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To: BC Ferries From: Tomasz Zolyniak  
File: 1161107845 Date: March 25, 2019

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**Reference: Storm Water Consideration  
Descanso Bay, Gabriola Island Ferry Terminal**

## **OVERVIEW**

BC Ferries (BCF) is in the process of producing a Terminal Development Plan (TDP) for the Gabriola Island Terminal. The intent of the plan is to develop a concept level plan for the upgrades to the terminal which are anticipated to include the construction and a new berth as well as improvements to parking, queuing lanes, and traffic flows. Passenger amenities such as a waiting room with washroom facilities are also included in the TDP. This plan will provide the framework for BCF to implement the upgrade strategies over the next 25 years.

The implementation of the TDP will require rezoning and updates to the Gabriola Island Official Community Plan (OCP). Stantec has been retained by BCF to aide with this process.

This memorandum reviews stormwater considerations as they correspond to the updates to the OCP.

## **EXISTING STORMWATER INFRASTRUCTURE**

The rural location of the Gabriola Terminal location is reflected in the existing stormwater infrastructure. A brief summary of the major components is identified below. The following Figure depicts the existing site layout.

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**Figure 1 - Existing Site Layout**

### **Taylor Bay Road**

On the west side of Taylor Bay Road, the existing topography gradually drops off down towards Descanso Bay. The embankment is heavily naturalized and stormwater that sheet flows onto the embankment continues to sheet flow down the embankment slope and makes its way to the bay. Absorption and infiltration likely occurs along this path as well.

A roadside ditch is present along the east side of Taylor Bay Road, the ditch follows the roadway slope and flows southward toward North Road. The ditch ultimately connects to a 1000mm Ø PVC culvert that crosses underneath Taylor Bay Road, just north of North Road, and conveys stormwater westward. The stormwater from the culvert ultimately discharges into Descanso Bay via an existing ditch.

### **North Road**

The south side of North Road contains a ditch that runs from Taylor Bay Road (and east of thereof) down to the Skol pub (355 North Road). Two discharge points are present for this ditch, the first is a 500mm Ø CSP

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culvert that crosses underneath North Road approximately 35m west of Taylor Bay Road. Discharge stormwater from this culvert likely flows along a natural ditch and into Descanso Bay. The second discharge point is a catchbasin at the Skol pub, the discharge point of this catchbasin is undetermined however it is assumed it also flows into Descanso Bay.

An asphalt curb is present on the North side of North Road, from the intersection of Taylor Bay Road and extending to across the Skol Pub. A no-post barrier is located west thereof and extends along the ferry ramp. Small openings at the base of the existing no-post barrier allow stormwater to pass through and make its way to the rip-rap embankment and ultimately Descanso Bay.

### **BC Ferries Terminal Site**

Limited information is available regarding the underground stormwater infrastructure on the BC Ferries site. The site is primarily composed of the parking lot, the ferry ramp, and the restrooms and waiting room. The majority of the site is asphalt, thereby generating sheet flow along the impervious surface. The site is bound by a riparian embankment on both the north and west sides.

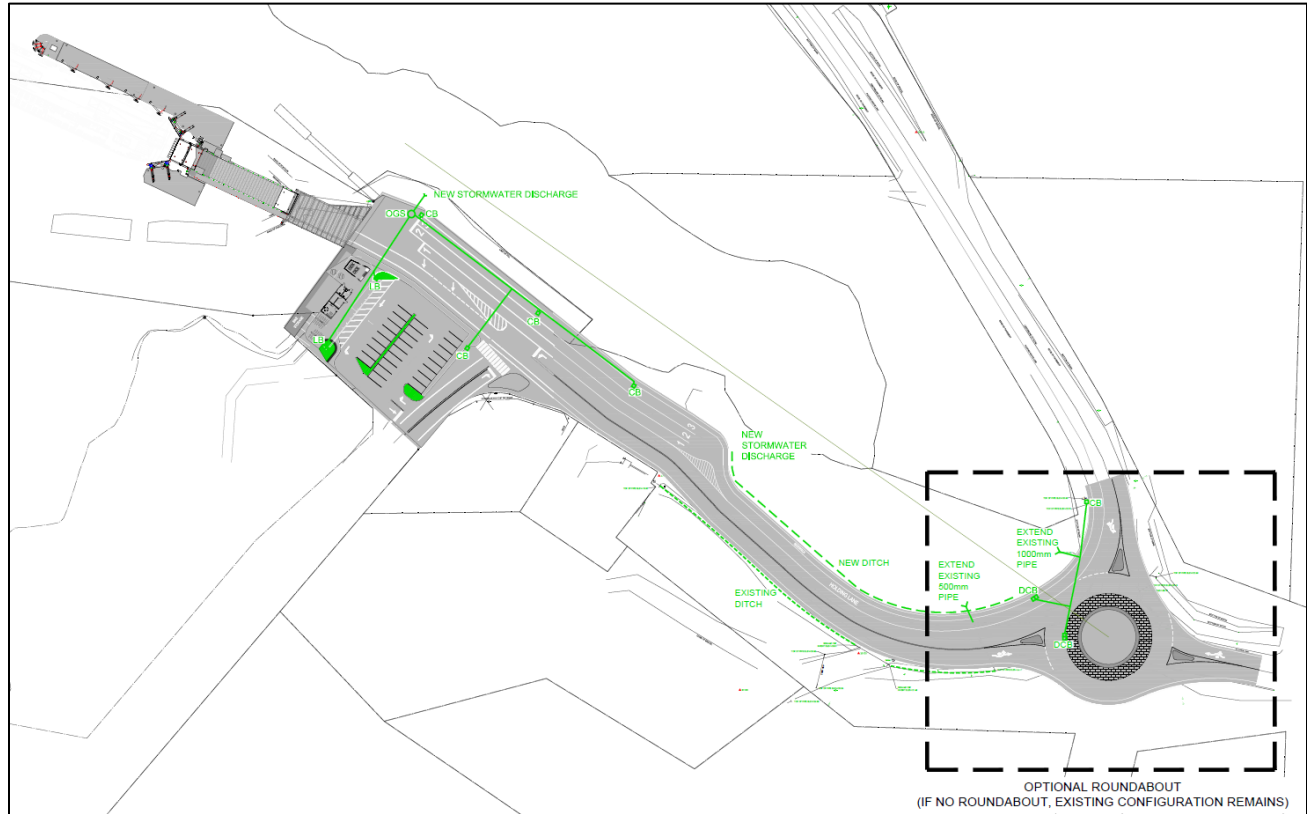
It is assumed that stormwater that gathers on this site sheet flows along the asphalt onto either the north or west riparian embankments and then discharges into the Descanso Bay.

A trench drain exists in front of the waiting room building to prevent stormwater from entering the at-grade structure. The trench drain likely discharges directly into the Descanso Bay.

## **PROPOSED STORMWATER SYSTEM**

Upgrades to the stormwater system are described in this section, an overview of the proposed layout is provided in Figure 2.

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**Figure 2 - Proposed Stormwater System**

The proposed new stormwater system is shown in green in Figure 2. The system is a combination of underground infrastructure, surface collection and conveyance components. Additional stormwater infrastructure such as infiltration areas are detailed in the Landscape section.

**Taylor Bay Road:**

The existing roadside ditch along Taylor Bay Road will remain in operation capturing and conveying stormwater from Taylor Bay Road. With the potential construction of a roundabout, maintaining the ditch stormwater flows will require a collection device, such as a lawnbasin or inflow headwall. The collection device will be located at the terminal point (southern) of the ditch and direct the flows to a piped system that will tie into the existing ditch that discharges into Descanso Bay.

**Proposed Roundabout**

The roundabout could be constructed of a combination of impervious surfaces (such as asphalt pavement for the driving lanes) and pervious surfaces (such as topsoil for the roundabout central island). In order to capture runoff from the impervious surfaces, a series of catchbasin would be located strategically at the low points along the roundabout and connected using PVC piping to convey the stormwater to the discharge location. The existing 1000mm culvert would be a logical location to tie the roundabout discharge into. The

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pervious surfaces could include perforated drain pipe to alleviate the existing soil of any excessive moisture and prevent stormwater overflow onto the roundabout driving lanes. It is proposed that the perforated pipe be tied into the existing 1000mm culvert for discharge.

### **North Road**

A new ditch is also proposed to be constructed along North Road, on the north side of the roadway. It is proposed to divert stormwater from the existing and proposed new lanes, into this ditch by maintaining a constant cross fall along the roadway (approximately 2% cross slope). The new ditch would then discharge into Descanso Bay via a new discharge route along the existing embankment. The existing ditch on the south side of North Road would be retained to capture stormwater from existing off-site stormwater contributors.

### **BC Ferries Terminal Site – Parking Area**

The parking area and new building occupy an area of approximately 1750m<sup>2</sup>, although this area is mostly impervious due to the parking being constructed of asphalt, opportunities exist to include green stormwater infrastructure. Refer to landscape drawings and report for further information on the green initiatives in this area. In general, plantings and areas of stormwater infiltration are proposed in two planting areas on the north and south sides of the new terminal buildings. The intent is to capture all the stormwater entering this parking area and attenuate the stormwater as well as treat it prior to discharging. The parking lot could be graded to direct stormwater to flow into a gutter and then into the landscape areas and utilize green measures for stormwater quality control, this would include peak attenuation and quality control. Stormwater run off from the building roof could also be directed into the landscape area. The landscape areas would then flow through a piped stormwater system into an oil-grit separator to further remove pollutants and sediment before discharging the stormwater into the Descanso Bay. It is proposed that lawn basins be utilized in the landscape area as a means of capturing stormwater in the event of overflow scenarios during heavy rain periods.

The parking area stormwater would go through two stages of stormwater quality control, first, the surface water would sheet flow into the planting area. Second, the discharge from the planting area would flow to an oil-grit separator before final discharge into Descanso Bay.

### **BC Ferries Terminal Site – Holding Compound**

The new vehicle holding compound in addition to the remainder of the terminal site (not including North Road or Easthom Road) represent an area of approximately 2000m<sup>2</sup>. This area would be constructed of predominantly asphalt, thereby generating stormwater runoff without infiltration. Given the area would be heavily used by parked vehicular traffic, it is likely that pollutants, such as oil, grease, toxic chemicals, and heavy metals, would be captured in the stormwater. To mitigate the release of these pollutants into the natural environment, it is proposed that an oil separator unit be constructed as part of the overall stormwater management system. For collection of stormwater within this area, it is proposed that a series of catchbasins be included along the north extent of the holding compound. The new compound would then be graded to direct stormwater inflow into the catchbasins. Once the stormwater is captured, a main pipe would be used to convey the stormwater into the oil separator and then discharge into Descanso Bay.

## **STORMWATER COMPONENTS**

A brief overview of the major stormwater components is provided below.

Design with community in mind

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### **Catchbasins**

Catchbasins should be designed for a 5 year return stormwater event as per the British Columbia Ministry of Transportation and Infrastructure Supplement to Transportation Association of Canada Geometric Design Guide (BC TAC Supplement). Grates should be bicycle friendly and catchbasin spacing should be according to the supply area. In general catchbasins should be designed in accordance with Master Municipal Construction Document (MMCD) and BC TAC Supplement design requirements.

### **Storm Mains**

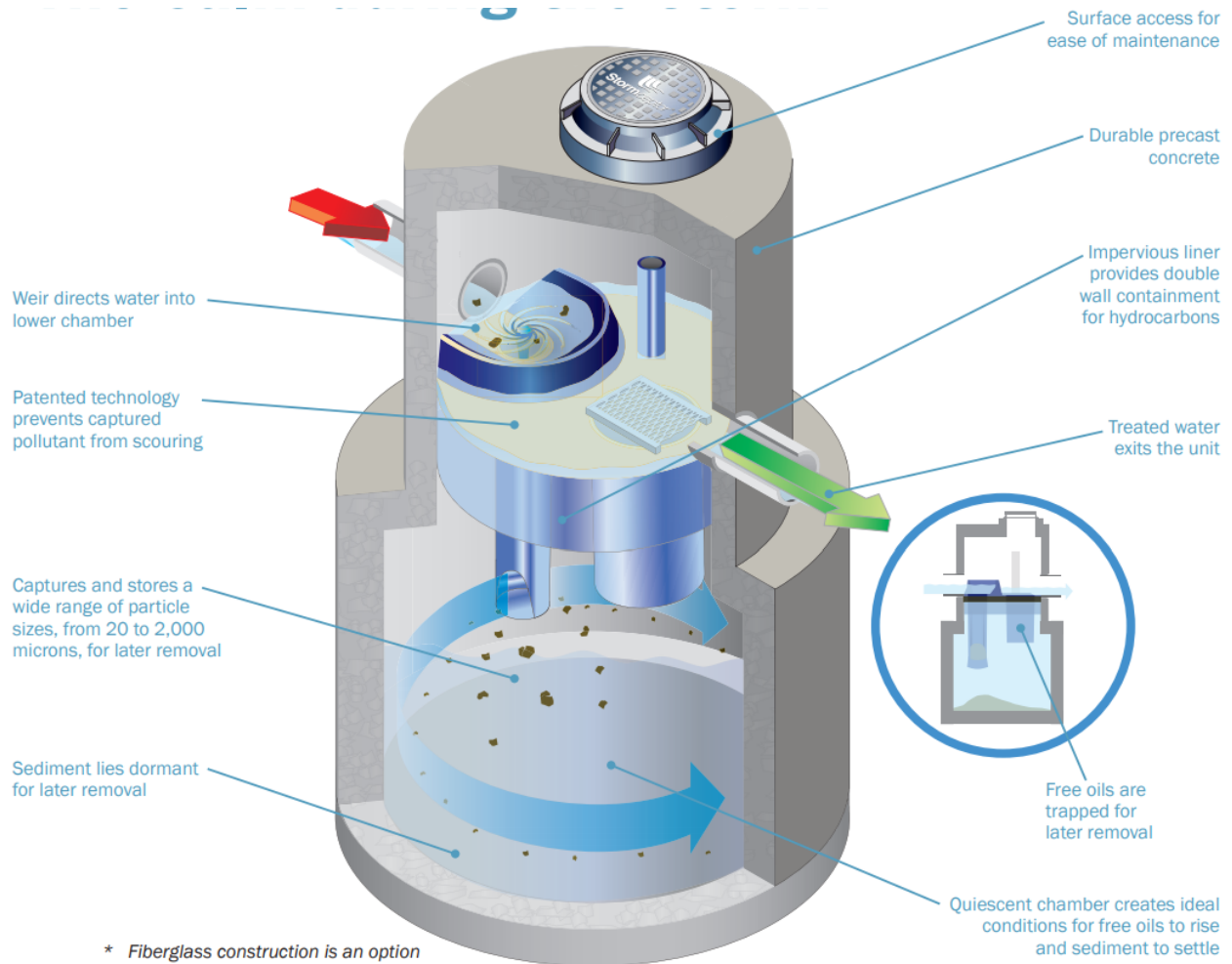
Storm mains should be sized for the 10 - 25 year stormwater return period. Commonly PVC would be used in this type of roadway application, buried to a sufficient depth to mitigate loading from vehicular traffic and generally be constructed with a minimum grade of 2%. Additional requirement would be as per the MMCD and BC TAC Supplement.

Major storm events, such as those for the 100 year return period would surcharge the storm main and the stormwater collection systems. These events are generally routed for overland flow such as along roadways where temporary flooding would occur but minimize flooding of private lots.

### **Oil Separator**

A stormwater oil-grit separator is an underground apparatus used to capture and separate pollutants such as oils and sediment from the stormwater which carries them. These are proprietary devices which treat the stormwater by means of filtration and hydrodynamic forces. The pollutants are captured and stored within the underground chamber and require periodic maintenance in order to dispose of these pollutants. By capturing the pollutants, they are prevented from entering the discharge streams and bodies of water such as Descanso Bay. A sample oil separator is shown in the following figure.

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**Figure 3 – Sample Oil Grit Separator (sample shown Stomceptor® by Imbrium Systems)**

## REZONING AND OFFICIAL COMMUNITY PLAN POLICY

The following section identifies relevant policies and discusses how the proposed terminal upgrades support the policies.

### **Gabriola Island Official Community Plan, Bylaw No. 434 Section 6.1 - Environmentally Sensitive Area Policies**

*f) The sandstone and conglomerate banks along Gabriola's shoreline shall be protected against the accelerated effects of erosion resulting from human activity by requiring the setback of buildings or structures and control of storm water runoff.*

**TDP Impact:** Amenities provided as part of the Terminal Development Plan will support several aspects of this clause.

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- New stormwater discharge points will need to be designed to minimize erosion of the existing shoreline. This can be achieved through several measures such as stormwater peak attenuation by routing the stormwater flows through ditches and green infrastructure to slow the flow rate and temporarily storing the stormwater in underground structures to offset the peak flow time. Creating appropriate end-of-pipe structures that protect the shoreline will also need to be implemented by providing riparian protection of the shore where the stormwater discharges and include appropriate geofabric materials to reduce the mitigation of fine aggregate materials.

### **Gabriola Island Land Use Bylaw No. 177 Section E1.9 – Drainage Requirements**

*E.1.9.1 Every subdivision must be designed and constructed to maximise the amount of natural drainage that is percolated into the ground and to minimise direct overland runoff.*

**TDP Impact:** Amenities provided as part of the Terminal Development Plan will support several aspects of this clause.

- Refer to Landscape for additional Details. In general, green initiatives have been implemented at the new parking area to promote groundwater infiltration.

### **Gabriola Island Land Use Bylaw No. 177 Section E1.9 – Drainage Requirements**

*E.1.9.5 The surface drainage system must be designed and constructed so as to minimise scouring and the erosion of ditch banks.*

**TDP Impact:** Amenities provided as part of the Terminal Development Plan will support several aspects of this clause.

- Stormwater discharge points will be designed to minimize erosion of the embankments by use of riparian protected slopes and geofabric materials to prevent erosion of fine aggregate material. .

### **Gabriola Island Land Use Bylaw No. 177 Section E1.9 – Drainage Requirements**

*E.1.9.6 In the case where storm water is discharged from a surface drainage system to the sea or a watercourse on or adjacent to the lot to be subdivided, the system must be constructed and designed such that storm water is retained in storage basins for the period of time necessary to allow for the setting out of silt and other suspended solids.*

**TDP Impact:** Amenities provided as part of the Terminal Development Plan will support several aspects of this clause.

- An Oil Grit separator is proposed as an end-of-line treatment facility to remove the aforementioned pollutants.



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## CONCLUSIONS

The proposed stormwater management system at the BC Ferries Gabriola terminal utilizes a series of conventional and BMP components for the roadway and parking lot facilities.

Along North Road, a stormwater ditch is proposed to capture stormwater and direct it to either an existing discharge point (1000mm Ø culvert at North Road / Taylor Bay intersection) or a proposed discharge point into Descanso Bay.

A combined stormwater system is proposed for the new holding compound as well as the new parking / terminal area. The holding compound will capture stormwater using a series of catchbasins. This stormwater will be routed through an oil/grit separator prior to release into Descanso Bay. The parking lot / Terminal area will capture stormwater by sheet piling into landscape areas. Overflow from these landscape areas will then be routed into the shared oil / grit separator and released. The oil / grit separator will act as a means to control stormwater quality. Stormwater attenuation is proposed through routing the flows through the landscape areas. Additional details on the landscape areas is provided in the landscape report.

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