



Mackenzie Valley Land and Water Board
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Staff Report

Applicant: De Beers Canada Inc.	
Location: Kennady Lake, NT	Application: MV2005L2-0015
Date Prepared: January 23, 2017	Meeting Date: February 9, 2017
Subject: New analytical method for microbiological parameters by ALS Environmental Laboratories	

1. Purpose

The purpose of this Report is to present to the Mackenzie Valley Land and Water Board (MVLWB/the Board) a new analytical method, the Quanti-Tray method, to be implemented by ALS Environmental Laboratory (ALS) for the testing and reporting of microbiological parameters, including fecal coliforms. Board staff request direction from the Board on how to proceed, as current water licence criteria for fecal coliforms are not compatible with how the Quanti-Tray method results are reported.

2. Background

- October 21, 2016 – De Beers Canada Inc. (De Beers) Gahcho Kué Mine informs Board staff of the package they received from ALS (attached);
- October 26, 2016 – Board staff contact Yellowknife’s ALS facility for further information;
- November 2, 2016 – ALS submits further information to Board staff (attached);
- November 17, 2016 – Board staff contact Taiga Environmental Laboratory (Taiga Lab) requesting further information on the Quanti-Tray method (attached);
- November 18, 2016 – Taiga Lab responds to Board staff (attached);
- December 20, 2016 – Letter from De Beers submitted to the Board with request on how to proceed (attached) and distributed for review;
- January 11, 2017 – Review comments due and received;
- January 18, 2017 – Proponent responses due and received; and
- **February 9, 2017 – Presented to the Board for direction.**

3. Discussion

Water licenses containing criteria for fecal coliforms have been developed with the assumption that the membrane filtration technique will be used to analyze collected water samples. This technique involves directly counting coliform colonies that remain after filtering 100mL (or 1dL) of sample water. The results from this membrane filtration testing method are reported in colony forming units per 1dL (CFU/dL), with the assumption that one colony forming unit grows from one coliform in the original sample.

ALS in Yellowknife has stated that beginning on May 2, 2017, they will implement a method change for microbiological testing which will affect the analyses for fecal coliforms. Bacterial testing by the membrane filtration technique will be replaced by the Enzyme Substrate (Colilert Quanti-Tray) method. The Quanti-Tray method involves adding reagents to 1dL of sample. If there is a presence of target microbes in the sample, it will change colour. This method enables statistical counting of the organisms. The results from this method are reported as “most probable number per dL” (MPN/dL), and so the result is a statistical number, not an actual enumeration. Judy Mah, a Chemist from Taiga Lab in Yellowknife, informed Board staff (attached) that results for some sample types analyzed using the membrane filtration technique (CFU/dL) have consistently shown to be lower than MPN results on the same samples. The shorter incubation period in the membrane filtration technique may not allow stressed bacteria to grow and reproduce. While the results between both testing methods can be compared for low concentrations (i.e. <1MPN/dL is equal to <1CFU/dL), there are differences that can cause deviation of results greater than 1. As such it is not possible to directly compare results greater than 1 CFU/dL and 1 MPN/dL.

Table 1 below displays effluent criteria for fecal coliforms used in other jurisdictions:

Table 1: Effluent Criteria for Fecal Coliforms, by jurisdiction surveyed

Jurisdiction	Criteria & Units	Source and Year
Alberta	200/dL*	Government of Alberta: Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage System ; Best Practical Technology Standards; March 2013
Alberta	<200/dL*	Alberta Environment: Guidelines for Municipal Wastewater Irrigation ; Treated Effluent Standards for Wastewater Irrigation; April 2000
British Columbia	10/1dL ¹ * 77/1dL ² * 385/1dL ³ *	Government of British Columbia: Ministry of Environment , Water Quality Criteria for Microbiological Indicators; August 2001
British Columbia	< 1 CFU/dL < 2.2 MPN/dL	Environmental Management Act, Municipal Wastewater Regulation . Municipal Effluent Quality Requirements for Reclaimed Water – Indirect potable reuse; February 2016.
Northwest Territories	<1000 MPN/g	Canadian Council of Ministers of the Environment (CCME): Canadian Legislative Framework for Wastewater Biosolids . CCME Guideline for Compost Quality; 2010.
Manitoba	200 MPN/dL	Government of Manitoba: South Whiteshell Wastewater Treatment Lagoon . Wastewater Treatment Lagoon Effluent Requirements; 2012.

* Does not specify MPN or CFU; only organisms per dL; analytical method used does not matter

¹ Water Use: Livestock – closely confined (no treatment)

² Water Use: Irrigation: Crops eaten raw

³ Water Use: Industrial Water

Lastly, it is important to note that the membrane filtration method (CFU/dL) has many more limitations than the newly proposed Quanti-Tray method (MPN/dL). For example, membrane filtration cannot be used for the following sample types: highly turbid; large amounts of algae; chlorinated primary effluents; toxic wastes; phenols; or estuarine waters capable of propagating shellfish. Additionally, results from the membrane filtration method (CFU/dL) may not be accepted in controversial situations. These limitations are not present for the Quanti-Tray testing method.

4. Comments

In their letter, De Beers requested that the MVLWB accept this new method change as an equivalent method with respect to the Gahcho Kué Water Licence (Licence) MV2005L2-0015. De Beers suggested that the MVLWB consider adding a footnote to the Licence MV2005L2-0015, indicating that the enzyme substrate test is considered equivalent to the membrane filtration test. The footnote would apply to all instances where fecal coliforms are tested and reported within Licence MV2005L2-0015.

5. Reviewer Comments

By January 11, 2017 comments were received from the following reviewers:

- Environment and Climate Change Canada (ECCC);
- Fisheries and Oceans Canada; and
- Government of the Northwest Territories (GNWT) – Environment and Natural Resources (ENR).

De Beers responded to review comments by January 18, 2017.

ECCC and Fisheries and Oceans Canada both submitted no comment letters to the ORS. GNWT-ENR, however, requested that De Beers analyze a series of samples using both test methods to confirm the direct comparability. De Beers responded that due diligence testing prior to the method change has been performed by ALS which should address the concerns of the GNWT regarding risk to the 1:1 relationship between methods. De Beers also responded that this would add unnecessary cost to De Beers with no material benefit or environmental protection at the mine.

Board staff agree with De Beers, in that there is enough information available on the correlation between the two testing methods. Requiring De Beers to carry out two separate testing analyses for Fecal Coliforms would not provide any benefit to the environment, or provide any further valuable information to the Board.

6. Conclusion

Board staff conclude that although (1) both tests are organism-based, and (2) a reported result of <1MPN/dL is equal to <1CFU/dL, there is no evidence that the Quanti-Tray method and membrane filtration method will result in equal results for samples containing greater than 1 MPN/dL and 1 CFU/dL.

There are still important differences between the testing methods, causing results to not be equivalent for all samples at varying detection limits. For some samples, results from the membrane filtration method (CFU/dL) have shown to be lower (or less sensitive) than results from the Quanti-Tray method (MPN/dL). However, for the purpose of compliance monitoring for fecal coliform (a health-related parameter), the differences may not be significant. Regardless of reporting fecal coliform results as MPN or CFU, compliance monitoring may reach the same goal - to ensure concentrations are at an appropriate level.

Based on evidence from guidelines in other Canadian jurisdictions, some guidelines do not specify CFU or MPN; those that do specify, use MPN.

7. Recommendation

Board staff recommend the Board consider the following options:

- 1) Consider fecal coliform results reported as MPN/dL to fulfill the criteria for current water licences. A letter could be issued to De Beers stating that the Board now recognizes the Quanti-Tray method, with results reported in MPN/dL, as an appropriate testing and reporting method that fulfills the goal of environmental protection and overall intent of the water licence. This would eliminate the need for an amendment to Licence MV2005L2-0015;

OR

- 2) Require proponents to only use laboratories that carry out membrane filtration methods and report results for fecal coliform as CFU/dL;

AND/OR

- 3) Require proponents who wish to report fecal coliform results for water licence compliance as MPN/dL to apply for an amendment to their water licence so that any effluent criteria for fecal coliform is indicated in those units.

A draft letter to De Beers is attached; the details will be included following the Board meeting, in accordance with the Board's selected direction.

8. Attachments

- [ALS Notification to De Beers on testing method change;](#)
- ALS further information: [EPA doc pg.244-333;](#)
- ALS further information: Enzyme Substrate Tests;
- Information provided by Judy Mah from Taiga Lab;
- [De Beers letter of notification and request to the Board;](#)
- Reviewer Comment Table; and
- Draft response letter to De Beers.

Respectfully submitted,



Kierney Leach
Regulatory Officer



Heather Scott
Technical Advisor

Review Comment Table

Board:	MVLWB
Review Item:	De Beers Gahcho Kue - Notification of Analytical Procedure Test Method Change (MV2005L2-0015)
File(s):	MV2005L2-0015
Proponent:	De Beers Canada Inc - Gahcho Kue
Document(s):	De Beers' Letter of Notification (279 KB) ALS Environmental Laboratory - Notification Document (1 MB)
Item For Review Distributed On:	Dec 21 at 16:08 Distribution List
Reviewer Comments Due By:	Jan 11, 2017
Proponent Responses Due By:	Jan 18, 2017
Item Description:	<p>De Beers Canada Inc. (De Beers) Gahcho Kue has submitted a letter to the Mackenzie Valley Land and Water Board (MVLWB) informing the Board of a new analytical method to be implemented by ALS Environmental Laboratory (ALS) for the testing and reporting of microbiological parameters, including fecal coliforms. ALS is currently contracted by De Beers for this laboratory testing required by Licence MV2005L2-0015.</p> <p>De Beers Gahcho Kue’s Water License contains criteria for fecal coliforms based on the membrane filtration technique, reported in colony forming units per 1dL (CFU/dL). However, the new analytical method being implemented by ALS has the membrane filtration technique replaced by the Enzyme Substrate (Colilert Quanti-Tray) method, reported in most probable number per dL (MPN/dL). This change causes De Beers to be out of compliance with their Water Licence reporting requirements.</p> <p>Reviewers are invited to submit questions, comments and recommendations using the Online Review System (ORS) by Wednesday January 11, 2017.</p> <p>Please review and provide comments and recommendations on the attached letter from De Beers notifying the MVLWB of this analytical procedure test method change, which includes De Beers’ request on how to proceed. To aid with this review, the ALS notification to De Beers is also attached below.</p> <p>All documents that have been uploaded to this review are also available on our public registry. If you have any questions or comments regarding this application or using the Online Review System, please contact Kierney Leach at 867-766-7470 or kleach@mvlwb.com or Angela Love at 867-766-7456 or angela.love@mvlwb.com.</p>

General Reviewer Information:	In addition to the email distribution list, the following organizations received review materials by fax: Fort Resolution Métis Council - Trudy King (867) 394-3322 Hay River Metis Council - Trevor Beck, President (867) 874-4472 NWT Metis Nation - Tim Heron, NWTMN IMA Coordinator (867) 872-3586
Contact Information:	Angela Love 867-766-7456 Heather Scott 867-766-7463 Jen Potten 867-766-7468 Kierney Leach 867-766-7470

Comment Summary

Environment and Climate Change Canada: Melissa Pinto				
ID	Topic	Reviewer Comment/Recommendation	Proponent Response	Board Staff Analysis
1	None	Comment ECCC has reviewed De Beers Canada Inc. - Gahcho Kue Notification of Analytical Procedure Test Method Change and has no comments at this time. Recommendation None	Jan 11: Acknowledged	N/A.
Fisheries and Oceans Canada: Laura Watkinson				
ID	Topic	Reviewer Comment/Recommendation	Proponent Response	Board Staff Analysis
1	General	Comment DFO has reviewed in accordance with its mandate and doesn't have any comments. Recommendation Not applicable.	Jan 18: acknowledged	N/A.
GNWT - ENR: Central Email GNWT				
ID	Topic	Reviewer Comment/Recommendation	Proponent Response	Board Staff Analysis
2	General File	Comment (doc) ENR Letter with Comments and Recommendations Recommendation		Noted.
1	Topic 1: Switching from Membrane Filtration to Colilert	Comment The analytical laboratory (ALS) used by DeBeers for analyzing faecal coliforms in SNP samples is switching from the membrane filtration method to an enzyme substrate (Colilert) method. Information supplied by ALS indicates that the methods are expected to provide comparable	Jan 18: De Beers does not agree with the recommendation. There is nothing unique about the samples from Gahcho Kue that would require a re-analysis or comparative analysis using the two methods. The two methods have already been determined to be equivalent by	Acceptable response.

		<p>results. However, ENR notes that information showing that the results are comparable, e.g. the results of a series of samples from Gahcho Kue analyzed using both methods, would be useful to have on the record. This would aid the evaluation of historic faecal coliform water quality data by allowing for more robust comparisons to be made between the new and historic data sets.</p> <p>Recommendation 1) ENR recommends that DeBeers analyze a series of samples using both test methods to confirm the direct comparability of the two test methods.</p>	<p>such authorities as the U.S.A Environmental Protection Agency (EPA). ALS is a CALA accredited laboratory supplying services to municipal, provincial and federal clients working under legislation and authorizations similar to Gahcho Kue's. Due diligence testing prior to the method change has been performed by ALS which should address the concerns of the GNWT regarding risk to the 1:1 relationship between methods. Following through with this recommendation would add unnecessary cost to De Beers with no material benefit or environmental protection at the mine.</p>	
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January 11, 2017

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

Dear Ms. Leach,

**Re: DeBeers Canada Inc.
Water Licence – MV2005L2-0015
Notification of Analytical Procedure Test Method Change
Request for Comment**

The Department of Environment and Natural Resources (ENR), 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 *Species at Risk (NWT) Act*, the *Waters Act* and the *Wildlife Act* and provides the following comments and recommendations for the consideration of the Board.

Topic 1: Switching from Membrane Filtration to Colilert

Comment(s):

The analytical laboratory (ALS) used by DeBeers for analyzing faecal coliforms in SNP samples is switching from the membrane filtration method to an enzyme substrate (Colilert) method. Information supplied by ALS indicates that the methods are expected to provide comparable results.

However, ENR notes that information showing that the results are comparable, e.g. the results of a series of samples from Gahcho Kue analyzed using both methods, would be useful to have on the record. This would aid the evaluation of historic faecal coliform water quality data by allowing for more robust comparisons to be made between the new and historic data sets.

Recommendation(s):

- 1) ENR recommends that DeBeers analyze a series of samples using both test methods to confirm the direct comparability of the two test methods.

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