APPENDIX E.9.3

Aquatic Effects Monitoring Program

Hydrometric Report

2024 Aquatic Effects Monitoring Program
Hydrometric Monitoring Report

Mary River Project
Baffinland Iron Mines Corporation

Version	Issue Date
0	March 30, 2025

Prepared by:
North Water Environmental

TABLE OF CONTENTS

PAGE

1. INTRODUCTION 1
2. HYDROMETRIC MONITORING PROGRAM 1
3. STAGE-DISCHARGE DATA 2
3.1 Overview 2
3.2 H01 (Phillip's Creek Tributary) 2
3.3 H02 (Tom River) 2
3.4 H04 (Camp Lake Tributary CLT-2) 3
3.5 H05 (Camp Lake Tributary CLT-1) 3
3.6 H06 (Mary River) 3
3.7 H07 (Mary River Tributary F) 3
3.8 H11 (Sheardown Lake Tributary SDLT-1) 3
4. STREAMFLOW HYDROGRAPHS 4
5. DISCUSSION 5
5.1 MR-08 Catchment (H04) 6
5.2 MR-10 Catchment (H05) 6
5.3 MR-12 Catchment (H07) 7
5.4 MR-19 Catchment (H06) 7
5.5 SDLT-1 Catchments (H11) 8
6. SUMMARY AND RECOMMENDATIONS 8
7. REFERENCES 9
8. CERTIFICATION 9

TABLES

Table 1 2024 Hydrometric Monitoring Program Stations 1
Table 2 Summary of 2024 Mean Monthly Estimated Discharge and Unit Runoff 5
Table 4 Summary of Predicted Effects on Water Quantity 6
Table 5 Monthly Average Flows at H04 (m^3/s) 6
Table 6 Monthly Average Flows at H05 (m^3/s) 7
Table 7 Monthly Average Flows at H07 (m^3/s) 7
Table 8 Monthly Average Flows at H06 (m^3/s) 8
Table 8 Monthly Average Flows at H11 (m^3/s) 8

TABLES AND FIGURES (ATTACHED)

Table 3	Summary of Daily Average Flow at H05 from 2006 to 2024 (m^3/s)
Figure 1	2024 Hydrometric Monitoring Program Stations
Figure 2	H01 - Phillip's Creek Tributary Rating Curve
Figure 3	H02 - Tom River Rating Curve
Figure 4	H04 - Camp Lake Tributary (CLT-2) Rating Curve
Figure 5	H05 - Camp Lake Tributary (CLT-1) Rating Curve
Figure 6	H06 - Mary River Rating Curve
Figure 7	H07 - Mary River Tributary F Rating Curve
Figure 8	H11 - Sheardown Lake Tributary (SLDT-1) Rating Curve
Figure 9	H01 – Phillip's Creek Tributary 2024 Streamflow Record
Figure 10	H02 - Tom River 2024 Streamflow Record
Figure 11	H04 - Camp Lake Tributary (CLT-2) 2024 Streamflow Record
Figure 12	H05 - Camp Lake Tributary (CLT-1) 2024 Streamflow Record
Figure 13	H06 - Mary River 2024 Streamflow Record
Figure 14	H07 – Mary River Tributary F 2024 Streamflow Record
Figure 15	H11 - Sheardown Lake Tributary (SLDT-1) 2024 Streamflow Record
Figure 16	Comparison of 2024 Unit Runoff
Figure 17	H05 – Camp Lake Tributary (CLT-1) Measured Streamflow Hydrographs 2006-2024

1. INTRODUCTION

Stream flow is monitored at the Mary River Project (Project) as part of the Hydrometric Monitoring Program, which is a component study of the Project's Aquatic Effects Monitoring Plan (AEMP, Baffinland, 2015). Hydrometric data were collected at seven stations during 2024. Station identifiers, names, period of records, drainage areas, and station coordinates are summarized in Table 1. The locations of the monitoring stations are shown on Figure 1.

Table 1 2024 Hydrometric Monitoring Program Stations

Station ID	Station Name	Period of Record	Drainage Area (km^2)	Coordinates (UTM)	
				Easting	Northing
H01	Phillips Creek Tributary	2006-2008, 2011-2024	250	532831	7946247
H02	Tom River near outlet to Mary Lake	2006-2008, 2010-2024	210	555712	7915514
H04	Camp Lake Tributary (CLT-2)	2006-2008, 2010-2024	8.3	557639	7915579
H05	Camp Lake Tributary (CLT-1)	2006-2008, 2010-2024	5.3	558906	7915079
H06	Mary River	2006-2008, 2010-2024	240	563922	7912984
H07	Mary River Tributary F	2006-2008 2010, 2011, 2017-2024	14.7	564451	7913194
H11	Sheardown Lake Tributary (SDLT-1)	2011-2024	3.6[1]	560503	7913545

Note:

1. The natural catchment area at H11 is 3.6 km^2. Excess water from the KM105 water management pond is pumped to the headwaters of the catchment as required.

2. HYDROMETRIC MONITORING PROGRAM

The Hydrometric Monitoring Program consists of water level or stage being measured at each station using a pressure transducer and data logger (Seametrics PT2X), which record water level and temperature at 15-minute intervals. The pressure transducers are installed in a stilling well at each station. The water level is measured manually during each site visit relative to at least two benchmarks installed in bedrock. The benchmarks have been maintained throughout the life of each station and differential levelling surveys are conducted during each site visit to relate water level to a local datum. The dataloggers are downloaded and checked for proper operation during each site visit. The data logger water level data are related to the local datum at the end of the season using the survey data.

Where flows permit safe access to a watercourse's channel, a Hach FH950 wading current meter is used to measure stream velocity. Discharge is estimated from the current meter velocity using the area-velocity technique (mid-section method) per the Water Survey of Canada (WSC) guidelines (WSC, 1999). Whenever possible, the stream is divided into a minimum of 20 sections to measure depth and velocity with the objective of having less than 5% of the flow in each section. At least two cross sections of depth and velocity are measured during each site visit. Velocity is recorded at 0.6 of the stream depths where the stream depth is less than or equal to 0.75 m at the time of measurement.

Where higher flows prevent the use of a wading current meter, dilution gauging using Rhodamine WT is utilized to estimate discharge. The fluorescence of the Rhodamine WT is measured in-situ and recorded using a handheld fluorometer (YSI with EXO Rhodamine Sensor). Three-point calibration of the fluorometer is conducted in the field using a known concentration of Rhodamine WT solution and stream water. For estimating discharge, Rhodamine WT is added upstream of the station as an instantaneous release of a known volume. The fluorescence is recorded at a sufficient distance downstream to allow for complete mixing of the tracer. At least two measurements are typically performed during each site visit and the stream discharge is estimated using the integration method.

A summary of the data collected in 2024 is provided in the following section.

3. STAGE-DISCHARGE DATA

3.1 Overview

Reconnaissance of the hydrometric stations was initiated in June 2024 to monitor the onset and progression of snow melt and associated freshet flow. Each of the stations were installed as early as possible in June, when the stream channels were ice-free. Additional site visits were conducted at all stations in July, August, and September, and at some of the stations in October. The majority of the stations were decommissioned for winter in anticipation of freeze-up in September, as per previous seasons. However, September and early October 2024 were warmer than normal and some stations were not removed until October, prior to (and in some cases during) freeze-up.

The stage-discharge data obtained in 2024 were compared to the existing rating curves, which were last evaluated in the 2023 Hydrometric Monitoring Program Summary (North Water, 2024). The Water Survey of Canada Hydrometric Manual (EC, 2012) suggests that rating curves should not be extrapolated beyond twice the highest measured discharge. Where the observed water level is greater than twice the highest measured discharge, it is understood that flow data estimated from extrapolated rating curves are less reliable. Rating curves are extrapolated to the maximum recorded stage to capture the range of observed water level in a given year, relative to measured discharge. Rating curves for each station, inclusive of the data collected in 2024, are presented in Figures 2 to 8. A discussion of the 2024 data collected at each station and an interpretation of the fit of the rating curves is provided in the following sections:

3.2 H01 (Phillip's Creek Tributary)

The H01 hydrometric station was installed on June 30. A stage-discharge measurement was recorded at the time of installation using dilution gauging and provides good validation of the middle portion of the rating curve. Subsequent stage-discharge measurements were recorded in July, August, and September. The 2024 measurements are consistent with the existing rating curve presented in Figure 2. As such, no update to the rating curve was required and the existing curve developed in 2007 was used for the development of the 2024 streamflow record.

3.3 H02 (Tom River)

The H02 hydrometric station was installed on June 29. Stage-discharge measurements were recorded at the time of installation and again in July and August using dilution gauging. The measurements are generally consistent with the existing 2012 rating curve presented in Figure 3. One of the stage-discharge measurements is slightly above the rating curve, which may have been due to incomplete mixing of the rhodamine dye during gauging and not with a shift in the rating relationship. The other two stage-discharge measurements are in good agreement with and validate the 2012 rating curve, which was used for the development of the 2024 flow record.

3.4 H04 (Camp Lake Tributary CLT-2)

The H04 hydrometric station was installed on June 27. Stage-discharge measurements were recorded in June, July, August, and September using a wading current meter and the area-velocity technique. All of the measurements are consistent with the rating curve that was updated in 2013 (Figure 4). The high flow measured in early July further validates the upper portion of the rating curve. The 2013 rating curve was used for the development of the 2024 flow record.

3.5 H05 (Camp Lake Tributary CLT-1)

The H05 hydrometric station was installed on June 27. Stage-discharge measurements were recorded in June, July, and September using a wading current meter and the area-velocity technique. The measurements are consistent with the 2007 rating relationship (Figure 5). The 2007 rating curve was used for the development of the 2024 flow record.

3.6 H06 (Mary River)

The H06 hydrometric station was installed on June 28. Stage-discharge measurements were recorded in June, July, and August using dilution gauging. All of the measurements are consistent with and further validate the rating curve that was updated in 2007 (Figure 6). The 2007 rating curve was used for the development of the 2024 flow record.

The H06 rating curve is extrapolated to the maximum recorded stage in 2024 to capture the range of observed water level. The observed water level in 2024 was greater than twice the highest measured discharge and as outlined in Section 3.1, it is understood that flow data estimated from extrapolated rating curves are less reliable. The higher than normal recorded water level was due to an extreme rainfall event in September. Future measurements can be aimed at validating the high flow portion of the rating curve, however this is difficult to do as these types of extreme event are rare, can be difficult to anticipate, and produce high flows over a period of only a few hours. Fortunately, the extrapolated portion of the rating curve represents a very small portion of the overall flow record.

3.7 H07 (Mary River Tributary F)

The H07 hydrometric station was installed on June 28. Stage-discharge measurements were recorded at H07 during June, July, and August using dilution gauging. All but the highest recorded stage-discharge measurements were in good agreement with the 2019 rating curve. The highest recorded discharge was not consistent with the rating curve and corresponds to a water level greater than was recorded by the two pressure transducer dataloggers installed at H07. The channel was not completely ice-free at the time, which may have influenced recorded water levels. All other measurements were in good agreement with the 2019 rating curve shown on Figure 7, which was used for the development of the 2024 flow record. Where possible, future data collection should focus on further validating the upper portion of the rating curve.

3.8 H11 (Sheardown Lake Tributary SDLT-1)

The H11 hydrometric station was installed on June 18. Stage-discharge measurements were recorded at H11 during June, July, and August. The discharge measurements were consistent with the rating curve updated in 2021 (Figure 8). The 2021 rating curve was used for the development of the 2024 flow record.

4. STREAMFLOW HYDROGRAPHS

Streamflow records were developed for each station by applying the water level data to the corresponding rating curves. The discharge hydrographs for the H01, H02, H04, H05, H06, H07, and H11 hydrometric stations are presented in Figures 9 to 15.

The discharge records from all stations were converted to equivalent unit runoff (discharge per unit area) and are presented for comparison purposes on Figure 16. The 2024 records of unit runoff generally agree well with each other, exhibiting similar timing and magnitude of runoff events and similar patterns to previous years. The higher unit runoff at H11 relative to other stations, especially in August and September corresponds to the flow from upstream of the KM105 Sedimentation Pond being directed through a channel that eventually flows to H11.

The snowmelt freshet was similar to most previous years and the stations were installed as soon as practical following the stream channel and station mounting locations becoming ice free. As in previous seasons, flow monitoring is not possible with ice in the channel as the melting process continuously modifies the stage discharge relationship. The majority of the freshet occurred before some of the stations were able to be installed, particularly those around nearest to the Mine. The majority of the freshet period was captured at the H02, H06 and H07 stations. A strong diurnal melt pattern is evident into mid July at the H02, H06, and H07 stations as they have higher elevation catchments.

Generally similar patterns of unit runoff are evident at all stations in August and into September, which suggests that the precipitation was consistent throughout the region. The extreme rainfall event and corresponding runoff in September was evident at all the stations which remained installed (H06, H07, and H11). However, the H06 station produced a much greater unit runoff than the stations. The estimated mean monthly discharge and unit runoff for each station in 2024 are summarized in Table 2.

The H05 station has been used since 2014 to provide a comparison of general flow conditions from year to year. The H05 station has been used for this purpose because it is positioned near the Mine, has a relatively small drainage area, has had a stable rating relationship, and has a record of flow since 2006. A summary of daily average flow at H05 from 2006 to 2024 is shown on Figure 17 and Table 3 (attached). The total annual runoff recorded in 2024 at the H05 station was slightly above the average recorded from 2006 to 2024 for concurrent periods of record. The flow measured in 2024 was below normal in June to mid-July due to the majority of freshet occurring before this period. The volume of flow measured during summer (mid-July to mid-August) was slightly above average, and the volume of flow during late August and September was higher than average.

Table 3 Summary of 2024 Mean Monthly Estimated Discharge and Unit Runoff

STATION	Drainage Area (km^2)	Estimated Mean Monthly Discharge (m^3/s)					Period of Record
		June	July	August	September	October	
H01	250	14.0	11.4	5.8	3.7		June 30 to September 12
H02	210	31.8	13.5	6.5	6.3		June 29 to September 13
H04	8.3	0.29	0.21	0.20	0.15		June 27 to September 12
H05	5.3	0.15	0.16	0.19	0.18		June 27 to September 12
H06	240	31.2	16.3	6.2	10.7	6.0	June 28 to October 12
H07	14.7	1.1	0.53	0.28	0.35	0.11	June 28 to October 8
H11	3.6	0.085	0.11	0.13	0.18	0.19	June 18 to October 12

STATION	Drainage Area (km^2)	Estimated Mean Monthly Unit Runoff (l/s/km^2)					Period of Record
		June	July	August	September	October	
H01	250	56	46	23	15		June 30 to September 12
H02	210	152	64	31	30		June 29 to September 13
H04	8.3	35	25	24	18		June 27 to September 12
H05	5.3	29	30	36	34		June 27 to September 12
H06	240	130	68	26	45	25	June 28 to October 12
H07	14.7	77	36	19	24	7	June 28 to October 8
H11	3.6	24	31	37	50	52	June 18 to October 12

5. DISCUSSION

The Mary River Project Final Environmental Impact Statement (FEIS), includes three potential effects on surface water quantity in the Milne and Mine Site Local Study Areas (LSA) (Baffinland, 2012):

- Water withdrawal;
- Water Diversion; and
- Runoff or Effluent Discharge.

Previous analysis of hydrometric data shows that there is considerable variability in monthly flow within each year and there is also considerable variability in the runoff from year to year (SEI, 2018). The natural variability in stream flow is high as it is controlled primarily by spatial and temporal variability in snow cover, snow melt which is transient in the wind blown tundra environment, and rainfall. Detecting potential changes in water quantity is challenging as the predicted effects from water withdrawals, diversions, and discharges would typically be well within the range of natural variability and in some cases be below quantifiable limits.

Water quantity effects within the Mine Site LSA that were carried through the effects assessment included freshwater withdrawal, freshwater diversion, and runoff or effluent discharge (Baffinland, 2012). Water withdrawal was anticipated to be from Camp Lake, water diversions were expected to occur around the Waste Rock Stockpile, the Open Pit, and the Ore Stockpile Platform, and effluent was expected to be discharged from the Waste Rock Stockpile, the Ore Stockpile, and the Sewage Treatment Plant.

Several of the AEMP monitoring stations are located at or near the outlets of the catchments used in the effects assessment and as such can be used for analysis of the predicted changes in water quantity. The predicted effects to the MR-8, MR-10, MR-12, and MR-19 catchments are presented in the FEIS (Baffinland, 2012). The predicted effects to the SDLT-1 catchment in the FEIS were updated in KP, 2021a and the effects of the water management measures currently proposed are summarized in KP, 2021b. A summary of the predicted effects and corresponding AEMP monitoring station within the two catchments is provided in Table 4.

Table 4 Summary of Predicted Effects on Water Quantity

Catchment	Predicted Effect	AEMP Monitoring Station
MR-08	Reduction in mean monthly discharge from 17% to 32% from flow diversions (Baffinland, 2012)	H04
MR-10	Reduction in mean monthly flow of up to 30% from diversions and increase in mean monthly flow of up to 63% from discharge of effluent (Baffinland, 2012)	H05
MR-12	Reduction in mean monthly flow of up to 8% from diversions and increase in mean monthly flow of up to 16% from discharge of effluent (Baffinland, 2012)	H07
MR-19	Less than or equal to a 1% change in mean monthly discharge (Baffinland, 2012)	H06
SDLT-1	Reduction in flow of up to 26% due to diversions and corresponding increase in flow up to 31% from discharge of effluent (net mean annual discharge reduction of 5%) (KP, 2021b)	H11

5.1 MR-08 Catchment (H04)

The predicted effects within the MR-08 catchment are a reduction in flow from 17% to 32% from flow diversions (Baffinland, 2012). The H04 station is located in the MR-08 catchment, downstream of the flow diversions and approximately 750 m from the outlet of the catchment. The monthly average flows from 2006 to 2024 at the H04 station are provided in Table 5.

Table 5 Monthly Average Flows at H04 (m^3/s)

	2006	2007	2008	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
June		0.24	1.36	0.38	0.88		0.32	0.30	0.60	1.71	0.17	0.30	0.61	0.32	0.48		0.29
July	0.77	0.20	0.32	0.07	0.39	0.08	0.51	0.27	0.17	0.33	0.24	0.21	0.12	0.18	0.13	0.41	0.21
Aug	0.29	0.14	0.26	0.03	0.16	0.07	0.25	0.17	0.23	0.19	0.31	0.11	0.07	0.13	0.05	0.14	0.20
Sept	0.28	0.09	0.18	0.03	0.28	0.05	0.06	0.06	0.10	0.17	0.13	0.09	0.03	0.07	0.05	0.08	0.15

Note:

1. June and September have different periods of record each year due to the timing of station installation and removal

The data from H04 emphasize that there is considerable natural variability in the runoff from month to month and year to year. Patterns of drier or wetter annual runoff are evident and are generally seen among all stations within a given year, which suggests that the annual runoff trends occur on a regional scale. There appears to be a period of lower flow at H04 from 2020 to 2022, particularly in July and August. However, this period of lower flow is generally consistent with trends at other stations and likely a result of natural variability in precipitation. Nonetheless, the magnitude of change in flow at H04 is less than the predicted reduction in the MR-08 catchment of 17% to 32% relative to other stations.

5.2 MR-10 Catchment (H05)

The predicted effects within the MR-10 catchment are a reduction in mean monthly flow of up to 30% from diversions and increase in mean monthly flow of up to 63% from discharge of effluent (Baffinland, 2012). The H05 station is located in the MR-10 catchment, downstream of the flow diversions and approximately 1500 m from the outlet of the catchment. The monthly average flows from 2006 to 2024 at the H05 station are provided in Table 6.

Table 6 Monthly Average Flows at H05 (m^3/s)

	2006	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
June		0.30	0.42	0.80	0.30	0.81	0.30	0.29	0.13	0.17	0.63	0.07	0.11	0.24	0.16	0.13	0.68	0.15
July	0.35	0.10	0.22	0.19	0.05	0.22	0.25	0.42	0.06	0.06	0.13	0.15	0.13	0.08	0.13	0.07	0.32	0.16
Aug	0.15	0.10	0.22	0.08	0.02	0.10	0.08	0.20	0.08	0.14	0.11	0.21	0.06	0.06	0.12	0.04	0.13	0.19
Sept	0.16	0.05	0.12	0.15	0.02	0.12	0.06	0.06	0.03	0.03	0.10	0.07	0.04	0.03	0.05	0.03	0.10	0.18

Note:

1. June and September have different periods of record each year due to the timing of station installation and removal

The data from H05 have natural variability in the runoff from month to month and year to year consistent with data from the other stations. A period of lower average monthly flow is evident from 2015 to 2022, in July. This trend is also partially evident in the H04 data, which has a similarly sized and adjacent catchment. This period of lower flow is generally consistent with trends at other stations, is not apparent in other months, and was lowest in 2015 and 2016, prior to notable flow diversion. As such, it is likely the result of natural variability in precipitation. However, no other clear trends are apparent to suggest that the flow at H05 is significantly different relative to the flow at other AEMP stations or that the variability is greater than the predicted range of effects.

5.3 MR-12 Catchment (H07)

The predicted effects within the MR-12 catchment are a reduction in mean monthly flow of up to 8% from diversions and increase in mean monthly flow of up to 16% from discharge of effluent (Baffinland, 2012).

The H07 station is located in the MR-12 catchment, downstream of the flow diversions and approximately 200 m from the outlet of the catchment. The monthly average flows from 2006 to 2024 at the H07 station are provided in Table 7.

Table 7 Monthly Average Flows at H07 (m^3/s)

	2006	2007	2008	2010	2011	2017	2018	2019	2020	2021	2022	2023	2024
June		1.2	1.3	1.4	1.2	1.9	0.9	1.7	2.3	1.6	0.5	2.3	1.1
July	1.7	0.6	0.9	1.2	0.2	1.4	0.9	0.6	0.4	0.6	0.7	1.8	0.5
Aug	0.4	0.2	0.3	0.1	0.1	0.5	0.7	0.3	0.2	0.3	0.3	0.6	0.3
Sept	0.2	0.1	0.1	0.1	0.0	0.6	0.3	0.1	0.1	0.1	0.1	0.2	0.3

Note:

1. June and September have different periods of record each year due to the timing of station installation and removal

The data from H07 have natural variability in the runoff from month to month and year to year consistent with data from the other stations. There are no clear trends to suggest that the variability in flow at H07 is greater than the predicted effects and the patterns of higher and lower flow are generally consistent with other stations.

5.4 MR-19 Catchment (H06)

The predicted effects within the MR-19 catchment are less than or equal to a 1% change in mean monthly discharge (Baffinland, 2012). The H06 station is located at the outlet of the MR-19 catchment. The monthly average flows from 2006 to 2024 at the H06 station, which is at the outlet of the MR-19 catchment are provided in Table 8.

Table 8 Monthly Average Flows at H06 (m^3/s)

	2006	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
June			23.2	19.9	18.4	32.2	19.0		18.1	36.5	39.1	17.5	23.6	48.5	40.4	12.9	3.9	31.2
July	26.0	10.9	16.8	18.8	5.3	11.6	21.0	30.1	9.2	13.1	22.3	15.0	9.3	10.6	13.1	18.6	23.2	16.3
Aug	14.2	5.6	7.4	3.7	2.3	5.5	4.6	9.8	3.8	7.2	4.5	9.1	4.9	3.4	8.2	3.3	5.4	6.2
Sept	21.2	3.2	6.2	6.1	1.5	7.8	3.1	1.8	1.0	1.3	19.3	2.8	3.2	2.4		3.5	1.6	10.6

Note:

1. June and September have different periods of record each year due to the timing of station installation and removal

The data from H06 have natural variability in the runoff from month to month and year to year consistent with data from the other stations. The predicted 1% change in mean monthly discharge would be difficult to detect and to separate from natural variability. The trends in the data suggest that the natural variability in flow at H06 is consistent with other stations and that there is no evidence of Project related effects.

5.5 SDLT-1 Catchments (H11)

The predicted effects within the SDLT-1 catchment are a reduction in flow of up to 26% due to diversions and corresponding increase in flow up to 31% from discharge of effluent (net mean annual discharge reduction of 5%) (KP, 2021b). The H11 station is located in the SDLT-1 catchment, downstream of the flow diversions and approximately 220 m from the outlet of the catchment. The monthly average flows from 2011 to 2024 at the H11 station, which is near the outlet of the SDLT-1 catchment are provided in Table 9.

Table 9 Monthly Average Flows at H11 (m^3/s)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
June	0.07	0.12	0.13	0.13	0.03	0.03	0.06	0.04	0.07	0.06	0.06	0.19		0.08
July	0.02	0.07	0.12	0.09	0.04	0.04	0.06	0.11	0.09	0.05	0.12	0.09	0.11	0.11
Aug	0.02	0.06	0.05	0.09	0.06	0.14	0.09	0.15	0.05	0.04	0.15	0.07	0.17	0.13
Sept	0.02	0.08	0.06	0.04	0.03	0.04	0.14	0.04	0.03	0.03	0.07	0.07	0.13	0.15

Note:

1. June and September have different periods of record each year due to the timing of station installation and removal

The data from H11 have similar natural variability in runoff from month to month and year to year as at other stations prior to 2021. During 2021, the diversion of the Mine Haul Road increased the catchment size of H11. Since that time the average flow in all months has been higher and consistent with the predicted effects to the SDLT-1 catchment.

6. SUMMARY AND RECOMMENDATIONS

The 2024 iteration of the Project's Hydrometric Monitoring Program allowed for the continued monitoring of streamflow at hydrometric stations identified in the Project's AEMP (Baffinland, 2015). The data collected confirmed that the rating curves at all stations continue to be applicable.

Additional site visits are recommended throughout future seasons to verify the operation of data loggers and perform flow measurements. It is recommended that future hydrometric monitoring continue to target low flow and/or high flow periods to maintain and further validate the rating relationships. Peak flows tend to occur in the spring but not always when the channels are ice-free or when conditions permit safe access for gauging. Following the extreme rainfall observed in September 2024, peak flows that occur in summer and fall months continue to be a good to target. In future programs, if they occur, precipitation events of greater than 4 mm per day should continue to be noted as they typically result in an appreciable increase in flow, especially at the stations with smaller catchments. Precipitation events that last for more than one day, with cumulative precipitation over 10 mm, can result in much higher flow, especially earlier in the summer (mid-July to mid-August) before the active layer of permafrost fully develops.

7. REFERENCES

Water Survey of Canada (WSC), 1999. Hydrometric Technician Career Development Program. Lesson Package No. 10.1 – Principles of Discharge Measurement. Environment Canada, Fredericton, NB.

Environment Canada (EC), 2012. Hydrometric Manual, Data Computations (Beta Version). Water Survey of Canada, Environment Canada, Ottawa, ON. qSOP-NA037, 2012-12-17

Baffinland Iron Mines Corporation (Baffinland), 2015. Aquatic Effects Monitoring Plan – Rev. 1. October 30, 2015.

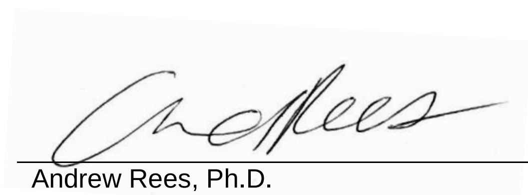
North Water Environmental (North Water), 2024. 2023 Hydrometric Monitoring Report, Mary River Project, Baffinland Iron Mines Corporation. March 15, 2024.

Story Environmental Inc (SEI), 2018. Review of Mary River Project Hydrology Data. 199-06-09. August 29, 2018.

8. CERTIFICATION

This document was prepared by the undersigned.

Prepared by:



Andrew Rees, Ph.D.
Senior Environmental Scientist / Hydrologist

Table 3 Summary Daily Average Flows at H05 from 2006 to 2024 (m^3/s)

	2006	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Jun 6			0.35															
Jun 7			0.23															
Jun 8			0.21															
Jun 9			0.16															
Jun 10			0.10															
Jun 11			0.11															
Jun 12			0.22															
Jun 13			0.23															
Jun 14			0.14										0.13					
Jun 15			0.19										0.12					
Jun 16			0.36										0.09		0.27			
Jun 17			0.42		0.33								0.08		0.23			
Jun 18			0.35		0.36								0.19		0.17			
Jun 19			0.68		0.38				0.10				0.27		0.15			
Jun 20			0.58		0.34				0.11				0.08		0.10			
Jun 21		0.07	1.15		0.29		0.05		0.08				0.05		0.11			
Jun 22		0.08	1.26	1.00	0.24		0.05	0.41	0.07				0.05	0.22	0.19			
Jun 23		0.06	0.45	0.76	0.14		0.19	0.30	0.06	0.28		0.07	0.05	0.25	0.17			
Jun 24		0.10	0.45	0.69	0.13	0.90	0.52	0.20	0.07	0.18	0.08	0.06	0.37	0.29	0.14	0.23		
Jun 25		0.13	0.63	0.74	0.30	0.93	0.57	0.21	0.08	0.14	0.07	0.09	0.11	0.26	0.17	0.09		
Jun 26		0.36	0.55	0.90	0.46	1.32	0.77	0.24	0.19	0.16	0.06	0.09	0.07	0.26	0.13	0.06		
Jun 27		0.59	0.57	0.85	0.43	1.09	0.21	0.22	0.37	0.16	0.06	0.08	0.05	0.20	0.11	0.10		0.17
Jun 28		0.59	0.55	0.92	0.33	0.66	0.19	0.24	0.19	0.18	0.06	0.06	0.05	0.17	0.20	0.17	0.49	0.17
Jun 29		0.64	0.37	0.74	0.31	0.44	0.22	0.33	0.12	0.14	0.06	0.06	0.04	0.39	0.13	0.14	0.75	0.14
Jun 30		0.35	0.26	0.61	0.21	0.32	0.26	0.48	0.08	0.14	0.05	0.06	0.04	0.17	0.17	0.15	0.80	0.14
Jul 1		0.48	0.15	0.41	0.18	0.32	0.43	0.57	0.08	0.12	0.04	0.05	0.03	0.28	0.36	0.14	1.10	0.12
Jul 2		0.47	0.15	0.38	0.15	0.40	0.30	0.64	0.07	0.09	0.04	0.26	0.03	0.20	0.11	0.12	1.12	0.33
Jul 3		0.26	0.17	0.38	0.13	0.31	0.19	0.68	0.15	0.08	0.03	0.17	0.03	0.13	0.07	0.14	0.78	0.53
Jul 4		0.19	0.13	0.41	0.11	0.22	0.29	0.87	0.54	0.07	0.03	0.14	0.03	0.10	0.07	0.09	0.54	0.47
Jul 5	0.55	0.17	0.11	0.37	0.10	0.21	0.30	0.68	0.12	0.08	0.03	0.09	0.02	0.08	0.07	0.07	0.39	0.76
Jul 6	0.32	0.15	0.11	0.29	0.08	0.25	0.23	0.70	0.08	0.07	0.02	0.06	0.02	0.06	0.07	0.09	0.63	0.21
Jul 7	0.33	0.13	0.08	0.25	0.07	0.32	0.14	0.66	0.07	0.06	0.02	0.06	0.03	0.06	0.07	0.09	0.63	0.14
Jul 8	0.36	0.10	0.14	0.20	0.07	0.50	0.16	0.53	0.06	0.06	0.02	0.07	0.03	0.05	0.05	0.08	0.67	0.10
Jul 9	0.31	0.09	0.14	0.22	0.05	0.29	0.29	0.59	0.06	0.05	0.02	0.25	0.03	0.05	0.05	0.08	0.66	0.09
Jul 10	0.34	0.09	0.10	0.17	0.05	0.15	0.30	0.55	0.05	0.05	0.03	0.22	0.03	0.05	0.05	0.09	0.41	0.08
Jul 11	0.38	0.08	0.09	0.19	0.06	0.16	0.39	0.51	0.05	0.04	0.03	0.15	0.11	0.05	0.07	0.09	0.33	0.08
Jul 12	0.28	0.06	0.08	0.39	0.04	0.53	0.45	0.37	0.04	0.06	0.03	0.10	0.22	0.04	0.22	0.08	0.32	0.06
Jul 13	0.29	0.05	0.07	0.29	0.04	0.29	0.39	0.36	0.04	0.06	0.03	0.27	0.35	0.04	0.14	0.07	0.33	0.06
Jul 14	0.29	0.04	0.06	0.18	0.03	0.16	0.19	0.27	0.03	0.05	0.03	0.12	0.75	0.14	0.29	0.07	0.25	0.06
Jul 15	0.30	0.03	0.06	0.13	0.03	0.37	0.93	0.30	0.03	0.05	0.03	0.09	0.24	0.12	0.33	0.07	0.13	0.07
Jul 16	0.32	0.03	0.07	0.12	0.04	0.23	0.33	0.25	0.03	0.04	0.03	0.07	0.16	0.10	0.23	0.07	0.11	0.11
Jul 17	0.27	0.05	0.08	0.13	0.03	0.17	0.72	0.22	0.03	0.04	0.03	0.06	0.13	0.09	0.12	0.06	0.11	0.07
Jul 18	0.25	0.05	0.12	0.10	0.03	0.14	0.25	0.59	0.03	0.04	0.03	0.05	0.28	0.09	0.10	0.05	0.30	0.06
Jul 19	0.21	0.03	0.18	0.09	0.03	0.14	0.18	1.07	0.04	0.04	0.03	0.05	0.14	0.09	0.08	0.05	0.11	0.04
Jul 20	0.15	0.03	0.10	0.11	0.03	0.13	0.14	0.44	0.03	0.04	0.03	0.05	0.11	0.07	0.14	0.04	0.07	0.06
Jul 21	0.14	0.03	0.08	0.12	0.03	0.10	0.12	0.63	0.03	0.04	0.03	0.05	0.09	0.06	0.12	0.04	0.10	0.06
Jul 22	0.22	0.08	0.73	0.25	0.03	0.09	0.10	0.31	0.03	0.04	0.02	0.05	0.07	0.06	0.09	0.04	0.08	0.05
Jul 23	0.50	0.14	1.38	0.13	0.03	0.08	0.10	0.20	0.03	0.04	0.02	0.04	0.07	0.05	0.07	0.04	0.07	0.07
Jul 24	0.21	0.08	0.65	0.10	0.02	0.07	0.10	0.16	0.03	0.04	0.02	0.06	0.12	0.05	0.06	0.04	0.09	0.08
Jul 25	0.97	0.05	0.31	0.08	0.02	0.06	0.10	0.13	0.03	0.08	0.03	0.12	0.18	0.05	0.06	0.05	0.09	0.09
Jul 26	0.77	0.05	0.20	0.07	0.02	0.06	0.09	0.11	0.03	0.09	0.06	0.09	0.18	0.05	0.08	0.05	0.08	0.11
Jul 27	0.62	0.04	0.15	0.07	0.01	0.22	0.10	0.10	0.03	0.06	0.07	0.06	0.11	0.05	0.22	0.05	0.07	0.14
Jul 28	0.50	0.03	0.21	0.06	0.01	0.51	0.08	0.10	0.03	0.05	0.08	0.60	0.10	0.05	0.19	0.05	0.06	0.20
Jul 29	0.27	0.03	0.36	0.06	0.01	0.17	0.07	0.08	0.05	0.05	0.09	0.40	0.08	0.05	0.18	0.03	0.06	0.23
Jul 30	0.20	0.03	0.30	0.05	0.01	0.12	0.11	0.11	0.04	0.05	0.18	0.48	0.15	0.06	0.13	0.02	0.05	0.18
Jul 31	0.16	0.03	0.25	0.05	0.01	0.09	0.18	0.09	0.04	0.05	0.56	0.40	0.12	0.06	0.10	0.03	0.05	0.21

Table 3 (continued) Summary Daily Average Flows at H05 from 2006 to 2024 (m^3/s)

	2006	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Aug 1	0.13	0.03	0.17	0.05	0.01	0.08	0.10	0.09	0.04	0.33	0.36	0.33	0.09	0.05	0.08	0.03	0.04	0.69
Aug 2	0.11	0.18	0.13	0.04	0.02	0.07	0.08	0.09	0.03	0.75	0.23	0.22	0.08	0.05	0.15	0.03	0.05	0.65
Aug 3	0.10	0.11	0.11	0.04	0.01	0.06	0.08	0.08	0.03	0.37	0.16	0.15	0.07	0.05	0.15	0.03	0.03	0.28
Aug 4	0.10	0.09	0.10	0.05	0.01	0.05	0.08	0.07	0.04	0.67	0.12	0.71	0.06	0.05	0.11	0.03	0.03	0.18
Aug 5	0.09	0.47	0.09	0.05	0.01	0.05	0.08	0.10	0.30	0.49	0.10	0.92	0.08	0.05	0.09	0.03	0.04	0.13
Aug 6	0.08	0.20	0.09	0.04	0.01	0.04	0.08	0.09	0.25	0.23	0.08	0.72	0.07	0.04	0.07	0.03	0.04	0.11
Aug 7	0.07	0.14	0.08	0.04	0.01	0.06	0.09	0.49	0.16	0.16	0.08	0.44	0.07	0.04	0.06	0.03	0.04	0.10
Aug 8	0.07	0.11	0.08	0.04	0.01	0.06	0.09	0.35	0.17	0.13	0.08	0.27	0.06	0.04	0.06	0.03	0.03	0.08
Aug 9	0.07	0.09	0.07	0.04	0.01	0.18	0.07	0.41	0.12	0.10	0.08	0.31	0.06	0.04	0.24	0.02	0.03	0.07
Aug 10	0.07	0.08	0.12	0.04	0.01	0.11	0.06	0.51	0.09	0.09	0.07	0.19	0.06	0.04	0.22	0.03	0.03	0.06
Aug 11	0.07	0.08	0.12	0.04	0.01	0.08	0.05	0.61	0.08	0.07	0.06	0.14	0.06	0.03	0.15	0.03	0.02	0.07
Aug 12	0.16	0.07	0.74	0.04	0.01	0.07	0.06	0.40	0.07	0.07	0.06	0.11	0.05	0.04	0.16	0.06	0.03	0.07
Aug 13	0.85	0.06	0.32	0.06	0.01	0.06	0.06	0.32	0.06	0.06	0.06	0.09	0.05	0.04	0.13	0.07	0.03	0.09
Aug 14	0.47	0.05	0.23	0.09	0.02	0.06	0.05	0.19	0.10	0.06	0.06	0.08	0.05	0.04	0.23	0.06	0.04	0.10
Aug 15	0.28	0.05	0.18	0.09	0.08	0.05	0.06	0.15	0.16	0.05	0.07	0.07	0.05	0.04	0.36	0.06	0.07	0.09
Aug 16	0.29	0.05	0.15	0.10	0.07	0.59	0.05	0.12	0.12	0.05	0.06	0.07	0.05	0.03	0.24	0.06	0.08	0.08
Aug 17	0.21	0.04	0.13	0.09	0.05	0.28	0.04	0.10	0.10	0.06	0.06	0.07	0.04	0.07	0.17	0.06	0.03	0.06
Aug 18	0.16	0.04	0.13	0.15	0.04	0.15	0.04	0.10	0.08	0.06	0.05	0.07	0.04	0.14	0.13	0.06	0.04	0.07
Aug 19	0.14	0.04	0.12	0.13	0.04	0.11	0.04	0.31	0.07	0.05	0.05	0.32	0.04	0.12	0.11	0.05	0.14	0.06
Aug 20	0.11	0.04	0.48	0.11	0.03	0.09	0.07	0.21	0.06	0.05	0.05	0.29	0.04	0.10	0.09	0.06	0.24	0.08
Aug 21	0.10	0.05	0.43	0.10	0.03	0.08	0.09	0.16	0.06	0.05	0.05	0.17	0.04	0.08	0.09	0.06	0.36	0.08
Aug 22	0.08	0.18	0.30	0.13	0.03	0.08	0.07	0.17	0.05	0.04	0.04	0.17	0.04	0.08	0.08	0.05	0.23	0.13
Aug 23	0.07	0.11	0.23	0.20	0.03	0.09	0.08	0.13	0.05	0.04	0.04	0.15	0.04	0.08	0.07	0.04	0.24	0.51
Aug 24	0.06	0.09	0.22	0.14	0.03	0.10	0.30	0.10	0.05	0.04	0.04	0.11	0.05	0.07	0.07	0.03	0.20	0.36
Aug 25	0.06	0.08	0.20	0.11	0.03	0.09	0.18	0.27	0.04	0.04	0.04	0.09	0.05	0.07	0.07	0.04	0.25	0.43
Aug 26	0.06	0.09	0.17	0.10	0.02	0.08	0.13	0.21	0.04	0.04	0.04	0.08	0.05	0.06	0.07	0.03	0.33	0.29
Aug 27	0.06	0.11	0.15	0.08	0.02	0.07	0.11	0.13	0.04	0.04	0.07	0.07	0.05	0.06	0.06	0.03	0.47	0.21
Aug 28	0.14	0.09	0.13	0.08	0.02	0.06	0.09	0.11	0.04	0.03	0.07	0.06	0.05	0.06	0.06	0.03	0.38	0.21
Aug 29	0.19	0.08	0.12	0.07	0.02	0.06	0.08	0.09	0.04	0.03	0.10	0.06	0.04	0.05	0.05	0.03	0.25	0.20
Aug 30	0.20	0.07	0.74	0.07	0.02	0.05	0.07	0.08	0.03	0.03	0.17	0.05	0.07	0.05	0.05	0.02	0.19	0.17
Aug 31	0.14	0.07	0.60	0.06	0.02	0.11	0.06	0.07	0.03	0.03	0.19	0.05	0.07	0.05	0.04	0.02	0.15	0.15
Sept 1	0.13	0.06	0.31	0.06	0.02	0.12	0.06	0.07	0.03	0.03	0.19	0.05	0.06	0.05	0.04	0.02	0.16	0.13
Sept 2	0.77	0.05	0.19	0.05	0.02			0.06		0.03	0.15	0.04	0.05	0.05	0.05	0.01	0.15	0.11
Sept 3	0.31	0.05	0.15	0.05	0.02			0.06		0.03	0.13	0.05	0.05	0.04	0.07	0.02	0.14	0.13
Sept 4	0.22	0.05	0.13	0.05	0.02			0.05		0.03	0.11	0.05	0.05	0.04	0.07	0.02	0.13	0.14
Sept 5	0.17	0.04	0.11	0.05	0.02			0.05			0.10	0.11	0.04	0.04	0.07	0.02	0.11	0.14
Sept 6	0.14	0.04	0.10	0.07	0.02			0.05				0.13	0.04	0.04	0.07	0.02	0.11	0.14
Sept 7	0.11	0.05	0.09	0.52	0.01			0.05					0.04	0.03	0.05	0.02	0.09	0.13
Sept 8	0.09	0.05	0.08	0.28	0.02			0.04					0.04	0.03	0.05	0.02	0.08	0.18
Sept 9	0.08	0.04	0.08	0.19	0.01			0.00					0.03	0.03	0.04	0.03	0.09	0.33
Sept 10	0.07	0.04	0.07					0.20					0.03	0.03	0.04	0.05	0.09	0.30
Sept 11	0.06	0.04	0.08										0.03	0.03	0.03	0.06	0.09	0.23
Sept 12	0.05	0.04	0.07										0.03	0.03	0.03	0.04	0.09	0.20
Sept 13	0.04		0.08										0.03	0.03		0.03	0.08	
Sept 14	0.06												0.02	0.02		0.02	0.07	
Sept 15													0.02	0.03		0.02	0.07	
Sept 16													0.03	0.03		0.02	0.06	
Sept 17													0.04	0.02		0.02	0.05	
Sept 18													0.04	0.02		0.02		
Sept 19													0.03	0.02				
Sept 20													0.03					
Sept 21													0.03					

SAVED: C:\Users\katie.mcguire\Documents\4 - Maps\Reporting\1_Annual\Hydrometric\2023\BIM_Fig 1 MineSite.mxd; 12-Mar-24

LEGEND

- Borrow Area
- Quarry Area
- Current Infrastructure
- Project Development Area
- Commercial Lease Boundary
- Hydrometric Monitoring Station

ᓄᓈᓯᓂ ᐅᔭᕋᒃᓯᐅᕐᑐᑦ MARY RIVER PROJECT

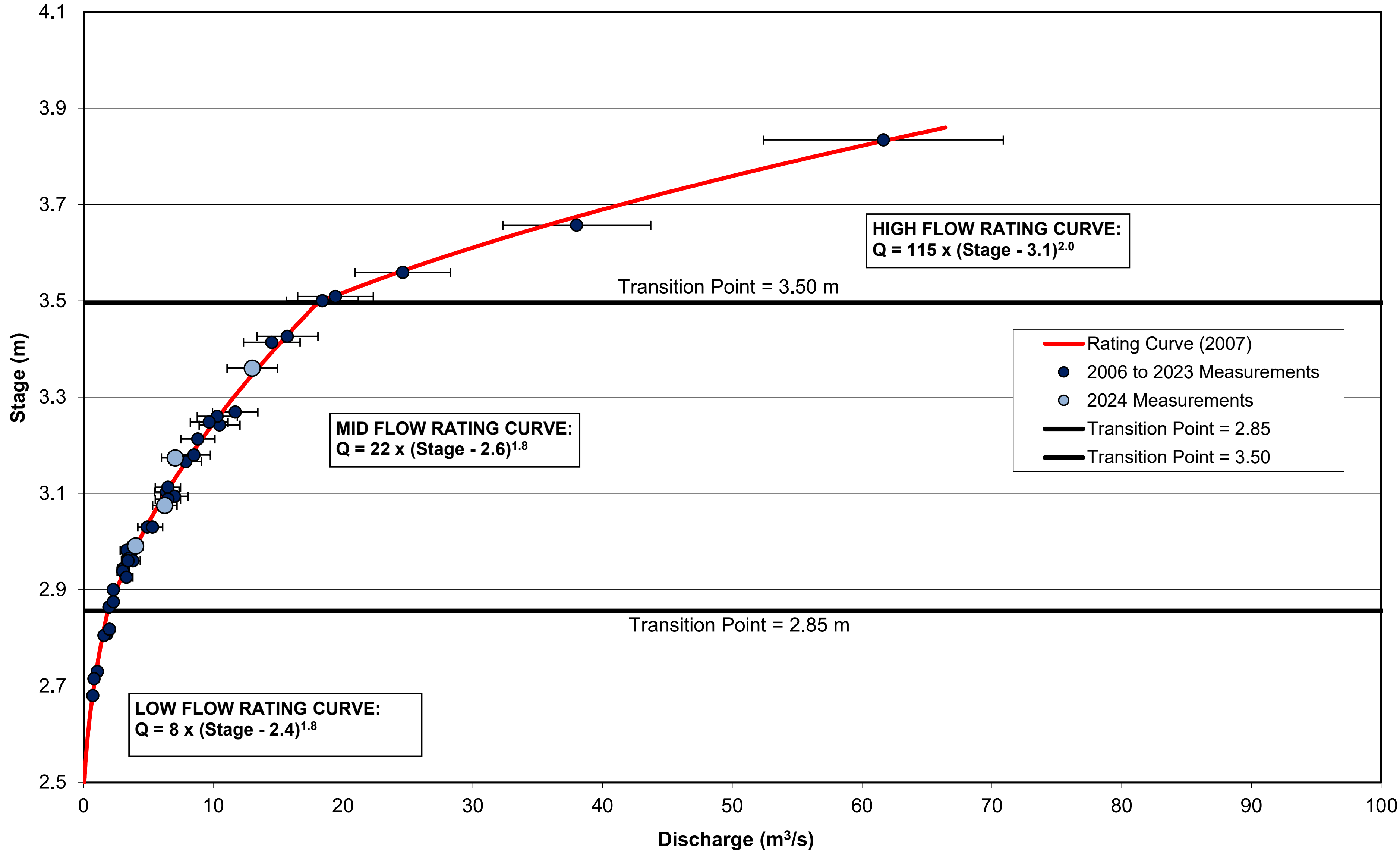
2024 Hydrometric Monitoring Program Stations

Projection: NAD 1983 UTM ZONE 17N.
Base Map: © 2024 Digital Globe, Inc.
Imagery and Infrastructure are representative as of July 2023.

0 250 500 1,000 Meters
Scale 1:30,000
N

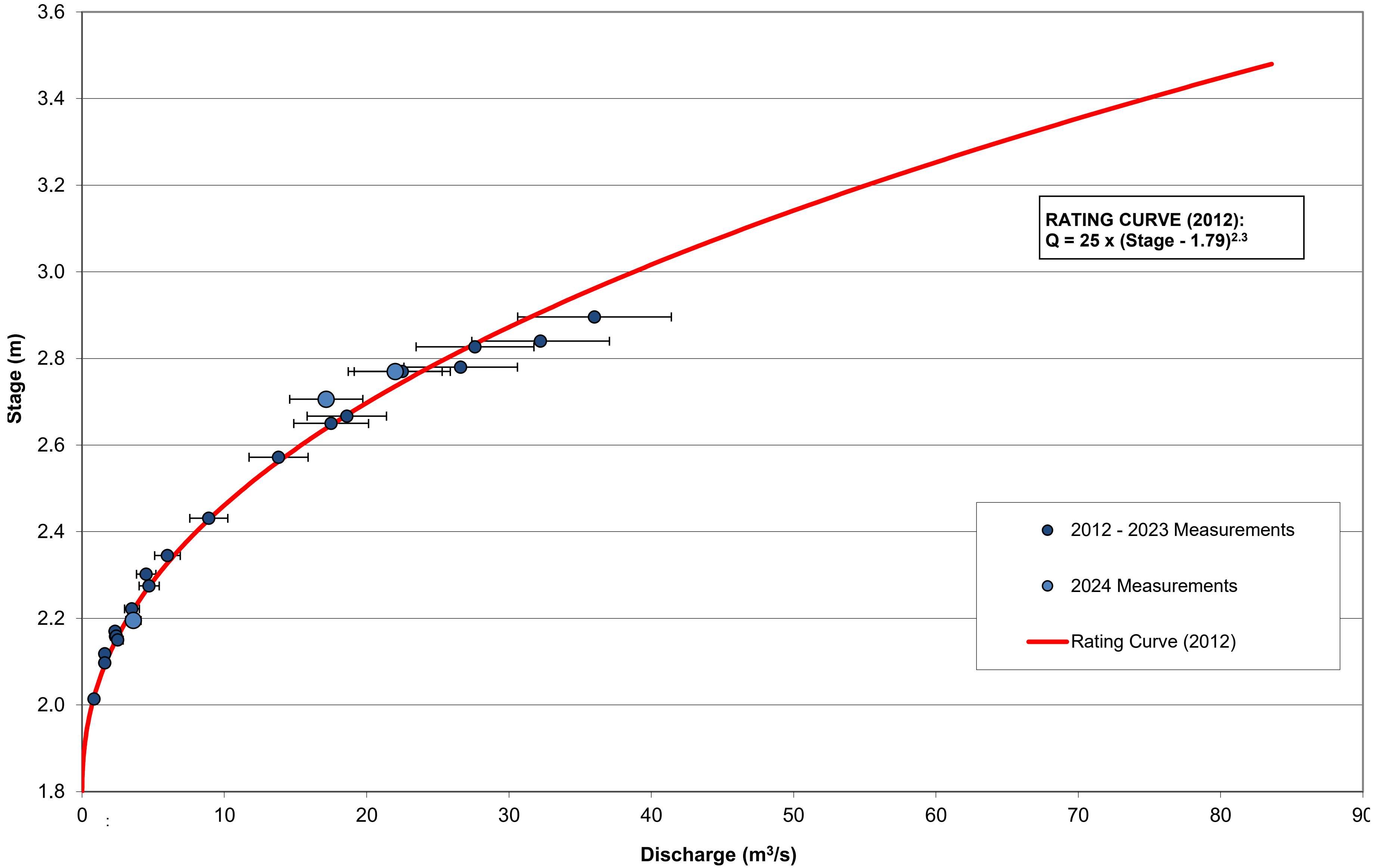
Baffinland

ᑎᑎᕋᐅᔾᔨᒪᔪᖅ
FIGURE 1



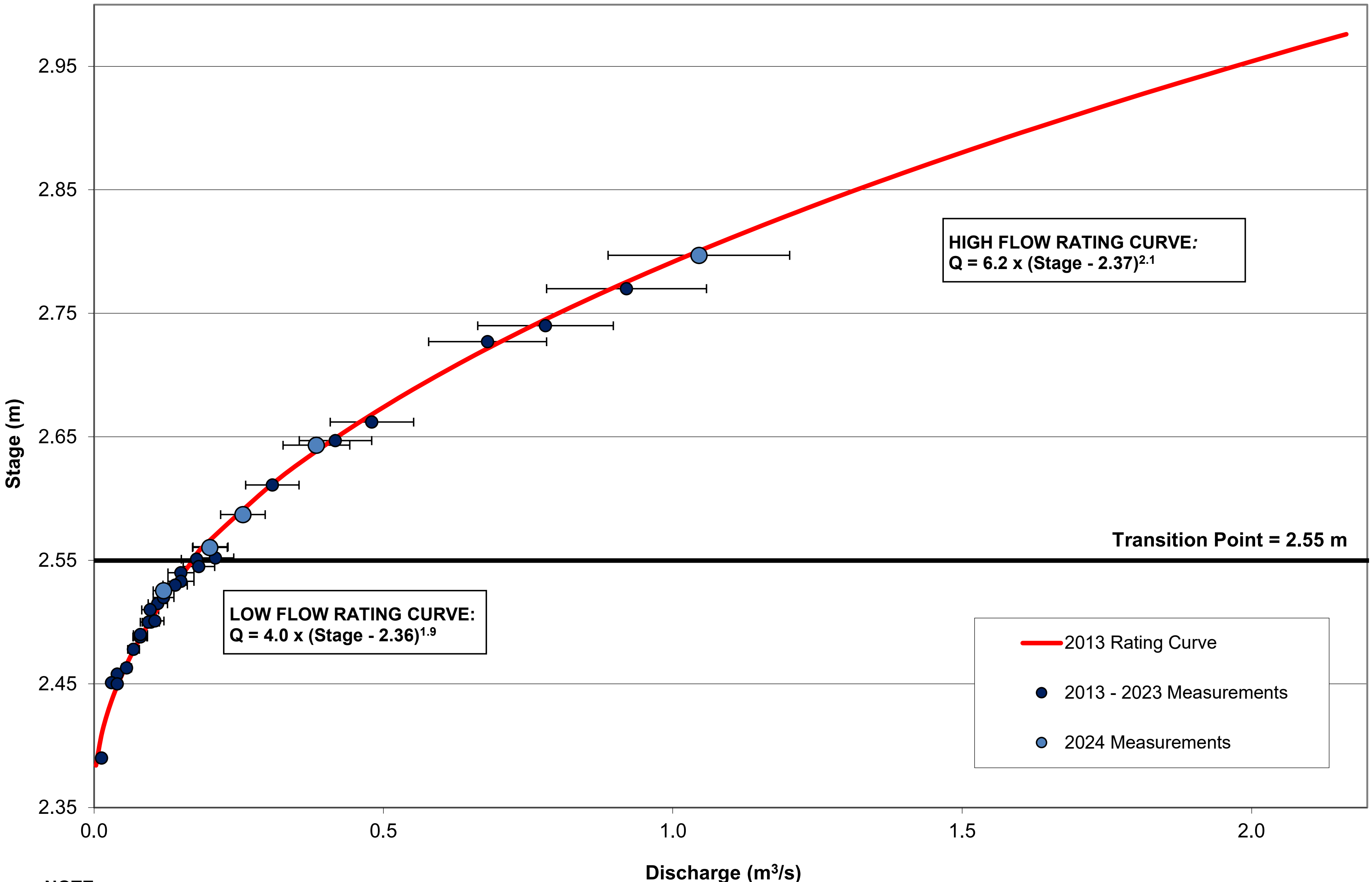
NOTE:
1. RATING CURVE SHOWN TO MAXIMUM RECORDED STAGE IN 2024

Figure 2 H01 - Philips Creek Tributary Rating Curve



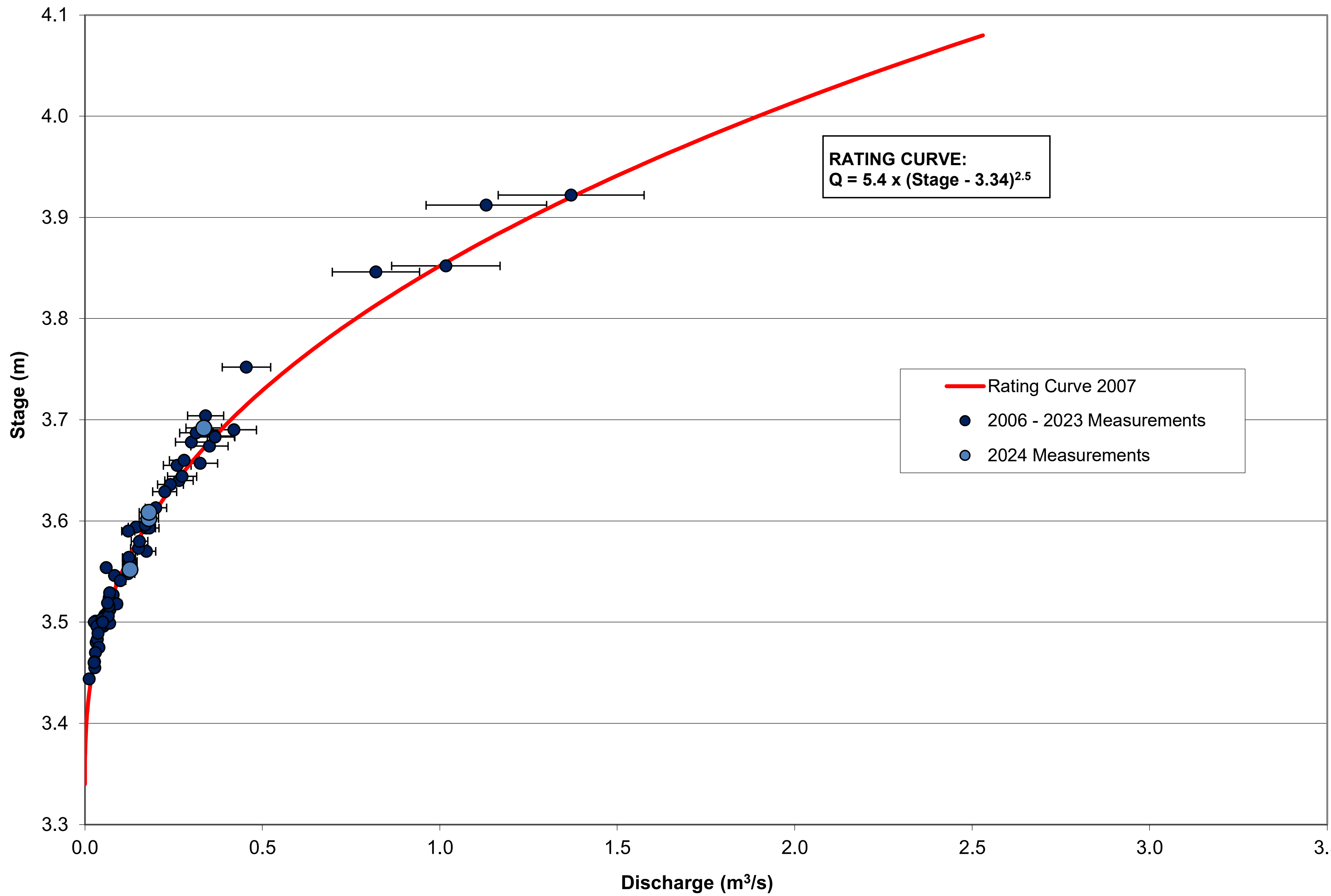
NOTE:
1. RATING CURVE SHOWN TO MAXIMUM RECORDED STAGE IN 2024

Figure 3 H02 - Tom River Rating Curve



NOTE:
1. RATING CURVE SHOWN TO MAXIMUM RECORDED STAGE IN 2024

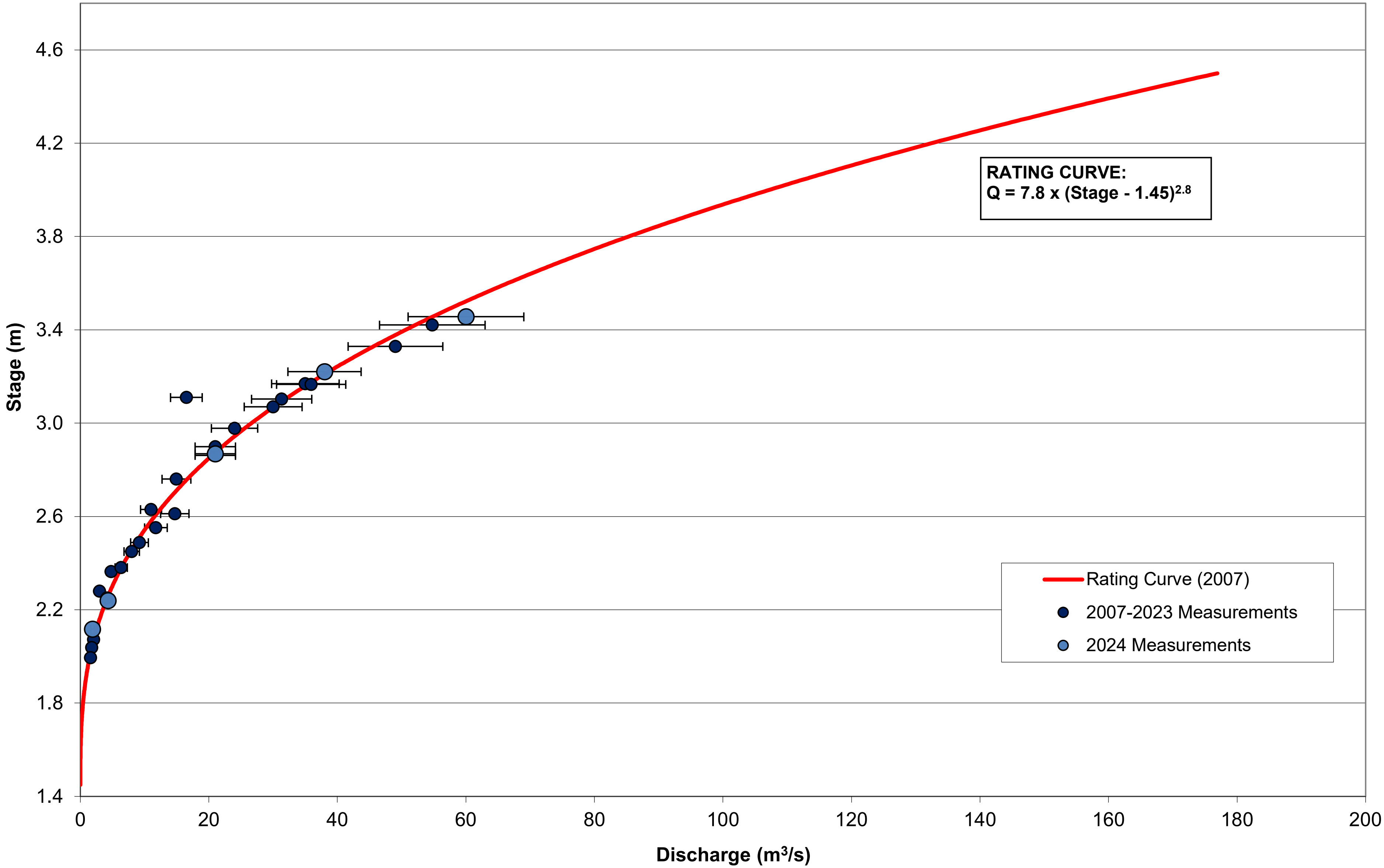
Figure 4 **H04 - Camp Lake Tributary (CLT-2) Rating Curve**



NOTE:

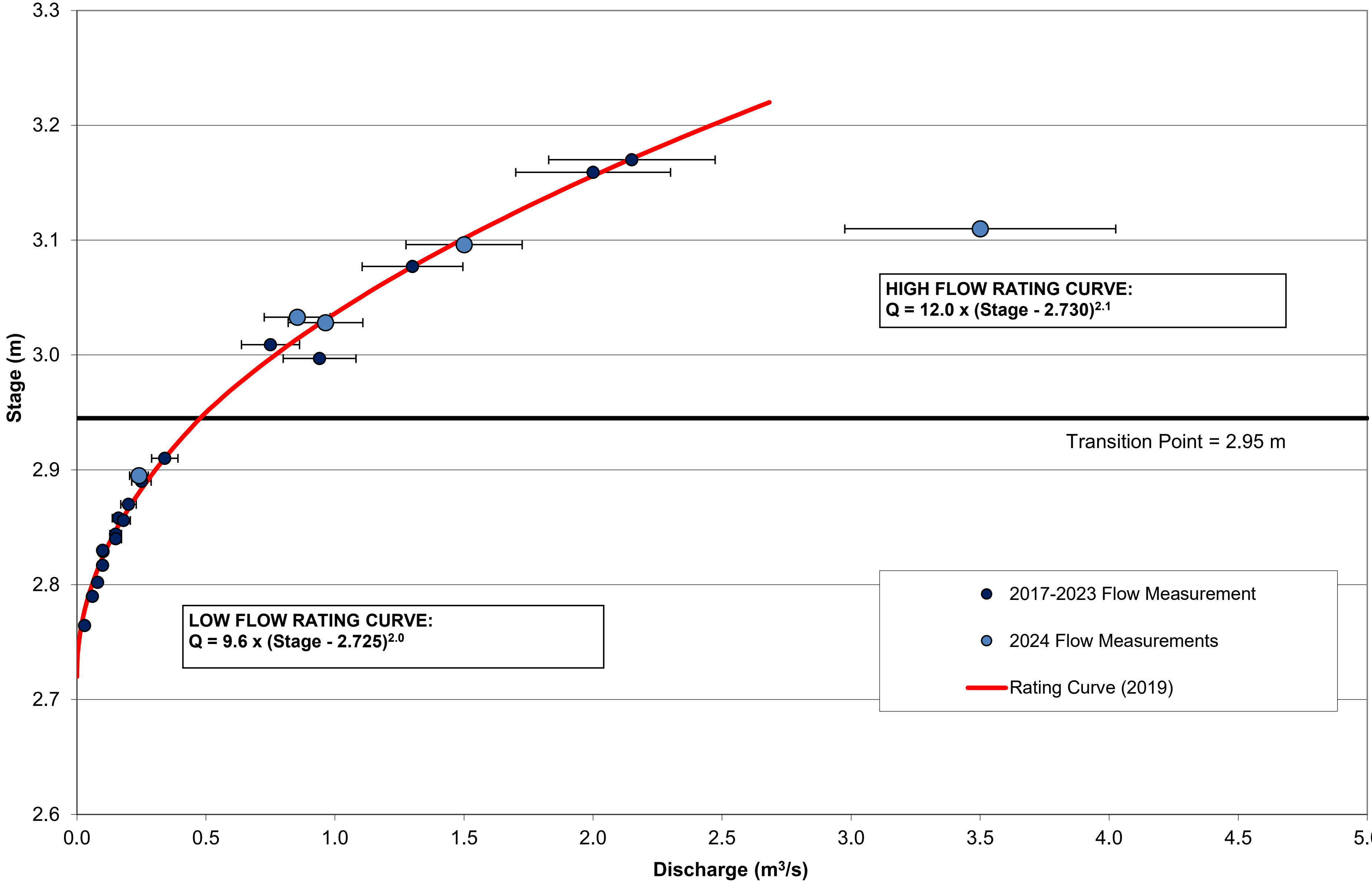
1. RATING CURVE SHOWN TO MAXIMUM RECORDED STAGE IN 2024

Figure 5 H05 - Camp Lake Tributary (CLT-1) Rating Curve



NOTES:
1. RATING CURVE SHOWN TO MAXIMUM RECORDED STAGE IN 2024

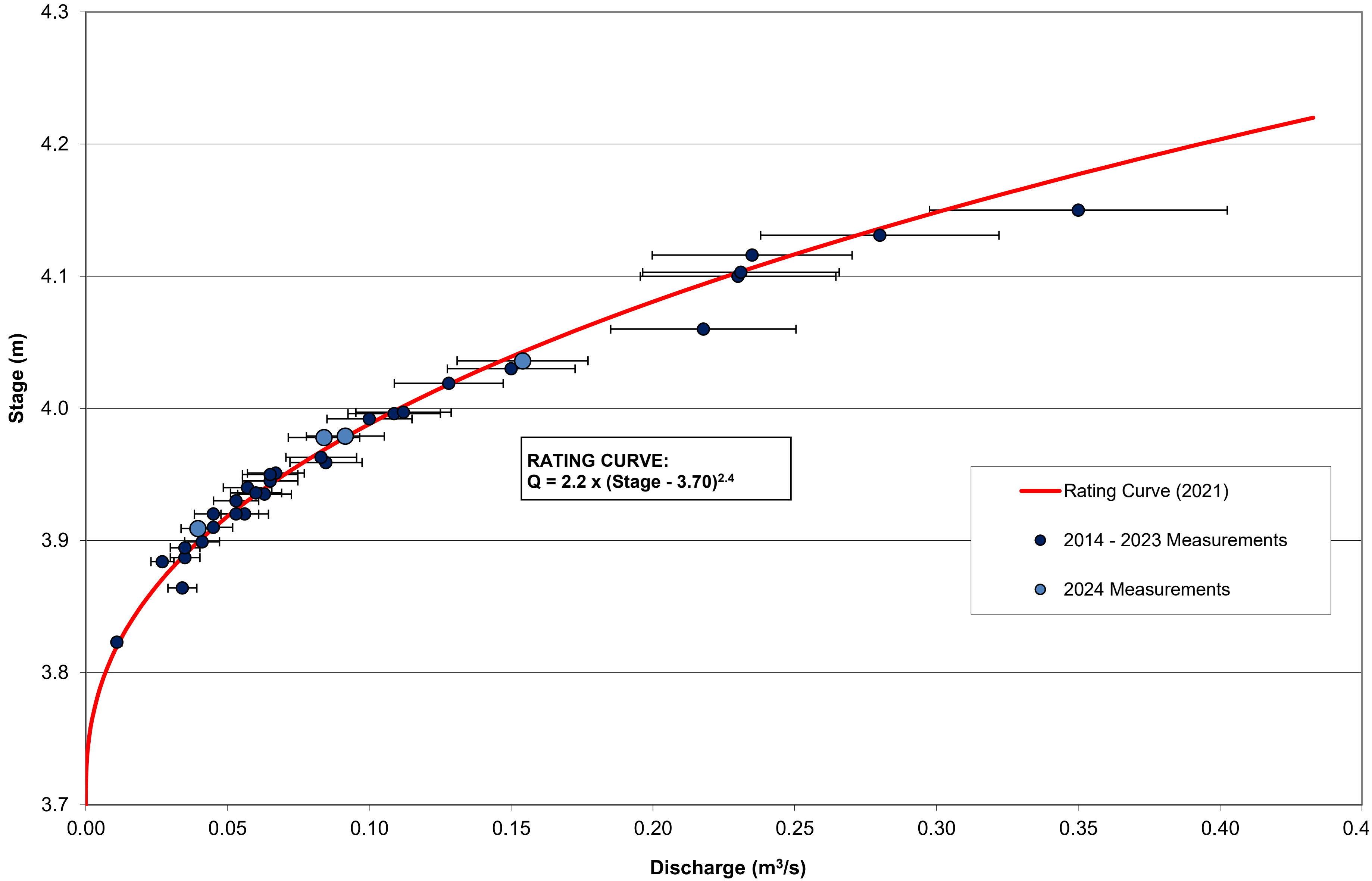
Figure 6 H06 - Mary River Rating Curve



NOTES:

1. RATING CURVE SHOWN TO MAXIMUM RECORDED STAGE IN 2024

Figure 7 **H07 - Mary River Tributary F Rating Curve**



NOTE:
1. UPDATED RATING CURVE SHOWN TO MAXIMUM RECORDED STAGE IN 2024

Figure 8 H11 - Sheardown Lake Tributary (SDLT-1) Rating Curve

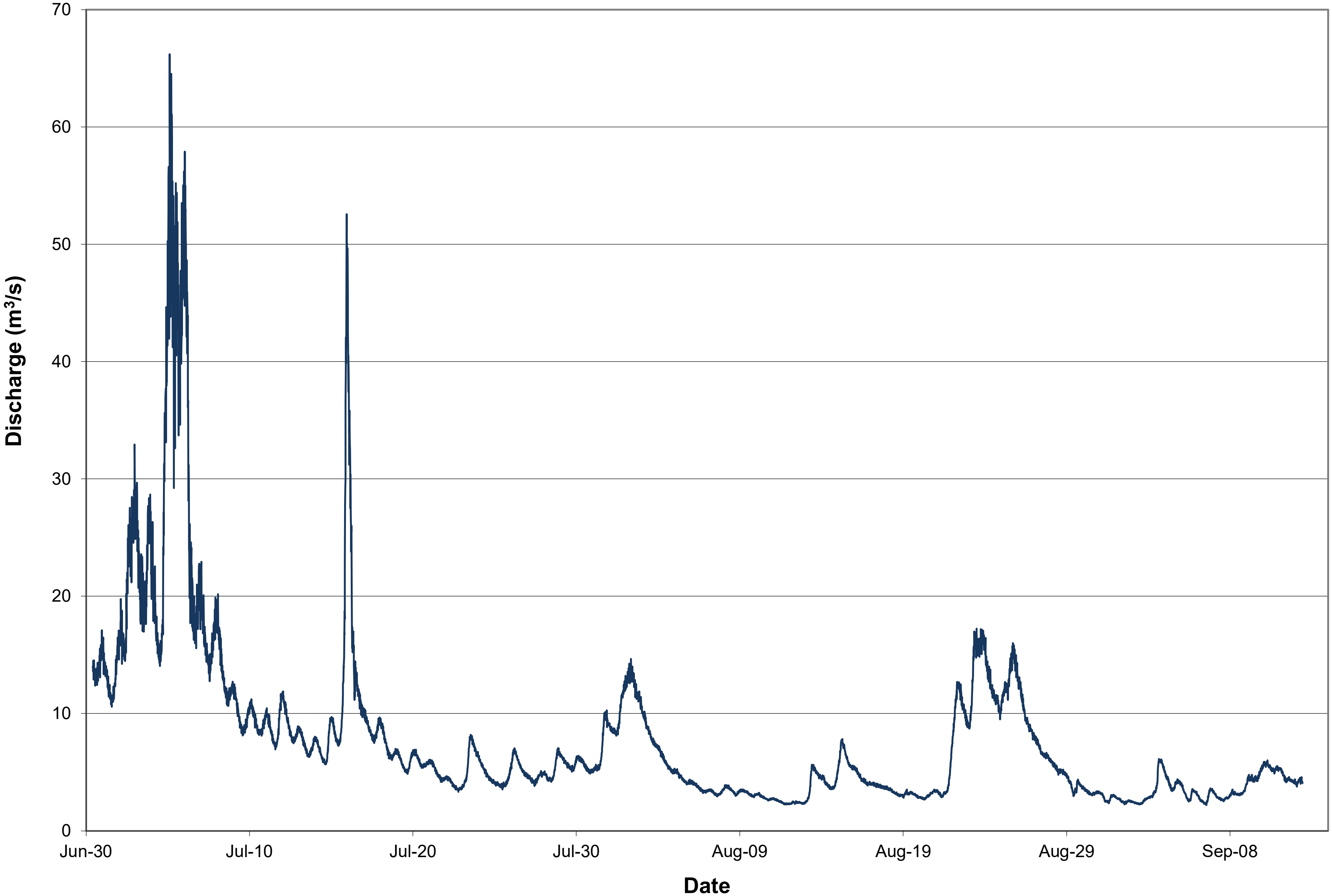


Figure 9 **H01 - Philips Creek Tributary 2024 Streamflow Record**

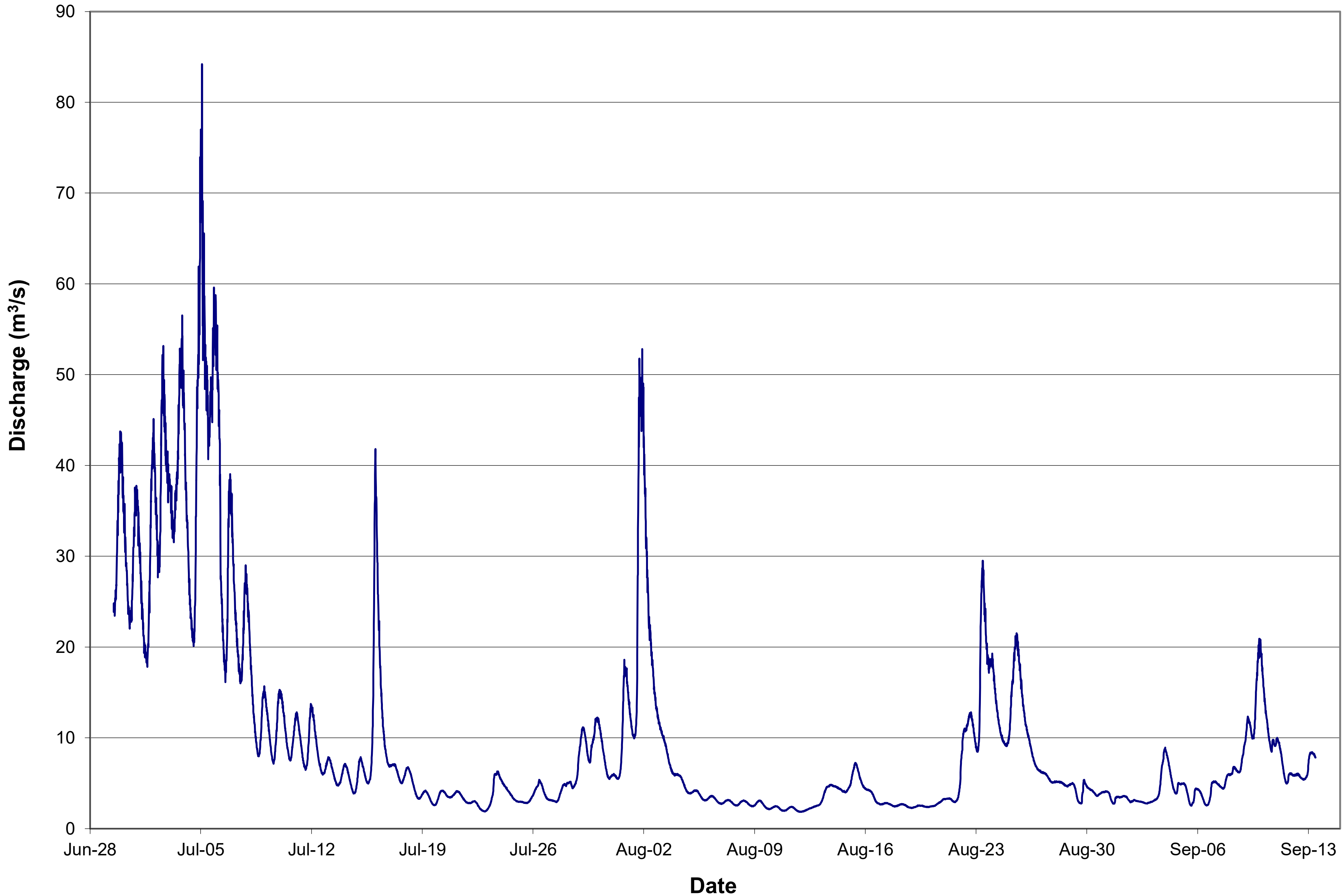


Figure 10 H02 - Tom River 2024 Streamflow Record

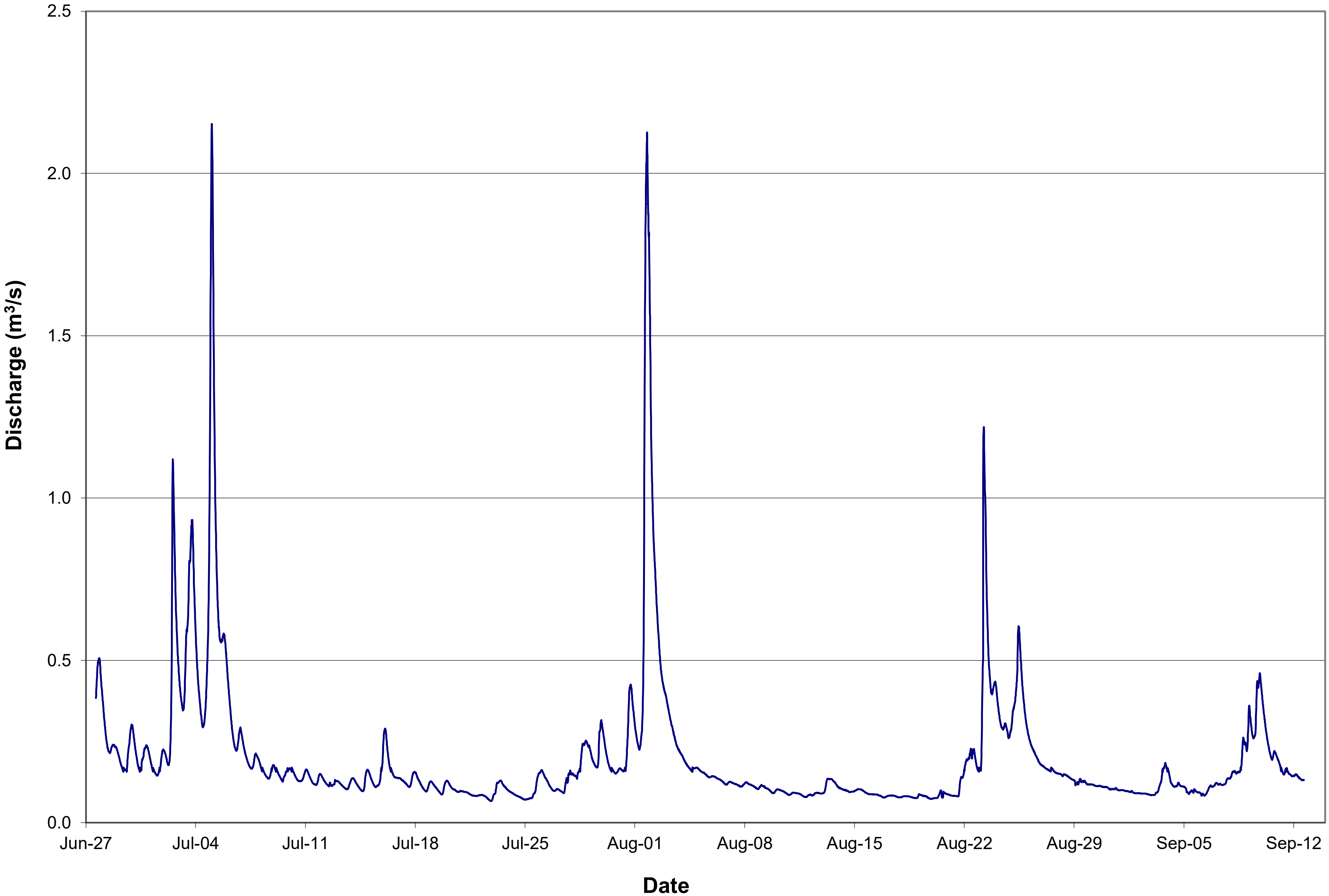


Figure 11 **H04 - Camp Lake Tributary (CLT-2) 2024 Flow Record**

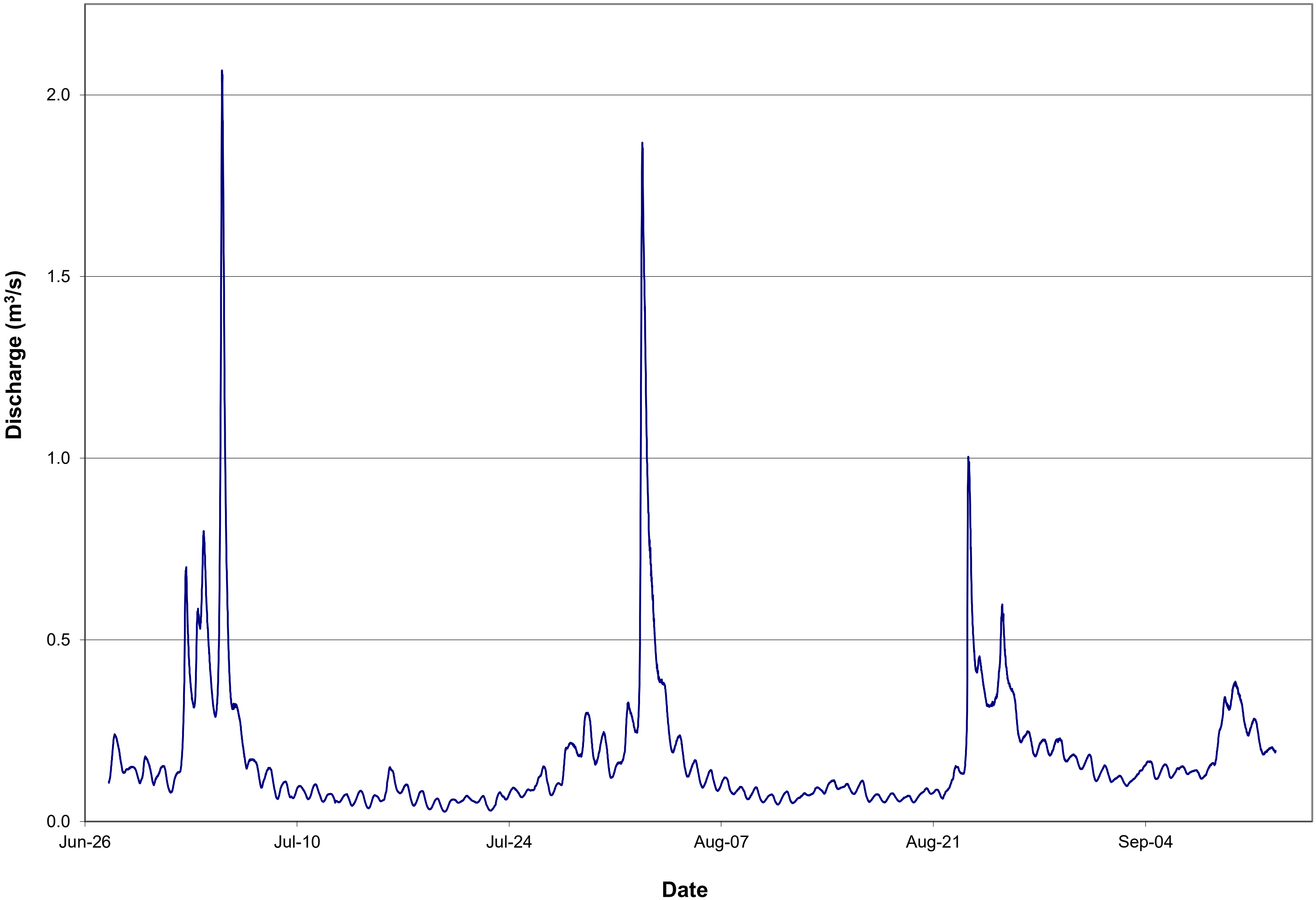


Figure 12 H05 - Camp Lake Tributary (CLT-1) 2024 Flow Record

]

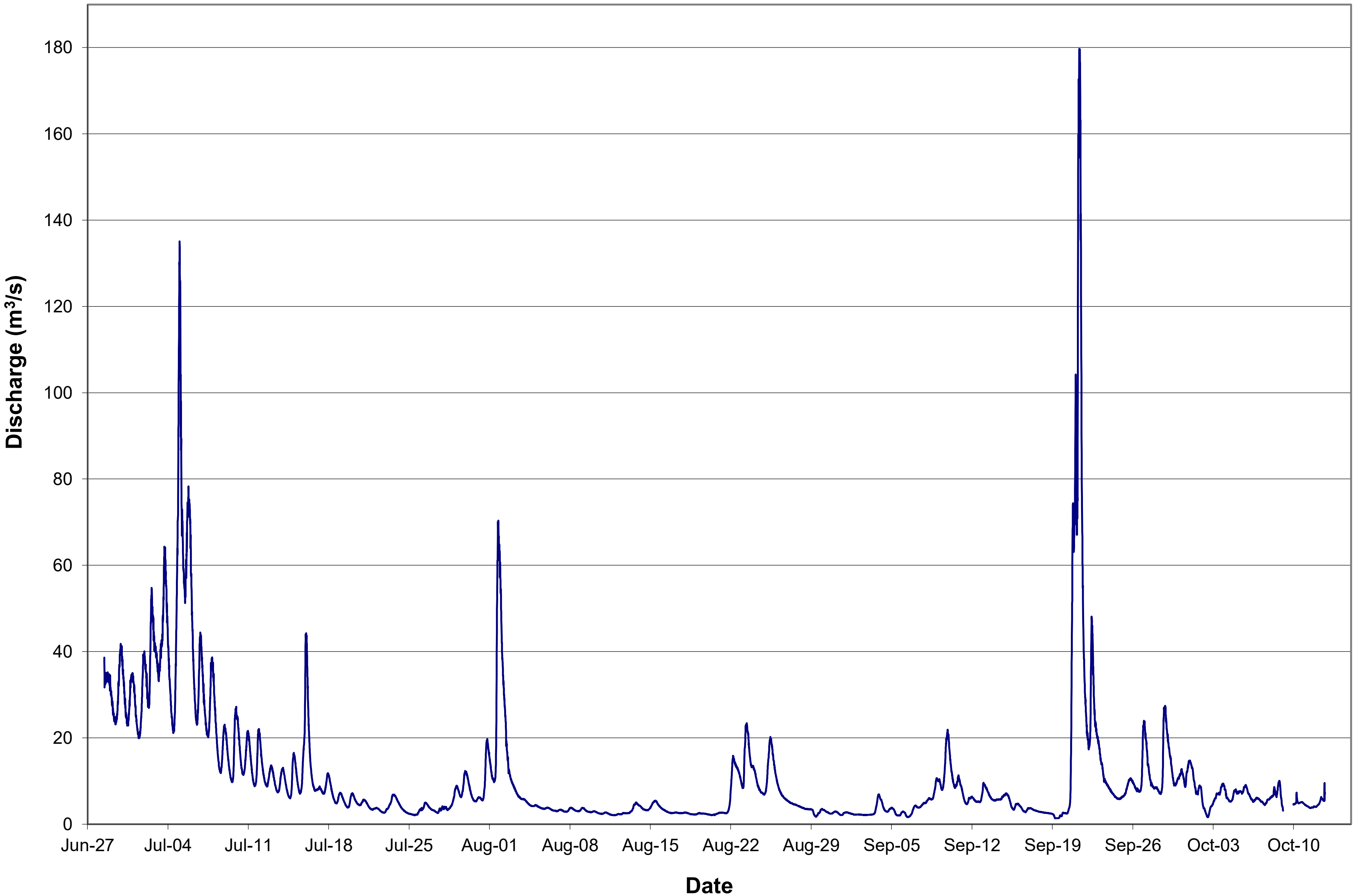


Figure 13 **H06 - Mary River 2024 Flow Record**

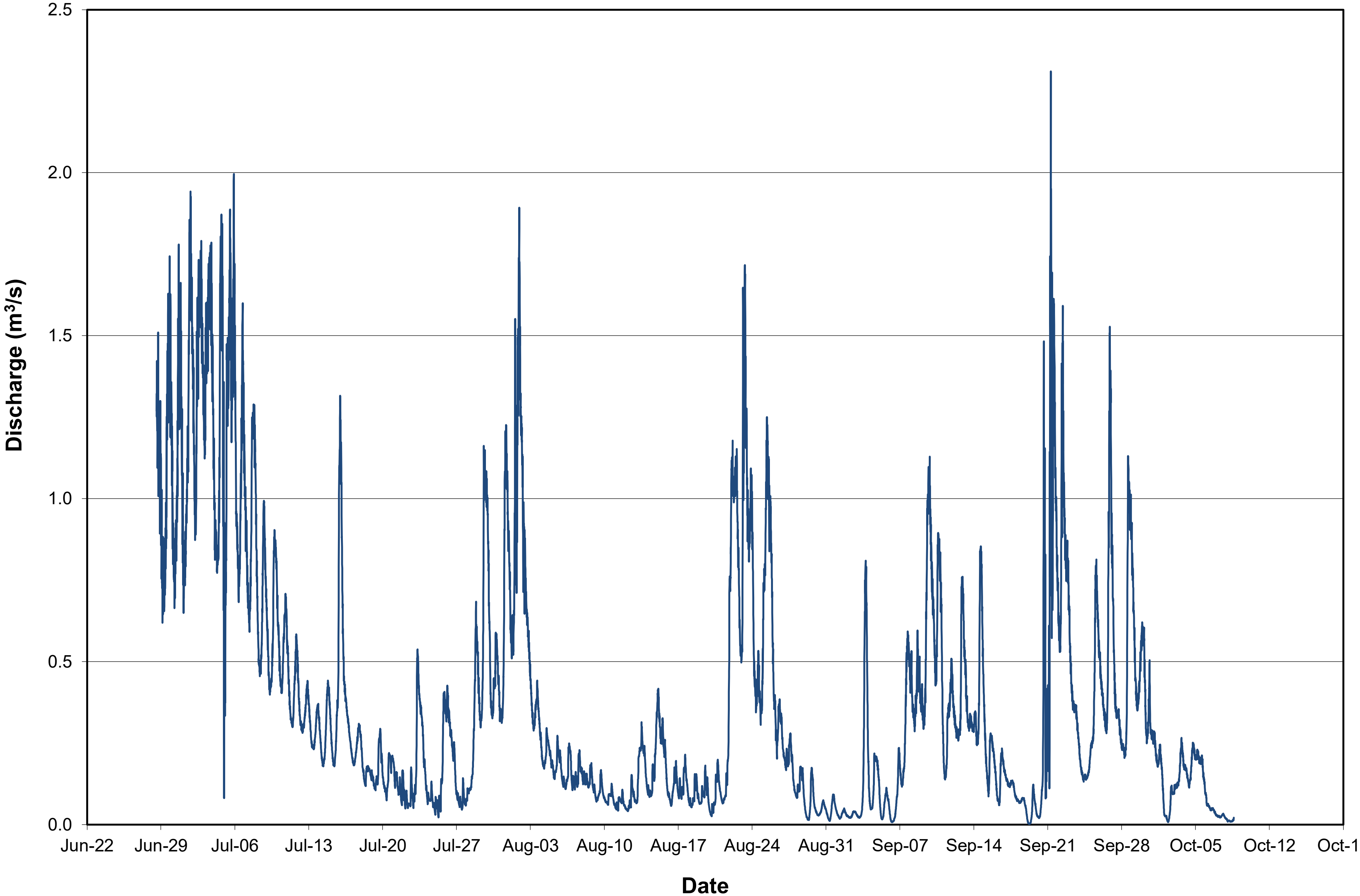


Figure 14 **H07 - Mary River Tributary F 2024 Flow Record**

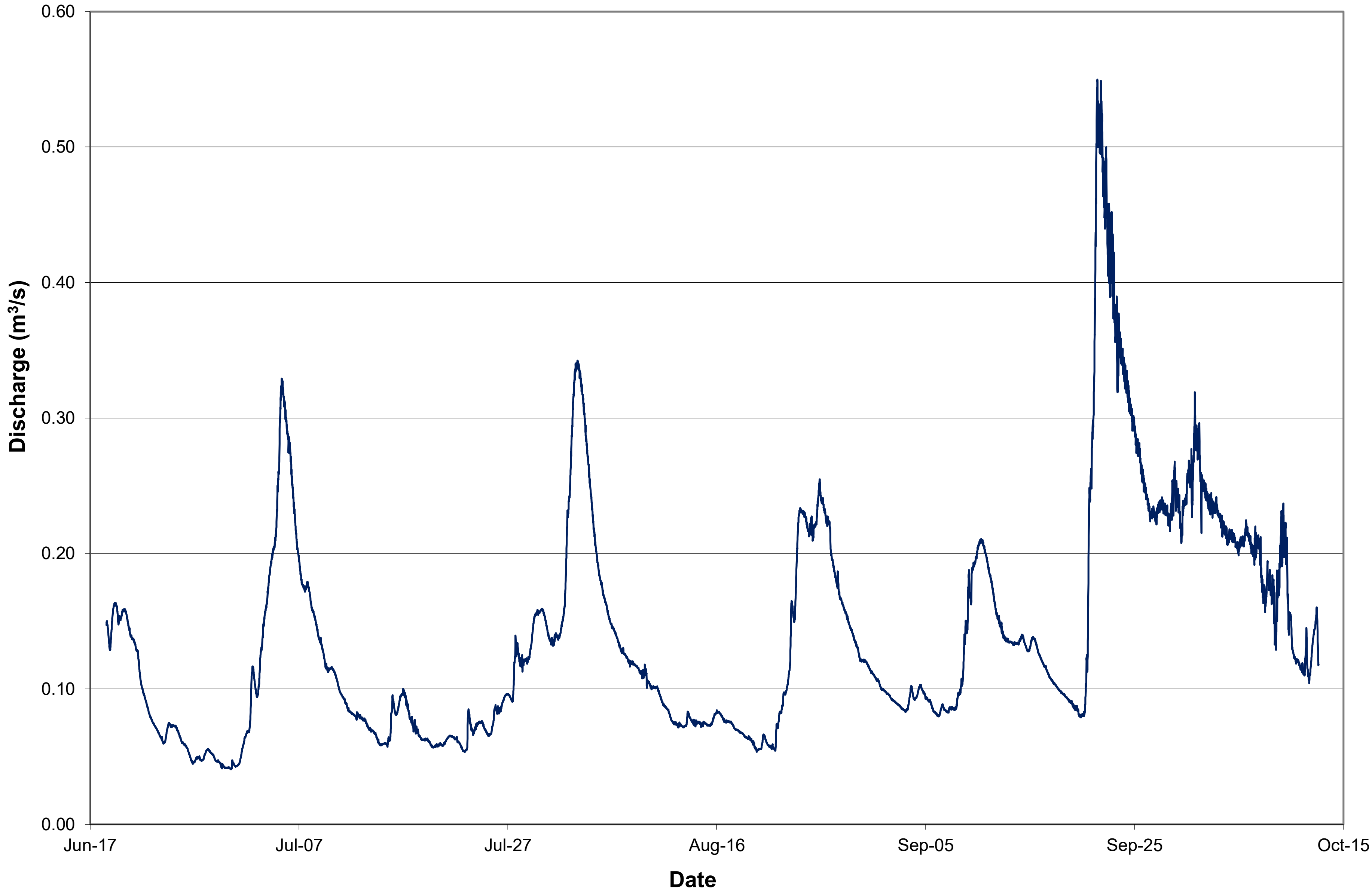


Figure 15 H11 - Sheardown Lake Tributary (SDLT-1) 2024 Streamflow Record

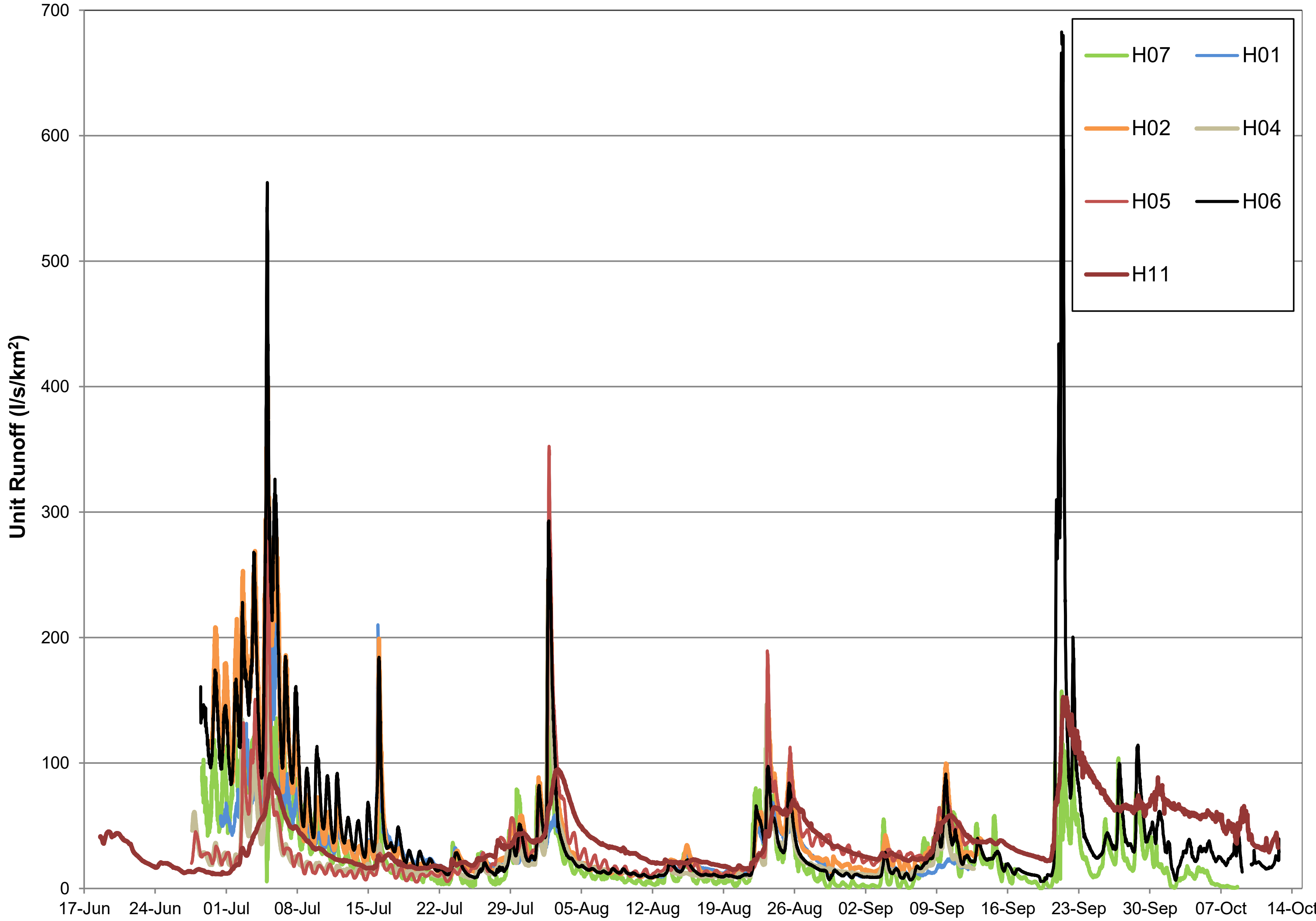


Figure 16 Comparison of 2024 Unit Runoff

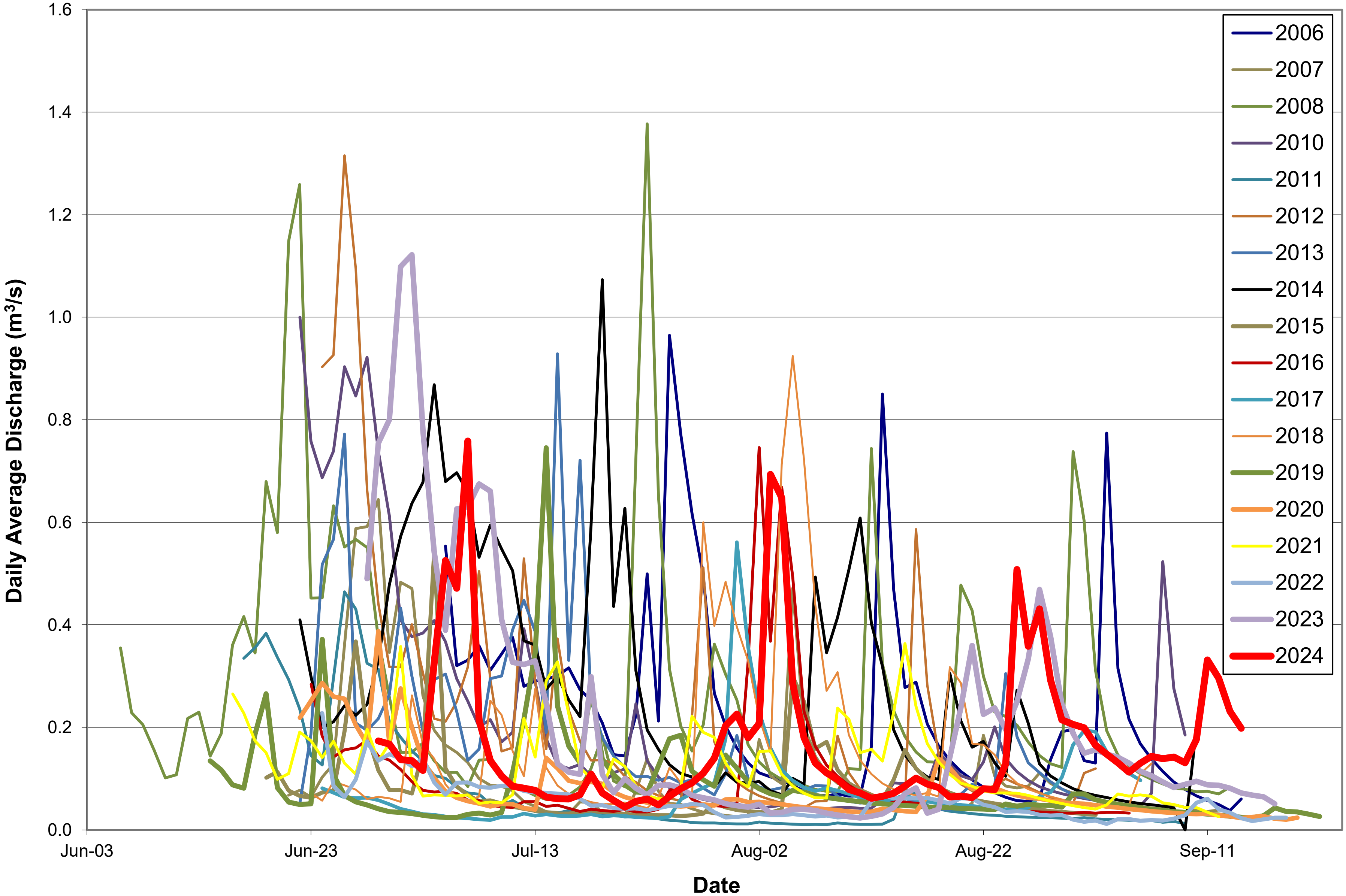


Figure 17 **H05 - Camp Lake Tributary (CLT-1) Measured Streamflow Hydrographs 2006 - 2024**