ROAD CORRIDOR ASSESSMENT REPORT
VILLAGE OF BELCARRA

November 1, 2017

4204.0002.01

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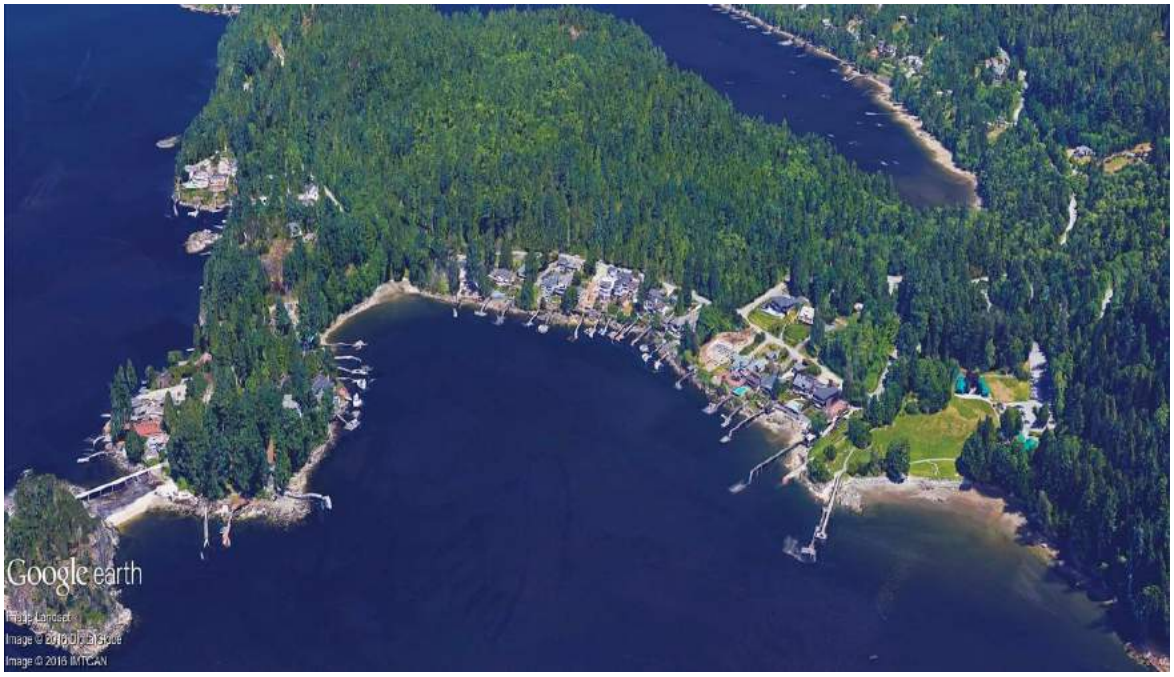
Contents

APPENDICES:

Introduction

This report provides the rationale for and findings of a Road Corridor Assessment (RCA) designed to determine the existing field conditions and urgency of investment in the Village's roadway assets. The impetus for this RCA is to inform the development of the Village's short, medium and long-term capital plans.



The RCA identifies and assesses the functional and physical characteristics of the Village's roadway corridors through standardized visual inspection. This is done to develop a surface condition rating as well as take stock of other roadway components that directly affect the condition and lifespan of the road surface and cost of roadway improvements (maintenance, resurface, reconstruction). In addition to the road surface review, the RCA included an inventory and general assessment of the curb, road-side barriers, retaining walls and bus stops which was of interest to Village staff.

A surface condition review does not provide definitive road structural strength assessments as can be provided through load deflection testing. It also does not provide more detailed road structure composition information that could be determined through core sampling or test pits. However, surface condition provide an indication of underlying problems. It therefore can

provide a general indication of road condition and, if assessments are completed over time, the rate of deterioration.

The inspection information is suitable for informing the Village's annual road operations and maintenance programs and to refine the Roads Asset Management Program that the Village undertook in early 2017. Road renewal and improvement needs, priorities, and options can then be identified by Village staff and Council, and affordable levels of service and risk can be determined. More detailed geotechnical and road structure investigations may be warranted in some cases to help determine if alternative road rehabilitation methods would be appropriate i.e. full depth reclamation (pulverizing) or full depth reconstruction as part of design.

The roadway corridor assessment examined the roadway characteristics which included: road surface condition, road surface type of defect, safety concerns and confirmed most cross-section components.

Background

Pavements will typically deteriorate over time at an ever-increasing rate in the absence of timely maintenance and rehabilitation actions as shown in **Figure 1**. As deterioration increases, so do the associated costs to repair them. Investments in effective and systematic maintenance and rehabilitation can slow or reverse this deterioration, extending the service life of the road and reducing life cycle costs.

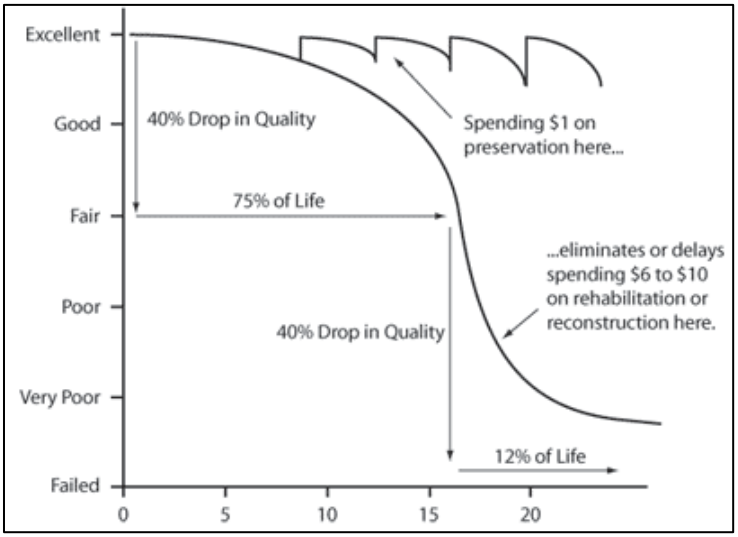


Figure 1: Typical Pavement Deterioration Curve

A typical pavement surface with a suitable base structure will deteriorate slowly for the first 75% of its life, after which it will lose the balance of its life very quickly. When the road surface is repaired regularly with maintenance interventions such as patching, crack sealing and shoulder repair, the useful life of the pavement can be extended dramatically. When it is no longer viable to extend the pavement life with maintenance, the road can be re-surfaced. Both of these timely actions (maintenance and resurfacing) can defer expensive re-construction, which includes the repair of the road base. It may be possible to get 3 or more resurfacings before reconstruction on a well-maintained and well-constructed roadway, depending on the amount of traffic and load on the roads. The road base provides the road strength, while the road surface provides a smooth, skid resistant waterproofing.

The Village can reduce its long-term road repair and reconstruction costs by proactively managing the life cycle of the pavement surface. Figure 2 provides a generalized example of the financial benefits of being proactive when considering a theoretical 1.0 kilometer of

roadway that is 7.0 meters wide. This example shows how the Uniform Annual Equivalent Cost savings is a factor of 2.6. To put this in monetary terms, for every $1 million spent on the road in proactive road maintenance and surface repairs, a community could save in the order of $1.6 million. Results will vary based upon pavement design, construction quality, weather, traffic loading and drainage.

Well Maintained Road		
Treatment	**Age**	**Cost**
Construction	0	$ 700,000
Crack Seal	5	$ 2,000
Crack Seal & Patch	10	$ 3,000
Resurface	15	$ 300,000
Crack Seal	20	$ 2,000
Crack Seal & Patch	25	$ 3,000
Resurface	30	$ 300,000
Crack Seal	35	$ 2,000
Crack Seal & Patch	40	$ 3,000
Resurface	45	$ 300,000
Crack Seal	50	$ 2,000
Crack Seal & Patch	55	$ 3,000
Re-construct	60	
Total		**$ 1,620,000**
UAEC		**$ 27,000**

Poorly Maintained Road		
Treatment	**Age**	**Cost**
Construction	0	$ 700,000
Crack Seal	10	$ 5,000
Re-construct	20	$ 700,000
Total		**$ 1,405,000**
UAEC		**$ 70,250**

Cost Saving Ratio
$70,250/$27,000 = **2.6**

***UAEC**: Uniform Annual Equivalent Cost*

Figure 2: Potential Life Cycle Cost Savings

The Village of Belcarra has approximately 8.4km of roads which made a visual assessment possible over a reasonable timeframe. The combination of standardized fieldwork, detailed inspection forms, photos and videos of each road segment allowed for site specific review and analysis for each road segment.

Recent cost estimates were provided by Belcarra staff and Ron Beesley, P. Eng of H.Y. Engineering Ltd. who has worked extensively with the Village providing engineering services over the past number of years. In addition, a 35% contingency is added in the cost estimates.

Note that assumptions should be updated over time as new information becomes available.

Road Corridor Assessment

The field assessment was conducted in late July 2017 and included all 8.4km of the Village owned roads as identified by Village staff. Each of the Village's roads segments were divided into 100 meter sections to facilitate the detailed assessment and documentation. The roads included in the RCA are shown in red on **Figure 3**.

Figure 3: Extent of 2017 Road Corridor Assessment

ROAD CORRIDOR INVENTORY

Included in the inventory was the physical dimensions and materials of the roadway components including the road surface, bike lanes, road shoulders, curbs, road-side barriers, retaining walls and bus stops.

As part of the assessment, the dimensions of the paved lanes and shoulders where measured and recorded. The road corridor dimensions are useful for calculating costs for rehabilitation efforts.

ROAD CORRIDOR RATINGS

Included in the condition assessment was the road distresses, condition of the existing crack sealing and patches. The distresses and condition were recorded using the Ministry of Transportation and Infrastructure Construction Branch's (MOTI) Pavement Surface Condition Rating Manual – Forth Edition as a guide.

http://www.th.gov.bc.ca/publications/const_maint/2012_pavement.pdf

From the assessment, we noted the recommended works to sustain or rehabilitate each road segment.

Road Surface

Pavement deteriorates for a broad number of reasons such as materials, thickness, base course, construction quality, design, loading, drainage, weather, and maintenance levels. This deterioration is exhibited through a variety of surface distresses. The Village's RCA included recording both the severity and density of each distress type observed. **Table 1** lists each distress type and provides a description of each severity level.

Table 1: Pavement Distress Rating System – Severity Levels

Pavement Distress Rating System – Severity Levels			
Distress Type	**Low Severity**	**Moderate Severity**	**High Severity**
Longitudinal Wheel Path Cracking (LWP)	Single cracks with no spalling; mean unsealed crack width < 5mm	Single or multiple cracks; moderate spalling; mean unsealed crack width 5-20mm	Single or multiple cracks; severe spalling; mean unsealed crack width >20mm; alligator
Longitudinal Joint Cracking (LJC)	Single cracks with no spalling; mean unsealed crack width < 5mm	Single or multiple cracks; moderate spalling; mean unsealed crack width 5-20mm	Single or multiple cracks; severe spalling; mean unsealed crack width >20mm; alligator
Pavement Edge Cracking (PEC)	Single cracks with no spalling; mean unsealed crack width < 5mm	Single or multiple cracks; moderate spalling; mean unsealed crack width 5-20mm	Single or multiple cracks; severe spalling; mean unsealed crack width >20mm; alligator
Transverse Cracking (TC)	Single cracks with no spalling; mean unsealed crack width < 5mm	Single or multiple cracks; moderate spalling; mean unsealed crack width 5-20mm	Single or multiple cracks; severe spalling; mean unsealed crack width >20mm; alligator
Meandering Longitudinal Cracking (MLC)	Single cracks with no spalling; mean unsealed crack width < 5mm	Single or multiple cracks; moderate spalling; mean unsealed crack width 5-20mm	Single or multiple cracks; severe spalling; mean unsealed crack width >20mm; alligator
Alligator Cracking (AC)	Not rated	Interconnected cracks forming a complete block pattern; slight spalling and no pumping	Interconnected cracks forming a complete block pattern, moderate to severe spalling, pieces may move and pumping may exist
Rutting (RUT)	Less than 10mm	10 to 20mm	Greater than 20mm
Shoving (SHV)	Barely noticeable to noticeable	Rough ride	Very rough ride
Distortion (DST)	Not rated	Noticeable swaying motion; good car control	Fair to Poor car control
Bleeding (BLD)	Not rated	Distinctive appearance with free excess asphalt	Free asphalt gives pavement surface a wet look; tire marks are evident
Potholes (POT)	Less than 25mm deep and greater than 175cm2 in area. (~15cm Ø)	25 to 50mm deep and greater than 175cm2 in area. (~15cm Ø)	Greater than 50mm deep and greater than 175cm2 in area. (~15cm Ø)
Ravelling (RAV)	Not rated	Aggregate and/or binder worn away; surface texture rough and pitted; loose particles exist	Aggregate and/or binder worn away; surface texture is very rough and pitted

Source: MOTI Pavement Surface Condition Rating Manual – Forth Edition

Table 2 describes the density rating for each distress type.

Table 2: Pavement Distress Rating System – Density Levels

Pavement Distress Rating System – Density Levels							
Distress Type	Units	None	Few	Intermittent	Frequent	Extensive	Throughout
Longitudinal Wheel Path Cracking (LWP)	Length	0%	< 10%	10-20%	20-50%	50-80%	80-100%
Longitudinal Joint Cracking (LJC)	Length	0%	< 10%	10-20%	20-50%	50-80%	80-100%
Pavement Edge Cracking (PEC)	Length	0%	< 10%	10-20%	20-50%	50-80%	80-100%
Transverse Cracking (TC)	Number	0	1-2	3-4	5-7	8-10	>10
Meandering Longitudinal Cracking (MLC)	Length	0%	< 10%	10-20%	20-50%	50-80%	80-100%
Alligator Cracking (AC)	Area	0%	< 10%	10-20%	20-50%	50-80%	80-100%
Rutting (RUT)	Length	0%	< 10%	10-20%	20-50%	50-80%	80-100%
Shoving (SHV)	Length	0%	< 10%	10-20%	20-50%	50-80%	80-100%
Distortion (DST)	Length	0%	< 10%	10-20%	20-50%	50-80%	80-100%
Bleeding (BLD)	Length	0%	< 10%	10-20%	20-50%	50-80%	80-100%
Potholes (POT)	Number	0	1-2	3-4	5-6	7-9	>10
Ravelling (RAV)	Length	0%	< 10%	10-20%	20-50%	50-80%	80-100%

Source: MOTI Pavement Surface Condition Rating Manual – Forth Edition

Table 3 on the next page provides a photo and description of each of the above road surface distresses. The photos are of Belcarra roads and the description and cause of the distress are from the MOTI Pavement Surface Condition Rating Manual – Forth Edition.

Table 3: Road Surface Distresses & Descriptions

DISTRESS	IMAGE	CAUSE
Longitudinal Wheel Path Cracking (LWP)		Cracks which follow a course predominantly parallel to the pavement centre line and are located at or near the centre of the wheel path. LWP cracking indicate fatigue failure from heavy vehicle loads. Cracks within one foot of the edge are caused by insufficient shoulder support, poor drainage, or frost action.
Longitudinal Joint Cracking (LJ)		Cracks running in the direction of traffic are longitudinal cracks. Centre line or lane cracks are caused by poor construction of longitudinal joint, frost action on adjacent lanes with variable granular depths.
Pavement Edge Cracking (PEC)		Cracks which occur parallel to and within 0.6 metres of the inside and/or outside of the fog line. Cracks may be crescent shaped cracks or other fairly consistent cracks which intersect the pavement edge. Possible causes include: Frost action, inadequate pavement structural support at the pavement edge and/or excessive traffic loading, poor drainage at the pavement edge and shoulder, inadequate pavement width forces traffic too close to the pavement edge.

DISTRESS	IMAGE	CAUSE
Transverse Cracking (TC)		Cracks that are predominantly perpendicular to the pavement centre line and extend fully or partially across the roadway. Possible causes include: surface shrinkage caused by low temperatures, temperature susceptibility of the asphalt cement binder in asphalt mixes, frost action, reflection cracks and hardening of the asphalt with aging
Meandering Longitudinal Cracking (MLJ)		Cracks which wander from edge to edge of the pavement or run parallel to the centre line, situated near the middle of the lane. MLJ cracks are usually single cracks, but secondary cracks can develop in areas where transverse thermal cracks also exist. Possible causes include: Frost action with greater heave at the pavement centre than at the edges. This is more prevalent in mixes where asphalt stripping is extensive. Faulty construction equipment can cause weak planes in the mix, which can fail from thermal shrinkage
Alligator Cracking (AC)		Cracks which form a network of multi-sided blocks resembling the skin of an alligator. Block size can range in size which indicates the depth of failure taking place. The pattern of cracking is usually longitudinal, originating in the wheel paths, but can occur transversely due to frost heaves or settlement and also along the centre line on narrow two-lane roads.

DISTRESS	IMAGE	CAUSE
		Possible causes include: areas subjected to repeated traffic loadings. Insufficient bearing support due to poor quality base materials or saturated base with poor drainage, stiff or brittle asphalt mixes at cold temperatures.
Rutting (RUT)		Longitudinal depressions left in the wheel paths after repeated loadings, combined with sideways shoving of the pavement material. Possible causes include: Poorly compacted structural layers, Heavy loadings of saturated unstable granular bases/sub-bases during spring thaw periods, unstable asphalt mixes due to high temperature or low binder viscosity, inadequate lateral support from unstable shoulder materials, permanent deformation of an overstressed subgrade
Shoving (SHV)	None observed in Belcarra	Longitudinal displacement of a localized area of the pavement surface generally caused by braking or accelerating vehicles and usually located on hills, curves or intersections. Possible causes include: Heavy traffic on steep downgrades or upgrades, low stability asphalt mix, lack of bond in asphalt surface and underlying layer, unstable granular base.

DISTRESS	IMAGE	CAUSE
Distortion (DST)		Any deviation of the pavement surface from its original shape other than that described for shoving and rutting. Generally, distortions result from settlement, slope failure, volume changes due to moisture changes and to frost heaving, and from residual effects of frost heaving accumulating after each season. Possible causes include: Differential frost heaves in poorly drained cuts, transitions and at pavement edges or centre. reverse differential frost heave at culverts, differential settlement of subgrade or base materials, lack of subgrade support, embankment slope failure.
Bleeding (BLD)	None observed in Belcarra	Excess bituminous binder on the pavement surface can create a shiny, glass-like, reflective surface that may be tacky to the touch. Bleeding quite often occurs in the wheel paths. Possible causes include: Mix design deficiencies where too high an asphalt content relative to voids results in excess asphalt forced to the surface by traffic, especially on hot days, paving over surfaces with severe bleeding or the application of a heavy prime or tack coat under a new pavement layer may result in excess primer bleeding through the pavement surface over a period of time, poor construction of surface seal coats.

DISTRESS	IMAGE	CAUSE
Potholes (POT)		Bowl-shaped holes of various sizes in the pavement surface. Possible causes include: Thin spot in the asphalt layer, localized drainage problems such as water infiltration through poorly bonded pavement structural layers or segregated spots in the asphalt mix where coarse patches allow intrusion of water, asphalt mix design deficiencies.
Ravelling (RAV)		The progressive loss of the pavement material from the surface downward, leaving a rough surface, vulnerable to weather deterioration. Possible causes include: poor adhesion of aggregates due to insufficient asphalt content, clay-coated aggregate, use of wet aggregates or stripping due to water action, fracture of aggregate particles by heavy loads or natural causes, the unbound particles are then removed by traffic, reducing the depth of the asphalt, poor compaction permits infiltration of water and salts which promote asphalt stripping, segregated mix placed during construction, aging and weathering.
Tree Roots	None observed in Belcarra	Surface failures caused by tree roots. Caused by tree roots growing between road base and asphalt surface. The force from the tree roots causes the localized swelling and cracking of the road surface.

DISTRESS	IMAGE	CAUSE
Trench Joint		Trench joint cracking occurs where there has been recent disturbance of the road surface and road base for the installation of infrastructure or for other purposes. If the fill material is not fully compacted or if compaction does not match the original material, it can cause cracking at the joint or surrounding area near the trench cut. Cracking is often at the edges for the original surface to crack and fail.

Photos of Village of Belcarra roads taken by Urban Systems – July 2017

Source: MOTI Pavement Surface Condition Rating Manual – Forth Edition

Crack Sealing and Patches

In addition to the surface distresses noted above, the condition of crack sealing and patches were reviewed. The crack sealing and patch conditions were recorded as Level 1-3 described below:

Crack Sealing Condition:

- Level 1 - < 30% of cracks are sealed
- Level 2 - 30% to 60% of cracks are sealed
- Level 3 - > 60% of cracks are sealed

Patch Condition:

- Level 1 - Few small localized patches
- Level 2 - Several larger patches
- Level 3- Full lane patching

For patch condition a condition rating was also added to take stock of the condition of the patches.

- 1 = Poor; patch ineffective and should be repaired as soon as possible
- 2 = Fair; some patch defects, repair if funding available
- 3 = Good; patch in good condition, no repair required

Level 2 Patch - In poor condition

Inadequate crack sealing

Figure 4: Examples of the Condition of Patching and Crack Sealing

Base Failure

As part of the assessment, roads that appeared to show signs of base failure were flagged for further review. Since the RCA was a visual assessment of the road surface and associated road corridor components, we could not definitively determine if the roads have an adequate road base, the base condition or extent of any base failure. We recommend that the Village have a geotechnical assessment done in key locations to better understand the condition of the road structure prior to overlaying or reconstructing the roads.

Drainage

Drainage is a very important factor to help ensure the integrity and longevity of the Village's roads. If water can penetrate the road structure it will weaken and fail prematurely. Any water needs to be kept below the road structure with the use of open ditches, culverts or other drainage infrastructure. Please note that and evaluation of the Village's ditches and drainage infrastructure was not included as part of our scope since this work will be carried out by another engineering firm as part of the Village's stormwater planning. It is recommended that the Village request that they consider how the current drainage deficiencies will affect the lifespan of the Village's roads. Once this stormwater planning is complete, the results can be used to further refine the Village's Asset Management Program. For reference, below is the drainage condition assessment guideline from the MOTI Pavement Surface Condition Rating Manual.

Table 4: Road Corridor - Drainage Condition

ACCEPTABLE
• Cross section and drainage are fully adequate. • Concealed underground storm drains in good repair. • Open ditching with no free-standing water and no silt bottom layer or obstructed culverts, etc. • Open ditching with free-standing water or bull rushes in the ditch and the fill height is greater than 1.5 metres.
BORDERLINE
• If the ditch grade line, cross-section elements and/or culvert and/or ditch capacity are somewhat below the standard that would be provided if the road and ditches were rebuilt. • Roads with acceptable design characteristics, but poorly maintained ditching, requiring work to be brought up to an acceptable level. Work required should generally fall into a category that could be completed by gradual cleaning of ditches, grading of shoulder areas and minor culvert repair.
UNACCEPTABLE
• Free-standing water in ditches, grass and other debris, requiring more than minor work to be brought up to an acceptable standard; granular washout of shoulder areas, etc. • Conditions could impede safe traffic movement. • Areas with lack of grade could possibly flood. • Catch basins are in a very poor state of repair with obvious pavement deterioration and free-standing water. • Water channels onto driven portion of road. • Road drains onto adjacent occupied properties

Source: MOTI Pavement Surface Condition Rating Manual – Forth Edition

Curb, Road-Side Barriers, Retaining Walls and Bus Stops

Included in our assessment was and inventory and general condition assessment of the Village's curb, road-side barriers, retaining walls and bus stops. For each of these components, we recorded their location, material, condition and any notable deficiencies.

The general condition rating was completed using the following scale:

- 0 = Not Inspected;
- 1 = Poor; severe defects, should repair immediately;
- 2 = Fair; some defects, monitor for future repair, repair now if funding available;
- 3 = Good; some minor defects, monitor for future repair; and
- 4 = Excellent; no substantial defect, no repair required.

Specific issues that were found during the road assessment were recorded to provide further detail about the distresses, hazards, potential causes and recommended works to sustain, or rehabilitate these assets.

Reporting Template

During the field inspections, a road inspection database was populated. Each road was also videoed with a high definition camera and distresses found were photographed. The photos and videos are organized by road segment for further reference. The database of the field inspections was compiled in GIS format but provided in MS Excel for ease of reference. This table is attached to this report. The found deficiencies inform an overall rating of the severity for each road segment.

All the collected GIS information, photos and videos are provided along with this report for future reference.

Assessment Findings

ROAD SURFACE

Although there are high severity deficiencies and roads needing attention, it should be noted that many of the road surface distresses can be addressed within a road maintenance program. As an initial overview, roads with high severity and high density are likely candidates for reconstruction whereas roads with high severity but lower density are in many cases, candidates for spot repair and priority patching. The severity of distress observed during the RCA is summarized by length in **Table 5**.

Table 5: Surface Distress Overview

Distresses Severity	Severity Score	Length (m)	Percentage
High	> 1000	747	8.9%
Moderate to High	> 200 & < 1000	628	7.5%
Moderate	> 101 & < 200	671	8%
Low to Moderate	> 10 & < 100	1179	14%
Low	< 11	5187	61.6%

A severity score was assigned to each road as a way of summarizing the number and severity of the distresses. The score applies a weighting factor to those distresses that are most severe. The score is simply used to help highlight candidate roads but then the actual field inspection reports were considered in more detail to help recommend maintenance, repair and reconstruction works.

Please note that the severity colour coding matches Map 2 – Distress Severity Ranking in **Appendix A**.

We do not recommend the approach of only investing in full reconstruction works first as it would defer maintenance works such as crack sealing and patching, shoulder as well as pothole repair. It would also delay investment in the overlay of some roads that would benefit from rehabilitation prior to major base failure occurring.

CRACK SEALING AND MINOR PATCHING

Surface cracking in the road surface allows water to penetrate and weaken the road structure. Once the road structure is weakened, the deterioration of the road surface increases. To prevent water from entering the road structure it is recommended that the Village use a portion of the annual roads budget to establish a crack sealing and minor patching program. In addition, as highlighted in the EXP Geotechnical Advice and Comments – Proposed Overlay of Bedwell Bay Road Report, it is good practice to fill existing cracks in the pavement before overlaying to help seal off moisture and retard reflective cracking.

We recommend an increased focus on crack sealing and patching until the Village has addressed most of the high and moderate severity cracking. Crack sealing should include the trench joint edges along the new and old asphalt from the recent water system installation.

In addition to the conventional linear crack sealing, SealTec and likely other contractors, can use spray patching for areas with alligator cracking, pothole repair and other applications. Spray patching may be an cost saving measure worth considering as a means to defer more expensive rehabilitation efforts. To determine the costs for the Village's crack sealing we contacted SealTec Industries and were provided the following costs:

Table 6: Cost Information Provided by SealTec Industries

Spray Patching	DESCRIPTION	UNIT	SealTec Costs
Cost per Litre	based on 5000 litres or more project	litre	$8.80
Cost per square metre		Sq.m.	$12.36
Cost per lineal meter		l.m.	$5.06
Cost per hour		hr	$440.00
Traffic control		hr	$150.00
Crack Sealing	**DESCRIPTION**	**UNIT**	**SealTec Costs**
Hot applied sealant (per MMCD)	Based on 10,000m or more project	l.m.	$1.55

Based on the above costs and the approximate extent of surface cracking and trench patches, we recommend the Village establish a budget allowance for crack sealing and spray patching. The Village should also include an allowance for patching of base failures that arise prior to reconstruction or resurfacing as well as repair of some existing trench patches.

Table 7: Crack Sealing and Minor Patching

Method	Quantity	Unit	Unit Cost	Totals
Spray patching for alligator cracks & potholes	2650	Sq.m.	$12.36	$32,755
Crack Sealing Program	4	days	5,000	$20,000
Total				**$52,755**

Please note that SealTec's costs are based on a minimum call out is $3500 plus $150/hour for traffic control. At this rate it is recommended that the Village allocate $10,000/year for the next couple of years to address the pavement cracking and alligator cracking in areas not scheduled for reclamation or reconstruction. The goal is to slow the deterioration of the existing roads. Future crack sealing can be completed as necessary. In the priority capital planning we have included $50,000 for crack sealing and spray patching.

BASE FAILURE

During the RCA, roads that appeared to show signs of base failure were flagged for further review. Map 4 – Road Surface with Distresses Indicating Potential Base Failure in Appendix A shows the result of the RCA and the roads with distresses indicating potential base failure. The distresses noted include:

- Moderate to severe longitudinal wheel path cracking;
- Moderate to severe pavement edge cracking with distortion;
- Roads with moderate to high severity rutting and distortion; and
- Alligator cracking.

Table 8: Roads with Potential Base Failure

Distress Severity	Length (m)	Percentage
Significant Base Repair Suspected	1,169m	13.9%
Moderate Base Repair Suspected	1,032m	12.2%
Spot Base Repair Suspected	289m	3.4%
Roads to monitor for base movement	668m	8%
Roads without base failure indications	5,255m	62.5%

We recommend the Village undertake the following to better understand the existence and condition of the road base prior to undertaking significant roadwork projects:

- Obtain photos and any geotechnical reporting from the recent water system construction to see if they show the structure of the road as an indication of depth of road base.
- Have a geotechnical assessment done (core testing or other load testing) along roads with high density distresses indicating potential base failure. The testing should be focused to the roads that are due for rehabilitation over the next 1-5 years. This testing will help determine the existence, condition and structural integrity of the existing road base as well as the condition of the existing asphalt material. This testing will help inform which rehabilitation method will be more appropriate including mill and overlay with base repair, reclamation or if full reconstruction is necessary. This testing will provide the Village with greater confidence that the best result with be achieved for the money spent. To have this testing done, we recommend the Village allocate up to $25,000 to cover the cost of this geotechnical assessment.
- If the road base is near adequate, the Village may be able to have the road reclaimed (pulverized). Reclaiming includes pulverizing the existing road surface and mixing with additional crushed gravel and magnesium chloride forming a strengthened road base. The road is then graded and repaved. If reclaiming is determined to be appropriate, it could be a significant cost savings and enable the Village to extend their roads program within the existing annual budget.

ROAD SHOULDER CONDITION

The road shoulder maintains the structural integrity of the road by preventing the asphalt from cracking and falling apart at the sides. A shoulder also makes the road way safer for cyclists, pedestrians, vehicles and drivers by maintaining a proper slope beside the road, thus decreasing the drop-off. With some of the narrow roads in Belcarra, the road shoulder often receives direct vehicle traffic which increases the amount of deterioration. If the shoulders are not maintained, they can quickly erode with surface water and vehicle traffic.

Pavement edge cracking was one of the main road deficiencies found during the field assessment which is directly tied to the integrity of the road shoulder and road base. As part of the assessment of the road surface, we made note of shoulder deterioration and deficiencies that the Village should consider addressing to prevent further deterioration and reduce potential safety concerns.

The below photos show examples of shoulder deterioration found during our assessment:

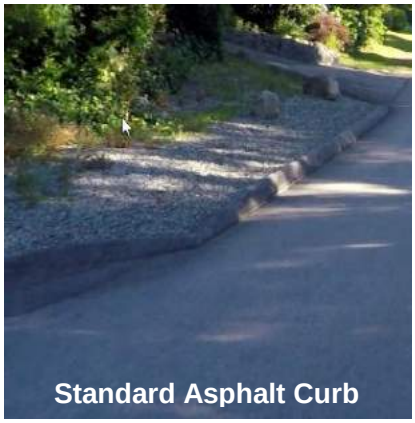
We recommend the Village ensure shouldering is included when the roads are rebuilt or resurfaced and establish and shouldering budget to address the current deficiencies and others that appear from one year to the next. This work may be able to be completed by Village staff or hired out to a local contractor with shouldering equipment that includes compaction.

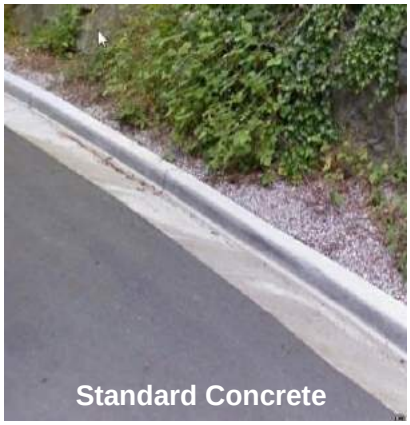


CURB CONDITION

The Village of Belcarra currently has three different types of curb. These include short 50mm asphalt curb, standard 150mm asphalt curb and standard 150mm concrete curb and gutter. Please note that most of the 150mm asphalt and concrete curb appear to be quite new and in good condition. Below are photos of each curb type in Belcarra.


Low Height Asphalt


Standard Asphalt Curb


Standard Concrete

During the field review it was found that most of the Village's 50mm short curb is in fair to good condition. There are however, curb that have some notable deficiencies and that show some signs of deterioration. Most of the deficiencies appear to be caused by heavy vehicle traffic along tight corners and recent construction activities where the curb has been disturbed. The deterioration appears to be caused by grading during snow removal and wear from vehicles coming in contact with the curb.

Table 9: Curb Condition

Condition	Length (m)	Percentage
Poor	0	0%
Fair	617	20%
Good	1996	65%
Excellent	456	15%

Map 6 in Appendix A shows an inventory of the Village's curb.

For the Village's curb assets, we recommend the following:

- Undertake spot repairs to address curb damage from excessive vehicle impact, tight corners and residential construction;
- Replace existing curb as part of road resurfacing and rehabilitation projects;
- Add curb where necessary to direct surface water and prevent shoulder and property damage; and
- Continue to have curbing a consideration as part of the road rehabilitation program.

We provide the curb costs in the following table for reference.

Table 10: Curb Cost

Rehabilitation	Unit	Cost
50mm Asphalt Curb	m	$25
150mm Asphalt Curb	m	$40
Concrete Curb and Gutter	m	$120

CONDITION OF EXISTING ROAD-SIDE BARRIERS

The Village has three main types of road side barriers in use. These include low concrete, standard concrete and metal W-beam road-side barriers. Below are photos of each type of road-side barrier used in Belcarra.


Low Barrier


Roadside Barrier


W-Beam Metal Barrier

During the field review, it was found that most of the Village's concrete road-side barriers are in fair to good condition with only mild corrosion, spalling and chipping. All of the W-beam road-side barriers are new in the past few years and they are in excellent condition.

Although the actual concrete barriers are in fair to good condition, there are some barriers which are currently leaning or partially buried and need to be re-seated. Re-seating the barriers requires the barrier to be removed or temporarily relocated, the road edge or shoulder regraded and compacted and the barrier put back into place.

If the Village decides to replace existing barriers or install new barriers, they can anticipate the following costs:

Table 11: Road-side Barrier Costs

Rehabilitation	Unit	Cost
Concrete Low Barrier	m	$75
Concrete Roadside Barrier	m	$100
W-Beam Barrier	m	$300

CONDITION OF RETAINING WALLS

As part of the RCA, we inventoried the retaining walls owned by the Village. Please note that we did not inventory or comment on the condition of private retaining walls. As part of the inventory, we recorded the material type, length, approximate height (above ground), the overall condition and notable deficiencies.

There are two main types of retaining walls in use that include gabion retaining walls and lock block retaining walls. There is also a stretch of road side barrier which is currently acting as a retaining wall along Marine Drive.

Below are photos of each type of retaining wall used in Belcarra.


Gabion Wall


Lock Block Wall


Roadside Barrier Wall

The only notable deficiencies found are on the two gabion retaining walls. The walls are at the intersection of Bedwell Bay Road and Main Avenue and the other retaining wall is at Bedwell Bay Road and Kelly Road. Both walls show signs of wire deterioration and bulging. Village staff have been maintaining the wall at Bedwell Bay Road and Main Avenue by adding wire and reseating the fill rock to keep it in place. The north-west lane of Bedwell Bay Road is built on top of the gabion wall at Bedwell Bay Road and Kelly Road and therefore this wall would have the highest impact if the wall was to further deteriorate or fail. It is our recommendation that both walls be assessed by a qualified Geotechnical Engineer to determine if there are any concern with these walls, provide recommended actions, timing and cost if any work should be considered in the next 5-10 years.


Bedwell Bay Road and Main

Wall Bulging & Wire Repair


Bedwell Bay & Kelly

Wall Bulging

CONDITION OF BUS STOPS AND SHELTERS

As part of the RCA, we inventoried the bus stops and shelters within the Village. As part of the inventory, we recorded if the bus stop is a sign only or includes a shelter structure, the overall condition and notable deficiencies. The shelters typically have a small concrete pad, painted metal frames with painted wood bench, side panels and roof structure.

Below are photos of typical bus stops and shelters used in Belcarra.


Bus Stop with Shelter


Bus Stop – Sign Only


Deficiencies

The only notable bus stop deficiencies found during our field assessment is that a few of the shelters have a few rotting side panel and roof structure boards and the paint on the metal frame and bench is chipping and pealing. It is recommended that Village staff replace the rotting boards, sand and re-paint the frame, bench and side panels within the next year or two to prevent further deterioration. Both deficiencies should be easy addressed within the Village's regular maintenance program.

SAFETY CONCERNS

As part of the field assessment, we looked to identify specific risks, hazards and pedestrian safety concerns. This assessment includes noting potential for vehicle damage or loss of control while driving as well as cycling safety. Prior to starting the field assessment, we consulted the Village Public Works staff to get their insight and identify any safety issues they were already aware of.

There were a few safety concerns that are identified during the field assessment. The deficiencies that were of concern included:

- Potholes, road edge, corner failures and shoulder drop-offs;
- Catch basin failure;
- Steep slopes with no roadside barriers;

- A power pole within paved road surface;
- Blind corner;
- Private stair case that starts at road edge; and
- Cross-walk signage.

Figure 9: Safety Concerns Found During the RCA

Potholes, road edge, corner failures and shoulder drop-offs:

These deficiencies are a concern as they can cause drivers or cyclists to lose control of their vehicle or bicycle and cause damage. It is recommended that the Village address these deficiencies as soon as possible. Village staff could quickly eliminate the shoulder and corner drop-off issues by adding gravel and compacting the road shoulder or have a contractor come

fill and compact these areas. Adding gravel may be a fix until asphalt repair work can be scheduled to deal with failed road edge.

Catch basin failure:

There was a single catch basin drain that was found near the intersection of Marine Drive and Young Road that is significantly rusted and corroded. The grate of the catch basin is caving in and is a safety hazard for vehicles, cyclists, kids and animals. The catch basin is currently marked with a traffic delineator. It is recommended that this catch basin either be replaced or filled and capped if it is not needed at that location.

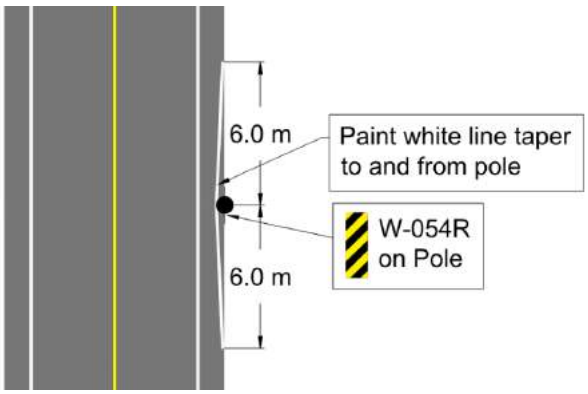
Steep slopes with no roadside barriers:

Due to the steep side slopes in Belcarra, there are several locations where roadside barriers could be added to improve safety. Particular locations to note are on Bedwell Bay Road between Main and the Village office on the steep slope section on the north-west side of the road. The below map shows the road sections where roadside barrier should be considered. In areas with steep slopes just off the road shoulder, it is recommended that Village consider W-beam roadside barrier since it can be installed without significant disturbance to the road edge or the steep slope.

A power pole within paved road surface:

In the newly paved section of Bedwell Bay Road, the contractor paved around a power pole which creates a potential hazard for vehicles and cyclists. It is recommended that the pole be relocated off the road to ensure this hazard is eliminated.

Currently there is a reflective sign on the pole but until the pole is relocated, the Village may wish to add additional paint lines to guide motorists and cyclists around the pole. Below is a graphic showing a potential layout of the barrier at this pole. The Village may wish to add additional signage in advance of this hazard. To fully scope out a solution, the Village could draw upon the services of the Municipal Insurance Association of BC (MIABC) risk management team.



Blind corner:

At Coombe Lane there is a blind corner that the Village may wish to address in the future. This is a pre-existing hazard and likely residents are used to this corner. There is signage but there is very limited visibility for vehicles, pedestrians and cyclists. The Village may want to eventually straighten this s-turn section of road and address the blind corner at the same time.

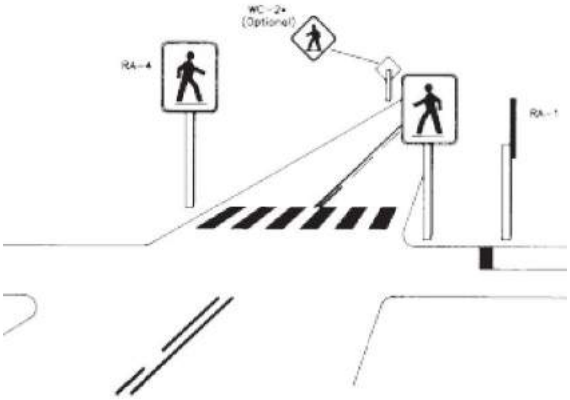
Private stair case that starts at road edge:

On Marine Drive there is a private stair case leading to a dock that starts right at the road edge. The first stair tread starts at the edge of the road. Although there is a railing that starts on the top of the stairs, it is recommended to add reflective signage to both sides of the stair handrail to ensure motorists and cyclists to do hit the stair case.

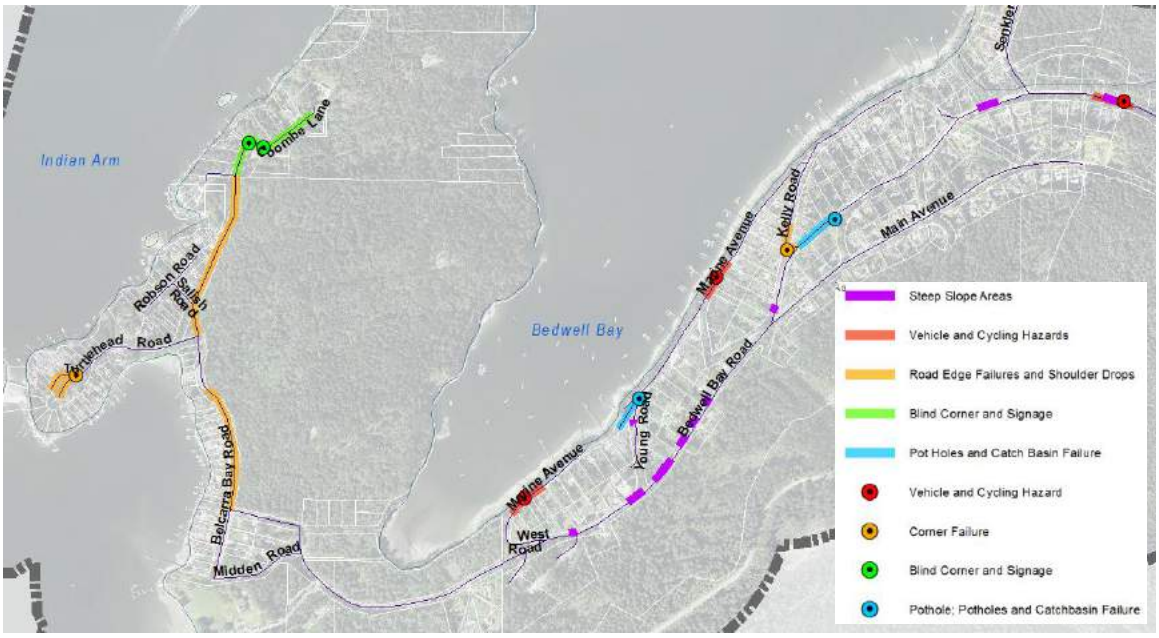
Cross-walk signage:

It was mentioned by Village staff that the current cross walk signage is yellow and not the standard white cross walk signage. In checking with the Ministry of Transportation and Infrastructure (MOTI) design guidelines for signage, it was confirmed that the standard cross walk signage is white and a yellow diamond shaped signage is typically used as an approach warning. Approach signage is optional but if installed should be mounted 65m before the cross walk given a 50km/h speed limit.

For the low cost of switching the signage to the white version, it is likely worth the cost and effort to reduce potential liability for the Village. To confirm the need to switch out the signage, the Village could draw upon the services of the Municipal Insurance Association of BC (MIABC) risk management team.



The map below shows the location of the safety concerns found during the field assessment.



Cost Estimates for Prioritized Roads

For this project, Urban Systems has provided Class C cost estimates for the identified roads that can be addressed over the next ten years. Capital works have been identified as either fully reconstruct or mill and overlay roads depending on the severity and density of distresses and indications of potential base failure. Please note that it may be possible to do full depth reclamation (pulverizing) instead of the full reconstruction which would enable the Village to save costs and extend the roads program. From our experience full depth reclamation costs approximately half of the cost of full reconstruction (if a sufficient area of road undergoes reclamation to help offset the costs of mobilizing the reclamation equipment).

For the cost estimates, we have costed the roads with high distress severity as full reconstruction projects. It may be possible to use full depth reclamation or localized, large area base repairs but the approach is best determined by a Geotechnical Engineer with the use of core samples and other testing.

KEY PERSPECTIVES FOR SCHEDULING WORKS

The following perspectives were utilized to help establish priority road works that could be accommodated within the Village's budget.

Health and Safety Concerns

Road edge and shoulder repair should be a priority focusing first on the sections with health and safety concerns including damaged corners due to heavy truck activity from new construction, pavement edge and pot holes patching and building up shoulder drops. Addressing these issues will significantly reduce hazards to vehicles and cyclists and reduce the likelihood of accelerated deterioration at these locations.

The addition of road side barrier along Bedwell Bay Road and other noted locations will increase roadway safety.

The costs for these repairs are best determined by your Public Works staff but we have provided an allowance for this work in 2018.

Crack Sealing and Minor Patching

Crack sealing and patching on all roads that are not candidates for full depth reconstruction should be considered as higher priority. The investment in that maintenance work could help avoid or delay more extensive base failure. Crack sealing and minor patching works were therefore distributed over the first five years with further investments over the ten-year period

as new cracks occur. Cost per meter for crack sealing was provided by SealTec Industries and applied to the amount of surface cracking observed during the RCA.

Rehabilitation of Local and Collector Roads

Based on our visual assessment, approximately 55% of the Village's roads are in good condition and do not currently need any surface work besides crack sealing and monitoring for surface and base deterioration.

Approximately 14% of the roads in Belcarra are suspected of requiring significant base repair when they are to be addressed. It is recommended that a geotechnical assessment be completed for the identified areas with potential base failure to determine if full-depth reclamation should be used instead of a mill and overlay with localized base repair. The addition of consistent base structure should help extend the service life for these roads. Once this assessment has been completed, the costs and the Village's 5-year plan can be updated.

The remaining 31% of roads are candidates for crack sealing, patching and mill and overlay rehabilitation with some base repair to address localized base issues. Completing the road maintenance and surface repair works as soon as possible can help defer more expensive reconstruction work for some of the road segments.

Shoulder Repair and Maintenance

We have provided an allowance for shoulder repair that will enable the Village to address many of the issue found during the RCA. It is anticipated that this work will include the grading of built-up vegetation at the pavement edge as well as other shoulder rehabilitation.

The priorities for some of the shoulder road work may be influenced by the stormwater planning work, so it is recommended to align these priority projects once they have been identified.

Coordination with Other Infrastructure Works

The general priorities provided in this report may be impacted by other capital works in the community. We understand that the Village is pursuing adding the Bedwell Bay Road, Belcarra Bay Road and Midden Road to the Major Road Network (MRN) as it is an existing transit route. If it looks like this section of road will be added to the MRN, the Village may wish to defer the road works in this area so that MRN funding can be used to help fund the rehabilitation. In addition to this section of road, drainage improvements or other roadway improvements may change road priority timings.

PROPOSED CAPITAL WORKS

Priority road works were identified using the above considerations. The recommended road works can be seen on Map 2 – Recommended Road Surface Works 2018 – 2028. **Table 12** summarizes the costs associated with these priority road works.

Table 12: Priority Road Project Considerations

Road Rehabilitation	Costs
Geotechnical Assessment of Priority Roads	$25,000
Addition of priority roadside barrier	$130,000
Priority Road Shouldering	$9,000
Spot Repairs	$30,000
Crack Sealing and Minor Patching	$50,000
Mill & Overlay	$947,000
Reconstruction of Local and Collector Roads	$1,084,000
Total	$2,275,000

It is important to note that costs are provided in 2017 Canadian Dollars and construction works include 35% for survey, Geotechnical and Civil Engineering, tendering, contract administration and contingency. Costs should be adjusted for annual budgeting to reflect inflation.

At the time of this report, the Village provided a breakdown of how the capital and operating budget is currently allocated for roads and infrastructure. The current budget allocation is summarized in Table 13 below:

Table 13: Current Budget Allocation

Budget Category Description	Allocation
Annual Capital Budget – MRN (only for MRN)	$30,000
Annual Operating Budget – MRN (only for MRN) - includes snow removal budget of $4,500 and vegetation budget of $3,000; does NOT include portion of MRN funding that is used to cover S&B of Belcarra staff for work on MRN roads)	$33,300
Annual Capital Budget, non MRN	$124,000
Annual Operating Budget, non MRN roads (includes snow removal ($7,000) and vegetation budget ($7,000))	$23,200
Trails/Tennis Court	$7,000
Community Works Fund. Can be used towards most capital works (i.e. not just for roads but could be for water system or recycling/garbage system assets).	$53,000
Current Budget for Capital and Operations - Roads and Infrastructure	**$270,500**

Based on a $270,500 annual budget, the Village could make significant progress over the next 10 years and address most of the identified priority roadworks. This would require the Village to allocate the bulk of the budget to road works which is unlikely as compromises will still need to be made to optimize the roads program and align with other priority projects. This further emphasizes the need to stretch the useful life of the roads with crack sealing and patching as well as have a geotechnical engineer determine if less expensive renewal options can be used.

Map 3 – Recommended Road Surface Works 2018 - 2028 provides the recommended rehabilitation method over the next 10 years for each road based on the visual inspection.

For reference, we have provided Class C cost estimates for the roads identified to be addressed in the next five years. These cost estimates can be found in Appendix B.

Summary of Recommendations

This RCA data, photos and videos taken during the field work will provide critical information to inform the Village's roads capital program. This information will also be valuable when planning other infrastructure projects. Combining the transportation and other priority infrastructure works will ensure the Village makes best use of their capital funds.

The Village of Belcarra should consider the following short-term recommendations that will provide immediate benefits while also helping to enhance the Village's ongoing road maintenance program:

1. Review and become familiar with the data collected from the RCA. There was a lot of information collected that can be used to help inform the Village's capital program including establishing level of service and investment levels to sustain the Village's roads. Information can be used to information staff and Council decisions.
2. Address all health and safety concerns as soon as possible. If the pavement edge failures and shoulder drops are addressed, it will significantly eliminate the majority of the health and safety concerns;
3. Install guard rails at identified locations to reduce concern along Bedwell Bay Road and other key locations;
4. Undertake the shoulder repair and maintenance to help strengthen road edge in identified locations;
5. Undertake a crack sealing and minor patching program. That work will be critical to slow the deterioration of the Village's roads and may defer higher cost work;
6. Have a geotechnical review done for the roads to be rehabilitated over the next five years;
7. Use the RCA spreadsheet to assist in setting maintenance, rehabilitation and reconstruction priorities in conjunction with the priorities determined from the stormwater planning;
8. Continue to monitor, track progress and update the RCA each year, with a focus on roads that are experiencing changes in conditions; and
9. Re-establish curbs at identified locations that were affected by vehicle damage, tight corners and those affected by new construction.

VILLAGE OF BELCARRA

"Between Forest and Sea"

Corporate Strategic Plan 2016 – 2019/2020 Updated November 2017

Corporate Strategic Plan Purpose & Process

This Corporate Strategic Plan ("the Strategic Plan") is Council's leadership document for the Village.

The purpose of the Strategic Plan is to provide overall direction and set strategic priorities to focus the Village's limited resources to best support the achievement of a community, and the provision of services, desired by the citizens of Belcarra.

Although the Village is guided by various plans, the Strategic Plan fulfills a need to have a single plan that provides over-riding direction given the complexity of our operating environment and the ever-increasing demand on our limited resources. As such, the Strategic Plan is considered the "mother of all plans", and accordingly, all plans, activities and actions of the Village must be consistent with, and support the implementation of, the Strategic Plan.

The Strategic Plan articulates the purpose of the Village (Mission Statement), details Community and Corporate Values to be honored and used to guide all actions and decisions, sets out the longer-term direction of the Village (Vision and Goal Statements), and identifies and prioritizes a limited number of Strategic Objectives and supporting Strategies and Action Plans. The Strategic Objectives are the "core" of the Strategic Plan as they identify the areas of Village operations, identified by Council, to be the most important to focus on, in order to move the Village towards achievement of its longer-term Vision and Goals. Strategic Objectives are prioritized and limited in number in recognition of the Village's limited resources and existing legislative and operational requirements

The Mission, Vision, Values, Goals, Strategic Objectives and Strategies contained in the Strategic Plan will be revisited and either confirmed or amended by Council near the beginning of each new term of Council, augmented by annual review and adjustments as required prior to the coming years financial planning process. In response to Council's set Strategic Objectives and Strategies the Village's Management Team will develop two year supporting Action Plans that will identify the actions to be undertaken to support their achievement. The Action Plans will be approved by Council and included in the Strategic Plan. The Action Plans will be reviewed and updated as required, following quarterly Progress Reports to Council that identify actions and achievements to date and provide an opportunity to make timely changes thereto as approved by Council.

Village of Belcarra Mission

To enhance the quality of life for citizens, visitors and future generations in our municipality and the region. We strive to live in harmony with each other and our environment, while providing core municipal services.

Community Values

Belcarra is a proud and unique community.

Belcarra recognizes our municipality's natural west coast beauty as a source of pride worth protecting. We treasure tradition in our community comprised in its welcoming character and accessible allure.

Belcarra is a model municipal entity that works effectively to engage and respect the diverse interests of its citizens.

Belcarra celebrates the diverse and active engagement of its citizens and the significance of its volunteerism. Belcarra offers simple and basic neighbourhood opportunities to sustain and enrich our lives. We are actively involved in the social, environmental and political life of the region.

Belcarra is a clean, green, semi-rural and sustainable municipality.

We recognize the importance of the natural beauty surrounding Belcarra and integrate environmental stewardship into our daily activities. We respect, preserve and enhance the health of the environment for present and future generations.

Corporate Values

The Village of Belcarra supports community engagement and advocates accessible and transparent local government administration.

We utilize clear, consistent and transparent decision-making processes, offering opportunities for input and guidance; embracing change while respecting tradition.

The Village of Belcarra fosters civic stability and security.

Our semi-rural setting provides a distinct perspective within the regional district, and the municipality seeks to represent the interests of those in similar environments while supporting economic, social and community consistency and sustainability. In endeavoring to preserve health and safety, we consider the needs and well being of the community, our operations and our physical environment.

The Village of Belcarra promotes wellness and progression in the workplace.

We embrace principles which facilitate staff empowerment, development and succession opportunities, while striking a balance between home and work life.

Village of Belcarra Vision & Goals

We are committed to achieving social, environmental and economic sustainability. Given the value of our community's heritage and its diversification, we will harness **a balance between consistency and progression** – **enhancing the livability, health, safety and civic pride** for future generations of Belcarra.

Community Sustainability:

Goal 1 Individuals and groups have a collective sense of belonging and contributing to the municipality, and the municipality's social, political, economic and cultural life.

Goal 2 Volunteerism is an integral component of community sustainability and is encouraged.

Goal 3 Individuals have access to the natural amenities of the area and feel safe and secure in doing so.

Environmental Sustainability

Goal 1 Awareness of environmental impacts results in active public participation in environmental improvements.

Goal 2 Human activities and consumption are balanced with the environment's ability to absorb emissions and impacts.

Goal 3 The health of residents is protected from environmental risks.

Governance:

Goal 1 We are a model of open, accessible, democratic decision-making processes. We encourage and embrace dialogue encouraging residents to contribute their ideas, opinions, and energy to the well being of the municipality.

Goal 2 The municipality has appropriate legislative authority, financial tools and organizational structures and processes to undertake its responsibilities and achieve goals that support and enhance the municipality's quality of life within its financial capacity.

Goal 3 Core Public services are appropriate for community needs, of high quality, well-coordinated and easy to access.

Goal 4 The Village of Belcarra actively engages with other orders of government particularly regarding issues affecting the municipality.

Economic Sustainability:

Goal 1	The Village of Belcarra has the necessary social, budgetary and physical infrastructure to ensure sustainability as a municipality.
Goal 2	Long term financial planning with minimal debt financing, focused on maintaining and acquiring quality infrastructure.
Goal 3	Projects and initiatives are evaluated against sustainability.

Village of Belcarra Strategic Objectives/Priorities, Strategies and Action Plans

The following Strategic Objectives/Priorities identify topic areas and strategies and specific action plans where staffs limited discretionary time, beyond the day-to-day operational requirements, should be focused in order to best move the Village toward achievement of its' Vision. They are not intended to, nor do they, encompass everything that the Village does or all services. These Plans are prioritized with significant focus directed to the top one to four items.

Priority # 1 – Municipal Bylaws & Policies, Review/Update – 2018 FOCUS: ZONING BYLAW, HIGHWAY ENCROACHMENT BYLAW, PARKING BYLAW					
Objective	Strategy	2017 Plan	2017 Results	2018 Plan	2019/2020 Plan
Ensure key municipal bylaws and policies meet legislative and operational requirements	Identify, prioritize and review and update municipal Bylaws and policies	• Complete review and update of the Zoning Bylaw with the Zoning Advisory Committee and Planning Consultants - Prepare Draft and finalize with Council - Hold Public Hearing - Obtain Council approval	• Worked with Consultants and the Zoning Advisory Committee ("ZAC") to substantially complete Zoning Bylaw review and update	• Complete review and update of the Zoning Bylaw - Prepare Draft and finalize with Council - Hold Public Hearing - Obtain Council approval • Complete review and update of Highway Encroachment Bylaw & Agreements • Parking/MTI Bylaw review and update - Hire consultant - Update bylaw - Develop supporting policy/procedures	• Possible NEW options include: - MTI Bylaw - Tree Bylaw

Priority # 2 – Public Safety – Non Vehicle Travel – 2018 FOCUS: TRAIL & ROADWAY IMPROVEMENTS					
Objective	Strategy	2017 Plan	2017 Results	2018 Plan	2019 /2020 Plan
Improve non-vehicle (pedestrian, bike etc.): - Safety on roadways - Trails	Increase driver awareness Identify and implement new and improved signage and/or physical roadway changes/additions Identify and implement new and improved trail options	New and improved signage and/or physical roadway changes/additions • Establish budget for improvements Identify and implement new and improved trail options • Identify/Prioritize and complete possible improvements	• Improved / additional road signage • Bedwell Bay Road cat eyes installed • Roads Asset Management Plan identified, prioritized and set budgets for all roads safety issues • Obtained cost estimates for priority trail improvements • Completed - Upper Tatlow - Phase I Watson	Address prioritized road safety concerns identified in the 2017 Asset Management Plan • Complete priority trail works: - Middle Tatlow - Phase II Watson • Identify and apply for all possible grants to fund planned capital works in 2018	• *To be determined*

Priority # 3 – Transportation Infrastructure – 2018 FOCUS: REFINE & IMPLEMENT TRANSPORTATION CAPITAL PLAN					
Objective	Strategy	2017 Plan	2017 Results	2018 Plan	2019 /2020 Plan
Infrastructure meets current and future community needs	Develop infrastructure Long-Term Asset Management and Financial Plan(s) that identifies maintenance, and capital expenditure needs and supporting funding plan	• Complete Roads Long Term Plan	• Plan completed and reviewed with Council	• Refine plan via obtaining geotech report on priority road works and retaining walls • Develop prioritized 10 year funding plan • Address prioritized safety concerns identified in the 2017 Asset Management Plan • Implement recommended Crack Fill etc. maintenance programs detailed in the 2017 Asset Management Plan • Identify and apply for all possible grants to fund planned capital works in 2018	• *To be determined*

Priority # 4 – Recreation Infrastructure – 2018 FOCUS: TENNIS COURTS					
Objective	Strategy	2017 Plan	2017 Results	2018 Plan	2019 /2020 Plan
Infrastructure meets current and future community needs	Develop infrastructure Long-Term Asset Management and Financial Plan(s) that identifies maintenance, and capital expenditure needs and supporting funding plan	Conclude operational status review and update with Metro Parks	• Metro Vancouver Board approval for Tennis Court License (expected in October 2017) • Reviewed court condition and obtained quotes for needed repairs and updates	• Prioritize needed repairs and develop implementation and funding plan (phase works if reasonable)	• *To be determined*

Priority # 5 – Drainage Infrastructure – 2018 FOCUS: LONG TERM DRAINAGE CAPITAL PLAN					
Objective	Strategy	2017 Plan	2017 Results	2018 Plan	2019/2020 Plan
Drainage (and related) infrastructure meets community needs and provides protection from climate change related events	**Update/Identify risks and requirements (maintenance & capital) to address drainage needs**	• Phase I - Terms of Reference for Proposal (RFP) - draft in process with Consultant • Complete Drainage Study Phase I - Complete mapping and RFP - Issue and award RFP - Complete preliminary review of Study and identify next steps	• Phase I completed	• Draft and Issue RFP /w Consultant for Drainage Asset Mgmt Plan, to identify operating and capital needs /w focus on next 10 years • Apply for grant funding for Plan • Complete Drainage Long Term Plan • Consider and address any Bylaw changes	• *To be determined*

Priority # 6 – Emergency Preparedness – 2018 FOCUS: BASIC SUPPLIES UPDATE & ESTABLISH EMERGENCY PREPAREDNESS COMMUNITY GROUP					
Objective	Strategy	2017 Plan	2017 Results	2018 Plan	2019/2020 Plan
Ensure emergency plans and supplies are up to date and relevant in the event of an emergency	Identify and update the municipality's emergency supplies and review and update emergency plan	• Prepare inventory of current emergency supplies and replenish identified needs • Facilitate creation of Community Group to lead Emergency Preparedness efforts	• Not complete	• Prepare inventory of current emergency supplies and replenish identified needs • Facilitate creation of Community Group to lead Emergency Preparedness efforts	*To be determined* Options: • Hire consultant to lead and facilitate process to review and update emergency plan • Complete other key supporting plans: - Geotechnical Hazard Mapping - Wildfire Assessment

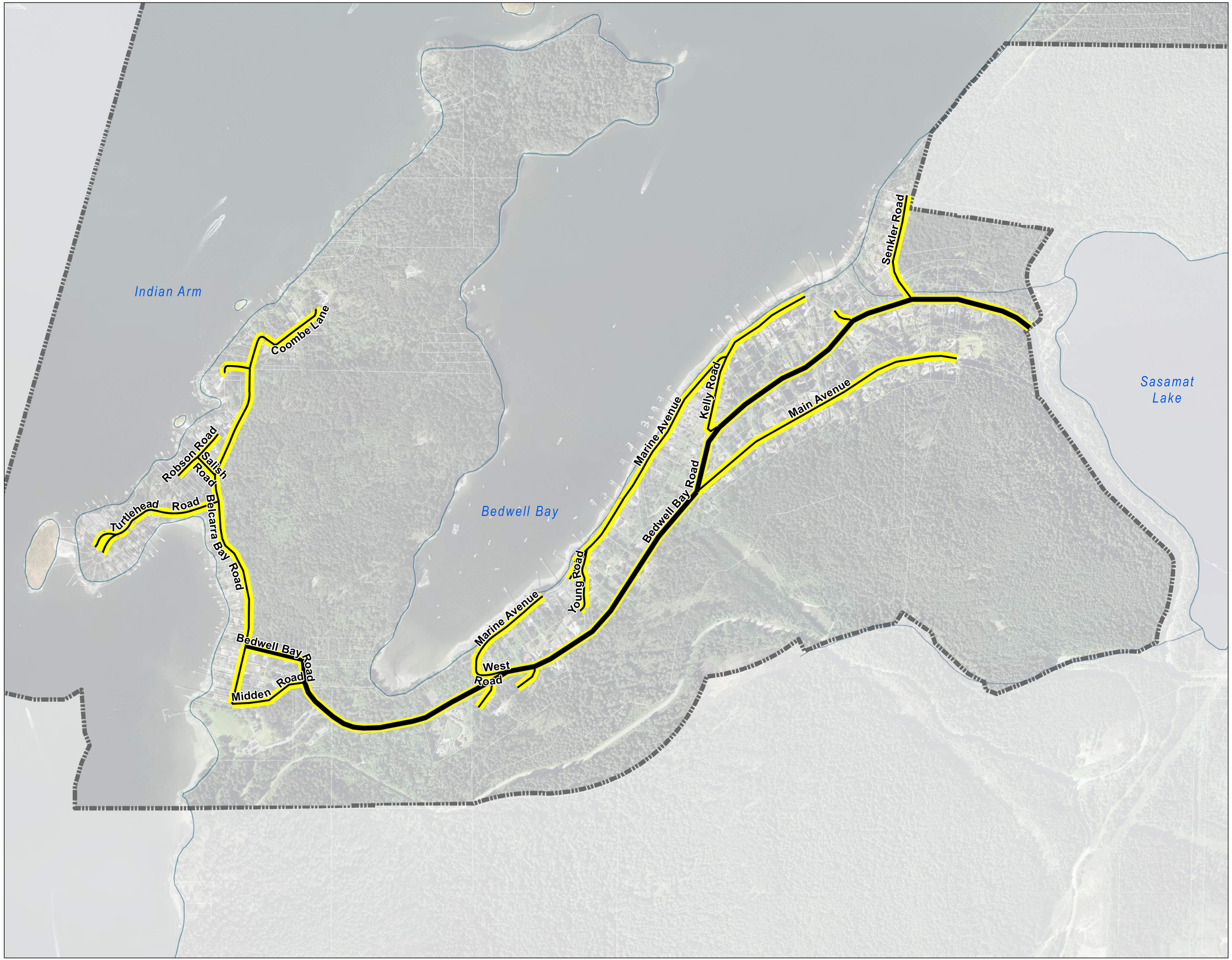
Priority # 7 – Water Infrastructure – 2018 FOCUS: WATER METERING & LONG TERM WATER SYSTEM PLAN					
Objective	Strategy	2017 Plan	2017 Results	2018 Plan	2019/2020 Plan
Infrastructure meets current and future community needs	Develop infrastructure Long-Term Asset Management and Financial Plan(s) that identifies maintenance, and capital expenditure needs and supporting funding plan			Using existing inventory data develop a high-level Asset Management Plan	• *To be determined*
Increase benefiter/user pay component of water fee and encourage water conservation	Consider implementing community water metering	• Complete update of meter information • Communicate status of Project to community	• Basic update complete and high-level review of costs vs. benefits complete • Complete	• Review 2018 Metro Vancouver study of water metering for region once complete • Update water metering business case	

Priority # 8 – Operational Efficiency – 2018 FOCUS: RECORDS MANAGEMENT					
Objective	Strategy	2017 Plan	2017 Results	2018 Plan	2019/2020 Plan
Support and enhance operational efficiency and ensure legislative requirements are met	Establish and implement policy and procedures with respect to the retention, storage and disposal of municipal records	• Identify Records Management needs and issues and develop a Plan to address, using contracted services • Begin implementation of Plan (initial focus is to develop a records retention and destruction policy)	Not completed	Complete initial project planning if time permits	• Identify Records Management needs and issues and develop a Plan to dress, using contracted services • Begin implementation of Plan (initial focus is to develop a records retention and destruction policy)

The following Strategic Objectives are high priorities of Council that are currently being addressed within Village operations. They are included in the Strategic Plan due to their high priority nature and the desire to continue to more closely monitor and prioritize their on-going delivery.

Vegetation Management		
Objective	Strategy	2016 – 2019/2020
Management and reduction of invasive plants within municipal boundaries.	Implement a phased approach for invasive plant control using contemporary management techniques and education outreach	• Continue to consult with Invasive Species Council of Metro Vancouver, and other relevant authorities, and implement annual recommendations for invasive plant removal and community education, within financial plan constraints

Recycling & Refuse		
Objective	Strategy	2016 – 2019/2020
Meet Metro Vancouver's Zero Waste Initiative	Research and implement actions to meet Metro Vancouver's requirements to remove from the waste stream and recycle organic waste	• Continue to monitor and fine-tune the Recycling & Refuse Deport and related community education.



BELCARRA

Road Assessment

Existing Road Classes & Roads Included in RCA

Legend

- Roads Included in Assessment
- Highway & Arterial Roads
- Collector - MRN
- Collector Roads
- Local/Strata Roads
- Local Roads
- Resource Roads

The accuracy & completeness of information shown on this drawing is not guaranteed. It will be the responsibility of the user of the information shown on this drawing to locate & establish the precise location of all existing information whether shown or not.

150 75 0 150 300
m

N

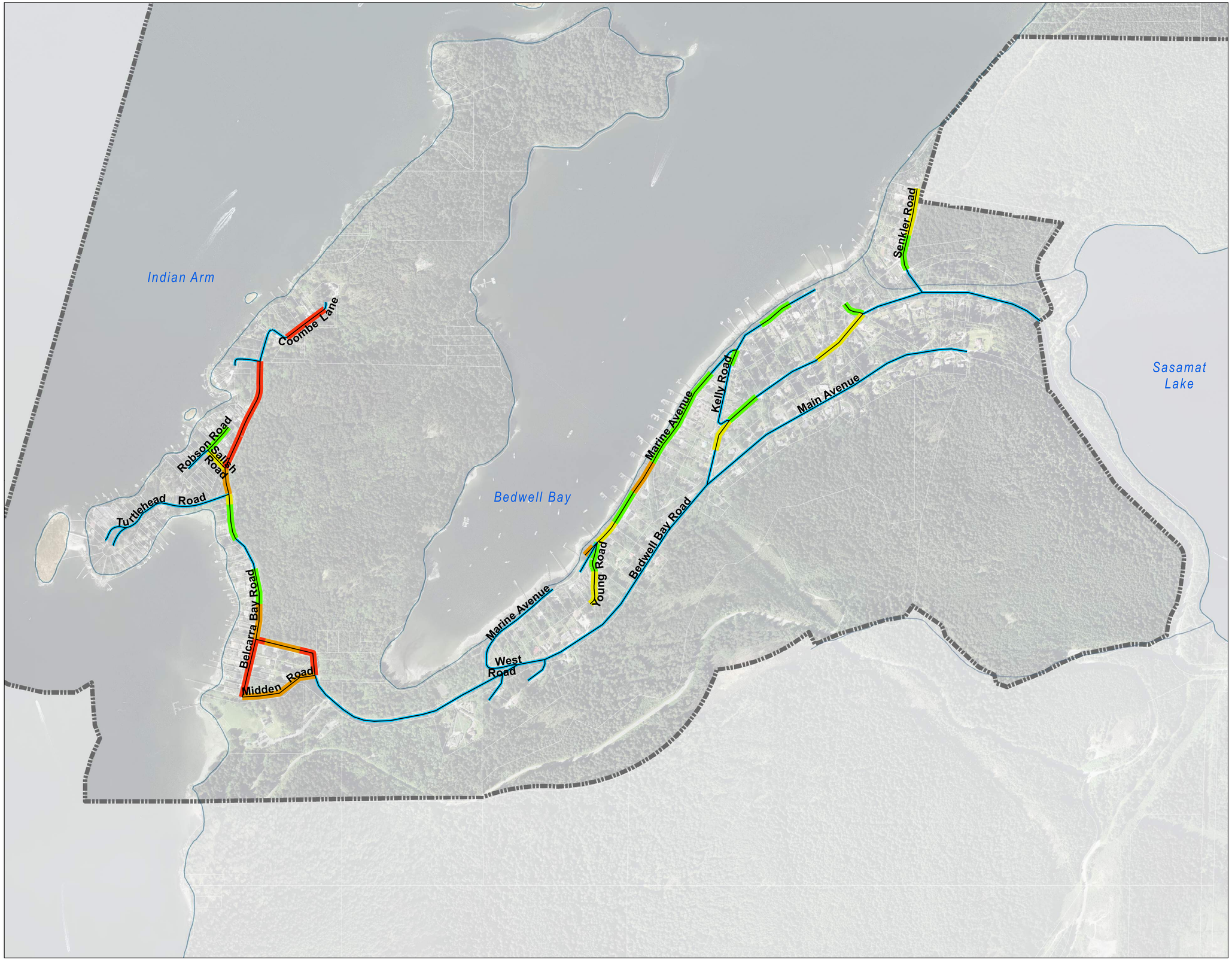
Coordinate System:
NAD 1983 UTM Zone 10N

Data Sources:
National Road Network - Geobase.ca
Orthophoto: Port Moody
Cadastral: Integrated Cadastral Information Society

Project #:	4204.0002.01
Author:	WT
Checked:	JW
Status:	
Revision:	A
Date:	2017 / 10 / 18

URBAN systems

MAP 1



BELCARRA

Road Assessment

Road Surface Distress Severity Rankings

Legend

Severity Assessment Score

- 1 - (0 - 100)
- 2 - (12 - 100)
- 3 - (101 - 200)
- 4 - (201 - 1000)
- 5 - (1001 - 1520)

150 75 0 150 300
m

N

Coordinate System:
NAD 1983 UTM Zone 10N

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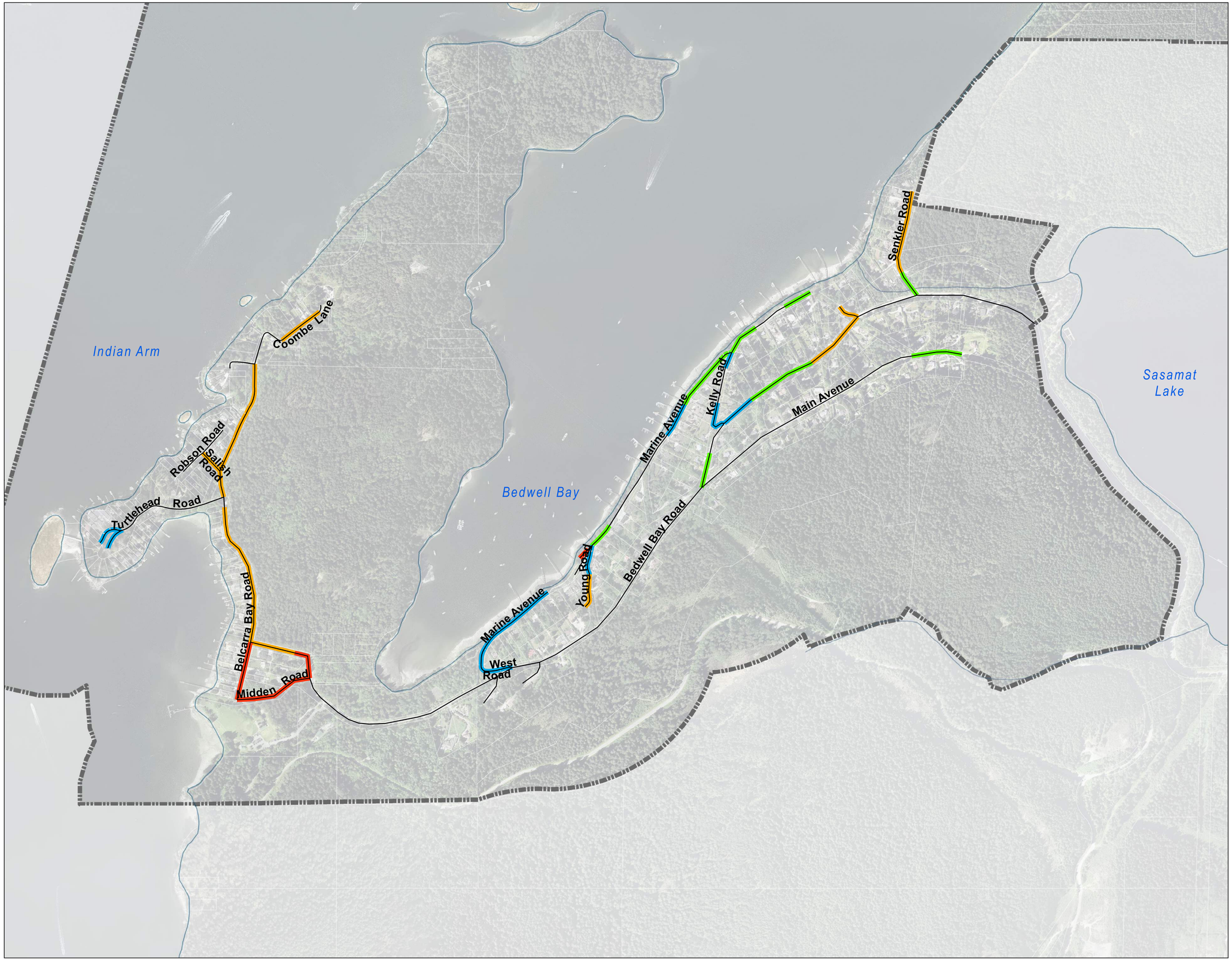
URBAN systems

MAP 2



Road Assessment

Recommended Road Surface Works 2018 - 2028 Years

Legend

- Roads Included in RCA
- Reclaim or Reconstruct
- Mill and Overlay or Reclaim
- Spot Repairs
- Crack Sealing

150 75 0 150 300
m

N

Coordinate System:
NAD 1983 UTM Zone 10N

Data Sources:
National Road Network - Geobase.ca
Orthophoto: Port Moody
Cadastral: Integrated Cadastral Information Society

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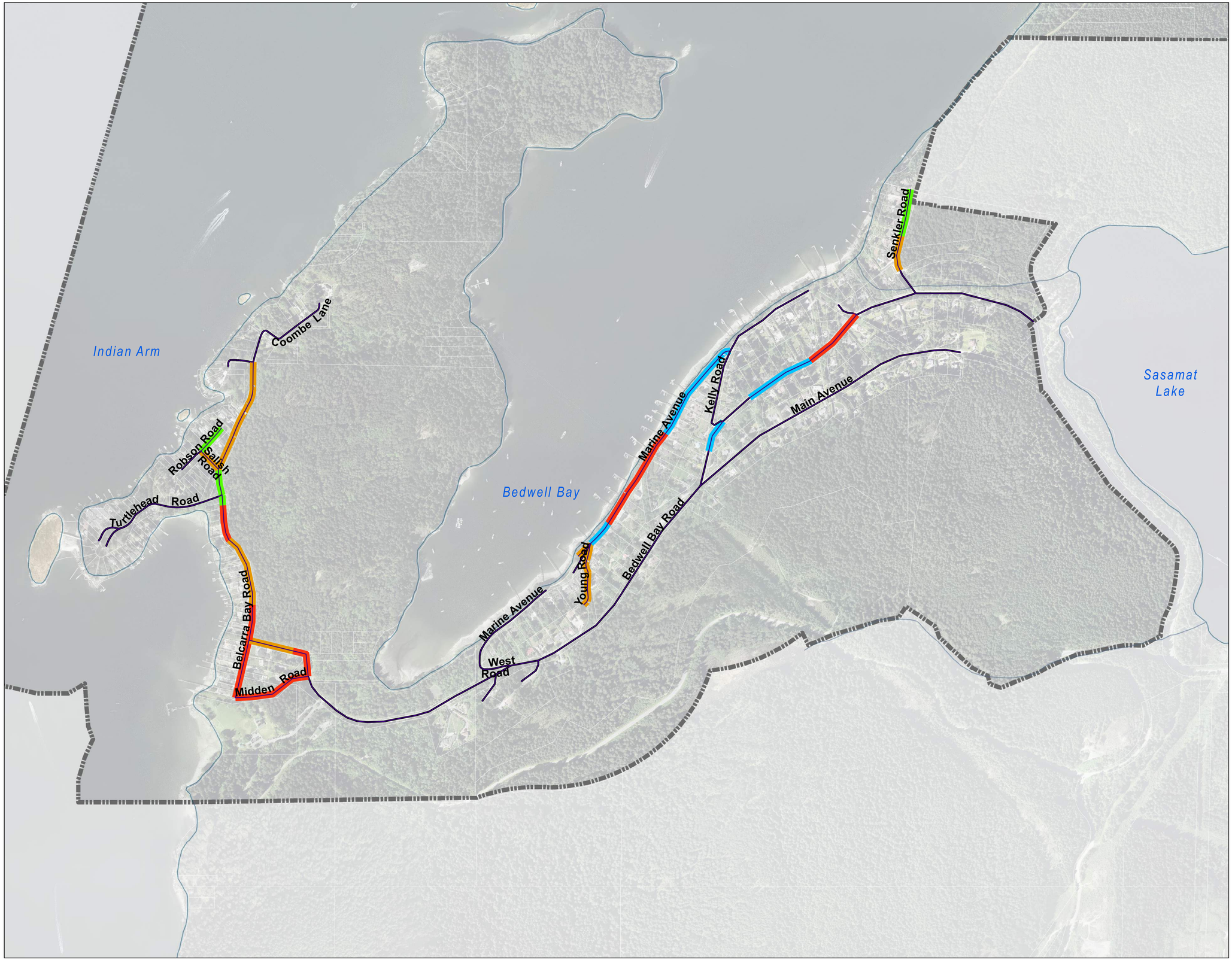
Revision:	A
Date:	2017 / 10 / 18

URBAN systems

MAP 3



Road Assessment

Road Surface with Distresses Indicating Potential Base Failure

Legend

- Significant base repair
- Moderate base repair
- Spot base repair
- Monitor
- Not found

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150 75 0 150 300
m

N

Coordinate System:
NAD 1983 UTM Zone 10N

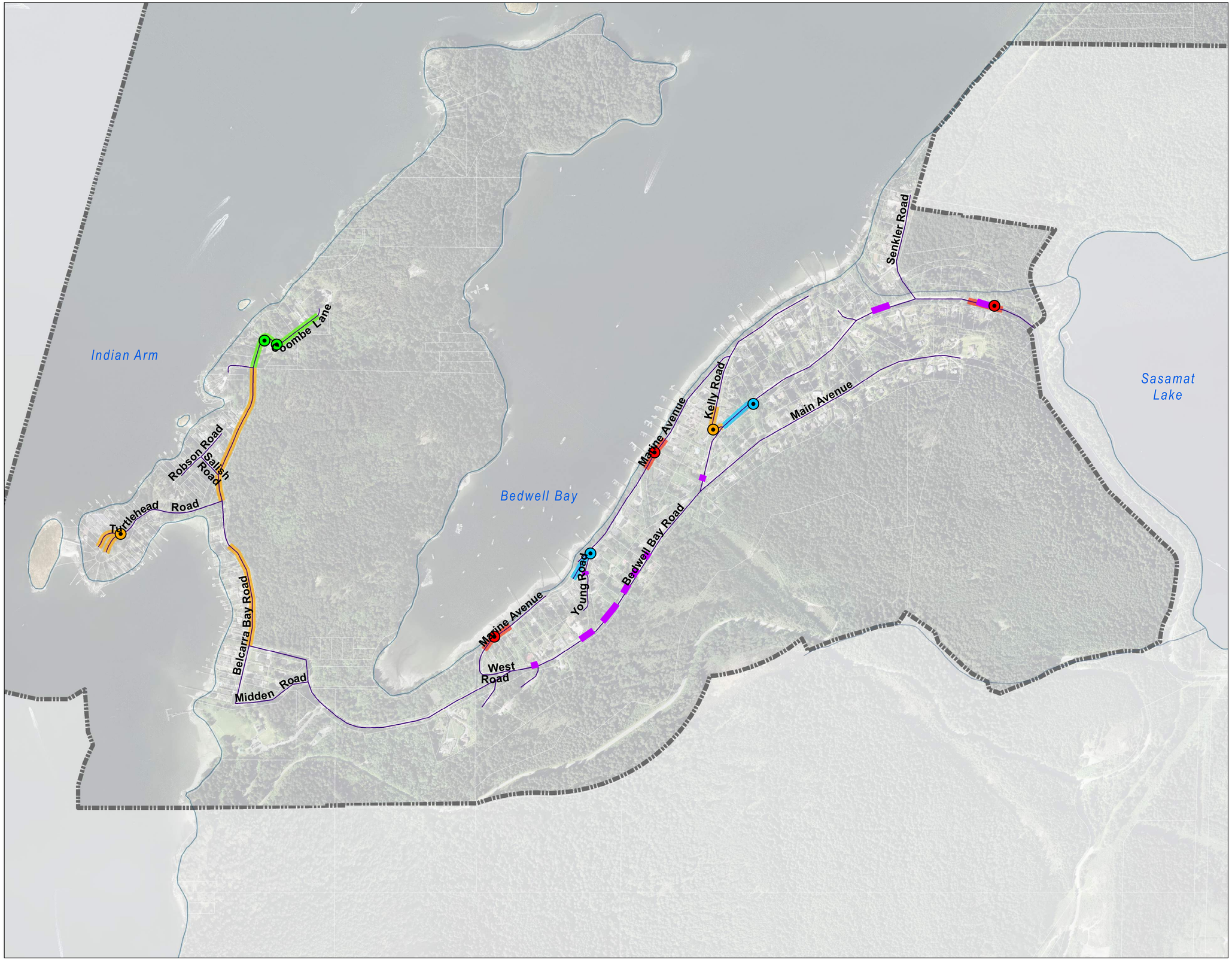
Data Sources:
National Road Network - Geobase.ca
Orthophoto: Port Moody
Cadastral: Integrated Cadastral Information Society

Project #:	4204.0002.01
Author:	WT
Checked:	JW
Status:	
Revision:	A
Date:	2017 / 10 / 18

URBAN systems

MAP 4

C:\Projects\4204\0002\01\D-Drafting-Design-Analysis\GIS\Projects\MXD\Map 4 - Distresses Indicating Potential Base Failure.mxd Last updated by wturner on October 18, 2017 at 11:53:37 PM



BELCARRA

Road Assessment

Recommended Location of Hazards and Health and Safety Concerns

Legend

- Steep Slope Areas
- Vehicle and Cycling Hazards
- Road Edge Failures and Shoulder Drops
- Blind Corner and Signage
- Pot Holes and Catch Basin Failure
- Vehicle and Cycling Hazard
- Corner Failure
- Blind Corner and Signage
- Pothole; Potholes and Catchbasin Failure

150 75 0 150 300
m

N

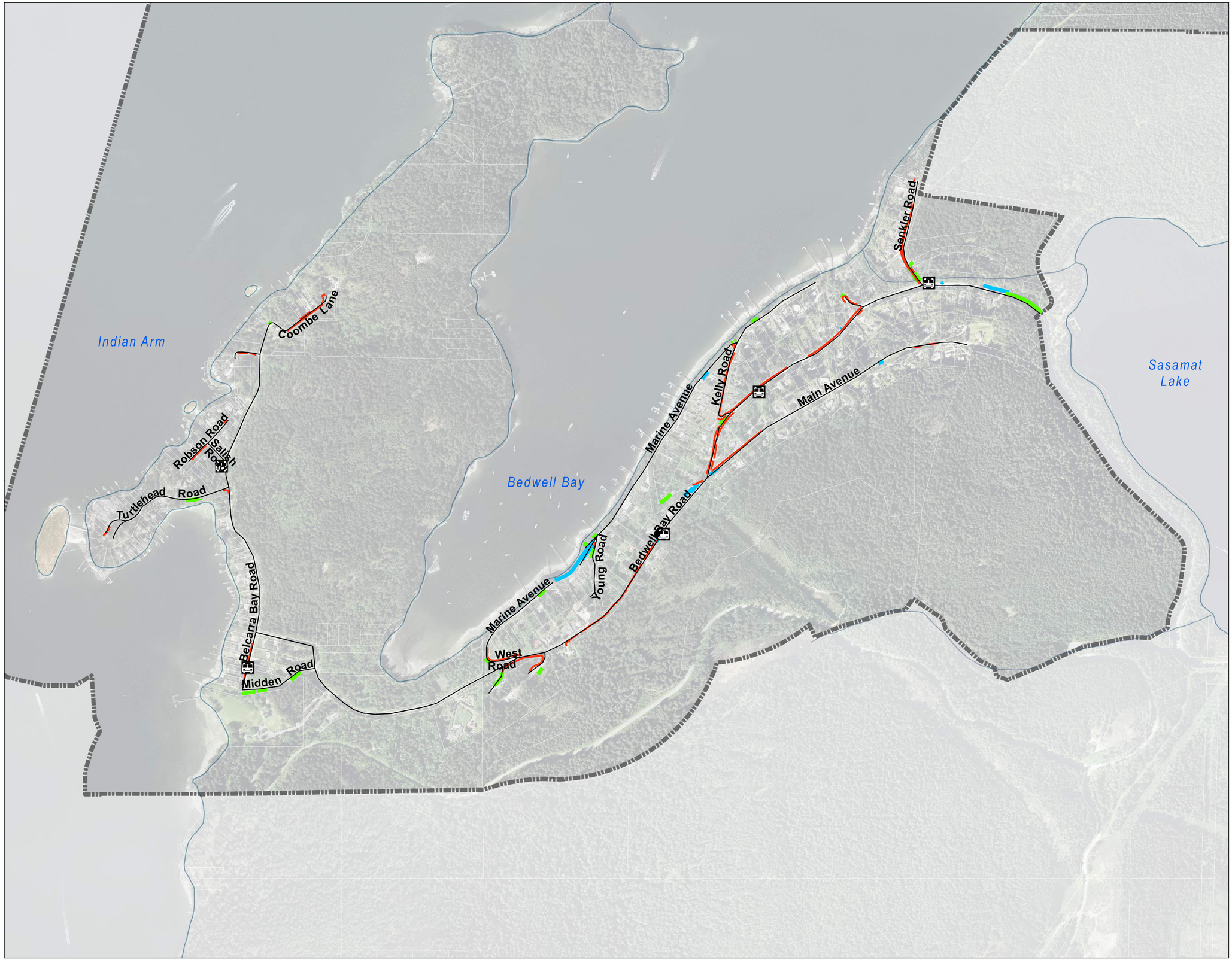
Coordinate System:
NAD 1983 UTM Zone 10N

Data Sources:
National Road Network - Geobase.ca
Orthophoto: Port Moody
Cadastral: Integrated Cadastral Information Society

Project #:	4204.0002.01
Author:	WT
Checked:	JW
Status:	
Revision:	A
Date:	2017 / 10 / 19

URBAN systems

MAP 5



Road Assessment

Road Corridor Assets Curb, Road Side Barrier, Retaining Walls and Bus Stops

Legend

- Bus Stop - Sign Only
- Bus Stop Structure
- Roadside Barrier
- Retaining Walls
- Roadside Curb

The accuracy & completeness of information shown on this drawing is not guaranteed. It will be the responsibility of the user of the information shown on this drawing to locate & establish the precise location of all existing information whether shown or not.

150 75 0 150 300
m

N

Coordinate System:
NAD 1983 UTM Zone 10N

Data Sources:

National Road Network - Geobase.ca
Orthophoto: Port Moody
Cadastral: Integrated Cadastral Information Society

Project #:	4204.0002.01
Author:	WT
Checked:	JW
Status:	
Revision:	A
Date:	2017 / 10 / 19

URBAN systems

MAP 6

C:\Projects\4204\0002\01\D-Drafting-Design-Analysis\GIS\Projects\MXD\Map 6 - Curb - Roadside Barrier - Retaining Walls - Bus Stops.mxd Last updated by wturner on October 19, 2017 at 1:04:40 AM

			Road ID		**R0012**		**R0013**		**R0034**		**R0006**		**R-0007**	
			Road Name		**Midden Road Reconstruction**		**Belcarra Bay Road Reconstruction**		**Bedwell Bay Road Reconstruction**		**Marine Drive Reconstruction**		**Marine Drive - Cul-de-sac Reconstruction**	
			From		**Bedwell Bay Road**		**Midden Road**		**Midden Road**		**Kelly Road**		**Young Road**	
			To		**Belcarra Bay Road**		**Bedwell Bay Road**		**Belcarra Bay Road**		**Young Road**		**3974 Marine Drive**	
	DESCRIPTION	**UNIT**	**UNIT PRICE**	**Estimated Quantity**	**Amount**	**Estimated Quantity**	**Amount**	**Estimated Quantity**	**Amount**	**Estimated Quantity**	**Amount**	**Estimated Quantity**	**Amount**
		m		**220**		**165**		**230**		**300**		**34**	
		m		**8.5**		**8.5**		**8.5**		**5.2**		**10.8**	
	Mobilization and Insurance Attributable to Road Works	L.S.	1	$8,300	$ 8,300	$6,700	$ 6,700	$8,600	$ 8,600	$7,300	$ 7,300	$1,600	$ 1,600
	Sawcut Existing Asphalt	m	$ 9	17	$ 153	17	$ 153	17	$ 153	10	$ 94	22	$ 194
	Asphalt Removal and dispose offsite (500mm)	Cu.m.	$ 90	935	$ 84,150	701	$ 63,113	978	$ 87,975	780	$ 70,200	184	$ 16,548
	Pulverize, Stabilize and Shape Asphalt Top Gravels (Gravels shown below)	Sq.m.	$ 10	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
	Milling (Skid-steer Mounted Machine)	Sq.m.	$ 4	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
	Milling (Larger Areas)	Sq.m.	$ 3	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
	Common Excavation and Disposal	Sq.m.	$ 4	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
	Remove and Replace Unsuitable Soils	Cu.m.	$ 45	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
	Base and Gravel Preparation												
.1	Subgrade Preparation	Sq.m.	$ 3	2530	$ 7,590	1898	$ 5,693	2645	$ 7,935	2460	$ 7,380	470	$ 1,410
.2	Geogrid (Tensar BX1100 or equivalent) and Non-Woven Geotextile	Sq.m.	$ 5	0	$ -		$ -		$ -	780	$ 3,900	184	$ 919
.3	Supply and Place Gravels (Large Areas)												
	(i) Arterial Road Sub-base Gravel (450 mm)	Cu.m.	$ 45	0	$ -		$ -		$ -		$ -		$ -
	(ii) Arterial Road Base Gravel or Extra Gravel When Pulverizing (100 mm)	Cu.m.	$ 45	0	$ -		$ -		$ -		$ -		$ -
	(iii) Local Road Sub-base Gravel (300 mm)	Cu.m.	$ 45	759	$ 34,155	569	$ 25,616	794	$ 35,708	738	$ 33,210	141	$ 6,344
	(iv) Local Base Gravel (150mm)	Cu.m.	$ 45	380	$ 17,078	285	$ 12,808	397	$ 17,854	369	$ 16,605	70	$ 3,172
.4	Supply and Place Gravels (Small Areas / Patches)												
	(i) Sub-base Gravel (300 mm)	Cu.m.	$ 45	0	$ -		$ -		$ -		$ -		$ -
	(ii) Base Gravel (150 mm)	Cu.m.	$ 45	0	$ -		$ -		$ -		$ -		$ -
.5	Shouldering	m	$ 7				$ -		$ -		$ -		$ -
	Asphalt												
.1	Prime Coating or Tack Coating	Sq.m.	$ 0.57	1870	$ 1,066	1403	$ 799	1955	$ 1,114	1560	$ 889	368	$ 210
.2	Arterial Asphalt Surface (100mm) for Areas Requiring Patching	Sq.m.	$ 140		$ -		$ -		$ -		$ -		$ -
.3	Local Asphalt Surface (80mm)	Sq.m.	$ 25	1870	$ 46,750	1403	$ 35,063	1955	$ 48,875	1560	$ 39,000	368	$ 9,194
.4	Level Course (not needed in all instances)	Sq.m.	$ 4		$ -		$ -		$ -		$ -		$ -
.5	Asphalt Overlay (50 mm)	Sq.m.	$ 14		$ -		$ -		$ -		$ -		$ -
.6	Asphalt Driveway Tie ins (40 mm)	each	$ 400	2	$ 800	12	$ 4,800	3	$ 1,200	3	$ 1,200	3	$ 1,200
.7	Asphalt Curb (50mm)	m	$ 25	165	$ 4,125	200	$ 5,000	0	$ -	0	$ -	0	$ -
	Ditching and Outfalls												
.1	Ditching (per side)	m	$ 7	220	$ 1,540	165	$ 1,155	460	$ 3,220	600	$ 4,200	68	$ 477
.2	Reset Culverts / New Culverts and Minor Road/Driveway Repair	each	$ 1,500	2	$ 3,000	5	$ 7,500	3	$ 4,500	0	$ -	0	$ -
.3	Add w-beam roadside barrier	m	$ 300	0		0	$ -	0		0		0	$ -
	Boulevard (Topsoil and Seeding)	Sq.m.	$ 7	440	$ 3,080	330	$ 2,310	460	$ 3,220	600	$ 4,200	0	$ -
	Line Painting (Centreline)	m	$ 5	220	$ 1,100	165	$ 825	230	$ 1,150	300	$ 1,500	34	$ 170
	Water Valve Adjustments	each	$ 105	3	$ 315	3	$ 315	2	$ 210	2	$ 210	0	$ -
	Manhole Adjustments	each	$ 560	1	$ 560	1	$ 560	1	$ 560	0	$ -	0	$ -
	Signage	each	$ 300	4	$ 1,200	7	$ 2,100	4	$ 1,200	0	$ -	2	$ 600
	SUB-TOTAL ROAD WORKS (Rounded)				**$ 215,000**		**$ 175,000**		**$ 223,000**		**$ 190,000**		**$ 42,000**
	Comments			**Full Depth Reconstruction**		**Full Depth Reconstruction**		**Full Depth Reconstruction**		**Full Depth Reconstruction**		**Full Depth Reconstruction**	
	SUMMARY												
	SUB-TOTAL ROAD WORKS (Rounded)				$ 215,000		$ 175,000		$ 223,000		$ 190,000		$ 42,000
					$ 215,000		**$ 175,000**		**$ 223,000**		**$ 190,000**		**$ 42,000**
	Other, Non-Standard Items				$ -		$ -		$ -		$ -		$ -
	Survey, Geotechnical and Civil Engineering, Tendering, Contract Administration and Contingency			35%	$ 75,000	35%	$ 61,000	35%	$ 78,000	35%	$ 67,000	35%	$ 15,000
	TOTAL (Rounded):				**$ 290,000**		**$ 236,000**		**$ 301,000**		**$ 257,000**		**$ 57,000**

			Road ID		**R0029**		**R0032**		**R0014**		**R0014**		**R0016**	
			Road Name		**Young Road - Mill and Overlay**		**Bedwell Bay Road - Mill and Overlay**		**Belcarra Bay Road - Mill and Overlay**		**Belcarra Bay Road - Mill and Overlay**		**Belcarra Bay Road - Mill and Overlay**	
			From		**Upper Half**		**Watson Road**		**Bedwell Bay Road**		**100m North of Bedwell Bay Road**		**Salish Rd**	
			To		**End**		**183m West of Watson Road**		**100m North of Bedwell Bay Road**		**28m South of Turtlehead Road**		**Whiskey Cover Ln**	
			UNIT	**UNIT PRICE**	**Estimated Quantity**	**Amount**	**Estimated Quantity**	**Amount**	**Estimated Quantity**	**Amount**	**Estimated Quantity**	**Amount**	**Estimated Quantity**	**Amount**
DESCRIPTION			m		**96**		**183**		**100**		**300**		**321**	
			m		**4.2**		**7.3**		**7.0**		**7.0**		**7.1**	
	Mobilization and Insurance Attributable to Road Works		L.S.	1	$700	$ 700	$4,300	$ 4,300	$2,000	$ 2,000	$5,100	$ 5,100	$5,500	$ 5,500
	Sawcut Existing Asphalt		m	$ 9	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
	Asphalt Removal and dispose offsite (500mm)		Cu.m.	$ 90	40	$ 3,629	134	$ 12,023	70	$ 6,300	210	$ 18,900	228	$ 20,512
	Pulverize, Stabilize and Shape Asphalt Top Gravels (Gravels shown below)		Sq.m.	$ 10	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
	Milling (Skid-steer Mounted Machine)		Sq.m.	$ 4	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
	Milling (Larger Areas)		Sq.m.	$ 3	403	$ 1,210	1336	$ 4,008	700	$ 2,100	2100	$ 6,300	2279	$ 6,837
	Common Excavation and Disposal		Sq.m.	$ 4	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
	Remove and Replace Unsuitable Soils		Cu.m.	$ 45	50	$ 2,268	267	$ 12,023	140	$ 6,300	263	$ 11,813	285	$ 12,820
	Base and Gravel Preparation													
.1	Subgrade Preparation		Sq.m.	$ 3	40	$ 121	534	$ 1,603	280	$ 840	525	$ 1,575	570	$ 1,709
.2	Geogrid (Tensar BX1100 or equivalent) and Non-Woven Geotextile		Sq.m.	$ 5	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
.3	Supply and Place Gravels (Large Areas)				0		0		0		0		0	
	(i) Arterial Road Sub-base Gravel (450 mm)		Cu.m.	$ 45	0	$ -		$ -		$ -		$ -		$ -
	(ii) Arterial Road Base Gravel or Extra Gravel When Pulverizing (100 mm)		Cu.m.	$ 45	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
	(iii) Local Road Sub-base Gravel (300 mm)		Cu.m.	$ 45	0	$ -	160	$ 7,214	84	$ 3,780	158	$ 7,088	171	$ 7,692
	(iv) Local Base Gravel (150mm)		Cu.m.	$ 45	0	$ -	80	$ 3,607	42	$ 1,890	79	$ 3,544	85	$ 3,846
.4	Supply and Place Gravels (Small Areas / Patches)				0		0		0		0		0	
	(i) Sub-base Gravel (300 mm)		Cu.m.	$ 45	12	$ 544	160	$ 7,214	84	$ 3,780	158	$ 7,088	171	$ 7,692
	(ii) Base Gravel (150 mm)		Cu.m.	$ 45	6	$ 272	80	$ 3,607	42	$ 1,890	79	$ 3,544	85	$ 3,846
.5	Shouldering		m	$ 7		$ -	0		0		300	$ 2,040	321	$ 2,182.80
Asphalt														
.1	Prime Coating or Tack Coating		Sq.m.	$ 0.57	403	$ 230	1336	$ 761	700	$ 399	2100	$ 1,197	2279	$ 1,299
.2	Arterial Asphalt Surface (100mm) for Areas Requiring Patching		Sq.m.	$ 140	12	$ 1,693	0	$ -	0	$ -	0	$ -	0	$ -
.3	Local Asphalt Surface (80mm)		Sq.m.	$ 25	0	$ -	1336	$ 33,398	700	$ 17,500	2100	$ 52,500	2279	$ 56,978
.4	Level Course (not needed in all instances)		Sq.m.	$ 4	0	$ -	732	$ 2,928	400	$ 1,600	1200	$ 4,800	1284	$ 5,136
.5	Asphalt Overlay (50 mm)		Sq.m.	$ 14	403	$ 5,645	0	$ -	0	$ -	0	$ -	0	$ -
.6	Asphalt Driveway Tie ins (40 mm)		each	$ 400	4	$ 1,600	6	$ 2,400	4	$ 1,600	13	$ 5,200	7	$ 2,800
.7	Asphalt Curb (50mm)		m	$ 25	0	$ -	231	$ 5,775	0	$ -	0	$ -	0	$ -
Ditching and Outfalls														
.1	Ditching (per side)		m	$ 7	0	$ -	183	$ 1,281	100	$ 700	150	$ 1,050	321	$ 2,247
.2	Reset Culverts / New Culverts and Minor Road/Driveway Repair		each	$ 1,500	0	$ -	4	$ 6,000	0	$ -	0	$ -	0	$ -
.3	Add w-beam roadside barrier		m	$ 300	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
Boulevard (Topsoil and Seeding)			Sq.m.	$ 7	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
Line Painting (Centreline)			m	$ 5	0	$ -	549	$ 2,745	0	$ -	0	$ -	0	$ -
Water Valve Adjustments			each	$ 105	0	$ -	3	$ 315	0	$ -	1	$ 105	2	$ 210
Manhole Adjustments			each	$ 560	0	$ -	3	$ 1,680	1	$ 560	2	$ 1,120	1	$ 560
Signage			each	$ 300	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
	SUB-TOTAL ROAD WORKS (Rounded)					**$ 18,000**		**$ 113,000**		**$ 51,000**		**$ 133,000**		**$ 142,000**
	Comments				**Mill & Overlay**		**Mill & Overlay with 40% Base Repair**		**Mill & Overlay with 40% Base Repair**		**Mill & Overlay with 25% Base Repair**		**Mill & Overlay with 25% Base Repair**	
	SUMMARY													
	SUB-TOTAL ROAD WORKS (Rounded)					$ 18,000		$ 113,000		$ 51,000		$ 133,000		$ 142,000
						$ 18,000		**$ 113,000**		**$ 51,000**		**$ 133,000**		**$ 142,000**
	Other, Non-Standard Items					$ -		$ -		$ -		$ -		$ -
	Survey, Geotechnical and Civil Engineering, Tendering, Contract Administration and Contingency				35%	$ 6,000	35%	$ 40,000	35%	$ 18,000	35%	$ 47,000	35%	$ 50,000
	TOTAL (Rounded):					**$ 24,000**		**$ 153,000**		**$ 69,000**		**$ 180,000**		**$ 192,000**

			Road ID		**R0028**		**R0015**		**R0001**		**R0001**		**R0020**		**R0018**	
			Road Name		**Watson Rd - Mill and Overlay**		**Belcarra Bay Road - Mill and Overlay**		**Senkler Rd - Mill and Overlay**		**Senkler Rd - Mill and Overlay**		**Salish Road - Mill and Overlay**		**Coomb Ln - Mill and Overlay**	
			From		**Bedwell Bay Rd**		**Turtlehead Road**		**3345 Senkley Rd**		**178m from Bedwell Bay Rd**		**Robson Rd**		**Blind Corner**	
			To		**Cul-de-sac**		**Salish Rd**		**200m from Bedwell Bay Rd**		**Cul-de-sac**		**Belcarra Bay Rd**		**Cul-de-sac**	
	DESCRIPTION	**UNIT**	**UNIT PRICE**		**Estimated Quantity**	**Amount**	**Estimated Quantity**	**Amount**	**Estimated Quantity**	**Amount**	**Estimated Quantity**	**Amount**	**Estimated Quantity**	**Amount**	**Estimated Quantity**	**Amount**
		m			**62**		**74**		**178**		**133**		**70**		**133**	
		m			**5.9**		**7.1**		**6.2**		**5.4**		**6.3**		**7.1**	
	Mobilization and Insurance Attributable to Road Works	L.S.	1		$800	$ 800	$1,300	$ 1,300	$2,600	$ 2,600	$1,500	$ 1,500	$1,200	$ 1,200	$2,000	$ 2,000
	Sawcut Existing Asphalt	m	$ 9		0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
	Asphalt Removal and dispose offsite (500mm)	Cu.m.	$ 90		37	$ 3,292	53	$ 4,729	110	$ 9,932	72	$ 6,464	44	$ 3,969	94	$ 8,499
	Pulverize, Stabilize and Shape Asphalt Top Gravels (Gravels shown below)	Sq.m.	$ 10		0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
	Milling (Skid-steer Mounted Machine)	Sq.m.	$ 4		0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
	Milling (Larger Areas)	Sq.m.	$ 3		366	$ 1,097	525	$ 1,576	1104	$ 3,311	718	$ 2,155	441	$ 1,323	944	$ 2,833
	Common Excavation and Disposal	Sq.m.	$ 4		0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
	Remove and Replace Unsuitable Soils	Cu.m.	$ 45		18	$ 823	66	$ 2,955	138	$ 6,208	36	$ 1,616	55	$ 2,481	47	$ 2,125
	Base and Gravel Preparation															
.1	Subgrade Preparation	Sq.m.	$ 3		37	$ 110	131	$ 394	276	$ 828	72	$ 215	110	$ 331	94	$ 283
.2	Geogrid (Tensar BX1100 or equivalent) and Non-Woven Geotextile	Sq.m.	$ 5		0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
.3	Supply and Place Gravels (Large Areas)				0		0		0		0		0		0	
	(i) Arterial Road Sub-base Gravel (450 mm)	Cu.m.	$ 45			$ -		$ -		$ -		$ -		$ -		$ -
	(ii) Arterial Road Base Gravel or Extra Gravel When Pulverizing (100 mm)	Cu.m.	$ 45		0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
	(iii) Local Road Sub-base Gravel (300 mm)	Cu.m.	$ 45		11	$ 494	39	$ 1,773	83	$ 3,725	22	$ 970	33	$ 1,488	28	$ 1,275
	(iv) Local Base Gravel (150mm)	Cu.m.	$ 45		5	$ 247	20	$ 887	41	$ 1,862	11	$ 485	17	$ 744	14	$ 637
.4	Supply and Place Gravels (Small Areas / Patches)				0		0		0		0		0		0	
	(i) Sub-base Gravel (300 mm)	Cu.m.	$ 45		11	$ 494	39	$ 1,773	83	$ 3,725	22	$ 970	33	$ 1,488	28	$ 1,275
	(ii) Base Gravel (150 mm)	Cu.m.	$ 45		5	$ 247	20	$ 887	41	$ 1,862	11	$ 485	17	$ 744	14	$ 637
.5	Shouldering	m	$ 7		62	$ -	74	$ 503.20	178	$ -	133	$ -	70	$ -	0	$ -
	Asphalt															
.1	Prime Coating or Tack Coating	Sq.m.	$ 0.57		366	$ 209	525	$ 299	1104	$ 629	718	$ 409	441	$ 251	944	$ 538
.2	Arterial Asphalt Surface (100mm) for Areas Requiring Patching	Sq.m.	$ 140		0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
.3	Local Asphalt Surface (80mm)	Sq.m.	$ 25		366	$ 9,145	525	$ 13,135	1104	$ 27,590	718	$ 17,955	441	$ 11,025	944	$ 23,608
.4	Level Course (not needed in all instances)	Sq.m.	$ 4		0	$ -	296	$ 1,184	712	$ 2,848	0	$ -	280	$ 1,120	0	$ -
.5	Asphalt Overlay (50 mm)	Sq.m.	$ 14		0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
.6	Asphalt Driveway Tie ins (40 mm)	each	$ 400		3	$ 1,200	0	$ -	0	$ -	3	$ 1,200	3	$ 1,200	4	$ 1,600
.7	Asphalt Curb (50mm)	m	$ 25		71	$ 1,770	0	$ -	0	$ -	71	$ 1,770	70	$ 1,750	193	$ 4,825
	Ditching and Outfalls															
.1	Ditching (per side)	m	$ 7		0	$ -	74	$ 518	178	$ 1,246	133	$ 931	70	$ 490	0	$ -
.2	Reset Culverts / New Culverts and Minor Road/Driveway Repair	each	$ 1,500		0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
.3	Add w-beam roadside barrier	m	$ 300		0	$ -	0	$ -	0	$ -	0	$ -	0		0	$ -
	Boulevard (Topsoil and Seeding)	Sq.m.	$ 7		0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
	Line Painting (Centreline)	m	$ 5		0	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	$ -
	Water Valve Adjustments	each	$ 105		0	$ -	3	$ 315	2	$ 210	2	$ 210	2	$ 210	1	$ 105
	Manhole Adjustments	each	$ 560		0	$ -	0	$ -	1	$ 560	3	$ 1,680	1	$ 560	1	$ 560
	Signage	each	$ 300		0	$ -	2	$ 600	3	$ 900	2	$ 600	3	$ 900	0	$ -
	SUB-TOTAL ROAD WORKS (Rounded)					**$ 20,000**		**$ 33,000**		**$ 68,000**		**$ 40,000**		**$ 31,000**		**$ 51,000**
	Comments				**Mill & Overlay with 10% Base Repair**		**Mill & Overlay with 25% Base Repair**		**Mill & Overlay with 25% Base Repair**		**Mill & Overlay with 10% Base Repair**		**Mill & Overlay with 25% Base Repair**		**Mill & Overlay with 10% Base Repair**	
	SUMMARY															
	SUB-TOTAL ROAD WORKS (Rounded)					$ 20,000		$ 33,000		$ 68,000		$ 40,000		$ 31,000		$ 51,000
						$ 20,000		**$ 33,000**		**$ 68,000**		**$ 40,000**		**$ 31,000**		**$ 51,000**
	Other, Non-Standard Items					$ -		$ -		$ -		$ -		$ -		$ -
	Survey, Geotechnical and Civil Engineering, Tendering, Contract Administration and Contingency			35%		$ 7,000	35%	$ 12,000	35%	$ 24,000	35%	$ 14,000	35%	$ 11,000	35%	$ 18,000
	TOTAL (Rounded):					**$ 27,000**		**$ 45,000**		**$ 92,000**		**$ 54,000**		**$ 42,000**		**$ 69,000**

			Road ID		**Spot Repairs**		**Priority Shouldering**		**Priority Roadside Barrier**	
			Road Name		**Multiple Areas**		**Multiple Areas**		**Multiple Areas**	
			From							
			To							
			UNIT	**UNIT PRICE**	**Estimated Quantity**	**Amount**	**Estimated Quantity**	**Amount**	**Estimated Quantity**	**Amount**
DESCRIPTION			m		**430**		**1000**		**350**	
			m		**5.8**					
	Mobilization and Insurance Attributable to Road Works		L.S.	1	$900	$ 900	$300	$ 300	$0	$ -
	Sawcut Existing Asphalt		m	$ 9	0	$ -	0	$ -	0	$ -
	Asphalt Removal and dispose offsite (500mm)		Cu.m.	$ 90	25	$ 2,245	0	$ -	0	$ -
	Pulverize, Stabilize and Shape Asphalt Top Gravels (Gravels shown below)		Sq.m.	$ 10	0	$ -	0	$ -	0	$ -
	Milling (Skid-steer Mounted Machine)		Sq.m.	$ 4	0	$ -	0	$ -	0	$ -
	Milling (Larger Areas)		Sq.m.	$ 3	249	$ 748	0	$ -	0	$ -
	Common Excavation and Disposal		Sq.m.	$ 4	0	$ -	0	$ -	0	$ -
	Remove and Replace Unsuitable Soils		Cu.m.	$ 45	62	$ 2,806	0	$ -	0	$ -
	Base and Gravel Preparation									
	.1	Subgrade Preparation	Sq.m.	$ 3	25	$ 75	0	$ -	0	$ -
	.2	Geogrid (Tensar BX1100 or equivalent) and Non-Woven Geotextile	Sq.m.	$ 5	0	$ -	0	$ -	0	$ -
	.3	Supply and Place Gravels (Large Areas)			0		0		0	
		(i) Arterial Road Sub-base Gravel (450 mm)	Cu.m.	$ 45		$ -	0	$ -	0	$ -
		(ii) Arterial Road Base Gravel or Extra Gravel When Pulverizing (100 mm)	Cu.m.	$ 45	0	$ -	0	$ -	0	$ -
		(iii) Local Road Sub-base Gravel (300 mm)	Cu.m.	$ 45	7	$ 337	0	$ -	0	$ -
		(iv) Local Base Gravel (150mm)	Cu.m.	$ 45	4	$ 168	0	$ -	0	$ -
	.4	Supply and Place Gravels (Small Areas / Patches)			0		0		0	
		(i) Sub-base Gravel (300 mm)	Cu.m.	$ 45	7	$ 337	0	$ -	0	$ -
		(ii) Base Gravel (150 mm)	Cu.m.	$ 45	4	$ 168	0	$ -	0	$ -
	.5	Shouldering	m	$ 7	0	$ -	1000	$ 6,800.00	0	$ -
	Asphalt									
	.1	Prime Coating or Tack Coating	Sq.m.	$ 0.57	249	$ 142	0	$ -	0	$ -
	.2	Arterial Asphalt Surface (100mm) for Areas Requiring Patching	Sq.m.	$ 140	0	$ -	0	$ -	0	$ -
	.3	Local Asphalt Surface (80mm)	Sq.m.	$ 25	249	$ 6,235	0	$ -	0	$ -
	.4	Level Course (not needed in all instances)	Sq.m.	$ 4	0	$ -	0	$ -	0	$ -
	.5	Asphalt Overlay (50 mm)	Sq.m.	$ 14	0	$ -	0	$ -	0	$ -
	.6	Asphalt Driveway Tie ins (40 mm)	each	$ 400	4	$ 1,600	0	$ -	0	$ -
	.7	Asphalt Curb (50mm)	m	$ 25	50	$ 1,250	0	$ -	0	$ -
	Ditching and Outfalls									
	.1	Ditching (per side)	m	$ 7	20	$ 140	0	$ -	0	$ -
	.2	Reset Culverts / New Culverts and Minor Road/Driveway Repair	each	$ 1,500	2	$ 3,000	0	$ -	0	$ -
	.3	Add w-beam roadside barrier	m	$ 300	0	$ -	0	$ -	350	$ 105,000
	Boulevard (Topsoil and Seeding)		Sq.m.	$ 7	10	$ 70	0	$ -	0	$ -
	Line Painting (Centreline)		m	$ 5	0	$ -	0	$ -	0	$ -
	Water Valve Adjustments		each	$ 105	0	$ -	0	$ -	0	$ -
	Manhole Adjustments		each	$ 560	4	$ 2,240	0	$ -	0	$ -
	Signage		each	$ 300	0	$ -	0	$ -	0	$ -
		SUB-TOTAL ROAD WORKS (Rounded)				**$ 22,000**		**$ 7,000**		**$ 105,000**
	Comments				**10% Mill & Overlay with 10% Base Repair**		**Priority Shouldering**		**Priority Roadside Barrier**	
	SUMMARY									
		SUB-TOTAL ROAD WORKS (Rounded)				$ 22,000		$ 7,000		$ 105,000
						$ 22,000		**$ 7,000**		**$ 105,000**
		Other, Non-Standard Items				$ -		$ -		$ -
		Survey, Geotechnical and Civil Engineering, Tendering, Contract Administration and Contingency			35%	$ 8,000	35%	$ 2,000	25%	$ 26,000
		TOTAL (Rounded):				**$ 30,000**		**$ 9,000**		**$ 131,000**