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REPORT

City of Port Alberni

Wastewater Treatment Facility Operating Plan

APRIL 2023

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1 INTRODUCTION

This Operating Plan is intended to provide a high-level overview of the key activities required to successfully operate the City of Port Alberni's new wastewater treatment facility (WWTF). The WWTF was commissioned in 2022 and consists of a secondary treatment lagoon facility with fine screening and ultraviolet disinfection. Effluent from the lagoon system is pumped through the ultraviolet reactors to an outfall in the estuary formed by the Somass River in the Alberni Inlet. The WWTF treats municipal wastewater from the City, in addition to leachate from the Alberni Valley landfill. Greater detail for the required activities is provided in the Operations and Maintenance Manual for the facility.

This plan addresses:

1. The proper operation, maintenance and monitoring of the new works at the wastewater facility.
2. Staff education and certification.

A separate plan is being prepared to cover emergency operations. Refer to the Contingency Plan for details related to these items.

1.1 Operational Components

The facility is broken down into the following areas:

- Junction Chamber and Influent Flow Monitoring
- Screening Building
- Lagoon cells including aeration system
- Effluent Pump Stations
- Treatment Building including UV disinfection, standby generator and electrical components
- Outfall and Discharge Diffusers

1.1.1 Junction Chamber and Influent Flow Monitoring

Six pipes convey wastewater to the new treatment facility. Four are forcemains from the City's pump stations: Argyle, Wallace, Josephine and Margaret. In addition, two gravity lines also feed into the facility: Johnstone gravity main and the leachate pipe from the local landfill. All six pipes have a magnetic flowmeter at the influent flowmeter chambers to measure incoming flow. In addition, adjacent to the flowmeter chambers is a kiosk with sample points for each incoming wastewater flow.

Figure 1-1 Influent Flowmeter Chambers and Sampling Kiosk

After the flowmeter chambers, the six pipes connect to a junction chamber that combines flow from all six catchments. The combined incoming wastewater flows through a 1050 mm HDPE pipe to the screening building.

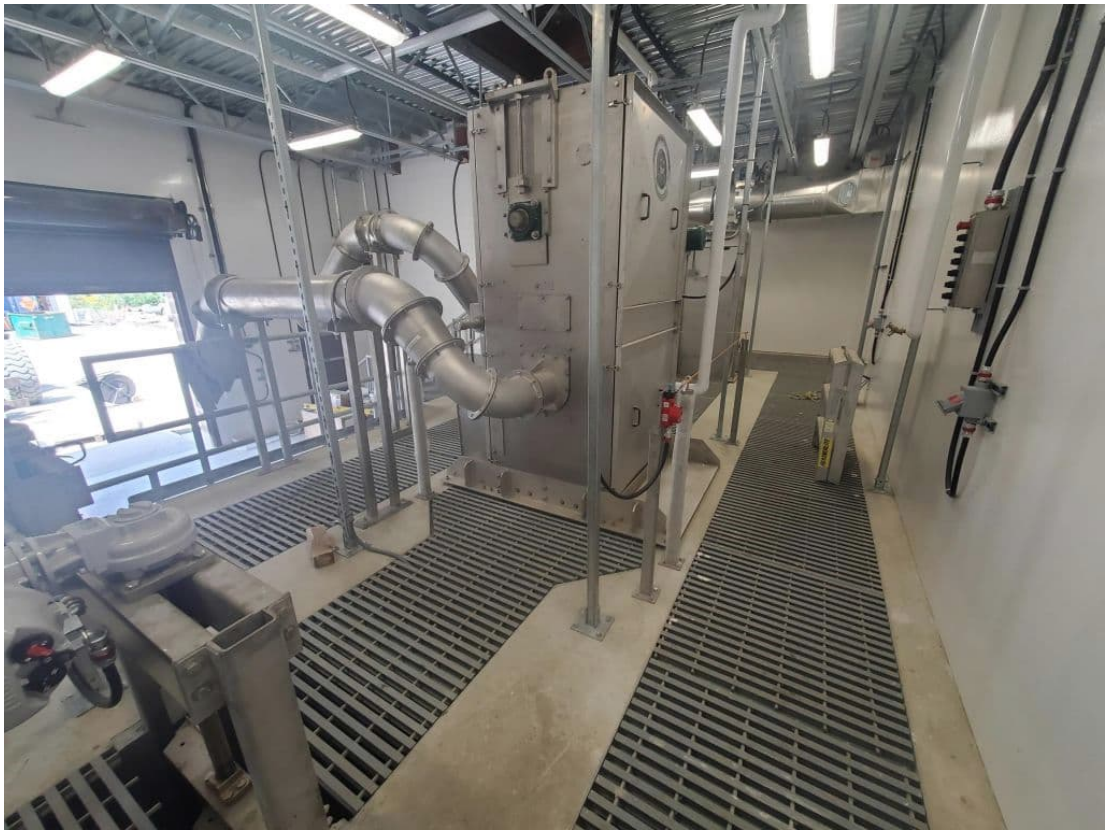
Figure 1-2 Influent Wastewater Junction Chamber

1.1.2 Screening Facility

Influent wastewater flows through two perforated plate band screens in the screening building. Each screen has capacity to handle peak flows entering the treatment facility, providing redundancy if one unit is out of service. The screens have 6 mm openings and remove rags, plastics and other debris from the wastewater flow. Screenings are dumped into a compactor unit that deposits the screenings in bins for disposal off-site.

The screenings room is equipped with gas sensors for methane and hydrogen sulfide. These sensors trigger an alarm to alert operators when high gas levels are present.

Figure 1-3 Fine Screens



1.1.3 Lagoon Aeration System

The lagoon consists of an extended aeration system split into two parallel cells. Wastewater flow from the screening building is split between the two cells in a splitter box located in the center berm. Each cell can be isolated for maintenance using stop logs placed on either side of the splitter box. The aeration system consists of fine bubble diffusers suspended from laterals that run across each cell. Air is supplied by three turbo blowers (two duty, one standby) located at the treatment building.

Figure 1-4 Aeration Laterals and Screening Building in Background

1.1.4 Effluent Pumping and UV Disinfection System

Effluent is pumped from each cell by two effluent pump stations (one in each lagoon cell) on pile supported steel platforms. Each effluent pump station has two submersible axial flow pumps. The effluent pumping system is designed to pump flows ranging from 40 ML/day to 80 ML/day. Each pump is capable of producing 40 ML/day flow rate. For peak flows up to 80 ML/day one pump from each cell operates. This provides redundancy in the form of a spare pump in each cell when a pump is out of service for maintenance.

Figure 1-5 Effluent Pump Stations

Effluent is pumped into the treatment building where it's treated with UV disinfection before discharge through the outfall. There are five UV reactors in the treatment building, each with a capacity of 20 ML/day, resulting in four duty and one standby reactor. The reactors are designed to meet disinfection requirements for the effluent over a wide range of UV transmittance (UVT) values to account for any variability in effluent characteristics.

Figure 1-6 UV Disinfection

1.2 Electrical Classification

The site has a single building that carries a hazardous area classification per Section 18 of the Canadian Electrical Code (CEC). The screening building carries a Class 1 Zone 2 Grp IIB rating due to the presence of potentially explosive, H_2S gas. The exposure to the hazardous gas is minimal, with exposure to the lower explosive limit (LEL) of H_2S to be less than 10 hours in a given calendar year.

Due to the nature of the wastewater treatment facility, the screening building is classified as a Category 2 corrosive location per Section 22-704 of the CEC.

2 FACILITY CERTIFICATION

The City is in the process of preparing application to EOCP, to re-classify the treatment facility. EOCP also routinely re-classifies all wastewater treatment facilities five years after their last classification. With the upgrades, it is expected that the classification of the Port Alberni WWTF will be upgraded to a Level II facility. The City will work with the EOCP to upgrade the certifications of operators, to meet new requirements with a higher certification level.

The wastewater collection (WWC) system was rated as a Class III system in October 1983 (Certificate No. 94).

3 OPERATOR CERTIFICATION

Since the WWTF is currently classified as MWWT-I, EOCP requires the Chief Operator to be certified as a Wastewater Operator Level I. At present, the plant will normally be staffed during weekdays. In 2019, the following operators were working at the Port Alberni WWTF:

- Karry Berke (Wastewater System Chargehand) Level 2 for WWC
- Crystal Hiltunen (Wastewater System Chief Operator) Level 2 for WWC; Level 1 for WWT
- Brian Povey (Wastewater System Operator) Level 2 for WWC; Level 1 for WWT
- Trevor Lepine (Wastewater Treatment Plant Technician, Chief Operator for WWTF) Level 1 for WWC; Level 1 WWT
- Justin Bishop (Wastewater System Operator) WWC Level 2

4 OPERATION AND MAINTENANCE

4.1 The Operations Manual

As part of the City of Port Alberni WWTF upgrades, a comprehensive Operations and Maintenance Manual that covers all of the new equipment and processes in the plant was prepared. The Operation's Manual consists of four volumes: The Operating Manual, Architectural and Structural, Mechanical Operations and Maintenance, and Electrical, Instrumentation and Control Operations.

For each system and major piece of equipment the following is included:

- Maintenance and operating instructions including:
  - Installation instructions (for equipment replacement)
  - Proper adjustment procedures
  - Procedures for starting
  - Test procedures
  - Procedures for operation
  - Procedures for shutdown
  - Safety precautions
  - List of electrical relay settings and control and alarm contact settings
  - Troubleshooting procedures and data

- Preventative Maintenance Program details including:
  - Suggested checklist sheets
  - A list of points to be lubricated
  - A recommended list of type, grade, and temperature range of lubricants
  - A suggested schedule for lubrication and inspection
  - Schematic, single line, and wiring diagrams
  - A valve tag list
  - A recommended spare parts list
  - Records of certification, guarantees, and warranties
  - A list of service representatives - name, address, and telephone number
  - A list of suppliers for replacement parts - name, address, and telephone number

- Test results; witness testing and commissioning, reports
- Test data for piping systems (degreasing, flushing, disinfection)
- Hydrostatic or air tests performance
- Equipment alignment certificates
- Balancing data for air and water systems
- Inspection approval certificates for all types of systems; plumbing and piping, hot air and ventilating, electrical supervisory, etc.

4.2 Facility Operation

As discussed in Section 3 above, the City of Port Alberni's WWTF will be operated by an appropriately EOCP-certified operator who will inspect the treatment facility regularly and maintain the facility in good working order. Should the facility have any malfunction(s) that will impact the quality of the effluent such that the discharge will exceed the specified maximum flows and/or concentrations, notification will be made as described in the Contingency Plan. The facility is equipped with alarms that are transmitted via the City's SCADA system to notify operators of equipment issues. This system will call-out the operator or standby/on-call operator on a 24 hour, seven days a week basis.

Plant operation includes:

- Daily attendance at the plant on a Monday through Friday basis with weekends covered through remote SCADA system monitoring and standby/on-call staff.
- Checking condition of the outfall signage and lagoon site on a regular basis.
- Checking the operation and physical condition of the equipment daily on a Monday to Friday basis, or as specified by the equipment manufacturer (and referenced in the Facility Operations Manual to be supplied by the Construction Contractor).
- Sampling and analysis of the influent and effluent, as required to meet the monitoring requirements (analysis either in the plant lab or shipped off-site to an accredited lab, as appropriate).
- Logging data (such as influent and effluent flows and lagoon level) as needed for plant operations records and reporting requirements.

4.3 Facility Maintenance

Plant maintenance will follow procedures that are laid out in the plant operations manual. This includes, a minimum, of the following regular activities:

- Lubrication and checking of moving equipment.
- Checking and adjustment of drive belts and/or chain tension and/or alignments, as required.
- Adjusting equipment tolerances to compensate for wear, as required.
- Removal, tear-down, repair and replacement of failed equipment, as needed and when possible and/or replacement with on the-shelf-spares; shipment of failed equipment to off-site firms for repair.
- Logging of maintenance and repair data in the plant computer data base.
- Updating and revising the maintenance schedule, as required.
- Testing/replacement of UV tubes on scheduled basis.

The O&M manual also contains the name and contact information for service agents of all major equipment on site, including UV reactors, turbo blowers and effluent pumps.

4.4 SCADA System & Alarms

Any failed equipment will issue an alarm. All alarms are transmitted via the central supervisory control and data acquisition (SCADA) system. In general, where equipment fails or is unable to start, a backup unit will start. Alarms are assigned one of the follow priority levels:

Alarm Priority 1 (call-out):

- Requires immediate attention.
- Alarm will trigger the SCADA to call-out operator to the facility.

Alarm Priority 2:

- Does not require immediate attention, and can be addressed the next time operator is on site (i.e. regular working hours Monday to Friday).
- May be classified as an 'alert'.
- May precede a priority 1 alarm.

In addition to equipment alarms, security alarms are also provided.

Doors are monitored by intrusion switches; the status is wired back to the plant PLC and monitored through SCADA. If someone enters without logging into the PLC system within a set time, then a building intrusion alarm will be issued. Operations staff can also view the current operating status of the equipment through the SCADA system.

5 EMERGENCY PROCEDURES

The Port Alberni WWTF is maintained proactively and has built-in redundancy in the treatment plant design. However, in the case of unforeseen problems, the following multi-step process is designed to mitigate potential impacts. In addition to the proactive maintenance described in Section 4.3, the stages of this process are:

- Built-in Redundancy
- Report Spills Promptly
- Measures To Mitigate Potential Health or Environmental Impact

5.1 Built-in Redundancy

The Port Alberni WWTF is designed to meet or exceed the reliability requirements of Division 1 of Part 3 of the MWR for a Reliability Category II treatment plant. The Port Alberni WWTF, meets the reliability requirements in the following ways:

- Duty/Standby fine screening (no requirement in MWR)
- Full redundancy in the lagoon system and operation (multiple blower units, two lagoon cells)
- Full redundancy in the pump station (as per Section 37 of MWR)
- Standby unit in the ultraviolet disinfection system providing full treatment of flow when largest unit is out of service (as per disinfection requirements)

5.2 Spill Response and Reporting

Based on the proactive maintenance and redundancy measures outlined above, there should not be any spills of either treated or untreated wastewater from this plant. If a spill occurs, the person in Direct Responsible Charge for the WWTF will act in accordance with the Spill Reporting Regulation to "take all reasonable and practical action, having due regard for the safety of the public and of himself or herself, to stop, contain and minimize the effects of the spill."

The following protocol will be followed:

1. Ascertain the reason for the spill, e.g., power failure, blockages, etc. in the event that a quick solution can be implemented.
2. Report the spill to the Provincial Emergency Program (PEP) of the Ministry of Attorney General under the Spill Reporting Regulation (BC Reg. 263/90) of the Environmental Management Act, by telephoning 1-800-663-3456 as provided in Section 2 (1) of the Act.
3. Notify the Ministry of Environment Regional Environmental Management Manager in Nanaimo (250-751-3100) and the local public Health Authority of the situation and the intended plan of action.
4. Following the spill, prepare a Spill Report document and submit to Ministry of Environment in Nanaimo. In accordance with the Spill Reporting Regulation, the report must include the following:
    - The reporting person's name and telephone number,
    - The name and telephone number of the person who caused the spill,
    - The location and time of the spill,
    - The type and quantity of the substance spilled,
    - The cause and effect of the spill,
    - Details of spill containment and minimizing action taken,
    - A description of the spill location and of the area surrounding the spill,
    - The details of further action contemplated or required,
    - The names of agencies on the scene, and
    - The names of other persons or agencies advised concerning the spill.

5.3 Measures to Mitigate Potential Health or Environmental Impact

The measures incorporated into the new works of the expanded City of Port Alberni WWTF to mitigate potential health or environmental impacts include:

- A series of redundancy features (as described in Section 5.1 above) to help prevent any problems due to equipment failure.
- A spill response protocol plan (See Section 5.2 above) to prevent or minimize problems with a spill, should one occur.

6 FACILITY MONITORING AND TRIGGER RESPONSE PLAN

6.1 Facility Effluent Monitoring

The monitoring requirements for the City of Port Alberni WWTF are taken from Operational Certificate (OC) #110576 for this facility.

Table 6-1 Effluent Quality and Sampling Requirements

Effluent Discharge Parameter	Limit	Units	Collection Method	Collection Frequency	Reporting Frequency
Flow	79,400	m^3/d	Flowmeter	Daily or continuous	Annually
$CBOD_5$	45	mg/L	Composite	Twice/week	Annually
TSS	45	mg/L	Composite	Twice/week	Annually
Fecal Coliform Organisms	3,200	MPN/100mL	Grab	Twice/month	Annually
Escherichia coli	6,400	e.coli/100 mL	Grab	Twice/month	Annually
Enterococci	1,120	Enterococci/100 mL	Grab	Twice/month	Annually
Ammonia-N	27.2[1]	mg/L	Composite	Twice/Month	Annually
pH (for determination of un-ionized ammonia)	6-9	pH units	Field measurement and Laboratory analysis of composite samples	With all samples at time of sampling	Annually
Total and Dissolved Metals	Varies per individual metal	Mg/L	Composite	Monthly	Annually
Toxicity (96 Hr RBT single concentration)	Test must pass in 100% effluent concentration	N/A	Grab	Twice/year (February and September)	Annually
Total Phosphorus	6[2]	mg/L	Composite	Twice/Month	Annually
Orthophosphate	4[2]	mg/L	Composite	Twice/Month	Annually

1. Ammonia limit is not in the Operating Certificate, but as per EIS, this is the maximum allowable “end of pipe” average total ammonia concentration recommendation
2. As per Section 95 Substitution request for Phosphorus requirements

The requirements of Table 6-1 are the minimum frequencies per the OC, and the City of Port Alberni may elect to sample for some parameters more frequently in support of process control and optimization. The required sampling will be conducted by an accredited laboratory, and sampling will be done using laboratory-supplied bottles and preservation requirements. Data will be reviewed as they are collected, and any exceedance of the permitted

concentration will be reported immediately to the responsible operator, who will determine the appropriate course of action including process modification, re-sampling, and reporting of the exceedance. Field collected data includes DO monitoring in the aerated lagoons, and pH monitoring throughout the facility. Calibration procedures for the probes will be followed as per the manufacture's requirements.

In all cases, the data from the day-to-day, weekly and monthly monitoring and analysis programs will be recorded in the plant computer using appropriate spreadsheets. Electronic back-ups of these spreadsheets will be maintained.

6.2 Trigger Response Plan

The table below outlines the framework for the Trigger Response Plan (TRP) for the Port Alberni WWTF. The TRP is intended as a guide for operations staff regarding actions that should be taken when parameters in the table below exceed their normal operating range. The sampling location for the parameters is the lagoon effluent header pipe downstream of the UV reactors.

Table 6-2 TRP Framework

Parameter	Normal Operating Range	Permit Level	Level 1 Trigger	Level 1 Response	Level 2 Trigger	Level 2 Response
Effluent BOD	0-25 mg/L	45 mg/L	25 mg/L	Check blower operation and conduct additional dissolved oxygen sampling in lagoon to confirm adequate aeration Inform supervisor	35 mg/L	Inform management staff Reduce effluent flow as much as possible, to increase retention time in lagoon. Review past influent sampling to identify unusual results (i.e., high strength influent).
Effluent TSS	0-25 mg/L	45 mg/L	25 mg/L	Check blower operation and conduct additional dissolved oxygen sampling in lagoon to confirm adequate aeration Inform supervisor	35 mg/L	Inform management staff Reduce effluent flow as much as possible, to increase retention time in lagoon. Inspect effluent pump stations to identify any accumulated

Parameter	Normal Operating Range	Permit Level	Level 1 Trigger	Level 1 Response	Level 2 Trigger	Level 2 Response
						solids that may be drawn into effluent pumps.
Fecal Coliform Organisms	0-100 MPN/100 mL	3,200 MPN/100mL	250 MPN/100 mL	Review condition of UV reactors, confirm UV dose and flow per reactor within design Sample lagoon water at effluent pump stations to confirm if unusually high bacterial counts.	1,000 MPN/100 mL	Reduce effluent flow as much as possible, to increase retention time in lagoon. Increase target dosing in UV reactor controls.
Escherichia coli	0-200 e.coli/100 mL	6,400 e.coli/100 mL	500 e.coli/100 mL	Review condition of UV reactors, confirm UV dose and flow per reactor within design Sample lagoon water at effluent pump stations to confirm if unusually high bacterial counts.	2,000 e.coli/100 mL	Reduce effluent flow as much as possible, to increase retention time in lagoon. Increase target dosing in UV reactor controls.
Enterococci	0-50 Enterococci/100 mL	1,120 Enterococci/100 mL	150 Enterococci/100 mL	Review condition of UV reactors, confirm UV dose and flow per reactor within design Sample lagoon water at effluent pump stations to confirm if unusually high bacterial counts.	300 Enterococci/100 mL	Reduce effluent flow as much as possible, to increase retention time in lagoon. Increase target dosing in UV reactor controls.

7 STAFF COMPETENCY

Staff training is conducted on a continuous basis, with operators encouraged to learn on the job and also take advantage of outside training opportunities. Under normal circumstances, a total of $7,500 per year is allocated to wastewater operator training per year. This allows the City to send three wastewater operators to a week-long training program to meet EOCP requirements.

When new equipment or processes are introduced to the treatment facility, contracts with consultants and contractors are set up to include training for the processes. In this way, any new processes come with hands-on training which is custom designed and delivered on site.

8 CONFIRMATION THAT OPERATING PLAN IS ADEQUATE FOR THE DESIGN OF THE FACILITY

Following construction, the Construction Contractor and Engineer will prepare the final Operating Plan for the new works, including a statement confirming that the Operating Plan is adequate for the design of the facility.

CERTIFICATION PAGE

This report presents our findings regarding the City of Port Alberni, Wastewater Treatment Facility Operating Plan.

Respectfully submitted,

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