ANNUAL REPORT

April 1, 1996 - March 30, 1997

NECHAKO FISHERIES CONSERVATION PROGRAM

(A joint Program of the Government of Canada,
Alcan, and the Province of British Columbia)

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CONTENTS

Under the terms of the 1987 Settlement Agreement between Alcan Aluminium Limited, the Government of Canada and the Province of British Columbia, the Nechako Fisheries Conservation Program (NFCP) is in the 9th year of implementation of a program of studies related to the conservation of chinook and sockeye salmon in the upper Nechako River. The studies have included pilot tests of remedial measures, monitoring of adult and juvenile abundance and condition, and flow control measures. This work continued into the 1996/97 program year.

The NFCP oversaw the Allocation of Flows and the Summer Water Temperature Management projects in 1996/97 to achieve the most advantageous flows and temperatures for chinook and sockeye salmon. Pilot testing of the habitat complexes continued in 1996/97 with the addition of small evergreen trees placed along the river margins as potential emergent fry structures. Juvenile chinook continue to use the complexes, with debris catchers showing more durability than debris bundles.

Adult monitoring projects were also continued in 1996/97, and 2,040 chinook spawners were estimated in the Nechako River. As in previous years, the dominant age class was 5 year old chinook. Baseline data collection consisted of the monitoring of gravel quality and dissolved oxygen, water temperature and flow, and winter physical conditions .

Indices calculated from the monitoring of fry emergence and juvenile outmigrants were correlated with the number of spawners the previous fall, evidence that the index reflects natural processes.

Applied research on a Chinook Life History Model was conducted in 1996/97, including a workshop to define the parameters of the model. In addition, studies on the Ecology of Juvenile Chinook were conducted in the Nechako River.

With the cancellation of KCP in 1995, the flow regime is no longer expected to change, and the evaluation framework integrating these programs will be reevaluated in the future. There remains a need to evaluate the information as it is collected, however. The decision pathways and criteria were refined, and the documentation of the work completed to date was conducted in 1996/97.

In 1980, Alcan Aluminium Limited proposed to use the remaining portion of its water rights granted by the Provincial Crown in 1950. Alcan planned to divert water from the Nechako River to expand its hydroelectric facilities to produce power for additional aluminum smelting facilities in northwestern British Columbia. To establish appropriate fisheries conservation measures and stock monitoring projects, several years of scientific and engineering studies were undertaken by the federal government and Alcan.

In September 1987, Alcan, the Government of Canada and the Province of British Columbia signed an agreement for the conservation of Nechako River chinook salmon and the protection of migrating sockeye salmon populations in the Nechako River. Known as the 1987 Settlement Agreement, this agreement led to the establishment of the Nechako Fisheries Conservation Program (NFCP). The NFCP identified the annual allocation of water for fish, including releases to reduce water temperatures for the benefit of sockeye during July and August; a Conservation Goal for chinook (including harvest plus escapement of 1,700 to 4,000 spawners); and a program of monitoring, pilot testing of remedial measures and applied research to assure the Conservation Goal is achieved.

The 1987 Agreement included the requirement that Alcan develop a water release facility at Kenney Dam to provide control of flow and temperature to protect salmon. It also described the flows required before (Short Term Annual Water Allocation) and after (Long Term Annual Water Allocation) completion of the facility. NFCP monitoring projects were designed to collect baseline data during the Short Term flows as a basis for comparison to conditions after the completion of the release facility and the shift to the lower Long Term flows. Further discussion regarding the terms of the agreement may be found in the 1988/89 NFCP Annual Report.

The NFCP is comprised of a Technical Committee and a Steering Committee. The Technical Committee is responsible for the implementation and ongoing administration of the program of remedial measures, monitoring and applied research to achieve the conservation goal. The Steering Committee is responsible for overseeing the implementation of the Settlement Agreement, and approving the annual program of activities relating to the achievement of the Conservation Goal as submitted by the Technical Committee.

During 1987-1988, the first year of the NFCP, operating procedures and a five year program framework of activities were developed in anticipation of a reduction in Nechako River flows. In addition, a strategic framework was developed by the Technical Committee to direct the overall plan (see previous NFCP Annual Reports). It focused on specific and measurable elements of habitat and chinook ecology. The framework provides guidelines for testing and executing remedial measures, as well as the monitoring of stock and habitat performance and research into the ecology of Nechako River chinook. Under the strategic framework, the Technical Committee designed three flow charts to assist in the understanding of how committee activities are directed. These included:

1) The Decision Chart used in the evaluation of selection, implementation and success of Remedial Measures (Appendix A.1).
2) The NFCP Early Warning Monitoring Program used to assess trends reflected by monitoring programs targeted at juvenile chinook life histories, and to suggest actions to be taken in response to these trends (Appendix A.2).
3) Assessment of the Conservation Goal which presents an assessment of achievements and shows the extrinsic and intrinsic factors that may affect Nechako River chinook production (Appendix A.3).

Remedial Measures

Projects to test and evaluate appropriate measures, which were intended to protect against any change in the chinook salmon habitat following implementation of the long-term flow regime under KCP, have been the focus of the first seven years of the NFCP work. There are three stages of remedial measures (Levels A, B, and C). These were identified in the Settlement Agreement and have been developed in accordance with the Department of Fisheries and Oceans Policy for the Management of Fish Habitat.

To date only Level A measures have been pilot tested. Several types of habitat complexes have been pilot tested, assessed, modified and re-assessed for structural integrity and juvenile chinook utilization. Characteristics of natural cover already existing in the river were incorporated into habitat complexes constructed and maintained over the past 9 years. Ongoing assessments continue to help define the characteristics of the complexes best suited to meet the needs of Nechako River chinook. Rail debris catchers are proving the most durable of the in-stream habitat complex types.

Results from biological sampling indicate that the habitat complexes are well used by chinook fry. There is also continued evidence that the complexes are used as overwintering habitat by chinook.

Monitoring

The second component of the NFCP involved developing and implementing monitoring projects on stock and habitat performance. The projects have been designed to detect changes in physical and biological parameters, by collecting baseline data on stock strength. To date, efforts have been directed at establishing monitoring projects which would expand the existing database. Monitoring studies were targeted at three life history phases of Nechako River chinook salmon.

The primary monitoring measure for chinook salmon is the number of adult chinook returning to the Nechako River to spawn. To help assess whether the Conservation Goal is being achieved, adult spawning enumeration is undertaken annually to determine the number of adults returning to the Nechako River. Enumeration and carcass recovery are also conducted in the Stuart River, which has fish stocks of similar life history patterns and acts as a control. This provides an opportunity to compare relative numbers of returning adult chinook salmon. Various population characteristics such as age structure, sex ratio, length and egg retention in females are also measured.

Secondary monitoring measures include juvenile outmigration monitoring and monitoring of fry emergence to develop an egg / alevin survival index. These measures can provide an early indication of life cycle stresses or productivity changes in the system four or five years before the effects may be observed in returning adult spawners.

Tertiary measures include monitoring of parameters that may affect habitat quality such as monitoring of gravel quality, ice conditions and temperature.

The primary monitoring measure for sockeye salmon is the summer water temperature at Finmoore, just upstream of the confluence of the Nechako and Stuart rivers.

Applied Research

A third component of the Program involves identifying and implementing applied research programs to aid in the overall understanding of Nechako River chinook life history and ecology. Research on overwintering juvenile chinook populations has examined their winter abundance and distribution within the Nechako River. In addition, research into predator / prey relationships has been conducted to identify predators and define the potential risks posed to chinook populations. Research to gain an understanding of the effects of temperature (cooler water released from the Kenney Dam Release Facility) on invertebrate production and fish growth has also been conducted.

Chronology of Significant Events

Field projects for the first year of an initial five-year plan began in 1988. Construction of the Kemano Completion Project (KCP), initiated in 1988, was halted by Alcan in 1991 as a result of the uncertainty created by a federal court decision which set aside the 1987 Settlement Agreement. That decision was overturned by the Federal Court of Appeal in 1992 and leave to appeal that decision was dismissed by the Supreme Court of Canada in February 1993, confirming the legal validity of the 1987 Settlement Agreement.

In January 1993, the Province of British Columbia directed the British Columbia Utilities Commission (BCUC) to conduct a public review of the Kemano Completion Project. From April 1, 1994 until June 1994 the Nechako Fisheries Conservation Program Technical Committee was involved in preparing and presenting evidence to the BCUC outlining the mandate of the NFCP and the progress of the program to date.

On January 23, 1995, the Province announced that it would not allow the Kemano Completion Project to proceed. However, the NFCP continues to have ongoing responsibility for managing the annual water allocation and the summer water temperature program, and undertaking projects that enable the Technical Committee to assess and / or respond to achieve the Conservation Goal. It was decided to carry on with the collection of data to maintain a database to complete at least 10 years (two life cycles of chinook) of data while the program for subsequent years is being evaluated. Remedial measures projects such as the Cheslatta-Murray inflow management project have been discontinued or will be scaled back. Monitoring projects will continue. However, given that the focus of the strategic framework is on the detection of the effects of changes in flow on the aquatic environment, and that flow changes will not occur due to the cancellation of KCP, the Technical Committee will be re-evaluating this framework in the future.

Year 9 - Project Summary
Year 10 - Approved Projects

This Annual Report for 1996/97 covers Year 9 of the Nechako Fisheries Conservation Program. It describes the operations of the NFCP, the development of the program and its various components. In light of the rejection of KCP, the focus of the NFCP has shifted to the monitoring component of the program to provide continuity of the database, and to finalizing some of the remedial measures projects. This report provides the rationale and review of the remedial measures, monitoring of stock and habitat performance and applied research projects undertaken in 1996/97 (Year 9). It also includes a brief description of approved projects for Year 10 (1997/98) of the NFCP. A summary chart presents a review of all projects carried out since 1987.

In Year 9 of the NFCP (April 1, 1996 to March 31, 1997) the Technical Committee convened 14 meetings. Annual reports from 1988/89 to 1994/95 are available and provide information on specific projects and test results of remedial measures, habitat and stock monitoring and applied research. A summary report on 1991/92 projects is also available.

YEAR 9: PROJECT SUMMARY (1996/97)

REMEDIAL MEASURES

FLOW MANAGEMENT
- Allocation of Flows
- Summer Water Temperature and Flow Management Projects

IN-STREAM HABITAT COMPLEXES
- Physical Assessment of In-Stream Habitat Complexes
- Biological Assessment of Habitat Complexes

HABITAT AND STOCK MONITORING

ADULT PROGRAMS
- Adult Spawner Enumeration
- Adult Carcass Recovery

INCUBATION ENVIRONMENT
- Gravel Quality and Dissolved Oxygen Monitoring
- Fry Emergence
- Winter Physical Conditions

JUVENILE OUTMIGRATION

TEMPERATURE MONITORING/PHYSICAL DATA COLLECTION

EVALUATION FRAMEWORK/TREND ANALYSIS

APPLIED RESEARCH

CHINOOK LIFE HISTORY MODEL

ECOLOGY OF JUVENILE CHINOOK SALMON

YEAR 10: APPROVED PROJECTS (1997/98)

REMEDIAL MEASURES

FLOW MANAGEMENT
- Allocation of Flows
- Summer Water Temperature and Flow Management Projects

IN-STREAM HABITAT COMPLEXES
- Physical Assessment of In-Stream Habitat Complexes
- Biological Assessment of Habitat Complexes

HABITAT AND STOCK MONITORING

ADULT PROGRAMS
- Adult Spawner Enumeration
- Adult Carcass Recovery

INCUBATION ENVIRONMENT
- Gravel Quality and Dissolved Oxygen Monitoring
- Fry Emergence
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JUVENILE OUTMIGRATION

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EVALUATION FRAMEWORK/TREND ANALYSIS

APPLIED RESEARCH

CHINOOK LIFE HISTORY MODEL

ECOLOGY OF JUVENILE CHINOOK SALMON

Chart 1: Summry of NFCP Projects by Year

Program		Years Collected									
	#	88/89	89/90	90/91	91/92	92/93	93/94	94/95	95/96	96/97	97/98
REMEDIAL MEASURES											
Cheslatta Murray Data Collection	6		x	x	x	x	x		x		
Summer Temperature Management	10	x	x	x	x	x	x	x	x	x	x
Instream Habitat Modification	10	x	x	x	x	x	x	x	x	x	x
Fertilization	5	x	x	x	x	x					
Biological Assessment of Habitat Complexing	9		x	x	x	x	x	x	x	x	x
Inventory of Habitat	2		x	x							
Inventory of Sediment	1		x								
Flow Control	9		x	x	x	x	x	x	x	x	x
Winter Remedial Measures	1			x							
River Bed Survey HEC-2 Model	1			x							
Riparian Bank Stabilization	3				x	x	x				
MONITORING											
Adult Chinook Spawner Enumeration	10	x	x	x	x	x	x	x	x	x	x
Chinook Carcass Recovery	10	x	x	x	x	x	x	x	x	x	x
Juvenile Outmigration Monitoring	10	x	x	x	x	x	x	x	x	x	x
Winter Physical Conditions	10	x	x	x	x	x	x	x	x	x	x
Physical Data Collection	10	x	x	x	x	x	x	x	x	x	x
Fry Emergence	9		x	x	x	x	x	x	x	x	x
Gravel Quality	5	x	x	x	x	x					
Dissolved Oxygen Monitoring	7				x	x	x	x	x	x	x
Evaluation Framework and Trend Analysis	7				x	x	x	x	x	x	x
APPLIED RESEARCH											
Ecology of Juvenile Chinook Salmon	2									x	x
Chinook Life History Model	2		x							x	
Predator Prey Studies	6			x	x	x	x	x	x		
Temperature Effects	4					x	x	x	x		
Chinook Overwintering	6	x	x	x		x	x		x		

FLOW MANAGEMENT

Allocation of Flows

RATIONALE

The management of the annual water allocation to the Nechako River is designed to benefit fish in the river and achieve the Conservation Goal of the Settlement Agreement. To meet the objectives for flow control in the Nechako River, necessary adjustments must be made regarding Skins Lake Spillway releases.

PROJECT SUMMARY 1996/97

The annual water allocation was again managed by the NFCP Technical Committee to achieve the most advantageous flows for chinook and sockeye.

Skins Lake Spillway releases were scheduled and the spring and summer mean monthly flows were monitored by recording mean daily releases from Skins Lake Spillway and mean daily flows at the gauging station on the Nechako River below Cheslatta Falls. Reservoir releases from Skins Lake Spillway and flow in the Nechako River are shown in Figures 1 and 2.

Due to higher than normal snowpack conditions in the spring and heavy rainfall in the reservoir basin during the summer and fall, releases from Skins Lake Spillway were increased several times over the year. Although summer releases reached a maximum of 255 m^3/s in July, the summer temperature management program operated normally and on August 20, 1996, the spillway release was reduced to 14 m^3/s to achieve the fall spawning flows in early September. In the fall releases were again increased due to flood control, and reached a maximum of 236 m^3/s, which, when combined with a sudden drop in temperatures, contributed to the formation of ice in the upper river. Near-normal winter flows were re-established by November 15, 1996.

APPROVED PROJECT 1997/98

In 1997/98, flow allocation will again be managed by the NFCP Technical Committee to best utilize available water.

FIGURE 1

COMPARISON OF ACTUAL AND SETTLEMENT AGREEMENT - SKINS LAKE SPILLWAY RELEASES
(January to December 1996)

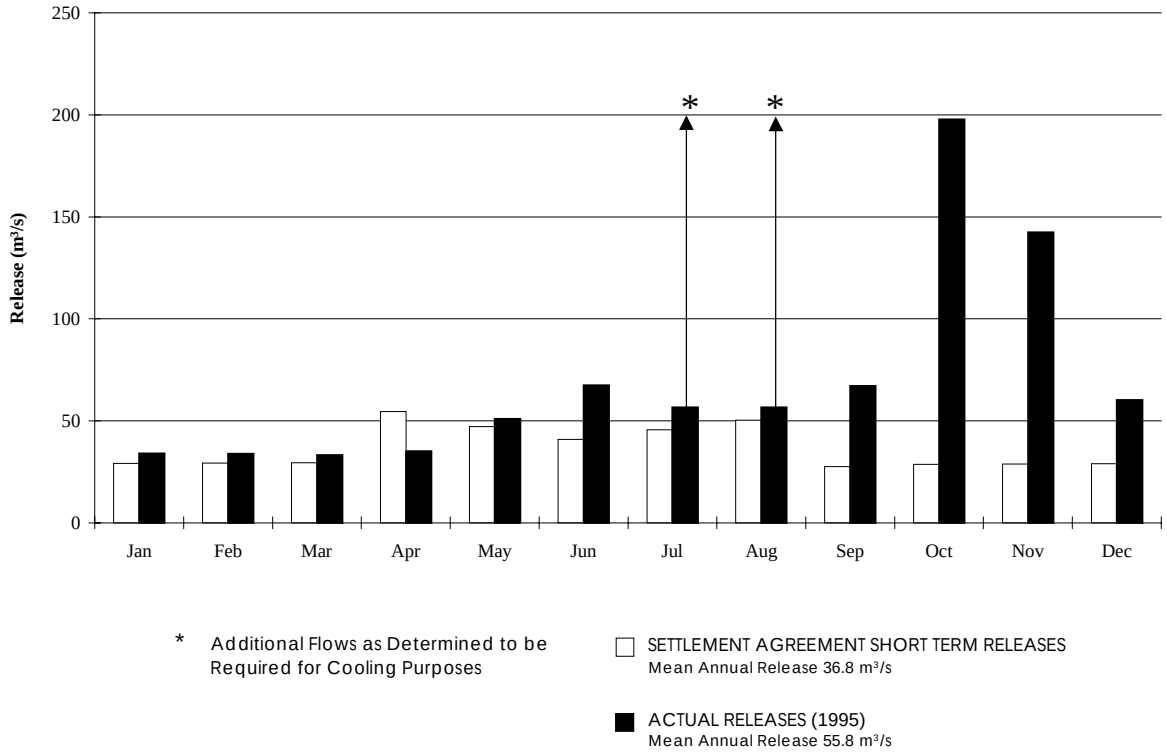
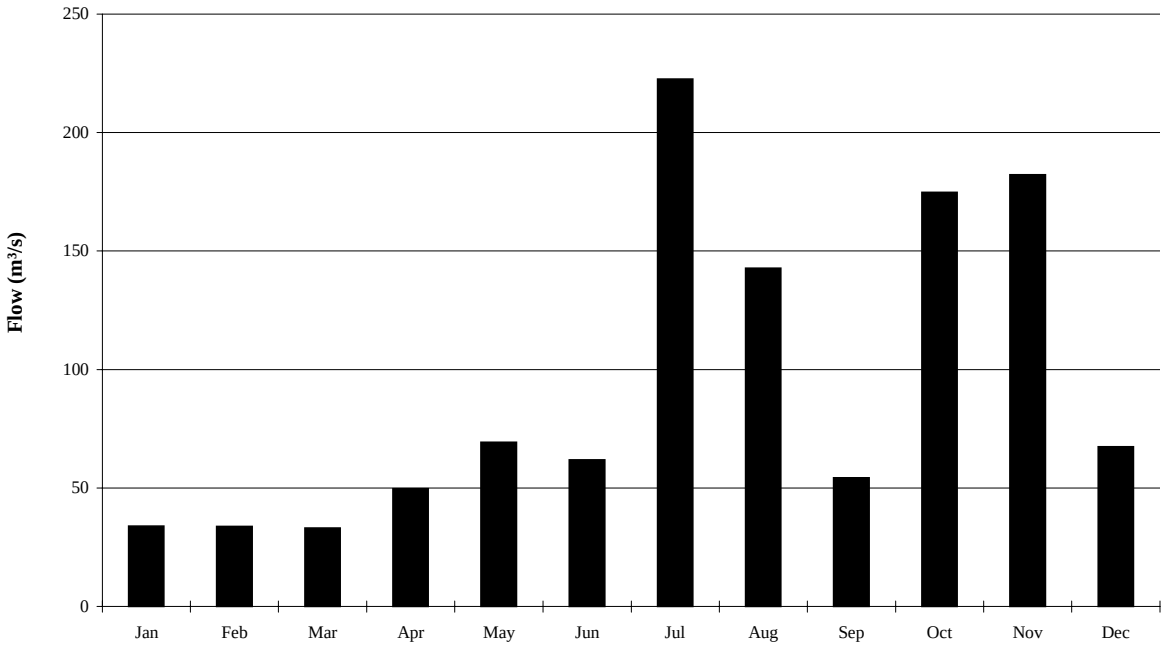


FIGURE 2

ACTUAL FLOWS IN THE NECHAKO RIVER BELOW CHESLATTA FALLS
(January to December 1996)



Summer Water Temperature Management

RATIONALE

To protect sockeye salmon during their migration within the lower Nechako River, it is necessary to manage river water temperature.

Nechako River flows and water temperatures are managed through releases from the Skins Lake Spillway. This is done in an attempt to maintain mean daily water temperatures at or below 20 °C in the Nechako River upstream of the Stuart River at Finmoore. Management is carried out through a computer program defined in the Settlement Agreement. The program protocol uses a trend analysis developed from five-day meteorological forecasts and daily in-stream temperature measurements to schedule releases from the Skins Lake Spillway.

PROJECT SUMMARY 1996/97

The Summer Water Temperature Management Program was again implemented in 1996/97. The program was successful in maintaining the mean daily water temperatures below 20.0°C. Mean daily water temperatures upstream of the Stuart River confluence reached a maximum of 18.7°C on July 27.

The average flow in Nechako River below Cheslatta Falls was approximately 190 m^3/s during the water temperature control period. Increases in releases from Skins Lake Spillway above base flows from July 4 to 26 resulted in peak flows at Cheslatta Falls of at or near 270 m^3/s. Mean daily water temperatures averaged 17.4°C (range 14.6°C to 18.7°C) during the water temperature control period (July 10 - August 30).

APPROVED PROJECT 1997/98

The 1997/98 project will follow the same protocol and will be conducted in a manner consistent with previous projects.

IN-STREAM HABITAT COMPLEXES

Physical Assessment of In-stream Habitat Complexes

RATIONALE

Cover habitat provides refuge for fish from fast-flowing water and predators, yet still allows them access to food in the river. As part of the pilot testing of remedial measures, a number of habitat structures (complexes) have been constructed in the Nechako River. The construction of habitat complexes at a larger scale was intended to manage the risk to chinook stocks associated with changes in the amount of in-stream cover habitat after the shift to the long-term flow regime with KCP. With the cancellation of KCP, the larger scale construction of these complexes is not longer contemplated.

The physical assessment of different pilot scale habitat complexes aids in the identification of the types of structures most suitable for use in the Nechako or other rivers. As testing of the long term durability of the pilot structures was not yet complete when KCP was canceled, the physical assessment of the structures is continuing, although at a reduced level of effort.

PROJECT SUMMARY 1996/97

In 1996/97, physical assessment and photographic/video documentation of the habitat complexes was conducted to provide a chronological record of the effects from winter conditions and summer cooling flows. In general, rail debris catchers, providing simulated log jam structures, continue to be durable although some debris loss is taking place in Reach 4. Debris bundle complexes are generally less durable than debris catchers.

During 1996/97 a series of emergent fry structures, consisting of small evergreen trees placed along river margins in areas of known high density spawning, were pilot tested. Durability of these structures will continue to be monitored.

APPROVED PROJECT 1997/98

In 1997/98 physical monitoring of habitat complex durability will continue. Also, it is proposed that the habitat structures for emergent fry continue to be pilot tested. In addition, physical assessment and photographic/video documentation of the habitat complexes will continue to provide a chronological record of the effects from winter conditions and summer cooling flows.

Biological Assessment of Habitat Complexes

RATIONALE

Assessment of fish usage of the man-made habitat complexes is intended to identify the most beneficial types of habitat complexes. These complexes must provide habitat for all life history phases of Nechako River juvenile chinook but not contribute advantageous rearing conditions to non-salmonids.

PROJECT SUMMARY 1996/97

Results from 1996/97 assessments continue to indicate good usage of the habitat complexes. Initial assessments, conducted by snorkel survey, suggest that up to 46% of the chinook enumerated during May and June within Reach 2, and 30% in Reach 4, were associated with the habitat complexes. Furthermore, electroshocking surveys continue to provide evidence that suggests that the complexes are used as rearing and overwintering habitat by juvenile chinook.

APPROVED PROJECT 1997/98

Assessment efforts will continue in 1997/98. This year's projects will include assessments in May and June, reflecting those periods of maximum observed use during summer rearing flows. In addition, information gathered during the April, July and November monitoring projects will also be used to investigate chinook utilization of habitat complexes. The control sites and the complexes constructed in previous years and a selection of natural sites will be assessed for their use by juvenile chinook and compared to the habitat complexes.

ADULT PROGRAMS

Adult Spawner Enumeration

RATIONALE

The number of adult chinook salmon returning to spawn in the Nechako River is the primary indicator of the overall state of the Nechako River chinook salmon stocks and indicates achievement of the Target Population.

PROJECT SUMMARY 1996/97

In 1996, 7 overflights were undertaken between August 21 and September 29 and the escapement was estimated as 2,040 spawners. This is a decline from 2,360 spawners estimated in the brood year (1991). The Stuart River chinook carcass recovery project estimated 7,415 returning spawners, an increase from last year's 3,730 spawners.

APPROVED PROJECT 1997/98

The 1997/98 project on the Nechako and Stuart Rivers will employ methods similar to those of previous years.

Adult enumeration on the Stuart River will occur using a tagging and carcass recovery program. Procedures will be overseen by DFO personnel.

Adult Carcass Recovery

RATIONALE

The analysis of data from adult carcasses collected near the spawning grounds provides life history information on freshwater and marine components of Nechako River chinook salmon. This information aids to interpret enumeration results and indicates which brood years have contributed to the spawning population. It also helps to determine the success of juvenile rearing strategies and the quality of spawning habitat and condition of spawning fish. Data on age at return and egg deposition will also help to interpret results from other monitoring projects.

PROJECT SUMMARY 1996/97

Adult chinook salmon carcasses were recovered from the Nechako and Stuart Rivers. Preliminary analysis of the data collected in 1996 indicates that the dominant age class in the Nechako River in 1996 was 5-year-old chinook (46.9%) with one complete year of fresh water residency. This is the lowest percentage observed since 1988 (53.2 % - 86.6% 5 year olds). In addition, 4-year-old chinook with one complete year of freshwater residency made up 40.8% of the spawners returning. The chinook returning to the Stuart River were 60.5% 5 year-olds and 30.1% 4 year-olds, all with one year of freshwater residency.

APPROVED PROJECT 1997/98

In 1997/98, the carcass recovery project will continue to collect biological data on size, sex, age, life history, and egg retention of chinook.

INCUBATION ENVIRONMENT

The incubation environment refers to the habitat area and conditions within the river where salmon spawn. This environment is used during the winter months, from September to April, when the eggs and alevins are within the gravel.

Fry emergence is an indicator of the quality of the ingravel environment and can also indicate when winter physical conditions have affected this environment. Studies are being conducted in each of these areas.

Gravel Quality and Dissolved Oxygen Monitoring

RATIONALE

The substrate of the Nechako River provides habitat for spawning, incubating, rearing, and food production for chinook salmon. The oxygen concentration in the interstitial gravel is directly related to emergent success of juvenile chinook salmon. One method to determine the quality of the incubation environment is through the measurement of intergravel dissolved oxygen.

PROJECT SUMMARY 1996/97

In 1996/97, the complete dissolved oxygen monitoring station was modified and but was operational on the Nechako River. Since July 1994, the equipment has been operational, serviced and calibrated every three months.

APPROVED PROJECT 1997/98

The equipment will remain in the river in 1997/98 to further test the data collection system. Pending the analysis of 1996/97 results, it will be used to collect baseline data.

Fry Emergence

RATIONALE

The quality and quantity of fry emerging from the gravel is a key indicator of the condition of the incubation environment. A monitoring project designed to assess emergent success and fry condition serves as an early warning indicator of any changes in the incubation environment.

PROJECT SUMMARY 1996/97

In 1996/97, four inclined plane traps were again installed downstream of a major spawning area near Bert Irvine's (km 19). Data indicates that the correlation between the number of spawners during previous years and the total number of emergent fry is very strong. This strong correlation validates the use of the index as an indicator of fry emergence in years of similar flows.

APPROVED PROJECT 1997/98

The 1997/98 project will repeat the program conducted in the previous five years. Four inclined plane traps will be installed at Bert Irvine's and mark/recapture experiments will be conducted to determine trap efficiency. The results of the fry emergence project continue to be important for monitoring the incubation environment in the Nechako River.

Winter Physical Conditions

RATIONALE

Understanding winter physical conditions and their effect on chinook incubation and overwintering in the Nechako River is important to gain a better understanding of the life history of the Nechako River stock.

Baseline data collected during the short-term flow regime contributes to the existing database and has provided some of the basis for design and application of remedial measures in areas of severe icing conditions.

PROJECT SUMMARY 1996/97

In 1996/97, air and water temperatures, ice data, and discharge on the Nechako River were collected and added to the database.

APPROVED PROJECT 1997/98

In 1997/98, data will continue to be collected and analyzed, and a report documenting the results of the project will be completed.

JUVENILE OUTMIGRATION

RATIONALE

The number and condition of juvenile chinook migrating down the Nechako River is an early indicator of the productivity of the river's spawning, incubation and rearing areas. Declines in numbers of outmigrants can provide a warning of any change in juvenile chinook survival.

Monitoring the timing and abundance of migrating juveniles on an annual basis will indicate any changes and will also provide life history and juvenile population information four to five years prior to the return of adult spawners. As outlined in the Strategic Framework, indications of changes in numbers of juvenile chinook leaving the system will determine subsequent monitoring and remedial action.

PROJECT SUMMARY 1996/97

In 1996/97, three "rotary screw traps" (RST) were again fished at Diamond Island. The peak catches of emergent chinook fry at Diamond Island occurred during mid May while low numbers of chinook emigrated from the system throughout the sampling period (April 12 - July 14). Comparisons of seasonal trends in size-at-date, electroshocking catch-per-unit-effort and spatial distribution, and the index of outmigration showed that the population dynamics of 0+ chinook salmon in the upper Nechako River in 1996 were similar to the population dynamics for the years 1991 to 1995.

APPROVED PROJECT 1997/98

In 1997/98 the three rotary screw traps will again be deployed at Diamond Island and run in conjunction with electrofishing. The traps will be fished from April 1 to the start of the summer water temperature cooling period, July 20, the period of greatest chinook outmigration. Index sampling (electrofishing) will be conducted in April, May, June, July and in November.

TEMPERATURE MONITORING/PHYSICAL DATA COLLECTION

RATIONALE

The timing of emergence, growth rates and life history dynamics of chinook salmon are closely related to the temperature of their environment. The collection of reliable river temperature information is part of the ongoing database of observed physical conditions in the Nechako River. The data is important in the designing of other monitoring projects and in assessing the timing of juvenile chinook life history events.

PROJECT SUMMARY 1996/97

In 1996/97 the collection of physical data (air and water temperature, and discharge) was continued as in previous years. The data was applied to the fry emergence, juvenile outmigration, chinook enumeration and winter physical conditions projects, primarily with respect to interpreting the timing of biological and physical events.

APPROVED PROJECT 1997/98

In 1997/98, collection of baseline data will continue to provide physical data to the other program components.

EVALUATION FRAMEWORK/TREND ANALYSIS

RATIONALE

The projects conducted by the NFCP consist of numerous physical and biological components. The need was identified for the Technical Committee to systematically analyze cause and effect relationships to best manage the overall program. This approach was developed within the context of the Conservation Goal outlined in the Settlement Agreement, to help accelerate action after the change to the long-term flow regime if deemed necessary. It would also help define the duration and effort required by monitoring and remedial measures projects to ensure that the chinook Conservation Goal is met. With the cancellation of KCP and the resulting fact that there will not be a change in the flow regime, the Technical Committee will have to re-evaluate this decision framework in the future.

To adequately follow the decision path of the NFCP Early Warning Monitoring Program, a synthesis of the available data and completion of an initial trend analysis of the data is planned. This will be done for both sockeye and chinook salmon and documented in a formal report setting out the approach and criteria within which future decisions on the implementation of remedial measures will be undertaken.

PROJECT SUMMARY 1996/97

The preparation of an evaluation framework document was continued in 1996/97. Work was undertaken to better define the decision pathways and criteria and to document the work completed to date, primarily analysis of data related to the conservation of sockeye salmon.

APPROVED PROJECT 1997/98

In 1997/98, work will continue on the Strategic Framework document which will include sections on the Evaluation Framework, but in the context of the continuation of the existing flows as a result of the decision to cancel KCP.

CHINOOK LIFE HISTORY MODEL

RATIONALE

The terms of reference for scientific input into the NFCP program include a life history model for the Nechako River Chinook. DFO Science is currently developing a life history model for the Fraser Basin. This model is based on approximately 1,300 1:20,000 TRIM maps forming a geo-referenced spatial platform. Streams are connected by an integrated network allowing spatial analysis upstream and downstream from a given point and providing over 1 million geo-referenced locations to assign attributes.

DFO is responsible for the management of Upper Fraser chinook salmon. These fish have complex life histories not yet fully understood. The construction of a Nechako chinook model which integrates habitat and fisheries data on a spatial platform will potentially further our understanding of these salmon populations and provide a tool for examining a variety of "what if scenarios".

PROJECT SUMMARY 1996/97

Analysis of the data for the Chinook Life History Model continues to be refined on an ongoing basis. A workshop was held to identify the parameters to be integrated into the model.

APPROVED PROJECT 1997/98

In 1997/98, work will continue on the Chinook Life History Model which will include integration of the parameters discussed at the workshop.

ECOLOGY OF JUVENILE CHINOOK SALMON

RATIONALE

Work conducted since the early 1980's has indicated that Nechako chinook spend one full year of residency in fresh water prior to migrating out into the ocean. This residency can take place either in the Nechako River or downstream in the Fraser River. Studies conducted in the upper Nechako River have documented large numbers of chinook juveniles migrating out of this river section within a period of 3 months after emergence. The downstream rearing distribution of these fish is not well known. Similarly, the rearing distribution of fry from chinook spawning in the middle reaches (km 80 - 140) is not well understood. There has been no recent work on the distribution and abundance of juveniles in the lower river (from the Stuart River confluence to Prince George).

A percentage of returning adults result from juveniles that reared downstream, and factors that affect their survival are important in determining overall adult abundance. This project will provide quantitative information on 1) the distribution of juveniles along the length of the Nechako River, 2) the importance of the lower Nechako and mainstem Fraser River for rearing, 3) the non-salmonid communities of the lower Nechako that may impact chinook through competition and predation.

The results of this project will attempt to fill gaps in our understanding of the relative roles of different habitats in producing juvenile chinook salmon. The data will be directly comparable to that recently collected on the Chilcotin, Bowron and Slim watersheds and will allow an assessment of flow regulation on the life history of the Nechako population.

PROJECT SUMMARY 1996/97

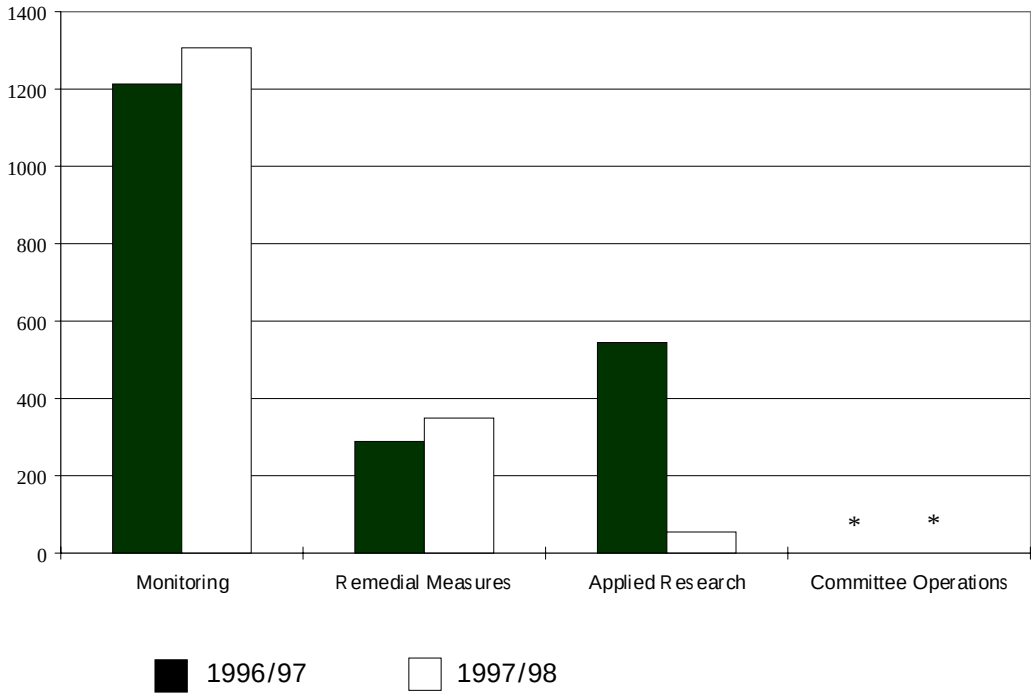
During 1996/97 two Rotary Screw Traps were operated in the Nechako River upstream and downstream of the Stuart River confluence, and a third trap was operated in the Stuart River to assess downstream movements of juvenile chinook salmon. Rearing surveys of juvenile chinook were also conducted by seining and electrofishing in the middle and lower Nechako River, to determine the distribution and abundance of rearing chinook salmon. DNA samples were collected from juvenile chinook captured throughout the study area, and will be used to identify each population. As well, a behavioural study using Nechako, Bowron, and Chilko River chinook was undertaken to determine the various stocks propensity to downstream migratory behaviour. The results of this study are currently being analyzed.

APPROVED PROJECT 1997/98

In 1997/98 the results of the Ecology of Juvenile Chinook study will continue to be analyzed and integrated with results from other NFCP programs on the upper river.

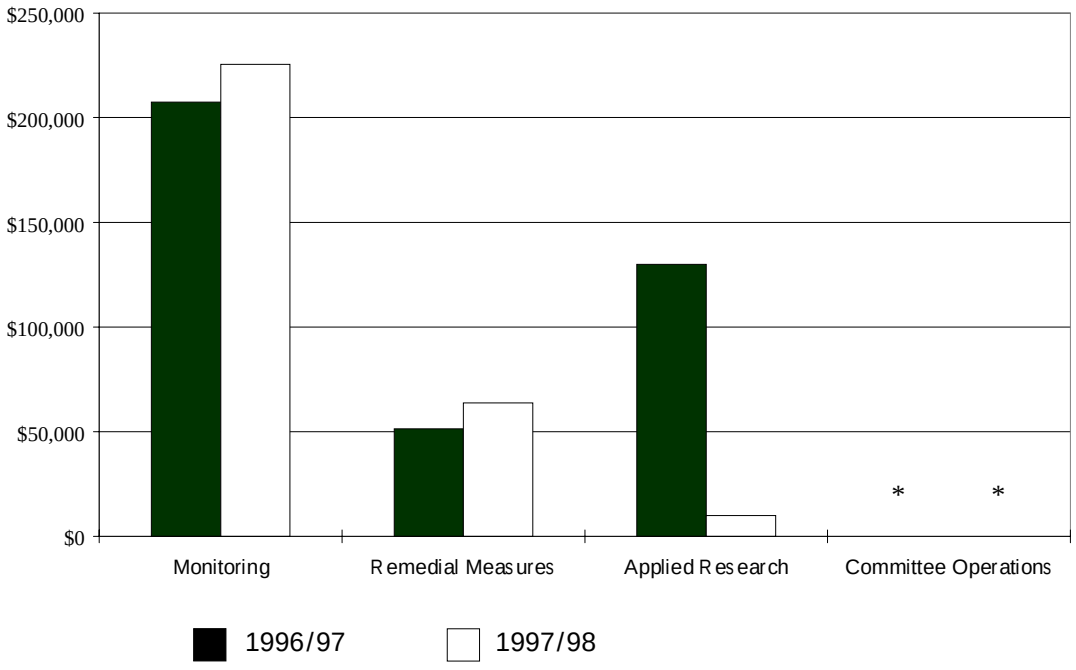
Summaries of the 1996/97 budget and the proposed 1997/98 budget are provided in Figures 3 and 4.

FIGURE 3
COMPARISON OF YEAR 9 & YEAR 10 MANPOWER BUDGETS



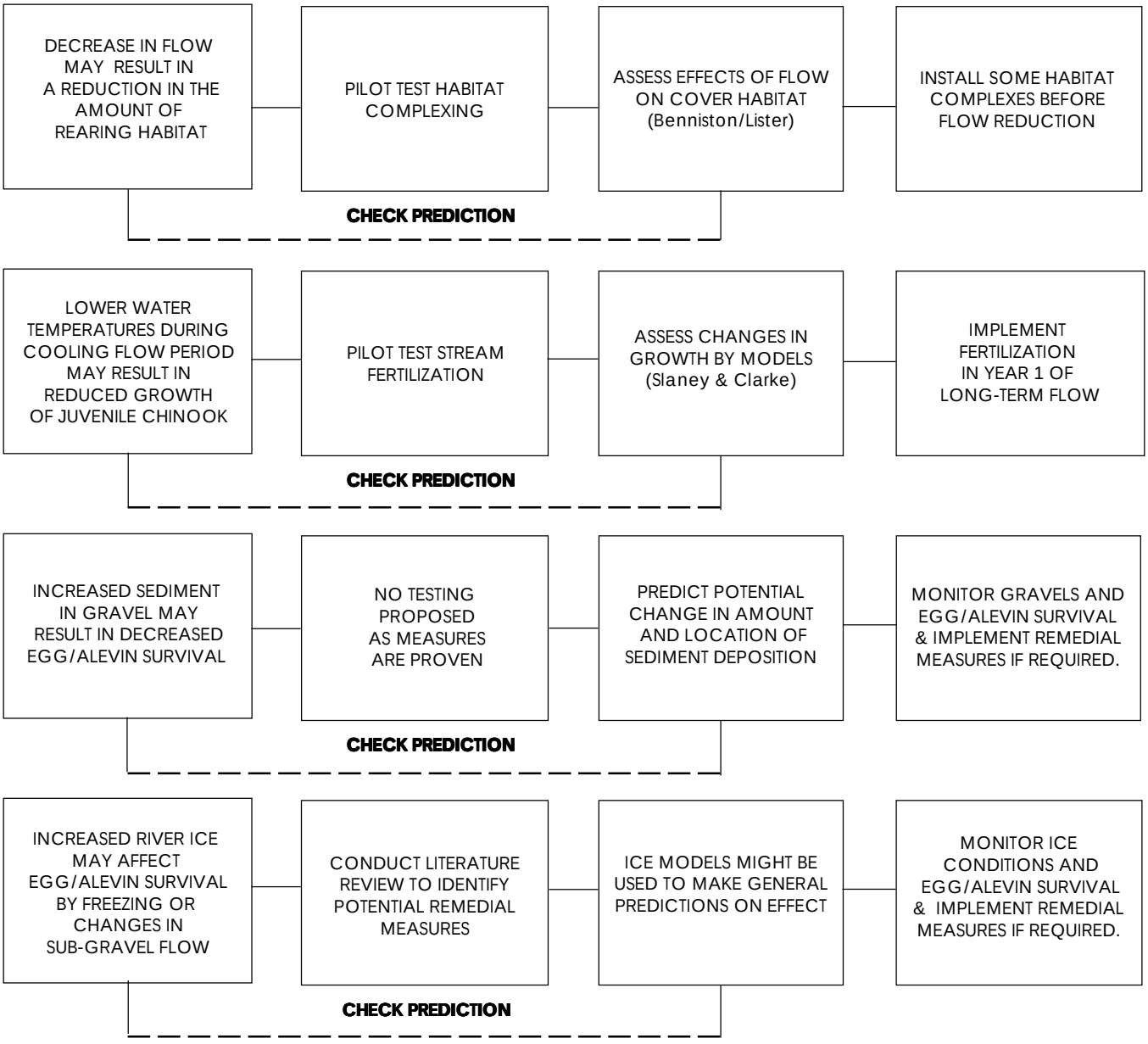
* Cost of manpower budgets are over and above the cost of disbursement budgets.

FIGURE 4
COMPARISON OF YEAR 9 & YEAR 10 DISBURSEMENT BUDGETS

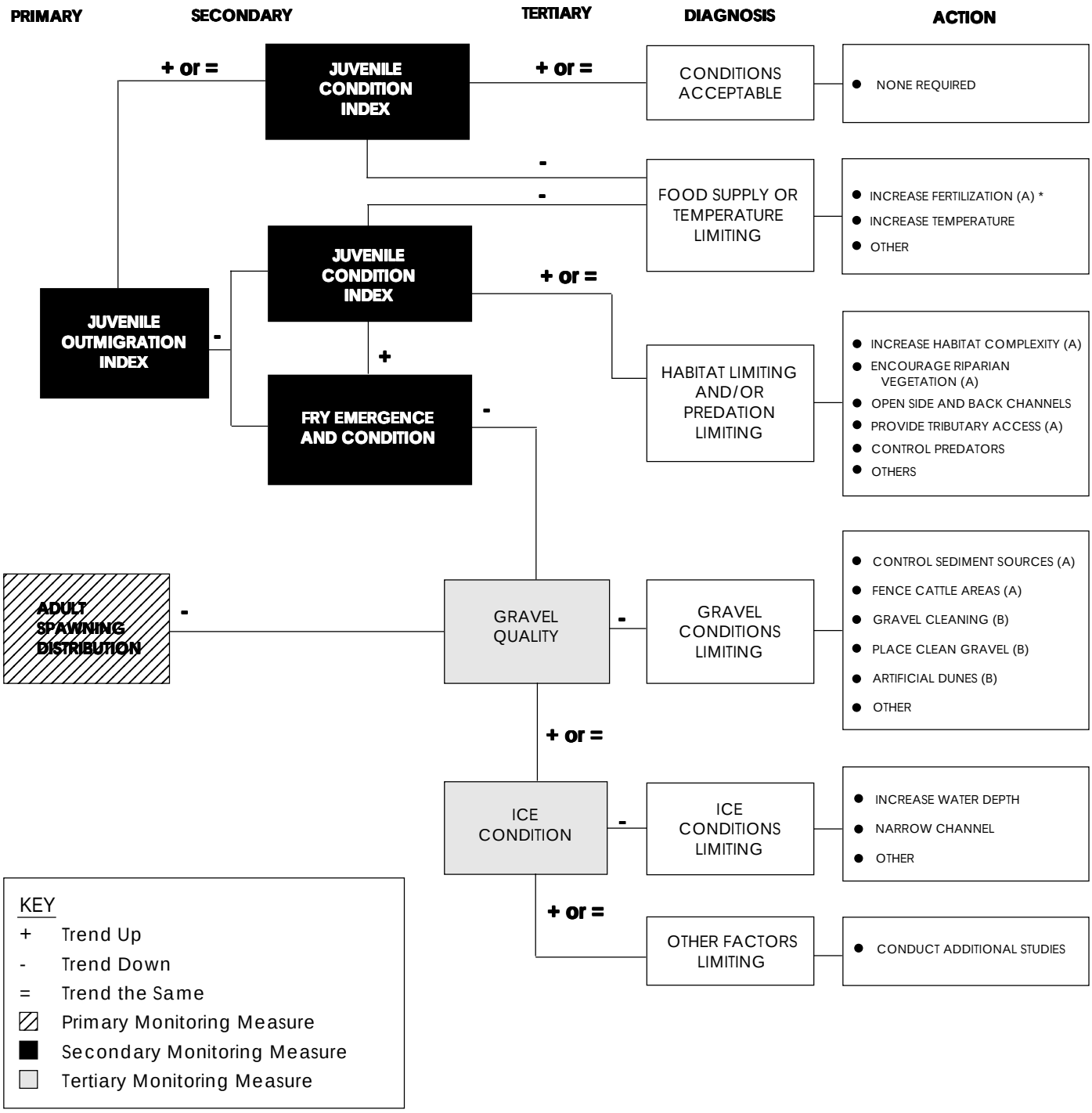


APPENDICES

DECISION CHART FOR REMEDIAL MEASURES PROGRAM

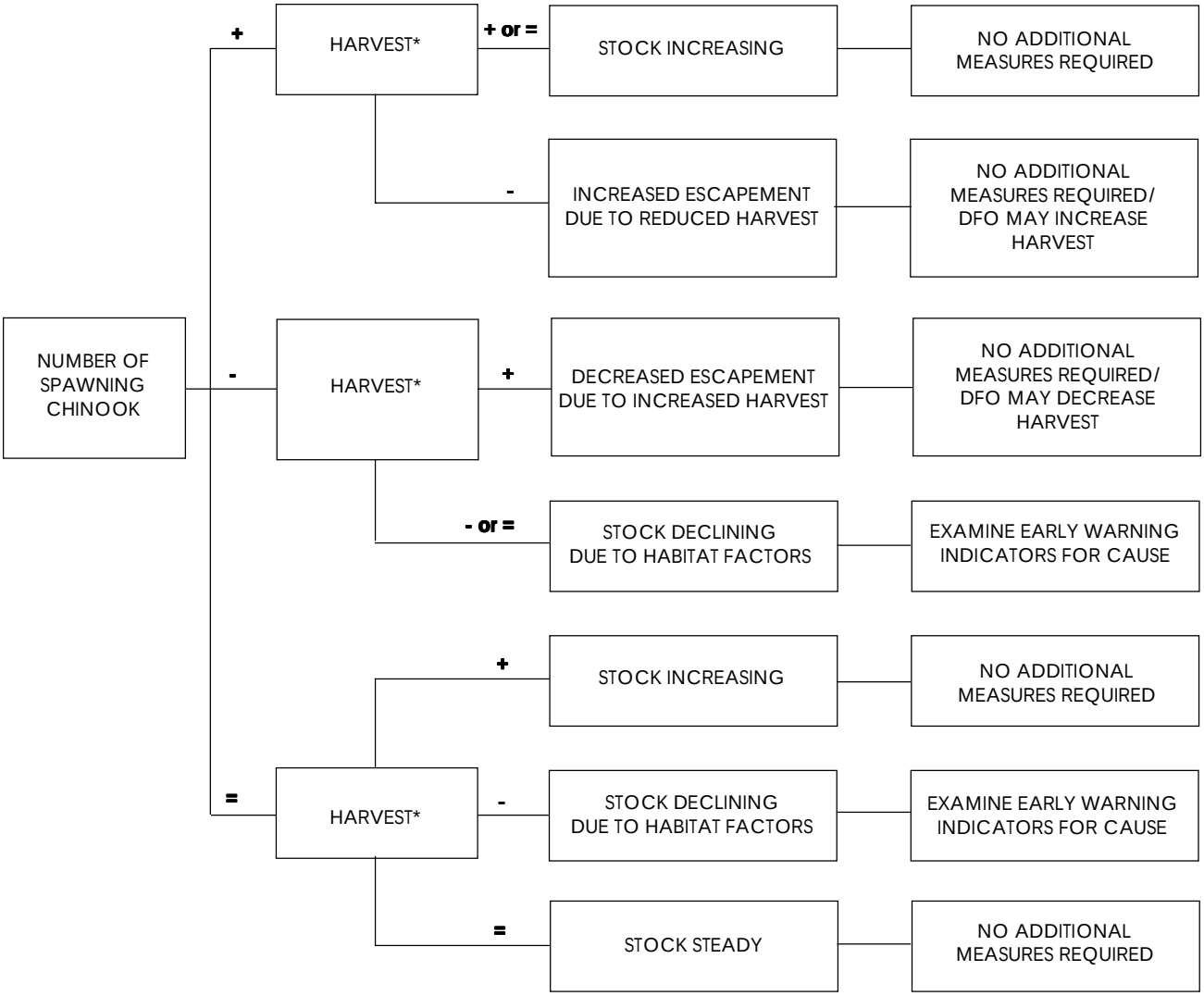


N.F.C.P. EARLY WARNING MONITORING PROGRAM



*** Stage of Remedial Measures**

ASSESSMENT OF CONSERVATION GOAL



* Harvest analysis includes: comparison of trends in index stream, coastwide trends in chinook stocks and ocean survival.

LISTS OF REPORTS

REPORT NO.	TITLE	AUTHOR
RM96-1	The 1995 Summer Water Temperature and Flow Management Project	Triton Environmental Consultants Ltd.
RM96-2	Instream Habitat Complexing 1993 - 1995	Triton Environmental Consultants Ltd.
RM96-3	Biological Assessment of Habitat Complexing in the Nechako River, 1995	Triton Environmental Consultants Ltd.
RM96-4	Nechako River Flow Control 1995/1996	Triton Environmental Consultants Ltd.
M96-1	Nechako and Stuart Rivers Chinook Spawner Enumeration	DFO
M96-2	Nechako and Stuart Rivers Chinook Carcass Recovery	DFO
M96-3	Juvenile Outmigration	Triton Environmental Consultants Ltd.
M96-4	Winter Physical Conditions	DFO
M96-5	Nechako River Physical Data Summary - Database	DFO
M96-6	1996 Fry Emergence	Triton Environmental Consultants Ltd.
M96-7	Gravel Quality and Dissolved Oxygen Monitoring	DFO
M96-8	Evaluation Framework and Trend Analysis	DFO Triton Environmental Consultants Ltd.
AR96	Predation and Competition Temperature Effects	DFO

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Director General, Pacific Region
Department of Fisheries & Oceans

ALCAN ALUMINIUM LIMITED
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Alcan Smelters and Chemicals

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J.H.C. Walker
Assistant Deputy Minister
B.C. Environment

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Marvin Rosenau
Fisheries Biologist
Fish, Wildlife and Habitat Protection
Ministry of Environment Lands and Parks

DECISION RECORDS
FROM THE TECHNICAL COMMITTEE

NECHAKO FISHERIES CONSERVATION PROGRAM

A Joint Program of the Government of Canada, Alcan and the Province of British Columbia

TECHNICAL COMMITTEE

DATE: April 26, 1996

Decision Record (1996/97-1)

1. Based on monitoring of ice conditions in the Nechako watershed and the timing of the juvenile chinook emergence in the Nechako River, the Technical Committee has decided that the change in releases at Skins Lake Spillway to the scheduled spring flow should proceed. Therefore, Alcan will be instructed to increase Skins Lake Spillway release flows to approximately 49 m^3/sec on April 27, 1996.

P. Delaney

D. Hay

A.C. Mitchell

E. Bonham

P.O. Box 1630, Station "A", Vancouver, B.C. V6C 2P7

NECHAKO FISHERIES TECHNICAL COMMITTEE MEETING

DATE: Monday, September 30, 1996

PLACE: Department of Fisheries and Oceans
555 West Hastings Street
Vancouver, B.C.

ATTENDESS: D. Hay (Independent Member)
P.W. Delaney (Federal Crown)
J. Hwang (Federal Crown)
E. Bonham (Provincial Crown)
K. Conlin (Provincial Crown)
A.C. Mitchell (Alcan Aluminium)
W.O. Rublee (Alcan Aluminium)

Decision Record (1996/97- 2)

2. a) Following the summer temperature management program, the release from the Skins Lake Spillway was decreased from 170 m^3/s (6,000 cfs) to 14.2 m^3/s (500 cfs) on August 19, 1996. On September 3, 1996 the release from the Skins Lake Spillway was increased to 32.4 m^3/s (1145 cfs) to fully utilize the annual water allocation specified in the Settlement Agreement.

b) Alcan have advised that Nechako Reservoir levels are higher than normal for this time of year and that, to bring these closer to the reservoir operating curve, a spill of surplus water will be necessary in order to minimize the risk of a forced spill in the spring. As referenced in Section 2.1A(c)iv of the Settlement Agreement, Alcan is to notify the Technical Committee regarding proposals to release flows in excess of the Short Term Water Allocation and follow such directions deemed necessary by

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the Technical Committee with respect to the timing of the release unless otherwise directed by the Water Comptroller of B.C. In this regard, Alcan has proposed that a release of up to 226 m³/s (8,000 cfs) be made for at least a month to achieve this goal. This would include an immediate increase in the spill to 56.6 m³/s (2000 cfs) and a subsequent increase to 226 m3/s (8,000 cfs) pending direction from the Technical Committee.

The Technical Committee has reviewed Alcan's request and, contingent on the following criteria being met, agree that the spill would not have a significant effect on fish production in the Nechako River:

- the winter flow should not be less than 50 % of the maximum flow in the Nechako River below Cheslatta Falls during the chinook spawning period to limit any potential effects to incubating eggs from possible re-distribution of spawners due to the increased flows. The spawning period typically ends on 8 October but the Technical Committee would consider advancing that date subject to field monitoring indicating that at least 95% of the spawning was complete; and,

- any subsequent ramp down meet the KCP down ramping guideline of 25 to 60 mm/hr to minimize the potential for stranding of juveniles in back/side channels.

Subsequent to accepting these criteria, Alcan proposed that the Skins Lake Spillway release be increased on September 20, 1996 to 113 m³/s (4000 cfs) and later to 226 m³/s (8000 cfs) at the end of chinook spawning in the Nechako River. The Technical Committee approved this proposal.

If the 226 m³/s (8,000 cfs) release were to start on October 8, Alcan proposed that the release continue to November 8, 1996. The Technical Committee reviewed this proposal in the light of fish values in the Nechako River and found it acceptable. It then reviewed the options for ramping down the flows to a minimum winter flow of 56.6 m³/s (2000 cfs). All options met the down ramping criteria and therefore the Alcan proposed option of changing the release from 226m³/s (8000 cfs) to 56.6 m³/s (2000 cfs) was accepted as the buffering effect of Murray and Cheslattta Lakes would ensure ramping rates on the

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Nechako below Cheslatta Falls were acceptable. The Technical Committee further decided that additional monitoring should be added to the regular fall chinook monitoring project to allow the monitoring of fish usage in side channels that may go dry during the proposed ramp-down. Based on the results of this monitoring program, additional monitoring work may be required at selected locations as the flows ramp down.

Nechako Fisheries Conservation Program
Technical Committee

P. Delaney
Federal Crown

D. Hay
Independent Member

A.C. Mitchell
Alcan Smelters and Chemicals Ltd

E. Bonham
Provincial Crown

P.O. Box 1630, Station "A", Vancouver, B.C. V6C 2P7

NECHAKO FISHERIES CONSERVATION PROGRAM

A Joint Program of the Government of Canada, Alcan and the Province of British Columbia

NECHAKO FISHERIES TECHNICAL COMMITTEE MEETING

DATE: Thursday, November 7, 1996

PLACE: Ministry of Enivironment, Lands and Parks
780 Blanshard Street
Room 302
Victoria, B.C.

ATTENDESS: D. Hay (Independent Member)
P.W. Delaney (Federal Crown)
J. Hwang (Federal Crown)
J. Heinonen (Federal Crown)
E. Bonham (Provincial Crown)
K. Conlin (Provincial Crown)
A.C. Mitchell (Alcan Aluminium)
W.O. Rublee (Alcan Aluminium)

Decision Record (1996/97- 3)

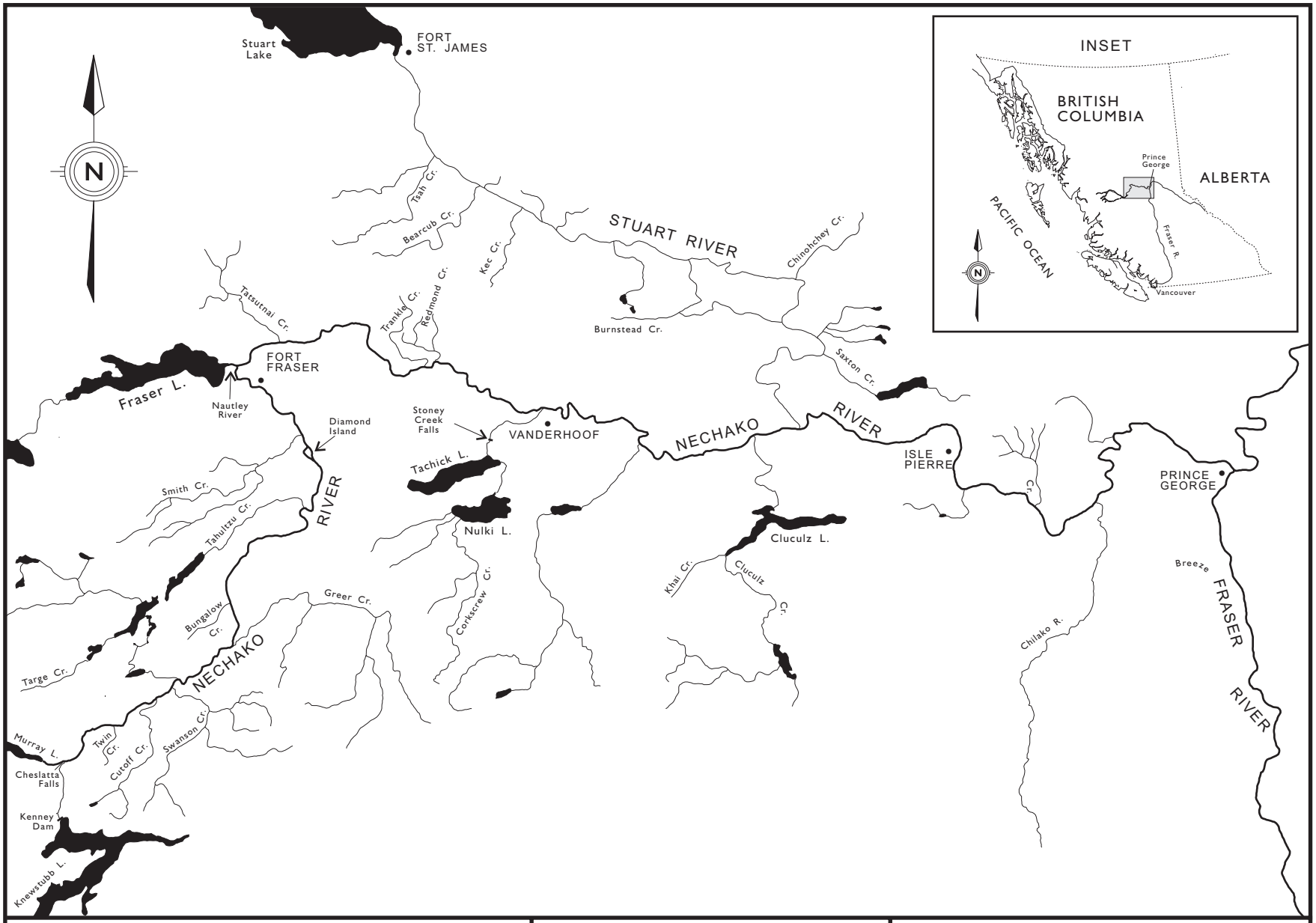
3. On November 7, 1996, the Technical Committee received a request from Alcan to extend the period of the release of 226 m^3/s (8000 cfs) at the Skins Lake Spillway from November 8, 1996 to November 15, 1996. The rationale given was that the additional release period was needed to ensure that Alcan met the goal of creating sufficient reservoir storage to accomodate spring inflow. The Technical Committee reviewed the request from the perspective of chinook conservation and agreed that Alcan should be permitted to proceed with the additional release period.

P. Delaney
Federal Crown

D. Hay
Independent Member

A.C. Mitchell
Alcan Smelters and Chemicals Ltd

E. Bonham
Provincial Crown


Stuart Lake
FORT ST. JAMES
N
Tsah Cr.
Bearcub Cr.
Kec Cr.
STUART RIVER
Chinchchey Cr.
Tatsutnai Cr.
Trankle Cr.
Redmond Cr.
Burnstead Cr.
Saxton Cr.
FORT FRASER
Fraser L.
Nautley River
Diamond Island
Stoney Creek Falls
VANDERHOOF
NECHAKO RIVER
ISLE PIERRE
PRINCE GEORGE
Tachick L.
Smith Cr.
Tahultzu Cr.
Nulki L.
Cluculz L.
Khai Cr.
Cluculz Cr.
Breeze
FRASER RIVER
Chilako R.
Bungalow Cr.
Greer Cr.
Corkscrew Cr.
Targe Cr.
NECHAKO
Murray L.
Twin Cr.
Cutoff Cr.
Swanson Cr.
Cheslatta Falls
Kenney Dam
Knewstubb L.
INSET
BRITISH COLUMBIA
ALBERTA
Prince George
PACIFIC OCEAN
Fraser R.
Vancouver
N
Nechako Fisheries Conservation Program
Map # AREP96-97
NECHAKO RIVER DRAINAGE
0
25 KM

APPENDIX E