



Mackenzie Valley Land and Water Board
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Staff Report

Applicant: City of Yellowknife	
Location: Yellowknife, NT	Application: MV2009L3-0007
Date Prepared: June 24, 2016	Meeting Date: July 7, 2016
Subject: BOD/CBOD Trend Analysis and Request to Modify Surveillance Network Program	

1. Purpose/Report Summary

The purpose of this Report is to present to the Mackenzie Valley Land and Water Board (MVLWB/the Board):

- a) A CBOD (Carbonaceous Biochemical Oxygen Demand) and BOD (Biochemical Oxygen Demand) study findings and trend analysis, for Board approval, submitted by the City of Yellowknife (the City) under Water Licence (Licence) MV2009L3-0007, Part D, item 21; and
- b) A request from the City to eliminate the water quality parameter CBOD from SNP 0032-F1 and 0032-F3.

2. Background

- May 31, 2010 – Licence MV2009L3-0007 was issued for 12 years;
- May 6, 2016 – City submitted CBOD and BOD Trend Analysis and Request to Eliminate CBOD Testing;
- May 13, 2016 – Item posted for review;
- June 14, 2016 – Review comments due;
- June 23, 2016 – Responses posted by the City; and
- May 31, 2022 – Licence expiry date.

3. Discussion

Biochemical Oxygen Demand (BOD) is the amount of dissolved oxygen needed by aerobic biological organisms to break down organic material present in a given water sample at certain temperature over a specific time period. Carbonaceous Biochemical Oxygen Demand (CBOD) is a test measured by the depletion of dissolved oxygen by biological organisms in a body of water in which the contribution from nitrogenous bacteria has been suppressed. Both of these parameters are used to measure the degree of organic pollution of water, and are thus used to test the water quality of discharge from sewage treatment systems.

Part D, item 21 of MV2009L3-0007 states:

The Licensee shall complete monitoring of wastewater effluent quality for carbonaceous biological oxygen demand (CBOD) and biological oxygen demand (BOD) for a minimum of three years. The study findings, including a trend analysis, shall be submitted to the Board for approval before August 31, 2014.

The Surveillance Network Program, Part B, item 1 of MV2009L3-0007 states:

Station Numbers 0032-F1 and 0032-F3 shall be sampled once monthly except during a decant. Water at Station Numbers 0032-F1 and 0032-F3 shall be sampled weekly during each decant and for a period of four weeks following each decant. All samples collected at Station Numbers 0032-F1 and 0032-F3 shall be analyzed for the following parameters:

³ Nutrients	⁴ Major ions
Faecal Coliform	Faecal Streptococci
Suspended Solids	Oil and Grease
² Field parameters	BOD ₅
CBOD	

SNP 0032-F1 and 0032-F3 are locations downstream of the discharge of the Sewage Treatment Facilities and are included in the SNP to monitor water quality and effectiveness of the Fiddler's Lake sewage disposal system. Station 0032-F3 is the Licence compliance point.

With respect to the requirement to measure both CBOD and BOD at 0032-F1 and 0032-F3 (the SNP locations related to sewage discharge), the Reasons for Decision for MV2009L3-0007 state:

Currently, the CCME "Municipal Wastewater Strategy for the Treatment of Municipal Wastewater Effluent" uses CBOD as an indicator for the quality of municipal wastewater. INAC suggested that the City include CBOD (in addition to BOD) as a parameter to be sampled for a minimum of three years. This helps maintain the existing long-term BOD dataset collected by the City and identify a relationship between BOD and CBOD. After three years, the City is to submit the findings of a trend analysis to the Board for approval (condition D.21). It is expected that this will provide northern-specific values to use for CBOD. The Board has decided to maintain these effluent quality criteria values as per the previous Licence. Upon the submission of, and following review of the study findings for CBOD and BOD, effluent quality criteria can be re-visited.

On May 6, 2016, the City submitted three (3) years of BOD and CBOD data for SNP locations 0032-F1 and 0032-F2 and included graphs that plotted trends between the two data sets.

In the May 6, 2016 report, the City also requested that BOD be removed as a sampling parameter from MV2009L3-0007, SNP Part B, item 1. The report and SNP request are attached.

4. Reviewer Comments

Comments were submitted by the Department of Environment and Natural Resources, Government of the Northwest Territories (ENR), Environment and Climate Change Canada, and Board staff.

Reviewer comments noted that the City had fulfilled the requirements of MV2009L3-007, Part D, item 21.

In the May 6, 2016 submission, the City requested that BOD be removed as a sampling parameter from MV2009L3-0007, Surveillance Network Program, Part B, item 1; however, reviewer comments noted that an effluent quality criteria for BOD is required for SNP 0032-F3 (the compliance point) in Part D, item 2 of MV2009L3-0007 and therefore BOD testing could not be eliminated without an amendment process to modify Part D, item 2 to use CBOD instead of BOD. In their response to comments, the City stated that they would prefer to then eliminate CBOD as a testing parameter from SNP Part B, item 1 of MV2009L3-0007.

5. Comments

Part B, item 6 of MV2009L3-0007 states:

The Surveillance Network Program, Schedules, and compliance dates specified in the Licence may be modified at the discretion of the Board.

6. Conclusion

The City has fulfilled Part D, item 21 of MV2009L3-0007, and showed a close relationship between BOD and CBOD at SNP locations 0032-F1 and 0032-F3. Since BOD and CBOD are both indicators of organic pollution from sewage effluents, it is reasonable that the City only measure one of the parameters.

7. Recommendation

- a) Board staff recommend that the Board approve the BOD/CBOD Trend Analysis under MV2009L3-0007, Part D, item 21.
- b) As per MV2009L3-0007, Part B, item 6, Board staff recommend that the Board modify MV2009L3-0007, Surveillance Network Program Part B, item 1 to remove CBOD from the list of required testing parameters for SNP locations 0032-F1 and 0032-F2.

Because CBOD is the parameter used in the Wastewater System Effluent Regulations and has become the “industry standard” for measuring the extent of organic pollution from sewage, Board staff recommend that future amendments and renewals of MV2009L3-0007 consider CBOD instead of BOD for monitoring sewage quality and establishing effluent quality criteria.

8. Attachments

- [BOD/CBOD Trend Analysis and Request to Modify SNP](#);
- Review Comment Table;
- Draft decision letter regarding the CBOD/BOD Trend Analysis and Request to Modify SNP;
- Licence MV2009L3-0007, with recommended changes made to SNP Part B, item 1; and
- Draft Reasons for Decision.

Respectfully Submitted,

Reviewed by,



Heather Scott
Technical Advisor

Miki Ehrlich
Regulatory Officer

Rebecca Chouinard
A/Executive Director

Review Comment Table

Board:	MVLWB
Review Item:	City of Yellowknife - BOD/CBOD Study and proposed change to Surveillance Network Program (MV2009L3-0007)
File(s):	MV2009L3-0007
Proponent:	City of Yellowknife
Document(s):	MV2009L3-0007 - City of Yellowknife - BOD and CBOD Study and SNP Proposal (1 MB)
Item For Review Distributed On:	May 13 at 15:30 Distribution List
Reviewer Comments Due By:	June 14, 2016
Proponent Responses Due By:	June 23, 2016
Item Description:	<p>The City of Yellowknife has submitted a BOD and CBOD Study, as per item D.21 of the City's municipal Licence. A portion of the Study was submitted previously with the Fiddlers Lake Treatment System Plan, however the Study did not go before the Board for a decision at that time as it was incomplete. The City has resubmitted the Study with the requisite three years of data. This Study will go to the Board for their consideration and approval.</p> <p>Along with the BOD and CBOD Study, the City has submitted a request to change the Surveillance Network Program (SNP).</p> <p>June 6, 2016 update: The document at the link provided was missing several pages and tables were cut off. The link has been corrected and the due date for reviewer comments has been extended by one week to June 14, 2016.</p> <p>Please submit comments and recommendations on the Study and SNP proposal using the Online Review System. If you have questions or comments regarding this review or the Online Review System please contact Miki Ehrlich at (867)766-7469 or mehrich@mvlwb.com.</p>
General Reviewer Information:	<p>In addition to the email distribution list, the following organizations received review materials by fax:</p> <ul style="list-style-type: none"> • Fort Resolution Métis Council - Trudy King (867)394-3322 • Hay River Metis Council - Karen Lafferty, President (867)874-4472 • NWT Metis Nation - Tim Heron, NWTMN IMA Coordinator (867)872-3586
Contact Information:	<p>Heather Scott 867-766-7463 Jen Potten 867-766-7468 Miki Ehrlich 867-766-7469</p>

Comment Summary

Environment and Climate Change Canada: Bradley Summerfield				
ID	Topic	Reviewer Comment/Recommendation	Proponent Response	Board Response
1	General File	Comment (doc) ECCC Cover letter Recommendation		
2	Cover Letter	Comment The City of Yellowknife has presented data which show reasonable correlation between BOD and CBOD measurements for the 0032-F1 and 0032-F3 sampling points. The City requests removal of the requirement to measure BOD at these two stations. Recommendation ECCC has no objections to the proposed use of cBOD and removal of BOD.		Noted.
3	Figures 1 and 2	Comment The titles for Figures 1 and 2 are mislabeled "BOD and COD" which can cause confusion, as COD has in other situations been proposed as a surrogate for BOD measurements. Recommendation Correct the graph titles to "BOD and cBOD".	June 13: The graphs have been edited accordingly in the attached file.	Noted. Satisfactory response.
4	Figures 1 and 2; Dillon Memo - July 14, 2014	Comment The licence requirement was for a trend analysis which was based on a minimum of 3 years of data. It does not appear that a formal trend analysis was done (i.e. to identify future behaviour based on past data) and it would be of interest to determine if there is an upward trend in the F3 data over time, and whether it is consistent for both BOD and CBOD. The data presented in Figures 1 and 2 show the reasonably close tracking of the two analytical		Noted.

		<p>tests. Both the data points and the running averages are well below the licence limits, and below potential future national performance standards.</p> <p>Recommendation There are currently no concerns with the BOD / CBOD concentrations meeting regulatory limits; however, the City of Yellowknife could give consideration to conducting periodic review of the data for upward trends. This would be informative for tracking system performance and identifying treatment needs. If there are material changes to the influent quality, or to system configuration or performance, future BOD testing could be done to confirm the correlation to cBOD holds.</p>		
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GNWT - ENR: Central Email GNWT

ID	Topic	Reviewer Comment/Recommendation	Proponent Response	Board Response
2	General File	Comment (doc) ENR Letter with Comments and Recommendations Recommendation		
1	Topic 1: Removal of BOD Analysis	Comment The City of Yellowknife (the City) is requesting to remove BOD after showing for the last three (3) year's results indicate that CBOD can be utilized as a surrogate for BOD. The City has provided water quality results for the compliance SNP stations that demonstrate CBOD concentrations have been below the CCME National Performance Standards guideline of 25 mg/L for the last three (3) years. However, Water Licence MV2009L3-	June 22: The City only wishes to test for either CBOD or BOD. If a formal amendment is required to change the sampling at F3 to CBOD, then the City will continue to sample for BOD and not CBOD. The City will consider submitting a request to amend the License in order to monitor for CBOD rather than BOD at a future date.	Noted. Recommended that the City continue to test for BOD to align with the criteria outlined in Part D, item 2.

		<p>0007 stipulates in the main body of the License, under Part D, that effluent shall meet 20 mg/L for maximum average and 30 mg/L for maximum grab sample for BOD. Therefore, BOD cannot be removed solely from the monitoring of SNP Station 0032-F3 in isolation, without a proper amendment to the City's Type "A" Water Licence.</p> <p>Recommendation 1) ENR is not opposed the City's request to remove BOD and the inclusion of CBOD. However, ENR notes that BOD monitoring is required under Part D of the Licence. Consideration should be given to amending the Water Licence to reflect any changes to the SNP or Licence requirements, and if required, once the Municipal Wastewater Effluent Regulations are completed for the North.</p>		
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GNWT - ENR: Tyanna Steinwand

ID	Topic	Reviewer Comment/Recommendation	Proponent Response	Board Response
1	City of YK - request to revise SNP sampling	<p>Comment North Slave ENR water officers have reviewed the City's request to eliminate BOD testing from two sample sites and have no objections to it.</p> <p>Recommendation Consider condition D part 21 in compliance.</p>		Noted.

MVLWB: Heather Scott

ID	Topic	Reviewer Comment/Recommendation	Proponent Response	Board Response
1	CBOD and BOD Data and Trend Analysis	<p>Comment Figures 1 and 2 indicate that 3 years of CBOD and BOD data have been taken and a trend analysis conducted as per Part D, item</p>		N/A

		<p>21 of MV2009L3-0007. Recommendation The City of Yellowknife has fulfilled Part D, item 21 of MV2009L3-0007.</p>		
2	<p>Request to change sampling requirements of SNP 0032-F1 and 0032-F3</p>	<p>Comment As per MV2009L3-0007, Part B, item 6, "B.6 The Surveillance Network Program, Schedules, and compliance dates specified in the Licence may be modified at the discretion of the Board", so considering this condition, and the evidence presented by the City, it would be prudent to eliminate BOD from the sampling requirements for SNP 0032-F1 and 0032-F3; however, Part D, item 2, SNP 0032-F3 must meet an effluent quality criteria of 20 mg/L. If the City wishes to change the effluent quality criteria in Part D, item 2 to CBOD instead of BOD, an amendment of MV2009L3-0007 could be applied for so that the effluent criteria may be derived for CBOD rather than BOD.</p> <p>Recommendation Recommend that the City continue to collect BOD5 samples at SNP 0032-F3 to meet Part D, item 2 of MV2009L3-0007. Recommend that Part B, item 1 of the Surveillance Network Program of MV2009L3-0007 be revised so that the sampling parameters required for SNP 0032-F1 no longer include BOD5.</p>	<p>June 22: The City only wishes to test for either CBOD or BOD. If a formal amendment is required to change the sampling at F3 to CBOD, then the City will continue to sample for BOD and not CBOD. The City will consider submitting a request to amend the License in order to monitor for CBOD rather than BOD at a future date.</p>	<p>Noted. Recommended that the City continue to test for BOD to align with the criteria outlined in Part D, item 2.</p>

June 14, 2016

Miki Ehrlich
Regulatory Officer
Mackenzie Valley Land and Water Board
7th Floor – 4910 50th Avenue
P.O. Box 2130
Yellowknife, NT
X1A 2P6

Dear Ms. Ehrlich,

**Re: City of Yellowknife
Water Licence – MV2009L3-0007
BOD/CBOD Study
Proposed Change to Surveillance Network Program
Request for Review and Comments**

The Department of Environment and Natural Resources, Government of the Northwest Territories has reviewed the information at reference based on its mandated responsibilities under the *Environmental Protection Act*, the *Forest Management Act*, the *Forest Protection Act*, the *Waters Act* and the *Wildlife Act* and provides the following comments and recommendations for the consideration of the Board.

Topic 1: Removal of BOD Analysis

Comment(s):

The City of Yellowknife (the City) is requesting to remove BOD after showing for the last three (3) year's results indicate that CBOD can be utilized as a surrogate for BOD. The City has provided water quality results for the compliance SNP stations that demonstrate CBOD concentrations have been below the CCME National Performance Standards guideline of 25 mg/L for the last three (3) years.

However, Water Licence MV2009L3-0007 stipulates in the main body of the License, under Part D, that effluent shall meet 20 mg/L for maximum average and 30 mg/L for maximum grab sample for BOD. Therefore, BOD cannot be removed solely from the monitoring of SNP Station 0032-F3 in isolation, without a proper amendment to the City's Type "A" Water Licence.

Recommendation(s):

- 1) ENR is not opposed the City's request to remove BOD and the inclusion of CBOD. However, ENR notes that BOD monitoring is required under Part D of the Licence. Consideration should be given to amending the Water Licence to reflect any changes to the SNP or Licence requirements, and if required, once the Municipal Wastewater Effluent Regulations are completed for the North.

Comments and recommendations were provided by ENR technical experts in the Water Resources Division and the North Slave Region and were coordinated and collated by the Environmental Impact Assessment Section, Conservation, Assessment and Monitoring Division (CAM).

Should you have any questions or concerns, please do not hesitate to contact Patrick Clancy, Environmental Regulatory Analyst at (867) 767-9233 Ext: 53096 or email patrick.clancy@gov.nt.ca.

Sincerely,



Patrick Clancy
Environmental Regulatory Analyst
Environmental Impact Assessment Section
Conservation, Assessment and Monitoring Division
Department of Environment and Natural Resources
Government of the Northwest Territories



Environmental Protection Operations Directorate (EPOD)
Prairie & Northern Region (PNR)
5019 52nd Street, 4th Floor
P.O. Box 2310
Yellowknife, NT X1A 2P7

June 13, 2016

EC File: 5200 000 001/004
WLWB File: MV2009L3-0007

Heather Scott
Technical Advisor
Mackenzie Valley Land and Water Board
7th Floor, 4922 48th St.
P.O. Box 2130
Yellowknife, NT X1A 2P6

Submitted via online review system

RE: MV2009L3-0007 – City of Yellowknife – BOD/CBOD Study and proposed change to the Surveillance Network Program

Attention: Heather Scott

Environment and Climate Change Canada (ECCC) has reviewed the information submitted to the Mackenzie Valley Land and Water Board (MVLWB) regarding the above-mentioned study and proposed SNP changes and is submitting comments to the MVLWB via the online review system. ECCC's specialist advice is provided based on our mandate pursuant to the *Canadian Environmental Protection Act*, the pollution prevention provisions of the *Fisheries Act*, the *Migratory Birds Convention Act*, and the *Species at Risk Act*.

Should you require further information, please do not hesitate to contact me at (867) 669-4707 or Bradley.Summerfield@Canada.ca

Sincerely,

Bradley Summerfield
Environmental Assessment Coordinator, Environmental Assessment North (NT and NU),
EPOD-PNR

Attachment: ECCC Comments on the City of Yellowknife's BOD/CBOD Study and proposed change to the Surveillance Network Program

cc: Wade Romanko, Head, Environmental Assessment North (NT and NU), PNR-EPOD