

# **Appendix B:**

## **Hydrological Modeling Details**

## APPENDIX B: Hydrological Modeling Details

In order to model the storage capabilities of the 16 projects of interest, a hydrological record must be established for each site of interest. Note that, due to multiple variations of certain projects, there are only ten unique sites that require a hydrological record.

A Water Survey of Canada gauge is selected for each site and an area proration technique is used to calculate indicative long-term synthetic water flow strings and monthly average water flows for each of the ten sites. The table below provides a summary of key hydrological data for each site. Note how the sixteen projects of interest are represented in the “Project Variant” column.

Intake Site	Site ID	Project Variant	Drainage Area	ID of WSC Gauge Used	Mean Annual Discharge
Detour Canyon	PELLY-PELLY-0567-A	Detour Only	28,400 km <sup>2</sup>	09BC004	257 m <sup>3</sup> /s
	PELLY-PELLY-0567-B	Detour + Fortin			
False Canyon	LIARD-FRANC-0696	-	12,200 km <sup>2</sup>	10AB001	151 m <sup>3</sup> /s
Fraser Falls	STEWA-STEWA-0519-B	High	30,500 km <sup>2</sup>	09DC002	359 m <sup>3</sup> /s
	STEWA-STEWA-0519-A	Low			
Granite Canyon	PELLY-PELLY-0480-B	Large	45,700 km <sup>2</sup>	09DC002	362 m <sup>3</sup> /s
	PELLY-PELLY-0480-A	Small			
Hoole Canyon	PELLY-PELLY-0760-A	Hoole + Fortin	9,900 km <sup>2</sup>	09BC002	97 m <sup>3</sup> /s
Middle or Lower Canyon	LIARD-FRANC-0670-B	Large	12,900 km <sup>2</sup>	10AB001	160 m <sup>3</sup> /s
	LIARD-FRANC-0670-A	Small			
NWPI	YUKON-TESLI-0670-A	Low	32,600 km <sup>2</sup>	09AE001	323 m <sup>3</sup> /s
Slate Rapids	PELLY-PELLY-0847-B	Diversion	5,400 km <sup>2</sup>	09BC002	53 m <sup>3</sup> /s
Two Mile Canyon	STEWA-HESS -0552	-	14,100 km <sup>2</sup>	09DC002	166 m <sup>3</sup> /s
Upper Canyon	LIARD-FRANC-0730-C	Large	11,000 km <sup>2</sup>	10AB001	137 m <sup>3</sup> /s
	LIARD-FRANC-0730-B	Medium			
	LIARD-FRANC-0730-A	Small			

With the above hydrology data collected, the long term prorated water flows are converted into monthly average flows for each site of interest, and these represent the natural river flows into the project sites. These twelve data points for each project site are one of the primary inputs to the storage model.

The table below provides some additional commentary on the decisions made during the process of compiling the hydrological data for each site.

Site	Description of Hydrology Process
Detour Canyon	The Detour Canyon site on the Pelly River has a watershed area of 28,400 km <sup>2</sup> . Water Survey of Canada gauge 09BC004, located on Pelly River with a drainage area of 21,900 km <sup>2</sup> , is the most appropriate gauge to use because, although it is upstream of the Detour Canyon site, the intervening watershed area appears consistent with the rest of the watershed. Downstream gauge 09BC001 was rejected because it has a much greater watershed area than the site. Available data for this gauge spans January 1972 through December 2011.
False Canyon	The False Canyon site on the Frances River has a watershed area of 12,200 km <sup>2</sup> . Water Survey of Canada gauge 10AB001, located on Frances River with a drainage area of 12,800 km <sup>2</sup> , is the most appropriate gauge to use because there are no other nearby gauges on the river. Available data for this gauge spans January 1962 through December 2011.
Fraser Falls	The Fraser Falls site on the Stewart River has a watershed area of 30,500 km <sup>2</sup> . Water Survey of Canada gauge 09DC002, located on Stewart River with a drainage area of 31,600 km <sup>2</sup> , is the most appropriate gauge to use because it is not far downstream of the Fraser Falls site and there are no major tributaries between this gauge and the site. Available data for this gauge spans January 1949 through December 1977.
Granite Canyon	The Granite Canyon site on the Pelly River has a watershed area of 45,700 km <sup>2</sup> . Water Survey of Canada gauge 09BC001, located on Pelly River with a drainage area of 48,900 km <sup>2</sup> , is the most appropriate gauge to use because it is not far downstream of the Granite Canyon site and there are no major tributaries between this gauge and the site. Available data for this gauge spans October 1951 through December 2011.
Hoole Canyon	The Hoole Canyon site on the Pelly River has a watershed area of 9,900 km <sup>2</sup> . Water Survey of Canada gauge 09BC002, located on Pelly River with a drainage area of 18,400 km <sup>2</sup> , is the most appropriate gauge to use because it is located on the same river as the site intake and has twenty-two years of record. Upstream gauge 09BA002 was rejected due to an inadequate period of record of thirteen years. Available data for this gauge spans July 1954 through June 1977.
Middle (or Lower) Canyon	The Middle Canyon site on the Frances River has a watershed area of 12,900 km <sup>2</sup> . Water Survey of Canada gauge 10AB001, located on Frances River with a drainage area of 12,800 km <sup>2</sup> , is the most appropriate gauge to use because there are no other nearby gauges on the river. Available data for this gauge spans January 1962 through December 2011.
NWPI	The NWPI site on the Teslin River has a watershed area of 32,600 km <sup>2</sup> . Water Survey of Canada gauge 09AE001, located on Teslin River with a drainage area of 30,300 km <sup>2</sup> , is the most appropriate gauge to use due to its proximity to the site of interest. A cursory inspection suggests that the runoff characteristics of the intervening watershed are not substantively different than those of the gauge watershed. Available data for this gauge spans April 1944 through December 1994.

Site	Description of Hydrology Process
Slate Rapids	<p>The Slate Rapids site on the Pelly River has a watershed area of 5,400 km<sup>2</sup>. Water Survey of Canada gauge 09BC002, located on Pelly River with a drainage area of 18,400 km<sup>2</sup>, is the most appropriate gauge to use because it is located on the same river as the site intake and has twenty-two years of record. Upstream gauge 09BA002 was rejected due to an inadequate period of record of thirteen years. Available data for this gauge spans July 1954 through June 1977.</p>
Two Mile Canyon	<p>The Two Mile Canyon site on the Stewart River has a watershed area of 14,100 km<sup>2</sup>. Water Survey of Canada gauge 09DC002, located on Stewart River with a drainage area of 31,600 km<sup>2</sup>, is the most appropriate gauge to use because it is located on the same river as the site intake. Upstream gauge 09BA002 was rejected due to a large discrepancy in watershed sizes and inadequate geographic diversity of gauge watershed. Available data for this gauge spans January 1949 through December 1977.</p>
Upper Canyon	<p>The Upper Canyon site on the Frances River has a watershed area of 11,000 km<sup>2</sup>. Water Survey of Canada gauge 10AB001, located on Frances River with a drainage area of 12,800 km<sup>2</sup>, is the most appropriate gauge to use because there are no other nearby gauges on the river. Available data for this gauge spans January 1962 through December 2011.</p>