Environment | Water Resources Branch

Water Licence Audit Report

City of Whitehorse Stormwater

Date of site visit: April 18th and 23rd, 2020	**Audit Team:** John Minder
Licensee: City of Whitehorse	**Prepared by:** Meghan Bouvier, Amelie Janin, and Stephanie Lyons
Licence number: MN20-008 (In Review)	**Distribution list:** YG-ENV-EC&I, City of Whitehorse, Yukon Water Board

The Water Resource Branch (WRB) is responsible for monitoring surface and groundwater in Yukon and is committed to responsible management, protection and conservation of the territory's water resources. As technical experts in water resources, we provide advice for compliance and inspections purposes and conduct reviews of projects undergoing water licensing and environmental assessment processes.
One of WRB's responsibilities is to conduct site visits of various undertakings that use or deposit waste to water. Site visits are undertaken to improve understanding of a project's effects on the receiving water environment, with the intention of identifying emerging issues and enhancing understanding of existing water quality and quantity conditions to support technical advice and input into assessment, licensing, and post-licensing processes. The opinions and recommendations expressed in this report are based on relevant data, reports, interpretation/analyses of scientific information available to WRB, and what was observed in the field.

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1. Key Findings

- Five storm sewers were sampled on April 18 or 23, 2020; (WH)STRICK-SS (Strickland Street outfall), (WH)HNSN (Hanson Street outfall), (WH)Spook-SS (Spook Creek outfall), (WH)SSD-04 (Selkirk Street outfall) and (WH)SSD-01 (FH Collins outfall).
- All five samples collected showed exceedances of the Canadian Council of Ministers of the Environment's (CCME) water quality guidelines for the protection of aquatic life and the Yukon Contaminated Sites Regulation (CSR) standards. Three samples (Hanson, Strickland and Spook) exceeded the Whitehorse Sewer and Storm Bylaw (SSB).
- Parameters that exceeded guidelines in the April 2020 sampling included: silver, aluminum, arsenic, cadmium, cobalt, chromium, copper, iron, lead, benzo-a-pyrene, pyrene, light extractable petroleum hydrocarbons, titanium, total suspended solids, and zinc.
- The earliest sampling of these sites occurred in 1988. Of the 110 samples collected at the sites since 1988, 41% had exceedances of one or more water quality guidelines.

2. Background

- The Whitehorse Municipal Water Use Licence (WUL) application (MN20-008) is currently being reviewed by the Yukon Water Board. The previous WUL is MN18-059.
- Stormwater in Whitehorse is managed via ditches, drains, culverts and other infrastructure.
- Stormwater discharges to low laying vegetation areas and the Yukon River. According to the MN20-008 application, there are 19 stormwater outfalls in the City of Whitehorse that drain directly to the Yukon River (See Figure 1).
- The Strickland Street outfall is the only stormwater site required to be monitored by the previous WUL. During breakup, oil and grease, pH, fecal coliforms, chloride, total zinc, total copper, total cadmium, and total lead were required to be sampled. During mid-season and September sampling COD, oil and grease, and phenols were required to be sampled.
- The majority of stormwater does not enter the wastewater system or treatment facilities, with the exception of Riverdale and some isolated areas downtown, where stormwater flows into the sanitary system.

- Stormwater is directed by gravity, with the exception of two lift stations located at Ogilvie Street and Strickland Street. Both lift stations pump stormwater from the downtown area into the Yukon River.
- The stormwater system is largely inactive between November and April as a result of below-freezing temperatures.
- Maintenance of the stormwater system includes multiple seasonal cleaning measures as well as emergency repairs and brushing at stormwater infrastructure as required.
- Vacuum trucks are used to remove liquids and debris from manholes, storm lines, and catch basins annually.

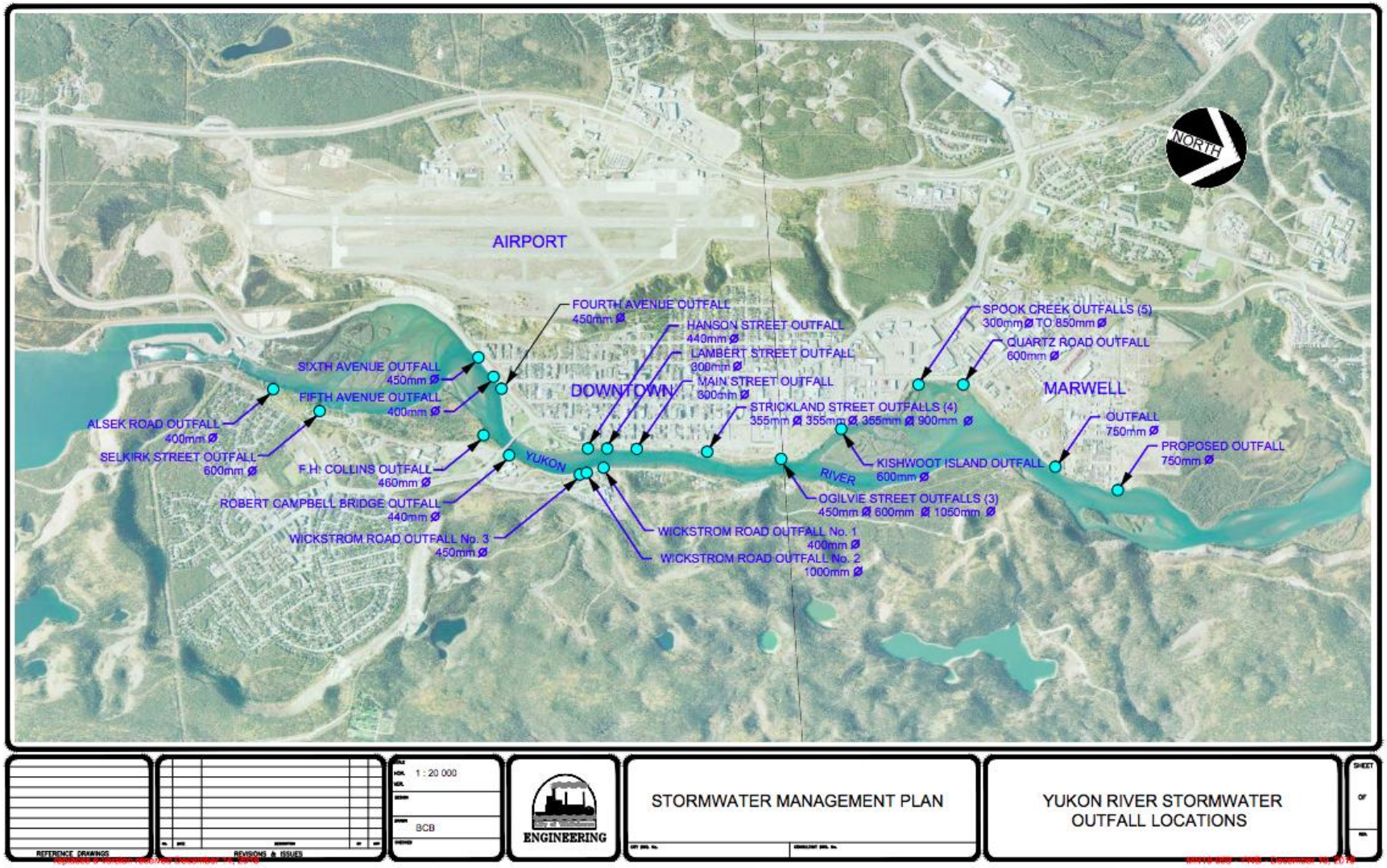

Figure 1. Location of the 19 stormwater sites in Whitehorse with direct discharge into Yukon River including a proposed location in the industrial area. Retrieved from the MN20-008 Water Licence Application, Appendix B

3. Audit Objective

The objective of this audit was to characterize the water quality at five stormwater drains during spring melt to determine if there were any exceedances of guidelines and standards. Three of the five sampled locations are not monitored on a regular basis by the City.

4. Compliance

The City of Whitehorse was previously authorized to "collect, convey and discharge stormwater to the Yukon River through existing stormwater outfalls" as per Water Licence MN18-059. This licence expired May 1, 2020. The City is still required to ensure the Waters Act is not contravened by allowing the use or deposit of waste in any waters. There are no water quality standards in the WUL that apply to the discharge of stormwater to the Yukon River. Therefore this report does not speak for compliance, rather it intends to compare the observed water quality with existing guidelines.

5. Water Quality Trends and Results

Five sites were sampled in the April 2020 audit (Table 1). All five of the sites exceeded CCME guidelines for aluminum, copper, and iron. The five sites also exceeded CSR guidelines for cadmium and copper. The method detection limit (MDL) for light extractable petroleum hydrocarbons (LEPH) is higher than the CSR guideline, therefore the results for all sample sites were flagged as potential exceedances and may or may not actually exceed the standard. Exceedances and potential exceedances observed in these samples are presented in Table 2.

Table 1. Location of stormwater outfall samples taken April 2020 by WRB.

Site Description	Sample Station	Sample Date (MM-DD-YYYY)	Latitude	Longitude
Hanson Street	(WH)HNSN	04-18-2020	60.7178	-135.0478
Spook Creek	(WH)Spook-SS	04-18-2020	60.7322	-135.0668
Selkirk Street	(WH)SSD-04	04-18-2020	60.7038	-135.0415
Strickland Street	(WH)STRICK-SS	04-23-2020	60.7234	-135.0513
FH Collins	(WH)SSD-01	04-18-2020	60.7125	-135.0450

Fecal Coliforms were detected in samples at four of the five sites sampled in April 2020 (Table 3). Currently there are no CCME, CSR or SSB guidelines for fecal coliforms, however the previous WUL for the City of Whitehorse had established Effluent Quality

Standards of 2000 MPN/100 mL in the sewage effluent being discharged and 200 MPN/100mL in the Yukon River itself.

Two methods can be used to measure fecal coliform results in a sample. One is a statistical analysis known as the Most Probable Number method (MPN). Organisms grow in a liquid medium and the analysis is done by comparing the number of positive growth samples. MPN is measured in MPN/100mL. The other method is Colony Forming Units (CFU), this is a direct count of colonies that have formed on a solid medium (i.e. agar). CFU is measured in cfu/100mL. It is possible to receive different results from the same sample when using the different methods. However, both units are considered to be equivalent and represent the same value; number of fecal coliform organisms found in 100mL of sample. The CFU method of analysis was used for the analysis of the five samples collected in April 2020. Fecal coliform samples were processed and analyzed by WRB staff in the lab.

Table 2. Comparison of the April 2020 stormwater outfall samples taken by WRB against the CCME, CSR, and SSB standards/guidelines.

Parameter	Water Quality Standard/Guideline (mg/L)			Sample Station				
				(WH)HNSN Hanson Street	(WH)Spook-SS Spook Creek	(WH)SSD-04 Millennium Trial near Selkirk Street	(WH)STRICK-SS Strickland Street	(WH)SSD-01 Millennium Trial near FH Collins
	CCME	CSR	SSB	04/18/2020	04/18/2020	04/18/2020	04/23/2020	04/18/2020
Aluminum-T	*		50	7.53 (CCME)	21.3 (CCME)	0.898 (CCME)	7.11 (CCME)	0.453 (CCME)
Arsenic-T	0.005	0.005	1	0.00856 (CCME CSR)	0.0201 (CCME CSR)	0.00519 (CCME CSR)	0.00653 (CCME CSR)	0.00362
Benzo-a-pyrene		10		<10	<10	<10	45 (CSR)	<10
Cadmium-T	*	*	0.1	0.000237 (CCME CSR)	0.00106 (CCME CSR)	0.000074 (CSR)	0.000189 (CCME CSR)	0.000047 (CSR)
Chromium-T	0.0089		2.8	0.0188 (CCME)	0.0567 (CCME)	0.00223	0.018 (CCME)	0.00144
Cobalt-T		0.0009	5.0	0.00498 (CSR)	0.022 (CSR)	0.00142 (CSR)	0.00519 (CSR)	0.00082
Copper-T	*	*	1	0.0248 (CCME CSR)	0.0745 (CCME CSR)	0.0106 (CCME CSR)	0.027 (CCME CSR)	0.0056 (CCME CSR)
Iron-T	0.3		5	9.89 CCME (SSB)	31.5 CCME SSB	1.59 (CCME)	9.36 CCME SSB	0.688 (CCME)
Lead-T	*	*	0.7	0.00568 (CCME CSR)	0.0226 (CCME CSR)	0.00142	0.00736 (CCME CSR)	0.00147 (CCME)
LEPH		50		<250 (CSR)	<250 (CSR)	<250 (CSR)	<250 (CSR)	<250 (CSR)
Pyrene		20		<20	<20	<20	72 (CSR)	<20
Silver-T	0.00025	*	0.4	0.000111 (CSR)	0.000252 (CCME)	0.000052 (CSR)	0.000116 (CSR)	<0.000050
Titanium-T		0.1	5	0.311 (CSR)	0.919 (CSR)	0.026	0.253 (CSR)	0.0105
TSS			300	342 (SSB)	3220 (SSB)	20.2	176	30

Note: CCME- Canadian Council of Ministers of the Environment; CSR- Yukon Contaminated Sites Regulations; SSB- Whitehorse Sewer and Storm Bylaw; T- Total; LEPH- Light Extractable Petroleum Hydrocarbons, TSS- Total Suspended Solids.
Only parameters with exceedances or potential exceedance are shown. If the source of the standard is blank, it indicates there is no standard. If the source of the standard has a *, it indicates the standard is calculated (Appendix A). Highlighted values are either in exceedance or potential exceedance with the indicated standard/guideline in brackets.

Table 3. Fecal Coliform results for the April 2020 stormwater outfall samples taken by WRB.

Sample Station	Fecal Coliform Results (cfu/100mL)
(WH)HNSN	110
(WH)Spook-SS	<1
(WH)SSD-04	21
(WH)STRICK-SS	10
(WH)SSD-01	32

6. Historical Results

There have been 110 samples collected from the five sites selected for this audit since 1988. Two samples were collected in 1988 and 108 samples from 1992 – April 23, 2020. (WH)STRICK-SS has been sampled regularly since 1992. (WH)HNSN has been sampled sporadically since 1999. (WH)Spook-SS has been samples sporadically since 2012. The storm drains (WH)SSD-04 and (WH)SSD-01 were both sampled for the first time during April 2020 sampling. Historical data for the five stormwater sites is summarized in Table 4.

Of the five sites sampled on April 18 and 23, 2020, and their combined 108 samples collected since 1992, 43 of those samples had water quality guideline exceedances. It is worth noting that all 65 samples with no recorded exceedances were collected at the Strickland Street site and have relatively little data when compared to all other samples. CCME exceedances occurred at 39 of the 43 samples with silver, aluminum, arsenic, chromium, iron, selenium, and zinc being the most common. Whitehorse Sewer and Storm Bylaw exceedances occurred at 11 of the 43 samples with iron and total suspended solids being the most common. Yukon CSR were exceeded at 42 of the 43 samples for cadmium, copper, and zinc guidelines. Silver, arsenic, cobalt, lead, selenium, and titanium commonly exceeded CSR guideline values.

All three guidelines (CCME, CSR and SSB) had water quality exceedances for both samples collected in 1988.

Fecal Coliforms were analyzed in 30 of the 110 samples, of those, 21 samples had results exceeding the MDL (Table 5).

Table 4. Summary of all the historical water quality data for (WH)HNSN, (WH)Spook-SS, (WH)SSD-04, (WH)STRICK-SS, and (WH)SSD-01 (n=110).

Parameter (mg/L)	Water Quality Standard/Guideline			% of samples over Standard/Guideline	# of exceedances/ # of samples	Mean	Median
	CCME	CSR	SSB				
Aluminum-T	*		50	44.40%	16 / 36	6.504278	2.24
Ammonium	*	*		5%	1 / 20	0.2097	0.144
Antimony-T		0.02	5.0	5.70%	2 / 35	0.005305	0.002
Arsenic-T	0.005	0.005	1.0	62.20%	23 / 37	0.021573	0.0081
Benzo-a-pyrene		10		16.70%	1 / 6	12.5	5
Cadmium-T	*	*	0.1	100%	44 / 44	0.548547	0.00025
COD			600	1.30%	1 / 76	234.8487	22.5
Chromium-T	0.0089		2.8	32.40%	12 / 37	0.013996	0.006
Cobalt-T		0.0009	5.0	86.50%	32 / 37	0.032866	0.00154
Copper-T	*	*	1	100%	44 / 44	0.027913	0.0182
Iron-T	0.3		5	91.90%	34 / 37	8.168459	2.94
Lead-T	*	*	0.7	68.20%	30 / 44	0.030229	0.005
LEPH		50		100%	5 / 5	125	125
Nickel-T	*	*	2	5.70%	2 / 35	0.014198	0.007
N-NH3u(calc)	0.019			7.70%	1 / 13	0.00676	0.00133
Nitrite	0.06	*		11.80%	2 / 17	0.027618	0.011
pH-F	6.5 - 9		5.5 - 10.5	7.10%	2 / 28	7.862857	7.865
Pyrene		20		20%	1 / 5	22.4	10
Selenium-T	0.001	0.001	0.80	50%	18 / 36	0.006157	0.00125
Silver-T	0.00025	*	0.4	62.50%	20 / 32	0.001029	0.0001055
Titanium-T		0.1	5.0	42.40%	14 / 33	0.312427	0.083
TSS			300	16.20%	6 / 37	246.9378	91
Uranium-T	0.033	0.3		21.40%	6 / 28	0.01036	0.00373
Zinc-T	0.03	*	2	100%	44 / 44	0.090082	0.04485

Note: '*'- the standard is calculated (Appendix A); N-NH3u(calc)- Ammonia, un-ionized (NH3), as N @15C; COD- Chemical Oxygen Demand; LEPH- Light Extractable Petroleum Hydrocarbons; TSS- Total Suspended Solids..
Includes all parameters with exceedances and the percentage of samples that exceeded a guideline or standard. No standard value exists where the value is blank. Half the MDL (method detection limit) was used to calculate the mean and median when the value was below the MDL.

Table 5. Historical fecal coliform results for (WH)HNSN, (WH)Spook-SS, (WH)SSD-04, (WH)STRICK-SS, and (WH)SSD-01.

Site	Date (MM-DD-YYYY)	Fecal Coliform Results (cfu/100mL)	Fecal Coliform Result (MPN/100mL)
(WH)HNSN	04-16-2012	70	-
	04-24-2014	14	-
	04-18-2020	110	-
(WH)Spook-SS	04-16-2012	<10	-
	04-16-2012	<10	-
	04-18-2020	<1	-
(WH)SSD-04	04-18-2020	21	-
(WH)STRICK-SS	05-31-1994	<2	-
	05-07-1995	<1	-
	05-06-1996	56	-
	05-05-1997	<3	-
	05-11-1999	5	-
	05-24-2001	7	-
	05-08-2002	<1	-
	05-03-2004	1	-
	05-16-2005	609	-
	05-07-2006	<10	-
	05-12-2009	-	900
	05-13-2009	900	-
	04-22-2010	10	-
	07-15-2011	2100	-
	04-16-2012	20	-
	04-24-2014	214	-
	04-08-2015	<1000	-
	04-25-2016	5	-
	04-26-2017	30	-
	04-25-2018	30	-
	04-26-2019	1	-
	04-23-2020	10	-
(WH)SSD-01	04-18-2020	32	-

7. Conclusions

Exceedance of the CCME Water Quality Guidelines indicates that the stormwater being discharged may be unsuitable for aquatic life organisms. Chemicals and fecal coliforms present in the stormwater are unlikely to be detected in the Yukon River because the volume of stormwater is significantly less than that of the Yukon River. However, depositing stormwater with concentrations of metals, hydrocarbons and fecal coliforms that exceed guidelines is not desired and should be monitored, controlled and managed. It should be noted that the City of Whitehorse is currently considering a

number of stormwater management actions that are described in the Water Licence application MN20-008.

The presence of Fecal Coliforms in the stormwater is likely due to the presence of excrements from dogs or other animals on the roads or adjacent landscape. Concentrations are generally below the 200 MPN/100 mL limit listed in the licence for the Yukon River. Discharge of Fecal Coliforms in the Yukon River through the stormwater is not likely to cause an effect in the Yukon River due to low count and dilution. Fecal Coliforms are short-lived and its toxicity decreases rapidly (i.e. the bacteria hosted in the digestive track of an animal is unlikely to survive for a long time in the stormwater or in the Yukon River).

8. Recommendations

Recommendation: Conduct robust monitoring of stormwater being discharged to the Yukon River

Rationale: The previous Water Licence, MN18-059, required the City of Whitehorse to monitor the stormwater from the Strickland Street lift station. Typically, the city has also reported stormwater data from Ogilvie Street. The licence required the monitoring of pH, fecal coliforms, chloride, total zinc, total copper, total cadmium and total lead during break-up, COD and phenols during mid-season and Oil and Grease during breakup, mid-season and in September.

YG recommended in its intervention to the Yukon Water Board the following:

1) Replace Oil and Grease is replaced with hydrocarbons (as defined in MN18-059) at breakup since hydrocarbons are regulated through CSR standards associated and “Oil and Grease” do not have associated guidelines.
2) Replace “total zinc, total copper, total cadmium and total lead” by “total metals”
3) Remove the requirement for fecal coliform analysis in the stormwater because fecal coliforms have a very short holding time and creates sampling logistical challenge Coliforms found in stormwater are likely from dog or animal excrement on the road and sidewalks, not sewage effluent, and is not present in large amount.

9. References:

CCME Standard for ammonia http://ceqg-rcqe.ccme.ca/download/en/141

City of Whitehorse. (2013). Sewer and Storm Utility Bylaw. https://www.whitehorse.ca/home/showdocument?id=76

City of Whitehorse, Municipal Water Licence Application MN20-080 https://apps.gov.yk.ca/waterline/f?p=127:3070:0::NO:::

City of Whitehorse, Municipal Water Licence MN18-059 https://apps.gov.yk.ca/waterline/f?p=127:3070:0::NO:3010,3070:P3010_APPLICATION_ID:7638&cs=379ECAD9DC7A820EBC431776F76D430DD

Environment Act - Contaminated Sites Regulation https://legislation.yukon.ca/regs/oic2002_171.pdf

10. Appendices:

Appendix A: Formulas for standards and guidelines

Parameter	Source of Standard/Guideline	
	CCME	CSR (ug/L)
Total Aluminum	= 5 µg/L if pH < 6.5 = 100 µg/L if pH ≥ 6.5	
Ammonia	See Table below	1310 @pH ≥ 8.5 3700 @pH 8.0 - < 8.5 11300 @pH 7.5 - < 8.0 18500 @pH 7.0 - < 7.5 18400 @pH < 7.0 Temperature 10°C assumed
Total Cadmium	The CWQG for cadmium (i.e. long-term guideline) of 0.09 µg·L^{-1} is for waters of 50 mg $CaCO_3$·L^{-1} hardness. The CWQG for cadmium is related to water hardness (as $CaCO_3$): When the water hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L At hardness ≥ 17 to ≤ 280 mg/L, the CWQG is calculated using this equation (see calculator below) CWQG (µg/L) = $10^{\{0.83[\log[\text{hardness}]) - 2.46\}}$ At hardness > 280 mg/L, the CWQG is 0.37 µg/L	0.1 @ H <30 0.3 @ H=30-<90 0.5 @ H=90-<150 0.6 @ H= 150-<210 H means water hardness in mg/L CaCO3
Total Copper	The CWQG for copper is related to water hardness (as $CaCO_3$): When the water hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L At hardness ≥82 to ≤180 mg/L the CWQG is calculated using this equation (see calculator below) CWQG (µg/L) = 0.2 * $e^{\{0.8545[ln(\underline{\text{hardness}})]-1.465\}}$ At hardness >180 mg/L, the CWQG is 4 µg/L If the hardness is unknown, the CWQG is 2 µg/L	20 @ H < 50 30 @ H = 50 - < 75 40 @ H = 75 - < 100 50 @ H = 100 - < 125 60 @ H = 125 - < 150 70 @ H = 150 - < 175 80 @ H = 175 - < 200 90 @ H ≥ 200 H means water hardness in mg/L CaCO3

Parameter	Source of Standard/Guideline	
	CCME	CSR (ug/L)
Total Lead	The CWQG for lead is related to water hardness (as $CaCO_3$): When the hardness is 0 to ≤ 60 mg/L, the CWQG is 1 µg/L At hardness >60 to ≤ 180 mg/L the CWQG is calculated using this equation (see calculator below) CWQG (µg/L)= $e^{\{1.273[\ln(\underline{\text{hardness}})]-4.705\}}$ At hardness >180 mg/L, the CWQG is 7 µg/L If the hardness is unknown, the CWQG is 1 µg/L	40 @ H <50 50 @ H =50 - <100 60 @ H =100 - <200 110 @ H =200 - <300 160 @ H ≥300 H means water hardness in mg/L CaCO3
Total Nickel	The CWQG for nickel is related to water hardness (as $CaCO_3$): When the water hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L At hardness > 60 to ≤ 180 mg/L the CWQG is calculated using this equation (see calculator below) CWQG (µg/L) = $e^{\{0.76[\ln(\underline{\text{hardness}})]+1.06\}}$ At hardness >180 mg/L, the CWQG is 150 µg/L If the hardness is unknown, the CWQG is 25 µg/L	250 @ H <60 650 @ H =60-<120 1100 @ H= 120-<180 1500 @ H ≥ 180 H means water hardness in mg/L CaCO3
Nitrite		200 (Cl < 2mg/L) 400 (Cl = 2 - < 4 mg/L) 600 (Cl = 4 - < 6 mg/L) 800 (Cl = 6 - < 8 mg/L) 1000 (Cl = 8 - <10 mg/L) 2000 (Cl ≥ 10 mg/L)
Total Silver	0.00025	0.5 @ H≤100 15 @ H> 100 H means water hardness in mg/L CaCO3
Total Zinc	0.03	75 @ H < 90 120 @ H = 90 - < 100 900 @ H = 100 - < 200 1650 @ H = 200 - < 300 2400 @ H = 300 - < 400 H means water hardness in mg/L CaCO3

CCME water quality guidelines for total ammonia (mg/L) as a function of temperature and pH								
Temp (°C)	**pH**							
	6.0	**6.5**	**7.0**	**7.5**	**8.0**	**8.5**	**9.0**	**10**
0	231	73.0	23.1	7.32	2.33	0.749	0.250	0.042
5	153	48.3	15.3	4.84	1.54	0.502	0.172	0.034
10	102	32.4	10.3	3.26	1.04	0.343	0.121	0.029
15	69.7	22.0	6.98	2.22	0.715	0.239	0.089	0.026
20	48.0	15.2	4.82	1.54	0.499	0.171	0.067	0.024
25	33.5	10.6	3.37	1.08	0.354	0.125	0.053	0.022
30	23.7	7.5	2.39	0.767	0.256	0.094	0.043	0.021

* The guideline values are reported in mg/L NH3; measurements of total ammonia in the aquatic environment are often also expressed as mg/L total ammonia-N. The present guideline values (mg/L NH3) can be converted to mg/L total ammonia-N by multiplying the corresponding guideline value by 0.8224.

** Values falling outside of shaded area should be used with caution.

Appendix B: Photo Log

Photo 1. Upstream view of the stormwater outfall location at (WH)Spook-SS from the right bank of Spook Creek (April 18, 2020).

Photo 2. Downstream view of the (WH)Spook-SS stormwater outfall on Spook Creek from right bank looking towards Yukon River (April 18, 2020).

Photo 3. Downstream view of the (WH)SSD-01 stormwater outfall adjacent to the Millennium Trial near FH Collins from right bank looking towards Yukon River (April 18, 2020).

Photo 4. View of the (WH)HNSN stormwater outfall at Hanson Street along the left bank of Yukon River (April 18, 2020).

Photo 5. Downstream view of the (WH)HNSN stormwater outfall located near Hanson Street along the left bank of Yukon River looking towards Yukon River (April 18, 2020).

Photo 6. Downstream view from the (WH)SSD-04 stormwater outfall located along the Millennium Trial near Selkirk Street along the right bank of Yukon River looking towards Yukon River (April 18, 2020).

Photo 7. View from the (WH)STRICK-SS stormwater outfall located at Strickland Street as it discharges into Yukon River along the right bank (April 18, 2020).

Photo 8. Left bank view of the stormwater outfall at (WH)STRICK-SS located on the left bank of Yukon River (April 18, 2020).