Seabed Pipeline Route for Clover Point Forcemain

Report Context

The CRD has been planning wastewater treatment for the Core Area for over 30 years. During this time a significant number of reports have been prepared and/or reviewed to assess options and provide information to further planning.

In May 2016 a Project Board was established to define and implement wastewater treatment for the Core Area. The Project Board heard delegations and presentations from the public, industry professionals, and a CRD Director. The Project Board Chair and Vice Chair also met with staff from the CRD, all of the Core Area municipalities, and with Esquimalt and Songhees Nations representatives. The Project Board reviewed the previous technical work and extensive public commentary and developed a methodology to review and evaluate all options. This methodology included evaluation of a large number of options to identify a short list that best addressed the Project goals.

In September 2016 the Project Board presented its recommendation for wastewater treatment and on September 14, 2016 the CRD Board approved the Wastewater Treatment Project (the Project).

A significant number of the reports that have been prepared and/or reviewed still serve as useful background information, but not all of the reports are applicable to the Project. To respond to several recent public inquiries regarding topics of interest, the CRD has prepared a synopsis of reports along with a summary of the applicability of the report to the Project. The document summary is available here: https://www.crd.bc.ca/docs/default-source/wastewater-planning-2014/2017-05-30-summary-of-documents-related-to-topics-of-interest.pdf. The document summary does not provide a comprehensive list of reports completed as part of wastewater treatment planning for the Core Area, it is a compilation of a number of reports related to key topics of interest: odour; seabed pipeline; bluffs and shoreline; geotechnical; and noise.

Purpose of this Report

This technical memo was prepared to assess the feasibility of a seabed pipeline from Clover Point to McLoughlin Point as an alternative to the forcemain that will be constructed along Dallas Road from the Clover Point Pump Station to Ogden Point (the Clover Point Forcemain) as part of the Project. This memo was prepared to respond to a March 3, 2107 letter from John Gunton regarding a seabed pipeline concept proposal. The memo outined a number of concerns for a seabed pipeline option, including permitting, anchoring from wave action, protection from anchor damage, repair and maintenance concerns and cost. Furthermore, the seabed option would present challenges to completion by December 31, 2020 and would require a Canadian Environmental Assessment Agency (CEAA) review.

Applicability to Project

This memo was prepared for the Project and remains applicable.

Memo to: Jane Bird
Chair, Core Area Wastewater Treatment Project Board

From: Dave Clancy
Project Director, Wastewater Treatment Project

Date: March 13, 2017

Please find attached a technical memo developed by Stantec Consulting Ltd, which responds to a seabed proposal route for the Clover Point Forcemain.

For its review of the seabed proposal, Stantec engaged experts with backgrounds in environmental permitting, geological terrain analysis, marine pipeline engineering, geotechnical engineering and civil engineering. The memo summarizes the collective professional opinion of Stantec's consulting engineers that a seabed pipeline will present long term maintenance and access issues and would be significantly more costly than the land based option under the current program.

Stantec Consulting Ltd.
13401 108 Avenue, 10th Floor, Surrey BC V3T 5T3

March 13, 2017
File: 111700431

Attention: Dave Clancy, Project Director

Capital Regional District
510 – 1675 Douglas Street
Victoria , British Columbia

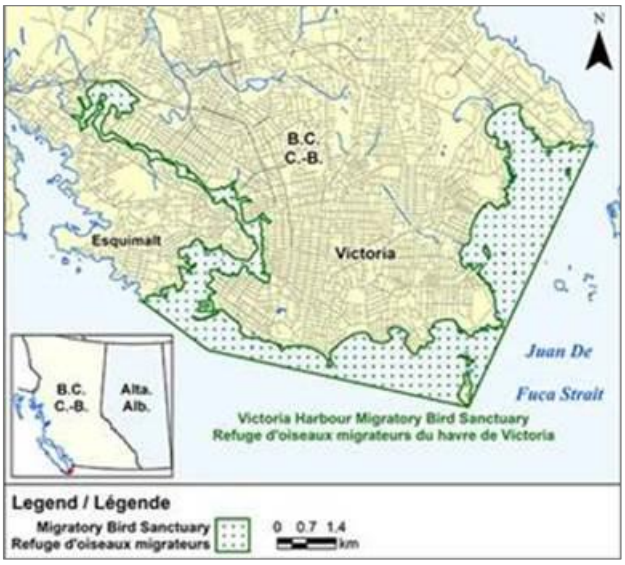
Dear Dave:

Reference: Seabed Pipeline Route for Clover Forcemain – John Gunton, BSc., Ph.D
Letter of March 3, 2017

Stantec was engaged in the review of Mr. Gunton's original proposal and provided feedback which formed the basis of your March 3rd 2017 reply.

We have further reviewed the March 3rd, 2017 letter prepared by John Gunton. Mr. Gunton has raised a number of points in his submission. We have reviewed each of Mr. Gunton's assertions and have engaged the necessary experts to address the noted concerns. These experts have included professionals with backgrounds in environmental permitting, geological terrain analysis, marine pipeline engineering, geotechnical engineering and civil engineering. Our response to each of the items noted in Mr. Gunton's letter is provided below.

1. **Permitting** – The Stage 1 EIS that Mr. Gunton references applies to outfalls which discharge effluent not a seabed pipeline. A seabed pipeline proposal would require completion of an Environmental Impact Assessment which could take 18- 24 months to complete. The proposal would likely trigger a Canadian Environmental Assessment Agency (CEAA) review which involves conducting studies and in-depth assessment, usually reserved for large scale projects having the potential for significant adverse environmental effects. The conceptual seabed route suggested by Mr. Gunton would be entirely within the migratory bird sanctuary that was established in 1923 under the federal Migratory Bird Convention Act. It is 1841 ha in size (31.03 ha terrestrial, and



Reference: Seabed Pipeline Route for Clover Forcemain – John Gunton, BSc., Ph.D
Letter of March 3, 2017

1809.97 ha marine). Obtaining approval from regulatory authorities would present some challenges and detailed studies and assessment of environmental effects resulting from construction and operation of the pipeline would be required.

The installation of a seabed pipeline through the marine environment would result in environmental impacts through a variety of potential effects, including changes in water quality, harm to fish and impacts to fish habitat. As an example, eelgrass is considered fish habitat and is therefore protected from harmful alteration, disruption and destruction (HADD) unless authorized under Section 35 of the Fisheries Act. The conceptual seabed route could potentially impact eelgrass beds and would need to be approved by the Department of Fisheries and Oceans.

Permitting of a seabed pipeline option would be a significant effort and even after the completion of an Environmental Impact Assessment there is no guarantee that regulatory authorities would approve such a proposal.

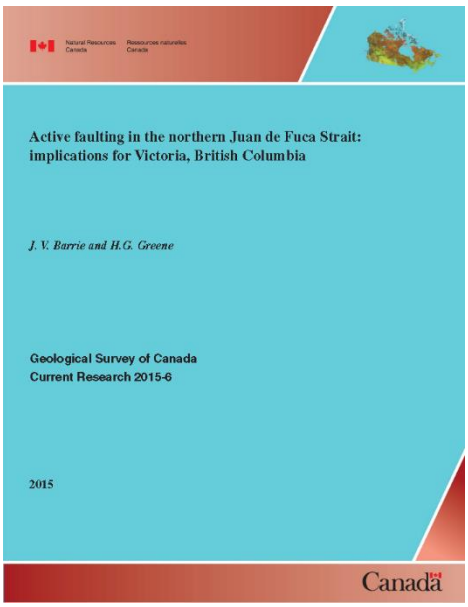
2. **Protection from Wave Action** – Mr. Gunton dismisses the possibility of wave length and resulting wave forces from ever reaching a depth of 60 metres. However, 4m high, 7s period waves have been measured in the Juan de Fuca straight which results in a wave length of 90 m. It is not inconceivable that the pipeline would have to be designed to withstand wave forces that would have to be mitigated even at deeper pipeline installation depths. Evidence of concern for significant wave forces can be seen in the design of the existing Clover Point outfall which is fully rip rapped and armoured from the shoreline to the terminus.

   Construction of a long pipeline parallel to the shoreline in strong currents could be challenging and controlling the installation would present some challenges and would require large barge mounted cranes and tugs. Although these concerns can be mitigated, the installation of such a pipeline on a curvilinear alignment would have significant construction and technical challenges and is not merely a 'float and sink" operation as Mr. Gunton suggests. The seabed pipeline would likely have to be anchored and protected from wave forces, similar to what was done to mitigate similar impacts on the Clover Point outfall.

Reference: Seabed Pipeline Route for Clover Forcemain – John Gunton, BSc., Ph.D
Letter of March 3, 2017

3. **Ship Anchors** – The discussion about anchoring and piloting large vessels does not acknowledge "emergency power failure" and only addresses normal controlled vessel maneuvering and docking. In an emergency an anchor can be deployed anywhere at any time. Deployment of anchors by other vessels using the Victoria Harbour is also a concern and cannot be summarily dismissed. It should be noted that the friction from the anchor shackles is the main stopping force for a ship or large marine vessel, not the anchor itself. These shackles are dropped over a long length increasing the probability of traversing a marine pipeline buried in a shallow trench. The weight of these shackles is significant and would likely cause significant stress on a marine pipeline adding further risk to potential rupture or damage. At the low point in the pipeline, a break in the pipeline in the Victoria Harbour would result in the release of significant volumes of raw sewage directly into Victoria Harbour and the nearshore environment.

4. **Location of Fault Line** – The known fault line that is referenced offshore from Victoria comes from a 2015 Geological Survey of Canada report by J.V. Barrie and H.G. Green titled Active faulting in the northern Juan de Fuca Strait: implications for Victoria, British Columbia (GSC Current Research 2015-6). The authors used multi-beam echo sounder swath (MBES) bathymetry to produce high-resolution sub-bottom profiles to identify a main strand, primary, and secondary (conjugate) faults of the Devil's Mountain Fault Zone. Core samples were also taken and analyzed.



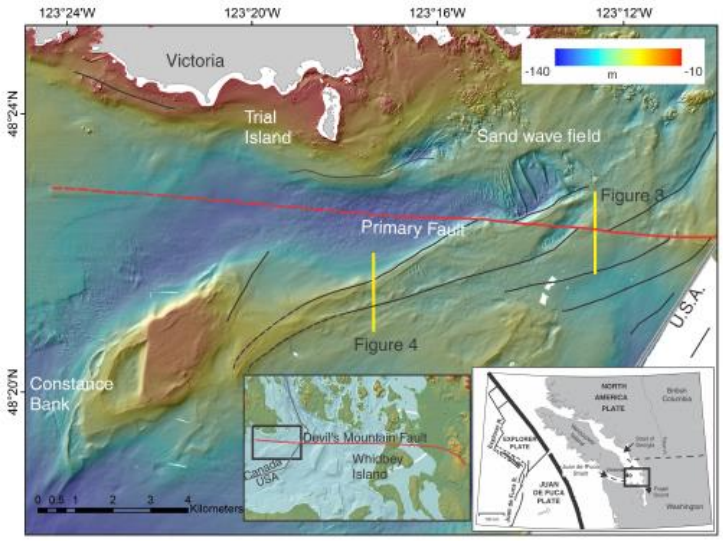


Figure 1. Multibeam swath bathymetry image of northern Strait of Juan de Fuca adjacent to the city of Victoria, showing mapped active faults of the DMFZ. Locations of Figures 3 and 4 are shown.

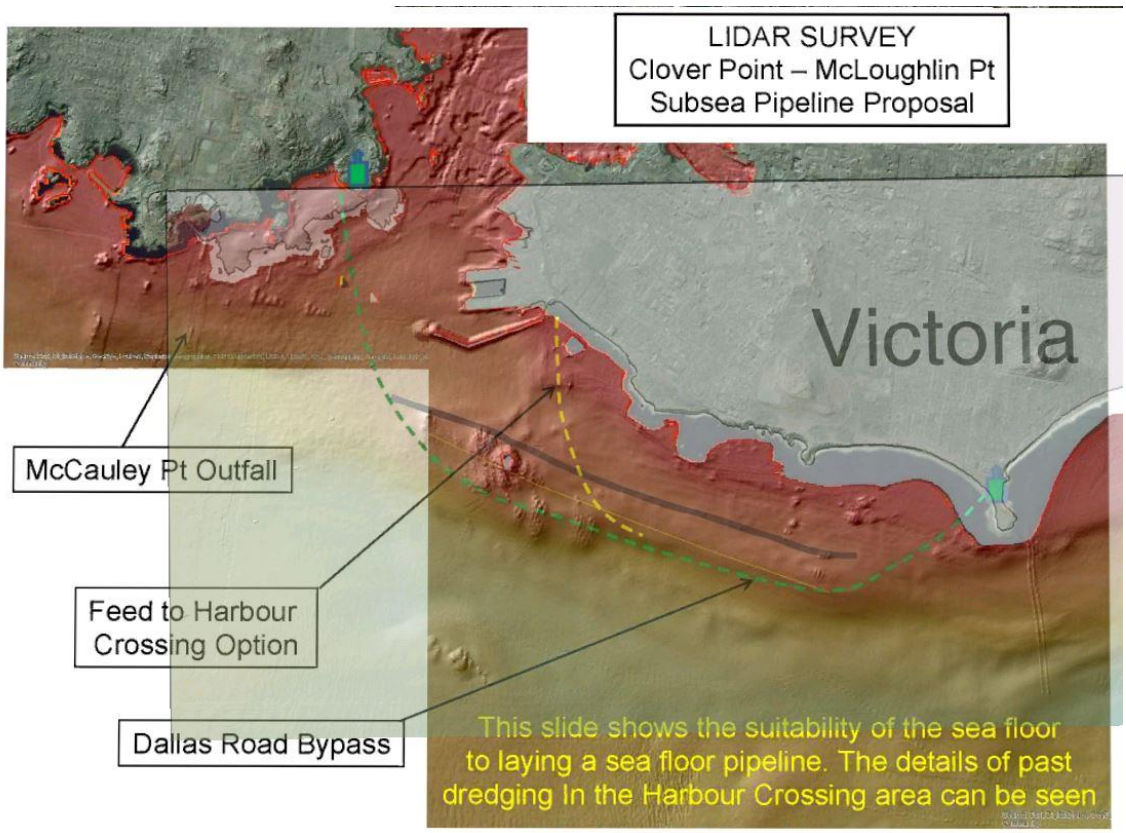
Reference: Seabed Pipeline Route for Clover Forcemain – John Gunton, BSc., Ph.D
Letter of March 3, 2017

The mapped active faults are shown in Figure 1 (above) and their methods are described in the GSC 2015 report along with the authors' results of the detailed survey work near Victoria.

As an aside, the GSC 2015 report comments on trench evidence across the Utsalady Point fault near Whidbey Island (50 km east of Victoria) of about 95 to 150 cm of vertical displacement in glaciomarine drift from at least one or probably two late Holocene earthquakes (possibly 100 to 400 calendar years before present). If a similar displacement were to occur across a fault along the proposed seabed pipeline route it is possible that damage could occur to the pipeline.

The GSC 2015 report does state that further survey data are required to map the western extent of the DMFZ directly offshore of Victoria and Esquimalt.

Finally, an approximate overlay (below) of Mr. Gunton's seabed pipeline alignment is presented with the GSC fault mapping.



Reference: Seabed Pipeline Route for Clover Forcemain – John Gunton, BSc., Ph.D
Letter of March 3, 2017

The figure above shows that the proposed yellow line seabed pipeline alignment appears to cross the secondary fault identified by the GSC 2015 report and the green pipeline alignment is also very close to the fault.

5. **Repair and Maintenance** – Repair and maintenance of a marine seabed pipeline is significantly more complicated than a land based pipeline which is easily accessible by conventional construction equipment. The CRD also has extensive experience with repair and maintenance of land based utilities.

   The currents in the area of the proposed seabed pipeline are significant. Mobilization of barges and equipment to complete such a repair would take some time because specialized marine contractors with the necessary equipment must be contracted to complete this work.

   Mr. Gunton has indicated that a break in a seabed pipeline is no different than discharge of untreated wastewater from the Clover Point and Macaulay Point outfalls. A break in the proposed marine pipeline is very different than the discharge of wastewater through the outfalls at Clover Point and Macaulay Point. The Clover Point and Macaulay Point outfalls have diffusers which are designed to disperse and mix the effluent into the marine environment 1.6 kilometres off shore at a depth of 60 metres. A break in the marine pipeline proposed by Mr. Gunton would cause a significant sewage spill that would impact the foreshore and elevate fecal coliform counts.

   Maintenance and repair of marine or shoreline pipelines is a real issue and there are many examples where the maintenance and repair of marine pipelines has been a major issue for communities on Vancouver Island. The Comox Valley Regional District, the Regional District of Nanaimo and the District of Campbell River have experienced operational and maintenance issues with existing marine shoreline pipelines. For reference we refer you to the following website which provides a presentation of issues faced by the Comox Valley Regional District with a foreshore pipeline;
   http://www.comoxvalleyrd.ca/assets/Department/Documents/Risk_Analysis_of_CVRD_Forcemain_on_Balmoral_Beach_presentation.pdf

   While each circumstance needs to be evaluated on its own merits. This presentation speaks to the major issues which can be encountered with a foreshore seabed pipeline.

6. **Cost Implications of a Seabed Pipeline Option** – It is well recognized in the construction industry that marine pipelines are more expensive to construct than land based pipelines. This is simply demonstrated by the equipment, manpower and level of effort required for each

Reference: Seabed Pipeline Route for Clover Forcemain – John Gunton, BSc., Ph.D Letter of March 3, 2017

construction method. A marine pipeline installation requires barges to carry and operate equipment such as cranes, excavating clamshells or dredging equipment and more extensive environmental protection and mitigation measures.

Based on our high-level estimate of the capital costs we are confident that Mr. Gunton's sea bed pipeline proposal would be more expensive to construct and maintain than the land-based option approved by the CRD Board as part of the Core Area Wastewater Treatment Project.

Conclusion

The installation of a seabed pipeline through the marine environment will result in environmental impacts through a variety of potential effects, including changes in water quality, harm to fish and change in fish habitat. This along with the fact that the proposed route is within a Federal migratory bird sanctuary will likely trigger a CEAA review. The permitting requirements for a seabed pipeline option are significant and would likely extend completion of the Core Area Wastewater Treatment Project well beyond the December 31, 2020 regulatory deadline.

The construction of a seabed pipeline would pose significant technical challenges to ensure the integrity of the pipeline is maintained for the life of the pipeline. In addition recent experience at a number of locations on Vancouver Island with similar installations has presented significant maintenance and pipeline integrity issues.

Our professional opinion is that even if we were successful in obtaining the required permits we could not maintain the project schedule. In addition, a seabed pipeline will present long term maintenance and access issues and would be significantly costlier than the land-based option under the current program.

Regards,

STANTEC CONSULTING LTD.

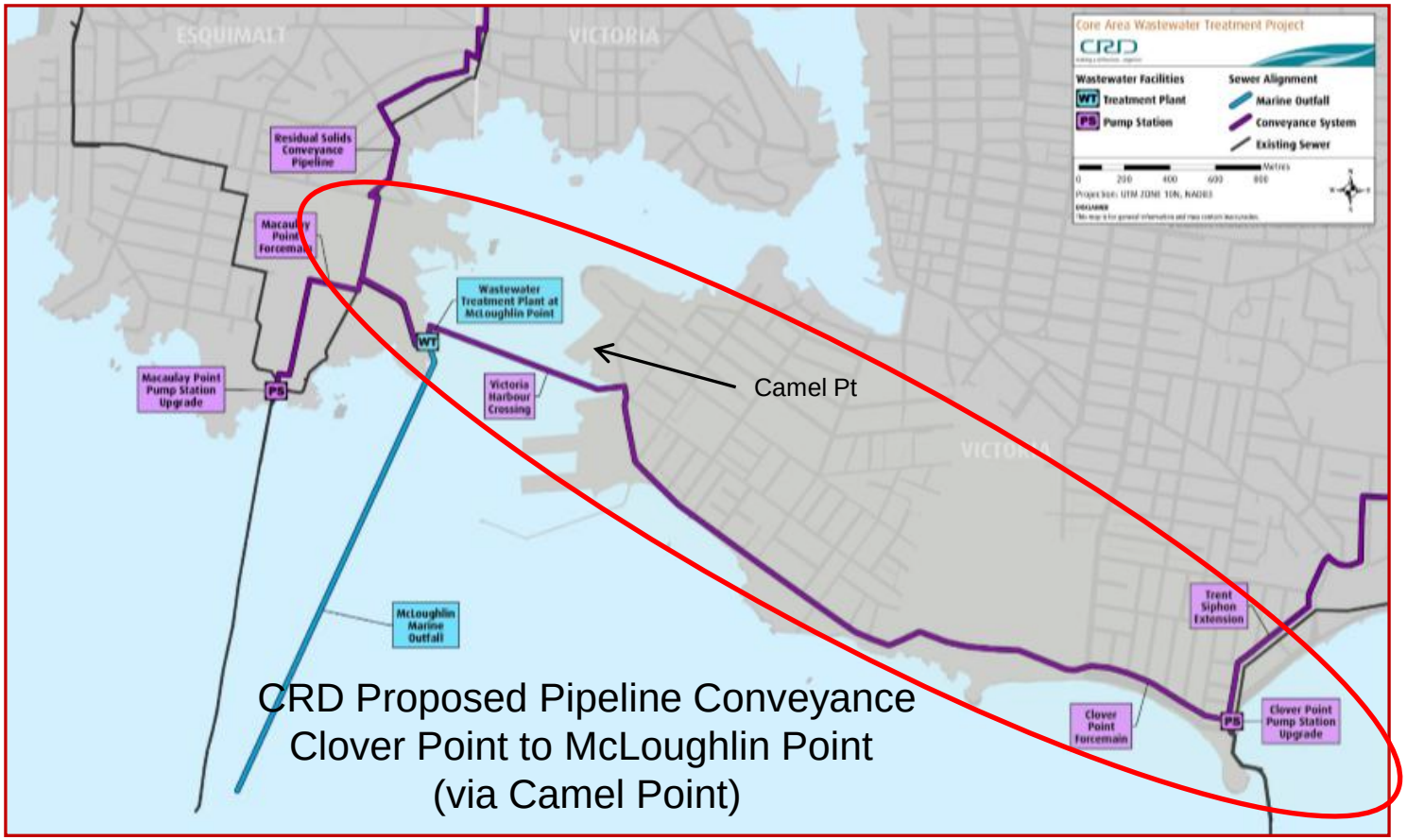
Reno Fiorante, P.Eng., PE
Senior Vice President, Water
Phone: (604) 587-8402
Fax: (604) 587-8489
reno.fiorante@stantec.com

CLOVER PT TO MCLOUGHLIN PT CONVEYANCE – AN ALTERNATIVE PROPOSAL

John Gunton B.Sc, Ph.D. (Geology)

Current CRD Proposal (February 2017)

1. Trench and lay 1.2 m OD of steel pipe 3.4 km from Clover Pt to Camel Pt.
   - Cost ???
   - Timing ???
2. Drill and ream a tunnel to accommodate 1.2m OD steel pipe 1 km from Camel Pt to McLoughlin Pt.
   - Cost ???
   - Timing 12 months



4 CONCERNS with CRD Proposal

COST

- Estimated saving of 75% using HDPE pipe vs STEEL
- Installation costs excessive due to drilling required & other engineering

SAFETY

- Geotechnical concern on the stability of the Dallas Cliffs and Sea Wall
- Heavy equipment and truck movements
- Noise and dust during construction including 12 months of drilling
- Vulnerable to rupture following predicted seismic events

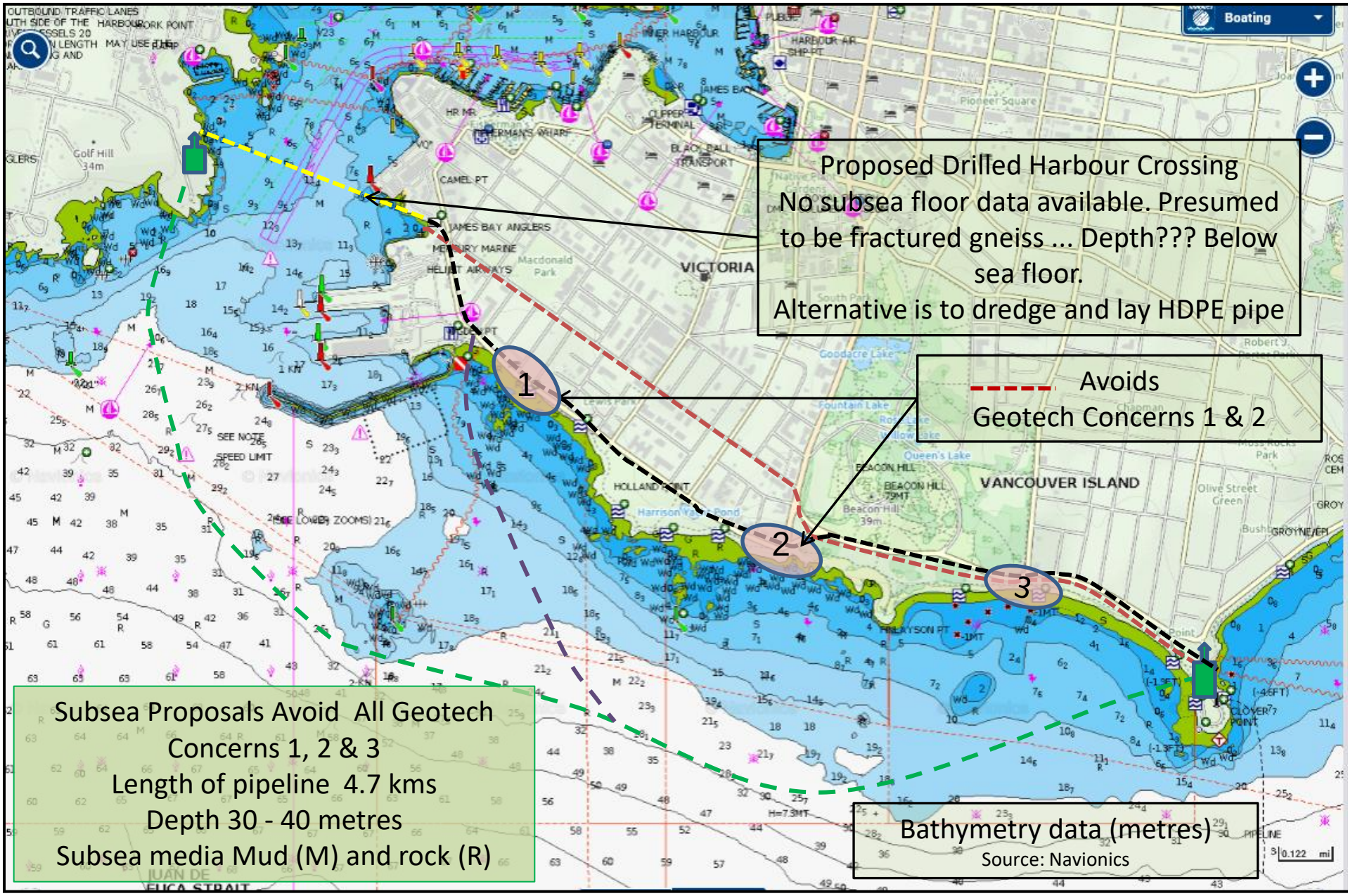
ENVIRONMENTAL

- Victoria Harbour Migratory Bird Sanctuary disturbance of the backshore

COMMUNITY DISRUPTION during construction

- Lengthy access restrictions to Niagara St & Dallas Rd residents
- Restrictions on current pathway users
- Cruise ship passengers inconvenienced

Conveyance Options - Clover Point to McLoughlin Point



Dr. Gunton, Seabed Proposal, 02/08/2017

Recommendation to consider a SUBSEA PIPELINE OPTION

Assures all stakeholders that the team is managing the project in a consultative, fiduciary responsible manner with safety and environmental protection in mind. The recommendation to evaluate **subsea pipeline options** is aimed to either minimize Dallas Road impacts or completely eliminate them. Bypassing Dallas Road should:

- Lower costs & expedite the construction of the pipeline
- Increase safety by avoiding on land construction
- Enhance protection of the environment by minimizing future problems of premature cliff erosion & by avoiding the Migratory Bird Sanctuary.
- Eliminate disruption to the James Bay Community and tourists.

1. Determine the **feasibility**, (costs and timing) of using HDPE pipe and laying the pipe using a shallow water barge for:
   a) Clover Pt – McLoughlin Pt direct offshore route
   b) Camel Pt – McLoughlin Pt Harbour Crossing in dredged sea floor trench.

   A simple conversation and discussion of the design proposals presented here should provide answers within days.

   Contact: Corix Water Products, Victoria, 250-475-0055 (Don Davis)
   Makai Ocean Engineering, Honolulu, 808-259-8871
   Sclairpipe – KWH, Surrey, 604-574-7473
2. Identify **permitting** requirements to proceed with subsea pipeline installation for both 1a and 1b
   a) Laying HDPE pipe directly on the sea bed with concrete ballast collars is benign as demonstrated worldwide
   b) The pipeline shoreface engineering design for the crossing at McLoughin Pt is already approved
   c) Dredging (if required) in the vicinity of the harbour is commonplace.

   A road map of the permitting required could be identified within days.

A decision should be made by the end of February to proceed with a subsea pipeline option or not based on the findings of the recommended actions above. This decision should be made taking into consideration:

a) the break-fee for the let contract to drill the harbour crossing which will no longer be required, and
b) the cost of completing the Dallas Road onshore route currently in the project plan.

ADDITIONAL SLIDES

TO SUPPORT PRESENTATION TO CRD, FEBRUARY 8, 2017

A potential solution to convey wastewater from Clover Point to McLoughlin Point is to place a pipeline offshore.

A SUBSEA Pipeline Proposal – The SUBSTANTIAL BENEFITS

- Cause only minimal disturbance of the shoreline
  - ✓at entry - Clover Point (note existing outfall)
  - ✓and egress - McLoughlin Point (note new outfall crossing approved)
- Zero disruption during construction and emplacement
- Potentially lower cost than onshore.
- Minimizes environmental impact.
  - ✓The pipeline traverses under water at a depth of 30-40 metres thereby avoiding any impact on the shoreline Migratory Bird Sanctuary. No trees, bushes or grasses disturbed or removed
- Sea floor 30 - 40 m bathymetry contour (diver accessible) along the route is favourable.
- Sea floor composition at depth is favourable. (mud & occasional rock)
- Use HDPE pipe: flexible, cost effective, rapid installation, no cathodic protection required, it has been used in numerous wastewater and outfall applications for the past 35 years - its lifetime is believed to be extremely long, and it doesn't suffer from potential corrosion problems that steel pipe has to endure (whether buried in the earth, or submerged in seawater).
- Sea floor pipeline installations have had no negative impacts on marine life. Based on worldwide experience, HDPE pipe has benefits of creating artifical reef habitat. Sea floor stability is greater than onshore in the event of seismic tremors
- Avoids need for expensive, disruptive Harbour Crossing Drilling: Note, if the break-fee for the drilling contract is prohibitive, 2 further options to by-pass Dallas Road are:
  1. Use offshore route to Ogden Point Breakwater at Dallas (see map purple line), or
  2. Use Niagara Street (see map red line)
- Sea floor pipe laying technology is well understood and commonly practiced:
  - ✓pipe is laid from a shallow water barge with zero environmental impact
  - ✓duration of the laying is weeks and not months
  - ✓existing approved landing can be used at McLoughlin Point

Two Key Risks to the Dallas Road Shoreline caused by Current CRD Proposal

GEOTECHNICAL RISK:

There are 3 zones of geotechnical concern along the proposed Dallas Road Pipeline Corridor: (for detail see appropriate illustrative slide)

Zone 1 – Oswego-Boyd Sea Wall

Zone 2 – Dallas Douglas Corner

Zone 3 – Dallas – Cook Intersection

Slope stability engineering principles are clear on the impact of loading or unloading on the upside of a slope comprising unconsolidated material as will be required in the installation of a pipeline connecting Clover Point with Camel Point.

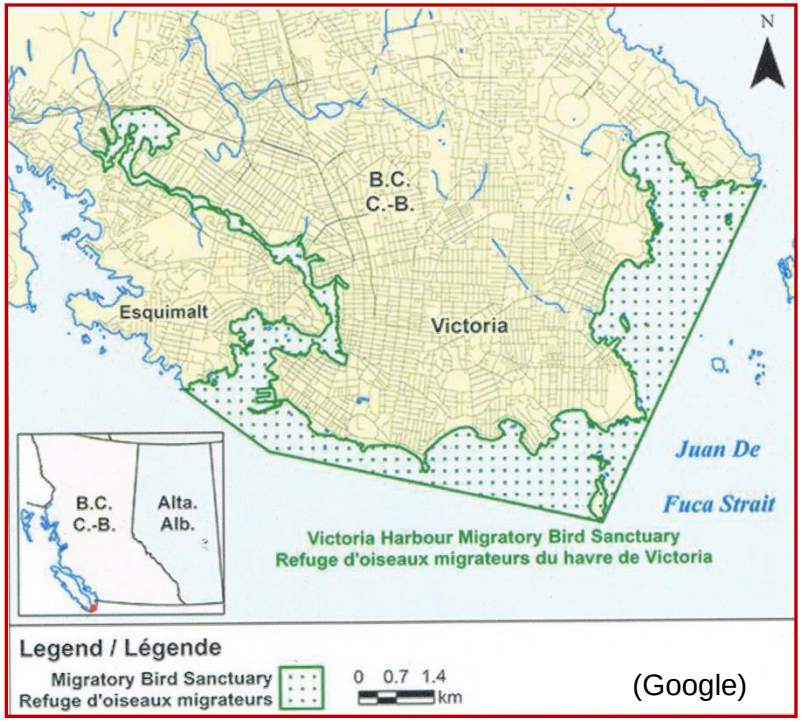
•Geotechnical observations (JG & colleague Tom Gallagher) made from transits plus BCGS mapping reveal the unconsolidated section of glacial till resting on a wave cut platform, noting incipient fracturing on cliff tops, slumps and sea wall erosion and undercutting (constantly under repair!). This section of coastline is dominantly subject to destructive wave action (by geomorphological definition) and as a result the shoreline is receding in an unstoppable fashion (unless extreme armouring).

•Capital Regional District "Coastal Sea Level Rise Risk Assessment", Jan 15 *Aecom* Estimated Extreme High Tides of 2.8 m (existing) to 3.25m (forecast 2050) & vulnerability to modest tsunami wave impacts.

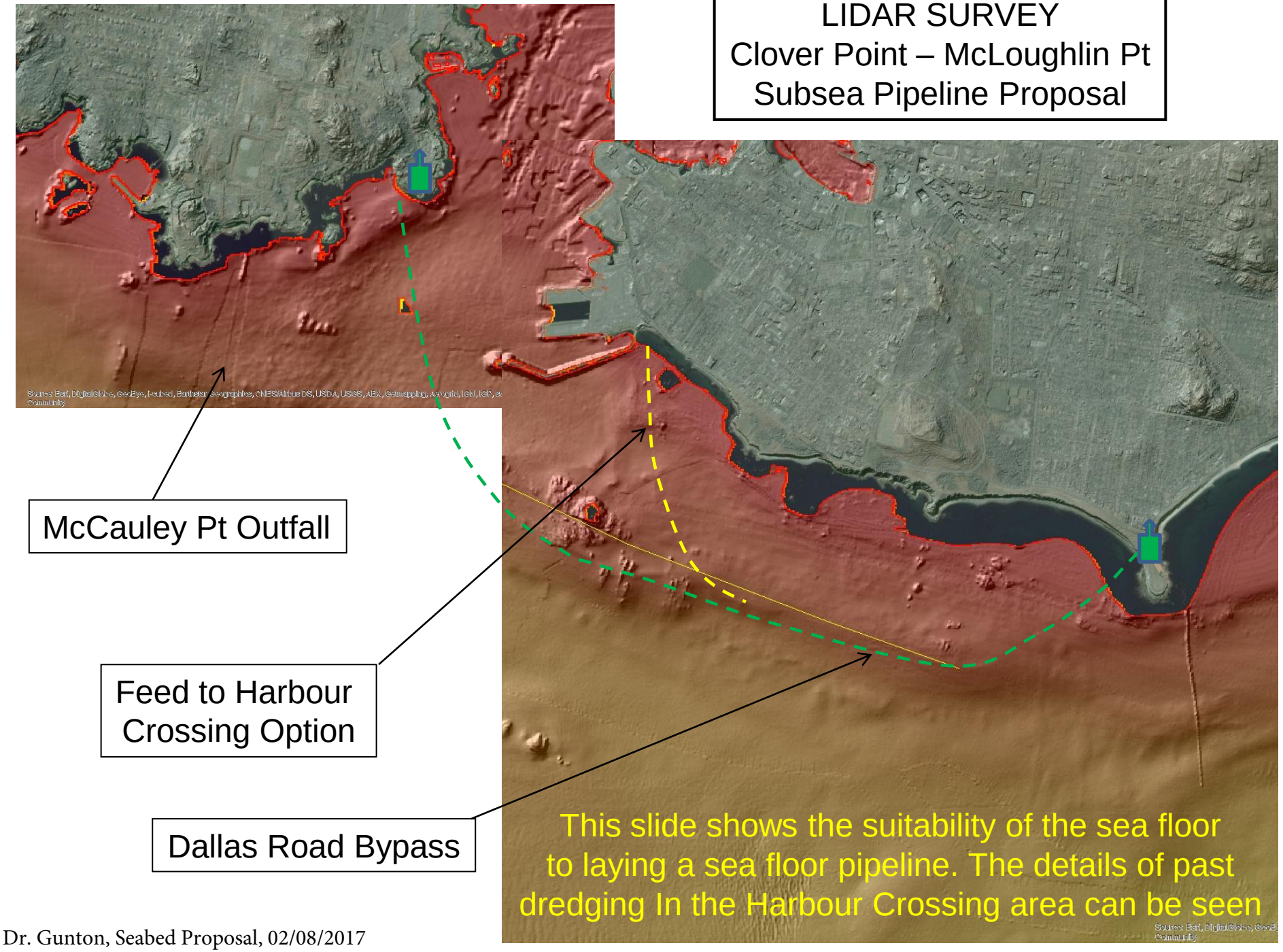
•BCG Geoscience Maps 2000-1 and 2000-2, Sections subject to high liquefaction and moderate to high amplification in the event of a seismic event and damaging earth tremors. (See appropriate illustrative slides)

RIPARIAN ZONE VEGETATION &BIRD LIFE RISKS

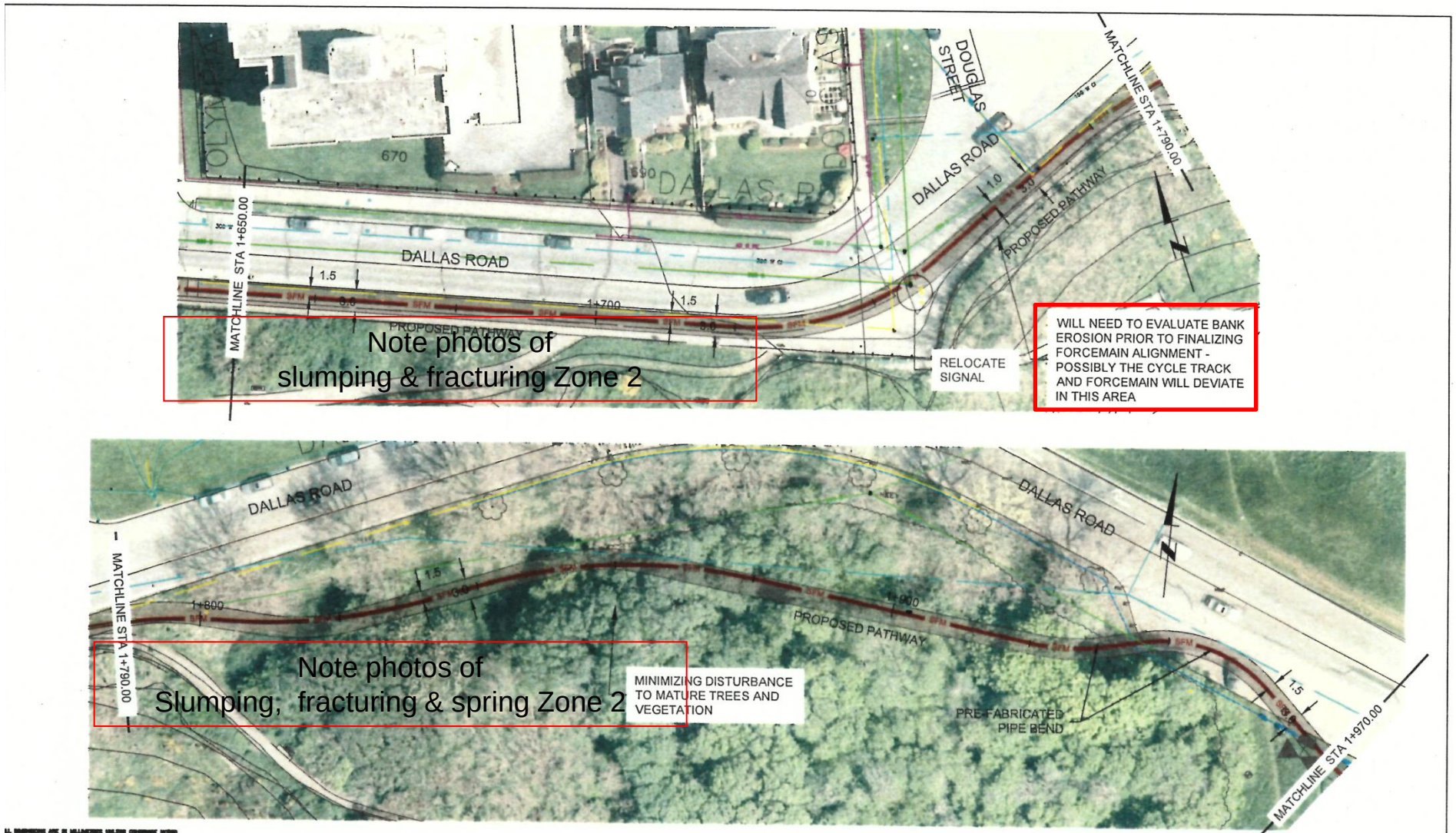
The shoreline is within the Victoria Harbour Migratory Bird Sanctuary falling under the Migratory Birds Convention Act. As such it is an area managed pursuant to the Migratory Bird Sanctuary Regulations. The excavation of a trench to accommodate the pipeline as proposed will have a significant impact on the back shore. Trees, bushes and grasslands will be disturbed and some removed. Combining the threats from sea level rise, earth tremors and erosional forces and the potential ecological damage to the riparian zone, it would be a foolhardy decision to proceed with the construction of a pipeline along the cliff top section.



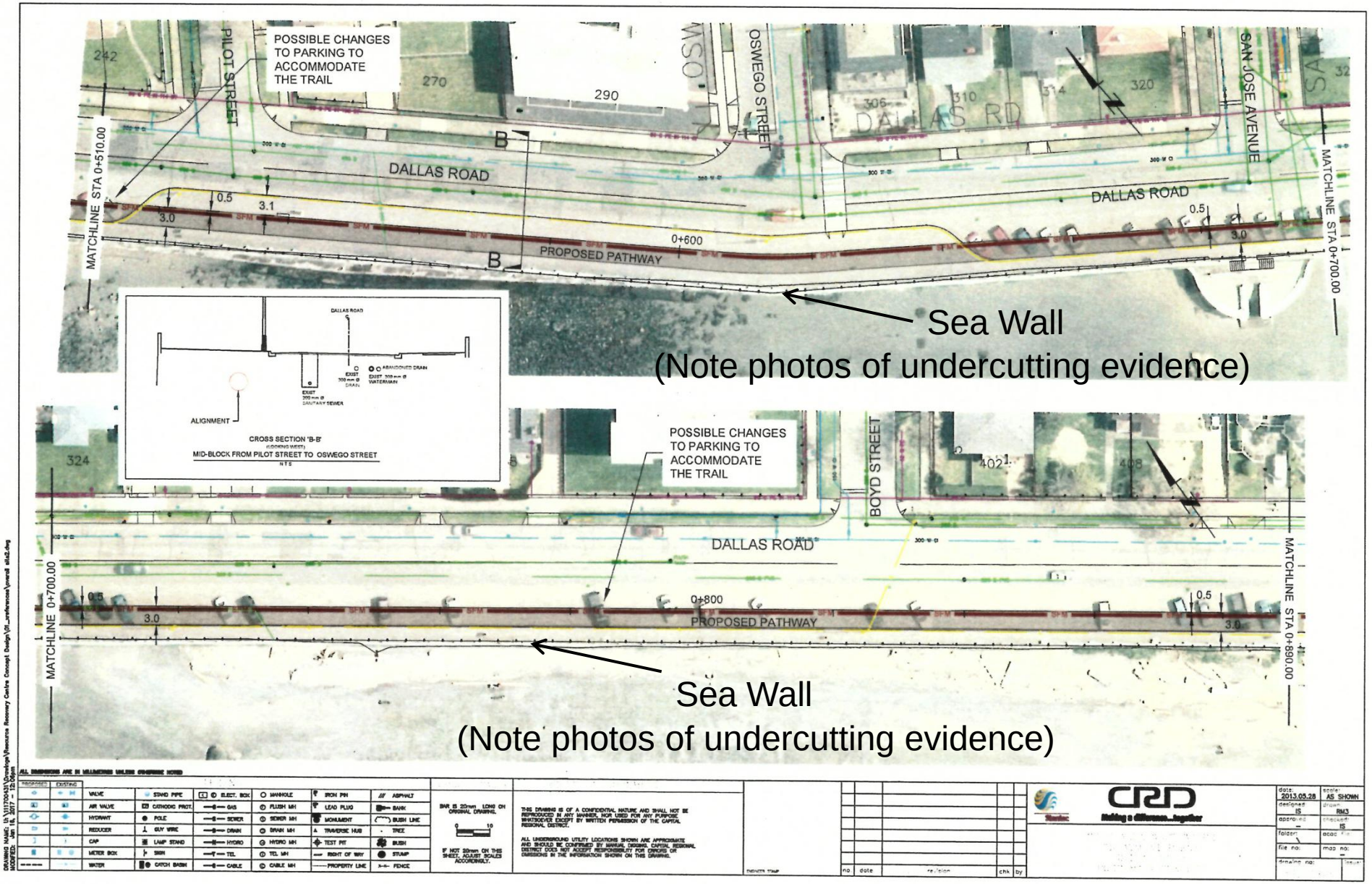
LIDAR SURVEY
Clover Point – McLoughlin Pt
Subsea Pipeline Proposal



Example of CRD Proposed Pipeline Route Dallas at Douglas - Zone 2



Example of CRD Proposed Pipeline Route Dallas at Boyd - Oswego - Zone 1



Dr. Gunton, Seabed Proposal, 02/08/2017

AREAS WITH BEDROCK AT OR NEAR SURFACE

R2 **UNIT R2; THIN SOIL COVER WITH SCATTERED BEDROCK OUTCROP:** This unit generally consist of shallow soils over bedrock. In much of Greater Victoria, this unit includes areas with less than 5 metres of Victoria Clay, mainly the brown clay facies, overlying thin older Pleistocene deposits or bedrock. Scattered outcrops occur throughout the unit, and bedrock is commonly found in the upper fe metres (e.g. in utility line excavations). The thickness of older Pleistocene deposits in most places is less than a few metres, but may locally be up to 10 metres. In areas adjoining the Colwood delta and outwash plain, this unit is assigned to areas where borehole data show that less than 5 metres of the Colwood sand and grave overlies bedrock. In upland regions above 60 metres elevation, the unit is assigned to areas where bedrock is generally overlain by less than a few metres of sediment, commonly older Pleistocene deposits with some colluvium, although locally sediment thicknesses are up to 10 metres. This map unit generally occurs in hilly areas, where the topography is clearly controlled by the irregular bedrock surface. Due to the irregularity of the bedrock surface, the thickness of the sedimentary cover over bedrock can vary by several metres across short distances, such as the length of a building lot.

R2a Unit R2a consists of those areas of unit R2 where thicknesses of older Pleistocene deposits between 5 and 10 metres can be mapped.

R1/2 **UNIT R1/2; OUTCROP AND THIN SOIL COVER UNDIFFERENTIATED:** This unit includes sparsely developed, mainly rocky, upland areas with little or no subsurface control, and where units R1 (bedrock) and R2 (thin soil cover) could not be readily differentiated on air photos due to extensive tree cover. This unit may include small unmapped upland peat bogs and areas of older Pleistocene deposits.

R1 **UNIT R1; BEDROCK:** This unit consists of nearly continuous outcrop and generally occurs in hilly and mountainous areas.

C3 **UNIT C3; THIN CLAY OVER THICK OLDER PLEISTOCENE DEPOSITS:** This unit occurs in areas with less than 5 metres of Victoria clay overlying older Pleistocene deposits greater than 10 metres thick. It generally occurs on the upper flanks o drumlinoid ridges.

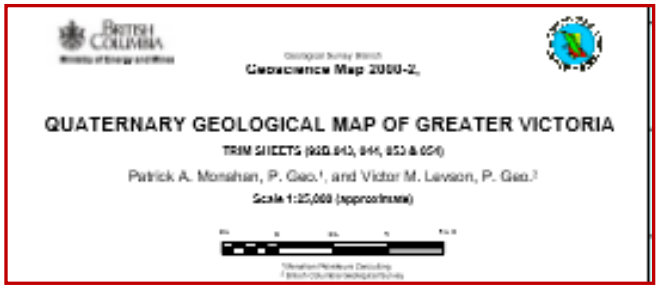
C2 **UNIT C2; THICK SOFT CLAY:** This unit is assigned to areas with more than 3 metres of the grey clay facies of the Victoria clay. The thickness of the grey clay facies is commonly greater than 10 metres and locally exceeds 20 metres. In this unit, the grey clay facies is overlain by the brown clay facies, which is generally 2 to 5 metres thick. The thickness of older Pleistocene deposits underlying the Victoria clay is generally less than a few metres, but may be greater adjacent to drumlinoid ridges. The unit occupies low-lying and gently sloping ground, and where borehole data are not available, this unit is assigned to such areas below 60 metres elevation.

C2a Unit C2a is assigned to areas where the lower slopes of the Colwood delta are overlain by the Victoria clay. Little is known about the thickness or geotechnical properties of the Victoria clay in these areas. However, the land is low-lying and organic soils locally occur at surface (unit O1), indicating that thicknesses of sof clay greater than 3 metres could be present.

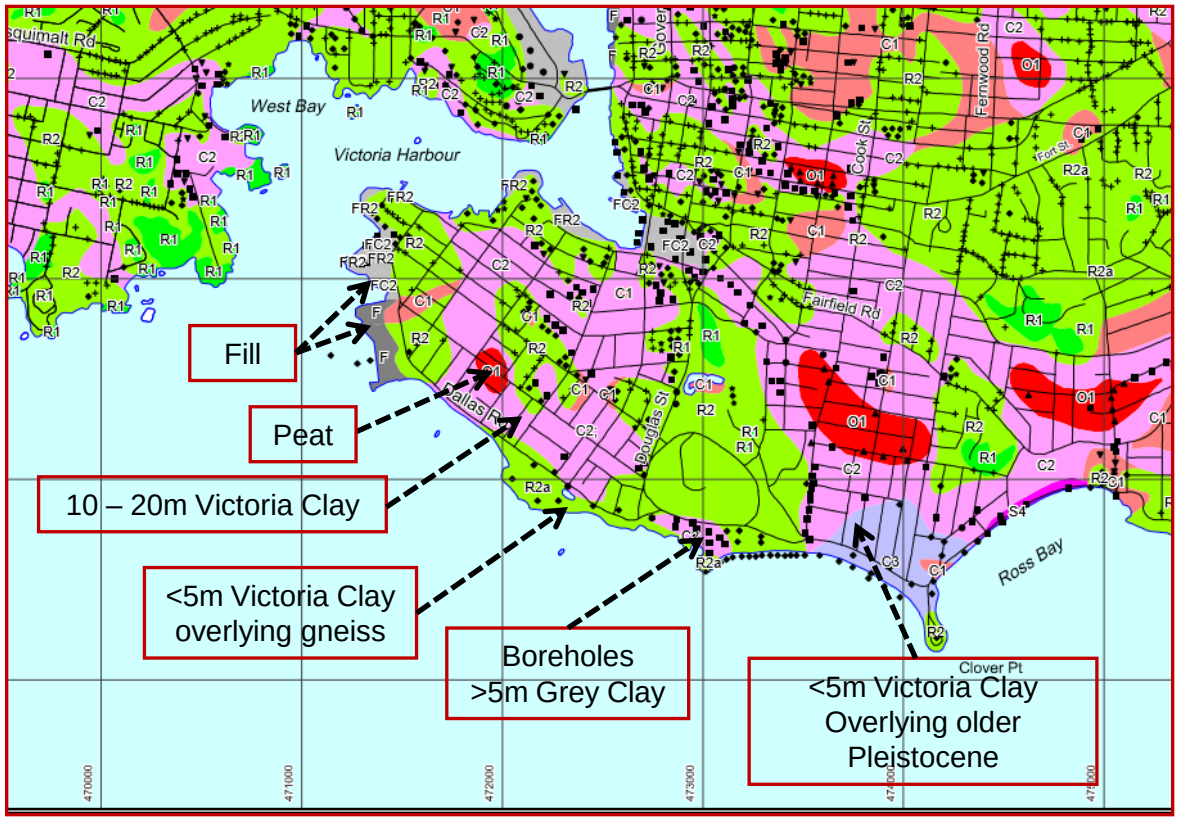
C1 **UNIT C1; INTERMEDIATE BETWEEN UNITS R2 AND C2, INCLUDING UNDIFFERENTIATED AREAS:** This unit mainly includes areas where soil profiles typical of units R2 and C2 occur together on a scale that is not 'mappable' with the data available. This unit also includes areas where there is greater than 5 metres of Victoria clay, but where the thickness of the lower grey clay facies is less than 3 metres. In regions of poor subsurface control, the unit is commonly assigned to areas of sloping ground between units R2 and C2, and to small low-lying areas tha cannot be confidently mapped as unit C2. In such cases, use of this map unit indicates uncertainty. However, where borehole data are present, they commonly demonstrate that the subsurface conditions are truly a complex mixture of units R2 and C2. In some areas of sloping ground mapped as unit C1, the absence of reported bedrock may indicate that older Pleistocene deposits underlie the Victoria clay (unit C3). As additional data become available, much of unit C1 could be reassigned to units R2, C2 and possibly C3.

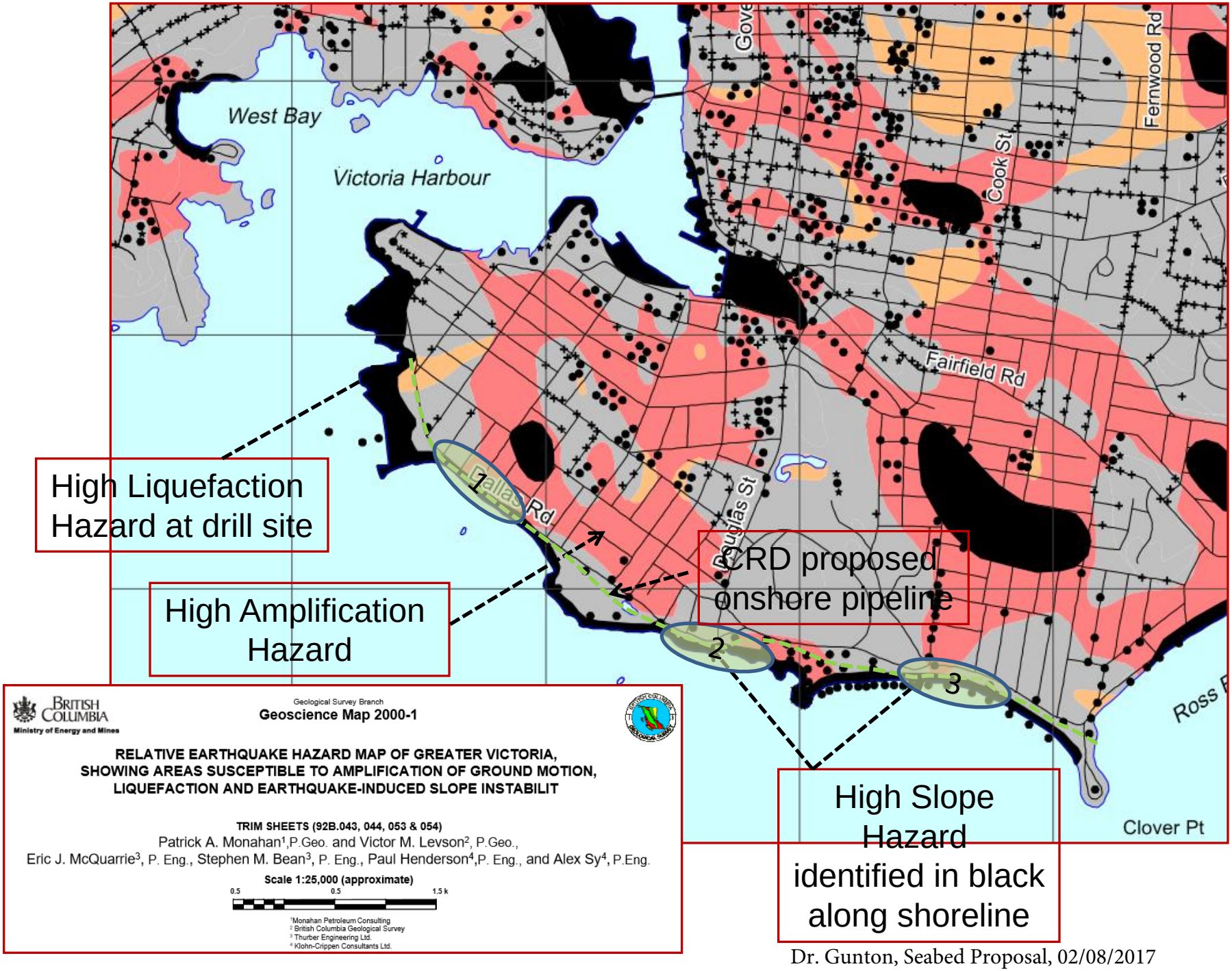
Borehole Legend

- ▲ Peat
- ■ >3 m Grey Clay
- ▼ >5 m Victoria Clay & <3 m Grey Clay
- ◆ <5 m of Victoria Clay
  Adjacent to unit G1: < 3 m to bedrock
  or in upland areas < 10 m sediment over bedrock
- ● Boreholes with lithologic data but insufficient depth to classify
- ● In unit G1: sand and gravel present at borehole
- : Bedrock in shallow (generally < 3 m) excavation
- ★ Small outcrop



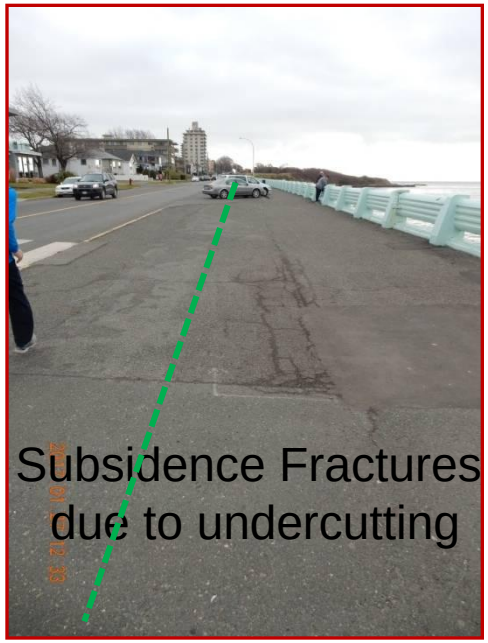
Weak unconsolidated clays create geotechnical challenges

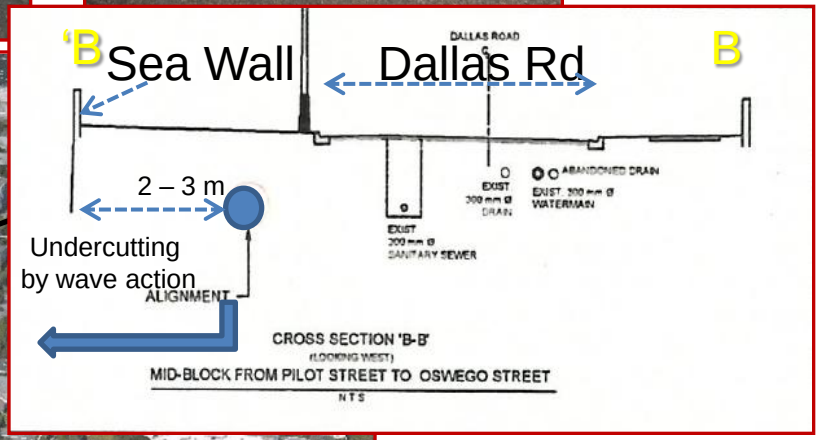



West Bay
Victoria Harbour
Fernwood Rd
Cook St
Fairfield Rd
Dallas Rd
Douglas St
Ross
Clover Pt
1
2
3
High Liquefaction Hazard at drill site
High Amplification Hazard
CRD proposed onshore pipeline
High Slope Hazard identified in black along shoreline
BRITISH COLUMBIA
Ministry of Energy and Mines
Geological Survey Branch
Geoscience Map 2000-1
RELATIVE EARTHQUAKE HAZARD MAP OF GREATER VICTORIA, SHOWING AREAS SUSCEPTIBLE TO AMPLIFICATION OF GROUND MOTION, LIQUEFACTION AND EARTHQUAKE-INDUCED SLOPE INSTABILIT
TRIM SHEETS (92B.043, 044, 053 & 054)
Patrick A. Monahan[1],P.Geo. and Victor M. Levson[2], P.Geo.,
Eric J. McQuarrie[3], P. Eng., Stephen M. Bean[3], P. Eng., Paul Henderson[4],P. Eng., and Alex Sy[4], P.Eng.
Scale 1:25,000 (approximate)
0.5 0.5 1.5 k
[1]Monahan Petroleum Consulting
[2] British Columbia Geological Survey
[3] Thurber Engineering Ltd.
[4] Klohn-Crippen Consultants Ltd.

Examples of Slope Failure

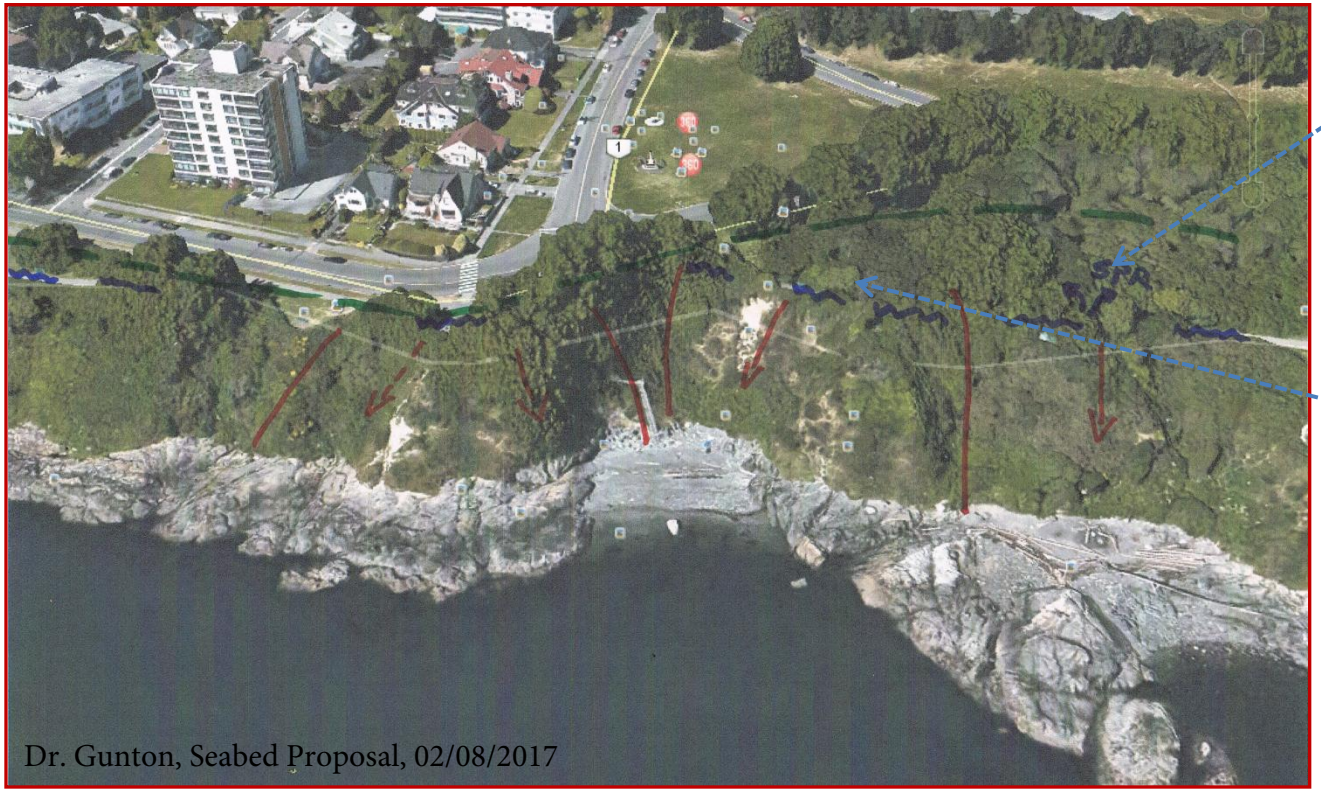
- Slope failure of unconsolidated glacial and post glacial sediments marginal to the Georgia Basin (Salish Sea).
- These are catastrophic events the timing of which cannot be predicted.
- Frequency of occurrence rises following periods of high rainfall.
- Earth tremors (seismic events) undoubtedly contribute to triggering failure



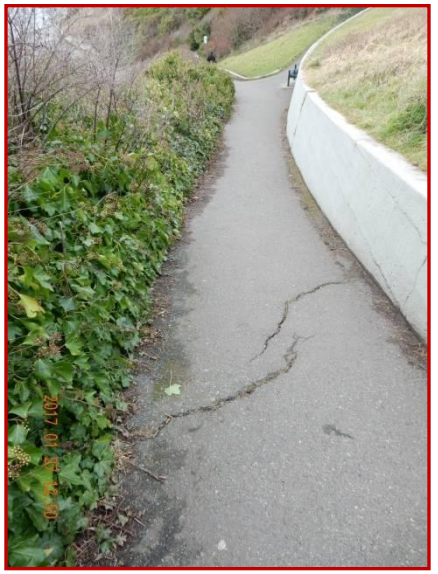


Dallas at Oswego-Boyd 1

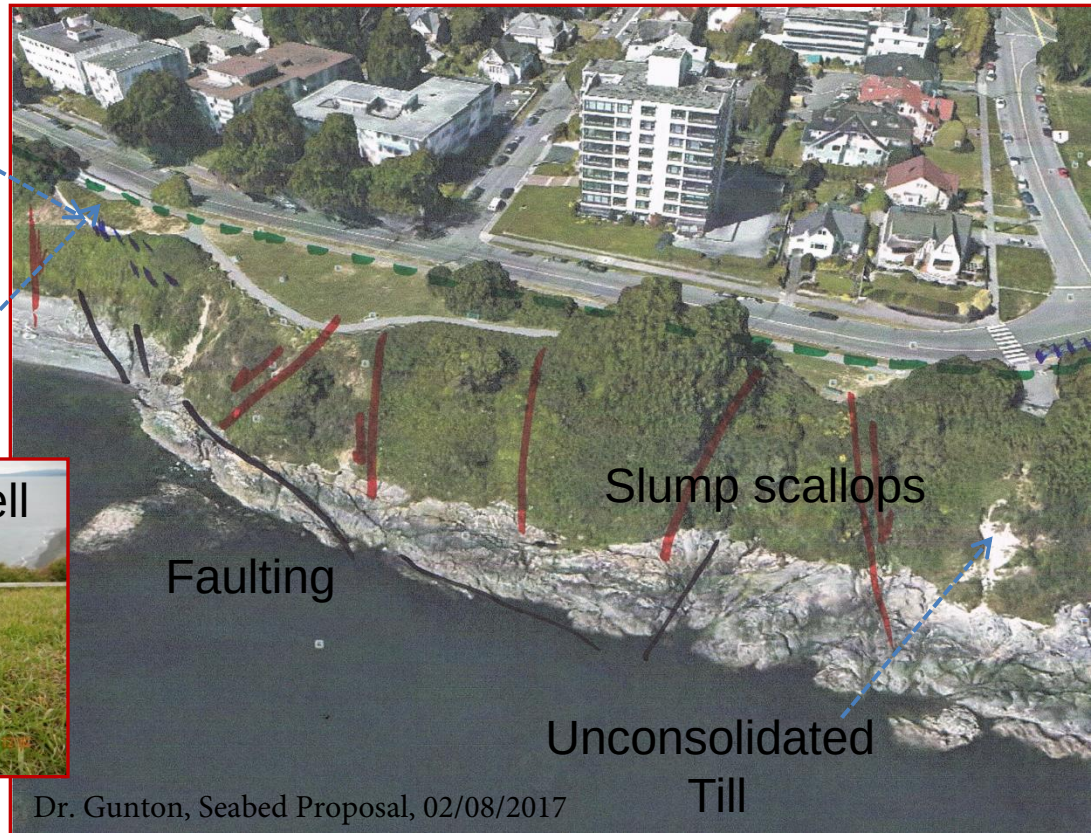
Dr. Gunton, Seabed Proposal, 02/08/2017



Dallas at Douglas
2



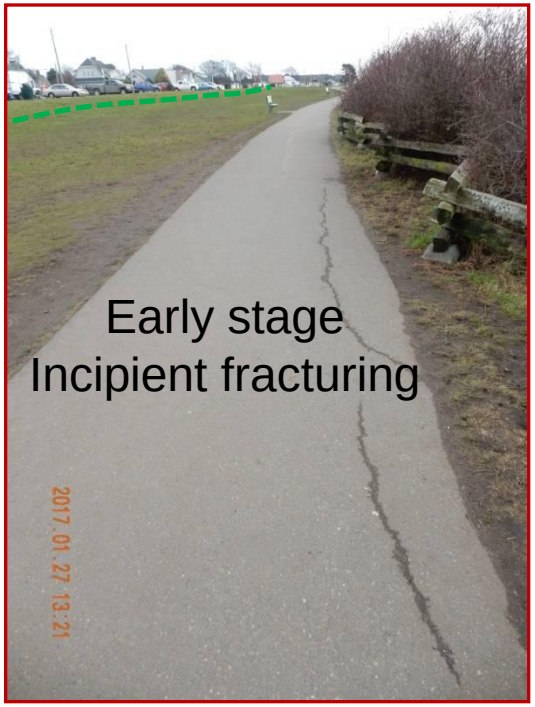
Fractures & Incipient Slumping

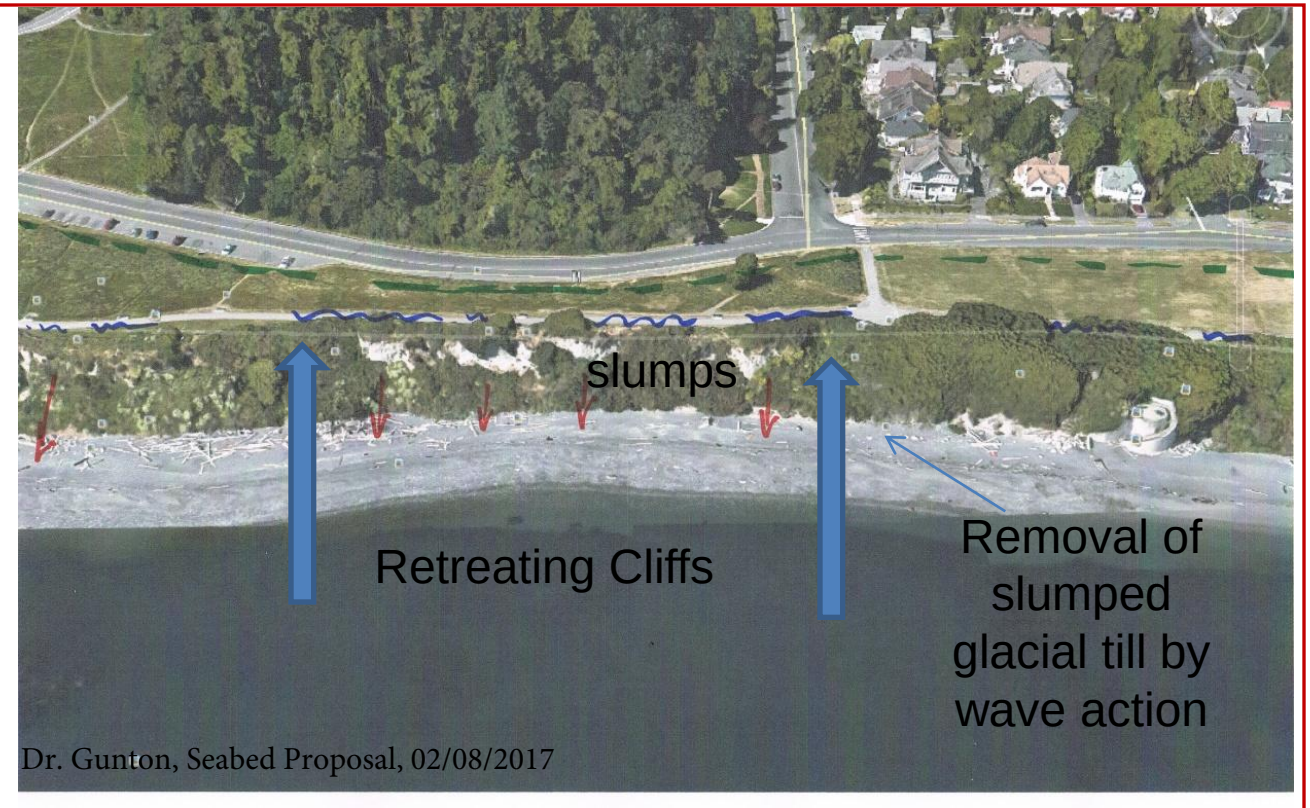


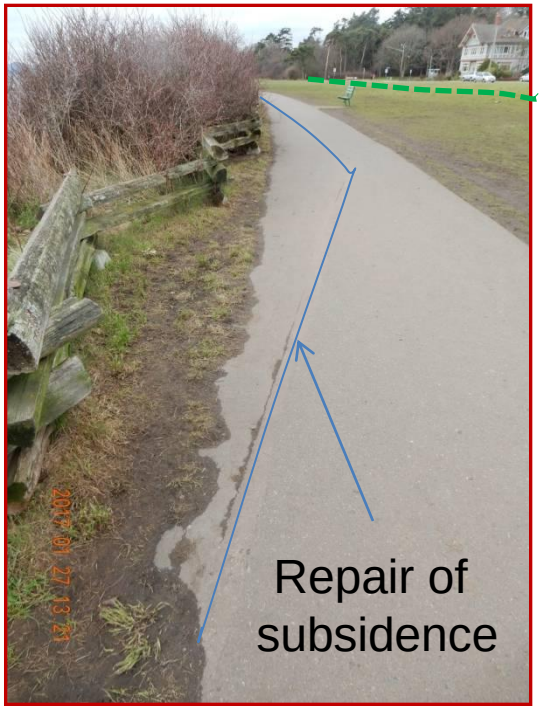
Dallas at Douglas
2

Dr. Gunton, Seabed Proposal, 02/08/2017

Dallas at Cook 3



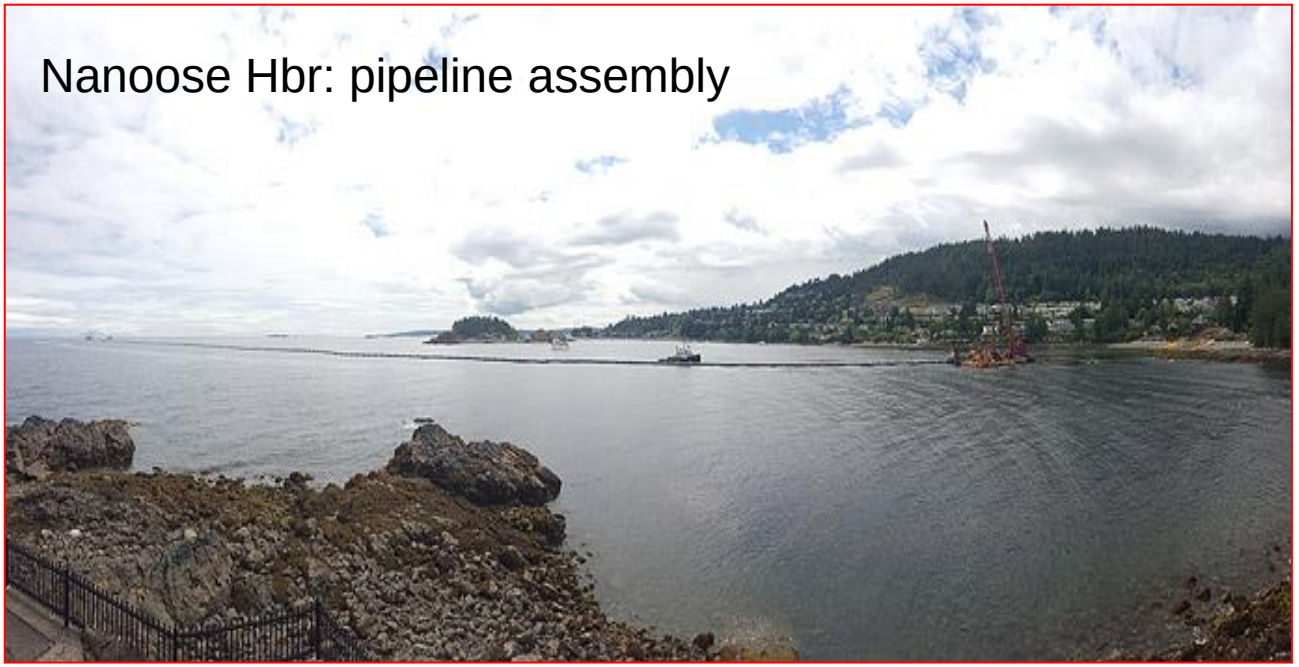




REFERENCE

RDN Website

- ❖Greater Nanaimo Pollution Control Centre (GNPCC)
- ❖2016 Installation of a 2km marine section 54” HDPE outfall
- ❖Cost $14MM (cost of pipe $2MM: shoreline crossing & installation $12MM)
- ❖Timing: Apr– Jun assembly in Nanoose Hbr
  Jun 24 – 25 Tow out and emplacement of pipe.
- ❖Compare with $28MM budgeted cost of McLoughlin 2 km outfall of 48” pipe



“April to September 2016: The 54" diameter HDPE (high density polyethylene) pipe is being assembled in Nanoose Bay with the cooperation of the Nanoose First Nations. Two sections of pipe will be assembled from land at the Nanoose Reserve, eased into the bay, and floated on the water surface in a westerly direction from the assembly area. Once the pipe is assembled in Nanoose, the sections will be joined together and towed to Morningside Park for installation during the June to September 2016 fisheries window.”

Dr. Gunton, Seabed Proposal, 02/08/2017

Letter Received Dated: March 3, 2017
To: John Gunton
SEABED PIPELINE ROUTE
Rebuttal of Points Raised By David Clancy,
Project Director,
CRD Wastewater Treatment Project

1. Permitting -Environmental

Your statement that "there could be significant environmental impacts including the potential disturbance of contaminated soils, during installation" is overstating the case. Your reference to contaminated soils relates specifically to the immediate region of McLoughlin Point. Paying careful attention to the maps provided in my proposal and to the wording in the proposal itself, you will realize that I am proposing using the access route for which you either have, or will have, obtained approval for your similar sized Outfall line. Even should dredging be required (and I see no reason why it should be), the outer harbour has been extensively dredged in the past as shown on the LIDAR map provided and the sea bed disturbed on numerous occasions without issue (not to mention the proposed installation of the new dolphin in the next few months). It could be argued that cleaning up the seabed might be a good idea as was recently considered in giving approval for the International Marina to proceed at Songhees.

I have attached a document Stantec August 9, 2016 outlining requirements for a Stage 1 EIS in respect of the McLoughlin Outfall. I assume the EIS is now well in hand given the estimated time to complete an EIS is between 24 and 14 months. The BC Ministry of Environment, Lands and Parks, Pollution Prevention and Remediation Branch (2000) stipulates that an EIS is required prior to construction of any facility discharging to the environment or providing reclaimed water for use. Neither of these uses are contemplated in my proposal. I find there is no specific requirement to complete an EIS for the laying of a closed-loop pipe on the sea floor with **no discharge**.

I might suggest there will be far more significant environmental permitting issues facing your team as you propose to trench the pipeline along the cliff tops in the Migratory Bird Sanctuary.
A sea floor proposal mitigates disturbing the shoreline along the entire length of Dallas Road.

2. Protection from Wave Action

The concern cited here displays the lilted knowledge of the team providing you with advice which in itself raises significant alarm bells. My proposal clearly states the depth contour along which the pipeline will be laid on the sea bed is between 30 and 40 metres. This would place the line well below the influence of waves even under the most stormy of conditions contemplated. The concept of wave base is basic engineering and it is stated that it is the maximum depth at which water wave passage causes water motion at depth. At water depths deeper than the wave base, bottom sediments and the sea floor are no longer stirred by the wave motion above. At depths greater than half the wavelength, the water motion is less than 4% of its value at the

surface and may be neglected. As a result, at 30 meters water depth, the pipeline would not sense wave action unless the wavelength was over 60 meters and then it would be minor. If we ever experienced wave lengths of 60 meters off the Dallas Cliffs, the integrity of a sea floor pipeline would be the least of the CRD's problem!! There would be no unusual protection or anchoring requirement other than that which is practiced around the world when emplacing HDPE pipe on the sea floor. It would be useful for you to directly contact those contractors and stakeholders that have successfully used the proposed pipeline laying techniques: My letter provided you with several contacts just a phone call away.

3. Ship Anchors

Like you, I was concerned that ships may be required to drop anchor under an emergency situation on approach to Ogden Point. This would clearly place the pipeline at risk and I was contemplating trenching as is frequently used in oil and gas pipeline emplacement when there are risks of this sort. However it appears that this will not be necessary. The following is a personal written communication to me from a fully licensed marine pilot with the Pacific-Pilotage Authority keeping the BC coast line safe and healthy.

"When a cargo vessel approaches Ogden Point pier during a windy day; the pilot may deploy an anchor as a tool to assist him for a safe landing. About one shackle on deck would be let go (27 meters) and the main engine kept at dead slow ahead and there would be enough propeller wash on the rudder to maintain steerage way. The anchor is used quite often when going bow in at Ogden Point due to the fact that the tug horsepower is not adequate for berthing large vessels. The anchor would be let go only about 150 meters from the berth when the bow is in line with the breakwater light. Therefore, ***the subsea pipeline would be located behind the vessel at this point.***
The ship should have corrected chart indicating the latest notices to mariners for Victoria harbour, and the Master should have the latest updates on his electronic charts system ECDIS, plus all pilots carry its on PPU (portable pilot unit).
Cruise ships do not dredge in (use anchor). They have adequate bow and stern thrusters."
Carefully note on the chart accompanying my proposal that the 30-40 metre bathymetric contour is well to the south of Ogden Point Breakwater and therefore, as the pilot has noted, is well removed from any emergency anchor deployment zone.

4. Location of a Fault Line

As with any pipeline, every effort should be made to locate it away from known faults. Your letter refers to a "known fault line" along the proposed route. You are perhaps referring to a line shown on the LIDAR Survey submitted as part of my proposal which was located on the survey by the interpreter as a linear. A fault requires clear evidence of its existence. Such evidence in an underwater setting requires any combination of the following: imaging of offset vertically or in plan, surface trace topographic feature. The linear shown is not a fault as there is no corresponding evidence. I would be pleased to reconsider this interpretation if you could provide me with data in support of your statement that the proposed line crosses a fault. USGS

geologists published extensively in 2001 on the Devils Mountain Fault well defined to the east in the area of the San Juan Islands. Seismic data aeromagnetic data and land based field observations define the fault with a high degree of certainty and, moreover, provide a confident interpretation of the direction and timing of movement. Current thinking is that the fault trends north of Victoria as it crosses Haro Strait. Even so the fault is a transpressional, oblique-slip fault, characterized by both north-south shortening and left-lateral slip. This means that the amount of vertical movement is minor and has been calculated over the last million years or so at about 0.05-0.30 mm/yr. If the fault does extend in to the area and trends parallel to the proposed pipeline, the impact of this is considered to be minimal. One of the truly valuable properties of using HDPE in a sea floor setting is it flexibility. This is considered to be a significant advantage over more rigid pipeline systems contemplated for the land based route where there is a much higher degree of potential failure due to the slumping of the Dallas Cliffs.

5. Repair and Maintenance

If HDPE pipeline is used as proposed, its service life expectancy of 100 years will not result in any failure. Note the highest cause of forcemain failures is corrosivity when pipe materials other than HDPE are used. Maintenance requirements other than regular pigging are not contemplated and access points along the proposed CRD land route are not contemplated or required as best I can see from the sparse information available.

Notwithstanding these points, should pipeline repair be required, I would argue that deploying a shallow water barge and crane would be far less disruptive than digging up Dallas Road and cleaning up a mess on land. Should a sea floor pipeline leak occur, sensors would identify the pressure drop and the pump stations shut down: This would cause any effluent release in to the ocean to be minor (the pipeline would not empty in entirety). How different would this momentary circumstance be in comparison to the years of continuous effluent discharge from the Clover Point and McCauley Point Outfalls?

In conclusion, I fail to be convinced by any points you raise in discrediting the Seabed Pipeline Route. I firmly believe you have not given it serious consideration and have no idea of the cost of choosing this option versus the cost of a land conveyance including the extremely risky harbour crossing drilling and reaming project.

I first made Mayor Helps aware of this subsea pipeline proposal in April 2016. As you know I have tried to draw this to the attention of CRD Board members, some of whom have shown interest and are awaiting your response to my proposal. Both you and Ms. Bird have stated, right from our first meeting at JBNA in January, (and as you do in your concluding sentence in your letter to me,) that you are now **in the implementation phase of the approved project.** I along with many other tax payers, will be watching with a keen eye as you stumble forward doing the wrong thing. I would not be as irritated if your replies, which took over a month to develop, were not so poorly thought through and reasoned with good supporting engineering data. Your letter strikes me as dismissive and I cannot thank you for it.

Respectfully submitted,

John Gunton, B.Sc. Ph.D

(In future, would you kindly acknowledge my credentials: I would have added my APEGBC designation however as a retired member, I am not allowed to do so)