NORTH VANCOUVER
DISTRICT

2022 ANNUAL DRINKING WATER QUALITY REPORT

June 30, 2023.

District of North Vancouver Utilities Department

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EXECUTIVE SUMMARY

This report is the twenty-first 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 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 to 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 2022, the District of North Vancouver's scheduled water sampling consistently 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 reservoirs, followed by secondary treatment at the Seymour Capilano Filtration Plant (SCFP). Metro uses multiple barriers to protect, treat and supply 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 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 analyzes source water for bacteriological, chemical and physical parameters according to the "BC Drinking Water Protection Regulation." The "Greater Vancouver Water District 2022 Water Quality Annual Report - Volume 1 & 2" summarizes water quality for all of the Metro Vancouver service area and is available on their website www.metrovancouver.org. The report will demonstrate that drinking water supplied by Metro to DNV met or exceeded all water quality standards and guidelines in 2022.

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 363 km of water mains, seven water pumping stations, 12 water storage reservoirs, and 35 pressure reducing stations. A population of approximately 92,390 is served through 21,233 service connections.

In 2022, Metro measured 18.5 million cubic metres of water delivered to the DNV distribution system through 18 metered connections. A map of the overall water distribution pipe system showing the 36 sampling stations and the 26 pressure zones is in Appendix A. Sampling and testing 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)
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 objectives or operational guidance values.

- Maximum Acceptable Concentrations (MAC) are set for parameters that are known to detrimentally affect 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 affect water quality in the distribution system.

With the exception of temperature and free chlorine residual, which are analyzed and recorded by DNV staff at the time of sampling, all other parameters are analyzed and reported by the accredited Lake City Metro lab after being collected and transported by DNV operators.

2.1.1 Scheduled Weekly Sampling

In 2022, DNV staff collected 1,182 regular scheduled samples from 36 sample sites or an average of 98 samples per month. This meets the Regulations population-based sample requirement for DNV of 36 sites and 86 samples per month. Three of the previous 39 sites were removed in July 2019 to improve the efficiency of the sampling program. Sample collection is scheduled weekly on a rotating basis using a strategic grouping of sample sites distributed across the system. Generally, 12 samples are collected twice weekly for a total of 24 samples per week.

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

- 18% of sampling points at "source" (supply points from Metro transmission mains)
- 33% of sampling points at locations with medium flow
- 36% of sampling points at locations with low flow
- 13% 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 Health Canada's Guidelines for Canadian Drinking Water Quality. The guidelines provide either a maximum allowable concentration (MAC), an aesthetic 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 1.0 NTU
- Chemical or physical parameter guidelines are:
  - Chlorine: OG between 0.04 – 2.0 mg/L
  - Temperature: AO less than or equal to 15^{o}C
  - pH: OG between 7.0 and 10.5

Figure 1 below shows the number of scheduled weekly samples collected and analysed in 2022 on a monthly basis.

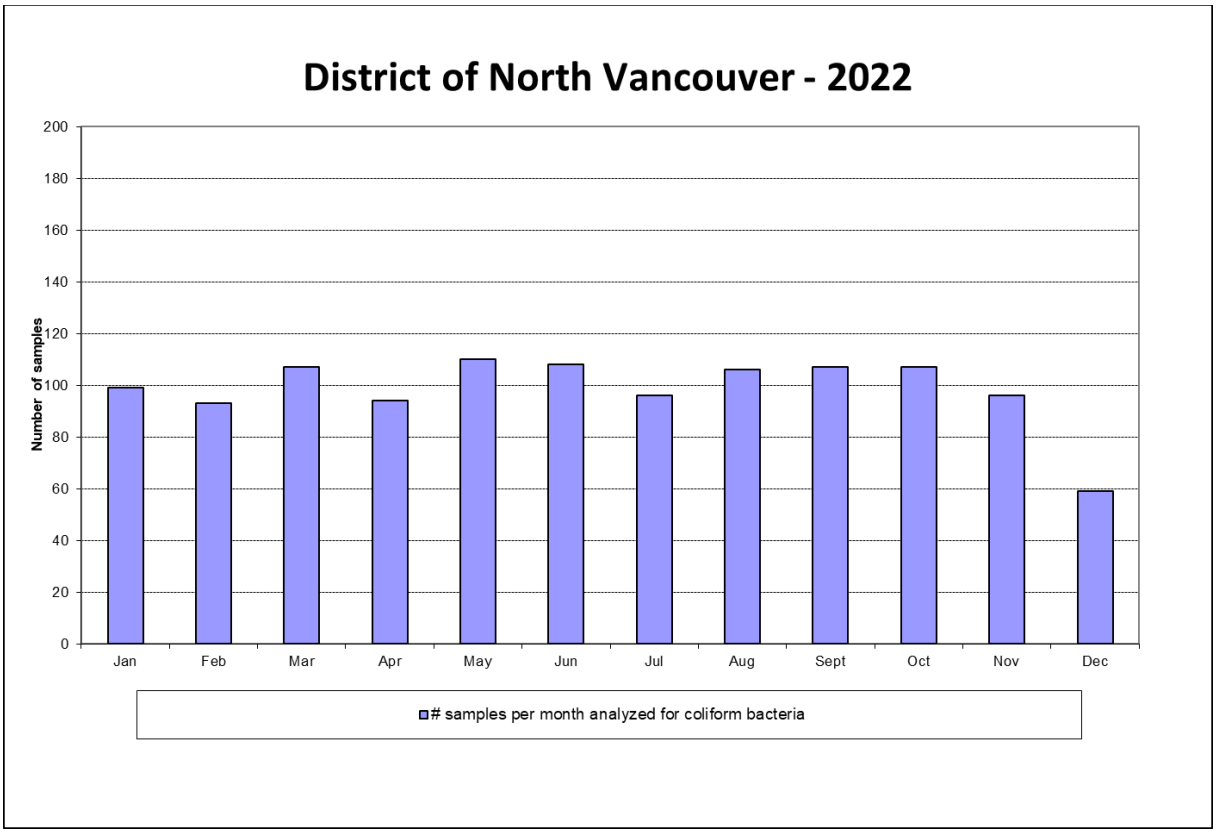


Figure 1. Number of Scheduled Weekly Samples Collected

2.1.2 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 (parts per billion) 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.

2.1.3 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. Metro controls and stabilizes pH at the source.

2.1.4 Metal Semi-Annual Sampling

In 2022, DNV staff collected eight samples for analysis at four locations for metal testing in conformance with regulatory requirement.

2.1.5 Unscheduled Sampling

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

1. An unintentional consequence of DNV or private activities (water main flushing, hydrant flow testing, structure fire response, construction activities or pipe breaks). Planned and unexpected work is performed in a manner that limits the impact on water quality, however, sometimes it occurs.
2. Spontaneous degradation of cast iron pipe. Cast iron pipe naturally breaks down and can release corrosion products that can, in sufficient concentration, make water appear discoloured, typically orange or brown in colour. In response to the issue, we slightly altered our practice for renewing water services on cast iron mains and reduced the force used for post-work flushing.

In 2022, 59 unscheduled samples were collected and analyzed.

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, HPC, E-coli and turbidity) 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 occur 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 Guideline suggest 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.

The scheduled samples collected in 2022 met the guidelines for safe potable water. There were no occurrences of detectable E. coli nor Total Coliform. Five samples were collected in 2022 with turbidity over 1.0 NTU, which were the results of unintended high flows within the system due to operational and fire-fighting activities. The sites were all resampled days following the higher reading day and were back to acceptable levels. One sample was over the HPC OG recommendation of 500 CFU/mL. Subsequent resampling resulted in normal levels. Because HPC is used as an indicator of general bacteriological quality, a single sample above 500 CFU/ml is not a cause for concern. The HPC and turbidity levels are stable over time. The annual DNV average HPC and turbidity for the last five years are presented below.

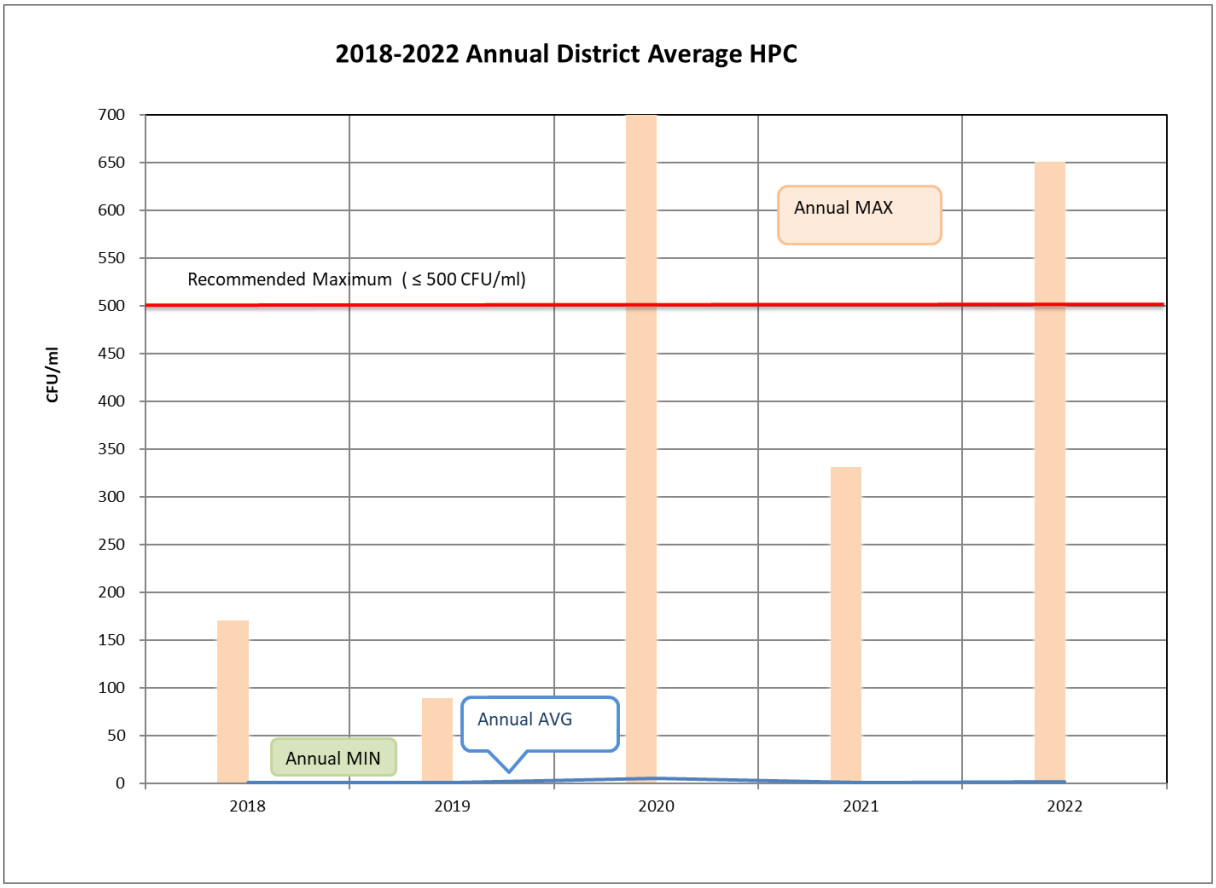


Figure 2. HPC Five Year Annual Average and Maximum Values.

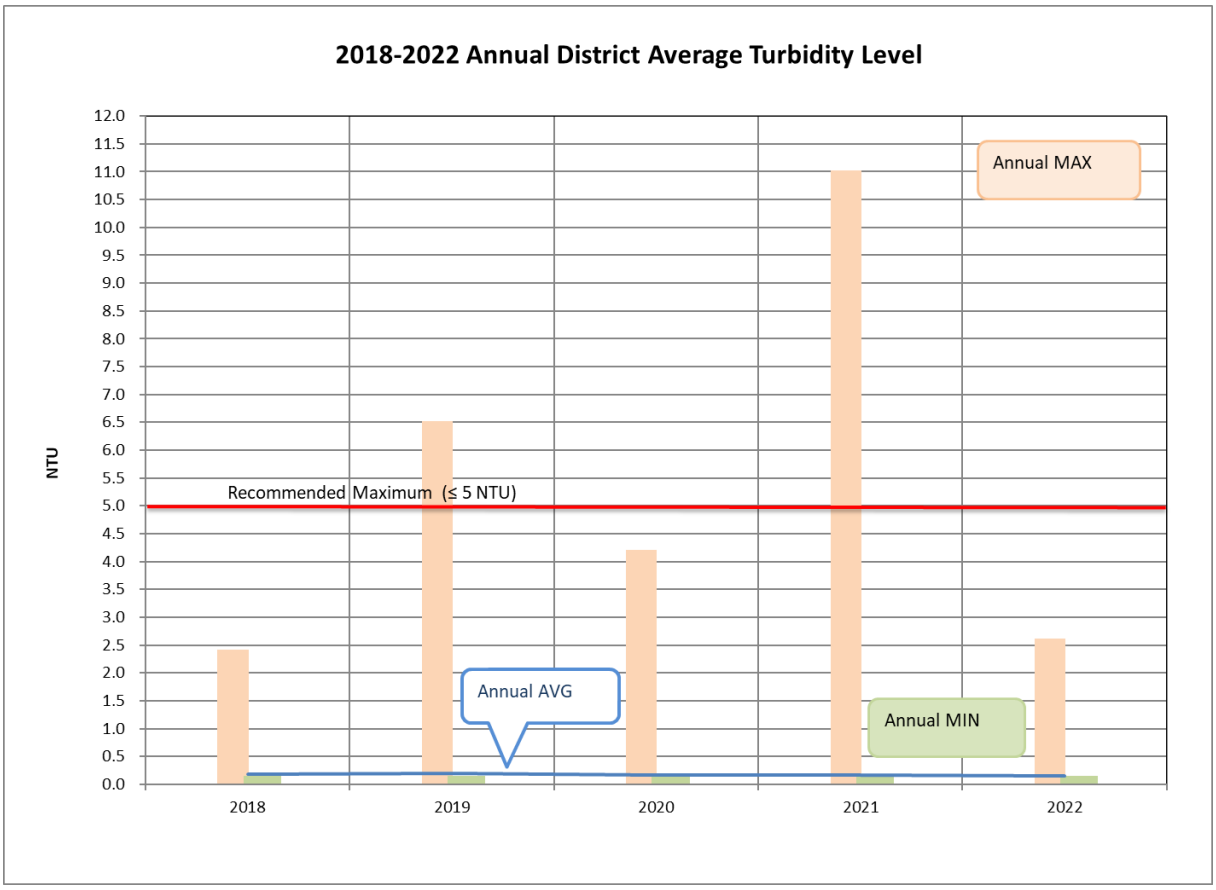


Figure 3. Turbidity Five Year Annual Average and Maximum Values.

3.2 Scheduled Weekly Chemical and Physical Parameter Results

Chemical and physical parameters, chlorine, temperature and pH results for 2022 are summarized 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 2022, 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 0.71 mg/L. The minimum recorded chlorine residual was 0.27 mg/L. The maximum recorded chlorine residual was 0.95 mg/L. The annual DNV average free chlorine for the past five 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 2022, 41 samples or 3% were above 15°C and occurred primarily during July, August and September. The highest temperature recorded was 18 °C, the lowest temperature recorded was 1 °C and the annual system average was 8.5 °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 2022 was 8.1.

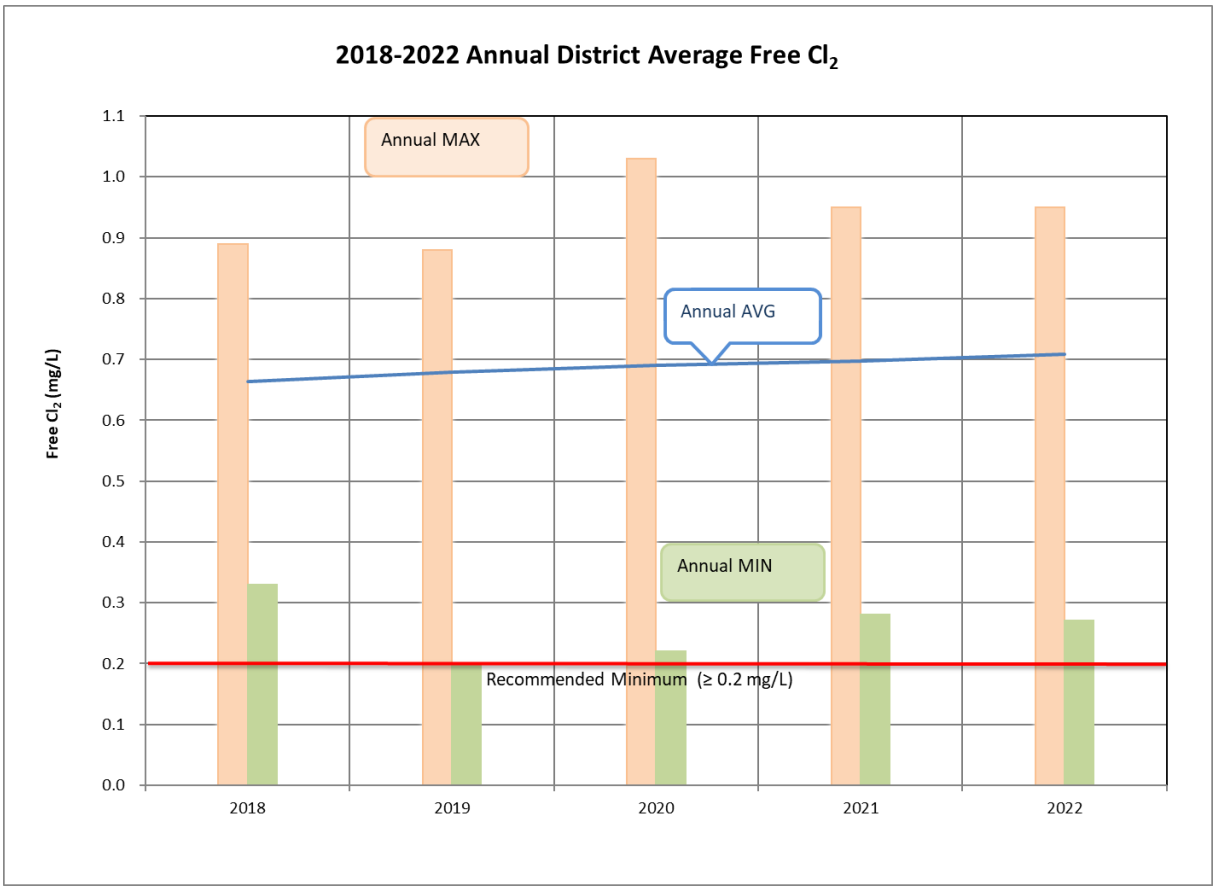


Figure 4. Free Cl_2 Five Year Annual Minimum, Average and Maximum Values.

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)						
		Bromodichloromethane	Bromoform	Chlorodibromomethane	Chloroform	Total Trihalomethanes	**Total THM Quarterly Average (Guideline Limit 100 ppb)**	Dibromoacetic Acid	Dichloroacetic Acid	Monobromoacetic Acid	Monochloroacetic Acid	Trichloroacetic Acid	Total Haloacetic Acid	**Total HAA Quarterly Average (Guideline Limit 80 ppb)**
DNV-727	15-Feb-22	<1	<1	<1	9	10	18	<0.5	7.7	<5.0	<5.0	5	15	13
DNV-727	10-May-22	<1	<1	<1	21	23	19	<0.5	7.7	<0.5	<0.5	4.1	12	14
DNV-727	23-Aug-22	<1.0	<1.0	<1.0	18	18	19	<0.5	6.8	<0.5	<5.0	3	11	15
DNV-727	15-Nov-22	<1	<1	<1	20	22	18	<0.5	8.3	<0.5	0.6	3.9	13	13
DNV-733	15-Feb-22	<1	<1	<1	18	19	21	<0.5	7.2	<5.0	<5.0	5.1	12	14
DNV-733	10-May-22	<1	<1	<1	24	26	23	<0.5	7.7	<0.5	<0.5	4.1	12	13
DNV-733	23-Aug-22	<1.0	<1.0	<1.0	21	21	23	<0.5	6.5	<0.5	<0.5	2.9	9.4	13
DNV-733	15-Nov-22	<1	<1	<1	21	22	22	<0.5	7.9	<0.5	0.6	4.6	13	12
DNV-734	15-Feb-22	<1	<1	<1	17	18	21	<0.5	7.7	<5.0	<5.0	4.9	13	14
DNV-734	10-May-22	<1	<1	<1	21	22	22	<0.5	9	<0.5	0.8	5	15	15
DNV-734	23-Aug-22	<1.0	<1.0	<1.0	17	17	22	<0.5	7.3	<0.5	<5.0	3.5	11	15
DNV-734	15-Nov-22	<1	<1	<1	22	23	20	<0.5	8.6	<0.5	<0.5	5	14	13
DNV-736	15-Feb-22	<1	<1	<1	19	20	26	<0.5	8.5	<5.0	0.6	6.8	16	17
DNV-736	10-May-22	<1	<1	<1	22	23	26	<0.5	10	<0.5	0.6	7.9	19	16
DNV-736	23-Aug-22	<1.0	<1.0	<1.0	22	22	25	<0.5	6.7	<0.5	<5.0	3.7	10	18
DNV-736	15-Nov-22	1	<1	<1	24	26	23	<0.5	8.9	<0.5	0.5	6.2	16	15

Table 1. Quarterly Disinfection By-products 2022 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 aesthetic or detrimental health effects for that parameter at the levels typically found in drinking water.

Parameter	Canadian Guideline Limit	DNV-721	DNV-721	DNV-730	DNV-730	DNV-734	DNV-734	DNV-747	DNV-747
		2838 Panorama	2838 Panorama	Braemar Reservoir	Braemar Reservoir	1181 West 22nd	1181 West 22nd	1231 Lennox St.	1231 Lennox St.
		05/03/2022 10:00	11/08/2022 13:10	05/03/2022 08:30	11/08/2022 10:05	05/03/2022 07:55	11/08/2022 08:45	05/03/2022 09:30	11/08/2022 12:35
Aluminium Total (µg/L)	100	26	35	25	33	24	30	22	34
Antimony Total (µg/L)	6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic Total (µg/L)	10 (ALARA)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Barium Total (µg/L)	2000	3.2	4.2	2.6	3.4	2.8	3.5	2.8	3.4
Boron Total (µg/L)	5000	<10	<10	<10	<10	<10	<10	<10	<10
Cadmium Total (µg/L)	7	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Calcium Total (µg/L)	none	8510	8380	8380	8300	8620	8100	8930	8320
Chromium Total (µg/L)	50	<0.05	0.06	<0.05	0.06	<0.05	0.05	<0.05	0.06
Cobalt Total (µg/L)	none	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Copper Total (µg/L)	≤2000	0.7	1.1	<0.5	0.6	1.3	2.9	<0.5	<0.5
Iron Total (µg/L)	≤ 300	15	54	7	7	7	7	6	7
Lead Total (µg/L)	5 (ALARA)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Magnesium Total (µg/L)	none	188	209	194	217	190	218	192	218
Manganese Total (µg/L)	120	4.3	20.3	4.1	10.2	3.9	9.0	4.6	9.1
Mercury Total (µg/L)	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Molybdenum Total (µg/L)	none	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel Total (µg/L)	none	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Potassium Total (µg/L)	none	153	228	153	231	158	230	161	227
Selenium Total (µg/L)	50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver Total (µg/L)	none	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sodium Total (µg/L)	≤ 200,000	1480	1760	1470	1810	1500	1810	1490	1820
Zinc Total (µg/L)	≤ 5000	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

Table 2. 2022 Semi Annual Metal parameter, Guideline Limits and Results

3.4.1 Lead

Lead, along with 21 other metals, is one of the parameters analyzed semi-annually at the four locations listed above. Our lead levels are consistently less than 0.5 µg/L; the Canadian Guideline Limit is 5.0 µg/L. Metro Vancouver samples and tests our source water. Metro Vancouver's results show lead levels <0.5 µg/L.

In March 2019, the Canadian Drinking Water Guideline limits for maximum allowable concentration (MAC) of lead in drinking water was reduced from 10 µg/L to 5 µg/L or as low as reasonably achievable (ALARA). Based on a Government of Canada news release, Health Canada lowered the limit to safeguard the health of Canadians. The previous limit of 10 µg/L was set in 1992. Since then, lead levels in Canada have fallen dramatically due to strong actions taken by the Government of Canada to reduce exposure to lead. The new limits reflect the changed risk levels and were developed in collaboration with the provinces, territories, and other federal departments.

The primary source of lead in drinking water is leaching from distribution and plumbing system parts. The District does not currently use nor has ever used lead pipes in our drinking water distribution system, including services. Lead was historically used in private plumbing for the service lines that connect a home or business to the municipal water service and in plumbing fittings and solders. Until 1975, lead was an acceptable material in pipes based on the National Plumbing Code of Canada, so it is more likely to be found in older homes and neighbourhoods. The best approach to minimize lead exposure is the removal of private lead services. Vancouver Coastal Health also recommends flushing whenever a faucet has not been used for six hours or longer. Details of this recommendation are included in Appendix C. The District of North Vancouver does not have jurisdiction and is not required, to test private property.

3.5 Unscheduled Results

In addition to scheduled samples, 59 unscheduled samples were collected and analyzed in 2022. Eleven samples were in response to customer or staff requests, 29 were for new construction and 19 were due to watermain breaks. All results were within the guideline-recommended limits.

4 OPERATIONS, MAINTENANCE & CAPITAL PROGRAMS

4.1 Water System Scheduled Maintenance

Scheduled annual system maintenance programs that support water quality include water main flushing, reservoir cleaning and scheduled water facility inspections. We follow the AWWA flushing program standards. In 2022, the DNV developed a new GIS application to schedule and track our watermain flushing. The application will be used in 2023 for a renewed effort in proactive flushing across the DNV's system in the next five years. An example screenshot from the application is shown in the Figure below.

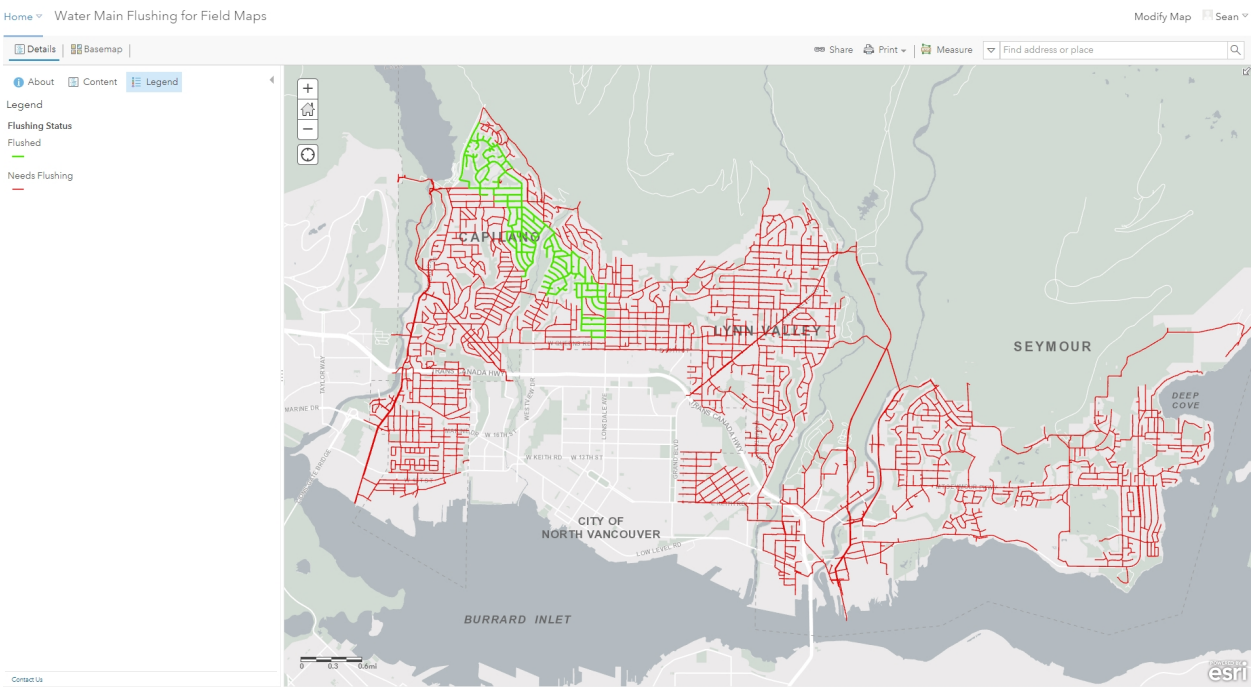


Figure 5: Example Screenshot from DNV's Watermain Flushing GIS Application

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, cement-lined ductile iron. Six permanent flushing stations remain in our system at the following locations:

- 4011 Lions Avenue: Dead end 4-inch cast iron main
- 4331 Arundel Road: Dead end 4-inch cast iron main
- Bridgeman Avenue at West 21st Street: 6-inch cast iron main
- Cortell Street at W 21st Street: 8-inch ductile iron main (downstream of chronic cast iron mains)
- 1953 Pemberton Avenue: 10-inch asbestos cement main (downstream of chronic cast iron mains)
- 3248 Milton Avenue: 6-inch ductile iron main (downstream of chronic cast iron mains)

The DNV uses an integrated SCADA system to optimize 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 17 weighted hazard and consequence criteria. The DNV's water main replacement program takes into consideration multiple parameters to prioritize 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. In 2018, we began using TR Flex Restraint Joint Pipe wrapped in polyethylene for all our installations.

Our prioritization protocol heavily weighs the potential of failure, consequence of failure, and water quality. In 2022, DNV construction crews completed the replacement of 4,446 metres of pipe.

The primary focus of the watermain replacement program is the replacement of asbestos cement pipe. The high consequence of failure and resulting cost and impact (such as property damage, sidewalk and road damage) has driven the large percentage of asbestos cement water main replacements. The DNV estimates that most - if not all - of the asbestos cement pipe in our network will be replaced by 2030 to 2035 as we continue to follow our replacement program. The Federal Government (Health Canada) provides additional information about asbestos and drinking water on its website: https://www.canada.ca/en/health-canada/services/publications/healthy-living/asbestos-drinking-water-infographic-2021.html.

The water mains replaced in 2022 is listed in Table 3.

Asset_Id of Existing Main	Existing Main Year	Existing Main Material	Existing Main Size	Project Name	New Main Size	Length (m)	New Main Material
WTRMN01857	1959	AC	150	Berkley Rd: Layton-Carnation	200	85.4	DI
WTRMN02005	1967	AC	200	Berkley Rd: Layton-Carnation	200	87.8	DI
WTRMN02003	1959	AC	200	Berkley Rd: Layton-Carnation	200	88.6	DI
WTRMN01848	1961	AC	150	Berkley Rd: Layton-Carnation	200	105.5	DI
WTRMN01832	1962	AC	150	Berkley Rd: Layton-Carnation	200	81.5	DI
WTRMN11552	1961	AC	150	Berkley Rd: Layton-Carnation	200	6.1	DI
WTRMN02010	1966	AC	200	Berkley Rd: Layton-Carnation	200	83.8	DI
WTRMN01838	1968	AC	150	Berkley Rd: Layton-Carnation	200	101.8	DI
WTRMN01780	1959	AC	150	McGuire Ave: Hope - Marine	300	155.4	DI
WTRMN01805	1959	AC	150	McGuire Ave: Hope - Marine	300	42.0	DI

Asset_Id of Existing Main	Existing Main Year	Existing Main Material	Existing Main Size	Project Name	New Main Size	Length (m)	New Main Material
WTRMN01487	1964	AC	150	Prime St – off Coleman St.	200	44.8	DI
WTRMN01498	1964	AC	150	Prime St – off Coleman St.	200	106.5	DI
WTRMN01718	1970	AC	150	Masefield Rd: Viney Rd-Link St	200	121.5	DI
WTRMN01708	1970	AC	150	Masefield Rd: Viney Rd-Link St	200	90.8	DI
WTRMN01714	1970	AC	150	Masefield Rd: Viney Rd-Link St	200	80.2	DI
WTRMN01707	1959	AC	150	Masefield Rd: Viney Rd-Link St	200	70.8	DI
WTRMN04713	1955	AC	150	W Keith Rd: Phillip-Pemberton	200	148.3	DI
WTRMN01995	1966	AC	200	W Keith Rd: Phillip-Pemberton	200	175.8	DI
WTRMN01996	1966	AC	200	W Keith Rd: Phillip-Pemberton	200	251.1	DI
WTRMN10358	1967	AC	150	Sandringham: Braemar-Holyrood	200	178.1	DI
WTRMN10357	1967	AC	150	Sandringham: Braemar-Holyrood	200	171.4	DI
WTRMN02026	1973	AC	200	Seymour Blvd: 1000-1300 Block	200	71.0	DI
WTRMN01858	1974	AC	150	Seymour Blvd: 1000-1300 Block	200	154.4	DI
WTRMN02039	1966	AC	200	Seymour Blvd: 1000-1300 Block	200	92.8	DI
WTRMN09989	1966	AC	150	Seymour Blvd: 1000-1300 Block	200	6.9	DI
WTRMN02146	1957	AC	300	Mahon Ave: St James-Evergreen	300	158.5	DI
WTRMN02141	1957	AC	150	Mahon Ave: St	250	79.8	DI

Asset_Id of Existing Main	Existing Main Year	Existing Main Material	Existing Main Size	Project Name	New Main Size	Length (m)	New Main Material
				James-Evergreen			
WTRMN02150	1957	AC	300	Mahon Ave: St James-Evergreen	300	77.3	DI
WTRMN01781	1959	AC	150	Garden Ave: Hope Rd - Marine	200	156.3	DI
WTRMN10530	1959	AC	150	Garden Ave: Hope Rd - Marine	200	28.3	DI
WTRMN03989	1994	DI	300	Skyline Dr: Chalet-4900 Skylin	300	60.0	DI
WTRMN02110	1959	AC	300	Skyline Dr: Chalet-4900 Skylin	300	79.4	DI
WTRMN01470	1958	AC	150	Skyline Dr: Chalet-4900 Skylin	300	115.7	DI
WTRMN01469	1958	AC	150	Skyline Dr: Chalet-4900 Skylin	300	56.7	DI
WTRMN00150	1959	STEEL	300	Skyline Dr: Chalet-4900 Skylin	300	39.9	DI
WTRMN00131	1959	AC	300	Skyline Dr: Chalet-4900 Skylin	300	18.0	DI
WTRMN01468	1959	AC	150	Skyline Dr: Chalet-4900 Skylin	300	13.0	DI
WTRMN02108	1959	AC	300	Skyline Dr: Chalet-4900 Skylin	300	141.6	DI
WTRMN02106	1959	AC	300	Skyline PS: Skyline Dr-Chalet	300	28.1	DI
WTRMN01601	1963	AC	150	Burrill Ave - McEwen Ave	200	93.7	DI
WTRMN01584	1963	AC	150	Burrill Ave - McEwen Ave	200	100.5	DI
WTRMN04229	1963	STEEL	150	Burrill Ave - McEwen Ave	200	12.1	DI
WTRMN01577	1963	AC	150	Burrill Ave - McEwen Ave	200	52.2	DI
WTRMN01573	1970	AC	150	Burrill Ave -	200	112.2	DI

Asset_Id of Existing Main	Existing Main Year	Existing Main Material	Existing Main Size	Project Name	New Main Size	Length (m)	New Main Material
				McEwen Ave			
WTRMN01512	1954	AC	150	Ralph St: Hoskins Rd-Jerome Pl	200	260.5	DI
New Main				Ralph St: Hoskins Rd-Jerome Pl	200	160.4	DI

Table 3. Water Mains Replaced in 2022

The planned water main replacement for 2023 is listed in Table 4.

Asset_Id of Existing Main	Existing Main Year	Existing Main Material	Existing Main Size	Project Name	New Main Size	Length (m)	New Main Material
WTRMN02205	1954	CI	100	Cheviot Arundel WMR	100	75	DI
WTRMN02200	1954	CI	100	Cheviot Arundel WMR	100	220	DI
WTRMN11186	2015	DI	150	Cheviot Arundel WMR	200	27	DI
WTRMN02204	1954	CI	100	Cheviot Arundel WMR	100	61	DI
WTRMN02061	1958	AC	250	Crestlynn & E 27th WMR	250	108	DI
WTRMN01730	1958	AC	150	Crestlynn & E 27th WMR	200	207	DI
WTRMN02062	1958	AC	250	Crestlynn & E 27th WMR	250	125	DI
WTRMN01719	1958	AC	150	Crestlynn & E 27th WMR	200	85	DI
WTRMN02063	1958	AC	250	Crestlynn & E 27th WMR	250	81	DI
WTRMN02129	1966	AC	300	Doran Rd	300	187	DI
WTRMN01851	1954	AC	150	E 13th St WMR	200	92	DI
WTRMN01849	1954	AC	150	E 13th St WMR	200	235	DI
WTRMN01661	1955	AC	150	E Windsor WMRP	200	99	DI
WTRMN01662	1955	AC	150	E Windsor WMRP	200	130	DI
WTRMN01497	1957	AC	150	Edgewood and Quinton	200	132	DI
WTRMN04916	1957	AC	150	Edgewood and Quinton	200	76	DI
WTRMN01917	1961	AC	150	Fairway WMR -	200	153	DI

Asset_Id of Existing Main	Existing Main Year	Existing Main Material	Existing Main Size	Project Name	New Main Size	Length (m)	New Main Material
				Dollar to Golf			
WTRMN02154	1955	AC	300	Fromme - Ross to Harold WMR	300	56	DI
WTRMN02155	1955	AC	300	Fromme - Ross to Harold WMR	300	131	DI
WTRMN01620	1967	AC	150	Holyrood Rd	200	177	DI
WTRMN01619	1967	AC	150	Holyrood Rd	200	204	DI
WTRMN01489	1960	AC	150	Linnae and Primrose	200	13	DI
WTRMN01488	1961	AC	150	Linnae and Primrose	200	81	DI
WTRMN00211	1963	AC	100	Linnae and Primrose	100	49	DI
WTRMN01483	1960	AC	150	Linnae and Primrose	200	96	DI
WTRMN02194	1955	CI	100	Mapleridge Dr	100	171	DI
WTRMN01818	1972	AC	150	Medwin Place	200	204	DI
WTRMN01529	1979	AC	150	Page Rd	200	89	DI
WTRMN10276	1962	AC	300	Prospect Road WMR	300	201	DI
WTRMN10275	1961	AC	300	Prospect Road WMR	300	202	DI
WTRMN02109	1964	AC	300	Prospect Road WMR	300	85	DI
New Asset				Ralph St 200 mm Underwood to Hoskins			DI
WTRMN01512	1954	AC	150	Ralph St 200 mm Underwood to Hoskins	200	261	DI
WTRMN02180	1963	AC	400	Ramsay Reservoir WMR	400	135	DI
WTRMN01530	1972	AC	150	St Pauls Ave	200	43	DI
WTRMN01534	1967	AC	150	St Pauls Ave	200	143	DI
WTRMN04826	1954	CI	150	W20th and Lloyd	200	89	DI
WTRMN03531	1967	CI	150	W20th and Lloyd	200	52	DI
WTRMN03538	1967	CI	150	W20th and Lloyd	200	75	DI
WTRMN08977	1954	CI	150	W20th and Lloyd	200	29	DI
WTRMN08975	1948	CI	150	W20th and Lloyd	200	186	DI

Table 4. Proposed Water Main Replacement 2023

4.3 Operator Training & Qualification

The DNV's distribution system is EOCP classified as a Level 2 system. The DNV currently has distribution system operators with Level 2 and Level 3 operator's certification from the EOCP, keeping the DNV fully compliant with current requirements.

5 ISSUES, INCIDENTS & RESPONSE PLANS

5.1 Boil Water Advisory

A precautionary boil water advisory is issued when, in consultation with Vancouver Coastal Health, a situation exists that increases the risk of possible contamination. No precautionary boil water advisories were issued in 2022.

5.2 Customer Complaints

We recorded 25 customer complaints for either colour or odour. The DNV investigates all water quality complaints from customers. For complaints stemming from known operational activities (water main breaks, fire fighting, water main flushing), customers may be advised to run outside taps until the water clears up.

5.3 Ductile Iron Supply & Storage

In 2018, we had an incident that resulted in repeat total coliform detected in new ductile iron pipe not yet tied into the system. This led us to investigate and change our pipe storage and purchase practices. As a result, pipe stored in our secondary area (Beach Yard) is elevated on skids. This practice continued in 2022.

5.4 Security

DNV water storage reservoirs and pumping facilities have signage, 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. In addition, each facility is attended frequently for inspection and routine operation and maintenance.

5.5 Water Main Breaks

We responded to 21 emergency water main breaks in 2022. Water main break response protocol includes maintaining positive pressure to protect the water system from potential contamination. The number of breaks in 2022 was up from previous years and countered the ten-year trend of declining breaks due to our replacement program eliminating more of the asbestos cement pipe which is most prone to failure. We expect the trend to normalize in 2023 and continue the downward trend or at least maintain the lower levels from past years where it surpassed 30 breaks per year.

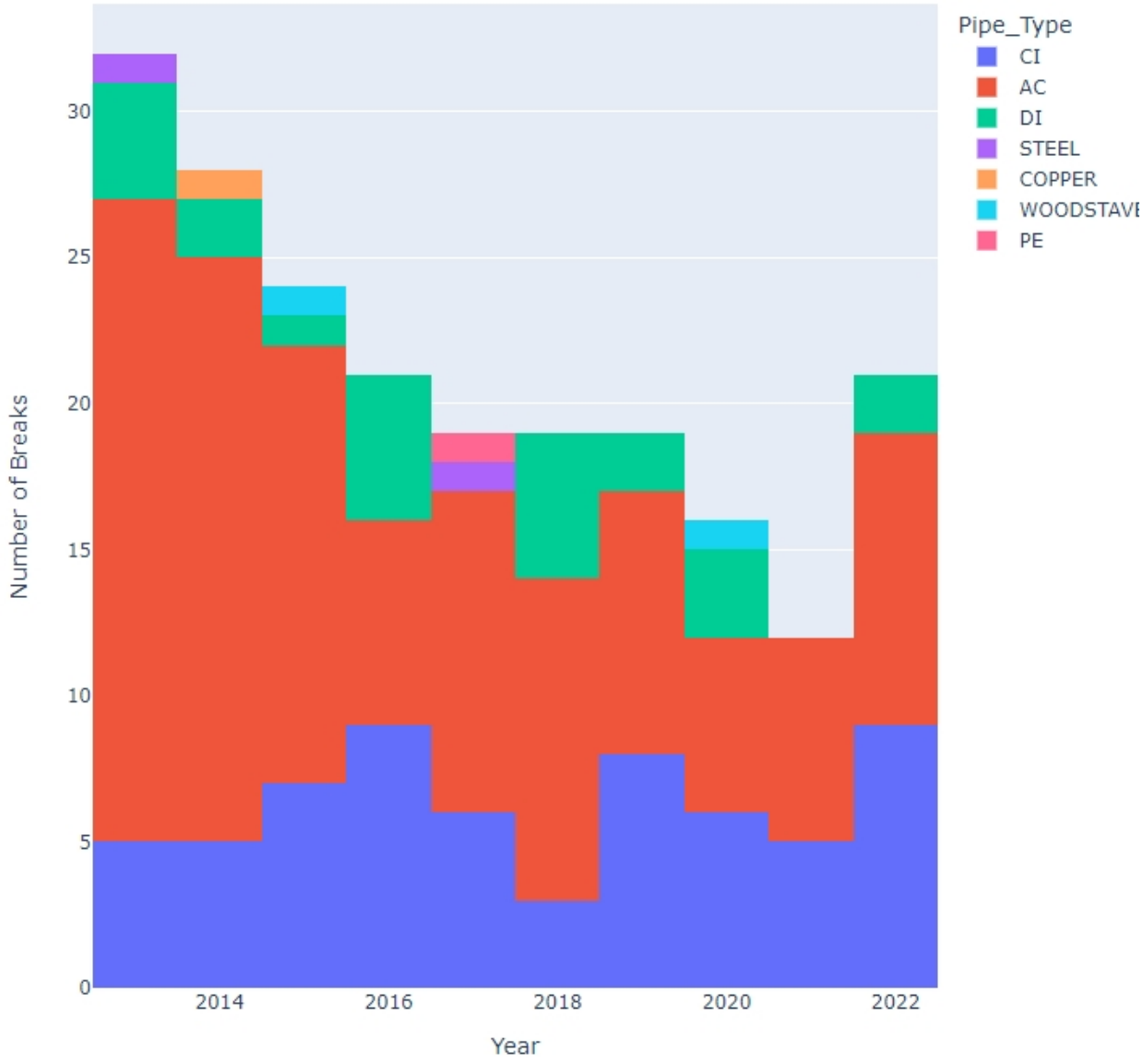


Figure 6. 10-Year Water Main Break Summary

5.6 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**
E. coli -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

5.7 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.

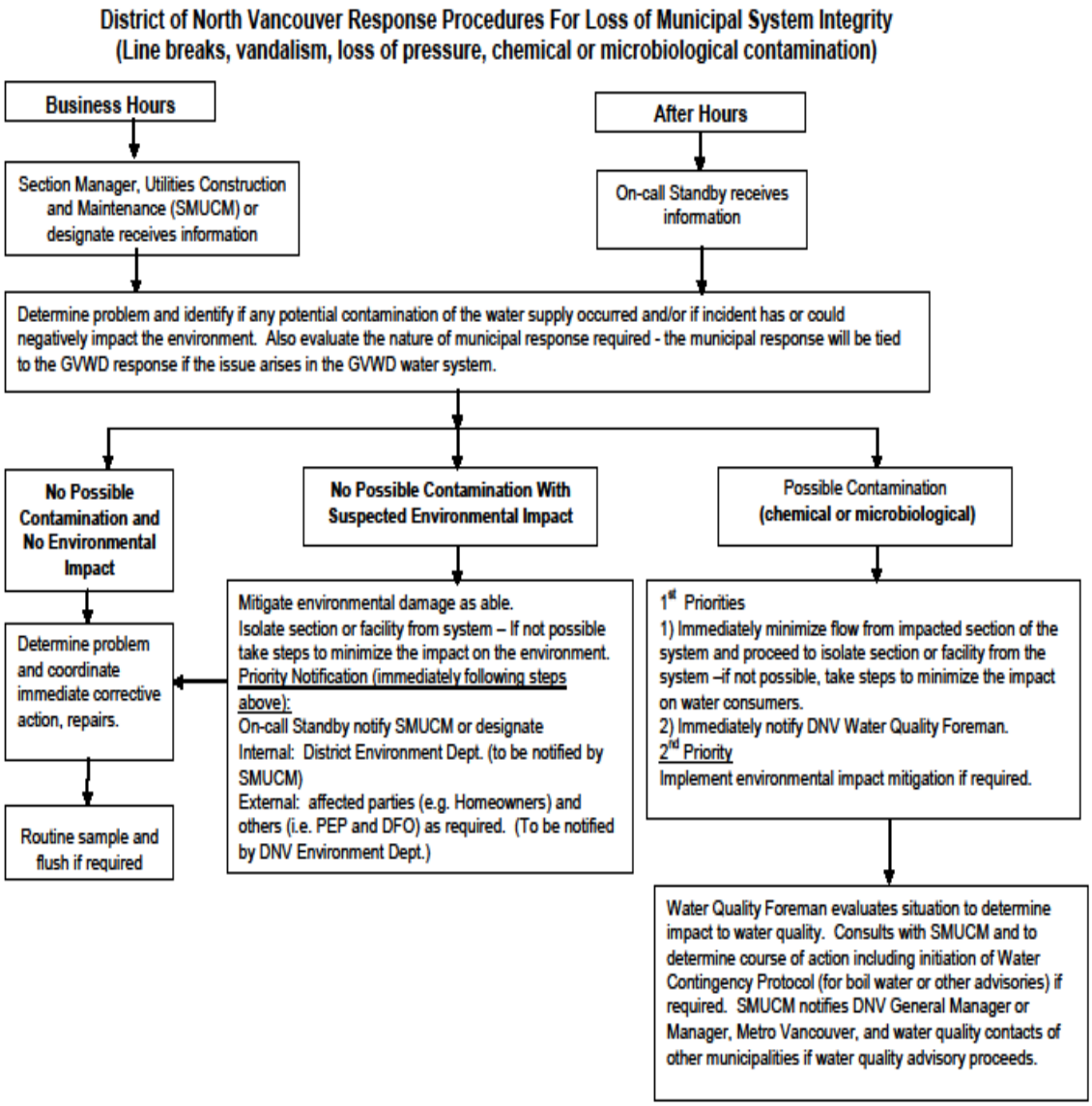


Figure 7. Loss of System Integrity Response

- ***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 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 analyzed 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. All areas from which turbidity results > 5 NTU are flushed and re-sampled for free chlorine and turbidity. Flushing in areas with turbidity < 5NTU is at the operator's discretion.

- ***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 analyzed 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.

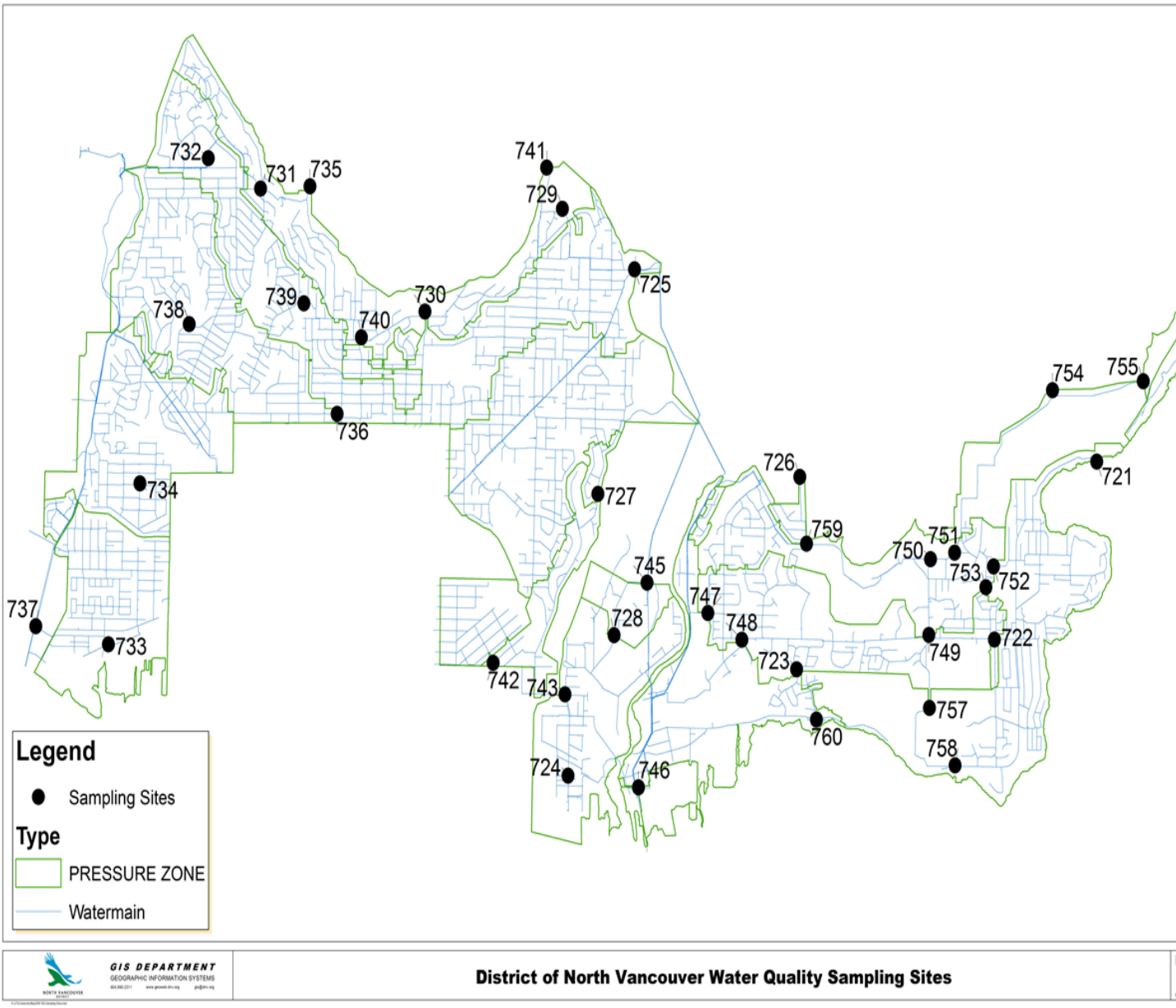
- ***Source Water Event***

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 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.	Dead End
2	722	Fairway & Mt Seymour Pkwy.	Medium
3	723	Plymouth Dr & Fairfield Dr.	Medium
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

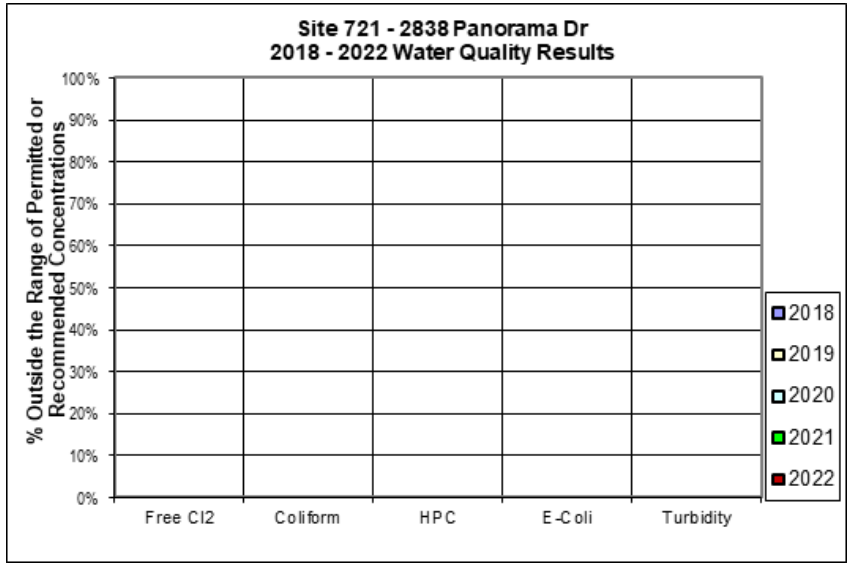
9	729	Ramsay Pump Station	Medium
10	730	Braemar Reservoir	Low
11	731	Skyline Pump Station	Medium
12	732	Sarita Pump Station	Source
13	733	McKeen Ave & Phillip Ave.	Dead End
14	734	Pemberton Heights	Low
15	735	Prospect Reservoir	Low
16	736	PRV #4 (W Queens Rd. & Lonsdale Ave.)	Low
17	737	N. of BC Rail 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
	743	Not in Use	
	744	Not in use	
23	745	PRV # 13 (N. of 1388 Monashee Drive (Capilano College))	Source
24	746	PRV #17 (60 Riverside Dr.)	Source
25	747	PRV # 19 (1231 Lennox St.)	Source
26	748	PRV # 16 (2592 Bendale Rd.)	Low
27	749	PRV # 18 (3728 Mt. Seymour Parkway)	Medium
	750	Not in Use	Medium
	751	Not in Use	Low
28	752	PRV # 25 (4068 Deane Pl.)	Medium
29	753	PRV # 20 (1501 Theta Ct.)	Low
30	754	Woodlands reservoir (2.1 km N. of Hixon Rd. on Indian River Dr.)	Low
31	755	PRV # 26 3.7 km NE of Hixon Rd. on Indian River Dr.	Low
32	756	End of Fire Lane # 7 (Firelane #7 is 3.6 km from Hixon Rd.)	Dead End
33	757	PRV 200 m south of 879 Roche Point Dr.	Medium
34	758	3860 Dollarton Hwy.	Medium
35	759	Hyannis Pump Station (1919 Hyannis drive)	Low
36	760	3000 Block Dollarton Hwy.	Dead End

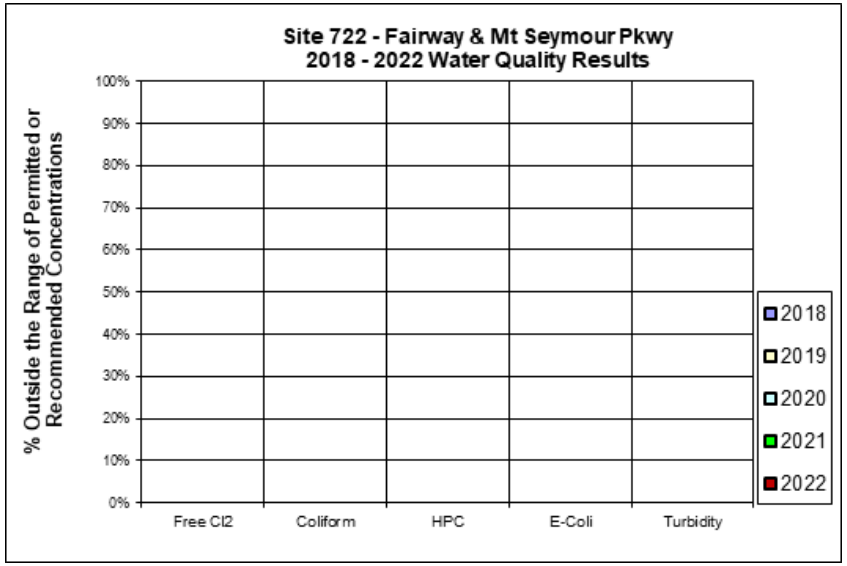
DISTRICT OF NORTH VANCOUVER
WATER QUALITY SAMPLING AND REPORTING
CALENDAR - 2020

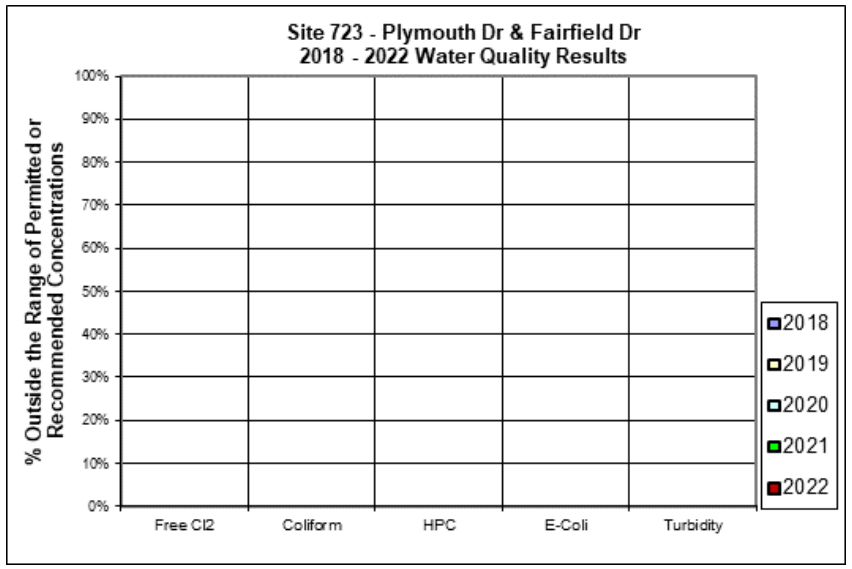
	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
DISTRIBUTION SYSTEM SAMPLING																								
bacteria, turbidity,	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx

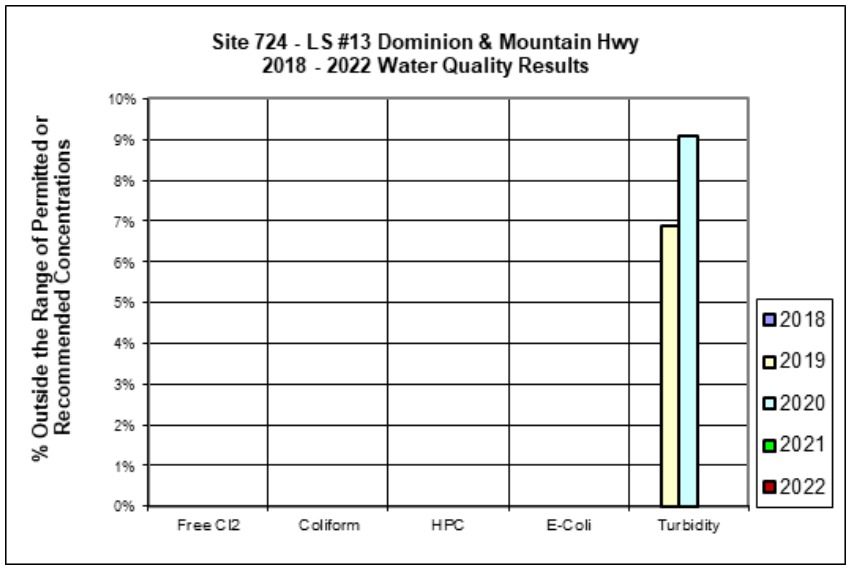
chlorine, temperature	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
(twice weekly)																							
HAA's, THM's, pH (quarterly)				X						X						X						X	
metals - copper, lead, zinc									X													X	
(semi-annually)																							
NOTIFICATION																							
Annual Report:																							
Annual report send to MHO											X												
MHO responds															X								
Staff report to Council																	X						
Post on Web																			X				

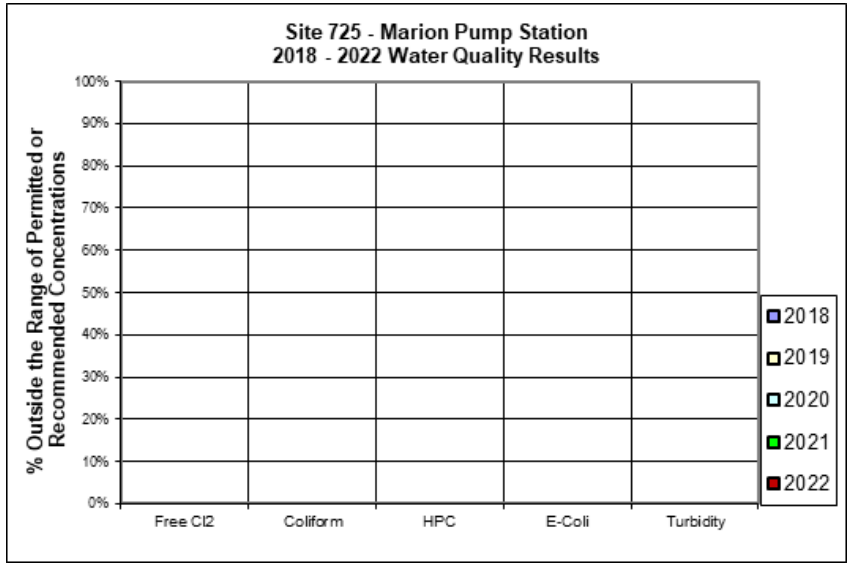
APPENDIX B: Five Year Results by Water Quality Sample Site. 2018 - 2022

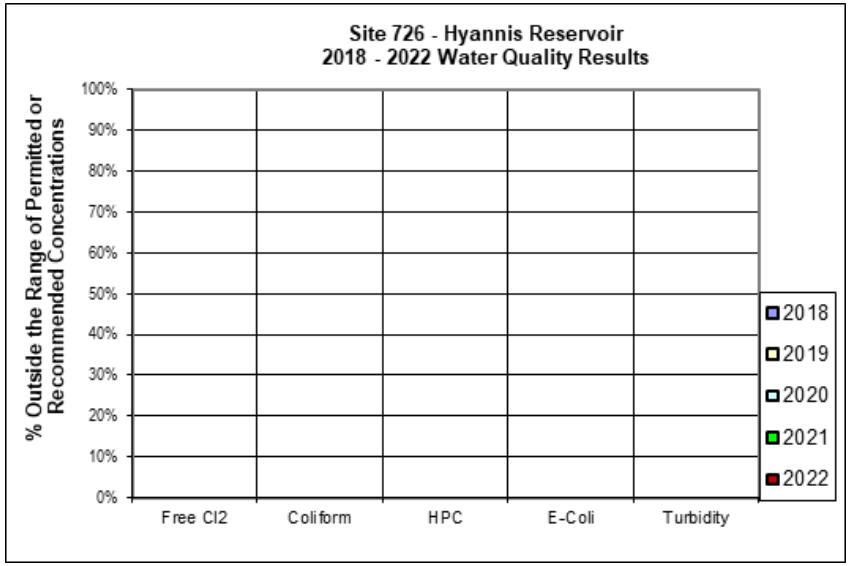

Site 721 - 2838 Panorama Dr
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

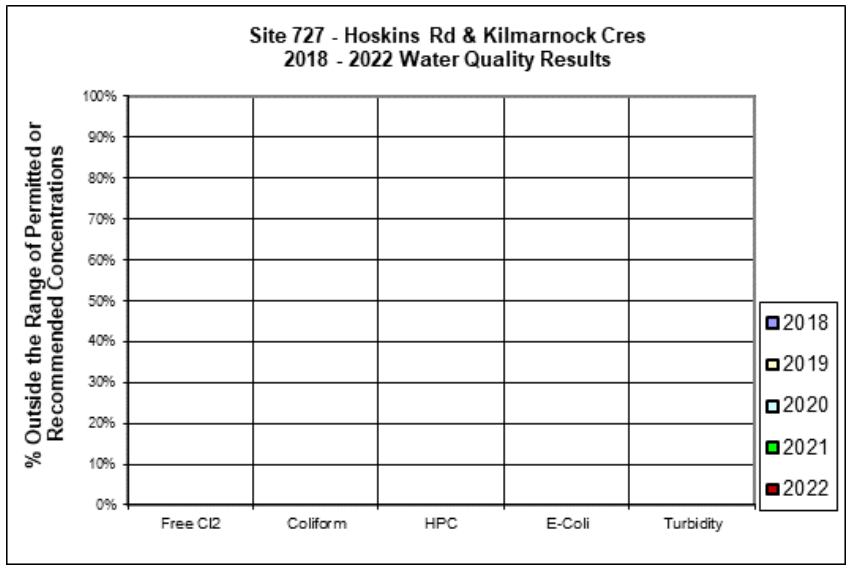

Site 722 - Fairway & Mt Seymour Pkwy
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

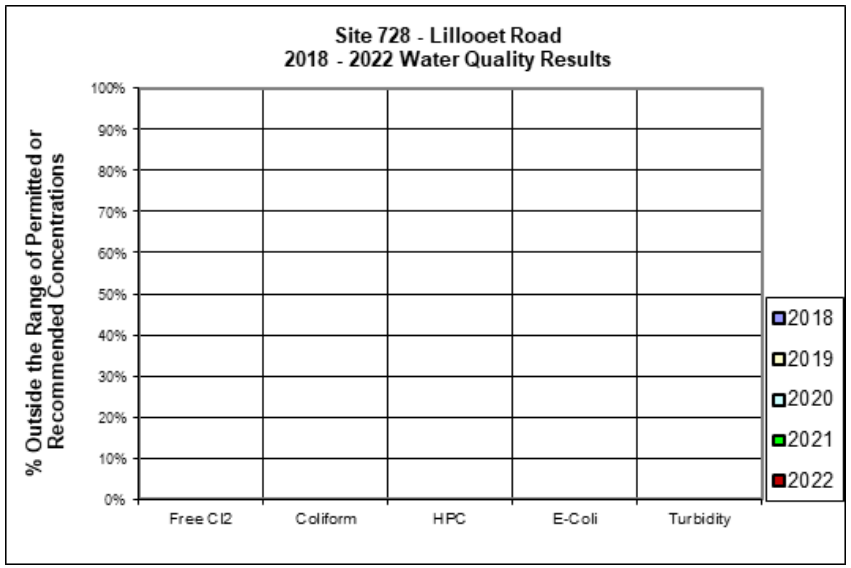

Site 723 - Plymouth Dr & Fairfield Dr
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

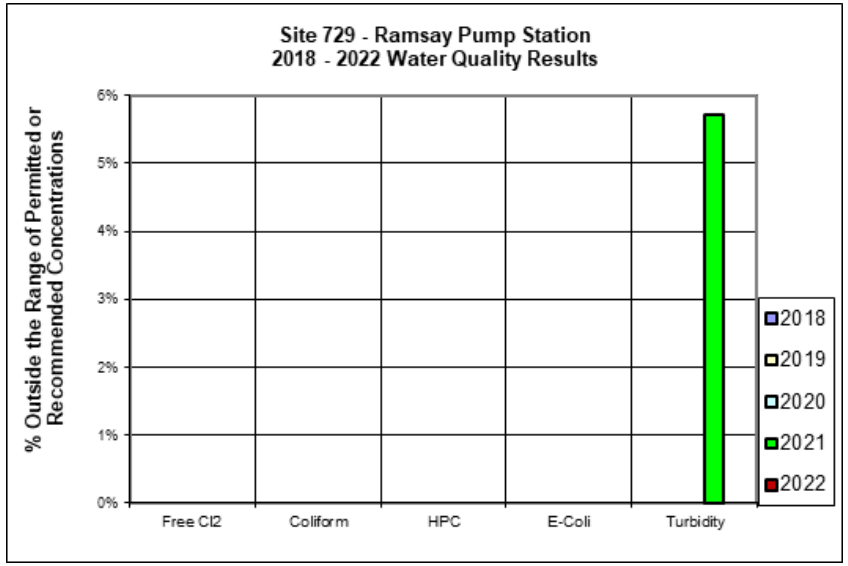

Site 724 - LS #13 Dominion & Mountain Hwy
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
10%
9%
8%
7%
6%
5%
4%
3%
2%
1%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

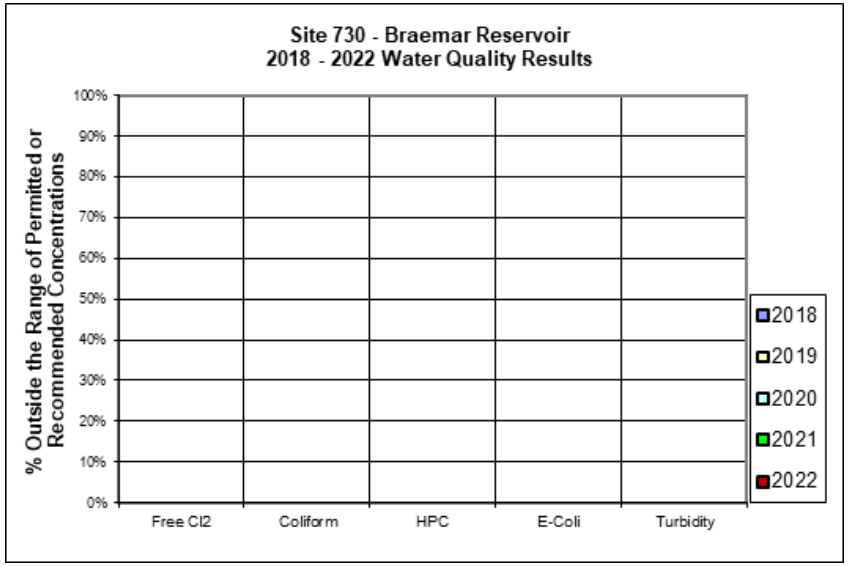

Site 725 - Marion Pump Station
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

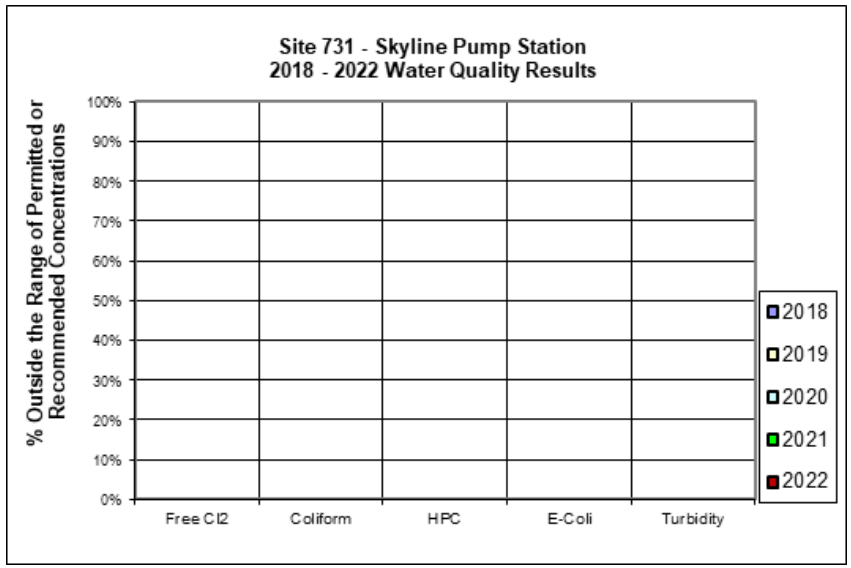

Site 726 - Hyannis Reservoir
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

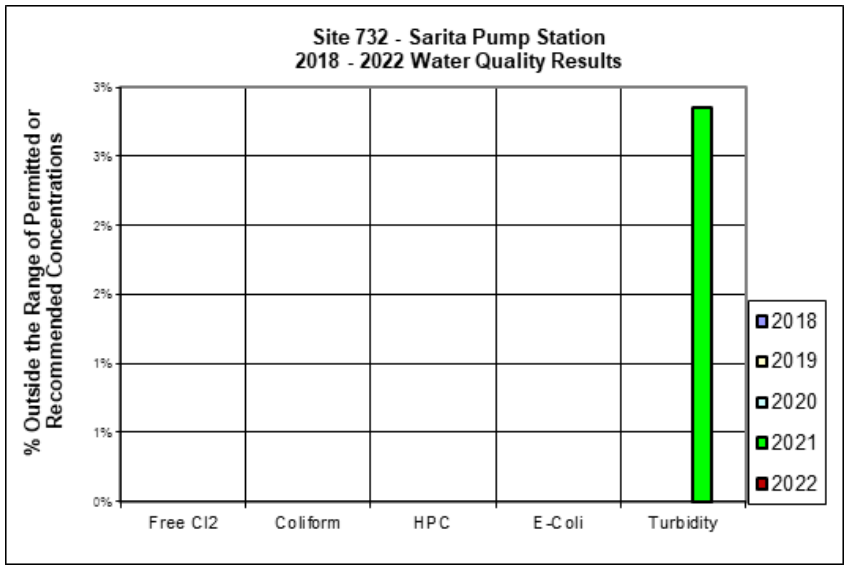

Site 727 - Hoskins Rd & Kilmarnock Cres
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

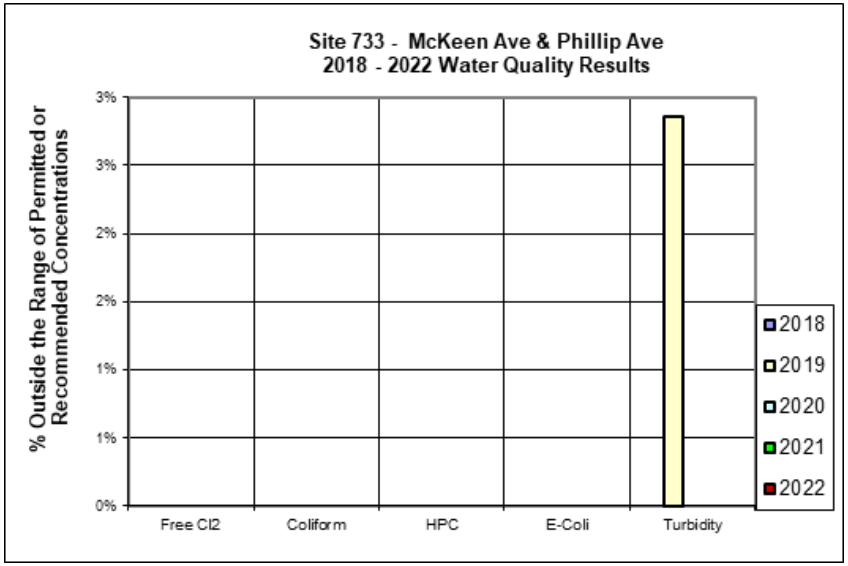

Site 728 - Lillooet Road
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

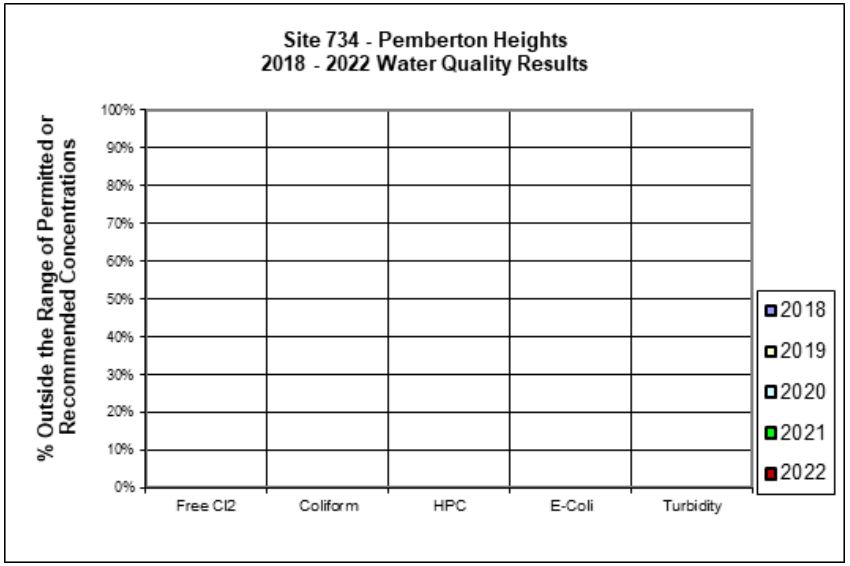

Site 729 - Ramsay Pump Station
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
6%
5%
4%
3%
2%
1%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

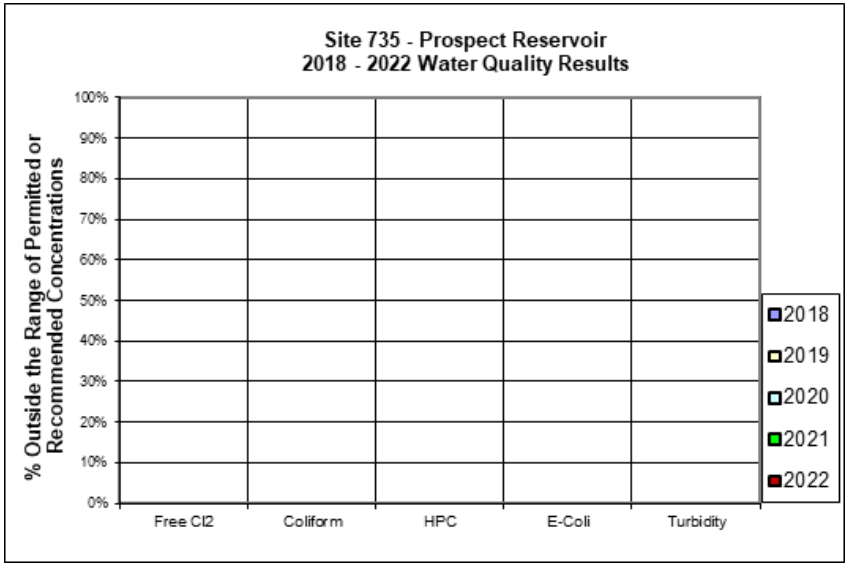

Site 730 - Braemar Reservoir
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

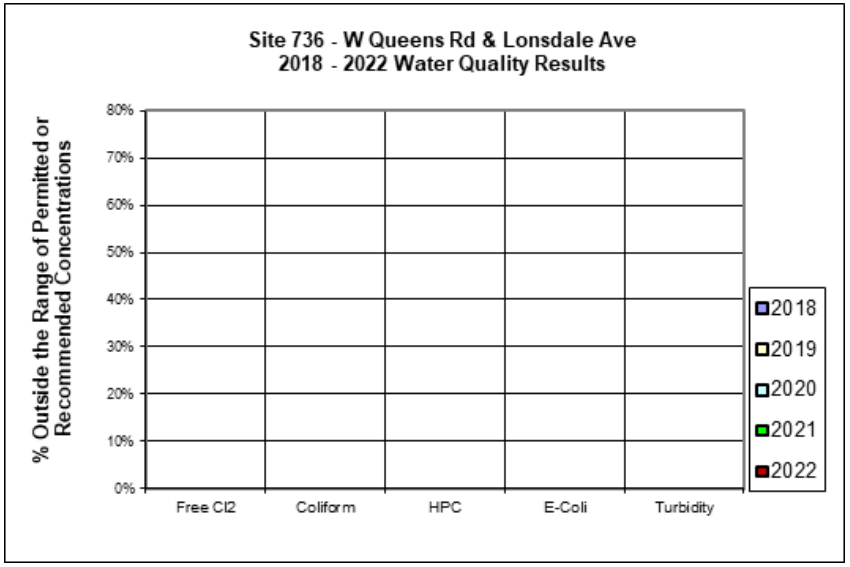

Site 731 - Skyline Pump Station
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

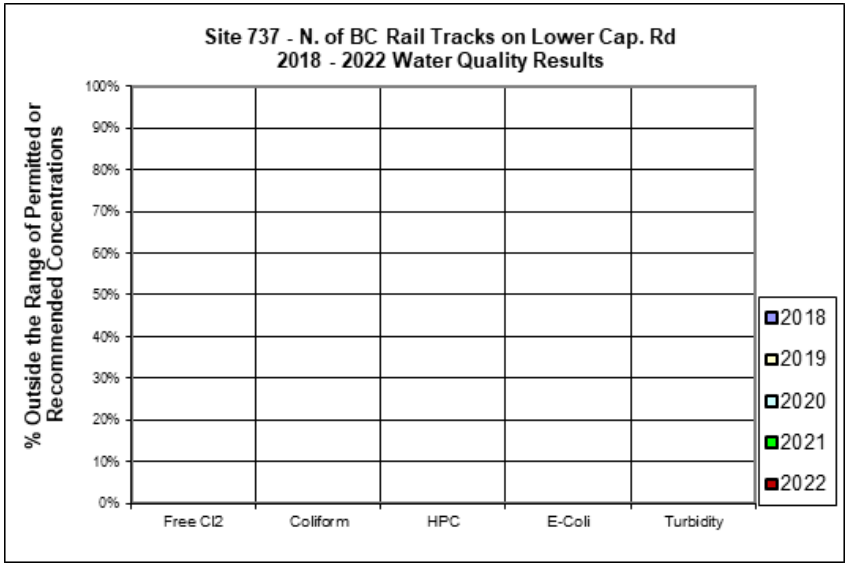

Site 732 - Sarita Pump Station
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
3%
3%
2%
2%
1%
1%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

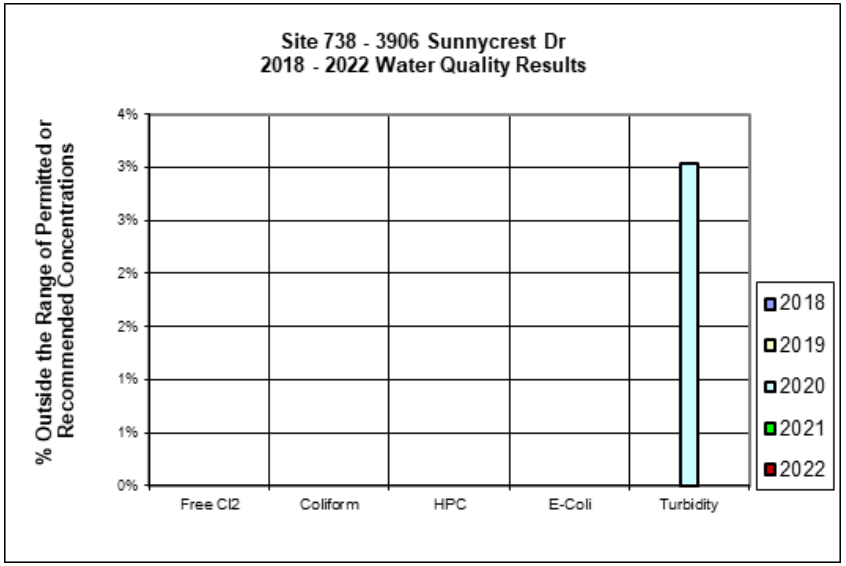

Site 733 - McKeen Ave & Phillip Ave
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
3%
3%
2%
2%
1%
1%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022


Site 734 - Pemberton Heights
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

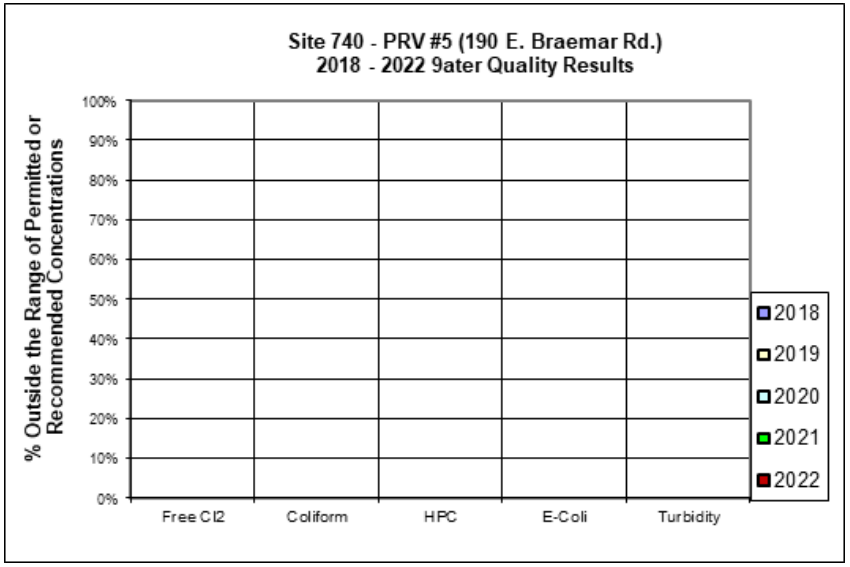

Site 735 - Prospect Reservoir
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

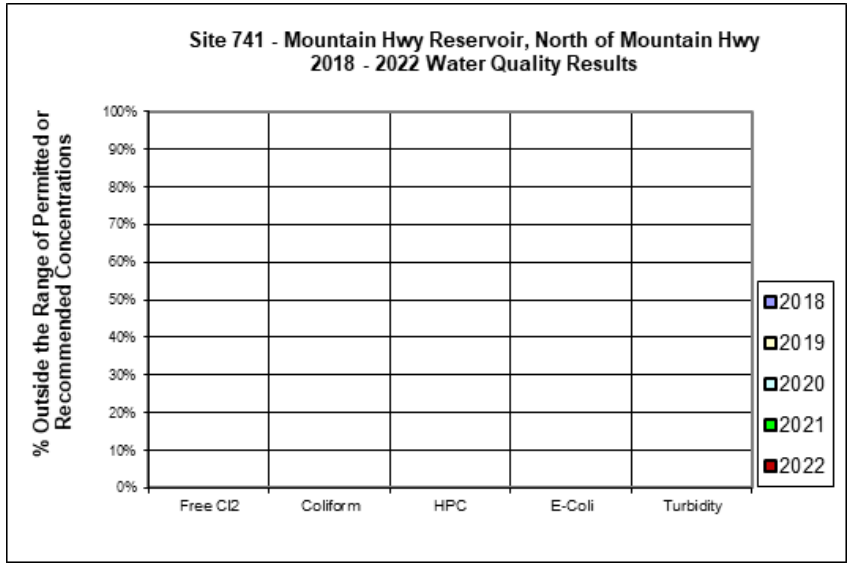

Site 736 - W Queens Rd & Lonsdale Ave
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

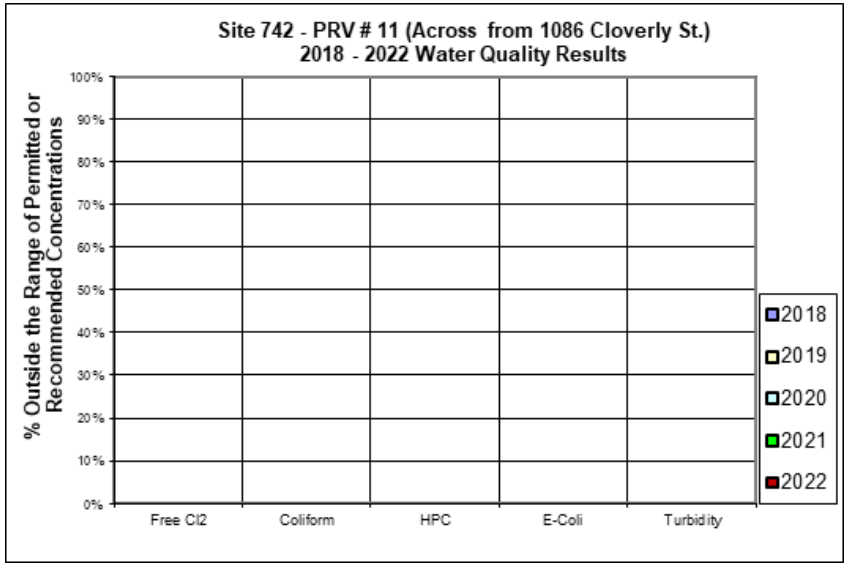

Site 737 - N. of BC Rail Tracks on Lower Cap. Rd
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

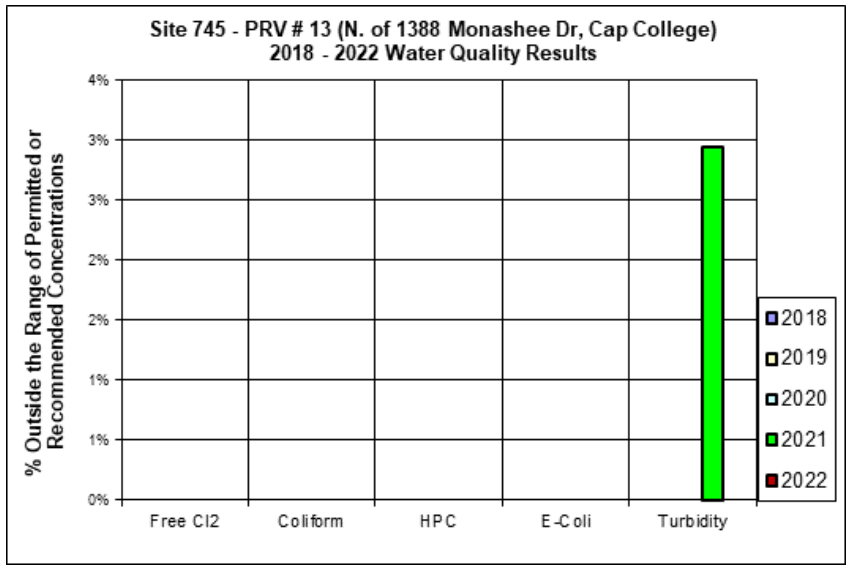

Site 738 - 3906 Sunnycrest Dr
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
4%
3%
3%
2%
2%
1%
1%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

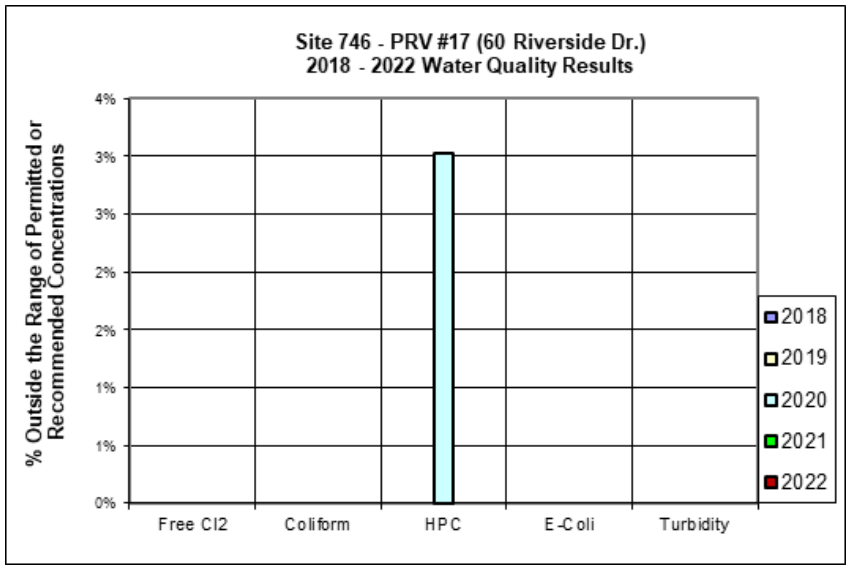

Site 739 - 376 Cartelier Rd.
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
4%
3%
3%
2%
2%
1%
1%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

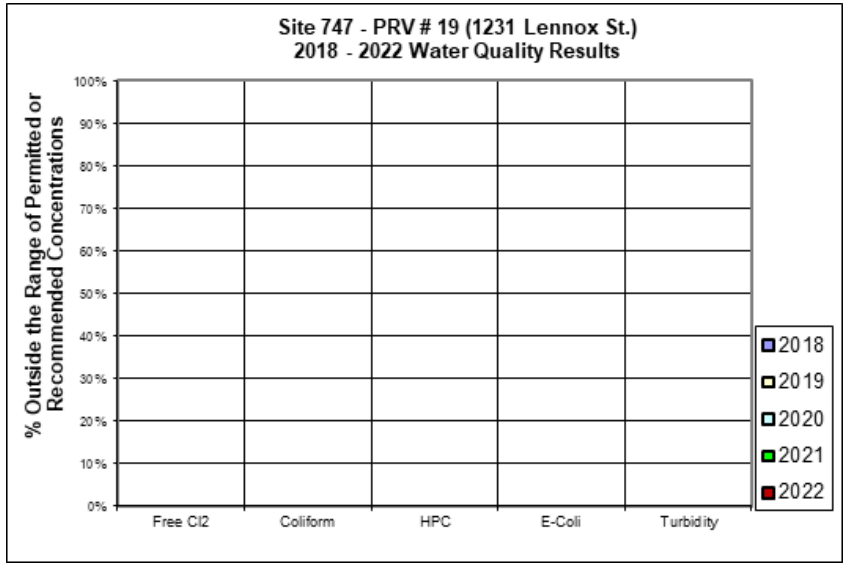

Site 740 - PRV #5 (190 E. Braemar Rd.)
2018 - 2022 9ater Quality Results
% Outside the Range of Permitted or Recommended Concentrations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

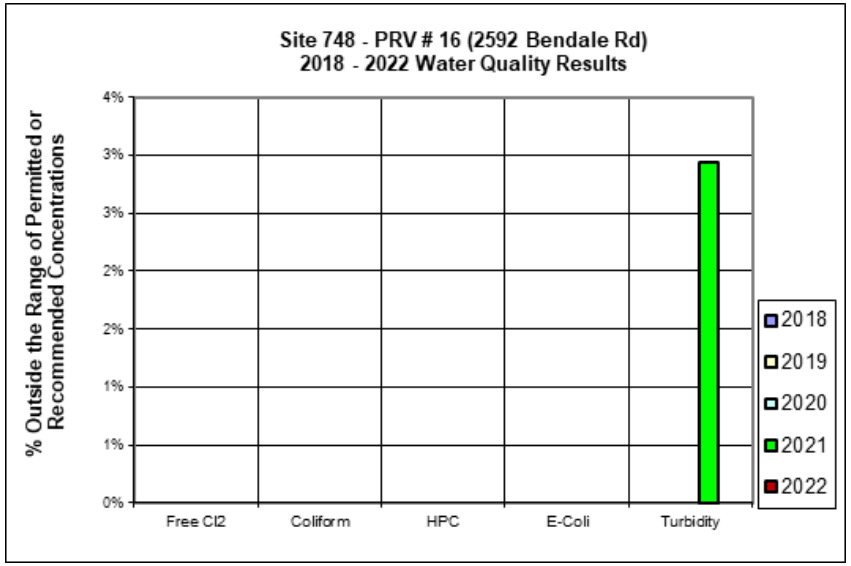

Site 741 - Mountain Hwy Reservoir, North of Mountain Hwy
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

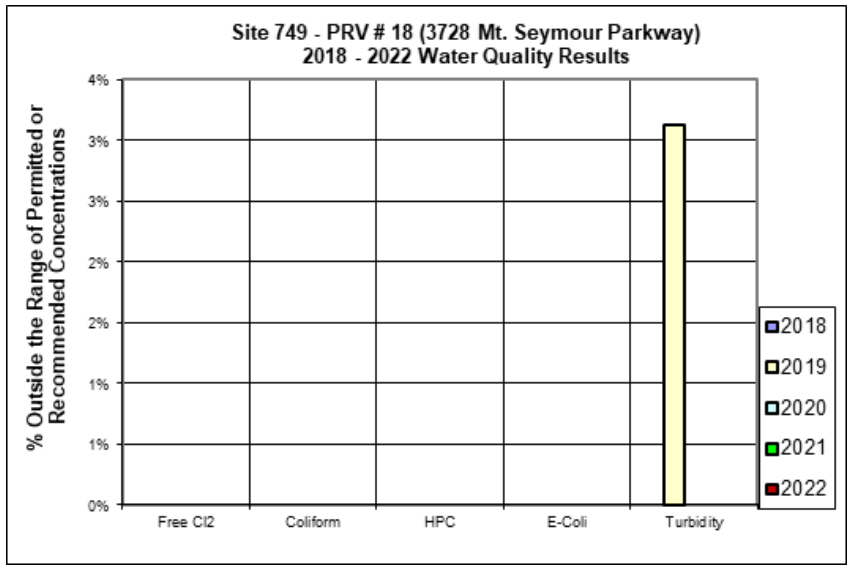

Site 742 - PRV # 11 (Across from 1086 Cloverly St.)
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

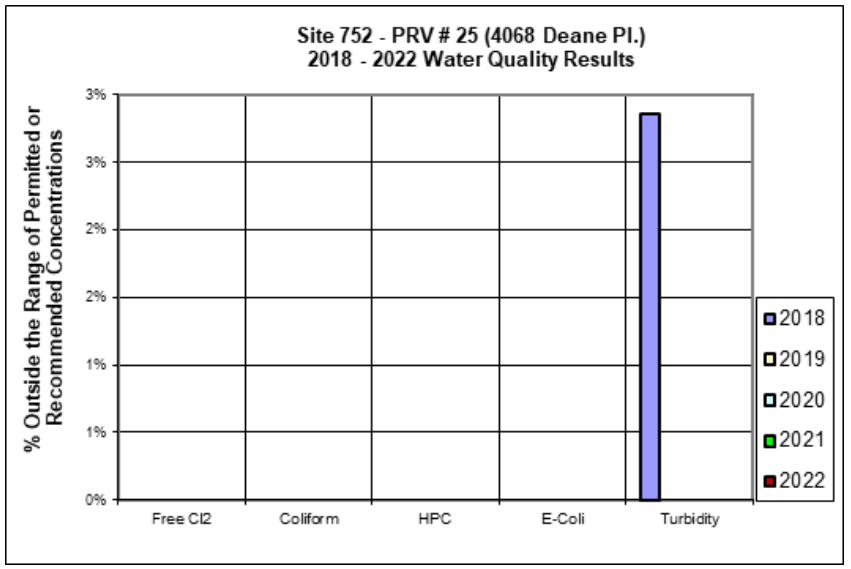

Site 745 - PRV # 13 (N. of 1388 Monashee Dr, Cap College)
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
4%
3%
3%
2%
2%
1%
1%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

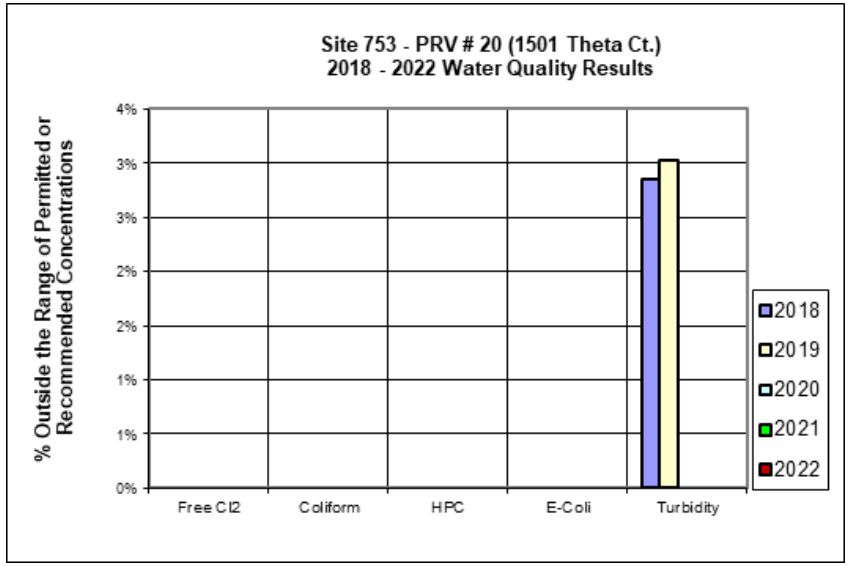

Site 746 - PRV #17 (60 Riverside Dr.)
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
4%
3%
3%
2%
2%
1%
1%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

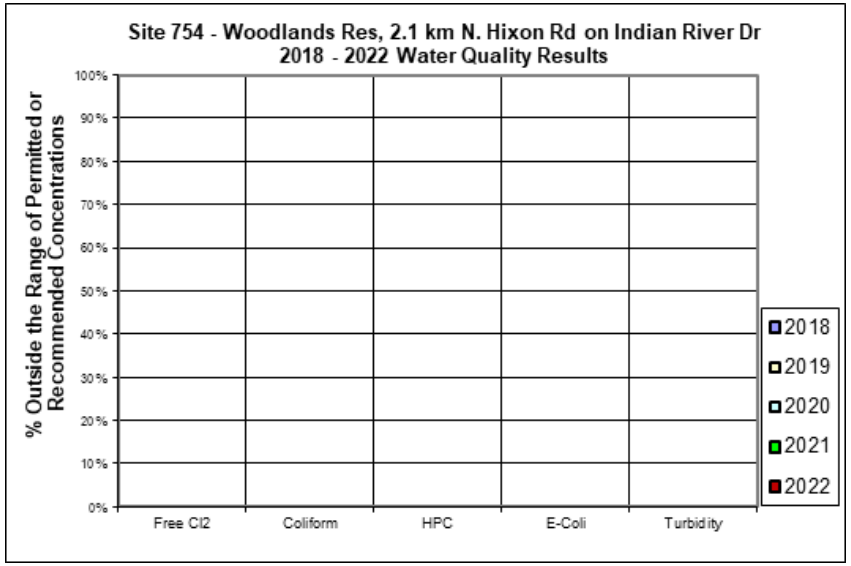

Site 747 - PRV # 19 (1231 Lennox St.)
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

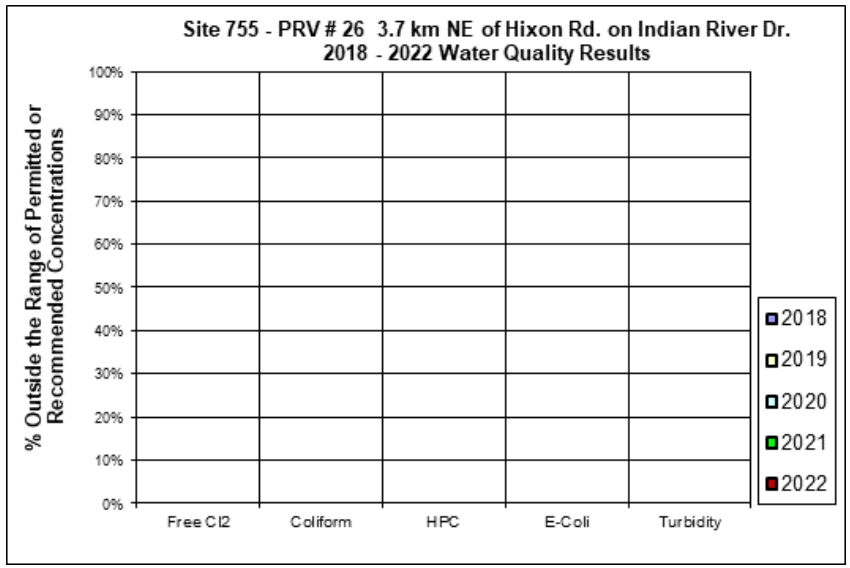

Site 748 - PRV # 16 (2592 Bendale Rd)
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
4%
3%
3%
2%
2%
1%
1%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

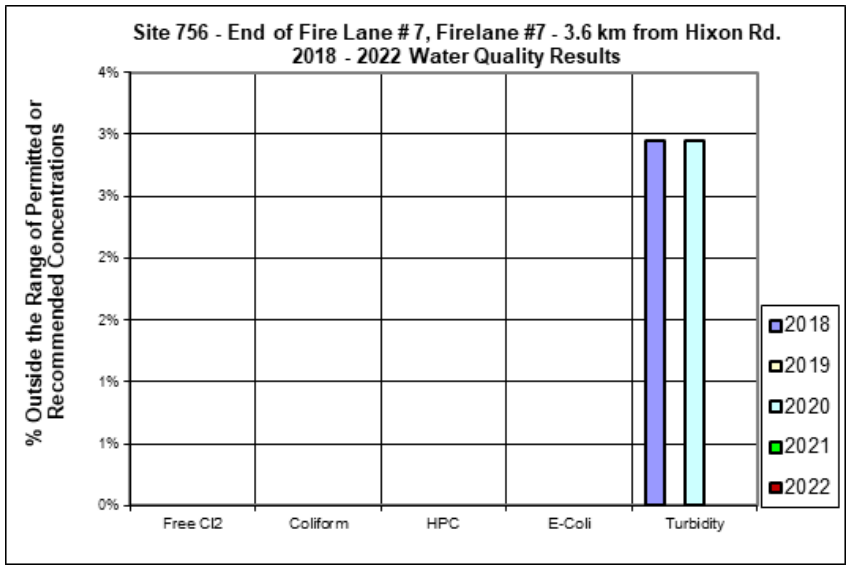

Site 749 - PRV # 18 (3728 Mt. Seymour Parkway)
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
4%
3%
3%
2%
2%
1%
1%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

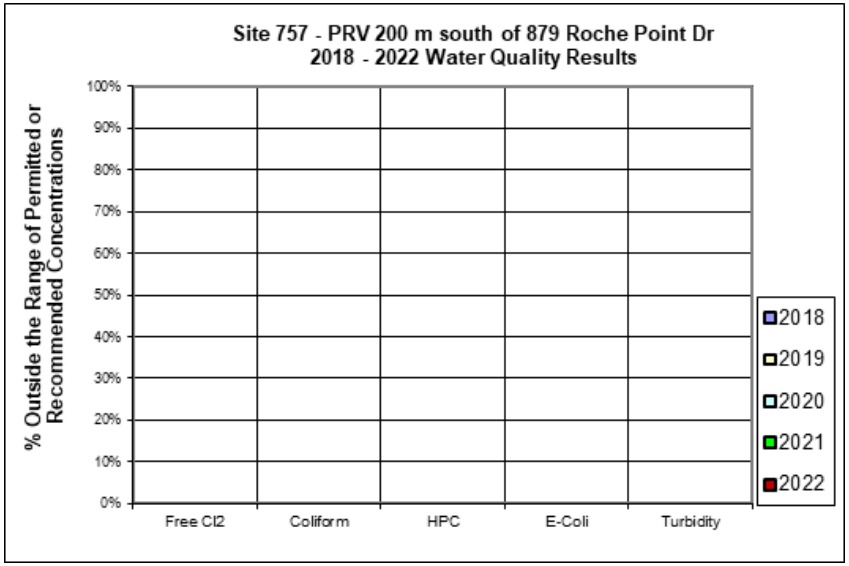

Site 752 - PRV # 25 (4068 Deane Pl.)
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
3%
3%
2%
2%
1%
1%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

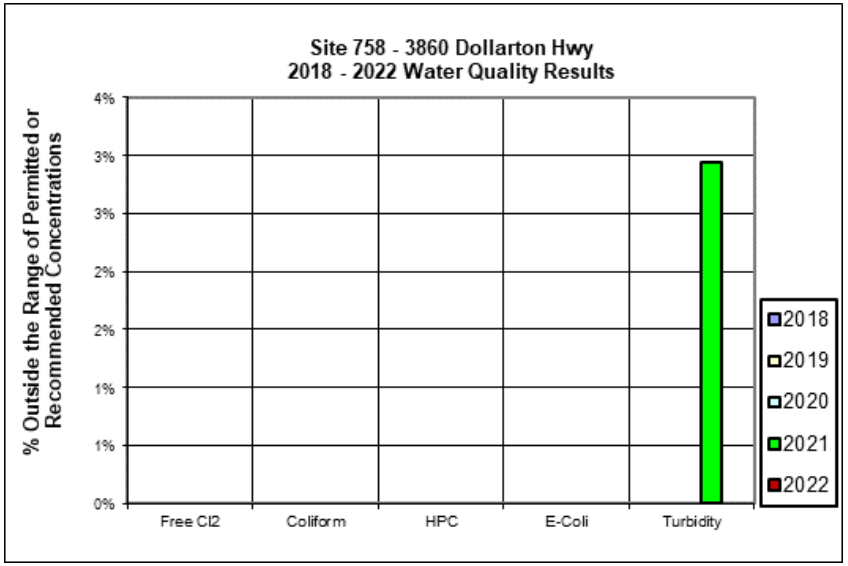

Site 753 - PRV # 20 (1501 Theta Ct.)
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
4%
3%
3%
2%
2%
1%
1%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

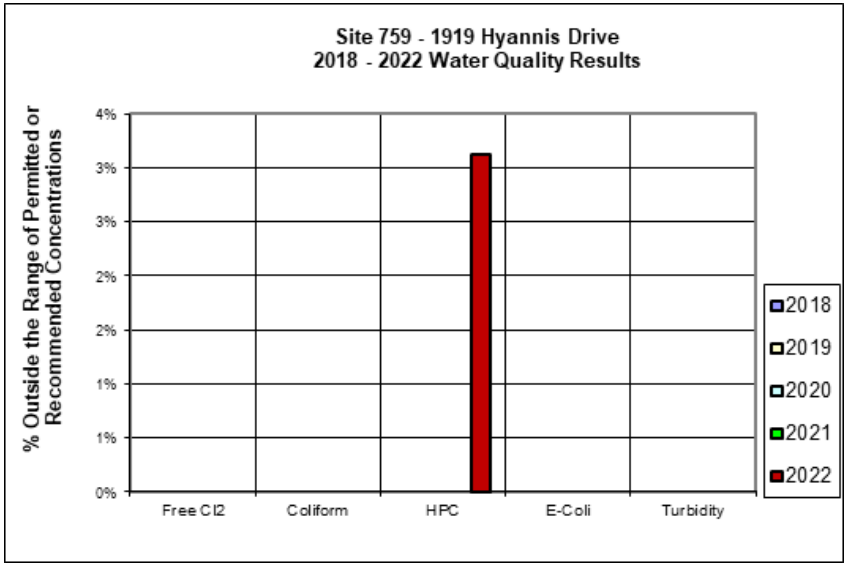

Site 754 - Woodlands Res, 2.1 km N. Hixon Rd on Indian River Dr
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

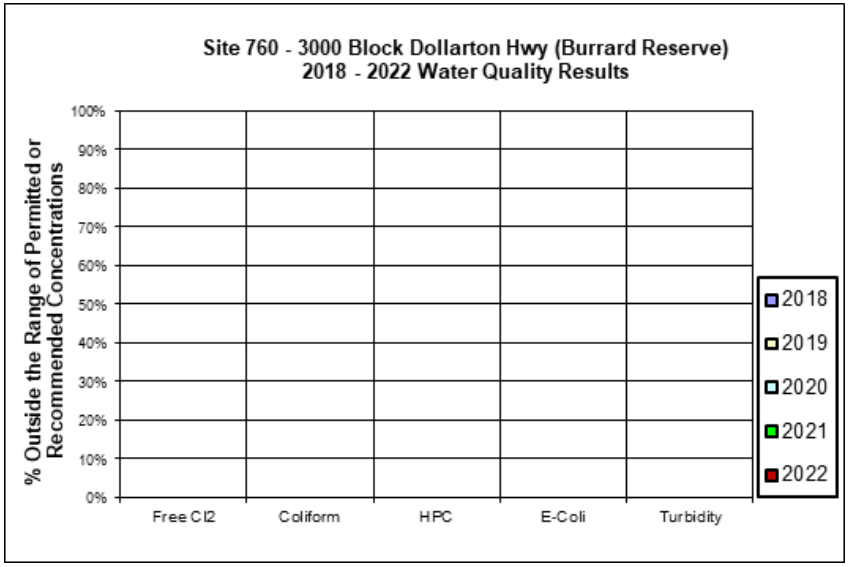

Site 755 - PRV # 26 3.7 km NE of Hixon Rd. on Indian River Dr.
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022


Site 756 - End of Fire Lane # 7, Firelane #7 - 3.6 km from Hixon Rd.
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
4%
3%
3%
2%
2%
1%
1%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022


Site 757 - PRV 200 m south of 879 Roche Point Dr
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022


Site 758 - 3860 Dollarton Hwy
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
4%
3%
3%
2%
2%
1%
1%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022


Site 759 - 1919 Hyannis Drive
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
4%
3%
3%
2%
2%
1%
1%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022


Site 760 - 3000 Block Dollarton Hwy (Burrard Reserve)
2018 - 2022 Water Quality Results
% Outside the Range of Permitted or Recommended Concentrations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Free Cl2
Coliform
HPC
E-Coli
Turbidity
2018
2019
2020
2021
2022

APPENDIX C: Vancouver Coastal Health Recommendations on Flushing of Faucets

Vancouver Coastal Health
800 – 601 West Broadway
Vancouver, BC V5Z 4C2

May 12th. 2022

Water System Operators

Re: Metals in Drinking Water – "Flush" Message in Annual Reports

Vancouver Coastal Health (VCH) is requiring all water systems to include the following health message with your next annual reports to your users:

> ***Contamination of drinking water with Lead can have health impacts over time, and in BC the source is most likely to be plumbing fixtures within a building. Anytime the water in a particular faucet has not been used for six hours or longer, "flush" your cold-water pipes by running the water until you notice a change in temperature. This could take as little as five to thirty seconds if there has been recent heavy water use such as showering or toilet flushing. Otherwise, it could take two minutes or longer. The more time water has been sitting in your home's pipes, the more Lead it may contain.***
>
> ***Use only water from the cold-tap for drinking cooking, and especially making baby formula. Hot water is likely to contain higher levels of Lead.***
>
> ***The two actions recommended above are very important to the health of your family. They will probably be effective in reducing Lead levels because most of the Lead in household water usually comes from the plumbing in your house, not from the local water supply.***
>
> ***Conserving water is still important. Rather than just running the water down the drain you could use the water for things such as watering your plants.***

If you have any questions, please contact you closest Drinking Water Officer noted below.

Sincerely,

Dr. Michael Schwandt
Mecical Health Officer
Vancouver Coastal Health

- (604) 983-6793 Central Coast
- (604) 983-6793 North Shore
- (604) 485-3310 Powell River
- (604) 233-3147 Richmond
- (604) 885-5164 Sechelt
- (604) 892-2293 Squamish
- (604) 675-3800 Vancouver
- (604) 932-3202 Whistler