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PROPOSED WORK PLAN

For the Cold Water Release Facility at Kenney Dam

Submitted to:

**The Honourable Rick Thorpe
Minister of Competition, Science and Enterprise**

By the:

Nechako Watershed Council

**In Regard to the
June 2001 Report of the
Nechako Environmental Enhancement
Fund Management Committee**

February 2002

Revised March 2002

NECHAKO WATERSHED COUNCIL

Alcan British Columbia
British Columbia Trappers Association
City of Prince George
City of Terrace
Cluculz Lake Cattlemen's Association
Community Futures Development Corporation of Stuart Nechako
District of Fort St. James
District of Kitimat
District of Vanderhoof
Ecology Circle of Prince George
Fort Fraser Chamber of Commerce
Kitimat Chamber of Commerce
Lheidli T'enneh First Nation
Nechako Valley Cattlemen's Association
Province of British Columbia
Regional District of Bulkley Nechako, Area D
Regional District of Bulkley Nechako, Area E
Regional District of Bulkley Nechako, Area F
Southside Economic Development Association
Terrace and District Chamber of Commerce
Tweedsmuir Recreation Commission
University of Northern British Columbia
Vanderhoof and District Chamber of Commerce
Vanderhoof Fish and Game
Village of Burns Lake

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PREFACE

The Nechako Watershed Council (NWC) was formed in 1998 to provide a forum for the diverse interests in the Nechako watershed and the communities that depend on the watershed to work cooperatively to address long-standing water management and related issues. On August 29-30, 2001 a delegation from the NWC met with provincial ministers, Members of the Legislative Assembly and senior provincial staff, to commend the Nechako Environmental Enhancement Fund Management Committee's decision to build a Cold Water Release Facility (CWRF) at Kenney Dam, and to offer support and assistance to implement that decision. One outcome of those meetings was a request that the NWC prepare a work plan outlining the activities and costs required for construction of the CWRF.

This document presents that work plan. It was prepared cooperatively by the NWC, the Province of British Columbia, Alcan and by the Fraser Basin Council acting on behalf of the Nechako Environmental Enhancement Fund Management Committee (NEEFMC). It describes fourteen activities in three phases necessary for the construction and operation of a CWRF at Kenney Dam: Phase 1 – Planning, Phase 2 – Pre-engineering and Environmental Review and Phase 3 – Implementation. The work plan provides a description of each activity and identifies Objectives, Key Tasks and Dependencies, Deliverables, Timing, Cost, Resources, and Assumptions.

The work plan is designed to provide guidance and direction for government, Alcan and regional, provincial and national organizations to work together to make a CWRF a reality. Through the Nechako Fisheries Conservation Program (NFCP), the federal government is also actively involved in the development of the current management model for the Nechako River. The CWRF is clearly an environmental enhancement of the Nechako watershed and thus advances federal government policies.

In developing the work plan, the NWC believes that eleven years is an unacceptably long time frame for construction of a CWRF. If funding becomes available, the NWC strongly recommends that the project schedule be advanced accordingly.

It is acknowledged that this work plan is a flexible planning tool that uses the best information and knowledge available at the present time. As new information becomes available the work plan will be re-assessed and revised as required.

While there is broad agreement that a CWRF is the best option for meeting the region's needs, a full assessment of the NEEFMC's decisions and recommendations has not been made by all parties engaged in the plan. Basing the work plan on decisions and recommendations of the NEEFMC is thus considered a first step in the planning process that will mark the next stage in the long and eventful history of the Nechako River.

Mission Key
DFO !!

EXPLAIN !!
EXPLORE !!

EXECUTIVE SUMMARY

Two years of public consultations and studies conducted by the Nechako Environmental Enhancement Fund Management Committee (NEEFMC) indicated that the construction of a Cold Water Release Facility (CWRF) at Kenney Dam is the best option available for the downstream enhancement of the Nechako watershed area. The Nechako Watershed Council (NWC) represents twenty-six organizations in the Nechako and Kemano watersheds, including the Government of British Columbia, local government, first nations, community economic development interests, agriculture, Alcan and others.

*Has DFO
bought into
this?*

The Council was established in 1998 "...to enhance the long-term health and viability of the Nechako Watershed with consideration for all interests and to provide a forum to address water management and related issues in the Watershed and to work toward cooperative resolution of these issues." The NWC supports the NEEFMC decision to construct a CWRF at Kenney Dam and believes that a CWRF will also provide benefits upstream of Kenney Dam.

This work plan describes fourteen key activities that are required to construct a CWRF at Kenney Dam and identifies the timing and costs of these activities. These activities are planned in the following three distinct phases:

- Phase 1 – Planning: Planning the necessary project management structures, information management systems, data bases and assessment of benefits based on the NEEFMC Report;
- Phase 2 – Pre-Engineering and Environmental Review: Pre-engineering of the CWRF and related infrastructure and completing environmental review and regulatory permitting; and
- Phase 3 – Implementation: Implementation of construction plans and CWRF operations.

The total project spans eleven years. The three project phases and constituent activities are summarized below.

Phase 1 – Planning

Activity 1: Establish Management System

A project management system is required to ensure effective and efficient decision-making, coordination of all project activities, and responsible and accountable expenditure of financial resources. The complexity of the project means the management system will operate at multiple levels to enable decisions at the steering, strategic and operational levels. It will be designed to evolve over time to reflect the different activities, tasks, roles and responsibilities.

Key Deliverables: The management framework, processes and accountabilities required to facilitate the completion of Phase 1 will be developed and implemented, as well as the conceptual design of the management structure required to implement Phase 2.

Estimated Cost: \$5,000 plus in kind resources

Timeframe: 2002

Activity 2: NEEFMC Deliverables

The NEEFMC Report summarizes decisions and recommendations made by the Management Committee to support downstream enhancement of the Nechako watershed area including the planning, construction and operation of a CWRF. This portion of the work plan has been prepared without the benefit of a response to the NEEFMC report from the Government of British Columbia, Alcan, the NWC or other interested parties. This section of the work plan suggests activities, agency responsibilities and sub-project timelines to implement the decisions and recommendations made in the NEEFMC Report.

Where are we?

Key Deliverables: A series of agreements and actions in response to the NEEFMC Report with the Government of British Columbia, Alcan, the Nechako Watershed Council, potentially the Government of Canada, and the Nechako Fisheries Conservation Program (NFCP) under an expanded mandate. ?

Estimated Cost: \$150,000

Timeframe: Timing is unique for each of the NEEFMC recommendations

Activity 3: Information and Communication Program

An Information and Communication Program ensures that the local, provincial, first nations and national levels of government, community organizations and stakeholders are informed of the benefits and value of a CWRF to local communities, the environment and the economy.

Key Deliverables: A Phase 1 communication strategy and a variety of communication tools such as a web site, annual report, regular public information meetings, media relations, stakeholder consultations, presentations and issues tracking system.

Estimated Cost: \$130,000

Timeframe: 2002-2004

Activity 4: Compilation of Background Information

The development of a bibliography of existing information concerning the CWRF is crucial for supporting cost effective and efficient project management.

Key Deliverables: A bibliography of existing information concerning the CWRF.

Estimated Cost: \$ 7,000

Timeframe: 2002

Activity 5: Assessment of Benefits

Identifying and evaluating the many social, economic and environmental benefits of a CWRF to the residents of the area, as well as the upstream benefits and benefits to the province as a whole, assists with making informed investment decisions throughout the planning process.

Key Deliverables: A report evaluating benefits.

Estimated Cost: \$70,000

Timeframe: 2002-2004

Phase 2 – Pre-Engineering and Environmental Review

Activity 6: Pre-Engineering and Environmental Studies

The collection of environmental and engineering data concerning the proposed CWRF and Cheslatta Fan pilot channel is required to develop a range of design and operating criteria necessary to design the proposed facility.

Key Deliverables: Reports providing key data that will allow for the detailed engineering and design work to be completed for the release facility and provide detailed information needed for environmental assessment.

Estimated Cost: \$975,000

Timeframe: 2002-2006

Activity 7: Preliminary Engineering of a Pilot Channel at Cheslatta Fan

Evaluating key physical characteristics of the Cheslatta Fan and the financial, technical and environmental practicality of a pilot channel concept will enable critical decisions to be made regarding passing water from a CWRF through the Cheslatta Fan.

Key Deliverables: Preliminary design of a channel to cross the Cheslatta Fan in a manner that meets all fisheries requirements.

Estimated Cost: \$60,000

Timeframe: 2006-2007

Activity 8: Preliminary Engineering of a Cold Water Release Facility

This activity provides additional design studies and engineering for various components of the facility.

Key Deliverables: A preliminary design that will meet performance criteria and provide the basis for federal and provincial environmental assessment.

Estimated Cost: \$1.25 million

Timeframe: 2006-2007

Activity 9: Environmental Review and Permitting

A CWRF will require review under the British Columbia Environmental Assessment Act and the Canadian Environmental Assessment Act. Site development and construction will also require various statutory permits to be issued by federal and provincial regulatory agencies for site development and construction activities.

Key Deliverables: A provincial Project Approval Certificate and required regulatory agency permits, together with demonstrated public support.

Estimated Cost: \$1.64 million

Timeframe: 2007-2008

Phase 3 - Implementation

Activity 10: Detailed Engineering and Construction of a Pilot Channel at Cheslatta Fan

This activity encompasses the development of the pilot channel concept, detailed design, preparation of bid documents, tendering and construction, as well as the development of the regime channel.

Key Deliverables: Development of the concept, risks, alternatives, drawings, specifications, contract, construction and regime channel.

Estimated Cost: \$780,000 plus approximately \$20,000 for monitoring

Timeframe: 2008-2009

Activity 11: Detailed Engineering of a Cold Water Release Facility

This activity completes all the designs and documentation required to award the construction contract, including accommodation of hydroelectric generation at Kenney Dam.

Key Deliverables: Design report, bid documents and engineer's estimate.

Estimated Cost: \$3.6 million

Timeframe: 2008-2010

Activity 12: Cold Water Release Facility Construction

This activity involves the construction of the facility.

Key Deliverables: A completed structure constructed according to specifications.

Estimated Cost: \$92.1 million

Timeframe: 2010-2012

Activity 13: Cold Water Release Facility Commissioning

Following construction, the facility, and control systems and instruments will be thoroughly tested.

Key Deliverables: Commissioning Plan and preparations for the facility to be operated.

Estimated Cost: \$500,000

Timeframe: 2012

Activity 14: Adaptive Management of Operations

Once the CWRF is fully operational, the downstream conditions are continually monitored with respect to the desired and expected goals and objectives, and the operations are adapted for improvement as necessary.

Key Deliverables: Operating structure.

Estimated Cost: \$75,000 per year for adaptive management program administration and up to \$1.0 million per year for data collection and evaluation to monitor success of the program (both depending on how the NFCP annual operating funds are accounted for).

Timeframe: 2012 and ongoing

ACTIVITY TIMELINE

The following Gantt chart illustrates the high level sequencing of phases and related activities as described in this document.

**Cold Water Release Facility Work Plan - Schedule
2002 - 2012**

Phases	#	Activities	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Phase I Planning	1	Establish Management System -												
	2	NEEF Deliverables ~												
	3	Education and Communication <i>Angwin Nish</i>												
	4	Compilation of Background Information <i>CDI</i>												
	5	Assessment of Benefits												
Phase II Pre-Engineering and Environmental Studies	6	Pre-engineering/Environmental Studies												
	7	Pre-engineering of Cheslatta Fan Channel												
	8	Pre-engineering of CWRF												
	9	Environmental Review and Permitting												
Phase III Implementation	10	Detailed Eng. & Construction of Cheslatta Fan												
	11	Detailed Eng. Of CWRF												
	12	Construction of CWRF												
	13	Commissioning												
	14	Operation & Adaptive Management												

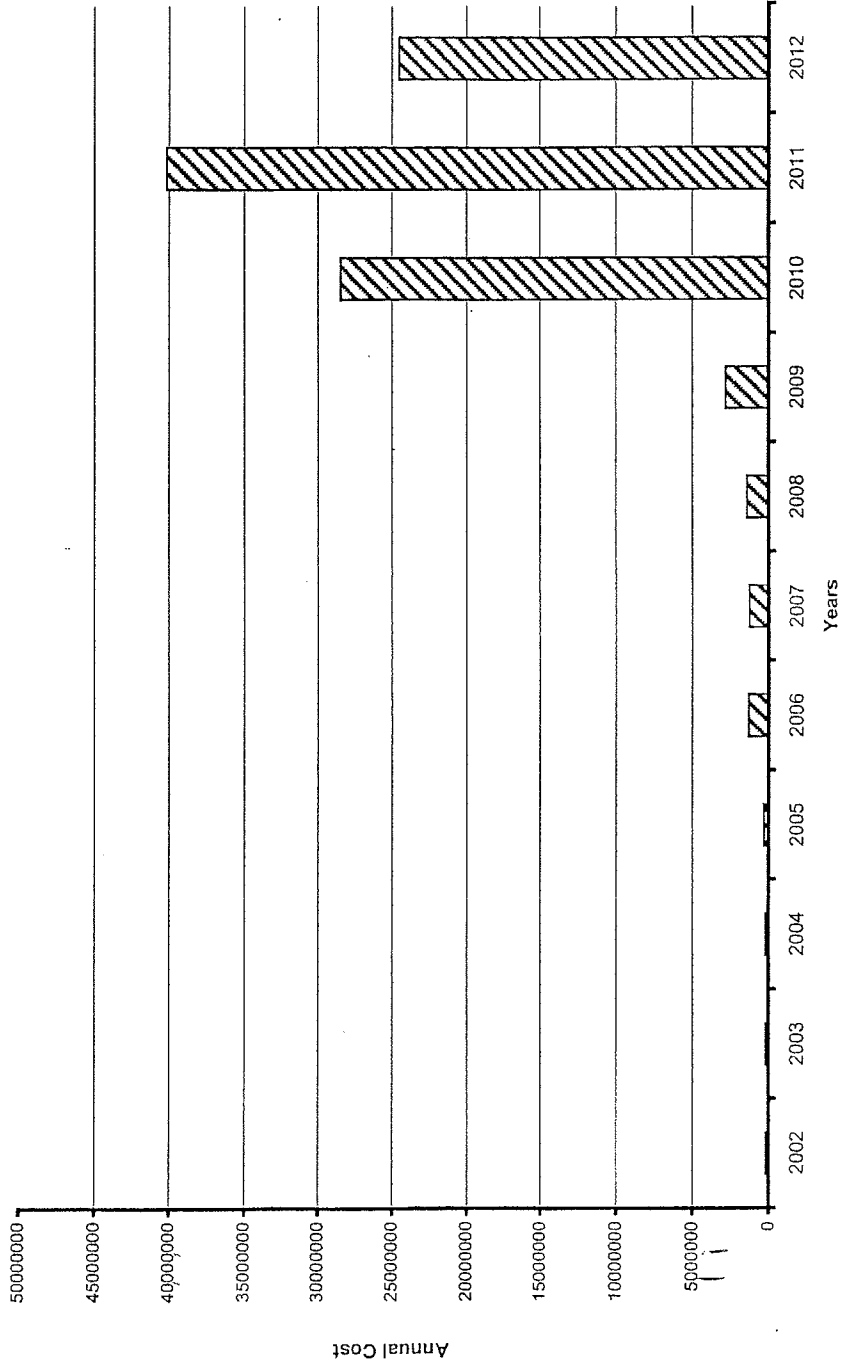
Black - Continuous Activities
Gray - Intermittent Activities

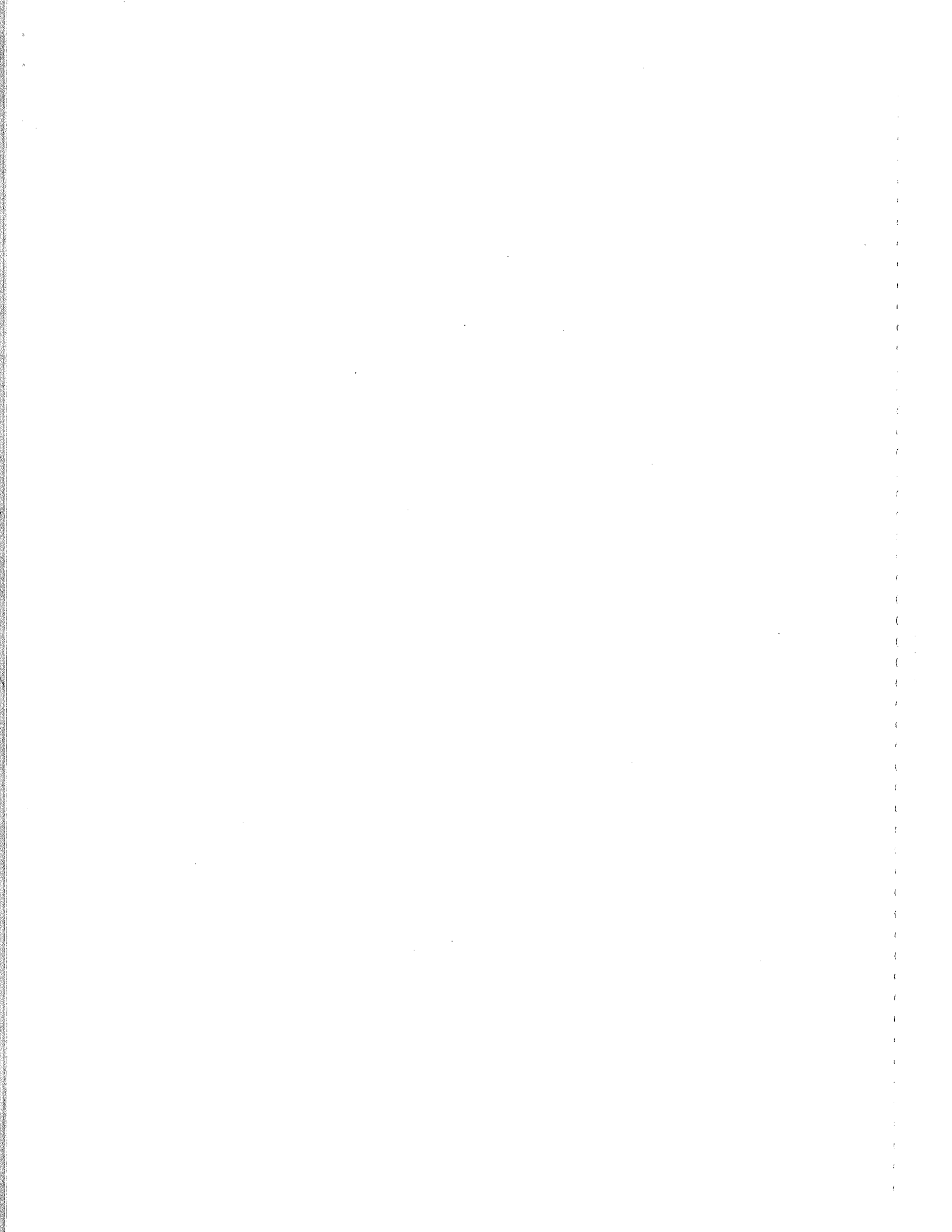
Date : February 4, 2002



FORECAST FINANCIAL REQUIREMENTS

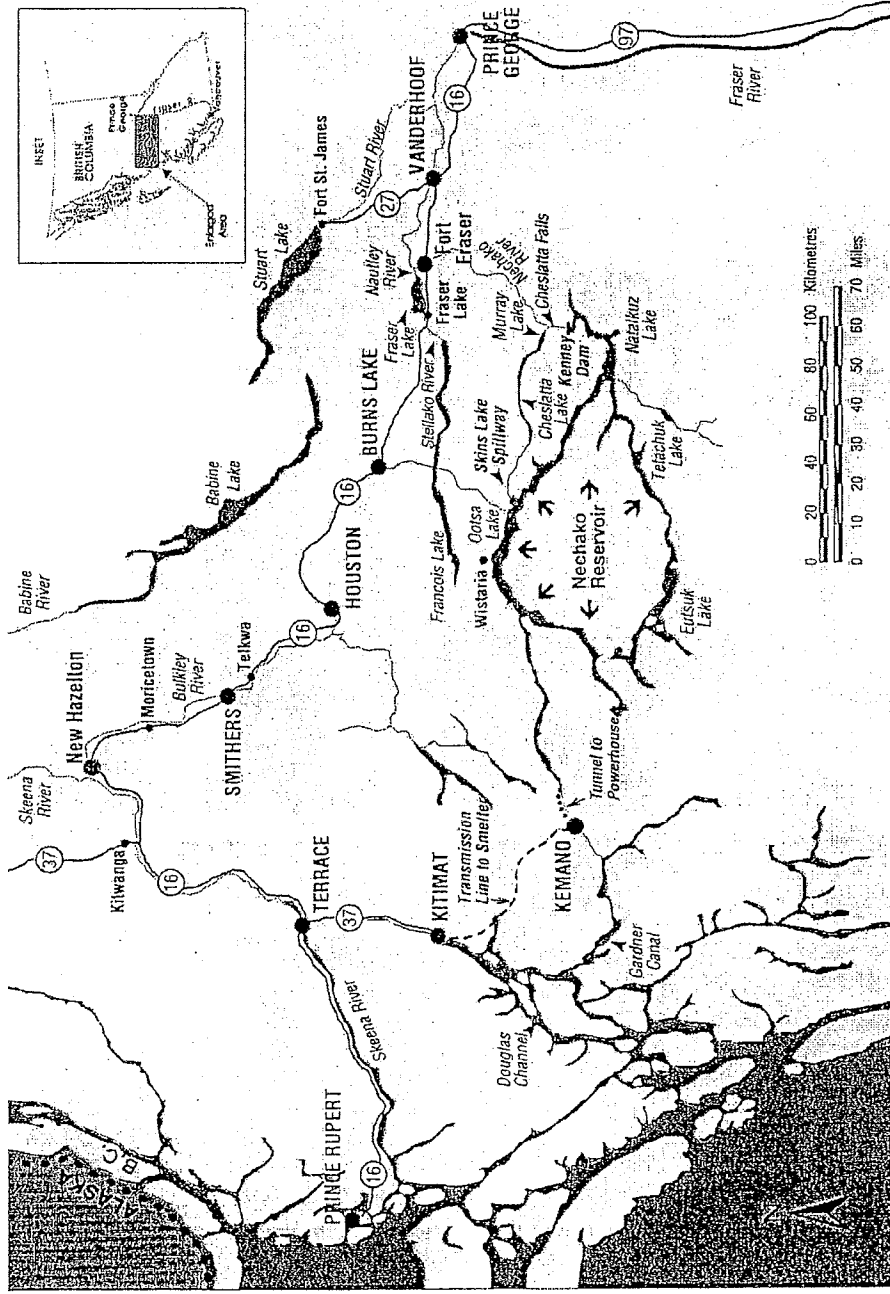
CWRF Work Plan - Financial Forecast 2002-2012
(Date Revised: February 4, 2002)





GEOGRAPHIC AREA

The area affected by the proposed CWRF is shown in the following map.





CONTEXT

Nechako Watershed Council

The Nechako Watershed Council (NWC) was formally established in June 1998. It now includes representatives from twenty-six organizations in the Nechako watershed and the Kitimat-Terrace area of west-central British Columbia, which relies heavily on Alcan's operations in the region and associated economic benefits. The member organizations are listed at the beginning of this document and include the Province of British Columbia, local government, first nations, community economic development interests, agriculture, Alcan and others. The federal government participates as an observer and technical resource through Fisheries and Oceans Canada.

change this!!

The Council is recognized in Schedule 4 of the BC/Alcan 1997 Agreement as the primary public consultative body for Nechako River enhancement issues. As stated in the NWC Terms of Reference, its purpose is "...to enhance the long-term health and viability of the Nechako Watershed with consideration for all interests, and to provide a forum to address water management and related issues in the Watershed and to work toward cooperative resolution of these issues." The NWC supports the NEEFMC decision to construct a Cold Water Release Facility (CWRF) at Kenney Dam and believes that a CWRF will also provide benefits upstream of Kenney Dam.

Nechako Environmental Enhancement Fund

The Nechako Environmental Enhancement Fund (NEEF) was established as part of the BC/Alcan 1997 Agreement between the Government of British Columbia and Alcan. This Agreement addressed outstanding legal matters arising from cancellation of the Kemano Completion Project by the Government of British Columbia.

Schedule 4 of the 1997 Agreement established the NEEF Management Committee with a mandate to "...review, assess and report on options that may be available for the downstream enhancement of the Nechako watershed area". The Committee's terms of reference specified "...these options may include, but are not limited to, the development of a water release facility at or near Kenney Dam...".

The NEEF Management Committee released its final report on June 7, 2001. The report includes two decisions and five sets of recommendations and calls for a Cold Water Release Facility to be constructed on the Nechako River near Kenney Dam. The Committee believed that a CWRF would allow for a more natural flow regime in the Nechako River and create the conditions that would support rehabilitation of the Murray-Cheslatta system.

✓

Cold Water Release Facility

Kenney Dam is situated approximately 87 km southwest of Vanderhoof, British Columbia and impounds the Nechako Reservoir. Currently there are no facilities to release water at the dam. Releases from the reservoir are made into the Cheslatta River system at the Skins Lake Spillway, 87 km west of the dam. A Cold Water Release Facility is a structure that will draw water from the Nechako Reservoir immediately upstream of Kenney Dam and discharge that water into the Nechako Canyon downstream of the dam. The facility will consist of:

- A rock-cut channel to draw surface water
- Separate intakes and pipelines to draw water from deep in the reservoir

Nechako Watershed Council Cold Water Release Facility Work Plan

- A high-level outlet regulating structure capable of releasing water from the surface or deep intakes, either separately or simultaneously, and a chute spillway equipped with a flip bucket energy dissipator
- A low-level outlet capable of releasing water from the surface or deep intakes, either separately or simultaneously, and equipped with hollow cone valves for energy dissipation and dissolved gas control.

The name given to the CWRF reflects its ability to release relatively cold water during the summer, thereby providing the capability to control downstream water temperatures. The capacity to draw water from two levels in the reservoir, either separately or simultaneously, will enable the facility to release water at different temperatures, depending upon the season and the seasonal objectives.

The facility will also provide an alternative to Skins Lake Spillway as a means of releasing flows for the conservation and protection of salmon in the Nechako River, and of releasing excess reservoir inflows. The facility will thus provide a number of benefits, including, but not limited to:

- The removal of large summer cooling water flows from the Murray-Cheslatta system, thus affording the opportunity for restoration of the system
- Re-watering of the Nechako Canyon
- A reduction in the volume of cooling water required for the protection of sockeye salmon
- The potential to redistribute "freed up" cooling water for other uses and at other times of the year, and
- The potential to develop hydroelectric generation at Kenney Dam.

The CWRF is clearly an environmental enhancement of the Nechako watershed and thus advances federal government policies.

Work Plan Outline

This work plan describes fourteen key activities that are required to construct a CWRF at Kenney Dam and identifies the timing and costs of these activities. These activities are planned in the following three distinct phases:

- Phase 1: Planning: Planning the necessary project management structures, information management systems, data bases and assessment of benefits based on the NEEFMC Report;
- Phase 2: Pre-engineering and Environmental Review: Pre-engineering of the CWRF and related infrastructure and completing environmental review and regulatory permitting; and
- Phase 3: Implementation: Implementation of construction plans and CWRF operations.

The total project spans eleven years. The three project phases and constituent activities are described on the following pages.

PHASE 1. PLANNING

Activity 1. Establish Management System

Description

The management framework, processes and accountabilities required to facilitate the completion of Phase 1 will be developed and implemented, as well as the conceptual design of the management structure required to implement Phase 2. A project management system is required to ensure effective and efficient decision-making, coordination of all project activities, and responsible and accountable expenditure of financial resources. The complexity of the project means that the management system will operate at multiple levels to enable decisions at the steering, strategic and operational levels, and will be designed to evolve over time to reflect different activities, tasks, roles and responsibilities.

Objectives

- a. Identify the types of decisions, decision criteria, responsibility centres and timeframes required for Phase 1 of the project
- b. Establish an effective and accountable financial system to manage the allocation of resources and funds to support this project
- c. Anticipate the evolution of decision-making roles and timeframes, taking into account the changing nature of activities from planning to implementation
- d. Describe and document the management processes required, including descriptions of the interaction between all levels of government, Alcan, NWC, NFCP and other stakeholders.

Key Tasks and Dependencies

- a. Develop and assess management system options
- b. Develop and assess financial accountability options
- c. Seek consensus on roles and responsibilities for decision-making and financial accountability.

Deliverables

- a. Achieve consensus on an effective management system that allows for fair and efficient decision-making at all management levels
- b. Achieve consensus on an accountable financial management system
- c. Implement an agreed upon management system.

Timing

July 2002

Cost

\$ 5,000 plus in-kind expenditures

Want details?

Resources

- a. The Government of British Columbia
- b. Alcan
- c. The NWC (in an advisory capacity)
- d. Other parties as required.

Assumption

Any financial contribution from the Government of B.C. or Alcan will require that an effective and accountable financial management system be established to allocate the funds.

Results ?

Activity 2. NEEFMC Report Deliverables

Description

The Nechako Environmental Enhancement Fund Management Committee report sets out decisions and recommendations to support the downstream enhancement of the Nechako watershed area including the planning, construction and operation of a Cold Water Release Facility. The NWC supports the NEEFMC's first decision to build a CWRF. The Management Committee's second decision regarding the Cheslatta Fan channel requires further study, which is described in Activity 6 and Appendix 1.

This portion of the workplan has been prepared without the benefit of a response to the NEEFMC report from the Government of British Columbia, Alcan, the NWC or other interested parties. The NWC will review the Management Committee's five sets of recommendations and provide its response to the Government of British Columbia and Alcan. The NWC encourages the Government of British Columbia and Alcan to respond to the Management Committee's report as well. The following sections suggest tasks, responsibilities, costs and timelines for further evaluation and implementation of the NEEFMC recommendations.

Objective

To carry out tasks that address the specific recommendations of the NEEFMC Report subject to acceptance by the responsible parties.

Key Tasks and Dependencies

Although some of the recommendations contained in the NEEFMC Report can be accomplished by a single organization, other recommendations need to be addressed through the cooperation of two or more organizations. The following list identifies the sole or joint responsibility centres for specific deliverables, as suggested by the NEEFMC Report:

- a. Government of Canada, Government of British Columbia and Alcan
- b. Government of British Columbia and Alcan
- c. Alcan
- d. Nechako Fisheries Conservation Program
- e. Nechako Watershed Council
- f. Nechako Fisheries Conservation Program and Nechako Watershed Council
- g. Fraser Basin Council
- h. Scientific body assessing a proposed optimal flow regime.

Deliverables

a. Government of British Columbia, Alcan and potentially the Government of Canada

- By March 1, 2002 designate officials to be responsible for coordinating the work associated with the implementation of the decisions and recommendations in the NEEFMC Report
- By June 2002 for the first annual report and until an enhanced river management structure is established, publish an annual progress report on the status of the decisions and recommendations contained in the NEEFMC Report
- By January 1, 2003 develop a legal agreement to enhance the mandate of the NCFP to include activities beyond salmon management and to enable more community input into its decision-making processes.

b. Government of British Columbia and Alcan

- By June 1, 2003 create a joint venture agreement to ensure the CWRF is constructed in an efficient, cost effective and expeditious manner. Structure the joint venture agreement so that a public-private consortium designs, builds, and owns the facility leaving Alcan with the responsibility to operate the facility.
- Address the recommendation regarding a \$3 million NWC Endowment Fund
- On an ongoing basis, ensure the public-private consortium acts as the proponent for the environmental assessment review and assumes responsibility for conduct of the review.

c. Alcan

- Operate the CWRF at Kenney Dam as set out in Schedule 4, of the 1997 BC/Alcan Agreement.

d. Nechako Fisheries Conservation Program

- By November 1, 2003 develop a plan to address the following issues outlined in the NEEFMC Report:
 - ❖ Section 2: Fish requirement issues including flow (including Total Gas Pressure criteria) and other environmental criteria to meet the needs of resident and anadromous species;
 - ❖ Section 3: Sediment criteria for fish and appropriate mitigation plans; and
 - ❖ Section 4: Further studies to determine the optimal flow regime at Skins Lake Spillway and at the confluence of the Nechako and Cheslatta Rivers, and the optimal lake levels in the Murray - Cheslatta system.
- By December 1, 2003 propose an optimal flow regime
- By January 1, 2004 set aside \$150,000 to cover the costs associated with the work of an expert scientific panel
- By February 1, 2004 consider and commission if necessary, an objective scientific body, preferably an expert panel of the Royal Society of Canada, to assess the proposed optimal flow regime

Status?

Nechako Watershed Council Cold Water Release Facility Work Plan

- By August 1, 2004 receive the expert panel's completed report
- By October 1, 2004 finalize the optimal flow regime for the Nechako River in consideration of:
 - ❖ Alcan's legal entitlements to water;
 - ❖ Support for the rehabilitation of the Murray – Cheslatta system with releases through the Skins Lake Spillway;
 - ❖ High flow, average flow and low flow years; and
 - ❖ Water "freed up" by the CWRF will be used primarily for downstream enhancement.
- Conduct continuing research in support of fish and fish habitat
- Within twelve months of construction of the CWRF, manage the transition from the current Summer Temperature Management Program to the proposed optimal flow regime.

e. Nechako Watershed Council

- By June 1, 2002 address the NWC organizational structure in order to:
 - ❖ Advise the NFCP on the interests of Nechako watershed residents;
 - ❖ Provide advice and input on the development of the optimal flow regime with the CWRF;
 - ❖ Establish a series of indicators to monitor and report on the environmental health of the watershed;
 - ❖ Conduct research in support of watershed management activities;
 - ❖ Provide an open forum for discussion and resolution of watershed issues; and
 - ❖ Manage a communication and consultation program with Nechako watershed residents.
- By June 2003 establish itself as a legal entity and make a formal request to the Government of British Columbia and Alcan for the \$3 million NWC Endowment Fund, or equivalent funding arrangement such as an annual financial contribution agreement or notional fund, to allow the NWC to operate as a financially sustainable and viable organization capable of carrying out enhanced roles and responsibilities in the Nechako watershed, for the financing of ongoing administration of the NWC and for research to be carried out by the NWC.

f. Nechako Fisheries Conservation Program and Nechako Watershed Council

- By March 1, 2003 jointly explore ways to improve the management of the Nechako watershed through the following principles:
 - ❖ Inclusiveness;
 - ❖ Openness and transparency;
 - ❖ Recognition of existing jurisdictional roles and responsibilities;
 - ❖ Recognition of the Nechako as a managed river; and
 - ❖ Financial viability
- Develop closer linkages between the NFCP and the NWC through a cooperative management structure.

Nechako Watershed Council Cold Water Release Facility Work Plan

*capture
Role?*

g. Fraser Basin Council

- Through March 31, 2002 ensure NEEF administrative tasks are carried out in accordance with its contract with the NEEFMC.

h. Expert panel

- By August 1, 2004 assess a proposed optimal flow regime, taking into account the following:
 - ❖ The managed state of the Nechako River;
 - ❖ The recent work of the NWC on Nechako River flow regimes;
 - ❖ The conditions necessary for rehabilitation of the Murray-Cheslatta system; and
 - ❖ Existing water licenses and legal agreements.

Timing

Timing is unique for each of the NEEFMC recommendations

Cost

a. Government of British Columbia, Alcan and potentially the Government of Canada

- Staff time

b. Government of British Columbia and Alcan

- Staff time plus legal fees

c. Alcan

- Staff time, which may include engineering, legal and other expertise

d. Nechako Fisheries Conservation Program

- Staff time, including senior management involvement in the NFCP Steering Committee
- Scientific studies to address outstanding issues associated with the determination of optimal flow referred to in section 4(i) of the NEEFMC Report

e. Nechako Watershed Council

- Volunteer, research and staff time

f. Nechako Fisheries Conservation Program and Nechako Watershed Council

- Volunteer time and staff time

g. Fraser Basin Council

- Budgeted costs continue for fiscal 2001/2

h. Scientific body assessing proposed optimal flow regime

- \$150,000 as estimated in the NEEFMC Report.

Resources

- a. Government of British Columbia: Ministry of Competition, Science and Enterprise (provincial lead); Ministry of Sustainable Resource Management (regional lead); Ministry of Water, Land and Air Protection
- b. Alcan representatives
- c. Government of Canada: Department of Fisheries and Oceans
- d. Representatives to the Nechako Fisheries Conservation Program
- e. Nechako Watershed Council
- f. Fraser Basin Council.

Assumptions

- a. NWC will monitor and report on the progress of implementation of the NEEFMC recommendations
- b. The dates and activities described in this section are based on the assumption that the Government of British Columbia and Alcan will implement all or some of the recommendations contained in the NEEFMC Report
- c. However, the NWC acknowledges that no decision has been made on the recommendations contained in the NEEFMC Report by either the Government of British Columbia or Alcan.

Activity 3. Information and Communication Program

Description

Building and sustaining understanding and support for the creation of a CWRF is critical to overall program success. An Information and Communication Program will ensure that local and regional stakeholders are informed of the benefits and value of a CWRF to the local community, environment and economy. As well, it will seek the input and opinions of all levels of government, the NWC and other stakeholders regarding the progress of this project. Recognizing the fluid environment and the three distinct phases of the work plan, this communication plan focuses solely on the Planning Phase. Subsequent communication plans would be developed for the second and third phases. These activities would enable public values, views and opinions to be taken into account in the final design, construction and commissioning of a CWRF.

Objectives

- a. Build awareness, understanding and support for the CWRF, its benefits and the series of activities proposed in this work plan
- b. Update local, provincial, federal and first nations governments on the progress and milestones of the work plan including new information, research and data that may affect the design or operation of a CWRF
- c. Define the role that the Nechako Watershed Council is playing and its desire to involve and engage other regional, provincial and federal stakeholders
- d. Continue to encourage all levels of government and third parties to support the CWRF and this work plan
- e. Maintain effective public communications in northern communities from Prince George to Kitimat and Terrace as well as the rest of British Columbia
- f. Continue to inform and engage internal audiences on the values and the progress of workplan implementation.

Key Tasks and Dependencies

- a. Baseline research to identify people's attitudes and understanding of the CWRF concept
- b. Development of a CWRF work plan communication strategy and activities
- c. Development of communication protocols between the NWC, the Government of British Columbia, and Alcan for determination of communication responsibilities, joint decision-making, etc.
- d. Outline the communication plan to stakeholders, including announcement of sub-committee and management system model and public access and feedback opportunities
- e. Centralized communication vehicles where people can receive information
- f. Key activity and process announcements, for example NFCP mandate, NWC evolution, progress on NEEFMC recommendations, studies and reports

Nechako Watershed Council Cold Water Release Facility Work Plan

- g. Regular updates to stakeholders on progress of process and next steps
- h. Feedback systems built into all forms of communication
- i. Government relations strategy for informing MPs, MLAs, local government, first nation governments and community leaders.

Deliverables

- a. Annual research study of attitudes and understanding of the CWRF concept
- b. Regular public meetings to discuss and present updates
- c. Annual status report as recommended in the NEEFMC Report
- d. Media relations surrounding key announcements and events
- e. Creation of NWC web site content
- f. Stakeholder consultations and presentations
- g. Speakers Bureau for updates and information to service clubs, school groups, community organizations, etc.
- h. A tracking database to ensure that the strategy is reaching government, business and community stakeholders with information and communication. The tracking database will also create an inventory of relevant issues and the appropriate positioning and messaging that can be used to inform or communicate.

Timing

- a. Communication activities for 2002
 - Community research
 - Develop Phase 1 Communication Plan
 - Develop communication tools
 - Website and tracking database infrastructure
 - Annual status report.
- b. Ongoing communication activities:
 - Annual stakeholder presentations and consultation
 - Speakers Bureau.

Cost

- Year 1: Total: \$30,000
- Year 2: \$50,000 estimated, depending on action requirements
- Year 3: \$50,000 estimated, depending on action requirements.

Resources

Responsibility for the development and implementation of the Information and Communication Program will be coordinated between the NWC, the Government of British Columbia, Alcan, and potentially the federal government. In the initial stages, it is recommended that the parties agree to outsource the development of the strategic plan and the early phases of implementation. As the level and load of responsibility is defined, decisions can be made on the most effective and efficient manner to manage communication activities.

While a consultant would be used to manage the program, each party will define a communication lead for the formation of an information and communication team to guide the communication process.

Assumptions

- a. The Government of British Columbia, Alcan and others, as required, will develop communications in close cooperation with the NWC
- b. The plan will support the first year of activities and will thereafter be refined
- c. NWC members will play an active and supporting role in the delivery of information and communication to key audiences
- d. The intention of all parties remains to engage the federal government in the process
- e. All parties believe that a CWRF should be built but acknowledge the fiscal realities.

Activity 4. Compilation of Background Information

Description

The tasks in this activity include compiling existing information into a bibliography. This will include information on the Kenney Dam Release Facility and related structures proposed in the Kemano Completion Project (KCP) studies, as well as studies subsequent to the British Columbia Utilities Commission (BCUC) report of December 1995, and all relevant reports by the NFCP, NWC and NEEFMC.

Objective

Compile and catalogue relevant documents prepared for the design and review of the KCP Kenney Dam Release Facility (KDRF) between 1988 and 1994, as well as for the NEEFMC.

Key Tasks and Dependencies

- a. Review existing list of documents compiled by the NEEFMC
- b. Review the documents prepared during the design of the KDRF for relevance to the CWRF
- c. Review documents submitted to BCUC hearing into KCP for relevant documents
- d. Review documents prepared post-1994 by the KDRF Working Group and for the NEEFMC on the topic of a CWRF and Cheslatta Fan including the bibliography listed on the NEEFMC website
- e. Prepare a bibliography and database which allows the easy location of all documents by key words
- f. Prepare a document index that can be posted in a project web site
- g. Place key documents such as the document index and key report summaries on the existing NEEFMC or NFCP web sites for convenient access and retrieval
- h. All background information must be compiled before commencing Activity 6.

Deliverable

A bibliography that can be posted on a project web site and provided in hardcopy to regional libraries.

Timing

2002 (4 weeks)

Cost

\$ 7,000

Resources

- a. Government of British Columbia
- b. Government of Canada
- c. Alcan.

Assumptions

- a. Documents are readily available
- b. Project web site would have been set up and can be used to present the information
- c. The documents accumulated by the NEEFMC, BCUC and NFCP will form the starting point for this activity.

Activity 5. Assessment of Benefits

Description

The communities of central British Columbia, Terrace, and Kitimat have recognized that a CWRF would generate environmental and socioeconomic benefits to the residents of these regions as well as the rest of the province. Identifying, assessing and reporting on these diverse benefits is a key activity in the planning stage of this facility as it will provide decision makers with the data and analysis needed to make informed investment decisions.

To fully understand and appreciate the social, economic and environmental benefits, it may be necessary to assess the upstream and downstream benefits through a variety of methods. For example, traditional cost-benefit monetary assessment methods could be used to evaluate the economic benefits. The more difficult-to-quantify social and environmental benefits may require alternative assessment tools.

Objectives

- a. Identify the specific values, interests and obligations that could be addressed by the construction of a CWRF
- b. Reach agreement among stakeholders, including all government agencies and Alcan, on the appropriate method or methods to evaluate the benefits of a CWRF
- c. Evaluate the broad benefits that are anticipated as a result of a CWRF including both upstream and downstream benefits
- d. Provide decision-makers with a comprehensive analysis of benefits to support well-informed financial decisions related to construction of a CWRF
- e. Assist determination of an optimal flow regime
- f. Inform the environmental assessment process.

Key Tasks and Dependencies

- a. Determine the criteria that decision makers will use in making key investment decisions regarding funding of the project
- b. Determine the interests that will be addressed by construction of a CWRF. The development of the optimal flow regime, described in Activity 2, will allow for refinement of the list of interests addressed by the facility and enhance the accuracy of the assessment
- c. Determine and assess different methods available to evaluate the social, environmental and economic benefits of the project and select the appropriate methods to be used

Note: A NWC contract to review evaluation methods, and recommend the most appropriate, has been issued.

- d. Determine the value of the benefits that will be generated from this facility
- e. Review of the background documents in Activity 4 to provide information and data regarding the assessment of benefits.

Deliverable

A report that will contain an assessment of the environmental, social, and economic benefits of a CWRF to British Columbia regionally, provincially and nationally.

Timing

- a. NWC plans to have the background review of evaluation methods and initial optimal flow regime scenarios completed by June 2002
- b. Identification of the interests that will be addressed (3 months)
- c. Agreement on the appropriate evaluation methods (4 months)
- d. Determination of the benefits that will be generated from a CWRF (4 months)
- e. This analysis will support key decisions related to investment and therefore will have to occur before the major investment decisions are made.

Cost

- a. Refine the values and interests that will be addressed: \$10,000
- b. Determination of benefits: \$60,000

Resources

- a. The NWC in cooperation with other community groups and with input from government agencies will identify the interests to be addressed by the facility
- b. The Government of British Columbia and Alcan in cooperation with the NWC and other stakeholders will select or develop the appropriate assessment or evaluation methods
- c. A consultant hired by the Government of British Columbia and Alcan will identify and analyze the benefits, in consultation with the NWC and other stakeholders.

Assumptions

- a. Key investment decisions related to the CWRF will require a comprehensive analysis of the benefits that will be generated by this facility
- b. All benefits of this facility cannot be quantified in the same manner. Some will be assessed on monetary criteria while others will be based on other criteria
- c. Benefits to be assessed will include all those realized at the regional, provincial and national level
- d. Appropriate evaluation methods will allow assessment of benefits
- e. This information will be valuable in the environmental assessment process.

PHASE 2. PRE-ENGINEERING AND ENVIRONMENTAL REVIEW

Activity 6. Pre-Engineering and Environmental Studies

Description

The CWRF proposed in the NEEFMC Report is different, but conceptually similar, to that planned as part of KCP, and the design of the facility will require the collection, assessment, and analysis of additional data about the reservoir, the Nechako Canyon and surrounding areas. Descriptions of the new studies to be undertaken are included in the Appendices. Numerous studies were completed for the Kenney Dam Release Facility (KDRF) under KCP and these will be referred to prior to new studies being commissioned.

Objective

To determine key information required to facilitate the design of the proposed CWRF.

Key Tasks and Dependencies

- a. Studies that expand on or test the feasibility of the proposed option, including:
 - Review of the Cheslatta Fan pilot channel concept (Appendix 1) *(LPI Report) ACTION ITEM*
 - Further assessment of Nechako Canyon sediment flushing (Appendix 2) *vv*
 - Further assessment of the reservoir hydrothermal structure (Appendix 5) *Greg Lawrence Report addresses approaches. but not the issue*
- b. Studies that set criteria for the proposed structure:
 - Confirmation of CWRF release water temperature criteria (Appendix 4) - *TRIRON AS PER REPORT*
 - Establish project-specific total gas pressure criteria (Appendix 6) - *TRIRON/ASPLN.*
- c. Studies that collect information needed for the environmental assessment, which may be seasonally time sensitive:
 - Compile information for assessment of fish entrainment at the CWRF (Appendix 3) *TRIRON FISH ENTRAINMENT.*

Deliverables

Key data that will allow for the detailed engineering and design work to be completed for the release facility and provide detailed information needed for environmental assessment.

Timing

Three years:

- Review of the Cheslatta Fan pilot channel concept to be completed by October 1, 2002
- The work should take up to four months.

Cost

\$765,000 to \$975,000

Resources

See detailed activity descriptions included in the Appendices.

Assumptions

See detailed activity descriptions included in the Appendices.

Activity 7. Preliminary Engineering of a Pilot Channel at Cheslatta Fan

Description

Development of the pilot channel concept to the preliminary engineering phase.

Objectives

- a. To develop the pilot channel concept to the level of detail needed for environmental review and permitting
- b. To conduct pre-engineering work for the pilot channel.

Key Tasks and Dependencies

Development of the concept and evaluation of the benefits, risks and a comparison with other alternatives to the level needed to obtain approval in an environmental review.

Deliverable

Preliminary design report of a channel to cross the Cheslatta Fan in a manner that meets all fisheries requirements including a development plan for the regime channel, which can be used in the environmental review stage.

Timing

Six months for the concept development stage

Cost

\$60,000 for the concept development stage

Resources

- a. CWRF consortium's engineer and environmental consultant
- b. Government agencies.

Assumptions

- a. A pilot channel concept is technically feasible, environmentally acceptable, and economically viable in comparison to other alternatives
- b. A regime channel can be developed as envisaged in the pilot channel concept.

Activity 8. Preliminary Engineering of a Cold Water Release Facility

Description

The Cold Water Release Facility proposed in the NEEFMC Report is different, but conceptually similar, from the KDRF planned as part of the Kemano Completion Project. Design of the facility will therefore require additional studies and engineering to be completed for various components of the release facility. Some of the key areas that require investigative and preliminary engineering include:

- Dissolved gas measurements at an existing flip bucket spillway and a physical hydraulic model study of the same flip bucket spillway
- Physical hydraulic model studies of the surface water intake channel, low-level intake, regulating structure and flip bucket spillway
- Refinement of the regulating structure layout and the upper sections of the spillway chute
- Subsurface geo-technical investigations in locations outside those areas covered by investigations for the KDRF proposed under KCP.

Objectives

- a. To enable the gas transfer characteristics of a flip bucket spillway to be evaluated empirically from total gas pressure (TGP) measurements at an existing flip bucket spillway and apply them to the CWRF spillway
- b. To evaluate the withdrawal characteristics of the surface water intake channel and the low-level outlet intake so as to in turn evaluate the capability to control the release water temperature
- c. To evaluate and confirm the hydraulic performance and dimensions of the various components, including the mixing capability of the spillway chute
- d. To evaluate the gas transfer performance of the flip bucket spillway
- e. To finalize the conceptual layout of the regulating structure, road bridge and upper section of the spillway chute for best mixing performance
- f. To establish the geotechnical conditions and parameters for uninvestigated areas of the facility.

Key Tasks and Dependencies

- a. Assuming that TGP levels remain a principal criteria, and that prior research has not been conducted, the key task is to be able to estimate the TGP that would be produced by the CWRF spillway. This work would precede all other tasks
- b. The withdrawal characteristics of the intakes in terms of water temperature control are the second key task
- c. The mixing capability of the chute to avoid temperature shears is the third key task
- d. All the above activities must precede the commencement of detailed engineering design.

Nechako Watershed Council Cold Water Release Facility Work Plan

Deliverables

- a. A preliminary design that will meet the performance criteria assumed to have been finalized in Activity 6, and a document that can be the basis of the environmental assessment reviews
- b. Geotechnical design parameters.

Timing

Fifteen months

Cost

\$1.25 million

Resources

CWRF consortium's engineer

Assumptions

- a. The performance criteria, including hydraulic capacities and flow regime have been firmly established in advance
- b. The CWRF is essentially the same as that envisaged in the NEEFMC Report
- c. This activity does not include preliminary engineering for the works at the Cheslatta Fan
- d. The Government of British Columbia and Alcan create a joint venture agreement among funders structured so that a public-private consortium designs, builds and owns the facility.

Activity 9. Environmental Review and Permitting

Description

A Cold Water Release Facility will require review under the British Columbia Environmental Assessment Act (BCEAA) and the Canadian Environmental Assessment Act (CEAA). Site development and construction will also require various statutory permits to be issued by federal and provincial regulatory agencies.

Objectives

- a. To conduct necessary biophysical studies related to the environmental assessment of a CWRP
- b. To prepare necessary documentation for environmental assessment
- c. To obtain a provincial Project Approval Certificate
- d. To obtain all necessary federal and provincial regulatory permits
- e. To obtain public support for the project.

Key Tasks and Dependencies

- a. The CWRP proponent will develop the project proposal and permit applications
- b. Government will manage the environmental assessment and permitting processes
- c. The NWC will support the review process with public participation and existing research studies
- d. Government will decide upon the applications and any subsequent requirements.

Deliverables

- a. Application and review documents required under the BCEAA and the CEAA
- b. Project Approval Certificate under the BCEAA
- c. Regulatory agency permits and authorizations for site development and construction activities
- d. Public support.

Timing

Twelve – fifteen months

Cost

\$1.64 million likely to be reduced by pre-application studies and prior public and first nation consultation work

Note: Estimated at an average of 1.7% of total project cost

Nechako Watershed Council Cold Water Release Facility Work Plan

Resources

- a. Proponent would prepare and submit project application
- b. British Columbia Environmental Assessment Office would manage an environmental assessment process harmonized with the federal government
- c. Proponent would apply for necessary permits and authorizations
- d. Federal and provincial line agencies would decide on applications and issue permits and authorizations
- e. NWC would support the review process, including the pre-application consultation and research.

Assumptions

- a. Federal and provincial environmental assessment processes will be harmonized
- b. Public participation and studies commissioned by the NWC, participants and Alcan will partially satisfy pre-application research and public and first nation consultation requirements
- c. NWC will support the review process.

PHASE 3. IMPLEMENTATION

Activity 10. Detailed Engineering and Construction of a Pilot Channel at Cheslatta Fan

Description

Complete the detailed design, preparation of bid documents, tendering and construction.

Objectives

- a. To design and prepare drawings, specifications and other bid documents for tendering
- b. To award a contract and construct the pilot channel
- c. To develop the regime channel
- d. To monitor fish and fish habitat response to sediment introductions.

Key Tasks and Dependencies

- a. After permitting, design and prepare drawings, specifications and other bid documents and issue for tender
- b. Review tenders, award contract and construct pilot channel
- c. Manage the project and monitor contractor compliance with contract conditions
- d. Release water from the CWRF in volumes and at times required to develop a regime channel
- e. Monitor developments and adjust the development program as necessary.

Deliverables

- a. Drawings, specifications, other bid documents, and engineer's estimate
- b. Tender review
- c. A completed pilot channel
- d. Construction report
- e. Periodic reports on development of the pilot channel
- f. Biological evaluation and monitoring.

Timing

- a. Six months for design and tendering and a further six months for construction
- b. Possibly several years to develop regime channel depending upon availability of suitable hydrologic cycle releases from CWRF.

Cost

- a. \$80,000 for design and tendering
- b. \$100,000 for construction management and monitoring
- c. \$600,000 for construction
- d. Cost for monitoring regime channel development depends on timing.

Resources

- a. CWRF consortium's engineer and environmental consultant
- b. Contractor
- c. Government agencies.

Assumptions

- a. A pilot channel concept for Cheslatta Fan is technically feasible, environmentally acceptable and economically viable in comparison to other alternatives
- b. A regime channel will develop as envisaged in the concept.

Activity 11. Detailed Engineering of a Cold Water Release Facility (Conventional Construction Contract Approach)

Description

Complete the detailed design, preparation of bid documents, tendering and construction. This includes detailed design of the civil, structural, mechanical and electrical components of the facility, including:

- Preparation of specifications and drawings
- Preparation of other bid documents including any special conditions, tender form, schedule of quantities and unit prices according to the CWRF consortium's requirements and contract form
- Pre-qualification and tendering
- Engineer's estimate
- Tender evaluation.

Objective

To produce the designs and documents necessary to tender and award a contract to construct the facility.

Key Tasks and Dependencies

- a. All tasks are key and the sequence is as indicated above. Pre-qualification can run concurrently with preparation of bid documents and could be done using preliminary design
- b. The environmental assessment review process should be well advanced with no major outstanding issues unresolved prior to commencing final detailed engineering.

Deliverables

- a. Design report
- b. Bid documents
- c. Engineer's estimate
- d. Tender evaluation and recommendation on award.

Timing

Eighteen months plus three months for tendering, evaluation and award

Cost

\$3.6 million

Resources

CWRF consortium's engineer and environmental consultant.

Assumptions

- a. Construction under conventional construction contract approach
- b. Environmental assessment review based on preliminary design
- c. The pilot channel concept for Cheslatta Fan is found to be technically feasible, environmentally acceptable and economically viable.

Activity 12. Cold Water Release Facility Construction

Description

This activity involves the construction of the CWRF.

Objectives

- a. To construct the facility
- b. To monitor contractor compliance with the contract.

Key Tasks and Dependencies

- a. Contractor mobilization
- b. Construction of a camp, aggregate processing and concrete batching plant and other infrastructure
- c. Award of sub-contracts for fabrication and supply of mechanical and electrical equipment
- d. Excavate and construct works and install and dry test mechanical and electrical equipment
- e. Demobilize except for personnel and equipment required for wet testing and commissioning
- f. Manage project administration and monitor construction.

Deliverable

A completed structure, ready for wet testing and commissioning.

Timing

Twenty-nine months

Cost

\$87.8 million plus:

- \$3.3 million for engineering services during construction
- \$1 million for CWRF consortium's costs for administration and financing expenses
- Escalation to start date from 2001dollars.

Nechako Watershed Council Cold Water Release Facility Work Plan

Resources

- a. Contractor
- b. CWRF consortium and CWRF consortium's engineer and environmental consultant
- c. Probably an independent environmental monitor.

Assumptions

- a. Construction is done under conventional construction contract approach
- b. The pilot channel concept for the Cheslatta Fan is found to be technically feasible, environmentally acceptable and economically viable.

Activity 13. Cold Water Release Facility Commissioning

Description

The next steps following construction are wet testing of the gates, control systems and instruments in the facility, any necessary adjustments, and clearing and flushing of the Nechako Canyon.

Objectives

- a. To ensure that the mechanical and electrical equipment and control systems and sensors function correctly under wet (loaded) conditions
- b. To clear the Nechako Canyon of readily removable brush, beaver dams and other organic matter
- c. Flushing of accumulated sediments from the canyon.

Key Tasks and Dependencies

- a. Update survey of conditions in the canyon if not already done
- b. Preparation of a commissioning plan, including the clearing and flushing of the canyon
- c. Obtaining agency approval of the commissioning plan
- d. Clearing the canyon prior to the start of wet testing
- e. Flushing of the canyon
- f. Continuous monitoring during commissioning.

Deliverables

- a. Commissioning Plan
- b. A successfully commissioned and operating facility.

Timing

- a. Two months preparation in the canyon
- b. Up to one additional month for commissioning.

Cost

\$500,000

Resources

- a. Contractor, and possibly a separate contractor for canyon clearing
- b. CWRF consortium
- c. CWRF consortium's engineer and environmental consultant
- d. Government agencies
- e. Probably an independent environmental monitor.

Assumptions

- a. Canyon preparation is completed ahead of the substantial completion of CWRF construction, so that wet testing and commissioning can follow immediately thereafter
- b. The pilot channel concept for Cheslatta Fan is found to be technically feasible, environmentally acceptable and economically viable.

Activity 14. Adaptive Management of Operations

Description

Within the agreed design parameters of the CWRF and a Cheslatta Fan channel, operate the facility, monitor the downstream conditions with respect to the desired objectives and adapt operations to suit within the capabilities of the facility and the constraints of other objectives.

Objectives

- a. To achieve the goals and objectives of the facility
- b. To monitor and adjust flow regimes, as required, over time.

Key Tasks and Dependencies

- a. Establish an organizational framework for monitoring and adjusting operations
- b. Monitor actual conditions against the desired conditions
- c. Modify operations as necessary within the capabilities of the facility and the constraints of other objectives.

Deliverables

An operating structure that best meets the goals and objectives set for a CWRF.

Timing

Ongoing

Cost

Approximately \$75,000 per year in addition to normal operating and maintenance expenses plus up to \$1 million per year for data collection and evaluation to monitor success of program, depending on how the NFCP annual operating funds are accounted for.

Resources

NFCP with an expanded mandate and NWC participation.

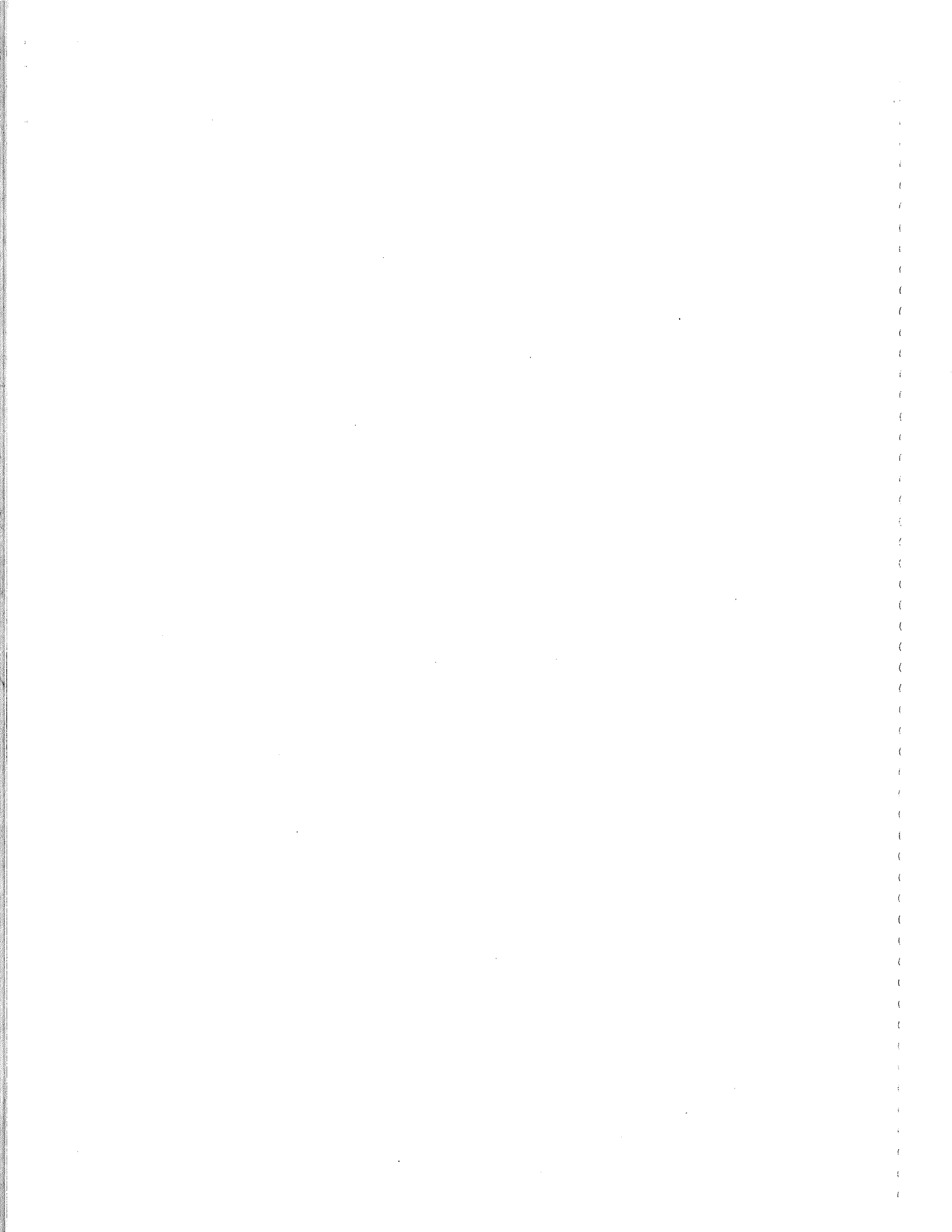
APPENDICES

Detailed Descriptions of Pre-Engineering and Environmental Design Activities

1. Review of Cheslatta Fan Pilot Channel Concept
2. Nechako Canyon Flushing
3. Fish Entrainment at the CWRP
4. Release Water Temperature Criteria
5. Reservoir Hydrothermal Structure (Reservoir Modeling)
6. Total Gas Pressure (TGP)

Glossary of Acronyms

7. Glossary of Acronyms



Appendix 1. Review of Cheslatta Fan Pilot Channel Concept EOI 2003

Description

Review the technical and economic feasibility of the pilot channel concept proposed by the NEEFMC using geo-technical data collected by Klohn Crippen Consultants in 1988/89 and subsequent analysis thereof.

Objectives

The concept of a pilot channel proposed by the NEEFMC was selected for least cost and other environmental factors. However, among other parameters, the concept did not consider the geotechnical information collected in 1988/89 by Klohn Crippen Consultants Ltd. for the KCP design developed from 1989 to 1992. The current objectives are therefore to review the feasibility of the concept considering the following factors:

- a. The feasibility of constructing the pilot channel as proposed by the NEEFMC
- b. The likelihood of the channel concept developing as proposed by the NEEFMC when the geotechnical information is considered
- c. Determination of the expected timeframe for the channel to develop under operating or commissioning constraints
- d. The likely duration and magnitude of downstream sediment concentrations in view of the likely form and timing for the channel development
- e. Given these factors, determination of the cost-competitiveness of the concept with other options and the likelihood for approval of the concept by the agencies given the current regulations and standards in effect for sediment concentrations in this watershed.

Key Tasks and Dependencies

The 1988/89 geotechnical information and subsequent analysis needs to be factored into the evaluation by the team or consultant working on this review. Tasks include:

- a. Review of the Hay and Company (Hayco) report to the NEEFMC in view of the additional information, including the economic constraints imposed by operation of the reservoir and the need to achieve beneficial use of the CWRP in a relatively short period of time so that other benefits downstream and in the Cheslatta basin can be realized and the regulatory constraints can be met
- b. Review of the design criteria set for the KCP Cheslatta Fan Channel design
- c. Having reviewed these two items, revisit the Hay and Company design concept to determine:
 - The constructability, commissioning and likely development of the channel concept
 - If that concept is judged not to be feasible given existing criteria, determine if other options for construction and commissioning exist or if alternate criteria may be acceptable

- The likely method, constraints and duration of channel commissioning and development given the above factors. Specifically, the quantity of additional water that would have to be released from the reservoir during channel commissioning and over what time frame, should be determined, valued and reported.

Deliverables

A report detailing all of the relevant factors considered and proposed as a result of the review including a judgment on the feasibility of the concept given the additional information considered. The review should result in the development of a final concept for the pilot channel that can be turned over to the design team, or design-build team if that option is chosen, for use in the detailed design phase of the project.

Timing

To be completed by October 1, 2002. The work could take up to four months. It should be completed early in the overall schedule so that, in the event the concept is not considered feasible, alternate approaches can be developed and considered, and costs estimated, prior to decisions being made to proceed with the design and construction of a CWRF.

Cost

\$60,000

Resources

An engineering consultant or geomorphologist familiar with the development or design of river channels and the manner in which geotechnical conditions would influence the design, construction and development of such channels.

Assumptions

- a. Alcan will make the 1988/89 Klohn Crippen geotechnical data and design report available to the consultant
- b. All documents prepared for the NEEFMC will be available to the consultant
- c. All relevant documents from the NFCP review of the KCP concept will be made available to the consultant.

Appendix 2. Nechako Canyon Flushing

EOI 2003

Description

Sediment and vegetation have been accumulating in the Nechako Canyon between Kenney Dam and Cheslatta Fan, a distance of approximately eight km, since the completion of the dam in 1952. The proposed construction of a CWRF at Kenney Dam will require this sediment and vegetation to either be flushed out or removed by other means when flow is restored. A study on how this could be done was commissioned during the KCP design of a KDRF. A plan was developed to flush most of the sediment and vegetation out of the canyon. However, two factors suggest that this study should be revisited:

- First, the maximum flow from the CWRF will be about 2.5 times greater than the flow from the KCP KDRF, thus potentially flushing more material from the canyon.
- Second, sediment and vegetation have been accumulating or growing in the canyon over the past ten years and could present a different, more complex situation than existed in 1990.

Objective

Document the current state of sediment deposits and vegetation growth in the Nechako Canyon and re-evaluate the plan for flushing sediments and vegetative debris from the canyon in light of the present design parameters and regulatory environment.

Key Tasks and Dependencies

- a. Review the report entitled "Investigation of the Flushing of Accumulated Sediments from the Nechako Canyon" prepared for Alcan by Triton Environmental Consultants
- b. Review aerial photographs of the Nechako Canyon from the early 1980's and 1996
- c. Survey the canyon by foot and boat to document the location of significant sediment deposits and vegetation types or stands to update the information provided in the joint Klohn Crippen/Triton report on the canyon walk-through
- d. Review the hydraulic and transport estimates as documented in the above report, consider the preliminary comments from the NFCP Technical Committee on the 1991 plan and revise the plan in the context of the planned flows from the proposed facility.

Deliverable

A report documenting the current size and location of sediment deposits and vegetation stands along the canyon and a revised plan for removing accumulated sediments and vegetation from the canyon.

Timing

Six to eight months

Cost

\$60,000 to \$75,000

Resources

A team experienced in geotechnical and vegetation investigations and the estimation of sediment erosion and transport in streams.

Assumptions

- a. All air photos and reports are available
- b. Data developed during the KCP investigations for hydraulic modeling are available for use in the estimation of flow depths and velocities along the canyon
- c. The optimal flow regime to be released from the facility is available.

\$ 110k yes!

- LSR dynamics?
cost eng
with Mike
Ref Kellerhaus
(Dave Hamilton) → headed
it up!

Appendix 3. Fish Entrainment at the CWRF

Description

During the review of the KCP KDRF, the issue of fish entrainment through the facility was raised by government agencies. Some fish habitat use information was collected, but given the available time, additional data should be collected to document fish habitat use in the vicinity of Kenney Dam.

Objective

To document the fish habitat usage near Kenney Dam in order to assist the determination of whether or not fish entrainment at the facility will be an issue.

Key Tasks and Dependencies

Collect spring, summer, fall and winter seasonal data on fish usage of the area near Kenney Dam using gill nets, beach seines, electrofishing, minnow trapping and burbot traps (cod traps).

Deliverable

A brief technical memo documenting the findings of the study.

Timing

One year with seasonal sampling

Cost

\$20,000 – \$35,000

Resources

Any fisheries consultant with appropriate experience. Sampling for this project in conjunction with sampling for the NFCP on the Nechako River would keep logistic costs to a minimum.

Assumption

This information will be required for the environmental assessment process.

Appendix 4. Release Water Temperature Criteria

Description

The release of water to fulfill downstream fish protection criteria is a fundamental principle underlying the desire to construct a CWRF. For the KDRF proposed under KCP, the summer release water temperature was agreed prior to 1987 as 10 degrees C with the downstream control temperatures targetted at 20 degrees C, with 21.7 degrees C as the maximum temperature not to be exceeded more than once in 200 years on average. There has been some discussion during the provincial white sturgeon recovery project that would result in a revisiting of these temperatures. Finally, this activity will also establish water temperature criteria for other periods of the year, at least in general terms, to ensure that outlet capacities match water temperature expectations.

Note: A release water temperature of not greater than 10 degrees C will provide a maximum decrease in the amount of cooling water that would be released and therefore the maximum amount of currently released water that could be "freed up" and allocated for other purposes.

Objective

Confirm the design release water temperatures from the CWRF.

Key Tasks and Dependencies

- a. Discuss with the agencies the current progress on water temperature criteria from the provincial white sturgeon recovery project perspective
- b. Following that discussion, confirm that the release water temperature for the facility during the summer months should be 10 degrees C or another temperature as required
- c. This activity should be completed prior to undertaking any reservoir modeling.

Deliverables

The design release water temperatures from the CWRF.

Timing

Six to twelve months

Cost

\$15,000 - \$25,000 to conduct workshops and prepare background materials

Resources

- a. Alcan
- b. Government of British Columbia
- c. Fisheries and Oceans Canada representing the Federal Government.

Assumption

These agencies and Alcan will be available to discuss this topic at an appropriate time.

Workshops held!

Done

Appendix 5. Reservoir Hydrothermal Structure (Reservoir Modeling)

Description

Meteorological conditions over the reservoir, as well as the quantity and temperature of inflows into the reservoir, will affect the hydrothermal structure of the reservoir. This will in turn affect the temperature of releases from a low or high level outlet at a CWRF. Consideration should be given to the need for additional work on the modeling of the hydrothermal structure given the significant increases in the capacity of the proposed CWRF compared to those for the KDRF proposed under KCP.

Objective

To determine the required quantity and temperature of water that can be released from the CWRF throughout the year.

Key Tasks and Dependencies

- a. Prior to initiating any modeling, collect a time series of reservoir temperature and wind data at key locations including Knewstubb Lake near Kenney Dam and the intersection of Knewstubb and Nataalkuz Lakes
- b. Collect vertical temperature profiles at other locations to allow the initiation of the spring, summer and fall model
- c. Collect inflow quantity and temperature at major tributaries or current inflow gauging sites
- d. Collect meteorological data at Knewstubb Lake, the intersection of Knewstubb and Nataalkuz Lakes, and Skins Lake
- e. Prior to any modeling, determine the expected release regime at the CWRF including any temperature requirements
- f. Assemble detailed bathymetry data from Tahtsa Narrows work that can be used in the modeling
- g. Run the hydrothermal model to determine expected deep water and surface water release temperatures throughout the year and examine the effect of internal waves or perturbations in the thermal structure over time driven by wind and air pressure fluctuations.

Deliverables

- a. Confirmation of the feasibility of the reservoir to provide water at the necessary temperature throughout the open water season
- b. A summary and technical report.

Timing

Two years: one year for collecting field data plus one year for the modeling work

Cost

- a. Data Collection: \$325,000 to \$425,000 depending if previously-used temperature probes, meteorological recording equipment and data loggers are available
- b. Modeling: \$210,000 to \$300,000 depending in part on the USD/CAND exchange rate and the work required for setting up the model again.

Resources

The modeling would be conducted by a consultant or organization with the relevant experience and access to the necessary 2D or 3D models. Data collection can be conducted by a consultant or organization with experience in setting up and maintaining data collection networks.

Assumptions

- a. Alcan's reservoir inflow monitoring network provides sufficiently detailed coverage of the basins to not require the installation of additional inflow recording equipment
- b. The temperature probes and data recording equipment purchased by Alcan in 1994 are available and serviceable.

OK

Appendix 6. Total Gas Pressure (TGP)

Description

The subject of Total Gas Pressure in the waters released from the reservoir by the KDRF proposed under KCP was discussed at length during the KCP review of the proposed designs. This resulted in a specific and relatively expensive design for the regulating structure and the spillway which is not included in the current concept for the structure. In addition, considerable research was conducted during the 1990's on this topic and new federal and provincial criteria for TGP have been developed. Thus the topic needs to be revisited in the context of the current concept for a CWRF at Kenney Dam.

Objective

Determine if the design alternative proposed by the NEEFMC will meet current federal and provincial TGP criteria or objectives.

Key Tasks and Dependencies

- a. Review the current federal and provincial criteria for TGP in the context of the design alternative proposed by the NEEFMC
- b. Collect additional TGP data to characterize TGP levels in the reservoir near the surface and at depth during the period of operation envisioned for the spillway. This should be completed prior to the assessment of potential TGP levels downstream from the structure or the assessment of how these levels would comply with federal and provincial objectives or criteria
- c. Based on the research available, assess if additional studies such as prototype and physical hydraulic model studies need to be conducted to estimate the TGP that would result from the use of the proposed spillway.

Deliverables

- a. Database detailing the *in situ* TGP conditions in the reservoir during the period of May to October when a CWRF spillway would likely be operating
- b. Assess and report on the need for additional prototype or model studies to determine the ability of the current design concept to meet federal and provincial objectives.

Timing

Collection of the data would take place from the time ice leaves the reservoir until late October. The remainder of the assessment could take place during the subsequent six months.

Cost

\$60,000 to \$75,000

Resources

Data collection could be undertaken by organizations familiar with the collection of TGP data and having the required equipment. The assessment should be undertaken by an organization experienced in the evaluation of dissolved gas levels at large hydraulic structures.

Assumption

Clear federal and provincial criteria are in place.

Appendix 7. Glossary of Acronyms

BCEAA	British Columbia Environmental Assessment Act
BCUC	British Columbia Utilities Commission
CAND	Canadian Dollars
CEAA	Canadian Environmental Assessment Act
CWRF	Cold Water Release Facility
KCP	Kemano Completion Project
KDRF	Kenney Dam Release Facility
NEEF	Nechako Environmental Enhancement Fund
NEEFMC	Nechako Environmental Enhancement Fund Management Committee
NFCP	Nechako Fisheries Conservation Program
NWC	Nechako Watershed Council
TGP	Total Gas Pressure
USD	United States Dollars

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SCHEDULE "A:" SERVICES

Activity No. 1: Fish Entrainment.

Total Budget: \$29,990, exclusive of GST (Fees: \$24,380; Expenses: \$5,610)

- Obj 1*
1. Assess fish distribution through (a) queries of web-based fisheries database (FISS, Fish Wizard), (b) a review of past projects in the area, (c) a questionnaire of sport fishers operating out of the Nechako Lodge, and (d) fish samplings trips.
 2. Fish sampling will be completed seasonally from October 2003 to September 2004, all in accordance with the sampling process set out in section 4.0 of the Contractor's Proposal at p.3.
 3. The information collected in the field will be combined with the information of fish entrainment from the scientific literature identified in Triton's literature review prepared for NES and dated July 2003, together with the expected water inflow characteristics of the proposed water release facility to assess the potential risks of impingement or entrainment.
 4. Contractor will consult with relevant agencies (e.g. provincial environment ministries and Fisheries and Oceans Canada and representatives of organizations such as BC Hydro and Bonneville Power).
 5. Contractor will organize a workshop with relevant experts and government agency personnel to identify additional issues regarding reservoir fish populations in the context of the proposed water release facility.
 6. Contractor will carry out any additional activities as described in the original Triton proposal for this project.
 7. Prepare a report summarizing the efforts in sub-activities 1 to 6. A draft of the report must be submitted to the NES by no later than November 1, 2004. After submission of the draft report, a representative of the Contractor will attend a meeting of the Nechako Watershed Council (NWC) to explain the draft report and receive comments. After considering comments by the NES and NWC, the Contractor will finalize a final report, to be submitted to NES by no later than December 15, 2004.
- Obj 2*
Obj 3
Obj 4
Obj 5
Obj 6
Obj 7

- species
- time of year
- up/cycle stay

Obj 2
Guidelines
current policies

Obj: gov't
buy in to
assumptions /
conclusions
need for
compensation?

Activity No. 2: Release Water Temperature Criteria

Final waiting EREC Summary.

Total Budget: \$14,900, exclusive of GST (Fees: \$11,400; Expenses: \$3,500)

1. Complete a comparison of the annotated bibliography on this topic prepared for NES by Triton in 2003 and the recent BC Water Quality Guideline for Temperature prepared by Dr. Fidler and Mr. Oliver.
2. Compile water temperature data for the Nechako River for a full range of discharge conditions expected as detailed in the Triton Reports for NEEF prepared in 2000 and 2001.
3. Develop a comprehensive list of all fish species present in the Cheslatta River and the Nechako River below Cheslatta Falls based on reports compiled for the Nechako Fisheries Conservation Program (NFCP) and determine existing priority species in the context of water temperature criteria. Focus should be on fish species upstream of the Nechako - Stuart Rivers confluence.
4. Determine if expected water temperatures meet the new B.C. Water Quality Guidelines for Temperature. The focus should be on key areas such as Cheslatta Falls, the Nechako River upstream of the Nautley confluence, and the Nechako River between the Nautley River confluence and the Stuart River confluence.
5. Organize and participate in a workshop with the key review agencies (eg. provincial environment ministries and Fisheries and Oceans Canada), the NFCP and others as needed with the objective of reaching consensus on the Water Release Facility release water temperature or, if that is not possible, determine what further work is necessary.

6. Carry out any additional activities as described in the original Triton proposal for this project.
7. Prepare a report summarizing the efforts in sub-activities 1 to 6, describing whether there was consensus on any issues, and providing recommendations for future work (if any future work is required). A draft of the report must be submitted to the NES by no later than **May 1, 2004**. After submission of the draft report, a representative of the Contractor will attend a meeting of the Nechako Watershed Council (NWC) to explain the draft report and receive comments. After considering comments by the NES and NWC, the Contractor will finalize a final report, to be submitted to NES by no later than **June 30, 2004**.




Activity No. 3: Total Gas Pressure (TGP)

Total Budget: \$64,689, exclusive of GST (Fees: \$46,689; Expenses: \$18,000)

1. Review the current provincial and federal TGP criteria and objectives focusing on the work recently done by Antcliffe, Fidler, and Birtwell towards new interim criteria (in preparation).
2. Re-examine past work on TGP production undertaken for the proposed Kemano Completion Project Release Facility at Kenney Dam.
3. Implement a TGP and temperature-monitoring program in Knewstubb Arm and at Cheslatta Falls during the ice-free period May to late October using continuous TGP monitoring devices manufactured by Common Sensing Instruments. Measure TGP, temperature, dissolved oxygen, barometric pressure and relative humidity at two levels in Knewstubb Arm and at one location in the Nechako River at Cheslatta Falls. Obtain TGP levels at Skins Lake, Little Cheslatta Falls, and the Cheslatta River near Cheslatta Lake under the lower (30 to 50 m³/s) discharge conditions. All data collected will be entered in a database and will be used to establish a baseline condition for modeling exercises. Also, using the results, establish whether solar heating or primary production lead to dissolved gas supersaturation at these locations.
4. Review the available scientific literature to identify analytical studies of the gas transfer characteristics of flip bucket spillways and/or measurements of the production of TGP downstream of flip bucket spillways at existing facilities with a view to estimating the TGP levels likely to be produced by the NEEFMC design concept and the concepts described in the EDI Report entitled "Nechako Cold Water Release Facility Year 1 Pre-Engineering and Environmental Studies – Nechako Canyon and Cheslatta Fan". Set up the Triton dissolved gas model using estimated TGP levels at Kenney Dam (both in the Reservoir and downstream of the flip bucket spillway and the low level outlet of the proposed water release facility) along with dissolved gas production and dissipation of the Cheslatta River under the expected future discharge conditions (as proposed by the NWC and others), and Cheslatta Falls to estimate TGP levels in the Nechako River below Cheslatta Falls. The model will use estimated re-aeration coefficients for the Nechako Canyon and Upper Nechako River. As well, the model will use existing release regime and proposed release regime scenarios consisting of appropriate flow, temperature and dissolved gas conditions to predict the expected changes from existing TGP conditions with operation of the water release facility and changes in release from the Skin Lake Spillway and calculate the net TGP balance.
5. Review previous studies of the Kenney Dam and other facilities to establish whether the hollow cone valves of the low-level discharge facility will generate dissolved gas supersaturation.
6. Use the list of all fish species in the Nechako and Cheslatta Rivers developed in Activity 2 to identify species using the river that have not been examined for the susceptibility to dissolved gas super-saturation.
7. Carry out any additional activities as described in the original Triton proposal for this project.

8. Prepare a report summarizing the efforts in sub-activities 1 to 8. A draft of the report must be submitted to the NES by no later than **November 1, 2004**. After submission of the draft report, a representative of the Contractor will attend a meeting of the Nechako Watershed Council (NWC) to explain the draft report and receive comments (meeting to the same one at which Contractor presents Activity No. 1 draft report). After considering comments by the NES and NWC, the Contractor will finalize a final report, to be submitted to NES by no later than **December 15, 2004**.

Initials:

➤ TRITON: 
➤ NES: 
➤ NES: 

SCHEDULE "B:" FEES AND DISBURSEMENTS

1. THE ALLOWABLE FEES ARE THOSE DESCRIBED IN THE PROPOSAL MADE BY THE CONTRACTOR TO THE NES, DATED AUGUST 19, 2003 (THE "PROPOSAL"). THE FEES ARE DESCRIBED AT PAGE 7 OF THE PROPOSAL. THE TOTAL MAXIMUM FEES ARE DESCRIBED ON THE FIRST PAGE OF THE SERVICE CONTRACT UNDER THE HEADING "SCHEDULE B". THE MAXIMUM FEES BY ACTIVITY ARE DESCRIBED IN SCHEDULE "A". EXCEPT AS PROVIDED IN PARAGRAPH 3, THE CONTRACTOR'S TOTAL FEES BY ACTIVITY MUST NOT EXCEED THE MAXIMUM FEES BY ACTIVITY DESCRIBED IN SCHEDULE "A".

2. IN ACCORDANCE WITH THE ESTIMATED DISBURSEMENTS OR EXPENSE FOR EACH ACTIVITY DESCRIBED IN THE PROPOSAL AND SCHEDULE "A", THE CONTRACTOR MAY SUBMIT FOR REIMBURSEMENT ALL REASONABLE EXPENSES, PROVIDED THE DISBURSEMENTS ARE SUPPORTED, WHERE APPLICABLE, BY PROPER RECEIPTS AND ARE, IN THE OPINION OF NES, NECESSARILY INCURRED BY THE CONTRACTOR IN THE FULFILLMENT OF THE CONTRACTOR'S OBLIGATIONS UNDER THIS AGREEMENT. EXCEPT AS PROVIDED IN PARAGRAPH 3, THE MAXIMUM DISBURSEMENTS OR EXPENSES FOR EACH ACTIVITY MUST NOT EXCEED THE MAXIMUM DISBURSEMENTS OR EXPENSES FOR EACH ACTIVITY DESCRIBED IN SCHEDULE "A". THE TYPES OF ALLOWABLE DISBURSEMENTS AND THEIR LIMITS ARE AS FOLLOWS:
 - HOTELS & LODGING: MAXIMUM OF \$80/NIGHT;
 - MEALS: \$9.25 FOR BREAKFAST, \$11 FOR LUNCH, & \$20 FOR DINNER (NO RECEIPTS NEEDED);
 - CAR RENTALS AND FUEL;
 - MILEAGE, IF OWN VEHICLE USED, AT A RATE OF \$0.43 PER KILOMETRE;
 - AIR FARE, AND RELATED EXPENSES SUCH AS AIRPORT IMPROVEMENT FEES;
 - OUT-POCKET COSTS FOR ITEMS SUCH AS PHOTOCOPIES, MAPS, PHOTOGRAPHS, AND OTHER ITEMS REASONABLY NECESSARY TO FULFILL THE OBJECTIVES OF THIS CONTRACT; AND
 - OTHER TYPES OF DISBURSEMENTS OR EXPENSES REASONABLY NECESSARY TO FULFILL THE OBJECTIVES OF THIS AGREEMENT AND APPROVED IN ADVANCE AND IN WRITING BY NES.




HOWEVER, THE NES RESERVES THE RIGHT TO REFUSE TO PAY PART OR ALL OF A CLAIMED ALLOWABLE EXPENSE OR DISBURSEMENT IF, IN THE REASONABLE OPINION OF THE NES, THE AMOUNT OF THE CLAIMED ALLOWABLE EXPENSE OR DISBURSEMENT IS UNREASONABLE OR NOT RELATED, IN WHOLE OR IN PART, TO THE OBJECTIVES OF THIS AGREEMENT AND THE SERVICES.

3. IF THE CONTRACTOR, OR ANY OF ITS SUBCONTRACTORS, DETERMINES THAT, IN ITS OPINION, UNEXPECTED FEES OR DISBURSEMENTS MUST BE REASONABLY INCURRED TO FULFILL THE OBJECTIVES OF THIS AGREEMENT AND THOSE FEES OR DISBURSEMENTS ARE NOT SET OUT IN THE PROPOSAL, THE CONTRACTOR MUST, BEFORE INCURRING THE ADDITIONAL FEES OR DISBURSEMENTS, OBTAIN THE PRIOR WRITTEN CONSENT OF THE NES. IF SUCH PRIOR WRITTEN CONSENT IS NOT OBTAINED, THE CONTRACTOR BEARS THE RISK THAT THE NES MAY SUBSEQUENTLY DETERMINE, AT ITS ABSOLUTE DISCRETION, THAT THE FEES WERE NOT NECESSARY AND THEREFORE WILL NOT BE REIMBURSED OR PAID. IN MAKING SUCH DETERMINATIONS, THE NES MAY ACT UNREASONABLY.

4. THE CONTRACTOR SHOULD SUBMIT TO NES ON A MONTHLY BASIS TO NES, COMMENCING OCTOBER 1, 2002, A WRITTEN STATEMENT OF ACCOUNT:

- (A) SHOWING THE CALCULATION OF ALL FEES CLAIMED FOR THE PERIOD FOR WHICH THE STATEMENT IS SUBMITTED, WITH NUMBER OF HOURS AND DATES FOR EACH INDIVIDUAL SUBMITTING A BILLING;
 - (B) LISTING, IN REASONABLE DETAIL AND WITH DATES, ANY AND ALL DISBURSEMENTS CLAIMED FOR THE PERIOD FOR WHICH THE STATEMENT IS SUBMITTED WITH RECEIPTS, WHERE APPLICABLE, ATTACHED;
 - (C) ALL G.S.T. AND/OR P.S.T. PAID (EACH TAX DESCRIBED SEPARATELY);AND
 - (D) A SUMMARY OF THE FEES AND EXPENSES BY ACTIVITY (AS DESCRIBED IN SCHEDULE "A").
5. AFTER 30 DAYS OF RECEIPT BY NES OF THE STATEMENT OF ACCOUNT REFERENCED IN PARAGRAPH 4, THE FEES REFERRED TO IN PARAGRAPH 1 OF THIS SCHEDULE AND THE EXPENSES REFERRED TO IN PARAGRAPH 2 OF THIS SCHEDULE THAT ARE SHOWN THEREON WILL BE PAID TO THE CONTRACTOR SUBJECT ALWAYS TO THE RESPECTIVE MAXIMUM AMOUNTS SET FORTH ON THE FIRST PAGE OF THE SERVICE CONTRACT UNDER SCHEDULE "B" AND THE ACTIVITY BUDGET IN SCHEDULE "A".

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

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SCHEDULE "C:" APPROVED SUB-CONTRACTORS

Notwithstanding Section 1(e) or any other provisions of the Agreement, the following sub-contractor(s) have been approved under this Agreement:

- **Dr. Larry Fidler, Aspen Applied Sciences Ltd.**
 - Release Water Temperature Criteria and Total Gas Pressure expertise and guidance and participation in any NES/Agency/NFCP Workshops.
- **Mr. Chris Wilson, P.Eng., Klohn Crippen Consultants Lt.d**
 - Engineering and hydraulic expertise and guidance with Total Gas Pressure investigations.

Initials:

➤ TRITON: 
➤ NES: 
➤ NES: 

SCHEDULE "D:" INSURANCE

1) Workers Compensation Board Coverage

The Contractor and approved sub-contractors will comply generally with the *Workers' Compensation Act* and in particular will obtain and maintain during the term of this Agreement, the necessary coverage for himself and any employees or subcontractors, and will, upon request by the NES provide particulars of such coverage.

2) Insurance

The Contractor and approved sub-contractors shall, without limiting its obligations or liabilities herein and at its own expense, provide and maintain the following insurance with insurers licensed in British Columbia and in forms and amounts acceptable to the NES as follows:

(A) Vehicle Insurance

(i) Automobile Insurance

Automobile Liability Insurance is required by all contractors except where the Contractor or approved sub-contractor does not use a vehicle in delivering any of the goods or services specified in the contract. Automobile Liability is required for all vehicles owned, operated or licensed in the name of the Contractor or approved sub-contractor in an amount not less than \$3,000,000. The NES, Alcan Inc., and the Province of British Columbia must be added as an additional insured under this policy

(ii) Watercraft Insurance

Where a contractor or approved sub-contractor will be using a watercraft in performance of the specified services, the owner of the watercraft must have \$2,000,000 coverage of Comprehensive General Liability (described in (B) below) plus a special watercraft clause addition. This applies to boats over eight metres.

(iii) Aircraft or Helicopter Insurance

Where a Contractor or approved sub-contractor will be using an aircraft in performance of the specified services, the owner of the aircraft must have \$2,000,000 of Comprehensive General Liability coverage (described in (B) below).

(B) Comprehensive General Liability Insurance

Comprehensive General Liability is required in an amount not less than \$1,000,000 inclusive per occurrence against bodily injury and property damage. The NES, Alcan Inc., and the Province of British Columbia must be added as an additional insured under this policy. Such insurance shall include, but is not necessarily limited to the following:

1. Products and Completed Operations Liability
2. Owner's and Contractor's Protective Liability
3. Blanket Written Contractual Liability
4. Contingent Employer's Liability
5. Personal Injury Liability

6. Non-Owned Automobile Liability
7. Cross Liability
8. Employees as additional Insured
9. Broad Form Property Damage
10. If applicable, Tenants' Legal Liability in an amount adequate to cover a loss to premises of the Province occupied by the Contractor.

(C) Errors and Omissions Insurance

Errors and Omissions Liability Insurance or Professional Errors and Omissions Liability Insurance, as appropriate, in an amount not less than \$1,000,000 inclusive per occurrence against damages caused by Contractor or approved sub-contractor errors and omissions in performance of the services under this contract.

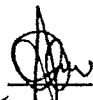


(D) All the foregoing insurance shall be primary and not require the sharing of any loss by any insurer of the NES, Alcan Inc. or the Province of British Columbia.

(E) The Contractor and approved sub-contractors shall provide the NES with evidence of all required insurance prior to the commencement of the work or services. Such evidence shall be in the form of a completed Certificate of Insurance or, (when requested by the NES), the Contractor and approved sub-contractors shall provide certified copies of required insurance policies. The form that is generally accepted by the Province of B.C. is acceptable to NES.

(F) The Contractor and approved sub-contractors shall ensure any insurance in paragraphs 2(B) and/or 2(C) above must be endorsed to provide the NES with 30 days advance written notice of cancellation or material change.

(G) The Contractor and approved sub-contractors hereby waives all rights of recourse against the NES, Alcan Inc. and the Province of British Columbia with regard to damage to the Contractor's property.

Initials:

➤ TRITON: 
➤ NES: 
➤ NES: 

SCHEDULE "E:" TERMS OF SERVICE CONTRACT

CONTRACTOR'S OBLIGATIONS

1. You must provide the services described in Schedule A (the "Services") in accordance with this agreement. You must provide the Services during the term described in Schedule A, regardless of the date of execution or delivery of this agreement.
2. Unless the parties otherwise agree in writing, you must supply and pay for all labour, materials, facilities and approvals necessary or advisable to perform your obligations under this agreement.
3. Unless otherwise specified in the agreement, you must perform the Services to a standard of care, skill, and diligence maintained by persons providing, on a commercial basis, services similar to the Services.
4. You must ensure that all persons you employ or retain to perform the Services are competent to perform them and are properly trained, instructed, and supervised.
5. We may from time to time give you reasonable instructions (in writing or otherwise) as to the performance of the Services. You must comply with those instructions but, unless otherwise specified in this agreement, you may determine the manner in which those instructions are carried out.
6. You must, upon our request, fully inform us of all work done by you or a subcontractor in connection with providing the Services.
7. You must maintain time records and books of account, invoices, receipts, and vouchers of all expenses incurred, in form and content satisfactory to us. You must retain the foregoing documents for a period of seven years after the expiry or termination of this agreement.
8. You must permit us all reasonable times to inspect and copy all material that has been produced or received by you or any subcontractor as a result of this agreement (collectively the "Material"), including, without limitation, accounting records, findings, software, data, specifications, drawings, reports, and documents, whether complete or not.
9. You must treat as confidential all Material and not permit its disclosure without our prior written consent except as required by applicable law.
10. The Material and any property we provide to you or a subcontractor is our exclusive property. You must deliver it to us immediately upon our request.
11. The copyright in the Material belongs exclusively to us. Upon our request, you must deliver to us documents satisfactory to us waiving in our favour any moral rights which you or your employees or subcontractors may have in the Material and confirming the vesting of the copyright in us.
12. You must maintain and pay for insurance on the terms, including form, amounts, and deductibles, outlined in Schedule D, if any, as modified from time to time in accordance with our directions.
13. You must apply for and, immediately on receipt, remit to us any refund or remission of federal or provincial tax or duty available with respect to any items

that we have paid for or agreed to pay for under this agreement.

14. You must comply with all applicable laws.
15. You must indemnify and save harmless us and our employees and agents from any losses, claims, damages, actions, causes of action, costs and expenses that we or any of our employees or agents may sustain, incur, suffer or be put to at any time, either before or after this agreement ends, which are based upon, arise out of or occur, directly or indirectly, by reason of, any act or omission by you or by any of your agents, employees, officers, directors, or subcontractors in providing the Services.
16. You must not assign your rights under this agreement without our prior written consent. We have the right to refuse our consent at our absolute discretion and for any reason whatsoever, no matter how unreasonable.
17. You must not subcontract any of your obligations under this agreement other than to persons listed in Schedule C without our prior written consent. No subcontract, whether consented to or not, relieves you from any obligations under this agreement – your obligations will continue as if you had not subcontracted the work. You must ensure that any subcontractor you retain fully complies with this agreement in performing the subcontracted obligations. You will contract directly with subcontractors. You must not represent yourself to be our agent for the purpose of entering into any relationships with subcontractors.
18. You must not provide any services to any person in circumstances that, in our reasonable opinion, could give rise to a conflict of interest between your duties to that person and your duties to us under this agreement.
19. You must not do anything that would result in personnel hired by you or a subcontractor being considered our employees.
20. You must not commit or purport to commit us to pay any money unless specifically authorized by this agreement.

PAYMENT

21. If you comply with this agreement, we must pay you the fees described in Schedule B, and the expenses, if any, in accordance with Schedule B if they are supported, where applicable, by proper receipts and, in our opinion, are necessarily incurred by you in providing the Services. We are not obliged to pay you more than the "Maximum Amount" specified in Schedule B on account of fees and expenses.
22. In order to obtain payment of any fees and expenses under this agreement, you must submit to us written statements of account in a form satisfactory to us (see Schedule "B", section 4), but no sooner than the dates referred to in Schedule B.
23. We may withhold from any payment due to you an amount sufficient to indemnify us against any lien or other third party claims that could arise in connection with the provision of the Services. If no liens or third party claims are filed within 90 days after the expiry or termination of this agreement, we will no longer have the right to withhold any payments.
24. Unless otherwise specified in this agreement, all references to money are to Canadian dollars.

25. If you are not a resident of Canada, we may be required by law to withhold income tax from the fees described in Schedule B and then remit that tax to the Receiver General for Canada on your behalf.
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TERMINATION

26. We may terminate this agreement (a) for your failure to comply with this agreement, immediately on giving written notice of termination to you; and (b) for any reason, on giving 10 days' written notice of termination to you. If we terminate this agreement under (b), we must pay you the portion of the fees and expenses described in Schedule B that equals the portion of the Services completed to our satisfaction before termination. That payment discharges us from all liability to you under this agreement.
27. If you fail to comply with this agreement, we may terminate it and pursue other remedies as well.

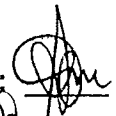
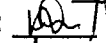
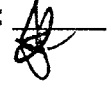
GENERAL

28. You are an independent contractor and not our employee, agent, or partner.
29. If you are a corporation, you represent and warrant to us that you have authorized your signatory or signatories who have signed this agreement on your behalf to enter into and execute this agreement on your behalf without affixing your common seal.
30. This agreement is governed by and is to be construed in accordance with the laws of British Columbia.
31. Time is of the essence in this agreement.
32. Any notice contemplated by this agreement, to be effective, must be in writing and either: sent by fax to the addressee's fax number specified in this agreement; delivered by hand to the addressee's address specified in this agreement; or mailed by prepaid registered mail to the addressee's address specified in this agreement. Any notice mailed by prepaid registered mail is deemed to be received 96 hours after mailing. Either of the parties may give notice to the other of a substitute address or fax number from time to time.
33. A waiver of any term of this agreement or of any breach by you of this agreement is effective only if it is in writing and signed by us and is not a waiver of any other term or any other breach.
34. No modification of this agreement is effective unless it is in writing and signed by the parties.
35. This agreement and any modification of it constitute the entire agreement between the parties as to performance of the Services.
36. All disputes arising out of or in connection with this agreement or in respect of any defined legal relationship associated with it or derived from it must, unless the parties otherwise agree, be referred to and finally resolved by arbitration administered by the British Columbia International Commercial Arbitration Centre under its rules. Despite these Rules, the parties agree there will be one arbitrator only and the arbitration will take place in Vancouver, British Columbia. Each of the parties will share the costs of the arbitrator and any associate

arbitration fees on a "50 - 50" sharing basis, regardless whether the arbitrator finds in their favour or not. Each party will bear their own legal costs, disbursements, expert fees, and other related costs associated with the arbitration.

37. Sections 6, 8 to 11, 13, 15, 24, 25, 27 to 29, 30 and 36 continue in force indefinitely, even after this agreement ends. When this agreement ends, sections 7 and 23 continue in force according to the time limits specifically described in each section.
38. The schedules to this agreement are part of this agreement.
39. If there is a conflict between a provision in a schedule to this agreement and any other provision of this agreement, the provision in the schedule is inoperative to the extent of the conflict unless it states that it operates despite a conflicting provision of this agreement.
40. In this agreement, "we", "us", and "our" refer to the NES alone and never refer to the combination of the Contractor and the NES; that combination is referred to as "the parties".
41. This agreement does not operate as a permit, license, approval or other statutory authority that you may be required to obtain from the Province of British Columbia or any of its agencies in order to provide the Services. Nothing in this agreement is to be construed as interfering with the exercise by the Province or its agencies of any statutory power or duty.
42. The agreement may be entered into by each party signing a separate copy of this agreement (including a photocopy or faxed copy) and delivering it to the other party by fax.

Initials:

✔ TRITON: 
✔ NES: 
✔ NES: 

-END-

CSIO CERTIFICATE OF INSURANCE DATE (YY/MM/DD)
03/08/19

BROKER
TOS Insurance Services Ltd
#100 - 3875 Henning Drive
Burnaby, BC V5C 6N5

This certificate is issued as a matter of information only and confers no rights upon the certificate holder. This certificate does not amend, extend or alter the coverage afforded by the policies below.

INSURED
Triton Environmental Cons. Ltd
150 - 13091 Vanier Place
Richmond, BC V6V 2J1

COMPANIES AFFORDING COVERAGE	
COMPANY A	Lombard Canada
COMPANY B	Axa Pacific Insurance Company
COMPANY C	Elliott Special Risks Ltd
COMPANY D	

COVERAGES
This is to certify that the policies of insurance listed below have been issued to the insured named above for the policy period indicated, notwithstanding any requirement, term or condition of any contract or other document with respect to which this certificate may be issued or may pertain, the insurance afforded by the policies described herein is subject to all the terms, exclusions and conditions of such policies.
LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

CO LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (YY/MM/DD)	POLICY EXPIRATION DATE (YY/MM/DD)	LIMITS	
A	GENERAL LIABILITY	CBP0862312	03/06/30	04/06/30	EACH OCCURRENCE	\$ 1000000
	<input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY				GENERAL AGGREGATE	\$ 1000000
	<input type="checkbox"/> CLAIMS MADE				PRODUCTS - COMP/OP AGG	\$ 1000000
	<input checked="" type="checkbox"/> OCCURRENCE				PERSONAL INJURY	\$ 1000000
	<input type="checkbox"/> TENANT'S LEGAL LIABILITY				TENANT'S LEGAL LIABILITY	\$
	<input checked="" type="checkbox"/> NON-OWNED				MED EXP (Any one person)	\$ 10000
	<input type="checkbox"/> HIRED	NON-OWNED	\$ 1000000			
B	AUTOMOBILE LIABILITY	1000153	03/02/28	04/03/28	BODILY INJURY & PROPERTY DAMAGE COMBINED	\$ 1000000
	<input checked="" type="checkbox"/> DESCRIBED AUTOMOBILES				BODILY INJURY (Per person)	\$
	<input type="checkbox"/> ALL OWNED AUTOS				BODILY INJURY (Per accident)	\$
	<input type="checkbox"/> LEASED AUTOMOBILES				PROPERTY DAMAGE	\$
A	EXCESS LIABILITY	1188379	03/06/30	04/06/30	EACH OCCURRENCE	\$ 4000000
	<input checked="" type="checkbox"/> UMBRELLA FORM				AGGREGATE	\$
	<input type="checkbox"/> OTHER THAN UMBRELLA FORM					\$
C	Professional Liability	92529	02/09/11	03/09/11	Professional Liability	1000000
B	Protection & Indemnity	MAR3003691	03/06/30	04/06/30	Protection & Indemnity	1000000

ADDITIONAL INSURED	DESCRIPTION OF OPERATIONS/LOCATIONS/AUTOMOBILES/SPECIAL ITEMS
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CERTIFICATE HOLDER To Whom it May Concern	CANCELLATION Should any of the above described policies be cancelled before the expiration date thereof, the issuing company will endeavor to mail _____ days written notice to the certificate holder named to the left, but failure to mail such notice shall impose no obligation or liability of any kind upon the company, its agents or representatives.
	AUTHORIZED REPRESENTATIVE 