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MEMORANDUM

To: Stephan Hall, Brown's Bay Packing Company Ltd.
From: Monica Stewardson, RPBio, CPESC. Mainstream Biological Consulting
Subject: BAP Q2 Receiving Environment Monitoring – June 1, 2021
Date: June 14, 2021
CC: Lorne Sandberg, H2Ops Water Services Inc.

This document presents the results of water quality sampling conducted in the vicinity of the effluent outfall for the fish processing facility operated by Brown's Bay Packing Company Ltd, in Brown's Bay, BC (Figure 1).

Sampling was completed on June 1, 2021. Grab samples were collected at predetermined locations up and down current from the outfall and submitted for lab analysis. The information was collected at the request of Brown's Bay Packing Ltd. for use in maintaining the Best Aquaculture Practices (BAP) certification for their fish processing facility in Brown's Bay, BC. One component of this certification is confirming compliance with the Effluent Management Requirements, described in Annex 3 of the Seafood Processing Plant Standards¹.

Methods:

The water samples were collected from a work vessel positioned at predetermined distances from the terminus of the discharge pipe while the plant was operating, and effluent was being discharged from the plant. To maintain position for the duration of sample collection around the terminus, the vessel was positioned bow forward against the current and held in place using the motor with a GPS for reference. Sampling occurred on an ebb tide.

The outfall pipe terminus was previously located on March 19, 2018 using a drop camera and Trimble GeoExplorer (Firmware v1.05) GPS receiver equipped with an external Hurricane antenna. The terminus coordinates were 50° 09.78568' N, 125° 22.37109' W. During the sampling on June 1, 2021, the grab sample locations were determined by moving the prescribed distance away from the pipe terminus coordinates.

¹ Issue 4, Revision 2, December 2015. Global Aquaculture Alliance.

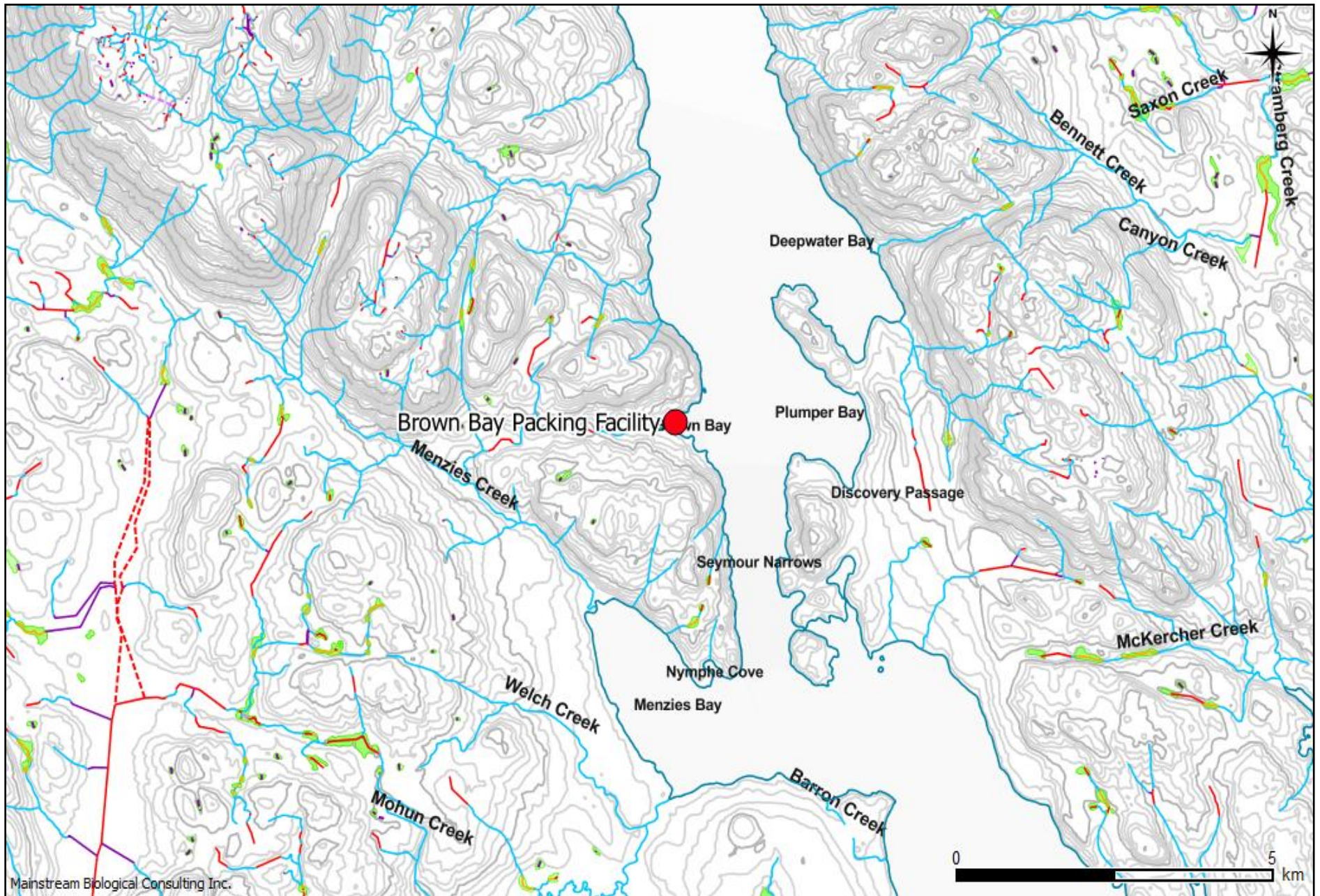


Figure 1. An overview map showing the location of Brown's Bay, in relation to the adjacent area.

Grab samples were collected using a weighted Van Dorn water sampler. The dilution modeling report for the facility was consulted to determine appropriate sampling depths at each location such that samples would be collected within the projected dispersion plume². At the sample points 3 m upstream and downstream from the pipe terminus, samples were collected 2 m above the seabed. At 10 m downstream from the pipe terminus, the sample was collected 5 m above the seabed. The sample at the reference station was collected 2 m above the seabed to mimic the 3 m upstream and downstream sample locations. The location of each grab sample was recorded with the Trimble GPS where the rope attached to the Van Dorn emerged at the surface of the water.

A sample of effluent was also collected at the processing plant at the time the receiving environment sample collection was occurring. All samples were stored in coolers with ice packs for transport to the receiving laboratory.

Samples were analyzed for the following parameters:

- Total oil and grease,
- Total suspended solids (TSS),
- Bacteria (*Enterococcus spp.*),
- Soluble phosphorus (orthophosphate),
- Total ammonia nitrogen,
- pH, and
- 5-day biological oxygen demand (BOD).

Results:

The results of the analysis are summarized below. Sample locations relative to the pipe terminus are shown in Figure 2, and the location and depth information for each of the sample stations is summarized in Table 2. On June 1, 2021, the 24-hour discharge from the facility was estimated to be 150 m³.³

Table 2. Location and depth information for water sampling stations at the Brown Bay Packing outfall.

Station	Actual distance from outfall terminus (m)	Location		Depth	
		Lat	Long	Sample Depth (m)	Corrected (chart datum) (m)
3 m upstream	3.4	50 09.7834	125 22.3752	22	20
3 m downstream	2.9	50 09.7859	125 22.3725	21	19
10 m downstream	8.1	50 09.7884	125 22.3701	21	19
Reference	190.3	50 09.8526	125 22.2540	29	27

The results of the sample analysis for total suspended solids, enterococcus, soluble phosphate, ammonia, pH, and biological oxygen demand (BOD) in the receiving environment and effluent are presented in Table 3. BC Water Quality Guidelines (WQG)⁴ are included where applicable, along with the Reportable Detection Limit (RDL) for each parameter.

² Great Pacific Engineering & Environment, 2018. Brown’s Bay Packing- Dilution Modelling Study.

³ Email from L. Sandberg (H2Ops Water Services Inc), June15, 2021.

⁴ <https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/water-quality-guidelines/approved-water-quality-guidelines>

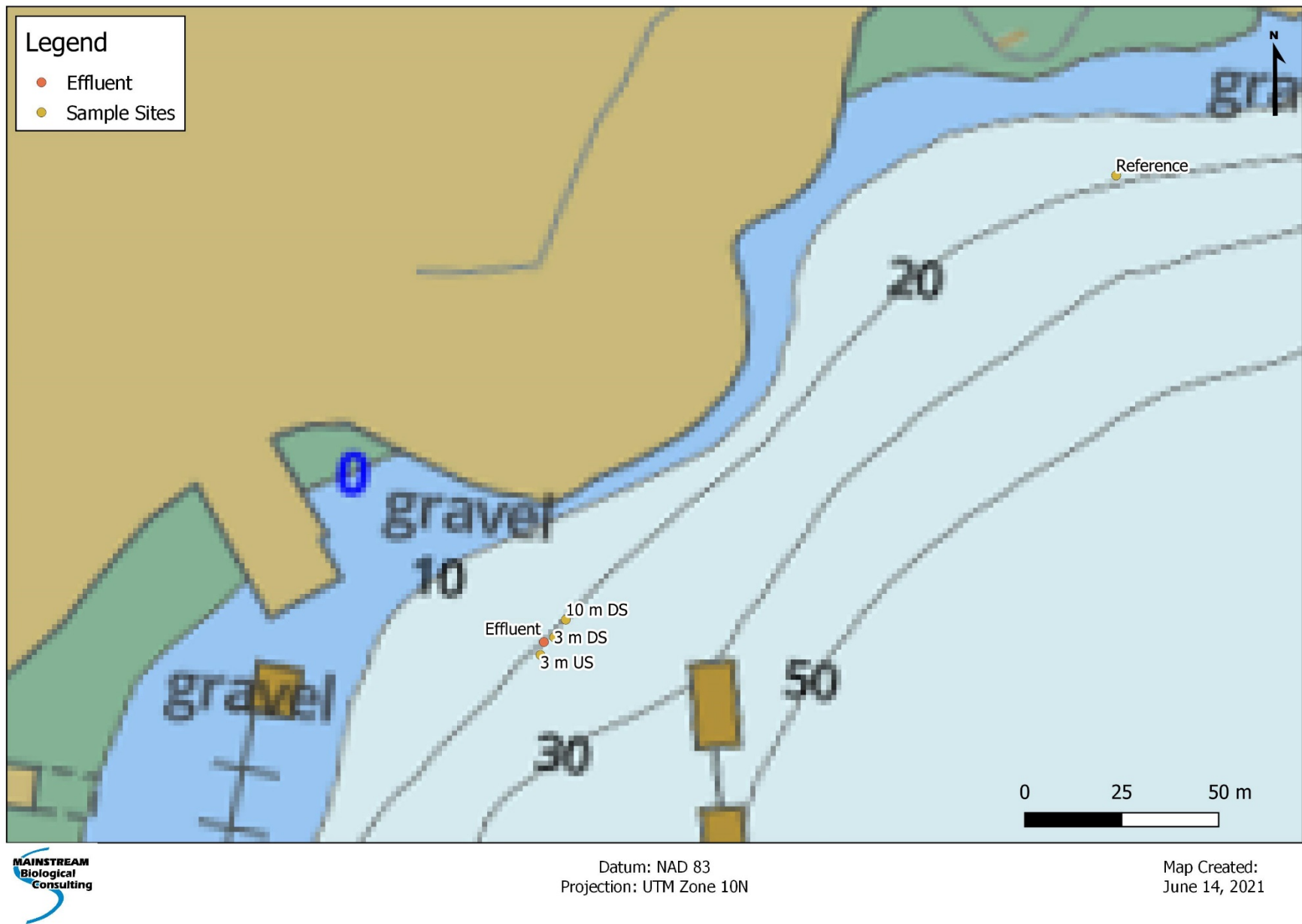


Figure 2. An overview map of Brown Bay, showing the location of receiving environment water quality sampling stations on June 1, 2021.

Table 3. The results of lab analysis of water samples collected in the receiving environment for the effluent discharge from the Brown's Bay Packing facility on June 1, 2021.

Station Name	BOD (mg/L)	TSS (mg/L)	Enterococcus (CFU/100mL)	Soluble phosphorus (Orthophosphate) (mg/L)	Ammonia (mg/L)	pH	Oil & Grease (mg/L)
3 m US	<2.0	5.6	<1.0	0.053	0.090	7.6	<1.0
3 m DS	<2.0	3.6	<1.0	0.056	0.076	7.7	<1.0
10 m DS	<2.0	5.6	<1.0	0.055	0.072	7.7	<1.0
Reference	<2.0	3.2	<1.0	0.056	0.062	7.8	<1.0
RDL	2.0	1.0	1.0	0.0030	0.0050	N/A	1.0
Effluent	480	250 ¹	700	3.8 ²	2.4 ²	7.2	2.1
Effluent RDL	50	5.0	10	0.030	0.025	N/A	1.0
BC Water Quality Guideline (marine aquatic life)	N/A	25 mg/L above background for 24 h.	N/A	N/A	23-37 mg/L ⁵	7.0-8.7	N/A

RDL = Reportable Detection Limit

Highlighted values indicate samples analyzed past their recommended hold time.

¹ RDL raised by lab due to high concentration of solids in the sample.

² RDL raised by lab due to dilution to bring analyte within the calibrated range.

Biological oxygen demand (BOD), oil and grease concentration and enterococcus counts were below the detection limit of the requested analyses at all receiving environment stations. These results confirm that the effluent is not measurably influencing the levels of these parameters in the receiving environment.

The level of TSS detected at the three stations in the bay was comparable to TSS at the reference station. All stations measured below the BC water quality guideline for marine aquatic life.

Soluble phosphorus concentrations at the three stations near the discharge point were consistent with the result at the reference station. There is no guideline established for phosphorus due to a general deficiency of this nutrient in the aquatic environment.

Ammonia concentration at all stations were below BC Water Quality Guidelines for aquatic life in the marine environment. Results in the receiving environment were similar to the reference station, with the results 3 m upstream marginally higher than the downstream stations.

The measured pH was similar at all stations, which suggests no influence on the level of this parameter in the receiving environment due to the effluent discharge. The measured pH in the receiving environment was within the BC water quality guideline for marine aquatic life.

⁵ Range determined using water temperature of 10 °C, salinity of 30 ppt and a pH range of 7.6 - 7.8