

Peace River Water Use Plan

Peace River Baseline TDGP/Temperature

GMSWORKS-2

Year 5 Monitoring Program – Final Report

January 2013 to December 2013

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May 16, 2014

PEACE RIVER WATER USE PLAN
IMPLEMENTATION PROGRAM

PEACE RIVER BASELINE TDGP/TEMPERATURE
GMSWorks-2
YEAR 5 MONITORING PROGRAM - INTERIM REPORT
January 2013 to December 2013

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EXECUTIVE SUMMARY

Long-term monitoring of baseline water temperature and total dissolved gas pressure (TDGP) in the vicinity of the WAC Bennett and Peace Canyon dams is an essential component of the Peace Spill Protocol and the Peace River Flood Pulse Plan as set out by the Peace Water Use Plan Committee and the Peace Water Use Plan (WUP; BC Hydro 2010). Data collected through the monitoring of these parameters will be used to help assess and quantify the environmental effects of spills, as well as to provide information on the temperature regime of the Peace River under normal operating conditions and the influence of reservoir operations on downstream temperature. Long-term baseline temperature data will also be available for use in other projects and monitoring programs within and outside of the Peace WUP. This report summarizes data collection and maintenance activities conducted at 18 monitoring sites located between the WAC Bennett Dam forebay (Williston Reservoir) and a point approximately 6.5 km downstream of the confluence of the Pine and Peace rivers during Year 5 (Jan 01, 2013 to Dec 31, 2013).

In situ reference temperatures were recorded at the time of each field download event using a certified laboratory-grade mercury thermometer calibrated in increments of 0.1°C, for comparison to the corresponding hourly logger readings. With the exception of 1 site (halfUP2), mean calibration errors for all temperature loggers were $\leq 0.3^\circ\text{C}$.

Results of Year 5 water temperature monitoring over the 132 km length of the study area indicate a moderating effect of hypolimnetic withdrawal from Williston Reservoir and seasonal effects associated with ambient air temperature. Minimum winter temperatures decrease and maximum summer temperatures increase with distance downstream from the facilities.

No significant logistical problems were encountered in Year 5. Short-term data gaps were observed at some stations immediately downstream of tributary mouths due to loggers becoming temporarily stranded near the waterline due to out-flowing ice and large woody debris. Data gaps were generally covered by functioning back-up loggers at these locations. One back-up logger (halfDN2BU) was lost and replaced when its tether cable was parted by large debris entering from the Halfway River during freshet.

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1.0 INTRODUCTION

Long-term monitoring of baseline water temperature and total dissolved gas pressure (TDGP) in the vicinity of the WAC Bennett and Peace Canyon dams has been identified as an essential component of the Peace Spill Protocol and the Peace River Flood Pulse Plan as set out by the Peace Water Use Plan Committee and the Peace Water Use Plan (WUP; BC Hydro 2010). Data collected through the monitoring of these parameters will be used to help assess and quantify the environmental effects of spills, as well as to provide information on the temperature regime of the Peace River under normal operating conditions and the influence of reservoir operations on downstream temperature. Long-term baseline temperature data will also be available for use by other projects and monitoring programs within and outside the Peace WUP.

The objectives of this program are to collect data on spatial and temporal variations in water temperature between the WAC Bennett Dam forebay (Williston Reservoir) and a point 6.5 km downstream of the Pine River confluence for up to 10 years, and to maintain TDGP data loggers and related equipment for immediate deployment in the event of a spill at either the Gordon M. Shrum (GMS) or Peace Canyon (PCN) generating stations. This report summarizes data collection activities completed during Year 5 of the monitoring program (January 01, 2013 to December 31, 2013).

2.0 METHODS

Temperature data presented in this summary were recorded between January 01, 2013 and December 31, 2013.

2.1 Temperature Monitoring

Upon commencement of the Peace River baseline temperature monitoring program in September 2008 (Year 1), 20 Tidbit v2 Model #UTBI-001 temperature sensor/logger units (0.2°C accuracy over 0°C to 50°C; 0.02°C resolution @ 25°C; Onset Corp., Bourne, MA) were deployed at 18 locations between the WAC Bennett Dam forebay and a site approximately 6.5 km downstream of the confluence of the Pine and Peace rivers (Fig. 1). During Years 2 and 3, revisions were made to monitoring site positioning and configuration to account for changes in bank conditions, to reduce the potential for logger stranding due to debris and flow level extremes, to increase redundancy in case of logger failure or loss, and to improve accessibility during high flow stage.

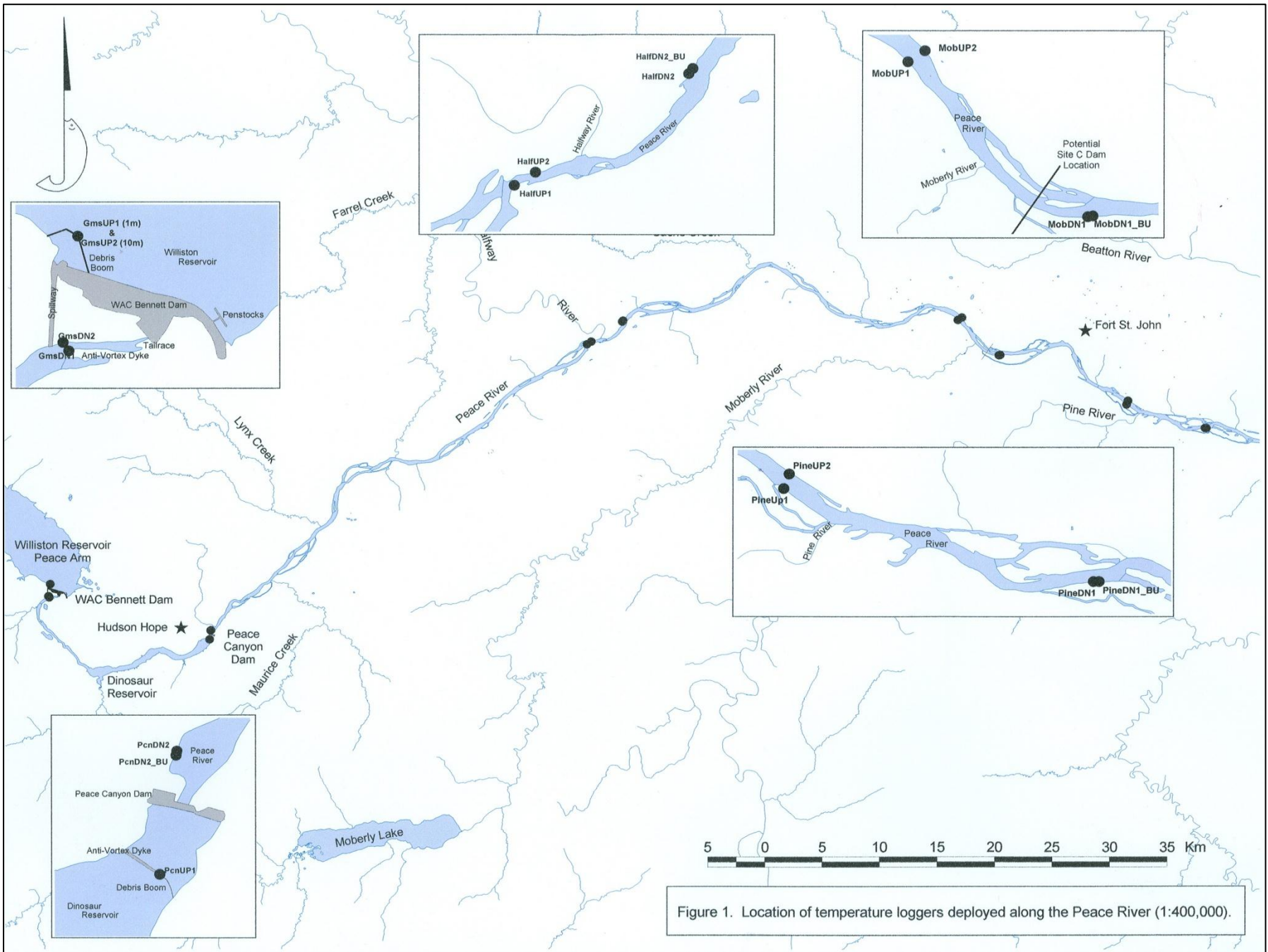


Figure 1. Location of temperature loggers deployed along the Peace River (1:400,000).

Monitoring stations are typically maintained in pairs at each general location in order to minimize the risk of data gaps in the event of logger stranding, failure, or loss. At Peace River locations upstream of major tributaries (Halfway, Moberly, and Pine rivers), monitoring stations are maintained on opposing banks of the river in order to provide redundancy and confirm temperature consistency across the channel. At Peace River locations downstream of major tributaries, paired station configuration was revised in 2011 (Year 3) from opposing banks to common banks in order to provide better redundancy in tributary outflow paths prone to stranding by passing ice and debris.

By late in Year 3, monitoring site configuration had been revised to include 21 data loggers at 18 monitoring sites. This configuration was maintained throughout Years 4 and 5. A summary of temperature monitoring station location information as of the end of Year 5 appears in Appendix I. A description of site configuration changes prior to Year 3 can be found in DES 2013.

Temperature loggers were programmed to record water temperature (°C) at 1 hour intervals throughout Year 5. Loggers continued to be housed in 38 mm x 100 mm steel nipples with threaded steel end caps, weighted with 5 kg steel anchors, and tethered to rooted trees or large bedrock fragments using either 6.35 mm galvanized steel cable or 3.18 mm stainless steel cable.

Temperature data recorded and stored on each logger during 2013 were downloaded at approximately 3 month intervals by field transfer to a Model U-DTW-1 Hobo® waterproof shuttle (Onset Corp., Bourne, MA). Data from the shuttle were then downloaded to a desktop computer after each field session. Logger sites at the WAC Bennett Dam and Peace Canyon Dam forebay and tailrace locations were accessed by vehicle, while all Peace River mainstem sites were accessed by riverboat. Conditions and observations at the time of each download event were documented in the field on hardcopy Download Information Forms and subsequently entered into digital format. *In situ* reference temperatures were recorded at the time of each field download event using a certified laboratory-grade mercury thermometer calibrated in increments of 0.1°C for comparison to the corresponding hourly logger readings (within 30 minutes of reference temperature).

In addition to scheduled download events, temperature loggers at some Peace River mainstem locations were visually checked and re-positioned by DES staff during the course of activities unrelated to the temperature monitoring program.

Data files were exported as MS Office Excel and Access compatible text files using Onset® Hoboware Pro software (Ver. 2.3.0), amalgamated into single Excel worksheets for each data logger, and plotted relative to time.

2.1.1 Year 5 Site Logistics

Few logistical problems were encountered during Year 5, partially due to refinements in station location and configuration made in Years 2 and 3. Occasional stranding of loggers above the waterline during Year 5 was largely associated with extremely low water levels during parts of May and June and the dislodging of logger anchors due to the accumulation of debris on tether cables during tributary freshet and flood events.

Several tether cables were replaced during Year 5 due to ongoing corrosion of the 6.35 mm galvanized cable originally deployed in Years 1 to 3. Corroded galvanized tether cables were replaced with 3.18 mm stainless steel cable, which appears to have a longer lifespan.

2.2 Total Dissolved Gas Pressure (TDGP)

Six Model TBO-DL6(F) TDGP monitors (Common Sensing Inc., Clark Fork, ID) were purchased by BC Hydro in Year 1, and stored at the office of Diversified Environmental Services (DES) in Fort St. John, BC. Appendix II contains an inventory of dissolved gas pressure meters and probes. Meters and probes were checked for functionality on a quarterly basis when not in use and battery charge was maintained. Initialization check routines were repeated and the condition of each probe oxygen sensor membrane was examined for evidence of ZnO precipitate build-up. In addition to routine quarterly maintenance records, calibration statements were obtained for meters that were returned to the manufacturer for repair or factory re-calibration.

No spill events or TDGP meter deployments occurred during Year 5.

3.0 RESULTS AND DISCUSSION

Figures 2 to 10 are presented following Section 4.0.

3.1 Temperature Monitoring

Reference temperatures recorded during download events are presented in Appendix III along with corresponding logger temperatures and indicated error values. With the exception of logger halfUP2 (serial# 2038572), which exhibits a consistent, correctable zero error of approximately 0.8 degrees C,

calibration errors for all temperature loggers were typically within the range of 0.3°C. Corrected values for logger halfUP2 are provided in the accompanying 2013 dataset.

A summary of temperature data collection results and related conditions and limitations are discussed in the following 5 sections, which correspond to the 5 major generating station and tributary features. Download Information Forms completed during each download are provided in Appendix IV.

3.1.1 WAC Bennett Dam Forebay and Tailrace

The WAC Bennett Dam forebay temperature monitoring station is located at the GMS spillway log boom and consists of a vertical cable suspended from the northernmost log boom steel buoy. Temperature is recorded with 2 loggers, the first located at 1 m depth and the second suspended at a depth of 10 m. Continuous hourly data for Year 5 were recorded at both the 1 m and 10 m depths (gmsUP1 and gmsUP2). Temperature data recovered from both units for Year 5 is presented in Figure 2. Although seasonal thermal stratification of Williston Reservoir is evident, the relatively small temperature differential (mean=0.6°C) suggests the primary thermocline may lie deeper than 10 m. Maximum temperature differentials of 7-8°C were recorded during a period of significant daytime surface warming in late June 2013, when annual ambient temperatures peaked. Temperature profiles recorded further up the Peace Reach during unrelated work in August 2012 indicated a thermocline at approximately 26 m depth (B. Culling, pers. obs.).

The GMS tailrace monitoring sites are located on opposite banks, approximately 700 m downstream of the outflow manifolds. Logger gmsDN1 records the temperature of water flowing from the south tailrace manifold, which originates from the shallowest penstock depth. Logger gmsDN2 measures water from the north tailrace manifold, which originates from a deeper withdrawal point. The tethered steel capsule at both stations contains a back-up logger in addition to the primary unit (gmsDN1BU and gmsDN2BU). All 4 loggers collected seamless data through Year 5.

As in previous years, water temperatures at gmsDN2 showed the lowest annual variation and are consistently cooler in the summer and warmer in the winter than gmsDN1 flow, which originates closer to the surface of Williston Reservoir. Temperatures recorded at gmsUP1 (forebay surface) exhibit greater annual variation than tailrace values (Fig. 3).

3.1.2 Peace Canyon Dam Forebay and Tailrace

The data logger recording temperature at the Peace Canyon Dam forebay (pcnUP1) is attached to the anti-vortex dam log boom, approximately 450 m upstream of the dam face. Forebay water temperature at 1 m depth was recorded seamlessly through Year 5.

Both Peace Canyon Tailrace loggers (pcnDN2 and pcnDN2BU) recorded continuous data throughout Year 5, with the exception of possible periodic stranding during extremely low water levels during parts of May and June. A comparison of PCN tailrace temperature (pcnDN2) and GMS tailrace temperature (mean of gmsDN1 and gmsDN2) indicates a relatively small temperature change through Dinosaur Reservoir during all seasons (Fig. 4). For example, mean differentials of 0.2°C were recorded in winter (December through February) and 0.8°C in summer (June through August). Figure 4 also illustrates limited thermal stratification of the Peace Canyon forebay during peak ambient temperatures in June 2013 (i.e., water exiting the Peace Canyon powerhouse (pcnDN2) was slightly cooler than forebay temperatures at 1 m depth (pcnUP1)).

3.1.3 Halfway River Confluence

Peace River water temperature was monitored at points approximately 1 km upstream and 2.5 km downstream of the Halfway River confluence. Upstream stations were maintained on opposing banks throughout Year 5 (halfUP1 and halfUP2). Logger halfUP1 recorded continuous data while logger halfUP2 became periodically stranded in May 2013 during extremely low water levels. As in previous years, no cross-channel differential was recorded between the opposing upstream stations.

The primary logger at the Halfway downstream station (halfDN2) was partially swung to shore by debris from the Halfway River during May 2013 and became sporadically stranded during periodic low water levels prior to the July download. The cable tethering the back-up logger at the same site (halfDN2BU) was apparently parted by large debris prior to the July download; the logger was not recovered and was replaced on July 13.

As in previous years, Peace River temperature values recorded at stations upstream and downstream of the Halfway confluence differed markedly. Temperatures collected downstream of the confluence exhibited a greater degree of daily and annual variability (Fig. 5). Halfway River inputs typically have a cooling effect during the winter period (October through April) and a warming effect during the summer

(May through September). Temperatures within the Halfway River upstream of its confluence with the Peace are not recorded as part of this project.

3.1.4 Moberly River Confluence

Peace River water temperature was monitored at points approximately 2.6 km upstream and 2.5 km downstream of the Moberly River confluence. Upstream stations were maintained on opposing banks (mobUP1 and mobUP2) and both recorded seamless hourly data throughout Year 5. Slight cross-channel differential was recorded during July and August, with the north bank being 2-3°C degrees warmer. This may be partially due to warmer inputs from Cache Creek and the Halfway River, located 20 km and 36 km upstream, respectively, and reduced solar effect on the shaded south bank.

The Moberly downstream logger and downstream back-up logger were both located on the south river bank, within the influence of outfall from the Moberly River. The primary Moberly downstream logger (mobDN1) recorded continuous data through Year 5, while the nearby back-up logger became periodically stranded above the waterline after being swung to shore by debris accumulation.

As in previous years, Peace River temperatures recorded within the influence of the Moberly River (downstream of confluence), were warmer than upstream stations from May through July and cooler than upstream stations from October through December (Fig. 6). The influence of the Moberly River is significantly less than that of the Halfway River and appears to correspond to the difference in relative contributed volumes. Temperatures within the Moberly River upstream of its confluence with the Peace are not recorded as part of this project.

3.1.5 Pine River Confluence

Peace River water temperature was monitored at points approximately 2.0 km upstream and 6.5 km downstream of the Pine River confluence. During Year 5, upstream stations were maintained on opposing banks (pineUP1 and pineUP2) and both downstream loggers (pnDN1 and pnDN1BU) were located on the south river bank, within the influence of inputs from the Pine River.

Logger mobUP1 recorded continuous hourly data throughout Year 5, while its north bank counterpart (mobUP2) became temporarily exposed at the waterline during a period of extremely

low water levels between April 17 and May 05, after being swung partially to shore by debris or ice. Little cross-channel differential was noted.

Temperature values recorded within the downstream influence of the Pine River (pineDN1) were typically cooler than the Pine River upstream stations from late September through December and slightly warmer from July through mid September (Fig. 7). Maximum temperature values were recorded around July 03, slightly earlier than normal.

Figure 8 presents comparative seasonal temperature changes over the 132 km length of the study area between the WAC Bennett Dam tailrace (gmsDN2) and the Pine River confluence (pineUP1) during 2013 and Figure 9 compares ambient air temperature at the Fort St. John airport with Peace River water temperature at the Pine river confluence. Data appearing in these figures includes Halfway and Pine confluence stations not directly influenced by their respective tributary inputs. The graphs illustrate the moderating effect of hypolimnetic withdrawal from Williston Reservoir on downstream temperatures in the Peace River and the seasonal impact of ambient air temperature on downstream water temperatures, i.e., winter temperatures decrease and summer temperatures increase with distance downstream. Brief periods of homogeneity occurred in early April and mid October, with gradients inverting on either side of these dates to form the typical annual pattern.

Figures 10 and 11 represent temporal comparisons of water temperatures over the 5 calendar years encompassed by the current monitoring program for WAC Bennett Dam tailrace and Pine River confluence sites, respectively. Year to year temperature differences in output from the north manifold of the GMS tailrace suggest corresponding inter-annual variation in Williston Reservoir hypolimnion temperature, with 2012 being the coolest year recorded and 2010 being the warmest (Fig. 10). Temperatures during 2013 lie within the ranges established over the previous 4 years. Possible factors for this variation may include the proportion of reservoir input contributed by snow melt versus precipitation and annual variations in storage level and drawdown rate and timing. Year to year variations in Peace River water temperature immediately above the Pine River confluence (pnUP1) appear to follow a pattern similar to that observed at the GMS tailrace, with 2012 being the coolest and 2010 the warmest (Fig. 11). Temperatures recorded in 2013 generally lie within the established range.

4.0 RECOMMENDATIONS

The 6.35 mm galvanized cable used during the initial years of the program has proven to have low resistance to corrosion and should continue to be replaced by the smaller diameter stainless steel cable.

The battery life of the Tidbit v2 Model #UTBI-001 temperature sensors is estimated at approximately 5 years. Scheduled replacement of units should begin in 2014 as per the table presented in Appendix 6.

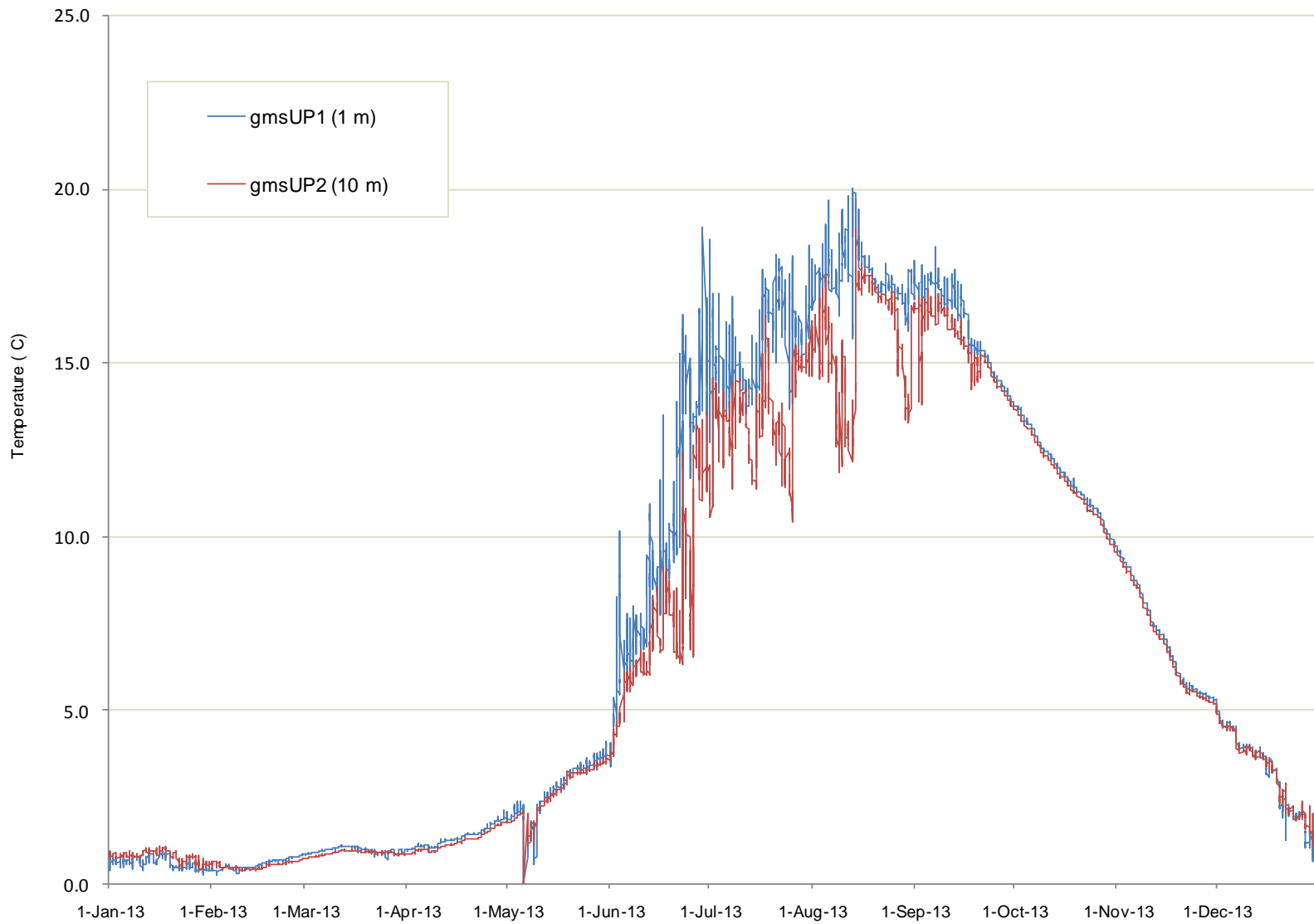


Figure 2. Comparison of water temperature at WAC Bennett Dam forebay station from 1 m depth (gmsUP1) and 10 m depth (gmsUP2) during Year 5, January 01, 2013 – December 31, 2013.

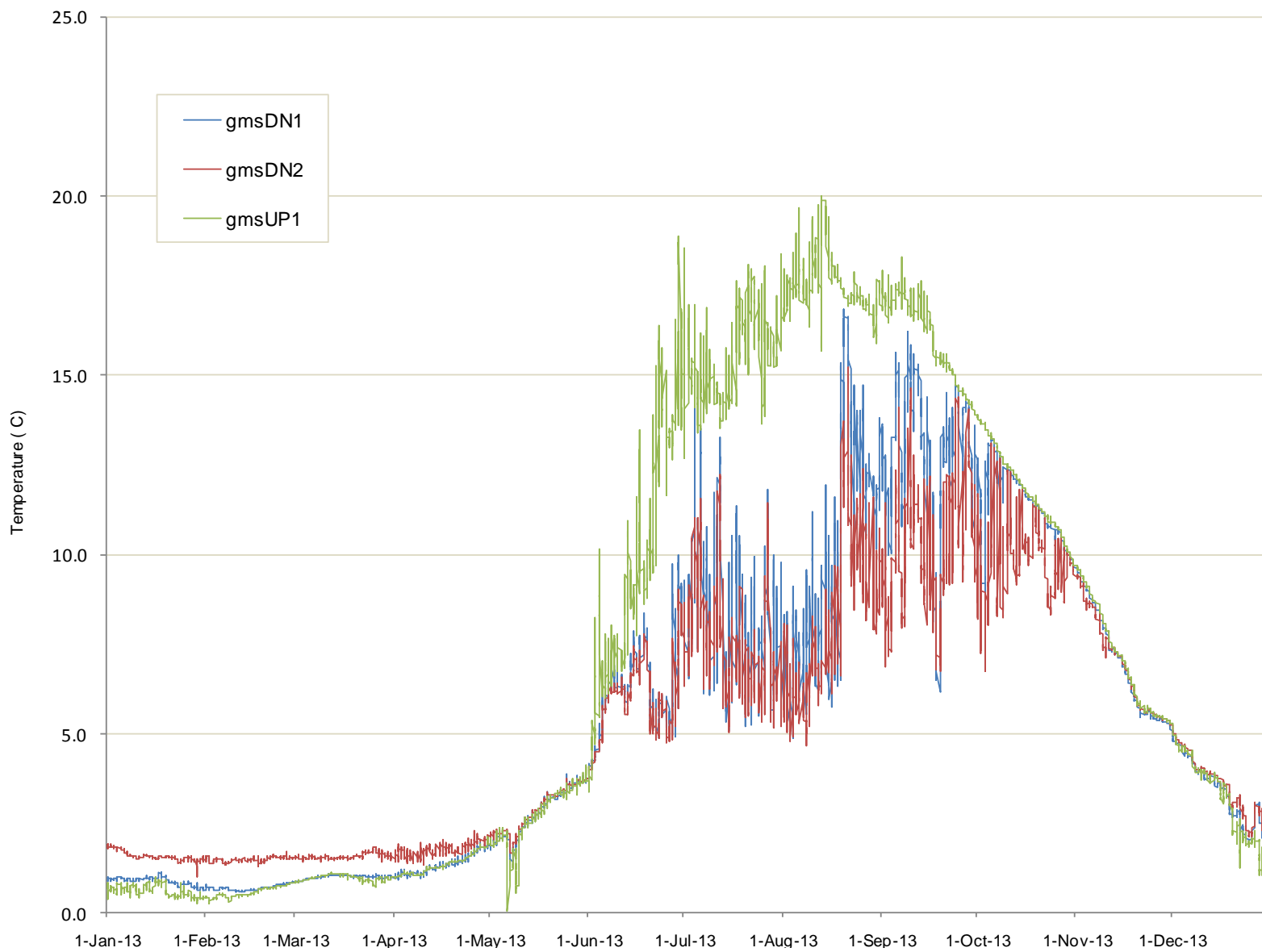


Figure 3. Comparison of water temperature at WAC Bennett Dam forebay surface (gmsUP1), and WAC Bennett Dam tailrace (gmsDN1 and gmsDN2) during Year 5, January 01, 2013 – December 31, 2013.

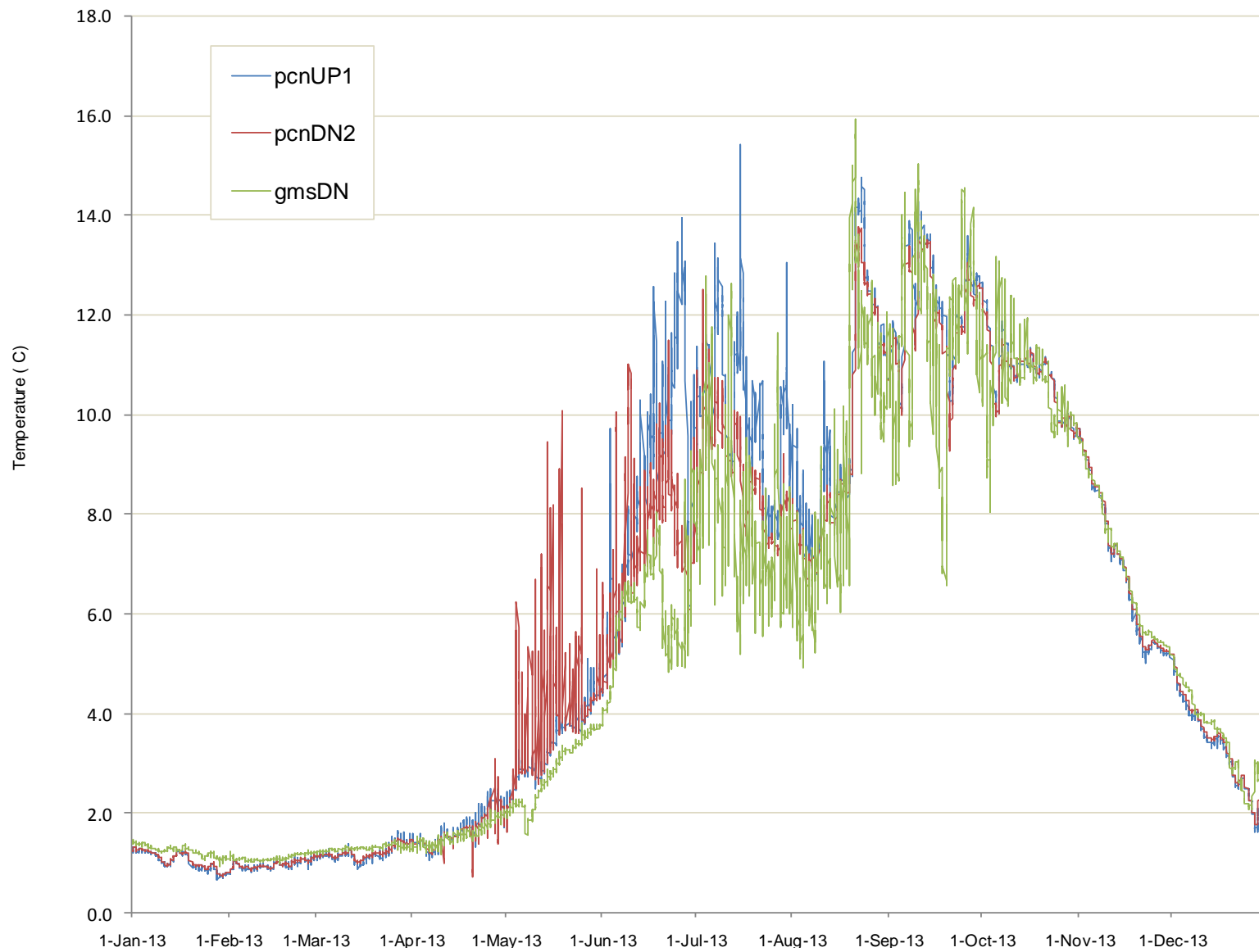


Figure 4. Comparison of water temperature at Peace Canyon forebay surface (pcnUP1), Peace Canyon tailrace (pcnDN2), and WAC Bennett Dam tailrace (gmsDN) during Year 5, January 01, 2013 – December 31, 2013.

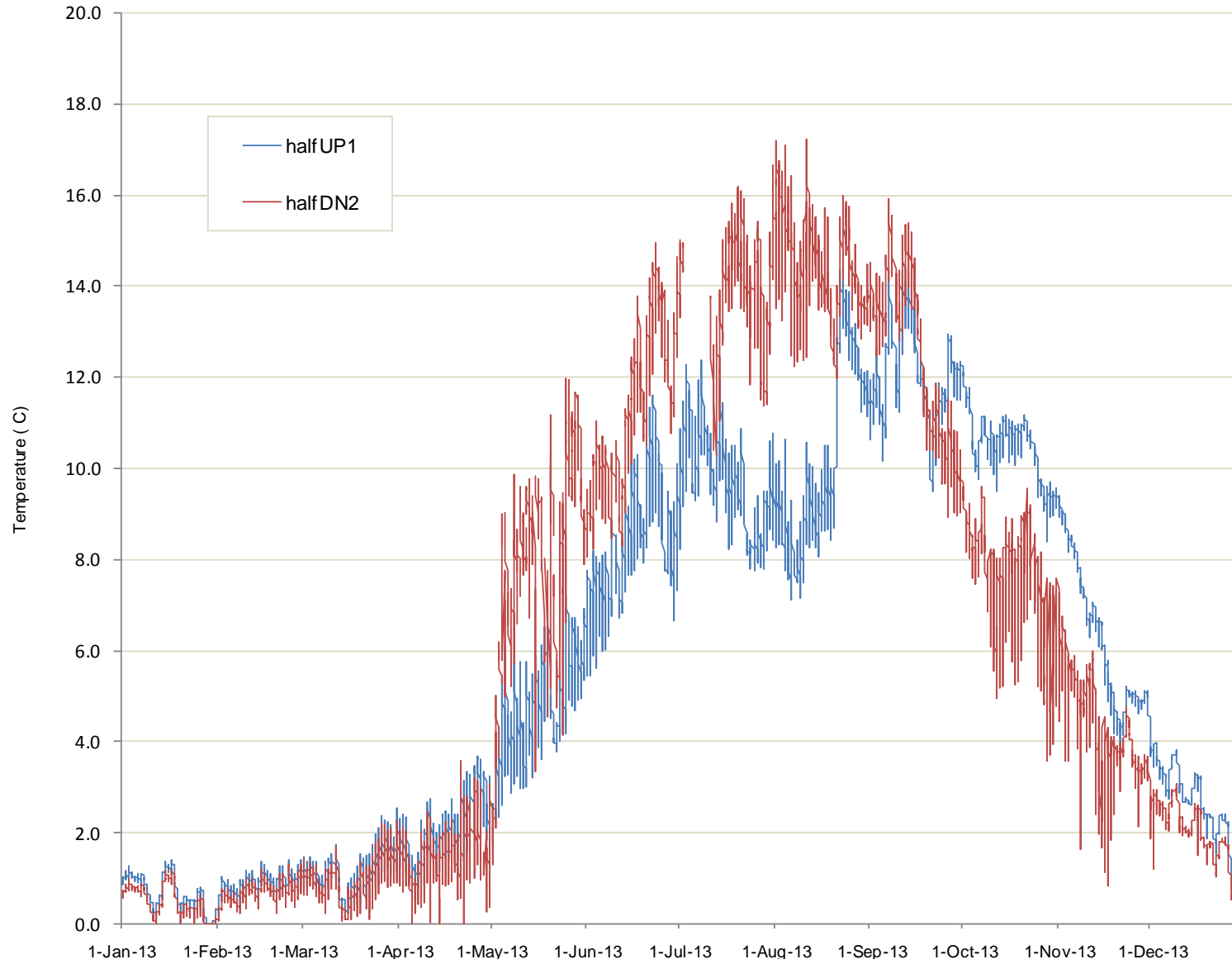


Figure 5. Comparison of Peace River water temperature upstream of Halfway River confluence (halfUP1) and downstream of Halfway River confluence (halfDN2) during Year 5, January 01, 2013 – December 31, 2013.

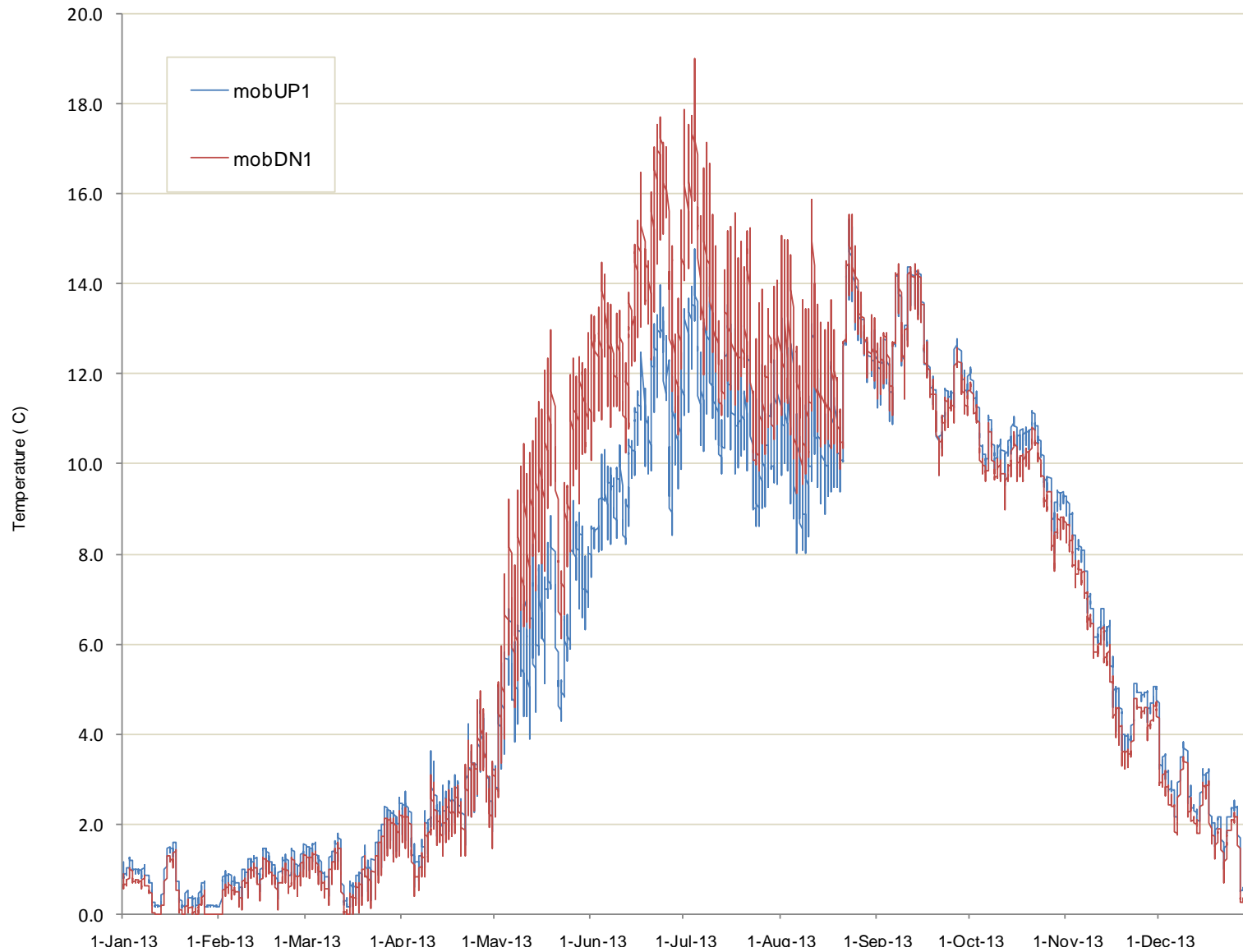


Figure 6. Comparison of Peace River water temperature upstream of Moberly River confluence (mobUP1) and downstream of Moberly River confluence (mobDN1) during Year 5, January 01, 2013 – December 31, 2013.

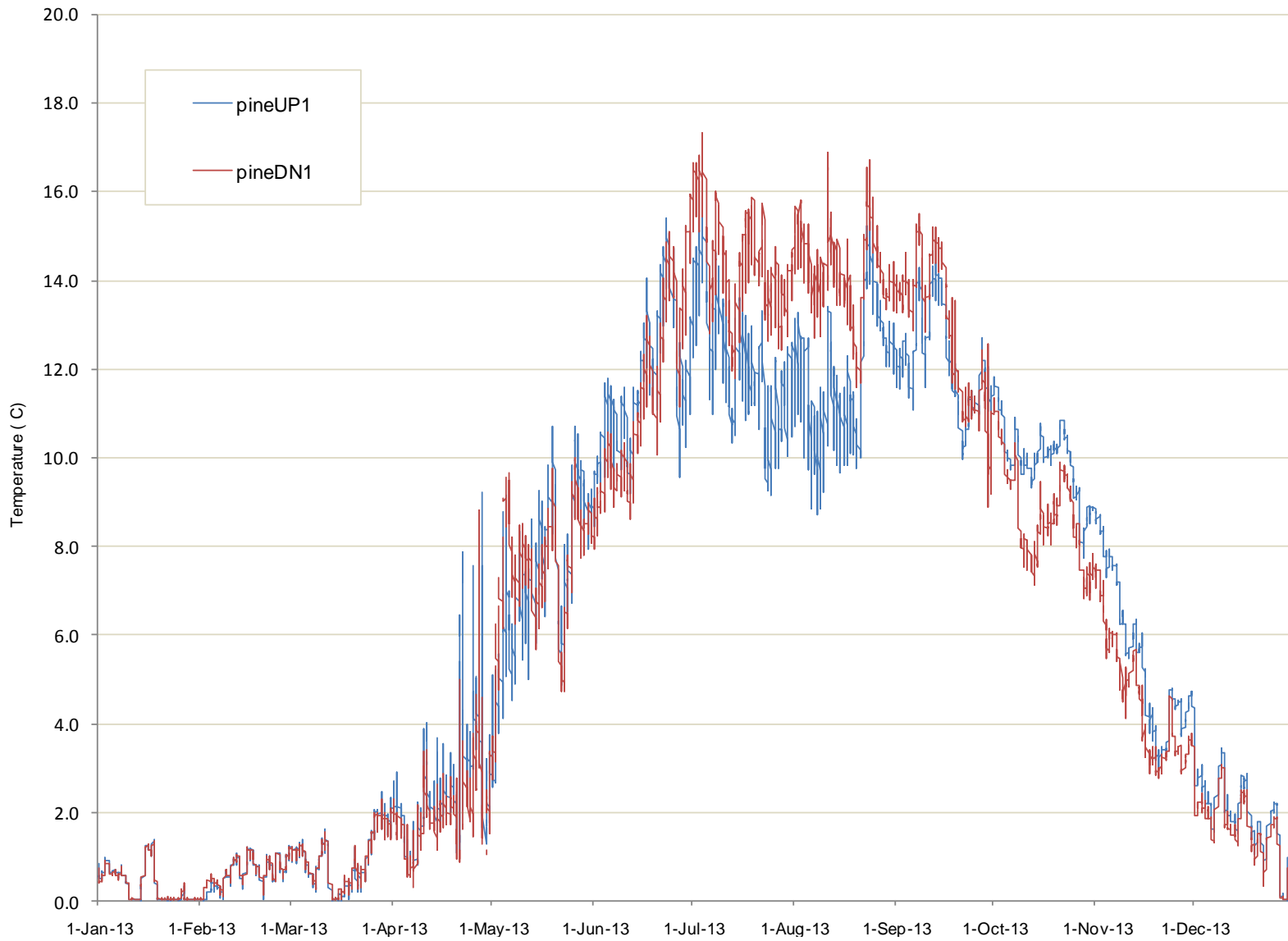


Figure 7. Comparison of Peace River water temperature upstream of Pine River confluence (pineUP1) and downstream of Pine River confluence (pineDN1) during Year 5, January 01, 2013 – December 31, 2013.

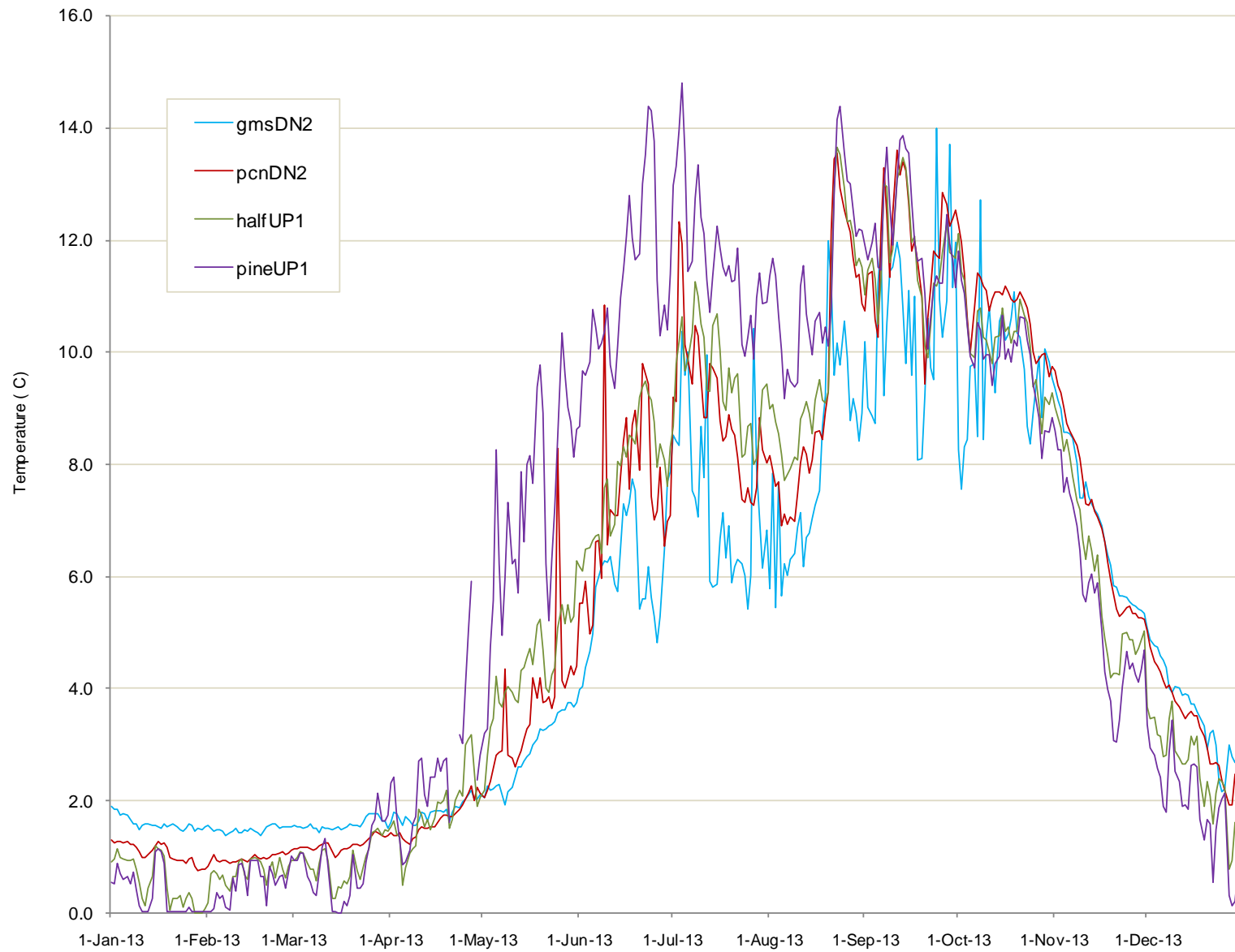


Figure 8. Peace River water temperature gradient from WAC Bennett Dam tailrace, downstream to Pine River confluence, during Year 5, January 01, 2013 – December 31, 2013.

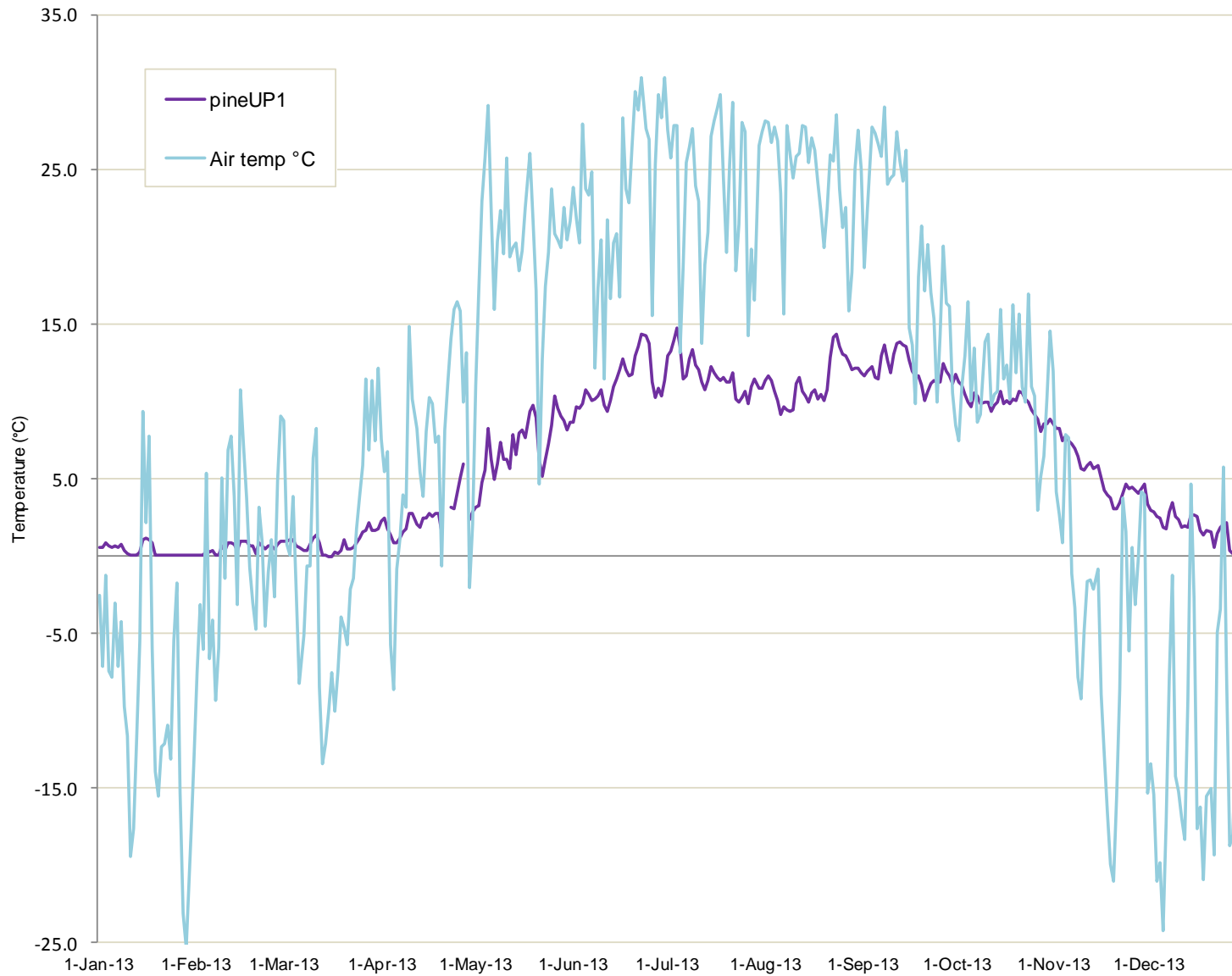


Figure 9. Comparison of Peace River water temperature upstream of the Pine River confluence (pnUP1) and ambient air temperature at the Fort St. John airport during Year 5, January 01, 2013 to December 31, 2013.

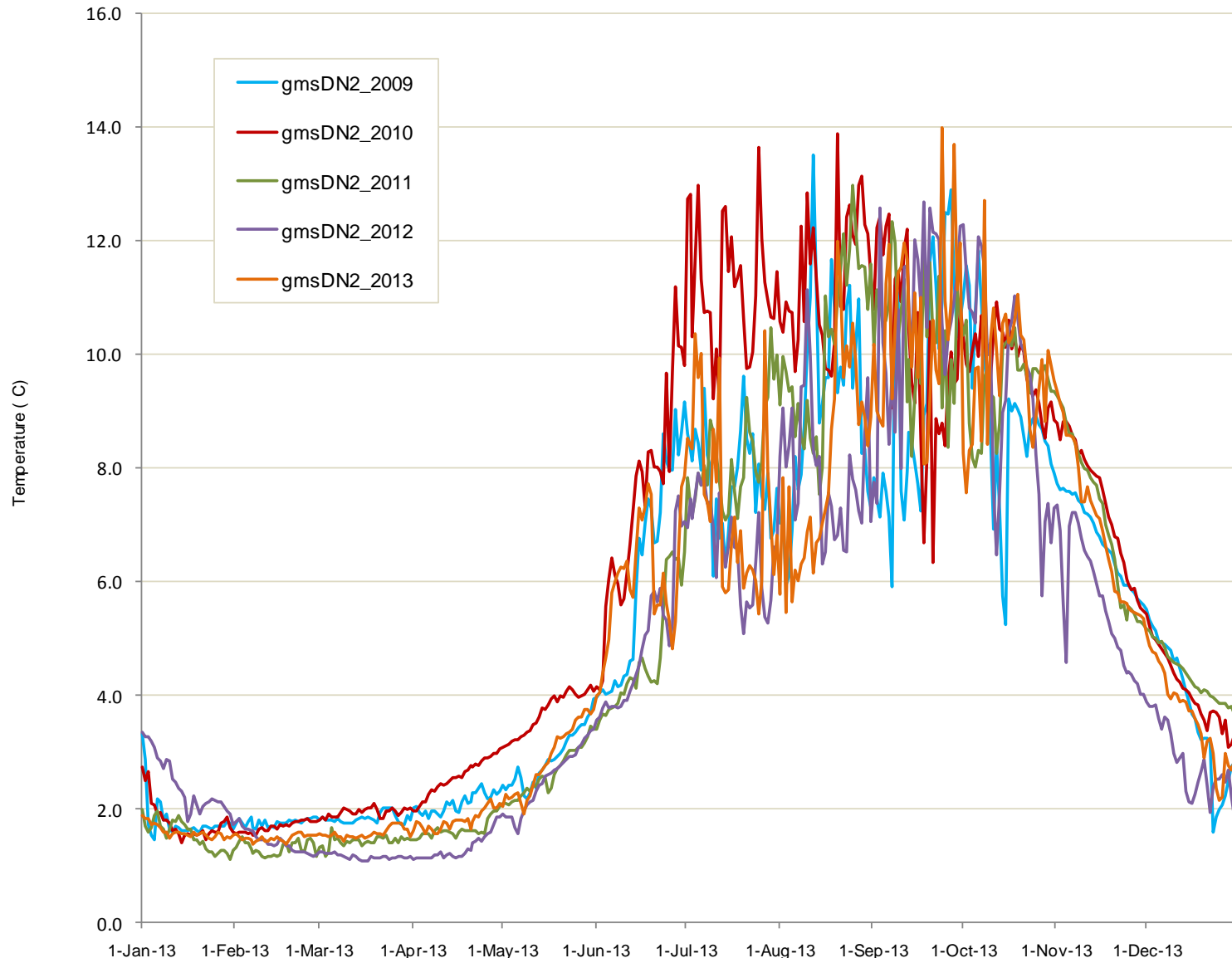


Figure 10. Comparison of water temperature at WAC Bennett Dam tailrace north manifold (gmsDN2) from January 2009 to December 2013.

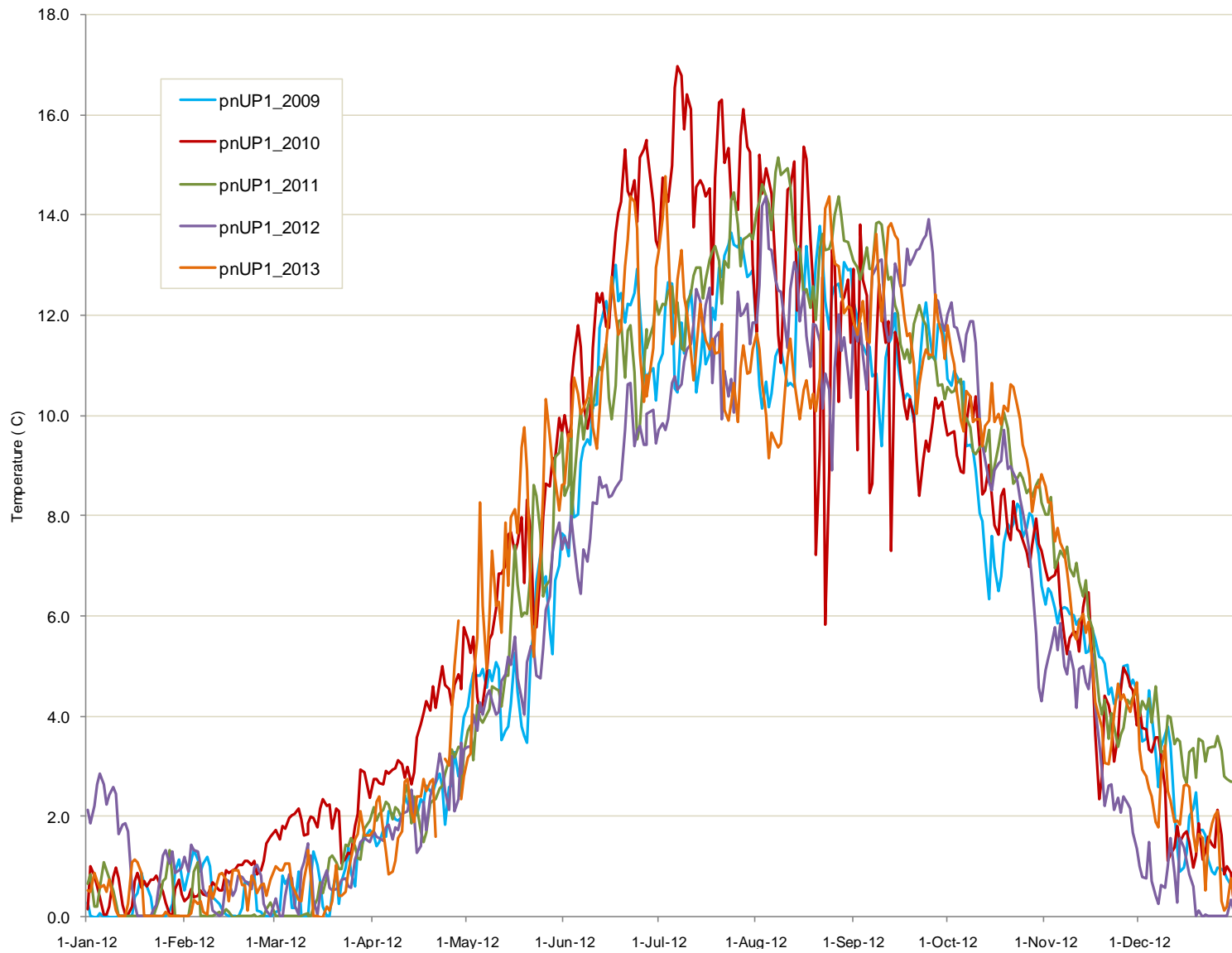


Figure 11. Comparison of water temperature upstream of the Pine River confluence (pnUP1) from January 2009 to December 2013.

REFERENCES

BC Hydro. 2010. Peace River Water Use Plan; monitoring program terms of reference – Peace River Baseline TGP/Temp. BC Hydro, Vancouver, BC. 7pp.

DES (Diversified Environmental Services). 2013. Peace River Water Use Plan Peace River Baseline TDGP/Temperature GMSWorks-2 - Year 4 Monitoring Program - Interim Report January 2012 to December 2012. Prepare for BC Hydro, Vancouver, BC. 24pp + appendices.

Appendix I. Temperature monitoring station location information for Year 5, January 01, 2013 to December 31, 2013.

Site ID	Serial #	Location	UTM		Comment
			East	North	
gmsUP1	2038617	WAC Bennett Forebay	548841	6209022	steel buoy; 1 m depth
gmsUP2	10156318	WAC Bennett Forebay	548841	6209022	steel buoy; 10 m depth
gmsDN1	2038619	GMS Tailrace	548881	6207761	southbank; deflection wier riprap
gmsDN1BU	2038613	GMS Tailrace	548881	6207761	southbank; deflection wier riprap
gmsDN2	2038620	GMS Tailrace	548828	6207836	north bank; riprap below Tunnel portal #3
gmsDN2BU	2038614	GMS Tailrace	548828	6207836	north bank; riprap below Tunnel portal #3
pcnUP1	2225325	Peace Canyon Forebay	562684	6204075	anti-vortex log boom; 1 m depth
pcnDN2	2038621	Peace Canyon Tailrace	562803	6204854	north bank; rock slab
pcnDN2BU	2038568	Peace Canyon Tailrace	562803	6204854	north bank; rock slab
HalfUP1	9767573	Halfway Confluence - upstream	595204	6230148	south bank; spruce tree
HalfUP2	2038572	Halfway Confluence - upstream	595578	6230542	north bank; spruce tree
HalfDN2	2038574	Halfway Confluence - downstream	598198	6232169	north bank; balsam poplar
HalfDN2BU	2038623	Halfway Confluence - downstream	598364	6231605	north bank; balsam poplar
MobUP1	2038612	Moberly Confluence - upstream	627158	6232349	south bank; alder
MobUP2	2038616	Moberly Confluence - upstream	627501	6232563	north bank; spruce tree
MobDN1	2038622	Moberly Confluence - downstream	630583	6229281	south bank; alder
MobDN1BU	2038576	Moberly Confluence - downstream	631187	6229623	south bank; alder
PineUP1	2038624	Pine Confluence - upstream	641034	6225375	south bank; alder
PineUP2	9767572	Pine Confluence - upstream	641653	6225304	north bank; balsam poplar
PineDN1	2225322	Pine Confluence - downstream	648408	6222831	south bank; alder
PineDN1BU	9762095	Pine Confluence - downstream	649601	6223357	south bank; alder

Appendix II. Inventory of dissolved gas pressure meters and probes.

Meter Number	Serial Number	Probe Number	Cable Length (ft)
1	231	1	50
2	228	2	100
3	230	3	100
4	227	4	100
5	226	5	100
6	229	6	100

Appendix III. Reference temperature values and corresponding logger fix values recorded during download events in Year 5, January 01, 2013 to December 31, 2013.

Logger ID	Date	Fix Temp	Ref Temp	Error
gmsUP1	4-Jan-13	0.6	0.1	0.5
	11-Jul-13	14.2	14.4	-0.2
	26-Sep-13	14.4	14.5	-0.1
gmsUP2	11-Jul-13	13.7	13.4	0.3
	26-Sep-13	14.3	14.2	0.1
gmsDN1	4-Jan-13	1.0	0.7	0.3
	11-Jul-13	9.8	9.9	-0.1
	26-Sep-13	13.5	13.5	0.0
gmsDN1_BU	4-Jan-13	1.0	0.7	0.3
	11-Jul-13	9.9	9.9	0.0
	26-Sep-13	13.5	13.5	0.0
gmsDN2	4-Jan-13	1.7	1.4	0.3
	11-Jul-13	7.8	7.7	0.1
	26-Sep-13	9.4	9.3	0.1
gmsDN2_BU	4-Jan-13	1.7	1.4	0.3
	11-Jul-13	7.8	7.7	0.1
	26-Sep-13	9.5	9.3	0.2
pcnUP1	4-Jan-13	1.3	1.0	0.3
	11-Jul-13	9.3	9.4	-0.1
	26-Sep-13	13.0	12.7	0.3
pcnDN2	4-Jan-13	1.3	1.0	0.3
	11-Jul-13	8.9	8.9	0.0
	26-Sep-13	12.7	12.8	-0.1
pcnDN2_BU	4-Jan-13	1.3	1.0	0.3
	11-Jul-13	9.0	8.9	0.1
	26-Sep-13	12.8	12.8	0.0
halfUP1	1-Jan-13	0.9	0.7	0.2
	3-Jun-13	8.1	8.1	0.0
	29-Sep-13	12.2	12.2	0.0
halfUP2	1-Jan-13	0.1	0.7	-0.6
	3-Jun-13	7.8	8.8	-1.0
	29-Sep-13	11.2	12.2	-1.0

Appendix III. Reference temperature values and corresponding logger fix values recorded during download events in Year 5, January 01, 2013 to December 31, 2013, cont.

Logger ID	Date	Logger Temp	Reference Temp	Error
halfDN2	1-Jan-13	0.7	0.0	0.7
	3-Jun-13	10.3	10.1	0.2
	29-Sep-13	10.8	10.8	0.0
halfDN2_BU	1-Jan-13	0.7	0.0	0.7
	13-Jul-13	12.7	12.8	-0.1
	29-Sep-13	11	10.8	0.2
mobUP1	2-Jan-13	1.0	0.5	0.5
	2-Jun-13	8.3	8.2	0.1
	17-Oct-13	10.4	10.2	0.2
mobUP2	2-Jan-13	0.7	0.4	0.3
	2-Jun-13	8.8	8.8	0.0
	17-Oct-13	10.2	10.1	0.1
mobDN1	2-Jan-13	0.8	0.5	0.3
	2-Jun-13	11.4	11.5	-0.1
	17-Oct-13	10.1	9.9	0.2
mobDN1_BU	2-Jan-13	0.7	0.5	0.2
	2-Jun-13	11.4	11.5	-0.1
	17-Oct-13	10.1	9.9	0.2
pineUP1	2-Jan-13	0.6	0.4	0.2
	2-Jun-13	9.7	9.6	0.1
	17-Oct-13	10.1	10.0	0.1
pineUP2	2-Jan-13	0.6	0.3	0.3
	2-Jun-13	9.2	9.0	0.2
	17-Oct-13	10.4	10.2	0.2
pineDN1	2-Jan-13	0.5	0.0	0.5
	2-Jun-13	8.7	8.6	0.1
	17-Oct-13	8.7	8.5	0.2
pineDN1_BU	2-Jan-13	0.5	0.0	0.5
	2-Jun-13	8.7	8.6	0.1
	17-Oct-13	8.7	8.5	0.2

Appendix IIV. Year 5 download information forms, January 01, 2013 to December 31, 2013.

BC HYDRO PEACE RIVER TEMPERATURE MONITORING - DOWNLOAD INFORMATION FORM										
SITE ID	gmsUP1		LOCATION	GMS Forebay			BANK			
LOGGER TYPE	Tidbit		LOGGER SERIAL #	2038617			UTM	548841	6209022	
DOWNLOAD DATE	11	Jul	2013	DOWNLOAD TIME	12:58			CREW	BC TE	
TEST RECORDER TYPE	YSI		WATER TEMP	14.4	AIR TEMP	18	ICE CONDITIONS	free		
LOGGER CONDITIONS										
WATER DEPTH	1 m		DISLODGED	no	REASON					
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	steel buoy			
COMMENTS										
down load OK										
SITE ID	gmsUP2		LOCATION	GMS Forebay			BANK			
LOGGER TYPE	Tidbit		LOGGER SERIAL #	10156318			UTM	548841	6209022	
DOWNLOAD DATE	11	Jul	2013	DOWNLOAD TIME	12:55			CREW	BC TE	
TEST RECORDER TYPE	YSI		WATER TEMP	13.4	AIR TEMP	18	ICE CONDITIONS	none		
LOGGER CONDITIONS										
WATER DEPTH	10 m		DISLODGED	no	REASON					
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	steel buoy			
COMMENTS										
Dow nload OK										
SITE ID	gmsDN1		LOCATION	GMS Tailrace LDB			BANK	south		
LOGGER TYPE	Tidbit		LOGGER SERIAL #	2038619			UTM	548881	6207761	
DOWNLOAD DATE	11	Jul	2013	DOWNLOAD TIME	12:11			CREW	BC TE	
TEST RECORDER TYPE	merc		WATER TEMP	9.9	AIR TEMP	18	ICE CONDITIONS	free		
LOGGER CONDITIONS										
WATER DEPTH	120 cm		DISLODGED	no	REASON					
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	rock			
COMMENTS										
Back-up logger 2038613 in same capsule (gmsDN2BU) both down loads OK replaced cable w ith stainless steel.										
SITE ID	gmsDN2		LOCATION	GMS Tailrace RDB			BANK	north		
LOGGER TYPE	Tidbit		LOGGER SERIAL #	2038620			UTM	548828	6207836	
DOWNLOAD DATE	11	Jul	2013	DOWNLOAD TIME	11:38			CREW	BC TE	
TEST RECORDER TYPE	merc		WATER TEMP	7.7	AIR TEMP	18	ICE CONDITIONS	free		
LOGGER CONDITIONS										
WATER DEPTH	140 cm		DISLODGED	no	REASON					
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	rock			
COMMENTS										
Back-up logger 2038614 in same capsule (gmsDN2BU) both down loads OK replaced cable w ith stainless steel.										

BC HYDRO PEACE RIVER TEMPERATURE MONITORING - DOWNLOAD INFORMATION FORM

SITE ID	pcnUP1	LOCATION	PCN Forebay			BANK	north	
LOGGER TYPE	Tidbit	LOGGER SERIAL #	2225325			UTM	562684	6204075
DOWNLOAD DATE	11	Jul	2013	DOWNLOAD TIME	10:38		CREW	BC TE
TEST RECORDER TYPE	YSI	WATER TEMP	9.4	AIR TEMP	18	ICE CONDITIONS	free	

LOGGER CONDITIONS

WATER DEPTH	1 m	DISLODGED	no	REASON				
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER		cm	TETHER TYPE	log boom

COMMENTS

download OK

SITE ID	pcnDN2	LOCATION	PCN Tailrace			BANK	north	
LOGGER TYPE	Tidbit	LOGGER SERIAL #	2038621			UTM	562803	6204854
DOWNLOAD DATE	11	Jul	2013	DOWNLOAD TIME	10:13		CREW	BC TE
TEST RECORDER TYPE	merc	WATER TEMP	8.9	AIR TEMP	18	ICE CONDITIONS	free	

LOGGER CONDITIONS

WATER DEPTH	130	cm	DISLODGED	no	REASON			
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER		cm	TETHER TYPE	rock

COMMENTS

download OK

repaqlced cable w ith stainless steel.

SITE ID	pcnDN2_BU	LOCATION	PCN Tailrace			BANK	north	
LOGGER TYPE	Tidbit	LOGGER SERIAL #	2038568			UTM	562803	6204854
DOWNLOAD DATE	11	Jul	2013	DOWNLOAD TIME	10:15		CREW	BC TE
TEST RECORDER TYPE	merc	WATER TEMP	8.9	AIR TEMP	18	ICE CONDITIONS	free	

LOGGER CONDITIONS

WATER DEPTH	130	cm	DISLODGED	no	REASON			
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER		cm	TETHER TYPE	rock

COMMENTS

download OK

Anchored to same rock as pcnDN2

SITE ID		LOCATION				BANK		
LOGGER TYPE		LOGGER SERIAL #				UTM		
DOWNLOAD DATE				DOWNLOAD TIME			CREW	
TEST RECORDER TYPE		WATER TEMP		AIR TEMP		ICE CONDITIONS		

LOGGER CONDITIONS

WATER DEPTH		cm	DISLODGED		REASON			
BURIED		FUNCTIONAL		IF DRY, HEIGHT ABOVE WATER		cm	TETHER TYPE	

COMMENTS

BC HYDRO PEACE RIVER TEMPERATURE MONITORING - DOWNLOAD INFORMATION FORM										
SITE ID	half UP1	LOCATION	u/s of Halfway River			BANK	south			
LOGGER TYPE	Tidbit	LOGGER SERIAL #	9767573			UTM	595165	6230094		
DOWNLOAD DATE	3	Jun	2013	DOWNLOAD TIME	19:37		CREW	BC TE		
TEST RECORDER TYPE	merc	WATER TEMP	8.1	AIR TEMP	16	ICE CONDITIONS	free			
LOGGER CONDITIONS										
WATER DEPTH	220	cm	DISLODGED	no	REASON					
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	spruce tree			
COMMENTS										
download OK										
SITE ID	half UP2	LOCATION	u/s of Halfway River			BANK	north			
LOGGER TYPE	Tidbit	LOGGER SERIAL #	2038572			UTM	595569	6230541		
DOWNLOAD DATE	3	Jun	2013	DOWNLOAD TIME	19:27		CREW	BC TE		
TEST RECORDER TYPE	merc	WATER TEMP	8.8	AIR TEMP	16	ICE CONDITIONS	free			
LOGGER CONDITIONS										
WATER DEPTH	180	cm	DISLODGED	no	REASON					
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	spruce			
COMMENTS										
download OK										
SITE ID	half DN2	LOCATION	d/s of Halfway River			BANK	north			
LOGGER TYPE	Tidbit	LOGGER SERIAL #	2038574			UTM	598198	6232169		
DOWNLOAD DATE	3	Jun	2013	DOWNLOAD TIME	19:50		CREW	BC TE		
TEST RECORDER TYPE	merc	WATER TEMP	10.1	AIR TEMP	16	ICE CONDITIONS	free			
LOGGER CONDITIONS										
WATER DEPTH	100	cm	DISLODGED	no	REASON					
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	balsam pop			
COMMENTS										
download OK										
SITE ID	half DN2_BU	LOCATION	d/s of Halfway River			BANK	north			
LOGGER TYPE	Tidbit	LOGGER SERIAL #	2038623			UTM	598179	6263144		
DOWNLOAD DATE	3	Jun	2013	DOWNLOAD TIME	n/a		CREW	BC TE		
TEST RECORDER TYPE	merc	WATER TEMP	10.1	AIR TEMP	16	ICE CONDITIONS	free			
LOGGER CONDITIONS										
WATER DEPTH	n/a	cm	DISLODGED	yes	REASON	debris				
BURIED	no	FUNCTIONAL	no	IF DRY, HEIGHT ABOVE WATER	n/a	cm	TETHER TYPE	balsam pop		
COMMENTS										
cable parted; logger lost										
replaced on July 13, 2013 (serial # 10156314); reference temp 12.8 @ 16:14.										

BC HYDRO PEACE RIVER TEMPERATURE MONITORING - DOWNLOAD INFORMATION FORM											
SITE ID	mobUP2		LOCATION			u/s of Moberly River			BANK	north	
LOGGER TYPE	Tidbit		LOGGER SERIAL #			2038616			UTM	627501	6232563
DOWNLOAD DATE	2	Jun	2013	DOWNLOAD TIME			9:36			CREW	BC TE
TEST RECORDER TYPE	merc		WATER TEMP	8.8	AIR TEMP	16	ICE CONDITIONS			free	
LOGGER CONDITIONS											
WATER DEPTH	150	cm	DISLODGED	no	REASON						
BURIED	yes	FUNCTIONAL	wet		IF DRY, HEIGHT ABOVE WATER			cm	TETHER TYPE	spruce	
COMMENTS											
down load Ok											
imbedded in silt but w etted											
SITE ID	mobUP1		LOCATION			u/s of Moberly River			BANK	south	
LOGGER TYPE	Tidbit		LOGGER SERIAL #			2038612			UTM	627158	6232349
DOWNLOAD DATE	2	Jun	2013	DOWNLOAD TIME			9:51			CREW	BC TE
TEST RECORDER TYPE	merc		WATER TEMP	8.2	AIR TEMP	16	ICE CONDITIONS			free	
LOGGER CONDITIONS											
WATER DEPTH	120	cm	DISLODGED	no	REASON						
BURIED	no	FUNCTIONAL	wet		IF DRY, HEIGHT ABOVE WATER			cm	TETHER TYPE	alder	
COMMENTS											
down load OK											
replaced last 2 m of cable w ith stainless steel											
SITE ID	mobDN1_BU		LOCATION			d/s of Moberly River			BANK	south	
LOGGER TYPE	Tidbit		LOGGER SERIAL #			2038576			UTM	630403	6229275
DOWNLOAD DATE	2	Jun	2013	DOWNLOAD TIME			10:10			CREW	BC TE
TEST RECORDER TYPE	merc		WATER TEMP	11.5	AIR TEMP	16	ICE CONDITIONS			free	
LOGGER CONDITIONS											
WATER DEPTH	50	cm	DISLODGED		yes	REASON			debris		
BURIED	no	FUNCTIONAL	wet		IF DRY, HEIGHT ABOVE WATER			cm	TETHER TYPE	alder	
COMMENTS											
down load OK											
sw ung to shore due to debris											
replaced end of cable w ith stainless steel											
SITE ID	mobDN1		LOCATION			d/s of Moberly River			BANK	south	
LOGGER TYPE	Tidbit		LOGGER SERIAL #			2038622			UTM	630583	6229281
DOWNLOAD DATE	2	Jun	2013	DOWNLOAD TIME			10:26			CREW	BC TE
TEST RECORDER TYPE	merc		WATER TEMP	11.5	AIR TEMP	16	ICE CONDITIONS			free	
LOGGER CONDITIONS											
WATER DEPTH	120	cm	DISLODGED	no	REASON						
BURIED	no	FUNCTIONAL	wet		IF DRY, HEIGHT ABOVE WATER			cm	TETHER TYPE	alder	
COMMENTS											
down load OK											

BC HYDRO PEACE RIVER TEMPERATURE MONITORING - DOWNLOAD INFORMATION FORM										
SITE ID	pineUP1	LOCATION	u/s of Pine River			BANK	south			
LOGGER TYPE	Tidbit	LOGGER SERIAL #	2038624			UTM	641034	6225375		
DOWNLOAD DATE	2	Jun	2013	DOWNLOAD TIME	10:53		CREW	BC TE		
TEST RECORDER TYPE	merc	WATER TEMP	9.6	AIR TEMP	18	ICE CONDITIONS	free			
LOGGER CONDITIONS										
WATER DEPTH	200	cm	DISLOGGED	yes	REASON	ice	debris			
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	60	cm	TETHER TYPE	alder		
COMMENTS										
down load OK										
sw ung in due to ice/debris but still fuctional										
SITE ID	pineUP2	LOCATION	u/s of Pine River			BANK	north			
LOGGER TYPE	Tidbit	LOGGER SERIAL #	9767572			UTM	641653	6225304		
DOWNLOAD DATE	2	Jun	2013	DOWNLOAD TIME	11:00		CREW	BC TE		
TEST RECORDER TYPE	merc	WATER TEMP	9.0	AIR TEMP	18	ICE CONDITIONS	free			
LOGGER CONDITIONS										
WATER DEPTH	200	cm	DISLOGGED	yes	REASON	tampered				
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER		cm	TETHER TYPE	balsam pop		
COMMENTS										
down load OK										
dislodged by debris but still functional										
SITE ID	pineDN1_BU	LOCATION	d/s of Pine River			BANK	south			
LOGGER TYPE	Tidbit	LOGGER SERIAL #	9762095			UTM	648362	6222823		
DOWNLOAD DATE	2	Jun	2013	DOWNLOAD TIME	11:22		CREW	BC TE		
TEST RECORDER TYPE	merc	WATER TEMP	8.6	AIR TEMP	18	ICE CONDITIONS	free			
LOGGER CONDITIONS										
WATER DEPTH	200	cm	DISLOGGED	yes	REASON		debris			
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER		cm	TETHER TYPE	alder		
COMMENTS										
down load OK										
dislodged by debris but still functional										
replaced end of cable w ith stainless steel										
SITE ID	pineDN1	LOCATION	d/s of Pine River			BANK	south			
LOGGER TYPE	Tidbit	LOGGER SERIAL #	2225322			UTM	648427	6222837		
DOWNLOAD DATE	2	Jun	2013	DOWNLOAD TIME	11:38		CREW	BC TE		
TEST RECORDER TYPE	merc	WATER TEMP	8.6	AIR TEMP	18	ICE CONDITIONS	free			
LOGGER CONDITIONS										
WATER DEPTH	200	cm	DISLOGGED	yes	REASON		debris			
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER		cm	TETHER TYPE	alder		
COMMENTS										
down load OK										
dislodged by debris but still functional										

BC HYDRO PEACE RIVER TEMPERATURE MONITORING - DOWNLOAD INFORMATION FORM											
SITE ID	gmsUP1		LOCATION	GMS Forebay				BANK			
LOGGER TYPE	Tidbit		LOGGER SERIAL #	2038617				UTM	548841	6209022	
DOWNLOAD DATE	26	Sep	2013	DOWNLOAD TIME	11:10				CREW	BC TE	
TEST RECORDER TYPE	merc		WATER TEMP	14.5	AIR TEMP	6		ICE CONDITIONS	free		
LOGGER CONDITIONS											
WATER DEPTH	1 m		DISLODGED	no		REASON					
BURIED	no		FUNCTIONAL	wet		IF DRY, HEIGHT ABOVE WATER	cm		TETHER TYPE	steel buoy	
COMMENTS											
down load OK											
SITE ID	gmsUP2		LOCATION	GMS Forebay				BANK			
LOGGER TYPE	Tidbit		LOGGER SERIAL #	10156318				UTM	548841	6209022	
DOWNLOAD DATE	26	Sep	2013	DOWNLOAD TIME	11:09				CREW	BC TE	
TEST RECORDER TYPE	YSI		WATER TEMP	14.2	AIR TEMP	6		ICE CONDITIONS	none		
LOGGER CONDITIONS											
WATER DEPTH	10 m		DISLODGED	no		REASON					
BURIED	no		FUNCTIONAL	wet		IF DRY, HEIGHT ABOVE WATER	cm		TETHER TYPE	steel buoy	
COMMENTS											
Dow nload OK											
SITE ID	gmsDN1		LOCATION	GMS Tailrace LDB				BANK	south		
LOGGER TYPE	Tidbit		LOGGER SERIAL #	2038619				UTM	548881	6207761	
DOWNLOAD DATE	26	Sep	2013	DOWNLOAD TIME	10:28				CREW	BC TE	
TEST RECORDER TYPE	merc		WATER TEMP	13.5	AIR TEMP	3		ICE CONDITIONS	free		
LOGGER CONDITIONS											
WATER DEPTH	150	cm	DISLODGED	no		REASON					
BURIED	no		FUNCTIONAL	wet		IF DRY, HEIGHT ABOVE WATER	cm		TETHER TYPE	rock	
COMMENTS											
Back-up logger 2038613 in same capsule (gmsDN2BU) both dow nloads OK											
SITE ID	gmsDN2		LOCATION	GMS Tailrace RDB				BANK			north
LOGGER TYPE	Tidbit		LOGGER SERIAL #	2038620				UTM	548828	6207836	
DOWNLOAD DATE	26	Sep	2013	DOWNLOAD TIME	10:14				CREW	BC TE	
TEST RECORDER TYPE	merc		WATER TEMP	9.3	AIR TEMP	2		ICE CONDITIONS	free		
LOGGER CONDITIONS											
WATER DEPTH	180	cm	DISLODGED	no		REASON					
BURIED	no		FUNCTIONAL	wet		IF DRY, HEIGHT ABOVE WATER	cm		TETHER TYPE	rock	
COMMENTS											
Back-up logger 2038614 in same capsule (gmsDN2BU) both dow nloads OK											

BC HYDRO PEACE RIVER TEMPERATURE MONITORING - DOWNLOAD INFORMATION FORM										
SITE ID	pcnUP1	LOCATION	PCN Forebay			BANK			north	
LOGGER TYPE	Tidbit		LOGGER SERIAL #	2225325		UTM	562684	6204075		
DOWNLOAD DATE	26	Sep	2013	DOWNLOAD TIME	9:20		CREW	BC TE		
TEST RECORDER TYPE	YSI		WATER TEMP	12.7	AIR TEMP	5	ICE CONDITIONS	free		
LOGGER CONDITIONS										
WATER DEPTH	1 m	DISLODGED	no		REASON					
BURIED	no	FUNCTIONAL	wet		IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	log boom		
COMMENTS										
dow nload OK										
SITE ID	pcnDN2	LOCATION	PCN Tailrace			BANK			north	
LOGGER TYPE	Tidbit		LOGGER SERIAL #	2038621		UTM	562803	6204854		
DOWNLOAD DATE	26	Sep	2013	DOWNLOAD TIME	8:56		CREW	BC TE		
TEST RECORDER TYPE	merc		WATER TEMP	12.8	AIR TEMP	5	ICE CONDITIONS	free		
LOGGER CONDITIONS										
WATER DEPTH	150	cm	DISLODGED	no		REASON				
BURIED	no	FUNCTIONAL	wet		IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	rock		
COMMENTS										
dow nload OK										
SITE ID	pcnDN2_BU	LOCATION	PCN Tailrace			BANK			north	
LOGGER TYPE	Tidbit		LOGGER SERIAL #	2038568		UTM	562803	6204854		
DOWNLOAD DATE	26	Sep	2013	DOWNLOAD TIME	9:00		CREW	BC TE		
TEST RECORDER TYPE	merc		WATER TEMP	12.8	AIR TEMP	5	ICE CONDITIONS	free		
LOGGER CONDITIONS										
WATER DEPTH	150	cm	DISLODGED	no		REASON				
BURIED	no	FUNCTIONAL	wet		IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	rock		
COMMENTS										
dow nload OK										
Anchored to same rock as pcnDN2										
SITE ID		LOCATION				BANK				
LOGGER TYPE			LOGGER SERIAL #			UTM				
DOWNLOAD DATE				DOWNLOAD TIME			CREW			
TEST RECORDER TYPE			WATER TEMP		AIR TEMP		ICE CONDITIONS			
LOGGER CONDITIONS										
WATER DEPTH		cm	DISLODGED			REASON				
BURIED		FUNCTIONAL			IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE			
COMMENTS										

BC HYDRO PEACE RIVER TEMPERATURE MONITORING - DOWNLOAD INFORMATION FORM											
SITE ID	halfDN2_BU	LOCATION	d/s of Halfway River			BANK			north		
LOGGER TYPE	Tidbit	LOGGER SERIAL #	10156314			UTM	598179	6263144			
DOWNLOAD DATE	29	Sep	2013	DOWNLOAD TIME	15:26		CREW	BC DC			
TEST RECORDER TYPE	merc		WATER TEMP	10.8	AIR TEMP	12	ICE CONDITIONS	free			
LOGGER CONDITIONS											
WATER DEPTH	0	cm	DISLODGED		yes	REASON			debris		
BURIED	no	FUNCTIONAL		dry	IF DRY, HEIGHT ABOVE WATER	60	cm	TETHER TYPE	balsam pop		
COMMENTS											
download OK											
logger swung to shore by debris											
SITE ID	halfDN2	LOCATION	d/s of Halfway River			BANK			north		
LOGGER TYPE	Tidbit	LOGGER SERIAL #	2038574			UTM	598198	6232169			
DOWNLOAD DATE	29	Sep	2013	DOWNLOAD TIME	15:37		CREW	BC DC			
TEST RECORDER TYPE	merc		WATER TEMP	10.8	AIR TEMP	12	ICE CONDITIONS	free			
LOGGER CONDITIONS											
WATER DEPTH	60	cm	DISLODGED		no	REASON					
BURIED	no	FUNCTIONAL	wet		IF DRY, HEIGHT ABOVE WATER		cm	TETHER TYPE	balsam pop		
COMMENTS											
download OK											
replaced corroded cable											
SITE ID	halfUP2	LOCATION	u/s of Halfway River			BANK			north		
LOGGER TYPE	Tidbit	LOGGER SERIAL #	2038572			UTM	595569	6230541			
DOWNLOAD DATE	29	Sep	2013	DOWNLOAD TIME	16:12		CREW	BC DC			
TEST RECORDER TYPE	merc		WATER TEMP	12.2	AIR TEMP	12	ICE CONDITIONS	free			
LOGGER CONDITIONS											
WATER DEPTH	100	cm	DISLODGED		no	REASON					
BURIED	no	FUNCTIONAL	wet		IF DRY, HEIGHT ABOVE WATER		cm	TETHER TYPE	spruce		
COMMENTS											
download OK											
change cable next download											
SITE ID	halfUP1	LOCATION	u/s of Halfway River			BANK	south				
LOGGER TYPE	Tidbit	LOGGER SERIAL #	9767573			UTM	595165	6230094			
DOWNLOAD DATE	29	Sep	2013	DOWNLOAD TIME	16:22		CREW	BC DC			
TEST RECORDER TYPE	merc		WATER TEMP	12.2	AIR TEMP	12	ICE CONDITIONS	free			
LOGGER CONDITIONS											
WATER DEPTH	200	cm	DISLODGED		no	REASON					
BURIED	no	FUNCTIONAL	wet		IF DRY, HEIGHT ABOVE WATER		cm	TETHER TYPE	spruce tree		
COMMENTS											
download OK											
change cable next download											

BC HYDRO PEACE RIVER TEMPERATURE MONITORING - DOWNLOAD INFORMATION FORM										
SITE ID	mobUP2	LOCATION	u/s of Moberly River			BANK	north			
LOGGER TYPE	Tidbit	LOGGER SERIAL #	2038616			UTM	627501	6232563		
DOWNLOAD DATE	17	Oct	2013	DOWNLOAD TIME	14:20		CREW	BC TE		
TEST RECORDER TYPE	merc	WATER TEMP	10.1	AIR TEMP	10	ICE CONDITIONS	free			
LOGGER CONDITIONS										
WATER DEPTH	140	cm	DISLODGED	no	REASON					
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	spruce			
COMMENTS										
dow nload Ok										
SITE ID	mobUP1	LOCATION	u/s of Moberly River			BANK	south			
LOGGER TYPE	Tidbit	LOGGER SERIAL #	2038612			UTM	627158	6232349		
DOWNLOAD DATE	17	Oct	2013	DOWNLOAD TIME	14:35		CREW	BC TE		
TEST RECORDER TYPE	merc	WATER TEMP	10.2	AIR TEMP	10	ICE CONDITIONS	free			
LOGGER CONDITIONS										
WATER DEPTH	120	cm	DISLODGED	no	REASON					
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	alder			
COMMENTS										
dow nload OK										
SITE ID	mobDN1_BU	LOCATION	d/s of Moberly River			BANK	south			
LOGGER TYPE	Tidbit	LOGGER SERIAL #	2038576			UTM	630403	6229275		
DOWNLOAD DATE	17	Oct	2013	DOWNLOAD TIME	14:59		CREW	BC TE		
TEST RECORDER TYPE	merc	WATER TEMP	9.9	AIR TEMP	10	ICE CONDITIONS	free			
LOGGER CONDITIONS										
WATER DEPTH	0	cm	DISLODGED	yes	REASON	debris				
BURIED	no	FUNCTIONAL	dry	IF DRY, HEIGHT ABOVE WATER	50	cm	TETHER TYPE	alder		
COMMENTS										
dow nload OK										
stranded on shore due to debris; re-positioned in 1.2 m of w ater.										
galvanized cable OK untl next dow nload.										
SITE ID	mobDN1	LOCATION	d/s of Moberly River			BANK	south			
LOGGER TYPE	Tidbit	LOGGER SERIAL #	2038622			UTM	630583	6229281		
DOWNLOAD DATE	17	Oct	2013	DOWNLOAD TIME	15:08		CREW	BC TE		
TEST RECORDER TYPE	merc	WATER TEMP	9.9	AIR TEMP	10	ICE CONDITIONS	free			
LOGGER CONDITIONS										
WATER DEPTH	150	cm	DISLODGED	no	REASON					
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	alder			
COMMENTS										
dow nload OK										
galvanized cable OK untl next dow nload.										

BC HYDRO PEACE RIVER TEMPERATURE MONITORING - DOWNLOAD INFORMATION FORM										
SITE ID	pineUP1	LOCATION	u/s of Pine River			BANK	south			
LOGGER TYPE	Tidbit	LOGGER SERIAL #	2038624			UTM	641034	6225375		
DOWNLOAD DATE	17	Oct	2013	DOWNLOAD TIME	15:30		CREW	BC TE		
TEST RECORDER TYPE	merc	WATER TEMP	10.0	AIR TEMP	10	ICE CONDITIONS	free			
LOGGER CONDITIONS										
WATER DEPTH	200	cm	DISLODGED	no	REASON					
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	alder			
COMMENTS										
dow nload OK										
galvanized cable OK										
SITE ID	pineUP2	LOCATION	u/s of Pine River			BANK	north			
LOGGER TYPE	Tidbit	LOGGER SERIAL #	9767572			UTM	641653	6225304		
DOWNLOAD DATE	17	Oct	2013	DOWNLOAD TIME	15:39		CREW	BC TE		
TEST RECORDER TYPE	merc	WATER TEMP	10.2	AIR TEMP	10	ICE CONDITIONS	free			
LOGGER CONDITIONS										
WATER DEPTH	200	cm	DISLODGED	no	REASON					
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	balsam pop			
COMMENTS										
dow nload OK										
galvanized cable OK										
SITE ID	pineDN1_BU	LOCATION	d/s of Pine River			BANK	south			
LOGGER TYPE	Tidbit	LOGGER SERIAL #	9762095			UTM	648362	6222823		
DOWNLOAD DATE	17	Oct	2013	DOWNLOAD TIME	16:00		CREW	BC TE		
TEST RECORDER TYPE	merc	WATER TEMP	8.5	AIR TEMP	10	ICE CONDITIONS	free			
LOGGER CONDITIONS										
WATER DEPTH	100	cm	DISLODGED	no	REASON					
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	alder			
COMMENTS										
dow nload OK										
replaced anchnor with heavier metal										
SITE ID	pineDN1	LOCATION	d/s of Pine River			BANK	south			
LOGGER TYPE	Tidbit	LOGGER SERIAL #	2225322			UTM	648427	6222837		
DOWNLOAD DATE	17	Oct	2013	DOWNLOAD TIME	16:11		CREW	BC TE		
TEST RECORDER TYPE	merc	WATER TEMP	8.5	AIR TEMP	10	ICE CONDITIONS	free			
LOGGER CONDITIONS										
WATER DEPTH	120	cm	DISLODGED	no	REASON					
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	alder			
COMMENTS										
dow nload OK										

BC HYDRO PEACE RIVER TEMPERATURE MONITORING - DOWNLOAD INFORMATION FORM											
SITE ID	gmsUP1		LOCATION	GMS Forebay				BANK			
LOGGER TYPE	Tidbit		LOGGER SERIAL #	2038617				UTM	548841	6209022	
DOWNLOAD DATE	31	Jan	2014	DOWNLOAD TIME	11:26				CREW	BC TE	
TEST RECORDER TYPE	YSI		WATER TEMP	0.3	AIR TEMP	-10		ICE CONDITIONS	none		
LOGGER CONDITIONS											
WATER DEPTH	100	cm	DISLODGED	no		REASON					
BURIED	no	FUNCTIONAL	wet		IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	steel buoy			
COMMENTS											
Dow nload OK											
SITE ID	gmsUP2		LOCATION	GMS Forebay				BANK			
LOGGER TYPE	Tidbit		LOGGER SERIAL #	10156318				UTM	548841	6209022	
DOWNLOAD DATE	31	Jan	2014	DOWNLOAD TIME	11:23				CREW	BC TE	
TEST RECORDER TYPE	YSI		WATER TEMP	0.3	AIR TEMP	-10		ICE CONDITIONS	none		
LOGGER CONDITIONS											
WATER DEPTH	10 m	DISLODGED	no		REASON						
BURIED	no	FUNCTIONAL	wet		IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	steel buoy			
COMMENTS											
Dow nload OK											
SITE ID	gmsDN2		LOCATION	GMS Tailrace RDB				BANK			north
LOGGER TYPE	Tidbit		LOGGER SERIAL #	2038620				UTM	548828	6207836	
DOWNLOAD DATE	20	Jan	2014	DOWNLOAD TIME	13:07				CREW	BC TE	
TEST RECORDER TYPE	merc		WATER TEMP	0.7	AIR TEMP	1		ICE CONDITIONS	none		
LOGGER CONDITIONS											
WATER DEPTH	200	cm	DISLODGED	no		REASON					
BURIED	no	FUNCTIONAL	wet		IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	rock			
COMMENTS											
Back-up logger 2038614 in same capsule											
both dow nloads OK											
SITE ID	gmsDN1		LOCATION	GMS Tailrace LDB				BANK	south		
LOGGER TYPE	Tidbit		LOGGER SERIAL #	2038619				UTM	548881	6207761	
DOWNLOAD DATE	31	Jan	2014	DOWNLOAD TIME	10:27				CREW	BC TE	
TEST RECORDER TYPE	merc		WATER TEMP	0.4	AIR TEMP	-10		ICE CONDITIONS	light shore ice		
LOGGER CONDITIONS											
WATER DEPTH	180	cm	DISLODGED	no		REASON					
BURIED	no	FUNCTIONAL	wet		IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	rock			
COMMENTS											
Back-up logger 2038613 in same capsule											
both dow nloads OK											

BC HYDRO PEACE RIVER TEMPERATURE MONITORING - DOWNLOAD INFORMATION FORM											
SITE ID	pcnUP1	LOCATION	PCN Forebay			BANK			north		
LOGGER TYPE	Tidbit		LOGGER SERIAL #	2225325		UTM	562684	6204075			
DOWNLOAD DATE	20	Jan	2014	DOWNLOAD TIME	15:44		CREW	BC TE			
TEST RECORDER TYPE	YSI		WATER TEMP	0.6	AIR TEMP	7.0	ICE CONDITIONS	none			
LOGGER CONDITIONS											
WATER DEPTH	100	cm	DISLODGED	no	REASON						
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	log boom				
COMMENTS											
dow nload OK											
SITE ID	pcnDN2	LOCATION	PCN Tailrace			BANK			north		
LOGGER TYPE	Tidbit		LOGGER SERIAL #	2038621		UTM	562803	6204854			
DOWNLOAD DATE	20	Jan	2014	DOWNLOAD TIME	15:20		CREW	BC TE			
TEST RECORDER TYPE	merc		WATER TEMP	0.5	AIR TEMP	7.0	ICE CONDITIONS	none			
LOGGER CONDITIONS											
WATER DEPTH	200	cm	DISLODGED	no	REASON						
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	rock				
COMMENTS											
dow nload OK											
SITE ID	pcnDN2_BU	LOCATION	PCN Tailrace			BANK			north		
LOGGER TYPE	Tidbit		LOGGER SERIAL #	2038568		UTM	562803	6204854			
DOWNLOAD DATE	20	Jan	2014	DOWNLOAD TIME	15:22		CREW	BC TE			
TEST RECORDER TYPE	merc		WATER TEMP	0.5	AIR TEMP	7.0	ICE CONDITIONS	none			
LOGGER CONDITIONS											
WATER DEPTH	200	cm	DISLODGED	no	REASON						
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	rock				
COMMENTS											
dow nload OK											
Anchored to same rock as pcnDN2											
SITE ID		LOCATION				BANK					
LOGGER TYPE			LOGGER SERIAL #			UTM					
DOWNLOAD DATE				DOWNLOAD TIME			CREW				
TEST RECORDER TYPE			WATER TEMP		AIR TEMP		ICE CONDITIONS				
LOGGER CONDITIONS											
WATER DEPTH		cm	DISLODGED		REASON						
BURIED		FUNCTIONAL		IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE					
COMMENTS											

BC HYDRO PEACE RIVER TEMPERATURE MONITORING - DOWNLOAD INFORMATION FORM											
SITE ID	half UP2	LOCATION	u/s of Halfway River			BANK			north		
LOGGER TYPE	Tidbit	LOGGER SERIAL #	2038572			UTM	595569	6230541			
DOWNLOAD DATE	31	Jan	2014	DOWNLOAD TIME	14:03		CREW	BC TE			
TEST RECORDER TYPE	merc	WATER TEMP	0.4	AIR TEMP	-10	ICE CONDITIONS	none				
LOGGER CONDITIONS											
WATER DEPTH	200	cm	DISLODGED	no	REASON						
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	spruce				
COMMENTS											
download OK											
change cable to stainless steel in spring											
SITE ID	half UP1	LOCATION	u/s of Halfway River			BANK	south				
LOGGER TYPE	Tidbit	LOGGER SERIAL #	9767573			UTM	595165	6230094			
DOWNLOAD DATE	31	Jan	2014	DOWNLOAD TIME	14:13		CREW	BC TE			
TEST RECORDER TYPE	merc	WATER TEMP	0.3	AIR TEMP	-10	ICE CONDITIONS	light shore ice				
LOGGER CONDITIONS											
WATER DEPTH	200	cm	DISLODGED	no	REASON						
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	spruce tree				
COMMENTS											
download OK											
change cable to stainless steel in spring											
SITE ID	half DN2	LOCATION	d/s of Halfway River			BANK	north				
LOGGER TYPE	Tidbit	LOGGER SERIAL #	2038574			UTM	598198	6232169			
DOWNLOAD DATE	31	Jan	2014	DOWNLOAD TIME	14:39		CREW	BC TE			
TEST RECORDER TYPE	merc	WATER TEMP	0.2	AIR TEMP	-10	ICE CONDITIONS	moderate shore ice				
LOGGER CONDITIONS											
WATER DEPTH	160	cm	DISLODGED	no	REASON						
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	balsam pop				
COMMENTS											
download OK											
change anchor tree in spring											
SITE ID	half DN2_BU	LOCATION	d/s of Halfway River			BANK	north				
LOGGER TYPE	Tidbit	LOGGER SERIAL #	10156314			UTM	598179	6263144			
DOWNLOAD DATE	31	Jan	2014	DOWNLOAD TIME	14:32		CREW	BC TE			
TEST RECORDER TYPE	merc	WATER TEMP	0.2	AIR TEMP	-10	ICE CONDITIONS	moderate shore ice				
LOGGER CONDITIONS											
WATER DEPTH	100	cm	DISLODGED	yes	REASON	ice	debris				
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	balsam pop				
COMMENTS											
download OK											
sw ung patially to shore											

BC HYDRO PEACE RIVER TEMPERATURE MONITORING - DOWNLOAD INFORMATION FORM											
SITE ID	mobUP2		LOCATION	u/s of Moberly River				BANK			north
LOGGER TYPE	Tidbit		LOGGER SERIAL #	2038616				UTM	627501	6232563	
DOWNLOAD DATE	18	Jan	2014	DOWNLOAD TIME	12:52				CREW	BC TE	
TEST RECORDER TYPE	merc		WATER TEMP	0.5	AIR TEMP	-2.0		ICE CONDITIONS	continuous shore ice		
LOGGER CONDITIONS											
WATER DEPTH	200	cm	DISLODGED	no	REASON						
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	spruce				
COMMENTS											
dow nload Ok											
SITE ID	mobUP1		LOCATION	u/s of Moberly River				BANK	south		
LOGGER TYPE	Tidbit		LOGGER SERIAL #	2038612				UTM	627158	6232349	
DOWNLOAD DATE	18	Jan	2014	DOWNLOAD TIME	13:01				CREW	BC TE	
TEST RECORDER TYPE	merc		WATER TEMP	0.5	AIR TEMP	-2.0		ICE CONDITIONS	continuous shore ice		
LOGGER CONDITIONS											
WATER DEPTH	200	cm	DISLODGED	no	REASON						
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	alder				
COMMENTS											
dow nload OK											
SITE ID	mobDN1_BU		LOCATION	d/s of Moberly River				BANK	south		
LOGGER TYPE	Tidbit		LOGGER SERIAL #	2038576				UTM	630403	6229275	
DOWNLOAD DATE	18	Jan	2014	DOWNLOAD TIME	13:32				CREW	BC TE	
TEST RECORDER TYPE	merc		WATER TEMP	0.4	AIR TEMP	-5.0		ICE CONDITIONS	light shore ice		
LOGGER CONDITIONS											
WATER DEPTH	60	cm	DISLODGED		yes	REASON	ice	debris			
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	alder				
COMMENTS											
dow nload OK											
dislodged and stretched out dow nstream by scouring ice; still in water at high flow stage.											
SITE ID	mobDN1		LOCATION	d/s of Moberly River				BANK	south		
LOGGER TYPE	Tidbit		LOGGER SERIAL #	2038622				UTM	630583	6229281	
DOWNLOAD DATE	18	Jan	2014	DOWNLOAD TIME	13:22				CREW	BC TE	
TEST RECORDER TYPE	merc		WATER TEMP	0.4	AIR TEMP	-5.0		ICE CONDITIONS	light shore ice		
LOGGER CONDITIONS											
WATER DEPTH	180	cm	DISLODGED	no	REASON						
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER	cm	TETHER TYPE	alder				
COMMENTS											
dow nload OK											

BC HYDRO PEACE RIVER TEMPERATURE MONITORING - DOWNLOAD INFORMATION FORM											
SITE ID	pineUP2	LOCATION			u/s of Pine River			BANK			north
LOGGER TYPE	Tidbit	LOGGER SERIAL #			9767572			UTM	641653	6225304	
DOWNLOAD DATE	18	Jan	2014	DOWNLOAD TIME	11:50			CREW	BC TE		
TEST RECORDER TYPE	merc	WATER TEMP	0.4	AIR TEMP	-2.0		ICE CONDITIONS	light shore ice			
LOGGER CONDITIONS											
WATER DEPTH	250	cm	DISLODGED	no	REASON						
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER		cm	TETHER TYPE	balsam pop			
COMMENTS											
dow nload OK											
change cable to stainless steel in spring											
SITE ID	pineUP1	LOCATION			u/s of Pine River			BANK			south
LOGGER TYPE	Tidbit	LOGGER SERIAL #			2038624			UTM	641034	6225372	
DOWNLOAD DATE	18	Jan	2014	DOWNLOAD TIME	12:02			CREW	BC TE		
TEST RECORDER TYPE	merc	WATER TEMP	0.4	AIR TEMP	-2.0		ICE CONDITIONS	light shore ice			
LOGGER CONDITIONS											
WATER DEPTH	200	cm	DISLODGED	no	REASON						
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER		cm	TETHER TYPE	alder			
COMMENTS											
dow nload OK											
change cable to stainless steel in spring											
SITE ID	pineDN1_BU	LOCATION			d/s of Pine River			BANK			south
LOGGER TYPE	Tidbit	LOGGER SERIAL #			9762095			UTM	648362	6222823	
DOWNLOAD DATE	18	Jan	2014	DOWNLOAD TIME	14:18			CREW	BC TE		
TEST RECORDER TYPE	merc	WATER TEMP	0.3	AIR TEMP	-5.0		ICE CONDITIONS	continuous shore ice			
LOGGER CONDITIONS											
WATER DEPTH	180	cm	DISLODGED	no	REASON						
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER		cm	TETHER TYPE	alder			
COMMENTS											
dow nload OK											
SITE ID	pineDN1	LOCATION			d/s of Pine River			BANK			south
LOGGER TYPE	Tidbit	LOGGER SERIAL #			2225322			UTM	648427	6222837	
DOWNLOAD DATE	18	Jan	2014	DOWNLOAD TIME	14:31			CREW	BC TE		
TEST RECORDER TYPE	merc	WATER TEMP	0.3	AIR TEMP	-5.0		ICE CONDITIONS	continuous shore ice			
LOGGER CONDITIONS											
WATER DEPTH	180	cm	DISLODGED	no	REASON						
BURIED	no	FUNCTIONAL	wet	IF DRY, HEIGHT ABOVE WATER		cm	TETHER TYPE	alder			
COMMENTS											
dow nload OK											

Appendix V. Summary of temperature logger deployment dates and anticipated replacement dates.

Site ID	Serial #	Location	Date Deployed	Replace Date
gmsUP1	2038617	WAC Bennett Forebay	Sep 2008	2014
gmsUP2	10156318	WAC Bennett Forebay	June 2012	2018
gmsDN1	2038619	GMS Tailrace	Sep 2008	2014
gmsDN1backup	2038613	GMS Tailrace	Nov 2009	2015
gmsDN2	2038620	GMS Tailrace	Sep 2008	2014
gmsDN2backup	2038614	GMS Tailrace	Nov 2009	2015
pcnUP1	2225325	Peace Canyon Forebay	Sep 2008	2014
pcnDN2	2038621	Peace Canyon Tailrace	Sep 2008	2014
pcnDN2BU	2038568	Peace Canyon Tailrace	Sep 2008	2014
HalfUP1	9767573	Halfway Confluence - upstream	May 2011	2017
HalfUP2	2038572	Halfway Confluence - upstream	Sep 2010	2015
HalfDN2	2038574	Halfway Confluence - downstream	Sep 2008	2014
HalfDN2BU	10156314	Halfway Confluence - downstream	Jul 2013	2018
MobUP1	2038612	Moberly Confluence - upstream	Sep 2008	2014
MobUP2	2038616	Moberly Confluence - upstream	Sep 2008	2014
MobDN1	2038622	Moberly Confluence - downstream	Sep 2008	2014
MobDN1BU	2038576	Moberly Confluence - downstream	Sep 2008	2014
PineUP1	2038624	Pine Confluence - upstream	Sep 2008	2014
PineUP2	9767572	Pine Confluence - upstream	May 2011	2017
PineDN1	2225322	Pine Confluence - downstream	Sep 2008	2014
PineDN1BU	9762095	Pine Confluence - downstream	July 2011	2017