NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Memo

To: Dave Green, North Star Infrastructure
From: Blair Baldwin, Natural Resource Solutions Inc.
Date: June 9, 2023
Re: Northwest Territories 2023 Tlicho Highway Crossing Flow Monitoring

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Introduction

Natural Resource Solutions Inc. (NRSI) was retained by North Star Infrastructure to complete the necessary instantaneous flow monitoring at the existing Duport and James River Crossings on the newly completed Tlicho Highway within the Northwest Territories. It is our understanding that instantaneous flow monitoring is necessary to support dosage calculation for calcium chloride applications in support of ongoing annual maintenance works.

Flow Monitoring

In preparation to complete the necessary field surveys NRSI acquired the necessary Northwest Territories Scientific Research Licence (No. 17286) from the Scientific Services Office of the Department of Education, Culture and Employment of the Government of the Northwest Territories. Following licence acquisition NRSI field crews completed instantaneous flow discharge monitoring at the Duport and James River Tlicho Highway crossing locations following the manual quantitative stream discharge protocol as described in Section 4: Module 5 of the Ontario Stream Assessment Protocol on June 9, 2023 (OSAP 2017).

In stream velocity measurements were collected through the use of a Swoffer Instruments Inc Model 2100 open stream current velocity meter calibrated following manufacturer's recommended guidelines.

Duport River

The Duport River flow monitoring occurred on June 9th, 2023 at 10:00am. Weather conditions during the sampling were clear and calm with no wind, or precipitation, with 30% cloud cover and air temperatures of 15°C, water temperatures were observed to be 8°C. Instantaneous flow discharge at the Duport River on June 9, 2023 was 1.001145 m^3/sec. The Duport River instantaneous flow discharge was characterized approximately 25m upstream of the existing Duport River crossing location, upstream of the highly braided reach in the immediate vicinity of the Duport River bridge. The Duport River crossing location is characterized by soft highly organic substrates with abundant overhanging bank vegetation (primarily herbaceous shrubs and terrestrial grasses) and instream woody debris. Abundant small bodied fish were observed throughout the Duport River.

Wetted Width (m)	**3.1**
Discharge (m3/sec)	**1.001145**

	Depth (m)	Velocity (m/sec)	Measurement Method
Observation Point 1 **0.19m**	0.75	0.19	0.6
Observation Point 2 **0.58m**	0.93	0.27	0.6
Observation Point 3 **0.97m**	0.88	0.38	0.6
Observation Point 4 **1.36m**	0.92	0.38	0.6
Observation Point 5 **1.74m**	0.84	0.51	0.6
Observation Point 6 **2.13m**	0.86	0.51	0.6
Observation Point 7 **2.52m**	0.77	0.45	0.6
Observation Point 8 **2.91m**	0.65	0.45	0.6

Picture 1. Duport River Flow Monitoring Station

Picture 2. Duport River Flow Monitoring

James River

The James River flow monitoring occurred on June 9th, 2023 at 10:45am. Weather conditions during the sampling were clear and calm with no wind, or precipitation, with 35% cloud cover and air temperatures of 23°C, water temperatures were observed to be 9°C. Instantaneous flow discharge at the James River on June 9, 2023 was 1.153656 m^3/sec. The James River instantaneous flow discharge was characterized approximately 35m downstream of the existing James River crossing location, downstream of unwadeable habitat in the immediate vicinity of the James River bridge. The James River crossing location is characterized by shallow boulder riffle habitat with abundant encrusting algae and overhanging bank vegetation (primarily coniferous trees). Abundant small bodied fish and fragmentary freshwater mussel shells were observed throughout the James River crossing location.

Wetted Width (m)		**7.2**	
Discharge (m^3/sec)		**1.153656**	
	Depth (m)	**Velocity (m/sec)**	**Measurement Method**
Observation Point 1 **0.36m**	0.35	0.12	0.6
Observation Point 2 **1.08m**	0.45	0.16	0.6
Observation Point 3 **1.8m**	0.79	0.15	0.6
Observation Point 4 **2.52m**	0.64	0.25	0.6
Observation Point 5 **3.24m**	0.7	0.33	0.6

Observation Point 6 **3.96m**	0.7	0.31	0.6
Observation Point 7 **4.68m**	0.78	0.31	0.6
Observation Point 8 **5.4m**	0.53	0.35	0.6
Observation Point 9 **6.12m**	0.45	0.29	0.6
Observation Point 10 **6.84m**	0.68	0.3	0.6

Picture 3. James River Flow Monitoring Station

Picture 4. James River Flow Monitoiring

Should you have any questions or comments regarding the Tlicho Highway crossing flow monitoring, please do not hesitate to contact the undersigned.

Sincerely,
Natural Resource Solutions Inc.

Blair Baldwin B.Sc.