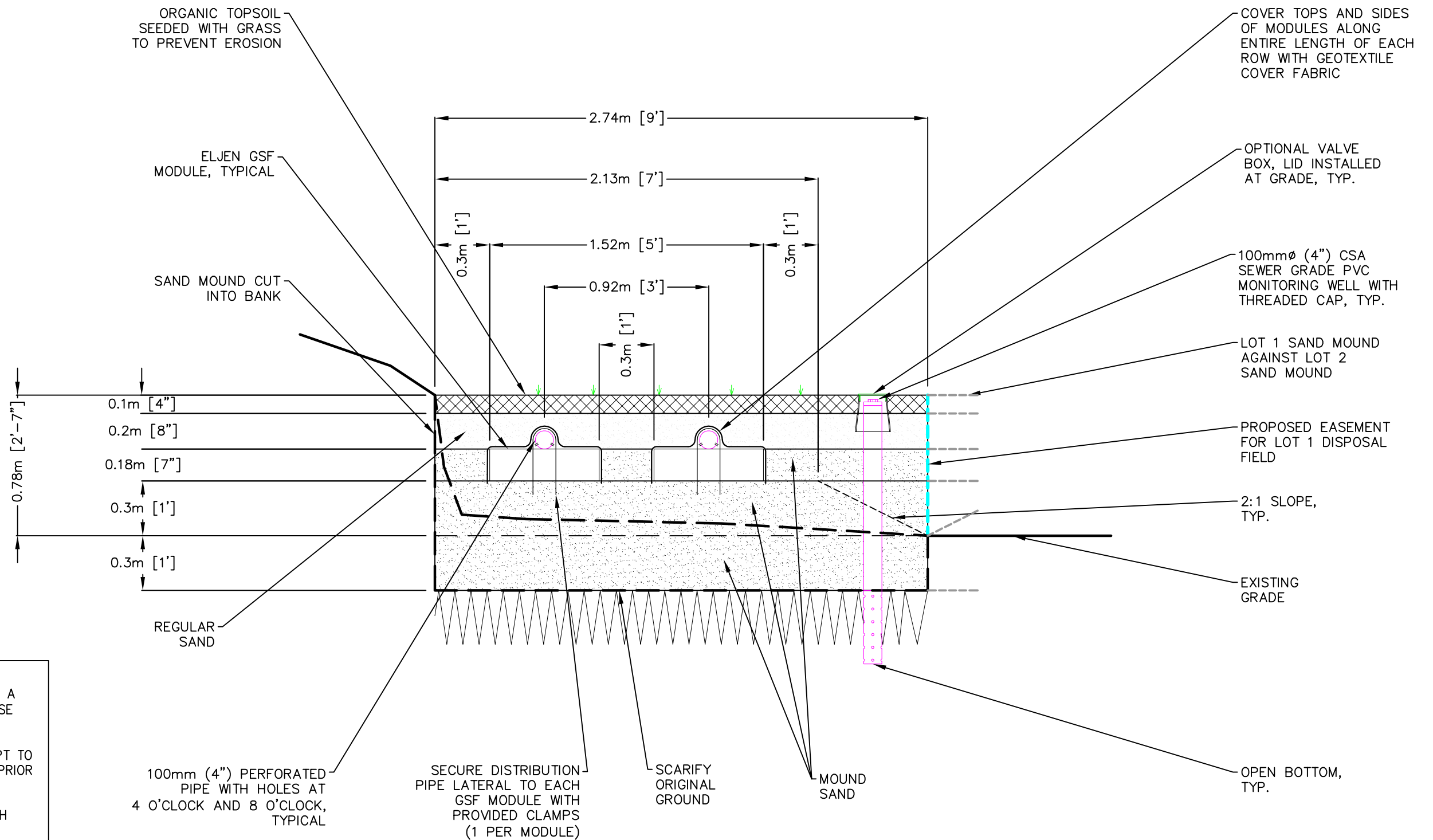
TITLE:
SITE PLAN AND SYSTEM LOCATION

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CONSTRUCTION UNLESS SO SEALED.
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1	26/JAN/2021	ISSUED FOR UPDATE
0	17/SEP/2020	ISSUED FOR INFORMATION



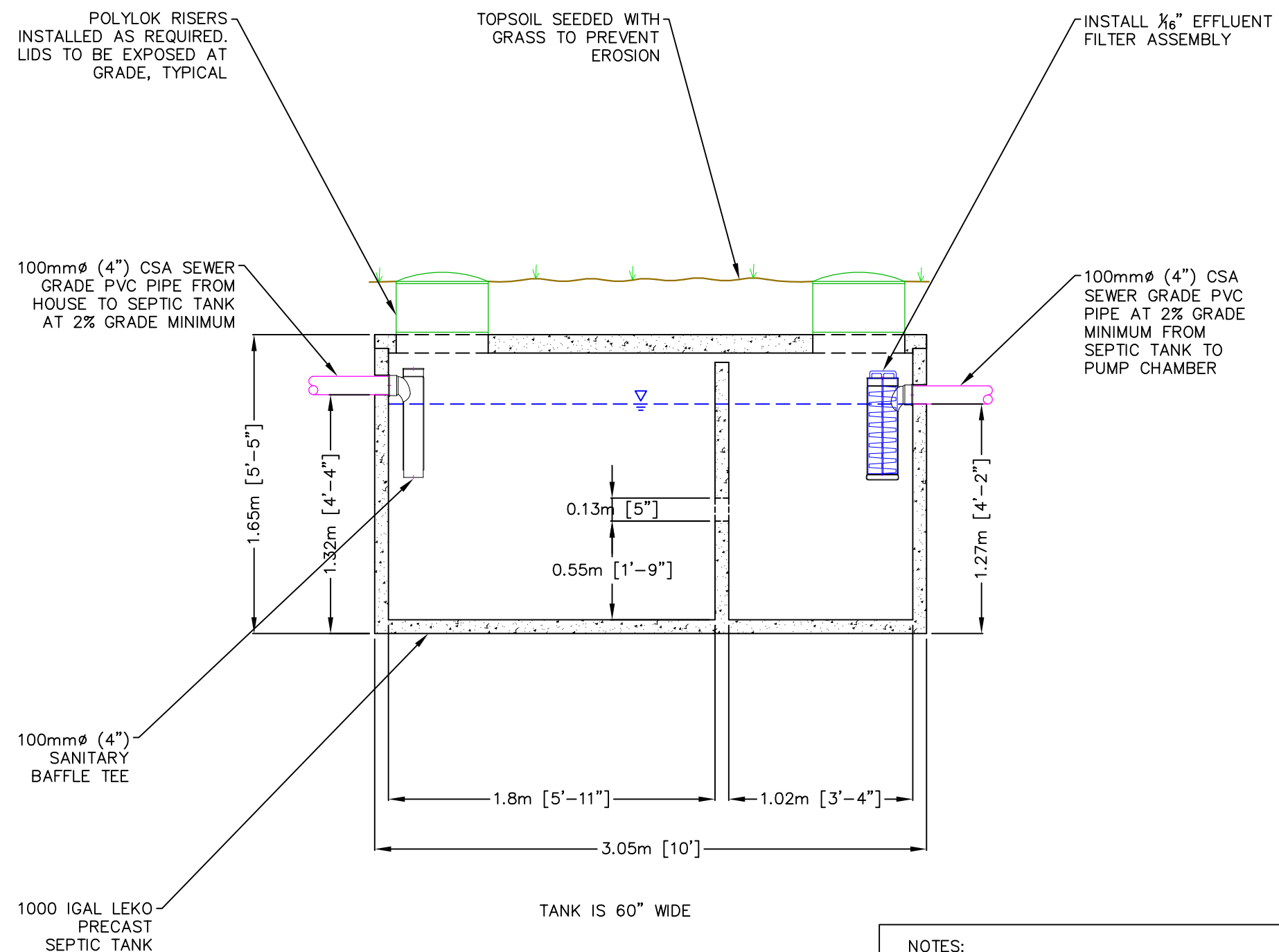
FRANKLIN
ENGINEERING LTD.
Jayme Franklin, P.Eng.
250.832.8380
DRAWING NO. 20-102-02-L2



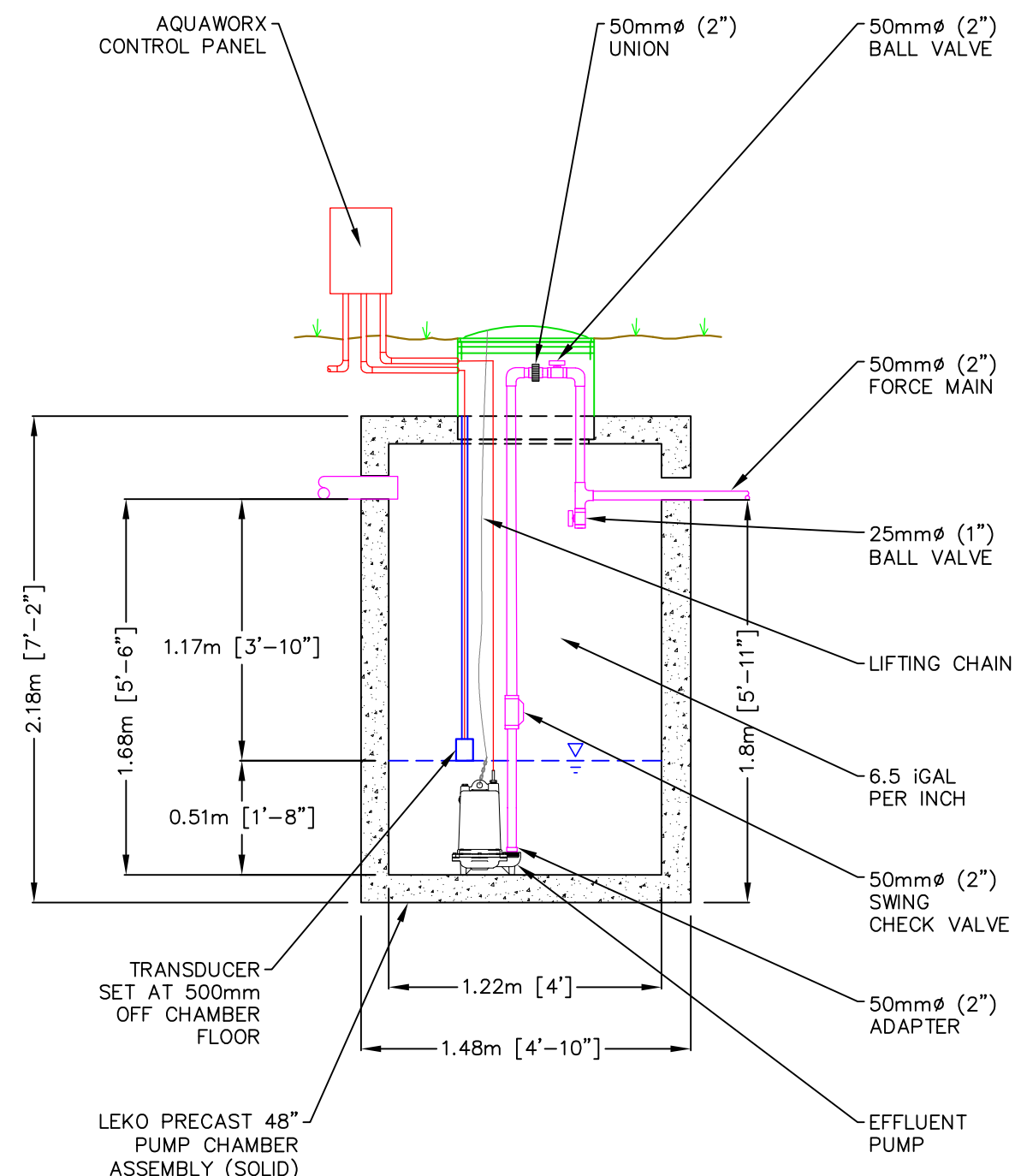
- NOTES:**
1. SAND BED BASE TO BE SCARIFIED TO A MINIMUM DEPTH OF 0.3m (1') BELOW BASE OF EXCAVATION.
 2. CONSTRUCTION TRAFFIC MUST BE KEPT TO A MINIMUM WITHIN THE DISPOSAL AREA PRIOR AND DURING CONSTRUCTION.
 3. SAND BED TO BE CONSTRUCTED WITH BASE LEVEL ALONG LENGTH AND WIDTH BELOW INFILTRATORS.

MOUND SECTION
SCALE 1:50

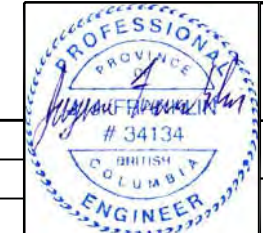
CLIENT: MALONEY LOT 2 2223 WESTSIDE RD	PROJECT: 20-102-S SEWERAGE SYSTEM	TITLE: DISPOSAL FIELD DETAILS	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SO SEALED. © FRANKLIN ENGINEERING LTD.			I 26/JAN/2021 0 17/SEP/2020	ISSUED FOR UPDATE ISSUED FOR INFORMATION		 Jayme Franklin, P.Eng. 250.832.8380 DRAWING NO. 20-102-04-L2



NOTES:
1. TANK TO BE INSTALLED ON STABLE AND
LEVEL FOUNDATION SUBGRADE.
2. MANUFACTURERS BACKFILL
SPECIFICATION MUST BE FOLLOWED.
3. EFFLUENT FILTER TO BE INSTALLED.



SEPTIC TANK AND PUMP CHAMBER DETAILS
SCALE: 1:25

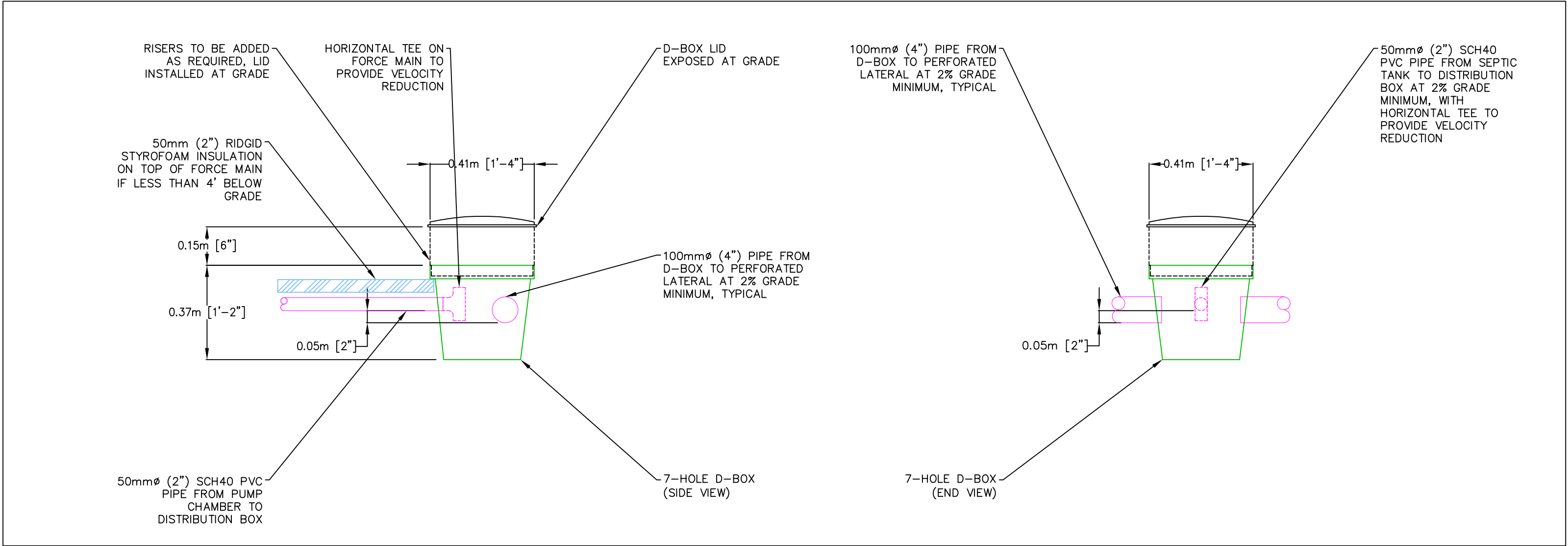


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ENGINEERING LTD.

Jayme Franklin, P.Eng.
250.832.8380

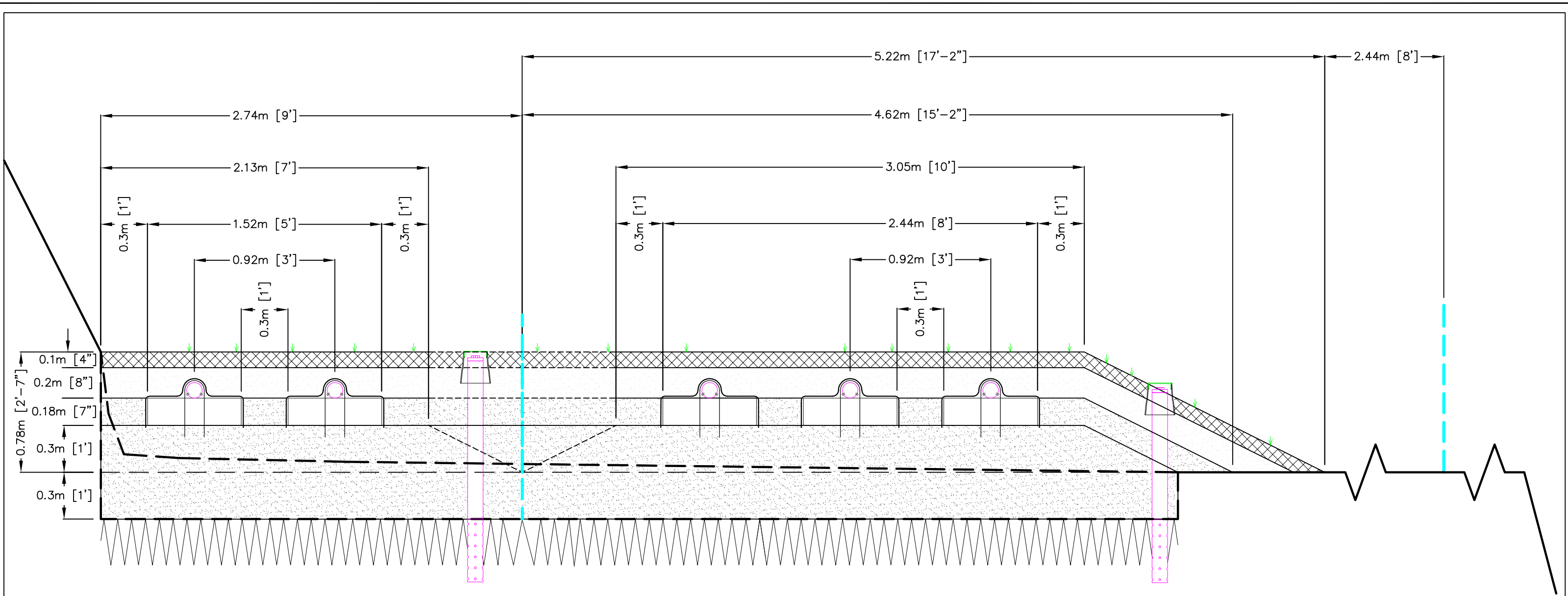
DRAWING NO. 20-102-05-L2

CLIENT: MALONEY LOT 2 2223 WESTSIDE RD	PROJECT: 20-102-S SEWERAGE SYSTEM	TITLE: DISPOSAL SYSTEM DETAILS	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SO SEALED. © FRANKLIN ENGINEERING LTD.		I 26/JAN/2021 0 17/SEP/2020	ISSUED FOR UPDATE ISSUED FOR INFORMATION		
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LATERAL END DETAILS
SCALE: 1:15

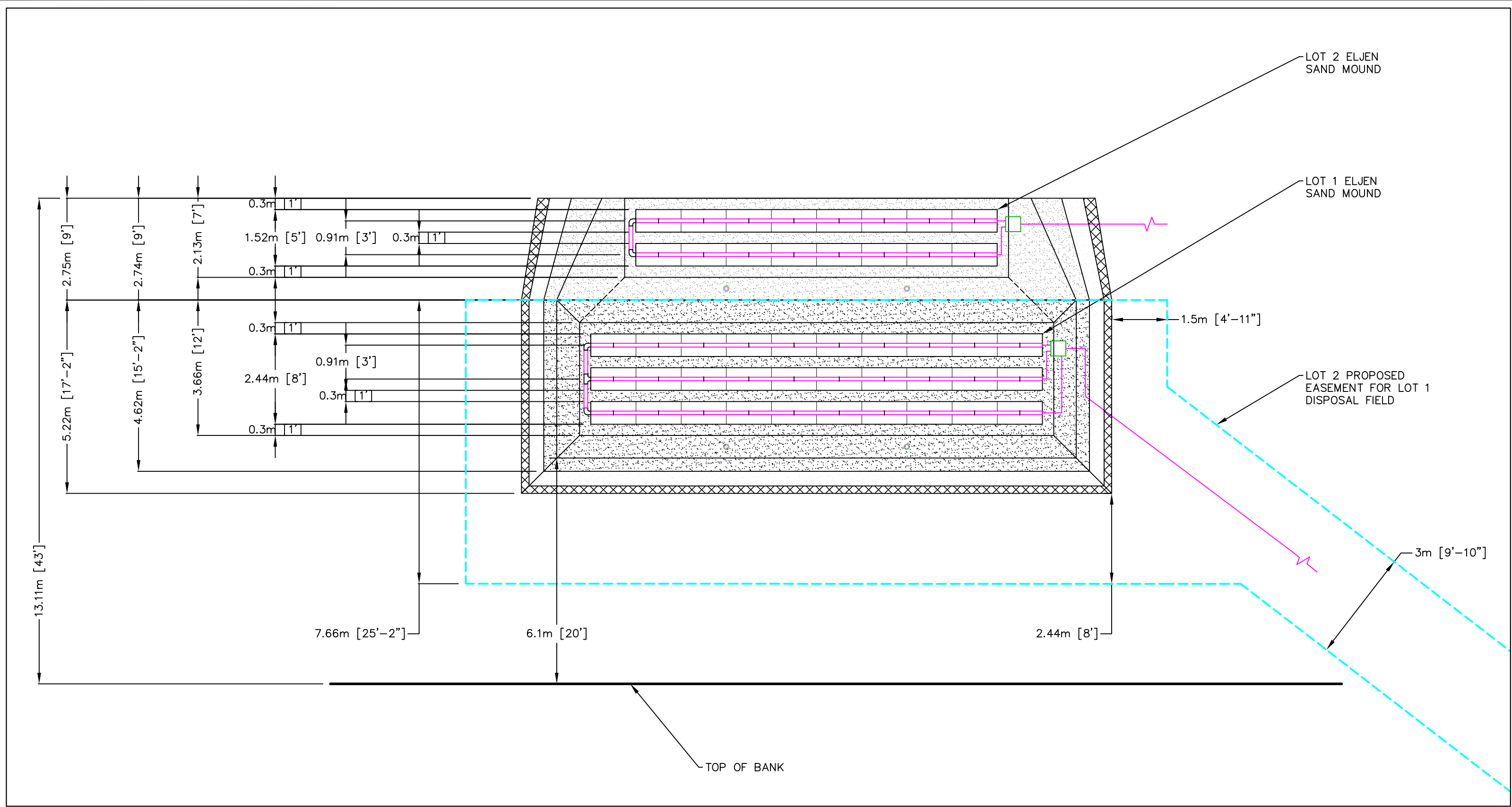
CLIENT: MALONEY LOT 2 2223 WESTSIDE RD	PROJECT: 20-102-S SEWERAGE SYSTEM	TITLE: DISPOSAL SYSTEM DETAILS	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SO SEALED. © FRANKLIN ENGINEERING LTD.					 Jayme Franklin, P.Eng. 250.832.8380 DRAWING NO. 20-102-06-L2
				I	26/JAN/2021	ISSUED FOR UPDATE		
				0	17/SEP/2020	ISSUED FOR INFORMATION		



- NOTES:
1. SAND BED BASE TO BE SCARIFIED TO A MINIMUM DEPTH OF 0.3m (1') BELOW BASE OF EXCAVATION.
 2. CONSTRUCTION TRAFFIC MUST BE KEPT TO A MINIMUM WITHIN THE DISPOSAL AREA PRIOR AND DURING CONSTRUCTION.
 3. SAND BED TO BE CONSTRUCTED WITH BASE LEVEL ALONG LENGTH AND WIDTH BELOW INFILTRATORS.

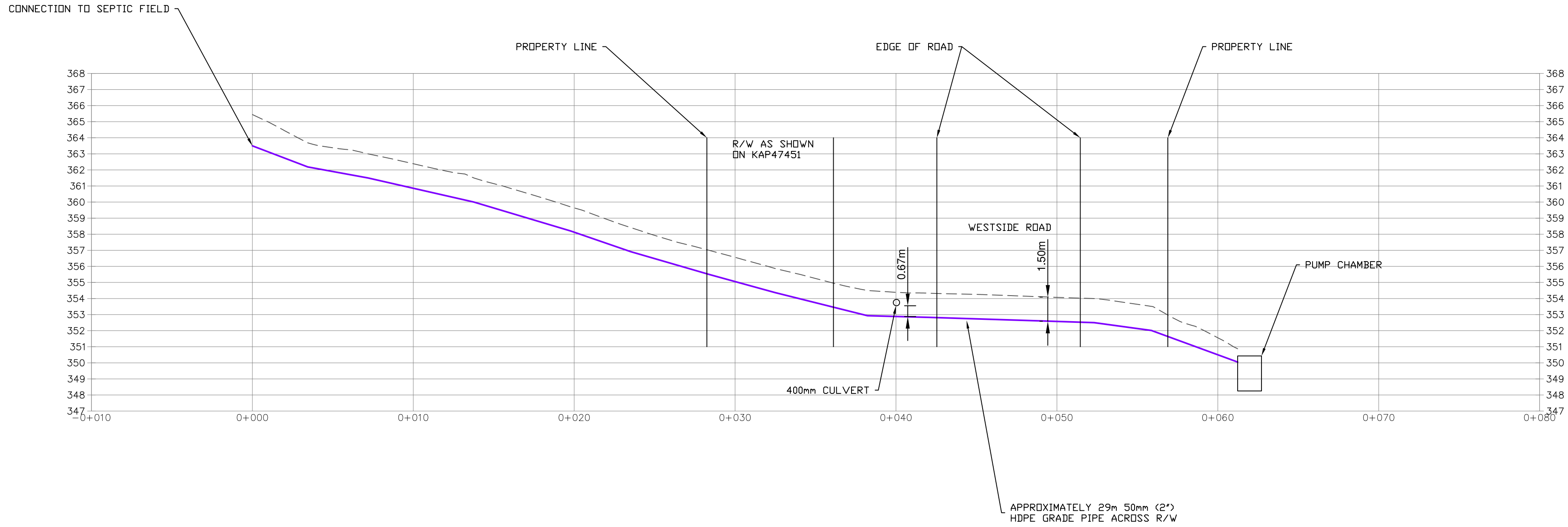
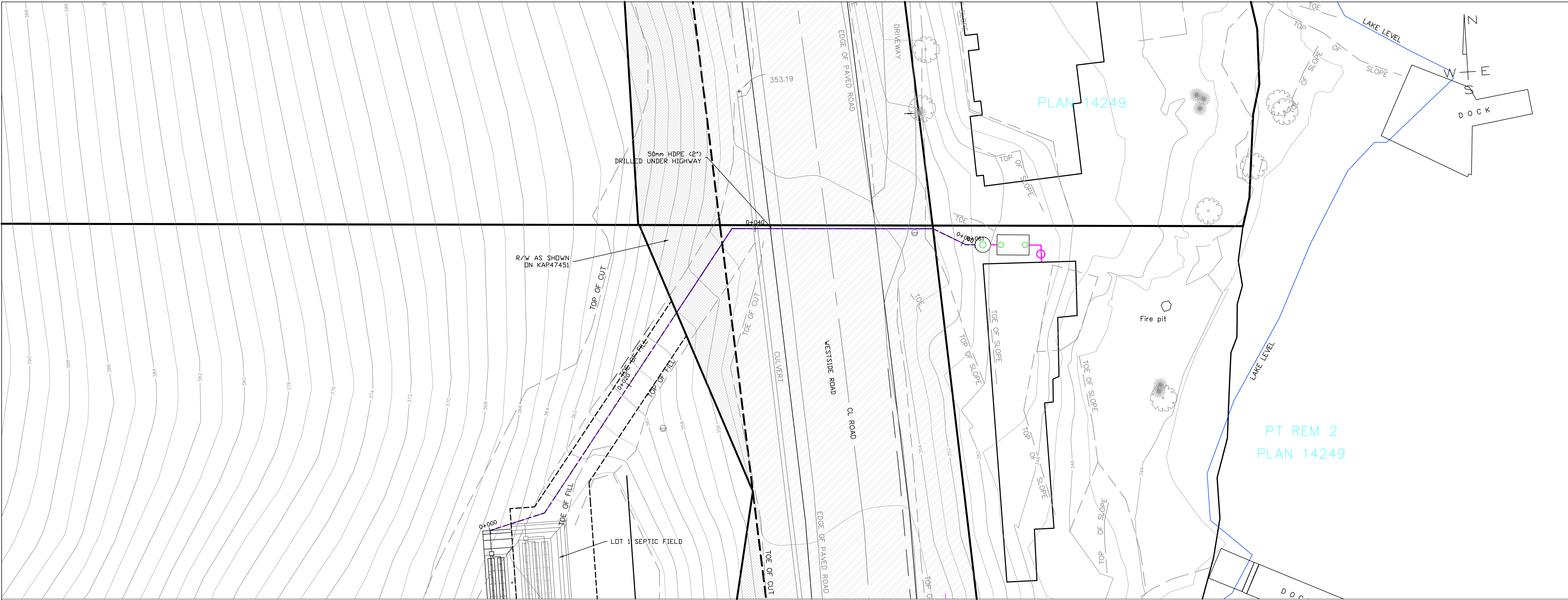
LOT 1 AND LOT 2 DISPOSAL FIELDS SECTION
SCALE 1:50

CLIENT: MALONEY LOT 2 2223 WESTSIDE RD	PROJECT: 20-102-S SEWERAGE SYSTEM	TITLE: DISPOSAL FIELD DETAILS	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SO SEALED.				Jayme Franklin, P.Eng. 250.832.8380
			I	26/JAN/2021	ISSUED FOR UPDATE		DRAWING NO. 20-102-07
			0	17/SEP/2020	ISSUED FOR INFORMATION		
			© FRANKLIN ENGINEERING LTD.				



LOT 1 AND LOT 2 DISPOSAL FIELDS PLAN
SCALE 1:100

CLIENT: MALONEY Lot 2 2223 WESTSIDE RD	PROJECT: 20-102-S SEWERAGE SYSTEM	TITLE: DISPOSAL FIELD DETAILS	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SO SEALED.				 Jayme Franklin, P.Eng. 250.832.8380
			I	26/JAN/2021	ISSUED FOR UPDATE		
			0	17/SEP/2020	ISSUED FOR INFORMATION		DRAWING NO. 20-102-08



LEGEND

EXISTING

●

HYDRO/TELEPHONE POLE

○

HYDRO/TELEPHONE POLE C/W DAVIT

○

TELEPHONE POLE

●

HYDRO POLE

●

HYDRO POLE C/W TRANS.

○

POST TOP STREET LIGHT

○

GUY

○

SANITARY MANHOLE

○

STORM MANHOLE

■

CATCHBASIN

○

FIRE HYDRANT

○

GATE VALVE

—

SAN— SANITARY SEWER

—

STM— STORM MAIN

—

FM— FORCE MAIN

—

W— WATER MAIN

—

G— GAS

—

U/T— UNDERGROUND TELEPHONE

—

FENCE

○

DECIDUOUS/EVERGREEN

○

INSTALLED

○

SANITARY MANHOLE

○

STORM MANHOLE

■

CATCHBASIN

○

GATE VALVE

○

FIRE HYDRANT

—

SEWER — PUMPED

—

SEWER — GRAVITY

1	01.26.21	FOR INFORMATION	JAW	JJF
—	12.16.20	FOR INFORMATION	JAW	JJF
NO.	DATE	DESCRIPTION	BY	APP'D
REVISIONS				
		DESIGN	JAW	
		DRAWN	JAW	
		DATE	JAN 26, 2021	
		CHECKED	JJF	
P.ENG JAYME FRANKLIN				
SCALES 0 5 10 Meters				
<div><div><div>F</div><div>FRANKLIN</div><div>ENGINEERING LTD.</div><div>250.832.8380 • www.franklinengineering.ca</div></div></div>				
Katawa Construction Ltd.				
WESTSIDE ROAD				
2223 WESTSIDE ROAD				
CROSSING DETAILS LOT 2				
PROJECT No. 20-102				
SHEET OF 1 1				
DWG. No. C-01				REV. No. 1

APPENDIX G: NO BUILD MEMO FROM BEACON GEOTECHNICAL LTD.



BEACON GEOTECHNICAL LTD.

February 23, 2021

Beacon File No: 16-J1972

KATAWA Construction Ltd.
c/o Ecoscape Environmental Consultants Ltd.
#102 – 450 Neave Court
Kelowna, B.C.
V1V 2M2

Attention: Mr. Kathy Maloney-Johnson

Re: Review of Environmental No-Build Covenant - 2223 Westside Road, RDCO

At the request of Mr. Kris Mohoruk of Ecoscape Environmental Consultants Ltd. (Ecoscape), Beacon Geotechnical Ltd. (Beacon) has carried out a review of the proposed location of the “No Build” covenant line for the above-mentioned property. This letter summarizes our review and provides our comments.

Beacon has been involved with this property since the spring of 2020, completing a site reconnaissance and preparing a geotechnical hazard report for the site. We have reviewed work done on the file by Ecoscape and Clarke Geoscience Ltd. the foreshore erosion consultants on the project. It is proposed to construct a home on the eastern side of Westside Road, adjacent to Okanagan Lake and to construct a septic dispersal field on the western side of Westside Road.

Ecoscape has defined a proposed limit of disturbance on the on the western portion of the property, as shown on their drawing, Figure 4, “*Riparian Areas Regulation Assessment*”, File No. 19-J3064, dated February 22, 2021, shown as “*Environmentally Restricted No Build Limit*”. We understand that the land to the west of the line will not be disturbed and will be protected by covenant. The land between the No Build Line and Westside Road will only be used for the construction of the septic dispersal field. Figure 4 is attached.

Based on our understanding of the project and the existing site conditions, Beacon is satisfied that the proposed No Build Limit, as discussed above, is in general conformance with the recommendations presented in our geotechnical hazard report.

We thank you for your interest in our company. Should you have any further questions, please feel free to contact our office.

Very truly,
Seacon Construction Ltd.



Peter W. W. Wong
Chartered Engineer

Attachment:

Seacon Construction Ltd. Figure 4 (1 page)



FIGURE 4
Riparian Areas Regulation Assesment

Project: Environmental Assessment
Location: Regional District of Central Okanagan
Project No.: 19-3064
Prepared for: Maloney Construction Ltd.
Prepared by: Ecoscape Environmental Consultants Ltd.
Josh Castanier, GIS Technician
Coordinate System: NAD83-UTM Zone 11
Imagery: ESRI World Imagery
Map Date: February 22, 2021

- LEGEND**
- Subject Property
 - Cadastre
 - Streamside Protection and Enhancement Area (SPEA)
 - Buildable Area Outside Natural and Legal Restrictions Excluding SPEA
 - Development SPEA Encroachment
 - Proposed Building Footprint
 - Proposed Septic Tanks
 - Proposed Dispersal Bed
 - Developable Area
 - 10 Meter Setback
 - Stream Boundary i.e. Surveyed High Water Level (343 m.a.s.l.)
 - 30 m Riparian Areas Regulation Assessment Area
 - Zone of Sensitivity - Large Woody Debris (15 m)
 - Zone of Sensitivity - Litterfall (15 m)
 - Zone of Sensitivity - Shade (30 m due south)
 - Proposed Front Yard Setback (2.29m)
 - Proposed Septic Piping

Hardship Area Calculation (Greenfield)	
Total Property Area =	13057.4m ²
Total Buildable Area (Outside Municipal Setbacks + Geotech Approved area Western Lot) =	868.4m ²
Developable Area (Outside Natural/Legal Restrictions) =	232.2m ²
Total Proposed Development Area =	343.5m ²
Allowable Footprint (30% of Buildable Area) =	260.5m ²
Allowable Variance Area/Encroachment into SPEA =	28.3m ²

***Caveat**
Under this specific hardship case; a geotechnical assessment of the property has granted a specific area on the western lot safe to engineer for a septic field area. This area is included within the hardship calculations and is added to Buildable Area, Developable Area, and added to the Total Proposed Development Area.

DISCLAIMER
The data displayed is for conceptual purposes only and should not be interpreted as a legal survey or for legal purposes. If discrepancies are found between the data portrayed in this report and that of a legal survey, the legal survey will supersede any data presented herein.

