

**THE 2002 SUMMER WATER TEMPERATURE
AND FLOW MANAGEMENT PROJECT**

*NECHAKO FISHERIES CONSERVATION PROGRAM
Technical Report No. RM02-1*

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ABSTRACT

The 2002 Nechako River Summer Water Temperature and Flow Management Project (the Project) was undertaken to attempt to prevent mean daily water temperatures in the Nechako River above the Stuart River confluence (at Finmoore) from exceeding 20.0°C (68.0°F) between July 20 and August 20. Water temperatures were managed by regulating Skins Lake Spillway releases to control flows in the Nechako River below Cheslatta Falls and at Vanderhoof. In 2002, mean daily water temperatures in the Nechako River above the Stuart River confluence did not exceed 20.0°C (68.0°F).

Over the duration of the 2002 Summer Water Temperature and Flow Management Project (July 10 to August 20), the total volume of water released was 9,240.5 m³/s-d, (326,327 cfs-d), and the average release during the Project was 220.0 m³/s (7,770 cfs).

INTRODUCTION

The Nechako River Summer Water Temperature and Flow Management Project (the Project) currently in place was designed and developed in 1982 and has been successfully implemented since 1983. Since 1988, water temperature and flow management projects (Triton 1995a through 1995h, Triton 1996 through 2001) have been carried out under the auspices of the Nechako Fisheries Conservation Program (NFCP).

The objective of the Project is to attempt to prevent mean daily water temperatures in the Nechako River above the Stuart River confluence (at Finmoore) from exceeding 20.0°C (68.0°F). This objective is met by regulating releases from the Skins Lake Spillway to control flows in the Nechako River below Cheslatta Falls and at Vanderhoof. The Project operates from July 10 to August 20 (the operational period) with the goal of managing water temperatures in the Nechako River at Finmoore between July 20 and August 20 (the water temperature control period, hereafter referred to as the control period). These dates may vary as directed by the NFCP in accordance with the timing of sockeye runs in the system. Flows in the Nechako River at Cheslatta Falls are also to be reduced to fall spawning flows by early September. The Project study area is shown in Figure 1. Unless otherwise stated, references to water temperatures, flows (including releases) and meteorological data are mean daily values, and the location of the Nechako River above the Stuart River confluence refers to the Nechako River at Finmoore.

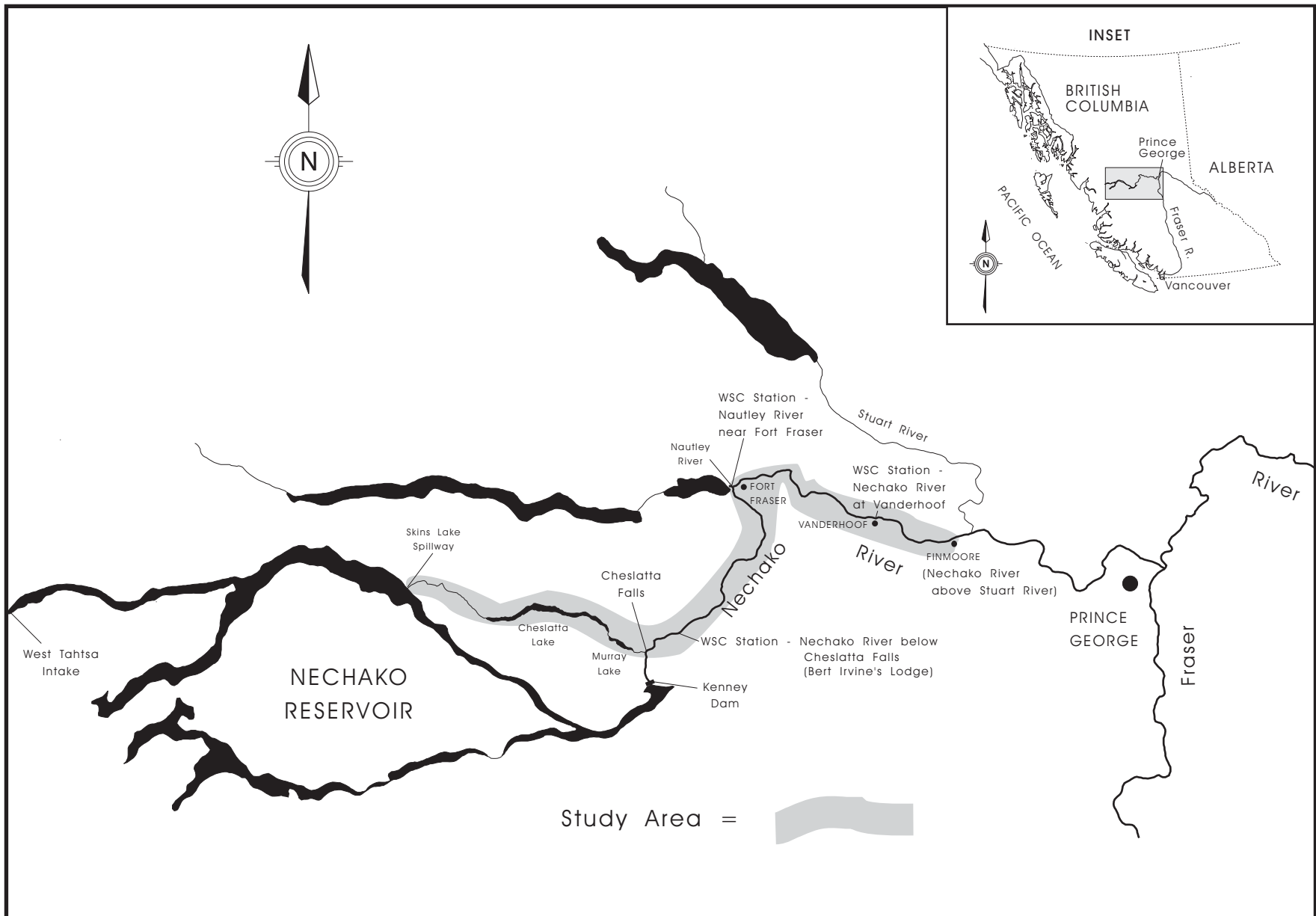
This report reviews the 2002 Summer Water Temperature and Flow Management Project and includes an outline of the method of determining Skins Lake Spillway releases, a summary of the 2002 Skins Lake Spill-

way release recommendations for the period July 10 to September 6 inclusive, and a summary of recorded flows (July 10 to September 6) and water temperatures (July 10 to August 20) at various locations along the Nechako River. Also discussed is the volume of cooling water used in the 2002 Summer Water Temperature and Flow Management Project.

METHODS

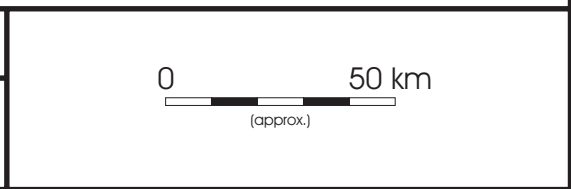
The management of the Nechako River flows and water temperatures was accomplished using water temperature predictions based on five-day meteorological forecasts to determine the schedule of Skins Lake Spillway releases required to meet project objectives. The Summer Water Temperature and Flow Management uses an unsteady-state flow routing model and an unsteady-state water temperature prediction model designed to compute the conditions in the Nechako River defined by the nature of the meteorological conditions. Numerical modelling of flows and water temperatures in the Nechako River was performed daily during the entire operational period.

Daily operations followed the protocol as set out in the Settlement Agreement (Anon. 1987), and involved collection of water temperature and river stage data from several locations in the study area, and development of five-day meteorological forecasts. Water temperatures were obtained daily from recorders maintained in the Nechako River below Cheslatta Falls (at Bert Irvine's Lodge), in the Nechako River at Fort Fraser (upstream of the Nautley River), in the Nechako River above the Stuart River confluence and in the Nautley River. River stages were obtained daily from record-



Nechako Fisheries Conservation Program Map # RM02-01

FIGURE 1. NECHAKO RIVER STUDY AREA



ers maintained in the Nechako River below Cheslatta Falls, in the Nechako River at Vanderhoof and from a staff gauge in the Nautley River. Five-day meteorological forecasts were obtained from World Weatherwatch, a sub consultant to Triton.

River stage and minimum and maximum water temperature data were obtained daily by Triton (staff member resident in Vanderhoof) for each location identified except the Nechako River below Cheslatta Falls. Each morning, hourly water temperature and river stage data recorded by the data collection platform located on the Nechako River below Cheslatta Falls were obtained via computer link to Water Survey of Canada (WSC), Vancouver. In addition, spot and corresponding recorded water temperatures were collected at each location during these daily site visits and used to adjust the recorded water temperatures. The adjustment provided an ongoing check of each thermograph, and was performed in the following manner. If the spot temperature was higher than the thermograph record, the thermograph record was adjusted to agree with the recorded spot temperature for that day. If the thermograph record was higher than the spot temperature, the thermograph record was not adjusted. This procedure was implemented as a conservative measure.

Skins Lake Spillway releases reported are as requested by Triton. All Nechako River and Nautley River flow data reported are preliminary data, and are part of the database utilized in the daily operation of the Summer Water Temperature and Flow Management Project. These data are not updated as it is the preliminary data that was used in real-time modelling of the Nechako River system. Therefore, values presented may differ slightly from those reported by WSC.

The first 10 days of the operational period, July 10 to July 19, were utilized for system start up; for initialization of the database required to schedule Skins Lake Spillway releases and to increase flows in the Nechako River from spring flows to the minimum cooling flow of 170 m³/s (6,000 cfs) below Cheslatta Falls. The 2002 Skins Lake Spillway spring base release as directed by the NFCP was 53.7 m³/s (1,897 cfs). Upon commencement of the operational period on July 10, the observed flow in the Nechako River below Cheslatta Falls was 57.5 m³/s (2,031 cfs). On July 11, 2002, the Skins Lake Spillway release was increased from the spring base release to 227 m³/s (8,000 cfs) to ensure flows in the

Nechako River below Cheslatta Falls reached the minimum cooling flow of 170 m³/s (6,000 cfs) by July 20 (the beginning of the water temperature control period).

Due to high Nechako Reservoir water levels, releases from the Skins Lake Spillway were maintained at or above 227 m³/s (8,000 cfs) from July 11 to August 18 when the release was decreased to 14.2 m³/s (500 cfs) to achieve fall spawning flows by early September in the Nechako River below Cheslatta Falls.

Throughout the operational period, water temperatures in the Nechako River were calculated daily for the previous day, the current day and each of the next four days. These calculations were based on recorded and five-day forecast meteorological data, recorded water temperature and computed flow data. Forecast water temperature predictions were tabulated and reviewed daily to identify trends in water temperature changes. These trends are the same as those used in the water temperature and flow management projects since 1984 (Envirocon Ltd. 1985), and are best explained through reference to Table 1.

Assuming the current day is July 16, entries corresponding to the current day's operation are represented by the letter c. Entries co and cs represent the recorded and calculated water temperatures, respectively, for the previous day (July 15). Entries c1 through c5 represent predicted water temperatures computed using the current day's five-day meteorological forecast and an assumed current day's flow regime. The entry rc represents the current day Skins Lake Spillway release required to meet project objectives.

The following three trends in water temperature changes were reviewed on a day-by-day basis:

1. Observed trend; developed from recorded mean daily water temperatures measured in the Nechako River above the Stuart River confluence each day (bo and co in Table 1). The difference in recorded water temperatures for the previous two days is extrapolated over the next five days to determine the observed water temperature trend.
2. Predicted trend; developed from the predicted water temperatures for the previous day and the following five days (cs, c1, c2, c3, c4, c5, in Table 1). These data represent the predicted trend.

Table 1
Daily Operations to Manage Water Temperatures in the Nechako River Above the Stuart River Confluence

Date	11-Jul	12-Jul	13-Jul	14-Jul	15-Jul	16-Jul*	17-Jul	18-Jul	19-Jul	20-Jul
Fifth Day's Predicted Water Temperature @ Date + 4 Days								a5	b5	c5
Fourth Day's Predicted Water Temperature @ Date + 3 Days							a4	b4	c4	
Third Day's Predicted Water Temperature @ Date + 2 Days						a3	b3	c3		
Second Day's Predicted Water Temperature @ Date + 1 Day					a2	b2	c2			
Current Day's Predicted Water Temperature @ Date				a1	b1	c1				
Previous Day's Calculated Water Temperature @ Date - 1 Day			as	bs	cs					
Previous Day's Recorded Water Temperature @ Date - 1 Day				ao	bo	co				
Current Day's Release @ Date				ra	rb	rc				

—————→ observed trend

—————→ predicted trend

-----→ forecast trend

* the current day (i.e., the day of operation) for this example is July 16.

-
3. Forecast trend; developed from the difference between the current five-day and previous five-day predictions for the same calendar days (c3 and b4, c2 and b3, c1 and b2 in Table 1). Differences between forecasted data on coincident dates for the current day and the next two days only are averaged and added to the fifth day predicted temperature to determine the trend in forecasted temperatures.

A numerical example of how the trends are calculated is presented in Appendix A.

Each day predicted water temperatures for the five-day forecast period were checked and the three trends calculated. If two of the three trends indicated that the water temperature in the Nechako River above the Stuart River confluence could potentially exceed 19.4°C (67.0°F) then an increase in the Skins Lake Spillway release was required. When this occurred the current day's release was revised and the flow and temperature models were rerun using the modified flow regime. Results of each day's final computer run were subsequently used to initialize water temperatures for the following day's computations. Entries in Table 1 represent each day's final cooling water release and resultant predicted water temperatures.

The following release criteria were used with the three trends identified above to determine the timing and magnitude of Skins Lake Spillway releases:

1. When two of the three trends show an increase in water temperature in the Nechako River above the Stuart River confluence, and these trends show that potentially the water temperature could exceed 19.4°C (67.0°F), increase the Skins Lake Spillway release according to criteria 2 and 3 below.
2. Operate Skins Lake Spillway such that flow in the Nechako River below Cheslatta Falls ranges between 170 m³/s (6,000 cfs) and 283 m³/s (10,000 cfs) as required, and flow in the Nechako River above the Stuart River confluence does not exceed 340 m³/s (12,000 cfs). It is understood that the flow in the Nechako River below Cheslatta Falls is to be not less than 170 m³/s (6,000 cfs) by the beginning of the control period, and is to be reduced to ap-

proximately 31.2 m³/s (1,100 cfs) by September 6.

3. At any time, increase the Skins Lake Spillway release from the current level to 453 m³/s (16,000 cfs) to achieve the flow changes in the Nechako River as fast as possible.
4. During cooling periods when two of three trends in forecasted water temperatures are decreasing and these trends indicate that potentially the water temperature could drop below 19.4°C (67.0°F) within the forecast period (five days), reduce the Skins Lake Spillway release from the current level to 14.2 m³/s (500 cfs).

RESULTS

Predicted and recorded mean daily water temperatures for the Nechako River above the Stuart River confluence, Skins Lake Spillway releases and changes in Skins Lake Spillway releases over the duration of the Project operational period are summarized in Table 2.

Recorded mean daily water temperatures in the Nechako River above the Stuart River confluence (Figure 2 and Table 3) did not exceed 20.0°C (68.0°F). The respective maximum and minimum mean daily water temperatures recorded during the control period were 19.9°C (67.8°F) on July 25, and 14.4°C (57.9°F) on August 4 and 6. A summary of mean daily water temperatures recorded during the Project in the Nechako River below Cheslatta Falls, near Fort Fraser and above the Stuart River confluence, and in the Nautley River near Fort Fraser is presented in Appendix B.

As outlined in the Methods section, Skins Lake Spillway releases required for water temperature control were regulated during the control period to ensure flows in the Nechako River below Cheslatta Falls were to range between 170 m³/s (6,000 cfs) and 283 m³/s (10,000 cfs) and flows at Vanderhoof were not to exceed 340 m³/s (12,000 cfs).

Skins Lake Spillway releases and their corresponding flows in the Nechako River below Cheslatta Falls and at Vanderhoof are plotted in Figure 3. Daily Skins Lake Spillway releases, Nautley River flows and flows in the Nechako River below Cheslatta Falls and at Vanderhoof are tabulated in Appendix C. A record of

Table 2
 Predicted and Recorded Mean Daily Water Temperatures in the Nechako River Above the Stuart River Confluence, July 10 to August 20, 2002

Date	JULY																					
	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
5th Day's Predicted Water Temperature at Date + 4 Days					20.9	19.0	19.3	19.3	19.2	18.8	18.4	18.4	18.4	19.2	19.4	19.3	19.0	19.1	19.1	19.2	19.1	18.8
4th Day's Predicted Water Temperature at Date + 3 Days				21.4	19.6	19.6	19.4	18.7	18.6	18.5	18.1	18.4	18.9	18.9	19.3	19.2	19.5	19.3	19.0	19.1	18.6	18.3
3rd Day's Predicted Water Temperature at Date + 2 Days			21.7	20.0	20.1	19.9	18.4	18.5	18.5	17.9	18.2	18.9	18.3	18.8	19.3	19.6	20.0	19.5	19.1	18.4	18.0	17.1
2nd Day's Predicted Water Temperature at Date + 1 Day		20.6	20.0	20.4	20.8	18.9	18.8	18.6	17.8	18.5	18.5	17.9	18.0	19.2	19.4	20.7	20.4	19.5	18.5	17.8	17.2	16.7
Current Day's Predicted Water Temperature at Date	19.5	19.2	20.2	20.7	19.0	19.1	18.4	18.0	18.6	18.6	17.8	17.5	18.6	18.9	20.4	20.7	20.2	18.9	17.9	17.5	16.9	15.2
Previous Day's Calculated Water Temperature at Date - 1 Day	19.1	19.3	20.3	19.6	19.2	18.9	18.3	18.3	18.7	18.3	17.6	17.8	18.5	19.3	20.4	20.5	20.0	18.6	17.7	17.3	16.3	15.4
Previous Day's Recorded Water Temperature at Date - 1 Day	17.6	18.4	19.0	18.9	18.1	17.7	17.6	17.8	17.9	17.8	17.3	17.4	17.7	18.8	19.5	19.9	19.4	18.4	17.5	17.1	16.4	15.5
Current Day's Skins Lake Spillway Release at Date (m ³ /s)	53.7	53.7 to 227 @ 1600 hrs	227	227	227	227	227	227	227	227	227	227	227	227	227	453 to 227 @ 1600 hrs	227	227	227	227	227	227

Table 2 (continued)
 Predicted and Recorded Mean Daily Water Temperatures in the Nechako River Above the Stuart River Confluence, July 10 to August 20, 2002

Date	AUGUST																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
5th Day's Predicted Water Temperature at Date + 4 Days	18.5	17.1	17.0	16.2	15.4	16.4	16.2	16.6	16.7	16.5	16.0	15.6	16.1	16.5	16.9	16.1	15.6	16.0	15.9	15.8
4th Day's Predicted Water Temperature at Date + 3 Days	17.2	17.0	16.0	15.0	15.8	15.5	16.0	16.7	16.3	16.2	16.2	16.0	16.4	16.3	16.2	16.0	15.8	15.7	15.8	15.7
3rd Day's Predicted Water Temperature at Date + 2 Days	16.9	15.3	14.7	15.0	15.1	15.1	15.4	15.7	16.5	16.4	16.1	16.3	15.5	15.9	16.5	16.1	15.6	15.4	16.0	15.9
2nd Day's Predicted Water Temperature at Date + 1 Day	14.7	14.9	14.4	14.8	15.1	14.1	15.0	16.8	16.3	16.3	16.3	15.3	15.4	16.7	16.7	16.2	15.3	16.1	16.3	16.5
Current Day's Predicted Water Temperature at Date	15.2	14.7	14.9	15.2	14.3	14.7	16.0	16.4	16.4	16.5	15.6	15.3	16.3	16.9	16.8	15.7	16.0	16.5	16.5	16.5
Previous Day's Calculated Water Temperature at Date - 1 Day	15.1	15.0	14.9	14.8	14.5	15.0	15.8	16.4	16.6	16.2	15.5	15.6	16.2	17.0	16.6	15.9	16.1	16.4	16.5	
Previous Day's Recorded Water Temperature at Date - 1 Day	15.1	15.1	14.9	14.4	15.0	14.4	15.3	16.2	16.3	15.9	15.3	15.3	16.0	16.5	16.6	15.8	15.8	15.9	16.1	15.9
Current Day's Skins Lake Spillway Release at Date (m ³ /s)	227	283	283	283	283	283	227	227	227	227	227	227	227	227	227	227	227	227	14.2	14.2
	to					to												to		
	283					227												14.2		
	@					@												@		
	1600					1600												1600		
	hrs					hrs												hrs		

Figure 2
 Recorded Mean Daily Temperatures in the Nechako River Above the
 Stuart River Confluence, July 10 to August 20, 2002

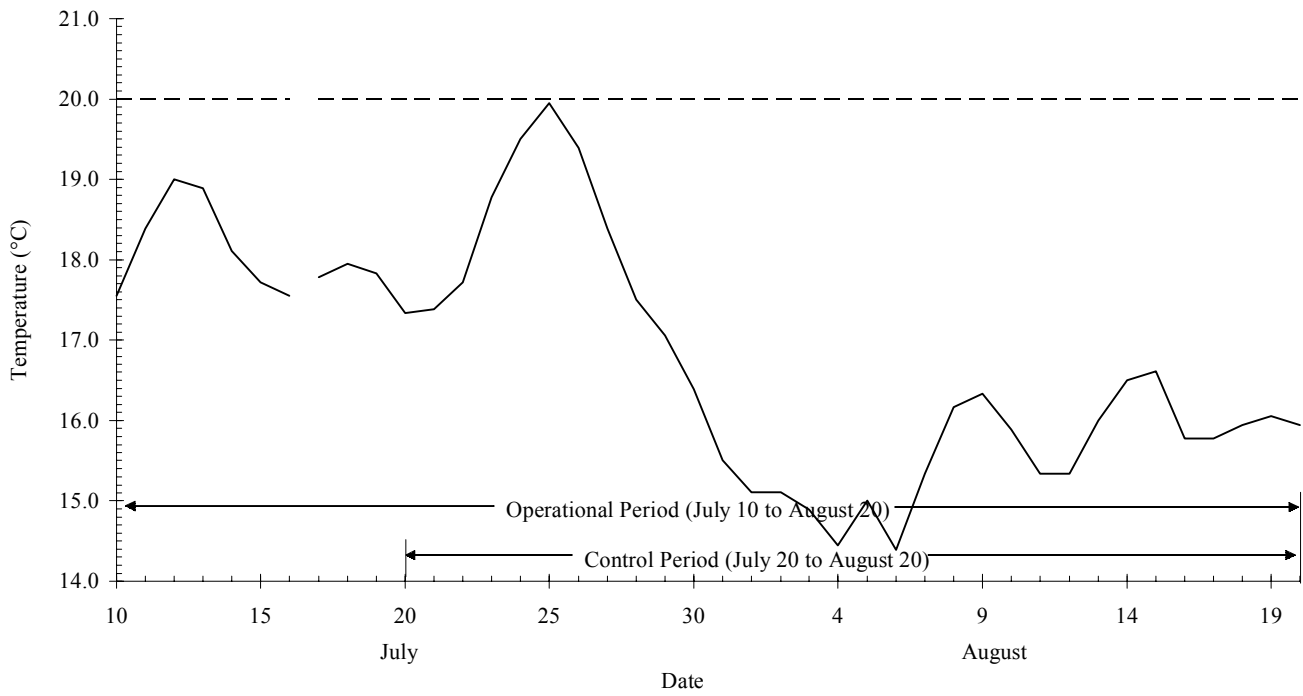


Figure 3
 Skins Lake Spillway Releases and Flows in the Nechako River below
 Cheslatta Falls and at Vanderhoof, July 10 to September 6, 2002

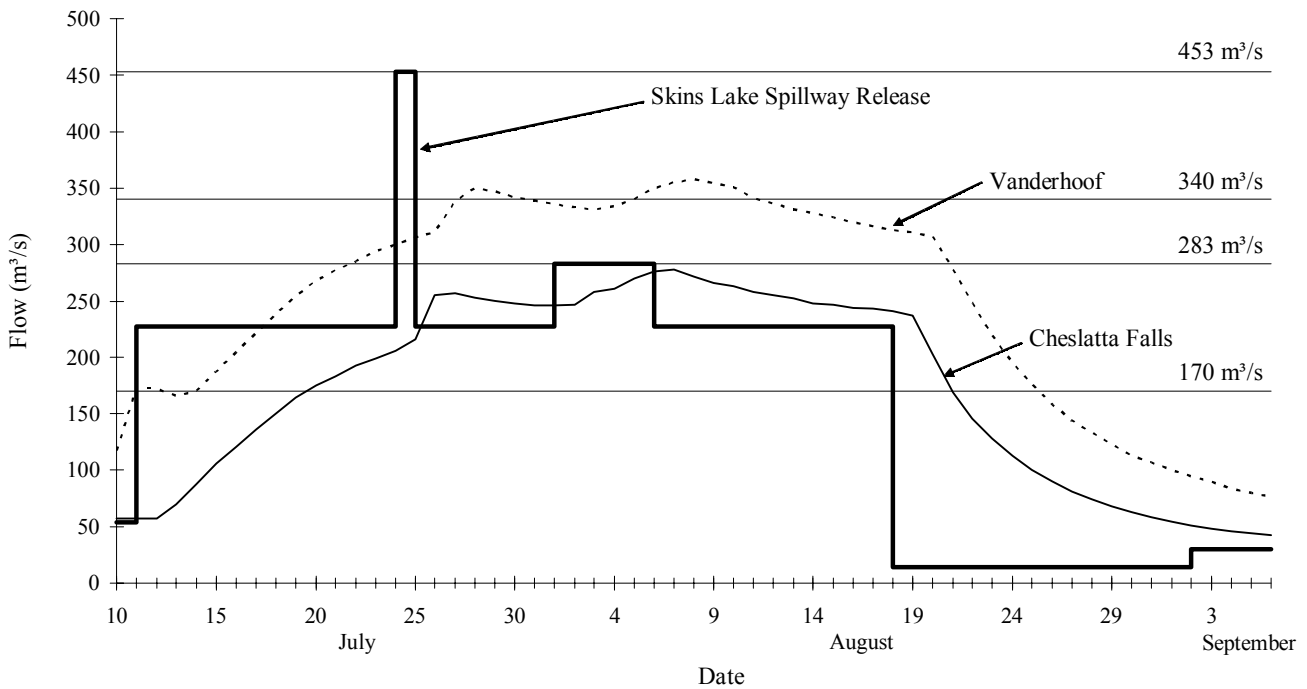


Table 3
Recorded Mean Daily Water Temperatures in the
Nechako River Above the Stuart River Confluence,
July to August 20, 2002

Date	Water Temp. (°C)	Date	Water Temp. (°C)
10-Jul	17.6	01-Aug	15.1
11-Jul	18.4	02-Aug	15.1
12-Jul	19.0	03-Aug	14.9
13-Jul	18.9	04-Aug	14.4
14-Jul	18.1	05-Aug	15.0
15-Jul	17.7	06-Aug	14.4
16-Jul	17.6	07-Aug	15.3
17-Jul	17.8	08-Aug	16.2
18-Jul	17.9	09-Aug	16.3
19-Jul	17.8	10-Aug	15.9
20-Jul	17.3	11-Aug	15.3
21-Jul	17.4	12-Aug	15.3
22-Jul	17.7	13-Aug	16.0
23-Jul	18.8	14-Aug	16.5
24-Jul	19.5	15-Aug	16.6
25-Jul	19.9	16-Aug	15.8
26-Jul	19.4	17-Aug	15.8
27-Jul	18.4	18-Aug	15.9
28-Jul	17.5	19-Aug	16.1
29-Jul	17.1	20-Aug	15.9
30-Jul	16.4		
31-Jul	15.5		

Skins Lake Spillway release changes during the Project and the reasoning behind them is presented in Table 4.

During the control period, measured flows in the Nechako River below Cheslatta Falls (based on preliminary WSC data from the WSC data collection platform at Bert Irvine’s Lodge) ranged between a maximum of 278 m³/s (9,818 cfs) on August 7 and a minimum of 175 m³/s (6,180 cfs) on July 20. Flows measured in the Nechako River at Vanderhoof ranged between a maximum of 358 m³/s (12,643 cfs) on August 8 and a minimum of 268 m³/s (9,464 cfs) on July 20. Following the control period, the mean daily flow in the Nechako River below Cheslatta Falls was reduced to 42.4 m³/s (1,497 cfs) by September 6.

DISCUSSION

The discussion of the 2002 Summer Water Temperature and Flow Management Project has been divided into three sections. The first section reviews the collection and use of recorded field data. Variables measured include water temperature, flow, and meteorological data (recorded and forecast). The second section discusses the volume of water used during the 2002 Summer Water Temperature and Flow Management Project. The third section discusses instances when judgment was exercised during the application of the release criteria. This was based on experience gained in previous years’ operation of the Summer Water Temperature and Flow Management Project.

Recorded Data

Triton’s modelling procedure is based on the premise that the best way to forecast water temperatures is to initialise computations with recorded conditions. For this reason, the quality of the field data used in the modelling process directly affects the accuracy of the computed water temperatures. Therefore, data must be collected accurately and consistently to ensure that random errors are kept to a minimum. Consistency in data collection techniques also ensures a constant bias throughout the project.

In 2002, flow data obtained from gauging stations in the Nechako River below Cheslatta Falls, in the Nechako River at Vanderhoof and in the Nautley River near Fort Fraser appeared to be accurate. Flows in the Nechako River below Cheslatta Falls and at Vanderhoof responded as expected in response to Skins Lake Spillway releases. The Nautley River flow regime was well above average and near average at the beginning and end of the project operational period, respectively. The ability to obtain hourly stage data from the gauging station located on the Nechako River below Cheslatta Falls proved very useful in verifying the daily predictions of the flow model and accounting for changes in the local inflow to the Cheslatta/Murray Lakes system.

As previously stated, spot and corresponding recorder (thermograph) water temperatures were collected in the Nechako River at Fort Fraser (upstream of the Nautley River), in the Nechako River above the Stuart River confluence and in the Nautley River during each site visit. The thermograph water temperatures were

Table 4
Rationale for Skins Lake Spillway Release Changes, July 10 to September 6, 2002

Date	Old Setting (m ³ /s)	New Setting (m ³ /s)	Time of Change (hrs)	Reason for Changing SLS Release Setting
Jul-11	53.7	227	1600	To ensure base flow of 170 m ³ /s in the Nechako River below Cheslatta Falls by July 20
Jul-24	227	453	1600	In response to a predicted warming trend
Jul-25	453	227	1600	In response to a predicted cooling trend reduced to 227 m ³ /s as part of a spill program
Aug-01	227	283	1600	increased to 283 m ³ /s as part of a spill program
Aug-06	283	227	1600	reduced to 227 m ³ /s as part of a spill program
Aug-18	227	14.2	1600	To achieve spawning flow in the Nechako River below Cheslatta Falls by early September

not consistently higher or lower than their associated spot temperatures. These data were used to adjust water temperatures following the method outlined in the Methods section of this report.

Recorded and forecast meteorological data were obtained daily from World Weatherwatch, a sub-consultant to Triton. These forecast weather data were developed using recorded weather data acquired from the Atmospheric Environmental Service (AES) station at Prince George Airport and from the meteorological monitoring station installed by Triton at Fort Fraser. The recorded and forecast weather data were used to estimate water temperatures in the Nechako River below Cheslatta Falls and in the Nautley River for the current day and following four days. A listing of the recorded and forecast meteorological data is provided in Appendix D.

Volume of Water Used

Figure 4 presents the recorded flows in the Nechako River below Cheslatta Falls for the 2002 Summer Water Temperature and Flow Management Project. Also indicated is the minimum cooling flow of 170 m³/s (6,000 cfs) in the Nechako River below Cheslatta Falls,

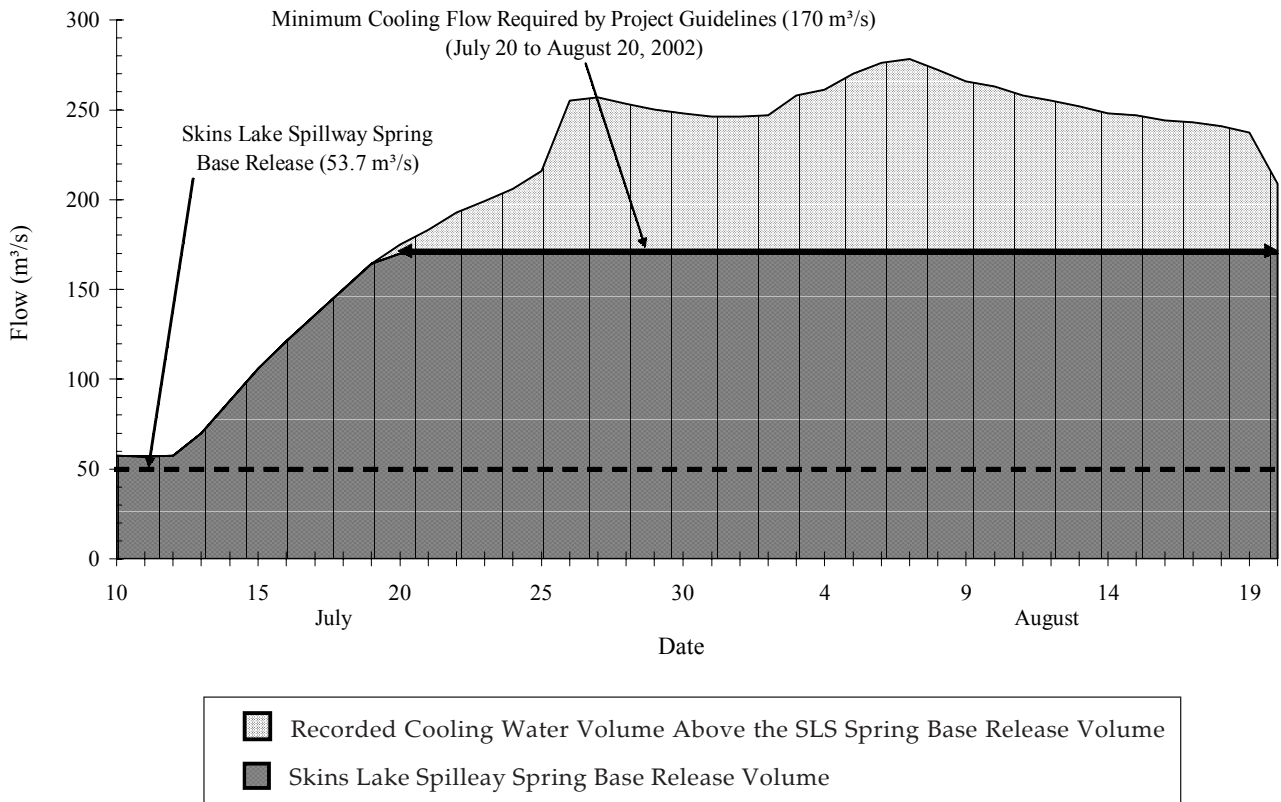
and the Skins Lake Spillway release of 53.7 m³/s (1,897 cfs) as determined by the NFCP Technical Committee as part of the “Annual Water Allocation” defined in the Settlement Agreement. This year Skins Lake Spillway releases in excess of 53.7 m³/s (1,897 cfs) include releases used for cooling purposes and reservoir operational management releases (spills).

The total volume of water released during the 2002 Summer Water Temperature and Flow Management Project operational period was 9,240.5 m³/s-d, (326,327 cfs-d). The volume released for cooling purposes and spills was 6,985.1 m³/s-d (246,677 cfs-d), and is based on an assumed Skins Lake Spillway release of 53.7 m³/s (1,897 cfs) for the period July 10 to August 20, inclusive. The average release during the operational period was 220.0 m³/s (7,770 cfs). Volume calculations are presented in Appendix E.

Application of the Summer Water Temperature and Flow Management Project Release Criteria

The Summer Water Temperature and Flow Management Project is very sensitive to the accuracy of meteorological forecasting. If an increase or decrease in temperature occurs over a prolonged period of time

Figure 4
Flows in the Nechako River below Cheslatta Falls Resulting from Skins Lake Spillway Releases,
July 10 to August 20, 2002



(three or four days), inaccurate meteorological forecasts may predict the reversal of the temperature change prematurely. In these instances, it may be required to exercise judgment when applying the Summer Water Temperature and Flow Management Project release criteria used with the three water temperature trends. This judgement is based on experience gained in the operation of the Summer Water Temperature and Flow Management Project since 1984 and may result in exceptions to the decision based on strict adherence to the release criteria. No exceptions were made to the application of the release criteria during the entire operational period.

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APPENDIX A
Numerical Example of Water
Temperature Trend Calculation

Appendix A
Numerical Example of Water Temperature Trend Calculation

From data for July 16 date of operation (Table A1).

1. Observed Trend

The observed trend is down by 0.4°C from 18.1°C (J14) to 17.7°C (J15). Take the previous day's recorded temperature 17.7°C (J15) and extrapolate the trend for five days at -0.4°C. The observed trend shows that the water temperature could potentially reach $17.7^{\circ}\text{C} + 5(-0.4^{\circ}\text{C}) = 15.7^{\circ}\text{C}$.

2. Predicted Trend

The predicted trend is the difference between the previous day's calculated water temperature (J15) and the fifth day predicted water temperature (J20). The predicted trend is down from 18.9°C to 18.4°C with the potential to reach 18.4°C.

3. Forecast Trend

The forecast trend for the current day of July 16 is based on the first, second and third day forecasts.

July 16	18.8 to 18.4 = down 0.4°C
July 17	18.5 to 18.6 = up 0.1°C
July 18	18.6 to 18.5 = down 0.1°C
Mean of 3 differences	= down 0.1°C

This mean of -0.1°C is added to the fifth day predicted water temperature to give $18.4.3^{\circ}\text{C} + (-0.1^{\circ}\text{C}) = 18.3^{\circ}\text{C}$.

The forecast trend is down 0.1°C with the potential to reach 18.3°C.

Appendix A (continued)
Numerical Example of Water Temperature Trend Calculation

Table A1: Predicted and Recorded Mean Daily Water Temperatures in
the Nechako River above the Stuart River Confluence, 2002

Date	JULY										
	10	11	12	13	14	15	16	17	18	19	20
5th Day's Predicted Water Temperature at Date + 4 Days					20.9	19.0	19.3	19.3	19.2	18.8	18.4
4th Day's Predicted Water Temperature at Date + 3 Days				21.4	19.6	19.6	19.4	18.7	18.6	18.5	
3rd Day's Predicted Water Temperature at Date + 2 Days			21.7	20.0	20.1	19.9	18.4	18.5	18.5		
2nd Day's Predicted Water Temperature at Date + 1 Day		20.6	20.0	20.4	20.8	18.9	18.8	18.6			
Current Day's Predicted Water Temperature at Date	19.5	19.2	20.2	20.7	19.0	19.1	18.4				
Previous Day's Calculated Water Temperature at Date - 1 Day	19.1	19.3	20.3	19.6	19.2	18.9					
Previous Day's Recorded Water Temperature at Date - 1 Day	17.6	18.4	19.0	18.9	18.1	17.7					
Current Day's Skins Lake Spillway Release at Date (m ³ /s)	53.7	53.7 to 227 @ 1600 hrs	227	227	227	227	227				

Appendix B
Mean Daily Water Temperatures in the
Nechako and Nautley Rivers, 2002

Appendix B
Mean Daily Water Temperatures in the Nechako and Nautley Rivers, 2002

Date	Nechako River			Nautley	Date	Nechako River			Nautley
	Cheslatta Falls (°C)	Fort Fraser (°C)	above the Stuart River (°C)	Fort Fraser (°C)		Cheslatta Falls (°C)	Fort Fraser (°C)	above Stuart River (°C)	Fort Fraser (°C)
10-Jul	14.4	18.2	17.6	15.3	01-Aug	14.6	15.1	15.1	16.4
11-Jul	15.6	18.3	18.4	15.8	02-Aug	14.4	14.7	15.1	15.2
12-Jul	16.8	19.4	19.0	16.9	03-Aug	14.1	14.9	14.9	15.5
13-Jul	15.8	19.4	18.9	17.2	04-Aug	13.7	14.7	14.4	14.6
14-Jul	15.1	17.5	18.1	17.3	05-Aug	13.7	14.4	15.0	14.4
15-Jul	14.4	17.1	17.7	16.1	06-Aug	13.8	15.1	14.4	15.7
16-Jul	14.4	16.2	17.6	16.0	07-Aug	13.7	15.4	15.3	16.4
17-Jul	14.3	16.9	17.8	17.5	08-Aug	13.9	15.4	16.2	16.6
18-Jul	14.8	16.8	17.9	17.4	09-Aug	13.9	15.3	16.3	17.2
19-Jul	14.8	16.5	17.8	17.3	10-Aug	13.8	14.9	15.9	16.6
20-Jul	14.6	15.8	17.3	16.8	11-Aug	13.6	14.3	15.3	16.4
21-Jul	14.9	16.5	17.4	17.3	12-Aug	14.1	15.1	15.3	16.3
22-Jul	15.4	17.2	17.7	18.1	13-Aug	14.4	15.9	16.0	17.3
23-Jul	15.9	17.8	18.8	18.4	14-Aug	14.4	15.8	16.5	16.7
24-Jul	16.4	18.8	19.5	19.7	15-Aug	14.3	15.3	16.6	17.3
25-Jul	16.6	19.1	19.9	20.1	16-Aug	14.4	15.3	15.8	17.0
26-Jul	16.4	17.9	19.4	18.3	17-Aug	14.7	15.5	15.8	17.4
27-Jul	16.1	17.3	18.4	18.1	18-Aug	14.7	15.5	15.9	17.3
28-Jul	15.9	17.3	17.5	17.3	19-Aug	14.7	15.7	16.1	17.2
29-Jul	15.5	16.3	17.1	16.7	20-Aug	14.7	16.1	15.9	17.3
30-Jul	15.2	15.4	16.4	15.8					
31-Jul	14.9	15.4	15.5	16.7					

Appendix C
Mean Daily Skins Lake Spillway Releases and Flows
in the Nechako and Nautley Rivers, 2002

Appendix C
Mean Daily Skins Lake Spillway Releases and Flows
in the Nechako and Nautley Rivers, 2002

Date	Skins Lake Spillway Release (m ³ /s)	Nechako River		Nautley River
		Cheslatta Falls (m ³ /s)	At Vanderhoof (m ³ /s)	Fort Fraser (m ³ /s)
10-Jul	53.7	57.5	117.0	86.4
11-Jul	53.7 to 227 @ 1600 hrs	56.9	173.0	84.8
12-Jul	227	57.5	172.0	82.3
13-Jul	227	69.6	166.0	79.1
14-Jul	227	88.0	170.0	76.6
15-Jul	227	106.0	187.0	73.3
16-Jul	227	121.0	204.0	70.9
17-Jul	227	136.0	221.0	70.2
18-Jul	227	150.0	238.0	69.5
19-Jul	227	164.0	254.0	68.2
20-Jul	227	175.0	268.0	66.1
21-Jul	227	183.0	277.0	64.1
22-Jul	227	193.0	285.0	62.9
23-Jul	227	199.0	294.0	60.9
24-Jul	227 to 453 @ 1600 hrs	206.0	300.0	59.7
25-Jul	453 to 227 @ 1600 hrs	216.0	306.0	57.8
26-Jul	227	255.0	311.0	61.4
27-Jul	227	257.0	338.0	57.0
28-Jul	227	253.0	350.0	55.2
29-Jul	227	250.0	347.0	53.5
30-Jul	227	248.0	342.0	51.1
31-Jul	227	246.0	339.0	51.1
01-Aug	227 to 283 @ 1600 hrs	246.0	336.0	48.9
02-Aug	170	247.0	333.0	47.8
03-Aug	170	258.0	331.0	46.8
04-Aug	170	261.0	334.0	45.7
05-Aug	170	270.0	340.0	42.3
06-Aug	283 to 227 @ 1600 hrs	276.0	350.0	42.7
07-Aug	227	278.0	355.0	42.2
08-Aug	227	272.0	358.0	39.4
09-Aug	227	266.0	354.0	40.7
10-Aug	227	263.0	351.0	38.8
11-Aug	227	258.0	341.0	37.8
12-Aug	227	255.0	337.0	37.3
13-Aug	227	252.0	331.0	35.9
14-Aug	227	248.0	328.0	35.9
15-Aug	227	247.0	324.0	34.1

Appendix C (continued)
Mean Daily Skins Lake Spillway Releases and Flows
in the Nechako and Nautley Rivers, 2002

Date	Skins Lake Spillway Release (m ³ /s)	Nechako River		Nautley River
		Cheslatta Falls (m ³ /s)	At Vanderhoof (m ³ /s)	Fort Fraser (m ³ /s)
16-Aug	227	244.0	320.0	33.7
17-Aug	227	243.0	316.0	32.0
18-Aug	227 to 14.2 @ 1600 hrs	241.0	313.0	31.1
19-Aug	14.2	237.0	311.0	31.1
20-Aug	14.2	209.0	307.0	29.6
21-Aug	14.2	169.0	278.0	28.8
22-Aug	14.2	146.0	248.0	28.5
23-Aug	14.2	128.0	219.0	28.0
24-Aug	14.2	113.0	195.0	27.1
25-Aug	14.2	100.0	176.0	26.7
26-Aug	14.2	90.0	158.0	26.3
27-Aug	14.2	81.1	144.0	25.6
28-Aug	14.2	74.3	133.0	25.5
29-Aug	14.2	68.4	123.0	25.5
30-Aug	14.2	63.0	113.0	24.8
31-Aug	14.2	58.4	107.0	24.4
01-Sep	14.2	54.5	100.0	24.5
02-Sep	14.2 to 30.0 @ 1600 hrs	50.9	94.7	23.6
03-Sep	30.0	47.9	89.9	23.0
04-Sep	30.0	45.7	83.8	22.4
05-Sep	30.0	44.0	79.9	22.2
06-Sep	30.0	42.4	76.8	21.8

Appendix D
Recorded and Forecast Meteorological Data

Appendix D
Recorded and Forecast Meteorological Data

17.30	700.00	0.34	10.20	7.20	94.50	66.60	9 07 02
20.70	580.00	0.35	12.10	6.50	93.80	58.00	10 07 02
19.50	620.00	0.30	11.00	7.00	93.60	58.00	
18.00	540.00	0.55	10.00	6.00	93.30	60.00	
17.00	500.00	0.60	10.00	4.00	93.10	63.00	
16.00	450.00	0.70	9.80	8.00	93.30	67.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED JUL 10/02

19.20	593.70	0.46	11.40	9.60	93.90	58.00	10 07 02
17.70	620.00	0.37	11.50	7.00	93.60	67.00	11 07 02
17.50	580.00	0.45	10.50	6.00	93.30	64.00	
17.00	500.00	0.60	10.00	4.00	92.90	63.00	
16.00	450.00	0.70	9.80	8.00	93.20	67.00	
16.50	520.00	0.55	8.50	12.00	93.40	60.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED JUL 11/02

19.10	631.00	0.42	11.10	4.40	93.60	64.50	11 07 02
19.50	580.00	0.47	10.00	4.00	93.50	54.00	12 07 02
18.50	500.00	0.60	10.50	5.00	92.90	60.00	
17.00	600.00	0.30	8.80	10.00	93.20	58.00	
17.30	550.00	0.50	8.50	8.00	93.30	56.00	
17.50	580.00	0.45	8.50	6.00	93.50	56.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED JUL 12/02

19.70	704.60	0.42	8.70	3.50	93.60	52.50	12 07 02
18.40	480.00	0.76	10.80	6.00	92.90	61.00	13 07 02
16.50	550.00	0.45	8.00	12.00	93.10	57.00	
16.00	480.00	0.60	8.50	8.00	93.30	61.00	
16.50	550.00	0.45	8.50	6.00	93.50	59.00	
17.00	550.00	0.48	8.70	6.00	93.50	58.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED JUL 13/02

17.00	269.80	0.85	11.60	5.50	93.10	71.40	13 07 02
16.40	570.00	0.50	6.50	10.00	93.30	55.00	14 07 02
16.10	350.00	0.70	9.00	9.00	93.40	67.00	
17.50	520.00	0.50	8.00	5.00	93.60	60.00	
18.20	550.00	0.30	8.50	4.00	93.60	58.00	
19.00	520.00	0.40	10.00	6.00	93.50	65.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED JUL 14/02

Appendix D (continued)
Recorded and Forecast Meteorological Data

15.70	718.00	0.41	5.10	12.10	93.20	53.00	14 07 02
16.00	470.00	0.65	5.50	9.00	93.30	53.00	15 07 02
16.40	480.00	0.65	7.00	6.00	93.20	54.00	
16.50	500.00	0.60	8.80	5.00	93.00	60.00	
17.50	490.00	0.60	9.50	7.00	93.10	60.00	
17.00	475.00	0.70	9.50	8.00	93.10	60.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED JUL 15/02

14.40	544.00	0.64	6.10	6.60	93.50	59.00	15 07 02
16.80	525.00	0.75	11.00	4.00	93.30	69.00	16 07 02
15.80	480.00	0.60	9.60	7.00	93.50	62.00	
17.00	510.00	0.60	9.60	7.00	93.50	62.00	
16.50	470.00	0.75	9.70	6.00	93.70	64.00	
17.20	530.00	0.50	8.00	5.00	93.90	55.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED JUL 16/02

16.90	462.90	0.71	11.10	4.90	93.30	69.00	16 07 02
16.00	420.00	0.70	10.20	11.00	93.40	72.00	17 07 02
17.20	510.00	0.60	9.50	8.00	93.50	65.00	
16.80	470.00	0.75	9.80	5.00	93.60	65.00	
17.50	600.00	0.50	8.00	4.00	93.80	60.00	
17.50	550.00	0.55	8.50	6.00	93.70	65.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED JUL 17/02

19.20	451.70	0.84	10.60	10.70	93.20	61.50	17 07 02
17.00	440.00	0.70	11.50	7.00	93.42	70.00	18 07 02
15.80	370.00	0.80	9.40	6.50	93.43	60.00	
17.00	600.00	0.45	7.50	6.00	94.03	54.00	
17.50	500.00	0.60	10.00	7.00	93.71	61.00	
16.50	340.00	0.80	11.00	8.50	93.15	70.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED JUL 18/02

17.20	481.80	0.84	12.70	4.40	93.40	76.80	18 07 02
16.30	420.00	0.75	10.00	12.50	93.47	66.00	19 07 02
16.60	560.00	0.50	8.00	8.00	94.06	57.00	
17.50	525.00	0.55	9.50	6.50	94.00	59.00	
17.50	420.00	0.70	11.00	7.50	93.45	66.00	
18.50	580.00	0.45	11.00	6.00	93.10	62.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED JUL 19/02

Appendix D (continued)
Recorded and Forecast Meteorological Data

15.50	404.40	0.85	10.50	12.50	93.50	73.60	19 07 02
16.50	540.00	0.50	8.00	9.00	94.10	57.00	20 07 02
17.00	550.00	0.45	8.50	6.00	94.20	57.00	
17.80	500.00	0.50	10.00	6.50	94.00	60.00	
19.00	590.00	0.40	11.00	6.00	93.30	60.00	
19.50	490.00	0.55	11.50	6.00	93.40	60.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED JUL 20/02

14.60	430.70	0.66	8.60	8.00	94.10	69.00	20 07 02
14.80	660.00	0.25	8.70	4.00	94.30	70.00	21 07 02
16.30	600.00	0.30	9.50	5.00	94.10	65.00	
18.50	590.00	0.40	10.50	5.00	93.50	60.00	
19.20	500.00	0.50	11.00	8.00	93.30	62.00	
19.40	480.00	0.50	12.00	9.00	93.40	65.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED JUL 21/02

15.40	684.30	0.13	8.20	2.40	94.40	67.00	21 07 02
16.50	600.00	0.35	9.50	3.00	93.80	65.00	22 07 02
18.00	650.00	0.35	10.50	5.00	93.60	62.00	
18.90	520.00	0.50	11.00	6.00	93.20	60.00	
19.40	550.00	0.40	12.00	7.00	93.40	65.00	
17.50	500.00	0.50	9.50	10.00	93.20	70.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED JUL 22/02

16.60	495.70	0.39	11.70	3.10	93.90	75.00	22 07 02
18.00	560.00	0.40	12.70	4.00	93.60	78.00	23 07 02
18.70	570.00	0.50	11.00	6.00	93.40	65.00	
18.60	530.00	0.50	12.00	8.00	93.30	70.00	
17.20	550.00	0.40	9.50	10.00	93.20	65.00	
16.00	570.00	0.30	8.00	8.00	93.60	60.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED JUL 23/02

19.60	651.80	0.27	13.00	2.00	93.50	70.60	23 07 02
21.50	610.00	0.50	12.70	6.00	93.60	65.00	24 07 02
18.00	490.00	0.65	12.00	10.00	93.60	70.00	
16.80	550.00	0.40	9.00	12.00	93.30	62.00	
15.60	570.00	0.40	8.00	8.00	93.50	60.00	
15.40	650.00	0.20	8.00	6.00	93.60	55.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED JUL 24/02

Appendix D (continued)
Recorded and Forecast Meteorological Data

23.00	658.40	0.40	12.90	8.90	93.60	57.00	24 07 02
20.90	490.00	0.65	11.50	10.00	93.70	60.00	25 07 02
17.00	540.00	0.50	9.00	12.00	93.70	62.00	
15.80	570.00	0.40	8.00	10.00	93.70	60.00	
15.20	650.00	0.25	7.50	9.00	93.90	55.00	
16.50	680.00	0.20	8.50	7.00	94.10	65.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY
WORLD WEATHERWATCH FORECAST ISSUED JUL 25/02							

22.40	455.80	0.70	10.90	11.10	93.50	49.90	25 07 02
17.50	570.00	0.40	6.50	14.00	93.60	55.00	26 07 02
16.40	570.00	0.30	8.50	10.00	93.50	60.00	
16.00	590.00	0.50	8.00	8.00	93.70	60.00	
15.00	570.00	0.60	7.50	7.00	93.80	65.00	
15.50	530.00	0.60	9.00	9.00	93.90	70.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY
WORLD WEATHERWATCH FORECAST ISSUED JUL 26/02							

17.50	646.60	0.44	5.60	15.80	93.40	46.00	26 07 02
15.30	600.00	0.30	6.50	8.00	93.60	55.00	27 07 02
14.00	570.00	0.50	7.00	9.00	93.50	60.00	
14.60	560.00	0.60	7.50	8.00	93.70	62.00	
15.20	550.00	0.60	8.50	8.00	93.90	70.00	
15.50	570.00	0.50	9.00	4.00	93.60	70.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY
WORLD WEATHERWATCH FORECAST ISSUED JUL 27/02							

16.00	472.00	0.52	6.40	12.50	93.50	56.00	27 07 02
15.60	520.00	0.73	7.00	12.00	93.30	57.00	28 07 02
14.60	560.00	0.35	6.50	8.50	93.50	58.00	
15.20	550.00	0.50	7.50	7.50	93.40	60.00	
14.50	520.00	0.70	9.00	7.00	93.40	70.00	
14.30	450.00	0.80	9.00	6.00	93.20	70.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY
WORLD WEATHERWATCH FORECAST ISSUED JUL 28/02							

17.10	483.00	0.74	5.00	16.50	93.30	46.00	28 07 02
15.50	530.00	0.60	4.00	15.00	93.80	48.00	29 07 02
14.90	490.00	0.80	6.00	13.00	93.50	55.00	
14.50	470.00	0.88	7.80	15.00	93.80	64.00	
14.00	430.00	0.90	8.00	13.00	93.80	72.00	
14.00	440.00	0.75	7.50	15.00	93.60	65.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY
WORLD WEATHERWATCH FORECAST ISSUED JUL 29/02							

Appendix D (continued)
Recorded and Forecast Meteorological Data

14.20	604.00	0.59	2.50	17.50	93.50	46.00	29 07 02
12.80	460.00	0.95	6.40	12.00	93.80	65.00	30 07 02
13.00	440.00	0.95	8.00	11.00	93.60	72.00	
13.00	420.00	0.90	8.50	12.00	93.60	74.00	
13.50	440.00	0.80	8.00	13.00	93.80	70.00	
15.00	510.00	0.50	4.00	10.00	94.20	50.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED JUL 30/02

10.00	221.00	0.97	5.80	12.00	93.60	76.00	30 07 02
9.70	300.00	0.93	5.00	11.00	93.90	73.00	31 07 02
10.50	360.00	0.90	7.50	12.00	93.50	82.00	
11.00	380.00	0.88	7.00	12.00	93.30	75.00	
13.00	400.00	0.70	5.00	10.00	93.50	60.00	
13.30	400.00	0.65	4.50	9.00	93.60	55.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED JUL 31/02

9.50	360.00	0.84	4.30	10.10	94.30	72.00	31 07 02
9.00	340.00	0.90	4.50	12.00	93.40	73.00	01 08 02
9.60	340.00	0.90	5.50	12.00	93.80	73.00	
11.00	360.00	0.83	4.50	11.00	93.50	64.00	
12.00	390.00	0.75	4.50	10.00	93.40	60.00	
14.50	470.00	0.50	4.00	14.00	93.60	50.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED AUG 01/02

9.10	215.80	0.95	5.20	13.20	94.10	76.60	01 08 02
9.60	300.00	0.90	5.00	12.50	93.73	73.00	02 08 02
12.00	360.00	0.83	5.00	10.00	93.56	62.00	
12.60	370.00	0.80	5.00	11.00	93.20	60.00	
14.00	450.00	0.60	5.00	10.00	93.50	55.00	
14.50	500.00	0.50	6.00	4.00	93.63	57.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED AUG 02/02

11.20	412.50	0.81	3.60	16.00	93.70	61.90	02 08 02
11.50	480.00	0.55	4.50	10.00	93.70	62.00	03 08 02
12.40	350.00	0.80	5.20	10.00	93.20	61.00	
13.20	430.00	0.60	6.00	9.00	93.65	62.00	
13.90	500.00	0.50	6.00	4.00	93.50	59.00	
13.80	550.00	0.40	5.00	4.50	93.91	55.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED AUG 03/02

Appendix D (continued)
Recorded and Forecast Meteorological Data

10.50	528.90	0.40	3.50	14.10	93.90	63.80	03 08 02
11.60	410.00	0.70	5.40	14.00	93.35	64.00	04 08 02
12.70	380.00	0.75	7.00	10.00	93.57	68.00	
13.70	490.00	0.60	6.60	5.00	93.51	62.00	
14.10	550.00	0.40	6.00	4.50	94.05	58.00	
14.40	370.00	0.70	8.00	6.00	94.31	65.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED AUG 04/02

11.00	336.30	0.58	4.70	18.50	93.40	66.70	04 08 02
10.70	280.00	0.90	6.40	10.00	93.51	75.00	05 08 02
12.70	440.00	0.70	5.50	6.50	93.52	62.00	
13.80	550.00	0.55	5.50	5.00	93.96	57.00	
14.40	470.00	0.60	7.00	6.00	94.44	61.00	
13.00	360.00	0.75	6.00	7.00	93.88	62.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED AUG 05/02

10.20	235.70	0.88	7.00	7.30	93.60	80.90	05 08 02
11.70	440.00	0.50	6.20	6.80	93.70	69.00	06 08 02
13.80	550.00	0.40	6.50	6.00	94.00	61.00	
15.50	480.00	0.55	7.50	4.00	94.20	59.00	
15.00	400.00	0.68	7.80	4.00	93.80	62.00	
14.80	550.00	0.45	6.50	8.00	93.50	58.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED AUG 06/02

12.70	525.80	0.52	6.30	10.40	93.70	70.50	06 08 02
16.30	650.00	0.19	6.70	8.00	94.10	53.00	07 08 02
16.50	400.00	0.55	7.80	6.00	94.30	58.00	
16.00	300.00	0.70	8.00	4.00	94.00	60.00	
15.00	450.00	0.50	7.50	6.00	93.80	62.00	
13.00	250.00	0.80	7.00	10.00	93.50	68.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED AUG 07/02

16.00	598.90	0.20	6.20	10.70	94.00	54.90	07 08 02
16.30	400.00	0.67	7.80	9.00	94.30	57.00	08 08 02
17.00	500.00	0.55	8.00	8.00	94.00	55.00	
15.00	480.00	0.60	7.50	10.00	93.80	61.00	
13.00	350.00	0.75	6.80	12.00	93.70	65.00	
12.80	400.00	0.60	6.00	12.00	93.90	62.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED AUG 08/02

Appendix D (continued)
Recorded and Forecast Meteorological Data

17.10	367.30	0.72	9.40	8.20	94.10	61.80	08 08 02
17.80	400.00	0.65	9.70	12.00	94.10	59.00	09 08 02
15.50	450.00	0.60	8.00	14.00	94.00	61.00	
14.50	500.00	0.50	6.50	10.00	93.90	59.00	
14.80	480.00	0.55	7.00	10.00	93.70	60.00	
15.00	490.00	0.55	7.00	10.00	93.70	58.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED AUG 09/02

17.90	560.70	0.61	8.40	13.70	93.90	57.70	09 08 02
15.20	470.00	0.60	6.10	15.00	93.90	59.00	10 08 02
15.00	550.00	0.40	7.00	8.00	94.20	60.00	
15.40	480.00	0.60	7.00	10.00	94.10	60.00	
15.50	450.00	0.70	8.00	14.00	93.90	65.00	
16.00	530.00	0.50	7.00	12.00	93.70	60.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED AUG 10/02

13.70	360.40	0.64	6.00	11.70	93.80	60.60	10 08 02
12.00	400.00	0.55	5.50	6.00	94.10	72.00	11 08 02
14.00	370.00	0.70	8.00	8.00	94.30	70.00	
15.50	460.00	0.50	7.50	8.00	94.20	65.00	
15.80	580.00	0.30	7.00	12.00	93.90	60.00	
15.00	560.00	0.40	8.00	9.00	93.70	60.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED AUG 11/02

11.60	333.00	0.51	5.50	6.10	94.00	70.00	11 08 02
14.20	490.00	0.24	8.00	10.00	94.40	66.00	12 08 02
15.20	450.00	0.45	7.50	9.00	93.90	60.00	
15.00	550.00	0.25	5.50	13.00	93.40	53.00	
13.80	500.00	0.55	7.00	8.00	93.20	64.00	
10.90	300.00	0.90	7.50	7.00	93.20	80.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED AUG 12/02

15.90	531.00	0.29	7.90	11.80	94.20	63.00	12 08 02
18.90	380.00	0.93	9.20	12.00	93.70	55.00	13 08 02
15.50	520.00	0.30	5.00	14.00	93.60	50.00	
13.20	450.00	0.60	6.50	8.00	93.30	64.00	
11.50	350.00	0.70	7.50	10.00	93.70	75.00	
14.00	400.00	0.40	5.00	6.00	93.60	55.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED AUG 13/02

Appendix D (continued)
Recorded and Forecast Meteorological Data

20.50	332.70	0.75	9.30	16.00	93.60	49.70	13 08 02
16.80	530.00	0.40	7.00	15.00	93.58	52.00	14 08 02
14.00	400.00	0.60	7.50	10.00	93.26	65.00	
12.10	425.00	0.60	6.50	8.50	93.52	69.00	
14.50	480.00	0.45	5.00	6.00	93.53	53.00	
15.20	425.00	0.65	7.50	6.00	93.24	60.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED AUG 14/02

17.70	516.70	0.41	6.80	11.00	93.50	50.00	14 08 02
13.80	480.00	0.50	6.00	12.00	93.63	59.00	15 08 02
12.00	425.00	0.55	4.50	8.50	93.73	60.00	
13.80	480.00	0.50	4.50	7.00	93.40	53.00	
15.20	410.00	0.60	7.00	6.00	93.18	58.00	
14.50	275.00	0.90	9.00	7.00	92.70	70.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED AUG 15/02

12.50	439.00	0.34	5.30	12.20	93.70	65.00	15 08 02
11.10	490.00	0.20	3.70	11.00	93.80	60.00	16 08 02
14.00	480.00	0.40	4.00	9.00	93.60	51.00	
15.40	410.00	0.50	5.50	7.00	93.50	52.00	
15.00	325.00	0.70	7.00	10.00	93.20	60.00	
14.00	300.00	0.75	7.00	11.00	93.50	63.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED AUG 16/02

11.50	543.00	0.21	3.00	7.00	93.80	63.00	16 08 02
13.70	440.00	0.59	6.50	7.00	93.50	62.00	17 08 02
15.70	440.00	0.45	5.00	9.00	93.00	49.00	
15.00	325.00	0.70	7.00	9.00	92.80	59.00	
14.00	340.00	0.65	6.00	11.00	92.90	59.00	
15.50	410.00	0.40	5.00	9.00	93.30	50.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED AUG 17/02

13.70	485.00	0.60	6.80	6.60	93.50	65.00	17 08 02
15.50	440.00	0.40	7.00	9.80	93.50	57.00	18 08 02
15.20	360.00	0.55	7.50	8.00	93.20	60.00	
14.70	370.00	0.45	5.50	10.00	93.30	54.00	
15.70	410.00	0.40	5.50	9.00	93.40	51.00	
16.00	475.00	0.20	5.00	6.00	93.60	50.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY

WORLD WEATHERWATCH FORECAST ISSUED AUG 18/02

Appendix D (continued)
Recorded and Forecast Meteorological Data

15.50	392.00	0.36	7.10	11.70	93.30	60.70	18 08 02
14.10	500.00	0.30	6.00	7.00	93.10	60.00	19 08 02
15.00	520.00	0.35	6.00	8.00	93.40	55.00	
15.30	370.00	0.60	7.00	10.00	93.50	65.00	
15.60	580.00	0.30	5.50	6.00	93.80	55.00	
16.20	600.00	0.20	5.00	3.00	94.10	52.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY
WORLD WEATHERWATCH FORECAST ISSUED AUG 19/02							

13.00	487.10	0.26	5.00	5.00	93.10	61.00	19 08 02
13.50	500.00	0.35	5.50	5.00	93.30	60.00	20 08 02
13.90	400.00	0.50	7.50	8.00	93.60	65.00	
14.50	500.00	0.40	6.50	5.00	93.80	55.00	
16.00	580.00	0.30	5.00	3.00	94.00	52.00	
15.80	590.00	0.20	4.50	2.00	93.90	50.00	
ATEMP(C)	RAD(LY)	CC(TTHS)	DPT(C)	SPD(KH)	SPR(KPA)	RH(%)	DD MM YY
WORLD WEATHERWATCH FORECAST ISSUED AUG 20/02							

Appendix E
Summer Water Temperature and Flow Management
Project Reservoir Release Volume Calculations for
July 10 to August 20, 2002

Appendix E
 Summer Water Temperature and Flow Management Project Reservoir Release Volume
 Calculations for July 10 to August 20, 2002

Skins Lake Spillway base release for the period July 10 (191) to August 20 (232) = 53.7 m³/s (1,897 cfs)

Summer Water Temperature and Flow Management Project Base Release Volume = (232 - 190) * 53.7 = 2,255.4 m³/s*days

Time period (Julian Day)	Time (hrs)	Flow Rate (m ³ /s)	Volume (m ³ /s*hrs)
July 10 (191) @ 2400 hrs to July 11 (192) @ 1600 hrs	40.0	53.7	2,149
July 11 (192) @ 1600 hrs to July 24 (205) @ 1600 hrs	312.0	227	70,677
July 24 (205) @ 1600 hrs to July 25 (206) @ 1600 hrs	24.0	453	10,874
July 25 (206) @ 1600 hrs to August 1 (213) @ 1600 hrs	168.0	227	38,057
August 1 (213) @ 1600 hrs to August 6 (218) @ 1600 hrs	120.0	283	33,980
August 6 (218) @ 1600 hrs to August 18 (230) @ 1600 hrs	288.0	227	65,241
August 18 (230) @ 1600 hrs to August 20 (232) @ 2400 hrs	56.0	14.2	793
Total	1,008 (42 days)		221,771
Total Release Volume			= 221,771 m ³ /s*hrs = 9,240.5 m ³ /s*days = 326,327 cfs*days
Therefore, Volume Released for Cooling Purposes and Spills			= Total Volume - Base Volume = 9,240.5 - 2,255.4 = 6,985.1 m ³ /s*days = 246,677 cfs*days
Average Release over Summer Management Period (July 10 to August 20, 2002)			= 9,240.5 m ³ /s*days / 42 days = 220.0 m ³ /s = 7,769.7 cfs