2015 Annual Water Quality Monitoring Report

Former Nanisivik Mine Site, Nunavut

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Executive Summary

This report provides a summary of the 2015 water quality monitoring results for the Nanisivik Mine located on the Borden Peninsula of northern Baffin Island in Nunavut. The water quality monitoring program has been conducted as required under Nunavut Water Licence 1AR–NAN1419 and is intended to assess the overall performance of reclamation and closure activities at the former mine site. The effectiveness and adequacy of mine reclamation is to be demonstrated through monitoring key 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 their 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 2015 resulted in full compliance with Maximum Authorized Concentrations at the final discharge point of the West Twin Disposal Area for the months of July and August. In addition, there was full compliance with action levels at all other sampling stations for the months of July and August.

Concentrations of heavy metals and total suspended sediments in the analyzed water samples were uniformly low. There was no detection of petroleum hydrocarbons either at the landfill site (Stations NML-29 and NML-30), or at the mouth of Twin Lakes Creek (Station 159-6). These results indicate that the decommissioning plan for the former Nanisivik Mine is meeting its objectives.

The loss of water samples collected in September was unfortunate. By the time it was realized that the samples had failed to arrive at the analytical laboratory, freezing conditions at the former mine site made it impossible to obtain replacement samples. Similarly the failure of the field technician to transmit field notes, including the field measured parameters of pH, conductivity, temperature, and visual observations of hydrocarbon sheen is regrettable. However, in this case the missing field observations are replaced by laboratory measured values for pH, conductivity and petroleum hydrocarbon fractions F2 to F4. Nyrstar should take measures to ensure that field notes are transmitted in a timely manner, and that water samples are more rigorously monitored while in transit. This would create the possibility of re-sampling in order to meet the expectation of three sampling periods (i.e., July, August and September) as outlined in the Water Licence, in the event that future samples are delayed or lost in transit.

The results of the 2015 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 those that existed prior to the mine development.

A sampling plan has been prepared for the 2016 field season, and is attached to this report as Appendix D.

1.0 Introduction

1.1 GENERAL INTRODUCTION

Stantec Consulting Ltd. (Stantec) is pleased to present CanZinco Mines Ltd. with a review of the 2015 water quality monitoring data for the former Nanisivik Mine on the Borden Peninsula of northern Baffin Island in the Nunavut. The monitoring program is being conducted as required under Water Licence 1AR-NAN1419 (the Water Licence, Nunavut Water Board, 2015) and is intended to assess the overall performance of reclamation and closure activities. The Water Licence issued by the Nunavut Water Board for the period of December 23, 2014 to December 22, 2019 was approved by the Minister of Aboriginal Affairs and Northern Development Canada on January 29, 2015.

1.2 SITE DESCRIPTION

The former Nanisivik Mine, herein referred to as the "Mine", is located in Nunavut on the Borden Peninsula, part of northern Baffin Island (Drawing A-1, Appendix A). Specifically, the Mine is located on the southern shore of Strathcona Sound, approximately 33 kilometres by road from the nearest settlement, the hamlet of Arctic Bay. The Mine is located 750 kilometres north of the Arctic Circle at an approximate latitude of 73 degrees north. In 1998, CanZinco Ltd., a wholly owned subsidiary of Breakwater Resources Ltd., took possession of the Mine, and operated it until 2002. Breakwater Resources was acquired by Nyrstar Canada (Holdings) Ltd. 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 throughout 2015 under Nunavut Water Licence 1AR–NAN1419, issued by the Nunavut Water Board (2015).

1.3 SAMPLING LOCATIONS

The main sampling locations used historically for water quality monitoring near the Mine are described in Table 1.1 and are shown in Drawing A-2 (Appendix A). During the 2015 Water Quality Monitoring Program, monitoring stations included those listed in Schedule I, Table 2 of Water Licence 1AR-NAN1419, with the addition of sampling at Station ELO (Table 1.1). Station ELO is located upstream of NML-23 and

was added during the 2012 program to confirm that elevated sulphate concentrations originate from the watershed of East Twin Lake, and not from seepage proximal to NML–23.

Table 1.1 Surface Water Quality Sampling Locations Tested in 2015

Group	Station	Distance Downstream of Headwaters (m)	Description
Twin Lakes Creek Watershed	ELO	0	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	7,250	Outlet of Twin Lakes Creek into Strathcona Sound
	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), with the exception of Station ELO implemented during the 2012 Water Quality Monitoring Program.

1.4 PREVIOUS WATER QUALITY MONITORING PROGRAMS

1.4.1 Water Licences

Since 1976, Nanisivik 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, the conditions of the current Water Licence (Schedule I, Table 2) include a reduced number of 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 values (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 triggered to determine the cause of the exceedance. Action levels have not been identified for other parameters because they are of less 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).

Table 1.3 Non-Regulatory Station-Specific Action Levels for the 2015 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	0.005	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:
1. NML-29 flow is intermittent and rare; action levels in case of flow are the same as NML-30.
2. Re-calculated station specific action levels per the Contingency Plan 2015.

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 1.4 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	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
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:
1. Station ELO is sampled on a voluntary basis by Nyrstar.
2. Monthly monitoring to be carried out during periods of flow or July 1 to September 1, annually.
3. 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).
4. NAN-2 includes: Petroleum hydrocarbon analysis of F2 to F4 hydrocarbons.
5. NAN-4 includes: ICP (trace metal) scan.

1.4.2 Summary of Water Quality Monitoring Prior to 2015

Two main themes emerged from the six-year period of monitoring subsequent to the decommissioning of the Nanisivik mine site. Of greatest significance, the decommissioning appeared to have achieved its objectives with respect to overall water quality. Key areas that were decommissioned, such as the West Twin Disposal Area and landfill showed consistently good results over the period 2008 to 2014. Water quality trends over time are illustrated graphically in Appendix C.

Sampling stations lower in the Twin Lakes Creek drainage system (*i.e.*, 159–10 and 159–6) also showed substantial improvement after decommissioning activities ceased. Station 159–6, however, remained subject to upset conditions due to the unpredictable nature of weathering and erosion 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, likewise produced results that were consistent with conditions that prevailed before mining occurred.

The decommissioned facilities overall behaved as expected throughout the post-decommissioning period (2008-2014). Minor variations in water quality were likely driven by regional weather patterns. Years that are characterized by warm, wet summers appeared to produce results that reflected deeper seasonal melting of shallow permafrost (with occasional exceedances of non-regulatory water quality target concentrations), whereas cooler years (including 2014) when the depth of thawing would be shallower showed fewer such exceedances. On this basis, the results obtained between 2008 and 2014 showed a range of results that reflected regional weather trends over the period, and can be considered indicative of likely future performance.

2.0 Review of 2015 Water Quality Data

Water samples were collected from the Twin Lakes Creek watershed, Chris Creek watershed and Landfill watershed during the 2015 open flow sampling season. A summary of the 2015 water quality monitoring results, along with the sampling frequency is presented in tabular format in Appendix B. It should be noted that water samples collected in late August/early September 2015 (the third sampling event required by the Water Licence) were unfortunately mislaid in transit between Arctic Bay, Nunavut, and the Exova Laboratory in Ottawa, Ontario, and therefore no results are available for this period. In addition, field data collected during the 2015 sampling events was not received by Stantec at the time of writing this report. As a result, field measurements for pH and temperature, and visual observations are not available.

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 Station 159–4 are presented in Table 2.1 for the parameters specified in the Water Licence, with full data provided in Table B1 (Appendix B). Temporal trends are provided graphically in Figure C1 (Appendix C). Concentrations of each of the regulatory parameters measured (*i.e.*, arsenic, cadmium, copper, lead, nickel, zinc and TSS) remained below the maximum authorized concentrations. Measured pH values were within the authorized range.

For the additional non-regulatory parameters, the sulphate concentrations at Station 159-4 ranged between 155 and 264 mg/L (Table B1 and Figure C1), below the action level of 1,471 mg/L based on the station–specific 95th percentile value.

Table 2.1 Concentrations of Water Licence Parameters at Station 159–4 in 2015

Parameter	Maximum Authorized Concentration (mg/L)	159–4		
		July	August	September
Total Arsenic (mg/L)	0.25	---	<0.001	n/a
Total Copper (mg/L)	0.10	---	0.001	n/a
Total Lead (mg/L)	0.10	0.001	<0.001	n/a
Total Nickel (mg/L)	0.50	---	<0.005	n/a
Total Zinc (mg/L)	0.25	0.02	0.03	n/a
Total Suspended Solids (mg/L)	15.0	<1	<1	n/a
Total Cadmium (mg/L)	0.005	<0.0001	<0.0001	n/a
pH (units)	6.0-9.5 (pH units)	7.74	7.80	n/a

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 annual testing by ICP scan for trace metals generally.
2. n/a = data not available (the water sample collected at Station 159-4 in September 2015 was mislaid in transit to Ottawa).

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

Two additional stations are identified in the Water Licence for post-closure monitoring within the Twin Lakes Creek watershed. Station NML-23, located in the upper reach of the Twin Lakes Creek watershed

near the outlet of East Twin Lake, and Station 159-6, located in Twin Lakes Creek, immediately before it discharges into Strathcona Sound. In addition, Nyrstar samples station ELO at the outlet to East Twin Lake on a voluntary basis. Selected water quality data for Stations 159–6 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.

Table 2.2 Concentrations of Selected Parameters at Station 159–6 in 2015

Parameter	Action Level for Station 159-6	July	August	September
Total Cadmium (mg/L)	0.014	0.0002	0.0006	n/a
Total Lead (mg/L)	0.044	<0.001	<0.001	n/a
Total Zinc (mg/L)	4.6	0.04	0.19	n/a
Total Sulphate (mg/L)	463	22	104	n/a
Total Suspended Solids (mg/L)	53	<1	<3	n/a
Petroleum Hydrocarbons (mg/L)	visible sheen[1]	n.d.	n.d.	n/a

Notes:
1. Required sampling at 159-6 includes monthly testing for NAN-1 (total cadmium, lead and zinc) with major cations, major anions, TSS, the field parameters of specific conductivity, temperature, pH and visual observation for hydrocarbon sheens and NAN-2 (petroleum hydrocarbons), as well as annual sampling for NAN-4 (ICP trace metal scan).
2. n/a = data not available (the water samples collected at Station 159-6 in September 2015 were mislaid in transit to Ottawa).
3. n.d. = results for F2, F3 and F4 below analytical detection limits of 0.02, 0.5 and 0.05 mg/L, respectively.

Table 2.3 Concentrations of Selected Parameters at Station NML–23 in 2015

Parameter	Action Level for Station NML-23	July	August	September
Total Cadmium (mg/L)	0.0044	<0.0001	<0.0001	n/a
Total Lead (mg/L)	0.016	<0.001	<0.001	n/a
Total Zinc (mg/L)	0.12	<0.01	<0.01	n/a
Total Sulphate (mg/L)	25	2	8	n/a
Total Suspended Solids (mg/L)	10.0	<1	<2	n/a

Notes:
1. Required sampling at NML-23 includes monthly testing for NAN-1 (total cadmium, lead and zinc) with major cations, major anions, TSS, the field parameters of specific conductivity, temperature, pH and visual observation for hydrocarbon sheens, and annual testing by ICP scan for trace metals generally.
2. n/a = data not available (the water samples collected at Station NML-23 in September 2015 were mislaid in transit to Ottawa).

All of the water quality results for Stations 159-6 and NML-23 were within the expected ranges in 2015, with no indications of water quality impairment that would indicate any concerns with respect to the environmental performance of the decommissioned Mine.

Although not required under the Water Licence, water samples were collected at Station ELO in July, 2015. The water quality recorded at Station ELO was very similar to the water quality recorded at the nearby reference station NML-23 (see Table B2-2).

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 are presented in Table 2.4, with the full data

provided in Table B3, in Appendix B. All of the water quality results for Station 159-14 were within the expected ranges in 2015, with no indications of water quality impairment that would indicate any concerns with respect to the environmental performance of the decommissioned Mine.

Table 2.4 Concentrations of Selected Parameters at Station 159-14 in 2015

Parameter	Action Level for Station 159-14	July	August	September
Total Cadmium (mg/L)	0.005	0.0001	<0.0001	n/a
Total Lead (mg/L)	0.0022	<0.001	<0.001	n/a
Total Zinc (mg/L)	0.13	0.06	0.06	n/a
Total Sulphate (mg/L)	408	75	264	n/a
Total Suspended Solids (mg/L)	32	<1	<1	n/a

Notes:
1. Required sampling at 159-14 includes monthly testing for NAN-1 (total cadmium, lead and zinc) with major cations, major anions, TSS, the field parameters of specific conductivity, temperature, pH and visual observation for hydrocarbon sheens.
2. n/a = data not available (the water samples collected at Station 159-14 in September 2015 were mislaid in transit to Ottawa).

2.4 LANDFILL WATERSHED

The landfill is located west of Nanisivik, 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 2015 monitoring period. Flow at this site has been intermittent throughout the post-closure period and no flow was recorded at station NML-29 during the recorded site visits in 2015. Samples were collected in both July and August, 2015, from Station NML-30. A summary of the water quality data for Stations NML-30 is presented in Table 2.5, raw data provided in Table B4-1, in Appendix B. All of the water quality results for Station NML-30 were within the expected ranges in 2015, with no indications of water quality impairment that would indicate any concerns with respect to the environmental performance of the decommissioned Mine. Traces of petroleum hydrocarbon fractions were detected at this sampling station in 2014, and it was recommended that this station be carefully examined for the potential presence of sheens in 2015. Analytical results for 2015 indicate no detectable hydrocarbon fractions, and therefore no further investigation into the source of the detection in 2014 is recommended at this time.

Table 2.5 Concentrations of Selected Parameters at Station NML-30 in 2015

Parameter	Action Level for Stations NML-29 and NML-30	July	August	September
Total Cadmium (mg/L)	0.00025	<0.0001	<0.0001	n/a
Total Lead (mg/L)	0.0050	<0.001	<0.001	n/a
Total Zinc (mg/L)	0.03	<0.01	<0.01	n/a
Total Sulphate (mg/L)	240	22	86	n/a
Total Suspended Solids (mg/L)	22	<1	<1	n/a
Petroleum hydrocarbons (mg/L)	visible sheen[1]	n.d.	n.d.	n/a

Notes:
1. Required sampling at NML-30 includes monthly testing for NAN-1 (total cadmium, lead and zinc) with major cations, major anions, TSS, the field parameters of specific conductivity, temperature, pH and visual observation for hydrocarbon sheens and NAN-2 (petroleum hydrocarbons).
2. n/a = data not available (the water samples collected at Station NML-30 in September 2015 were mislaid in transit to Ottawa).
3. n.d. = results for F2, F3 and F4 below analytical detection limits of 0.02, 0.5 and 0.05 mg/L, respectively.

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 cleanliness of the sampling, and the reproducibility of the sampling results. Three field duplicate samples (two at Stations 159–6 and NML-30) and two blank samples were collected at the Mine and submitted for analysis of key parameters during the 2015 Water Quality Monitoring Program. Relative Percent Difference (RPD) of each duplicate parameter measured is provided in Table 2.6.

In general, the duplicate results agree closely with their corresponding samples and confirm the representativeness of sampling procedures. For most of the samples the relative percent difference (RPD) from the mean for individual parameters ranged between 0% and 5% for field duplicates. Three outliers with a RPD of greater than 40% were observed for various parameters when sample values were close to or at the laboratory detection limits. 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 the sample, as well as potential contaminant distribution. However, the values noted above are considered to indicate acceptable duplication. The blank samples contained a trace of ammonia, which was reproducible between the two blank sampled, but at a higher concentration than was reported in most of the field samples. The ammonia result is therefore considered to be a minor problem with the laboratory-supplied distilled water, and not indicative of elevated background or contamination in the field samples. The overall data quality is considered acceptable.

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

Parameter	Parent	Field Dup	RPD	Parent	Field Dup	RPD	Parent	Field Dup	RPD	Parent	Field Dup	RPD	Greater Than
	159-6 July 11, 2015	159-6D July 11, 2015	(%)	159-6 August 3, 2015	159-6D August 3, 2015	(%)	NML-30 August 3, 2015	NML-30D August 3, 2015	(%)	Field Blank July 11, 2015	Field Blank August 3, 2015	(%)	40% RPD
pH (pH units)	7.7	7.85	1.93%	7.64	7.64	0.00%	8.27	8.25	0.24%	6.09	5.94	2.49%	0
Conductivity (mS)	0.116	0.117	0.86%	0.316	0.322	1.88%	0.422	0.447	5.75%	<0.005	<0.005	0.00%	0
TSS	<1	<1	0.00%	<1	<3	100.00%	<1	<1	0.00%	<1	<2	66.67%	2
Sulphate	22	22	0.00%	104	105	0.96%	86	88	2.30%	<1	<1	0.00%	0
Aluminum	0.04	0.02	66.67%	<0.01	<0.01	0.00%							1
Antimony	<0.0005	<0.0005	0.00%	<0.0005	<0.0005	0.00%							0
Arsenic	<0.001	<0.001	0.00%	<0.001	<0.001	0.00%							0
Beryllium	<0.0005	<0.0005	0.00%	<0.0005	<0.0005	0.00%							0
Boron	0.04	0.03	28.57%	0.09	0.09	0.00%							0
Cadmium	0.0002	0.0002	0.00%	0.0006	0.0006	0.00%	<0.0001	<0.0001	0.00%	<0.0001	<0.0001	0.00%	0
Chromium	<0.001	<0.001	0.00%	<0.001	<0.001	0.00%							0
Cobalt	<0.0002	<0.0002	0.00%	0.0003	0.0002	40.00%							0
Copper	<0.001	<0.001	0.00%	<0.001	<0.001	0.00%							0
Iron	<0.03	<0.03	0.00%	<0.03	<0.03	0.00%							0
Lead	<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	<0.01	<0.01	0.00%	<0.01	<0.01	0.00%							0
Molybdenum	<0.005	<0.005	0.00%	<0.005	<0.005	0.00%							0
Nickel	<0.005	<0.005	0.00%	<0.005	<0.005	0.00%							0
Selenium	<0.001	<0.001	0.00%	<0.001	<0.001	0.00%							0
Silicon	0.4	0.3	28.57%	0.6	0.6	0.00%							0
Silver	<0.0001	<0.0001	0.00%	<0.0001	<0.0001	0.00%							0
Strontium	0.032	0.032	0.00%	0.104	0.102	1.94%							0
Thallium	<0.0001	<0.0001	0.00%	<0.0001	<0.0001	0.00%							0
Titanium	<0.01	<0.01	0.00%	<0.01	<0.01	0.00%							0
Uranium	<0.001	<0.001	0.00%	<0.001	<0.001	0.00%							0
Vanadium	<0.001	<0.001	0.00%	<0.001	<0.001	0.00%							0
Zinc	0.04	0.04	0.00%	0.19	0.19	0.00%	<0.01	<0.01	0.00%	<0.01	<0.01	0.00%	0
Alkalinity (as $CaCO_3$)	31	32	3.17%	47	48	2.11%	154	150	2.63%	<5	<5	0.00%	0
Chloride	2	2	0.00%	3	3	0.00%	3	3	0.00%	<1	<1	0.00%	0
Ammonia (as nitrogen)	0.13	0.09	36.36%	0.15	0.15	0.00%	0.14	0.09	43.48%	0.22	0.23	4.44%	1
$NO_2 + NO_3$ as N	<0.10	<0.10	0.00%	0.32	0.3	6.45%	0.15	0.17	12.50%	<0.10	<0.10	0.00%	0
Hardness (as $CaCO_3$)	52	52	0.00%	162	162	0.00%	248	250	0.80%	<1	<1	0.00%	0
HCO_3 as $CaCO_3$	31	32	3.17%	47	48	2.11%	154	150	2.63%	<1	<1	0.00%	0
Calcium	11	11	0.00%	32	32	0.00%	53	54	1.87%	<1	<1	0.00%	0

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

Parameter	Parent	Field Dup	RPD	Parent	Field Dup	RPD	Parent	Field Dup	RPD	Parent	Field Dup	RPD	Greater Than
	159-6 July 11, 2015	159-6D July 11, 2015	(%)	159-6 August 3, 2015	159-6D August 3, 2015	(%)	NML-30 August 3, 2015	NML-30D August 3, 2015	(%)	Field Blank July 11, 2015	Field Blank August 3, 2015	(%)	40% RPD
Magnesium	6	6	0.00%	20	20	0.00%	28	28	0.00%	<1	<1	0.00%	0
Potassium	<1	<1	0.00%	1	1	0.00%	2	2	0.00%	<1	<1	0.00%	0
Sodium	<2	<2	0.00%	<2	<2	0.00%	2	2	0.00%	<2	<2	0.00%	0
F2	<0.02	<0.02	0.00%	<0.02	<0.02	0.00%	<0.02	<0.02	0.00%				0
F3	<0.05	<0.05	0.00%	<0.05	<0.05	0.00%	<0.05	<0.05	0.00%				0
F4	<0.05	<0.05	0.00%	<0.05	<0.05	0.00%	<0.05	<0.05	0.00%				0

Notes:

1. F2, F3, F4 represent petroleum hydrocarbon fractions by increasing molecular weight.
2. D = Field Duplicate
3. n/a = Not Applicable
4. RPD = Relative Percent Difference
5. Concentrations of parameters are reported in mg/L unless otherwise specified.
6. Shaded orange cells represent RPD higher than 40%.

3.0 Discussion

Water quality monitoring of the decommissioned Nanisivik Mine in 2015 resulted in full compliance with Maximum Authorized Concentrations at the final discharge point of the West Twin Disposal Area for the months of July and August. In addition, there was full compliance with action levels at all other sampling stations for the months of July and August.

Concentrations of heavy metals and total suspended sediments in the analyzed water samples were uniformly low. There was no detection of petroleum hydrocarbons either at the landfill site (Stations NML-29 and NML-30), or at the mouth of Twin Lakes Creek (Station 159-6). These results indicate that indicating that the decommissioning plan for the former Nanisivik Mine is meeting its objectives.

The loss of water samples collected in September was unfortunate. By the time it was realized that the samples had failed to arrive at the analytical laboratory, freezing conditions at the former mine site made it impossible to obtain replacement samples. Similarly the failure of the field technician to transmit field notes, including the field measured parameters of pH, conductivity, temperature, and visual observations of hydrocarbon sheen is regrettable. However, in this case the missing field observations are replaced by laboratory measured values for pH, conductivity and petroleum hydrocarbon fractions F2 to F4.

4.0 Conclusions and Recommendations

The results of the 2015 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 those that existed prior to the mine development.

The failure of the field technician to transmit field notes collected during sampling, and the loss of the samples collected in September, 2015, while in transit from Nanisivik to the laboratory located in Ottawa, are both unfortunate events. Nyrstar should take measures to ensure that field notes are transmitted in a timely manner, and that water samples are more rigorously monitored while in transit. This would create the possibility of re-sampling in order to meet the expectation of three sampling periods (*i.e.*, July, August and September) as outlined in the Water Licence, in the event that future samples are delayed or lost in transit.

A sampling plan has been prepared for the 2016 field season, and is attached to this report as Appendix D.

5.0 Closing

This report has been prepared for the sole benefit of CanZinco Mines Ltd., as a subsidiary of the Nyrstar group of companies (Nyrstar). The report may not be used by any other person or entity, other than for its intended purposes, without the consent of Nyrstar 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 Nyrstar, 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 Nyrstar 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. Stantec cannot comment on whether the samples adequately represent site conditions. 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.

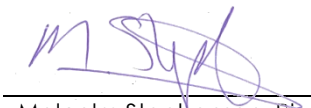
This report was prepared by Jodie Lowe and Annick St-Amand, Ph.D. and reviewed by Malcolm Stephenson, Ph.D. Should you have any questions or comments on the contents of this report, please contact the undersigned.

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, Ph.D.
Environmental Scientist, Organic Chemist



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

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6.0 References

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

THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

SITE LOCATION

WATER QUALITY MONITORING

NANISIVIK MINE, NUNAVUT

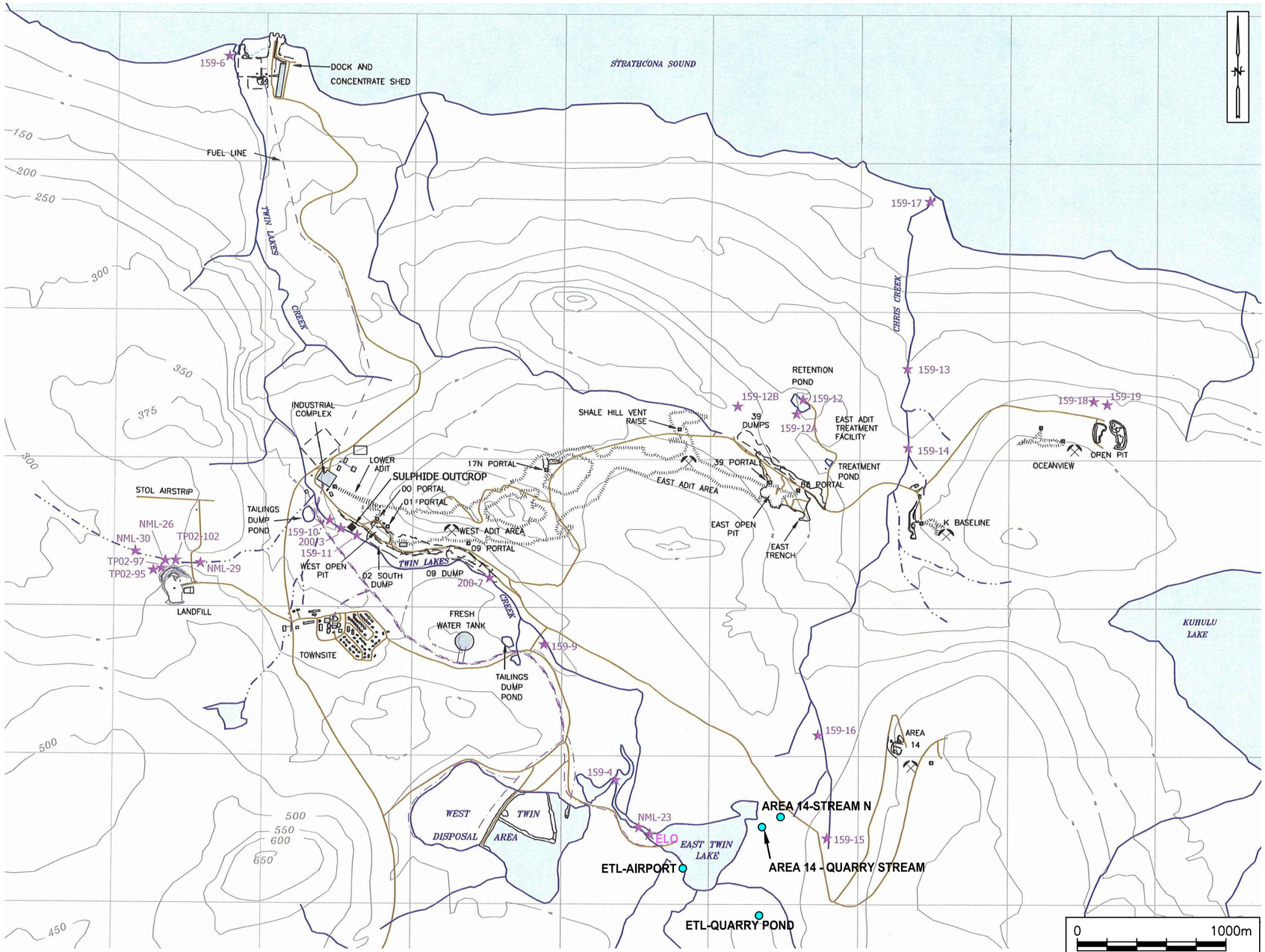
Client: CANZINCO MINES LTD. c/o NYRSTAR SALES & MARKETING AG

Job No.:	121811900
Scale:	1 : 2□0,000
Date:	11-MAR-2016
Dwn. By:	JL
App'd By:	MS

Dwg. No.: A-1

Stantec

V:\1218\active\121811900\1_environmental\3_drawings\121811900_WQM_A-1.dwg



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

THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

Reference:
ORIGINAL FIGURES PROVIDED BY NANISIVIK MINE

WATER SAMPLING LOCATIONS - MINE AREA

WATER QUALITY MONITORING
NANISIVIK MINE, NUNAVUT

Client: CANZINCO MINES LTD. c/o NYRSTAR SALES & MARKETING AG

Job No.:	121811900
Scale:	1 : 30,000
Date:	11-MAR-2016
Dwn. By:	JL
App'd By:	MS

Dwg. No.: A-2

Stantec

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Appendix B 2015 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)	
		11-Jul-15	03-Aug-15
		159-4	159-4
Lab pH (units)	6 - 9.5	7.74	7.86
Lab Conductivity (mS)	N/A	0.422	0.632
Temperature (°C)	N/A	NR	NR
Total Suspended Solids	15	<1	<1
Sulphate	1,471	155	264
Aluminum	N/A	---	0.01
Antimony	N/A	---	<0.0005
Arsenic	0.25	---	<0.001
Beryllium	N/A	---	<0.0005
Boron	N/A	---	0.33
Cadmium	0.005	<0.0001	<0.0001
Chromium	N/A	---	<0.001
Cobalt	N/A	---	<0.0002
Copper	0.1	---	0.001
Iron	N/A	---	<0.03
Lead	0.1	0.001	<0.001
Manganese	N/A	---	<0.01
Molybdenum	N/A	---	<0.005
Nickel	0.5	---	<0.005
Selenium	N/A	---	<0.001
Silicon	N/A	---	0.5
Silver	N/A	---	<0.0001
Strontium	N/A	---	0.377
Thallium	N/A	---	<0.0001
Titanium	N/A	---	<0.01
Uranium	N/A	---	<0.001
Vanadium	N/A	---	<0.001
Zinc	0.25	0.02	0.03
Alkalinity (as $CaCO_3$)	N/A	42	49
Chloride	N/A	4	6
Ammonia (as N)	N/A	0.28	0.13
Nitrate + Nitrite (as NO_2+NO_3)	N/A	<0.10	<0.10
Hardness (as $CaCO_3$)	N/A	212	348
Bicarbonate (as $CaCO_3$)	N/A	42	49
Calcium	N/A	47	75
Magnesium	N/A	23	39
Potassium	N/A	3	4
Sodium	N/A	<2	2

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

Parameter	Action Level (mg/L; unless otherwise specified)	Concentration (mg/L; unless otherwise specified)			
		11-Jul-15 159-6	11-Jul-15 159-6 Dup	03-Aug-15 159-6	03-Aug-15 159-6 Dup
Lab pH (units)	6 - 9.5	7.7	7.85	7.64	7.64
Lab Conductivity (mS)	N/A	0.116	0.117	0.316	0.322
Temperature (°C)	N/A	NR	NR	NR	NR
Total Suspended Solids	53	<1	<1	<1	<3
Sulphate	463	22	22	104	105
Aluminum	N/A	0.04	0.02	<0.01	<0.01
Antimony	N/A	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	N/A	<0.001	<0.001	<0.001	<0.001
Beryllium	N/A	<0.0005	<0.0005	<0.0005	<0.0005
Boron	N/A	0.04	0.03	0.09	0.09
Cadmium	0.014	0.0002	0.0002	0.0006	0.0006
Chromium	N/A	<0.001	<0.001	<0.001	<0.001
Cobalt	N/A	<0.0002	<0.0002	0.0003	0.0002
Copper	N/A	<0.001	<0.001	<0.001	<0.001
Iron	N/A	<0.03	<0.03	<0.03	<0.03
Lead	0.044	<0.001	<0.001	<0.001	<0.001
Manganese	N/A	<0.01	<0.01	<0.01	<0.01
Molybdenum	N/A	<0.005	<0.005	<0.005	<0.005
Nickel	N/A	<0.005	<0.005	<0.005	<0.005
Selenium	N/A	<0.001	<0.001	<0.001	<0.001
Silicon	N/A	0.4	0.3	0.6	0.6
Silver	N/A	<0.0001	<0.0001	<0.0001	<0.0001
Strontium	N/A	0.032	0.032	0.104	0.102
Thallium	N/A	<0.0001	<0.0001	<0.0001	<0.0001
Titanium	N/A	<0.01	<0.01	<0.01	<0.01
Uranium	N/A	<0.001	<0.001	<0.001	<0.001
Vanadium	N/A	<0.001	<0.001	<0.001	<0.001
Zinc	4.6	0.04	0.04	0.19	0.19
Alkalinity (as $CaCO_3$)	N/A	31	32	47	48
Chloride	N/A	2	2	3	3
Ammonia (as N)	N/A	0.13	0.09	0.15	0.15
Nitrate + Nitrite (as NO_2+NO_3)	N/A	<0.10	<0.10	0.32	0.3
Hardness (as $CaCO_3$)	N/A	52	52	162	162
Bicarbonate (as $CaCO_3$)	N/A	31	32	47	48
Calcium	N/A	11	11	32	32
Magnesium	N/A	6	6	20	20
Potassium	N/A	<1	<1	1	1
Sodium	N/A	<2	<2	<2	<2
F2 ($C_{>10}$-C_{16})	N/A	<0.02	<0.02	<0.02	<0.02
F3 ($C_{>16}$-C_{34})	N/A	<0.05	<0.05	<0.05	<0.05
F4 ($C_{>34}$-C_{50})	N/A	<0.05	<0.05	<0.05	<0.05

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)		
		11-Jul-15 ELO	11-Jul-15 NML-23	03-Aug-15 NML-23
Lab pH (units)	6 - 9.5	7.03	8.04	7.08
Lab Conductivity (mS)	N/A	0.028	0.038	0.052
Temperature (°C)	N/A	NR	NR	NR
Total Suspended Solids	10	<1	<1	<2
Sulphate	25	2	2	8
Arsenic	N/A	---	---	---
Cadmium	0.0044	0.0001	<0.0001	<0.0001
Copper	N/A	---	---	---
Lead	0.016	<0.001	<0.001	<0.001
Nickel	N/A	---	---	---
Zinc	0.12	<0.01	<0.01	<0.01
Alkalinity (as $CaCO_3$)	N/A	11	14	10
Chloride	N/A	2	2	1
Ammonia (as N)	N/A	0.11	0.17	0.14
Nitrate + Nitrite (as NO_2+NO_3)	N/A	<0.10	<0.10	<0.10
Hardness (as $CaCO_3$)	N/A	9	9	22
Bicarbonate (as $CaCO_3$)	N/A	11	14	10
Calcium	N/A	2	2	4
Magnesium	N/A	1	1	3
Potassium	N/A	<1	<1	<1
Sodium	N/A	<2	<2	<2

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)	
		12-Jul-15	03-Aug-15
		159-14	159-14
Lab pH (units)	6 - 9.5	8.06	8.18
Lab Conductivity (mS)	N/A	0.308	0.731
Temperature (°C)	N/A	NR	NR
Total Suspended Solids	32	<1	<1
Sulphate	408	75	264
Arsenic	N/A	---	---
Cadmium	0.0005	0.0001	<0.0001
Copper	N/A	---	---
Lead	0.0022	<0.001	<0.001
Nickel	N/A	---	---
Zinc	0.13	0.06	0.06
Alkalinity (as $CaCO_3$)	N/A	86	113
Chloride	N/A	3	4
Ammonia (as N)	N/A	0.1	0.16
Nitrate + Nitrite (as NO_2+NO_3)	N/A	0.1	0.17
Hardness (as $CaCO_3$)	N/A	160	429
Bicarbonate (as $CaCO_3$)	N/A	86	113
Calcium	N/A	31	76
Magnesium	N/A	20	58
Potassium	N/A	<1	1
Sodium	N/A	<2	2

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)			
		10-Jul-15 NML-30	10-Jul-15 NML-30 DUP	03-Aug-15 NML-30	03-Aug-15 NML-30 DUP
Lab pH (units)	6 - 9.5	8.23	8.2	8.27	8.25
Lab Conductivity (mS)	N/A	0.285	0.284	0.422	0.447
Temperature (°C)	N/A	NR	NR	NR	NR
Total Suspended Solids	22	<1	<1	<1	<1
Sulphate	240	22	22	86	88
Arsenic	N/A	---	---	---	---
Cadmium	0.00025	<0.0001	<0.0001	<0.0001	<0.0001
Copper	N/A	---	---	---	---
Lead	0.005	<0.001	<0.001	<0.001	<0.001
Nickel	N/A	---	---	---	---
Zinc	0.03	<0.01	<0.01	<0.01	<0.01
Alkalinity (as $CaCO_3$)	N/A	130	130	154	150
Chloride	N/A	3	3	3	3
Ammonia (as N)	N/A	0.12	0.11	0.14	0.09
Nitrate + Nitrite (as NO_2+NO_3)	N/A	0.17	0.15	0.15	0.17
Hardness (as $CaCO_3$)	N/A	153	153	248	250
Bicarbonate (as $CaCO_3$)	N/A	130	130	154	150
Calcium	N/A	35	35	53	54
Magnesium	N/A	16	16	28	28
Potassium	N/A	<1	<1	2	2
Sodium	N/A	<2	<2	2	2
F2 ($C_{>10}$-C_{16})	N/A	<0.02	<0.02	<0.02	<0.02
F3 ($C_{>16}$-C_{34})	N/A	<0.05	<0.05	<0.05	<0.05
F4 ($C_{>34}$-C_{50})	N/A	<0.05	<0.05	<0.05	<0.05

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 2015 Temporal Trend Figures

Figure C1: Temporal trends at Station 159-4

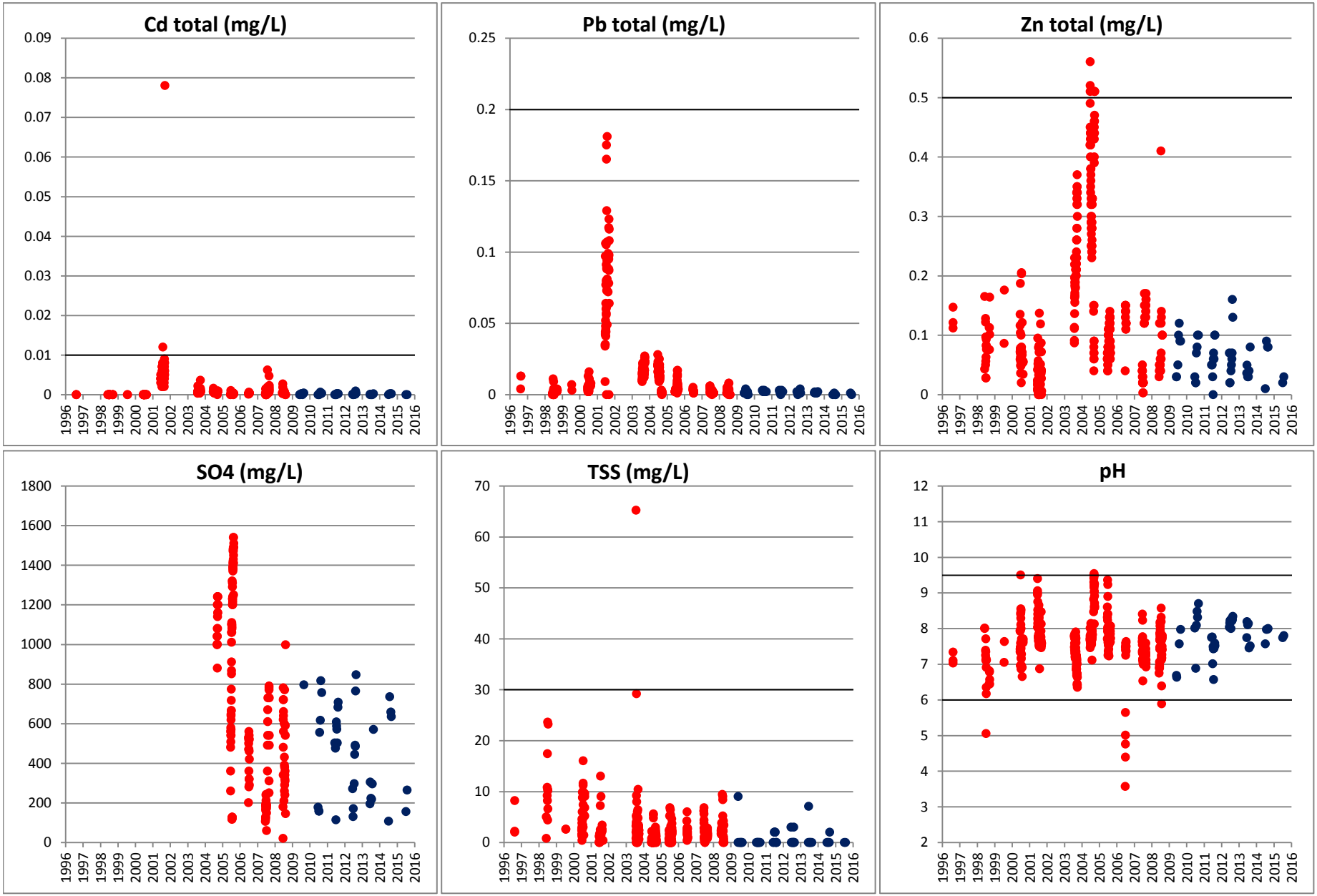


Figure C2: Temporal trends at Station 159-6

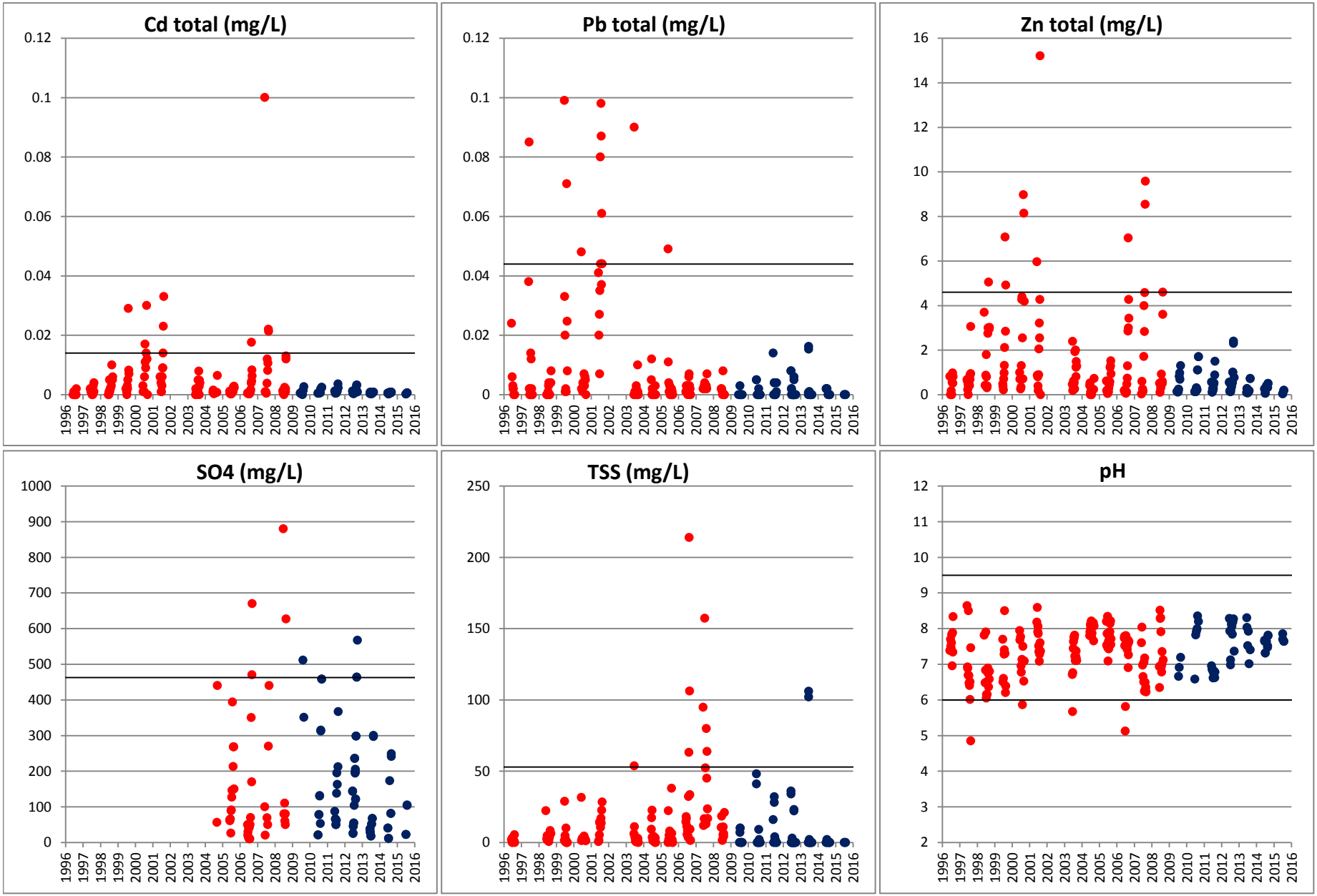


Figure C3: Temporal trends at Station NML-23

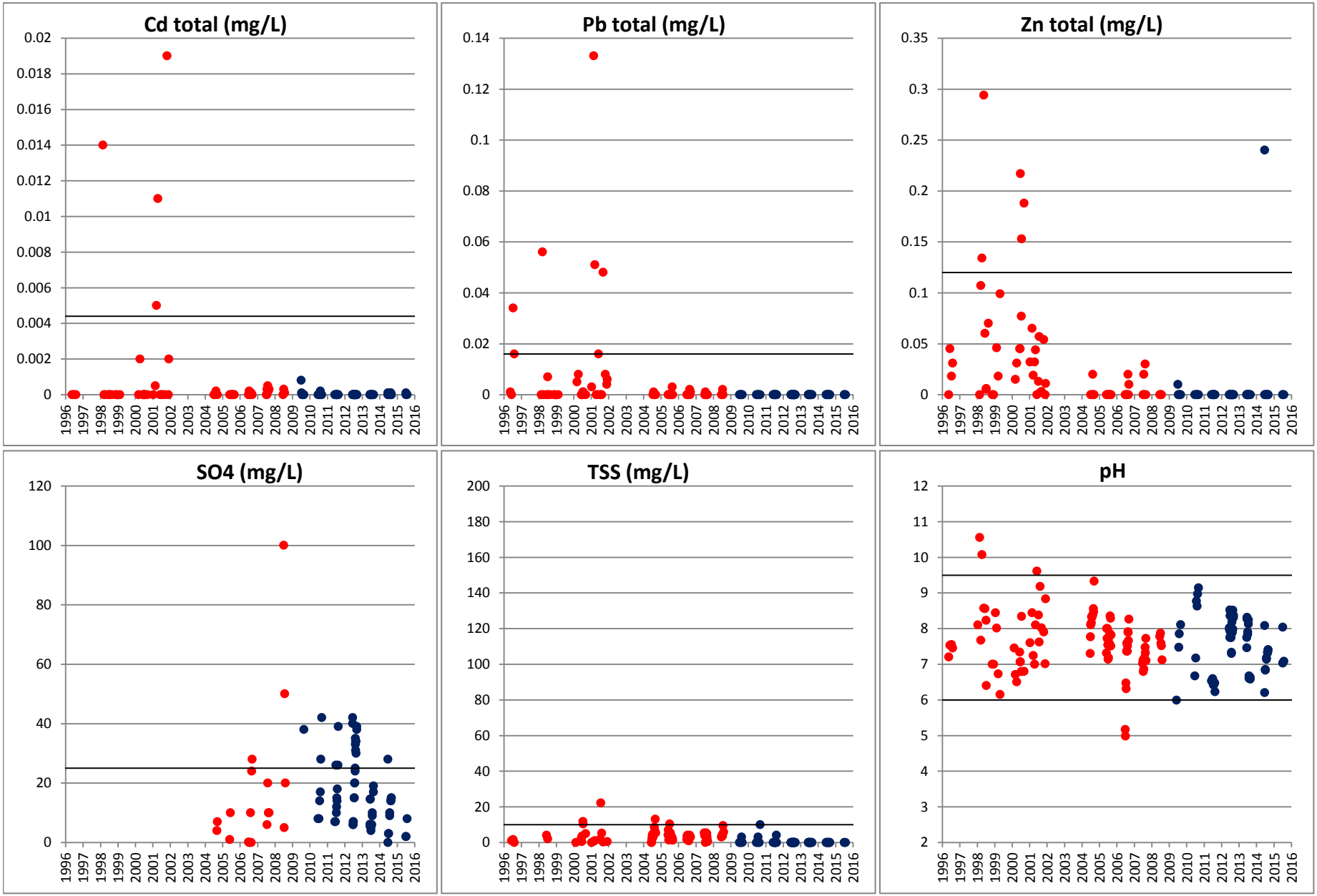


Figure C4: Temporal trends at Station 159-14

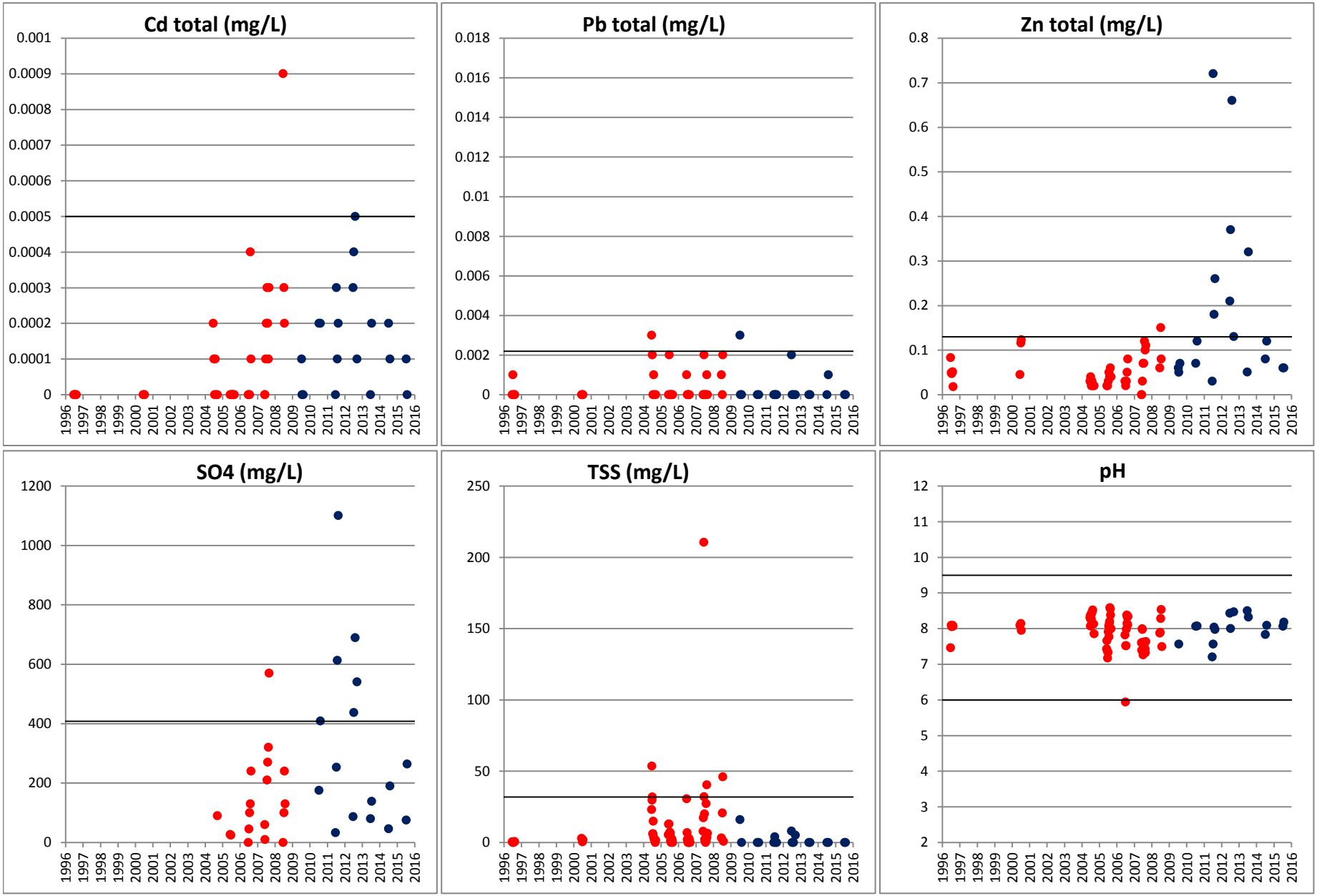
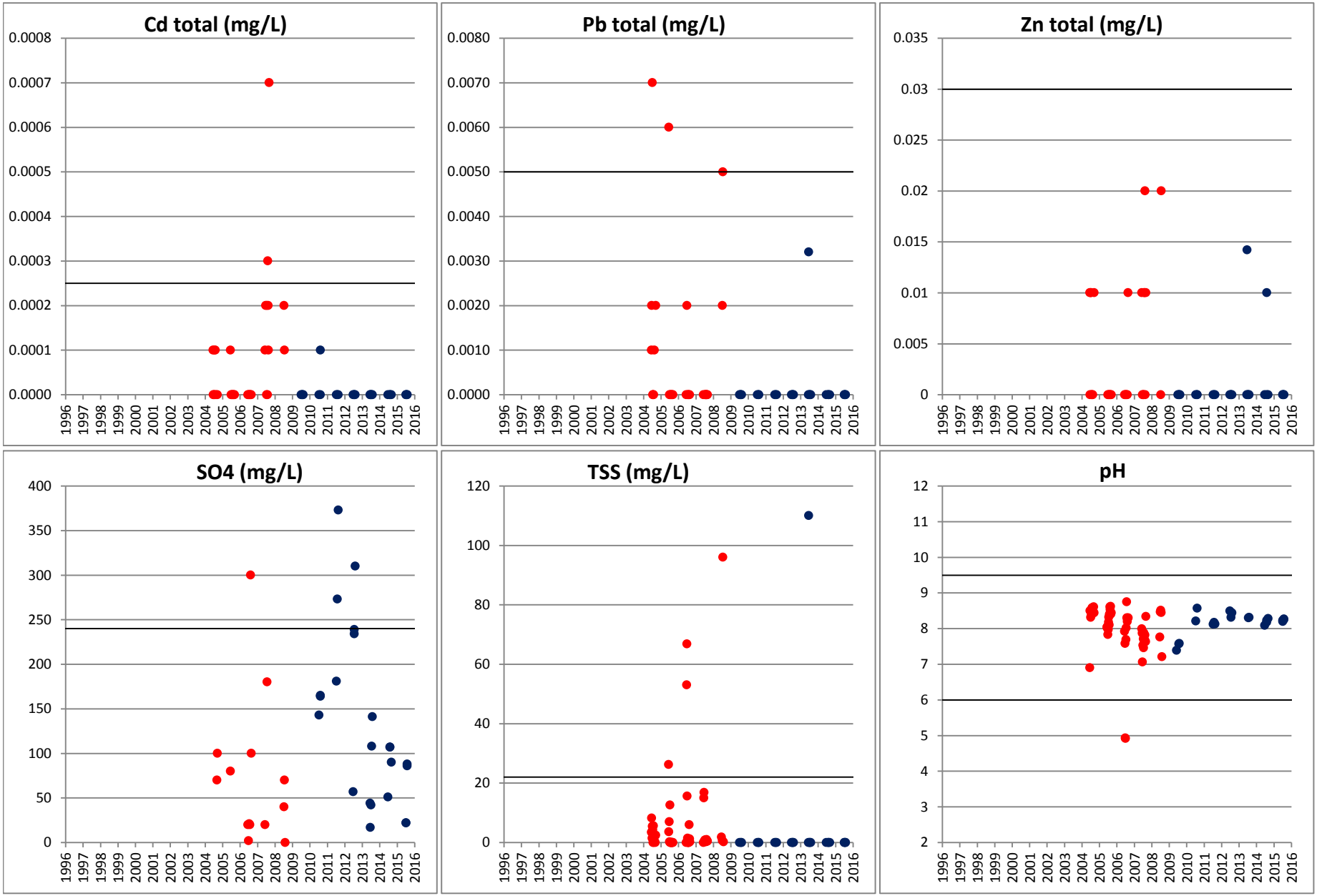


Figure C5: Temporal trends at Station NML-30



Appendix D 2016 Field Plans

Stantec

Memo

To:	Ms. Lily Kigutaq PO Box 84 Arctic Bay NU X0A 0A0	From:	Malcolm Stephenson Annick St-Amand 845 Prospect Street Fredericton, NB E3B 2T7 Phone: 1-506-452-7000 Fax: 1-506-452-0112
File:	121811900	Date:	March 1, 2016

2016 Nanisivik Monitoring Program

Hi Lily,

When you get this box, please give us a call or send us an email at the address below to confirm that you have received this package and to notify us of any questions or concerns with this season's sampling plan.

- Annick at 1-506-457-3278 or 1-506-440-5028 (cell, accepts text message)
    - Email: Annick.St-Amand@stantec.com
- Malcolm at 1-506-457-9623
    - Email: Malcolm.Stephenson@stantec.com

Enclosed you will find a new sampling book for the 2016 sampling season that reflects the requirements of the renewed Water Licence (2014-2019) for the former Nanisivik Mine site as well as calibration instructions for the pH/Conductivity meter. If you are experiencing any difficulties with the pH meter, please let us know right away so that a replacement meter can be procured if necessary. A new meter was purchased last year, so unless we are notified of trouble with the meter, a new meter will not be purchased for the 2016 season.

The sampling book is very similar to previous years and should be used every time you go in the field. It is extremely important that a copy of the fieldbook as well as the First Air tracking number for each shipment is provided to us following each sampling event. Please either fax or email (addresses above) the field notes to Annick within 48 hours of completing the sampling. A pre-filled fax cover sheet is enclosed in this package for your use.

Please note that the field book has been updated to reflect the changes in sampling frequency, stations, data requirements and analysis groups required by the renewed water licence for the former mine site.

Any questions give us a call or send us an email.

Thanks,

Annick and Malcolm

Stantec

PCSTester 35 Multi-Parameter – Instructions

pH CALIBRATION

Calibration for pH should be performed each day you use the meter.

1. Pour calibration solutions and clean water into containers.
2. Press the "ON OFF" button on the meter.
3. Press the "MODE ENT" button until finding "pH USA". Values for pH will be at the top and temperature at bottom.
4. Rinse sensor with clean water.
5. Put sensor in red buffer solution and press "CAL" button. Wait for top reading to stabilize and press "MODE ENT". Value will blink shortly and eventually change to 4.01.
6. Rinse sensor with clean water.
7. Put sensor in yellow buffer solution and press "CAL" button. Wait for top reading to stabilize and press "MODE ENT". Value will blink shortly and eventually change to 7.00.
8. Press "CAL" button to complete calibration.
9. Rinse sensor with clean water and press the "ON OFF" button to turn off.

CONDUCTIVITY CALIBRATION

1. Pour conductivity calibration solution and clean water in containers.
2. Press the "ON OFF" button.
3. Press the "MODE ENT" button until finding "Cond Auto". Values for conductivity will be at the top and temperature at bottom.
4. Rinse sensor with clean water.
5. Put sensor in the clear (no colour) conductivity solution and press "CAL" button. Wait for top reading to stabilize and press "MODE ENT". Value will blink shortly and eventually change to 1413.
6. Rinse sensor with clean water and press the "ON OFF" button to turn off.

FIELD MEASUREMENTS

1. Turn on the meter by pressing the "ON OFF" button.
2. Press the "MODE ENT" button until finding "pH USA". Values for pH will be at the top and temperature at bottom.
3. Take and write down pH and temperature measurements.
4. Press "MODE ENT" bottom.
5. pH meter will display "Cond Auto" with conductivity at top and temperature at bottom.
6. Take and write down conductivity measurements. Note units found between conductivity and temperature (should be either µS or mS).
7. Turn off the meter by pressing the "ON OFF" button.

Fax

Stantec Consulting Ltd.
845 Prospect Street
Fredericton NB E3B 2T7
Phone: (506) 452-7000
Fax: (506) 452-0112

To:	Annick St-Amand	From:	Lily Kigutaq
Company:	Stantec Consulting Ltd.	Phone:	
Fax:	1-506-452-0112	Fax:	
Date:			
File:	Nanisivik Mine Water Quality Monitoring Program (121811900)	_____ page(s) total includes cover sheet. Original will NOT follow by mail.	

Reference: **Nanisivik Water Quality Monitoring: field data 2016**

GENERAL INSTRUCTIONS - 2016 WATER QUALITY MONITORING

Field collected data must be documented using this bound field notebook.
Photocopies or digital scans/photos of the notebook will be made immediately following each sampling event.
The a copy of the file must be either e-mailed to Stantec at: Annick.St-Amand@stantec.com; or faxed to Annick St-Amand's attention at 1-506-452-0112 within 2 days of sampling.

Field measured parameters include: specific conductivity, water temperature and pH.
These measurements will be performed using field instruments.
The pH meter will be calibrated in advance of each sampling event and recorded in this bound field notebook.

All information must be provided within the available boxes. No box shall remain empty.
If a station has no flow, then "N/F" shall be used to indicate "no flow" in all applicable boxes.

For this program, all water samples will be collected as grab samples.
Water samples should be collected at a depth of 15 cm (where permitting). If 15 cm depth is not available, depth should be noted in the comments section for the sampling site in this field notebook.

Grab sample - plastic no preservative	Bottles and cap will be rinsed three times before filling to the top.
Grab sample - plastic with preservative	Bottles and cap will not be rinsed as it is pre-charged with a preservative. Care should be taken as bottles contain concentrated acid preservative.
Grab sample - amber glass	Bottles and cap will be rinsed three times before filling to the top.

Sample LABELS: include station, date, initials of sampler, intended analytical package (NAN1 (general chemistry), NAN2 (TPH analysis) or NAN4 (trace element scan)).

QA/QC (See field sheets - highlighted in light grey); One field duplicate and one field blank will be submitted for each analytical group for each sampling month.

MONTH 1 **Week of July 4, 2016**			Sampling Date pH-meter Calibration Date				**Field Data and Observations**				
Field collected	**GPS Coordinates**	**Date / Time**	**Bottles Required** **per sample**	**rinse?**	✓	**Chain of Custody**	**Temp (°C)**	**pH**	**Conductivity**	**Visual Observations** Hydrocarbon sheen, Turbidity, etc...	**Licence Requirement**
TWIN LAKES CREEK WATERSHED											
NML-23 (159-20) *Outflow from East Twin Lake*			1 liter plastic	YES		NAN-1			□ mS □ µS		Monthly
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
159-4 *Outflow from West Twin Lake Disposal Area*			1 liter plastic	YES		NAN-1			□ mS □ µS		Monthly
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter plastic	YES		NAN-4					Annually
159-6 *Outflow from West Twin Lake Disposal Area*			1 liter plastic	YES		NAN-1			□ mS □ µS		Monthly
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter amber glass - **fill to top**	YES		NAN-2					Monthly
			1 liter plastic	YES		NAN-4					Annually
DUP-1 *Field Duplicate - Twin Lakes Creek*			1 liter plastic	YES		NAN-1			□ mS □ µS		QAQC
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter amber glass - **fill to top**	YES		NAN-2					
			1 liter plastic	YES		NAN-4					
CHRIS CREEK WATERSHED											
159-14 *Outflow from East Twin Lake*			1 liter plastic	YES		NAN-1			□ mS □ µS		Monthly
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
LANDFILL											
NML-29 (159-21) *East side of landfill*			1 liter plastic	YES		NAN-1			□ mS □ µS		Monthly
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter amber glass - **fill to top**	YES		NAN-2					
NML-30 *West side of landfill*			1 liter plastic	YES		NAN-1			□ mS □ µS		Monthly
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter amber glass - **fill to top**	YES		NAN-2					
DUP-2 *Field Duplicate - Landfill*			1 liter plastic	YES		NAN-1			□ mS □ µS		QAQC
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter amber glass - **fill to top**	YES		NAN-2					
Quality Control											
BLANK *Field Blank*	Pre-filled by lab		1 liter plastic	NO		NAN-1					QAQC
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter amber glass - **fill to top**	NO		NAN-2					
			1 liter plastic	NO		NAN-4					

IF NO FLOW : INDICATE USING N/F.

FIRST AIR TRACKING NUMBER _____

DATE SHIPPED: _____

☐ Provided field notes to Annick (email Annick.St-Amand@stantec.com)

Date: _____

MONTH 2 **Week of August 8, 2016**			Sampling Date pH-meter Calibration Date				**Field Data and Observations**				
Field collected	**GPS Coordinates**	**Date / Time**	**Bottles Required** **per sample**	**rinse?**	✓	**Chain of Custody**	**Temp (°C)**	**pH**	**Conductivity**	**Visual Observations** Hydrocarbon sheen, Turbidity, etc...	**Licence Requirement**
TWIN LAKES CREEK WATERSHED											
NML-23 (159-20) *Outflow from East Twin Lake*			1 liter plastic	YES		NAN-1			□ mS □ µS		Monthly
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
159-4 *Outflow from West Twin Lake Disposal Area*			1 liter plastic	YES		NAN-1			□ mS □ µS		Monthly
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter plastic	YES		NAN-4					Annually
159-6 *Outflow from West Twin Lake Disposal Area*			1 liter plastic	YES		NAN-1			□ mS □ µS		Monthly
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter amber glass - **fill to top**	YES		NAN-2					Monthly
			1 liter plastic	YES		NAN-4					Annually
DUP-1 *Field Duplicate - Twin Lakes Creek*			1 liter plastic	YES		NAN-1			□ mS □ µS		QAQC
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter amber glass - **fill to top**	YES		NAN-2					
			1 liter plastic	YES		NAN-4					
CHRIS CREEK WATERSHED											
159-14 *Outflow from East Twin Lake*			1 liter plastic	YES		NAN-1			□ mS □ µS		Monthly
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
LANDFILL											
NML-29 (159-21) *East side of landfill*			1 liter plastic	YES		NAN-1			□ mS □ µS		Monthly
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter amber glass - **fill to top**	YES		NAN-2					
NML-30 *West side of landfill*			1 liter plastic	YES		NAN-1			□ mS □ µS		Monthly
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter amber glass - **fill to top**	YES		NAN-2					
DUP-2 *Field Duplicate - Landfill*			1 liter plastic	YES		NAN-1			□ mS □ µS		QAQC
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter amber glass - **fill to top**	YES		NAN-2					
Quality Control											
BLANK *Field Blank*	Pre-filled by lab		1 liter plastic	NO		NAN-1					QAQC
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter amber glass - **fill to top**	NO		NAN-2					
			1 liter plastic	NO		NAN-4					

IF NO FLOW : INDICATE USING N/F.

FIRST AIR TRACKING NUMBER _____

DATE SHIPPED: _____

☐ Provided field notes to Annick (email Annick.St-Amand@stantec.com)

Date: _____

MONTH 3 **Week of September 5, 2016**			Sampling Date pH-meter Calibration Date				**Field Data and Observations**				
Field collected	**GPS Coordinates**	**Date / Time**	**Bottles Required** **per sample**	**rinse?**	✓	**Chain of Custody**	**Temp (°C)**	**pH**	**Conductivity**	**Visual Observations** Hydrocarbon sheen, Turbidity, etc...	**Licence Requirement**
TWIN LAKES CREEK WATERSHED											
NML-23 (159-20) *Outflow from East Twin Lake*			1 liter plastic	YES		NAN-1			□ mS □ µS		Monthly
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
159-4 *Outflow from West Twin Lake Disposal Area*			1 liter plastic	YES		NAN-1			□ mS □ µS		Monthly
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter plastic	YES		NAN-4					Annually
159-6 *Outflow from West Twin Lake Disposal Area*			1 liter plastic	YES		NAN-1			□ mS □ µS		Monthly
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter amber glass - **fill to top**	YES		NAN-2					Monthly
			1 liter plastic	YES		NAN-4					Annually
DUP-1 *Field Duplicate - Twin Lakes Creek*			1 liter plastic	YES		NAN-1			□ mS □ µS		QAQC
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter amber glass - **fill to top**	YES		NAN-2					
			1 liter plastic	YES		NAN-4					
CHRIS CREEK WATERSHED											
159-14 *Outflow from East Twin Lake*			1 liter plastic	YES		NAN-1			□ mS □ µS		Monthly
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
LANDFILL											
NML-29 (159-21) *East side of landfill*			1 liter plastic	YES		NAN-1			□ mS □ µS		Monthly
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter amber glass - **fill to top**	YES		NAN-2					
NML-30 *West side of landfill*			1 liter plastic	YES		NAN-1			□ mS □ µS		Monthly
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter amber glass - **fill to top**	YES		NAN-2					
DUP-2 *Field Duplicate - Landfill*			1 liter plastic	YES		NAN-1			□ mS □ µS		QAQC
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter amber glass - **fill to top**	YES		NAN-2					
Quality Control											
BLANK *Field Blank*	Pre-filled by lab		1 liter plastic	NO		NAN-1					QAQC
			125 mL plastic with H_2SO_4 preservative	NO							
			125 mL plastic with HNO_3 preservative	NO							
			1 liter amber glass - **fill to top**	NO		NAN-2					
			1 liter plastic	NO		NAN-4					

IF NO FLOW : INDICATE USING N/F.

FIRST AIR TRACKING NUMBER _____

DATE SHIPPED: _____

☐ Provided field notes to Annick (email Annick.St-Amand@stantec.com)

Date: _____

THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

SITE LOCATION

WATER QUALITY MONITORING

NANISIVIK MINE, NUNAVUT

Client: CANZINCO MINES LTD. c/o NYRSTAR SALES & MARKETING AG

Job No.:	121811900
Scale:	1 : 2□0,000
Date:	11-MAR-2016
Dwn. By:	JL
App'd By:	MS

Dwg. No.: A-1

Stantec

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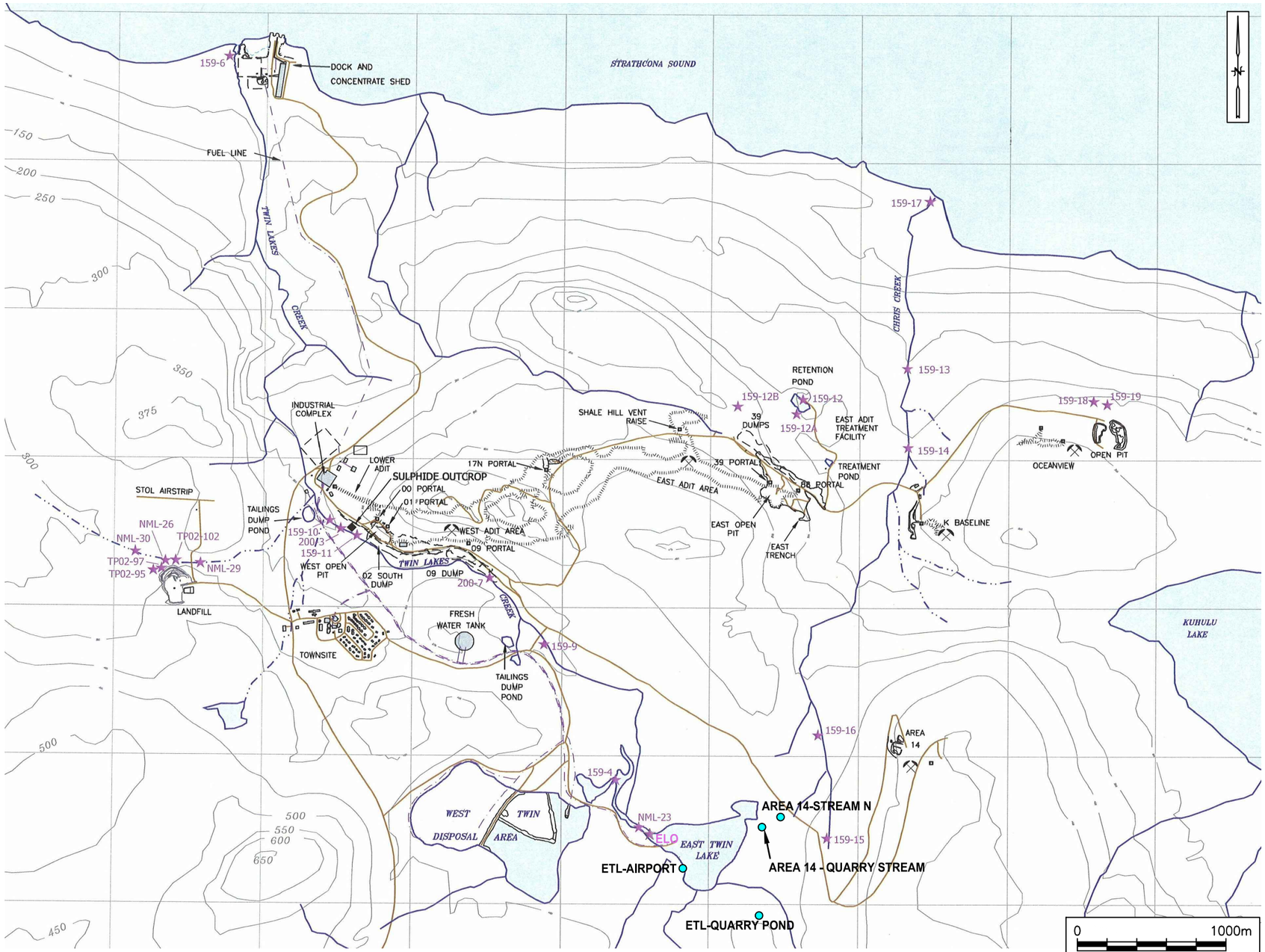

LEGEND:

- 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

THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

Reference:
ORIGINAL FIGURES PROVIDED BY NANISIVIK MINE

WATER SAMPLING LOCATIONS - MINE AREA

WATER QUALITY MONITORING
NANISIVIK MINE, NUNAVUT

Client: CANZINCO MINES LTD. c/o NYRSTAR SALES & MARKETING AG

Job No.:	121811900
Scale:	1 : 30,000
Date:	11-MAR-2016
Dwn. By:	JL
App'd By:	MS

Dwg. No.: A-2

Stantec

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