

Drinking Water Quality – 2014 Annual Report

APRIL 2015 | ENGINEERING, PARKS AND ENVIRONMENT



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1.0 SUMMARY

The City of North Vancouver's Drinking Water Quality Annual Report provides pertinent information about our drinking water and supports the City's application for the annual Operating Permit. The Medical Health Officer issues the permit as required by the Drinking Water Protection Act.

In conjunction with the Greater Vancouver Water District (GVWD), the City continues to deliver safe, high quality water to its residents. The City's Ten Year Plan continues to support the ongoing replacement of the water infrastructure and to provide funding for the maintenance programs related to water quality.

The Regional Drinking Water Management Plan 2005 with 2007 Amendment (DWMP) provides direction for a sustainable water supply and includes commitments at both the municipal and regional level.

The primary goals of the Plan are as follows:

- Goal 1: Provide Clean, Safe Drinking Water
- Goal 2: Ensure the Sustainable Use of Water
- Goal 3: Ensure the Efficient Supply of Water

2.0 SOURCE WATER

The GVWD (Metro Vancouver) supplies water to the region through a network of mountain storage lakes, dams, reservoirs and over 550 kilometres of supply mains. The GVWD is responsible for acquiring and maintaining the supply of water, treating the water to ensure its safe quality and delivering the water to the member municipalities. The distribution to consumers is the responsibility of the municipalities.

GVWD water is supplied from the Capilano, Seymour and Coquitlam watersheds. These three watersheds are comprised of 585 square kilometres of protected forested areas. Several years ago, the GVWD developed a Drinking Water Treatment Program (DWTP) to effectively address source water quality issues that include the potential for waterborne disease, seasonal source water turbidity, source water corrosiveness and bacterial re-growth in the distribution system. The DWTP adopted a “four barrier” approach to reduce the risk of waterborne infection. The four “barriers” are: watershed protection; primary disinfection; water main cleaning (primarily by the municipalities) and water quality monitoring. This approach is now incorporated in the Drinking Water Management Plan

Metro Vancouver is responsible for monitoring and testing water for bacteriological, chemical and physical quality. Metro Vancouver maintains a laboratory for the program, testing all source water as well as samples collected by member municipalities from their distribution systems. The Greater Vancouver Water District Quality Control Annual Report provides a comprehensive report on water quality information for the entire Metro Vancouver service area. Extensive information on water in general is provided on the Metro Vancouver web site. (www.metrovancouver.org)

3.0 DISTRIBUTION SYSTEM

3.1 General

The City of North Vancouver's water distribution system serves a population of 50,957 along with an institutional, commercial and industrial base that accounts for approximately 57% of the yearly water consumption. There are 133 kilometres of pipe divided into four pressure zones with nine pressure reducing stations and 7,111 service connections. Approximately 55% of the water main system is cast iron, 35% is ductile iron, 8% is PVC and 2% is steel. The oldest pipes in the system were installed in 1911. Appendix A is a map showing the sampling station locations, the pressure reducing stations which correlate with the GVWD water intakes to the City and the various pressure zones.

3.2 Testing

The City's sampling program is based on accepted protocols developed in consultation with the Medical Health Officer (MHO). The program provides bacteriological, chemical and physical testing to evaluate water quality. There are 20 sampling stations located throughout the City to give a cross section of the water quality in the distribution system. Samples are taken from half the stations each week such that each station is tested on a bi-weekly basis. The City has also installed an inline Chlorine Analyzer in the Westmoreland PRV chamber to provide real time free chlorine, pH and temperature data for source water supplied by Metro Vancouver.

The samples are tested for chlorine residual, bacteriological evidence (E.coli, HPC, coliform), temperature and turbidity. Three sampling stations are tested quarterly for Haloacetic acids (HAA) and Trihalomethanes (THMs). Metals analysis is provided at three stations and Vinyl Chloride at one station. Metro Vancouver provides the testing and data summary services as well as alerting the City to any water quality problems.

Maximum acceptable concentrations have been established for certain substances known or suspected to cause adverse effects on health. The Health Canada standards have been developed to safeguard health on the basis of lifelong consumption and the use of the water for all usual domestic purposes, including personal hygiene.

Appendix B provides a description of the sampling parameters, allowable limits and a summary of the 2014 test results.

3.3 Results

Bacteria

Bacteriological results for the 2014 testing year were excellent. All E.coli and coliform tested below the guidelines. This is indicative of positive system wide disinfection. October 1, 2014 Water Sample Station 803 (264-268 E 9th St) had an E.coli of 1MF/100mls and also 1MF/100mls coliform. The City was notified and proceeded to resample as instructed by the Metro Vancouver lab. All subsequent samples (three sets) were clear of E.coli and Total coliforms. This indicated that likely there was an inadvertent contamination issue when the original sample was taken.

Physical

Water temperature during the summer months at times could exceed the recommended value of 15 degrees C. Higher temperatures are not aesthetically pleasing and may influence bacterial re-growth.

Turbidity is generally caused by rainfall events affecting the watersheds and is beyond the control of the City except for turbidity caused by water main cleaning, water main breaks, or high velocity flows due to firefighting. The Seymour Filtration Plant has resulted in overall improvements in turbidity levels. Turbidity values are posted in the daily newspapers and chlorine doses are increased during periods of high turbidity to mitigate associated risks. The City also includes turbidity testing for each sample in the field as part of the sampling program. This ensures an immediate response to turbidity problems if necessary rather than the delay caused through waiting for GVWD lab results.

Chemical

Chlorine residual sampling results showed a system average at .48 mg/l well above the 0.2 mg/l minimum standard. Zone 601, sample station CNV 801 and CNV 803 had 42% and 62% of sample readings (respectively) registering below the 0.2mg/l minimum standard. The City operation division has made adjustments to the water system in the area of sample station CNV 801 by adding two water quality stations. A third water quality station has been added in the area of sample station CNV 803. This will help improve flow characteristics in these areas.. Better flow will help maintain higher chlorine residual in the area.

Sampling for disinfection by-products, Vinyl Chloride and metals were all within the Canadian Guidelines.

3.4 Risks

Risks to distribution water quality are:

Increased chlorine residuals can increase the levels of Haloacetic acid and Trihalomethanes (THMs). Longer than average exposure to THMs is an indicator of by-product related cancer risk.

Chlorine residuals below 0.2 mg/l can potentially allow pathogenic organisms to multiply.

Insufficient levels of maintenance and care can put the water system at risk. Water main cleaning is an essential component of the care that is required to maintain high quality drinking water. Planned replacement of aging pipes reduces the risk of water main breaks and the associated risk of contamination.

3.5 Issues

As previously determined, any long-term improvements to increase chlorine residuals on the part of the City are pending given the anticipated improvement in water quality that will result upon final completion of the Seymour filtration project in 2015.

3.6 Water System Operation and Maintenance

The water system is cleaned within a 365-day cycle and the following table depicts the generalized water system cleaning schedule. The zones are mapped in Appendix A.

City of North Vancouver Water Main Cleaning Plan	
Water Zones	Frequency
385	Annually
601	Annually
632	Annually
785	Two times per 365 day cycle
Turbid Water Reports	As required

The cleaning program combined with the valve actuation program has the added benefit of ensuring all valves in the system are open and maintaining flows in the designed fashion.

2014 Water Main Construction	Future Water Main Construction
A. 100 Blk E 8 th Street (R)	1. 400 Blk. E 8 th St. (R)
B. 200 Blk E 8 th Street (R)	2. 500 Blk. E 8 th St. (R)
C. 300 Blk E 8 th Street (R)	3. 800/900 West 1 st Street (R)
D. Moody Ave. 2 nd Street to Low Level Road (R)	
E. 500 Blk W 14 th Street (N)	
F. (3) Water Quality Stations (N)	

R – replacement water main construction

N – new water main construction

All the new and replacement water main construction improves flow capability and pipe quality both of which have a positive influence on water quality and overall system resiliency.

4.0 SIGNIFICANT INCIDENTS

There were no incidents in the City's water distribution system that significantly compromised water quality in 2014. Of note, the City of North Vancouver's Engineering Department updated its Emergency Plan which includes identification of critical elements in the water system infrastructure as well as key water quality topics.

A comprehensive water communication protocol for source water turbidity events was established through a task force of Metro Vancouver member municipalities and the Vancouver Coastal and Fraser Health Authorities and endorsed in March 2008. The protocol is now included in the Appendix D Response Plan.

5.0 OPERATOR QUALIFICATIONS

The table below highlights the qualifications and experience of the City of North Vancouver staff directly involved in the operation of water system.

Employee	Position	Courses	Qualifications	Work Experience
R. Greenlees	Waterworks Supervisor	Water Distribution I&II Other trades related education		35 years
D. Price	Utility Tradesman	Tradesman Plumber	EOCP Water Distribution II	27 years
M. Trinkl	Utility Tradesman		EOCP Water Distribution II	25 years
D. Sherwood	Pipefitter		EOCP Water Distribution II	15 Years
W. Mason	Pipefitter	Tradesman Plumber	EOCP Water Distribution III	14 years
S. McCartney	Pipefitter	Cross Connection Control	EOCP Water Distribution III	9 years
G. Stead	Irrigation System Worker	Cross Connection Control		26 years
T. Stefas	Pipefitter		EOCP Water Distribution I	8 years
T. Van Nes	Utility Crew			2 years
J. Siemens	Plumbing and Gas Inspector	Cross Connection Control Tradesman Plumber Hydronic Technician		13 years
Bryce Pollock	Plumbing and Gas Inspector	Cross Connection Control Tradesman Plumber Hydronic Technician		10 years

The City recognizes the value that operator education and training provides. Staff members participate annually in a variety of workshops, product orientation and technical courses. The City's water system is a Class III distribution system which includes staff with Level III certification. The City staff complement is knowledgeable, experienced and eminently competent to operate the City's water distribution system.

6.0 SECURITY MEASURES

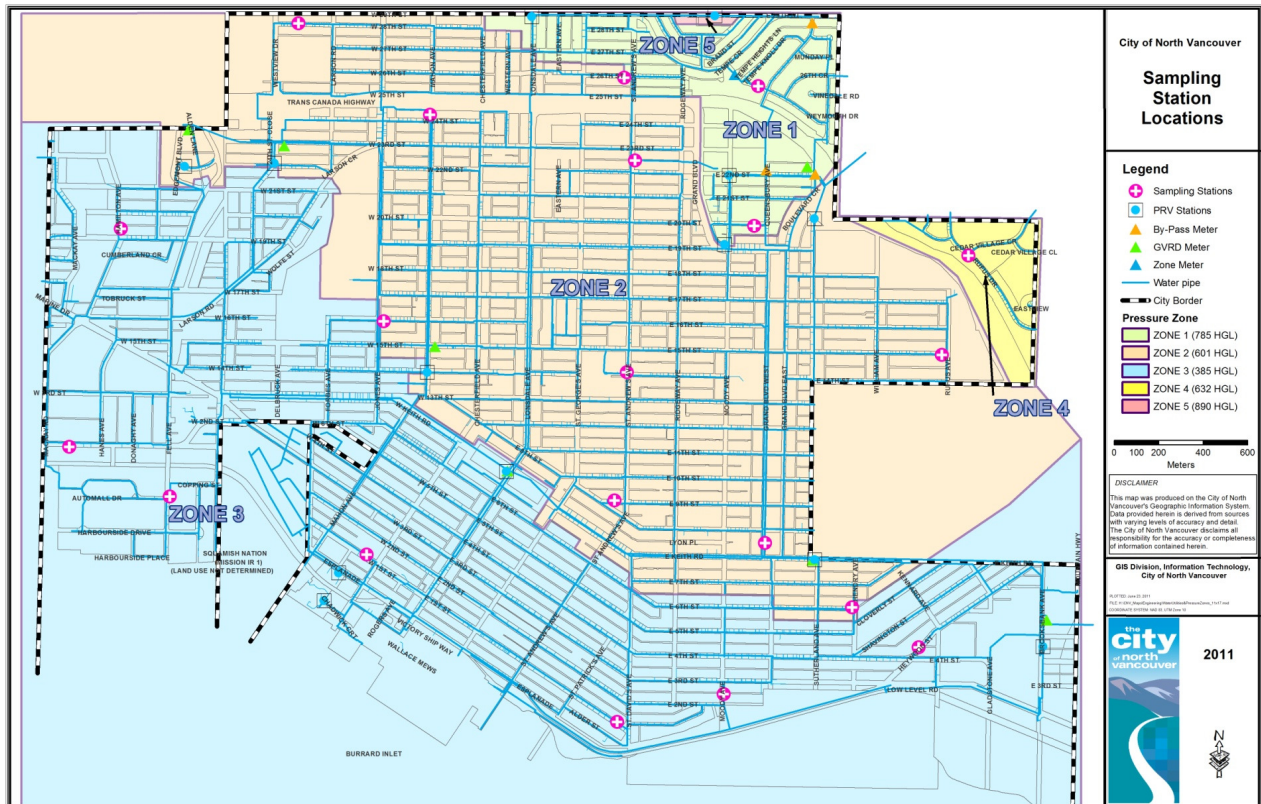
Security measures for water systems typically concentrate on the protection of water sources and reservoirs. The City's system relies upon the GVWD for water supply and storage and therefore has not employed any extraordinary measures. Supply points (GVWD meter stations, and PRVs) could be the most vulnerable components of our system but in reality are no more vulnerable than fire hydrants and individual service connections. City staff will continue to keep apprised of security issues and will implement operational changes as required.

7.0 NOTIFICATION AND EMERGENCY RESPONSE PLAN

The City's Notification and Emergency Response Plan is included in Appendix D. The City of North Vancouver's Engineering, Parks and Environment Emergency Response Plan is up to date and tested annually to ensure new staff are aware of expectations in the event of an emergency .

8.0 APPENDICES

Appendix A: CNV Water Zones and Sampling Station Locations



The following chart shows the sampling station locations with a designation for the type of flow being evaluated.

City of North Vancouver - Water Sampling Locations																								
Number	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	Source Samples			
Zone	601	601	601	601	601	601	385	385	385	385	385	785	632	785	385	601	601	601	601	385	S	S	S	S
Address	550 West 28th	1546 Jones	264-268 East 9th	848 East 6th	895 East 19th	259 East 26th	1904 Hamilton	961 West 1st	202-238 West 1st	472-474 East 1st	1050 Heywood	533 East 20th	1903 Rufus	2640 Tempe Knoll	42 Fall (Pump Station)	231 East 15th (LGH)	326 E 22nd Street	755 Grand Blvd	304 West 24th	209 Moody	20th & Sutherland	Westmoreland	29th & Regent	29th & Lonsdale
Flow	B	A	B	C	B	B	B	B	A	B	B	C	B	C	B	A	A	A	B	B	S	S	S	S

Flow Description for Sampling Locations

S= Source water (14% of samples)

A= High to Medium flow - transmission mains (24% of samples)

B= Medium to Low flow - distribution mains (48% of samples)

C= Very little flow - dead ends, unlooped lines, poor circulation (14% of samples)

Flow Description for Sampling Locations

- S= Source water (14% of samples)
- A= High to Medium flow - transmission mains (24% of samples)
- B= Medium to Low flow - distribution mains (48% of samples)
- C= Very little flow - dead ends, unlooped lines, poor circulation (14% of samples)

Sampling Station Work Program

In general the City distribution system is in sound condition and has a good water quality record. The water is supplied by the GVRD from the Capilano and Seymour watersheds through eight entry connections with meters. The system is not complex, comprising of 133,000 metres of water main in a basic grid format.

Sampling is done on Wednesdays. Each station is sampled on a bi-weekly basis and the GVRD provides the testing and data summary services.

Appendix B: Water Sampling Parameters and 2014 Sampling Results

The following provides a simple description of the sampling parameters:

Sample Parameter	Sample Description	Guideline Limit
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CL2Free mg/L	Free Chlorine in milligrams per litre	Min 0.2
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The chlorine residual within the water distribution system is the indicator for the effectiveness of the disinfection process. The source water at Capilano and Seymour is treated to 1.5 mg/L and the goal is to maintain .2 to .4 mg/L at the extremities of the distribution system.

E.coli MF/100mLs	E.coli coliforms – Membrane Filtered per 100 millilitres	0
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The microbiological quality of water is measured by sampling the number of coliform organisms. E.coli coliforms are considered key indicators and could indicate sewage contamination. None of the coliform organisms detected should be E.coli coliforms.

In rare circumstances, the E.coli coliform test and the total coliform test will read MPN/100mLs. This indicates the sample was too turbid for the normal Membrane Filtration test and required an alternative method. MPN is an abbreviation of “Most Probable Number”.

HPC CFU/mLs	Heterotrophic Plate Count – Colony Forming Units per milliliters	Max 500
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Aerobic heterotrophic plate count bacteria are a group useful in monitoring the effectiveness of disinfection and in assessing the changes in finished water quality during distribution and storage. The bacteria are measured in colony forming units per milliliter.

Tcoli MF/100mLs	Total coliforms – Membrane Filtered per 100 millilitres	Max 10
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The microbiological quality of water is measured by sampling the number of coliform organisms. No sample should contain more than 10 total coliforms per 100 millilitres and 90 percent or more of the samples taken in a 30-day period must have zero coliform organisms. As well, no consecutive samples from the same site should show the presence of coliform organisms.

Temp °C	Temperature – Degrees Celsius	Max 15
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Temperature is measured in degrees Celsius at the time of sample. Higher temperatures in the distribution system may contribute to bacterial regrowth.

Turbidity NTU	Turbidity – Nephelometric Turbidity Unit	Max 1
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Turbidity describes the amount of disturbed sediment in water. The presence of turbidity can have significant effects on both the microbiological quality of water and on the detection of bacteria and viruses. More important, however, is the sediment interferes with the disinfection process. The interference with chlorination can range from negligible to severe.

Water Sampling Results

The following tables summarize the chlorine residual and turbidity for the source water stations in 2014. The 29th and Regent and 29th and Lonsdale sites are from the District of North Vancouver distribution system and not direct from GVWD mains. Sutherland and Westmoreland are direct from GVWD mains.

2014 Metro Vancouver Source

601 20th/Sutherland							385 Westmoreland						
	count	high	low	average	#outside guidelines	%outside guidelines		count	high	low	average	#outside guidelines	%outside guidelines
Free-CL2	26	0.90	0.10	0.67	1	4%	Free-CL2	26	1.14	0.58	0.81	0	0%
Turbidity	25	0.67	0.05	0.13	0	0%	Turbidity	26	0.65	0.07	0.29	0	0%

782 29TH/Regent							782 29th/Lonsdale						
	count	high	low	average	#outside guidelines	%outside guidelines		count	high	low	average	#outside guidelines	%outside guidelines
Free-CL2	26	0.63	0.20	0.39	0	0%	Free-CL2	26	0.68	0.20	0.42	0	0%
Turbidity	26	0.53	0.11	0.33	0	0%	Turbidity	26	0.63	0.11	0.34	0	0%

The tables on the next two pages summarize the sampling results for each of the 20 stations.

Table 1: 2014: Zone 601

801 601 550 West 28th	# outside %outside					
	count	high	low	average	guidelines	guidelines
Free-CL2	26	0.38	0.00	0.18	11	42%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	34.00	0.00	1.60	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	20.00	5.00	12.08	10	38%
Turbidity	26	14.00	0.12	0.93	1	4%

802 601 1546 Jones	# outside %outside					
	count	high	low	average	guidelines	guidelines
Free-CL2	26	0.54	0.24	0.40	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	24.00	0.00	1.04	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	19.00	4.50	11.58	7	27%
Turbidity	26	0.60	0.12	0.21	0	0%

803 601 264-268 East 9th	# outside %outside					
	count	high	low	average	guidelines	guidelines
Free-CL2	26	0.52	0.00	0.17	16	62%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	300.0	0.00	15.68	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	19.00	5.00	11.98	8	31%
Turbidity	26	13.00	0.10	1.49	4	15%

804 601 848 East 6th	# outside %outside					
	count	high	low	average	guidelines	guidelines
Free-CL2	26	1.10	0.42	0.57	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	6.00	0.00	0.80	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	20.00	5.00	12.19	10	38%
Turbidity	26	0.32	0.09	0.14	0	0%

805 601 895 East 15th	# outside %outside					
	count	high	low	average	guidelines	guidelines
Free-CL2	26	0.61	0.15	0.41	1	4%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	2.00	0.00	0.16	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	20.00	5.00	11.81	7	27%
Turbidity	26	1.40	0.12	0.30	1	4%

806 601 259 East 26th	# outside %outside					
	count	high	low	average	guidelines	guidelines
Free-CL2	26	0.68	0.05	0.46	1	4%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	78.00	0.00	3.20	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	18.00	4.00	10.60	6	23%
Turbidity	26	1.20	0.11	0.20	1	4%

816 601 231 East 15th-LGH	# outside %outside					
	count	high	low	average	guidelines	guidelines
Free-CL2	26	0.87	0.44	0.64	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	44.00	0.00	3.28	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	18.00	3.00	10.12	5	19%
Turbidity	26	0.41	0.08	0.15	0	0%

817 601 326 East 22nd	# outside %outside					
	count	high	low	average	guidelines	guidelines
Free-CL2	26	0.79	0.45	0.60	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	2.00	0.00	0.48	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	17.00	2.00	9.63	4	15%
Turbidity	26	1.20	0.09	0.18	1	4%

818 601 755 Grand Blvd	# outside %outside					
	count	high	low	average	guidelines	guidelines
Free-CL2	26	0.98	0.44	0.65	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	4.00	0.00	0.24	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	18.00	3.00	10.10	5	19%
Turbidity	26	0.24	0.08	0.13	0	0%

819 601 304 West 24th	# outside %outside					
	count	high	low	average	guidelines	guidelines
Free-CL2	26	0.80	0.40	0.60	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	530.0	0.00	22.40	1	4%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	18.00	4.00	10.54	5	19%
Turbidity	26	0.21	0.09	0.14	0	0%

Table 2: 2014: Zones 385, 632, 785

807 385 1904 Hamilton								812 785 533 East 20th							
# outside %outside								# outside %outside							
count	high	low	average	guidelines	guidelines			count	high	low	average	guidelines	guidelines		
Free-CL2	26	0.77	0.01	0.54	2	8%		Free-CL2	26	0.35	0.00	0.13	17	65%	
EColi	26	0.00	0.00	0.00	0	0%		EColi	26	0.00	0.00	0.00	0	0%	
HPC	25	4.00	0.00	0.56	0	0%		HPC	25	8.00	0.00	0.80	0	0%	
Coliform	26	1.00	0.00	0.04	0	0%		Coliform	26	0.00	0.00	0.00	0	0%	
Temp	26	16.00	3.50	9.79	2	8%		Temp	26	19.00	4.00	11.94	7	27%	
Turbidity	26	2.60	0.11	0.41	1	4%		Turbidity	26	1.00	0.13	0.30	0	0%	
808 385 961 West 1st								813 632 1903 Rufus							
# outside %outside								# outside %outside							
count	high	low	average	guidelines	guidelines			count	high	low	average	guidelines	guidelines		
Free-CL2	26	0.73	0.45	0.60	0	0%		Free-CL2	26	0.85	0.45	0.67	0	0%	
EColi	26	0.00	0.00	0.00	0	0%		EColi	26	0.00	0.00	0.00	0	0%	
HPC	25	46.00	0.00	4.56	0	0%		HPC	25	8.00	0.00	0.64	0	0%	
Coliform	26	0.00	0.00	0.00	0	0%		Coliform	26	0.00	0.00	0.00	0	0%	
Temp	26	18.00	4.00	11.06	5	19%		Temp	26	18.00	3.00	10.23	5	19%	
Turbidity	26	0.73	0.11	0.26	0	0%		Turbidity	26	0.19	0.09	0.12	0	0%	
809 385 202-236 West 1st								814 785 2640 Tempe Knoll							
# outside %outside								# outside %outside							
count	high	low	average	guidelines	guidelines			count	high	low	average	guidelines	guidelines		
Free-CL2	26	0.81	0.37	0.63	0	0%		Free-CL2	26	0.39	0.00	0.20	10	38%	
EColi	26	0.00	0.00	0.00	0	0%		EColi	26	0.00	0.00	0.00	0	0%	
HPC	25	8.00	0.00	0.56	0	0%		HPC	25	2.00	0.00	0.08	0	0%	
Coliform	26	0.00	0.00	0.00	0	0%		Coliform	26	0.00	0.00	0.00	0	0%	
Temp	26	17.00	2.00	9.90	3	12%		Temp	26	18.00	3.00	11.54	7	27%	
Turbidity	26	0.67	0.09	0.26	0	0%		Turbidity	26	0.62	0.12	0.27	0	0%	
810 385 472-474 East 1st								815 385 42 Fell (Pump Station)							
# outside %outside								# outside %outside							
count	high	low	average	guidelines	guidelines			count	high	low	average	guidelines	guidelines		
Free-CL2	26	0.76	0.00	0.48	2	8%		Free-CL2	26	0.64	0.38	0.54	0	0%	
EColi	26	0.00	0.00	0.00	0	0%		EColi	26	0.00	0.00	0.00	0	0%	
HPC	25	44.00	0.00	2.24	0	0%		HPC	25	20.00	0.00	0.96	0	0%	
Coliform	26	0.00	0.00	0.00	0	0%		Coliform	26	0.00	0.00	0.00	0	0%	
Temp	26	18.00	2.00	10.58	5	19%		Temp	26	17.00	5.00	10.62	4	15%	
Turbidity	26	1.80	0.11	0.41	2	8%		Turbidity	26	0.66	0.10	0.25	0	0%	
811 385 1050 Heywood								820 385 209 Moody							
# outside %outside								# outside %outside							
count	high	low	average	guidelines	guidelines			count	high	low	average	guidelines	guidelines		
Free-CL2	26	1.10	0.36	0.65	0	0%		Free-CL2	26	0.85	0.09	0.51	2	8%	
EColi	26	0.00	0.00	0.00	0	0%		EColi	26	0.00	0.00	0.00	0	0%	
HPC	25	600.0	0.00	24.72	1	4%		HPC	25	24.00	0.00	1.44	0	0%	
Coliform	26	0.00	0.00	0.00	0	0%		Coliform	26	0.00	0.00	0.00	0	0%	
Temp	26	16.00	2.50	9.77	4	15%		Temp	26	16.00	2.00	9.77	2	8%	
Turbidity	26	0.48	0.11	0.22	0	0%		Turbidity	26	2.30	0.09	0.36	2	8%	

The following analytical results are from the City's distribution system and include: disinfection by-products (DBPs) (Haloacetic Acids and Trihalomethanes), metals and vinyl chloride. DBP is a term used to describe a group of organic and inorganic compounds formed during water disinfection. This monitoring is required under the Water Quality Monitoring and Reporting Plan for the GVRD and Member Municipalities.

The table below shows the current guidelines.

Parameter	Guidelines for Canadian Drinking Water
Total Trihalomethanes	100 µg/L (ppb) or 0.1 mg/L (ppm)
Total Haloacetic Acids ⁽⁵⁾	80 µg/L (ppb) or 0.080 mg/L (ppm)
Copper	≤1000 µg/L (ppb) or ≤ 1.0 mg/L (AO)
Iron	≤ 300 µg/L (ppb) or ≤0.3 mg/L (AO)
Lead	10 µg/L (ppb) or 0.01 mg/L (MAC)
Zinc	≤ 5000 µg/L (ppb) or ≤ 5.0 mg/L (AO)
Vinyl Chloride	2 µg/L (ppb) or 0.002 mg/L (MAC)

(MAC) Maximum Acceptable Concentration (AO) Aesthetic Objective

The table below contains the data from the analysis carried out each quarter for the individual compounds in each group of disinfection by-products. The standard for these compounds is based on the total amount of the group detected, therefore the total for each group has been calculated for each site. The table also contains the quarterly running average results for total Trihalomethanes and total Haloacetic Acids for individual sites. Results are both within Canadian guideline limits.

Semiannual vinyl chloride analysis is done where PVC pipe is used in the distribution system. Analysis was provided in the 2nd and 4th quarters for Station 814 in the Tempe Heights area. Both samples were within Canadian guideline limits.

Quarterly Disinfection By-Products Results – 2014

Source	Period 2014	Total THMs Ppb (100 mg/L max acceptable)	Total HAAs Acids ppb (80 mg/L max acceptable)	Quarterly Average THMs ppb	Quarterly Average HAAs ppb	Chloride Vinyl ug/L (2mg/L max acceptable)
807	1 st Qtr	17.3	16.3	25	25	
	2 nd Qtr	28.2	44.4	24	25	
	3 rd Qtr	23.1	43.2	23	30	
	4 th Qtr	23.3	27.3	23	33	
808	1 st Qtr	17.5	18.3	26	28	
	2 nd Qtr	33.1	49.8	26	29	
	3 rd Qtr	28.2	49.1	25	34	
	4 th Qtr	24.9	27.4	26	36	
812	1 st Qtr	22.6	22.3	33	28	
	2 nd Qtr	39.1	39.8	30	23	
	3 rd Qtr	46.7	28	33	28	
	4 th Qtr	30.5	27.1	35	29	
814	2 nd Qtr					<0.0010
814	4 th Qtr					<0.0010

The maximum acceptable concentration (MAC) in the Canadian Guidelines for TTHMs is a location yearly running average of 100 ug/L based on quarterly samples.

Metals analysis is done semiannually. Copper, Iron, Lead and Zinc are the parameters required under the Water Quality Monitoring and Reporting Plan but since the method of analysis produces other metals results, they are included. All the results were within the guidelines.

Metals Sampling Results – 2014

	Station 801 550 West 28th Street		Station 803 264-268 East 9th Street		Station 804 848 East 6th Street	
Date Collected	1 st Half	2 nd Half	1 st Half	2 nd Half	1 st Half	2 nd Half
Aluminum Total ug/L	23	36	23	37	25	40
Antimony Total ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic Total ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Barium Total ug/L	3	3.1	3	3.2	2.9	3.1
Boron Total ug/L	<10	<10	<10	<10	<10	<10
Cadmium Total ug/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Calcium Total ug/L	3900	3420	3840	3390	3800	3410
Chromium Total ug/L	<0.05	<.05	<0.05	,0.05	<0.05	0.05
Cobalt Total ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Copper Total ug/L	3.4	3	6.1	6.3	10.6	11.7
Iron Total ug/L	238	121	369	200	17	44
Lead Total ug/L	<0.5	<0.5	<0.5	2.2	<0.5	<0.5
Magnesium Total ug/L	157	139	161	141	157	139
Manganese Total ug/L	2.9	3	6.5	4.5	1.2	1.6
Mercury Total ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Molybdenum Total ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel Total ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Potassium ug/L	151	159	146	210	149	161
Selenium Total ug/L	<0.5	<0.5	<0.5	<0.5	<.5	<0.5
Silver Total ug/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sodium Total ug/L	1310	1530	1320	1520	1310	1510
Zinc Total ug/L	<3	<3	<3	<3	<3	<3

Parameter	Guidelines for Canadian Drinking Water
Copper	≤1000 µg/L (ppb) or ≤ 1.0 mg/L (AO)
Iron	≤ 300 µg/L (ppb) or ≤0.3 mg/L (AO)
Lead	10 µg/L (ppb) or 0.01 mg/L (MAC)
Zinc	≤ 5000 µg/L (ppb) or ≤ 5.0 mg/L (AO)

Appendix C: Water Sample Trends

Appendix C was an addition to the Water Quality Report in 2003 and provides a year-to-year comparison of sampling results to help understand trends with regard to water quality. The appendix provides information for the six most recent years.

The table and chart statistics are based on the results from the six weekly sampling parameters taken for the water distribution system as a whole and do not separate the four different pressure zones within the City's system.

The tables present a summary of the weekly sampling station results, not including the high and low categories, for each of the last six years. The acceptable limits for each category are listed in between the tables for comparison to the averages.

The six charts compare each sampling parameter by year with respect to the number of samples outside the target standards described in Appendix B.

Tables: System Wide Summary of Weekly Samples

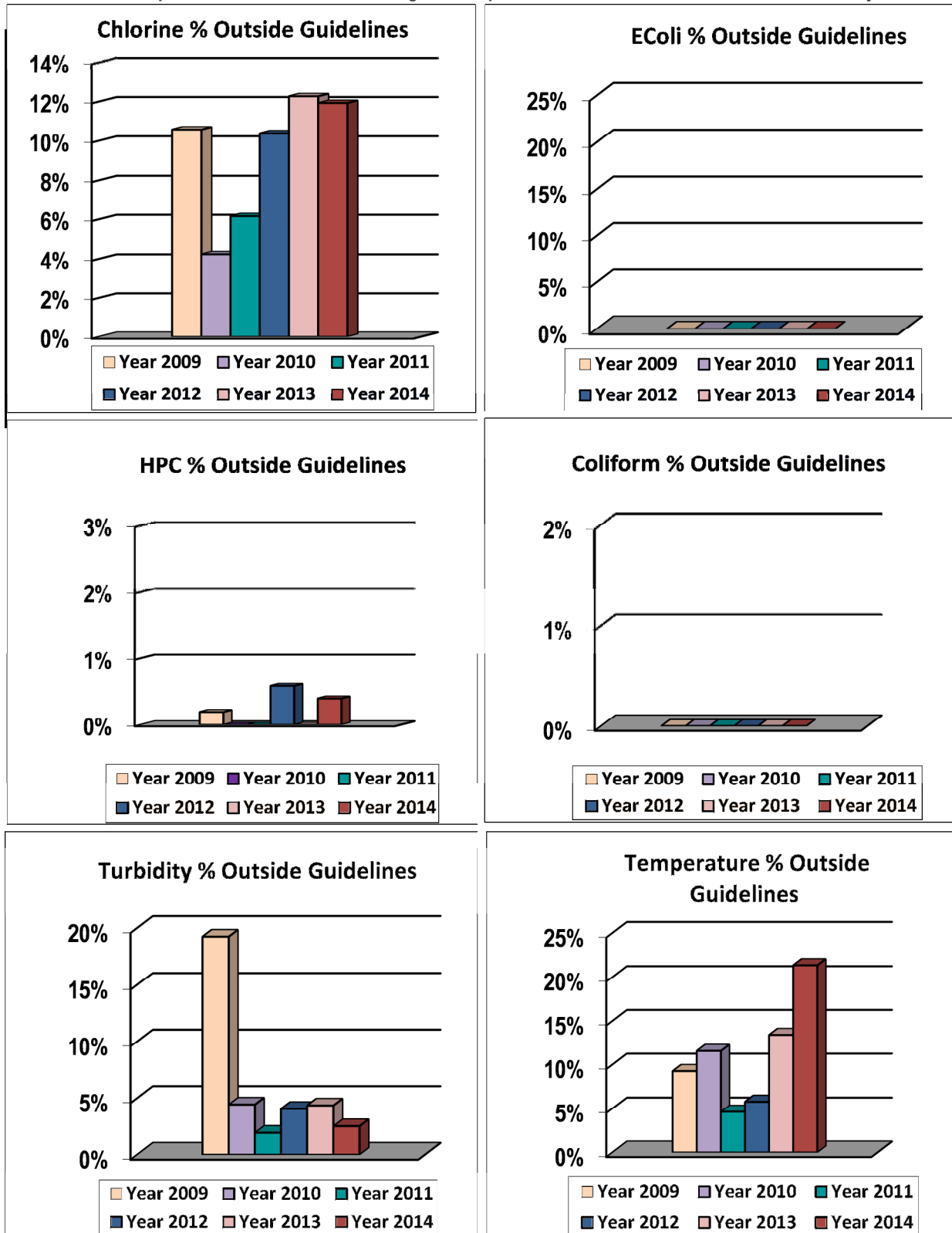
#Outside %Outside					Max	#Outside %Outside					Max
Year	Count	Guidelines	Guidelines	Averages		Year	Count	Guidelines	Guidelines	Averages	
Year 2009	Count	Guidelines	Guidelines	Averages	Guideline	Year 2010	Count	Guidelines	Guidelines	Averages	Guideline
Free-CL2	520	55	10.58%	0.69	<.2	Free-CL2	520	22	4.23%	0.74	<.2
EColi	520	0	0.00%	0.00	>0	EColi	520	0	0.00%	0.00	>0
HPC	507	1	0.20%	3.97	>500	HPC	508	0	0.00%	1.65	>500
Coliform	520	0	0.00%	0.01	>10	Coliform	520	0	0.00%	0.00	>10
Temp	519	48	9.25%	9.24	>15	Temp	520	60	11.54%	10.09	>15
Turbidity	520	100	19.23%	0.94	>1	Turbidity	520	23	4.42%	0.37	>1

#Outside %Outside					Max	#Outside %Outside					Max
Year	Count	Guidelines	Guidelines	Averages		Year	Count	Guidelines	Guidelines	Averages	
Year 2011	Count	Guidelines	Guidelines	Averages	Guideline	Year 2012	Count	Guidelines	Guidelines	Averages	Guideline
Free-CL2	520	32	6.15%	0.59	<.2	Free-CL2	520	54	10.38%	0.60	<.2
EColi	520	0	0.00%	0.00	>0	EColi	520	0	0.00%	0.00	>0
HPC	508	0	0.00%	2.39	>500	HPC	509	3	0.59%	12.10	>500
Coliform	520	0	0.00%	0.00	>10	Coliform	520	0	0.00%	0.00	>10
Temp	520	24	4.62%	8.79	>15	Temp	520	30	5.77%	9.08	>15
Turbidity	520	10	1.92%	0.24	>1	Turbidity	520	21	4.04%	0.47	>1

#Outside %Outside					Max	#Outside %Outside					Max
Year	Count	Guidelines	Guidelines	Averages		Year	Count	Guidelines	Guidelines	Averages	
Year 2013	Count	Guidelines	Guidelines	Averages	Guideline	Year 2014	Count	Guidelines	Guidelines	Averages	Guideline
Free-CL2	530	65	12.26%	0.53	<.2	Free-CL2	520	62	11.92%	0.48	<.2
EColi	530	0	0.00%	0.00	>0	EColi	520	0	0.00%	0.00	>0
HPC	510	0	0.00%	7.51	>500	HPC	500	2	0.40%	4.27	>500
Coliform	530	0	0.00%	0.00	>10	Coliform	520	0	0.00%	0.00	>10
Temp	530	71	13.40%	10.08	>15	Temp	520	111	21.35%	10.79	>15
Turbidity	530	23	4.34%	0.29	>1	Turbidity	520	13	2.50%	0.34	>1

Note: It should be recognized the sampling parameter averages are sometimes skewed by high values for a low number of samples outside of the guidelines.

Charts: Comparison of the Annual Percentage of Samples Outside of the Guidelines for CNV Water System



Appendix D: Notification and Emergency Response Plan

1. Notification Requirements: for situations that may affect water potability.

Situation	Notifying Agency	Agency Notified	Time Frame For Notification
E. coli Positive Sample	GVWD	CNV and VCH	Immediate
Total Coliforms over 10/100mLs and no chlorine residual	GVWD	CNV	Immediate
Chemical Contamination	GVWD	CNV and VCH	Immediate
Chemical Contamination - Municipality	CNV	VCH GVWD and DNV	Immediate
Turbidity > 5 NTU	CNV/GVWD	CNV and VCH	Immediate
GVWD Disinfection Failure	GVWD	CNV and VCH	Immediate in any situation where water quality regulations may not be met.
Loss of Pressure Due to High Demand	CNV	GVWD Operations and VCH	Immediate
Main Break With Suspected Contamination	CNV	VCH	Immediate
Main Break With Potential Environmental Damage	CNV	MOE	Immediate

2. Response Plans:

[a] E.coli Positive Samples

1. If any interim samples have been taken from the site they will be examined by the lab. Interim samples are 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.
2. 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.
3. The Section Manager – Utilities or designate and the VCH will be notified immediately by the GVWD laboratory.
4. Arrangements will be made for the immediate collection of a repeat sample and where possible, samples from upstream and downstream of the E.coli positive sample location.
5. VCH will be contacted and the need for a "boil water" notice will be evaluated.
6. If a boil water notice is warranted, the public notification process as outlined in the Water Quality Monitoring and Reporting Plan for the GVWD and Member

Municipalities will be followed. The boil water notice will be under the direction of Vancouver Coastal Health.

7. The lab will initiate the procedures necessary for the identification of E.coli with standard biochemical tests.
8. The lab will contact the CNV with consecutive negative sample results and the results of the species identification tests. The CNV will contact VCH to evaluate these results and to determine whether the advisory can be lifted.

[b] Chemical Contamination

In the event of chemical contamination in the water distribution system, VCH 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. A public advisory will be carried out under the guidance of VCH.

[c] Turbidity Events

Turbidity in the water distribution system is monitored on a regular basis through the water sampling program. Water sampling results yielding readings > 1 NTU are scrutinized, along with corresponding free chlorine. Any sections of the water system generating high turbidity results will be field checked and flushed if necessary.

For turbidity sample results > 5 NTU, VCH will be immediately notified and an evaluation made for any necessary actions. The Source Water Turbidity event procedures are noted below.

[d] GVWD Disinfection Failure

Upon notification by GVWD that an interruption in disinfection has occurred, the City will immediately commence more frequent monitoring of free chlorine residual levels at strategic locations. The monitoring frequency will be at the advice of the GVWD and VCH which will continue until disinfection is resumed.

[e] Loss of Pressure

In the event of extreme pressure loss, the City will isolate the section or facility from the distribution system and supplement pressure to the affected area. The City will immediately consult with GVWD and VCH regarding further actions. All water quality complaints from the public will be immediately and thoroughly investigated for potential contamination.

[f] Water Main Break

For water main breaks where chemical or microbiological contamination of the system is suspected, the City will isolate the contaminated section from the rest of the distribution system. The City will immediately consult with VCH regarding further actions. All water quality complaints from the public will be immediately and thoroughly investigated for potential contamination.

Water samples will be taken from the vicinity of all water main breaks and tested for bacteria if contamination is suspected. The procedures outlined above in [b] will be implemented if necessary.

The Emergency Management British Columbia will also be notified if the water main break results in potential harm to fish habitat (chlorine or siltation).

3. Follow Up

Following a return to normal after any of the above situations, an assessment will be made for the need to notify the affected public.

4. Response Protocol addition for part [c] Turbidity Events

The procedures below are from the Source Water Turbidity Communications Task Force and endorsed by the REAC Water Subcommittee at its meeting on March 12th, 2008 and by the Medical Health Officers from the Vancouver Coastal and Fraser Health Authorities at a meeting on April 7, 2008.

Metro Vancouver Communications Responsibilities

Requirement	Status	Comments
Notify Vancouver Coastal Health (VCH) as required under the Drinking Water Protection Act and provide timely updates to VCH and Fraser Health (FH) as required.	No change from current practice.	Vancouver Coastal Health is the Regulator of the Greater Vancouver Water District under the Drinking Water Protection Act.
Notify member municipalities and provide timely updates. Concurrent or advance notification is required when public messages are involved. , Notify municipal Water Quality Contacts (or alternate as required) by phone (24/7) for extraordinary turbidity events.	There is an established practice to notify both operations and water quality contacts of municipalities.	The intent is to use telephone, email, pager or other means of communication as required until it is confirmed that the notification of an extraordinary event has been received by each municipality.
Maintain up-to-date phone and e-mail contact lists.	Updated on regular basis.	
For water quality issues related to the regional (GVWD) water system, take the lead in the development of public messages in advance by working with the Vancouver Coastal Health Authority (GVWD Regulator) and the Fraser Health Authority.		General guidelines for public messages for source water turbidity events are shown on page 4.
For water quality issues related to the regional (GVWD) water system, notify the general public by using appropriate means.	No change from current practice.	Metro Vancouver is responsible for broad public communications. Communications to specific groups is the responsibility of the municipalities and Health Authorities.

Requirement	Status	Comments
For extraordinary turbidity events, organize conference calls and invite municipalities to participate along with health authorities.	As required.	Highly effective way of coordinating response.
For extraordinary turbidity events, notify the BC Nurse Line.	New	Improved communication.
Answer calls from the public and refer calls to health authorities and specific municipalities as required.	No change from current practice.	
At the end of the event, provide information to the Health Authorities and affected municipalities that the situation has improved to the point where normal operations can be resumed.	New	

Communications Responsibilities of Health Authorities

Requirement	Status	Comments
Regulatory issues.	Underway.	Working to ensure clarity and consistency of terminology.
Assist water suppliers with drafting answers to health-related questions from the public and with identifying communications responsibilities for specific groups.	New.	Will facilitate consistent and appropriate communication and messaging.
Refer regional water system operational questions to Metro Vancouver.	No change.	
Refer local water system questions to the appropriate municipality.	No change.	
Improve communication protocols between Vancouver Coastal and Fraser Health authorities.	Underway.	For example, VCH and FH will harmonize their Question and Answer sheets for Turbidity.
As required, answer calls from the public and refer calls to Metro Vancouver and specific municipalities.	No change.	
Maintain up-to-date phone and e-mail contact lists.	Updated on a regular basis.	

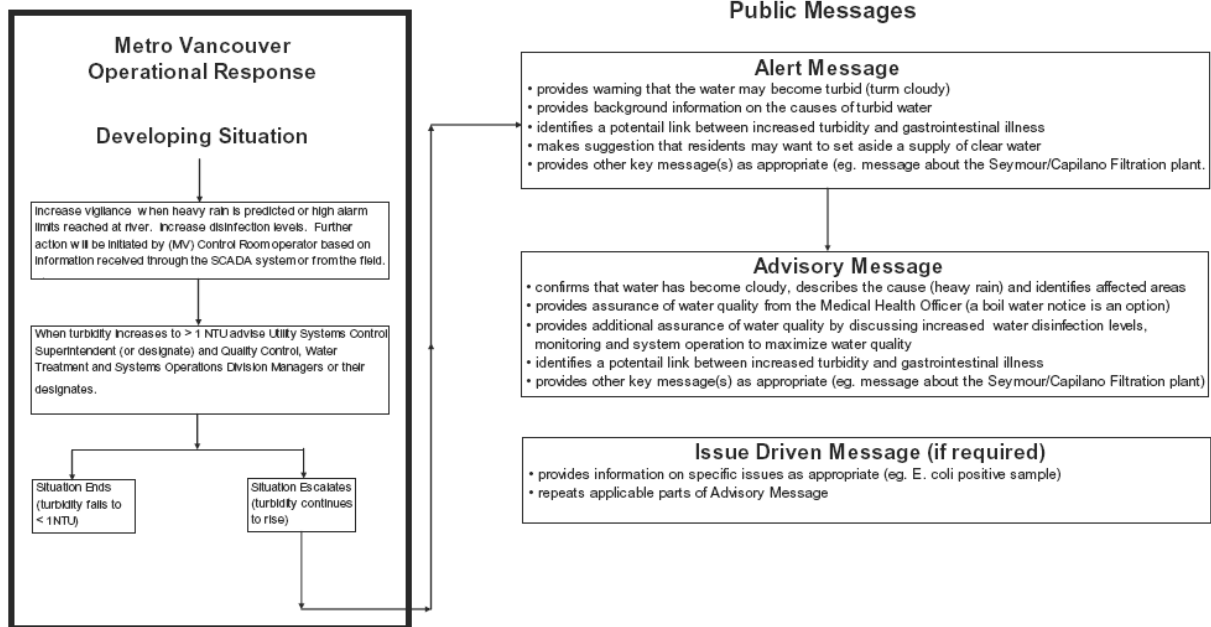
Requirement	Status	Comments
For extraordinary events, the VCH MHO will direct Metro Vancouver to organize and implement regular conference calls. VCH and FH (if applicable) and all member municipalities should be invited to participate.	New.	Highly effective way of coordinating response.
Confirm to all participants that normal operations can be resumed and special communications efforts (e.g. web site messages etc.) can be ended.	New	

Communications Responsibilities of Municipalities

Requirement	Status	Comments
Municipalities must notify the appropriate health authority drinking water program staff of an extraordinary turbidity event (unless both parties participate in a conference call – the conference call will constitute notification).	No change.	Meets regulatory requirement.
Include customer notification as part of the municipal water supply plan. Consult with the health authority about notification responsibilities for specific groups.	Some municipalities have begun this work.	Will clarify customer notification processes.
Answer local calls and enquiries and refer calls to Metro Vancouver and health authorities as required.	No change.	
Maintain up-to-date phone and e-mail contact lists.	Updated on a regular basis.	
Respond to local issues.	No change from current practices.	
Develop answers to anticipated questions from consumers. For matters related to health, consult the health authority before finalizing messages which involve health issues. In consultation with the health authority, develop processes for referring callers with questions about clinical symptoms to health professionals.	Municipalities in various stages of this process.	Will improve ability of municipalities to respond to questions from the public.

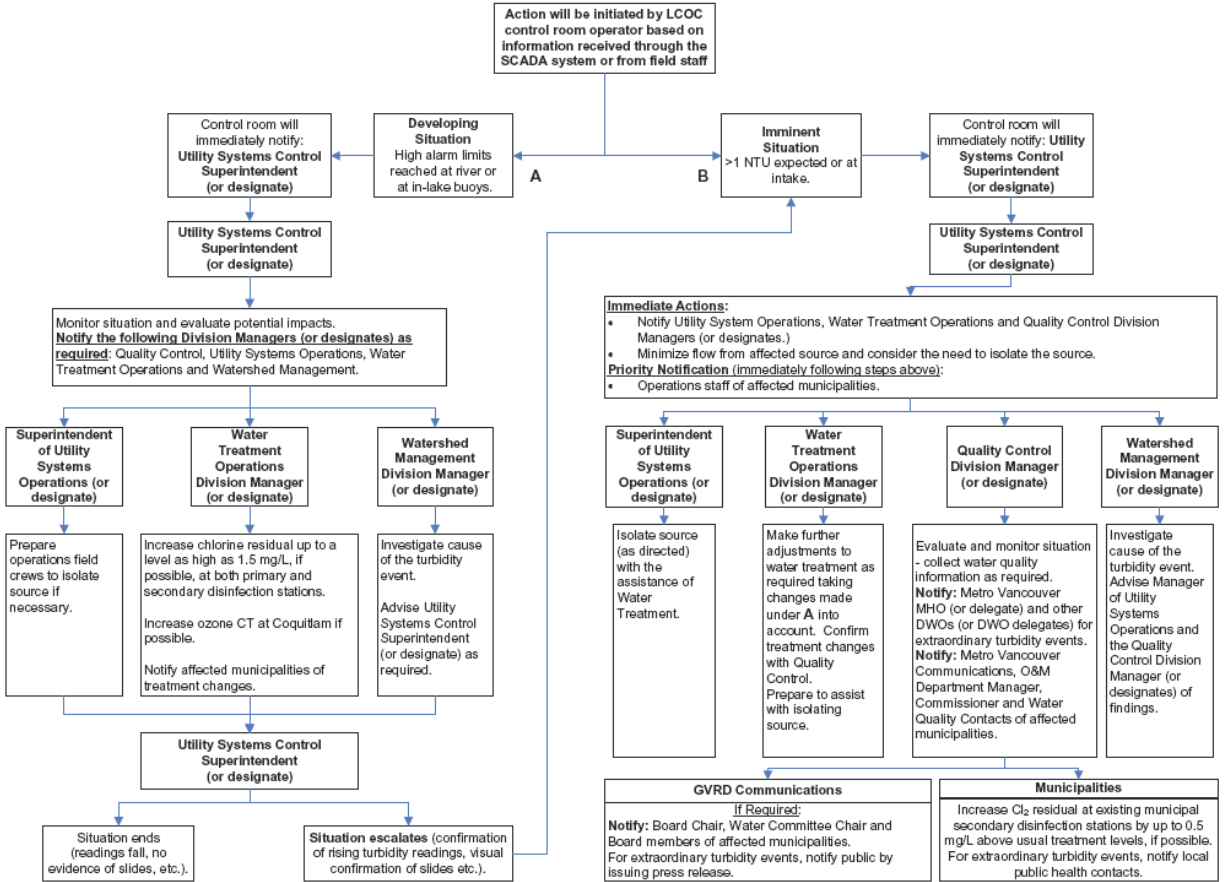
Requirement	Status	Comments
Ensure that local messages are consistent with Metro Vancouver messages and refer regional water system operational issues to Metro Vancouver.	Municipalities in various stages of this process.	Will improve ability of municipalities to respond to questions from the public.
Based on information received from Metro Vancouver regarding the resumption of normal operations, inform the applicable health authority that normal operations can be resumed.	New	

Guidelines For Source Water Turbidity Event Messages



SOURCE WATER TURBIDITY EVENTS

Metro Vancouver and Municipal Response Procedures



Updated October 2007