2017 Annual Water Quality Monitoring Report

Former Nanisivik Mine Site, Nunavut

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Executive Summary

This report provides a summary of the 2017 water quality monitoring results for the Nanisivik Mine located on the Borden Peninsula of northern Baffin Island in Nunavut, Canada. The water quality monitoring program has been conducted as required under Nunavut Water Licence 1AR–NAN1419. The effectiveness and adequacy of mine reclamation is to be demonstrated through monitoring key water quality parameters at key sampling stations. Results for the Final Discharge Point (Station 159–4) are compared to the authorized criteria stated in the Water Licence, while parameters at the remaining sampling stations are compared to non–regulatory, station–specific 95th percentile action levels (calculated from historical data) as indicated in the Contingency Plan for Water Quality Exceedances, Former Nanisivik Mine Site, submitted to Canzinco Mines Ltd. in March, 2015.

Water quality monitoring of the decommissioned Nanisivik Mine in 2017 was successful in July and August, but only partly successful in September, due to freezing conditions which precluded water sampling at some stations. Water quality monitoring of the decommissioned Nanisivik Mine in 2017 indicates that the mine decommissioning is meeting its objectives, and that conditions in the freshwater environment at the site are returning to a state similar to conditions that existed prior to the mine development.

The results indicated compliance with maximum authorized concentrations at Station 159-4, the final discharge point of the West Twin Disposal Area, with the exception of an apparent exceedance of the upper limit for pH in August, based on a suspect field measurement. The corresponding laboratory measured pH value was within the authorized range.

Water quality data from Station NML-23 (Twin Lakes Creek near the outlet of East Twin Lake) showed no unusual results during 2017. Results for Station 159-6 (near the mouth of Twin Lakes Creek at Strathcona Sound) were within typical ranges for this station, with the exception of one value for total suspended solids (TSS, 145 mg/L) which exceeded the site-specific action level in early July; and one value for sulphate (471 mg/L) which slightly exceeded the site-specific action level (463 mg/L) in September. High values for TSS were observed at several stations in July, and this was attributed to spring freshet conditions. The high sulphate concentration in September may be related to the onset of freezing conditions, which would limit the diluting potential of surface water runoff. Comparison of water chemistry results at Station 159-6 with results from Station 159-6 Temp2 showed no evidence of water quality impairment related to contractor activities unrelated to the former Mine near Strathcona Sound.

Minor non-conformances of the site-specific action levels were observed for TSS (148 mg/L) in early July, and for zinc (0.14 mg/L) in August, at Chris Creek (Station 159-14). The high TSS value was attributed to spring freshet conditions. The zinc concentration only slightly exceeded the site-specific action level (0.13 mg/L), and was well within the range of values observed at this station in recent years. Sampling was not possible in September due to freezing conditions.

Water quality at Station NML-30 near the Landfill showed no indication of impairment, with the exception of a high TSS concentration observed in samples collected in early July. Sampling was not possible in September due to freezing conditions. There was no flow at Station NML-29 during any of the scheduled sampling events.

The incomplete sampling in September 2017, is regrettable. A sampling plan that will further reduce the risk of encountering frozen conditions in September has been prepared for the 2018 field season, and is attached to this report as Appendix D. In addition, steps will be taken to ensure that field instruments (e.g., pH meter) are in good working condition and properly calibrated prior to sampling in 2018.

1.0 INTRODUCTION

1.1 GENERAL INTRODUCTION

Stantec Consulting Ltd. (Stantec) is pleased to provide Canzinco Mines Ltd. with a review of the 2017 water quality monitoring data for the former Nanisivik Mine (the Mine) in the territory of Nunavut, Canada. The monitoring program is required under Water Licence 1AR-NAN1419 (the Water Licence, Nunavut Water Board, 2015) and is intended to help assess the overall performance of reclamation and closure activities at the former Nanisivik Mine.

1.2 SITE DESCRIPTION

The Mine is located 750 kilometres north of the Arctic Circle at an approximate latitude of 73 degrees north, approximately 33 kilometres by road from the hamlet of Arctic Bay, on the southern shore of Strathcona Sound, on the Borden Peninsula, part of northern Baffin Island (Drawing A-1, Appendix A). In 1998, Canzinco Ltd., a wholly owned subsidiary of Breakwater Resources Ltd., took possession of the Mine, and operated it until 2002. Breakwater Resources Ltd., was acquired by Nyrstar Sales & Marketing AG in 2011.

The Mine facilities, which are now decommissioned, consisted of an underground mine and a 2,200 tonnes per day concentrator that used conventional crushing, rod and ball mill grinding, differential lead and zinc flotation, and concentrate drying. Between 1976 and 2002, the underground facility extracted and shipped zinc and lead concentrates. Ore concentrates were shipped from a concentrate storage shed located adjacent to Strathcona Sound, where a deepwater wharf allowed ocean-going vessels to moor. Concentrates were transferred to ships using a ship-loader. Process tailings were transported to and deposited at the West Twin Disposal Area (WTDA), where resulting effluent was discharged into Twin Lakes Creek. The Mine was in full operation from its opening in 1976 until closure in September, 2002.

Reclamation activities began at Nanisivik in 2002. On July 30, 2006, Environment Canada approved Nanisivik as having achieved “recognized closed mine” status under the *Metal Mining Effluent Regulations* and therefore, mine effluent and environmental effects monitoring requirements under those regulations were no longer required. On October 1, 2008, reclamation of the site was completed and a post-closure monitoring period began. Water quality monitoring continued during 2017 under Nunavut Water Licence 1AR–NAN1419, issued by the Nunavut Water Board (2015).

1.3 SAMPLING LOCATIONS

The main sampling locations used for water quality monitoring near the Mine are described in Table 1.1 and are shown in Drawing A-2 (Appendix A). During the 2017 Water Quality Monitoring Program, monitoring stations included those listed in Schedule I, Table 2 of Water Licence 1AR-NAN1419, with the voluntary addition of sampling at Stations ELO and 159-6 Temp2 (Table 1.1).

Station ELO is located upstream of NML-23 and was added during the 2012 program to confirm that elevated sulphate concentrations that were sporadically being detected originate from the watershed of East Twin Lake, and not from seepage proximal to NML–23 that could indicate a release from the WTDA.

Station 159-6 Temp was added in 2016 when an independent contractor's laydown and storage area was identified within 30 m of Twin Lakes Creek, and within 10 m of the usual sampling Station 159-6 (see Photo A1, Appendix A). Station 159-6 Temp was established approximately 120 m upstream of Station 159-6, and 30 m upstream of the laydown area, to confirm that water monitoring results at the Station 159-6 were not influenced by activities or events at the laydown area.

Station 159-6 Temp2 was added in 2017 when earthwork activities and a water pump were identified upstream of the Contractor's laydown, and within 5 m of Station 159-6 Temp. The new Station 159-6 Temp2 was established approximately 150 m upstream of Station 159-6, and approximately 20 m upstream of the laydown area and earthworks (see Photos A2 and A3, Appendix A), and replaced Station 159-6 Temp for the 2017 sampling year. Station 159-6 Temp2 was sampled to confirm that the results for Station 159-6 were not influenced by the Contractor's work area.

Table 1.1 Surface Water Quality Sampling Locations Tested in 2017

Group	Station	Distance Downstream of Headwaters (m)	Description
Twin Lakes Creek Watershed	ELO	100	Outflow of East Twin Lake upstream of NML–23
	NML–23	400	Outflow of East Twin Lake
	159–4	750	Outflow from West Twin Disposal Area
	159–6	7,200	Outlet of Twin Lakes Creek into Strathcona Sound
	159-6 Temp2	7,050	Outlet of Twin Lakes Creek into Strathcona Sound, upstream of the wharf construction laydown area*
Chris Creek Watershed	159–14	2,600	Chris Creek downstream of K–Baseline
Landfill Watershed	NML–29	75	Downstream of landfill – east drainage system
	NML-30	75	Downstream of landfill – west drainage system

Note:
Sampling locations as detailed by Gartner Lee Ltd. (2004), except as otherwise noted in the text.
* Contractors for the Department of National Defence/Defence Construction Canada at the Nanisivik wharf.

1.4 PREVIOUS WATER QUALITY MONITORING PROGRAMS

1.4.1 Water Licences

Since 1976, the Mine has operated under five different Water Licences issued by the Northwest Territories Water Board and the Nunavut Water Board:

- Northwest Territories Water Licence N5L3–0159 – Northwest Territories Water Board (July, 1976; renewed in 1978, 1983, 1988 and 1991);
- Nunavut Water Licence NWB1NAN9702 – Nunavut Water Board (July, 1997; the original term of five years was extended until closure in September, 2002);
- Nunavut Water Licence NWB1NAN0208 – Nunavut Water Board (October, 2002 to May, 2008);
- Nunavut Water Licence NWB1AR–NAN0914 – Nunavut Water Board (April, 2009 to December, 2014); and
- Nunavut Water Licence 1AR-NAN1419 – Nunavut Water Board (renewal for the period December 23, 2014 through December 22, 2019).

In comparison with previous Water Licences, and consistent with the progression of the decommissioning and post-closure monitoring, the conditions of the current Water Licence (Schedule I, Table 2) implement a reduction in sampling locations, frequency and parameters required for analysis. The Water Licence (Part F, Sections 1 and 2) contains maximum authorized concentrations of certain water quality parameters at Station 159-4, the final discharge point for the decommissioned West Twin Disposal Area (Table 1.2).

Table 1.2 Effluent Quality Requirements for the West Twin Disposal Area, Station 159-4

Parameter	Maximum Authorized Concentration (mg/L)
Total Arsenic (mg/L)	0.25
Total Copper (mg/L)	0.10
Total Lead (mg/L)	0.10
Total Nickel (mg/L)	0.50
Total Zinc (mg/L)	0.25
Total Suspended Solids (mg/L)	15.0
Total Cadmium (mg/L)	0.005
pH (units)	6.0 – 9.5 (pH units)
Note: Where a visible sheen has been observed in effluent the maximum authorized concentration of oil and grease shall not exceed 15.0 mg/L.	

Data for the remaining stations are compared to station-specific 95th percentile action levels (Table 1.3) that were presented to the Nunavut Water Board in the Contingency Plan for Water Quality Exceedances (Stantec, 2015). These are non-regulatory values calculated from historical data for each key parameter. If the 95th percentile value is exceeded for any key parameter at the same monitoring station on two consecutive occasions, an investigation will be initiated to determine the cause of the exceedance.

Action levels have not been identified for other parameters because they are of lesser concern from a toxicological perspective (*e.g.,* major ion concentrations such as calcium and chloride), or because there is insufficient data to develop an estimate of the 95th percentile value. For pH, values are compared to the acceptable range listed in the Water Licence limits for Station 159–4 (*i.e.,* 6.0 to 9.5).

The Water Licence (Schedule I, Table 2) provides details of the expected Stations, Monitoring Parameters, and Frequency for the monitoring period of 2015 to 2019. Details of the monitoring requirements are provided in Table 1.4.

Table 1.3 Non-Regulatory Station-Specific Action Levels for the Water Quality Monitoring Program

Parameter	Station				
	Twin Lakes Creek Watershed		Chris Creek Watershed	Landfill Watershed	
	159–6	NML–23	159–14	NML–30	NML–29
Total Cadmium (mg/L)	0.014	0.0044	0.0005	0.00025	0.00025
Total Lead (mg/L)	0.044	0.016	0.0022	0.0050	0.0050
Total Zinc (mg/L)	4.6	0.12	0.13	0.03	0.03
Total Sulphate (mg/L)	463	25	408	240	240
Total Suspended Solids (mg/L)	53	10	32	22	22
pH (units)	6.0 – 9.5 (pH units)				
Notes: NML-29 flow is intermittent; action levels in case of flow are the same as at NML-30.					

Table 1.4 Water Quality Monitoring Schedule for Post Closure Period, 2015 to 2019

Water Quality Monitoring Stations 2015 to 2019				
Station Number	**Station Description**	**Purpose**	**Parameters to be Measured**	**Monitoring Frequency**
Twin Lakes Creek Watershed				
ELO^	Outflow of East Twin Lake upstream of NML–23	Voluntary Water Quality at the Outlet to East Twin Lake (Control)	NAN-1	Monthly
NML–23	Outflow from East Twin Lake	Upstream Control Station	NAN-1	Monthly
159–4	Outflow from West Twin Disposal Area	Final Discharge Point	NAN-1	Monthly
			NAN-4	Annually
159–6	Outlet of Twin Lakes Creek into Strathcona Sound	General Monitoring	NAN-1 NAN-2	Monthly
			NAN-4	Annually
159–6 Temp2*	Outlet of Twin Lakes Creek into Strathcona Sound upstream of the wharf construction laydown area and ground disturbing activities and upstream of 159-6 Temp	Voluntary General Monitoring	NAN-1 NAN-2	Monthly
Chris Creek Watershed				
159–14	Chris Creek downstream of K–Baseline	K–Baseline Monitoring	NAN-1	Monthly
Landfill Watershed				
NML–29	Downstream of landfill – East Drainage System	Landfill Monitoring	NAN-1 NAN-2	Monthly
NML–30	Downstream of landfill – West Drainage	Landfill Monitoring	NAN-1 NAN-2	Monthly

Notes:
Monthly monitoring to be carried out during periods of flow or July 1 to September 1, annually.
NAN-1 includes: Metals analysis (total cadmium, lead and zinc), major cations (calcium, magnesium, sodium, potassium, ammonia, and hardness), major anions (chloride, sulphate, bicarbonate, carbonate, nitrate+nitrite, and alkalinity), TSS, and field-measured parameters (specific conductivity, temperature, pH and visual observation for hydrocarbon sheen).
NAN-2 includes: Petroleum hydrocarbon analysis of F2 to F4 hydrocarbons.
NAN-4 includes: ICP (trace metal) scan.
^ voluntary station sampled in 2012; analysis is the same as at NML-23.
* voluntary station added for 2017; analysis is the same as at 159-6.

1.4.2 Summary of Water Quality Monitoring Prior to 2017

In the years of monitoring following the decommissioning of the Mine, two main themes have emerged.

Of greatest significance, the Mine decommissioning appears to have achieved its objectives with respect to overall water quality. Key areas that were decommissioned, such as the West Twin Disposal Area, Chris Creek, and Landfill watersheds show consistently good water quality results over the period 2008 to 2016. Water quality trends over time are illustrated graphically in Appendix C.

Sampling stations lower in the Twin Lakes Creek drainage system show substantial improvement and have stabilized since decommissioning activities ceased in 2008. The area remains subject to occasional upset conditions due to the unpredictable nature of erosion and weathering in the zone where the creek valley cuts through the natural mineral outcrop. Stations located within the Chris Creek drainage, where natural mineralization exists at or close to the ground surface, are similarly subject to occasional upsets, but have likewise produced results that are consistent with conditions that prevailed before mining occurred.

2.0 REVIEW OF 2017 WATER QUALITY DATA

Water samples were collected from the Twin Lakes Creek, Chris Creek and Landfill watersheds during the 2017 open flow sampling season (*i.e.*, late June to early September). A summary of the 2017 water quality monitoring results is presented in tabular format in Appendix B. Water samples could not be collected at some Stations in September, 2017, as a result of freeze up. Photographs showing frozen conditions at the sampling stations are provided in Appendix A. Where possible, a third sampling event was completed in early September in accordance with the Water Licence. Samples were collected at Stations 159-4, 159-6 and 159-6 Temp2 in September 2017.

Duplicate samples were collected at several Stations during the 2017 water quality monitoring program for quality assurance and control purposes. Unfortunately, in error, no field blanks were submitted for analysis during the 2017 program.

2.1 STATION 159-4 (FINAL DISCHARGE POINT)

Only the data for Station 159-4 are compared to the effluent quality requirements for the final discharge point (from the Water Licence, Part F, Item 1). The water quality data for the parameters specified in the Water Licence at Station 159-4 are presented in Table 2.1. Full data are provided in Table B1 (Appendix B). Temporal trends are shown graphically in Figure C1 (Appendix C).

Concentrations of the regulated parameters (*i.e.,* arsenic, cadmium, copper, lead, nickel, zinc and total suspended solids) remained below the maximum authorized concentrations. The field measured pH value slightly exceeded the authorized range in August 2017. However, the laboratory-measured result for pH in August, 2017, as well as the July and September results, were within the regulated range (pH 6.0 to 9.5) at Station 159-4 (Table 2.1). Therefore, the field-measured pH value may be the result of a faulty instrument calibration, and not reflective of actual site conditions.

For the additional, non-regulated parameters, the sulphate concentrations at Station 159-4 ranged between 115 mg/L and 604 mg/L (Table B1 and Figure C1), below the station-specific action level of 1,471 mg/L. No visible hydrocarbon sheen was observed at Station 159-4, and therefore hydrocarbon fractions F2 through F4 were not measured during the 2017 sampling program.

Table 2.1 Concentrations of Water Licence Regulated Parameters at Station 159-4

Parameter	Maximum Authorized Concentration (mg/L)	June 29, 2017	August 10, 2017	September 13, 2017
Total Arsenic (mg/L)	0.25	< 0.01	< 0.01	---
Total Copper (mg/L)	0.10	< 0.001	0.001	---
Total Lead (mg/L)	0.10	< 0.001	< 0.001	< 0.001
Total Nickel (mg/L)	0.50	< 0.005	< 0.005	---
Total Zinc (mg/L)	0.25	0.02	0.08	0.05
Total Suspended Solids (mg/L)	15.0	< 2	< 2	< 2
Total Cadmium (mg/L)	0.005	<0.0001	0.0001	< 0.0001
pH (units) Field Measured	6.0-9.5 (pH units)	8.4	**9.8**	8.6
pH (units) Laboratory Measured	6.0-9.5 (pH units)	7.69	8.04	7.93
Petroleum Hydrocarbons	visible sheen[1]	--- (nvs)	--- (nvs)	--- (nvs)

Notes:
[1] Required sampling includes monthly testing for NAN-1 (total cadmium, lead and zinc) with major cations, major anions, TSS, and the field parameters of specific conductivity, temperature, pH and visual observation for hydrocarbon sheens, and NAN-4 annual testing by ICP scan for trace metals generally.
n/a = data not available.
Bold = exceeds a regulatory limit in the Water Licence
--- = data not required; annual testing per Schedule I, Table 2 of the Water Licence.
nvs = no visual sheen observed.

2.2 TWIN LAKES CREEK WATERSHED (EXCLUDING STATION 159–4)

Two additional stations (Station 159-6, located in Twin Lakes Creek, immediately before it discharges into Strathcona Sound; and Station NML-23, located in the upper reach of the Twin Lakes Creek watershed near the outlet of East Twin Lake) are identified in the Water Licence for post-closure monitoring within the Twin Lakes Creek watershed. In addition, Canzinco samples Station ELO at the outlet to East Twin Lake (Drawing A2, Appendix A) on a voluntary basis.

A temporary station (159-6 Temp2) was implemented in 2017 when a contractor's laydown/storage area, as well as a water pumping station and active heavy equipment, were identified immediately upstream of Station 159-6 (Photos A2 and A3, Appendix A). Station 159-6 Temp2 was established approximately 150 m upstream of Station 159-6, so as to be upstream from the ground-disturbing activities. Sample analysis for Station 159-6 Temp2 follow the Water Licence requirements for Station 159-6.

Selected water quality data for Stations 159-6, 159-6 Temp2 and NML-23 are presented in Tables 2.2 and 2.3, with the full data provided in Tables B2-1 and B2-2, in Appendix B.

No exceedances of the screening limits were noted during the July and August, 2017 monitoring events at Station NML-23. Frozen conditions at Station NML-23 in September 2017 prevented the third sampling event at this Station (Photo A4, Appendix A). As a result, no water quality samples could be collected for the third sampling event required by the Water Licence.

Table 2.2 Maximum Concentrations of Selected Parameters at Station 159–6

Parameter	Action Level for Station 159-6	June 28, 2017	August 10, 2017	September 13, 2017
Total Cadmium (mg/L)	0.014	0.0008	0.0003	0.0004
Total Lead (mg/L)	0.044	0.020	<0.001	<0.001
Total Zinc (mg/L)	4.6	0.31	0.14	0.26
Total Sulphate (mg/L)	463	30	65	**471**
Total Suspended Solids (mg/L)	53	**145**	<2	<2
pH (units) Field Measured	6.0-9.5 (pH units)	8.4	n/a	8.3
pH (units) Laboratory Measured	6.0-9.5 (pH units)	7.7	7.66	7.79
Petroleum Hydrocarbons (mg/L)	visible sheen	nvs/n.d.	nvs/n.d.	nvs/n.d.

Notes:
n/a = data not available.
Bold = exceedance of 95th percentile site-specific action level.
n.d. = results for F2, F3 and F4 below analytical detection limits of 0.02, 0.05 and 0.05 mg/L, respectively.
nvs = no visual sheen observed.

Table 2.3 Maximum Concentrations of Selected Parameters at Station NML–23

Parameter	Action Level for Station NML-23	June 29, 2017	August 10, 2017	September 13, 2017
Total Cadmium (mg/L)	0.0044	<0.0001	<0.0001	n.f.
Total Lead (mg/L)	0.016	<0.001	<0.001	n.f.
Total Zinc (mg/L)	0.12	<0.01	<0.01	n.f.
Total Sulphate (mg/L)	25	12	6	n.f.
Total Suspended Solids (mg/L)	10.0	<2	<2	n.f.
pH (units) Field Measured	6.0-9.5 (pH units)	8.3	8.7	n.f.
pH (units) Laboratory Measured	6.0-9.5 (pH units)	7.4	7.41	n.f.
Petroleum Hydrocarbons (mg/L)	visible sheen	nvs/n.d.	nvs/n.d.	n.f.

Notes:
n.d. = results for F2, F3 and F4 below analytical detection limits of 0.02, 0.05 and 0.05 mg/L, respectively.
nvs = no visual sheen observed.
n.f. = no flow present at the time of sampling.

An exceedance of the 95th percentile screening limit for TSS (53 mg/L) was observed in late June at Station 159-6, with a laboratory measurement of 145 mg/L. Observed conditions in Twin Lakes Creek at the time of sampling were very turbid, opaque in clarity and with a faster than normal flow; conditions typical of spring freshet (Photo A1, Appendix A). TSS concentrations at Station 159-6 returned to normal in the subsequent two sampling events in August and September 2017, with laboratory measurements being non-detectable (below 2 mg/L).

One exceedance of the 95th percentile screening limit for sulphate (463 mg/L) was recorded in the September 2017 results at Station 159-6, at 471 mg/L. However, the duplicate sample at this location had a sulphate concentration of 444 mg/L, and the sample taken at Station 159-6 Temp2 had a concentration of 405 mg/L. Therefore, this exceedance is not considered to be serious. Sampling in Twin Lakes Creek at Station 159-6 has occasionally shown elevated sulphate levels, in the range of 241 mg/L and 576 mg/L in late summer. This may be a result of natural erosion and weathering processes during the open water season, through the natural mineral deposit located upstream of the Station. However, a more likely explanation is that the onset of freezing conditions limited the diluting effects of surface water runoff, so that the water chemistry on this date was more reflective of base flow (i.e., groundwater) in this highly mineralized watershed.

Results from Stations 159-6 Temp and ELO (see Tables B2-1 and B2-2, Appendix B) were generally consistent with the results from the nearby Stations 159-6 and NML-23, respectively, and did not indicate any abnormal condition or need for further investigation.

2.3 CHRIS CREEK WATERSHED

The Water Licence requires continued sampling at Station 159-14 during the period 2015 to 2019. Station 159-14 is located on Chris Creek approximately 1.6 km upstream of its discharge to Strathcona Sound. Selected water quality data for Station 159-14 in 2017 are presented in Table 2.4, with the full data provided in Table B3, in Appendix B.

Sample collection at Station 159-14 was successful in July and August, however, frozen conditions were encountered in September (Photo A4, Appendix A), and therefore water samples could not be collected in September, 2017.

Table 2.4 Concentrations of Selected Parameters at Station 159-14

Parameter	Action Level for Station 159-14	June 29, 2017	August 11, 2017	September 13, 2017
Total Cadmium (mg/L)	0.0005	<0.0001	<0.0001	n.f.
Total Lead (mg/L)	0.0022	0.0002	<0.001	n.f.
Total Zinc (mg/L)	0.13	0.01	**0.14**	n.f.
Total Sulphate (mg/L)	408	7	146	n.f.
Total Suspended Solids (mg/L)	32	**148**	<2	n.f.
pH (units) Field Measured	6.0-9.5 (pH units)	8.2	8.3	n.f.
pH (units) Laboratory Measured	6.0-9.5 (pH units)	7.97	8.1	n.f.
Petroleum Hydrocarbons (mg/L)	visible sheen	nvs/n.d.	nvs/n.d.	n.f.

Notes:
Bold = exceedance of 95th percentile site-specific action level.
n.d. = results for F2, F3 and F4 below analytical detection limits of 0.02, 0.05 and 0.05 mg/L, respectively.
nvs = no visual sheen observed.
n.f. = no flow present at the time of sampling.

Elevated TSS was recorded at Station 159-14 in late June, 2017. Conditions in Chris Creek at the time of sampling were noted by the field technician as being indicative of spring freshet (*i.e.*, fast flowing and very turbid). TSS levels returned to below laboratory detection limits (less than 2 mg/L) in August.

The zinc concentration in Chris Creek during the August, 2017 sampling period (0.14 mg/L) slightly exceeded the site-specific action level (0.13 mg/L). Zinc concentrations in Chris Creek have historically ranged between <0.01 and 0.72 mg/L at Station 159-14. The variation in zinc concentrations at this location is most likely a result of natural erosion and weathering processes within the mineralized overburden during the freeze-thaw cycle. No slumping or thermokarsting was observed by the field technician upstream of the sampling station during the August site visit. However, warmer than normal temperatures in the region (Government of Canada 2017) may have amplified these natural processes during the open water season.

2.4 LANDFILL WATERSHED

The Landfill is located west of the Mine, with primary drainage systems that flow intermittently to the east and west, monitored at Stations NML-29 and NML-30, respectively. No sampling was conducted at Station NML-29 during the 2017 monitoring period, as no flow was observed (Photos A6 and A7, Appendix A). Flow at this site has been intermittent throughout the post-closure period.

Samples were collected in both July and August, 2017, from Station NML-30 (Photo A7, Appendix A). Frozen conditions were encountered at NML-30 in September, and therefore no samples were collected. A summary of the water quality data for Station NML-30 is presented in Table 2.5. Full data are provided in Table B4-1, in Appendix B.

Water quality results for Station NML-30 were generally below the site-specific action levels in 2017, with no indication of water quality impairment. The exception occurred in July, when the TSS level exceeded the site-specific action level of 22 mg/L in both the parent (33 mg/L) and duplicate (162 mg/L) samples. Conditions at Station NML-30 were noted by the field technician to be typical of spring freshet conditions (e.g., fast flowing and turbid). Given the difference in water quality results between the parent and duplicate samples at Station NML-30 it is assumed that an accidental disturbance of the shallow creek bed may have taken place between the two sample collections. For this reason, the results from duplicate sample NML-30 are not considered further in the assessment of water quality for 2017 program.

The zinc concentration for Station NML-30 during the July, 2017 sampling period (0.07 mg/L) slightly exceeded the site-specific action level (0.03 mg/L). Zinc concentrations at Station NML-30 have historically ranged between <0.01 and 0.09 mg/L. The variation in zinc concentrations at this location is most likely a result of natural erosion and weathering processes within the mineralized overburden during the freeze-thaw cycle. No slumping or thermokarsting was observed by the field technician upstream of the sampling station during the July site visit. However, warmer than normal temperatures in the region (Government of Canada 2017) may have amplified these natural processes during the open water season.

Table 2.5 Concentrations of Selected Parameters at Station NML-30

Parameter	Action Level for Stations NML-29 and NML-30	June 29, 2017	August 10, 2017	September 13, 2017
Total Cadmium (mg/L)	0.00025	<0.0001	<0.0001	n.f.
Total Lead (mg/L)	0.0050	0.002	<0.001	n.f.
Total Zinc (mg/L)	0.03	**0.07**	<0.01	n.f.
Total Sulphate (mg/L)	240	23	84	n.f.
Total Suspended Solids (mg/L)	22	**33** (**162**^)	<2	n.f.
pH (units) Field Measured	6.0-9.5 (pH units)	8.2	8.2	n.f.
pH (units) Laboratory Measured	6.0-9.5 (pH units)	7.90	8.23	n.f.
Petroleum hydrocarbons (mg/L)	visible sheen[1]	nvs/n.d.	nvs/n.d.	n.f.

Notes:
Bold = exceedance of 95th percentile site-specific action level.
^ laboratory measurement in the field duplicate sample for Station MNL-30.
nvs = no visible sheen observed.
n.d. = results for F2, F3 and F4 below analytical detection limits of 0.02, 0.05 and 0.05 mg/L, respectively.
n.f. = no flow present at the time of sampling.

2.5 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC) DISCUSSION

The Quality Assurance/Quality Control (QA/QC) sampling program consisted of the collection and analysis of "blank" and "field duplicate" samples for quality assurance purposes. The QA/QC program permits the evaluation of the efficiency of quality control measures implemented during sampling to limit potential contamination and produce reliable results.

Six (6) field duplicate samples (from Stations 159-6, 159-6 Temp and NML-30) were submitted for analysis during the 2017 program. Unfortunately, no field blanks were collected for analysis during the 2017 sampling program. Therefore, for quality control purposes, the laboratory blanks have been used as a surrogate measure of quality for the 2017 program.

Relative Percent Difference (RPD) of each duplicate parameter measured is provided in Table 2.6. Higher RPDs are typically observed when analyte concentrations are very low (*i.e.*, close to their respective laboratory detection limit). There are no firm guidelines for the degree of correlation expected between duplicates due to the potential for natural heterogeneity within and between samples, as well as potential contaminant distribution.

In general, the duplicate results for August and September agree closely with their corresponding samples and confirm the representativeness of sampling procedures. For most of the samples the RPD from the mean for individual parameters ranged between 0% and 20% for field duplicates.

Overall, the 2017 program reported 17 of the 192 tested parameters had a calculated RPD greater than 40%. The highest frequency of RPD over 40% (12 instances) occurred with the samples taken on June 28, during the spring freshet. The highest outlier for this sampling event was reported for Zinc at 150% RPD. Variability in the June 28th sampling events are likely a result of high turbidity at the time of sampling, or as result of a disturbance of sediments during collection after the primary sample.

The remaining five outliers with RPD greater than 40% were observed in the August samples; four of which occurred in the sample from Station 159-6. Due to the relatively high RPD variability in the August sample from Station 159-6, it is possible that disturbance of the creek bed occurred accidentally during the collection of the duplicate sample. A review of sampling procedures is recommended prior to the 2018 sampling program, to ensure that the samples collected are fully representative of undisturbed site conditions.

Table 2.6 Results of QA/QC Samples and Associated Relative Percent Differences

Parameter	Parent	Field Dup		Parent	Field Dup		Parent	Field Dup		Parent	Field Dup		Parent	Field Dup		Parent	Field Dup		lab blank	lab blank		lab blank	lab blank		Greater Than
Station	159-6 TEMP	159-6 TEMP DUP	RPD	NML-30	NML-30 DUP	RPD	159-6 DUP	159-6 TEMP	RPD	NML-30	NML-30 DUP	RPD	159-6	159-6 TEMP	RPD	159-6 DUP	159-6 TEMP DUP	RPD							
Date	6/28/17	6/28/17	(%)	6/28/17	6/28/17	(%)	8/10/17	8/10/17	(%)	8/10/17	8/10/17	(%)	9/13/17	9/13/17	(%)	9/13/17	9/13/17	(%)	7/18/17	8/22/17	(%)	8/22/17	10/12/17	(%)	40% RPD
pH	7.9	8.3	4.94%	8.2	8.2	0.00%				8.2			8.1	8.3	2.44%	8.3									0
lab pH	7.81	7.97	2.03%	7.9	7.98	1.01%	7.66	7.88	2.83%	8.23	8.23	0.00%	7.79	7.77	0.26%	7.79	7.77	0.26%	5.88	7.05	18.10%	7.05	6.21	12.67%	0
Conductivity (mS)	0.167	0.168	0.60%	0.13	0.13	0.00%				0.436			0.965	0.983	1.85%	0.983									0
lab Conductivity	0.149	0.152	1.99%	0.153	0.126	19.35%	0.206	0.276	29.05%	0.398	0.397	0.25%	0.887	0.893	0.67%	0.895	0.883	1.35%	<0.005	<0.005	0.00%	<0.005	<0.005	0.00%	0
Temperature (°C)	3.5	2.8	22.22%	2.2	2.2	0.00%				11.8			0.3	0.3	0.00%	0.3									0
TSS (mg/L)	198	268	30.04%	33	162	***132.31%***	<2	<2	0.00%	<2	<2	0.00%	<2	<2	0.00%	<2	<2	0.00%	<2	<2	0.00%	<2	<2	0.00%	1
Sulphate (mg/L)	30	31	3.28%	23	7	***106.67%***	65	86	27.81%	84	84	0.00%	471	405	15.07%	444	425	4.37%	<1	<1	0.00%	<1	<1	0.00%	1
Aluminum total (mg/L)	0.83	1.58	***62.24%***				0.03	<0.01	***100.00%***										<0.01	<0.01	0.00%	<0.01			2
Antimony total (mg/L)	<0.0005	<0.0005	0.00%				<0.0005	<0.0005	0.00%										<0.0005	<0.0005	0.00%	<0.0005			0
Arsenic total (mg/L)	<0.001	<0.001	0.00%				<0.001	<0.001	0.00%										<0.001	<0.001	0.00%	<0.001			0
Barium total (mg/L)	0.03	0.03	0.00%				0.02	0.02	0.00%										<0.01	<0.01	0.00%	<0.01			0
Beryllium total (mg/L)	<0.0005	<0.0005	0.00%				<0.0005	<0.0005	0.00%										<0.0005	<0.0005	0.00%	<0.0005			0
Boron total (mg/L)	0.03	0.04	28.57%				0.06	0.07	15.38%										<0.01	<0.01	0.00%	<0.01			0
Cadmium total (mg/L)	0.0008	0.0008	0.00%	<0.0001	<0.0001	0.00%	0.0003	0.0002	***40.00%***	<0.0001	<0.0001	0.00%	0.0004	0.0004	0.00%	0.0004	0.0004	0.00%	<0.0001	<0.0001	0.00%	<0.0001	<0.0001	0.00%	0
Chromium total (mg/L)	0.001	0.002	***66.67%***				<0.001	<0.001	0.00%										<0.001	<0.001	0.00%	<0.001			1
Cobalt total (mg/L)	0.0018	0.0031	***53.06%***				0.0002	<0.0002	0.00%										<0.0002	<0.0002	0.00%	<0.0002			1
Copper total (mg/L)	0.003	0.006	***66.67%***				<0.001	<0.001	0.00%										<0.001	<0.001	0.00%	<0.001			1
Iron total (mg/L)	1.8	3.02	***50.62%***				0.04	<0.03	28.57%										<0.03	<0.03	0.00%	<0.03			1
Lead total (mg/L)	0.021	0.023	9.09%	0.002	0.002	0.00%	<0.001	<0.001	0.00%	<0.001	<0.001	0.00%	<0.001	<0.001	0.00%	<0.001	<0.001	0.00%	<0.001	<0.001	0.00%	<0.001	<0.001	0.00%	0
Manganese total (mg/L)	0.05	0.09	***57.14%***				<0.01	<0.01	0.00%										<0.01	<0.01	0.00%	<0.01			1
Molybdenum total (mg/L)	<0.005	<0.005	0.00%				<0.005	<0.005	0.00%										<0.005	<0.005	0.00%	<0.005			0
Nickel total (mg/L)	<0.005	<0.005	0.00%				<0.005	<0.005	0.00%										<0.005	<0.005	0.00%	<0.005			0
Selenium total (mg/L)	<0.001	<0.001	0.00%				<0.001	<0.001	0.00%										<0.001	<0.001	0.00%	<0.001			0
Silicon total (mg/L)	1.6	2.7	***51.16%***				0.5	0.5	0.00%										<0.1	<0.1	0.00%	<0.1			1
Silver total (mg/L)	<0.0001	<0.0001	0.00%				<0.0001	<0.0001	0.00%										<0.0001	<0.0001	0.00%	<0.0001			0
Strontium total (mg/L)	0.046	0.057	21.36%				0.057	0.071	21.88%										<0.001	<0.001	0.00%	<0.001			0
Thallium total (mg/L)	<0.0001	<0.0001	0.00%				<0.0001	<0.0001	0.00%										<0.0001	<0.0001	0.00%	<0.0001			0
Titanium total (mg/L)	<0.01	0.02	***66.67%***				<0.01	<0.01	0.00%										<0.01	<0.01	0.00%	<0.01			1
Uranium total (mg/L)	<0.001	<0.001	0.00%				<0.001	<0.001	0.00%										<0.001	<0.001	0.00%	<0.001			0
Vanadium total (mg/L)	0.002	0.004	***66.67%***				<0.001	<0.001	0.00%										<0.001	<0.001	0.00%	<0.001			1
Zinc total (mg/L)	0.29	0.31	6.67%	0.07	0.01	***150.00%***	0.13	0.05	***88.89%***	<0.01	<0.01	0.00%	0.26	0.26	0.00%	0.26	0.26	0.00%	<0.01	<0.01	0.00%	<0.01	<0.01	0.00%	2
Alkalinity (as CaCO3) (mg/L)	33	34	2.99%	48	54	11.76%	29	47	***47.37%***	124	124	0.00%	58	57	1.74%	58	57	1.74%	<5	<5	0.00%	<5	<5	0.00%	1

Parameter	Parent	Field Dup		Parent	Field Dup		Parent	Field Dup		Parent	Field Dup		Parent	Field Dup		Parent	Field Dup		lab blank	lab blank		lab blank	lab blank		Greater Than
Station	159-6 TEMP	159-6 TEMP DUP	*RPD*	NML-30	NML-30 DUP	*RPD*	159-6 DUP	159-6 TEMP	*RPD*	NML-30	NML-30 DUP	*RPD*	159-6	159-6 TEMP	*RPD*	159-6 DUP	159-6 TEMP DUP	*RPD*							
Date	6/28/17	6/28/17	*(%)*	6/28/17	6/28/17	*(%)*	8/10/17	8/10/17	*(%)*	8/10/17	8/10/17	*(%)*	9/13/17	9/13/17	*(%)*	9/13/17	9/13/17	*(%)*	7/18/17	8/22/17	*(%)*	8/22/17	10/12/17	*(%)*	40% RPD
Chloride (mg/L)	2	2	0.00%	1	<1	0.00%	2	2	0.00%	2	2	0.00%	13	12	8.00%	13	11	16.67%	<1	<1	0.00%	<1	<1	0.00%	0
Ammonia (as nitrogen) (mg/L)	0.08	0.1	22.22%	0.09	0.12	28.57%	0.08	0.08	0.00%	0.07	0.09	25.00%	<0.02	<0.02	0.00%	0.04	0.03	28.57%	<0.02	<0.02	0.00%	<0.02	<0.02	0.00%	0
NO2 + NO3 as N (mg/L)	<0.10	<0.10	0.00%	<0.10	<0.10	0.00%	0.1	<0.10	0.00%	<0.10	<0.10	0.00%	0.48	0.64	28.57%	0.67	0.51	27.12%	<0.10	<0.10	0.00%	<0.10	<0.10	0.00%	0
Hardness (as CaCO3) (mg/L)	75	82	8.92%	84	73	14.01%	111	150	29.89%	242	242	0.00%	525	527	0.38%	525	521	0.76%			0.00%	nr			0
HCO3 as CaCO3 (mg/L)	33	34	2.99%	48	54	11.76%	29	47	***47.37%***	124	124	0.00%	58	57	1.74%	58	57	1.74%			0.00%	nr			1
Calcium (mg/L)	17	18	5.71%	17	16	6.06%	23	32	32.73%	54	54	0.00%	108	109	0.92%	108	108	0.00%	<1	<1	0.00%	<1	<1	0.00%	0
Magnesium (mg/L)	8	9	11.76%	10	8	22.22%	13	17	26.67%	26	26	0.00%	62	62	0.00%	62	61	1.63%	<1	<1	0.00%	<1	<1	0.00%	0
Potassium (mg/L)	<1	<1	0.00%	<1	<1	0.00%	<1	1	0.00%	1	2	***66.67%***	2	2	0.00%	2	2	0.00%	<1	<1	0.00%	<1	<1	0.00%	1
Sodium (mg/L)	<2	<2	0.00%	<2	<2	0.00%	<2	<2	0.00%	<2	<2	0.00%	4	4	0.00%	5	4	22.22%	<2	<2	0.00%	<2	<2	0.00%	0
F1 (mg/L)													<0.020	<0.020	0.00%	<0.020	<0.020	0.00%					<0.020		0
F2 (mg/L)	<0.020	<0.020	0.00%	<0.020	<0.020	0.00%	<0.020	<0.020	0.00%	<0.020	<0.020	0.00%				<0.020	<0.020	0.00%	<0.02	<0.020	0.00%	<0.020	<0.020	0.00%	0
F3 (mg/L)	<0.050	<0.050	0.00%	<0.050	<0.050	0.00%	<0.050	<0.050	0.00%	<0.050	<0.050	0.00%				<0.050	<0.050	0.00%	<0.05	<0.050	0.00%	<0.050	<0.050	0.00%	0
F4 (mg/L)	<0.050	<0.050	0.00%	<0.050	<0.050	0.00%	<0.050	<0.050	0.00%	<0.050	<0.050	0.00%				<0.050	<0.050	0.00%	<0.05	<0.050	0.00%	<0.050	<0.050	0.00%	0

Notes:
1. F2, F3, F4 represent petroleum hydrocarbon fractions by increasing molecular weight.
2. Dup = Field Duplicate
3. RPD = Relative Percent Difference
4. Concentrations of parameters are reported in mg/L unless otherwise specified.
5. Shaded orange cells represent RPD higher than 40%.

3.0 DISCUSSION

Water quality monitoring of the decommissioned Nanisivik Mine in 2017 was successful in late June and August, but only partially successful in September, as a result of delayed sampling and freezing conditions. Sampling in 2018 should be initiated immediately after the spring freshet (*i.e.,* early July), and sampling in September will be scheduled for the first week of the month, in order to ensure three monthly sampling periods are achieved.

The results from 2017 indicated compliance with maximum authorized concentrations at Station 159-4, the final discharge point of the West Twin Disposal Area, with the exception of an apparent exceedance of the upper limit for pH, based on a suspect field measurement. The corresponding laboratory measured pH value was within the authorized range.

Results were similar at Station 159-6, near the mouth of Twin Lakes Creek. A TSS concentration above the site specific action level in the June 29 sampling results was attributed to natural spring freshet conditions at the time of sampling. There was also an exceedance of the site specific action level for sulphate (471 mg/L compared to the action level of 463 mg/L) at this location in the September sample. This minor exceedance of the site specific action level for sulphate is likely attributable to natural erosion and weathering processes at the mineral deposit upstream of Station 159-6 during the open water season. The presence of a contractor's laydown area associated with construction near the dock had no effect on water quality as determined by comparison of results from Stations 159-6 and 159-6 Temp2.

There were no exceedances of the site specific action limits at Stations NML-30 or ELO. It is unfortunate that samples could not be taken in September, due to frozen conditions at the time of the sampling event. However, all indications point towards the continued safe performance of the tailings pond. Planning for the 2018 field season will include sampling during the first week of September, to avoid early freeze-up and ensure that three sampling events are achieved.

Two non-conformances of the site-specific action levels were reported at Station 159-14 on Chris Creek in 2017. These included a TSS concentration from the June 28 sample (148 mg/L) that was above the site-specific action limit of 32 mg/L; and a zinc concentration from the August 10 sample (0.14 mg/L) that was above the site-specific action level of 0.13 mg/L. The TSS exceedance in late June is likely caused by spring freshet conditions in Chris Creek at the time of sampling. TSS levels returned to a low level in August, 2017. The slight exceedance of the zinc action level in August 2017 may have been caused by natural erosion and weathering processes within the watershed.

Sampling near the Landfill (Stations NML-29 and NML-30) showed no flow at NML-29 during 2017. Water quality at Station NML-30 showed no indication of water quality impairment, with the exception of TSS and zinc concentrations that exceeded site-specific action levels in late June. All parameters were below their site-specific action levels in the August sampling.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The results of the 2017 Water Quality Monitoring Program at the former Nanisivik Mine site in Nunavut indicate that the mine decommissioning is meeting its objectives, and that conditions in the freshwater environment at the site are returning to a state similar to conditions that existed prior to the mine development.

The incomplete sampling in September 2017, is regrettable. A sampling plan that will further reduce the risk of encountering frozen conditions in September has been prepared for the 2018 field season, and is attached to this report as Appendix D. In addition, steps will be taken to ensure that field instruments (e.g., pH meter) are in good working condition and properly calibrated prior to sampling in 2018.

5.0 CLOSING

This report has been prepared for the sole benefit of Canzinco Mines Ltd., as a subsidiary of Nyrstar Sales & Marketing AG. The report may not be used by any other person or entity, other than for its intended purposes, without the consent of Nyrstar Sales & Marketing AG and Stantec Consulting Ltd.

The information and conclusions contained in this report are based upon work undertaken in accordance with generally accepted engineering and scientific practices current at the time the work was performed. The information provided in this report was compiled from existing documents, information provided by Canzinco Mines Ltd., data provided by analytical laboratories, and others. Information obtained from these sources has been assumed to be correct. Stantec Consulting Ltd. accepts no responsibility for damages or liability that may arise from use of this data.

The conclusions presented in this report represent the best technical judgment of Stantec based on the data obtained from the work. The conclusions are based on samples collected by field personnel contracted by Canzinco Mines Ltd. at the time the work was performed, at the specific testing and/or sampling locations, and can only be extrapolated to an undefined limited area around these locations. Samples were obtained by others and submitted directly to Exova Accutest for laboratory analysis. Due to the nature of the investigation and the limited data available, Stantec cannot warrant against undiscovered environmental liabilities.

If any conditions become apparent that deviate from our understanding of conditions as presented in this report, Stantec Consulting Ltd. requests to be notified immediately, and permitted to reassess the conclusions provided herein.

This report was prepared by Jodie Lowe and Annick St-Amand, Ph.D. and reviewed by Malcolm Stephenson, Ph.D. Should you have any questions or comments on the contents of this report, please contact the undersigned.

We trust that the above information fulfills your needs at this time. Should you require additional information, please do not hesitate to contact us.

Sincerely,

STANTEC CONSULTING LTD.

Annick St-Amand
2018.03.08
10:28:43 -04'00'

Malcolm Stephenson
2018.03.08 10:33:57
-04'00'

Annick St-Amand, Ph.D.
Environmental Scientist, Organic Chemist

Malcolm Stephenson, Ph.D.
Senior Principal, Project Manager

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6.0 REFERENCES

BC Research. 1975. Terrestrial Environmental Studies at Strathcona Sound, N.W.T. Project 1552, Progress Report No. 2. March, 1975.

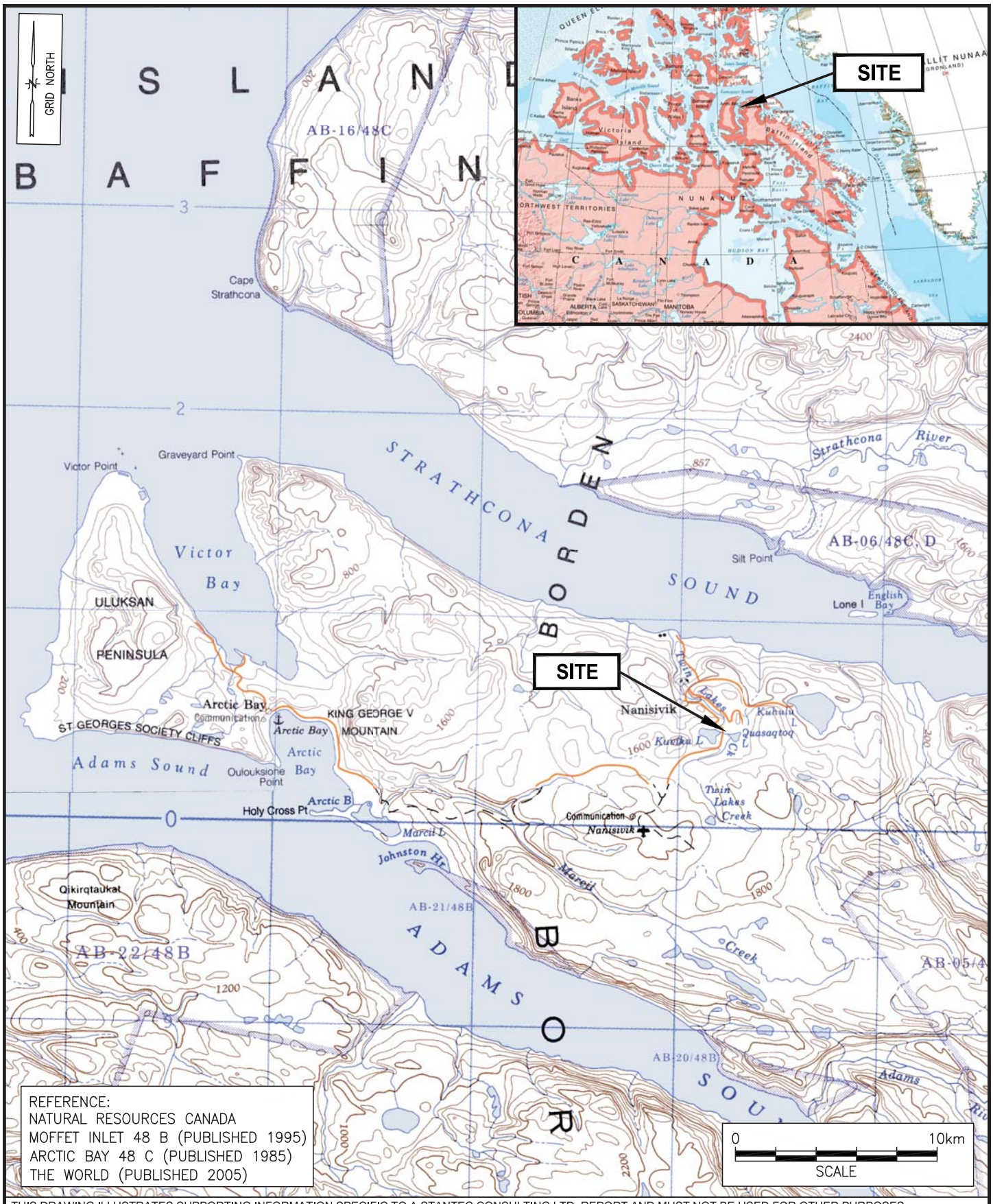
Government of Canada. 2017. Monthly Climate Summaries, territory of Nunavut, Arctic Bay CS station. Available online at: http://climate.weather.gc.ca/prods_servs/cdn_climate_summary_e.html.

Gartner Lee Limited. 2004. Nanisivik Mine Reclamation and Closure Monitoring Plan. February, 2004.

Nunavut Water Board. 2015. Water Licence No: 1AR-NAN1419. Approved by the Minister of Aboriginal Affairs and Northern Development Canada on January 29, 2015.

Stantec. 2015. Contingency Plan for Water Quality Exceedances, Former Nanisivik Mine Site. Prepared by Stantec Consulting Ltd. (Stantec) on behalf of Nyrstar, dated March 24, 2015.

Appendix A DRAWINGS AND PHOTOS



REFERENCE:
NATURAL RESOURCES CANADA
MOFFET INLET 48 B (PUBLISHED 1995)
ARCTIC BAY 48 C (PUBLISHED 1985)
THE WORLD (PUBLISHED 2005)

SITE LOCATION

WATER QUALITY MONITORING
NANISIVIK MINE, NUNAVUT

Job No.:	121812613
Scale:	1 : 250,000
Date:	28-FEB-2018
Dwn. By:	JL
App'd By:	MS

Dwg. No.: A-1

Client: CANZINCO LTD. c/o NYRSTAR CANADA (HOLDINGS) LTD.

Stantec

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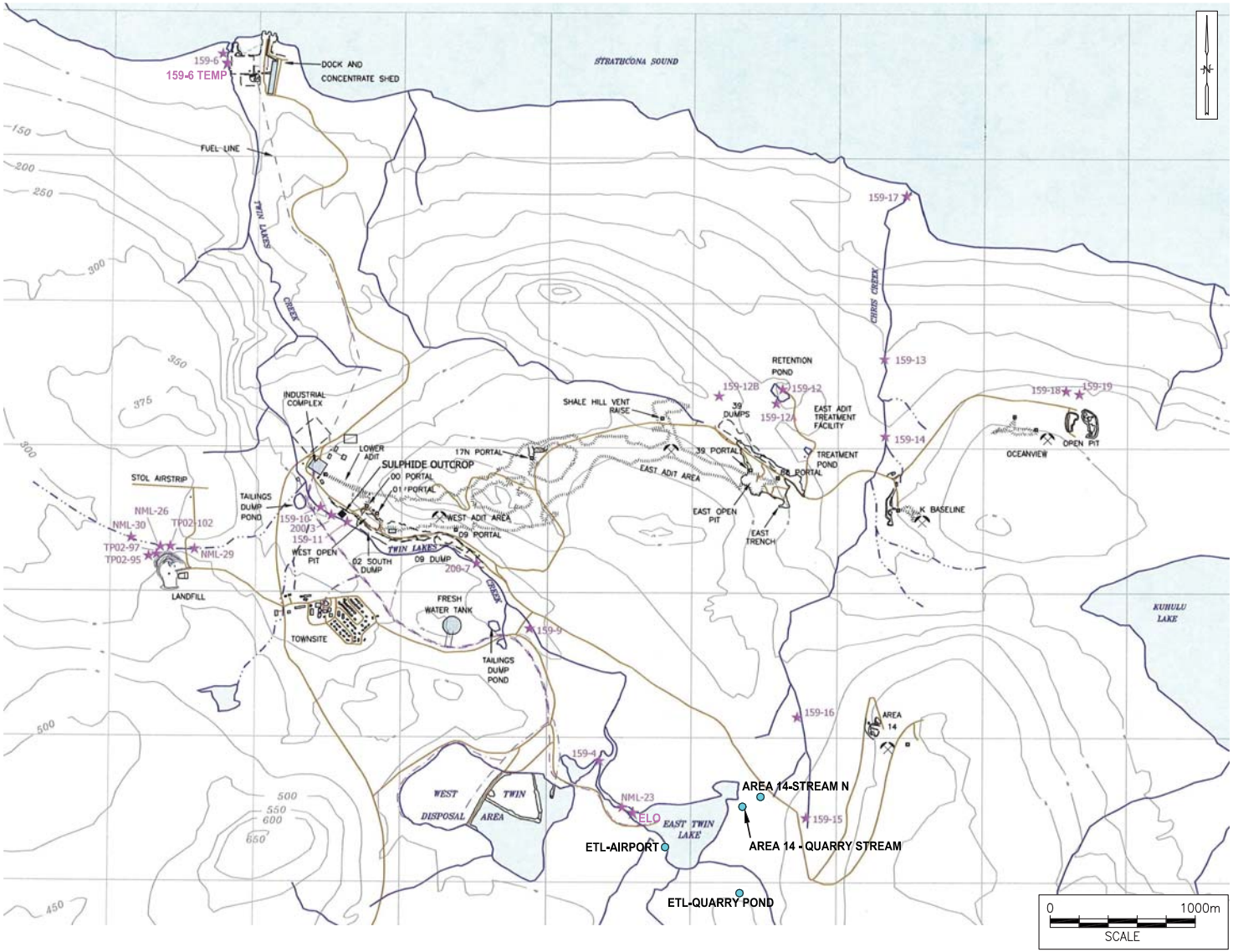

LEGEND:

- ROAD
- GROUND CONTOUR (50 m INTERVAL)
- SHORELINE, DRAINAGE, STREAMS
- INTERMITTENT DRAINAGE
- HIGH TIDE LINE – SURVEYED
- TOP OF BANK
- PIPELINE
- EXTENT OF UNDERGROUND WORKINGS
- MINING AREA
- ADIT, RAISE
- NML-16 WATER SAMPLING LOCATION

WATER QUALITY MONITORING STATIONS 2014-2019		
STATION	LATITUDE	LONGITUDE
ELO	73.022543 N	−84.470025 W
NML−23	73.022970 N	−84.472946 W
159−4	73.025644 N	−84.477130 W
NML−29	73.038523 N	−84.555158 W
NML−30	73.038580 N	−84.574106 W
159−6	73.069603 N	−84.557824 W
159−14	73.047278 N	−84.418062 W
159−6 TEMP	73.069141 N	−84.556367 W

Reference:
ORIGINAL FIGURES PROVIDED BY NANISIVIK MINE

WATER SAMPLING LOCATIONS - MINE AREA

WATER QUALITY MONITORING
NANISIVIK MINE, NUNAVUT

Client: CANZINCO LTD. c/o NYRSTAR CANADA (HOLDINGS) LTD.

Job No.:	121812613
Scale:	1 : 30,000
Date:	28-FEB-2018
Dwn. By:	JL
App'd By:	MS

Dwg. No.: A-2

Stantec

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Photo A1 Station 159-6 at Contractor's Laydown Area facing Upstream, June 2017

Photo A2 Station 159-6 Temp Upstream of the Laydown Area, September 2017

Photo A3 Station 159-6 Temp2, Upstream of the Laydown Area facing downstream to Strathcona Sound and Stations 159-6 and 159-6 Temp, September 2017

Photo A4 Earth work and water pump line at Station 159-6, June 2017

Photo A5 Frozen conditions at Stations NML-23 and ELO, September 2017

Photo A6 Station 159-14 facing downstream to Strathcona Sound, September 2017

Photo A7 Photo from Landfill showing intermittent flow at Stations NML-30, June 2017

Photo A8 Station NML-30 at the Landfill, June 2017

Photo A9 Frozen conditions at the Landfill (Station NML-29), September 2017

Appendix B 2017 SUMMARY DATA TABLES

Table B1: Final Discharge Point (Station 159-4)

Parameter	Authorized Licence Limit (mg/L; unless otherwise specified)	Concentration (mg/L; unless otherwise specified)		
		29-Jun-17	10-Aug-17	13-Sep-17
		159-4	159-4	159-4
Laboratory pH (units)	6 - 9.5	7.69	8.04	7.93
Field pH (units)	6 - 9.5	8.4	**9.8**	8.6
Laboratory Conductivity (mS)	N/A	0.312	1.22	1.21
Field Conductivity (mS)	N/A	0.389	1.34	1.319
Field Temperature (°C)	N/A	1.7	8.3	NR
Total Suspended Solids	15	<2	<2	<2
Sulphate	1,471	115	577	604
Aluminum	N/A	0.03	<0.01	---
Antimony	N/A	<0.0005	<0.0005	---
Arsenic	0.25	<0.001	<0.001	---
Beryllium	N/A	<0.0005	<0.0005	---
Boron	N/A	0.2	0.73	---
Cadmium	0.005	<0.0001	0.0001	<0.0001
Chromium	N/A	<0.001	0.001	---
Cobalt	N/A	<0.0002	<0.0002	---
Copper	0.1	<0.001	0.001	---
Iron	N/A	0.04	0.03	---
Lead	0.1	<0.001	<0.001	<0.001
Manganese	N/A	<0.01	<0.01	---
Molybdenum	N/A	<0.005	0.007	---
Nickel	0.5	<0.005	<0.005	---
Selenium	N/A	<0.001	<0.001	---
Silicon	N/A	0.4	0.4	---
Silver	N/A	<0.0001	<0.0001	---
Strontium	N/A	0.168	0.722	---
Thallium	N/A	<0.0001	<0.0001	---
Titanium	N/A	<0.01	<0.01	---
Uranium	N/A	<0.001	0.002	---
Vanadium	N/A	<0.001	<0.001	---
Zinc	0.25	0.02	0.08	0.05
Alkalinity (as $CaCO_3$)	N/A	33	81	82
Chloride	N/A	2	13	13
Ammonia (as N)	N/A	0.05	0.09	0.04
Nitrate + Nitrite (as NO_2+NO_3)	N/A	<0.10	0.13	0.19
Hardness (as $CaCO_3$)	N/A	167	803	748
Bicarbonate (as $CaCO_3$)	N/A	33	81	82
Calcium	N/A	37	178	166
Magnesium	N/A	18	87	81
Potassium	N/A	2	9	9
Sodium	N/A	<2	5	5
F2 ($C_{>10}$-C_{16})	N/A	---	---	---
F3 ($C_{>16}$-C_{34})	N/A	---	---	---
F4 ($C_{>34}$-C_{50})	N/A	---	---	---

Notes:

Authorized Licence Limit – Monthly Measurement (most conservative)

A station specific action level of 1,471 mg/L is also available for sulphate based on 95th percentile calculated from Station specific historical

--- = Analysis not required NR = Not Reported

N/A = Not applicable, station specific action level not defined.

Bold = Value exceeds Authorized Licence Limit, as listed within the Water Licence requirements

Table B2-1: Twin Lakes Creek Water Quality Data (Station 159-6)

Parameter	Action Level (mg/L; unless otherwise specified)	Concentration (mg/L; unless otherwise specified)									
		28-Jun-17	28-Jun-17	28-Jun-17	10-Aug-17	10-Aug-17	10-Aug-17	13-Sep-17	13-Sep-17	13-Sep-17	13-Sep-17
		159-6	159-6 TEMP	159-6 TEMP DUP	159-6	159-6 DUP	159-6 TEMP	159-6	159-6 DUP	159-6 TEMP	159-6 TEMP DUP
Laboratory pH (units)	6 - 9.5										
Field pH (units)	6 - 9.5	8.4	7.9	8.3	---	---	---	8.1	8.3	8.3	---
Laboratory Conductivity (mS)	N/A										
Field Conductivity (mS)	N/A	0.168	0.167	0.168	---	---	---	0.965	0.983	0.983	---
Field Temperature (°C)	N/A	2.8	3.5	2.8	---	---	---	0.3	0.3	0.3	---
Total Suspended Solids	53	**145**	**198**	**268**	<2	<2	<2	<2	<2	<2	<2
Sulphate	463	30	30	31	65	65	86	**471**	444	405	425
Aluminum	N/A	0.91	0.83	1.58	0.05	0.03	<0.01	---	---	---	---
Antimony	N/A	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	---	---	---	---
Arsenic	N/A	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	---	---	---	---
Beryllium	N/A	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	---	---	---	---
Boron	N/A	0.03	0.03	0.04	0.06	0.06	0.07	---	---	---	---
Cadmium	0.014	0.0008	0.0008	0.0008	0.0003	0.0003	0.0002	0.0004	0.0004	0.0004	0.0004
Chromium	N/A	0.001	0.001	0.002	<0.001	<0.001	<0.001	---	---	---	---
Cobalt	N/A	0.0019	0.0018	0.0031	0.0002	0.0002	<0.0002	---	---	---	---
Copper	N/A	0.005	0.003	0.006	<0.001	<0.001	<0.001	---	---	---	---
Iron	N/A	2.02	1.8	3.02	0.05	0.04	<0.03	---	---	---	---
Lead	0.044	0.02	0.021	0.023	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	N/A	0.06	0.05	0.09	<0.01	<0.01	<0.01	---	---	---	---
Molybdenum	N/A	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	---	---	---	---
Nickel	N/A	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	---	---	---	---
Selenium	N/A	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	---	---	---	---
Silicon	N/A	1.7	1.6	2.7	0.5	0.5	0.5	---	---	---	---
Silver	N/A	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	---	---
Strontium	N/A	0.048	0.046	0.057	0.057	0.057	0.071	---	---	---	---
Thallium	N/A	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	---	---
Titanium	N/A	0.01	<0.01	0.02	<0.01	<0.01	<0.01	---	---	---	---
Uranium	N/A	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	---	---	---	---
Vanadium	N/A	0.002	0.002	0.004	<0.001	<0.001	<0.001	---	---	---	---
Zinc	4.6	0.31	0.29	0.31	0.14	0.13	0.05	0.26	0.26	0.26	0.26
Alkalinity (as $CaCO_3$)	N/A	33	33	34	30	29	47	58	58	57	57
Chloride	N/A	2	2	2	2	2	2	13	13	12	11
Ammonia (as N)	N/A	0.12	0.08	0.1	0.09	0.08	0.08	<0.02	0.04	<0.02	0.03
Nitrate + Nitrite (as NO_2+NO_3)	N/A	<0.10	<0.10	<0.10	0.1	0.1	<0.10	0.48	0.67	0.64	0.51
Hardness (as $CaCO_3$)	N/A	75	75	82	111	111	150	525	525	527	521
Bicarbonate (as $CaCO_3$)	N/A	33	33	34	30	29	47	58	58	57	57
Calcium	N/A	17	17	18	23	23	32	108	108	109	108
Magnesium	N/A	8	8	9	13	13	17	62	62	62	61
Potassium	N/A	<1	<1	<1	<1	<1	1	2	2	2	2
Sodium	N/A	<2	<2	<2	<2	<2	<2	4	5	4	4
F2 ($C_{>10}$-C_{16})	N/A	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	---	<0.020	---	<0.020
F3 ($C_{>16}$-C_{34})	N/A	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	---	<0.050	---	<0.050
F4 ($C_{>34}$-C_{50})	N/A	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	---	<0.050	---	<0.050

Notes:

Station specific action levels based on 95th percentile calculated from Station specific historical data.

--- = Analysis not required NR = Not Reported

N/A = Not applicable, station specific action level not defined.

Bold = Value exceeds Authorized Licence Limit, as listed within the Water Licence requirements.

Table B2-2: Twin Lakes Creek Water Quality Data (Station NML-23/ELO)

Parameter	Action Level (mg/L; unless otherwise specified)	Concentration (mg/L; unless otherwise specified)			
		29-Jun-17	29-Jun-17	10-Aug-17	10-Aug-17
		NML-23	ELO	ELO	NML-23
Laboratory pH (units)	6 - 9.5	7.40	7.39	8.87	7.41
Field pH (units)	6 - 9.5	8.3	8.5	9.3	8.7
Laboratory Conductivity (mS)	N/A	0.069	0.069	0.043	0.038
Field Conductivity (mS)	N/A	0.071	0.074	0.040	0.039
Field Temperature (°C)	N/A	2.9	1.800	8.300	7.700
Total Suspended Solids	10	<2	<2	<2	<2
Sulphate	25	12	11	6	6
Arsenic	N/A	---	---	---	---
Cadmium	0.0044	<0.0001	<0.0001	<0.0001	<0.0001
Copper	N/A	---	---	---	---
Lead	0.016	<0.001	<0.001	<0.001	<0.001
Nickel	N/A	---	---	---	---
Zinc	0.12	<0.01	<0.01	<0.01	<0.01
Alkalinity (as $CaCO_3$)	N/A	13	14	15	12
Chloride	N/A	2	2	1	1
Ammonia (as N)	N/A	0.1	0.1	0.08	0.07
Nitrate + Nitrite (as NO_2+NO_3)	N/A	<0.10	<0.10	<0.1	<0.1
Hardness (as $CaCO_3$)	N/A	34	34	16	18
Bicarbonate (as $CaCO_3$)	N/A	13	14	14	12
Calcium	N/A	7	7	3	4
Magnesium	N/A	4	4	2	2
Potassium	N/A	<1	<1	<1	<1
Sodium	N/A	<2	<2	<2	<2
F2 ($C_{>10}$-C_{16})	N/A	---	---	---	---
F3 ($C_{>16}$-C_{34})	N/A	---	---	---	---
F4 ($C_{>34}$-C_{50})	N/A	---	---	---	---

Notes:

Station specific action levels based on 95th percentile calculated from Station specific historical data.

--- = Analysis not required NR = Not Reported

N/A = Not applicable, station specific action level not defined.

Bold = Value exceeds Authorized Licence Limit, as listed within the Water Licence requirements.

Table B3: Chris Creek Water Quality Data (Station 159-14)

Parameter	Action Level (mg/L; unless otherwise specified)	Concentration (mg/L; unless otherwise specified)	
		28-Jun-17	10-Aug-17
		159-14	159-14
Laboratory pH (units)	6 - 9.5	7.97	8.10
Field pH (units)	6 - 9.5	8.2	8.3
Laboratory Conductivity (mS)	N/A	0.124	0.5
Field Conductivity (mS)	N/A	0.160	0.510
Field Temperature (°C)	N/A	7.8	8.700
Total Suspended Solids	32	**148**	<2
Sulphate	408	7	146
Arsenic	N/A	---	---
Cadmium	0.0005	<0.0001	<0.0001
Copper	N/A	---	---
Lead	0.0022	0.002	<0.001
Nickel	N/A	---	---
Zinc	0.13	0.01	**0.14**
Alkalinity (as $CaCO_3$)	N/A	51	89
Chloride	N/A	1	3
Ammonia (as N)	N/A	0.1	0.06
Nitrate + Nitrite (as NO_2+NO_3)	N/A	<0.10	0.13
Hardness (as $CaCO_3$)	N/A	73	285
Bicarbonate (as $CaCO_3$)	N/A	51	89
Calcium	N/A	16	53
Magnesium	N/A	8	37
Potassium	N/A	<1	<1
Sodium	N/A	<2	<2
F2 ($C_{>10}$-C_{16})	N/A	<0.020	---
F3 ($C_{>16}$-C_{34})	N/A	<0.050	---
F4 ($C_{>34}$-C_{50})	N/A	<0.050	---

Notes:

Station specific action levels based on 95th percentile calculated from Station specific historical data.

--- = Analysis not required NR = Not Reported

'N/A = Not applicable, station specific action level not defined.

Bold = Value exceeds Authorized Licence Limit, as listed within the Water Licence requirements.

Table B4: Landfill Water Quality Data (Station NML-30)

Parameter	Action Level (mg/L; unless otherwise specified)	Concentration (mg/L; unless otherwise specified)			
		28-Jun-17	28-Jun-17	10-Aug-17	10-Aug-17
		NML-30	NML-30 DUP	NML-30	NML-30 DUP
Laboratory pH (units)	6 - 9.5	7.90	7.98	8.23	8.23
Field pH (units)	6 - 9.5	8.2	8.2	8.2	---
Laboratory Conductivity (mS)	N/A	0.153	0.126	0.398	0.397
Field Conductivity (mS)	N/A	0.130	0.130	0.436	---
Field Temperature (°C)	N/A	2.2	2.2	11.8	---
Total Suspended Solids	22	**33**	**162**	<2	<2
Sulphate	240	23	7	84	84
Arsenic	N/A	---	---	---	---
Cadmium	0.00025	<0.0001	<0.0001	<0.0001	<0.0001
Copper	N/A	---	---	---	---
Lead	0.005	0.002	0.002	<0.001	<0.001
Nickel	N/A	---	---	---	---
Zinc	0.03	**0.07**	0.01	<0.01	<0.01
Alkalinity (as $CaCO_3$)	N/A	48	54	124	124
Chloride	N/A	1	<1	2	2
Ammonia (as N)	N/A	0.09	0.12	0.07	0.09
Nitrate + Nitrite (as NO_2+NO_3)	N/A	<0.10	<0.10	<0.10	<0.10
Hardness (as $CaCO_3$)	N/A	84	73	242	242
Bicarbonate (as $CaCO_3$)	N/A	48	54	124	124
Calcium	N/A	17	16	54	54
Magnesium	N/A	10	8	26	26
Potassium	N/A	<1	<1	1	2
Sodium	N/A	<2	<2	<2	<2
F2 ($C_{>10}$-C_{16})	N/A	<0.020	<0.020	<0.020	<0.020
F3 ($C_{>16}$-C_{34})	N/A	<0.050	<0.050	<0.050	<0.050
F4 ($C_{>34}$-C_{50})	N/A	<0.050	<0.050	<0.050	<0.050

Notes:

Station specific action levels based on 95th percentile calculated from Station specific historical data.

--- = Analysis not required NR = Not Reported

N/A = Not applicable, station specific action level not defined.

Bold = Value exceeds Authorized Licence Limit, as listed within the Water Licence requirements.

Appendix C TEMPORAL TREND FIGURES

Figure C1: Temporal trends at Station 159-4

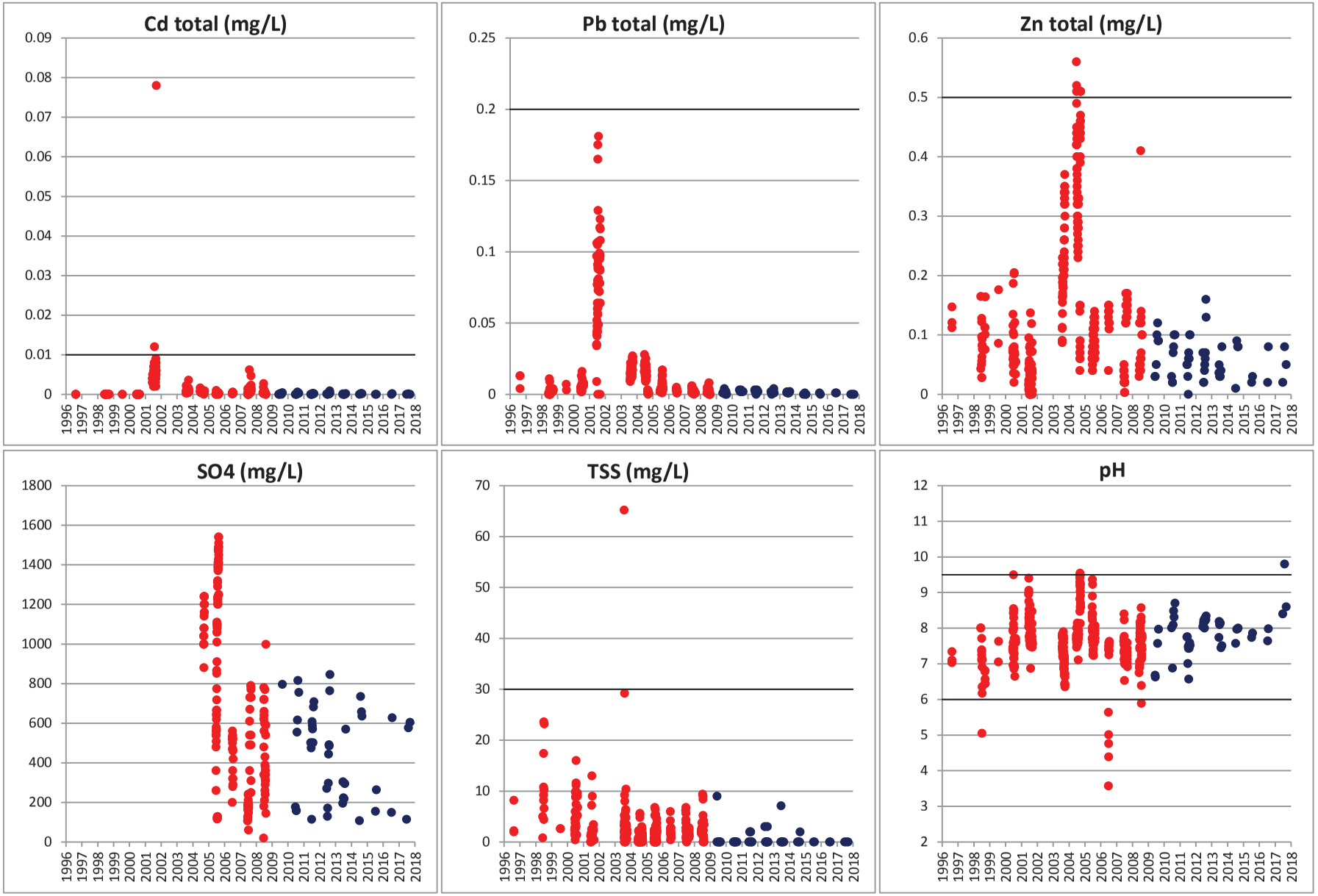


Figure C2: Temporal trends at Station 159-6

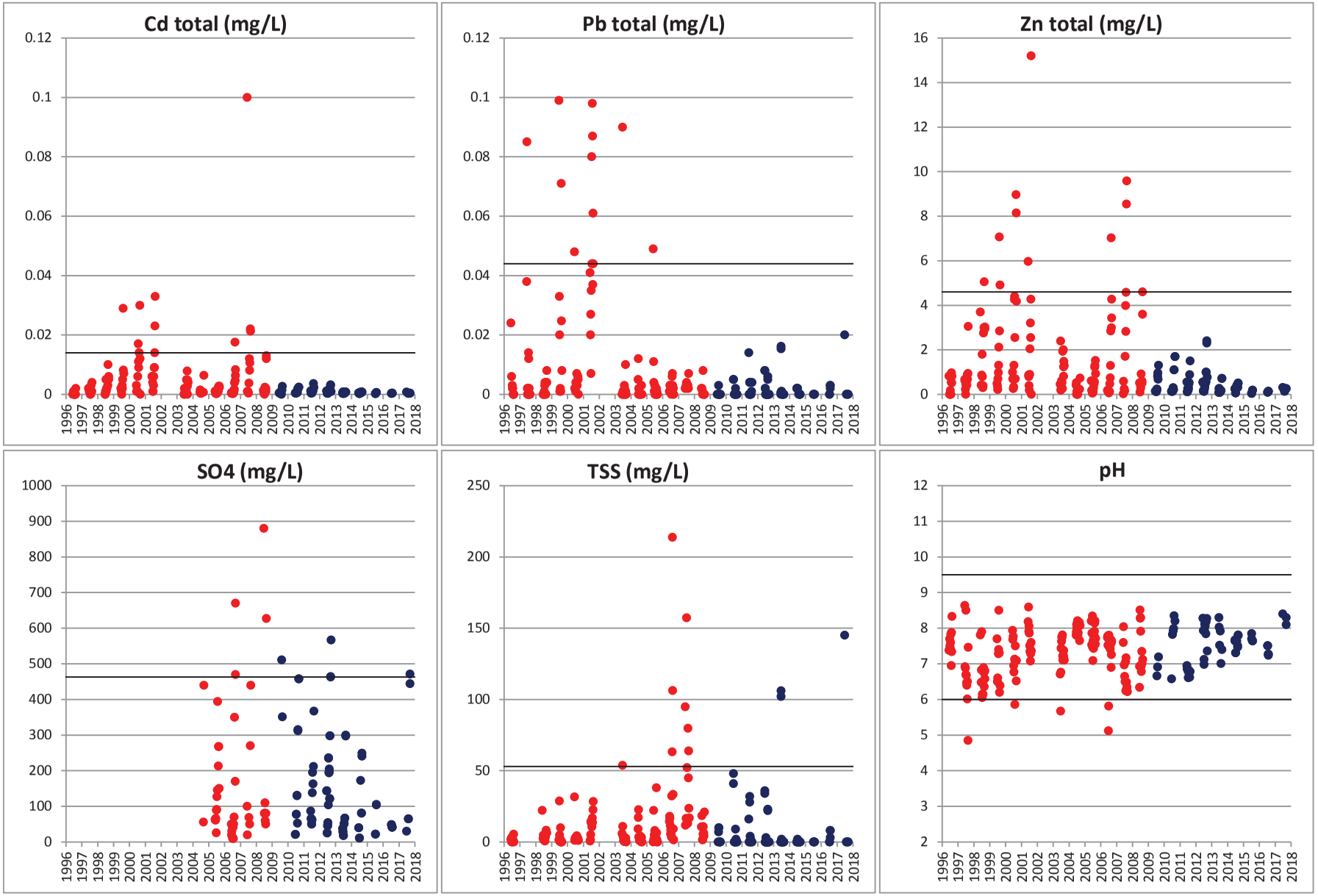


Figure C3: Temporal trends at Station NML-23

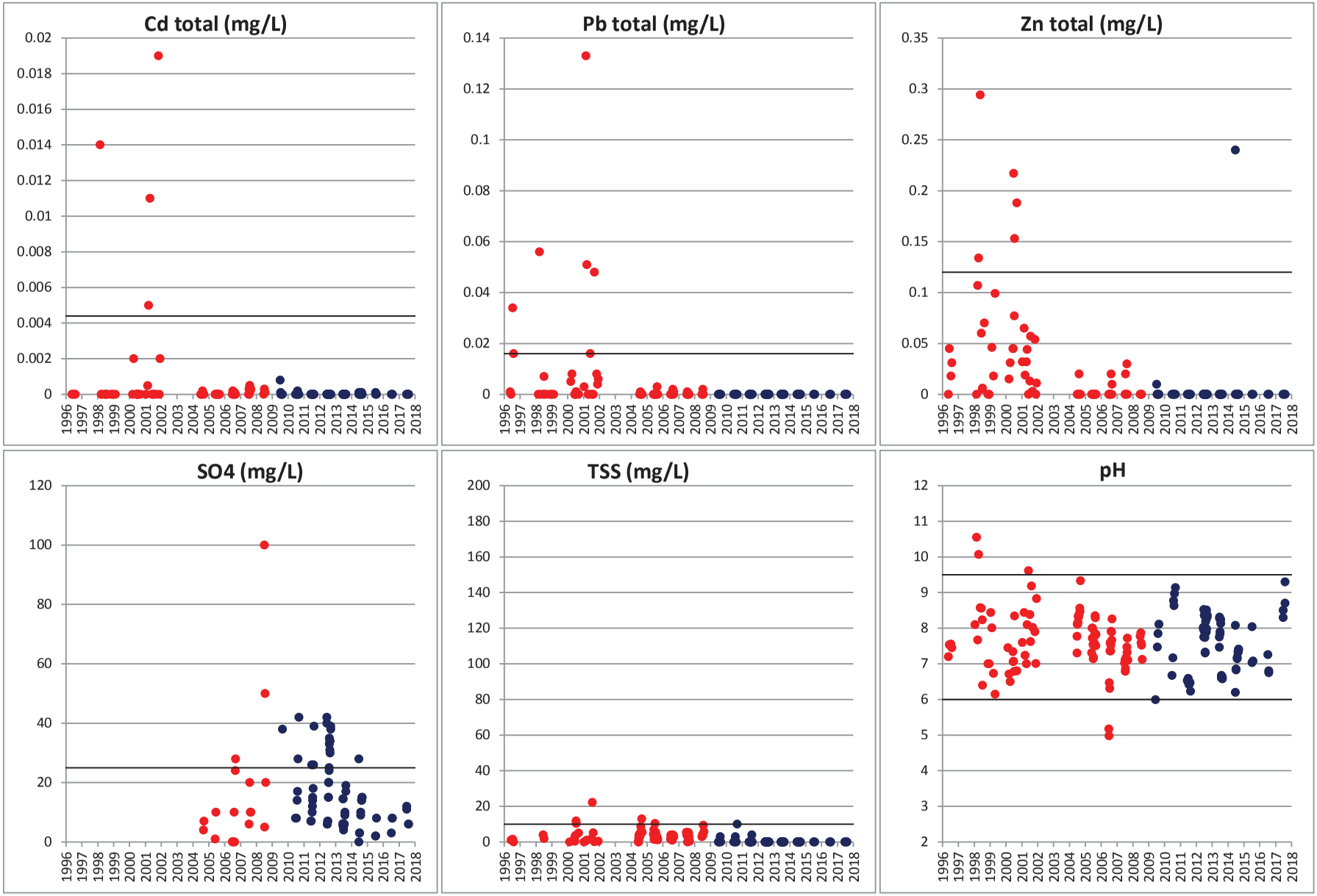


Figure C4: Temporal trends at Station 159-14

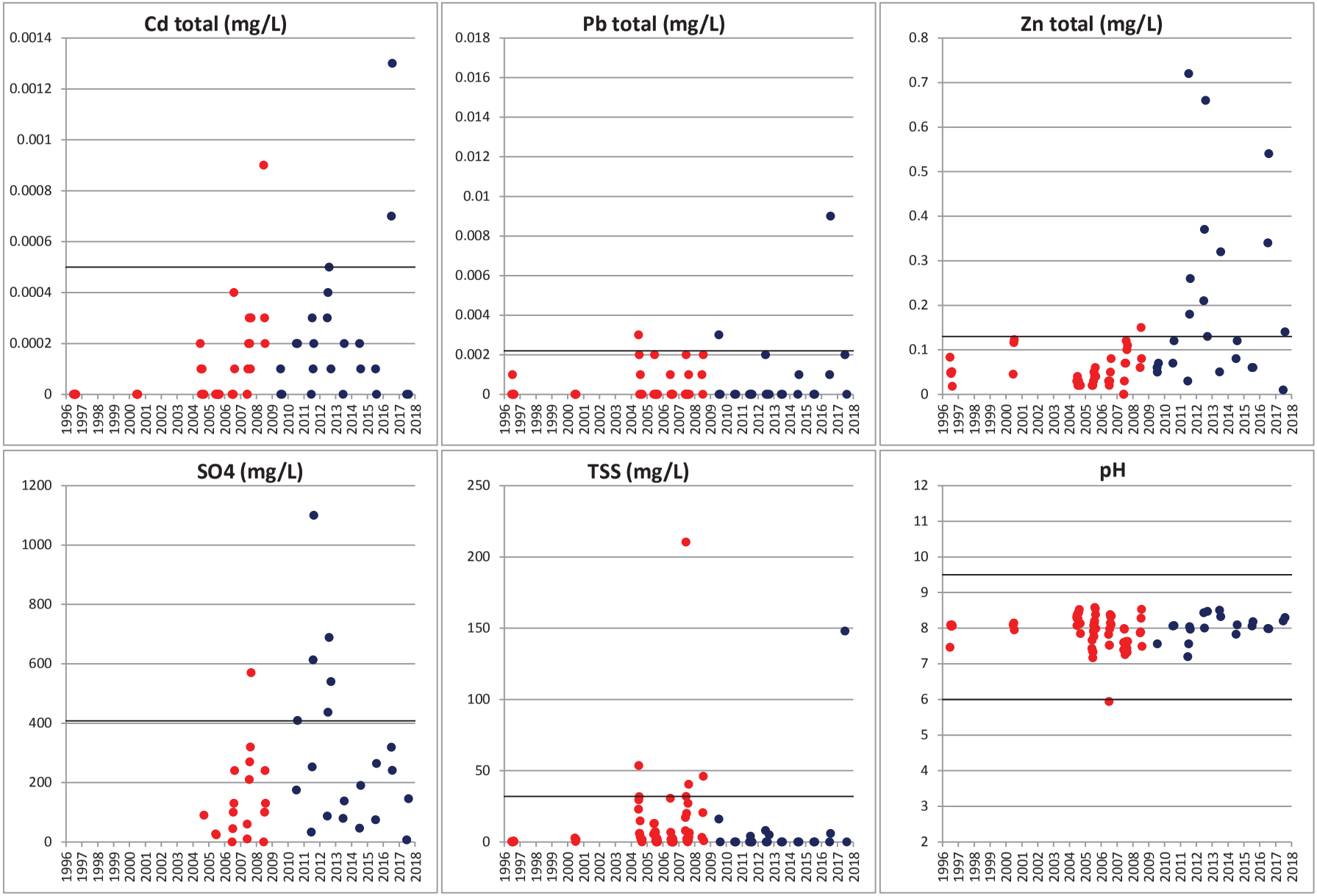
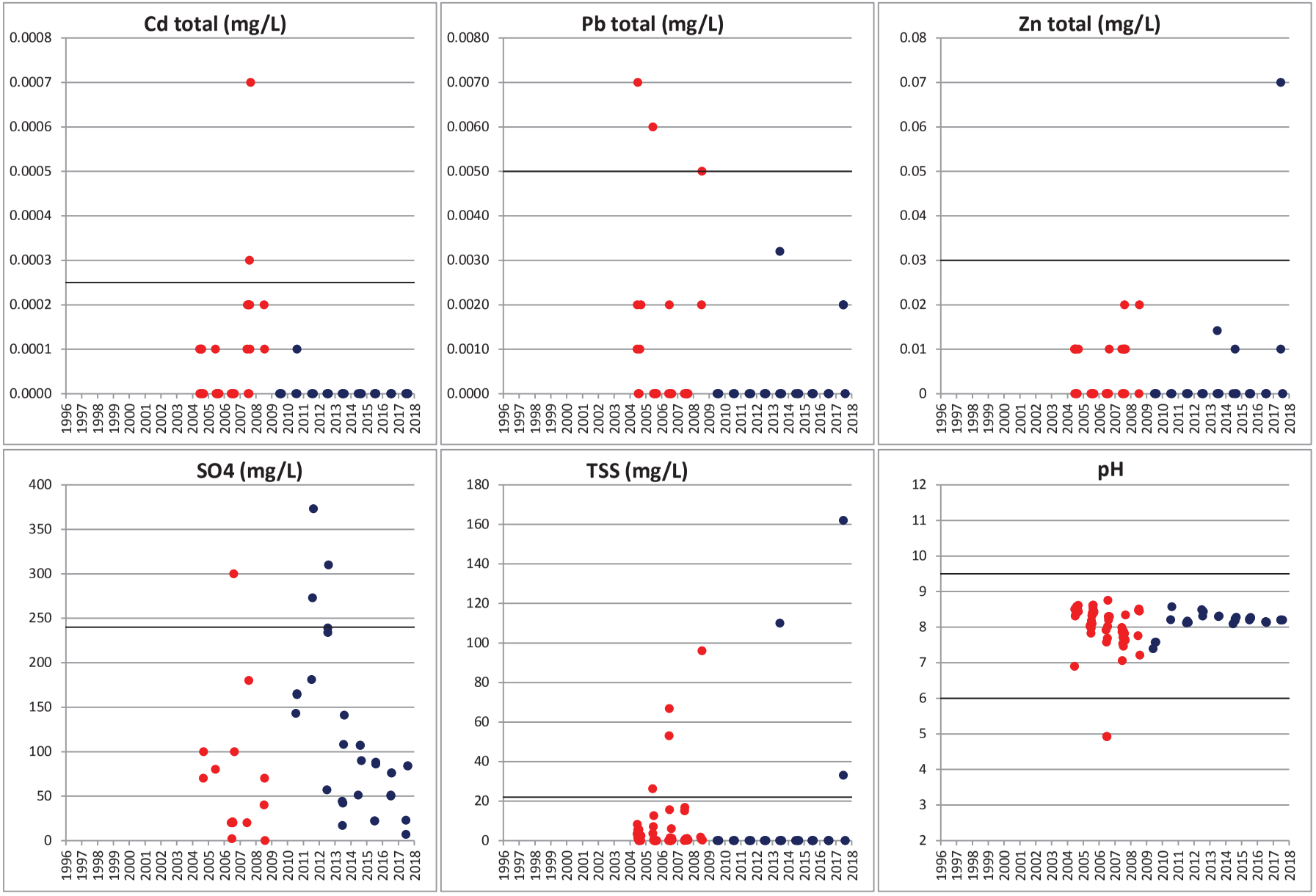


Figure C5: Temporal trends at Station NML-30



Appendix D 2018 FIELD PLANS

Nanisivik Mine Water Quality Monitoring Program 2018

Hi Lily,

We hope this box finds you well. We are looking forward to working with you again this year to complete the water quality monitoring program at the former Nanisivik Mine site. When you get this box, please give us a call or send us an email to confirm that you have received this package and that you have understood the requirements of this year's water sampling program.

The following pages include the calibration instructions for the field meters you will need to complete the water sampling program this year, as well as the simplified field forms for the 2018 water sampling program. Please take a few minutes to review the instructions on page 3 of this booklet, and let us know if you have any questions or concerns. Feel free also take a few minutes to test out the new meters, practice the calibration procedure (Page 3 of this booklet) and familiarize yourself with the new meters.

The regulatory requirements for the 2018 sampling program are the same as last year's and includes 5 stations within Twin Lakes Creek, 1 station in Chris Creek, and 2 stations at the Landfill. Last year, it was great that you identified the Contractor's laydown area and were able to take some photos. Details like this help us understand what activities are taking place at Nanisivik that could change the water quality in the area. Any photos you can take of the sampling stations, watercourses, and the surrounding areas are appreciated. There is a comment field in the field form where these photos and activities can be noted.

A couple of important sampling notes:

- The Nunavut Water Board requires there to be three sampling events per year. We have identified 3 equally spaced weeks for samples to be taken as noted in the field sheets that follow. Please keep an eye on the weather forecast leading into these weeks and try to select a day to collect the samples that will provide safe access to the Mine site. If weather prevents you from going to the Mine site, please let Stantec know as soon as possible. It's important that we make every effort this year to complete all three sampling events. I will be your contact at Stantec for this year's sampling, and my contact informaton is provided below.
- It is very important that the field forms and FIRST AIR shipping information is sent to us at Stantec in a timely basis. A photo or scanned copy of the field form should be emailed to Stantec when you return from the field visit prior to shipping the cooler back to the Lab in Ottawa. Please remember to include the First Air tracking number on the top of the form so that we can track the shipment and let the Lab know it is on the way.
    - **IMPORTANT NOTE**: The Lab in Ottawa has changed their name from Exxova to Eurofins Environment Testing Canada, but their address and contact information remains the same. The Lab's address and contact information should be on the cooler already and is included on Page 2 of this booklet for your information.
- Before you go into the field please check that both hand held meters are working properly, have sufficient battery (over 75%) and have been calibrated. If you have any questions or run into any trouble with the field meters, please let us know as soon as possible. We would be happy to work with you and answer any of your questions.

Thanks again Lily for all your support at the Nanisivik Mine site. We appreciate your efforts and look forward to hearing from you when you receive this package.

Regards,

Jodie
Stantec Project Coordinator
Jodie.Lowe@stantec.com
Office: 506-457-3227
Cell: 506-292-6639 (texting capable)

Your Water Quality Monitoring Program Support Team Contact Information

at Stantec Consulting Ltd.

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office fax 1-506-452-0112

at Eurofins Laboratory in Ottawa, Ontario

Scott Clark, Client Services Supervisor/Project Manager
Eurofins Environment Testing Canada
8-146 Colonnade Road
Ottawa, Ontario
K2E 7Y1
Phone: 1-613-727-5692 ext. 323

After the site visits reminder:

- ☐ Clean and dry the Conductivity and pH meters. You can do this by running them under gently flowing tap water and allowing them to air dry before replacing the black cap and storing them in a cool and dry place until their next use.
- ☐ Package the water samples collected for shipping. Be sure to include the Discarded Solution bottle from the calibration step.
- ☐ Record the First Air Tracking Number on the field form.
- ☐ Send a copy of the form (photo or scan) of the field form to Jodie Lowe at Stantec via email at Jodie.Lowe@stantec.com or text it to 506-292-6639.

Calibration Instructions

Blue Conductivity Meter Calibration

From the box we sent you:

1. Take out the small glass jar labeled **Conductivity**.
2. Take out the small plastic bottle with the blue cap and orange striped label marked with **HI7031**.
3. Carefully pour the contents of the small plastic bottle into the glass jar until you have reached the bottom of the **FILL** line marked on the glass jar.
4. Take the black cap off and touch the ON button ⏻ until the display screen lights up.
5. The screen will automatically display zero conductivity and the temperature of the space you are in.
6. Click the **CAL** button; the screen will display **CAL**, and then change to **1413 USE** and the current temperature. When CAL is blinking in the bottom left of the display screen you are ready to calibrate the meter.
7. Place it into the solution you poured into the glass jar. The display screen will change to briefly display **1413 rec**.
8. The ⧗ is now blinking in the upper left and CAL is blinking in the bottom left of the display screen. This means it is reading the conductivity. Do not touch the meter. It takes about 15 seconds to calibrate.
9. The display screen will briefly show **STOR** when it has finished measuring, and the display screen will provide you with the results. Conductivity should be 1413 µSm and with a room temperature of between 18 and 24 °C.
10. RECORD THE NUMBERS OF THE DISPLAY AT THE TOP OF THE FIELDNOTE SHEET FOR THE SAMPLING EVENT
11. Press the ON button ⏻ to exit calibration mode. The display will show **CLR** briefly and return to ready mode.
12. Press the ON/OFF button ⏻ to turn the meter off. Gently dry the end of the meter with paper towel and replace the black cap.

You are now ready for the field measurement.

Red pH Meter Calibration

From the box we sent you:

1. Take out the 2 small glass jars labeled **pH 4** and **pH 7**
2. Take out the 2 small plastic bottles of pH calibration solution with the Red and Green striped labels.
3. Carefully pour the contents of the green striped bottle labeled **HI7007** into the glass jar marked **pH7** to the **FILL** line marked on the glass jar.
4. Carefully pour the contents of the red striped bottle labeled **HI7004M** into the glass jar marked **pH4** to the **FILL** line marked on the jar. Set this jar to the side, you will need it at Step XX.
5. Take the black cap off and touch the ON button ⏻ until the display screen lights up.
6. The screen will be blinking 0.0 and a temperature in °C.
7. Click the **CAL** button; the screen will display **CAL**, and then change to **7.01 USE** and CAL is blinking in the bottom left of the display screen you are ready to calibrate the meter.
8. Place the meter in the jar with the 7.0 solution and hold it there until the ⧗ stops flashing. The screen will briefly display **REC 7.01** while it is measuring the pH. When it is done, it will show 4.01 USE.
9. Remove the meter from the 7.0 solution and place it into the 4.0 solution. Again, hold it in the solution until the ⧗ stops flashing. The screen will briefly display **REC 4.01**. When the meter has calibrated, the screen will briefly display **STOR** and then change to the default on display (pH measurement and the temperature of the solution in °C.)
10. Press the CAL button once, and then the ⏻ to set the calibration.
11. The CAL display should not be showing in the bottom left of the display screen.
12. Press the ON/OFF button ⏻ to turn the meter off. Gently dry the end of the meter with paper towel and replace the black cap.

You are now ready for the field measurement.

Pour the solutions from the small glass jars into the plastic bottle marked Discarded Solutions.
Send this Discarded Solutions bottle to the lab with the samples.

Field Instructions

How to take a Field Measurement
These instructions apply to both Conductivity and pH measurements.

1. Remove the meter from the plastic box.
2. Turn on the meter by pressing the ⏻ button
3. Wait for the display screen show the ⧗ in the upper left corner. After a few seconds it will start to blink.
4. Place the end of the meter (to the top of the cap line) in the water.

   It is important to not touch the end of the meter to the bottom of the watercourse.

5. Hold the meter in the water until the ⧗ stops blinking. This will take about 30 seconds.
6. Record the measurement in the field book (pages below) including the pH/Conductivity reading and the temperature.

7. If you receive an ERR---. Stop.

   Take the meter out of the water. Turn the meter off. Wait 5 seconds to turn the meter on again and repeat steps 1 to 6 above.

If you have any trouble in the field, please contact Jodie or Annick as soon as possible.

Month 1: Week of **July 9 to 13, 2018**

Sample Date: _____ **Calibration:** Date: _____ pH meter ☐ Conductivity meter: ☐

First Air Tracking No: _____ **Date Shipped:** _____

Sampling Station ID/Description	Date & Time Sample Collected	Temperature °C	pH	Conductivity	Comments: *Is there anything different at the site (e.g., equipment, construction activity, animal activity)? Have you taken any photos? Is there flow in the Creek?*
Twin Lakes Creek Watershed					
Station: NML-23 (159-20) Outflow from East Twin Lake					
Station: ELO Outflow from East Twin Lake					
Station: 159-4 Outflow from West Twin Lake Disposal Area					
Station: 159-6 Outflow from West Twin Lake Disposal Area					
Station: Temporary 159-6 Samples required if laydown area identified in 2016 remains on the shore of Twin Lakes Creek					
Station: FIELD-DUP Stn_____ Field Duplicate *Select one of the stations above*					
Chris Creek Watershed					
Station: 159-14 Outflow from East Twin Lake					
Landfill					
Station: NML-29 (159-21) East side of Landfill					
Station: NML-30 West side of Landfill					
Station: NML-30-DUP Field Duplicate					
Quality Control					
Station: _____ Field Blank					

Month 2: Week of **August 6 to 10, 2018**

Sample Date: _____ **Calibration:** Date: _____ pH meter ☐ Conductivity meter: ☐

First Air Tracking No: _____ **Date Shipped:** _____

Sampling Station/Description	Date & Time Sample Collected	Temperature °C	pH	Conductivity	Comments: *Is there anything different at the site (e.g., equipment, construction activity, animal activity)? Have you taken any photos? Is there flow in the Creek?*
Twin Lakes Creek Watershed					
Station: NML-23 (159-20) Outflow from East Twin Lake					
Station: ELO Outflow from East Twin Lake					
Station: 159-4 Outflow from West Twin Lake Disposal Area					
Station: 159-6 Outflow from West Twin Lake Disposal Area					
Station: Temporary 159-6 Samples required if laydown area identified in 2016 remains on the shore of Twin Lakes Creek					
Station: FIELD-DUP Stn_____ Field Duplicate *Select one of the stations above*					
Chris Creek Watershed					
Station: 159-14 Outflow from East Twin Lake					
Landfill					
Station: NML-29 (159-21) East side of Landfill					
Station: NML-30 West side of Landfill					
Station: NML-30-DUP Field Duplicate					
Quality Control					
Station: _____ Field Blank					

Month 3: Week of **August 27 to September 1, 2018**

Sample Date: _____ **Calibration:** Date: _____ pH meter ☐ Conductivity meter: ☐

First Air Tracking No: _____ **Date Shipped:** _____

Sampling Station/Description	Date & Time Sample Collected	Temperature °C	pH	Conductivity	Comments: *Is there anything different at the site (e.g., equipment, construction activity, animal activity)? Have you taken any photos? Is there flow in the Creek?*
Twin Lakes Creek Watershed					
Station: NML-23 (159-20) Outflow from East Twin Lake					
Station: ELO Outflow from East Twin Lake					
Station: 159-4 Outflow from West Twin Lake Disposal Area					
Station: 159-6 Outflow from West Twin Lake Disposal Area					
Station: Temporary 159-6 Samples required if laydown area identified in 2016 remains on the shore of Twin Lakes Creek					
Station: FIELD-DUP Stn_____ Field Duplicate *Select one of the stations above*					
Chris Creek Watershed					
Station: 159-14 Outflow from East Twin Lake					
Landfill					
Station: NML-29 (159-21) East side of Landfill					
Station: NML-30 West side of Landfill					
Station: NML-30-DUP Field Duplicate					
Quality Control					
Station: _____ Field Blank					