THE MUNICIPALITY OF THE VILLAGE OF LIONS BAY

INFRASTRUCTURE COMMITTEE MEETING
OF THE VILLAGE OF LIONS BAY
HELD ON THURSDAY, JANUARY 23, 2020 at 7:00 PM
COUNCIL CHAMBERS, 400 CENTRE ROAD, LIONS BAY

AGENDA

1. Call to Order

2. Appointment of Recorder

3. Approval of the Agenda

4. Public Questions & Comments

5. Approval of Minutes

A. Infrastructure Committee Meeting – December 2, 2019 (Page 3)

6. Business Arising from the Minutes

7. Unfinished Business

A. EV Charging Station
B. Kelvin Grove Wastewater Treatment Plant
C. Corrosion Control
D. PRV
E. Oceanview Drainage Report (Page 7)

8. New Business

A. Infrastructure Meeting Schedule

9. Public Questions & Comments

10. Adjournment

LIONS BAY INFRASTRUCTURE COMMITTEE MEETING
MONDAY 2 DECEMBER 2010 AT 7:00 PM
COUNCIL CHAMBERS, 400 CENTER ROAD, LIONS BAY

MINUTES OF THE MEETING

In Attendance:

Fred Bain – Councilor and Committee Chair
Ron McLaughlin - Mayor
Norm Barmeier - Councilor
Neville Abbott – Councilor
Tony Greville – Resident
Karl Buhr – Resident
Brian Ulrich – Resident

Regrets:

Peter Dejong - CAO
Jim Mutrie – Resident
Naizam Jaffer – Public Works Manager

1. **Call to Order**
   Meeting was called to order at 7:04 pm.

2. **Appointment of Recorder**
   Brian Ulrich was appointed Recorder.

3. **Approval of the Agenda**
   The Agenda was approved with the insertion of two items:
   Proposal for education about lead in our water, and
   Comments about the 3rd PRV mentioned in plans

4. **Public Questions & Comments**
   None

5. **Approval of the Minutes**
   The 4 November 2019 IC meeting minutes were approved as is.

6. **Business Arising from the Minutes**
   Nai provided an update on the Oceanview Stormwater Drainage Study. ISL Engineering's study will be ready in January.

   Nai indicated that he liked Tony Greville's suggestion from last meeting that instead of issuing a tender for the WWTP replacement project, we issue an RFP which gives more flexibility in selecting the contractor to do the work. As a result, we will issue an RFP.

In segue from #8 in previous minutes we revisited the idea of using the highway tank grounds as an exercise area.
ACTION: Ron to put this suggestion down for the budget talks.

Unfinished Business – EV Charging Station;
Norm tabled material on what he believes is the most promising charger option (the Express 250 from Chargepoint). Apparently, Hydro will now allow us to charge (whatever price we choose) for the electricity consumed at the chargers. The charger presented can only charge one vehicle at a time.

The chargers come with a 5-year service and maintenance package and we would have to pay for the capital and the hydro service to the chargers. The maintenance fees are about $5,500 per year. The capital element entails civil infrastructure (concrete pad and parking etc.), power from the nearest Hydro pole and a transformer. This is all in the order of $40K.

Discussion turned again to the issue of how to deal with the possibility of people parking at the charger station and then going for a 3 hour hike and rendering the charger unusable by others (ref issues experienced at other charging stations in Vancouver and elsewhere). Since we can now charge for the electricity, a fee in combination with a parking fee can be incorporated into the smart app that the user would use to operate the charger. For example; $3/each ½ hour until charged and then $30/each ½ hour thereafter.

Grants previously available for this were a maximum of $100K. Depending on the grant available at the time, we may have to contribute up to 25%.

Karl asked if they (the charger suppliers) provide business cases for these installations. Since this would go to tender because it's over $2,500, a business case would be needed from each vendor. All agreed that the next step should be to request a business case for the charger.
ACTION: Norm to ask Chargepoint to provide a business case for the installation, and also what is the incremental cost to go from a single station to 2 stations.

The question is: do these things pay back in 5 years?

Also, it needs to be determined if the nearest Hydro pole can provide enough power for this charger.
Nai would need to submit an Electric Service Info form to Hydro to see if power available at the nearest pole would be adequate. (will need a designer assigned to the project before Hydro will look at it).

Since users will operate the charger using a smart phone app, we will need adequate cell phone signal at the charger location, which supports the case for the proposed new cell phone tower.

7. New Business

Tony reviewed for us quickly the instance where Global TV ran a piece about lead in water supplies in Flint Michigan which scared a lot of people…needlessly.

We can ease a lot of minds here about our Lions Bay water safety with respect to lead by issuing a piece on how we regularly test for lead and that our water is perfectly safe. All agreed that Tony should go ahead and draft an article on our lead testing and that the results clearly show that our water is safe from lead content. He will need specific test data from Nai for the article.

ACTION: Fred to take IC request to Council to have Nai provide the lead test data to Tony for the article.

Neville had a question from a Kelvin Grove resident regarding the 3rd of 3 PRV's being replaced in the village (the first two being paid for by the Grant and the third paid for by the village). This is the one at the school. He wanted to know the timing and if the cost was most efficient. The IC's input for Neville's response is yes it is the most cost efficient. It is a critical piece of infrastructure and currently it does not provide adequate fire flow at the school. For timing, this PRV still needs to be detail designed before it can move forward (the first two PRV's were designed by AECOM as part of the Harvey tank project).

8. Public Questions and Comments

None

9. Next Meeting Date

The next meeting will be Thursday 23 January 2020.

10. Adjournment

The meeting was adjourned at 8:3o pm.

Memorandum

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To:	**Village of Lions Bay**	Date:	**January 10, 2020**
Attention:	**Nai Jaffer, Public Works Manager**	Project No.:	**32282**
Cc:			
Reference:	**Oceanview Road Open Channel Hydraulic Assessment - Draft**		
From:	**Ghazal Shirazian, E.I.T., Project Engineer** **Andrew Baird, P.Eng., Senior Project Engineer**		

1.0 Background

ISL Engineering and Land Services (ISL) was retained by the Village of Lions Bay to provide engineering services for the hydraulic assessment of the open drainage channel beginning at 270 Oceanview Road.

The existing storm drainage on the upper portion of Oceanview Road prior to 2005 discharged to Rundle Creek through an existing CSP culvert that ran between House #260 and #270 Oceanview Road. In 2005 this culvert failed and was subsequently filled with concrete and the drainage re-routed to an existing ditch on the east side of Oceanview Road. The Village has received multiple complaints related to infiltration through this ditch.

The open channel begins at an existing 450mm concrete culvert located west of 270 Oceanview Road that inlets on the south side of Oceanview Road and outlets on the North Side of Oceanview Road. The remaining ditch consists of 7 driveway culverts and an open channel as well as a 60.0m long above ground corrugated HDPE storm main that was installed in 2011 to mitigate infiltration issues. The infiltration issues were reviewed by Golder Associates in 2008 and in 2011 the Village installed the HDPE pipe to reduce the infiltration, this HDPE pipe is still in place at the time of this memorandum. Ultimately, the storm sewer outfalls to Harvey Creek at Crosscreek Road through an underground corrugated Steel pipe. Refer to Figure 1.1 Site Location. Also, Figure C (attached) showing the Photo Index Map.

ISL's scope for the assessment included:

- Review background information
- Site review and field measurements
- Confirm the design flows
- Hydraulic assessment of the open channel and driveway culverts
- Discuss options to improve the existing drainage course down Oceanview Road to Harvey Creek and the old drainage course between 260 and 270 Oceanview Road to Rundle Creek.

This memorandum summarizes ISL's findings and recommendations with respect to the above scope of work.

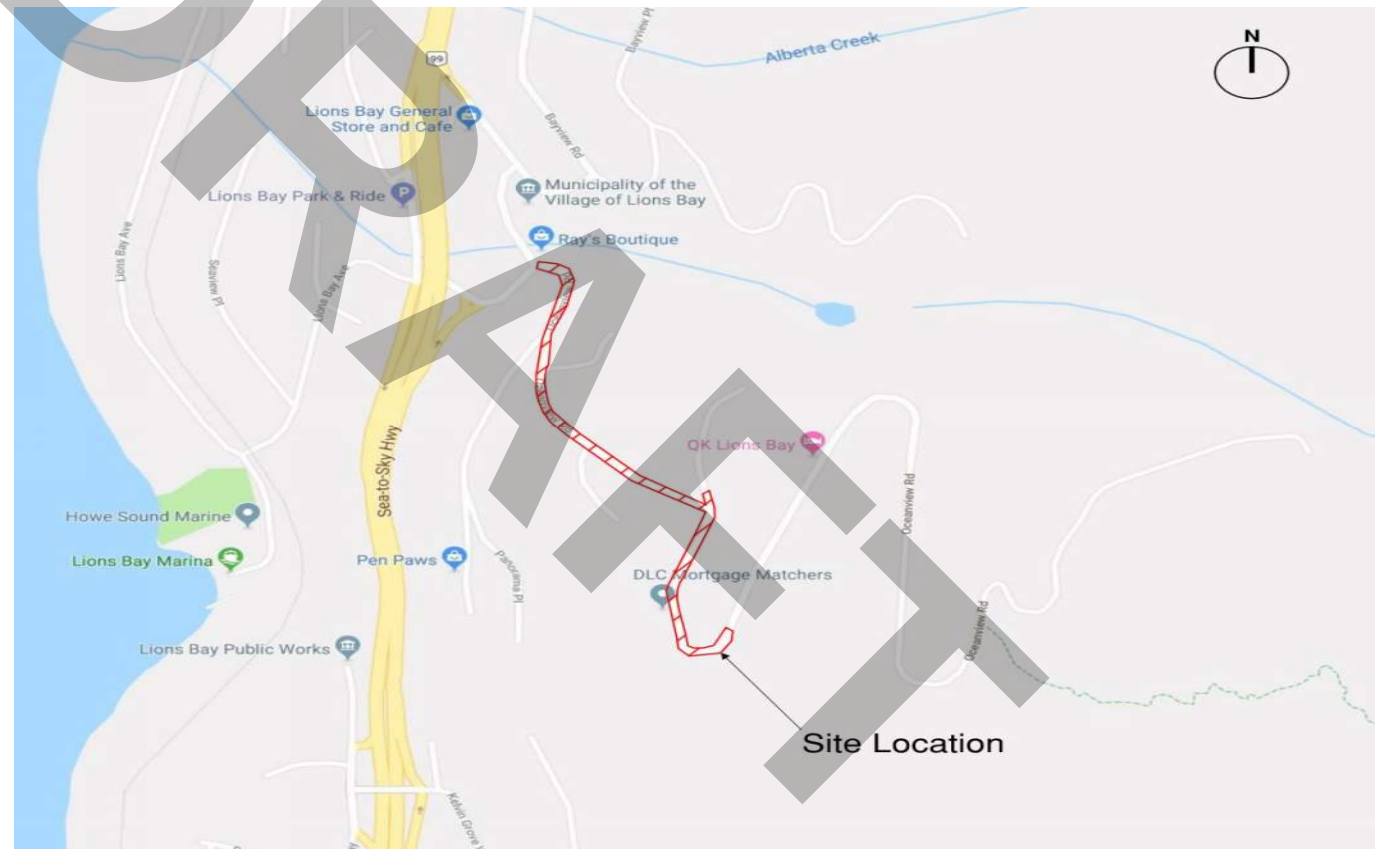


Figure 1.1 – Site Location

2.0 Open Channel Assessment

2.1 Desktop and Site Observations

Following the request by the Village of Lions Bay to review the open channel on Oceanview Road, Ghazal Shirazian, EIT from ISL performed a site visit on April 26, 2019. Observations from site visit are attached. ISL considered the south (upstream) property boundary of 270 Oceanview Road to be STA 1+000 and the outlet at Harvey Creek STA 1+615 the end of the study area. The open channel from STA 1+000 to STA 1+615 had steep gradients which are varied for each section of the channel. Table 1 (attached) summarizes the channel characteristics, culvert data, and the overall condition of each section.

After STA. 1+200, the water in the channel was observed to decrease in volume, the bottom of the channel is wet for approximately 15.0m downstream of the 450mm Corrugated Steel culvert at STA. 1+238 downstream of this location no water was observed. In general, the culverts were observed to be in poor condition and require replacement. The ditch channel was overgrown with vegetation in many areas and it was observed that the flow decreased lower down the channel likely due to infiltration that has been observed previously.

2.2 Peak Flow Assessment

The catchment area for the channel in this study area is approximately 30ha consisting of 1.6ha of paved roadway and 28.4ha of natural forested area with an average gradient of 56%. The extent of the catchment area is shown in Figure A (attached). The Village of Lions Bay Infrastructure Master Plan Report done by AECOM, dated July 28, 2016 (IMP), suggested to use the higher value for a specific storm event between Squamish IDF Curve and West Vancouver Municipal Hall IDF Curve. A synthetic hyetograph was developed using the highest numbers obtained from the IDF Curves mentioned above and an SCS Type IA rainfall distribution was used in this analysis. The peak flows for 10-year, 25-year, and 100-year for the duration of 1hr, 2hr, 6hr, 12hr, and 24hr calculated using XPSWMM are shown in Table 2.1.

Table 2.1 – Oceanview Road Open Channel – Peak Flows Obtained XPSWMM

Return Period/Duration (yrs/hrs)	Rainfall Depth (mm)	Total Runoff Depth (mm)	Total Runoff Volume (m^3)	Q_{Peak} (m^3/s)
10/1	19.3	1.29	386.3	0.21
10/2	29.2	4.96	1489.2	0.32
10/6	58.8	23.27	6979.8	1.02
10/12	100.8	57.29	17185.9	1.94
10/24	**180.0**	**129.66**	**38898.9**	**2.70**
25/1	22.8	2.37	710.7	0.34
25/2	33.6	7.12	2136.8	0.45
25/6	71.4	32.85	9855.1	1.57
25/12	117.6	72.07	21621.7	2.51
25/24	**216.0**	**163.95**	**49184.0**	**3.44**
100/1	27.5	4.21	1261.8	0.55
100/2	38.6	9.87	2962.2	0.67
100/6	87.6	46.04	13810.9	2.34
100/12	147.6	99.36	29809.2	3.55
100/24	**285.6**	**231.30**	**69389.4**	**4.86**

The results obtained from XPSWMM are 10-year peak flow of **2.70 m^3/s**, 25-year peak flow of **3.44 m^3/s**, and 100-year peak flow of **4.86 m^3/s**.

2.3 Hydraulic Capacity Assessment

ISL used the 10-year Peak Flow to assess the channel capacity since Village of Lions Bay IMP suggested the minor systems must safely convey the 10-year Peak Flow.

Table 2.2 shows the capacity of the channel at different sections based on field measurements. The capacity assessment utilized a freeboard of 0m (i.e. this assessment assumed the maximum capacity is reached when the water level at the entrance reaches the top of pipe).

Table 2.2 – Oceanview Road Open Channel – Flow Capacity

Station	Capacity (m^3/s)	Meet 10yr Storm (Y/N)	Meet 25yr Storm (Y/N)	Meet 100yr Storm (Y/N)
1+015	2.58	N	N	N
1+037	4.85	Y	Y	N
1+082	3.28	Y	N	N
1+098	0.54	N	N	N
1+112	1.27	N	N	N
1+196	2.61	N	N	N
1+223	0.20	N	N	N
1+274	2.62	N	N	N
1+282	3.63	Y	Y	N
1+337	2.22	N	N	N
1+375	0.64	N	N	N
1+429	1.79	N	N	N

As it is shown in Table 2.2, some sections of the channel have inadequate capacity to convey the 10-year and 25-year peak flows and the entire channel doesn't have enough capacity to convey the 100-yr peak flow.

The capacities of culverts are shown in Table 2.3.

Table 2.3 – Existing Oceanview Road and Driveways Culverts – Flow Capacity

Station / House No.	Capacity (m^3/s)	Meet 10yr Storm (Y/N)	Meet 25yr Storm (Y/N)	Meet 100yr Storm (Y/N)
1+000	1.07	N	N	N
1+090	0.78	N	N	N
1+106 House# 265	0.59	N	N	N
1+127 House# 215	0.98	N	N	N
1+200 (Highview Place)	0.87	N	N	N
1+262 House# 145	0.91	N	N	N
1+276 House# 135	0.98	N	N	N
1+324 House# 115 -125	1.46	N	N	N
1+362 House# 107	1.46	N	N	N
1+394 House# 105	0.96	N	N	N
1+465	1.31	N	N	N

Table 2.3 shows that the existing culverts have inadequate capacity to convey the 10-year peak flow.

3.0 Upgrade Recommendation

Some sections of the open channel and all the culverts were found to be under capacity based on the 10-year design event. In addition, the culverts are in poor condition and should to be replaced. The following three options were evaluated to increase the capacity of channel and culverts. Figure B and Figure B1 attached show the three options.

- Option 1 - Modify the channel cross section and upsize the culverts
- Option 2 – Divert the flow through a new culvert between House# 260 and House# 270
- Option 3 – Split the flow between the existing system and a new culvert between House# 260 and House# 270

The analysis of results of these options are presented below.

3.1 Option 1 – Modify the Channel Cross Section and Upsize the Culverts

3.1.1 Hydraulic Capacity Assessment

Option 1 would involve upgrading the channel to an impervious ditch liner system such as SmartDitch 24” Depth Trapezoidal and upsizing the culverts as shown in Table 3.3 to improve the entire channel’s capacity. The

impervious ditch liner would solve the existing infiltration issue as well as reduce maintenance and increase the ditch capacity. Prior to each culvert, an inlet structure needs to be installed to improve the hydraulics of the flow. In addition, the existing 525mm HDPE to be replaced with the impervious ditch liner. Table 3.1 shows the Smart Ditch cross section parameters.

Table 3.1 – Oceanview Road Open Channel – Flow Capacity

Channel Depth (m)	Side Slopes (H:V)	Base Width (m)	Bed Slope (%)	n Value (roughness coefficient)
0.762	1:0.926	0.387	Varies	0.0222

The channel capacity varies for each section due to the different channel bed slopes. Table 3.2 shows the capacity of each section with freeboard of 0.3m.

Table 3.2 – Oceanview Road Open Channel – Option 1 Flow Capacity

Station	Bed Slope (%)	Capacity (m^3/s)	Meet 10yr Storm (Y/N)
1+015	21.5	6.30	Y
1+037	9.8	4.47	Y
1+082	10.0	3.71	Y
1+098	6.3	3.43	Y
1+112	8.5	3.71	Y
1+136 (Replaced HDPE)	6.1	3.36	Y
1+223	9.2	4.28	Y
1+274	20.5	6.14	Y
1+282	16.9	5.57	Y
1+337	14.8	5.22	Y
1+375	15.3	5.30	Y
1+429	15.4	5.32	Y

Table 3.3 shows the proposed culvert parameters and capacities.

Table 3.3 – Oceanview Road and Driveways Culverts – Option 1 Flow Capacity

Station/ House No.	Dia. (mm)	Material	L (m)	S (%)	Capacity (m^3/s)	Meet 10yr Storm (Y/N)
1+000	675	Conc.	15	10.1	3.15	Y
1+090	750	Conc.	8	8.75	3.06	Y
1+106 House# 265	750	Conc.	6	5.0	2.94	Y
1+127 House# 215	900	Conc.	9	1.7	2.76	Y
1+200 (Highview Place)	750	Conc.	23	10.9	4.33	Y
1+262 House# 145	675	Conc.	12	11.8	3.39	Y
1+276 House# 135	675	Conc.	6	13.7	3.67	Y
1+324 House# 115 -125	675	Conc.	14	13.3	2.85	Y
1+362 House# 107	675	Conc.	13	13.3	3.61	Y
1+394 House# 105	675	Conc.	5	13.2	3.59	Y
1+465 - 1+615 Creekview Pl. to Harvey Creek Outlet	675	Conc.	150	10.7	3.25	Y

The culvert sizes shown in Table 3.3 are theoretical based on the existing culvert parameters (slope, length, etc.). Should this option be chosen, the sizes, slopes, and lengths of culverts will be reviewed and revised in detailed design. It is best practice to not decrease the size of the storm sewers and culverts downstream from the preceding structure.

3.1.2 Costs

Table 3.4 shows the cost breakdown for Option 1.

Table 3.4 – Cost Estimate – Option 1

Item	Quantity	Unit	Unit Price	Total Price
Driveway Culverts				
675mm Concrete	50	Linear Meter	$950	$47,500
750mm Concrete	6	Linear Meter	$975	$5,850
900mm Concrete	9	Linear Meter	$1,100	$9,900
Roadway Crossing Culverts				
675mm Concrete – Sta. 1+000 to Sta. 1+015 and Sta. 1+465 to Sta. 1+615 (Harvey Creek outlet)	165	Linear Meter	$1,500	$247,500
750mm Concrete - Sta. 1+090 to Sta. 1+098 and Sta. 1+200 to Sta. 1+223	31	Linear Meter	$1,500	$46,500
Inlet Structure	10	Each	$12,000	$120,000
SmartDitch 24” Depth Trapezoidal	354	Linear Meter	$350	$123,900
General; Ditch Cleaning, Mobilization, etc	1	Lump Sum	$10,000	$10,000
Subtotal				$611,150
Contingency		20%		$122,230
Total				**$733,380**

3.2 Option 2 – Divert the Flow through a New Culvert between House# 260 and House# 270

3.2.1 Hydraulic Capacity Assessment

In this option, the 10-year peak flow would be re-routed to Rundle Creek through a proposed 675mm HDPE pipe located between House# 260 and House# 270 as it is shown in Figure B (attached). The existing 450mm culvert crossing Oceanview Road would be removed, and the open channel system would remain in place to facilitate the road drainage. Table 3.5 shows the proposed pipes parameters and capacities.

Table 3.5 – Oceanview Road Pipe – Option 2 Flow Capacity

From/To	Dia. (mm)	Material	L (m)	S (%)	Capacity (m^3/s)	Meet 10yr Storm (Y/N)
HW01 to MH01	675	HDPE	30	8.1	2.82	Y
MH01 to Out	675	HDPE	45	9.6	3.08	Y

This option however does not address the existing concerns related to infiltration of the existing ditch on Oceanview Drive. Likely ditch improvements would still be required should option 2 be chosen. These improvements would include the installation of an impermeable ditch liner such as SmartDitch and improvements to the existing deteriorated culverts.

3.2.2 Challenges and Costs

Option 2 would likely require Geotechnical assessment required to stabilize the excavation required between 260 and 270 Oceanview drive. The 3.0m Right-Of-Way between the lots is limited and already contains an existing abandoned storm pipe and 2 existing live watermains. Construction Considerations as to the replacement of the watermains or protection would also be required during detailed design that would likely include the following

- temporary bypassing of the watermains,
- temporary re-configuring the overall water system to provide service during shut downs and tie ins,
- determining an appropriate revised watermain alignment

Ideal separation between a storm system and watermain is 3.0m, where this is not achievable additional considerations such as alternate pipe materials and concrete encasements may be used to protect the separate utilities. Depending on the actual location of the watermains within this Right-Of-Way and practicality of relocation, property acquisition to fit the watermains and storm mains through this corridor may have to be investigated.

The existing open channel infiltration issue and poor condition of driveway culverts should also be considered.

Table 3.6a shows the cost breakdown for Option 2. This breakdown does not include any upgrades to the existing ditch system on Oceanview Road and should be considered when reviewing the overall costs for this option. While this study does not include details on the required improvements to the Oceanview Road driveway culverts and ditch system for this option it is likely that an impermeable system similar to Option 3 would be required and culvert upgrades of similar size to existing. Table 3.6b details out the additional costs for rehabilitating the Oceanview Ditch that would be recommended as part of this Option.

Table 3.6a – High Level Cost Estimate – Option 2

Item	Quantity	Unit	Unit Price	Total Price
675mm HDPE Pipe	75	Linear Meter	$950	$71,250
Inlet/Outlet Structure	2	Each	$12,000	$24,000
1200mm diameter Manhole	1	Each	$8,000	$8,000
Removal of existing abandoned CSP Pipe (assumed 60m)	1	Lump Sum	$12,000	$12,000
Legal Survey of ROW between 260 and 270	1	Lump Sum	$5,000	$5,000
*General; Geotechnical Consideration for trench wall stabilization between 260 and 270 Oceanview Rd.	1	Lump Sum	$100,000	$100,000
Pre-Condition Survey 260 and 270 Oceanview Rd.	1	Lump Sum	$5,000	$5,000
Protection of Existing Watermain	1	Lump Sum	$20,000	$20,000
Clearing and Preparation of R.O.W.	1	Lump Sum	$30,000	$30,000
Subtotal				$275,250
Contingency		30%**		$82,575
Total				**$357,825**

**A significant grade differential between the 260 and 270 Oceanview Rd. and existing retaining wall would require a geotechnical investigation to review and advise on construction practices. The construction cost could differ depending on the findings of a geotechnical investigation. In addition to this review legal survey would also be required to verify the right-of-way extents. A pre-condition survey of both 260 and 270 should also be conducted to verify pre-construction condition of the homes and confirm that no damage occurred during construction.*

***given the higher uncertainty of installation for this option a higher contingency of 30% is used.*

Table 3.6b – High Level Cost Estimate – Option 2 (Oceanview Road Improvements)

Item	Quantity	Unit	Unit Price	Total Price
SmartDitch 12” Depth Trapezoidal	374	Linear Meter	$285	$100,890
450mm Concrete Culverts	96	Lineal Meter	$550	$52,800
Inlet	9	Each	$12,000	$108,000
Subtotal				$261,690
Contingency		20%		$52,338
Total				**$314,028**
Total Table 3.6a & 3.6b				**$671,853**

3.3 Option 3 - Split the Flow between the Existing System and a New Culvert between House# 260 and House# 270

3.3.1 Hydraulic Capacity Assessment

Option 3 was added by the Village of Lions Bay request on September 25, 2019. This option would involve entering the entire 10-year peak flow through a 675mm HDPE pipe to a 1500mm manhole that splits the flow between the existing system and the new 600mm culvert. Approximately 90% of the 10-year peak flow, 2.4 m^3/s, would be diverted to Rundle Creek through a pipe located between House# 260 and House# 270. The remaining 10% of 10-year peak flow, 0.3 m^3/s, would flow through the existing channel through a reducer to the existing 450mm concrete culvert.

Table 3.7 shows the capacities of the proposed 675mm and 600mm HDPE culverts.

Table 3.7 – Oceanview Road Pipe – Option 3 Flow Capacity

From/To	Dia. (mm)	Material	L (m)	S (%)	Capacity (m^3/s)	Meet 10yr Storm (Y/N)
HW01 to MH01	675	HDPE	2.0	10.1	3.15	Y
MH01 to MH02	600	HDPE	24	10.0	2.29	Y (with overflow)
MH02 to OUT	600	HDPE	46	10.0	2.29	Y (with overflow)

Similar to Option 1 the existing open channel system would be upgraded to an impervious ditch liner system, due to the lower flow being directed down Oceanview Road a smaller product would be required such as SmartDitch 12" Depth Trapezoidal and all the culverts including driveways could be replaced to 450mm concrete culverts to improve the entire channel's capacity and condition. The impervious ditch liner would solve the existing infiltration issue as well as reduce maintenance and increase the ditch capacity. Upstream of each culvert, an inlet structure would be installed to improve the hydraulics of the flow. Option 3 is shown in Figure B1 (attached). Table 3.8 shows the Smart Ditch cross section parameters.

Table 3.8 – Oceanview Road Open Channel – SmartDitch Cross Section Parameters

Channel Depth (m)	Side Slopes (H:V)	Base Width (m)	Bed Slope (%)	n Value (roughness coefficient)
0.41275	1:0.813	0.254	Varies	0.0222

The channel capacity varies for each section due to the different channel bed slopes. Table 3.9 shows the capacity of each section with freeboard of 0.3m.

Table 3.9 – Oceanview Road Open Channel – Option 3 SmartDitch Flow Capacity

Station	Bed Slope (%)	Capacity (m^3/s)	Meet 10yr Storm (Y/N)
1+015	21.5	2.2	Y
1+037	9.8	1.4	Y
1+082	10.0	1.5	Y
1+098	6.3	1.2	Y
1+112	5.25	1.1	Y
1+136 (Replaced HDPE)	6.1	1.2	Y
1+223	9.2	1.5	Y
1+274	20.5	2.2	Y
1+282	16.9	2.0	Y
1+337	14.8	1.9	Y
1+375	15.3	1.9	Y
1+429	15.4	1.9	Y

Table 3.10 shows the proposed culvert parameters and capacities within the existing system.

Table 3.10 – Oceanview Road Culvert – Option 3 Culverts Flow Capacity within the Existing System

Station/ House No.	Dia. (mm)	Material	L (m)	S (%)	Capacity (m^3/s)	Meet 10yr Storm (Y/N)
1+000 (Existing Culvert)	450	Conc.	15	10.1	1.07	Y
1+090	450	Conc.	8	8.75	1.00	Y
1+106 House# 265	450	Conc.	6	5.0	0.75	Y
1+127 House# 215	450	Conc.	9	5.25	0.77	Y
1+200 (Highview Place)	450	Conc.	23	10.9	1.11	Y
1+262 House# 145	450	Conc.	12	11.8	1.30	Y
1+276 House# 135	450	Conc.	6	13.7	1.25	Y
1+324 House# 115 -125	450	Conc.	14	13.3	1.23	Y

Station/ House No.	Dia. (mm)	Material	L (m)	S (%)	Capacity (m^3/s)	Meet 10yr Storm (Y/N)
1+362 House# 107	450	Conc.	13	13.3	1.22	Y
1+394 House# 105	450	Conc.	5	13.2	1.22	Y
1+465 (Existing Culvert)	525	*Corrugated Steel	150	10.7	1.30	Y

**The existing culvert at station 1+465 has capacity in this option to convey the revised flow however this pipe was found to have a corroded inlet. Further investigation should be conducted to confirm the overall condition of this pipe to determine if a replacement is warranted.*

The culvert sizes shown in Table 3.7 and Table 3.10 are theoretical based on the existing conditions and culvert parameters (slope, length, etc.). Should this option be chosen, the sizes, slopes, and lengths of culverts will be reviewed and revised during detailed design.

3.3.2 Challenges and Costs

Similar to Option 2, this option would likely require Geotechnical assessment required to stabilize the excavation required between 260 and 270 Oceanview Road. The 3.0m Right-Of-Way between the lots is limited and already contains an existing abandoned storm pipe and 2 existing live watermains. Construction Considerations as to the replacement of the watermains or protection would also be required during detailed design similar to those of Option 2.

Table 3.11 – High Level Cost Estimate – Option 3

Item	Quantity	Unit	Unit Price	Total Price
750mm HDPE Culvert	2	Linear Meter	$1,500	$3,000
1200mm diameter Manhole	1	Each	$8,000	$8,000
1500mm diameter Manhole	1	Each	$10,000	$10,000
1050mm x 600mm HDPE Eccentric Reducer	1	Each	$15,000	$15,000
750mm x 450mm HDPE Eccentric Reducer	1	Each	$10,000	$10,000
600mm HDPE Culvert	70	Linear Meter	$915	$42,090
450mm Concrete Culverts	96	Linear Meter	$550	$52,800
Inlet/Outlet Structures	13	Each	$12,000	$156,000
SmartDitch 12” Depth Trapezoidal	354	Linear Meter	$285	$100,890
Removal of existing abandoned CSP Pipe (assumed 60m)	1	Lump Sum	$12,000	$12,000
Legal Survey of ROW between 260 and 270	1	Lump Sum	$5,000	$5,000
*General; Geotechnical Consideration for trench wall stabilization between 260 and 270 Oceanview Rd.	1	Lump Sum	$100,000	$100,000
Pre-Condition Survey 260 and 270 Oceanview Rd.	1	Lump Sum	$5,000	$5,000
Protection of Existing Watermain	1	Lump Sum	$20,000	$20,000
Clearing and Preparation of R.O.W.	1	Lump Sum	$30,000	$30,000
Subtotal				$591,740
Contingency		30%		$177,522
Total				**$769,262**

**A significant grade differential between the 260 and 270 Oceanview Rd. and existing retaining wall would require a geotechnical investigation to review and advise on construction practices. The construction cost could differ depending on the findings of a geotechnical investigation. In addition to this review legal survey would also be required to verify the right-of-way extents. A pre-condition survey of both 260 and 270 will be required to verify pre-construction condition of the homes and confirm that no damage occurred during construction.*

***given the higher uncertainty of installation for this option a higher contingency of 30% is used.*

4.0 Conclusion & Closing Remarks

The existing open channel system starting at 450mm concrete culvert at 270 Oceanview Road has inadequate hydraulic capacity to convey the 10-year design flow. The driveway culverts along the system are corrugated steel pipes which are in a poor condition.

ISL has reviewed three options to deal with the channel hydraulic capacity. The first option is to upgrade the open channel sections to an impervious system such as SmartDitch and upsize the culverts to increase their capacity. The second option is to divert the flow through a proposed 675mm pipe between House #260 and #270 to Rundle Creek. This option would still require upgrades to the open channel down Oceanview Road to deal with the infiltration issue. The replacement of existing culverts is recommended as well due to their poor condition. The third option combines Option One and Option Two that splits the flow to Rundle Creek and down Oceanview Road allowing for less impacts to Oceanview Road. The advantages, disadvantages, and the costs for each option are summarized in Table 4.1.

Table 4.1 – Option Comparison

Option No.	Advantages	Disadvantages	Total Cost
1	• Improvements to existing deteriorated culverts • Solves existing ditch infiltration issue	• Removal of pre 2005 drainage course • Larger construction impact to residents	$733,380
2	• Less impact to residents (Smaller Construction footprint) • Reinstates original drainage path (Pre-2005)	• Does not solve existing ditch infiltration issue • Does not improve the condition of driveway culverts • Limited access to the 3.0m R.O.W. between House #260 and #270 • Challenging construction through Reinstating the existing retaining wall between House #260 and #270 • Challenging construction adjacent to existing live watermains	$357,825 (Excluding improvements to the open channel and driveway culverts on Oceanview Rd.) *$671,853 (including improvements to Open Channel and Culverts on Oceanview Rd.)*
3	• Improvements to existing deteriorated culverts • Solves existing ditch infiltration issue • Provides alternate drainage path in the event of a blockage	• Limited access to the 3.0m R.O.W. between House #260 and #270 • Challenging construction through Reinstating the existing retaining wall between House #260 and #270 • Challenging construction adjacent to existing live watermains	$769,262

Options Two and Three utilize an existing R.O.W. between House# 260 & 270 that contains and existing abandoned concrete filled culvert and two watermains. The separation of these conduits is unknown at the time of preparing this memorandum. Should Option Two or Three be chosen it is recommend that a pre-location of these pipes be completed prior to detailed design.

We trust you find this memorandum in accordance with your request. Should you require clarification or further information, please contact ISL at your convenience.

Sincerely,

Andrew Baird, P.Eng.
Senior Project Engineer

Ghazal Shirazian, E.I.T.
Project Engineer

Attachments:
1. Table 1 – Existing Condition of Open Channel and Culverts
2. Figure A – Catchment Plan
3. Figure B & B1 – Stormwater Management Options
4. Figure C – Photo Index Map
5. Site Photos

Table 1 – Existing Condition of Open Channel and Culverts

Sta.	Culvert				Channel Cross section					Comments
	Dia. (mm)	Material	L (m)	S (%)	D (m)	W (m)	Side Slope (H:V)	S (%)	n	
1+000	450	Concrete	15.0	10.1	-	-	-	-	-	Good condition, concrete headwall inlet
1+015	-	-	-	-	0.45	0.9	1:0.8	21.5	0.05	Boulders observed in channel for approx. the first 5m, cobbles and gravel banks including some vegetation thereafter
1+037	-	-	-	-	0.7	0.3	1:0.5	9.8	0.04	Channel consisted of cobbles and gravel banks including some vegetation and trees
1+082	-	-	-	-	0.7	0.4	1:0.8	7.5	0.035	Channel consisted of cobbles and gravel banks including some vegetation and trees
1+090	450	Corrugated Steel	8.0	8.75	-	-	-	-	-	Poor condition, corroded bottom and deformed, debris covered inlet, and outlet not visible due to vegetation cover
1+098	-	-	-	-	0.55	0.5	Rect.	6.3	0.04	Channel consisted of large cobbles and vegetation, banks contained large rocks in some sections and overgrown vegetation causing flow restriction

Sta.	Culvert				Channel Cross section					Comments
	Dia. (mm)	Material	L (m)	S (%)	D (m)	W (m)	Side Slope (H:V)	S (%)	n	
1+106	450	Corrugated Steel	6.0	5.0	-	-	-	-	-	Poor Condition, corroded bottom, inlet was obstructed by large rocks and vegetation, and outlet not visible due to vegetation cover
1+112	-	-	-	-	0.45	0.4	1:0.5	7.4	0.035	Channel consisted of cobbles and overgrown vegetation, over hanging branches observed obstructing the channel
1+127	525	Corrugated HPDE	69.0	5.1	-	-	-	-	-	Inlet not visible due to overhanging branches, installed in 2011 to mitigate infiltration issues
1+196	-	-	-	-	0.9	0.3	1:0.25	11.5	0.05	Channel consisted of cobbles and gravel banks including vegetation growth
1+200	450	Corrugated Steel	23.0	10.9	-	-	-	-	-	Poor Condition, corroded bottom, three vertical grates at the inlet with trapped leaves and sticks, outlet not visible due to vegetation cover
1+223	-	-	-	-	0.3	0.4	Rect.	9.2	0.035	Channel consisted of cobbles, gravel and thick vegetation in some areas, banks contained vegetation, wet

Sta.	Culvert				Channel Cross section					Comments
	Dia. (mm)	Material	L (m)	S (%)	D (m)	W (m)	Side Slope (H:V)	S (%)	n	
										channel, but no presence of flowing water
1+262	450	Corrugated Steel	12.0	11.8	-	-	-	-	-	Poor Condition, corroded bottom, obstructed inlet with small rocks, leaves, and sticks, outlet not visible due to vegetation cover, no presence of water
1+274	-	-	-	-	0.5	0.4	1:0.5	20.5	0.05	Channel consisted of cobbles and vegetation
1+276	450	Corrugated Steel	6.0	13.7	-	-	-	-	-	Poor Condition, corroded bottom, inlet and outlet not visible due to vegetation cover
1+282	-	-	-	-	0.6	0.4	1:0.5	16.9	0.05	Channel consisted of cobbles and gravel, banks including vegetation.
1+324	525	Corrugated Steel	14.0	13.3	-	-	-	-	-	Poor Condition, corroded bottom, misplaced four vertical grates, outlet not visible due to vegetation cover, no presence of water
1+337	-	-	-	-	0.5	0.4	1:0.5	14.8	0.05	Channel consisted of cobbles and vegetation, no presence of water
1+362	525	Corrugated Steel	13.0	13.3	-	-	-	-	-	Poor Condition, corroded bottom, imbedded in the ground at outlet, small rocks, leaves, and sticks at the outlet, no presence of water

Sta.	Culvert				Channel Cross section					Comments
	Dia. (mm)	Material	L (m)	S (%)	D (m)	W (m)	Side Slope (H:V)	S (%)	n	
1+375	-	-	-	-	0.3	0.4	1:0.8	15.3	0.05	Channel consisted of cobbles and vegetation, no presence of water
1+394	450	Corrugated Steel	5.0	13.2	-	-	-	-	-	Poor Condition, corroded bottom, outlet not visible due to vegetation cover, no presence of water
1+429	-	-	-	-	0.5	0.5	1:0.8	15.4	0.05	Channel consisted of cobbles and vegetation, no presence of water
1+465	525	Corrugated Steel	150	10.7						Inlet in poor Condition, corroded bottom, no presence of water
1+615	Outlet to Harvey Creek									

LEGEND

CATCHMENT BOUNDARY

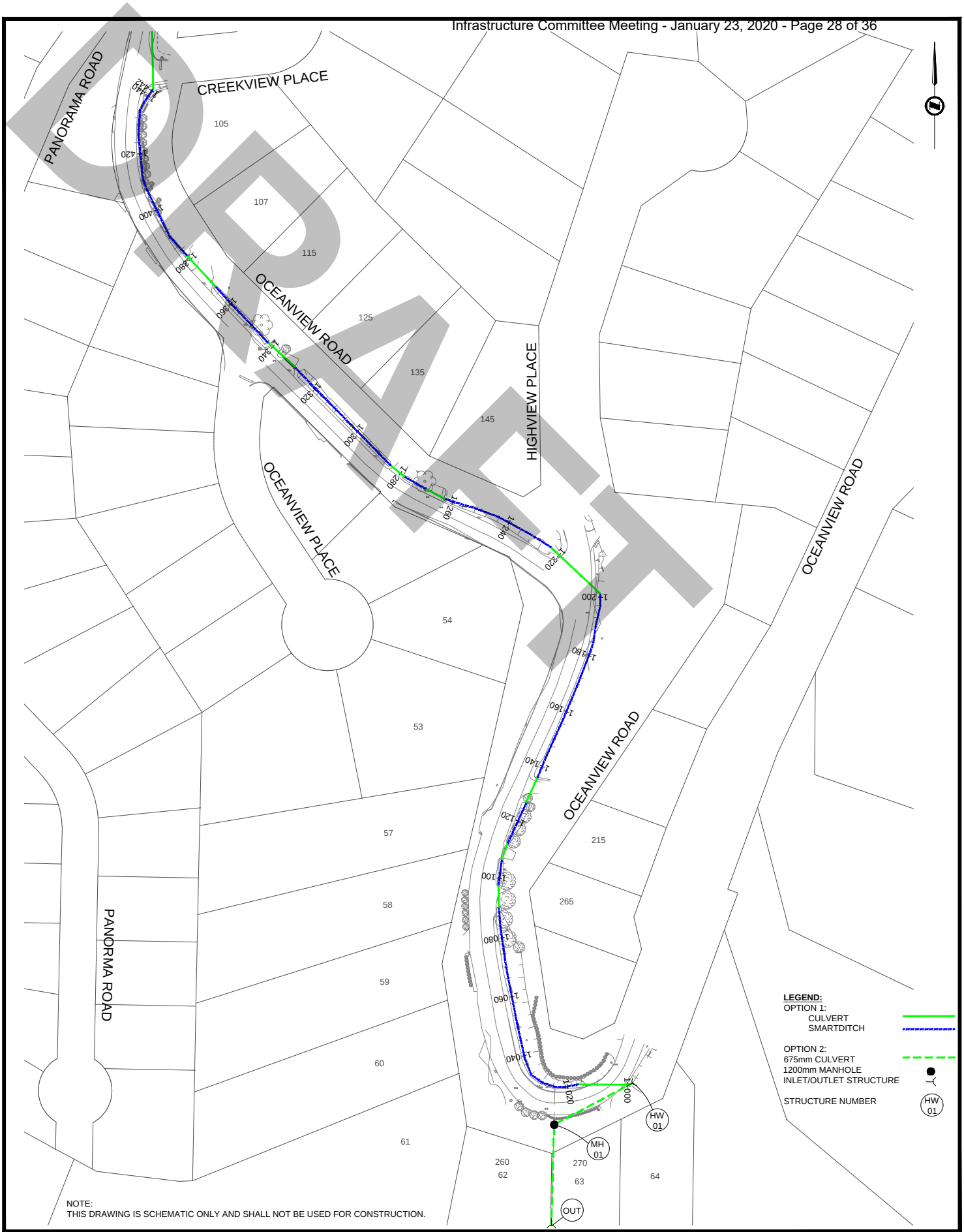
NOTE:
THIS DRAWING IS SCHEMATIC ONLY AND SHALL NOT BE USED FOR CONSTRUCTION.

CATCHMENT PLAN

OCEANVIEW ROAD
VILLAGE OF LIONS BAY

ISL
#503, 4190 Lougheed Hwy, Burnaby, B.C. V5C 6A8
T: (604)629-2696 F: (604)629-2698

SCALE	NTS	DATE	19-09-04	DWG. NO. 1 OF 1
DRAWN BY	EJS	DESIGN BY	GSH	
CHECKED	ATB	APPROVED BY	ATB	
PROJECT NUMBER	32282	DRAWING NUMBER	FIGURE A	REV.



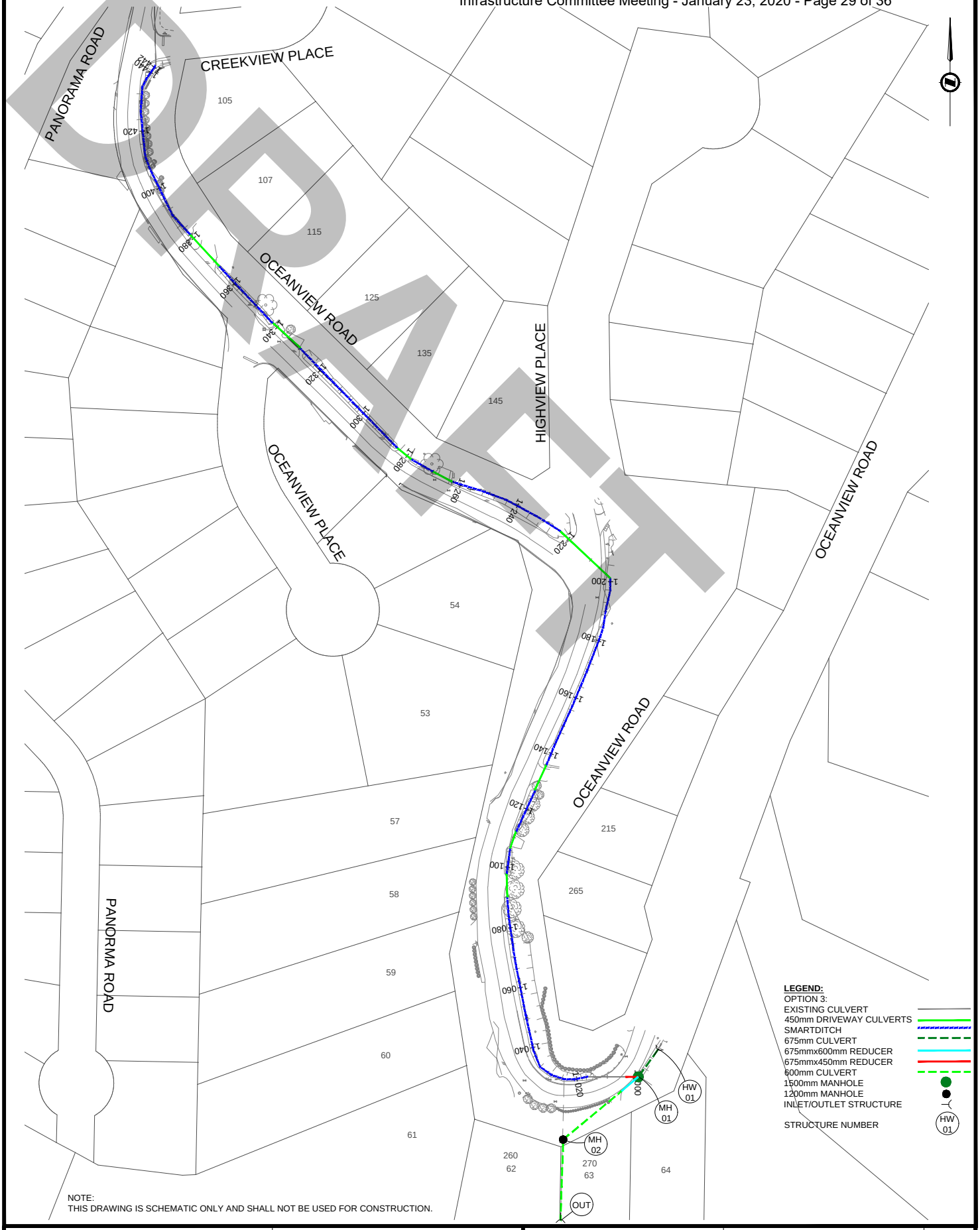
NOTE:
THIS DRAWING IS SCHEMATIC ONLY AND SHALL NOT BE USED FOR CONSTRUCTION.

STORMWATER MANAGEMENT OPTIONS

OCEANVIEW ROAD
VILLAGE OF LIONS BAY

ISL
#503, 4190 Lougheed Hwy, Burnaby, B.C. V5C 6A8
T: (604)629-2696 F: (604)629-2698

SCALE	NTS	DATE	19-08-22	DWG. NO. 1 OF 1
DRAWN BY	GSH	DESIGN BY	GSH	
CHECKED	ATB	APPROVED BY	ATB	
PROJECT NUMBER	32282	DRAWING NUMBER	FIGURE B	REV.



NOTE:
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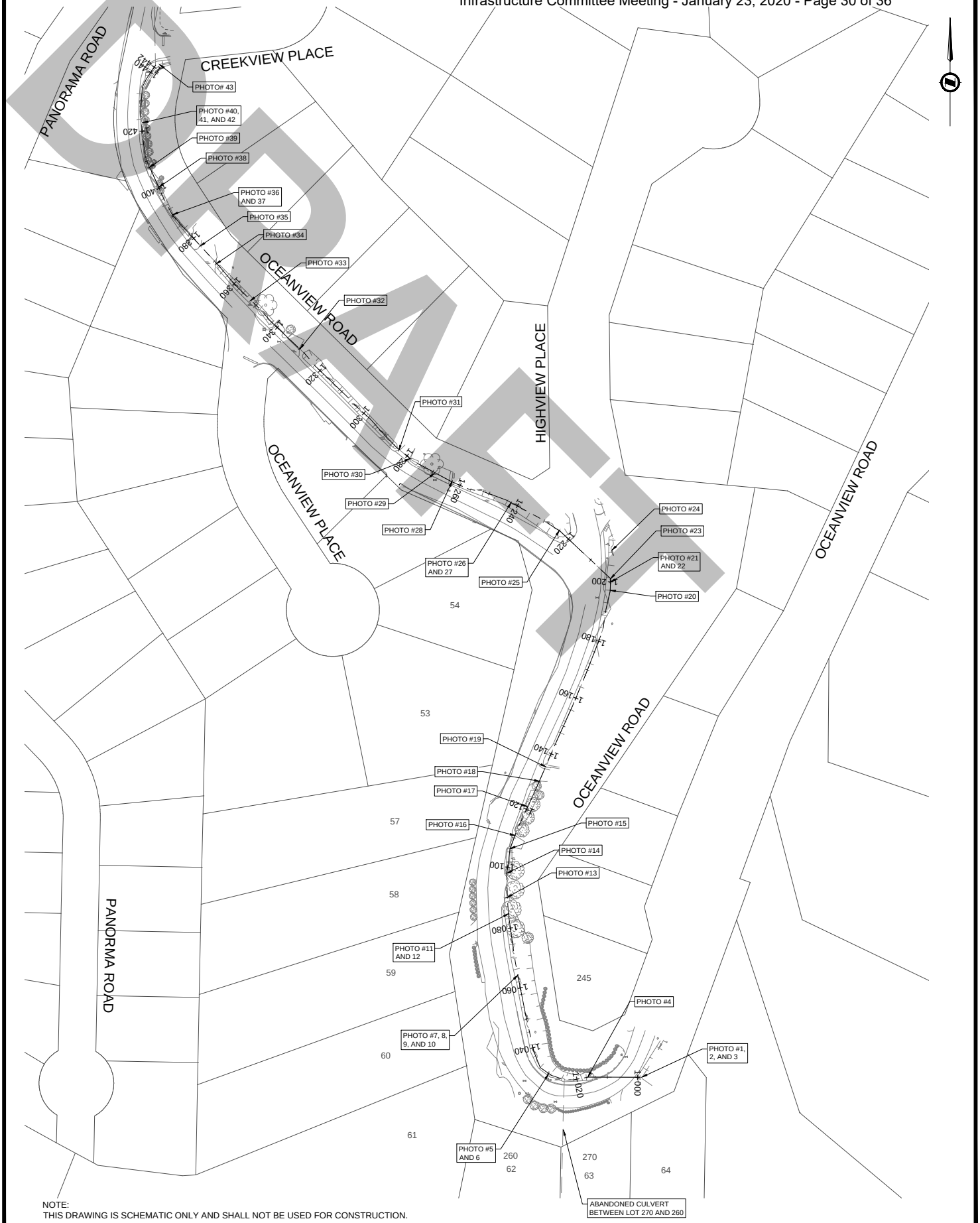
STORMWATER MANAGEMENT OPTION 3

OCEANVIEW ROAD
VILLAGE OF LIONS BAY

ISL
#503, 4190 Lougheed Hwy, Burnaby, B.C. V5C 6A8
T: (604)629-2696 F: (604)629-2698

SCALE	NTS	DATE	19-10-11	DWG. NO. 2 OF 2
DRAWN BY	GSH	DESIGN BY	GSH	
CHECKED	ATB	APPROVED BY	ATB	
PROJECT NUMBER	32282	DRAWING NUMBER	FIGURE B1	REV.



NOTE:
THIS DRAWING IS SCHEMATIC ONLY AND SHALL NOT BE USED FOR CONSTRUCTION.

PHOTO INDEX MAP

OCEANVIEW ROAD
VILLAGE OF LIONS BAY

ISL
#503, 4190 Lougheed Hwy, Burnaby, B.C. V5C 6A8
T: (604)629-2696 F: (604)629-2698

SCALE	NTS	DATE	19-08-22	DWG. NO.
DRAWN BY	GSH	DESIGN BY	GSH	1 OF 1
CHECKED	ATB	APPROVED BY	ATB	
PROJECT NUMBER	32282	DRAWING NUMBER	FIGURE C	REV.

Photo #1

Photo #2

Photo #3

Photo #4

Photo #5

Photo #6

Photo #7

Photo #8

Photo #9

Photo #10

Photo #11

Photo #12

Photo #13

Photo #14

Photo #15

Photo #16

Photo #17

Photo #18

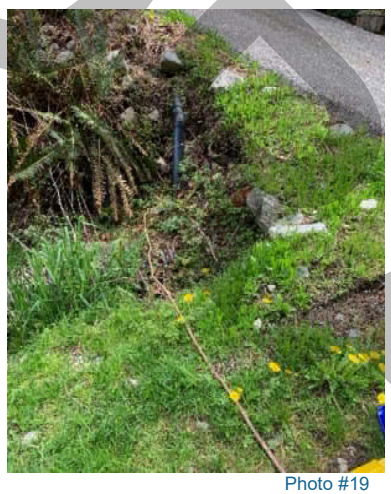


Photo #19


Photo #20


Photo #21


Photo #22


Photo #23


Photo #24


Photo #25


Photo #26


Photo #27

Photo #28

Photo #29

Photo #30

Photo #31

Photo #32

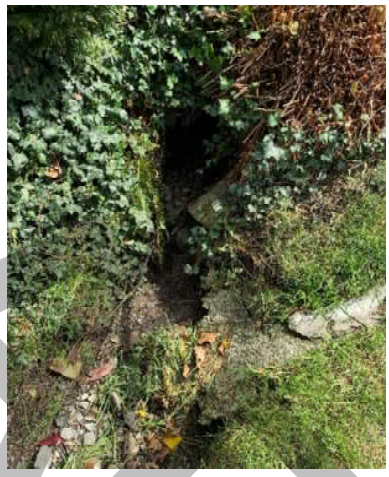
Photo #33

Photo #34

Photo #35

Photo #36


Photo #37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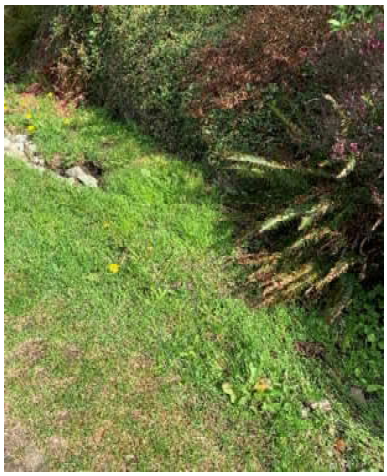
Photo #40


Photo #41


Photo #42


Photo #43


Outlet to Harvey Creek


Outlet to Harvey Creek