

# **AUDIT REPORT**

**The Corporation of the City of Nelson  
Sewage Treatment and Disposal Facility**

**Pollution Control Permit PE00291**

**By: R. Mickel  
Waste Management Officer  
Ministry of Environment Lands and Parks  
Kootenay Region**

**Date: March 6, 2001**

## **TABLE OF CONTENTS**

EXECUTIVE SUMMARY.....	1
INTRODUCTION.....	2
PERMIT REVIEW.....	3
REGULATION REVIEW.....	4
INTERVIEW.....	6
INSPECTION OF WORKS.....	9
ASSESSMENT.....	10
RECOMMENDATIONS.....	11

## **EXECUTIVE SUMMARY**

The City of Nelson is substantially in compliance with the terms and conditions of Pollution Control Permit PE00291 authorizing the treatment and disposal of sewage effluent into Kootenay River, however, the terms and conditions of Pollution Control Permit PE00291 do not reflect the minimum standards as necessitated by BC Reg. 129/99 – Waste Management Act Municipal Sewage Regulation – effective July 15, 1999, or the requirements of Environmental Canada.

The City of Nelson should address these concerns by upgrading the existing sewage treatment works to minimum standards or initiating a Liquid Waste Management Plan to demonstrate why meeting these minimum standards is not necessary.

## 1. INTRODUCTION

The Nelson Office of the Ministry of Environment conducted an audit of the City of Nelson sewage treatment facility Thursday December 21, 2000. The audit team consisted of Ron Mickel, Waste Management Officer, Pollution Prevention Branch and Ralph Krenz, District Conservation Officer.

The Nelson sewage treatment facility was chosen to be the subject of the audit because;

- It is one of the few remaining primary sewage treatment plants still operating in BC.
- There have been a number of failures with the plant and conveyance systems in the past few years.
- The permit was issued in 1977 and not substantially amended since.
- The permittee has failed to submit effluent quality monitoring reports for 1999 as required.
- BC Environment has not actively monitored or inspected the treatment works during recent years.

The audit team was chosen by the management of their respective programs.

The Audit consists of;

- A permit review
- A review of potentially pertinent Regulations
- An interview with City of Nelson staff,
- An inspection of the sewage treatment works
- The Audit report.

## 2. PERMIT REVIEW

Pollution Control Permit PE00291 was issued July 31, 1969 in the name of the Corporation of the City of Nelson authorizing the discharge of 5,680 m<sup>3</sup>/d (1,250,000 g) treated municipal sewage effluent to Kootenay river approximately 1.5 km downstream of Nelson. In consideration of the infiltration factor, peak flows of 8.5 m<sup>3</sup>/min were also authorized.

The treatment works included a primary treatment plant with comminution, flow measurement, chlorination facilities, and submerged outfall. Effluent quality was to be equivalent or better than an average of 100 mg/l, suspended solids, 140 mg/l Biochemical Oxygen Demand (BOD), and 150,000 u/100ml Coliform Bacteria.

Pollution Control Permit PE00291 was amended October 25, 1977 to include provisions for;

- Chlorine Residual – maintain between 0.1 and 1.0 at all times and provide not less than 1-hour chlorine contact at average flow rates.

- Reduction of Non Sanitary Flows – significantly reduce non-sanitary flows by December 31, 1979.
- Monitoring – sample effluent weekly and influent monthly and analyze for BOD, TSS and fecal coliform.
- Flow Measurement – measure effluent volumes discharged during each 24-hour period.
- Reporting – submit data, suitably tabulated, annually to the Director.

Pollution Control Permit PE00291 was amended April 15, 1993 to include provisions for;

- Facility Classification – the facility to be classified with the BC Water and Wastewater Operators Certification Program Society.
- Operator Certification – All operators to be certified by the BC Water and Wastewater Operators Certification Program Society.

All other terms and conditions contained in the 1977 permit amendment remained unchanged.

### **3. REGULATION REVIEW**

There have been a number of legislative initiatives pertaining to the treatment, reuse and disposal of municipal liquid waste since the permit was substantively amended in 1977. These include;

- BC Reg. 129/99 – Waste Management Act Municipal Sewage Regulation – effective July 15, 1999.
- BC Reg. 334/93 – Waste Management Act Production and Use of Compost Regulation – January 1, 1994.
- BC Reg. 299/92 – Waste Management Act Waste Management Fees Regulation – September 1, 1992
- BC Reg. 301/90 – Waste Management Act Environmental Data Quality Assurance Regulation – August 31, 1990

Of these Regulations, the Waste Management Act Municipal Sewage Regulation is the most substantive development in the control of municipal sewage treatment since the issuance of the Pollution Control Objectives for Municipal Type Waste Discharges in British Columbia.

The Waste Management Act Municipal Sewage Regulation does not apply to discharges is authorized by a permit, approval, order or operational certificate first issued before the Regulation came into force, however should the permit require amendment to authorize an increase in flow, a decrease in effluent quality or the inclusion of unauthorized discharges all sections of the Regulation would apply.

The Sections of particular interest to this discharge would be;

- **Section 7. Effluent Quality**

(1) A person must not discharge effluent or provide reclaimed water that exceeds the effluent quality limits for use as reclaimed water or for discharge to the environment set out in Schedules 2 to 5.

(2) Unless specifically stated otherwise, the effluent quality limits specified in Schedules 2 to 5 are maximum values not to be exceeded.

**Maximum Daily Flow  $\geq 50 \text{ m}^3/\text{d}$**

Treatment requirement for daily flows up to 2.0 times ADWF	Secondary	High Quality Secondary	Secondary	Secondary	Secondary
Effluent Quality for daily flows up to 2.0 times ADWF	45	10	45	45	45
BOD5, mg/L	45	10	45	45	45
TSS, mg/L (13)	45	10	45	45	45
Ph	6.0-9.0	6.0-9.0	6.0-9.0	6.0-9.0	6.0-9.0
Total phosphorus (P), mg/L	1.0	1.0	1.0	1.0	1.0
Ortho-phosphate	0.5	0.5	0.5	0.5	0.5

**COLIFORM** - The allowable number of fecal coliform organisms in the effluent is dependent on the use of the receiving water. For discharges to recreational use waters the number of fecal coliform organisms outside the initial dilution zone must be less than 200/100 mL. Where domestic water extraction occurs within 300 meters of a discharge the median number of fecal coliform organisms must be less than 2.2/100 mL in the effluent with no sample exceeding 14/100 mL. The geometric mean, as determined from the bacteriological results of the last 5 samples for which analyses have been completed over the last 30 days, must not exceed the coliform limits specified, and for this purpose, "**geometric mean**" means the anti-logarithm of a calculation in which the logarithms of a series of numerical measures are summed and divided by the number of numerical measures.

**AMMONIA** - The maximum allowable effluent ammonia concentration at the "end of pipe" must be determined from a back calculation from the edge of the initial dilution zone. The back calculation must consider the ambient temperature and pH characteristics of the receiving water and known water quality guidelines.

- **Section 8 Effluent Disinfecting**

1) If disinfecting the effluent is required to ensure that water quality parameters for domestic or agricultural water extraction, recreational uses or aquatic food production meet any known water quality guidelines, a person must not discharge the effluent unless the effluent is disinfected.

(2) **A person must not use chlorine to disinfect an effluent which is to be discharged to surface water unless the effluent is dechlorinated before discharge.**

(3) **If dechlorination is required in accordance with subsection (2) or (7), the discharger must dechlorinate the effluent to reduce the chlorine residual below 0.01 mg/L total residual chlorine before discharge.**

(4) The discharger must review and assess alternative disinfection methods before selecting the chlorination and dechlorination disinfection option.

(5) If disinfection is required under subsection (1), the median coliform values for 7 consecutive daily tests and any single value test must be less than the value specified in Schedules 2 to 4 (see COLIFORM above).

- **Section 9. Toxicity**

A person must not discharge effluent, unless

(a) the discharge passes a 96 hour LC50 bioassay test as defined by Environment Canada's Biological Test Method, Reference Method For Determining Acute

Lethality of Effects to Rainbow Trout, Reference Method, EPS 1/RM/13, or

(b) if the discharge fails a bioassay test described in paragraph (a) that was conducted at a "Regular" time as specified in Schedule 6, Table 3, the discharge passes that test as conducted as a follow up under Column 5 in Schedule 6, Table 3.

- **Section 11. Discharges to Water**

A person must not introduce effluent to water unless

(a) the effluent quality standards for discharges to water as set out in Schedule 3 or 5 are met, and

(b) an environmental impact study has been conducted in accordance with condition 8 in Schedule 1.

- **Section 21. Semi-solid Waste**

1) A person must not dispose of semi-solid waste to a sewage facility unless

(a) the sewage facility is capable of treating these wastes, in accordance with the standards outlined in Schedules 2 to 5,

(b) the sewage facility discharge does not cause water quality parameters, outside the initial dilution zone to exceed any known water quality guidelines, and

(c) the quality of any biosolids removed from the sewage facility will meet the requirements of an authorization given under the Act.

(2) If necessary to protect the sewage facility, the discharger must install pre-treatment or containment facilities.

(3) In this section, "**semi-solid waste**" means septic tank pumpage, holding tank solids or sludge from sewage facilities.

#### 4. INTERVIEW

An interview was conducted December 21, 2000 at the Nelson Sewage treatment facility. The interview was conducted by Ron Mickel, Waste Management Officer, Pollution Prevention Program and Ralph Krenz, District Conservation Officer. Speaking on behalf of the City of Nelson were Jim Caveris, Chief operator, Ernie Gillfillan, Utilities and Civic Center Supervisor, and Bob Adams, Director of Public Works. The interview was informal with questions and responses occurring randomly.

Questions	Yes	No	??	Comments
<b>Appendix 01</b>				
Has the effluent discharge rate of 5680 m <sup>3</sup> per day or the maximum discharge rate of 8.5 m <sup>3</sup> per minute been exceeded?	✓			During spring runoff
Have the permit limits been exceeded (average)				
Total Suspended Solids of 100 mg/L		✓		
BOD <sub>5</sub> of 140 mg/L	✓			One result in July 1999
Coliform Bacteria MPN of 150,000 per 100 ml		✓		
Has the Regional Waste manager been notified - Maintenance Procedures		✓		
Are the works installed a primary treatment plant with comminution, flow measurement, chlorination facilities and outfall?		✓		Sludge drying, mechanical bar screen, added. Gas chlorination replaced with hypochloride system
IF NO - has the Regional Waste manager been notified - Process Modifications		✓		
	<b>Yes</b>	<b>No</b>	<b>??</b>	<b>Comments</b>



Letter of Transmittal

A. Chlorination

Has the chlorine residual been maintained between 0.1 & 1.0 mg/L at all times?

Has not less than one-hour chlorine contact time been provided at average flow rates?

**B. Reduction of Non Sanitary Flows in Sewerage System**

Has the permittee significantly reduced non-sewage flows to the system? (Was to be done by December 31, 1979)

Has plant performance been assessed following any significant flow reduction

**C. Monitoring**

**1. Sampling**

Have suitable sampling facilities been installed?

Have composite samples of the effluent been obtained weekly?

Have composite samples of the influent been obtained monthly?

**2. Analyses**

Have samples collected been analyzed for:

a. Total suspended solids?

b. 5-day biochemical oxygen demand?

c. Faecal coliforms? (Monthly grab sample)

✓			
✓			
✓			On-going process
	✓		Unclear whether assessment to be done by permittee or MELP
✓			
✓			
✓			
✓			
✓			
	✓		

**3. Flow Measurement**

Has a flow-measuring device acceptable to the Regional Manager been installed?

Have the effluent volume discharging from the treatment plant been measured during each 24 hour period?

**4. Reporting**

Is the data of analysis and flow maintained on site?

Is the required data submitted to annually, suitable tabulated, by March 1 of the year after it was collected?

**D. Bypasses**

Have any discharges of dry weather effluent flows bypassed any portion of the designated treatment works?

**E. Process Modifications**

Has the permittee notified the Regional Waste Manager prior to implementing any changes to the treatment works that may have (negatively)affected the quality and/or quantity of the effluent?

**F. Maintenance Procedures**

Has the permittee regularly inspected the pollution control works and maintained them in good working order?

Has the permittee notified the Regional Waste Manager of significant malfunctions of these works?

reporting structure in event of malfunction

Yes	No	??	Comments
✓			
✓			
✓			
	✓		1999 data submitted 00/12/30
	✓		
✓			
✓			
			Operator E. Gillfillan B. Adams

**Minor Amendment Dated April 15, 1993**

**G. Facility Classification**

Has the treatment facility been classified and the classification been maintained with the "British Columbia Water and Wastewater Operators Certification Program Society"?

**H. Operator Certification**

Are the operators at the plant currently certified by the Operators Certification Program to at least a Class 1 level?

**I. Special Waste Regulation**

Are any special wastes stored on site?

Are any fuels stored on site?

**J. Draft Organic Matter Recycling Regulation**

How do you handle sludge?

**K. Municipal Sewage Regulation**

If the permit required amendment could the facility meet the requirements of the "Municipal Sewage Regulation"?

Yes	No	??	Comments
✓			Class 2
✓			
	✓		
✓			Diesel Propane
			Filter press, storage, composting
	✓		

**5. Inspection of Works**

Following the interview, the works were inspected by R. Mickel and R. Krenz accompanied by E. Gillfillan and Jim Caveris.

All works appeared to be in good working order and the effluent quality appeared as expected following primary treatment (grey colour, high solid content). There was little or no odour noticeable throughout the treatment plant even those areas with little ventilation.

The 'new' works (Mechanical bar screen, filter press and hypochloride disinfection system) were operating well and were credited with improving plant safety and performance.

The works appeared well maintained and the operator appeared competent and knowledgeable.

## **6. ASSESSMENT**

The City of Nelson is substantively in compliance with Pollution Control Permit PE00291, except as noted in Section 4 of this audit.

Effluent quality complied with the limits set by PE00291 with the exception of one BOD analysis in July 1999. All Total Suspended Solids were within the limits prescribed. No Coliform tests were not performed, in accordance with the permit's monitoring program, however the effluent was disinfected as per requirements.

Given that this is primary quality effluent, current knowledge suggests that normal disinfection practices would not be expected to significantly reduce coliform counts. The Permit, when written, attempted to minimize the potential impact of the effluent on human health by limiting the coliform bacteria in the effluent to a MPN of 150,000 per 100 ml and a requiring a chlorine residual in the effluent of 0.1 to 1.0 mg/l. There have not been any recent studies of the Kootenay River to determine the impact of the sewage effluent on river water quality. One could consider increasing the chlorine residual as a measure to lower bacteria levels however this practice, without dechlorination, will increase the toxicity of the effluent.

The City of Nelson has significantly reduced storm water inflow and groundwater infiltration into its collection system. They are aware that there still remain a significant number of roof and basement drains hooked into the domestic sewage system however they are redirecting these to the storm sewer system whenever they are uncovered as part of an infrastructure upgrade.

The monitoring program is being carried out in accordance with permit requirements with the exception of the coliform analysis. The results of the monitoring program are submitted annually on electronic medium, although not always promptly.

The City of Nelson has had a number of failures in the main trunk line connecting the airport sanitary lift station with the sewage treatment plant. Due to its location on the bottom of the West Arm of Kootenay Lake, these failures have resulted in the spillage of untreated sewage effluent directly into Kootenay Lake and have delayed necessary repairs. Furthermore the City of Nelson failed to report these spills in a timely manner in contravention of the BC Reg. 263/90, the Waste Management Act Spill Reporting Regulation. The latest incident, a suspected underwater failure was reported in accordance with regulatory requirement indicating some improvement in the City's spill reporting procedure.

The City of Nelson sewage treatment system is 30+ years old and in need of major retrofit. During the past several years the front end of the plant has been upgraded with the addition of a mechanical bar screen (1983) and improvements to the grit removal

system. Back end modifications include mechanical sludge dewatering, addition of hypochloride disinfection and, modifications to the anaerobic digestors (currently underway).

The sewage treatment system, however, continues to be primary treatment (settling chambers). Primary treatment does not meet the minimum requirements as specified in the BC Reg. 129/99 – Waste Management Act Municipal Sewage Regulation – effective July 15, 1999. The facility is exempt from the Regulation because it is presently authorized by Pollution Control Permit PE00291 however this exemption is only valid until a permit amendment to increase flows, or expand the service area, is required. A further exemption can be obtained following the preparation and approval of a Liquid Waste Management Plan, which would have to be supported by an Environmental Impact Assessment.

## **7. RECOMMENDATIONS**

### **A. City of Nelson**

- The City of Nelson should be required to upgrade its sewage treatment works to meet the Environment Canada toxicity requirements and to comply with BC Reg. 129/99 – Waste Management Act Municipal Sewage Regulation. or The City of Nelson should undertake a Liquid Waste Management Plan and an Environmental Impact Assessment to determine whether continued use of primary treatment adequately protects the receiving environment.
- The City of Nelson should consider replacing the underwater interceptor line with an above ground line or relocate the sewage treatment plant, thereby reducing the risk to the environment.
- The City of Nelson must monitor for coliform as per Section C. (2) of Pollution Control Permit PE00291 and report these values as per Section C. (4).
- The City of Nelson should be required to submit a contingency plan detailing response actions to major failures of its treatment and collection system, for approval of the Regional Waste Manager.

### **B. Ministry of Environment**

- The Ministry of Environment should proactively promote the Liquid Management Planning process.
- The Ministry of Environment should require dechlorination.
- The Ministry of Environment should initiate discussions with the City of Nelson regarding an environmental impact-monitoring program.

---

Ron Mickel,  
Waste Management Officer

---

Ralph Krenz  
District Conservation Officer

