



NORTH VANCOUVER
DISTRICT

DRAFT DRINKING WATER QUALITY ANNUAL REPORT 2017

May 31, 2018.

District of North Vancouver Utilities Department

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EXECUTIVE SUMMARY

This report is the seventeenth Drinking Water Quality Annual Report prepared by the District of North Vancouver. It provides water consumers with information about the quality of the potable water and the programs that support the drinking water quality. Submission of this report to the Office of the Medical Health Officer for North Shore Vancouver Coastal Health fulfills regulatory obligations of the Drinking Water Protection Act, the British Columbia Drinking Water Protection Regulation and our application to the Medical Health Officer for an annual Drinking Water System Permit to operate a potable water system. This report adheres Metro Vancouver's "Water Quality Monitoring and Reporting Plan for the GVWD and Member Municipalities", a template for the Greater Vancouver Water District and member municipalities water quality monitoring and reporting.

The Greater Vancouver Water District and the District of North Vancouver employ a multi-barrier science based approach that encompasses water from the source to the point of delivery. This approach ensures consistent delivery of a reliable supply of safe drinking water. All potable water supplied to District of North Vancouver is treated at the Seymour Capilano Filtration Plant. In 2017, 100% of the District of North Vancouver water samples met or exceeded regulatory requirements. The combined efforts of the Greater Vancouver Water District and the District of North Vancouver once again resulted in excellent water quality for our customers.

1 SOURCE WATER

All water supplied to the District of North Vancouver (DNV) by the Greater Vancouver Water District (GVWD or Metro) comes from the Capilano or Seymour surface water reservoir following secondary treatment at the Seymour Capilano Filtration Plant (SCFP). Metro uses multiple barriers to protect and deliver safe drinking water including watershed protection, water treatment, source quality testing, transmission point quality testing and ongoing operation and maintenance of the water systems.

Prior to 2009, Metro's treatment of both the Capilano and Seymour sources was primary disinfection including chlorine. In 2010 Seymour source water was treated at the Seymour Capilano Filtration Plant (SCFP). The SCFP incorporates multiple disinfection processes including ultra filtration, ultraviolet radiation disinfection and chlorine. In 2015 tunnels were commissioned that linked the Capilano source water to the SCFP marking a significant water treatment and quality milestone for the DNV and the region.

Metro analyses source water for bacteriological, chemical and physical parameters according to the "BC Drinking Water Protection Regulation" and the "Water Quality Monitoring and Reporting Plan for the GVWD and Member Municipalities – 2018". The "2017 - GVWD Quality Control Annual Report" summarises water quality for all of the Metro Vancouver service area and is made available on their website www.metrovancouver.org. The report demonstrates that drinking water supplied by Metro to DNV met or exceeded all water quality standards and guidelines in 2017.

2 DNV DISTRIBUTION SYSTEM & QUALITY ASSURANCE TESTING

2.1 General

The DNV water distribution system delivers potable water to its customers through a waterworks system incorporating 376 km of water mains, 7 water pumping stations, 11 water storage reservoirs, and 37 pressure reducing stations. A population of approximately 86,000 is served through 21,500 service connections.

In 2017, Metro delivered 19.9 million cubic metres of water to the DNV distribution system through nineteen metered connections. A map of the overall water system, showing pressure zones is included in Appendix A.

2.2 Sampling and Testing

Sampling is performed in three scheduled categories according to the requirement of the British Columbia Drinking Water Protection Regulation (the Regulation);

1. **Weekly** (bacteriological, chemical and physical parameters),
2. **Quarterly** (Disinfection by-products), and
3. **Semi-Annually** (Metals).

Health Canada's Guideline for Drinking Water Quality (the Guideline) sets category parameter limits on peer-reviewed scientific based research as either maximum acceptable concentrations, aesthetic objective or operational guidance values.

- Maximum Acceptable Concentrations (MAC) are set for parameters that are known to detrimentally impact human health.
- Aesthetic Objectives (AO) are set for parameters which consumers base opinions about the drinkability of water.
- Operational Guidelines (OG) are set for parameters that could detrimentally impact water quality in the distribution system.

With the exception of temperature and free chlorine residual, which are analysed and recorded by DNV staff at the time of sampling, all samples are collected by DNV staff and transported to the accredited Lake City Metro lab for analysis.

2.2.1 Scheduled Weekly Sampling

In 2017 DNV staff collected a total of 1,287 regular scheduled samples from 39 sample sites or an average of 107 samples per month. This exceeds the Regulations population based sample requirement for DNV of 34 sites and 86 samples per month. Sample collection is scheduled weekly on a rotating basis using strategic grouping of sample sites distributed across the system. Generally 13 samples are collected twice weekly for a total of 26 samples per week.

Locations of weekly sample points are distributed according to the regulation recommendations as follows;

- 10% of sampling points at "source" (supply points from Metro transmission mains),
- 40% of sampling points at locations with medium flow,
- 40% of sampling points at locations with low flow, and
- 10% of sampling points at system dead-ends (very low flow).

Scheduled weekly analysis can be grouped into two categories bacteriological and chemical or physical parameters. Standards for water distribution systems are dictated by the requirements of the Regulation and the Health Canada's Guidelines for Canadian Drinking Water Quality. The guidelines provide either a maximum allowable concentration (MAC), an athletic objective (AO) or an operational guidance (OG) value.

- Bacteriological parameters guidelines are:
 - Escherichia coli (E coli): MAC none detectable per 100mL
 - Total coliform: MAC none detectable in 100mL
 - Heterotrophic plate count (HPC): OG less than or equal to 500 CFU/mL
 - Turbidity: OG less than or equal to 5.0 NTU

- Chemical or physical parameter guidelines are:
 - Chlorine: OG between 0.04 – 2.0 mg/L
 - Temperature: AO less than or equal to 15°C
 - pH: OG between 7.0 and 10.5

Figure 1 below shows the number of scheduled weekly sample collected and analysed in 2017 on a monthly basis.

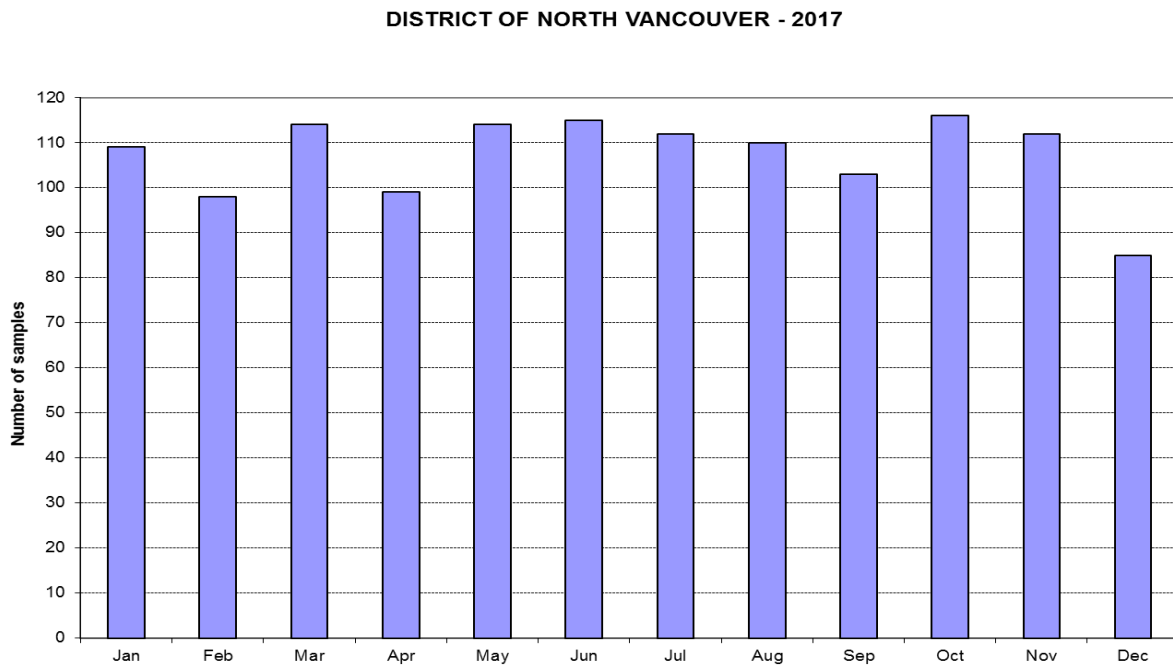


Figure 1. Number of Scheduled Weekly Samples Collected

2.2.2 Quarterly Disinfection By-Products Sampling

Haloacetic acids (HAA) and Trihalomethanes (THM) are groups of compounds that can form as by-products when water is treated with chlorine. The Guideline maximum allowable concentrations for the running quarterly averages are 80 ppb for HAA and 100 ppb for THM with the added recommendation that they be kept as low as reasonably achievable (ALARA) without compromising disinfection.

In conformance with the regulation, DNV staff collected 16 samples for HAA and THM disinfection by-product analysis.

2.2.3 pH

A measurement of pH in the distribution system is made at the same time as the disinfection by-products at one of the four locations on a quarterly basis. The Guideline does not provide a required value but sets a target range of 7.0-10.5 and is primarily for corrosion control.

2.2.4 Metal Semi-Annual Sampling

In 2017 DNV staff collected 8 samples for analysis at 4 locations for metal testing in conformance with regulatory requirement.

2.2.5 Unscheduled Sampling

In addition to the scheduled weekly, quarterly and semi-annual samples, additional samples are collected and analysed when warranted for water quality complaint, operational concern or maintenance activity. All water quality complaints are investigated immediately. The majority of water quality complaints received are about discolored water. The cause of discolored water in the DNV tend to can fall into one of two categories:

1. An unintentional consequence of DNV or private activities (water main flushing, hydrant flow testing, construction activities or pipe breaks). Planned and unexpected work is performed in a manner that limits the impact on water quality, however, sometimes it is unavoidable.
2. Spontaneous degradation of cast iron pipe. Cast iron pipe naturally breaks down and can release corrosion product that can, in sufficient concentration, make water appear reddish brown or 'dirty'.

In 2017 a total of 117 unscheduled samples were collected and analysed.

3 RESULTS

The DNV water sampling program meets the regulatory requirements for sample location, frequency and quantity. Analytical results are provided by Metro to DNV on a weekly basis and reviewed internally upon receipt. The five year summary of scheduled weekly sample results (free chlorine residual, total Coliform, E-coli, HPC, turbidity and temperature) for each sample site are presented in Appendix B. A summary of the results by parameter is provided below.

3.1 Scheduled Weekly Bacteriological Parameter Results

Bacteriological standards for water distribution systems are dictated by the requirements of the regulation and by Health Canada's [Guidelines for Canadian Drinking Water Quality](#) which provide the following criteria:

- **E. coli:** Escherichia coli is an indicator of potential micro bacteriological contamination and possible pathogens. Some strains of E coli are pathogenic. The guideline states that the MAC is zero detectable E. coli per 100 mL sample.
- **Total Coliform:** Coliforms occurs naturally in water sources and alone are not pathogenic but indicate the potential presence of pathogens. The guideline states that the MAC is 10 or less total coliform per 100 mL sample and that 90% or more of the samples for a given month must have zero detectable total coliform per 100 mL sample.
- **HPC:** Heterotrophic plate count is used to monitor general bacteriological quality. The Guideline does not provide an allowable level but instead offers the OG that increases in HPC concentrations above a baseline level of 500 CFU/mL s are undesirable.

- Turbidity:** Particles in drinking water can inhibit treatment and indicate potential quality concerns. The Guidelines suggests an OG of supply water turbidity target of < 1 Nephelometric Turbidity Unit (NTU) or “best possible” and should not exceed 5.0 in distribution systems.

All samples collected in 2017 met all guidelines for safe potable water. There were no occurrences of detectable E-coli nor Total Coliform. All samples were below the recommended maximum HPC and turbidity level and are stable over time. The annual DNV average HPC and turbidity for the last five years are presented below.

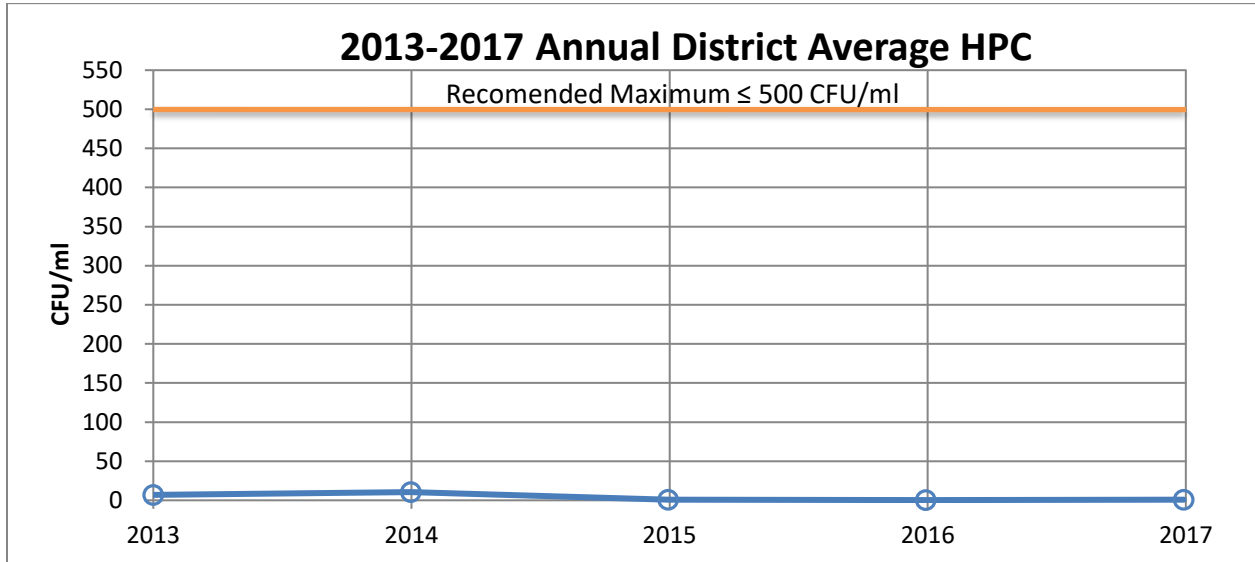


Figure 2. HPC Five Year Annual Averages

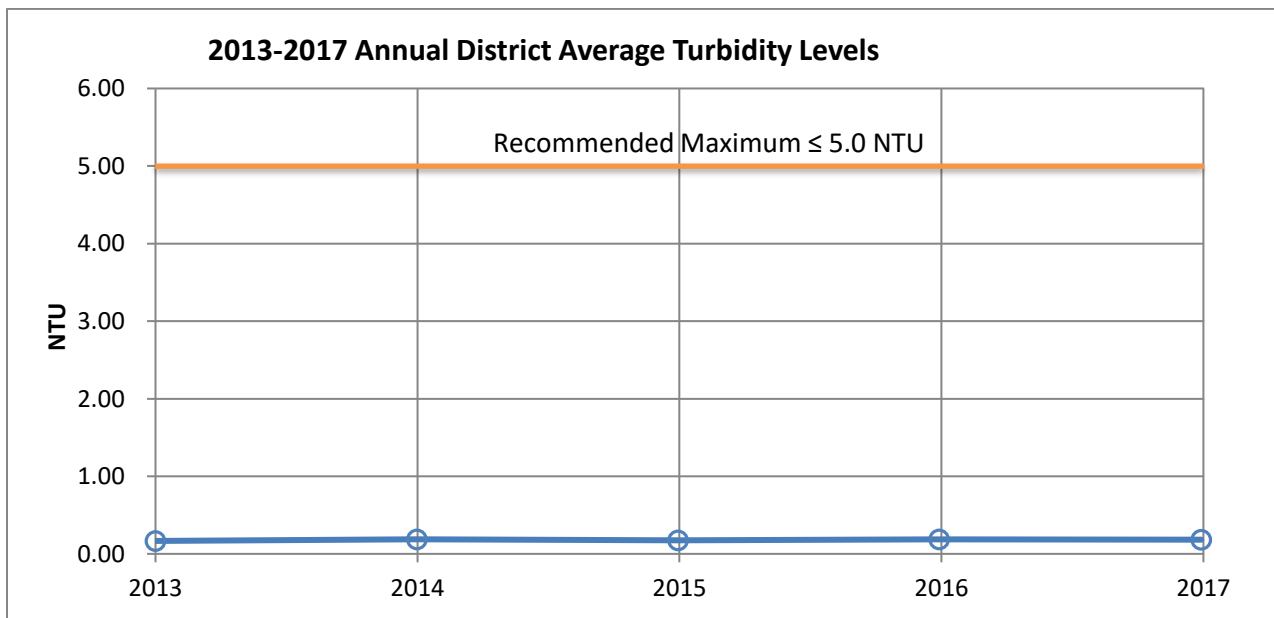


Figure 3. Turbidity Five Year Annual Averages.

3.2 Scheduled Weekly Chemical and Physical Parameter Results

Chemical and physical parameters, chlorine, temperature and pH, results for 2017 are summarised below.

- **Chlorine:** Chlorine is used in the disinfection process and a residual amount in the distribution system is desirable to maintain potable water quality. In 2017 all samples were within the OG range for residual chlorine, 0.04-2.0 mg/L and above the OG of 0.2 mg/L. The average system-wide chlorine residual was 0.69 mg/L. The annual DNV average free chlorine for the past 5 years is presented below in figure 4.
- **Temperature:** The temperature of drinking water can impact water quality and is an aesthetic parameter. The guidelines provide an AO for water temperature at less than or equal to 15°C. In 2017, 126 or 9.7% of samples were above 15°C and occurred during the months of July, August and September only. The highest temperature recorded was 20 °C , the lowest temperature recorded was 3 °C and the annual system average was 9.4 °C.
- **pH:** pH is a measure of acidity/basicity and can impact corrosion rates of the distribution systems. The operational guideline is 7.0-10.5 in drinking water and the average pH for our system in 2017 was 7.4.

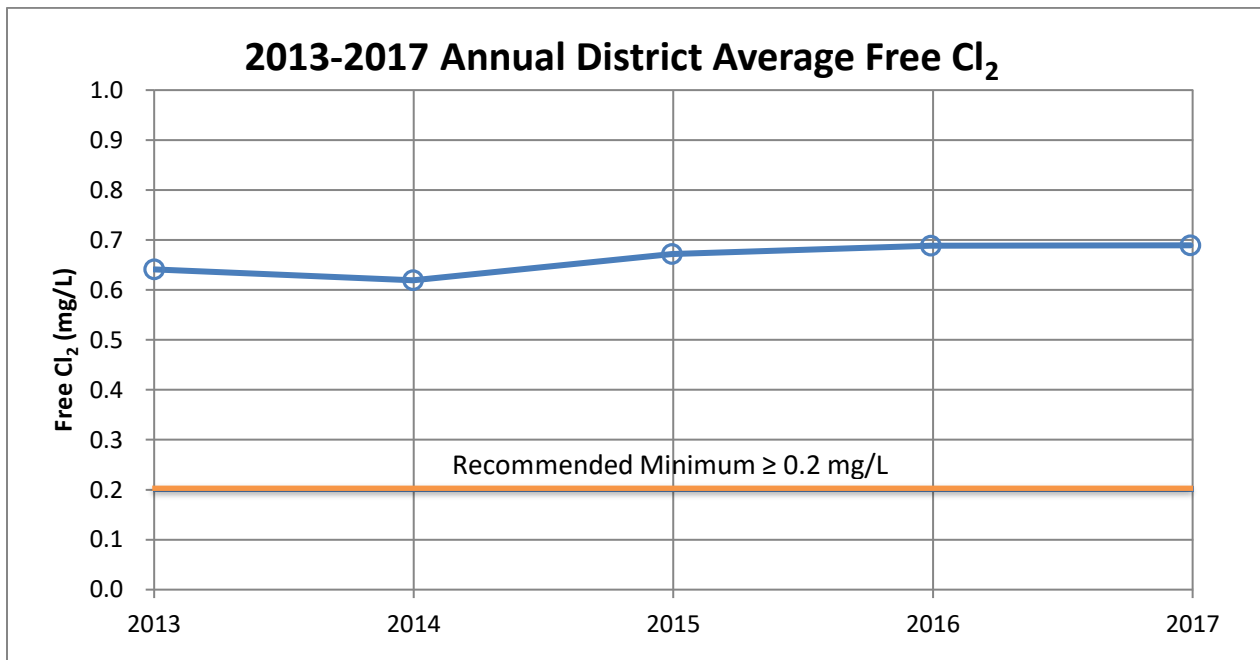


Figure 4. Free Cl₂ Five Year Annual Averages.

3.3 Quarterly Disinfection By-products Results

Quarterly disinfection by-products tested were well below guideline limits and are presented below in Table 1.

Sample	Date Sampled	THM (ppb)		HAA (ppb)	
		Total Trihalomethanes	Total THM Quarterly Average (Guileline Limit 100 ppb)	Total Haloacetic Acid	Total HAA Quarterly Average (Guileline Limit 80 ppb)
DNV-727	3/1/2017	17	17	14	14
DNV-727	5/16/2017	18	18	17	16
DNV-727	8/23/2017	18	18	11	14
DNV-727	11/29/2017	25	20	18	15
DNV-733	3/1/2017	13	13	12	12
DNV-733	5/16/2017	17	15	14	13
DNV-733	8/23/2017	16	15	12	13
DNV-733	11/29/2017	25	18	16	13
DNV-734	3/1/2017	19	19	19	19
DNV-734	5/16/2017	19	19	19	19
DNV-734	8/23/2017	17	18	13	17
DNV-734	11/29/2017	26	20	18	17
DNV-736	3/1/2017	20	20	17	17
DNV-736	5/16/2017	21	21	25	21
DNV-736	8/23/2017	20	20	15	19
DNV-736	11/29/2017	27	22	21	19

Table 1. Quarterly Disinfection By-products 2017 Results

3.4 Scheduled Semi-Annual Metal Results

A total of eight samples from four locations were analyzed for metals, including copper, lead and zinc. Sample sites, results, and maximum concentrations are given in Table 2 below. All samples tested for metals were below the maximum acceptable concentration guidelines for Canadian Drinking Water Quality. Where the guideline limit is 'none', Health Canada has determined that there is currently no scientific evidence of detrimental health effects for that parameter at the levels typically found in drinking water.

Parameter & Guideline Limit	Site ID	DNV-721		DNV-730		DNV-734		DNV-747	
	Site Description	2838 Panorama Dr.		Braemar Reservoir		1181 West 22nd		1231 Lennox St. PRV	
	Sample Date	03/05/2017	24/10/2017	03/05/2017	24/10/2017	03/05/2017	24/10/2017	03/05/2017	24/10/2017
	Sample Type	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
Aluminum Total	200 µg/L *	22	24	24	26	22	25	23	32
Antimony Total	6 µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic Total	10 µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Barium Total	1000 µg/L	5.8	3.8	3.0	3.5	2.6	3.4	2.7	3.3
Boron Total	5000 µg/L	<10	<10	<10	<10	<10	<10	<10	<10
Cadmium Total	5 µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Calcium Total	none	6320	4750	4240	4180	2420	4120	2080	4090
Chromium Total	50 µg/L	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cobalt Total	none	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Copper Total	1000 µg/L	2.6	1.7	1.2	0.8	7.4	6.3	<0.5	<0.5
Iron Total	≤ 300 µg/L	15	6	7	<5	18	<5	<5	<5
Lead Total	10 µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Magnesium Total	none	159	161	149	165	135	167	141	171
Manganese Total	≤ 50 µg/L	2.1	2.0	2.0	16.9	3.5	3.0	2.5	5.5
Mercury Total	1.0 µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Molybdenum Total	none	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel Total	none	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Potassium Total	none	143	204	138	200	135	198	135	197
Selenium Total	50 µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver Total	none	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sodium Total	≤ 200,000 µg/L	1390	1600	1380	1620	1400	1650	1320	1620
Zinc Total	≤ 5000 µg/L	<3.0	<3.0	3.8	<3.0	<3.0	<3.0	<3.0	<3.0

*No health-based guideline for aluminum has been established in Canada, however where aluminum based coagulants are used in water treatment this operating guideline has been set.

Table 2. 2017 Semi Annual Metal parameter, Guideline Limits and Results

3.5 Unscheduled Results

In 2017, in addition to scheduled samples, 117 unscheduled samples were collected and analysed in 2017. Forty five (45) samples were in response to customer or staff requests and seventy two (72) were in response to operational incidents or planned capital construction activities such as water main breaks or water main construction. All results were within the guideline recommended limits with the exception of 1 sample which had a turbidity of 7 NTU which was determined to be a direct result of planned construction work on cast iron pipe. Subsequent flushing and retesting resulted in acceptable turbidity results.

4 OPERATIONS, MAINTENANCE & CAPITAL PROGRAMS

4.1 Water System Scheduled Maintenance

Scheduled annual system maintenance that supports water quality includes water main flushing, reservoir cleaning programs and water facility inspections. We follow the AWWA flushing program standards and in 2017 focused on 17,000 m of primarily cast iron pipes in areas with known water color issues.

The DNV uses permanent flushing stations or regularly scheduled flushing to maintain water quality in areas with chronic aesthetic issues related to cast iron pipe. We are eliminating the flushing stations by upgrading cast iron with our standard water main pipe, lined ductile iron. In 2017 we eliminated one permanent flushing station at Cortell Street at W 21st Street leaving two permanent flushing stations left in our system.

The DNV uses and integrated SCADA system to optimise pumping, reservoir filling and retention time to support water turnover and quality.

4.2 Capital Upgrades

The DNV has a fully funded water main replacement program that uses a risk based protocol with seventeen weighted hazard criteria. The DNV's water main replacement program takes into consideration multiple parameters to prioritise the annual replacement schedule. The DNV standard replacement water main is ANSI/AWWA C151 & C140 special class 50 cement lined ductile iron pipe and specified in our Design Guidelines of our Development Servicing Bylaw.

Our prioritisation protocol heavily weighs the potential of failure, consequence of failure, and water quality. The 2017 DNV construction crews completed the replacement of 4,738 metres of pipe including 85% asbestos cement, 14% cast iron and 1% copper and steel.

IN 2018 we plan to replace 6,955 m of water main pipe in 2018 65% of which is asbestos cement, 23% cast iron and the balance a mix of other materials.

The following two tables list the water main replaced in 2017 and the replacement plan for 2018.

Street	From	To	Length (m)
W 23 rd St	Philip Avenue	Bridgman Avenue	168
Wellington Drive	St. Andrews Avenue	End of Cul-de-sac	72
Tudor Avenue	Canterbury Crescent	Chelsea Crescent	98
Newdale Crescent	Beaver Road	End of Cul-de-sac	286
Starlight Way	Newdale Crescent	4355 Starlight Way	291
Croydon Place	Delbrook Avenue	End of Cul-de-sac	42
Appin Road	E 14 th Street	Alderlynn Drive	226
Edgemont Boulevard	Riviere Place	3630 Edgemont Boulevard	278
Hoskins Road/Arborlynn Dr.	Arborlynn Drive	Torquay Avenue	688
Windsor Avenue	Stanley Avenue	Mahon Avenue	391
E Kensington	St. Andrews Avenue	End of Cul-de-sac	88
Mountain Highway	Frederick Road	Harold Road	296
Ranger Avenue	Sarita Avenue	Malaspina Place	182
W 20 th Street	Bridgman Avenue	Pemberton Avenue	189
Keats Road	Berkley Road	End of Cul-de-sac	128
Belloc Street	Berkley Road	2590 Belloc Street	277
Maginnis Avenue	Frederick Road	Wellington Drive	210
Dovercourt Road	Maginnis Avenue	Mountain Highway	234
Wellington Drive	Maginnis Avenue	Mountain Highway	245
Selby Road	Kilmer Road	End of Cul-de-sac	137
Sunnycrest Drive	Highland Boulevard	Glenview Crescent	212

Table 3. Water Main Replaced in 2017 by DNV

The planned Water main replacements for 2018 are listed below.

Street	From	To	Length (m)
Appin Road	Alderlynn Drive	Ayleslynn Drive	506
Cliffridge Avenue	Prospect Avenue	Clements Avenue	
Clements Avenue	Cliffridge Avenue	End of Cul-de-sac	219
Pinewood Crescent	Redwood Street	1231 Pinewood Street	
Redwood Street	McBride Street	Alderwood Place	379
Phyllis Road	Lynn Valley Road	Burrill Avenue	464
Banbury Road	Rockcliff Road	Raeburn Street	225
St Andrews Avenue	E Braemar Road	Wellington Drive	189
Brockton Crescent	Beaufort Road	4043 Brockton Crescent	120
Wavertree Road	Highland Boulevard	End of Cul De Sac	60
Highland Boulevard	Wavertree Road	Sunnycrest Drive	67
Kilmer Road	Hoskins Road	Lynn Valley Road	284
St Andrews Avenue	E Osborne Road	E Carisbrooke Road	127
Mt Seymour Parkway	Emerson Way	Plymouth Drive	756
William Street	E 29 th Street	Lynn Valley Road	
E 26 th Street	William Avenue	739 E 26 th Street	718
St Annes Drive	Paisley Road	End of Cul-de-sac	
Winton Avenue	St Annes Drive	End of Cul-de-sac	
Monton Avenue	St Annes Drive	Ridgewood Drive	431
Chaucer Avenue	Fromme Road	Shakespeare Avenue	357
Wendel Place	Fromme Road	End of Cul-de-sac	110
Fromme Road	E 27 th Street	End of Cul-de-sac	125
Granada Crescent	Delbrook Avenue	End of Cul-de-sac	211
Arundel Road	Lions Avenue	End of Cul-de-sac	
Cheviot Road	Lions Avenue	Arundel Road	383
Trillium Place	Emerson Way	End of Cul-de-sac	258
MacGowan Avenue	Marine Drive	W 15 th Street	169
Terrace Avenue	Sunnyside Drive	End of Cul-de-sac	121
Mill Street	Mountain Highway	1417 Mill Street	201
Drayton Street	Hendry Avenue	E 10 th Street	176
Canterbury Crescent	Tudor Avenue	Skyline Drive	299

Table 4. Proposed Water Main Replacement 2018

4.3 Operator Training & Qualification

The DNV's distribution system is EOCP classified as a Level 3 system. The DNV currently has distribution system operators with Level 3 operator's certification from the EOCP, keeping the DNV in full compliance with the Regulation.

5 ISSUES, INCIDENTS & RESPONSE PLANS

5.1 Boil Water Advisory

A precautionary boil water advisory is issued when, in consultation with the Vancouver Coastal Health, a situation exists that increases the risk of possible contamination. The failure of the private plumbing system and subsequent repairs on the Twin Lakes townhome development at 3700 block of Princess Avenue resulted in a precautionary boil water advisory in 2017.

5.2 Public Concern

One DNV resident brought forward the concern of microplastics in our drinking water. The response, which was ultimately written and delivered by Metro, provided that microplastics contamination in our region is unlikely because;

- the location and protection of our water sources,
- microplastics have not ever been detected in over 30,000 samples annually, and
- the SCFP is designed to remove microplastics should they find a pathway into our water.

5.3 Security

There were no security threats to the DNV system in 2017.

DNV water storage reservoirs and pumping facilities have secured access, intrusion detection linked to the automated SCADA alarm system and designed fail safe valve operation to inhibit or reduce the impact of security threats. Assessments of new technology and improved systems to protect DNV water supply facilities are ongoing.

5.4 Water Main Breaks

We responded to 19 emergency water main breaks in 2017. Water main break response protocol includes maintaining positive pressure to protect the water system from potential contamination.

Challenges facing the DNV in 2017 for maintaining good water quality in the distribution system were ensuring that water system maintenance and replacement programs had the greatest possible positive effect on maintaining good water quality, while at the same time achieving target levels for infrastructure repair and replacement. The capital, operating and maintenance budgets along with the staffing and management of related programs continue to be a high priority for the DNV. A 10 year summary of water main break is provided below.

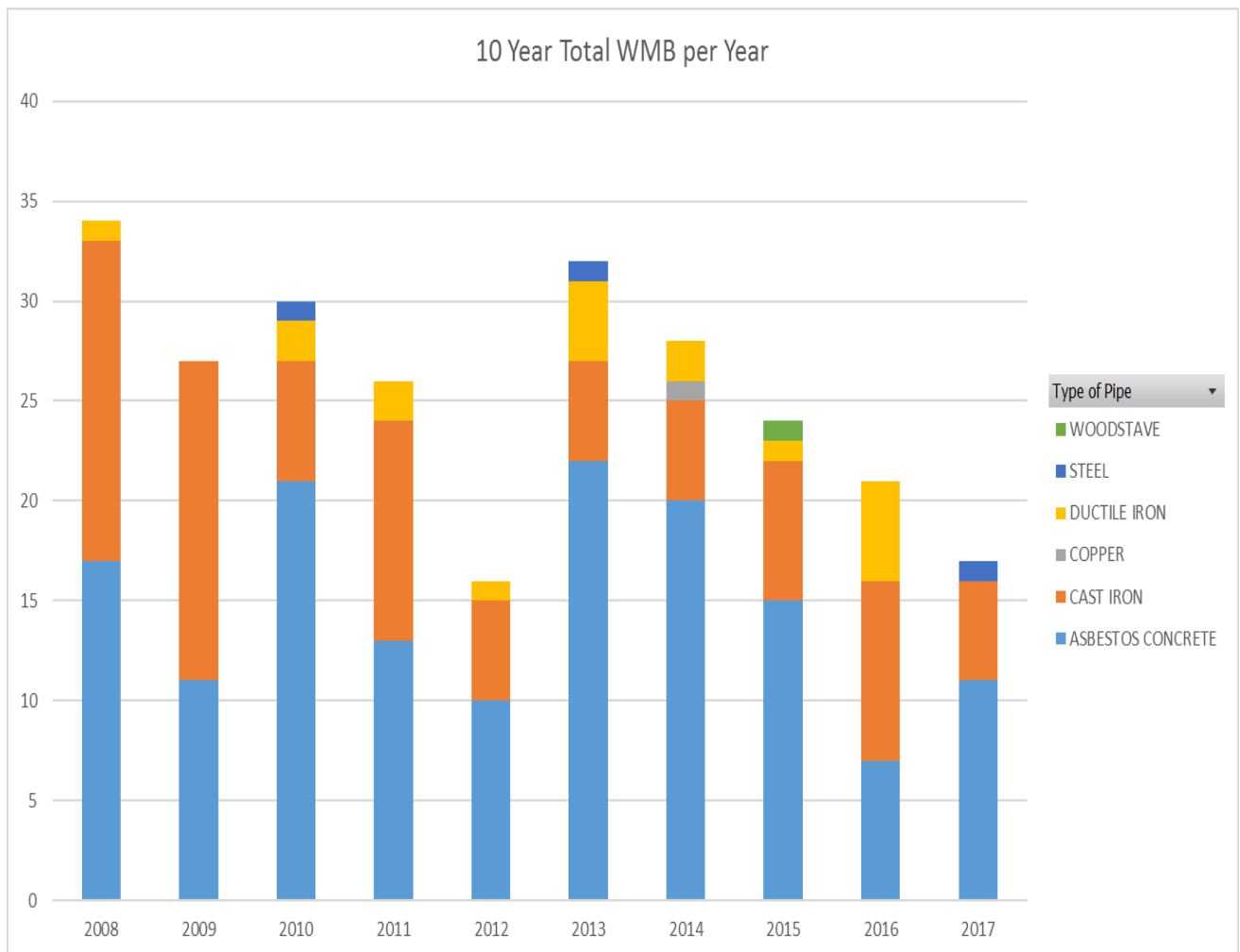


Figure 5. 10-Year Water Main Break Summary

5.5 Notification & Emergency Response

The table below outlines our notification process for unusual situations that could potentially affect water quality and notification is required.

NOTIFICATION FOR UNUSUAL SITUATIONS POTENTIALLY AFFECTING WATER QUALITY			
Situation	Notifying Agency	Agency Notified	Time Frame For Notification
<i>E. coli</i> -positive sample	GVWD	DNV and Vancouver Coastal Health (North Shore)	Immediate
Chemical Contamination	GVWD DNV	Vancouver Coastal Health (North Shore)	Immediate
Turbidity > 5 NTU (Coquitlam Reservoir only)	GVWD	DNV and Vancouver Coastal Health (North Shore)	Immediate
GVRD Source treatment failure	GVWD	DNV and Vancouver Coastal Health (North Shore)	Immediate in any situation in which the BCSDWR or the GCDWQ may not be met
Loss of pressure	GVWD DNV	GVWD Operations and Vancouver Coastal Health (North Shore)	Immediate
Water main break with contamination suspected	DNV	Vancouver Coastal Health (North Shore) PEP	Immediate
Water main break with no suspect contamination	DNV	Vancouver Coastal Health (North Shore) PEP	As required by Health Authority. PEP as soon as possible

Table 5. Water Quality Notification

5.6 Response Plans

The flow diagram below illustrates the process that has been put in place for response to incidents that could potentially affect water quality during a loss of system integrity. Additional or cascading response protocols are outlined after the chart.

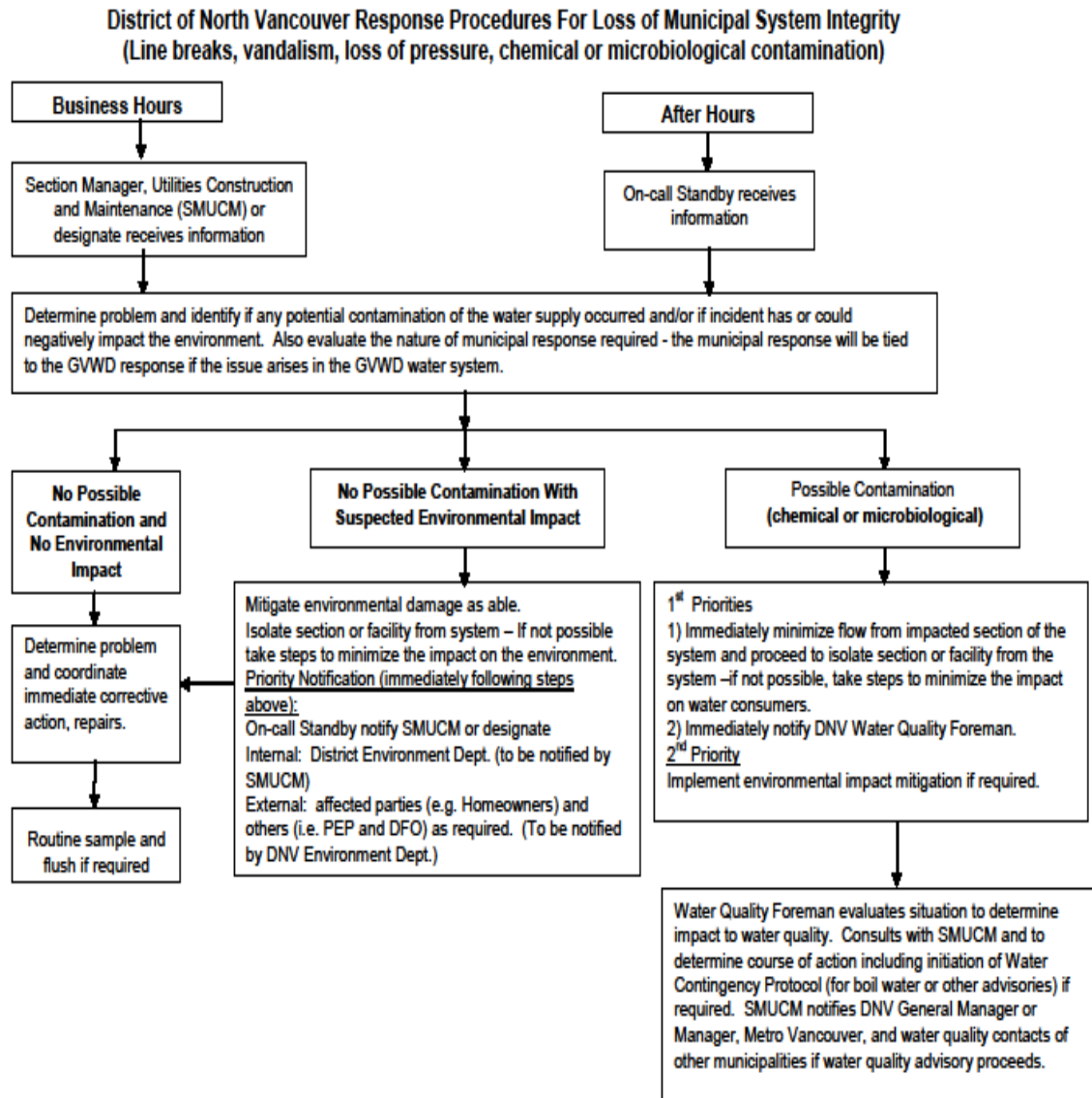


Figure 6. Loss of System Integrity Response

5.7 Response Plans

- *Water main Breaks*

Water main breaks pose an increased risk for potential contamination. Response procedure and repair practices are in place to reduce the risk of contamination. In instances where chemical or microbiological contamination of the system is suspected, DNV Utilities crews make adjustments to isolate the section or facility from the system. The DNV immediately consults with Vancouver Coastal Health (North Shore) regarding further actions, and all water quality complaints from the public will be immediately and thoroughly investigated for potential contamination.

Following all water main breaks, water samples are analysed from the vicinity of the break and tested for bacteriological, chemical and physical parameters.

- *Turbidity Events*

Turbidity in the DNV water distribution system is monitored on a regular basis through the water sampling program. Water sampling results yielding readings greater than 1 NTU are scrutinized, along with corresponding free chlorine. Any areas from which high turbidity results originate will be flushed and re-sampled for free chlorine and turbidity.

- *Loss of Pressure Due to High Demand*

In the event of adverse pressure loss due to high demand, DNV Utilities crews make adjustments to the system to isolate the section or facility and then take measures to supplement pressure in the affected area. The DNV immediately consults with GVWD and Vancouver Coastal Health (North Shore) regarding further actions and all water quality complaints from the public are immediately investigated.

- *Positive E-coli Results*

If a sample submitted from DNV and analysed by the Metro Vancouver laboratory or the BC Centre for Disease Control tests positive for E. coli, the following response plan will be put into action.

- i) Results of interim samples, if any, from the site will be examined by the lab. Interim samples are any samples that may have been taken from the site in the period between when the E. coli -positive sample was taken and when it was determined to be positive.
- ii) The chlorine residual noted on the sampler's field sheet will be reviewed by the lab and compared to previous readings to determine if there had been a localized loss of disinfectant residual.
- iii) The DNV Section Manager of Utilities Construction and Maintenance (SMUCM) or designate and Vancouver Coastal Health (North Shore) will be notified immediately by the laboratory.

- iv) Arrangements will be made for the immediate collection of a repeat sample (including, where possible, samples from upstream and downstream of the positive sample location).
- v) Vancouver Coastal Health (North Shore) will be contacted and the need for a “boil water” advisory will be evaluated.
- vi) If a “boil water” advisory is warranted, the public notification process as outlined in the Water Quality Monitoring And Reporting Plan For The GVRD and Member Municipalities will be followed.
- vii) The lab will contact the DNV with repeat sample results and the results of the species identification tests. The DNV will contact Vancouver Coastal Health (North Shore) to evaluate these results and to determine whether or not the advisory can be lifted.

- ***Chemical Contamination***

In the event of chemical contamination in the DNV water distribution system, Vancouver Coastal Health (North Shore) will be immediately notified. Immediate steps will be taken to isolate the contaminated area and the level of contamination will be determined through water sampling and testing. The chemical will be identified and any public health risk factors associated with the chemical presence will be determined. Through consultation with Vancouver Coastal Health (North Shore), a public advisory will be carried out.

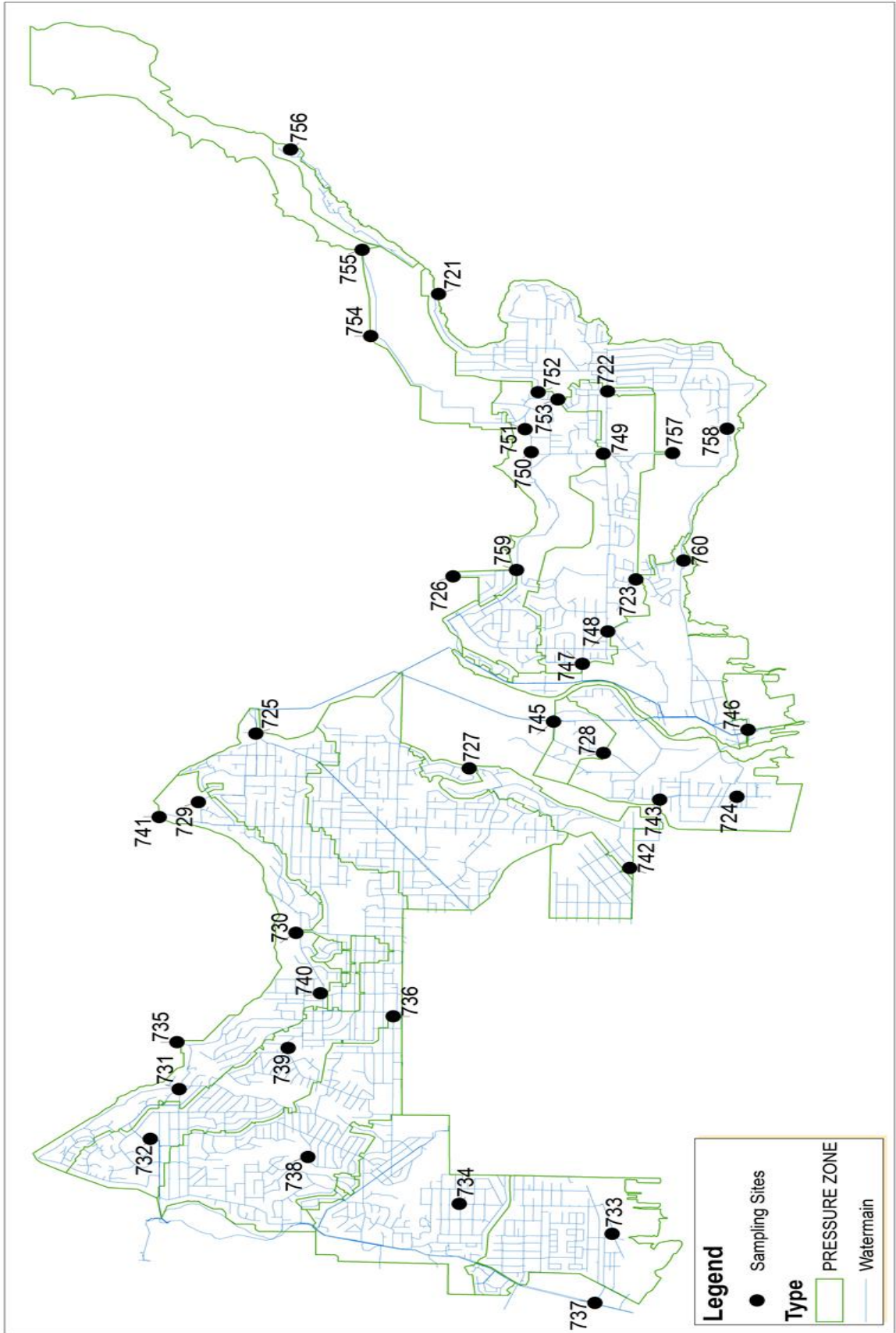
- ***Source Water Event***

In 2007 a task force comprised of Metro Vancouver, Vancouver Coastal Health, Fraser Health and member municipalities developed a communications template for source water major turbidity events. The template outlines the responsibilities of Metro Vancouver, the Health Authorities, and municipalities for notification and communications to each other and to the public.

- ***GVRD Disinfection Failure***

Upon notification by GVWD Operations that an interruption in disinfection has occurred, DNV Water Quality personnel will immediately commence monitoring free chlorine residual levels at strategic locations and will contact the Vancouver Coastal Health (North Shore) if continued loss of residual is observed.

APPENDIX A: Water System, Sample Sites and Sample Schedule.



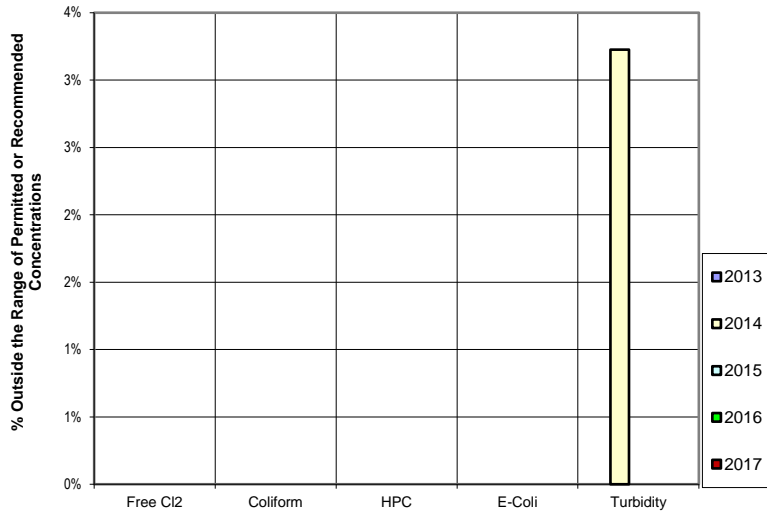
Site I.D.	Lab No.	Sample Site Location	Flow Rate
1	721	2838 Panorama Dr.	Low
2	722	Fairway & Mt Seymour Pkwy.	Medium
3	723	Plymouth Dr & Fairfield Dr.	Low
4	724	LS #13 Dominion & Mountain Hwy.	Low
5	725	Marion Pump Station	Source
6	726	Hyannis Reservoir	Low
7	727	Hoskins Rd & Kilmarnock Cres.	Medium
8	728	Lillooet Road	Low
9	729	Ramsay Pump Station	Medium
10	730	Braemar Reservoir	Low
11	731	Skyline Pump Station	Medium
12	732	Sarita Pump Station	Source
13	733	McKeen Ave & Phillip Ave.	Medium
14	734	Pemberton Heights	Low
15	735	Prospect Reservoir	Medium
16	736	PRV #4 (W Queens Rd. & Lonsdale Ave.)	Dead End
17	737	N. of BC Rail Tracks just East of Lower Cap. Rd.	Source
18	738	3906 Sunnycrest Dr.	Medium
19	739	376 Cartelier Rd.	Medium
20	740	PRV #5 (190 E. Braemar Rd.)	Medium
21	741	Mountain Hwy Reservoir (North up access Rd., N. of Mountain Hwy.)	Low
22	742	PRV # 11 (Across from 1086 Cloverly St.)	Source
23	743	PRV #7 (N across from 481 Mountain Highway)	Dead End
24	744	Not in use	
25	745	PRV # 13 (N. of 1388 Monashee Drive (Capilano College))	Source
26	746	PRV #17 (60 Riverside Dr.)	Medium
27	747	PRV # 19 (1231 Lennox St.)	Dead End
28	748	PRV # 16 (2592 Bendale Rd.)	Dead End
29	749	PRV # 18 (3728 Mt. Seymour Parkway)	Low
30	750	up path behind 1610 Mt. Seymour Rd.	Medium
31	751	Access Rd, N. end of Cascade Ct.	Low
32	752	PRV # 25 (4068 Deane Pl.)	Medium
33	753	PRV # 20 (1501 Theta Ct.)	Low
34	754	Woodlands reservoir (2.1 km N. of Hixon Rd. on Indian River Dr.)	Low
35	755	PRV # 26 3.7 km NE of Hixon Rd. on Indian River Dr.	Low
36	756	End of Fire Lane # 7 (Firelane #7 is 3.6 km from Hixon Rd.)	Dead End
37	757	PRV 200 m south of 879 Roche Point Dr.	Medium
38	758	3860 Dollarton Hwy.	Medium
39	759	Hyannis Pump Station (1919 Hyannis drive)	Low
40	760	3000 Block Dollarton Hwy.	Low

**DISTRICT OF NORTH VANCOUVER
WATER QUALITY SAMPLING AND REPORTING
CALENDAR - 2016**

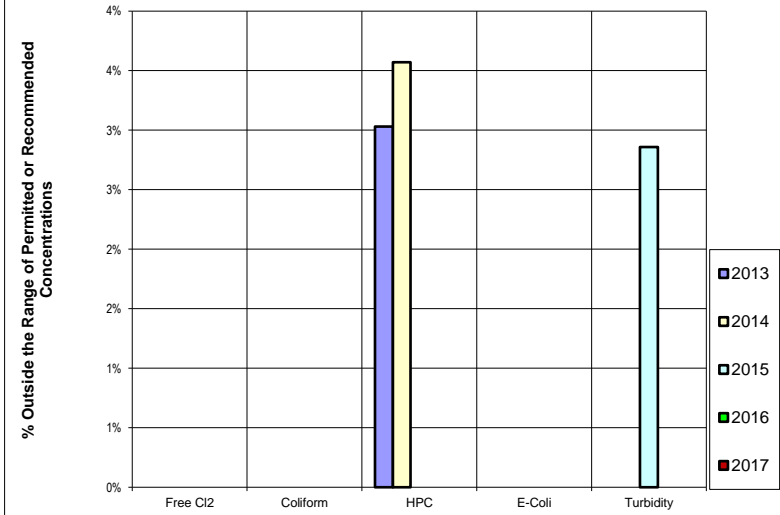
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<u>DISTRIBUTION SYSTEM SAMPLING</u>												
bacteria, turbidity, chlorine, temperature (twice weekly)	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
HAA's, THM's, pH (quarterly)			X			X		X			X	
metals - copper, lead, zinc (semi-annually)					X					X		
<u>NOTIFICATION</u>												
Annual Report:												
Annual report sent to MHO				X								
MHO responds to Council					x							
Staff report to Council						x						
Posted on Web							x					

**APPENDIX B: Five Year Results by Water Quality
Sample Site. 2013 - 2017**

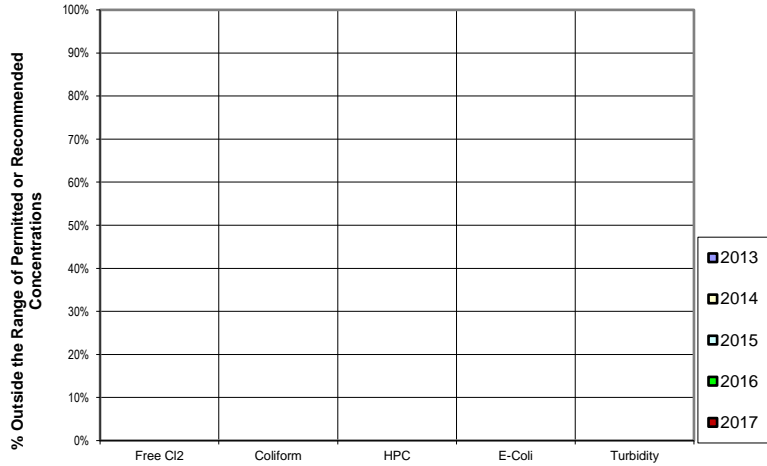
Site 721 - 2838 Panorama Dr
2013 - 2017 Water Quality Results



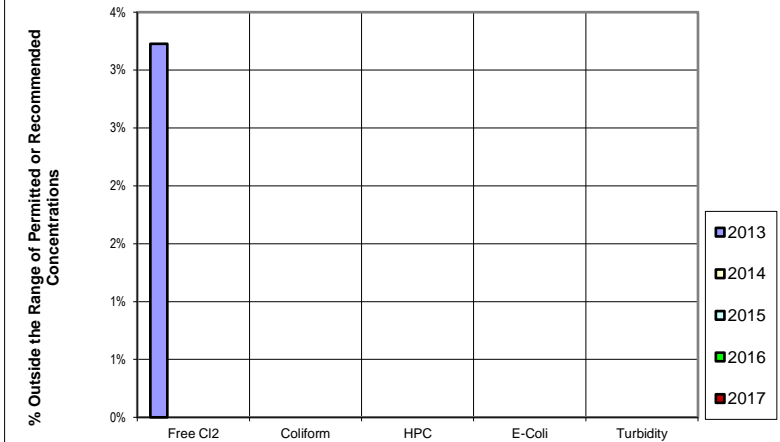
Site 722 - Fairway & Mt Seymour Pkwy
2013 - 2017 Water Quality Results



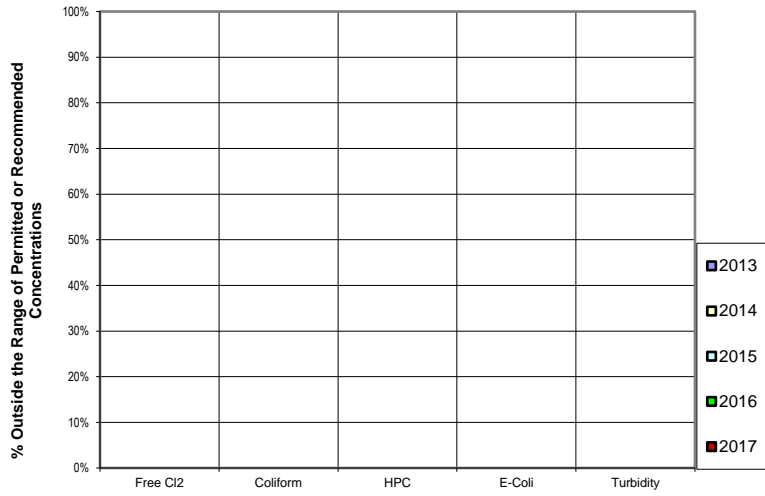
Site 723 - Plymouth Dr & Fairfield Dr
2013 - 2017 Water Quality Results



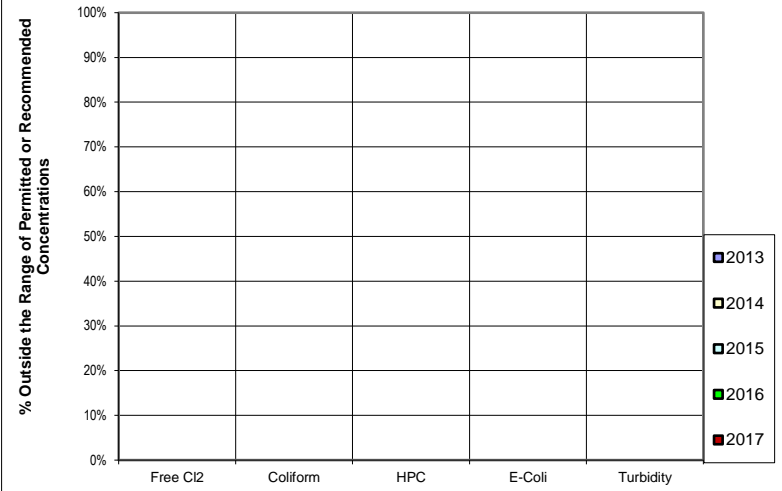
Site 724 - LS #13 Dominion & Mountain Hwy
2013 - 2017 Water Quality Results



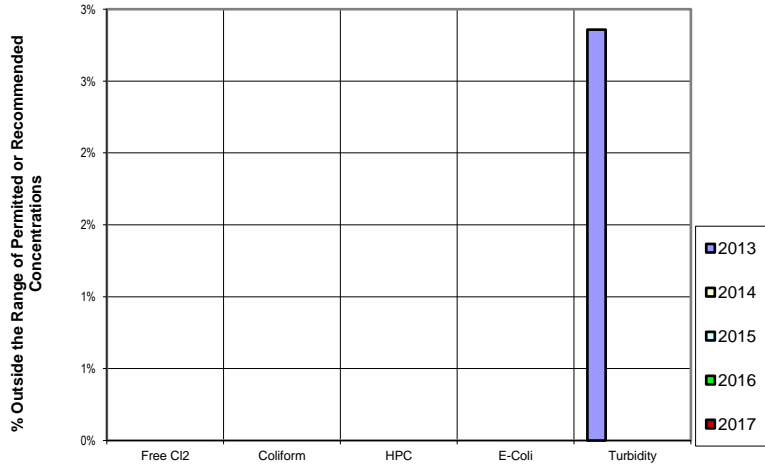
**Site 725 - Marion Pump Station
2013 - 2017 Water Quality Results**



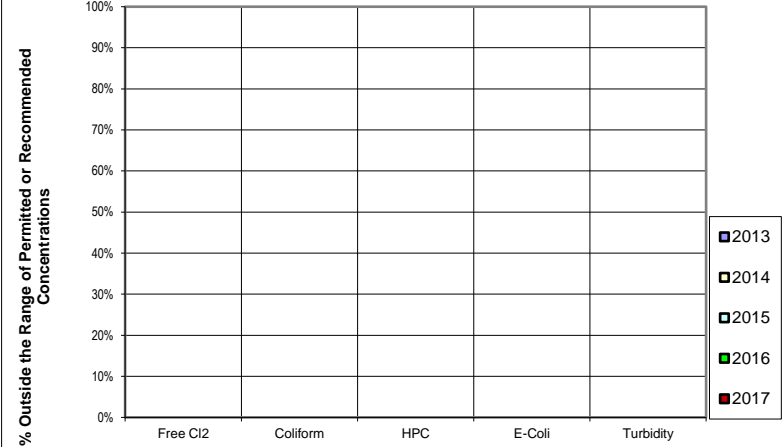
**Site 726 - Hyannis Reservoir
2013 - 2017 Water Quality Results**



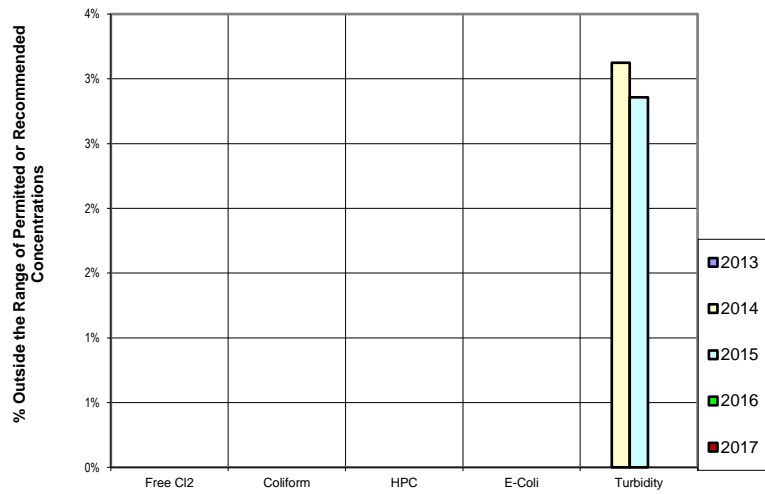
**Site 727 - Hoskins Rd & Kilmarnock Cres
2013 - 2017 Water Quality Results**



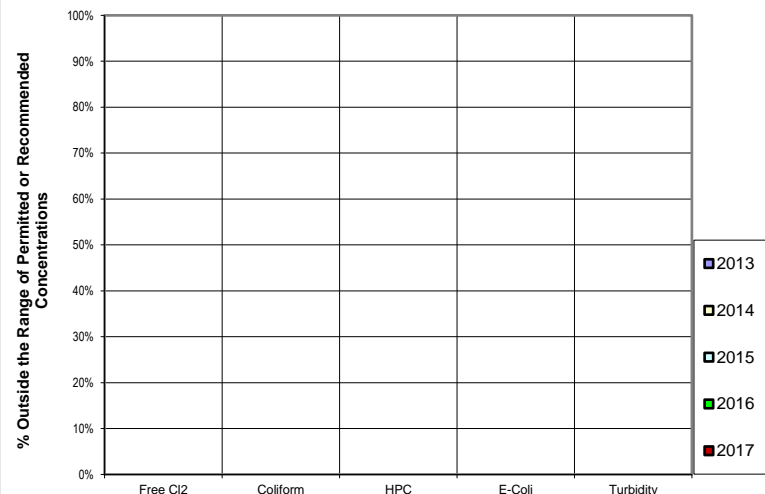
**Site 728 - Lilloet Road
2013 - 2017 Water Quality Results**



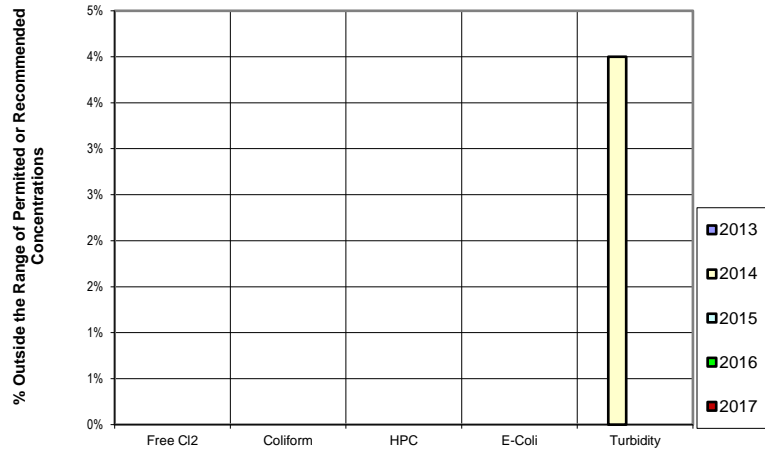
**Site 729 - Ramsay Pump Station
2013 - 2017 Water Quality Results**



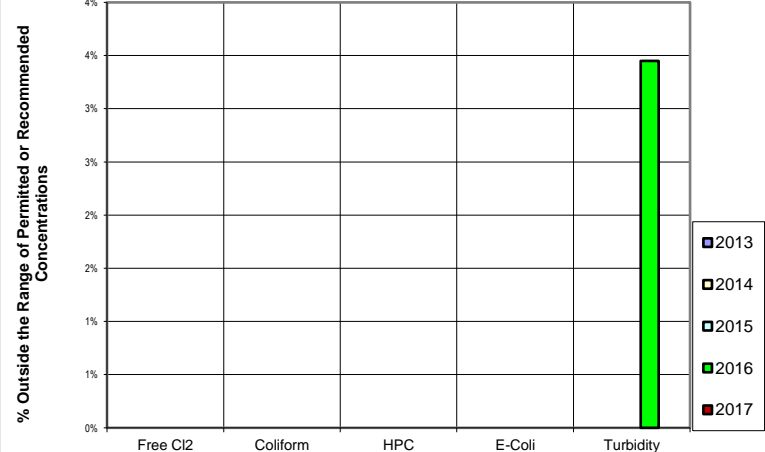
**Site 730 - Braemar Reservoir
2013 - 2017 Water Quality Results**



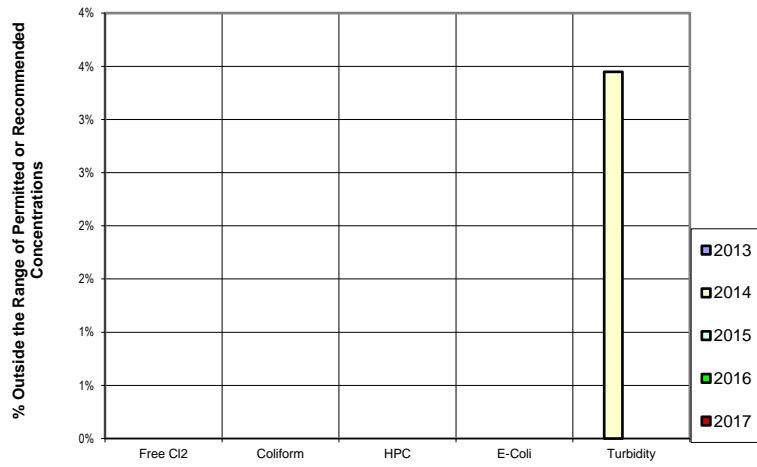
**Site 731 - Skyline Pump Station
2013 - 2017 Water Quality Results**



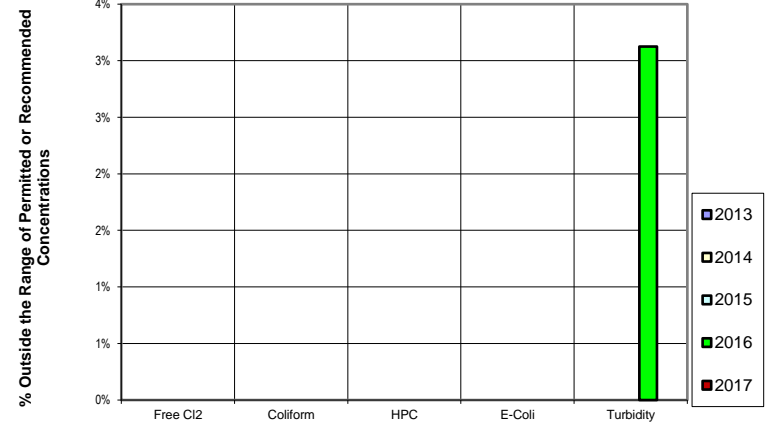
**Site 732 - Sarita Pump Station
2013 - 2017 Water Quality Results**



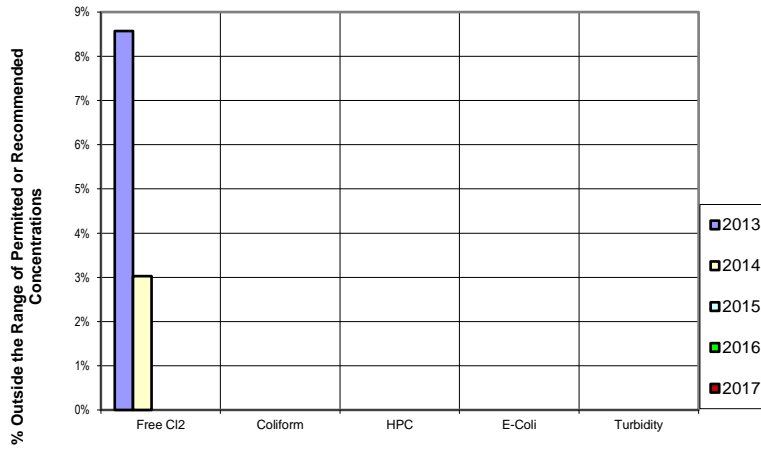
**Site 733 - McKeen Ave & Phillip Ave
2013 - 2017 Water Quality Results**



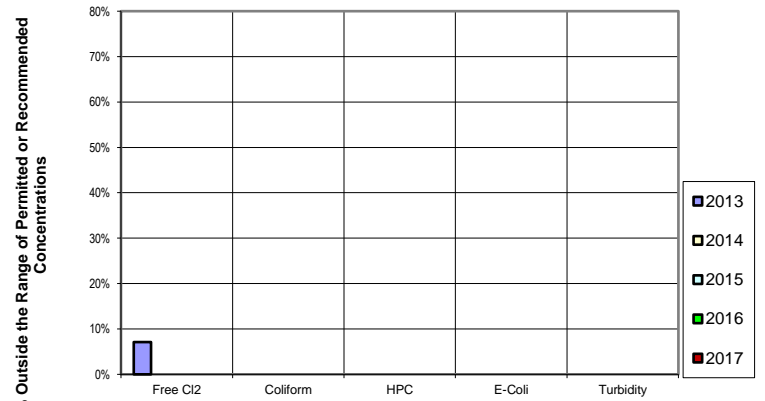
**Site 734 - Pemberton Heights
2013 - 2017 Water Quality Results**



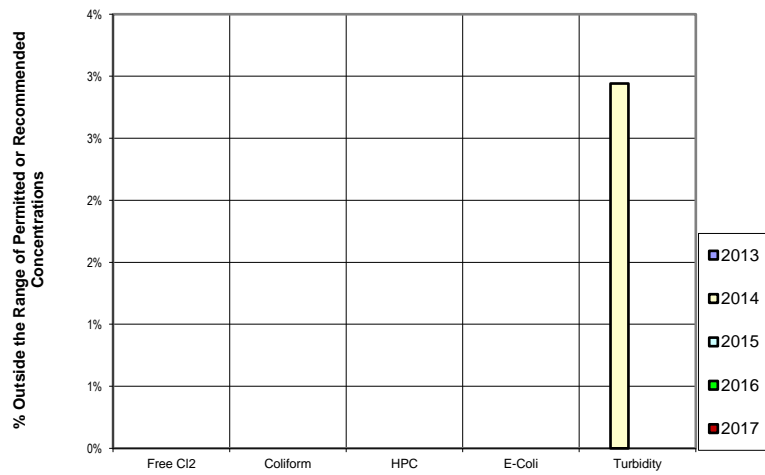
**Site 735 - Prospect Reservoir
2013 - 2017 Water Quality Results**



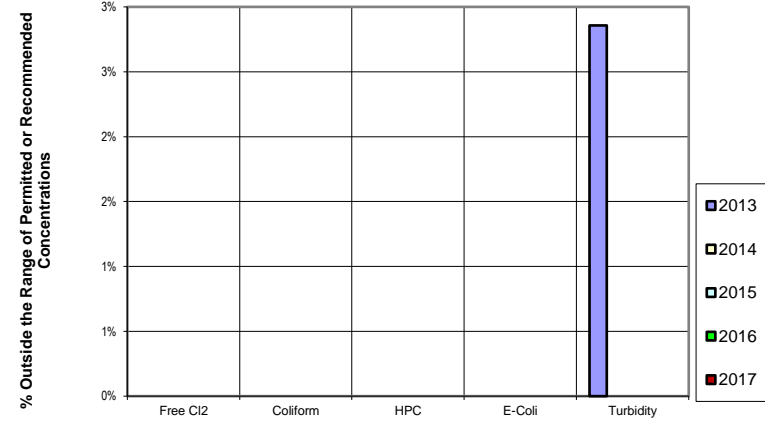
**Site 736 - W Queens Rd & Lonsdale Ave
2013 - 2017 Water Quality Results**



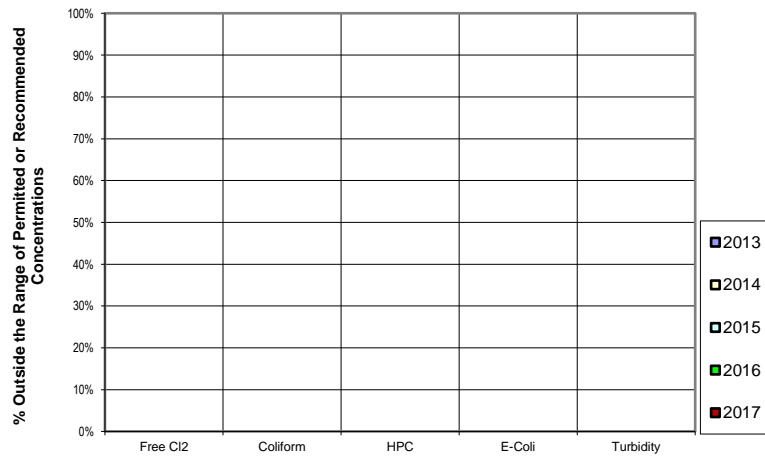
**Site 737 - N. of BC Rail Tracks on Lower Cap. Rd
2013 - 2017 Water Quality Results**



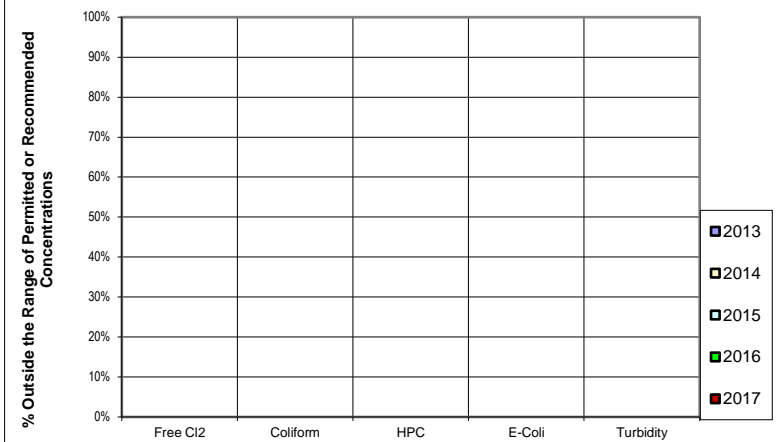
**Site 738 - 3906 Sunnycrest Dr
2013 - 2017 Water Quality Results**



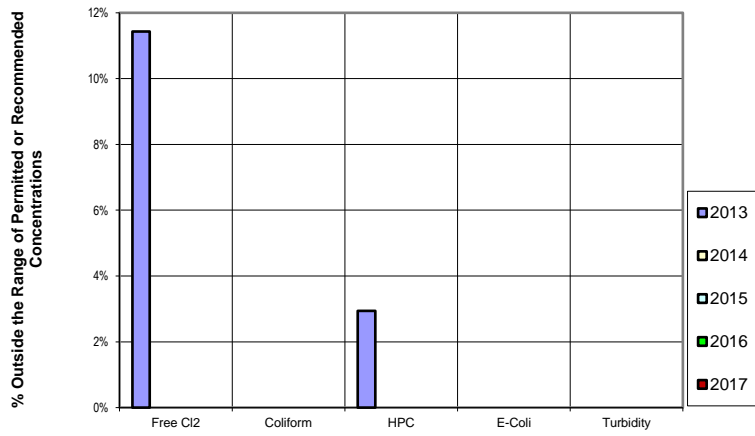
**Site 739 - 376 Cartelier Rd.
2013 - 2017 Water Quality Results**



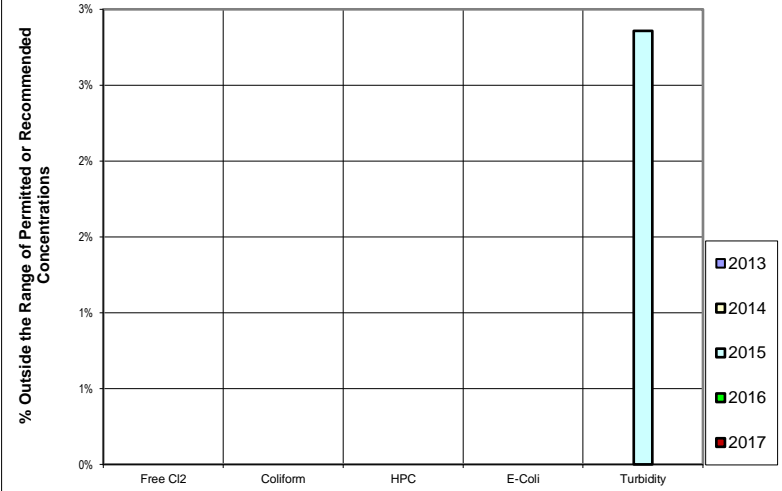
**Site 740 - PRV #5 (190 E. Braemar Rd.)
2013 - 2017 Water Quality Results**



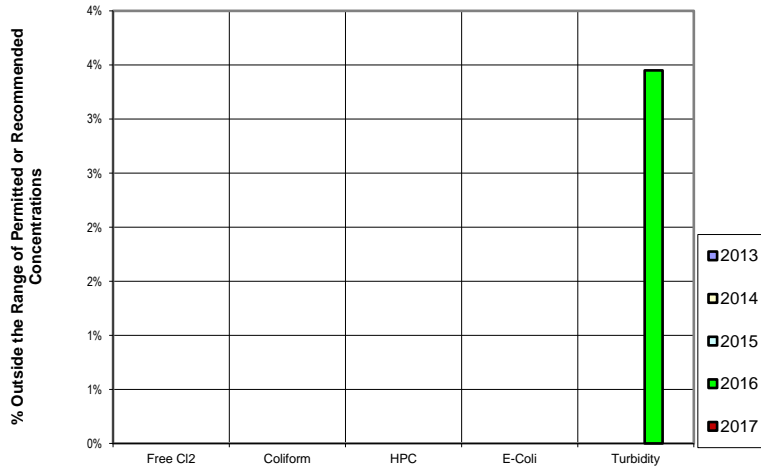
Site 741 - Mountain Hwy Reservoir, North of Mountain Hwy
2013 - 2017 Water Quality Results



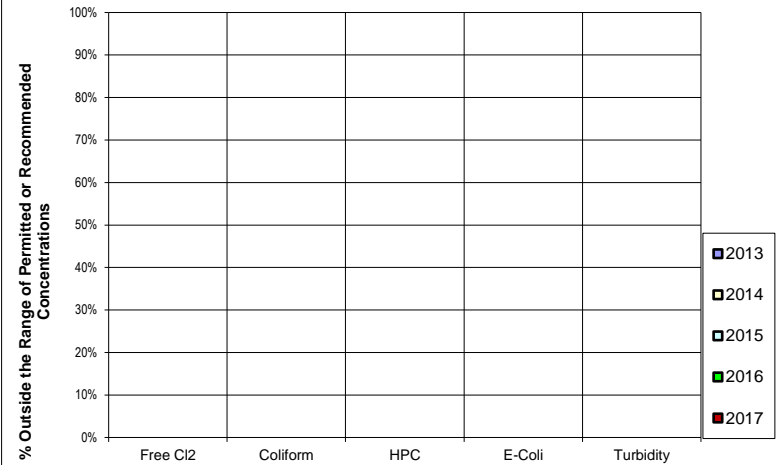
Site 742 - PRV # 11 (Across from 1086 Cloverly St.)
2013 - 2017 Water Quality Results



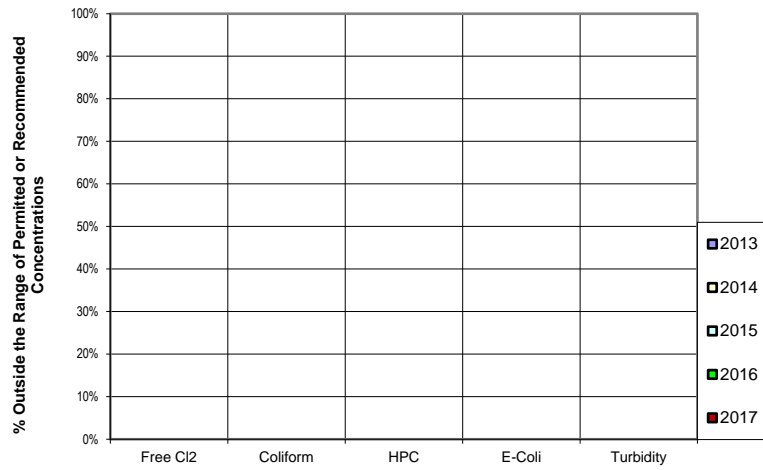
Site 743 - PRV #7 (N across from 481 Mountain Highway)
2013 - 2017 Water Quality Results



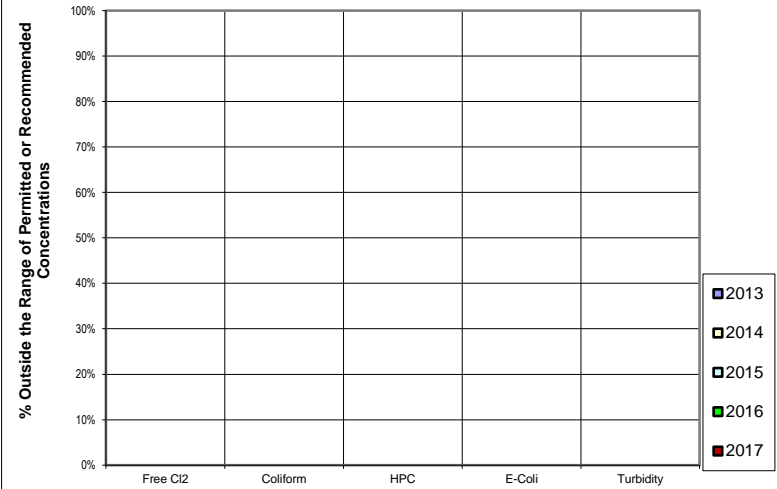
Site 745 - PRV # 13 (N. of 1388 Monashee Dr, Cap College)
2013 - 2017 Water Quality Results



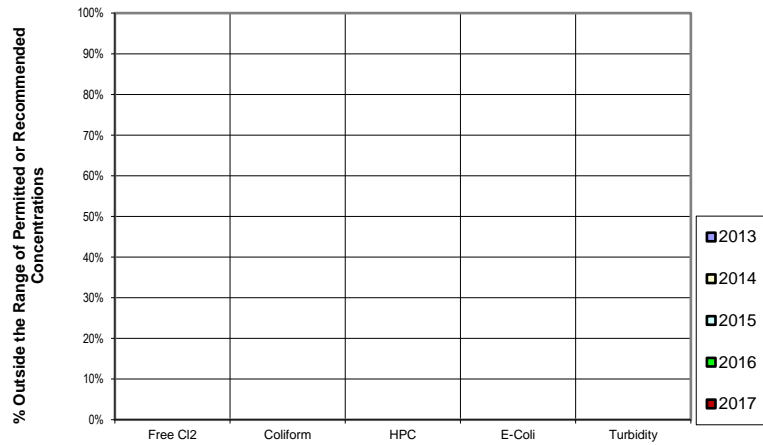
**Site 746 - PRV #17 (60 Riverside Dr.)
2013 - 2017 Water Quality Results**



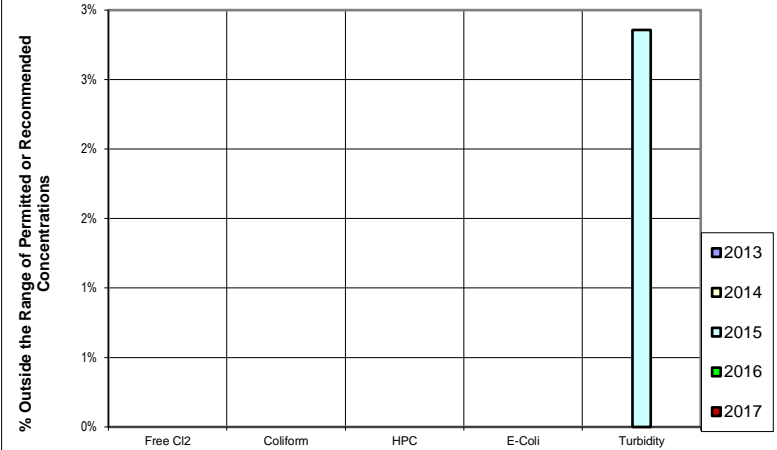
**Site 747 - PRV # 19 (1231 Lennox St.)
2013 - 2017 Water Quality Results**



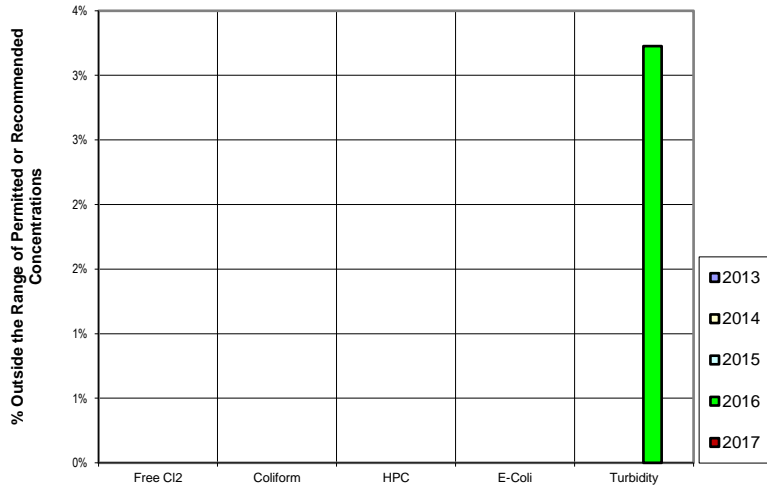
**Site 748 - PRV # 16 (2592 Bendale Rd)
2013 - 2017 Water Quality Results**



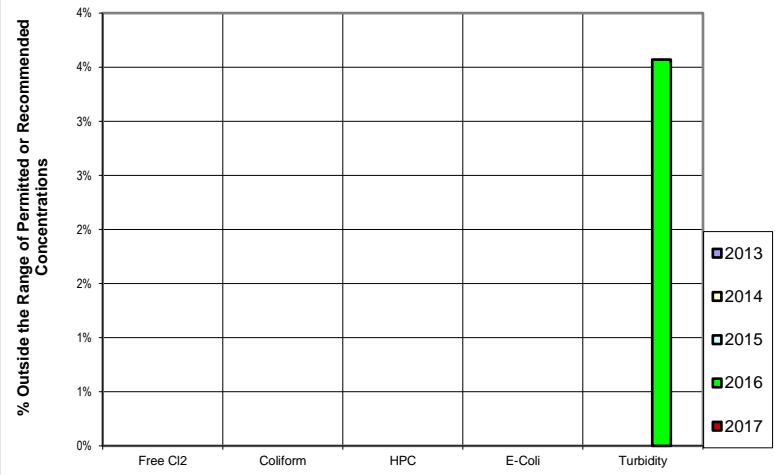
**Site 749 - PRV # 18 (3728 Mt. Seymour Parkway)
2013 - 2017 Water Quality Results**



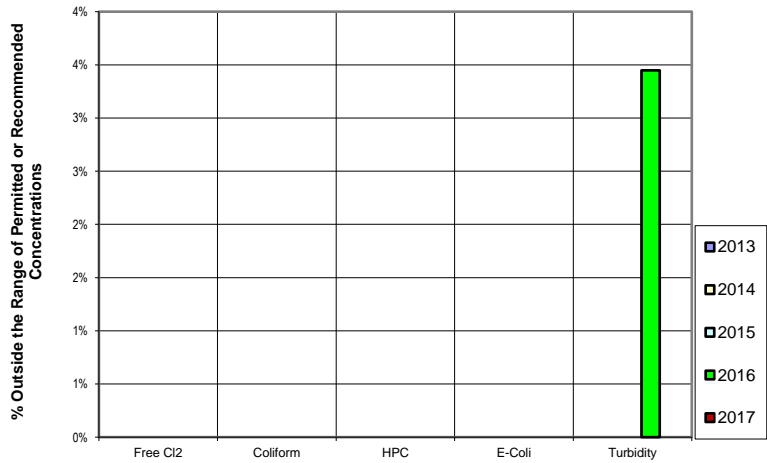
Site 750 - up path behind 1610 Mt. Seymour Rd
2013 - 2017 Water Quality Results



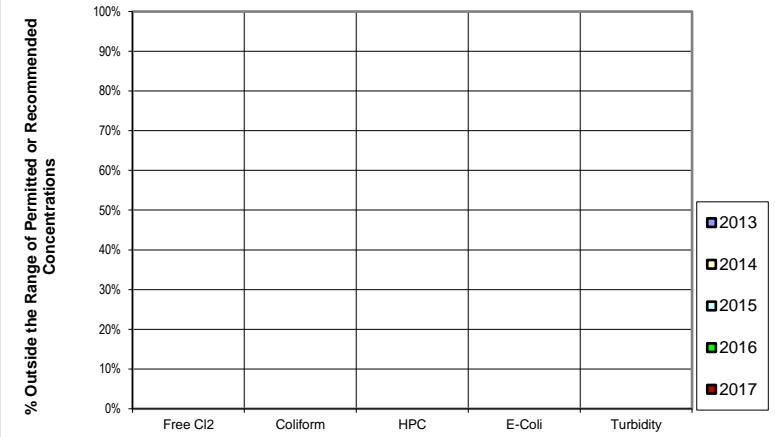
Site 751 - Access Rd, N. end of Cascade Ct.
2013 - 2017 Water Quality Results



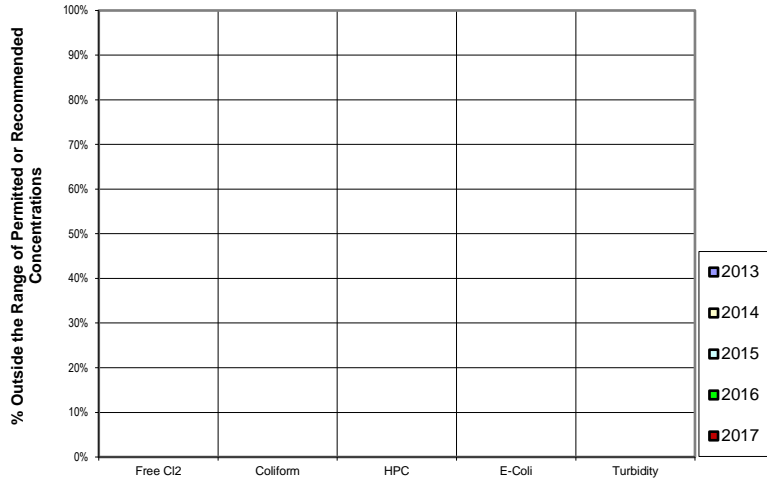
Site 752 - PRV # 25 (4068 Deane Pl.)
2013 - 2017 Water Quality Results



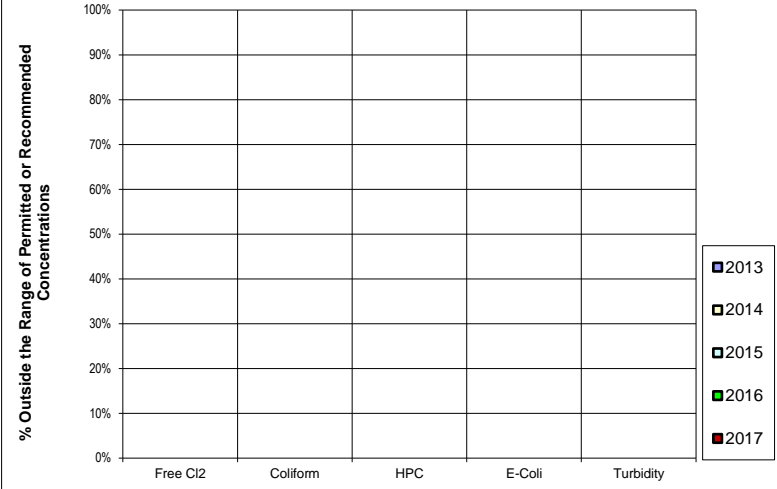
Site 753 - PRV # 20 (1501 Theta Ct.)
2013 - 2017 Water Quality Results



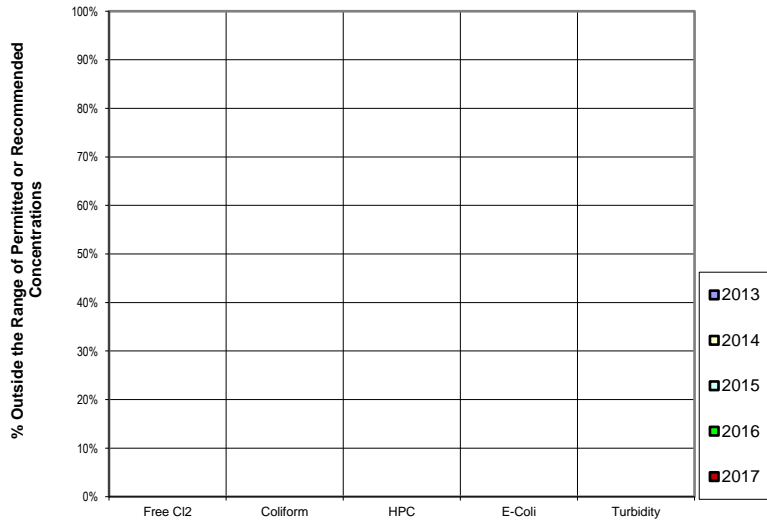
**Site 754 - Woodlands Res, 2.1 km N. of Hixon Rd on Indian River Dr
2013 - 2017 Water Quality Results**



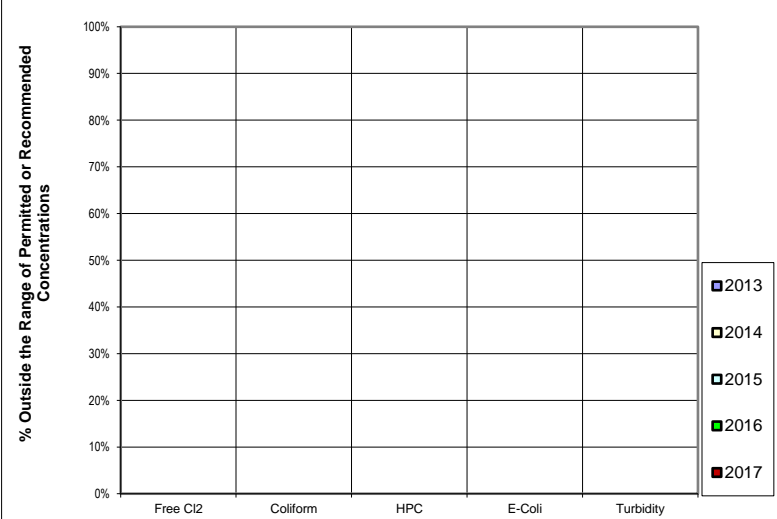
**Site 755 - PRV # 26 3.7 km NE of Hixon Rd. on Indian River Dr.
2013 - 2017 Water Quality Results**



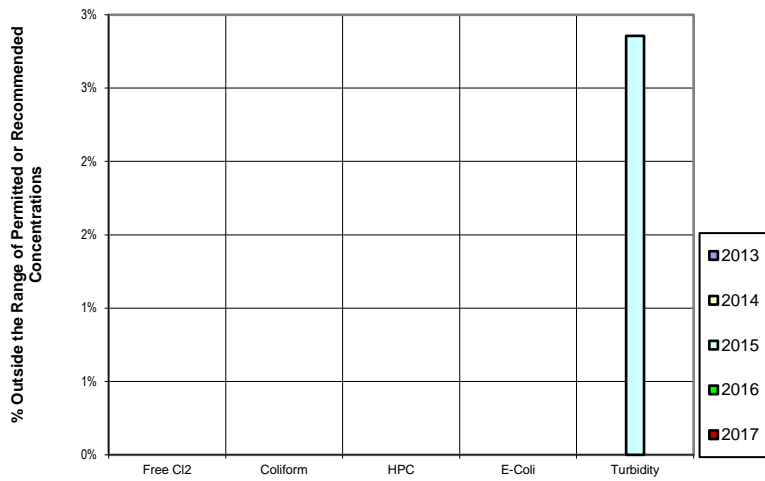
**Site 756 - End of Fire Lane # 7, Firelane #7 is 3.6 km from Hixon Rd.
2013 - 2017 Water Quality Results**



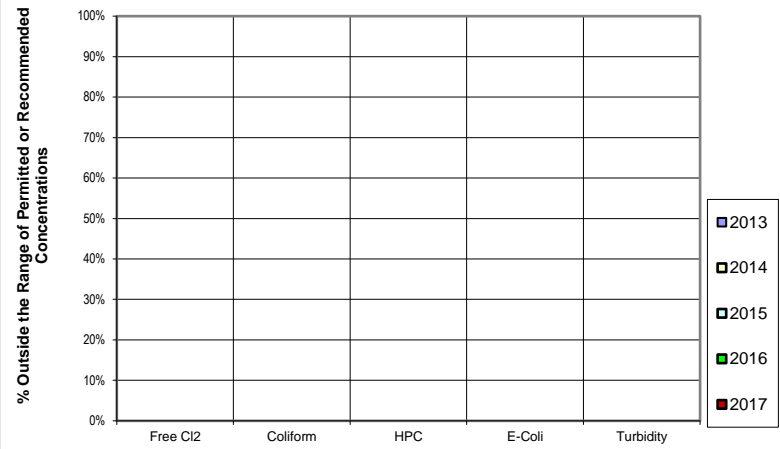
**Site 757 - PRV 200 m south of 879 Roche Point Dr
2013 - 2017 Water Quality Results**



**Site 758 - 3860 Dollarton Hwy
2013 - 2017 Water Quality Results**



**Site 759 - 1919 Hyannis Drive
2013 - 2017 Water Quality Results**



**Site 760 - 3000 Block Dollarton Hwy (Burrard Reserve)
2013 - 2017 Water Quality Results**

