

Memorandum



Date: February 17, 2015
To: John Roberts, VP Environmental Affairs
Jill Turk, Environmental Coordinator
CC: April Hayward (Ph. D), Project Manager
Marc Wen (M.Sc., R.P.Bio), Partner in Charge
From: Michael Soloducha (B.Sc., ASCT)
Subject: Doris North Project 2014 Hydrology Compliance Monitoring Program

Refer to File No.: 1009-008 Hope Bay Belt

This memorandum was prepared at the request of TMAC Resources Inc. (TMAC). The purpose of the memorandum is to present annual hydrometric data that were collected as part of the 2014 Doris North Hydrology Compliance Monitoring Program, which addresses hydrometric monitoring requirements set out in the Doris North Gold Mine Project Certificate (Nunavut Impact Review Board (NIRB) No. 003, issued September 15, 2006; NIRB (2006)) and Type A Water Licence (Nunavut Water Board (NWB) Licence No. 2AM-DOH1323 Type A, renewed August 16, 2013).

GLOSSARY AND ABBREVIATIONS

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

Datum	A reference system for computing or correlating the results of a survey.
ERM Rescan	ERM Consultants Canada Ltd.
Hydrograph	A graphical plot of water discharge versus time.
NIRB	Nunavut Impact Review Board
NWB	Nunavut Water Board
Root Mean Square	A statistical measure of the differences between modelled and observed values.
Runoff	The part of precipitation that appears in surface streams and is a measure of the hydrologic response of a watershed, commonly presented as a depth of water over an entire watershed in mm.
Stage	The depth of water in a water course or channel with respect to a chosen reference height.
Stage-Discharge Curve (Rating Curve)	A curve derived from concurrently measured stage and discharge data that is used to estimate the discharge for any given observed stage at a hydrometric station (often referred to as a rating curve).

TMAC	TMAC Resources Inc.
Unit Yield	A ratio of water discharges normalized to the drainage area for a basin.
UTM	Universal Transverse Mercator
Watershed	The entire geographical area drained by a river and its tributaries; an area characterized by all runoff being conveyed to the same outlet.

1. INTRODUCTION

ERM Consultants Canada Ltd. (ERM Rescan) monitors and reports, on behalf of TMAC Resources Inc. (TMAC), the following elements of the Doris North Gold Mine Project Certificate (Nunavut Impact Review Board (NIRB) No. 003, issued September 15, 2006; NIRB (2006)), Type A Water Licence (Nunavut Water Board (NWB) Licence No. 2AM-DOH1323 Type A, renewed August 16, 2014), and Interim Water Management Plan (SRK 2012), as part of the annual Doris North Hydrology Monitoring Program (the Program): Open water season volumetric discharge from Doris Creek, Roberts Lake, and Windy Lake; water level variation at Doris Lake and the TIA. These items correspond to the following elements of the Doris North Gold Mine Project Certificate and Water Licence:

- Doris North Gold Mine Project Certificate
 - *Appendix C: Final Hearing Report Appendix B, Additional Comments, DFO, Item 2: [The Proponent] will monitor stage and discharge in Doris Outflow both upstream and downstream of the decant discharge point to provide information that can be used in assessing the accuracy of the impact predictions relating to fish habitat downstream.*
- NWB Type A Water Licence
 - *Part G. Item 31. The Licensee shall ensure that water within the Tailings Impoundment Area is maintained at an elevation of least 28.3 metres above sea level such that a minimum of four (4) metres of water cover is maintained over the tailings at all times.*
 - *Part G. Item 32. The Licensee shall ensure that the flow from the Tailings Impoundment Area into Doris Creek at monitoring station TL-4 does not exceed 10% of the background flow in Doris Creek as measured at monitoring station TL-2 at the time of discharge.*
 - *Part J. Item 2: The Licensee shall install appropriate instrumentation in Doris Creek at Monitoring Station TL-2, to monitor flow when ice conditions allow for such measurements to be taken, on a real time and continuous basis.*
 - *Part J. Item 3. The Licensee shall undertake the Water Monitoring Program detailed in the Tables of Schedule J.*

Note: ERM Rescan monitors discharge at sites TL-2 and TL-3. All other requirements under this element are monitored by TMAC and presented elsewhere.

- Interim Water Management Plan (IWMP)
 - *Section 4.2: Continuous monitoring of Doris Lake water levels and outflows will continue under the hydrologic baseline characterization. These data will be used to calibrate the existing water balance and quality model.*

Note: This item was formerly part of the NWB Type A Water Licence (No. 2AM-DOH0713, issued September 19th, 2007): Part F, Item 1a. [the Water Management Plan should include a] requirement to continuously monitor Doris Lake levels and outflow during the two (2) years of mining and beyond to confirm water balance model predictions.

ERM Rescan also monitors and reports, on behalf of TMAC, hydrometric data collected to support habitat compensation projects and monitoring requirements for Fisheries Authorization NU-02-0117.3. ERM Rescan has conducted baseline hydrometric monitoring in the Project area since 2009. The current Compliance Program has been in place since 2011.

All other aspects of water and waste water monitoring (e.g., water use and recycling, pumping volumes, etc.) are monitored by TMAC under the Surveillance Network Program and reported monthly and annually to the NWB in accordance with the relevant clauses of Water Licence 2AM-DOH1323.

2. METHODOLOGY

ERM Rescan re-established the existing network of hydrometric stations for the Program at the beginning of the open water season in 2014 (Figure 1; Table 1). Four streamflow and two lake level monitoring stations were established in the same locations as the 2013 monitoring network. Details regarding the standard methodologies used for installation of hydrometric stations, development of stage-discharge rating equations, and daily flow hydrographs for the Program were provided in the Doris North Project 2013 Hydrology Compliance Monitoring Report (ERM Rescan 2014).

3. RESULTS AND DISCUSSION

Results from the 2014 Program are presented as follows: 1) manual stage-discharge measurements; 2) rating equations; 3) daily discharge hydrographs; 4) hydrologic indices; 5) lake water levels; 6) Quality Assurance. Results of the 2014 Program were compared to results from the 2009 to 2013 monitoring programs, which are available in previously published hydrology baseline and compliance reports (Rescan 2009, 2011a, 2011b, 2012a, 2012b, ERM Rescan 2014).

3.1 Manual Stage-Discharge Measurements

In 2014, a minimum of eight stage-discharge measurements were completed at each hydrometric station over a variety of flow conditions to create new stage-discharge relationships or validate existing rating curves (Table 2).

Figure 1

Hydrometric Monitoring Stations, Doris North Project, 2014

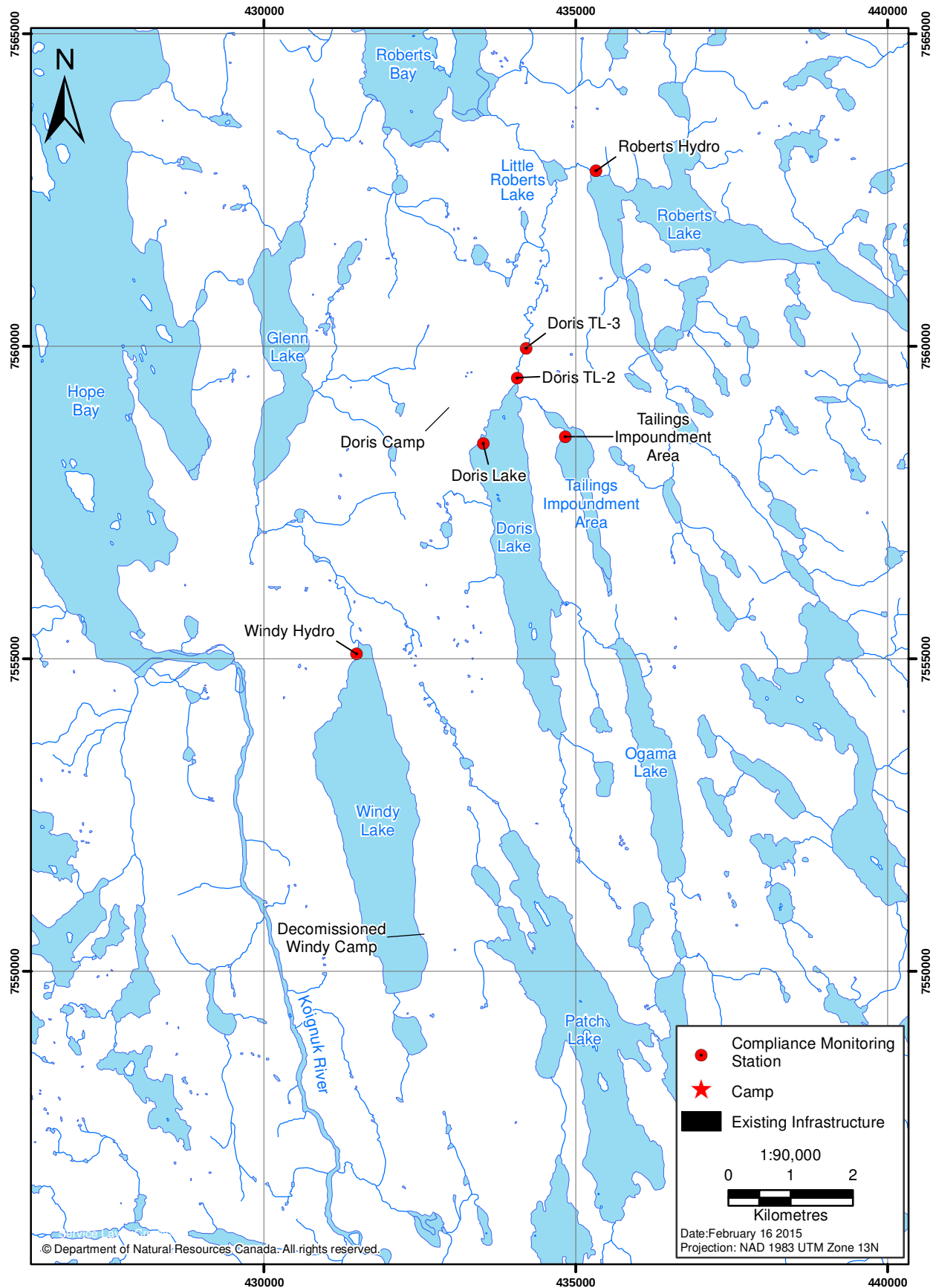


Table 1. 2014 Hydrometric Compliance Monitoring Stations, Doris North Project, 2014

Hydrometric Station	Location	UTM Coordinates (Zone 13W, NAD83)		Drainage Area (km ²)	Lake Coverage (%)	Monitoring Period	Period of Operation in 2014	Purpose
		Easting	Northing					
Streamflow Monitoring Stations								
Doris TL-2	Doris Lake outflow	434,059	7,559,504	94.6	20	1996-1998, 2000, 2003-2014	June 15 - September 22	Monitoring required for Project Certificate and Type A Water Licence
Doris TL-3	Doris Creek, downstream of waterfall	434,204	7,559,985	95.3	20	2011-2014	June 1 - September 22	Monitoring required for Project Certificate and Type A Water Licence
Roberts Hydro	Roberts Lake outflow	435,325	7,562,815	97.9	17	2003-2014	June 18 - September 21	Supports requirements for Fisheries Authorization and No Net Loss Plan
Windy Hydro ^a	Northwest shore of Windy Lake	431,481	7,555,089	14.1	39	2006-2014	June 18 -September 21	Supports requirements for Fisheries Authorization and No Net Loss Plan
Lake Monitoring Stations								
Doris Lake	Northwest shore of Doris Lake	433,512	7,558,452	n/a	n/a	2004-2014	January 1 -September 21	Monitoring required for Type A Water Licence
Tailings Impoundment Area	Northwest shore of Tail Lake	434,832	7,558,560	n/a	n/a	2004-2014	March 16 -September 18	Monitoring required for Type A Water Licence

^a The station is also used for monitoring water level variation in Windy Lake.

Table 2. Summary of Manual Stage-Discharge Measurements, Doris North Project, 2014

Hydrometric Station and Drainage Area	Date	Stage (m) ^a	Discharge (m ³ /s)	Discharge Measurement Uncertainty (%) ^b	Equipment Used
Doris TL-2 (94.6 km ²)	June 14	96.503	1.26	5.9	Flo-Mate 2000
	June 16	96.537	1.63	6.2	Flo-Mate 2000
	June 19	96.649	2.30	5.4	Swoffer 2100
	July 22	96.445	1.13	5.7	Flo-Mate 2000
	July 24	96.449	1.33	5.5	Flo-Mate 2000
	July 26	96.440	1.18	5.9	Flo-Mate 2000
	July 27	96.435	1.22	5.3	Flo-Mate 2000
	July 28	96.428	1.21	5.7	Flo-Mate 2000
	August 20	96.311	0.73	5.7	Flo-Mate 2000
	August 21	96.310	0.71	6.0	Flo-Mate 2000
	September 16	96.283	0.63	5.7	Flo-Mate 2000
	September 19	96.276	0.60	6.0	Flo-Mate 2000
	September 20	96.273	0.63	5.9	Flo-Mate 2000
	September 22	96.271	0.59	5.7	Flo-Mate 2000
Doris TL-3 (95.3 km ²)	June 19	97.789	2.89	4.9	Swoffer 2100
	July 24	97.477	1.23	6.3	Flo-Mate 2000
	July 25	97.466	1.23	5.5	Flo-Mate 2000
	July 27	97.452	1.02	6.4	Flo-Mate 2000
	July 28	97.467	1.09	6.5	Flo-Mate 2000
	August 19	97.325	0.68	6.7	Flo-Mate 2000
	September 18	97.291	0.64	6.8	Flo-Mate 2000
	September 22	97.279	0.54	6.8	Flo-Mate 2000
Roberts Hydro (97.9 km ²)	June 18	99.578	5.72	5.1	Swoffer 2100
	July 25	99.332	1.44	6.1	Flo-Mate 2000
	July 27	99.316	1.29	6.2	Flo-Mate 2000
	July 28	99.316	1.29	6.2	Flo-Mate 2000
	August 16	99.233	0.78	7.0	Flo-Mate 2000
	August 21	99.194	0.62	6.8	Flo-Mate 2000
	September 19	99.184	0.56	6.1	Flo-Mate 2000
	September 21	99.155	0.49	6.4	Flo-Mate 2000
Windy Hydro (14.1 km ²)	June 18	95.070	0.23	7.2	Swoffer 2100
	July 24	95.095	0.20	5.9	Flo-Mate 2000
	July 25	95.100	0.20	5.7	Flo-Mate 2000
	July 28	95.086	0.14	6.4	Flo-Mate 2000
	August 18	95.061	0.11	6.6	Flo-Mate 2000
	September 19	95.026	0.08	6.9	Flo-Mate 2000
	September 20	95.012	0.08	6.7	Flo-Mate 2000
	September 21	95.021	0.07	6.6	Flo-Mate 2000

^a Water levels referenced to site-specific arbitrary local datum.

^b 95% level of confidence.

3.2 Stage-Discharge Rating Equations

Stage-discharge rating curves were developed for all hydrometric stations in the network. Rating equations are summarized in Table 3.

Table 3. Summary of Stage-Discharge Rating Equations, Doris North Project, 2014

Hydrometric Station	Rating Equation ^a	Number of Flow Measurements Used in Curve	Root Mean Square Error (%)	Monitoring Period Used to Develop Curve (Years) ^b
Doris TL-2	$Q = 3.84(h-98.851)^{2.098}$	22	6.1	2013-2014
Doris TL-3	$Q = 2.79(h-96.766)^{2.427}$	8	5.7	2014
Roberts Hydro	$h < 99.259 : Q = 7.00(h-98.894)^{1.931}$ $h > 99.259 : Q = 15.33(h-99.002)^{2.009}$	23	7.5	2009-2014
Windy Hydro	$4.71(h-94.854)^{2.041}$	7	11.3	2014

^a Q = discharge (m^3/s); h = stage (m)

^b In some cases not all of the data collected during the year(s) listed were used in the development of the rating curve (e.g., stage measurements affected by ice were excluded). See Section 3.6 for details.

3.3 Hydrographs

Discharge hydrographs were generated at each active hydrometric station by applying the constructed rating equation to the collected stage record (Figures 2 to 5). Each hydrograph includes the 10-minute discharge showing the variance in daily measured discharge, daily mean discharge, and estimated discharge when mean daily discharge could not be calculated based on stage records. Estimation methods follow those detailed in previous reports (ERM Rescan 2014). Hydrographs also include manual flow measurements to show the goodness of fit for discharge measurements collected in 2014. Daily mean air temperature and daily mean precipitation collected at the Doris Meteorological station were included to provide context for the hydrologic response of the stream monitored at each station.

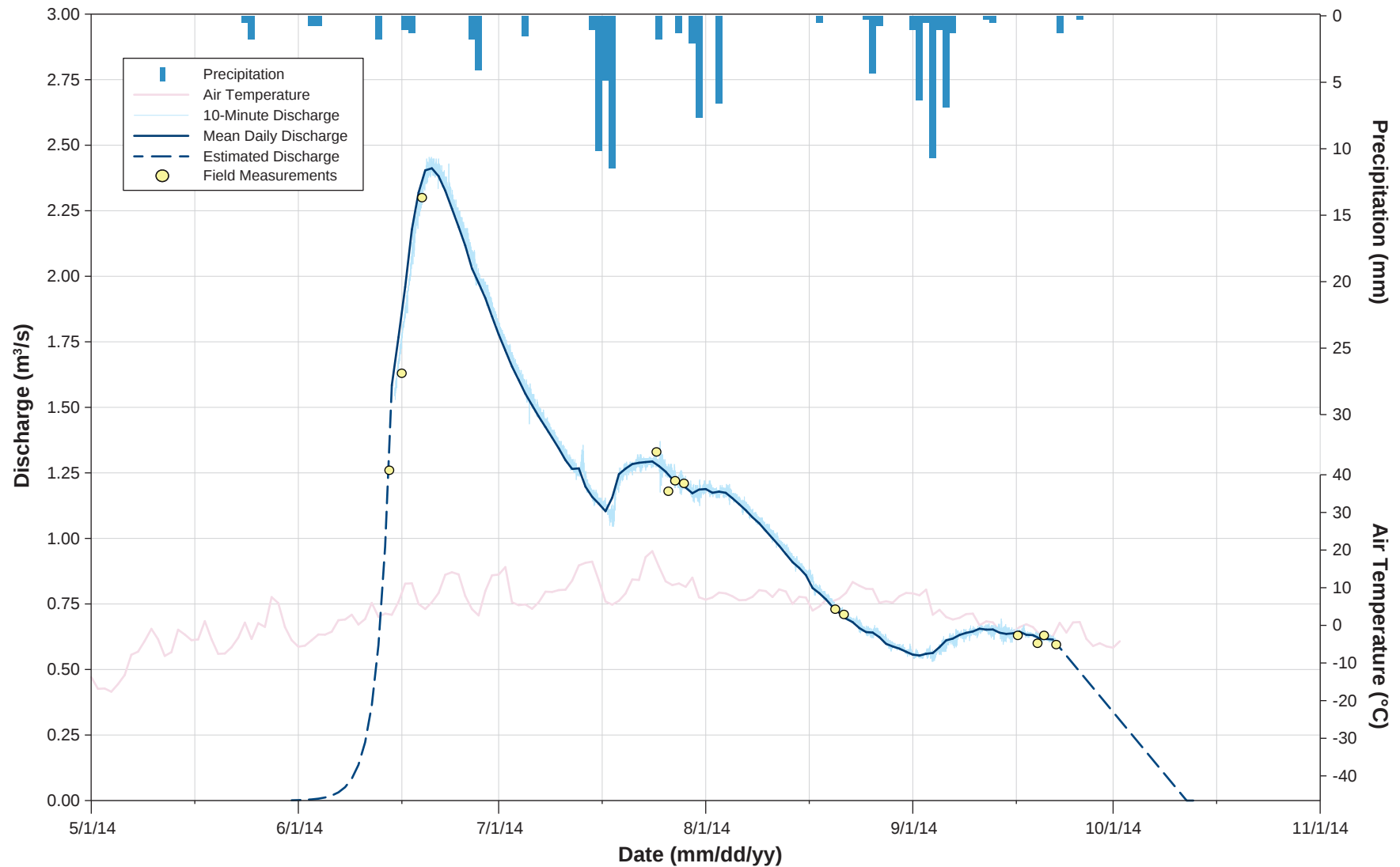
The relatively large variance observed in the 10-minute discharge at Windy Hydro is likely related to a combination of factors that affect the stage record. These factors include the relatively shallow depth of the site, windy conditions (which sometimes create a seiche effect), and relatively high wave action.

3.4 Hydrologic Indices

Discharge and runoff (discharge normalised to drainage area) results for 2014 are presented in Tables 4 and 5, respectively. Annual peak flow and peak unit yield (an expression of discharge normalized to drainage area) for 2014 are presented in Tables 6 and 7, respectively. Data from 2009-2013 are provided for comparison. Observed low flows for 2014 are provided in Table 8.

Figure 2

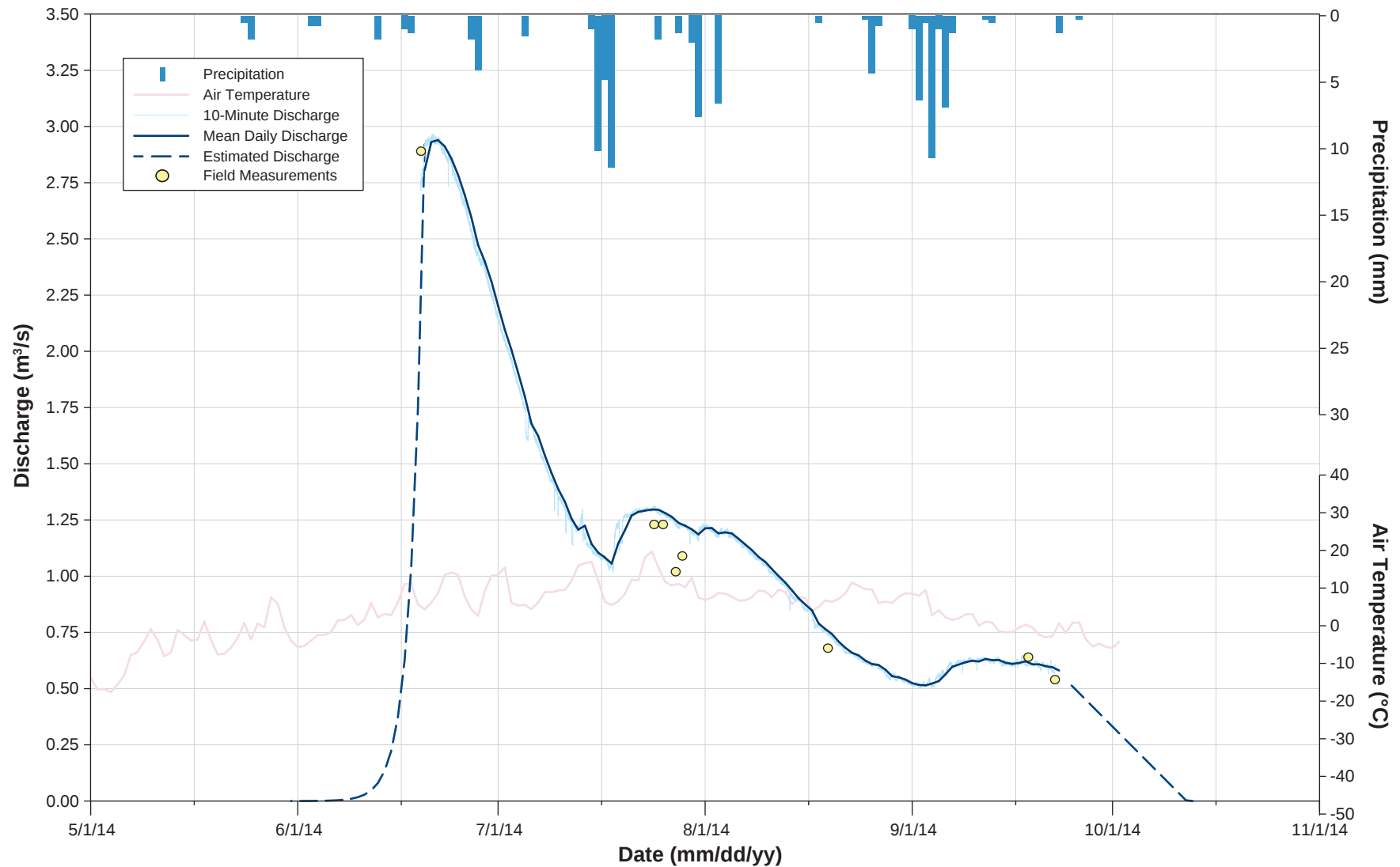
Annual Hydrograph at Station TL-2,
Doris North Project, 2014



Notes: Precipitation and air temperature based on Doris North Meteorological Station.
Station installed June 15, 2014; demolished September 22, 2014.
Mean daily discharge values between May 31 to June 14 are estimated using a logarithmic growth function.
Mean daily discharge values between Sept 23 to Oct 16 are estimated using a linear regression function.
The channel was assumed to be frozen to the bed from Jan 1 to May 31, and from Oct 16 to Dec 31, 2014.

Figure 3

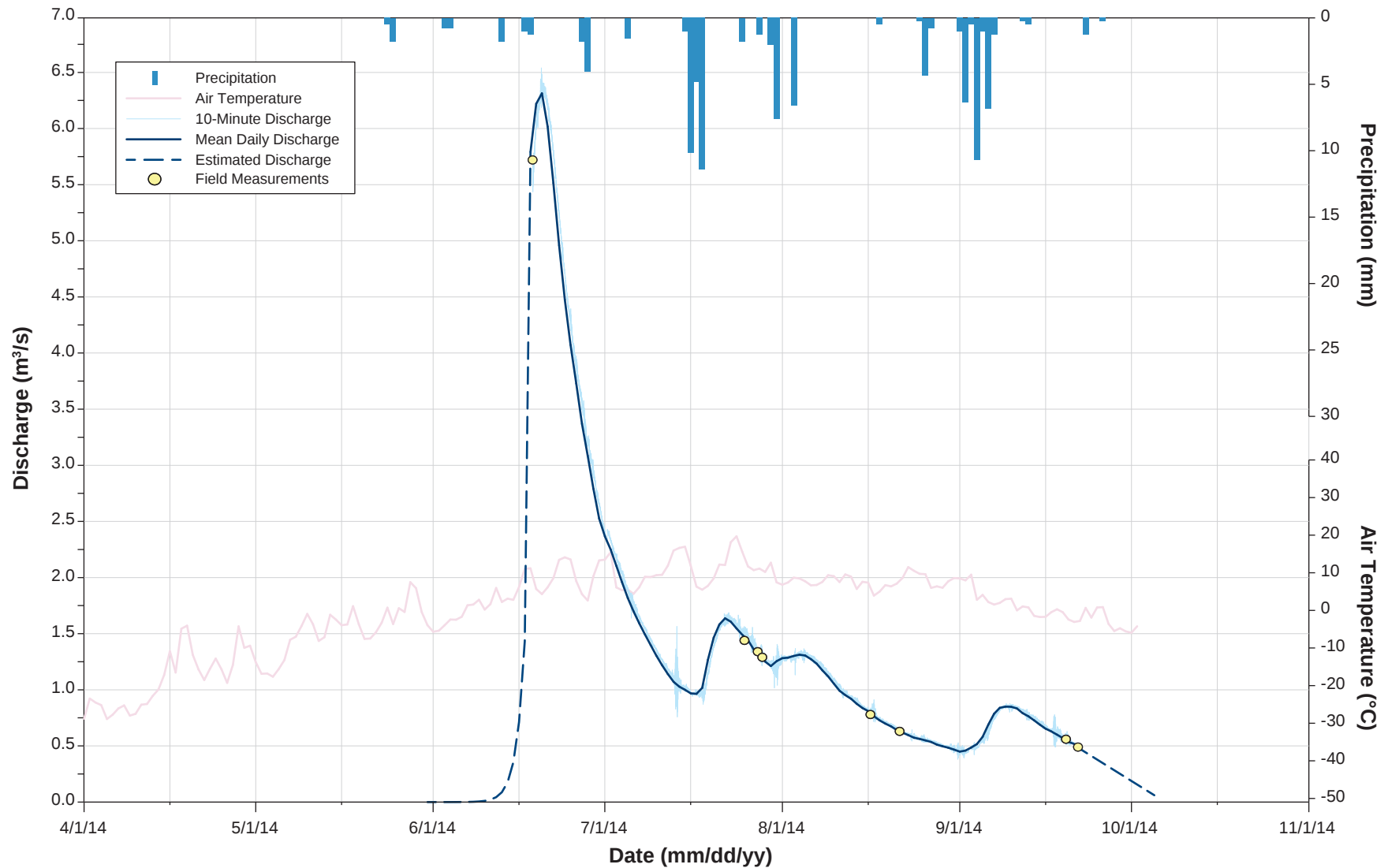
**Annual Hydrograph at Station TL-3,
Doris North Project, 2014**



Notes: Precipitation and air temperature based on Doris North Meteorological Station.
 Station installed June 20, 2014; demobilized September 23, 2014.
 Mean daily discharge values between May 31 to June 19 are estimated using a logarithmic growth function.
 Mean daily discharge values between Sept 24 to Oct 13 are estimated using a linear regression function.
 The channel was assumed to be frozen to the bed from Jan 1 to May 31, and from Oct 14 to Dec 31, 2014.

Figure 4

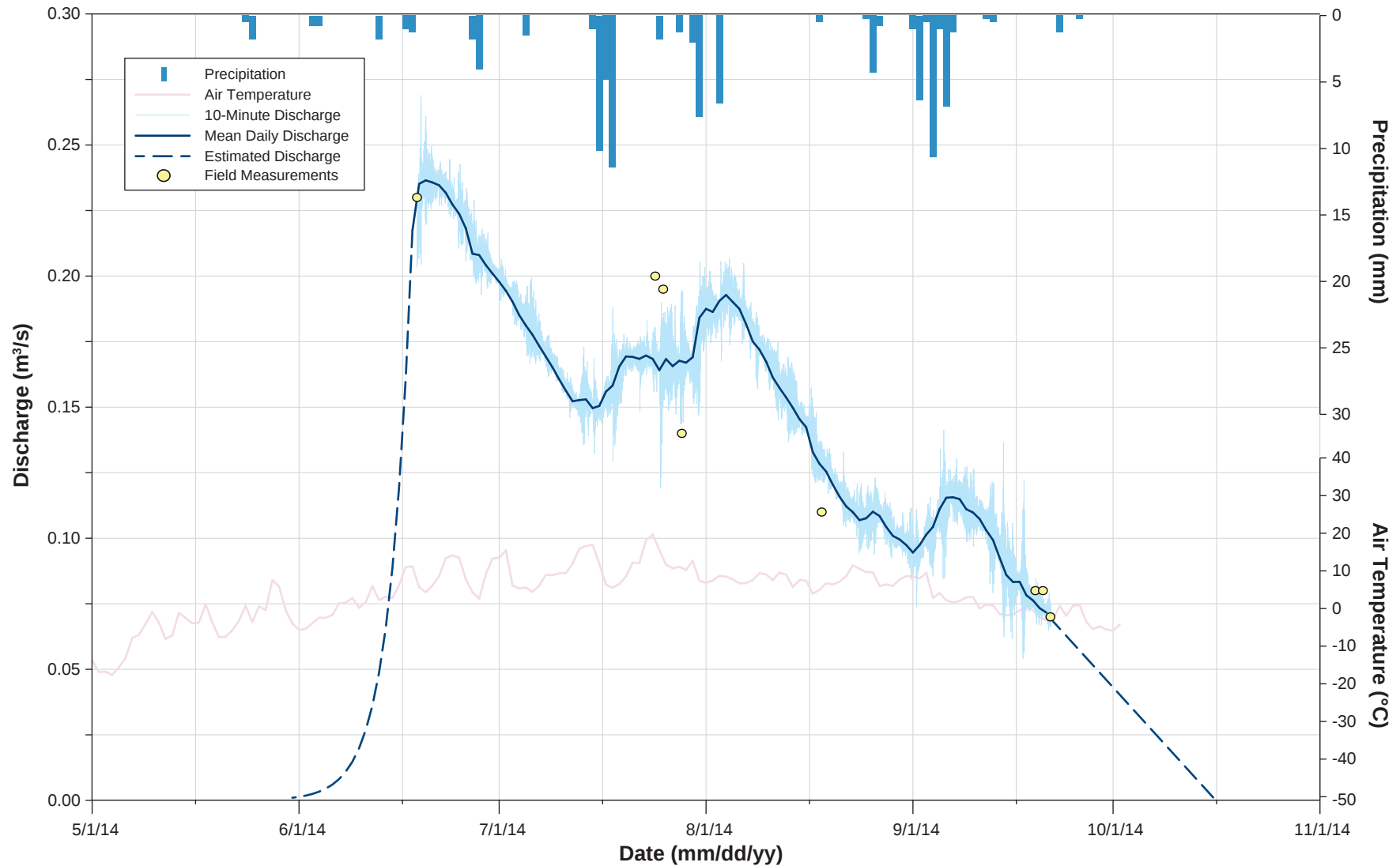
Annual Hydrograph at Station Roberts Hydro,
Doris North Project, 2014



Notes: Precipitation and air temperature based on Doris North Meteorological Station.
Station installed June 18, 2014; demobilized September 21, 2014.
Mean daily discharge values between June 1 to June 18 are estimated using a logarithmic growth function.
Mean daily discharge values between Sept 22 to Oct 5 are estimated using a linear regression function.
The channel was assumed to be frozen to the bed from Jan 1 to May 31, and from Oct 6 to Dec 31, 2014.

Figure 5

**Annual Hydrograph at Station Windy Hydro,
Doris North Project, 2014**



Notes: Precipitation and air temperature based on Doris North Meteorological Station.
 Station installed June 18, 2014; demobilized September 21, 2014.
 Mean daily discharge values between May 31 to June 18 are estimated using a logarithmic growth function.
 Mean daily discharge values between Sept 22 to Oct 16 are estimated using a linear regression function.
 The channel was assumed to be frozen to the bed from Jan 1 to May 31, and from Oct 16 to Dec 31, 2014.

Table 4. Observed and Annual Runoff, Doris North Project, 2009 to 2014^a

Hydrometric Station	Total Runoff (mm)									
	2009 to 2013 Observed ^b								2014	2014
	2009	2010	2011	2012	2013	Min	Mean	Max	Observed ^b	Annual ^c
Doris TL-2	87	121	184	104	40	40	107	184	105	113
Doris TL-3 ^d	n/a	n/a	183	105	44	44	111	183	103	120
Roberts Hydro ^e	87	137	144	98	56	56	104	144	135	138
Windy Hydro	141	197	143	112	42	42	127	197	89	98

Notes:

^a Italics denote estimated values.

^b Calculated from recorded values during the open water season. Site-specific periods of record for historic data are presented in published baseline and compliance reports (Rescan 2009, 2011a, 2011b, 2012a, and 2012b, Rescan 2014), and site-specific periods of record for 2014 data are provided in Table 1.

^c Annual values include estimated data for periods when stations were demobilized.

^d Station established in July 2011: Values were estimated for June 2011; historical minimum and maximum values are not available.

^e Roberts Hydro values from 2009 include estimated values for the period when the station was damaged.

Table 5. Observed and Annual Mean Discharge, Doris North Project, 2009 to 2014^a

Hydrometric Station	Mean Discharge (m ³ /s)									
	2009 to 2013 Observed ^b								2014	2014
	2009	2010	2011	2012	2013	Min	Mean	Max	Observed ^b	Annual ^c
Doris TL-2	1.00	1.15	1.58	1.16	0.46	0.46	1.07	1.58	1.15	0.34
Doris TL-3 ^d	n/a	n/a	1.58	1.23	0.53	0.53	1.11	1.58	1.19	0.36
Roberts Hydro ^e	1.02	1.40	1.68	1.16	0.67	0.67	1.19	1.68	1.50	0.41
Windy Hydro	0.23	0.30	0.26	0.22	0.07	0.07	0.22	0.30	0.15	0.04

Notes:

^a Italics denote estimated values

^b Calculated from recorded values during the open water season. Site-specific periods of record for historic data are presented in published baseline and compliance reports (Rescan 2009, 2011a, 2011b, 2012a, and 2012b, Rescan 2014), and site-specific periods of record for 2014 data are provided in Table 1.

^c Annual values include estimated data for periods of when stations were demobilized.

^d Station established in July 2011: Values were estimated for June 2011; historical minimum and maximum values are not available.

^e Roberts Hydro values from 2009 include estimated values for the period when the station was damaged.

3.5 Lake Water Levels

Water level monitoring was conducted at Doris Lake, the Tailing Impoundment Area (TIA), and Windy Lake (at station Windy Hydro; Table 9). Pressure transducers at Doris Lake and the TIA have been monitoring water level (stage) continuously since 2004, with the following exception:

- Data from the TIA is missing from September 8, 2013 to March 16, 2014 because the datalogger associated with the permanent pressure transducer malfunctioned. The cause of the malfunction was unclear. The datalogger was removed from site for repairs and will be reinstalled when ice conditions permit in 2015. A temporary data logger and pressure transducer collected data through the open water season of 2014. The temporary station was removed in September 18, 2014.

Table 6. Peak Flow, Doris North Project, 2009 to 2014^a

Hydrometric Station	Peak Flow (m³/s)								2014 (Date)
	2009 to 2013								
	2009	2010	2011	2012	2013	Min	Mean	Max	
Doris TL-2									
Instantaneous	2.39	4.61	5.88	3.62	1.00	1.00	3.50	5.88	2.45 (June 20)
Daily	2.29	4.44	5.77	3.56	0.98	0.98	3.41	5.77	2.41 (June 21)
Doris TL-3^b									
Instantaneous	n/a	n/a	5.96	3.83	1.29	1.29	3.69	5.96	2.97 (June 21)
Daily	n/a	n/a	5.86	3.78	1.25	1.25	3.63	5.86	2.94 (June 22)
Roberts Hydro									
Instantaneous	2.55	5.84	7.47	3.63	2.01	2.01	4.30	7.47	6.54 (June 19)
Daily	2.49	5.78	7.34	3.60	1.97	1.97	4.24	7.34	6.31 (June 20)
Windy Hydro									
Instantaneous	0.36	0.49	0.66	0.37	0.13	0.13	0.40	0.66	0.27 (June 19)
Daily	0.34	0.46	0.64	0.36	0.12	0.12	0.38	0.64	0.24 (June 20)

Notes:

^a Italics denote estimated values.^b Station established in July 2011; historical minimum and maximum values are not available. Peak flow values for 2011 were estimated from modelled data.**Table 7. Peak Unit Yield, Doris North Project, 2009 to 2014^a**

Hydrometric Station	Peak Unit Yield (L/s/km²)								2014 (Date)
	2009 to 2013								
	2009	2010	2011	2012	2013	Min	Mean	Max	
Doris TL-2									
Instantaneous	25.24	48.57	62.19	38.29	10.55	10.55	36.97	62.19	25.94 (June 20)
Daily	24.17	46.73	60.97	37.65	10.37	10.37	35.98	60.97	25.50 (June 21)
Doris TL-3 ^b									
Instantaneous	n/a	n/a	62.51	40.14	13.50	13.50	38.72	62.51	31.13 (June 21)
Daily	n/a	n/a	61.50	39.66	13.15	13.15	38.10	61.51	30.85 (June 22)
Roberts Hydro									
Instantaneous	26.03	59.59	76.35	37.09	20.58	20.58	43.93	76.35	69.13 (June 19)
Daily	25.47	58.97	75.00	36.82	20.10	20.10	43.27	75.00	66.74 (June 20)
Windy Hydro									
Instantaneous	25.76	34.95	46.62	25.93	9.21	9.21	28.49	46.62	19.07 (June 19)
Daily	23.91	32.55	45.47	25.49	8.25	8.25	27.13	45.47	16.77 (June 20)

Notes:

^a Italics denote estimated values.^b Station established in July 2011. Historical minimum and maximum values are not available. Peak unit yield values for 2011 were estimated from modelled data.

Table 8. Observed Low Flows, Doris North Project, 2009 to 2014^a

Hydrometric Station	Daily Low Flow (m³/s)								
	2009 to 2013								2014 (Date)
	2009	2010	2011	2012	2013	Min	Mean	Max	
Doris TL-2	0.43	0.45	0.40	0.14	0.09	0.09	0.30	0.45	0.55 (Sept 21)
Doris TL-3 ^b	n/a	n/a	0.37	0.17	0.09	0.09	0.21	0.37	0.51 (Sept 3)
Roberts Hydro ^c	0.52	0.33	0.12	0.11	0.11	0.11	0.24	0.52	0.45 (Sept 1)
Windy Hydro	0.15	0.16	0.11	0.06	0.02	0.02	0.10	0.16	0.07 (Sept 21)

Notes:

^a Italics denote estimated values.^b Station established in July 2011. Historical minimum and maximum values are not available.^c Roberts Hydro station was damaged in 2009. Observed low flow value for 2009 was estimated from modelled data.**Table 9. Lake Water Level Variations in Doris Lake and the TIA, Doris North Project, 2014**

Lake	Lake Area (km ²)	Drainage Area at Lake Outlet (km ²)	Period of Operation in 2014	Min Water Level (m)	Max Water Level (m)	Mean Water Level (m)	Water Level Change (m)
Doris ^{ab}	3.4	94.6	January 1 - September 21	5.458	6.139	5.627	0.681
TIA ^{abc}	0.8	4.2	March 16 - September 18	5.159 (29.013)	5.565 (29.419)	5.328 (29.182)	0.406
Windy ^b	5.3	14.1	June 5 - September 8	0.479	0.604	0.546	0.125

Notes:

^a Data is monitored continuously. The end date in the Period of Operation column notes the last day of data collected during the final site visit. Dataloggers will collect data through winter 2014/15. A secondary pressure transducer was installed in July 2014 to augment the stage record at each site.^b Water level is depth of water recorded by each pressure transducer and is not referenced to a geodetic datum.^c Water level in masl in parenthesis.

3.6 Quality Assurance

Quality Assurance/Quality Control was completed at each hydrometric station. At station TL-2, all measurements collected in 2014 were within 15% of the established stage-discharge rating curve. The measurements collected in 2014 validated the rating curve constructed in 2013, and no new curves were necessary. No corrections were made to the stage record. At station TL-3, measurements collected in 2014 varied by more than 15% from the rating curve, and so a new stage-discharge relationship was created. All measurements collected in 2014 were within 15% of the new rating curve. No corrections were made to the stage record. At station Roberts Hydro, a rating shift was introduced in July, suggesting a gradual change in the stage-discharge relationship. All measurements were within 10% of the shifted rating curve. No changes were made to the stage record. At station Windy Hydro, a shift was introduced in late June, suggesting a gradual change in the stage-discharge relationship. No changes were made to the stage record.

At station TL-2, recorded discharge was used to determine the allowable pumping rate from the TIA to ensure that discharge remained less than 10% of background flow levels. Data was recorded for 96 days in 2014. Discharge from the TIA exceeded 10% of background flow on two occasions (September 9th and 21st). Discharge was 10.3 % of the background volumetric flow at TL-2 on September 9th (i.e., a 0.3% exceedance), and 15.0 % of daily volumetric flow at TL-2 on September 21st (i.e., a 5% exceedance). On both occasions, the volume of discharge was within the range of natural variation of Doris Creek and no adverse effects on the stream channel or biological communities are expected.

4. SUMMARY

In 2014, observed runoff for the gauged basins ranged from 89 to 135 mm, and annual runoff ranged from 98 to 138 mm (Table 4). The winter of 2013/2014 was an average precipitation year in the Arctic Tundra climatic region according to Environment Canada's Climate Trends and Variations Bulletin: Environment Canada ranked winter 2013/2014 the 39th wettest winter out of 66 years of record (-5.4% below normal) for this region (EC 2014). Precipitation in summer was slightly (7.1%) greater than the mean precipitation for the region (21st wettest of 66 years on record). Runoff for the monitored watersheds during the 2014 open water season was 2 to 7% lower than the 2009 to 2013 average along Doris Creek, 31% lower than the average at Windy Hydro, and 26% above the average at Roberts Hydro.

Daily peak flows ranged from 0.2 to 6.3 m³/s, while instantaneous peak flows ranged from 0.3 to 6.5 m³/s. Along Doris Creek, peak flows were approximately 20% below the 2009 to 2013 average at station TL-3 and 30% below the 2009 to 2013 average at station TL-2. Daily peak flows were 2.9 and 2.4 m³/s respectively. Instantaneous peak flows were 3.0 and 2.5 m³/s respectively. Daily and instantaneous peak flows at Windy Hydro were approximately 35% below the 2009 to 2013 average peakflows of 0.2 m³/s and 0.3 m³/s, respectively. At Roberts Hydro, daily and instantaneous peak flows were approximately 50% above the 2009 to 2013 average peak flows of 6.3 m³/s and 6.5 m³/s, respectively.

Recorded low flows at active stations in the Project area were much higher in 2014 (ranging from 84 to 125% above the observed mean) at all stations except Windy Hydro, which was approximately 25% lower than the observed mean low flows. This may be related to the timing of station demobilization in 2014 compared to previous years: Stations typically have been demobilized in early September, but were demobilized in late September in 2014. A rise in discharge was recorded at all sites except Windy Hydro in mid-September 2014, which likely explains the higher than average low flows recorded in 2014.

During the monitoring period over which pumping occurred (94 days) at the TIA, discharge exceeded 10% of background flow on two occasions (September 9th and 21st) representing a 98% level of target achievement. Discharge was 10.3 % of the background volumetric flow on September 9th (i.e., 0.3% above target), and 15.0 % of the background volumetric flow on September 21st (i.e., 5% above target).

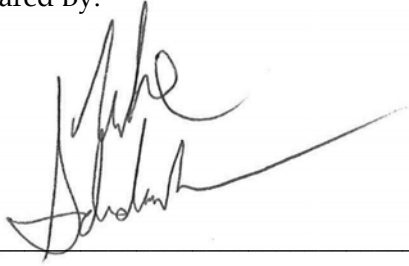
Summary of Compliance Points

Doris North Project Certificate	Target Achieved	Results
Proponent will monitor stage and discharge in Doris Outflow both upstream and downstream of the decant discharge point to provide information that can be used in assessing the accuracy of the impact predictions relating to fish habitat downstream.	Yes	Hydrometric station TL-2 is located upstream of the discharge location. Station TL-3 is located downstream of the discharge location. Each station collects and records stage at 10-minute intervals during the open water season. A minimum of eight discharge measurements were completed at each location and were used to convert recorded stage to discharge using a stage-discharge relationship.
Doris North Project Type A Water Licence		
Part G. Item 31. The Licensee shall ensure that water within the Tailings Impoundment Area is maintained at an elevation of least 28.3 metres above sea level such that a minimum of four (4) metres of water cover is maintained over the tailings at all times.	Yes	Though tailings have not yet been deposited in the TIA, water levels have been monitored almost continuously, with a data gap from September 8, 2013 to March 16, 2014 due to a datalogger malfunction and after September 18, 2014 when the temporary datalogger and pressure transducer were removed.
Part G. Item 31. The Licensee shall ensure that the flow from the Tailings Impoundment Area into Doris Creek at monitoring station TL-4 does not exceed 10% of the background flow in Doris Creek as measured at monitoring station TL-2 at the time of discharge.	No	During the monitoring period over which pumping occurred (94 days), discharge exceeded 10% of background flow on two occasions (September 9 and 21. Discharge was 10.3% of the background volumetric flow on September 9 (i.e., 0.3% exceedance), and 15.0% of the background volumetric flow on September 21 (i.e., 5% exceedance).
Part J. Item 2: The Licensee shall install appropriate instrumentation in Doris Creek at Monitoring Station TL-2, to monitor flow when ice conditions allow for such measurements to be taken, on a real time and continuous basis.	Yes	Real time continuous monitoring was conducted at station TL-2 when ice conditions allowed to provide flow predictions for TIA dewatering operations.
Part J. Item 3. The Licensee shall undertake the Water Monitoring Program detailed in the Tables of Schedule J ^a	Yes	Automated hydrometric stations TL-2 and TL-3 were operated throughout the open-water season in 2014. Stage-discharge measurements were collected at each site and annual discharge hydrographs were generated.
Interim Water Management Plan		
Section 4.2: Continuous monitoring of Doris Lake water levels and outflows will continue under the hydrologic baseline characterization. These data will be used to calibrate the existing water balance and quality model.	Yes	Though mining has not yet commenced, water levels are continuously monitored in Doris Lake, although ice affected stage readings are discarded during QA/QC review.

Note:

^a ERM Rescan monitors discharge at sites TL-2 and TL-3. All other requirements under this element are monitored by TMAC and presented elsewhere.

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– Appendix A –

Hydrometric Monitoring Station Information Sheets

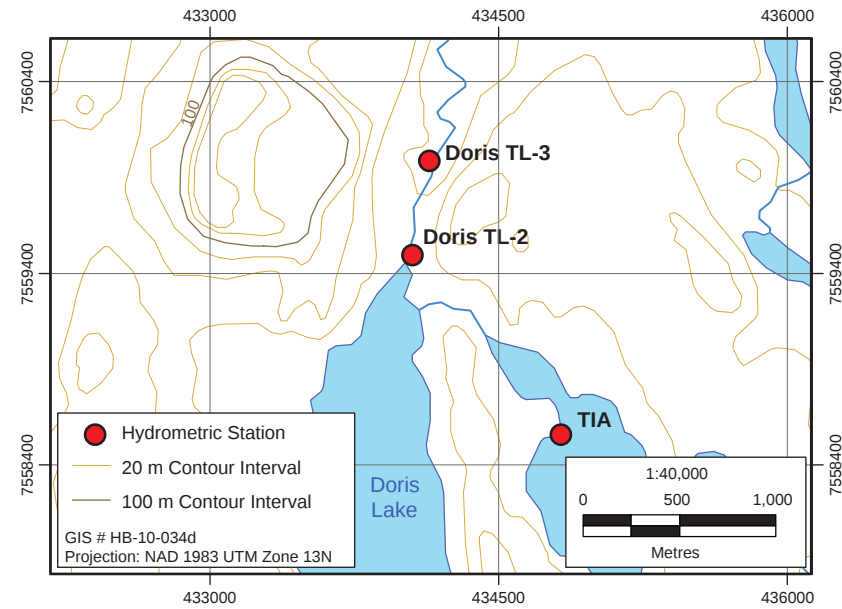
Appendix A-1

Station Information Sheet for Hydrometric Station Doris TL-2

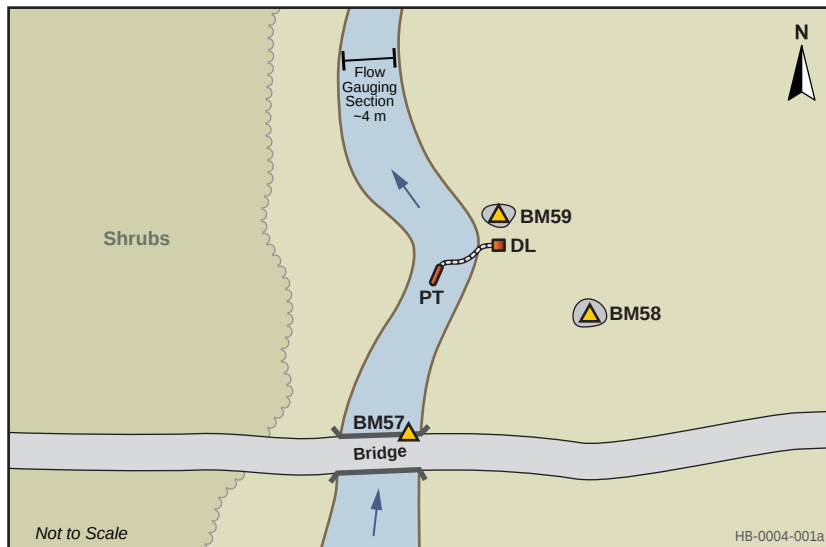


Site ID:	Doris TL - 2	Drainage Area (km²):	94.6
Site Location:	Doris Creek at Doris Lake outflow		
UTM:	NAD 83, Zone 13 W	434,059 E	7,559,504 N
Benchmarks	Elevation	Description	
BM59	100.000	Bolt in boulder	
BM58	100.593	Bolt in boulder	
BM57	102.608	Underside of bridge (right bank)	
Transducer:	PS9800		Data Logger: HOBO Energy Pro
Operating Period: 1996-1998, 2000, 2003-2014			
2014	June 15 – September 22		
General Comments:			
• Access by TIA road • Transducer is paired with satellite telemetry station for real-time data monitoring during open water season (sat. receiver needs replacement) • Wadeable under all flow conditions • Flow gauging section is approximately 60 m downstream from station			

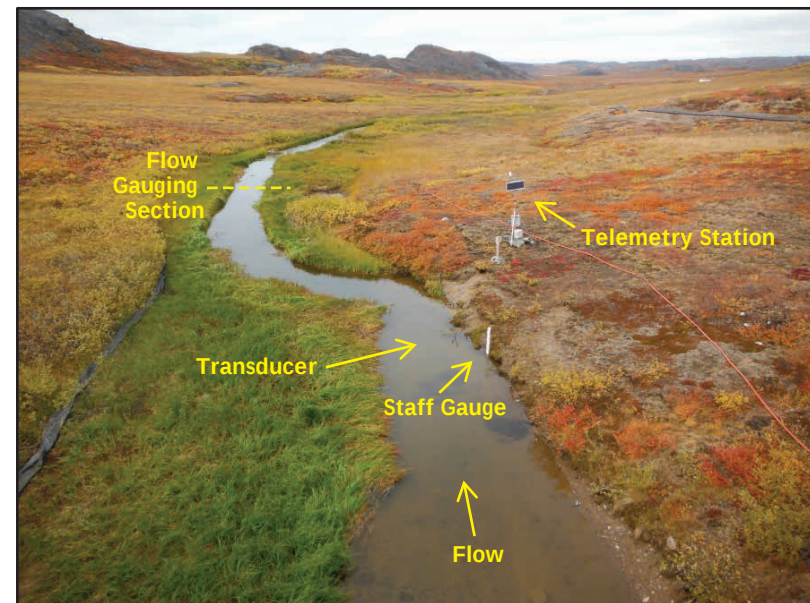
General Site Information



Site Map



Plan View of Site



Site Photo: View is downstream (north)

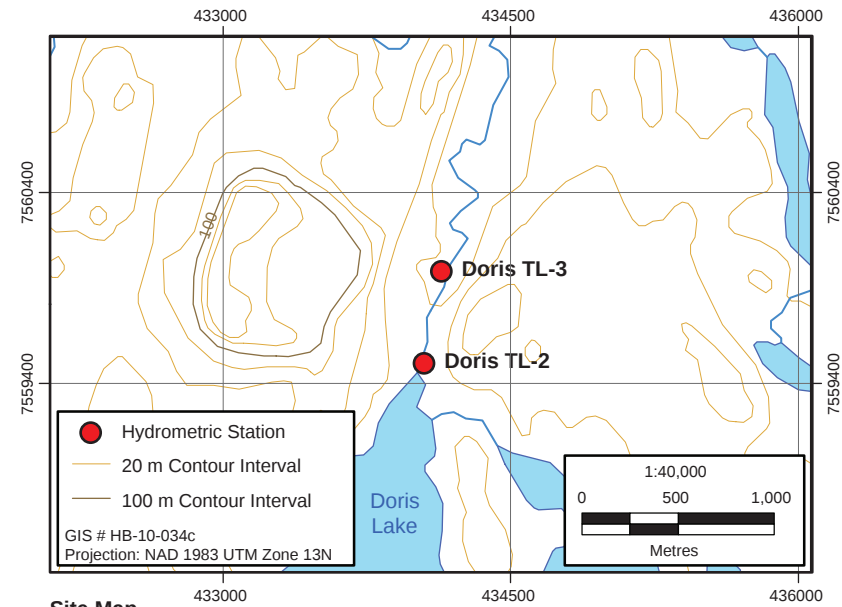
Appendix A-2

Station Information Sheet for Hydrometric Station Doris TL-3

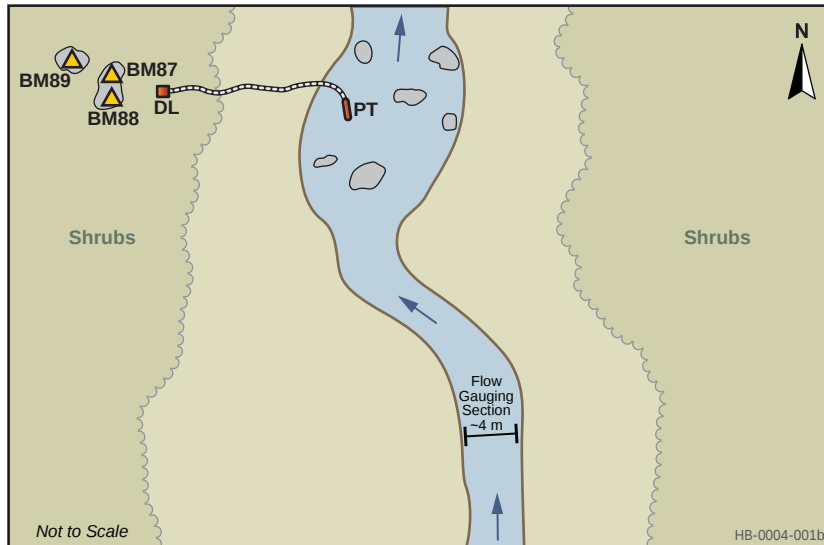


Site ID:	Doris TL-3	Drainage Area (km²):	95.3
Site Location:	Doris Creek downstream from waterfall		
UTM:	NAD 83, Zone 13 W	434,204 E	7,559,985 N
Benchmarks	Elevation	Description	
BM87	100.000	Bolt in boulder	
BM88	100.945	Bolt in boulder	
BM89	102.277	Bolt in boulder	
Transducer and Data Logger:	PT2x		
Operating Period: 2011 - 2014			
2014	June 19 - September 22		
General Comments:			
• Access by foot from Tail Lake Road (approximately 500 m downstream from Doris bridge and station Doris TL-2) or by helicopter • Wadeable under most flow conditions (drysuit at high flow) • Flow gauging section is approximately 20 m upstream from station			

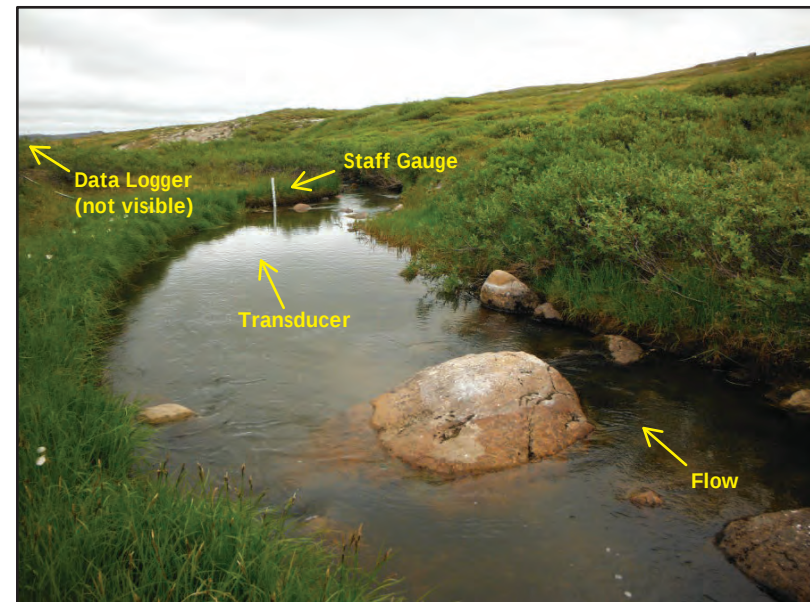
General Site Information



Site Map



Plan View of Site



Site Photo: View is downstream (north)

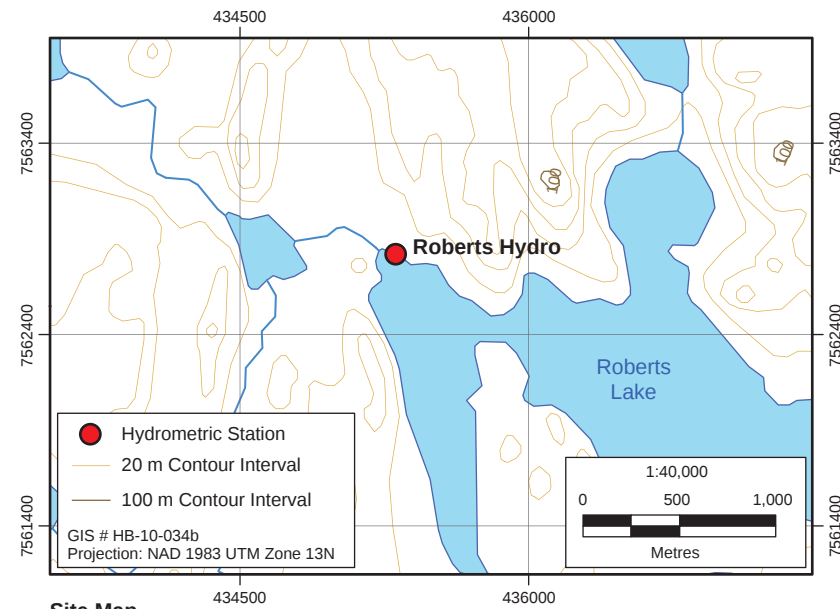
Appendix A-3

Station Information Sheet for Hydrometric Station Roberts Hydro

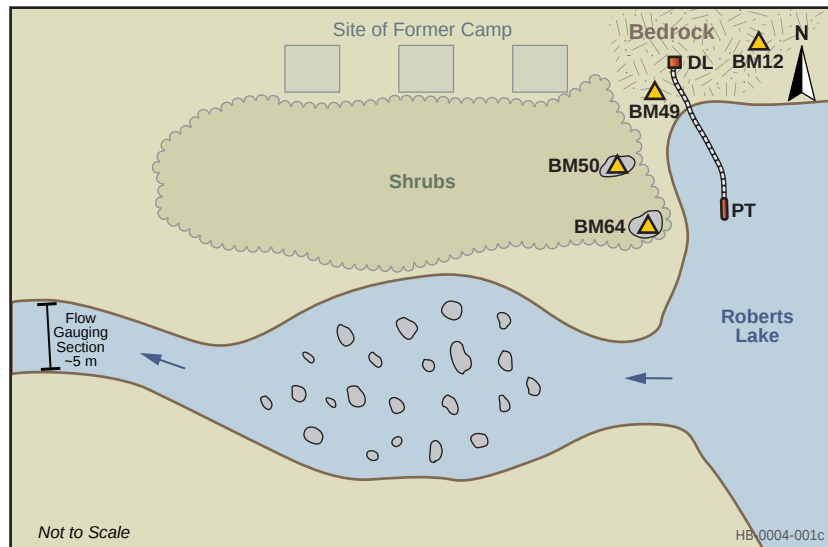


Site ID:	Roberts Hydro	Drainage Area (km²):	97.9
Site Location:	Roberts Lake outflow		
UTM:	NAD 83, Zone 13 W	435,325 E	7,562,815 N
Benchmarks	Elevation	Description	
BM49	100.000	Bolt in bedrock	
BM50	100.077	Bolt in boulder	
BM64	99.813	Bolt in boulder	
BM12	100.059	Bolt in bedrock	
Transducer and Data Logger:	PT2x		
Operating Period: 2003 - 2014			
2014	June 18 - September 21		
General Comments:			
- Access by helicopter - Wadeable under most flow conditions (drysuit at high flows) - Flow gauging section is approximately 80 m downstream from lake outlet			

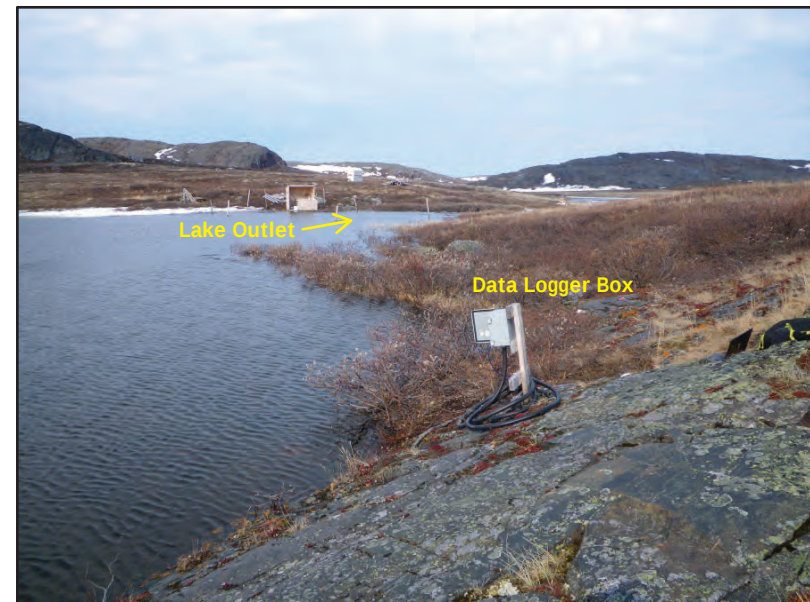
General Site Information



Site Map



Plan View of Site



Site Photo: View is northwest towards lake outlet.

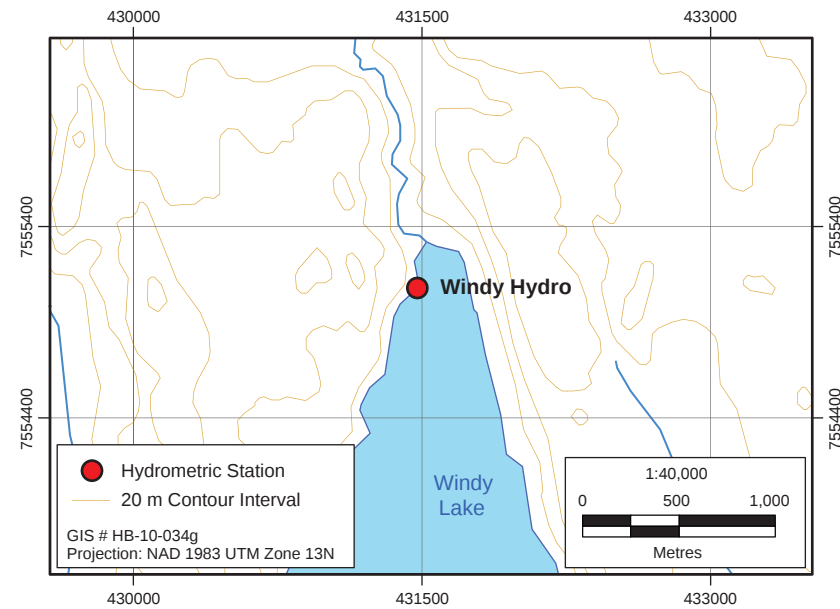
Appendix A-4

Station Information Sheet for Hydrometric Station Windy Hydro

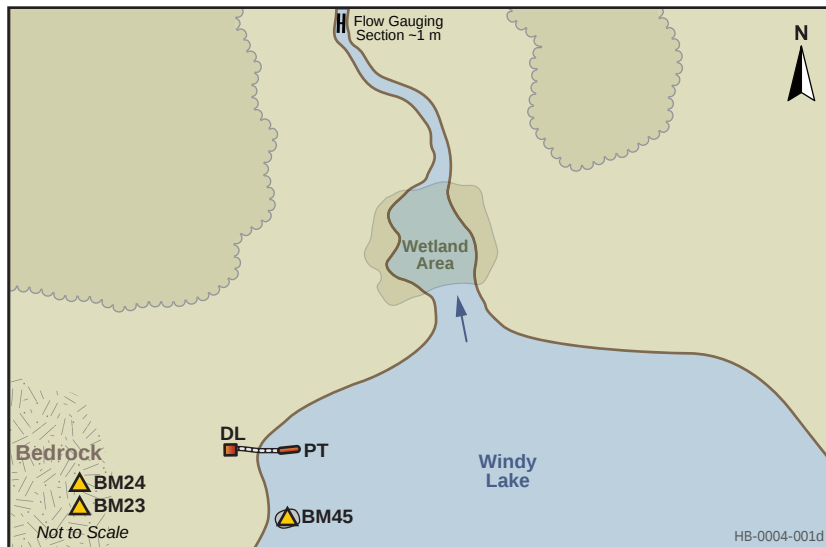


Site ID:	Windy Hydro	Drainage Area (km²):	14.1
Site Location:	Windy Lake outflow		
UTM:	NAD 83, Zone 13 W	431,481 E	7,555,089 N
Benchmarks	Elevation	Description	
BM24	100.000	Bolt in bedrock	
BM23	99.656	Bolt in bedrock	
BM45	95.617	Bolt in boulder	
Transducer and Data Logger:	PT2x		
Operating Period: 2006 - 2014			
2014	June 18 - September 21		
General Comments:			
- Access by helicopter - Wadeable under all flow conditions (very small stream) - Flow gauging section is approximately 50 m downstream from lake outlet			

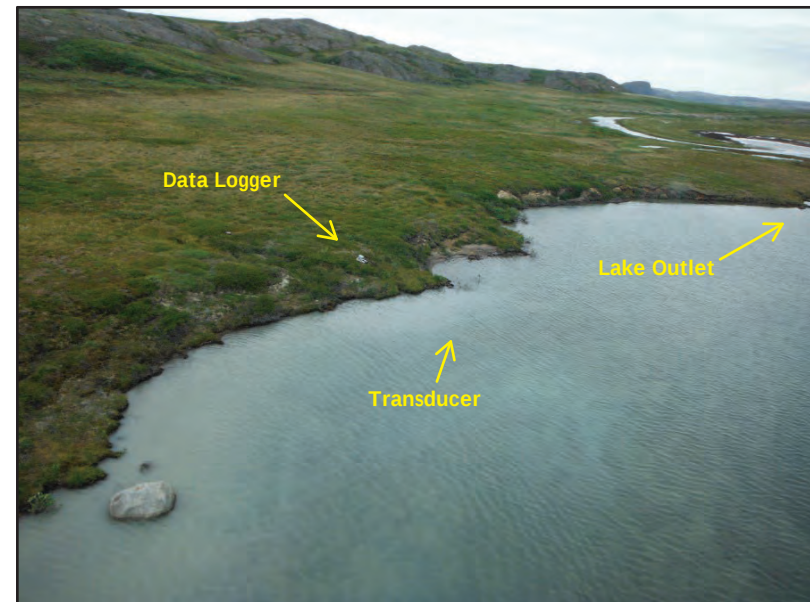
General Site Information



Site Map



Plan View of Site



Site Photo: View is northwest.

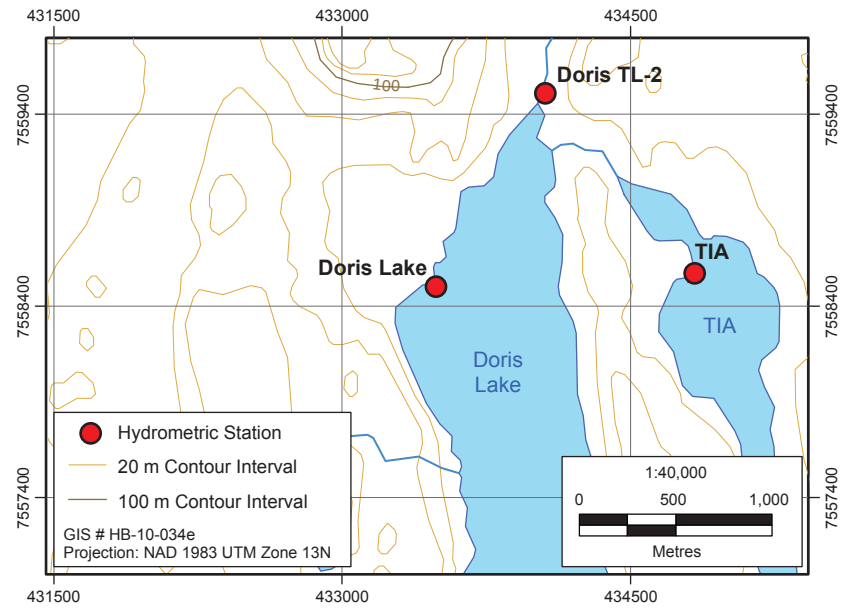
Appendix A-5

Station Information Sheet for Hydrometric Station Doris Lake

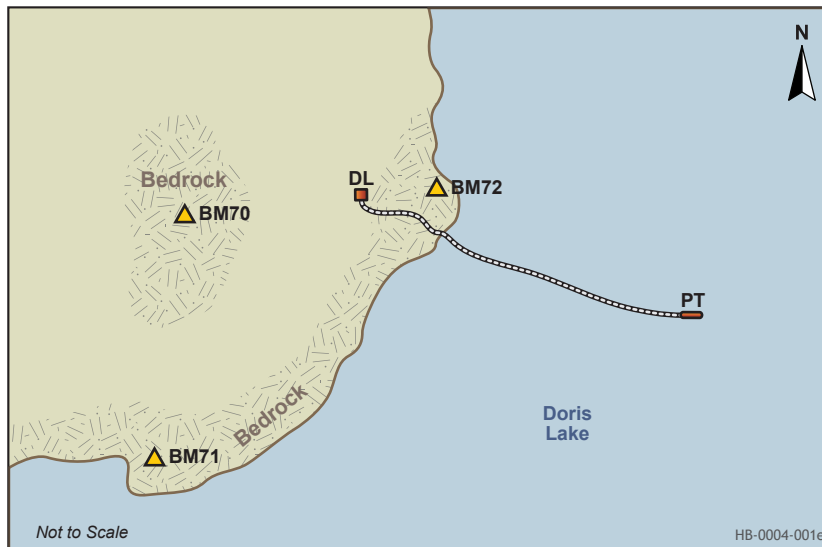


Site ID:	Doris Lake	Drainage Area (km²):	94.6
Site Location:	Northwest shore of Doris Lake near Doris Camp		
UTM:	NAD 83, Zone 13 W	433,512 E	7,558,452 N
Benchmarks	Elevation	Description	
BM70	100.000	Bolt in bedrock	
BM71	99.243	Bolt in bedrock	
BM72	98.550	Bolt in bedrock	
Transducer:	KPSI 730-series	Data Logger:	DD-320
Operating Period: 2004 - 2014			
2014	Continuous operation		
General Comments:			
- Access by foot from Doris Lake boat ramp - Station monitors lake levels only, no flow measurements are taken at this location - Station operates continuously; transducer is installed approximately 5 m deep to prevent ice damage... (Transducer is old and should be replaced)			

General Site Information



Site Map



Plan View of Site



Site Photo: View is east.

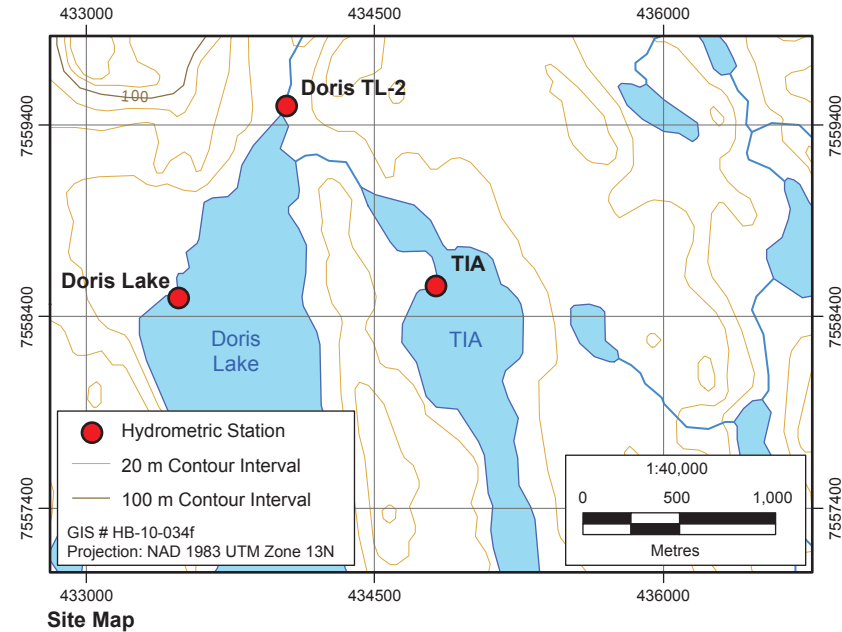
Appendix A-6

Station Information Sheet for Hydrometric Station Tailings Impoundment Area (TIA)

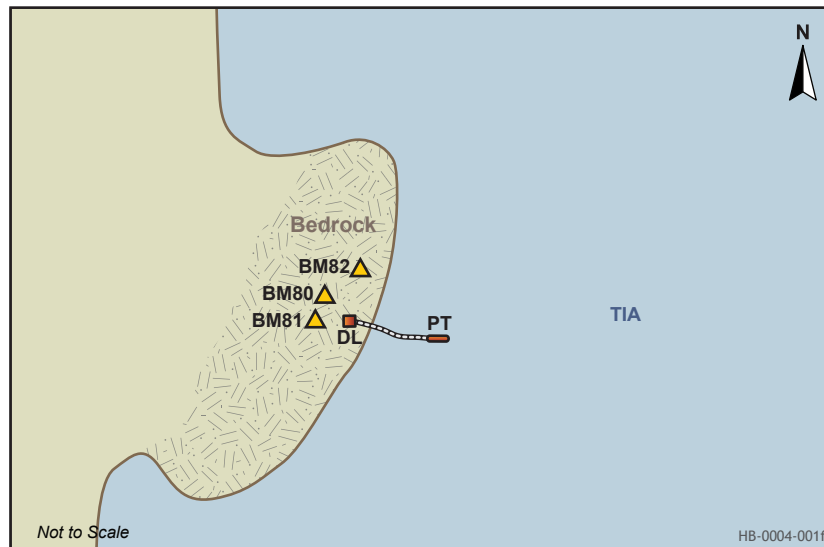


Site ID:	TIA	Drainage Area (km ²):	4.2
Site Location:	Northwest shore of TIA		
UTM:	NAD 83, Zone 13 W	434,832 E	7,558,560 N
Benchmarks	Elevation	Description	
BM80	100.000	Bolt in bedrock	
BM81	97.480	Bolt in bedrock	
BM82	98.173	Bolt in bedrock	
Transducer:	KPSI 730-series	Data Logger:	DD-320
Operating Period: 2004 - 2014			
2014	January 1 - September 19		
General Comments:			
• Access by foot from North Dam (station is approximately 800 m south of dam) or by helicopter • Station monitors lake levels only, no flow measurements are taken at this location • Station operates continuously; transducer is installed approximately 5 m deep to prevent ice damage... (Transducer damaged. Needs replacement)			

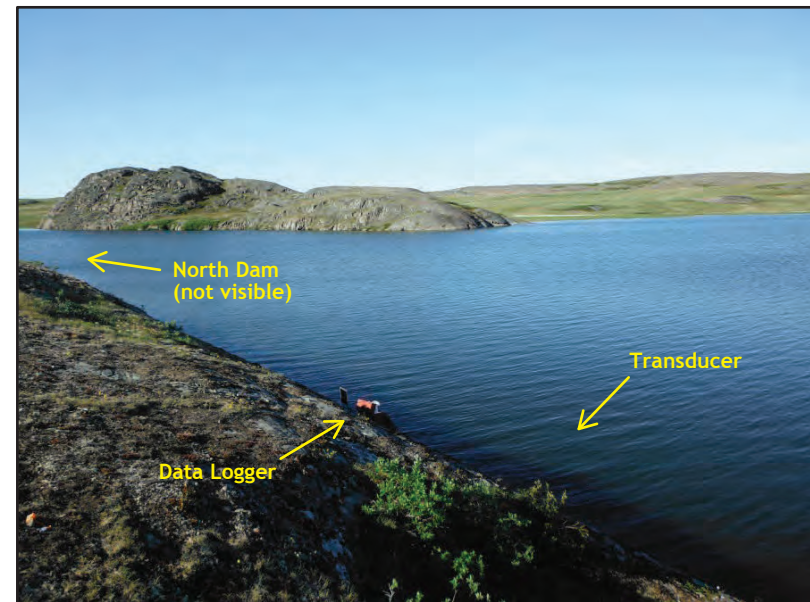
General Site Information



Site Map



Plan View of Site



Site Photo: View is northeast.

– Appendix B –

Manual Stage and Discharge Measurements

Appendix B-1. Stage Measurement at Station Doris TL-2 - June 14, 2014

Site Information						Discharge Measurement - Mid-Section Method																									
Project Name		Hope Bay				Measurement Time		Start		14:40		End		15:10		Location		Approx 200 m downstream of telemetry station													
Station Identification		TL-2				Method		Velocity-area (Mid-section)				Instrument Model		Marsh McBirney Flo-Mate 2000																	
Stream Name		Doris Creek				Flow Meter Type		Electromagnetic current meter				Instrument Serial #		3747																	
Date Monitored		June 14 2014				Real Time Reading (m)		Start		Reading		Time		Staff Gauge (m)		0.63															
Time at Site (24 hr)		Start Time:		2:20:00 PM		End Time:		6:30:00 PM		End		Reading		Time		Time of SG Reading		14:20													
Personnel		H. Buehler, M. Soloducha						Station		Depth		Distance		Area		Velocity (m/s)		Q		% of Total Q											
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m ²)		60%		20%		80%		(m ³ /s)		%	
Weather Conditions		Sunny, windy, 5-10 km/hr from N				1		RB		11.80		0.00		0.0		0.02		0								0.000		0.0			
Transducer Information						2		11.55		0.16		0.3		0.06		-0.01										-0.001		0.0			
PT Model		PS9800		Serial #		2104003		3		11.10		0.38		0.5		0.16		0.31										0.050		4.0	
Gain		Low: 4mA = 0.0m H2O		Offset		High: 20mA = 3.515 m H2O		4		10.70		0.45		0.4		0.18		0.39										0.070		5.6	
Status		Active		Battery		100%		5		10.30		0.51		0.4		0.20		0.41										0.084		6.6	
# of Records		None		Memory Free		wrap		6		9.90		0.60		0.4		0.24		0.41										0.098		7.8	
Date Serviced		Unknown		Crest Gauges		None		7		9.50		0.66		0.4		0.26		0.44										0.116		9.2	
Hydrometric Leveling Survey						8		9.10		0.66		0.4		0.26		0.46												0.121		9.6	
Stn	BS	HI	FS	Elevation	Notes	9		8.70		0.66		0.4		0.26		0.49												0.129		10.2	
BM 1		0.000				10		8.30		0.62		0.4		0.25		0.47												0.117		9.2	
BM 2				0.000		11		7.90		0.64		0.4		0.26		0.52												0.133		10.5	
BM 3				0.000		12		7.50		0.64		0.4		0.26		0.44												0.113		8.9	
WL				0.000		13		7.10		0.57		0.4		0.23		0.44												0.100		7.9	
PT				0.000		14		Grassy		6.70		0.45		0.4		0.18		0.13										0.023		1.9	
						15		Grassy		6.30		0.32		0.4		0.13		0.12										0.015		1.2	
						16		Grassy		5.90		0.30		0.4		0.12		0.17										0.020		1.6	
						17		Grassy		5.50		0.25		0.4		0.10		0										0.000		0.0	
						18		Grassy		5.10		0.20		0.4		0.08		0.03										0.002		0.2	
						19		Grassy		4.70		0.18		0.4		0.07		0.07										0.005		0.4	
TBM				0.000		20		Grassy		4.30		0.18		0.4		0.07		0.07										0.005		0.4	
TBM		0.000		0.000		21		Less veg		3.90		0.28		0.4		0.11		0.32										0.036		2.8	
BM 1				0.000		22				3.50		0.26		0.4		0.10		0.17										0.018		1.4	
BM 2				0.000		23				3.10		0.20		0.4		0.08		0.09										0.007		0.6	
BM 3				0.000		24				2.70		0.13		0.4		0.05		-0.01										0.000		0.0	
WL				0.000		25		LB		2.40		0.00		0.3		0.00		0										0.000		0.0	
PT				0.000																											
BM#	Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes																										
BM 1		0.000		0.000																											
BM 2		0.000		0.000																											
BM 3		0.000		0.000																											
Summary						General Notes																									
Staff Gauge Reading (m)		0.632				Satellite station not started due to technical difficulties. Discharge measurement conducted just downstream of bend with boulder marking the right bank. Dense veg near the left bank on the inside bend.																									
Stage from WL Survey (m)		0.000																													
Pressure Transducer Reading (m)		(Average of 3 At Time of Stage Measurement)																													
Pressure Transducer Elevation (m)																															
Discharge (m ³ /s)		1.3																													
Cross Sectional Area		3.735																													
Average Velocity		0.338																													
Total Q						1.263 100.0																									

Appendix B-1. Stage Measurement at Station Doris TL-2 - June 16, 2014

Site Information						Discharge Measurement - Mid-Section Method											
Project Name		Hope Bay				Measurement Time		Start	11:20	End	11:55	Location	Approx 200 m downstream of telemetry station				
Station Identification		TL-2				Method		Velocity-area (Mid-section)			Instrument Model		Marsh McBirney Flo-Mate 2000				
Stream Name		Doris Creek				Flow Meter Type		Electromagnetic current meter			Instrument Serial #		3747				
Date Monitored		June 16 2014				Real Time Reading (m)		Start	Reading		Time		Staff Gauge (m)		0.67		
Time at Site (24 hr)		Start Time:	11:21:00 AM	End Time:	11:55:00 AM			End	Reading		Time		Time of SG Reading		11:00		
Personnel		H. Buehler, M. Soloducha						Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q	
Station Coordinates		Easting	Northing	Elevation		No.	Notes	(m)	(m)	(m)	(m²)	60%	20%	80%	(m³/s)	%	
		434059	7559504	10 m		1	LB	3.45	0.00	0.0	0.09	0			0.000	0.0	
Weather Conditions		Sunny windy				2	Veg submerged	4.50	0.18	1.1	0.14	0.03			0.004	0.2	
Transducer Information						3	Veg submerged	4.95	0.27	0.5	0.13	0.14			0.018	1.1	
PT Model		PS9800		Serial #		2104003	4	Veg submerged	5.45	0.36	0.5	0.18	0.36		0.065	4.0	
Gain		Low: 4mA = 0.0m H2O		Offset		High: 20mA = 3.515 m H2O	5	Veg submerged	5.95	0.24	0.5	0.12	0.23		0.028	1.7	
Status		Active		Battery		100%	6	Veg submerged	6.45	0.24	0.5	0.12	0.13		0.016	1.0	
# of Records		None		Memory Free		wrap	7	Veg submerged	6.95	0.28	0.5	0.14	0.07		0.010	0.6	
Date Serviced		Unknown		Crest Gauges		None	8	Veg submerged	7.45	0.34	0.5	0.17	0.19		0.032	2.0	
Hydrometric Leveling Survey						9	Veg submerged	7.95	0.37	0.5	0.17	0.22			0.037	2.2	
Stn	BS	HI	FS	Elevation	Notes	10	Veg submerged	8.35	0.47	0.4	0.15	0.24			0.037	2.2	
BM 1		0.000		0.000		11		8.60	0.57	0.3	0.17	0.53			0.091	5.5	
BM 2				0.000		12		8.95	0.66	0.4	0.28	0.52			0.146	8.9	
BM 3				0.000		13		9.45	0.68	0.5	0.34	0.63			0.214	13.1	
WL				0.000		14		9.95	0.66	0.5	0.33	0.62			0.205	12.5	
PT				0.000		15		10.45	0.67	0.5	0.34	0.57			0.191	11.7	
						16		10.95	0.68	0.5	0.34	0.53			0.180	11.0	
						17		11.45	0.59	0.5	0.30	0.52			0.153	9.4	
						18		11.95	0.53	0.5	0.27	0.4			0.106	6.5	
						19		12.45	0.49	0.5	0.23	0.37			0.086	5.3	
TBM				0.000		20		12.90	0.47	0.5	0.18	0.06			0.011	0.6	
TBM		0.000		0.000		21	By rock	13.20	0.16	0.3	0.04	0.13			0.005	0.3	
BM 1				0.000		22	RB	13.40	0.00	0.2	0.00	0			0.000	0.0	
BM 2				0.000													
BM 3				0.000													
WL				0.000													
PT				0.000													
BM#	Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes												
BM 1		0.000		0.000													
BM 2		0.000		0.000													
BM 3		0.000		0.000		Total Q										1.633	100.0
Summary						General Notes											
Staff Gauge Reading (m)				0.666		Over bank flow on LB. <1% of flow											
Stage from WL Survey (m)				0.000													
Pressure Transducer Reading (m)				1.079													
Pressure Transducer Elevation (m)				-1.079													
Discharge (m³/s)				1.6													
Cross Sectional Area				4.213													
Average Velocity				0.388													

Appendix B-1. Stage Measurement at Station Doris TL-2 - June 19, 2014

Site Information						Discharge Measurement - Mid-Section Method																									
Project Name		Hope Bay				Measurement Time		Start		12:20		End		12:45:00		Location		Approx 200 m downstream of telemetry station													
Station Identification		TL-2				Method		Velocity-area (Mid-section)				Instrument Model				Swoffer (C2 Prop)															
Stream Name		Doris Creek				Flow Meter Type		Rotating Current Meter				Instrument Serial #				Unit C															
Date Monitored		June 19 2014				Real Time Reading (m)		Start		Reading				Time				Staff Gauge (m)		0.78											
Time at Site (24 hr)		Start Time:		12:20:00 PM				End Time:		1:00:00 PM		End		Reading		Time		Time of SG Reading		13:00:00											
Personnel		H. Buehler, M. Soloducha						Station		Depth		Distance		Area		Velocity (m/s)			Q		% of Total Q										
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m²)		60%		20%		80%		(m³/s)		%	
		434059		7559504		10 m				1		LB		2.85		0.00		0.0		0.03		0						0.000		0.0	
Weather Conditions		Clear sky, windy				2				3.10		0.21		0.3		0.06		0.15										0.008		0.4	
Transducer Information						3				3.40		0.35		0.3		0.11		0.35										0.037		1.6	
PT Model		PS9800		Serial #		2104003		4				3.70		0.37		0.3		0.11		0.61								0.068		3.0	
Gain		Low: 4mA = 0.0m H2O		Offset		High: 20mA = 3.515 m H2O		5				4.00		0.40		0.3		0.12		0.64								0.076		3.3	
Status		Active		Battery		100%		6				4.30		0.38		0.3		0.11		0.73								0.083		3.6	
# of Records		None		Memory Free		wrap		7				4.60		0.52		0.3		0.16		0.69								0.108		4.7	
Date Serviced		Unknown		Crest Gauges		None		8				4.90		0.64		0.3		0.19		0.67								0.129		5.6	
Hydrometric Leveling Survey						9				5.20		0.65		0.3		0.20		0.67										0.131		5.7	
Stn	BS	HI		FS		Elevation		Notes		10				5.50		0.71		0.3		0.21		0.75						0.159		6.9	
BM 59	1.657	101.657				100.000				11				5.80		0.75		0.3		0.23		0.78						0.176		7.6	
BM 58				1.073		100.584				12				6.10		0.75		0.3		0.23		0.73						0.165		7.2	
BM 57				0.947		100.710				13				6.40		0.74		0.3		0.22		0.71						0.157		6.8	
WL				2.416		99.241				14				6.70		0.81		0.3		0.24		0.64						0.154		6.7	
SG				2.182		99.475				15				7.00		0.80		0.3		0.24		0.66						0.159		6.9	
										16				7.30		0.81		0.3		0.24		0.62						0.151		6.6	
										17				7.60		0.81		0.3		0.24		0.56						0.136		5.9	
										18				7.90		0.78		0.3		0.23		0.47						0.109		4.8	
										19				8.20		0.75		0.3		0.23		0.48						0.108		4.7	
TBM				1.656		100.001				20				8.50		0.74		0.3		0.22		0.44						0.098		4.2	
TBM	1.684	101.685				100.001				21		Bankfull chan. Edge		8.80		0.36		0.3		0.11		0.30						0.032		1.4	
BM 59				1.684		100.001				22		Submerged veg		9.10		0.30		0.3		0.09		0.29						0.026		1.1	
BM 58										23		Submerged veg		9.40		0.23		0.3		0.07		0.28						0.019		0.8	
BM 57										24		Submerged veg		9.70		0.15		0.3		0.08		0.16						0.013		0.6	
WL				2.445		99.240				25		RB		10.50		0.00		0.8		0.00		0						0.000		0.0	
SG				2.206		99.479																									
BM#	Elevation (m)	Mean Elevation (this date) (m)				Difference (m)		Notes																							
BM 59		100.001																													
BM 58		100.584																													
BM 57		100.710																													
SG		99.477								Total Q																		2.303		100.0	
Summary									General Notes																						
Staff Gauge Reading (m)				0.778		Staff gauge measured at 0.778 at 13:00. The depth of the pressure transducer at this time was 1.070 (as measured from stadia rod). Swoffer was used for these measurements. Conversion ratio of 426/610 was used. Levelling survey completed on June 18 at 18:50																									
Stage from WL Survey (m)				99.241																											
Pressure Transducer Reading (m)				1.184																											
Pressure Transducer Elevation (m)				98.057																											
Discharge (m³/s)				2.3																											
Cross Sectional Area				3.962																											
Average Velocity				0.581																											

Appendix B-1. Stage Measurement at Station Doris TL-2 - July 22, 2014

Site Information						Discharge Measurement - Mid-Section Method													
Project Name		Hope Bay				Measurement Time		Start		17:30		End		18:30		Location		Approx 200 m downstream of telemetry station	
Station Identification		Doris TL-2				Method		Velocity-area (Mid-section)				Instrument Model		Marsh McBirney Flo-Mate 2000					
Stream Name		Doris Creek				Flow Meter Type		Electromagnetic current meter				Instrument Serial #		6592					
Date Monitored		22-Jul-14				Real Time Reading (m)		Start		Reading		Time		Staff Gauge (m)		0.5742		0.575	
Time at Site (24 hr)		Start Time:		5:30:00 PM		End Time:		6:30:00 PM		End		Reading		Time		Time of SG Reading		17:30 18:36	
Personnel		H. Buehler, L. Wingnek						Station		Depth		Distance		Area		Velocity (m/s)		Q	
Station Coordinates		Easting		Northing		Elevation		No.		Notes		(m)		(m)		(m)		(m ²)	
		434059		7559504		10 m		1		LB		2.14		0.00		0.0		0.01	
Weather Conditions		Sunny, no wind				2		veg		2.30		0.11		0.2		0.02		0.24	
Transducer Information						3		veg		2.45		0.17		0.2		0.03		0.24	
PT Model		PS9800		Serial #		2104003		4				2.60		0.45		0.2		0.08	
Gain		Low: 4mA = 0.0m H2O		Offset		High: 20mA = 3.515 m H2O		5				2.80		0.43		0.2		0.09	
Status		Active		Battery		100%		6				3.00		0.44		0.2		0.09	
# of Records		None		Memory Free		wrap		7				3.20		0.41		0.2		0.08	
Date Serviced		Unknown		Crest Gauges		None		8				3.40		0.42		0.2		0.08	
Hydrometric Leveling Survey						9				3.60		0.40		0.2		0.08		1.08	
Stn	BS	HI	FS	Elevation	Notes	10				3.80		0.41		0.2		0.08		1.08	
BM 1		0.000				11				4.00		0.40		0.2		0.08		1.09	
BM 2				0.000		12				4.20		0.38		0.2		0.08		1.02	
BM 3				0.000		13				4.40		0.37		0.2		0.07		1.16	
WL				0.000		14				4.60		0.38		0.2		0.08		1.08	
PT				0.000		15				4.80		0.39		0.2		0.08		1.05	
						16				5.00		0.40		0.2		0.08		1.04	
						17				5.20		0.40		0.2		0.08		0.93	
						18				5.40		0.41		0.2		0.06		0.95	
						19				5.50		0.38		0.1		0.06		0.83	
TBM				0.000		20		veg		5.70		0.31		0.2		0.08		0.43	
TBM		0.000		0.000		21		veg		6.00		0.18		0.3		0.09		0.17	
BM 1				0.000		22		RB		6.70		0.00		0.7		0.00		0	
BM 2				0.000															
BM 3				0.000															
WL				0.000															
PT				0.000															
BM#	Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes														
BM 1		0.000		0.000															
BM 2		0.000		0.000															
BM 3		0.000		0.000															
Summary						Total Q												1.134 100.0	
General Notes																			
Staff Gauge Reading (m)						0.574													
Stage from WL Survey (m)						0.000													
Pressure Transducer Reading (m)						0.990													
Pressure Transducer Elevation (m)						-0.990													
Discharge (m ³ /s)						1.1													
Cross Sectional Area						1.462													
Average Velocity						0.776													

Appendix B-1. Stage Measurement at Station Doris TL-2 - July 24, 2014

Site Information						Discharge Measurement - Mid-Section Method																							
Project Name		Hope Bay				Measurement Time		Start		17:00		End		17:25		Location		Approx 200 m downstream of telemetry station											
Station Identification		Doris TL-2				Method		Velocity-area (Mid-section)				Instrument Model		Marsh McBirney Flo-Mate 2000															
Stream Name		Doris Creek				Flow Meter Type		Electromagnetic current meter				Instrument Serial #		6592															
Date Monitored		24-Jul-14				Real Time Reading (m)		Start		Reading				Time				Staff Gauge (m)		0.58									
Time at Site (24 hr)		Start Time:		4:53:00 PM				End Time:		6:45:00 PM		End		Reading		Time		Time of SG Reading		17:50									
Personnel		H. Buehler, L. Wingnek						Station		Depth		Distance		Area		Velocity (m/s)				Q		% of Total Q							
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m²)		60%		80%		(m³/s)		%	
		434059		7559504		10 m				1		RB		2.90		0.00		0.0		0.00		0				0.000		0.0	
Weather Conditions		Smokey				2		veg		3.10		0.04		0.2		0.01		-0.01								0.000		0.0	
Transducer Information						3		veg, RB bankfull		3.40		0.14		0.3		0.03		0.07								0.002		0.1	
PT Model		PS9800		Serial #		2104003		4		3.50		0.40		0.1		0.07		0.48								0.034		2.5	
Gain		Low: 4mA = 0.0m H2O		Offset		High: 20mA = 3.515 m H20		5		3.75		0.48		0.3		0.12		0.65								0.078		5.9	
Status		Active		Battery		100%		6		4.00		0.50		0.3		0.13		0.65								0.081		6.1	
# of Records		None		Memory Free		wrap		7		4.25		0.51		0.3		0.13		0.68								0.087		6.5	
Date Serviced		Unknown		Crest Gauges		None		8		4.50		0.50		0.3		0.13		0.68								0.085		6.4	
Hydrometric Leveling Survey						9				4.75		0.52		0.3		0.13		0.75								0.098		7.4	
Stn	BS	HI	FS	Elevation	Notes	10				5.00		0.53		0.3		0.13		0.77								0.102		7.7	
BM59	1.766	101.766		100.000	started at 17:50	11				5.25		0.52		0.3		0.13		0.75								0.098		7.4	
BM58			1.178	100.588		12				5.50		0.55		0.3		0.14		0.74								0.102		7.7	
BM57			0.857	102.623		13				5.75		0.51		0.3		0.13		0.76								0.097		7.3	
WL			2.724	99.042		14				6.00		0.48		0.3		0.12		0.7								0.084		6.3	
						15				6.25		0.47		0.3		0.12		0.62								0.073		5.5	
						16				6.50		0.47		0.3		0.12		0.61								0.072		5.4	
						17		on rock		6.75		0.39		0.3		0.10		0.66								0.064		4.9	
						18				7.00		0.38		0.3		0.10		0.6								0.057		4.3	
						19				7.25		0.34		0.3		0.09		0.59								0.050		3.8	
TBM			1.633	100.133		20				7.50		0.25		0.3		0.06		0.42								0.026		2.0	
TBM	1.318	101.451		100.133		21				7.75		0.21		0.3		0.06		0.45								0.026		2.0	
BM59			1.449	100.002		22		Left bankfull		8.05		0.19		0.3		0.05		0.2								0.010		0.8	
BM58			0.858	100.593		23		veg		8.30		0.09		0.3		0.03		-0.01								0.000		0.0	
BM57			1.176	102.627		24		LB		8.70		0.00		0.4		0.00		0								0.000		0.0	
WL			2.408	99.043												0.00													

Appendix B-1. Stage Measurement at Station Doris TL-2 - July 26, 2014

Site Information						Discharge Measurement - Mid-Section Method												
Project Name		Hope Bay				Measurement Time		Start	9:40		End	10:10	Location	Approx 200 m downstream of telemetry station				
Station Identification		Doris TL-2				Method		Velocity-area (Mid-section)				Instrument Model		Marsh McBirney Flo-Mate 2000				
Stream Name		Doris Creek				Flow Meter Type		Electromagnetic current meter						Instrument Serial #				
Date Monitored		26-Jul-14				Real Time Reading (m)		Start	Reading			Time		Staff Gauge (m)		0.569	0.568	
Time at Site (24 hr)		Start Time:	8:57:00 AM	End Time:	10:22:00 AM		End	Reading			Time		Time of SG Reading		9:19	10:26		
Personnel		H. Buehler, L. Wingnek					Station	Depth		Distance	Area	Velocity (m/s)			Q	% of Total Q		
Station Coordinates		Easting	Northing	Elevation		No.	Notes		(m)	(m)	(m)	(m²)	60%	20%	80%	(m³/s)	%	
		434059	7559504	10 m		1	LB		2.79	0.00	0.0	0.01	0			0.000	0.0	
Weather Conditions		Fog, low ceiling, 10d C				2			3.00	0.07	0.2	0.02	0.07			0.001	0.1	
Transducer Information						3			3.30	0.23	0.3	0.07	0.19			0.013	1.1	
PT Model		PS9800	Serial #		2104003	4			3.60	0.21	0.3	0.06	0.32			0.020	1.7	
Gain		Low: 4mA = 0.0m H2O		Offset		High: 20mA = 3.515 m H2O	5			3.90	0.27	0.3	0.08	0.34			0.028	2.3
Status		Active		Battery		100%	6			4.20	0.26	0.3	0.07	0.49			0.032	2.7
# of Records		None		Memory Free		wrap	7			4.40	0.29	0.2	0.07	0.41			0.030	2.5
Date Serviced		Unknown		Crest Gauges		None	8			4.70	0.45	0.3	0.14	0.47			0.063	5.4
Hydrometric Leveling Survey						9			5.00	0.49	0.3	0.15	0.61			0.090	7.6	
Stn	BS	HI	FS	Elevation	Notes	10			5.30	0.66	0.3	0.20	0.61			0.121	10.2	
BM 59	1.713	101.713		100.000	Started at 8:57	11			5.60	0.73	0.3	0.22	0.56			0.123	10.4	
BM 58			1.123	100.590		12			5.90	0.76	0.3	0.23	0.61			0.139	11.8	
BM 57			0.909	102.622		13			6.20	0.63	0.3	0.19	0.53			0.100	8.5	
WL			2.676	99.037	WL at 0.568	14			6.50	0.67	0.3	0.20	0.51			0.103	8.7	
						15			6.80	0.71	0.3	0.18	0.48			0.085	7.2	
						16			7.00	0.54	0.2	0.14	0.46			0.062	5.3	
						17			7.30	0.52	0.3	0.13	0.39			0.051	4.3	
						18			7.50	0.60	0.2	0.15	0.39			0.059	5.0	
						19			7.80	0.56	0.3	0.14	0.33			0.046	3.9	
TBM			1.748	99.965		20			8.00	0.55	0.2	0.11	0.12			0.013	1.1	
TBM	2.000	101.965		99.965		21	veg, right bankfull		8.20	0.31	0.2	0.08	0.01			0.001	0.1	
BM 59			1.963	100.002		22	veg, right bankfull		8.50	0.22	0.3	0.06	0.03			0.002	0.2	
BM 58			1.377	100.588		23	RB		8.78	0.00	0.3	0.00	0			0.000	0.0	
BM 57			0.657	102.622														
WL			2.931	99.034														
BM#	Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes													
BM 59	100	100.001		0.001														
BM 58	100.593	100.589		-0.004														
BM 57	102.608	102.622		0.014		Total Q										1.181	100.0	
Summary						General Notes												
Staff Gauge Reading (m)				0.569														
Stage from WL Survey (m)				99.036														
Pressure Transducer Reading (m)				0.983														
Pressure Transducer Elevation (m)				98.053														
Discharge (m³/s)				1.2														
Cross Sectional Area				2.677														
Average Velocity				0.441														

Appendix B-1. Stage Measurement at Station Doris TL-2 - July 27, 2014

Site Information						Discharge Measurement - Mid-Section Method												
Project Name		Hope Bay				Measurement Time		Start	9:30	End	10:15	Location	Approx 200 m downstream of telemetry station					
Station Identification		Doris TL-2				Method		Velocity-area (Mid-section)				Instrument Model		Marsh McBirney Flo-Mate 2000				
Stream Name		Doris Creek				Flow Meter Type		Electromagnetic current meter						Instrument Serial #		6592		
Date Monitored		27-Jul-14				Real Time Reading (m)		Start	Reading			Time		Staff Gauge (m)		0.56		
Time at Site (24 hr)		Start Time:	8:51:00 AM	End Time:	11:00:00 AM			End	Reading			Time		Time of SG Reading		9:17		
Personnel		H. Buehler, L. Wingnek						Station	Depth	Distance	Area	Velocity (m/s)				Q	% of Total Q	
Station Coordinates		Easting	Northing	Elevation		No.	Notes	(m)	(m)	(m)	(m²)	60%	20%	80%	(m³/s)	%		
		434059	7559504	10 m		1	LB	3.02	0.00	0.0	0.01	0			0.000	0.0		
Weather Conditions		Overcast 10 d C				2		3.30	0.10	0.3	0.02	0.05			0.001	0.1		
Transducer Information						3		3.50	0.13	0.2	0.03	0.05			0.002	0.1		
PT Model		PS9800		Serial #		2104003		4		3.80	0.22	0.3	0.06	0.33		0.018	1.5	
Gain		Low: 4mA = 0.0m H2O		Offset		High: 20mA = 3.515 m H2O		5		4.00	0.27	0.2	0.05	0.29		0.016	1.3	
Status		Active		Battery		100%		6		4.20	0.28	0.2	0.07	0.38		0.027	2.2	
# of Records		None		Memory Free		wrap		7		4.50	0.27	0.3	0.05	0.5		0.027	2.2	
Date Serviced		Unknown		Crest Gauges		None		8		4.60	0.37	0.1	0.07	0.51		0.038	3.1	
Hydrometric Leveling Survey						9		4.90	0.44	0.3	0.11	0.57			0.063	5.2		
Stn	BS	HI	FS	Elevation	Notes	10		5.10	0.51	0.2	0.13	0.55			0.070	5.8		
BM 59	1.671	101.671		100.000	Started at 8:53	11		5.40	0.58	0.3	0.17	0.59			0.103	8.4		
BM 58			1.084	100.587		12		5.70	0.55	0.3	0.14	0.66			0.091	7.5		
BM 57			0.951	102.622		13		5.90	0.67	0.2	0.13	0.61			0.082	6.7		
WL			2.648	99.023	WL 0.564	14		6.10	0.64	0.2	0.13	0.62			0.079	6.5		
						15		6.30	0.66	0.2	0.17	0.58			0.096	7.9		
						16		6.60	0.61	0.3	0.18	0.57			0.104	8.6		
						17		6.90	0.71	0.3	0.18	0.5			0.089	7.3		
						18		7.10	0.69	0.2	0.14	0.47			0.065	5.3		
						19		7.30	0.67	0.2	0.17	0.46			0.077	6.3		
TBM			1.710	99.961		20		7.60	0.62	0.3	0.19	0.44			0.082	6.7		
TBM	1.745	101.706		99.961		21		7.90	0.60	0.3	0.15	0.35			0.053	4.3		
BM 59			1.706	100.000		22		8.10	0.58	0.2	0.10	0.26			0.026	2.2		
BM 58			1.119	100.587		23		edge of bankfull right bank	8.25	0.49	0.2	0.10	0.05			0.005	0.4	
BM 57			0.915	102.621		24		veg	8.50	0.28	0.3	0.08	0.04			0.003	0.3	
WL			2.681	99.025		25		veg	8.80	0.19	0.3	0.04	0.04			0.002	0.1	
						26		veg	8.90	0.12	0.1	0.02	-0.01			0.000	0.0	
						27		RB	9.09	0.00	0.2	0.00	0			0.000	0.0	
BM#	Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes													
BM 59	100	100.000		0.000														
BM 58	100.593	100.587		-0.006														
BM 57	102.608	102.622		0.014		Total Q										1.216	100.0	
Summary						General Notes												
Staff Gauge Reading (m)				0.564		Station in good conditions. Made modifications to telemetry station to prevent/reduce further wildlife damage. Added hose covering to wires and bird deterrent spikes to reciever. Completed at 14:30												
Stage from WL Survey (m)				99.024														
Presssure Transducer Reading (m)				0.979														
Presssure Transducer Elevation (m)				98.045														
Discharge (m³/s)				1.2														
Cross Sectional Area				2.687														
Average Velocity				0.452														

Appendix B-1. Stage Measurement at Station Doris TL-2 - July 28, 2014

Site Information						Discharge Measurement - Mid-Section Method																									
Project Name		Hope Bay				Measurement Time		Start		15:20		End		15:45		Location		Approx 200 m downstream of telemetry station													
Station Identification		Doris TL-2				Method		Velocity-area (Mid-section)				Instrument Model				Marsh McBirney Flo-Mate 2000															
Stream Name		Doris Creek				Flow Meter Type		Electromagnetic current meter				Instrument Serial #				6592															
Date Monitored		28-Jul-14				Real Time Reading (m)		Start		Reading				Time				Staff Gauge (m)		0.56											
Time at Site (24 hr)		Start Time:		3:20:00 PM		End Time:		5:00:00 PM		End		Reading				Time				Time of SG Reading		16:02									
Personnel		H. Buehler, L. Wingnek						Station		Depth		Distance		Area		Velocity (m/s)			Q		% of Total Q										
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m ²)		60%		20%		80%		(m ³ /s)		%	
		434027		7559657		10 m				1		RB		3.92		0.00		0.0		0.02		0						0.000		0.0	
Weather Conditions		Overcast, 16 d C				2		veg		4.30		0.13		0.4		0.04		0.04										0.002		0.1	
Transducer Information						3				4.50		0.43		0.2		0.10		0.45										0.044		3.6	
PT Model		PS9800		Serial #		2104003		4		4.75		0.46		0.3		0.12		0.54										0.062		5.1	
Gain		Low: 4mA = 0.0m H2O		Offset		High: 20mA = 3.515 m H2O		5		5.00		0.48		0.3		0.12		0.57										0.068		5.6	
Status		Active		Battery		100%		6		5.25		0.50		0.3		0.13		0.58										0.073		6.0	
# of Records		None		Memory Free		wrap		7		5.50		0.52		0.3		0.13		0.61										0.079		6.5	
Date Serviced		Unknown		Crest Gauges		None		8		5.75		0.54		0.3		0.14		0.62										0.084		6.9	
Hydrometric Leveling Survey						9				6.00		0.55		0.3		0.14		0.67										0.092		7.6	
Stn	BS	HI		FS		Elevation		Notes		10		on rock		6.25		0.52		0.3		0.13		0.68						0.088		7.3	
BM 59	1.912	101.912				100.000		Started at 16:02		11				6.50		0.53		0.3		0.13		0.71						0.094		7.8	
BM 58				1.350		100.562				12				6.75		0.49		0.3		0.12		0.68						0.083		6.9	
BM 57				0.749		102.661				13				7.00		0.49		0.3		0.12		0.66						0.081		6.7	
WL				2.861		99.051				14				7.25		0.49		0.3		0.12		0.66						0.081		6.7	
										15				7.50		0.46		0.3		0.12		0.64						0.074		6.1	
										16				7.75		0.35		0.3		0.09		0.63						0.055		4.6	
										17				8.00		0.35		0.3		0.09		0.63						0.055		4.6	
										18				8.25		0.30		0.3		0.08		0.57						0.043		3.5	
										19				8.50		0.30		0.3		0.08		0.4						0.030		2.5	
TBM				1.833		100.079				20				8.75		0.20		0.3		0.05		0.3						0.015		1.2	
TBM	1.637	101.716				100.079				21				9.00		0.15		0.3		0.03		0.24						0.008		0.7	
BM 59				1.720		99.996				22				9.20		0.11		0.2		0.03		0.02						0.001		0.0	
BM 58				1.147		100.569				23		LB		9.53		0.00		0.3		0.00		0						0.000		0.0	
BM 57				0.936		102.652																									
WL				2.667		99.049		Finished at 16:23																							
BM#	Elevation (m)	Mean Elevation (this date) (m)		Difference (m)		Notes																									
BM 59	100	99.998		-0.002																											
BM 58	100.593	100.566		-0.027																											
BM 57	102.608	102.657		0.049						Total Q																		1.211		100.0	
Summary										General Notes																					
Staff Gauge Reading (m)				0.557																											
Stage from WL Survey (m)				99.050																											
Pressure Transducer Reading (m)				0.974																											
Pressure Transducer Elevation (m)				98.076																											
Discharge (m ³ /s)				1.2																											
Cross Sectional Area				2.105																											
Average Velocity				0.575																											

Appendix B-1. Stage Measurement at Station Doris TL-2 - August 20, 2014

Site Information						Discharge Measurement - Mid-Section Method																									
Project Name		Hope Bay				Measurement Time		Start		9:07		End		9:40		Location		Approx 200 m downstream of telemetry station													
Station Identification		Doris TL-2				Method		Velocity-area (Mid-section)						Instrument Model				Marsh McBirney Flo-Mate 2000													
Stream Name		Doris Creek				Flow Meter Type		Electromagnetic current meter						Instrument Serial #				6592													
Date Monitored		20-Aug-14				Real Time Reading (m)		Start		Reading				Time				Staff Gauge (m)		0.44											
Time at Site (24 hr)		Start Time:		8:15:00 AM				End Time:		4:30:00 PM		End		Reading		Time		Time of SG Reading		8:52											
Personnel		H. Buehler, P. House						Station		Depth		Distance		Area		Velocity (m/s)				Q		% of Total Q									
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m²)		60%		20%		80%		(m³/s)		%	
		434059		7559504		10 m				1		RB		4.19		0.00		0.0		0.00		0						0.000		0.0	
Weather Conditions		slightly overcast, light breeze, 6 d C				2		sedge		4.25		0.05		0.1		0.01		0										0.000		0.0	
Transducer Information						3		sedge		4.40		0.32		0.2		0.06		0.33										0.018		2.5	
PT Model		PS9800		Serial #		2104003		4		4.60		0.38		0.2		0.08		0.39										0.030		4.0	
Gain		Low: 4mA = 0.0m H2O		Offset		High: 20mA = 3.515 m H20		5		4.80		0.39		0.2		0.08		0.46										0.036		4.9	
Status		Active		Battery		100%		6		5.00		0.40		0.2		0.09		0.49										0.044		6.0	
# of Records		None		Memory Free		wrap		7		5.25		0.41		0.3		0.10		0.48										0.049		6.7	
Date Serviced		Unknown		Crest Gauges		None		8		5.50		0.41		0.3		0.10		0.51										0.052		7.1	
Hydrometric Leveling Survey						9				5.75		0.43		0.3		0.11		0.52										0.056		7.6	
Stn	BS	HI	FS	Elevation	Notes	10				6.00		0.45		0.3		0.11		0.51										0.057		7.8	
BM 59	1.885	101.885		100.000	Started at 9:56	11				6.25		0.44		0.3		0.11		0.55										0.061		8.3	
BM58			1.306	100.579		12				6.50		0.45		0.3		0.11		0.54										0.061		8.3	
BM 57			0.738	102.623		13				6.75		0.41		0.3		0.10		0.51										0.052		7.1	
WL1			2.967	98.918	98.919	14				7.00		0.37		0.3		0.09		0.55										0.051		6.9	
WL2			2.966	98.919		15		behind boulder		7.25		0.39		0.3		0.10		0.42										0.041		5.6	
						16				7.50		0.37		0.3		0.08		0.46										0.038		5.2	
						17		boulder		7.70		0.26		0.2		0.05		0.48										0.025		3.4	
						18				7.90		0.25		0.2		0.05		0.5										0.025		3.4	
						19				8.10		0.27		0.2		0.05		0.48										0.026		3.5	
TBM			2.200	99.685		20				8.30		0.16		0.2		0.03		0.26										0.008		1.1	
TBM	2.139	101.824		99.685		21				8.50		0.15		0.2		0.03		0.07										0.002		0.3	
BM 59			1.823	100.001		22				8.70		0.10		0.2		0.02		0										0.000		0.0	
BM58			1.245	100.579		23				8.90		0.08		0.2		0.02		0										0.000		0.0	
BM 57			0.800	102.624		24				9.21		0.00		0.3		0.00		0										0.000		0.0	
WL1			2.905	98.919																											
WL2			2.906	98.918																											
BM#	Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes																										
BM 59	100	100.001		0.001																											
BM58	100.593	100.579		-0.014																											
BM 57	102.608	102.624		0.016		Total Q																						0.733		100.0	
Summary						General Notes																									
Staff Gauge Reading (m)			0.440																												
Stage from WL Survey (m)			98.919																												
Presssure Transducer Reading (m)			0.851																												
Pressure Transducer Elevation (m)			98.068																												
Discharge (m³/s)			0.7																												
Cross Sectional Area			1.588																												
Average Velocity			0.461																												

Appendix B-1. Stage Measurement at Station Doris TL-2 - August 21, 2014

Site Information						Discharge Measurement - Mid-Section Method																									
Project Name		Hope Bay				Measurement Time		Start		16:00		End		16:21		Location		Approx 200 m downstream of telemetry station													
Station Identification		Doris TL-2				Method		Velocity-area (Mid-section)				Instrument Model		Marsh McBirney Flo-Mate 2000																	
Stream Name		Doris Creek				Flow Meter Type		Electromagnetic current meter				Instrument Serial #		6592																	
Date Monitored		21-Aug-14				Real Time Reading (m)		Start		Reading				Time				Staff Gauge (m)		0.44											
Time at Site (24 hr)		Start Time:		3:54:00 AM				End Time:		5:30:00 PM		End		Reading				Time				Time of SG Reading		16:25							
Personnel		H. Buehler, P. House						Station		Depth		Distance		Area		Velocity (m/s)			Q		% of Total Q										
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m²)		60%		20%		80%		(m³/s)		%	
		434059		7559504		10 m				1		RB, sedge		4.22		0.00		0.0		0.00		0						0.000		0.0	
Weather Conditions		sunny, light breeze, 7 d C				2		sedge		4.30		0.03		0.1		0.00		0										0.000		0.0	
Transducer Information						3		sedge		4.40		0.30		0.1		0.05		0.28										0.015		2.1	
PT Model		PS9800		Serial #		2104003		4		gravel/cobble		4.65		0.36		0.3		0.09		0.48								0.043		6.1	
Gain		Low: 4mA = 0.0m H2O		Offset		High: 20mA = 3.515 m H2O		5				4.90		0.36		0.3		0.09		0.49								0.044		6.2	
Status		Active		Battery		100%		6				5.15		0.40		0.3		0.10		0.49								0.049		6.9	
# of Records		None		Memory Free		wrap		7				5.40		0.40		0.3		0.12		0.52								0.062		8.8	
Date Serviced		Unknown		Crest Gauges		None		8				5.75		0.43		0.4		0.13		0.55								0.071		10.1	
Hydrometric Leveling Survey						9				6.00		0.45		0.3		0.11		0.54										0.061		8.6	
Stn	BS	HI	FS	Elevation	Notes	10				6.25		0.45		0.3		0.11		0.55										0.062		8.8	
BM 59	1.716	101.716		100.000	Started at 16:30	11		on rock		6.50		0.41		0.3		0.10		0.54										0.055		7.8	
BM58			1.138	100.578		12		on rock		6.75		0.33		0.3		0.08		0.57										0.047		6.7	
BM 57			0.908	102.624		13				7.00		0.39		0.3		0.10		0.51										0.050		7.0	
WL1			2.802	98.914	98.914	14		behind rock		7.25		0.34		0.3		0.09		0.4										0.034		4.8	
WL2			2.804	98.912		15				7.50		0.32		0.3		0.08		0.44										0.035		5.0	
						16				7.75		0.26		0.3		0.07		0.47										0.031		4.3	
						17				8.00		0.22		0.3		0.06		0.5										0.028		3.9	
						18				8.25		0.16		0.3		0.04		0.25										0.010		1.4	
						19				8.50		0.15		0.3		0.03		0.2										0.005		0.7	
TBM			1.852	99.864		20				8.60		0.11		0.1		0.01		0.3										0.004		0.6	
TBM	1.817	101.681		99.864		21				8.75		0.10		0.2		0.02		0										0.000		0.0	
BM 59			1.680	100.001		22		LB, sedge		9.09		0.00		0.3		0.00		0										0.000		0.0	
BM58			1.102	100.579																											
BM 57			0.941	102.622																											
WL1			2.766	98.915																											
WL2			2.767	98.914																											
BM#	Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes																										
BM 59	100	100.001		0.000																											
BM58	100.593	100.579		-0.015																											
BM 57	102.608	102.623		0.015		Total Q																						0.706		100.0	
Summary						General Notes																									
Staff Gauge Reading (m)				0.439																											
Stage from WL Survey (m)				98.914																											
Pressure Transducer Reading (m)				0.843																											
Pressure Transducer Elevation (m)				98.071																											
Discharge (m³/s)				0.7																											
Cross Sectional Area				1.482																											
Average Velocity				0.476																											

Appendix B-1. Stage Measurement at Station Doris TL-2 - September 16, 2014

Site Information						Discharge Measurement - Mid-Section Method																									
Project Name		Hope Bay				Measurement Time		Start		17:01		End		17:47		Location		Approx 200 m downstream of telemetry station													
Station Identification		TL-2				Method		Velocity-area (Mid-section)				Instrument Model		Marsh McBirney Flo-Mate 2000																	
Stream Name		Doris Creek				Flow Meter Type		Electromagnetic current meter				Instrument Serial #		6592																	
Date Monitored		Sept 16 2014				Real Time Reading (m)		Start				0.412		Time				Staff Gauge (m)		0.412		0.411									
Time at Site (24 hr)		Start Time:		4:45:00 PM				End Time:		6:45:00 PM		End				0.411		Time				Time of SG Reading		16:45		18:45					
Personnel		H. Buehler,C. Bolt						Station		Depth		Distance		Area		Velocity (m/s)				Q		% of Total Q									
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m²)		60%		20%		80%		(m³/s)		%	
		434059		7539504		10 m				1		RB		4.03		0.00		0.0		0.03		0						0.000		0.0	
Weather Conditions		overcast 0 d C				2		Gravel		4.20		0.30		0.2		0.06		0.3										0.017		2.7	
Transducer Information						3		Gravel		4.40		0.34		0.2		0.07		0.4										0.027		4.3	
PT Model		PS9800		Serial #		2104003		4		Gravel		4.60		0.35		0.2		0.07		0.44								0.031		4.9	
Gain		Low: 4mA = 0.0m H2O		Offset		High: 20mA = 3.515 m H20		5		Gravel		4.80		0.37		0.2		0.07		0.48								0.036		5.7	
Status		Active		Battery		100%		6		Gravel		5.00		0.39		0.2		0.08		0.48								0.037		6.0	
# of Records		None		Memory Free		wrap		7		Gravel		5.20		0.39		0.2		0.08		0.5								0.039		6.2	
Date Serviced		Unknown		Crest Gauges		None		8		Gravel		5.40		0.41		0.2		0.08		0.5								0.041		6.6	
Hydrometric Leveling Survey						9		Gravel		5.60		0.42		0.2		0.08		0.49										0.041		6.6	
Stn	BS	HI	FS	Elevation	Notes	10		Gravel		5.80		0.42		0.2		0.08		0.49										0.041		6.6	
BM 59	1.645	101.645		100.000	Started at 17:47	11		Gravel		6.00		0.42		0.2		0.08		0.47										0.039		6.3	
BM 58			1.064	100.581	Upside down	12		Gravel		6.20		0.41		0.2		0.08		0.47										0.039		6.2	
BM 57			0.981	102.626		13		Gravel		6.40		0.39		0.2		0.08		0.47										0.037		5.9	
WL			2.773	98.872		14		Gravel		6.60		0.37		0.2		0.07		0.49										0.036		5.8	
						15		Gravel		6.80		0.35		0.2		0.07		0.48										0.034		5.4	
						16		Gravel		7.00		0.33		0.2		0.07		0.41										0.027		4.3	
						17		Gravel		7.20		0.33		0.2		0.07		0.41										0.027		4.3	
						18		Gravel		7.40		0.29		0.2		0.06		0.37										0.021		3.4	
						19		Gravel		7.60		0.27		0.2		0.05		0.34										0.018		2.9	
TBM			1.615	100.030		20		Gravel		7.80		0.25		0.2		0.05		0.46										0.023		3.7	
TBM	1.577	101.607		100.030		21		Gravel		8.00		0.21		0.2		0.04		0.27										0.011		1.8	
BM 59			1.605	100.002	Upside down	22		bedrock		8.20		0.16		0.2		0.03		0.1										0.003		0.5	
BM 58			1.028	100.579		23		moss		8.40		0.10		0.2		0.03		0										0.000		0.0	
BM 57			1.021	102.628		24		LB		8.83		0.00		0.4		0.00		0										0.000		0.0	
WL			2.739	98.868																											
BM#	Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes																										
BM 59	100	100.001		0.001																											
BM 58	100.593	100.580		-0.013																											
BM 57	102.608	102.627		0.019		Total Q																				0.626		100.0			
Summary						General Notes																									
Staff Gauge Reading (m)				0.412																											
Stage from WL Survey (m)				98.870																											
Pressure Transducer Reading (m)				0.809																											
Pressure Transducer Elevation (m)				98.061																											
Discharge (m³/s)				0.6																											
Cross Sectional Area				1.487																											
Average Velocity				0.421																											

Appendix B-1. Stage Measurement at Station Doris TL-2 - September 19, 2014

Site Information						Discharge Measurement - Mid-Section Method											
Project Name		Hope Bay				Measurement Time		Start	17:01	End	17:47	Location	Approx 200 m downstream of telemetry station				
Station Identification		TL-2				Method		Velocity-area (Mid-section)			Instrument Model		Marsh McBirney Flo-Mate 2000				
Stream Name		Doris Creek				Flow Meter Type		Electromagnetic current meter			Instrument Serial #		6592				
Date Monitored		Sept 19 2014				Real Time Reading (m)		Start	Reading		Time		Staff Gauge (m)		0.405	0.404	
Time at Site (24 hr)		Start Time:	3:38:00 PM	End Time:	5:00:00 PM		End	Reading		Time		Time of SG Reading		15:38	16:30		
Personnel		H. Buehler,C. Bolt					Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q		
Station Coordinates		Easting	Northing	Elevation		No.	Notes	(m)	(m)	(m)	(m²)	60%	20%	80%	(m³/s)	%	
		434059	7559504	10 m		1	RB. Veg	4.18	0.00	0.0	0.03	0			0.000	0.0	
Weather Conditions		overcast windy 0 d C				2	veg	4.40	0.31	0.2	0.06	0.42			0.024	4.0	
Transducer Information						3	gravel	4.55	0.34	0.1	0.06	0.44			0.026	4.3	
PT Model		PS9800	Serial #	2104003		4	gravel	4.75	0.35	0.2	0.08	0.45			0.035	5.9	
Gain		Low: 4mA = 0.0m H20	Offset	High: 20mA = 3.515 m H20		5	gravel	5.00	0.37	0.3	0.09	0.45			0.042	6.9	
Status		Active	Battery	100%		6	gravel	5.25	0.38	0.3	0.10	0.47			0.045	7.4	
# of Records		None	Memory Free	wrap		7	gravel	5.50	0.41	0.3	0.10	0.49			0.050	8.3	
Date Serviced		Unknown	Crest Gauges	None		8	gravel	5.75	0.42	0.3	0.11	0.48			0.050	8.4	
Hydrometric Leveling Survey						9	gravel	6.00	0.42	0.3	0.11	0.45			0.047	7.8	
Stn	BS	HI	FS	Elevation	Notes	10	gravel	6.25	0.39	0.3	0.10	0.48			0.047	7.8	
BM 59	1.739	101.739		100.000	Started at 16:40	11	gravel	6.50	0.41	0.3	0.10	0.45			0.046	7.6	
BM 58			1.159	100.580	Upside down	12	on rock	6.75	0.37	0.3	0.09	0.49			0.045	7.5	
BM 57			0.884	102.623		13	gravel	7.00	0.30	0.3	0.08	0.46			0.035	5.7	
WL			2.867	98.872		14	gravel	7.25	0.35	0.3	0.09	0.31			0.027	4.5	
						15	on rock	7.50	0.28	0.3	0.07	0.38			0.027	4.4	
						16	on rock	7.75	0.27	0.3	0.05	0.39			0.018	3.1	
						17	on rock	7.85	0.27	0.1	0.03	0.39			0.013	2.2	
						18	gravel	8.00	0.23	0.2	0.03	0.46			0.016	2.6	
						19	bedrock	8.15	0.21	0.2	0.04	0.21			0.009	1.5	
TBM			1.904	99.835		20	behind rock	8.40	0.15	0.3	0.03	0.02			0.001	0.1	
TBM	1.785	101.620		99.835		21	behind rock	8.60	0.08	0.2	0.02	0			0.000	0.0	
BM 59			1.621	99.999	Upside down	22	LB	8.96	0.00	0.4	0.00	0			0.000	0.0	
BM 58			1.041	100.579													
BM 57			1.003	102.623													
WL			2.748	98.872													
BM#	Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes												
BM 59	100	100.000		0.000													
BM 58	100.593	100.580		-0.014													
BM 57	102.608	102.623		0.015		Total Q										0.603	100.0
Summary						General Notes											
Staff Gauge Reading (m)				0.405													
Stage from WL Survey (m)				98.872													
Pressure Transducer Reading (m)				0.805													
Pressure Transducer Elevation (m)				98.067													
Discharge (m³/s)				0.6													
Cross Sectional Area				1.468													
Average Velocity				0.411													

Appendix B-1. Stage Measurement at Station Doris TL-2 - September 20, 2014

Site Information						Discharge Measurement - Mid-Section Method																											
Project Name		Hope Bay				Measurement Time		Start		15:19		End		15:53		Location		Approx 200 m downstream of telemetry station															
Station Identification		TL-2				Method		Velocity-area (Mid-section)				Instrument Model		Marsh McBirney Flo-Mate 2000																			
Stream Name		Doris Creek				Flow Meter Type		Electromagnetic current meter				Instrument Serial #		6592																			
Date Monitored		Sept 20 2014				Real Time Reading (m)		Start		Reading				Time				Staff Gauge (m)		0.40													
Time at Site (24 hr)		Start Time:		2:57:00 PM				End Time:		4:30:00 PM		End		Reading				Time				Time of SG Reading		14:57									
Personnel		H. Buehler,C. Bolt						Station		Depth		Distance		Area		Velocity (m/s)				Q		% of Total Q											
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m²)		60%		20%		80%		(m³/s)		%			
		434059		7539504		10 m				1		RB veg		4.67		0.00		0.0		0.01		0						0.000		0.0			
Weather Conditions		sunny windy 0 d C				2		veg		4.75		0.22		0.1		0.04		0.24						0.009		1.4							
Transducer Information						3		gravel		5.00		0.35		0.3		0.09		0.47						0.041		6.6							
PT Model		PS9800		Serial #		2104003		4		gravel		5.25		0.36		0.3		0.09		0.48						0.043		6.9					
Gain		Low: 4mA = 0.0m H2O		Offset		High: 20mA = 3.515 m H20		5		gravel		5.50		0.37		0.3		0.09		0.51						0.047		7.5					
Status		Active		Battery		100%		6		gravel		5.75		0.38		0.3		0.10		0.51						0.048		7.7					
# of Records		None		Memory Free		wrap		7		gravel		6.00		0.40		0.3		0.09		0.52						0.047		7.5					
Date Serviced		Unknown		Crest Gauges		None		8		gravel		6.20		0.42		0.2		0.08		0.53						0.045		7.1					
Hydrometric Leveling Survey						9		gravel		6.40		0.41		0.2		0.08		0.5						0.041		6.6							
Stn		BS		HI		FS		Elevation		Notes		10		gravel		6.60		0.42		0.2		0.08		0.5						0.042		6.7	
BM 59		1.571		101.571				100.000		Started at 16:06		11		gravel		6.80		0.41		0.2		0.08		0.48						0.039		6.3	
BM 58						0.992		100.579		Upside down		12		gravel		7.00		0.38		0.2		0.08		0.48						0.036		5.8	
BM 57						1.053		102.624				13		gravel		7.20		0.35		0.2		0.07		0.47						0.033		5.3	
WL						2.709		98.862				14		gravel		7.40		0.36		0.2		0.07		0.46						0.033		5.3	
												15		gravel		7.60		0.36		0.2		0.07		0.35						0.025		4.0	
												16		gravel		7.80		0.35		0.2		0.07		0.29						0.020		3.2	
												17		gravel		8.00		0.30		0.2		0.06		0.33						0.020		3.2	
												18		gravel		8.20		0.26		0.2		0.05		0.37						0.019		3.1	
												19		gravel		8.40		0.24		0.2		0.05		0.41						0.020		3.1	
TBM						1.736		99.835				20		gravel		8.60		0.21		0.2		0.04		0.31						0.013		2.1	
TBM		1.710		101.545				99.835				21		behind rock		8.80		0.16		0.2		0.03		0.1						0.003		0.5	
BM 59						1.547		99.998		Upside down		22		behind rock		9.00		0.14		0.2		0.05		0						0.000		0.0	
BM 58						0.978		100.567				23		LB		9.45		0.00		0.4		0.00		0						0.000		0.0	
BM 57						1.079		102.624																									
WL						2.685		98.860																									
BM#		Elevation (m)		Mean Elevation (this date) (m)		Difference (m)		Notes																									
BM 59		100		99.999		-0.001																											
BM 58		100.593		100.573		-0.020																											
BM 57		102.608		102.624		0.016				Total Q																		0.625		100.0			
Summary						General Notes																											
Staff Gauge Reading (m)				0.402																													
Stage from WL Survey (m)				98.861																													
Pressure Transducer Reading (m)				0.801																													
Pressure Transducer Elevation (m)				98.060																													
Discharge (m³/s)				0.6																													
Cross Sectional Area				1.472																													
Average Velocity				0.425																													

Appendix B-1. Stage Measurement at Station Doris TL-2 - September 22, 2014

Site Information						Discharge Measurement - Mid-Section Method																									
Project Name		Hope Bay				Measurement Time		Start		11:00		End		11:39		Location		Approx 200 m downstream of telemetry station													
Station Identification		TL-2				Method		Velocity-area (Mid-section)					Instrument Model					Marsh McBirney Flo-Mate 2000													
Stream Name		Doris Creek				Flow Meter Type		Electromagnetic current meter					Instrument Serial #					6592													
Date Monitored		Sept 22 2014				Real Time Reading (m)		Start		Reading				Time				Staff Gauge (m)		0.40											
Time at Site (24 hr)		Start Time:		10:57:00 AM				End Time:		4:30:00 PM		End		Reading				Time													
Personnel		H. Buehler,C. Bolt						Station		Depth		Distance		Area		Velocity (m/s)			Q		% of Total Q										
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m ²)		60%		20%		80%		(m ³ /s)		%	
		434028		7559657		10 m				1		LB ice veg		8.94		0.00		0.0		0.03		0						0.000		0.0	
Weather Conditions		overcast windy from SE -5 d C				2		behind rock		8.50		0.12		0.4		0.04		-0.02								-0.001		-0.1			
Transducer Information						3		behind rock		8.30		0.16		0.2		0.03		-0.01								0.000		-0.1			
PT Model		PS9800		Serial #		2104003		4		behind rock		8.10		0.22		0.2		0.04		0.3						0.013		2.2			
Gain		Low: 4mA = 0.0m H2O		Offset		High: 20mA = 3.515 m H20		5		gravel		7.90		0.21		0.2		0.04		0.48						0.020		3.4			
Status		Active		Battery		100%		6		gravel		7.70		0.21		0.2		0.05		0.45						0.024		4.0			
# of Records		None		Memory Free		wrap		7		between rock		7.40		0.33		0.3		0.08		0.37						0.031		5.1			
Date Serviced		Unknown		Crest Gauges		None		8		on rock		7.20		0.21		0.2		0.04		0.49						0.021		3.5			
Hydrometric Leveling Survey						9		on rock		7.00		0.25		0.2		0.05		0.51								0.026		4.3			
Stn	BS	HI	FS	Elevation	Notes	10		gravel		6.80		0.37		0.2		0.07		0.48								0.036		6.0			
BM 59	1.580	101.580		100.000	Started at 11:45	11		gravel		6.60		0.36		0.2		0.07		0.45								0.032		5.4			
BM 58			1.000	100.580		12		gravel		6.40		0.38		0.2		0.08		0.45								0.034		5.7			
BM 57			1.044	102.624	Upside down	13		gravel		6.20		0.42		0.2		0.08		0.45								0.038		6.4			
WL			2.713	98.867		14		gravel		6.00		0.42		0.2		0.08		0.42								0.035		5.9			
						15		gravel		5.80		0.43		0.2		0.09		0.45								0.039		6.5			
						16		gravel		5.60		0.42		0.2		0.08		0.46								0.039		6.5			
						17		gravel		5.40		0.41		0.2		0.08		0.46								0.038		6.3			
						18		gravel		5.20		0.40		0.2		0.08		0.45								0.036		6.1			
						19		gravel		5.00		0.38		0.2		0.08		0.44								0.033		5.6			
TBM			1.745	99.835		20		gravel		4.80		0.38		0.2		0.08		0.43								0.033		5.5			
TBM	1.639	101.474		99.835		21		gravel		4.60		0.36		0.2		0.07		0.42								0.030		5.1			
BM 59			1.472	100.002		22		gravel		4.40		0.36		0.2		0.05		0.39								0.021		3.5			
BM 58			0.893	100.581		23		gravel		4.30		0.35		0.1		0.05		0.37								0.019		3.2			
BM 57			1.149	102.623	Upside down	24		RB ice veg		4.11		0.00		0.2		0.00		0								0.000		0.0			
WL			2.603	98.871																											

Appendix B-2. Stage and Discharge Measurement at Station Doris-TL3 - June 19, 2014

Site Information						Discharge Measurement - Mid-Section Method											
Project Name		Hope Bay				Measurement Time		Start	10:15	End	10:45	Location	Aprox 70 m upstream from PT at meander bend				
Station Identification		TL-3				Method		Velocity-area (Mid-section)			Instrument Model						
Stream Name		Doris Creek				Flow Meter Type		Swoffer (C1 Prop)			Instrument Serial #		1279				
Date Monitored		June 19 2014				Real Time Reading (m)		Start	Reading		Time	10:15	Staff Gauge (m)				
Time at Site (24 hr)		Start Time:	10:15:00 AM	End Time:	11:45:00 AM			End	Reading		Time	10:45	Time of SG Reading				
Personnel		H. Buehler, M. Soloducha						Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q	
Station Coordinates		Easting	Northing	Elevation		No.	Notes	(m)	(m)	(m)	(m²)	Cal. 60%	20%	80%	(m³/s)	%	
		434204	7559985			1	Right bank	14.20	0.00	0.0	0.02	0			0.000	0.0	
Weather Conditions		Clear skies, windy				2		veg	14.00	0.21	0.2	0.07	0.4			0.020	0.7
Transducer Information						3		veg	13.50	0.30	0.5	0.15	0.5			0.052	1.8
DL Model		PT2X	PT Serial #		21220022	4		on rock	13.00	0.46	0.5	0.23	0.59			0.094	3.3
Gain		0.999285	Offset		-0.31	5		bankfull right	12.50	0.73	0.5	0.37	0.71			0.180	6.2
Status		Active	Battery		3	6			12.00	1.21	0.5	0.61	0.8	0.86	0.74	0.336	11.6
# of Records		1	Memory Free		524138	7			11.50	1.05	0.5	0.53	0.8	0.95	0.65	0.292	10.1
Date Served			Crest Gauges			8			11.00	1.11	0.5	0.56	0.835	1.01	0.66	0.322	11.1
Hydrometric Leveling Survey						9			10.50	1.12	0.5	0.56	0.875	0.98	0.77	0.341	11.8
Stn	BS	HI	FS	Elevation	Notes	10			10.00	1.13	0.5	0.57	0.775	0.93	0.62	0.304	10.5
BM 87	0.896	100.896		100.000	Started at 11:00	11			9.50	1.13	0.5	0.57	0.665	0.69	0.64	0.261	9.0
BM 88			0.947	99.949		12			9.00	1.22	0.5	0.61	0.505	0.53	0.48	0.214	7.4
BM 89			0.647	100.249		13		bankfull left	8.50	1.21	0.5	0.61	0.49	0.57	0.41	0.206	7.1
WL			3.108	97.788		14		grass/veg	8.00	0.66	0.5	0.33	0.39			0.089	3.1
PT			3.949	96.947		15		grass/veg	7.50	0.57	0.5	0.29	0.2			0.040	1.4
						16		grass/veg	7.00	0.46	0.5	0.23	0.21			0.034	1.2
						17		grass/veg	6.50	0.42	0.5	0.21	0.24			0.035	1.2
						18		grass/veg	6.00	0.43	0.5	0.22	0.15			0.022	0.8
						19		grass/veg	5.50	0.43	0.5	0.22	0.16			0.024	0.8
TBM			1.784	99.112		20		grass/veg	5.00	0.43	0.5	0.22	0.13			0.019	0.7
TBM	1.726	100.838		99.112		21		grass/veg	4.50	0.33	0.5	0.13	0.05			0.005	0.2
BM 87			0.836	100.002		22		left bank	4.20	0.00	0.3	0.00	0			0.000	0.0
BM 88			0.889	99.949													
BM 89			0.586	100.252													
WL			3.040	97.798	Incorrect value												
PT			3.853	96.985													
BM 87	0.251	100.251		100.000	Rechecking data												
WL			2.462	97.789	Rechecking data												
					Finished at 11:45												
BM#	Established Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes												
BM 87	100	100.001		0.001													
BM 88	99.945	99.949		0.004													
BM 89	100.277	100.251		-0.027		Total Q										2.892	100.0
Summary						General Notes											
Staff Gauge Reading (m)		0.000				Reconducted last survey measurement to ensure accuracy. Installed PT at 10:00 AM. Staff gauge damaged by ice over winter.											
Stage from WL Survey (m)		97.789															
Pressure Transducer Reading (m)		0.901															
Pressure Transducer Elevation (m)		96.888															
Discharge (m³/s)		2.9															
Cross Sectional Area		7.262															
Average Velocity		0.398															

Appendix B-2. Stage and Discharge Measurement at Station Doris-TL3 - July 24, 2014

Site Information						Discharge Measurement - Mid-Section Method																									
Project Name		Hope Bay				Measurement Time		Start		14:40		End		15:15		Location		Aprox 70 m upstream from PT at meander bend													
Station Identification		Doris TL-3				Method		Velocity-area (Mid-section)				Instrument Model		Marsh McBirney Flo-Mate 2000																	
Stream Name		Doris Creek				Flow Meter Type		Electromagnetic current meter				Instrument Serial #		6592																	
Date Monitored		24-Jul-14				Real Time Reading (m)		Start		Reading		0.5764		Time		14:10		Staff Gauge (m)													
Time at Site (24 hr)		Start Time:		2:00:00 PM				End Time:		4:30:00 PM		End		Reading		0.5725		Time		15:25		Time of SG Reading									
Personnel		H. Buehler, L. Wingnek						Station		Depth		Distance		Area		Velocity (m/s)				Q		% of Total Q									
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m ²)		60%		20%		80%		(m ³ /s)		%	
		434204		7559985						1		RB		9.20		0.00		0.0		0.01		0						0.000		0.0	
Weather Conditions		smokey, light breeze				2		veg		8.90		0.06		0.3		0.02		-0.01										0.000		0.0	
Transducer Information						3		veg		8.60		0.06		0.3		0.02		-0.01										0.000		0.0	
DL Model		PT2X		PT Serial #		21220022		4		veg		8.10		0.09		0.5		0.04		-0.01								0.000		0.0	
Gain		0.999285		Offset		-0.31		5		veg		7.75		0.23		0.4		0.07		0.03								0.002		0.2	
Status		Active		Battery		3		6		RB bankfull, veg		7.50		0.45		0.3		0.10		0.07								0.007		0.6	
# of Records		5065		Memory Free		519074		7				7.30		0.93		0.2		0.19		0.04								0.007		0.6	
Date Serviced				Crest Gauges				8				7.10		0.97		0.2		0.24		0.06								0.015		1.2	
Hydrometric Leveling Survey						9				6.80		0.98		0.3		0.29		0.17										0.050		4.1	
Stn		BS		HI		FS		Elevation		Notes		10				6.50		0.98		0.3		0.25		0.23				0.056		4.6	
BM 87		0.583		100.583				100.000		Started at 15:31		11				6.30		1.00		0.2		0.25		0.3				0.075		6.1	
BM 88						0.634		99.949				12				6.00		0.98		0.3		0.29		0.32				0.094		7.6	
BM 89						0.332		100.251				13				5.70		1.00		0.3		0.30		0.35				0.105		8.5	
WL						3.107		97.476				14				5.40		1.00		0.3		0.30		0.36				0.108		8.8	
PT						3.592		96.991				15				5.10		0.99		0.3		0.30		0.33				0.098		8.0	
												16				4.80		0.98		0.3		0.29		0.35				0.103		8.4	
												17				4.50		0.96		0.3		0.29		0.36				0.104		8.4	
												18				4.20		0.94		0.3		0.28		0.36				0.102		8.2	
												19				3.90		0.93		0.3		0.28		0.36				0.100		8.2	
TBM						2.528		98.055				20				3.60		0.90		0.3		0.27		0.34				0.092		7.5	
TBM		2.180		100.235				98.055				21				3.30		0.88		0.3		0.26		0.28				0.074		6.0	
BM 87						0.233		100.002				22				3.00		0.86		0.3		0.26		0.16				0.041		3.4	
BM 88						0.287		99.948				23		LB bankfull, veg		2.70		0.43		0.3		0.17		-0.01				-0.002		-0.1	
BM 89								100.235				24		LB		2.20		0.00		0.5		0.00		0				0.000		0.0	
BM#		Established Elevation (m)		Mean Elevation (this date) (m)		Difference (m)		Notes																							
BM 87		100		100.001		0.001																									
BM 88		99.945		99.949		0.004																									
BM 89		100.277		100.243		-0.034				Total Q																		1.231		100.0	
Summary						General Notes																									
Staff Gauge Reading (m)				0.000		Overbank flow on both sides of channel. Very little flow in these areas, appeared to be stagnant on right bank. Other locations dangerously fast or had even greater percentage of water as overbank flow																									
Stage from WL Survey (m)				97.477																											
Pressure Transducer Reading (m)				0.573																											
Pressure Transducer Elevation (m)				96.904																											
Discharge (m³/s)				1.2																											
Cross Sectional Area				4.775																											
Average Velocity				0.258																											

Appendix B-2. Stage and Discharge Measurement at Station Doris-TL3 - July 25, 2014

Site Information						Discharge Measurement - Mid-Section Method																											
Project Name		Hope Bay				Measurement Time		Start		16:55		End		17:35		Location		Aprox 70 m upstream from PT at meander bend															
Station Identification		Doris TL-3				Method		Velocity-area (Mid-section)				Instrument Model		Marsh McBirney Flo-Mate 2000																			
Stream Name		Doris Creek				Flow Meter Type		Electromagnetic current meter				Instrument Serial #		6592																			
Date Monitored		25-Jul-14				Real Time Reading (m)		Start		Reading		0.5703		Time		16:42		Staff Gauge (m)															
Time at Site (24 hr)		Start Time:		4:15:00 PM				End Time:		5:45:00 PM		End		Reading		0.5695		Time		17:39		Time of SG Reading											
Personnel		H. Buehler, L. Wingnek						Station		Depth		Distance		Area		Velocity (m/s)				Q		% of Total Q											
Station Coordinates		Easting		Northing		Elevation				1		Notes		RB		1.97		0.00		0.0		0.02		60%		20%		80%		0.000		0.0	
		434204		7559985						2		veg		2.40		0.07		0.4		0.03		-0.01						0.000		0.0			
Weather Conditions		overcast, smokey, 12d C				3		veg		2.80		0.12		0.4		0.04		-0.01										0.000		0.0			
DL Model		PT2X		PT Serial #		21220022		4		veg, Right bankfull		3.00		0.23		0.2		0.07		0.01								0.001		0.1			
Gain		0.999285		Offset		-0.31		5		behind submerged veg bar		3.40		0.91		0.4		0.27		0.05								0.014		1.1			
Status		Active		Battery		3		6		behind submerged veg bar		3.60		0.92		0.2		0.18		0.09								0.017		1.3			
# of Records		5222		Memory Free		518917		7		behind submerged veg bar		3.80		0.97		0.2		0.19		0.5								0.097		7.9			
Date Serviced				Crest Gauges				8				4.00		0.98		0.2		0.20		0.12								0.024		1.9			
Hydrometric Leveling Survey						9				4.20		0.98		0.2		0.20		0.2										0.039		3.2			
Stn		BS		HI		FS		Elevation		Notes		10				4.40		1.02		0.2		0.20		0.23				0.047		3.8			
BM 87		0.701		100.701				100.000		Started at 14:16		11				4.60		1.04		0.2		0.21		0.29				0.060		4.9			
BM 88						0.754		99.947				12				4.80		1.02		0.2		0.20		0.3				0.061		5.0			
BM 89						0.454		100.247				13				5.00		1.01		0.2		0.20		0.33				0.067		5.4			
WL						3.237		97.464		WL at 0.5709		14				5.20		1.00		0.2		0.20		0.32				0.064		5.2			
												15				5.40		0.98		0.2		0.20		0.31				0.061		4.9			
												16				5.60		0.98		0.2		0.20		0.32				0.063		5.1			
												17				5.80		0.98		0.2		0.20		0.33				0.065		5.3			
												18				6.00		0.97		0.2		0.19		0.31				0.060		4.9			
												19				6.20		0.96		0.2		0.19		0.32				0.061		5.0			
TBM						2.646		98.055				20				6.40		0.95		0.2		0.19		0.28				0.053		4.3			
TBM		2.801		100.856				98.055				21				6.60		0.93		0.2		0.19		0.32				0.060		4.8			
BM 87						0.857		99.999				22				6.80		0.92		0.2		0.23		0.28				0.064		5.2			
BM 88						0.910		99.946				23				7.10		0.92		0.3		0.28		0.31				0.086		7.0			
BM 89						0.610		100.246				24				7.40		0.90		0.3		0.27		0.29				0.078		6.4			
WL						3.389		97.467				25				7.70		0.87		0.3		0.22		0.26				0.057		4.6			
												26				7.90		0.86		0.2		0.22		0.15				0.032		2.6			
												27		veg, left bankfull		8.20		0.34		0.3		0.09		0.01				0.001		0.1			
												28		veg		8.40		0.18		0.2		0.05		0.01				0.000		0.0			
												29		LB		8.71		0.00		0.3		0.00		0				0.000		0.0			
BM#		Established Elevation (m)		Mean Elevation (this date) (m)		Difference (m)		Notes																									
BM 87		100		100.000		-0.001																											
BM 88		99.945		99.947		0.001																											
BM 89		100.277		100.247		-0.031				Total Q														1.230		100.0							
Summary						General Notes																											
Staff Gauge Reading (m)		0.000																															
Stage from WL Survey (m)		97.466																															
Pressure Transducer Reading (m)		0.570																															
Pressure Transducer Elevation (m)		96.895																															
Discharge (m³/s)		1.2																															
Cross Sectional Area		4.900																															
Average Velocity		0.251																															

Appendix B-2. Stage and Discharge Measurement at Station Doris-TL3 - July 27, 2014

Site Information						Discharge Measurement - Mid-Section Method											
Project Name		Hope Bay				Measurement Time		Start	14:00	End	14:40	Location	Aprox 70 m upstream from PT at meander bend				
Station Identification		Doris TL-3				Method		Velocity-area (Mid-section)			Instrument Model		Marsh McBirney Flo-Mate 2000				
Stream Name		Doris Creek				Flow Meter Type		Electromagnetic current meter			Instrument Serial #		6592				
Date Monitored		27-Jul-14				Real Time Reading (m)		Start	Reading	0.559	Time	13:55	Staff Gauge (m)				
Time at Site (24 hr)		Start Time:	1:21:00 PM	End Time:	3:20:00 PM			End	Reading	0.5581	Time	14:47	Time of SG Reading				
Personnel		H. Buehler, L. Wingnek						Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q	
Station Coordinates		Easting	Northing	Elevation		No.	Notes	(m)	(m)	(m)	(m ²)	60%	20%	80%	(m ³ /s)	%	
Weather Conditions		overcast 10d C				2	veg	2.20	0.04	0.3	0.01	-0.01			0.000	0.0	
Transducer Information						3	veg	2.50	0.03	0.3	0.01	-0.01			0.000	0.0	
DL Model		PT2X	PT Serial #		21220022	4	veg	2.80	0.08	0.3	0.02	-0.01			0.000	0.0	
Gain		0.999285	Offset		-0.31	5	veg, RB bankfull	3.10	0.15	0.3	0.05	0.01			0.000	0.0	
Status		Active	Battery		3	6	changed batteries	3.40	0.46	0.3	0.12	0.01			0.001	0.1	
# of Records		5493	Memory Free		518646	7		3.60	0.84	0.2	0.21	0.06			0.013	1.2	
Date Serviced			Crest Gauges			8		3.90	0.90	0.3	0.27	0.04			0.011	1.1	
Hydrometric Leveling Survey						9		4.20	1.00	0.3	0.30	0.17			0.051	5.0	
Stn	BS	HI	FS	Elevation	Notes	10		4.50	1.03	0.3	0.31	0.22			0.068	6.7	
BM 87	0.302	100.302		100.000	Started at 13:27	11		4.80	1.01	0.3	0.30	0.22			0.067	6.5	
BM 88			0.355	99.947		12		5.10	1.00	0.3	0.30	0.26			0.078	7.6	
BM 89			0.057	100.245		13		5.40	0.98	0.3	0.29	0.3			0.088	8.6	
WL			2.849	97.453	WL 0.5590	14		5.70	0.96	0.3	0.29	0.3			0.086	8.5	
						15		6.00	0.95	0.3	0.29	0.3			0.085	8.4	
						16		6.30	0.93	0.3	0.28	0.28			0.078	7.6	
						17		6.60	0.92	0.3	0.28	0.28			0.077	7.6	
						18		6.90	0.91	0.3	0.27	0.28			0.076	7.5	
						19		7.20	0.88	0.3	0.26	0.3			0.079	7.8	
TBM			2.247	98.055		20		7.50	0.86	0.3	0.26	0.29			0.075	7.3	
TBM	2.512	100.567		98.055		21		7.80	0.85	0.3	0.21	0.28			0.060	5.8	
BM 87			0.567	100.000		22		8.00	0.83	0.2	0.12	0.16			0.020	2.0	
BM 88			0.621	99.946		23		8.10	0.80	0.1	0.12	0.07			0.008	0.8	
BM 89			0.322	100.245		24	veg, LB bankfull	8.30	0.23	0.2	0.07	-0.01			-0.001	-0.1	
WL			3.116	97.451		25	veg	8.70	0.10	0.4	0.04	-0.01			0.000	0.0	
						26	LB	9.04	0.00	0.3	0.00	0			0.000	0.0	
BM#	Established Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes												
BM 87	100	100.000		0.000													
BM 88	99.945	99.947		0.002													
BM 89	100.277	100.245		-0.032		Total Q										1.021	100.0
Summary						General Notes											
Staff Gauge Reading (m)		0.000															
Stage from WL Survey (m)		97.452															
Pressure Transducer Reading (m)		0.560															
Pressure Transducer Elevation (m)		96.892															
Discharge (m³/s)		1.0															
Cross Sectional Area		4.684															
Average Velocity		0.218															

Appendix B-2. Stage and Discharge Measurement at Station Doris-TL3 - July 28, 2014

Site Information						Discharge Measurement - Mid-Section Method																									
Project Name		Hope Bay				Measurement Time		Start		14:15		End		14:40		Location		Aprox 70 m upstream from PT at meander bend													
Station Identification		Doris TL-3				Method		Velocity-area (Mid-section)				Instrument Model		Marsh McBirney Flo-Mate 2000																	
Stream Name		Doris Creek				Flow Meter Type		Electromagnetic current meter				Instrument Serial #		6592																	
Date Monitored		28-Jul-14				Real Time Reading (m)		Start		Reading		0.5576		Time		14:03		Staff Gauge (m)													
Time at Site (24 hr)		Start Time:		1:35:00 PM				End Time:		3:00:00 PM		End		Reading		0.5561		Time		14:44		Time of SG Reading									
Personnel		H. Buehler, L. Wingnek						Station		Depth		Distance		Area		Velocity (m/s)				Q		% of Total Q									
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m ²)		60%		20%		80%		(m ³ /s)		%	
Weather Conditions		overcast, high fog, 14 d C				1		RB		2.13		0.00		0.0		0.02		0								0.000		0.0			
						2		veg		2.70		0.06		0.6		0.03		-0.01								0.000		0.0			
						3		veg		3.10		0.14		0.4		0.04		-0.01								0.000		0.0			
DL Model		PT2X		PT Serial #		21220022		4		veg, RB bankfull		3.30		0.19		0.2		0.05		0.01						0.001		0.0			
Gain		0.999385		Offset		-0.031		5		behind veg		3.65		0.87		0.4		0.22		0.04						0.009		0.8			
Status		Active		Battery		3		6		behind veg		3.80		0.86		0.2		0.15		0.06						0.009		0.8			
# of Records		5638		Memory Free		518501		7		behind veg		4.00		0.91		0.2		0.23		0.04						0.009		0.8			
Date Serviced				Crest Gauges				8				4.30		1.00		0.3		0.30		0.13						0.039		3.6			
Hydrometric Leveling Survey						9				4.60		1.02		0.3		0.31		0.2								0.061		5.6			
Stn	BS	HI	FS	Elevation	Notes	10				4.90		1.00		0.3		0.30		0.25								0.075		6.9			
BM 87	0.535	100.535		100.000	Started at 13:36	11				5.20		0.99		0.3		0.30		0.29								0.086		7.9			
BM 88			0.592	99.943		12				5.50		0.98		0.3		0.29		0.32								0.094		8.6			
BM 89			0.283	100.252		13				5.80		0.96		0.3		0.29		0.31								0.089		8.2			
WL			3.070	97.465	WL at 0.5576	14				6.10		0.94		0.3		0.28		0.31								0.087		8.0			
						15				6.40		0.92		0.3		0.28		0.31								0.086		7.8			
						16				6.70		0.91		0.3		0.27		0.36								0.098		9.0			
						17				7.00		0.90		0.3		0.27		0.33								0.089		8.2			
						18				7.30		0.87		0.3		0.26		0.35								0.091		8.4			
						19				7.60		0.86		0.3		0.26		0.34								0.088		8.0			
TBM			2.487	98.048		20				7.90		0.84		0.3		0.25		0.29								0.073		6.7			
TBM	2.588	100.636		98.048		21		veg		8.20		0.77		0.3		0.23		0.04								0.009		0.8			
BM 87			0.632	100.004		22		veg		8.50		0.18		0.3		0.06		-0.01								-0.001		-0.1			
BM 88			0.689	99.947		23		veg		8.90		0.09		0.4		0.03		-0.01								0.000		0.0			
BM 89			0.381	100.255		24		LB		9.16		0.00		0.3		0.00		0								0.000		0.0			
WL			3.168	97.468																											
BM#	Established Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes																										
BM 87	100	100.002		0.002																											
BM 88	99.945	99.945		0.000																											
BM 89	100.277	100.254		-0.023		Total Q																	1.092		100.0						
Summary						General Notes																									
Staff Gauge Reading (m)		0.000																													
Stage from WL Survey (m)		97.467																													
Pressure Transducer Reading (m)		0.556																													
Pressure Transducer Elevation (m)		96.910																													
Discharge (m³/s)		1.1																													
Cross Sectional Area		4.717																													
Average Velocity		0.232																													

Appendix B-2. Stage and Discharge Measurement at Station Doris-TL3 - August 19, 2014

Site Information						Discharge Measurement - Mid-Section Method											
Project Name		Hope Bay				Measurement Time		Start	8:25	End	9:50	Location	Aprox 70 m upstream from PT at meander bend				
Station Identification		Doris TL-3				Method		Velocity-area (Mid-section)			Instrument Model		Marsh McBirney Flo-Mate 2000				
Stream Name		Doris Creek				Flow Meter Type		Electromagnetic current meter			Instrument Serial #		6592				
Date Monitored		19-Aug-14				Real Time Reading (m)		Start	Reading	0.423633333	Time	10:35	Staff Gauge (m)				
Time at Site (24 hr)		Start Time:	8:15:00 AM	End Time:	5:00:00 PM			End	Reading		Time		Time of SG Reading				
Personnel		H. Buehler, P. House						Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q	
Station Coordinates		Easting	Northing	Elevation		No.	Notes	(m)	(m)	(m)	(m ²)	60%	20%	80%	(m ³ /s)	%	
		434204	7559905			1	RB	4.39	0.00	0.0	0.01	0			0.000	0.0	
Weather Conditions		Overcast, light breeze				2	sedge	4.50	0.10	0.1	0.02	0			0.000	0.0	
Transducer Information						3	behind sedge bar	4.75	0.80	0.3	0.20	0	0	0.01	0.000	0.0	
DL Model		PT2X	PT Serial #		21220022	4	behind sedge bar	5.00	0.78	0.3	0.20	0.01	0	0.01	0.002	0.3	
Gain		0.999385	Offset		-0.031	5	behind sedge bar	5.25	0.82	0.3	0.21	0.02	0.65	0.05	0.072	10.6	
Status		Active	Battery		2.9	6	behind sedge bar	5.50	0.81	0.3	0.20	0.11	0.11	0.09	0.020	3.0	
# of Records		8793	Memory Free		515346	7	open sand bed/boulder	5.75	0.86	0.3	0.22	0.13	0.15	0.1	0.027	4.0	
Date Serviced			Crest Gauges			8		6.00	0.88	0.3	0.22	0.17	0.18	0.16	0.037	5.5	
Hydrometric Leveling Survey						9		6.25	0.84	0.3	0.21	0.22	0.22	0.18	0.042	6.2	
Stn	BS	HI	FS	Elevation	Notes	10		6.50	0.85	0.3	0.21	0.23	0.21	0.19	0.043	6.3	
BM 87	0.993	100.993		100.000		11		6.75	0.83	0.3	0.21	0.23	0.21	0.25	0.048	7.0	
BM 88			1.050	99.943		12		7.00	0.82	0.3	0.21	0.27	0.23	0.26	0.050	7.4	
BM 89			0.757	100.236		13		7.25	0.82	0.3	0.21	0.26	0.23	0.27	0.051	7.6	
PIN1			0.442	100.551		14		7.50	0.80	0.3	0.20	0.22	0.23	0.27	0.050	7.4	
WL1			3.668	97.325		15		7.75	0.79	0.3	0.20	0.26	0.21	0.29	0.049	7.3	
WL2			3.669	97.324		16		8.00	0.77	0.3	0.19	0.27	0.22	0.26	0.046	6.8	
						17		8.25	0.76	0.3	0.19	0.27	0.23	0.2	0.041	6.0	
						18		8.50	0.76	0.3	0.19	0.26	0.21	0.18	0.037	5.5	
						19		8.75	0.74	0.3	0.19	0.24	0.2	0.11	0.029	4.2	
TBM			3.347	97.646		20		9.00	0.72	0.3	0.18	0.22	0.16	0.13	0.026	3.8	
TBM	3.438	101.084		97.646		21		9.25	0.71	0.3	0.16	0.09	0.07	0.03	0.008	1.2	
BM 87			1.083	100.001		22	veg	9.45	0.26	0.2	0.07	0			0.000	0.0	
BM 88			1.140	99.944		23	veg	9.75	0.07	0.3	0.02	0			0.000	0.0	
BM 89			0.848	100.236		24	LB	9.88	0.00	0.1	0.00	0			0.000	0.0	
PIN1			0.533	100.551													
WL1			3.760	97.324													
WL2			3.759	97.325													
BM#	Established Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes												
BM 87	100	100.001		0.001													
BM 88	99.945	99.944		-0.001													
BM 89	100.277	100.236		-0.041		Total Q										0.678	100.0
Summary						General Notes											
Staff Gauge Reading (m)		0.000															
Stage from WL Survey (m)		97.325															
Pressure Transducer Reading (m)		0.424															
Pressure Transducer Elevation (m)		96.901															
Discharge (m³/s)		0.7															
Cross Sectional Area		3.876															
Average Velocity		0.175															

Appendix B-2. Stage and Discharge Measurement at Station Doris-TL3 - September 18, 2014

Site Information						Discharge Measurement - Mid-Section Method														
Project Name		Hope Bay				Measurement Time		Start	9:24		End	10:20	Location	Aprox 70 m upstream from PT at meander bend						
Station Identification		TL-3				Method		Velocity-area (Mid-section)				Instrument Model		Marsh McBirney Flo-Mate 2000						
Stream Name		Doris Creek				Flow Meter Type		Electromagnetic current meter				Instrument Serial #		6592						
Date Monitored		Sept 18 2014				Real Time Reading (m)		Start	Reading		0.38		Time	9:03		Staff Gauge (m)				
Time at Site (24 hr)		Start Time:	9:00:00 AM		End Time:			12:00:00 PM		End	Reading			Time		Time of SG Reading				
Personnel		H. Buehler, C. Bolt						Station	Depth		Distance		Area		Velocity (m/s)			Q	% of Total Q	
Station Coordinates		Easting	Northing		Elevation		No.	Notes		(m)	(m)		(m)	(m ²)	60%	20%	80%	(m ³ /s)	%	
Weather Conditions		Snow 0 d C				2		veg		3.40	0.12		0.1	0.02	0			0.000	0.0	
Transducer Information						3		veg		3.60	0.42		0.2	0.07	0.01			0.001	0.1	
DL Model		PT2X	PT Serial #		21220022	4		Behind veg bar		3.75	0.73		0.2	0.15	0.02			0.003	0.5	
Gain		0.999385	Offset		-0.031	5		Behind veg bar		4.00	0.74		0.3	0.19	0.04			0.007	1.2	
Status		Active	Battery		2.9	6		gravel		4.25	0.76		0.3	0.19	0.09			0.017	2.7	
# of Records		13099	Memory Free		511040	7		gravel		4.50	0.79		0.3	0.20	0.17			0.034	5.2	
Date Served			Crest Gauges			8		gravel		4.75	0.78		0.3	0.20	0.21			0.041	6.4	
Hydrometric Leveling Survey						9		gravel		5.00	0.79		0.3	0.20	0.23			0.045	7.1	
Stn	BS	HI	FS	Elevation	Notes	10		gravel		5.25	0.79		0.3	0.20	0.25			0.049	7.7	
BM 87	0.728	100.728		100.000	Started at 10:51	11		gravel		5.50	0.78		0.3	0.20	0.23			0.045	7.0	
BM 88			0.785	99.943		12		gravel		5.75	0.78		0.3	0.20	0.25			0.049	7.6	
BM 89			0.492	100.236		13		gravel		6.00	0.76		0.3	0.19	0.23			0.044	6.8	
WL			3.438	97.290		14		gravel		6.25	0.76		0.3	0.19	0.25			0.048	7.4	
						15		gravel		6.50	0.74		0.3	0.19	0.24			0.044	6.9	
						16		gravel		6.75	0.73		0.3	0.18	0.26			0.047	7.4	
						17		gravel		7.00	0.72		0.3	0.18	0.24			0.043	6.7	
						18		gravel		7.25	0.71		0.3	0.18	0.22			0.039	6.1	
						19		gravel		7.50	0.69		0.3	0.17	0.2			0.035	5.4	
TBM			1.914	98.814		20		gravel		7.75	0.67		0.3	0.17	0.2			0.034	5.2	
TBM	1.765	100.579		98.814		21		gravel		8.00	0.66		0.3	0.13	0.11			0.015	2.3	
BM 87			0.579	100.000		22		gravel		8.15	0.64		0.2	0.18	0.02			0.004	0.6	
BM 88			0.637	99.942		23		LB		8.56	0.00		0.4	0.00	0			0.000	0.0	
BM 89			0.343	100.236																
WL			3.288	97.291																
BM#	Established Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes															
BM 87	100	100.000		0.000																
BM 88	99.945	99.943		-0.002																
BM 89	100.277	100.236		-0.041		Total Q													0.642	100.0
Summary						General Notes														
Staff Gauge Reading (m)		0.000																		
Stage from WL Survey (m)		97.291																		
Pressure Transducer Reading (m)		0.380																		
Pressure Transducer Elevation (m)		96.910																		
Discharge (m³/s)		0.6																		
Cross Sectional Area		3.556																		
Average Velocity		0.181																		

Appendix B-2. Stage and Discharge Measurement at Station Doris-TL3 - September 22, 2014

Site Information						Discharge Measurement - Mid-Section Method																											
Project Name		Hope Bay				Measurement Time		Start		9:00		End		9:32		Location		Aprox 70 m upstream from PT at meander bend															
Station Identification		TL-3				Method		Velocity-area (Mid-section)				Instrument Model		Marsh McBirney Flo-Mate 2000																			
Stream Name		Doris Creek				Flow Meter Type		Electromagnetic current meter				Instrument Serial #		6592																			
Date Monitored		Sept 22 2014				Real Time Reading (m)		Start		Reading				Time				Staff Gauge (m)															
Time at Site (24 hr)		Start Time:		8:46:00 AM				End Time:		10:22:00 AM		End		Reading		0.3773		Time		10:05		Time of SG Reading											
Personnel		H. Buehler, C. Bolt						Station		Depth		Distance		Area		Velocity (m/s)				Q		% of Total Q											
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m ²)		60%		20%		80%		(m ³ /s)		%			
		434160		7559962						1		RB veg ice		3.28		0.00		0.0		0.02		0						0.000		0.0			
Weather Conditions		Sunny, light breeze from SE, -10 d C				2		veg		3.50		0.19		0.2		0.04		-0.01										0.000		-0.1			
Transducer Information						3		behind veg		3.75		0.73		0.3		0.18		-0.01										-0.002		-0.3			
DL Model		PT2X		PT Serial #		21220022		4		gravel		4.00		0.73		0.3		0.18		0.02								0.004		0.7			
Gain		0.999385		Offset		-0.031		5		gravel		4.25		0.75		0.3		0.19		0.07								0.013		2.4			
Status		Active		Battery		2.9		6		gravel		4.50		0.77		0.3		0.19		0.11								0.021		3.9			
# of Records		13681		Memory Free		510458		7		gravel		4.75		0.79		0.3		0.20		0.12								0.024		4.4			
Date Served				Crest Gauges				8		gravel		5.00		0.77		0.3		0.19		0.17								0.033		6.1			
Hydrometric Leveling Survey						9		gravel		5.25		0.78		0.3		0.20		0.19										0.037		6.9			
Stn	BS	HI	FS	Elevation	Notes	10		gravel		5.50		0.78		0.3		0.20		0.2										0.039		7.3			
BM 87	0.736	100.736		100.000	Started at 9:46	11		gravel		5.75		0.77		0.3		0.19		0.21										0.040		7.5			
BM 88			0.793	99.943		12		gravel		6.00		0.76		0.3		0.19		0.21										0.040		7.4			
BM 89			0.499	100.237		13		gravel		6.25		0.76		0.3		0.15		0.22										0.033		6.2			
WL			3.458	97.278		14		gravel		6.40		0.74		0.2		0.13		0.21										0.027		5.1			
						15		gravel		6.60		0.74		0.2		0.15		0.2										0.030		5.5			
						16		gravel		6.80		0.72		0.2		0.14		0.2										0.029		5.4			
						17		gravel		7.00		0.71		0.2		0.14		0.2										0.028		5.3			
						18		gravel		7.20		0.70		0.2		0.14		0.22										0.031		5.7			
						19		gravel		7.40		0.70		0.2		0.14		0.26										0.036		6.8			
TBM			2.235	98.501		20		gravel		7.60		0.68		0.2		0.14		0.21										0.029		5.3			
TBM	2.099	100.600		98.501		21		gravel		7.80		0.67		0.2		0.13		0.22										0.029		5.5			
BM 87			0.599	100.001		22		within shrub branches		8.00		0.65		0.2		0.13		0.11										0.014		2.7			
BM 88			0.655	99.945		23		within shrub branches		8.20		0.61		0.2		0.16		0.01										0.002		0.3			
BM 89			0.361	100.239		24		LB ice veg		8.51		0.00		0.3		0.00		0										0.000		0.0			
WL			3.320	97.280																													
BM#	Established Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes																												
BM 87	100	100.001		0.001																													
BM 88	99.945	99.944		-0.001																													
BM 89	100.277	100.238		-0.039		Total Q																								0.537		100.0	
Summary						General Notes																											
Staff Gauge Reading (m)			0.000			Demobilized at 10:15 AM																											
Stage from WL Survey (m)			97.279																														
Pressure Transducer Reading (m)			0.378																														
Pressure Transducer Elevation (m)			96.902																														
Discharge (m³/s)			0.5																														
Cross Sectional Area			3.524																														
Average Velocity			0.152																														

Appendix B-3. Stage Measurement at Station Roberts Hydro - June 18, 2014

Site Information						Discharge Measurement - Mid-Section Method											
Project Name		Hope Bay				Measurement Time		Start	12:00	End	12:25	Location		5m downstream of fish fence			
Station Identification		Roberts Hydro				Method		Velocity-area (Mid-section)				Instrument Model					
Stream Name		Roberts				Flow Meter Type		Swoffer (C1 Prop)				Instrument Serial #				2179	
Date Monitored		June 18 2014				Real Time Reading (m)		Start	Reading	0.9142	Time	12:39	Staff Gauge (m)				
Time at Site (24 hr)		Start Time:	8:45:00 AM	End Time:	1:10:00 PM			End	Reading		Time		Time of SG Reading				
Personnel		H. Buehler, M. Soloducha					Station	Depth	Distance	Area	Velocity (m/s)			Calibration	Q	% of Total Q	
Station Coordinates		Easting	Northing	Elevation		No.	Notes	(m)	(m)	(m)	(m ²)	60%	20%	80%	(m ³ /s)	%	
		435425	7562815			1	RB	5.10	0.00	0.0	0.04	0			0.00	0.000	0.0
Weather Conditions		Overcast, windy 6d C				2	In grass, back eddy	5.50	0.20	0.4	0.14	0			0.00	0.000	0.0
Transducer Information						3	Back eddy	6.50	0.35	1.0	0.35	-0.01			-0.01	-0.002	0.0
DL Model		PT2X	PT Serial #		2922010	4		7.50	0.37	1.0	0.28	0			0.00	0.000	0.0
Gain		1.007895	Offset		-0.222	5		8.00	0.42	0.5	0.21	0.04			0.03	0.006	0.1
Status		Active	Battery		3.4	6		8.50	0.49	0.5	0.25	0			0.00	0.000	0.0
# of Records		1	Memory Free		130704	7		9.00	0.52	0.5	0.26	0.14			0.10	0.025	0.4
Date Serviced			Crest Gauges			8		9.50	0.57	0.5	0.29	0.27			0.19	0.054	0.9
Hydrometric Leveling Survey						9		10.00	0.68	0.5	0.31	0.21			0.15	0.045	0.8
Stn	BS	HI	FS	Elevation	Notes	10	Right bankfull	10.40	1.11	0.4	0.50	0.295	0.48	0.11	0.21	0.147	2.6
BM49	2.528	102.528		100.000		11		10.90	1.06	0.5	0.53	0.49	0.61	0.37	0.34	0.260	4.5
BM64			2.713	99.815		12		11.40	0.96	0.5	0.48	0.66	0.83	0.49	0.46	0.317	5.5
BM50			2.428	100.100		13		11.90	0.86	0.5	0.43	0.775	0.98	0.57	0.54	0.333	5.8
WL			2.962	99.566		14		12.40	0.77	0.5	0.39	0.83			0.58	0.223	3.9
						15		12.90	0.77	0.5	0.39	0.79			0.55	0.212	3.7
						16		13.40	0.74	0.5	0.37	0.88			0.61	0.227	4.0
						17		13.90	0.78	0.5	0.39	0.93			0.65	0.253	4.4
						18		14.40	0.85	0.5	0.43	0.945	1.19	0.7	0.66	0.402	7.0
						19		14.90	0.94	0.5	0.47	1.12	1.3	0.94	0.78	0.526	9.2
TBM			2.468	100.060	BM12	20		15.40	1.04	0.5	0.52	1.275	1.45	1.1	0.89	0.663	11.6
TBM	2.465	102.525		100.060		21		15.90	1.08	0.5	0.59	1.225	1.47	0.98	0.86	0.728	12.7
BM49			2.527	99.998		22	Left Bankfull	16.50	1.07	0.6	0.59	1.11	1.23	0.99	0.78	0.653	11.4
BM64			2.704	99.821		23		17.00	0.73	0.5	0.37	0.96			0.67	0.245	4.3
BM50			2.429	100.096		24		17.50	0.63	0.5	0.32	0.77			0.54	0.169	3.0
WL			2.956	99.569		25		18.00	0.54	0.5	0.27	0.49			0.34	0.092	1.6
						26		18.50	0.49	0.5	0.25	0.32			0.22	0.055	1.0
						27		19.00	0.44	0.5	0.33	0.26			0.18	0.060	1.0
						28		20.00	0.26	1.0	0.82	0.04			0.03	0.023	0.4
						29	LB	12.70	0.00	7.3	0.00	0			0.00	0.000	0.0
BM#	Established Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes												
BM49	100	99.999		-0.001													
BM64	99.813	99.818		0.005													
BM50	100.077	100.098		0.021		Total Q										5.717	100.0
Summary						General Notes											
Staff Gauge Reading (m)		0.000															
Stage from WL Survey (m)		99.568															
Pressure Transducer Reading (m)		0.914															
Pressure Transducer Elevation (m)		98.653															
Discharge (m ³ /s)		5.7															
Cross Sectional Area		10.525															
Average Velocity		0.543															

Appendix B-3. Stage Measurement at Station Roberts Hydro - July 25, 2014

Site Information						Discharge Measurement - Mid-Section Method																									
Project Name		Hope Bay				Measurement Time		Start		9:20		End		9:50		Location		5m downstream of fish fence													
Station Identification		Roberts Hydro				Method		Velocity-area (Mid-section)					Instrument Model		Marsh McBirney Flo-Mate 2000																
Stream Name		Roberts				Flow Meter Type		Electromagnetic current meter					Instrument Serial #		6592																
Date Monitored		25-Jul-14				Real Time Reading (m)		Start		Reading		0.694		Time		8:53		Staff Gauge (m)													
Time at Site (24 hr)		Start Time:		8:45:00 AM				End Time:		11:10:00 AM		End		Reading		0.6875		Time		10:50		Time of SG Reading									
Personnel		H. Buehler, L. Wingnek						Station		Depth		Distance		Area		Velocity (m/s)				Q		% of Total Q									
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m ²)		60%		20%		80%		(m ³ /s)		%	
		435325		7562815						1		Left bank		2.10		0.00		0.0		0.02		0						0.000		0.0	
Weather Conditions		overcast, light rain				2		Veg		2.50		0.09		0.4		0.04		-0.01								0.000		0.0			
Transducer Information						3		veg		3.00		0.17		0.5		0.09		-0.01								-0.001		-0.1			
DL Model		PT2X		PT Serial #		2922010		4		veg		3.50		0.27		0.5		0.14		0.03						0.004		0.3			
Gain		1.007895		Offset		-0.222		5		veg		4.00		0.47		0.5		0.20		0.17						0.034		2.4			
Status		Active		Battery		3.4		6				4.35		0.59		0.4		0.15		0.31						0.046		3.2			
# of Records		5324		Memory Free		125381		7				4.50		0.58		0.2		0.19		0.38						0.072		5.0			
Date Serviced				Crest Gauges				8				5.00		0.56		0.5		0.28		0.49						0.137		9.5			
Hydrometric Leveling Survey						9				5.50		0.53		0.5		0.27		0.51								0.135		9.4			
Stn	BS	HI	FS	Elevation	Notes	10				6.00		0.51		0.5		0.26		0.49								0.125		8.7			
BM 49	2.401	102.401		100.000	Started at 10:04	11				6.50		0.50		0.5		0.25		0.43								0.108		7.5			
BM 50			2.341	100.060		12				7.00		0.47		0.5		0.24		0.41								0.096		6.7			
BM 64			2.609	99.792		13				7.50		0.43		0.5		0.22		0.44								0.095		6.6			
BM 12			2.342	100.059		14				8.00		0.39		0.5		0.20		0.41								0.080		5.6			
WL			3.070	99.331		15				8.50		0.38		0.5		0.19		0.35								0.067		4.6			
						16				9.00		0.43		0.5		0.22		0.41								0.088		6.1			
						17				9.50		0.49		0.5		0.25		0.44								0.108		7.5			
						18				10.00		0.52		0.5		0.26		0.44								0.114		7.9			
						19				10.50		0.59		0.5		0.30		0.4								0.118		8.2			
TBM			2.766	99.635		20				11.00		0.64		0.5		0.26		0.08								0.020		1.4			
TBM	2.783	102.418		99.635		21		veg		11.30		0.53		0.3		0.19		-0.01								-0.002		-0.1			
BM 49			2.418	100.000		22		veg		11.70		0.38		0.4		0.17		-0.01								-0.002		-0.1			
BM 50			2.357	100.061		23		veg		12.20		0.11		0.5		0.12		-0.01								-0.001		-0.1			
BM 64			2.625	99.793		24		Right bank		13.80		0.00		1.6		0.00		0								0.000		0.0			
BM 12			2.359	100.059																											
WL			3.085	99.333																											
BM#	Established Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes																										
BM 49	100	100.000		0.000																											
BM 50	100.077	100.061		-0.017																											
BM 64	99.813	99.793		-0.021		Total Q																				1.440		100.0			
BM 12	100.059	100.059		0.000																											
Summary						General Notes																									
Staff Gauge Reading (m)			0.000																												
Stage from WL Survey (m)			99.332																												
Pressure Transducer Reading (m)			0.694																												
Pressure Transducer Elevation (m)			98.638																												
Discharge (m ³ /s)			1.4																												
Cross Sectional Area			4.442																												
Average Velocity			0.324																												

Appendix B-3. Stage Measurement at Station Roberts Hydro - July 27, 2014

Site Information						Discharge Measurement - Mid-Section Method																									
Project Name		Hope Bay				Measurement Time		Start		16:50		End		17:20		Location		5m downstream of fish fence													
Station Identification		Roberts Hydro				Method		Velocity-area (Mid-section)				Instrument Model		Marsh McBirney Flo-Mate 2000																	
Stream Name		Roberts				Flow Meter Type		Electromagnetic current meter				Instrument Serial #		6592																	
Date Monitored		27-Jul-14				Real Time Reading (m)		Start		Reading		0.6717		Time		16:37		Staff Gauge (m)													
Time at Site (24 hr)		Start Time:		4:09:00 PM				End Time:		5:45:00 PM		End		Reading		0.67		Time		17:38		Time of SG Reading									
Personnel		H. Buehler, L. Wingnek						Station		Depth		Distance		Area				Velocity (m/s)		Q		% of Total Q									
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m ²)		60%		20%		80%		(m ³ /s)		%	
Weather Conditions		overcast, 13d C				1		LB		2.26		0.00		0.0		0.02		0				0.000		0.0							
						2		veg		2.75		0.08		0.5		0.04		-0.01				0.000		0.0							
						3		veg		3.25		0.19		0.5		0.08		-0.01				-0.001		-0.1							
DL Model		PT2X		PT Serial #		2922010		4		LB bankfull		3.60		0.32		0.4		0.10		0.01				0.001		0.1					
Gain		1.007895		Offset		-0.222		5				3.90		0.52		0.3		0.21		0.06				0.012		0.9					
Status		Active		Battery		3.4		6		gravel bar		4.40		0.53		0.5		0.27		0.37				0.098		7.3					
# of Records		5655		Memory Free		125050		7				4.90		0.53		0.5		0.27		0.48				0.127		9.5					
Date Serviced				Crest Gauges				8				5.40		0.50		0.5		0.25		0.52				0.130		9.7					
						9				5.90		0.43		0.5		0.22		0.54				0.116		8.7							
Hydrometric Leveling Survey						10				6.40		0.39		0.5		0.20		0.51				0.099		7.4							
Stn	BS	HI	FS	Elevation	Notes	11				6.90		0.38		0.5		0.19		0.41				0.078		5.8							
BM 49	2.413	102.413		100.000	Started at 16:11	12				7.40		0.38		0.5		0.19		0.47				0.089		6.7							
BM 50			2.355	100.058		13				7.90		0.32		0.5		0.16		0.39				0.062		4.7							
BM 64			2.622	99.791		14				8.40		0.34		0.5		0.17		0.38				0.065		4.8							
BM 12			2.354	100.059		15				8.90		0.41		0.5		0.21		0.42				0.086		6.4							
WL			3.090	99.323	WL at 0.6681	16				9.40		0.45		0.5		0.23		0.42				0.095		7.1							
						17				9.90		0.45		0.5		0.23		0.44				0.099		7.4							
						18				10.40		0.55		0.5		0.28		0.39				0.107		8.0							
						19				10.90		0.60		0.5		0.24		0.28				0.067		5.0							
TBM			2.812	99.601		20				11.20		0.63		0.3		0.16		0.01				0.002		0.1							
TBM	2.678	102.279		99.601		21		veg		11.40		0.49		0.2		0.17		0.01				0.002		0.1							
BM 49			2.282	99.997		22		veg		11.90		0.31		0.5		0.19		0.01				0.002		0.1							
BM 50			2.221	100.058		23		veg		12.60		0.13		0.7		0.10		-0.01				-0.001		-0.1							
BM 64			2.490	99.789		24		RB		13.47		0.00		0.9		0.00		0				0.000		0.0							
BM 12			2.219	100.060																											
WL			2.953	99.326																											
BM#	Established Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes																										
BM 49	100	99.999		-0.001																											
BM 50	100.077	100.058		-0.019																											
BM 64	99.813	99.790		-0.023																											
BM 12	100.059	100.060		0.001																											
Summary						General Notes																									
Staff Gauge Reading (m)		0.000																													
Stage from WL Survey (m)		99.325																													
Pressure Transducer Reading (m)		0.668																													
Pressure Transducer Elevation (m)		98.657																													
Discharge (m ³ /s)		1.3																													
Cross Sectional Area		4.139																													
Average Velocity		0.323																													

Appendix B-3. Stage Measurement at Station Roberts Hydro - July 28, 2014

[illegible]

Appendix B-3. Stage Measurement at Station Roberts Hydro - August 16, 2014

Site Information						Discharge Measurement - Mid-Section Method																					
Project Name		Hope Bay				Measurement Time		Start		9:30		End		10:07		Location		5m downstream of fish fence									
Station Identification		Roberts Hydro				Method		Velocity-area (Mid-section)					Instrument Model		Marsh McBirney Flo-Mate 2000												
Stream Name		Roberts Outflow				Flow Meter Type		Electromagnetic current meter					Instrument Serial #		6592												
Date Monitored		16-Aug-14				Real Time Reading (m)		Start		Reading		0.5843		Time				Staff Gauge (m)									
Time at Site (24 hr)		Start Time:		9:30:00 AM				End Time:		11:20:00 AM		End		Reading				Time				Time of SG Reading					
Personnel		H. Buehler, P. House						Station		Depth		Distance		Area		Velocity (m/s)			Q		% of Total Q						
Station Coordinates		Easting		Northing		Elevation				(m)		(m)		(m)		(m ²)		60%		20%		80%		(m ³ /s)		%	
		435325		7562815						1		LB sedge		4.17		0.00		0.0		0.02		0				0.000	
Weather Conditions		Overcast				2		sub veg		4.50		0.12		0.3		0.04		-0.01						0.000		0.0	
Transducer Information						3		sub veg		4.80		0.27		0.3		0.11		0.02						0.002		0.3	
DL Model		PT2X		PT Serial #		2922010		4		5.30		0.43		0.5		0.22		0.2						0.043		5.5	
Gain		1.007895		Offset		-0.222		5		5.80		0.40		0.5		0.20		0.37						0.074		9.5	
Status		Active		Battery		3.4		6		6.30		0.40		0.5		0.20		0.48						0.096		12.3	
# of Records		8505		Memory Free		122200		7		6.80		0.33		0.5		0.17		0.54						0.089		11.4	
Date Serviced				Crest Gauges				8		7.30		0.32		0.5		0.16		0.45						0.072		9.2	
Hydrometric Leveling Survey						9		7.80		0.29		0.5		0.15		0.34								0.049		6.3	
Stn	BS	HI	FS	Elevation	Notes	10		8.30	0.28	0.5	0.14	0.45												0.063	8.1		
BM 49	2.498	102.498		100.000	Started at 10:25	11		8.80	0.24	0.5	0.12	0.39												0.047	6.0		
BM 50			2.441	100.057		12		9.30	0.24	0.5	0.12	0.27												0.032	4.2		
BM 12			2.440	100.058		13		9.80	0.31	0.5	0.16	0.25												0.039	5.0		
WL1			3.268	99.230	99.233	14		10.30	0.32	0.5	0.16	0.23												0.037	4.7		
WL2			3.261	99.237		15		10.80	0.32	0.5	0.16	0.25												0.040	5.1		
BM1			1.192	101.306	Total Station	16		11.30	0.39	0.5	0.20	0.24												0.047	6.0		
BM 64			2.714	99.784		17		11.80	0.47	0.5	0.19	0.23												0.043	5.5		
						18	Edge of veg	12.10	0.48	0.3	0.17	0.04												0.007	0.9		
						19	sub veg	12.50	0.39	0.4	0.18	0												0.000	0.0		
TBM			1.859	100.639		20	sub veg	13.00	0.18	0.5	0.10	0												0.000	0.0		
TBM	1.842	102.481		100.639		21	RB sedge	13.59	0.00	0.6	0.00	0												0.000	0.0		
BM 49			2.482	99.999																							
BM 50			2.424	100.057																							
BM 12			2.423	100.058																							
WL1			3.250	99.231	+/- 5 mm wave action																						
WL2			3.248	99.233																							
BM1			1.176	101.305	Total Station																						
BM 64			2.699	99.782																							
					Finished at 10:55																						
BM#	Established Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes																						
BM 49		100.000		100.000																							
BM 50		100.057		100.057																							
BM 12		100.058		100.058																							
BM 64		99.783		99.783	Total Q																			0.780	100.0		
Summary						General Notes																					
Staff Gauge Reading (m)			0.000																								
Stage from WL Survey (m)			99.233																								
Pressure Transducer Reading (m)			0.584																								
Pressure Transducer Elevation (m)			98.648																								
Discharge (m ³ /s)			0.8																								
Cross Sectional Area			2.930																								
Average Velocity			0.266																								

Appendix B-3. Stage Measurement at Station Roberts Hydro - August 21, 2014

Site Information						Discharge Measurement - Mid-Section Method																									
Project Name		Hope Bay				Measurement Time		Start		11:30		End		12:00		Location		5m downstream of fish fence													
Station Identification		Roberts Hydro				Method		Velocity-area (Mid-section)					Instrument Model			Marsh McBirney Flo-Mate 2000															
Stream Name		Roberts Hydro				Flow Meter Type		Electromagnetic current meter					Instrument Serial #																		
Date Monitored		21-Aug-14				Real Time Reading (m)		Start		Reading		0.536		Time		12:33		Staff Gauge (m)													
Time at Site (24 hr)		Start Time:		11:15:00 AM				End Time:		12:45:00 PM		End		Reading				Time				Time of SG Reading									
Personnel		H. Buehler, P. House						Station		Depth		Distance		Area		Velocity (m/s)				Q		% of Total Q									
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m ²)		60%		20%		80%		(m ³ /s)		%	
Weather Conditions		Sunny, light breeze, 7 d C				1		RB		13.98		0.00		0.0		0.03		0								0.000		0.0			
Transducer Information						2		sedge/ fine organic sed		13.50		0.14		0.5		0.05		0.01								0.001		0.1			
						3		sedge/ fine organic sed		13.20		0.25		0.3		0.09		0.01										0.001		0.1	
DL Model		PT2X		PT Serial #		2922010		4		sedge/ fine organic sed		12.80		0.37		0.4		0.11		0.01						0.001		0.2			
Gain		1.007895		Offset		-0.222		5		sand/ gravel		12.60		0.42		0.2		0.13		0.02						0.003		0.4			
Status		Active		Battery		3.4		6				12.20		0.40		0.4		0.16		0.24						0.038		6.1			
# of Records		9234		Memory Free		121471		7				11.80		0.33		0.4		0.13		0.26						0.034		5.5			
Date Serviced				Crest Gauges				8				11.40		0.29		0.4		0.12		0.23						0.027		4.3			
Hydrometric Leveling Survey						9				11.00		0.22		0.4		0.09		0.23								0.020		3.2			
						10				10.60		0.23		0.4		0.09		0.22										0.020		3.2	
Stn	BS	HI	FS	Elevation	Notes	11				10.20		0.25		0.4		0.10		0.21								0.021		3.4			
BM49	2.379	102.379		100.000	started at 12:15	12				9.80		0.23		0.4		0.09		0.24								0.022		3.5			
BM64			2.598	99.781		13				9.40		0.18		0.4		0.07		0.44								0.032		5.1			
BM50			2.323	100.056		14				9.00		0.16		0.4		0.06		0.53								0.034		5.4			
BM12			2.321	100.058		15				8.60		0.17		0.4		0.07		0.51								0.035		5.5			
WL2			3.190	99.189	99.194	16				8.20		0.17		0.4		0.07		0.5								0.034		5.4			
WL3			3.186	99.193		17				7.80		0.21		0.4		0.11		0.44								0.046		7.4			
						18				7.20		0.24		0.6		0.12		0.51								0.061		9.8			
						19				6.80		0.33		0.4		0.13		0.52								0.069		11.0			
TBM			2.191	100.188		20				6.40		0.35		0.4		0.14		0.43								0.060		9.6			
TBM	2.136	102.324		100.188		21				6.00		0.35		0.4		0.12		0.36								0.044		7.1			
BM49			2.323	100.001		22		veg		5.70		0.35		0.3		0.11		0.18								0.019		3.0			
BM64			2.541	99.783		23		veg, fine organic sed		5.40		0.36		0.3		0.09		0.02								0.002		0.3			
BM50			2.266	100.058		24		veg, fine organic sed		5.20		0.32		0.2		0.06		0.02								0.001		0.2			
BM12			2.264	100.060		25		veg, fine organic sed		5.05		0.12		0.2		0.02		0.02								0.000		0.1			
WL2			3.128	99.196		26		LB		4.83		0.00		0.2		0.00		0								0.000		0.0			
WL3			3.127	99.197																											
BM#	Established Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes																										
BM49		100.001		100.001																											
BM64		99.782		99.782																											
BM50		100.057		100.057		Total Q																				0.625		100.0			
Summary						General Notes																									
Staff Gauge Reading (m)		0.000																													
Stage from WL Survey (m)		99.194																													
Pressure Transducer Reading (m)		0.536																													
Pressure Transducer Elevation (m)		98.658																													
Discharge (m ³ /s)		0.6																													
Cross Sectional Area		2.357																													
Average Velocity		0.265																													

Appendix B-3. Stage Measurement at Station Roberts Hydro - September 19, 2014

Site Information						Discharge Measurement - Mid-Section Method											
Project Name		Hope Bay				Measurement Time		Start	12:00	End	12:25	Location	5m downstream of fish fence				
Station Identification		Roberts Hydro				Method		Velocity-area (Mid-section)				Instrument Model		Marsh McBirney Flo-Mate 2000			
Stream Name		Roberts				Flow Meter Type		Electromagnetic current meter				Instrument Serial #		6592			
Date Monitored		Sept 19 2014				Real Time Reading (m)		Start	Reading	0.5198	Time	12:01	Staff Gauge (m)				
Time at Site (24 hr)		Start Time:	11:55:00 AM	End Time:	3:00:00 PM			End	Reading		Time	13:15	Time of SG Reading				
Personnel		H. Buehler, C. Bolt						Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q	
Station Coordinates		Easting	Northing	Elevation		No.	Notes	(m)	(m)	(m)	(m²)	60%	20%	80%	(m³/s)	%	
		435425	7562815			1	LB	2.08	0.00	0.0	0.02	0			0.000	0.0	
Weather Conditions		Overcast, windy 6d C				2		veg	2.40	0.13	0.3	0.03	0			0.000	0.0
Transducer Information						3		2.60	0.39	0.2	0.08	0.01			0.001	0.1	
DL Model		PT2X	PT Serial #		2922010	4		2.80	0.32	0.2	0.08	0.09			0.007	1.3	
Gain		1.007895	Offset		-0.222	5		3.10	0.37	0.3	0.11	0.24			0.027	4.8	
Status		Active	Battery		3.3	6		3.40	0.35	0.3	0.11	0.33			0.035	6.2	
# of Records		13406	Memory Free		117299	7		3.70	0.36	0.3	0.11	0.35			0.038	6.8	
Date Serviced			Crest Gauges			8		4.00	0.35	0.3	0.11	0.04			0.004	0.8	
Hydrometric Leveling Survey						9		4.30	0.34	0.3	0.12	0.38			0.045	8.1	
Stn	BS	HI	FS	Elevation	Notes	10		4.70	0.28	0.4	0.10	0.38			0.037	6.7	
BM49	2.434	102.434		100.000	Started at 13:53	11		5.00	0.27	0.3	0.08	0.32			0.026	4.7	
BM64			2.657	99.777		12		5.30	0.25	0.3	0.08	0.21			0.016	2.8	
BM50			2.383	100.051		13		5.60	0.25	0.3	0.08	0.15			0.011	2.0	
WL			3.252	99.182	WL @ 0.5173	14		5.90	0.26	0.3	0.08	0.21			0.016	3.0	
BM12			2.376	100.058		15		6.20	0.25	0.3	0.08	0.32			0.024	4.3	
						16		6.50	0.22	0.3	0.07	0.33			0.022	3.9	
						17		6.80	0.18	0.3	0.05	0.33			0.018	3.2	
						18		7.10	0.19	0.3	0.07	0.33			0.022	4.0	
						19		7.50	0.22	0.4	0.08	0.27			0.021	3.7	
TBM			2.573	99.861		20		7.80	0.26	0.3	0.09	0.23			0.021	3.8	
TBM	2.374	102.235		99.861		21		8.20	0.29	0.4	0.12	0.27			0.031	5.6	
BM49			2.236	99.999		22		8.60	0.31	0.4	0.12	0.25			0.031	5.6	
BM64			2.459	99.776		23		9.00	0.36	0.4	0.14	0.24			0.035	6.2	
BM50			2.185	100.050		24		9.40	0.42	0.4	0.17	0.27			0.045	8.2	
WL			3.050	99.185		25		9.80	0.50	0.4	0.23	0.1			0.023	4.1	
BM12			2.177	100.058		26		veg	10.30	0.36	0.5	0.27	0		0.000	0.0	
						27		RB veg	11.28	0.00	1.0	0.00	0		0.000	0.0	
BM#	Established Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes												
BM49	100	100.000		-0.001													
BM64	99.813	99.777		-0.037													
BM50	100.077	100.051		-0.026		Total Q									0.555	100.0	
Summary						General Notes											
Staff Gauge Reading (m)		0.000															
Stage from WL Survey (m)		99.184															
Pressure Transducer Reading (m)		0.518															
Pressure Transducer Elevation (m)		98.666															
Discharge (m³/s)		0.6															
Cross Sectional Area		2.641															
Average Velocity		0.210															

Appendix B-3. Stage Measurement at Station Roberts Hydro - September 21, 2014

Site Information						Discharge Measurement - Mid-Section Method											
Project Name		Hope Bay				Measurement Time		Start	12:05	End	12:42	Location	5m downstream of fish fence				
Station Identification		Roberts Hydro				Method		Velocity-area (Mid-section)			Instrument Model		Marsh McBirney Flo-Mate 2000				
Stream Name		Roberts				Flow Meter Type		Electromagnetic current meter			Instrument Serial #		6592				
Date Monitored		Sept 12 2014				Real Time Reading (m)		Start	Reading	0.5074	Time	13:02	Staff Gauge (m)				
Time at Site (24 hr)		Start Time:	11:34:00 AM	End Time:	2:20:00 PM			End	Reading		Time		Time of SG Reading				
Personnel		H. Buehler, C. Bolt						Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q	
Station Coordinates		Easting	Northing	Elevation		No.	Notes	(m)	(m)	(m)	(m²)	60%	20%	80%	(m³/s)	%	
		435425	7562815			1	LB veg ice	2.60	0.00	0.0	0.04	0			0.000	0.0	
Weather Conditions		sunny 3 d C				2		behind veg	2.90	0.24	0.3	0.06	-0.01			-0.001	-0.1
Transducer Information						3		behind veg	3.10	0.28	0.2	0.08	0.11			0.009	1.9
DL Model		PT2X	PT Serial #		2922010	4		gravel	3.50	0.34	0.4	0.14	0.27			0.037	7.5
Gain		1.007895	Offset		-0.222	5		gravel	3.90	0.34	0.4	0.14	0.34			0.046	9.5
Status		Active	Battery		3.3	6		gravel	4.30	0.31	0.4	0.12	0.37			0.046	9.4
# of Records		13702	Memory Free		117003	7		gravel	4.70	0.24	0.4	0.10	0.38			0.036	7.5
Date Serviced			Crest Gauges			8		gravel	5.10	0.15	0.4	0.06	0.46			0.028	5.6
Hydrometric Leveling Survey						9		gravel	5.50	0.13	0.4	0.05	0.5			0.026	5.3
Stn	BS	HI	FS	Elevation	Notes	10		gravel	5.90	0.12	0.4	0.05	0.46			0.022	4.5
BM49	2.033	102.033		100.000	Started at 12:50	11		gravel	6.30	0.12	0.4	0.05	0.46			0.022	4.5
BM64			2.257	99.776		12		gravel	6.70	0.16	0.4	0.06	0.35			0.022	4.6
BM50			1.982	100.051		13		gravel	7.10	0.20	0.4	0.08	0.28			0.022	4.6
WL			2.880	99.153	WL @ 0.5074	14		gravel	7.50	0.23	0.4	0.09	0.16			0.015	3.0
						15		gravel	7.90	0.25	0.4	0.10	0.21			0.021	4.3
						16		gravel	8.30	0.25	0.4	0.10	0.2			0.020	4.1
						17		gravel	8.70	0.24	0.4	0.10	0.24			0.023	4.7
						18		gravel	9.10	0.29	0.4	0.12	0.24			0.028	5.7
						19		gravel	9.50	0.34	0.4	0.14	0.25			0.034	6.9
TBM			1.974	100.059	BM12	20		gravel	9.90	0.41	0.4	0.16	0.21			0.034	7.0
TBM	2.058	102.117		100.059		21		behind veg	10.30	0.35	0.4	0.14	-0.01			-0.001	-0.3
BM49			2.117	100.000		22		behind veg	10.70	0.20	0.4	0.09	-0.01			-0.001	-0.2
BM64			2.340	99.777		23		RB	11.21	0.00	0.5	0.00	0			0.000	0.0
BM50			2.064	100.053													
WL			2.960	99.157													

Appendix B-4. Stage and Discharge Measurement at Station Windy Hydro - June 18, 2014

Site Information						Discharge Measurement - Mid-Section Method																											
Project Name		Hope Bay				Measurement Time		Start		17:45		End		18:05		Location		Approximately 500 m DS of station															
Station Identification		Windy Hydro				Method		Velocity-area (Mid-section)					Instrument Model																				
Stream Name		Windy				Flow Meter Type		Swoffer (C1 Prop)					Instrument Serial #																				
Date Monitored		June 18 2014				Real Time Reading (m)		Start		Reading				Time				Staff Gauge (m)															
Time at Site (24 hr)		Start Time:		4:22:00 PM				End Time:		5:25:00 PM		End		Reading		0.4919		Time		16:53		Time of SG Reading											
Personnel		H. Buehler, M. Soloducha						Station		Depth		Distance		Area		Velocity (m/s)			Q		% of Total Q												
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m ²)		60%		20%		80%		(m ³ /s)		%			
		431481		7555089						1		RB		6.00		0.00		0.0		0.03		0		0.0				0.000		0.0			
Weather Conditions		Sunny 6 d C				2		veg		5.60		0.15		0.4		0.04		0.37		0.3						0.011		4.6					
Transducer Information						3				5.45		0.24		0.1		0.03		0.61		0.4						0.013		5.6					
DL Model		PT2x		PT Serial #		21019100		4		5.35		0.29		0.1		0.03		0.73		0.5						0.015		6.4					
Gain		1.020166		Offset		0.004		5		5.25		0.34		0.1		0.03		0.63		0.4						0.015		6.5					
Status		Active		Battery		3.4		6		5.15		0.35		0.1		0.04		0.67		0.5						0.016		7.1					
# of Records		3		Memory Free		261,774		7		5.05		0.36		0.1		0.04		0.81		0.6						0.020		8.9					
Date Serviced				Crest Gauges				8		4.95		0.36		0.1		0.04		0.82		0.6						0.021		9.0					
Hydrometric Leveling Survey						9		4.85		0.35		0.1		0.04		0.78		0.5								0.019		8.3					
Stn		BS		HI		FS		Elevation		Notes		10		4.75		0.34		0.1		0.03		0.76		0.5				0.018		7.9			
BM 24		0.167		100.167				100.000				11		4.65		0.33		0.1		0.03		0.8		0.6				0.018		8.0			
BM 23						0.513		99.654				12		4.55		0.37		0.1		0.04		0.85		0.6				0.022		9.6			
TP 1		0.971		98.095		3.043		97.124		turning point		13		4.45		0.37		0.1		0.04		0.88		0.6				0.023		9.9			
WL						3.027		95.068				14		veg		4.35		0.26		0.1		0.03		0.69		0.5				0.013		5.5	
BM 45						2.426		95.669				15		veg		4.25		0.17		0.1		0.04		0.24		0.2				0.006		2.8	
												16		LB		3.90		0.00		0.4		0.00		0		0.0				0.000		0.0	
TBM		3.191		98.350		2.936		95.159																									
BM 45						2.684		95.666																									
WL						3.278		95.072																									
TP 2		2.795		99.917		1.228		97.122																									
BM 24						0.176		99.741																									
BM 23						0.551		99.366																									
BM#		Established Elevation (m)		Mean Elevation (this date) (m)		Difference (m)		Notes																									
BM 24		100		99.871		-0.130																											
BM 23		99.656		99.510		-0.146																											
BM 45		95.617		95.668		0.050				Total Q																				0.230		100.0	
Summary						General Notes																											
Staff Gauge Reading (m)				0.000		Station mobilized at 16:53																											
Stage from WL Survey (m)				95.070																													
Pressure Transducer Reading (m)				0.492 95.002																													
Pressure Transducer Elevation (m)				94.578 94.510																													
Discharge (m ³ /s)				0.2																													
Cross Sectional Area				0.512																													
Average Velocity				0.449																													

Appendix B-4. Stage and Discharge Measurement at Station Windy Hydro - July 24, 2014

Site Information						Discharge Measurement - Mid-Section Method										
Project Name		Hope Bay				Measurement Time		Start	11:00	End	11:36	Location	Approximately 500 m DS of station			
Station Identification		Windy Hydro				Method		Velocity-area (Mid-section)			Instrument Model		Marsh McBirney Flo-Mate 2000			
Stream Name		Windy				Flow Meter Type		Electromagnetic flow meter			Instrument Serial #		6592			
Date Monitored		24-Jul-14				Real Time Reading (m)		Start	Reading	0.5788	Time	10:35	Staff Gauge (m)			
Time at Site (24 hr)		Start Time:	9:15:00 AM	End Time:	12:00:00 PM			End	Reading		Time		Time of SG Reading			
Personnel		H. Buehler, L. Wingnek						Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q
Station Coordinates		Easting	Northing	Elevation		No.	Notes	(m)	(m)	(m)	(m ²)	60%	20%	80%	(m ³ /s)	%
		431481	7555089			1	LB	1.96	0.00	0.0	0.01	0			0.000	0.0
Weather Conditions		Smokey, light wind				2		2.00	0.32	0.0	0.01	0.24			0.003	1.7
Transducer Information						3		2.05	0.32	0.0	0.02	0.4			0.006	3.2
DL Model		PT2x	PT Serial #		21019100	4		2.10	0.33	0.1	0.02	0.43			0.007	3.5
Gain		1.020166	Offset		0.004	5		2.15	0.33	0.0	0.02	0.62			0.010	5.1
Status		Active	Battery		3.4	6		2.20	0.35	0.1	0.02	0.57			0.010	5.0
# of Records		5142	Memory Free		256635	7		2.25	0.36	0.0	0.02	0.6			0.011	5.4
Date Serviced			Crest Gauges			8		2.30	0.37	0.0	0.02	0.68			0.013	6.3
Hydrometric Leveling Survey						9		2.35	0.38	0.1	0.02	0.7			0.013	6.6
Stn	BS	HI	FS	Elevation	Notes	10		2.40	0.37	0.0	0.02	0.73			0.014	6.7
BM 24	0.549	100.549		100.000	Started at 9:27	11		2.45	0.37	0.1	0.02	0.77			0.014	7.1
BM 23			0.895	99.654		12		2.50	0.37	0.0	0.02	0.75			0.014	6.9
TP 1	1.429	98.495	3.483	97.066	turning point	13		2.55	0.38	0.0	0.02	0.84			0.016	7.9
WL			3.402	95.093		14		2.60	0.38	0.1	0.02	0.84			0.016	7.9
BM 45			2.892	95.603		15		2.65	0.38	0.0	0.02	0.83			0.016	7.8
						16		2.70	0.38	0.1	0.02	0.75			0.014	7.1
TBM	2.533	98.621	2.407	96.088		17		2.75	0.38	0.0	0.02	0.64			0.012	6.0
						18		2.80	0.37	0.0	0.02	0.45			0.008	4.1
BM 45			3.013	95.608		19		2.85	0.36	0.1	0.02	0.14			0.003	1.3
WL			3.525	95.096		20	eg, top of RB bankfr	2.90	0.08	0.0	0.01	0.12			0.001	0.4
TP 2	3.114	100.177	1.558	97.063	turning point	21	Veg	3.00	0.06	0.1	0.01	-0.01			0.000	0.0
BM 24			0.176	100.001		22	RB	3.20	0.00	0.2	0.00	0			0.000	0.0
BM 23			0.52	99.657	WL measured at 0.5791	23										
						24										
						25										
						26										
						27										
						28										
						29										
						30										
BM#	Established Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes	31										
BM 24	100	100.001		0.001		32										
BM 23	99.656	99.656		0.000		33										
BM 45	95.617	95.606		-0.011		Total Q									0.201	100.0
Summary						General Notes										
Staff Gauge Reading (m)		0.000														
Stage from WL Survey (m)		95.095														
Pressure Transducer Reading (m)		0.580 95.090														
Pressure Transducer Elevation (m)		94.514 94.510														
Discharge (m ³ /s)		0.2														
Cross Sectional Area		0.345														
Average Velocity		0.583														

Appendix B-4. Stage and Discharge Measurement at Station Windy Hydro - July 25, 2014

Site Information						Discharge Measurement - Mid-Section Method																									
Project Name		Hope Bay				Measurement Time		Start		15:20		End		15:50		Location		Approximately 500 m DS of station													
Station Identification		Windy Hydro				Method		Velocity-area (Mid-section)				Instrument Model		Marsh McBirney Flo-Mate 2000																	
Stream Name		Windy				Flow Meter Type		Electromagnetic flow meter				Instrument Serial #		6592																	
Date Monitored		25-Jul-14				Real Time Reading (m)		Start		Reading		0.5798		Time		14:55		Staff Gauge (m)													
Time at Site (24 hr)		Start Time:		1:55:00 PM				End Time:		4:20:00 PM		End		Reading				Time				Time of SG Reading									
Personnel		H. Buehler, L. Wingnek						Station		Depth		Distance		Area		Velocity (m/s)				Q		% of Total Q									
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m ²)		60%		20%		80%		(m ³ /s)		%	
		431481		7555089						1		RB		1.80		0.00		0.0		0.00		0						0.000		0.0	
Weather Conditions		Overcast, smokey, 15d C				2		veg		1.85		0.05		0.1		0.00		-0.01								0.000		0.0			
Transducer Information						3		veg		1.90		0.05		0.0		0.00		-0.01								0.000		0.0			
DL Model		PT2X		PT Serial #		21019100		4		veg		2.00		0.08		0.1		0.01		-0.01						0.000		0.0			
Gain		1.020166		Offset		0.004		5		2.05		0.35		0.0		0.02		0.37								0.006		3.3			
Status		Active		Battery		3.4		6		2.10		0.37		0.1		0.02		0.51								0.009		4.8			
# of Records		5313		Memory Free		256464		7		2.15		0.38		0.0		0.02		0.69								0.013		6.7			
Date Served				Crest Gauges				8		2.20		0.38		0.1		0.02		0.82								0.016		8.0			
Hydrometric Leveling Survey						9				2.25		0.38		0.0		0.02		0.85								0.016		8.3			
Stn		BS		HI		FS		Elevation		Notes		10				2.30		0.39		0.0		0.02		0.86				0.017		8.6	
BM 24		0.708		100.708				100.000		Started at 13:55		11				2.35		0.38		0.1		0.02		0.84				0.016		8.2	
BM 23						1.052		99.656				12				2.40		0.38		0.0		0.02		0.79				0.015		7.7	
TP 1		1.381		98.443		3.646		97.062				13				2.45		0.37		0.1		0.02		0.78				0.014		7.4	
WL						3.344		95.099		WL at 0.5903		14				2.50		0.36		0.0		0.02		0.7				0.013		6.5	
BM 45						2.834		95.609				15				2.55		0.35		0.0		0.02		0.73				0.013		6.6	
												16				2.60		0.34		0.1		0.02		0.64				0.011		5.6	
TBM		1.358		98.399		1.402		97.041				17				2.65		0.34		0.0		0.02		0.56				0.010		4.9	
												18				2.70		0.34		0.1		0.02		0.52				0.009		4.5	
BM 45						2.791		95.608				19				2.75		0.34		0.0		0.02		0.46				0.008		4.0	
WL						3.298		95.101				20				2.80		0.31		0.0		0.02		0.38				0.006		3.0	
TP 2		3.478		100.541		1.336		97.063				21				2.85		0.31		0.1		0.02		0.24				0.004		1.9	
BM 24						0.541		100.000				22		veg		2.90		0.05		0.0		0.00		-0.01				0.000		0.0	
BM 23						0.886		99.655				23		LB		3.04		0.00		0.1		0.00		0				0.000		0.0	
BM#		Established Elevation (m)		Mean Elevation (this date) (m)		Difference (m)		Notes																							
BM 24		100		100.000		0.000																									
BM 23		99.656		99.656		-0.001																									
BM 45		95.617		95.609		-0.009				Total Q																		0.195		100.0	
Summary						General Notes																									
Staff Gauge Reading (m)				0.000																											
Stage from WL Survey (m)				95.100																											
Pressure Transducer Reading (m)				0.590																											
Pressure Transducer Elevation (m)				94.510																											
Discharge (m ³ /s)				0.2																											
Cross Sectional Area				0.322																											
Average Velocity				0.605																											

Appendix B-4. Stage and Discharge Measurement at Station Windy Hydro - July 28, 2014

Site Information						Discharge Measurement - Mid-Section Method																									
Project Name		Hope Bay				Measurement Time		Start		10:15		End		10:40		Location		Approximately 500 m DS of station													
Station Identification		Windy Hydro				Method		Velocity-area (Mid-section)					Instrument Model		Marsh McBirney Flo-Mate 2000																
Stream Name		Windy				Flow Meter Type		Electromagnetic flow meter					Instrument Serial #		6592																
Date Monitored		28-Jul-14				Real Time Reading (m)		Start		Reading		0.5888		Time		9:39		Staff Gauge (m)													
Time at Site (24 hr)		Start Time:		8:47:00 AM				End Time:		11:30:00 AM		End		Reading				Time				Time of SG Reading									
Personnel		H. Buehler, L. Wingnek						Station		Depth		Distance		Area		Velocity (m/s)				Q		% of Total Q									
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m²)		60%		20%		80%		(m³/s)		%	
Weather Conditions		Overcast				1		RB		1.72		0.00		0.0		0.00		0								0.000		0.0			
Transducer Information						2		veg		1.80		0.03		0.1		0.00		-0.01								0.000		0.0			
						3		RB bankfull, veg		1.90		0.05		0.1		0.01		-0.01												0.000	
DL Model		PT2X		PT Serial #		21019100		4				2.00		0.35		0.1		0.03		0.23						0.006		4.3			
Gain		1.020166		Offset		0.004		5				2.05		0.35		0.0		0.02		0.35						0.006		4.3			
Status		Active		Battery		3.4		6				2.10		0.36		0.1		0.02		0.75						0.014		9.6			
# of Records		5715		Memory Free		256062		7				2.15		0.36		0.0		0.02		0.81						0.015		10.3			
Date Served				Crest Gauges				8				2.20		0.35		0.1		0.02		0.78						0.014		9.7			
Hydrometric Leveling Survey						9				2.25		0.36		0.0		0.02		0.75								0.014		9.6			
Stn		BS		HI		FS		Elevation		Notes		10				2.30		0.35		0.0		0.02		0.68				0.012		8.4	
BM 24		0.803		100.803				100.000		Started at 8:47		11				2.35		0.34		0.1		0.02		0.63				0.011		7.6	
BM 23						1.151		99.652				12				2.40		0.34		0.0		0.02		0.62				0.011		7.5	
TP 1		1.363		98.419		3.747		97.056				13				2.45		0.33		0.1		0.02		0.51				0.008		6.0	
WL						3.333		95.086				14				2.50		0.33		0.0		0.02		0.5				0.008		5.9	
BM 45						2.826		95.593				15				2.55		0.33		0.0		0.02		0.47				0.008		5.5	
												16				2.60		0.32		0.1		0.02		0.39				0.006		4.4	
TBM		1.387		98.416		1.390		97.029				17				2.65		0.31		0.0		0.02		0.34				0.005		3.7	
												18				2.70		0.31		0.1		0.02		0.2				0.005		3.3	
BM 45						2.822		95.594				19		LB bankfull, veg		2.80		0.03		0.1		0.00		-0.01				0.000		0.0	
WL						3.331		95.085		WL at 0.5701		20		LB		2.92		0.00		0.1		0.00		0				0.000		0.0	
TP 2		3.712		100.768		1.360		97.056																							
BM 24						0.770		99.998																							
BM 23						1.116		99.652																							
BM#		Established Elevation (m)		Mean Elevation (this date) (m)		Difference (m)		Notes																							
BM 24		100		99.999		-0.001																									
BM 23		99.656		99.652		-0.004																									
BM 45		95.617		95.594		-0.023				Total Q																		0.141		100.0	
Summary						General Notes																									
Staff Gauge Reading (m)				0.000																											
Stage from WL Survey (m)				95.086																											
Pressure Transducer Reading (m)				0.570 95.080																											
Pressure Transducer Elevation (m)				94.515 94.510																											
Discharge (m³/s)				0.1																											
Cross Sectional Area				0.283																											
Average Velocity				0.498																											

Appendix B-4. Stage and Discharge Measurement at Station Windy Hydro - August 18, 2014

Site Information						Discharge Measurement - Mid-Section Method										
Project Name		Hope Bay				Measurement Time		Start	8:37	End	9:05	Location	Approximately 500 m DS of station			
Station Identification		Windy Hydro				Method		Velocity-area (Mid-section)			Instrument Model		Marsh McBirney Flo-Mate 2000			
Stream Name		Windy Outflow				Flow Meter Type		Electromagnetic flow meter			Instrument Serial #		6592			
Date Monitored		18-Aug-14				Real Time Reading (m)		Start	Reading	0.552333333	Time	10:42	Staff Gauge (m)			
Time at Site (24 hr)		Start Time:	8:00:00 AM	End Time:	5:00:00 PM			End	Reading		Time		Time of SG Reading			
Personnel		H. Buehler, P. House					Station	Depth	Distance	Area	Velocity (m/s)			Q	% of Total Q	
Station Coordinates		Easting	Northing	Elevation		No.	Notes	(m)	(m)	(m)	(m²)	60%	20%	80%	(m³/s)	%
		431356	7555669			1	RB	3.60	0.00	0.0	0.01	0			0.000	0.0
Weather Conditions		Sunny, light breeze 4 °C				2		3.70	0.29	0.1	0.02	0.01			0.000	0.2
Transducer Information						3		3.75	0.30	0.0	0.01	0.22			0.003	3.1
DL Model		PT2X	PT Serial #		21019100	4		3.80	0.29	0.0	0.01	0.42			0.006	5.7
Gain		1.020166	Offset		0.004	5		3.85	0.31	0.1	0.02	0.56			0.009	8.2
Status		Active	Battery		3.4	6		3.90	0.31	0.0	0.02	0.65			0.010	9.5
# of Records		8749	Memory Free		253028	7		3.95	0.31	0.1	0.02	0.67			0.010	9.8
Date Serviced			Crest Gauges			8		4.00	0.31	0.0	0.02	0.64			0.010	9.3
Hydrometric Leveling Survey						9		4.05	0.30	0.0	0.01	0.62			0.009	8.8
Stn	BS	HI	FS	Elevation	Notes	10		4.10	0.28	0.0	0.01	0.58			0.008	7.6
BM 24	0.752	100.752		100.000	Started at 9:40	11		4.15	0.27	0.1	0.01	0.56			0.008	7.1
BM 23			1.098	99.654		12		4.20	0.28	0.0	0.01	0.5			0.007	6.6
TP 1	1.431	98.481	3.702	97.050		13		4.25	0.26	0.0	0.01	0.5			0.006	6.1
WL1			3.422	95.059		14		4.30	0.25	0.0	0.01	0.48			0.006	5.7
BM 45			2.896	95.585		15		4.35	0.25	0.0	0.01	0.38			0.005	4.5
						16		4.40	0.25	0.1	0.01	0.32			0.004	3.8
TBM	1.493	98.517	1.457	97.024		17		4.45	0.26	0.0	0.01	0.22			0.003	2.7
						18		4.50	0.26	0.0	0.01	0.1			0.001	1.3
BM 45			2.933	95.584		19	LB	4.56	0.00	0.1	0.00	0			0.000	0.0
WL			3.454	95.063												
TP 2	3.778	100.828	1.467	97.050												
BM 24			0.826	100.002												
BM 23			1.172	99.656												
BM#	Established Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes											
BM 24	100	100.001		0.001												
BM 23	99.656	99.655		-0.001												
BM 45	95.617	95.585		-0.033		Total Q									0.106	100.0
Summary						General Notes										
Staff Gauge Reading (m)				0.000												
Stage from WL Survey (m)				95.061												
Pressure Transducer Reading (m)				0.552												
Pressure Transducer Elevation (m)				94.509												
Discharge (m³/s)				0.1												
Cross Sectional Area				0.262												
Average Velocity				0.405												

Appendix B-4. Stage and Discharge Measurement at Station Windy Hydro - September 19, 2014

Site Information						Discharge Measurement - Mid-Section Method																									
Project Name		Hope Bay				Measurement Time		Start		9:23		End		9:55		Location		Approximately 500 m DS of station													
Station Identification		Windy Hydro				Method		Velocity-area (Mid-section)					Instrument Model		Marsh McBirney Flo-Mate 2000																
Stream Name		Windy				Flow Meter Type		Electromagnetic flow meter					Instrument Serial #		6592																
Date Monitored		Sept 19 2014				Real Time Reading (m)		Start		Reading		0.504		Time		8:25		Staff Gauge (m)													
Time at Site (24 hr)		Start Time:		8:20:00 AM				End Time:		11:25:00 AM		End		Reading				Time				Time of SG Reading									
Personnel		H. Buehler, C. Bolt						Station		Depth		Distance		Area		Velocity (m/s)				Q		% of Total Q									
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m ²)		60%		20%		80%		(m ³ /s)		%	
		431481		7555089						1		RB. Veg		1.94		0.00		0.0		0.01		0						0.000		0.0	
Weather Conditions		0 d C overcast				2		gravel		1.98		0.26		0.0		0.01		0.06										0.000		0.6	
Transducer Information						3		gravel		2.00		0.26		0.0		0.01		0.14										0.001		1.5	
DL Model		PT2X		PT Serial #		21019100		4		gravel		2.05		0.27		0.0		0.01		0.39								0.005		6.2	
Gain		1.020166		Offset		0.004		5		gravel		2.10		0.27		0.1		0.01		0.6								0.008		9.6	
Status		Active		Battery		3.4		6		gravel		2.15		0.27		0.0		0.01		0.58								0.008		9.3	
# of Records		13343		Memory Free		248343		7		gravel		2.20		0.27		0.1		0.01		0.56								0.008		9.0	
Date Served				Crest Gauges				8		gravel		2.25		0.27		0.0		0.02		0.55								0.011		13.2	
Hydrometric Leveling Survey						9		gravel		2.35		0.25		0.1		0.02		0.51										0.010		11.3	
Stn	BS	HI	FS	Elevation	Notes	10		gravel		2.40		0.24		0.0		0.01		0.49										0.006		7.0	
BM 24	0.776	100.776		100.000		11		gravel		2.45		0.25		0.1		0.01		0.49										0.006		7.3	
BM 23			1.121	99.655		12		gravel		2.50		0.22		0.0		0.01		0.46										0.005		6.0	
TP 1	1.329	98.336	3.769	97.007	turning point	13		gravel		2.55		0.22		0.0		0.01		0.42										0.005		5.5	
WL			3.312	95.024		14		gravel		2.60		0.22		0.1		0.01		0.36										0.004		4.7	
BM 45			2.755	95.581		15		gravel		2.65		0.22		0.0		0.01		0.29										0.003		3.8	
						16		gravel		2.70		0.22		0.1		0.01		0.24										0.003		3.1	
TBM	1.273	98.287	1.322	97.014		17		gravel		2.75		0.21		0.0		0.01		0.14										0.002		1.9	
						18		LB veg		2.81		0.00		0.1		0.00		0										0.000		0.0	
BM 45			2.707	95.580																											
WL			3.259	95.028																											
TP 2	3.653	100.657	1.283	97.004																											
BM 24			0.655	100.002																											
BM 23			1.001	99.656																											
BM#	Established Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes																										
BM 24	100	100.001		0.001																											
BM 23	99.656	99.656		-0.001																											
BM 45	95.617	95.581		-0.037		Total Q																						0.084	100.0		
Summary						General Notes																									
Staff Gauge Reading (m)				0.000																											
Stage from WL Survey (m)				95.026																											
Pressure Transducer Reading (m)				0.503 95.013																											
Pressure Transducer Elevation (m)				94.523 94.510																											
Discharge (m3/s)				0.1																											
Cross Sectional Area				0.206																											
Average Velocity				0.409																											

Appendix B-4. Stage and Discharge Measurement at Station Windy Hydro - September 20, 2014

Site Information						Discharge Measurement - Mid-Section Method																											
Project Name		Hope Bay				Measurement Time		Start		12:21		End		12:49		Location		Approximately 500 m DS of station															
Station Identification		Windy Hydro				Method		Velocity-area (Mid-section)					Instrument Model		Marsh McBirney Flo-Mate 2000																		
Stream Name		Windy				Flow Meter Type		Electromagnetic flow meter					Instrument Serial #		6592																		
Date Monitored		Sept 20 2014				Real Time Reading (m)		Start		Reading		0.5001		Time		11:29		Staff Gauge (m)															
Time at Site (24 hr)		Start Time:		11:31:00 AM				End Time:		2:00:00 PM		End		Reading				Time				Time of SG Reading											
Personnel		H. Buehler, C. Bolt						Station		Depth		Distance		Area		Velocity (m/s)				Q		% of Total Q											
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m ²)		60%		20%		80%		(m ³ /s)		%			
		431353		7555674						1		RB veg		2.08		0.00		0.0		0.00		0						0.000		0.0			
Weather Conditions		0 d C windy overcast				2		gravel		2.10		0.25		0.0		0.01		0.02										0.000		0.2			
Transducer Information						3		gravel		2.15		0.25		0.0		0.01		0.16										0.002		2.5			
DL Model		PT2X		PT Serial #		21019100		4		gravel		2.20		0.25		0.1		0.02		0.4								0.008		9.3			
Gain		1.020166		Offset		0.004		5		gravel		2.30		0.26		0.1		0.02		0.62								0.012		14.9			
Status		Active		Battery		3.4		6		gravel		2.35		0.26		0.1		0.01		0.62								0.008		9.9			
# of Records		13506		Memory Free		248271		7		gravel		2.40		0.26		0.0		0.01		0.59								0.008		9.5			
Date Served				Crest Gauges				8		gravel		2.45		0.25		0.1		0.01		0.57								0.007		8.8			
Hydrometric Leveling Survey						9		gravel		2.50		0.23		0.0		0.01		0.5										0.006		7.1			
Stn		BS		HI		FS		Elevation		Notes		10		gravel		2.55		0.23		0.0		0.01		0.47				0.005		6.7			
BM 24		0.629		100.629				100.000		Started at 13:19		11		gravel		2.60		0.23		0.1		0.01		0.47				0.005		6.7			
BM 23						0.974		99.655				12		gravel		2.65		0.21		0.0		0.01		0.44				0.005		5.7			
TP 1		1.393		98.430		3.592		97.037		turning point		13		gravel		2.70		0.21		0.1		0.01		0.36				0.004		4.7			
WL						3.418		95.012				14		gravel		2.75		0.21		0.0		0.01		0.31				0.003		4.0			
BM 45						2.868		95.562				15		gravel		2.80		0.21		0.0		0.01		0.27				0.003		3.5			
												16		gravel		2.85		0.21		0.1		0.01		0.22				0.002		2.9			
TBM		3.368		98.381		3.417		95.013				17		gravel		2.90		0.20		0.0		0.01		0.17				0.002		2.1			
												18		gravel		2.95		0.20		0.1		0.01		0.19				0.001		1.6			
BM 45						2.819		95.562				19		LB veg		2.97		0.00		0.0		0.00		0				0.000		0.0			
WL						3.369		95.012																									
TP 2		3.582		100.620		1.343		97.038																									
BM 24						0.620		100.000																									
BM 23						0.964		99.656																									
BM#		Established Elevation (m)		Mean Elevation (this date) (m)		Difference (m)		Notes																									
BM 24		100		100.000		0.000																											
BM 23		99.656		99.656		-0.001																											
BM 45		95.617		95.562		-0.055				Total Q																				0.081		100.0	
Summary						General Notes																											
Staff Gauge Reading (m)				0.000		5 min offset between computer and logger																											
Stage from WL Survey (m)				95.012																													
Pressure Transducer Reading (m)				0.500																													
Pressure Transducer Elevation (m)				94.512																													
Discharge (m3/s)				0.1																													
Cross Sectional Area				0.205																													
Average Velocity				0.396																													

Appendix B-4. Stage and Discharge Measurement at Station Windy Hydro - September 21, 2014

Site Information						Discharge Measurement - Mid-Section Method																									
Project Name		Hope Bay				Measurement Time		Start		14:35		End		15:03		Location		Approximately 500 m DS of station													
Station Identification		Windy Hydro				Method		Velocity-area (Mid-section)					Instrument Model		Marsh McBirney Flo-Mate 2000																
Stream Name		Windy				Flow Meter Type		Electromagnetic flow meter					Instrument Serial #		6592																
Date Monitored		Sept 21 2014				Real Time Reading (m)		Start		Reading				Time				Staff Gauge (m)													
Time at Site (24 hr)		Start Time:		2:31:00 PM				End Time:		5:00:00 PM		End		Reading		Time				Time of SG Reading											
Personnel		H. Buehler, C. Bolt						Station		Depth		Distance		Area		Velocity (m/s)				Q		% of Total Q									
Station Coordinates		Easting		Northing		Elevation				No.		Notes		(m)		(m)		(m)		(m ²)		60%		20%		80%		(m ³ /s)		%	
		431353		7555674						1		RB veg		1.95		0.00		0.0		0.01		0						0.000		0.0	
Weather Conditions		sunny 5 d C				2		gravel		2.00		0.24		0.1		0.01		0.06										0.001		1.0	
Transducer Information						3		gravel		2.05		0.24		0.0		0.01		0.07										0.001		1.2	
DL Model		PT2X		PT Serial #		21019100		4		gravel		2.10		0.25		0.1		0.01		0.46								0.006		7.9	
Gain		1.020166		Offset		0.004		5		gravel		2.15		0.25		0.0		0.01		0.58								0.007		9.9	
Status		Active		Battery		3.4		6		gravel		2.20		0.26		0.1		0.01		0.59								0.008		10.5	
# of Records		13678		Memory Free		248099		7		gravel		2.25		0.26		0.0		0.01		0.55								0.007		9.8	
Date Serviced				Crest Gauges				8		gravel		2.30		0.25		0.0		0.01		0.53								0.007		9.1	
Hydrometric Leveling Survey						9		gravel		2.35		0.25		0.1		0.01		0.5										0.006		8.6	
Stn	BS	HI	FS	Elevation	Notes	10		gravel		2.40		0.24		0.0		0.01		0.46										0.006		7.6	
BM 24	0.385	100.385		100.000	Started at 15:23	11		gravel		2.45		0.23		0.1		0.01		0.44										0.005		6.9	
BM 23			0.730	99.655		12		gravel		2.50		0.23		0.0		0.01		0.41										0.005		6.5	
TP 1	1.239	98.281	3.343	97.042	turning point	13		gravel		2.55		0.21		0.0		0.01		0.37										0.004		5.3	
WL			3.260	95.021		14		gravel		2.60		0.21		0.1		0.01		0.32										0.003		4.6	
BM 45			2.701	95.580		15		gravel		2.65		0.21		0.0		0.01		0.29										0.003		4.2	
						16		gravel		2.70		0.21		0.1		0.01		0.24										0.003		3.5	
TBM	1.167	98.177	1.271	97.010		17		gravel		2.75		0.20		0.0		0.01		0.16										0.002		2.2	
						18		gravel		2.80		0.20		0.0		0.01		0.11										0.001		1.2	
BM 45			2.599	95.578		19		gravel		2.83		0.20		0.0		0.01		0.04										0.000		0.3	
WL			3.156	95.021		20		LB veg		2.85		0.00		0.0		0.00		0										0.000		0.0	
TP 2	3.409	100.453	1.133	97.044																											
BM 24			0.455	99.998																											
BM 23			0.801	99.652																											
BM#	Established Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes																										
BM 24	100	99.999		-0.001																											
BM 23	99.656	99.654		-0.002																											
BM 45	95.617	95.579		-0.038		Total Q																						0.073	100.0		
Summary						General Notes																									
Staff Gauge Reading (m)		0.000				Demobilized																									
Stage from WL Survey (m)		95.021																													
Pressure Transducer Reading (m)		0.498		95.008																											
Pressure Transducer Elevation (m)		94.523		94.510																											
Discharge (m3/s)		0.1																													
Cross Sectional Area		0.206																													
Average Velocity		0.355																													

Appendix B-5. Stage and Discharge Measurement at Station Doris Lake - July 26, 2014

Site Information					General Notes
Project Name	Hope Bay				Station placed directly west of the permanent station.
Station Identification	Doris Lake				
Stream Name	Doris Lake				
Date Monitored	26-Jul-14				
Time at Site (24 hr)	Start Time:	11:00:00 AM	End Time:	1:15:00 PM	
Personnel	H. Buehler, L. Wingnek				
Station Coordinates	Easting	433514	Northing	7558460	
			Elevation		
Weather Conditions	overcast, fog, low ceiling				
Transducer Information					
DL Model	PT2X	PT Serial #	2922011		
Gain	0.991596	Offset	0.014		
Status	Active	Battery	3.4		
# of Records	1	Memory Free	130704		
Date Serviced		Crest Gauges			
Hydrometric Leveling Survey					
Stn	BS	HI	FS	Elevation	Notes
BM 70	0.907	100.907		100.000	Started at 13:29
BM 71			1.667	99.240	
BM 72			2.360	98.547	
WL			2.721	98.186	WL at 0.5993
PT				100.907	
TBM			2.590	98.317	
TBM	2.521	100.838		98.317	
BM 70			0.837	100.001	
BM 71			1.598	99.240	
BM 72			2.290	98.548	
WL			2.650	98.188	
PT				100.838	
BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes	
BM 70	100	100.001	0.000		
BM 71	99.242	99.240	-0.002		
BM 72	98.55	98.548	-0.003		
Summary					
Stage from WL Survey (m)			98.187		
Pressure Transducer Reading (m)			0.600		
Pressure Transducer Elevation (m)			97.587		

Appendix B-5. Stage and Discharge Measurement at Station Doris Lake - August 21, 2014

Site Information					General Notes	
Project Name		Hope Bay				
Station Identification		Doris Lake				
Stream Name		Doris Lake				
Date Monitored		21-Aug-14				
Time at Site (24 hr)		Start Time:	1:20:00 PM	End Time:		2:40:00 PM
Personnel		H. Buehler, P. House				
Station Coordinates		Easting	Northing	Elevation		
		433514	7558460			
Weather Conditions		Sunny 7 d C light breeze				
Transducer Information						
DL Model		PT2X	PT Serial #	2922011		
Gain		0.991596	Offset	0.014		
Status		Active	Battery	3.4		
# of Records		3747	Memory Free	126958		
Date Serviced			Crest Gauges			
Hydrometric Leveling Survey						
Stn	BS	HI	FS	Elevation	Notes	
BM 70	0.828	100.828		100.000	Started at 1:50	
BM 72			2.278	98.550		
BM 71			1.585	99.243		
WL 1			2.772	98.056	WL @ 0.5043 m	
WL 2			2.769	98.059		
TBM			2.290	98.538		
TBM	2.245	100.783		98.538		
BM 70			0.784	99.999		
BM 72			2.233	98.550		
BM 71			1.540	99.243		
WL 1			2.723	98.060		
WL 2			2.726	98.057		
BM#	Established Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes	
BM 70	100	100.000		-0.001		
BM 72	98.55	98.550		0.000		
BM 71	99.242	99.243		0.001		
Summary						
Stage from WL Survey (m)			98.058			
Pressure Transducer Reading (m)			0.504			
Pressure Transducer Elevation (m)			97.554			

Appendix B-5. Stage and Discharge Measurement at Station Doris Lake - September, 2014

Site Information					General Notes
Project Name	Hope Bay				PT2X station demobilized. Data downloaded from permanent sensor but lost connectivity multiple times throughout data download.
Station Identification	Doris Lake				
Stream Name	Doris Lake				
Date Monitored	Sept 18 2014				
Time at Site (24 hr)	Start Time:	2:05:00 PM	End Time:	2:45:00 PM	
Personnel	H. Buehler, C. Bolt				
Station Coordinates	Easting	433514	Northing	7558460	
Weather Conditions	snow 0 d C				
Transducer Information					
DL Model	PT2X	PT Serial #	2922011		
Gain	0.991596	Offset	0.014		
Status	Active	Battery	3.3		
# of Records	7780	Memory Free	122925		
Date Serviced		Crest Gauges			
Hydrometric Leveling Survey					
Stn	BS	HI	FS	Elevation	Notes
BM 70	0.918	100.918		100.000	Started at 14:20
BM 71			1.677	99.241	
BM 72			2.370	98.548	
WL			2.911	98.007	
WL2			2.900	98.018	
TBM			2.547	98.371	
TBM	2.549	100.920		98.371	
BM 70			0.917	100.003	
BM 71			1.675	99.245	
BM 72			2.369	98.551	
WL			2.910	98.010	
WL2			2.896	98.024	
BM#	Established Elevation (m)	Mean Elevation (this date) (m)	Difference (m)	Notes	
BM 70	100	100.002	0.002		
BM 71	99.242	99.243	0.001		
BM 72	98.55	98.550	0.000		
Summary					
Stage from WL Survey (m)			98.015		
Pressure Transducer Reading (m)			0.467		
Pressure Transducer Elevation (m)			97.547		

[illegible]

Appendix B-6. Stage Measurement at Station Tailings Impoundment Area - September 18, 2014

Site Information						General Notes
Project Name		Hope Bay				
Station Identification		TIA				
Stream Name		TIA				
Date Monitored		20-Aug-14				
Time at Site (24 hr)		Start Time:	3:20:00 PM	End Time:	5:00:00 PM	
Personnel		H. Buehler, P. House				
Station Coordinates		Easting	434832	Northing	7558560	
Weather Conditions		sunny, light breeze, 6 d C				
Transducer Information						
DL Model		PT2X	PT Serial #	2922020		
Gain		1.006475	Offset	-0.006		
Status		Active	Battery	3.4		
# of Records		3594	Memory Free	127111		
Date Serviced			Crest Gauges			
Hydrometric Leveling Survey						
Stn	BS	HI	FS	Elevation	Notes	
BM 80	0.214	100.214		100.000	Started at 17:00	
BM 82			2.041	98.173		
BM 81			2.736	97.478		
TP 1	2.528	98.101	4.641	95.573	turning point	
WL1			4.248	93.853	93.855	
WL2			4.247	93.854		
TBM	2.542	98.104	2.539	95.562		
WL1			4.246	93.858		
WL2			4.249	93.855		
BM81	2.835	100.315	0.624	97.480	turning point	
BM 80			0.313	100.002		
BM 82			2.14	98.175		
BM#	Established Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes	
BM 80	100	100.001		0.001		
BM 82	98.173	98.174		0.001		
BM 81	97.48	97.478		-0.002		
Summary						
Stage from WL Survey (m)				95.573		
Pressure Transducer Reading (m)				0.669		
Pressure Transducer Elevation (m)				94.904		

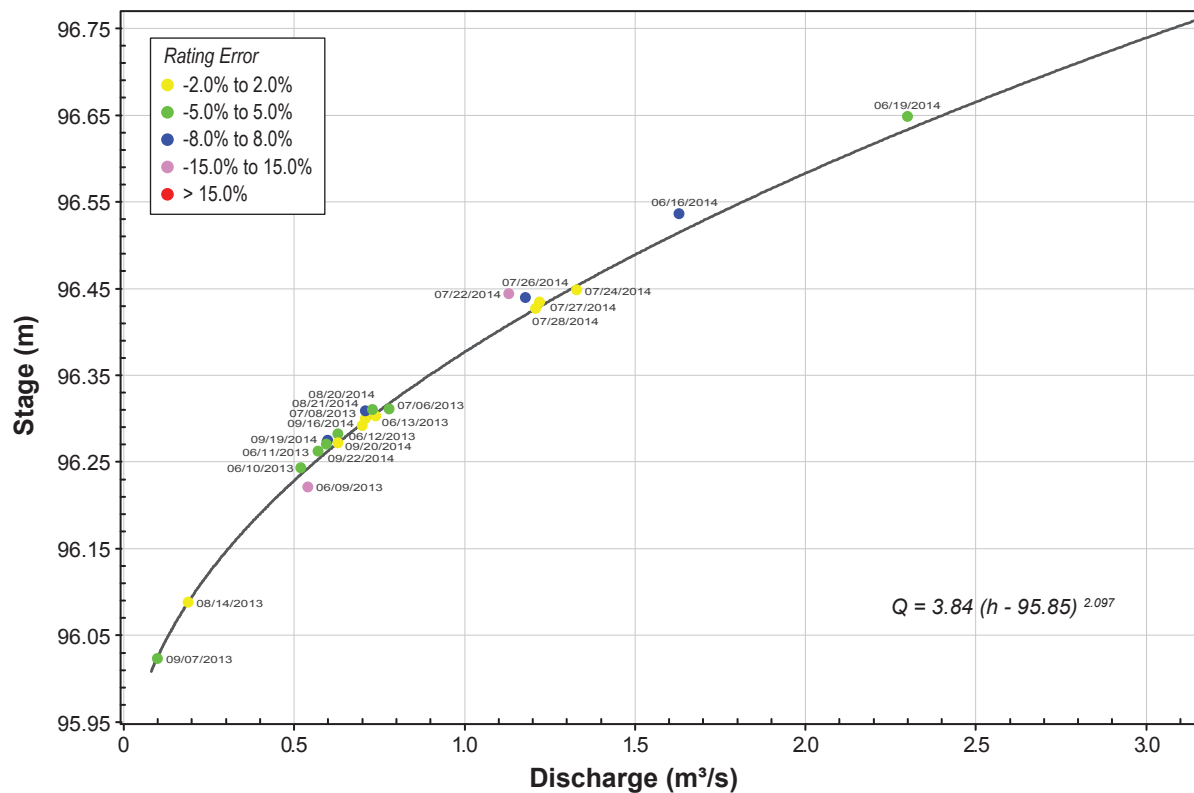
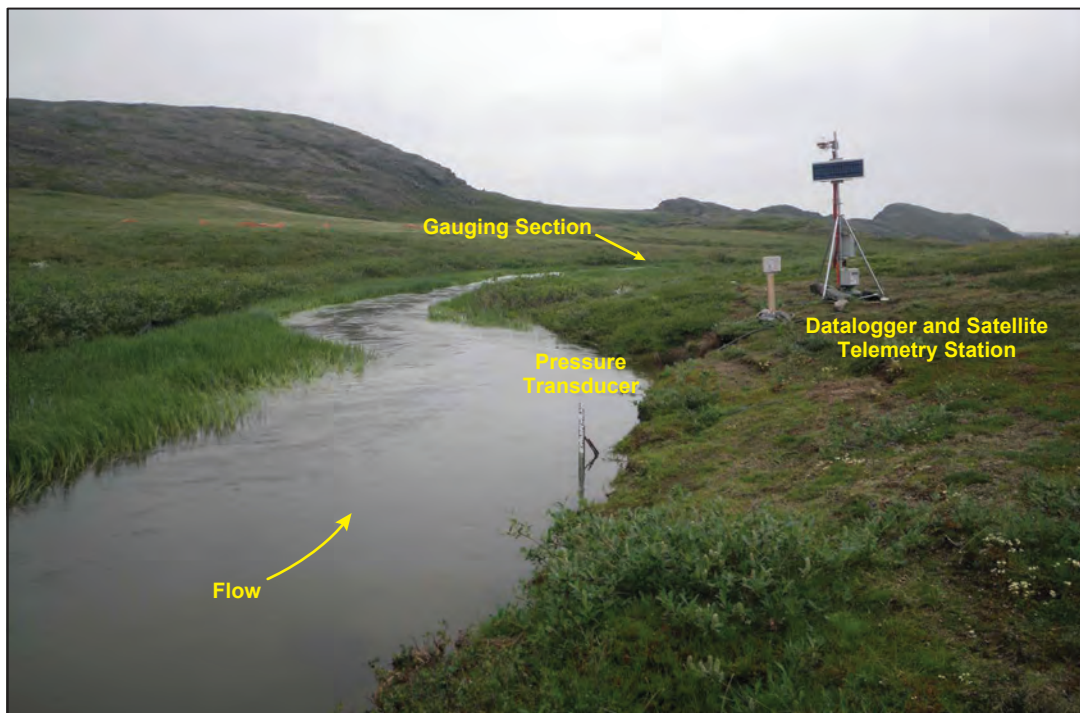
Site Information					General Notes
Project Name	Hope Bay				
Station Identification	TIA				
Stream Name	TIA				
Date Monitored	Sept 18 2014				
Time at Site (24 hr)	Start Time:	12:20:00 PM	End Time:	2:05:00 PM	
Personnel	H. Buehler, C. Bolt				
Station Coordinates	Easting	Northing	Elevation		
	434832	7558560			
Weather Conditions	Snow 0 d C				
Transducer Information					
DL Model		PT Serial #			
Gain		Offset			
Status	Active	Battery		3.3	
# of Records	7744	Memory Free		122961	
Date Serviced		Crest Gauges			
Hydrometric Leveling Survey					
Stn	BS	HI	FS	Elevation	Notes
BM 80	0.605	100.605		100.000	started at 12:40
BM 82			2.432	98.173	
BM 81	0.703	98.180	3.128	97.477	turning point
WL			4.405	93.775	
WL2			4.403	93.777	
TBM	3.199	98.176	3.203	94.977	
WL2			4.399	93.777	
WL1			4.398	93.778	
BM 81	3.043	100.521	0.698	97.478	turning point
BM 82			2.347	98.174	
BM 80			0.521	100.000	
BM#	Established Elevation (m)	Mean Elevation (this date) (m)		Difference (m)	Notes
BM 80	100	100.000		0.000	
BM 82	98.173	98.174		0.001	
BM 81	97.48	97.478		-0.002	
Summary					
Stage from WL Survey (m)		93.777			
Pressure Transducer Reading (m)		0.605			
Pressure Transducer Elevation (m)		93.172			

– Appendix C –

Rating Curves

Appendix C-1

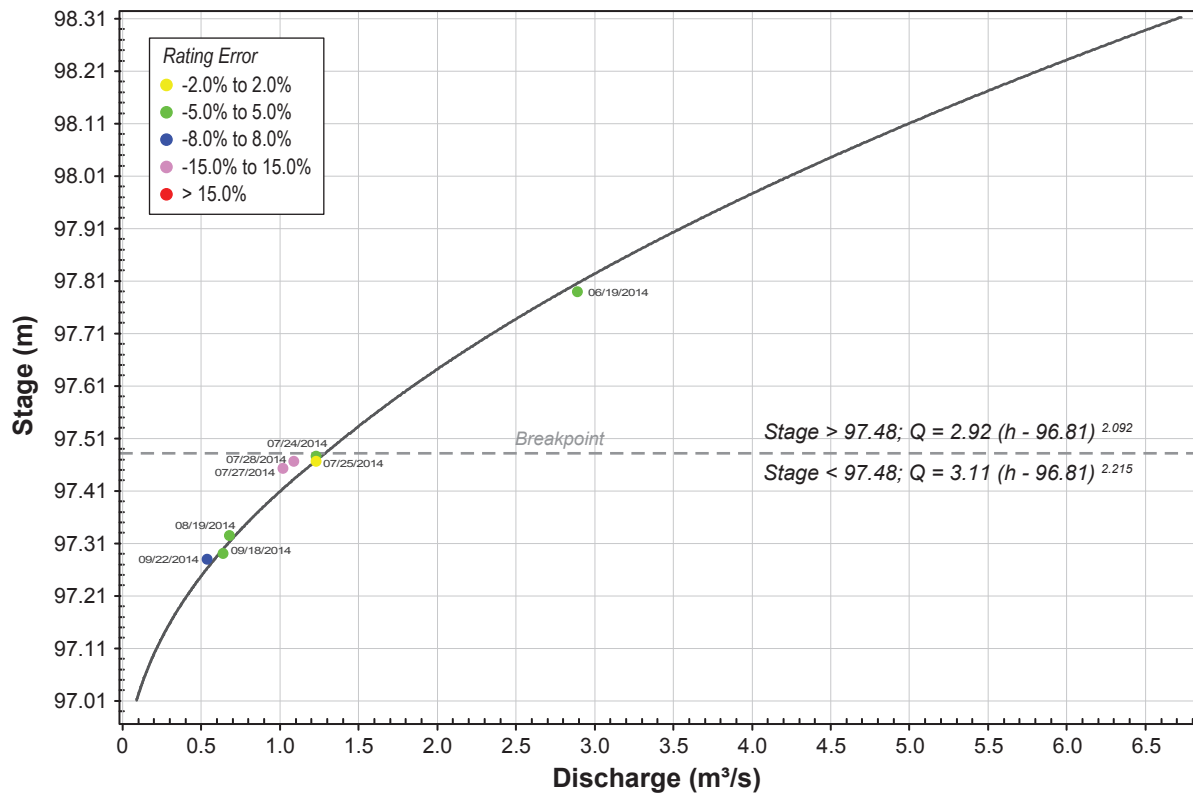
TL-2 Stage-Discharge Rating Curve



Notes: Rating period from June 10, 2013 to September 22, 2014.
Pressure transducer stage readings are referenced to local (non-geodetic) datum.

Appendix C-2

TL-3 Stage-Discharge Rating Curve

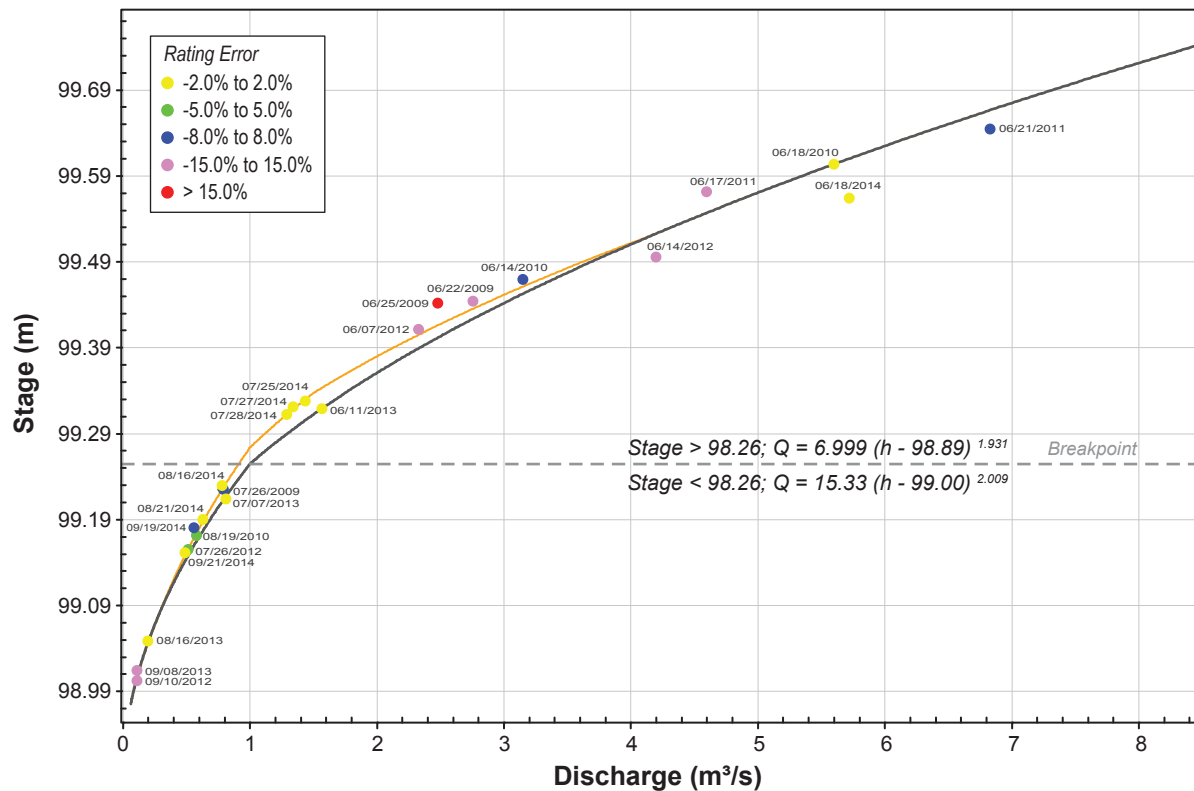


Notes: Rating period from June 19, 2013 to September 22, 2014.
Pressure transducer stage readings are referenced to local (non-geodetic) datum.

Appendix C-3

Roberts Hydro

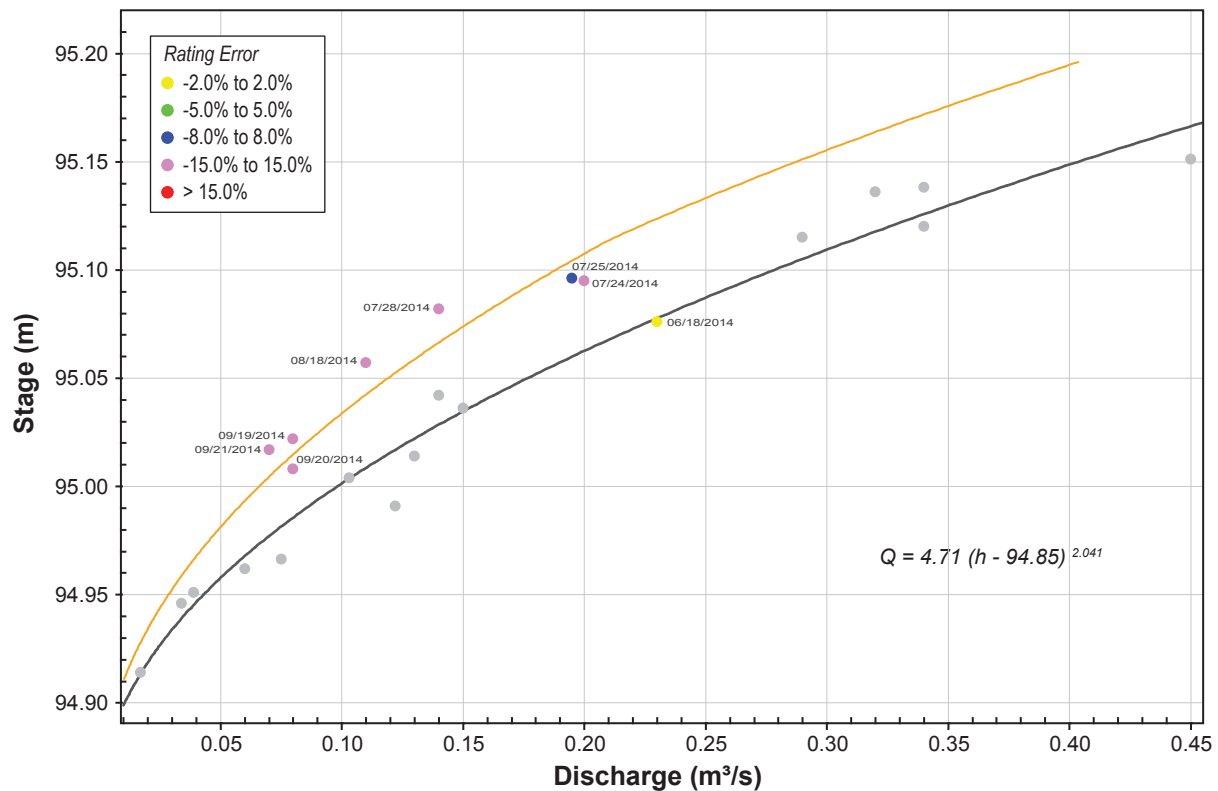
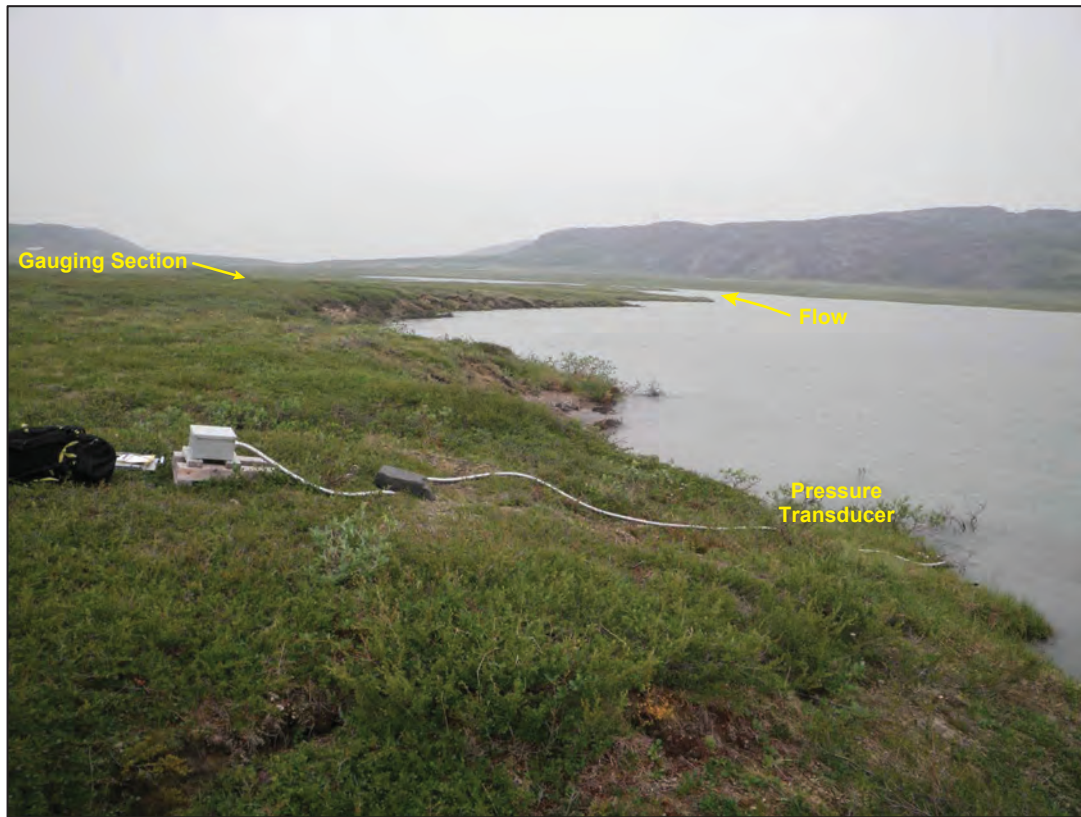
Stage-Discharge Rating Curve



Appendix C-4

Windy Hydro

Stage-Discharge Rating Curve



Notes: Rating period from June 18, 2014 to September 21, 2014.
 Pressure transducer stage readings are referenced to local (non-geodetic) datum.
 Orange line indicates shifted rating.
 Grey points indicate historic rating measurements.

– Appendix D –

Mean Daily Discharge Tables

Appendix D-1. Summary of Daily Mean Discharge

Summary of Daily Discharge [Q, m³/s] at Hydrometric Station TL-2, 2014

Drainage Area = 94.6 km²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.000	0.000	0.000	0.000	0.000	0.002	1.778	1.188	0.557	0.338	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000	0.003	1.717	1.174	0.553	0.307	0.000	0.000
3	0.000	0.000	0.000	0.000	0.000	0.004	1.655	1.178	0.560	0.276	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.007	1.604	1.174	0.563	0.246	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000	0.012	1.552	1.153	0.585	0.215	0.000	0.000
6	0.000	0.000	0.000	0.000	0.000	0.019	1.508	1.131	0.611	0.184	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000	0.031	1.465	1.107	0.618	0.154	0.000	0.000
8	0.000	0.000	0.000	0.000	0.000	0.051	1.425	1.080	0.632	0.123	0.000	0.000
9	0.000	0.000	0.000	0.000	0.000	0.083	1.384	1.058	0.640	0.092	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000	0.136	1.343	1.029	0.645	0.061	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000	0.222	1.299	1.000	0.656	0.031	0.000	0.000
12	0.000	0.000	0.000	0.000	0.000	0.363	1.265	0.972	0.652	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000	0.593	1.267	0.940	0.653	0.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000	0.969	1.197	0.910	0.640	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000	1.584	1.158	0.887	0.636	0.000	0.000	0.000
16	0.000	0.000	0.000	0.000	0.000	1.767	1.132	0.860	0.638	0.000	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000	1.959	1.104	0.811	0.644	0.000	0.000	0.000
18	0.000	0.000	0.000	0.000	0.000	2.179	1.156	0.791	0.632	0.000	0.000	0.000
19	0.000	0.000	0.000	0.000	0.000	2.319	1.245	0.768	0.631	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000	2.404	1.266	0.739	0.618	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000	2.412	1.283	0.716	0.616	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000	2.382	1.289	0.694	0.614	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000	2.327	1.291	0.681	0.583	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000	2.258	1.294	0.658	0.553	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000	2.189	1.276	0.643	0.522	0.000	0.000	0.000
26	0.000	0.000	0.000	0.000	0.000	2.117	1.255	0.641	0.491	0.000	0.000	0.000
27	0.000	0.000	0.000	0.000	0.000	2.029	1.226	0.623	0.461	0.000	0.000	0.000
28	0.000	0.000	0.000	0.000	0.000	1.974	1.212	0.598	0.430	0.000	0.000	0.000
29	0.000		0.000	0.000	0.000	1.917	1.194	0.588	0.399	0.000	0.000	0.000
30	0.000		0.000	0.000	0.000	1.846	1.172	0.580	0.369	0.000	0.000	0.000
31	0.000		0.000		0.001		1.186	0.568		0.000		0.000
Mean	0.000	0.000	0.000	0.000	0.000	1.205	1.329	0.869	0.580	0.065	0.000	0.000
Max	0.000	0.000	0.000	0.000	0.001	2.412	1.778	1.188	0.656	0.338	0.000	0.000
Min	0.000	0.000	0.000	0.000	0.000	0.002	1.104	0.568	0.369	0.000	0.000	0.000
Total	0.000	0.000	0.000	0.000	0.001	36.158	41.199	26.939	17.402	2.027	0.000	0.000

Note: Estimated and modelled values are italicized

Monitoring period is from June 15 to September 22

Appendix D-2. Summary of Daily Mean Discharge

Summary of Daily Discharge [Q, m³/s] at Hydrometric Station TL-3, 2014

Drainage Area = 95.3 km²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.000	0.000	0.000	0.000	0.000	0.000	2.202	1.213	0.525	0.331	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000	0.000	2.097	1.214	0.517	0.540	0.000	0.000
3	0.000	0.000	0.000	0.000	0.000	0.000	2.006	1.190	0.514	0.510	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.001	1.904	1.195	0.523	0.480	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000	0.001	1.800	1.190	0.534	0.450	0.000	0.000
6	0.000	0.000	0.000	0.000	0.000	0.002	1.678	1.167	0.564	0.421	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000	0.004	1.623	1.141	0.597	0.391	0.000	0.000
8	0.000	0.000	0.000	0.000	0.000	0.006	1.537	1.116	0.607	0.361	0.000	0.000
9	0.000	0.000	0.000	0.000	0.000	0.010	1.459	1.086	0.618	0.331	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000	0.017	1.388	1.064	0.624	0.301	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000	0.029	1.331	1.032	0.621	0.272	0.000	0.000
12	0.000	0.000	0.000	0.000	0.000	0.048	1.256	1.001	0.632	0.242	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000	0.080	1.207	0.972	0.627	0.212	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000	0.134	1.224	0.937	0.627	0.182	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000	1.584	1.143	0.902	0.615	0.152	0.000	0.000
16	0.000	0.000	0.000	0.000	0.000	1.767	1.104	0.874	0.610	0.123	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000	1.959	1.083	0.848	0.614	0.000	0.000	0.000
18	0.000	0.000	0.000	0.000	0.000	2.179	1.056	0.790	0.621	0.000	0.000	0.000
19	0.000	0.000	0.000	0.000	0.000	2.319	1.146	0.765	0.608	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000	2.805	1.205	0.742	0.608	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000	2.931	1.270	0.709	0.600	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000	2.939	1.286	0.682	0.595	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000	2.912	1.292	0.659	0.581	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000	2.858	1.296	0.647	0.540	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000	2.786	1.296	0.624	0.510	0.000	0.000	0.000
26	0.000	0.000	0.000	0.000	0.000	2.696	1.281	0.609	0.480	0.000	0.000	0.000
27	0.000	0.000	0.000	0.000	0.000	2.595	1.264	0.604	0.450	0.000	0.000	0.000
28	0.000	0.000	0.000	0.000	0.000	2.473	1.237	0.584	0.421	0.000	0.000	0.000
29	0.000		0.000	0.000	0.000	2.401	1.225	0.555	0.391	0.000	0.000	0.000
30	0.000		0.000	0.000	0.000	2.311	1.208	0.550	0.361	0.000	0.000	0.000
31	0.000		0.000		0.000		1.186	0.540		0.000		0.000
Mean	0.000	0.000	0.000	0.000	0.000	1.328	1.397	0.878	0.558	0.171	0.000	0.000
Max	0.000	0.000	0.000	0.000	0.000	2.939	2.202	1.214	0.632	0.540	0.000	0.000
Min	0.000	0.000	0.000	0.000	0.000	0.000	1.056	0.540	0.361	0.000	0.000	0.000
Total	0.000	0.000	0.000	0.000	0.000	39.847	43.293	27.203	16.733	5.298	0.000	0.000

Note: Estimated and modelled values are italicized

Monitoring period is from June 20 to September 23, 2014

Appendix D-3. Summary of Daily Mean Discharge

Summary of Daily Discharge [Q, m³/s] at Hydrometric Station Roberts Hydro, 2014

Drainage Area = 94.6 km²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.000	0.000	0.000	0.000	0.000	0.000	2.367	1.282	0.450	0.188	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000	0.000	2.251	1.286	0.459	0.156	0.000	0.000
3	0.000	0.000	0.000	0.000	0.000	0.000	2.105	1.302	0.486	0.124	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	1.957	1.313	0.516	0.093	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000	0.000	1.818	1.305	0.581	0.061	0.000	0.000
6	0.000	0.000	0.000	0.000	0.000	0.001	1.699	1.273	0.690	0.000	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000	0.001	1.593	1.233	0.787	0.000	0.000	0.000
8	0.000	0.000	0.000	0.000	0.000	0.003	1.493	1.173	0.840	0.000	0.000	0.000
9	0.000	0.000	0.000	0.000	0.000	0.005	1.398	1.120	0.850	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000	0.011	1.304	1.055	0.849	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000	0.022	1.218	0.992	0.834	0.000	0.000	0.000
12	0.000	0.000	0.000	0.000	0.000	0.044	1.141	0.953	0.792	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000	0.088	1.071	0.921	0.764	0.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000	0.176	1.028	0.875	0.728	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000	0.354	1.000	0.838	0.690	0.000	0.000	0.000
16	0.000	0.000	0.000	0.000	0.000	0.713	0.968	0.810	0.654	0.000	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000	1.433	0.964	0.765	0.629	0.000	0.000	0.000
18	0.000	0.000	0.000	0.000	0.000	5.792	1.017	0.728	0.600	0.000	0.000	0.000
19	0.000	0.000	0.000	0.000	0.000	6.220	1.267	0.699	0.571	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000	6.314	1.463	0.674	0.536	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000	6.017	1.582	0.642	0.517	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000	5.514	1.637	0.619	0.474	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000	4.960	1.607	0.597	0.442	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000	4.476	1.547	0.574	0.411	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000	4.072	1.491	0.563	0.379	0.000	0.000	0.000
26	0.000	0.000	0.000	0.000	0.000	3.728	1.442	0.550	0.347	0.000	0.000	0.000
27	0.000	0.000	0.000	0.000	0.000	3.368	1.360	0.536	0.315	0.000	0.000	0.000
28	0.000	0.000	0.000	0.000	0.000	3.085	1.305	0.512	0.283	0.000	0.000	0.000
29	0.000		0.000	0.000	0.000	2.790	1.251	0.497	0.252	0.000	0.000	0.000
30	0.000		0.000	0.000	0.000	2.525	1.212	0.484	0.220	0.000	0.000	0.000
31	0.000		0.000		0.000		1.255	0.467		0.000		0.000
Mean	0.000	0.000	0.000	0.000	0.000	2.057	1.446	0.859	0.565	0.020	0.000	0.000
Max	0.000	0.000	0.000	0.000	0.000	6.314	2.367	1.313	0.850	0.188	0.000	0.000
Min	0.000	0.000	0.000	0.000	0.000	0.000	0.964	0.467	0.220	0.000	0.000	0.000
Total	0.000	0.000	0.000	0.000	0.000	61.711	44.812	26.637	16.945	0.622	0.000	0.000

Note: Estimated and modelled values are italicized

Monitoring period is from June 18 to September 21, 2014

Appendix D-4. Summary of Daily Mean Discharge

Summary of Daily Discharge [Q, m³/s] at Hydrometric Station Windy Hydro, 2014

Drainage Area = 14.1 km²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.000	0.000	0.000	0.000	0.000	0.001	0.198	0.187	0.095	0.043	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000	0.002	0.194	0.186	0.097	0.040	0.000	0.000
3	0.000	0.000	0.000	0.000	0.000	0.002	0.190	0.191	0.101	0.038	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.003	0.185	0.193	0.104	0.035	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000	0.004	0.181	0.190	0.111	0.032	0.000	0.000
6	0.000	0.000	0.000	0.000	0.000	0.006	0.178	0.187	0.115	0.029	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000	0.008	0.173	0.182	0.116	0.026	0.000	0.000
8	0.000	0.000	0.000	0.000	0.000	0.011	0.169	0.175	0.115	0.024	0.000	0.000
9	0.000	0.000	0.000	0.000	0.000	0.015	0.165	0.172	0.111	0.021	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000	0.020	0.161	0.167	0.110	0.018	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000	0.027	0.156	0.161	0.107	0.015	0.000	0.000
12	0.000	0.000	0.000	0.000	0.000	0.036	0.152	0.157	0.103	0.012	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000	0.049	0.153	0.154	0.099	0.009	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000	0.066	0.153	0.150	0.093	0.007	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000	0.089	0.150	0.145	0.086	0.004	0.000	0.000
16	0.000	0.000	0.000	0.000	0.000	0.120	0.150	0.142	0.083	0.001	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000	0.161	0.156	0.133	0.083	0.000	0.000	0.000
18	0.000	0.000	0.000	0.000	0.000	0.217	0.158	0.128	0.078	0.000	0.000	0.000
19	0.000	0.000	0.000	0.000	0.000	0.235	0.166	0.125	0.076	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000	0.237	0.169	0.120	0.073	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000	0.236	0.169	0.116	0.072	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000	0.235	0.168	0.112	0.068	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000	0.232	0.170	0.110	0.066	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000	0.227	0.168	0.107	0.063	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000	0.224	0.164	0.108	0.060	0.000	0.000	0.000
26	0.000	0.000	0.000	0.000	0.000	0.218	0.168	0.110	0.057	0.000	0.000	0.000
27	0.000	0.000	0.000	0.000	0.000	0.209	0.166	0.108	0.054	0.000	0.000	0.000
28	0.000	0.000	0.000	0.000	0.000	0.208	0.168	0.104	0.052	0.000	0.000	0.000
29	0.000		0.000	0.000	0.000	0.204	0.167	0.101	0.049	0.000	0.000	0.000
30	0.000		0.000	0.000	0.000	0.201	0.169	0.100	0.046	0.000	0.000	0.000
31	0.000		0.000		0.001		0.184	0.097		0.000		0.000
Mean	0.000	0.000	0.000	0.000	0.000	0.117	0.168	0.143	0.085	0.011	0.000	0.000
Max	0.000	0.000	0.000	0.000	0.001	0.237	0.198	0.193	0.116	0.043	0.000	0.000
Min	0.000	0.000	0.000	0.000	0.000	0.001	0.150	0.097	0.046	0.000	0.000	0.000
Total	0.000	0.000	0.000	0.000	0.001	3.502	5.219	4.421	2.544	0.354	0.000	0.000

Note: Estimated and modelled values are italicized

Monitoring period is from June 18 to September 21, 2014

– Appendix E –

Lake Water Level Tables

Appendix E-1. Mean Daily Water Levels [m] at Windy Lake, 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	-	-	-	-	-	95.112	95.101	95.035	-	-	-
2	-	-	-	-	-	-	95.110	95.104	95.033	-	-	-
3	-	-	-	-	-	-	95.108	95.103	95.035	-	-	-
4	-	-	-	-	-	-	95.105	95.106	95.039	-	-	-
5	-	-	-	-	-	-	95.102	95.107	95.042	-	-	-
6	-	-	-	-	-	-	95.099	95.105	95.047	-	-	-
7	-	-	-	-	-	-	95.097	95.104	95.051	-	-	-
8	-	-	-	-	-	-	95.094	95.100	95.051	-	-	-
9	-	-	-	-	-	-	95.091	95.095	95.051	-	-	-
10	-	-	-	-	-	-	95.089	95.093	95.047	-	-	-
11	-	-	-	-	-	-	95.085	95.090	95.046	-	-	-
12	-	-	-	-	-	-	95.082	95.086	95.044	-	-	-
13	-	-	-	-	-	-	95.080	95.083	95.040	-	-	-
14	-	-	-	-	-	-	95.080	95.081	95.037	-	-	-
15	-	-	-	-	-	-	95.080	95.078	95.031	-	-	-
16	-	-	-	-	-	-	95.078	95.075	95.025	-	-	-
17	-	-	-	-	-	-	95.078	95.072	95.022	-	-	-
18	-	-	-	-	-	-	95.082	95.065	95.022	-	-	-
19	-	-	-	-	-	95.076	95.084	95.062	95.017	-	-	-
20	-	-	-	-	-	95.083	95.089	95.059	95.015	-	-	-
21	-	-	-	-	-	95.088	95.092	95.055	95.012	-	-	-
22	-	-	-	-	-	95.093	95.091	95.051	95.010	-	-	-
23	-	-	-	-	-	95.098	95.091	95.048	-	-	-	-
24	-	-	-	-	-	95.101	95.092	95.046	-	-	-	-
25	-	-	-	-	-	95.104	95.091	95.044	-	-	-	-
26	-	-	-	-	-	95.106	95.088	95.044	-	-	-	-
27	-	-	-	-	-	95.108	95.091	95.047	-	-	-	-
28	-	-	-	-	-	95.107	95.089	95.045	-	-	-	-
29	-	-	-	-	-	95.112	95.090	95.042	-	-	-	-
30	-	-	-	-	-	95.114	95.090	95.039	-	-	-	-
31	-	-	-	-	-	-	95.091	95.037	-	-	-	-
Mean	-	-	-	-	-	95.099	95.091	95.073	95.034	-	-	-
Max	0.000	0.000	0.000	0.000	0.000	95.114	95.112	95.107	95.051	0.000	0.000	0.000
Min	0.000	0.000	0.000	0.000	0.000	95.076	95.078	95.037	95.010	0.000	0.000	0.000
Total	0.000	0.000	0.000	0.000	0.000	1141.190	2947.821	2947.267	2090.754	0.000	0.000	0.000

Appendix E-2. Mean Daily Water Levels [m] at Doris Lake, 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	-	-	-	-	-	-	98.180	98.028	-	-	-
2	-	-	-	-	-	-	-	98.176	98.028	-	-	-
3	-	-	-	-	-	-	-	98.176	98.029	-	-	-
4	-	-	-	-	-	-	-	98.177	98.031	-	-	-
5	-	-	-	-	-	-	-	98.174	98.040	-	-	-
6	-	-	-	-	-	-	-	98.169	98.047	-	-	-
7	-	-	-	-	-	-	-	98.164	98.051	-	-	-
8	-	-	-	-	-	-	-	98.158	98.054	-	-	-
9	-	-	-	-	-	-	-	98.152	98.057	-	-	-
10	-	-	-	-	-	-	-	98.145	98.059	-	-	-
11	-	-	-	-	-	-	-	98.137	98.060	-	-	-
12	-	-	-	-	-	-	-	98.129	98.060	-	-	-
13	-	-	-	-	-	-	-	98.122	98.060	-	-	-
14	-	-	-	-	-	-	-	98.114	98.056	-	-	-
15	-	-	-	-	-	-	-	98.107	98.054	-	-	-
16	-	-	-	-	-	-	-	98.105	98.053	-	-	-
17	-	-	-	-	-	-	-	98.118	98.052	-	-	-
18	-	-	-	-	-	-	-	98.113	98.052	-	-	-
19	-	-	-	-	-	-	-	98.106	98.049	-	-	-
20	-	-	-	-	-	-	-	98.097	98.046	-	-	-
21	-	-	-	-	-	-	-	98.089	98.045	-	-	-
22	-	-	-	-	-	-	-	98.081	-	-	-	-
23	-	-	-	-	-	-	-	98.075	-	-	-	-
24	-	-	-	-	-	-	-	98.068	-	-	-	-
25	-	-	-	-	-	-	-	98.062	-	-	-	-
26	-	-	-	-	-	-	98.188	98.061	-	-	-	-
27	-	-	-	-	-	-	98.184	98.056	-	-	-	-
28	-	-	-	-	-	-	98.182	98.048	-	-	-	-
29	-	-	-	-	-	-	98.177	98.043	-	-	-	-
30	-	-	-	-	-	-	98.173	98.038	-	-	-	-
31	-	-	-	-	-	-	98.179	98.033	-	-	-	-
Mean	-	-	-	-	-	-	98.181	98.112	98.048	-	-	-
Max	0.000	0.000	0.000	0.000	0.000	0.000	98.188	98.180	98.060	0.000	0.000	0.000
Min	0.000	0.000	0.000	0.000	0.000	0.000	98.173	98.033	98.028	0.000	0.000	0.000
Total	0.000	0.000	0.000	0.000	0.000	0.000	589.084	3041.473	2059.008	0.000	0.000	0.000

Data dolphin pressure transducer malfunctioned. Data from January 1 to July 26 was removed. A secondary transducer was installed.

Stage data values are based on a secondary transducer installed July 26, 2014 and removed September 21, 2014.

Appendix E-3. Mean Daily Water Levels [m] at Tailings Impoundment Area, 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	-	-	93.940	93.947	94.056	94.164	94.003	93.816	-	-	-
2	-	-	-	93.940	93.949	94.057	94.157	93.998	93.817	-	-	-
3	-	-	-	93.939	93.949	94.058	94.149	93.998	93.820	-	-	-
4	-	-	-	93.939	93.949	94.062	94.141	93.996	93.823	-	-	-
5	-	-	-	93.939	93.949	94.062	94.135	94.001	93.835	-	-	-
6	-	-	-	93.938	93.949	94.062	94.129	93.995	93.844	-	-	-
7	-	-	-	93.938	93.948	94.062	94.120	93.987	93.850	-	-	-
8	-	-	-	93.936	93.947	94.066	94.111	93.977	93.851	-	-	-
9	-	-	-	93.935	93.944	94.076	94.102	93.969	93.851	-	-	-
10	-	-	-	93.935	93.944	94.090	94.093	93.960	93.848	-	-	-
11	-	-	-	93.935	93.946	94.100	94.085	93.950	93.845	-	-	-
12	-	-	-	93.936	93.947	94.108	94.077	93.941	93.841	-	-	-
13	-	-	-	93.937	93.947	94.121	94.070	93.933	93.835	-	-	-
14	-	-	-	93.935	93.941	94.134	94.058	93.923	93.828	-	-	-
15	-	-	-	93.939	93.941	94.145	94.049	93.914	93.822	-	-	-
16	-	-	93.938	93.932	93.943	94.155	94.042	93.908	93.817	-	-	-
17	-	-	93.937	93.932	93.943	94.170	94.038	93.896	93.812	-	-	-
18	-	-	93.936	93.934	93.942	94.197	94.050	93.888	93.811	-	-	-
19	-	-	93.940	93.931	93.944	94.212	94.064	93.882	-	-	-	-
20	-	-	93.942	93.934	93.944	94.217	94.064	93.876	-	-	-	-
21	-	-	93.940	93.938	93.944	94.215	94.059	93.870	-	-	-	-
22	-	-	93.937	93.937	93.943	94.210	94.053	93.863	-	-	-	-
23	-	-	93.944	93.943	93.942	94.205	94.045	93.857	-	-	-	-
24	-	-	93.942	93.944	93.946	94.200	94.038	93.852	-	-	-	-
25	-	-	93.938	93.943	93.959	94.196	94.032	93.848	-	-	-	-
26	-	-	93.939	93.943	93.958	94.191	94.025	93.847	-	-	-	-
27	-	-	93.939	93.938	93.959	94.184	94.017	93.842	-	-	-	-
28	-	-	93.940	93.937	93.966	94.184	94.012	93.835	-	-	-	-
29	-	-	93.941	93.935	93.995	94.179	94.005	93.830	-	-	-	-
30	-	-	93.941	93.938	94.040	94.172	93.999	93.826	-	-	-	-
31	-	-	93.940	-	94.053	-	94.006	93.821	-	-	-	-
Mean	-	-	93.940	93.937	93.956	94.138	94.071	93.912	93.831	-	-	-
Max	0.000	0.000	93.944	93.944	94.053	94.217	94.164	94.003	93.851	0.000	0.000	0.000
Min	0.000	0.000	93.936	93.931	93.941	94.056	93.999	93.821	93.811	0.000	0.000	0.000
Total	0.000	0.000	1503.034	2818.122	2912.621	2824.144	2916.187	2911.285	1688.966	0.000	0.000	0.000

A data gap exists from January 1 to March 15, 2014

The pressure transducer monitors data continuously; September 18 is the last day that ERM personnell were onsite to download data.