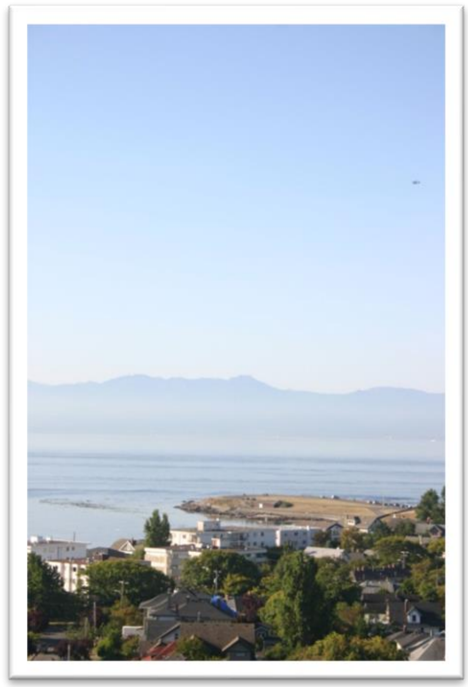
Core Area Wastewater Facilities

Environmental Monitoring Program - 2021 Report

Cycle 3 – Year 1

Capital Regional District | Parks & Environmental Services, Environmental Protection



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CORE AREA WASTEWATER FACILITIES ENVIRONMENTAL MONITORING PROGRAM 2021 REPORT

EXECUTIVE SUMMARY

In mid-2020, the Capital Regional District (CRD) commissioned a new tertiary treatment plant and outfall at McLoughlin Point (McLoughlin). Prior to this, the CRD discharged fine-screened municipal wastewater for over 100 years through two core area outfalls located at Macaulay Point (Macaulay) and Clover Point (Clover). Full optimization of treatment processes at McLoughlin is not expected until the end of 2022. Therefore, both 2020 and 2021 are considered transitional years for both sewage treatment in the Core Area and the associated wastewater and receiving environment monitoring program. Caution must therefore be taken when comparing 2021 results to those from previous years.

Monitoring of wastewater quality, and the surface water and seafloor environments in the vicinity of the Macaulay and Clover outfalls, has occurred on a regular basis since the late 1980s. The focus of this monitoring shifted to McLoughlin in 2021, but there is significant overlap with historic monitoring locations. The CRD is required to monitor for compliance with the Municipal Wastewater Regulation (MWR) under the provincial *Environmental Management Act* and the Wastewater Systems Effluent Regulations (WSER) under the federal *Fisheries Act*.

Beyond regulatory compliance, to ensure protection of human health and the environment, the CRD undertakes monitoring, as outlined in the Core Area Liquid Waste Management Plan, and to assess the impacts of the outfalls on the marine environment. This monitoring is done on a five-year cycle.

The 2021 environmental monitoring program (EMP) report represents Year 1 of Cycle 3 and includes:

- wastewater monitoring and analysis for a list of substances, including conventional parameters, metals, and other priority substances and toxicity (conducted monthly at McLoughlin)
- surface water and water column monitoring and analysis for bacteriological indicators of potential for human exposure to wastewater in the marine environment. Additionally, a list of substances, including conventional parameters, metals, and other priority substances (conducted quarterly at McLoughlin, and, only if they are discharging coincident with routine McLoughlin sampling, around the Macaulay and Clover outfalls)
- wet weather overflow and bypass sampling for bacteriological indicators indicating potential for human exposure to wastewater in the marine environment, and a subset of conventional parameters indicative of wastewater strength (conducted as needed at Macaulay and Clover, and around the various shoreline overflow locations when bypass, overflow or wet weather events occurred)
- continuing additional investigations that address specific questions about water column and seafloor monitoring components and that investigate emerging scientific issues regarding wastewater discharges and environmental effects

Access limitations during final construction and equipment installation delays necessitated continued deviations from established sampling protocols in 2021. As such, comparisons of 2021 results to previous years must be done with caution. It is expected that these logistical challenges will be resolved in 2022.

Overall, risks to human health and the environment were low. The installation of tertiary treatment at McLoughlin has substantively reduced the concentrations and loadings of contaminants to the marine receiving environment relative to the historic discharge practices out of the Macaulay and Clover outfalls. As such, potential risks to human health and the environment have also been reduced.

McLoughlin effluent quality achieved tertiary standards for most of the year but was slightly above regulatory limits intermittently from February to October. This was expected as neither provincial nor federal wastewater regulations allow for a commissioning period when a new facility comes online, and it is not possible for all treatment processes to be instantly and fully effective. While effluent quality steadily

improved as the year progressed, it could take up to two years (i.e., to the end of 2022) for all McLoughlin treatment processes to be optimized and effluent quality to stabilize. In addition, there is potential that highly variable centrate return flows from the Residuals Treatment Facility may be impacting the treatment plant's ability to continuously achieve effluent quality limits.

Wet weather high flows are predicted to occur up to 70 days per year resulting in blended primary and tertiary effluent being discharged out the McLoughlin outfall. In 2021, there were only 32 days when blending occurred. Many of these days occurred when the full tertiary treatment capacity was not achieved. Operators are continuing to refine internal flow balancing to ensure blending only happens when full tertiary treatment capacity is reached.

Macaulay and Clover effluent monitoring efforts were dropped for 2021 as flows were completely diverted to the new treatment plant. There are commitments to monitor wet weather overflows and bypasses at Macaulay and Clover, but due to logistical limitations throughout 2021, this sampling was not possible. Systems will be in place to undertake this sampling in 2022.

The McLoughlin reclaimed water system was abandoned early in 2021 due to operational challenges. As such, no reclaimed water samples were collected for analysis.

Surface water and water column sampling confirmed that the new McLoughlin outfall was operating as predicted from plume dispersion and dilution modelling. Bacteriological and other contaminant levels in the receiving environment were well below those observed when Macaulay and Clover were discharging. This further affirms the benefit of installing treatment at McLoughlin.

The conveyance system is designed with numerous shoreline sanitary and combined sewer overflow and relief points that discharge during heavy rains, planned maintenance activities or following unexpected non-routine or emergency events. Shoreline monitoring is required to assess human health risk for people engaged in recreational activities on beaches adjacent to the overflows. The 2021 monitoring confirmed that wastewater overflow signals typically dissipate within 48 hours, but adjacent municipal stormwater discharge signals persist longer, sometimes continuously.

No seafloor monitoring was required in 2021. Macaulay and McLoughlin seafloor sampling will next take place in 2022 and Clover in 2025.

ADDITIONAL INVESTIGATIONS

Additional investigations address specific questions or issues pertaining to the monitoring program, clarify aspects of the program, or provide concurrent data for the assessment of environmental effects. Some additional investigations are also requirements of the Liquid Waste Management Plan approval. Recommended studies have historically been reviewed by the Marine Monitoring Advisory Group (MMAG) and other experts.

In April 2020, the CRD was asked to provide weekly wastewater samples from Macaulay, Clover, McLoughlin and the Saanich Peninsula wastewater treatment plants by a consortium of researchers from the University of Victoria (UVIC) and a private contractor. The project also included samples from the Regional District of Nanaimo. All samples were analyzed using similar methodologies to those used elsewhere on the BC Lower Mainland, across Canada and internationally with the goal of using results to inform local health authority COVID-19 response plans. As of mid-2021, this project's funding was not renewed and the project was cancelled. Results confirmed that COVID-19 levels were low on Vancouver Island, with many samples being non-detectable. Pooling of all Vancouver Island results allowed the researchers to determine the lowest detectable levels of COVID-19 in sewage for the commonly used methodology; results have recently been published in a scientific journal. The BC Centre for Disease Control (BCCDC) has since started collecting samples from McLoughlin and elsewhere in BC for both COVID-19 and influenza analyses; results will soon be made available via the BCCDC.

The CRD continued to participate in a related project with the University of British Columbia and Harbour Resource Partners, the consortium that built the McLoughlin treatment plant. This project involves the development of a simple handheld sensor that could be used by operators to detect various pathogens in wastewater (including viruses like COVID-19), with the hope that the data would be used to inform local health authorities about changes in pathogen levels over time. No results are available currently.

In 2021, the CRD continued to participate in two Ocean Wise Conservation Association initiatives: the Salish Sea Ambient Monitoring Exchange (SSAMEx) and Pollution Tracker. The CRD and Pollution Tracker data from the Salish Sea have been incorporated into a recently published scientific journal manuscript that characterized monitoring program biota concentrations of polychlorinated biphenyls (PCBs) and how concentrations change with trophic level and sediment physical and geochemical characteristics. The Ocean Wise Conservation Association has been using CRD samples to develop analytical methodologies for microplastics in environmental samples and to add to the broader Pollution Tracker dataset. Discussions are ongoing regarding opportunities to assess the effectiveness of the McLoughlin treatment plant to reduce microplastic loadings to the environment. It is hoped that the Ocean Wise Conservation Association will have greater capacity in 2022 to accept CRD samples. In the meantime, the Regional Source Control Program and a Royal Roads University BSc student team worked with Ocean Wise and a private contractor to refine methodologies for microplastic analyses in commercial laundry and compost facility wastewater.

The CRD has also provided benthic invertebrate debris samples from Macaulay Point to a University of Chicago researcher as part of a collaborative project with the CRD's contract benthic taxonomist. The researcher has been comparing the "death assemblages" of molluscs and bivalves contained within the archived debris to the "live" communities that are assessed as part of the routine sediment sampling program. Assessments are ongoing, with results likely to be published in a relevant scientific journal.

The CRD also continued participation in a second collaborative project with the contract benthic taxonomist, UVIC and Metro Vancouver to develop an inexpensive benthos toxicogenomic tool that could be used in years when seafloor sampling does not take place. It could also be used at historic monitoring stations that have been abandoned. The project has a five-year timeline and in 2021 the team optimized field collection methods and successfully isolated environmental DNA (eDNA) from several indicator species. The CRD will continue to provide support, including future sampling vessel and sample access in 2022 and beyond. Results to-date have been presented at three scientific conferences in 2021 and 2022.

Finally, the CRD continued to support deployment of sensors adjacent to the McLoughlin and Macaulay outfalls, in Boundary Pass and in the Strait of Juan de Fuca, in collaboration with Ocean Networks Canada. The data from these sensors is used to calibrate the oceanographic models used to predict the dispersion patterns of the CRD's Core Area wastewater outfall plumes, and is fed into other Salish Sea oceanographic models used by academia and state and provincial government agencies.

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Terms & Abbreviations

ADWF	Average Dry Weather Flow
BAF	Biological Aerated Filters
BOD	Biochemical Oxygen Demand
CALA	Canadian Association For Laboratory Accreditation Inc.
CBOD	Carbonaceous Biochemical Oxygen Demand
CCME	Canadian Council of Ministers of the Environment
CFU	colony-forming unit
Cl	Chloride
COD	Chemical Oxygen Demand
COND	Conductivity
CPS	Clover Pump Station
CRD	Capital Regional District
CSO	combined sewer overflow
CTD	conductivity-temperature-depth
EMP	Environmental Monitoring Program
ENT	Enterococci
ENV	BC Ministry of Environment and Climate Change Strategy
FC	Fecal Coliform
ICES	International Council for the Exploration of the Sea
IDZ	Initial Dilution Zone
LWMP	Liquid Waste Management Program
MBBR	Moving Bed Biofilm Reactors
McLWWTP	McLoughlin Point Wastewater Treatment Plant
MLD	megalitres per day
MMAG	Marine Monitoring Advisory Group
MPS	Macaulay Pump Station
NH_3	Ammonia
NO_2	nitrite
NO_3	nitrate
NP	Nonylphenols
OC	Organochlorine pesticides
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxins
PDBE	Polybrominated diphenyl ethers
PFAS	Per- and poly-fluoroalkyl substances
PFOS	perfluorooctane sulfonate
PICES	North Pacific Marine Science Organization
PPCP	Pharmaceuticals and personal care products
Q+	Quarterly Plus
QA/QC	quality assurance/quality control
SCADA	Supervisory Control and Data Acquisition
SETAC	Society of Environmental Toxicology and Chemistry
SQG	sediment quality guidelines
SSAMEx	Salish Sea Ambient Monitoring Exchange
SSO	sanitary sewer overflow
TDP	total dissolved phosphorus
TKN	total Kjeldahl nitrogen
TOC	total organic carbon
TP	total phosphorus
TSS	Total Suspended Solids
TWQRP	Technical Water Quality Review Panel

Terms & Abbreviations

US EPA	US Environmental Protection Agency
UVIC	University of Victoria
WAD	weak acid dissociable (WAD) cyanide
WMEP	Wastewater Marine Environment Program
WQG	Water Quality Guidelines
WSER	Wastewater Systems Effluent Regulations
MWR	Municipal Wastewater Regulation
WWTP	Wastewater Treatment Plant

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1.0 BACKGROUND

The CRD treats Core Area wastewater at the McLoughlin Point Wastewater Treatment Plant (McLWWTP) (Figure 1.1). This facility was commissioned in August 2020 to replace the long-standing practice of discharge of 6 mm fine-screened wastewater through the Macaulay and Clover Point outfalls. The McLoughlin treatment plant treats most of the Core Area wastewater to a tertiary standard before discharge through a 1,925 metre (m) long outfall. This outfall includes a 210 m multiport diffuser that terminates at approximately 60 m depth and is located approximately 200 m east of the existing Macaulay Point outfall terminus.

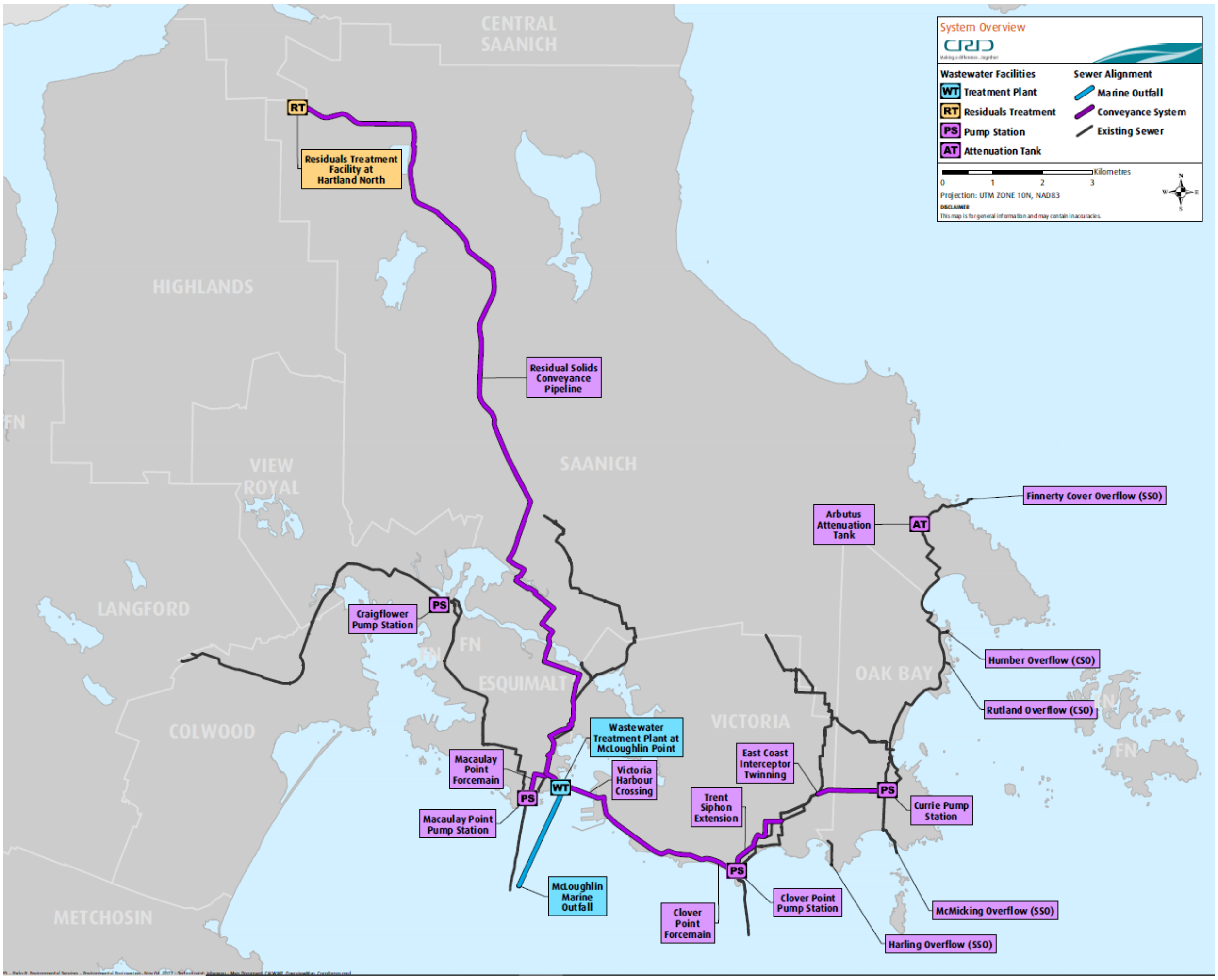
Screening and grit removal occurs at the Macaulay and Clover pump stations (Figure 1.1) prior to pumping flows to McLWWTP. The McLWWTP plant capacity can handle up to four times Average Dry Weather Flow (ADWF; 1xADWF = 108 megalitres per day [MLD]; 4xADWF = 432 MLD) and treatment processes include:

- Primary:
  - Lamella plate settlers for flows up to 216 MLD (i.e., 2xADWF)
  - High rate Densadegs for flows exceeding 216 MLD and up to 432 MLD (i.e., from 2-4xADWF)
- Secondary: a sequence of Moving Bed Biofilm Reactors (MBBR) and Biological Aerated Filters (BAF) for primary flows up to 216 MLD
- Tertiary: Cloth Disk Filters for secondary flows up to 216 MLD

Flows up to 216 MLD (i.e., 2xADWF) receive full tertiary treatment. When flows exceed 216 MLD, typically during wet weather, the flows above 216 MLD receive primary only (high rate Densadeg) treatment, and are then blended with the 216 MLD of tertiary effluent, prior to outfall discharge.

Both Clover and Macaulay pump stations now have the capacity to pump 4xADWF to McLoughlin. During heavy rain events, flows may exceed this threshold. In these rain events, flows exceeding 4xADWF are screened to 6 mm and discharged out their respective long outfalls – effectively operating as sanitary sewer overflow points for the upstream conveyance system.

Figure 1.1 Locations of major Core Area Wastewater Facilities and Discharge Locations



Wastewater has been discharged from the Macaulay Point and Clover Point outfalls for approximately 100 years. The Macaulay outfall has been in use since 1915, with the initial discharge at low tide level. In 1971, to alleviate shoreline pollution, the location of discharge was moved offshore. The outfall is now approximately 1,800 m long and terminates in a multiport diffuser at a depth of 60 m. The discharge of municipal wastewater at Clover began in 1894. Discharge was to the shoreline until 1981, when construction of an extended outfall was completed. The Clover outfall is now approximately 1,160 m long and discharges through a multiport diffuser at a depth of approximately 65 m.

The treated McLoughlin and screened wet weather Macaulay and Clover wastewaters are discharged to the fast-moving waters of Juan de Fuca Strait. The non-saline wastewaters are then rapidly diluted, as they mix with surrounding marine waters. As the wastewater plumes mix with the marine waters, they rapidly rise and trap at mean depths of 20-50 m (McLoughlin) and 45-60 m (Macaulay and Clover), with some plume surfacing predicted during periods of slack tide, predominantly during the winter months (Hodgins, 2006; Seaconsult 2019).

In addition, there are several shoreline sanitary sewer overflow (SSO) and combined sewer overflow (CSO) locations in the upstream conveyance system (Figure 1.1) that serve as wet weather and emergency bypass and overflow locations. A new flow attenuation tank was installed in the upstream conveyance system at Arbutus as part of the McLoughlin project. This tank substantively reduces the frequency of most downstream SSO discharge events relative to the old configuration. The two CSO locations are within the District of Oak Bay; Oak Bay is required to separate these systems and is developing a plan to do so. Until separated, the frequency of CSO discharge events will remain unchanged as they are operated independently of the adjacent trunk conveyance system during wet weather events.

In March 2003, the CRD Core Area Liquid Waste Management Plan (LWMP) (CRD, 2000) was approved by the BC Ministry of Environment and Climate Change Strategy (ENV). The plan outlined the CRD's strategy to manage liquid wastes for the next 25 years. Commitments made in this plan were designed to protect public health and the environment from the impacts of liquid waste discharges. On July 21, 2006, the CRD received a letter from the minister of environment requiring an amendment to the plan, detailing a schedule for the provision of secondary or better sewage treatment. In the letter, the minister also requested that the CRD continue the current monitoring program. The plan amendment #7 (CRD, 2009) was submitted to the ministry in December 2009, with follow up amendments #8 in June 2010, #9 in July 2014, #10 in March 2016, #11 in September 2016, and #12 in February 2017. These amendments have all been conditionally approved by ENV and included the CRD's commitment to build the new plant at McLoughlin Point, plus a facility at Hartland Landfill to treat the resulting sewage residuals to a Class A biosolids standard, as per the BC Organic Matter Recycling Regulation. Amendment #12, detailing the District of Oak Bay's plans to eliminate the two CSO locations in the Clover system, was also conditionally approved in June 2018.

The McLoughlin outfall operates under *BC Municipal Wastewater Regulation* registration RE-108831, which was originally issued in June 2020 and revised in February 2021. The McLoughlin treatment plant also achieves all requirements of the Federal *Wastewater Systems Effluent Regulation* (WSER). The Macaulay and Clover outfalls historically operated under permits issued by ENV under the 2004 *BC Environmental Management Act* [formerly the *BC Waste Management Act* (BCMoE, 2004)]. Following the commissioning of the McLoughlin facility, the permit for Clover was cancelled effective June 20, 2021 and for Macaulay effective January 7, 2022. The transitional authorizations for Macaulay and Clover, to discharge deleterious substances under WSER, were also cancelled effective December 31, 2020. All three outfalls also operate under the long-term direction of the LWMP (see Section 1.1.1 for more detail).

Monitoring year 2021 represents Cycle 3, Year 1 of the Environmental Monitoring Program (EMP; formerly the Wastewater and Marine Environment Program [WMEP]), which is the first year when the McLoughlin facility treated the majority of Core Area wastewaters and routine monitoring shifted almost completely to the McLoughlin facility and outfall. Intermittent flows out of the Macaulay and Clover outfalls continued throughout 2021, as optimizations were made to conveyance and treatment plant system operation. Monitoring of any flows out of the Macaulay and Clover outfalls is required in the future, but ongoing construction and commissioning activities made sampling these two locations challenging in 2021. The transition to McLoughlin also led to deviations from standard sampling protocols that precluded direct comparison to previous years' results. Continued non-compliance was also expected at McLoughlin throughout 2021 because of process optimization. Neither the provincial nor federal wastewater regulations have provisions that allow for effluent quality exceedances during commissioning, even though it is challenging for a commissioning treatment plant to immediately achieve full levels of treatment. As such, the 2021 monitoring year, as in 2020, must be considered a transition year for both monitoring and regulatory compliance. Comparisons to previous monitoring results should be done with caution.

1.1 Environmental Monitoring Program Components

1.1.1 Program History

Monitoring of wastewater discharges, surface waters and the seafloor environment in the vicinity of the Macaulay and Clover outfalls has been conducted as part of the Environmental Monitoring Program (EMP) (formerly the Wastewater and Marine Environment Program [WMEP]) on a regular basis since the late 1980s. The program has undergone several changes over the years. Monitoring of wastewater, marine surface waters close to the outfalls, and benthic communities were conducted in the 1970s and 1980s in collaboration with UVIC and independent consultants. In addition, special additional investigations were undertaken to more clearly define the effects of the outfalls on the receiving environment. In 1992, a detailed investigation of effects related to the outfalls was conducted by EVS Environment Consultants Ltd. (North Vancouver, BC) (1992). This study included the analysis of wastewater and sediment chemistry, sediment toxicity, and the assessment of the health of biological communities near the outfalls. The 1992 study results were used to design a regular monitoring and assessment program, in collaboration with MMAG (see Section 1.2 for details).

From 1992 until 1999, the program consisted of monthly wastewater analysis for conventional parameters, quarterly wastewater analysis for priority substances, monthly surface water (<1 m depth) sampling for indicator bacteria, yearly sediment chemistry analysis and seafloor organism monitoring on a three-year cycle. Starting in 2000, the program was again revised in consultation with MMAG. The major changes were not in the components of the program, but rather in the increased frequency of monitoring. Special additional investigations continued to supplement the routine monitoring as necessary.

Toxicity testing also used to be a component of the monitoring program for both wastewater and sediment. Wastewater toxicity testing invariably failed, primarily due to the high ammonia concentrations in the Macaulay and Clover wastewaters. Because ammonia is not typically a concern in the marine environment, it was agreed in consultation with MMAG and ENV, that wastewater toxicity testing be dropped from the program. Sediment toxicity testing was also a component of the program and was dropped following the 1992 EVS study (EVS, 1992) due to confounding total organic carbon concentrations. Both sediment and wastewater toxicity testing, using updated methodologies, were reintroduced to the monitoring program in 2011 as part of a revised monitoring program for which more details are provided below.

The Society of Environmental Toxicology and Chemistry (SETAC) completed a review of the CRD Core Area LWMP in 2006 (SETAC, 2006). This review panel commented that the monitoring program was substantial and well designed, and that continuing it would be appropriate for assessing the CRD wastewater discharge in the future. However, the panel made several recommendations to enhance the monitoring program, including considering more extensive monitoring with better spatial and temporal resolution in the far field to provide a better understanding of the fate of the surfaced sewage plume. Since the SETAC review, the decision to move to advanced treatment was made.

In 2008, CRD and ENV staff initiated a review of the objectives and design of the monitoring program considering the SETAC review and plans to install additional treatment for the Macaulay and Clover wastewaters. As a result of this review, a revised monitoring program, based on a five-year cycle, was implemented in 2011. Both the MMAG and consultants familiar with the monitoring program data reviewed the new program (Golder, 2011) and provided recommendations. There is also a commitment within the five-year monitoring program that CRD and ENV staff will meet on an annual basis to review the results of the previous monitoring year.

The monitoring program design for Cycle 3 and beyond has been revised based on these annual collaborative reviews, comments from the advisory group and other external expert reviews, and the transition to treatment at McLoughlin in 2020. Since 2020, EMP revisions have primarily included shifting most of the wastewater and surface water monitoring effort to McLoughlin and adding new stations to the seafloor monitoring to encompass the predicted impact footprint of the new McLoughlin outfall. Monitoring of the new seafloor locations began in 2019, along with some effluent quality monitoring once McLoughlin commissioning began. In addition, the bulk of the wastewater monitoring effort at Macaulay and Clover was dropped effective December 31, 2020, aligning with cancellation of the Federal Transitional Authorizations for the two facilities, and shifted instead to the McLoughlin facility. As such, the overall monitoring shift to McLoughlin effectively started in 2021, which aligns with Cycle 3, Year 1 of the EMP.

1.1.2 Approach and Program Components

As noted above, the current monitoring program components were developed in conjunction with ENV and MMAG, as part of the new environmental monitoring program based on a five-year cycle. The first cycle (Cycle 1) took place from 2011-2015, but one component (the fish survey) was delayed until 2018 due to logistical concerns. Cycle 2 started in 2016 and ended in 2020. Cycle 3 started in 2021. The objectives of the monitoring program [as contained in the Core Area Liquid Waste Management Plan (CRD, 2000) and updated in amendment #7 (CRD, 2009)] are as follows:

- monitor and assess wastewater quality and quantity
- monitor and assess the potential effects of the wastewater discharges to the marine environment

- monitor and assess the potential effects of the wastewater discharges to human health
- provide information to the CRD's Regional Source Control Program
- provide information to wastewater managers regarding plant and outfall diffuser performance
- provide compliance monitoring results to regulatory agencies
- provide scientific assessment to the general public regarding the use of the marine environment for the disposal of municipal wastewater

A summary of the monitoring components and sampling frequency of the current five-year EMP Cycle 3 is presented in Table 1.1. The 2021 monitoring program is presented in Table 1.2 and Figure 1.2, and consisted of the following components:

- wastewater monitoring and analysis for a list of substances, including conventional parameters, metals, and other priority substances and toxicity (conducted monthly at McLoughlin)
- surface water and water column monitoring and analysis for bacteriological indicators of potential for human exposure to wastewater in the marine environment. Additionally, a list of substances, including conventional parameters, metals, and other priority substances (conducted quarterly at McLoughlin, and, only if they are discharging coincident with routine McLoughlin sampling, around the Macaulay and Clover outfalls)
- wet weather overflow and bypass sampling for bacteriological indicators of potential for human exposure to wastewater in the marine environment, and a subset of conventional parameters indicative of wastewater strength (conducted as needed at Macaulay and Clover, and around the various shoreline overflow locations when bypass, overflow or wet weather events occurred)
- continuing additional investigations that address specific questions about water column and seafloor monitoring components and that investigate emerging scientific issues regarding wastewater discharges and environmental effects

Reclaimed water monitoring is also a requirement of the EMP, but the reclaimed water system was abandoned early in 2021 due to operational challenges. As such, no reclaimed water data will be presented in this report.

An evidence-based approach is used to assess potential environmental effects. Wastewater is analyzed on a regular basis to monitor the substances present in sewage. The potential effects of these substances on organisms in surface waters and the water column are assessed by comparing the concentrations that are predicted in the marine environment to water quality guidelines. The predicted concentrations are calculated by applying computer model-derived receiving environment dilution factors to the wastewater concentrations. Predicted concentrations are then confirmed by surface and water column monitoring around each outfall. Human health risks are assessed via the surface, water column and shoreline bacteriological monitoring. Concentrations of substances present in the wastewater discharges are also analyzed in sediments around the outfalls and at reference sites. Sediment chemistry results are compared to various sediment quality guidelines, as a screening tool to predict potential effects on biological organisms in the marine environment. Finally, organisms that live around the outfalls are monitored to assess direct *in situ* outfall effects.

The organisms that have the potential for the most severe effects in the marine environment close to the outfalls are those that are sessile and/or continuously exposed to the wastewater discharges. These include benthic communities off the McLoughlin and Macaulay outfalls and mussel communities off the Clover outfall. Prior to 2011, these organisms were monitored annually. As part of the revised EMP design, their monitoring frequency was reduced to only once (mussel communities) or twice (benthic invertebrate communities) in the five-year cycle. This reduced frequency has allowed for the addition of sediment toxicity and bioaccumulation assessments, along with the finfish health assessment.

In addition to the sediment toxicity and bioaccumulation studies, the health of the seafloor communities is evaluated by assessing what organisms are present, along with their abundance, growth, and reproductive status. These biological indicators provide a direct assessment of *in situ* environmental effects. Potential effects to higher trophic levels (e.g., fish and marine mammals) are also assessed by measuring concentrations of substances present in wastewater, sediments, benthic invertebrate, mussel, and finfish tissues.

The five-year monitoring cycles will continue to be supplemented by additional investigations, as necessary. Additional investigations are important elements of the monitoring program, with some of the investigations part of the requirements under the Core Area LWMP 2003 approval. Current additional investigations are presented in Table 5.1 and are discussed in Section 5.0. Results from these investigations are incorporated in the overall assessment of effects on the marine environment.

1.2 Marine Monitoring Advisory Group

The CRD formed the MMAG in 1987 to advise on and provide an independent assessment of CRD marine monitoring programs. The MMAG consisted of university and government scientists with expertise in the fields of marine science, oceanography, toxicology, chemistry and environmental health. Since 1987, the MMAG has worked with the CRD to develop a comprehensive monitoring program for the Macaulay and Clover outfalls and has historically been required to submit an annual review of the program to ENV. In September 2010, ENV waived all formal advisory group reporting requirements. The CRD, however, retained the MMAG and broadened the group's mandate to include the review of the CRD's Integrated Watershed Management Program marine monitoring activities, as well as expanded the group's membership to include members of the public with relevant expertise. Because of the transition to a new treatment system to replace the Macaulay and Clover outfalls, the monitoring program has largely been kept unchanged in recent years, except for adding new seafloor stations adjacent to the new McLoughlin outfall. Advice of the MMAG has not been solicited since 2015, but there are plans to resurrect the group once the new McLoughlin treatment system is fully commissioned and operation has stabilized.

1.3 Data Presentation and Analysis

Until 2000, the results of the EMP were tabulated in separate reports according to each sampling component (wastewater monitoring results, etc.). Each of these reports presented a snapshot into the effects of the outfalls on the receiving environment. A comprehensive summary of the results was provided by compiling the data from the different components on a regular basis (once every three to five years). As the frequency of the seafloor components was increased from every three years to annually in 2000, and as additional elements were incorporated into the program, it became evident that the program would benefit from the production of an annual report. Annual reporting began with the 2000-2001 report, which was completed in 2002 (CRD, 2002) and continued up to and including the 2010 monitoring year (CRD, 2011).

Following the review and redesign of the EMP, the need for annual comprehensive reporting was reassessed. Summary data reports are now provided following each of the first four years of a five-year cycle, beginning with the 2011 monitoring year. These data reports will include any completed statistical assessments of the data and the results used to confirm the suitability of the upcoming year's monitoring design. A more comprehensive interpretive report (similar to the annual reports prepared for the 2000-2010 monitoring results) will be prepared at the end of each five-year cycle (after year five) and will include detailed statistical and environmental risk assessments of all data collected within the five-year cycle. The comprehensive report for Cycle 1 was expanded to include 2016-2019 Cycle 2 data. The final report was received in the fall of 2020 (Hatfield, 2020) and a summary of the findings was presented in last year's report (CRD, 2021).

This report presents a summary of the results of the 2021 Core Area EMP (Cycle 3, Year 1), along with any data and analyses of results from previous years that have not yet already been presented. Limited statistical analyses have been performed on the 2021 data; a more detailed and comprehensive statistical assessment of the 2021 results will be undertaken as part of a future 2020 plus Cycle 3 (2021-2025) review that will be initiated in 2024/2025.

Table 1.1 Monitoring Components of the Five-Year McLoughlin, Macaulay, and Clover Environmental Monitoring Program (Cycle 3)

Monitoring Component	Sub-component	Year 1 (2021)			Year 2 (2022)			Year 3 (2023)			Year 4 (2024)			Year 5 (2025)		
		McL[1]	Mac[1]	Clo[1]	McL	Mac	Clo	McL	Mac	Clo	McL	Mac	Clo	McL	Mac	Clo
WASTEWATER																
Wastewater	daily, weekly, monthly and quarterly chemistry	√			√			√			√			√		
	quarterly high-resolution chemistry	√			√			√			√			√		
	monthly toxicity testing	√			√			√			√			√		
	ad hoc wet weather, overflow and bypass chemistry		√[3]	√[3]		√	√		√	√		√	√		√	√
Reclaimed Water	weekly chemistry	√			√			√			√			√		
SEAFLOOR																
Sediment	sediment chemistry				√	√	√				√	√				√
	pore-water chemistry				√	√	√				√	√				
	sediment toxicity				√	√	√				√	√				
	sediment/benthic invertebrate bioaccumulation				√	√					√	√				
Benthic Invertebrates	community structure				√	√					√	√				
Mussels	community indices and health															√
	tissue chemistry															√
Fish	health indices														√[2]	√[2]
	whole fish and fillet tissue chemistry														√[2]	√[2]
SURFACE WATER AND WATER COLUMN																
Surface Water	bacteria	√			√			√			√			√		
Water Column	bacteria, conventionals, metals	√			√			√			√			√		
Ad Hoc Wet Weather, Overflow and Bypass Events	surface and water column bacteria		√	√		√	√		√	√		√	√		√	√
	shoreline bacteria	various conveyance system sanitary and combined sewer overflow shoreline locations														
REPORTING AND ADDITIONAL INVESTIGATIONS																
Additional Investigations	dependent upon emerging environmental issues and recommendations by the advisory group and others	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Reporting	annual data summary report	√	√	√	√	√	√	√	√	√	√	√	√			
	five-year comprehensive report													√	√	√

Notes: [1] McL-McLoughlin, Mac-Macaulay, Clo-Clover [2] Timing of this study to be determined as the Cycle 1 fish survey didn't take place until Cycle 2 [3] Or upstream proxy locations when access was restricted due to construction

Table 1.2 Monitoring Components of the 2021 McLoughlin, Macaulay, and Clover Environmental Monitoring Program

McLoughlin Outfall	Parameter	Monitoring Frequency
Wastewater	Flow	Daily
	Compliance monitoring and process control	Federal – Weekly Provincial – Various frequencies
	Conventional parameters[1] and priority substances[1]	Monthly
	Enhanced priority substances[1]	Quarterly (January, April, July, October)
	Toxicity – acute	Monthly
	Toxicity – chronic	Annually
Surface Water & Water Column	Indicator bacteria (fecal coliform and Enterococci) and CTD (dissolved oxygen, salinity, temperature) Conventional parameters[1] and metals[1]	Quarterly with 5 sampling events in 30 days during each quarter
Macaulay Outfall	**Parameter**	**Monitoring Frequency**
Wastewater	Flow	Measured during bypasses and overflows
	Indicator bacteria and select conventional parameters	Measured during bypasses and overflows
	Compliance monitoring	Discontinued in 2021 once McLoughlin was commissioned
	Conventional parameters[1] and priority substances[1]	Discontinued in 2021 once McLoughlin was commissioned
	Priority substances[1]	Discontinued in 2021 once McLoughlin was commissioned
	Toxicity – acute	Discontinued in 2021 once McLoughlin was commissioned
	Toxicity – chronic	Discontinued in 2021 once McLoughlin was commissioned
Surface Water & Water Column	Indicator bacteria (fecal coliform and Enterococci) and CTD (dissolved oxygen, salinity, temperature) Conventional parameters[1] and metals[1]	Measured during bypasses and overflows if coincident with routine McLoughlin surface water sampling
Clover Outfall	**Parameter**	**Monitoring Frequency**
Wastewater	Flow	Measured during bypasses and overflows
	Indicator bacteria and select conventional parameters	Measured during bypasses and overflows
	Compliance monitoring	Discontinued in 2021 once McLoughlin was commissioned
	Conventional parameters[1] and priority substances[1]	Discontinued in 2021 once McLoughlin was commissioned
	Priority substances[1]	Discontinued in 2021 once McLoughlin was commissioned
	Toxicity – acute	Discontinued in 2021 once McLoughlin was commissioned
	Toxicity – chronic	Discontinued in 2021 once McLoughlin was commissioned
Surface Water & Water Column	Indicator bacteria (fecal coliform and Enterococci) and CTD (dissolved oxygen, salinity, temperature) Conventional parameters[1] and metals[1]	Measured during bypasses and overflows if coincident with routine McLoughlin surface water sampling
Conveyance Overflows	**Parameter**	**Monitoring Frequency**
Shoreline	Indicator bacteria (fecal coliform and Enterococci)	Measured during bypasses and overflows

Notes:
[1]Analyte lists can be found in Appendices B1 (wastewater); C1 (water column)

Figure 1.2 Elements of the 2021 McLoughlin, Macaulay, and Clover Environmental Monitoring Program

MCLOUGHLIN, MACAULAY, AND CLOVER ENVIRONMENTAL MONITORING PROGRAM 2021

MONITORING COMPONENTS (Core program)

Regular analyses conducted monthly, quarterly and once or twice in the five-year cycle

***WASTEWATER* (McLoughlin and bypasses/overflows)**

- Contaminant chemistry
- Toxicity

***SURFACE WATER & WATER COLUMN* (McLoughlin and Macaulay & Clover bypasses/overflows)**

- Indicator bacteria
- Contaminant chemistry

OVERFLOWS (Shoreline Bypasses/Overflows)

- Indicator bacteria

ADDITIONAL INVESTIGATIONS

Studies to address specific questions related to the monitoring program

Investigations Completed in 2021 and early 2022

- Completion of a UVIC and industry collaborative project to assess COVID-19 presence in regional wastewaters
- Completion of a collaborative assessment of the uptake and trophic changes in PCB in the benthic marine food chain around the Macaulay outfall

Investigations Continuing/Starting in 2021 to 2022

- Continued participation in the Ocean Wise Conservation Association's SSAMEx and Pollution Tracker programs
- Continuation of a collaborative project with the Ocean Wise Conservation Association and Royal Roads University to develop methods for microplastic analyses in wastewater and environmental samples
- Continuation of a collaborative project with Biologica Environmental Services Ltd. (Victoria, BC) and the University of Chicago to assess live versus dead benthos assemblages around the Macaulay outfall
- Continuation of a collaborative project with Biologica Environmental Services Ltd., the UVIC, and Metro Vancouver to develop benthic invertebrate toxicogenomic monitoring tools
- Initiation of a BC Centre for Disease control project to assess COVID-19 and influenza presence in BC wastewaters
- Participation in a University of British Columbia and Harbour Resource Partners collaborative project to develop a handheld microorganism detection device

2.0 WASTEWATER MONITORING

2.1 Introduction

Influent and final effluent monitoring is conducted regularly at the McLoughlin Wastewater Treatment Plant (McLWWTP) to assess compliance with the registration under the Municipal Wastewater Regulation (Authorization Number RE108831) and with the Federal Wastewater Systems Effluent Regulations (WSER). Regulated parameters include carbonaceous biochemical oxygen demand (CBOD), un-ionized ammonia, toxicity, total suspended solids (TSS), and pH. Table 2.2 presents the federal and provincial limits and Table 2.3 presents this data with comparisons to the limits.

Monitoring is also conducted to profile the chemical and physical constituents of influent and effluent before it is released to the marine receiving environment. Assessment of influent and effluent provides information on the concentrations and loadings of contaminants released to the marine receiving environment and provides an indication of which substances may be of environmental concern. These results are then used to direct the efforts of the receiving environment monitoring program and the CRD's Regional Source Control Program.

Wastewater monitoring is also required at the Clover and Macaulay pump stations during conveyance system wet weather overflows or planned and approved maintenance bypass events. The objective of this monitoring is to assess equivalency to primary treatment and provide data to determine potential risk to the receiving environment. If these events happen concurrently with routine McLWWTP surface water sampling, then receiving environment sampling around the Macaulay and Clover outfalls is also required (discussed in Section 3.0).

Intermittent fows out of the Macaulay and Clover outfalls continued throughout 2021, as optimizations were made to conveyance and treatment plant system operation. Monitoring of any flows out of the Macaulay and Clover outfalls is required in the future, but ongoing construction and commissioning activities made sampling these two locations challenging in 2021. The transition to McLoughlin also led to deviations from standard sampling protocols that precluded direct comparison to previous years' results. Continued non-compliance was also expected at McLoughlin throughout 2021 as a result of process optimization. Neither the provincial nor federal wastewater regulations have provisions that allow for effluent quality exceedances during commissioning, even though it is challenging for a commissioning treatment plant to immediately achieve full levels of treatment. As such, the 2021 monitoring year, like 2020, must be considered a transition year for both monitoring and regulatory compliance. Comparisons to previous monitoring results should be done with caution.

The McLWWTP provincial registration allows the use of reclaimed water for operations use (i.e., wash down treatment works). The registration designates the use as "moderate exposure-frequent use", which stipulates criteria for reclaimed water quality to protect the environment and human health. Reclaimed water was utilized in 2020 and compliance results were reported in that year's annual report. The use of reclaimed water was discontinued in 2021 due to difficulty maintaining quality that was compliant with the registration. This challenge was because of frequency of use: the reclaimed system was designed to operate more frequently than it was, resulting in fouling and non-compliance.

2.2 Methods

Federal and Provincial Compliance Sampling

Both federal and provincial compliance monitoring of McLWWTP final effluent were taken as 24-hour flow based composite samples as required by regulations. Flow-based sampling methods lead to samples taken proportional to the flow (recorded by the SCADA system). After collection, samples were immediately dispatched to two CALA certified laboratories to conduct chemical analyses (Bureau Veritas Laboratories (BV Labs, Burnaby, BC) and the McLoughlin Treatment Plant Laboratory).

Toxicity testing using rainbow trout and *Daphnia magna* was conducted monthly by Nautilus Environmental (Burnaby, BC) using final effluent grab samples. The rainbow trout test methods approved by regulators (provincial and federal) allow both EPS 1/RM/50 and EPS 1/RM/13. Test method EPS 1/RM/13 does not use CO2 aeration to adjust for pH drift while EPS 1/RM/50 does. To use test method EPS 1/RM/50, the discharger must demonstrate that any toxicity is caused by ammonia and pH drift in the test conditions. Final effluent was tested initially in 2021 using 1/RM/13, but was switched to pH stabilized 1/RM/50 after ammonia toxicity was demonstrated (discussed further in Section 2.3.4).

Influent and effluent flow volumes were measured continuously (every few minutes) by a SCADA system at the McLWWTP influent and effluent points. Final effluent flow measurements were compared to maximum daily and annual mean flow limits specified in the permits. Flow values were also used for the calculation of loadings of conventional and priority substances by multiplying daily flows against daily concentrations then extrapolating out to annual loadings to the marine receiving environment.

Wastewater Characterization

CRD staff conducted influent and effluent sampling at the McLWWTP for wastewater characterization and treatment plant performance. Samples were analyzed daily, weekly, monthly, or quarterly for over 20 conventional parameters, such as total suspended solids and nutrients. A comprehensive list of up to 500 priority substances were analyzed monthly or quarterly as described in Table 2.1 and Appendix B1. Acute toxicity was tested monthly and chronic toxicity was tested annually in autumn.

McLWWTP influent and effluent samples were taken as grab samples in 2021. Optimally, samples would have been taken as 24-hour time-based composites (400 mL wastewater collected every 30 minutes for 24 hours and combined into one sample). Treatment plant operations needed some time to plumb in automated samplers at both the influent and effluent sampling points. Composite sampling commenced in 2022.

The list of priority substances was originally adapted from the US Environmental Protection Agency (US EPA) National Recommended Water Quality Criteria; Priority Toxic Pollutants list (US EPA, 2002). The CRD's list is reviewed periodically to determine the need to remove or add substances depending on new developments in terms of analytical techniques, potential presence in wastewaters, and potential effects on the receiving environment. The list was most recently revised to align with cean Wise's Pollution Tracker Program (Section 5.1.1).

After collection, samples were immediately dispatched to Canadian Association for Laboratory Accreditation Inc. (CALA) certified laboratories to conduct chemical analyses. Conventional and priority substance parameters were analyzed by Bureau Veritas Laboratories (BV Labs, Burnaby, BC), and high-resolution analyses were conducted at SGS AXYS Analytical Services (Sidney, BC). Substances were analyzed using methods capable of achieving method detection limits suitable for comparison to applicable water quality guidelines. Acute (Appendix B6) and chronic (Appendix B7) wastewater toxicity testing was conducted by Nautilus Environmental (Burnaby, BC), using standardized and Environment Canada approved protocols.

Overflow and Bypass Sampling

As required by ENV, any overflow or bypass event discharged from either the Clover or Macaulay pump station must be sampled by automated composite samplers. These samplers are programmed to trigger half hourly composite samples if an overflow or bypass event exceeds one hour of discharge out of either respective long outfall. After collection, composite samples are then dispatched to CALA certified laboratories for fecal coliform, Enterococci, TSS and CBOD analysis. This sampling did not occur in 2021 as there was only one overflow event and the composite sampler did not trigger as planned. The program has been reviewed and tested for successful operation in 2022.

Table 2.1 Frequency of Wastewater Sampling by Analytical Group

(Appendix B1 provides a listing of individual analytes within each analytical group)

Parameter Group	Influent and Final Effluent Analytics			
	Daily/ weekly	Monthly	Quarterly	Annual
Conventionals (nutrients, oxygen demand, pH, TSS)	√	√	√	
Metals, total		√	√	
Metals, speciated (MeHg and TBT)			√	
Metals, dissolved		√	√	
Aldehydes		√	√	
Phenolic compounds		√	√	
Chlorinated phenolics		√	√	
Non-chlorinated phenolics		√	√	
Polycyclic aromatic hydrocarbons		√	√	
Semi-volatile organics		√	√	
Miscellaneous semi-volatile organics		√	√	
Volatile organics		√	√	
Terpenes		√	√	
Acute Toxicity				
Rainbow trout 96-hr LC50 pH stabilized		√*		
Daphnia magna 48-hr LC50		√*		
Chronic Toxicity				
Ceriodaphnia seven-day (survival and reproduction)				√*
Rainbow trout alevin and embryo (EA) 30-day (survival and growth)				√*
Top smelt seven-day (survival and growth)				√*
Echinoderm fertilization (reproduction)				√*
High-Resolution Analyses				
Nonylphenols (NP)			√	
Organochlorine pesticides (OC Pest)			√	
Pharmaceuticals and personal care products (PPCP)			√	
Polychlorinated biphenyls (PCB)			√	
Polycyclic aromatic hydrocarbons (PAH)			√	
Polybrominated diphenyl ethers (PBDE)			√	
Per- and poly-fluoroalkyl substances (PFAS)			√	

Notes:
*final effluent only

DATA QUALITY ASSESSMENT

CRD staff followed a rigorous quality assurance/quality control (QA/QC) assessment procedure for both field sampling procedures and laboratory analyses for the routine wastewater monitoring component. From each analytical batch (12 monthly batches in 2021), one sample was randomly chosen for laboratory triplicate analysis every quarter (January, April, July and October) and one sample was randomly chosen for field triplicate analysis annually. In addition, one sample each month was analyzed as a matrix spike, and trip and field blanks were tested once in 2021. The analytical laboratories also conducted internal QA/QC analyses, including method analyte spikes, method blanks and standard reference materials.

Any data that exhibited failures of QA/QC criteria was not included in any statistical analysis.

2.3 Results and Discussion

Table 2.2 presents the Federal and Provincial compliance limits.

Table 2.2 McLoughlin Point WWTP Provincial and Federal Compliance Limits – Final Effluent

Parameter	Unit	Provincial Limit		Federal Limit
		McLoughlin WWTP ≤216,000 m^3/day	McLoughlin WWTP* >216,000 m^3/day	McLoughlin WWTP ≤432,000 m^3/day
CBOD	mg/L	25 (maximum) 10 (monthly average)	130 (maximum)	25 (monthly average)
Rainbow Trout Toxicity	pass/fail	pass	---	pass
TSS	mg/L	25 (maximum) 10 (monthly average)	130 (maximum)	25 (monthly average)
Unionized NH_3 @ 15°C	mg/L	---	---	1.25 (maximum)
pH	pH	6-9	---	---
Effluent Flow (maximum)	m^3/day	432,000		---

Notes:
*Provincial registration allows only 70 days per year >216,000 m^3/day

2.3.1 Provincial Compliance Monitoring

Effluent monitoring is undertaken to ensure compliance with the provincial registration issued for McLWWTP; effluent quality limits vary depending on whether the facility is discharging solely tertiary effluent when flows are less than or equal to 216,000 m^3/day (≤2ADWF), or blended (primary + tertiary) effluent when flows are greater than 216,000 m^3/day (>2DWF). Table 2.2 presents these compliance limits. The McLWWTP is authorized to blend primary and tertiary flows for 70 days per year. The provincial registration also requires monitoring and reporting of ammonia, phosphate, total phosphorous, fecal coliforms and Enterococci, but there are no effluent quality limits for these parameters. Results for pH, ortho-phosphate and total phosphorous are presented in Table 2.5.

Effluent flows did not exceed the allowable daily maximum flows for McLWWTP (maximum 432,000 m^3/day). The average daily effluent flow from McLWWTP was 95,551 m^3/day, and the maximum was 238,900 m^3/day on December 18, 2021. Flow information is presented in Figure 2.1 and Appendix B2 (influent) and Appendix B3 (effluent).

Table 2.3 presents the compliance results for non-blended flow days (<216,000 m^3/day). McLWWTP effluent was not compliant with provincial registration requirements on several occasions:

Monthly Averages

- Monthly average TSS concentrations were out of compliance in 5 of the 12 monthly averages (February, March, April, May, and June).
- Monthly average CBOD concentrations were out of compliance for 6 of the 12 monthly averages (March, April, May, June, September, and October).

Maximum Values

- Individual maximum TSS concentrations were out of compliance 2 times in March, 5 times in April, 2 times in May and 1 time in October.
- Individual maximum CBOD was out of compliance 4 times in April, 3 times in May, 2 times in June and 1 time in October.

Maximum CBOD and TSS concentration exceedances did not align with blended days and are most likely a result of continued optimization of plant operations at the McLWWTP. In addition, there is potential that highly variable centrate return flows from the Hartland Residuals Treatment Facility may be impacting the treatment plant's ability to achieve effluent quality limits at all times. Investigations are ongoing. In 2021, there were 32 days when blending occurred but of those, only 7 days were when flows were greater than 216,000 m^3. The remaining 25 days were technically out of compliance because full tertiary treatment capacity was not achieved prior to blending. Operators continue to refine the instantaneous flow control set points that resulted in the premature blending.

Table 2.4 presents flow measurements and compliance results for the 32 days that blending occurred. During the 32 days that blending occurred and flows were >216,000 m^3/day, all compliance results were below the normal non-blended maximum limits of 25 mg/L for TSS and CBOD except for October 28th when the TSS and CBOD results were above these limits, but still below the blended limits of 130 mg/L.

An acute toxicity test conducted on January 20th using method EPS 1/RM/13 (not pH stabilized) failed. Subsequent testing using EPS 1/RM/50 (pH stabilized) proved that the cause of this toxicity was pH drift in test conditions due to elevated ammonia. All subsequent toxicity tests in 2021 passed using pH-stabilized test methods. All Daphnia acute toxicity testing passed without any test modifications.

2.3.2 Federal Compliance Monitoring

Table 2.3 presents results of compliance to WSER. The McLWWTP was compliant with WSER limits for TSS, unionized ammonia and CBOD all year except in April when the TSS average was 25.2 mg/L (limit is 25 mg/L).

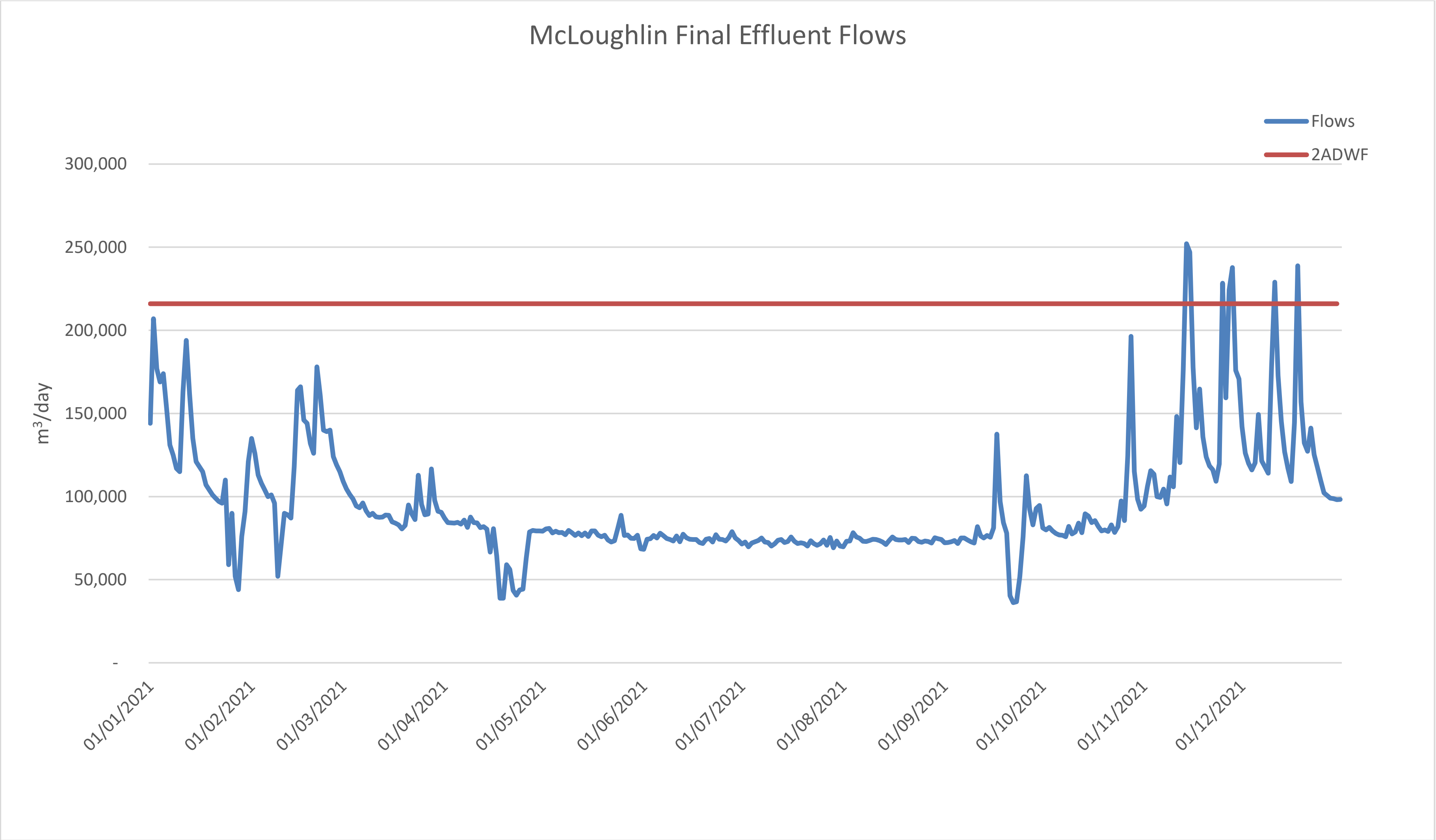


Figure 2.1 McLoughlin WWTP Final Effluent Flows in 2021

Table 2.3 McLoughlin Federal and Provincial Wastewater Compliance Results for 2021 (<2x ADWF*)

	McLoughlin Wastewater Treatment Plant Final Effluent								
	Total Daily Flow (<2ADWF)	Secondary Bypass Flow	Rainbow Trout Toxicity	CBOD	TSS	Unionized NH_3 @ 15°C	NH_3-N	Fecal Coliforms	Enterococci
	m^3/day	m^3/day	96-hour LC50	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	CFU/100 mL
Provincial Registration 108831	<216,000	≤70 days per year	Pass/Fail	25 (maximum) 10 (monthly average)	25 (maximum) 10 (monthly average)	---	**BC WQG 58 mg/L (max), 8.7 mg/L monthly average	---	---
Wastewater Systems Effluent Regulations			Pass (100% v/v%)	25 (monthly average)	25 (monthly average)	1.25 (maximum)	---	---	---
01-Jan-21	144,009			5.5	4.2		14.5		
02-Jan-21	206,962	9,930		7.0	7.8		13.0		
03-Jan-21	176,814			8.5	8.0				
04-Jan-21	168,859			5.6	6.7		15.4	63,700	73,000
05-Jan-21	173,573			6.4	6.5		16.5		
06-Jan-21	152,600	960		3.3	3.0		14.8		
07-Jan-21	131,201			5.8	7.1		15.7		
08-Jan-21	124,968								
09-Jan-21	117,158			8.5	4.7		17.6		
10-Jan-21	115,251			9.3	4.7		17.3		
11-Jan-21	163,214			6.5	10.3		15.3	37,300	48,000
12-Jan-21	193,683	410							
13-Jan-21	161,653			9.9	5.6				
14-Jan-21	135,100			12.0	6.4	0.034	14.0	50,000	77,000
15-Jan-21	120,800								
16-Jan-21	117,600			14.0	9.6				
17-Jan-21	114,500								
18-Jan-21	107,300	60		13.0	8.8	0.074	26.0		
19-Jan-21	104,000			10.0	8.0	0.51	27.3	51,000	250,000
20-Jan-21	101,300		Fail		15.0	0.07			
21-Jan-21	98,800				4.0	0.54	32.5		
22-Jan-21	96,800								
23-Jan-21	95,900			14.0	11.0	0.61	53.0		
24-Jan-21	109,800			14.0	11.0	0.63			

Table 2.3, cont'd

	McLoughlin Wastewater Treatment Plant Final Effluent								
	Total Daily Flow (<2ADWF)	Secondary Bypass Flow	Rainbow Trout Toxicity	CBOD	TSS	Unionized NH_3 @ 15°C	NH_3-N	Fecal Coliforms	Enterococci
	m^3/day	m^3/day	96-hour LC50	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	CFU/100 mL
Provincial Registration 108831	<216,000	≤70 days per year	Pass/Fail	25 (maximum) 10 (monthly average)	25 (maximum) 10 (monthly average)	---	**BC WQG 58 mg/L (max), 8.7 mg/L monthly average	---	---
Wastewater Systems Effluent Regulations			Pass (100% v/v%)	25 (monthly average)	25 (monthly average)	1.25 (maximum)	---	---	---
25-Jan-21	59,300			13.0	11.0			76,000	7,600
26-Jan-21	89,900			16.0					
27-Jan-21	51,700			10.1	10.0				
28-Jan-21	44,300			5.4	5.5	0.132	19.0		
29-Jan-21	76,000								
30-Jan-21	90,700								
31-Jan-21	120,500			10.5	16.0	0.175	37.9		
January Average				**9.5**	**8.0**		**21.9**		
01-Feb-21	135,400			8.4	19.7				
02-Feb-21	125,880		Pass	9.7	17.0	0.225	25.7		
03-Feb-21	112,780			3.6	3.8				
04-Feb-21	108,060			8.2	9.4	0.41	30.4		
05-Feb-21	103,910							840,000	95,000
06-Feb-21	100,400								
07-Feb-21	101,060			11.9	11.6	0.255	29.8		
08-Feb-21	96,010			11.7	10.1				
09-Feb-21	52,160			11.9	17.3	0.154	29.8	750,000	130,000
10-Feb-21	71,430			11.0	14.1				
11-Feb-21	90,150			9.4	13.6	0.221	24.7		
12-Feb-21	89,100								
13-Feb-21	87,470								
14-Feb-21	118,410			9.8	14.7	0.188	32.4		
15-Feb-21	163,520	24		8.6	19.7				
16-Feb-21	165,690		Pass	9.0	12.6	0.168	18.8	71,000	700,000
17-Feb-21	146,240			6.0	7.7				

Table 2.3, cont'd

	McLoughlin Wastewater Treatment Plant Final Effluent								
	Total Daily Flow (<2ADWF)	Secondary Bypass Flow	Rainbow Trout Toxicity	CBOD	TSS	Unionized NH_3 @ 15°C	NH_3-N	Fecal Coliforms	Enterococci
	m^3/day	m^3/day	96-hour LC50	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	CFU/100 mL
Provincial Registration 108831	<216,000	≤70 days per year	Pass/Fail	25 (maximum) 10 (monthly average)	25 (maximum) 10 (monthly average)	---	**BC WQG 58 mg/L (max), 8.7 mg/L monthly average	---	---
Wastewater Systems Effluent Regulations			Pass (100% v/v%)	25 (monthly average)	25 (monthly average)	1.25 (maximum)	---	---	---
18-Feb-21	143,990			8.9	11.5	0.139	18.6		
19-Feb-21	131,690								
20-Feb-21	126,380								
21-Feb-21	178,290			7.0	3.1	0.203	22.7		
22-Feb-21	161,100	200		7.1	10.2				
23-Feb-21	140,010			10.9	12.5	0.136	20.4	300,000	1,800,000
24-Feb-21	139,130			13.1	24.4				
25-Feb-21	140,460			10.2	15.1	0.178	21.3		
26-Feb-21	124,010								
27-Feb-21	118,900								
28-Feb-21	115,330			8.2	8.7	0.234	26.8		
February Average				**9.3**	**12.8**		**25.1**		
01-Mar-21	109,210				15.0				
02-Mar-21	104,730		Pass	14.3	15.3	0.166	34.4	79,000	120,000
03-Mar-21	101,340				7.0				
04-Mar-21	98,600			9.9	7.4	0.227	33.4		
05-Mar-21	94,410								
06-Mar-21	93,270			5.4	8.1	0.164	24.1		
07-Mar-21	96,110			9.1	6.7	0.2	23.9		
08-Mar-21	91,430				9.0				
09-Mar-21	88,560			8.2	9.0	0.265	27.0	290,000	40,000
10-Mar-21	89,990			12.9	16.0				
11-Mar-21	87,820			10.5	10.0	0.266	40.9		
12-Mar-21	87,470								
13-Mar-21	87,640								

Table 2.3, cont'd

	McLoughlin Wastewater Treatment Plant Final Effluent								
	Total Daily Flow (<2ADWF)	Secondary Bypass Flow	Rainbow Trout Toxicity	CBOD	TSS	Unionized NH_3 @ 15°C	NH_3-N	Fecal Coliforms	Enterococci
	m^3/day	m^3/day	96-hour LC50	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	CFU/100 mL
Provincial Registration 108831	<216,000	≤70 days per year	Pass/Fail	25 (maximum) 10 (monthly average)	25 (maximum) 10 (monthly average)	---	**BC WQG 58 mg/L (max), 8.7 mg/L monthly average	---	---
Wastewater Systems Effluent Regulations			Pass (100% v/v%)	25 (monthly average)	25 (monthly average)	1.25 (maximum)	---	---	---
14-Mar-21	88,920			11.8	13.0	0.403	29.9		
15-Mar-21	88,680			11.9	13.0				
16-Mar-21	84,780			8.1	9.3	0.432	39.3	240,000	36,000
17-Mar-21	84,090								
18-Mar-21	83,000		Pass			0.049			
19-Mar-21	80,630								
20-Mar-21	82,580			8.4	5.6				
21-Mar-21	94,880			15.9	17.6	0.319	41.8		
22-Mar-21	89,610			6.0	14.0				
23-Mar-21	86,060			9.3	22.5	0.534	25.2	140,000	30,000
24-Mar-21	112,790			11.7	26.0				
25-Mar-21	95,270			11.1	18.9	0.137	20.6		
26-Mar-21	89,040								
27-Mar-21	89,510								
28-Mar-21	116,740	43				0.235			
29-Mar-21	97,720			11.3	23.5		34.6		
30-Mar-21	91,220				21.0	0.136			
31-Mar-21	90,470			9.7	33.8		23.0		
March Average				**10.3**	**14.6**		**30.6**		
01-Apr-21	87,053			19.9	14.0				
02-Apr-21	84,399								
03-Apr-21	84,249								
04-Apr-21	84,058			7.8	10.0				
05-Apr-21	84,494				6.0	0.185			
06-Apr-21	83,359			12.0	12.0	0.214	27.8	830,000	200,000

Table 2.3, cont'd

	McLoughlin Wastewater Treatment Plant Final Effluent								
	Total Daily Flow (<2ADWF)	Secondary Bypass Flow	Rainbow Trout Toxicity	CBOD	TSS	Unionized NH_3 @ 15°C	NH_3-N	Fecal Coliforms	Enterococci
	m^3/day	m^3/day	96-hour LC50	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	CFU/100 mL
Provincial Registration 108831	<216,000	≤70 days per year	Pass/Fail	25 (maximum) 10 (monthly average)	25 (maximum) 10 (monthly average)	---	**BC WQG 58 mg/L (max), 8.7 mg/L monthly average	---	---
Wastewater Systems Effluent Regulations			Pass (100% v/v%)	25 (monthly average)	25 (monthly average)	1.25 (maximum)	---	---	---
07-Apr-21	85,949			17.6	19.0		31.5		
08-Apr-21	81,442			18.1	14.0	0.274			
09-Apr-21	87,608			28.2	30.0		31.3		
10-Apr-21	84,286								
11-Apr-21	84,205			19.4	17.0	0.22	44.0		
12-Apr-21	81,340			28.1	33.6	0.1	35.0		
13-Apr-21	81,937			33.0	220.0	0.097	36.0	950,000	100,000
14-Apr-21	80,435			34.8	69.0				
15-Apr-21	66,567		Pass	22.3	38.0	0.0005			
16-Apr-21	80,660								
17-Apr-21	64,220			18.0	24.0	0.11	32.0		
18-Apr-21	38,796			6.6	6.0	0.027	11.0		
19-Apr-21	38,750			7.2	4.0				
20-Apr-21	58,965			7.7	6.0	0.019	9.0	99,000	10,000
21-Apr-21	56,071	90		9.7	8.0				
22-Apr-21	43,596			10.3	9.0				
23-Apr-21	40,735								
24-Apr-21	43,767								
25-Apr-21	44,331			5.8	5.0	0.39			
26-Apr-21	63,000			10.2	9.0	0.33			
27-Apr-21	78,672				8.0	0.13		27,000	1,800
28-Apr-21	79,556				12.0				
29-Apr-21	79,253			22.3	17.0				
30-Apr-21	79,253								
April Average				**16.6**	**25.2**		**28.6**		

Table 2.3, cont'd

	McLoughlin Wastewater Treatment Plant Final Effluent								
	Total Daily Flow (<2ADWF)	Secondary Bypass Flow	Rainbow Trout Toxicity	CBOD	TSS	Unionized NH_3 @ 15°C	NH_3-N	Fecal Coliforms	Enterococci
	m^3/day	m^3/day	96-hour LC50	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	CFU/100 mL
Provincial Registration 108831	<216,000	≤70 days per year	Pass/Fail	25 (maximum) 10 (monthly average)	25 (maximum) 10 (monthly average)	---	**BC WQG 58 mg/L (max), 8.7 mg/L monthly average	---	---
Wastewater Systems Effluent Regulations			Pass (100% v/v%)	25 (monthly average)	25 (monthly average)	1.25 (maximum)	---	---	---
01-May-21	79,190								
02-May-21	80,510			8.2	5.0	0.12	27.0		
03-May-21	80,860			11.7	16.0	0.12	27.0		
04-May-21	78,130			16.6	12.0	0.13	28.0	59,000	9,500
05-May-21	79,210			22.4	14.0				
06-May-21	78,270			13.2	8.0				
07-May-21	78,370								
08-May-21	77,030								
09-May-21	79,670			13.0	9.0				
10-May-21	78,320			12.6	7.0				
11-May-21	76,600			20.1	12.0			80,000	12,000
12-May-21	78,090			24.0	12.0	0.09	38.0		
13-May-21	76,430			10.7	10.0				
14-May-21	78,050								
15-May-21	75,980								
16-May-21	79,410			9.8	9.0	0.21	38.0		
17-May-21	79,300			10.9	8.0				
18-May-21	76,830			16.6	11.0	0.17	34.0	48,000	21,000
19-May-21	75,900		Pass	26.4	22.0	0.18	37.0		
20-May-21	76,760			24.1	17.0				
21-May-21	73,940								
22-May-21	72,550								
23-May-21	73,360			19.7	19.0	0.12	37.0		
24-May-21	80,930			13.2	12.0	0.11	30.0		
25-May-21	88,710	80		31.5	29.0			360,000	98,000

Table 2.3, cont'd

	McLoughlin Wastewater Treatment Plant Final Effluent								
	Total Daily Flow (<2ADWF)	Secondary Bypass Flow	Rainbow Trout Toxicity	CBOD	TSS	Unionized NH_3 @ 15°C	NH_3-N	Fecal Coliforms	Enterococci
	m^3/day	m^3/day	96-hour LC50	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	CFU/100 mL
Provincial Registration 108831	<216,000	≤70 days per year	Pass/Fail	25 (maximum) 10 (monthly average)	25 (maximum) 10 (monthly average)	---	**BC WQG 58 mg/L (max), 8.7 mg/L monthly average	---	---
Wastewater Systems Effluent Regulations			Pass (100% v/v%)	25 (monthly average)	25 (monthly average)	1.25 (maximum)	---	---	---
26-May-21	76,550			35.0	39.0	0.21	38.0		
27-May-21	76,920			21.4	20.0				
28-May-21	74,960								
29-May-21	74,820								
30-May-21	76,720			10.4	9.0	0.22			
31-May-21	68,620			10.8	11.0	0.22			
May Average				**17.4**	**14.1**		**33.4**		
01-Jun-21	68,310			28.3	20.0	0.15	33.0		
02-Jun-21	74,290			17.2	17.0			53,000	5,200
03-Jun-21	74,570				16.0				
04-Jun-21	76,600								
05-Jun-21	75,050								
06-Jun-21	77,900			11.2	15.0	0.13	36.0		
07-Jun-21	76,510			10.1	14.0				
08-Jun-21	74,750			7.9	12.0	0.13	34.0	80,000	11,000
09-Jun-21	74,200	700		21.0	19.0				
10-Jun-21	73,190		Pass	14.0	10.0	0.15	34.0		
11-Jun-21	76,270								
12-Jun-21	72,830			10.0					
13-Jun-21	77,340			11.2	5.0	0.11	29.0		
14-Jun-21	75,230			10.3	6.0				
15-Jun-21	74,250			12.7	8.0	0.19	31.0	230,000	36,000
16-Jun-21	74,170			15.3	10.0	0.19	38.0		
17-Jun-21	74,110			11.3	8.0				
18-Jun-21	72,320								

Table 2.3, cont'd

	McLoughlin Wastewater Treatment Plant Final Effluent								
	Total Daily Flow (<2ADWF)	Secondary Bypass Flow	Rainbow Trout Toxicity	CBOD	TSS	Unionized NH_3 @ 15°C	NH_3-N	Fecal Coliforms	Enterococci
	m^3/day	m^3/day	96-hour LC50	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	CFU/100 mL
Provincial Registration 108831	<216,000	≤70 days per year	Pass/Fail	25 (maximum) 10 (monthly average)	25 (maximum) 10 (monthly average)	---	**BC WQG 58 mg/L (max), 8.7 mg/L monthly average	---	---
Wastewater Systems Effluent Regulations			Pass (100% v/v%)	25 (monthly average)	25 (monthly average)	1.25 (maximum)	---	---	---
19-Jun-21	71,690								
20-Jun-21	74,390			7.8	5.0	0.19	31.0		
21-Jun-21	74,780			13.5	14.0				
22-Jun-21	72,580			12.7	9.0	0.14	31.0	83,000	21,000
23-Jun-21	77,020			24.7	16.0				
24-Jun-21	74,250			30.6	24.0	0.19	45.0		
25-Jun-21	74,190								
26-Jun-21	73,170								
27-Jun-21	75,330			9.6	8.0	0.13			
28-Jun-21	78,860			14.6	14.0				
29-Jun-21	75,120				16.0	0.13		820,000	240,000
30-Jun-21	73,640			16.0	10.0				
June Average				**14.9**	**12.6**		**34.2**		
01-Jul-21	71,470			18.0	16.0	0.17	34.0		
02-Jul-21	72,570								
03-Jul-21	69,770			8.0					
04-Jul-21	72,120			10.0	7.0	0.11	23.0		
05-Jul-21	72,830								
06-Jul-21	73,450			8.2	3.0	0.3	33.0	150,000	6,400
07-Jul-21	75,050			9.4	6.0				
08-Jul-21	72,640			10.1	6.0	0.42	49.0		
09-Jul-21	72,360								
10-Jul-21	70,330			8.8	4.0				
11-Jul-21	71,590			7.0	3.0	0.14	26.0		
12-Jul-21	73,680			6.8	5.0				

Table 2.3, cont'd

	McLoughlin Wastewater Treatment Plant Final Effluent								
	Total Daily Flow (<2ADWF)	Secondary Bypass Flow	Rainbow Trout Toxicity	CBOD	TSS	Unionized NH_3 @ 15°C	NH_3-N	Fecal Coliforms	Enterococci
	m^3/day	m^3/day	96-hour LC50	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	CFU/100 mL
Provincial Registration 108831	<216,000	≤70 days per year	Pass/Fail	25 (maximum) 10 (monthly average)	25 (maximum) 10 (monthly average)	---	**BC WQG 58 mg/L (max), 8.7 mg/L monthly average	---	---
Wastewater Systems Effluent Regulations			Pass (100% v/v%)	25 (monthly average)	25 (monthly average)	1.25 (maximum)	---	---	---
13-Jul-21	74,180			7.1	5.0	0.15	23.0	94,000	15,000
14-Jul-21	72,440		Pass	9.4	6.0	0.088			
15-Jul-21	72,910			7.6	4.0	0.29	39.0		
16-Jul-21	75,680								
17-Jul-21	73,140								
18-Jul-21	71,650			8.2	5.0	0.24	43.0		
19-Jul-21	72,150			7.7	4.0				
20-Jul-21	71,700			8.4	6.0	0.13	30.0		
21-Jul-21	70,210			9.2	6.0				
22-Jul-21	73,360				7.0	0.17	32.0	230,000	34,000
23-Jul-21	71,720								
24-Jul-21	70,660								
25-Jul-21	71,640			7.8	6.0	0.29	54.0		
26-Jul-21	73,930			6.5	4.0				
27-Jul-21	70,730			8.9	5.0	0.14	31.0	190,000	28,000
28-Jul-21	75,370			8.0	5.0				
29-Jul-21	69,230			8.3	7.0	0.14	31.0		
30-Jul-21	73,220								
31-Jul-21	70,230								
July Average				**8.7**	**5.7**		**34.5**		
01-Aug-21	69,830			6.5	5.0	0.13	29.0		
02-Aug-21	73,100			6.5	7.0				
03-Aug-21	73,270			9.5	6.0	0.17	36.0	160,000	8,400
04-Aug-21	78,180			14.3	10.0				
05-Aug-21	75,740			10.3	6.0	0.27	41.0		

Table 2.3, cont'd

	McLoughlin Wastewater Treatment Plant Final Effluent								
	Total Daily Flow (<2ADWF)	Secondary Bypass Flow	Rainbow Trout Toxicity	CBOD	TSS	Unionized NH_3 @ 15°C	NH_3-N	Fecal Coliforms	Enterococci
	m^3/day	m^3/day	96-hour LC50	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	CFU/100 mL
Provincial Registration 108831	<216,000	≤70 days per year	Pass/Fail	25 (maximum) 10 (monthly average)	25 (maximum) 10 (monthly average)	---	**BC WQG 58 mg/L (max), 8.7 mg/L monthly average	---	---
Wastewater Systems Effluent Regulations			Pass (100% v/v%)	25 (monthly average)	25 (monthly average)	1.25 (maximum)	---	---	---
06-Aug-21	74,980								
07-Aug-21	73,120								
08-Aug-21	73,000			6.5	4.0	0.15	27.0		
09-Aug-21	73,480								
10-Aug-21	74,280		Pass	9.5	7.0	0.15	30.0	99,000	9,600
11-Aug-21	74,080			11.8	6.0				
12-Aug-21	73,570			11.7	6.0	0.19	38.0		
13-Aug-21	72,700								
14-Aug-21	71,230								
15-Aug-21	73,510			6.6	7.0	0.1	34.0		
16-Aug-21	75,660			8.2	9.0				
17-Aug-21	74,150			11.6	4.0	0.16	36.0		
18-Aug-21	73,840			11.0		0.039			
19-Aug-21	73,800			10.6	7.0	0.12	31.0	880,000	72,000
20-Aug-21	74,100								
21-Aug-21	72,340								
22-Aug-21	74,900			6.5	8.0	0.19	42.0		
23-Aug-21	74,820								
24-Aug-21	72,960			13.1	8.0	0.25	45.0	450,000	47,000
25-Aug-21	72,460			16.0	9.0				
26-Aug-21	73,300			9.5	7.0	0.18	31.0		
27-Aug-21	72,890								
28-Aug-21	72,140			7.6	6.0				
29-Aug-21	75,340			8.3	6.0	0.23			
30-Aug-21	74,730			8.9	5.0				

Table 2.3, cont'd

	McLoughlin Wastewater Treatment Plant Final Effluent								
	Total Daily Flow (<2ADWF)	Secondary Bypass Flow	Rainbow Trout Toxicity	CBOD	TSS	Unionized NH_3 @ 15°C	NH_3-N	Fecal Coliforms	Enterococci
	m^3/day	m^3/day	96-hour LC50	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	CFU/100 mL
Provincial Registration 108831	<216,000	≤70 days per year	Pass/Fail	25 (maximum) 10 (monthly average)	25 (maximum) 10 (monthly average)	---	**BC WQG 58 mg/L (max), 8.7 mg/L monthly average	---	---
Wastewater Systems Effluent Regulations			Pass (100% v/v%)	25 (monthly average)	25 (monthly average)	1.25 (maximum)	---	---	---
31-Aug-21	74,220			10.3	6.0	0.17		410,000	31,000
August Average				**9.8**	**6.6**		**35.0**		
01-Sep-21	73,620			12.4	6.0				
02-Sep-21	73,780			16.0	8.0	0.15	37.0		
03-Sep-21	74,080								
04-Sep-21	74,980								
05-Sep-21	72,960			6.2	5.0	0.21	44.0		
06-Sep-21	76,420			9.7	5.0				
07-Sep-21	76,510			13.8	12.0	0.14	34.0	420,000	42,000
08-Sep-21	75,530			23.0	20.0				
09-Sep-21	75,090			17.0	13.0	0.22	42.0		
10-Sep-21	73,620								
11-Sep-21	83,250								
12-Sep-21	77,580			5.9	4.0	0.17	30.0		
13-Sep-21	76,530			10.2	8.0				
14-Sep-21	78,000			13.2	10.0	0.12	28.0	370,000	22,000
15-Sep-21	76,900		Pass	11.2	9.0	0.048			
16-Sep-21	82,350			13.9	9.0	0.36	64.0		
17-Sep-21	139,180	70							
18-Sep-21	98,500								
19-Sep-21	85,620			6.2	4.0	0.34	34.0		
20-Sep-21	79,420			7.9	7.0				
21-Sep-21	41,340			6.0	5.0	0.077	17.0	59,000	5,100
22-Sep-21	36,640				2.0				
23-Sep-21	37,180			6.0	6.0	0.014	7.3		

Table 2.3, cont'd

	McLoughlin Wastewater Treatment Plant Final Effluent								
	Total Daily Flow (<2ADWF)	Secondary Bypass Flow	Rainbow Trout Toxicity	CBOD	TSS	Unionized NH_3 @ 15°C	NH_3-N	Fecal Coliforms	Enterococci
	m^3/day	m^3/day	96-hour LC50	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	CFU/100 mL
Provincial Registration 108831	<216,000	≤70 days per year	Pass/Fail	25 (maximum) 10 (monthly average)	25 (maximum) 10 (monthly average)	---	**BC WQG 58 mg/L (max), 8.7 mg/L monthly average	---	---
Wastewater Systems Effluent Regulations			Pass (100% v/v%)	25 (monthly average)	25 (monthly average)	1.25 (maximum)	---	---	---
24-Sep-21	52,550								
25-Sep-21	76,910								
26-Sep-21	113,850	150		19.7	20.0	0.045	26.0		
27-Sep-21	93,620			6.4	6.0				
28-Sep-21	84,340	240		6.1	4.0	0.073	20.0	25,000	2,700
29-Sep-21	94,250			7.7	8.0				
30-Sep-21	96,100			11.1	8.0	0.094	25.0		
September Average				**10.9**	**8.1**		**31.4**		
01-Oct-21	81,198								
02-Oct-21	79,890								
03-Oct-21	81,490			7.3	7.0				
04-Oct-21	79,340			8.0	7.0				
05-Oct-21	77,785			7.7	7.0			12,000	2,800
06-Oct-21	76,915			6.5	6.0				
07-Oct-21	76,779		Pass	10.4	9.0	0.032			
08-Oct-21	75,899								
09-Oct-21	82,130								
10-Oct-21	77,451			11.0	5.0	0.15	46.0		
11-Oct-21	78,664			12.0	6.0				
12-Oct-21	84,073			13.0	6.0			46,000	4,600
13-Oct-21	78,341			10.0	6.0				
14-Oct-21	89,706			11.0	5.0	0.12	34.0		
15-Oct-21	88,337								
16-Oct-21	84,433								
17-Oct-21	85,471			9.3	5.0	0.078	31.0		

Table 2.3, cont'd

	McLoughlin Wastewater Treatment Plant Final Effluent								
	Total Daily Flow (<2ADWF)	Secondary Bypass Flow	Rainbow Trout Toxicity	CBOD	TSS	Unionized NH_3 @ 15°C	NH_3-N	Fecal Coliforms	Enterococci
	m^3/day	m^3/day	96-hour LC50	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	CFU/100 mL
Provincial Registration 108831	<216,000	≤70 days per year	Pass/Fail	25 (maximum) 10 (monthly average)	25 (maximum) 10 (monthly average)	---	**BC WQG 58 mg/L (max), 8.7 mg/L monthly average	---	---
Wastewater Systems Effluent Regulations			Pass (100% v/v%)	25 (monthly average)	25 (monthly average)	1.25 (maximum)	---	---	---
18-Oct-21	82,121		Pass	11.0	4.0	0.16	32.0		
19-Oct-21	79,387			12.0	7.0	0.082	37.0	59,000	4,700
20-Oct-21	79,899			12.0	6.0				
21-Oct-21	79,109			8.4	5.0	0.16	39.0		
22-Oct-21	82,892								
23-Oct-21	78,393								
24-Oct-21	81,911			8.8	4.0	0.091	25.0		
25-Oct-21	97,293			12.0	5.0				
26-Oct-21	85,566			9.6	5.0	0.12	30.0	210,000	24,000
27-Oct-21	124,534			12.0	6.0				
28-Oct-21	196,353	18,720		30.0	51.0	0.038	20.0		
29-Oct-21	115,057								
30-Oct-21	98,528								
31-Oct-21	92,346			3.3	7.0	0.095			
October Average				**10.7**	**8.0**		**32.7**		
01-Nov-21	94,284			5.5	5.0				
02-Nov-21	105,951			8.1	6.0	0.063	21.0	26,000	3,100
03-Nov-21	115,610			6.9	2.5				
04-Nov-21	113,370			7.5	5.0	0.076	19.0		
05-Nov-21	99,861								
06-Nov-21	99,533					0.088			
07-Nov-21	104,515			6.0	5.0		29.0		
08-Nov-21	95,581			5.8	4.0	0.07			
09-Nov-21	111,706		Pass	9.4	6.0		26.0	64,000	7,800
10-Nov-21	105,806			5.5	4.0				

Table 2.3, cont'd

	McLoughlin Wastewater Treatment Plant Final Effluent								
	Total Daily Flow (<2ADWF)	Secondary Bypass Flow	Rainbow Trout Toxicity	CBOD	TSS	Unionized NH_3 @ 15°C	NH_3-N	Fecal Coliforms	Enterococci
	m^3/day	m^3/day	96-hour LC50	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	CFU/100 mL
Provincial Registration 108831	<216,000	≤70 days per year	Pass/Fail	25 (maximum) 10 (monthly average)	25 (maximum) 10 (monthly average)	---	**BC WQG 58 mg/L (max), 8.7 mg/L monthly average	---	---
Wastewater Systems Effluent Regulations			Pass (100% v/v%)	25 (monthly average)	25 (monthly average)	1.25 (maximum)	---	---	---
11-Nov-21	148,093	2,500		10.5	9.0	0.067	23.0		
12-Nov-21	120,409								
13-Nov-21	176,187	9,870							
14-Nov-21	252,078	44,550		5.5	7.0	0.039			
15-Nov-21	247,007	29,760		4.9	7.0				
16-Nov-21	177,794	1,720		4.4	2.0	0.026		31,000	4,600
17-Nov-21	141,325			4.4	6.0				
18-Nov-21	164,697	420		9.1	6.0	0.058			
19-Nov-21	135,862								
20-Nov-21	123,923								
21-Nov-21	118,519				5.0	0.08			
22-Nov-21	116,218				4.0				
23-Nov-21	109,176			7.5	6.0	0.097		11,000	1,600
24-Nov-21	119,662			9.4	7.0				
25-Nov-21	228,411	26,130		14.3	20.0	0.056			
26-Nov-21	159,424	50							
27-Nov-21	224,229	20,700							
28-Nov-21	237,833	31,090		5.4	9.0				
29-Nov-21	175,862	610		4.9	5.0	0.023			
30-Nov-21	170,660	60		5.6	4.0			27,000	2,800
November Average				**7.2**	**6.2**		**23.6**		
01-Dec-21	142,132			5.4	6.0				
02-Dec-21	126,194			6.1	5.0	0.12			
03-Dec-21	119,910								
04-Dec-21	115,968								

Table 2.3, cont'd

	McLoughlin Wastewater Treatment Plant Final Effluent								
	Total Daily Flow (<2ADWF)	Secondary Bypass Flow	Rainbow Trout Toxicity	CBOD	TSS	Unionized NH_3 @ 15°C	NH_3-N	Fecal Coliforms	Enterococci
	m^3/day	m^3/day	96-hour LC50	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	CFU/100 mL
Provincial Registration 108831	<216,000	≤70 days per year	Pass/Fail	25 (maximum) 10 (monthly average)	25 (maximum) 10 (monthly average)	---	**BC WQG 58 mg/L (max), 8.7 mg/L monthly average	---	---
Wastewater Systems Effluent Regulations			Pass (100% v/v%)	25 (monthly average)	25 (monthly average)	1.25 (maximum)	---	---	---
05-Dec-21	120,345			5.4	6.0	0.15	30.0		
06-Dec-21	149,379			6.1	11.0				
07-Dec-21	121,527			6.9	6.0	0.14	26.0	10,000	1,800
08-Dec-21	117,768			6.8	6.0	0.039			
09-Dec-21	114,014			8.7	6.0	0.15	27.0		
10-Dec-21	177,384	14,740							
11-Dec-21	228,953	24,180							
12-Dec-21	172,700	860		3.6	11.0	0.065	21.0		
13-Dec-21	145,067	10		4.8	5.0				
14-Dec-21	127,009			6.5	5.0	0.087	25.0	3,100	270
15-Dec-21	117,126			8.9	6.0				
16-Dec-21	109,141			9.7	6.0	0.12	25.0		
17-Dec-21	144,562	1,130							
18-Dec-21	238,925	37,260							
19-Dec-21	156,887				6.0	0.017	12.0		
20-Dec-21	132,173				5.0				
21-Dec-21	127,254			7.9	5.0	0.052	17.0	21,000	4,600
22-Dec-21	141,152			7.9	5.0				
23-Dec-21	125,329			8.5	5.0	0.034			
24-Dec-21	117,578								
25-Dec-21	109,684					0.092			
26-Dec-21	102,229				6.0	0.12			
27-Dec-21	100,735			8.1	8.0				
28-Dec-21	98,995			8.4	8.0	0.053			
29-Dec-21	98,669			9.8	11.0			84,000	6,500

Table 2.3, cont'd

	McLoughlin Wastewater Treatment Plant Final Effluent								
	Total Daily Flow (<2ADWF)	Secondary Bypass Flow	Rainbow Trout Toxicity	CBOD	TSS	Unionized NH_3 @ 15°C	NH_3-N	Fecal Coliforms	Enterococci
	m^3/day	m^3/day	96-hour LC50	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	CFU/100 mL
Provincial Registration 108831	<216,000	≤70 days per year	Pass/Fail	25 (maximum) 10 (monthly average)	25 (maximum) 10 (monthly average)	---	**BC WQG 58 mg/L (max), 8.7 mg/L monthly average	---	---
Wastewater Systems Effluent Regulations			Pass (100% v/v%)	25 (monthly average)	25 (monthly average)	1.25 (maximum)	---	---	---
30-Dec-21	98,132			8.8	8.0	0.072			
31-Dec-21	98,287								
December Average		**32 (total days)**		**7.3**	**6.6**		**22.9**	**208,617*** **	

Notes:
2ADWF = 2 times the average dry weather flow
Orange shading indicates that single values exceed the maximum limit
Purple shading indicates that average values exceed the monthly average limit
*ADWF – Average Dry Weather Flow
LC50 – The concentration at which 50% of test organisms experience mortality after an acute exposure time
** BC WQG for ammonia is not part of compliance but inserted into table for informational purposes
*** annual average

Table 2.4 McLoughlin Provincial Wastewater Compliance Results for 2021 Blended Effluent Days (>216,000 m³/day)

	McLoughlin Wastewater Treatment Plant Final Effluent			
	Flow (<2ADWF)	Flow (>2ADWF*)	CBOD	TSS
	m³/day	m³/day	mg/L	mg/L
Provincial Limit Registration	<216,000	>216,000**	130 (maximum)	130 (maximum)
02-Jan-21	144,009	9,930	7.0	7.8
06-Jan-21	152,600	960	3.3	3.0
12-Jan-21	193,683	410	9.9 (Jan 13)	5.6 (Jan 13)
18-Jan-21	107,300	60	13.0	8.8
15-Feb-21	163,500	24	8.6	19.7
16-Feb-21	165,690	200	7.1	10.2
28-Mar-21	116,740	43	---	---
21-Apr-21	56,071	90	9.7	8.0
25-May-21	88,710	80	31.5	29.0
09-Jun-21	74,200	700	21.0	19.0
17-Sep-21	139,80	70	---	---
26-Sep-21	113,850	150	19.7	20.0
28-Sep-21	84,340	240	6.1	4.0
28-Oct-21	196,353	18,720	30.0***	51.0***
11-Nov-21	148,093	2,500	10.5	9.0
13-Nov-21	176,187	9,870	---	---
14-Nov-21	252,078	44,55	5.5	7.0
15-Nov-21	247,007	29,760	4.9	7.0
16-Nov-21	177,794	1,720	4.4	2.0
18-Nov-21	164,697	420	9.1	6.0
25-Nov-21	228,411	26,130	14.3	20.0
26-Nov-21	159,424	50	---	---
27-Nov-21	224,229	20,700	---	---
28-Nov-21	237,833	31,090	5.4	9.0
29-Nov-21	175,862	610	4.9	5.0
30-Nov-21	170,660	60	5.6	4.0
10-Dec-21	177,384	14,740	---	---
11-Dec-21	228,953	24,180	---	---
12-Dec-21	172,700	860	3.6	11.0
13-Dec-21	145,067	10	4.8	5.0
17-Dec-21	144,562	1,130	---	---
18-Dec-21	238,925	37,260	---	---

Notes:
*ADWF – Average Dry Weather Flow
**Represents the amount of flow over and above the tertiary capacity of 216,000 m³/day
--- no sample
Grey shading indicates non-compliant blending occurred.
*** Technically out of compliance as the 130 mg/L TSS and 130 mg/L CBOD maximum value not applicable when flows <216,000 m³/day

2.3.3 Priority Substances

McLoughlin final effluent was analyzed for priority substances listed in Table 2.1 and Appendix B1. There were more than 170 routine resolution substances analyzed and more than half of these were not detected in 2021 (at routine detection limits chosen for comparison to the applicable water quality guidelines). The high-resolution analyses resulted in higher frequency of detection relative to the routine resolution analysis for the same parameters due to the lower detection limits of the high-resolution methods. Frequency of detections were slightly less in effluent from McLoughlin WWTP than historical Clover and Macaulay screened discharges because of the higher levels of treatment. The frequencies of detection of all substances analyzed in wastewater are included in Appendix B7 (McLoughlin).

McLoughlin Point WWTP effluent had lower loadings than the combined historic Clover and Macaulay loadings. Concentrations of substances that were frequently detected (greater than 50% of sampling events) in final effluent are presented in Table 2.5. Annual loadings to the marine environment are presented in Appendix B4, with influent loadings in Appendix B5.

To determine the potential for effects of the wastewater discharges on the receiving environment, average and maximum wastewater concentrations of frequently detected substances (Table 2.5) were compared to the BC Approved and Working water Quality Guidelines (https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/water-quality-guidelines) and CCME Environmental Quality Guidelines (CCME, 2003) developed to protect aquatic life. Conservative estimates of the minimum initial dilution of the wastewaters in receiving waters off the outfalls (113:1 for McLoughlin) (Seaconsult, 2019) were applied to maximum wastewater substance concentrations to predict maximum potential concentrations in the marine environment. These minimum initial dilution factors are predicted to occur at the edge of the initial dilution zone (IDZ) of each outfall. The use of estimated minimum initial dilution factors allows for a conservative (i.e., highly protective) estimation of potential effects, because the predicted average (mean) initial dilution factors are much higher in the marine receiving environments around the outfall (711:1 [median] for McLoughlin).

Before application of minimum initial dilution factors, there were a few substances that exceeded applicable guidelines in undiluted final effluent prior to discharge (Table 2.5), including ammonia (Table 2.3), weak acid dissociable cyanide, nitrate, copper, zinc, total PCBs, bisphenol A and mercury.

After application of the minimum initial dilution factor there were no substances exceeding applicable guidelines in final effluent, indicating that receiving environment concentrations were unlikely to exceed guidelines beyond the initial dilution zone (i.e., the area that extends 100 m around the outfall diffusers), and the potential for effects on aquatic life were likely limited to within the initial dilution zone.

In final effluent, the bacterial indicator Enterococci, presented in Table 2.3, routinely exceeded WQG protective of the public engaging in recreational activities like swimming. Enterococci results ranged from 1,800,000 CFU/100 mL on February 23 to a low of 270 CFU/100 mL on December 14. This bacterial indicator is highly variable and could at times (such as on December 14), be calculated to be below recreational guidelines after application of an initial dilution factor of 113:1 at the discharge point of the outfall diffuser. The McLWWTP does not use disinfection as part of tertiary treatment and as such, bacterial indicators will continue to exceed water quality criteria.

Table 2.5 Concentrations of Frequently Detected Substances (>50% of the time) in McLoughlin Final Effluent – 2021

Parameter	State	Unit	Frequency of Detection	Average Concentration	*n*	Max Concentration	Min Concentration	Max 1:113 Dilution	BC WQG	CCME WQG
CONVENTIONALS										
Chloride	TOT	mg/L	100%	68.9	12	120	52	1.1		
Total/SAD Cyanide	TOT	mg/L	88%	0.00207	12	0.00273	0.0005	0.00002		
WAD Cyanide	TOT	mg/L	91%	0.00131	12	0.0025	0.0007	0.00002	0.001[b]	
Alkalinity - Total - Ph 4.5	TOT	mg/L	100%	150.4	12	230	74	2.04		
Hardness (as CaCO3)	DIS	mg/L	100%	72.65	12	113	49.2	1		
Hardness (as CaCO3)	TOT	mg/L	100%	72.69	12	112	49.3	0.991		
Sulphate	TOT	mg/L	100%	25.9	12	39	17	0.3		
N - NO2 (As N)	TOT	mg/L	100%	0.2901	12	0.433	0.155	0.00383		
N - NO3 (As N)	TOT	mg/L	100%	7.903	12	16.2	1.52	0.143	3.7 (mean)[ac]	
N - NO3 + NO2 (As N)	TOT	mg/L	100%	8.192	12	16.5	1.69	0.146		
N - TKN (As N)	TOT	mg/L	100%	25.33	12	42.3	6.21	0.37		
N - Total (As N)	TOT	mg/L	100%	33.53	12	45.8	22.7	0.41		
P – PO4 (as P)	DISS	mg/L	100%	3.3	12	4.8	1.6	0.04		
Total Organic Carbon	TOT	mg/L	86%	15	12	22	10	0.2		
Oil & Grease, Mineral	TOT	mg/L	0%	ND>50%	12	---	---	---		
Oil & grease, Total	TOT	mg/L	3%	ND>50%	12	---	---	---		
Biological Oxygen Demand	TOT	mg/L	100%	38.53	12	170	10	1.5		
Chemical Oxygen Demand	TOT	mg/L	100%	96.8	12	217	45	1.9		
pH	TOT	pH	100%	7.183	12	8.38	6.53	0.074	7.0-8.7[a]	7.0-8.7
Sulfide	TOT	mg/L	64%	0.02897	12	0.074	0.014	0.00065		
Conductivity	TOT	µS/cm	100%	663.3	12	770	520	6.81		
METALS - TOTAL										
Aluminum	TOT	µg/L	100%	29.87	12	91.1	16.4	0.81		
Antimony	TOT	µg/L	100%	0.2421	12	0.428	0.165	0.0038		
Arsenic	TOT	µg/L	100%	0.5728	12	0.871	0.337	0.0077	12.5[a]	12.5
Barium	TOT	µg/L	100%	5.26	12	16.1	2.71	0.1425		
Beryllium	TOT	µg/L	0%	ND>50%	12	---	---	---	100[b]	
Cadmium	TOT	µg/L	100%	0.02912	12	0.0811	0.0104	0.00072	0.12[b]	0.12
Calcium	TOT	mg/L	100%	18.24	12	29.8	11.6	0.264		
Chromium	TOT	µg/L	100%	0.978	12	2.21	0.27	0.02		
Cobalt	TOT	µg/L	100%	0.5706	12	0.889	0.358	0.0079		
Copper	TOT	µg/L	100%	27.67	12	58.2	13.8	0.515	2 (mean) / 3 (max)[a]	
Iron	TOT	µg/L	100%	609.9	12	1200	266	10.62		

Table 2.5, cont'd

Parameter	State	Unit	Frequency of Detection	Average Concentration	*n*	Max Concentration	Min Concentration	Max 1:113 Dilution	BC WQG	CCME WQG
Lead	TOT	µg/L	100%	0.5934	12	1.66	0.319	0.0147	2 (mean) / 140 (max)[a]	
Magnesium	TOT	mg/L	100%	6.629	12	9.21	4.92	0.082		
Manganese	TOT	µg/L	100%	48.95	12	58.6	39.8	0.519	100[b]	
Mercury	TOT	µg/L	69%	0.01458	12	0.038	0.0021	0.00034		0.016
Molybdenum	TOT	µg/L	100%	1.159	12	2.73	0.726	0.0242		
Nickel	TOT	µg/L	100%	3.032	12	3.97	2.07	0.035	8.3[b]	
Phosphorus	TOT	µg/L	100%	3808	12	6200	2100	54.8		
Potassium	TOT	mg/L	100%	14.18	12	19.7	10	0.174		
Selenium	TOT	µg/L	100%	0.1665	12	0.203	0.107	0.0018	2[a]	
Silver	TOT	µg/L	100%	0.0546	12	0.094	0.02	0.0008	1.5 (mean) / 3 (max)[a]	7.5
Thallium	TOT	µg/L	0%	ND>50%	12	---	---	---		
Tin	TOT	µg/L	100%	0.484	12	0.71	0.36	0.006		
Zinc	TOT	µg/L	100%	25.86	12	53	15.2	0.47	10[a]	
METALS - DISSOLVED										
Aluminum	DIS	µg/L	100%	13.69	12	17.1	8.76	0.151		
Antimony	DIS	µg/L	100%	0.2403	12	0.415	0.16	0.0037		
Arsenic	DIS	µg/L	100%	0.5621	12	0.851	0.319	0.0075		
Barium	DIS	µg/L	100%	3.428	12	7.57	1.75	0.067		
Beryllium	DIS	µg/L	0%	ND>50%	12	---	---	---		
Cadmium	DIS	µg/L	100%	0.01923	12	0.0481	0.0063	0.00043		
Calcium	DIS	mg/L	100%	18.2	12	29.9	11.5	0.2646		
Chromium	DIS	µg/L	100%	0.894	12	2.02	0.19	0.018		
Cobalt	DIS	µg/L	100%	0.5568	12	0.866	0.343	0.00766		
Copper	DIS	µg/L	100%	17.97	12	35.3	11.3	0.3124		
Iron	DIS	µg/L	100%	334.3	12	623	174	5.51		
Lead	DIS	µg/L	100%	0.2816	12	0.458	0.0903	0.00405		
Magnesium	DIS	mg/L	100%	6.563	12	9.23	4.86	0.0817		
Manganese	DIS	µg/L	100%	46.8	12	57.9	37.8	0.5124		
Mercury	DIS	µg/L	45%	ND>50%	12	---	---	---		
Molybdenum	DIS	µg/L	100%	1.177	12	2.73	0.721	0.0242		
Nickel	DIS	µg/L	100%	3.003	12	4	2.02	0.0354		
Phosphorus	DIS	µg/L	100%	3311	12	4750	1010	42.04		
Potassium	DIS	mg/L	100%	13.9	12	21.2	10.2	0.1876		
Selenium	DIS	µg/L	100%	0.1506	12	0.196	0.091	0.0017		
Silver	DIS	µg/L	100%	0.03363	12	0.0613	0.0051	0.00054		
Thallium	DIS	µg/L	6%	ND>50%	12	---	---	---		

Table 2.5, cont'd

Parameter	State	Unit	Frequency of Detection	Average Concentration	*n*	Max Concentration	Min Concentration	Max 1:113 Dilution	BC WQG	CCME WQG
Tin	DIS	µg/L	100%	0.466	12	0.7	0.34	0.006		
Zinc	DIS	µg/L	100%	19.33	12	28.4	13.1	0.251		
METALS - SPECIATED										
Chromium III	TOT	mg/L	55%	0.001262	4	0.0022	0.00099	0.000019	0.056[b]	0.056
Chromium VI	TOT	mg/L	6%	ND>50%	4	---	---	---	1.5[b]	1.5
Dibutyltin	TOT	µg/L	25%	ND>50%	4	---	---	---		
Dibutyltin Dichloride	TOT	µg/L	25%	ND>50%	4	---	---	---		
Methyl Mercury	TOT	ng/L	100%	0.3513	4	0.46	0.216	0.0041		
Monobutyltin	TOT	µg/L	75%	0.01467	4	0.032	0.004	0.00028		
Monobutyltin Trichloride	TOT	µg/L	75%	0.02217	4	0.052	0.006	0.00046		
Tributyltin	TOT	µg/L	0%	ND>50%	4	---	---	---		0.001
Tributyltin Chloride	TOT	µg/L	0%	ND>50%	4	---	---	---		
ORGANICS										
Dimethyl Ketone	TOT	µg/L	57%	79.6	12	370	15	3.3		
Endrin Ketone	TOT	ng/L	0%	ND>50%	12	---	---	---		
Isophorone	TOT	µg/L	0%	ND>50%	12	---	---	---		
1,1,1,2-Tetrachloroethane	TOT	µg/L	0%	ND>50%	12	---	---	---		
Dichlorodifluoromethane	TOT	µg/L	0%	ND>50%	12	---	---	---		
Tetrabromomethane	TOT	µg/L	0%	ND>50%	12	---	---	---		
Nitrobenzene	TOT	µg/L	0%	ND>50%	12	---	---	---		
N-Nitrosodi-N-Propylamine	TOT	µg/L	0%	ND>50%	12	---	---	---		
N-Nitrosodimethylamine	TOT	µg/L	0%	ND>50%	12	---	---	---		
NNDMA	TOT	µg/L	0%	ND>50%	12	---	---	---		
Benzene	TOT	µg/L	0%	ND>50%	12	---	---	---	110[a]	110
Ethylbenzene	TOT	µg/L	0%	ND>50%	12	---	---	---		25
Toluene	TOT	µg/L	0%	ND>50%	12	---	---	---		215
Xylenes	TOT	µg/L	6%	ND>50%	12	---	---	---		
1,2,3,4-Tetrachlorobenzene	TOT	ng/L	0%	ND>50%	12	---	---	---		
1,4-Dioxane	TOT	µg/L	100%	0.302	12	0.4	0.23	0.004		
Acrolein	TOT	µg/L	0%	ND>50%	12	---	---	---		
Acrylonitrile	TOT	µg/L	0%	ND>50%	12	---	---	---		
Dibromomethane	TOT	µg/L	0%	ND>50%	12	---	---	---		
Tetrachloromethane	TOT	µg/L	0%	ND>50%	12	---	---	---		
Tribromomethane	TOT	µg/L	0%	ND>50%	12	---	---	---		
Trichloromethane	TOT	µg/L	50%	ND>50%	12	---	---	---		
1,2-Diphenylhydrazine	TOT	µg/L	0%	ND>50%	12	---	---	---		

Table 2.5, cont'd

Parameter	State	Unit	Frequency of Detection	Average Concentration	*n*	Max Concentration	Min Concentration	Max 1:113 Dilution	BC WQG	CCME WQG
2,4-Dinitrotoluene	TOT	µg/L	0%	ND>50%	12	---	---	---		
2,6-Dinitrotoluene	TOT	µg/L	0%	ND>50%	12	---	---	---		
3,3-Dichlorobenzidine	TOT	µg/L	0%	ND>50%	12	---	---	---		
4-Bromophenyl Phenyl Ether	TOT	µg/L	0%	ND>50%	12	---	---	---		
4-Chlorophenyl Phenyl Ether	TOT	µg/L	0%	ND>50%	12	---	---	---		
Hexachlorocyclopentadiene	TOT	µg/L	0%	ND>50%	12	---	---	---		
Hexachloroethane	TOT	µg/L	0%	ND>50%	12	---	---	---		
Alpha-Terpineol	TOT	µg/L	0%	ND>50%	12	---	---	---		
1,1,1-Trichloroethane	TOT	µg/L	0%	ND>50%	12	---	---	---		
1,1,2,2-Tetrachloroethane	TOT	µg/L	0%	ND>50%	12	---	---	---		
1,1,2-Trichloroethane	TOT	µg/L	0%	ND>50%	12	---	---	---		
1,1-Dichloroethane	TOT	µg/L	0%	ND>50%	12	---	---	---		
1,1-Dichloroethene	TOT	µg/L	0%	ND>50%	12	---	---	---		
1,2,4-Trichlorobenzene	TOT	µg/L	0%	ND>50%	12	---	---	---		5.4
1,2-Dibromoethane	TOT	µg/L	0%	ND>50%	12	---	---	---		
1,2-Dichlorobenzene	TOT	µg/L	0%	ND>50%	12	---	---	---	42[a]	42
1,2-Dichloroethane	TOT	µg/L	0%	ND>50%	12	---	---	---		
1,2-Dichloropropane	TOT	µg/L	0%	ND>50%	12	---	---	---		
1,3-Dichlorobenzene	TOT	µg/L	0%	ND>50%	12	---	---	---		
1,4-Dichlorobenzene	TOT	µg/L	0%	ND>50%	12	---	---	---		
Bromodichloromethane	TOT	µg/L	0%	ND>50%	12	---	---	---		
Bromomethane	TOT	µg/L	0%	ND>50%	12	---	---	---		
Chlorobenzene	TOT	µg/L	0%	ND>50%	12	---	---	---		
Chlorodibromomethane	TOT	µg/L	0%	ND>50%	12	---	---	---		
Chloroethane	TOT	µg/L	0%	ND>50%	12	---	---	---		
Chloroethene	TOT	µg/L	0%	ND>50%	12	---	---	---		
Chloromethane	TOT	µg/L	0%	ND>50%	12	---	---	---		
Cis-1,2-Dichloroethene	TOT	µg/L	0%	ND>50%	12	---	---	---		
Cis-1,3-Dichloropropene	TOT	µg/L	0%	ND>50%	12	---	---	---		
Hexachlorobutadiene	TOT	µg/L	0%	ND>50%	12	---	---	---		
M & P Xylenes	TOT	µg/L	0%	ND>50%	12	---	---	---		
Methyl Ethyl Ketone	TOT	µg/L	0%	ND>50%	12	---	---	---		
Methyl Tertiary Butyl Ether	TOT	µg/L	0%	ND>50%	12	---	---	---		5,000
O-Xylene	TOT	µg/L	6%	ND>50%	12	---	---	---		
Styrene	TOT	µg/L	0%	ND>50%	12	---	---	---		
Tetrachloroethene	TOT	µg/L	0%	ND>50%	12	---	---	---		

Table 2.5, cont'd

Parameter	State	Unit	Frequency of Detection	Average Concentration	*n*	Max Concentration	Min Concentration	Max 1:113 Dilution	BC WQG	CCME WQG
Trans-1,2-Dichloroethene	TOT	µg/L	0%	ND>50%	12	---	---	---		
Trans-1,3-dichloropropene	TOT	µg/L	3%	ND>50%	12	---	---	---		
Trichloroethene	TOT	µg/L	0%	ND>50%	12	---	---	---		
Trichlorofluoromethane	TOT	µg/L	0%	ND>50%	12	---	---	---		
2,4,6-trichlorophenol	TOT	µg/L	0%	ND>50%	12	---	---	---		
2,4 + 2,5 Dichlorophenol	TOT	µg/L	0%	ND>50%	12	---	---	---		
2-Chlorophenol	TOT	µg/L	0%	ND>50%	12	---	---	---		
4-Chloro-3-Methylphenol	TOT	µg/L	0%	ND>50%	12	---	---	---		
Pentachlorophenol	TOT	µg/L	0%	ND>50%	12	---	---	---		
2,4-Dimethylphenol	TOT	µg/L	0%	ND>50%	12	---	---	---		
2,4-Dinitrophenol	TOT	µg/L	0%	ND>50%	12	---	---	---		
2-Methyl-4,6-Dinitrophenol	TOT	µg/L	0%	ND>50%	12	---	---	---		
2-Nitrophenol	TOT	µg/L	0%	ND>50%	12	---	---	---		
Phenol	TOT	µg/L	0%	ND>50%	12	---	---	---		
4-Nitrophenol	TOT	µg/L	0%	ND>50%	12	---	---	---		
Total Phenols	TOT	mg/L	42%	ND>50%	12	---	---	---		
PAHs										
2-Chloronaphthalene	TOT	µg/L	0%	ND>50%	12	---	---	---		
2-Methylnaphthalene	TOT	µg/L	56%	0.017	12	0.038	0.01	0.0003		
Acenaphthene	TOT	µg/L	44%	ND>50%	12	---	---	---	6[c]	
Acenaphthylene	TOT	µg/L	14%	ND>50%	12	---	---	---		
Anthracene	TOT	µg/L	22%	ND>50%	12	---	---	---		
Benzo(B)fluoranthene + Benzo(J)fluoranthene	TOT	µg/L	0%	ND>50%	12	---	---	---		
Benzo(K)fluoranthene	TOT	µg/L	3%	ND>50%	12	---	---	---		
Benzo[a]anthracene	TOT	µg/L	8%	ND>50%	12	---	---	---		
Benzo[a]pyrene	TOT	µg/L	8%	ND>50%	12	---	---	---	0.01[c]	
Benzo[b]fluoranthene	TOT	µg/L	0%	ND>50%	12	---	---	---		
Benzo[ghi]perylene	TOT	µg/L	0%	ND>50%	12	---	---	---		
Chrysene	TOT	µg/L	8%	ND>50%	12	---	---	---	0.1[c]	
Dibenzo(a,h)anthracene	TOT	µg/L	0%	ND>50%	12	---	---	---		
Fluoranthene	TOT	µg/L	86%	0.0201	12	0.043	0.01	0.0004		
Fluorene	TOT	µg/L	100%	0.0266	12	0.061	0.011	0.0005	12[c]	
High Molecular Weight PAH`s	TOT	µg/L	56%	0.0386	12	0.1	0.02	0.0009		
Indeno(1,2,3-C,D)Pyrene	TOT	µg/L	0%	ND>50%	12	---	---	---		
Low Molecular Weight PAH`s	TOT	µg/L	89%	0.1252	12	0.38	0.026	0.0034		
Naphthalene	TOT	µg/L	83%	0.0308	12	0.12	0.01	0.0011	1[c]	1.4

Table 2.5, cont'd

Parameter	State	Unit	Frequency of Detection	Average Concentration	*n*	Max Concentration	Min Concentration	Max 1:113 Dilution	BC WQG	CCME WQG
Phenanthrene	TOT	µg/L	100%	0.0319	12	0.077	0.012	0.0007		
Pyrene	TOT	µg/L	78%	0.0164	12	0.033	0.01	0.0003		
Total PAH	TOT	µg/L	97%	0.1609	12	0.44	0.05	0.0039		
NONYLPHENOLS										
4-Nonylphenol diethoxylates	TOT	ng/L	82%	1060	12	2620	8	23.19		
4-Nonylphenol monoethoxylates	TOT	ng/L	100%	1518	12	2580	863	22.83		
Nonylphenol	TOT	ng/L	100%	293	12	325	255	2.88	700[b]	700
HIGH RESOLUTION PAHS										
1-Methylphenanthrene	TOT	ng/L	100%	2.063	12	3.42	0.918	0.03		
2,3,5-Trimethylnaphthalene	TOT	ng/L	92%	2.287	12	4.78	0.42	0.042		
2,6-Dimethylnaphthalene	TOT	ng/L	100%	2.724	12	4.47	0.978	0.04		
2-Methylnaphthalene	TOT	ng/L	100%	11.12	12	25.6	4.08	0.227		
Acenaphthene	TOT	ng/L	100%	23.6	12	57.7	3.77	0.511	6000[c]	
Acenaphthylene	TOT	ng/L	92%	2.677	12	8.96	0.273	0.079		
Anthracene	TOT	ng/L	100%	2.856	12	6.38	0.528	0.056		
Benzo[a]anthracene	TOT	ng/L	100%	4.688	12	8.16	2.33	0.072		
Benzo[a]pyrene	TOT	ng/L	100%	2.665	12	4.77	0.848	0.042	10[c]	
Benzo[b]fluoranthene	TOT	ng/L	100%	2.436	12	4.5	0.759	0.04		
Benzo[e]pyrene	TOT	ng/L	100%	2.465	12	4.37	0.722	0.039		
Benzo[ghi]perylene	TOT	ng/L	100%	2.007	12	3.61	0.86	0.032		
Benzo[J,K]fluoranthenes	TOT	ng/L	100%	2.42	12	4.09	0.87	0.036		
Chrysene	TOT	ng/L	100%	5.358	12	8.75	2.76	0.077	100[c]	
Dibenzo(a,h)anthracene	TOT	ng/L	17%	ND>50%	12	---	---	---		
Dibenzothiophene	TOT	ng/L	100%	3.011	12	5.26	1.4	0.047		
Fluoranthene	TOT	ng/L	100%	20.26	12	32.3	8.34	0.286		
Fluorene	TOT	ng/L	100%	15.51	12	32.9	4.37	0.291	12,000[c]	
Indeno(1,2,3-C,D)pyrene	TOT	ng/L	100%	1.955	12	3.21	0.718	0.028		
Naphthalene	TOT	ng/L	100%	31.71	12	83.7	7.63	0.741	1,000[c]	1,400
Perylene	TOT	ng/L	50%	ND>50%	12	---	---	---		
Phenanthrene	TOT	ng/L	100%	19.42	12	35.2	7.25	0.312		
Pyrene	TOT	ng/L	100%	20.29	12	27.2	14.5	0.241		
HIGH RESOLUTION ORGANICS										
1,3,5-Trichlorobenzene	TOT	ng/L	0%	ND>50%	4	---	---	---	---	
1,7-Dimethylxanthine	TOT	ng/L	100%	5385	4	17300	630	153		
Delta-HCH	TOT	ng/L	0%	ND>50%	4	---	---	---		
Pentachlorobenzene	TOT	ng/L	100%	0.0558	4	0.082	0.03	0.0007		

Table 2.5, cont'd

Parameter	State	Unit	Frequency of Detection	Average Concentration	*n*	Max Concentration	Min Concentration	Max 1:113 Dilution	BC WQG	CCME WQG
Perfluorobutanoic Acid	TOT	ng/L	100%	19.62	4	35.6	12	0.32		
Trans-Chlordane	TOT	ng/L	73%	0.0876	4	0.115	0.0614	0.001		
Trans-Nonachlor	TOT	ng/L	73%	0.0775	4	0.12	0.0614	0.0011		
1,2,3-Trichlorobenzene	TOT	ng/L	0%	ND>50%	4	---	---	---		
1,2,4,5-/1,2,3,5-Tetrachlorobenzene	TOT	ng/L	0%	ND>50%	4	---	---	---		
1,2,4-Trichlorobenzene	TOT	ng/L	36%	ND>50%	4	---	---	---		
1,2-Dichlorobenzene	TOT	ng/L	91%	0.975	4	2.63	0.309	0.023		
1,3-Dichlorobenzene	TOT	ng/L	64%	38.7	4	145	0.2	1.283		
1,4-Dichlorobenzene	TOT	ng/L	100%	39.1	4	70.5	3.82	0.624		
Hexachlorobutadiene	TOT	ng/L	100%	0.1483	4	0.282	0.054	0.0025		
4-n-Octylphenol	TOT	ng/L	36%	ND>50%	4	---	---	---		
2,4-DDD	TOT	ng/L	100%	0.835	4	1.3	0.482	0.012		
2,4-DDE	TOT	ng/L	0%	ND>50%	4	---	---	---		
2,4-DDT	TOT	ng/L	0%	ND>50%	4	---	---	---		
4,4-DDD	TOT	ng/L	0%	ND>50%	4	---	---	---		
4,4-DDE	TOT	ng/L	100%	0.2327	4	0.341	0.135	0.003		
4,4-DDT	TOT	ng/L	45%	ND>50%	4	---	---	---		
ABHC	TOT	ng/L	0%	ND>50%	4	---	---	---		
Aldrin	TOT	ng/L	0%	ND>50%	4	---	---	---		
Alpha Chlordane	TOT	ng/L	45%	ND>50%	4	---	---	---		
Alpha-Endosulfan	TOT	ng/L	67%	0.206	4	0.288	0.108	0.003		
Beta-Endosulfan	TOT	ng/L	100%	0.52	4	0.712	0.204	0.006		
Beta-HCH	TOT	ng/L	64%	0.127	4	0.203	0.086	0.002		
Bis(2-Chloroethoxy)Methane	TOT	µg/L	0%	ND>50%	4	---	---	---		
Bis(2-Chloroethyl)Ether	TOT	µg/L	0%	ND>50%	4	---	---	---		
Bis(2-Chloroisopropyl)Ether	TOT	µg/L	0%	ND>50%	4	---	---	---		
Cis-Nonachlor	TOT	ng/L	27%	ND>50%	4	---	---	---		
Dieldrin	TOT	ng/L	83%	0.243	4	0.364	0.116	0.003		
Endosulfan Sulfate	TOT	ng/L	0%	ND>50%	4	---	---	---	0.16[b]	
Endrin	TOT	ng/L	8%	ND>50%	4	---	---	---		
Endrin Aldehyde	TOT	ng/L	8%	ND>50%	4	---	---	---		
HCH, Gamma	TOT	ng/L	91%	0.9335	4	3.18	0.071	0.0281		
Heptachlor	TOT	ng/L	27%	ND>50%	4	---	---	---		
Heptachlor Epoxide	TOT	ng/L	0%	ND>50%	4	---	---	---		
Hexachlorobenzene	TOT	ng/L	100%	0.0766	4	0.12	0.047	0.0011		
Methoxyclor	TOT	ng/L	0%	ND>50%	4	---	---	---		

Table 2.5, cont'd

Parameter	State	Unit	Frequency of Detection	Average Concentration	*n*	Max Concentration	Min Concentration	Max 1:113 Dilution	BC WQG	CCME WQG
Mirex	TOT	ng/L	9%	ND>50%	4	---	---	---		
Octachlorostyrene	TOT	ng/L	45%	ND>50%	4	---	---	---		
Oxychlordane	TOT	ng/L	18%	ND>50%	4	---	---	---		
PBDEs										
PBDE 10	TOT	pg/L	25%	ND>50%	4	---	---	---		
PBDE 100	TOT	pg/L	100%	991.2	4	1490	488	13.19		
PBDE 105	TOT	pg/L	0%	ND>50%	4	---	---	---		
PBDE 116	TOT	pg/L	25%	ND>50%	4	---	---	---		
PBDE 119/120	TOT	pg/L	58%	29.73	4	69	5.85	0.61		
PBDE 12/13	TOT	pg/L	33%	ND>50%	4	---	---	---		
PBDE 126	TOT	pg/L	8%	ND>50%	4	---	---	---		
PBDE 128	TOT	pg/L	0%	ND>50%	4	---	---	---		
PBDE 138/166	TOT	pg/L	100%	52.4	4	83	24.3	0.73		
PBDE 140	TOT	pg/L	100%	16.77	4	24.3	8.2	0.22		
PBDE 15	TOT	pg/L	100%	9.34	4	15.5	4.63	0.14		
PBDE 153	TOT	pg/L	100%	453	4	664	200	5.88		
PBDE 154	TOT	pg/L	100%	357.5	4	522	167	4.62		
PBDE 155	TOT	pg/L	100%	29.1	4	39.5	13.8	0.35		
PBDE 17/25	TOT	pg/L	100%	47.65	4	68.8	22.7	0.61		
PBDE 181	TOT	pg/L	8%	ND>50%	4	---	---	---		
PBDE 183	TOT	pg/L	100%	79.23	4	243	32.9	2.15		
PBDE 190	TOT	pg/L	67%	9.59	4	32.2	2.6	0.28		
PBDE 203	TOT	pg/L	100%	58.32	4	108	26	0.96		
PBDE 206	TOT	pg/L	100%	362.8	4	576	119	5.1		
PBDE 207	TOT	pg/L	100%	445.6	4	913	94.2	8.08		
PBDE 208	TOT	pg/L	100%	297.8	4	591	66	5.23		
PBDE 209	TOT	pg/L	100%	3,701	4	5,450	1,630	48.2		
PBDE 28/33	TOT	pg/L	100%	101.9	4	150	52.9	1.33		
PBDE 30	TOT	pg/L	0%	ND>50%	4	---	---	---		
PBDE 32	TOT	pg/L	0%	ND>50%	4	---	---	---		
PBDE 35	TOT	pg/L	33%	ND>50%	4	---	---	---		
PBDE 37	TOT	pg/L	83%	4.83	4	7.93	3.07	0.07		
PBDE 47	TOT	pg/L	100%	4,958	4	7,550	2,210	66.81		
PBDE 49	TOT	pg/L	100%	160.3	4	248	75.1	2.19		
PBDE 51	TOT	pg/L	100%	17.99	4	28.7	9.4	0.25		
PBDE 66	TOT	pg/L	100%	96.83	4	148	32.3	1.31		

Table 2.5, cont'd

Parameter	State	Unit	Frequency of Detection	Average Concentration	*n*	Max Concentration	Min Concentration	Max 1:113 Dilution	BC WQG	CCME WQG
PBDE 7	TOT	pg/L	58%	4.09	4	8.83	1.41	0.08		
PBDE 71	TOT	pg/L	100%	17.46	4	26.2	9.16	0.23		
PBDE 75	TOT	pg/L	83%	7.22	4	10.8	3.7	0.1		
PBDE 77	TOT	pg/L	8%	ND>50%	4	---	---	---		
PBDE 79	TOT	pg/L	100%	33.88	4	46.9	22.1	0.42		
PBDE 8/11	TOT	pg/L	50%	ND>50%	4	---	---	---		
PBDE 85	TOT	pg/L	100%	202.2	4	324	98.9	2.87		
PBDE 99	TOT	pg/L	100%	4,856	4	7,520	2,440	66.55		
PCBs										
PCB 1	TOT	pg/L	100%	15.75	4	32.7	4.56	0.289		
PCB 10	TOT	pg/L	25%	ND>50%	4	---	---	---		
PCB 103	TOT	pg/L	42%	ND>50%	4	---	---	---		
PCB 104	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 105	TOT	pg/L	100%	18.78	4	26.1	13.6	0.23	90[a]	
PCB 106	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 107/124	TOT	pg/L	75%	1.86	4	2.96	1.2	0.03		
PCB 109	TOT	pg/L	100%	3.32	4	5.37	1.66	0.05		
PCB 11	TOT	pg/L	100%	114.2	4	188	77.4	1.664		
PCB 110/115	TOT	pg/L	100%	64.72	4	87.5	43.8	0.77		
PCB 111	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 112	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 114	TOT	pg/L	75%	1.82	4	2.89	1.03	0.03		
PCB 118	TOT	pg/L	100%	51.69	4	69.4	34.2	0.61		
PCB 12/13	TOT	pg/L	92%	5.373	4	9.5	2.81	0.084		
PCB 120	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 121	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 122	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 123	TOT	pg/L	83%	2.42	4	3.91	1.18	0.03		
PCB 126	TOT	pg/L	0%	ND>50%	4	---	---	---	0.25[a]	
PCB 127	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 128/166	TOT	pg/L	100%	7.54	4	12.2	5.07	0.11		
PCB 129/138/160/163	TOT	pg/L	100%	54.71	4	73.9	35.7	0.65		
PCB 130	TOT	pg/L	83%	3.39	4	5.11	1.91	0.05		
PCB 131	TOT	pg/L	8%	ND>50%	4	---	---	---		
PCB 132	TOT	pg/L	100%	18.03	4	24.8	10.8	0.22		
PCB 133	TOT	pg/L	8%	ND>50%	4	---	---	---		

Table 2.5, cont'd

Parameter	State	Unit	Frequency of Detection	Average Concentration	*n*	Max Concentration	Min Concentration	Max 1:113 Dilution	BC WQG	CCME WQG
PCB 134/143	TOT	pg/L	75%	3.04	4	5.13	1.66	0.05		
PCB 135/151/154	TOT	pg/L	100%	18.52	4	24.8	11.7	0.22		
PCB 136	TOT	pg/L	100%	7.26	4	10.4	4.25	0.09		
PCB 137	TOT	pg/L	92%	3.1	4	4.57	1.73	0.04		
PCB 139/140	TOT	pg/L	58%	1.97	4	2.5	1.34	0.02		
PCB 14	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 141	TOT	pg/L	100%	9.63	4	13.4	6.09	0.12		
PCB 142	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 144	TOT	pg/L	100%	2.69	4	4.04	1.67	0.04		
PCB 145	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 146	TOT	pg/L	100%	7.8	4	11.1	4.62	0.1		
PCB 147/149	TOT	pg/L	100%	40.6	4	53.9	25.6	0.48		
PCB 148	TOT	pg/L	8%	ND>50%	4	---	---	---		
PCB 15	TOT	pg/L	100%	13.3	4	18.2	10.3	0.161		
PCB 150	TOT	pg/L	8%	ND>50%	4	---	---	---		
PCB 152	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 153/168	TOT	pg/L	100%	47.9	4	63.8	30.7	0.56		
PCB 155	TOT	pg/L	100%	5.154	4	7.72	2.96	0.068		
PCB 156157	TOT	pg/L	100%	7.6	4	10.8	4.35	0.1		
PCB 158	TOT	pg/L	100%	5.01	4	6.94	3.35	0.06		
PCB 159	TOT	pg/L	17%	ND>50%	4	---	---	---		
PCB 16	TOT	pg/L	100%	11.7	4	16.3	6.76	0.144		
PCB 161	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 162	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 164	TOT	pg/L	100%	3.14	4	5.19	1.75	0.05		
PCB 165	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 167	TOT	pg/L	83%	2.09	4	2.9	1.31	0.03		
PCB 169	TOT	pg/L	0%	ND>50%	4	---	---	---	60[a]	
PCB 17	TOT	pg/L	100%	15.05	4	23.7	7.96	0.21		
PCB 170	TOT	pg/L	100%	9.213	4	12.5	5.57	0.111		
PCB 171/173	TOT	pg/L	83%	2.796	4	4.44	0.963	0.039		
PCB 172	TOT	pg/L	75%	1.686	4	2.86	0.675	0.025		
PCB 174	TOT	pg/L	100%	10.27	4	14.7	5.98	0.13		
PCB 175	TOT	pg/L	8%	ND>50%	4	---	---	---		
PCB 176	TOT	pg/L	83%	1.636	4	2.89	0.747	0.026		
PCB 177	TOT	pg/L	100%	5.669	4	7.05	3.51	0.062		

Table 2.5, cont'd

Parameter	State	Unit	Frequency of Detection	Average Concentration	*n*	Max Concentration	Min Concentration	Max 1:113 Dilution	BC WQG	CCME WQG
PCB 178	TOT	pg/L	83%	2.661	4	4.02	1.5	0.036		
PCB 179	TOT	pg/L	100%	5.304	4	7.33	3.37	0.065		
PCB 18/30	TOT	pg/L	100%	28.08	4	40.2	16.3	0.356		
PCB 180/193	TOT	pg/L	92%	26.09	4	39.4	1.63	0.349		
PCB 181	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 182	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 183/185	TOT	pg/L	83%	6.903	4	10.3	1.54	0.091		
PCB 184	TOT	pg/L	100%	9.703	4	14.5	5.87	0.128		
PCB 186	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 187	TOT	pg/L	100%	14.67	4	19.5	9.51	0.173		
PCB 188	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 189	TOT	pg/L	17%	ND>50%	4	---	---	---		
PCB 19	TOT	pg/L	100%	8.923	4	16.8	2.59	0.149		
PCB 190	TOT	pg/L	92%	1.727	4	2.35	1.01	0.021		
PCB 191	TOT	pg/L	8%	ND>50%	4	---	---	---		
PCB 192	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 194	TOT	pg/L	100%	5.085	4	7.21	2.48	0.064		
PCB 195	TOT	pg/L	83%	1.635	4	3.34	0.824	0.03		
PCB 196	TOT	pg/L	75%	2.271	4	3.4	1.27	0.03		
PCB 197/200	TOT	pg/L	42%	ND>50%	4	---	---	---		
PCB 198/199	TOT	pg/L	100%	7.007	4	10.5	3.63	0.093		
PCB 2	TOT	pg/L	100%	3.023	4	6.8	1.42	0.06		
PCB 20/28	TOT	pg/L	100%	40.04	4	54.6	27.4	0.483		
PCB 201	TOT	pg/L	50%	ND>50%	4	---	---	---		
PCB 202	TOT	pg/L	92%	2.236	4	3.02	1.28	0.027		
PCB 203	TOT	pg/L	92%	3.783	4	7.29	1.41	0.065		
PCB 204	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 205	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 206	TOT	pg/L	75%	7.431	4	14.7	2.52	0.13		
PCB 207	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 208	TOT	pg/L	67%	3.264	4	7.51	1.05	0.066		
PCB 209	TOT	pg/L	100%	7.426	4	13.8	3.27	0.122		
PCB 21/33	TOT	pg/L	100%	21.73	4	30.9	12.7	0.273		
PCB 22	TOT	pg/L	100%	16.23	4	22.4	10.8	0.198		
PCB 23	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 24	TOT	pg/L	8%	ND>50%	4	---	---	---		

Table 2.5, cont'd

Parameter	State	Unit	Frequency of Detection	Average Concentration	*n*	Max Concentration	Min Concentration	Max 1:113 Dilution	BC WQG	CCME WQG
PCB 25	TOT	pg/L	100%	7.43	4	14.3	2.75	0.127		
PCB 26/29	TOT	pg/L	100%	11.24	4	19.3	4.41	0.171		
PCB 27	TOT	pg/L	100%	8.343	4	16.3	2.72	0.144		
PCB 3	TOT	pg/L	100%	6.934	4	10.1	4.34	0.089		
PCB 31	TOT	pg/L	100%	36.38	4	51.6	22.9	0.457		
PCB 32	TOT	pg/L	100%	10.99	4	16.4	5.78	0.145		
PCB 34	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 35	TOT	pg/L	92%	3.013	4	5.13	1.4	0.045		
PCB 36	TOT	pg/L	25%	ND>50%	4	---	---	---		
PCB 37	TOT	pg/L	100%	10.74	4	15.1	6.27	0.134		
PCB 38	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 39	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 4	TOT	pg/L	100%	47.9	4	83.6	15.9	0.74		
PCB 40/41/71	TOT	pg/L	100%	20.87	4	29	13.3	0.257		
PCB 42	TOT	pg/L	100%	10.6	4	17.4	5.45	0.154		
PCB 43	TOT	pg/L	67%	1.864	4	3.1	0.798	0.027		
PCB 44/47/65	TOT	pg/L	100%	89.1	4	127	40.1	1.124		
PCB 45/51	TOT	pg/L	100%	15.83	4	22.2	7.03	0.196		
PCB 46	TOT	pg/L	100%	3.565	4	6.5	1.34	0.058		
PCB 48	TOT	pg/L	100%	7.147	4	10.1	4.3	0.089		
PCB 49/69	TOT	pg/L	100%	33.68	4	56.2	16	0.497		
PCB 5	TOT	pg/L	25%	ND>50%	4	---	---	---		
PCB 50/53	TOT	pg/L	100%	11.16	4	19.4	3.93	0.172		
PCB 52	TOT	pg/L	100%	74.08	4	115	43.1	1.018		
PCB 54	TOT	pg/L	42%	ND>50%	4	---	---	---		
PCB 55	TOT	pg/L	25%	ND>50%	4	---	---	---		
PCB 56	TOT	pg/L	100%	13.55	4	19.6	7.87	0.173		
PCB 57	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 58	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 59/62/75	TOT	pg/L	100%	3.716	4	7.05	1.61	0.062		
PCB 6	TOT	pg/L	92%	7.099	4	12.7	2.57	0.112		
PCB 60	TOT	pg/L	100%	7.553	4	10.1	4.66	0.089		
PCB 61/70/74/76	TOT	pg/L	100%	66.13	4	95.6	40.8	0.846		
PCB 63	TOT	pg/L	58%	1.535	4	2.09	0.82	0.018		
PCB 64	TOT	pg/L	100%	16.18	4	23.8	10.5	0.211		
PCB 66	TOT	pg/L	100%	27.34	4	38.5	18.1	0.341		

Table 2.5, cont'd

Parameter	State	Unit	Frequency of Detection	Average Concentration	*n*	Max Concentration	Min Concentration	Max 1:113 Dilution	BC WQG	CCME WQG
PCB 67	TOT	pg/L	25%	ND>50%	4	---	---	---		
PCB 68	TOT	pg/L	100%	5.645	4	8.65	2.68	0.077		
PCB 7	TOT	pg/L	75%	4.211	4	13.3	0.82	0.118		
PCB 72	TOT	pg/L	50%	ND>50%	4	---	---	---		
PCB 73	TOT	pg/L	42%	ND>50%	4	---	---	---		
PCB 77	TOT	pg/L	92%	2.409	4	3.27	1.44	0.029	40[a]	
PCB 78	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 79	TOT	pg/L	17%	ND>50%	4	---	---	---		
PCB 8	TOT	pg/L	100%	23.04	4	38.7	12.5	0.342		
PCB 80	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 81	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 82	TOT	pg/L	100%	6.39	4	9.49	3.78	0.08		
PCB 83/99	TOT	pg/L	100%	36.19	4	48.5	23.6	0.43		
PCB 84	TOT	pg/L	100%	17	4	23.6	9.93	0.21		
PCB 85/116/117	TOT	pg/L	100%	10.46	4	14.6	6.56	0.13		
PCB 86/87/97/108/119/125	TOT	pg/L	100%	44.7	4	59.3	30.3	0.52		
PCB 88/91	TOT	pg/L	100%	8.89	4	13.3	4.76	0.12		
PCB 89	TOT	pg/L	0%	ND>50%	4	---	---	---		
PCB 9	TOT	pg/L	50%	ND>50%	4	---	---	---		
PCB 90/101/113	TOT	pg/L	100%	65.2	4	88	42	0.78		
PCB 92	TOT	pg/L	100%	12.23	4	17.2	7.65	0.15		
PCB 93/95/98/100/102	TOT	pg/L	100%	55.71	4	76.3	36.2	0.68		
PCB 94	TOT	pg/L	8%	ND>50%	4	---	---	---		
PCB 96	TOT	pg/L	25%	ND>50%	4	---	---	---		
Total Hexachloro Biphenyls	TOT	pg/L	100%	243.7	4	315	134	2.79		
Total Decachloro Biphenyl	TOT	pg/L	75%	6.22	4	13.8	1	0.12		
Total Dichloro Biphenyls	TOT	pg/L	100%	211.8	4	360	94.1	3.19		
Total Heptachloro Biphenyls	TOT	pg/L	100%	84.48	4	133	24.4	1.18		
Total Hexachloro Biphenyls	TOT	pg/L	100%	155.7	4	164	144	1.45		
Total Monochloro Biphenyls	TOT	pg/L	100%	23.87	4	45.8	6.61	0.41		
Total Nonachloro Biphenyls	TOT	pg/L	75%	7.34	4	20.4	1	0.18		
Total Octachloro Biphenyls	TOT	pg/L	100%	15.66	4	29.3	7.86	0.26		
Total Pentachloro Biphenyls	TOT	pg/L	100%	380.8	4	527	226	4.66		
Total Tetrachloro Biphenyls	TOT	pg/L	100%	393.1	4	589	191	5.21		
Total Trichloro Biphenyls	TOT	pg/L	100%	221.7	4	332	90.6	2.94		
PCB Teq 3	TOT	pg/L	100%	0.03	4	0.19	0.01	0		

Table 2.5, cont'd

Parameter	State	Unit	Frequency of Detection	Average Concentration	*n*	Max Concentration	Min Concentration	Max 1:113 Dilution	BC WQG	CCME WQG
PCB Teq 4	TOT	pg/L	100%	0.7	4	3.32	0.07	0.03		
Total PCB	TOT	pg/L	100%	1,566	4	2,310	823	20.44	100[a]	
PCDDs										
1,2,3,4,6,7,8-HPCDD	TOT	pg/L	100%	3.218	4	10.6	0.99	0.094		
1,2,3,4,6,7,8-HPCDF	TOT	pg/L	60%	0.775	4	1.2	0.459	0.011		
1,2,3,4,7,8,9-HPCDF	TOT	pg/L	0%	ND>50%	4	---	---	---		
1,2,3,4,7,8-HXCDD	TOT	pg/L	10%	ND>50%	4	---	---	---		
1,2,3,4,7,8-HXCDF	TOT	pg/L	10%	ND>50%	4	---	---	---		
1,2,3,6,7,8-HXCDD	TOT	pg/L	10%	ND>50%	4	---	---	---		
1,2,3,6,7,8-HXCDF	TOT	pg/L	10%	ND>50%	4	---	---	---		
1,2,3,7,8,9-HXCDD	TOT	pg/L	10%	ND>50%	4	---	---	---		
1,2,3,7,8,9-HXCDF	TOT	pg/L	80%	0.603	4	0.783	0.452	0.007		
1,2,3,7,8-PECDD	TOT	pg/L	10%	ND>50%	4	---	---	---		
1,2,3,7,8-PECDF	TOT	pg/L	10%	ND>50%	4	---	---	---		
2,3,4,6,7,8-HXCDF	TOT	pg/L	10%	ND>50%	4	---	---	---		
2,3,4,7,8-PECDF	TOT	pg/L	10%	ND>50%	4	---	---	---		
2,3,7,8-TCDD	TOT	pg/L	0%	ND>50%	4	---	---	---		
2,3,7,8-TCDF	TOT	pg/L	0%	ND>50%	4	---	---	---		
OCDD	TOT	pg/L	100%	26.03	4	79.3	4.81	0.702		
OCDF	TOT	pg/L	80%	1.062	4	2.06	0.508	0.018		
TOTAL Hepta-dioxxins	TOT	pg/L	60%	5.72	4	20.8	0.45	0.18		
TOTAL Hepta-furans	TOT	pg/L	30%	ND>50%	4	---	---	---		
TOTAL Hexa-dioxins	TOT	pg/L	20%	ND>50%	4	---	---	---		
TOTAL Hexa-furans	TOT	pg/L	20%	ND>50%	4	---	---	---		
TOTAL Penta-dioxins	TOT	pg/L	0%	ND>50%	4	---	---	---		
TOTAL Penta-furans	TOT	pg/L	0%	ND>50%	4	---	---	---		
TOTAL Tetra-dioxins	TOT	pg/L	0%	ND>50%	4	---	---	---		
TOTAL Tetra-furans	TOT	pg/L	0%	ND>50%	4	---	---	---		
PFAS										
Perfluorodecanoic Acid (PFDA)	TOT	ng/L	100%	1.29	4	2.32	0.569	0.021		
Perfluoroheptanoic Acid (PFHpA)	TOT	ng/L	100%	3.84	4	9.7	1.53	0.086		
Perfluorohexanoic Acid (PFHxA)	TOT	ng/L	100%	18.81	4	45.2	6.65	0.4		
Perfluorononanoic Acid (PFNA)	TOT	ng/L	92%	0.879	4	1.6	0.405	0.014		
Perfluorooctane sulfonamide (PFOSA)	TOT	ng/L	17%	ND>50%	4	---	---	---		
Perfluorooctanesulfonic Acid (PFOS)	TOT	ng/L	100%	5.106	4	9.04	1.72	0.08		
Perfluorooctanoic Acid (PFOA)	TOT	ng/L	100%	8.93	4	26.4	2.73	0.234		

Table 2.5, cont'd

Parameter	State	Unit	Frequency of Detection	Average Concentration	*n*	Max Concentration	Min Concentration	Max 1:113 Dilution	BC WQG	CCME WQG
Perfluoropentanoic Acid (PFPeA)	TOT	ng/L	100%	18.26	4	27.5	10.6	0.243		
PFBS	TOT	ng/L	100%	5.88	4	17.3	1.19	0.153		
PFDoA	TOT	ng/L	0%	ND>50%	4	---	---	---		
PFHxS	TOT	ng/L	100%	6.252	4	18.6	1.39	0.165		
PFUnA	TOT	ng/L	0%	ND>50%	4	---	---	---		
Bis(2-Ethylhexyl)Phthalate	TOT	µg/L	6%	ND>50%	4	---	---	---		
PHTHALATES										
Butylbenzyl Phthalate	TOT	µg/L	0%	ND>50%	4	---	---	---		
Di-N-Butyl Phthalate	TOT	µg/L	14%	ND>50%	4	---	---	---		
Di-N-Octyl Phthalate	TOT	µg/L	0%	ND>50%	4	---	---	---		
Diethyl Phthalate	TOT	µg/L	36%	ND>50%	4	---	---	---		
Dimethyl Phthalate	TOT	µg/L	0%	ND>50%	4	---	---	---		
PPCPs										
2-Hydroxy-Ibuprofen	TOT	ng/L	100%	6,261	4	19,200	2,030	169.9		
Acetaminophen	TOT	ng/L	50%	ND>50%	4	---	---	---		
Azithromycin	TOT	ng/L	100%	545	4	972	210	8.6		
Bisphenol A	TOT	ng/L	100%	640	4	2,490	34	22	900[b]	
Caffeine	TOT	ng/L	100%	4,594	4	15,400	120	136.3		
Carbadox	TOT	ng/L	8%	ND>50%	4	---	---	---		
Carbamazepine	TOT	ng/L	100%	703	4	929	596	8.22		
Cefotaxime	TOT	ng/L	25%	ND>50%	4	---	---	---		
Ciprofloxacin	TOT	ng/L	100%	166	4	228	79.6	2		
Clarithromycin	TOT	ng/L	100%	253	4	374	140	3.31		
Clinafloxacin	TOT	ng/L	0%	ND>50%	4	---	---	---		
Cloxacillin	TOT	ng/L	25%	ND>50%	4	---	---	---		
Dehydronifedipine	TOT	ng/L	100%	5.6	4	7.8	3.33	0.07		
Digoxigenin	TOT	ng/L	0%	ND>50%	4	---	---	---		
Digoxin	TOT	ng/L	25%	ND>50%	4	---	---	---		
Diltiazem	TOT	ng/L	100%	390	4	703	258	6.221		
Diphenhydramine	TOT	ng/L	100%	903	4	1190	664	10.53		
Enrofloxacin	TOT	ng/L	0%	ND>50%	4	---	---	---		
Erythromycin-H2O	TOT	ng/L	100%	31.0	4	37.4	23.6	0.33		
Flumequine	TOT	ng/L	25%	ND>50%	4	---	---	---	---	
Fluoxetine	TOT	ng/L	100%	46.9	4	67.9	29.3	0.6		
Furosemide	TOT	ng/L	100%	827	4	1,280	490	11.33		
Gemfibrozil	TOT	ng/L	100%	82.5	4	116	44.1	1.027		

Table 2.5, cont'd

Parameter	State	Unit	Frequency of Detection	Average Concentration	*n*	Max Concentration	Min Concentration	Max 1:113 Dilution	BC WQG	CCME WQG
Glipizide	TOT	ng/L	0%	ND>50%	4	---	---	---		
Glyburide	TOT	ng/L	75%	3.477	4	4.21	2.4	0.037		
Hydrochlorothiazide	TOT	ng/L	100%	1,336	4	1,800	872	15.9		
Ibuprofen	TOT	ng/L	100%	1,294	4	3,610	347	31.95		
Lincomycin	TOT	ng/L	33%	ND>50%	4	---	---	---		
Lomefloxacin	TOT	ng/L	0%	ND>50%	4	---	---	---		
Miconazole	TOT	ng/L	100%	11.3	4	28.7	5.97	0.25		
Naproxen	TOT	ng/L	100%	2,228	4	4760	531	42.12		
Norfloxacin	TOT	ng/L	0%	ND>50%	4	---	---	---		
Norgestimate	TOT	ng/L	0%	ND>50%	4	---	---	---		
Ofloxacin	TOT	ng/L	100%	14.2	4	35.7	4.73	0.32		
Ormetoprim	TOT	ng/L	0%	ND>50%	4	---	---	---		
Oxacillin	TOT	ng/L	0%	ND>50%	4	---	---	---		
Oxolinic Acid	TOT	ng/L	0%	ND>50%	4	---	---	---		
Penicillin G	TOT	ng/L	0%	ND>50%	4	---	---	---		
Penicillin V	TOT	ng/L	0%	ND>50%	4	---	---	---		
Roxithromycin	TOT	ng/L	75%	2.45	4	5.09	0.847	0.045		
Sarafloxacin	TOT	ng/L	0%	ND>50%	4	---	---	---		
Sulfachloropyridazine	TOT	ng/L	0%	ND>50%	4	---	---	---		
Sulfadiazine	TOT	ng/L	0%	ND>50%	4	---	---	---		
Sulfadimethoxine	TOT	ng/L	8%	ND>50%	4	---	---	---		
Sulfamerazine	TOT	ng/L	25%	ND>50%	4	---	---	---		
Sulfamethazine	TOT	ng/L	17%	ND>50%	4	---	---	---		
Sulfamethizole	TOT	ng/L	0%	ND>50%	4	---	---	---		
Sulfamethoxazole	TOT	ng/L	100%	818	4	947	644	8.381		
Sulfanilamide	TOT	ng/L	92%	26.9	4	60.8	15.1	0.5		
Sulfathiazole	TOT	ng/L	25%	ND>50%	4	---	---	---		
Thiabendazole	TOT	ng/L	100%	27.2	4	36.3	14.9	0.32		
Triclocarban	TOT	ng/L	100%	3.34	4	6.32	1.42	0.056		
Triclosan	TOT	ng/L	100%	51.5	4	86.1	22.1	0.76		
Trimethoprim	TOT	ng/L	100%	253	4	348	205	3.08		
Tylosin	TOT	ng/L	25%	ND>50%	4	---	---	---		
Virginiamycin	TOT	ng/L	0%	ND>50%	4	---	---	---		
Warfarin	TOT	ng/L	100%	4.18	4	5.19	3.49	0.046		
17 beta-Estradiol 3-benzoate	TOT	ng/L	0%	ND>50%	4	---	---	---		
Allyl Trenbolone	TOT	ng/L	17%	ND>50%	4	---	---	---		

Table 2.5, cont'd

Parameter	State	Unit	Frequency of Detection	Average Concentration	*n*	Max Concentration	Min Concentration	Max 1:113 Dilution	BC WQG	CCME WQG
Androstenedione	TOT	ng/L	100%	3.546	4	5.04	2.27	0.045		
Androsterone	TOT	ng/L	25%	ND>50%	4	---	---	---		
Desogestrel	TOT	ng/L	0%	ND>50%	4	---	---	---		
Mestranol	TOT	ng/L	0%	ND>50%	4	---	---	---		
Norethindrone	TOT	ng/L	0%	ND>50%	4	---	---	---		
Norgestrel	TOT	ng/L	0%	ND>50%	4	---	---	---		
Progesterone	TOT	ng/L	67%	0.746	4	1.33	0.4	0.012		
Testosterone	TOT	ng/L	0%	ND>50%	4	---	---	---		
17 alpha-Dihydroequilin	TOT	ng/L	0%	ND>50%	4	---	---	---		
17 alpha-Estradiol	TOT	ng/L	0%	ND>50%	4	---	---	---		
17 alpha-Ethinyl-Estradiol	TOT	ng/L	0%	ND>50%	4	---	---	---	0.5 (mean) 0.75 (max)[a]	
17 beta-Estradiol	TOT	ng/L	0%	ND>50%	4	---	---	---		
Equilenin	TOT	ng/L	25%	ND>50%	4	---	---	---		
Equilin	TOT	ng/L	0%	ND>50%	4	---	---	---		
Estriol	TOT	ng/L	25%	ND>50%	4	---	---	---		
Estrone	TOT	ng/L	100%	12.58	4	24.2	3.6	0.21		

Notes:

*Dilution calculated from maximum concentration, BC WQG = British Columbia water quality guidelines, CCME WQG = Canadian Council of Ministers of the Environment water quality guidelines, a. approved guideline, b. working guideline, c. rescinded guideline.

*guidelines are maximum concentrations unless otherwise stated.

2.3.4 Acute Toxicity Testing

Acute toxicity describes the adverse effects of a substance that results either from a single exposure or from multiple exposures in a short period of time (usually less than 24 hours). To be described as acutely toxic, the adverse effects should occur within 14 days of the administration of the test substance. Acute toxicity results for the McLoughlin final effluent are reported as the LC50, which is the effluent concentration that will cause mortality in 50% of the organisms within the specified test period. An LC50 result that is less than 100% effluent is a failed test. Refer to Appendix B6 for acute toxicity reports.

Table 2.6 presents the results from acute toxicity testing. Results indicated McLoughlin WWTP final effluent was not acutely toxic (i.e., kills 50% in 96 hours) to trout during 2021. A toxicity test conducted in January failed but this was due to pH drift from ammonia concentrations. Following confirmation testing, pH stabilized testing confirmed ammonia caused the toxicity. Testing was shifted to pH stabilized toxicity testing and subsequent results all passed.

Daphnia magna toxicity testing is not required by regulations but is conducted as part of expanded EMP commitments. There was no toxicity in any sample tested in 2021.

Table 2.6 McLoughlin Acute Toxicity Test Results – 2021

	Rainbow Trout LC50 (96-hour) (%)	Rainbow Trout LC50 (96-hour) (%) pH Stabilized	Daphnia magna 48-hour % Survival in 100% Effluent
January 20	70.7	---	>100
February 2	---	>100	>100
February 16	---	>100	>100
March 2	---	>100	---
March 18	---	>100	>100
April 15	---	>100	>100
May 19	---	>100	>100
June 10	---	>100	>100
July 14	---	>100	>100
August 10	---	>100	>100
September 15	---	>100	>100
October 7	---	>100	>100
November 18	---	>100	>100
December 9	---	>100	>100

Notes: Test pass = >100%
Results are presented as v/v%
Shaded cells indicated test failure (trout only)
--- Test not conducted

2.3.5 Chronic Toxicity Testing

Chronic toxicity testing was conducted using McLoughlin Point WWTP final effluent in October 2021. Several species were tested, including Topsmelt (*Atherinops affinis*), *Ceriodaphnia,* Echinoids and a 30-day Rainbow Trout embryo/alevin viability test.

Chronic toxicity is described as adverse health effects from repeated or continuous exposures to a substance, often at lower levels over a longer time (weeks or years). Chronic toxicity results are reported as the LC50, which is the concentration that will result in mortality of 50% of the organisms in the specified test period, or as EC50, EC25 (effective concentration), IC50 or IC25 (inhibition concentration) which are the concentrations that will have a sub-lethal negative effect upon 50% or 25%, respectively, of the organisms in the specified test period (e.g., decreased fertilization or growth). Refer to Appendix B7 for chronic toxicity reports.

The Rainbow Trout embryo/alevin viability test is based on assessing non-viable alevins or the failure to reach the alevin stage with timely and expected development, due to deterioration at any previous stage, including failure of egg fertilization, mortality of embryo or alevin, failure to hatch by test end, or abnormal development. One or both of the following two endpoints are obtained for the same effect: (1) effective concentration for failure of 25% of individuals to develop normally to the alevin stage (EC25); and (2) median effective concentration for failure of 50% of individuals to develop normally to the alevin stage (EC50).

Table 2.7 presents the results from chronic toxicity testing of McLoughlin Point WWTP effluent. Chronic toxicity (survival) ranged from 59.6% to 100% effluent (lethal concentration) (LC50), with sub-lethal effects (inhibition concentration) (IC25 and IC50), such as growth, reproduction and fertilization impairment occurring at wastewater concentrations ranging from 72.6% to 100% (EC50 and IC50) and 57.7% to 100% (EC25 and IC25).

Like the acute toxicity test results, the effluent concentrations at which most chronic effects were observed were substantially higher than the predicted wastewater concentrations in the marine receiving environment at the edge of the initial dilution zone (i.e., 0.9% at McLoughlin based on minimum initial dilution of 113:1) (Seaconsult, 2019). Marine life is unlikely to be exposed to the chronically toxic wastewater concentrations unless exposure occurs close to the outfall diffusers within the initial dilution zone and the organisms spend a prolonged time exposed to the sewage plume.

Table 2.7 McLoughlin Chronic Toxicity Test Results – 2021

Chronic Toxicity Test	%v/v (CI)
Six-day Topsmelt	
Survival - LC50	>100
Dry Biomass - IC25	77.6 (49.8-n/a)
Dry Biomass - IC50	>100
Dry Weight - IC25	74.1 (50.7->100)
Dry Weight - IC50	>100
Seven-day Ceriodaphnia	
Survival -LC50	>100
Reproduction-IC25	>100
Reproduction-IC50	>100
Echinoid Fertilization	
IC25	>100
IC50	>100
Rainbow Trout Embryo-Alevin	
Embryo Survival-EC25	59.6 (49.8-66.8)
Embryo Survival-EC50	77.7 (64.8-91.8)
Embryo Viability-EC25	57.7 (0.6-63.8)
Embryo Viability-EC50	72.6 (64.4-81.7)

Notes: CI = 95% confidence limits

2.3.6 Overall Assessment

The 2021 McLoughlin wastewater monitoring results are qualitatively an improvement from historical Macaulay and Clover results, indicating that from an operational and regulatory compliance perspective, wastewater quality has improved substantively since the installation of treatment. Tertiary effluent quality was achieved for the bulk of the year, but there were a few non-compliant effluent days and months as treatment process optimization was ongoing. Effluent quality was less variable than in 2020, but ongoing process optimization work is needed to be fully compliant with provincial and federal wastewater regulations in the future. It is anticipated that the McLoughlin treatment processes could take up to two years to fully optimize (estimated the end of 2022), with occasional non-compliance events expected throughout this time. In addition, there is potential that highly variable centrate return flows from the Hartland Residuals

Treatment Facility may be impacting the treatment plant's ability to achieve effluent quality limits at all times. This issue is being investigated.

All effluent quality parameters were predicted to be below applicable water quality guidelines in the marine receiving environment at the edge of the initial dilution zone, except for bacteriological indicators. The use of estimated minimum initial dilution factors allows for a conservative (i.e., highly protective) estimation of potential effects in the marine receiving environment. However, predicted average initial dilution factors are much higher around the outfall (711:1 median for McLoughlin Point), so overall risk to human health and the environment is lower than predictions indicate. These bacteriological indicator guideline exceedances will continue as disinfection has not been installed as part of the new McLoughlin treatment process, and disinfection is also not feasible at Macaulay or Clover during rain events. However, with tertiary treatment at McLoughlin, even without disinfection, the magnitude of the bacteriological exceedances has been greatly reduced.

3.0 SURFACE WATER MONITORING

3.1 Introduction

CRD staff have been monitoring receiving waters around the Macaulay and Clover outfalls for fecal indicator bacteria concentrations since the early 1980s. This indicator is used as a surrogate to assess the potential for human health impacts from exposure to wastewaters in the marine environment, during recreational activities such as kite surfing, diving, and swimming. Observed impacts at the shoreline have been attributed to stormwater discharges, which are currently monitored by the CRD's Stormwater Quality Program.

The McLoughlin Point Wastewater Treatment Plant commenced operation in August 2020. Since the beginning of 2021, surface water and initial dilution zone (IDZ) sampling shifted from Clover and Macaulay receiving environments to the McLoughlin receiving environment. The IDZ is a 100-meter area around the end of the outfall, as described by BC ENV.

Clover and Macaulay Point screening and pump stations have been converted to only discharge sewage out their respective long outfalls during very heavy rain events or planned overflow and bypass events that occur during maintenance of the conveyance system. In the event of an overflow out either Clover Point or Macaulay Point outfalls, surface water sampling will be attempted, conditional on vessel availability and weather conditions. Often, overflow events occur during storms which makes sampling dangerous to staff and vessel crew.

3.2 Methods

Staff collected 5 samples in 30 days ("5-in-30") in each quarter (i.e., January, April, July, and October) at the IDZ and at the surface of the receiving environment at stations around the McLoughlin outfall (Figure 3.1). Sampling was undertaken using the University of Victoria's 16-metre science vessel, the MSV John Strickland. The Strickland is equipped with a hydraulic winch and an electric slip ring winch, an A-frame, bow thrusters and a differential global positioning system. The equipment and rigging are required for this work.

For surface water sampling, CRD staff collected samples at a depth of 1 m using a sampling pole. For IDZ sampling, staff collected samples using a Seabird ECO55 rosette sampler along with a SBE19PlusV2 conductivity-temperature-depth (CTD) instrument. The CTD instrument was also equipped with a SBE43 dissolved oxygen sensor. Water column instrument profiles were taken at each initial dilution zone station and water column samples were taken at the top (at a depth of 5 m), middle (middle of predicted plume trapping depth at approximately 40 m, and bottom (5 m above the seafloor, approximately 55 m). Surface and initial dilution zone sampling parameters are presented in Appendix C1. CTD casts were captured at each IDZ sample station. Each CTD cast measured depth, conductivity, salinity, temperature and dissolved oxygen.

Surface sampling stations are presented in Figure 3.1 and Appendix C2. The surface sampling grid, consisting of a total of 13 stations, was used to ensure good spatial coverage of the receiving environment where plume surfacing is most likely to occur. In addition, samples were collected at the location at which the drift drogue was retrieved (see Appendix C2, sample D1). Surface samples were collected in sterile, wide-mouth bottles by rapidly submerging open, upright bottles to a depth of 1 m using a sampling pole. Reference stations were also sampled at Parry Bay, Metchosin and Constance Bank (see Figure 3.1).

Initial dilution zone stations (surrounding the IDZ) are also presented in Figure 3.1. For each cruise, the predicted current direction and plume trapping depth were determined using the CRD's hydrodynamic C3 model. The model incorporates local conditions (historic instrument data and current and tide tables) to estimate current direction and effluent trapping depth (Hodgins, 2006). The model is also updated on an annual basis to incorporate the previous year's data. Four stations and the "middle" sampling depth were then selected to ensure that they fell within the plume's model-predicted direction of travel and trapping depth for that day and time. Samples were collected with a Seabird ECO55 rosette sampler and were decanted into sample bottles and preserved for analysis of metals, various conventional parameters and nutrients (Appendix C1). Bacteriological, ammonia, hardness, metals, total suspended solids and pH samples were collected for each of the “5-in-30” cruise days, while analysis of oil and grease, phosphorus, sulfide and total organic carbon were conducted on samples collected from only one day per quarter (usually the first of the “5-in-30” cruise days).

The surface and initial dilution zone water column samples were analyzed for two bacteriological indicators (fecal coliforms and Enterococci) by BV Labs (Victoria, BC). Fecal coliforms were enumerated using 0.45 µm membrane filters on mFC medium at 44.5°C for 24 hours and Enterococci were enumerated using 0.45 µm nitrocellulose membranes on mEI medium at 41°C for 22-26 hours.

Bacteriological results were evaluated against the historical human health guidelines developed by the BC ENV (BCMoE&CCS 2017; 2019) for recreational primary contact (for informational purposes only) and to Health Canada (2012) guidelines for recreational water quality. The Health Canada guidelines for Enterococci are:

- The geometric mean of five samples taken 5 times in 30 days, should not exceed 35 CFU/100 mL
- Single Enterococci values should not exceed 70 CFU/100 mL

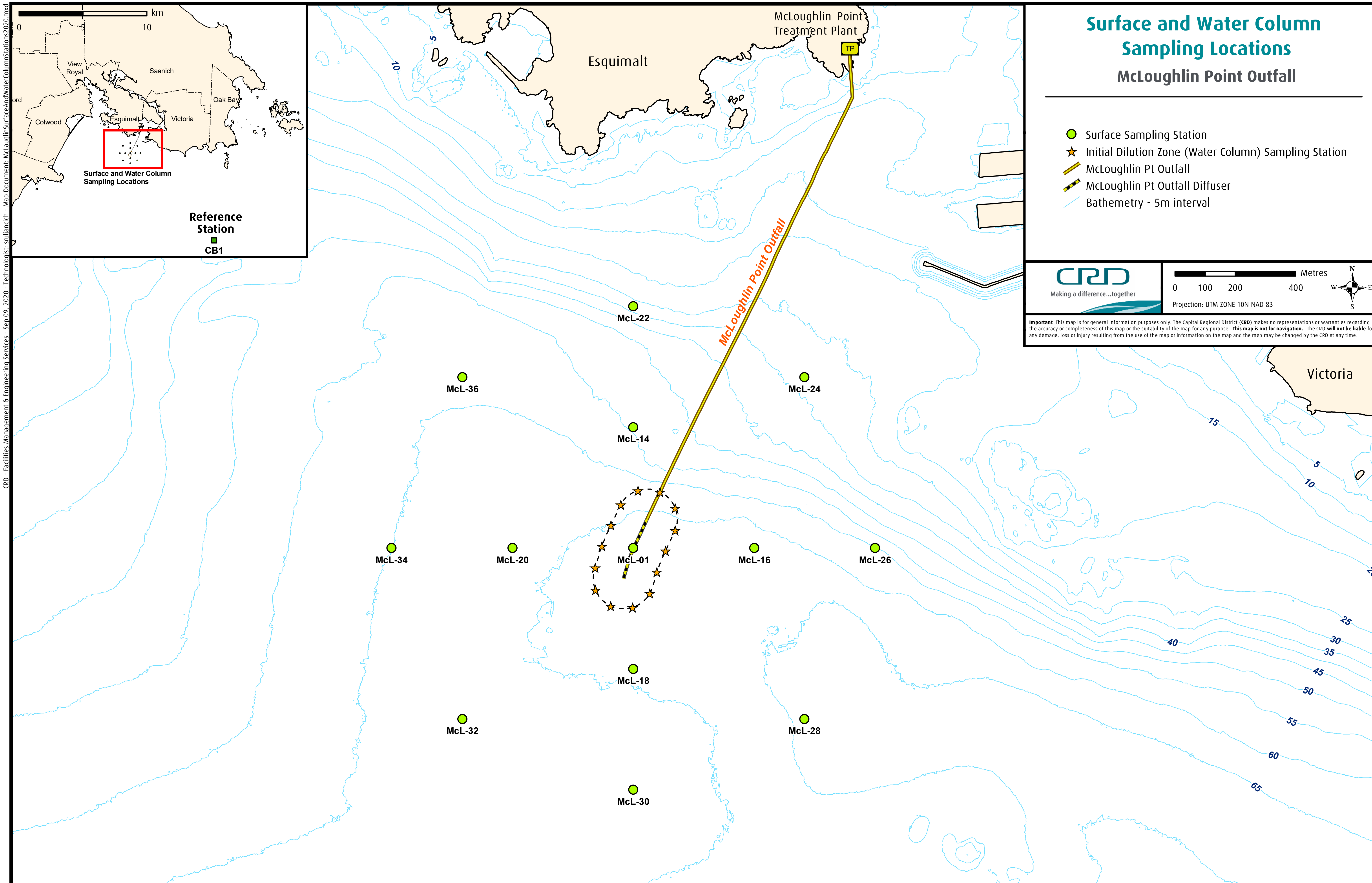
All other IDZ water column results were evaluated against Approved BC Water Quality Guidelines for the Protection of Aquatic Life (BCMoE&CCS 2017; 2019).

The registration under the Municipal Wastewater Regulation (MWR), Authorization #108831, requires minimum dilution model field testing. Testing is required using concurrent effluent and receiving environment water quality samples at the edge of the IDZ at McLoughlin Point outfall and far field sites (Haystock Islets, Ogden Point, Cook Street, Chatham and Discovery Islands, Trial Island) and at Clover (CPS) and Macaulay pump stations (MPS) during potential overflow events, for modelled scenarios 1, 2 and 3 (Seaconsult, 2019).

The three modelled scenarios are based on the influent flow hydrographs prepared by Seaconsult (2019) representing typical conditions expected up to the year 2030.

- Scenario 1 is summer conditions with flows of about 80% of the average dry weather flow (ADWF) for McLWWTP (ADWF of 108,000 m3/day) of tertiary effluent.
- Scenario 2 is wet weather conditions providing discharge through only the McLWWTP outfall (flows 0.5 x to 2.9 x ADWF when McLWWTP is discharging primary + tertiary blended effluent).
- Scenario 3 is wet weather storm conditions providing discharge through both the McLWWTP (primary + tertiary blended effluent) and CPS (screened effluent) deep outfalls.

Appendix C18 presents results from two overflow events that occurred in April 2021 when Macaulay and Clover pump stations (MPS and CPS) were undergoing commissioning works and were overflowing screened sewage over several days. From April 15-22, 2021, 133,818 m^3 of screened sewage was discharged out the MPS long outfall and from April 21-26, 2021, 215,114 m^3 of screened sewage was discharged out the CPS long outfall. Appendix C18 Table 1 presents McLWWTP total daily flows and MPS and CPS overflows for the month of April 2021. While these overflow events do not mirror any of the modelled scenarios, sampling was conducted regardless. Ambient conditions were also assessed at five far field stations both when overflows were occurring in April and when not overflowing in August.



CRD - Facilities Management & Engineering Services - Sep 09, 2020 - Technologist: sruljancich - Map Document: McLauglinSurfaceAndWaterColumnStations2020.mxd

3.3 Results and Discussion

3.3.1 Surface Water Sampling

CRD staff collected 320 surface water samples at McLoughlin's WWTP marine receiving environment in 2021.

Fecal coliform results for each sampling event (including seasonal geometric means) are presented in Appendix C3. Station seasonal geometric means were one or two orders of magnitude below the historical provincial guideline of 200 CFU/100 mL (Table 3.1). Two individual fecal coliform measurements out of 320 were above the value of 200 CFU/100 mL (Appendix C3). The maximum fecal coliform concentration measured in 2021 was 390 CFU/100 mL on week two in the winter at the drogue station.

Enterococci results for each sampling event (including seasonal station geometric means) are presented in Appendix C4. All seasonal geometric means were below the federal guideline of a geomean of 35 CFU/100 mL (Table 3.2). One individual Enterococci measurement out of 320 measurements was above the federal single value guideline of 70 CFU/100 mL (Appendix C3), occurring on week five in the autumn.

There were no recreational (historical guideline) exceedances for fecal coliforms in any quarter and no exceedances for Enterococci in the winter, spring or summer. The frequency and location of exceedances are much less than results from historic Clover and Macaulay receiving environment monitoring. 2021 surface water sampling results indicate that treatment has substantively reduced bacteria concentrations in effluent and the receiving environment by up to two orders of magnitude (i.e., millions to tens of thousands).

Overall, the data indicate that the McLoughlin effluent plume was predominantly trapped below the surface, as predicted by the CRD's hydrodynamic C3 model, and that the outfall diffuser was achieving adequate dilution. Had the effluent plume not been predominantly trapped, more frequent high fecal coliform and Enterococci concentrations would have been observed, particularly at stations approximately 100 m from the outfall, where the model predicts the plume is most likely to surface (Hodgins, 2006). If more regular plume surfacing was occurring, we would expect to see more fecal coliform concentrations of approximately 1,846 CFU/100 mL, based on applying the average dilution factor of 113:1 to the 2021 mean wastewater fecal coliform concentration of 208,617 CFU/100 mL (Table 2.3). As mentioned above, the maximum single fecal coliform concentration found at 1 m depths was 390 CFU/100 mL, with most results below 10 CFU/100 mL.

Table 3.1 McLoughlin Surface Water (1 m depth) Fecal Coliform Seasonal Geometric Means

Fecal Coliforms	Winter						Spring						Summer						Autumn					
	1	2	3	4	5	Geo-mean	1	2	3	4	5	Geo-mean	1	2	3	4	5	Geo-mean	1	2	3	4	5	Geo-mean
McL-01	3	6	6	1	20	5	1	7	1	1	1	1	1	1		3	1	1	1	1	1	60	42	5
McL-14	6	22	14	4	11	10	1	5	1	1	13	2	1	1	1	1	1	1	2	3	1	63	39	7
McL-16	4	4	24	2	4	5	3	5	2	2	1	2	1	1	1	1	1	1	1	1	1	20	130	5
McL-18	7	2	16	1	7	4	2	5	2	2	1	2	1	1	2	1	1	1	1	1	1	19	74	4
McL-20	1	53	8	6	28	9	1	1	1	2	1	1	1	1	1	1	1	1	2	1	1	20	16	4
McL-22	5	10	18	3	8	7	1	10	2	4	1	2	1	1	1	1	1	1	1	2	3	110	9	6
McL-24	4	1	22	3	5	4	11	12	1	6	1	4	1	1	1	1	1	1	1	1	1	62	61	5
McL-26	1	5	24	4	1	3	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	26	10	3
McL-28	1	2	25	3	1	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	20	61	4
McL-30	7	1	22	5	2	4	2	2	1	1	1	1	1	2	1	1	1	1	1	1	1	28	75	5
McL-32	4	3	13	1	11	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	17	12	3
McL-34	6	1	4	10	14	5	1	4	1	1	1	1	1	1	1	1	1	2	11	1	1	8	23	5
McL-36	5	**240**	1	1	9	6	1	12	1	1	9	3	1	1	1	1	1	2	13	1	1	45	24	7
McL-D1	3	**390**	19	1	36	15	3	1	---	1	1	1	1	1	1	---	1	1	---	1	---	16	54	10
Ref-CB	1	2	1	1	64	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	7	2	2
Ref-PB	1	1	1	1	---	1	7	1	1	---	1	2	1	1	1	1	1	1	1	1	1	1	2	1

Notes: Shaded cells indicate exceedance to the historical BC WQG Geomean of 200 CFU/100 mL
--- denotes sample not taken due to weather issues

Table 3.2 McLoughlin Surface Water (1 m depth) Enterococci Seasonal Geometric Means

Enterococci	Winter						Spring						Summer						Autumn					
	1	2	3	4	5	Geo-mean	1	2	3	4	5	Geo-mean	1	2	3	4	5	Geo-mean	1	2	3	4	5	Geo-mean
McL-01	1	1	1	1	3	1	1	2	1	1	1	1	1	1		1	1	1	1	1	1	21	25	3
McL-14	2	7	1	2	4	3	1	1	1	1	4	1	1	1	1	1	1	1	1	1	1	27	27	4
McL-16	1	1	3	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	18	**71**	4
McL-18	3	1	2	1	1	1	1	2	2	1	1	1	1	1	2	1	1	1	1	1	1	10	44	3
McL-20	1	10	1	3	11	3	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	12	15	3
McL-22	1	3	1	1	3	2	1	2	2	2	1	2	1	1	1	1	1	1	1	1	2	26	4	3
McL-24	1	2	2	2	4	2	1	6	1	2	1	2	1	1	1	1	1	1	1	1	1	26	69	4
McL-26	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	18	10	3
McL-28	1	1	3	1	1	1	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	12	44	4
McL-30	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	13	53	4
McL-32	2	1	3	2	1	2	1	1	1	2	1	1	1	1	1	3	1	1	1	1	2	15	15	3
McL-34	3	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1	1	1	11	2
McL-36	1	21	1	1	4	2	1	2	1	1	6	2	1	1	1	1	1	1	1	1	1	19	9	3
McL-D1	3	1	1	1	15	2	1	1	---	1	1	1	1	1	1	---	1	1	---	1	---	20	44	10

Notes: Shaded cells indicate exceedance to Environment Canada maximum guideline of 70 CFU/100 mL (blue) and geomean of 35 CFU/100 mL (red)
--- denotes sample not taken due to weather issues

3.3.2 Initial Dilution Zone Water Column Sampling

Analytical results for each round of initial dilution zone water column sampling are presented in Appendices C3-C16. CTD and dissolved oxygen plots for each cruise day are presented in Appendix C17.

Only samples for which results were above detection limits, and have BC approved recreational water quality guidelines are presented (Appendices C5-C16) (arsenic, boron, cadmium, copper, Enterococci, lead, manganese, nickel, silver and zinc).

Table 3.3 and Table 3.4 present the geometric means of maximum (worst case from each day in the "5-in-30" round) fecal coliform and Enterococci concentrations for each of the seasons' samples (winter, spring, summer, and autumn).

The geometric means of the "5-in-30" fecal coliform water column results exceeded guidelines (historical guideline) once at the middle sampling depth during the winter sampling (within the plume's predicted trapping depth) with a geomean of 217 CFU/100 mL. Exceedances to historical limits did not occur at the surface or at the bottom depth during any season (Appendix C3).

The geometric means of the "5-in-30" Enterococci water column results did not exceed guidelines during any season (Appendix C4). Single value exceedances to the federal Enterococci guideline of 70 CFU/100 mL also did not occur in 2021 (Appendix C4). There were no exceedances of provincial or federal guidelines for any of the metals that were analyzed in the water column initial dilution zone samples, except for boron. Concentrations of total boron exceeded the provincial guideline of 1.2 mg/L in all samples, with values ranging from 2.69 to 4.88 mg/L including the reference station. However, ambient boron concentrations, as demonstrated at the reference station, are approximately 4.0 mg/L in southern Vancouver Island marine waters (BCMoE, 2006). Therefore, it is inevitable that guidelines are exceeded.

These results indicate an improvement of surface and IDZ water quality since sewage treatment has been installed. The treatment process reduced the concentration of bacterial indicators, heavy metals, and nutrients in the water column or on the water surface by up to an order of magnitude or more. More sampling is needed to determine long term reductions.

Water column profiles of temperature, salinity, dissolved oxygen and transmissivity (Appendix C17) generally followed expected seasonal patterns for the Strait of Georgia (well mixed in winter and stratified in summer). It appears that the plume was only occasionally detected by the sensors, based on decreases in oxygen and increases in bacteriological indicators (fecal coliforms and Enterococci). A master's thesis (Krogh *et al*., 2018) examining vertical profiles of dissolved oxygen between 2011 and 2016 confirmed that of the approximately 850 CTD casts conducted, only six profiles showed any evidence of a sewage plume layer, using decreases in dissolved oxygen as a primary indicator.

CTD profiling will continue as part of the routine environmental monitoring program and the data will be fed into the oceanographic plume dispersion model on a regular basis to maintain an up-to-date background condition database.

Table 3.3 McLoughlin Water Column Initial Dilution Zone (IDZ) Fecal Coliform Monitoring

Fecal Coliforms CFU/100 mL			
	Top	**Middle**	**Bottom**
Winter Geomean	16	217	69
Spring Geomean	7	36	56
Summer Geomean	2	53	152
Autumn Geomean	45	25	24

Notes: Red shaded cells indicate exceedance of historical BC WQG geomean of 200 CFU/100 mL
Top (depth of 5 m), middle (middle of predicted plume trapping depth, and bottom (5 m above the seafloor).

Table 3.4 McLoughlin Water Column Initial Dilution Zone (IDZ) Enterococci Monitoring

Enterococci CFU/100 mL			
	Top	Middle	Bottom
Winter Geomean	6	7	7
Spring Geomean	3	9	22
Summer Geomean	1	11	21
Autumn Geomean	17	7	7

Notes: Shaded cells indicate and exceedance of Health Canada recreational guideline geomean of 35 CFU/100 mL
Top (depth of 5 m), middle (middle of predicted plume trapping depth, and bottom (5 m above the seafloor).

3.3.3 Model Validation Sampling

Results of the model validation sampling are presented in Appendix C18 and include surface bacteria, bacterial source tracking results, and tidal information.

Sampling confirmed that the effluent flows from the McLoughlin WWTP were non-detectable at far field stations.

3.3.4 Overall Assessment

Overall, the 2021 surface fecal coliform and Enterococci results indicate that the newly commissioned McLoughlin Wastewater Treatment Plant is operating as designed. The treated effluent plume was trapped well below the ocean surface and the diffusers were working as expected. There were no exceedances on the surface at any time of the year for Enterococci, except one measurement that was above guidelines in the fifth week in the autumn.

There were no detectable heavy metals, oil and grease or elevated nutrients in any of the 360 samples taken in 2021 except boron which exceeded guidelines in all samples, even those at the reference station. Boron is naturally elevated in the Salish Sea at levels of approximately 4.0 mg/L in southern Vancouver Island marine waters (BCMoE, 2006). Therefore, it is inevitable that guidelines are exceeded around the McLoughlin outfall.

In summary, the new McLoughlin WWTP treatment processes have substantively reduced potential impacts to human health and the marine receiving environment, particularly from a bacteriological perspective, relative to the historical Macaulay and Clover discharges.

4.0 OVERFLOW AND BYPASS MONITORING

4.1 Introduction

During high volume storm events, the input to the Core Area conveyance system (Figure 1.1) may exceed system capacity, resulting in overflows at designated combined sewer overflow (CSO) and sanitary sewer overflow (SSO) relief points. There are also periodic bypass events to allow for planned maintenance to the treatment works or following unexpected non-routine or emergency events.

There are multiple relief points in the system (Table 4.2), but most are never used and are only in place for emergencies. The relief points that are expected to overflow in rain events, and their historical and predicted future overflow frequencies, are presented in Table 4.1. The new McLoughlin Wastewater Treatment Plant, and the conveyance system upgrades and additions, have reduced the frequency of overflows from most of the SSO points. These additions include the 5,000 m^3 underground Arbutus Attenuation Tank, that temporarily stores wastewater flows during high volume storm events, and moderates release into the downstream system. The frequency of overflows at the Humber and Rutland CSO locations, however, will remain unchanged until the District of Oak Bay separates the wastewater and stormwater systems in the Uplands neighborhood.

In the event of an overflow or bypass, sampling is required as part of the EMP at the adjacent beaches and/or stormwater outputs (Table 4.2, Appendix D1), following protocols developed in consultation with Island Health, and approved by ENV. The purpose of this shoreline monitoring is to assess human health risk for people engaged in recreational activities on beaches adjacent to the overflows by comparing bacterial results to recreational guidelines (Health Canada (2012).

This sampling program has evolved over the years, and currently indicates that from May 1 to September 14 of each year, when beach use is highest, all overflow events are immediately monitored during (if prolonged duration and as safety protocols allow), and after the overflow event. Temporary beach closure signs are posted, Emergency Management BC (EMBC) is notified, and Island Health is consulted.

For the remainder of the year (September 15 to April 30), the response varies. For the Humber and Rutland CSO locations, permanent signage has been posted at all potential affected beaches advising beach users to stay out of the water for 48 hours after any weather event, and no sampling is undertaken for routine wet weather overflows. For the remaining SSO locations, and any unexpected non-routine or emergency CSO discharges, shoreline monitoring is still required during these winter months.

4.2 Methods

A network of shoreline and stormwater sampling stations cover the beach area around the CSO/SSO locations. Shoreline stations are named based on their proximity to the overflow/relief point in the conveyance system, e.g., HUM-H for Humber H. Stormwater stations are named using “SW” plus numbers, (e.g., 0503/SW0503).

When sampling was required, shoreline sampling stations were selected based on the location of the overflow/bypass event(s) (Table 4.1, Appendix D1), and sampled approximately 48 hours after the event occurred. Samples are collected concurrently at adjacent stormwater discharges.

All samples are collected by submerging a sterile 500 mL plastic bottle into the marine shoreline waters as far as the sampling technician could reach, or by holding the bottle in the stormwater discharge flow, and then sent to Bureau Veritas (Burnaby, BC) for analysis for Enterococci. Results were compared to Health Canada (2012) limit of 70 CFU/100 mL for a single sample.

4.3 Results and Discussion

There were multiple overflow and bypass events in 2021, as listed in Table 4.3. Shoreline sampling conducted following overflow events consistently indicated that any wastewater signals dissipate within 48 hours following an event. Stormwater discharge signals were more persistent and were frequently still elevated when samples were collected. Appendix D2 lists the overflow/bypass shoreline sampling results. Those overflow sample stations close to the overflow outfall or adjacent to storm drains at times exceeded Health Canada's (2012) recreational guideline of 70 CFU/100 mL.

Table 4.1 Overflow Frequency Pre- and Post-Treatment Plant Upgrade

Location	Pre Upgrade	Post Upgrade
Finnerty	3-4 times/year	>25-year return period storm
Humber	7-10 times/year	7-10 times/year
Rutland	7-10 times/year	7-10 times/year
McMicking	3-4 times/year	>25-year return period storm
Clover Long Outfall	continuous	61 hours/year
Clover Short Outfall	3-4 times/year	>100-year return period storm
Macaulay	continuous	>10-year return period storm

Table 4.2 Sanitary Sewer Overflow and Combined Sewer Overflow Locations

Outfall	Discharge Site	Location*		Treatment Equipment	Diffusers	Discharge Type
		Latitude	Longitude			
Clover Point Pump Station Long Outfall	Marine Outfall	48.394	-123.346	Travelling Panel Screen	Yes	Screened overflows
Humber Pump Station	Marine Outfall	48.449	-123.291	Bar Screen	N/A	Screened overflows
Rutland Pump Station	Marine Outfall	48.441	-123.291	Bar Screen	N/A	Screened overflows
Arbutus Trunk at Finnerty Cove	Marine Outfall	48.473	-123.286	N/A	N/A	Unscreened
Currie Major Pump Station (through McMicking Outfall)	Marine Outfall	48.409	-123.306	Travelling Bar Screen	N/A	Screened overflows From Currie Major
Currie Minor Pump Station (through McMicking Outfall)	Marine Outfall	48.409	-123.306	N/A	N/A	Unscreened from Currie Minor****
Penrhyn Minor Pump Station	Local Storm Sewer	48.459	-123.292	N/A	N/A	Unscreened
Hood Pump Station (through McMicking Outfall)	Marine Outfall	48.409	-123.306	N/A	N/A	Unscreened
East Coast Interceptor at Broom	Local Storm Sewer (Marine Discharge)	48.428	-123.307	N/A	N/A	Unscreened
Bowker Trunk to Bowker Creek at Monterey Avenue	Creek/River	48.429	-123.314	N/A	N/A	Unscreened
Northeast Trunk-B at Broom	Local Storm Sewer (Marine Discharge)	48.428	-123.308	N/A	N/A	Unscreened
Harling Pump Station	Local Storm Sewer (Marine Discharge)	48.407	-123.324	N/A	N/A	Unscreened
Clover Point Pump Station Emergency Bypass Outfall	Marine Outfall	48.404	-123.348	Travelling Panel Screen	N/A	Can be screened and unscreened
Clover Point Pump Station Short Outfall	Marine Outfall	48.402	-123.347	Travelling Panel Screen	N/A	Can be screened and unscreened
Macaulay Point Pump Station Long Outfall	Marine Outfall	48.403	-123.410	Travelling Panel Screen	Yes	Screened overflows
Macaulay Point Pump Station Short Outfall	Marine Outfall	48.416	-123.407	Travelling Panel Screen	N/A	Can be screened and unscreened
Head Street Northwest	Local Storm Sewer	48.427	-123.399	N/A	N/A	Unscreened
Sea Terrace Northwest Trunk	Local Storm Sewer	48.431	-123.394	N/A	N/A	Unscreened
Harriet Siphon Northwest Trunk to Gorge	Marine Outfall	48.443	-123.392	N/A	N/A	Unscreened
Gorge Siphon to Gorge	Marine Outfall	48.440	-123.388	N/A	N/A	Unscreened
Craigflower Pump Station at manhole S0560 on Shoreline Trunk	Marine Outfall	48.453	-123.425	N/A	N/A	Unscreened
Langcove Pump Station	Local Storm Sewer	48.433	-123.419	N/A	N/A	Unscreened
Marigold Pump Station to local storm sewer and into Colquitz Creek	Creek/River	48.468	-123.399	N/A	N/A	Unscreened

Table 4.3 2021 Core Area Overflow and Bypass Events

Date	Location	DGIR Number (Dangerous Good Incident Report)	Type of Event
Jan 02	Finnerty, Currie, Humber, Rutland	202945, 203597, 203598, 203604	Heavy rain overflow through CSO/SSO points
Jan 05	Humber, Rutland	203644	Heavy rain overflow through CSO points
Jan 11	Rutland	203721	Heavy rain overflow through CSO point
Jan 12	Currie, Humber, Rutland	203757, 203758	Heavy rain overflow through CSO/SSO points
Jan 13	Currie	203761	Heavy rain overflow
Jan 18	McLoughlin	203842	Brief unplanned bypass
Feb 01	Humber, Rutland	204027, 204028	Heavy rain overflow through CSO points
Feb 21	Currie, Humber, Rutland	204288	Heavy rain overflow through CSO/SSO points
Feb 22	McLoughlin	204303	Unplanned bypass resulting in discharge of plastic media
Mar 28	McLoughlin	204728	Secondary bypass with influent flow <216 MLD
Jun 01	McLoughlin	210750	Complete Plant power failure, diverting flow to PS
Jun 09	McLoughlin	210874	Error in preventative maintenance resulting in plant bypass
Jul 13	Finnerty	211387	Very small overflow during testing at Arbutus Attenuation Tank
Jul 16	Finnerty	211386	Very small overflow during testing at Arbutus Attenuation Tank
Oct 28	Clover, Humber Rutland	212893, 212894, 212895, 213732	Heavy rain overflow through CSO/SSO points
Nov 11	Humber, Rutland	213133, 213134	Heavy rain overflow through CSO points
Nov 13 to 15	All CSO/SSO points	213152, 213172, 213190, 213191, 213192, 213193, 213194, 213267, 213268, 213269, 213270, 213513, 213525	Extremely heavy rain event
Nov 25	Clover, Humber Rutland	213439, 213434, 213435	Heavy rain overflow through CSO/SSO points
Nov 27 and 28	Currie, Humber, Rutland, Clover	213500, 213501, 213502, 213503	Heavy rain overflow through CSO/SSO points
Dec 7 and 8	McLoughlin	213408	Unplanned bypass during treatment works optimization
Dec 11	Clover, Humber Rutland	213730, 213731, 213733	Heavy rain overflow through CSO/SSO points
Dec 17 and 18	Clover, Humber, Rutland, Currie	213832	Heavy rain overflow through CSO/SSO points

4.4 Overall Assessment

Overflow and bypass sampling conducted in the Core Area in 2021 reaffirmed that the wastewater signal in the vicinity of the overflow or bypass has generally dissipated by 48 hours following the events. Stormwater discharge signals were more persistent and were frequently still elevated after 48 hours when samples were collected. The risk to humans recreating on area beaches was highest in the 48 hours after rain events. Overflow and bypass sampling will continue to be conducted as required in 2022.

5.0 ADDITIONAL INVESTIGATIONS

Additional investigations are important elements of the monitoring program and are conducted to address focused or emerging issues, clarify aspects of the program, and provide concurrent data for the assessment of environmental effects. The Society of Ecotoxicology and Chemistry (SETAC) review of the program agreed that one-time investigations are appropriate to fill in information gaps, as needed (SETAC, 2006). Studies undertaken as part of the additional investigations component of the monitoring program are usually recommended and reviewed by the MMAG. The advisory group periodically reviewed the list of additional investigations based on program results, current scientific issues, and the need to supplement the existing knowledge on environmental effects of the Macaulay and Clover wastewater discharges. Other additional investigations are identified opportunistically through contacts in the local academic and scientific communities.

In 2005, the MMAG initiated a comprehensive review of the list of additional investigations. This review was completed in 2006 and Table 5.1 presents the studies that were recommended based on a risk assessment framework: contaminant source, pathways (ways in which contaminants can reach receptors), and receptors (e.g., fish, invertebrates and human health, etc.). For each of these categories, studies were ranked as high, medium or low priority.

Subsequently, in 2006, the CRD received a letter from the BC Minister of Environment requesting that an amendment to the Core Area Liquid Waste Management Plan detailing a schedule for the provision of wastewater treatment be provided by June 30, 2007. The additional investigations presented were evaluated by the MMAG before this decision to move to advanced treatment was made. As such, all additional investigations that had already been implemented by the receipt date of this letter were continued. Implementation of other investigations was put on hold because their priority was likely to change once higher levels of treatment were put in place at McLoughlin Point. Following a meeting in early 2013, the advisory group was tasked with reviewing and reprioritizing the list, as well as adding any additional potential new studies. This review was put on hold in 2015 at the last meeting of the MMAG.

Investigations that deal with new emerging scientific issues are best undertaken under collaborative research programs. For example, the potential for environmental effects of pharmaceuticals and personal care products (PPCP) has been identified as a potential environmental concern in the scientific community and was identified as high priority by the MMAG. There was also a requirement under the Core Area Liquid Waste Management Plan approval letter of March 26, 2003, to undertake some collaborative studies on PPCPs. However, when this emerging issue was identified, routine laboratory analytical techniques for quantifying these substances had only recently been developed and there were no commercial laboratories in Canada that could analyze for these compounds. As such, these substances were best assessed in research programs where collaborative resources from academia and government could be used. Since then, commercial laboratories have developed standardized methods and PPCP analyses are now a routine part of the EMP.

Studies that were underway in 2006 have since been completed or are continuing, but new investigations from Table 5.1 have not been initiated. However, several opportunistic collaborative opportunities have come up in recent years. Section 5.1 summarizes additional investigations that were ongoing, completed or initiated in 2021 to mid-2022.

Table 5.1 Core Area Additional Investigations Prioritization by MMAG (2006)

Category	Investigation	Description and Characteristics	2006 Rating	Status/ Anticipated Initiation Date	Anticipated Completion Date
Contaminant Source	Study to address the presence of endocrine disrupting compounds and PPCP in wastewater and the potential effects on the receiving environment	The first part of an overall phased-approach to study these substances will be to measure the concentrations of a group of substances in wastewater. This is an area of emerging concern related to human health and potential environmental effects (from the chemical, biological and toxicological aspects).	High	Initiated in 2004	Completed in 2010
	Assessment of contaminants associated with oil and grease	Determination of contaminants associated with oil and grease originating from the outfalls. Relates to the potential human health and environmental effects issues (e.g., windsurfers, seagulls, etc.). The first phase of this investigation will be to undertake a literature review.	Medium	No dates (study will be re-evaluated in the advisory group additional investigation review).	
	Identification of pathogens in wastewater and the presence of these in surface waters around the outfalls	Analysis of wastewater for different types of pathogens that have the potential to affect human health and determine if these pathogens are present in the receiving environment around the outfalls (related to die-offs, etc., in marine waters).	Low	Enterococci was added to the bacteriological target analyte list in 2011. Consideration of additional pathogens will be re-evaluated in the advisory group additional investigation review.	
	Bacteria source identification	Determine the different sources of fecal coliform to differentiate between various mammals, such as cows, dogs and humans.	Low	Planning on undertaking far field characterisation work off the new treatment plant to validate plume modelling.	
Pathways	Sediment transport/deposition/ re-suspension	The first step in this investigation would include a determination of the different particle size fractions in wastewater (this could be conducted through a literature review and/or through laboratory experiments). The second phase would include the determination of the settling of particles from the discharge onto sediments. Results from these analyses would be used in the overall assessment of sediment particle deposition and the subsequent movement of sediments around the outfalls.	High	Initiated in 2005 (study is on hold – will be re-evaluated as part of the advisory group additional investigation review).	

Table 5.1, cont'd

Category	Investigation	Description and Characteristics	2006 Rating	Status/ Anticipated Initiation Date	Anticipated Completion Date
Pathways, *cont'd*	Conduct a sediment core sampling program	Determination of sedimentation and mixing rates and the fluxes of contaminants near the outfalls and at reference sites. A mass balance approach could be used where rates of contaminant accumulation in sediments are compared with the rate of contaminant discharge from the outfalls in an attempt to determine the proportion of each contaminant captured by and stored in the sediments. A sediment trap study could be added to study contaminant transport in the near bottom nepheloid layer.	Medium	Initiated in 2006 in conjunction with the Institute of Ocean Sciences.	Completed in 2011
Receptors and Potential Effects	Effects of endocrine disrupting compounds and PPCP on the receiving environment	As part of a phased-approach to study effects of endocrine disrupting compounds, laboratory exposures, bioassay and/or caged studies (or an organism found around the outfall) could be conducted to assess the potential effects of these substances on the receiving environment around the outfalls.	High	Collaborative study with UVic on toxicogenomic effects to benthic invertebrates was initiated in 2007.	Funding not secured and project was shelved
	Assessment of chemical concentrations in tissue of different trophic level organisms (including higher trophic levels)	Measurement of contaminants in crab, finfish or other organisms near the outfalls would provide a basis for a food-ingestion human health risk assessment. This information could also be used to model bioconcentration and biomagnification of contaminants to higher trophic levels near the outfalls.	High	A finfish sampling program was added to the five-year monitoring cycle.	Delayed Cycle 1 survey completed in 2018, with final report received in 2019 Results were presented in the 2019 annual report
	Identification of biological resources	Identification of the harvestable organisms around the outfalls.	Low	No dates (study will be re-evaluated in the advisory group additional investigation review).	
	Clover mussel population biology	Conduct some additional studies on the mussel population around the Clover outfall (e.g., reproductive cycle, health, etc.). Additional data relates to the current monitoring and to potential studies on emerging chemicals.	Low	No dates (study will be re-evaluated in the advisory group additional investigation review).	
	Levels of pathogens in biota (e.g., epibenthic, etc.)	Assess the presence and concentration of pathogens in biota near the outfalls.	Low	No dates (study will be re-evaluated in the advisory group additional investigation review).	
	Assess potential risks associated with pathogens/antibacterial resistance	A literature review, risk assessment or a pilot study could be conducted to study antibiotic bacteria and the relevance as a potential emerging concern to human health, wildlife and domestic animals.	Low	No dates (study will be re-evaluated in the advisory group additional investigation review).	
	Investigate the structure of algal plankton communities	Assess the potential effects of the wastewater discharges on algal communities (planktonic and benthic).	Low	No dates (study will be re-evaluated in the advisory group additional investigation review).	

5.1 Investigations Completed or Underway from 2021 to mid-2022

The EMP completed or participated in the following additional investigations:

- continued participation in the Ocean Wise Conservation Association's SSAMEx and Pollution Tracker programs;
- continuation of a collaborative project with the Ocean Wise Conservation Association and Royal Roads University to develop methods for microplastic analyses in wastewater and environmental samples;
- continuation of a collaborative project with Biologica Environmental Services Ltd. (Victoria, BC) and the University of Chicago to assess live versus dead benthos assemblages around the Macaulay outfall;
- continuation of a collaborative project with Biologica Environmental Services Ltd., UVIC, and Metro Vancouver to develop benthic invertebrate toxicogenomic monitoring tools;
- completion of a collaborative assessment of the uptake and trophic changes in PCBs in the benthic marine food chain around the Macaulay outfall;
- completion of a UVIC and industry collaborative project to assess COVID-19 presence in regional wastewaters;
- initiation of a BC Centre for Disease Control project to assess COVID-19 and influenza presence in BC wastewaters; and
- participation in a University of British Columbia and industry collaborative project to develop a handheld device to monitor and detect microorganisms in wastewater.

5.1.1 Ocean Wise Conservation Association's SSAMEx and Pollution Tracker Programs

The Ocean Wise Conservation Association's SSAMEx program is a trans-boundary initiative with the aim to build on current monitoring initiatives, enable data sharing to fill gaps in existing coverage for the Salish Sea, and provide a platform for discussion and dialogue among partners. The primary objective of SSAMEx is to facilitate the generation of a cross-jurisdictional trans-boundary dataset that focuses on ambient background conditions in the Salish Sea, such that other monitoring activities (e.g., municipal wastewater outfall monitoring) have a greater ability to determine whether observed shifts in results are associated with natural factors (e.g., climate related) or anthropogenic influences (e.g., wastewater outfalls). One of the main ways that SSAMEx achieves its objective is by developing harmonized sampling methodologies that can be adapted by the various organizations undertaking monitoring throughout the Salish Sea.

The objective of the Ocean Wise Conservation Association's Pollution Tracker program is to assess contaminant levels and profiles along the BC coast, via the collection of surface sediments and shellfish, both near and far from pollution sources. The program meets its objective by supporting new and existing sampling efforts and through coordinating laboratory analyses. The data generated is used to produce "state of the coastal environment" reports for partners and the general public, produce scientific publications, and populate the SSAMEx with data from background sample locations. Results can be found at https://pollutiontracker.org/.

In 2021, the CRD continued to analyze an expanded contaminant list in Core Area wastewaters that aligns with the Pollution Tracker target analyte list. Staff also partially funded and assisted with the collection of Pollution Tracker samples in Victoria Harbour and other areas in the region during the spring of 2022. Finally, staff and external researchers used monitoring program and Pollution Tracker data to characterize and assess behaviour of PCB contaminants throughout the Salish Sea; additional details about this assessment can be found in Section 5.1.5.

5.1.2 Microplastic Analytical Methodology Development

The Ocean Wise Conservation Association is working to assess microplastics in the ocean waters and sea life of the Salish Sea. The Vancouver Island University was also undertaking similar work, though their program has since stopped. The CRD provided 2015 Clover mussel samples to Vancouver Island University to help them develop methods that will be used to determine if plastics are accumulating in sea life tissues. It is doubtful that any results will be received due to the program shutting down. In addition, the CRD provided the Ocean Wise Conservation Association with 2016 wastewater and 2017 sediment samples from Clover and Macaulay and, in conjunction with the Regional Source Control Program, samples from a residential wastewater catchment area upstream in the sewage system. The Ocean Wise Conservation Association has been using these samples to develop analytical methodologies that determine both quantity and type of plastics in wastewater and environmental samples.

In 2021, the CRD reached out to the Ocean Wise Conservation Association to determine whether their lab has capacity to receive more CRD samples, specifically from McLoughlin to determine the plant's efficiency at reducing microplastic loadings to the environment. It is hoped that the lab will be able to start receiving samples in 2023 once McLoughlin treatment processes have stabilized.

In the meantime, the CRD's Regional Source Control Program and a Royal Roads University student group worked with Ocean Wise and Ocean Diagnostics Inc. (Victoria, BC) to refine analytical methodologies for microplastics in commercial laundry and compost facility wastewater. Results of their work can be found in Willms *et al.* (2022). In short, the three commercial laundries studied were each estimated to discharge 75.1 to 781 billion microplastic fibers per year into the regional wastewater system, while the effluent from the single compost facility studied contained non-detectable levels of microplastic fibres.

5.1.3 Benthos Death Assemblages

In early 2016, the monitoring program was approached by the CRD contract taxonomist (Biologica Environmental Services Ltd.) and a University of Chicago researcher to gauge willingness to provide archived Macaulay benthic sample debris for further assessment. The researcher was interested in comparing the "death assemblages" of molluscs and bivalves contained within the archived debris to the "live" communities that are assessed by Biologica in routine environmental monitoring program sediment samples. Such live-dead comparisons have been used elsewhere to assess anthropogenic stressors over time.

The monitoring program provided 2010, 2014 and 2017 debris to the University of Chicago. The 2005-2017 "live" Macaulay community data were pooled to establish average bivalve species composition per site and the 2014 and 2017 debris samples were picked for "dead" individuals.

The live-dead comparisons generally matched the spatial patterns observed in the other monitoring program seafloor monitoring components (sediment chemistry, etc.) and were indicative of the already known outfall nutrification impacts. Pollution and organic enrichment-tolerant bivalves were found in higher abundance in the debris samples collected close to the outfall, and decreased with distance from the outfall. There were also differences in live-dead taxa abundances that varied with proximity to the outfall. Overall, the results suggest a nutrient footprint that extends greater than one kilometre away from the Macaulay diffuser, slightly farther than what the routine environmental monitoring program stations would capture. The results are being further assessed.

The preliminary findings were presented at the Geological Society of America Annual Meeting in Seattle in October 2017, and more complete findings were presented at the 2020 Salish Sea Ecosystem Conference in Vancouver. Findings will also eventually be published in a relevant scientific journal.

5.1.4 Benthos Toxicogenomic Tool Development

Benthic taxonomy is a useful tool for the assessment of anthropogenic stressors and has proven invaluable in determining the impacts of the Macaulay outfall. Taxonomic assessments, however, are labour- and time-intensive, and can be costly. In addition, the revised monitoring program five-year monitoring cycle has a reduced frequency of benthos assessments in comparison to the annual programs that took place pre-2011. This has resulted in a loss of temporal and spatial resolution for the program.

In 2016, the EMP program was approached by our contract taxonomist (Biologica Environmental Services Ltd.) and a UVIC researcher regarding interest in supporting the development of a benthos toxicogenomic tool that would be inexpensive relative to a full taxonomic assessment. This tool could be used in years when seafloor sampling does not take place and at historic monitoring stations that have been abandoned. The CRD collaborated on developing similar toxicogenomic tools for the Clover Point horse mussels

(Veldhoen et al., 2009; Veldhoen et al., 2011; CRD, 2011); development of these tools was put on hold following the provincial order to install further treatment, which resulted in the long-term fate of the Clover outfall becoming unknown.

Biologica is the financial driver of this industrial research and development project, with the same UVIC researcher, that historically developed some Clover mussel eDNA tools, providing the scientific and technical lead. To date, the monitoring program has provided benthos samples collected during seafloor sampling in 2017, 2019 and 2022, as well as access to the archived Macaulay taxonomic reference collection. These were used to identify taxa to prioritize for further toxicogenomic work-up and by various UVIC co-op students for preliminary method development.

In 2018, Biologica and UVIC submitted a grant application to fully implement the project. The application was a success and a five-year project was initiated in April 2019. The CRD and Metro Vancouver were both financial supporters of the project and will continue to provide sampling vessel and sample access throughout the project's duration.

The team has confirmed the best field sample collection methods to optimize eDNA signals and has since developed assays for a number of positive, negative and control benthic species to assess of wastewater effects around marine outfalls in the Salish Sea. Work is progressing on isolating eDNA from additional indicator species using sediment samples collected during the September 2022 seafloor sampling program around the McLoughlin and Macaulay outfalls.

Results have so far been presented at the SETAC North America 42nd Annual Meeting (Acharya-Patel, 2021a), the 47th Canadian Ecotoxicty Workshop (Acharya-Patel, 2021b), and the 4th International Council for the Exploration of the Sea (ICES)/North Pacific Marine Science Organization (PICES) Early Career Conference (Acharya-Patel, 2022). Journal articles will be prepared as the project wraps up.

5.1.5 Uptake and Trophic Changes of Polychlorinated Biphenyls

Following completion of last year's assessment of PBDE flame retardant contaminants (Burd *et al*., 2019), a similar assessment was initiated for PCBs, another group of contaminants that are persistent, bio-accumulative, and toxic. Because of these properties, their production has been banned and they are no longer in active use, but legacy sources to the environment exist. Understanding their environmental behaviour is important for determining why environmental concentrations are not decreasing in some locations, as expected. In 2019 and early 2020, staff worked with external researchers to compile monitoring program and Ocean Wise Conservation Association Pollution Tracker data to assess uptake and trophic changes in PCBs in the benthic marine food chain in the Salish Sea relative to sediment physical and geochemical characteristics. Tissue data from the Cycle 1 Macaulay and Clover fish survey was also included.

Findings were published in Burd et al., (2022) and indicated that PCBs in local sediments exceeded environmental guidelines, particularly in the industrialized Victoria Harbour, suggesting an ongoing historic terrestrial source as there is no longer industrial use of PCBs. Some guideline exceedances were observed around the Macaulay outfall, but levels were lower than in the harbour. Overall, tissue PCBs were an order of magnitude higher than sediments, with higher tissue concentrations in more depositional areas. Results indicate that PCBs appear to be more bio-accumulative and persistent at higher trophic levels than PBDEs.

5.1.6 COVID-19 in Wastewater

Throughout the world, researchers have been investigating ways to predict timing of COVID-19 outbreaks to inform health care planning. One promising technique is wastewater epidemiology, which has been used elsewhere in the world to detect COVID-19 in wastewater systems, sometimes as much as a week or two before patients started presenting with widespread symptoms in health care facilities.

The COVID-19 pandemic arrived in British Columbia early in 2020. In April 2020, the CRD was asked to provide weekly wastewater samples from Macaulay, Clover and the Saanich Peninsula wastewater treatment plants by a consortium of researchers from UVIC and Pani Energy Inc. (Victoria, BC). McLoughlin samples were also provided once the new plant was commissioned in early 2021. The Regional District of Nanaimo also provided samples to the project. All samples have been analyzed using similar methodologies to those used elsewhere on the BC Lower Mainland, across Canada and internationally with the goal of using results to inform local health authority COVID-19 response plans. As of mid-2021, this project's funding was not renewed, and the project was cancelled. Findings have recently been published in Masri et al. (2022) and confirmed that COVID-19 levels in the individual Vancouver Island communities were relatively low throughout the study period, with many samples having non-detectable levels of COVID-19. However, by pooling results from all the study locations, the team was able to calculate the sensitivity/detection limit of the commonly used lab method.

In 2022, the CRD was approached by the BC Centre for Disease control to provide McLoughlin wastewater samples for COVID-19 and influenza analyses, along with other treatment plants throughout Vancouver Island and the rest of the province. Results, when available, will be provided via an online data dashboard at https://bccdc.shinyapps.io/respiratory_wastewater/.

5.1.7 Handheld Microorganism Detection Device

A researcher at the University of British Columbia and Harbour Resource Partners, the consortium that built the McLoughlin Point WWTP, began a project to develop a novel handheld DNA sequencing device to monitor and detect microorganisms in wastewater. The aim is to provide utility operators with an easy-to-use screening tool that can provide a qualitative assessment of pathogen presence in wastewaters. Results could then be used to inform health agencies of any changes in pathogen presence over time. The contractor began providing McLoughlin wastewater and sludge samples during commissioning and the CRD continued to provide samples after taking over plant operation in January 2021. Results are not yet available.

5.1.8 Oceanographic Sensor Deployment

In 2012, the CRD entered into a collaborative project with Ocean Networks Canada to deploy oceanographic sensors adjacent to the Macaulay outfall, and elsewhere in the Salish Sea (Boundary Pass and Strait of Juan de Fuca). The objectives of the deployment were to determine whether the wastewater discharge was contributing to reduced dissolved oxygen levels and benthic invertebrate community health declines around the Macaulay outfall. Findings of this project were presented in CRD (2017) and Krogh et al. (2018).

While the investigation has wrapped up, the CRD continues to support mooring deployment as the data is used for calibration of the oceanographic models used to predict the dispersion patterns of the CRD's Core Area wastewater outfall plumes, and is fed into other Salish Sea oceanographic models used by academia and state and provincial government agencies.

5.1.9 Investigations Planned for 2022

No new additional investigations or studies are planned for 2022/2023, unless novel opportunities arise.

6.0 CONCLUSIONS

2021 continued to be a transitional year for sewage treatment in the Core Area and the EMP. The new McLoughlin Point WWTP began commissioning in August 2020, with flows gradually being diverted from Macaulay and Clover pump stations to the new facility. In 2021, most flows received treatment at McLoughlin and monitoring efforts were therefore shifted to focus on the new facility and outfall. By design, EMP monitoring requirements still exist for Macaulay and Clover, but now focus on wet weather or other bypass/overflow events, with the bulk of the wastewater sampling being dropped effective December 31, 2020 coincident with the cancellation of the federal Transitional Authorizations for these two pump stations. Regardless of discharge location, the different routine monitoring components of the program, and the additional investigations, were effective tools to assess the effects of the McLoughlin, Macaulay, and Clover discharges on the marine receiving environment.

Wastewater monitoring took place entirely at McLoughlin in 2021. Access limitations and equipment challenges precluded wet weather or bypass sampling at Macaulay and Clover, but these have been resolved for 2022. Other logistical challenges at McLoughlin led to deviations from established wastewater sampling protocols as well. As such, comparisons to previous years' monitoring results must be done with caution. In addition, neither provincial nor federal wastewater regulations allow for a commissioning period when a new facility comes online. Full compliance with McLoughlin regulatory limits was, therefore, not expected during commissioning, as it was not possible for all treatment processes to be instantly and fully effective. In 2021, influent and effluent sampling at McLoughlin was undertaken to assess regulatory compliance and to determine contaminant removal efficiency of the tertiary treatment processes.

Receiving environment surface and water column monitoring shifted to McLoughlin in 2021. There were no Macaulay or Clover overflow events coincident with the routine McLoughlin sampling in 2021, and as noted above, wet weather effluent sampling was not possible at Macaulay and Clover due to equipment installation issues.

Seafloor monitoring design remained largely unchanged with the commissioning of McLoughlin, except for new seafloor stations around the McLoughlin outfall that were added to the east of the Macaulay stations in 2019. Macaulay/McLoughlin seafloor sampling is only required twice per monitoring cycle, with the next sampling event in 2022. Clover seafloor sampling took place in 2020, and will next take place in 2025.

Various additional investigations were ongoing in 2021/2022. These investigations continue to address gaps in the routine monitoring program or emerging environmental and human health concerns related to the discharge of wastewater to the marine environment.

Details about individual monitoring program components can be found in preceding sections of this report; the results of the overall weight of assessment are provided below.

it is expected that it will take up to the end of 2022 for the McLWWTP processes to fully stabilize and a further two to three years (i.e., 2024-2025) before enough influent and effluent data will have been collected to make definitive statements about the efficacy of treatment and resulting reductions of effects in the marine environment. The installation of tertiary treatment is expected to substantively reduce overall contaminant loading to the environment and reduce the footprint of impact. The CRD is committed to continuing the EMP to assess these improvements both spatially and temporally.

6.1 Wastewater

Wastewater compliance monitoring results indicated that the quality of the wastewater from McLoughlin achieved tertiary standards for most of the year. However, McLoughlin effluent quality was not expected to be always compliant during commissioning and provincial regulatory limits were intermittently exceeded from February to October. As treatment processes stabilized, the frequency of non-compliance events decreased. TSS exceeded federal limits in April, but only slightly. It is expected that non-compliance frequency will be reduced in 2022, but treatment processes can take up to two years to fully stabilize. Beyond process optimization, there is also potential that highly variable centrate return flows from the

Hartland Residuals Treatment Facility may be impacting the treatment plant's ability to consistently achieve effluent quality limits. This issue is being investigated.

Wastewater priority substance monitoring results confirmed the efficacy of the tertiary treatment plant to substantively reduce concentrations and loadings of contaminants to the marine receiving environment relative to the historical untreated discharges out of Macaulay and Clover. Except for bacteriological indicators, the estimated receiving environment concentrations (based on applying predicted minimum initial dilution factors to wastewater concentrations) did not exceed applicable provincial and federal water quality guidelines for the protection of human health and aquatic life. Most were below guidelines in wastewater even before discharge. More detailed concentration and loading assessments will be undertaken in 2022.

Tertiary treatment at McLoughlin has also improved acute toxicity. Except for the January rainbow trout test, all McLoughlin acute rainbow trout and invertebrate toxicity tests passed. This represents a substantive improvement over historical Macaulay and Clover discharge practices, when effluent was regularly acutely lethal to fish and sometimes to invertebrates. January's failure was caused by ammonia, and subsequent tests were then run with a pH stabilized method. McLoughlin effluent was also much less chronically toxic than historic Macaulay and Clover effluents, further affirming the value of advanced treatment to reduce potential for adverse effects to organisms around the outfall.

Chronic toxicity results indicated that the predicted wastewater concentrations at the edge of the IDZ of both outfalls would have little to no effect on organism health.

The bacteriological guideline exceedances will continue at McLoughlin, as disinfection was not included as part of the treatment processes. However, the magnitude and duration of the exceedances has decreased substantially overall, relative to historic Macaulay and Clover flows, as bacterial levels in McLoughlin final effluent are an order of magnitude lower, and unscreened flows out of Macaulay and Clover will only occur during heavy rain events. Future consideration of the need to disinfect effluent will be subject to ongoing monitoring of the impact of the treated McLoughlin effluent and wet weather overflows. Reduction of wet weather discharges will be advanced through the ongoing implementation of CRD and municipal inflow and infiltration reduction programs.

There are many newer and emerging substances that the CRD may or may not yet monitor and for which guidelines have yet to be developed. The potential influence of these chemicals on the environment is relatively unknown. The CRD attempts to assess the risk of these newer chemicals through additional investigations as described in Section 5.0.

6.2 Reclaimed Water

The reclaimed water system was abandoned early in 2021 due to operational challenges. As such, no reclaimed water samples were collected for analysis.

6.3 Surface Water

Surface water and IDZ sampling shifted completely to the McLoughlin outfall in 2021. Overall, surface fecal coliform and Enterococci results indicated that the outfall plume was predominantly trapped below the ocean surface. The potential for human exposure to high fecal coliform and Enterococci concentrations around the outfall was very low, as fecal coliform and Enterococci surface water geometric mean results were only infrequently above thresholds used to assess risk to human health, as expected based on effluent quality and outfall design. These exceedances occurred mostly during the autumn or winter sampling periods when surfacing events were more likely to occur.

The 2021 water column monitoring (at depths of 5 m or greater) confirmed that bacteriological indicators rarely exceeded both provincial and federal guidelines at the edge of the IDZ around the McLoughlin outfall. Magnitude and frequency of exceedances were much lower than historic observations around the Clover and Macaulay outfalls, affirming the environmental improvement of tertiary treatment at McLoughlin. These minor exceedances were expected, based on the wastewater concentrations of the bacteriological indicators (in the hundreds of thousands of bacteria per 100 mL) and the intended design of the outfall diffusers, even with tertiary treatment. The diffusers were designed specifically to ensure that the wastewater plumes were predominantly trapped below the surface.

Overall, the fecal coliform and Enterococci results were within the concentrations predicted by hydrodynamic modelling. The seasonality of the moderately high bacterial counts can be attributed to higher wastewater flows in winter, coupled with the oceanography of this area during the winter months (relative lack of water column stratification due to wind and relatively cool surface waters). Summer plume surfacing events are also predicted to occur occasionally at both outfalls, associated with the morning flush in the wastewater system, weak water column stratification and slack tide. Events are predicted to be much less frequent in summer than in winter.

Boron routinely exceeded guidelines at both the outfall and reference stations. These exceedances cannot be attributed to the outfall, as natural background concentrations of boron in the Salish Sea are routinely higher than guidelines.

While the plume was predominantly trapped below the surface, and only low risk to human health, there is higher potential risk to organisms that live in the water column. The 2021 water column monitoring results for metals were all low or at background levels (e.g., boron) indicating that risk to organisms was also likely low. However, the monitoring program is relatively lacking in assessments of organisms living in the water column, except for the finfish monitoring component of the EMP. Organisms living in the water column may move in and out of the plume and, therefore, potential effects cannot be easily attributed to the outfalls themselves.

Overall, the bacteriological monitoring results indicated that the surface water effects of the outfall were limited and substantively lower than the signals observed historically around the Clover and Macaulay outfalls. The McLoughlin plume was predominantly trapped at depth (below 40 m) for most of the year, and substantially diluted wastewater only occasionally reached the surface.

6.4 Overflow and Bypass Monitoring

The conveyance system is designed with numerous shoreline sanitary and combined sewer overflow and relief points that discharge during heavy rains, planned maintenance activities or following unexpected non-routine or emergency events. Shoreline monitoring is required to assess human health risk for people engaged in recreational activities on beaches adjacent to the overflows. The 2021 monitoring confirmed that wastewater overflow signals typically dissipate within 48-hours, but adjacent municipal stormwater discharge signals persist longer, sometimes continuously. Overall, risk to human health is short-lived following bypass and overflow events.

6.5 Seafloor Monitoring

Seafloor monitoring is required every two to three years around the Macaulay and McLoughlin outfalls and every five years around the Clover outfall. No seafloor monitoring was required in 2021.

6.6 Additional Investigations

Additional investigations are important elements of the program that address specific questions or issues pertaining to the monitoring program, clarify aspects of the program and provide concurrent data for the assessment of environmental effects.

The CRD's ongoing participation in the two Ocean Wise Conservation Association initiatives included ensuring the monitoring program's samples were collected using harmonized methodologies, thereby benefiting both the CRD when assessing monitoring results, as well as others doing similar monitoring elsewhere in the Salish Sea. In addition, participation in these initiatives provided access to other Salish Sea datasets for comparison to monitoring program results. Access to such datasets was integral during the preparation of the recently completed journal manuscript that characterizes trophic changes of PCBs in CRD biota samples. By providing various types of samples to the Ocean Wise Conservation Association, the monitoring program has helped facilitate the development of new analytical methodologies for microplastics in wastewater and environmental samples, including working with a private contractor to develop methods for microplastics in commercial laundry and compost facility effluents. The death assemblage assessments are ongoing, and it is hoped that the development of the benthos toxicogenomic tools will provide the CRD and Metro Vancouver with a useful and inexpensive monitoring tool for filling in spatial and temporal gaps in the routine benthos programs. By providing wastewater samples to UVIC for COVID-19 analyses, researchers were able to determine the practical detection limit of the most used analytical method, relative to the number of cases in the community. Ongoing submission of samples to the BC Centre for Disease Control will continue to give health authorities an advanced notice of local COVID-19 and influenza outbreaks prior to widespread increases in patient hospitalization. Similarly, CRD provision of McLoughlin wastewater samples to UBC will hopefully result in an easy-to-use, handheld device that will allow operators to detect microorganisms in wastewater and ultimately inform health authorities. Finally, the continued deployment of oceanographic sensors with Ocean Networks Canada around the McLoughlin and Macaulay outfalls, and elsewhere in the Salish Sea, provides data that feeds into plume dispersion and other oceanographic models.

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APPENDIX A
GUIDANCE MANUAL FOR
ASSESSMENT AND ANALYSIS OF WMEP DATA

Available upon request.

Contact: CRD's Environmental Monitoring Program, 250.360.3296

APPENDIX B
2021 WASTEWATER MONITORING

Appendix B1 Priority Substance List and Sampling Frequency

Substance	McLoughlin WWTP Influent and Effluent	
	(full list)	(modified list)
	Quarterly	Monthly
CONVENTIONALS		
alkalinity	√	√
biochemical oxygen demand (BOD)	√	√
carbonaceous biochemical oxygen demand (CBOD)	√	√
chemical oxygen demand (COD)	√	√
chloride	√	√
conductivity	√	√
cyanide-SAD	√	√
cyanide-WAD	√	√
enterococci	√	√
fecal coliforms	√	√
hardness, total	√	√
nitrogen, ammonia	√	√
nitrogen, nitrate	√	√
nitrogen, nitrite	√	√
nitrogen, total Kjeldahl	√	√
oil and grease, mineral	√	√
oil and grease, total	√	√
organic carbon, total	√	√
pH	√	√
sulphate	√	√
sulphide	√	√
suspended solids, total	√	√
METALS		
Total Metals		
aluminum	√	√
antimony	√	√
arsenic	√	√
barium	√	√
beryllium	√	√
cadmium	√	√
calcium	√	√
chromium	√	√
chromium VI	√	√
cobalt	√	√
copper	√	√
iron	√	√
lead	√	√
magnesium	√	√
manganese	√	√
mercury	√	√
molybdenum	√	√
nickel	√	√
phosphorus	√	√
potassium	√	√
selenium	√	√
silver	√	√

Appendix B1, cont'd

Substance	McLoughlin WWTP Influent and Effluent	
	(full list)	(modified list)
	Quarterly	Monthly
thallium	√	√
tin	√	√
zinc	√	√
Dissolved Metals		
aluminum	√	√
antimony	√	√
arsenic	√	√
barium	√	√
beryllium	√	√
cadmium	√	√
calcium	√	√
chromium	√	√
cobalt	√	√
copper	√	√
iron	√	√
lead	√	√
magnesium	√	√
manganese	√	√
mercury	√	√
molybdenum	√	√
nickel	√	√
phosphorus	√	√
potassium	√	√
selenium	√	√
silver	√	√
thallium	√	√
tin	√	√
zinc	√	√
Speciated Metals		
dibutyltin	√	
dibutyltin dichloride	√	
methyl mercury	√	
monobutyltin	√	
monobutyltin trichloride	√	
tributyltin	√	
tributyltin dichloride	√	
ALDEHYDES		
acrolein	√	√
PHENOLIC COMPOUNDS		
total phenols	√	√
CHLORINATED PHENOLICS		
2,4,6-trichlorophenol	√	√
2,4/2,5-dichlorophenol	√	√
2-chlorophenol	√	√
4-chloro-3-methylphenol	√	√
pentachlorophenol	√	√
NON-CHLORINATED PHENOLICS		
2,4-dimethylphenol	√	√
2,4-dinitrophenol	√	√

Appendix B1, cont'd

Substance	McLoughlin WWTP Influent and Effluent	
	(full list)	(modified list)
	Quarterly	Monthly
2-methyl-4,6-dinitrophenol	√	√
2-nitrophenol	√	√
4-nitrophenol	√	√
phenol	√	√
ORGANOCHLORINE PESTICIDES		
2,4-DDD	√*	
2,4-DDE	√*	
2,4-DDT	√*	
4,4-DDD	√*	
4,4-DDE	√*	
4,4-DDT	√*	
aldrin	√*	
alpha chlordane	√*	
alpha-endosulfan	√*	
alpha-BHC	√*	
beta-endosulfan	√*	
beta-BHC	√*	
chlordane	√*	
delta-BHC	√*	
dieldrin	√*	
endosulfan sulfate	√*	
endrin	√*	
endrin aldehyde	√*	
gamma chlordane	√*	
heptachlor	√*	
heptachlor epoxide	√*	
gamma BHC	√*	
methoxyclor	√*	
mirex	√*	
octachlorostyrene	√*	
toxaphene	√*	
POLYCHLORINATED BIPHENYLS		
PCB-1	√*	
PCB-3	√*	
PCB-4/10	√*	
PCB-5/8	√*	
PCB-15	√*	
PCB-18	√*	
PCB-19	√*	
PCB-23/34	√*	
PCB-28	√*	
PCB-31	√*	
PCB-37	√*	
PCB-40	√*	
PCB-44	√*	
PCB-43/49	√*	
PCB-52/73	√*	
PCB-54	√*	
PCB-56/60	√*	

Appendix B1, cont'd

Substance	McLoughlin WWTP Influent and Effluent	
	(full list)	(modified list)
	Quarterly	Monthly
PCB-66/80	√*	
PCB-77	√*	
PCB-81	√*	
PCB-87/115/116	√*	
PCB-89/90/101	√*	
PCB-93/95	√*	
PCB-99	√*	
PCB-104	√*	
PCB-105/127	√*	
POLYCYCLIC AROMATIC HYDROCARBONS		
dibenzo(a,h)anthracene	√*	√
fluoranthene	√*	√
fluorene	√*	√
indeno(1,2,3-c,d)pyrene	√*	√
naphthalene	√*	√
phenanthrene	√*	√
pyrene	√*	√
total high molecular weight - PAH	√*	√
total low molecular weight - PAH	√*	√
total PAH	√*	√
SEMIVOLATILE ORGANICS		
Phthalates		
bis(2-ethylhexyl)phthalate	√	√
butylbenzyl phthalate	√	√
diethyl phthalate	√	√
dimethyl phthalate	√	√
di-n-butyl phthalate	√	√
di-n-octyl phthalate	√	√
MISCELLANEOUS SEMIVOLATILE ORGANICS		
1,2,4-trichlorobenzene	√	
1,2-diphenylhydrazine	√	√
2,4-dinitrotoluene	√	√
2,6-dinitrotoluene	√	√
3,3-dichlorobenzidine	√	√
4-bromophenyl phenyl ether	√	
4-chlorophenyl phenyl ether	√	
benzidine	√	√
bis(2-chloroethoxy)methane	√	
bis(2-chloroethyl)ether	√	
bis(2-chloroisopropyl)ether	√	
hexachlorobenzene	√	
hexachlorobutadiene	√	
hexachlorocyclopentadiene	√	
hexachloroethane	√	
isophorone	√	√
nitrobenzene	√	√
N-nitrosodimethylamine	√	√
N-nitrosodi-n-propylamine	√	√
N-nitrosodiphenylamine	√	√

Appendix B1, cont'd

Substance	McLoughlin WWTP Influent and Effluent	
	(full list)	(modified list)
	Quarterly	Monthly
VOLATILE ORGANICS		
Monocyclic Aromatic Hydrocarbons		
benzene	√	√
chlorobenzene	√	√
1,2-dichlorobenzene	√	√
1,3-dichlorobenzene	√	√
1,4-dichlorobenzene	√	√
ethylbenzene	√	√
m & p xylenes	√	√
o-xylene	√	√
styrene	√	√
toluene	√	√
xylenes	√	√
Aliphatic		
acrylonitrile	√	√
methyl tertiary butyl ether	√	√
Chlorinated Aliphatic		
1,1,1,2-tetrachloroethane	√	√
1,1,1-trichloroethane	√	√
1,1,2,2-tetrachloroethane	√	√
1,1,2-trichloroethane	√	√
1,1-dichloroethane	√	√
1,1-dichloroethene	√	√
1,2-dichloroethane	√	√
1,2-dichloropropane	√	√
bromomethane	√	√
chloroethane	√	√
chloroethene	√	√
chloromethane	√	√
cis-1,2-dichloroethene	√	√
cis-1,3-dichloropropene	√	√
dibromoethane	√	√
dibromomethane	√	√
dichloromethane	√	√
tetrabromomethane	√	√
tetrachloroethene	√	√
tetrachloromethane	√	√
trans-1,2-dichloroethene	√	√
trans-1,3-dichloropropene	√	√
trichloroethene	√	√
trichlorofluoromethane	√	√
Trihalomethanes		
bromodichloromethane	√	√
chlorodibromomethane	√	√
tribromomethane	√	√
trichloromethane	√	√
Ketones		
dimethyl ketone	√	√
methyl ethyl ketone	√	√

Appendix B1, cont'd

Substance	McLoughlin WWTP Influent and Effluent	
	(full list)	(modified list)
	Quarterly	Monthly
methyl isobutyl ketone	√	√
alpha-terpineol	√	√
High resolution Analysis		
Nonylphenols (NP)	√	
Polybrominated Diphenyl Ethers (PBDE)	√	
Polycyclic Aromatic Hydrocarbons (PAH)	√	
Per and Polyfluoroalkyl Substances (PFOS)	√	
Pharmaceuticals and Personal Care Products (PPCP)	√	
Dioxins and Furans (PCDD)	√	
Polychlorinated Biphenyls (PCB)	√	
TOXICITY-ACUTE		
96-hr Rainbow Trout- pH stabilized		√
48-hr Daphnia magna		√
TOXICITY-CHRONIC (Annual)		
Rainbow Trout Avelin and Egg Test (EA)	√**	
Ceriodaphnia 7-day	√**	
Top smelt 7-day	√**	
Echinoderm fertilization	√**	

Notes:
√* Analyses were conducted at a higher resolution (i.e., at SGS AXYS Analytics), **annually

Appendix B2 McLoughlin Wastewater Treatment Plant Influent Flow (m^3/day)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	145,340	135,400	109,210	88,330	79,190	68,310	71,470	69,830	73,620	82,720	96,040	143,850
2	208,460	125,880	104,730	85,770	80,510	74,290	72,570	73,100	73,780	81,350	107,590	127,850
3	177,900	112,780	101,340	85,410	80,860	74,570	69,770	73,270	74,080	83,180	117,270	121,900
4	170,180	108,060	98,600	85,150	78,130	76,600	72,120	78,180	74,980	80,840	115,110	117,870
5	174,820	103,910	94,410	85,750	79,210	75,050	72,830	75,740	72,960	79,250	101,390	122,100
6	153,790	100,400	93,270	84,740	78,270	77,900	73,450	74,980	76,420	78,340	101,220	151,430
7	132,310	101,060	96,110	87,030	78,370	76,510	75,050	73,120	76,510	78,000	106,210	123,260
8	126,210	96,010	91,430	82,820	77,030	74,750	72,640	73,000	75,530	77,190	97,270	119,540
9	118,150	52,160	88,560	89,130	79,670	74,200	72,360	73,480	75,090	83,740	113,490	115,610
10	116,510	71,430	89,990	85,550	78,320	73,190	70,330	74,280	73,620	78,750	107,530	179,250
11	164,450	90,150	87,820	85,240	76,600	76,270	71,590	74,080	83,250	80,150	150,080	230,810
12	194,580	89,100	87,470	82,590	78,090	72,830	73,680	73,570	77,580	85,490	122,100	174,290
13	163,360	87,470	87,640	83,520	76,430	77,340	74,180	72,700	76,530	79,750	178,180	146,910
14	136,280	118,410	88,920	81,770	78,050	75,230	72,440	71,230	78,000	91,170	254,180	128,690
15	122,120	163,520	88,680	67,720	75,980	74,250	72,910	73,510	76,900	89,990	248,980	118,960
16	118,750	165,690	84,780	81,930	79,410	74,170	75,680	75,660	82,350	85,730	179,470	111,100
17	115,770	146,240	84,090	65,370	79,300	74,110	73,140	74,150	139,180	87,160	142,950	146,490
18	108,660	143,990	83,000	39,510	76,830	72,320	71,650	73,840	98,500	83,630	166,720	241,320
19	105,320	131,690	80,630	39,460	75,900	71,690	72,150	73,800	85,620	81,020	137,540	158,600
20	103,040	126,380	82,580	59,650	76,760	74,390	71,700	74,100	79,420	81,570	125,430	133,780
21	100,040	178,290	94,880	57,190	73,940	74,780	70,210	72,340	41,340	80,760	120,170	128,830
22	97,930	161,100	89,610	44,430	72,550	72,580	73,360	74,900	36,640	84,570	118,030	142,900
23	97,240	140,010	86,060	41,340	73,360	77,020	71,720	74,820	37,180	79,860	110,860	127,040
24	111,220	139,130	112,790	44,320	80,930	74,250	70,660	72,960	52,550	83,550	121,050	119,290
25	60,350	140,460	95,270	45,600	88,710	74,190	71,640	72,460	76,910	99,030	230,490	111,360
26	91,060	124,010	89,040	64,070	76,550	73,170	73,930	73,300	113,850	86,830	161,040	103,790
27	52,750	118,900	89,510	80,030	76,920	75,330	70,730	72,890	93,620	126,060	226,300	102,730
28	45,020	115,330	116,740	81,170	74,960	78,860	75,370	72,140	84,340	198,820	239,660	100,690
29	76,720	---	97,720	80,500	74,820	75,120	69,230	75,340	94,250	116,770	177,190	100,230
30	91,830	---	91,220	80,610	76,720	73,640	73,220	74,730	96,100	99,900	172,580	99,800
31	121,850	---	90,470	---	68,620	---	70,230	74,220	---	93,780	---	100,120
Average	122,645	120,963	92,793	72,190	77,451	74,564	72,323	73,733	78,357	90,289	148,204	133,884
Maximum	208,460	178,290	116,740	89,130	88,710	78,860	75,680	78,180	139,180	198,820	254,180	241,320
Minimum	45,020	52,160	80,630	39,460	68,620	68,310	69,230	69,830	36,640	77,190	96,040	99,800
											Annual Average	96,282

Appendix B3 McLoughlin Wastewater Treatment Plant Effluent Flow (m^3/day)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	144,000	135,000	109,200	87,100	79,200	68,300	71,500	69,800	72,200	81,200	94,300	142,100
2	207,000	126,000	104,700	84,400	80,500	74,300	72,600	73,100	72,400	79,900	106,000	126,200
3	177,000	113,000	101,300	84,200	80,900	74,600	69,800	73,300	72,800	81,500	115,600	119,900
4	169,000	108,000	98,600	84,100	78,100	76,600	72,100	78,200	73,600	79,300	113,400	116,000
5	174,000	104,000	94,400	84,500	79,200	75,100	72,800	75,700	71,800	77,800	99,900	120,300
6	153,000	100,000	93,300	83,400	78,300	77,900	73,500	75,000	75,100	76,900	99,500	149,400
7	131,000	101,000	96,100	85,900	78,400	76,500	75,100	73,100	75,100	76,800	104,500	121,500
8	125,000	96,000	91,400	81,400	77,000	74,800	72,600	73,000	73,800	75,900	95,600	117,800
9	117,000	52,000	88,600	87,600	79,700	74,200	72,400	73,500	72,800	82,100	111,700	114,000
10	115,000	71,000	90,000	84,300	78,300	73,200	70,300	74,300	72,000	77,500	105,800	177,400
11	163,000	90,000	87,800	84,200	76,600	76,300	71,600	74,100	81,900	78,700	148,100	229,000
12	194,000	89,000	87,500	81,300	78,100	72,800	73,700	73,600	76,300	84,100	120,400	172,700
13	162,000	87,000	87,600	81,900	76,400	77,300	74,200	72,700	75,100	78,300	176,200	145,100
14	135,000	118,000	88,900	80,400	78,100	75,200	72,400	71,200	76,600	89,700	252,100	127,000
15	121,000	164,000	88,700	66,600	76,000	74,300	72,900	73,500	75,500	88,300	247,000	117,100
16	118,000	166,000	84,800	80,700	79,400	74,200	75,700	75,700	81,100	84,400	177,800	109,100
17	115,000	146,000	84,100	64,200	79,300	74,100	73,100	74,200	137,500	85,500	141,300	144,600
18	107,000	144,000	83,000	38,800	76,800	72,300	71,700	73,800	97,000	82,100	164,700	238,900
19	104,000	132,000	80,600	38,800	75,900	71,700	72,200	73,800	84,300	79,400	135,900	156,900
20	101,000	126,000	82,600	59,000	76,800	74,400	71,700	74,100	78,000	79,900	123,900	132,200
21	99,000	178,000	94,900	56,100	73,900	74,800	70,200	72,300	40,300	79,100	118,500	127,300
22	97,000	161,000	89,600	43,600	72,600	72,600	73,400	74,900	36,200	82,900	116,200	141,200
23	96,000	140,000	86,100	40,700	73,400	77,000	71,700	74,800	36,700	78,400	109,200	125,300
24	110,000	139,000	112,800	43,800	80,900	74,300	70,700	73,000	51,800	81,900	119,700	117,600
25	59,000	140,000	95,300	44,300	88,700	74,200	71,600	72,500	75,900	97,300	228,400	109,700
26	90,000	124,000	89,000	63,000	76,600	73,200	73,900	73,300	112,500	85,600	159,400	102,200
27	52,000	119,000	89,500	78,700	76,900	75,300	70,700	72,900	92,300	124,500	224,200	100,700
28	44,000	115,000	116,700	79,600	75,000	78,900	75,400	72,100	83,000	196,400	237,800	99,000
29	76,000	---	97,700	79,300	74,800	75,100	69,200	75,300	92,800	115,100	175,900	98,700
30	91,000	---	91,200	79,300	76,700	73,600	73,200	74,700	94,600	98,500	170,700	98,100
31	121,000	---	90,500	---	68,600	---	70,200	74,200	---	92,300	---	98,300
Average	121,516	120,857	92,790	71,040	77,455	74,570	72,326	73,732	77,033	88,752	146,457	132,106
Maximum	207,000	178,000	116,700	87,600	88,700	78,900	75,700	78,200	137,500	196,400	252,100	238,900
Minimum	44,000	52,000	80,600	38,800	68,600	68,300	69,200	69,800	36,200	75,900	94,300	98,100
											Annual Average	95,551

Notes: Shaded cells indicate exceedance to maximum daily flow = 432,000 m^3/day (comprising 216,000 m^3/day tertiary treated and 216,000 m^3/day primary treatment during wet weather)

Appendix B4 Frequency of Detection and Loadings of Substances in McLoughlin Point Final Effluent

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Effluent		Loading
				n	% Freq	kg/year
Conventionals						
Chloride	TOT	mg/L	68.9	12	100%	2,258,177
Total/SAD Cyanide	TOT	mg/L	0.002068	12	88%	67
WAD Cyanide	TOT	mg/L	0.001312	12	91%	43
Alkalinity - Total - Ph 4.5	TOT	mg/L	150.4	12	100%	4,747,708
Hardness (as CaCO3)	DIS	mg/L	72.65	12	100%	2,544,527
Hardness (as CaCO3)	TOT	mg/L	72.69	12	100%	2,525,588
Sulphate	TOT	mg/L	25.9	12	100%	885,743
N - NO2 (As N)	TOT	mg/L	0.2901	12	100%	9,609
N - NO3 (As N)	TOT	mg/L	7.903	12	100%	283,303
N - NO3 + NO2 (As N)	TOT	mg/L	8.192	12	100%	292,898
N - TKN (As N)	TOT	mg/L	25.33	12	100%	770,054
N - Total (As N)	TOT	mg/L	33.53	12	100%	1,063,049
Total Organic Carbon	TOT	mg/L	15	12	86%	511,741
Oil & Grease, Mineral	TOT	mg/L	ND>50%	12	---	---
Oil & grease, total	TOT	mg/L	ND>50%	12	---	---
Biological Oxygen Demand	TOT	mg/L	38.53	12	100%	1,217,135
Chemical Oxygen Demand	TOT	mg/L	96.8	12	100%	3,007,275
pH	TOT	pH	7.183	12	100%	---
Sulfide	TOT	mg/L	0.02897	12	64%	904
Conductivity	TOT	µS/cm	663.3	12	100%	---
Metals-Total						
Aluminum	TOT	µg/L	29.87	12	100%	969
Antimony	TOT	µg/L	0.2421	12	100%	8
Arsenic	TOT	µg/L	0.5728	12	100%	20
Barium	TOT	µg/L	5.26	12	100%	184
Beryllium	TOT	µg/L	ND>50%	12	---	---
Cadmium	TOT	µg/L	0.02912	12	100%	1
Calcium	TOT	mg/L	18.24	12	100%	639,840
Chromium	TOT	µg/L	0.978	12	100%	35
Cobalt	TOT	µg/L	0.5706	12	100%	20
Copper	TOT	µg/L	27.67	12	100%	870
Iron	TOT	µg/L	609.9	12	100%	18,891

Appendix B4, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Effluent		Loading
				n	% Freq	kg/year
Lead	TOT	µg/L	0.5934	12	100%	19
Magnesium	TOT	mg/L	6.629	12	100%	226,433
Manganese	TOT	µg/L	48.95	12	100%	1624
Mercury	TOT	µg/L	0.01458	12	69%	0.4
Molybdenum	TOT	µg/L	1.159	12	100%	38
Nickel	TOT	µg/L	3.032	12	100%	101
Potassium	TOT	mg/L	14.18	12	100%	446,156
Selenium	TOT	µg/L	0.1665	12	100%	6
Silver	TOT	µg/L	0.0546	12	100%	2
Thallium	TOT	µg/L	ND>50%	12	---	---
Tin	TOT	µg/L	0.484	12	100%	16
Zinc	TOT	µg/L	25.86	12	100%	830
Metals-Dissolved						
Aluminum	DIS	µg/L	13.69	12	100%	456
Antimony	DIS	µg/L	0.2403	12	100%	8
Arsenic	DIS	µg/L	0.5621	12	100%	20
Barium	DIS	µg/L	3.428	12	100%	127
Beryllium	DIS	µg/L	ND>50%	12	---	---
Cadmium	DIS	µg/L	0.01923	12	100%	1
Calcium	DIS	mg/L	18.2	12	100%	645,673
Chromium	DIS	µg/L	0.894	12	100%	32
Cobalt	DIS	µg/L	0.5568	12	100%	19
Copper	DIS	µg/L	17.97	12	100%	602
Iron	DIS	µg/L	334.3	12	100%	10,141
Lead	DIS	µg/L	0.2816	12	100%	9
Magnesium	DIS	mg/L	6.563	12	100%	226,569
Manganese	DIS	µg/L	46.8	12	100%	1,566
Mercury	DIS	µg/L	ND>50%	12	---	---
Molybdenum	DIS	µg/L	1.177	12	100%	39
Nickel	DIS	µg/L	3.003	12	100%	101
Phosphorus	DIS	µg/L	3311	12	100%	98,992
Potassium	DIS	mg/L	13.9	12	100%	438,568
Selenium	DIS	µg/L	0.1506	12	100%	5
Silver	DIS	µg/L	0.03363	12	100%	1
Thallium	DIS	µg/L	ND>50%	12	---	---
Tin	DIS	µg/L	0.466	12	100%	15

Appendix B4, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Effluent		Loading
				n	% Freq	kg/year
Zinc	DIS	µg/L	19.33	12	100%	640
Metals-Speciated						
Chromium III	TOT	mg/L	0.001262	4	55%	44
Chromium Vi	TOT	mg/L	ND>50%	4	---	---
Dibutyltin	TOT	µg/L	ND>50%	4	---	---
Dibutyltin Dichloride	TOT	µg/L	ND>50%	4	---	---
Methyl Mercury	TOT	ng/L	0.3513	4	100%	0.01
Monobutyltin	TOT	µg/L	0.01467	4	75%	0.4
Monobutyltin Trichloride	TOT	µg/L	0.02217	4	75%	0.6
Tributyltin	TOT	µg/L	ND>50%	4	---	---
Tributyltin Chloride	TOT	µg/L	ND>50%	4	---	---
Organics						
1,1,1,2-Tetrachloroethane	TOT	µg/L	ND>50%	12	---	---
Dichlorodifluoromethane	TOT	µg/L	ND>50%	12	---	---
Tetrabromomethane	TOT	µg/L	ND>50%	12	---	---
Nitrobenzene	TOT	µg/L	ND>50%	12	---	---
N-Nitrosodi-N-Propylamine	TOT	µg/L	ND>50%	12	---	---
N-nitrosodimethylamine	TOT	µg/L	ND>50%	12	---	---
4-Methyl-2-Pentanone	TOT	µg/L	ND>50%	12	---	---
Dimethyl Ketone	TOT	µg/L	79.6	12	57%	2,356
Endrin Ketone	TOT	ng/L	ND>50%	12	---	---
Isophorone	TOT	µg/L	ND>50%	12	---	---
NNDMA	TOT	µg/L	ND>50%	12	---	---
Benzene	TOT	µg/L	ND>50%	12	---	---
Ethylbenzene	TOT	µg/L	ND>50%	12	---	---
Toluene	TOT	µg/L	ND>50%	12	---	---
Xylenes	TOT	µg/L	ND>50%	12	---	---
1,2,3,4-Tetrachlorobenzene	TOT	ng/L	ND>50%	12	---	---
1,4-Dioxane	TOT	µg/L	0.302	12	100%	9
Acrolein	TOT	µg/L	ND>50%	12	---	---
Acrylonitrile	TOT	µg/L	ND>50%	12	---	---
Dibromomethane	TOT	µg/L	ND>50%	12	---	---
Tetrachloromethane	TOT	µg/L	ND>50%	12	---	---
Tribromomethane	TOT	µg/L	ND>50%	12	---	---
Trichloromethane	TOT	µg/L	ND>50%	12	---	---
1,2-Diphenylhydrazine	TOT	µg/L	ND>50%	12	---	---

Appendix B4, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Effluent		Loading
				n	% Freq	kg/year
2,4-Dinitrotoluene	TOT	µg/L	ND>50%	12	---	---
2,6-Dinitrotoluene	TOT	µg/L	ND>50%	12	---	---
3,3-Dichlorobenzidine	TOT	µg/L	ND>50%	12	---	---
4-Bromophenyl Phenyl Ether	TOT	µg/L	ND>50%	12	---	---
4-Chlorophenyl Phenyl Ether	TOT	µg/L	ND>50%	12	---	---
Hexachlorocyclopentadiene	TOT	µg/L	ND>50%	12	---	---
Hexachloroethane	TOT	µg/L	ND>50%	12	---	---
Alpha-Terpineol	TOT	µg/L	ND>50%	12	---	---
1,1,1-Trichloroethane	TOT	µg/L	ND>50%	12	---	---
1,1,2,2-Tetrachloroethane	TOT	µg/L	ND>50%	12	---	---
1,1,2-Trichloroethane	TOT	µg/L	ND>50%	12	---	---
1,1-Dichloroethane	TOT	µg/L	ND>50%	12	---	---
1,1-Dichloroethene	TOT	µg/L	ND>50%	12	---	---
1,2,4-Trichlorobenzene	TOT	µg/L	ND>50%	12	---	---
1,2-Dibromoethane	TOT	µg/L	ND>50%	12	---	---
1,2-Dichlorobenzene	TOT	µg/L	ND>50%	12	---	---
1,2-Dichloroethane	TOT	µg/L	ND>50%	12	---	---
1,2-Dichloropropane	TOT	µg/L	ND>50%	12	---	---
1,3-Dichlorobenzene	TOT	µg/L	ND>50%	12	---	---
1,4-Dichlorobenzene	TOT	µg/L	ND>50%	12	---	---
Bromodichloromethane	TOT	µg/L	ND>50%	12	---	---
Bromomethane	TOT	µg/L	ND>50%	12	---	---
Chlorobenzene	TOT	µg/L	ND>50%	12	---	---
Chlorodibromomethane	TOT	µg/L	ND>50%	12	---	---
Chloroethane	TOT	µg/L	ND>50%	12	---	---
Chloroethene	TOT	µg/L	ND>50%	12	---	---
Chloromethane	TOT	µg/L	ND>50%	12	---	---
Cis-1,2-Dichloroethene	TOT	µg/L	ND>50%	12	---	---
Cis-1,3-Dichloropropene	TOT	µg/L	ND>50%	12	---	---
Hexachlorobutadiene	TOT	µg/L	ND>50%	12	---	---
M & P Xylenes	TOT	µg/L	ND>50%	12	---	---
Methyl Ethyl Ketone	TOT	µg/L	ND>50%	12	---	---
Methyl Tertiary Butyl Ether	TOT	µg/L	ND>50%	12	---	---
O-Xylene	TOT	µg/L	ND>50%	12	---	---
Styrene	TOT	µg/L	ND>50%	12	---	---
Tetrachloroethene	TOT	µg/L	ND>50%	12	---	---

Appendix B4, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Effluent		Loading
				n	% Freq	kg/year
Trans-1,2-Dichloroethene	TOT	µg/L	ND>50%	12	---	---
Trans-1,3-dichloropropene	TOT	µg/L	ND>50%	12	---	---
Trichloroethene	TOT	µg/L	ND>50%	12	---	---
Trichlorofluoromethane	TOT	µg/L	ND>50%	12	---	---
2,4,6-Trichlorophenol	TOT	µg/L	ND>50%	12	---	---
2,4 + 2,5 Dichlorophenol	TOT	µg/L	ND>50%	12	---	---
2-Chlorophenol	TOT	µg/L	ND>50%	12	---	---
4-Chloro-3-Methylphenol	TOT	µg/L	ND>50%	12	---	---
Pentachlorophenol	TOT	µg/L	ND>50%	12	---	---
2,4-Dimethylphenol	TOT	µg/L	ND>50%	12	---	---
2,4-Dinitrophenol	TOT	µg/L	ND>50%	12	---	---
2-Methyl-4,6-Dinitrophenol	TOT	µg/L	ND>50%	12	---	---
2-Nitrophenol	TOT	µg/L	ND>50%	12	---	---
Phenol	TOT	µg/L	ND>50%	12	---	---
4-Nitrophenol	TOT	µg/L	ND>50%	12	---	---
Total Phenols	TOT	mg/L	ND>50%	12	---	---
2-Chloronaphthalene	TOT	µg/L	ND>50%	12	---	---
2-Methylnaphthalene	TOT	µg/L	0.017	12	56%	0.6
PAHs						
Acenaphthene	TOT	µg/L	ND>50%	12	---	---
Acenaphthylene	TOT	µg/L	ND>50%	12	---	---
Anthracene	TOT	µg/L	ND>50%	12	---	---
Benzo(B)Fluoranthene + Benzo(J)Fluoranthene	TOT	µg/L	ND>50%	12	---	---
Benzo(K)Fluoranthene	TOT	µg/L	ND>50%	12	---	---
Benzo[a]anthracene	TOT	µg/L	ND>50%	12	---	---
Benzo[a]pyrene	TOT	µg/L	ND>50%	12	---	---
Benzo[b]fluoranthene	TOT	µg/L	ND>50%	12	---	---
Benzo[ghi]perylene	TOT	µg/L	ND>50%	12	---	---
Chrysene	TOT	µg/L	ND>50%	12	---	---
Dibenzo(a,h)anthracene	TOT	µg/L	ND>50%	12	---	---
Fluoranthene	TOT	µg/L	0.0201	12	86%	0.6
Fluorene	TOT	µg/L	0.0266	12	100%	0.8
High Molecular Weight PAH`s	TOT	µg/L	0.0386	12	56%	1.0
Indeno(1,2,3-C,D)Pyrene	TOT	µg/L	ND>50%	12	---	---
Low Molecular Weight PAH`s	TOT	µg/L	0.1252	12	89%	3.2
Naphthalene	TOT	µg/L	0.0308	12	83%	1

Appendix B4, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Effluent		Loading
				n	% Freq	kg/year
Phenanthrene	TOT	µg/L	0.0319	12	100%	1
Pyrene	TOT	µg/L	0.0164	12	78%	0.5
Total PAH	TOT	µg/L	0.1609	12	97%	5
Nonylphenols						
4-Nonylphenol Diethoxylates	TOT	ng/L	1060	4	82%	26
4-Nonylphenol Monoethoxylates	TOT	ng/L	1518	4	100%	41
Np	TOT	ng/L	293.1	4	100%	8
PAHs-High Resolution						
1-Methylphenanthrene	TOT	ng/L	2.063	4	100%	0.06
2,3,5-Trimethylnaphthalene	TOT	ng/L	2.287	4	92%	0.07
2,6-Dimethylnaphthalene	TOT	ng/L	2.724	4	100%	0.08
2-Methylnaphthalene	TOT	ng/L	11.12	4	100%	0.4
Acenaphthene	TOT	ng/L	23.6	4	100%	0.8
Acenaphthylene	TOT	ng/L	2.677	4	92%	0.1
Anthracene	TOT	ng/L	2.856	4	100%	0.09
Benzo[a]anthracene	TOT	ng/L	4.688	4	100%	0.1
Benzo[a]pyrene	TOT	ng/L	2.665	4	100%	0.08
Benzo[b]fluoranthene	TOT	ng/L	2.436	4	100%	0.08
Benzo[e]pyrene	TOT	ng/L	2.465	4	100%	0.08
Benzo[ghi]perylene	TOT	ng/L	2.007	4	100%	0.06
Benzo[J,K]Fluoranthenes	TOT	ng/L	2.42	4	100%	0.07
Chrysene	TOT	ng/L	5.358	4	100%	0.2
Dibenzo(a,h)anthracene	TOT	ng/L	ND>50%	4	---	---
Dibenzothiophene	TOT	ng/L	3.011	4	100%	0.09
Fluoranthene	TOT	ng/L	20.26	4	100%	0.6
Fluorene	TOT	ng/L	15.51	4	100%	0.5
Indeno(1,2,3-C,D)Pyrene	TOT	ng/L	1.955	4	100%	0.1
Naphthalene	TOT	ng/L	31.71	4	100%	1
Perylene	TOT	ng/L	ND>50%	4	---	---
Phenanthrene	TOT	ng/L	19.42	4	100%	0.6
Pyrene	TOT	ng/L	20.29	4	100%	0.6
Organics - High Resolution						
1,3,5-Trichlorobenzene	TOT	ng/L	ND>50%	4	---	---
1,7-Dimethylxanthine	TOT	ng/L	5385	4	100%	137
Delta-Hch Or Delta-Bhc	TOT	ng/L	ND>50%	4	---	---
Pentachlorobenzene	TOT	ng/L	0.0558	4	100%	0.002

Appendix B4, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Effluent		Loading
				n	% Freq	kg/year
Perfluorobutanoic Acid	TOT	ng/L	19.62	4	100%	0.6
Trans-Chlordane	TOT	ng/L	0.0876	4	73%	0.003
Trans-Nonachlor	TOT	ng/L	0.0775	4	73%	0.002
1,2,3-Trichlorobenzene	TOT	ng/L	ND>50%	4	---	---
1,2,4,5-/1,2,3,5-Tetrachlorobenzene	TOT	ng/L	ND>50%	4	---	---
1,2,4-Trichlorobenzene	TOT	ng/L	ND>50%	4	---	---
1,2-Dichlorobenzene	TOT	ng/L	0.975	4	91%	0.03
1,3-Dichlorobenzene	TOT	ng/L	38.7	4	64%	0.9
1,4-Dichlorobenzene	TOT	ng/L	39.1	4	100%	1
Hexachlorobutadiene	TOT	ng/L	0.1483	4	100%	0.005
4-n-Octylphenol	TOT	ng/L	ND>50%	4	---	---
2,4-DDD	TOT	ng/L	0.835	4	100%	0.02
2,4-DDE	TOT	ng/L	ND>50%	4	---	---
2,4-DDT	TOT	ng/L	ND>50%	4	---	---
4,4-Ddd	TOT	ng/L	ND>50%	4	---	---
4,4-DDE	TOT	ng/L	0.2327	4	100%	0.01
4,4-DDT	TOT	ng/L	ND>50%	4	---	---
ABHC	TOT	ng/L	ND>50%	4	---	---
Aldrin	TOT	ng/L	ND>50%	4	---	---
Alpha Chlordane	TOT	ng/L	ND>50%	4	---	---
Alpha-Endosulfan	TOT	ng/L	0.206	4	67%	0.01
Beta-Endosulfan	TOT	ng/L	0.52	4	100%	0.02
Beta-Hch Or Beta-Bhc	TOT	ng/L	0.127	4	64%	0.004
Bis(2-Chloroethoxy)Methane	TOT	µg/L	ND>50%	4	---	---
Bis(2-Chloroethyl)Ether	TOT	µg/L	ND>50%	4	---	---
Bis(2-Chloroisopropyl)Ether	TOT	µg/L	ND>50%	4	---	---
Cis-Nonachlor	TOT	ng/L	ND>50%	4	---	---
Dieldrin	TOT	ng/L	0.243	4	83%	0.01
Endosulfan Sulfate	TOT	ng/L	ND>50%	4	---	---
Endrin	TOT	ng/L	ND>50%	4	---	---
Endrin Aldehyde	TOT	ng/L	ND>50%	4	---	---
Hch, Gamma	TOT	ng/L	0.9335	4	91%	0.02
Heptachlor	TOT	ng/L	ND>50%	4	---	---
Heptachlor Epoxide	TOT	ng/L	ND>50%	4	---	---
Hexachlorobenzene	TOT	ng/L	0.0766	4	100%	0.002
Methoxyclor	TOT	ng/L	ND>50%	4	---	---

Appendix B4, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Effluent		Loading
				n	% Freq	kg/year
Mirex	TOT	ng/L	ND>50%	4	---	---
Octachlorostyrene	TOT	ng/L	ND>50%	4	---	---
Oxychlordane	TOT	ng/L	ND>50%	4	---	---
PBDEs						
PBDE 10	TOT	pg/L	ND>50%	4	---	---
PBDE 100	TOT	pg/L	991.2	4	100%	0.03
PBDE 105	TOT	pg/L	ND>50%	4	---	---
PBDE 116	TOT	pg/L	ND>50%	4	---	---
PBDE 119/120	TOT	pg/L	29.73	4	58%	0.001
PBDE 12/13	TOT	pg/L	ND>50%	4	---	---
PBDE 126	TOT	pg/L	ND>50%	4	---	---
PBDE 128	TOT	pg/L	ND>50%	4	---	---
PBDE 138/166	TOT	pg/L	52.4	4	100%	0.002
PBDE 140	TOT	pg/L	16.77	4	100%	0.0005
PBDE 15	TOT	pg/L	9.34	4	100%	0.0003
PBDE 153	TOT	pg/L	453	4	100%	0.01
PBDE 154	TOT	pg/L	357.5	4	100%	0.01
PBDE 155	TOT	pg/L	29.1	4	100%	0.001
PBDE 17/25	TOT	pg/L	47.65	4	100%	0.001
PBDE 181	TOT	pg/L	ND>50%	4	---	---
PBDE 183	TOT	pg/L	79.23	4	100%	0.002
PBDE 190	TOT	pg/L	9.59	4	67%	0.0003
PBDE 203	TOT	pg/L	58.32	4	100%	0.002
PBDE 206	TOT	pg/L	362.8	4	100%	0.01
PBDE 207	TOT	pg/L	445.6	4	100%	0.01
PBDE 208	TOT	pg/L	297.8	4	100%	0.009
PBDE 209	TOT	pg/L	3701	4	100%	0.1
PBDE 28/33	TOT	pg/L	101.9	4	100%	0.003
PBDE 30	TOT	pg/L	ND>50%	4	---	---
PBDE 32	TOT	pg/L	ND>50%	4	---	---
PBDE 35	TOT	pg/L	ND>50%	4	---	---
PBDE 37	TOT	pg/L	4.83	4	83%	0.0001
PBDE 47	TOT	pg/L	4958	4	100%	0.1
PBDE 49	TOT	pg/L	160.3	4	100%	0.005
PBDE 51	TOT	pg/L	17.99	4	100%	0.001
PBDE 66	TOT	pg/L	96.83	4	100%	0.003

Appendix B4, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Effluent		Loading
				n	% Freq	kg/year
PBDE 7	TOT	pg/L	4.09	4	58%	0.0001
PBDE 71	TOT	pg/L	17.46	4	100%	0.001
PBDE 75	TOT	pg/L	7.22	4	83%	0.0002
PBDE 77	TOT	pg/L	ND>50%	4	---	---
PBDE 79	TOT	pg/L	33.88	4	100%	0.001
PBDE 8/11	TOT	pg/L	ND>50%	4	---	---
PBDE 85	TOT	pg/L	202.2	4	100%	0.01
PBDE 99	TOT	pg/L	4856	4	100%	0.14
PCBs						
PCB 1	TOT	pg/L	15.75	4	100%	0.0005
PCB 10	TOT	pg/L	ND>50%	4	---	---
PCB 103	TOT	pg/L	ND>50%	4	---	---
PCB 104	TOT	pg/L	ND>50%	4	---	---
PCB 105	TOT	pg/L	18.78	4	100%	0.001
PCB 106	TOT	pg/L	ND>50%	4	---	---
PCB 107/124	TOT	pg/L	1.86	4	75%	0.0001
PCB 109	TOT	pg/L	3.32	4	100%	0.0001
PCB 11	TOT	pg/L	114.2	4	100%	0.003
PCB 110/115	TOT	pg/L	64.72	4	100%	0.002
PCB 111	TOT	pg/L	ND>50%	4	---	---
PCB 112	TOT	pg/L	ND>50%	4	---	---
PCB 114	TOT	pg/L	1.82	4	75%	0.0001
PCB 118	TOT	pg/L	51.69	4	100%	0.002
PCB 12/13	TOT	pg/L	5.373	4	92%	0.0002
PCB 120	TOT	pg/L	ND>50%	4	---	---
PCB 121	TOT	pg/L	ND>50%	4	---	---
PCB 122	TOT	pg/L	ND>50%	4	---	---
PCB 123	TOT	pg/L	2.42	4	83%	0.0001
PCB 126	TOT	pg/L	ND>50%	4	---	---
PCB 127	TOT	pg/L	ND>50%	4	---	---
PCB 128/166	TOT	pg/L	7.54	4	100%	0.0002
PCB 129/138/160/163	TOT	pg/L	54.71	4	100%	0.002
PCB 130	TOT	pg/L	3.39	4	83%	0.0001
PCB 131	TOT	pg/L	ND>50%	4	---	---
PCB 132	TOT	pg/L	18.03	4	100%	0.0005
PCB 133	TOT	pg/L	ND>50%	4	---	---

Appendix B4, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Effluent		Loading
				n	% Freq	kg/year
PCB 134/143	TOT	pg/L	3.04	4	75%	0.0001
PCB 135/151/154	TOT	pg/L	18.52	4	100%	0.0005
PCB 136	TOT	pg/L	7.26	4	100%	0.0002
PCB 137	TOT	pg/L	3.1	4	92%	0.0001
PCB 139/140	TOT	pg/L	1.97	4	58%	0.0001
PCB 14	TOT	pg/L	ND>50%	4	---	---
PCB 141	TOT	pg/L	9.63	4	100%	0.0003
PCB 142	TOT	pg/L	ND>50%	4	---	---
PCB 144	TOT	pg/L	2.69	4	100%	0.0001
PCB 145	TOT	pg/L	ND>50%	4	---	---
PCB 146	TOT	pg/L	7.8	4	100%	0.0002
PCB 147/149	TOT	pg/L	40.6	4	100%	0.001
PCB 148	TOT	pg/L	ND>50%	4	---	---
PCB 15	TOT	pg/L	13.3	4	100%	0.0004
PCB 150	TOT	pg/L	ND>50%	4	---	---
PCB 152	TOT	pg/L	ND>50%	4	---	---
PCB 153/168	TOT	pg/L	47.9	4	100%	0.001
PCB 155	TOT	pg/L	5.154	4	100%	0.0001
PCB 156157	TOT	pg/L	7.6	4	100%	0.0002
PCB 158	TOT	pg/L	5.01	4	100%	0.0001
PCB 159	TOT	pg/L	ND>50%	4	---	---
PCB 16	TOT	pg/L	11.7	4	100%	0.0003
PCB 161	TOT	pg/L	ND>50%	4	---	---
PCB 162	TOT	pg/L	ND>50%	4	---	---
PCB 164	TOT	pg/L	3.14	4	100%	0.0001
PCB 165	TOT	pg/L	ND>50%	4	---	---
PCB 167	TOT	pg/L	2.09	4	83%	0.0001
PCB 169	TOT	pg/L	ND>50%	4	---	---
PCB 17	TOT	pg/L	15.05	4	100%	0.0005
PCB 170	TOT	pg/L	9.213	4	100%	0.0003
PCB 171/173	TOT	pg/L	2.796	4	83%	0.0001
PCB 172	TOT	pg/L	1.686	4	75%	0.0001
PCB 174	TOT	pg/L	10.27	4	100%	0.0003
PCB 175	TOT	pg/L	ND>50%	4	---	---
PCB 176	TOT	pg/L	1.636	4	83%	0.00005
PCB 177	TOT	pg/L	5.669	4	100%	0.0002

Appendix B4, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Effluent		Loading
				n	% Freq	kg/year
PCB 178	TOT	pg/L	2.661	4	83%	0.0001
PCB 179	TOT	pg/L	5.304	4	100%	0.0002
PCB 18/30	TOT	pg/L	28.08	4	100%	0.0008
PCB 180/193	TOT	pg/L	26.09	4	92%	0.0008
PCB 181	TOT	pg/L	ND>50%	4	---	---
PCB 182	TOT	pg/L	ND>50%	4	---	---
PCB 183/185	TOT	pg/L	6.903	4	83%	0.0002
PCB 184	TOT	pg/L	9.703	4	100%	0.0003
PCB 186	TOT	pg/L	ND>50%	4	---	---
PCB 187	TOT	pg/L	14.67	4	100%	0.0004
PCB 188	TOT	pg/L	ND>50%	4	---	---
PCB 189	TOT	pg/L	ND>50%	4	---	---
PCB 19	TOT	pg/L	8.923	4	100%	0.0003
PCB 190	TOT	pg/L	1.727	4	92%	0.0001
PCB 191	TOT	pg/L	ND>50%	4	---	---
PCB 192	TOT	pg/L	ND>50%	4	---	---
PCB 194	TOT	pg/L	5.085	4	100%	0.0002
PCB 195	TOT	pg/L	1.635	4	83%	0.00005
PCB 196	TOT	pg/L	2.271	4	75%	0.0001
PCB 197/200	TOT	pg/L	ND>50%	4	---	---
PCB 198/199	TOT	pg/L	7.007	4	100%	0.0002
PCB 2	TOT	pg/L	3.023	4	100%	0.0001
PCB 20/28	TOT	pg/L	40.04	4	100%	0.001
PCB 201	TOT	pg/L	ND>50%	4	---	---
PCB 202	TOT	pg/L	2.236	4	92%	0.0001
PCB 203	TOT	pg/L	3.783	4	92%	0.0001
PCB 204	TOT	pg/L	ND>50%	4	---	---
PCB 205	TOT	pg/L	ND>50%	4	---	---
PCB 206	TOT	pg/L	7.431	4	75%	0.0002
PCB 207	TOT	pg/L	ND>50%	4	---	---
PCB 208	TOT	pg/L	3.264	4	67%	0.0001
PCB 209	TOT	pg/L	7.426	4	100%	0.0002
PCB 21/33	TOT	pg/L	21.73	4	100%	0.0006
PCB 22	TOT	pg/L	16.23	4	100%	0.0005
PCB 23	TOT	pg/L	ND>50%	4	---	---
PCB 24	TOT	pg/L	ND>50%	4	---	---

Appendix B4, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Effluent		Loading
				n	% Freq	kg/year
PCB 25	TOT	pg/L	7.43	4	100%	0.0002
PCB 26/29	TOT	pg/L	11.24	4	100%	0.0003
PCB 27	TOT	pg/L	8.343	4	100%	0.0003
PCB 3	TOT	pg/L	6.934	4	100%	0.0002
PCB 31	TOT	pg/L	36.38	4	100%	0.001
PCB 32	TOT	pg/L	10.99	4	100%	0.0003
PCB 34	TOT	pg/L	ND>50%	4	---	---
PCB 35	TOT	pg/L	3.013	4	92%	0.0001
PCB 36	TOT	pg/L	ND>50%	4	---	---
PCB 37	TOT	pg/L	10.74	4	100%	0.0003
PCB 38	TOT	pg/L	ND>50%	4	---	---
PCB 39	TOT	pg/L	ND>50%	4	---	---
PCB 4	TOT	pg/L	47.9	4	100%	0.001
PCB 40/41/71	TOT	pg/L	20.87	4	100%	0.0006
PCB 42	TOT	pg/L	10.6	4	100%	0.0003
PCB 43	TOT	pg/L	1.864	4	67%	0.0001
PCB 44/47/65	TOT	pg/L	89.1	4	100%	0.0026
PCB 45/51	TOT	pg/L	15.83	4	100%	0.0005
PCB 46	TOT	pg/L	3.565	4	100%	0.0001
PCB 48	TOT	pg/L	7.147	4	100%	0.0002
PCB 49/69	TOT	pg/L	33.68	4	100%	0.001
PCB 5	TOT	pg/L	ND>50%	4	---	---
PCB 50/53	TOT	pg/L	11.16	4	100%	0.0003
PCB 52	TOT	pg/L	74.08	4	100%	0.002
PCB 54	TOT	pg/L	ND>50%	4	---	---
PCB 55	TOT	pg/L	ND>50%	4	---	---
PCB 56	TOT	pg/L	13.55	4	100%	0.0004
PCB 57	TOT	pg/L	ND>50%	4	---	---
PCB 58	TOT	pg/L	ND>50%	4	---	---
PCB 59/62/75	TOT	pg/L	3.716	4	100%	0.0001
PCB 6	TOT	pg/L	7.099	4	92%	0.0002
PCB 60	TOT	pg/L	7.553	4	100%	0.0002
PCB 61/70/74/76	TOT	pg/L	66.13	4	100%	0.002
PCB 63	TOT	pg/L	1.535	4	58%	0.00005
PCB 64	TOT	pg/L	16.18	4	100%	0.0005
PCB 66	TOT	pg/L	27.34	4	100%	0.0008

Appendix B4, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Effluent		Loading
				n	% Freq	kg/year
PCB 67	TOT	pg/L	ND>50%	4	---	---
PCB 68	TOT	pg/L	5.645	4	100%	0.0002
PCB 7	TOT	pg/L	4.211	4	75%	0.0001
PCB 72	TOT	pg/L	ND>50%	4	---	---
PCB 73	TOT	pg/L	ND>50%	4	---	---
PCB 77	TOT	pg/L	2.409	4	92%	0.0001
PCB 78	TOT	pg/L	ND>50%	4	---	---
PCB 79	TOT	pg/L	ND>50%	4	---	---
PCB 8	TOT	pg/L	23.04	4	100%	0.0007
PCB 80	TOT	pg/L	ND>50%	4	---	---
PCB 81	TOT	pg/L	ND>50%	4	---	---
PCB 82	TOT	pg/L	6.39	4	100%	0.0002
PCB 83/99	TOT	pg/L	36.19	4	100%	0.001
PCB 84	TOT	pg/L	17	4	100%	0.0005
PCB 85/116/117	TOT	pg/L	10.46	4	100%	0.0003
PCB 86/87/97/108/119/125	TOT	pg/L	44.7	4	100%	0.001
PCB 88/91	TOT	pg/L	8.89	4	100%	0.0003
PCB 89	TOT	pg/L	ND>50%	4	---	---
PCB 9	TOT	pg/L	ND>50%	4	---	---
PCB 90/101/113	TOT	pg/L	65.2	4	100%	0.002
PCB 92	TOT	pg/L	12.23	4	100%	0.0004
PCB 93/95/98/100/102	TOT	pg/L	55.71	4	100%	0.002
PCB 94	TOT	pg/L	ND>50%	4	---	---
PCB 96	TOT	pg/L	ND>50%	4	---	---
Total Hexachloro Biphenyls	TOT	pg/L	243.7	4	100%	0.007
Total Decachloro Biphenyl	TOT	pg/L	6.22	4	75%	0.0002
Total Dichloro Biphenyls	TOT	pg/L	211.8	4	100%	0.006
Total Heptachloro Biphenyls	TOT	pg/L	84.48	4	100%	0.003
Total Hexachloro Biphenyls	TOT	pg/L	155.7	4	100%	0.004
Total Monochloro Biphenyls	TOT	pg/L	23.87	4	100%	0.0007
Total Nonachloro Biphenyls	TOT	pg/L	7.34	4	75%	0.0002
Total Octachloro Biphenyls	TOT	pg/L	15.66	4	100%	0.0005
Total Pentachloro Biphenyls	TOT	pg/L	380.8	4	100%	0.01
Total Tetrachloro Biphenyls	TOT	pg/L	393.1	4	100%	0.01
Total Trichloro Biphenyls	TOT	pg/L	221.7	4	100%	0.007
PCB Teq 3	TOT	pg/L	0.03	4	100%	0.000001

Appendix B4, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Effluent		Loading
				n	% Freq	kg/year
PCB Teq 4	TOT	pg/L	0.7	4	100%	0.00002
PCBs Total	TOT	pg/L	1566	4	100%	0.05
PCDDs				4		
1,2,3,4,6,7,8-HPCDD	TOT	pg/L	3.218	4	100%	0.0001
1,2,3,4,6,7,8-HPCDF	TOT	pg/L	0.775	4	60%	0.00002
1,2,3,4,7,8,9-HPCDF	TOT	pg/L	ND>50%	4	---	---
1,2,3,4,7,8-HXCDD	TOT	pg/L	ND>50%	4	---	---
1,2,3,4,7,8-HXCDF	TOT	pg/L	ND>50%	4	---	---
1,2,3,6,7,8-HXCDD	TOT	pg/L	ND>50%	4	---	---
1,2,3,6,7,8-HXCDF	TOT	pg/L	ND>50%	4	---	---
1,2,3,7,8,9-HXCDD	TOT	pg/L	ND>50%	4	---	---
1,2,3,7,8,9-HXCDF	TOT	pg/L	0.603	4	80%	0.00002
1,2,3,7,8-PECDD	TOT	pg/L	ND>50%	4	---	---
1,2,3,7,8-PECDF	TOT	pg/L	ND>50%	4	---	---
2,3,4,6,7,8-HXCDF	TOT	pg/L	ND>50%	4	---	---
2,3,4,7,8-PECDF	TOT	pg/L	ND>50%	4	---	---
2,3,7,8-TCDD	TOT	pg/L	ND>50%	4	---	---
2,3,7,8-TCDF	TOT	pg/L	ND>50%	4	---	---
OCDD	TOT	pg/L	26.03	4	100%	0.001
OCDF	TOT	pg/L	1.062	4	80%	0.00003
TOTAL HEPTA-DIOXINS	TOT	pg/L	5.72	4	60%	0.0002
TOTAL HEPTA-FURANS	TOT	pg/L	ND>50%	4	---	---
TOTAL HEXA-DIOXINS	TOT	pg/L	ND>50%	4	---	---
TOTAL HEXA-FURANS	TOT	pg/L	ND>50%	4	---	---
TOTAL PENTA-DIOXINS	TOT	pg/L	ND>50%	4	---	---
TOTAL PENTA-FURANS	TOT	pg/L	ND>50%	4	---	---
TOTAL TETRA-DIOXINS	TOT	pg/L	ND>50%	4	---	---
TOTAL TETRA-FURANS	TOT	pg/L	ND>50%	4	---	---
PFAS						
Perfluorodecanoic Acid (PFDA)	TOT	ng/L	1.292	4	100%	0.04
Perfluoroheptanoic Acid (PFHpA)	TOT	ng/L	3.847	4	100%	0.1
Perfluorohexanoic Acid (PFHxA)	TOT	ng/L	18.81	4	100%	0.6
Perfluorononanoic Acid (PFNA)	TOT	ng/L	0.879	4	92%	0.03
Perfluorooctane Sulfonamide (PFOSA)	TOT	ng/L	ND>50%	4	---	---
Perfluorooctanesulfonic Acid (PFOS)	TOT	ng/L	5.106	4	100%	0.2
Perfluorooctanoic Acid (PFOA)	TOT	ng/L	8.933	4	100%	0.3

Appendix B4, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Effluent		Loading
				n	% Freq	kg/year
Perfluoropentanoic Acid (PFPeA)	TOT	ng/L	18.26	4	100%	0.6
PFBS	TOT	ng/L	5.881	4	100%	0.2
PFDoA	TOT	ng/L	ND>50%	4	---	---
PFHxS	TOT	ng/L	6.252	4	100%	0.2
PFUnA	TOT	ng/L	ND>50%	4	---	---
Phthalates						
Bis(2-Ethylhexyl)Phthalate	TOT	µg/L	ND>50%	12	---	---
Butylbenzyl Phthalate	TOT	µg/L	ND>50%	12	---	---
Di-N-Butyl Phthalate	TOT	µg/L	ND>50%	12	---	---
Di-N-Octyl Phthalate	TOT	µg/L	ND>50%	12	---	---
Diethyl Phthalate	TOT	µg/L	ND>50%	12	---	---
Dimethyl Phthalate	TOT	µg/L	ND>50%	12	---	---
PPCPs						
2-Hydroxy-Ibuprofen	TOT	ng/L	6261	4	100%	161
Acetaminophen	TOT	ng/L	ND>50%	4	---	---
Azithromycin	TOT	ng/L	544.9	4	100%	15
Bisphenol A	TOT	ng/L	640.3	4	100%	23
Caffeine	TOT	ng/L	4594	4	100%	116
Carbadox	TOT	ng/L	ND>50%	4	---	---
Carbamazepine	TOT	ng/L	703.4	4	100%	20
Cefotaxime	TOT	ng/L	ND>50%	4	---	---
Ciprofloxacin	TOT	ng/L	165.8	4	100%	5
Clarithromycin	TOT	ng/L	253.1	4	100%	8
Clinafloxacin	TOT	ng/L	ND>50%	4	---	---
Cloxacillin	TOT	ng/L	ND>50%	4	---	---
Dehydronifedipine	TOT	ng/L	5.61	4	100%	0.2
Digoxigenin	TOT	ng/L	ND>50%	4	---	---
Digoxin	TOT	ng/L	ND>50%	4	---	---
Diltiazem	TOT	ng/L	390.3	4	100%	11
Diphenhydramine	TOT	ng/L	902.7	4	100%	26
Enrofloxacin	TOT	ng/L	ND>50%	4	---	---
Erythromycin-H2O	TOT	ng/L	30.95	4	100%	1
Flumequine	TOT	ng/L	ND>50%	4	---	---
Fluoxetine	TOT	ng/L	46.85	4	100%	1
Furosemide	TOT	ng/L	826.6	4	100%	23
Gemfibrozil	TOT	ng/L	82.53	4	100%	2

Appendix B4, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Effluent		Loading
				n	% Freq	kg/year
Glipizide	TOT	ng/L	ND>50%	4	---	---
Glyburide	TOT	ng/L	3.477	4	75%	0.1
Hydrochlorothiazide	TOT	ng/L	1336	4	100%	38
Ibuprofen	TOT	ng/L	1294	4	100%	34
Lincomycin	TOT	ng/L	ND>50%	4	---	---
Lomefloxacin	TOT	ng/L	ND>50%	4	---	---
Miconazole	TOT	ng/L	11.3	4	100%	0.3
Naproxen	TOT	ng/L	2228	4	100%	64
Norfloxacin	TOT	ng/L	ND>50%	4	---	---
Norgestimate	TOT	ng/L	ND>50%	4	---	---
Ofloxacin	TOT	ng/L	14.21	4	100%	0.5
Ormetoprim	TOT	ng/L	ND>50%	4	---	---
Oxacillin	TOT	ng/L	ND>50%	4	---	---
Oxolinic Acid	TOT	ng/L	ND>50%	4	---	---
Penicillin G	TOT	ng/L	ND>50%	4	---	---
Penicillin V	TOT	ng/L	ND>50%	4	---	---
Roxithromycin	TOT	ng/L	2.448	4	75%	0.07
Sarafloxacin	TOT	ng/L	ND>50%	4	---	---
Sulfachloropyridazine	TOT	ng/L	ND>50%	4	---	---
Sulfadiazine	TOT	ng/L	ND>50%	4	---	---
Sulfadimethoxine	TOT	ng/L	ND>50%	4	---	---
Sulfamerazine	TOT	ng/L	ND>50%	4	---	---
Sulfamethazine	TOT	ng/L	ND>50%	4	---	---
Sulfamethizole	TOT	ng/L	ND>50%	4	---	---
Sulfamethoxazole	TOT	ng/L	818.3	4	100%	24
Sulfanilamide	TOT	ng/L	26.9	4	92%	0.8
Sulfathiazole	TOT	ng/L	ND>50%	4	---	---
Thiabendazole	TOT	ng/L	27.2	4	100%	0.8
Triclocarban	TOT	ng/L	3.338	4	100%	0.09
Triclosan	TOT	ng/L	51.48	4	100%	1
Trimethoprim	TOT	ng/L	252.8	4	100%	7
Tylosin	TOT	ng/L	ND>50%	4	---	---
Virginiamycin	TOT	ng/L	ND>50%	4	---	---
Warfarin	TOT	ng/L	4.182	4	100%	0.1
17 Beta-Estradiol 3-Benzoate	TOT	ng/L	ND>50%	4	---	---
Allyl Trenbolone	TOT	ng/L	ND>50%	4	---	---

Appendix B4, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Effluent		Loading
				n	% Freq	kg/year
Androstenedione	TOT	ng/L	3.546	4	100%	0.1
Androsterone	TOT	ng/L	ND>50%	4	---	---
Desogestrel	TOT	ng/L	ND>50%	4	---	---
Mestranol	TOT	ng/L	ND>50%	4	---	---
Norethindrone	TOT	ng/L	ND>50%	4	---	---
Norgestrel	TOT	ng/L	ND>50%	4	---	---
Progesterone	TOT	ng/L	0.746	4	67%	0.02
Testosterone	TOT	ng/L	ND>50%	4	---	---
17 Alpha-Dihydroequilin	TOT	ng/L	ND>50%	4	---	---
17 Alpha-Estradiol	TOT	ng/L	ND>50%	4	---	---
17 Alpha-Ethinyl-Estradiol	TOT	ng/L	ND>50%	4	---	---
17 Beta-Estradiol	TOT	ng/L	ND>50%	4	---	---
Equilenin	TOT	ng/L	ND>50%	4	---	---
Equilin	TOT	ng/L	ND>50%	4	---	---
Estriol	TOT	ng/L	ND>50%	4	---	---
Estrone	TOT	ng/L	12.58	4	100%	0.4

Appendix B5 Frequency of Detection and Loadings of Substances in McLoughlin Point Influent

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Influent		Loading
				n	% Freq	kg/year
Conventionals						
Chloride	TOT	mg/L	58.8	12	100%	2,014,642
Total/SAD Cyanide	TOT	mg/L	0.003372	12	75%	104
WAD Cyanide	TOT	mg/L	0.001879	12	92%	61
Alkalinity - Total - Ph 4.5	TOT	mg/L	212.5	12	100%	7,031,247
Alkalinity - Bicarbonate	TOT	mg/L	260	12	100%	8,609,031
Alkalinity - Carbonate	TOT	mg/L	ND>50%	12	---	---
Alkalinity - Hydroxide	TOT	mg/L	ND>50%	12	---	---
Alkalinity - Phenolphthalein - Ph 8.3	TOT	mg/L	ND>50%	12	---	---
Hardness (as CaCO3)	DIS	mg/L	70.47	12	100%	2,552,358
Hardness (as CaCO3)	TOT	mg/L	79.99	12	100%	2,808,742
Sulphate	TOT	mg/L	20.3	12	100%	729,302
N - NO2 (As N)	TOT	mg/L	ND>50%	12	---	---
N - NO3 (As N)	TOT	mg/L	ND>50%	12	---	---
N - NO3 + NO2 (As N)	TOT	mg/L	ND>50%	12	---	---
N - TKN (As N)	TOT	mg/L	47	12	100%	1,473,194
N - Total (As N)	TOT	mg/L	47.04	12	100%	1,475,695
Total Organic Carbon	TOT	mg/L	61.3	12	100%	1,894,434
Oil & Grease, Mineral	TOT	mg/L	6.87	12	75%	213,115
Oil & grease, total	TOT	mg/L	25.53	12	100%	765,604
Biological Oxygen Demand	TOT	mg/L	288.7	12	100%	8,684,314
Chemical Oxygen Demand	TOT	mg/L	632.8	12	100%	19,158,534
pH	TOT	pH	7.128	12	100%	---
Sulfide	TOT	mg/L	0.7228	12	100%	20,466
Conductivity	TOT	µS/cm	716.7	12	100%	---
Metals-Total				12		
Aluminum	TOT	µg/L	278.2	12	100%	8,685
Antimony	TOT	µg/L	0.239	12	100%	8.7
Arsenic	TOT	µg/L	0.5856	12	100%	21
Barium	TOT	µg/L	23.8	12	100%	763
Beryllium	TOT	µg/L	ND>50%	12	---	---
Cadmium	TOT	µg/L	0.1004	12	100%	3.1
Calcium	TOT	mg/L	19.41	12	100%	690,143

Appendix B5, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Influent		Loading
				n	% Freq	kg/year
Chromium	TOT	µg/L	1.432	12	100%	51
Cobalt	TOT	µg/L	0.7141	12	100%	24
Copper	TOT	µg/L	57.43	12	100%	1,841
Iron	TOT	µg/L	1616	12	100%	50,072
Lead	TOT	µg/L	5.923	12	100%	181
Magnesium	TOT	mg/L	7.022	12	100%	243,903
Manganese	TOT	µg/L	52.42	12	100%	1,751
Mercury	TOT	µg/L	ND>50%	12	---	---
Molybdenum	TOT	µg/L	1.37	12	100%	46
Nickel	TOT	µg/L	3.017	12	100%	101
Potassium	TOT	mg/L	13.8	12	100%	441,664
Selenium	TOT	µg/L	0.2763	12	100%	9.3
Silver	TOT	µg/L	0.0813	12	92%	2.6
Thallium	TOT	µg/L	0.00544	12	83%	0.2
Tin	TOT	µg/L	0.666	12	100%	21
Zinc	TOT	µg/L	191.8	12	100%	5,816
Metals-Dissolved						
Aluminum	DIS	µg/L	21.97	12	100%	708
Antimony	DIS	µg/L	0.2559	12	100%	9.4
Arsenic	DIS	µg/L	0.5368	12	100%	20
Barium	DIS	µg/L	6.37	12	100%	223
Beryllium	DIS	µg/L	ND>50%	12	---	---
Cadmium	DIS	µg/L	0.01535	12	100%	0.5
Calcium	DIS	mg/L	17.31	12	100%	636,625
Chromium	DIS	µg/L	0.843	12	100%	34
Cobalt	DIS	µg/L	0.4398	12	100%	16
Copper	DIS	µg/L	28.82	12	100%	909
Iron	DIS	µg/L	498.5	12	100%	15,255
Lead	DIS	µg/L	0.559	12	100%	17
Magnesium	DIS	mg/L	6.628	12	100%	234,355
Manganese	DIS	µg/L	37.74	12	100%	1,301
Mercury	DIS	µg/L	ND>50%	12	---	---
Molybdenum	DIS	µg/L	1.805	12	100%	63
Nickel	DIS	µg/L	2.176	12	100%	76
Phosphorus	DIS	µg/L	4741	12	100%	143,098
Potassium	DIS	mg/L	13.25	12	100%	426,044

Appendix B5, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Influent		Loading
				n	% Freq	kg/year
Selenium	DIS	µg/L	0.2086	12	100%	7
Silver	DIS	µg/L	0.1013	12	90%	3
Thallium	DIS	µg/L	ND>50%	12	---	---
Tin	DIS	µg/L	0.656	12	100%	22
Zinc	DIS	µg/L	22.61	12	100%	718
Metals-Speciated						
Chromium III	TOT	mg/L	0.00378	4	55%	118
Chromium Vi	TOT	mg/L	ND>50%	4	---	---
Dibutyltin	TOT	µg/L	0.00625	4	75%	0.2
Dibutyltin Dichloride	TOT	µg/L	0.0075	4	75%	0.2
Methyl Mercury	TOT	ng/L	0.7505	4	100%	0.02
Monobutyltin	TOT	µg/L	0.0105	4	100%	0.4
Monobutyltin Trichloride	TOT	µg/L	0.01675	4	100%	1
Tributyltin	TOT	µg/L	ND>50%	4	---	---
Tributyltin Chloride	TOT	µg/L	ND>50%	4	---	---
Organics						
1,1,1,2-Tetrachloroethane	TOT	µg/L	ND>50%	12	---	---
Dichlorodifluoromethane	TOT	µg/L	ND>50%	12	---	---
Tetrabromomethane	TOT	µg/L	ND>50%	12	---	---
Nitrobenzene	TOT	µg/L	ND>50%	12	---	---
N-Nitrosodi-N-Propylamine	TOT	µg/L	ND>50%	12	---	---
N-Nitrosodimethylamine	TOT	µg/L	ND>50%	12	---	---
NNDMA	TOT	µg/L	ND>50%	12	---	---
Benzene	TOT	µg/L	ND>50%	12	---	---
Ethylbenzene	TOT	µg/L	ND>50%	12	---	---
Toluene	TOT	µg/L	9.153	12	100%	279
Xylenes	TOT	µg/L	ND>50%	12	---	---
1,2,3,4-Tetrachlorobenzene	TOT	ng/L	ND>50%	12	---	---
1,4-Dioxane	TOT	µg/L	0.293	12	100%	9.3
Acrolein	TOT	µg/L	ND>50%	12	---	---
Acrylonitrile	TOT	µg/L	ND>50%	12	---	---
Dibromomethane	TOT	µg/L	ND>50%	12	---	---
Tetrachloromethane	TOT	µg/L	ND>50%	12	---	---
Tribromomethane	TOT	µg/L	ND>50%	12	---	---
Trichloromethane	TOT	µg/L	4.35	12	100%	144
1,2-Diphenylhydrazine	TOT	µg/L	ND>50%	12	---	---

Appendix B5, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Influent		Loading
				n	% Freq	kg/year
2,4-Dinitrotoluene	TOT	µg/L	ND>50%	12	---	---
2,6-Dinitrotoluene	TOT	µg/L	ND>50%	12	---	---
3,3-Dichlorobenzidine	TOT	µg/L	ND>50%	12	---	---
4-Bromophenyl Phenyl Ether	TOT	µg/L	ND>50%	12	---	---
4-Chlorophenyl Phenyl Ether	TOT	µg/L	ND>50%	12	---	---
Hexachlorocyclopentadiene	TOT	µg/L	ND>50%	12	---	---
Hexachloroethane	TOT	µg/L	ND>50%	12	---	---
Alpha-Terpineol	TOT	µg/L	7.15	12	67%	226
1,1,1-Trichloroethane	TOT	µg/L	ND>50%	12	---	---
1,1,2,2-Tetrachloroethane	TOT	µg/L	ND>50%	12	---	---
1,1,2-Trichloroethane	TOT	µg/L	ND>50%	12	---	---
1,1-Dichloroethane	TOT	µg/L	ND>50%	12	---	---
1,1-Dichloroethene	TOT	µg/L	ND>50%	12	---	---
1,2,4-Trichlorobenzene	TOT	µg/L	ND>50%	12	---	---
1,2-Dibromoethane	TOT	µg/L	ND>50%	12	---	---
1,2-Dichlorobenzene	TOT	µg/L	ND>50%	12	---	---
1,2-Dichloroethane	TOT	µg/L	ND>50%	12	---	---
1,2-Dichloropropane	TOT	µg/L	ND>50%	12	---	---
1,3-Dichlorobenzene	TOT	µg/L	ND>50%	12	---	---
1,4-Dichlorobenzene	TOT	µg/L	ND>50%	12	---	---
Bromodichloromethane	TOT	µg/L	ND>50%	12	---	---
Bromomethane	TOT	µg/L	ND>50%	12	---	---
Chlorobenzene	TOT	µg/L	ND>50%	12	---	---
Chlorodibromomethane	TOT	µg/L	ND>50%	12	---	---
Chloroethane	TOT	µg/L	ND>50%	12	---	---
Chloroethene	TOT	µg/L	ND>50%	12	---	---
Chloromethane	TOT	µg/L	ND>50%	12	---	---
Cis-1,2-Dichloroethene	TOT	µg/L	ND>50%	12	---	---
Cis-1,3-Dichloropropene	TOT	µg/L	ND>50%	12	---	---
Hexachlorobutadiene	TOT	µg/L	ND>50%	12	---	---
M & P Xylenes	TOT	µg/L	ND>50%	12	---	---
Methyl Ethyl Ketone	TOT	µg/L	ND>50%	12	---	---
Methyl Tertiary Butyl Ether	TOT	µg/L	ND>50%	12	---	---
O-Xylene	TOT	µg/L	ND>50%	12	---	---
Styrene	TOT	µg/L	ND>50%	12	---	---
Tetrachloroethene	TOT	µg/L	ND>50%	12	---	---

Appendix B5, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Influent		Loading
				n	% Freq	kg/year
Trans-1,2-Dichloroethene	TOT	µg/L	ND>50%	12	---	---
Trans-1,3-Dichloropropene	TOT	µg/L	ND>50%	12	---	---
Trichloroethene	TOT	µg/L	ND>50%	12	---	---
Trichlorofluoromethane	TOT	µg/L	ND>50%	12	---	---
2,4,6-Trichlorophenol	TOT	µg/L	ND>50%	12	---	---
2,4 + 2,5 Dichlorophenol	TOT	µg/L	ND>50%	12	---	---
2-Chlorophenol	TOT	µg/L	ND>50%	12	---	---
4-Chloro-3-Methylphenol	TOT	µg/L	ND>50%	12	---	---
Pentachlorophenol	TOT	µg/L	ND>50%	12	---	---
2,4-Dimethylphenol	TOT	µg/L	ND>50%	12	---	---
2,4-Dinitrophenol	TOT	µg/L	ND>50%	12	---	---
2-Methyl-4,6-Dinitrophenol	TOT	µg/L	ND>50%	12	---	---
2-Nitrophenol	TOT	µg/L	ND>50%	12	---	---
Phenol	TOT	µg/L	14.27	12	83%	416
4-Nitrophenol	TOT	µg/L	ND>50%	12	---	---
Total Phenols	TOT	mg/L	0.05575	12	100%	1,657
4-Methyl-2-Pentanone	TOT	µg/L	ND>50%	12	---	---
Dimethyl Ketone	TOT	µg/L	135.3	12	100%	4,506
Endrin Ketone	TOT	ng/L	ND>50%	12	---	---
Isophorone	TOT	µg/L	ND>50%	12	---	---
PAHs						
2-Chloronaphthalene	TOT	µg/L	ND>50%	12	---	---
2-Methylnaphthalene	TOT	µg/L	0.2147	12	100%	7.0
Acenaphthene	TOT	µg/L	0.1256	12	100%	4.8
Acenaphthylene	TOT	µg/L	ND>50%	12	---	---
Anthracene	TOT	µg/L	0.0622	12	92%	2.0
Benzo(B)Fluoranthene + Benzo(J)Fluoranthene	TOT	µg/L	0.0899	12	92%	2.7
Benzo(K)Fluoranthene	TOT	µg/L	0.0361	12	67%	1.1
Benzo[a]anthracene	TOT	µg/L	0.0746	12	83%	2.3
Benzo[a]pyrene	TOT	µg/L	0.07075	12	83%	2.1
Benzo[b]fluoranthene	TOT	µg/L	0.0588	12	83%	1.8
Benzo[ghi]perylene	TOT	µg/L	ND>50%	12	---	---
Chrysene	TOT	µg/L	0.0977	12	92%	2.9
Dibenzo(a,h)anthracene	TOT	µg/L	ND>50%	12	---	---
Fluoranthene	TOT	µg/L	0.1831	12	100%	5.6
Fluorene	TOT	µg/L	0.1329	12	100%	4.5

Appendix B5, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Influent		Loading
				n	% Freq	kg/year
High Molecular Weight PAH`s	TOT	µg/L	0.767	12	100%	6.4
Indeno(1,2,3-C,D)Pyrene	TOT	µg/L	ND>50%	12	---	---
Low Molecular Weight PAH`s	TOT	µg/L	1.192	12	100%	63
Naphthalene	TOT	µg/L	0.2363	12	100%	10
Phenanthrene	TOT	µg/L	0.255	12	100%	8.1
Pyrene	TOT	µg/L	0.1437	12	100%	4.4
Total PAH	TOT	µg/L	1.947	12	100%	64
Nonylphenols						
4-Nonylphenol Diethoxylates	TOT	ng/L	438	4	75%	12
4-Nonylphenol Monoethoxylates	TOT	ng/L	2675	4	100%	78
Np	TOT	ng/L	571.3	4	100%	16
PAHs High Resolution						
1-Methylphenanthrene	TOT	ng/L	12.15	4	100%	0.4
2,3,5-Trimethylnaphthalene	TOT	ng/L	15.35	4	100%	0.4
2,6-Dimethylnaphthalene	TOT	ng/L	56.2	4	100%	1.7
2-Methylnaphthalene	TOT	ng/L	169	4	100%	5.3
Acenaphthene	TOT	ng/L	129	4	100%	4.2
Acenaphthylene	TOT	ng/L	3.648	4	100%	0.1
Anthracene	TOT	ng/L	34.8	4	100%	1.1
Benzo[a]anthracene	TOT	ng/L	36.28	4	100%	1.0
Benzo[a]pyrene	TOT	ng/L	36.73	4	100%	1.0
Benzo[b]fluoranthene	TOT	ng/L	30.3	4	100%	0.9
Benzo[e]pyrene	TOT	ng/L	27.73	4	100%	0.8
Benzo[ghi]perylene	TOT	ng/L	25.08	4	100%	0.7
Benzo[J,K]Fluoranthenes	TOT	ng/L	32.73	4	100%	0.9
Chrysene	TOT	ng/L	27.65	4	100%	0.8
Dibenzo(a,h)anthracene	TOT	ng/L	9.053	4	100%	0.3
Dibenzothiophene	TOT	ng/L	29.83	4	100%	0.9
Fluoranthene	TOT	ng/L	127.7	4	100%	3.8
Fluorene	TOT	ng/L	79.13	4	100%	2.5
Indeno(1,2,3-C,D)Pyrene	TOT	ng/L	28.13	4	100%	0.8
Naphthalene	TOT	ng/L	208.5	4	100%	6.6
Perylene	TOT	ng/L	10.15	4	100%	0.3
Phenanthrene	TOT	ng/L	240	4	100%	7.2
Pyrene	TOT	ng/L	93.7	4	100%	2.7

Appendix B5, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Influent		Loading
				n	% Freq	kg/year
Organics-High Resolution						
1,3,5-Trichlorobenzene	TOT	ng/L	ND>50%	4	---	---
1,7-Dimethylxanthine	TOT	ng/L	50950	4	100%	1,476
Delta-Hch Or Delta-Bhc	TOT	ng/L	ND>50%	4	---	---
Pentachlorobenzene	TOT	ng/L	0.0998	4	100%	0.003
Perfluorobutanoic acid	TOT	ng/L	67.3	4	100%	2.5
Trans-Chlordane	TOT	ng/L	0.226	4	100%	0.01
Trans-Nonachlor	TOT	ng/L	0.187	4	100%	0.01
1,2,3-Trichlorobenzene	TOT	ng/L	ND>50%	4	---	---
1,2,4,5-/1,2,3,5-Tetrachlorobenzene	TOT	ng/L	ND>50%	4	---	---
1,2,4-Trichlorobenzene	TOT	ng/L	ND>50%	4	---	---
1,2-Dichlorobenzene	TOT	ng/L	1.487	4	100%	0.05
1,3-Dichlorobenzene	TOT	ng/L	ND>50%	4	---	---
1,4-Dichlorobenzene	TOT	ng/L	85.84	4	100%	2.7
Hexachlorobutadiene	TOT	ng/L	0.1325	4	100%	0.004
4-n-Octylphenol	TOT	ng/L	ND>50%	4	---	---
2,4-DDD	TOT	ng/L	5.409	4	100%	0.2
2,4-DDE	TOT	ng/L	ND>50%	4	---	---
2,4-DDT	TOT	ng/L	ND>50%	4	---	---
4,4-Ddd	TOT	ng/L	ND>50%	4	50%	---
4,4-DDE	TOT	ng/L	0.8005	4	100%	0.02
4,4-DDT	TOT	ng/L	ND>50%	4	---	---
ABHC	TOT	ng/L	ND>50%	4	---	---
Aldrin	TOT	ng/L	ND>50%	4	---	---
Alpha Chlordane	TOT	ng/L	0.174	4	100%	0.01
Alpha-Endosulfan	TOT	ng/L	0.228	4	75%	0.01
Beta-Endosulfan	TOT	ng/L	0.654	4	100%	0.02
Beta-Hch Or Beta-Bhc	TOT	ng/L	0.138	4	100%	0.004
Bis(2-Chloroethoxy)Methane	TOT	µg/L	ND>50%	4	---	---
Bis(2-Chloroethyl)Ether	TOT	µg/L	ND>50%	4	---	---
Bis(2-Chloroisopropyl)Ether	TOT	µg/L	ND>50%	4	---	---
Cis-Nonachlor	TOT	ng/L	ND>50%	4	---	---
Dieldrin	TOT	ng/L	0.628	4	100%	0.02
Endosulfan Sulfate	TOT	ng/L	ND>50%	4	---	---
Endrin	TOT	ng/L	ND>50%	4	---	---
Endrin Aldehyde	TOT	ng/L	ND>50%	4	---	---

Appendix B5, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Influent		Loading
				n	% Freq	kg/year
Hch, Gamma	TOT	ng/L	0.4375	4	100%	0.01
Heptachlor	TOT	ng/L	0.5413	4	75%	0.01
Heptachlor Epoxide	TOT	ng/L	ND>50%	4	---	---
Hexachlorobenzene	TOT	ng/L	0.2185	4	100%	0.01
Methoxyclor	TOT	ng/L	ND>50%	4	---	---
Mirex	TOT	ng/L	ND>50%	4	---	---
Octachlorostyrene	TOT	ng/L	ND>50%	4	---	---
Oxychlordane	TOT	ng/L	ND>50%	4	---	---
PBDEs						
PBDE 10	TOT	pg/L	ND>50%	4	---	---
PBDE 100	TOT	pg/L	3480	4	100%	0.1
PBDE 105	TOT	pg/L	ND>50%	4	---	---
PBDE 116	TOT	pg/L	ND>50%	4	---	---
PBDE 119/120	TOT	pg/L	263.6	4	75%	0.01
PBDE 12/13	TOT	pg/L	2.66	4	75%	0.0001
PBDE 126	TOT	pg/L	ND>50%	4	---	---
PBDE 128	TOT	pg/L	ND>50%	4	---	---
PBDE 138/166	TOT	pg/L	131.8	4	100%	0.004
PBDE 140	TOT	pg/L	74.18	4	100%	0.002
PBDE 15	TOT	pg/L	27.53	4	100%	0.001
PBDE 153	TOT	pg/L	1608	4	100%	0.05
PBDE 154	TOT	pg/L	1212	4	100%	0.04
PBDE 155	TOT	pg/L	113.9	4	100%	0.003
PBDE 17/25	TOT	pg/L	137.8	4	100%	0.004
PBDE 181	TOT	pg/L	ND>50%	4	---	---
PBDE 183	TOT	pg/L	387.3	4	100%	0.01
PBDE 190	TOT	pg/L	60.3	4	100%	0.002
PBDE 203	TOT	pg/L	330	4	100%	0.009
PBDE 206	TOT	pg/L	2793	4	100%	0.08
PBDE 207	TOT	pg/L	3438	4	100%	0.09
PBDE 208	TOT	pg/L	2162	4	100%	0.06
PBDE 209	TOT	pg/L	54580	4	100%	1.5
PBDE 28/33	TOT	pg/L	359.8	4	100%	0.01
PBDE 30	TOT	pg/L	ND>50%	4	---	---
PBDE 32	TOT	pg/L	ND>50%	4	---	---
PBDE 35	TOT	pg/L	3.49	4	100%	0.0001

Appendix B5, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Influent		Loading
				n	% Freq	kg/year
PBDE 37	TOT	pg/L	8.25	4	100%	0.0002
PBDE 47	TOT	pg/L	17050	4	100%	0.5
PBDE 49	TOT	pg/L	571	4	100%	0.02
PBDE 51	TOT	pg/L	69.48	4	100%	0.002
PBDE 66	TOT	pg/L	222.3	4	100%	0.006
PBDE 7	TOT	pg/L	8.03	4	75%	0.0003
PBDE 71	TOT	pg/L	80.5	4	100%	0.002
PBDE 75	TOT	pg/L	28.45	4	100%	0.0008
PBDE 77	TOT	pg/L	ND>50%	4	---	---
PBDE 79	TOT	pg/L	37.85	4	100%	0.001
PBDE 8/11	TOT	pg/L	8.28	4	100%	0.0003
PBDE 85	TOT	pg/L	705	4	100%	0.02
PBDE 99	TOT	pg/L	17350	4	100%	0.5
Decachloro Biphenyl	TOT	pg/L	37.3	4	100%	0.001
PCBs						
PCB 1	TOT	pg/L	32.5	4	100%	0.001
PCB 10	TOT	pg/L	ND>50%	4	---	---
PCB 103	TOT	pg/L	2.4	4	75%	0.0001
PCB 104	TOT	pg/L	1.155	4	75%	0.00003
PCB 105	TOT	pg/L	66.68	4	100%	0.002
PCB 106	TOT	pg/L	ND>50%	4	---	---
PCB 107/124	TOT	pg/L	7.18	4	100%	0.0002
PCB 109	TOT	pg/L	10.51	4	100%	0.0003
PCB 11	TOT	pg/L	349.5	4	100%	0.01
PCB 110/115	TOT	pg/L	224.5	4	100%	0.007
PCB 111	TOT	pg/L	ND>50%	4	---	---
PCB 112	TOT	pg/L	ND>50%	4	---	---
PCB 114	TOT	pg/L	4.91	4	100%	0.0001
PCB 118	TOT	pg/L	178.5	4	100%	0.005
PCB 12/13	TOT	pg/L	13.81	4	100%	0.0004
PCB 120	TOT	pg/L	ND>50%	4	---	---
PCB 121	TOT	pg/L	1.65	4	75%	0.00005
PCB 122	TOT	pg/L	2.79	4	75%	0.0001
PCB 123	TOT	pg/L	7.84	4	100%	0.0002
PCB 126	TOT	pg/L	ND>50%	4	---	---
PCB 127	TOT	pg/L	ND>50%	4	---	---

Appendix B5, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Influent		Loading
				n	% Freq	kg/year
PCB 128/166	TOT	pg/L	28.1	4	100%	0.0008
PCB 129/138/160/163	TOT	pg/L	212	4	100%	0.006
PCB 130	TOT	pg/L	11.7	4	100%	0.0004
PCB 131	TOT	pg/L	ND>50%	4	---	---
PCB 132	TOT	pg/L	67.9	4	100%	0.002
PCB 133	TOT	pg/L	3.78	4	100%	0.0001
PCB 134/143	TOT	pg/L	10.91	4	100%	0.0003
PCB 135/151/154	TOT	pg/L	64.45	4	100%	0.002
PCB 136	TOT	pg/L	28.88	4	100%	0.0009
PCB 137	TOT	pg/L	10.65	4	100%	0.0003
PCB 139/140	TOT	pg/L	4.75	4	100%	0.0001
PCB 14	TOT	pg/L	ND>50%	4	---	---
PCB 141	TOT	pg/L	39.7	4	100%	0.001
PCB 142	TOT	pg/L	ND>50%	4	---	---
PCB 144	TOT	pg/L	10.95	4	100%	0.0003
PCB 145	TOT	pg/L	ND>50%	4	---	---
PCB 146	TOT	pg/L	26.53	4	100%	0.0008
PCB 147/149	TOT	pg/L	154.8	4	100%	0.005
PCB 148	TOT	pg/L	ND>50%	4	50%	---
PCB 15	TOT	pg/L	36.45	4	100%	0.001
PCB 150	TOT	pg/L	1.32	4	75%	0.00004
PCB 152	TOT	pg/L	ND>50%	4	---	---
PCB 153/168	TOT	pg/L	187	4	100%	0.006
PCB 155	TOT	pg/L	19.33	4	100%	0.0006
PCB 156157	TOT	pg/L	30.38	4	100%	0.0009
PCB 158	TOT	pg/L	19.08	4	100%	0.0006
PCB 159	TOT	pg/L	ND>50%	4	---	---
PCB 16	TOT	pg/L	38.75	4	100%	0.001
PCB 161	TOT	pg/L	ND>50%	4	---	---
PCB 162	TOT	pg/L	ND>50%	4	---	---
PCB 164	TOT	pg/L	11.7	4	100%	0.0004
PCB 165	TOT	pg/L	ND>50%	4	---	---
PCB 167	TOT	pg/L	8.35	4	100%	0.0002
PCB 169	TOT	pg/L	ND>50%	4	---	---
PCB 17	TOT	pg/L	43.78	4	100%	0.001
PCB 170	TOT	pg/L	47.4	4	100%	0.001

Appendix B5, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Influent		Loading
				n	% Freq	kg/year
PCB 171/173	TOT	pg/L	14.11	4	100%	0.0004
PCB 172	TOT	pg/L	7.323	4	75%	0.0002
PCB 174	TOT	pg/L	47.75	4	100%	0.001
PCB 175	TOT	pg/L	2.37	4	75%	0.0001
PCB 176	TOT	pg/L	6.628	4	100%	0.0002
PCB 177	TOT	pg/L	26.13	4	100%	0.0008
PCB 178	TOT	pg/L	12.64	4	100%	0.0004
PCB 179	TOT	pg/L	22.7	4	100%	0.0007
PCB 18/30	TOT	pg/L	70.85	4	100%	0.002
PCB 180/193	TOT	pg/L	138.2	4	100%	0.004
PCB 181	TOT	pg/L	ND>50%	4	---	---
PCB 182	TOT	pg/L	ND>50%	4	---	---
PCB 183/185	TOT	pg/L	34.98	4	100%	0.001
PCB 184	TOT	pg/L	31.28	4	100%	0.0009
PCB 186	TOT	pg/L	ND>50%	4	---	---
PCB 187	TOT	pg/L	63.48	4	100%	0.002
PCB 188	TOT	pg/L	ND>50%	4	---	---
PCB 189	TOT	pg/L	ND>50%	4	---	---
PCB 19	TOT	pg/L	18.62	4	100%	0.0006
PCB 190	TOT	pg/L	10.34	4	100%	0.0003
PCB 191	TOT	pg/L	2.098	4	75%	0.0001
PCB 192	TOT	pg/L	ND>50%	4	---	---
PCB 194	TOT	pg/L	25.58	4	100%	0.0008
PCB 195	TOT	pg/L	9.475	4	100%	0.0003
PCB 196	TOT	pg/L	12.96	4	100%	0.0004
PCB 197/200	TOT	pg/L	5.27	4	100%	0.0002
PCB 198/199	TOT	pg/L	37.78	4	100%	0.001
PCB 2	TOT	pg/L	7.658	4	100%	0.0002
PCB 20/28	TOT	pg/L	129.3	4	100%	0.004
PCB 201	TOT	pg/L	4.535	4	100%	0.0001
PCB 202	TOT	pg/L	9.898	4	100%	0.0003
PCB 203	TOT	pg/L	22.38	4	100%	0.0007
PCB 204	TOT	pg/L	1.468	4	75%	0.00004
PCB 205	TOT	pg/L	ND>50%	4	---	---
PCB 206	TOT	pg/L	36.5	4	100%	0.001
PCB 207	TOT	pg/L	4.615	4	75%	0.0001

Appendix B5, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Influent		Loading
				n	% Freq	kg/year
PCB 208	TOT	pg/L	12.1	4	100%	0.0004
PCB 209	TOT	pg/L	37.3	4	100%	0.001
PCB 21/33	TOT	pg/L	78.68	4	100%	0.002
PCB 22	TOT	pg/L	51.25	4	100%	0.002
PCB 23	TOT	pg/L	ND>50%	4	---	---
PCB 24	TOT	pg/L	ND>50%	4	---	---
PCB 25	TOT	pg/L	18.4	4	100%	0.0006
PCB 26/29	TOT	pg/L	31.18	4	100%	0.001
PCB 27	TOT	pg/L	18.11	4	100%	0.0006
PCB 3	TOT	pg/L	18.7	4	100%	0.0006
PCB 31	TOT	pg/L	122.2	4	100%	0.004
PCB 32	TOT	pg/L	25.9	4	100%	0.0008
PCB 34	TOT	pg/L	ND>50%	4	---	---
PCB 35	TOT	pg/L	12.88	4	100%	0.0004
PCB 36	TOT	pg/L	2.745	4	100%	0.0001
PCB 37	TOT	pg/L	35.38	4	100%	0.001
PCB 38	TOT	pg/L	ND>50%	4	---	---
PCB 39	TOT	pg/L	1.07	4	75%	0.00003
PCB 4	TOT	pg/L	80.15	4	100%	0.003
PCB 40/41/71	TOT	pg/L	64.88	4	100%	0.002
PCB 42	TOT	pg/L	31.9	4	100%	0.001
PCB 43	TOT	pg/L	7.015	4	100%	0.0002
PCB 44/47/65	TOT	pg/L	459.8	4	100%	0.01
PCB 45/51	TOT	pg/L	90.75	4	100%	0.003
PCB 46	TOT	pg/L	10.12	4	100%	0.0003
PCB 48	TOT	pg/L	23.9	4	100%	0.0007
PCB 49/69	TOT	pg/L	95.73	4	100%	0.003
PCB 5	TOT	pg/L	ND>50%	4	---	---
PCB 50/53	TOT	pg/L	27.83	4	100%	0.0009
PCB 52	TOT	pg/L	476.8	4	100%	0.01
PCB 54	TOT	pg/L	ND>50%	4	---	---
PCB 55	TOT	pg/L	2.703	4	100%	0.0001
PCB 56	TOT	pg/L	49.2	4	100%	0.001
PCB 57	TOT	pg/L	ND>50%	4	---	---
PCB 58	TOT	pg/L	ND>50%	4	---	---
PCB 59/62/75	TOT	pg/L	12.5	4	100%	0.0004

Appendix B5, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Influent		Loading
				n	% Freq	kg/year
PCB 6	TOT	pg/L	21.08	4	100%	0.0007
PCB 60	TOT	pg/L	27.48	4	100%	0.0008
PCB 61/70/74/76	TOT	pg/L	233.8	4	100%	0.007
PCB 63	TOT	pg/L	4.403	4	100%	0.0001
PCB 64	TOT	pg/L	51.33	4	100%	0.002
PCB 66	TOT	pg/L	93.6	4	100%	0.003
PCB 67	TOT	pg/L	2.808	4	100%	0.0001
PCB 68	TOT	pg/L	41.15	4	100%	0.001
PCB 7	TOT	pg/L	5.76	4	100%	0.0002
PCB 72	TOT	pg/L	ND>50%	4	---	---
PCB 73	TOT	pg/L	6.065	4	100%	0.0002
PCB 77	TOT	pg/L	8.928	4	100%	0.0003
PCB 78	TOT	pg/L	ND>50%	4	---	---
PCB 79	TOT	pg/L	2.913	4	100%	0.0001
PCB 8	TOT	pg/L	61.28	4	100%	0.002
PCB 80	TOT	pg/L	ND>50%	4	---	---
PCB 81	TOT	pg/L	ND>50%	4	---	---
PCB 82	TOT	pg/L	24.5	4	100%	0.0007
PCB 83/99	TOT	pg/L	126	4	100%	0.004
PCB 84	TOT	pg/L	61.05	4	100%	0.002
PCB 85/116/117	TOT	pg/L	37.25	4	100%	0.001
PCB 86/87/97/108/119/125	TOT	pg/L	155.8	4	100%	0.005
PCB 88/91	TOT	pg/L	30.83	4	100%	0.0009
PCB 89	TOT	pg/L	2.3	4	75%	0.0001
PCB 9	TOT	pg/L	4.405	4	100%	0.0001
PCB 90/101/113	TOT	pg/L	250.3	4	100%	0.007
PCB 92	TOT	pg/L	44.85	4	100%	0.001
PCB 93/95/98/100/102	TOT	pg/L	214.5	4	100%	0.006
PCB 94	TOT	pg/L	ND>50%	4	---	---
PCB 96	TOT	pg/L	1.83	4	75%	0.0001
Total Hexachloro Biphenyls	TOT	pg/L	822.3	4	---	---
Total Dichloro Biphenyls	TOT	pg/L	564.8	4	100%	0.02
Total Heptachloro Biphenyls	TOT	pg/L	429	4	100%	0.01
Total Hexachloro Biphenyls	TOT	pg/L	1170	4	100%	0.02
Total Monochloro Biphenyls	TOT	pg/L	58.83	4	100%	0.002
Total Nonachloro Biphenyls	TOT	pg/L	45.1	4	75%	0.002

Appendix B5, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Influent		Loading
				n	% Freq	kg/year
Total Octachloro Biphenyls	TOT	pg/L	118.7	4	100%	0.004
Total Pentachloro Biphenyls	TOT	pg/L	1435	4	100%	0.04
Total Tetrachloro Biphenyls	TOT	pg/L	1808	4	100%	0.05
Total Trichloro Biphenyls	TOT	pg/L	693.3	4	100%	0.02
PCB Teq 3	TOT	pg/L	0.07	4	100%	0.000002
PCB Teq 4	TOT	pg/L	1.12	4	100%	0.00003
PCBs Total	TOT	pg/L	6100	4	100%	0.2
PCDD						
1,2,3,4,6,7,8-HPCDD	TOT	pg/L	27.03	4	100%	0.0008
1,2,3,4,6,7,8-HPCDF	TOT	pg/L	2.025	4	100%	0.0001
1,2,3,4,7,8,9-HPCDF	TOT	pg/L	ND>50%	4	---	---
1,2,3,4,7,8-HXCDD	TOT	pg/L	ND>50%	4	---	---
1,2,3,4,7,8-HXCDF	TOT	pg/L	ND>50%	4	---	---
1,2,3,6,7,8-HXCDD	TOT	pg/L	0.927	4	75%	0.0000
1,2,3,6,7,8-HXCDF	TOT	pg/L	ND>50%	4	---	---
1,2,3,7,8,9-HXCDD	TOT	pg/L	ND>50%	4	---	---
1,2,3,7,8,9-HXCDF	TOT	pg/L	ND>50%	4	---	---
1,2,3,7,8-PECDD	TOT	pg/L	ND>50%	4	---	---
1,2,3,7,8-PECDF	TOT	pg/L	ND>50%	4	---	---
2,3,4,6,7,8-HXCDF	TOT	pg/L	ND>50%	4	---	---
2,3,4,7,8-PECDF	TOT	pg/L	ND>50%	4	---	---
2,3,7,8-TCDD	TOT	pg/L	ND>50%	4	---	---
2,3,7,8-TCDF	TOT	pg/L	ND>50%	4	---	---
OCDD	TOT	pg/L	167.3	4	100%	0.005
OCDF	TOT	pg/L	3.95	4	100%	0.0001
TOTAL HEPTA-DIOXINS	TOT	pg/L	47.2	4	100%	0.001
TOTAL HEPTA-FURANS	TOT	pg/L	1.93	4	75%	0.0001
TOTAL HEXA-DIOXINS	TOT	pg/L	4.89	4	100%	0.0002
TOTAL HEXA-FURANS	TOT	pg/L	0.7	4	75%	0.00002
TOTAL PENTA-DIOXINS	TOT	pg/L	ND>50%	4	---	---
TOTAL PENTA-FURANS	TOT	pg/L	ND>50%	4	---	---
TOTAL TETRA-DIOXINS	TOT	pg/L	ND>50%	4	---	---
TOTAL TETRA-FURANS	TOT	pg/L	ND>50%	4	---	---
PFAS				4		
Perfluorodecanoic acid (PFDA)	TOT	ng/L	ND>50%	4	---	---
Perfluoroheptanoic Acid (PFHpA)	TOT	ng/L	7.578	4	75%	0.3

Appendix B5, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Influent		Loading
				n	% Freq	kg/year
Perfluorohexanoic Acid (PFHxA)	TOT	ng/L	21.76	4	100%	0.8
Perfluorononanoic Acid (PFNA)	TOT	ng/L	2.202	4	75%	0.1
Perfluorooctane sulfonamide (PFOSA)	TOT	ng/L	ND>50%	4	---	---
Perfluorooctanesulfonic acid (PFOS)	TOT	ng/L	7.433	4	100%	0.2
Perfluorooctanoic acid (PFOA)	TOT	ng/L	10.02	4	100%	0.4
Perfluoropentanoic Acid (PFPeA)	TOT	ng/L	31.75	4	100%	1.2
PFBS	TOT	ng/L	7.038	4	100%	0.2
PFDoA	TOT	ng/L	ND>50%	4	---	---
PFHxS	TOT	ng/L	6.01	4	75%	0.2
PFUnA	TOT	ng/L	ND>50%	4	---	---
Phthalates						
Bis(2-Ethylhexyl)Phthalate	TOT	µg/L	7.97	12	75%	244
Butylbenzyl Phthalate	TOT	µg/L	ND>50%	12	---	---
Di-N-Butyl Phthalate	TOT	µg/L	ND>50%	12	---	---
Di-N-Octyl Phthalate	TOT	µg/L	ND>50%	12	---	---
Diethyl Phthalate	TOT	µg/L	1.139	12	75%	30
Dimethyl Phthalate	TOT	µg/L	ND>50%	12	---	---
PPCPs						
2-Hydroxy-Ibuprofen	TOT	ng/L	14940	4	100%	403
Acetaminophen	TOT	ng/L	140300	4	100%	4,118
Azithromycin	TOT	ng/L	457.5	4	75%	15
Bisphenol A	TOT	ng/L	4407	4	100%	166
Caffeine	TOT	ng/L	119400	4	100%	3,400
Carbadox	TOT	ng/L	ND>50%	4	---	---
Carbamazepine	TOT	ng/L	966.8	4	100%	28
Cefotaxime	TOT	ng/L	ND>50%	4	---	---
Ciprofloxacin	TOT	ng/L	205.3	4	100%	6
Clarithromycin	TOT	ng/L	347.3	4	100%	11
Clinafloxacin	TOT	ng/L	ND>50%	4	---	---
Cloxacillin	TOT	ng/L	ND>50%	4	---	---
Dehydronifedipine	TOT	ng/L	6.67	4	100%	0
Digoxigenin	TOT	ng/L	ND>50%	4	---	---
Digoxin	TOT	ng/L	35.75	4	100%	1
Diltiazem	TOT	ng/L	385	4	100%	10
Diphenhydramine	TOT	ng/L	920.3	4	100%	27
Enrofloxacin	TOT	ng/L	ND>50%	4	---	---

Appendix B5, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Influent		Loading
				n	% Freq	kg/year
Erythromycin-H2O	TOT	ng/L	26.1	4	100%	1
Flumequine	TOT	ng/L	ND>50%	4	---	---
Fluoxetine	TOT	ng/L	35.58	4	100%	1
Furosemide	TOT	ng/L	866	4	100%	25
Gemfibrozil	TOT	ng/L	89.78	4	100%	3
Glipizide	TOT	ng/L	ND>50%	4	---	---
Glyburide	TOT	ng/L	ND>50%	4	---	---
Hydrochlorothiazide	TOT	ng/L	1283	4	100%	37
Ibuprofen	TOT	ng/L	14360	4	100%	419
Lincomycin	TOT	ng/L	ND>50%	4	---	---
Lomefloxacin	TOT	ng/L	ND>50%	4	---	---
Miconazole	TOT	ng/L	16.46	4	75%	1
Naproxen	TOT	ng/L	8405	4	100%	244
Norfloxacin	TOT	ng/L	ND>50%	4	---	---
Norgestimate	TOT	ng/L	ND>50%	4	---	---
Ofloxacin	TOT	ng/L	13.95	4	100%	0.5
Ormetoprim	TOT	ng/L	ND>50%	4	---	---
Oxacillin	TOT	ng/L	ND>50%	4	---	---
Oxolinic Acid	TOT	ng/L	ND>50%	4	---	---
Penicillin G	TOT	ng/L	ND>50%	4	---	---
Penicillin V	TOT	ng/L	ND>50%	4	---	---
Roxithromycin	TOT	ng/L	ND>50%	4	---	---
Sarafloxacin	TOT	ng/L	ND>50%	4	---	---
Sulfachloropyridazine	TOT	ng/L	ND>50%	4	---	---
Sulfadiazine	TOT	ng/L	ND>50%	4	---	---
Sulfadimethoxine	TOT	ng/L	10.69	4	75%	0.3
Sulfamerazine	TOT	ng/L	ND>50%	4	---	---
Sulfamethazine	TOT	ng/L	ND>50%	4	---	---
Sulfamethizole	TOT	ng/L	ND>50%	4	---	---
Sulfamethoxazole	TOT	ng/L	1181	4	100%	35
Sulfanilamide	TOT	ng/L	ND>50%	4	---	---
Sulfathiazole	TOT	ng/L	ND>50%	4	---	---
Thiabendazole	TOT	ng/L	31.68	4	100%	0.9
Triclocarban	TOT	ng/L	5.925	4	100%	0.2
Triclosan	TOT	ng/L	102.2	4	100%	3.0
Trimethoprim	TOT	ng/L	291.3	4	100%	8.6

Appendix B5, cont'd

Parameter	State Code	Unit Code	Average Concentration	McLoughlin Influent		Loading
				n	% Freq	kg/year
Tylosin	TOT	ng/L	ND>50%	4	---	---
Virginiamycin	TOT	ng/L	ND>50%	4	---	---
Warfarin	TOT	ng/L	4.278	4	100%	0.1
17 beta-Estradiol 3-benzoate	TOT	ng/L	ND>50%	4	---	---
Allyl Trenbolone	TOT	ng/L	ND>50%	4	---	---
Androstenedione	TOT	ng/L	168.5	4	100%	4.8
Androsterone	TOT	ng/L	1	4	100%	0.03
Desogestrel	TOT	ng/L	ND>50%	4	---	---
Mestranol	TOT	ng/L	64	4	75%	1.7
Norethindrone	TOT	ng/L	ND>50%	4	---	---
Norgestrel	TOT	ng/L	ND>50%	4	---	---
Progesterone	TOT	ng/L	14.96	4	75%	0.4
Testosterone	TOT	ng/L	49.13	4	100%	1.5
17 alpha-Dihydroequilin	TOT	ng/L	ND>50%	4	---	---
17 alpha-Estradiol	TOT	ng/L	ND>50%	4	---	---
17 alpha-Ethinyl-Estradiol	TOT	ng/L	ND>50%	4	---	---
17 beta-Estradiol	TOT	ng/L	19.18	4	75%	0.6
Equilenin	TOT	ng/L	ND>50%	4	---	---
Equilin	TOT	ng/L	ND>50%	4	---	---
Estriol	TOT	ng/L	203	4	100%	6.1
Estrone	TOT	ng/L	41.33	4	100%	1.2

Notes:
ND>50% Not detected above detection limit greater than 50% of the time

Appendix B6   Acute Toxicity Test Results and Bench Sheets

Acute Toxicity Test Results and Bench Sheets available upon request
Contact: CRD's Environmental Monitoring Program, 250.360.3296

Appendix B7   Chronic Toxicity Test Results and Bench Sheets

Chronic Toxicity Test Results and Bench Sheets available upon request
Contact: CRD's Environmental Monitoring Program, 250.360.3296

APPENDIX C
2021 SURFACE WATER MONITORING

Appendix C1 Substance List

Parameter	Edge of IDZ (3 depths top, middle, bottom)*	Surface Water (1 m depth)
CONVENTIONAL VARIABLES		
conductivity	x	
enterococci	x	x
fecal coliform	x	x
hardness (as $CaCO_3$)	x	
ammonia (NH3)	x	
total Kjeldahl nitrogen	x*	
nitrate	x	
nitrite	x	
nitrogen, total	x	
oil & grease, mineral	x*	
oil & grease, total	x*	
organic carbon, total	x*	
pH	x	
phosphate, dissolved	x*	
phosphate, total	x*	
salinity	x	
sulphate	x	
sulphide	x	
suspended solids, total	x	
temperature	x	
CTD parameters	x	
METALS TOTAL		
aluminum	x	
antimony	x	
arsenic	x	
barium	x	
beryllium	x	
bismuth	x	
cadmium	x	
calcium	x	
chromium	x	
chromium VI	x	
cobalt	x	
copper	x	
iron	x	
lead	x	
lithium	x	
magnesium	x	
manganese	x	
mercury	x	
molybdenum	x	
nickel	x	
phosphorus	x	
potassium	x	
selenium	x	
silver	x	
sodium	x	

Appendix C1, cont'd

Parameter	Edge of IDZ (3 depths top, middle, bottom)*	Surface Water (1 m depth)
strontium	x	
thallium	x	
tin	x	
titanium	x	
vanadium	x	
zinc	x	

Notes: IDZ – initial dilution zone, *Top=5 m depth, middle=in predicted plume, bottom=5 m off bottom, x* sampled once in each 5 in 30 sample quarter.

Appendix C2 Stations

McLoughlin Point	Latitude 48º	Longitude 123º
McL-01	24.299	24.409
McL-14	24.515	24.411
McL-16	24.300	24.085
McL-18	24.083	24.407
McL-20	24.298	24.733
McL-22	24.731	24.412
McL-24	24.606	23.953
McL-26	24.302	23.760
McL-28	23.996	23.948
McL-30	23.867	24.405
McL-32	23.992	24.865
McL-34	24.297	25.057
McL-36	24.603	24.870
+ four dynamic edge of IDZ stations (3 depths)		
Macaulay Point	**Latitude 48°**	**Longitude 123°**
Mac-01	24.186	24.616
Mac-14	24.402	24.616
Mac-16	24.186	24.290
Mac-18	23.970	24.616
Mac-20	24.186	24.941
Mac-22	24.617	24.616
Mac-24	24.491	24.155
Mac-26	24.186	23.965
Mac-28	23.880	24.155
Mac-30	23.754	24.616
Mac-32	23.880	25.076
Mac-34	24.186	25.266
Mac-36	24.491	25.076
+ four dynamic edge of IDZ stations (3 depths)		
Clover Point	**Latitude 48°**	**Longitude 123°**
Clo-01	23.701	20.764
Clo-14	23.916	20.764
Clo-16	23.701	20.438
Clo-18	23.485	20.764
Clo-20	23.701	21.089
Clo-22	24.132	20.764
Clo-24	24.006	20.304
Clo-26	23.701	20.113
Clo-28	23.395	20.304
Clo-30	23.269	20.764
Clo-32	23.395	21.224
Clo-34	23.701	21.414
Clo-36	24.006	21.224
+ four dynamic edge of IDZ stations (3 depths)		
Reference		
Constance Bank	20.640	19.080
Parry Bay	21.258	30.647

Appendix C3 McLoughlin Point Surface Results 5 Sampling Events in 30 Days - Fecal Coliform

Fecal Coliforms	Winter						Spring						Summer						Autumn					
	1	2	3	4	5	Geomean	1	2	3	4	5	Geomean	1	2	3	4	5	Geomean	1	2	3	4	5	Geomean
McL-01	3	6	6	1	20	5	1	7	1	1	1	1	1	1		3	1	1	1	1	1	60	42	5
McL-14	6	22	14	4	11	10	1	5	1	1	13	2	1	1	1	1	1	1	2	3	1	63	39	7
McL-16	4	4	24	2	4	5	3	5	2	2	1	2	1	1	1	1	1	1	1	1	1	20	130	5
McL-18	7	2	16	1	7	4	2	5	2	2	1	2	1	1	2	1	1	1	1	1	1	19	74	4
McL-20	1	53	8	6	28	9	1	1	1	2	1	1	1	1	1	1	1	1	2	1	1	20	16	4
McL-22	5	10	18	3	8	7	1	10	2	4	1	2	1	1	1	1	1	1	1	2	3	110	9	6
McL-24	4	1	22	3	5	4	11	12	1	6	1	4	1	1	1	1	1	1	1	1	1	62	61	5
McL-26	1	5	24	4	1	3	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	26	10	3
McL-28	1	2	25	3	1	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	20	61	4
McL-30	7	1	22	5	2	4	2	2	1	1	1	1	1	2	1	1	1	1	1	1	1	28	75	5
McL-32	4	3	13	1	11	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	17	12	3
McL-34	6	1	4	10	14	5	1	4	1	1	1	1	1	1	1	1	1	2	11	1	1	8	23	5
McL-36	5	240	1	1	9	6	1	12	1	1	9	3	1	1	1	1	1	2	13	1	1	45	24	7
McL-D1	3	390	19	1	36	15	3	1	---	1	1	1	1	1	1	---	1	1	---	1	---	16	54	10
Ref-CB	1	2	1	1	64	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	7	2	2
Ref-PB	1	1	1	1	---	1	7	1	1	---	1	2	1	1	1	1	1	1	1	1	1	1	2	1

Notes: Red shaded cells indicate exceedance to ~~BC WQG~~ Geomean of 200 CFU/100 mL, Geomean = Geometric Mean --- denotes sample not taken due to weather issues

Appendix C4 McLoughlin Point Surface Results 5 Sampling Events in 30 Days - Enterococci

Enterococci	Winter						Spring						Summer						Autumn					
	1	2	3	4	5	Geomean	1	2	3	4	5	Geomean	1	2	3	4	5	Geomean	1	2	3	4	5	Geomean
McL-01	1	1	1	1	3	1	1	2	1	1	1	1	1	1		1	1	1	1	1	1	21	25	3
McL-14	2	7	1	2	4	3	1	1	1	1	4	1	1	1	1	1	1	1	1	1	1	27	27	4
McL-16	1	1	3	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	18	71	4
McL-18	3	1	2	1	1	1	1	2	2	1	1	1	1	1	2	1	1	1	1	1	1	10	44	3
McL-20	1	10	1	3	11	3	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	12	15	3
McL-22	1	3	1	1	3	2	1	2	2	2	1	2	1	1	1	1	1	1	1	1	2	26	4	3
McL-24	1	2	2	2	4	2	1	6	1	2	1	2	1	1	1	1	1	1	1	1	1	26	69	4
McL-26	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	18	10	3
McL-28	1	1	3	1	1	1	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	12	44	4
McL-30	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	13	53	4
McL-32	2	1	3	2	1	2	1	1	1	2	1	1	1	1	1	3	1	1	1	1	2	15	15	3
McL-34	3	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1	1	1	11	2
McL-36	1	21	1	1	4	2	1	2	1	1	6	2	1	1	1	1	1	1	1	1	1	19	9	3
McL-D1	3	1	1	1	15	2	1	1	---	1	1	1	1	1	1	---	1	1	---	1	---	20	44	10
Ref-CB	1	1	1	1	20	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1	1
Ref-PB	1	1	1	1	---	1	1	1	1	---	1	1	1	1	1	1	1	1	1	1	1	2	1	1

Notes: Red shaded cells indicates exceedance to Health Canada's Geomean of 35 CFU/100 mL. Blue shaded cells indicate exceedances to Health Canada (2012) WQG of 70 CFU/100 mL, Geomean = Geometric Mean. --- not sampled due to weather issues

Appendix C5 McLoughlin Point IDZ Results - 5 Sampling Events in 30 Days - Fecal Coliforms

	Ref-CB	Ref-PB	Station 1	Station 2	Station 3	Station 4	Geomean IDZ Stations
Winter – Week 1							
Top	1	1	7	3	3	13	**5**
Middle	1	3	15	740	190	10	**68**
Bottom	110	1	341	340	540	380	**393**
Winter – Week 2							
Top	1	1	2	5	16	7	**6**
Middle	3	180	27	2	8	9	**8**
Bottom	19	30	8	1	28	24	**9**
Winter – Week 3							
Top	1	5	21	29	25	18	**23**
Middle	1	21	2	330	2	130	**20**
Bottom	29	2	15	11	15	13	**13**
Winter – Week 4							
Top	2	1	4	1	5	1	**2**
Middle	1	780	78	90	120	170	**109**
Bottom	3	1	7	3	4	4	**4**
Winter – Week 5							
Top	1	120	39	29	23	17	**26**
Middle	1	17	59	430	78	32	**89**
Bottom	1	4	740	990	580	560	**698**
Spring – Week 1							
Top	1	2	2	3	1	6	**2**
Middle	4	1	26	7	55	13	**19**
Bottom	1	420	15	11	76	12	**20**
Spring - Week 2							
Top	40	4	9	7	11	11	**9**
Middle	1	9	25	23	21	49	**28**
Bottom	8	19	65	50	69	260	**87**
Spring - Week 3							
Top	1	3	42	1	10	5	**7**
Middle	67	1	56	32	35	21	**34**
Bottom	15	14	56	65	54	37	**52**
Spring - Week 4							
Top	3	---	2	4	6	1	**3**
Middle	8	---	7	30	15	8	**13**
Bottom	170	---	16	29	15	6	14
Spring - Week 5							
Top	1	1	1	1	1	1	**1**
Middle	1	1	13	1	1	7	**3**
Bottom	1	1	2	2	2	15	**3**
Summer – Week 1							
Top	1	110	20	1	1	1	**2**
Middle	1	2	17	73	11	7	**18**
Bottom	600	530	640	840	690	270	**563**
Summer – Week 2							
Top	1	3	1	1	1	1	**1**
Middle	1	48	3	1	23	1	**3**
Bottom	440	7	24	130	300	83	**94**

Appendix C5, cont'd

	Ref-CB	Ref-PB	Station 1	Station 2	Station 3	Station 4	Geomean IDZ Stations
Summer - Week 3							
Top	1	1	29	15	45	42	**30**
Middle	1	74	1		1	66	**4**
Bottom	1	1	5	1	24	60	**9**
Summer - Week 4							
Top	1	1	1	1	1	1	**1**
Middle	1	1	11	27	2	51	**13**
Bottom	120	22	70	14	4	14	**15**
Summer - Week 5							
Top	1	1	1	1	1	1	**1**
Middle	59	15	12	38	74	47	**35**
Bottom	29	23	20	26	77	47	**37**
Autumn – Week 1							
Top	1	1	12	1	1	45	**5**
Middle	8	1	1	1	1	1	**1**
Bottom	1	1	1	1	1	1	**1**
Autumn – Week 2							
Top	1	2	1	1	1	1	**1**
Middle	1	1	47	40	46	1	**17**
Bottom	1	1	12	23	42	17	**21**
Autumn - Week 3							
Top	1	1	7		1	2	**2**
Middle	1	1	24	46	44	5	**22**
Bottom	1	2	10	35	26	12	**18**
Autumn - Week 4							
Top	1	8	23	12	15	12	**15**
Middle	6	1	14	37	36	10	**21**
Bottom	4	1	61	38	52	5	**28**
Autumn - Week 5							
Top	22	3	4	2	4	3	**3**
Middle	1	2	120	47	28	2	**24**
Bottom	1	2	89	29	5	1	**11**

Notes: Orange shaded cells indicate exceedance to ~~BC WQG~~ Geomean of 200 CFU/100 mL, Geomean = Geometric Mean, --- not sampled due to weather issues

Appendix C6 - McLoughlin Point IDZ Results - 5 Sampling Events in 30 Days - Enterococci

	Ref-CB	Ref-PB	Station 1	Station 2	Station 3	Station 4	Geomean IDZ Stations
Winter - Week 1							
Top	1	1	2	1	2	1	**1**
Middle	1	1	3	31	15	1	**6**
Bottom	1	1	1	31	30	31	**13**
Winter - Week 2							
Top	1	1	1	1	4	1	**1**
Middle	1	1	2	1	3	3	**2**
Bottom	1	1	1	1	1	1	**1**
Winter - Week 3							
Top	1	1	1	3	1	4	**2**
Middle	1	3	1	1	1	1	**1**
Bottom	1	1	1	2	1	1	**1**
Winter - Week 4							
Top	1	1	2	1	1	4	**2**
Middle	1	1	1	1	1	1	**1**
Bottom	1	1	1	1	2	1	**1**
Winter - Week 5							
Top	1	40	12	3	7	4	**6**
Middle	1	4	11	63	43	11	**24**
Bottom	1	3	130	140	98	87	**112**
Spring – Week 1							
Top	1	1	1	2	1	2	**1**
Middle	1	1	4	9	16	2	**6**
Bottom	1	1	6	5	37	6	**9**
Spring – Week 2							
Top	1	1	2	1	2	5	**2**
Middle	1	1	17	7	7	13	**10**
Bottom	1	1	24	13	15	41	**21**
Spring - Week 3							
Top	1	1	1	1	3	1	**1**
Middle	1	1	13	13	9	7	**10**
Bottom	1	1	21	13	20	7	**14**
Spring - Week 4							
Top	1	---	1	1	1	5	**1**
Middle	1	---	2	3	1	3	**2**
Bottom	1	---	7	11	1	1	**3**
Spring - Week 5							
Top	1	1	1	1	1	1	**1**
Middle	1	1	1	1	1	6	**2**
Bottom	1	1	1	1	3	14	**3**
Summer – Week 1							
Top	1	1	1	1	1	1	**1**
Middle	1	1	1	9	3	1	**2**
Bottom	1	1	57	240	70	37	**77**
Summer – Week 2							
Top	1	1	1	1	1	1	**1**
Middle	1	1	1	1	2	1	**1**
Bottom	1	1	1	12	11	9	**6**

Appendix C6, cont'd

	Ref-CB	Ref-PB	Station 1	Station 2	Station 3	Station 4	Geomean IDZ Stations
Summer - Week 3							
Top	1		5	3	6	1	**3**
Middle	1	1	1	1	1	17	**2**
Bottom	1	1	1	1	5	11	**4**
Summer - Week 4							
Top	1	1	1	1	1	1	**1**
Middle	1	1	1	5	1	16	**3**
Bottom	1	1	1	4	2	5	**3**
Summer - Week 5							
Top	1	1	1	1	1	1	**1**
Middle	1	1	1	15	28	6	**7**
Bottom	1	1	2	2	24	7	**5**
Autumn - Week 1							
Top	1	1	2	1	1	16	**2**
Middle	1	1	1	1	1	2	**1**
Bottom	1	1	1	1	1	1	**1**
Autumn - Week 2							
Top	1	1	1	1	1	1	**1**
Middle	1	1	13	11	5	1	**5**
Bottom	1	1	2	9	13	3	**5**
Autumn - Week 3							
Top	1	1	1	1	1	1	**1**
Middle	1	1	5	8	4	2	**4**
Bottom	1	1	4	5	6	4	**5**
Autumn - Week 4							
Top	1	2	2	4	2	3	**3**
Middle	1	1	1	6	6	4	**3**
Bottom	1	1	10	6	3	1	**4**
Autumn - Week 5							
Top	17	1	6	2	1	1	**2**
Middle	1	1	12	10	11	1	**6**
Bottom	1	1	15	12	3	1	**5**

Notes:
Orange Shaded cells indicate exceedance to Health Canada (2012) Geomean of 35 CFU/100 mL, Blue Shaded cells indicate exceedances to Health Canada (2012) single sample WQG of 70 CFU/100 mL, *Geomean = Geometric Mean, --- not sampled due to weather issues

Appendix C7 McLoughlin Point IDZ Results - 5 Sampling Events in 30 Days – NH3

NH3	BC Approved WQG = 20 mg/L N (average over 5 samples) or 148 mg/L N (max) for the protection of aquatic life						
Winter							**Average**
Station 1	Top	0.062	0.066	0.049	0.068	0.062	0.061
	Middle	0.054	0.079	0.048	0.065	0.053	0.060
	Bottom	0.057	0.070	0.040	0.059	0.130	0.071
Station 2	Top	0.061	0.060	0.053	0.061	0.057	0.058
	Middle	0.067	0.053	0.049	0.044	0.084	0.059
	Bottom	0.077	0.064	0.051	0.051	0.150	0.079
Station 3	Top	0.052	0.065	0.047	0.063	0.061	0.058
	Middle	0.047	0.100	0.049	0.063	0.069	0.066
	Bottom	0.077	0.060	0.054	0.073	0.093	0.071
Station 4	Top	0.065	0.065	0.056	0.062	0.061	0.062
	Middle	0.044	0.071	0.053	0.055	0.064	0.057
	Bottom	0.072	0.130	0.054	0.056	0.096	0.082
Ref-CB	Top	0.052	0.055	0.045	0.076	0.058	0.057
	Middle	0.056	0.087	0.042	0.058	0.054	0.059
	Bottom	0.039	0.071	0.039	0.064	0.033	0.049
Ref-PB	Top	0.063	0.087	0.054	0.057	0.055	0.063
	Middle	0.052	0.065	0.054	0.058	0.058	0.057
	Bottom	0.046	0.130	0.042	0.061	0.040	0.064
Spring							**Average**
Station 1	Top	0.057	0.075	0.059	0.039	0.120	0.070
	Middle	0.050	0.069	0.038	0.071	0.100	0.066
	Bottom	0.060	0.088	0.050	0.069	0.110	0.075
Station 2	Top	0.068	0.078	0.042	0.042	0.100	0.066
	Middle	0.047	0.073	0.053	0.055	0.100	0.066
	Bottom	0.068	0.077	0.059	0.100	0.110	0.083
Station 3	Top	0.065	0.065	0.042	0.053	0.097	0.064
	Middle	0.063	0.071	0.045	0.056	0.110	0.069
	Bottom	0.061	0.087	0.046	0.081	0.110	0.077
Station 4	Top	0.053	0.078	0.038	0.052	0.110	0.066
	Middle	0.053	0.079	0.055	0.056	0.140	0.077
	Bottom	0.057	0.075	0.046	0.071	0.130	0.076
Ref-CB	Top	0.052	0.074	0.060	0.048	0.110	0.069
	Middle	0.051	0.070	0.047	0.066	0.095	0.066
	Bottom	0.059	0.084	0.047	0.063	0.100	0.071
Ref-PB	Top	0.059	0.069	0.047	---	0.097	0.068
	Middle	0.055	0.083	0.040	---	0.093	0.068
	Bottom	0.063	0.070	0.038	---	0.100	0.068
Summer							**Average**
Station 1	Top	0.060	0.048	0.097	0.067	0.083	0.071
	Middle	0.047	0.059	0.087	0.064	0.076	0.067
	Bottom	0.120	0.056	0.077	0.071	0.078	0.080
Station 2	Top	0.069	0.057	0.092	0.062	0.068	0.070
	Middle	0.064	0.062	0.085	0.077	0.083	0.074
	Bottom	0.200	0.074	0.085	0.071	0.072	0.100
Station 3	Top	0.056	0.046	0.110	0.061	0.070	0.069
	Middle	0.061	0.060	0.078	0.073	0.110	0.076
	Bottom	0.120	0.084	0.091	0.075	0.110	0.096

Appendix C7, cont'd

NH3	BC Approved WQG = 20 mg/L N (average over 5 samples) or 148 mg/L N (max) for the protection of aquatic life					
Station 4	Top	0.062	0.047	0.120	0.072	0.072	0.075
	Middle	0.051	0.047	0.160	0.095	0.086	0.088
	Bottom	0.075	0.095	0.150	0.072	0.092	0.097
Ref-CB	Top	0.061	0.056	0.078	0.066	0.085	0.069
	Middle	0.055	0.043	0.085	0.067	0.066	0.063
	Bottom	0.051	0.048	0.086	0.053	0.053	0.058
Ref-PB	Top	0.045	0.066	0.084	0.070	0.074	0.068
	Middle	0.053	0.059	0.080	0.068	0.059	0.064
	Bottom	0.072	0.053	0.077	0.060	0.066	0.066
Autumn							**Average**
Station 1	Top	0.043	0.075	0.056	0.068	0.043	0.057
	Middle	0.031	0.110	0.092	0.059	0.140	0.086
	Bottom	0.012	0.060	0.056	0.098	0.092	0.064
Station 2	Top	0.032	0.062	0.054	0.071	0.047	0.053
	Middle	0.022	0.110	0.081	0.100	0.110	0.085
	Bottom	0.017	0.089	0.093	0.081	0.064	0.069
Station 3	Top	0.030	0.058	0.054	0.059	0.045	0.049
	Middle	0.044	0.110	0.087	0.078	0.085	0.081
	Bottom	0.029	0.091	0.076	0.087	0.040	0.065
Station 4	Top	0.081	0.061	0.053	0.051	0.044	0.058
	Middle	0.023	0.050	0.054	0.064	0.035	0.045
	Bottom	0.035	0.078	0.050	0.065	0.037	0.053
Ref-CB	Top	0.013	0.066	0.051	0.065	0.043	0.048
	Middle	0.015	0.053	0.052	0.068	0.050	0.048
	Bottom	0.007	0.058	0.048	0.059	0.035	0.041
Ref-PB	Top	0.024	0.066	0.050	0.056	0.051	0.049
	Middle	0.017	0.065	0.053	0.054	0.034	0.045
	Bottom	0.025	0.057	0.056	0.056	0.039	0.047

Notes: Shaded cells indicate exceedance to BC WQG, --- not sampled due to weather issues, Approved Guideline is based on Salinity = 30 g/kg, Temperature = 10ºC and pH.= 7.0

Appendix C8 McLoughlin Point IDZ Results - 5 Sampling Events in 30 Days – Silver

Silver	BC Approved WQG for protection of marine aquatic life = 0.003 mg/L (geometric mean over 5 samples) or 0.0015 mg/L (max)						
Winter							Geomean
Station 1	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Station 2	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Station 3	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Station 4	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Ref-CB	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Ref-PB	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Spring							Geomean
Station 1	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Station 2	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Station 3	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Station 4	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Ref-CB	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Ref-PB	Top	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001
Summer							Geomean
Station 1	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Station 2	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Station 3	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Appendix C8, cont'd

Silver	BC Approved WQG = 0.003 mg/L (geometric mean over 5 samples) or 0.00015 mg/L (max) for the protection of aquatic life						
Station 4	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Ref-CB	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Ref-PB	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Autumn						Geomean
Station 1	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Station 2	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Station 3	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Station 4	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Ref-CB	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Ref-PB	Top	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Middle	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bottom	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Notes:
Shaded cells indicate exceedance to BC WQG, --- not sampled due to weather issues, Geomean = Geometric Mean, Detection limit was used in calculations of average values.

Appendix C9 McLoughlin Point IDZ Results - 5 Sampling Events in 30 Days – Arsenic

Arsenic	BC Approved WQG 0.0125 mg/L (max) for the protection of aquatic life					
Winter						
Station 1	Top	0.00163	0.0016	0.00166	0.00166	0.00173
	Middle	0.00153	0.00136	0.00157	0.0016	0.00162
	Bottom	0.00164	0.00155	0.0017	0.00163	0.0017
Station 2	Top	0.00159	0.0015	0.00167	0.00167	0.00167
	Middle	0.00165	0.00164	0.00162	0.00164	0.00163
	Bottom	0.00167	0.0015	0.00159	0.00163	0.0017
Station 3	Top	0.00167	0.0016	0.00168	0.00171	0.00164
	Middle	0.00168	0.00161	0.00162	0.00167	0.00183
	Bottom	0.00158	0.00161	0.00168	0.00163	0.00171
Station 4	Top	0.0016	0.00158	0.00162	0.0017	0.00174
	Middle	0.00162	0.00162	0.00175	0.00171	0.0017
	Bottom	0.00163	0.00163	0.0017	0.00171	0.00176
Ref-CB	Top	0.0016	0.00162	0.00163	0.0016	0.0017
	Middle	0.00162	0.00154	0.0016	0.00165	0.00164
	Bottom	0.00161	0.00167	0.00162	0.00158	0.00179
Ref-PB	Top	0.00161	0.00154	0.00151	0.00154	0.00171
	Middle	0.00158	0.00152	0.00174	0.00165	0.00169
	Bottom	0.00167	0.00164	0.00174	0.00167	0.00171
Spring						
Station 1	Top	0.0015	0.00184	0.00156	0.00156	0.00162
	Middle	0.00158	0.00167	0.00156	0.00157	0.00163
	Bottom	0.00162	0.00164	0.00159	0.00173	0.00164
Station 2	Top	0.00162	0.0016	0.00159	0.00156	0.00155
	Middle	0.00161	0.00159	0.00163	0.00165	0.0016
	Bottom	0.0016	0.00167	0.00153	0.00164	0.0016
Station 3	Top	0.00158	0.00162	0.00154	0.00163	0.00169
	Middle	0.00157	0.0016	0.00156	0.00164	0.00165
	Bottom	0.00166	0.00171	0.00162	0.00161	0.00163
Station 4	Top	0.00153	0.00165	0.00158	0.00169	0.00158
	Middle	0.0016	0.00158	0.00156	0.00165	0.00165
	Bottom	0.00162	0.00163	0.00163	0.00164	0.00161
Ref-CB	Top	0.0017	0.00168	0.00153	0.00166	0.0017
	Middle	0.00167	0.00162	0.00153	0.00165	0.00172
	Bottom	0.00156	0.00161	0.0016	0.00175	0.00162
Ref-PB	Top	0.0016	0.00157	0.00156	---	0.00164
	Middle	0.0016	0.00163	0.00159	---	0.00162
	Bottom	0.00169	0.00171	0.00161	---	0.00162
Summer						
Station 1	Top	0.00162	0.00152	0.00165	0.00156	0.00161
	Middle	0.0016	0.00152	0.0015	0.00164	0.00155
	Bottom	0.00165	0.00154	0.00164	0.00159	0.00165
Station 2	Top	0.0016	0.00156	0.00159	0.00157	0.00166
	Middle	0.00164	0.0016	0.00164	0.00163	0.00161
	Bottom	0.0016	0.00161	0.00158	0.00154	0.0016
Station 3	Top	0.00156	0.00158	0.00168	0.00159	0.00165
	Middle	0.00159	0.0016	0.00156	0.00152	0.00159
	Bottom	0.00158	0.00156	0.00174	0.00163	0.0017

Appendix C9, cont'd

Arsenic	BC Approved WQG* 0.0125 mg/L (max) for the protection of aquatic life					
Summer						
Station 4	Top	0.00154	0.00155	0.00159	0.00161	0.00162
	Middle	0.00161	0.00156	0.00164	0.00157	0.00164
	Bottom	0.00157	0.00163	0.00162	0.00156	0.00165
Ref-CB	Top	0.00155	0.00159	0.00164	0.00157	0.00157
	Middle	0.00159	0.0017	0.00157	0.00154	0.00166
	Bottom	0.00162	0.00162	0.00163	0.00157	0.00164
Ref-PB	Top	0.00164	0.00149	0.00159	0.00161	0.00156
	Middle	0.00159	0.00154	0.00159	0.00156	0.00161
	Bottom	0.00164	0.0015	0.00162	0.00161	0.00157
Autumn						
Station 1	Top	0.0016	0.00172	0.00162	0.00165	0.00172
	Middle	0.00165	0.0017	0.0016	0.00182	0.0017
	Bottom	0.00165	0.0017	0.0015	0.00178	0.00166
Station 2	Top	0.00164	0.00165	0.00166	0.00178	0.00161
	Middle	0.00165	0.00169	0.0015	0.00174	0.00159
	Bottom	0.0016	0.00166	0.00161	0.00171	0.00158
Station 3	Top	0.00159	0.0018	0.00155	0.00169	0.00152
	Middle	0.00167	0.00178	0.00165	0.0017	0.00165
	Bottom	0.0017	0.00174	0.00162	0.00179	0.00164
Station 4	Top	0.00164	0.00174	0.00168	0.00171	0.00159
	Middle	0.00164	0.00175	0.00157	0.00171	0.00169
	Bottom	0.00167	0.00181	0.00164	0.00177	0.00162
Ref-CB	Top	0.00161	0.00167	0.00173	0.00158	0.00174
	Middle	0.00166	0.00156	0.00175	0.00159	0.00169
	Bottom	0.00169	0.00164	0.00174	0.00156	0.0017
Ref-PB	Top	0.00158	0.00167	0.00168	0.00159	0.00165
	Middle	0.00166	0.00177	0.00173	0.00163	0.00179
	Bottom	0.0016	0.00169	0.00161	0.00162	0.00174

Notes: Shaded cells indicate exceedance to BC WQG, --- not sampled due to weather issues, *Guideline is interim

Appendix C10 McLoughlin Point IDZ Results - 5 Sampling Events in 30 Days – Boron

Boron	BC Approved WQG = 1.2 mg/L (max) for the protection of aquatic life					
Winter						
Station 1	Top	3.1	2.9	3.08	3.53	4.05
	Middle	3.36	2.7	3.02	3.5	4.06
	Bottom	3.2	2.69	3.08	3.54	4.1
Station 2	Top	3.37	3.36	3.42	3.54	4.06
	Middle	3.21	2.99	3.25	3.53	4.06
	Bottom	3.13	3.01	3.19	3.96	3.92
Station 3	Top	3.04	3.05	3.02	3.73	4.02
	Middle	3.09	2.92	3.18	3.81	4.52
	Bottom	3.04	3.00	3.07	3.67	4.8
Station 4	Top	3.27	2.87	3.22	3.83	4.67
	Middle	3.06	2.93	3.22	3.84	4.57
	Bottom	3.07	2.82	3.24	3.93	4.88
Ref-CB	Top	3.01	3.02	3.05	3.25	3.89
	Middle	2.99	2.99	3.24	3.35	3.96
	Bottom	3.64	3.24	3.55	3.38	3.98
Ref-PB	Top	3.35	2.92	3.16	3.64	3.95
	Middle	3.26	2.98	3.21	3.76	4.01
	Bottom	3.19	3.01	3.16	3.5	4.1
Spring						
Station 1	Top	3.68	3.79	3.79	3.68	3.74
	Middle	3.66	3.85	4.08	3.87	3.67
	Bottom	3.95	3.7	3.88	3.82	3.7
Station 2	Top	3.65	3.79	3.92	3.66	3.56
	Middle	3.79	3.72	4.09	3.71	3.58
	Bottom	3.75	3.73	3.79	3.73	4.15
Station 3	Top	3.57	3.85	3.9	3.65	4.18
	Middle	3.58	3.8	3.86	3.56	4.18
	Bottom	3.93	3.66	3.93	3.68	4.02
Station 4	Top	3.64	3.68	3.78	3.56	4.11
	Middle	3.55	3.8	3.92	3.57	4.17
	Bottom	3.57	3.81	3.79	3.79	4.04
Ref-CB	Top	3.95	3.88	3.56	3.93	3.66
	Middle	3.7	3.86	3.62	3.8	3.65
	Bottom	3.56	3.7	3.67	3.89	3.66
Ref-PB	Top	3.78	3.73	3.75	---	3.59
	Middle	3.69	3.78	3.91	---	3.6
	Bottom	3.69	3.86	3.92	---	3.7
Summer						
Station 1	Top	4.28	4.08	4.02	3.92	3.53
	Middle	4.16	3.99	4.01	3.74	3.63
	Bottom	4.22	3.89	4.02	3.69	4.41
Station 2	Top	4.15	3.89	4.2	3.56	4.37
	Middle	4.08	4.13	3.95	3.57	4.32
	Bottom	4.39	4.13	3.93	3.5	4.06
Station 3	Top	4.12	4.13	4.04	3.62	4.4
	Middle	4.24	4.21	4.04	3.67	4.73
	Bottom	4.26	4.25	4.02	3.58	4.57

Appendix C10, cont'd

Boron	BC Approved WQG = 1.2 mg/L (max) for the protection of aquatic life					
Station 4	Top	4.35	4.44	3.75	3.56	4.5
	Middle	4.19	4.18	3.85	3.65	4.55
	Bottom	4.23	4.34	4.2	3.63	4.49
Ref-CB	Top	4.18	4.08	4.17	3.8	3.61
	Middle	4.5	4.39	4.23	4.02	3.57
	Bottom	4.68	4.46	4.19	3.93	3.55
Ref-PB	Top	4.48	4.24	4.3	3.64	3.77
	Middle	4.59	4.03	3.88	3.58	3.64
	Bottom	4.52	4.1	4.03	3.54	3.68
Autumn						
Station 1	Top	2.9	3.27	3.28	4.1	3.13
	Middle	2.86	3.34	2.99	4.29	3.11
	Bottom	3.36	3.36	2.99	4.05	3.52
Station 2	Top	3.1	3.2	3.02	4.14	3.21
	Middle	3.03	3.48	3.01	4.03	3.1
	Bottom	3.02	3.39	2.91	3.88	3.12
Station 3	Top	2.91	3.3	3.28	3.8	3.04
	Middle	3.01	3.32	3.05	3.68	3.18
	Bottom	3.04	3.37	3.16	3.42	3.19
Station 4	Top	2.99	3.35	3.08	3.4	3.11
	Middle	3	3.27	3.11	3.34	3.25
	Bottom	2.99	3.31	3.17	3.4	3.47
Ref-CB	Top	3.43	2.9	3.22	3.03	3.28
	Middle	3.02	2.91	3.22	3.13	3.4
	Bottom	3.33	3.34	3.18	3.18	3.25
Ref-PB	Top	3.13	3.22	3.22	3.08	3.19
	Middle	2.9	3.32	3.63	3.01	3.19
	Bottom	2.95	3.24	3.06	2.94	3.25

Notes: Shaded cells indicate exceedance to BC WQG for protection of marine aquatic life, --- not sampled due to weather issues. Note that the BC WQG is above background levels for boron in this area which are around 4.0 mg/L

Appendix C11 McLoughlin Point IDZ Results - 5 Sampling Events in 30 Days – Cadmium

Cadmium	BC Working WQG = 0.00012 mg/L (max) to protect of consumers of shellfish					
Winter						
Station 1	Top	0.000078	0.00008	0.000072	0.000076	0.000081
	Middle	0.000073	0.000072	0.000067	0.000076	0.000063
	Bottom	0.000075	0.00008	0.000079	0.000083	0.00007
Station 2	Top	0.000081	0.000076	0.000082	0.000086	0.000069
	Middle	0.000085	0.000084	0.00008	0.000084	0.000066
	Bottom	0.000058	0.000069	0.000069	0.000076	0.000065
Station 3	Top	0.000068	0.000085	0.000084	0.000076	0.000066
	Middle	0.000079	0.000073	0.000077	0.000071	0.000065
	Bottom	0.000074	0.000078	0.00008	0.000063	0.000068
Station 4	Top	0.000073	0.000072	0.000086	0.000072	0.000067
	Middle	0.00009	0.000076	0.000086	0.000074	0.000068
	Bottom	0.00012	0.000077	0.000081	0.000074	0.000074
Ref-CB	Top	0.000076	0.000078	0.000076	0.000074	0.000078
	Middle	0.000078	0.000077	0.000078	0.000076	0.000068
	Bottom	0.00007	0.000078	0.000076	0.000066	0.000065
Ref-PB	Top	0.000074	0.00009	0.000082	0.000066	0.000067
	Middle	0.000068	0.000091	0.000073	0.000079	0.000067
	Bottom	0.000072	0.000072	0.000083	0.000071	0.000063
Spring						
Station 1	Top	0.000102	0.000081	0.000095	0.000077	0.00009
	Middle	0.000082	0.000097	0.000089	0.000088	0.000092
	Bottom	0.000083	0.000085	0.000094	0.000087	0.000094
Station 2	Top	0.000085	0.000094	0.000085	0.000078	0.000094
	Middle	0.000083	0.000088	0.00009	0.000091	0.000071
	Bottom	0.000087	0.000074	0.00009	0.000088	0.000089
Station 3	Top	0.000085	0.000085	0.00009	0.000094	0.000075
	Middle	0.000082	0.000087	0.000077	0.000093	0.00009
	Bottom	0.000086	0.000101	0.000078	0.000082	0.000088
Station 4	Top	0.000081	0.00008	0.000073	0.000083	0.000083
	Middle	0.000092	0.000073	0.000074	0.000087	0.000088
	Bottom	0.000087	0.000101	0.000075	0.000095	0.000094
Ref-CB	Top	0.000088	0.000094	0.000108	0.00009	0.000112
	Middle	0.000082	0.000087	0.00009	0.000085	0.000099
	Bottom	0.000089	0.00008	0.000084	0.000095	0.000098
Ref-PB	Top	0.000088	0.000087	0.000088	---	0.000088
	Middle	0.000075	0.000082	0.000079	---	0.000089
	Bottom	0.000087	0.000089	0.000084	---	0.000086
Summer						
Station 1	Top	0.000077	0.000082	0.000079	0.000088	0.00008
	Middle	0.000082	0.000088	0.000082	0.000075	0.000085
	Bottom	0.000077	0.000085	0.000084	0.000078	0.00008
Station 2	Top	0.000081	0.000079	0.000087	0.000077	0.000087
	Middle	0.00008	0.000081	0.000094	0.000079	0.000082
	Bottom	0.00008	0.000076	0.000088	0.000076	0.000081
Station 3	Top	0.000089	0.000072	0.000075	0.00009	0.000087
	Middle	0.000085	0.000081	0.000094	0.000074	0.000088
	Bottom	0.000086	0.000081	0.000081	0.000088	0.000083

Appendix C11, cont'd

Cadmium	BC Working WQG = 0.00012 mg/L (max) to protect of consumers of shellfish					
Station 4	Top	0.000079	0.000086	0.000089	0.000083	0.000079
	Middle	0.000088	0.000073	0.000088	0.000087	0.000079
	Bottom	0.000082	0.000082	0.000088	0.000081	0.000085
Ref-CB	Top	0.00009	0.000086	0.000078	0.000078	0.000087
	Middle	0.00008	0.000079	0.000083	0.000076	0.000081
	Bottom	0.000084	0.000089	0.000081	0.000079	0.000089
Ref-PB	Top	0.00008	0.000077	0.000084	0.00008	0.00008
	Middle	0.000083	0.00009	0.000078	0.000076	0.000084
	Bottom	0.000078	0.000077	0.000087	0.000079	0.000077
Autumn						
Station 1	Top	0.000077	0.000094	0.000069	0.000082	0.000074
	Middle	0.000093	0.00009	0.00008	0.000075	0.000074
	Bottom	0.000077	0.000092	0.00007	0.000086	0.000072
Station 2	Top	0.000093	0.000082	0.000084	0.000084	0.000077
	Middle	0.000091	0.000079	0.000079	0.000079	0.000076
	Bottom	0.000095	0.000088	0.00007	0.000085	0.000068
Station 3	Top	0.000082	0.000086	0.000081	0.000085	0.000086
	Middle	0.000088	0.000098	0.000085	0.00008	0.00008
	Bottom	0.000087	0.000085	0.000085	0.000067	0.000072
Station 4	Top	0.000086	0.000087	0.000087	0.00008	0.000076
	Middle	0.000094	0.000092	0.000082	0.000087	0.00009
	Bottom	0.000083	0.00009	0.000076	0.000073	0.000073
Ref-CB	Top	0.000091	0.000095	0.000086	0.000089	0.000081
	Middle	0.000095	0.000092	0.000083	0.000077	0.000096
	Bottom	0.000084	0.000078	0.000077	0.000077	0.000076
Ref-PB	Top	0.000091	0.000083	0.000072	0.000079	0.000075
	Middle	0.000078	0.000088	0.000074	0.000082	0.00008
	Bottom	0.000086	0.000086	0.000085	0.000079	0.000078

Notes: Shaded cells indicate exceedance to BC WQG, --- not sampled due to weather issues

Appendix C12 McLoughlin Point IDZ Results - 5 Sampling Events in 30 Days – Copper

Copper	BC Approved WQG= 0.002 mg/L (average over 5 samples) or 0.003 mg/L (max)						
			Winter				Average
Station 1	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 2	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 3	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 4	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Ref-CB	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Ref-PB	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
			Spring				Average
Station 1	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 2	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 3	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 4	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Ref-CB	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	0.00087	<0.0005	<0.0005	<0.0005	<0.0005	0.0006
	Bottom	<0.0005	0.00060	<0.0005	<0.0005	<0.0005	0.0005
Ref-PB	Top	<0.0005	<0.0005	<0.0005	---	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	---	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	---	<0.0005	<0.0005
			Summer				Average
Station 1	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 2	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 3	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Copper	BC Approved WQG= 0.002 mg/L (average over 5 samples) or 0.003 mg/L (max)						
Station 4	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Ref-CB	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Ref-PB	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Autumn							**Average**
Station 1	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	0.00052	0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 2	Top	0.00238	<0.0005	0.0024	<0.0005	<0.0005	0.0009
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	0.00087	0.0005
Station 3	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 4	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Ref-CB	Top	<0.0005	<0.0005	0.00052	<0.0005	<0.0005	0.0005
	Middle	<0.0005	<0.0005	0.00106	<0.0005	<0.0005	0.0006
	Bottom	<0.0005	<0.0005	0.00065	<0.0005	<0.0005	0.0005
Ref-PB	Top	<0.0005	0.00076	<0.0005	<0.0005	<0.0005	0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Notes: Shaded cells indicate exceedance to BC WQG, --- not sampled due to weather issues, Detection limit was used in calculations of average values.

Appendix C13 McLoughlin Point IDZ Results - 5 Sampling Events in 30 Days – Lead

Lead	BC Approved WQG = 0.002 mg/L (average of 5 samples) or 0.140 mg/L (max)						
		Winter					Average
Station 1	Top	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Middle	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Bottom	<0.00005	<0.00005	<0.00005	0.000055	<0.00005	0.000411
Station 2	Top	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Middle	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Bottom	<0.00005	<0.00005	<0.00005	<0.00005	0.000081	0.000416
Station 3	Top	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Middle	<0.00005	<0.00005	<0.00005	0.00013	<0.00005	0.000426
	Bottom	<0.00005	<0.00005	<0.00005	<0.00005	0.000054	0.000411
Station 4	Top	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Middle	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Bottom	0.000066	<0.00005	<0.00005	<0.00005	0.000051	0.0003234
Ref-CB	Top	<0.00005	<0.00005	0.000176	<0.00005	<0.00005	0.0005
	Middle	<0.00005	<0.00005	0.000085	0.00200	<0.00005	0.000417
	Bottom	<0.00005	0.000084	<0.00005	0.000201	<0.00005	0.000357
Ref-PB	Top	<0.00005	<0.00005	0.000218	<0.00005	0.000057	0.000355
	Middle	<0.00005	<0.00005	0.000146	0.00037	0.000053	0.0003138
	Bottom	<0.00005	<0.00005	0.000116	<0.00005	0.000077	0.000339
		Spring					Average
Station 1	Top	<0.00005	<0.00005	<0.00005	0.000075	<0.00005	0.000342
	Middle	0.000055	0.000061	<0.00005	0.000060	0.000050	0.000087
	Bottom	0.00005	0.000050	<0.00005	0.000056	<0.00005	0.000128
Station 2	Top	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Middle	<0.00005	0.000055	<0.00005	<0.00005	<0.00005	0.000411
	Bottom	0.000057	0.000058	<0.00005	0.000066	0.000056	0.000147
Station 3	Top	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Middle	<0.00005	0.000052	<0.00005	0.000057	<0.00005	0.000322
	Bottom	0.000052	<0.00005	<0.00005	0.000053	<0.00005	0.000321
Station 4	Top	<0.00005	<0.00005	0.00007	<0.00005	0.000063	0.000326
	Middle	<0.00005	<0.00005	<0.00005	0.000067	<0.00005	0.000413
	Bottom	0.000054	<0.00005	<0.00005	0.000073	<0.00005	0.000325
Ref-CB	Top	0.000058	0.00007	0.000064	0.000095	0.000063	0.000157
	Middle	0.00033	<0.00005	<0.00005	0.000106	0.000089	0.000305
	Bottom	<0.00005	0.000060	0.000056	0.000217	0.000062	0.000179
Ref-PB	Top	0.000055	<0.00005	<0.00005	---	<0.00005	0.000411
	Middle	0.000064	<0.00005	<0.00005	---	<0.00005	0.000413
	Bottom	<0.00005	0.00028	<0.00005	---	<0.00005	0.000457
		Summer					Average
Station 1	Top	<0.00005	<0.00005	<0.00005	<0.00005	0.00006	0.000411
	Middle	0.00009	<0.00005	<0.00005	<0.00005	0.00007	0.000332
	Bottom	0.00023	0.00006	<0.00005	0.00005	<0.00005	0.000266
Station 2	Top	0.00008	<0.00005	0.00009	0.00007	<0.00005	0.000248
	Middle	<0.00005	0.00007	0.00008	0.00006	0.00006	0.000152
	Bottom	0.00007	0.00006	<0.00005	0.00006	0.00005	0.000149
Station 3	Top	<0.00005	<0.00005	0.00006	0.00006	<0.00005	0.000323
	Middle	0.00009	<0.00005	0.00006	<0.00005	<0.00005	0.000329
	Bottom	0.00011	0.00005	0.00005	0.00006	0.00007	0.000070

Appendix C13, cont'd

Lead	BC Approved WQG = 0.002 mg/L (average of 5 samples) or 0.140 mg/L (max)						
Station 4	Top	0.00006	<0.00005	0.00005	<0.00005	0.00006	0.000233
	Middle	0.00010	<0.00005	0.00005	0.00005	<0.00005	0.000241
	Bottom	0.00007	0.00006	0.00006	0.00012	<0.00005	0.000160
Ref-CB	Top	0.00006	<0.00005	<0.00005	0.00006	<0.00005	0.000322
	Middle	0.00008	<0.00005	<0.00005	0.00008	0.00007	0.000247
	Bottom	0.00006	0.00006	0.00011	0.00008	0.00012	0.000085
Ref-PB	Top	0.00006	<0.00005	<0.00005	0.00006	0.00012	0.000248
	Middle	0.00006	<0.00005	0.00006	0.00005	0.00005	0.000145
	Bottom	0.00006	0.00006	0.00007	<0.00005	0.00008	0.000153
Autumn							**Average**
Station 1	Top	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Middle	0.00005	<0.00005	<0.00005	<0.00005	0.00007	0.000324
	Bottom	0.00008	<0.00005	<0.00005	0.00006	0.00007	0.000327
Station 2	Top	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.000410
	Middle	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Bottom	<0.00005	<0.00005	<0.00005	0.00005	0.00009	0.000328
Station 3	Top	<0.00005	0.00013	<0.00005	<0.00005	<0.00005	0.000427
	Middle	0.00009	<0.00005	0.00007	0.00005	0.00006	0.000154
	Bottom	0.00005	<0.00005	0.00006	<0.00005	0.00006	0.000234
Station 4	Top	0.00006	<0.00005	<0.00005	<0.00005	<0.00005	0.000411
	Middle	0.00006	<0.00005	<0.00005	<0.00005	0.00007	0.000326
	Bottom	0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.000321
Ref-CB	Top	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Middle	0.00008	<0.00005	0.00008	<0.00005	0.00006	0.000243
	Bottom	0.00007	0.00005	<0.00005	<0.00005	<0.00005	0.000324
Ref-PB	Top	0.00006	<0.00005	<0.00005	<0.00005	<0.00005	0.000412
	Middle	<0.00005	<0.00005	<0.00005	<0.00005	0.00006	0.000412
	Bottom	<0.00005	<0.00005	<0.00005	0.00006	0.00010	0.000331

Notes: Shaded cells indicate exceedance to BC WQG, --- not sampled due to weather issues, Detection limit was used in calculations of average values.

Appendix C14 McLoughlin Point IDZ Results - 5 Sampling Events in 30 Days – Manganese

Manganese	BC Approved WQG = 0.1 mg/L (max)					
Winter						
Station 1	Top	0.00226	0.00199	0.00184	0.0019	0.00187
	Middle	0.00232	0.00174	0.00203	0.00211	0.00184
	Bottom	0.00237	0.00221	0.00219	0.00183	0.0026
Station 2	Top	0.0021	0.00186	0.00203	0.00205	0.00186
	Middle	0.00246	0.00196	0.00205	0.00201	0.00216
	Bottom	0.00275	0.00194	0.00227	0.00221	0.00278
Station 3	Top	0.00222	0.00227	0.00207	0.00199	0.00175
	Middle	0.00232	0.00206	0.00223	0.00232	0.00227
	Bottom	0.00251	0.00197	0.00252	0.00217	0.00267
Station 4	Top	0.00214	0.00192	0.00198	0.00204	0.00185
	Middle	0.00228	0.00213	0.00205	0.00224	0.00269
	Bottom	0.00273	0.00221	0.00264	0.00215	0.00283
Ref-CB	Top	0.0022	0.00194	0.00175	0.0022	0.00188
	Middle	0.00259	0.002	0.00311	0.00197	0.00191
	Bottom	0.00262	0.00424	0.0028	0.00175	0.00241
Ref-PB	Top	0.00226	0.00192	0.00217	0.00221	0.00134
	Middle	0.00256	0.00186	0.00346	0.00225	0.00187
	Bottom	0.00265	0.00292	0.00572	0.00197	0.00244
Spring						
Station 1	Top	0.00138	0.00151	0.00157	0.00147	0.00128
	Middle	0.00139	0.0016	0.00153	0.00177	0.00139
	Bottom	0.00142	0.00155	0.00153	0.00191	0.00134
Station 2	Top	0.00139	0.00147	0.00153	0.00148	0.00117
	Middle	0.00139	0.00156	0.0016	0.00168	0.00123
	Bottom	0.0016	0.00172	0.00156	0.00183	0.00156
Station 3	Top	0.00135	0.0015	0.0016	0.00151	0.00138
	Middle	0.00144	0.00149	0.00161	0.00153	0.00132
	Bottom	0.00151	0.00172	0.00163	0.00171	0.00143
Station 4	Top	0.00136	0.00148	0.00157	0.00164	0.00136
	Middle	0.00132	0.00141	0.0016	0.00203	0.00144
	Bottom	0.00136	0.00146	0.00156	0.00196	0.00143
Ref-CB	Top	0.00181	0.00234	0.00162	0.00325	0.00188
	Middle	0.00263	0.00139	0.00152	0.00358	0.00234
	Bottom	0.00154	0.00152	0.00164	0.00396	0.00186
Ref-PB	Top	0.00154	0.00145	0.00155	---	0.00125
	Middle	0.00153	0.00143	0.00156	---	0.00132
	Bottom	0.00133	0.00169	0.00158	---	0.00128
Summer						
Station 1	Top	0.00208	0.00228	0.00215	0.00255	0.00257
	Middle	0.00186	0.00232	0.00218	0.00265	0.003
	Bottom	0.00203	0.00248	0.00218	0.00281	0.00264
Station 2	Top	0.002	0.00238	0.00223	0.0026	0.00256
	Middle	0.00196	0.00233	0.00223	0.00294	0.00265
	Bottom	0.0023	0.00287	0.00215	0.00289	0.00244
Station 3	Top	0.00196	0.00247	0.00232	0.00253	0.00267
	Middle	0.00216	0.00268	0.00222	0.00256	0.00274
	Bottom	0.00221	0.00288	0.0024	0.00295	0.00529

Appendix C14, cont'd

Manganese	BC Approved WQG = 0.1 mg/L (max)					
Station 4	Top	0.00194	0.00216	0.00234	0.00253	0.00269
	Middle	0.00214	0.0023	0.00239	0.00298	0.00266
	Bottom	0.00217	0.003	0.00248	0.00306	0.00268
Ref-CB	Top	0.00212	0.00256	0.00237	0.00273	0.00259
	Middle	0.002	0.00227	0.00217	0.00286	0.00279
	Bottom	0.00218	0.00231	0.00304	0.00277	0.00337
Ref-PB	Top	0.00203	0.00227	0.00212	0.00254	0.00244
	Middle	0.00181	0.00221	0.00249	0.00256	0.00261
	Bottom	0.00193	0.00259	0.00236	0.00262	0.00328
Autumn						
Station 1	Top	0.00256	0.00254	0.00245	0.00242	0.00239
	Middle	0.00271	0.00271	0.00271	0.0029	0.00339
	Bottom	0.0028	0.00264	0.00263	0.0029	0.00309
Station 2	Top	0.0026	0.00255	0.00254	0.00255	0.00259
	Middle	0.00253	0.00286	0.00273	0.00277	0.00292
	Bottom	0.00272	0.00283	0.00287	0.00291	0.00282
Station 3	Top	0.00232	0.00262	0.00236	0.00254	0.00234
	Middle	0.00301	0.00292	0.00311	0.00269	0.00287
	Bottom	0.00276	0.00278	0.00297	0.00269	0.00266
Station 4	Top	0.0028	0.00259	0.00256	0.00243	0.00232
	Middle	0.00277	0.00258	0.00245	0.00255	0.00253
	Bottom	0.00264	0.00288	0.00274	0.00251	0.0025
Ref-CB	Top	0.00233	0.00275	0.00275	0.00227	0.0025
	Middle	0.00284	0.00272	0.00285	0.00246	0.00262
	Bottom	0.00275	0.00298	0.0029	0.00248	0.00255
Ref-PB	Top	0.00229	0.00241	0.00238	0.00234	0.00238
	Middle	0.00233	0.00256	0.0024	0.00254	0.00363
	Bottom	0.00232	0.00252	0.0025	0.00267	0.00375

Notes: Shaded cells indicate exceedance to BC WQG, --- not sampled due to weather issues

Appendix C15 McLoughlin Point IDZ Results - 5 Sampling Events in 30 Days – Nickel

Nickel		BC Working WQG = 0.0083 mg/L (max)				
Winter						
Station 1	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 2	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 3	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	0.00159	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 4	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Ref-CB	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Ref-PB	Top	<0.0005	<0.0005	<0.0005	0.00098	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Spring						
Station 1	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 2	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 3	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 4	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Ref-CB	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Ref-PB	Top	<0.0005	<0.0005	<0.0005	---	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	---	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	---	<0.0005
Summer						
Station 1	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	0.0006
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 2	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	0.0006	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 3	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	0.0005	0.0006

Appendix C15, cont'd

Nickel	BC Working WQG = 0.0083 mg/L (max)					
Station 4	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Ref-CB	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	0.0006
Ref-PB	Top	<0.0005	<0.0005	<0.0005	<0.0005	0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	0.0005
	Bottom	<0.0005	<0.0005	0.0006	<0.0005	<0.0005
Autumn						
Station 1	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 2	Top	0.0008	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 3	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 4	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Ref-CB	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Ref-PB	Top	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Middle	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bottom	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Notes: Shaded cells indicate exceedance to BC WQG, --- not sampled due to weather issues

Appendix C16 McLoughlin Point IDZ Results - 5 Sampling Events in 30 Days – Zinc

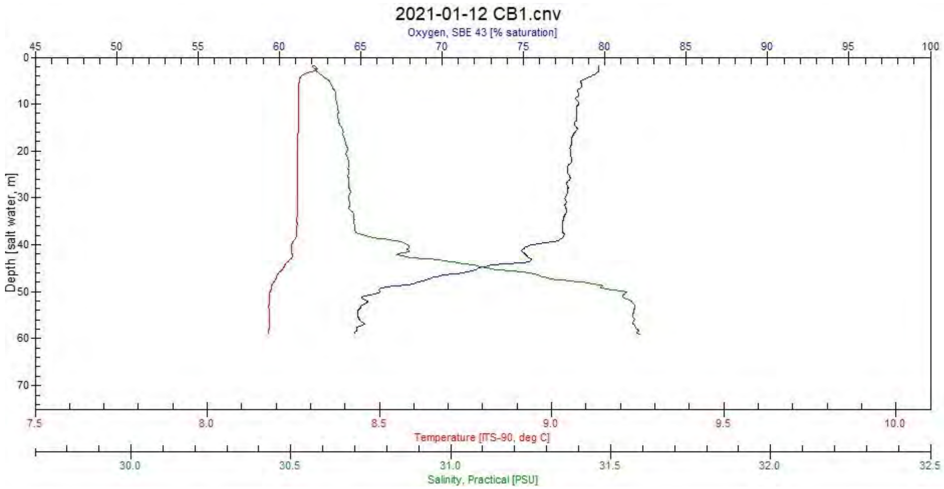
Zinc	BC Approved WQG = 0.01 mg/L (average of 5 samples)						
Winter							**Average**
Station 1	Top	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Middle	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Bottom	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Station 2	Top	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Middle	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Bottom	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Station 3	Top	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Middle	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Bottom	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Station 4	Top	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Middle	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Bottom	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Ref-CB	Top	<0.003	<0.003	<0.003	<0.003	0.0036	0.003
	Middle	<0.003	<0.003	<0.003	<0.003	0.0034	0.003
	Bottom	<0.003	<0.003	<0.003	<0.003	0.0047	0.004
Ref-PB	Top	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Middle	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Bottom	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Spring							**Average**
Station 1	Top	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Middle	0.0036	<0.003	<0.003	<0.003	<0.003	0.003
	Bottom	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Station 2	Top	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Middle	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Bottom	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Station 3	Top	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Middle	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Bottom	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Station 4	Top	0.005	<0.003	<0.003	<0.003	<0.003	0.004
	Middle	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Bottom	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Ref-CB	Top	<0.003	<0.003	<0.003	0.0043	<0.003	0.003
	Middle	0.0076	<0.003	<0.003	<0.003	<0.003	0.004
	Bottom	<0.003	0.007	<0.003	0.0035	<0.003	0.004
Ref-PB	Top	<0.003	<0.003	<0.003	---	<0.003	<0.003
	Middle	<0.003	<0.003	<0.003	---	<0.003	<0.003
	Bottom	<0.003	<0.003	<0.003	---	<0.003	<0.003
Summer							**Average**
Station 1	Top	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Middle	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Bottom	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Station 2	Top	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Middle	<0.003	0.0035	<0.003	<0.003	<0.003	0.003
	Bottom	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Station 3	Top	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Middle	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Bottom	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003

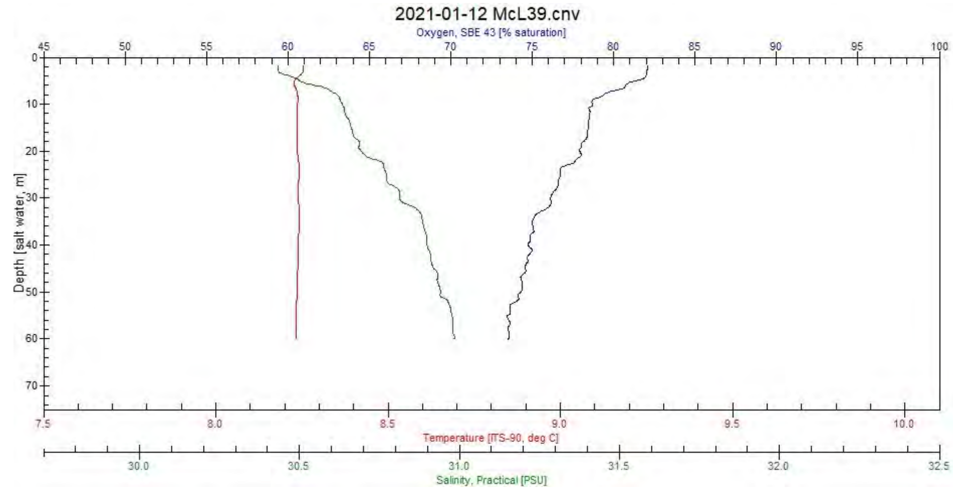
Appendix C16, cont'd

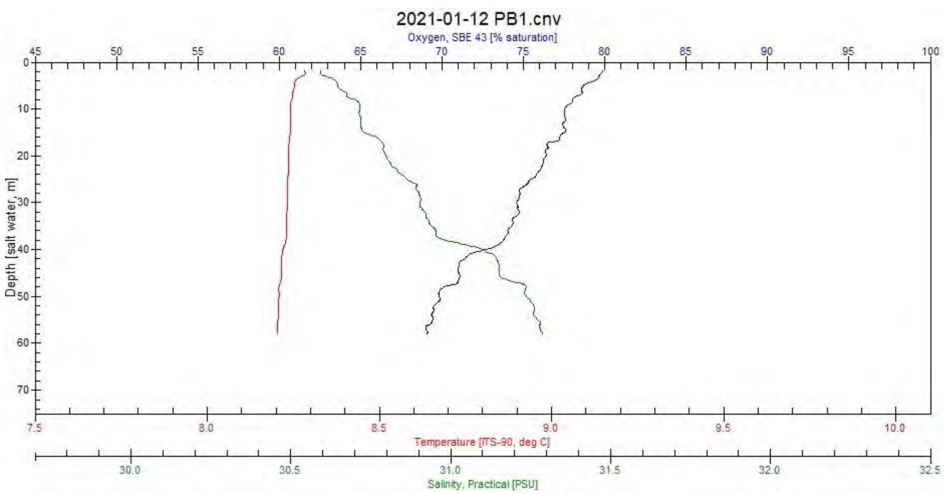
Zinc	BC Approved WQG = 0.01 mg/L (average of 5 samples)						
Station 4	Top	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Middle	<0.003	<0.003	0.0031	<0.003	<0.003	0.003
	Bottom	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Ref-CB	Top	0.0032	<0.003	<0.003	<0.003	<0.003	0.003
	Middle	<0.003	0.0050	0.0041	0.0037	<0.003	0.004
	Bottom	0.0036	<0.003	0.0038	<0.003	0.0032	0.003
Ref-PB	Top	<0.003	<0.003	<0.003	<0.003	0.0032	0.003
	Middle	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Bottom	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Autumn							**Average**
Station 1	Top	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Middle	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Bottom	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Station 2	Top	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Middle	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Bottom	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Station 3	Top	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Middle	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Bottom	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Station 4	Top	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Middle	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Bottom	<0.003	<0.003	<0.003	0.0049	<0.003	0.003
Ref-CB	Top	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Middle	0.0038	<0.003	<0.003	<0.003	<0.003	0.003
	Bottom	0.0036	<0.003	<0.003	0.0036	<0.003	0.003
Ref-PB	Top	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Middle	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Bottom	0.0032	<0.003	<0.003	<0.003	<0.003	0.003

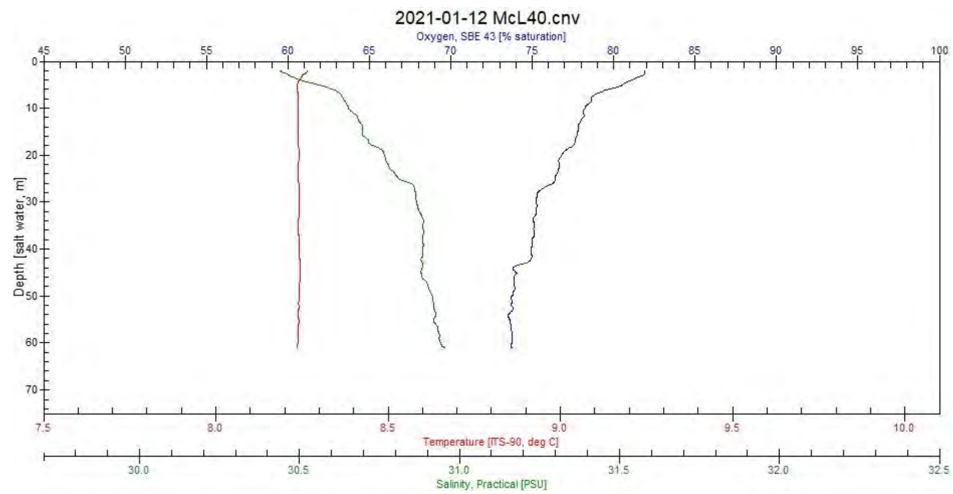
Notes: Shaded cells indicate exceedance to BC WQG, --- not sampled due to weather issues, Detection limit was used in calculations of average values.

Appendix C17 CTD Plots

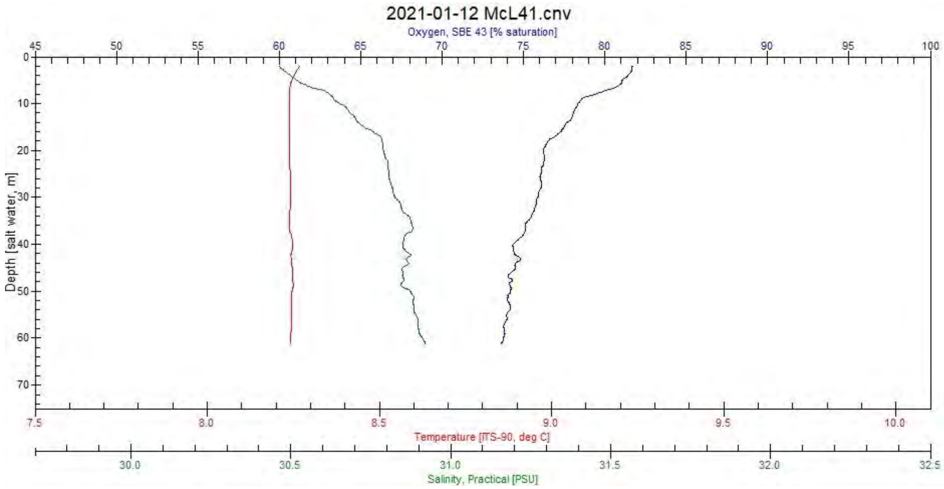


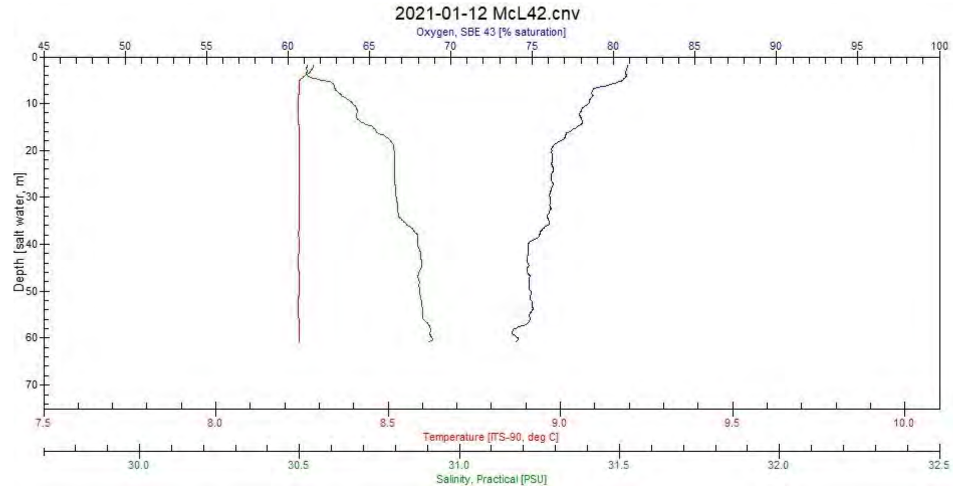


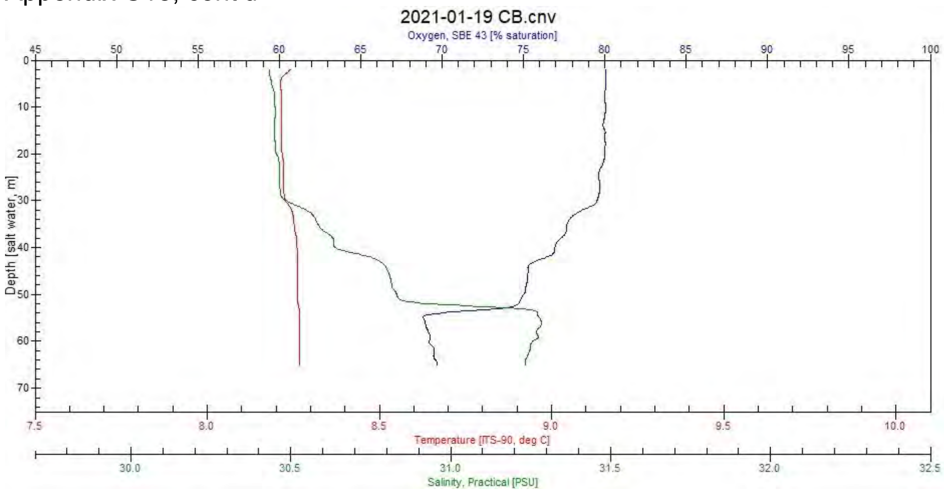


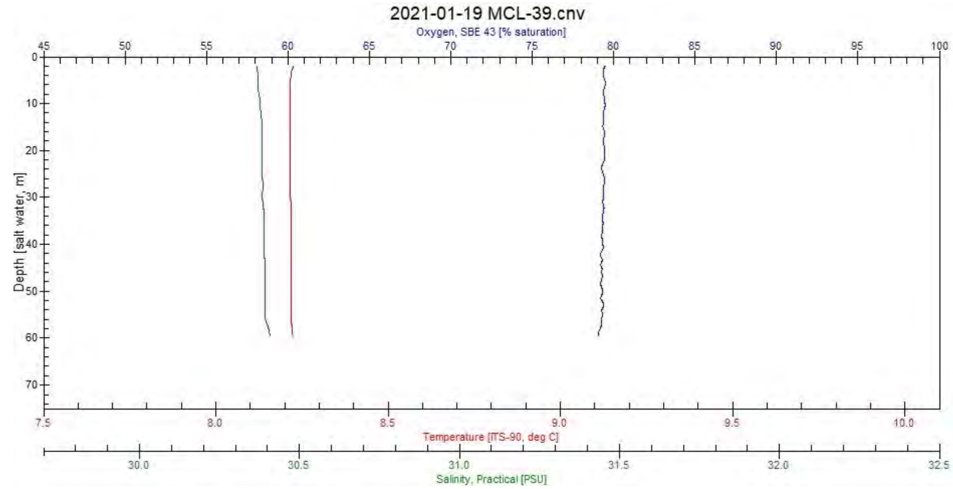


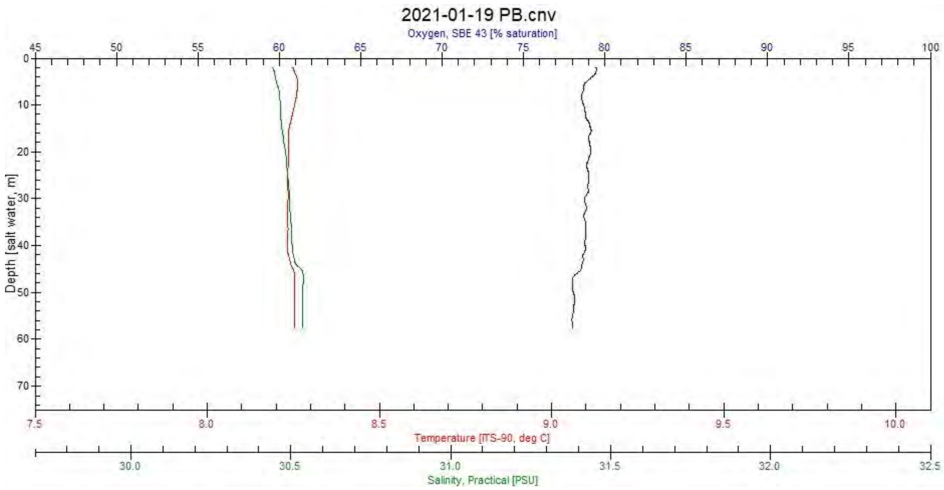
Appendix C18, cont'd

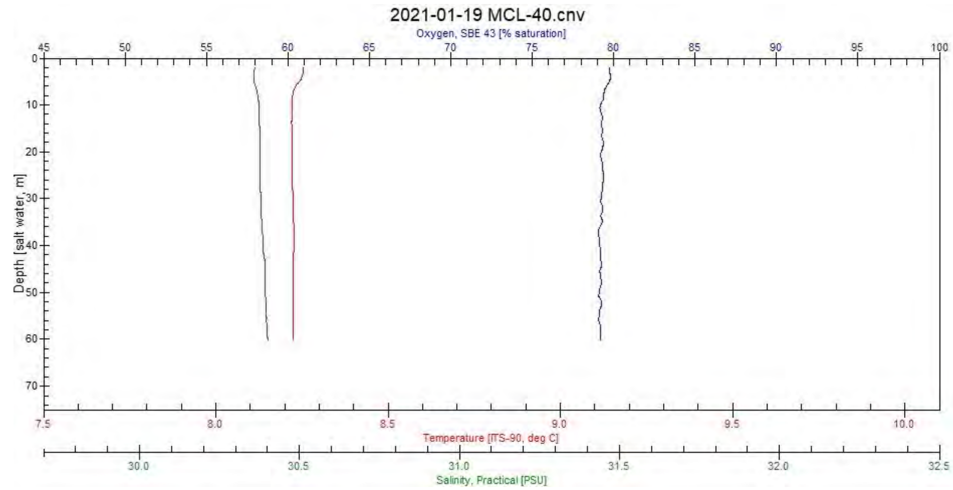




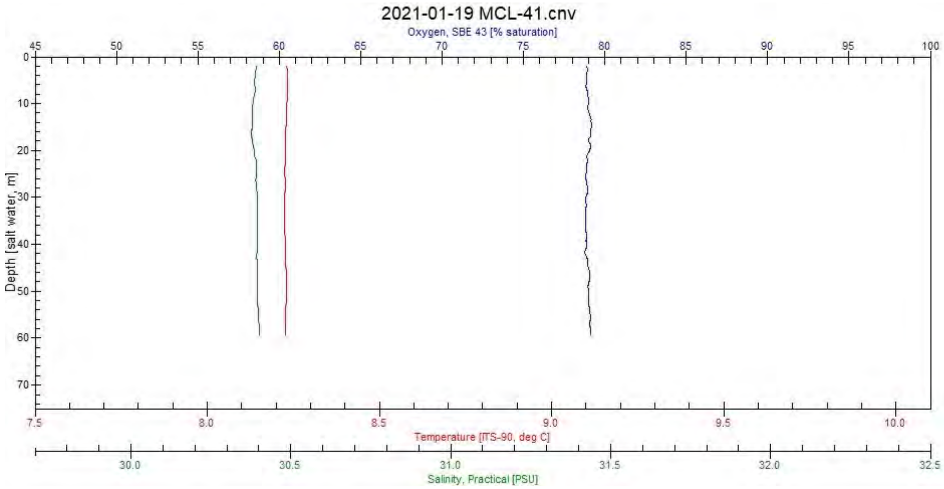

2021-01-19 CB.cnv
Oxygen, SBE 43 [% saturation]
45 50 55 60 65 70 75 80 85 90 95 100
Depth [salt water, m]
0 10 20 30 40 50 60 70
7.5 8.0 8.5 9.0 9.5 10.0
Temperature [ITS-90, deg C]
30.0 30.5 31.0 31.5 32.0 32.5
Salinity, Practical [PSU]

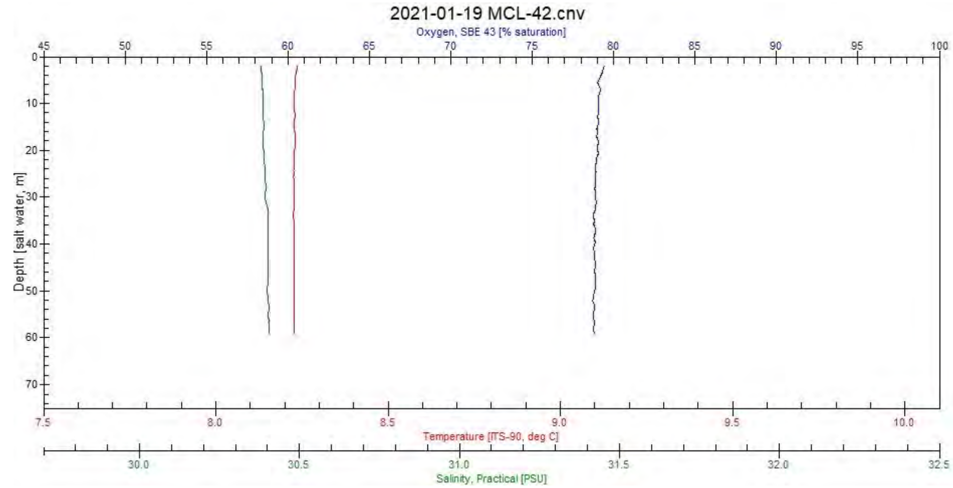

2021-01-19 MCL-39.cnv
Oxygen, SBE 43 [% saturation]
45 50 55 60 65 70 75 80 85 90 95 100
Depth [salt water, m]
0 10 20 30 40 50 60 70
7.5 8.0 8.5 9.0 9.5 10.0
Temperature [ITS-90, deg C]
30.0 30.5 31.0 31.5 32.0 32.5
Salinity, Practical [PSU]


2021-01-19 PB.cnv
Oxygen, SBE 43 [% saturation]
45 50 55 60 65 70 75 80 85 90 95 100
Depth [salt water, m]
0 10 20 30 40 50 60 70
7.5 8.0 8.5 9.0 9.5 10.0
Temperature [ITS-90, deg C]
30.0 30.5 31.0 31.5 32.0 32.5
Salinity, Practical [PSU]

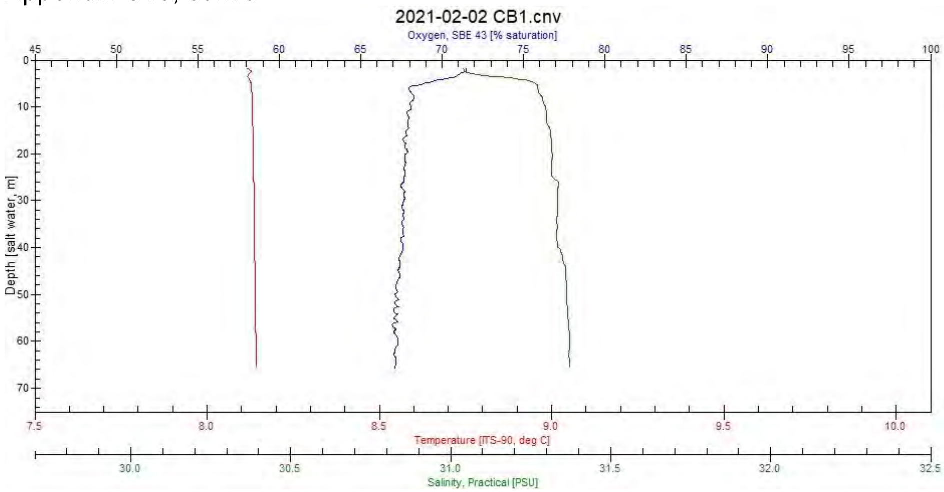

2021-01-19 MCL-40.cnv
Oxygen, SBE 43 [% saturation]
45 50 55 60 65 70 75 80 85 90 95 100
Depth [salt water, m]
0 10 20 30 40 50 60 70
7.5 8.0 8.5 9.0 9.5 10.0
Temperature [ITS-90, deg C]
30.0 30.5 31.0 31.5 32.0 32.5
Salinity, Practical [PSU]

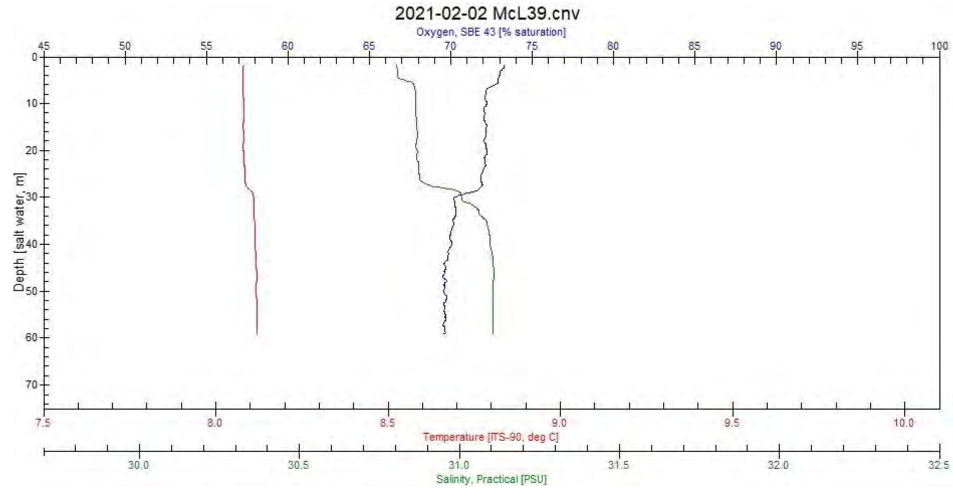
Appendix C18, cont'd

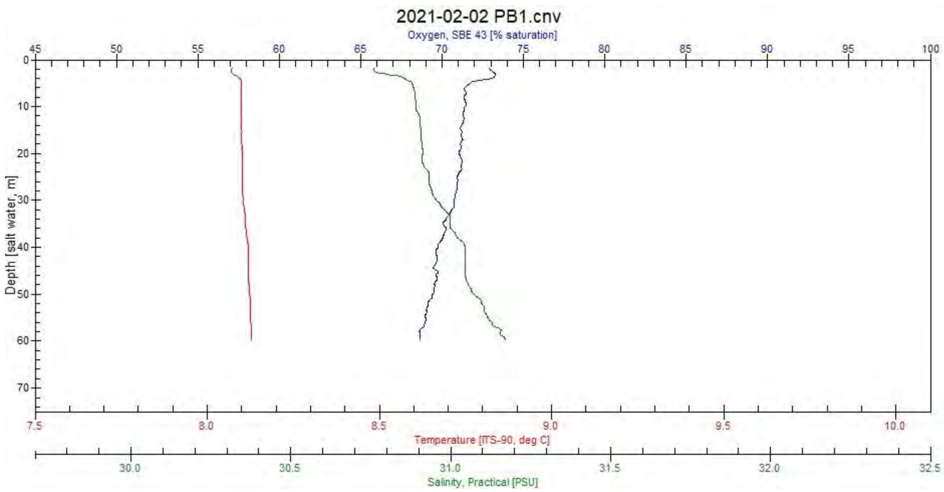


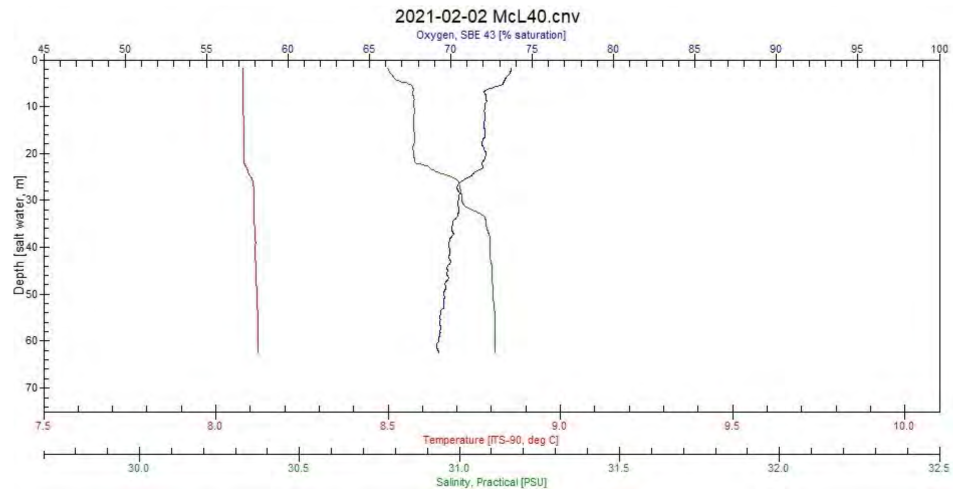


Appendix C18, cont'd



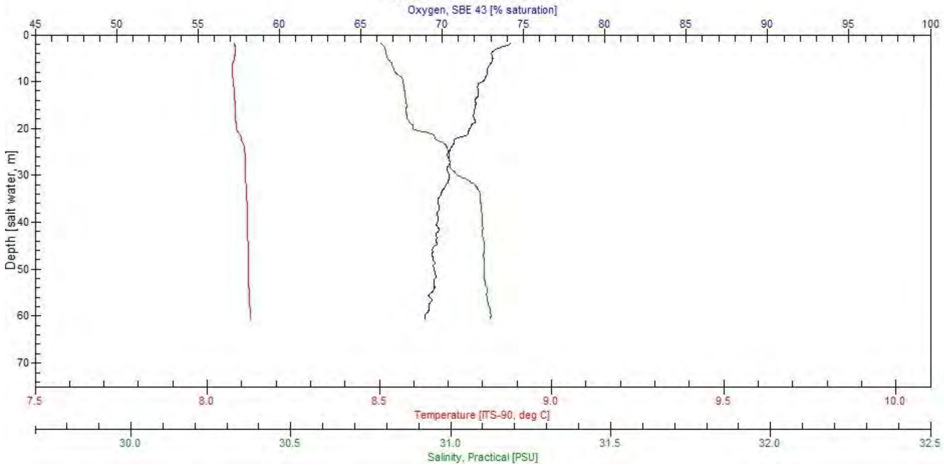




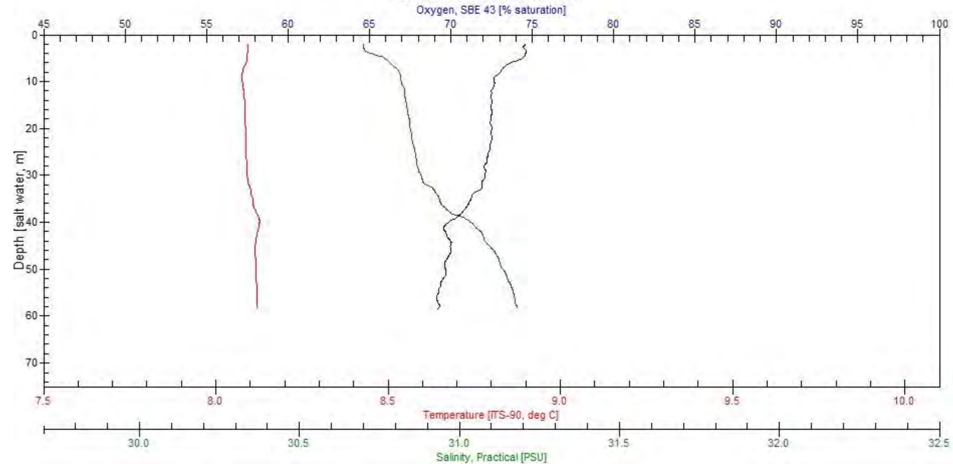


Appendix C18, cont'd

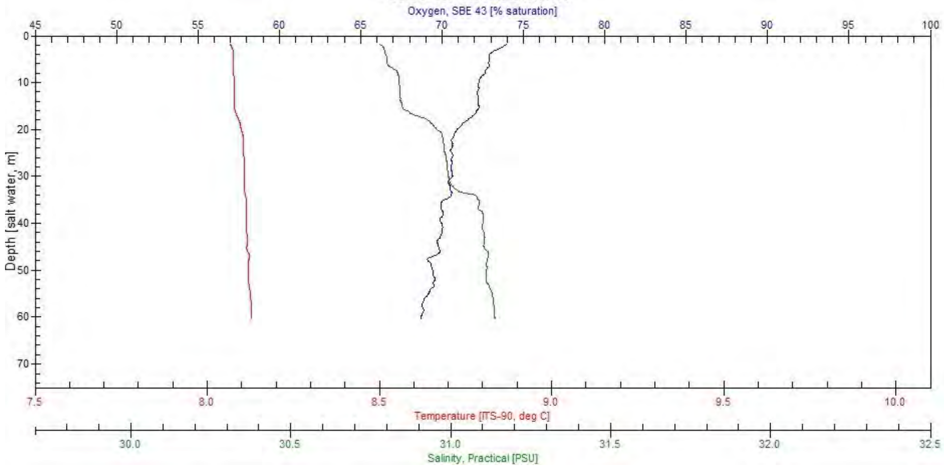
2021-02-02 McL41.cnv



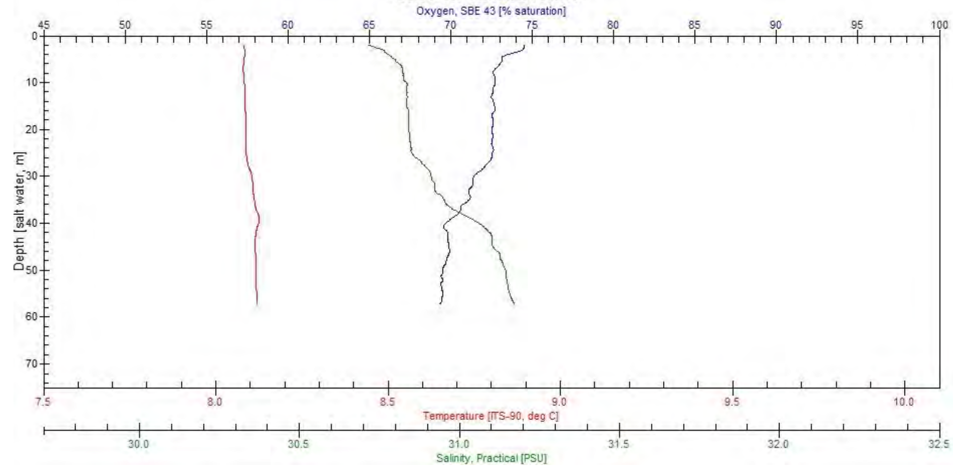
2021-02-02 McL47.cnv

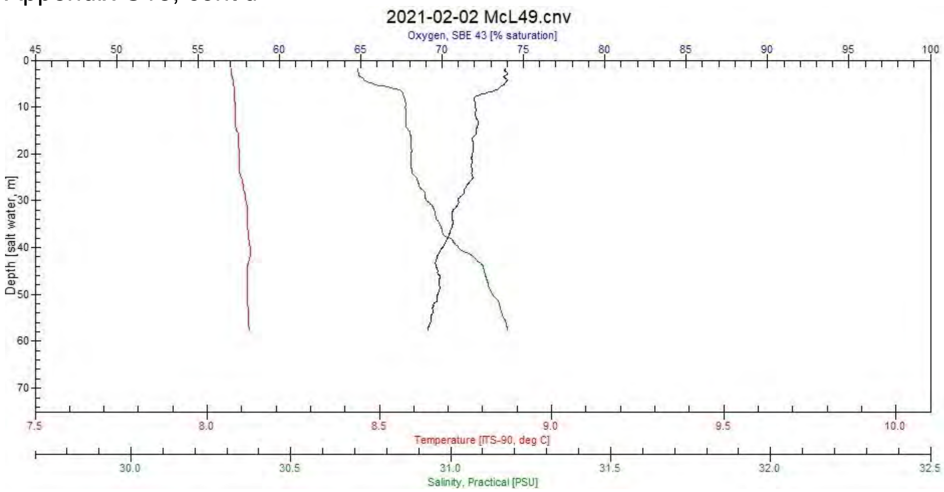


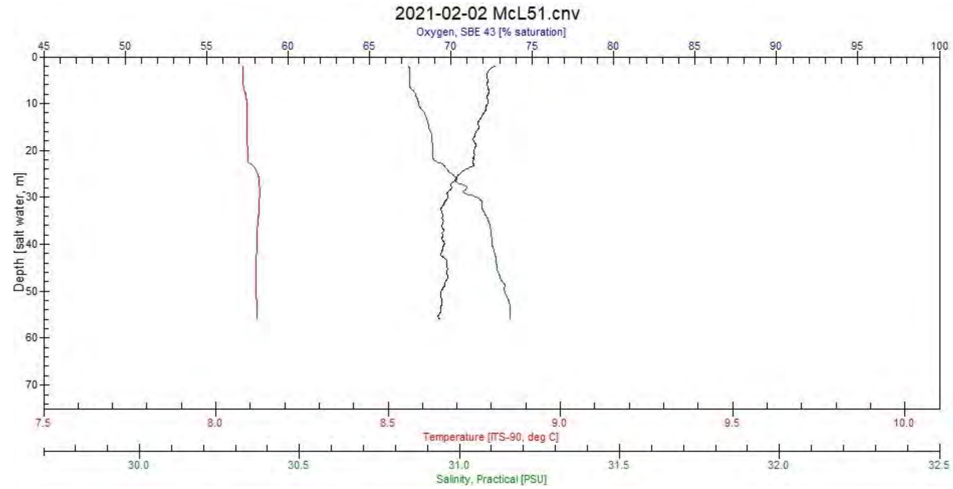
2021-02-02 McL42.cnv

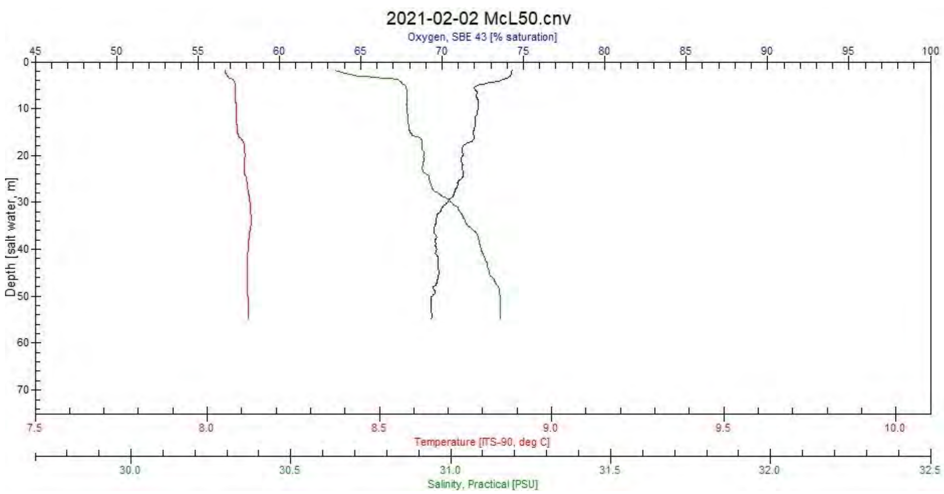


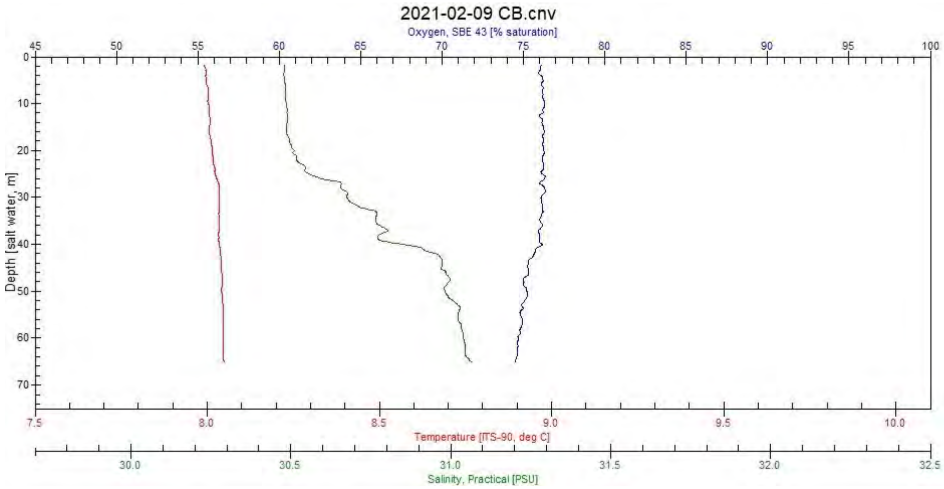
2021-02-02 McL48.cnv

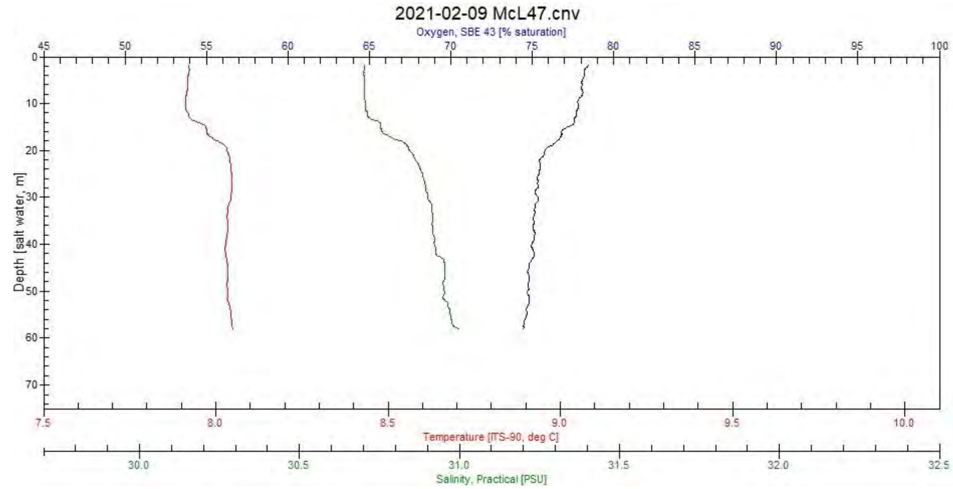


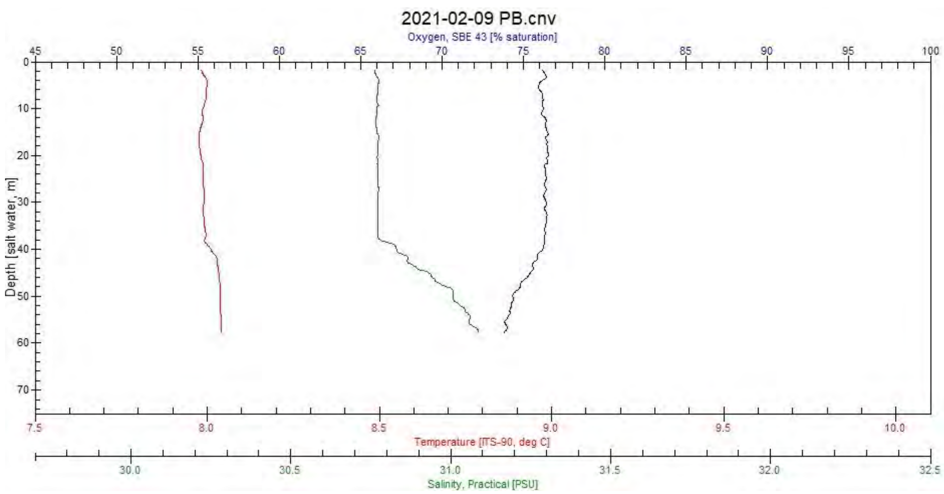

2021-02-02 McL49.cnv
Oxygen, SBE 43 [% saturation]
45 50 55 60 65 70 75 80 85 90 95 100
Depth [salt water, m]
0 10 20 30 40 50 60 70
7.5 8.0 8.5 9.0 9.5 10.0
Temperature [ITS-90, deg C]
30.0 30.5 31.0 31.5 32.0 32.5
Salinity, Practical [PSU]

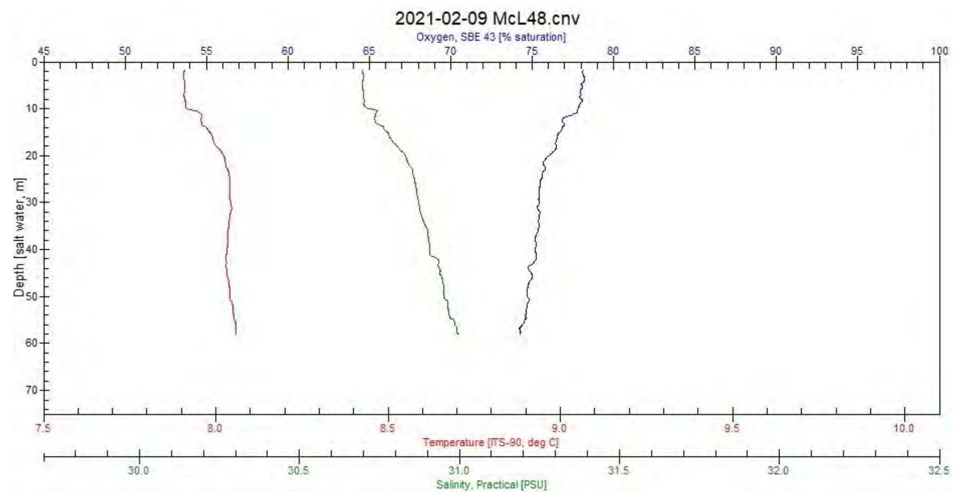

2021-02-02 McL51.cnv
Oxygen, SBE 43 [% saturation]
45 50 55 60 65 70 75 80 85 90 95 100
Depth [salt water, m]
0 10 20 30 40 50 60 70
7.5 8.0 8.5 9.0 9.5 10.0
Temperature [ITS-90, deg C]
30.0 30.5 31.0 31.5 32.0 32.5
Salinity, Practical [PSU]


2021-02-02 McL50.cnv
Oxygen, SBE 43 [% saturation]
45 50 55 60 65 70 75 80 85 90 95 100
Depth [salt water, m]
0 10 20 30 40 50 60 70
7.5 8.0 8.5 9.0 9.5 10.0
Temperature [ITS-90, deg C]
30.0 30.5 31.0 31.5 32.0 32.5
Salinity, Practical [PSU]

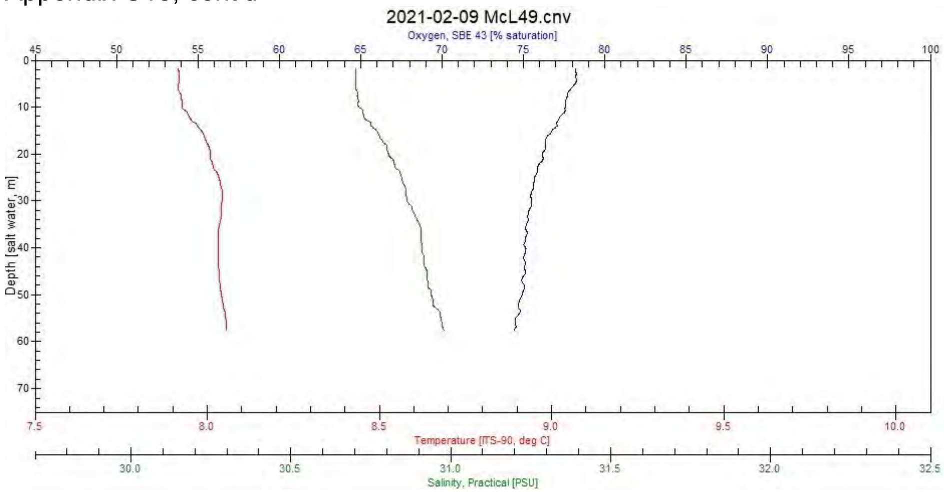

2021-02-09 CB.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]

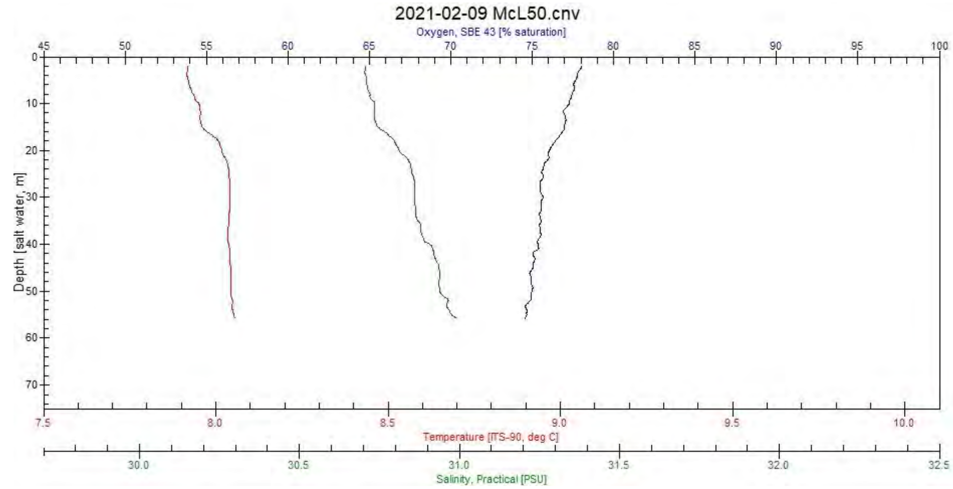

2021-02-09 McL47.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]

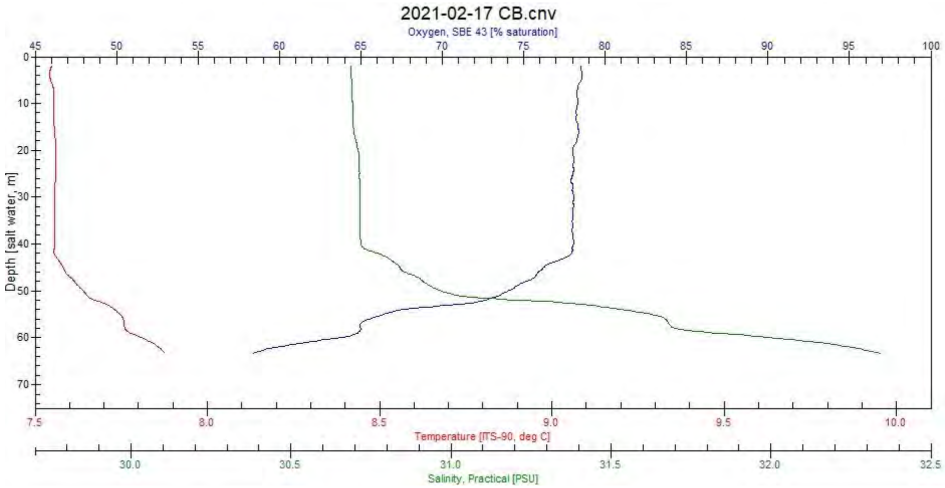

2021-02-09 PB.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]

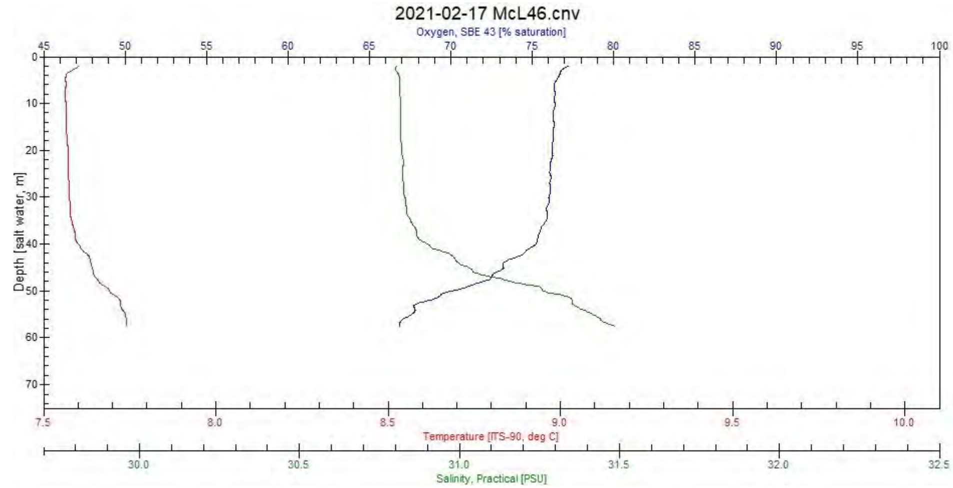

2021-02-09 McL48.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]

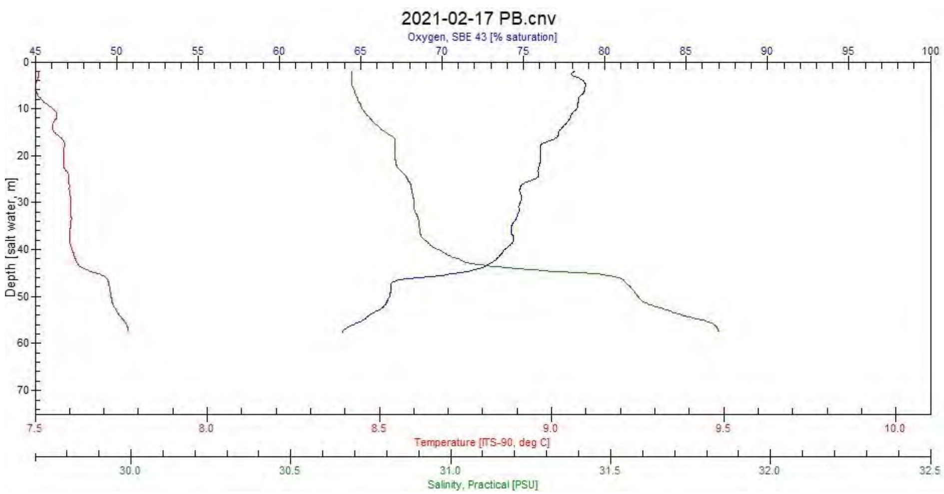
Appendix C18, cont'd

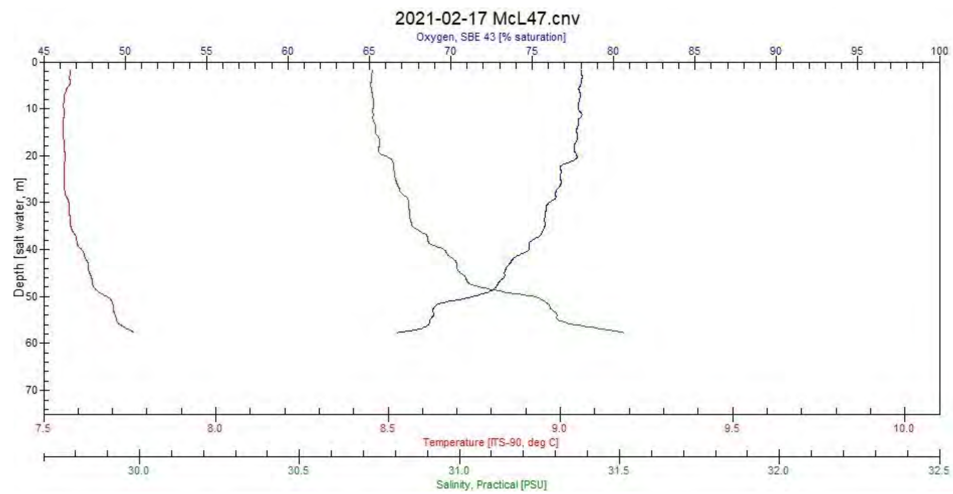




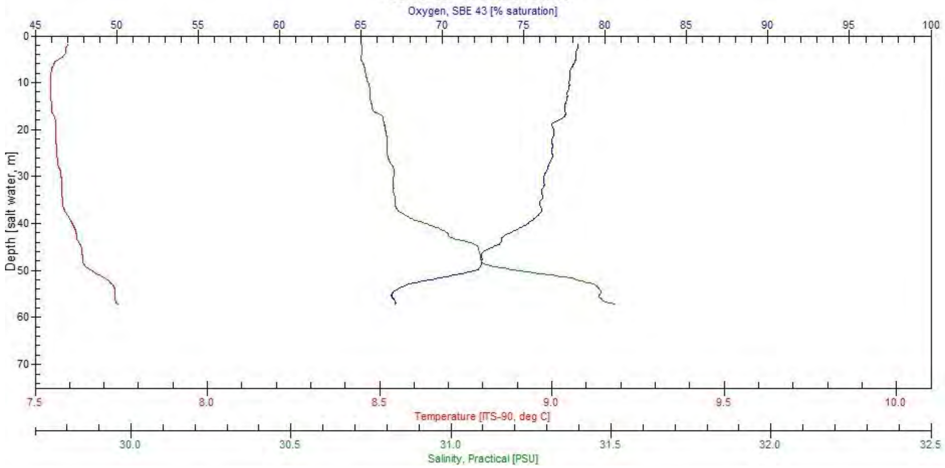

2021-02-17 CB.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]


2021-02-17 McL46.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]


2021-02-17 PB.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]


2021-02-17 McL47.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]

2021-02-17 McL48.cnv



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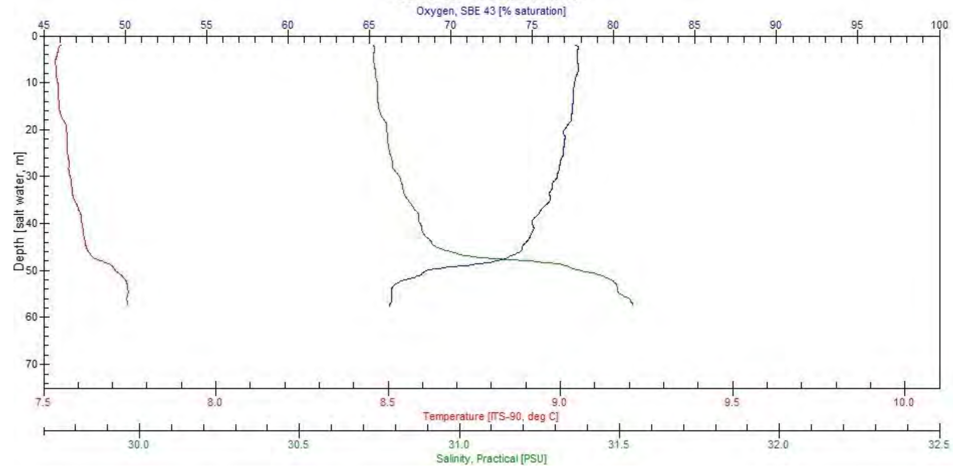
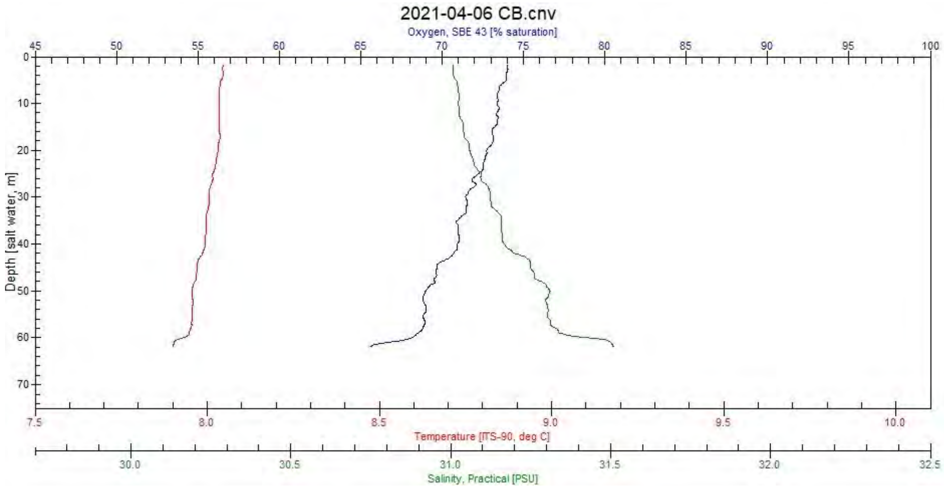
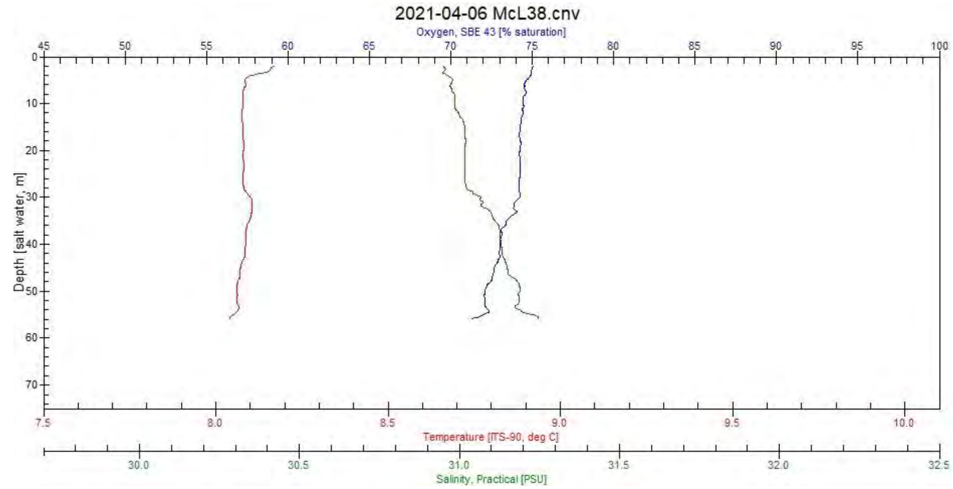
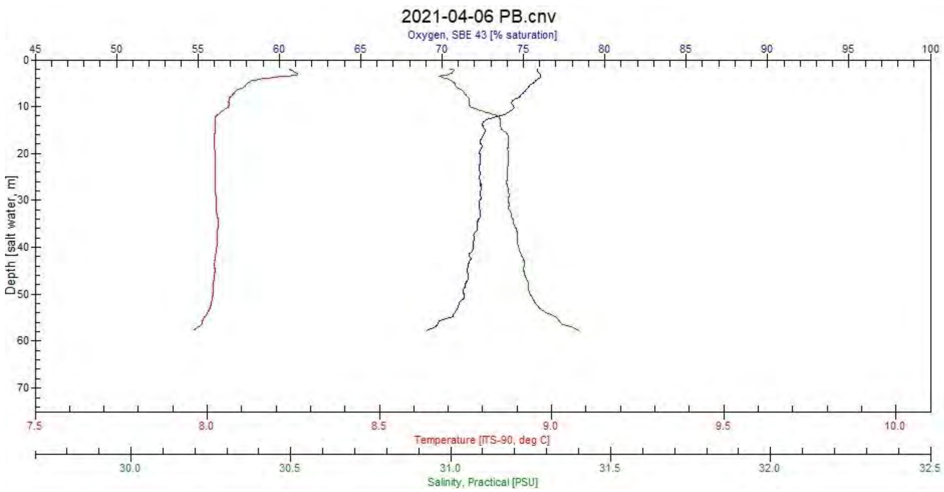
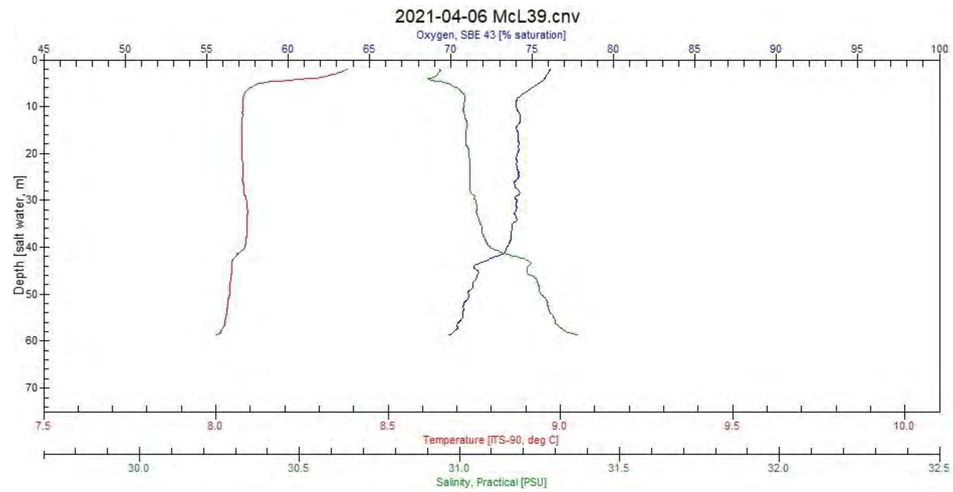


Appendix C18, cont'd

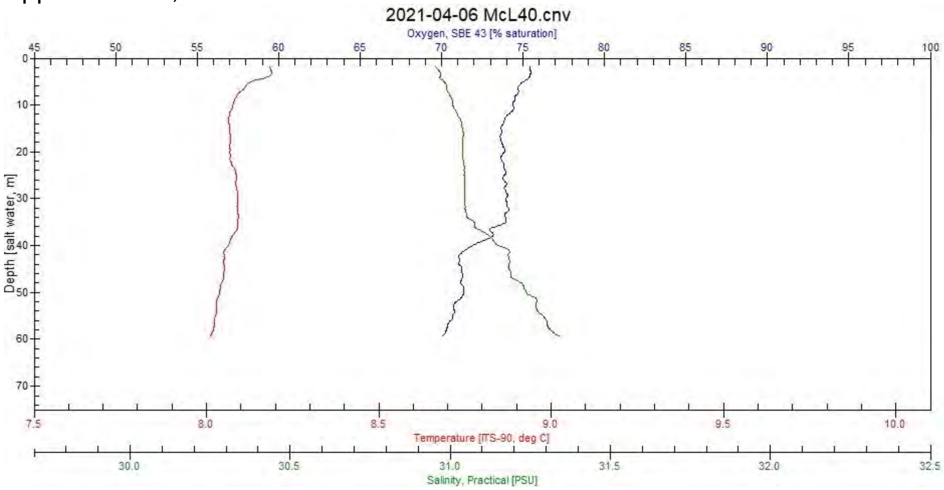


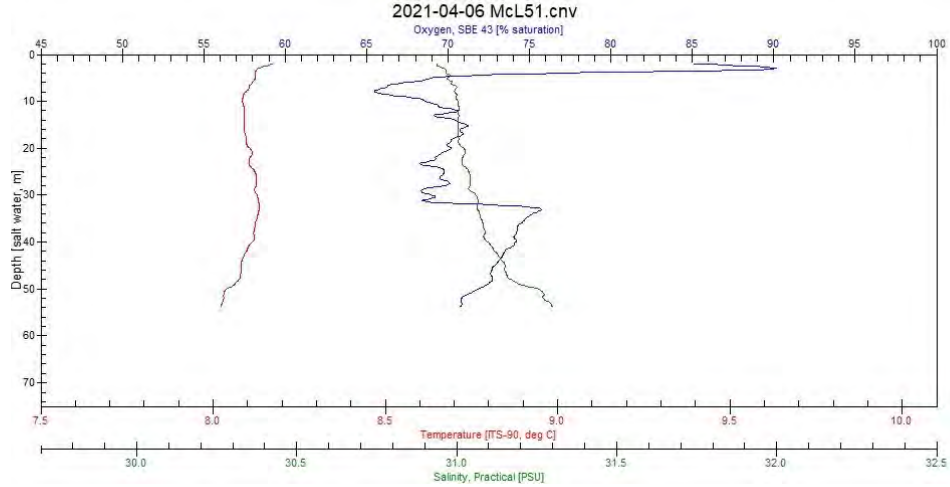




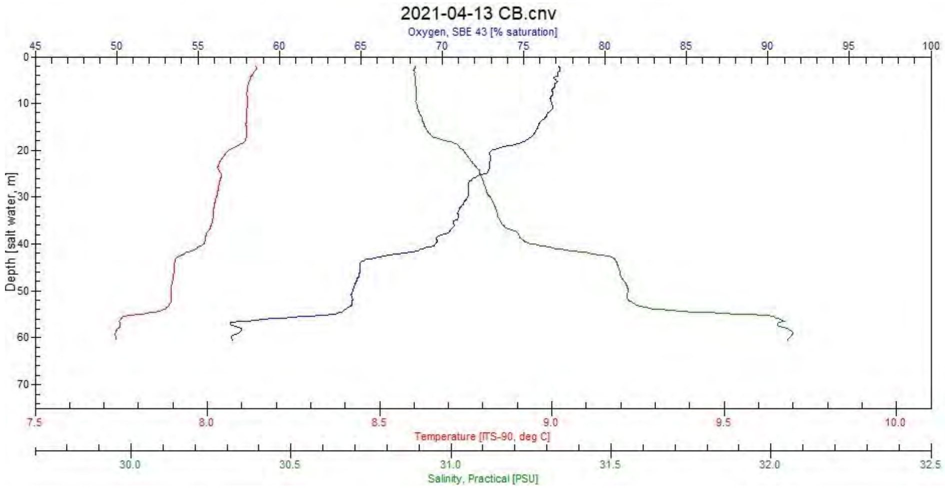


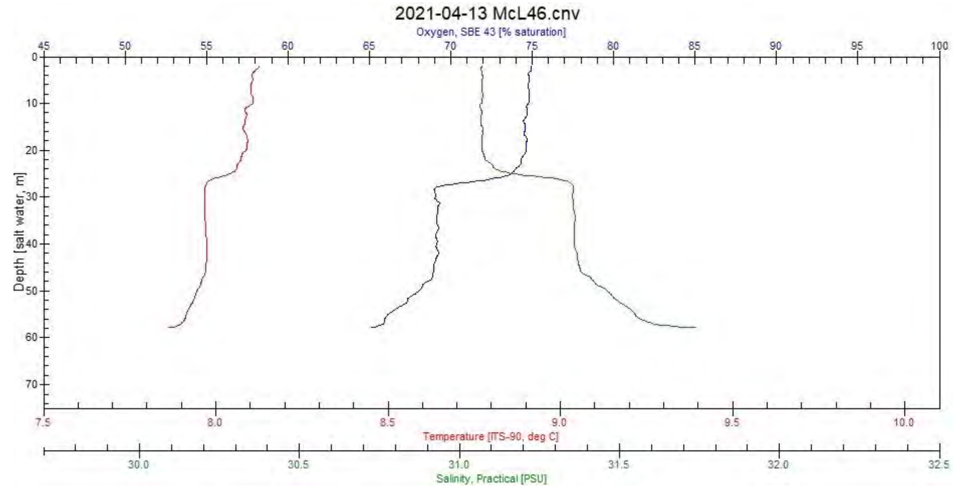
Appendix C18, cont'd

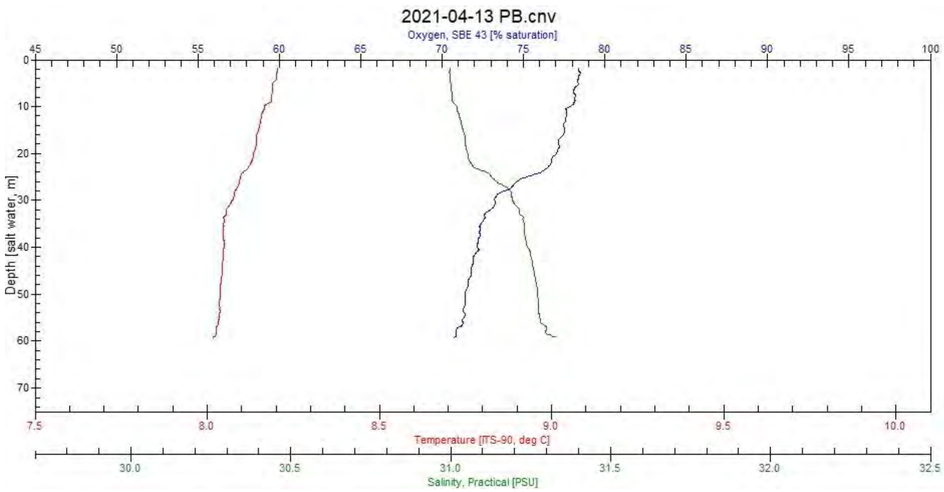


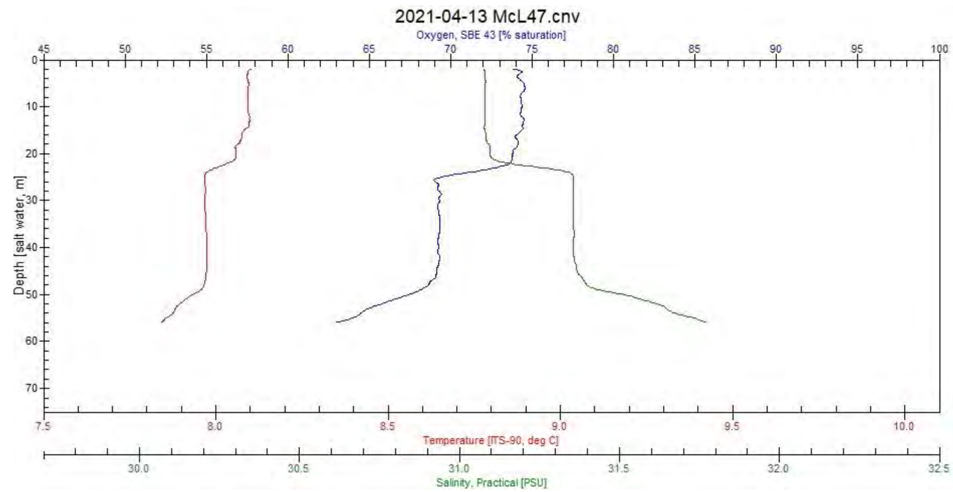


Appendix C18, cont'd

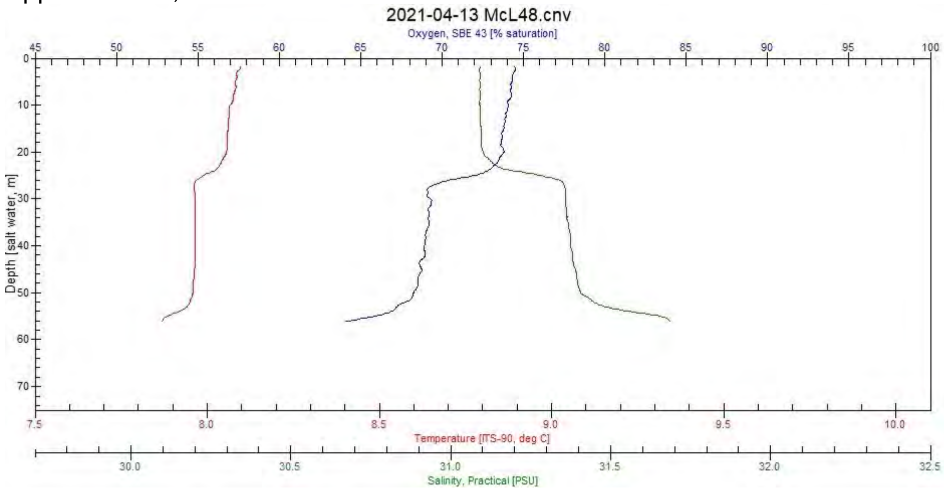


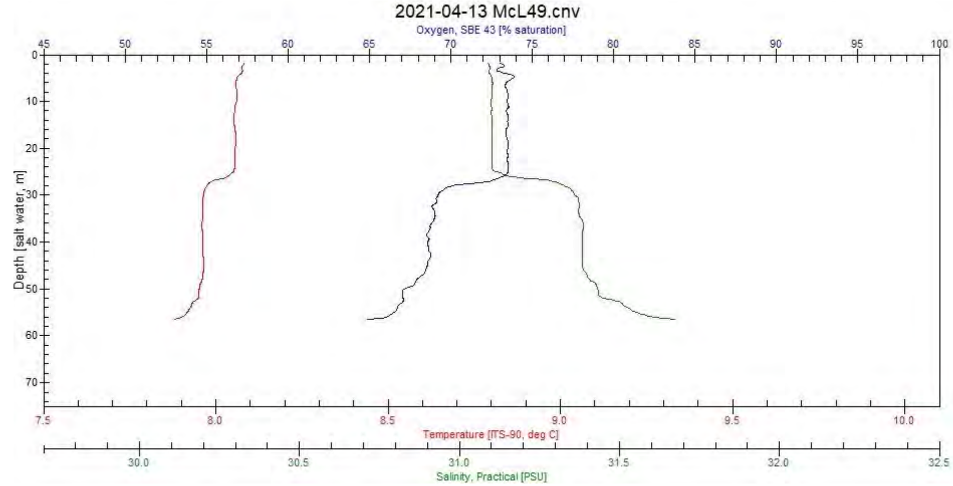


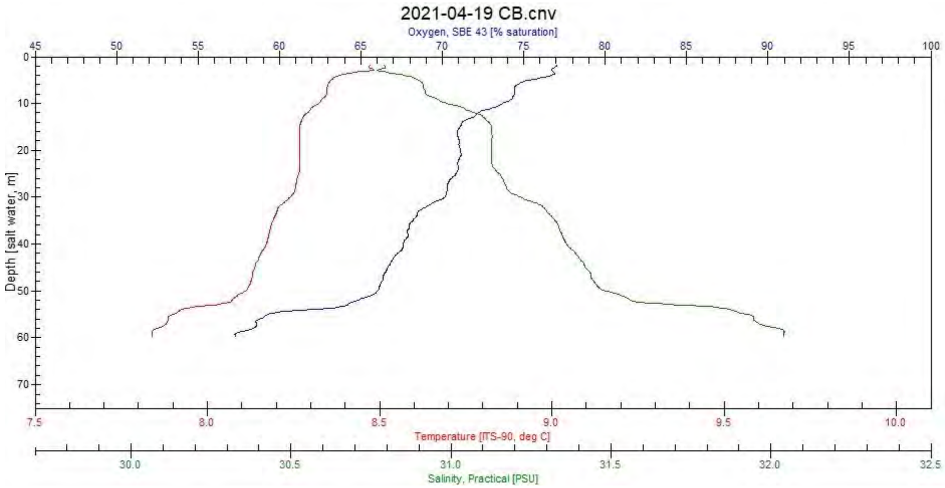


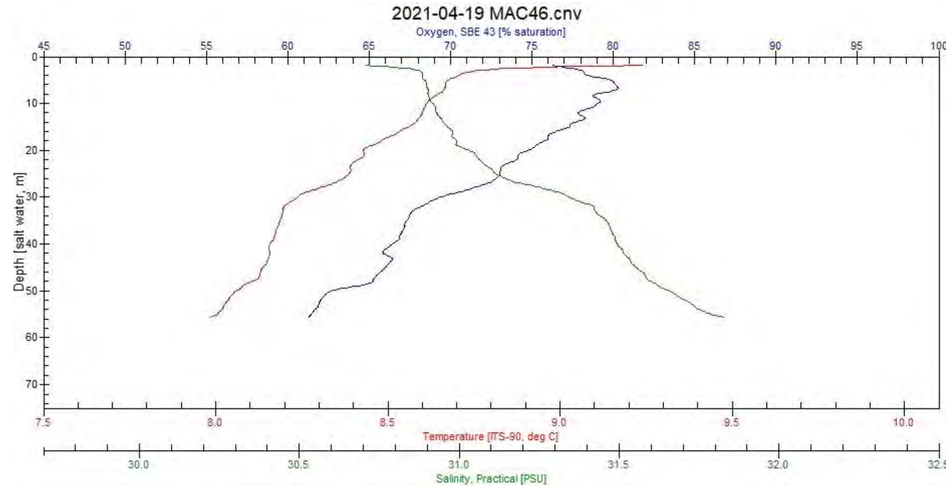


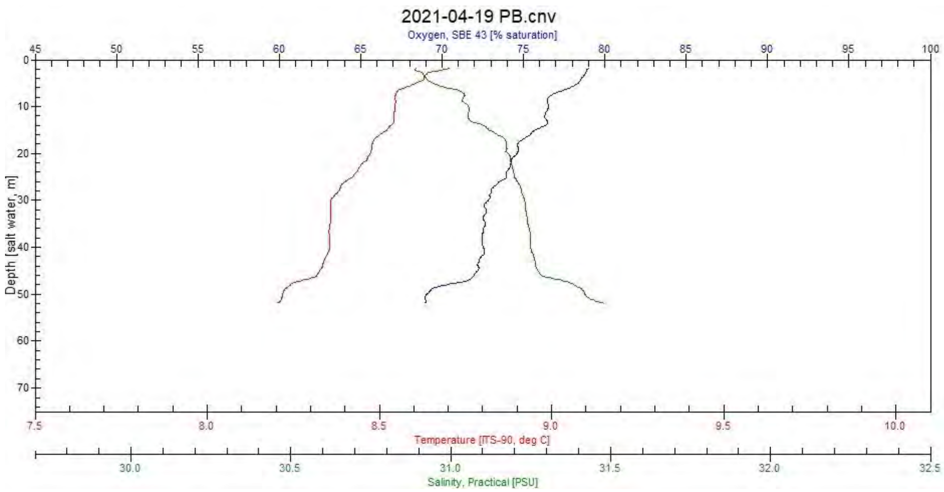
Appendix C18, cont'd

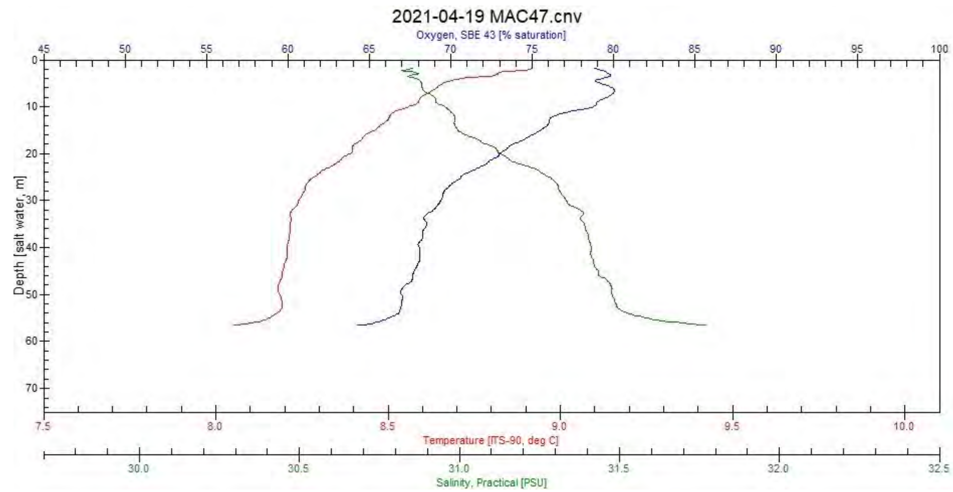




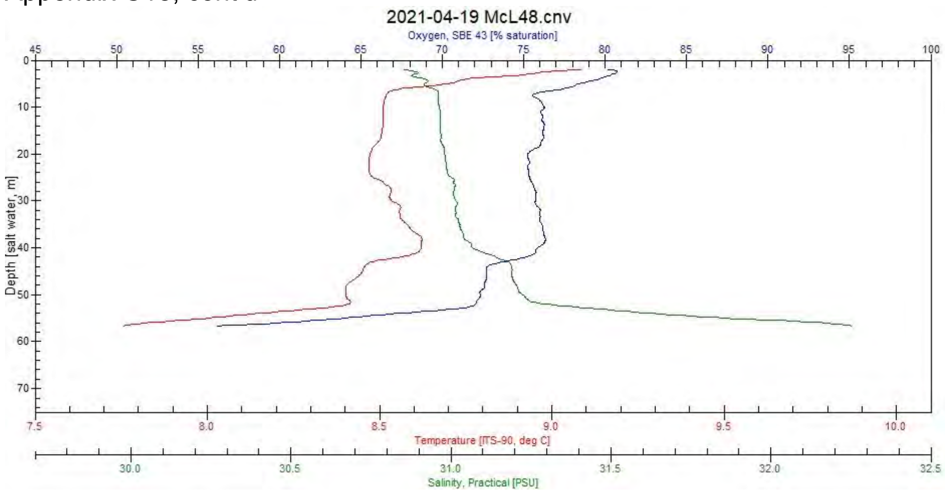

2021-04-19 CB.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]

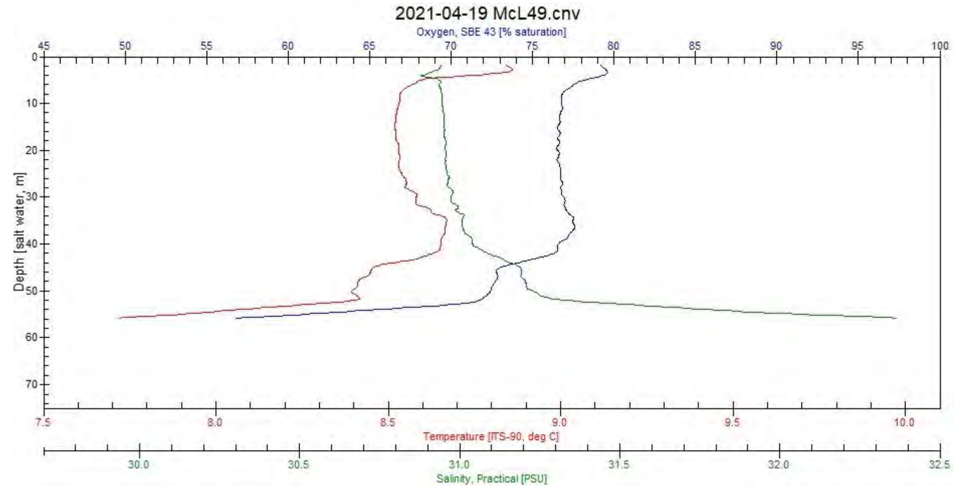

2021-04-19 MAC46.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]


2021-04-19 PB.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]

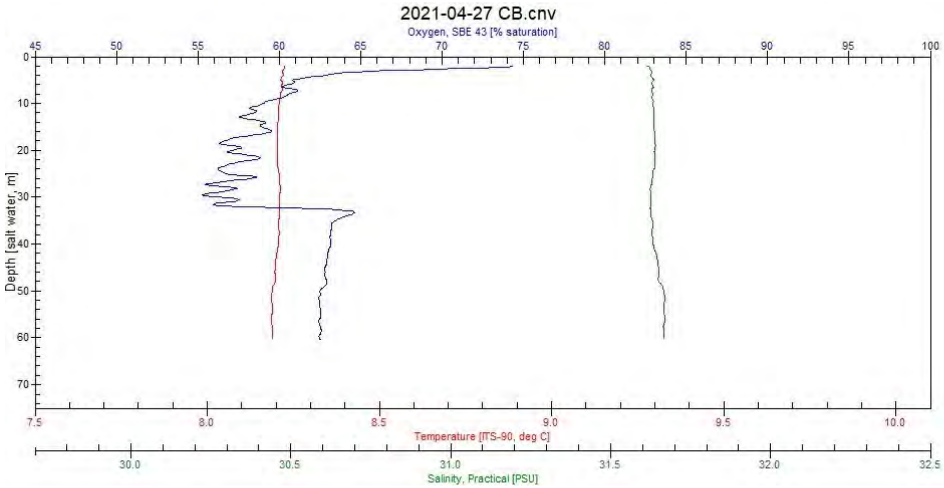

2021-04-19 MAC47.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]

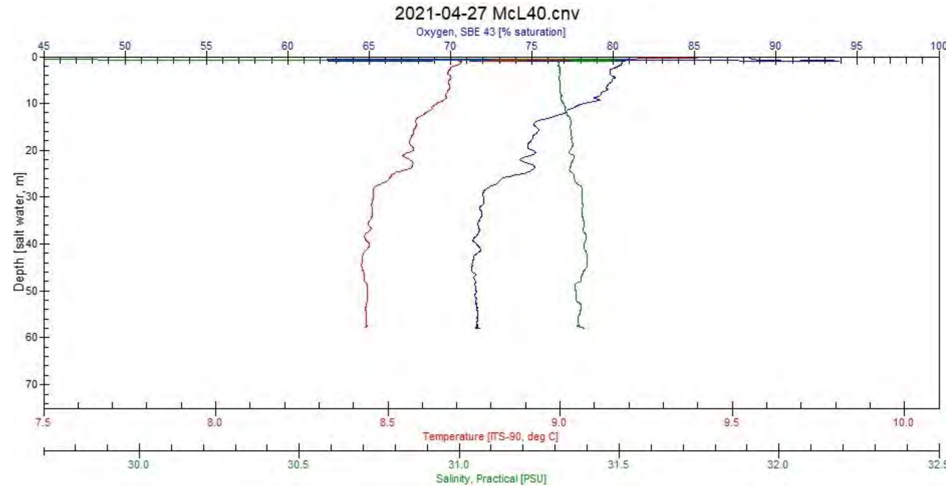
Appendix C18, cont'd

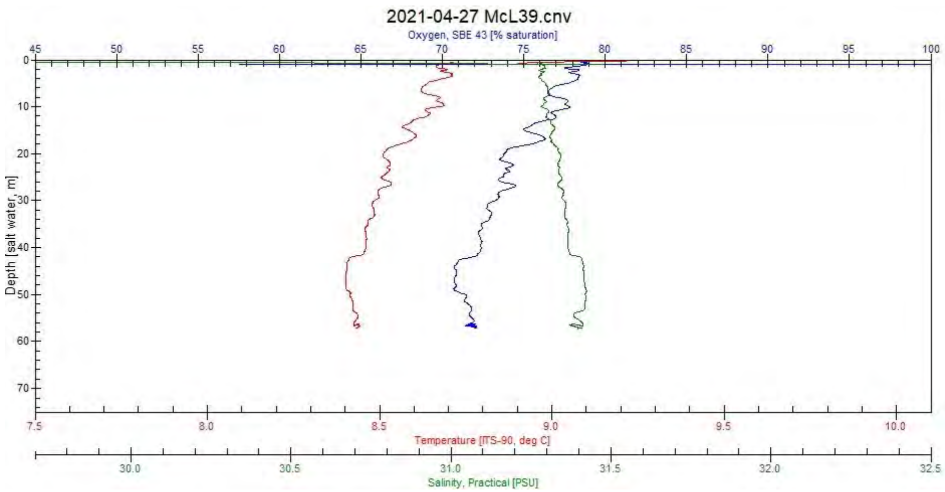


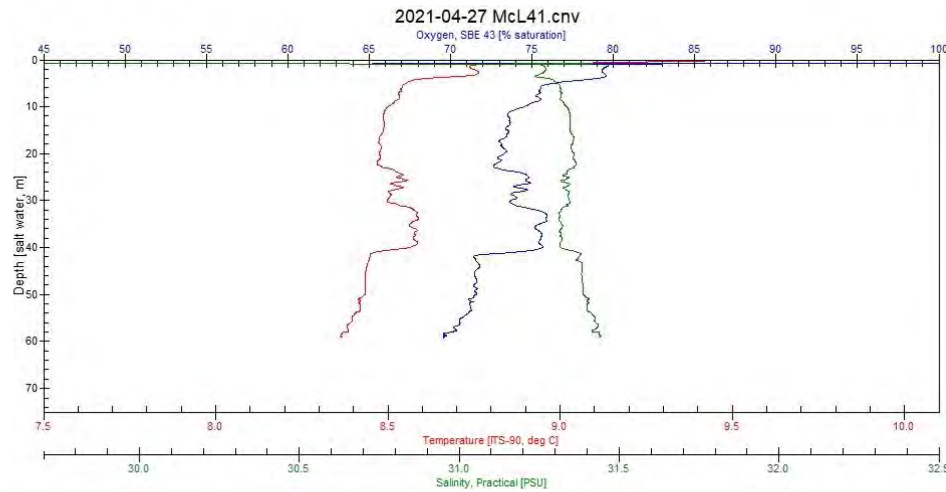


Appendix C18, cont'd

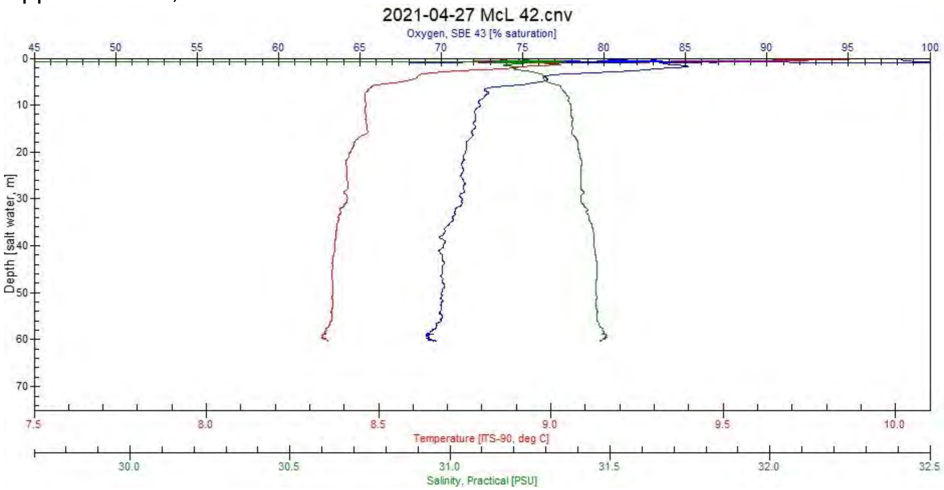




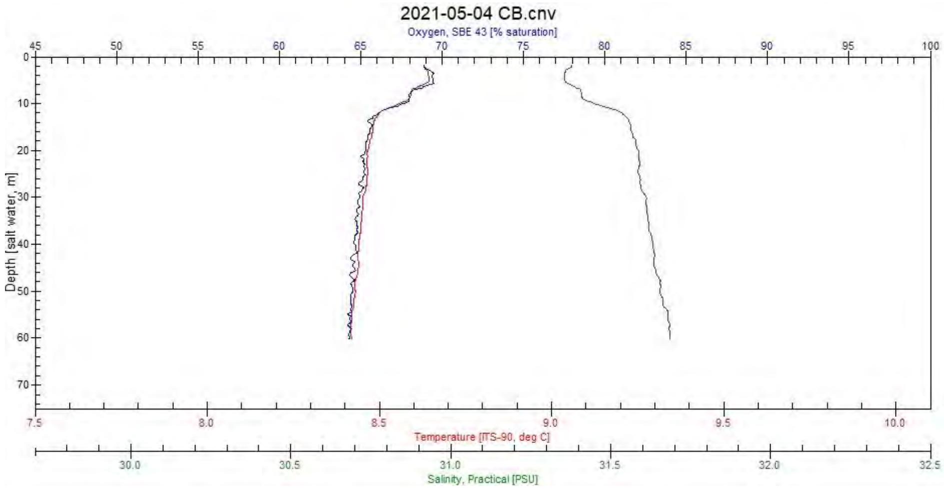


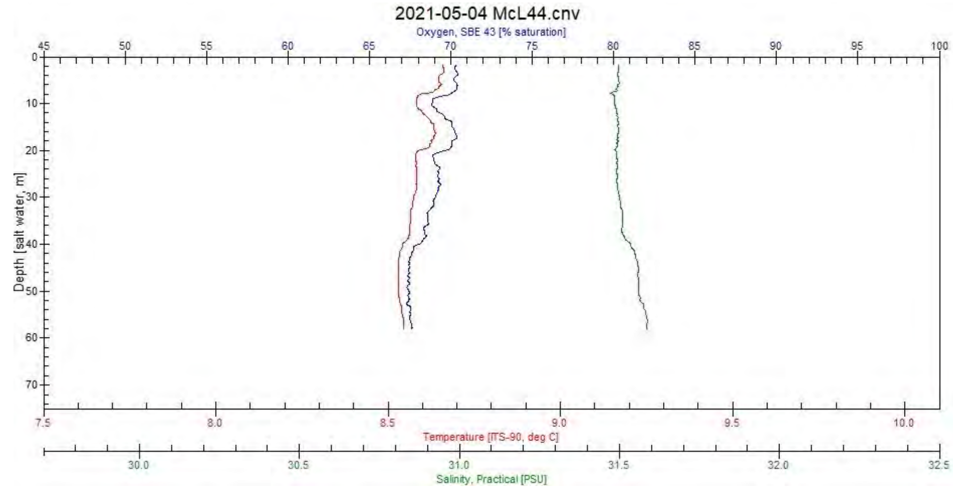


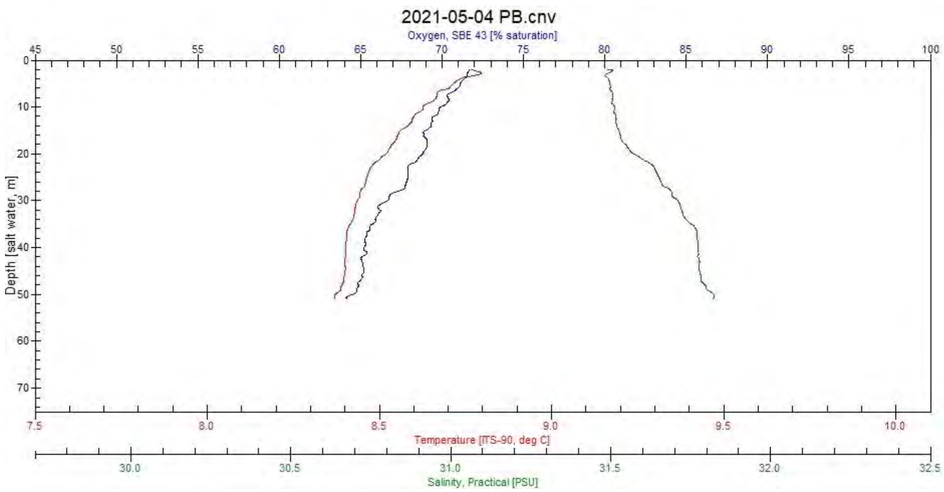
Appendix C18, cont'd

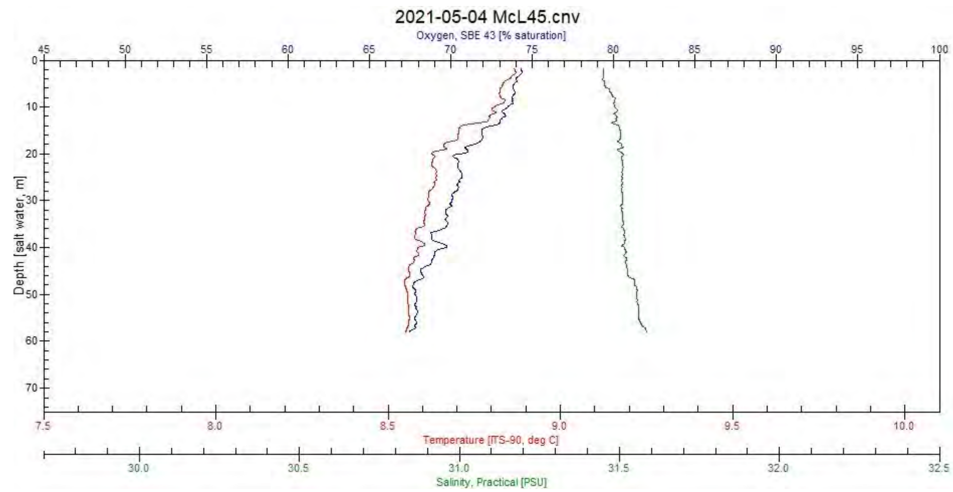


Appendix C18, cont'd



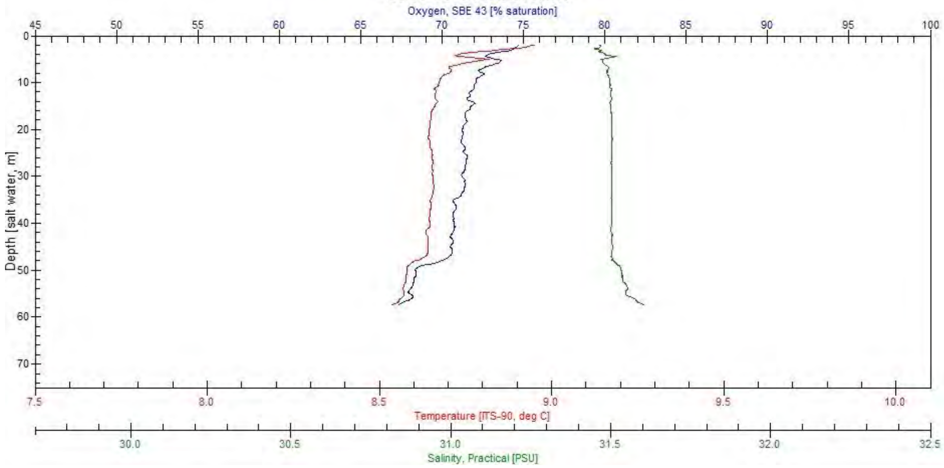




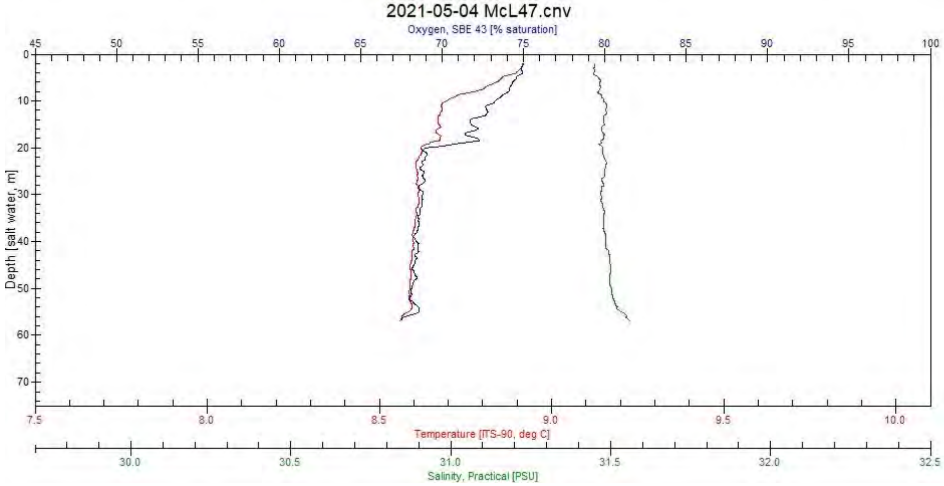


Appendix C18, cont'd

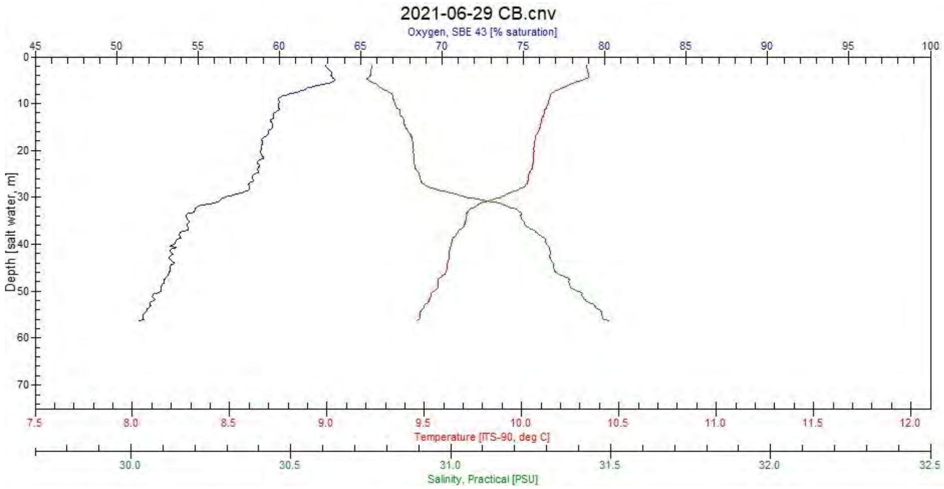
2021-05-04 McL46.cnv

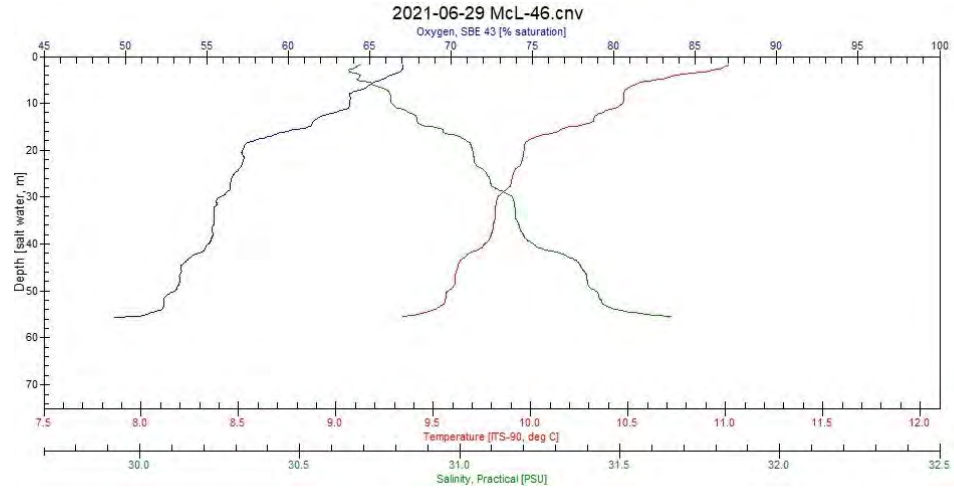


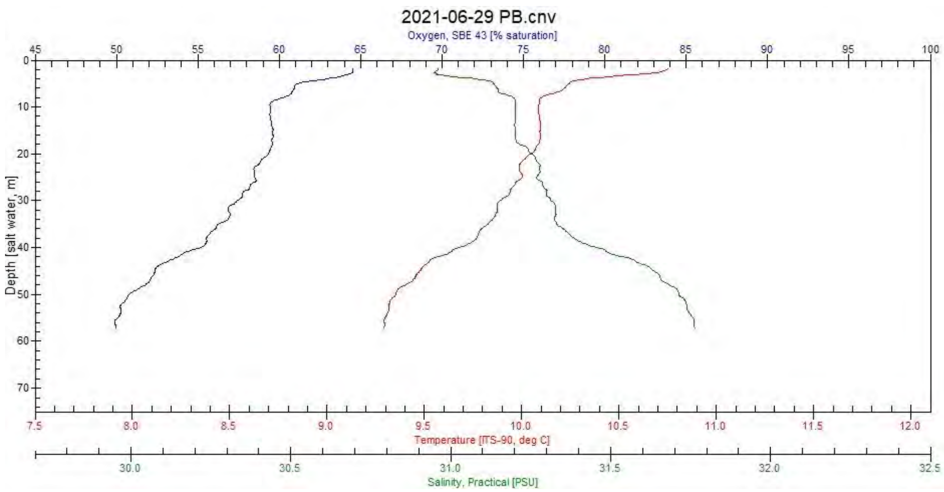
2021-05-04 McL47.cnv

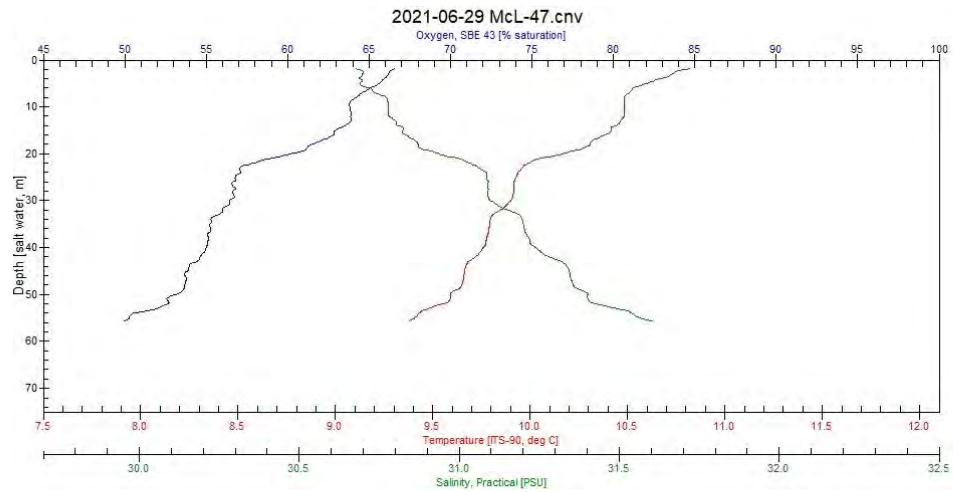


Appendix C18, cont'd

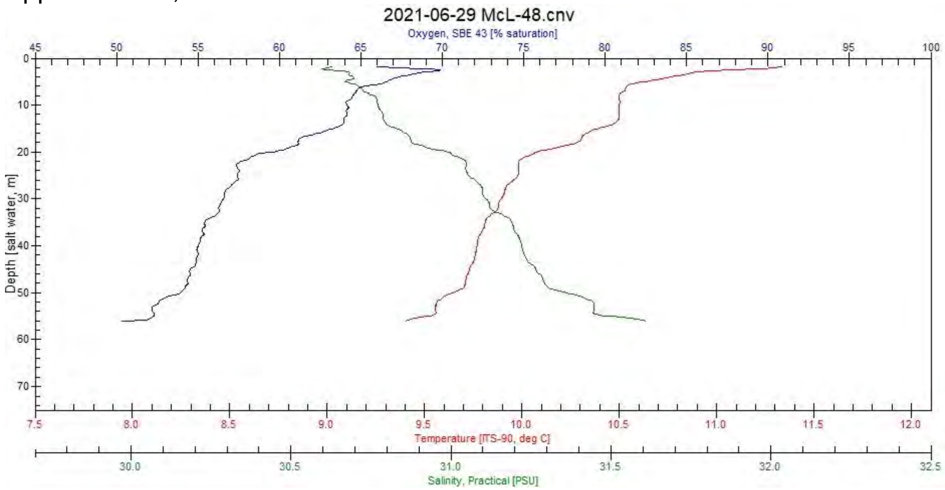


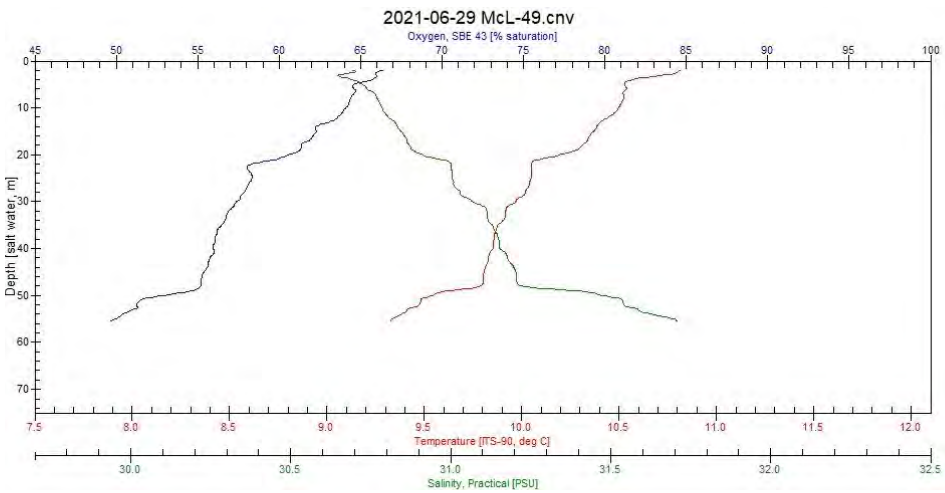


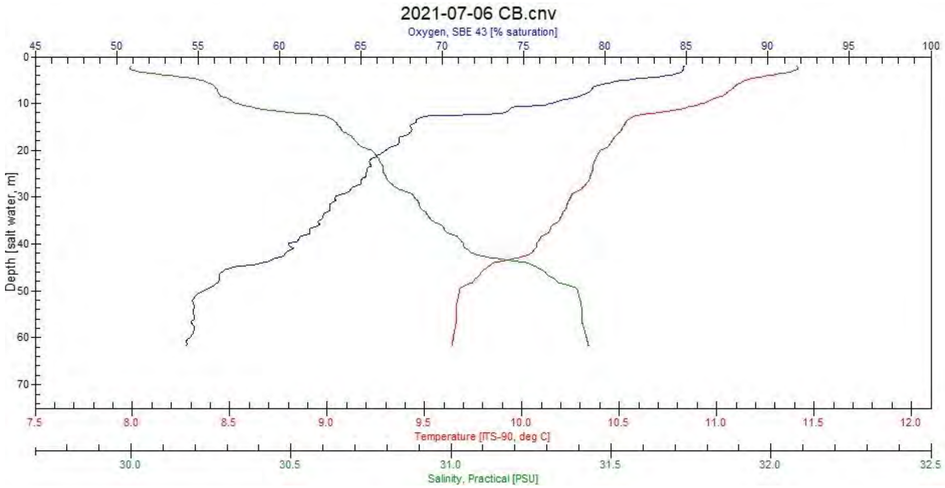


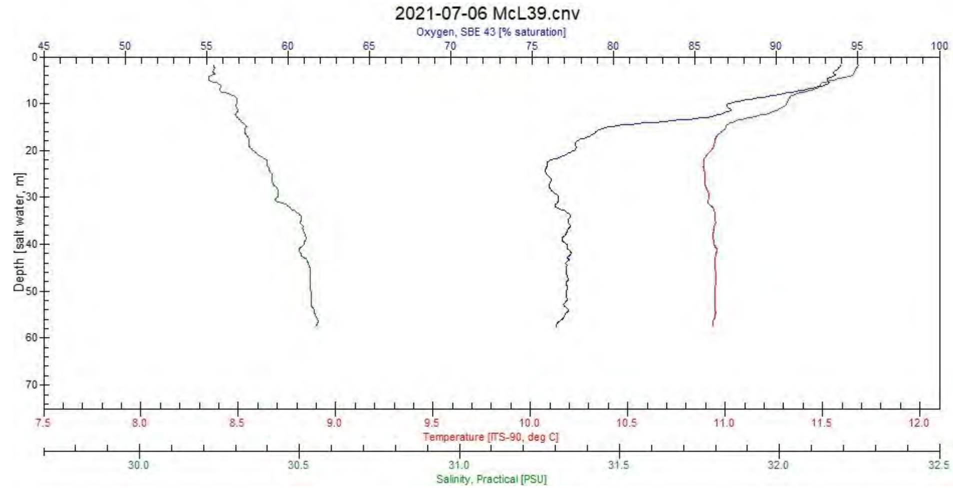


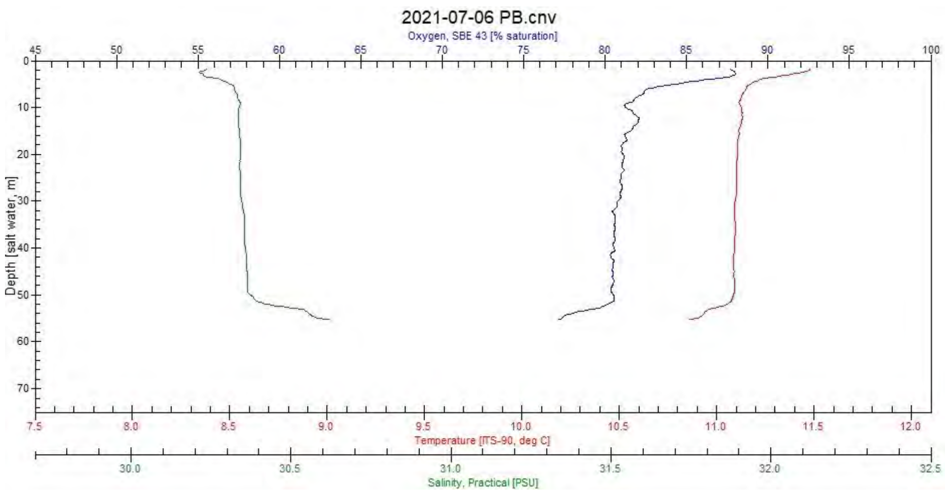
Appendix C18, cont'd

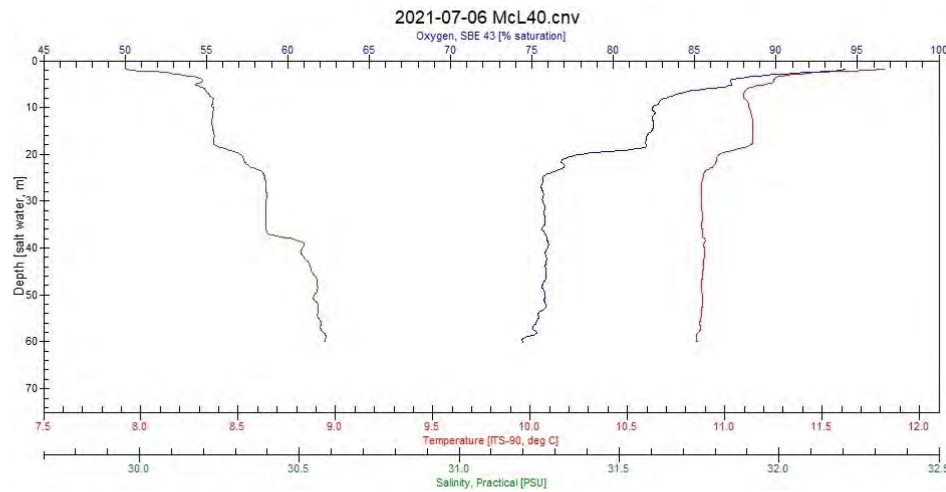




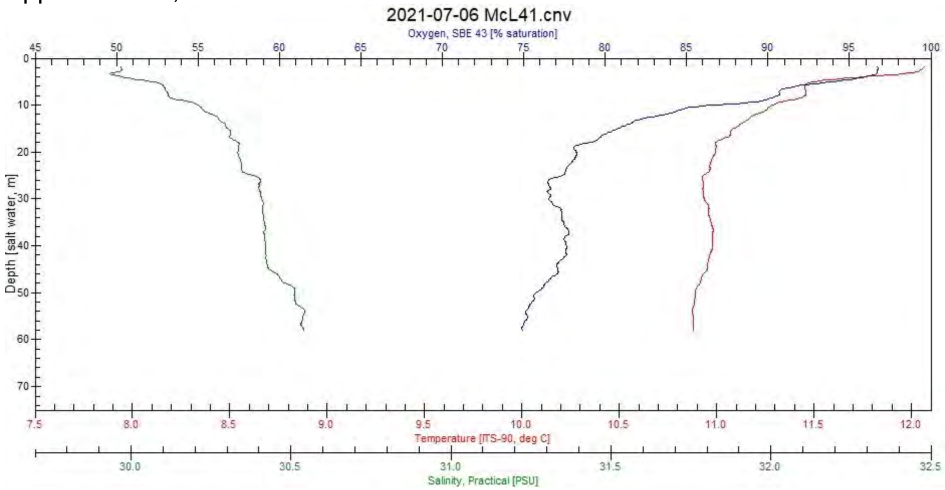

2021-07-06 CB.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]

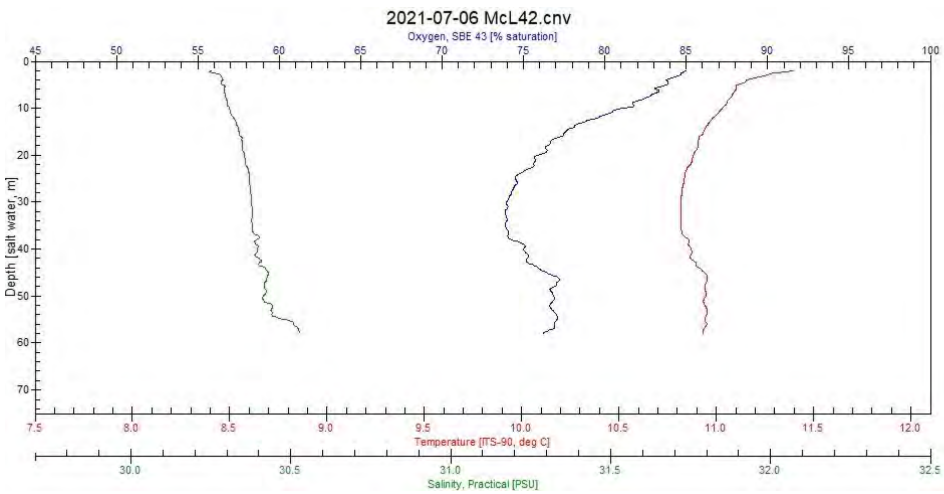

2021-07-06 McL39.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]


2021-07-06 PB.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]

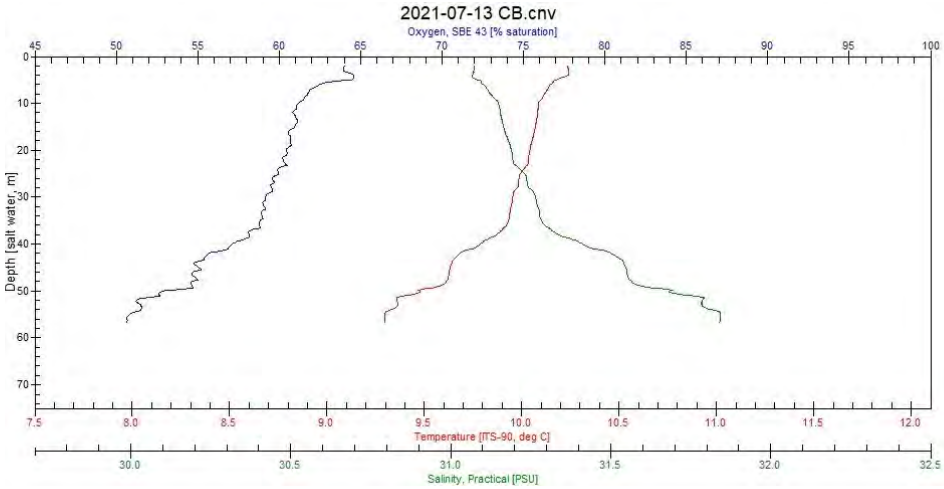

2021-07-06 McL40.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]

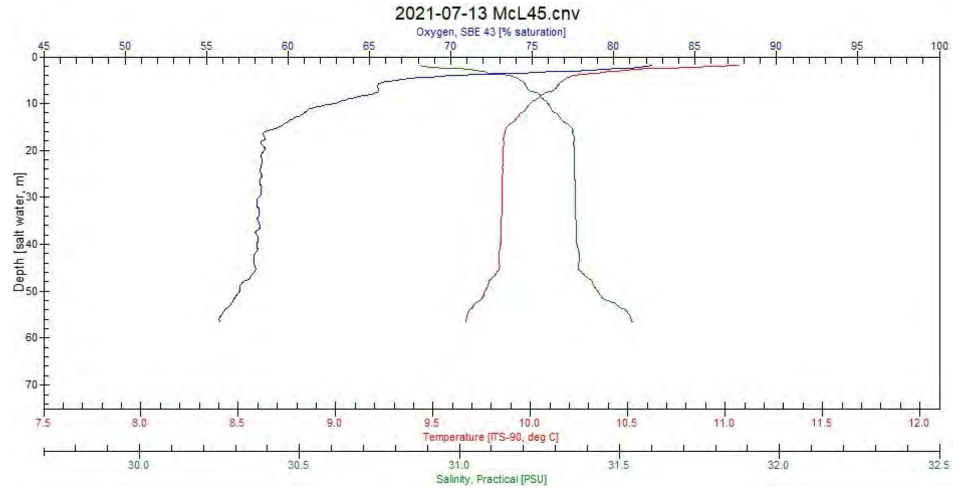
Appendix C18, cont'd

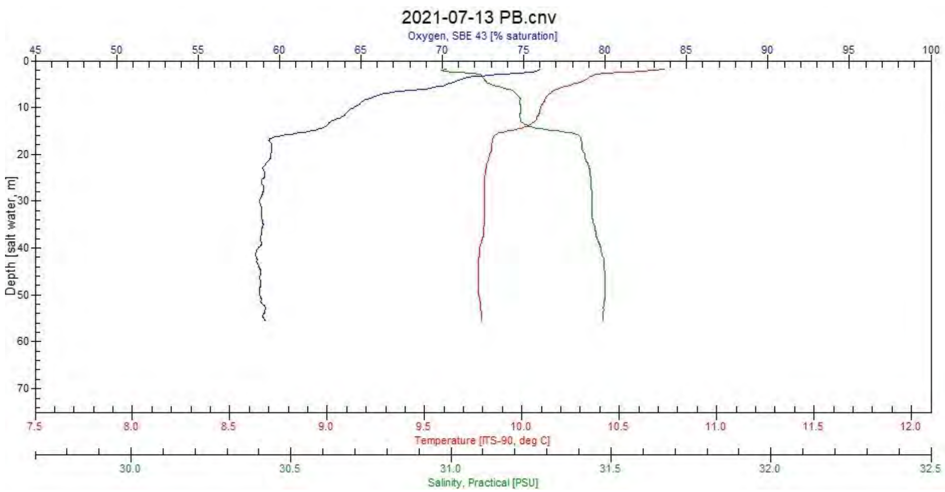


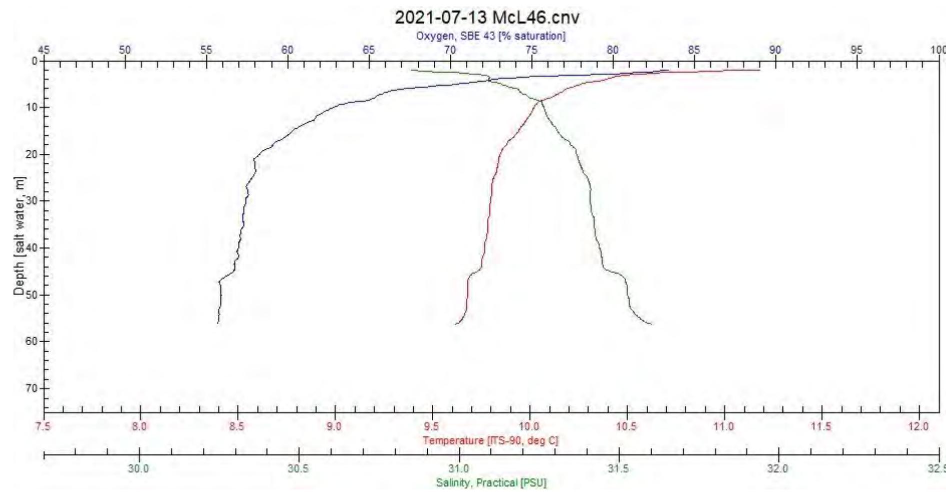


Appendix C18, cont'd

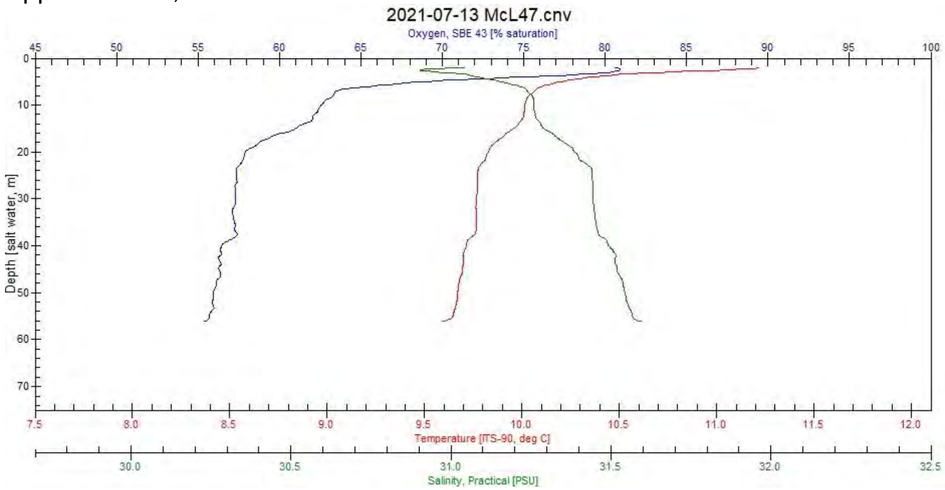


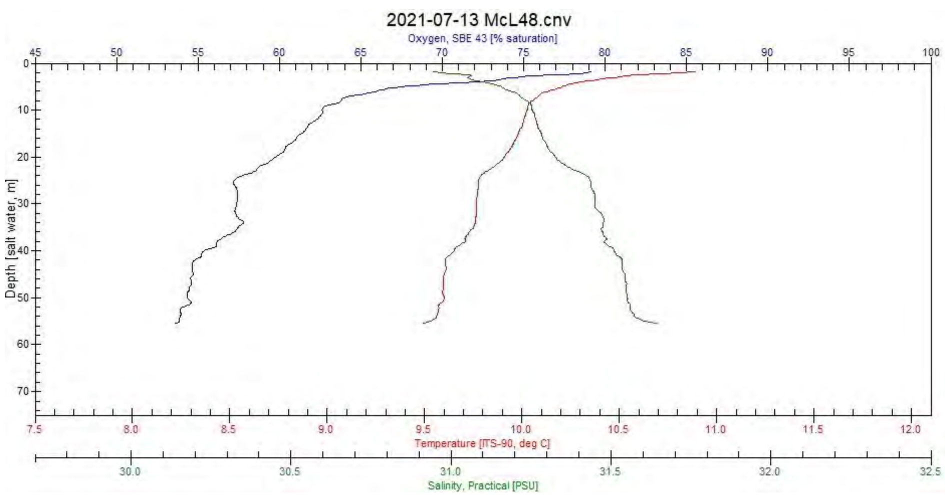




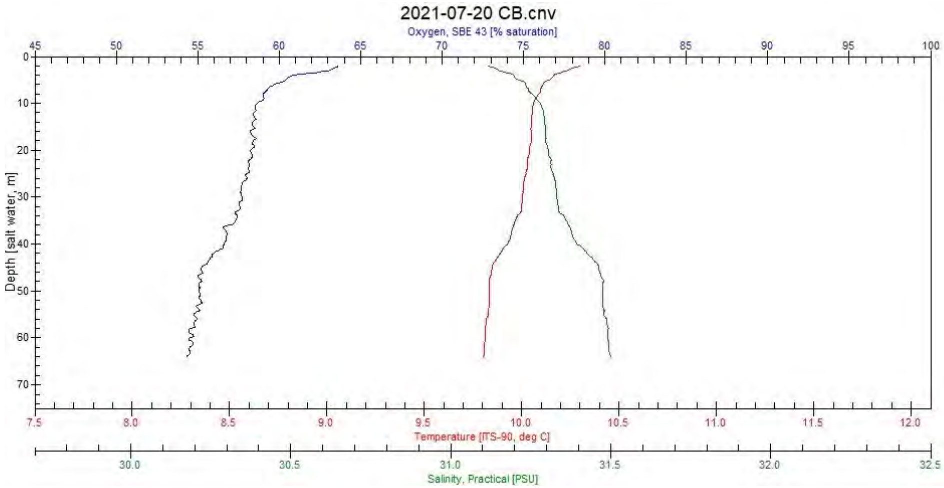


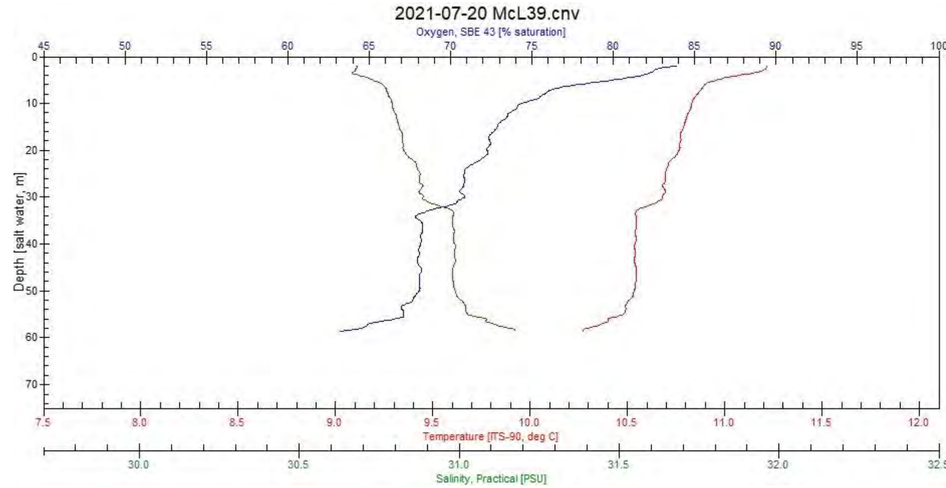
Appendix C18, cont'd

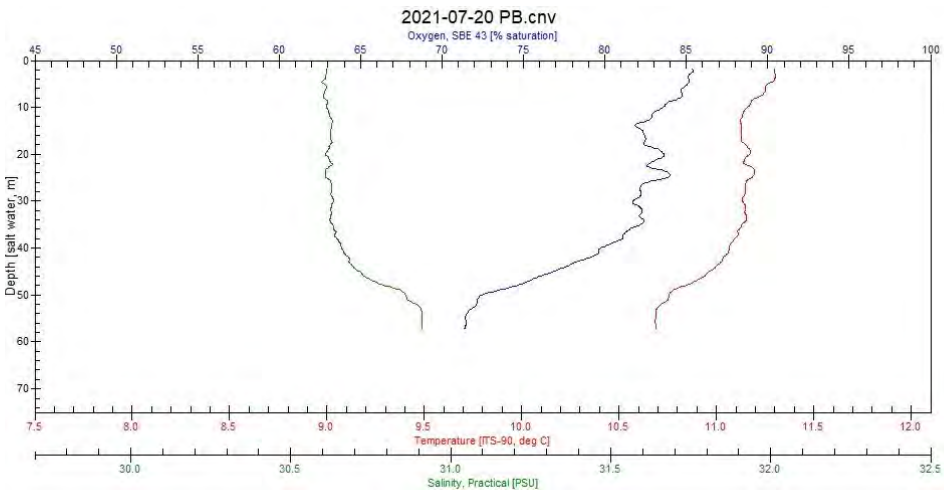


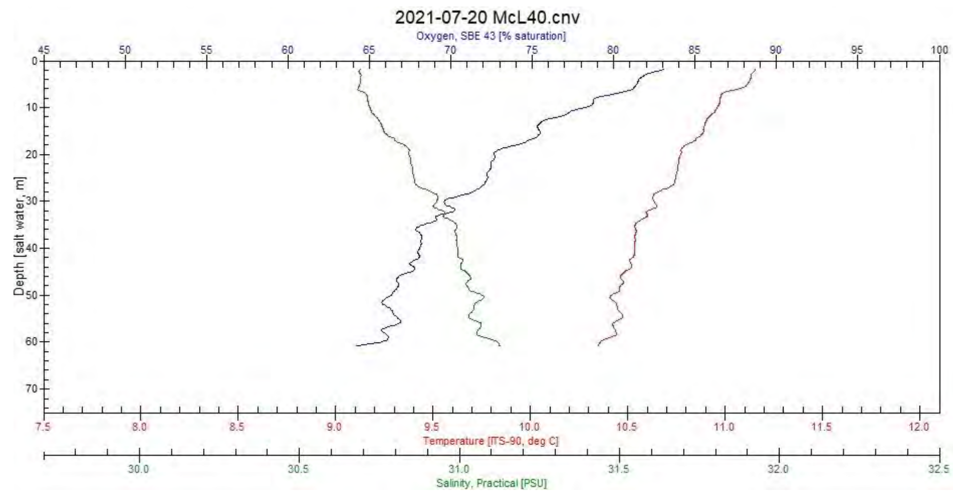


Appendix C18, cont'd

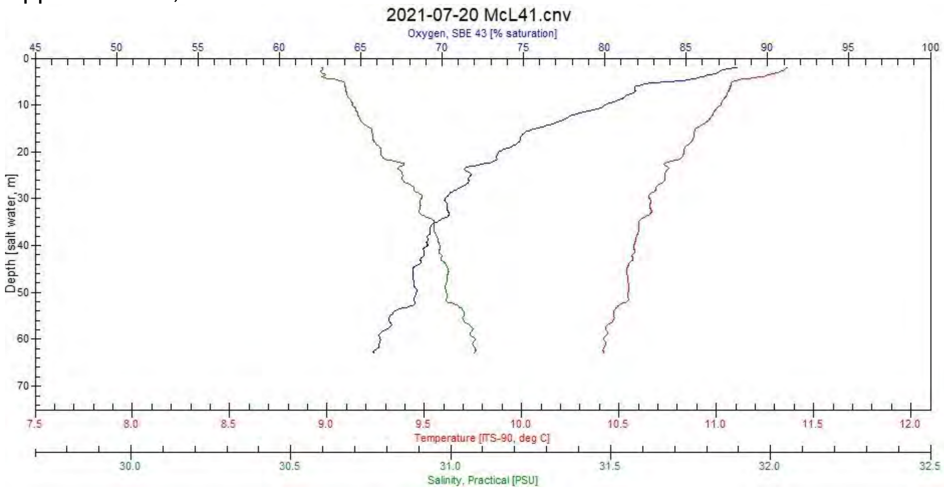


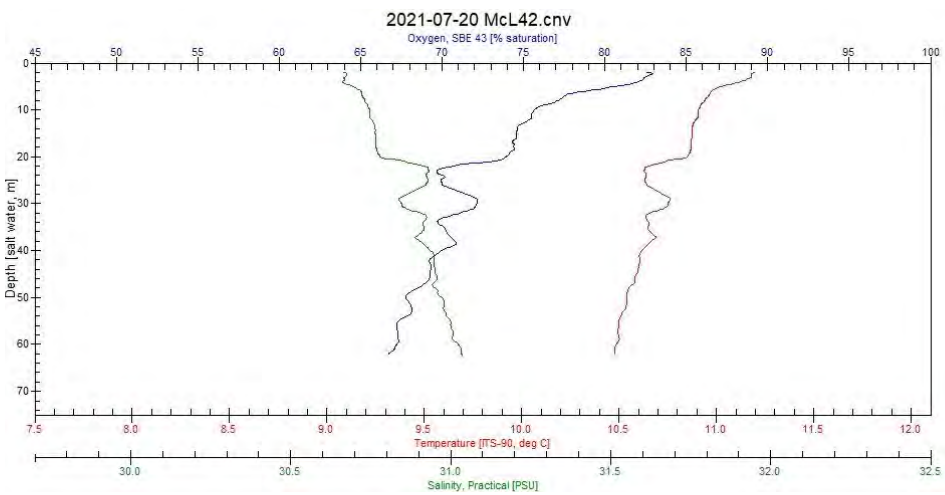


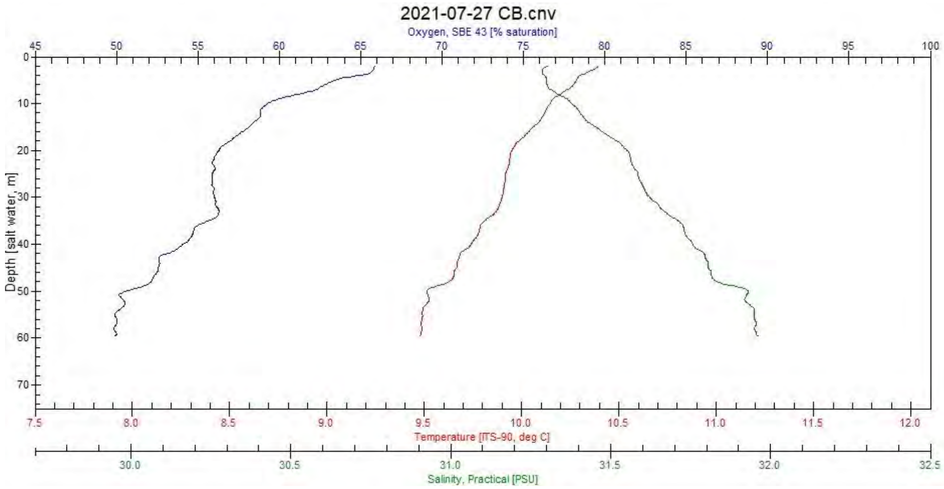


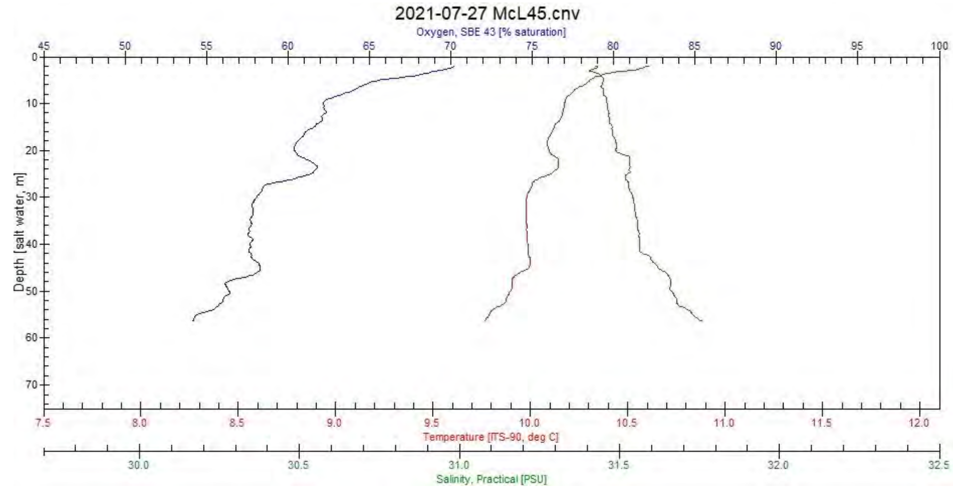


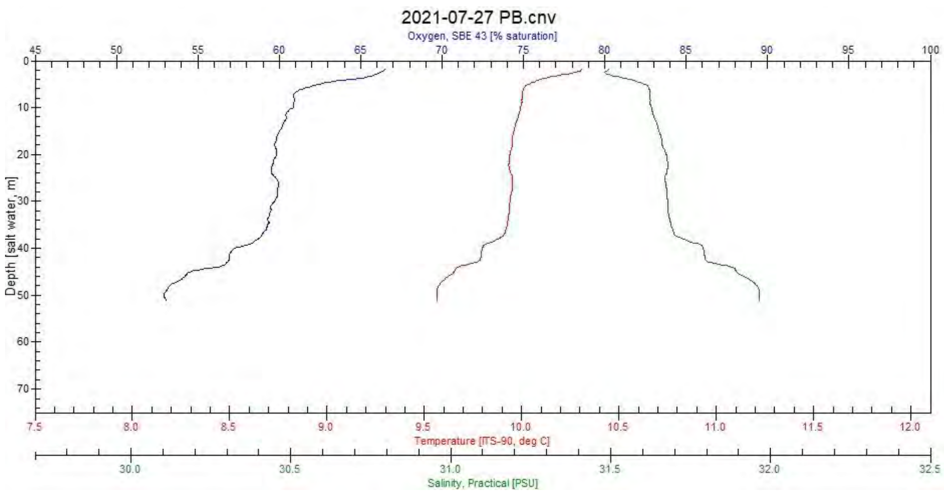
Appendix C18, cont'd

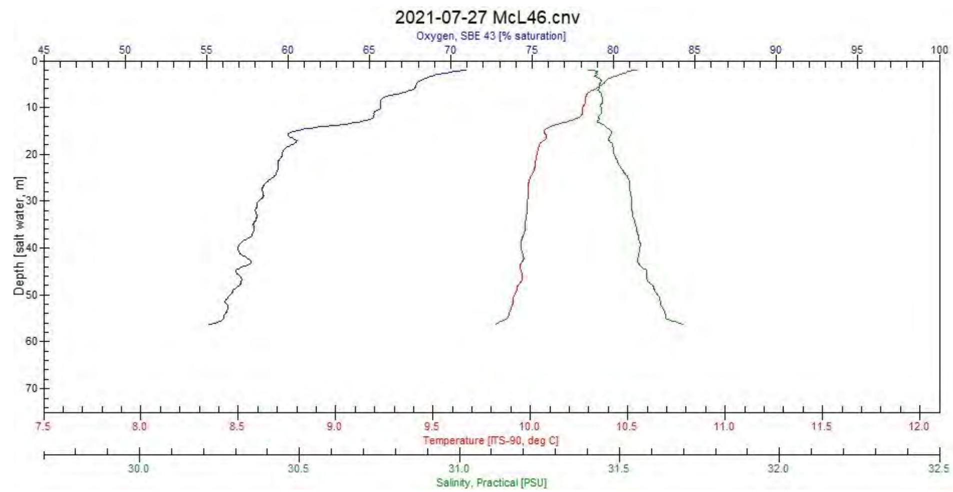




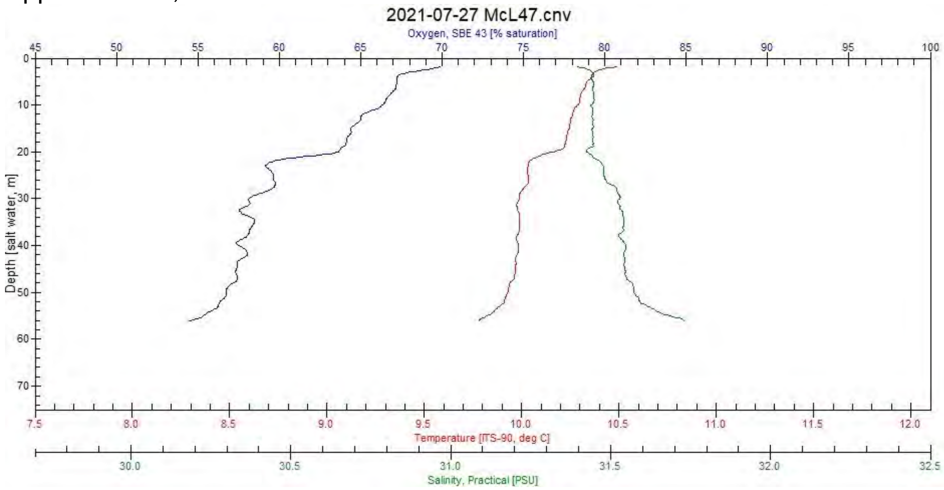

2021-07-27 CB.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]

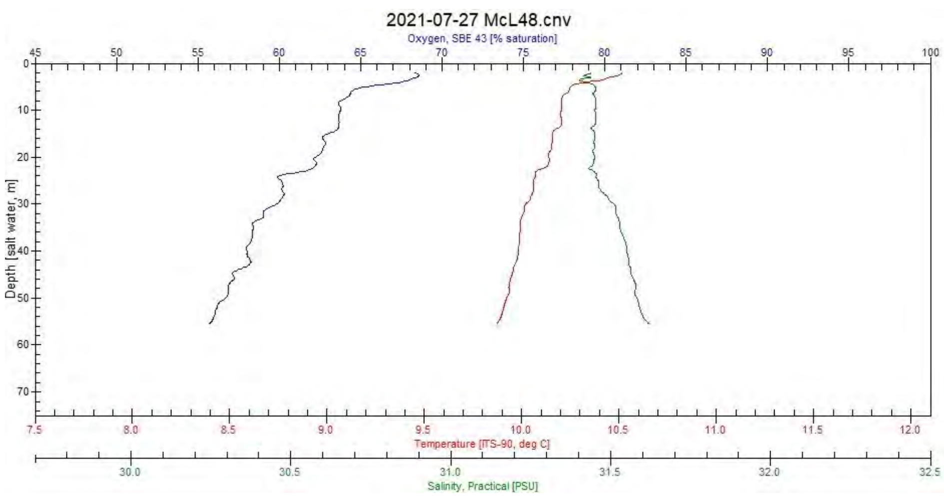

2021-07-27 McL45.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]

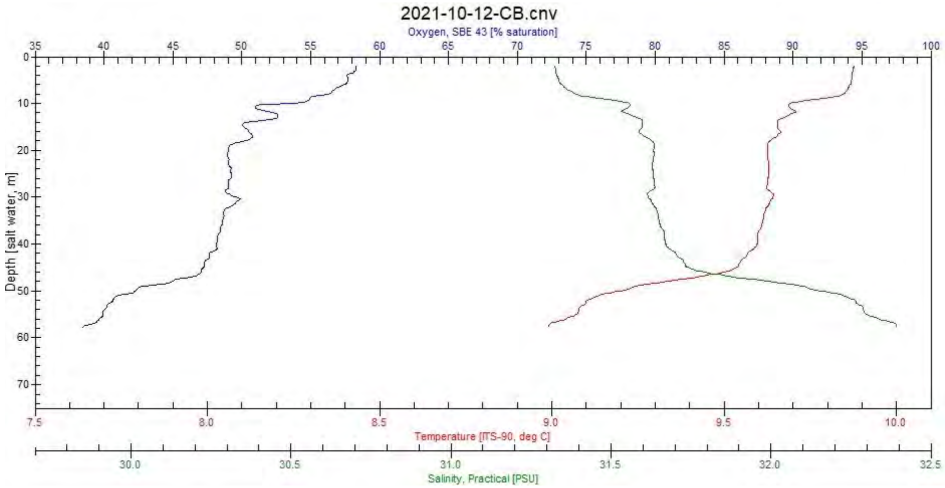

2021-07-27 PB.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]

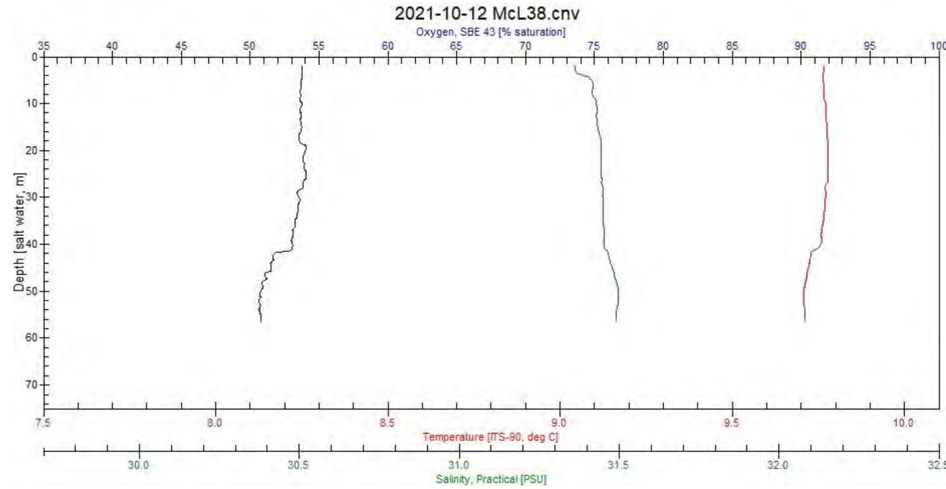

2021-07-27 McL46.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]

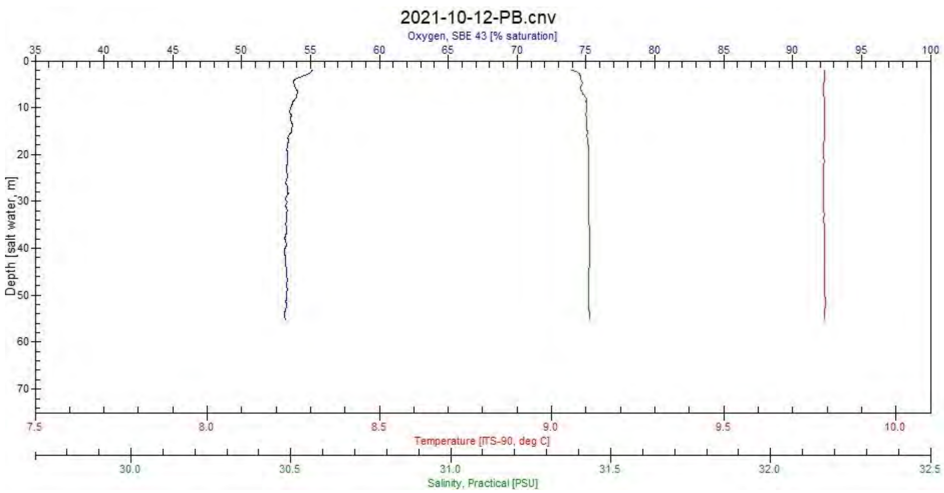
Appendix C18, cont’d






2021-10-12-CB.cnv
Oxygen, SBE 43 [% saturation]
35 40 45 50 55 60 65 70 75 80 85 90 95 100
Depth [salt water, m]
0 10 20 30 40 50 60 70
7.5 8.0 8.5 9.0 9.5 10.0
Temperature [ITS-90, deg C]
30.0 30.5 31.0 31.5 32.0 32.5
Salinity, Practical [PSU]


2021-10-12 McL38.cnv
Oxygen, SBE 43 [% saturation]
35 40 45 50 55 60 65 70 75 80 85 90 95 100
Depth [salt water, m]
0 10 20 30 40 50 60 70
7.5 8.0 8.5 9.0 9.5 10.0
Temperature [ITS-90, deg C]
30.0 30.5 31.0 31.5 32.0 32.5
Salinity, Practical [PSU]


2021-10-12-PB.cnv
Oxygen, SBE 43 [% saturation]
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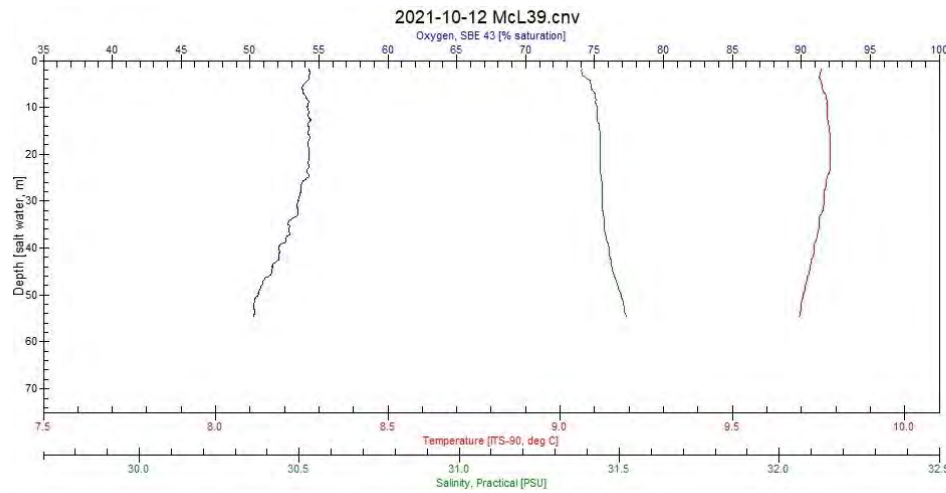
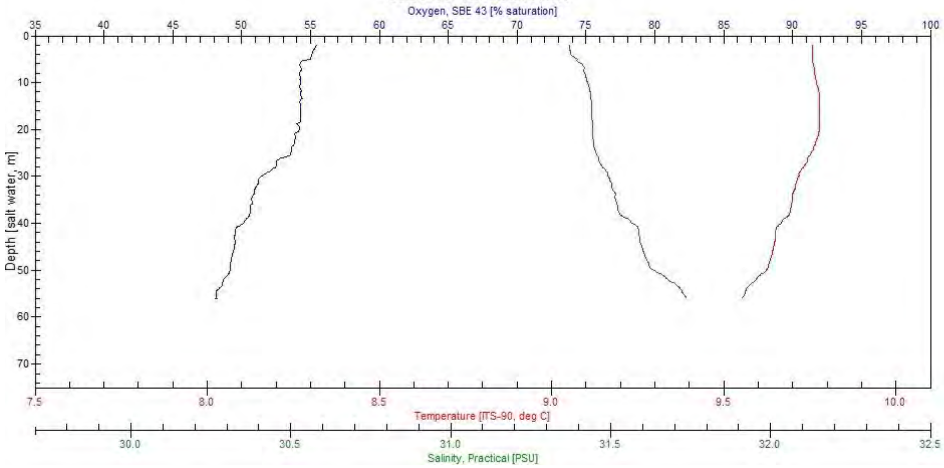
Depth [salt water, m]
0 10 20 30 40 50 60 70
7.5 8.0 8.5 9.0 9.5 10.0
Temperature [ITS-90, deg C]
30.0 30.5 31.0 31.5 32.0 32.5
Salinity, Practical [PSU]

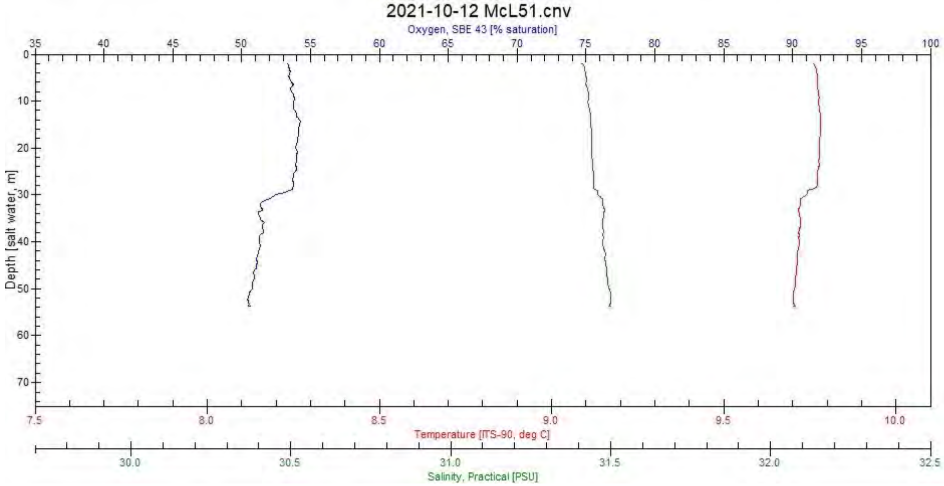

2021-10-12 McL39.cnv
Oxygen, SBE 43 [% saturation]
35 40 45 50 55 60 65 70 75 80 85 90 95 100
Depth [salt water, m]
0 10 20 30 40 50 60 70
7.5 8.0 8.5 9.0 9.5 10.0
Temperature [ITS-90, deg C]
30.0 30.5 31.0 31.5 32.0 32.5
Salinity, Practical [PSU]

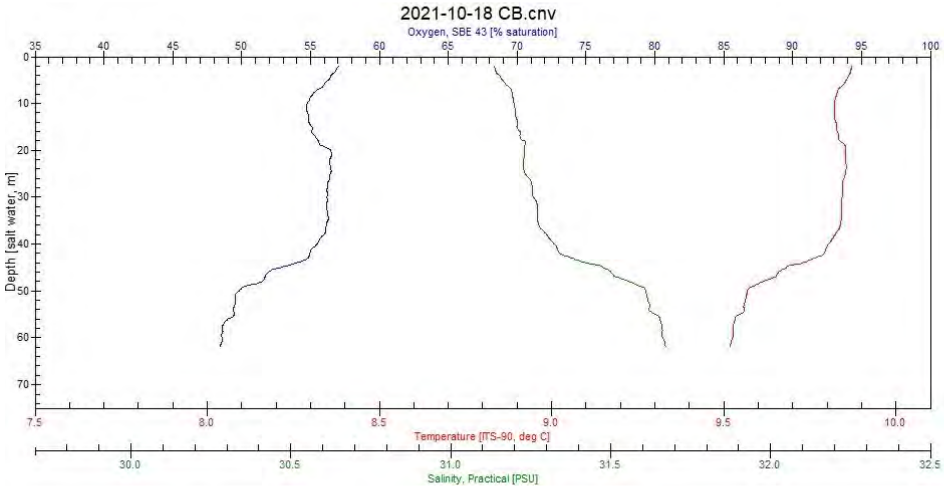
Appendix C18, cont'd

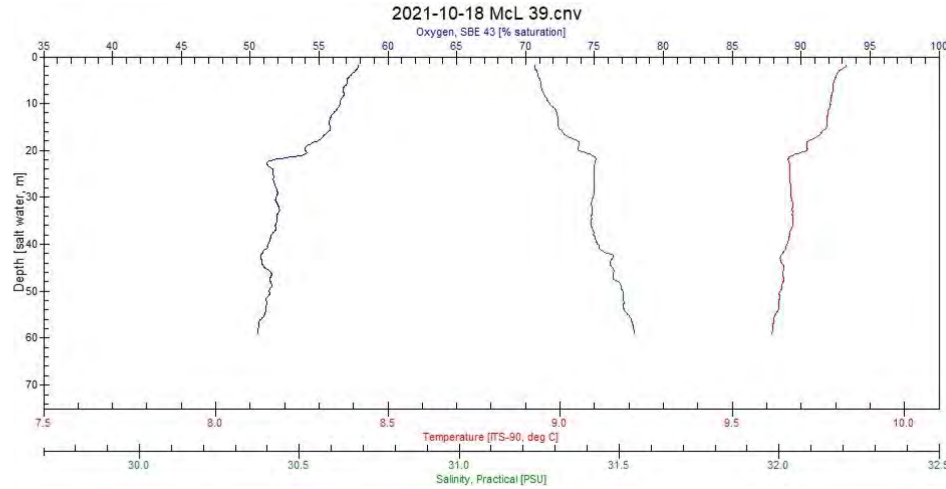
2021-10-12 McL40.cnv

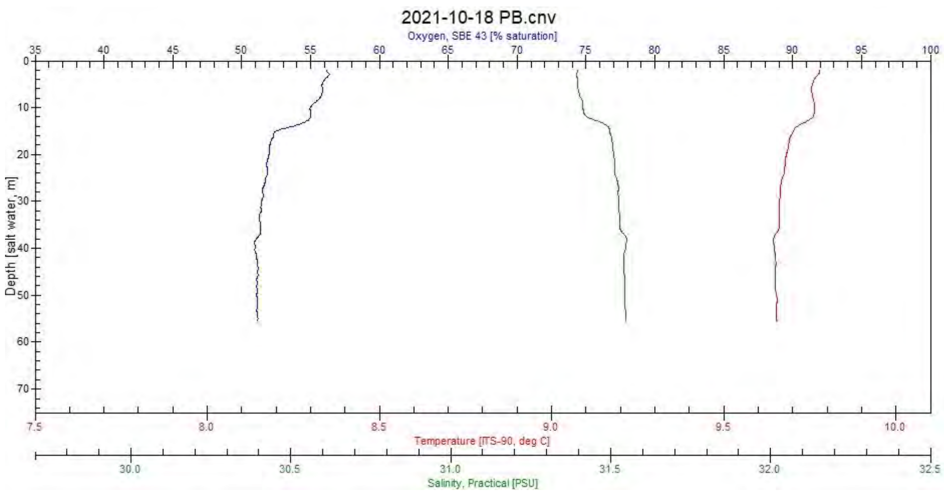


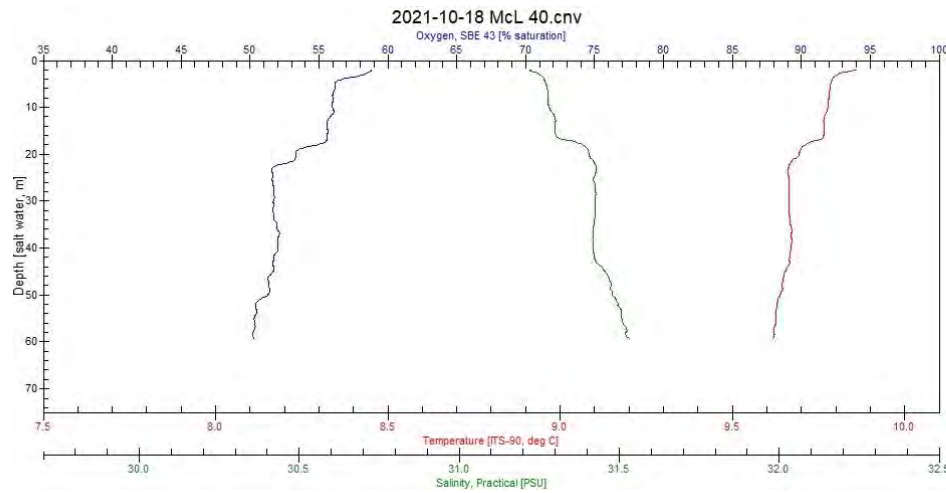
2021-10-12 McL51.cnv

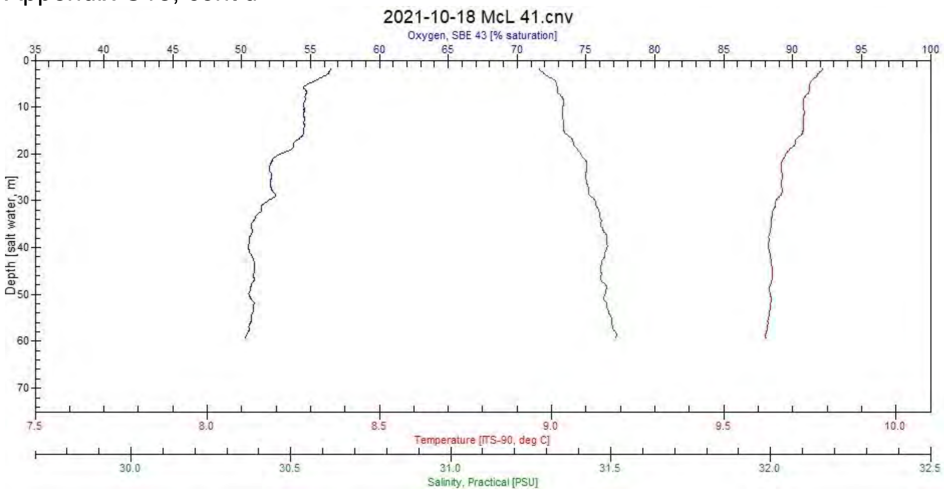


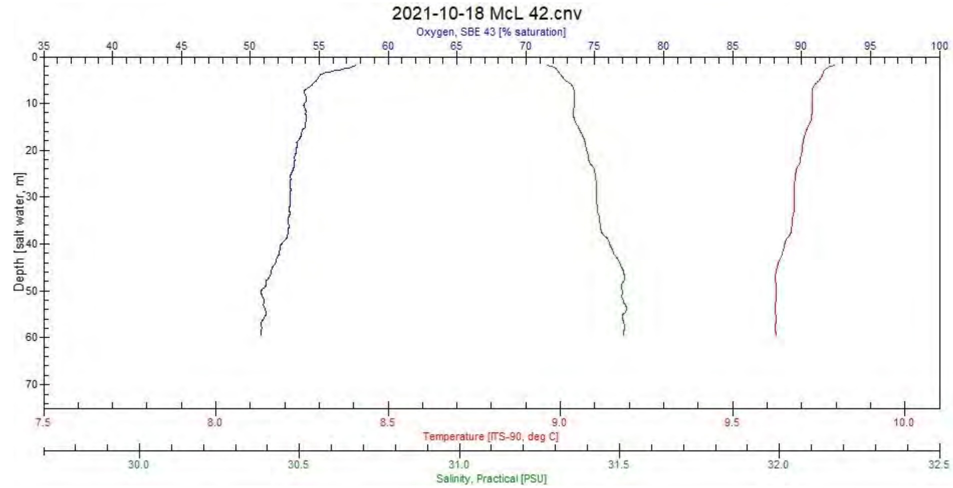

2021-10-18 CB.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]


2021-10-18 McL 39.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]

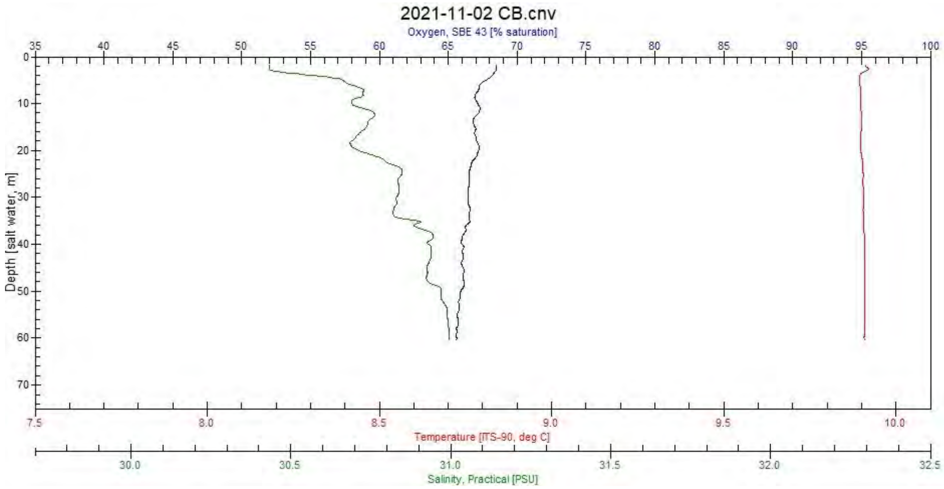

2021-10-18 PB.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]

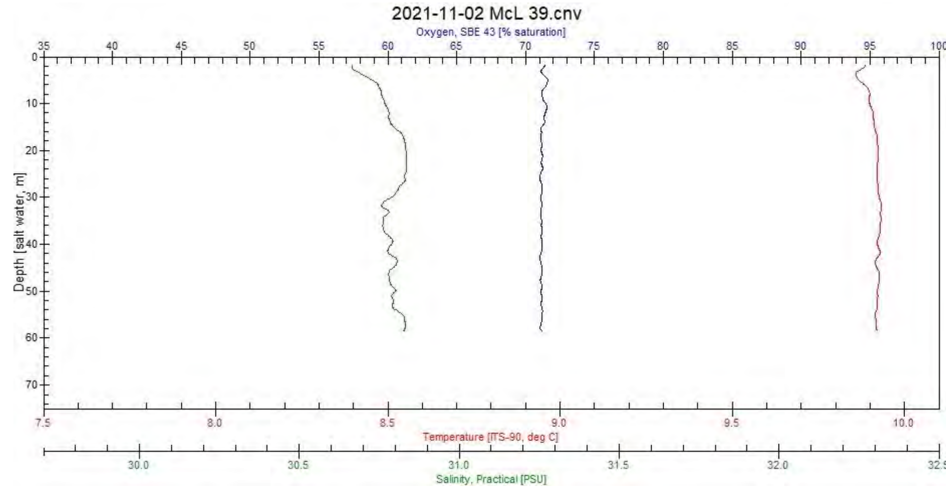

2021-10-18 McL 40.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]

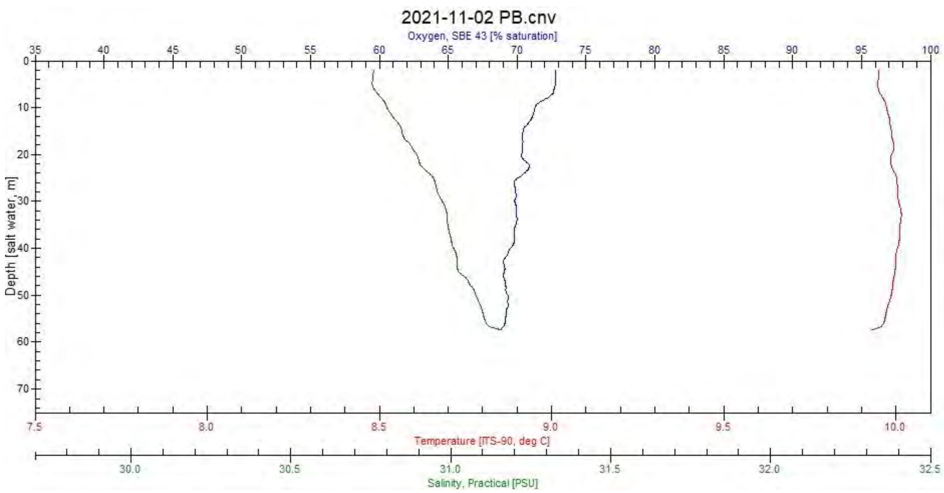

2021-10-18 McL 41.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]

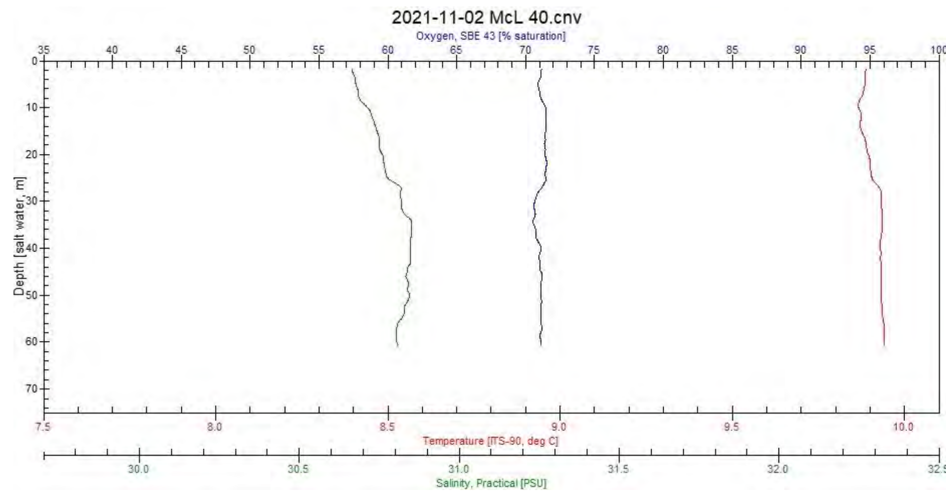

2021-10-18 McL 42.cnv
Oxygen, SBE 43 [% saturation]
Depth [salt water, m]
Temperature [ITS-90, deg C]
Salinity, Practical [PSU]

Appendix C18, cont'd

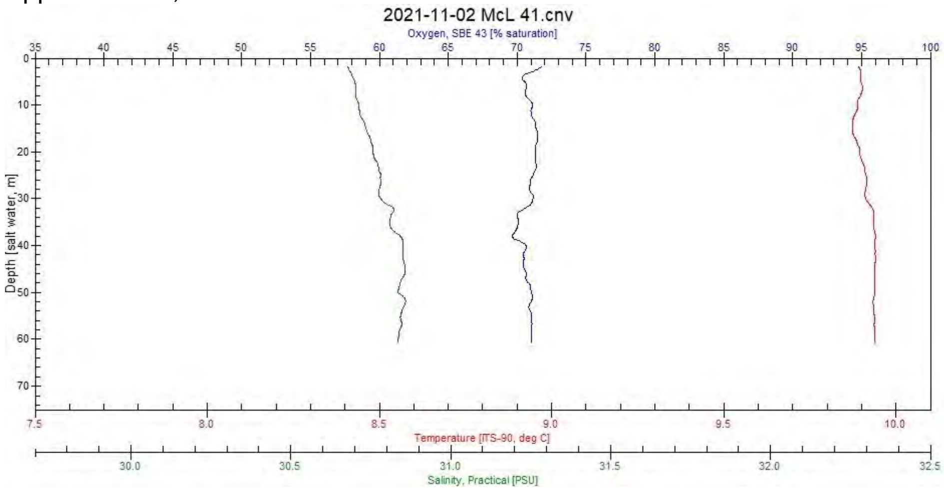


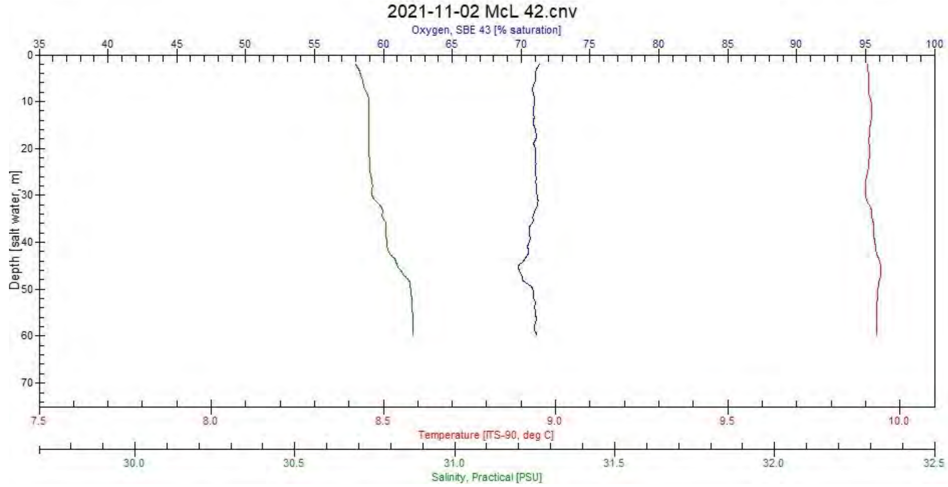


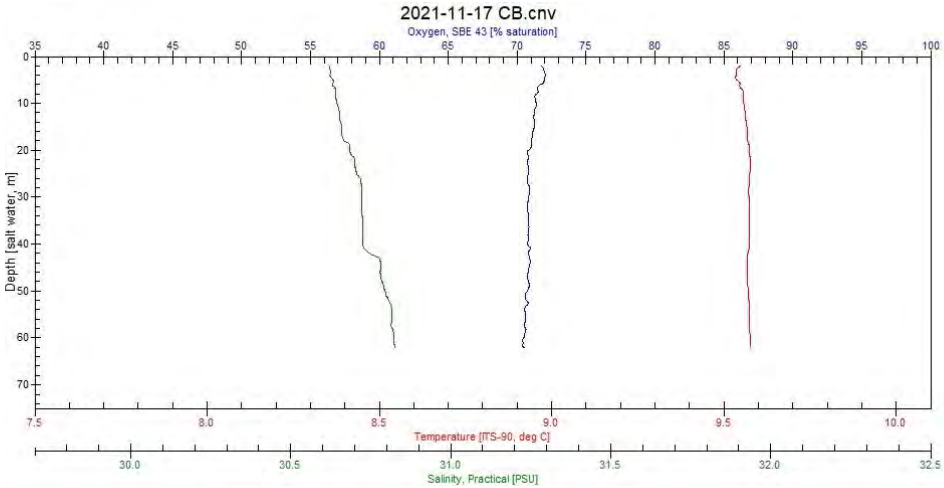


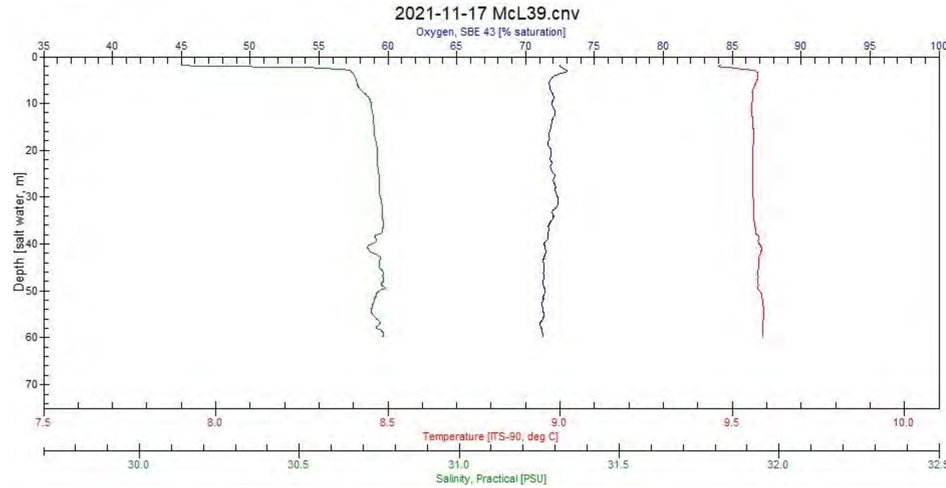


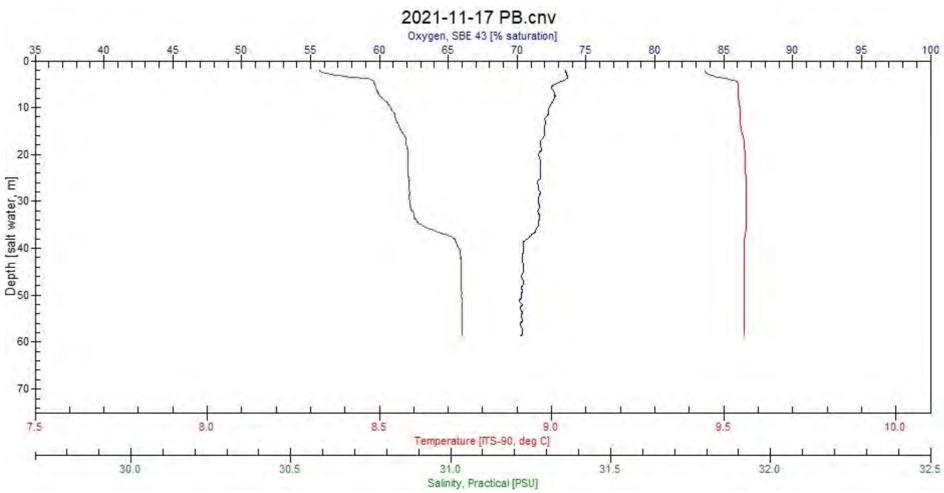
Appendix C18, cont'd

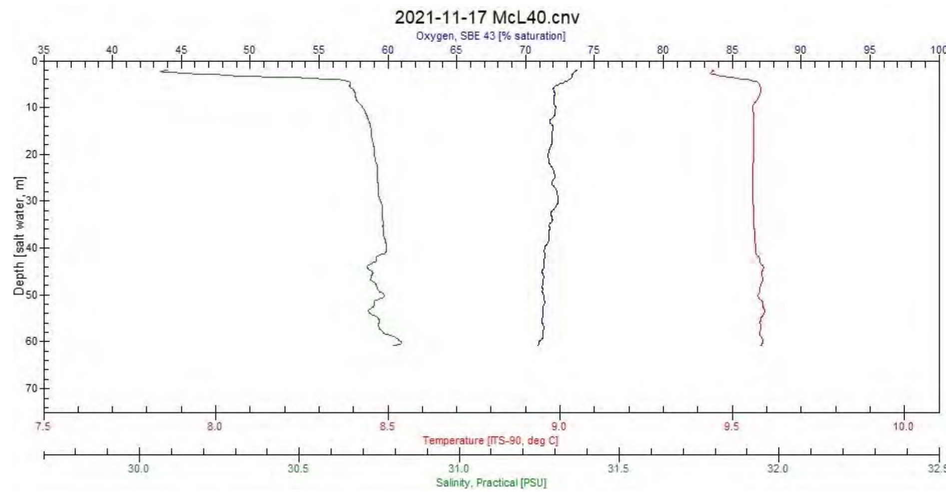




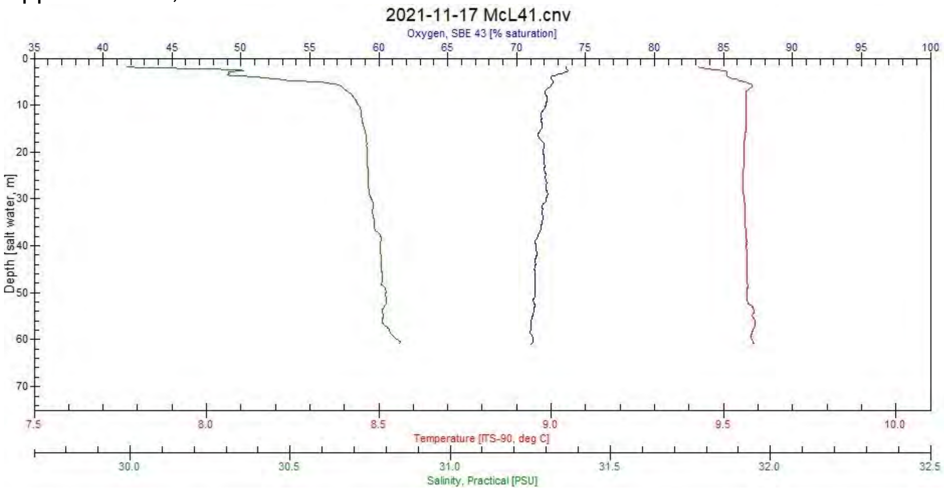

2021-11-17 CB.cnv
Oxygen, SBE 43 [% saturation]
35 40 45 50 55 60 65 70 75 80 85 90 95 100
Depth [salt water, m]
0 10 20 30 40 50 60 70
7.5 8.0 8.5 9.0 9.5 10.0
Temperature [ITS-90, deg C]
30.0 30.5 31.0 31.5 32.0 32.5
Salinity, Practical [PSU]

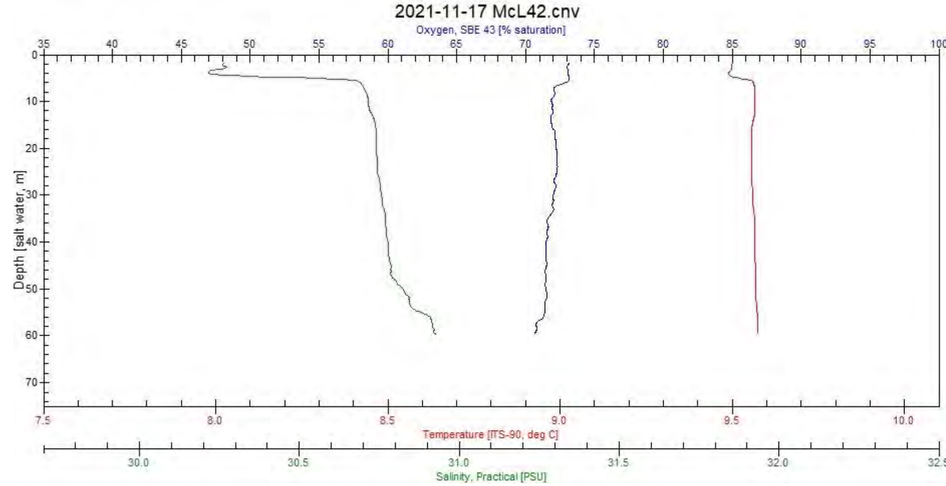

2021-11-17 McL39.cnv
Oxygen, SBE 43 [% saturation]
35 40 45 50 55 60 65 70 75 80 85 90 95 100
Depth [salt water, m]
0 10 20 30 40 50 60 70
7.5 8.0 8.5 9.0 9.5 10.0
Temperature [ITS-90, deg C]
30.0 30.5 31.0 31.5 32.0 32.5
Salinity, Practical [PSU]


2021-11-17 PB.cnv
Oxygen, SBE 43 [% saturation]
35 40 45 50 55 60 65 70 75 80 85 90 95 100
Depth [salt water, m]
0 10 20 30 40 50 60 70
7.5 8.0 8.5 9.0 9.5 10.0
Temperature [ITS-90, deg C]
30.0 30.5 31.0 31.5 32.0 32.5
Salinity, Practical [PSU]

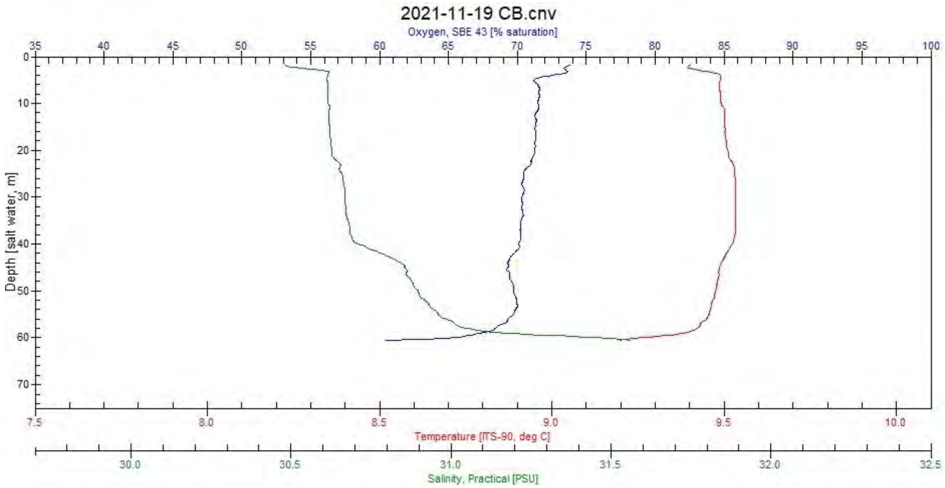

2021-11-17 McL40.cnv
Oxygen, SBE 43 [% saturation]
35 40 45 50 55 60 65 70 75 80 85 90 95 100
Depth [salt water, m]
0 10 20 30 40 50 60 70
7.5 8.0 8.5 9.0 9.5 10.0
Temperature [ITS-90, deg C]
30.0 30.5 31.0 31.5 32.0 32.5
Salinity, Practical [PSU]

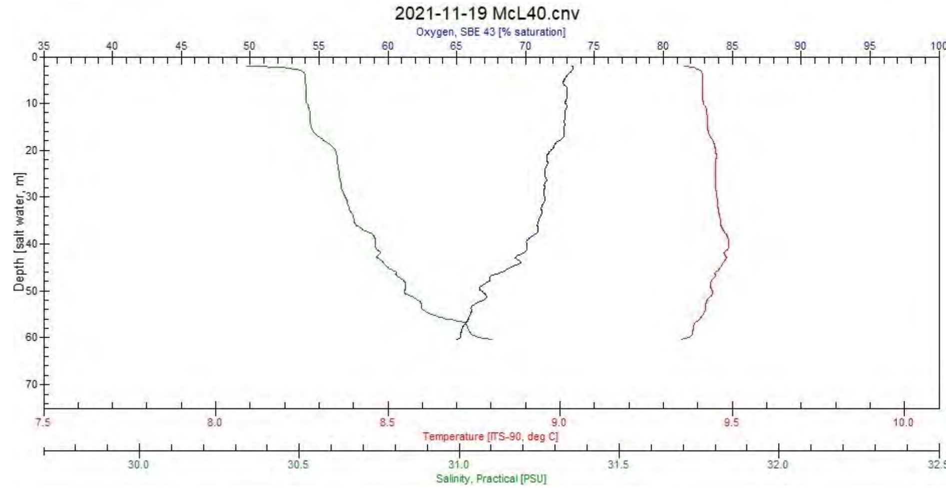
Appendix C18, cont'd

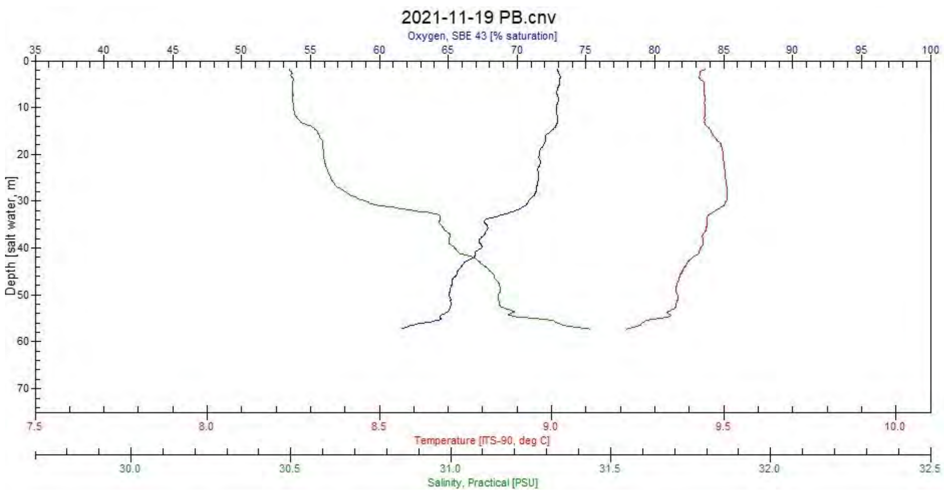


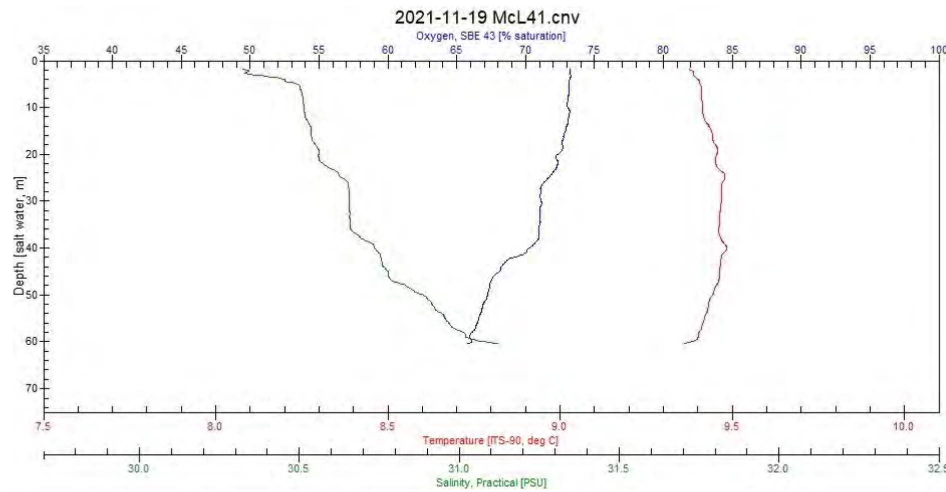


Appendix C18, cont'd

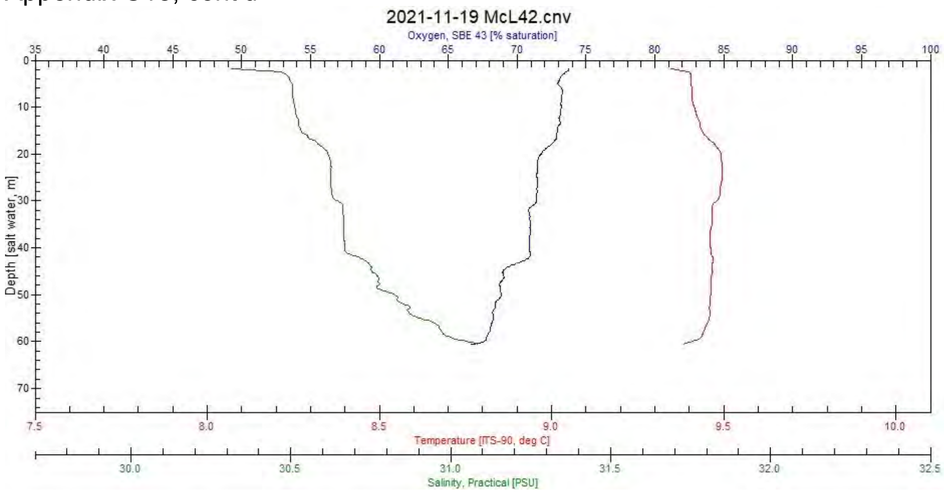


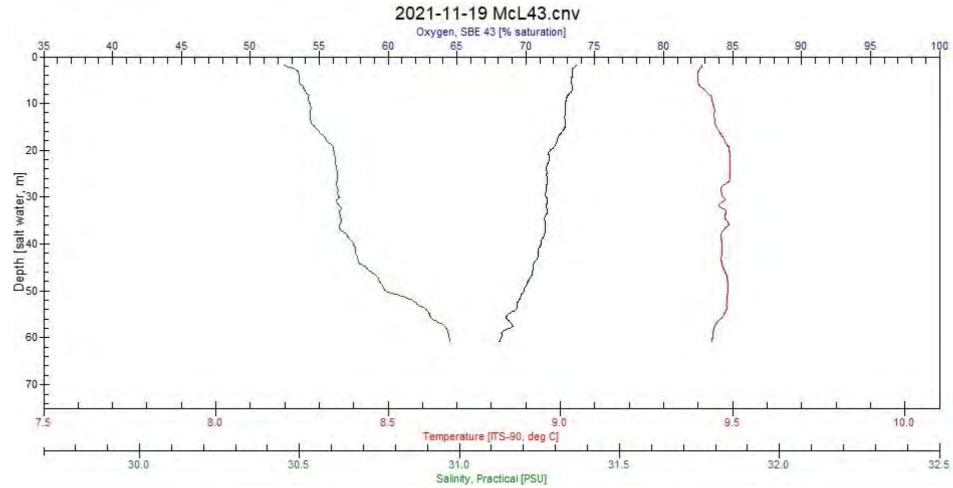






Appendix C18, cont'd





Appendix C18 Modelling Validation Sampling Spring and Summer 2021

The Capital Regional District (CRD) recently assumed the operation of the McLoughlin Point Wastewater Treatment Plant (McLWWTP) in January 2021 and is required by Registration under the Municipal Wastewater Regulation (MWR), Authorization #108831, to undertake minimum dilution model field testing. Testing is required using concurrent effluent and receiving environment water quality samples at the edge of the initial dilution zone (IDZ) at McLoughlin Point outfall and far-field sites (Haystock Islets, Ogden Point, Cook Street, Chatham and Discovery Islands, Trial Island) and at Clover Pump Station (CPS) and Macaulay Pump Station (MPS) during potential overflow events, for modelled scenarios 1, 2 and 3 Lorax (2019).

The three modelled scenarios are based on the influent flow hydrographs prepared by Lorax (2019)[1] representing typical conditions expected up to the year 2030.

- Scenario 1 is summer conditions with flows of about 80% of the average dry weather flow (ADWF) for McLWWTP (ADWF of 108,000 m3/day) of tertiary effluent.
- Scenario 2 is wet weather conditions providing discharge through only the McLWWTP outfall (flows 0.5 x to 2.9 x ADWF when McLWWTP is discharging primary + tertiary blended effluent).
- Scenario 3 is wet weather storm conditions providing discharge through both the McLWWTP (primary + tertiary blended effluent) and CPS (screened effluent) deep outfalls.

This report presents the results from two overflow events that occurred In April 2021 when MPS and CPS were undergoing commissioning works and were overflowing screened sewage over several days. From April 15-22, 2021, 133,818 m^3 of screened sewage was discharged out the MPS long outfall and from April 21-26, 2021, 215,114 m^3 of screened sewage was discharged out the CPS long outfall. Table 1 presents McLWWTP total daily flows and MPS and CPS overflows for the month of April, 2021. While these overflow events do not mirror any of the modelled scenarios, sampling was conducted regardless. Ambient conditions were also assessed at five far-field stations both when overflows were occurring in April, and when not overflowing in August.

Methods

Overflow sampling outfall was conducted off the MPS on April 19, 2021 opportunistically during a routine McLWWTP surface water (SFFC) and IDZ sampling event using UVIC's MV Strickland. Sampling was conducted at depths of 1 m for surface sampling and at 40 m for the IDZ sampling, with station selection based on predictive modelling of the Macaulay Outfall (Hodgins, 2006) [2]. All samples were tested for fecal coliforms and Enterococci. Figure 1 presents the MPS and CPS overflow sample stations.

Far-field surface water sampling at Haystock Islets, Ogden Point, Cook Street, Chatham and Discovery Islands, and Trial Island, was conducted on April 22, 2021 (during a CPS overflow) and on August 4, 2021 (when no overflows were occurring) using the CRD's sampling boat. All samples were tested for fecal coliforms, Enterococci and bacterial source tracking (BST), a DNA based assessment tool that identifies whether bacteria in the sample originated from humans or other animals (i.e., dogs and birds). Figure 2 presents far-field sample locations.

Samples were obtained using a sample pole for surface and far-field sampling and from a Seabird rosette for at depth samples at the IDZ.

Fecal and Enterococci samples were analysed at BV Laboratories (Burnaby, BC) and the BST samples at Microbial Insights (Knoxville, Tennessee).

[1] Lorax (2019) Effluent Dispersion Modelling for the McLoughlin WWTP
[2] Hodgins, D. O. (2006) Technical Memorandum: Assessment of Plume Trapping and Dilution at the Clover Point Outfall and the Macaulay Point Outfall. Seaconsult Marine Research Ltd., Salt Spring Island, BC, Canada.

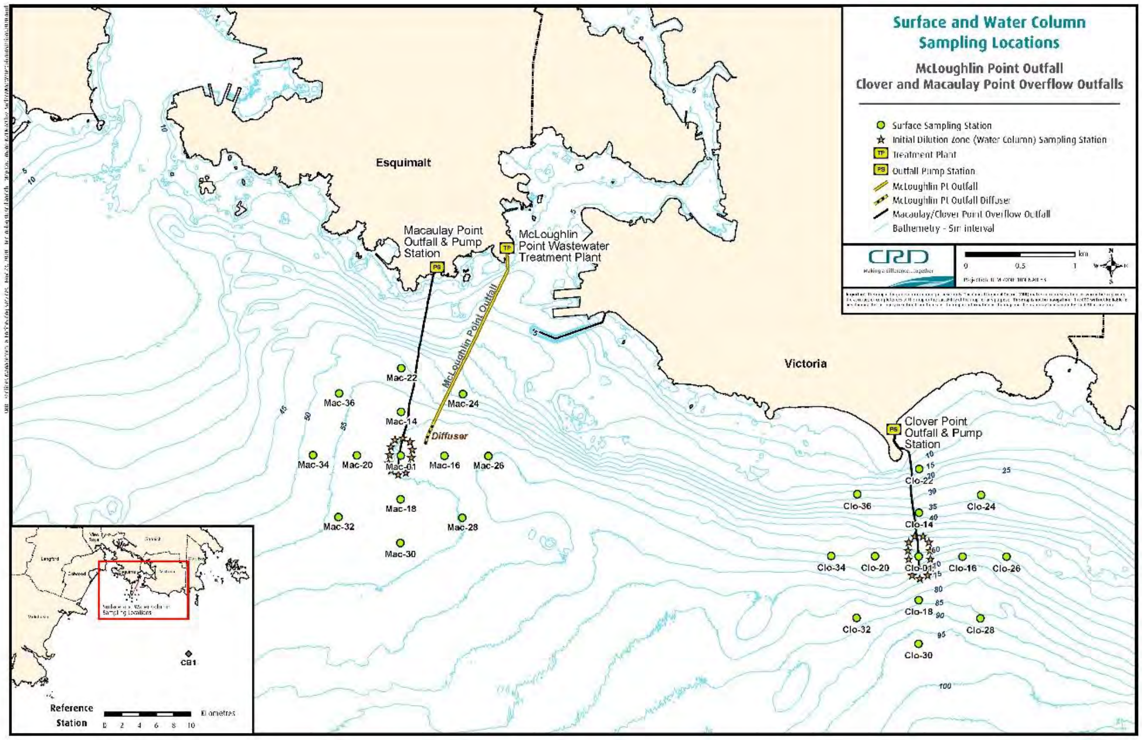


Figure 1 **Clover and Macaulay Pump Station Overflow Sampling Station Locations**

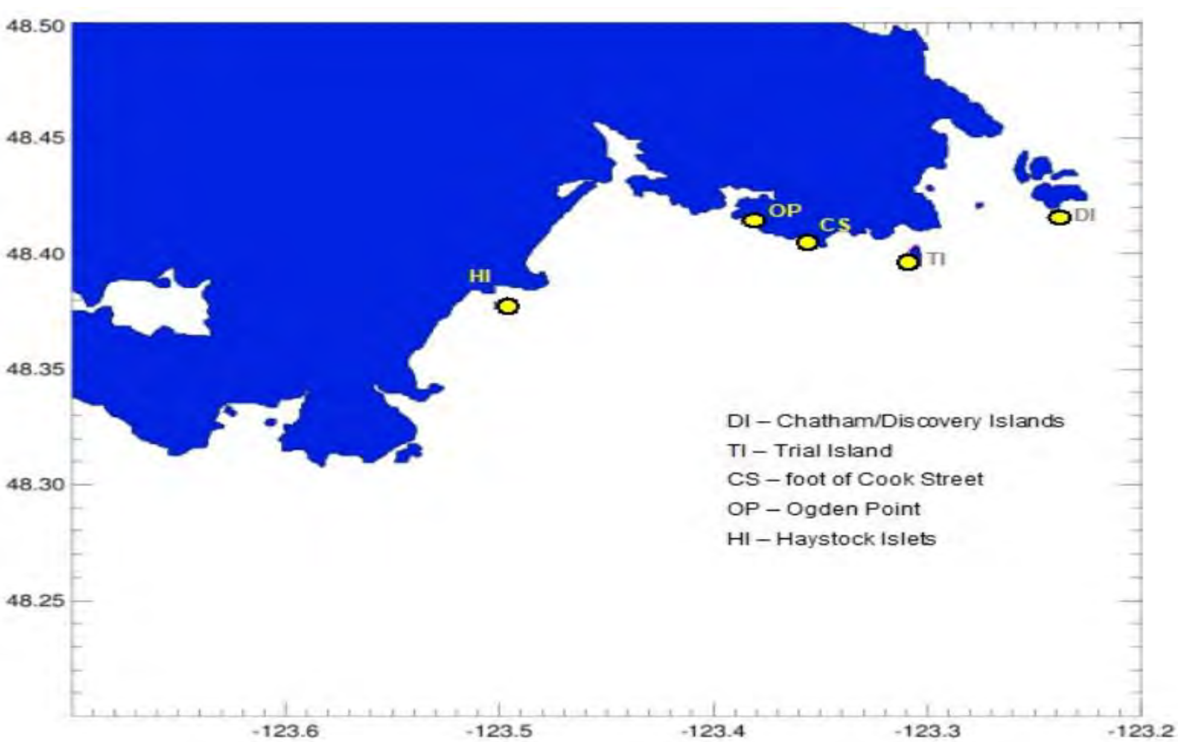


Figure 2 Far-field Sample Locations

Results - Spring Sampling Event

From April 15-22, 2021, 133,818 m^3 of screen sewage was discharged out the MPS long outfall and from April 21-26, 2021, 215,114 m^3 screened sewage was discharged out the CPS long outfall. Table 1 presents total daily flows and overflows for the month of April, 2021. Figure 3 presents tidal conditions at the time of sampling, ebbing at both sample dates.

Table 2 presents the bacteria results of Macaulay surface and IDZ sample results. Table 3 presents the bacteria and BST results of far-field sampling.

Table 1 Total Daily Flows for Clover and Macaulay Pump Stations and McLoughlin Point WWTP (m^3/day)

	Clover Pump Station	Macaulay Pump Station	McLoughlin WWTP
01/04/2021	35	---	87,100
02/04/2021	33	---	84,400
03/04/2021	29	---	84,200
04/04/2021	25	---	84,100
05/04/2021	32	---	84,500
06/04/2021	26	---	83,400
07/04/2021	85	---	85,900
08/04/2021	4	---	81,400
09/04/2021	---	---	87,600
10/04/2021	---	---	84,300
11/04/2021	---	---	84,200
12/04/2021	105	---	81,300
13/04/2021	272	---	81,900
14/04/2021	1	---	80,400
15/04/2021	---	13,198	66,600
16/04/2021	---	---	80,700
17/04/2021	---	6,677	64,200
18/04/2021	---	44,264	38,800
19/04/2021	---	42,852	38,800
20/04/2021	---	25,378	59,000
21/04/2021	12,156	1,385	56,100
22/04/2021	39,144	60	43,600
23/04/2021	39,393	---	40,700
24/04/2021	45,646	---	43,800
25/04/2021	48,233	---	44,300
26/04/2021	29,483	---	63,000
27/04/2021	158	---	78,700
28/04/2021	126	---	79,600
29/04/2021	64	---	79,300
30/04/2021	64	---	79,300

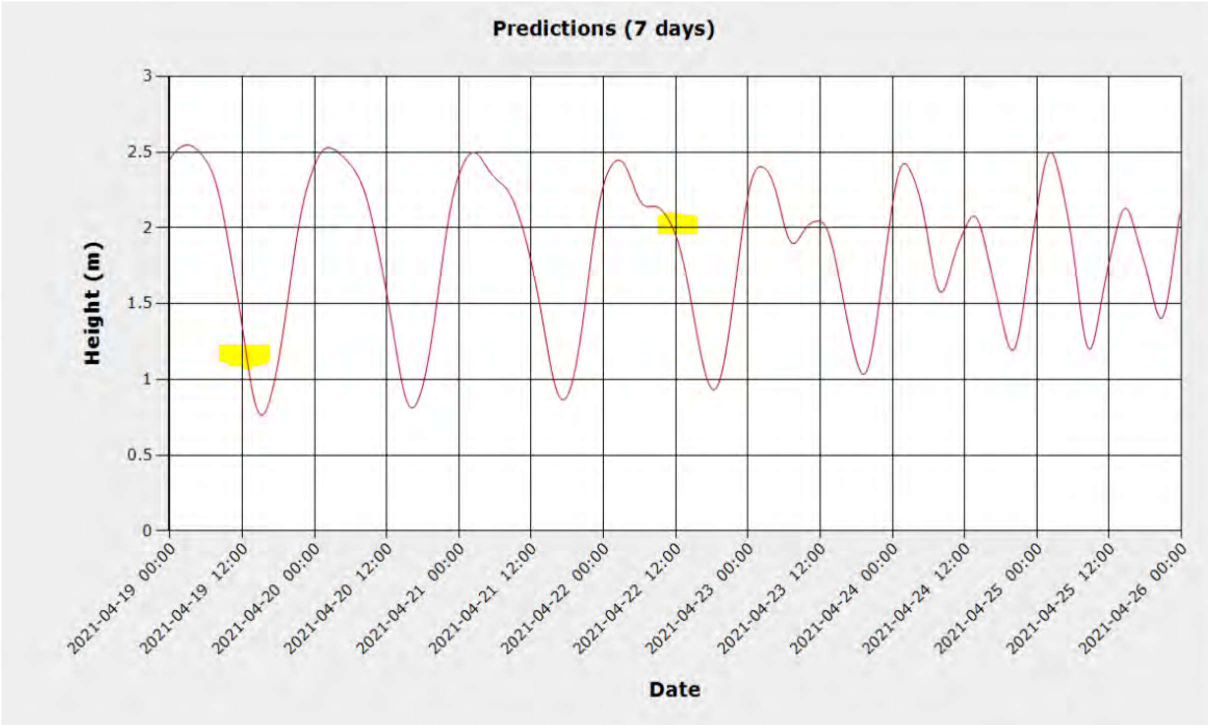


Figure 3 **Tidal Predictions for Victoria During April Sampling Events (sampling event indicated in yellow)**

Table 2 **Macaulay Pump Station SFFC and IDZ Sampling Results**

19/04/2021~13:00				
Program	**Station Name-Number**	**Depth (m)**	**Enterococci**	**Fecal Coliform**
			CFU/100 mL	
Macaulay SFFC	Mac-01	1	<1	<1
Macaulay SFFC	Mac-14	1	<1	<1
Macaulay SFFC	Mac-16	1	<1	<1
Macaulay SFFC	Mac-18	1	<1	<1
Macaulay SFFC	Mac-20	1	<1	<1
Macaulay SFFC	Mac-22	1	<1	1
Macaulay SFFC	Mac-24	1	<1	1
Macaulay SFFC	Mac-26	1	1	<1
Macaulay SFFC	Mac-28	1	<1	<1
Macaulay SFFC	Mac-30	1	<1	<1
Macaulay SFFC	Mac-32	1	<1	<1
Macaulay SFFC	Mac-34	1	<1	<1
Macaulay SFFC	Mac-36	1	<1	<1
Macaulay SFFC	Mac-D1	1	<1	<1
Macaulay IDZ	Mac-44	40	17	75
Macaulay IDZ	Mac-45	40	24	80
Macaulay IDZ	Mac-46	40	27	56
Macaulay IDZ	Mac-48	40	27	65

Table 3 Far-field Surface Water Sampling Results

April			Bacteria		Bacterial Source Tracking			
Program	**Station Name**	**Depth (m)**	**Enterococci**	**Fecal Coliform**	**Human**	**Gull**	**Canada Goose**	**Dog**
			CFU/100 mL		**gene copies/mL**			
Model Validation	Haystock Islets	1	1	2	82	90 (J)	ND	ND
Model Validation	Ogden Point Breakwater	1	1	6	69	ND	ND	ND
Model Validation	Foot of Cook Street	1	1	2	176	80 (J)	ND	ND
Model Validation	Trial Island	1	2	13	29	2 (J)	ND	ND
Model Validation	Chatham Island	1	<1	<1	ND	80 (J)	ND	ND

Notes:
(J) - Detected below practical level of quantification, ND - Not Detected

In the spring sampling event, evidence of the Macaulay Point overflow was detected in samples at depth (40 m) but were much lower than expected. Average Macaulay Point outfall fecal and Enterococci concentrations in 2020 were 6,471,428 and 991,875 CFU/100 mL respectively. After application of the 1:245 minimum initial dilution modelled in Lorax (2019), the expectation would be that fecals and Enterococci concentrations would be closer to 26,413 and 4,048 CFU/100 mL at the 40 m samples. The highest concentration found at 40 m depth was 27 CFU/100 mL Enterococci and 80 fecal coliforms CFU/100 mL.

BST results indicated evidence of human sourced fecal contamination at all far-field sites except Chatham Island with highest concentrations at the foot of Cook Street. These results align with model predictions (Lorax, 2019). Detections of Gull DNA are not confirmed due to concentrations being detected below the practical level of quantification.

Human bacteria is present, likely from sewage but not in high concentrations. The highest number of gene copies ever detected at the CRD was 1,930,000 from a stormwater discharge that had very high concentrations of sewage (the *E.coli* count was 170,000 CFU/100 mL). Our second highest was 370,000 from a station with an *E.coli* count of only 570 CFU/100 mL. The laboratory that processed the BST samples report that you can assume a 1:1 ratio of gene copies to the bacteroides bacteria. Bacteroides are more common in humans, so those could translate to bacteroides per mL.

Results - Summer Sampling Event

Table 4 Far-field Surface Water Sampling Results

August			Bacteria		Bacterial Source Tracking			
Program	Station Name	Depth (m)	Enterococci	Fecal Coliform	Human	Gull	Canada Goose	Dog
			CFU/100 mL		gene copies/mL			
Model Validation	Haystock Islets	1	1	3	ND	ND	ND	ND
Model Validation	Ogden Point Breakwater	1	<1	<1	6	1 (J)	ND	ND
Model Validation	Foot of Cook Street	1	<1	<1	2 (J)	3 (J)	ND	ND
Model Validation	Trial Island	1	2	3	99	1 (J)	ND	ND
Model Validation	Chatham Island	1	<1	<1	ND	ND	ND	ND

Notes:
(J) - Detected below practical level of quantification, ND - Not Detected

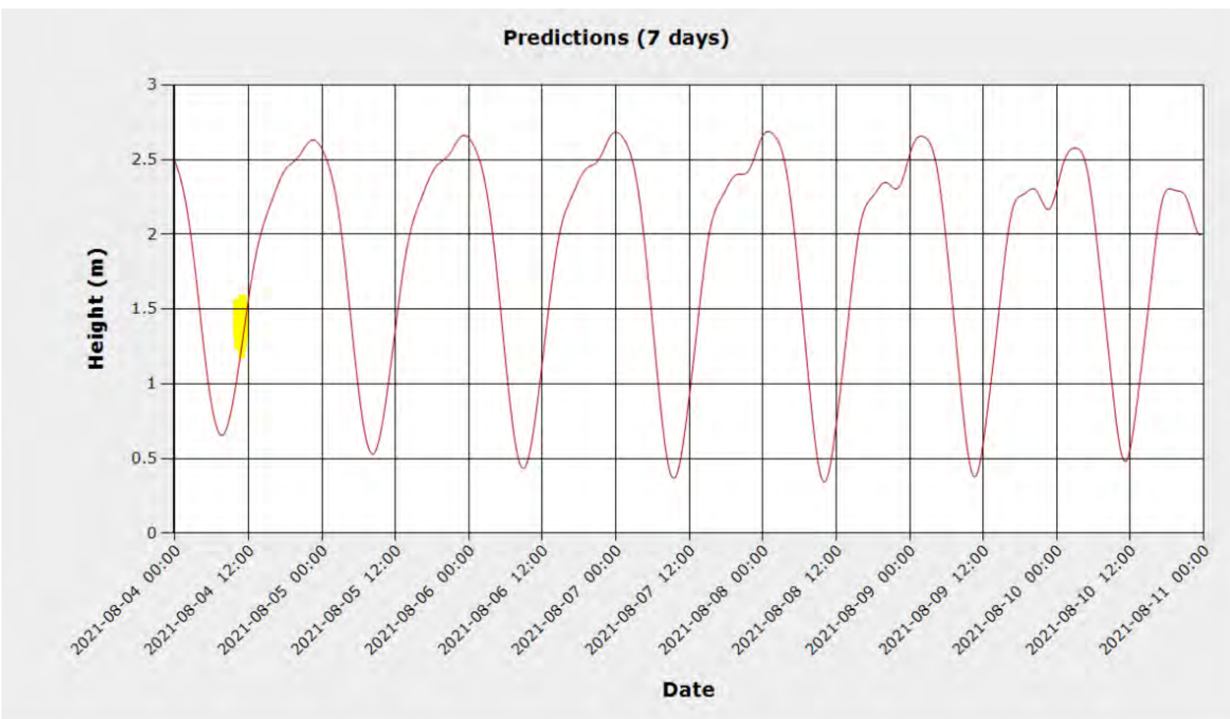


Figure 4 Tidal Predictions for Victoria During August Sampling Event (sampling event indicated in yellow)

APPENDIX D
2021 SHORELINE, OVERFLOW AND BYPASS MONITORING

CRD - Parks & Environmental Services - Environmental Engineering - Mar 16, 2020 - Technologist: srujjancich - Map Document: EmergencyOverflowSampSites2020.mxd

CRD
Making a difference...together

0 50 100 200 300 Metres

Projection: UTM ZONE 10N NAD 83

- Emergency Overflow Sampling Site
- !! Denotes potentially unsafe access during certain conditions

Stormwater Discharge Location

- End of Pipe/Manhole, High Impact
- End of Pipe, High Impact
- End of Pipe, Low Impact
- Manhole, High Impact
- Manhole, Low Impact
- Marine, High Impact
- Marine, Low Impact
- Upstream, High Impact
- PS CRD Pump Station
- Sanitary Emergency Overflow Outfall
- Sanitary Outfall
- Stream/Ditch
- Stormwater Culvert/Drain Pipe
- Lake/Pond/Reservoir/Storage Basin
- Lot Line

DRAFT

EMERGENCY OVERFLOW SAMPLING SITES
CLOVER

CRD - Parks & Environmental Services - Environmental Engineering - Mar 16, 2020 - Technologist: srujjancich - Map Document: EmergencyOverflowSampSites2020.mxd

Making a difference...together

Metres
0 50 100 200 300

Projection: UTM ZONE 10N NAD 83

- Emergency Overflow Sampling Site
- !! Denotes potentially unsafe access during certain conditions

Stormwater Discharge Location

- End of Pipe/Manhole, High Impact
- End of Pipe, High Impact
- End of Pipe, Low Impact
- Manhole, High Impact
- Manhole, Low Impact
- Marine, High Impact
- Marine, Low Impact
- Upstream, High Impact
- PS CRD Pump Station
- Sanitary Emergency Overflow Outfall
- Sanitary Outfall
- Stream/Ditch
- Stormwater Culvert/Drain Pipe
- Lake/Pond/Reservoir/Storage Basin
- Lot Line

DRAFT

EMERGENCY OVERFLOW SAMPLING SITES
MACAULAY

Making a difference...together

Metres
0 25 50 100

Projection: UTM ZONE 10N NAD 83

- Emergency Overflow Sampling Site
- !! Denotes potentially unsafe access during certain conditions

Stormwater Discharge Location

- End of Pipe/Manhole, High Impact
- End of Pipe, High Impact
- End of Pipe, Low Impact
- Manhole, High Impact
- Manhole, Low Impact
- Marine, High Impact
- Marine, Low Impact
- Upstream, High Impact
- PS CRD Pump Station
- Sanitary Emergency Overflow Outfall
- Sanitary Outfall
- Stream/Ditch
- Stormwater Culvert/Drain Pipe
- Lake/Pond/Reservoir/Storage Basin
- Lot Line

DRAFT

EMERGENCY OVERFLOW SAMPLING SITES
MCMICKING

Metres

0 50 100 200 300

Projection: UTM ZONE 10N NAD 83

Important This map is for general information purposes only. The Capital Regional District (CRD) makes no representations or warranties regarding the accuracy or completeness of this map or the suitability of the map for any purpose. This map is not for navigation. The CRD will not be liable for any damage, loss or injury resulting from the use of the map or information on the map and the map may be changed by the CRD at any time.

- Emergency Overflow Sampling Site
- !! Denotes potentially unsafe access during certain conditions

Stormwater Discharge Location

- End of Pipe/Manhole, High Impact
- End of Pipe, High Impact
- End of Pipe, Low Impact
- Manhole, High Impact
- Manhole, Low Impact
- Marine, High Impact
- Marine, Low Impact
- Upstream, High Impact
- CRD Pump Station
- Sanitary Emergency Overflow Outfall
- Sanitary Outfall
- Stream/Ditch
- Stormwater Culvert/Drain Pipe
- Lake/Pond/Reservoir/Storage Basin
- Lot Line

DRAFT

EMERGENCY OVERFLOW SAMPLING SITES
HUMBER & RUTLAND

Making a difference...together

Metres
0 25 50 100 150

Projection: UTM ZONE 10N NAD 83

- Emergency Overflow Sampling Site
- !! Denotes potentially unsafe access during certain conditions

Stormwater Discharge Location

- End of Pipe/Manhole, High Impact
- End of Pipe, High Impact
- End of Pipe, Low Impact
- Manhole, High Impact
- Manhole, Low Impact
- Marine, High Impact
- Marine, Low Impact
- Upstream, High Impact
- CRD Pump Station
- Sanitary Emergency Overflow Outfall
- Sanitary Outfall
- Stream/Ditch
- Stormwater Culvert/Drain Pipe
- Lake/Pond/Reservoir/Storage Basin
- Lot Line

DRAFT

EMERGENCY OVERFLOW SAMPLING SITES
HARLING

CRD - Parks & Environmental Services - Environmental Engineering - Mar 16, 2020 - Technologist: sruljancich - Map Document: EmergencyOverflowSampSites2020.mxd

EMERGENCY OVERFLOW SAMPLING SITES
FINNERTY

DRAFT

Making a difference...together

Metres: 0, 25, 50, 100, 150

Projection: UTM ZONE 10N NAD 83

- Emergency Overflow Sampling Site
- !! Denotes potentially unsafe access during certain conditions

Stormwater Discharge Location

- End of Pipe/Manhole, High Impact
- End of Pipe, High Impact
- End of Pipe, Low Impact
- Manhole, High Impact
- Manhole, Low Impact
- Marine, High Impact
- Marine, Low Impact
- Upstream, High Impact
- PS CRD Pump Station
- Sanitary Emergency Overflow Outfall
- Sanitary Outfall
- Stream/Ditch
- Stormwater Culvert/Drain Pipe
- Lake/Pond/Reservoir/Storage Basin
- Lot Line

CRD - Parks & Environmental Services - Environmental Engineering - Mar 16, 2020 - Technologist: srujancich - Map Document: EmergencyOverflowSampSites2020.mxd

Making a difference...together

0 25 50 100 Metres

Projection: UTM ZONE 10N NAD 83

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- Emergency Overflow Sampling Site
- !! Denotes potentially unsafe access during certain conditions

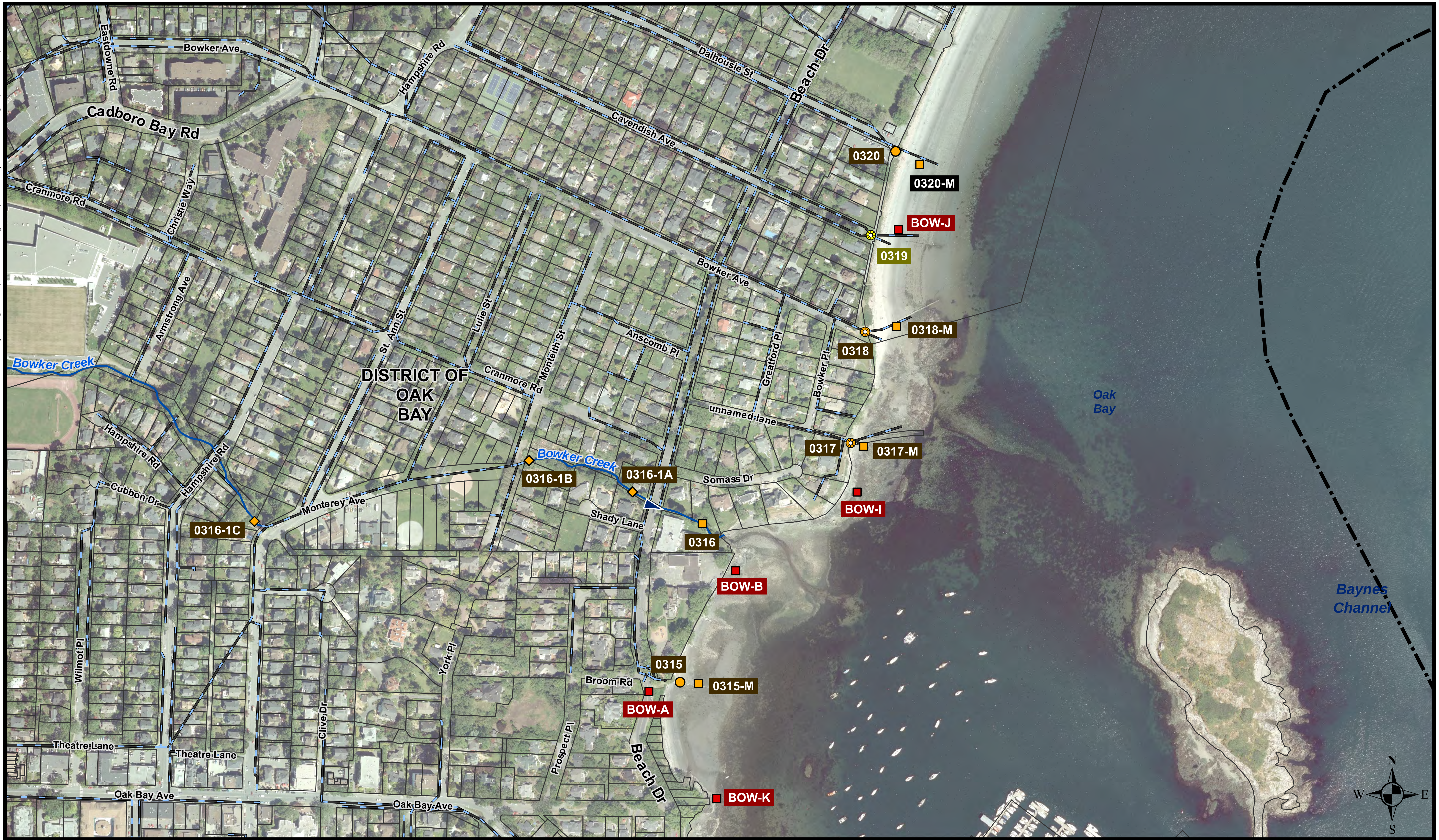
Stormwater Discharge Location

- End of Pipe/Manhole, High Impact
- End of Pipe, High Impact
- End of Pipe, Low Impact
- Manhole, High Impact
- Manhole, Low Impact
- Marine, High Impact
- Marine, Low Impact
- Upstream, High Impact
- PS CRD Pump Station
- Sanitary Emergency Overflow Outfall
- Sanitary Outfall
- Stream/Ditch
- Stormwater Culvert/Drain Pipe
- Lake/Pond/Reservoir/Storage Basin
- Lot Line

DRAFT

EMERGENCY OVERFLOW SAMPLING SITES
BROOM ROAD

CRD - Parks & Environmental Services - Environmental Engineering - Mar 16, 2020 - Technologist: sruljancich - Map Document: EmergencyOverflowSampSites2020.mxd



Making a difference...together

Metres
0 25 50 100 150

Projection: UTM ZONE 10N NAD 83

- Emergency Overflow Sampling Site
- !! Denotes potentially unsafe access during certain conditions

Stormwater Discharge Location

- End of Pipe/Manhole, High Impact
- End of Pipe, High Impact
- End of Pipe, Low Impact
- Manhole, High Impact
- Manhole, Low Impact
- Marine, High Impact
- Marine, Low Impact
- Upstream, High Impact
- PS CRD Pump Station
- Sanitary Emergency Overflow Outfall
- Sanitary Outfall
- Stream/Ditch
- Stormwater Culvert/Drain Pipe
- Lake/Pond/Reservoir/Storage Basin
- Lot Line

DRAFT

EMERGENCY OVERFLOW SAMPLING SITES
BOWKER

Appendix D2 Core Area Bypass and Overflow Sampling Results

Station	Overflow Date	Sampling Date	Enterococci (CFU/100 mL)
Finnerty Overflow/Spill Sampling - Shoreline Station A	Jan 2	Jan 6	1
Finnerty Overflow/Spill Sampling - Shoreline Station B		Jan 6	6
Finnerty Overflow/Spill Sampling - Shoreline Station E		Jan 6	1
SW0245 Foot of Monterey Ave, McNeill Bay		Jan 6	57
McMicking Overflow/Spill Sampling - Shoreline Station A		Jan 6	2
McMicking Overflow/Spill Sampling - Shoreline Station B		Jan 6	1
McMicking Overflow/Spill Sampling - Shoreline Station C		Jan 6	2
McMicking Overflow/Spill Sampling - Shoreline Station D		Jan 6	1
McMicking Overflow/Spill Sampling - Shoreline Station E		Jan 6	8
Harling Overflow/Spill Sampling - Shoreline Station G		Jan 6	30
SW0503 Hobbs creek drains duck pond; Cadboro Bay	Jan 5, 11, 12	Jan 15	440
SW0508 diffuser at foot of Telegraph Bay Rd, Cadboro Bay		Jan 15	4
SW0505-M marine station, near square cement diffuser, SE of playground, Cadboro Bay		Jan 15	<1
Humber and Rutland Overflow/Spill Sampling - Shoreline Station A		Jan 15	2
Humber and Rutland Overflow/Spill Sampling - Shoreline Station B		Jan 15	1
Humber and Rutland Overflow/Spill Sampling - Shoreline Station C		Jan 15	<1
Humber and Rutland Overflow/Spill Sampling - Shoreline Station D		Jan 15	1
Humber and Rutland Overflow/Spill Sampling - Shoreline Station E		Jan 15	23
Humber and Rutland Overflow/Spill Sampling - Shoreline Station F		Jan 15	56
Humber and Rutland Overflow/Spill Sampling - Shoreline Station G		Jan 15	5
Humber and Rutland Overflow/Spill Sampling - Shoreline Station H		Jan 15	6
Humber and Rutland Overflow/Spill Sampling - Shoreline Station I		Jan 15	5
SW0324 Cattle Point		Jan 15	16
SW0245 Foot of Monterey Ave, McNeill Bay	Jan 12	Jan 15	120
SW0249 Foot of Oliver, McNeill Bay		Jan 15	76
McMicking Overflow/Spill Sampling - Shoreline Station A		Jan 15	15
McMicking Overflow/Spill Sampling - Shoreline Station B		Jan 15	5
McMicking Overflow/Spill Sampling - Shoreline Station C		Jan 15	3
McMicking Overflow/Spill Sampling - Shoreline Station E		Jan 15	4
Harling Overflow/Spill Sampling - Shoreline Station G	Jan 12	Jan 15	<1
SW0244 Across from 242 Beach Drive, McNeill Bay		Jan 15	69,000
SW0505 large diffuser; east of Gyro Park parking lot, Cadboro Bay	Feb 1	Feb 04	51
SW0508 diffuser at foot of Telegraph Bay Rd, Cadboro Bay		Feb 04	100
Humber and Rutland Overflow/Spill Sampling - Shoreline Station A		Feb 04	7
Humber and Rutland Overflow/Spill Sampling - Shoreline Station B		Feb 04	<1
Humber and Rutland Overflow/Spill Sampling - Shoreline Station C		Feb 04	1

Station	Overflow Date	Sampling Date	Enterococci (CFU/100 mL)
Humber and Rutland Overflow/Spill Sampling - Shoreline Station D		Feb 04	3
Humber and Rutland Overflow/Spill Sampling - Shoreline Station E		Feb 04	<1
Humber and Rutland Overflow/Spill Sampling - Shoreline Station F		Feb 04	77
Humber and Rutland Overflow/Spill Sampling - Shoreline Station G		Feb 04	1,100
Humber and Rutland Overflow/Spill Sampling - Shoreline Station H		Feb 04	19
Humber and Rutland Overflow/Spill Sampling - Shoreline Station I		Feb 04	69
SW0503 Hobbs creek drains duck pond; Cadboro Bay		Feb 04	51
SW0324 Cattle Point		Feb 04	9
SW0503 Hobbs creek drains duck pond; Cadboro Bay	Feb 21	Feb 24	600
SW0505 large diffuser; east of Gyro Park parking lot, Cadboro Bay		Feb 24	110
SW0508 diffuser at foot of Telegraph Bay Rd, Cadboro Bay		Feb 24	21
Humber and Rutland Overflow/Spill Sampling - Shoreline Station A		Feb 24	3
Humber and Rutland Overflow/Spill Sampling - Shoreline Station B		Feb 24	1
Humber and Rutland Overflow/Spill Sampling - Shoreline Station C		Feb 24	<1
Humber and Rutland Overflow/Spill Sampling - Shoreline Station D		Feb 24	<1
Humber and Rutland Overflow/Spill Sampling - Shoreline Station E		Feb 24	1
Humber and Rutland Overflow/Spill Sampling - Shoreline Station F		Feb 24	3
Humber and Rutland Overflow/Spill Sampling - Shoreline Station G		Feb 24	9
Humber and Rutland Overflow/Spill Sampling - Shoreline Station H		Feb 24	12
Humber and Rutland Overflow/Spill Sampling - Shoreline Station I		Feb 24	1
SW0324 Cattle Point		Feb 24	31
SW0224 Foot of Monterey Ave, McNeill Bay	Feb 21	Feb 24	280
SW0249 Foot of Oliver, McNeill Bay		Feb 24	76
McMicking Overflow/Spill Sampling - Shoreline Station A	Feb 21	Feb 24	2
McMicking Overflow/Spill Sampling - Shoreline Station B		Feb 24	3
McMicking Overflow/Spill Sampling - Shoreline Station C		Feb 24	5
McMicking Overflow/Spill Sampling - Shoreline Station D		Feb 24	2
McMicking Overflow/Spill Sampling - Shoreline Station E		Feb 24	4
Harling Overflow/Spill Sampling - Shoreline Station G		Feb 24	2
SW0250-M marine station, in front of SW discharge at the foot of St. Patrick St., McNeil Bay		Feb 24	9
SW0503 Hobbs creek drains duck pond; Cadboro Bay	Oct 28	Nov 1	330
SW0505 large diffuser; east of Gyro Park parking lot, Cadboro Bay		Nov 1	21
SW0508 diffuser at foot of Telegraph Bay Rd, Cadboro Bay		Nov 1	20
SW0505-M marine station, near square cement diffuser, SE of playground, Cadboro Bay		Nov 1	79
Humber and Rutland Overflow/Spill Sampling - Shoreline Station A		Nov 1	<1
Humber and Rutland Overflow/Spill Sampling - Shoreline Station B		Nov 1	1

Appendix D2, cont'd

Station	Overflow Date	Sampling Date	Enterococci (CFU/100 mL)
Humber and Rutland Overflow/Spill Sampling - Shoreline Station C		Nov 1	18
Humber and Rutland Overflow/Spill Sampling - Shoreline Station D		Nov 1	10
Humber and Rutland Overflow/Spill Sampling - Shoreline Station E		Nov 1	9
Humber and Rutland Overflow/Spill Sampling - Shoreline Station F		Nov 1	57
Humber and Rutland Overflow/Spill Sampling - Shoreline Station G		Nov 1	15
Humber and Rutland Overflow/Spill Sampling - Shoreline Station H		Nov 1	35
Humber and Rutland Overflow/Spill Sampling - Shoreline Station I		Nov 1	27
Bowker Overflow/Spill Sampling - Shoreline Station B		Nov 17	<10
SW0316 south of Somass Drive above tidal influence.		Nov 17	310
SW0317 end of Bowker Lane (sample from manhole if tide too high).	Nov 13 to 15	Nov 17	30
SW0317-M marine station, end of Bowker Lane		Nov 17	<10
SW0315 Broom Road outfall, end of Broom Rd. Sample from crack in pipe if tide is too high.		Nov 17	20
SW0316-1C Bowker Creek, upstream of Monteray Avenue before pipe (Bowker Creek Walkway)	Nov 13 to 15	Nov 17	340
SW0316-1B Bowker Creek, daylight of creek downstream of Monteith Street (Fireman's Park)		Nov 17	290
Bowker Overflow/Spill Sampling - Shoreline Station A	Nov 13 to 15	Nov 17	<10
Finnerty Overflow/Spill Sampling - Shoreline Station B		Nov 17	100
SW0535 south edge of road; Guinivere Place beach access	Nov 13 to 15	Nov 17	300
SW0538A 7.5 m east of discharge 538 in front of the Queen Alexandra Hospital, Finnerty Cove (aqua blue/wooden pipe)		Nov 17	70
SW0503 Hobbs creek drains duck pond; Cadboro Bay		Nov 17	180
SW0508 diffuser at foot of Telegraph Bay Rd, Cadboro Bay		Nov 17	230
SW0505-M marine station, near square cement diffuser, SE of playground, Cadboro Bay		Nov 17	40
Humber and Rutland Overflow/Spill Sampling - Shoreline Station D	Nov 13 to 15	Nov 17	<10
Humber and Rutland Overflow/Spill Sampling - Shoreline Station F		Nov 17	490
Humber and Rutland Overflow/Spill Sampling - Shoreline Station H		Nov 17	<10
Humber and Rutland Overflow/Spill Sampling - Shoreline Station I		Nov 17	40
Finnerty Overflow/Spill Sampling - Shoreline Station E	Nov 13 to 15	Nov 17	10
Clover Overflow Station D		Nov 17	<10
Clover Overflow Station F	Nov 13 to 15	Nov 17	50
SW0212 foot of Cook Street, beach access via circular stairs, sample site just west of stairs (metal grate).		Nov 17	30
SW0245 Foot of Monterey Ave, McNeill Bay	Nov 13 to 15	Nov 17	750
SW0245-M marine station, foot of Monterey Ave, McNeill Bay, larger pipe at base of stairs		Nov 17	160
SW0229 Foot of Ross St, Gonzales Bay	Nov 13 to 15	Nov 17	250
McMicking Overflow/Spill Sampling - Shoreline Station B	Nov 13 to 15	Nov 17	<10
McMicking Overflow/Spill Sampling - Shoreline Station C		Nov 17	10
Harling Overflow/Spill Sampling - Shoreline Station D	Nov 13 to 15	Nov 17	30

Station	Overflow Date	Sampling Date	Enterococci (CFU/100 mL)
Harling Overflow/Spill Sampling - Shoreline Station A	Nov 13 to 15	Nov 17	<10
Harling Overflow/Spill Sampling - Shoreline Station B		Nov 17	50
SW0222-M marine station, discharge near SE corner of Ross Bay Cemetery, cement box conduit		Nov 17	10
Clover Overflow Station C	Nov 25, 27, 28	Dec 02	<1
Clover Overflow Station D		Dec 02	36
Clover Overflow Station E		Dec 02	<1
Clover Overflow Station F		Dec 02	<1
Clover Overflow Station G		Dec 02	2
SW0222-M marine station, discharge near SE corner of Ross Bay Cemetery, cement box conduit		Dec 02	<1
Harling Overflow/Spill Sampling - Shoreline Station D	Nov 27, 28	Dec 02	4
SW0503 Hobbs creek drains duck pond; Cadboro Bay	Nov 25, 27, 28	Dec 02	480
SW0505 large diffuser; east of Gyro Park parking lot, Cadboro Bay		Dec 02	18
SW0505-M marine station, near square cement diffuser, SE of playground, Cadboro Bay		Dec 02	11
Humber and Rutland Overflow/Spill Sampling - Shoreline Station B		Dec 02	6
Humber and Rutland Overflow/Spill Sampling - Shoreline Station D		Dec 02	4
Humber and Rutland Overflow/Spill Sampling - Shoreline Station E		Dec 02	18
Humber and Rutland Overflow/Spill Sampling - Shoreline Station F		Dec 02	29
Humber and Rutland Overflow/Spill Sampling - Shoreline Station G		Dec 02	50
Humber and Rutland Overflow/Spill Sampling - Shoreline Station H		Dec 02	55
Humber and Rutland Overflow/Spill Sampling - Shoreline Station I		Dec 02	80
SW0324 Cattle Point		Dec 02	200
SW0245 Foot of Monterey Ave, McNeill Bay	Nov 27, 28	Dec 02	110
SW0245-M marine station, foot of Monterey Ave, McNeill Bay, larger pipe at base of stairs		Dec 02	38
SW0249 Foot of Oliver, McNeill Bay		Dec 02	190
McMicking Overflow/Spill Sampling - Shoreline Station A	Nov 27, 28	Dec 02	4
McMicking Overflow/Spill Sampling - Shoreline Station B		Dec 02	6
McMicking Overflow/Spill Sampling - Shoreline Station C		Dec 02	5
McMicking Overflow/Spill Sampling - Shoreline Station D		Dec 02	<1
Harling Overflow/Spill Sampling - Shoreline Station G	Nov 27, 28	Dec 02	2
SW0218-M marine station, foot of Memorial Crescent beach access (at cross walk)	Nov 27, 28	Dec 02	12
SW0212 foot of Cook Street, beach access via circular stairs, sample site just west of stairs (metal grate).		Dec 02	3
Clover Overflow Station C	Dec 11	Dec 14	3
Clover Overflow Station D		Dec 14	2
Clover Overflow Station E		Dec 14	1
Clover Overflow Station F		Dec 14	27
Clover Overflow Station G		Dec 14	4

Appendix D2, cont'd

Station	Overflow Date	Sampling Date	Enterococci (CFU/100 mL)
SW0212 foot of Cook Street, beach access via circular stairs, sample site just west of stairs (metal grate).		Dec 14	3
SW0222-M marine station, discharge near SE corner of Ross Bay Cemetery, cement box conduit		Dec 14	100
Harling Overflow/Spill Sampling - Shoreline Station D	Dec 11	Dec 14	<1
SW0503 Hobbs creek drains duck pond; Cadboro Bay	Dec 11	Dec 14	10,000
SW0508 diffuser at foot of Telegraph Bay Rd, Cadboro Bay		Dec 14	6
SW0505-M marine station, near square cement diffuser, SE of playground, Cadboro Bay		Dec 14	40
Humber and Rutland Overflow/Spill Sampling - Shoreline Station B		Dec 14	7
Humber and Rutland Overflow/Spill Sampling - Shoreline Station D		Dec 14	11
Humber and Rutland Overflow/Spill Sampling - Shoreline Station E		Dec 14	27
Humber and Rutland Overflow/Spill Sampling - Shoreline Station F		Dec 14	720
Humber and Rutland Overflow/Spill Sampling - Shoreline Station G		Dec 14	10
Humber and Rutland Overflow/Spill Sampling - Shoreline Station H		Dec 14	11
Humber and Rutland Overflow/Spill Sampling - Shoreline Station I		Dec 14	5
SW0324 Cattle Point		Dec 14	230
SW0245 Foot of Monterey Ave, McNeill Bay	Dec 11	Dec 14	830
SW0245-M marine station, foot of Monterey Ave, McNeill Bay, larger pipe at base of stairs		Dec 14	3
SW0249 Foot of Oliver, McNeill Bay		Dec 14	67
McMicking Overflow/Spill Sampling - Shoreline Station A	Dec 11	Dec 14	1
McMicking Overflow/Spill Sampling - Shoreline Station B		Dec 14	2
McMicking Overflow/Spill Sampling - Shoreline Station C		Dec 14	2
McMicking Overflow/Spill Sampling - Shoreline Station D		Dec 14	4
Harling Overflow/Spill Sampling - Shoreline Station G	Dec 11	Dec 14	1
SW0250-M marine station, in front of SW discharge at the foot of St. Patrick St., McNeil Bay		Dec 14	4
Clover Overflow Station C	Dec 17, 18	Dec 21	4
Clover Overflow Station D		Dec 21	4
Clover Overflow Station E		Dec 21	3
Clover Overflow Station F		Dec 21	3
Clover Overflow Station G		Dec 21	<1
SW0212 foot of Cook Street, beach access via circular stairs, sample site just west of stairs (metal grate).		Dec 21	4
SW0222-M marine station, discharge near SE corner of Ross Bay Cemetery, cement box conduit		Dec 21	460
Harling Overflow/Spill Sampling - Shoreline Station D	Dec 17, 18	Dec 21	3
SW0503 Hobbs creek drains duck pond; Cadboro Bay	Dec 17, 18	Dec 21	2,800
SW0508 diffuser at foot of Telegraph Bay Rd, Cadboro Bay		Dec 21	31
SW0505-M marine station, near square cement diffuser, SE of playground, Cadboro Bay		Dec 21	8
Humber and Rutland Overflow/Spill Sampling - Shoreline Station B		Dec 21	<1
Humber and Rutland Overflow/Spill Sampling - Shoreline Station D		Dec 21	100

Appendix D2, cont'd

Station	Overflow Date	Sampling Date	Enterococci (CFU/100 mL)
Humber and Rutland Overflow/Spill Sampling - Shoreline Station E		Dec 21	10
Humber and Rutland Overflow/Spill Sampling - Shoreline Station F		Dec 21	790
Humber and Rutland Overflow/Spill Sampling - Shoreline Station G		Dec 21	1
Humber and Rutland Overflow/Spill Sampling - Shoreline Station H		Dec 21	3
Humber and Rutland Overflow/Spill Sampling - Shoreline Station I		Dec 21	3
SW0245 Foot of Monterey Ave, McNeill Bay	Dec 17, 18	Dec 21	56
SW0245-M marine station, foot of Monterey Ave, McNeill Bay, larger pipe at base of stairs		Dec 21	16
SW0249 Foot of Oliver, McNeill Bay		Dec 21	90
McMicking Overflow/Spill Sampling - Shoreline Station A	Dec 17, 18	Dec 21	1
McMicking Overflow/Spill Sampling - Shoreline Station B		Dec 21	<1
McMicking Overflow/Spill Sampling - Shoreline Station C		Dec 21	2
McMicking Overflow/Spill Sampling - Shoreline Station D		Dec 21	3
Harling Overflow/Spill Sampling - Shoreline Station G	Dec 17, 18	Dec 21	215
SW0250-M marine station, in front of SW discharge at the foot of St. Patrick St., McNeil Bay		Dec 21	<1

Notes:
Shaded cells exceed Health Canada (2012) recreational guideline of 70 CFU/100 mL maximum from one sample