



# VILLAGE OF BELCARRA



## DRINKING WATER QUALITY ANNUAL REPORT

2018

June 2019

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## A. INTRODUCTION

This report is the **Seventh** Drinking Water Quality Annual Report prepared by the Village of Belcarra (Belcarra) under the Water Quality Monitoring and Reporting Plan for the Metro Vancouver (MV) and Member Municipalities. The purpose of the report is to provide Belcarra water consumers and the Medical Health Officer (MHO) with drinking water sampling test results for 2018, as well as to present background information on Belcarra concerning water supply, treatment, and specific measures being taken to protect and enhance drinking water quality as per requirements under the Drinking Water Protection Act.

## B. GENERAL DESCRIPTION

The Belcarra delivers potable water to its customers via a waterworks distribution system incorporating approximately 11 Km of water mains, one pressure zone, pumping station and water storage reservoir. From the period January 1, 2018 to December 31, 2018, the water distribution system provided water to **176** of a possible 270 parcels (**65%**).

From January to December 2018, there was **65,720** cubic metres (**14,456,411** Imperial gallons) of water consumed by residents, used for flushing and water main flushing. All Belcarra's water is purchased from the Greater Vancouver Water District (GVWD), through the District of North Vancouver (DNV).

## C. WATER DISTRIBUTION SYSTEM – Village of Belcarra

### 1. General

The Belcarra water distribution system is comprised of four networks, these are further described as:

- Village of Belcarra Marine Crossing Mains
- Reservoir Supply Main
- Village of Belcarra Water Distribution System
- Upper Pressure Zone on Main Avenue and Bedwell Bay Road

For the purposes of water quality monitoring and reporting in Belcarra, the location where water is drawn from the GVWD transmission system into the DNV system are considered “sources” for the Belcarra system.

A map of the overall water system showing the gravity and pressure zones and water quality sampling site locations is included (See Appendix A).

### 2. Belcarra Water Quality Testing

Sample collection to monitor bacteria levels in the Belcarra water distribution system is performed monthly on conveyance water by Belcarra staff. Four to five of the 13 sample stations are tested monthly, with all 13 sample stations being tested over a three-month period (For a list of Belcarra Sample Site Stations See Appendix B).

Samples are delivered to the Metro Vancouver laboratory for analysis and reporting. Standard bacteriological parameters analysed by the Metro Vancouver laboratory are Total Coliform, E. coli and Heterotrophic Plate Count (HPC).

The Fraser Health Authority (FHA) may take random samples from; selected sites, or areas where water quality complaints have originated, or where waterworks construction or maintenance activities are underway.

Locations of water quality sampling points in the Belcarra system are based on a guideline provided by the Regional Medical Health Officers as follows:

- i. One sampling point at “source” (supply from GVWD/DNV)
- ii. Twelve sampling points at system dead-ends or near dead-ends

Sampling frequency for presence of bacteria was completed in accordance with the recommendations provided by the Fraser Health Authority.

A table showing the Schedule for Sampling and Reporting is included (See Appendix C).

#### (a) Physical Parameters

Water temperature and turbidity are measured for all samples collected for bacteriological testing and are reported in the overall microbiology test results from the Metro Vancouver laboratory. Turbidity is measured in Nephelometric Turbidity Units (NTUs). Health Canada Guidelines for Canadian Drinking Water Quality sets the Aesthetic Objective for water temperature at less than or equal to 15 degrees Celsius and an upper limit of 1 NTU for turbidity. Taste, odour and turbidity are monitored on a complaint basis.

#### (b) Chemical Parameters

In 2018, chemical monitoring in the water distribution system was conducted for the following:

- i. **Free chlorine residual** – The Medical Health Officer has indicated that the minimum concentration for chlorine residual in a water distribution system should be 0.2 mg/L free chlorine. Free chlorine is measured at all sampling sites when bacteriological samples are collected. 2018 results of less than 0.2mg/L free chlorine totalled **10** sample occurrences of **59**. All samples had chlorine residue available to continue the disinfection of the water.
- ii. **Haloacetic acids (HAA’s)** – HAA’s are disinfection by-products. In 2008 a new Canadian standard for HAA concentrations was established in the *Guidelines for Canadian Drinking Water Quality* (GCDWQ). The Maximum Acceptable Concentration (MAC) for HAA’s is 80 ppb (based on a running annual average calculated with quarterly results for different locations within the system). In 2018, **eight** tests were carried out by the Metro Vancouver laboratory with a maximum average of **31** ppb or less. (See Appendix G)
- iii. **Trihalomethanes (THM’s)** – THM’s are disinfection by-products. The *Guidelines for Canadian Drinking Water Quality* (GCDWQ) list a Maximum Acceptable Concentration (MAC) for THM’s at 100 ppb (based on a running annual average calculated with quarterly results for different locations within the system) sampled with HAA’s. In 2018, **eight** tests were carried out by the Metro Vancouver laboratory with a maximum average of **32** or less. (See Appendix G)

- iv. **pH** – pH is a measurement under the Aesthetic Objective guidelines, with the optimal range of values between 6.5 – 8.5 pH. In 2018, **eight** tests were carried out by the Metro Vancouver laboratory with results of **7.3 – 7.7** pH. (See Appendix G)
- v. **Metals** – during 2001, the regional Medical Health Officers developed a strategy for sampling metals “at the tap”. The requirement is to sample 10% of the sample sites twice yearly for lead, copper and zinc, with sample locations consisting of a mixture of private homes and public buildings, including schools. In 2018, **eight** samples were tested. (See Appendix H)
- vi. **PAHs or BETX** – PAH’s (Polynuclear Aromatic Hydrocarbons) and BETX (Benzene, Ethylbenzene, Toluene, Xylene) are compounds associated with pipe wall lining materials in steel water mains, and usually they can only be detected in water mains newer in age than approximately five years.  
(Since there are no significant lengths of PVC water main in the Belcarra System, no testing was performed for PolyVinyl Chloride in 2018.)

### 3. Results

Test results for bacteria, temperature, turbidity, and chlorine residual are compiled for each sample site.

#### 1. Bacteria

A table of results of bacteriological testing of Sample Station Readings of E. coli, HPC, Total Coliform from January to December is attached (See Appendix D).

Metro Vancouver’s analysis of HPC confirmed of the **58** samples, **nine** samples exceeded Metro Vancouver’s threshold of 500 CFU/ml. The samples were taken from dead end water mains and highly dependent on the waters age and usage at the dead ends. All mains with samples over the threshold were flushed to decrease age of water in those dead end water mains.

Metro Vancouver reported that all samples collected in 2018 satisfied the bacteriological requirements of the BC Drinking Water Protection Regulation (See Appendix F).

#### 2. Physical Parameters

In 2018, **59** samples were tested for of turbidity levels in the Belcarra water distribution system and **one** sample was greater than 1 NTU. Water temperatures ranged from a February low of **4.3°** C to an August high of **28.2°** C with **13** results above 15° C. Temperature is discussed further in the Challenges section below and measures to improve temperature readings are outlined in the 2018 Work Program below. (For Temperature and Turbidity data, See Appendix D). There were no reported concerns related to aesthetics.

### 3. Chemical Parameters

- i. Belcarra's source water from GVWD/DNV water transmission can be impacted by low chlorine residual levels. A real-time chlorine residual monitor is located at the Tatlow pump station and allows real time analysis and alarming for low chlorine conditions. The Belcarra chlorine residual at the Michael Rosen Water Receiving Building (Midden) averaged **0.61** mg/L. This shows that the level of chlorination continued to provide good chlorine residual levels throughout the water supply system.

In Belcarra, **10** of the **59** samples taken throughout the entire system had chlorine residual concentrations below 0.2 mg/L, the lowest one sample being **0.01** mg/L (See Appendix D). There was a **65** % increase in the number of low samples from the previous year. This is discussed further in the Challenges section below. Measures to improve Chlorine Residuals are outlined in the 2018 Work Program below.

- ii. **Haloacetic Acids (HAA's)** – Haloacetic Acids (HAA)  
In Belcarra all **8** of the 2018 samples taken were below the MAC of 80 ppb/mL for this parameter (See Appendix G).
- iii. **Trihalomethanes (THMs)** – Trihalomethanes (THMs)  
All **8** of the 2018 samples taken in Belcarra were below the MAC of 100 ppb/mL for this parameter (See Appendix G).
- iv. **pH** – All **8** of the samples taken were within the Aesthetic Objective guidelines of between **6.5** and **8.5** pH (See Appendix G).
- v. **Metals** – a total of **four** samples for metals, including copper, lead and zinc, were collected in 2018 for Metro Vancouver Metals Sampling Program for Belcarra (See Appendix H). All the metals tested were under the recommended maximum allowable Guideline Limits.
- vi. **PAHs or BETX** – as there are no significant lengths of Steel or PVC water mains in the Belcarra System, no testing was performed for PAHs, BETX or PolyVinyl Chloride in 2018.

### 4. Challenges

Chlorine residual issues generally related to flow from the Capilano source during times of high turbidity have been substantially reduced due to GVWD's operational strategy of the two sources and the performance of the filtration plant.

Maintaining chlorine residuals above the 0.20 mg/L range is supported by cold water temperature, consumption and by moving water through the utility to the consumer. The exchange of water through the reservoir and movement of water through the distribution system ensures the water will remain fresh and cool with a marginal loss in chlorine residual. Similarly, temperature and turbidity can maintain Aesthetic Objectives by the movement of water through the water distribution system. (For site specific data on chlorine residuals, See Appendix D).

Until such time as all the potential connections are made to the ends of the water main or water main branches, there is the potential for water to be held in suspension. Suspended water will result in higher HPC results. Resident consumption at the dead ends serves to ensure water is moved through the distribution system allowing for lower temperatures, higher chlorine residuals and a higher level of freshness. In the absence of consumers, water sampling ports located at the ends of water mains and branches are opened and allowed to bleed water as an operational means to move water through the water mains.

Belcarra Public Works monitors the HPC results and perform additional flushing in areas of HPC greater than 500 CFU/ml. Sampling ports are then changed to adjust the flow to improve circulation of the water main ends.

## **5. Work Program**

### **2018**

System maintenance, operational and emergency response refinements were made in 2018 to continue delivering water with optimum water quality. The water main cleaning program focused on unidirectional flushing in Zone 1 and Fire Hydrant Maintenance in Zone 2. The air valves of the Marine Crossing were purged monthly in the Midden building.

Improvements and upgrades were made to the Tatlow reservoir. The ladder rungs were removed to prevent people from climbing on them. The bird screening on the roof air vent was replaced and a backflow preventer installed on the overflow outlet to prevent creature access.

The Work Plan implemented a combination of measures to enhance water quality by promoting more consumers to connect to the water system or by increasing spillage rates in water main ends in areas of low or no consumer connections. An amendment to Waterworks No. Bylaw 456, 2012 with No. Bylaw 495, 2015 requires any transfer of ownership of a property to connect to the Waterworks system to be provided from the Water Services near property line which were installed during the initial construction.

Installation and monitoring of the Seismic Valve at the Tatlow Reservoir was in full service during 2018. The valve is very sensitive and needed to be cautiously calibrated so that it functions only during a seismic event, thereby closing the reservoir should there be a main failure, to prevent premature emptying. This allows the Public Works to assess any damage and to isolate and/or repair the area, so the water system can be put back into service. This would retain a source of water in the reservoir that could be used for fires, which is commonly associated with seismic events.

Installation of an actuated altitude valve at the Tatlow Reservoir was completed and put in service in November of 2017. The ability to start filling the reservoir remotely or manually on demand, improves water availability for firefighting with the ability to quickly adjust water levels. The altitude valve settings were adjusted and then monitored in 2018 to better balance the water quality and quantity. Water sample results were subsequently reviewed, and the altitude valve settings were readjusted to improve water quality. Water main flushing took place in the areas that are sensitive to water stagnation.

Continual routine monitoring and testing of the generator and fire pump at the Tatlow Building is done weekly to ensure they will be available in an emergency. The diesel fuel for all generators and the fire pump were scrubbed to ensure the quality of the fuel and to deter fouling. Diesel can go off over time and should be scrubbed on a five-year cycle. Surveillance video cameras have been added to further enhance security of the facilities. Real time visual monitoring of utility equipment and exterior of the buildings complements remote monitoring of the utility.

## **2019**

System maintenance, operational and emergency response refinements will continue to be made in 2019 for delivering water with optimum water quality. The 2019 water main cleaning program will focus on unidirectional flushing of Zone 2 & Fire Hydrant Maintenance of Zone 1.

A more aggressive schedule of maintenance of the filter screen at the Strathcona chamber in the District of North Vancouver (DNV) was established and high turbidity alerts critically assessed for this concern. Belcarra has contacted DNV Water Operators and have established protocols on how to work together in an emergency, deal with a breach of the system and alerts during periods of high flows in Belcarra.

Tatlow reservoir is budgeted for inspection by a Remotely Operated Vehicle to check for cleanliness and damage.

The rock armouring protection at the foreshore in Belcarra has been eroded away and will require replacement in 2019 to protect the main from damage and heating. Coordination of the pending works commenced in 2018 with applications to; Vancouver Fraser Port Authority representing the Department of Fisheries, Ministry of Forests, Lands, Natural Resource Operations and the People of the River Referrals Office representing First Nations and the Tsleil-Waututh Nation were directly contacted. A Qualified Environmental Professional and Archaeologist have been retained to ensure compliance of all permits and conditions.

In addition, there are Water Main extensions that could be made to the water distribution system, which could increase water circulation and fire flows by looping dead end mains, as the opportunities present. Strides were made in future connection of the Metro Vancouver Belcarra Park picnic area which may improve water circulation and quality.

## **D. INCIDENTS/SIGNIFICANT COMPLAINTS**

Protocols were refined to improve and coordinate Belcarra, Sasamat Volunteer Fire Department and District of North Vancouver requirements in a fire event.

**Nine** HPC samples were above and **ten** Chlorine sample were below the recommended guidelines. Public Works flushed those water mains until turbidity subsided and chlorine levels were elevated. Water main bleed rates at the water samplers were then increased on the deficient water main ends to reduce stagnation.

## **E. GENERAL WATER ADVISORIES**

There have not been any water advisories for many years.



## **F. OPERATOR TRAINING/QUALIFICATIONS**

In 2012 Environmental Operators Certification Program (EOCP) advised Belcarra, the water system would be classified as a Level 1 based on 270 connections. Belcarra currently has two water distribution system Operators with Level 1 operator's certification from the EOCP, keeping Belcarra in full compliance with the regulation. Continuing education of the water distribution system Operators ensures their relevant knowledge of operating a water system as they work towards their Level 2 certification.

## **G. SECURITY MEASURES**

Some of the security features at Belcarra include:

- Locked accesses to the reservoir with the ladder removed
- Exterior lighting and fencing for the water receiving building at Midden
- Dual locking mechanisms to enter the Midden and pump station buildings
- Door alarms at Strathcona chamber & kiosk, and Midden & Tatlow buildings
- iPhone intrusion alarm at the Strathcona chamber to the District of North Vancouver
- CCTV cameras at Public Works, Midden building, Tatlow reservoir and pump station

## **H. NOTIFICATION AND EMERGENCY RESPONSE PLAN**

### **Notification Requirements**

The notification process for unusual situations that could potentially affect water quality is shown in Appendix I.

## I. LIST OF APPENDICES

### **Appendix A**

Map of Belcarra Water System, Sampling Site Locations and Pressure Zones and Free Chlorine Residual data per Site

### **Appendix B**

List of Belcarra Sample Site Locations

### **Appendix C**

Schedule for Belcarra Sampling and Reporting

### **Appendix D**

Belcarra Sample Station Readings of Temperature, E. coli, HPC, Total Coliform, Turbidity and Free Chlorine

### **Appendix E**

Belcarra Monthly HPC Counts

### **Appendix F**

Metro Vancouver Results of Bacteriological Analysis of Belcarra Potable Water Samples

### **Appendix G**

Metro Vancouver Quarterly THMs, HAAs, and pH

### **Appendix H**

Metro Vancouver Annual Metals Sampling Program

### **Appendix I**

Notification for Unusual Situations Potentially Affecting Water Quality

### **Daily Drinking Water Testing by Metro Vancouver**

<http://www.metrovancouver.org/services/water/quality-facilities/testing-reporting/Pages/default.aspx>

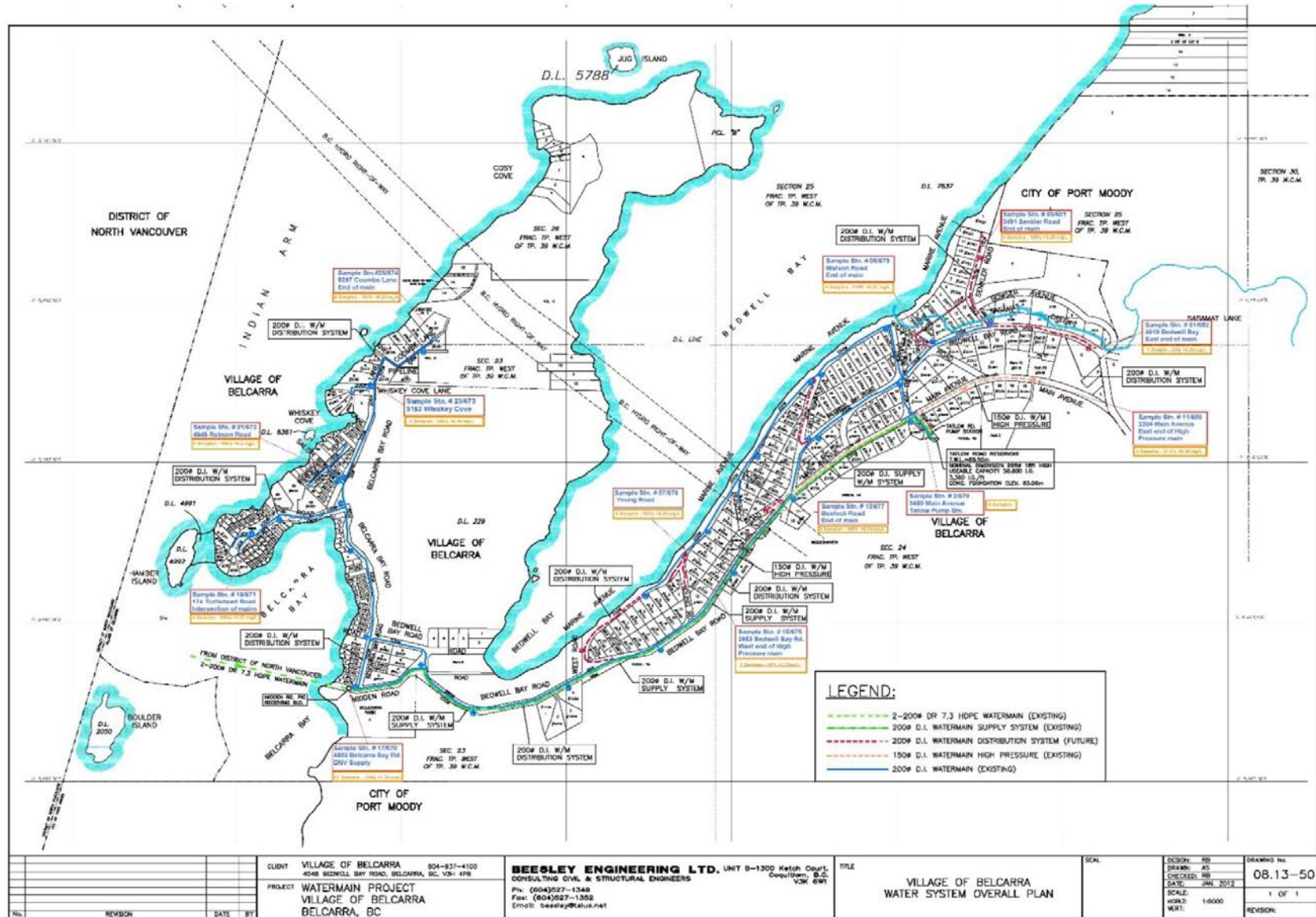
### **District of North Vancouver Annual Water Quality Report**

<https://www.dnv.org/our-government/annual-report>

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### Appendix A

## Map of Belcarra Water System, Sampling Site Locations and Pressure Zone



## Appendix B

### List of Belcarra Sample Site Locations

Station No.	Lab BLC No.	Location	Flow Rate	No. of samples taken in 2018
#17	670	4503 Belcarra Bay (Midden Supply GVWD\DNV)	Source	12
#19	671	174 Turtlehead Road	Low	3
#21	672	4945 Robson Road	Low	3
#23	673	5163 Whiskey Cove Lane	Low	3
#25	674	5297 Coombe Lane	Dead End	3
#15	675	3953 Bedwell Bay Road - High Pressure Zone (West)	Dead End	5
#07	676	Young Road	Low	5
#13	677	Bostock Road	Dead End	4
#02	678	3480 Main Avenue (Tatlow Pump Station)	Reservoir	0
#05	679	Watson Road	Dead End	5
#11	680	3204 Main Avenue – High Pressure Zone (East)	Dead End	7
#03	681	3491 Senkler Road	Dead End	4
#01	682	3819 Bedwell Bay Road – East end of Gravity Main	Dead End	5

## Appendix C

### Schedule for Belcarra Sampling and Reporting for 2018

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b><u>DISTRIBUTION SYSTEM SAMPLING</u></b>												
Temperature, E. coli, HPC, Total Coliform, Turbidity, & Free Chlorine Residuals (Monthly)	X	X	X	X	X	X	X	X	X	X	X	X
HAA's, THM's, pH (Quarterly)		X			X			X			X	
Metals: Copper, Lead, Zinc (Biannually)						X						X
<b><u>NOTIFICATION</u></b>												
2018 Annual Report:												
Annual Report sent to MHO						X						
MHO to send Council response							X					
Staff Report to Council						X						
Posted on Web						X						

## Appendix D

## Belcarra Sample Station Readings of; Chlorine Free, E. coli, HPC, Temperature, Total Coliform, and Turbidity

Sample Description	Sampled date	Chlorine Free (mg/L)	E. coli (MF/100 mLs)	HPC (CFU/mL)	Temperature (°C)	Total Coliform (MF/100 mLs)	Turbidity (NTU)
4503 Belcarra Bay Road	11-Jan-18	0.68	<1	<2	7.8	<1	0.37
174 Turtlehead Road	11-Jan-18	0.54	<1	<2	6.7	<1	0.20
4945 Robson Road	11-Jan-18	0.39	<1	230	6.6	<1	0.16
5163 Whiskey Cove Lane	11-Jan-18	0.53	<1	26	6.1	<1	0.37
5297 Coombe Lane	11-Jan-18	0.54	<1	<2	6.1	<1	0.20
4503 Belcarra Bay Road	15-Feb-18	0.65	<1	<2	7.4	<1	0.17
3819 Bedwell Bay Road	15-Feb-18	0.39	<1	<2	5.2	<1	0.23
3491 Senkler Road	15-Feb-18	0.45	<1	4	5.8	<1	0.61
3204 Main Avenue	15-Feb-18	0.04	<1	>11,000	4.3	<1	0.32
Bostock Road	15-Feb-18	0.04	<1	2,900	5.4	<1	0.29
4503 Belcarra Bay Road	14-Mar-18	0.54	<1	4	7.1	<1	0.15
3953 Bedwell Bay Road	14-Mar-18	0.07	<1	4,800	5.6	<1	0.14
Young Road	14-Mar-18	0.51	<1	<2	6.1	<1	0.60
Watson Road	14-Mar-18	0.01	<1	9,600	5.3	<1	0.30
3819 Bedwell Bay	14-Mar-18	0.64	<1	<2	4.8	<1	0.13
4503 Belcarra Bay Road	10-Apr-18	0.70	<1	<2	8.5	<1	0.21
174 Turtlehead Road	10-Apr-18	0.43	<1	<2	8.7	<1	0.19
4945 Robson Road	10-Apr-18	0.46	<1	4	8.5	<1	0.22
5163 Whiskey Cove Lane	10-Apr-18	0.37	<1	10	7.8	<1	0.21
5297 Coombe Lane	10-Apr-18	0.35	<1	<2	7.3	<1	0.13
4503 Belcarra Bay Road	8-May-18	0.73	<1	2	9.6	<1	0.14
Bostock Road	8-May-18	0.03	<1	1,900	9.5	<1	0.32
3204 Main Avenue	8-May-18	0.35	<1	>11,000	13.0	<1	1.10
3491 Senkler Road	8-May-18	0.52	<1	4	13.2	<1	0.15
3819 Bedwell Bay Road	8-May-18	0.44	<1	LA [There was no plate spread]	12.1	<1	0.17
4503 Belcarra Bay Road	15-Jun-18	0.70	<1	<2	12.0	<1	0.21
3953 Bedwell Bay Road	15-Jun-18	0.10	<1	14	13.4	<1	0.16

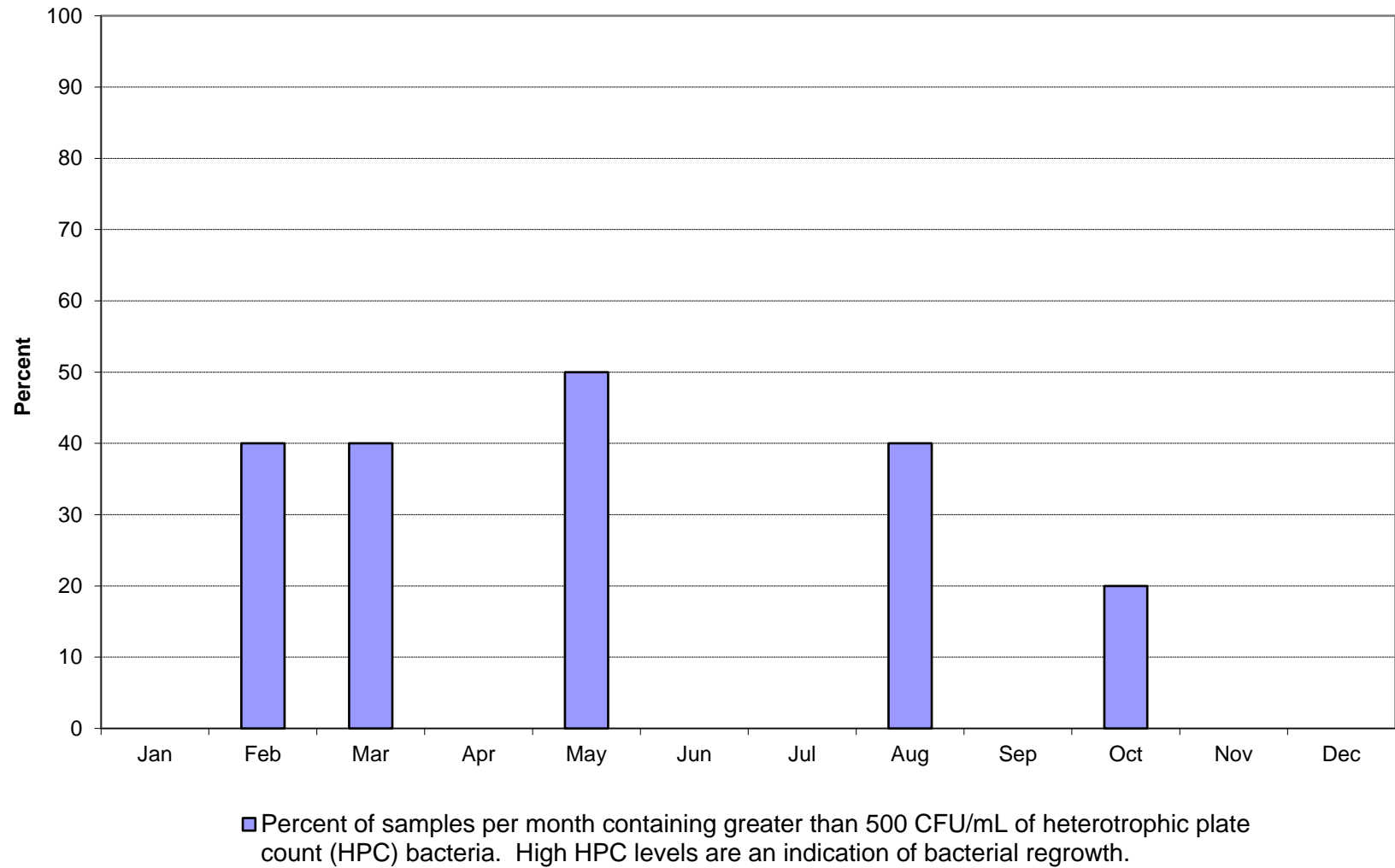
3204 Main Avenue	15-Jun-18	0.35	<1	32	16.5	<1	0.21
Watson Road	15-Jun-18	0.65	<1	<2	16.2	<1	0.70
Young Road	15-Jun-18	0.70	<1	64	15.9	<1	0.24
4503 Belcarra Bay Road	11-Jul-18	0.73	<1	4	12.8	<1	0.20
Young Road	11-Jul-18	0.64	<1	14	17.4	<1	0.22
Watson Road	11-Jul-18	0.57	<1	<2	16.2	<1	0.29
3953 Bedwell Bay Road	11-Jul-18	0.34	<1	64	15.3	<1	0.19
4503 Belcarra Bay Road	15-Aug-18	0.72	<1	2	15.0	<1	0.14
Bostock Road	15-Aug-18	0.07	<1	>11,000	14.9	<1	0.56
3204 Main Avenue	15-Aug-18	0.13	<1	>11,000	23.2	<1	1.00
3491 Senkler Road	15-Aug-18	0.44	<1	<2	19.8	<1	0.18
3819 Bedwell Bay	15-Aug-18	0.56	<1	<2	19.8	<1	0.15
4503 Belcarra Bay Road	13-Sep-18	0.63	<1	4	14.3	<1	0.13
Young Road	13-Sep-18	0.58	<1	8	16.9	<1	0.19
Watson Road	13-Sep-18	0.59	<1	2	15.9	<1	0.27
3204 Main Avenue	13-Sep-18	0.47	<1	490	18.0	<1	0.16
3953 Bedwell Bay Road	13-Sep-18	0.50	<1	26	15.9	<1	0.10
4503 Belcarra Bay Road	11-Oct-18	0.60	<1	<2	12.4	<1	0.23
174 Turtlehead Road	11-Oct-18	0.24	<1	10	13.8	<1	0.20
4945 Robson Road	11-Oct-18	0.23	<1	20	14.2	<1	0.17
5163 Whiskey Cove Lane	11-Oct-18	0.22	<1	370	13.8	<1	0.15
5297 Coombe Lane	11-Oct-18	0.11	<1	1,800	12.7	<1	0.40
4503 Belcarra Bay Road	14-Nov-18	0.66	<1	<2	10.5	<1	0.15
3204 Main Avenue	14-Nov-18	0.39	<1	<2	9.5	<1	0.15
3491 Senkler Road	14-Nov-18	0.34	<1	<2	10.3	<1	0.17
3819 Bedwell Bay Road	14-Nov-18	0.39	<1	2	9.6	<1	0.16
Bostock Road	14-Nov-18	0.46	<1	4	10.1	<1	0.15
4503 Belcarra Bay Road	13-Dec-18	0.62	<1	<2	8.6	<1	0.10
3953 Bedwell Bay Road	13-Dec-18	0.09	<1	34	7.6	<1	0.25
3204 Main Avenue	13-Dec-18	0.36	<1	<2	5.5	<1	0.16
Young Road	13-Dec-18	0.53	<1	6	5.5	<1	0.16
Watson Road	13-Dec-18	0.41	<1	4	6.9	<1	0.59

LA= Lab Accident



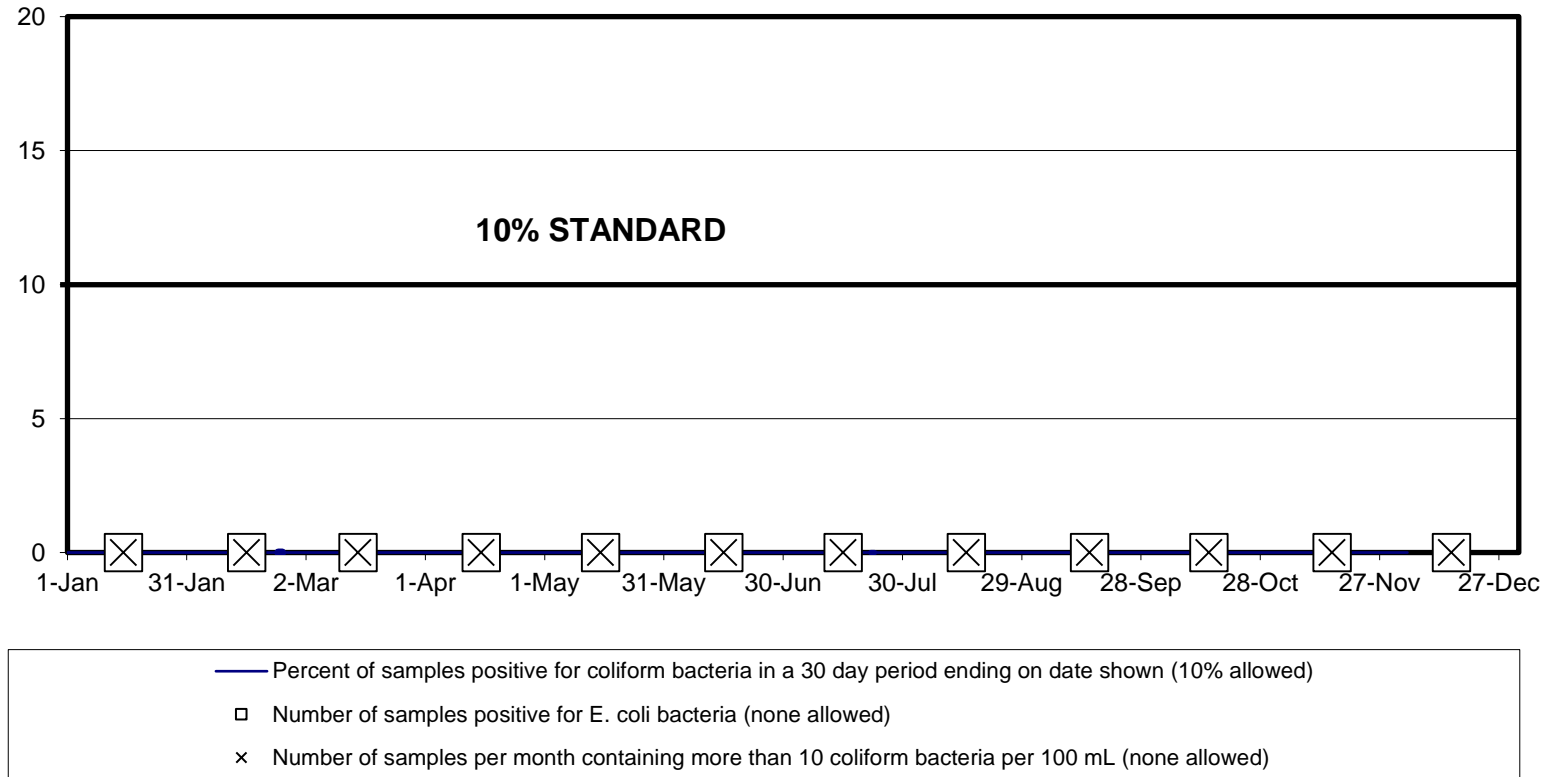
### Appendix E

#### Village Of Belcarra - Monthly Hpc Counts For 2018



**Appendix F**  
**Village Of Belcarra - 2018**

**Results of Bacteriological Analyses of Potable Water Samples  
 Compliance With BC Drinking Water Protection Regulation**



## Appendix G

## Metro Vancouver Quarterly THMs, HAAs, and pH Results of Bacteriological Analysis

Date Sampled	THM (ppb)						HAA (ppb)							Extras
	Bromodichloromethane	Bromoform	Chlorodibromomethane	Chloroform	Total Trihalomethanes		Dibromoacetic Acid	Dichloroacetic Acid	Monobromoacetic Acid	Monochloroacetic Acid	Trichloroacetic Acid	Total Haloacetic Acid		pH units pH
2018-02-15	<1	<1	<1	21	23		<0.5	12	<1	<2	14.4	28.5		<b>7.3</b>
2018-02-15	<1	<1	<1	26	28		<0.5	15	<1	<2	16.8	33.9		7.6
2018-05-30 10:15	<1	<1	<1	21	23		<0.5	11	<1	<2	10.1	22.7		7.5
2018-05-30 10:25	<1	<1	<1	30	32		<0.5	14	<1	<2	15.7	32.0		<b>7.7</b>
2018-08-08 11:40	<1	<1	<1	20	21		<0.5	6	<1	<2	4.5	12.2		7.5
2018-08-08 11:50	<1	<1	<1	23	23		<0.5	10	<1	<2	9.2	20.8		7.5
2018-11-19 08:50	1	<1	<1	38	39		<0.5	15	<1	<2	13.3	30.9		7.4
2018-11-19 09:10	1	<1	<1	44	45		<0.5	18	<1	<2	18.2	38.6		7.5

## Appendix H

## Metro Vancouver Annual Metals Sampling Program

		<b>BLC-670</b>	<b>BLC-682</b>	<b>BLC-670</b>	<b>BLC-682</b>	<b>Canadian Guideline Limit</b>	<b>Reason Guideline Established</b>
	<b>Sample Description</b>	4503 Belcarra Bay Road	3819 Bedwell Bay Road	4503 Belcarra Bay Road	3819 Bedwell Bay Road		
	<b>Sample Date</b>	6/11/2018 9:05	6/11/2018 9:20	12/5/2018 9:25	12/5/2018 9:41		
	<b>Sample Type</b>	GRAB	GRAB	GRAB	GRAB		
<b>Aluminium Total</b>	µg/L	26	25	43	36	200	aesthetic
<b>Antimony Total</b>	µg/L	<0.5	<0.5	<0.5	<0.5	6	health
<b>Arsenic Total</b>	µg/L	<0.5	<0.5	<0.5	<0.5	10	health
<b>Barium Total</b>	µg/L	2.7	3.2	3.2	3.8	1,000	health
<b>Boron Total</b>	µg/L	<10	<10	<10	<10	5,000	health
<b>Cadmium Total</b>	µg/L	<0.2	<0.2	<0.2	<0.2	5	health
<b>Calcium Total</b>	µg/L	4,790	4,980	4,640	4,910	none	
<b>Chromium Total</b>	µg/L	<0.05	<0.05	<0.05	<0.05	50	health
<b>Cobalt Total</b>	µg/L	<0.5	<0.5	<0.5	<0.5	none	
<b>Copper Total</b>	µg/L	3.9	5.6	<0.5	5.8	≤1,000	aesthetic
<b>Iron Total</b>	µg/L	<5	9	10	14	≤ 300	aesthetic
<b>Lead Total</b>	µg/L	<0.5	<0.5	<0.5	<0.5	10	health
<b>Magnesium Total</b>	µg/L	144	145	127	135	none	
<b>Manganese Total</b>	µg/L	1.1	0.9	0.9	1.4	≤ 50	aesthetic
<b>Mercury Total</b>	µg/L	<0.05	<0.05	<0.05	<0.05	1.0	health
<b>Molybdenum Total</b>	µg/L	<0.5	<0.5	<0.5	<0.5	none	
<b>Nickel Total</b>	µg/L	<0.5	<0.5	<0.5	<0.5	none	
<b>Potassium Total</b>	µg/L	132	142	140	165	none	
<b>Selenium Total</b>	µg/L	<0.5	<0.5	<0.5	<0.5	50	health
<b>Silver Total</b>	µg/L	<0.5	<0.5	<0.5	<0.5	none	
<b>Sodium Total</b>	µg/L	1,300	1,330	1,400	1,440	≤ 200,000	aesthetic
<b>Zinc Total</b>	µg/L	5.1	3.6	<3.0	4.2	≤ 5,000	aesthetic

## Appendix I

### Notification for Unusual Situations Potentially Affecting Water Quality

Situation	Notifying Agency	Agency Notified	Time Frame for Notification
E. coli – positive sample	MV Laboratory or BC Centre for Disease Control	Belcarra and Fraser Health Authority	Immediate
Total Coliform over 10 mg/L and no Free Chlorine Residual	Belcarra	Fraser Health Authority	Immediately upon receipt of sample test results
Chemical Contamination	Belcarra	Fraser Health Authority	Immediate
Turbidity > 5 NTU	MV Laboratory or GVWD Operations	Belcarra and Fraser Health Authority	Immediate
GVWD Disinfection failure	GVWD Operations	Belcarra and Fraser Health Authority	Immediate in any situation in which the BCSDWR or the GCDWQ may not be met
Loss of pressure due to high demand	Belcarra	DNV Operations and Fraser Health Authority	Immediate
Water main break in Belcarra, where contamination is suspected	Belcarra	Fraser Health Authority	Immediate
Water main break in DNV, where contamination is suspected	DNV	Belcarra and Fraser Health Authority	Immediate

#### REPORT PREPARED BY:

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**4084 Bedwell Bay Road**  
**Belcarra, BC V3H 4P8**  
**Canada**