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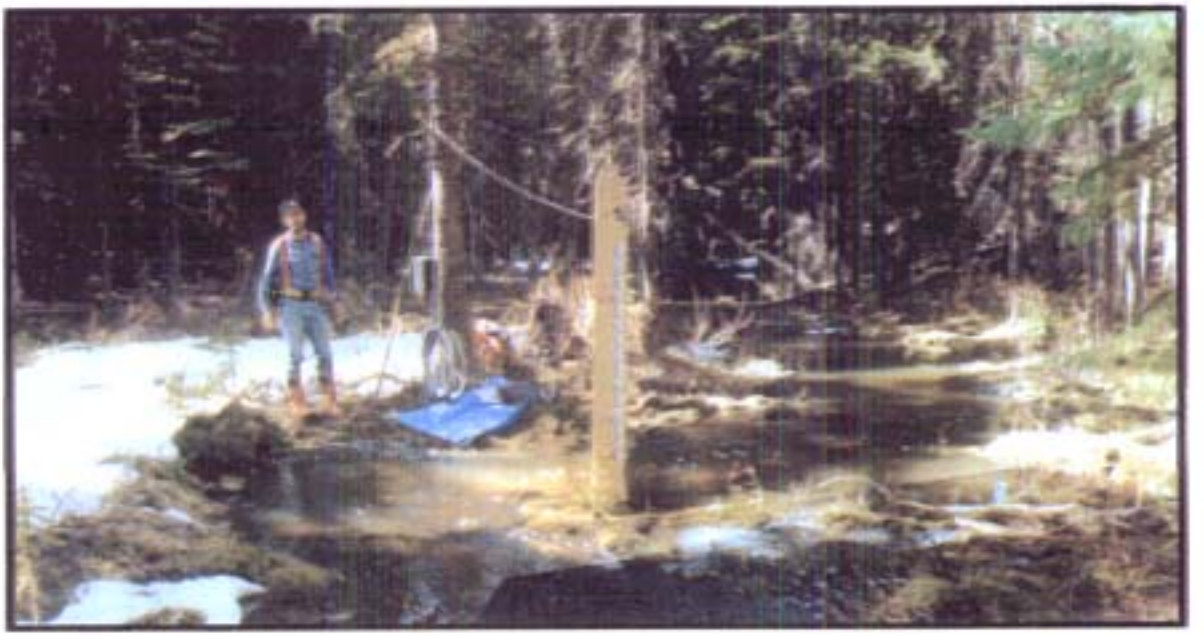
HYDROMETRIC STUDIES 1998 - 2001
GETTY NORTH PROJECT



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Mark Manning	Gartner Lee Ltd., Burnaby

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STATEMENT OF LIMITATIONS OF REPORT

This report was prepared by M. Miles and Associates Ltd. (MMA) for use by Getty Copper Corporation. The conclusions in this report reflect the judgement of MMA staff in light of the information available to MMA at the time of report preparation.

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GETTY COPPER HYDROMETRIC STUDIES 1998 – 2002
SUMMARY REPORT

1: INTRODUCTION AND OBJECTIVES

Getty Copper Corporation [Getty] requested that M. Miles and Associates Ltd. [MMA] undertake a hydrometric monitoring program in the vicinity of their Getty North property in April of 1998. This program persisted with varying levels of effort until the instrumentation was removed in October of 2001. The present report describes the monitoring program and summarizes the collected data. It is anticipated that more detailed analysis and interpretation of the compiled information will be undertaken when the mine site planning process is re-initiated. The principal objective of the present report is, therefore, to archive the collected information in a manner which would allow it to be readily used at some point in the future.

2: SUMMARY OF WORK UNDERTAKEN IN 2001

A variety of tasks were undertaken in 2001. These included:

1: Compiling data files obtained in 1998, 1999 and 2000;

2: Obtaining, assembling and testing replacement hydrometric equipment;

3: Undertaking a site inspection in May, 2001, measuring stream discharges, downloading the information collected over the previous 6 months and installing hydrometric equipment;

4: Compiling data collected during the May, 2001 field trip;

5: Undertaking a site inspection in October, 2001 to download collected data, measure stream discharges and remove all instrumentation; and

6: Compiling all study data.

7: Some accrued fees and expenses were also reimbursed.

The total cost was as follows:

Fees	$ 27,930.00
Expenses	$ 3,320.72
Sub-Total	$ 31,250.72
GST	$ 2,187.56
Total	**$ 33,438.28**

3: THE HYDROMETRIC DATA COLLECTION PROGRAM

3.1 INSTRUMENT LOCATION

Data loggers were installed at four locations as directed by Getty and Gartner Lee Ltd. (Getty's environmental consultant). These sites are shown on *Figures 3.1.1 and 3.1.2.* Three stations were placed on a headwater tributary to Forge Creek. This channel drains the east flank of Forge Mountain and the watershed containing the Getty North deposit.

The uppermost instrument was installed behind a small concrete dam at elevation 1,740 m. This site, which is referred to as "Dam", is located adjacent to the Getty North deposit and provides an indication of the amount of water which might have to be diverted around the proposed open pit. The basin area is approximately 0.25 km^2.

Two water level sensors were installed at Dam. One was placed within the reservoir, as it would be possible to develop a water level–discharge relationship for the dam crest, should a large flood occur. The second sensor was installed in the small incised upstream channel to monitor inflow to the reservoir. Photographs of this site are presented as *Plate 3.1.1.*

Another recorder was installed on Forge Creek below the potential open pit at elevation 1,630 m. This site, which is referred to as "Upper Forge", provides an indication of the amount of water which is draining from the area surrounding the proposed mine site. The basin area is approximately 1.17 km^2. Photographs of this site are presented as *Plate 3.1.2.* The channel can be seen to have low banks and a flood plain on both sides of the stream.

The third instrument on Forge Creek is located at elevation 1,440 m. This site, which is called "Lower Forge", has a basin area of approximately 5.85 km^2. It drains the east face of the Forge Mountain on which the Getty North deposit is located. Photographs of this site are presented as *Plate 3.1.3.* The channel has higher banks in comparison to the Upper Forge site and there was no field evidence that high flows spread out onto the adjacent terrain.

The fourth gauging site, called "Burr", is located in the headwaters of Burr Creek at elevation 1,650 m. The upstream basin area is approximately 3.69 km^2. Burr Creek drains the west side of Forge Mountain. There is a potential for a 'heap leach' to be located in the upstream valley bottom. Photographs of this site are presented as *Plate 3.1.4.* The well defined channel has low banks and flood waters were observed to overflow both sides of the valley flat during the early stages of the snowmelt freshet when the channel was infilled with snow and ice.

In addition to the four recording instruments, twelve staff gauges were installed on small streams in support of a water quality monitoring program. The location of these sites are shown on *Figure 3.1.2.* Only a small amount of water level or streamflow data are available and this information has not been compiled in the present report.

3.2 INSTRUMENT DESCRIPTION

All deployed instrumentation was manufactured by "Unidata". Data was stored on a Model 6004C multichannel data logger. The logger was programmed to sample at 1 minute intervals and to record average (or total values in the case of the tipping bucket rain gauge) at 15 minute intervals during most

summer period or one hour intervals during most winter periods. This multiple measurement and data averaging sampling methodology was employed to increase signal to noise ratios. The 15-minute time interval summer data will allow rainfall–runoff models to be developed at some point in the future.

Water levels were measured using capacitive probes which have an accuracy of 1% of full scale and a resolution of 0.4% of full scale. Three lengths of capacitive probes were employed. A half metre long probe was installed in the upstream channel at Dam. One metre probes were installed in the reservoir at Dam and at Burr. Two metre probes were installed at both the Upper and Lower Forge sites.

Water temperature sensors were placed at all sites. These consisted of thermistors which can measure temperature to an accuracy of ±0.2°C.

Each data logger was configured to monitor its internal temperature. The data logger instrument shelters were insulated with styrofoam in the winter to protect the electronics by reducing diurnal temperature variations. The insulation and instrument housing will affect the temperature measurements as discussed in Section 3.4.4. These data do, however, provide an indication of the air temperature regime at each of the monitoring sites.

Climate data was collected in a clearing at the Lower Forge site. This equipment consisted of a tipping bucket rain gauge and a combination air temperature/relative humidity sensor which measured summer precipitation in increments of 0.2 mm. The air temperature sensor has a stated accuracy of ± 0.5°C.

Enamelled staff gauges were installed at all streamflow gauging sites. The elevation of the staff gauges, the water level sensors and water level was surveyed using a LEICA NA28 engineers level and referenced to three bench marks established at each site. Bench marks consisted of rebar posts or survey tags and nails driven into adjacent trees.

The deployed instrumentation is summarized on *Table 3.2.1.*

3.3 THE MEASUREMENT PROGRAM

The period of operation of the various monitoring sites is summarized on *Table 3.3.1.* A complete data record is available at Burr. The water level sensor in the reservoir at Dam was destroyed (due to cable damage) on February 22, 1999 and could not be replaced until May 12, 2001. The cable to the water level sensor at Upper Forge was similarly destroyed by a falling tree on October 18, 1998. The instrumentation was removed and the water level sensor could not be replaced until May 12, 2001. The tipping bucket rain gauge at Lower Forge was removed on October 25, 1998 to prevent damage during the winter period. It was re-installed on May 11, 2001. All instrumentation was removed at the request of Getty Copper in October, 2001.

In addition to the hardware problems discussed above, data was lost in the period between February or April, 1999 and August 1999 as the internal memory capacity of the data loggers was exceeded. Financial constraints prevented undertaking a more timely field trip to download data and reprogram the loggers. A similar event occurred at the Lower Forge site between November 27, 2000 and May 11, 2001, when heavy snow cover prevented access to the site during the fall field trip.

Stream discharge measurements were periodically made to develop relationships between water level and streamflow at each of the measurement sites. Many of the measurements in the period between April 27th

and May 3, 1998 were undertaken by Mr. Mark Manning of Gartner Lee Ltd. Subsequent measurements were undertaken during site visits by MMA to download data or maintain the instruments. [One exception occurred in July, 2001 when discharge values were measured by Vic and Anita Preto of Getty Copper during a mine site inspection trip.] The gauging sites are subject to small accumulations of sediment, debris or leaves and ice or snow substantially infills the channels during the winter. It was therefore recognized that frequent discharge measurements would be required to develop reliable stage–discharge rating curves and detect seasonal shifts in the rating relationship. However, the opportunity to undertake these measurements was severely constrained by the available funding following July of 1998. The number of discharge measurements is summarized on *Table 3.3.2.*

Water velocity measurements were typically made using a Price Minimeter fitted with an optical sensor manufactured by Swoffer Instruments. A Price AA metre with a whisker (Gartner Lee Ltd.) or magnetic (MMA) contact was employed at higher flows. In a few cases, when streamflows were too small to be measured reliably using a current metre, surface floats or a container were used to measure water velocities or total discharge.

Discharge measurement procedures followed techniques recommended by the Water Survey of Canada *(Terzi, 1981).* These are similar to those recommended by the BC Government Resource Inventory Committee *(G. McG Clark and Associates, 1997)* and the US Geological Survey *(Rantz, 1982a and b).*

3.4 DATA SUMMARY

3.4.1 Water Levels

The recorded water level data are illustrated on *Figure 3.4.1.1 to 3.4.1.4.* The duration of ice cover has also been indicated, based on the thermistor measurements. The highest observed water levels occurred in 1998. The significance of these data will be discussed subsequently in SECTION 3.5.

3.4.2 Water Temperature

The recorded water temperature data are illustrated on *Figures 3.4.2.1 to 3.4.2.4.* A data summary is presented on *Table 3.4.2.1.*

3.4.3 Air Temperature

Air temperature data recorded at the Lower Forge site is illustrated on *Figure 3.4.3.1.* A data summary is presented on *Table 3.4.3.1.* Mid-summer air temperatures commonly exceeded 20°C; the minimum observed winter value was -17.8°C.

3.4.4 Instrument Temperature

The recorded instrument temperatures are summarized on *Figures 3.4.4.1 to 3.4.4.4.* A comparison with the air temperature data at Lower Forge indicates that summer daytime temperatures within the data logger enclosure significantly exceed those measured by the air temperature sensor. (see *Figures 3.4.4.4 and 3.4.3.1,* respectively). In contrast, the winter data appear to be relatively similar. If required, it

should be possible to correlate the two data sets such that air temperature values can be estimated from the instrument temperature records at the three other gauging sites.

3.4.5 Precipitation

The tipping bucket rainfall data collected at Lower Forge is illustrated on *Figure 3.4.5.1.* A data summary is presented on *Table 3.4.5.1.* This information indicates that the total May to August precipitation ranged from approximately 134 mm in 1998 to 147 mm in 2001. June was the wettest month with an average total precipitation of 93 mm and July was the driest with an average precipitation value of 4 mm. The largest 24-hour duration total of 25.6 mm occurred in June 1998. These values provide a basis for a regional comparison of summer rainfall values based on longer term Meteorological Service of Canada Stations at Logan Lake and Highland Valley.

3.4.6 Relative Humidity

Relative humidity data observed at Lower Forge are illustrated on *Figure 3.4.6.1.* As expected, these values show very large diurnal variations.

3.5 STREAM DISCHARGE MEASUREMENTS

As discussed in SECTION 3.3, stream discharge values were periodically measured to determine a relationship between water level (or stage) and discharge. The streamflow measurements from Burr, Dam, Upper Forge and Lower Forge are compiled in APPENDICES 1 to 4, respectively. These data are summarized on *Tables 3.5.1 to 3.5.5.*

3.6 RELATIONSHIP BETWEEN STREAM DISCHARGE AND WATER LEVEL

3.6.1 Burr Creek

The discharge and water level data on *Table 3.5.1* have been used to generate a stage discharge rating curve for the Burr Creek gauging station *(Figure 3.6.1.1).* This and all the subsequent graphs show a best fit line and the 95% "prediction" confidence limits. Given the small number of discharge measurements which were made after 1998, no attempt has been made to determine annual or seasonal shifts in the developed rating curves.

The maximum gauged flow at Burr was associated with a water depth (on the sensor) of 0.583 m *(Table 3.5.1)* and this was the highest value observed over the four-year gauging program. No extrapolation of the rating curve is therefore required.

3.6.2 Dam

As discussed in SECTION 3.1, two water level sensors were installed at Dam. The instrument in the reservoir [Dam 1] was intended to monitor large flows when the rating curve for the sensor in the

upstream channel [Dam 2] was likely to be poorly defined. The Dam 1 sensor will, however, not be very sensitive during small discharges due to the size of the reservoir. Low discharge estimates could also be affected by blockage of the notch in the dam crest by floating debris. The upstream channel was, however, occasionally observed to be dry when very small discharges were still flowing over the dam crest. This suggests that sub-surface flow was occurring in the rocky bed of this small channel. For these reasons, it is expected that there will be some unavoidable discrepancies between the stream discharge estimates calculated for these two sites.

A rating curve for the Dam 1 sensor (in the reservoir) is presented on *Figure 3.6.2.1.* The maximum gauged flow was associated with a water level of 0.519 m. This is the highest value observed over the period of record and extrapolation of the stage–discharge rating curve has therefore not been required.

The sensor at Dam 2 (in the upstream channel) was installed on May 14, which is 13 days later than Dam 1 (May 3, 1998) and streamflow was dropping throughout this period. No discharge measurements are available at Dam 2 until May 13. The maximum gauged flow when the Dam 2 sensor was operating corresponds to a water level of 0.250 m *(see Table 3.5.3).* However, the maximum observed water level was 0.299 m. We have therefore used the calculated discharge data from Dam 1 to determine what the corresponding flow was at Dam 2 (see Table 3.5.3). This value, and the associated recorded water level, have been used to extend the Dam 2 stage–discharge relationship. The resulting rating curve is shown on *Figure 3.6.2.2.* Inspection of this graph indicates that zero flow occurs at a water depth of approximately 9 cm when the small pool in which the sensor is located become isolated from the downstream channel. It should be noted that the lack of gauging measurements results in the middle to high portions of this rating curve being comparatively poorly defined.

3.6.3 Upper Forge Creek

The stage–discharge rating curve for Upper Forge Creek is shown on *Figure 3.6.3.1.* The highest gauged flow was associated with a water level of 0.537 m. The highest observed water level was 0.575 m. A modest extrapolation of the rating curve is therefore required to cover the range in observed water levels.

3.6.4 Lower Forge Creek

The stage–discharge rating curve for Lower Forge Creek is shown on *Figure 3.6.4.1.* Data from 2001 plot almost on top of the best fit line and indicate that the rating has been relatively stable over the period since 1998. The highest gauged flow was associated with a water depth of 0.759 m. The maximum observed water depth was 0.934 m and estimation of peak flow values at this site again requires some extrapolation of the rating curve.

3.7 CALCULATED STREAMFLOW VALUES

3.7.1 Burr Creek

The stage–discharge rating curve shown on *Figure 3.6.1.1* has been used to estimate stream discharge values on the basis of the water level data shown on *Figure 3.4.1.1.* The results, which have only been calculated for the ice free period, are illustrated on *Figure 3.7.1.1.* The streamflow data are summarized on *Table 3.7.1.1* and indicate that the maximum observed flow was 242 L/s.

3.7.2 Dam

The stage–discharge rating curve shown on *Figure 3.6.2.1* has been used to estimate stream discharge values at Dam 1 (i.e. through the reservoir) on the basis of the water level data shown on *Figure 3.4.1.2*. The results, which have only been calculated for the ice free period, are illustrated on *Figure 3.7.2.1.* The streamflow data are summarized on *Table 3.7.2.1* and indicate that the maximum observed flow was 24 L/s.

The stage–discharge rating curve shown on *Figure 3.6.2.2* has been used to estimate stream discharge values at Dam 2 (i.e. in the upstream channel) on the basis of the water level data shown on *Figure 3.4.1.2.* The results, which have only been calculated for the ice free period, are illustrated on *Figure 3.7.2.2.* The streamflow data are summarized on *Table 3.7.2.2* and indicate that the maximum observed flow is again 24 L/s.

3.7.3 Upper Forge

The stage–discharge rating curve shown on *Figure 3.6.3.1* has been used to estimate stream discharge values on the basis of the water level data shown on *Figure 3.4.1.3.* The results, which have only been calculated for the ice free period, are illustrated on *Figure 3.7.3.1.* The streamflow data are summarized on *Table 3.7.3.1* and indicate that the maximum observed flow was 172 L/s.

3.7.4 Lower Forge

The stage–discharge rating curve shown on *Figure 3.6.4.1* has been used to estimate stream discharge values on the basis of the water level data shown on *Figure 3.4.1.4.* The results, which have only been calculated for the ice free period, are illustrated on *Figure 3.7.4.1.* The streamflow data are summarized on *Table 3.7.4.1* and indicate that the maximum observed flow was 584 L/s.

4: REGIONAL STREAMFLOW CONDITIONS BETWEEN 1998 AND 2001

4.1 AVAILABLE INFORMATION

The closest active streamgauging station in the vicinity the Getty North project is *Guichon Creek Above Tunkwa Lake Diversion.* This site, which is located 8 km to the east of the Getty North deposit, is operated by the Water Survey of Canada. The upstream basin area is 78.2 km^2. Information from this site has been used to provide an initial indication of how the streamflow data collected in the period between 1998 and 2001 compare to the longer term data record.

4.2 SEASONAL VARIATION IN FLOW

The daily data observed at the Guichon Creek gauge in 1998, 1999, 2000 and 2001[*1] are presented on *Figure 4.2.1.* These analyses indicate that the daily discharges in 1998, 2000 and 2001 were generally smaller than average. Freshet flows in 1998 and 2001 can also be seen to have occurred earlier than normal. Stream discharges during the winter are very small. This supports our field observations which indicate that streamflow values at the Getty Copper gauging sites are very small or non-existent during the winter period.

4.3 ANNUAL MAXIMUM FLOWS

The historical variation in annual maximum daily and instantaneous flows observed at the Guichon Creek gauging station are summarized on *Figure 4.3.1.* The 2001 discharge data is not included as these flows have not been finalized. However, based on the data on *Figure 4.2.1*, the maximum flow in 2001 is expected to be approximately 0.5 m^3/s. A flood frequency analysis has been undertaken[*2] and the results are also shown on this figure.

These analyses indicate that flood flows in 1998, 2000 and 2001 were substantially smaller than the 2-year return period event. Freshet flows in 1999 slightly exceeded this value, but for the reasons previously discussed, no on-site data is available for this time period.

4.4 MEAN ANNUAL DISCHARGE

The historical variation in mean annual discharge observed at the Guichon Creek gauging station is shown on *Figure 4.4.1.* This analysis, which does not include data for 2001, indicate that the mean annual flows in 1998 and 2000 were 69 and 55%, respectively, of the long term average. The available data also indicate that average annual flows in 2001 were approximately 75% of the long term average. Thus the three years of hydrometric data collected during the Getty Copper streamflow monitoring program are representative of drier than average conditions.

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1 incomplete preliminary data

2 the Log Pearson Type III distribution has been adopted

5: DISCUSSION AND RECOMMENDATIONS

This report has summarized the hydrometric data collected in the vicinity of the Getty North Deposit between 1998 and 2001. With the exception of the summer of 2000 (for which little on-site data is available), this period was characterized by generally smaller than average flows. The collected hydrometric information therefore provides an indication of streamflows at the minesite during comparatively dry periods.

Further analyses of regional climate and streamflow data will allow the measured values to be used as a basis for computing streamflow values during wetter conditions. It is expected that these results will be adequate for initial minesite design and permitting requirements. However, given the high elevation of the site, it may be difficult to reliably compute discharge values in the vicinity of the proposed minesite based on scaling factors developed from measurements in the valley bottom. There could, therefore, be a benefit in re-establishing the hydrometric gauging program if streamflow information becomes a critical element in the minesite design process.

6: CERTIFICATION

This report was prepared by:

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Elizabeth Goldsworthy, B.Sc.

Mike Miles

Mike Miles, M.Sc., P.Geo.

7: SOURCES OF INFORMATION

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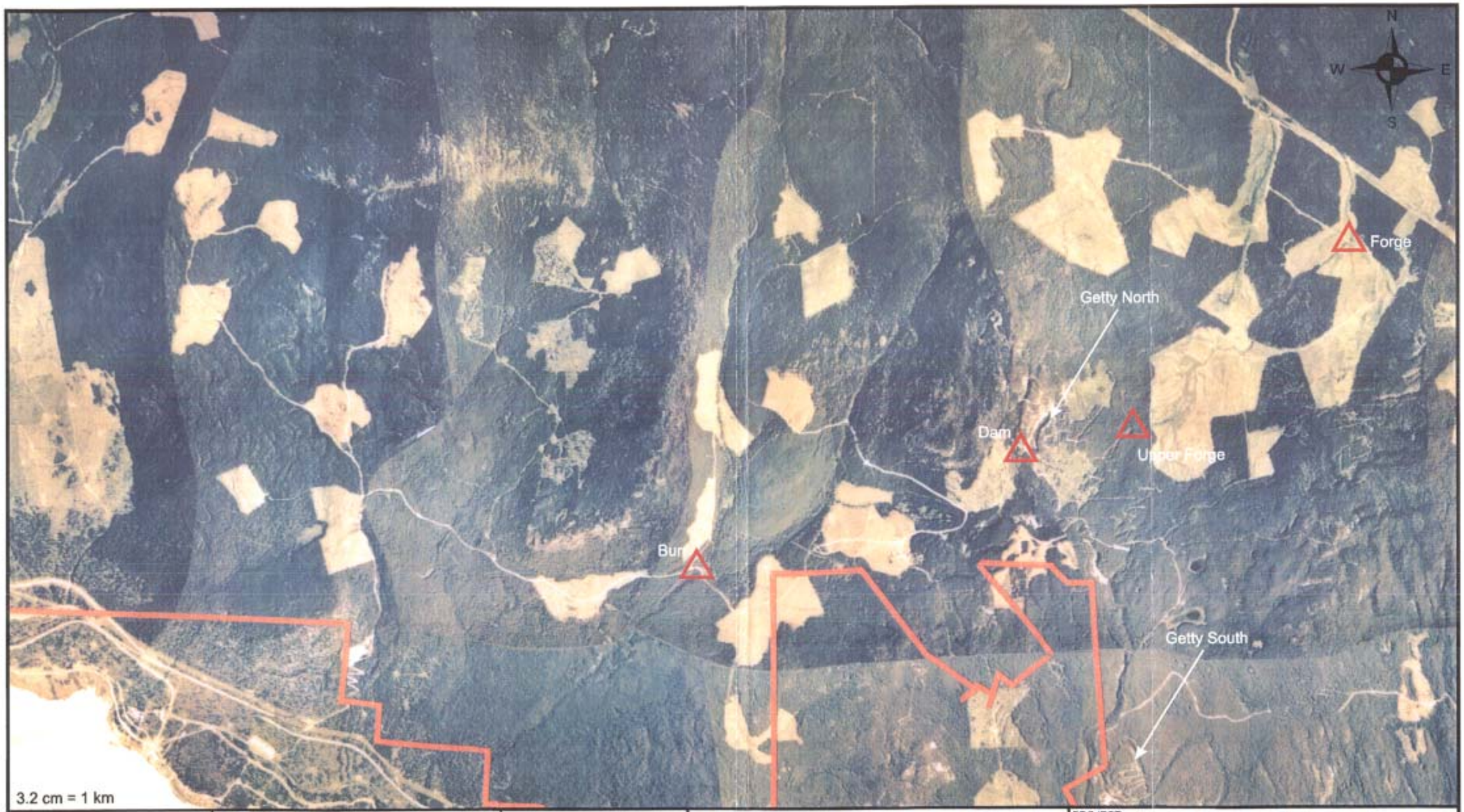
Figures



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						APPROVED:	

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FIGURE 3.1.1

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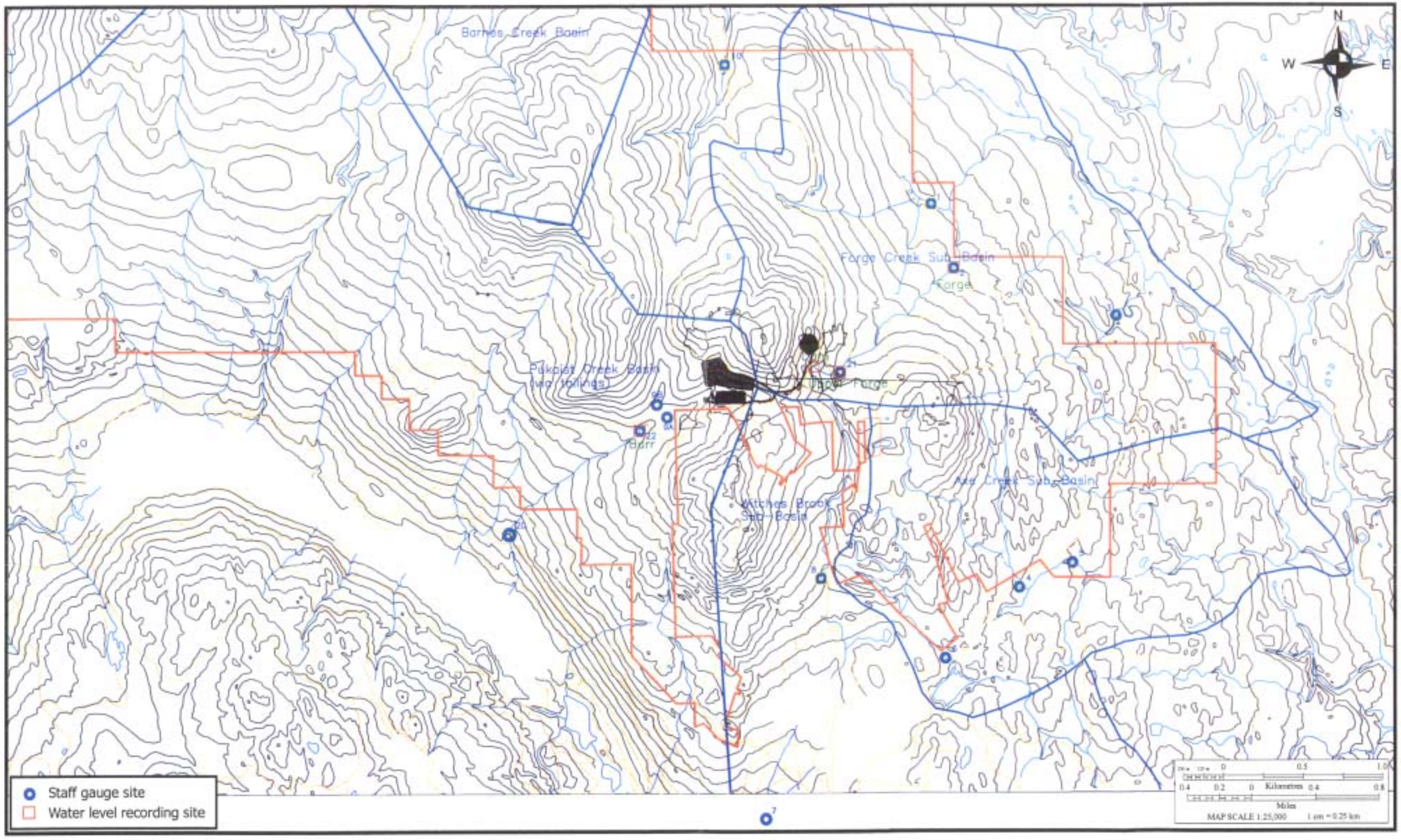
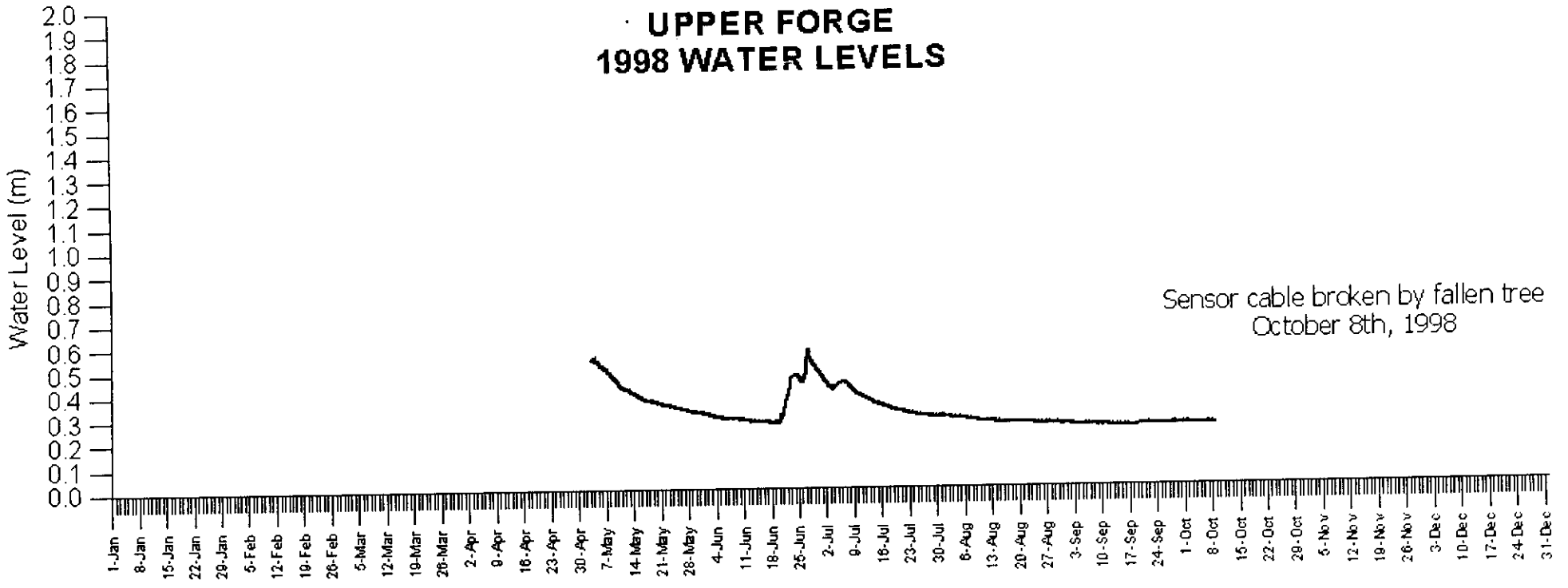
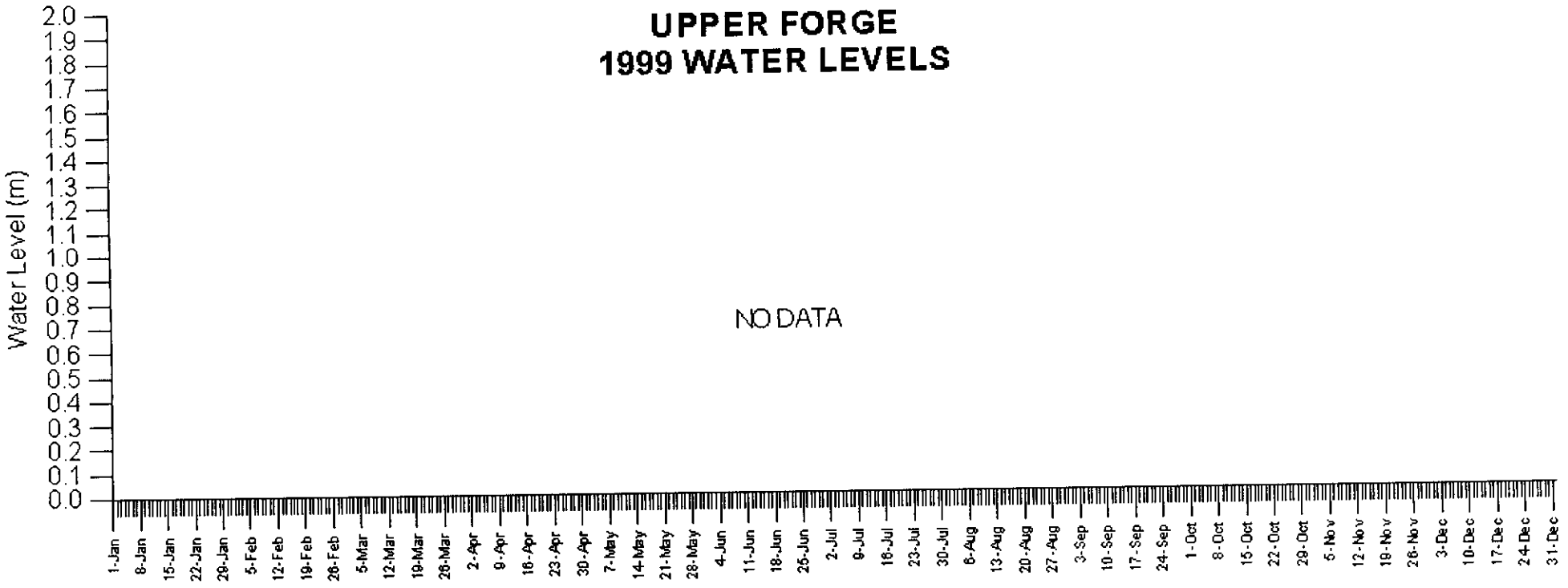


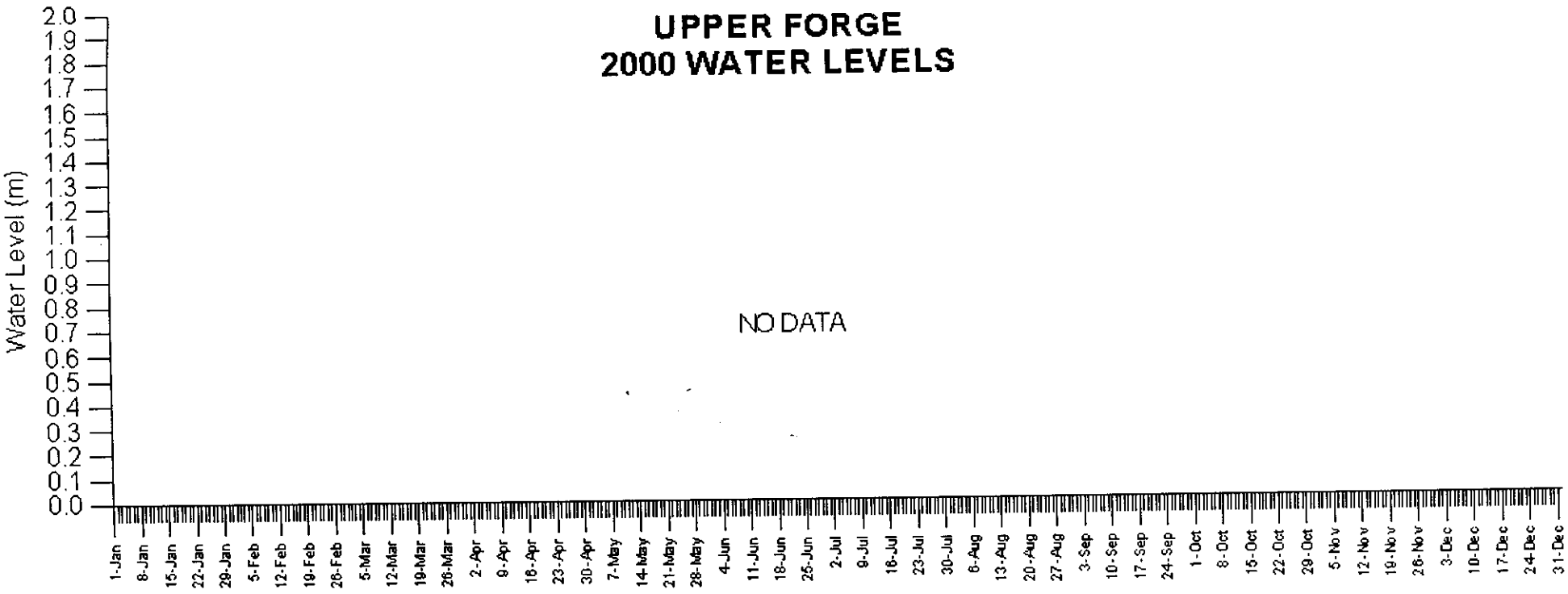
Figure 3.1.2: Location of water level recorders and staff gauges installed in support of the water quality sampling program.

Figure 3.4.1.1: Summary of observed water level data at Burr

Figure 3.4.1.2: Summary of observed water level data at Dam







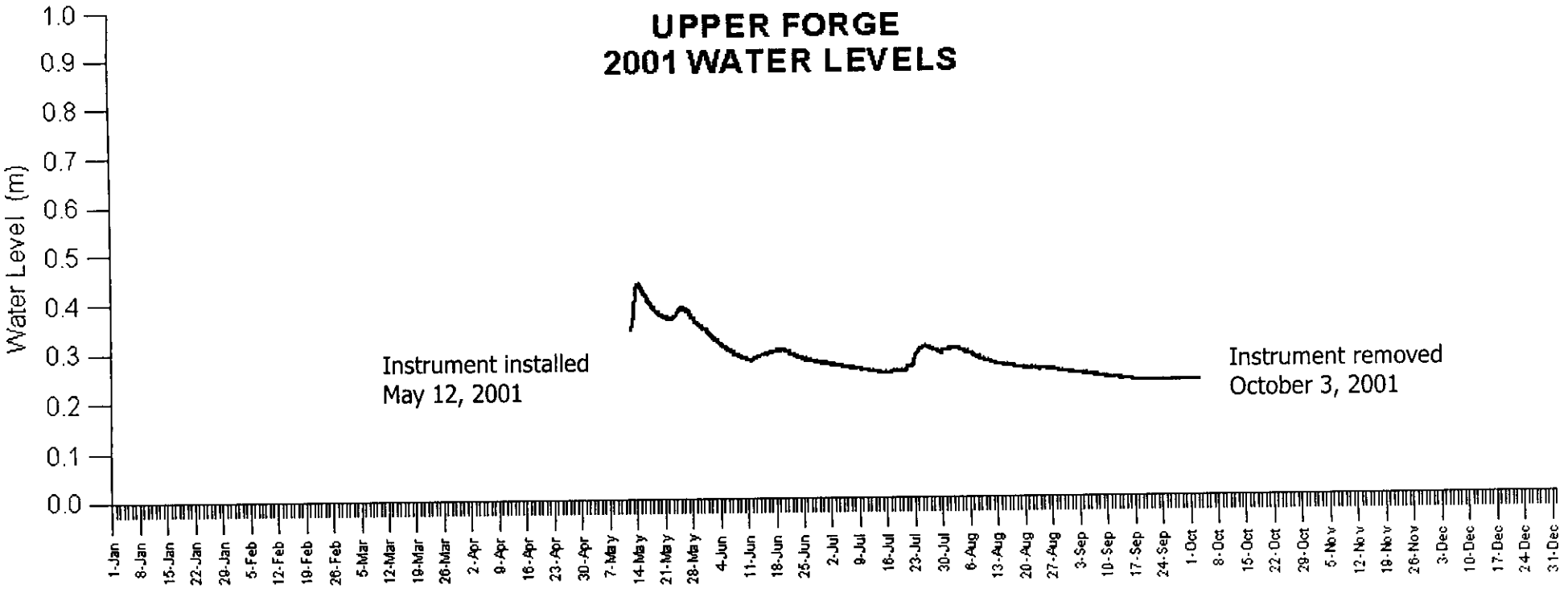
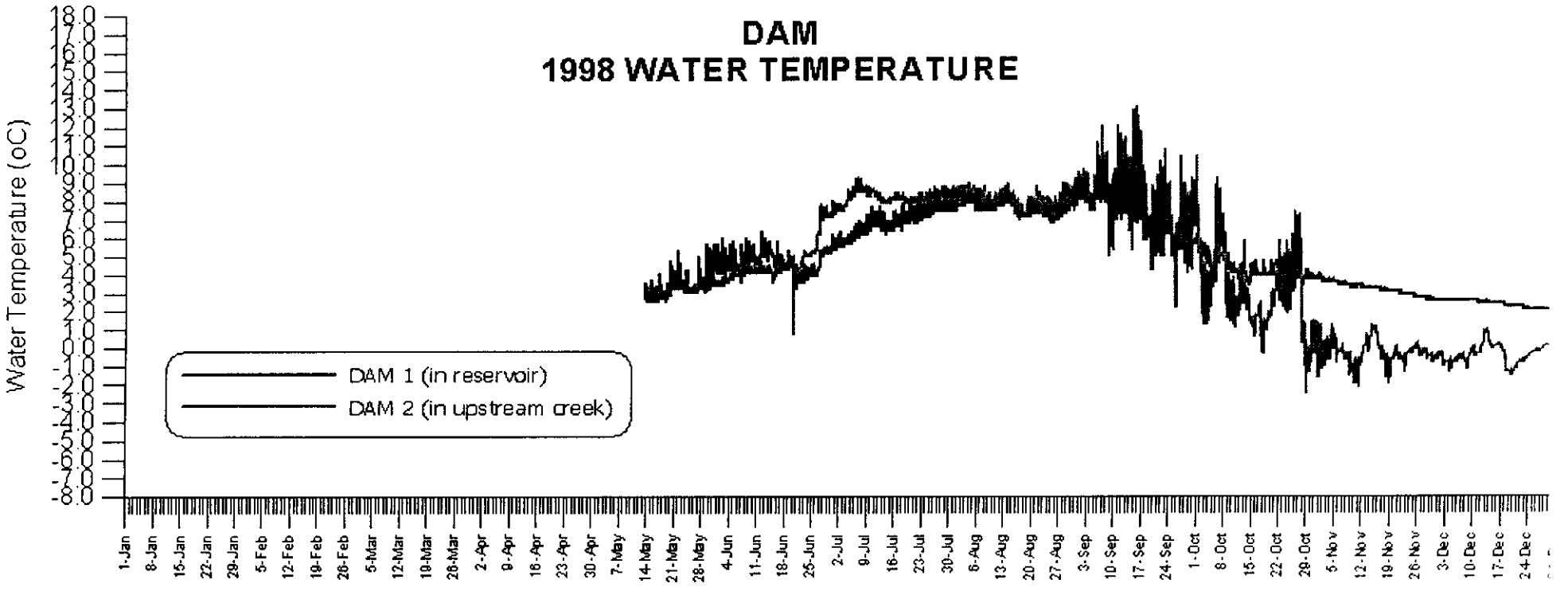
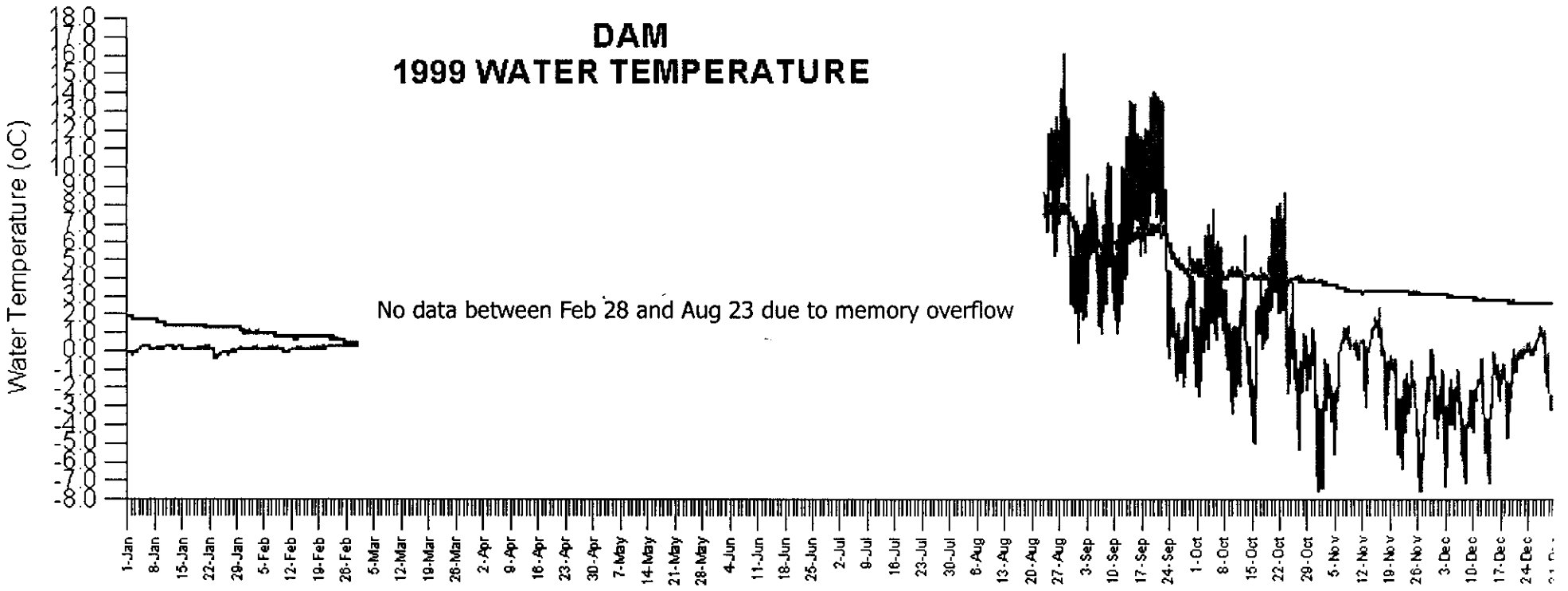


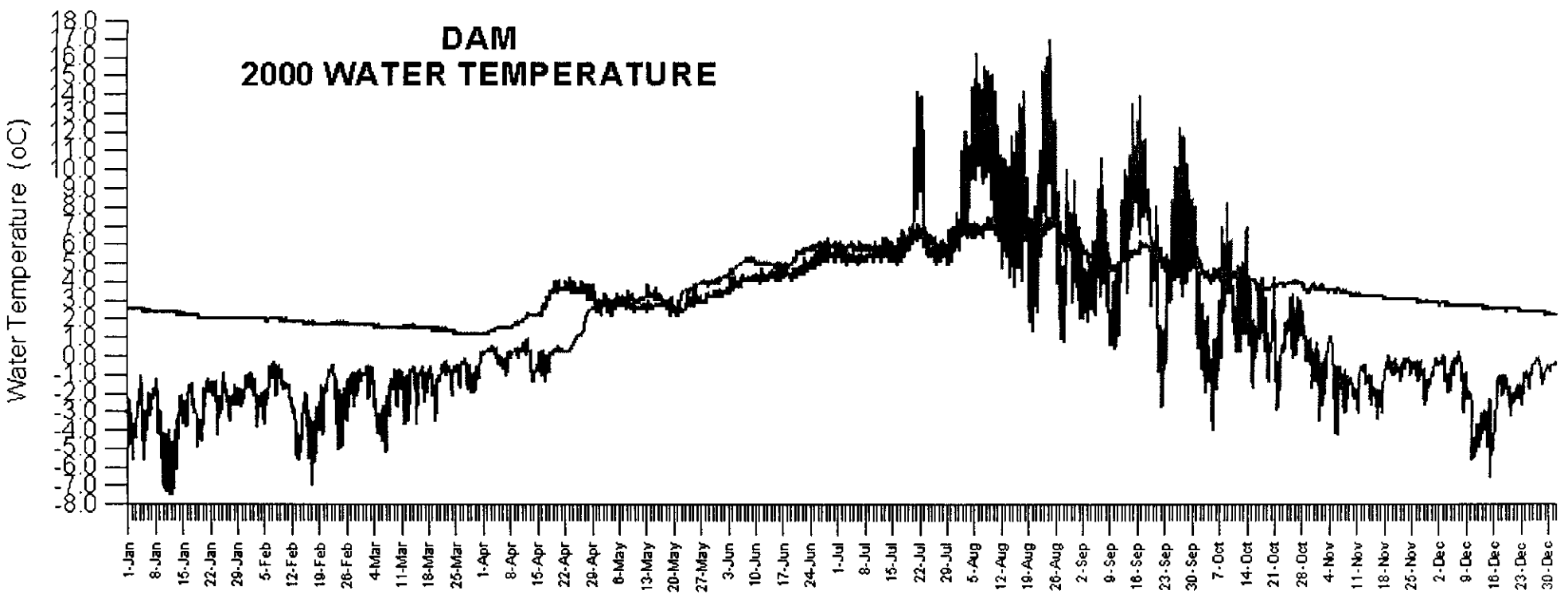
Figure 3.4.1.3: Summary of observed water level data at Upper Forge

Figure 3.4.1.4: Summary of observed water level data at Lower Forge

Figure 3.4.2.1: Summary of observed water temperature data at Burr







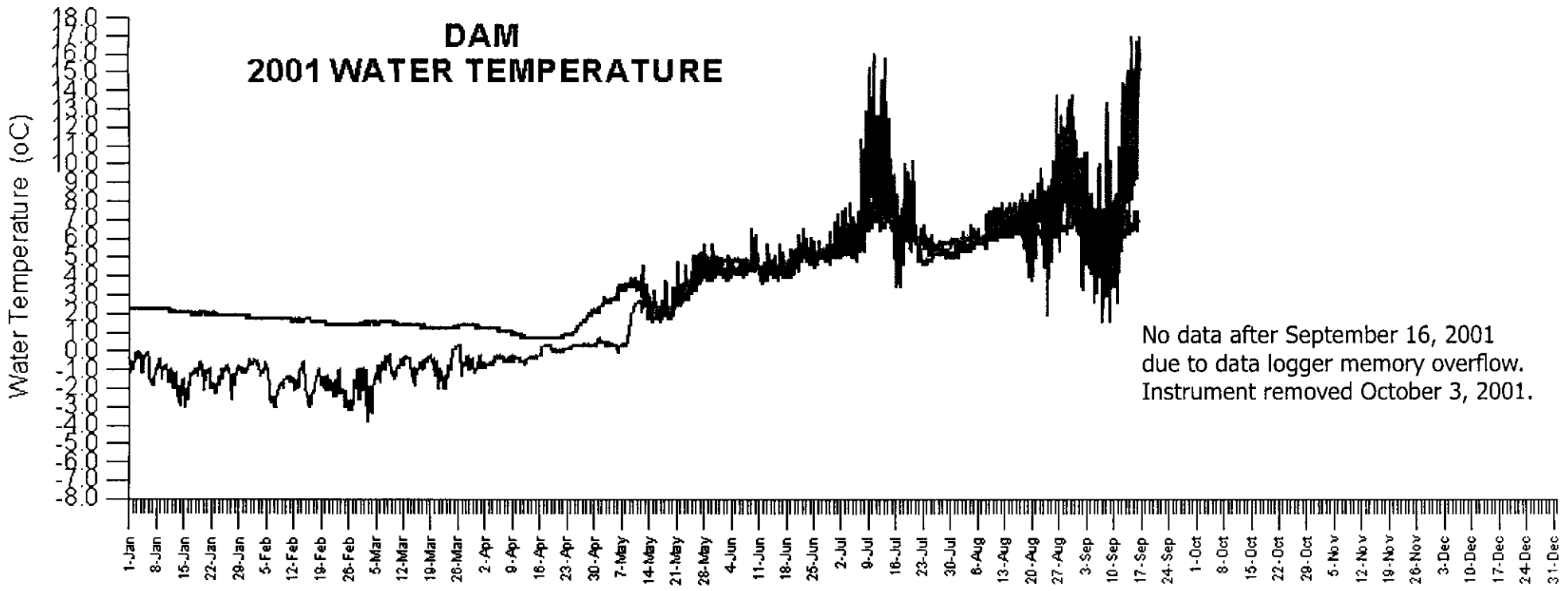
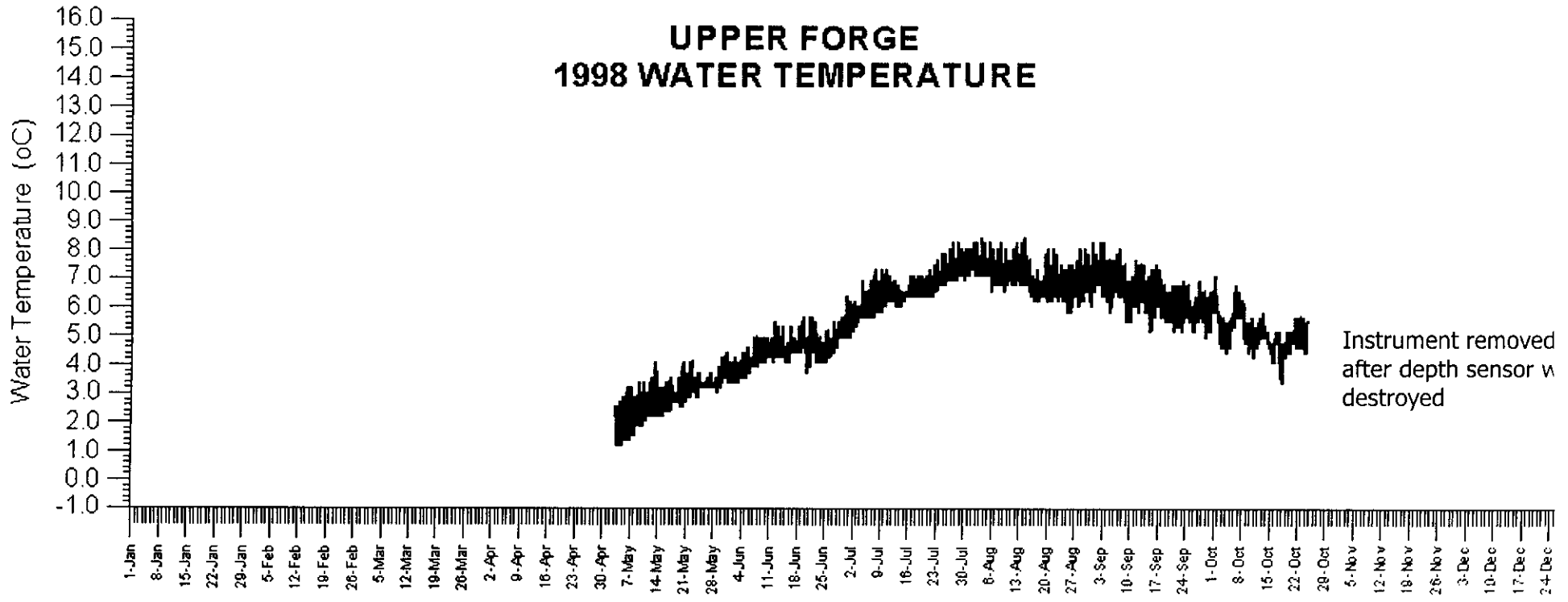
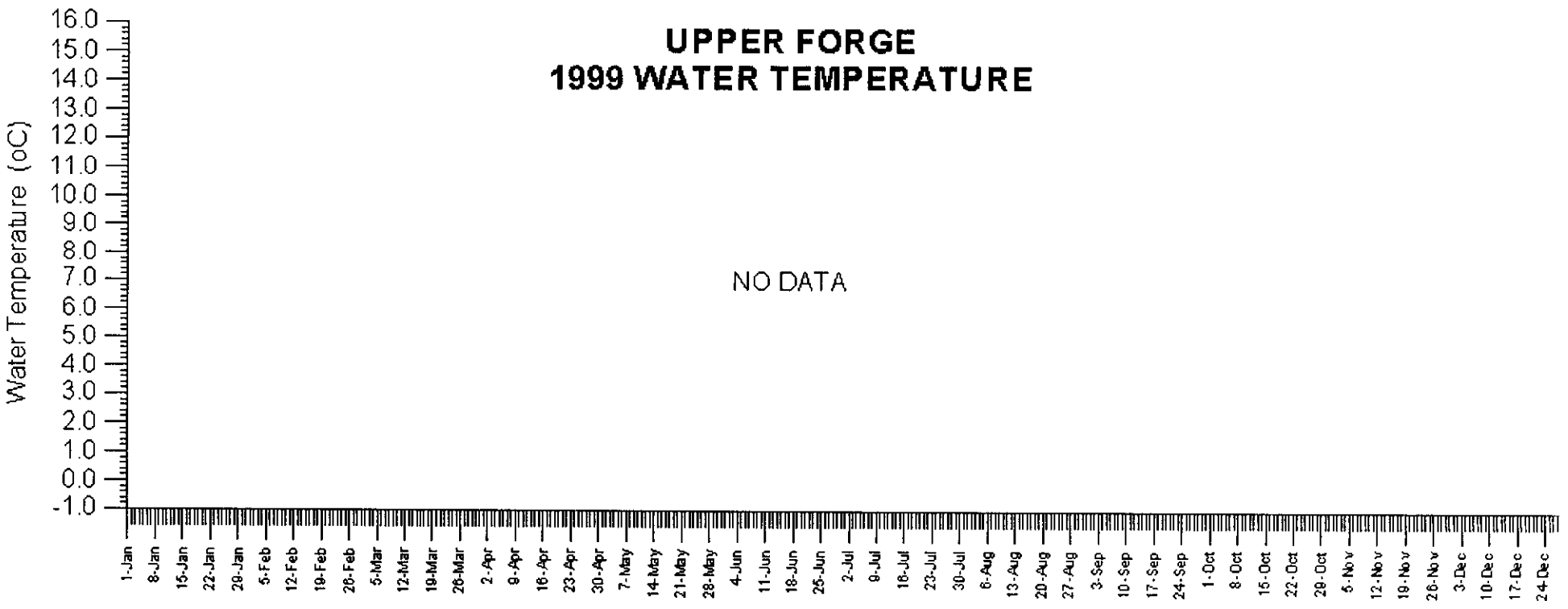
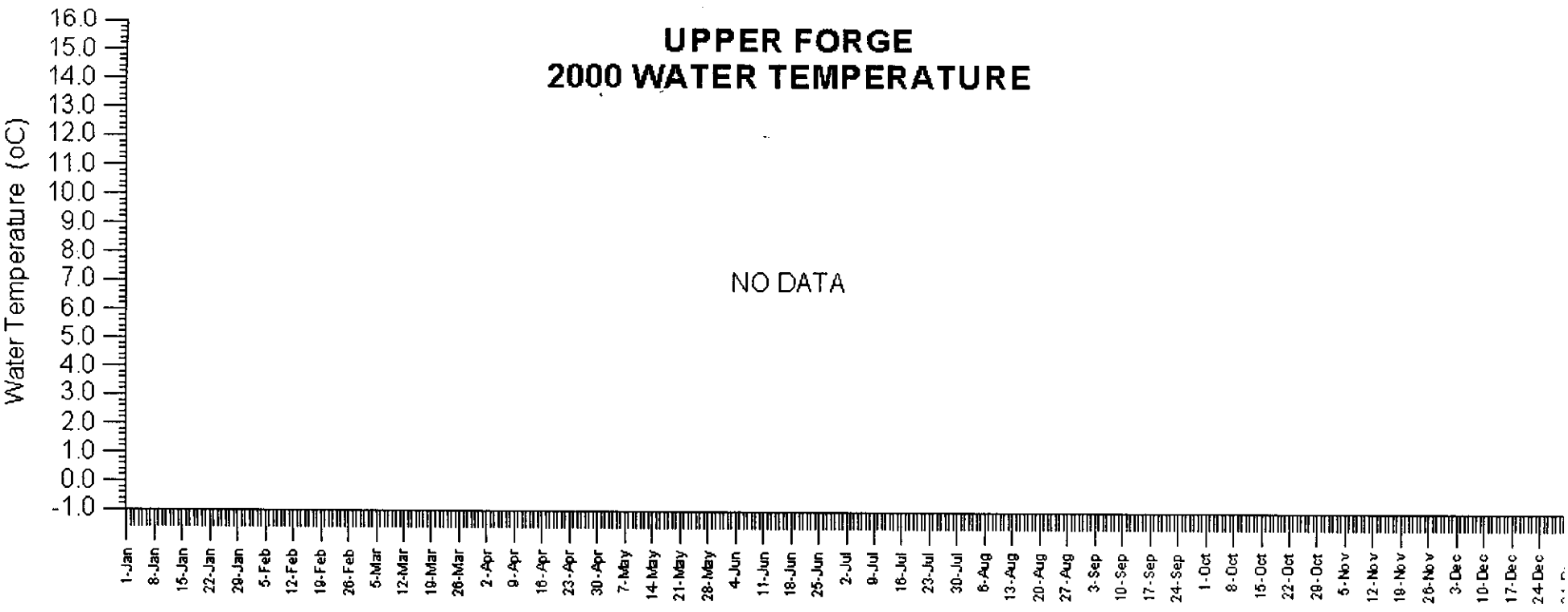


Figure 3.4.2.2: Summary of observed water temperature data at Dam







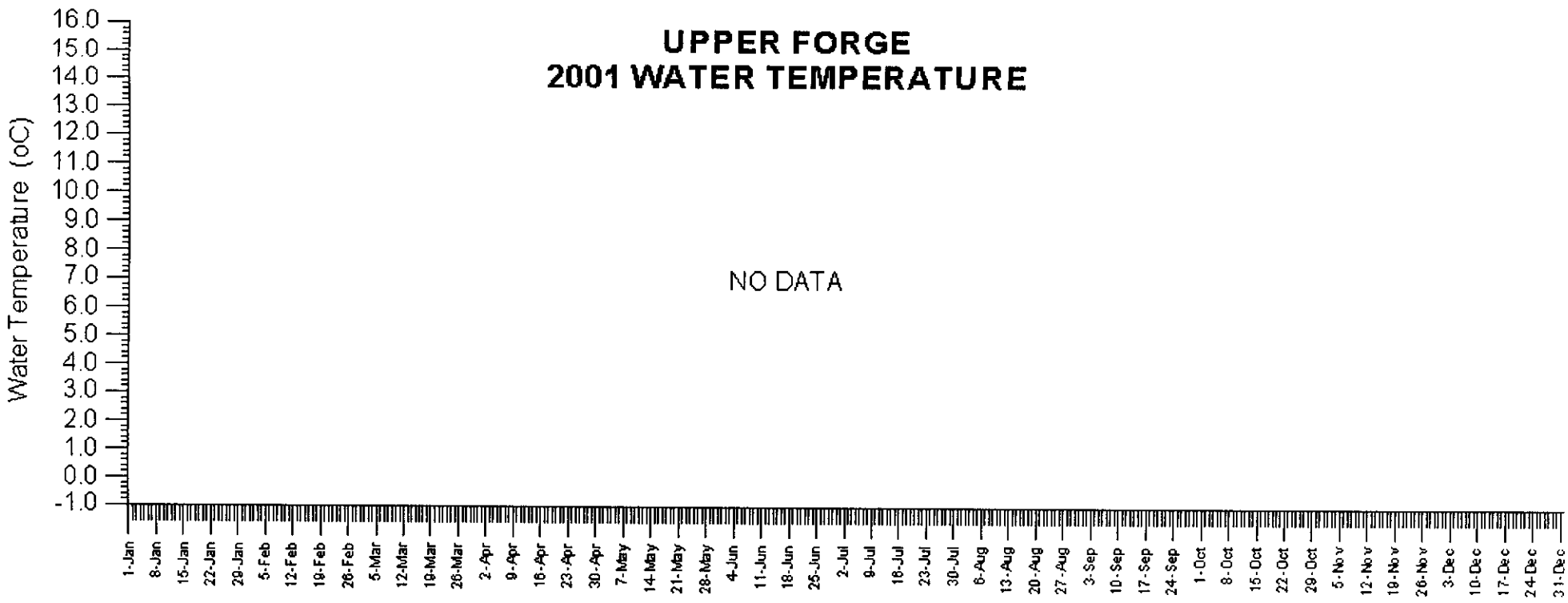
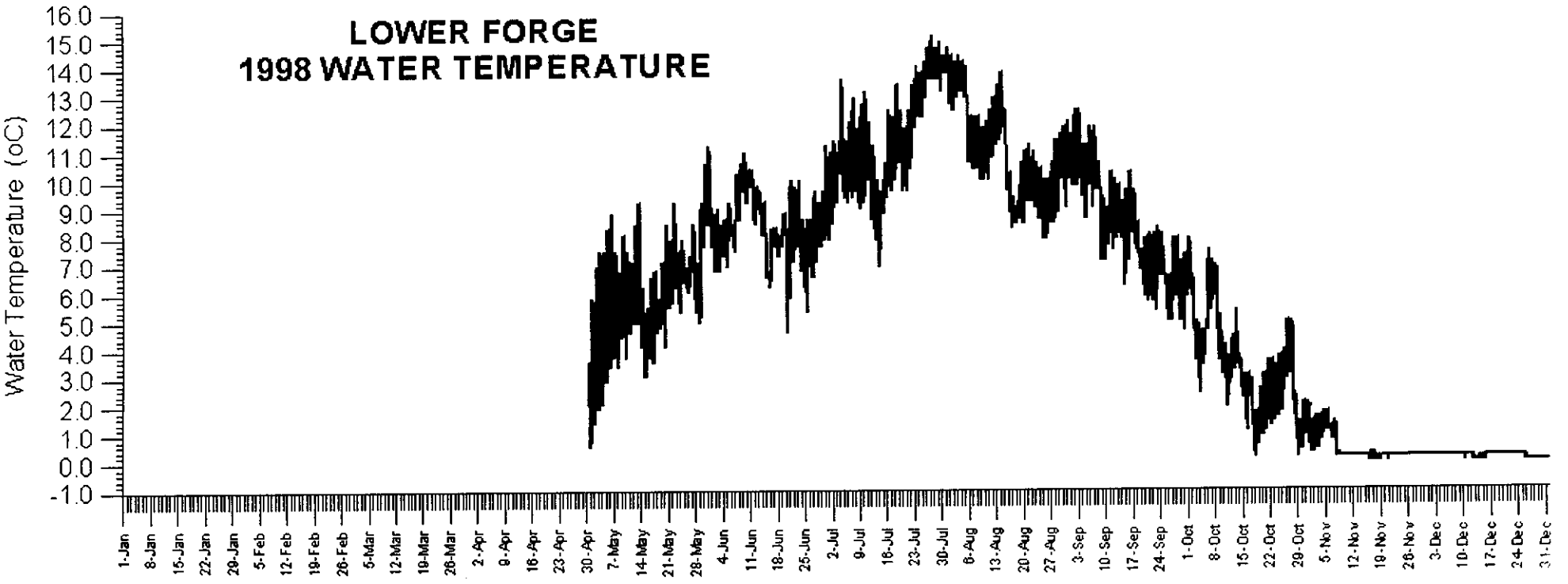
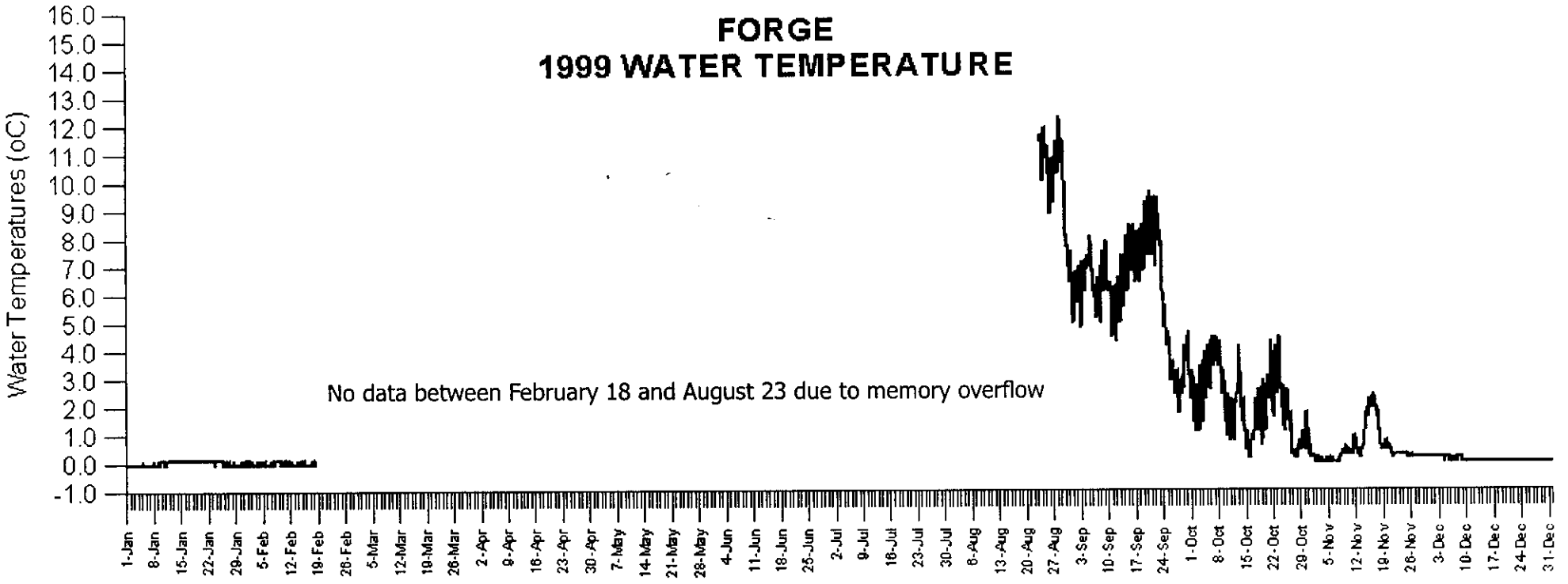
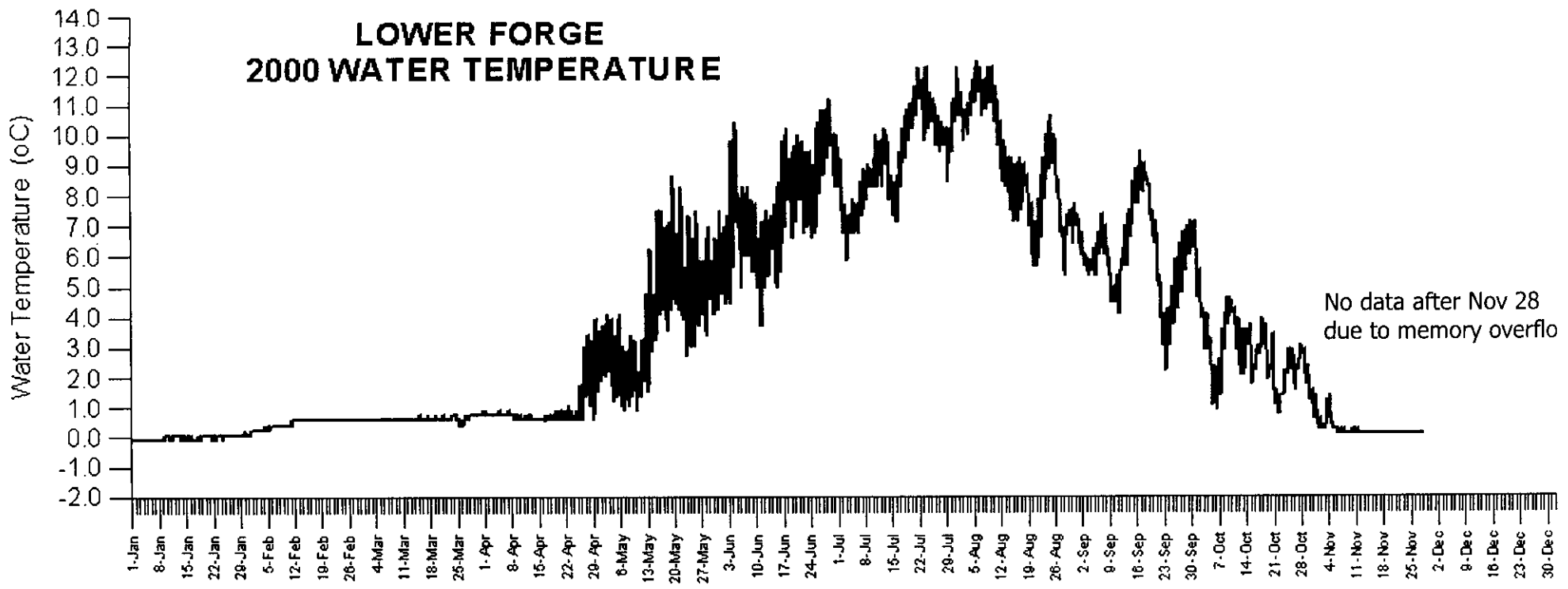


Figure 3.4.2.3: Summary of observed water temperature data at Upper Forge







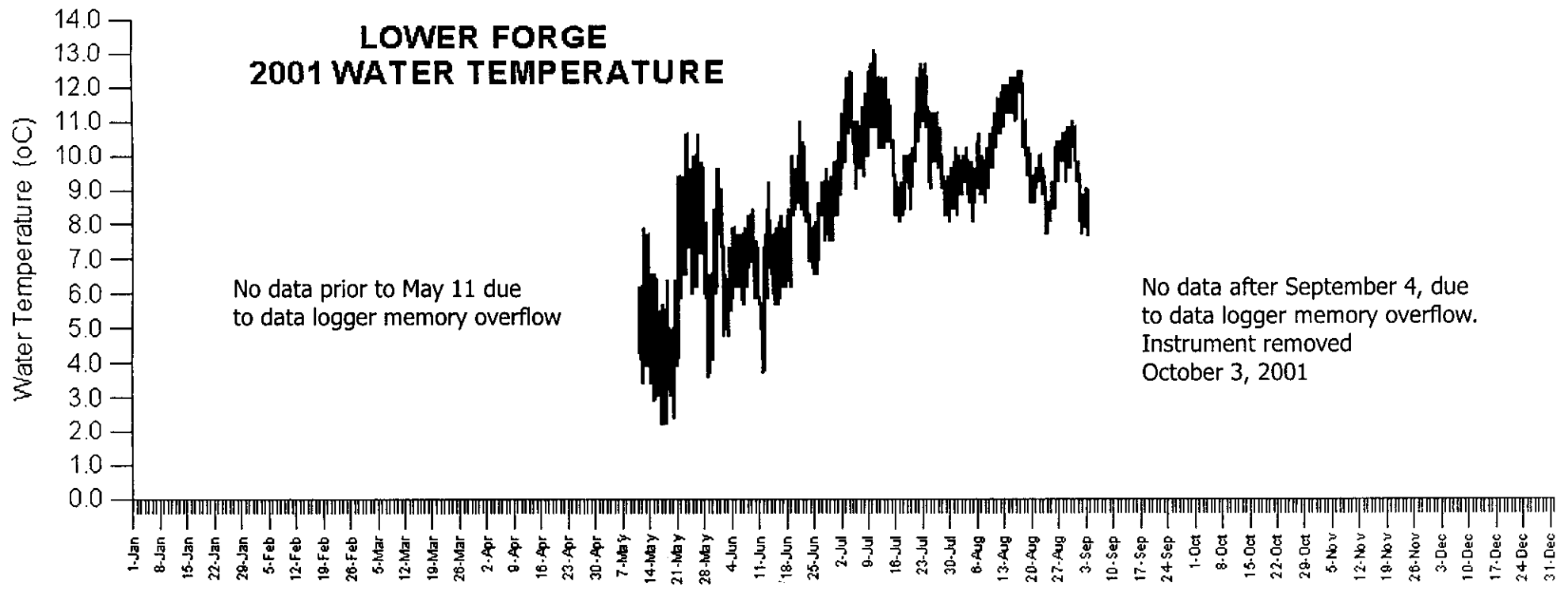
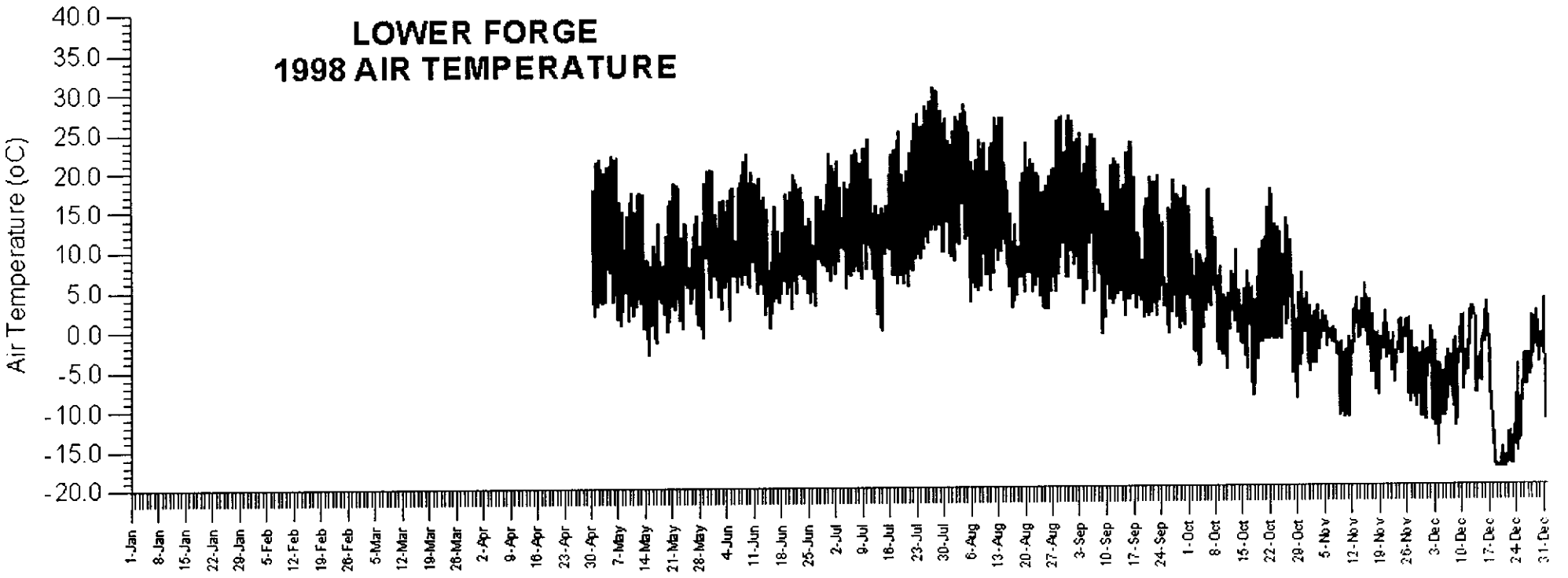
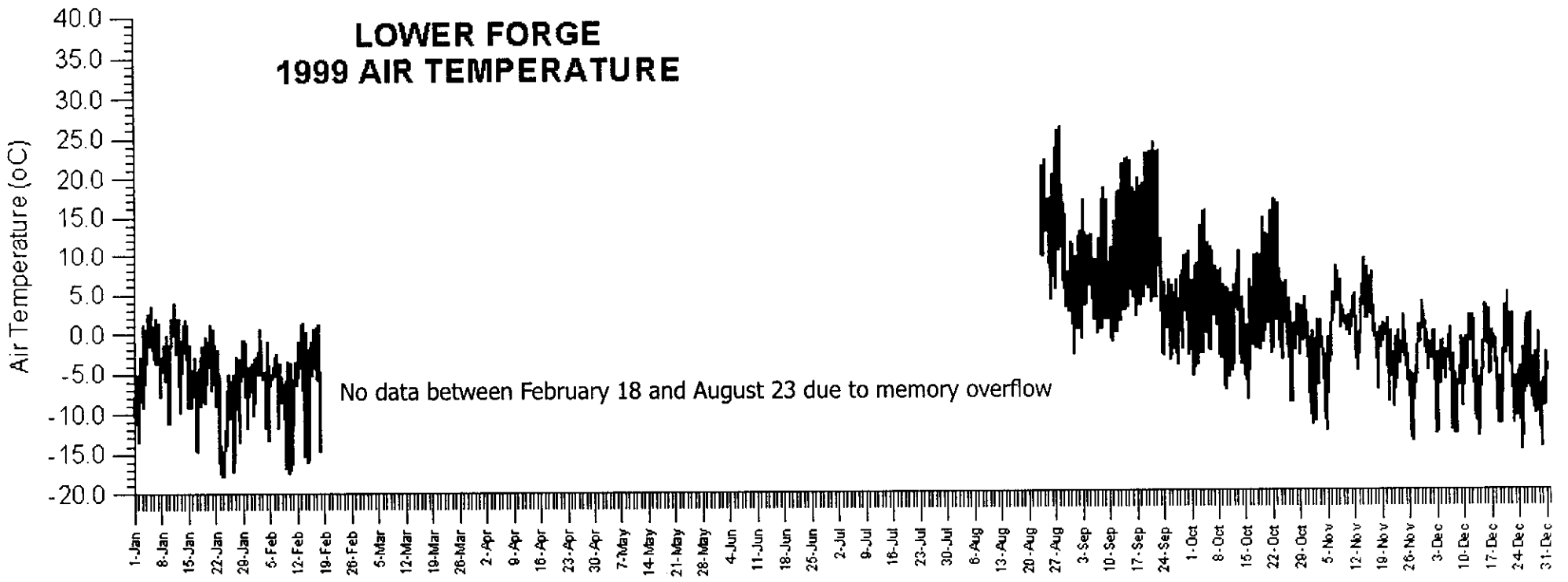
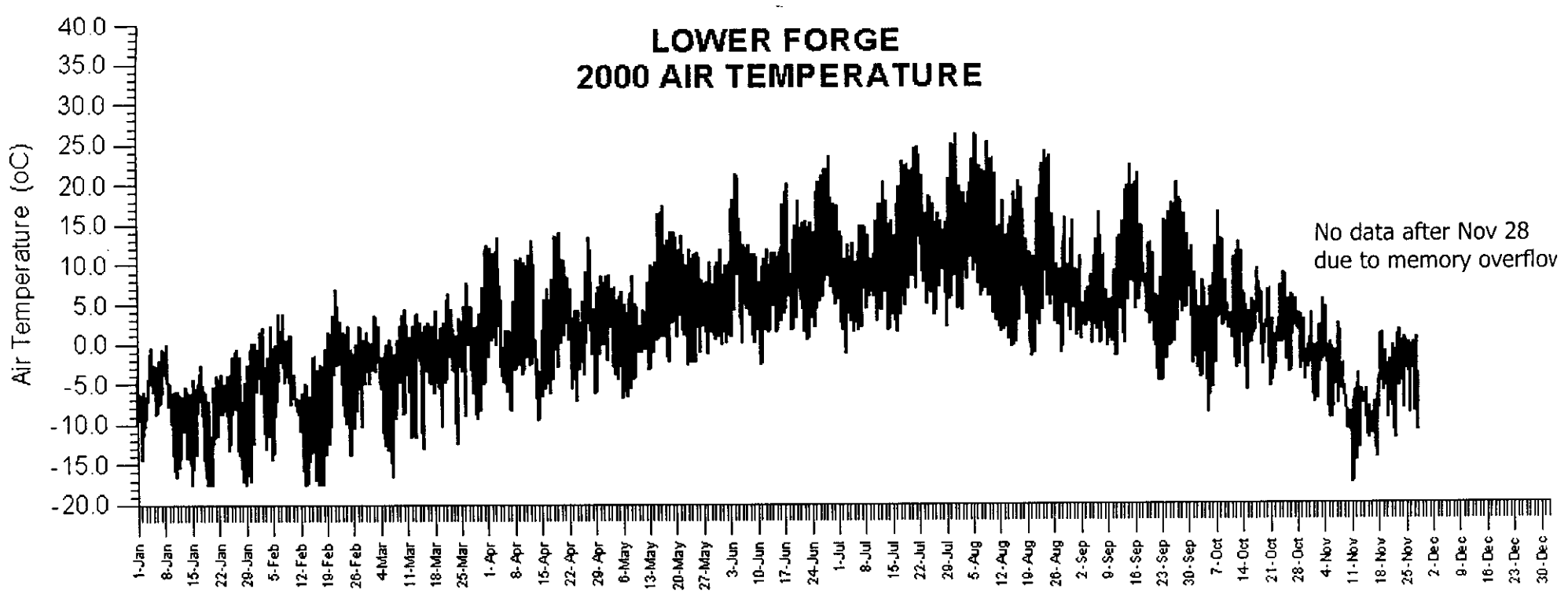


Figure 3.4.2.4: Summary of observed water temperature data at Lower Forge







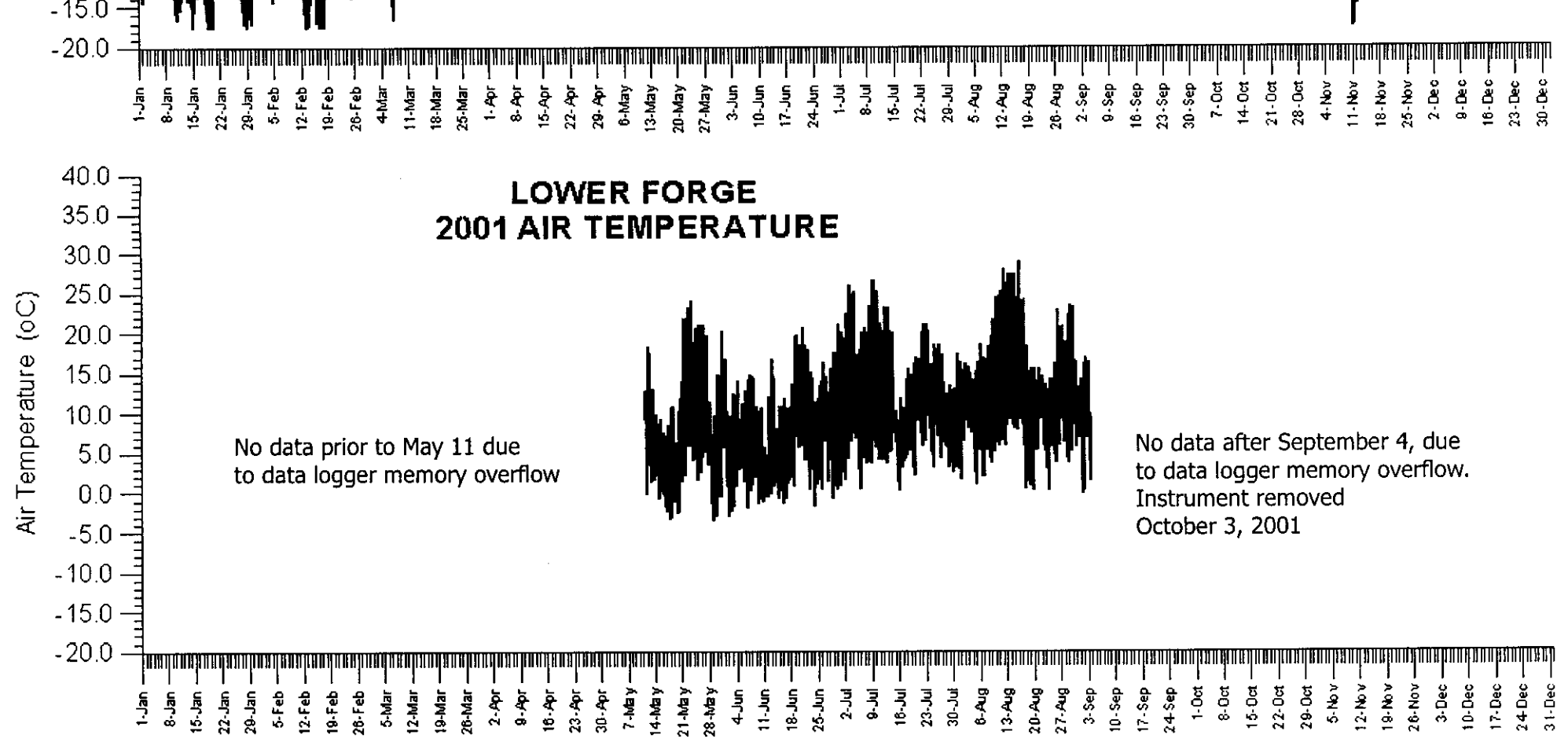
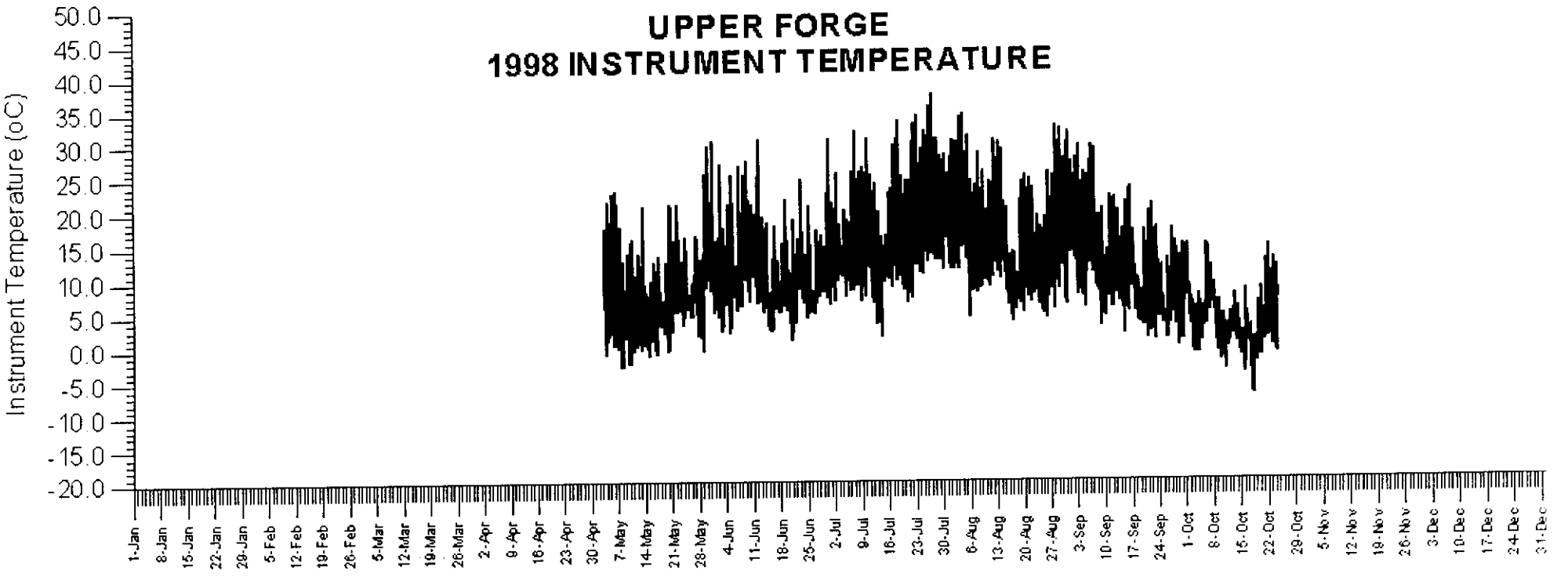
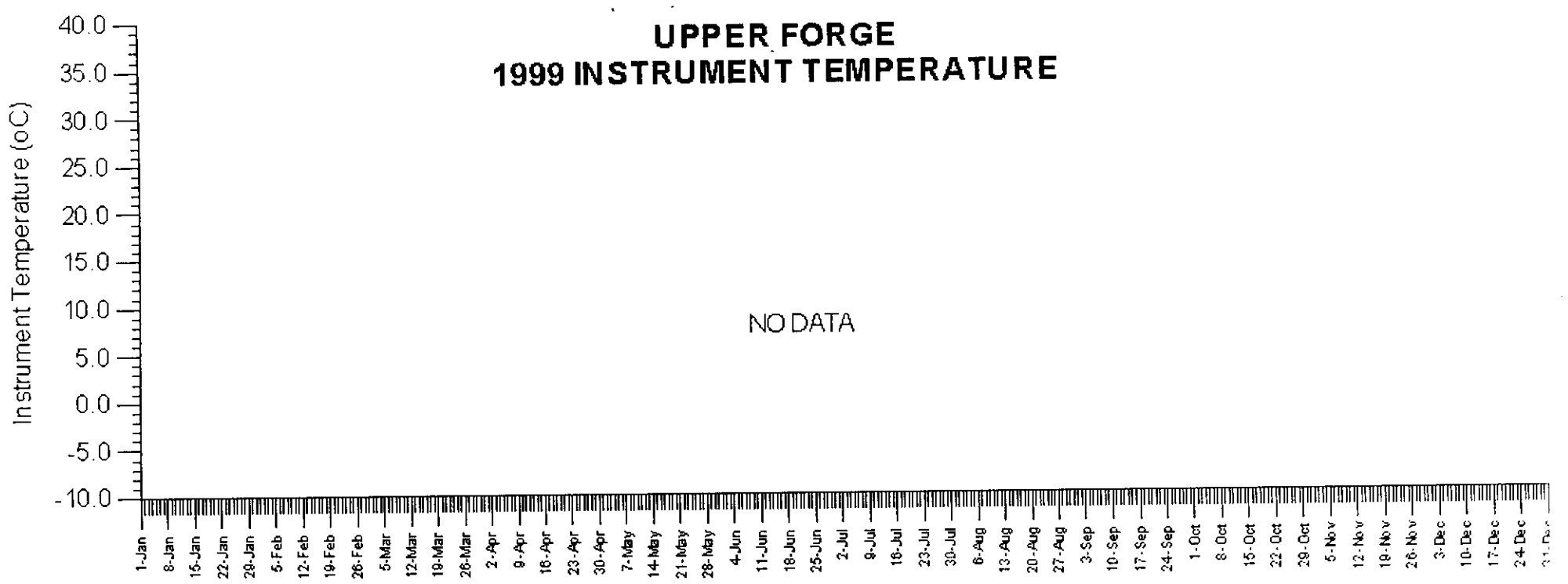


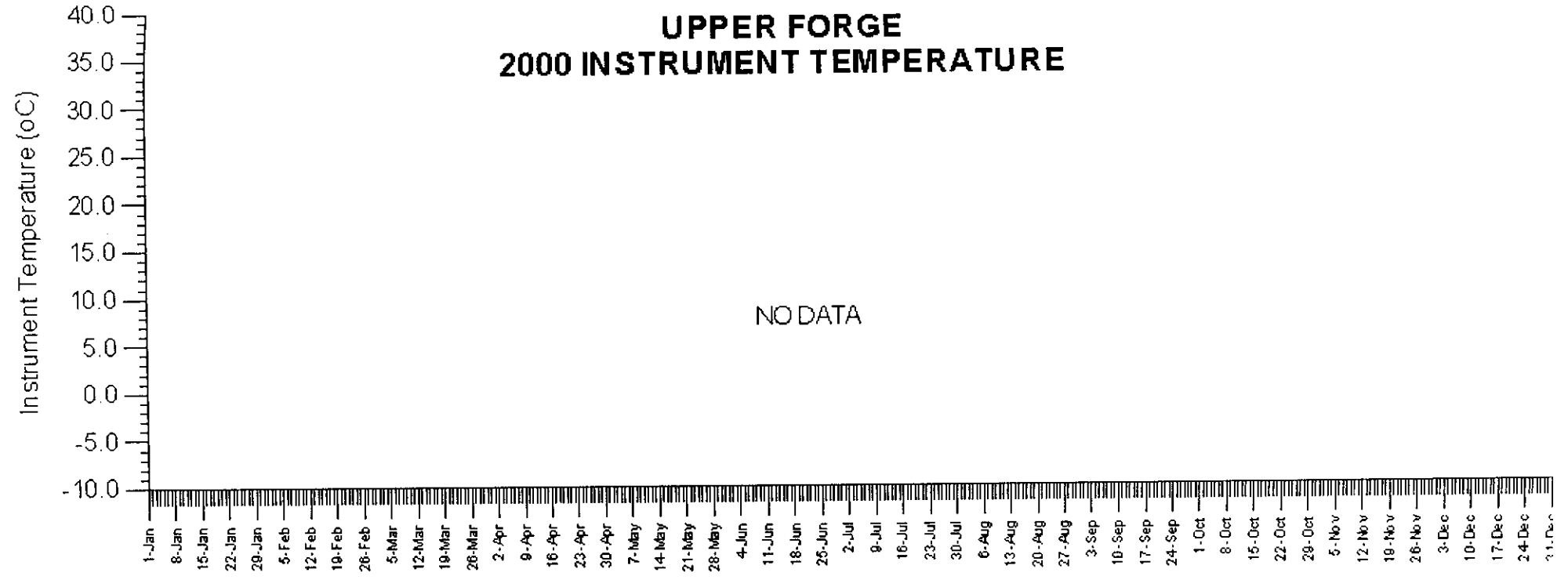
Figure 3.4.3.1: Summary of observed air temperature data at Lower Forge

Figure 3.4.4.1: Summary of observed instrument temperature data at Burr

Figure 3.4.4.2: Summary of observed instrument temperature data at Dam







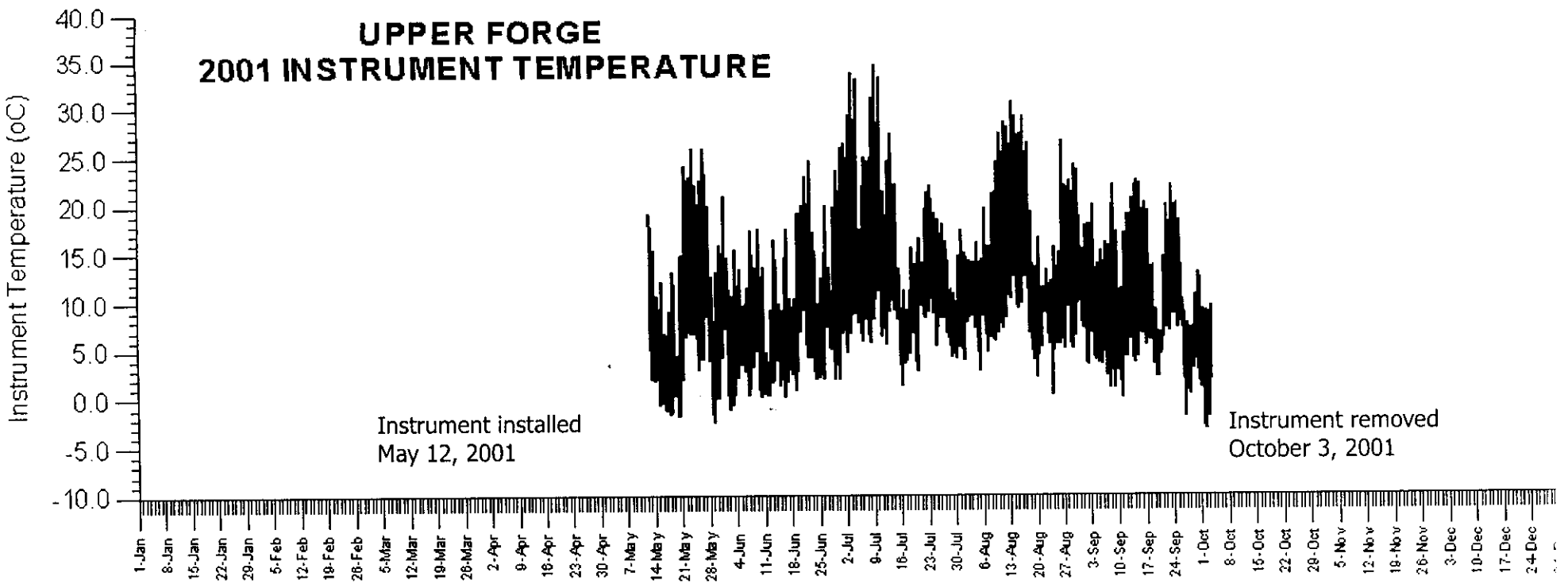
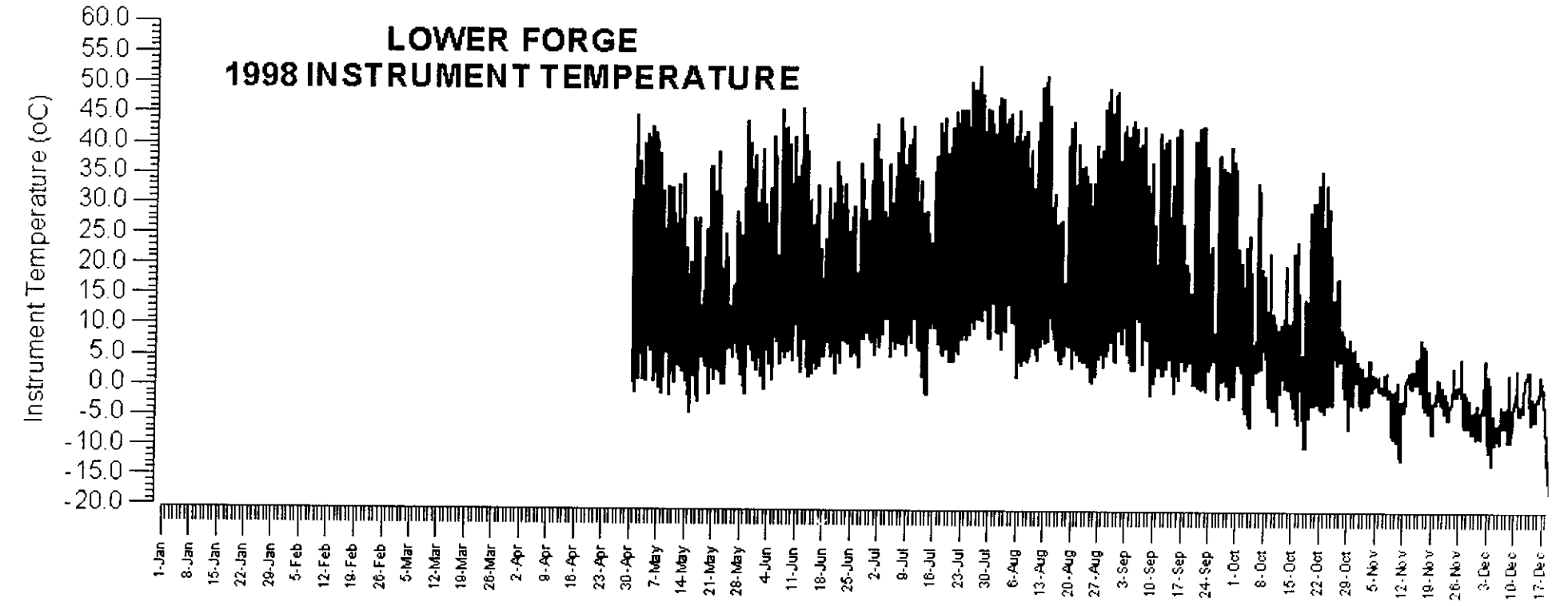
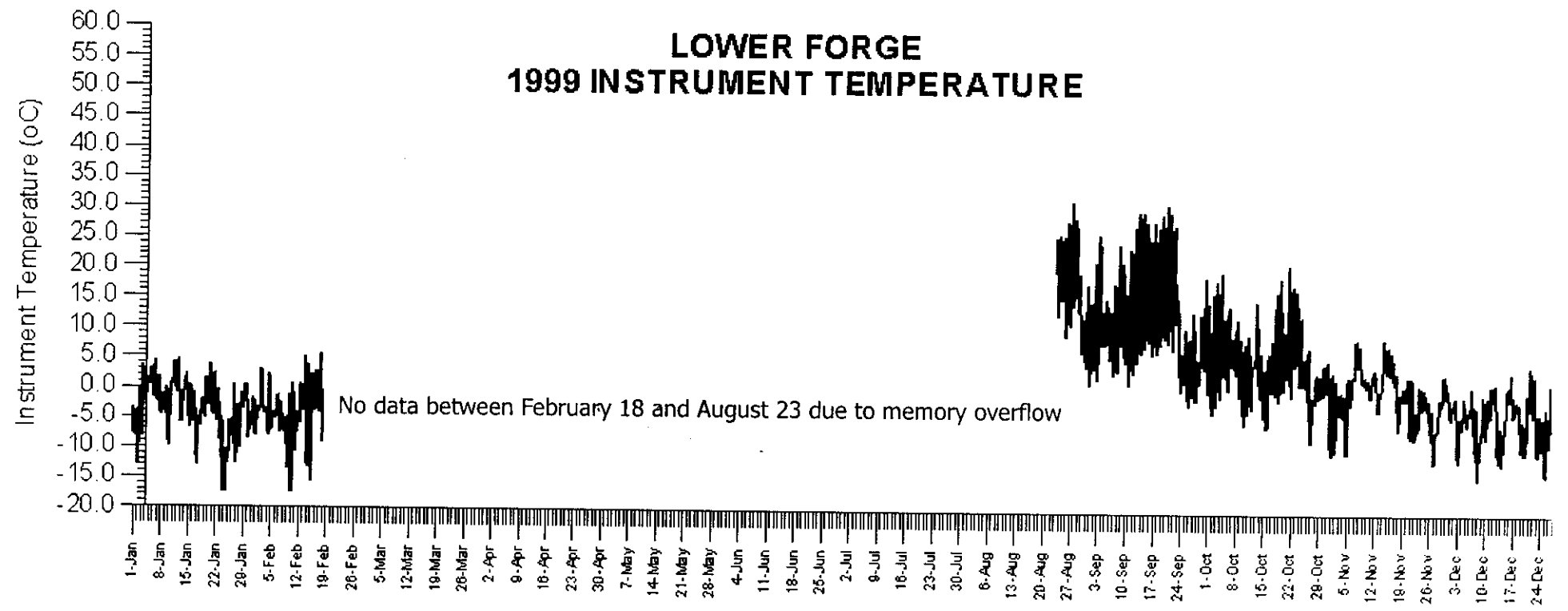
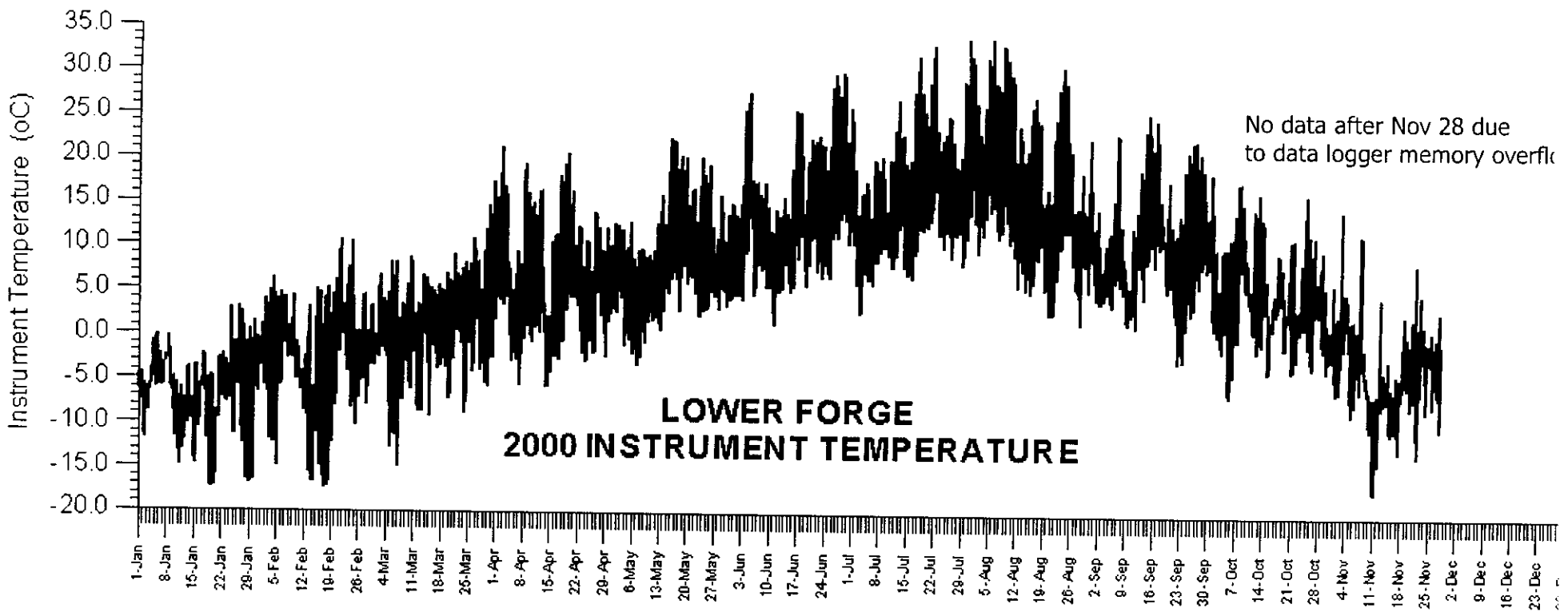


Figure 3.4.4.3: Summary of observed instrument temperature data at Upper Forge







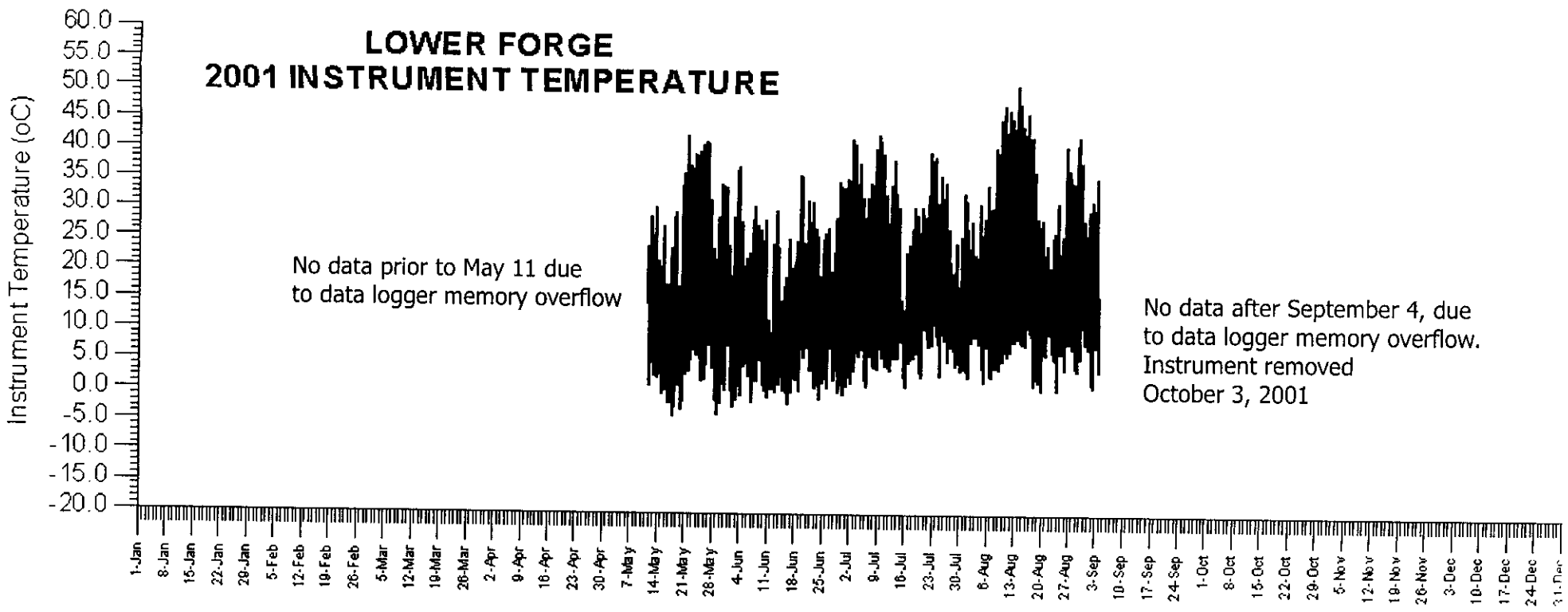
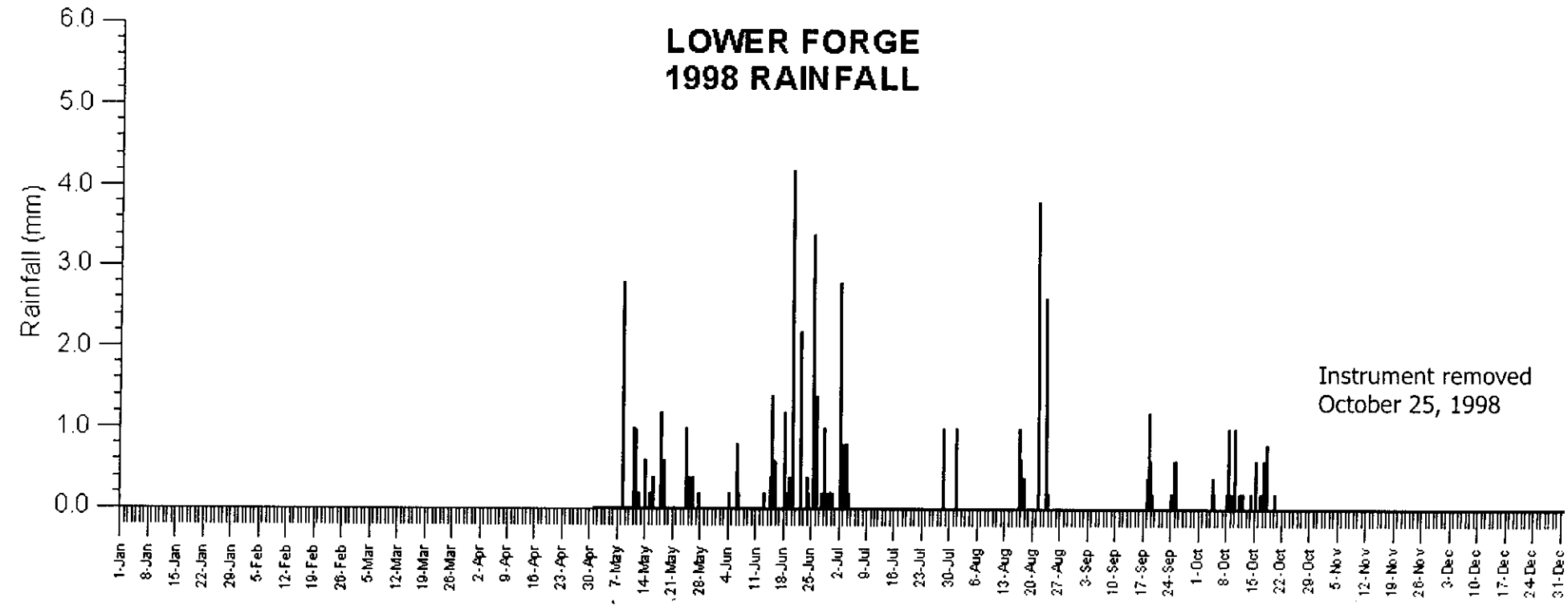
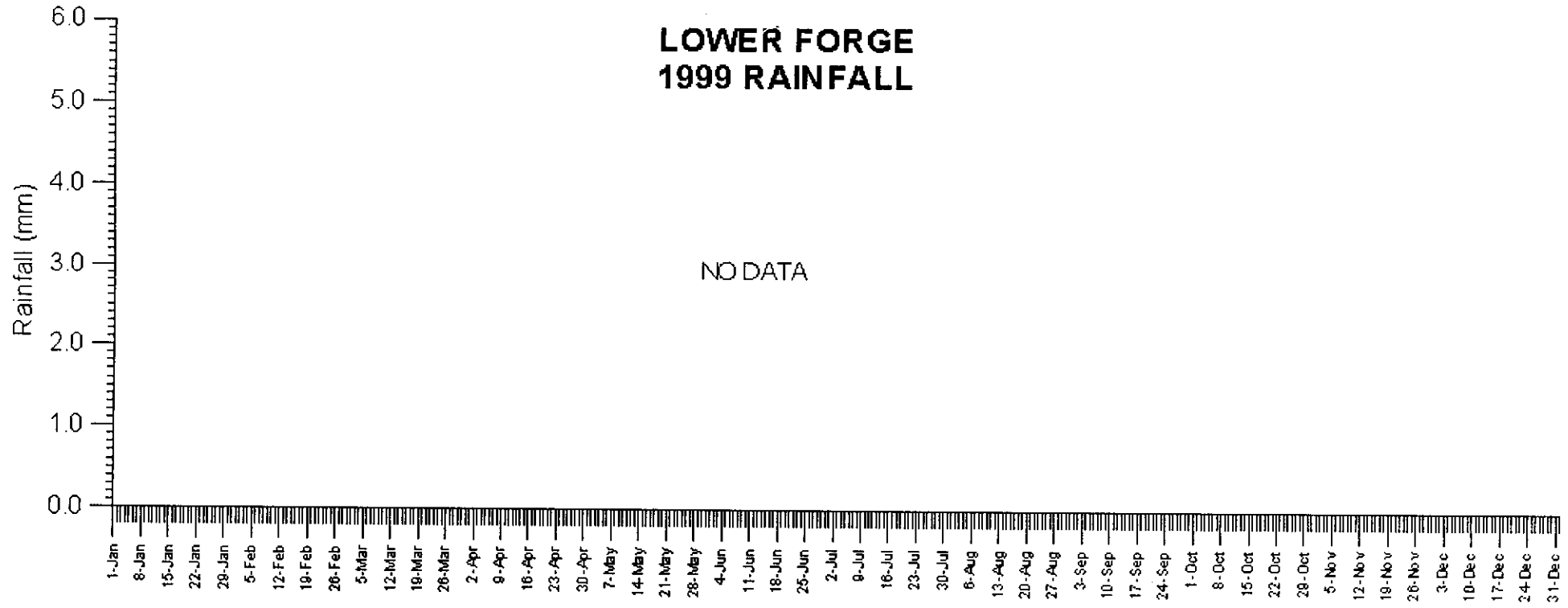
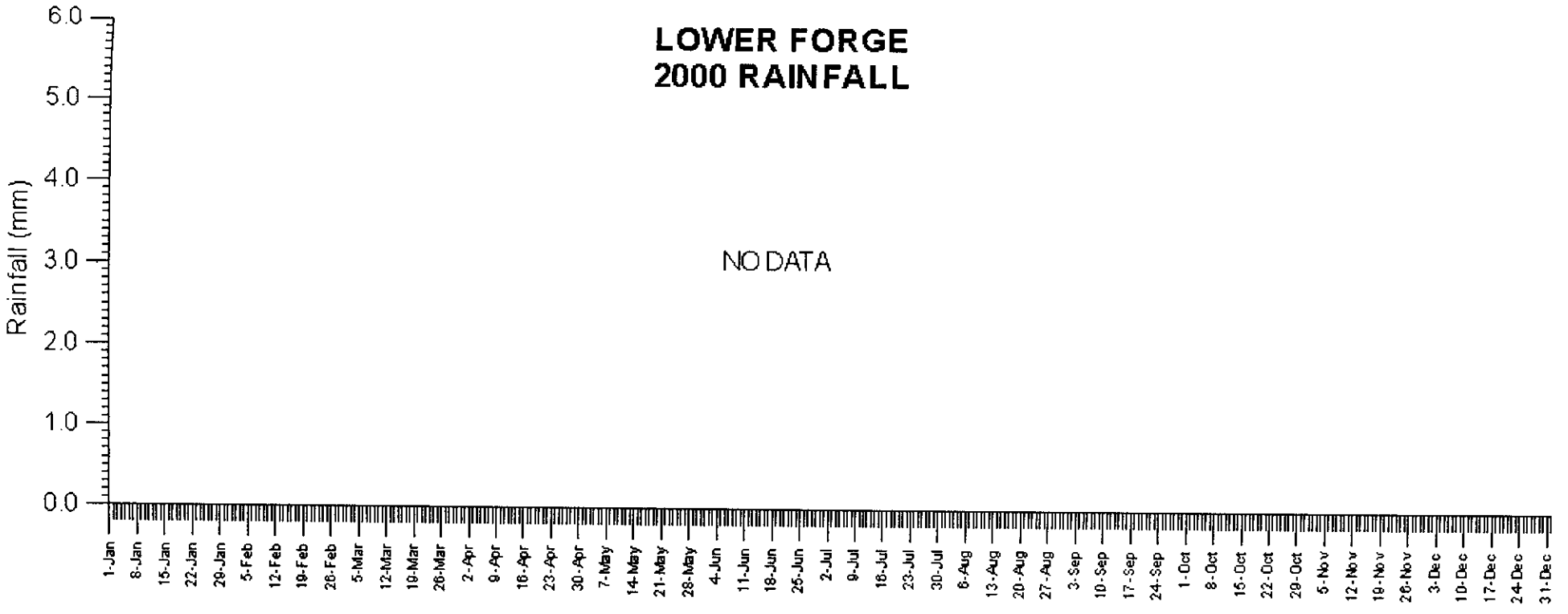


Figure 3.4.4.4: Summary of observed instrument temperature data at Lower F







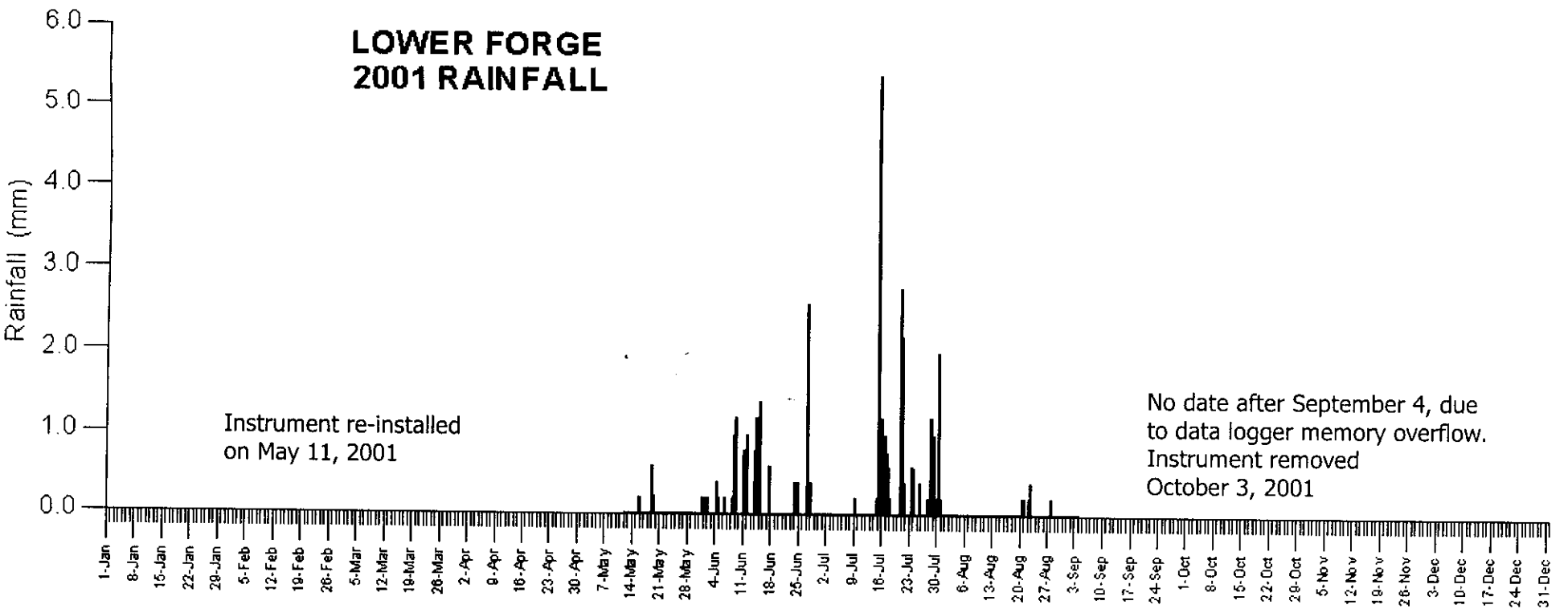


Figure 3.4.5.1: Summary of observed precipitation data at Lower Forge

Figure 3.4.6.1: Summary of observed relative humidity data at Lower Forge

FIGURE 3.6.1.1: STAGE DISCHARGE RATING CURVE FOR BURR

Rank 2 Eqn 8156 [Power_] $y=ax^b$

r^2=0.95854815 DF Adj r^2=0.95262646 FitStdErr=19.258079 Fstat=346.86562

a=0.25625218

b=1.6861048

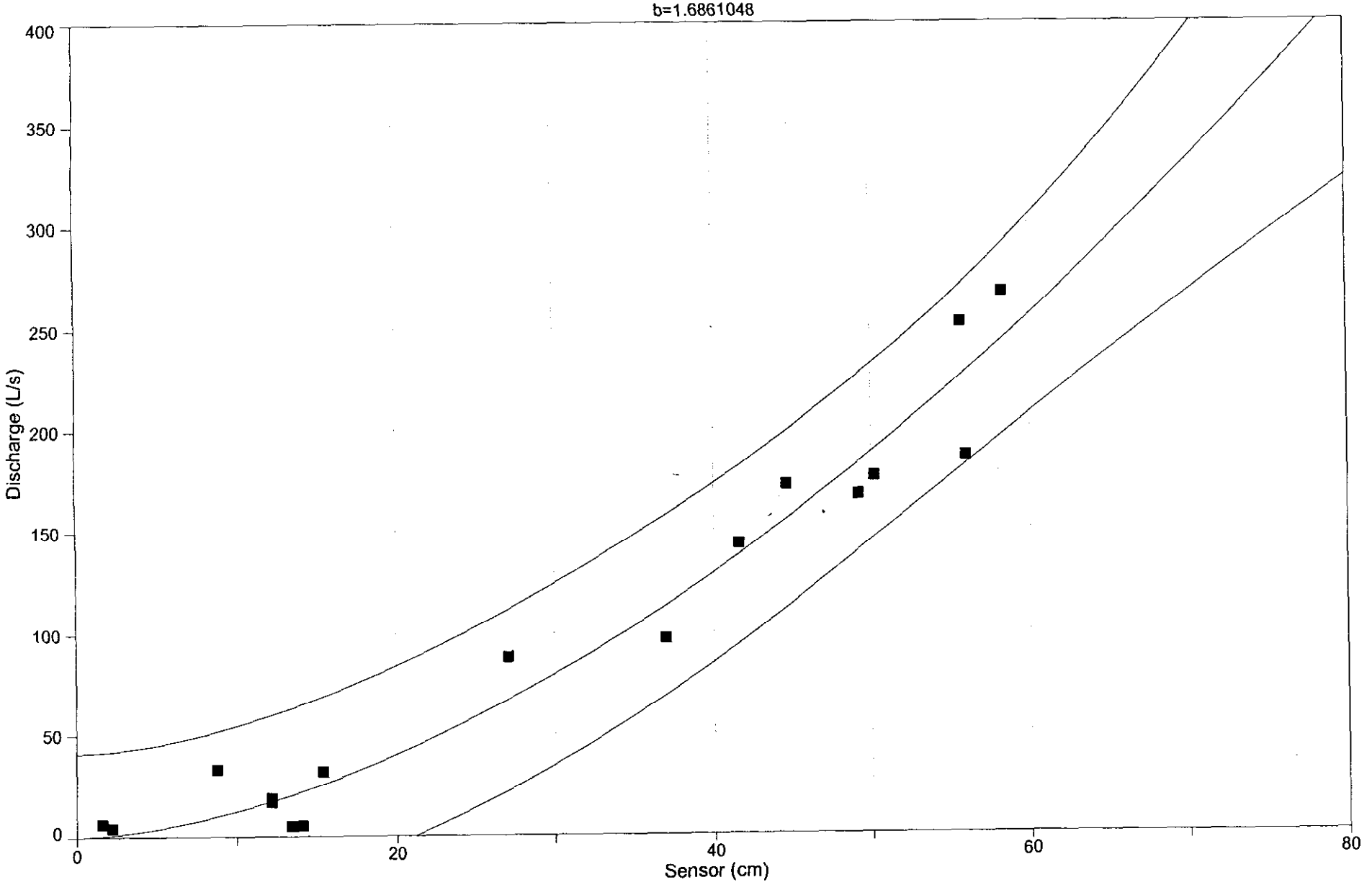


FIGURE 3.6.2.1: STAGE DISCHARGE RATING CURVE FOR DAM 1

Rank 1 Eqn 63 $y^{-1}=a+be^{-x}$

$r^2=0.84590158$ DF Adj $r^2=0.8150819$ FitStdErr=4.521596 Fstat=60.382951

a=0.032615762

b=1.2575628e+19

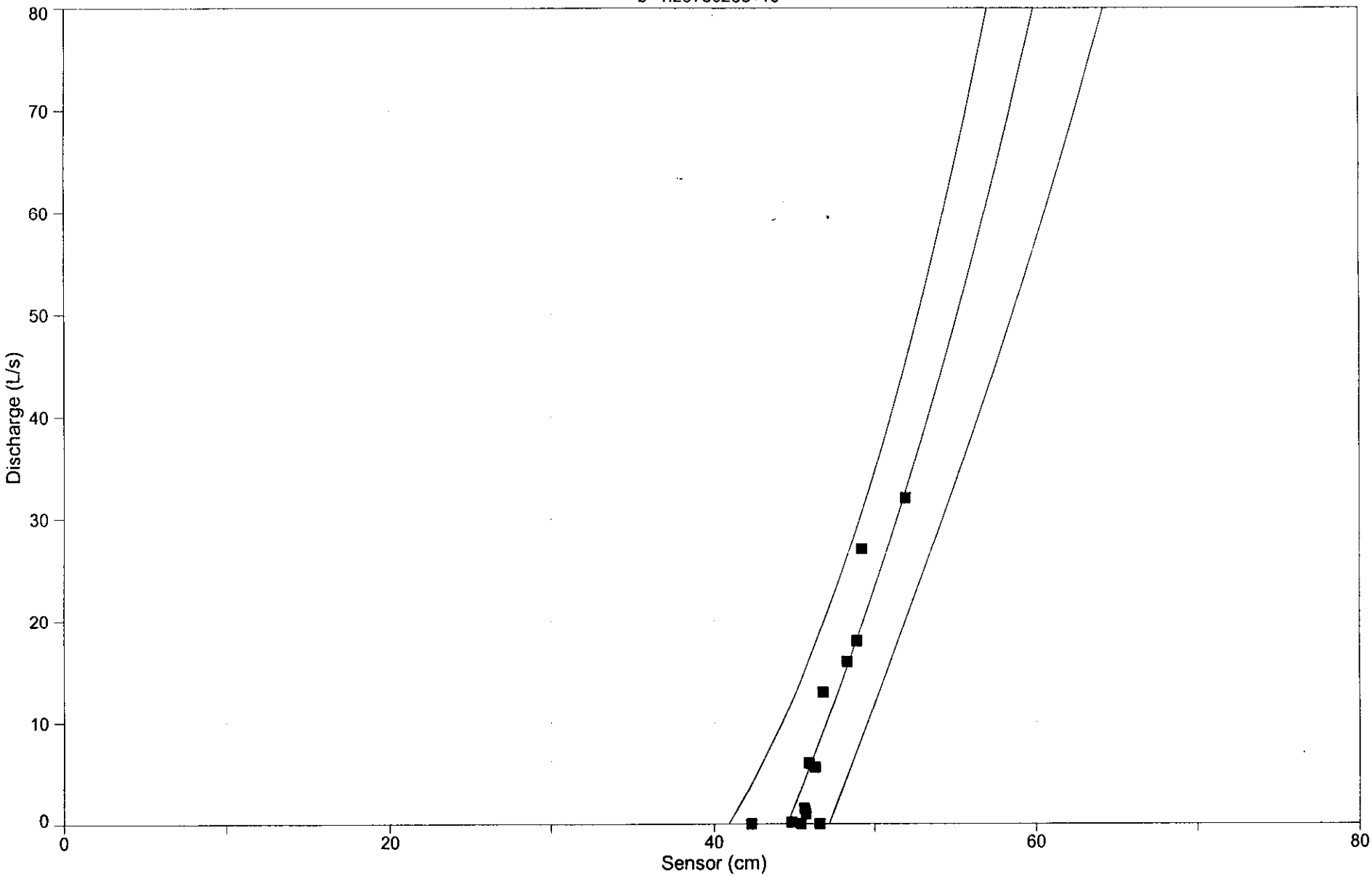


FIGURE 3.6.2.2: STAGE DISCHARGE RATING CURVE FOR DAM 2

Rank 14 Eqn 4 $y=a+bx^2$

r^2=0.98919028 DF Adj r^2=0.96757083 FitStdErr=1.3283472 Fstat=183.0186

a=-14.429216

b=0.043097861

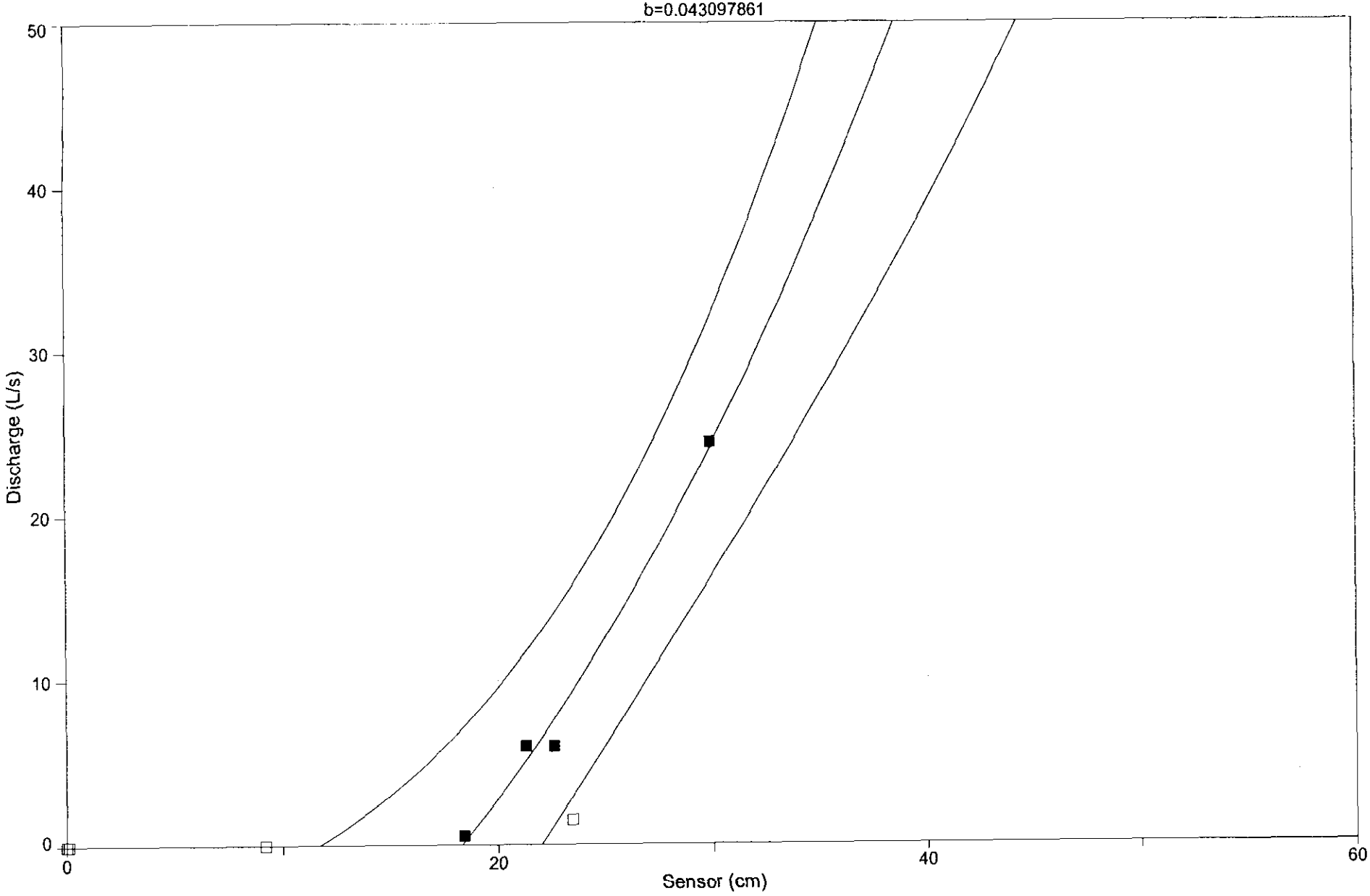


FIGURE 3.6.3.1: STAGE DISCHARGE RATING CURVE FOR UPPER FORGE CREEK

Rank 17 Eqn 7 $y=a+bx^3$

r^2=0.98009681 DF Adj r^2=0.97647805 FitStdErr=7.6129799 Fstat=590.91854

a=-12.025725

b=0.00096643805

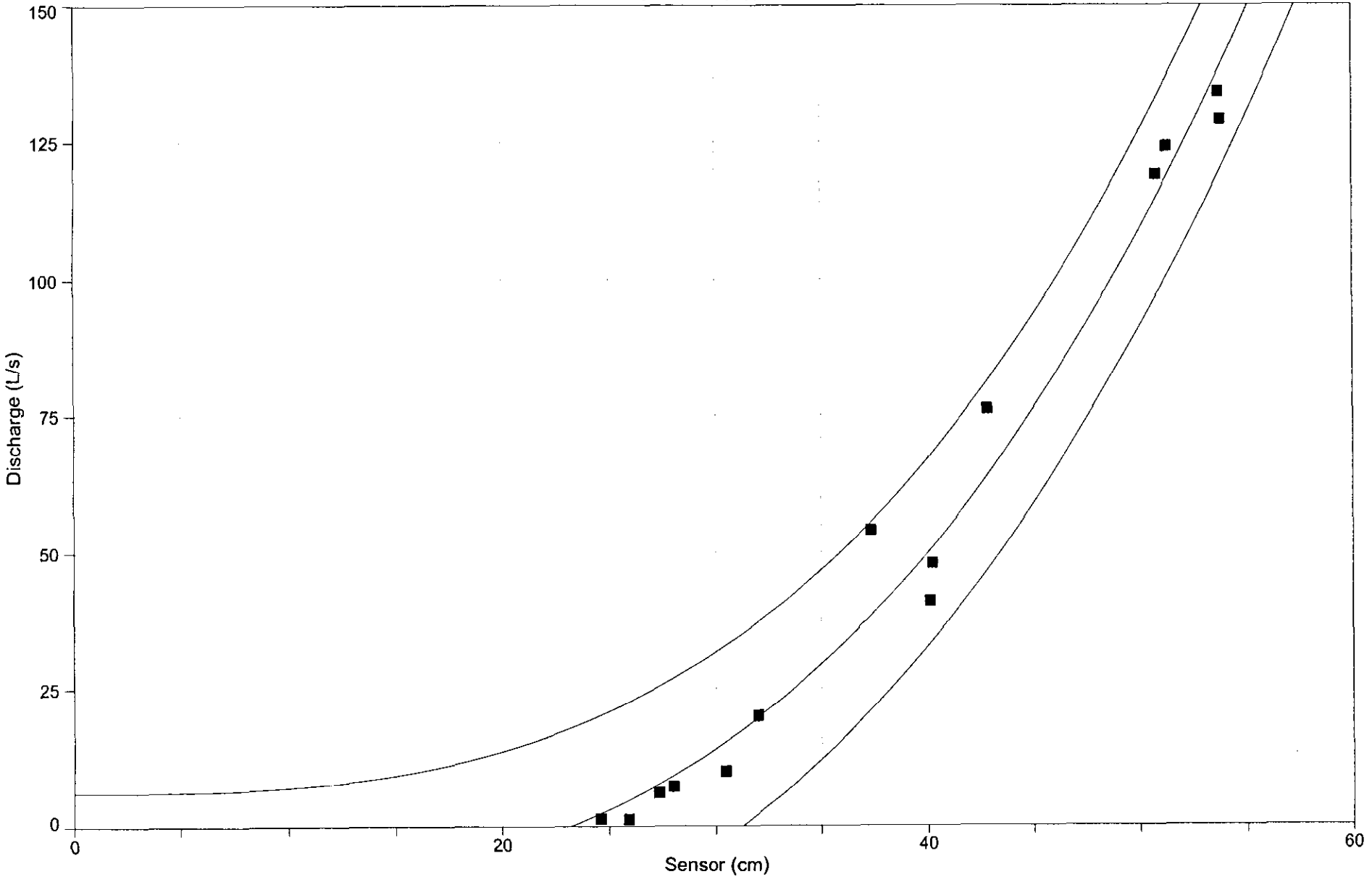


FIGURE 3.6.4.1: STAGE DISCHARGE RATING CURVE FOR LOWER FORGE CREEK

Rank 16 Eqn 7 $y=a+bx^3$

r^2=0.9760108 DF Adj r^2=0.97281224 FitStdErr=18.932555 Fstat=650.96682

a=-5.8204275

b=0.00072274752

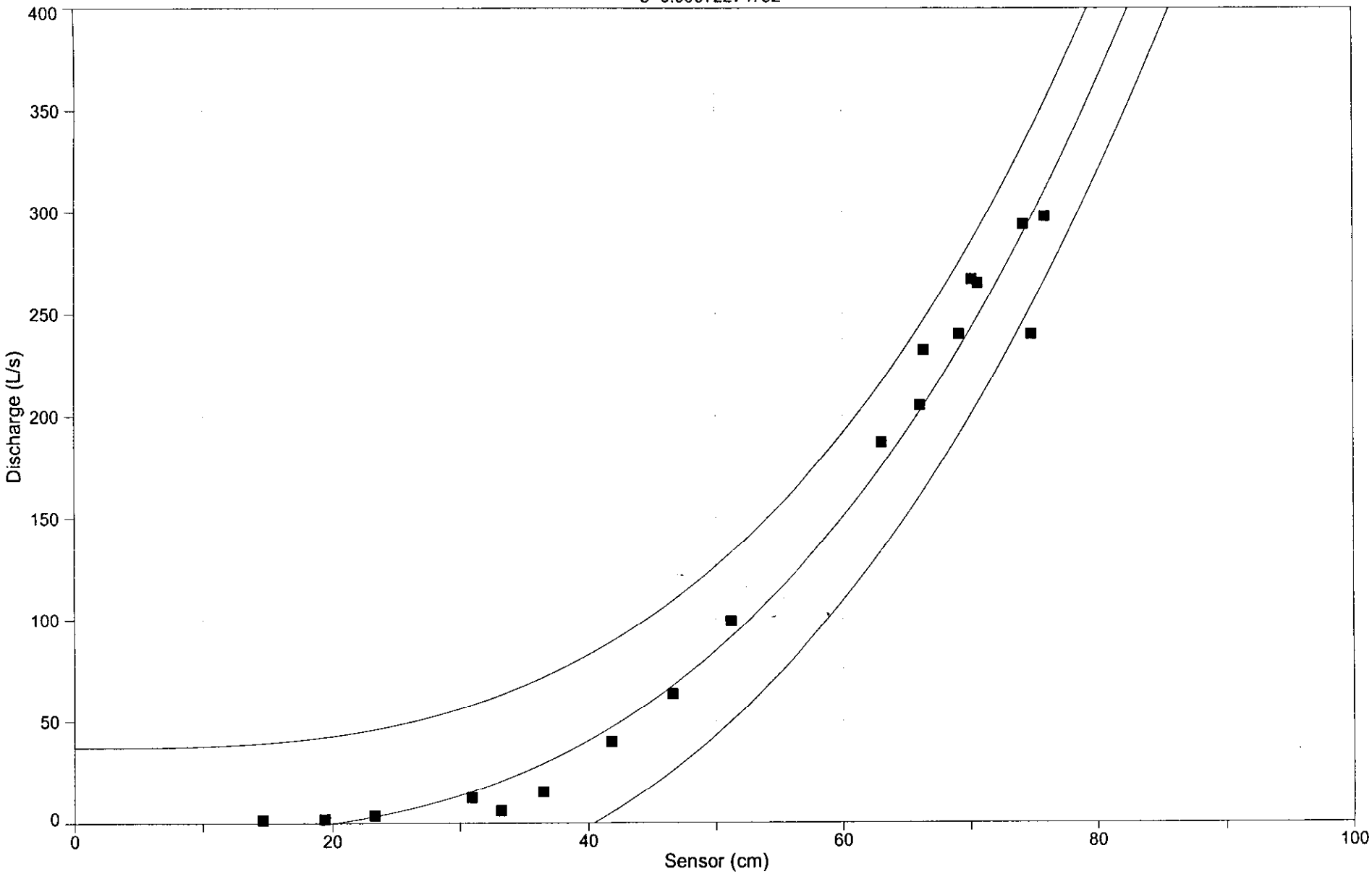
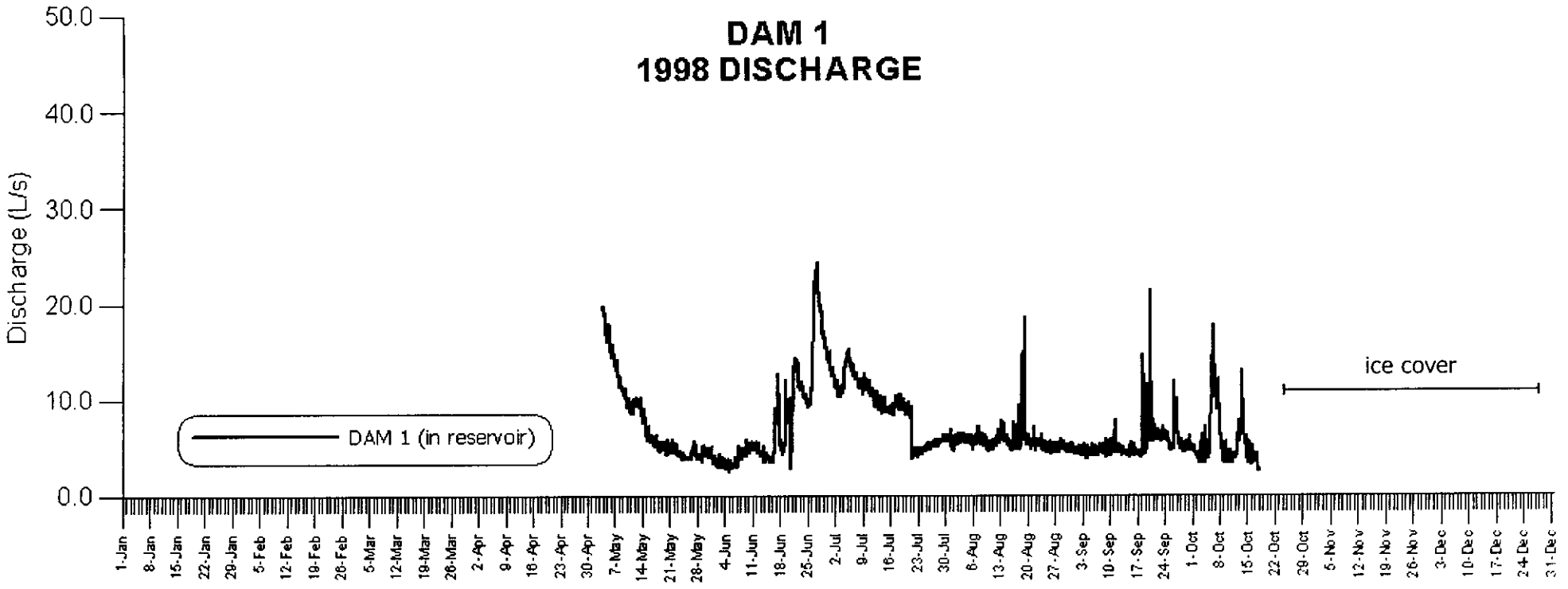
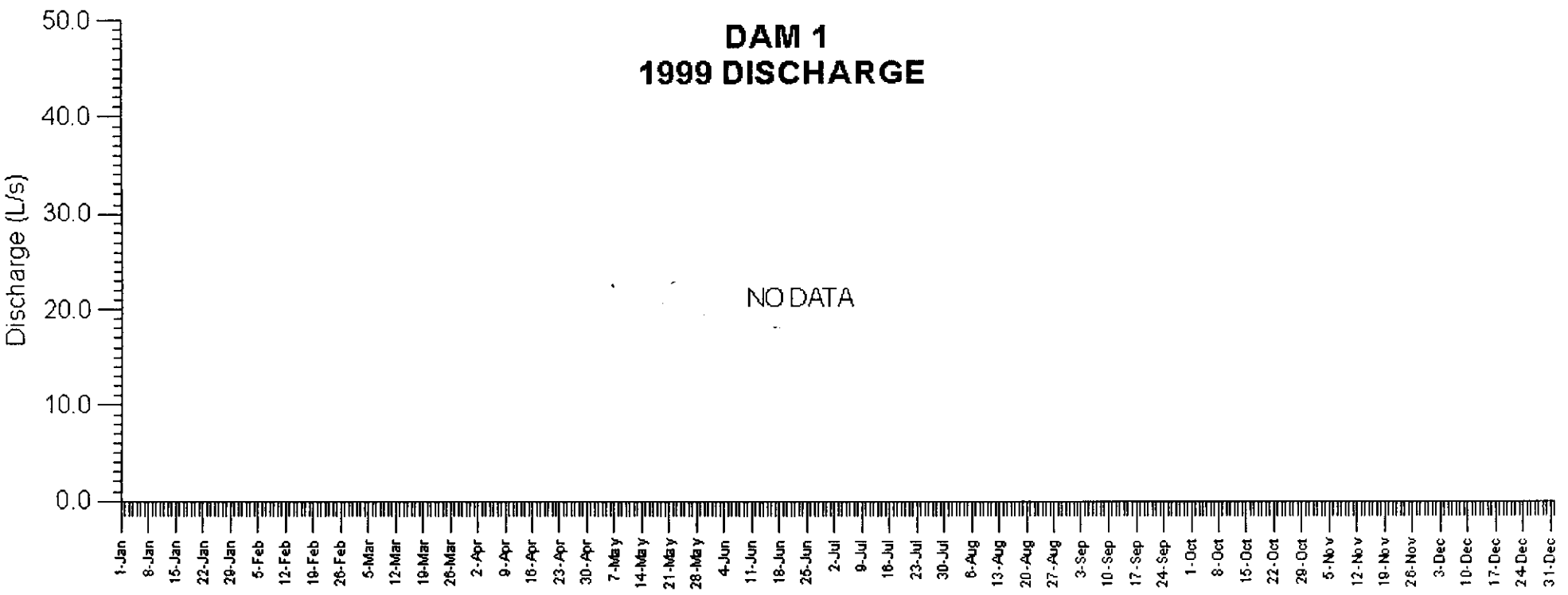


Figure 3.7.1.1: Summary of Burr discharge values during the ice free period.





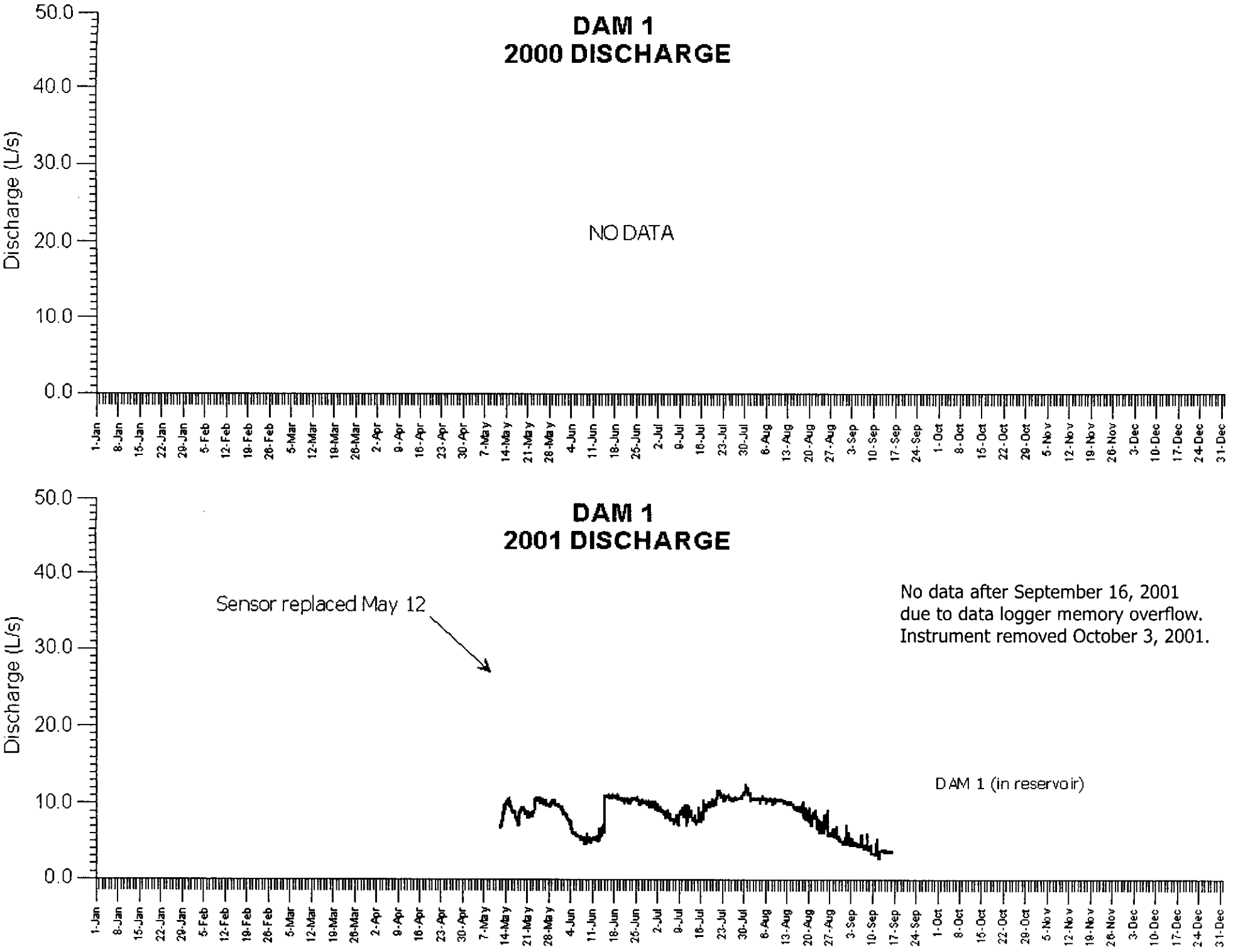


Figure 3.7.2.1: Summary of Dam 1 discharge values during the ice free period.

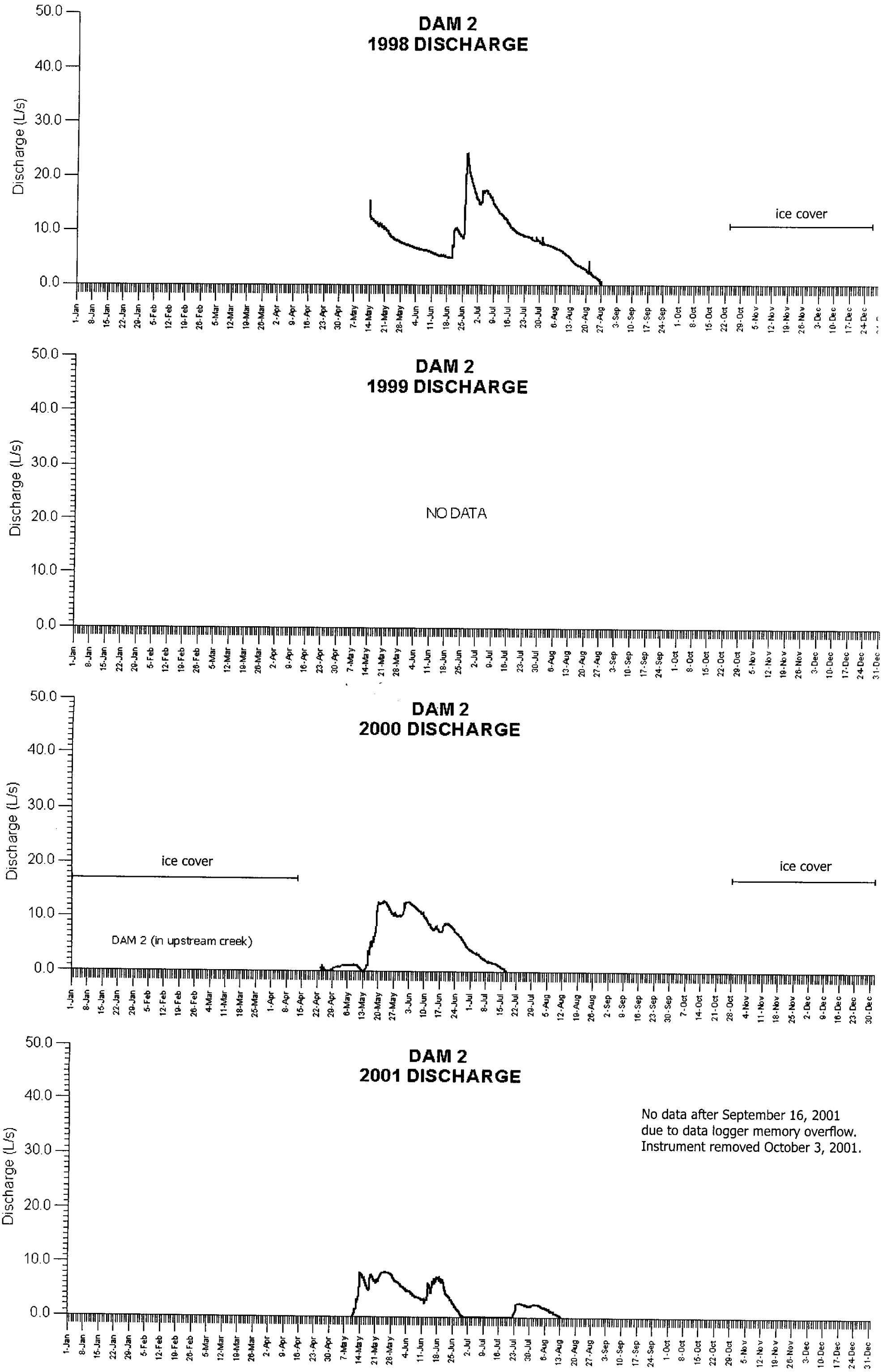
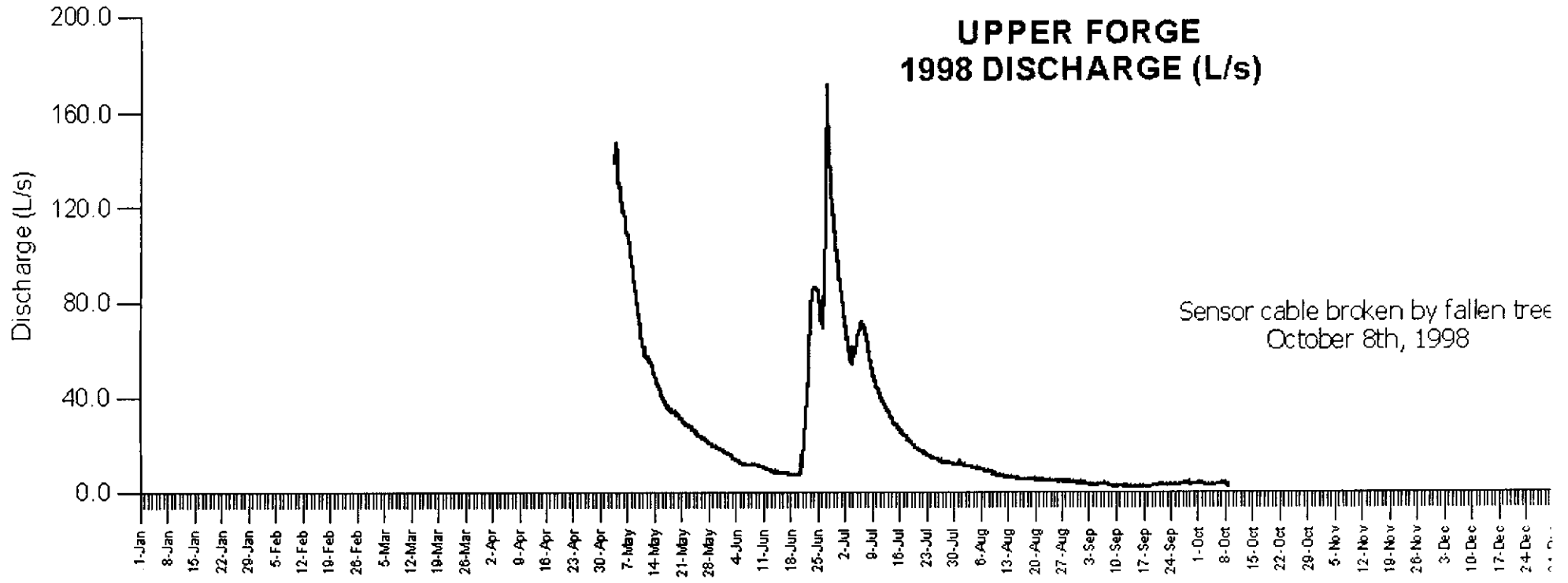
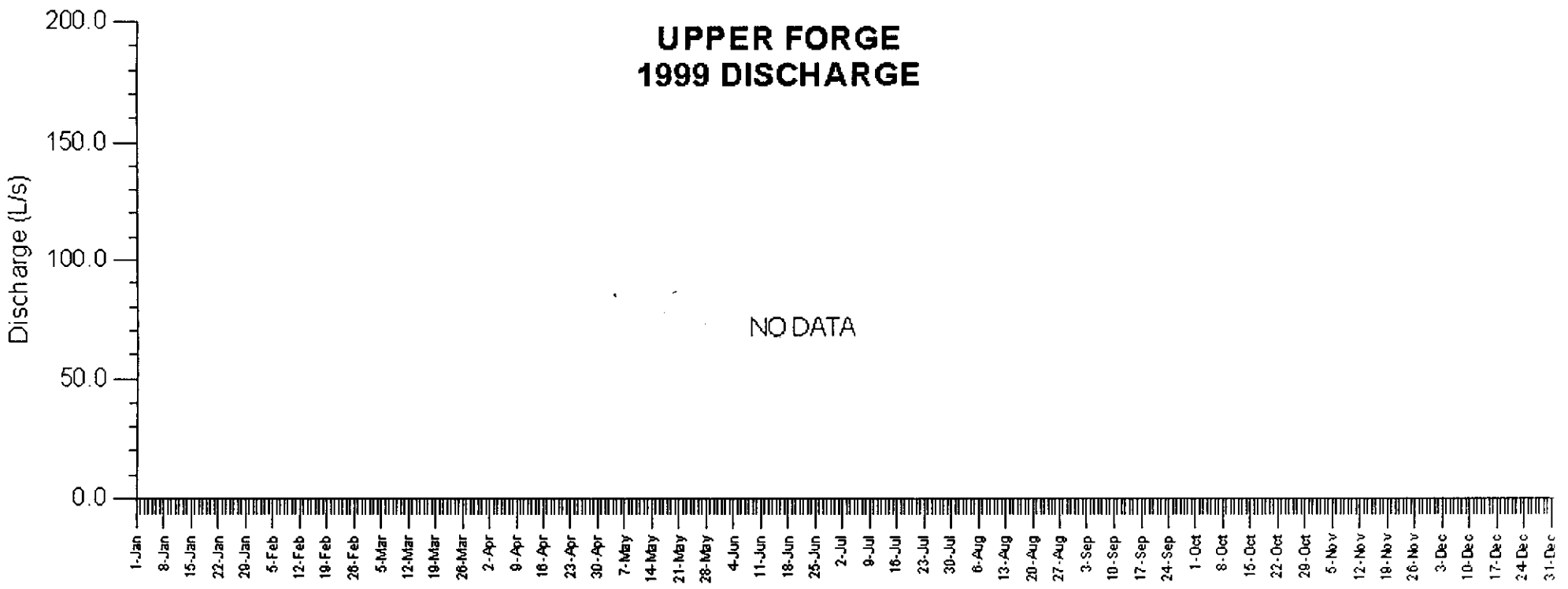
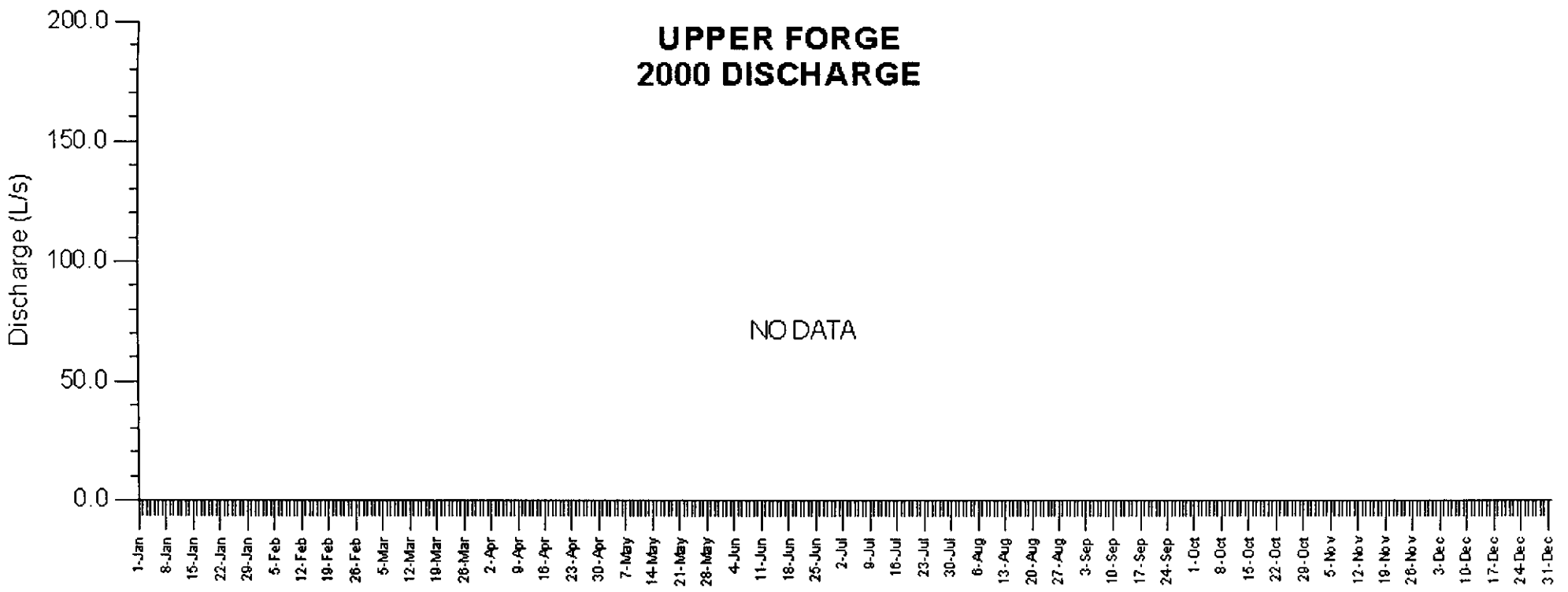


Figure 3.7.2.2: Summary of Dam 2 discharge values during the ice free period.







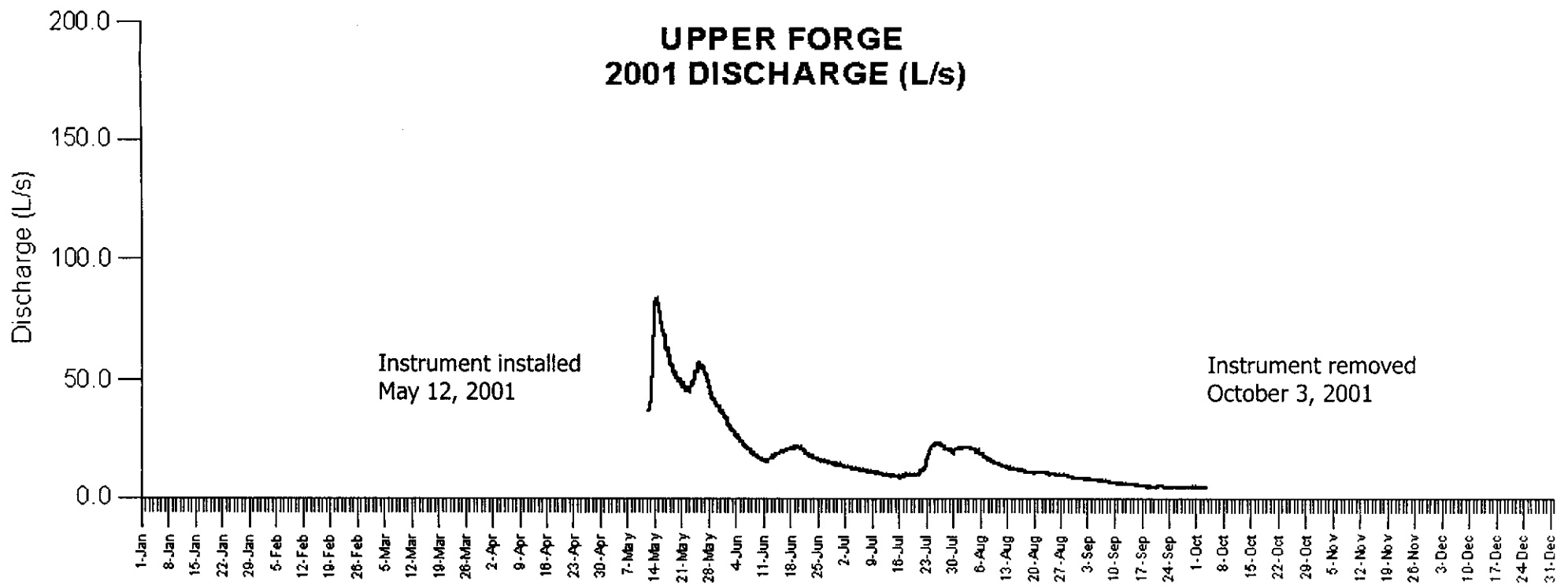
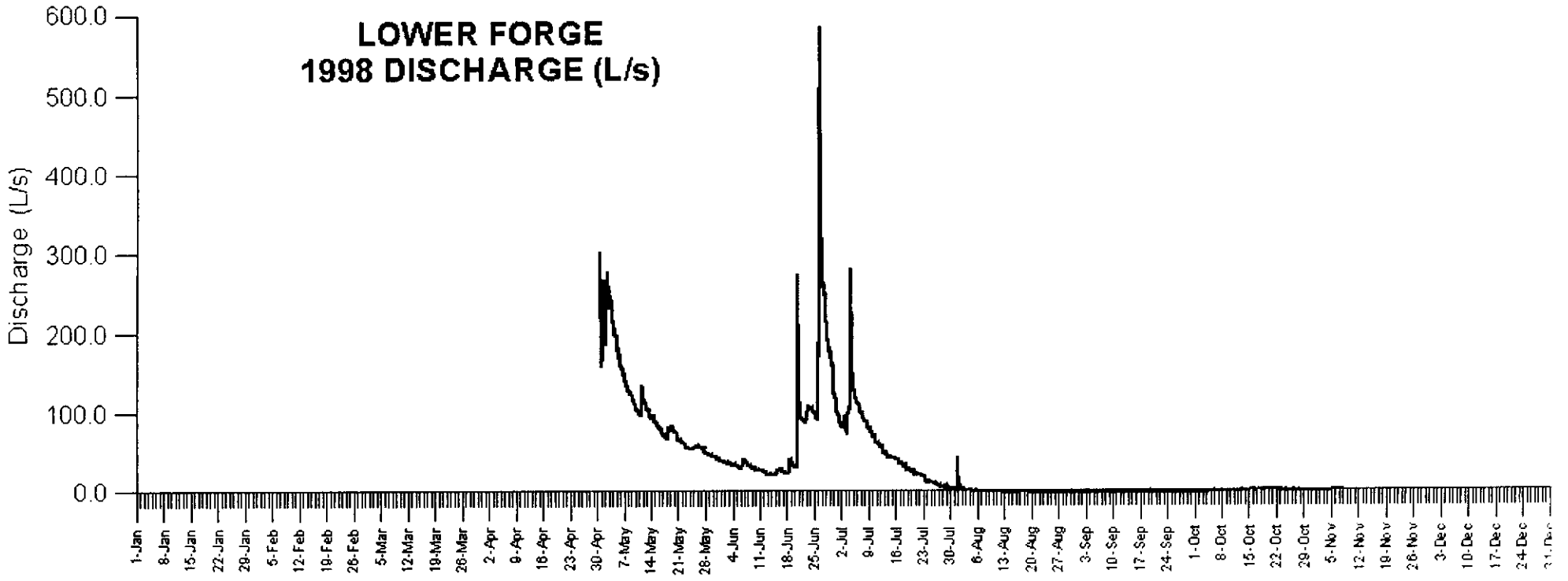
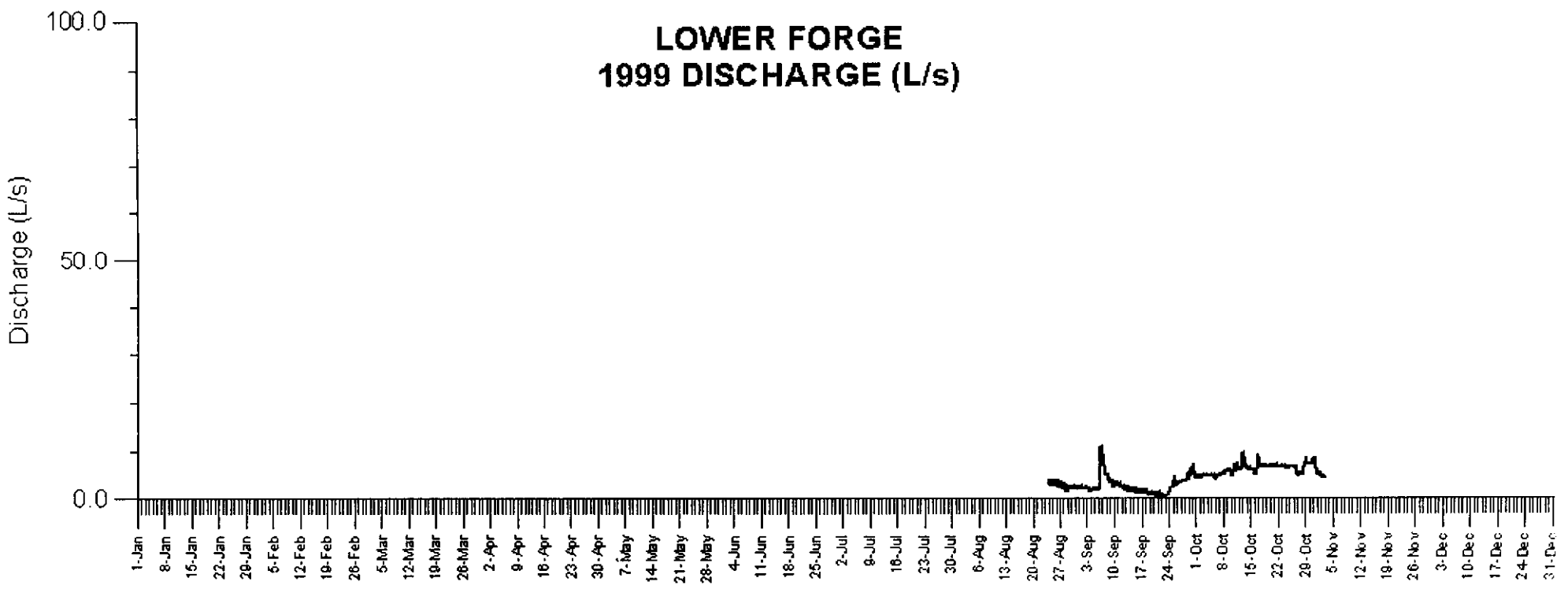


Figure 3.7.3.1: Summary of Upper Forge discharge values during the ice free period.





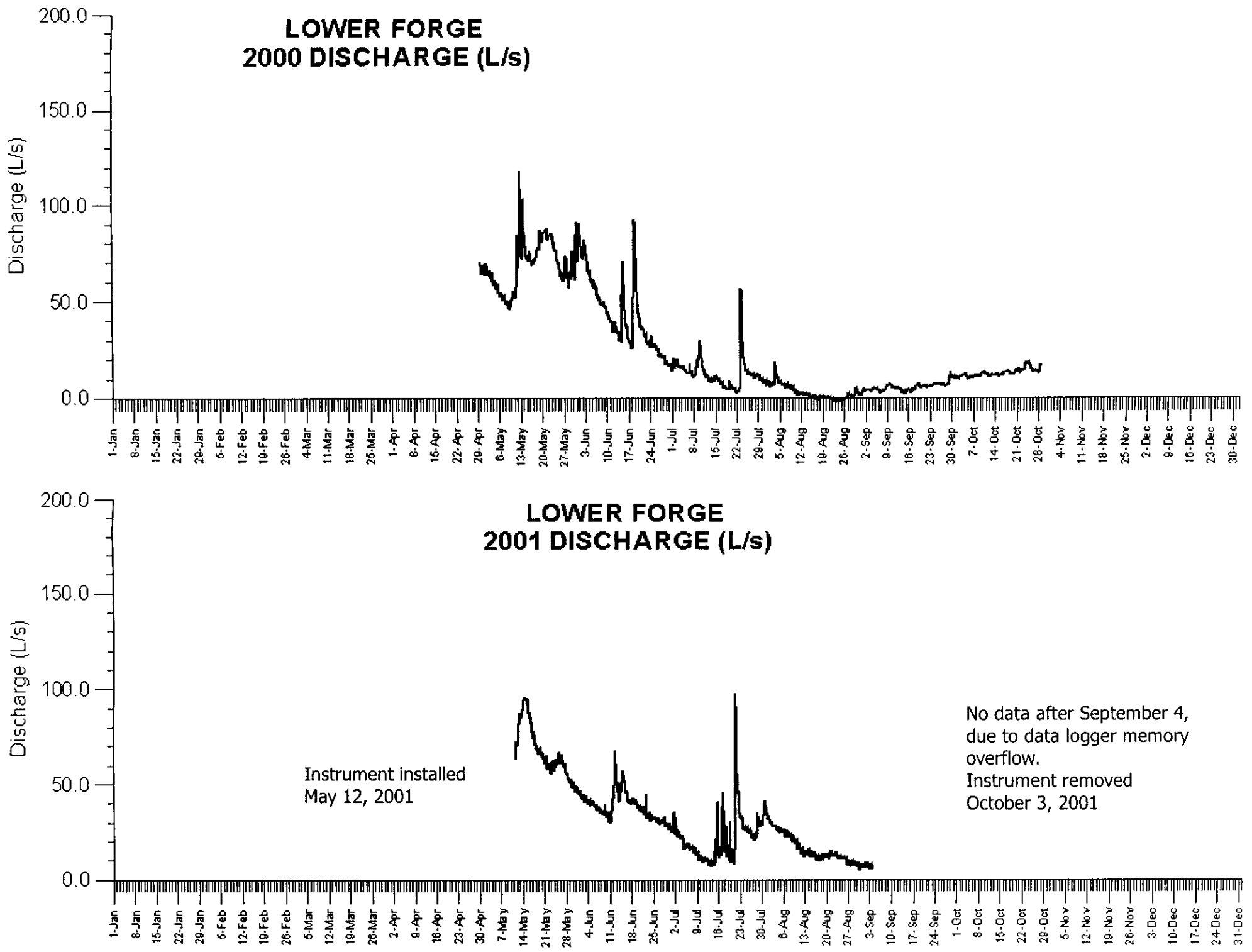
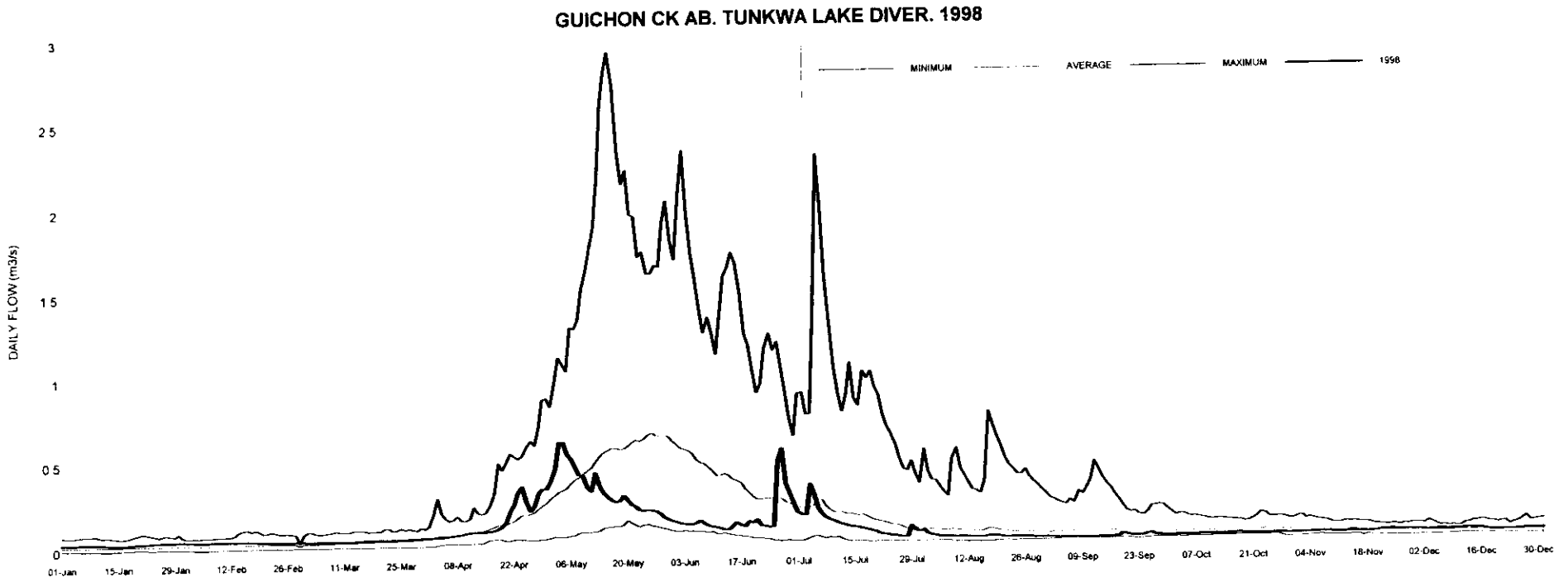
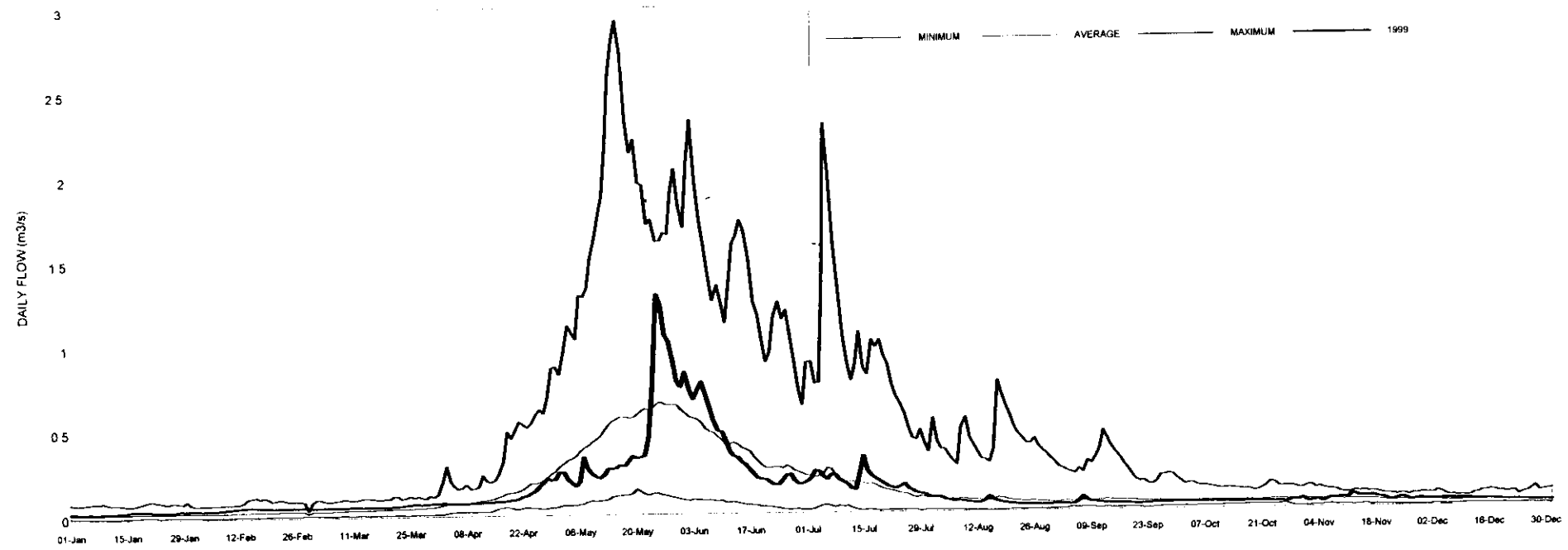
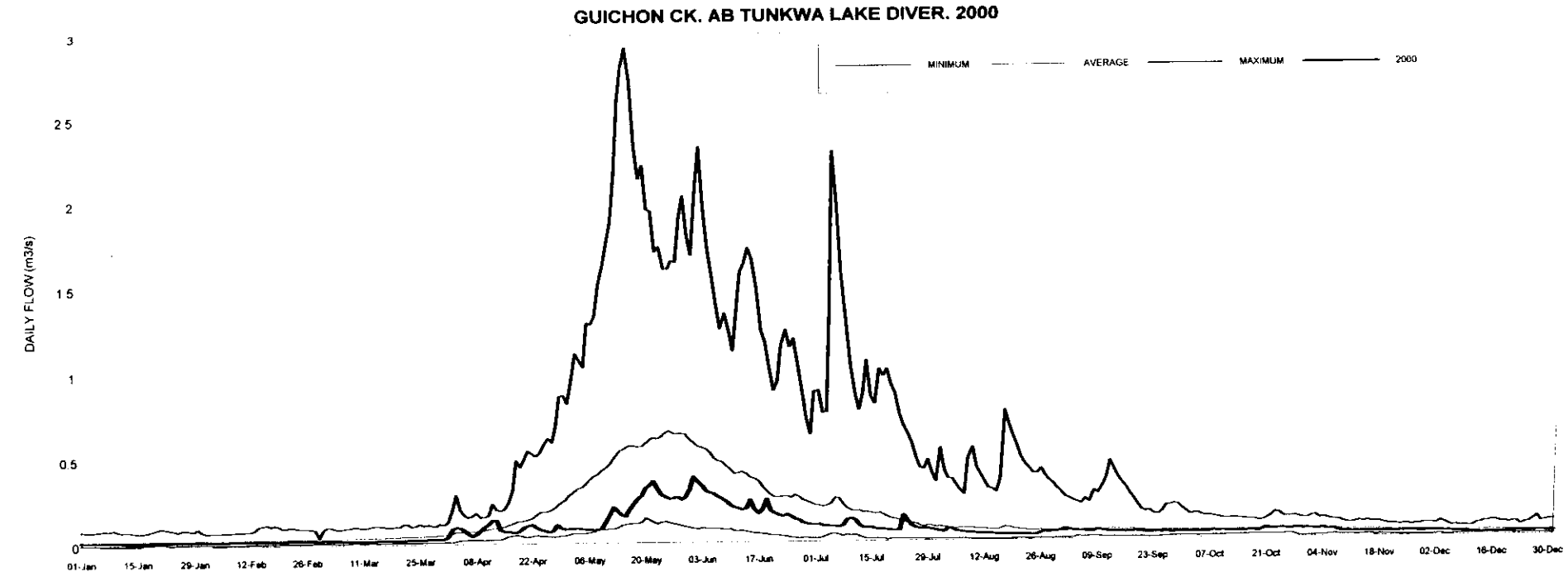


Figure 3.7.4.1: Summary of Lower Forge discharge values during the ice free period.







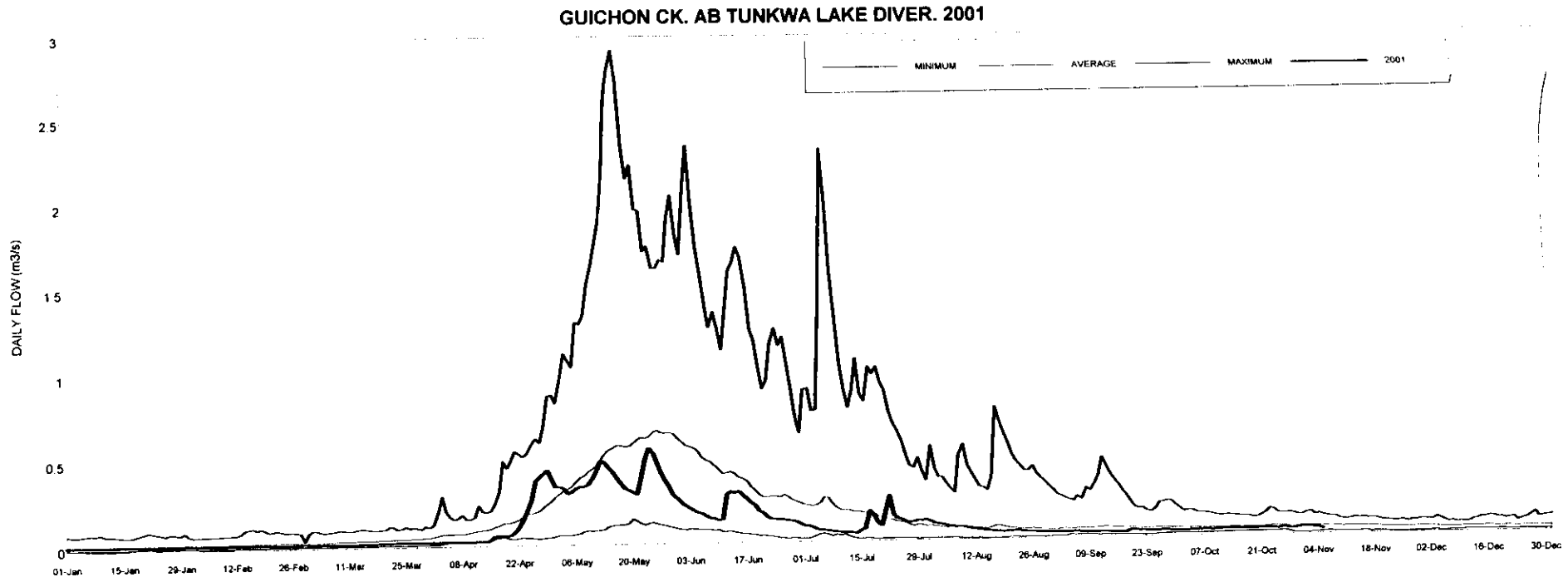
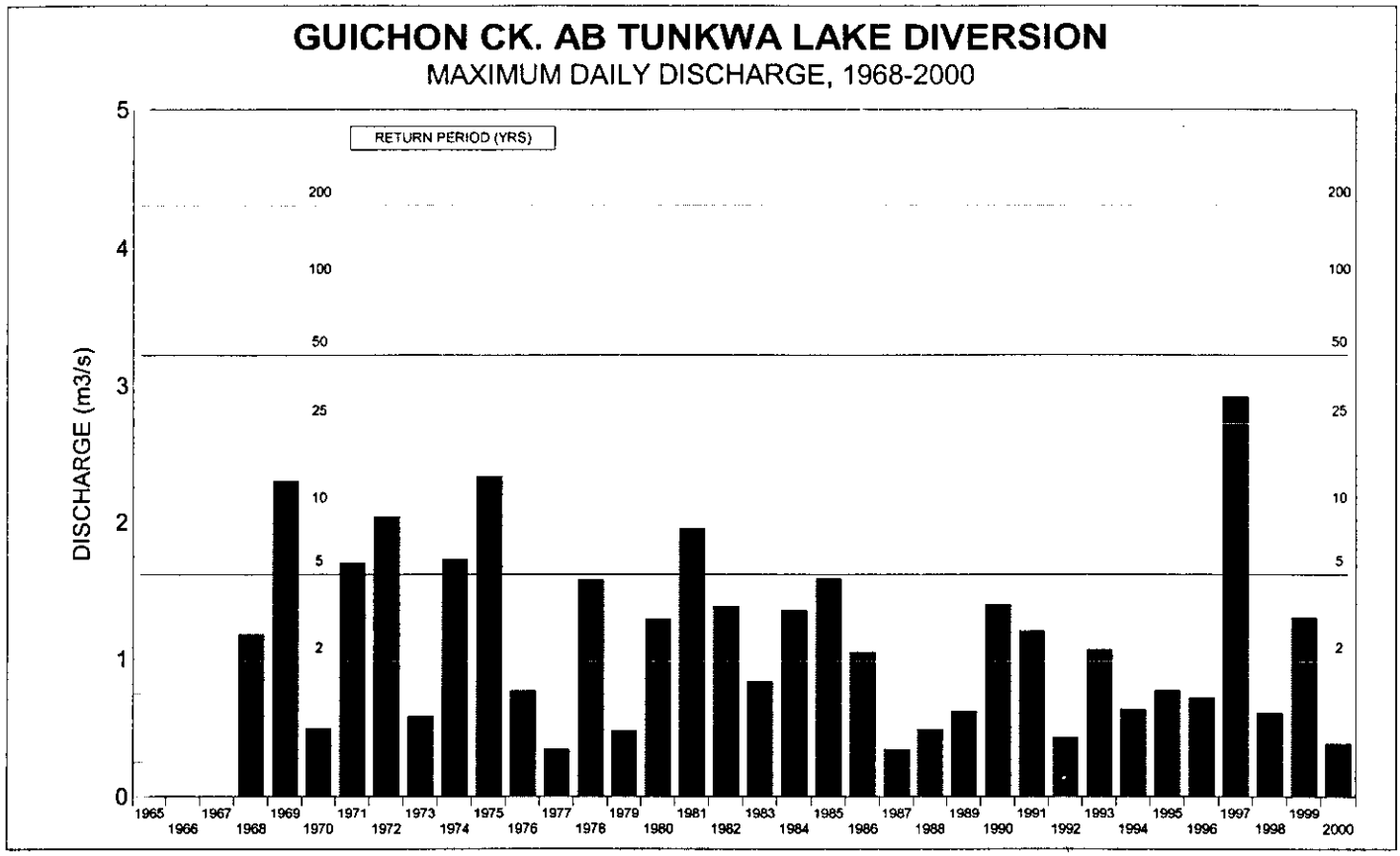


Figure 4.2.1: Seasonal variation in flow, Guichon Creek above Tunkwa Lake Diversion



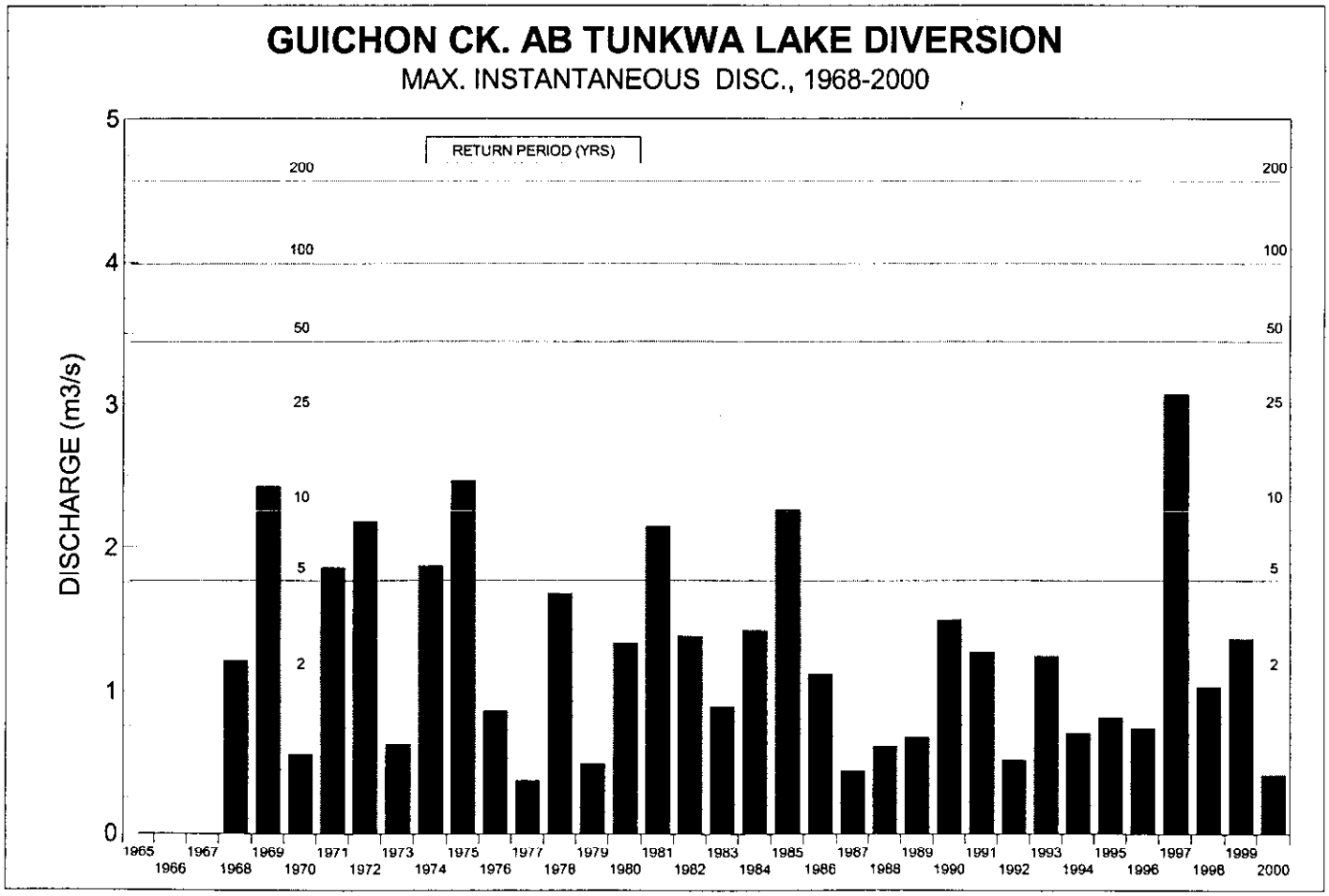


Figure 4.3.1: Historical variation in annual maximum daily and instantaneous discharge, Guichon Creek Above Tunkwa Lake Diversion, 1968-2000.

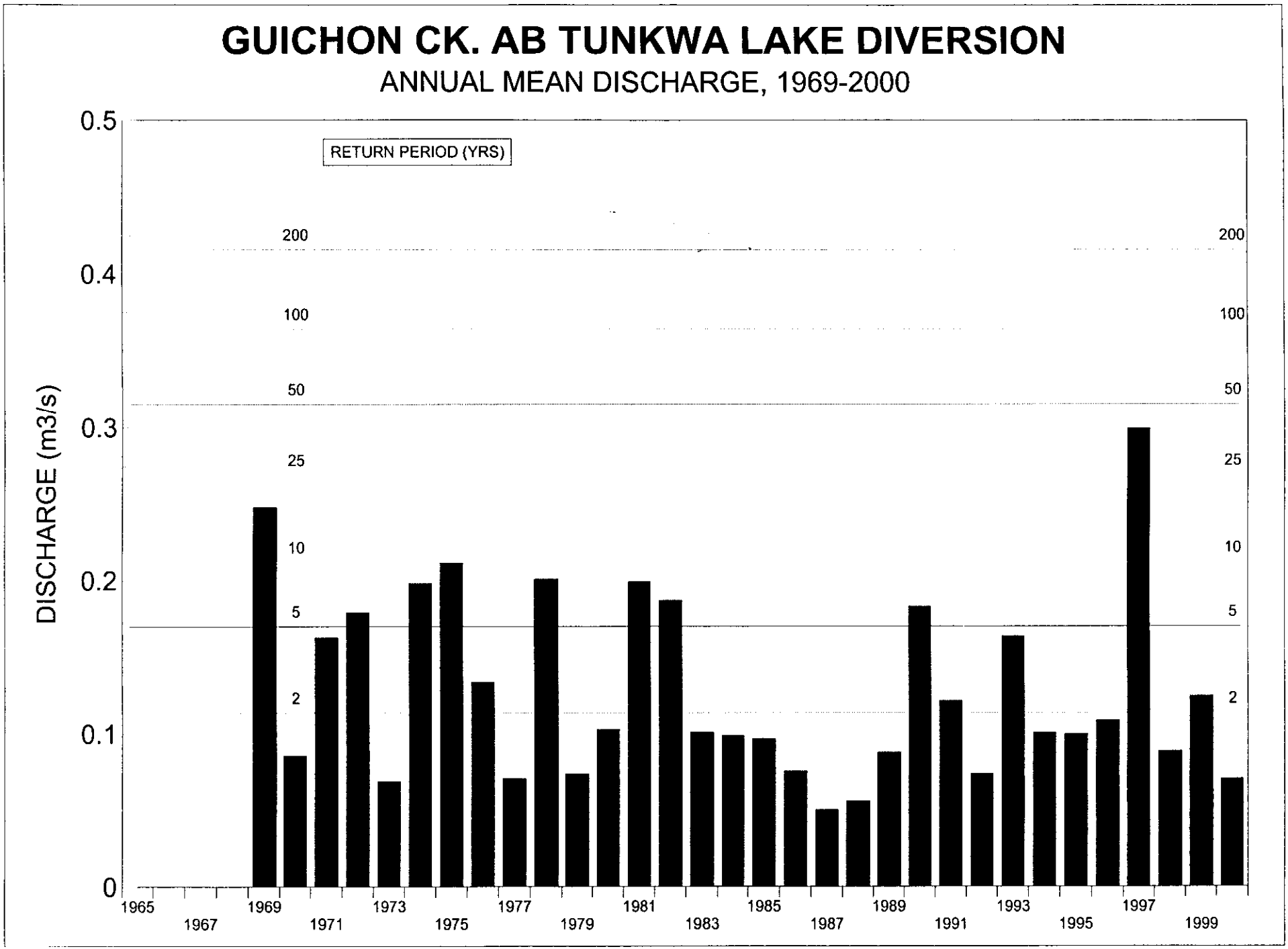


Figure 4.4.1: Historical variation in mean annual discharge, Guichon Creek Ab.Tunkwa Lake Diversion, 1969-2000.

Tables

TABLE 3.2.1: SUMMARY OF INSTALLED INSTRUMENTATION

INSTALLED EQUIPMENT	GAUGING STATION LOCATION			
	BURR	DAM	UPPER FORGE	LOWER FORGE
Staff Gauges				
1 m	1	2		
2 m			1	1
Capacitive Water Depth Sensor				
0.5 m		1		
1.0 m	1	1		
2.0 m			1	1
Water Temperature Sensor				
	1	2	1	1
Air Temperatures and Relative Humidity Sensor				
	0	0	0	1
Instrument Temperature Sensor				
	1	1	1	1
Tipping Bucket Rain Gauge				
	0	0	0	1

TABLE 3.3.1: DATA AVAILABILITY SUMMARY

STATION	PARAMETER	YEAR	PERIOD OF RECORD			
			START	END	# OF MISSING DAYS	NUMBER OF DAYS STREAM ICE COVERED
BURR	WATER LEVEL	1998	April 29	December 31	118	
		1999	January 01	December 31	119	
		2000	January 01	December 31	0	
		2001	January 01	October 03	89	
	WATER TEMPERATURE	1998	April 29	December 31	118	
		1999	January 01	December 31	119	
		2000	January 01	December 31	0	
		2001	January 01	October 03	89	
	INSTRUMENT TEMPERATURE	1998	April 29	December 31	118	
		1999	January 01	December 31	119	
		2000	January 01	December 31	0	
		2001	January 01	October 03	89	
DAM 1 IN RESERVOIR	WATER LEVEL	1998	May 03	December 31	122	
		1999	January 01	February 22	312	
		2000	-	-	366	
		2001	May 12	September 16	240	
	WATER TEMPERATURE	1998	May 13	December 31	132	
		1999	January 01	December 31	175	
		2000	January 01	December 31	0	
		2001	January 01	September 16	109	
	INSTRUMENT TEMPERATURE	1998	May 03	December 31	122	
		1999	January 01	December 31	175	
		2000	January 01	December 31	0	
		2001	January 01	September 16	109	
DAM 2	WATER LEVEL	1998	May 14	December 31	133	
		1999	January 01	December 31	176	
		2000	January 01	December 31	0	
		2001	January 01	September 16	109	
	WATER TEMPERATURE	1998	May 14	December 31	133	
		1999	January 01	December 31	175	
		2000	January 01	December 31	0	
		2001	January 01	September 16	109	
	INSTRUMENT TEMPERATURE	1998	May 03	December 31	122	
		1999	January 01	December 31	175	
		2000	January 01	December 31	0	
		2001	January 01	September 16	109	
UPPER FORGE	WATER LEVEL	1998	May 03	October 08	206	
		2001	May 12	October 03	131	
	WATER TEMPERATURE	1998	May 03	October 24	190	
		2001	-	-	365	
	INSTRUMENT TEMPERATURE	1998	May 03	October 24	190	
		2001	May 12	October 03	196	
LOWER FORGE	WATER LEVEL	1998	April 30	December 31	119	
		1999	January 01	December 31	184	
		2000	January 01	November 27	34	
		2001	May 11	September 04	248	
	WATER TEMPERATURE	1998	April 30	December 31	119	
		1999	January 01	December 31	184	
		2000	January 01	November 27	34	
		2001	May 11	September 04	248	
	INSTRUMENT TEMPERATURE	1998	April 30	December 31	119	
		1999	January 01	December 31	184	
		2000	January 01	November 27	34	
		2001	May 11	September 04	248	
	RAINFALL	1998	April 30	October 25	119	
		1999	-	-	365	
		2000	-	-	366	
		2001	May 11	September 04	248	
	AIR TEMPERATURE	1998	April 30	December 31	119	
		1999	January 01	December 31	184	
		2000	January 01	November 27	34	
		2001	May 11	September 04	248	
	RELATIVE HUMIDITY	1998	April 30	December 31	119	
		1999	January 01	December 31	184	
		2000	January 01	November 27	34	
		2001	May 11	September 04	248	

NOTE: * denotes incomplete record of data

TABLE 3.3.2: NUMBER OF STREAM DISCHARGE MEASUREMENTS

YEAR	NUMBER OF DISCHARGE MEASUREMENTS MADE DURING THE YEAR			
	BURR	DAM	UPPER FORGE	LOWER FORGE
1998	17	8	11	17
1999	1	1	0	1
2000	1	1	0	0
2001	3	3	3	3
TOTAL	22	13	14	21

TABLE 3.4.2.1: SUMMARY OF WATER TEMPERATURE DATA

STATION	PARAMETER	YEAR	TEMPERATURE °C BY MONTH											
			J	F	M	A	M	J	J	A	S	O	N	D
BURR	MAXIMUM	1998				0.58*	7.13	8.06	11.41	10.80	8.44	5.68	1.56	0.58
		1999	0.74	0.74	0.90	1.07*				8.64*	6.22	3.41	1.73	0.58
		2000	0.42	0.42	0.58	1.56	3.58	9.41	10.40	10.00	7.13	3.92	1.56	0.58
		2001	0.58	0.42	0.42	0.90	6.03	8.44	10.60	9.61	7.13	4.27*		
	AVERAGE	1998				-0.03*	2.77	5.66	8.00	7.06	5.24	2.20	0.41	-0.14
		1999	0.49	0.51	0.58	0.56*				6.44*	4.04	1.42	0.54	0.31
		2000	0.00	0.03	0.25	0.56	1.19	4.95	6.53	6.09	4.24	1.86	0.10	-0.33
		2001	0.19	0.05	0.17	0.31	2.02	4.20	6.62	6.35	4.70	2.48*		
	MINIMUM	1998				-0.23*	-0.23	3.75	5.50	4.27	2.73	0.09	-0.07	-0.71
		1999	-0.07	0.09	0.26	0.26*				3.75*	1.07	-0.07	-0.23	-0.07
		2000	-0.07	-0.23	-0.07	-0.07	-0.07	2.22	3.75	2.73	0.90	0.09	-0.07	-1.34
		2001	-0.07	-0.07	-0.07	-0.07	0.09	0.42	4.09	3.75	1.73	0.74*		
DAM 1	MAXIMUM	1998					5.68*	6.40	8.64	9.02	8.44	6.22	4.09	2.56
		1999	1.89	1.07						8.06	6.95*	4.97	3.92	3.07
		2000	2.56	2.06	1.73	4.27	3.92	6.22	7.30	7.69	6.22	5.32	3.92	2.90
		2001	2.22	1.73	1.56	2.22	5.68	6.95	8.64	8.06	7.88*			
	AVERAGE	1998					3.45*	4.71	6.93	7.99	7.08	4.31	3.18	2.33
		1999	1.42	0.73						7.52	5.91*	4.11	3.28	2.74
		2000	2.26	1.88	1.50	2.59	3.01	4.52	5.89	6.75	5.36	4.06	3.22	2.57
		2001	2.06	1.60	1.39	1.09	3.17	4.63	6.17	6.44	6.47*			
	MINIMUM	1998					2.56*	3.23	5.32	7.13	5.50	3.41	2.56	1.89
		1999	0.90	0.42						6.40	4.09*	3.58	3.07	2.56
		2000	2.06	1.73	1.23	1.23	2.22	3.23	4.97	5.68	4.61	3.23	2.90	2.22
		2001	1.73	1.40	1.23	0.74	1.56	3.58	4.97	4.97	5.68*			
DAM 2	MAXIMUM	1998					3.92*	8.06	9.21	9.21	13.10	10.40	1.23	0.90
		1999	0.26	0.26						16.02	13.97*	8.64	2.39	1.40
		2000	-0.86	-0.23	0.26	2.90	4.27	6.40	14.20	16.98	13.97	8.25	1.07	0.26
		2001	-0.07	-0.39	0.26	0.42	5.32	6.03	16.02	13.75	16.98*			
	AVERAGE	1998					3.27*	4.68	8.19	7.75	7.78	2.98	-0.35	-0.38
		1999	0.08	0.15						8.23	5.42*	1.02	-1.69	-2.00
		2000	-3.06	-2.34	-1.47	0.46	3.09	5.23	6.11	8.43	5.33	1.28	-1.14	-1.74
		2001	-1.18	-1.74	-0.90	-0.14	3.04	4.87	6.90	6.90	7.15*			
	MINIMUM	1998					3.07*	0.74	7.32	6.76	2.22	-2.43	-2.12	-1.50
		1999	-0.39	-0.07						1.73	-1.97*	-6.83	-7.58	-7.28
		2000	-7.43	-6.98	-5.19	-1.34	2.22	4.09	4.97	0.74	-2.74	-3.97	-4.28	-6.54
		2001	-3.05	-3.21	-3.82	-0.86	-0.07	3.58	3.41	1.89	1.56*			
UPPER FORGE	MAXIMUM	1998					4.44*	6.40	8.25	8.44	8.25	7.13*		
	AVERAGE	1998					2.85*	4.45	6.59	7.01	6.33	5.11*		
	MINIMUM	1998					1.23*	3.41	4.97	5.86	4.97	3.41*		
LOWER FORGE	MAXIMUM	1998				3.58*	11.21	11.21	15.10	14.42	12.46	7.88	1.73	0.09
		1999	0.09	0.09*										
		2000	0.26	0.58	0.90	3.92	8.64	11.21	12.25	12.46	9.41	6.03	1.40*	
		2001					10.60*	13.10	13.10	12.46	9.80*			
	AVERAGE	1998				2.32*	6.04	8.39	11.49	11.02	8.38	3.25	0.31	0.05
		1999	0.02	-0.01*										
		2000	0.03	0.50	0.61	0.94	4.12	7.69	9.33	9.14	6.10	2.71	0.19*	
		2001					6.13	8.94	10.36	10.04	8.64*			
	MINIMUM	1998				1.40*	0.58	4.61	6.95	7.88	4.61	0.09	-0.07	-0.07
		1999	-0.07	-0.07*										
		2000	-0.07	0.26	0.42	0.58	0.90	3.75	5.86	5.32	2.22	0.58	0.09*	
		2001					2.22*	3.75	8.06	7.69	7.69*			

NOTE: * denotes incomplete record of data

TABLE 3.4.3.1: SUMMARY OF AIR TEMPERATURE DATA

STATION	PARAMETER	YEAR	TEMPERATURE °C BY MONTH											
			J	F	M	A	M	J	J	A	S	O	N	D
LOWER FORGE	MAXIMUM	1998				17.59*	21.86	22.17	30.41	28.27	26.13	17.29	5.39	3.25
		1999	3.86	1.42*										
		2000	0.20	6.91	12.40	13.93	17.29	23.39	26.13	26.13	22.17	16.37	5.39*	
		2001					24.00*	26.44	26.44	28.88	16.98*			
	AVERAGE	1998				7.19*	8.94	10.33	15.22	14.24	10.56	2.84	-2.53	-6.96
		1999	-4.98	-6.04*										
		2000	-8.01	-5.66	-2.23	1.93	4.21	9.24	11.26	10.85	6.86	1.94	-5.21*	
		2001					8.19*	9.70	11.79	12.15	8.68*			
	MINIMUM	1998				3.25*	-3.16	0.20	-0.10	2.34	-0.71	-8.95	-11.39	-17.80
		1999	-17.80	-17.49*										
		2000	-17.49	-17.49	-16.58	-9.56	-6.82	-2.55	-1.32	-1.63	-4.68	-8.65	-17.49*	
		2001					-3.46*	-2.85	0.20	0.20	-0.10*			

NOTE: * denotes incomplete record of data

TABLE 3.4.5.1: SUMMARY OF PRECIPITATION DATA

STATION	PARAMETER	YEAR	RAINFALL (mm) BY MONTH											
			J	F	M	A	M	J	J	A	S	O	N	D
LOWER FORGE	EXTREME 24 HOUR RAINFALL	1998				0*	6.0	25.6	12.4	4.8	11.6	3.6		
		2001				1.8*	11.2	2.6	2.2	0*				
	MONTHLY PRECIPITATION	1998				0*	24.6	92.4	2.4	14.4	24.8	17.0		
		2001				3.4*	48.6	93.8	4.8	0*				

NOTE: * denotes incomplete record of data

TABLE 3.5.1: SUMMARY OF BURR CREEK DISCHARGE MEASUREMENTS

DATE	AVERAGE TIME (PST)	AVERAGE STAFF GAUGE (m)	AVERAGE SENSOR LEVEL (m)	DIFFERENCE (m)	DISCHARGE (L/s)	TYPE OF METER	OPERATOR	COMMENTS
Apr 27, 1998	?	N/A	N/A		43	Price AA	M. Manning	
Apr 28, 1998	10:00	N/A	N/A		142	Price AA	M. Manning	
Apr 28, 1998	17:00	N/A	N/A		249	Price AA	M. Manning	
Apr 29, 1998	11:15	N/A	N/A		200	Price AA	M. Manning	
Apr 29, 1998	19:40	0.413	0.370	0.043	97	Price AA	M. Manning	
May 1, 1998	10:08	0.460	0.416	0.044	143	Price AA	M. Manning	
May 1, 1998	11:40	0.492	0.446	0.046	172	Price AA	M. Manning	
May 1, 1998	20:11	0.590	0.557	0.033	252	Price AA	S. Moore	Overbank flow
May 2, 1998	19:40	0.623	0.583	0.040	267	Price AA	M. Manning	
May 3, 1998	18:30	0.595	0.560	0.035	186	Price AA	M. Manning	
May 4, 1998	13:48	0.539	0.502	0.037	176	Price AA	S. Moore	
May 5, 1998	16:45	0.532	0.492	0.040	167	Price AA	S. Moore	
May 14, 1998	16:30	0.313	0.271	0.042	88	Price Mini	S. Gibbins	
May 29, 1998	12:23	0.192	0.154	0.038	32	Price Mini	S. Moore	
Jun 17, 1998	12:58	0.161	0.122	0.039	19	Price Mini	S. Moore	
Jul 22, 1998	12:12	0.160	0.122	0.038	17	Price Mini	S. Moore	
Oct 24, 1998	15:18	0.130	0.088	0.042	33	Price Mini	MM/SM/V&AP	Bed aggraded 6 cm
Aug 23, 1999	14:40	0.168	0.134	0.034	5.2	Optical Mini	MM & SG	
Nov 24, 2000	10:49	0.142	0.141	0.001	5.2	Optical Mini	MM & VP	Ice in channel
May 11, 2001	18:12	0.236	0.187	0.049	92	Optical Mini	MM & SG	Water level sensor embedded in ice
Jul 15, 2001	10:00	0.056	0.016	0.040	6.4	Optical Mini	V&A Preto	
Oct 03, 2001	09:46	0.053	0.022	0.031	4.5	Optical Mini	MM & SG	

TABLE 3.5.2: SUMMARY OF DAM 1 DISCHARGE MEASUREMENTS (in reservoir)

DATE	AVERAGE TIME (PST)	AVERAGE STAFF GAUGE (m)	AVERAGE SENSOR LEVEL (m)	DIFFERENCE (m)	DISCHARGE (L/s)	TYPE OF METER	OPERATOR	COMMENTS
May 2 1998	19:05	0.559	0.519		32	Price Mini	S. Moore	Discharge in notch in dam 6-10 cm flow
May 3 1998	18:26	0.540	0.492	0.048	27	Price Mini	S. Moore	Discharge in channel - snow and ice
May 4 1998	12:00	0.531	0.489	0.042	18	Price Mini	S. Moore	Discharge in channel - snow and ice
May 5 1998	13:38	0.526	0.483	0.043	16	Price Mini	S. Moore	
May 13 1998	18:20	0.508	0.468	0.040	13	Price Mini	S. Gibbins	
May 29, 1998	10:54	0.492	0.459	0.040	6	Price Mini	S. Moore	
Jun 18, 1998	13:18	0.492	0.4565	0.036	1.0	Price Mini	S. Moore	
Jul 21, 1998	15:03	0.4835±	0.4555	0.028	1.5	Price Mini	S. Moore	
Aug 23, 1999	11:40	0.488	0.448	N/A	0.2±	Visual	MM & SG	Sensor destroyed
Nov 24, 2000	12:30	0.463	0.423	N/A	0	Visual	MM & VP	Sensor destroyed
Sensor replaced								
May 12, 2001	09:00	0.518	0.483	0.035	5.6	Litre Bottle	MM & SG	
May 12, 2001	09:00	0.498	0.463	0.035	5.6	Litre Bottle	MM & SG	
Jul 15, 2001	10:54	0.500	0.486	0.014	0	Visual	V&A Preto	
Jul 15, 2001	10:54	0.480	0.466	0.014	0	Visual	V&A Preto	
Oct 03, 2001	10:47	0.496	0.474	0.022	0	Visual	MM & SG	Small seepage over notch in dam
Oct 03, 2001	10:47	0.476	0.454	0.022	0	Visual	MM & SG	

Estimate based on average "difference" value of 0.040 m as sensor was not installed or was not functional.

Level surveys on October 3, 2001 indicate that the re-installed staff gauge is 0.020 m lower than the original. Staff gauge and water level sensor readings were therefore reduced by 0.020 m to confirm to the 1998 datum.

TABLE 3.5.3: SUMMARY OF DAM 2 DISCHARGE MEASUREMENTS (in upstream creek)

DATE	AVERAGE TIME (PST)	AVERAGE STAFF GAUGE (m)	AVERAGE SENSOR LEVEL (m)	DIFFERENCE (m)	DISCHARGE (L/s)	TYPE OF METER	OPERATOR	COMMENTS
May 13, 1998	18:20	N/A	N/A		13	Price Mini	S.Gibbins	
May 14, 1998	13:28	0.278	0.250	0.028			"Student"	2nd water level sensor installed
May 29, 1998	11:40	0.245	0.226	0.019	6	Price Mini	S. Moore	
Jun 18, 1998	13:18	0.230	0.213	0.017	6	Price Mini	S. Moore	
Jul 21, 1998	15:03	0.250	0.2345	0.016	1.5	Price Mini	S. Moore	
Aug 23, 1999	11:40	0.093	0.092	0.001	0	Visual	MM & SG	Flow approx 5 ml/s
Nov 24, 2000	12:30	0.000	0.001	0.001	0	Visual	MM & VP	Channel dry
May 12, 2001	09:50	0.208	0.184	0.024	0.56	Litre Bottle	MM & SG	
Jul 15, 2001	10:54	0.000	0.000	0.000	0	Visual	V&A Preto	
Oct 03, 2001	10:47	0.000	0.000	0.000	0	Visual	MM & SG	Channel dry

Note: Data from Dam 1 indicates that the flow on June 27, 1998 at 09:45 was 24.41 L/s and this corresponds to a water depth on the sensor of 0.299 m. This value has been used to extend the stage–discharge rating curve.

TABLE 3.5.4: SUMMARY OF UPPER FORGE CREEK DISCHARGE MEASUREMENTS

DATE	AVERAGE TIME (PST)	AVERAGE STAFF GAUGE (m)	AVERAGE SENSOR LEVEL (m)	DIFFERENCE (m)	DISCHARGE (L/s)	TYPE OF METER	OPERATOR	COMMENTS
May 1 1998	16:20	0.449	0.428		76	Price AA	M. Manning	Water level sensor not installed
May 2 1998	14:28	0.529	0.508		119	Price AA	S. Moore	Water level sensor not installed
May 3 1998	14:34	0.558	0.537	0.021	134	Price AA	S. Moore	
May 4 1998	09:28	0.556	0.538	0.018	129	Price AA	S. Moore	
May 5 1998	15:44	0.529	0.513	0.016	124	Price AA	S. Moore	
May 13 1998	12:44	0.427	0.402	0.025	48	Price Mini	S. Gibbins	
May 13 1998	14:42	0.423	0.401	0.022	41	Price AA	S. Gibbins	
May 29, 1998	10:54	0.341	0.320	0.021	20	Price Mini	S. Moore	
Jun 18, 1998	16:47	0.297	0.273	0.024	6.1	Price Mini	S. Moore	
Jul 23, 1998	10:48	0.328	0.3045	0.024	10	Price Mini	S. Moore	
Oct 25, 1998	10:00	0.267	0.246	N/A	1.4	Surface Float	MM, SM, VP	WL sensor destroyed by fallen tree. Discharge too small to measure with meter
Sensor replaced								
May 12, 2001	13:36	0.398	0.345	0.053	54	Price Mini	MM & SG	
May 12, 2001	13:36	0.398	0.373	0.025	54	Price Mini	MM & SG	
Jul 16, 2001	14:25	0.299	0.252	0.047	7.2	Optical Mini	V&A Preto	
Jul 16, 2001	14:25	0.299	0.280	0.019	7.2	Optical Mini	V&A Preto	
Oct 03, 2001	14:25	0.279	0.231	0.048	1.3	Optical Mini	MM & SG	
Oct 03, 2001	14:25	0.279	0.259	0.020	1.3	Optical Mini	MM & SG	

Estimate based on average "difference" of 0.021 m as sensor was not installed.

Replacement sensor height adjusted to Oct 25 1998 datum (0.028 m added to recorded values; this reduces the average "difference" values from 0.049 m to 0.021 m)

TABLE 3.5.5: SUMMARY OF LOWER FORGE CREEK DISCHARGE MEASUREMENTS

DATE	AVERAGE TIME (PST)	AVERAGE STAFF GAUGE (m)	AVERAGE SENSOR LEVEL (m)	DIFFERENCE (m)	DISCHARGE (L/s)	TYPE OF METER	OPERATOR	COMMENTS
Apr 27 1998	14:30	N/A	N/A		155	Price AA	M. Manning	High suspended sediment concentrations
Apr 28 1998	15:00	N/A	N/A		234	Price AA	M. Manning	
Apr 29 1998	09:00	N/A	N/A		150	Price AA	M. Manning	Water clearing up
Apr 30 1998	14:30	0.760	0.748	0.012	240	Price AA	M. Manning	
Apr 30 1998	15:45	0.780	0.742	0.038	294	Price AA	M. Manning	
Apr 30 1998	17:30	0.790	0.759	0.031	298	Price AA	M. Manning	
May 1 1998	18:40	0.758	0.706	0.052	265	Price AA	M. Manning	
May 2 1998	13:19	0.730	0.691	0.039	240	Price AA	M. Manning	
May 3 1998	15:00	0.745	0.701	0.044	267	Price AA	M. Manning	
May 4 1998	10:40	0.705	0.663	0.042	232	Price AA	M. Manning	
May 4 1998	19:02	0.689	0.660	0.029	205	Price AA	S. Moore	
May 5 1998	10:10	0.660	0.630	0.030	187	Price AA	S. Moore	
May 14 1998	19:31	0.550	0.512	0.038	99	Price Mini	S. Gibbins	
May 29, 1998	08:57	0.450	0.418	0.032	40	Price Mini	S. Moore	
Jun 16, 1998	11:00	0.388	0.365	0.023	15.5	Price Mini	S. Moore	
Jul 23, 1998	14:38	0.327	0.309	0.018	12.7	Price Mini	S. Moore	
Oct 25 1998	12:39	0.206	0.194	0.012	2.0	Surface Float	MM & SM	Stream too low to use meter
Aug 23, 1999	17:50	0.245	0.233	0.012	3.8	Optical Mini	MM & SG	
May 11, 2001	14:14	0.495	0.466	0.029	63.5	Price Mini	MM & SG	Channel is ice free
Jul 15, 2001	14:45	0.351	0.332	0.019	6.2	Optical Mini	V&A Preto	"Corrected" staff gauge reading
Oct 04, 2001	08:56	0.298	0.281	0.017	1.7	Optical Mini	MM & SG	Channel blocked by leaves and debris
Oct 04, 2001	09:30	0.135	0.146	0.017	1.7	Optical Mini	MM & SG	Channel blockage removed

Channel blockage removed. Sensor reading calculated from change in water level on staff gauge.

TABLE 3.7.1.1: STREAM DISCHARGE SUMMARY FOR BURR CREEK

PARAMETER	YEAR	STREAM DISCHARGE (L/s) BY MONTH											
		J	F	M	A	M	J	J	A	S	O	N	D
MAXIMUM INSTANTANEOUS FLOW	1998				177.0*	242.5	169.7	139.2	14.8	16.5	10.6	9.2	
	1999								21.0*	24.9	33.2		
	2000				28.7	128.9	81.5	71.2	25.1	21.4	16.7	26.5*	
	2001				13.7*	147.1	15.0	37.5	8.4	1.6	1.2*		
AVERAGE MONTHLY FLOW	1998				138.6*	79.2	42.4	36.4	11.7	10.6	9.7	9.1	
	1999								20.0*	18.0	17.1		
	2000				18.2	44.3	39.1	22.8	18.0	14.6	13.5	15.4*	
	2001				8.4*	24.8	6.6	5.0	3.3	1.3	1.0*		
MINIMUM FLOW	1998				84.3*	23.0	16.1	13.8	10.2	9.4	8.5	8.7	
	1999								19.3*	16.6	15.1		
	2000				12.5	17.1	21.9	16.7	14.3	12.4	12.2	13.1*	
	2001				2.8*	5.5	3.2	0.5	1.5	1.0	0.9*		

NOTE: * denotes incomplete record of data

TABLE 3.7.2.1: STREAM DISCHARGE SUMMARY FOR DAM 1

PARAMETER	YEAR	STREAM DISCHARGE (L/s) BY MONTH											
		J	F	M	A	M	J	J	A	S	O	N	D
MAXIMUM INSTANTANEOUS FLOW	1998					8.9*	24.4	15.4	18.6	21.5	17.8*		
	2001					10.9*	11.1	12.8	11.5	7.4*			
AVERAGE MONTHLY FLOW	1998					4.8*	7.9	8.8	5.6	5.3	5.6*		
	2001					9.5*	8.6	9.6	8.8	4.2*			
MINIMUM FLOW	1998					3.5*	2.4	3.7	4.3	3.7	2.4*		
	2001					6.8*	4.7	7.2	4.7	2.8*			

NOTE: * denotes incomplete record of data

TABLE 3.7.2.2: STREAM DISCHARGE SUMMARY FOR DAM 2

PARAMETER	YEAR	STREAM DISCHARGE (L/s) BY MONTH											
		J	F	M	A	M	J	J	A	S	O	N	D
MAXIMUM INSTANTANEOUS FLOW	1998					12.6*	24.3	17.4	7.7*				
	2000				1.1*	13.0	12.8	3.9*					
	2001					8.3*	7.5*	2.5*	2.4*				
AVERAGE MONTHLY FLOW	1998					9.4*	8.7	11.8	4.4*				
	2000				0.5*	5.7	8.7	2.0*					
	2001					6.7*	4.2*	2.0*	1.3*				
MINIMUM FLOW	1998					7.2*	4.9	7.4	0.1*				
	2000				0.0*	0.0	3.8	0.1*					
	2001					0.1*	0.0*	0.0*	0.0*				

NOTE: * denotes incomplete record of data

TABLE 3.7.3.1: STREAM DISCHARGE SUMMARY FOR UPPER FORGE

PARAMETER	YEAR	STREAM DISCHARGE (L/s) BY MONTH											
		J	F	M	A	M	J	J	A	S	O	N	D
MAXIMUM INSTANTANEOUS FLOW	1998					147.5*	172.1	82.9	11.8	4.5	4.3*		
	2001					84.3*	35.0	23.8	22.0	8.5	4.9*		
AVERAGE MONTHLY FLOW	1998					51.0*	36.0	33.1	6.5	2.9	3.3*		
	2001					53.4*	20.0	13.9	13.5	5.9	4.7*		
MINIMUM FLOW	1998					16.8*	7.0	11.1	3.4	1.9	2.9*		
	2001					35.0*	13.6	8.7	8.3	4.5	4.5*		

NOTE: * denotes incomplete record of data

TABLE 3.7.4.1: STREAM DISCHARGE SUMMARY FOR LOWER FORGE CREEK

PARAMETER	YEAR	STREAM DISCHARGE (L/s) BY MONTH											
		J	F	M	A	M	J	J	A	S	O	N	D
MAXIMUM INSTANTANEOUS FLOW	1998				302.2*	277.0	583.9	281.5	21.8	0.0	0.4	0.1*	
	1999								4.0*	10.8	9.5	55.9	
	2000				70.2*	117.9	92.4	56.3	18.9	13.4	18.9*		
	2001					95.7*	97.4	97.4	33.9	8.7*			
AVERAGE MONTHLY FLOW	1998				257.2*	101.6	74.0	48.6	0.3	0.0	0.0	0.0*	
	1999								2.7*	2.7	6.1	18.2	
	2000				67.5*	69.2	42.5	12.4	2.9	5.6	12.8*		
	2001					66.6*	30.1	22.2	16.0	7.2*			
MINIMUM FLOW	1998				215.5*	37.3	19.6	0.9	0.0	0.0	0.0	0.0*	
	1999								1.4*	0.1	4.1	4.2	
	2000				64.8*	46.4	14.4	2.8	0.0	1.6	9.7*		
	2001					44.6*	6.9	6.9	5.3	5.5*			

NOTE: * denotes incomplete record of data

Plates

October 03, 2001 MM 01 - 35 - 11

Looking upstream over the reservoir at Dam

October 03, 2001 MM 01 - 35 - 07

Data logger installation

October 03, 2001 MM 01 - 35 - 08

Staff gauge and water level sensor in the reservoir (Dam 1)

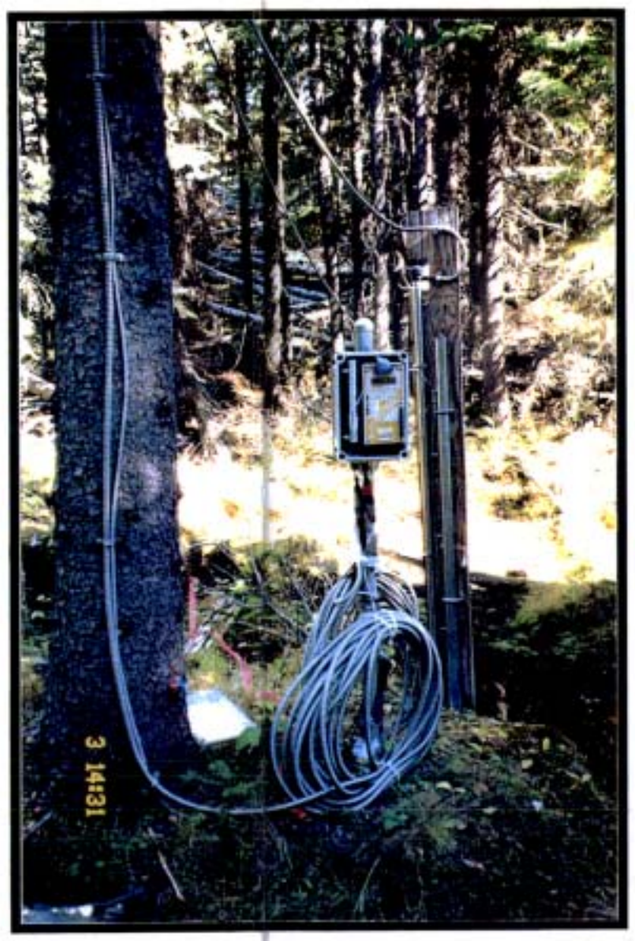
October 03, 2001 MM 01 - 35 - 09

Staff gauge and water level sensor in the upstream channel (Dam 2)

Plate 3.1.1: Photographs of the instrument installation at Dam.

October 03, 2001 MM 01 - 35 - 24

Site overview looking downstream



October 03, 2001 MM 01 - 35 - 22

Instrument enclosure with water depth sensor in the background

October 03, 2001 MM 01 - 35 - 27

Looking upstream to the stream gauging site

Plate 3.1.2: Photographs of the instrument installation at Upper Forge.

October 04, 2001 MM 01 - 35 - 33

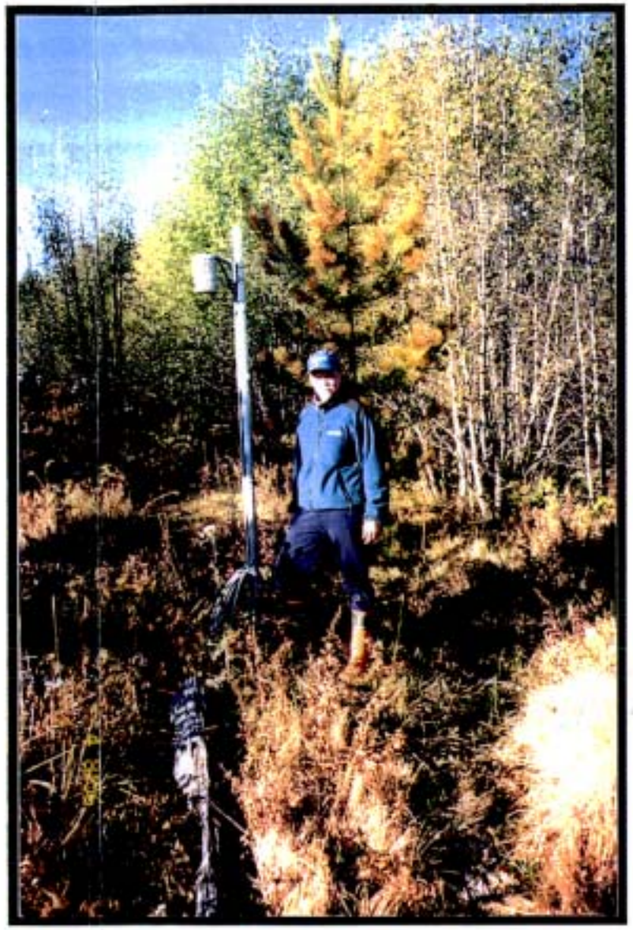
Data logger and tipping bucket rain gauge

October 04, 2001 MM 01 - 35 - 31

Tipping bucket rain gauge

October 04, 2001 MM 01 - 35 - 32

Staff gauge and water level sensor



October 03, 2001 MM 01 - 35 - 30

Air temperature and relative humidity sensor

Plate 3.1.3: Photographs of the instrument installation at Lower Forge.

October 03, 2001 MM 01 - 35 - 01

Looking upstream to the water level sensor and recorder.

October 03, 2001 MM 01 - 35 - 03

Looking downstream to the staff gauge and water level sensor.

October 03, 2001 MM 01 - 3526 - 02

Detailed view of the data logger.

October 03, 2001 MM 01 - 35 - 05

Looking downstream to the discharge measurement site.

Plate 3.1.4: Photographs of the instrument installation at Burr.

APPENDIX 1

STREAM DISCHARGE MEASUREMENTS: BURR

STATION:	BURR 2036			STAFF GAUGE: 0.590 m		SENSOR: 0.557 m	
DATE:	May 1, 1998 @ 20.11 PST			PARTY:	Mike Miles and Shane Moore		
DISTANCE (m)	WIDTH (m)	WATER DEPTH (m)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
1.25	0.03	0.00	0.00	0	60	0.006	0.0000
1.31	0.08	0.31	0.02	8	60	0.095	0.0023
1.41	0.07	0.30	0.02	13	60	0.150	0.0034
1.46	0.05	0.32	0.02	31	60	0.349	0.0056
1.51	0.05	0.48	0.02	31	60	0.349	0.0084
1.56	0.05	0.48	0.02	39	60	0.438	0.0105
1.61	0.05	0.48	0.02	40	60	0.450	0.0108
1.66	0.05	0.49	0.02	46	60	0.516	0.0126
1.71	0.05	0.50	0.03	56	60	0.626	0.0157
1.76	0.05	0.50	0.03	57	60	0.637	0.0159
1.81	0.05	0.50	0.03	57	60	0.637	0.0159
1.86	0.05	0.51	0.03	56	60	0.626	0.0160
1.91	0.05	0.52	0.03	59	60	0.660	0.0171
1.96	0.05	0.51	0.01	63	60	0.704	0.0035
2.01	0.05	0.51	0.01	66	60	0.737	0.0037
2.06	0.05	0.50	0.01	64	60	0.715	0.0036
2.11	0.05	0.50	0.01	67	60	0.748	0.0037
2.16	0.05	0.49	0.02	67	60	0.748	0.0150
2.21	0.05	0.54	0.03	67	60	0.748	0.0224
2.26	0.05	0.55	0.01	50	60	0.560	0.0028
2.31	0.05	0.55	0.06	30	60	0.338	0.0203
2.36	0.05	0.43	0.06	27	60	0.305	0.0168
2.41	0.05	0.44	0.05	17	60	0.194	0.0087
2.46	0.04	0.52	0.02	8	60	0.095	0.0014
2.49	0.07	0.41	0.23	4	60	0.050	0.0116
2.61	0.34	0.06	0.21	1	60	0.017	0.0035
3.16	0.28	0.00	0.03	0	60	0.006	0.0002
TOTAL	1.91						0.252

PRICE AA METRE

STATION:	BURR 2036			STAFF GAUGE: 0.539 m		SENSOR: 0.502 m	
DATE:	May 4, 1998 @ 13.48 PST			PARTY:	Mike Miles and Shane Moore		
DISTANCE (m)	WIDTH (m)	WATER DEPTH (m)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
0.90	0.05	0.00	0.00	0	60	0.006	0.0000
1.00	0.10	0.24	0.02	8	60	0.095	0.0023
1.10	0.10	0.47	0.05	19	60	0.217	0.0102
1.20	0.10	0.45	0.04	27	60	0.305	0.0137
1.30	0.10	0.45	0.04	23	60	0.261	0.0117
1.40	0.10	0.42	0.04	60	60	0.671	0.0282
1.50	0.10	0.42	0.04	42	60	0.472	0.0198
1.60	0.10	0.42	0.04	45	60	0.505	0.0212
1.70	0.10	0.42	0.04	48	60	0.538	0.0226
1.80	0.10	0.41	0.04	50	60	0.560	0.0230
1.90	0.10	0.40	0.04	26	60	0.294	0.0118
2.00	0.10	0.36	0.04	24	60	0.272	0.0098
2.10	0.11	0.34	0.04	4	60	0.050	0.0019
2.22	0.06	0.00	0.00	0	60	0.006	0.0000
TOTAL	1.32						0.176

PRICE AA METRE

STATION:	BURR 2036			STAFF GAUGE: 0.532 m		SENSOR: 0.492 m	
DATE:	May 5, 1998 @ 16.45 PST			PARTY:	Shane Moore		
DISTANCE (m)	WIDTH (m)	WATER DEPTH (m)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
1.00	0.05	0.00	0.00	0	60	0.006	0.0000
1.10	0.10	0.20	0.02	8	60	0.095	0.0019
1.20	0.10	0.44	0.04	12	60	0.139	0.0061
1.30	0.10	0.47	0.05	25	60	0.283	0.0133
1.40	0.10	0.45	0.04	27	60	0.305	0.0137
1.50	0.10	0.40	0.04	62	60	0.693	0.0277
1.60	0.10	0.40	0.04	41	60	0.461	0.0184
1.70	0.10	0.42	0.04	40	60	0.450	0.0189
1.80	0.10	0.38	0.04	50	60	0.560	0.0213
1.90	0.10	0.40	0.04	47	60	0.527	0.0211
2.00	0.10	0.38	0.04	24	60	0.272	0.0103
2.10	0.10	0.36	0.04	25	60	0.283	0.0102
2.20	0.10	0.35	0.03	9	60	0.106	0.0037
2.30	0.05	0.00	0.00	0	60	0.006	0.0000
TOTAL	**1.3**						**0.167**

PRICE AA METRE

STATION:	BURR 2036			STAFF GAUGE: 0.313 m		SENSOR: 0.271 m	
DATE:	May 14, 1998 @ 16.30 PST			PARTY:	Sandy Gibbins & Mike Miles		
DISTANCE (m)	WIDTH (m)	WATER DEPTH (cm)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
1.70	0.03	0.00	0.00	0	60	0.009	0.0000
1.75	0.04	13.50	0.01	49	60	0.252	0.0014
1.78	0.03	19.50	0.01	78	60	0.396	0.0023
1.81	0.03	38.80	0.01	96	60	0.485	0.0056
1.84	0.03	39.00	0.01	102	60	0.515	0.0060
1.87	0.03	39.60	0.01	100	60	0.505	0.0060
1.90	0.03	39.50	0.01	99	60	0.500	0.0059
1.93	0.03	38.20	0.01	97	60	0.490	0.0056
1.96	0.03	38.20	0.01	95	60	0.480	0.0055
1.99	0.03	38.00	0.01	95	60	0.480	0.0055
2.02	0.03	38.00	0.01	98	60	0.495	0.0056
2.05	0.03	38.00	0.01	96	60	0.485	0.0055
2.08	0.03	38.00	0.01	93	60	0.470	0.0054
2.11	0.03	38.20	0.01	89	60	0.450	0.0052
2.14	0.03	38.30	0.01	88	60	0.445	0.0051
2.17	0.03	38.10	0.01	84	60	0.425	0.0049
2.20	0.03	38.20	0.01	77	60	0.391	0.0045
2.23	0.03	29.90	0.01	67	60	0.341	0.0031
2.26	0.03	38.00	0.01	47	60	0.242	0.0028
2.29	0.03	28.00	0.01	30	60	0.157	0.0013
2.32	0.02	16.30	0.00	18	60	0.098	0.0004
2.34	0.05	12.00	0.01	16	60	0.088	0.0005
2.41	0.05	2.50	0.00	3	60	0.023	0.0000
2.43	0.01	0.00	0.00	0	60	0.009	0.0000
TOTAL	**0.73**						**0.088**

MINI METRE

STATION:	BURR 2036			STAFF GAUGE: 0.192 m		SENSOR: 0.154 m	
DATE:	May 29, 1998 @ 12.23 PST			PARTY:	SM and AC		
DISTANCE (m)	WIDTH (m)	WATER DEPTH (cm)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
1.59	0.03	0.00	0.00	0	60	0.009	0.0000
1.65	0.05	18.00	0.01	130	60	0.654	0.0065
1.70	0.05	18.00	0.01	106	60	0.535	0.0048
1.75	0.05	16.00	0.01	72	60	0.366	0.0029
1.80	0.05	15.00	0.01	78	60	0.396	0.0030
1.85	0.05	15.00	0.01	74	60	0.376	0.0028
1.90	0.05	15.00	0.01	84	60	0.425	0.0032
1.95	0.05	16.00	0.01	84	60	0.425	0.0034
2.00	0.05	16.00	0.01	68	60	0.346	0.0028
2.05	0.05	16.00	0.01	60	60	0.306	0.0027
2.11	0.03	0.00	0.00	0	60	0.009	0.0000
TOTAL	0.52						0.032

MINI METRE

STATION:	BURR 2036 (Site 9A)			STAFF GAUGE: 0.161 m			SENSOR: 0.122 m
DATE:	June 17, 1998 @ 12.58 PST			PARTY:	SM		
DISTANCE (m)	**WIDTH (m)**	**WATER DEPTH (cm)**	**AREA (m2)**	**REVOLUTIONS**	**TIME (sec)**	**VELOCITY (m/s)**	**DISCHARGE (m3/s)**
1.50	0.03	0.00	0.0000	0	60	0.009	0.0000
1.55	0.05	14.00	0.0070	132	60	0.664	0.0046
1.60	0.05	15.00	0.0075	102	60	0.515	0.0039
1.65	0.05	16.00	0.0080	88	60	0.445	0.0036
1.70	0.05	14.00	0.0070	76	60	0.386	0.0027
1.75	0.05	12.00	0.0060	40	60	0.207	0.0012
1.80	0.05	12.00	0.0060	40	60	0.207	0.0012
1.85	0.05	12.00	0.0060	40	60	0.207	0.0012
1.90	0.05	14.00	0.0070	10	60	0.058	0.0004
1.95	0.04	12.00	0.0048	8	60	0.048	0.0002
1.98	0.02	0.00	0.0000	0	60	0.009	0.0000
TOTAL	**0.48**						**0.019**

MINI METRE

STATION:	Burr - Station 2036			STAFF GAUGE: 0.16			SENSOR: 0.122
DATE:	July 22, 1998 @ 12:12 PST			PARTY:		Shane Moore	
DISTANCE (m)	WIDTH (m)	WATER DEPTH (cm)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
1.42	0.02	0.0	0.00	0	60	0.009	0.0000
1.45	0.04	11.2	0.00	21	60	0.113	0.0005
1.50	0.05	11.0	0.01	54	60	0.277	0.0015
1.55	0.05	11.4	0.01	106	60	0.535	0.0030
1.60	0.05	11.5	0.01	113	60	0.569	0.0033
1.65	0.05	11.0	0.01	112	60	0.564	0.0031
1.70	0.05	11.0	0.01	79	60	0.401	0.0022
1.75	0.05	10.0	0.01	60	60	0.306	0.0015
1.80	0.05	10.0	0.01	30	60	0.157	0.0008
1.85	0.05	9.5	0.00	25	60	0.133	0.0006
1.90	0.05	9.0	0.00	6	60	0.038	0.0002
1.95	0.06	9.0	0.01	2	60	0.018	0.0001
2.02	0.04	0.0	0.00	0	60	0.009	0.0000
TOTAL	**0.6**						**0.0169**

MINI METRE

STATION:	Burr - Station 2036			STAFF GAUGE:	0.13	SENSOR:	0.088
DATE:	Oct 24, 1998 @ 15:18 PST			PARTY:	MM-SM-VP-AP		
DISTANCE (m)	**WIDTH (m)**	**WATER DEPTH (cm)**	**AREA (m2)**	**REVOLUTIONS**	**TIME (sec)**	**VELOCITY (m/s)**	**DISCHARGE (m3/s)**
1.74	0.03	0.0	0.00	0	60	0.009	0.0000
1.80	0.06	5.0	0.00	28	60	0.148	0.0004
1.85	0.04	6.3	0.00	15	60	0.083	0.0002
1.88	0.03	6.2	0.00	18	60	0.098	0.0002
1.90	0.03	6.4	0.00	31	60	0.162	0.0003
1.93	0.02	6.6	0.00	21	60	0.113	0.0002
1.95	0.03	6.5	0.00	24	60	0.128	0.0002
1.98	0.03	6.5	0.00	45	60	0.232	0.0004
2.00	0.02	5.7	0.00	40	60	0.207	0.0003
2.03	0.02	5.8	0.00	62	60	0.316	0.0005
2.05	0.03	5.0	0.00	28	60	0.148	0.0002
2.08	0.03	5.0	0.00	58	60	0.296	0.0004
2.10	0.02	3.9	0.00	21	60	0.113	0.0001
2.13	0.02	5.0	0.00	0	60	0.009	0.0000
2.15	0.04	4.1	0.00	0	60	0.009	0.0000
2.20	0.06	3.8	0.00	5	60	0.033	0.0001
2.28	0.04	0.0	0.00	0	60	0.009	0.0000
TOTAL	**0.54**						**0.0033**

MINI METRE

Appendix 2

APPENDIX 2

STREAM DISCHARGE MEASUREMENTS: DAM

STATION:	DAM - 1154			STAFF GAUGE: 0.559 m			SENSOR: n/a
DATE:	May 2, 1998 @ 19:05 PST			PARTY:	M. Miles and Shane Moore		
DISTANCE (cm)	**WIDTH (cm)**	**WATER DEPTH (cm)**	**AREA (m2)**	**REVOLUTIONS**	**TIME (sec)**	**VELOCITY (m/s)**	**DISCHARGE (m3/s)**
6.00	5.00	10.0	0.01	137	60	0.688	0.0034
16.00	10.00	10.0	0.01	89	60	0.450	0.0045
26.00	9.50	10.0	0.01	83	60	0.420	0.0040
35.00	9.50	9.0	0.01	70	60	0.356	0.0030
45.00	12.50	9.0	0.01	70	60	0.356	0.0040
60.00	12.50	8.0	0.01	61	60	0.311	0.0031
70.00	10.00	8.0	0.01	60	60	0.306	0.0025
80.00	10.00	7.0	0.01	50	60	0.257	0.0018
90.00	10.00	7.0	0.01	50	60	0.257	0.0018
100.00	10.00	6.0	0.01	32	60	0.167	0.0010
110.00	17.50	6.0	0.01	32	60	0.167	0.0018
135.00	12.50	6.0	0.01	32	60	0.167	0.0013
TOTAL	**129**						**0.032**

MINI METRE

STATION:	DAM - 1154			STAFF GAUGE: 0.54 m		SENSOR: 0.492 m	
DATE:	May 3, 1998 @ 18.26 PST			PARTY:	M. Miles and Shane Moore		
DISTANCE (m)	WIDTH (m)	WATER DEPTH (cm)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
1.10	0.02	0.0	0.00	0	60	0.009	0.0000
1.15	0.05	14.0	0.01	53	60	0.272	0.0019
1.20	0.05	14.0	0.01	54	60	0.277	0.0019
1.25	0.05	15.0	0.01	70	60	0.356	0.0027
1.30	0.05	15.0	0.01	60	60	0.306	0.0023
1.35	0.05	18.0	0.01	68	60	0.346	0.0031
1.40	0.05	17.0	0.01	85	60	0.430	0.0037
1.45	0.05	15.0	0.01	92	60	0.465	0.0035
1.50	0.05	15.0	0.01	66	60	0.336	0.0025
1.55	0.05	14.0	0.01	55	60	0.282	0.0020
1.60	0.05	13.0	0.01	38	60	0.197	0.0013
1.65	0.05	13.0	0.01	43	60	0.222	0.0014
1.70	0.05	13.0	0.01	6	60	0.038	0.0002
1.75	0.05	12.0	0.01	13	60	0.073	0.0004
1.80	0.04	10.0	0.00	5	60	0.033	0.0001
1.82	0.01	0.0	0.00	0	60	0.009	0.0000
TOTAL	**0.72**						**0.027**

MINI METRE

STATION:	DAM - 1154			STAFF GAUGE: 0.531 m		SENSOR: 0.489 m	
DATE:	May 4, 1998 @ 12:32 PST			PARTY:	M. Miles and Shane Moore		
DISTANCE (m)	WIDTH (m)	WATER DEPTH (cm)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
0.65	0.02	0.0	0.00	0	60	0.009	0.0000
0.70	0.05	13.0	0.01	24	60	0.128	0.0008
0.75	0.05	12.0	0.01	33	60	0.172	0.0010
0.80	0.05	13.0	0.01	26	60	0.138	0.0009
0.85	0.05	14.0	0.01	35	60	0.182	0.0013
0.90	0.05	14.0	0.01	69	60	0.351	0.0025
0.95	0.05	16.0	0.01	56	60	0.286	0.0023
1.00	0.05	16.0	0.01	59	60	0.301	0.0024
1.05	0.05	14.0	0.01	72	60	0.366	0.0026
1.10	0.05	14.0	0.01	22	60	0.118	0.0008
1.15	0.05	13.0	0.01	35	60	0.182	0.0012
1.20	0.05	12.0	0.01	47	60	0.242	0.0015
1.25	0.05	12.0	0.01	22	60	0.118	0.0007
1.30	0.05	11.0	0.01	5	60	0.033	0.0002
1.35	0.05	10.0	0.00	0	60	0.009	0.0000
1.40	0.02	0.0	0.00	0	60	0.009	0.0000
TOTAL	**0.75**						**0.018**

MINI METRE

STATION:	DAM - 1154			STAFF GAUGE: 0.526 m		SENSOR: 0.483 m	
DATE:	May 5, 1998 @ 13:05 PST			PARTY:	Shane Moore		
DISTANCE (m)	WIDTH (m)	WATER DEPTH (cm)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
0.60	0.03	0.0	0.00	0	60	0.009	0.0000
0.65	0.05	11.0	0.01	21	60	0.113	0.0006
0.70	0.05	11.0	0.01	30	60	0.157	0.0009
0.75	0.05	13.0	0.01	25	60	0.133	0.0009
0.80	0.05	14.0	0.01	33	60	0.172	0.0012
0.85	0.05	15.0	0.01	45	60	0.232	0.0017
0.90	0.05	15.0	0.01	50	60	0.257	0.0019
0.95	0.05	14.0	0.01	51	60	0.262	0.0018
1.00	0.05	14.0	0.01	62	60	0.316	0.0022
1.05	0.05	13.0	0.01	30	60	0.157	0.0010
1.10	0.05	14.0	0.01	35	60	0.182	0.0013
1.15	0.05	12.0	0.01	42	60	0.217	0.0013
1.20	0.05	11.0	0.01	21	60	0.113	0.0006
1.25	0.05	10.0	0.01	3	60	0.023	0.0001
1.30	0.06	9.0	0.01	0	60	0.009	0.0000
1.38	0.04	0.0	0.00	0	60	0.009	0.0000
TOTAL	0.78						0.016

MINI METRE

STATION:	DAM - 1154			STAFF GAUGE: 0.508 m		SENSOR: 0.468 m	
DATE:	May 13, 1998 @ 18:20 PST			PARTY:	Sandy Gibbins & Mike Miles		
DISTANCE (m)	WIDTH (m)	WATER DEPTH (cm)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
0.64	0.03	0.0	0.00	0	60	0.009	0.0000
0.70	0.04	9.0	0.00	6	60	0.038	0.0002
0.73	0.03	9.2	0.00	1	60	0.013	0.0000
0.76	0.03	8.9	0.00	10	60	0.058	0.0002
0.79	0.03	9.0	0.00	10	60	0.058	0.0002
0.82	0.03	9.3	0.00	18	60	0.098	0.0003
0.85	0.03	9.8	0.00	21	60	0.113	0.0003
0.88	0.03	10.8	0.00	22	60	0.118	0.0004
0.91	0.03	11.9	0.00	26	60	0.138	0.0005
0.94	0.03	14.0	0.00	32	60	0.167	0.0007
0.97	0.03	14.0	0.00	47	60	0.242	0.0010
1.00	0.03	14.4	0.00	57	60	0.291	0.0013
1.03	0.03	12.5	0.00	62	60	0.316	0.0012
1.06	0.03	15.5	0.00	61	60	0.311	0.0014
1.09	0.03	12.0	0.00	55	60	0.282	0.0010
1.12	0.03	8.8	0.00	50	60	0.257	0.0007
1.15	0.03	8.9	0.00	42	60	0.217	0.0006
1.18	0.03	8.5	0.00	43	60	0.222	0.0006
1.21	0.03	8.6	0.00	49	60	0.252	0.0006
1.24	0.03	7.3	0.00	61	60	0.311	0.0007
1.27	0.03	8.3	0.00	63	60	0.321	0.0008
1.30	0.03	8.2	0.00	30	60	0.157	0.0004
1.33	0.03	7.4	0.00	13	60	0.073	0.0001
1.35	0.03	7.0	0.00	6	60	0.038	0.0001
1.40	0.02	0.0	0.00	0	60	0.009	0.0000
TOTAL	**0.76**						**0.013**

MINI METRE

STATION: DAM - 1154				STAFF GAUGE: 0.492 m			SENSOR: 0.459 m
DATE:	May 29, 1998 @ 11:39 PST			PARTY: SM & AC			
DISTANCE (m)	WIDTH (m)	WATER DEPTH (cm)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
0.78	0.01	0.0	0.000	0	60	0.009	0.0000
0.80	0.03	5.0	0.002	6	60	0.038	0.0001
0.85	0.05	6.0	0.003	1	60	0.013	0.0000
0.90	0.05	6.0	0.003	10	60	0.058	0.0002
0.95	0.05	6.0	0.003	10	60	0.058	0.0002
1.00	0.05	8.0	0.004	18	60	0.098	0.0004
1.05	0.05	9.5	0.005	21	60	0.113	0.0005
1.10	0.05	8.0	0.004	22	60	0.118	0.0005
1.15	0.05	8.0	0.004	26	60	0.138	0.0006
1.20	0.05	6.0	0.003	32	60	0.167	0.0005
1.25	0.05	5.0	0.003	47	60	0.242	0.0006
1.30	0.05	6.0	0.003	57	60	0.291	0.0009
1.35	0.05	4.8	0.002	62	60	0.316	0.0008
1.40	0.05	4.0	0.002	61	60	0.311	0.0006
1.45	0.03	0.0	0.000	55	60	0.282	0.0000
TOTAL	0.67						0.006

MINI METRE

STATION: DAM - 1154				STAFF GAUGE: 0.492 m		SENSOR: 0.4565 m	
DATE:	June 18, 1998 @ 13:18 PST			PARTY:	CM, AB, AC, ML, WM,TS		
DISTANCE (m)	WIDTH (m)	WATER DEPTH (cm)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
0.61	0.04	0.0	0.000	0	60	0.009	0.0000
0.70	0.10	4.2	0.004	0	60	0.009	0.0000
0.80	0.10	6.0	0.006	2	60	0.018	0.0001
0.90	0.07	7.5	0.006	7	60	0.043	0.0002
0.95	0.05	5.0	0.003	4	60	0.028	0.0001
1.00	0.05	4.9	0.002	8	60	0.048	0.0001
1.05	0.05	4.4	0.002	21	60	0.113	0.0002
1.10	0.05	4.1	0.002	14	60	0.078	0.0002
1.15	0.05	3.0	0.001		60	0.009	0.0000
1.20	0.08	3.0	0.002		60	0.009	0.0000
1.30	0.60	0.0	0.000		60	0.009	0.0000
TOTAL	**1.24**						**0.0010**

MINI METRE

STATION:	Dam - Station 1154/1277			STAFF GAUGE: 0.4835		SENSOR: 0.4555	
DATE:	July 21, 1998 @ 15:03 PST			PARTY:		Shane Moore	
DISTANCE (m)	WIDTH (m)	WATER DEPTH (cm)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
0.63	0.04	0.0	0.00	0	60	0.009	0.0000
0.70	0.06	6.9	0.00	0	60	0.009	0.0000
0.75	0.05	7.0	0.00	1	60	0.013	0.0000
0.80	0.05	7.0	0.00	1	60	0.013	0.0000
0.85	0.05	7.9	0.00	2	60	0.018	0.0001
0.90	0.05	8.2	0.00	1	60	0.013	0.0001
0.95	0.05	7.9	0.00	10	60	0.058	0.0002
1.00	0.05	6.3	0.00	44	60	0.227	0.0007
1.05	0.05	5.1	0.00	16	60	0.088	0.0002
1.10	0.05	4.3	0.00	1	60	0.013	0.0000
1.15	0.05	4.0	0.00	1	60	0.013	0.0000
1.20	0.05	3.8	0.00	1	60	0.013	0.0000
1.25	0.05	3.0	0.00	1	60	0.013	0.0000
1.30	0.03	0.0	0.00	0	60	0.009	0.0000
TOTAL	**0.67**						**0.0015**

MINI METRE

Appendix 3

APPENDIX 3

STREAM DISCHARGE MEASUREMENTS: UPPER FORGE

STATION:	UPPER FORGE			STAFF GAUGE: 0.529 m		SENSOR: n/a	
DATE:	May 2, 1998 @ 14:28 PST			PARTY:	Mike Miles and Shane Moore		
DISTANCE (m)	**WIDTH** (m)	**WATER DEPTH** (m)	**AREA** (m2)	**REVOLUTIONS**	**TIME** (sec)	**VELOCITY** (m/s)	**DISCHARGE** (m3/s)
1.51	0.02	0.00	0.00	0	60	0.006	0.0000
1.55	0.05	0.26	0.01	7	60	0.084	0.0010
1.60	0.07	0.25	0.02	8	60	0.095	0.0018
1.70	0.10	0.28	0.03	10	60	0.117	0.0033
1.80	0.10	0.30	0.03	36	60	0.405	0.0121
1.90	0.10	0.30	0.03	28	60	0.316	0.0095
2.00	0.10	0.25	0.03	37	60	0.416	0.0104
2.10	0.10	0.25	0.03	25	60	0.283	0.0071
2.20	0.10	0.24	0.02	24	60	0.272	0.0065
2.30	0.10	0.23	0.02	36	60	0.405	0.0093
2.40	0.10	0.23	0.02	40	60	0.450	0.0104
2.50	0.10	0.20	0.02	30	60	0.338	0.0068
2.60	0.10	0.20	0.02	40	60	0.450	0.0090
2.70	0.10	0.26	0.03	28	60	0.316	0.0082
2.80	0.10	0.22	0.02	28	60	0.316	0.0070
2.90	0.10	0.22	0.02	29	60	0.327	0.0072
3.00	0.10	0.20	0.02	23	60	0.261	0.0052
3.10	0.10	0.22	0.02	12	60	0.139	0.0031
3.20	0.07	0.18	0.01	8	60	0.095	0.0013
3.25	0.02	0.00	0.00	0	60	0.006	0.0000
TOTAL	**1.74**						**0.119**

PRICE AA METRE

STATION:	UPPER FORGE			STAFF GAUGE: 0.558 m		SENSOR: 0.537 m	
DATE:	May 3, 1998 @ 14:29 PST			PARTY:	Mike Miles and Shane Moore		
DISTANCE (m)	**WIDTH (m)**	**WATER DEPTH (m)**	**AREA (m2)**	**REVOLUTIONS**	**TIME (sec)**	**VELOCITY (m/s)**	**DISCHARGE (m3/s)**
1.20	0.05	0.00	0.00	0	60	0.006	0.0000
1.30	0.10	0.38	0.04	8	60	0.095	0.0036
1.40	0.10	0.38	0.04	14	60	0.161	0.0061
1.50	0.10	0.38	0.04	26	60	0.294	0.0112
1.60	0.10	0.39	0.04	34	60	0.383	0.0149
1.70	0.10	0.40	0.04	40	60	0.450	0.0180
1.80	0.10	0.37	0.04	34	60	0.383	0.0142
1.90	0.10	0.35	0.03	32	60	0.360	0.0126
2.00	0.10	0.32	0.03	26	60	0.294	0.0094
2.10	0.10	0.30	0.03	20	60	0.228	0.0068
2.20	0.10	0.30	0.03	28	60	0.316	0.0095
2.30	0.10	0.30	0.03	30	60	0.338	0.0101
2.40	0.10	0.28	0.03	22	60	0.250	0.0070
2.50	0.10	0.26	0.03	10	60	0.117	0.0030
2.60	0.10	0.25	0.03	14	60	0.161	0.0040
2.70	0.10	0.22	0.02	10	60	0.117	0.0026
2.80	0.10	0.24	0.02	2	60	0.028	0.0007
2.90	0.10	0.20	0.02	2	60	0.028	0.0006
3.00	0.05	0.00	0.00	0	60	0.006	0.0000
TOTAL	**1.80**						**0.134**

PRICE AA METRE

STATION:	UPPER FORGE			STAFF GAUGE: 0.556 m		SENSOR: 0.538 m	
DATE:	May 4, 1998 @ 09:26 PST			PARTY:	Mike Miles and Shane Moore		
DISTANCE (m)	WIDTH (m)	WATER DEPTH (m)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
1.17	0.02	0.00	0.00	0	60	0.006	0.0000
1.20	0.07	0.30	0.02	5	60	0.061	0.0012
1.30	0.10	0.37	0.04	10	60	0.117	0.0043
1.40	0.10	0.38	0.04	14	60	0.161	0.0061
1.50	0.10	0.39	0.04	23	60	0.261	0.0102
1.60	0.10	0.39	0.04	42	60	0.472	0.0184
1.70	0.10	0.40	0.04	36	60	0.405	0.0162
1.80	0.10	0.38	0.04	25	60	0.283	0.0108
1.90	0.10	0.36	0.04	25	60	0.283	0.0102
2.00	0.10	0.32	0.03	26	60	0.294	0.0094
2.10	0.10	0.31	0.03	36	60	0.405	0.0125
2.20	0.10	0.29	0.03	33	60	0.372	0.0108
2.30	0.10	0.25	0.02	28	60	0.316	0.0079
2.40	0.10	0.22	0.02	18	60	0.205	0.0045
2.50	0.10	0.23	0.02	16	60	0.183	0.0042
2.60	0.10	0.22	0.02	6	60	0.073	0.0016
2.70	0.10	0.21	0.02	2	60	0.028	0.0006
2.80	0.10	0.21	0.02	0	60	0.006	0.0001
2.90	0.08	0.19	0.01	0	60	0.006	0.0001
2.95	0.03	0.00	0.00	0	60	0.006	0.0000
TOTAL	**1.78**						**0.129**

PRICE AA METRE

STATION:	UPPER FORGE			STAFF GAUGE: 0.529 m		SENSOR: 0.513 m	
DATE:	May 5, 1998 @ 15:43 PST			PARTY:	Shane Moore		
DISTANCE (m)	**WIDTH (m)**	**WATER DEPTH (m)**	**AREA (m2)**	**REVOLUTIONS**	**TIME (sec)**	**VELOCITY (m/s)**	**DISCHARGE (m3/s)**
1.20	0.05	0.00	0.00	0	60	0.006	0.0000
1.30	0.10	0.28	0.03	4	60	0.050	0.0014
1.40	0.10	0.35	0.03	8	60	0.095	0.0033
1.50	0.10	0.36	0.04	15	60	0.172	0.0062
1.60	0.10	0.40	0.04	21	60	0.239	0.0095
1.70	0.10	0.38	0.04	35	60	0.394	0.0150
1.80	0.10	0.40	0.04	40	60	0.450	0.0180
1.90	0.10	0.35	0.03	30	60	0.338	0.0118
2.00	0.10	0.37	0.04	28	60	0.316	0.0117
2.10	0.10	0.30	0.03	25	60	0.283	0.0085
2.20	0.10	0.30	0.03	31	60	0.349	0.0105
2.30	0.10	0.30	0.03	30	60	0.338	0.0101
2.40	0.10	0.25	0.03	28	60	0.316	0.0079
2.50	0.10	0.21	0.02	17	60	0.194	0.0041
2.60	0.10	0.22	0.02	16	60	0.183	0.0040
2.70	0.10	0.21	0.02	4	60	0.050	0.0011
2.80	0.10	0.17	0.02	3	60	0.039	0.0007
2.90	0.05	0.00	0.00	0	60	0.006	0.0000
TOTAL	**1.7**						**0.124**

PRICE AA METRE

STATION:	UPPER FORGE - 1153			STAFF GAUGE: 0.427 m		SENSOR: 0.402 m	
DATE:	May 13, 1998 @ 12:44 PST			PARTY:	Sandy Gibbins & Mike Miles		
DISTANCE (m)	WIDTH (m)	WATER DEPTH (cm)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
1.50	0.03	0.0	0.00	0	60	0.009	0.0000
1.56	0.05	5.8	0.00	20	60	0.108	0.0003
1.60	0.04	7.3	0.00	62	60	0.316	0.0010
1.65	0.05	7.5	0.00	68	60	0.346	0.0013
1.70	0.05	9.3	0.00	70	60	0.356	0.0017
1.75	0.05	9.7	0.00	74	60	0.376	0.0018
1.80	0.05	9.7	0.00	47	60	0.242	0.0012
1.85	0.05	10.2	0.01	66	60	0.336	0.0017
1.90	0.05	10.4	0.01	80	60	0.406	0.0021
1.95	0.05	9.7	0.00	90	60	0.455	0.0022
2.00	0.05	10.0	0.00	98	60	0.495	0.0025
2.05	0.05	9.5	0.00	94	60	0.475	0.0023
2.10	0.05	10.1	0.01	75	60	0.381	0.0019
2.15	0.05	10.0	0.01	72	60	0.366	0.0018
2.20	0.05	10.5	0.01	86	60	0.435	0.0023
2.25	0.05	10.3	0.01	62	60	0.316	0.0016
2.30	0.05	10.5	0.01	62	60	0.316	0.0017
2.35	0.05	12.0	0.01	80	60	0.406	0.0024
2.40	0.05	12.5	0.01	73	60	0.371	0.0023
2.45	0.05	12.2	0.01	64	60	0.326	0.0020
2.50	0.05	11.9	0.01	79	60	0.401	0.0024
2.55	0.05	12.0	0.01	77	60	0.391	0.0023
2.60	0.05	12.4	0.01	79	60	0.401	0.0025
2.65	0.05	11.9	0.01	70	60	0.356	0.0021
2.70	0.05	11.5	0.01	67	60	0.341	0.0020
2.75	0.05	11.0	0.01	33	60	0.172	0.0009
2.80	0.05	10.5	0.01	30	60	0.157	0.0008
2.85	0.04	9.3	0.00	20	60	0.108	0.0004
2.87	0.04	9.0	0.00	10	60	0.058	0.0002
2.94	0.03	0.0	0.00	0	60	0.009	0.0000
TOTAL	1.44						0.048

MINI METRE

STATION:	UPPER FORGE - 1153			STAFF GAUGE: 0.423 m		SENSOR: 0.401 m	
DATE:	May 13, 1998 @ 14:42 PST			PARTY:	Sandy Gibbins & Mike Miles		
DISTANCE (m)	WIDTH (m)	WATER DEPTH (cm)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
1.50	0.09	0.00	0.00	0	60	0.006	0.0000
1.68	0.10	5.50	0.01	30	60	0.338	0.0019
1.70	0.04	7.30	0.00	33	60	0.372	0.0009
1.75	0.05	7.40	0.00	32	60	0.360	0.0013
1.80	0.05	7.90	0.00	16	60	0.183	0.0007
1.85	0.05	7.40	0.00	37	60	0.416	0.0015
1.90	0.05	7.70	0.00	39	60	0.438	0.0017
1.95	0.05	8.40	0.00	39	60	0.438	0.0018
2.00	0.05	8.40	0.00	33	60	0.372	0.0016
2.05	0.05	7.70	0.00	27	60	0.305	0.0012
2.10	0.05	8.30	0.00	29	60	0.327	0.0014
2.15	0.05	9.50	0.00	36	60	0.405	0.0019
2.20	0.05	9.90	0.00	38	60	0.427	0.0021
2.25	0.05	9.80	0.00	39	60	0.438	0.0021
2.30	0.05	10.00	0.01	37	60	0.416	0.0021
2.35	0.05	10.90	0.01	38	60	0.427	0.0023
2.40	0.05	10.80	0.01	26	60	0.294	0.0016
2.45	0.05	10.90	0.01	30	60	0.338	0.0018
2.50	0.05	11.10	0.01	40	60	0.450	0.0025
2.55	0.05	11.40	0.01	40	60	0.450	0.0026
2.60	0.05	11.50	0.01	36	60	0.405	0.0023
2.65	0.05	10.80	0.01	30	60	0.338	0.0018
2.70	0.05	10.80	0.01	25	60	0.283	0.0015
2.75	0.05	10.20	0.01	14	60	0.161	0.0008
2.80	0.04	8.50	0.00	13	60	0.150	0.0005
2.83	0.06	8.80	0.01	7	60	0.084	0.0004
2.92	0.04	0.00	0.00	0	60	0.006	0.0000
TOTAL	1.42						0.041

PRICE AA METRE

STATION:	UPPER FORGE - 1153			STAFF GAUGE: 0.341 m			SENSOR: 0.320 m
DATE:	May 29, 1998 @ 10:54 PST			PARTY:	Shane Moore		
DISTANCE (m)	WIDTH (m)	WATER DEPTH (cm)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
1.25	0.05	0.0	0.00	0	60	0.009	0.0000
1.35	0.07	15.7	0.01	51	60	0.262	0.0031
1.40	0.07	15.8	0.01	5	60	0.033	0.0004
1.50	0.10	16.0	0.02	2	60	0.018	0.0003
1.60	0.10	15.8	0.02	9	60	0.053	0.0008
1.70	0.10	16.0	0.02	12	60	0.068	0.0011
1.80	0.10	14.5	0.01	7	60	0.043	0.0006
1.90	0.10	13.0	0.01	12	60	0.068	0.0009
2.00	0.10	7.5	0.01	39	60	0.202	0.0015
2.10	0.10	4.1	0.00	86	60	0.435	0.0018
2.20	0.10	3.5	0.00	80	60	0.406	0.0014
2.30	0.10	3.2	0.00	112	60	0.564	0.0018
2.40	0.10	3.8	0.00	95	60	0.480	0.0018
2.50	0.10	3.8	0.00	64	60	0.326	0.0012
2.60	0.10	4.0	0.00	50	60	0.257	0.0010
2.70	0.10	3.0	0.00	44	60	0.227	0.0007
2.80	0.15	0.0	0.00	10	60	0.058	0.0000
3.00	1.40	12.0	0.17	0	60	0.009	0.0014
TOTAL	3.05						0.020

MINI METRE

STATION:	Upper Forge - Station 1153			**STAFF GAUGE:** 0.297			**SENSOR:** 0.273
DATE:	June 18, 1998 @ 16:47 PST			PARTY:		Shane Moore	
DISTANCE (m)	**WIDTH** (m)	**WATER DEPTH** (cm)	**AREA** (m2)	**REVOLUTIONS**	**TIME** (sec)	**VELOCITY** (m/s)	**DISCHARGE** (m3/s)
0.52	0.02	0.0	0.00	0	60	0.009	0.0000
0.55	0.04	1.0	0.00	5	60	0.033	0.0000
0.60	0.05	2.5	0.00	10	60	0.058	0.0001
0.65	0.05	4.0	0.00	42	60	0.217	0.0004
0.70	0.05	4.2	0.00	60	60	0.306	0.0006
0.75	0.05	5.0	0.00	81	60	0.411	0.0010
0.80	0.05	7.4	0.00	159	60	0.798	0.0030
0.85	0.05	4.1	0.00	60	60	0.306	0.0006
0.90	0.04	4.0	0.00	5	60	0.033	0.0001
0.94	0.47	8.0	0.04	0	60	0.009	0.0003
TOTAL	**0.87**						**0.0061**

MINI METRE

STATION:	Upper Forge - Station 1153			STAFF GAUGE: 0.328			SENSOR: 0.3045
DATE:	July 23, 1998 @ 10:48 PST			PARTY:		Shane Moore	
DISTANCE (m)	WIDTH (m)	WATER DEPTH (cm)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
0.49	0.01	0.0	0.00	0	60	0.009	0.0000
0.50	0.03	5.0	0.00	25	60	0.133	0.0002
0.55	0.05	6.0	0.00	88	60	0.445	0.0013
0.60	0.05	6.1	0.00	52	60	0.267	0.0008
0.65	0.05	5.8	0.00	139	60	0.698	0.0020
0.70	0.05	5.6	0.00	170	60	0.852	0.0024
0.75	0.05	7.8	0.00	70	60	0.356	0.0014
0.80	0.05	7.7	0.00	38	60	0.197	0.0008
0.85	0.05	8.0	0.00	10	60	0.058	0.0002
0.90	0.05	8.0	0.00	21	60	0.113	0.0005
0.95	0.05	8.0	0.00	26	60	0.138	0.0006
1.00	0.05	6.0	0.00	15	60	0.083	0.0002
1.05	0.07	3.8	0.00	2	60	0.018	0.0000
1.14	0.04	0.0	0.00	0	60	0.009	0.0000
TOTAL	**0.65**						**0.0104**

MINI METRE

Upper Forge - Station 1153				STAFF GAUGE:		SENSOR:			0.267
DATE:	Oct 25, 1998 @ 09:42 PST			PARTY:		MM & SM			
DISTANCE (cm)	WIDTH (cm)	WATER DEPTH (cm)	AREA (cm2)	DISTANCE (cm)	TIME (sec)	SURFACE VELOCITY (cm/s)	AVERAGE VELOCITY (cm/s)	INTERPOLATED VELOCITY (cm/s)	DISCHARGE (L/s)
0.00	0.50	0.0	0.00			0.000	0.000	0.000	0.0000
1.00	1.00	0.4	0.40					7.968	0.0032
2.00	1.00	0.8	0.80	40	2.008	19.920	15.936	15.936	0.0127
3.00	1.00	1.6	1.60					22.978	0.0368
4.00	1.00	2.0	2.00	40	1.066	37.523	30.019	30.019	0.0600
5.00	1.00	2.1	2.10					30.394	0.0638
6.00	1.00	2.3	2.30					30.769	0.0708
7.00	1.00	3.2	3.20	40	1.028	38.929	31.144	31.144	0.0997
8.00	1.00	2.7	2.70					30.293	0.0818
9.00	1.00	3.0	3.00					29.443	0.0883
10.00	1.00	2.9	2.90					28.592	0.0829
11.00	1.00	2.7	2.70					27.742	0.0749
12.00	1.00	2.1	2.10	40	1.190	33.613	26.891	26.891	0.0565
13.00	1.00	2.6	2.60					27.207	0.0707
14.00	1.00	2.7	2.70					27.523	0.0743
15.00	1.00	3.4	3.40					27.838	0.0947
16.00	1.00	2.6	2.60					28.154	0.0732
17.00	1.00	2.3	2.30	40	1.124	35.587	28.470	28.470	0.0655
18.00	1.00	2.3	2.30					27.724	0.0638
19.00	1.00	2.0	2.00					26.979	0.0540
20.00	1.00	2.0	2.00					26.233	0.0525
21.00	1.00	2.0	2.00					25.488	0.0510
22.00	1.00	1.6	1.60	40	1.293	30.928	24.742	24.742	0.0396
23.00	1.00	1.1	1.10					12.371	0.0136
24.00	0.50	0.0	0.00					0.000	0.0000
TOTAL	24								1.3841

STATION:	Upper Forge - Station 1153			STAFF GAUGE: 0.398		SENSOR: 0.345	
DATE:	May 12, 2001 @ 13:36 PST			PARTY:	Sandy Gibbins & Mike Miles		
DISTANCE (m)	WIDTH (m)	WATER DEPTH (cm)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
2.10	0.02	21.5	0.01	47	60	0.242	0.0013
2.15	0.06	19.0	0.01	33	60	0.172	0.0020
2.22	0.07	19.0	0.01	3	60	0.023	0.0003
2.29	0.07	19.0	0.01	6	60	0.038	0.0005
2.36	0.07	17.0	0.01	7	60	0.043	0.0005
2.43	0.07	13.2	0.01	11	60	0.063	0.0006
2.50	0.07	14.2	0.01	16	60	0.088	0.0009
2.57	0.06	12.5	0.01	46	60	0.237	0.0019
2.63	0.07	10.5	0.01	37	60	0.192	0.0013
2.70	0.08	10.5	0.01	65	60	0.331	0.0026
2.78	0.08	9.0	0.01	40	60	0.207	0.0015
2.86	0.08	6.5	0.01	68	60	0.346	0.0018
2.94	0.08	5.0	0.00	79	60	0.401	0.0016
3.02	0.08	6.5	0.00	121	60	0.609	0.0026
3.10	0.08	7.0	0.00	111	61	0.550	0.0000
3.18	0.08	7.0	0.00	129	62	0.628	0.0000
3.26	0.08	5.0	0.00	137	63	0.656	0.0000
3.34	0.08	7.0	0.00	82	64	0.390	0.0000
3.42	0.08	8.5	0.00	110	65	0.512	0.0000
3.50	0.08	7.5	0.00	75	66	0.347	0.0000
3.58	0.08	8.0	0.14	56	67	0.257	0.0348
3.66	0.10	7.5	0.00	6	68	0.035	0.0000
3.79	0.06	8.0	0.00	0	69	0.009	0.0000
TOTAL	**1.69**						**0.0542**

MINI METRE

Appendix 4

APPENDIX 4

STREAM DISCHARGE MEASUREMENTS: LOWER FORGE

STATION: FORGE				STAFF GAUGE: 0.689 m		SENSOR: 0.660 m	
DATE:	May 4, 1998 @ 19.02 PST			PARTY:	Mike Miles and Shane Moore		
DISTANCE (m)	WIDTH (m)	WATER DEPTH (m)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
1.20	0.05	0.00	0.00	0	60	0.006	0.0000
1.30	0.10	0.14	0.01	0	60	0.006	0.0001
1.40	0.10	0.16	0.02	0	60	0.006	0.0001
1.50	0.10	0.16	0.02	1	60	0.017	0.0003
1.60	0.10	0.19	0.02	10	60	0.117	0.0022
1.70	0.10	0.23	0.02	28	60	0.316	0.0073
1.80	0.10	0.24	0.02	18	60	0.205	0.0049
1.90	0.10	0.26	0.03	36	60	0.405	0.0105
2.00	0.10	0.27	0.03	56	60	0.626	0.0169
2.10	0.10	0.29	0.03	64	60	0.715	0.0207
2.20	0.10	0.29	0.03	53	60	0.593	0.0172
2.30	0.10	0.31	0.03	71	60	0.792	0.0245
2.40	0.10	0.31	0.03	82	60	0.913	0.0283
2.50	0.10	0.31	0.03	47	60	0.527	0.0163
2.60	0.10	0.29	0.03	32	60	0.360	0.0105
2.70	0.10	0.29	0.03	41	60	0.461	0.0134
2.80	0.10	0.30	0.03	31	60	0.349	0.0105
2.90	0.10	0.30	0.03	21	60	0.239	0.0072
3.00	0.10	0.29	0.03	14	60	0.161	0.0047
3.10	0.10	0.29	0.03	11	60	0.128	0.0037
3.20	0.10	0.29	0.03	4	60	0.050	0.0015
3.30	0.10	0.29	0.03	5	60	0.061	0.0018
3.40	0.10	0.30	0.03	3	60	0.039	0.0012
3.50	0.10	0.23	0.02	3	60	0.039	0.0009
3.60	0.15	0.15	0.02	2	60	0.028	0.0006
3.80	0.10	0.00	0.00	0	60	0.006	0.0000
TOTAL	**2.60**						**0.205**

PRICE AA METRE

STATION: FORGE				STAFF GAUGE: 0.660 m		SENSOR: 0.639 m	
DATE:	May 5, 1998 @ 10.15 PST			PARTY: Shane Moore			
DISTANCE (m)	**WIDTH (m)**	**WATER DEPTH (m)**	**AREA (m2)**	**REVOLUTIONS**	**TIME (sec)**	**VELOCITY (m/s)**	**DISCHARGE (m3/s)**
1.27	0.06	0.00	0.00	0	60	0.006	0.0000
1.40	0.17	0.14	0.02	13	60	0.150	0.0035
1.60	0.20	0.18	0.04	16	60	0.183	0.0066
1.80	0.20	0.21	0.04	52	60	0.582	0.0245
2.00	0.20	0.25	0.05	62	60	0.693	0.0346
2.20	0.20	0.25	0.05	73	60	0.814	0.0407
2.40	0.20	0.25	0.05	54	60	0.604	0.0302
2.60	0.20	0.27	0.05	25	60	0.283	0.0153
2.80	0.20	0.27	0.05	16	60	0.183	0.0099
3.00	0.20	0.25	0.05	24	60	0.272	0.0136
3.20	0.20	0.27	0.05	10	60	0.117	0.0063
3.40	0.20	0.24	0.05	2	60	0.028	0.0014
3.60	0.19	0.22	0.04	1	60	0.017	0.0007
3.78	0.09	0.00	0.00	0	60	0.006	0.0000
TOTAL	**2.51**						**0.187**

PRICE AA METRE

STATION: FORGE				STAFF GAUGE: 0.550 m		SENSOR: 0.512 m	
DATE:	May 14, 1998 @ 19.31 PST			PARTY:	Sandy Gibbins & Mike Miles		
DISTANCE (m)	WIDTH (m)	WATER DEPTH (cm)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
1.38	0.09	0.0	0.00	0	60	0.009	0.0000
1.55	0.11	3.8	0.00	0	60	0.009	0.0000
1.60	0.05	4.4	0.00	10	60	0.058	0.0001
1.65	0.05	6.6	0.00	13	60	0.073	0.0002
1.70	0.05	7.2	0.00	29	60	0.152	0.0005
1.75	0.05	7.8	0.00	22	60	0.118	0.0005
1.80	0.05	8.6	0.00	58	60	0.296	0.0013
1.85	0.05	9.7	0.00	88	60	0.445	0.0022
1.90	0.05	10.0	0.00	99	60	0.500	0.0025
1.95	0.05	10.4	0.01	85	60	0.430	0.0022
2.00	0.05	11.2	0.01	67	60	0.341	0.0019
2.05	0.05	14.0	0.01	61	60	0.311	0.0022
2.10	0.05	14.0	0.01	94	60	0.475	0.0033
2.15	0.05	13.3	0.01	71	60	0.361	0.0024
2.20	0.05	12.8	0.01	69	60	0.351	0.0022
2.25	0.05	12.4	0.01	62	60	0.316	0.0020
2.30	0.07	10.4	0.01	46	60	0.237	0.0018
2.40	0.10	12.2	0.01	111	60	0.559	0.0068
2.50	0.10	14.5	0.01	121	60	0.609	0.0088
2.60	0.10	13.0	0.01	92	60	0.465	0.0060
2.70	0.10	12.7	0.01	76	60	0.386	0.0049
2.80	0.10	12.3	0.01	78	60	0.396	0.0049
2.90	0.10	14.5	0.01	65	60	0.331	0.0048
3.00	0.10	14.5	0.01	92	60	0.465	0.0067
3.10	0.10	13.0	0.01	101	60	0.510	0.0066
3.20	0.10	13.8	0.01	105	60	0.530	0.0073
3.30	0.10	14.0	0.01	91	60	0.460	0.0064
3.40	0.10	14.5	0.01	69	60	0.351	0.0051
3.50	0.10	14.5	0.01	36	60	0.187	0.0027
3.60	0.10	14.2	0.01	14	60	0.078	0.0011
3.70	0.09	13.5	0.01	13	60	0.073	0.0009
3.78	0.04	0.0	0.00	0	60	0.009	0.0000
TOTAL	**2.4**						**0.099**

MINI METRE

STATION: FORGE				STAFF GAUGE: 0.450 m		SENSOR: 0.418 m	
DATE:	May 29, 1998 @ 08.57 PST			PARTY:	Shane Moore		
DISTANCE (m)	WIDTH (m)	WATER DEPTH (cm)	AREA (m2)	REVOLUTIONS	TIME (sec)	VELOCITY (m/s)	DISCHARGE (m3/s)
1.62	0.06	0.0	0.000	0	60	0.009	0.0000
1.75	0.09	5.5	0.005	64	60	0.326	0.0016
1.80	0.07	5.2	0.004	94	60	0.475	0.0019
1.90	0.10	3.6	0.004	40	60	0.207	0.0007
2.00	0.10	2.0	0.002	0	60	0.009	0.0000
2.10	0.10	5.8	0.006	406	60	2.024	0.0117
2.20	0.10	3.8	0.004	72	60	0.366	0.0014
2.30	0.10	3.5	0.003	66	60	0.336	0.0012
2.40	0.10	4.0	0.004	49	60	0.252	0.0010
2.50	0.10	4.2	0.004	132	60	0.664	0.0028
2.60	0.10	5.8	0.006	26	60	0.138	0.0008
2.70	0.10	5.0	0.005	48	60	0.247	0.0012
2.80	0.10	5.4	0.005	125	60	0.629	0.0034
2.90	0.10	5.0	0.005	80	60	0.406	0.0020
3.00	0.10	5.7	0.006	62	60	0.316	0.0018
3.10	0.10	6.0	0.006	124	60	0.624	0.0037
3.20	0.10	6.0	0.006	57	60	0.291	0.0017
3.30	0.10	6.0	0.006	57	60	0.291	0.0017
3.40	0.10	0.0	0.000	0	60	0.009	0.0000
3.50	0.10	4.0	0.004	52	60	0.267	0.0011
3.60	0.12	2.0	0.002	15	60	0.083	0.0002
3.73	0.06	0.0	0.000	0	60	0.009	0.0000
TOTAL	2.11						0.040

MINI METRE

STATION:	Forge - Station 2037			STAFF GAUGE: 0.6875		SENSOR: 0.365	
DATE:	June 16, 1998 @ 11:00 PST			PARTY:	Shane Moore		
DISTANCE (m)	**WIDTH** (m)	**WATER DEPTH** (cm)	**AREA** (m2)	**REVOLUTIONS**	**TIME** (sec)	**VELOCITY** (m/s)	**DISCHARGE** (m3/s)
0.72	0.02	0.0	0.00	0	60	0.009	0.0000
0.75	0.04	3.4	0.00	122	60	0.614	0.0008
0.80	0.05	4.1	0.00	112	60	0.564	0.0012
0.85	0.05	4.8	0.00	69	60	0.351	0.0008
0.90	0.05	5.2	0.00	68	60	0.346	0.0009
0.95	0.05	4.8	0.00	89	60	0.450	0.0011
1.00	0.08	5.4	0.00	64	60	0.326	0.0013
1.10	0.07	6.0	0.00	67	60	0.341	0.0015
1.15	0.05	6.2	0.00	53	60	0.272	0.0008
1.20	0.05	6.5	0.00	73	60	0.371	0.0012
1.25	0.05	7.9	0.00	46	60	0.237	0.0009
1.30	0.05	8.0	0.00	36	60	0.187	0.0007
1.35	0.05	8.1	0.00	22	60	0.118	0.0005
1.40	0.05	8.8	0.00	42	60	0.217	0.0010
1.45	0.05	8.0	0.00	70	60	0.356	0.0014
1.50	0.05	7.0	0.00	44	60	0.227	0.0008
1.55	0.06	9.1	0.01	18	60	0.098	0.0005
1.61	0.03	0.0	0.00	0	60	0.009	0.0000
TOTAL	**0.885**						**0.0155**

MINI METRE

STATION:	Forge - Station 2037			STAFF GAUGE: 0.3265		SENSOR: 0.309	
DATE:	July 23, 1998 @ 14:38 PST			PARTY:		Shane Moore	
DISTANCE (m)	**WIDTH** (m)	**WATER DEPTH** (cm)	**AREA** (m2)	**REVOLUTIONS**	**TIME** (sec)	**VELOCITY** (m/s)	**DISCHARGE** (m3/s)
0.68	0.03	0.0	0.00	0	60	0.009	0.0000
0.75	0.06	2.2	0.00	10	60	0.058	0.0001
0.80	0.05	3.0	0.00	74	60	0.376	0.0006
0.85	0.05	4.0	0.00	73	60	0.371	0.0007
0.90	0.05	4.3	0.00	60	60	0.306	0.0007
0.95	0.05	5.5	0.00	61	60	0.311	0.0009
1.00	0.05	6.0	0.00	21	60	0.113	0.0003
1.05	0.05	7.0	0.00	20	60	0.108	0.0004
1.10	0.05	9.0	0.00	34	60	0.177	0.0008
1.15	0.05	9.0	0.00	35	60	0.182	0.0008
1.20	0.05	8.5	0.00	41	60	0.212	0.0009
1.25	0.05	10.0	0.01	70	60	0.356	0.0018
1.30	0.05	11.0	0.01	69	60	0.351	0.0019
1.35	0.05	11.5	0.01	64	60	0.326	0.0019
1.40	0.05	11.0	0.01	23	60	0.123	0.0007
1.45	0.05	12.0	0.01	10	60	0.058	0.0003
1.50	0.03	0.0	0.00	0	60	0.009	0.0000
TOTAL	**0.82**						**0.0127**

MINI METRE

Lower Forge - Station 2037				STAFF GAUGE: 0.206		SENSOR:			0.194
DATE:	Oct 25, 1998 @ 12:57 PST			PARTY:		MM & SM			
ISTANCE (cm)	WIDTH (cm)	WATER DEPTH (cm)	AREA (cm2)	DISTANCE (cm)	TIME (sec)	SURFACE VELOCITY (cm/s)	AVERAGE VELOCITY (cm/s)	INTERPOLATED VELOCITY (cm/s)	DISCHARGE (L/s)
2.40	0.30	0.0	0.00			0.000	0.000	0.000	0.0000
3.00	0.80	0.2	0.16					3.000	0.0005
4.00	1.00	1.1	1.10					5.878	0.0065
5.00	1.00	1.8	1.80					8.755	0.0158
6.00	1.00	1.5	1.50					11.633	0.0174
7.00	1.00	1.6	1.60					14.511	0.0232
8.00	1.00	0.8	0.80					17.388	0.0139
9.00	1.00	0.5	0.50					20.266	0.0101
10.00	1.00	1.2	1.20	60	2.074	28.930	23.144	23.144	0.0278
11.00	1.00	2.0	2.00					24.001	0.0480
12.00	1.00	3.4	3.40					24.858	0.0845
13.00	1.00	4.0	4.00					25.715	0.1029
14.00	1.00	4.8	4.80					26.572	0.1275
15.00	1.00	5.0	5.00	60	1.750	34.286	27.429	27.429	0.1371
16.00	1.00	5.1	5.10					28.343	0.1445
17.00	1.00	4.2	4.20					29.257	0.1229
18.00	1.00	3.0	3.00					30.171	0.0905
19.00	1.00	3.1	3.10					31.085	0.0964
20.00	1.00	3.5	3.50	60	1.500	40.000	32.000	32.000	0.1120
21.00	1.00	3.0	3.00					30.922	0.0928
22.00	1.00	3.1	3.10					29.843	0.0925
23.00	1.00	3.0	2.98					28.765	0.0857
24.00	1.00	3.0	3.00					27.686	0.0831
25.00	1.00	3.0	3.00	60	1.804	33.259	26.608	26.608	0.0798
26.00	1.00	3.0	3.00					26.635	0.0799
27.00	1.00	2.8	2.80					26.661	0.0747
28.00	1.00	2.2	2.20					26.688	0.0587
29.00	1.00	2.4	2.40					26.714	0.0641
30.00	1.00	1.9	1.90	60	1.795	33.426	26.741	26.741	0.0508
31.00	1.00	1.5	1.50					26.042	0.0391
32.00	1.00	0.6	0.60					25.342	0.0152
33.00	1.00	0.5	0.50	60	1.978	30.329	24.263	24.263	0.0121
34.00	1.00	0.4	0.40					17.842	0.0071
35.00	1.00	1.1	1.10					11.421	0.0126
36.00	0.65	0.2	0.13					5.000	0.0006
36.30	0.15	0	0.00			0.000	0.000	0.000	0.0000
TOTAL	**33.9**								**2.0304**

M. Miles and Associates Ltd.
645 Island Road
Victoria, BC, Canada
V8S 2T7

Consultants in Hydrology, Geomorphology and Environmental Impact Mitigation

TO WHOM IT MAY CONCERN:

STATEMENT OF QUALIFICATIONS
MICHAEL JOHN MILES, M.Sc., P.Geo.

I, Michael Miles, received a B.Sc., from the University of British Columbia in 1972 and an M.Sc. in 1980. My masters degree was in the field of hydrology and fluvial geomorphology (or the study of river processes). I am registered as a Professional Geoscientist with the BC Association of Professional Engineers and Geoscientists (Registration No: 121255) and am a Fellow of the Geological Association of Canada.

As indicated on the attached resume, I worked for both the Geological Survey of Canada and the BC Government Resource Analysis Branch, prior to starting my own consulting company. I have 25-years experience working in Western Canada, twenty-two of which are as the Principal of M. Miles and Associates Ltd. During this period I have undertaken numerous hydrotechnical studies for coal or metal mines as well as various other government and industrial clients.

I have no direct or indirect interest in Getty Copper Corporation.

Signed at Victoria, B.C.:

PROFESSIONAL ENGINEER
M. J. MILES
BRITISH COLUMBIA
GEOSCIENTIST

Mike Miles

Michael J. Miles, M.Sc., P.Geo.

September 24, 2002

MINERAL TITLES BRANCH
VICTORIA, B.C.
SEP 26 2002
FILE NO.
LOG IN NO.

CORPORATE PROFILE

M. MILES AND ASSOCIATES LTD.

M. MILES AND ASSOCIATES LTD. (MMA) is a Victoria based firm specializing in hydrology, fluvial geomorphology and the assessment or mitigation of environmental impacts on river systems. The company has three full time staff.

MMA has undertaken a wide range of assignments in northwestern North America including work in Alaska, Yukon, the Northwest Territories, Manitoba, Saskatchewan, Alberta, Washington State and throughout British Columbia.

Recent hydrotechnical projects include engineering-related work on oil and gas pipelines, aerial and buried transmission lines, road construction or deactivation, minesite hydrology and hydroelectric development or re-licencing.

Environmental studies include developing stream management plans or prescriptions to mitigate river-related impacts due to hydroelectric development, placer mining, instream gravel removal, mine site development, forestry operations and sub-division development.

Legal or quasi-legal assignments include being retained as a technical specialist during the FEARO review of the Oldman River Dam Project, reviewing Pacific Coast Energy Corporation's Vancouver Island Gas Pipeline project for the B.C. Utilities Commission and providing advice to Alcan during the Kemano Completion Project. MMA frequently works with lawyers or other specialists on litigation relating to water use planning, instream construction activities, sediment production or other hydrotechnical issues.

Representative Clients:

Aluminium Company of Canada
Attorney General of Alberta
BC Hydro and Power Authority
BC Ministry of Transportation and Highways
BC Ministry of Environment, Lands and Parks
BC Gas
BC Ministry of Forests
Canadian Hydro Developers Ltd.
Chelan County Power Public Utilities Dist. #1
Curragh Resources Inc.
District of Highlands
Environment Canada
Fisheries and Oceans Canada
Getty Copper Corporation
Greater Vancouver Regional District
Gulf Canada
Indian and Northern Affairs Canada
International Forest Products Ltd.
Klondike Placer Miners Association
Municipality of Saanich
Pacific Northern Gas Co. Ltd.
Pacifica Papers Inc.
Skeena Cellulose
Tahera Resources Ltd.
Telus
Trans Mountain Pipe Line Ltd.
Victoria Capital Regional District
Weyerhaeuser Ltd.

MMA

M. Miles and Associates Ltd.
645 Island Road
Victoria, BC, Canada
V8S 2T7

Consultants in Hydrology, Geomorphology and Environmental Impact Mitigation

MICHAEL J. MILES

EDUCATION

B.Sc.	(General Science),	University of British Columbia, 1971
M.Sc.	(Geomorphology),	University of British Columbia, 1980

PROFESSIONAL AFFILIATION

Member, B.C. Association of Professional Engineers and Geoscientists
Fellow, Geological Association of Canada
Member, Canadian Water Resources Association
Member, Canadian Society for Hydrological Sciences
Member, American Geophysical Union
Member, Canadian Geomorphology Research Group
Member, BC Water and Waste Association

PROFESSIONAL EXPERIENCE

1978-date	Principal, M. Miles & Associates Ltd., Consulting Geomorphologists.
1977-1978	Geologist 3, Resource Analysis Branch, B.C. Ministry of Environment.
1977	Consulting Geomorphologist, Associated Resource Consultants Ltd.
1976	Consulting Geomorphologist, C.D. Schultz and Company Ltd.
1975	Geologist, Terrain Sciences Division, Geological Survey of Canada.
1973-1974	Hydrologist and Expeditor, F.F. Slaney & Company Limited.
1972-1973	Technician, New Zealand Department of Scientific and Industrial Research, Antarctic Division
1970-1971	Quality Control Engineer, Geophysical Services Inc.

AREAS OF SPECIALIZATION

- Hydrology and fluvial geomorphology.
- Hydrotechnical analysis for pipelines, roads, bridges, transmission lines, mines and dams.
- Watershed assessments, stream restoration and fisheries habitat design.

SEP-20-02 09:19 FROM: ID:

M. MILES AND ASSOCIATES LTD.

Consultants in Hydrology, Geomorphology and Environmental Impact Mitigation

645 ISLAND ROAD
VICTORIA, B.C., CANADA
V8S 2T7
TELEPHONE: (250) 595-0653
FAX: (250) 595-7367
email: mmaa@coastnet.com

GST REGISTRATION NO: R103728796

INVOICE - 71

Mr. Don Willoughby, Chief Financial Officer
GETTY COPPER CORPORATION
1,000 Austin Avenue
Coquitlam, British
Columbia
V3K 3P1

16 October, 2001

RE: GETTY NORTH HYDROLOGY STUDY 2001, Ref No: 0093

Work Undertaken:

Reduce hydrometric data from Vic Preto
Prepare for and undertake field trip
Download data and remove instruments
Compile digital data file
Begin data analysis

Professional Services:

Miles - 56.00 hours @ $95/hour	5,320.00
Goldsworthy - 35.00 hours @ $65/hour	2,275.00
Gibbins - 40.50 hours @ $55/hour	2,227.50

Expenses:

Expenses - as per attached list	613.93
Truck - 3 days @ $90 per day	270.00
917 km @ $0.20/km	183.40

P.S. 1327 Oct 16/01

SUB-TOTAL	10,889.83
GST	762.29
TOTAL	**$ 11,652.12**

Respectfully submitted

Mike Miles

CK # 3272 Oct 24/01

Mike Miles, M.Sc., P.Geo.

Note: 2% interest per month (or portion thereof) will be charged after 30 days

M. MILES AND ASSOCIATES LTD.

Consultants in Hydrology, Geomorphology and Environmental Impact Mitigation

645 ISLAND ROAD
VICTORIA, B.C., CANADA
V8S 2T7
TELEPHONE: (250) 595-0653
FAX: (250) 595-7367
email: mmaa@coastnet.com

GST REGISTRATION NO: R103728796

INVOICE - 54

Mr. Don Willoughby, Chief Financial Officer
GETTY COPPER CORPORATION
1,000 Austin Avenue
Coquitlam, British
Columbia
V3K 3P1

04 July, 2001

RE: GETTY NORTH HYDROLOGY STUDY 2001, Ref No: 0093

Work Undertaken:

Purchase one 1m and one 2 m water level sensor
To replace equipment installed on May 12-14, 2001
Order, fabricate and calibrate replacement equipment

Professional Services:

Miles - 1.25 hours @ $95/hour	118.75
Goldsworthy - 1.25 hours @ $65/hour	81.25
Gibbins - 4.25 hours @ $55/hour	233.75

Expenses:

Replacement equipment as per attached listing	1,227.75

1-0885 P.S. 1146 Aug 4/4

SUB-TOTAL	1,661.50
GST	116.31
TOTAL	**$ 1,777.81**

Respectfully submitted

Mike Miles

M. J. Miles, M.Sc., P.Geo.

Note: 2% interest per month (or portion thereof) will be charged after 30 days

Consultants in Hydrology, Geomorphology and Environmental Impact Mitigation

V8S 2T7
TELEPHONE: (250) 595-0653
FAX: (250) 595-7367
email: mmaa@coastnet.com

ST REGISTRATION NO: R103728796

INVOICE - 45

Mr. Don Willoughby, Chief Financial Officer
GETTY COPPER CORPORATION
1,000 Austin Avenue
Coquitlam, British
Columbia
V3K 3P1

22 June, 2001

RE: GETTY NORTH HYDROLLOGY STUDY 2001, Ref No: 0093

Work Undertaken:

Compile hydrometric data files
Fabricate and calibrate replacement hydrometric equipment
Travel to minesite, download data, install equipment
Reduce and compile collected information

Professional Services:

Miles - 94 hours @ $95/hour	1-0885	8,930.00
Goldsworthy - 64.5 hours @ $65/hour		4,192.50
Gibbins - 82.75 hours @ $55/hour		4,551.25

Expenses:

Expenses as per attached list	1-0855	1,025.64

CK#3219
June 27/01

SUB-TOTAL		18,699.39
GST 2-3200		1,308.96
TOTAL	**$**	**20,008.35**

Respectfully submitted

M. J. Miles, M.Sc., P.Geo.

P.S. 1135 June 22/01

Note: 2% interest per month (or portion thereof) will be charged after 30 days

TO WHOM IT MAY CONCERN:

The account submitted by Preto Geological Inc. to Getty Copper Corp. dated July 20th, 2001, in the total amount of $4,807.56 for seven days of professional services for the period July 13th – 19th, 2001, pertains to hydrological work done on the property of Getty Copper Corp. on behalf of Getty's consulting hydrologist M. Miles & Associates Ltd. This work consisted of:

1. downloading of data at the four hydrological stations as well as stream measurements such as stream flow, etc. All this data was submitted to M. Miles & Associates Ltd. and will be incorporated in that consultant's final report which is forthcoming.
2. sampling of drill core stored in Getty's warehouse and submission of the material collected to G. & T. Metalurgical Services Ltd. and Kamloops Geological Services Ltd. of Kamloops for mineral speciation studies and petrological studies respectively.

Preto Geological Inc.

Per:

V. A. Preto
January 27, 2002

PRETO GEOLOGICAL INC.

6393 West Saanich Road
Saanichton, B.C.
Canada V8M 1W8

Tel: 250-652-4298
Fax: 250-652-6392

STATEMENT OF ACCOUNT

Getty Copper Corp.
1000 Austin Avenue
Coquitlam, B.C.
V3K 3P3

20-Jul-2001

TO PROFESSIONAL SERVICES RENDERED:

Geological consulting for the period
July 13 - 19, 2001, inclusive

FEE: 7.0 days @ $450.00:		$ 3,150.00
GST @ 7%		220.50
DISBURSEMENTS:		
Vehicle expenses (2,275 km @ 0.28)	637.00	
B.C. Ferries, Coquihalla tolls, parking	121.00	
Travel (Accommodation, etc.)	389.75	
Meals and Groceries	252.52	
Miscellaneous	36.79	1,437.06
		$ 4,807.56

E. & O.E.
BIN: 88433 5183

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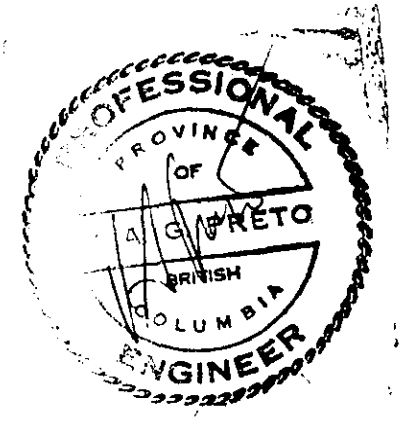
Preto Geological Inc.

Per: V. A. Preto

V. A. Preto
January 27, 2002



PRETO GEOLOGICAL INC.

6393 West Saanich Road
Saanichton, B.C.
Canada V8M 1W8

Tel: 250-652-4298
Fax: 250-652-6392

STATEMENT OF ACCOUNT

Getty Copper Corp.
1000 Austin Avenue
Coquitlam, B.C.
V3K 3P3

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		$	4,807.56

E. & O.E.
BIN: 88433 5183