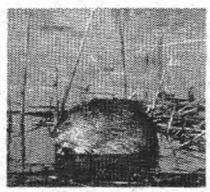
Canada Alberta Northwest Territories

Northern River Basins Study



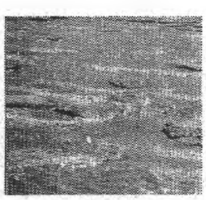




NORTHERN RIVER BASINS STUDY PROJECT REPORT NO. 112

CONTAMINANT FATE MODELLING, ATHABASCA, WAPITI AND SMOKY RIVERS






DATE DUE

Prepared for the
Northern River Basins Study
under Project 2381-D1

by

Golder Associates Ltd.

NORTHERN RIVER BASINS STUDY PROJECT REPORT NO. 112

CONTAMINANT FATE MODELLING, ATHABASCA, WAPITI AND SMOKY RIVERS

Published by the
Northern River Basins Study
Edmonton, Alberta
March, 1997

CANADIAN CATALOGUING IN PUBLICATION DATA

Main entry under title :

Contaminant fate modelling, Athabasca, Wapiti and
Smoky Rivers

(Northern River Basins Study project report,
ISSN 1192-3571 ; no. 112)
Includes bibliographical references.
ISBN 0-662-24839-2
Cat. no. R71-49/3-112E

1. Sedimentation and deposition -- Alberta -- Athabasca River -- Simulation methods.
2. Sedimentation and deposition -- Alberta -- Wapiti River -- Simulation methods.
3. Sedimentation and deposition -- Alberta -- Smoky River -- Simulation methods.
4. Organic water pollutants -- Alberta -- Athabasca River -- Simulation methods.
5. Organic water pollutants -- Alberta -- Wapiti River -- Simulation methods.
6. Organic water pollutants -- Alberta -- Smoky River -- Simulation methods.

I. Golder Associates.
II. Northern River Basins Study (Canada)
III. Series.

TD387.A43C66 1997 551.3'03'0971232 C96-980294-3

PREFACE:

The Northern River Basins Study was initiated through the "Canada-Alberta-Northwest Territories Agreement Respecting the Peace-Athabasca-Slave River Basin Study, Phase II - Technical Studies" which was signed September 27, 1991. The purpose of the Study is to understand and characterize the cumulative effects of development on the water and aquatic environment of the Study Area by coordinating with existing programs and undertaking appropriate new technical studies.

This publication reports the method and findings of particular work conducted as part of the Northern River Basins Study. As such, the work was governed by a specific terms of reference and is expected to contribute information about the Study Area within the context of the overall study as described by the Study Final Report. This report has been reviewed by the Study Science Advisory Committee in regards to scientific content and has been approved by the Study Board of Directors for public release.

It is explicit in the objectives of the Study to report the results of technical work regularly to the public. This objective is served by distributing project reports to an extensive network of libraries, agencies, organizations and interested individuals and by granting universal permission to reproduce the material.

This report contains referenced data obtained from sources external to the Northern River Basins Study. Individuals interested in using external data must obtain permission to do so from the donor agency.

NORTHERN RIVER BASINS STUDY
PROJECT REPORT RELEASE FORM

This publication may be cited as:

Golder Associates Ltd. 1997. *Northern River Basins Study Project Report No. 112, Contaminant Fate Modelling, Athabasca, Wapiti and Smoky Rivers.* Northern River Basins Study, Edmonton, Alberta.

Whereas the above publication is the result of a project conducted under the Northern River Basins Study and the terms of reference for that project are deemed to be fulfilled,
IT IS THEREFORE REQUESTED BY THE STUDY OFFICE THAT;
this publication be subjected to proper and responsible review and be considered for release to the public.

F. J. Wrona
(Dr. Fred J. Wrona, Science Director)

14 May 96
(Date)

Whereas it is an explicit term of reference of the Science Advisory Committee "to review, for scientific content, material for publication by the Board",
IT IS HERE ADVISED BY THE SCIENCE ADVISORY COMMITTEE THAT;
this publication has been reviewed for scientific content and that the scientific practices represented in the report are acceptable given the specific purposes of the project and subject to the field conditions encountered.
SUPPLEMENTAL COMMENTARY HAS BEEN ADDED TO THIS PUBLICATION: [ ] Yes [ ] No

P. A. Larkin
(Dr. P. A. Larkin, Ph.D., Chair)

24 May /96
(Date)

Whereas the Study Board is satisfied that this publication has been reviewed for scientific content and for immediate health implications,
IT IS HERE APPROVED BY THE BOARD OF DIRECTORS THAT;
this publication be released to the public, and that this publication be designated for: **[ ] STANDARD AVAILABILITY [ ] EXPANDED AVAILABILITY**

Lucille Partington
(Lucille Partington, Co-chair)

May 29/96
(Date)

Robert McLeod
(Robert McLeod, Co-chair)

May 21/96
(Date)

CONTAMINANT FATE MODELLING, ATHABASCA, WAPITI AND SMOKY RIVERS

STUDY PERSPECTIVE

> ***Related Study Questions***
>
> *13a) What predictive tools are required to determine the cumulative effects of man made discharges on the water and aquatic environment?*
>
> *14) What long term monitoring programs and predictive models are required to provide an ongoing assessment of the state of the aquatic ecosystems. These programs must ensure that all stake holders hove the opportunity for input.*

Environments are constantly changing; that the aquatic environments contained within the Northern River Basins Study (NRBS) area were being changed as a result of development was not challenged. However, the ability to describe and predict those changes likely to arise from development continued to be a challenge to resource managers at the onset of the Study.

Typically, the change that occurs within the environment like those found in the Peace, Athabasca and Slave rivers, take place over an extended period of time. Although not as evident or dramatic, the change and its effects can be just as substantive as those occurring within a shorter time frame; the changes are so subtle as to go unnoticed. A major difficulty for aquatic scientists working with these large aquatic systems is the lack of documented information covering a long period of time. The monitoring that was underway or done prior to the onset of the NRBS Study was disparate and information gaps existed.

For large, complex, aquatic ecosystems like the Peace, Athabasca and Slave rivers, subjected to significant seasonal variation, scientists use tools like models to help them assess the consequence of changing one or many parameters. Models offer researchers and managers with the capability of being better able to understand and predict changes arising from development. NRBS undertook to investigate the potential use of models. A decision was made to utilize WASP IV, Thomann/Connolly and Gobas food chain models, to assess the fate and bioaccumulation of point-source contaminants entering the upper Athabasca River.

Many contaminants released to the aquatic environment do not remain in solution but attach themselves to fine particles suspended in the water column. Knowledge of sediment - contaminant interaction, combined with an understanding of sediment transport dynamics better enables researchers to simulate the transport and uptake of contaminants within the aquatic environment.

The modelling effort by NRBS was a multi-faceted initiative involving review and interpretation of sediment transport dynamics, contaminant distribution and concentration in sediment, water and biota and the refinement of existing models. This report describes modification of the United States Environmental Protection Agency's WASP modelling system. The WASP model provides a generalized framework for modelling water quality and treats the water column of a river as segments. It permits the use of data that changes with time and space and has sub-model routines that allow for the modelling of contaminants.

Project results indicate that the revised model provides a good representation of water column concentrations but it poorly estimates bed sediment concentrations. Follow-up work is recommended for refining sediment transport models (NRBS Project Report No. 136). Not unexpectedly, the model predicts the Wapiti/Smoky rivers will more quickly respond to loads than the Athabasca River but it poorly predicted bed concentrations of seven selected organic chemicals except for 2,3,7,8 - TCDF.

While progress was made with the contaminant fate model, there are still some substantive deficiencies with its calibration. Calibration data, especially for the Wapiti/Smoky rivers, is generally lacking. Additional time and data precludes NRBS being able to bring this work to a conclusion but researchers have indicated an interest to pursue this work independently and to publish the results.

Complementary work is reported in Northern River Basins Study Project Reports No. 136 (*Contaminant Fate Modelling for the Athabasca River: Implementation of New Sediment Flux Routines*), No. 113 (*A Bioenergetic Model of Food Chain Uptake and Accumulation of Organic Chemicals, Athabasca River: Stochastic and Time Variable Version*), No. 129 (*Environmental Contaminants In Fish: Spatial and Temporal Trends of Polychlorinated Dibenzo-p-dioxins and Dibenzofurans, Peace, Athabasca and Slave River Basins, 1992 to 1994*), and No. 101 (*Environmental Contaminants in Fish: Polychlorinated Biphenyls, Organochlorine Pesticides and Chlorinated Phenols, Peace and Athabasca Rivers, 1992 to 1994*).

REPORT SUMMARY

Numerical models of the transport and fate of environmental chemicals were developed and a first level of calibration conducted for the Athabasca and Wapiti/Smoky Rivers. The models were developed using the USEPA WASP modelling system. The models were structured as one-dimensional (longitudinal) models with separate, interacting water column and bed sediment compartments. Seven selected organic chemicals were simulated over a two year period, 1992-1993 for the Athabasca River and 1990-1991 for the Wapiti/Smoky River system. Organic chemicals simulated included; 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF), dehydroabietic acid (DHA), 12,14-dichlorodehydroabietic acid (12,14-dichoro-DHA), 3,4,5-trichlorocatechol (3,4,5-TCC), 3,4,5-trichloroquiacol (3,4,5-TCG), 3,4,5-trichloroveratrole (3,4,5-TCV) and Phenanthrene. Phenanthrene simulation was limited to one synoptic survey, for which limited suspended sediment sorbed and no bed sediment phenanthrene concentrations were measured.

The models were first calibrated for a conservative substance (sodium), and total suspended solids (TSS). Sodium and TSS sources included the upstream boundary of the modelled system, tributaries, pulp mills, and significant non pulp mill industrial/municipal discharges. The TSS calibration was performed by adjusting time-series of settling/resuspension rates. for different settling zones below each pulp mill. The calibration was completely descriptive, in that settling rates were input into the model to match the observed pattern of TSS concentrations in the river. TSS was calibrated for both models using only settling. The available information was insufficient to define any resuspension events in the model.

Organic chemicals were simulated using a set of environmental fate constants developed from a literature search, numerical estimation software and estimation from field data. The results of the initial simulations were compared to observed data and adjustments made to selected fate constants to improve the calibration. Fate constants were only adjusted within the range of uncertainty for each constant.

The best calibration was achieved for 2,3,7,8-TCDF. The environment fate constants and behaviour of this substance are well known. The environmental fate constants and behaviour for the other organic chemicals are not as well understood. Calibration results for the other substances reflect this uncertainty and results were more inconsistent. The model consistently matched observed dissolved water column concentrations for all chemicals, except phenanthrene. Simulation of adsorption to suspended solids was adequate for all chemicals. 3,4,5-TCC and TCG calibrations could have been improved by increasing the organic carbon partition coefficient (K_{oc}), however experimental data would be needed to support such an increase.

While the model, as currently structured, provides a good representation of water column concentrations, for all chemicals but phenanthrene, it does not provide an adequate simulation of bed sediment concentrations. Simulated bed chemical concentrations in the Athabasca River responded very slowly to chemical loads and largely reflected the initial conditions specified. Simulated bed concentrations in the Wapiti/Smoky responded more rapidly to loads than in the Athabasca River, however bed concentrations were over-estimated for all substances but 2,3,7,8-TCDF.

Phenanthrene simulations do not agree with observed values, however the observed data, particularly for the mill effluents is very limited and in some cases inconsistent. Based on the limited data, it is not possible to draw conclusions on the adequacy of the model to simulate phenanthrene concentrations in the Athabasca River.

The simulation results indicate that the most significant model refinement required is a predictive sediment transport simulation capability, which includes sediment resuspension. The lack of adequate sediment transport simulation capabilities and poor resolution of key environmental fate constants for all substances except 2,3,7,8-TCDF, makes it difficult to properly evaluate the adequacy of the model for simulating contaminants in bed sediments. In particular, better resolution of the following constants are needed; benthic biodegradation (site-specific) and K_{oc} values.

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1.0 INTRODUCTION

The Northern River Basins Study (NRBS) is major initiative aimed at gathering comprehensive water quality, hydraulic, hydrologic, and biological information from the Peace, Athabasca, and Slave River Basins, within Alberta and the Northwest Territories. This information will then be used to develop a capability to assess and predict the cumulative effects of developments in the river basins.

The specific goals of this study were to develop numerical simulation models of the transport and fate of organic chemicals in the Athabasca River and in the Wapiti/Smoky Rivers (Figure 1.1), and to use available information to calibrate the models for seven selected organic chemicals:

- 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF),
- dehydroabietic acid (DHA),
- 12,14 dichlorodehydroabietic acid (12,14-dichloro-DHA),
- 3,4,5 trichlorocatechol (3,4,5-TCC),
- 3,4,5 trichloroguaiacol (3,4,5-TCG), and
- 3,4,5 trichloroveratrole (3,4,5-TCV),
- Phenanthrene.

The WASP modelling system (Version 4.33), developed and maintained by the USEPA, was used to develop the models.

The Athabasca River was selected because it was the major focus of instream organic contaminants sampling for the NRBS. There are four pulp mills which discharge directly to the Athabasca (Weldwood, Miller Western, Alberta Newsprint Company, Alberta Pacific Newsprint Company) and one mill which discharge to a major tributary (Slave Lake Pulp Company discharges to the Lesser Slave River).

The Wapiti river flows into the Smoky River which discharges into the Peace River. The Wapiti/Smoky River system was selected because there was comprehensive water quality and biological monitoring conducted on this system by the Weyerhaeuser Company which operates a kraft pulp mill that discharges into the Wapiti River near Grande Prairie, Alberta.

Each river was calibrated to two years worth of data, 1992 & 1993 for the Athabasca River and 1990 & 1991 for the Wapiti/Smoky Rivers. Calibration data consisted of synoptic survey data and network monitoring station data. Each river was initially calibrated to sodium as a conservative substance to confirm the mass balance of the model. Total suspended solids (TSS) were calibrated by describing a time-series of settling rates. Once the mass balance was confirmed and TSS calibrated the model was calibrated for the six organic chemicals.

1.1 WASP MODEL DESCRIPTION

The USEPA Water Quality Analysis Simulation Program (WASP) is a generalized framework for modelling water quality in surface waters (Ambrose et al. 1991). The flexibility afforded by WASP is unique among water quality models; it permits the structure of one-, two-, and three-dimensional models, allows the specification of time-variable exchange coefficients, advective flows, waste loads and water quality boundaries, and permits tailored structuring of its kinetic processes.

A body of water is represented in WASP as a series of computational elements (segments). Environmental properties and chemical concentrations are modelled as spatially constant within segments. Four different segment types may be simulated: surface water, subsurface water, surface benthic, and subsurface benthic.

The basic principle governing transport of water and material among different segments is conservation of mass. Water volumes and water quality constituent masses are tracked and accounted for over time and space using a series of mass-balancing equations. Six mechanisms may be used to describe mass transport; advection and dispersion in the water column, advection and dispersion in the porewater, settling, resuspension and sedimentation of up to three classes of solids, and evaporation and precipitation.

WASP includes two kinetic sub-models to simulate two of the major classes of water quality problems, toxic pollution (TOXI) and eutrophication (EUTRO). The toxics model (TOXI), which was used for contaminant fate modelling on the Athabasca and Wapiti/Smoky Rivers, simulates the transport and transformation of up to three toxic chemicals and up to three types of solids. The chemicals may be independent or they may be linked with reaction yields (i.e. parent compound-daughter products). Each chemical can exist as a neutral compound and in up to four ionic species. Each neutral and ionic species can exist in up to five phases; dissolved, sorbed to dissolved organic carbon (DOC), and sorbed to one or more of the three types of solids. Local equilibrium is assumed to exist between each phase of a chemical, so that the distribution of a chemical between species is defined by partition coefficients. TOXI tracks a single WASP state-variable for each chemical, representing the total chemical concentration, and calculates the concentration of any specie in any phase from the total chemical concentration based on the user specified partition coefficients.

Transfer processes defined in the TOXI model include sorption, ionization and volatilization. Transformation processes include biodegradation, hydrolysis, photolysis, and chemical oxidation. Sorption and ionization are treated as equilibrium reactions; whereas all other processes are defined by first- or second-order rate equations.

TOXI affords the flexibility to simulate chemicals processes with different levels of complexity. At the simplest level of complexity chemicals are treated as neutral compounds; and all transformation process rates and volatilization rates are defined by first-order rate equations. At higher levels of complexity different ionic species may be simulated, second order and internally calculated rate equations can be used for some or all processes, and reaction yields can be simulated. TOXI allows the user to decide on the level of complexity appropriate to their particular problem.

A similar level of flexibility is possible for the media simulated. At the simplest level only water column chemical concentrations would be simulated. At the highest level of complexity the model can simulated interaction between surface water, subsurface water, surface sediment, and subsurface sediment segments.

2.0 NORTHERN RIVER BASINS STUDY MODEL CONFIGURATION

2.1 CHEMICAL PROCESSES

For the Athabasca and Wapiti/Smoky Rivers all chemicals were modelled as neutral species (i.e. ionization will not be considered). The implementation of transport and transformation processes for the Athabasca River and Wapiti/Smoky Rivers models are described below.

Equilibrium sorption of chemical to organic carbon (OC) in suspended and bed sediments, and dissolved organic carbon (DOC) in the water column and porewater were simulated. Partitioning between the dissolved phase, sediment OC, and DOC was based on the OC partition coefficient (K_{oc}).

Volatilization was implemented using the two layer resistance model with transfer coefficients calculated based on water depth and velocity (see volatilization option 3). Chemical specific data required by the model includes molecular weight and the Henry's Law Constant. An Arrhenius temperature coefficient is required to temperature correct the reference rate constant to ambient river temperatures.

For volatilization the model was modified to prevent volatilization during ice cover conditions. WASP allows a time-series of river temperatures to be specified. Monthly average temperatures were specified in the model and the code modified to prevent volatilization when water temperatures were less than or equal to zero degrees Celsius.

Hydrolysis and oxidation were implemented as first order kinetic processes and required only a first-order rate coefficient. The Arrhenius activation energy for the hydrolysis and oxidation reactions, if specified, were used to temperature correct the hydrolysis rate.

Photolysis rates were assumed to be zero, due to high light extinction rates reported for the Athabasca River (Brian Brownlee, personal communication).

Biodegradation was implemented as a first-order kinetic process. Separate rate constants were specified for the water column and bottom sediment. Rate constants should be based on experiments conducted under levels of organic contamination comparable to those found in the Athabasca River (i.e. low level contamination). An Arrhenius temperature coefficient is required to temperature correct the reference rate constant to ambient river temperatures. In general, the biodegradation temperature coefficient should be very similar to the BOD temperature coefficient, which was used if a biodegradation temperature coefficient was not available (Schnoor et al. 1987).

2.2 PHYSICAL AND HYDRAULIC CONFIGURATION

For each river the model was set up to represent the river as a one-dimensional (vertically and laterally averaged) system, dividing the river into a series of fully mixed cells ranging from four to eleven kilometers long. Cell lengths were set so that hydraulic residence times under low flow conditions was approximately equal for all water column cells.

Bed sediment cells were included in the models as a single sediment (benthic) layer underlying each water column cell. The WASP variable bed volume option was used in the simulations. This option maintains a constant sediment concentration in each cell (i.e. ratio between solids and porosity) but varies cell volume in response to deposition and resuspension of solids. The variable bed volume option requires that a second lower bed layer be specified. This lower bed layer was not active in these simulations.

Bed sediments were represented by two solids types. Type 1 solids represented the fine sediment capable of sorbing organic chemical and subject to sediment transport. Type 2 solids represent the coarse sediment, and were assumed to be inert (i.e. do not sorb organics) and were not subject to sediment transport.

Flow is a critical parameter to model calibration. In this study, daily flows were used, and both temporal and spatial variations of flow during the simulation period were accounted for in modelling.

Variations of river flow can result in changes in the volume and velocity of model segments. In order to accommodate the effects of flow variation, the velocity, depth and width of the river were calculated at every time step of model simulation. This was accomplished by building a module in the WASP source code using the Leopold-Maddox (1959) method. As such, water column velocities, cell volumes and mass exchange areas were updated at each time step for the water column segments.

The Leopold-Maddox relationship relates the velocity, depth and width of a river to the amount of flow as follows:

$$V = aQ^b$$

$$D = cQ^d$$

$$W = eQ^f$$

where , V = velocity (m/s),

D = depth (m),

W = width (m),

Q = river flow (m^3/s).

Coefficients a, c and e, and exponents b, d, and f are the Leopold-Maddox constants for a particular hydraulic reach of a river.

Without this relationship implemented WASP tracks the water balance in each cell as the starting volume plus sum of the inflows and outflows for each model time-step. With the Leopold-Maddox relationship implemented, the total flow in the cell determines the volume of the water column cells. The Leopold-Maddox relationship as implement in WASP is a steady state hydraulic in that it does not incorporate flow routing. By default WASP conserves mass in cells; therefore, increasing flow would decrease concentrations (i.e. same constituent mass and more water) and decreasing flows would increase constituent concentrations. To overcome this problem without the complexities associated with dynamic flow routing, the WASP code was modified as follows:

- During increasing flows, the increase in cell volume is made up proportionately of the inflows to the cells.

- During decreasing flows, the mass in the cell is adjusted so that the concentration remains constant. This mass adjustment is made prior to calculation of kinetic losses, and inter-cell dispersion.

This implementation of the Leopold-Maddox relationship is suitable for gradually varied flows, but would not be suitable for highly dynamic flow conditions, such as tailwaters below hydroelectric reservoirs.

Bed cells are treated differently in the model, because the residence time in bed cell is much longer than in water column cells. The surface area of bed cells is set equal to the initial surface area of the overlying water column cell. This area is multiplied by the initial depth specified by the user, which determines the initial bed cell volume. Bed cell areas remain constant during the simulation and volumes vary in response to the described pattern of sediment deposition and erosion.

2.2.1 Athabasca River

The upper boundary of the Athabasca River included in the model was set at a sampling site coded as AD1085 in the 1989 Alberta Environment synoptic water quality survey. This site is located 1.9 km upstream of the Hinton Combined Effluent (HCE) and is 1243.4 km from the Goose Island Channel at the lower end of the Athabasca River. The lower boundary of the simulation domain, on the other hand, was set near Old Fort, 83 km upstream of Goose Island. The total length of the river modelled is 1160.4 km.

Hydraulic characteristics of the Athabasca River vary from upstream to downstream. The entire river was, therefore, divided into a number of hydraulic reaches based on their hydraulic characteristics. The Leopold-Maddox constants were then determined for each reach. Table 2.1 shows the cell configuration, hydraulic reaches, and Leopold-Maddox constants used in the study. A total of 15 hydraulic reaches were adopted from the upstream boundary above Hinton to the downstream boundary near Old Fort.

A number of studies have been carried out on mixing and hydraulic characteristics of the Athabasca River (Beltaos 1979, Van Der Vinne et al 1993, Van Der Vinne 1993). Leopold-Maddox coefficients for both open water and ice cover conditions have also been reported for the hydraulic reaches shown in Table 2.1 (HydroQual 1989). In 1994, the coefficients for reaches below the Town of Athabasca were re-calibrated by Golder Associates Ltd. (1994) based on the results of a dye tracer experiment in 1992 (Van Der Vinne and Andres 1993).

Considering water quality conditions in winter are more critical than in summer, only the Leopold-Maddox coefficient values obtained for the ice cover condition were used in model simulation. By incorporating these coefficients into the WASP model, velocities and volumes of water column cells at each time step can be updated as flow in the river changes over time.

Model set-up for the Athabasca River includes the definition of modelled domain, schematization of the river, and incorporation of tributaries and industrial discharges. Schematization divides the river into a number of segments for which constituent concentrations are simulated. Tributaries and industrial discharges control the water quality in the river and, thus, need to be represented in the model schematic.

The Lesser Slave River was configured as part of the simulation domain in the model. The simulated reach of the tributary starts at the outlet of the Lesser Slave Lake and has a length of 72 km. Similar to the Athabasca River, the one-dimensional approach was applied to the Lesser Slave River.

As indicated in Table 2.1, a total of 210 segments were used to represent the water column for the Athabasca River, and 12 segments were used for the Lesser Slave River. For the bed sediment layer, equal numbers of cells were used. This set-up allows each water column segment to have a corresponding bed cell underneath.

The lengths of segments in the model were set in such a way that the differences in travel time between segments at different locations of the river can be minimized. That is, shorter segment lengths were used for reaches that have lower velocities and longer lengths were adopted for reaches with higher velocities. A uniform distribution of travel time over the modelled range of the river will reduce the amount of numerical dispersion, an effect of mass dispersion resulting from the finite-difference approximation used in solving mass transport equations in the model.

The modelled domain covers more than 1100 km of the Athabasca River, along which there are numerous sources of flows and industrial discharges draining into the river. These tributaries and discharges have significant impact on the water quality of the Athabasca River. As such, all significant tributaries and discharges were identified and included in the WASP model.

Table 2.1 also shows the tributaries included in the WASP model, as well as some NRBS and Alberta Environment water quality sampling sites. There are a total of 26 tributaries included in the model. The locations of tributaries and sampling sites are referenced as the distance from both the mouth of the Athabasca River downstream and the town of Hinton upstream, respectively.

In the case of the Lesser Slave River, locations of the input sources are also identified as distances from the Lesser Slave Lake outlet and the confluence with the Athabasca River, respectively.

2.2.2 Wapiti/Smoky Rivers

The approach used for configuring the Wapiti/Smoky Rivers system is the same as for the Athabasca River. That is, the river was configured as an one-dimensional system; a bed layer was included in the model set-up, and the Leopold-Maddox relationship was applied to adjust velocities and volumes of segments.

The model configuration of the Wapiti/Smoky Rivers system is summarized in Table 2.2. The reach started at the Highway 40 bridge upstream on the Wapiti River and extends to the confluence of Smoky River with Peace River. The total length of the modelled reach is 250 km.

The locations of tributaries and discharges into the Wapiti/Smoky Rivers included in the model are include in Table 2.2. The modelled river system was divided into four hydraulic reaches. Leopold-Maddox constants for each reach adopted in this study are included in Table 2.2. These constants were obtained from a study by Macdonald and Taylor (1990) on modelling of the Wapiti/Smoky and Peace River system.

Similar to the model set-up for the Athabasca River, segment lengths in the Wapiti/Smoky Rivers model were also configured to reduce the differences in travel time through the cells. A total of 95 cells were used for the both water column and bed layer, respectively.

3.0 INPUT CONDITIONS

In order to be able to correctly simulate mass concentrations in the river system, all of the major constituent sources must be specified in the model. Time-series inputs for the Athabasca and Wapiti/Smoky River models were included for the following constituents; water flow, sodium, TSS, and organic chemicals. With the exception of flow, constituent inputs may be specified as mass loads, or as a concentrations, if a flow has been specified for that source. Water flow was included for the upstream boundary conditions (i.e. Athabasca River upstream of Hinton and Wapiti River upstream of Weyerhaeuser) and all major tributaries. Sodium and TSS sources included upstream boundary conditions and tributaries as concentrations, and pulp mills and non-pulp mill industrial/municipal discharges (TSS only) as loads. Pulp mills were the only organic chemical loading sources included in the model. Municipal effluents may be minor sources of dioxins and furans, however monitoring data is insufficient to include them in the model.

In addition to the time-series inputs, WASP requires that two parameters are specified, dissolved organic carbon (DOC) and fraction of organic carbon (FOC) in the fine solids. These parameters are set in the model as fixed values which must be specified for each water column and bed sediment cell. DOC and FOC along with organic carbon partition coefficients (K_{oc}) are used to define an equilibrium distribution between dissolved chemical, DOC-bound chemical, and solids sorbed chemical (based on FOC in solids). Initial concentrations in each bed sediment and water column cell must be specified for fine solids, coarse solids, and each organic chemical.

Input conditions were specified for 1991, 1992 and 1993 for the Athabasca River, and 1989, 1990, and 1991 for the Wapiti/Smoky River. For both systems, the latter two years are the simulation period; the first year is included to allow the simulation to be started earlier, in order that the simulation has stabilized by January 1st of the first simulation year.

Input conditions included in the Athabasca River and Wapiti/Smoky River models are summarized in Tables 3.1 and 3.2, respectively. Tables and electronic spreadsheets of all input data used in the Athabasca River and Wapiti/Smoky River models are included in Appendices A and B, respectively.

3.1 SODIUM

Sodium sources included upstream boundary conditions and tributaries as concentrations, and pulp mills. Sodium concentrations for the upstream boundary conditions and tributaries in both systems were derived from seasonal (spring, summer/fall, winter) averages of Alberta Environment (Naquadat) data for 1989-1994. Tributaries with no data were assumed to have the same sodium concentrations as nearby tributaries.

Pulp mill sodium loads were extracted from the Northdat database (NRBS 1995). No sodium data for Weldwood were available in Northdat. Weldwood sodium loadings were estimated by multiplying an average Weldwood effluent concentration from Naquadat data (N= 5) by the observed daily time-series of effluent flows.

Sodium loading rates for the Grand Prairie STP and stormwater outfall on the Wapiti River were assigned based on 1989-1990 water surveys (Macdonald and Taylor 1990). Based on the database developed by SENTAR Consultants Ltd. (1994), no other monitored municipal or non-pulp mill industrial discharges contributed significant sodium loads to the Athabasca or Wapiti/Smoky rivers.

3.2 TOTAL SUSPENDED SOLIDS LOADS

TSS sources in the model included upstream boundary conditions and tributaries as concentrations, and pulp mills and non-pulp mill industrial/municipal discharges as loads.

Total suspended solids (TSS) concentrations for the tributaries of both systems were derived from seasonal (spring, summer/fall, winter) averages of Alberta Environment (Naquadat) data for 1989-1994. Tributaries with no data were assumed to have the same TSS concentrations as nearby tributaries.

Historical TSS data for the Athabasca River upstream of Hinton were insufficient to define an adequate time-series (approximately five points per year). To overcome this problem, a daily time-series of TSS concentrations upstream of Hinton was derived by applying a turbidity-TSS linear regression equation ($N=12$, $r^2 = 0.98$) to daily turbidity measurements at the Hinton intake. Unpublished daily turbidity measurements at the Hinton intake were supplied by the Weldwood Canada. Upstream boundary concentrations for the Wapiti and Smoky Rivers were derived from Alberta Environment (Naquadat) and from on the Wapiti/Smoky Rivers Ecosystem Study (Swanson *et al.* 1993).

TSS loading rates to the Athabasca River from the Whitecourt, Athabasca and Fort McMurray Sewage Treatment Plants (STP), and Suncor, were based on the database developed by SENTAR Consultants Ltd. (1994). TSS loading rates for the Grand Prairie STP and stormwater outfall on the Wapiti River were assigned based on 1989-1990 Alberta Environmental Protection water surveys (documented in Macdonald and Taylor 1990). Based on the SENTAR Consultants Ltd. (1994) database, no other municipal or non-pulp mill industrial discharges contributed significant TSS loads to the rivers.

3.3 ORGANIC CHEMICAL INPUTS

Pulp mills were the only source of organic chemicals included in the model. Mill loadings of organic contaminants were obtained from the Northdat database, as well as from NRBS and AEP synoptic survey data. Non-detectable concentrations were input at one-half of the detection limit. Chemicals were input to the model as mass per unit time loadings (effluent concentration multiplied by effluent flow). For the Athabasca River, only Weldwood effluent had detectable levels of any of the chlorinated organic chemicals. The other Athabasca River mills were monitored regularly for DHA and 12,14-dichloro-DHA, however the reported detection limits of 10 mg/L were too high for the data to be useable. Only organic chemical loads from Weldwood were included in the model.

Due to high detection limits (10 ug/L), 30 of 33 recorded effluent DHA concentration and all 33 12,14-dichloro-DHA concentrations for Weldwood in 1992 and 1993 were below the detection limit. For the Wapiti/Smoky (Weyerhaeuser) all observed effluent 12,14-dichloro-DHA concentrations and all but one 3,4,5-TCV concentrations were below the detection limit. For samples with concentrations below the detection limit, one half of the detection limit was used in the load calculations.

The chemical concentrations reported in the Northdat database do not indicate either the analytical method used, or the sample type (i.e. grab or composite, total or dissolved). All values were assumed to represent daily average values for total chemical concentrations. A copy of Northdat (version 1.5) dated January 27, 1995 was used. Early copies of Northdat, with the same version number, were found to contain obvious errors. Golder has checked the data for obvious errors, but has not verified the Northdat database. Some discrepancies for 2,3,7,8-TCDF could not be resolved. 2,3,7,8-TCDF is stored in two separate fields in Northdat. Occasionally, corresponding values in the two fields did not agree. The 2,3,7,8-TCDF field with the most detectable values was used in this study.

Phenanthrene data was limited to results from one synoptic survey for the Athabasca River conducted in the spring of 1993. Except for the Slave Lake Pulp Mill, mill data was limited to dissolved phenanthrene concentrations. The Weldwood load was estimated as the total calculated load at the Obed monitoring station. Mill loads for Millar Western and Alberta Newsprint were set assuming the same TSS sorbed concentration as Slave Lake. The phenanthrene mill loads used in the model are summarized below:

Mill	Date	Q m3/day	Phen (ss) ug/kg	Phen (dis) ug/L	TSS kg/day	Phen Load kg/day
Weldwood	13-Feb-95	104300		0.019	3963	0.1690[1]
Alberta Newsprint	16-Feb-93	15608	4000[2]	0.021	598	0.0242
Millar Western	17-Feb-93	9535	4000[2]	0.01	1030	0.0413
Slave Lake Pulp	24-Feb-93	4126	4000	0.05	924	0.0039

[1] Phen(ss) not measured, Weldwood load based on mass balance at OBED
[2] Concentrations not measured but assumed to be equal to Slave Lake conc.

Using the total calculated load at Obed to back-calculate the TSS sorbed concentration at Weldwood results in a concentration of about 40 000 ug/kg. It is difficult to rationalize such a high TSS sorbed concentration when Weldwood effluent dissolved concentrations are lower and TSS concentrations higher than for Slave Lake Pulp effluent.

Unlike the other chemicals simulated, phenanthrene is naturally occurring compound and therefore tributaries can contribute to the total phenanthrene load. Tributary boundary conditions were set equal to the observed dissolved concentration (no total or TSS sorbed concentrations were measured), or the average measured tributary concentration (1.6 ng/L) for tributaries that were not monitored.

3.4 FRACTION OF ORGANIC CARBON (FOC) AND DISSOLVED ORGANIC CARBON (DOC)

The fraction of organic carbon in suspended and bed sediments, and dissolved organic carbon (DOC) in the water column and bed porewater are defined in WASP as constants for each model cell. FOC and water column DOC values were defined by average observed values from NAQUADAT, NRBS, and Swanson *et al.* (1993). Average observed values were interpolated and extrapolated to fill in missing data.

3.5 INITIAL CONCENTRATIONS

Initial concentrations of organic chemicals and solids must be specified for bed sediment and water column cells. Initial conditions are typically set to zero for water column cells, where the short residence time of chemicals and solids results in their concentrations being reset to reflect loadings in a matter of a hours near the top of the systems and a matter of a few weeks near the bottom of the systems. Initial conditions of chemicals and solids in benthic cells are much more important, where residence times are typically in the order of months to years.

Initial ratios of fine and coarse sediment fractions were based on estimates provided by Leigh Noton (Alberta Environmental Protection) and Bob Crosley (Environment Canada) based on their field experience on the rivers.

Initial chemical concentrations in Athabasca River bed sediments were based on the Early 1992 concentrations from the NRBS database. Observed values which were extrapolated and interpolated to fill in missing values. 1993 NRBS data and 1992 Alpac data (SENTAR 1994) were used to help determine downstream trends.

Initial chemical concentrations in Wapiti/Smoky River benthic cells were based on observed concentrations from the Wapiti/Smoky River Ecosystem Study (Swanson et al. 1993). All observed data from 1990 and 1991 were used and data collected from the same site were averaged. Observed concentrations were extrapolated and interpolated to fill in missing values.

3.6 RIVER TEMPERATURES

Water temperatures are used by the model to temperature correct kinetic degradation rates. Water temperatures for the Athabasca River were based on monthly average temperatures from Hinton to Windfall for 1989 to 1994. The monthly time-series was repeated for 1991 through 1993. Water temperatures for the Wapiti/Smoky Rivers were based on actual 1990 and 1991 monitored values for the Wapiti River at Highway 40 and near the confluence, and from the Smoky River at Watino. The 1990 temperature time-series was used for 1989. Winter values (December through March) were set to zero Celsius for both systems, to prevent volatilization.

4.0 MODEL CALIBRATION

4.1 INTRODUCTION

The USEPA WASP model (version 4.33) was used to simulate organic chemical concentrations in the water column and bed sediments in the Athabasca and Wapiti/Smoky Rivers. The Athabasca river simulations were conducted for 1992 and 1993, and the Wapiti/Smoky River simulations were conducted for 1990 and 1991. These periods represented the two consecutive years with the most complete datasets for each river system.

Simulations were started 90 days prior to January 1st of the first simulation year. Time is tracked in WASP as day numbers which can be arbitrarily referenced. For this study the reference date (day 1) was set to January 1st of the year prior to the simulation; this was January 1, 1991 for the Athabasca River model and January 1, 1989 for the Wapiti/Smoky River model. Model distances in this section are referenced as kilometers upstream of the mouth for the Athabasca River, and kilometers downstream of Highway 40 for the Wapiti/Smoky River (see Tables 2.1 and 2.2).

Model calibration was broken down into a series of four discrete steps. The first step was to confirm the models ability to simulate the mass balances of the Athabasca and Wapiti/Smoky River systems. Sodium was selected, since there is good source information, it remains in solution and is non-reactive. The second step was to calibrate TSS. WASP incorporates a descriptive simulation capability for TSS, which requires specification of a time-series of settling/resuspension rates which can vary from cell to cell in the model. The third step was the simulation of organic chemical concentrations based on the best estimates of values for model constants. The fourth step was to then adjust the model constants to improve the calibration for each organic chemical. Details of the calibration process and calibration results are presented in the remainder of this chapter.

4.2 SODIUM

Sodium is considered to behave conservatively in freshwater rivers. As such, model calibration based on sodium serves as a means to verify whether the model is set-up appropriately and that all major sources of flow into the system are included. Excellent agreement between observed and simulated values for both systems confirm the validity of the modelled mass balance and inclusion of all major sources.

4.2.1 Athabasca River

Simulated results for the synoptic surveys are presented in Figure 4.1, and time-series results for six monitoring locations are presented in Figure 4.2. The synoptic surveys, during which all major loads (including Weldwood) were measured, closely match the measure values. Continuous simulation results show general agreement with measured values, however there are some significant deviations for some periods, at some stations. For example, during the spring 1992 simulated concentrations are higher than observed values for stations downstream of Obed. However, during the March 1992 survey the observed concentrations were higher and matched the simulated concentrations. The differences between simulated and observed values can largely be attributed to uncertainties in loading rates to the river.

Spatial distribution of sodium shown in the winter synoptic surveys shows the effect of major loads which show up as sharp concentration increases. The major sodium loads are the Weldwood mill (1243 km), the ANC and Millar Western Mills (1048 and 1032 km, respectively), and the Clearwater River (293 km). The magnitude of the increase is relatively large, since the surveys were conducted in the winter when the flows are lowest. The continuous simulation plots (Figure 4.2) illustrate the effect of seasonal flow variability on a more or less constant pulp mill load. Sodium concentrations are higher in the winter, when flows are lower and the sodium load is diluted less and lower in the late spring and summer when flows are higher.

4.2.2 Wapiti/Smoky River

Spatial distributions of sodium concentration along the Wapiti/Smoky Rivers are shown in Figure 4.3 for six sampling events during the simulation period. There is a good match between simulated and observed values. The effect of the Weyerhaeuser pulp mill effluent on sodium concentration in the Wapiti River is profound in winter, but insignificant in summer. This is because of the higher flows and therefor dilution capacity in summer. In winter, the flow in the Wapiti River is low and sodium concentration increases significantly at the Weyerhaeuser Pulp mill outfall. The high concentrations extend to the Wapiti River confluence where further dilution by the Smoky River results in a large decease in sodium concentration.

Simulated and observed temporal distributions of sodium at three locations along the Wapiti/Smoky Rivers system are illustrated in Figure 4.4. As indicated in the figure, the simulated sodium concentrations match extremely well with the observed data. Both the seasonal variation pattern and the magnitude of sodium concentrations are in agreement between observed and simulated concentrations. This suggests that the configuration and flow conditions of the Wapiti/Smoky Rivers were properly represented by the model.

Similar to the Athabasca River, the effect of the seasonal flow pattern on sodium concentrations, illustrate that dilution of the river plays an important role in controlling contaminant concentrations in the Wapiti/Smoky Rivers. The difference between summer and winter concentrations were as high as four fold in the Smoky River. In the Wapiti River, in which flows were three to four times lower than the Smoky River, sodium concentrations in winter were as much as ten times higher than in summer.

4.3 TOTAL SUSPENDED SOLIDS

The organic compounds included in this study exist in various states and can be adsorbed to suspended solids in water. The transport of particulate solids in the river imposes an important impact on the fate of the organic contaminants. Calibration of the model to ensure a proper prediction of TSS concentrations is, therefore, an important step for reliable fate modelling of the organic compounds in the Athabasca River.

WASP contains only a descriptive simulation capability for TSS. The user must specify a time-series of settling and resuspension rates, which can be cell specific. WASP does not predict settling and resuspension rates based on hydraulic characteristics.

For both the Athabasca River and Wapiti/Smoky River models, TSS was calibrated with deposition only. Resuspension was not required to calibrate the model. This does not mean that resuspension is not significant in these systems, it simply means that to match the available observed data there were no times during high flow periods when the TSS load from upstream boundaries, tributaries and point source loads was insufficient to account for the observed TSS concentrations in the river. However, fine sediments in both rivers are dominantly cohesive. Cohesive sediments in these rivers will only resuspend when velocities (and therefore flow) at the water column-river bed interface are high enough to exceed a critical shear stress, at which point large amounts of bed sediments will be resuspended. With cohesive sediments resuspension and deposition do not occur together (Krishnappen and Stephens 1995). Typically TSS monitoring is not done during these very high flow events when resuspension is most likely to be occurring.

It is not possible to describe a pattern of resuspension without more information. The information necessary to develop predictive sediment transport routines for WASP have been collected for the Athabasca River (see Krishnappen and Stephens 1995), however the necessary modelling algorithms have not been developed.

For both models, three settling zones were defined; a high settling rate zone directly below each pulp mill, a moderate settling rate zone further downstream of each mill and background zone with a low settling rate (near zero) for the remainder of the river. This approach is consistent with prior modelling studies on both rivers (Macdonald and Taylor 1990), and with a recent field study of TSS settling rates downstream of Hinton (Krishnappen *et al.* 1995).

The settling zone sizes were set at the beginning of the simulation and the time-series of settling rates adjusted to provide the best match to observed data from synoptic surveys and for time-series of data at selected monitoring locations. Settling zones for the Athabasca and Wapiti/Smoky Rivers are summarized in Tables 4.1 and 4.2, respectively. Settling rates for each zone are summarized in Tables 4.3 and 4.4.

4.3.1 Athabasca River

Simulated results for the synoptic surveys are presented in Figure 4.5, and time-series results for six monitoring locations are presented in Figure 4.6. Although there is considerable scatter in the observed data, the simulated value match the observed data in both the magnitude of the values and the seasonal pattern. Both temporal and spatial profiles of TSS concentration show that the model setup for the Athabasca River is able to predict the distributions of suspended solids in the river.

In general, TSS concentrations in summer months are higher than in winter months. This indicates that a high amount of suspended solids is carried into the river by high flows of runoff in late spring and summer. In the winter months (November to March), TSS concentrations in the river are significantly lower. This difference in TSS concentration between summer and winter appears to be larger in the lower portion of the river (below Fort Assiniboine) than in the upper reach.

In the synoptic surveys, TSS concentrations drop quickly downstream of the Weldwood outfall and then maintain about the same level in the lower reach from Fort Assiniboine to the mouth of the river. Considering the transport of TSS is a complex process and modelling of it is more difficult compared to soluble constituents, the TSS calibration adequately mimics the measured results.

4.3.2 Wapiti/Smoky River

The results of the TSS calibration are shown in Figures 6.5 and 6.6. The time-series of TSS concentration in Figure 6.5 show a seasonal pattern, with high TSS values during the spring freshet in May and June. This indicates that the Weyerhaeuser effluent is no longer a significant factor in terms of TSS concentration in the river. Instead, runoff from other non-point sources appear to be a dominant contributor to the TSS level in the Wapiti/Smoky Rivers.

Figure 6.6 shows the spatial distributions of TSS along the Wapiti/Smoky River system. The Smoky River meets the Wapiti River at around 42 km from upper boundary (Highway 40 near Grand Prairie). It is seen in Figure 6.6 that TSS concentration increases significantly in the Smoky River below the Wapiti confluence, indicating that the Smoky River carries more TSS than the Wapiti River.

Figures 6.5 and 6.6 indicate that the model is able to predict the transport of TSS in the Wapiti/Smoky Rivers. It closely track not only the variation of TSS concentration over different seasons of the year, but also the spatial distribution of suspended solids along the river. Simulated concentrations agree with observed data very well.

4.4 ORGANIC CHEMICALS

4.4.1 General Comments

The Athabasca River and Wapiti/Smoky River models generate voluminous amounts of data. There are 444 cells (222 water column and 222 bed cells) for the Athabasca River 190 cells for the Wapiti/Smoky River model. For each cell, concentrations were output every five to seven days for two year simulations, for four separate chemical forms (total, dissolved, DOC-bound, solids sorbed), resulting in about 296000 simulated data values.

Presenting the results of such a large volume of data is quite difficult. Tabular presentation of the results is not feasible. A consistent format for graphical presentation of the results was developed to make the results easier to understand and interpret. Two types of plots are presented for each substance; synoptic survey plots and time-series plots.

Synoptic survey plots show the concentrations at one point in time over the whole length of the river. The x-axis for synoptic survey plots is distance from a reference point which for the Athabasca River is at Goose Island near the mouth and for the Wapiti/Smoky River is at the upstream boundary at the Highway 40 bridge, upstream of Grande Prairie. Each synoptic survey figure summarizes the results for one chemical and one survey on each page. Three separate plots are shown; the top one shows water column dissolved or total chemical concentrations, the middle plot shows TSS sorbed chemical concentrations, and the bottom plot shows bed sediment sorbed chemical concentrations.

Athabasca River synoptic survey plots are all for three surveys, January 1992, April 1992, and February 1993. Wapiti/Smoky data is more sporadic with fewer data points per survey but with more sampling times.

Time-series plots present the results at one location over the entire year period of the simulation. Six stations along the Athabasca River are shown, Obed, Windfall, Fort Assiniboine, Highway 2, Highway 813 and Horse River. Three stations are shown along the Wapiti/Smoky River, Wapiti River near the mouth, Smoky River 145 km downstream of Weyerhaeuser, and Smoky River at Watino.

Observed values above the detection limit are plotted as filled diamonds. Observed values below the detection limit are plotted at the detection limit, as open squared. Detection limits were not known for observed Wapiti/Smoky data for 2,3,7,8-TCDF, DHA, or 12,14-dichloro-DHA. Observed values for these compounds are not plotted.

Organic chemical loads were defined from the Northdat database and augmented with NRBS and AEP synoptic survey data. Based on the defined point concentrations, WASP uses linear interpolation to generate a continuous time-series of loads. In some cases this will result in an over- or under-estimation of chemical loading for synoptic surveys where the mill loads were not included in the survey. No attempt has been made to adjust the loads; where the load is over- or underestimated, the ratios of concentrations between the different media should be evaluated rather than the absolute match.

4.4.2 Kinetic and Equilibrium Constants

WASP includes a number of chemical specific environmental fate constants to calibrate the generalized equations of chemical transfer and transformation to the specific chemicals being simulated. Golder Associates compiled an initial list of environmental fate constants from previous modelling studies and a search of the EnviroFate (CIS) on-line database. This list was distributed to members of the NRBS modelling subcommittee and CanTox Inc., from which a revised list was generated for each chemical. The revised list of environmental fate constants for each chemical are summarized in Table 4.5.

Brian Brownlee (NRBS, Contaminants Component Leader), then reviewed the fate constants and selected a final set of fate constants for the initial model runs.

Two chemical specific fate constants were adjusted during the calibration, biodegradation rates and K_{oc} values. Values were only adjusted within the range of uncertainty for each constant. With the exception of 2,3,7,8-TCDF there was comparatively little information on fate constants for any of the chemicals. Model parameters and constants for the original and calibrated models are summarized in Table 4.5. Changes made to chemical specific parameters are discussed in the chemical specification discussion which follows.

In addition to the environmental fate constants there are three general (i.e. non-chemical specific) parameters which can effect the calibration including:

- DOC binding effectiveness constant (Typically 0.01 to 0.1, Velleux *et al.* 1995)
- porewater diffusion coefficient (m^2/s)
- water column dispersion coefficient (m^2/s)

The DOC binding effectiveness constant (E_c) allows the user to scale the DOC binding constants. Research has shown that DOC binding constants are generally one to two orders of magnitude smaller than predicted (Velleux *et al.* 1995). In the calibration the E_c can be adjusted to effect the ratio between dissolved and TSS sorbed chemical. Initially E_c values were set to 0.01 for both systems. The Wapiti/Smoky was adjusted slightly to 0.03 in the final calibration.

WASP computes diffusive porewater-surface water exchanges based on the interfacial area (surface area) between the two cell, the characteristic mixing length, the concentration gradient, and a user specified diffusion coefficient. When the Leopold-Maddox option is specified, WASP will calculate the interfacial area and mixing length based on the dimensions of the cell. The diffusion coefficient may be specified as a time-series of values. For chemicals with moderate to high K_{oc} values (all of the chemicals in this study), diffusion will generally always occur out of the bed layer and into the overlying water column.

There is no generally applicable guidance available for specifying a porewater diffusion rate in rivers. The turbulent nature of the flow and the porosity, permeability, roughness, grain-size distribution, and groundwater flow can all effect the diffusion rate. The diffusion rate can be calibrated to measured porewater and water column chemical concentrations, however no porewater chemical concentrations were measured for this study.

Initial calibrations were run with a porewater diffusion rate of $5 \times 10^{-8}\ m^2/s$. For all chemicals this resulted in a loss of chemical mass from the bed layers and an underestimation of bed sediment concentrations. During subsequent runs the rate was lowered and eventually set to zero, which improved the calibration of bed sediment chemical concentrations. The porewater diffusion rate is one mechanism for limiting chemical desorption in the bed layer. Setting the rate to zero, effectively prevents significant desorption from occurring.

Water column dispersion works the same way as porewater diffusion except that transfer occurs between water column cells. The transfer is called dispersion because it can account for the combined effects of diffusion and turbulent dispersion, the latter of which is generally significantly larger. In the NRBS models longitudinal dispersion can be specified to attenuate concentration peaks as the chemical is advected downstream. Because of the relatively steady nature of the chemical loads, longitudinal dispersion does not have a significant effect on the simulated concentrations and was not included in the simulations.

4.4.3 2.3.7.8-Tetrachlorodibenzofuran

A good calibration was achieved for 2,3,7,8-TCDF with consistent ratios between the water column, suspended sediment and bed sediment. None of the chemical-specific fate constants were adjusted during the calibration. The calibration results for the Athabasca River are shown in Figures 4.9 (synoptic surveys) and 4.10 (time-series), and for the Wapiti/Smoky River in Figures 4.11 (synoptic surveys) and 4.12 (time-series).

The ratios of chemical concentrations are consistent with observed values between the different media (i.e. dissolved, TSS sorbed, and bed sediment sorbed) even when the total load estimate is incorrect (see Figure 4.9b).

4.4.4 Dehydroabietic Acid

The calibration results for the Athabasca River are shown in Figures 4.13 (synoptic surveys) and 4.14 (time-series), and for the Wapiti/Smoky River in Figures 4.15 (synoptic surveys) and 4.16 (time-series).

A good calibration was achieved for water column concentrations for both systems, although there are few observed data points for the Wapiti/Smoky Rivers. Athabasca River loads (Weldwood) were almost all detection limit concentrations, which were input as one-half of the detection limit. Loads are underestimated in the January/February 1992 survey (based on detection limit for Hinton effluent, source; AEP), however loads are about right for the remaining surveys. The Athabasca River time-series plots of total water column DHA concentration indicate that the magnitude of the DHA loads is correct.

Ratios between suspended sediment and dissolved or total water column concentrations were inconsistent from survey to survey. For the Athabasca River suspended sediment is over-predicted for the 1992 survey but fall within the range of observed data for 1993. The simulated ratio of TSS sorbed to dissolved water column concentrations in 1992 (based on detection limit values) is about twice as large as the observed ratio. The difference between suspended sediment DHA concentrations from 1992 to 1993 can not be explained by the current model configuration. Factors in the model which could account for the difference include the FOC of the suspended sediment and the DOC concentration. Both of these are treated as constants in the model.

For the Wapiti/Smoky River only one of the surveys had corresponding dissolved and TSS DHA analyses, the April 1991 survey. This had three inconsistent dissolved measurements, two at the detection limit and a third anomalously high value (20 ug/L, where all other reported values are in the 0.05 to 2. ug/L range).

Athabasca River bottom sediments calibrations agree with observed data; however the calibration is quite dependent on initial conditions. A time-series plot of bed sediment concentrations over time (Figure 14.6c) illustrates a small time dependence quite clearly. The Wapiti/Smoky river results indicate a faster bed response to TSS settling. This is a function of a greater relative chemical and sediment loading for the Wapiti River.. These observations point to a weakness in the TSS calibration, where the lack of resuspension allows chemical mass in the bed to accumulate continuously, and does not provide a mechanism for periodic flushing of the sediments during high flow events. A more realistic sediment transport simulation with resuspension, would periodically reset (at least partially) sediment chemical concentrations and might result in more consistent predictions.

The results of the Athabasca River simulations do indicate that the bed sediment concentrations are not completely reset yearly. The April 1992 and May 1993 bottom sediment sorbed observed concentrations, with the exception of one data point, are very similar. Simulated concentrations show a slight increase during this period, resulting from the accumulation of additional DHA in the sediment. Had the bed sediment DHA concentration been reset during 1992 spring high flows, then the simulated accumulation of DHA would have been much lower than observed concentrations. This implies that resuspension was not significant in 1992.

4.4.5 12,14-Dichlorodehydroabietic acid

The 12,14-dichloro-DHA calibration results for the Athabasca River are shown in Figures 4.17 (synoptic surveys) and 4.18 (time-series), and for the Wapiti/Smoky River in Figures 4.19 (synoptic surveys) and 4.20 (time-series). The results parallel the DHA results quite closely.

There was only one Wapiti/Smoky survey with observed 12,14-dichloro-DHA data (water column only), which showed a good match between simulated and observed concentrations. The Athabasca River surveys show the same discrepancy as observed for DHA between the April 1992 and February 1993 surveys. The time-series plots for the Athabasca River also indicate that the magnitude of the loadings to the river are correct.

4.4.6 3,4,5-Trichlorocatechol and 3,4,5-Trichloroguaiacol

3,4,5-TCC and 3,4,5-TCG exhibit a very similar behaviour in all media and are discussed together. The 3,4,5-TCC calibration results for the Athabasca River are shown in Figures 4.21 (synoptic surveys) and 4.22 (time-series), and for the Wapiti/Smoky River in Figures 4.23 (synoptic surveys) and 4.24 (time-series). The 3,4,5-TCG calibration results for the Athabasca River are shown in Figures 4.25 (synoptic surveys) and 4.26 (time-series), and for the Wapiti/Smoky River in Figures 4.27 (synoptic surveys) and 4.28 (time-series).

The January 1992 survey on the Athabasca River provides an excellent downstream profile with which to calibrate water column concentrations. The water column biodegradation rate was lowered to match the observed concentration decline for this survey. The K_{oc} for 3,4,5-TCC was increased to improved the calibration of the ratio of dissolved to suspended sediment concentrations.

For the Athabasca River, only one survey (April 1992) had observed concentrations for more than one media. The simulated ratio of water column dissolved to suspended sediment concentrations is too low by a factor of about four. Furthermore the ratio between the dissolved and suspended sediment concentrations is too high even with the 3,4,5-TCC K_{oc} increased to what may be a reasonable maximum value. Bed concentration match observed concentrations, but this largely reflects the initial conditions specified and the slow response of bed sediments to water column loads.

Simulated water column concentrations for the February 1993 survey match observed concentrations near Hinton, but decline much faster with distance downstream than the observed concentrations. This anomaly is not due the highly dynamic loads input to the model rather than a simulated decay pattern. The 3,4,5-TCC and TCG load values prior to and during the survey are indicated below:

	Loads (kg/day)	
DATE	3,4,5-TCC	3,4,5-TCG
Feb 10/93	0.005	0.005
Feb 12/93	3.614	3.721

Observed concentrations were sampled with time-of-travel whereas the plotted simulated values represents are all from the beginning of the survey. Simulated concentrations near the mill reflect the high concentrations reported resulting from the survey, whereas downstream simulated concentrations reflect background loads. It is not clear whether the loading differences between two dates are real or due to sampling or analytical error; the background data (February 10) are from Northdat, whereas the high concentrations (February 12) were measured by AEP. During highly dynamic loading periods, sampling the simulation results with time-of-travel would provide a better representation of observed concentrations. No other media were sampled during this survey.

Observed data for the Wapiti/Smoky is sparse, and it is difficult to conclude much more than that the model seems to predict the correct water column behaviour and over-predict bed sediment concentrations. Suspended sediment concentrations seem to be about the right order of magnitude, however no surveys have corresponding observed water column and suspended sediment 3,4,5-TCC or TCG concentrations.

All observed 3,4,5-TCC and TCG bed sediment concentrations were below the detection limit (detection limit information was not available). Bed sediment concentrations respond much more rapidly in the model to effluent loading rates than in the Athabasca River. This is true for all chemicals, but is particularly obvious for 3,4,5-TCC and TCG where concentrations increase from below detection limits at the start of the simulation to significantly above normal detection limits at the end of the simulation. The relative chemical and suspended solids loading to the Wapiti/Smoky are considerably higher than for the Athabasca River, resulting in a much more rapid simulated response to loadings for the Wapiti/Smoky River. Clearly the observed behaviour is not properly accounted for in the model. Increasing the benthic biodegradation and resuspension are two possible mechanisms to decrease sediment concentrations. Because the model does not account for resuspension, the benthic biodegradation rate may have to be artificially elevated. Any increase in the benthic biodegradation rate, of the order required to keep Wapiti/Smoky concentration below normal detection limits, would cause problems for the Athabasca River simulations. It is possible that benthic biodegradation rates are high in the Athabasca River, however this possibility would have to be investigated through laboratory experiments.

4.4.7 <u>3,4,5-Trichloroveratrole</u>

The 3,4,5-TCV calibration results for the Athabasca River are shown in Figures 4.29 (synoptic surveys) and 4.30 (time-series), and for the Wapiti/Smoky River in Figures 4.31 (synoptic surveys) and 4.32 (time-series). The January 1992 survey for the Athabasca River was used to calibrate the water column loss rate. The observed pattern declines quite slowly with distance downstream. Athabasca River flows were increasing significantly with distance downstream during the survey, requiring a net gain in 3,4,5-TCV mass to maintain the observed decline with distance downstream. The observed pattern could be matched by adjusting three constants; 1) lowering both the water column biodegradation rate, 2) lowering the K_{oc} (this lowers the amount lost through settling), and 3) adding a reaction product, in which a fixed fraction of 3,4,5-TCC biodegradation will form 3,4,5-TCV. One combination of these changes is shown in the calibration figures, however, a range of combinations of the three factors could be used to calibrate the observed concentration decline. Without tighter experimental constraints on the three constants, and more observed data, the correct combination can not be determined.

Results of the one Athabasca River survey with observed sediment data for 3,4,5-TCV, indicates a reasonable calibration in all media, although observed suspended sediment concentrations were all below the detection limit. The Athabasca River time-series plots indicate that 3,4,5-TCV loads are of the correct magnitude and that the total water column loss/gain rate with distance downstream is adequately represented in the model. Wapiti/Smoky results indicate that bed sediment 3,4,5-TCV concentrations are over-estimated by the model.

4.4.8 Phenanthrene

Phenanthrene results for the Athabasca River February 1993 survey are shown in Figure 3.33. The simulated dissolved concentrations are overestimated and TSS sorbed concentrations underestimated by one to two orders of magnitude. The modelled distribution of phenanthrene between the dissolved and TSS sorbed states does not agree with the measured distribution at Obed. The model uses a literature based log K_{oc} of 4.3, whereas the calculated value at Obed is 6.2. The load data at Obed does not seem reasonable, in that to generate this load, the Weldwood (Hinton combined) effluent TSS sorbed concentration would have to be about 40 000 ug/kg or 10 times the concentration measured in Slave Lake Pulp effluent. The measured dissolved phenanthrene concentration in the Slave Lake Pulp effluent was 50 ng/L, compared to 19 ng/L in the Weldwood effluent.

The sorptive properties of phenanthrene have been studied quite extensively (see Mackay et al. 1992) and it seems unlikely that the Athabasca River should behave so differently from other aquatic systems studied. A more complete phenanthrene dataset is required to resolve the apparent discrepancies.

5.0 CONCLUSIONS

The following are the major conclusions of the modelling study:

- The model provides a good representation of the hydraulics and mass balance for both river systems. The adequacy of the sodium simulation was limited only by the information available to define loads to the rivers.

- The descriptive TSS simulation adequately simulated the water column TSS concentrations for both systems. The observed data and sediment transport information was not sufficient to include resuspension in the calibration. The model therefore does not adequately represent the dynamic nature of sediment transport, only the settling behaviour under normal flow conditions.

- The model provided a good representation of water column concentrations for all chemicals, as long as the loads were adequately defined. Simulated chemical adsorption to suspended solids was generally consistent with the observed data. Organic carbon partition coefficients (K_{oc}) could be adequately defined for only 2,3,7,8-TCDF. Simulated suspended solids concentrations for 3,4,5-TCC and TCG could have been improved by increasing the K_{oc}, which could be investigated experimentally with Athabasca River and Wapiti/Smoky river water and effluent.

- Observed suspended solids DHA and dichloroDHA concentration for the Athabasca were very different for the 1992 and 1993 surveys, which could not be explained by the model. The model simulated higher suspended solids concentrations consistent with levels observed in 1993, but over-estimated 1992 concentrations.

- Simulated bed sediment concentrations in the Wapiti/Smoky River system were over-estimated for all chemicals except 2,3,7,8-TCDF. Bed concentrations in the Athabasca River very insensitive to chemical loadings and largely reflected the defined initial concentrations. Simulation of bed sediment contaminant concentrations were limited by lack of adequate sediment transport simulations and insufficient information to calibrate benthic biodegradation rates or sediment-water column diffusion.

- Environmental fate constants for 2,3,7,8-TCDF are quite well defined and its environmental behaviour is fairly well understood. This showed up in the simulations in which 2,3,7,8-TCDF was the only substance which could be adequately simulated in all media for both systems.

- WASP does have the capability to simulate more complex behaviour, such as the ionization of 3,4,5-TCC, TCG, and TCV. However, increasing the complexity of the model should not be considered, until the fate constants for the current configuration are better defined, sediment transport is handled properly in the model, and the environmental behaviour of these compounds investigated in more detail. All of these issues were outside of the scope of this study, but should be considered for future modelling activities.

- The model as it is currently structured, provides reliable simulation of dissolved water column concentrations for both systems. Simulation of suspended sediment adsorption would probably be reliable with better estimates of K_{oc} values and possibly a more sophisticated treatment of sediment types and organic carbon contents. As currently structured the model does not adequately simulated sediment transport or bed sediment chemical concentrations.

- Athabasca River phenanthrene simulations were limited to a single water column synoptic survey in February 1993. Simulated resulted to not match observed concentrations. The limited and somewhat conflicting observed data make it impossible to determine whether the problem is related to analytical error or the model not adequately representing the sorptive characteristics of phenanthrene in the Athabasca River.

Specific recommendations for future model development and calibration activities which would have a greatest impact on the predictive capability of the model:

- Incorporation of predictive sediment transport routines based on the studies by Krishnappen et al. (1995) and Krishnappen and Stephens (1995).

- Experimental investigation of K_{oc} and benthic biodegradation values using Athabasca and Wapiti/Smoky River samples.

- Regular bed sediment monitoring to define seasonal and longer term trends in bed sediment chemical concentrations.

- More observed phenanthrene data would be required to assess the adequacy of the model. Specifically TSS sorbed and dissolved concentrations are required for all significant phenanthrene sources and in the river. A time-series of loading rates and measured bed-sediment concentrations would be required to attempt to simulate phenanthrene in bed sediments.

6.0 REFERENCES

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Table 2.1.
Schematic of WASP set-up for Athabasca River chemical fate modelling
(Page 1 of 3)

Distance from Hinton (km)	ARC Distance (km)	Cell # Water Column	Cell # Bed	Leopold Maddox Coefficients Vcoeff	Vexp	Dcoeff	Dexp	Wcoeff	Wexp	Hydraulic Reach	Cumulative Travel Time (day)	Flow for Travel Time (cms)	Tributary or Sampling Site
5.1	1243.4	1	223	0.16	0.369	0.098	0.498	63.6	0.133	1	0.09	39.7	AR U/S Hinton, AR HCE & AR 1km d/s HCE
10.2	1238.3	2	224	0.16	0.369	0.098	0.498	63.6	0.133	1	0.19	39.7	AR 6 km d/s HCE
15.2	1233.2	3	225	0.16	0.369	0.098	0.498	63.6	0.133	1	0.28	39.7	AR Weldwood Br, AR 11 km d/s HCE
20.3	1228.2	4	226	0.16	0.369	0.098	0.498	63.6	0.133	1	0.38	39.7	
25.4	1223.1	5	227	0.16	0.369	0.098	0.498	63.6	0.133	1	0.47	39.7	
30.5	1218.0	6	228	0.16	0.369	0.098	0.498	63.6	0.133	1	0.57	39.7	
35.6	1212.9	7	229	0.16	0.369	0.098	0.498	63.6	0.133	1	0.66	39.7	
41.2	1207.3	8	230	0.227	0.338	0.099	0.499	44.7	0.165	2	0.74	39.7	AR 36 km d/s HCE, AR @ Obed Br
46.8	1201.7	9	231	0.227	0.338	0.099	0.499	44.7	0.165	2	0.83	39.7	
52.4	1196.1	10	232	0.227	0.338	0.099	0.499	44.7	0.165	2	0.91	39.7	AR @ Emerson L
58.1	1190.4	11	233	0.227	0.338	0.099	0.499	44.7	0.165	2	0.99	42.1	Oldman Creek
63.8	1184.7	12	234	0.227	0.338	0.099	0.499	44.7	0.165	2	1.08	42.1	AR 60 km d/s HCE
69.5	1179.0	13	235	0.227	0.338	0.099	0.499	44.7	0.165	2	1.16	42.1	
75.2	1173.3	14	236	0.227	0.338	0.099	0.499	44.7	0.165	2	1.24	42.1	
80.9	1167.6	15	237	0.227	0.338	0.099	0.499	44.7	0.165	2	1.32	42.7	Spring 1
86.6	1161.9	16	238	0.227	0.338	0.099	0.499	44.7	0.165	2	1.41	42.7	
92.4	1156.1	17	239	0.227	0.338	0.099	0.499	44.7	0.165	2	1.49	42.7	
98.1	1150.4	18	240	0.227	0.338	0.099	0.499	44.7	0.165	2	1.57	42.7	
103.8	1144.7	19	241	0.227	0.338	0.099	0.499	44.7	0.165	2	1.65	42.7	AR u/s Berland River
[illegible]	1138.0	20	242	0.229	0.313	0.124	0.439	35.4	0.248	3	1.75	51.6	Berland River, AR d/s Berland R.
117.2	1131.3	21	243	0.229	0.313	0.124	0.439	35.4	0.248	3	1.85	51.6	
123.9	1124.6	22	244	0.229	0.313	0.124	0.439	35.4	0.248	3	1.95	51.73	Spring 2
130.6	1117.9	23	245	0.229	0.313	0.124	0.439	35.4	0.248	3	2.05	51.73	
137.5	1111.0	24	246	0.229	0.313	0.124	0.439	35.4	0.248	3	2.15	55.63	[illegible] Hard Creek, Pine Creek, AR @ Knight Br
144.4	1104.1	25	247	0.229	0.313	0.124	0.439	35.4	0.248	3	2.25	55.63	
151.4	1097.1	26	248	0.229	0.313	0.124	0.439	35.4	0.248	3	2.34	59.23	Spring 3
158.4	1090.1	27	249	0.229	0.313	0.124	0.439	35.4	0.248	3	2.44	59.23	
165.4	1083.1	28	250	0.229	0.313	0.124	0.439	35.4	0.248	3	2.54	60.23	Two Creek, AR 1.5 km d/s Two Creek
172.5	1076.0	29	251	0.229	0.313	0.124	0.439	35.4	0.248	3	2.64	62.13	Windfall Creek
179.6	1068.9	30	252	0.229	0.313	0.124	0.439	35.4	0.248	3	2.74	62.13	AR at Windfall Bridge, AR @ Windfall br
186.7	1061.8	31	253	0.229	0.313	0.124	0.439	35.4	0.248	3	2.84	62.13	AR above ANC
193.8	1054.7	32	254	0.229	0.313	0.124	0.439	35.4	0.248	3	2.94	62.13	
200.8	1047.7	33	255	0.229	0.313	0.124	0.439	35.4	0.248	3	3.03	62.13	
207.8	1040.7	34	256	0.229	0.313	0.124	0.439	35.4	0.248	3	3.13	62.13	
214.8	1033.7	35	257	0.201	0.362	0.083	0.463	60	0.175	4	3.22	62.13	AR u/s Whitecourt, AR McLeod R, Millar Western Eff
223.2	1025.3	36	258	0.201	0.362	0.083	0.463	60	0.175	4	3.32	70.77	Whitecourt STP & AR 10 km d/s Mcleod R
231.6	1016.8	37	259	0.201	0.362	0.083	0.463	60	0.175	4	3.43	70.77	
237.4	1011.0	38	260	0.267	0.248	0.144	0.413	26	0.339	5	3.52	70.77	AR at Blue Ridge Bridge, AR @ Blue Ridge Br
243.2	1005.2	39	261	0.267	0.248	0.144	0.413	26	0.339	5	3.60	70.77	
249.0	999.4	40	262	0.267	0.248	0.144	0.413	26	0.339	5	3.69	70.77	
254.8	993.6	41	263	0.267	0.248	0.144	0.413	26	0.339	5	3.78	70.77	
260.6	987.8	42	264	0.267	0.248	0.144	0.413	26	0.339	5	3.87	70.77	
266.4	982.0	43	265	0.267	0.248	0.144	0.413	26	0.339	5	3.95	70.77	
272.2	976.2	44	266	0.267	0.248	0.144	0.413	26	0.339	5	4.04	70.77	
278.0	970.4	45	267	0.267	0.248	0.144	0.413	26	0.339	5	4.13	70.77	AR d/s five mile island
283.8	964.6	46	268	0.267	0.248	0.144	0.413	26	0.339	5	4.22	70.77	
289.6	958.8	47	269	0.267	0.248	0.144	0.413	26	0.339	5	4.30	70.77	
295.4	953.0	48	270	0.267	0.248	0.144	0.413	26	0.339	5	4.39	70.77	
301.2	947.2	49	271	0.267	0.248	0.144	0.413	26	0.339	5	4.48	70.77	
305.2	943.2	50	272	0.244	0.276	0.147	0.4387	27.9	0.2853	6	4.54	70.77	
309.3	939.2	51	273	0.244	0.276	0.147	0.4387	27.9	0.2853	6	4.59	74.36	AR at Ft. Assin. u/s Freeman R, Freeman River
313.4	935.1	52	274	0.244	0.276	0.147	0.4387	27.9	0.2853	6	4.65	74.36	
317.4	931.1	53	275	0.244	0.276	0.147	0.4387	27.9	0.2853	6	4.71	74.36	
321.5	927.0	54	276	0.244	0.276	0.147	0.4387	27.9	0.2853	6	4.77	74.36	
325.5	922.9	55	277	0.244	0.276	0.147	0.4387	27.9	0.2853	6	4.83	74.36	
329.6	918.9	56	278	0.244	0.276	0.147	0.4387	27.9	0.2853	6	4.89	74.36	
333.7	914.8	57	279	0.244	0.276	0.147	0.4387	27.9	0.2853	6	4.95	74.36	
337.7	910.8	58	280	0.244	0.276	0.147	0.4387	27.8	0.2853	6	5.01	74.36	
341.8	906.7	59	281	0.244	0.276	0.147	0.4387	27.9	0.2853	6	5.06	74.36	
345.8	902.6	60	282	0.244	0.276	0.147	0.4387	27.9	0.2853	6	5.12	74.36	
349.8	898.7	61	283	0.122	0.33	0.125	0.465	66	0.205	7	5.21	74.36	
353.5	895.0	62	284	0.122	0.33	0.125	0.465	66	0.205	7	5.30	74.36	
357.2	891.2	63	285	0.122	0.33	0.125	0.465	66	0.205	7	5.38	74.36	
361.0	887.5	64	286	0.122	0.33	0.125	0.465	66	0.205	7	5.47	74.36	
364.7	883.8	65	287	0.122	0.33	0.125	0.465	66	0.205	7	5.55	74.36	
368.4	880.1	66	288	0.122	0.33	0.125	0.465	66	0.205	7	5.64	74.36	
372.1	876.4	67	289	0.122	0.33	0.125	0.465	66	0.205	7	5.72	74.36	
375.8	872.6	68	290	0.122	0.33	0.125	0.465	66	0.205	7	5.81	74.36	
379.6	868.9	69	291	0.122	0.33	0.125	0.465	66	0.205	7	5.89	74.36	
383.6	864.9	70	292	0.196	0.27	0.143	0.419	35.5	0.311	8	5.97	74.36	
387.6	860.9	71	293	0.196	0.27	0.143	0.419	35.5	0.311	8	6.04	74.36	
391.6	856.9	72	294	0.196	0.27	0.143	0.419	35.5	0.311	8	6.12	74.36	
395.8	852.7	73	295	0.196	0.27	0.143	0.419	35.5	0.311	8	6.19	81.97	AR u/s Pembina River, Pembina River
399.9	848.6	74	296	0.196	0.27	0.143	0.419	35.5	0.311	8	6.27	81.97	
404.0	844.5	75	297	0.196	0.27	0.143	0.419	35.5	0.311	8	6.34	81.97	
408.1	840.3	76	298	0.196	0.27	0.143	0.419	35.5	0.311	8	6.41	81.97	
412.3	836.2	77	299	0.196	0.27	0.143	0.419	35.5	0.311	8	6.49	81.97	
416.4	832.1	78	300	0.196	0.27	0.143	0.419	35.5	0.311	8	6.56	81.97	
420.5	828.0	79	301	0.196	0.27	0.143	0.419	35.5	0.311	8	6.64	81.97	
424.7	823.8	80	302	0.196	0.27	0.143	0.419	35.5	0.311	8	6.71	81.97	
428.8	819.7	81	303	0.196	0.27	0.143	0.419	35.5	0.311	8	6.78	81.97	
432.9	815.6	82	304	0.196	0.27	0.143	0.419	35.5	0.311	8	6.86	81.97	
437.1	811.4	83	305	0.196	0.27	0.143	0.419	35.5	0.311	8	6.93	81.97	
441.2	807.3	84	306	0.196	0.27	0.143	0.419	35.5	0.311	8	7.01	81.97	AR u/s Smith @ Hwy 2, AR above Smith
445.3	803.2	85	307	0.196	0.27	0.143	0.419	35.5	0.311	8	7.08	81.97	
449.9	798.6	86	308	0.196	0.27	0.143	0.419	35.5	0.311	8	7.16	125.67	Lesser Slave River
454.5	794.0	87	309	0.196	0.27	0.143	0.419	35.5	0.311	8	7.23	125.67	
459.1	789.4	88	310	0.196	0.27	0.143	0.419	35.5	0.311	8	7.30	125.67	
463.7	784.8	89	311	0.196	0.27	0.143	0.419	35.5	0.311	8	7.38	125.67	
468.3	780.2	90	312	0.196	0.27	0.143	0.419	35.5	0.311	8	7.45	125.67	
472.9	775.6	91	313	0.196	0.27	0.143	0.419	35.5	0.311	8	7.52	125.67	
477.5	771.0	92	314	0.196	0.27	0.143	0.419	35.5	0.311	8	7.60	125.67	
482.1	766.4	93	315	0.196	0.27	0.143	0.419	35.5	0.311	8	7.67	125.67	
486.7	761.8	94	316	0.196	0.27	0.143	0.419	35.5	0.311	8	7.74	125.67	
491.3	757.2	95	317	0.196	0.27	0.143	0.419	35.5	0.311	8	7.82	125.67	
495.9	752.6	96	318	0.196	0.27	0.143	0.419	35.5	0.311	8	7.89	125.67	
500.5	748.0	97	319	0.196	0.27	0.143	0.419	35.5	0.311	8	7.97	125.67	
505.1	743.4	98	320	0.196	0.27	0.143	0.419	35.5	0.311	8	8.04	125.67	
509.7	738.8	99	321	0.196	0.27	0.143	0.419	35.5	0.311	8	8.11	125.67	
514.3	734.2	100	322	0.196	0.27	0.143	0.419	35.5	0.311	8	8.19	125.67	AR north of Howe L
518.9	729.57	101	323	0.196	0.27	0.143	0.419	35.5	0.311	8	8.26	125.67	

Table 2.1.
Schematic of WASP set-up for Athabasca River chemical fate modelling

Distance from Hinton (km)	ARC Distance (km)	Cell # Water Column	Cell # Bed	Leopold Maddox Coefficients Vcoeff	Vexp	Dcoeff	Dexp	Wcoeff	Wexp	Hydraulic Reach	Cumulative Travel Time (day)	Flow for Travel Time (cms)	Tributary or Sampling Site
523.5	725.0	102	324	0.196	0.27	0.143	0.419	35.5	0.311	8	8.33	125.67	
528.1	720.4	103	325	0.196	0.27	0.143	0.419	35.5	0.311	8	8.41	125.67	
532.7	715.8	104	326	0.196	0.27	0.143	0.419	35.5	0.311	8	8.48	125.67	
537.3	711.2	105	327	0.196	0.27	0.143	0.419	35.5	0.311	8	8.55	125.67	
541.9	706.6	106	328	0.196	0.27	0.143	0.419	35.5	0.311	8	8.63	125.67	
546.5	702.0	107	329	0.196	0.27	0.143	0.419	35.5	0.311	8	8.70	125.67	
551.1	697.4	108	330	0.196	0.27	0.143	0.419	35.5	0.311	8	8.78	125.67	
555.7	692.8	109	331	0.196	0.27	0.143	0.419	35.5	0.311	8	8.85	125.67	
560.8	687.7	110	332	0.0869	0.378	0.0878	0.526	131	0.096	9	8.96	125.67	AR at Town of Athabasca, Town of Athabasca STP
565.8	682.7	111	333	0.0869	0.378	0.0878	0.526	131	0.096	9	9.07	125.67	
570.9	677.6	112	334	0.0869	0.378	0.0878	0.526	131	0.096	9	9.17	125.67	
575.9	672.6	113	335	0.0869	0.378	0.0878	0.526	131	0.096	9	9.28	125.67	
581.0	667.5	114	336	0.0869	0.378	0.0878	0.526	131	0.096	9	9.39	125.67	
586.0	662.5	115	337	0.0869	0.378	0.0878	0.526	131	0.096	9	9.50	125.67	
591.1	657.4	116	338	0.0869	0.378	0.0878	0.526	131	0.096	9	9.61	125.67	
596.1	652.4	117	339	0.0869	0.378	0.0878	0.526	131	0.096	9	9.71	125.67	
601.2	647.3	118	340	0.0869	0.378	0.0878	0.526	131	0.096	9	9.82	125.67	
606.2	642.3	119	341	0.0869	0.378	0.0878	0.526	131	0.096	9	9.93	125.67	
611.3	637.2	120	342	0.0869	0.378	0.0878	0.526	131	0.096	9	10.04	125.67	
616.3	632.2	121	343	0.0869	0.378	0.0878	0.526	131	0.096	9	10.15	125.67	
621.4	627.1	122	344	0.0869	0.378	0.0878	0.526	131	0.096	9	10.26	130.97	AR u/s La Biche River, La Biche River
626.5	622.0	123	345	0.0869	0.378	0.0878	0.526	131	0.096	9	10.36	130.97	
631.6	616.9	124	346	0.0869	0.378	0.0878	0.526	131	0.096	9	10.47	130.97	
636.8	611.7	125	347	0.0869	0.378	0.0878	0.526	131	0.096	9	10.58	131.67	Calling River
641.9	606.6	126	348	0.0869	0.378	0.0878	0.526	131	0.096	9	10.68	131.67	
647.0	601.5	127	349	0.0869	0.378	0.0878	0.526	131	0.096	9	10.79	131.67	
652.1	596.4	128	350	0.0869	0.378	0.0878	0.526	131	0.096	9	10.90	131.67	
657.2	591.2	129	351	0.0869	0.378	0.0878	0.526	131	0.096	9	11.01	131.67	
662.4	586.1	130	352	0.0869	0.378	0.0878	0.526	131	0.096	9	11.12	131.67	
667.5	581.0	131	353	0.0869	0.378	0.0878	0.526	131	0.096	9	11.23	131.67	
672.6	575.9	132	354	0.0869	0.378	0.0878	0.526	131	0.096	9	11.33	131.67	
677.7	570.8	133	355	0.0869	0.378	0.0878	0.526	131	0.096	9	11.44	131.67	
682.8	565.6	134	356	0.0869	0.378	0.0878	0.526	131	0.096	9	11.55	131.67	AR near McMillan L
688.0	560.5	135	357	0.0869	0.378	0.0878	0.526	131	0.096	9	11.66	131.67	
693.1	555.4	136	358	0.0869	0.378	0.0878	0.526	131	0.096	9	11.76	131.67	
699.4	549.1	137	359	0.121	0.343	0.0558	0.551	147	0.106	10	11.88	131.67	
705.7	542.8	138	360	0.121	0.343	0.0558	0.551	147	0.106	10	11.99	131.67	
712.0	536.5	139	361	0.121	0.343	0.0558	0.551	147	0.106	10	12.10	131.67	
718.3	530.2	140	362	0.121	0.343	0.0558	0.551	147	0.106	10	12.22	131.67	
724.6	523.9	141	363	0.121	0.343	0.0558	0.551	147	0.106	10	12.33	131.67	
730.9	517.6	142	364	0.121	0.343	0.0558	0.551	147	0.106	10	12.44	131.67	
737.2	511.3	143	365	0.121	0.343	0.0558	0.551	147	0.106	10	12.56	131.67	
743.5	505.0	144	366	0.121	0.343	0.0558	0.551	147	0.106	10	12.67	133.67	AR u/s Pelican River, Pelican River
749.8	498.7	145	367	0.121	0.343	0.0558	0.551	147	0.106	10	12.78	133.67	
756.1	492.3	146	368	0.121	0.343	0.0558	0.551	147	0.106	10	12.89	133.67	
762.5	486.0	147	369	0.121	0.343	0.0558	0.551	147	0.106	10	13.01	133.67	
768.8	479.7	148	370	0.121	0.343	0.0558	0.551	147	0.106	10	13.12	133.67	
775.1	473.4	149	371	0.121	0.343	0.0558	0.551	147	0.106	10	13.23	133.67	
781.4	467.1	150	372	0.121	0.343	0.0558	0.551	147	0.106	10	13.34	133.67	
787.7	460.7	151	373	0.121	0.343	0.0558	0.551	147	0.106	10	13.46	133.67	
794.1	454.4	152	374	0.121	0.343	0.0558	0.551	147	0.106	10	13.57	133.67	
800.4	448.1	153	375	0.121	0.343	0.0558	0.551	147	0.106	10	13.68	133.67	AR u/s House River
806.9	441.5	154	376	0.121	0.343	0.0558	0.551	147	0.106	10	13.80	150.67	House River
812.4	436.1	155	377	0.128	0.379	0.037	0.575	210	0.046	11	13.87	150.67	AR u/s Grand Rapids
817.9	430.6	156	378	0.128	0.379	0.037	0.575	210	0.046	11	13.94	150.67	
823.3	425.2	157	379	0.128	0.379	0.037	0.575	210	0.046	11	14.02	150.67	
828.8	419.7	158	380	0.128	0.379	0.037	0.575	210	0.046	11	14.09	150.67	
834.2	414.2	159	381	0.128	0.379	0.037	0.575	210	0.046	11	14.16	150.67	
839.7	408.8	160	382	0.128	0.379	0.037	0.575	210	0.046	11	14.24	150.67	
845.2	403.3	161	383	0.128	0.379	0.037	0.575	210	0.046	11	14.31	150.67	AR u/s Buffalo Creek
850.6	397.9	162	384	0.128	0.379	0.037	0.575	210	0.046	11	14.39	150.67	Buffalo Creek
856.1	392.4	163	385	0.128	0.379	0.037	0.575	210	0.046	11	14.46	150.67	
861.5	386.9	164	386	0.128	0.379	0.037	0.575	210	0.046	11	14.53	150.67	
867.0	381.5	165	387	0.128	0.379	0.037	0.575	210	0.046	11	14.61	150.67	
872.5	376.0	166	388	0.128	0.379	0.037	0.575	210	0.046	11	14.68	150.67	
877.9	370.6	167	389	0.128	0.379	0.037	0.575	210	0.046	11	14.75	150.67	
883.4	365.1	168	390	0.128	0.379	0.037	0.575	210	0.046	11	14.83	150.67	
891.0	357.5	169	391	0.15	0.311	0.0531	0.475	125	0.214	12	14.95	150.67	AR u/s Boiler Rapids
898.6	349.9	170	392	0.15	0.311	0.0531	0.475	125	0.214	12	15.07	150.67	
906.2	342.3	171	393	0.15	0.311	0.0531	0.475	125	0.214	12	15.20	150.67	
913.8	334.7	172	394	0.15	0.311	0.0531	0.475	125	0.214	12	15.32	150.67	
919.1	329.4	173	395	0.107	0.361	0.0398	0.566	234	0.073	13	15.42	150.67	
924.4	324.1	174	396	0.107	0.361	0.0398	0.566	234	0.073	13	15.51	150.67	
929.7	318.8	175	397	0.107	0.361	0.0398	0.566	234	0.073	13	15.60	150.67	
935.0	313.5	176	398	0.107	0.361	0.0398	0.566	234	0.073	13	15.70	150.67	
940.3	308.2	177	399	0.107	0.361	0.0398	0.566	234	0.073	13	15.79	150.67	
945.6	302.9	178	400	0.107	0.361	0.0398	0.566	234	0.073	13	15.89	150.67	AR u/s Horse River
950.7	297.8	179	401	0.158	0.25	0.0996	0.449	63.5	0.301	14	15.99	150.67	
956.2	292.3	180	402	0.158	0.25	0.0996	0.449	63.5	0.301	14	16.10	214.7	Clearwater River, Ft. McMurray STP
961.7	286.8	181	403	0.158	0.25	0.0996	0.449	63.5	0.301	14	16.20	214.7	
967.2	281.3	182	404	0.158	0.25	0.0996	0.449	63.5	0.301	14	16.31	214.7	
972.7	275.8	183	405	0.158	0.25	0.0996	0.449	63.5	0.301	14	16.41	214.7	
978.3	270.2	184	406	0.158	0.25	0.0996	0.449	63.5	0.301	14	16.52	214.7	AR u/s suncor
983.7	264.8	185	407	0.158	0.25	0.0996	0.449	63.5	0.301	14	16.62	215.5	Suncor process Effl., Steepbank River
989.2	259.3	186	408	0.158	0.25	0.0996	0.449	63.5	0.301	14	16.73	215.5	
994.6	253.9	187	409	0.158	0.25	0.0996	0.449	63.5	0.301	14	16.83	215.5	
1000.1	248.4	188	410	0.158	0.25	0.0996	0.449	63.5	0.301	14	16.94	218.23	Muskeg River
1005.5	243.0	189	411	0.158	0.25	0.0996	0.449	63.5	0.301	14	17.04	217.38	MacKay River
1011.0	237.5	190	412	0.158	0.25	0.0996	0.449	63.5	0.301	14	17.14	217.38	
1016.4	232.1	191	413	0.158	0.25	0.0996	0.449	63.5	0.301	14	17.25	217.38	
1021.9	226.6	192	414	0.158	0.25	0.0996	0.449	63.5	0.301	14	17.35	219.18	Ells River
1027.3	221.2	193	415	0.158	0.25	0.0996	0.449	63.5	0.301	14	17.45	219.18	
1032.8	215.7	194	416	0.158	0.25	0.0996	0.449	63.5	0.301	14	17.56	219.18	AR near Bitumount
1038.2	210.2	195	417	0.158	0.25	0.0996	0.449	63.5	0.301	14	17.66	219.18	
1043.7	204.8	196	418	0.158	0.25	0.0996	0.449	63.5	0.301	14	17.77	219.18	
1049.2	199.3	197	419	0.158	0.25	0.0996	0.449	63.5	0.301	14	17.87	219.18	
1054.6	193.7	198	420	0.158	0.25	0.0996	0.449	63.5	0.301	14	17.98	219.18	
1060.5	188.0	199	421	0.158	0.25	0.0996	0.449	63.5	0.301	14	18.09	219.18	
1066.3	182.2	200	422	0.158	0.25	0.0996	0.449	63.5	0.301	14	18.20	219.18	
1072.1	176.4	201	423	0.158	0.25	0.0996	0.449	63.5	0.301	14	18.31	219.18	AR u/s Firebag River, AR above Firebag R
1077.6	170.9	202	424	0.158	0.25	0.0996	0.449	63.5	0.301	14	18.41	230.28	Firebag River
1083.1	165.4	203	425	0.158	0.25	0.0996	0.449	63.5	0.301	14	18.51	230.28	
1094.1	154.4	204	426	0.13	0.351	0.245	0.555	31.4	0.094	15	18.66	230.28	
1105.2	143.3	205	427	0.13	0.351	0.245	0.555	31.4	0.094	15	18.81	230.28	
1116.2	132.3	206	428	0.13	0.351	0.245	0.555	31.4	0.094	15	18.95	230.28	
1127.3	121.2	207	429	0.13	0.351	0.245	0.555	31.4	0.094	15	19.10	230.28	
1138.3	110.2	208	430	0.13	0.351	0.245	0.555	31.4	0.094	15	19.24	230.28	
1149.4	99.1	209	431	0.13	0.351	0.245	0.555	31.4	0.094	15	19.39	230.28	
1160.4	88.1	210	432	0.13	0.351	0.245	0.555	31.4	0.094	15	19.53	230.28	AR at Old Fort

Table 2.1.

Schematic of WASP set-up for Athabasca River chemical fate modelling

(Continued page 3 of 3 for Lesser Slave River)

Distance from Lesser Slave Lake (km)	Cell #		Leopold Maddox Coefficients							Cumulative Travel Time (day)	Flow for Travel Time (cms)	Tributary or Sampling Site
	Water Column	Bed	Vcoeff	Vexp	Dcoeff	Dexp	Wcoeff	Wexp	Hydraulic Reach			
6.2	211	433	0.13	0.351	0.245	0.566	63.6	0.133	LSR1	0.15	43.7	Slave Lake STP
12.3	212	434	0.13	0.351	0.245	0.566	63.6	0.133	LSR1	0.29	43.7	
18.5	213	435	0.13	0.351	0.245	0.566	63.6	0.133	LSR1	0.44	43.7	At Mitsue Bridge
24.4	214	436	0.13	0.351	0.245	0.566	63.6	0.133	LSR1	0.58	43.7	
30.3	215	437	0.157	0.289	0.175	0.536	63.6	0.133	LSR1	0.72	43.7	
36.2	216	438	0.157	0.289	0.175	0.536	63.6	0.133	LSR1	0.87	43.7	
42.1	217	439	0.157	0.289	0.175	0.536	44.7	0.165	LSR2	1.02	43.7	
48.0	218	440	0.157	0.289	0.175	0.536	44.7	0.165	LSR2	1.16	43.7	u/s Driftwood River
53.9	219	441	0.157	0.289	0.175	0.536	44.7	0.165	LSR2	1.31	43.7	
59.8	220	442	0.157	0.289	0.175	0.536	44.7	0.165	LSR2	1.45	43.7	
65.7	221	443	0.157	0.289	0.175	0.536	44.7	0.165	LSR2	1.60	43.7	
71.6	222	444	0.157	0.289	0.175	0.536	44.7	0.165	LSR2	1.75	43.7	at AR confluence

Table 2.2.
Schematic of WASP set-up for Wapiti/Smoky River chemical fate modelling

Distance from HWY 40 (km)	Cell # Water Column	Cell # Bed	Leopold Maddox Coefficients Vcoeff	Vexp	Dcoeff	Dexp	Wcoeff	Wexp	Hydraulic Reach	Cumulative Travel Time (day)	Flow for Travel Time (cms)	Tributary or Sampling Site
2.0	1	96	0.057	0.503	0.279	0.455	62.9	0.042	1	0.16	6.03	
4.0	2	97	0.057	0.503	0.279	0.455	62.9	0.042	1	0.33	6.132	P&G STP
6.0	3	98	0.057	0.503	0.279	0.455	62.9	0.042	1	0.49	6.132	
8.0	4	99	0.057	0.503	0.279	0.455	62.9	0.042	1	0.66	6.132	
10.1	5	100	0.057	0.503	0.279	0.455	62.9	0.042	1	0.82	6.182	P&G Stormwater Outfall
12.2	6	101	0.057	0.503	0.279	0.455	62.9	0.042	1	0.98	6.942	Big Mtn Ck& P&G Effl
14.3	7	102	0.057	0.503	0.279	0.455	62.9	0.042	1	1.15	6.942	
16.5	8	103	0.057	0.503	0.279	0.455	62.9	0.042	1	1.31	6.942	
18.6	9	104	0.057	0.503	0.279	0.455	62.9	0.042	1	1.48	6.942	
20.8	10	105	0.057	0.503	0.279	0.455	62.9	0.042	1	1.64	6.942	
22.9	11	106	0.057	0.503	0.279	0.455	62.9	0.042	1	1.80	6.942	
25.0	12	107	0.057	0.503	0.279	0.455	62.9	0.042	1	1.97	6.942	
27.2	13	108	0.057	0.503	0.279	0.455	62.9	0.042	1	2.13	6.972	Bear Creek
29.3	14	109	0.057	0.503	0.279	0.455	62.9	0.042	1	2.30	6.972	
31.5	15	110	0.057	0.503	0.279	0.455	62.9	0.042	1	2.46	6.972	
33.6	16	111	0.057	0.503	0.279	0.455	62.9	0.042	1	2.63	6.972	
35.8	17	112	0.057	0.503	0.279	0.455	62.9	0.042	1	2.79	6.972	
37.9	18	113	0.057	0.503	0.279	0.455	62.9	0.042	1	2.95	6.972	
40.1	19	114	0.057	0.503	0.279	0.455	62.9	0.042	1	3.12	6.972	
43.8	20	115	0.057	0.503	0.279	0.455	62.9	0.042	1	3.28	20.572	Smoky River
47.6	21	116	0.057	0.503	0.279	0.455	62.9	0.042	1	3.45	22.072	Simonette River
50.1	22	117	0.088	0.224	0.11	0.662	103.3	0.114	2	3.61	22.072	
52.6	23	118	0.088	0.224	0.11	0.662	103.3	0.114	2	3.78	22.072	
55.1	24	119	0.088	0.224	0.11	0.662	103.3	0.114	2	3.94	22.072	
57.6	25	120	0.088	0.224	0.11	0.662	103.3	0.114	2	4.10	22.072	
60.1	26	121	0.088	0.224	0.11	0.662	103.3	0.114	2	4.27	22.072	
62.6	27	122	0.088	0.224	0.11	0.662	103.3	0.114	2	4.43	22.072	
65.1	28	123	0.088	0.224	0.11	0.662	103.3	0.114	2	4.60	22.072	
67.6	29	124	0.088	0.224	0.11	0.662	103.3	0.114	2	4.76	22.072	
70.4	30	125	0.079	0.298	0.142	0.674	89.1	0.028	3	4.93	22.072	
73.3	31	126	0.079	0.298	0.142	0.674	89.1	0.028	3	5.09	22.072	
76.1	32	127	0.079	0.298	0.142	0.674	89.1	0.028	3	5.26	22.072	
78.9	33	128	0.079	0.298	0.142	0.674	89.1	0.028	3	5.42	22.072	
81.7	34	129	0.079	0.298	0.142	0.674	89.1	0.028	3	5.58	22.072	
84.5	35	130	0.079	0.298	0.142	0.674	89.1	0.028	3	5.75	22.072	
87.4	36	131	0.079	0.298	0.142	0.674	89.1	0.028	3	5.91	22.072	
90.2	37	132	0.079	0.298	0.142	0.674	89.1	0.028	3	6.08	22.072	
93.0	38	133	0.079	0.298	0.142	0.674	89.1	0.028	3	6.24	22.072	
95.8	39	134	0.079	0.298	0.142	0.674	89.1	0.028	3	6.41	22.072	
98.6	40	135	0.079	0.298	0.142	0.674	89.1	0.028	3	6.57	22.072	
101.5	41	136	0.079	0.298	0.142	0.674	89.1	0.028	3	6.73	22.072	
104.3	42	137	0.079	0.298	0.142	0.674	89.1	0.028	3	6.90	22.072	Puskwaskau Creek
107.1	43	138	0.079	0.298	0.142	0.674	89.1	0.028	3	7.06	22.072	
109.9	44	139	0.079	0.298	0.142	0.674	89.1	0.028	3	7.23	22.072	
112.7	45	140	0.079	0.298	0.142	0.674	89.1	0.028	3	7.39	22.072	
115.6	46	141	0.079	0.298	0.142	0.674	89.1	0.028	3	7.56	22.072	Bad Heart Creek
118.4	47	142	0.079	0.298	0.142	0.674	89.1	0.028	3	7.72	22.072	
121.2	48	143	0.079	0.298	0.142	0.674	89.1	0.028	3	7.88	22.072	
124.0	49	144	0.079	0.298	0.142	0.674	89.1	0.028	3	8.05	22.072	
126.8	50	145	0.079	0.298	0.142	0.674	89.1	0.028	3	8.21	22.072	
129.7	51	146	0.079	0.298	0.142	0.674	89.1	0.028	3	8.38	22.072	
132.5	52	147	0.079	0.298	0.142	0.674	89.1	0.028	3	8.54	22.072	
135.3	53	148	0.079	0.298	0.142	0.674	89.1	0.028	3	8.71	22.072	
138.1	54	149	0.079	0.298	0.142	0.674	89.1	0.028	3	8.87	22.072	
140.9	55	150	0.079	0.298	0.142	0.674	89.1	0.028	3	9.03	22.072	
143.8	56	151	0.079	0.298	0.142	0.674	89.1	0.028	3	9.20	22.072	
146.6	57	152	0.079	0.298	0.142	0.674	89.1	0.028	3	9.36	22.072	
149.4	58	153	0.079	0.298	0.142	0.674	89.1	0.028	3	9.53	22.072	
152.2	59	154	0.079	0.298	0.142	0.674	89.1	0.028	3	9.69	22.072	
155.0	60	155	0.079	0.298	0.142	0.674	89.1	0.028	3	9.86	22.072	
157.9	61	156	0.079	0.298	0.142	0.674	89.1	0.028	3	10.02	22.072	
160.7	62	157	0.079	0.298	0.142	0.674	89.1	0.028	3	10.18	22.072	
163.5	63	158	0.079	0.298	0.142	0.674	89.1	0.028	3	10.35	22.072	
166.3	64	159	0.079	0.298	0.142	0.674	89.1	0.028	3	10.51	22.072	
169.1	65	160	0.079	0.298	0.142	0.674	89.1	0.028	3	10.68	22.072	
172.1	66	161	0.079	0.298	0.142	0.674	89.1	0.028	3	10.84	25.672	Little Smoky River
175.0	67	162	0.079	0.298	0.142	0.674	89.1	0.028	3	11.01	25.672	
178.0	68	163	0.079	0.298	0.142	0.674	89.1	0.028	3	11.17	25.672	Watino
180.9	69	164	0.079	0.298	0.142	0.674	89.1	0.028	3	11.33	25.672	
183.9	70	165	0.079	0.298	0.142	0.674	89.1	0.028	3	11.50	25.672	
186.8	71	166	0.079	0.298	0.142	0.674	89.1	0.028	3	11.66	25.672	
189.8	72	167	0.079	0.298	0.142	0.674	89.1	0.028	3	11.83	25.672	
192.7	73	168	0.079	0.298	0.142	0.674	89.1	0.028	3	11.99	25.672	
195.7	74	169	0.079	0.298	0.142	0.674	89.1	0.028	3	12.16	25.672	
198.6	75	170	0.079	0.298	0.142	0.674	89.1	0.028	3	12.32	25.672	
201.6	76	171	0.079	0.298	0.142	0.674	89.1	0.028	3	12.48	25.672	
204.5	77	172	0.079	0.298	0.142	0.674	89.1	0.028	3	12.65	25.672	
207.5	78	173	0.079	0.298	0.142	0.674	89.1	0.028	3	12.81	25.672	
210.4	79	174	0.079	0.298	0.142	0.674	89.1	0.028	3	12.98	25.672	
213.4	80	175	0.079	0.298	0.142	0.674	89.1	0.028	3	13.14	25.672	
216.3	81	176	0.079	0.298	0.142	0.674	89.1	0.028	3	13.31	25.672	
219.3	82	177	0.079	0.298	0.142	0.674	89.1	0.028	3	13.47	25.672	
222.2	83	178	0.079	0.298	0.142	0.674	89.1	0.028	3	13.64	25.672	
225.2	84	179	0.079	0.298	0.142	0.674	89.1	0.028	3	13.80	25.672	
228.1	85	180	0.079	0.298	0.142	0.674	89.1	0.028	3	13.96	25.672	
231.1	86	181	0.079	0.298	0.142	0.674	89.1	0.028	3	14.13	25.672	
234.0	87	182	0.079	0.298	0.142	0.674	89.1	0.028	3	14.29	25.672	
237.0	88	183	0.079	0.298	0.142	0.674	89.1	0.028	3	14.46	25.672	
239.9	89	184	0.079	0.298	0.142	0.674	89.1	0.028	3	14.62	25.672	
241.7	90	185	0.05	0.288	0.248	0.474	80.6	0.238	4	14.79	25.672	
243.6	91	186	0.05	0.288	0.248	0.474	80.6	0.238	4	14.95	25.672	
245.4	92	187	0.05	0.288	0.248	0.474	80.6	0.238	4	15.11	25.672	
247.2	93	188	0.05	0.288	0.248	0.474	80.6	0.238	4	15.28	25.672	
249.0	94	189	0.05	0.288	0.248	0.474	80.6	0.238	4	15.44	25.672	
250.8	95	190	0.05	0.288	0.248	0.474	80.6	0.238	4	15.61	25.672	

Table 3.1. Summary of Input conditions included for the Athabasca River Model.

Source	Na	TSS	TCDF	DHA	dcDHA	TCC	TCG	TCV	Flow
Weldwood	L	L	L	L	L	L	L	L	
Millar Western	L	L							
Alberta Newsprint	L	L							
Slave Lake Pulp	L	L							
Whitecourt STP		L							
Athabasca STP		L							
Suncor	L	L							
Athabasca R. upstream	C	C							Q
Tributaries	C	C							Q

L = Load (mass/time)
C = Concentration (mass/volume)
Q = Discharge (volume/time)

Table 3.2. Summary of Input conditions included for the Wapiti/Smoky River Model.

Source	Na	TSS	TCDF	DHA	dcDHA	TCC	TCG	TCV	Flow
Weyerhaeuser	L	L	L	L	L	L	L	L	
Grande Prairie STP	L	L							
Wapiti River (upstream)	C	C	C	C	C	C	C	C	Q
Smoky River (upstream)	C	C							Q
Tributaries	C	C							Q

L = Load (mass/time)
C = Concentration (mass/volume)
Q = Discharge (volume/time)

Table 4.1. Spatial distribution of TSS settling zones, Athabasca River model

Zone Description	WASP Cells	Distance (km)
Weldwood zone 1	2-17	1385-1156
Weldwood zone 2	18-34	1156-1041
ANC/Millar Western zone 1	35-49	1041-947
ANC/Millar Western zone 2	50-65	947884
Downstream ANC/Millar Western	66-210	884-88
Lesser Slave River	211-222	n/a

Table 4.2. Spatial distribution of TSS settling zones, Wapiti/Smoky River model

Zone Description	WASP Cells	Distance (km)
Wapiti River zone 1	1-5	2-10
Wapiti River zone 2	6-12	10-25
Wapiti River zone 3	13-22	25-50
Smoky River zone 1	23-39	50-96
Smoky River zone 1	40-95	96-251

Table 4.3.
Settling rates (m/day) is TSS settling zones, Athabasca River Model

Date	WWZ1	WWZ2	ANCZ1	ANCZ2	DS ANC	LSR
1-Jan-91	0.50	0.10	0.50	0.10	0.10	0.50
1-Feb-00	0.50	0.10	0.50	0.10	0.10	0.50
29-Feb-00	0.50	0.10	0.50	0.10	0.10	0.50
31-Mar-00	0.50	0.10	0.50	0.10	0.10	0.50
30-Apr-00	0.10	0.02	0.10	0.02	0.02	0.10
31-May-00	0.00	0.00	0.00	0.00	0.00	0.00
30-Jun-00	0.00	0.00	0.00	0.00	0.00	0.00
31-Jul-00	0.10	0.02	0.10	0.02	0.02	0.10
31-Aug-00	0.20	0.04	0.20	0.04	0.04	0.20
30-Sep-00	0.30	0.06	0.30	0.06	0.06	0.30
31-Oct-00	0.40	0.08	0.40	0.08	0.08	0.40
30-Nov-00	0.50	0.10	0.50	0.10	0.10	0.50
31-Dec-00	0.50	0.10	0.50	0.10	0.10	0.50
31-Jan-01	0.50	0.10	0.50	0.10	0.10	0.50
28-Feb-01	0.50	0.10	0.50	0.10	0.10	0.50
31-Mar-01	0.50	0.10	0.50	0.10	0.10	0.50
30-Apr-01	0.10	0.02	0.10	0.02	0.02	0.10
31-May-01	0.00	0.00	0.00	0.00	0.00	0.00
30-Jun-01	0.00	0.00	0.00	0.00	0.00	0.00
31-Jul-01	0.10	0.02	0.10	0.02	0.02	0.10
31-Aug-01	0.20	0.04	0.20	0.04	0.04	0.20
30-Sep-01	0.30	0.06	0.30	0.06	0.06	0.30
31-Oct-01	0.40	0.08	0.40	0.08	0.08	0.40
30-Nov-01	0.50	0.10	0.50	0.10	0.10	0.50
31-Dec-01	0.50	0.10	0.50	0.10	0.10	0.50
31-Jan-02	0.50	0.10	0.50	0.10	0.10	0.50
28-Feb-02	0.50	0.10	0.50	0.10	0.10	0.50
31-Mar-02	0.50	0.10	0.50	0.10	0.10	0.50
30-Apr-02	0.10	0.02	0.10	0.02	0.02	0.10
31-May-02	0.00	0.00	0.00	0.00	0.00	0.00
30-Jun-02	0.00	0.00	0.00	0.00	0.00	0.00
31-Jul-02	0.10	0.02	0.10	0.02	0.02	0.10
31-Aug-02	0.20	0.04	0.20	0.04	0.04	0.20
30-Sep-02	0.30	0.06	0.30	0.06	0.06	0.30
31-Oct-02	0.40	0.08	0.40	0.08	0.08	0.40
30-Nov-02	0.50	0.10	0.50	0.10	0.10	0.50
31-Dec-02	0.50	0.10	0.50	0.10	0.10	0.50

Table 4.4.
Settling rates (m/day) is TSS settling zones,
Wapiti/Smoky River Model

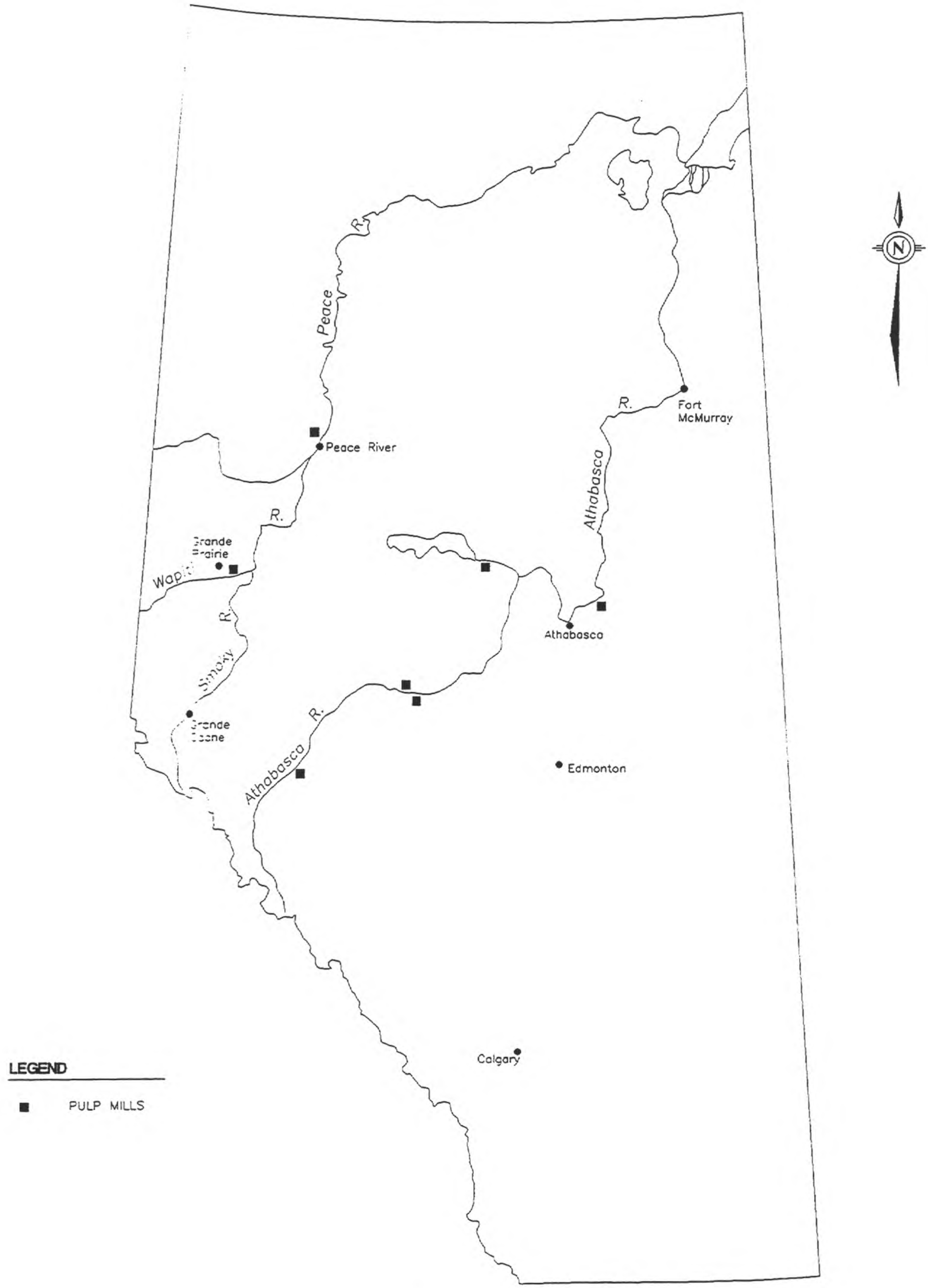
Date	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
1-Jan-89	0.05	0.10	0.10	1.00	0.01
1-Mar-89	0.05	0.10	0.10	1.50	0.01
20-May-89	0.05	0.10	0.10	0.50	0.01
30-May-89	0.05	0.10	0.10	0.50	0.01
2-Oct-89	0.05	0.10	0.10	0.50	0.01
31-Dec-89	0.05	0.10	0.10	1.00	0.01
15-Apr-90	0.05	0.10	0.50	1.00	0.01
20-May-90	0.05	0.10	0.10	0.50	0.01
29-Jun-90	0.05	0.10	0.10	0.50	0.01
2-Oct-90	0.05	0.10	0.10	0.60	0.01
31-Dec-90	0.05	0.10	0.50	1.00	0.01
15-Apr-91	0.05	0.05	0.50	1.50	0.01
20-May-91	0.05	0.05	0.10	0.50	0.01
29-Jun-91	0.05	0.05	0.10	0.50	0.01
2-Oct-91	0.05	0.05	0.20	1.00	0.01
31-Dec-91	0.05	0.05	0.20	1.00	0.01

Table 4.5 Environmental fate constants for the original and calibrated models

Constant	Description	Chemical	WASP ID #	VALUES	
				Initial	Calibration
CHEMICAL SPECIFIC CONSTANTS					
LKOC	log 10 of the organic carbon partition coefficient, log(Lw/kgoc)	237TCDF	101	6.5	6.5
		DHA	701	6.09	6.09
		1214cDHA	1301	6.54	6.32
		345TCC	101	3.3	3.6
		345TCG	701	3.3	3.3
		345TCV	1301	3.9	3.4
		Phen.	101	4.3	4.3
KBW	Water column biodegradation (1/d)	237TCDF	141	1.00E-03	1.00E-04
		DHA	741	1.65E-02	1.65E-03
		1214cDHA	1341	1.65E-02	1.65E-02
		345TCC	141	0.7	0.2
		345TCG	741	0.7	0.15
		345TCV	1341	0.7	0.1
		Phen.	141	0.0035	0.0035
KBS	Benthic biodegradation (1/d)	237TCDF	142	0	0
		DHA	742	9.00E-05	9.00E-06
		1214cDHA	1342	9.00E-05	9.00E-05
		345TCC	142		9.00E-05
		345TCG	742		9.00E-05
		345TCV	1342		9.00E-05
		Phen.	142	1.70E-03	1.70E-03
YBW31	Water column biodegradation yield coefficient for production of TCV from TCC	345TCC	177	0	1.50E-01
KO	Oxidation (1/d)	237TCDF	256	1.99E-10	1.99E-10
		DHA	856	0	0
		1214cDHA	1456	0	0
		345TCC	256	0	0
		345TCG	856	0	0
		345TCV	1456	0	0
		Phen.	256	0	0
SOLG	Solubility (mg/L)	237TCDF	82	4.19E-04	4.19E-04
		DHA	682	4.9	4.9
		1214cDHA	1282	4.9	4.9
		345TCC	82	16.5	16.5
		345TCG	682	9.1	9.1
		345TCV	1282	2.5	2.5
		Phen.	82	0.4	0.4
HENRY	Henry's constant atm-m^3/mole	237TCDF	137	1.50E-05	1.50E-05
		DHA	737	1.80E-07	1.80E-07
		1214cDHA	1337	9.80E-08	9.80E-08
		345TCC	137	8.10E-08	8.10E-08
		345TCG	737	1.60E-04	1.60E-04
		345TCV	1337	4.00E-04	4.00E-04
		Phen.	137	3.90E-05	3.90E-05
KDPG(1)	Photolysis rate (1/d)	237TCDF	291	0	0
		DHA	891	0	0
		1214cDHA	1491	0	0
		345TCC	291	0	0
		345TCG	891	0	0
		345TCV	1491	0	0
		Phen.	291	0	0
ATMOS	Atmospheric concentration of chemical (ug/L)	237TCDF	8	0	0
		DHA	608	0	0
		1214cDHA	1208	0	0
		345TCC	8	0	0
		345TCG	608	0	0
		345TCV	1208	0	0
		Phen.	8	0	0
GENERAL PARAMETERS (Not chemical specific)					
	Wapiti/Smoky DOC binding effectiveness constant			0.01	0.03
	Athabasca DOC binding effectiveness constant			0.01	0.01
	Bed-water column dispersion rate (m^2/s)			5.00E-08	0.00E+00

LOCATION MAP

Figure 1.1



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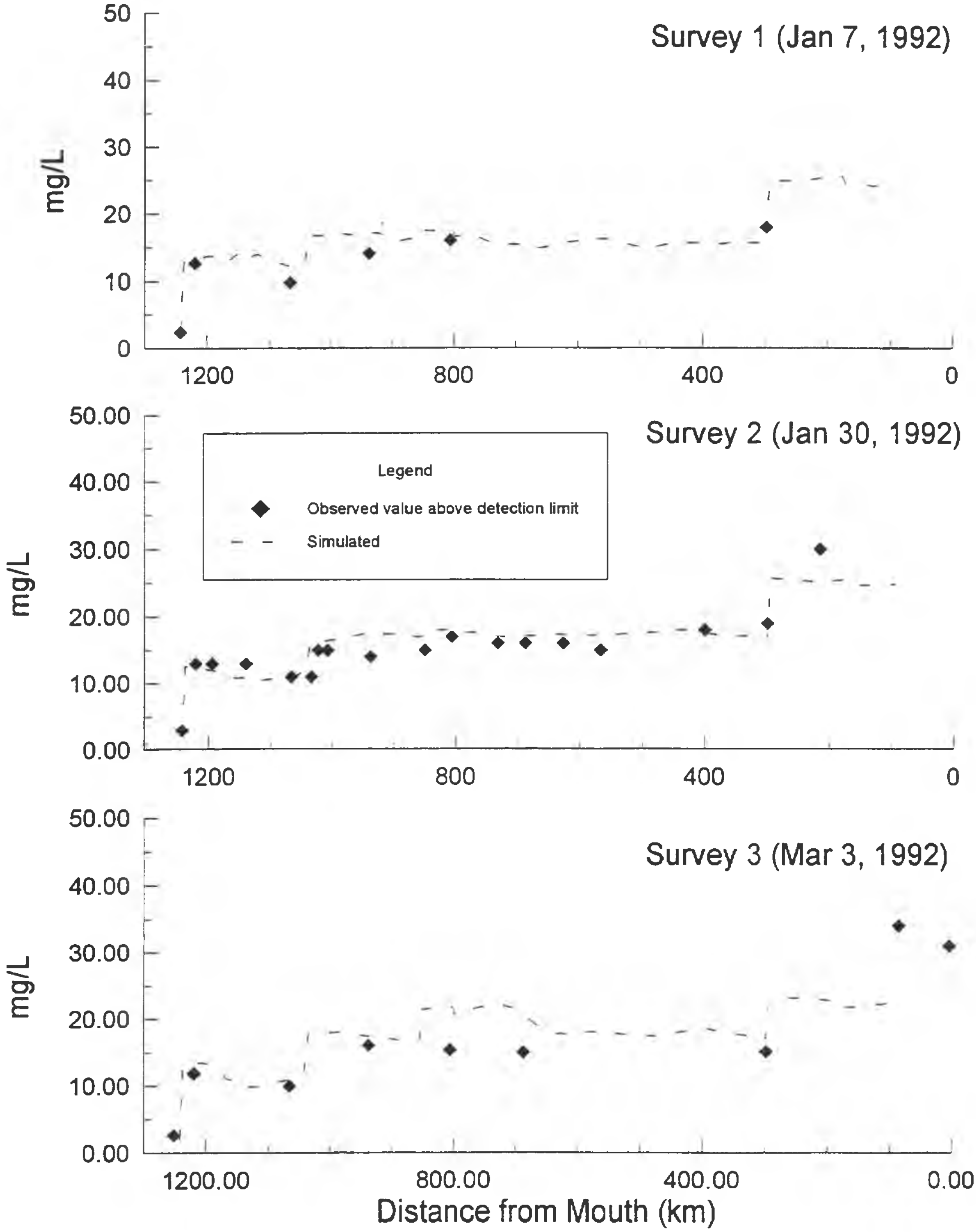

Figure 4.1.
Athabasca River, Sodium Calibration, Synoptic Surveys

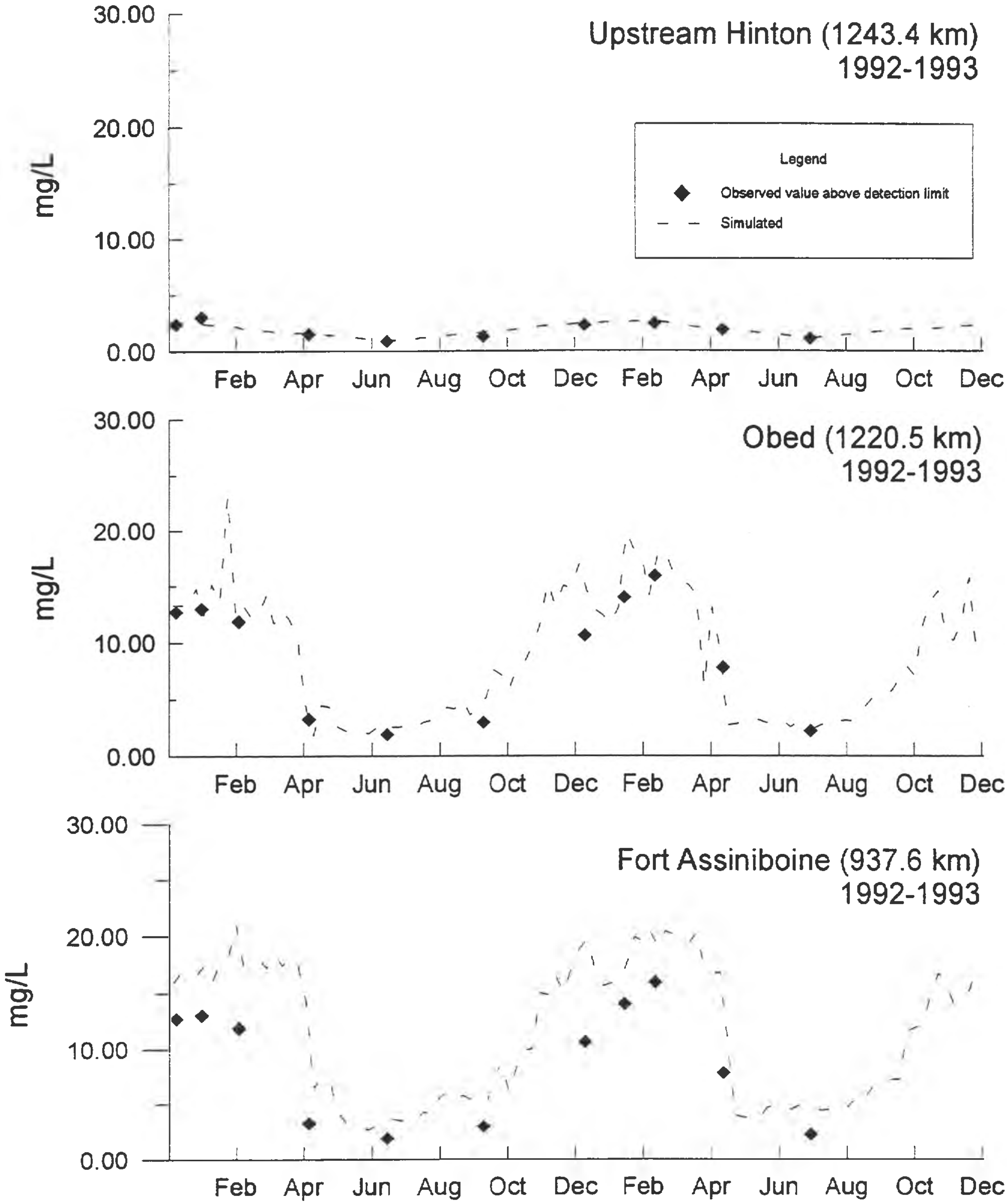

Figure 4.2a.
Athabasca River, Sodium Calibration, Time Series

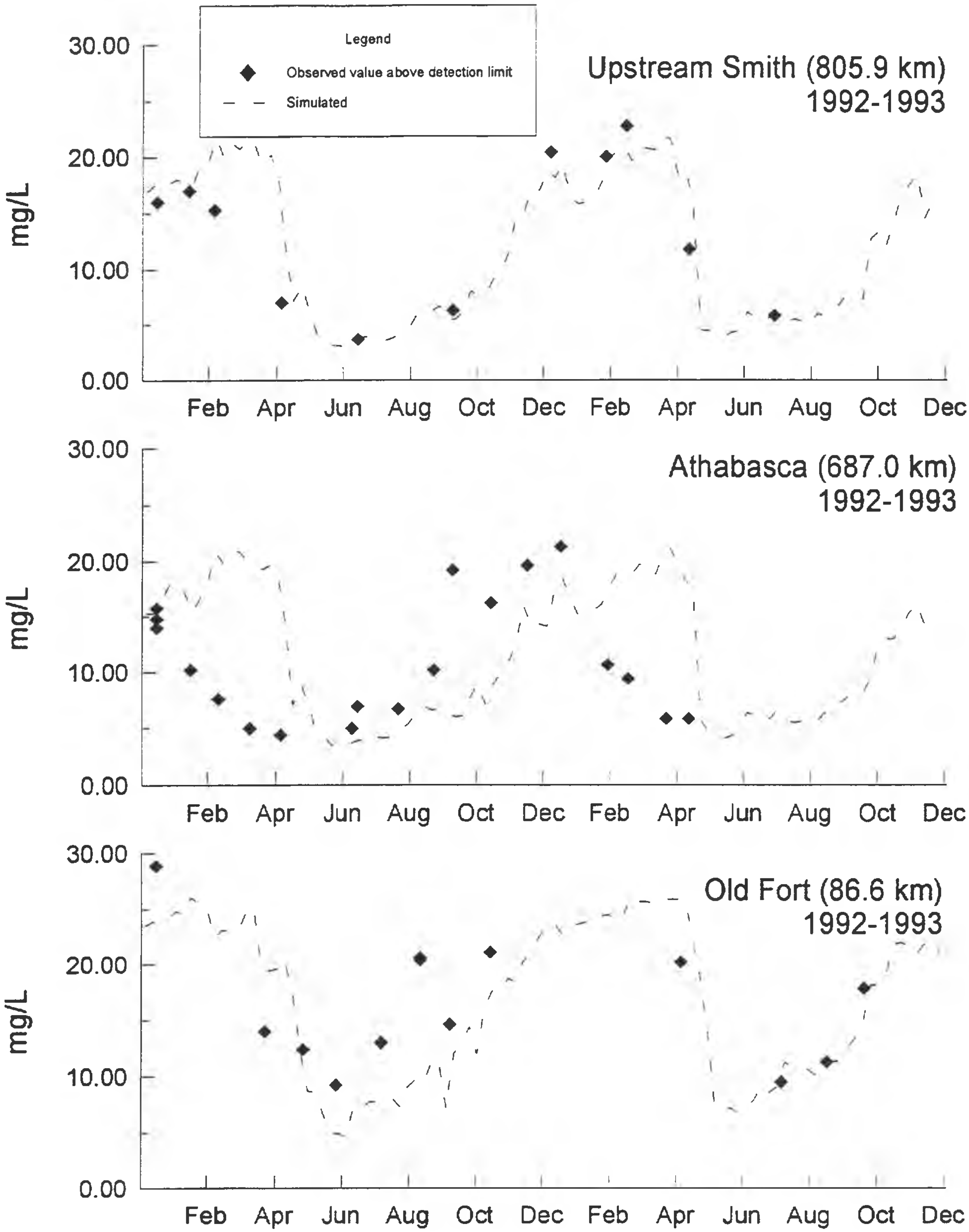

Figure 4.2b.
Athabasca River, Sodium Calibration, Time Series

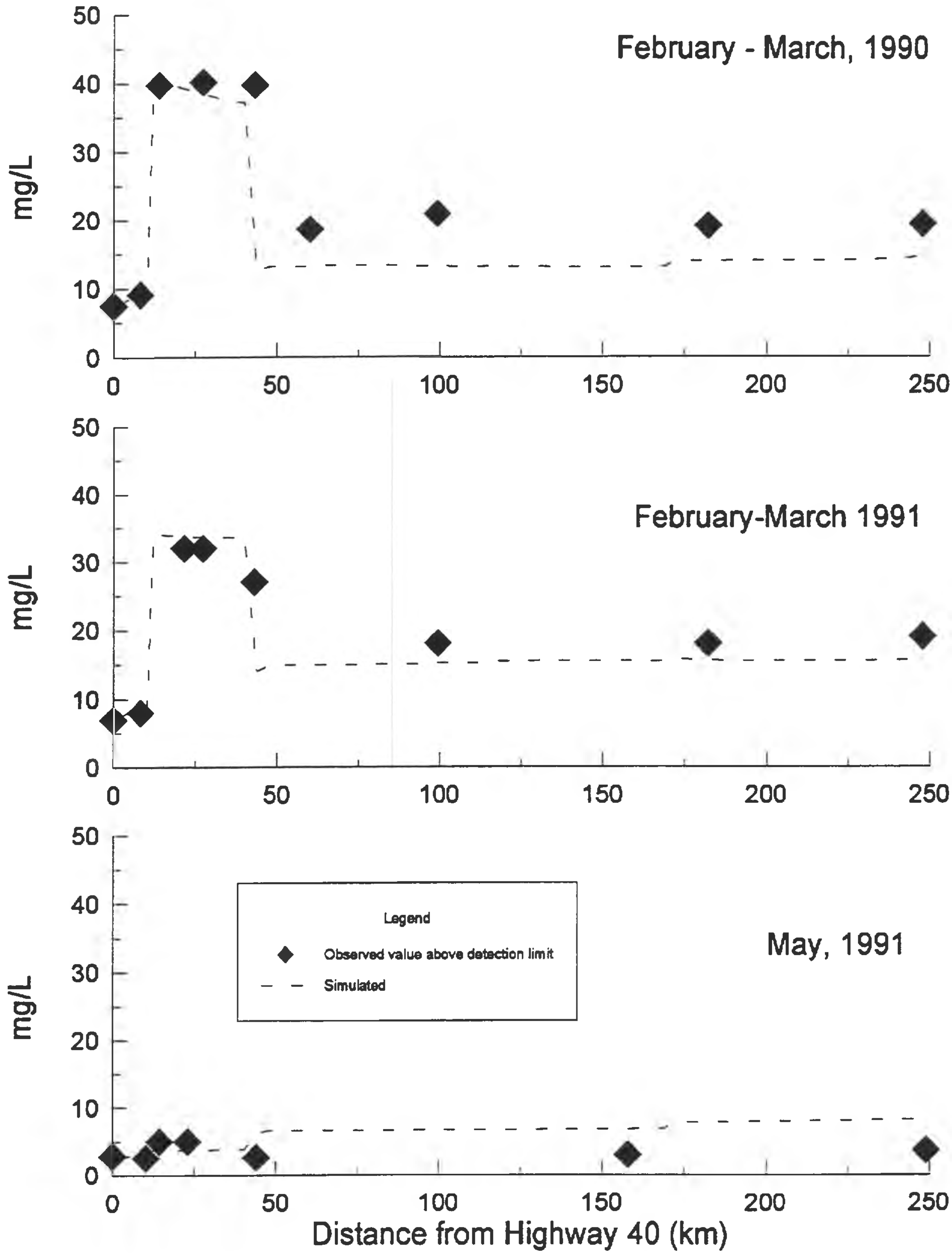

Figure 4.3a.
Wapiti/Smoky Rivers, Sodium Calibration, Synoptic Surveys

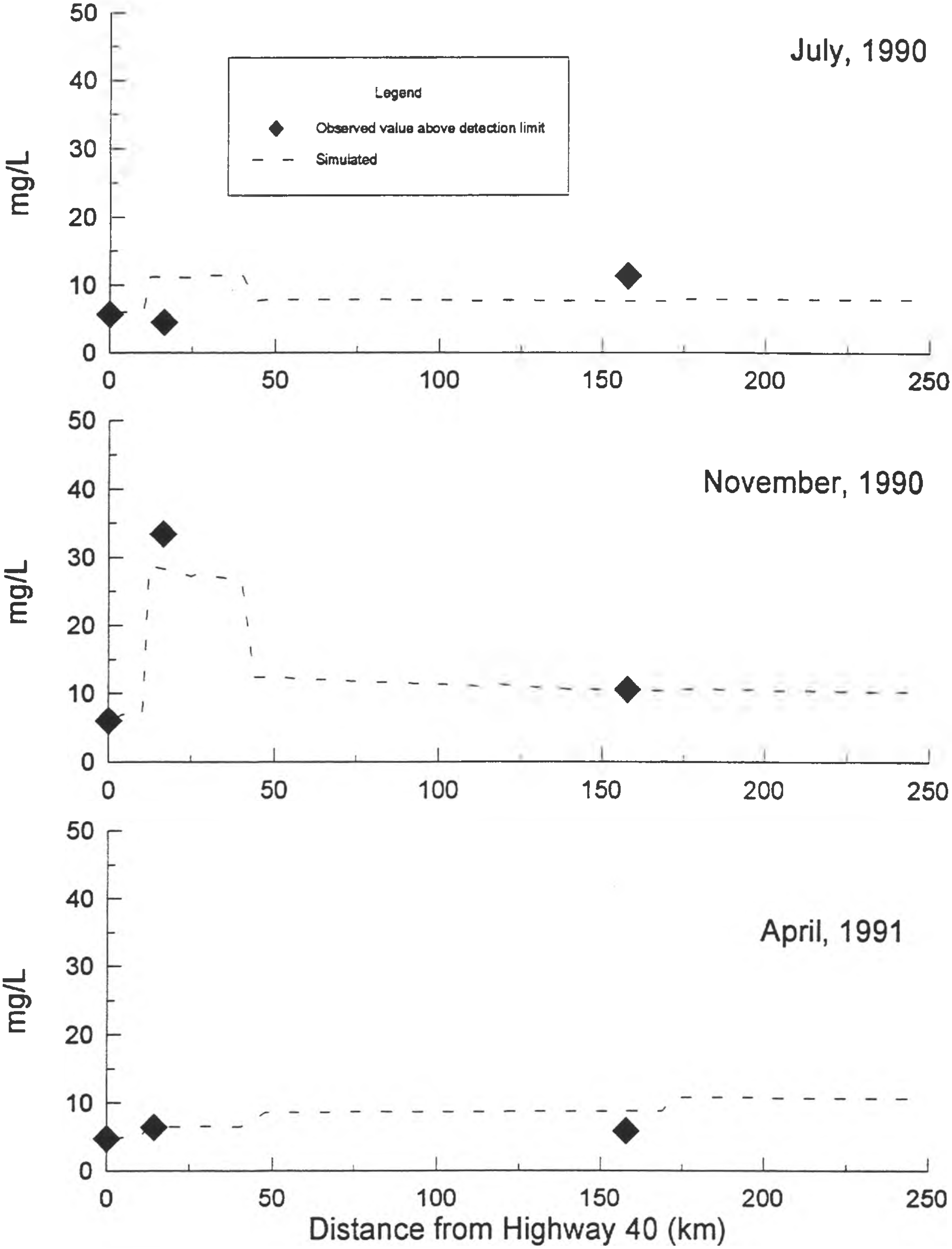

Figure 4.3b. Wapiti/Smoky River,
Sodium Calibration, Synoptic Surveys

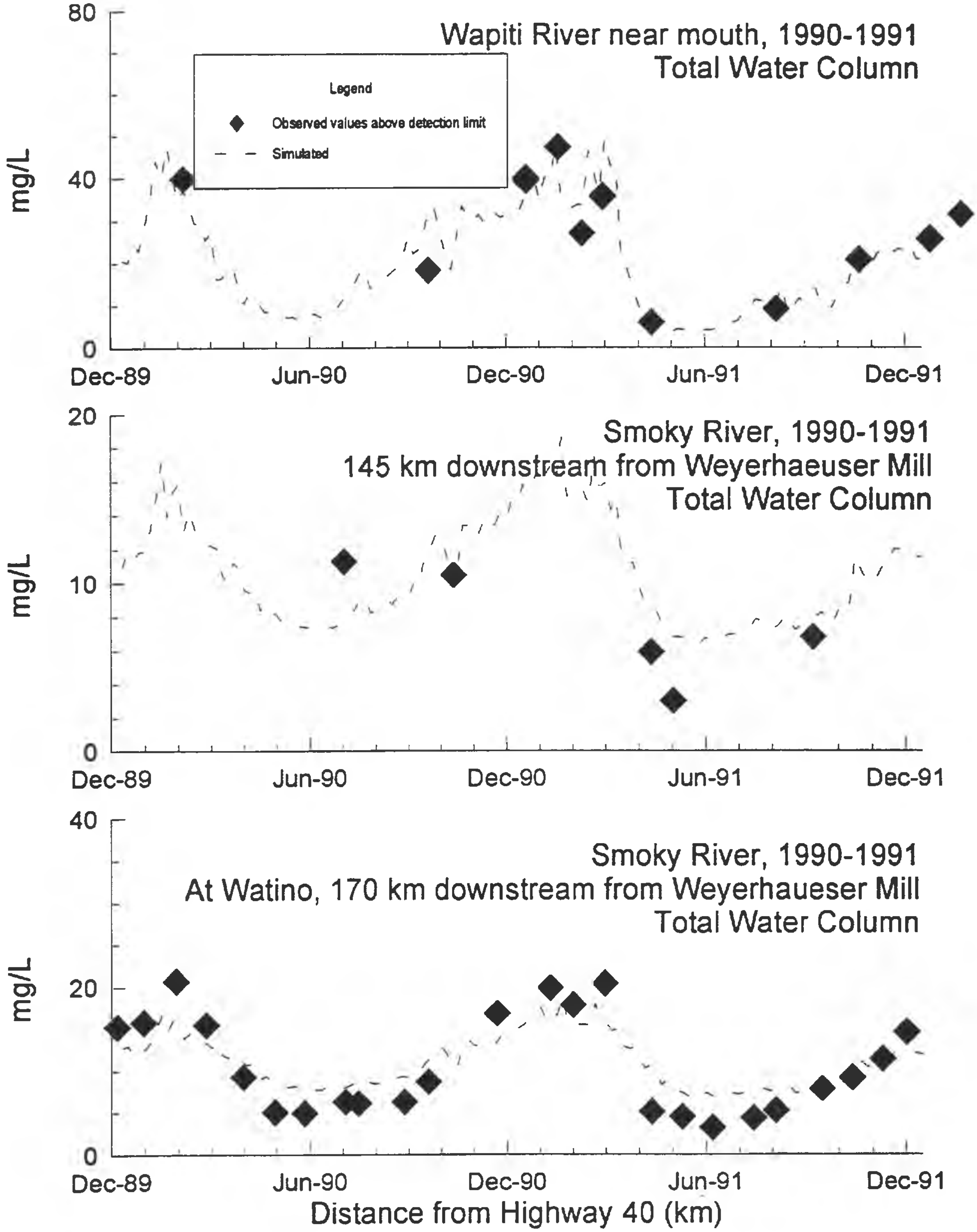

Figure 4.4.
Wapiti/Smoky Rivers, Sodium Calibration, Time Series

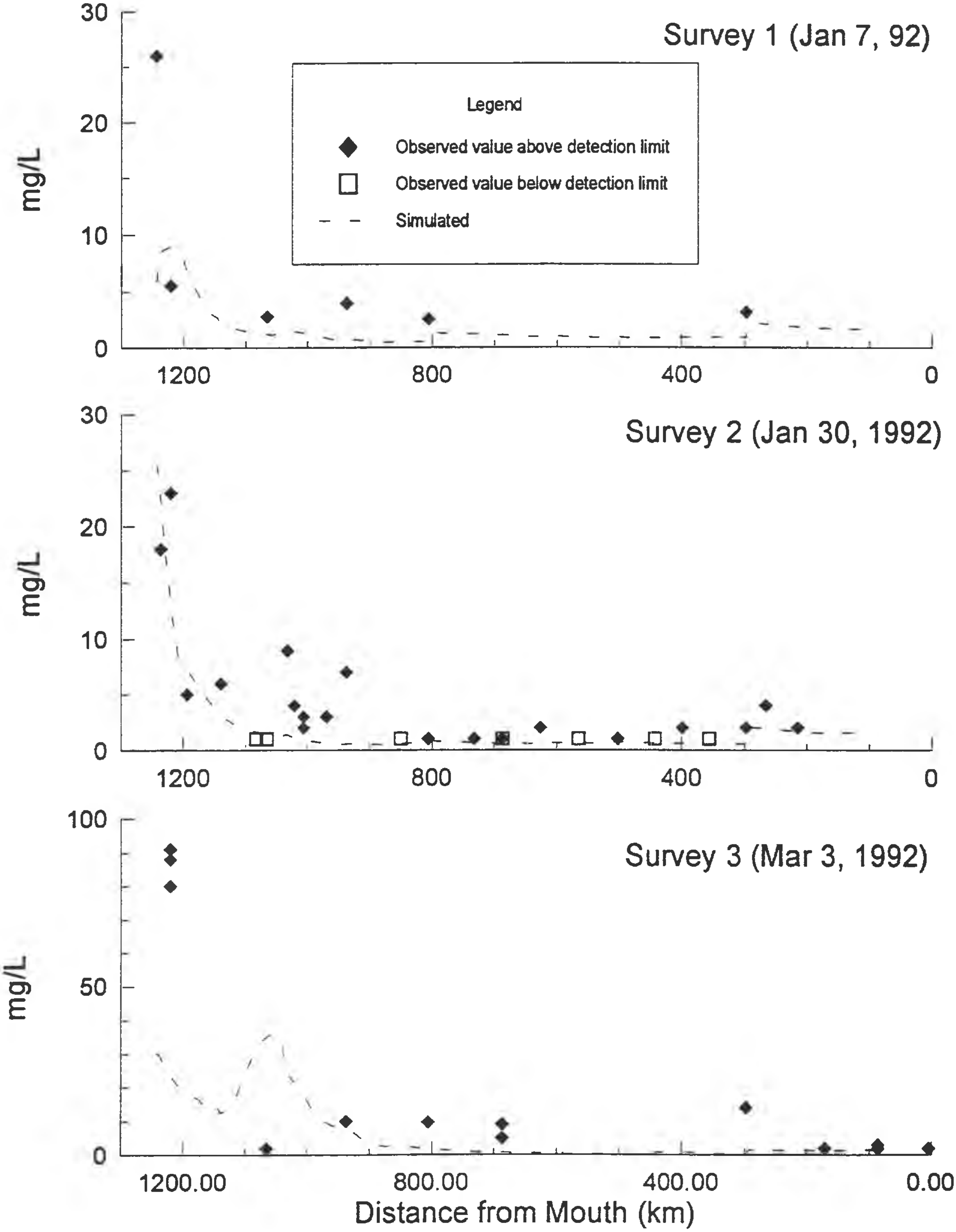

Figure 4.5.
Athabasca River, Total Suspended Solids, Synoptic Surveys

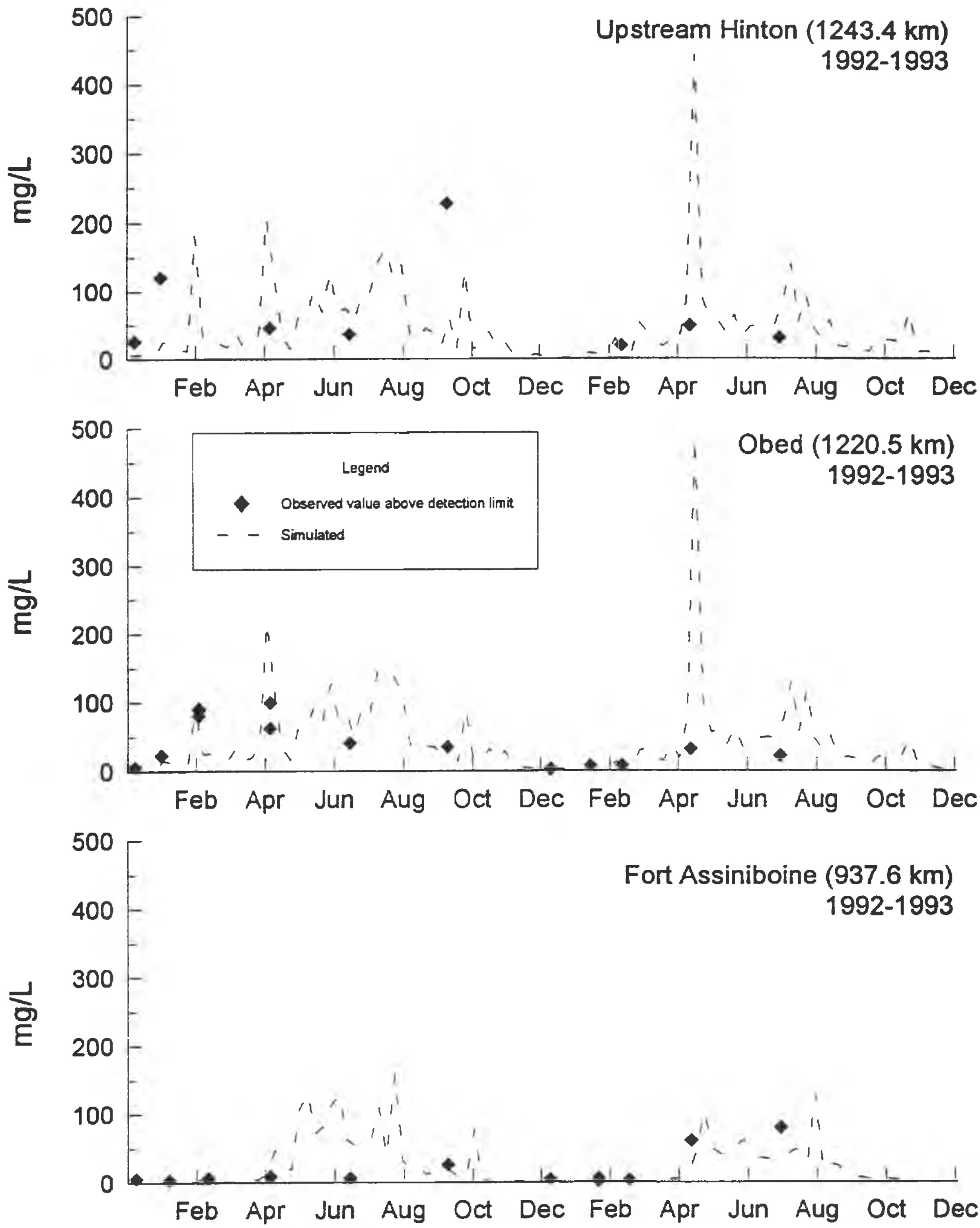

Figure 4.6a.
Athabasca River, Total Suspended Solids, Time Series

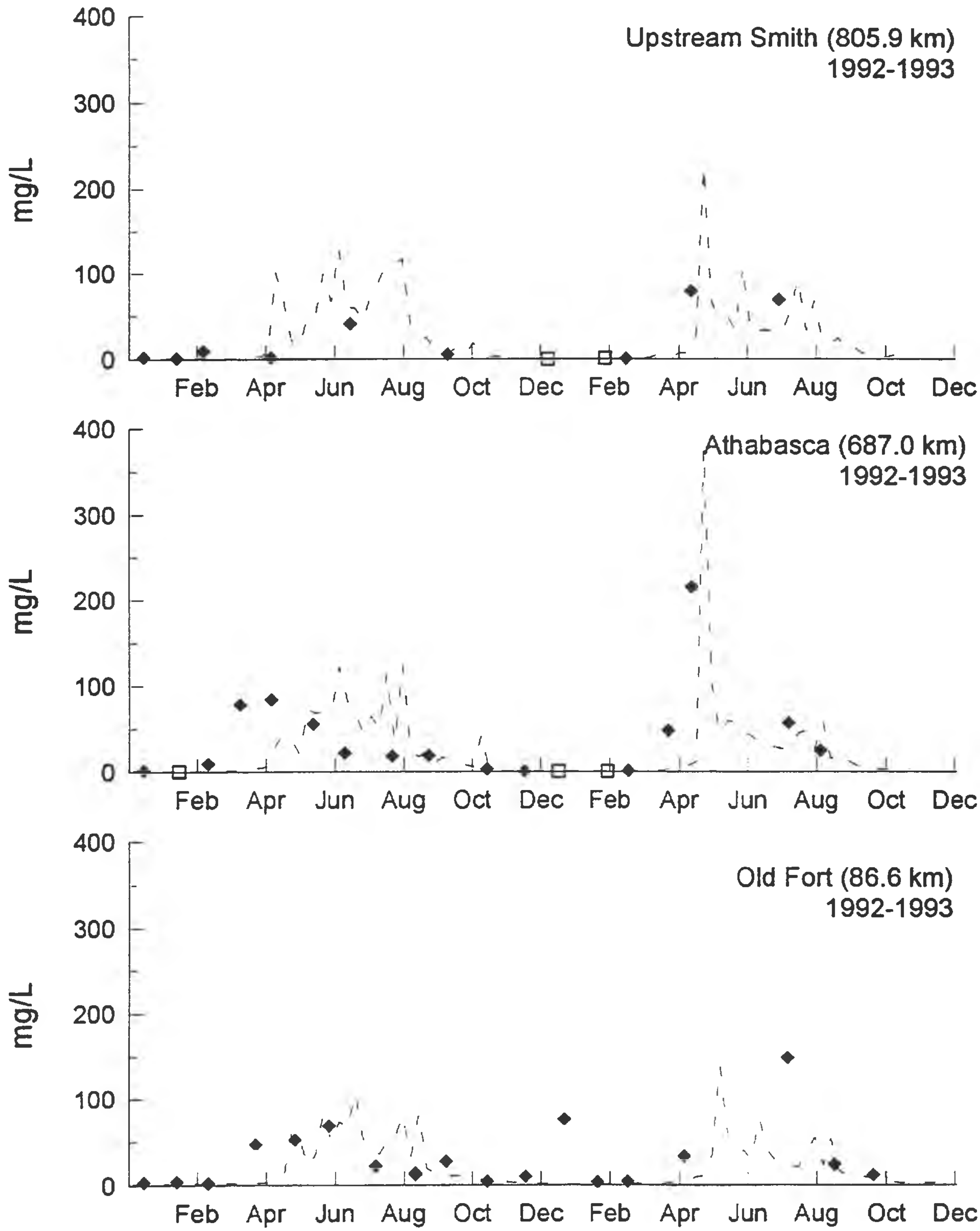

Figure 4.6b.
Athabasca River, Total Suspended Solids, Time Series

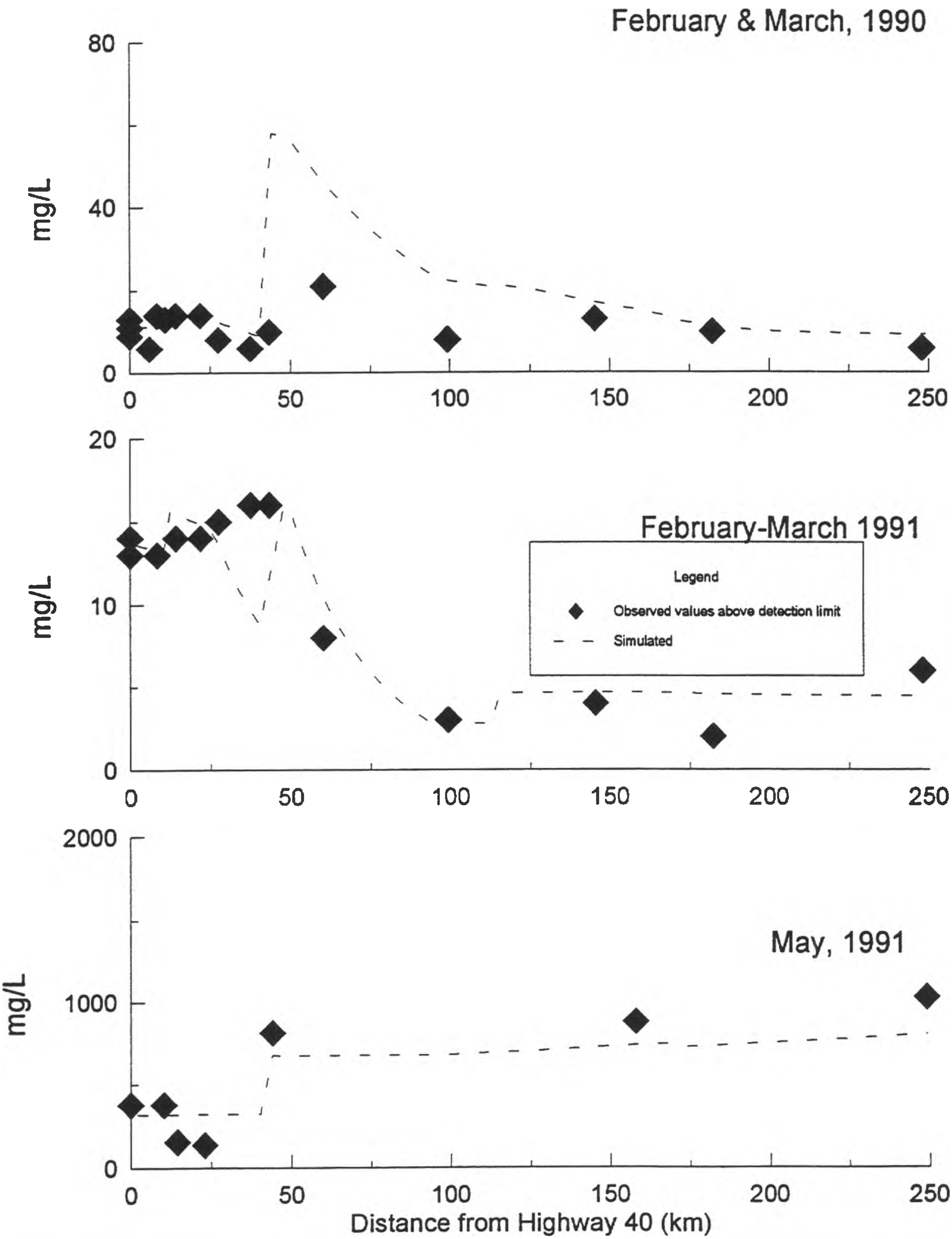

Figure 4.7.
Wapiti/Smoky River, TSS Calibration, Synoptic Surveys

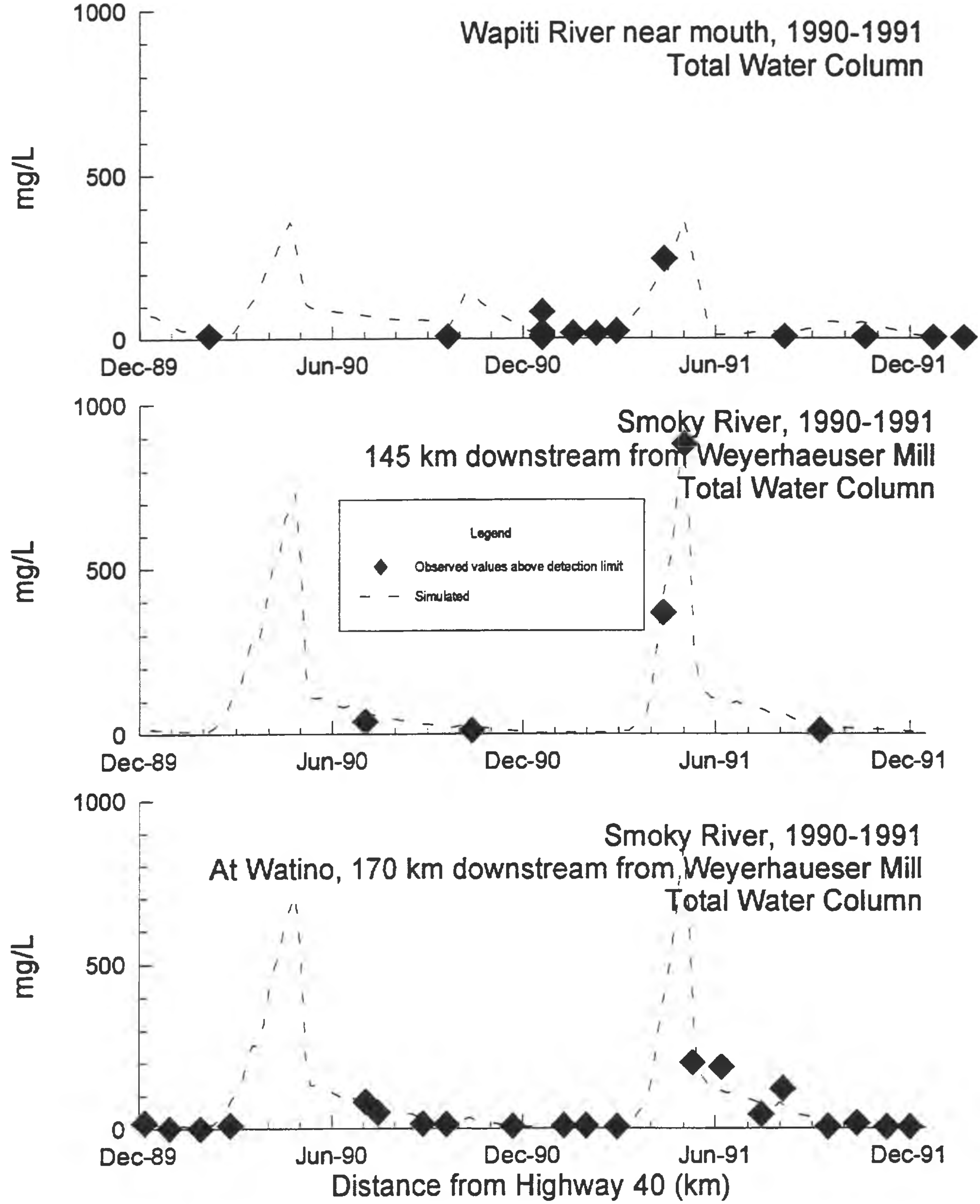

Figure 4.8.
Wapiti/Smoky Rivers, TSS Calibration, Time Series

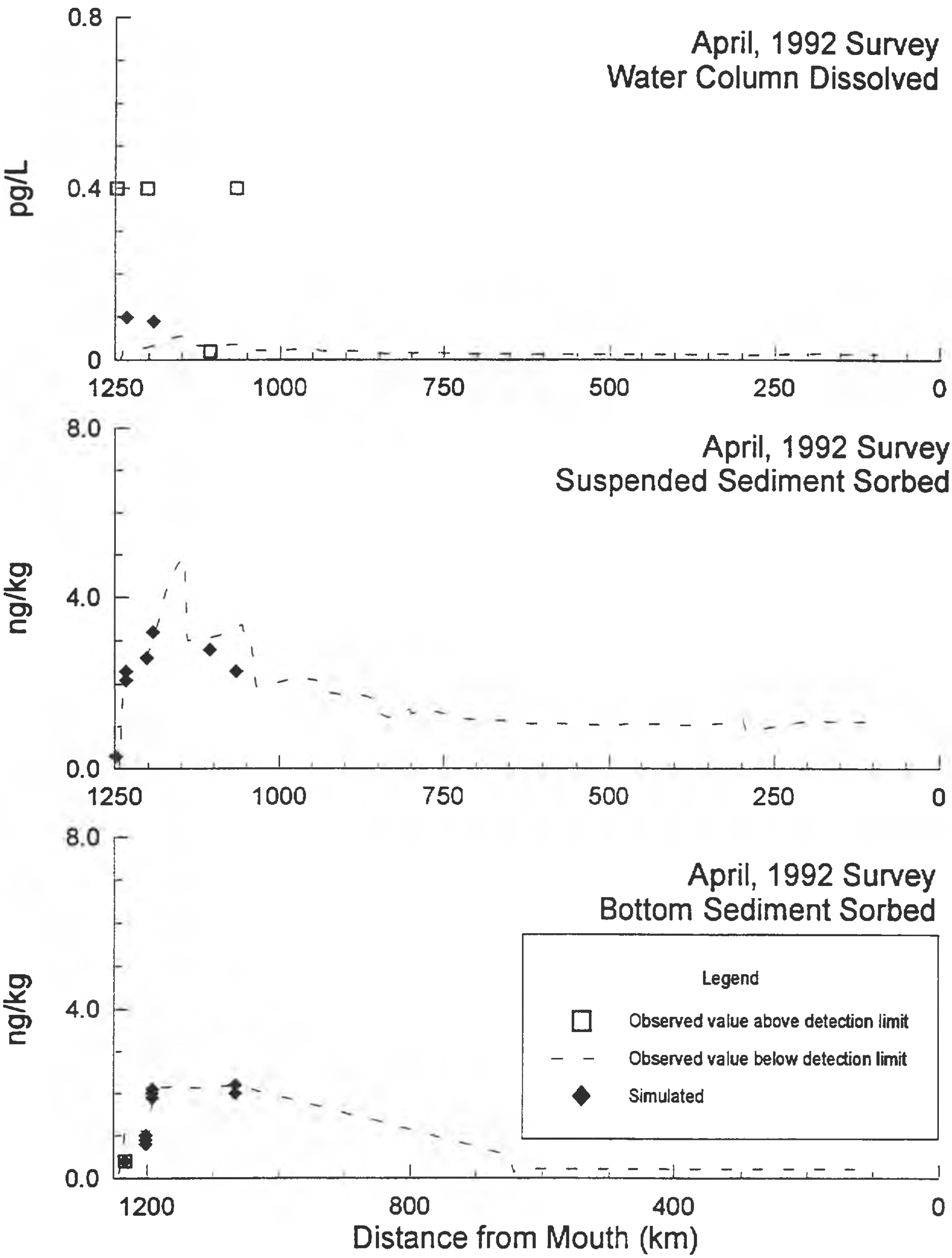

Figure 4.9a.
Athabasca River, 2,3,7,8-TCDF Calibration, Synoptic Surveys

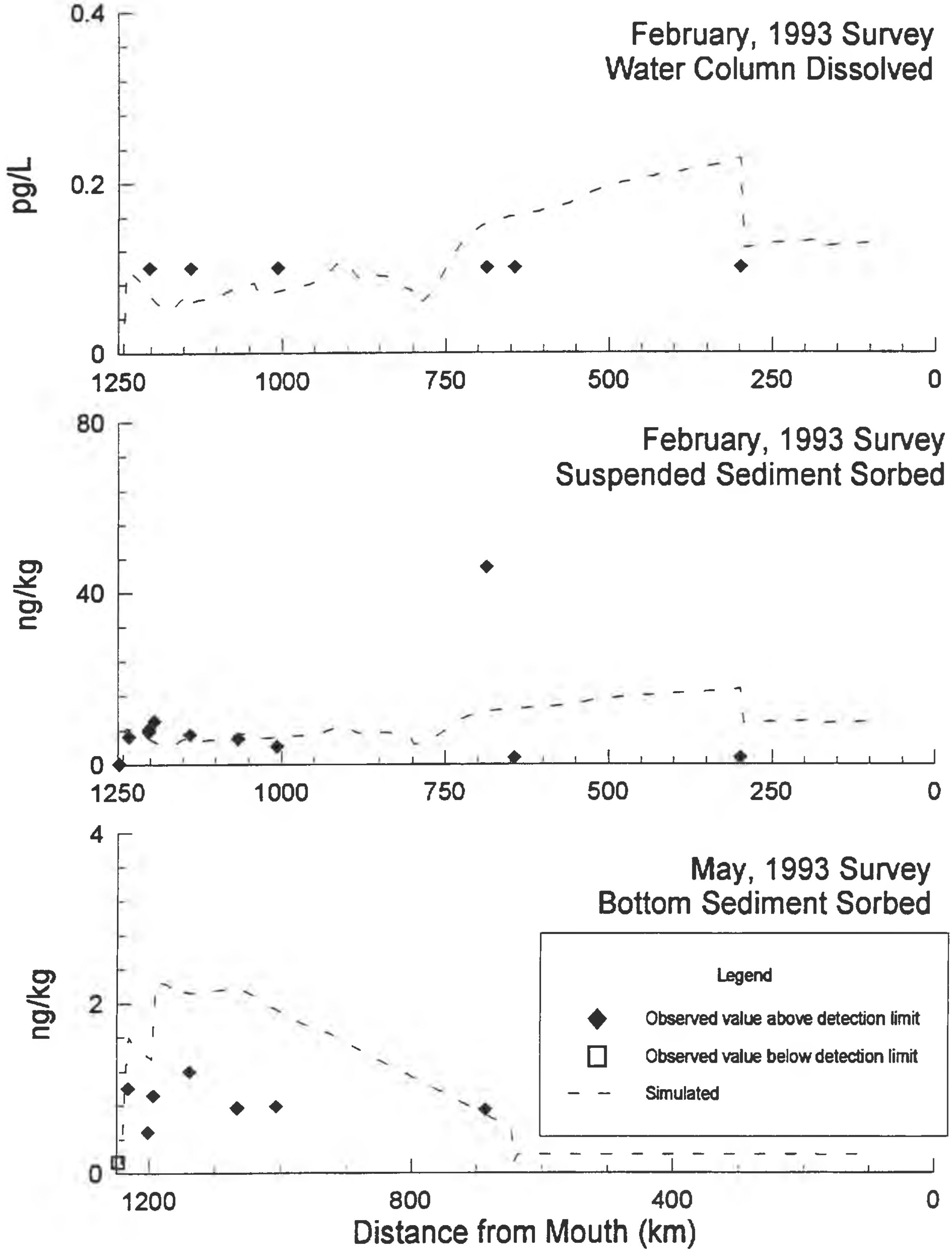

Figure 4.9b.
Athabasca River, 2,3,7,8 TCDF Calibration, Synoptic Surveys

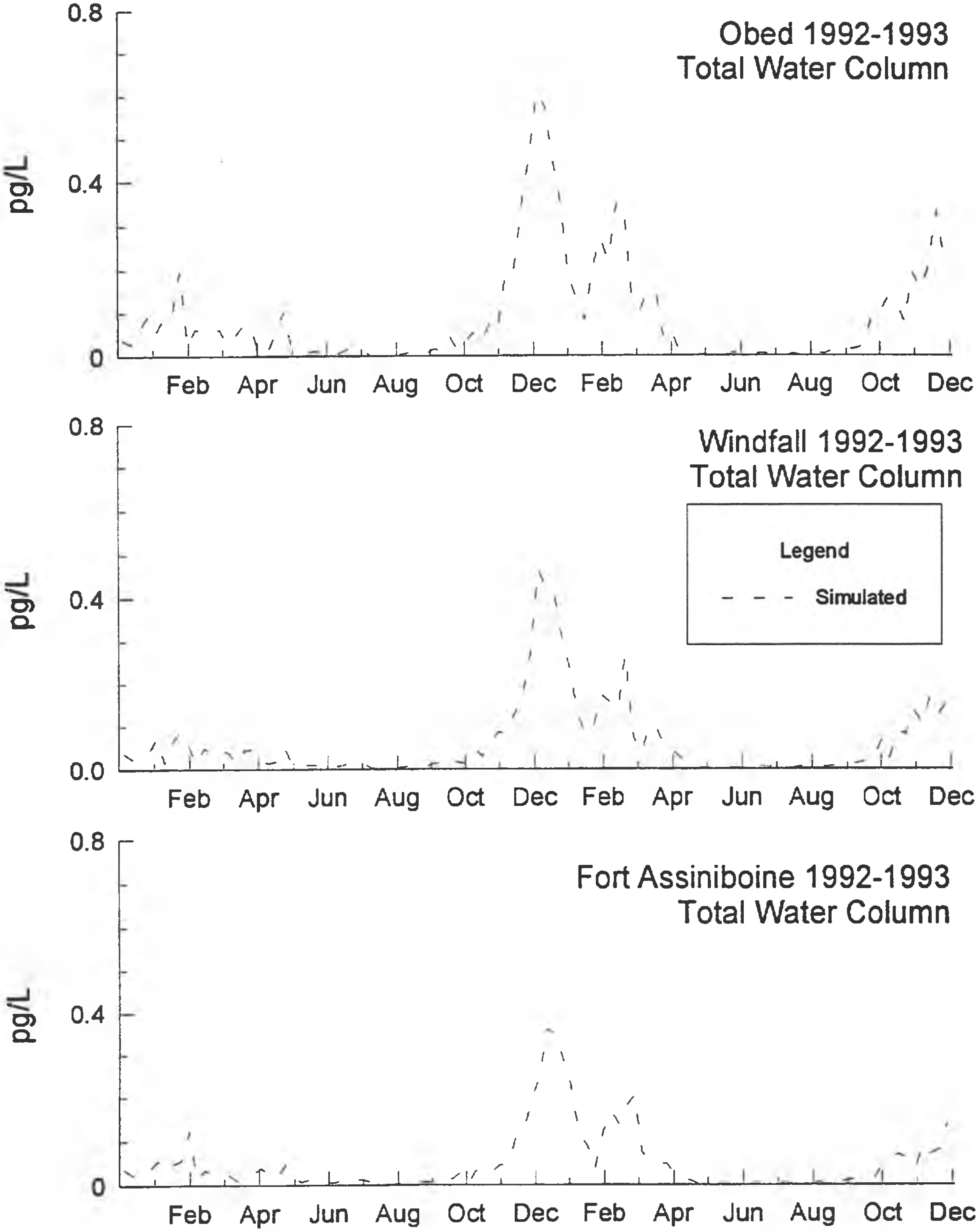

Figure 4.10a.
Athabasca River 2,3,7,8-TCDF Calibration, Time Series

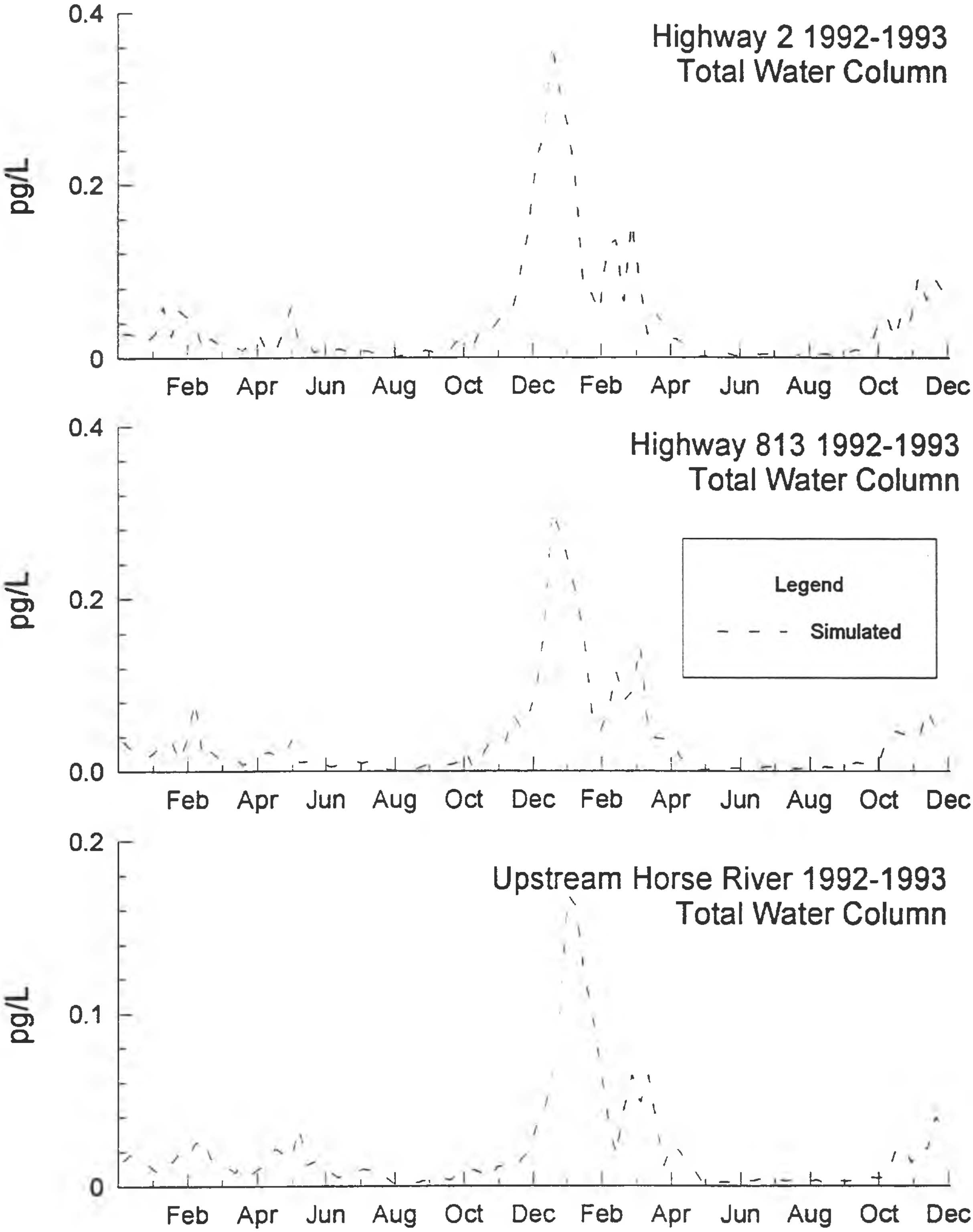

Figure 4.10b.
Athabasca River 2,3,7,8-TCDF Calibration, Time Series

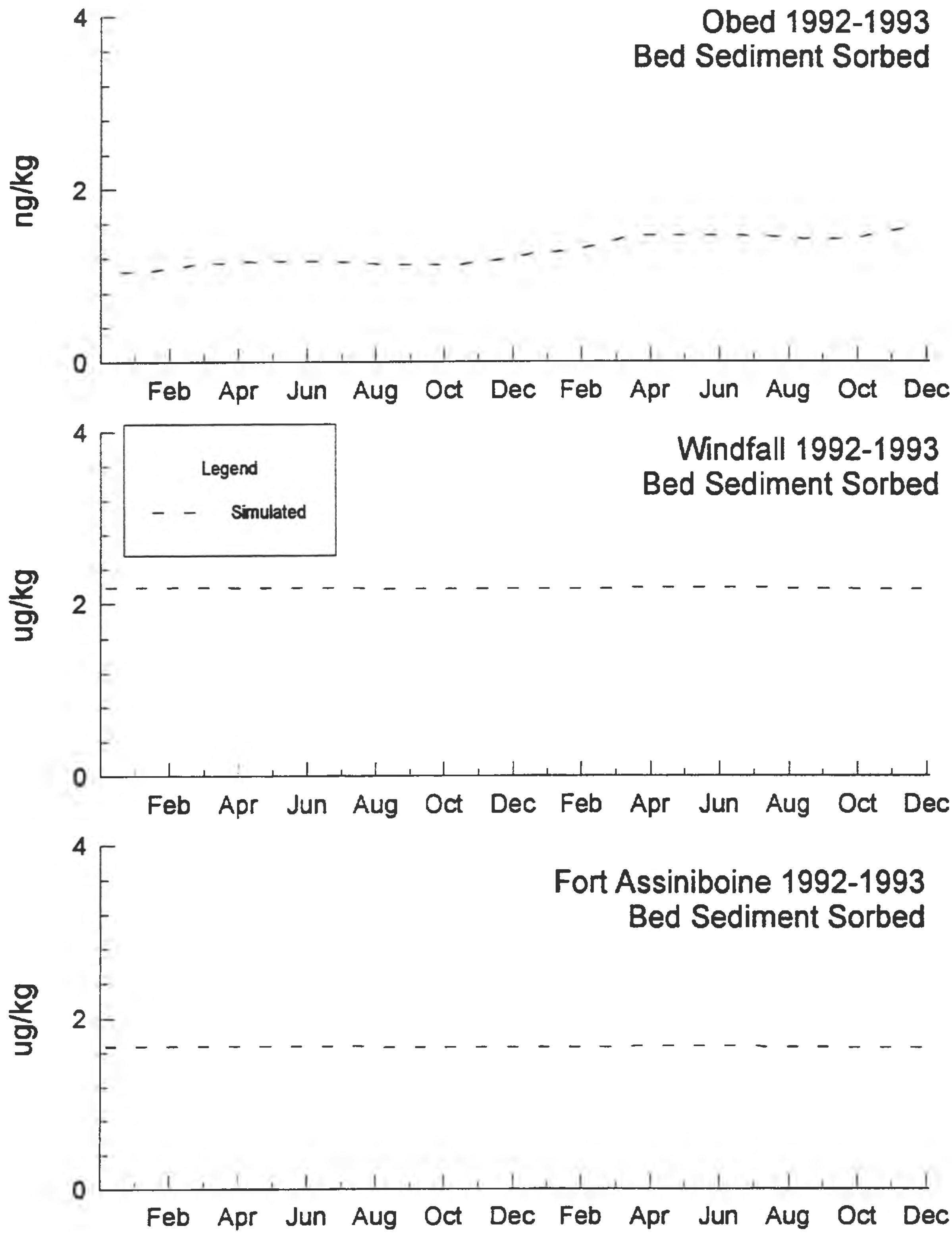

Figure 4.10c.
Athabasca River, 2,3,7,8-TCDF Calibration, Time Series

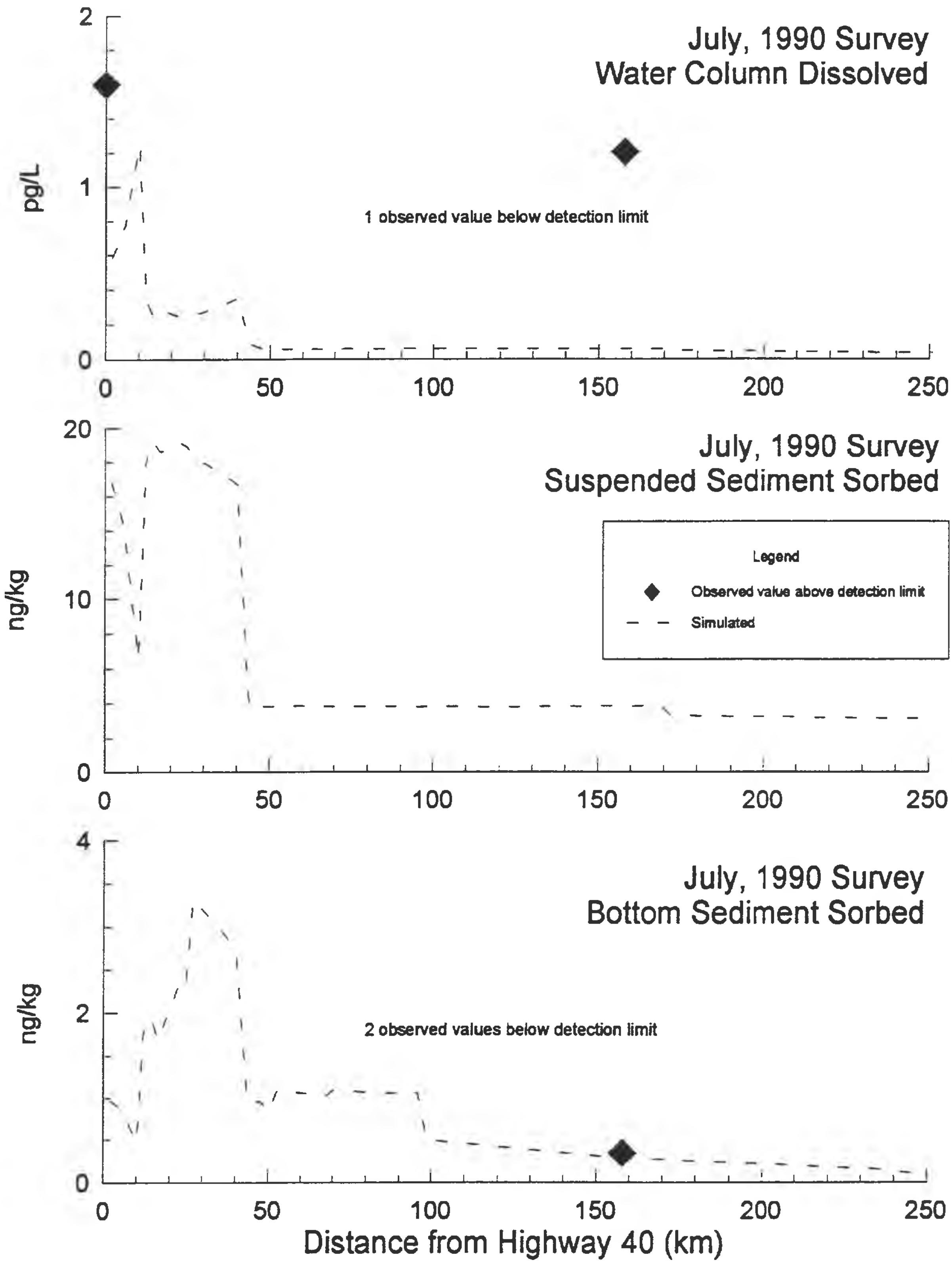

Figure 4.11a.
Wapiti/Smoky Rivers, 2,3,7,8 TCDF Calibration, Synoptic Surveys

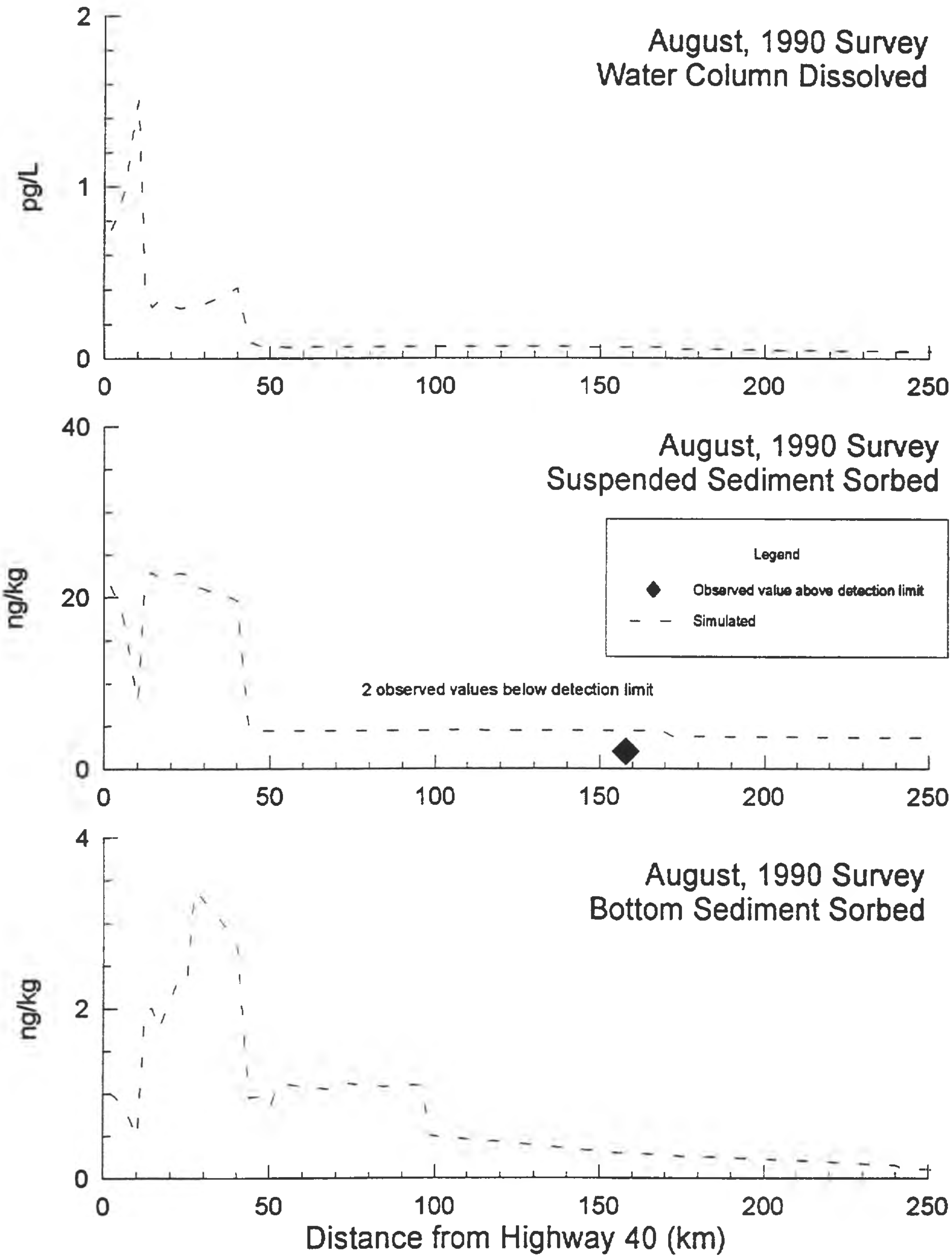

Figure 4.11b.
Wapiti/Smoky Rivers, 2,3,7,8 TCDF Calibration, Synoptic Surveys

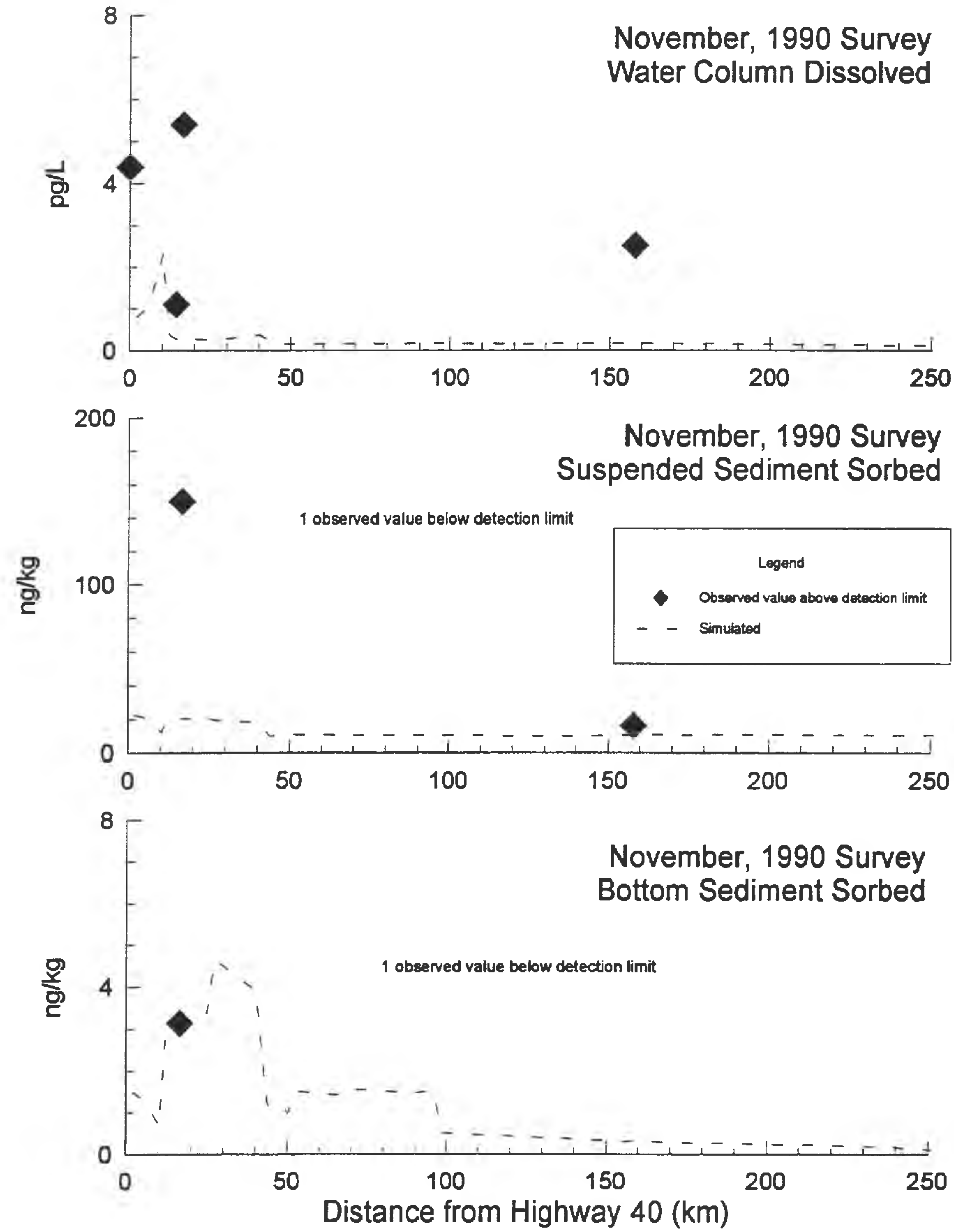

Figure 4.11c.
Wapiti/Smoky Rivers, 2,3,7,8 TCDF Calibration, Synoptic Surveys

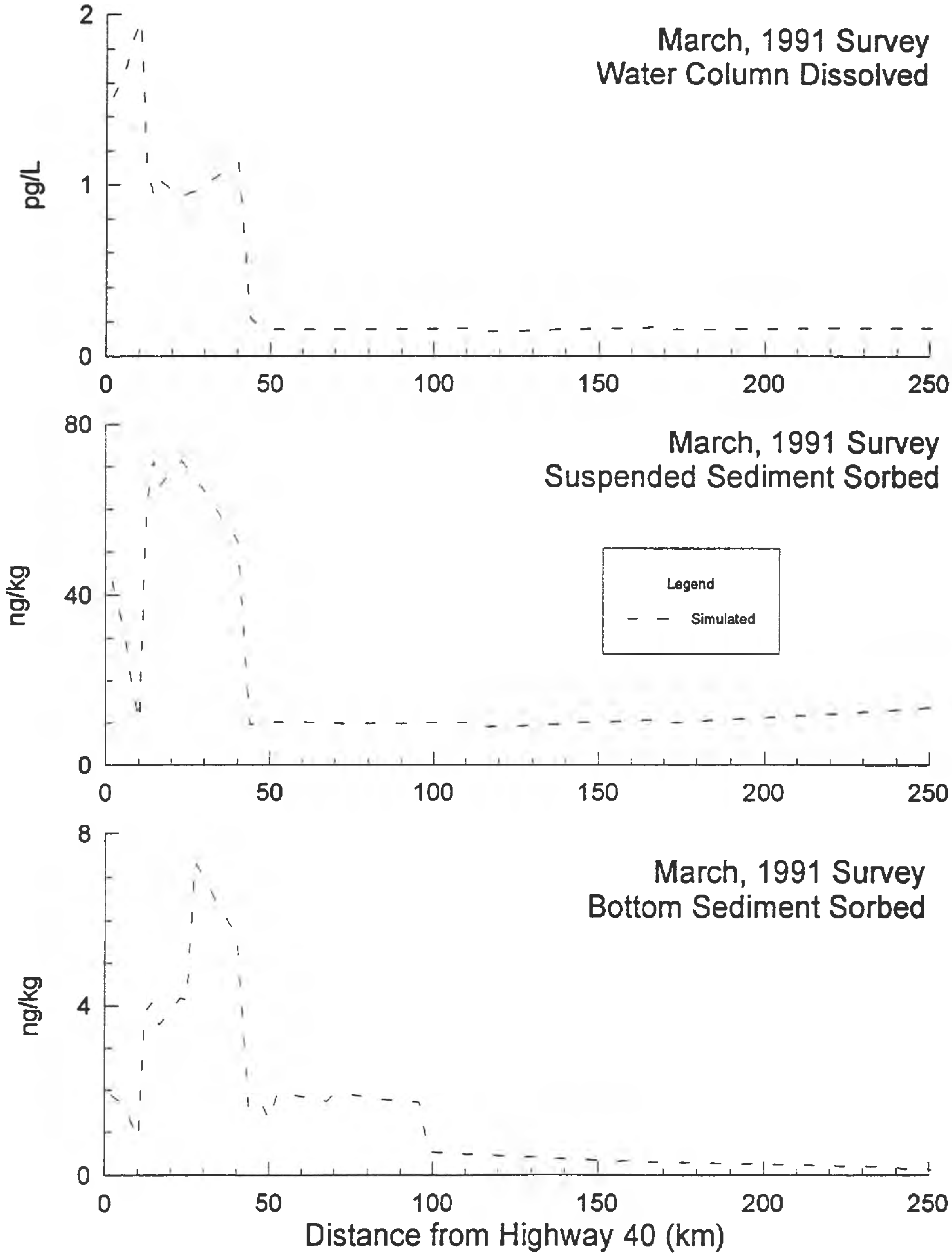

Figure 4.11d.
Wapiti/Smoky Rivers, 2,3,7,8 TCDF Calibration, Synoptic Surveys

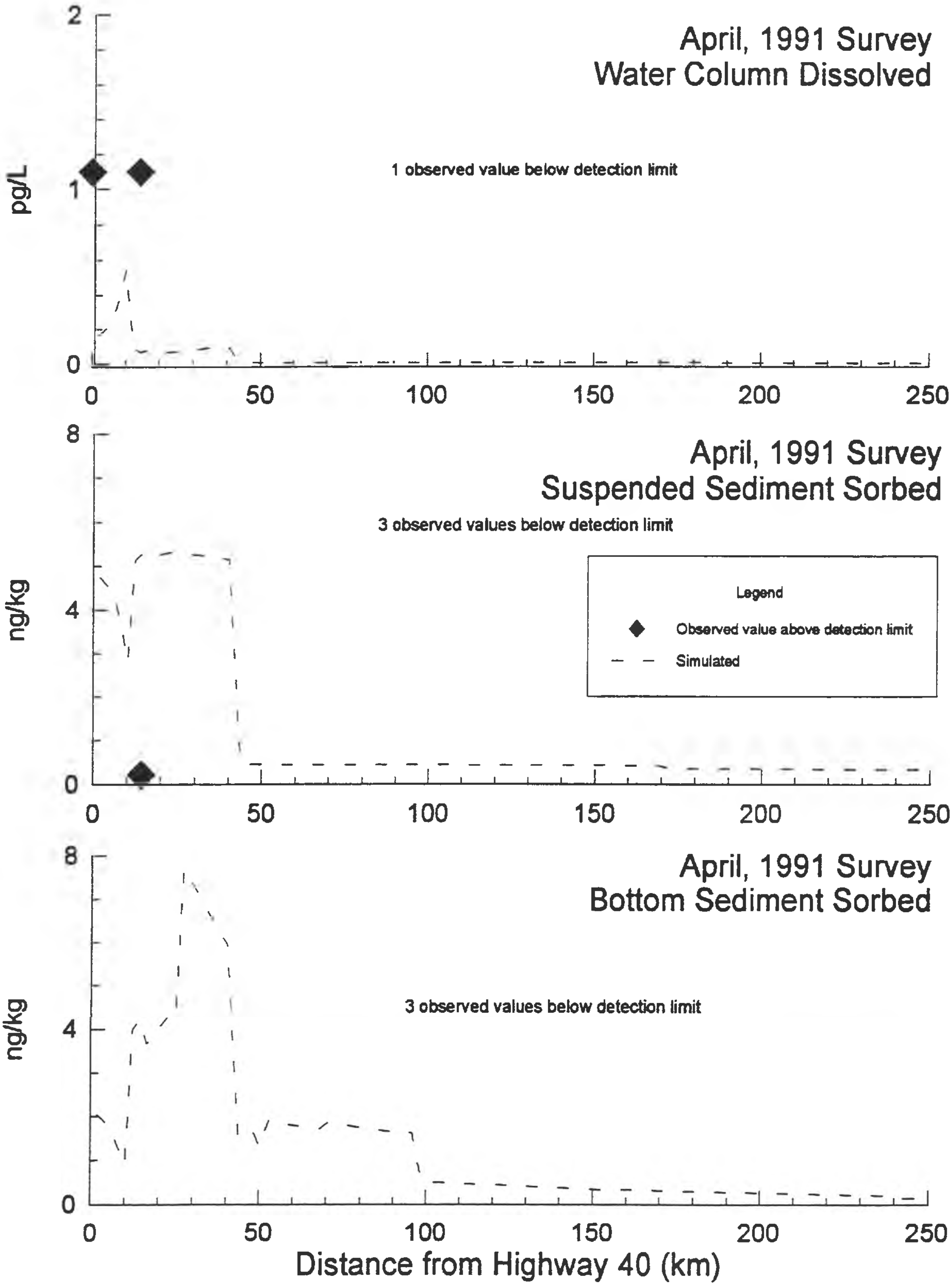

Figure 4.11e.
Wapiti/Smoky Rivers, 2,3,7,8 TCDF Calibration, Synoptic Surveys

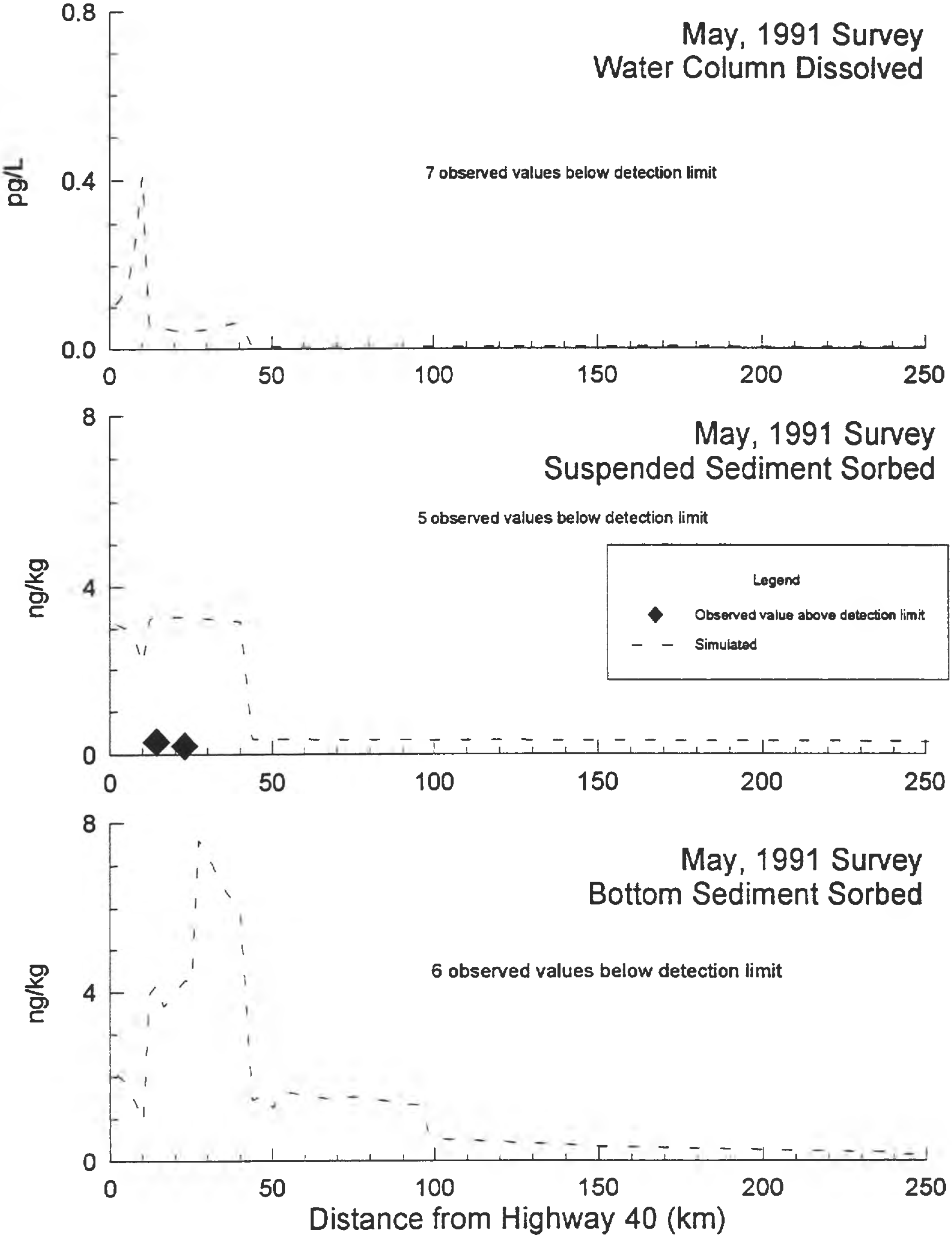

Figure 4.11f.
Wapiti/Smoky Rivers, 2,3,7,8 TCDF Calibration, Synoptic Surveys

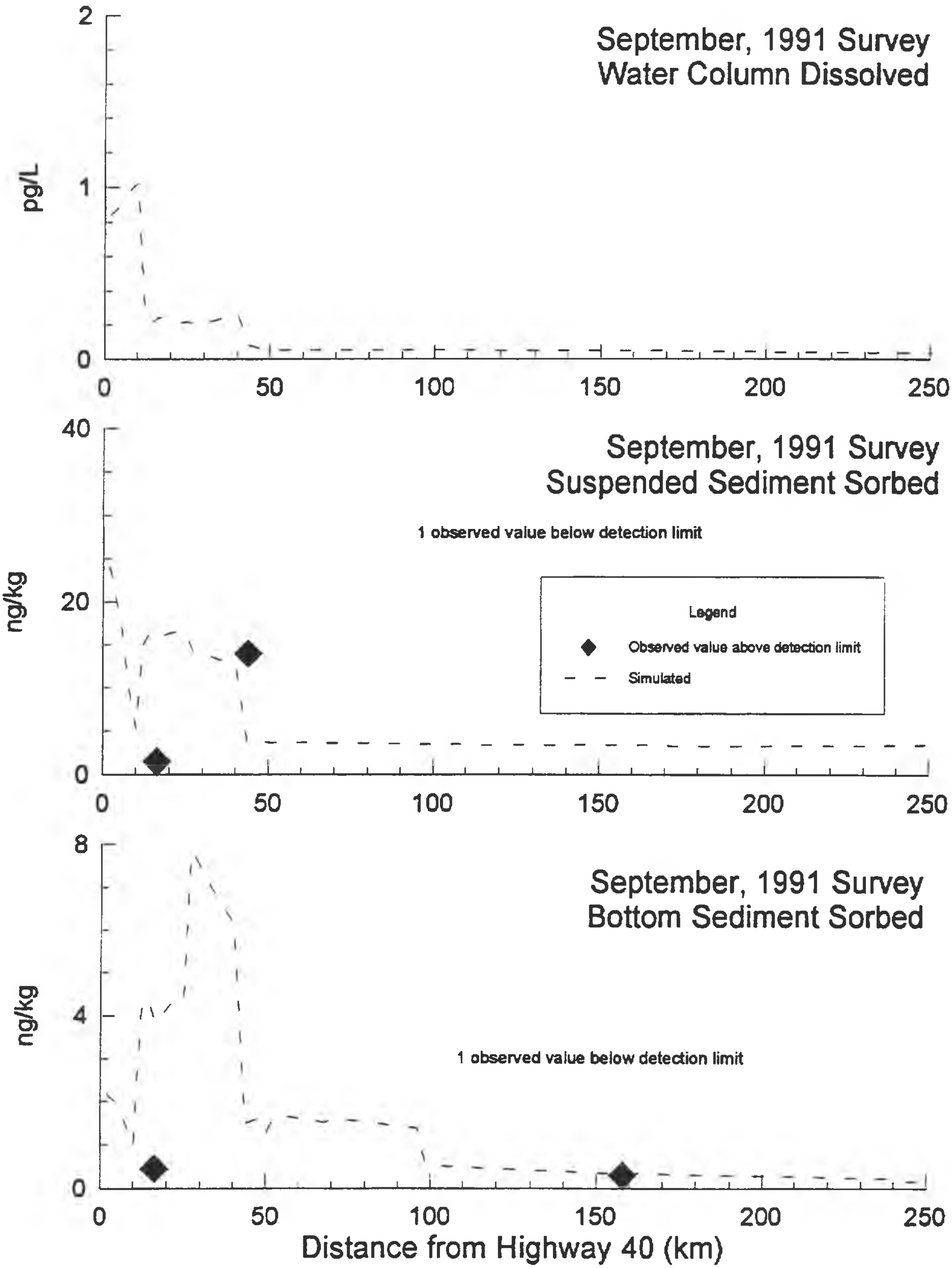

Figure 4.11g.
Wapiti/Smoky Rivers, 2,3,7,8 TCDF Calibration, Synoptic Surveys

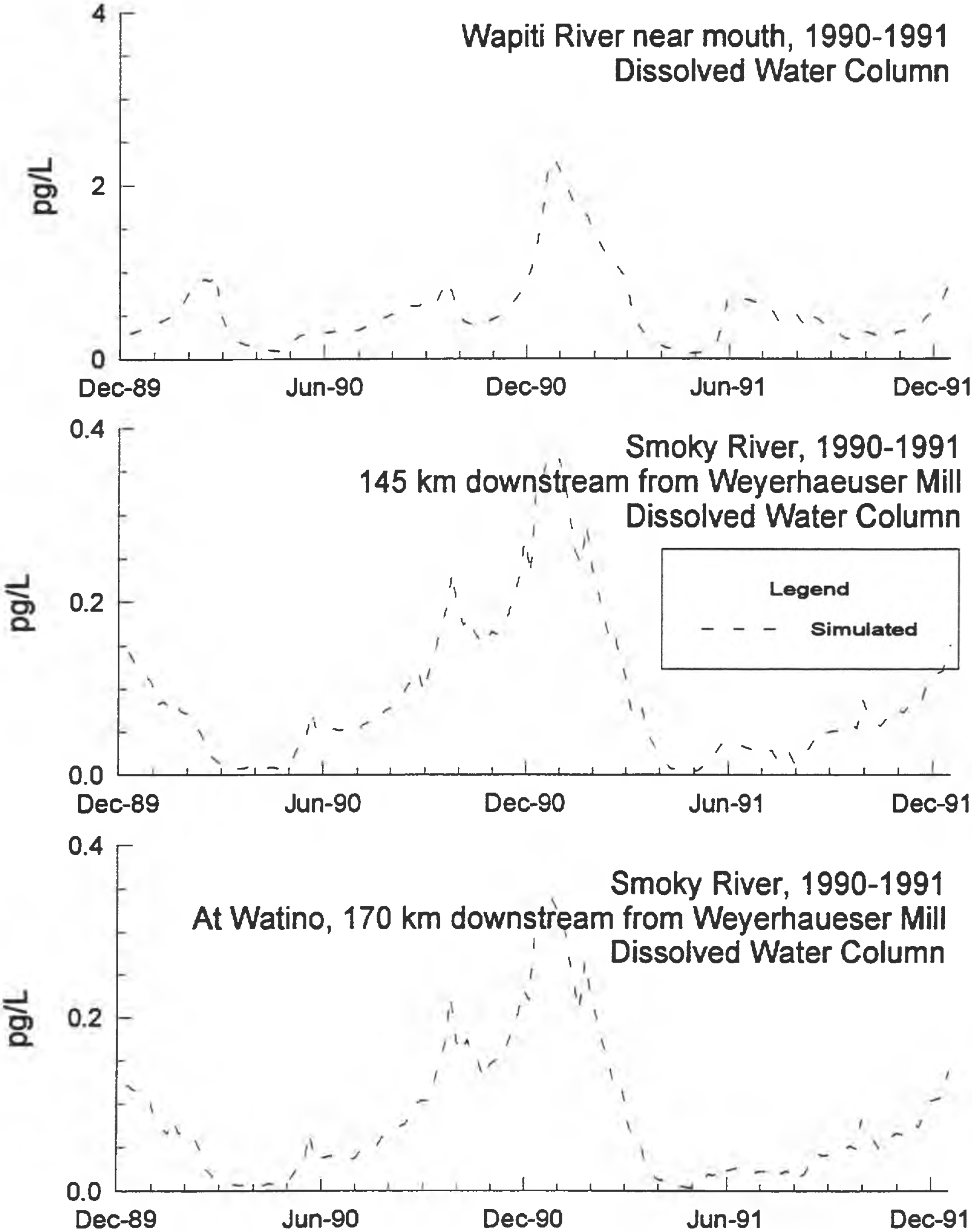

Figure 4.12a.
Wapiti/Smoky Rivers, 2,3,7,8 TCDF Calibration, Time Series

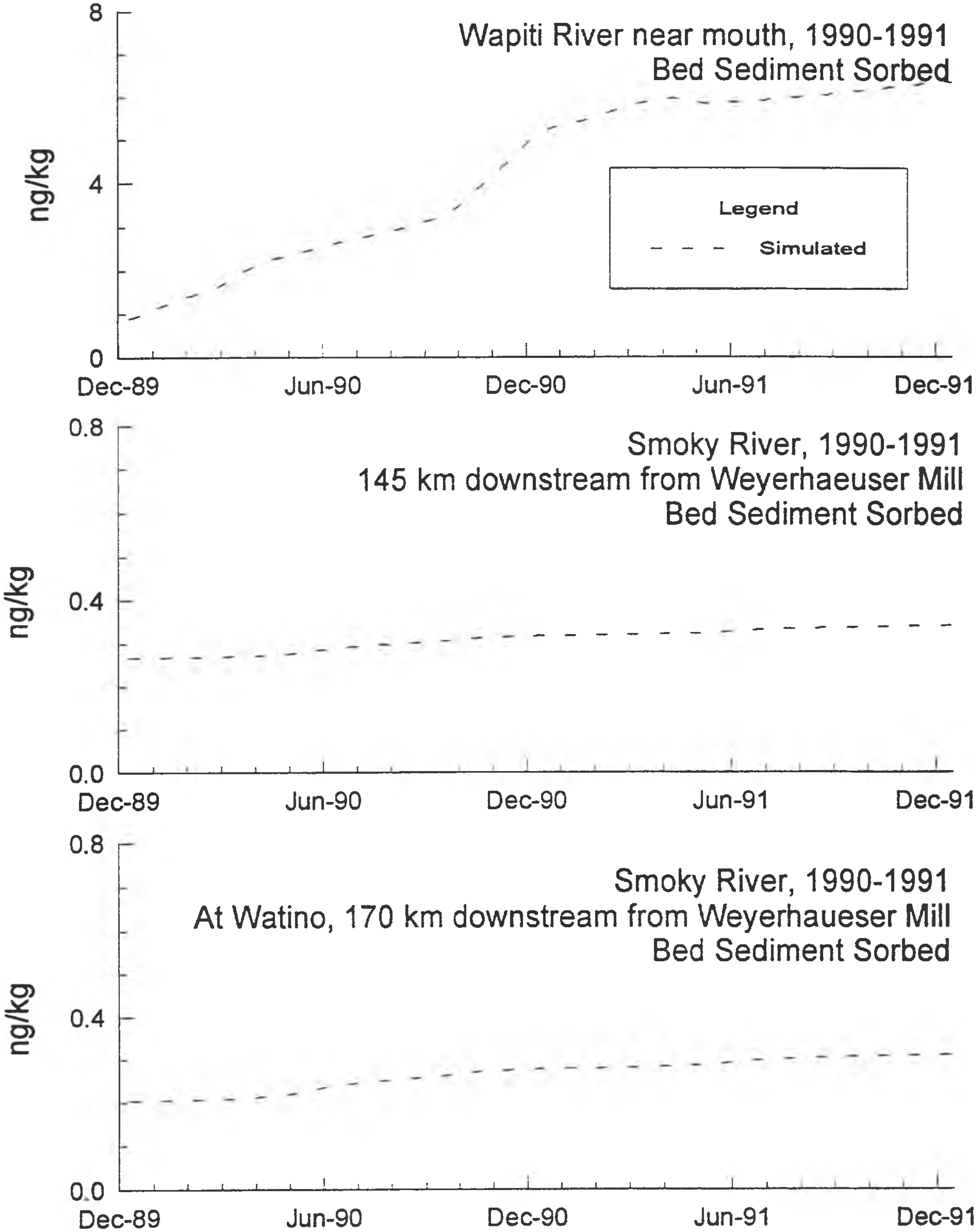

Figure 4.12b.
Wapiti/Smoky Rivers, 2,3,7,8 TCDF Calibration, Time Series

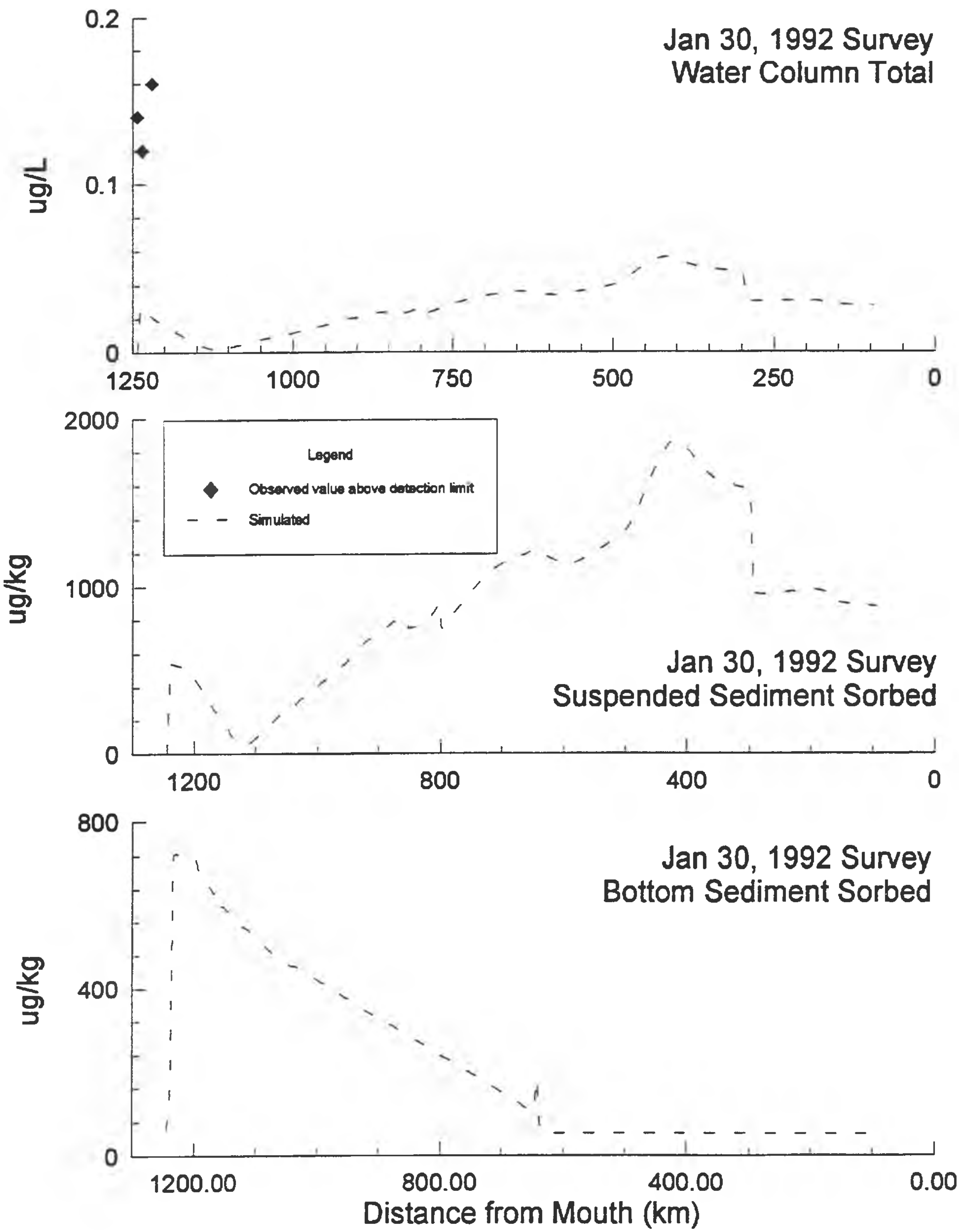

Figure 4.13a.
Athabasca River, DHA Calibration, Synoptic Surveys

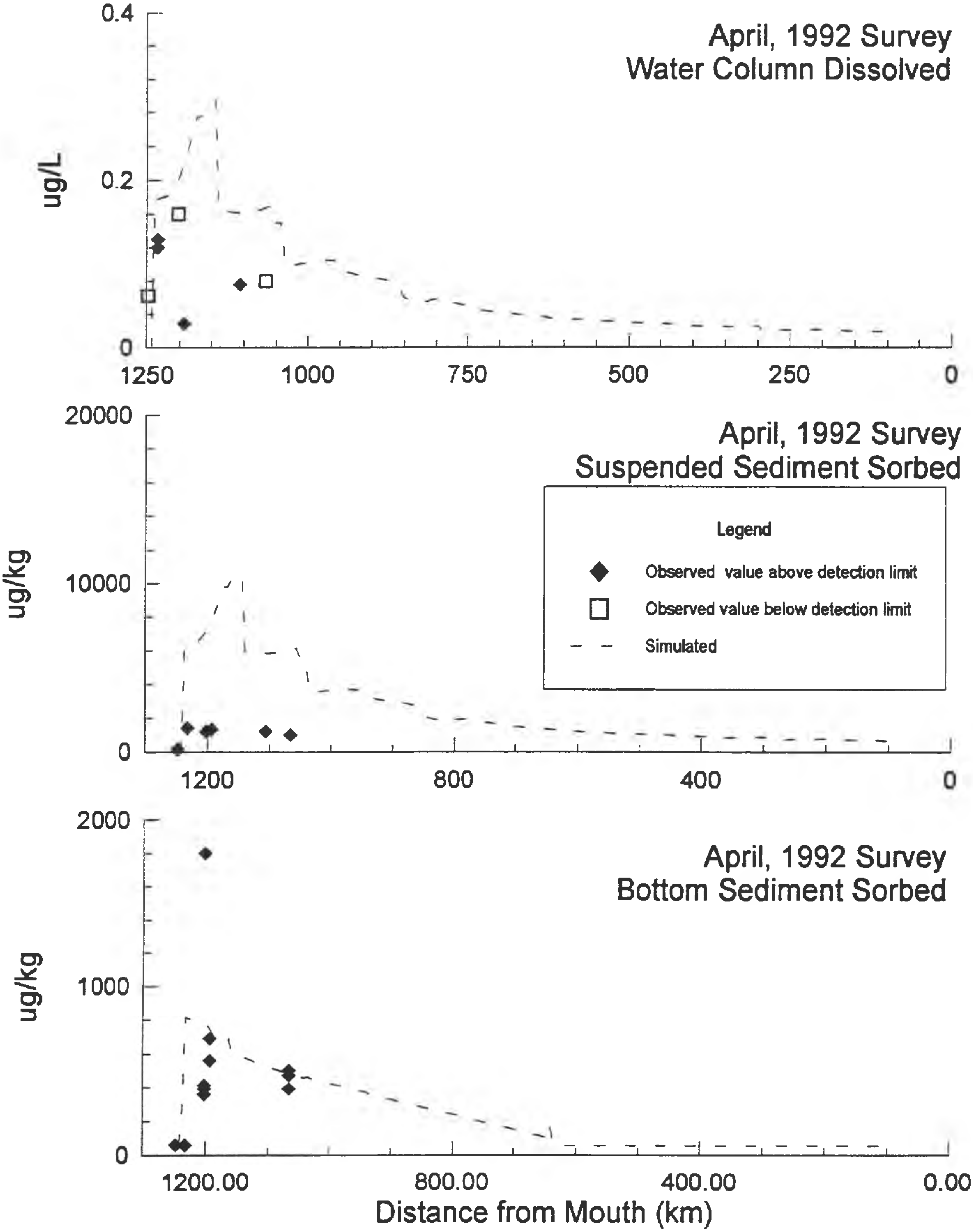

Figure 4.13b.
Athabasca River, DHA Calibration, Synoptic Surveys

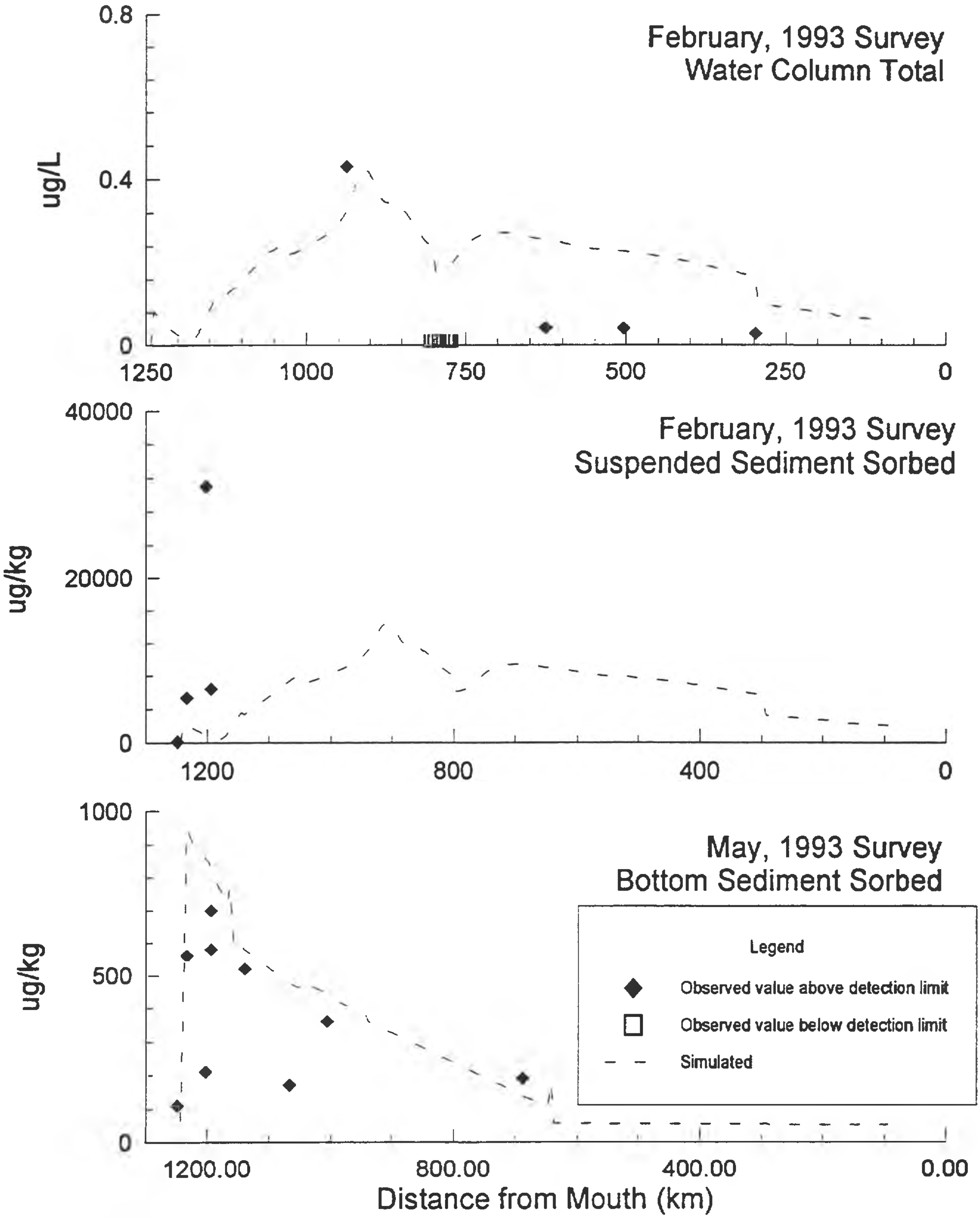

Figure 4.13c.
Athabasca River, DHA Calibration, Synoptic Surveys

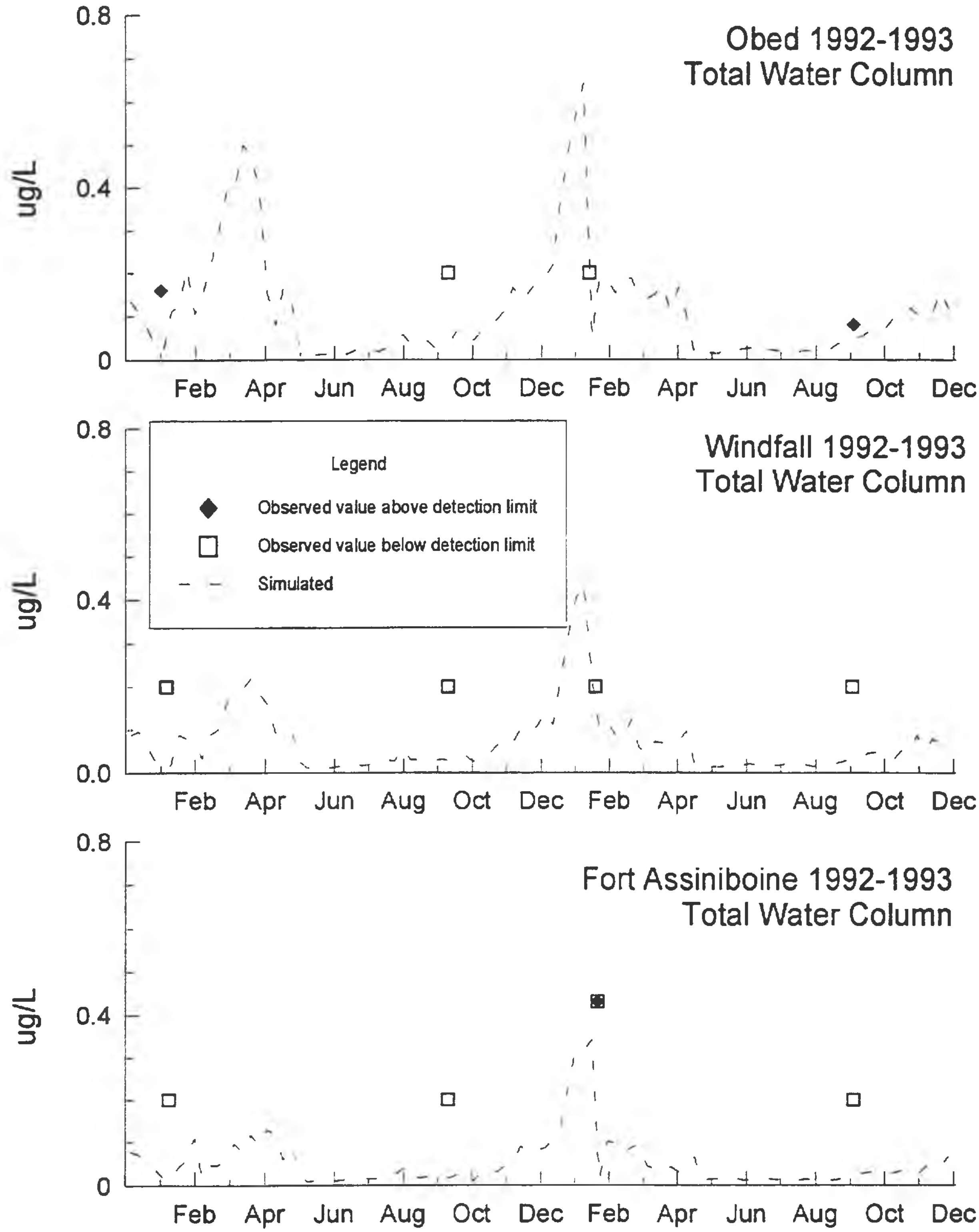

Figure 4.14a.
Athabasca River, DHA Calibration, Time Series

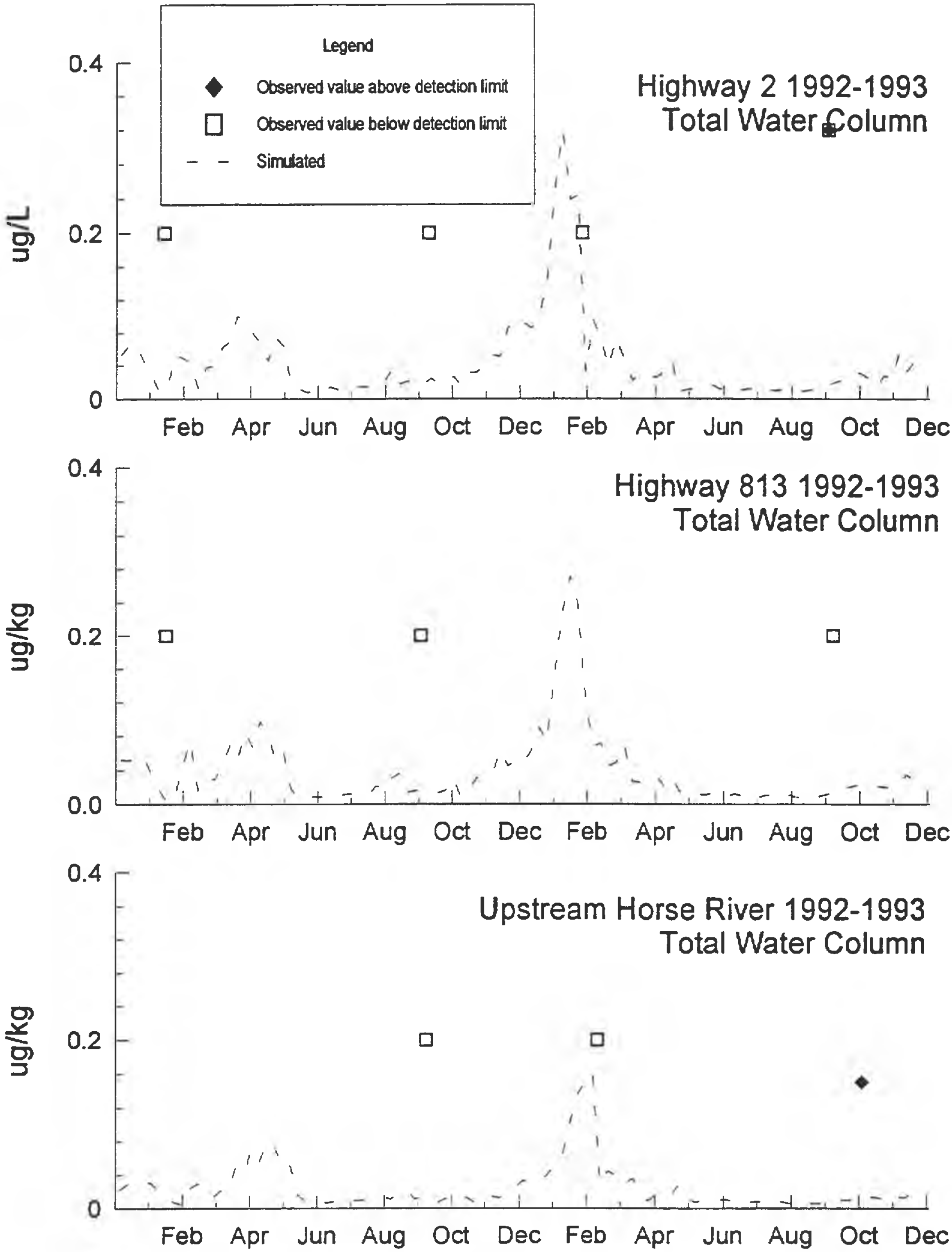

Figure 4.14b.
Athabasca River, DHA Calibration, Time Series

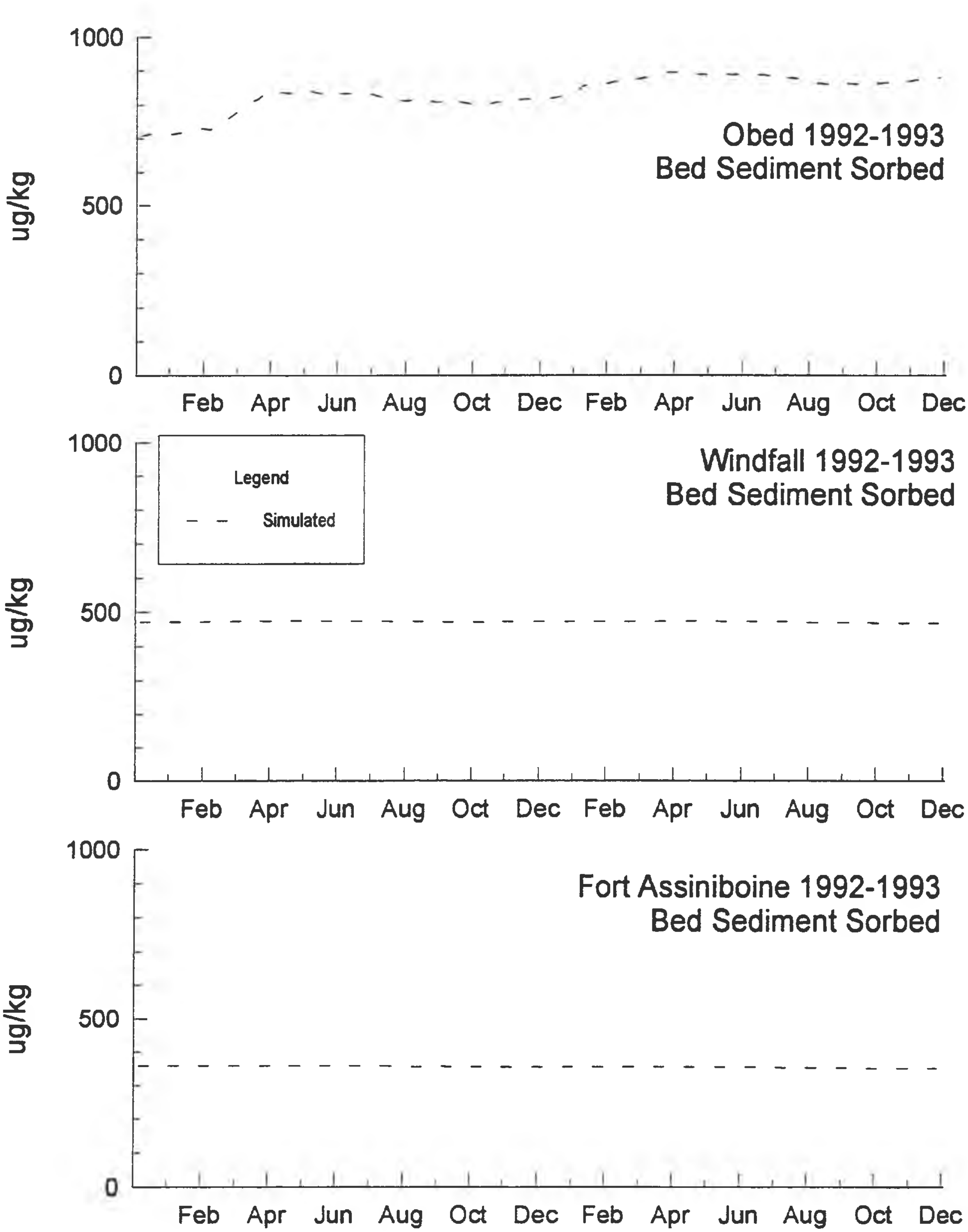

Figure 4.14c.
Athabasca River, DHA Calibration, Time Series

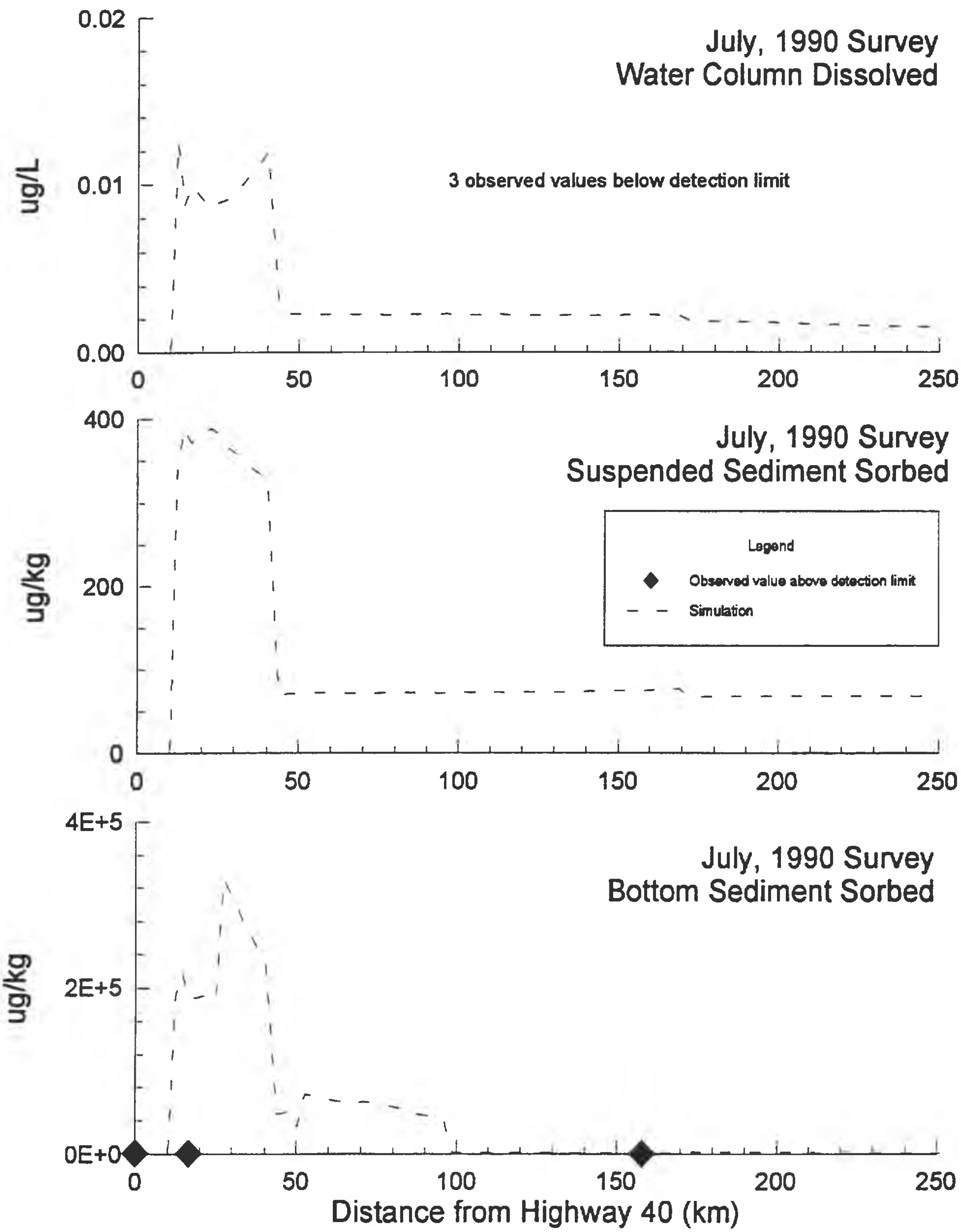

Figure 4.15a.
Wapiti/Smoky Rivers, DHA Calibration, Synoptic Surveys

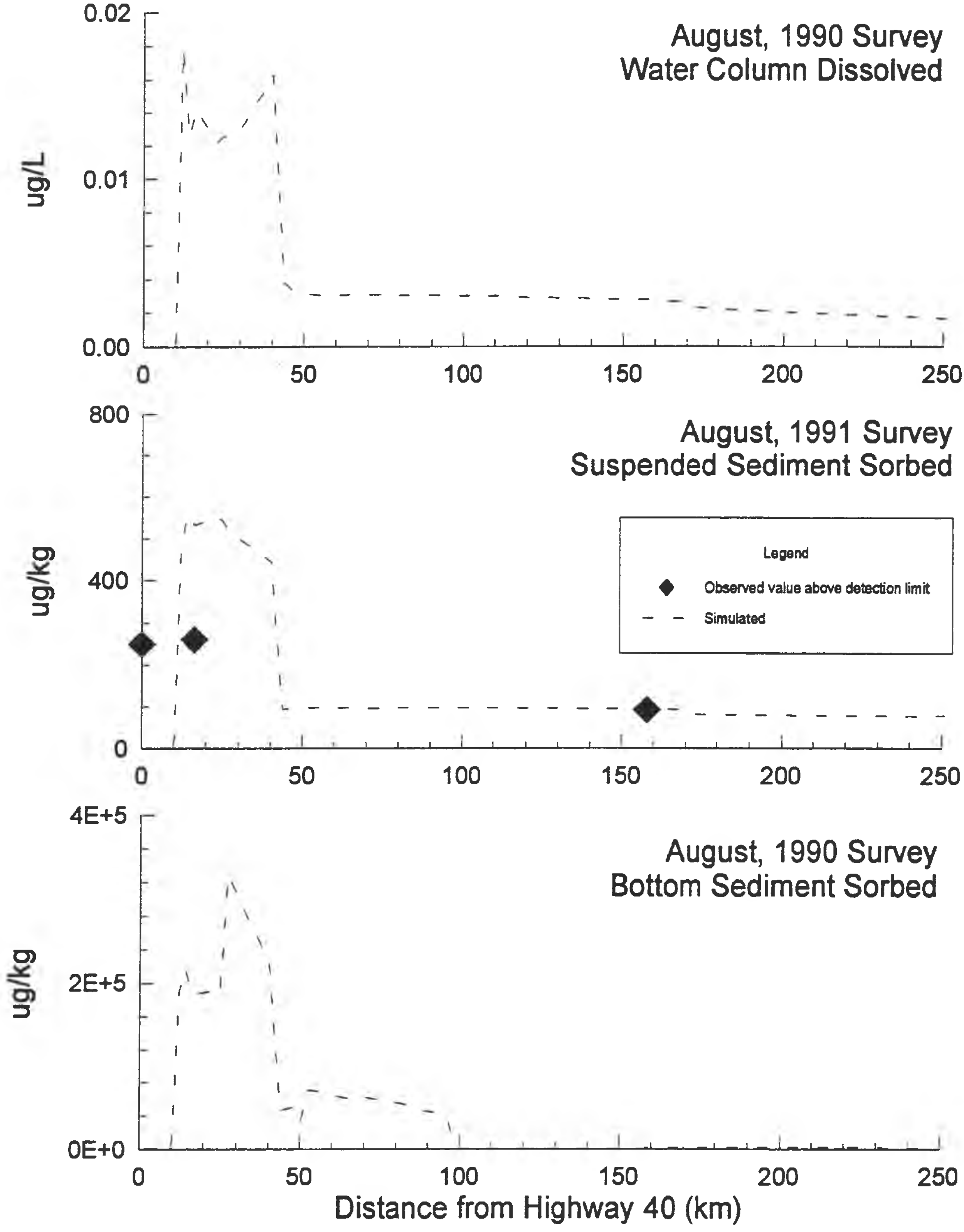

Figure 4.15b.
Wapiti/Smoky Rivers, DHA Calibration, Synoptic Surveys

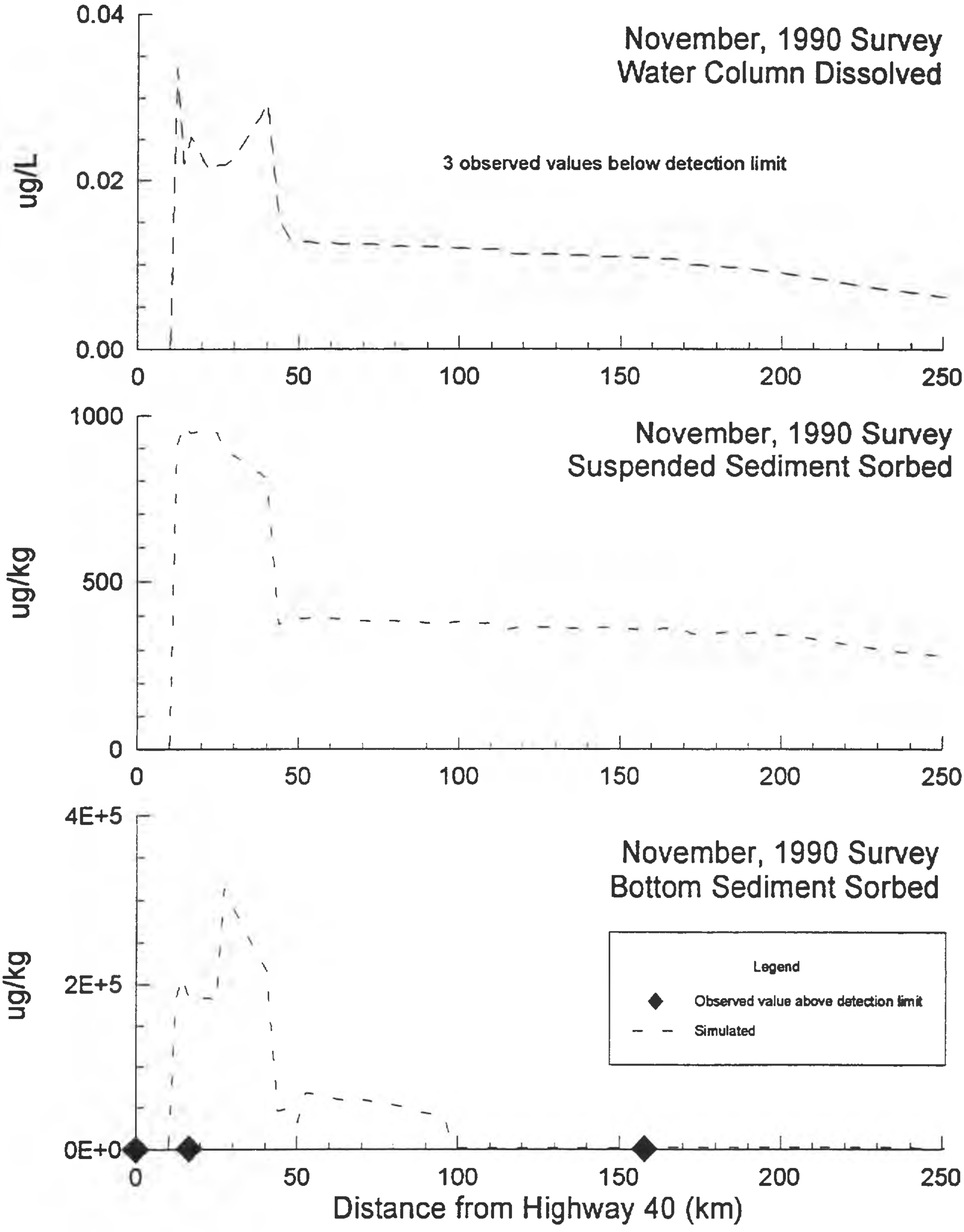

Figure 4.15c.
Wapiti/Smoky Rivers, DHA Calibration, Synoptic Surveys

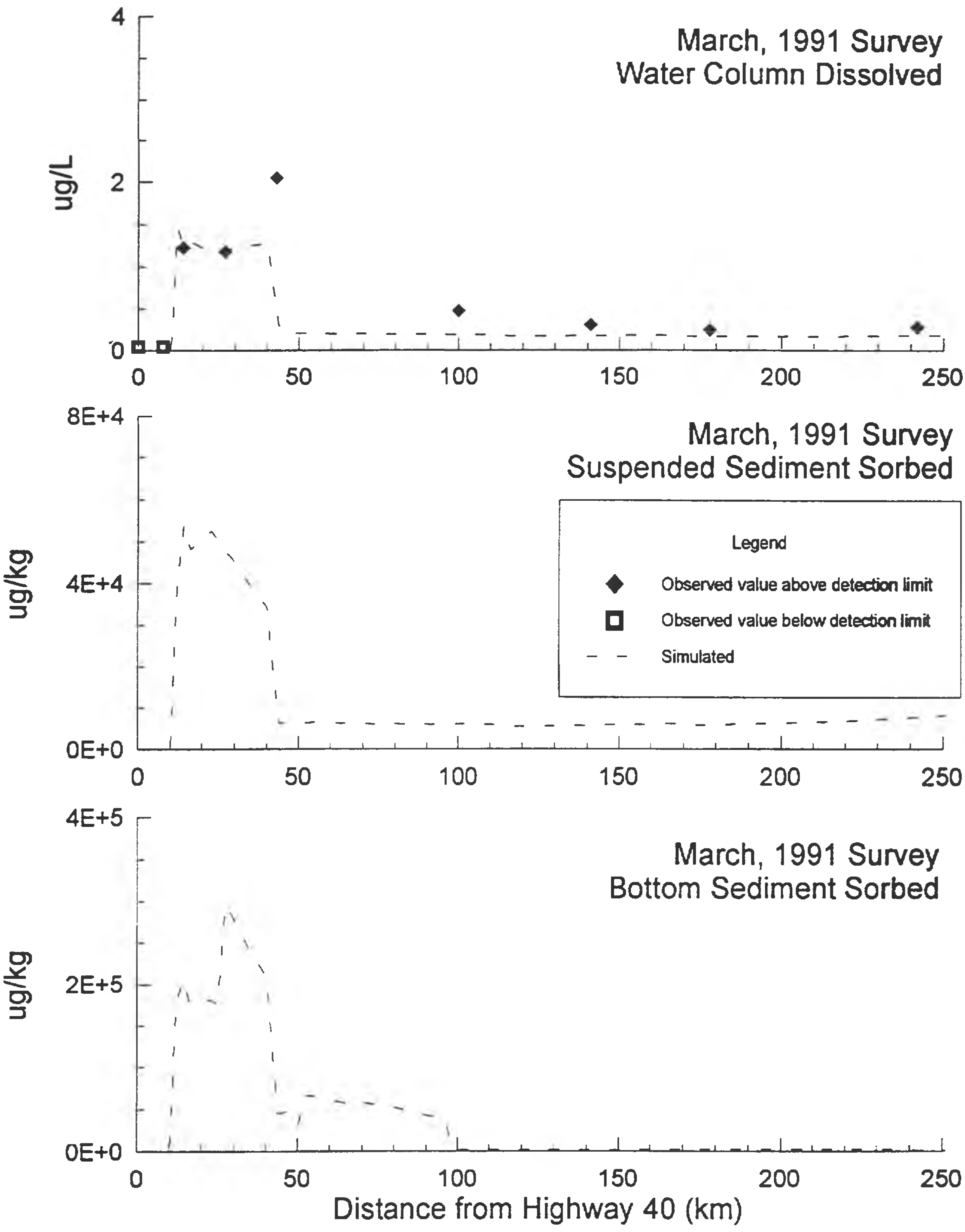

Figure 4.15d.
Wapiti/Smoky Rivers, DHA Calibration, Synoptic Surveys

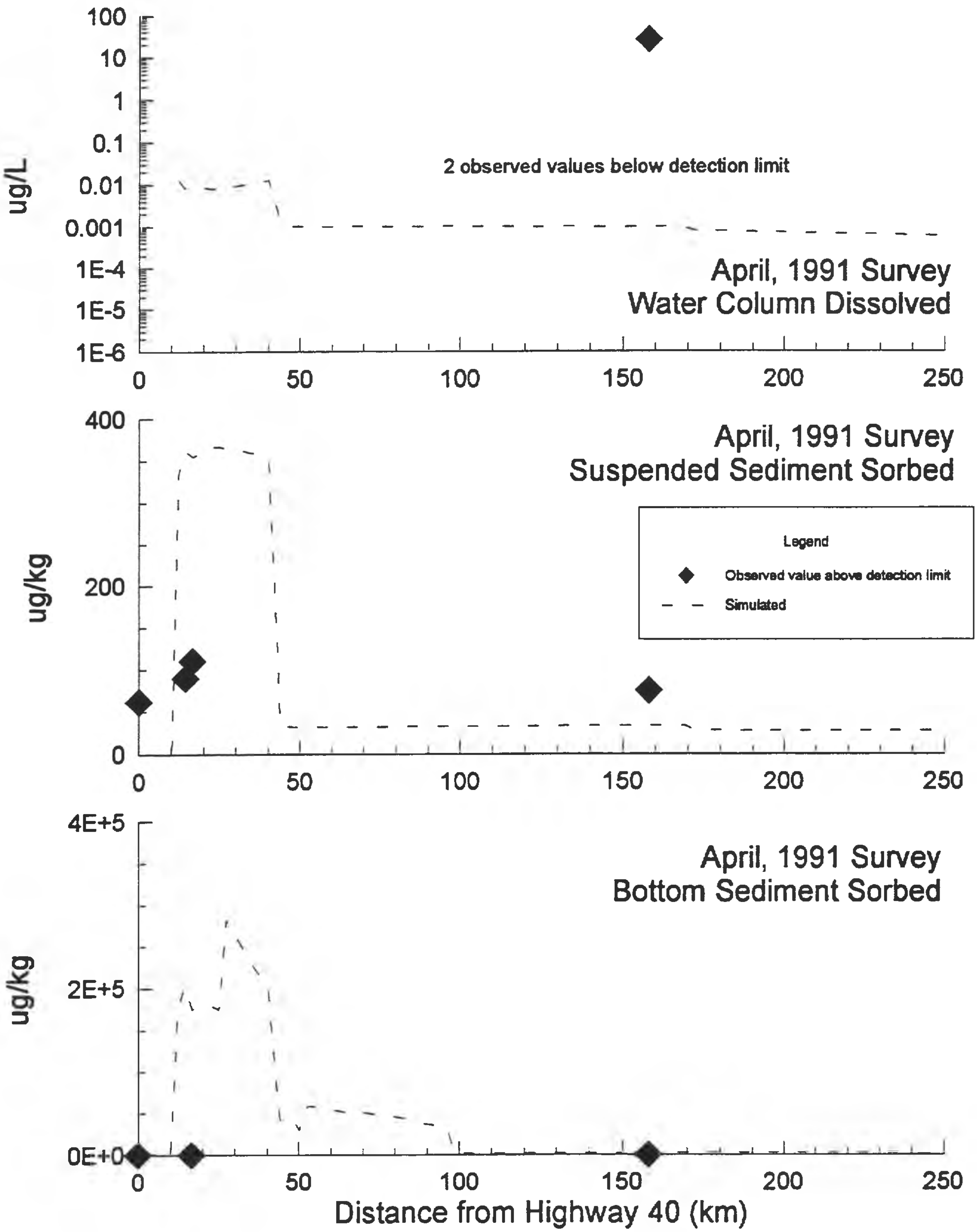

Figure 4.15e.
Wapiti/Smoky Rivers, DHA Calibration, Synoptic Surveys

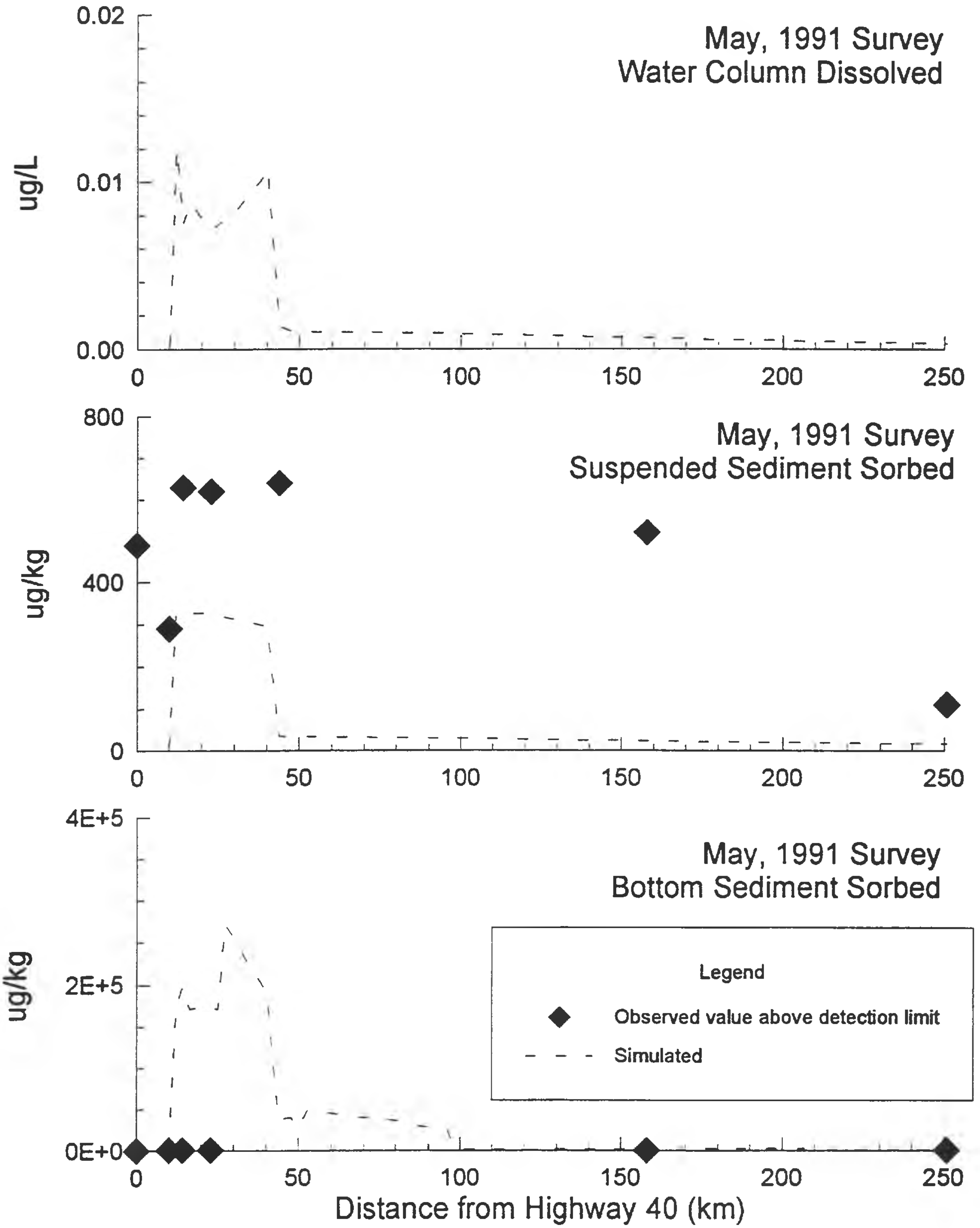

Figure 4.15f.
Wapiti/Smoky Rivers, DHA Calibration, Synoptic Surveys

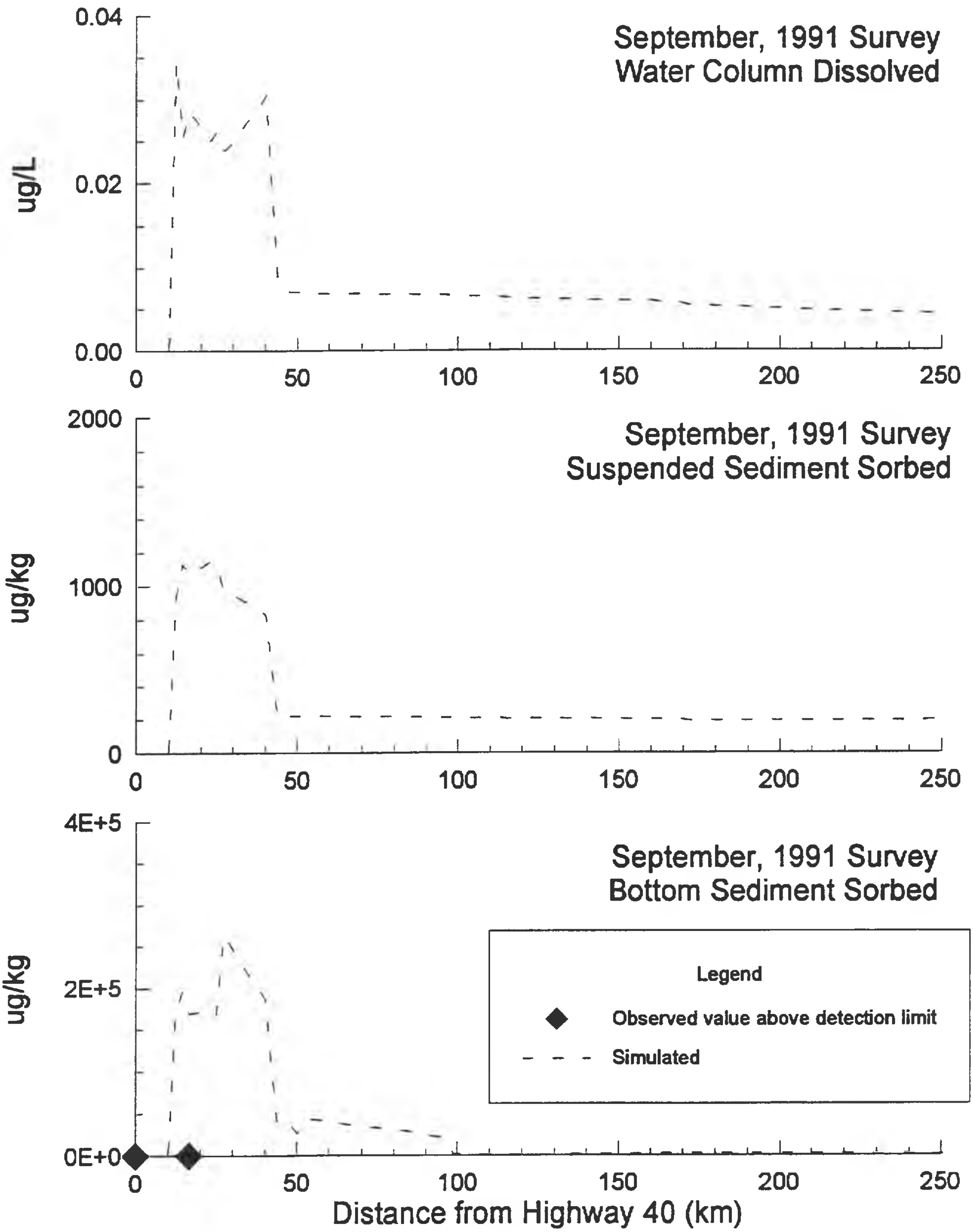

Figure 4.15g.
Wapiti/Smoky Rivers, DHA Calibration, Synoptic Surveys

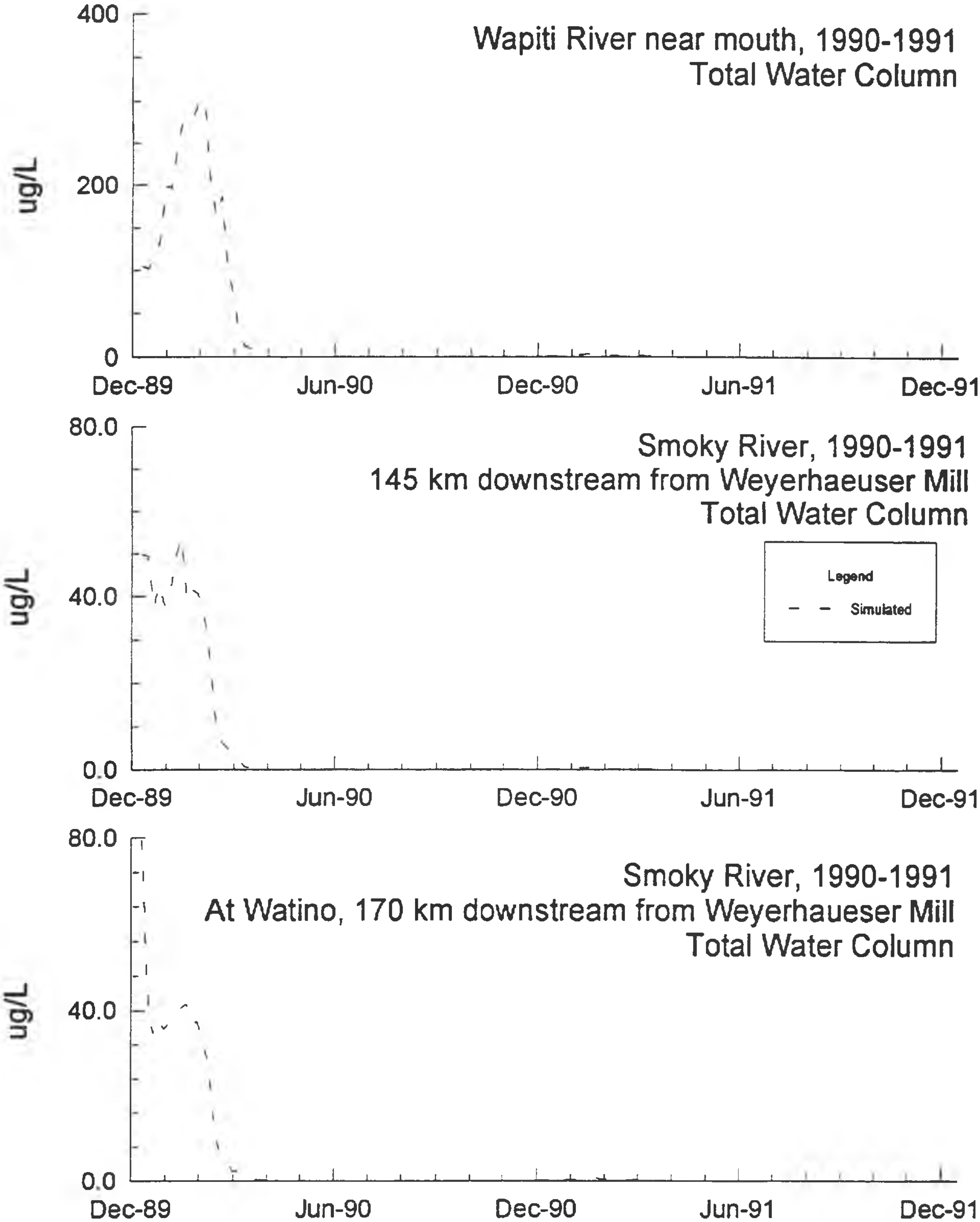

Figure 4.16a.
Wapiti/Smoky Rivers, DHA Calibration, Time Series

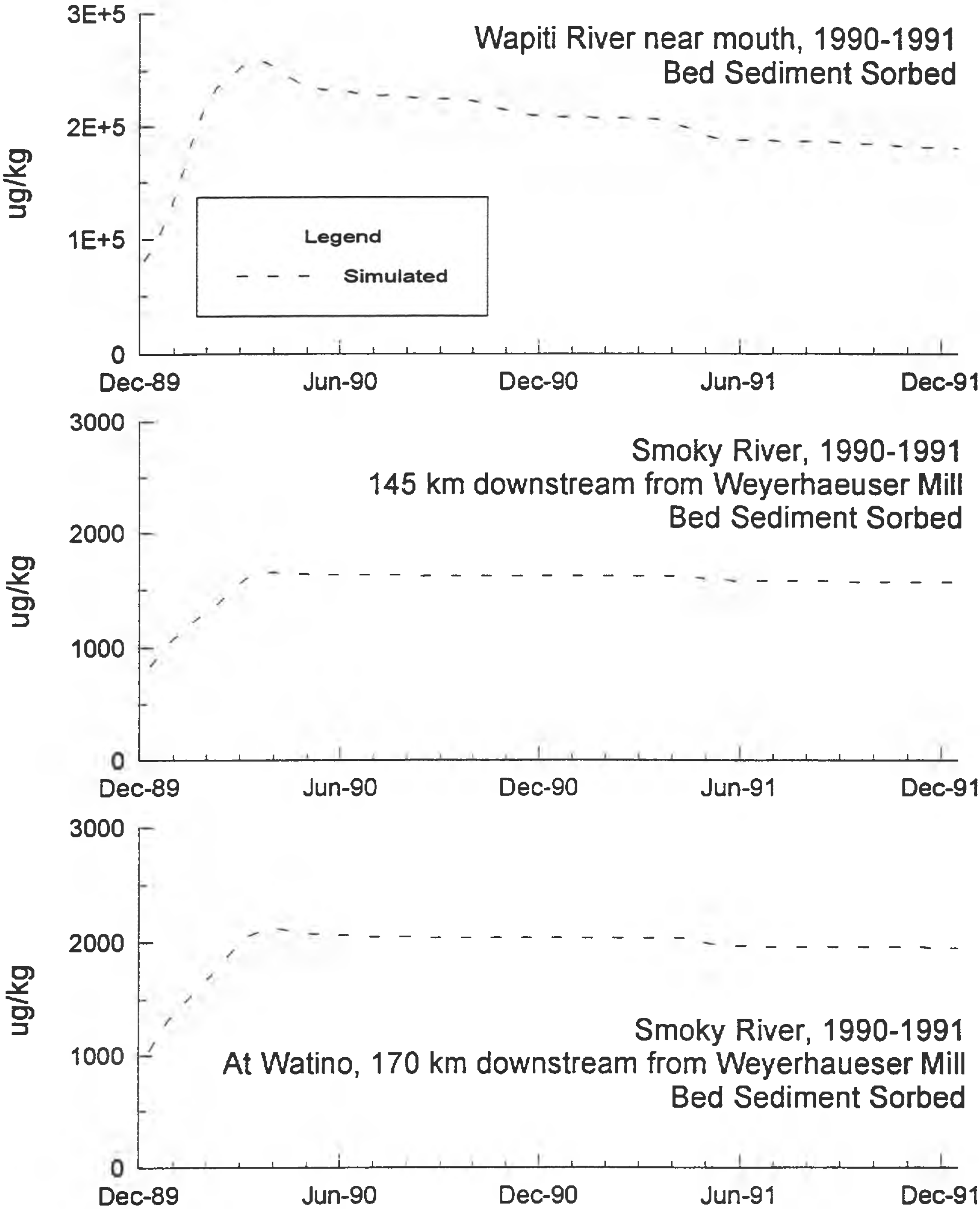

Figure 4.16b.
Wapiti/Smoky Rivers, DHA Calibration, Time Series

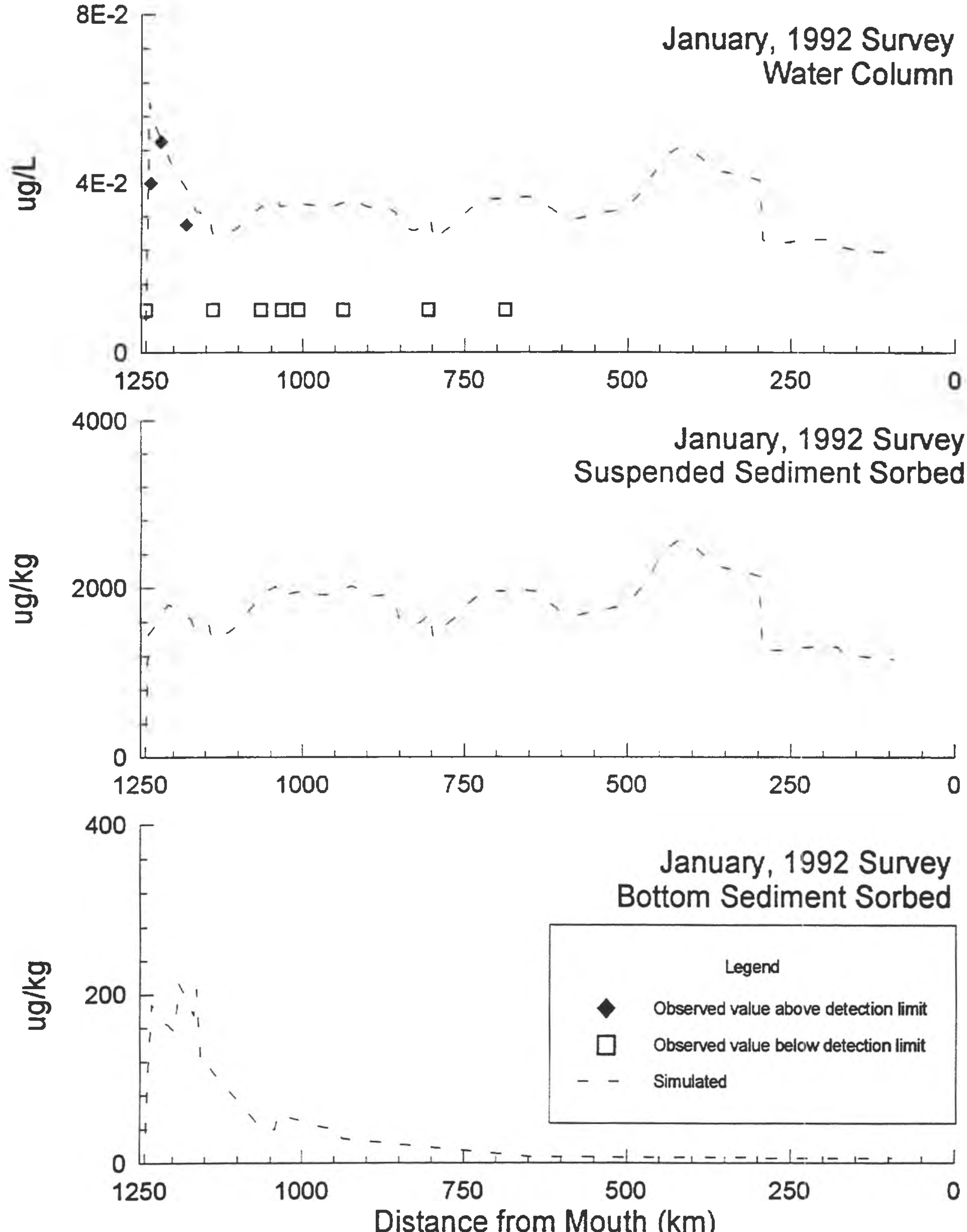

Figure 4.17a.
Athabasca River, 12,14-dichloro-DHA Calibration,
Synoptic Surveys

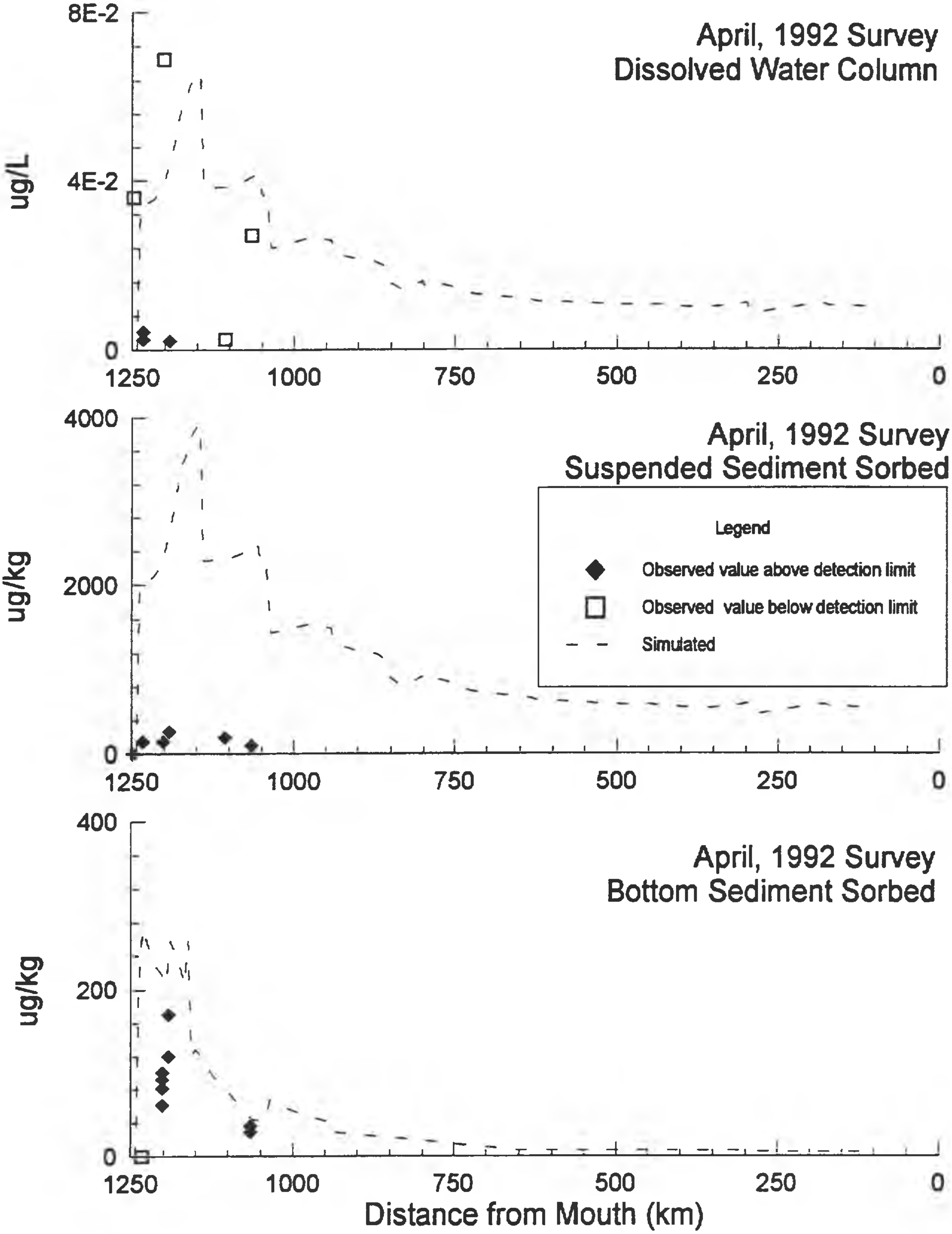

Figure 4.17b.
Athabasca River, 12,14-dichloro-DHA Calibration,
Synoptic Surveys

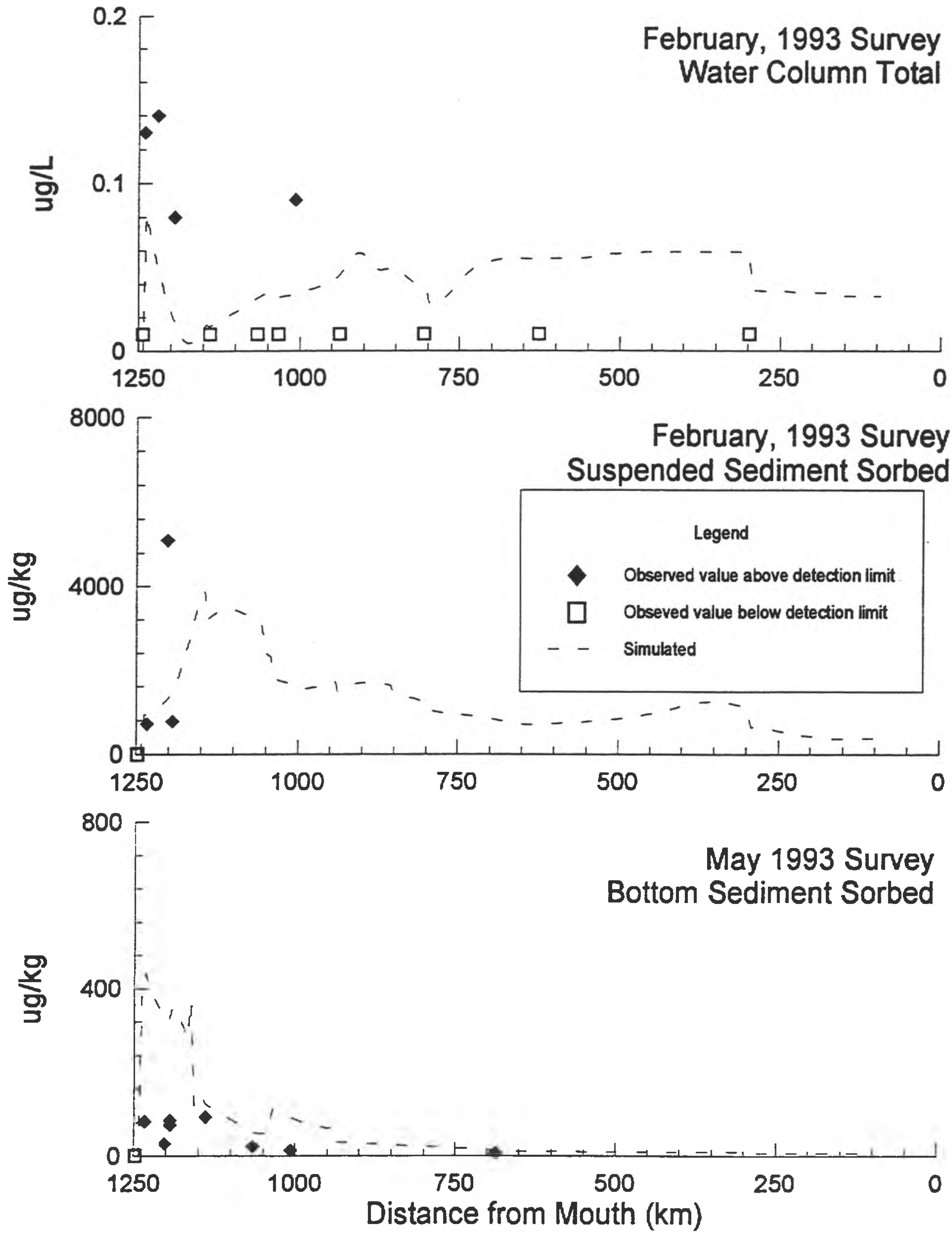

Figure 4.17c.
Athabasca River, 12,14-dichloro-DHA Calibration,
Synoptic Surveys

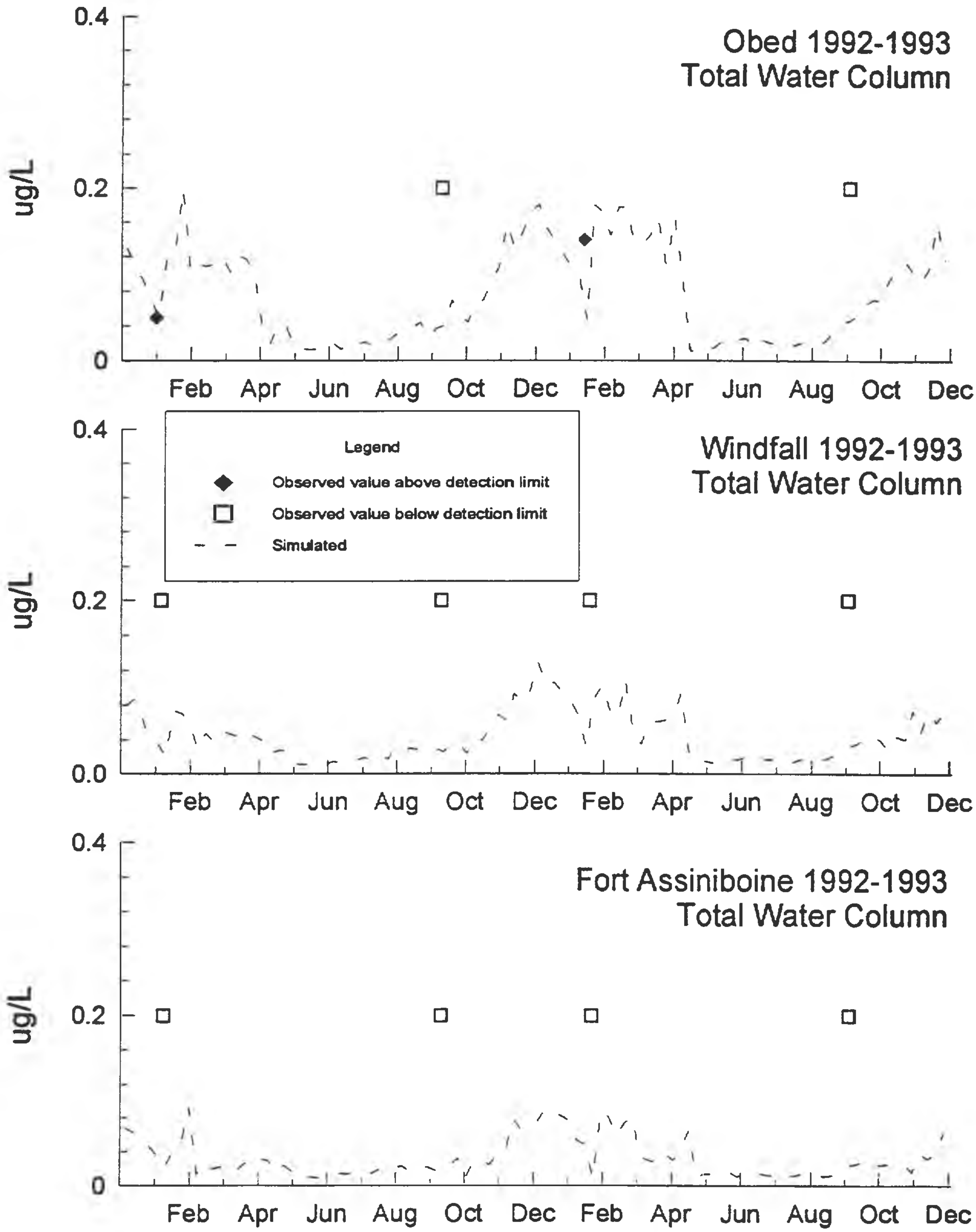

Figure 4.18a.
Athabasca River, 12,14-dichloro-DHA Calibration,
Time Series

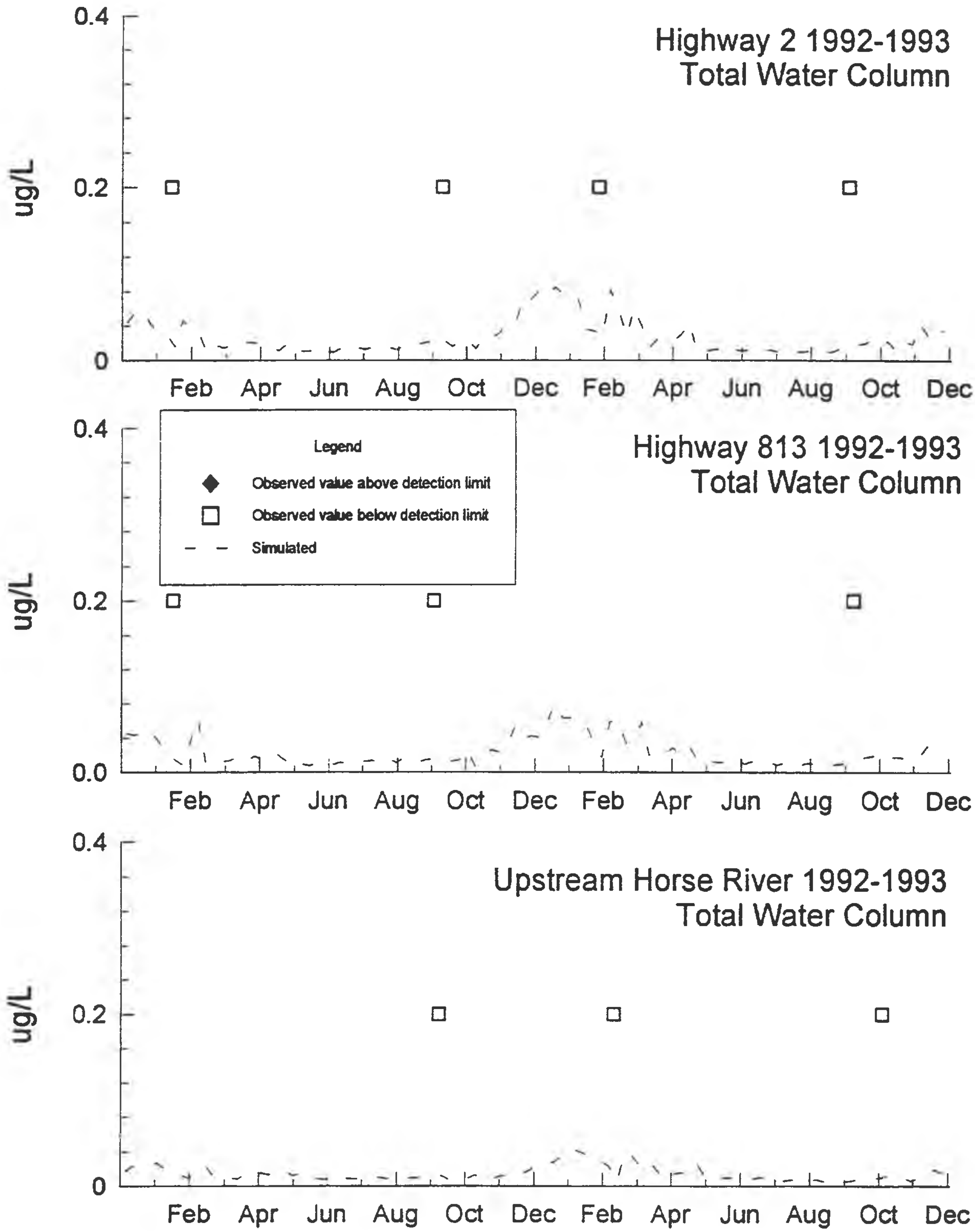

Figure 4.18b.
Athabasca River, 12,14-dichloro-DHA Calibration,
Time Series

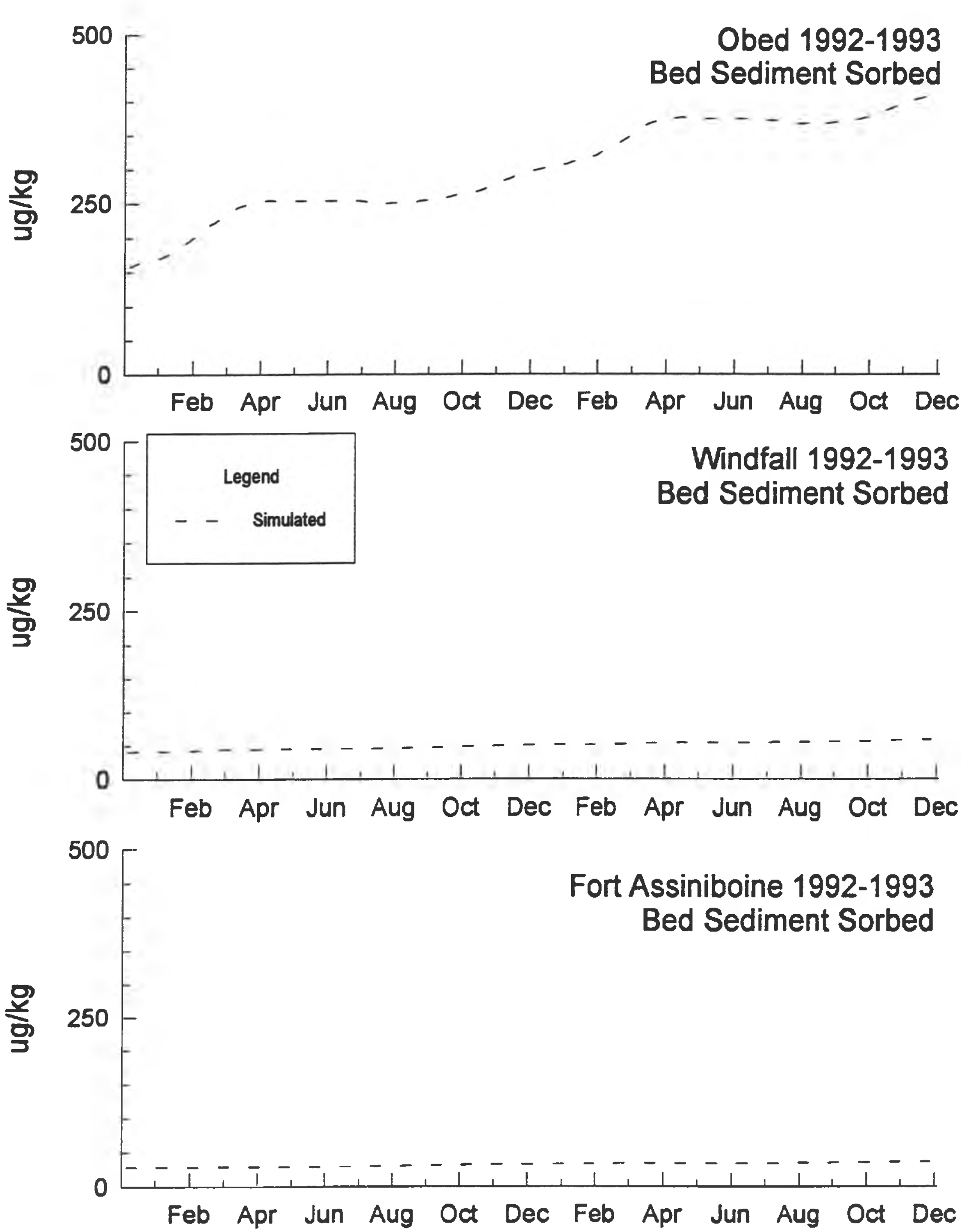

Figure 4.18c.
Athabasca River, 12,14-dichloro-DHA Calibration, Time Series

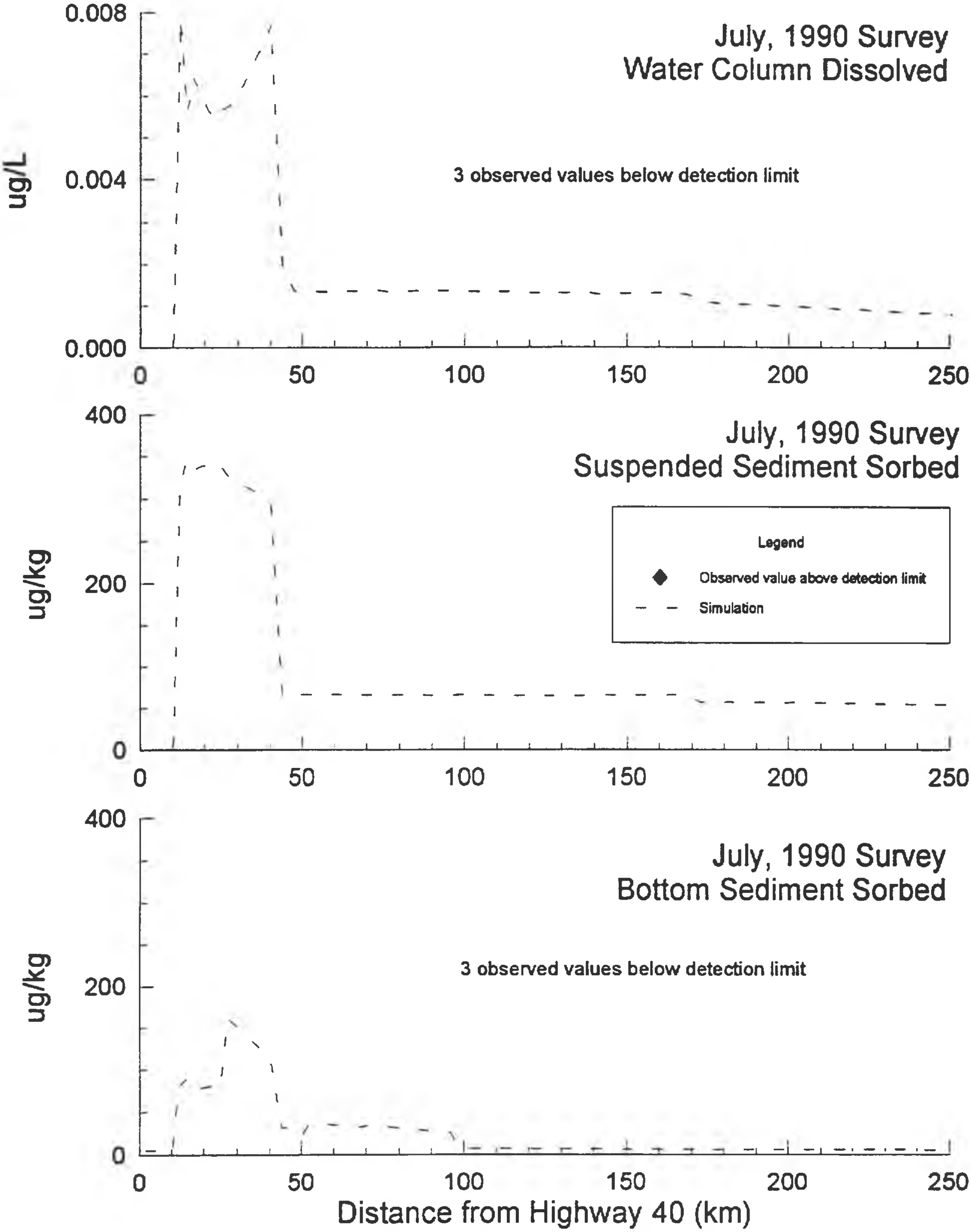

Figure 4.19a.
Wapiti/Smoky Rivers, 12,14 DichloroDHA Calibration, Synoptic Surveys

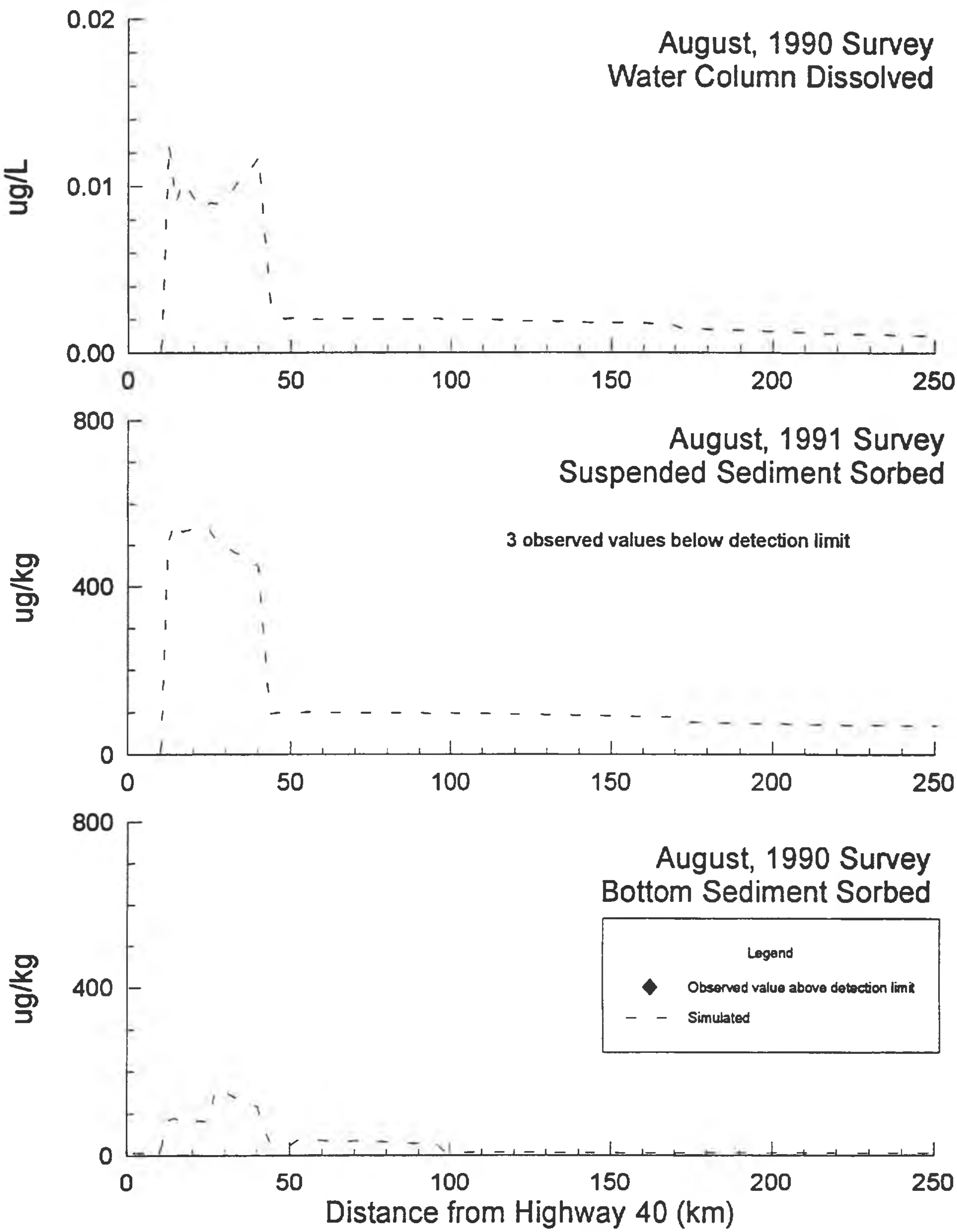

Figure 4.19b.
Wapiti/Smoky Rivers, 12,14 DichloroDHA Calibration, Synoptic Surveys

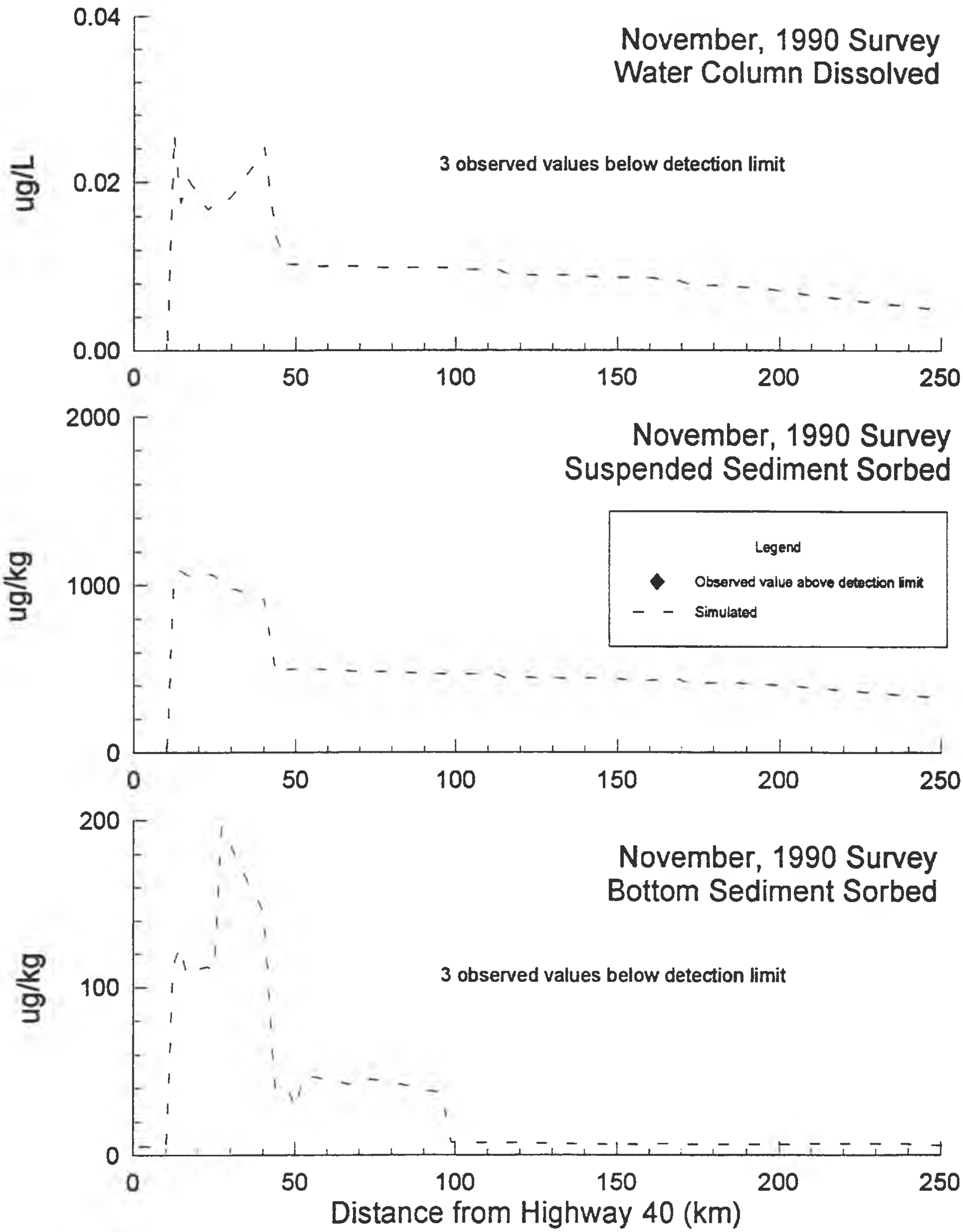

Figure 4.19c.
Wapiti/Smoky Rivers, 12,14 DichloroDHA Calibration, Synoptic Surveys

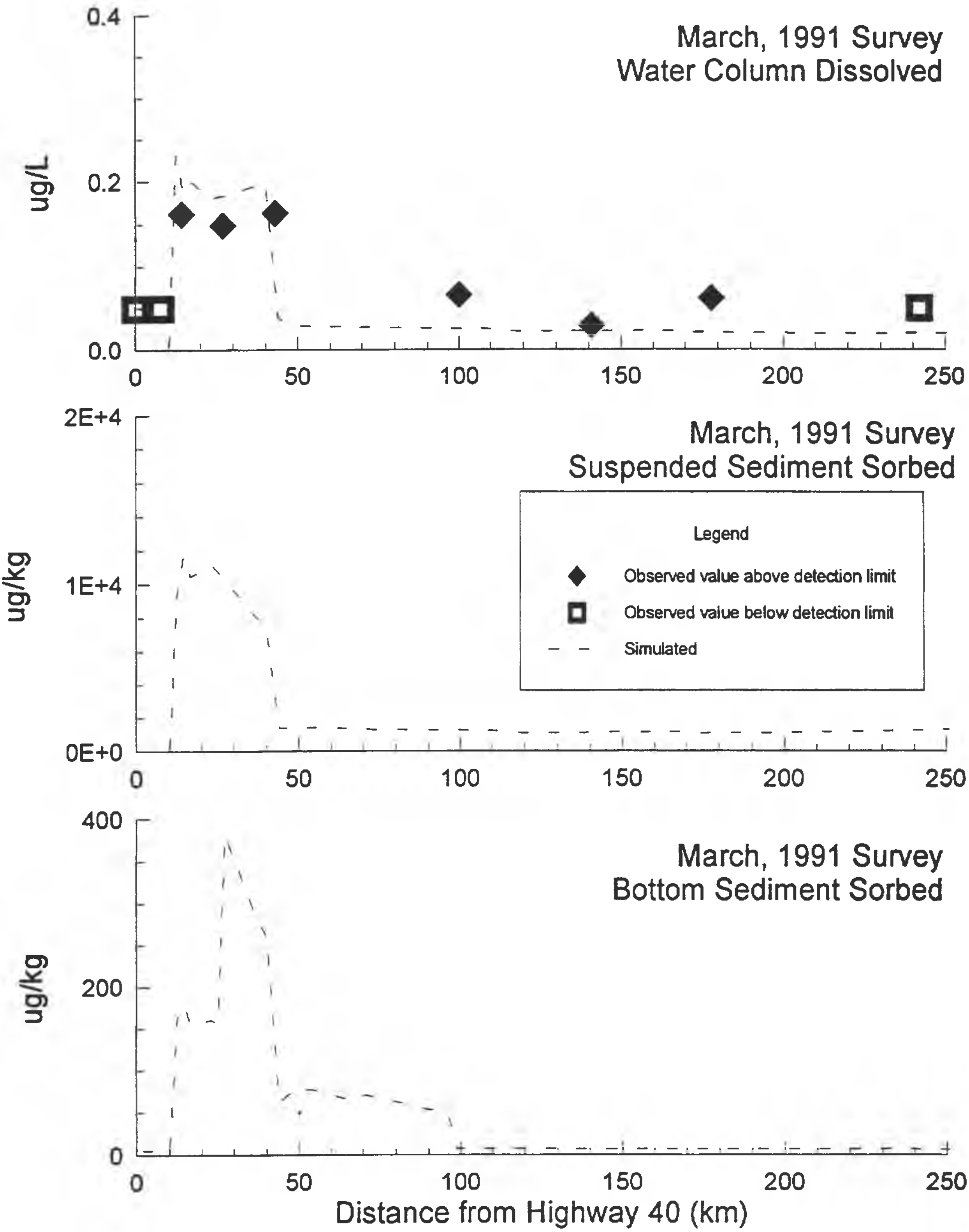

Figure 4.19d.
Wapiti/Smoky Rivers, 12,14 DichloroDHA Calibration, Synoptic Surveys

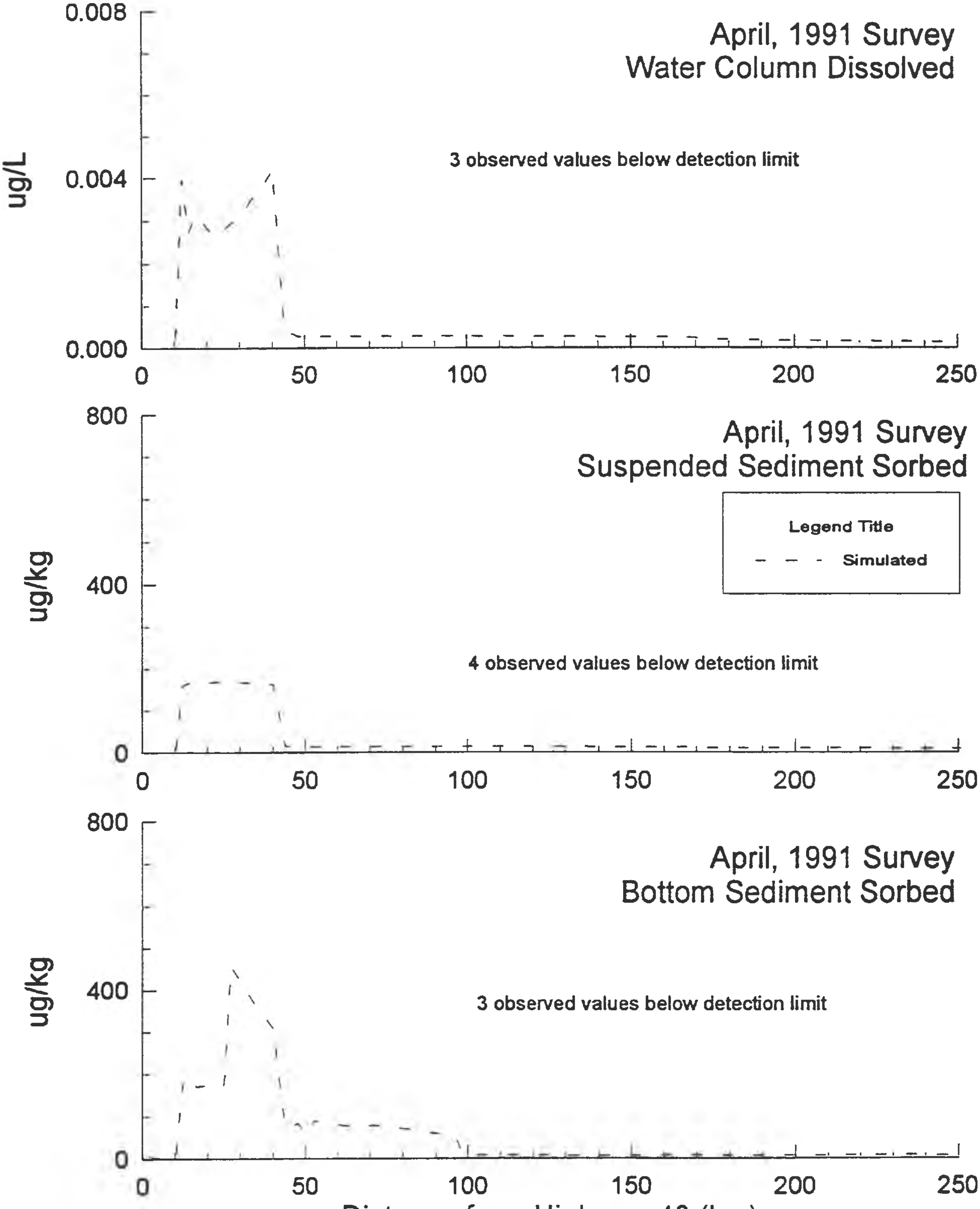

Figure 4.19e.
Wapiti/Smoky Rivers, 12,14 DichloroDHA Calibration, Synoptic Surveys

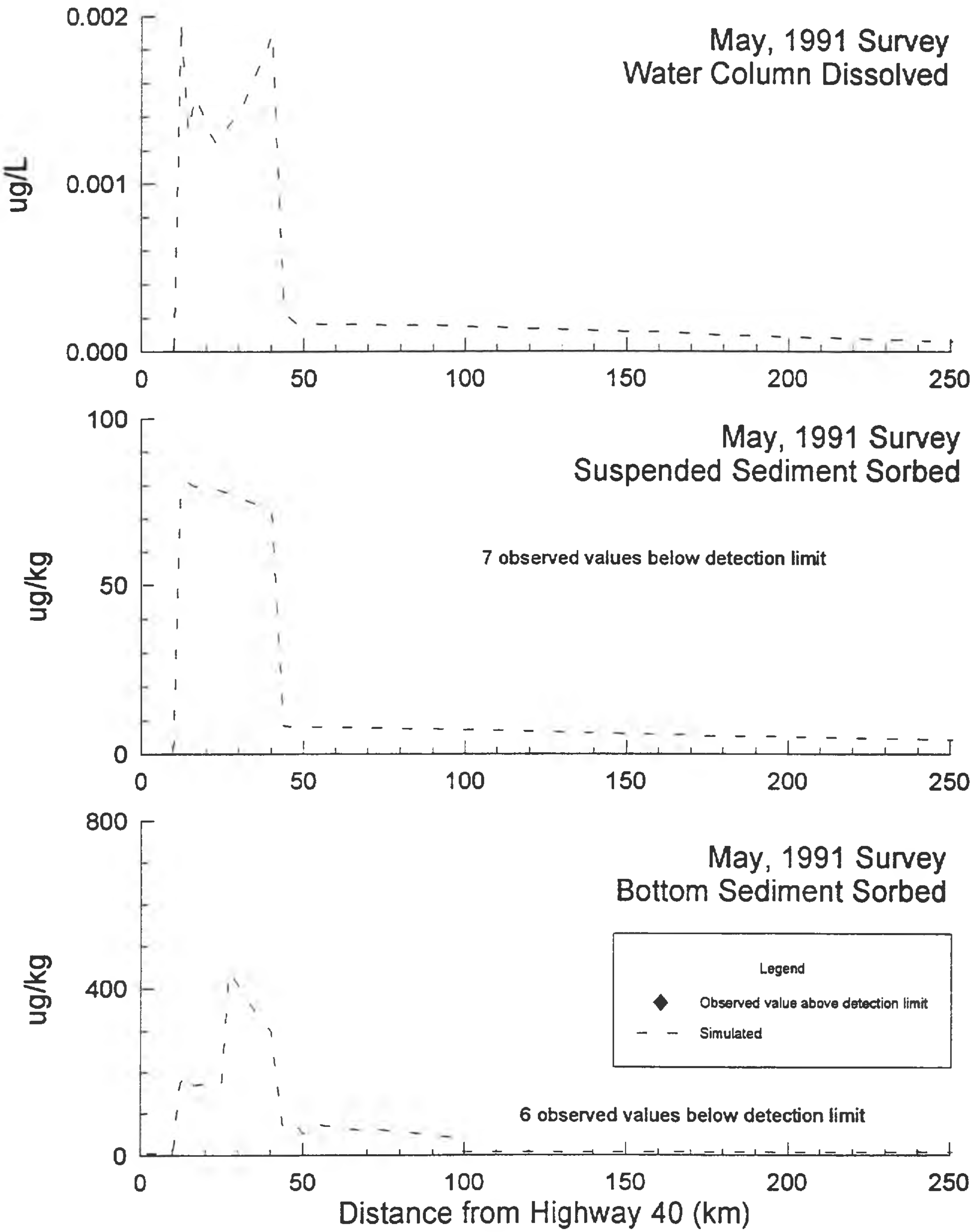

Figure 4.19f.
Wapiti/Smoky Rivers, 12,14 DichloroDHA Calibration, Synoptic Surveys

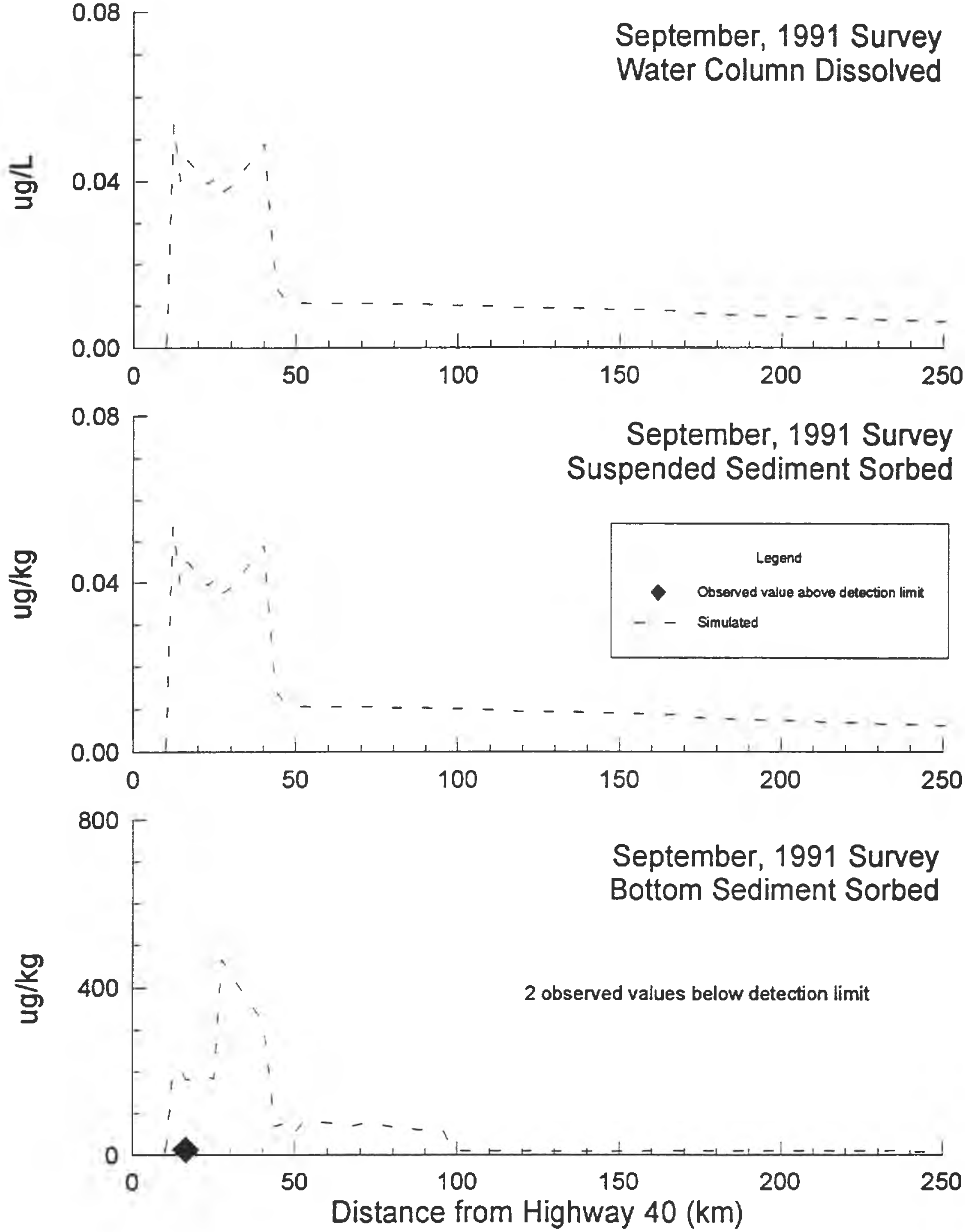

Figure 4.19g.
Wapiti/Smoky Rivers, 12,14 DichloroDHA Calibration, Synoptic Surveys

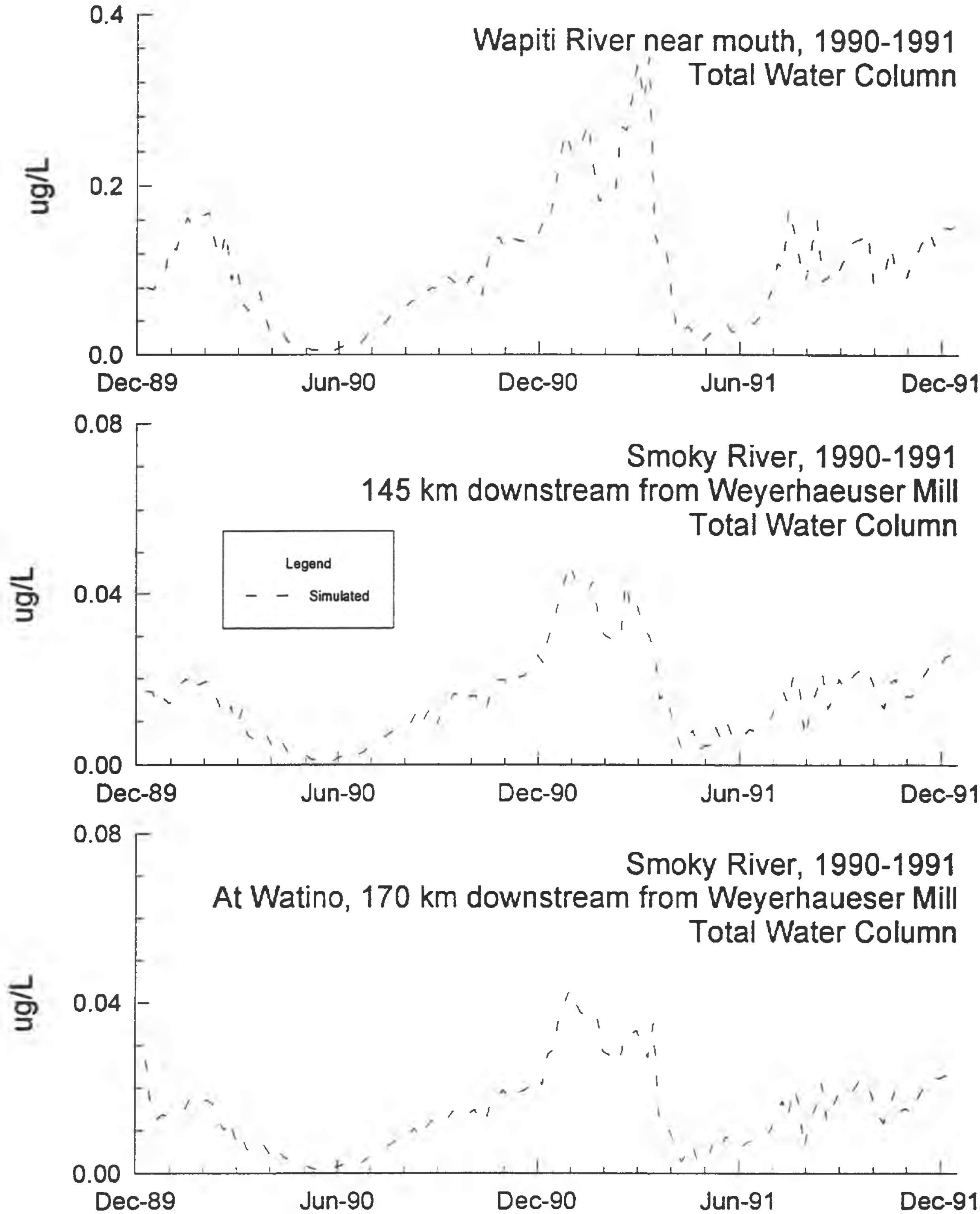

Figure 4.20a.
Wapiti/Smoky Rivers, 12,14-dichloro-DHA Calibration, Time Series

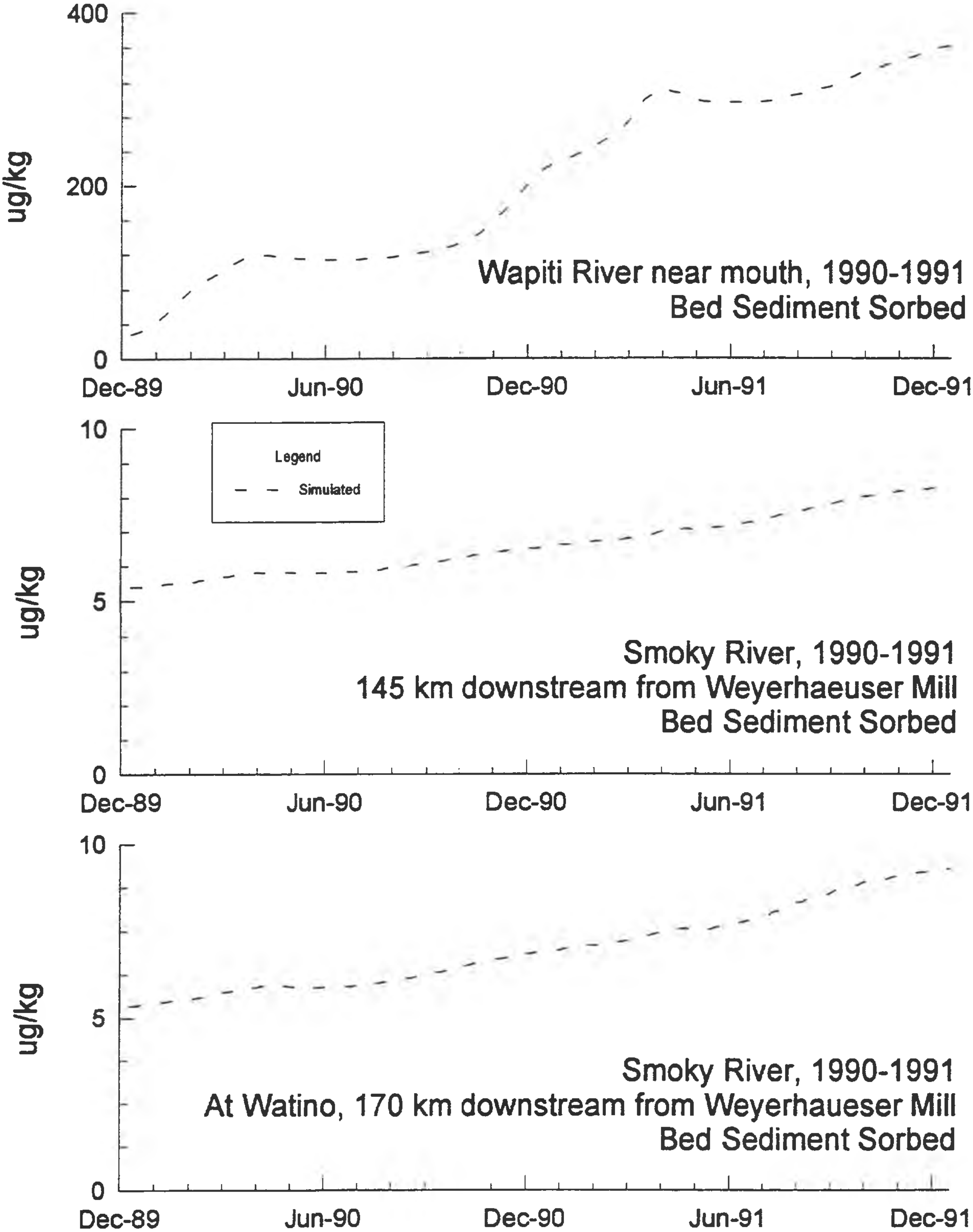

Figure 4.20b.
Wapiti/Smoky Rivers, 12,14-dichloro-DHA Calibration, Time Series

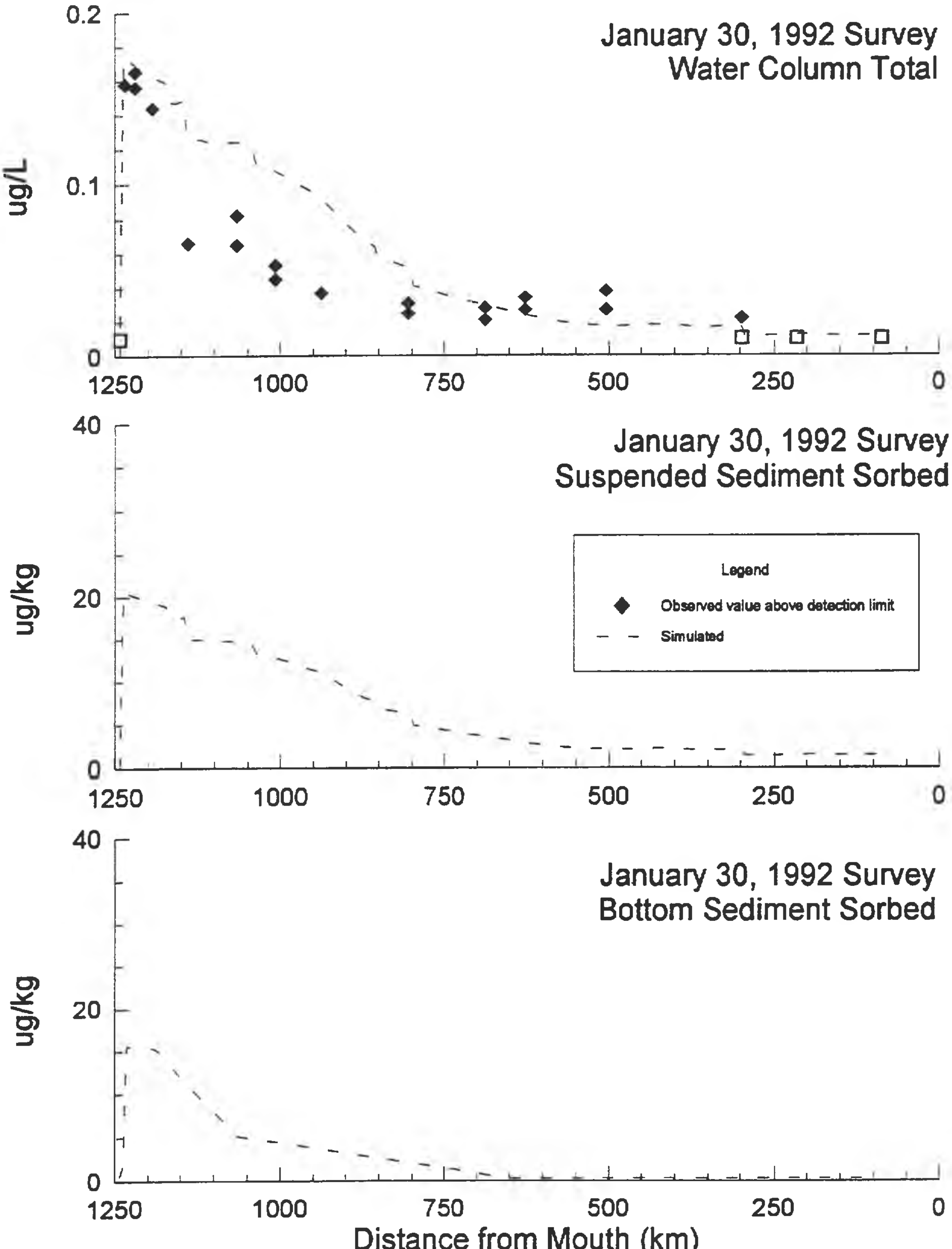

Figure 4.21a.
Athabasca River, 3,4,5-TCC Calibration, Synoptic Surveys

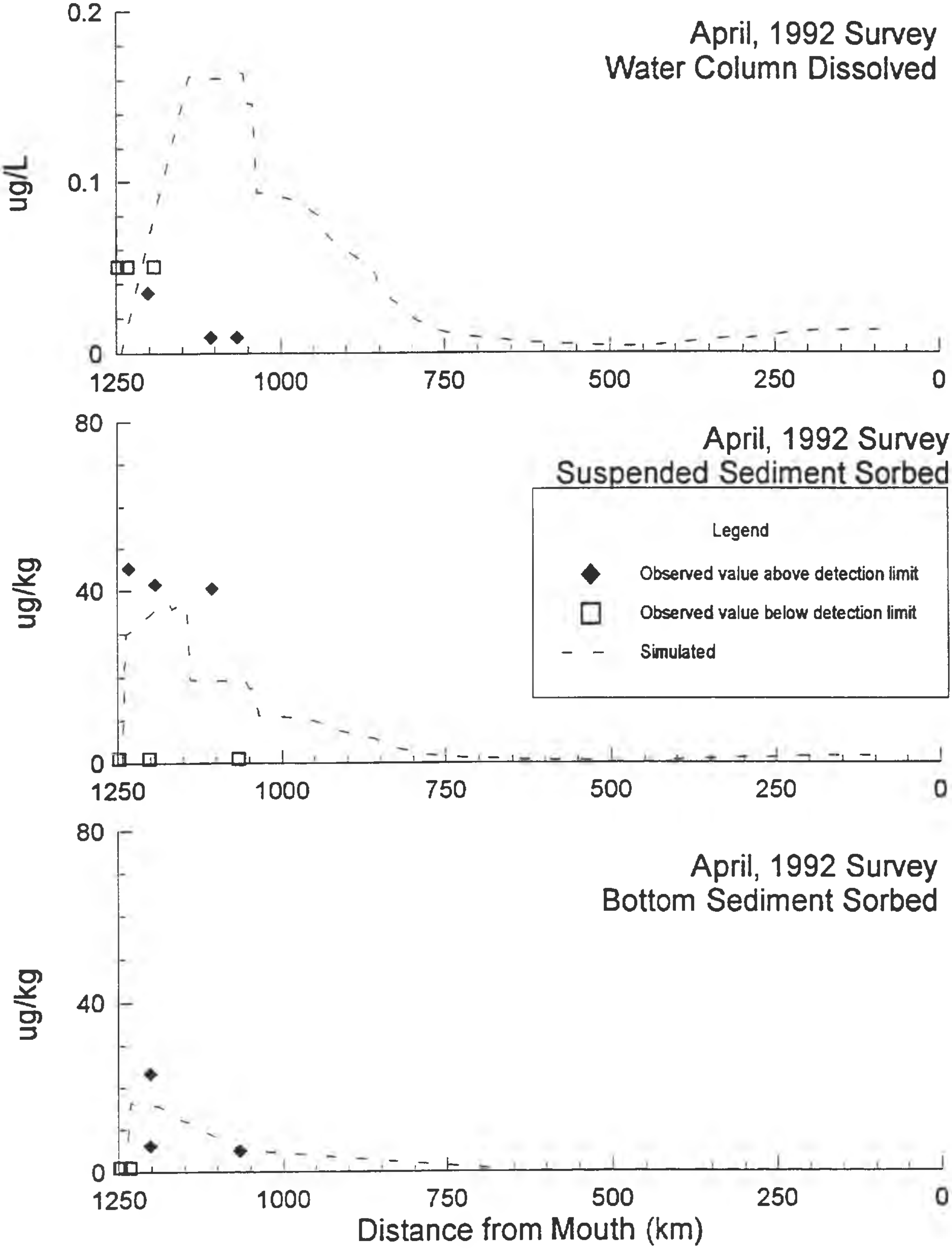

Figure 4.21b.
Athabasca River, 3,4,5-TCC Calibration, Synoptic Surveys

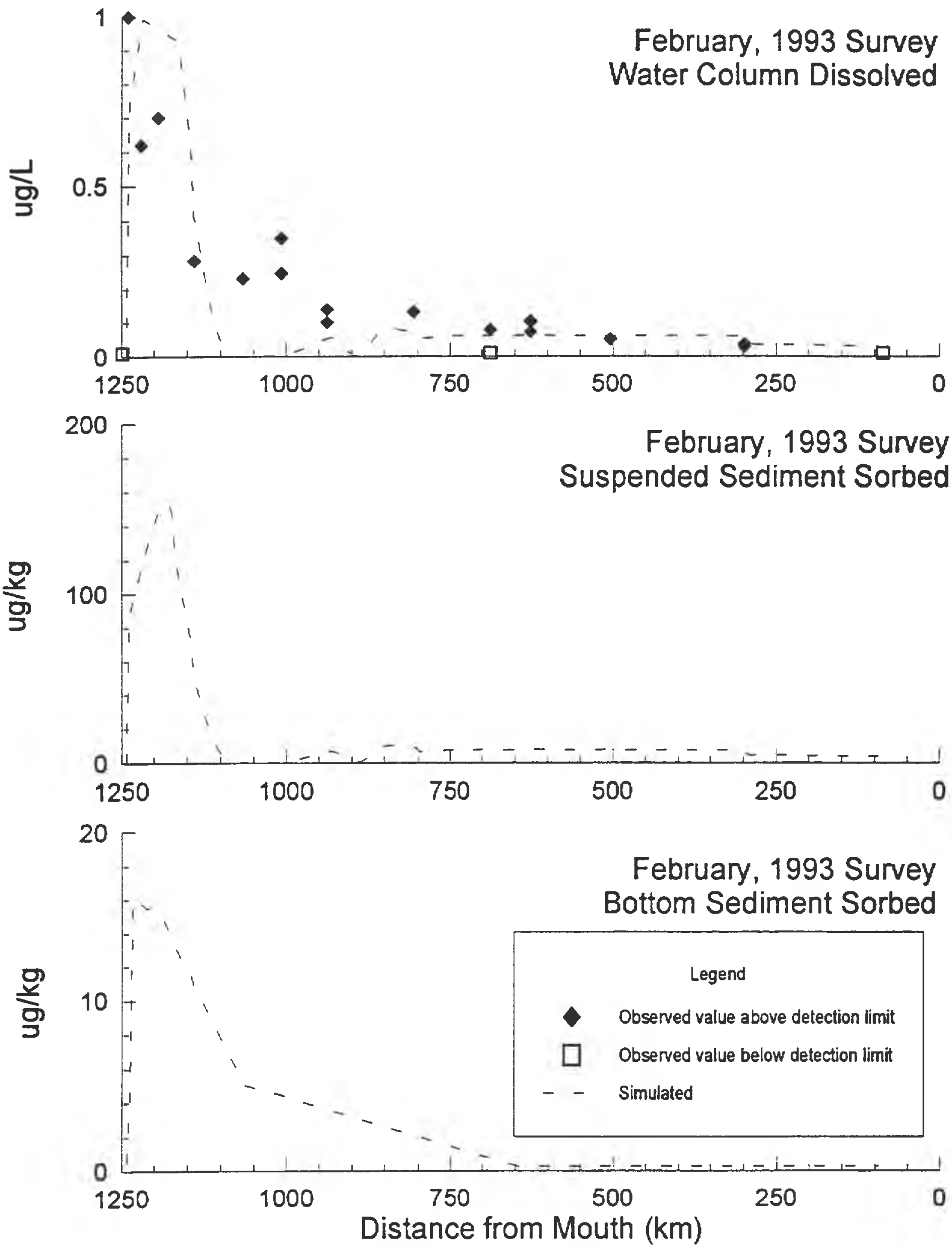

Figure 4.21c.
Athabasca River, 3,4,5-TCC (ug/L and ug/kg) Calibration, Synoptic Surveys

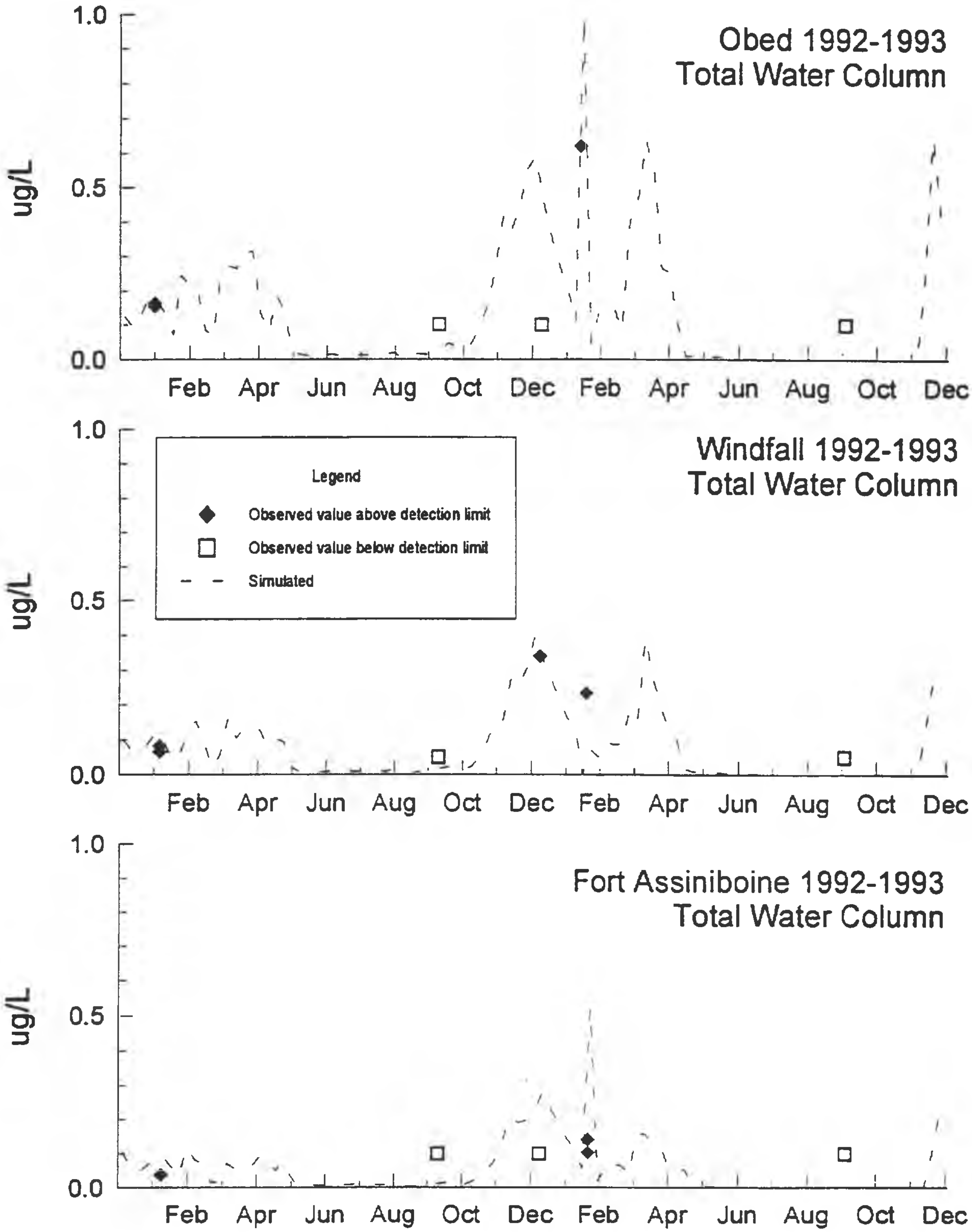

Figure 4.22a.
Athabasca River, 3,4,5-TCC Calibration, Time Series

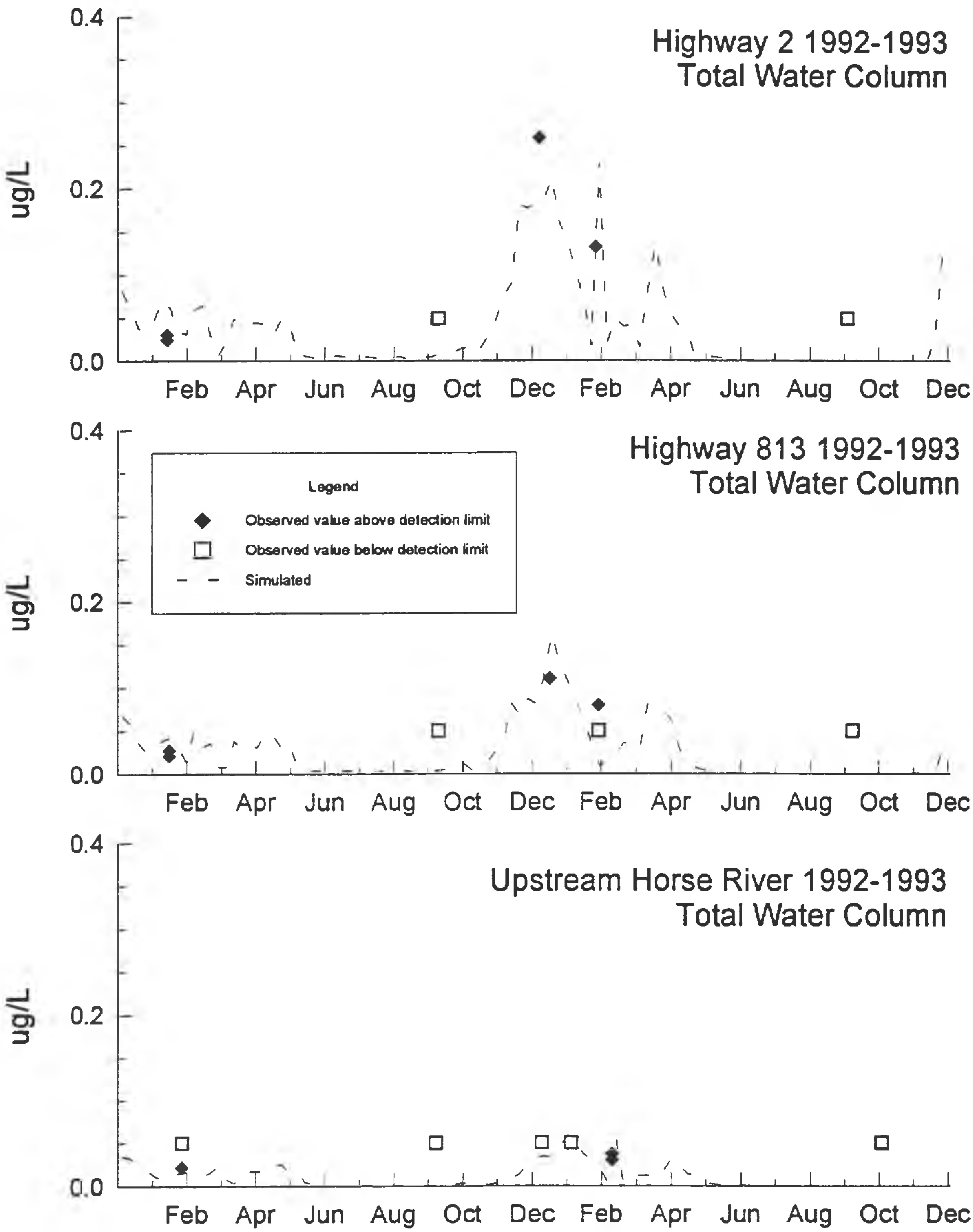

Figure 4.22b.
Athabasca River, 3,4,5-TCC Calibration, Time Series

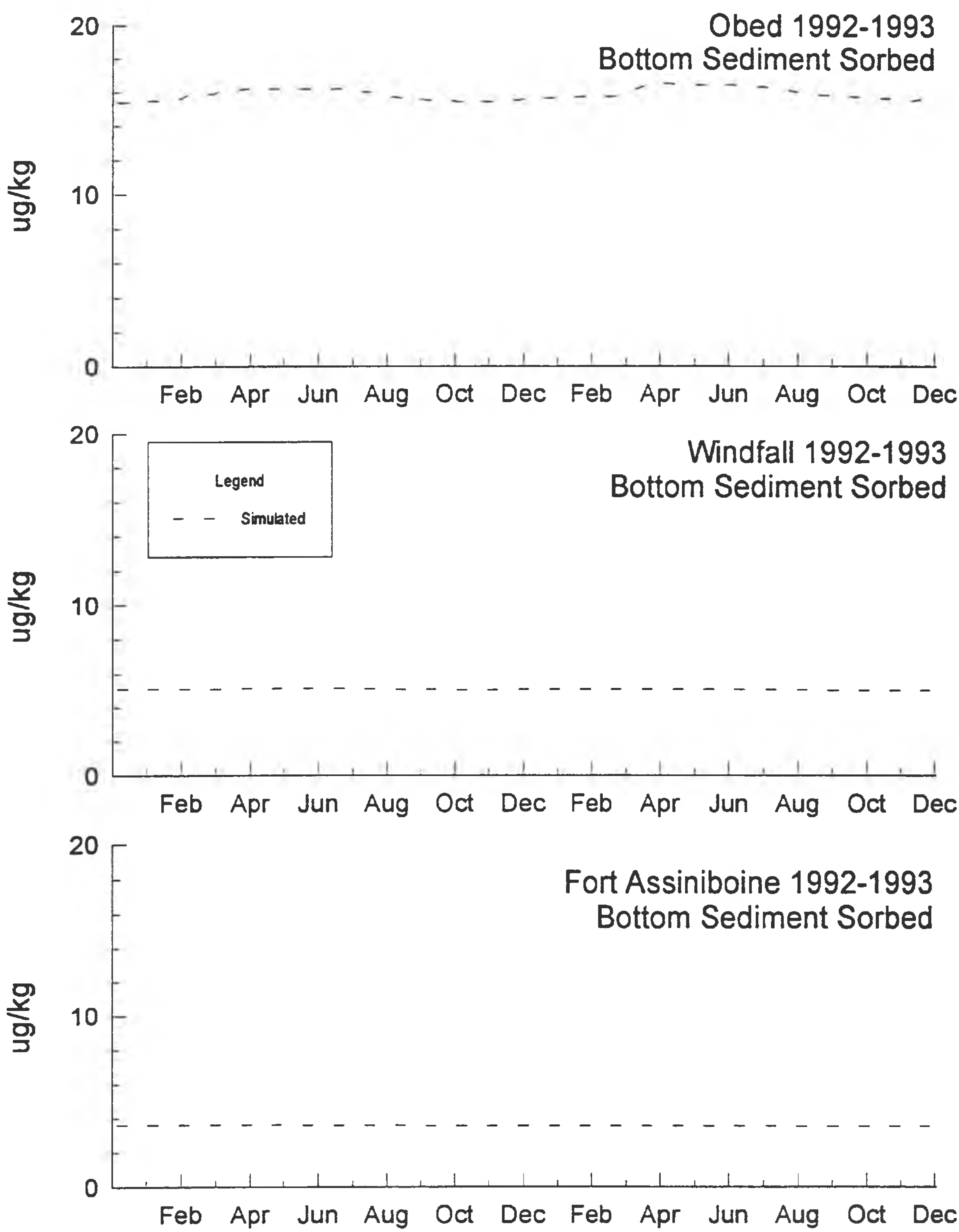

Figure 4.22c.
Athabasca River, 3,4,5-TCC Calibration, Time Series

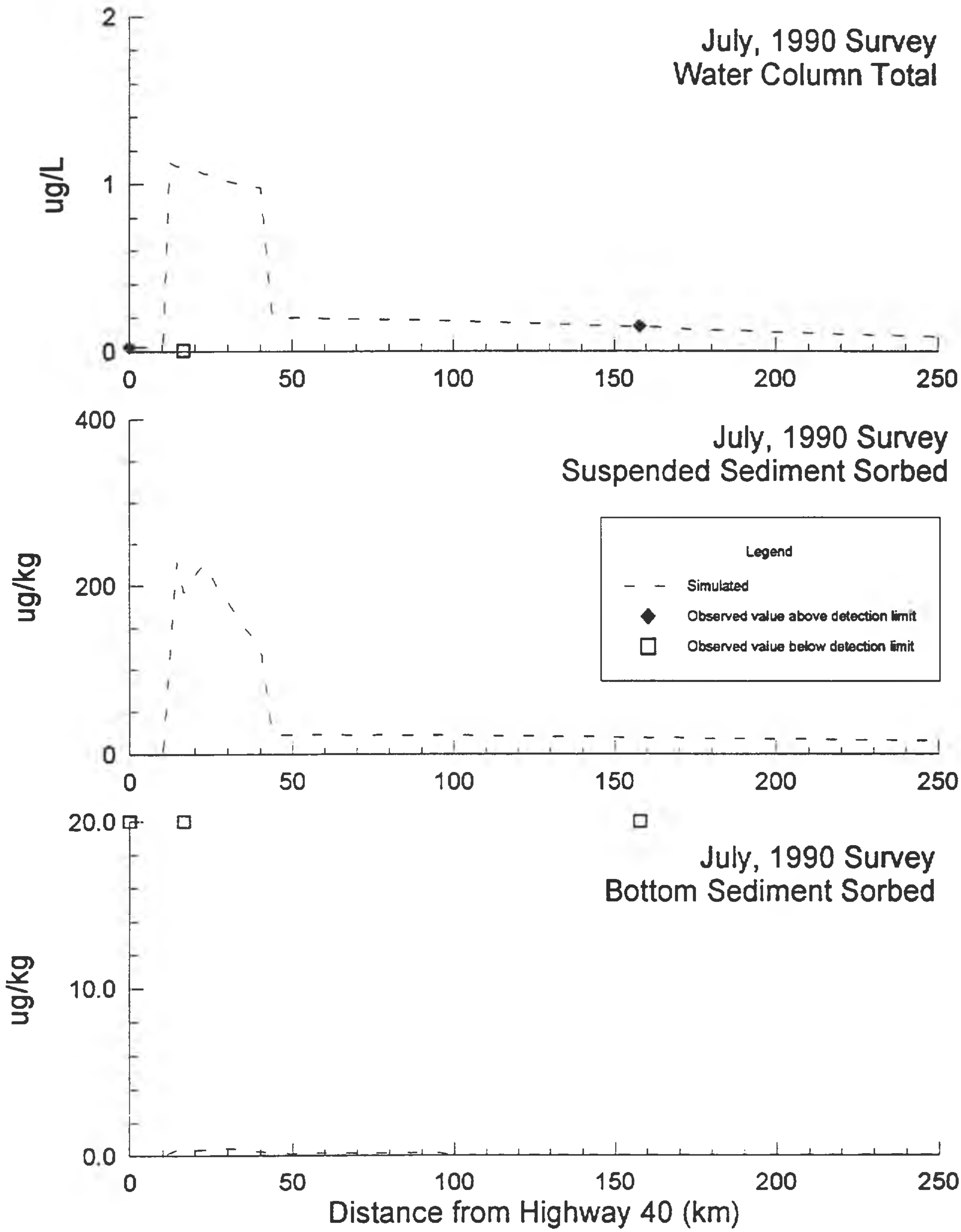

Figure 4.23a.
Wapiti/Smoky Rivers, 3,4,5-TCC Calibration, Synoptic Surveys

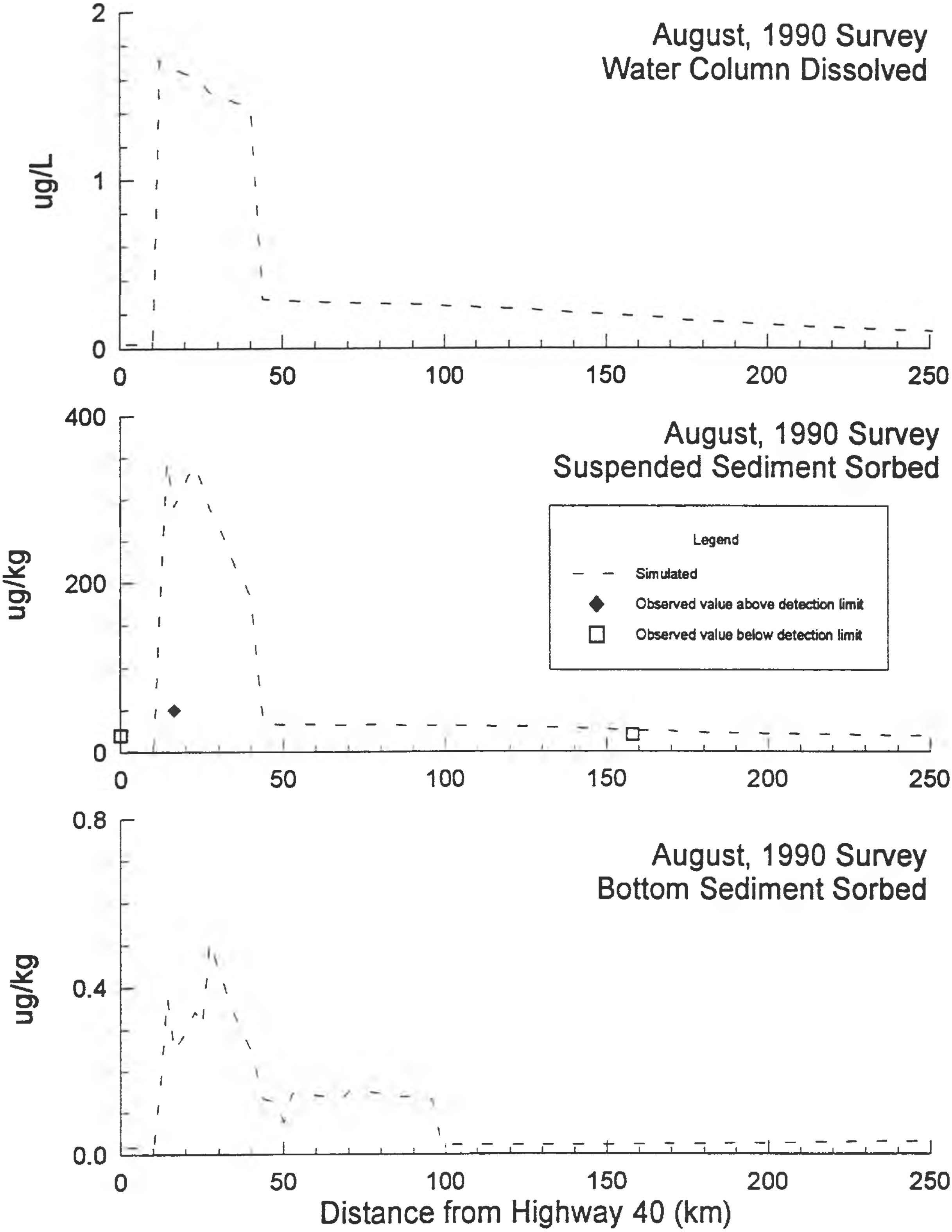

Figure 4.23b.
Wapiti/Smoky Rivers, 3,4,5-TCC Calibration, Synoptic Surveys

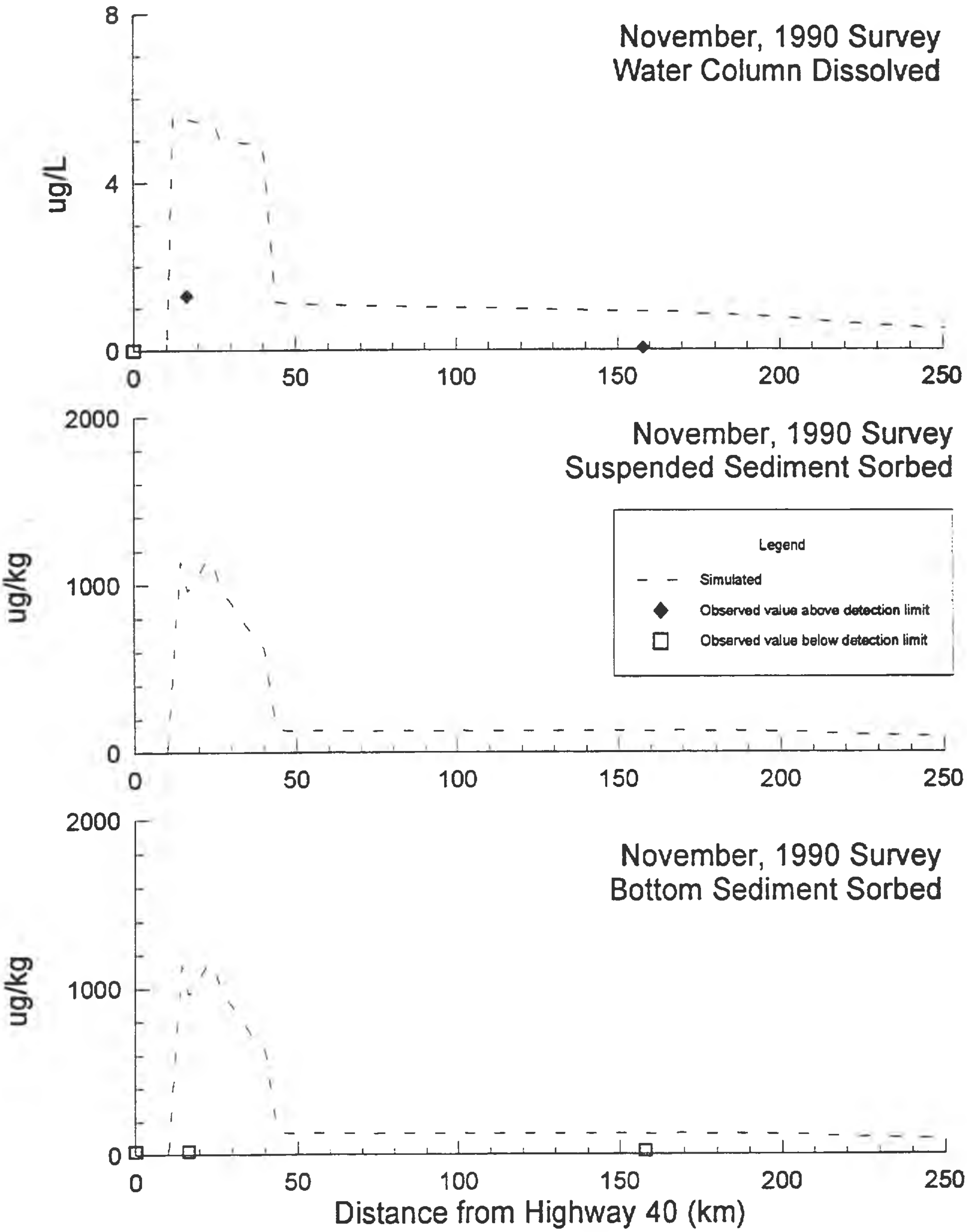

Figure 4.23c.
Wapiti/Smoky Rivers, 3,4,5-TCC Calibration, Synoptic Surveys

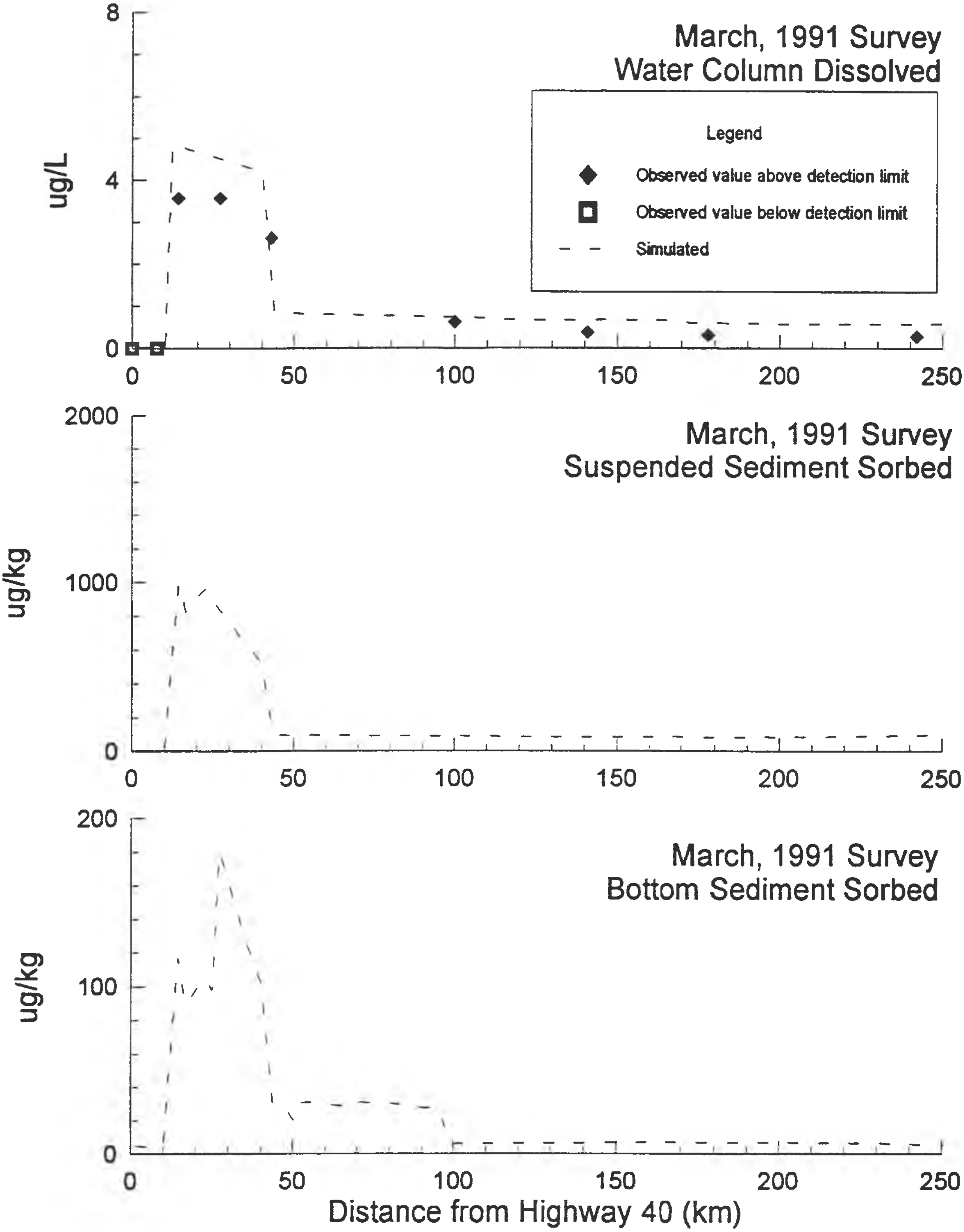

Figure 4.23d.
Wapiti/Smoky Rivers, 3,4,5-TCC Calibration, Synoptic Surveys

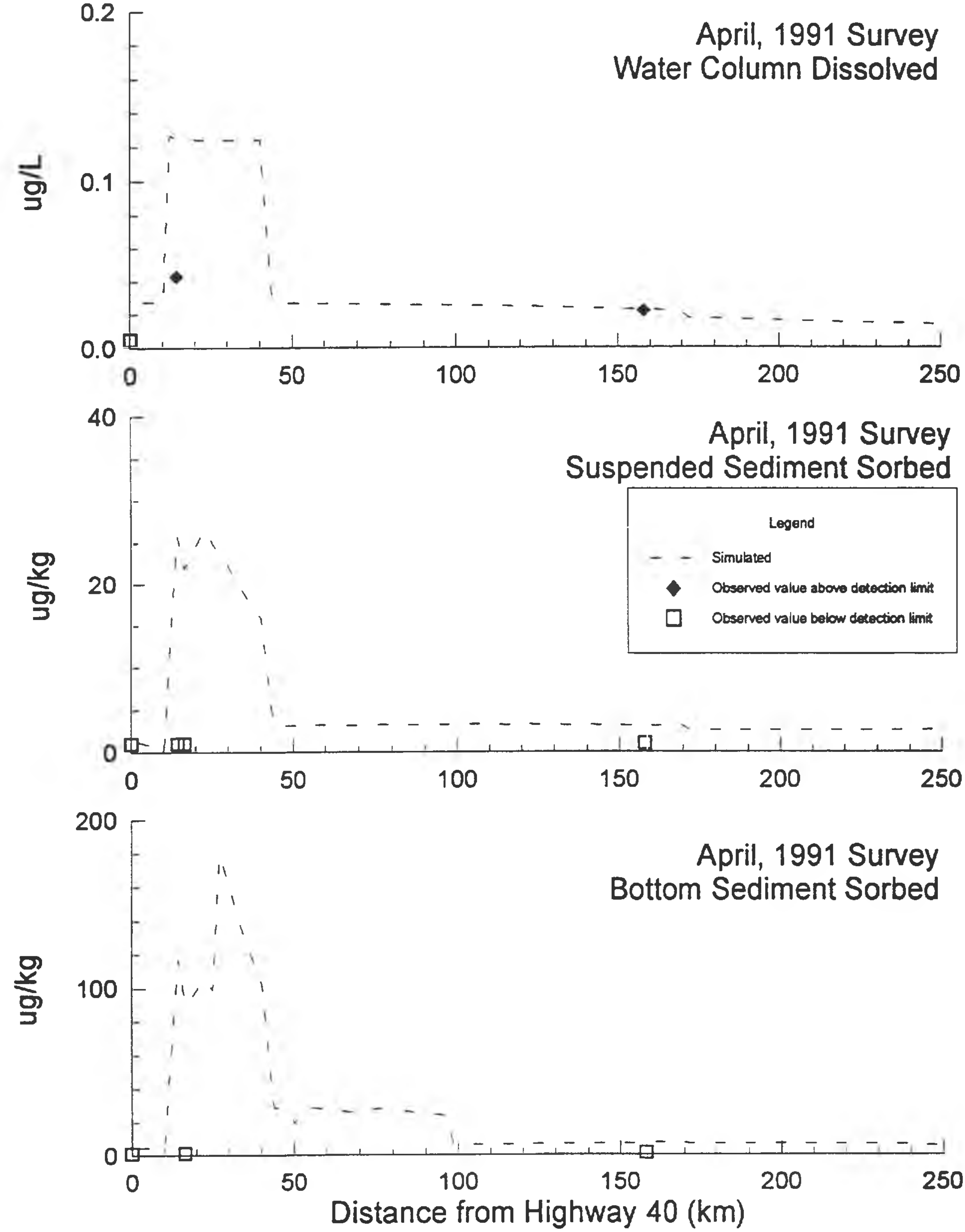

Figure 4.23e.
Wapiti/Smoky Rivers, 3,4,5-TCC Calibration, Synoptic Surveys

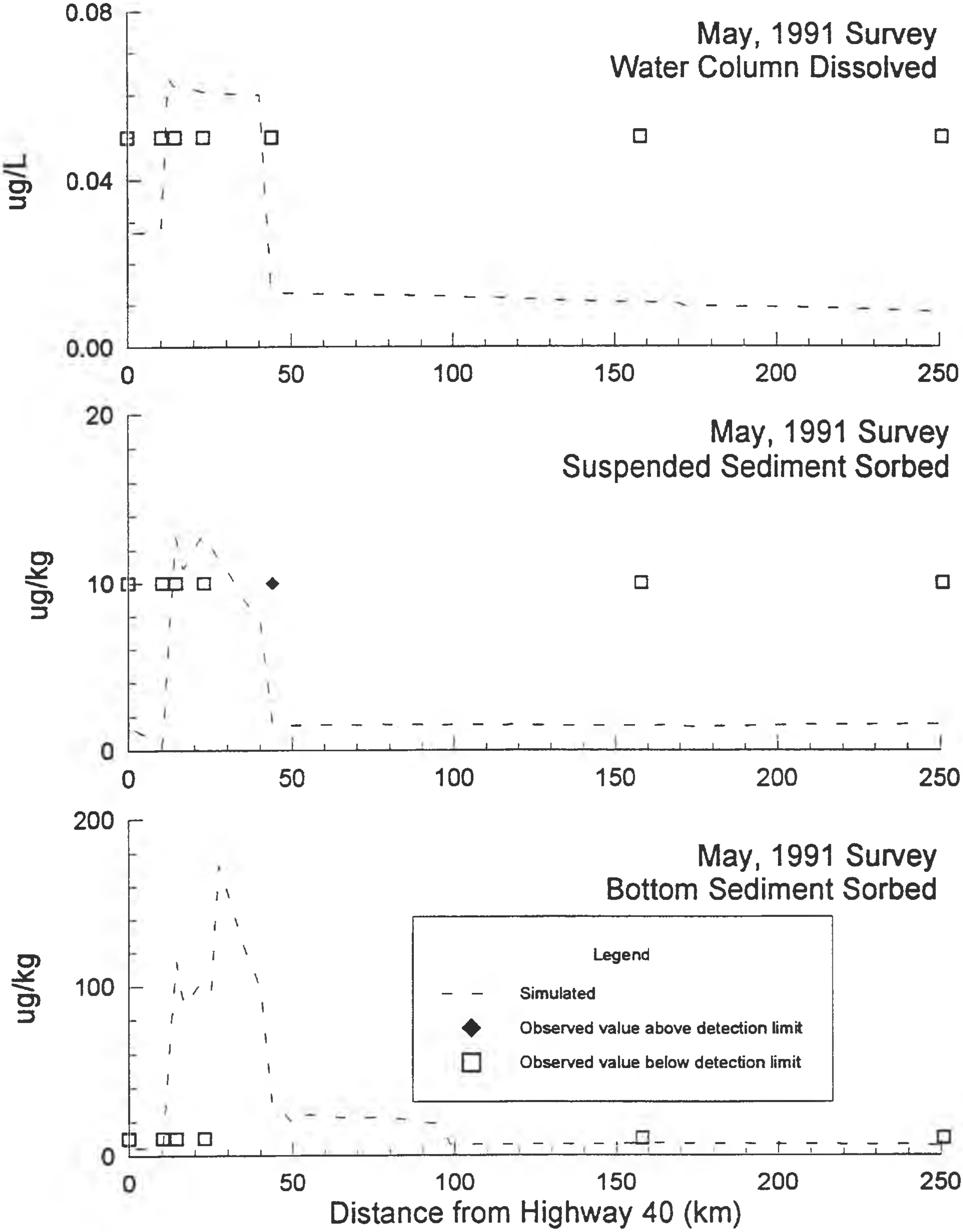

Figure 4.23f.
Wapiti/Smoky Rivers, 3,4,5-TCC Calibration, Synoptic Surveys

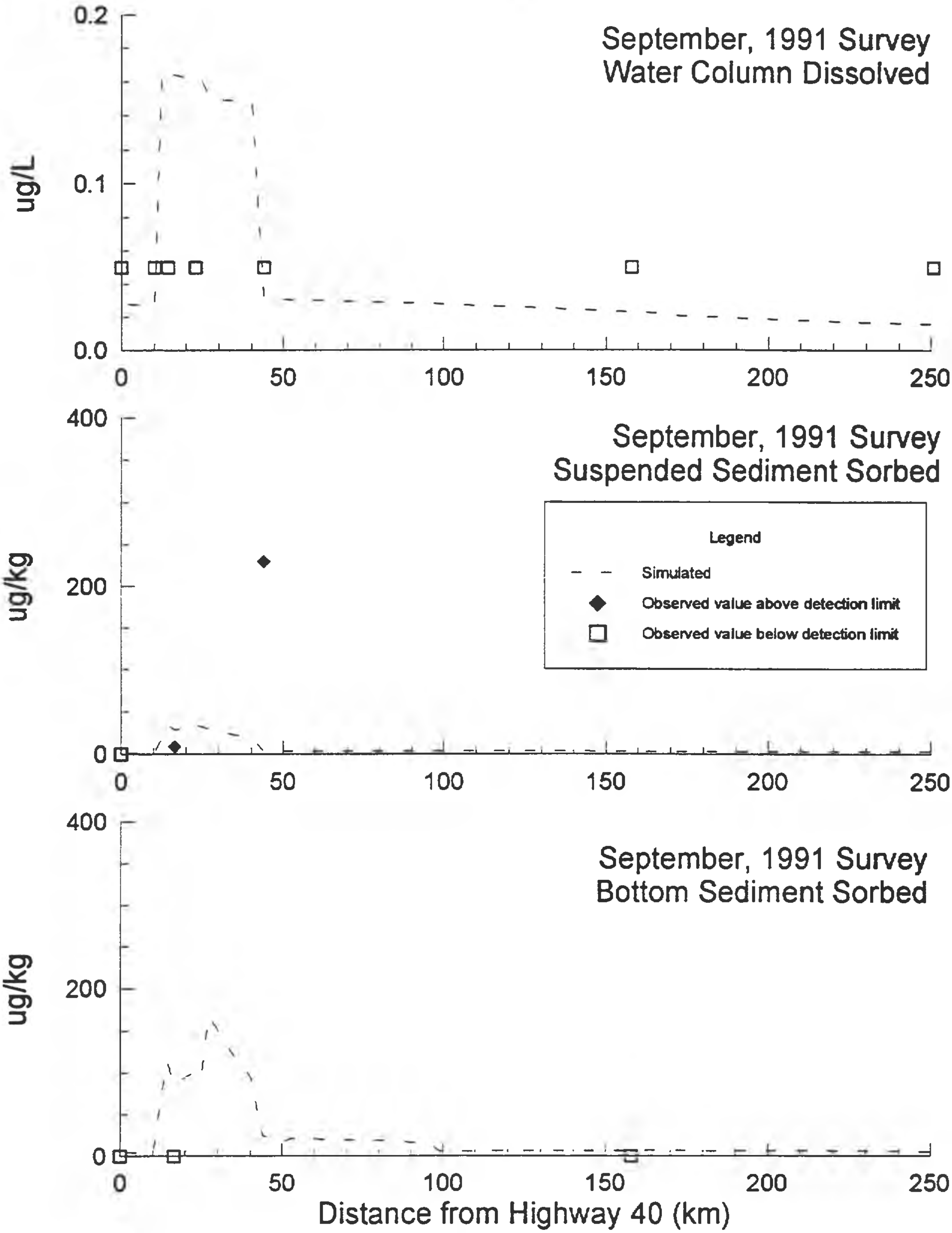

Figure 4.23g.
Wapiti/Smoky Rivers, 3,4,5-TCC Calibration, Synoptic Surveys

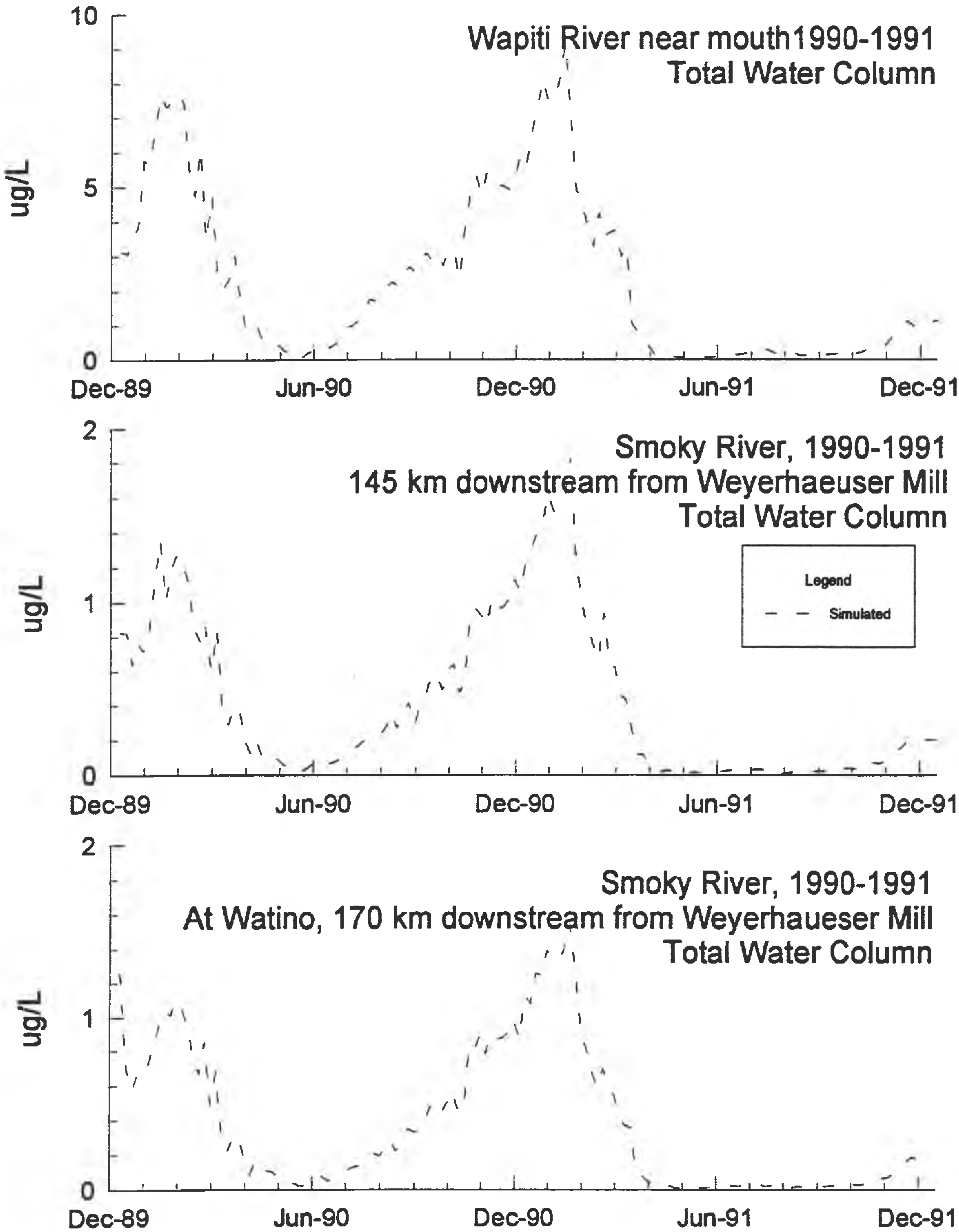

Figure 4.24a.
Wapiti/Smoky Rivers, 3,4,5-TCC Calibration, Time Series

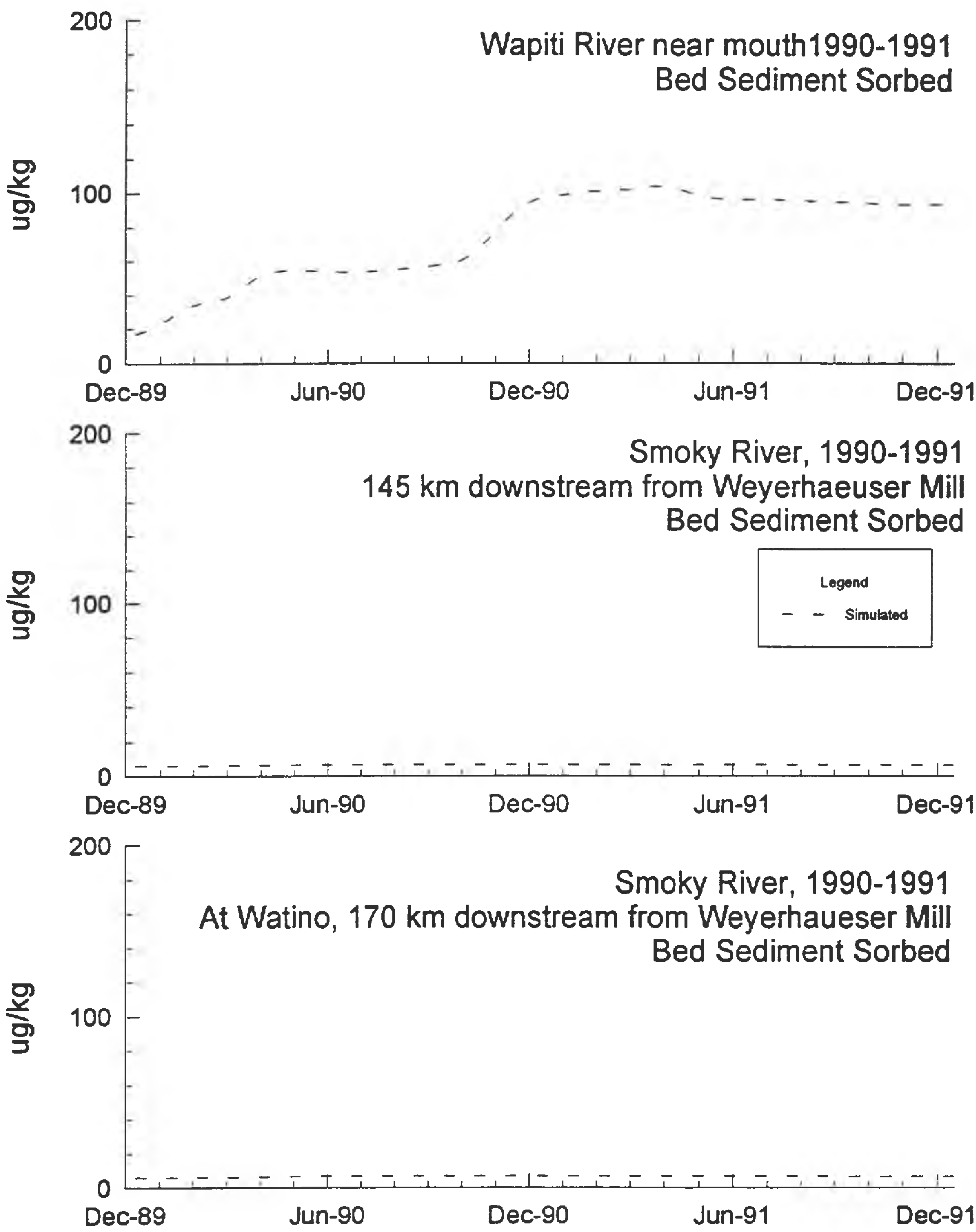

Figure 4.24b.
Wapiti/Smoky Rivers, 3,4,5-TCC Calibration, Time Series

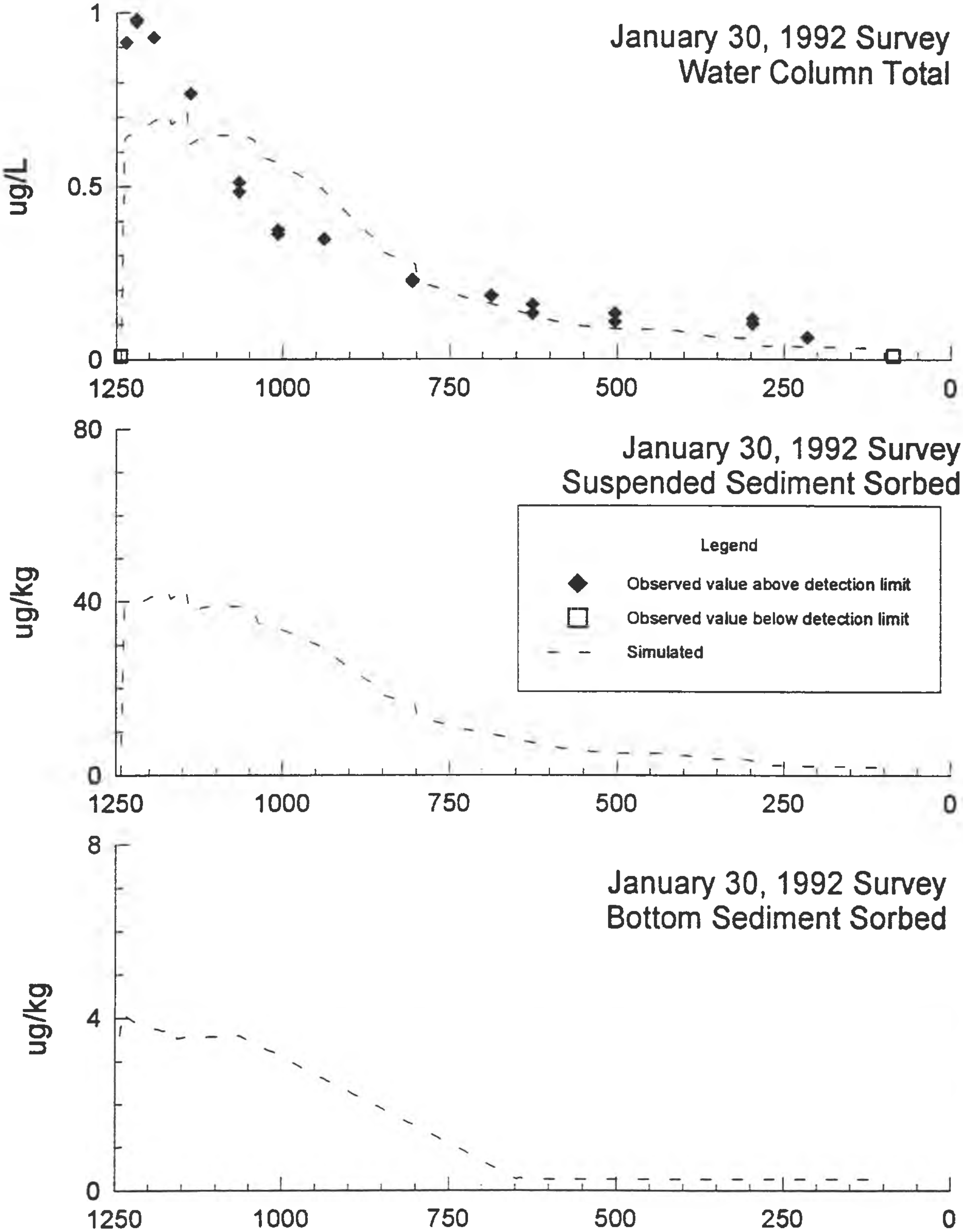

Figure 4.25a
Athabasca River, 3,4,5-TCG Calibration, Synoptic Surveys

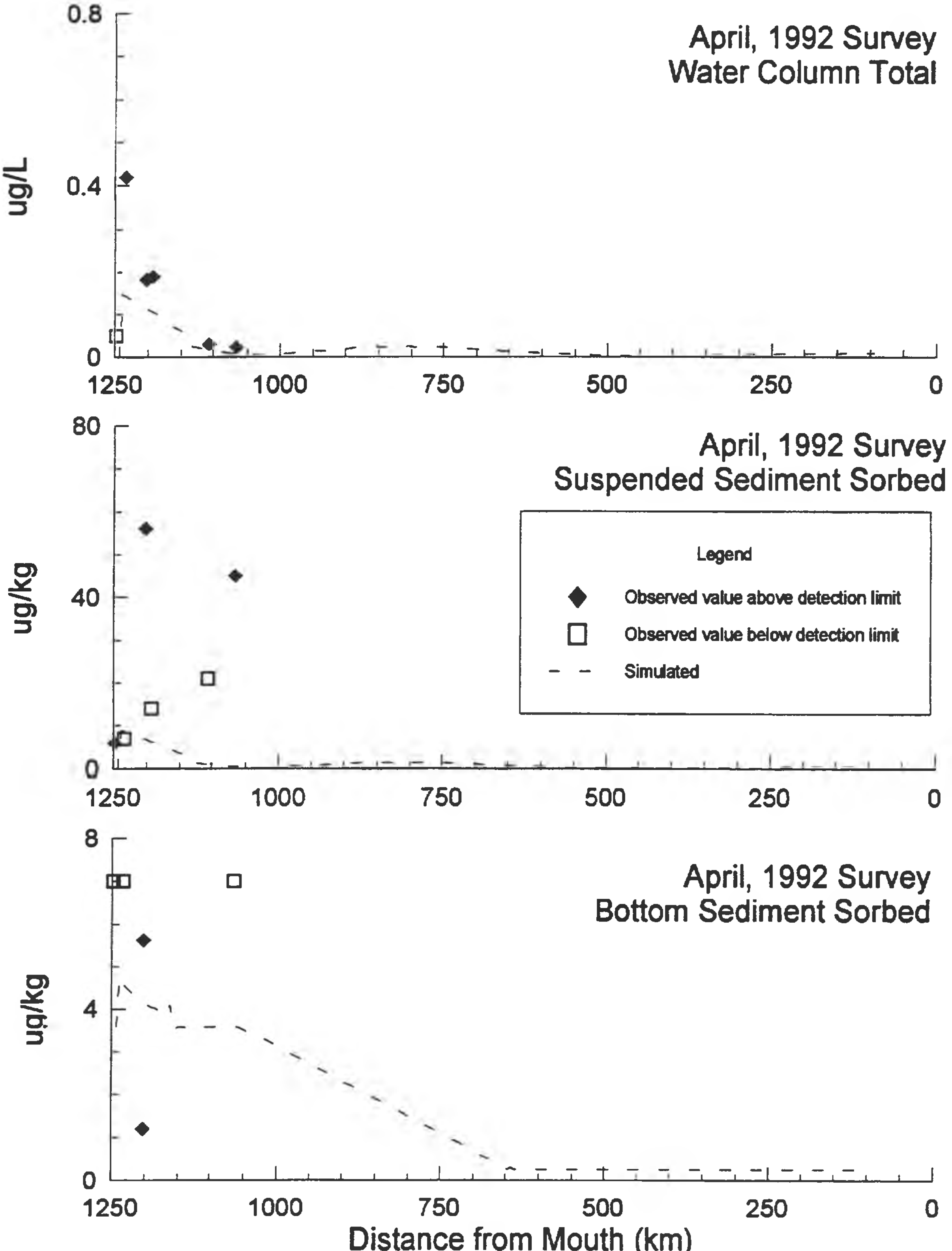

Figure 4.25b.
Athabasca River, 3,4,5-TCG Calibration, Synoptic Surveys

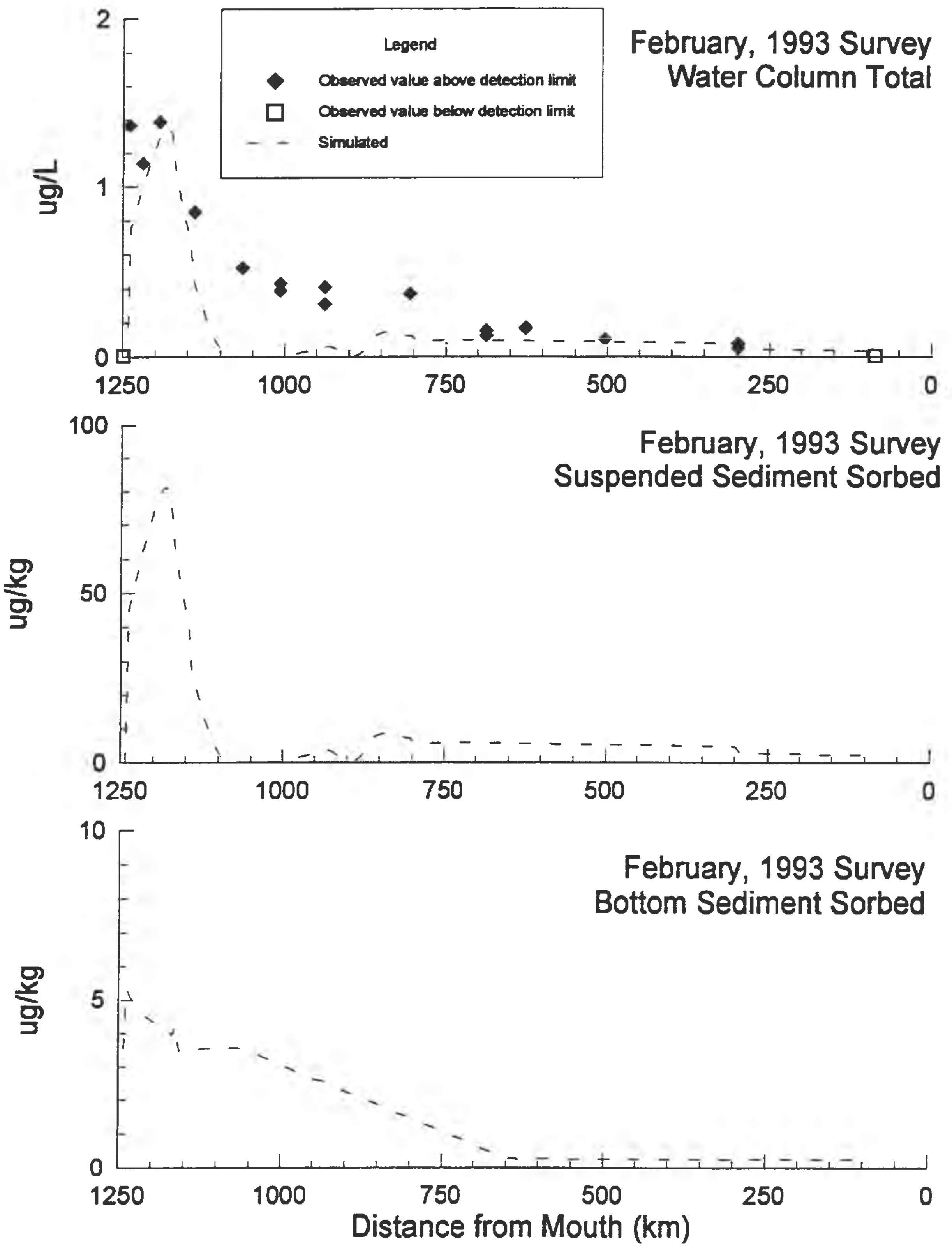

Figure 4.25c.
Athabasca River, 3,4,5-TCG Calibration, Synoptic Surveys

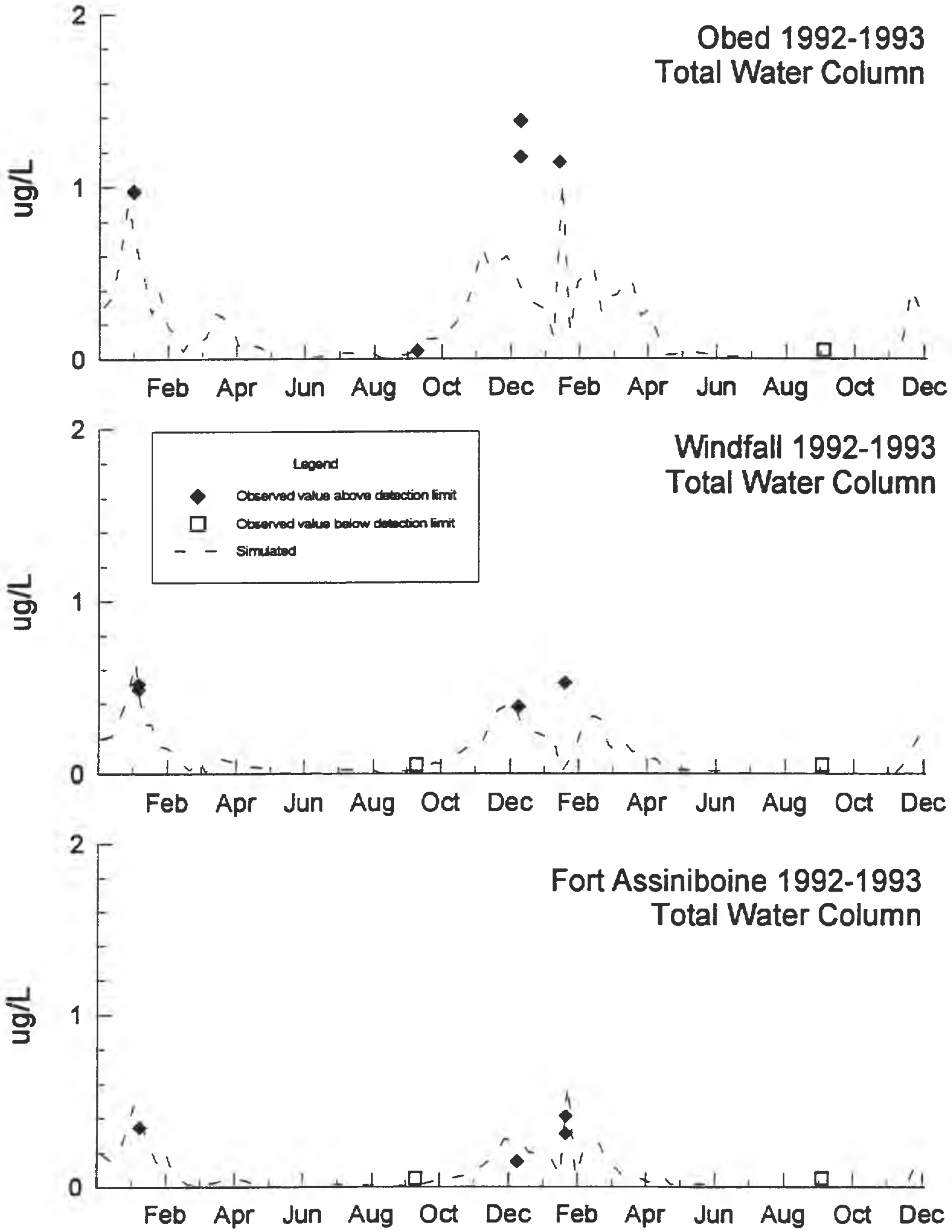

Figure 4.26a.
Athabasca River, 3,4,5-TCG Calibration, Time Series

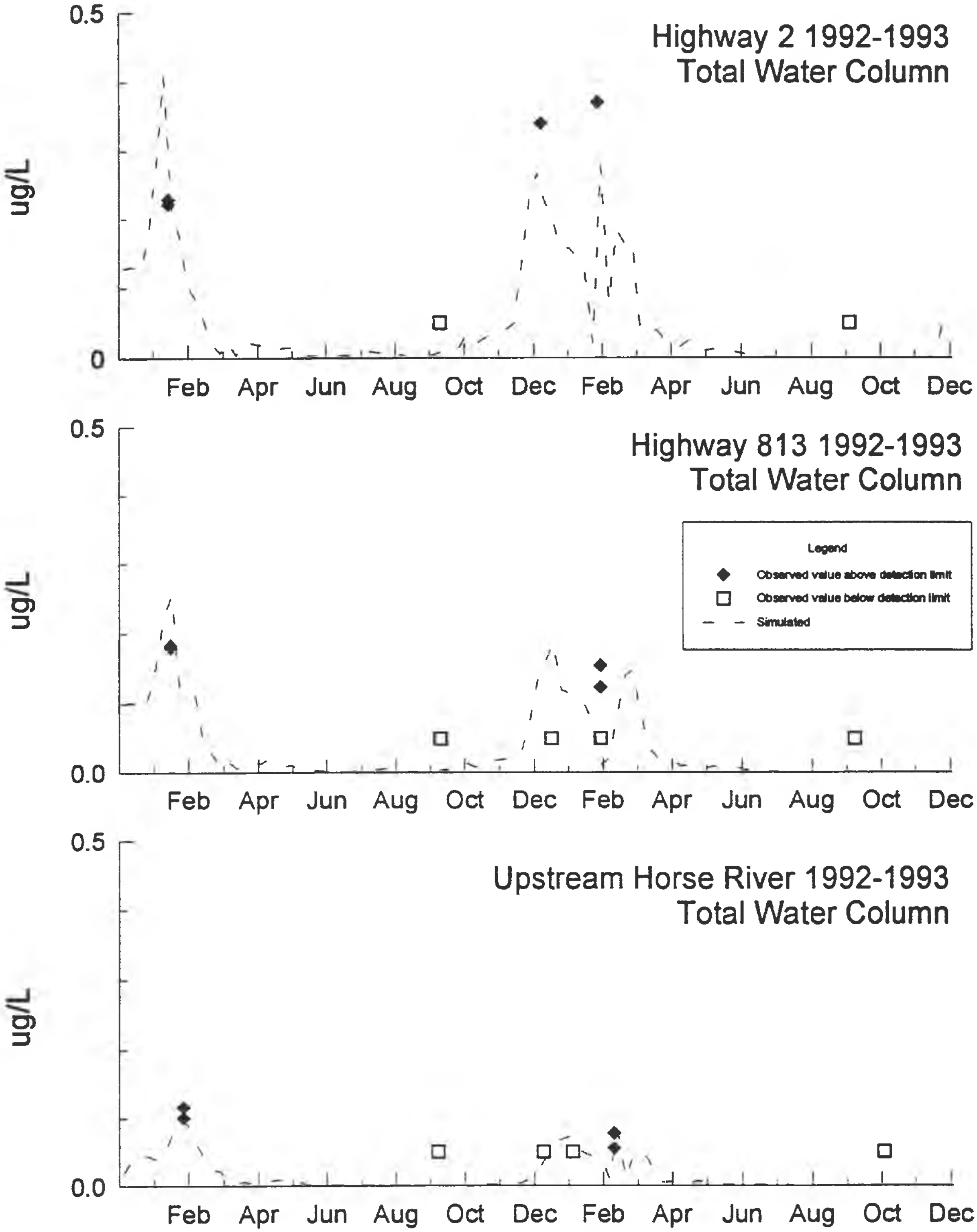

Figure 4.26b.
Athabasca River, 3,4,5-TCG Calibration, Time Series

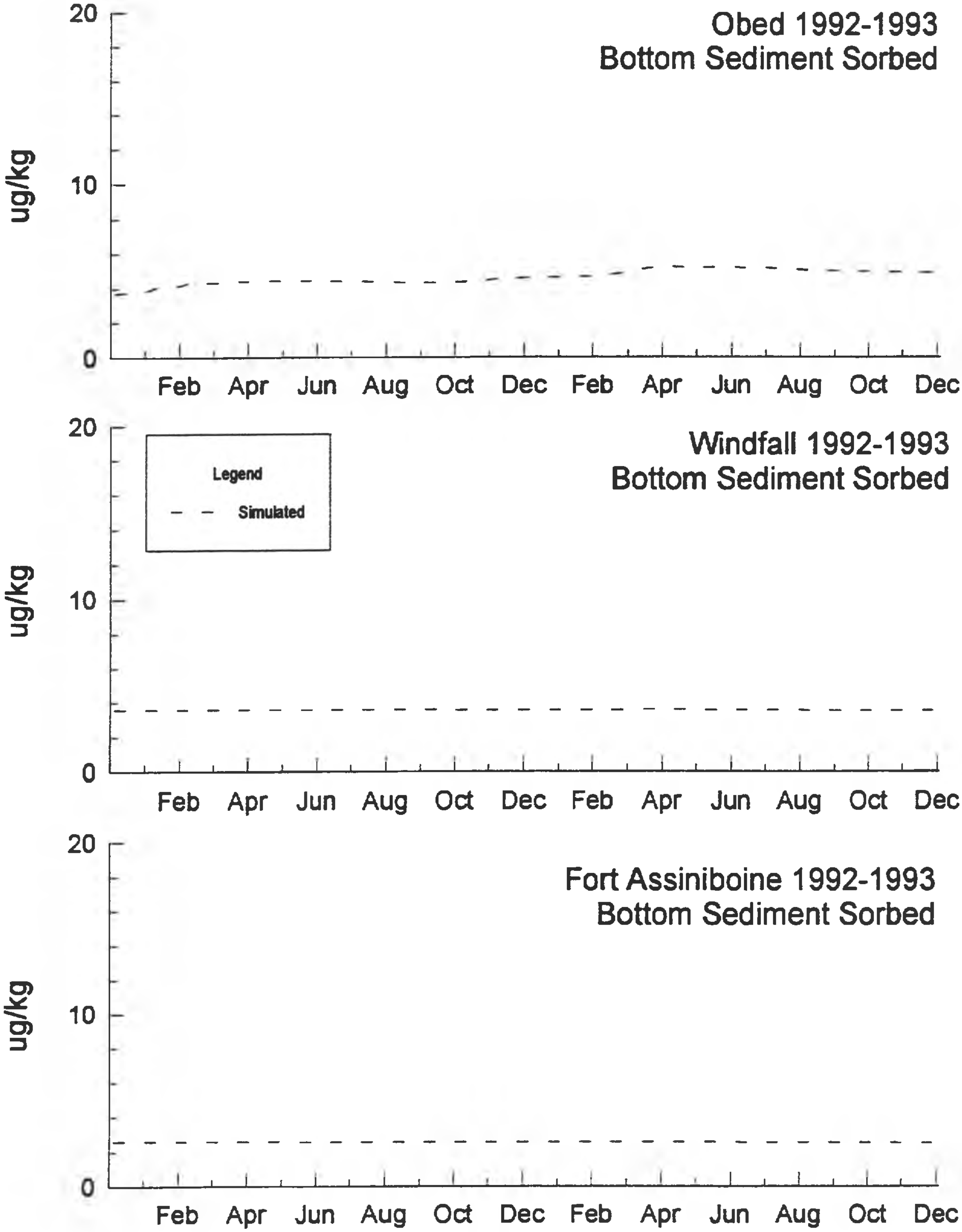

Figure 4.26c.
Athabasca River, 3,4,5-TCG Calibration, Time Series

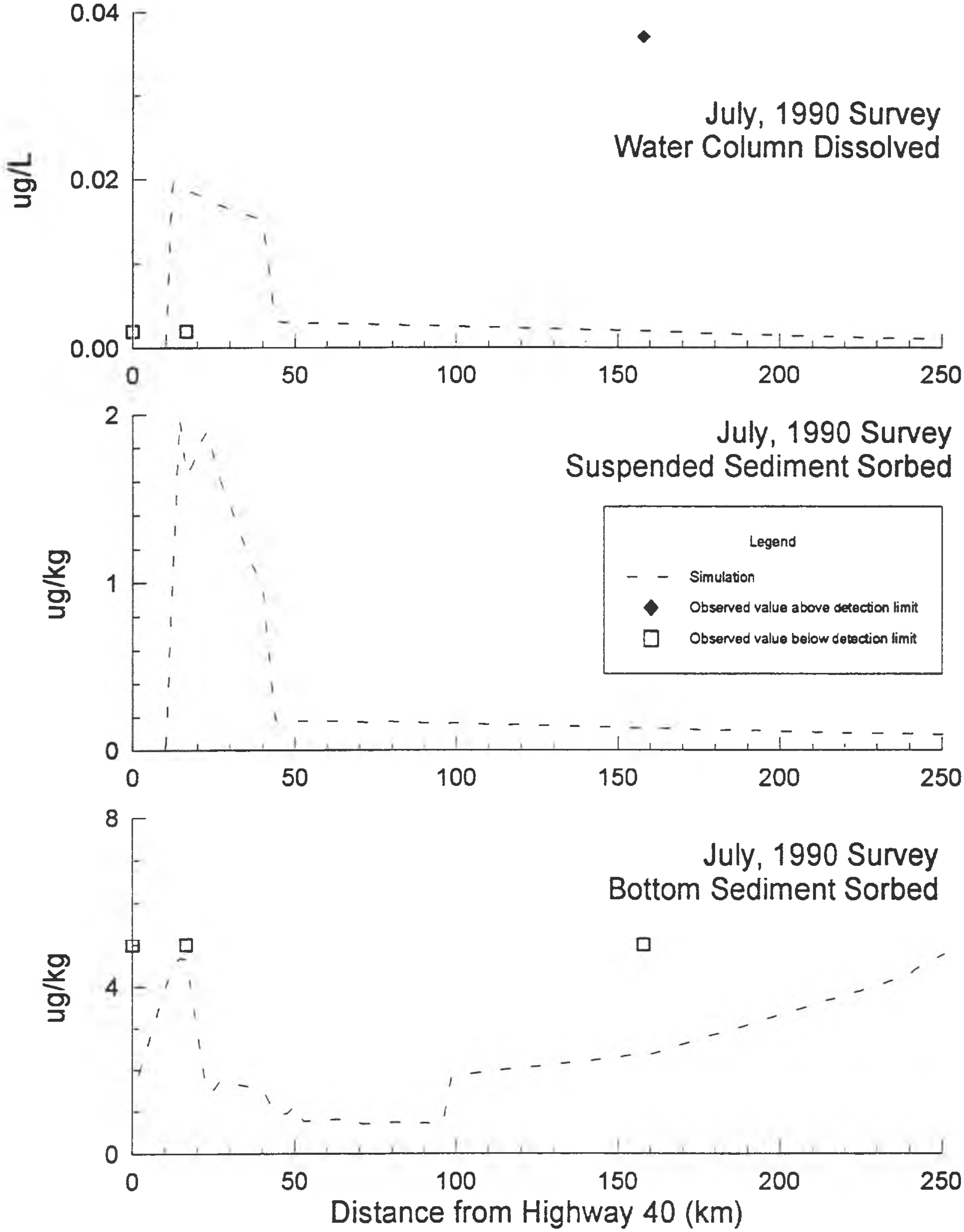

Figure 4.27a.
Wapiti/Smoky Rivers, 3,4,5-TCG Calibration, Synoptic Surveys

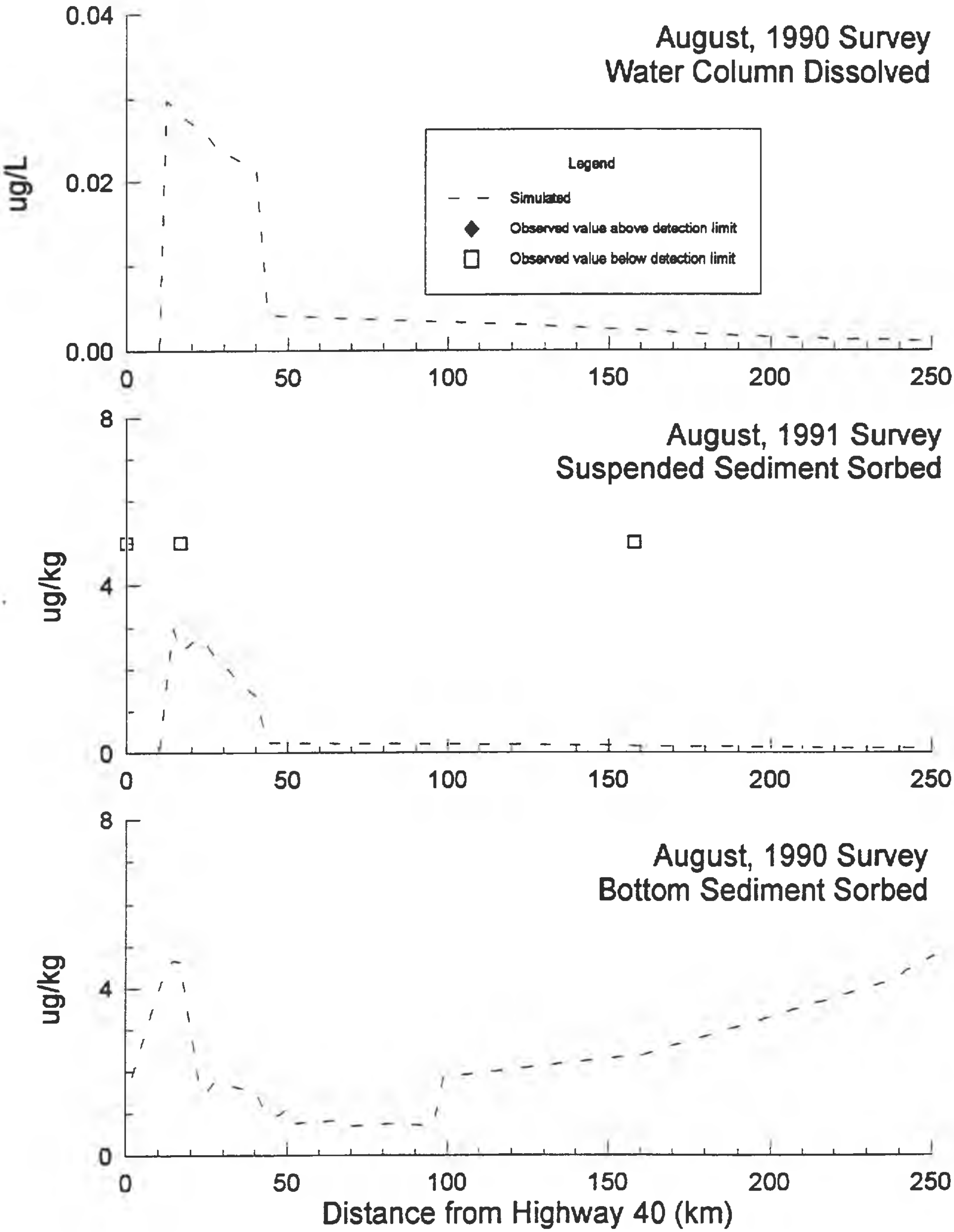

Figure 4.27b.
Wapiti/Smoky Rivers, 3,4,5-TCG Calibration, Synoptic Surveys

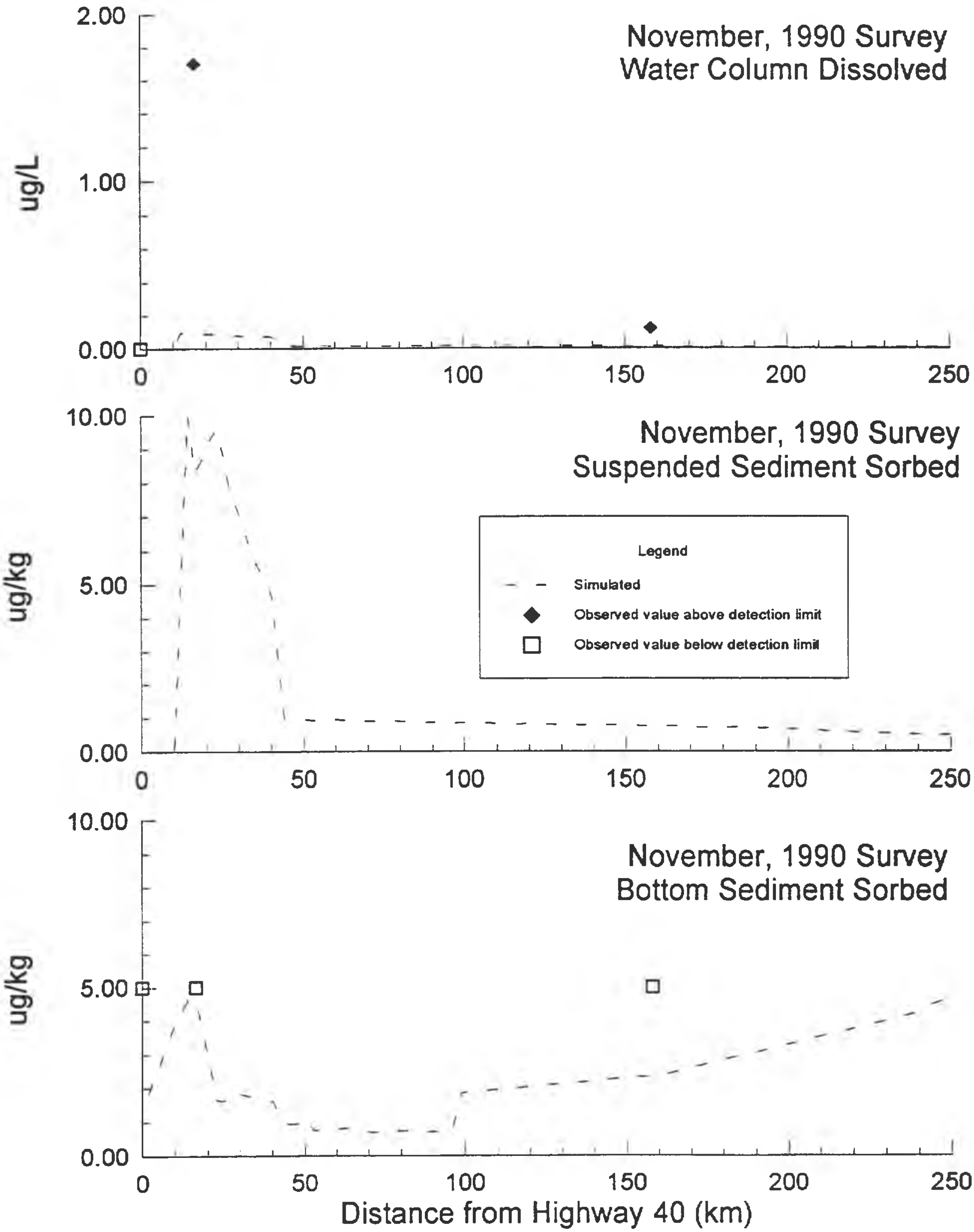

Figure 4.27c.
Wapiti/Smoky Rivers, 3,4,5-TCG Calibration, Synoptic Surveys

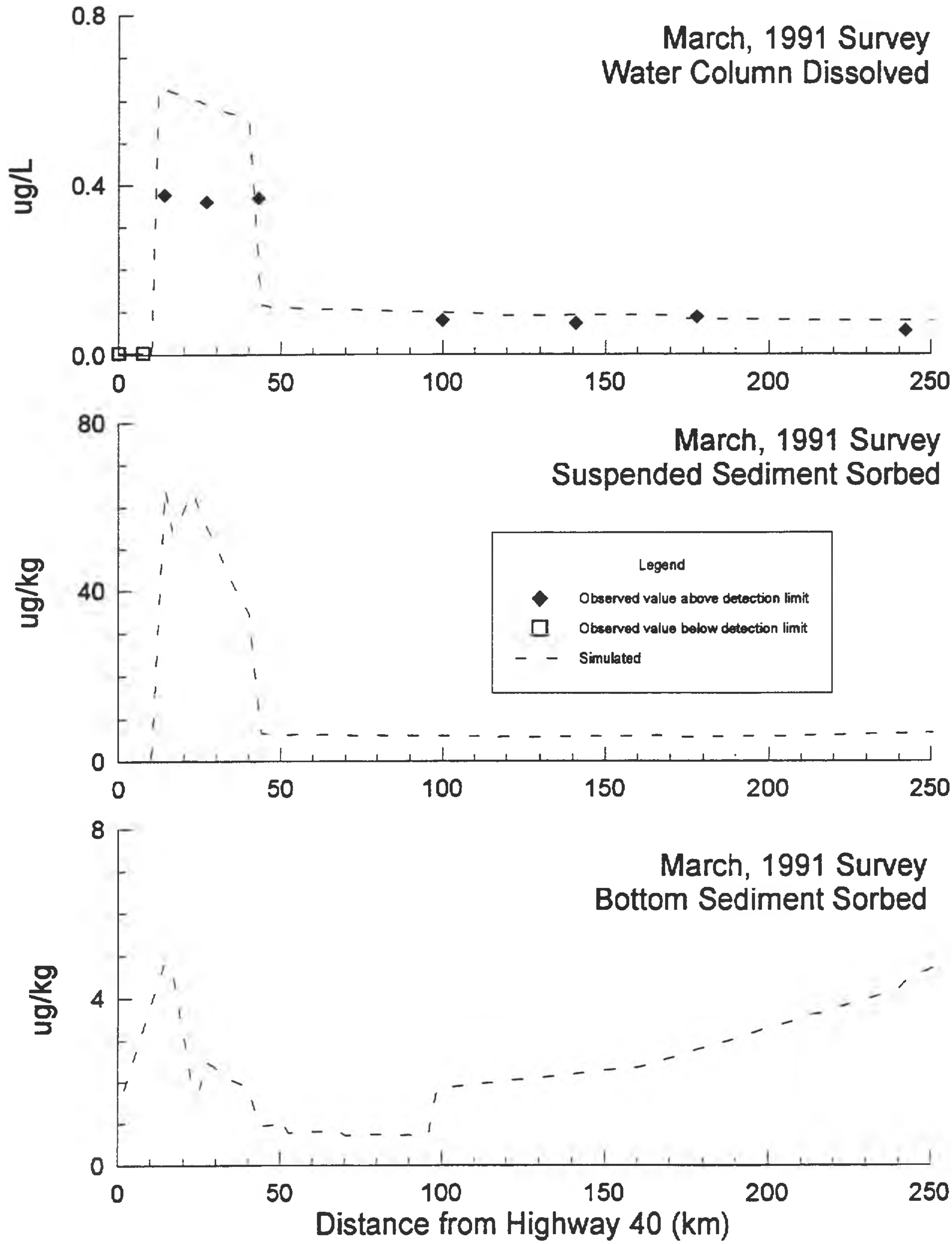

Figure 4.27d.
Wapiti/Smoky Rivers, 3,4,5-TCG Calibration, Synoptic Surveys

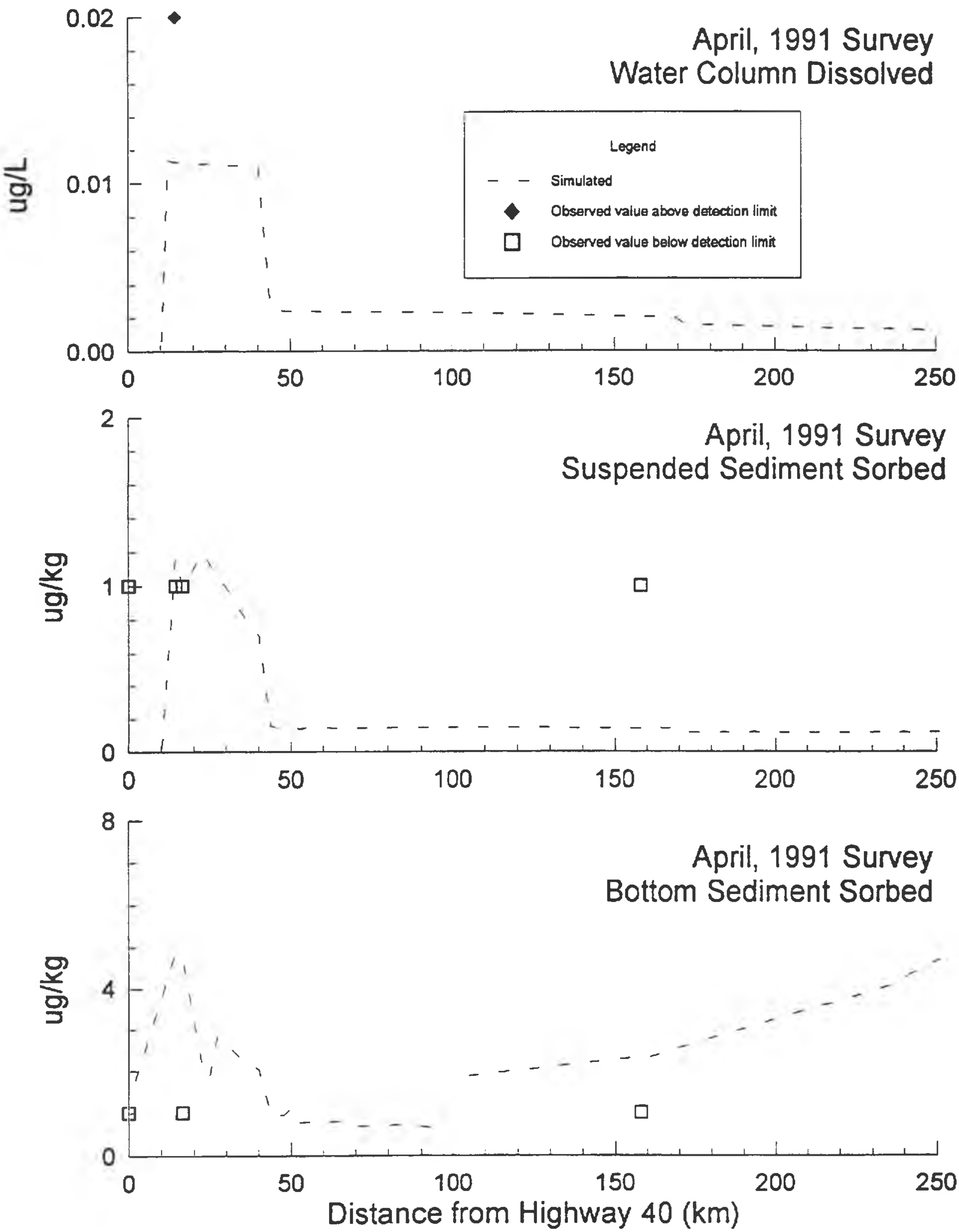

Figure 4.27e.
Wapiti/Smoky Rivers, 3,4,5-TCG Calibration, Synoptic Surveys

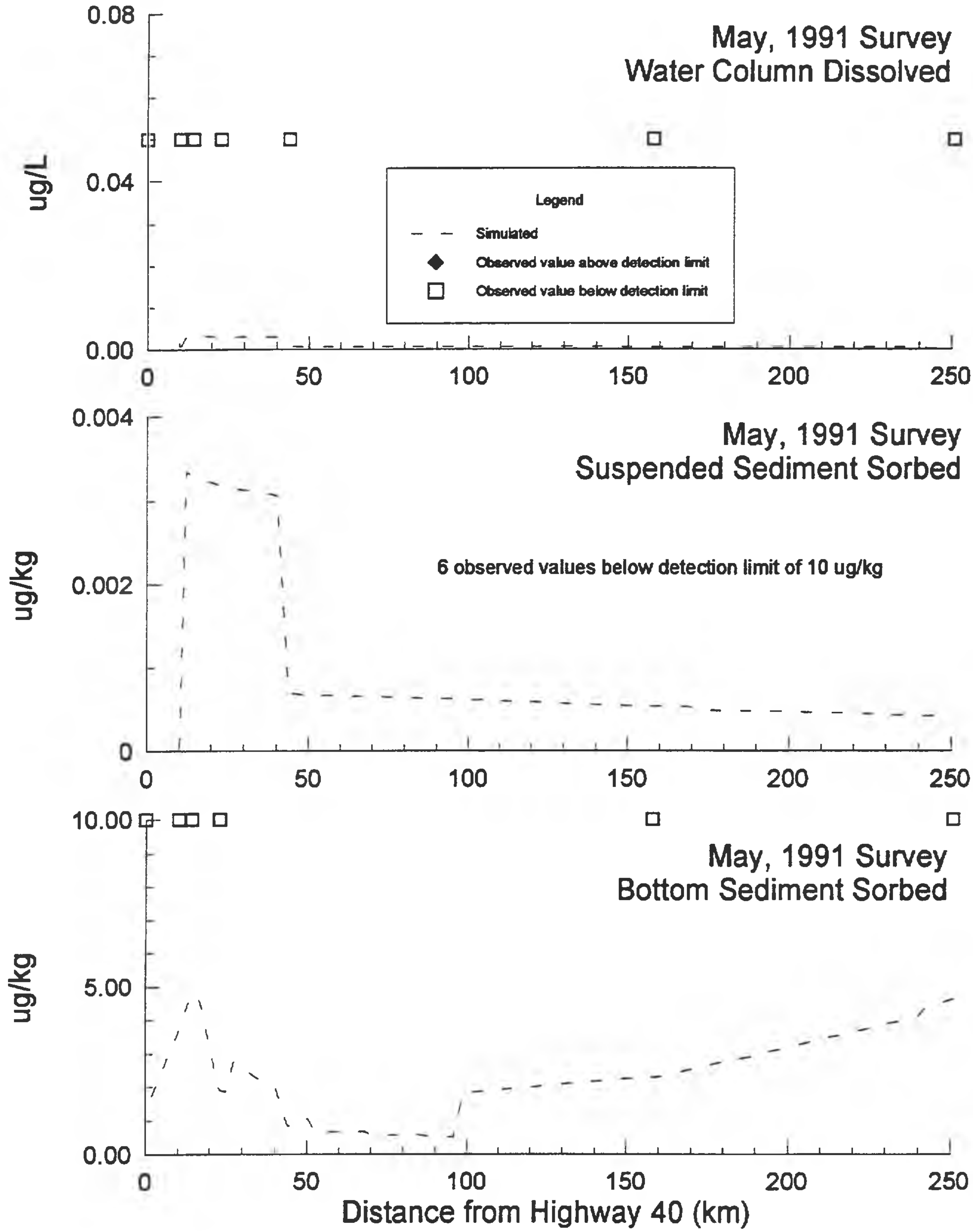

Figure 4.27f.
Wapiti/Smoky Rivers, 3,4,5-TCG Calibration, Synoptic Surveys

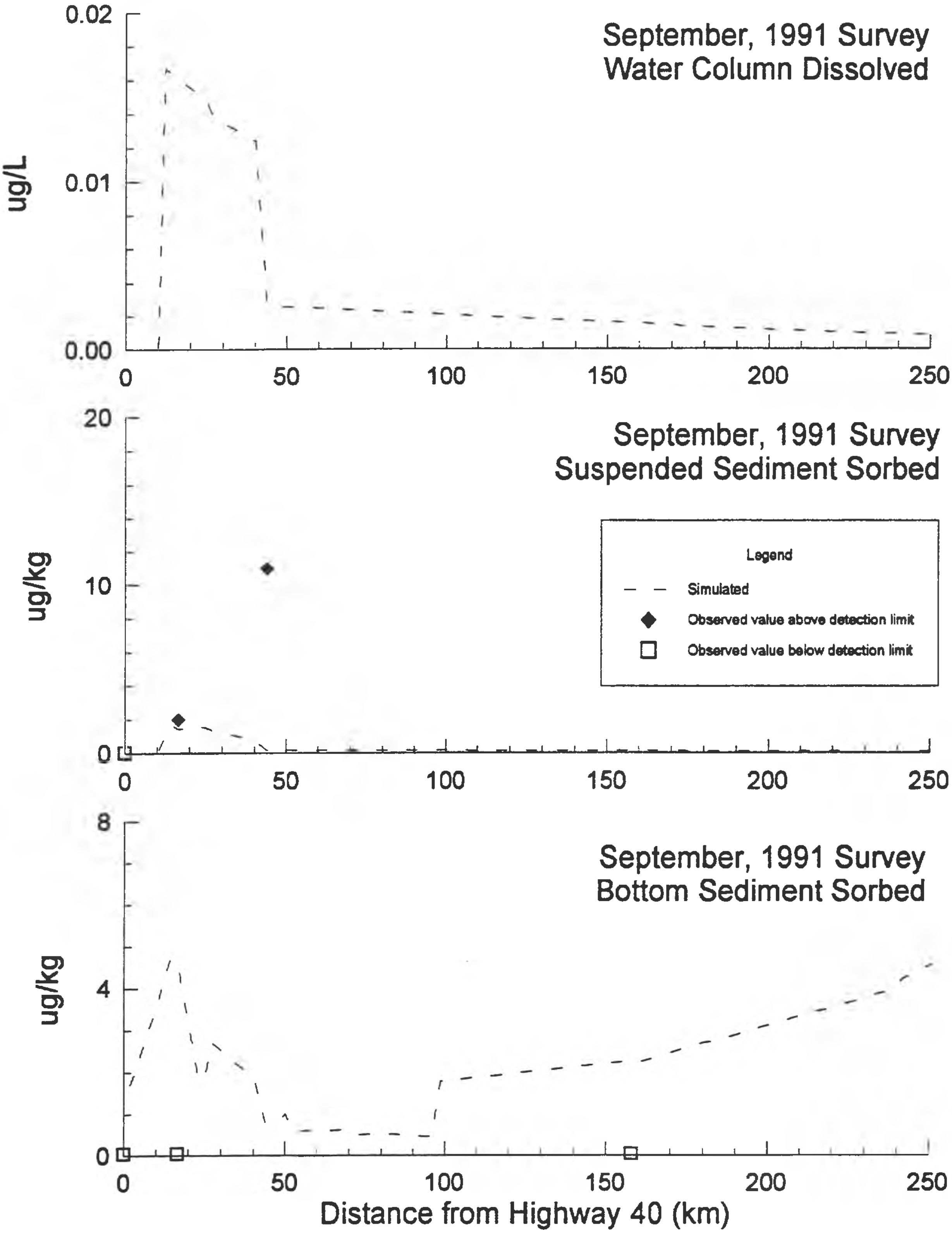

Figure 4.27g.
Wapiti/Smoky Rivers, 3,4,5-TCG Calibration, Synoptic Surveys

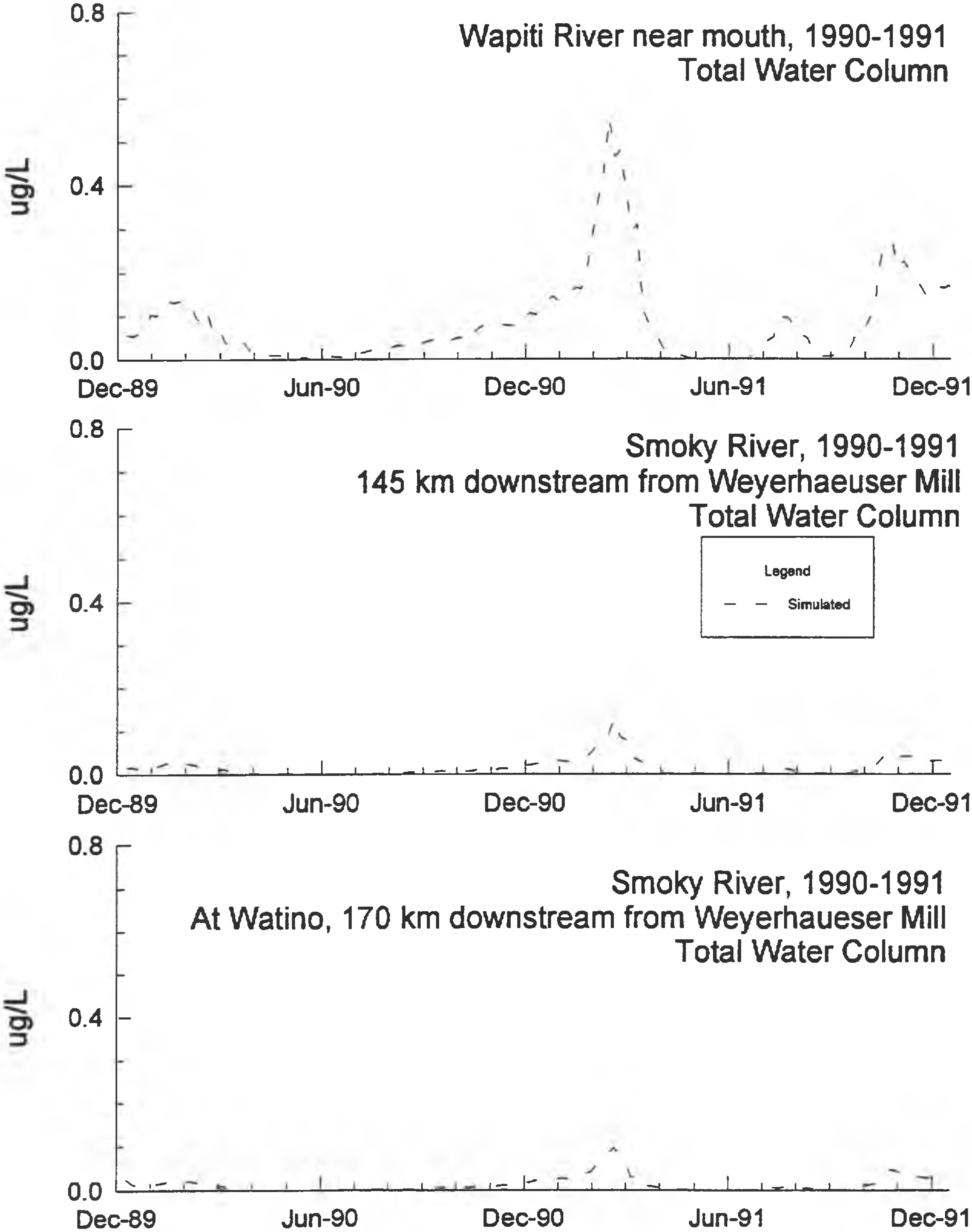

Figure 4.28a.
Wapiti/Smoky Rivers, 3,4,5-TCG Calibration, Time Series

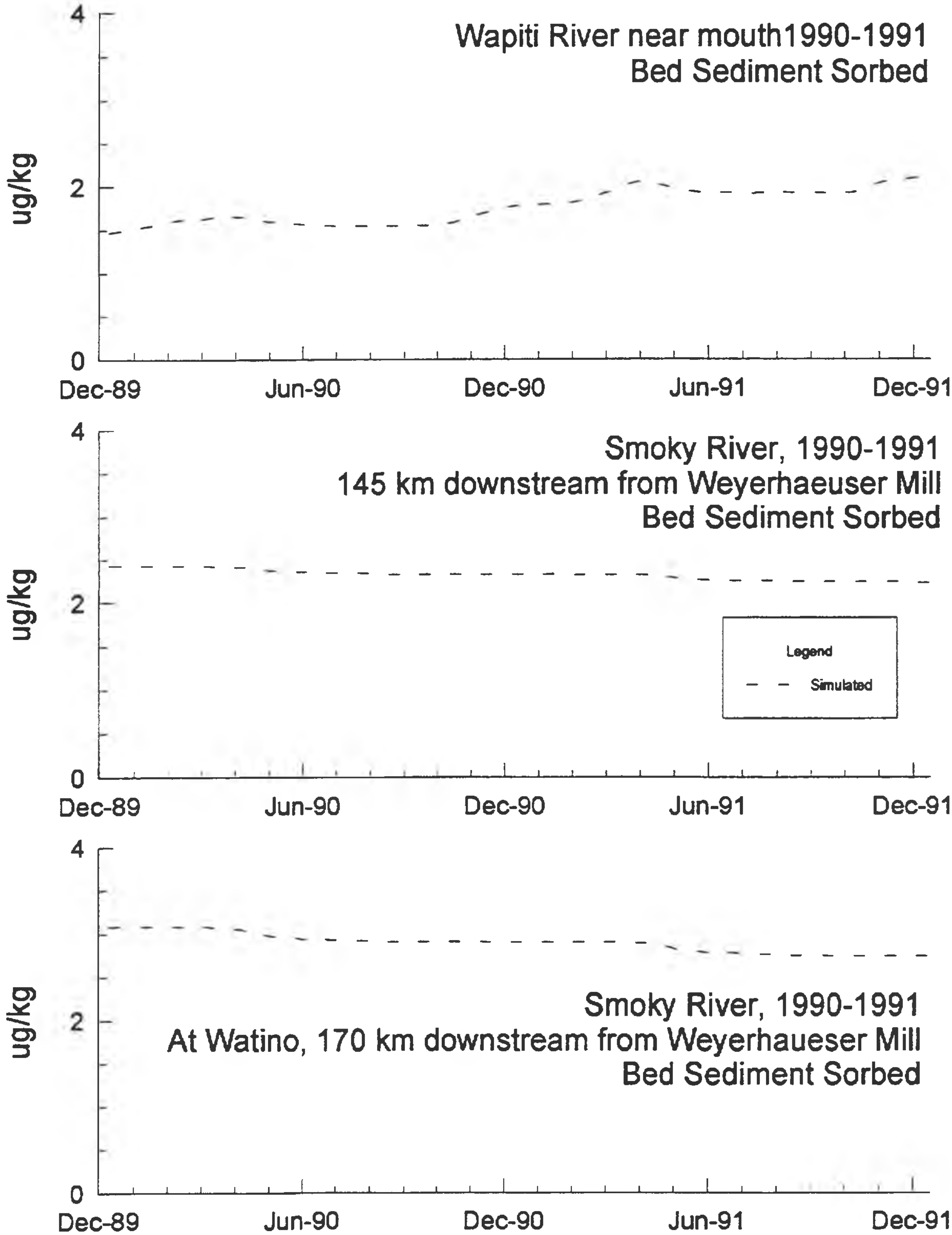

Figure 4.28b.
Wapiti/Smoky Rivers, 3,4,5-TCG Calibration, Time Series

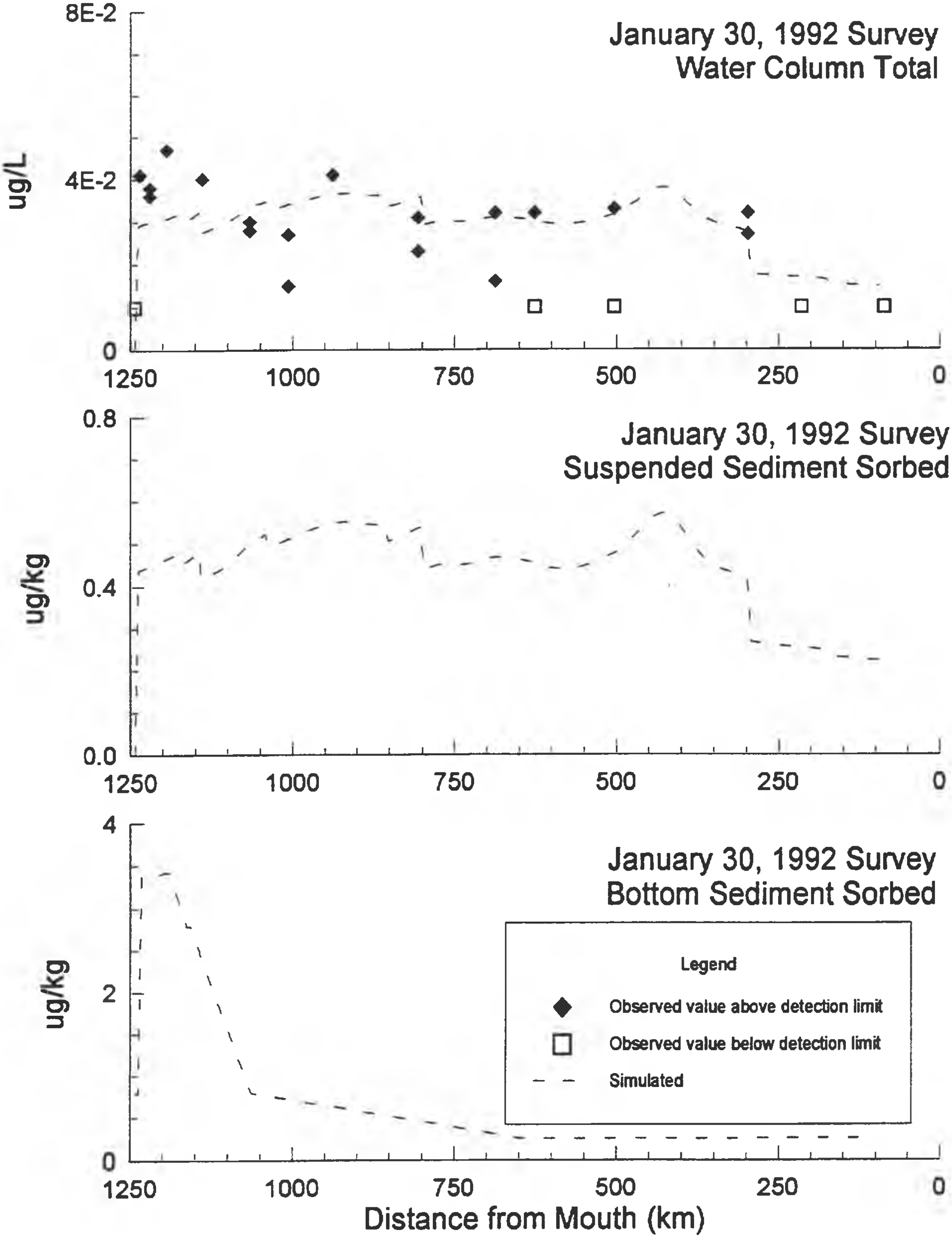

Figure 4.29a.
Athabasca River, 3,4,5-TCV Calibration, Synoptic Surveys

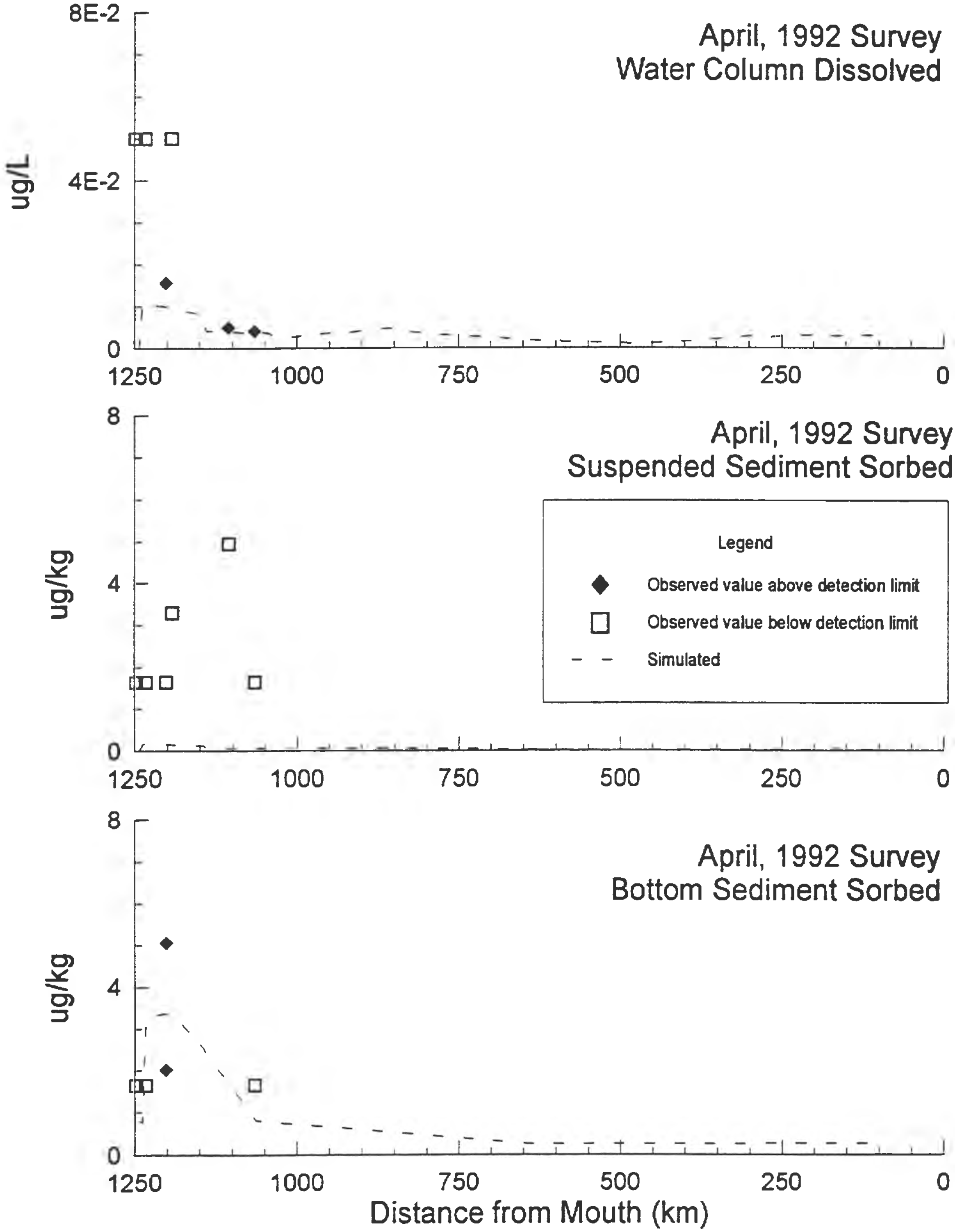

Figure 4.29b.
Athabasca River, 3,4,5-TCV Calibration, Synoptic Surveys

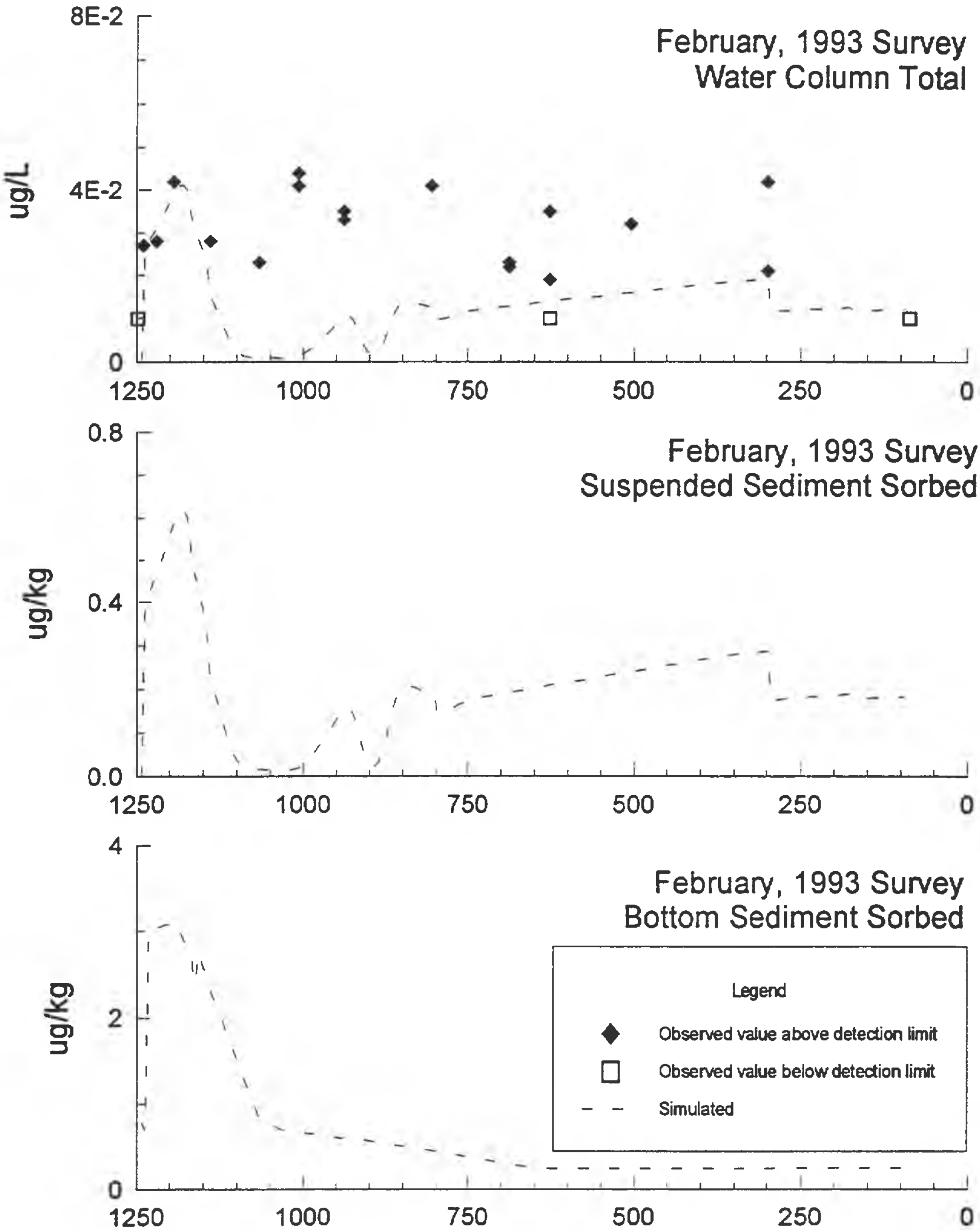

Figure 4.29c.
Athabasca River, 3,4,5-TCV Calibration, Synoptic Surveys

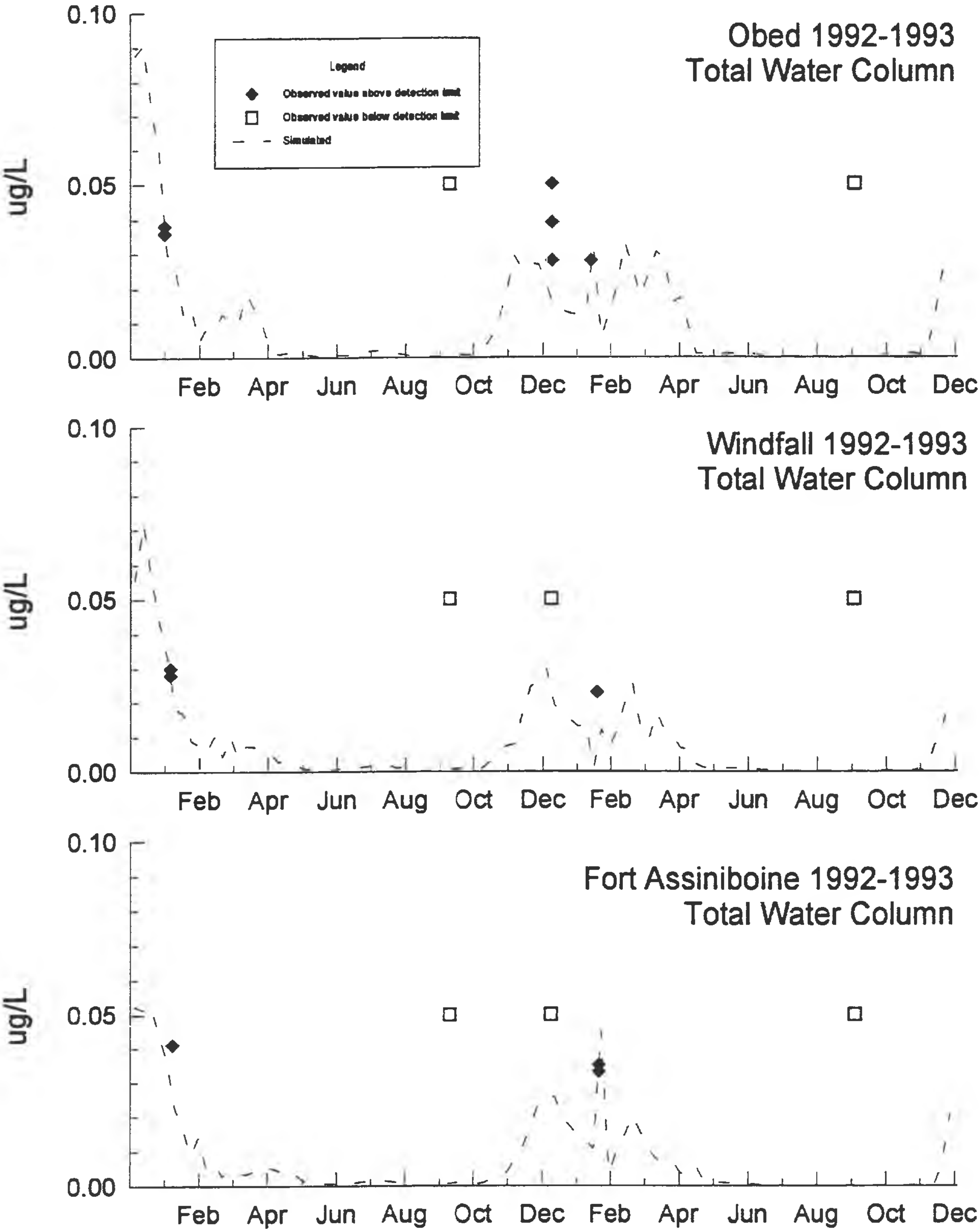

Figure 4.30a.
Athabasca River, 3,4,5-TCV Calibration, Time Series

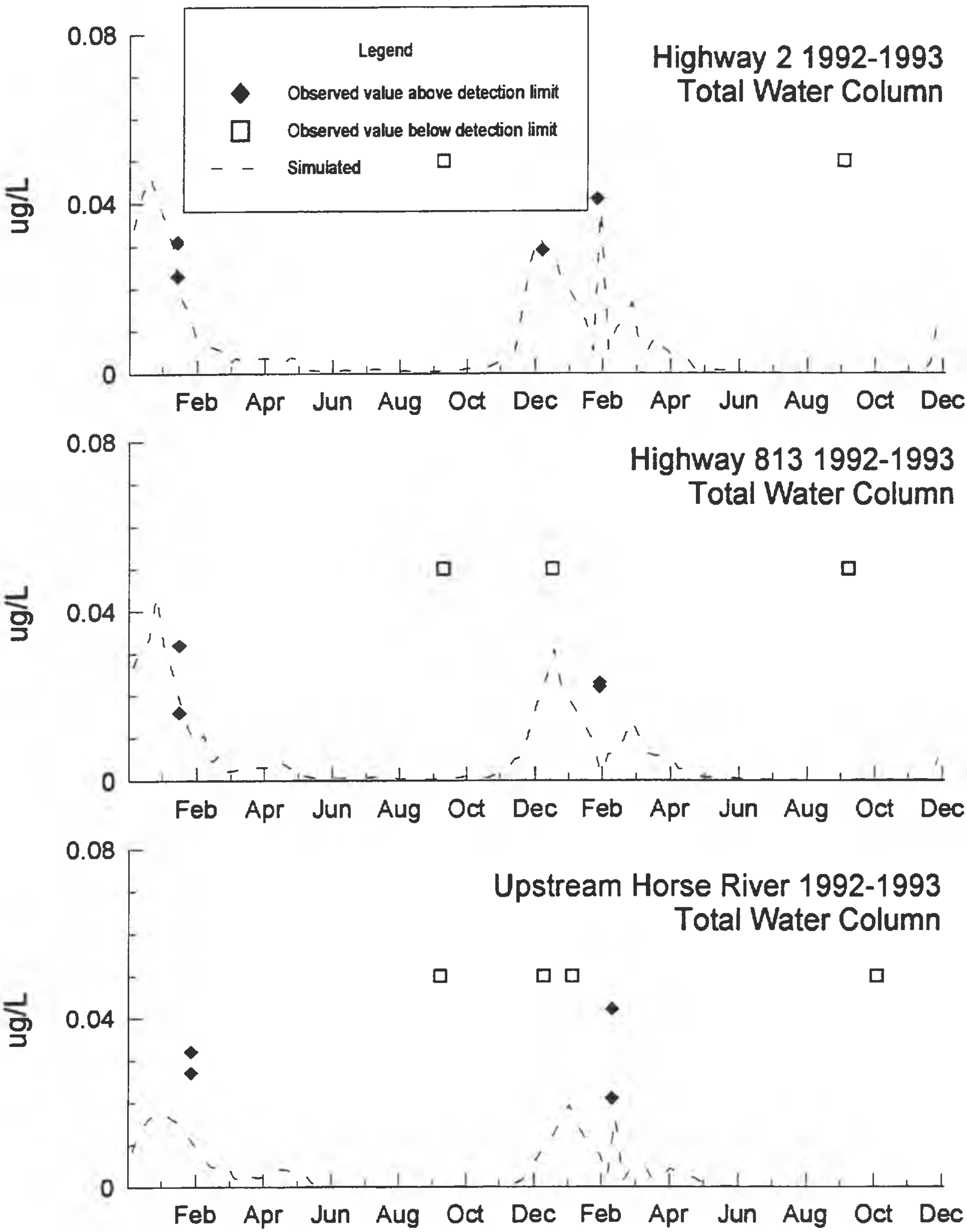

Figure 4.30b.
Athabasca River, 3,4,5-TCV Calibration, Time Series

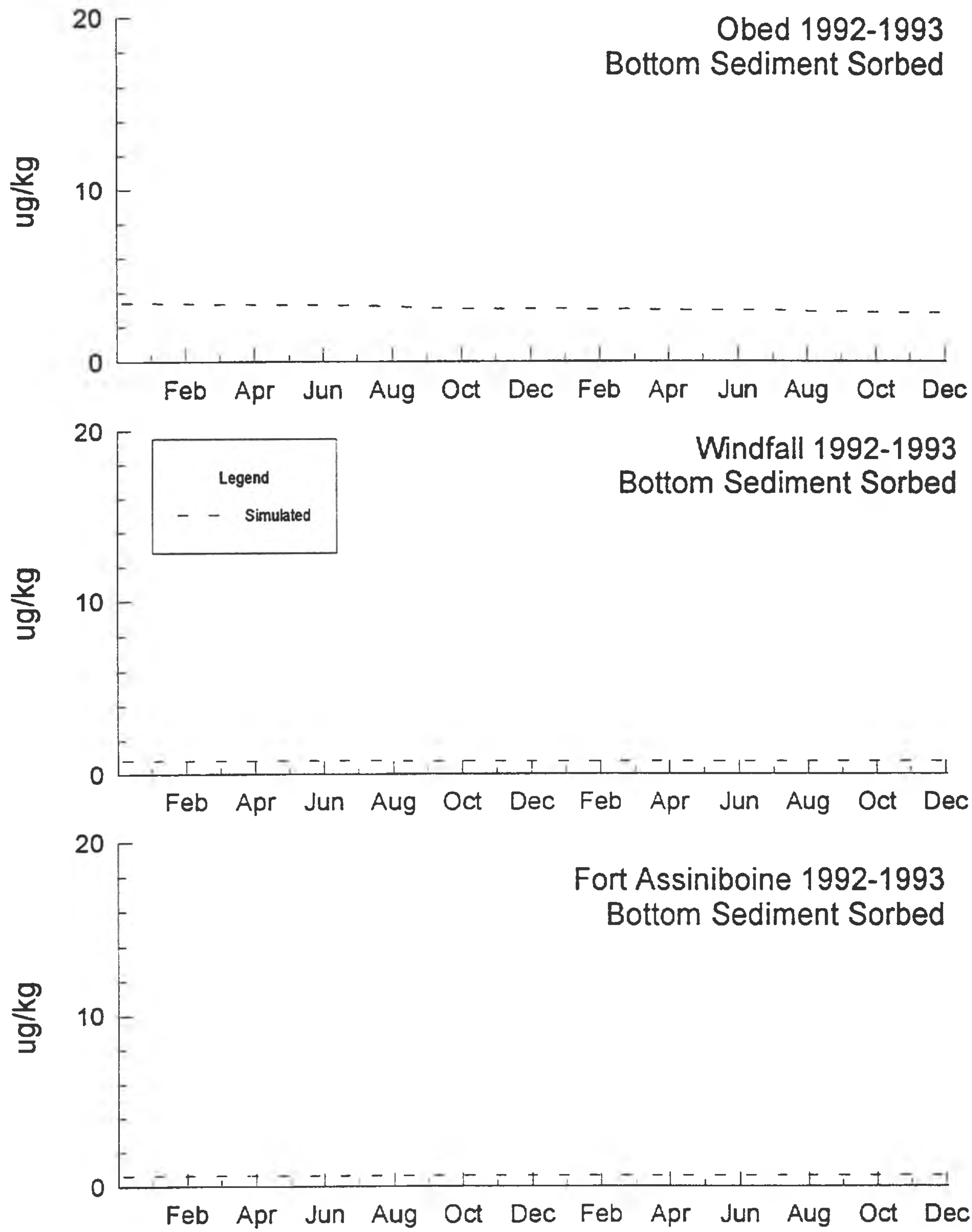

Figure 4.30c.
Athabasca River, 3,4,5-TCV Calibration, Time Series

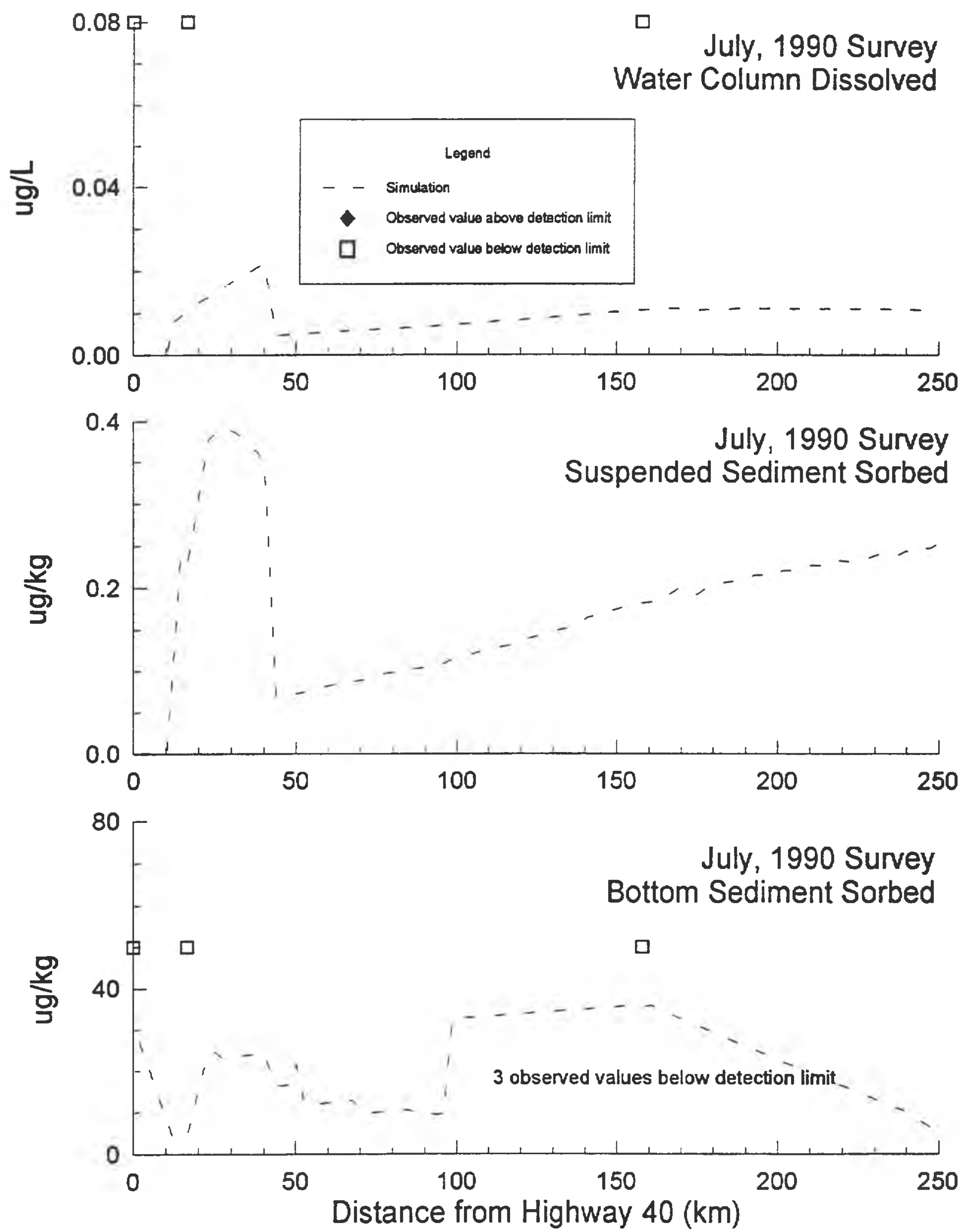

Figure 4.31a.
Wapiti/Smoky Rivers, 3,4,5-TCV Calibration, Synoptic Surveys

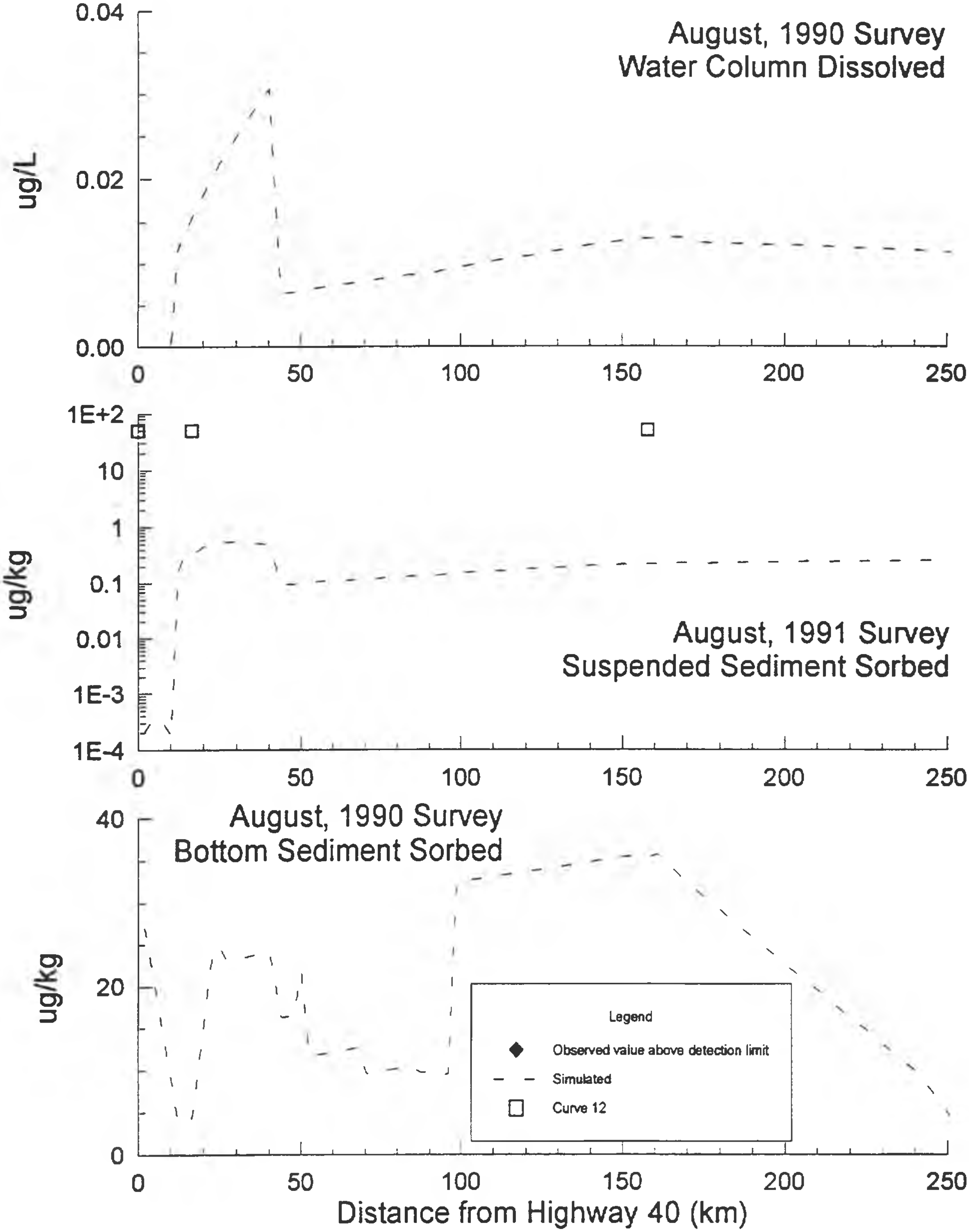

Figure 4.31b.
Wapiti/Smoky Rivers, 3,4,5-TCV Calibration, Synoptic Surveys

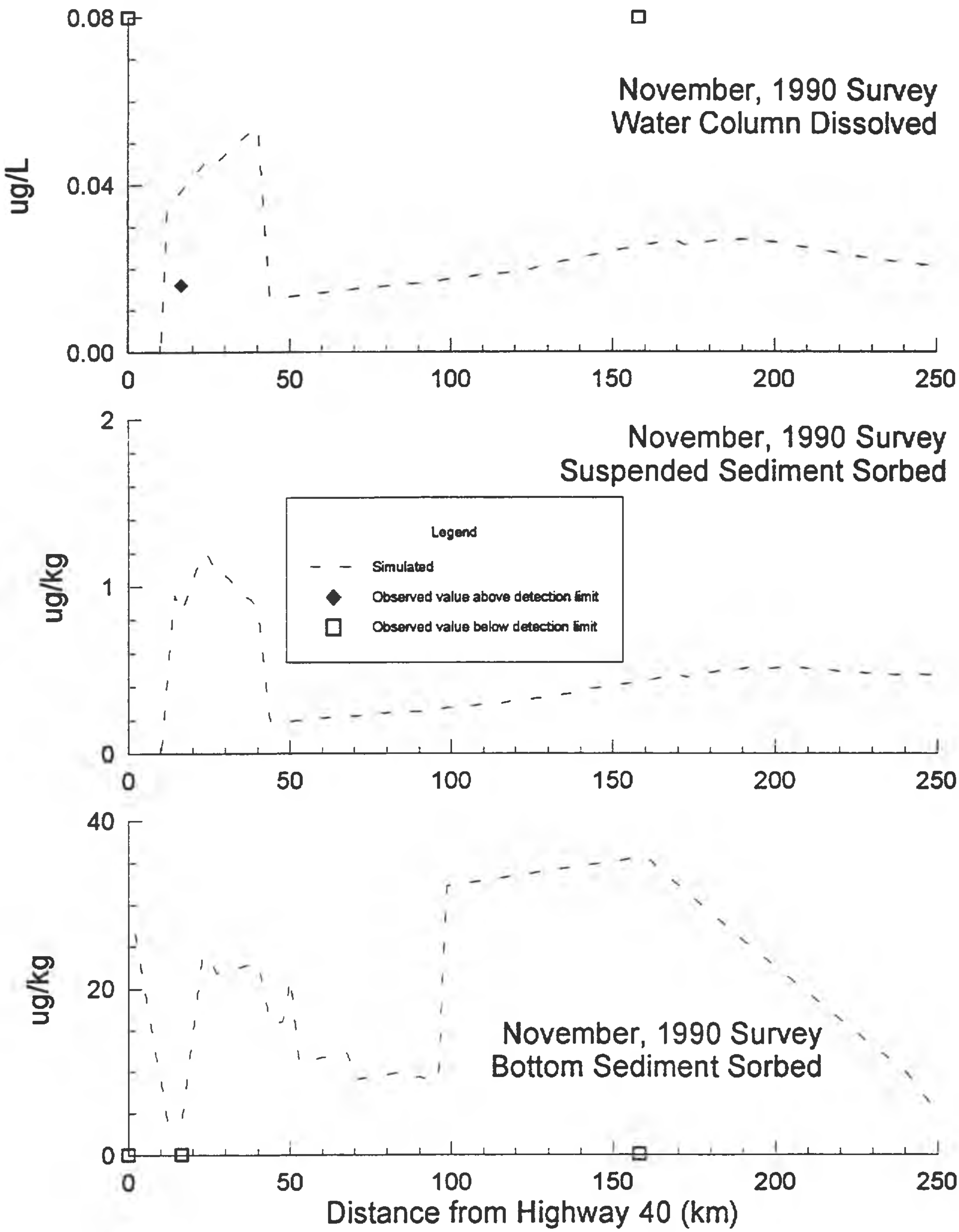

Figure 4.31c.
Wapiti/Smoky Rivers, 3,4,5-TCV Calibration, Synoptic Surveys

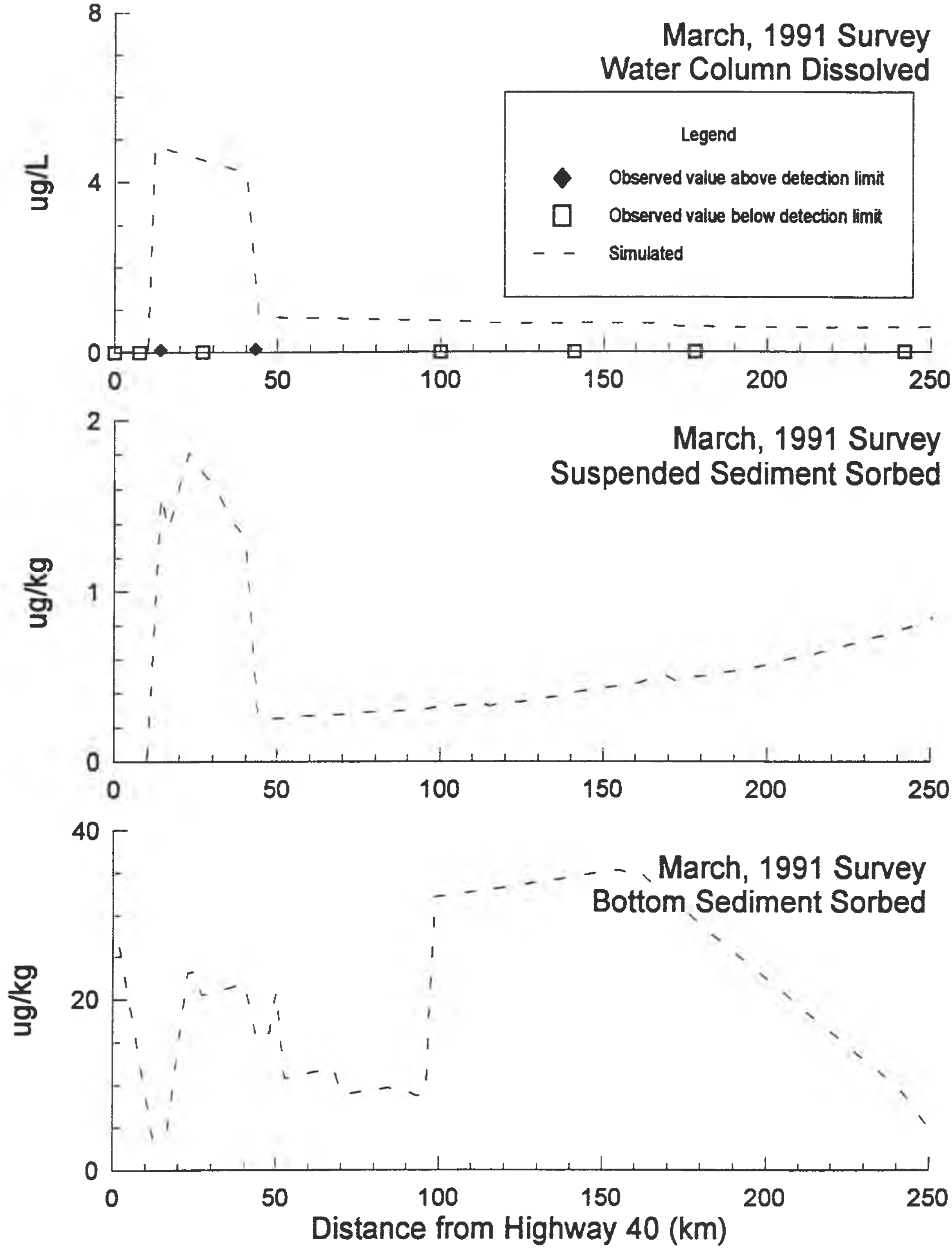

Figure 4.31d.
Wapiti/Smoky Rivers, 3,4,5-TCV Calibration, Synoptic Surveys

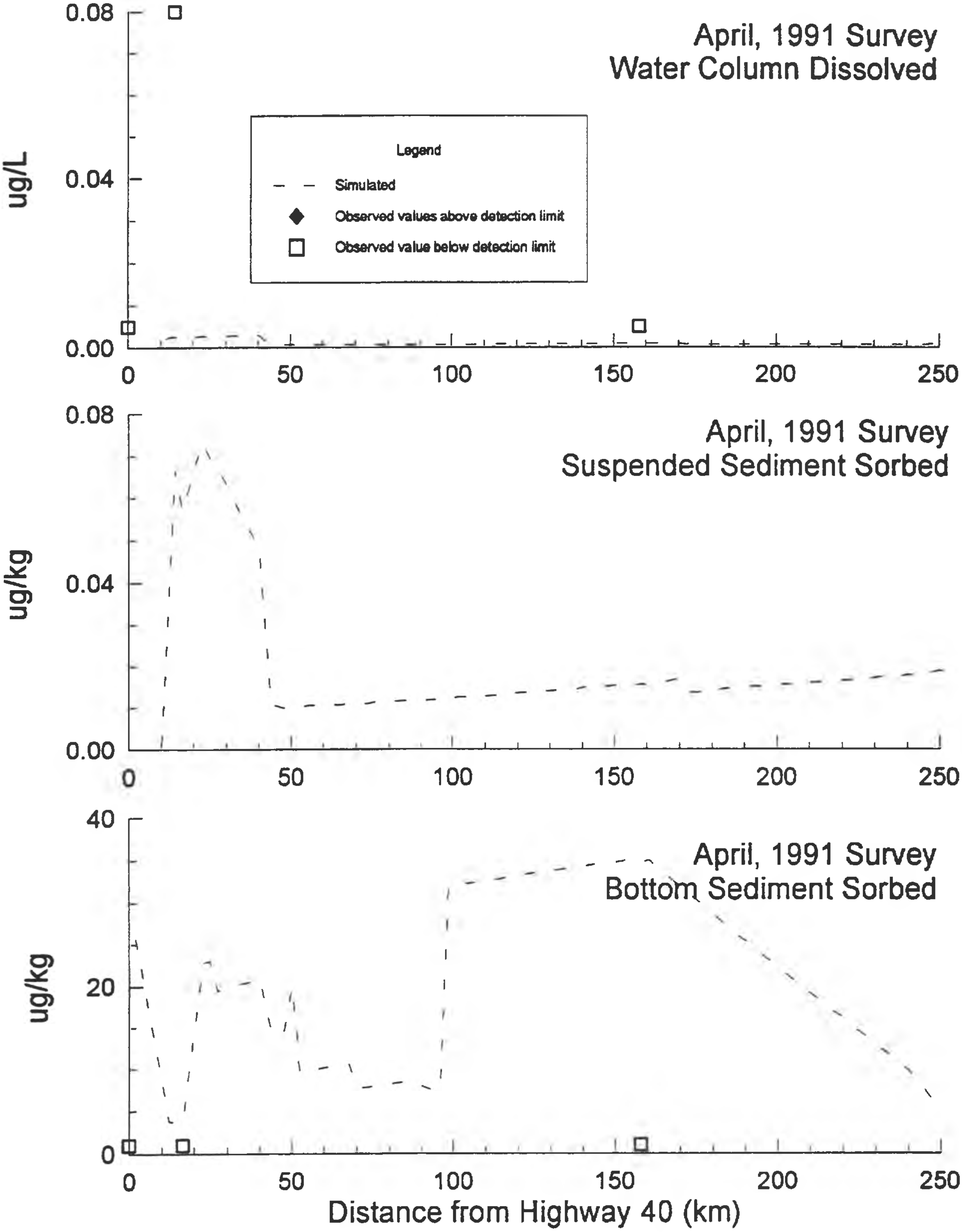

Figure 4.31e.
Wapiti/Smoky Rivers, 3,4,5-TCV Calibration, Synoptic Surveys

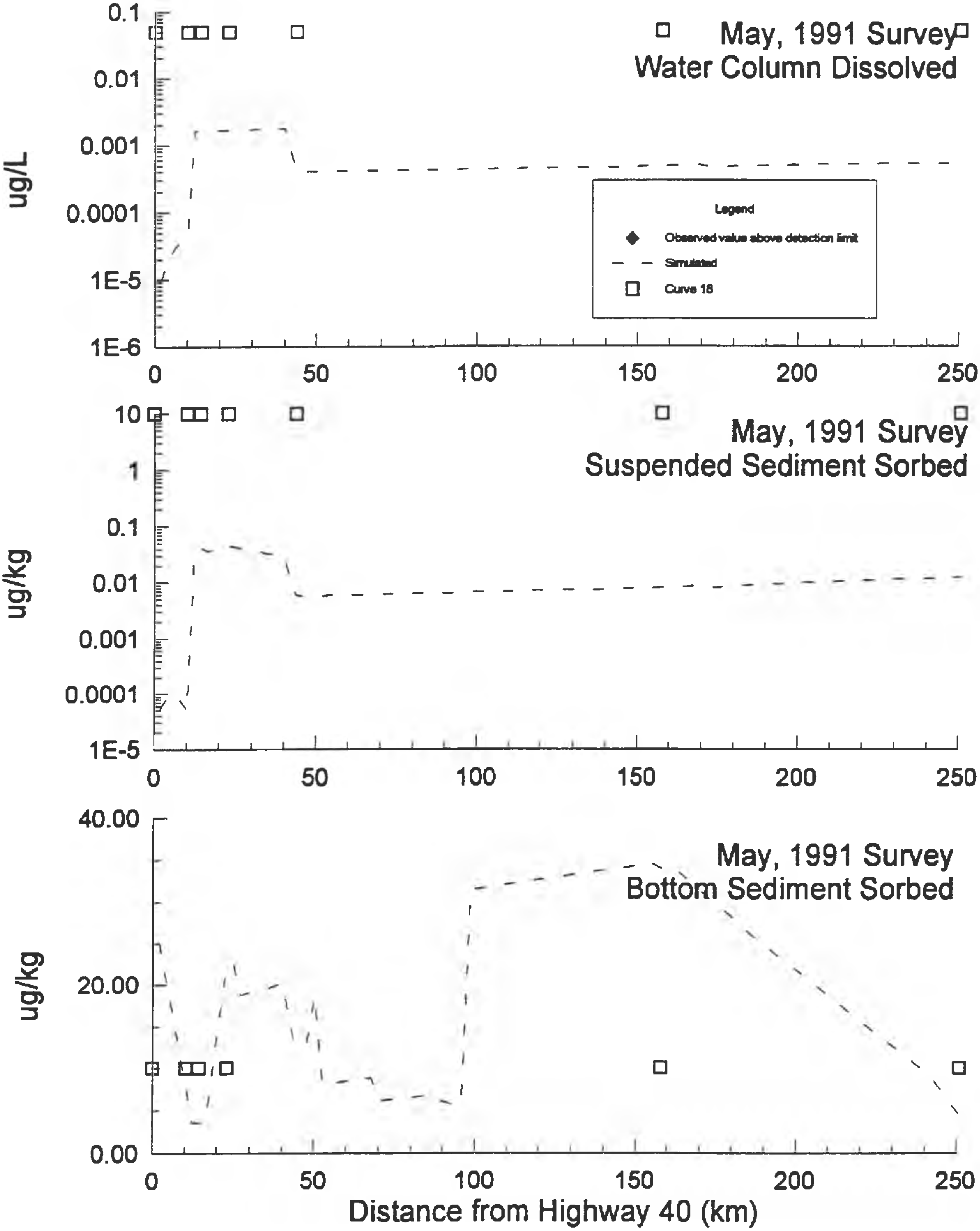

Figure 4.31f.
Wapiti/Smoky Rivers, 3,4,5-TCV Calibration, Synoptic Surveys

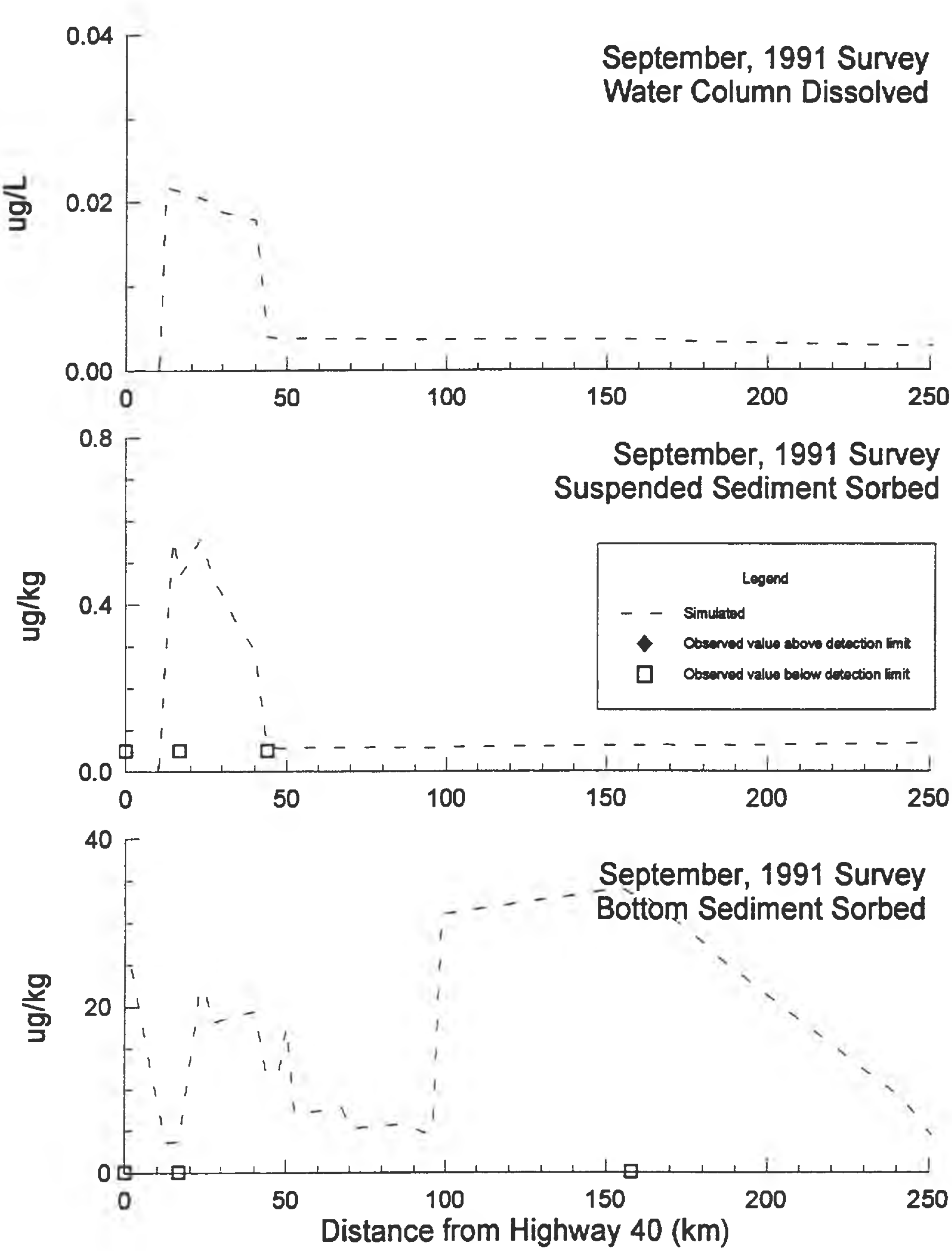

Figure 4.31g.
Wapiti/Smoky Rivers, 3,4,5-TCV Calibration, Synoptic Surveys

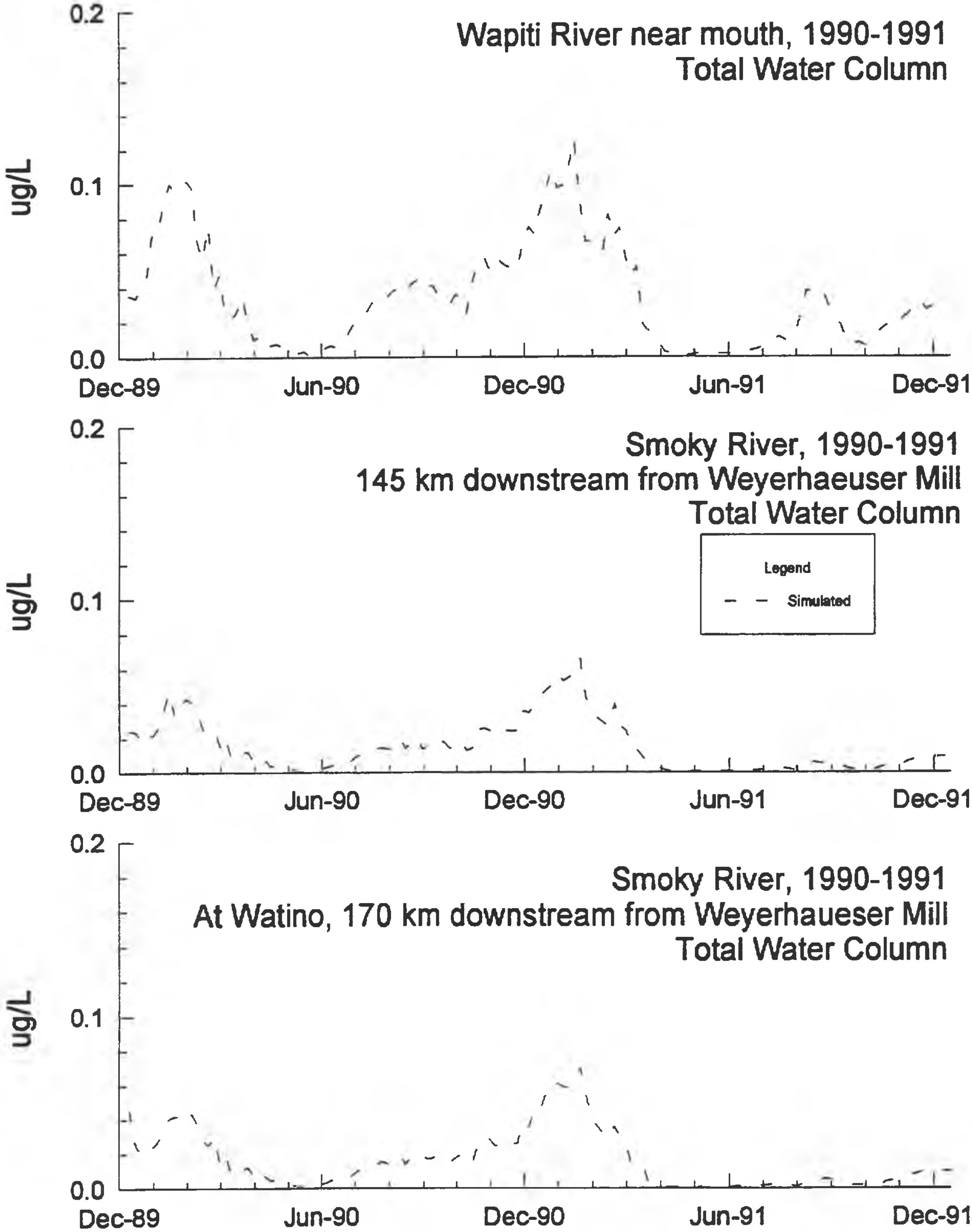

Figure 4.32a.
Wapiti/Smoky Rivers, 3,4,5-TCV Calibration, Time Series

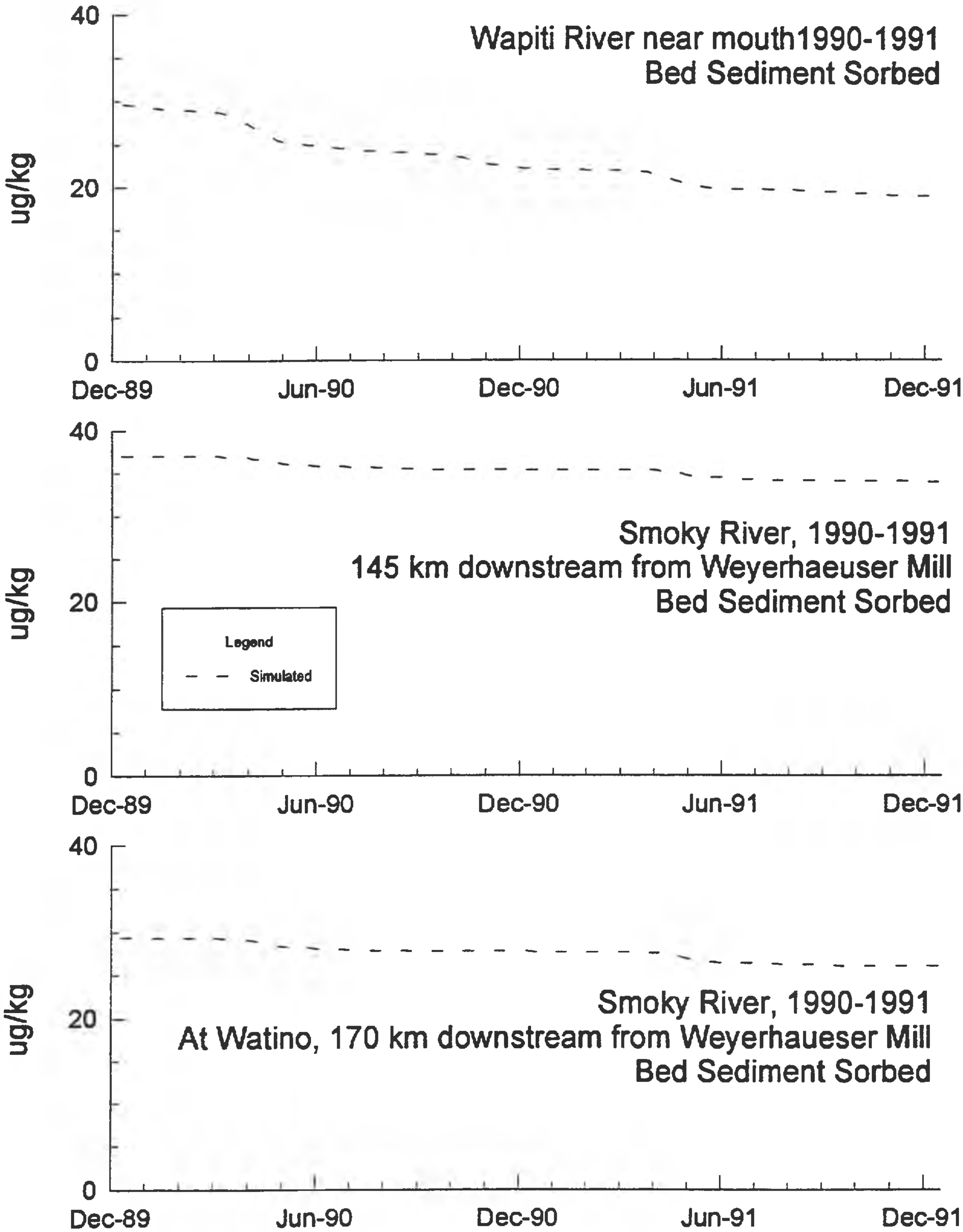

Figure 4.32b.
Wapiti/Smoky Rivers, 3,4,5-TCV Calibration, Time Series

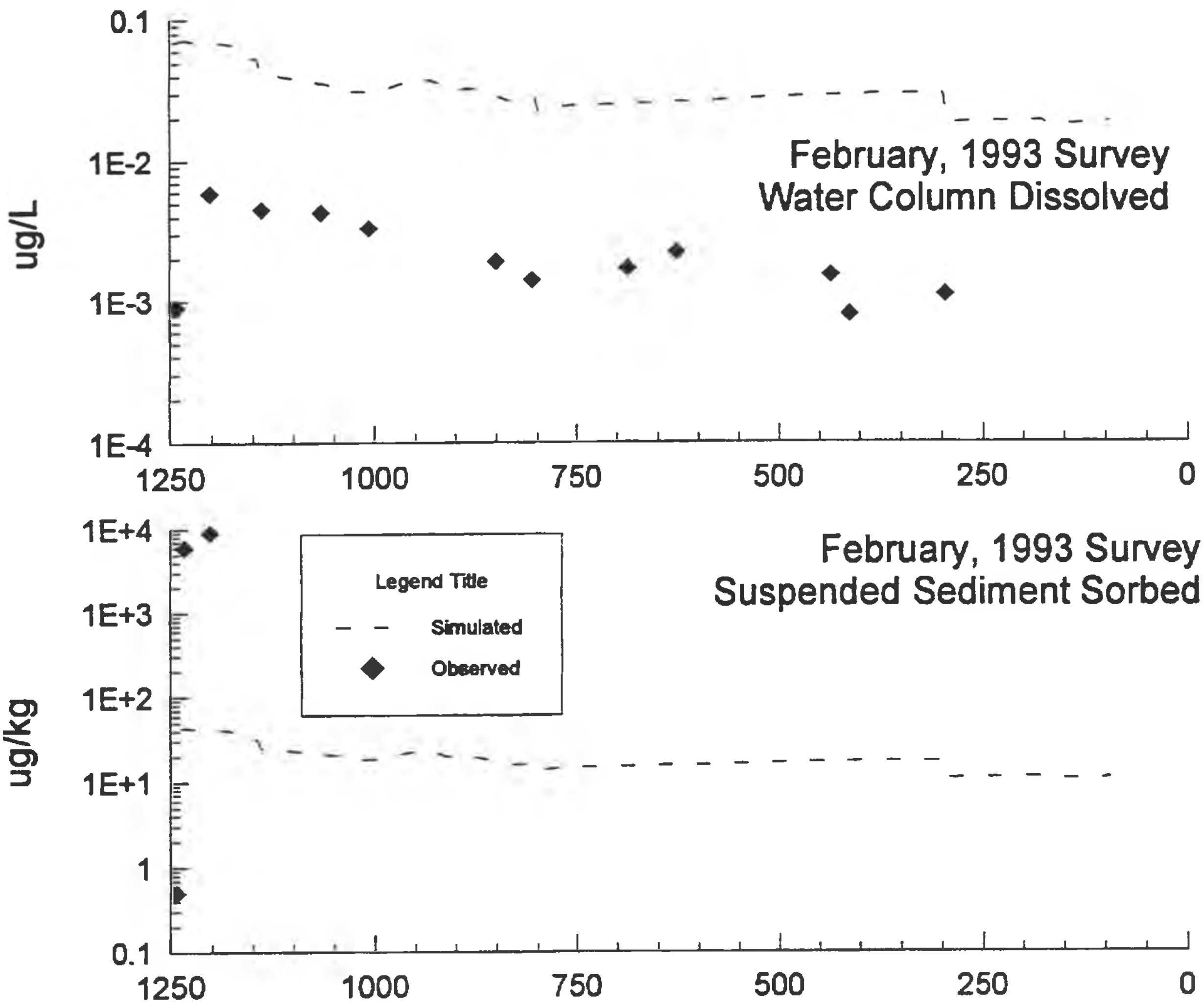

Figure 4.33.
Athabasca River, Phenanthrene,
Synoptic Survey

APPENDIX A: INFORMATION USED IN ATHABASCA RIVER CONTAMINANT FATE MODELLING

APPENDIX A: LIST OF TABLES

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.
Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

Date	Jday	HINTON INTAKE		NAQUADAT DATA		Regression
		Turb	pH	NTU	NFR	TSS (mg/L)
1/1/91	1	3	8.3			3.5
1/2/91	2	3				3.5
1/3/91	3	4	7.9			5.7
1/4/91	4	4	8			5.7
1/5/91	5	4	8			5.7
1/6/91	6	4	8.1			5.7
1/7/91	7	4	8.1			5.7
1/8/91	8	4	8	1.8	9.2	5.7
1/9/91	9	4	8			5.7
1/10/91	10	4	8			5.7
1/11/91	11	4	8			5.7
1/12/91	12	7	8.1			12.2
1/13/91	13	5	8			7.9
1/14/91	14	4	8.1			5.7
1/15/91	15	4	8.1			5.7
1/16/91	16	5	8			7.9
1/17/91	17	10	8			18.8
1/18/91	18	9	8			16.6
1/19/91	19	5	8.1			7.9
1/20/91	20	6	8.1			10.0
1/21/91	21	6	8.1			10.0
1/22/91	22	6	8.1			10.0
1/23/91	23	6	8.1			10.0
1/24/91	24	9	8			16.6
1/25/91	25	8	8.1			14.4
1/26/91	26	7	8.1			12.2
1/27/91	27	6	8.1			10.0
1/28/91	28	8	8.1			14.4
1/29/91	29	8	8.1			14.4
1/30/91	30	7	8.1			12.2
1/31/91	31	9	8.1			16.6
2/1/91	32	10	8.3			18.8
2/2/91	33	16	8.1			31.8
2/3/91	34	26	8.1			53.6
2/4/91	35	18	8.2			36.2
2/5/91	36	21	8.2			42.7
2/6/91	37	25	8.1			51.4
2/7/91	38	40	8.1			84.1
2/8/91	39	27	8.2			55.8
2/9/91	40	21	8.1			42.7
2/10/91	41	21	8.1			42.7
2/11/91	42	17	8.1			34.0
2/12/91	43	18	8.1			36.2
2/13/91	44	16	8			31.8
2/14/91	45	14	8.1			27.5
2/15/91	46	20	8.2			40.6
2/16/91	47	20	8.1			40.6
2/17/91	48	18	8.2			36.2
2/18/91	49	16	8.1			31.8
2/19/91	50	13	8.2			25.3
2/20/91	51	14	8.2			27.5
2/21/91	52	15	8.2			29.7
2/22/91	53	15	8.2			29.7
2/23/91	54	12	8.3			23.1
2/24/91	55	12	8.3			23.1
2/25/91	56	12	8.3			23.1
2/26/91	57	13	8.2			25.3
2/27/91	58	14	8.2			27.5
2/28/91	59	14	8.2			27.5
3/1/91	60	11	8.2			20.9
3/2/91	61	7	8.3			12.2
3/3/91	62	7	8.4			12.2
3/4/91	63	8	8.3			14.4
3/5/91	64	7	8.2			12.2
3/6/91	65	7	8.1			12.2
3/7/91	66	7	8.2			12.2
3/8/91	67	7	8.2			12.2
3/9/91	68	8	8.2			14.4
3/10/91	69	8	8.3			14.4
3/11/91	70	7	8.4	6.8	17.6	12.2
3/12/91	71	7	8.3			12.2
3/13/91	72	5	8.2			7.9

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.
Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

Date	Jday	HINTON INTAKE		NAQUADAT DATA		Regression
		Turb	pH	NTU	NFR	TSS (mg/L)
3/14/91	73	6	8.2			10.0
3/15/91	74	9	8.2			16.6
3/16/91	75	8	8.3			14.4
3/17/91	76	9	8.3			16.6
3/18/91	77	15	8.3			29.7
3/19/91	78	14	8.3			27.5
3/20/91	79	18	8.3			36.2
3/21/91	80	40	8.2			84.1
3/22/91	81	34	8.3			71.1
3/23/91	82	34	8.2			71.1
3/24/91	83	27	8.2			55.8
3/25/91	84	25	8.2			51.4
3/26/91	85	21	8.2			42.7
3/27/91	86	25	8.3			51.4
3/28/91	87	28	8.2			58.0
3/29/91	88	34	8.2			71.1
3/30/91	89	52	8.2			110.3
3/31/91	90	68	8.2			145.1
4/1/91	91	41	8.2			86.3
4/2/91	92	27	8.2			55.8
4/3/91	93	36	8.3			75.4
4/4/91	94	28	8.3			58.0
4/5/91	95	20	8.3			40.6
4/6/91	96	17	8.4			34.0
4/7/91	97	15	8.3			29.7
4/8/91	98	14	8.3			27.5
4/9/91	99	13	8.3			25.3
4/10/91	100	10	8.3			18.8
4/11/91	101	9	8.3			16.6
4/12/91	102	10	8.3			18.8
4/13/91	103	12	8.3			23.1
4/14/91	104	12	8.4			23.1
4/15/91	105	13	8.3			25.3
4/16/91	106	14	8.4			27.5
4/17/91	107	15	8.4			29.7
4/18/91	108	16	8.3			31.8
4/19/91	109	16	8.3			31.8
4/20/91	110	26	8.4			53.6
4/21/91	111	30	8.4			62.3
4/22/91	112	39	8.4			81.9
4/23/91	113	42	8.4			88.5
4/24/91	114	44	8.3			92.8
4/25/91	115	56	8.3			119.0
4/26/91	116	47	8.3			99.4
4/27/91	117	33	8.3			68.9
4/28/91	118	30	8.3			62.3
4/29/91	119	25	8.3			51.4
4/30/91	120	40	8.3			84.1
5/1/91	121	27	8.4			55.8
5/2/91	122	21	8.3			42.7
5/3/91	123	15	8.3			29.7
5/4/91	124	16	8.2			31.8
5/5/91	125	18	8.3			36.2
5/6/91	126	30	8.3			62.3
5/7/91	127	26	8.3			53.6
5/8/91	128	18	8.3			36.2
5/9/91	129	43	8.3			90.7
5/10/91	130	134	8.3	220	299	288.9
5/11/91	131	83	8.3			177.8
5/12/91	132	58	8.3			123.3
5/13/91	133	94	8.3			201.8
5/14/91	134	111	8.2			238.8
5/15/91	135	69	8.3			147.3
5/16/91	136	34	8.3			71.1
5/17/91	137	28	8.3			58.0
5/18/91	138	38	8.3			79.8
5/19/91	139	120	8.3			258.4
5/20/91	140	156	8.3			336.9
5/21/91	141	202	8.4			437.1
5/22/91	142	150	8.3			323.8
5/23/91	143	66	8.3			140.8
5/24/91	144	43	8.3			90.7

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.
Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

Date	Jday	HINTON INTAKE Turb	HINTON INTAKE pH	NAQUADAT DATA NTU	NAQUADAT DATA NFR	Regression TSS (mg/L)
5/25/91	145	34	8.3			71.1
5/26/91	146	36	8.2			75.4
5/27/91	147	29	8.3			60.2
5/28/91	148	28	8.3			58.0
5/29/91	149	28	8.3			58.0
5/30/91	150	27	8.2			55.8
5/31/91	151	56	8.3			119.0
6/1/91	152	46	8.5			97.2
6/2/91	153	33	8.3			68.9
6/3/91	154	28	8.5			58.0
6/4/91	155	41	8.4			86.3
6/5/91	156	23	8.4			47.1
6/6/91	157	17	8.3			34.0
6/7/91	158	16	8.4			31.8
6/8/91	159	28	8.4			58.0
6/9/91	160	52	8.4			110.3
6/10/91	161	38	8.5			79.8
6/11/91	162	41	8.5			86.3
6/12/91	163	211	8.4			456.7
6/13/91	164	84	8.4			180.0
6/14/91	165	41	8.4			86.3
6/15/91	166	30	8.4			62.3
6/16/91	167	22	8.4			44.9
6/17/91	168	18	8.5			36.2
6/18/91	169	17	8.4			34.0
6/19/91	170	21	8.4			42.7
6/20/91	171	22	8.4			44.9
6/21/91	172	23	8.4			47.1
6/22/91	173	22	8.4			44.9
6/23/91	174	18	8.4			36.2
6/24/91	175	21	8.4			42.7
6/25/91	176	24	8.3			49.3
6/26/91	177	26	8.4			53.6
6/27/91	178	28	8.4			58.0
6/28/91	179	36	8.4			75.4
6/29/91	180	57	8.4			121.2
6/30/91	181	65	8.5			138.6
7/1/91	182	68	8.5			145.1
7/2/91	183	55	8.6			116.8
7/3/91	184	49	8.4			103.7
7/4/91	185	67	8.4			143.0
7/5/91	186	86	8.4			184.4
7/6/91	187	68	8.4			145.1
7/7/91	188	56	8.4			119.0
7/8/91	189	41	8.4			86.3
7/9/91	190	40	8.4			84.1
7/10/91	191	41	8.4			86.3
7/11/91	192	45	8.4			95.0
7/12/91	193	50	8.4			105.9
7/13/91	194	52	8.4			110.3
7/14/91	195	95	8.3			204.0
7/15/91	196	118	8.3			254.1
7/16/91	197	67	8.3			143.0
7/17/91	198	60	8.3			127.7
7/18/91	199	49	8.4			103.7
7/19/91	200	27	8.2			55.8
7/20/91	201	36	8.3			75.4
7/21/91	202	24	8.2			49.3
7/22/91	203	21	8.3			42.7
7/23/91	204	24	8.3			49.3
7/24/91	205	21	8.3			42.7
7/25/91	206	36	8.2			75.4
7/26/91	207	50	8.2			105.9
7/27/91	208	49	8.2			103.7
7/28/91	209	48	8.2			101.6
7/29/91	210	38	8.2			79.8
7/30/91	211	31	8.2			64.5
7/31/91	212	24	8.2			49.3
8/1/91	213					
8/2/91	214					
8/3/91	215					
8/4/91	216					

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.
Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

Date	Jday	HINTON INTAKE		NAQUADAT DATA		Regression
		Turb	pH	NTU	NFR	TSS (mg/L)
8/5/91	217					
8/6/91	218					
8/7/91	219					
8/8/91	220					
8/9/91	221					
8/10/91	222					
8/11/91	223					
8/12/91	224					
8/13/91	225					
8/14/91	226					
8/15/91	227					
8/16/91	228					
8/17/91	229					
8/18/91	230					
8/19/91	231					
8/20/91	232			37	120	
8/21/91	233					
8/22/91	234					
8/23/91	235					
8/24/91	236					
8/25/91	237					
8/26/91	238					
8/27/91	239					
8/28/91	240					
8/29/91	241					
8/30/91	242					
8/31/91	243					
9/1/91	244	84	8.2			180.0
9/2/91	245	204	8.2			441.5
9/3/91	246	106	8.3			227.9
9/4/91	247	40	8.3			84.1
9/5/91	248	30	8.3			62.3
9/6/91	249	26	8.3			53.6
9/7/91	250	26	8.2			53.6
9/8/91	251	25	8.3			51.4
9/9/91	252	25	8.3			51.4
9/10/91	253	20	8.3			40.6
9/11/91	254	20	8.4			40.6
9/12/91	255	22	8.4			44.9
9/13/91	256	23	8.4			47.1
9/14/91	257	19	8.4			38.4
9/15/91	258	18	8.4			36.2
9/16/91	259	19	8.3			38.4
9/17/91	260	19	8.3			38.4
9/18/91	261	18	8.4			36.2
9/19/91	262	23	8.4			47.1
9/20/91	263	19	8.3			38.4
9/21/91	264	13	8.5			25.3
9/22/91	265	16	8.4			31.8
9/23/91	266	16	8.3			31.8
9/24/91	267	45	8.3			95.0
9/25/91	268	20	8.2			40.6
9/26/91	269	14	8.3			27.5
9/27/91	270	14	8.2			27.5
9/28/91	271	15	8.3			29.7
9/29/91	272	13	8.3			25.3
9/30/91	273	22	8.3			44.9
10/1/91	274	18	8.3			36.2
10/2/91	275	13	8.3			25.3
10/3/91	276	11	8.3			20.9
10/4/91	277	11	8.4			20.9
10/5/91	278	23	8.4			47.1
10/6/91	279	19	8.3			38.4
10/7/91	280	27	8.3			55.8
10/8/91	281	26	8.3			53.6
10/9/91	282	38	8.3			79.8
10/10/91	283	42	8.3			88.5
10/11/91	284	18	8.3			36.2
10/12/91	285	19	8.3			38.4
10/13/91	286	16	8.3			31.8
10/14/91	287	23	8			47.1
10/15/91	288	19	8.3			38.4

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.
Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

Date	Jday	HINTON INTAKE Turb	pH	NAQUADAT DATA NTU	NFR	Regression TSS (mg/L)
10/16/91	289	17	8.3			34.0
10/17/91	290	22	8.3	22	39	44.9
10/18/91	291	71	8.3			151.7
10/19/91	292	66	8.3			140.8
10/20/91	293	51	8.3			108.1
10/21/91	294	22	8.3			44.9
10/22/91	295	17	8.3			34.0
10/23/91	296	28	8.4			58.0
10/24/91	297	46	8.2			97.2
10/25/91	298	32	8.2			66.7
10/26/91	299	28	8.2			58.0
10/27/91	300	28	8.2			58.0
10/28/91	301	15	8.4			29.7
10/29/91	302	13	8.3			25.3
10/30/91	303	11	8.3			20.9
10/31/91	304	11	8.3			20.9
11/1/91	305	15	8.4			29.7
11/2/91	306	13	8.2			25.3
11/3/91	307	19	8.3			38.4
11/4/91	308	31	8.3			64.5
11/5/91	309	16	8.1			31.8
11/6/91	310	14	8.2			27.5
11/7/91	311	16	8.3			31.8
11/8/91	312	14	8.2			27.5
11/9/91	313	10	8.4			18.8
11/10/91	314	19	8.4			38.4
11/11/91	315	20	8.3			40.6
11/12/91	316	20	8.3			40.6
11/13/91	317	33	8.3			68.9
11/14/91	318	21	8.3			42.7
11/15/91	319	57	8.3			121.2
11/16/91	320	87	8.2			186.5
11/17/91	321	74	8.3			158.2
11/18/91	322	39	8.3			81.9
11/19/91	323	39	8.3			81.9
11/20/91	324	31	8.2			64.5
11/21/91	325	22	8.4			44.9
11/22/91	326	14	8.5			27.5
11/23/91	327	11	8.4			20.9
11/24/91	328	15	8.4			29.7
11/25/91	329	21	8.3			42.7
11/26/91	330	13	8.4			25.3
11/27/91	331	18	8.4			36.2
11/28/91	332	11	8.4			20.9
11/29/91	333	8	8.3			14.4
11/30/91	334	8	8.4			14.4
12/1/91	335	8	8.3			14.4
12/2/91	336	7	8.4			12.2
12/3/91	337	8	8.3			14.4
12/4/91	338	9	8.3			16.6
12/5/91	339	10	8.3			18.8
12/6/91	340	12	8.3			23.1
12/7/91	341	10	8.3			18.8
12/8/91	342	9	8.3			16.6
12/9/91	343	6	8.3			10.0
12/10/91	344	4	8.3			5.7
12/11/91	345	6	8.2			10.0
12/12/91	346	5	8.1			7.9
12/13/91	347	6	8.1			10.0
12/14/91	348	5	8.3			7.9
12/15/91	349	9	8.3			16.6
12/16/91	350	8	8.2			14.4
12/17/91	351	6	8.2			10.0
12/18/91	352	4	8.1			5.7
12/19/91	353	3	8			3.5
12/20/91	354	5	8			7.9
12/21/91	355	6	8.2			10.0
12/22/91	356	7	8.2			12.2
12/23/91	357	6	8.1			10.0
12/24/91	358	5	8.1			7.9
12/25/91	359	6	8.1			10.0
12/26/91	360	4	8.3			5.7

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.

Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

Date	Jday	HINTON INTAKE Turb	pH	NAQUADAT DATA NTU	NFR	Regression TSS (mg/L)
12/27/91	361	7	8.2			12.2
12/28/91	362	4	8.2			5.7
12/29/91	363	4	8.2			5.7
12/30/91	364	4	8.2			5.7
12/31/91	365	3	8.2			3.5
1/1/92	366	3	8.2			3.5
1/2/92	367	4	8.2			5.7
1/3/92	368	4	8.3			5.7
1/4/92	369	4	8.2			5.7
1/5/92	370	4	8.2			5.7
1/6/92	371	4	8.2			5.7
1/7/92	372	4	8.2	8.3	26	5.7
1/8/92	373	4	8.2			5.7
1/9/92	374	6	8.3			10.0
1/10/92	375	8	8.2			14.4
1/11/92	376	4	8.3			5.7
1/12/92	377	7	8			12.2
1/13/92	378	4	8.1			5.7
1/14/92	379	3	8.4			3.5
1/15/92	380	4	8.2			5.7
1/16/92	381	3	8.3			3.5
1/17/92	382	3	8.4			3.5
1/18/92	383	4	8.3			5.7
1/19/92	384	6	8.3			10.0
1/20/92	385	8	8.2			14.4
1/21/92	386	6	8.2			10.0
1/22/92	387	4	8.2			5.7
1/23/92	388	5	8.2			7.9
1/24/92	389	3	8.2			3.5
1/25/92	390	4	8.2			5.7
1/26/92	391	3	8.2			3.5
1/27/92	392	3	8.3			3.5
1/28/92	393	4	8.2			5.7
1/29/92	394	5	8.2			7.9
1/30/92	395	7	7.9			12.2
1/31/92	396	7	8.1			12.2
2/1/92	397	14	8.1			27.5
2/2/92	398	11	8.1			20.9
2/3/92	399	27	8.2			55.8
2/4/92	400	47	8.4			99.4
2/5/92	401	36	8.3			75.4
2/6/92	402	19	8.3			38.4
2/7/92	403	9	8.4			16.6
2/8/92	404	10	8.2			18.8
2/9/92	405	8	8.3			14.4
2/10/92	406	11	8.2			20.9
2/11/92	407	18	8.3			36.2
2/12/92	408	14	8.3			27.5
2/13/92	409	14	8.4			27.5
2/14/92	410	9	8.4			16.6
2/15/92	411	7	8.3			12.2
2/16/92	412	14	8.2			27.5
2/17/92	413	5	8.3			7.9
2/18/92	414	4	8.2			5.7
2/19/92	415	4	8.2			5.7
2/20/92	416	8	8.2			14.4
2/21/92	417	5	8.3			7.9
2/22/92	418	7	8.3			12.2
2/23/92	419	5	8.2			7.9
2/24/92	420	10	8.2			18.8
2/25/92	421	17	8.2			34.0
2/26/92	422	29	8.1			60.2
2/27/92	423	22	8.2			44.9
2/28/92	424	37	8.3			77.6
2/29/92	425	94	8.4			201.8
3/1/92	426	74	8.4			158.2
3/2/92	427	114	8.4			245.4
3/3/92	428	97	8.3	65	206	208.3
3/4/92	429	32	8.2			66.7
3/5/92	430	23	8.3			47.1
3/6/92	431	17	8.3			34.0
3/7/92	432	15	8.3			29.7

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.
Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

		HINTON INTAKE		NAQUADAT DATA		Regression
Date	Jday	Turb	pH	NTU	NFR	TSS (mg/L)
3/8/92	433	13	8.3			25.3
3/9/92	434	14	8.3			27.5
3/10/92	435	16	8.3			31.8
3/11/92	436	19	8.3			38.4
3/12/92	437	18	8.3			36.2
3/13/92	438	18	8.3			36.2
3/14/92	439	15	8.2			29.7
3/15/92	440	14	8.2			27.5
3/16/92	441	15	8.2			29.7
3/17/92	442	16	8.3			31.8
3/18/92	443	14	8.2			27.5
3/19/92	444	12	8.3			23.1
3/20/92	445	12	8.2			23.1
3/21/92	446	12	8.2			23.1
3/22/92	447	12	8.2			23.1
3/23/92	448	9	8.3			16.6
3/24/92	449	8	8.4			14.4
3/25/92	450	22	8.3			44.9
3/26/92	451	12	8.4			23.1
3/27/92	452	11	8.3			20.9
3/28/92	453	9	8.4			16.6
3/29/92	454	8	8.3			14.4
3/30/92	455	8	8.3			14.4
3/31/92	456	8	8.3			14.4
4/1/92	457	9	8.3			16.6
4/2/92	458	10	8.4			18.8
4/3/92	459	21	8.4			42.7
4/4/92	460	20	8.3			40.6
4/5/92	461	21	8.4			42.7
4/6/92	462	15	8.3			29.7
4/7/92	463	14	8.3			27.5
4/8/92	464	10	8.4			18.8
4/9/92	465	9	8.3			16.6
4/10/92	466	9	8.4			16.6
4/11/92	467	10	8.4			18.8
4/12/92	468	10	8.4			18.8
4/13/92	469	12	8.4			23.1
4/14/92	470	9	8.4			16.6
4/15/92	471	8	8.3			14.4
4/16/92	472	10	8.4			18.8
4/17/92	473	11	8.5			20.9
4/18/92	474	12	8.5			23.1
4/19/92	475	14	8.4			27.5
4/20/92	476	19	8.3			38.4
4/21/92	477	16	8.3			31.8
4/22/92	478	18	8.3			36.2
4/23/92	479	21	8.4			42.7
4/24/92	480	19	8.4			38.4
4/25/92	481	18	8.4			36.2
4/26/92	482	18	8.4			36.2
4/27/92	483	23	8.4			47.1
4/28/92	484	40	8.3			84.1
4/29/92	485	58	8.4			123.3
4/30/92	486	63	8.4			134.2
5/1/92	487	116	8.2			249.7
5/2/92	488	97	8.2			208.3
5/3/92	489	44	8.2			92.8
5/4/92	490	52	8.1			110.3
5/5/92	491	28		42.1	46	58.0
5/6/92	492	34	8.2			71.1
5/7/92	493	35				73.2
5/8/92	494	30				62.3
5/9/92	495	62	8.2			132.1
5/10/92	496	42	8.2			88.5
5/11/92	497	25	8.3			51.4
5/12/92	498	25	8.3			51.4
5/13/92	499	39	8.3			81.9
5/14/92	500	44	8.2			92.8
5/15/92	501	14	8.2			27.5
5/16/92	502	18	8.2			36.2
5/17/92	503	11				20.9
5/18/92	504	11	8.3			20.9

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.
Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

		HINTON INTAKE		NAQUADAT DATA		Regression
Date	Jday	Turb	pH	NTU	NFR	TSS (mg/L)
5/19/92	505	14	8.3			27.5
5/20/92	506	13	8.3			25.3
5/21/92	507	10	8.2			18.8
5/22/92	508	9	8.1			16.6
5/23/92	509	8	8.1			14.4
5/24/92	510	7	8.2			12.2
5/25/92	511	8	8.2			14.4
5/26/92	512	34	8.3			71.1
5/27/92	513	112	8.3			241.0
5/28/92	514	65	8.2			138.6
5/29/92	515	36	8.2			75.4
5/30/92	516	29	8.3			60.2
5/31/92	517	29	8.3			60.2
6/1/92	518	48	8.2			101.6
6/2/92	519	68	8.2			145.1
6/3/92	520	86	8.3			184.4
6/4/92	521	48	8.3			101.6
6/5/92	522	35	8.3			73.2
6/6/92	523	29	8.3			60.2
6/7/92	524	29	8.3			60.2
6/8/92	525	24	8.3			49.3
6/9/92	526	31	8.3			64.5
6/10/92	527	44	8.2			92.8
6/11/92	528	44	8.1			92.8
6/12/92	529	35	8.4			73.2
6/13/92	530	48	8.3			101.6
6/14/92	531	58	8.3			123.3
6/15/92	532	48	8.2			101.6
6/16/92	533	39	8			81.9
6/17/92	534	45	8.1			95.0
6/18/92	535	42	8.2			88.5
6/19/92	536	36	8.3			75.4
6/20/92	537	33	8.3			68.9
6/21/92	538	36	8.3			75.4
6/22/92	539	39	8.3			81.9
6/23/92	540	52	8.3			110.3
6/24/92	541	61	8.3			129.9
6/25/92	542	68	8.3			145.1
6/26/92	543	61	8.3			129.9
6/27/92	544	60	8.3			127.7
6/28/92	545	71	8.2			151.7
6/29/92	546	76	8.3			162.6
6/30/92	547	75	8.3			160.4
7/1/92	548	55	8.3			116.8
7/2/92	549	43				90.7
7/3/92	550	38				79.8
7/4/92	551	34	8.3			71.1
7/5/92	552	36	8.3			75.4
7/6/92	553	37	8.3			77.6
7/7/92	554	33	8.3			68.9
7/8/92	555	36	8.2			75.4
7/9/92	556	43	8.2			90.7
7/10/92	557	50	8.3			105.9
7/11/92	558	35	8.3			73.2
7/12/92	559	35	8.1			73.2
7/13/92	560	38	8.2			79.8
7/14/92	561	31	8.3	24.1	36	64.5
7/15/92	562	34	8.2			71.1
7/16/92	563	23	8.3			47.1
7/17/92	564	21	8.2			42.7
7/18/92	565	26	7.7			53.6
7/19/92	566	33	7.9			68.9
7/20/92	567	31	7.6			64.5
7/21/92	568	29	8			60.2
7/22/92	569	36	8.1			75.4
7/23/92	570	50	8			105.9
7/24/92	571	46	8.2			97.2
7/25/92	572	45	8.2			95.0
7/26/92	573	42	8.1			88.5
7/27/92	574	35	8.1			73.2
7/28/92	575	37	8.1			77.6
7/29/92	576	38	8.1			79.8

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.
Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

Date	Jday	HINTON INTAKE		NAQUADAT DATA		Regression
		Turb	pH	NTU	NFR	TSS (mg/L)
7/30/92	577	28	7.8			58.0
7/31/92	578	29	8.2			60.2
8/1/92	579	46	8.3			97.2
8/2/92	580	93	8.1			199.6
8/3/92	581	99	8.1			212.7
8/4/92	582	62	8.1			132.1
8/5/92	583	71	8.1			151.7
8/6/92	584	117	8.1			251.9
8/7/92	585	80	8.1			171.3
8/8/92	586	67	8.1			143.0
8/9/92	587	61	8.1			129.9
8/10/92	588	38	8.1	100	228	79.8
8/11/92	589	21	8.1			42.7
8/12/92	590	27	8.1			55.8
8/13/92	591	29	8.1			60.2
8/14/92	592	54	8.1			114.6
8/15/92	593	77	8.2			164.7
8/16/92	594	128	8.1			275.9
8/17/92	595	99	8.1			212.7
8/18/92	596	101	8.2			217.0
8/19/92	597	114	8.1			245.4
8/20/92	598	126	8.2			271.5
8/21/92	599	84	8.1			180.0
8/22/92	600	56	8			119.0
8/23/92	601	41	8.1			86.3
8/24/92	602	25	8.1			51.4
8/25/92	603	25	8.1			51.4
8/26/92	604	26	8.1			53.6
8/27/92	605	31	8.1			64.5
8/28/92	606	37	8.1			77.6
8/29/92	607	68	8.1			145.1
8/30/92	608	26	8.2			53.6
8/31/92	609	18	8.2			36.2
9/1/92	610	18	8.2			36.2
9/2/92	611	18	8.2			36.2
9/3/92	612	27	8.2			55.8
9/4/92	613	24	8.2			49.3
9/5/92	614	17	8.1			34.0
9/6/92	615	19				38.4
9/7/92	616	21				42.7
9/8/92	617	42	8.3			88.5
9/9/92	618	15	8.2			29.7
9/10/92	619	43	8.3			90.7
9/11/92	620	15	8.2			29.7
9/12/92	621	14	8.3			27.5
9/13/92	622	13	8.3			25.3
9/14/92	623	11	8.3			20.9
9/15/92	624	9	8.3			16.6
9/16/92	625	30	8.1			62.3
9/17/92	626	10	8.3			18.8
9/18/92	627	13	8.2			25.3
9/19/92	628	23	8.3			47.1
9/20/92	629	21	8.3			42.7
9/21/92	630	16	8.3			31.8
9/22/92	631	22	8.3			44.9
9/23/92	632	18	8.4			36.2
9/24/92	633	13	8.3			25.3
9/25/92	634	16	8.3			31.8
9/26/92	635	19	8.3			38.4
9/27/92	636	14	8.3			27.5
9/28/92	637	16	8.3			31.8
9/29/92	638	20	8.3			40.6
9/30/92	639	11	8.3			20.9
10/1/92	640	10	8.3			18.8
10/2/92	641	9	8.3			16.6
10/3/92	642	10	8.3			18.8
10/4/92	643	10	8.4			18.8
10/5/92	644	19	8.4			38.4
10/6/92	645	21	8.4			42.7
10/7/92	646	14	8.3			27.5
10/8/92	647	22	8.3			44.9
10/9/92	648	14	8.3			27.5

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.

Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

		HINTON INTAKE		NAQUADAT DATA		Regression
Date	Jday	Turb	pH	NTU	NFR	TSS (mg/L)
10/10/92	649	30	8.3			62.3
10/11/92	650	15	8.3			29.7
10/12/92	651	10	8.3			18.8
10/13/92	652	9	8.4			16.6
10/14/92	653	7	8.4			12.2
10/15/92	654	9	8.4			16.6
10/16/92	655	9	8.4			16.6
10/17/92	656	8	8.4			14.4
10/18/92	657	9	8.3			16.6
10/19/92	658	9	8.4			16.6
10/20/92	659	53	8.4			112.5
10/21/92	660	17	8.4			34.0
10/22/92	661	35	8.4			73.2
10/23/92	662	30	8.4			62.3
10/24/92	663	65	8.4			138.6
10/25/92	664	85	8.3			182.2
10/26/92	665	115	8.3			247.5
10/27/92	666	36	8.3			75.4
10/28/92	667	15	8.2			29.7
10/29/92	668	11	8.2			20.9
10/30/92	669	9	8.3			16.6
10/31/92	670	8	8.3			14.4
11/1/92	671	8	8.3			14.4
11/2/92	672	12	8.3			23.1
11/3/92	673	8	8.3			14.4
11/4/92	674	6	8.2			10.0
11/5/92	675	7	8.3			12.2
11/6/92	676	7	8.3			12.2
11/7/92	677	11	8.4			20.9
11/8/92	678	8	8.3			14.4
11/9/92	679	7	8.2			12.2
11/10/92	680	24	8.4			49.3
11/11/92	681	12	8.3			23.1
11/12/92	682	13	8.2			25.3
11/13/92	683	18	8.1			36.2
11/14/92	684	20	8.1			40.6
11/15/92	685	12	8.2			23.1
11/16/92	686	8	8.1			14.4
11/17/92	687	9	8.2			16.6
11/18/92	688	10	8.2			18.8
11/19/92	689	9	8.3			16.6
11/20/92	690	9	8.3			16.6
11/21/92	691	9	8.3			16.6
11/22/92	692	6	8.3			10.0
11/23/92	693	7	8.2			12.2
11/24/92	694	6	8.2			10.0
11/25/92	695	5	8.2			7.9
11/26/92	696	8	8.2			14.4
11/27/92	697	23	8.1			47.1
11/28/92	698	12	8.2			23.1
11/29/92	699	6	8.3			10.0
11/30/92	700	5	8.3			7.9
12/1/92	701	5	8.2			7.9
12/2/92	702	5	8.3			7.9
12/3/92	703	5	8.3			7.9
12/4/92	704	4	8.3			5.7
12/5/92	705	6	8.2			10.0
12/6/92	706	6	8.2			10.0
12/7/92	707	5	8.2			7.9
12/8/92	708	5	8.3			7.9
12/9/92	709	5	8.3			7.9
12/10/92	710	5	8.3			7.9
12/11/92	711	5	8.3			7.9
12/12/92	712	4	8.3			5.7
12/13/92	713	5	8.3			7.9
12/14/92	714	4	8			5.7
12/15/92	715	5	8.2			7.9
12/16/92	716	4	8.3			5.7
12/17/92	717	3	8.3			3.5
12/18/92	718	3	8.4			3.5
12/19/92	719	3	8.2			3.5
12/20/92	720	4	8.3			5.7

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.
Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

		HINTON INTAKE		NAQUADAT DATA		Regression
Date	Jday	Turb	pH	NTU	NFR	TSS (mg/L)
12/21/92	721	4	8.2			5.7
12/22/92	722	4	8.3			5.7
12/23/92	723	4	8.4			5.7
12/24/92	724	4	8.3			5.7
12/25/92	725	4	8.3			5.7
12/26/92	726	4	8.3			5.7
12/27/92	727	4	8.4			5.7
12/28/92	728	3	8.3			3.5
12/29/92	729	3	8.3			3.5
12/30/92	730	3	8.3			3.5
12/31/92	731	3	8.3			3.5
1/1/93	732	3	8.3			3.5
1/2/93	733	3	8.3			3.5
1/3/93	734	3	8.3			3.5
1/4/93	735	3	8.3			3.5
1/5/93	736	3	8.1			3.5
1/6/93	737	2	8.2			1.3
1/7/93	738	2	8.3	0.7	-0.4	1.3
1/8/93	739	2	8.1			1.3
1/9/93	740	2	8.2			1.3
1/10/93	741	2	8.3			1.3
1/11/93	742	2	8.2			1.3
1/12/93	743	2	8.2			1.3
1/13/93	744	2	8.2			1.3
1/14/93	745	2	8.3			1.3
1/15/93	746	2	8.2			1.3
1/16/93	747	2	8.2			1.3
1/17/93	748	2	8.3			1.3
1/18/93	749	2	8.2			1.3
1/19/93	750	2	8.3			1.3
1/20/93	751	2	8.2			1.3
1/21/93	752	2	8.3			1.3
1/22/93	753	2	8.3			1.3
1/23/93	754	2	8.2			1.3
1/24/93	755	2	8.2			1.3
1/25/93	756	2	8.2			1.3
1/26/93	757	2	8.3			1.3
1/27/93	758	2	8.3			1.3
1/28/93	759	2	8.3			1.3
1/29/93	760	3	8.2			3.5
1/30/93	761	9	8.2			16.6
1/31/93	762	10	8.1			18.8
2/1/93	763	8	8			14.4
2/2/93	764	5	8.1			7.9
2/3/93	765	6	8.2			10.0
2/4/93	766	6	8.2			10.0
2/5/93	767	6	8			10.0
2/6/93	768	5	8.1			7.9
2/7/93	769	5	8.2			7.9
2/8/93	770	5	8.2			7.9
2/9/93	771	6	8.2			10.0
2/10/93	772	5	8.3			7.9
2/11/93	773	8	8.3			14.4
2/12/93	774	5	8.2			7.9
2/13/93	775	5	8.2			7.9
2/14/93	776	5	8.1			7.9
2/15/93	777	4	8.2			5.7
2/16/93	778	4	8.1			5.7
2/17/93	779	4	8.1			5.7
2/18/93	780	4	8.1			5.7
2/19/93	781	4	8.1			5.7
2/20/93	782	4	8.1			5.7
2/21/93	783	4	8.1			5.7
2/22/93	784	4	8.2			5.7
2/23/93	785	4	8.2			5.7
2/24/93	786	4	8.2			5.7
2/25/93	787	4	8.2			5.7
2/26/93	788	5	8.1			7.9
2/27/93	789	5	8.1			7.9
2/28/93	790	7	8.1			12.2
3/1/93	791	7	8.1			12.2
3/2/93	792	11	8.2			20.9

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.
Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

		HINTON INTAKE		NAQUADAT DATA		Regression
Date	Jday	Turb	pH	NTU	NFR	TSS (mg/L)
3/3/93	793	11	8.2			20.9
3/4/93	794	7	8.2			12.2
3/5/93	795	6	8.1			10.0
3/6/93	796	16	8.2			31.8
3/7/93	797	18	8.4			36.2
3/8/93	798	11	8.3			20.9
3/9/93	799	10	8.3			18.8
3/10/93	800	8	8.2			14.4
3/11/93	801	6	8.3	8.7	19	10.0
3/12/93	802	5	8.3			7.9
3/13/93	803	6	8.3			10.0
3/14/93	804	5	8.2			7.9
3/15/93	805	5	8.3			7.9
3/16/93	806	5	8.3			7.9
3/17/93	807	5	8.3			7.9
3/18/93	808	5	8.3			7.9
3/19/93	809	5	8.3			7.9
3/20/93	810	6	8.1			10.0
3/21/93	811	9	8.3			16.6
3/22/93	812	18	8.2			36.2
3/23/93	813	24	8.3			49.3
3/24/93	814	21	8.3			42.7
3/25/93	815	22	8.3			44.9
3/26/93	816	18	8.3			36.2
3/27/93	817	27	8.2			55.8
3/28/93	818	47	8.3			99.4
3/29/93	819	67	8.4			143.0
3/30/93	820	78	8.3			166.9
3/31/93	821	78	8.3			166.9
4/1/93	822	33	8.3			68.9
4/2/93	823	23	8.3			47.1
4/3/93	824	19	8.3			38.4
4/4/93	825	21	8.3			42.7
4/5/93	826	19	8.3			38.4
4/6/93	827	14	8.3			27.5
4/7/93	828	12	8.2			23.1
4/8/93	829	11	8.2			20.9
4/9/93	830	12	8.3			23.1
4/10/93	831	13	8.4			25.3
4/11/93	832	12	8.3			23.1
4/12/93	833	12	8.3			23.1
4/13/93	834	11	8.3			20.9
4/14/93	835	12	8.3			23.1
4/15/93	836	9	8.1			16.6
4/16/93	837	9	8.3			16.6
4/17/93	838	10	8.2			18.8
4/18/93	839	15	8.4			29.7
4/19/93	840					
4/20/93	841					
4/21/93	842					
4/22/93	843					
4/23/93	844	26	8.4			53.6
4/24/93	845	12	7.9			23.1
4/25/93	846	10	7.9			18.8
4/26/93	847	11	8			20.9
4/27/93	848	13	8.3			25.3
4/28/93	849	12	8.4			23.1
4/29/93	850	12	8.3			23.1
4/30/93	851	10	8.2			18.8
5/1/93	852	11	8.1			20.9
5/2/93	853	14	8.3			27.5
5/3/93	854	13	8.1			25.3
5/4/93	855	11	8.1			20.9
5/5/93	856	9	8.2			16.6
5/6/93	857	11	8.2			20.9
5/7/93	858	35	8.3			73.2
5/8/93	859	42	8.3			88.5
5/9/93	860	53	8.2			112.5
5/10/93	861	34	8.2			71.1
5/11/93	862	23	8.2	20	49	47.1
5/12/93	863	78	8.1			166.9
5/13/93	864	191	8			413.1

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.
Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

		HINTON INTAKE		NAQUADAT DATA		Regression
Date	Jday	Turb	pH	NTU	NFR	TSS (mg/L)
5/14/93	865	294	7.8			637.5
5/15/93	866	203	7.9			439.3
5/16/93	867	118	8.1			254.1
5/17/93	868	66	8			140.8
5/18/93	869	62	8.1			132.1
5/19/93	870	52	7.9			110.3
5/20/93	871	62	8			132.1
5/21/93	872	59	7.9			125.5
5/22/93	873	41	8			86.3
5/23/93	874	35	7.6			73.2
5/24/93	875	29	7.8			60.2
5/25/93	876	29	7.9			60.2
5/26/93	877	28	7.9			58.0
5/27/93	878	24	8			49.3
5/28/93	879	23	7.9			47.1
5/29/93	880	29	7.9			60.2
5/30/93	881	22	7.9			44.9
5/31/93	882	18	7.9			36.2
6/1/93	883	20	7.8			40.6
6/2/93	884	25	7.9			51.4
6/3/93	885	38	7.9			79.8
6/4/93	886	35	7.8			73.2
6/5/93	887	26	7.8			53.6
6/6/93	888	21	7.9			42.7
6/7/93	889	20	7.8			40.6
6/8/93	890	21	7.98			42.7
6/9/93	891	21	7.9			42.7
6/10/93	892	51	7.9			108.1
6/11/93	893	21	7.9			42.7
6/12/93	894	18	7.4			36.2
6/13/93	895	16	7.9			31.8
6/14/93	896	15	7.9			29.7
6/15/93	897	31	7.9			64.5
6/16/93	898	40	7.9			84.1
6/17/93	899	24	7.9			49.3
6/18/93	900	28	8			58.0
6/19/93	901	31	8			64.5
6/20/93	902	100	7.8			214.9
6/21/93	903	42	7.7			88.5
6/22/93	904	43	8.1			90.7
6/23/93	905	42	8			88.5
6/24/93	906	31	8			64.5
6/25/93	907	17	8.1			34.0
6/26/93	908	17	8.1			34.0
6/27/93	909	31	8.4			64.5
6/28/93	910	46	8.1			97.2
6/29/93	911	30	8.2			62.3
6/30/93	912	23	8.3			47.1
7/1/93	913					
7/2/93	914					
7/3/93	915					
7/4/93	916					
7/5/93	917					
7/6/93	918					
7/7/93	919					
7/8/93	920					
7/9/93	921					
7/10/93	922					
7/11/93	923					
7/12/93	924					
7/13/93	925					
7/14/93	926					
7/15/93	927					
7/16/93	928					
7/17/93	929					
7/18/93	930					
7/19/93	931					
7/20/93	932					
7/21/93	933					
7/22/93	934					
7/23/93	935					
7/24/93	936					

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.
Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

		HINTON INTAKE		NAQUADAT DATA		Regression
Date	Jday	Turb	pH	NTU	NFR	TSS (mg/L)
7/25/93	937					
7/26/93	938					
7/27/93	939					
7/28/93	940			35	30	
7/29/93	941					
7/30/93	942					
7/31/93	943					
8/1/93	944	59	8.4			125.5
8/2/93	945	35	8.4			73.2
8/3/93	946	30	8.5			62.3
8/4/93	947	33	8.4			68.9
8/5/93	948	37	8.5			77.6
8/6/93	949	53	8.5			112.5
8/7/93	950	66	8.4			140.8
8/8/93	951	94	8.4			201.8
8/9/93	952	51	8.6			108.1
8/10/93	953	34	8.4			71.1
8/11/93	954	41	8.4			86.3
8/12/93	955	47	8.4			99.4
8/13/93	956	32	8.4			66.7
8/14/93	957	26	8.4			53.6
8/15/93	958	24	8.4			49.3
8/16/93	959	33	8.3			68.9
8/17/93	960	21	8.5			42.7
8/18/93	961	21	8.5			42.7
8/19/93	962	24	8.3			49.3
8/20/93	963	86	8.1			184.4
8/21/93	964	41	8.2			86.3
8/22/93	965	75	8.1			160.4
8/23/93	966	106	8.2			227.9
8/24/93	967	93	8.1			199.6
8/25/93	968	84	8.1			180.0
8/26/93	969	34	8.1			71.1
8/27/93	970	27	8.1			55.8
8/28/93	971	21	8.1			42.7
8/29/93	972	17	8.1			34.0
8/30/93	973	15	8.1			29.7
8/31/93	974	15	8.1			29.7
9/1/93	975	14	8.1			27.5
9/2/93	976	18	8.2			36.2
9/3/93	977	19	8.2			38.4
9/4/93	978	15	8.2			29.7
9/5/93	979	14	8.2			27.5
9/6/93	980	23	8.3			47.1
9/7/93	981	24	8.2			49.3
9/8/93	982	28	8.2			58.0
9/9/93	983	21	8.2			42.7
9/10/93	984	24	8.2			49.3
9/11/93	985	28	8.2			58.0
9/12/93	986	28	8.1			58.0
9/13/93	987	28	8.2			58.0
9/14/93	988	21	8.3			42.7
9/15/93	989	17	8.2			34.0
9/16/93	990	13	8.3			25.3
9/17/93	991	10	8.2			18.8
9/18/93	992	10	8.2			18.8
9/19/93	993	10	8.3			18.8
9/20/93	994	12	8.2			23.1
9/21/93	995	14	8.2			27.5
9/22/93	996	14	8.1			27.5
9/23/93	997	24	8			49.3
9/24/93	998	14	8.1			27.5
9/25/93	999	9	8.1			16.6
9/26/93	1000	9	8.1			16.6
9/27/93	1001	9	7.6			16.6
9/28/93	1002	9	7.8			16.6
9/29/93	1003	9	7.8			16.6
9/30/93	1004	10	8.2			18.8
10/1/93	1005	9	8.2			16.6
10/2/93	1006	12	8.2			23.1
10/3/93	1007	15	8.2			29.7
10/4/93	1008	9	8.3			16.6

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.

Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

Date	Jday	HINTON INTAKE		NAQUADAT DATA		Regression
		Turb	pH	NTU	NFR	TSS (mg/L)
10/5/93	1009	6	8.3			10.0
10/6/93	1010	10	8.3			18.8
10/7/93	1011	10	8.3			18.8
10/8/93	1012	8	8.4			14.4
10/9/93	1013	7	8.4			12.2
10/10/93	1014	7	8.4			12.2
10/11/93	1015	6	8.4			10.0
10/12/93	1016	6	8.2			10.0
10/13/93	1017	6	8.3			10.0
10/14/93	1018	6	8.3			10.0
10/15/93	1019	6	8.3			10.0
10/16/93	1020	6	8.3			10.0
10/17/93	1021	7	8.3			12.2
10/18/93	1022	8	8			14.4
10/19/93	1023	9	8.4			16.6
10/20/93	1024	6	8.3	1.6	9.6	10.0
10/21/93	1025	12	8.4			23.1
10/22/93	1026	8	8.3			14.4
10/23/93	1027	17	8.4			34.0
10/24/93	1028	20	8.4			40.6
10/25/93	1029	8	8.4			14.4
10/26/93	1030	10	8.4			18.8
10/27/93	1031	21	8			42.7
10/28/93	1032	11	8.3			20.9
10/29/93	1033	9	8.3			16.6
10/30/93	1034	14	8.4			27.5
10/31/93	1035	13	8.4			25.3
11/1/93	1036	9				16.6
11/2/93	1037	60	8.3			127.7
11/3/93	1038	40	8.3			84.1
11/4/93	1039	11	8.3			20.9
11/5/93	1040	11	8.3			20.9
11/6/93	1041	14	8.4			27.5
11/7/93	1042	15	8.4			29.7
11/8/93	1043	14	8.4			27.5
11/9/93	1044	17	8.4			34.0
11/10/93	1045	11				20.9
11/11/93	1046	18	8.4			36.2
11/12/93	1047	17	8.8			34.0
11/13/93	1048	12	8.6			23.1
11/14/93	1049	48	8.7			101.6
11/15/93	1050	22	8.8			44.9
11/16/93	1051	14	8.8			27.5
11/17/93	1052	10	8.5			18.8
11/18/93	1053	9	8.5			16.6
11/19/93	1054	29	8.5			60.2
11/20/93	1055	34	8.3			71.1
11/21/93	1056	26	8.3			53.6
11/22/93	1057	13	8.3			25.3
11/23/93	1058	15	8.3			29.7
11/24/93	1059	5	8.4			7.9
11/25/93	1060	4	8.5			5.7
11/26/93	1061	5	8.4			7.9
11/27/93	1062	6	8.6			10.0
11/28/93	1063	6				10.0
11/29/93	1064	7	8.5			12.2
11/30/93	1065	6	8.3			10.0
12/1/93	1066	5	8.2			7.9
12/2/93	1067	5	8.1			7.9
12/3/93	1068	6	8.4			10.0
12/4/93	1069	6	8.4			10.0
12/5/93	1070	5	8.3			7.9
12/6/93	1071	6	8.4			10.0
12/7/93	1072	4	8.1			5.7
12/8/93	1073	3	8.1			3.5
12/9/93	1074	4	8			5.7
12/10/93	1075	4	8.1			5.7
12/11/93	1076	6	8.1			10.0
12/12/93	1077	5	8.3			7.9
12/13/93	1078	5	8.1			7.9
12/14/93	1079	5	8.1			7.9
12/15/93	1080	3	8			3.5

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.
Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

Date	Iday	HINTON INTAKE Turb	pH	NAQUADAT DATA NTU	NFR	Regression TSS (mg/L)
12/16/93	1081	3	8.1			3.5
12/17/93	1082	3	8			3.5
12/18/93	1083	3	8.1			3.5
12/19/93	1084	4	8			5.7
12/20/93	1085	4	8.3			5.7
12/21/93	1086	4	8.4			5.7
12/22/93	1087	4				5.7
12/23/93	1088	3	8.1			3.5
12/24/93	1089	3				3.5
12/25/93	1090	3	8.1			3.5
12/26/93	1091	3				3.5
12/27/93	1092	4				5.7
12/28/93	1093	4				5.7
12/29/93	1094	4	8.1			5.7
12/30/93	1095	4	7.9			5.7
12/31/93	1096	4	8.1			5.7
1/1/94	1097	4	8			5.7
1/2/94	1098	4	8.2			5.7
1/3/94	1099	4	8.3			5.7
1/4/94	1100	4	8.2			5.7
1/5/94	1101	4	8.2			5.7
1/6/94	1102	3	8.2			3.5
1/7/94	1103	3	7.9			3.5
1/8/94	1104	3				3.5
1/9/94	1105	3	8.2			3.5
1/10/94	1106	3				3.5
1/11/94	1107	3	8			3.5
1/12/94	1108	4				5.7
1/13/94	1109	3	7.8			3.5
1/14/94	1110	3				3.5
1/15/94	1111	3	7.9			3.5
1/16/94	1112	3	7.9			3.5
1/17/94	1113	3	7.9			3.5
1/18/94	1114	3	7.8			3.5
1/19/94	1115	3	7.9			3.5
1/20/94	1116	3	7.9			3.5
1/21/94	1117	3	7.9			3.5
1/22/94	1118	4	7.9			5.7
1/23/94	1119	4	7.9			5.7
1/24/94	1120	3				3.5
1/25/94	1121	3				3.5
1/26/94	1122	3	7.9			3.5
1/27/94	1123	3	7.9			3.5
1/28/94	1124	4	7.9			5.7
1/29/94	1125	3	7.9			3.5
1/30/94	1126	3	7.9			3.5
1/31/94	1127	3	7.8			3.5
2/1/94	1128	3	7.9			3.5
2/2/94	1129	3	7.9			3.5
2/3/94	1130	3	7.9			3.5
2/4/94	1131	3	7.9			3.5
2/5/94	1132	3	7.9			3.5
2/6/94	1133	3	7.9			3.5
2/7/94	1134	3	7.9			3.5
2/8/94	1135	3	7.9			3.5
2/9/94	1136	3	7.9			3.5
2/10/94	1137	3	7.9			3.5
2/11/94	1138	3	7.8			3.5
2/12/94	1139	3	7.8			3.5
2/13/94	1140	4	7.9			5.7
2/14/94	1141	4	7.9			5.7
2/15/94	1142	4	7.9			5.7
2/16/94	1143	4	7.9			5.7
2/17/94	1144	3	7.9			3.5
2/18/94	1145	3	7.9			3.5
2/19/94	1146	3	7.9			3.5
2/20/94	1147	3	7.9			3.5
2/21/94	1148	3				3.5
2/22/94	1149	3	7.9			3.5
2/23/94	1150	3	8			3.5
2/24/94	1151	3	7.9			3.5
2/25/94	1152	3	7.9			3.5

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.

Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

		HINTON INTAKE		NAQUADAT DATA		Regression
Date	Jday	Turb	pH	NTU	NFR	TSS (mg/L)
2/26/94	1153	3	7.9			3.5
2/27/94	1154	3	7.9			3.5
2/28/94	1155	3	8.1			3.5
3/1/94	1156	17	8.2			34.0
3/2/94	1157	39	8.1			81.9
3/3/94	1158	28	8.2			58.0
3/4/94	1159	17	8			34.0
3/5/94	1160	13	7.9			25.3
3/6/94	1161	12	8			23.1
3/7/94	1162	11	8			20.9
3/8/94	1163	10	8			18.8
3/9/94	1164	9	8			16.6
3/10/94	1165	9	8			16.6
3/11/94	1166	12	8			23.1
3/12/94	1167	14	8			27.5
3/13/94	1168	29	8.1			60.2
3/14/94	1169	18	8.1			36.2
3/15/94	1170	18	8.1			36.2
3/16/94	1171	12	8.1			23.1
3/17/94	1172	19	8.2			38.4
3/18/94	1173	22	8.3			44.9
3/19/94	1174	31	8.2			64.5
3/20/94	1175	31	8.3			64.5
3/21/94	1176	22	8.4			44.9
3/22/94	1177	19	8.3			38.4
3/23/94	1178	26	8.3			53.6
3/24/94	1179	33	8.3			68.9
3/25/94	1180	51	8.3			108.1
3/26/94	1181	61	8.2			129.9
3/27/94	1182	21	8.2			42.7
3/28/94	1183	15	8.2			29.7
3/29/94	1184	12	8.1			23.1
3/30/94	1185	12	8.1			23.1
3/31/94	1186	11	8.2			20.9
4/1/94	1187	12	8.2			23.1
4/2/94	1188	11	8.2			20.9
4/3/94	1189	10	8.2			18.8
4/4/94	1190	14	8.2			27.5
4/5/94	1191	10	8.2			18.8
4/6/94	1192	11	8.3			20.9
4/7/94	1193	15	8.3			29.7
4/8/94	1194	11	8.2			20.9
4/9/94	1195	9	8.2			16.6
4/10/94	1196	9	8.1			16.6
4/11/94	1197	13	8.2			25.3
4/12/94	1198	24	8.2			49.3
4/13/94	1199	18	8.2			36.2
4/14/94	1200	15	8.2			29.7
4/15/94	1201	28	8.3			58.0
4/16/94	1202	16	8.3			31.8
4/17/94	1203	14	8.2			27.5
4/18/94	1204	16	8.2			31.8
4/19/94	1205	22	8.2			44.9
4/20/94	1206	22	8.2			44.9
4/21/94	1207	22	8.2			44.9
4/22/94	1208	42	8.1			88.5
4/23/94	1209	37	8.1			77.6
4/24/94	1210	35	8.1			73.2
4/25/94	1211	28	8.1			58.0
4/26/94	1212	20	8.1			40.6
4/27/94	1213	13	8.1			25.3
4/28/94	1214	13	8.1			25.3
4/29/94	1215	12	8.2			23.1
4/30/94	1216	10	8.2			18.8
5/1/94	1217	11	8			20.9
5/2/94	1218	19	8.1			38.4
5/3/94	1219	21	8.1			42.7
5/4/94	1220	20	8.2			40.6
5/5/94	1221	12	8.2			23.1
5/6/94	1222	24	8.2			49.3
5/7/94	1223	31	8.2			64.5
5/8/94	1224	48	8.1			101.6

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.

Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

Date	Jday	HINTON INTAKE Turb	pH	NAQUADAT DATA NTU	NFR	Regression TSS (mg/L)
5/9/94	1225	84	8.1			180.0
5/10/94	1226	78	8.1			166.9
5/11/94	1227	97	8.1			208.3
5/12/94	1228	76	8			162.6
5/13/94	1229	86	7.8			184.4
5/14/94	1230	47	7.9			99.4
5/15/94	1231	27	8			55.8
5/16/94	1232	22	8.1			44.9
5/17/94	1233	18	8.2			36.2
5/18/94	1234	16	8.1			31.8
5/19/94	1235	11	8.1			20.9
5/20/94	1236	17	8			34.0
5/21/94	1237	13	8.1			25.3
5/22/94	1238	15	8.1			29.7
5/23/94	1239	19	8.2			38.4
5/24/94	1240	15	8			29.7
5/25/94	1241	30	8.1			62.3
5/26/94	1242	40	8			84.1
5/27/94	1243	51	8.1			108.1
5/28/94	1244	53	8			112.5
5/29/94	1245	38	8.1			79.8
5/30/94	1246	26	8.1			53.6
5/31/94	1247	17	8.1			34.0
6/1/94	1248	10	7.9			18.8
6/2/94	1249	10	8.1			18.8
6/3/94	1250	9	8.1			16.6
6/4/94	1251	15	8.1			29.7
6/5/94	1252	21	8.1			42.7
6/6/94	1253	36	8.1			75.4
6/7/94	1254	62	8.1			132.1
6/8/94	1255	78	8.1			166.9
6/9/94	1256	50	8.1			105.9
6/10/94	1257	38	8.1			79.8
6/11/94	1258	21	8.1			42.7
6/12/94	1259	18	8.1			36.2
6/13/94	1260	21	8.1			42.7
6/14/94	1261	22	8.1			44.9
6/15/94	1262	23	8.1			47.1
6/16/94	1263	16	8.1			31.8
6/17/94	1264	9	8.1			16.6
6/18/94	1265	9	8.1			16.6
6/19/94	1266	31	8.1			64.5
6/20/94	1267	27	8.2			55.8
6/21/94	1268	18	8.2			36.2
6/22/94	1269	18	8.2			36.2
6/23/94	1270	27	8.1			55.8
6/24/94	1271	42	8			88.5
6/25/94	1272	60	8.1			127.7
6/26/94	1273	54	8.1			114.6
6/27/94	1274	52	8			110.3
6/28/94	1275	37	8.1			77.6
6/29/94	1276	35	7.9			73.2
6/30/94	1277	41	8			86.3
7/1/94	1278	49	8			103.7
7/2/94	1279	37	8			77.6
7/3/94	1280	71	8.1			151.7
7/4/94	1281	48	8			101.6
7/5/94	1282	23	7.9			47.1
7/6/94	1283	21	7.9			42.7
7/7/94	1284	19	8.1			38.4
7/8/94	1285	17	8.1			34.0
7/9/94	1286	24	8.1			49.3
7/10/94	1287	28	8.1			58.0
7/11/94	1288	25	8			51.4
7/12/94	1289	21	8			42.7
7/13/94	1290	19	8			38.4
7/14/94	1291	15	8			29.7
7/15/94	1292	17	8			34.0
7/16/94	1293	22	8			44.9
7/17/94	1294	29	8			60.2
7/18/94	1295	34	8			71.1
7/19/94	1296	35	8			73.2

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.
Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

		HINTON INTAKE		NAQUADAT DATA		Regression
Date	Jday	Turb	pH	NTU	NFR	TSS (mg/L)
7/20/94	1297	40	8			84.1
7/21/94	1298	32	8			66.7
7/22/94	1299	30	8			62.3
7/23/94	1300	86	8			184.4
7/24/94	1301	75	7.8			160.4
7/25/94	1302	72	7.9			153.8
7/26/94	1303	80	8			171.3
7/27/94	1304	110	8			236.6
7/28/94	1305	127	7.8			273.7
7/29/94	1306	84	8			180.0
7/30/94	1307	82	8			175.6
7/31/94	1308	82	8			175.6
8/1/94	1309	96	8			206.1
8/2/94	1310	64	8			136.4
8/3/94	1311	61	8			129.9
8/4/94	1312	176	8			380.4
8/5/94	1313	231	8			500.3
8/6/94	1314	116	8			249.7
8/7/94	1315	111	8			238.8
8/8/94	1316	89	7.9			190.9
8/9/94	1317	66	7.6			140.8
8/10/94	1318	97	7.5			208.3
8/11/94	1319	59	8.1			125.5
8/12/94	1320	40	8			84.1
8/13/94	1321	44	8.1			92.8
8/14/94	1322	47	8.1			99.4
8/15/94	1323	88	8.1			188.7
8/16/94	1324	105	7.8			225.8
8/17/94	1325	102	7.8			219.2
8/18/94	1326	91	8			195.2
8/19/94	1327	43	8			90.7
8/20/94	1328	36	8.2			75.4
8/21/94	1329	32	8.2			66.7
8/22/94	1330	100	8.2			214.9
8/23/94	1331	65	8.2			138.6
8/24/94	1332	42	8.1			88.5
8/25/94	1333	28	8.2			58.0
8/26/94	1334	20	8.2			40.6
8/27/94	1335	22	8.2			44.9
8/28/94	1336	20	8.1			40.6
8/29/94	1337	20	7.7			40.6
8/30/94	1338	20	7.7			40.6
8/31/94	1339	19	8			38.4
9/1/94	1340	24	8			49.3
9/2/94	1341	18	8			36.2
9/3/94	1342	19	8.3			38.4
9/4/94	1343	19	8.3			38.4
9/5/94	1344	30	8.3			62.3
9/6/94	1345	22	8.3			44.9
9/7/94	1346	18	8.3			36.2
9/8/94	1347	17	8.3			34.0
9/9/94	1348	18	8.3			36.2
9/10/94	1349	27	8.3			55.8
9/11/94	1350	30	8.3			62.3
9/12/94	1351	23	8.3			47.1
9/13/94	1352	24	8.4			49.3
9/14/94	1353	19	8.4			38.4
9/15/94	1354	16	8.4			31.8
9/16/94	1355	21	8.2			42.7
9/17/94	1356	15	8.2			29.7
9/18/94	1357	19	8.2			38.4
9/19/94	1358	20	8.2			40.6
9/20/94	1359	24	8.2			49.3
9/21/94	1360	22	8.3			44.9
9/22/94	1361	34	8.4			71.1
9/23/94	1362	23	8.3			47.1
9/24/94	1363	18	8.3			36.2
9/25/94	1364	21	8.4			42.7
9/26/94	1365	20	8.5			40.6
9/27/94	1366	20	8.4			40.6
9/28/94	1367	20	8.4			40.6
9/29/94	1368	18	8.4			36.2

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.

Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

Date	Jday	HINTON INTAKE Turb	pH	NAQUADAT DATA NTU	NFR	Regression TSS (mg/L)
9/30/94	1369	28	8.4			58.0
10/1/94	1370	43	8.4			90.7
10/2/94	1371	66	8.4			140.8
10/3/94	1372	54	8.4			114.6
10/4/94	1373	32	8.3			66.7
10/5/94	1374	26	8.3			53.6
10/6/94	1375	15	8.3			29.7
10/7/94	1376	14	8.4			27.5
10/8/94	1377	11	8.4			20.9
10/9/94	1378	24	8.4			49.3
10/10/94	1379	11	8.4			20.9
10/11/94	1380	10				18.8
10/12/94	1381	10	8.4			18.8
10/13/94	1382	9	8.3			16.6
10/14/94	1383	10	8.4			18.8
10/15/94	1384	9	8.5			16.6
10/16/94	1385	9	8.5			16.6
10/17/94	1386	9	8.4			16.6
10/18/94	1387					
10/19/94	1388					
10/20/94	1389					
10/21/94	1390					
10/22/94	1391	10				18.8
10/23/94	1392	10				18.8
10/24/94	1393	12	8			23.1
10/25/94	1394	20	8			40.6
10/26/94	1395	35	8			73.2
10/27/94	1396	19	7.9			38.4
10/28/94	1397	16	8			31.8
10/29/94	1398	11	8			20.9
10/30/94	1399	13	7.8			25.3
10/31/94	1400	10	7.8			18.8
11/1/94	1401	9	8			16.6
11/2/94	1402	10				18.8
11/3/94	1403	17	8.1			34.0
11/4/94	1404	33	8.1			68.9
11/5/94	1405	18	8.1			36.2
11/6/94	1406	14	8			27.5
11/7/94	1407	12	8.3			23.1
11/8/94	1408	15	8.3			29.7
11/9/94	1409	11	8.3			20.9
11/10/94	1410	9	8.3			16.6
11/11/94	1411	21	8.2			42.7
11/12/94	1412	12	8.2			23.1
11/13/94	1413	10	8.2			18.8
11/14/94	1414	12	8.2			23.1
11/15/94	1415	9	8.3			16.6
11/16/94	1416	6	8.4			10.0
11/17/94	1417	5	8.3			7.9
11/18/94	1418	5	8.3			7.9
11/19/94	1419	7	8.3			12.2
11/20/94	1420	6	8.4			10.0
11/21/94	1421	6	8.4			10.0
11/22/94	1422	7	8.3			12.2
11/23/94	1423	5	8.3			7.9
11/24/94	1424	5	8.3			7.9
11/25/94	1425	4	8.3			5.7
11/26/94	1426	3	8.3			3.5
11/27/94	1427	4	8.3			5.7
11/28/94	1428	4	8.3			5.7
11/29/94	1429	5	8.3			7.9
11/30/94	1430	9	8.3			16.6
12/1/94	1431	7	8.3			12.2
12/2/94	1432	8	8.3			14.4
12/3/94	1433	24	8.2			49.3
12/4/94	1434	6	8.4			10.0
12/5/94	1435	6	8.3			10.0
12/6/94	1436	5	8.3			7.9
12/7/94	1437	4	8.3			5.7
12/8/94	1438	3	8.3			3.5
12/9/94	1439	4	8.3			5.7
12/10/94	1440	3	8.2			3.5

Table A1a. Athabasca River u/s Hinton TSS-turbidity regression, results.

Sources: turbidity, Weldwood unpublished data; Naquadat, AEP

		HINTON INTAKE		NAQUADAT DATA		Regression
Date	Jday	Turb	pH	NTU	NFR	TSS (mg/L)
12/11/94	1441	3	8.2			3.5
12/12/94	1442	3	8.2			3.5
12/13/94	1443	3	8.1			3.5
12/14/94	1444	5	8.2			7.9
12/15/94	1445	3	8.2			3.5
12/16/94	1446	3	8.2			3.5
12/17/94	1447	4	8.2			5.7
12/18/94	1448	3	8.3			3.5
12/19/94	1449	4	8.2			5.7
12/20/94	1450	4	8.2			5.7
12/21/94	1451	4	8.3			5.7
12/22/94	1452	4	8.3			5.7
12/23/94	1453	4	8.3			5.7
12/24/94	1454	4	8.3			5.7
12/25/94	1455	4	8.3			5.7
12/26/94	1456	5	8.4			7.9
12/27/94	1457	4	8.2			5.7
12/28/94	1458	4	8.2			5.7
12/29/94	1459	4	8.2			5.7
12/30/94	1460	4	8.2			5.7
12/31/94	1461	3	8.2			3.5

Table A1b. Athabasca River u/s Hinton TSS-turbidity regression, regression statistics.

SUMMARY OUTPUT Hinton Turb (x) vs. NAQ NFR (y)

Regression Statistics	
Multiple R	0.991156716
R Square	0.982391635
Adjusted R Square	0.980630798
Standard Error	12.79443988
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	91328.88975	91328.88975	557.9118964	4.19669E-10
Residual	10	1636.976919	163.6976919		
Total	11	92965.86667			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-3.023483956	4.633627369	-0.652509085	0.528786407	-13.34785091	7.300882998
X Variable 1	2.178796174	0.092243079	23.62015869	4.19669E-10	1.97326575	2.384326599

Table A2a. Athabasca River Tributary TSS Concentrations (mg/L) used in modelling.

Date	JDAY	Berland	Oldman	Marsh	Mcleod	Freeman	Pembina	Satwat	LSR	Labiche	Calling	Pelican	House	Muskeg	Ells	Firebag	Clearwat
1-Jan-91	1	1	2	2	2	8	2	6		12	6	12	7	3	4	4	5
31-Mar-91	90	1	2	2	2	8	2	6		12	6	12	7	3	4	4	5
30-Apr-91	120	25	11	11	11	40	19	34		58	16	58	40	8	30	17	30
15-Jun-91	166	25	11	11	11	40	19	34		58	16	58	40	8	30	17	30
15-Jul-91	196	5	5	5	5	20	12	16		40	22	40	20	5	22	7	15
15-Oct-91	288	5	5	5	5	20	12	16		40	22	40	20	5	22	7	15
1-Jan-92	366	1	2	2	2	8	2	6		12	6	12	7	3	4	4	5
30-Apr-92	486	1	2	2	2	8	2	6		12	6	12	7	3	4	4	5
31-May-92	517	25	11	11	11	40	19	34		58	16	58	40	8	30	17	30
15-Jun-92	532	25	11	11	11	40	19	34		58	16	58	40	8	30	17	30
1-Jul-92	548	5	5	5	5	20	12	16		40	22	40	20	5	22	7	15
15-Oct-92	654	5	5	5	5	20	12	16		40	22	40	20	5	22	7	15
1-Jan-93	732	1	2	2	2	8	2	6		12	6	12	7	3	4	4	5
30-Apr-93	851	1	2	2	2	8	2	6		12	6	12	7	3	4	4	5
31-May-93	882	25	11	11	11	40	19	34		58	16	58	40	8	30	17	30
15-Jun-93	897	25	11	11	11	40	19	34		58	16	58	40	8	30	17	30
1-Jul-93	913	5	5	5	5	20	12	16		40	22	40	20	5	22	7	15
15-Oct-93	1019	5	5	5	5	20	12	16		40	22	40	20	5	22	7	15

Table A2b. Lesser Slave River Tributary TSS Concentrations (mg/L) used in modelling. Source: Alberta Environmental Protection

Date	JDAY	Berland
1-Jan-91	1	2
19-Feb-91	50	2
29-May-91	149	7
26-Jun-91	177	6
30-Jul-91	211	32
3-Sep-91	246	24
16-Oct-91	289	51
16-Oct-91	289	36
16-Oct-91	289	75
11-Feb-92	407	1
13-May-92	499	34
10-Jul-92	557	100
15-Jul-92	562	58
13-Aug-92	591	2
16-Sep-92	625	18
14-Oct-92	653	11
23-Feb-93	785	1
15-Jul-93	927	50

Table A3. Mill TSS Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
1-Jan-92	8182	1-Jan-92	1830	1-Jan-92	2816	1-Jan-92	5
2-Jan-92	6080	2-Jan-92	2449	2-Jan-92	2515	2-Jan-92	146
3-Jan-92	6020	3-Jan-92	1590	3-Jan-92	2139	3-Jan-92	133
4-Jan-92	5425	4-Jan-92	1963	4-Jan-92	1731	4-Jan-92	105
5-Jan-92	5445	5-Jan-92	1699	5-Jan-92	2144	5-Jan-92	96
6-Jan-92	5111	6-Jan-92	1825	6-Jan-92	2383	6-Jan-92	206
7-Jan-92	5746	7-Jan-92	2819	7-Jan-92	1442	7-Jan-92	106
8-Jan-92	7140	8-Jan-92	2237	8-Jan-92	2868	8-Jan-92	144
9-Jan-92	6790	9-Jan-92	1715	9-Jan-92	1770	9-Jan-92	216
10-Jan-92	3645	10-Jan-92	1010	10-Jan-92	3812	10-Jan-92	221
11-Jan-92	7733	11-Jan-92	1139	11-Jan-92	2325	11-Jan-92	199
12-Jan-92	5616	12-Jan-92	556	12-Jan-92	3933	12-Jan-92	377
13-Jan-92	6673	13-Jan-92	911	13-Jan-92	6052	13-Jan-92	270
14-Jan-92	5767	14-Jan-92	774	14-Jan-92	3360	14-Jan-92	170
15-Jan-92	4592	15-Jan-92	673	15-Jan-92	3628	15-Jan-92	174
16-Jan-92	6163	16-Jan-92	1443	16-Jan-92	2857	16-Jan-92	239
17-Jan-92	2613	17-Jan-92	1464	17-Jan-92	3975	17-Jan-92	161
18-Jan-92	13606	18-Jan-92	1619	18-Jan-92	2138	18-Jan-92	85
19-Jan-92	6423	19-Jan-92	1388	19-Jan-92	4053	19-Jan-92	192
20-Jan-92	7527	20-Jan-92	1222	20-Jan-92	2553	20-Jan-92	413
21-Jan-92	6481	21-Jan-92	3120	21-Jan-92	2610	21-Jan-92	322
22-Jan-92	6769	22-Jan-92	2406	22-Jan-92	1817	22-Jan-92	224
23-Jan-92	4776	23-Jan-92	1029	23-Jan-92	2513	23-Jan-92	392
24-Jan-92	5899	24-Jan-92	995	24-Jan-92	1646	24-Jan-92	684
25-Jan-92	6746	25-Jan-92	1081	25-Jan-92	1211	25-Jan-92	377
26-Jan-92	7105	26-Jan-92	1164	26-Jan-92	1748	26-Jan-92	275
27-Jan-92	4158	27-Jan-92	792	27-Jan-92	1633	27-Jan-92	115
28-Jan-92	3614	28-Jan-92	655	28-Jan-92	1006	28-Jan-92	127
29-Jan-92	5803	29-Jan-92	922	29-Jan-92	2411	29-Jan-92	120
30-Jan-92	9610	30-Jan-92	990	30-Jan-92	940	30-Jan-92	89
31-Jan-92	7358	31-Jan-92	455	31-Jan-92	1309	31-Jan-92	235
1-Feb-92	7636	1-Feb-92	420	1-Feb-92	1725	1-Feb-92	101
2-Feb-92	6317	2-Feb-92	881	2-Feb-92	1609	2-Feb-92	114
3-Feb-92	6142	3-Feb-92	219	3-Feb-92	971	3-Feb-92	179
4-Feb-92	7544	4-Feb-92	119	4-Feb-92	1510	4-Feb-92	208
5-Feb-92	5001	5-Feb-92	283	5-Feb-92	859	5-Feb-92	50
6-Feb-92	3424	6-Feb-92	1073	6-Feb-92	1792	6-Feb-92	209
7-Feb-92	1892	7-Feb-92	998	7-Feb-92	930	7-Feb-92	443
8-Feb-92	2709	8-Feb-92	1446	8-Feb-92	991	8-Feb-92	1079
9-Feb-92	4410	9-Feb-92	939	9-Feb-92	1200	9-Feb-92	334
10-Feb-92	4800	10-Feb-92	525	10-Feb-92	1478	10-Feb-92	986
11-Feb-92	8050	11-Feb-92	413	11-Feb-92	1362	11-Feb-92	1285
12-Feb-92	3947	12-Feb-92	598	12-Feb-92	1306	12-Feb-92	361
13-Feb-92	3386	13-Feb-92	297	13-Feb-92	1589	13-Feb-92	93
14-Feb-92	3421	14-Feb-92	602	14-Feb-92	749	14-Feb-92	101
15-Feb-92	4032	15-Feb-92	461	15-Feb-92	903	15-Feb-92	181
16-Feb-92	3437	16-Feb-92	671	16-Feb-92	990	16-Feb-92	124
17-Feb-92	4124	17-Feb-92	622	17-Feb-92	1007	17-Feb-92	193
18-Feb-92	3777	18-Feb-92	416	18-Feb-92	1623	18-Feb-92	293
19-Feb-92	4055	19-Feb-92	493	19-Feb-92	974	19-Feb-92	333
20-Feb-92	3654	20-Feb-92	368	20-Feb-92	1634	20-Feb-92	385

Table A3. Mill TSS Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
21-Feb-92	6966	21-Feb-92	689	21-Feb-92	874	21-Feb-92	2147
22-Feb-92	5978	22-Feb-92	449	22-Feb-92	1655	22-Feb-92	1097
23-Feb-92	5970	23-Feb-92	476	23-Feb-92	1341	23-Feb-92	3156
24-Feb-92	8024	24-Feb-92	530	24-Feb-92	1479	24-Feb-92	3412
25-Feb-92	3712	25-Feb-92	787	25-Feb-92	1495	25-Feb-92	1039
26-Feb-92	4934	26-Feb-92	870	26-Feb-92	1894	26-Feb-92	1072
27-Feb-92	4064	27-Feb-92	1489	27-Feb-92	1904	27-Feb-92	2172
28-Feb-92	4714	28-Feb-92	1006	28-Feb-92	1375	28-Feb-92	3578
29-Feb-92	3085	29-Feb-92	1136	29-Feb-92	1302	29-Feb-92	1426
1-Mar-92	2356	1-Mar-92	1318	1-Mar-92	1572	1-Mar-92	2872
2-Mar-92	3462	2-Mar-92	1354	2-Mar-92	1038	2-Mar-92	1431
3-Mar-92	2660	3-Mar-92	1570	3-Mar-92	1747	3-Mar-92	854
4-Mar-92	2476	4-Mar-92	1539	4-Mar-92	2006	4-Mar-92	1748
5-Mar-92	1115	5-Mar-92	944	5-Mar-92	1648	5-Mar-92	1615
6-Mar-92	3459	6-Mar-92	606	6-Mar-92	1056	6-Mar-92	2562
7-Mar-92	6009	7-Mar-92	862	7-Mar-92	2150	7-Mar-92	906
8-Mar-92	4024	8-Mar-92	984	8-Mar-92	1004	8-Mar-92	1196
9-Mar-92	3608	9-Mar-92	300	9-Mar-92	804	9-Mar-92	1833
10-Mar-92	3437	10-Mar-92	759	10-Mar-92	1960	10-Mar-92	1854
11-Mar-92	4959	11-Mar-92	742	11-Mar-92	1228	11-Mar-92	2527
12-Mar-92	4511	12-Mar-92	441	12-Mar-92	1123	12-Mar-92	3227
13-Mar-92	3251	13-Mar-92	441	13-Mar-92	2035	13-Mar-92	2372
14-Mar-92	3184	14-Mar-92	447	14-Mar-92	973	14-Mar-92	2232
15-Mar-92	5794	15-Mar-92	313	15-Mar-92	905	15-Mar-92	2076
16-Mar-92	5185	16-Mar-92	378	16-Mar-92	908	16-Mar-92	1840
17-Mar-92	6765	17-Mar-92	430	17-Mar-92	1086	17-Mar-92	1960
18-Mar-92	7931	18-Mar-92	284	18-Mar-92	1243	18-Mar-92	2071
19-Mar-92	6882	19-Mar-92	179	19-Mar-92	914	19-Mar-92	1320
20-Mar-92	7630	20-Mar-92	352	20-Mar-92	945	20-Mar-92	2600
21-Mar-92	4198	21-Mar-92	259	21-Mar-92	1323	21-Mar-92	733
22-Mar-92	4945	22-Mar-92	162	22-Mar-92	1053	22-Mar-92	408
23-Mar-92	6008	23-Mar-92	424	23-Mar-92	1198	23-Mar-92	323
24-Mar-92	8588	24-Mar-92	280	24-Mar-92	1074	24-Mar-92	405
25-Mar-92	7119	25-Mar-92	222	25-Mar-92	1047	25-Mar-92	276
26-Mar-92	9120	26-Mar-92	154	26-Mar-92	697	26-Mar-92	252
27-Mar-92	7232	27-Mar-92	285	27-Mar-92	1272	27-Mar-92	181
28-Mar-92	8280	28-Mar-92	238	28-Mar-92	691	28-Mar-92	130
29-Mar-92	4420	29-Mar-92	249	29-Mar-92	995	29-Mar-92	108
30-Mar-92	4104	30-Mar-92	341	30-Mar-92	1053	30-Mar-92	84
31-Mar-92	3917	31-Mar-92	319	31-Mar-92	784	31-Mar-92	82
1-Apr-92	5964	1-Apr-92	251	1-Apr-92	1106	1-Apr-92	120
2-Apr-92	4020	2-Apr-92	390	2-Apr-92	1501	2-Apr-92	117
3-Apr-92	5115	3-Apr-92	87	3-Apr-92	1180	3-Apr-92	185
4-Apr-92	2398	4-Apr-92	305	4-Apr-92	1523	4-Apr-92	104
5-Apr-92	3507	5-Apr-92	251	5-Apr-92	1639	5-Apr-92	79
6-Apr-92	4444	6-Apr-92	269	6-Apr-92	2881	6-Apr-92	117
7-Apr-92	6020	7-Apr-92	131	7-Apr-92	1291	7-Apr-92	145
8-Apr-92	4670	8-Apr-92	29	8-Apr-92	2062	8-Apr-92	162
9-Apr-92	4115	9-Apr-92	127	9-Apr-92	585	9-Apr-92	177
10-Apr-92	2920	10-Apr-92	91	10-Apr-92	1348	10-Apr-92	249
11-Apr-92	6516	11-Apr-92	83	11-Apr-92	597	11-Apr-92	265

Table A3. Mill TSS Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
12-Apr-92	5365	12-Apr-92	170	12-Apr-92	591	12-Apr-92	130
13-Apr-92	8911	13-Apr-92	141	13-Apr-92	1620	13-Apr-92	158
14-Apr-92	6882	14-Apr-92	106	14-Apr-92	1496	14-Apr-92	417
15-Apr-92	6670	15-Apr-92	201	15-Apr-92	2079	15-Apr-92	528
16-Apr-92	4900	16-Apr-92	162	16-Apr-92	854	16-Apr-92	307
17-Apr-92	5560	17-Apr-92	146	17-Apr-92	1225	17-Apr-92	2312
18-Apr-92	5500	18-Apr-92	287	18-Apr-92	1539	18-Apr-92	874
19-Apr-92	5440	19-Apr-92	147	19-Apr-92	944	19-Apr-92	100
20-Apr-92	5630	20-Apr-92	380	20-Apr-92	2234	20-Apr-92	103
21-Apr-92	5390	21-Apr-92	71	21-Apr-92	1378	21-Apr-92	366
22-Apr-92	5480	22-Apr-92	71	22-Apr-92	1687	22-Apr-92	544
23-Apr-92	3960	23-Apr-92	147	23-Apr-92	2912	23-Apr-92	121
24-Apr-92	5740	24-Apr-92	271	24-Apr-92	557	24-Apr-92	55
25-Apr-92	6960	25-Apr-92	562	25-Apr-92	1244	25-Apr-92	48
26-Apr-92	10670	26-Apr-92	142	26-Apr-92	394	26-Apr-92	145
27-Apr-92	7800	27-Apr-92	179	1-May-92	431	27-Apr-92	75
28-Apr-92	7350	28-Apr-92	70	2-May-92	1387	28-Apr-92	99
29-Apr-92	7520	29-Apr-92	113	3-May-92	675	29-Apr-92	157
30-Apr-92	8220	30-Apr-92	274	4-May-92	892	30-Apr-92	177
1-May-92	8527	1-May-92	43	5-May-92	569	1-May-92	178
2-May-92	6907	2-May-92	67	6-May-92	1102	2-May-92	425
3-May-92	7052	3-May-92	94	7-May-92	502	3-May-92	216
4-May-92	7791	4-May-92	509	8-May-92	634	4-May-92	150
5-May-92	2576	5-May-92	179	9-May-92	774	5-May-92	63
6-May-92	976	6-May-92	229	10-May-92	769	6-May-92	216
9-May-92	1064	7-May-92	45	11-May-92	283	7-May-92	326
10-May-92	839	8-May-92	840	12-May-92	835	8-May-92	190
11-May-92	956	9-May-92	197	13-May-92	932	9-May-92	291
12-May-92	1091	10-May-92	311	14-May-92	1488	10-May-92	1217
13-May-92	4853	11-May-92	385	15-May-92	1527	11-May-92	371
14-May-92	2604	12-May-92	130	16-May-92	542	12-May-92	873
15-May-92	3839	13-May-92	145	17-May-92	642	13-May-92	394
16-May-92	5597	14-May-92	140	18-May-92	693	14-May-92	293
17-May-92	6361	15-May-92	335	19-May-92	723	15-May-92	306
18-May-92	8344	16-May-92	200	20-May-92	1105	16-May-92	175
19-May-92	10692	17-May-92	102	21-May-92	860	17-May-92	162
20-May-92	13444	18-May-92	220	22-May-92	502	18-May-92	549
21-May-92	17538	19-May-92	63	23-May-92	1045	19-May-92	482
22-May-92	20666	20-May-92	130	24-May-92	1060	20-May-92	325
23-May-92	12608	21-May-92	176	25-May-92	1170	21-May-92	258
24-May-92	8309	22-May-92	41	26-May-92	1298	22-May-92	148
25-May-92	7948	23-May-92	57	27-May-92	1420	23-May-92	133
26-May-92	5008	24-May-92	175	28-May-92	1757	24-May-92	173
27-May-92	8029	25-May-92	528	29-May-92	1300	25-May-92	275
28-May-92	5293	26-May-92	136	30-May-92	2460	26-May-92	144
29-May-92	4944	27-May-92	179	31-May-92	1148	27-May-92	197
30-May-92	8669	28-May-92	235	1-Jun-92	1951	28-May-92	216
31-May-92	8734	29-May-92	98	2-Jun-92	3504	29-May-92	340
1-Jun-92	10746	30-May-92	98	3-Jun-92	4162	30-May-92	288
2-Jun-92	8880	31-May-92	224	4-Jun-92	2366	31-May-92	201
3-Jun-92	6461	1-Jun-92	113	5-Jun-92	2309	1-Jun-92	185

Table A3. Mill TSS Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
4-Jun-92	6666	2-Jun-92	212	6-Jun-92	1703	2-Jun-92	245
5-Jun-92	5190	3-Jun-92	68	7-Jun-92	1772	3-Jun-92	210
6-Jun-92	3329	4-Jun-92	173	8-Jun-92	4170	4-Jun-92	339
7-Jun-92	6221	5-Jun-92	260	9-Jun-92	1369	5-Jun-92	580
8-Jun-92	7898	6-Jun-92	716	10-Jun-92	1281	6-Jun-92	260
9-Jun-92	8596	7-Jun-92	145	11-Jun-92	1503	7-Jun-92	297
10-Jun-92	8138	8-Jun-92	285	12-Jun-92	1265	8-Jun-92	349
11-Jun-92	9014	9-Jun-92	44	13-Jun-92	1234	9-Jun-92	396
12-Jun-92	7584	10-Jun-92	136	14-Jun-92	1285	10-Jun-92	514
13-Jun-92	6620	11-Jun-92	90	15-Jun-92	1520	11-Jun-92	499
14-Jun-92	5588	12-Jun-92	77	16-Jun-92	1093	12-Jun-92	566
15-Jun-92	5292	13-Jun-92	221	17-Jun-92	712	13-Jun-92	407
16-Jun-92	4264	14-Jun-92	222	18-Jun-92	926	14-Jun-92	310
17-Jun-92	5069	15-Jun-92	108	19-Jun-92	1239	15-Jun-92	459
18-Jun-92	6989	16-Jun-92	198	20-Jun-92	1086	16-Jun-92	217
19-Jun-92	3321	17-Jun-92	145	21-Jun-92	1276	17-Jun-92	308
20-Jun-92	4772	18-Jun-92	84	22-Jun-92	870	18-Jun-92	308
21-Jun-92	4568	19-Jun-92	193	23-Jun-92	1271	19-Jun-92	408
22-Jun-92	3827	20-Jun-92	47	24-Jun-92	1097	20-Jun-92	515
23-Jun-92	2724	21-Jun-92	66	25-Jun-92	1270	21-Jun-92	792
24-Jun-92	2832	22-Jun-92	136	26-Jun-92	1013	22-Jun-92	2046
25-Jun-92	3816	23-Jun-92	198	27-Jun-92	1260	23-Jun-92	2163
26-Jun-92	2239	24-Jun-92	171	28-Jun-92	1069	24-Jun-92	872
27-Jun-92	1918	25-Jun-92	99	29-Jun-92	808	25-Jun-92	442
28-Jun-92	3988	26-Jun-92	92	30-Jun-92	1456	26-Jun-92	579
29-Jun-92	3621	27-Jun-92	73	1-Jul-92	2660	27-Jun-92	1790
30-Jun-92	2880	28-Jun-92	154	2-Jul-92	1548	28-Jun-92	647
1-Jul-92	4518	29-Jun-92	160	3-Jul-92	1707	29-Jun-92	895
2-Jul-92	4651	30-Jun-92	358	4-Jul-92	1241	30-Jun-92	369
3-Jul-92	6354	1-Jul-92	175	5-Jul-92	2584	1-Jul-92	274
4-Jul-92	3458	2-Jul-92	155	6-Jul-92	1649	2-Jul-92	506
5-Jul-92	2412	3-Jul-92	60	7-Jul-92	1796	3-Jul-92	748
6-Jul-92	5673	4-Jul-92	159	8-Jul-92	1954	4-Jul-92	569
7-Jul-92	3941	5-Jul-92	183	9-Jul-92	3130	5-Jul-92	1658
8-Jul-92	3438	6-Jul-92	203	10-Jul-92	3222	6-Jul-92	1813
9-Jul-92	4884	7-Jul-92	114	11-Jul-92	2663	7-Jul-92	1479
10-Jul-92	3471	8-Jul-92	144	12-Jul-92	3105	8-Jul-92	3360
11-Jul-92	4503	9-Jul-92	106	13-Jul-92	1196	9-Jul-92	741
12-Jul-92	1451	10-Jul-92	118	14-Jul-92	1414	10-Jul-92	893
13-Jul-92	4347	11-Jul-92	176	15-Jul-92	1101	11-Jul-92	690
14-Jul-92	4852	12-Jul-92	86	16-Jul-92	1573	12-Jul-92	840
15-Jul-92	3585	13-Jul-92	117	17-Jul-92	1889	13-Jul-92	814
16-Jul-92	1207	14-Jul-92	112	18-Jul-92	3103	14-Jul-92	533
17-Jul-92	6448	15-Jul-92	140	19-Jul-92	2003	15-Jul-92	3350
18-Jul-92	4180	16-Jul-92	83	20-Jul-92	2259	16-Jul-92	966
19-Jul-92	2743	17-Jul-92	265	21-Jul-92	1284	17-Jul-92	1390
20-Jul-92	4992	18-Jul-92	305	22-Jul-92	1376	18-Jul-92	1199
21-Jul-92	5828	19-Jul-92	135	23-Jul-92	1090	19-Jul-92	1169
22-Jul-92	4424	20-Jul-92	178	24-Jul-92	970	20-Jul-92	711
23-Jul-92	3026	21-Jul-92	134	25-Jul-92	1514	21-Jul-92	685
24-Jul-92	2518	22-Jul-92	129	26-Jul-92	1286	22-Jul-92	278

Table A3. Mill TSS Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
25-Jul-92	2900	23-Jul-92	41	27-Jul-92	1588	23-Jul-92	618
26-Jul-92	3882	24-Jul-92	155	28-Jul-92	620	24-Jul-92	945
27-Jul-92	4365	25-Jul-92	160	29-Jul-92	1095	25-Jul-92	697
28-Jul-92	5280	26-Jul-92	395	30-Jul-92	3265	26-Jul-92	433
29-Jul-92	4900	27-Jul-92	198	31-Jul-92	1975	27-Jul-92	656
30-Jul-92	5290	28-Jul-92	166	1-Aug-92	1936	28-Jul-92	825
31-Jul-92	3534	29-Jul-92	190	2-Aug-92	2494	29-Jul-92	870
1-Aug-92	2978	30-Jul-92	152	3-Aug-92	1743	30-Jul-92	935
2-Aug-92	4414	31-Jul-92	105	4-Aug-92	984	31-Jul-92	301
3-Aug-92	4378	1-Aug-92	185	5-Aug-92	1609	1-Aug-92	274
4-Aug-92	3492	2-Aug-92	195	6-Aug-92	753	2-Aug-92	506
5-Aug-92	3457	3-Aug-92	325	7-Aug-92	2176	3-Aug-92	748
6-Aug-92	4540	4-Aug-92	217	8-Aug-92	1108	4-Aug-92	569
7-Aug-92	3438	5-Aug-92	267	9-Aug-92	2510	5-Aug-92	1658
8-Aug-92	8244	6-Aug-92	452	10-Aug-92	1287	6-Aug-92	1813
9-Aug-92	3029	7-Aug-92	378	11-Aug-92	1288	7-Aug-92	1479
10-Aug-92	1872	8-Aug-92	279	12-Aug-92	1334	8-Aug-92	3360
11-Aug-92	2866	9-Aug-92	245	13-Aug-92	1294	9-Aug-92	741
12-Aug-92	658	10-Aug-92	321	14-Aug-92	1320	10-Aug-92	893
13-Aug-92	2614	11-Aug-92	219	15-Aug-92	1180	11-Aug-92	690
14-Aug-92	2560	12-Aug-92	356	16-Aug-92	1348	12-Aug-92	840
15-Aug-92	1816	13-Aug-92	232	17-Aug-92	1322	13-Aug-92	814
16-Aug-92	3122	14-Aug-92	232	18-Aug-92	1490	14-Aug-92	533
17-Aug-92	3466	15-Aug-92	371	19-Aug-92	1264	15-Aug-92	3350
18-Aug-92	4630	16-Aug-92	419	20-Aug-92	1393	16-Aug-92	966
19-Aug-92	2699	17-Aug-92	360	21-Aug-92	3131	17-Aug-92	1390
20-Aug-92	5492	18-Aug-92	280	22-Aug-92	4493	18-Aug-92	1199
21-Aug-92	4728	19-Aug-92	213	23-Aug-92	3562	19-Aug-92	1169
22-Aug-92	7742	20-Aug-92	687	24-Aug-92	4379	20-Aug-92	711
23-Aug-92	3387	21-Aug-92	521	25-Aug-92	4981	21-Aug-92	685
24-Aug-92	4768	22-Aug-92	571	26-Aug-92	3166	22-Aug-92	278
25-Aug-92	3519	23-Aug-92	422	27-Aug-92	3498	23-Aug-92	618
26-Aug-92	4077	24-Aug-92	469	28-Aug-92	2138	24-Aug-92	945
27-Aug-92	4060	25-Aug-92	456	29-Aug-92	4358	25-Aug-92	697
28-Aug-92	3639	26-Aug-92	284	30-Aug-92	2018	26-Aug-92	433
29-Aug-92	2473	27-Aug-92	524	31-Aug-92	3927	27-Aug-92	656
30-Aug-92	3220	28-Aug-92	427	1-Sep-92	4376	28-Aug-92	825
31-Aug-92	5441	29-Aug-92	305	2-Sep-92	4353	29-Aug-92	870
1-Sep-92	6397	30-Aug-92	246	3-Sep-92	3131	30-Aug-92	935
2-Sep-92	2894	31-Aug-92	226	4-Sep-92	3686	31-Aug-92	301
3-Sep-92	2070	1-Sep-92	300	5-Sep-92	3670	1-Sep-92	1536
4-Sep-92	4716	2-Sep-92	286	6-Sep-92	3863	2-Sep-92	631
5-Sep-92	5157	3-Sep-92	282	7-Sep-92	4002	3-Sep-92	855
6-Sep-92	1845	4-Sep-92	270	8-Sep-92	4432	4-Sep-92	791
8-Sep-92	1472	5-Sep-92	352	9-Sep-92	2734	5-Sep-92	1122
9-Sep-92	2481	6-Sep-92	211	10-Sep-92	4383	6-Sep-92	1007
10-Sep-92	2970	7-Sep-92	272	11-Sep-92	5106	7-Sep-92	987
11-Sep-92	4356	8-Sep-92	323	12-Sep-92	4488	8-Sep-92	1206
12-Sep-92	4268	9-Sep-92	372	13-Sep-92	4075	9-Sep-92	932
13-Sep-92	4168	10-Sep-92	731	14-Sep-92	4726	10-Sep-92	2227
14-Sep-92	5304	11-Sep-92	947	15-Sep-92	6147	11-Sep-92	836

Table A3. Mill TSS Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
15-Sep-92	5434	12-Sep-92	715	16-Sep-92	5058	12-Sep-92	762
16-Sep-92	6432	13-Sep-92	1142	17-Sep-92	4059	13-Sep-92	532
17-Sep-92	6108	14-Sep-92	1012	18-Sep-92	5612	14-Sep-92	456
18-Sep-92	3565	15-Sep-92	715	19-Sep-92	5407	15-Sep-92	417
19-Sep-92	3946	16-Sep-92	1130	20-Sep-92	5226	16-Sep-92	389
20-Sep-92	4283	17-Sep-92	1179	21-Sep-92	5523	17-Sep-92	3
21-Sep-92	3648	18-Sep-92	1187	22-Sep-92	1671	18-Sep-92	1973
22-Sep-92	3309	19-Sep-92	866	28-Sep-92	246	19-Sep-92	651
23-Sep-92	3654	20-Sep-92	822	29-Sep-92	2858	20-Sep-92	654
24-Sep-92	3063	21-Sep-92	674	30-Sep-92	1591	21-Sep-92	838
25-Sep-92	3372	22-Sep-92	577	1-Oct-92	2380	22-Sep-92	799
26-Sep-92	3013	23-Sep-92	342	2-Oct-92	4183	23-Sep-92	835
27-Sep-92	5251	24-Sep-92	211	3-Oct-92	2983	24-Sep-92	904
28-Sep-92	5288	25-Sep-92	303	4-Oct-92	3171	25-Sep-92	925
29-Sep-92	4045	26-Sep-92	270	5-Oct-92	3349	26-Sep-92	1267
30-Sep-92	3171	27-Sep-92	376	6-Oct-92	3527	27-Sep-92	959
1-Oct-92	3435	28-Sep-92	171	7-Oct-92	3273	28-Sep-92	868
2-Oct-92	3530	29-Sep-92	183	8-Oct-92	2664	29-Sep-92	1207
3-Oct-92	1355	30-Sep-92	210	9-Oct-92	2648	30-Sep-92	832
4-Oct-92	1590	1-Oct-92	129	10-Oct-92	2725	1-Oct-92	994
5-Oct-92	2915	2-Oct-92	274	11-Oct-92	5185	2-Oct-92	838
6-Oct-92	1921	3-Oct-92	254	12-Oct-92	1645	3-Oct-92	805
7-Oct-92	3556	4-Oct-92	212	13-Oct-92	3478	4-Oct-92	874
8-Oct-92	3946	5-Oct-92	341	14-Oct-92	1975	5-Oct-92	806
9-Oct-92	2262	6-Oct-92	199	15-Oct-92	1779	6-Oct-92	833
10-Oct-92	1770	7-Oct-92	152	16-Oct-92	1321	7-Oct-92	858
11-Oct-92	2433	8-Oct-92	177	17-Oct-92	2683	8-Oct-92	799
12-Oct-92	3059	9-Oct-92	191	18-Oct-92	4283	9-Oct-92	1008
13-Oct-92	4972	10-Oct-92	57	19-Oct-92	2833	10-Oct-92	1003
14-Oct-92	2102	11-Oct-92	83	20-Oct-92	3720	11-Oct-92	1085
15-Oct-92	5841	12-Oct-92	119	21-Oct-92	2710	12-Oct-92	1785
16-Oct-92	6662	13-Oct-92	202	22-Oct-92	3190	13-Oct-92	1177
17-Oct-92	7194	14-Oct-92	178	23-Oct-92	2599	14-Oct-92	453
18-Oct-92	6264	15-Oct-92	202	24-Oct-92	1591	15-Oct-92	908
19-Oct-92	10186	16-Oct-92	161	25-Oct-92	1226	16-Oct-92	751
20-Oct-92	9605	17-Oct-92	222	26-Oct-92	1841	17-Oct-92	695
21-Oct-92	3992	18-Oct-92	224	27-Oct-92	991	18-Oct-92	800
22-Oct-92	4805	19-Oct-92	261	28-Oct-92	1107	19-Oct-92	884
23-Oct-92	3429	20-Oct-92	451	29-Oct-92	1995	20-Oct-92	678
24-Oct-92	2607	21-Oct-92	363	30-Oct-92	1025	21-Oct-92	663
25-Oct-92	3779	22-Oct-92	529	31-Oct-92	1052	22-Oct-92	983
26-Oct-92	2740	23-Oct-92	332	1-Nov-92	1691	23-Oct-92	1051
27-Oct-92	4298	24-Oct-92	365	2-Nov-92	1032	24-Oct-92	621
28-Oct-92	4021	25-Oct-92	617	3-Nov-92	1343	25-Oct-92	2009
29-Oct-92	3318	26-Oct-92	466	4-Nov-92	1102	26-Oct-92	647
30-Oct-92	2372	27-Oct-92	283	5-Nov-92	1326	27-Oct-92	1399
31-Oct-92	3421	28-Oct-92	125	6-Nov-92	733	28-Oct-92	989
1-Nov-92	4642	29-Oct-92	130	7-Nov-92	598	29-Oct-92	1105
2-Nov-92	2920	30-Oct-92	370	8-Nov-92	922	30-Oct-92	1092
3-Nov-92	3792	31-Oct-92	722	9-Nov-92	1119	31-Oct-92	700
4-Nov-92	2909	1-Nov-92	838	10-Nov-92	591	1-Nov-92	692

Table A3. Mill TSS Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
5-Nov-92	2480	2-Nov-92	524	11-Nov-92	2150	2-Nov-92	400
6-Nov-92	2603	3-Nov-92	611	12-Nov-92	671	3-Nov-92	536
7-Nov-92	2122	4-Nov-92	1158	13-Nov-92	1314	4-Nov-92	1048
8-Nov-92	3694	5-Nov-92	736	14-Nov-92	720	5-Nov-92	592
9-Nov-92	4498	6-Nov-92	630	15-Nov-92	851	6-Nov-92	513
10-Nov-92	7917	7-Nov-92	3188	16-Nov-92	1479	7-Nov-92	425
11-Nov-92	5375	8-Nov-92	1572	17-Nov-92	682	8-Nov-92	474
12-Nov-92	5222	9-Nov-92	1743	18-Nov-92	1060	9-Nov-92	535
13-Nov-92	4541	10-Nov-92	1821	19-Nov-92	1323	10-Nov-92	459
14-Nov-92	3069	11-Nov-92	1618	20-Nov-92	814	11-Nov-92	610
15-Nov-92	3448	12-Nov-92	2979	21-Nov-92	464	12-Nov-92	432
16-Nov-92	3493	13-Nov-92	1370	22-Nov-92	950	13-Nov-92	727
17-Nov-92	3233	14-Nov-92	1182	23-Nov-92	1442	14-Nov-92	683
18-Nov-92	3580	15-Nov-92	1776	24-Nov-92	388	15-Nov-92	602
19-Nov-92	6042	16-Nov-92	1832	25-Nov-92	1309	16-Nov-92	450
20-Nov-92	5078	17-Nov-92	1083	26-Nov-92	1643	17-Nov-92	336
21-Nov-92	6838	18-Nov-92	334	27-Nov-92	1785	18-Nov-92	348
22-Nov-92	5921	19-Nov-92	150	28-Nov-92	1990	19-Nov-92	423
23-Nov-92	7148	20-Nov-92	497	29-Nov-92	1527	20-Nov-92	525
24-Nov-92	5853	21-Nov-92	1841	30-Nov-92	334	21-Nov-92	399
25-Nov-92	5752	22-Nov-92	1208	1-Dec-92	501	22-Nov-92	473
26-Nov-92	3708	23-Nov-92	652	2-Dec-92	1445	23-Nov-92	427
27-Nov-92	3370	24-Nov-92	2073	3-Dec-92	986	24-Nov-92	415
28-Nov-92	4310	25-Nov-92	2304	4-Dec-92	977	25-Nov-92	381
29-Nov-92	7920	26-Nov-92	2536	5-Dec-92	2215	26-Nov-92	352
30-Nov-92	7243	27-Nov-92	1537	6-Dec-92	43	27-Nov-92	436
1-Dec-92	5210	28-Nov-92	8854	7-Dec-92	1551	28-Nov-92	349
2-Dec-92	4910	29-Nov-92	2171	8-Dec-92	1048	29-Nov-92	319
3-Dec-92	4168	30-Nov-92	963	9-Dec-92	1320	30-Nov-92	417
4-Dec-92	5075	1-Dec-92	1348	10-Dec-92	1847	1-Dec-92	767
5-Dec-92	6192	2-Dec-92	1657	11-Dec-92	1321	2-Dec-92	866
6-Dec-92	4660	3-Dec-92	1276	12-Dec-92	1287	3-Dec-92	910
7-Dec-92	2909	4-Dec-92	1243	13-Dec-92	1707	4-Dec-92	866
8-Dec-92	4465	5-Dec-92	1682	14-Dec-92	1108	5-Dec-92	932
9-Dec-92	6332	6-Dec-92	2833	15-Dec-92	844	6-Dec-92	1309
10-Dec-92	5150	7-Dec-92	1280	16-Dec-92	752	7-Dec-92	1110
11-Dec-92	4677	8-Dec-92	1603	17-Dec-92	585	8-Dec-92	1111
12-Dec-92	7957	9-Dec-92	2200	18-Dec-92	434	9-Dec-92	630
13-Dec-92	9025	10-Dec-92	1529	19-Dec-92	1600	10-Dec-92	1437
14-Dec-92	6319	11-Dec-92	1985	20-Dec-92	683	11-Dec-92	1749
15-Dec-92	5645	12-Dec-92	1736	21-Dec-92	1045	12-Dec-92	1312
16-Dec-92	5646	13-Dec-92	1231	22-Dec-92	610	13-Dec-92	1050
17-Dec-92	6426	14-Dec-92	1238	23-Dec-92	1010	14-Dec-92	170
18-Dec-92	6174	15-Dec-92	1267	24-Dec-92	225	15-Dec-92	305
19-Dec-92	7245	16-Dec-92	660	25-Dec-92	461	16-Dec-92	297
20-Dec-92	6387	17-Dec-92	907	26-Dec-92	522	17-Dec-92	316
21-Dec-92	8196	18-Dec-92	902	27-Dec-92	515	18-Dec-92	352
22-Dec-92	2895	19-Dec-92	996	28-Dec-92	1709	19-Dec-92	414
23-Dec-92	7917	20-Dec-92	1048	29-Dec-92	100	20-Dec-92	373
27-Dec-92	3542	21-Dec-92	458	30-Dec-92	298	21-Dec-92	452
28-Dec-92	4089	22-Dec-92	434	31-Dec-92	541	22-Dec-92	447

Table A3. Mill TSS Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
29-Dec-92	3454	23-Dec-92	491	1-Jan-93	1226	23-Dec-92	87
30-Dec-92	6356	24-Dec-92	177	2-Jan-93	191	24-Dec-92	157
31-Dec-92	6904	25-Dec-92	288	3-Jan-93	330	25-Dec-92	378
1-Jan-93	7656	26-Dec-92	301	4-Jan-93	1115	26-Dec-92	186
2-Jan-93	5174	27-Dec-92	394	5-Jan-93	1270	27-Dec-92	163
3-Jan-93	5362	28-Dec-92	283	6-Jan-93	1079	28-Dec-92	223
4-Jan-93	6439	29-Dec-92	409	7-Jan-93	860	29-Dec-92	576
5-Jan-93	6924	30-Dec-92	403	8-Jan-93	1157	30-Dec-92	284
6-Jan-93	4466	31-Dec-92	320	9-Jan-93	458	31-Dec-92	180
7-Jan-93	4567	1-Jan-93	163	10-Jan-93	1082	1-Jan-93	113
8-Jan-93	5538	2-Jan-93	290	11-Jan-93	1307	2-Jan-93	261
9-Jan-93	6394	3-Jan-93	337	12-Jan-93	877	3-Jan-93	454
10-Jan-93	6030	4-Jan-93	384	13-Jan-93	450	4-Jan-93	194
11-Jan-93	7286	5-Jan-93	283	14-Jan-93	1189	5-Jan-93	293
12-Jan-93	4068	6-Jan-93	185	15-Jan-93	1875	6-Jan-93	267
13-Jan-93	6000	7-Jan-93	298	16-Jan-93	1132	7-Jan-93	238
14-Jan-93	2266	8-Jan-93	159	17-Jan-93	882	8-Jan-93	317
15-Jan-93	6270	9-Jan-93	257	18-Jan-93	496	9-Jan-93	380
16-Jan-93	7112	10-Jan-93	139	19-Jan-93	326	10-Jan-93	430
17-Jan-93	6916	11-Jan-93	154	20-Jan-93	917	11-Jan-93	313
18-Jan-93	8404	12-Jan-93	264	21-Jan-93	760	12-Jan-93	397
19-Jan-93	6825	13-Jan-93	169	22-Jan-93	1156	13-Jan-93	274
20-Jan-93	6565	14-Jan-93	109	23-Jan-93	1584	14-Jan-93	320
21-Jan-93	3648	15-Jan-93	183	24-Jan-93	835	15-Jan-93	560
22-Jan-93	5424	16-Jan-93	285	25-Jan-93	2877	16-Jan-93	1183
23-Jan-93	5340	17-Jan-93	225	26-Jan-93	2035	17-Jan-93	492
24-Jan-93	6765	18-Jan-93	270	27-Jan-93	1730	18-Jan-93	556
25-Jan-93	6100	19-Jan-93	242	28-Jan-93	3009	19-Jan-93	706
26-Jan-93	5771	20-Jan-93	221	29-Jan-93	145	20-Jan-93	651
27-Jan-93	3556	21-Jan-93	238	30-Jan-93	1135	21-Jan-93	788
28-Jan-93	7683	22-Jan-93	299	31-Jan-93	1139	22-Jan-93	1338
29-Jan-93	7430	23-Jan-93	361	1-Feb-93	2244	23-Jan-93	1225
30-Jan-93	4715	24-Jan-93	250	2-Feb-93	888	24-Jan-93	993
31-Jan-93	5729	25-Jan-93	335	3-Feb-93	2696	25-Jan-93	885
1-Feb-93	6963	26-Jan-93	301	4-Feb-93	1911	26-Jan-93	1002
2-Feb-93	4925	27-Jan-93	311	5-Feb-93	313	27-Jan-93	1111
3-Feb-93	4906	28-Jan-93	324	6-Feb-93	549	28-Jan-93	1026
4-Feb-93	6084	29-Jan-93	362	7-Feb-93	1374	29-Jan-93	968
5-Feb-93	10221	30-Jan-93	386	8-Feb-93	1502	30-Jan-93	901
6-Feb-93	5125	31-Jan-93	306	9-Feb-93	1220	31-Jan-93	942
7-Feb-93	2743	1-Feb-93	420	10-Feb-93	239	1-Feb-93	883
8-Feb-93	1563	2-Feb-93	368	11-Feb-93	1302	2-Feb-93	935
9-Feb-93	2881	3-Feb-93	384	12-Feb-93	353	3-Feb-93	764
10-Feb-93	5870	4-Feb-93	384	13-Feb-93	1298	4-Feb-93	891
11-Feb-93	4890	5-Feb-93	193	14-Feb-93	1249	5-Feb-93	750
12-Feb-93	3963	6-Feb-93	603	15-Feb-93	600	6-Feb-93	756
13-Feb-93	3708	7-Feb-93	346	16-Feb-93	1021	7-Feb-93	711
14-Feb-93	4246	8-Feb-93	404	17-Feb-93	1030	8-Feb-93	609
15-Feb-93	5284	9-Feb-93	380	18-Feb-93	803	9-Feb-93	955
16-Feb-93	4145	10-Feb-93	390	19-Feb-93	671	10-Feb-93	744
17-Feb-93	3972	11-Feb-93	611	20-Feb-93	502	11-Feb-93	790

Table A3. Mill TSS Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
18-Feb-93	2141	12-Feb-93	531	21-Feb-93	768	12-Feb-93	924
19-Feb-93	4910	13-Feb-93	598	22-Feb-93	946	13-Feb-93	995
20-Feb-93	5765	14-Feb-93	625	23-Feb-93	1311	14-Feb-93	907
21-Feb-93	5341	15-Feb-93	632	24-Feb-93	854	15-Feb-93	1132
22-Feb-93	6174	16-Feb-93	515	25-Feb-93	1727	16-Feb-93	1347
23-Feb-93	6221	17-Feb-93	643	26-Feb-93	1051	17-Feb-93	1592
24-Feb-93	4565	18-Feb-93	528	27-Feb-93	1947	18-Feb-93	905
25-Feb-93	5878	19-Feb-93	482	28-Feb-93	995	19-Feb-93	1084
26-Feb-93	8110	20-Feb-93	302	1-Mar-93	901	20-Feb-93	1128
27-Feb-93	5000	21-Feb-93	779	2-Mar-93	1450	21-Feb-93	895
28-Feb-93	6461	22-Feb-93	479	3-Mar-93	2094	22-Feb-93	645
1-Mar-93	7673	23-Feb-93	409	4-Mar-93	920	23-Feb-93	654
2-Mar-93	5454	24-Feb-93	649	5-Mar-93	1080	24-Feb-93	598
3-Mar-93	4109	25-Feb-93	459	6-Mar-93	524	25-Feb-93	885
4-Mar-93	3738	26-Feb-93	520	7-Mar-93	1088	26-Feb-93	680
5-Mar-93	3644	27-Feb-93	278	8-Mar-93	1145	27-Feb-93	722
6-Mar-93	3356	28-Feb-93	467	9-Mar-93	1072	28-Feb-93	744
7-Mar-93	3390	1-Mar-93	517	10-Mar-93	1331	1-Mar-93	838
8-Mar-93	4005	2-Mar-93	549	11-Mar-93	1131	2-Mar-93	606
9-Mar-93	2691	3-Mar-93	433	12-Mar-93	824	3-Mar-93	860
10-Mar-93	3219	4-Mar-93	247	13-Mar-93	900	4-Mar-93	593
11-Mar-93	2834	5-Mar-93	324	14-Mar-93	966	5-Mar-93	648
12-Mar-93	2036	6-Mar-93	195	15-Mar-93	969	6-Mar-93	769
13-Mar-93	2626	7-Mar-93	239	16-Mar-93	1042	7-Mar-93	834
14-Mar-93	4318	8-Mar-93	380	17-Mar-93	1250	8-Mar-93	681
15-Mar-93	4997	9-Mar-93	310	18-Mar-93	508	9-Mar-93	557
16-Mar-93	3238	10-Mar-93	356	19-Mar-93	732	10-Mar-93	599
17-Mar-93	2448	11-Mar-93	296	20-Mar-93	592	11-Mar-93	773
18-Mar-93	2998	12-Mar-93	227	21-Mar-93	1229	12-Mar-93	825
19-Mar-93	3784	13-Mar-93	282	22-Mar-93	961	13-Mar-93	823
20-Mar-93	2988	14-Mar-93	303	23-Mar-93	829	14-Mar-93	614
21-Mar-93	3594	15-Mar-93	180	24-Mar-93	1057	15-Mar-93	807
22-Mar-93	1688	16-Mar-93	596	25-Mar-93	1347	16-Mar-93	696
23-Mar-93	2286	17-Mar-93	78	26-Mar-93	878	17-Mar-93	874
24-Mar-93	4346	18-Mar-93	175	27-Mar-93	608	18-Mar-93	752
25-Mar-93	5040	19-Mar-93	143	28-Mar-93	540	19-Mar-93	847
26-Mar-93	4410	20-Mar-93	200	29-Mar-93	1187	20-Mar-93	725
27-Mar-93	5925	21-Mar-93	241	30-Mar-93	929	21-Mar-93	876
28-Mar-93	2918	22-Mar-93	187	31-Mar-93	540	22-Mar-93	790
29-Mar-93	4228	23-Mar-93	226	1-Apr-93	1324	23-Mar-93	1046
30-Mar-93	2193	24-Mar-93	93	2-Apr-93	1498	24-Mar-93	1013
31-Mar-93	3580	25-Mar-93	242	3-Apr-93	2463	25-Mar-93	1137
1-Apr-93	5074	26-Mar-93	122	4-Apr-93	1344	26-Mar-93	750
2-Apr-93	4268	27-Mar-93	156	5-Apr-93	1123	27-Mar-93	851
3-Apr-93	4055	28-Mar-93	365	6-Apr-93	1350	28-Mar-93	1101
4-Apr-93	1306	29-Mar-93	246	7-Apr-93	1454	29-Mar-93	1005
5-Apr-93	1885	30-Mar-93	60	8-Apr-93	589	30-Mar-93	959
6-Apr-93	3581	31-Mar-93	213	9-Apr-93	695	31-Mar-93	871
7-Apr-93	2459	1-Apr-93	67	10-Apr-93	1679	1-Apr-93	945
8-Apr-93	3291	2-Apr-93	256	11-Apr-93	513	2-Apr-93	918
9-Apr-93	4404	3-Apr-93	260	12-Apr-93	1368	3-Apr-93	854

Table A3. Mill TSS Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
10-Apr-93	2527	4-Apr-93	254	13-Apr-93	250	4-Apr-93	687
11-Apr-93	5445	5-Apr-93	311	14-Apr-93	1331	5-Apr-93	724
12-Apr-93	4026	6-Apr-93	222	15-Apr-93	1402	6-Apr-93	796
13-Apr-93	1830	7-Apr-93	178	16-Apr-93	803	7-Apr-93	685
14-Apr-93	7664	8-Apr-93	254	17-Apr-93	1904	8-Apr-93	717
15-Apr-93	5147	9-Apr-93	128	18-Apr-93	865	9-Apr-93	891
16-Apr-93	3573	10-Apr-93	187	19-Apr-93	772	10-Apr-93	757
17-Apr-93	1848	11-Apr-93	147	20-Apr-93	843	11-Apr-93	873
18-Apr-93	3900	12-Apr-93	131	21-Apr-93	874	12-Apr-93	965
19-Apr-93	218	13-Apr-93	57	22-Apr-93	134	13-Apr-93	670
20-Apr-93	131	14-Apr-93	120	23-Apr-93	240	14-Apr-93	564
21-Apr-93	1591	15-Apr-93	173	24-Apr-93	944	15-Apr-93	838
23-Apr-93	2496	16-Apr-93	85	25-Apr-93	1071	16-Apr-93	715
24-Apr-93	1742	17-Apr-93	214	26-Apr-93	632	17-Apr-93	550
25-Apr-93	570	18-Apr-93	102	27-Apr-93	813	18-Apr-93	786
26-Apr-93	2170	19-Apr-93	83	28-Apr-93	1087	19-Apr-93	825
27-Apr-93	4252	20-Apr-93	101	29-Apr-93	1136	20-Apr-93	858
28-Apr-93	3798	21-Apr-93	171	30-Apr-93	843	21-Apr-93	922
29-Apr-93	2096	22-Apr-93	76	1-May-93	844	22-Apr-93	1202
30-Apr-93	2629	23-Apr-93	111	2-May-93	1050	23-Apr-93	818
1-May-93	2590	24-Apr-93	203	3-May-93	611	24-Apr-93	1228
2-May-93	4032	25-Apr-93	115	4-May-93	598	25-Apr-93	899
3-May-93	2350	26-Apr-93	249	5-May-93	588	26-Apr-93	2540
4-May-93	4147	27-Apr-93	59	6-May-93	537	27-Apr-93	683
5-May-93	5324	28-Apr-93	165	7-May-93	820	28-Apr-93	1054
6-May-93	7310	29-Apr-93	151	8-May-93	2549	29-Apr-93	949
7-May-93	5626	30-Apr-93	119	9-May-93	838	30-Apr-93	847
8-May-93	3828	1-May-93	133	10-May-93	309	1-May-93	899
9-May-93	4188	2-May-93	551	13-May-93	464	2-May-93	912
10-May-93	1576	3-May-93	132	14-May-93	1015	3-May-93	756
11-May-93	2885	4-May-93	208	15-May-93	1071	4-May-93	863
12-May-93	1655	5-May-93	116	16-May-93	676	5-May-93	1004
13-May-93	3933	6-May-93	146	17-May-93	913	6-May-93	1157
14-May-93	4295	7-May-93	145	18-May-93	777	7-May-93	1287
15-May-93	2020	8-May-93	155	19-May-93	974	8-May-93	1524
16-May-93	3217	9-May-93	75	20-May-93	714	9-May-93	1045
17-May-93	1029	10-May-93	89	21-May-93	47	10-May-93	1233
18-May-93	3664	11-May-93	195	22-May-93	672	11-May-93	1039
19-May-93	3497	12-May-93	134	23-May-93	802	12-May-93	1027
20-May-93	4428	13-May-93	181	24-May-93	693	13-May-93	1307
21-May-93	1803	14-May-93	433	25-May-93	497	14-May-93	665
22-May-93	1537	15-May-93	778	26-May-93	461	15-May-93	403
23-May-93	6043	16-May-93	188	27-May-93	620	16-May-93	572
24-May-93	2086	17-May-93	344	28-May-93	757	17-May-93	442
25-May-93	1349	18-May-93	249	29-May-93	1413	18-May-93	521
26-May-93	3732	19-May-93	556	30-May-93	1553	19-May-93	470
27-May-93	2431	20-May-93	452	31-May-93	587	20-May-93	578
28-May-93	4847	21-May-93	298	1-Jun-93	862	21-May-93	569
29-May-93	4104	22-May-93	263	2-Jun-93	812	22-May-93	596
30-May-93	2738	23-May-93	136	3-Jun-93	1342	23-May-93	742
31-May-93	3772	24-May-93	151	4-Jun-93	558	24-May-93	693

Table A3. Mill TSS Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
1-Jun-93	2889	25-May-93	278	5-Jun-93	389	25-May-93	604
2-Jun-93	1953	26-May-93	197	6-Jun-93	358	26-May-93	777
3-Jun-93	3177	27-May-93	199	7-Jun-93	475	27-May-93	781
4-Jun-93	4302	28-May-93	400	8-Jun-93	569	28-May-93	940
5-Jun-93	4488	29-May-93	49	9-Jun-93	760	29-May-93	791
6-Jun-93	4180	30-May-93	181	10-Jun-93	676	30-May-93	754
7-Jun-93	3205	31-May-93	182	11-Jun-93	952	31-May-93	852
8-Jun-93	5251	1-Jun-93	259	12-Jun-93	798	1-Jun-93	738
9-Jun-93	2985	2-Jun-93	75	13-Jun-93	555	2-Jun-93	958
10-Jun-93	2855	3-Jun-93	122	14-Jun-93	487	3-Jun-93	701
11-Jun-93	2466	4-Jun-93	168	15-Jun-93	429	4-Jun-93	705
12-Jun-93	1973	5-Jun-93	79	16-Jun-93	530	5-Jun-93	559
13-Jun-93	635	6-Jun-93	95	17-Jun-93	770	6-Jun-93	664
14-Jun-93	2183	7-Jun-93	176	18-Jun-93	884	7-Jun-93	682
15-Jun-93	1363	8-Jun-93	160	19-Jun-93	339	8-Jun-93	627
16-Jun-93	1332	9-Jun-93	223	20-Jun-93	565	9-Jun-93	729
17-Jun-93	4115	10-Jun-93	114	21-Jun-93	482	10-Jun-93	756
18-Jun-93	6690	11-Jun-93	92	22-Jun-93	822	11-Jun-93	927
19-Jun-93	8072	12-Jun-93	117	23-Jun-93	509	12-Jun-93	843
20-Jun-93	3125	13-Jun-93	54	24-Jun-93	586	13-Jun-93	728
21-Jun-93	2374	14-Jun-93	83	25-Jun-93	1423	14-Jun-93	691
22-Jun-93	2979	15-Jun-93	84	26-Jun-93	789	15-Jun-93	593
23-Jun-93	838	16-Jun-93	38	27-Jun-93	539	16-Jun-93	196
24-Jun-93	1558	17-Jun-93	33	28-Jun-93	501	17-Jun-93	883
25-Jun-93	4843	18-Jun-93	70	29-Jun-93	719	18-Jun-93	428
26-Jun-93	5083	19-Jun-93	67	30-Jun-93	191	19-Jun-93	471
27-Jun-93	217	20-Jun-93	38	1-Jul-93	217	20-Jun-93	595
28-Jun-93	2576	21-Jun-93	35	2-Jul-93	316	21-Jun-93	769
29-Jun-93	2218	22-Jun-93	123	3-Jul-93	540	22-Jun-93	830
30-Jun-93	7930	23-Jun-93	24	4-Jul-93	331	23-Jun-93	603
1-Jul-93	3012	24-Jun-93	22	5-Jul-93	301	24-Jun-93	606
2-Jul-93	5531	25-Jun-93	60	6-Jul-93	213	25-Jun-93	212
3-Jul-93	5899	26-Jun-93	112	7-Jul-93	87	26-Jun-93	342
4-Jul-93	1739	27-Jun-93	28	8-Jul-93	504	27-Jun-93	357
5-Jul-93	3026	28-Jun-93	20	9-Jul-93	491	28-Jun-93	368
6-Jul-93	757	29-Jun-93	50	10-Jul-93	625	29-Jun-93	293
7-Jul-93	2162	30-Jun-93	124	11-Jul-93	573	30-Jun-93	178
8-Jul-93	4104	1-Jul-93	130	12-Jul-93	435	1-Jul-93	187
9-Jul-93	3292	2-Jul-93	150	13-Jul-93	1007	2-Jul-93	242
10-Jul-93	5338	3-Jul-93	115	14-Jul-93	774	3-Jul-93	214
11-Jul-93	2255	4-Jul-93	146	15-Jul-93	749	4-Jul-93	555
12-Jul-93	3186	5-Jul-93	84	16-Jul-93	525	5-Jul-93	524
13-Jul-93	3405	6-Jul-93	94	17-Jul-93	1337	6-Jul-93	332
14-Jul-93	1663	7-Jul-93	73	18-Jul-93	924	7-Jul-93	417
15-Jul-93	4117	8-Jul-93	18	19-Jul-93	886	8-Jul-93	374
16-Jul-93	742	9-Jul-93	52	20-Jul-93	768	9-Jul-93	391
17-Jul-93	2988	10-Jul-93	93	21-Jul-93	1149	10-Jul-93	288
18-Jul-93	3276	11-Jul-93	113	22-Jul-93	849	11-Jul-93	366
19-Jul-93	2613	12-Jul-93	80	23-Jul-93	1104	12-Jul-93	363
20-Jul-93	3960	13-Jul-93	107	24-Jul-93	587	13-Jul-93	25
21-Jul-93	4476	14-Jul-93	100	25-Jul-93	769	14-Jul-93	204

Table A3. Mill TSS Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
22-Jul-93	2616	15-Jul-93	151	26-Jul-93	643	15-Jul-93	254
23-Jul-93	7508	16-Jul-93	74	27-Jul-93	542	16-Jul-93	519
24-Jul-93	10357	17-Jul-93	112	28-Jul-93	937	17-Jul-93	509
25-Jul-93	2693	18-Jul-93	281	29-Jul-93	535	18-Jul-93	763
26-Jul-93	3363	19-Jul-93	135	30-Jul-93	1439	19-Jul-93	658
27-Jul-93	4208	20-Jul-93	123	31-Jul-93	1234	20-Jul-93	369
28-Jul-93	1794	21-Jul-93	214	1-Aug-93	566	21-Jul-93	441
29-Jul-93	2576	22-Jul-93	96			22-Jul-93	440
30-Jul-93	2484	23-Jul-93	92			23-Jul-93	391
31-Jul-93	2446	24-Jul-93	66			24-Jul-93	367
1-Aug-93	1588	25-Jul-93	114			25-Jul-93	395
		26-Jul-93	118			26-Jul-93	405
		27-Jul-93	115			27-Jul-93	445
		28-Jul-93	113			28-Jul-93	418
		29-Jul-93	98			29-Jul-93	422
		30-Jul-93	169			30-Jul-93	869
		31-Jul-93	71			31-Jul-93	399
		1-Aug-93	120			1-Aug-93	629

Table A4. Non Pulp Mill TSS Loads to the Athabasca River.
Source: Sentar 1994

Whitecourt STP		Athabasca STP		Suncor		Fort McMurray STP	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
1-Jan-91	19.8	1-Jan-91	5.4	1-Jan-91	378.0	1-Jan-91	0.0
1-Feb-91	23.2	1-Feb-91	7.8	2-Jan-91	378.0	1-Feb-91	132.0
1-Mar-91	35.1	1-Mar-91	7.5	4-Jan-91	0.0	1-Mar-91	182.0
1-Apr-91	30.0	1-Apr-91	4.2	7-Jan-91	432.6	1-Apr-91	130.0
1-May-91	62.4	1-May-91	22.0	9-Jan-91	60.0	1-May-91	231.0
1-Jun-91	25.1	1-Jun-91	10.8	11-Jan-91	101.9	1-Jun-91	180.0
1-Jul-91	22.1	1-Jul-91	7.0	14-Jan-91	490.1	1-Jul-91	0.0
1-Aug-91	20.2	1-Aug-91	6.6	16-Jan-91	10.7	1-Aug-91	0.0
1-Sep-91	22.5	1-Sep-91	5.9	18-Jan-91	195.0	1-Sep-91	0.0
1-Oct-91	22.3	1-Oct-91	4.8	21-Jan-91	488.0	1-Oct-91	0.0
1-Nov-91	39.8	1-Nov-91	5.9	23-Jan-91	404.6	1-Nov-91	0.0
1-Dec-91	24.3	1-Dec-91	10.4	25-Jan-91	0.0	1-Dec-91	0.0
1-Jan-92	19.6	1-Jan-92	9.7	28-Jan-91	0.0	1-Jan-92	0.0
1-Feb-92	22.7	1-Feb-92	12.1	30-Jan-91	0.0	1-Feb-92	0.0
1-Mar-92	20.6	1-Mar-92	9.1	1-Feb-91	0.0	1-Mar-92	0.0
1-Apr-92	15.4	1-Apr-92	12.4	4-Feb-91	0.0	1-Apr-92	0.0
1-May-92	16.9	1-May-92	7.5	6-Feb-91	271.3	1-May-92	0.0
1-Jun-92	19.5	1-Jun-92	11.1	8-Feb-91	315.0	1-Jun-92	0.0
1-Jul-92	13.8	1-Jul-92	4.0	11-Feb-91	496.0	1-Jul-92	0.0
1-Aug-92	15.4	1-Aug-92	4.7	13-Feb-91	0.0	1-Aug-92	0.0
1-Sep-92	13.2	1-Sep-92	4.1	15-Feb-91	0.0	1-Sep-92	0.0
1-Oct-92	16.0	1-Oct-92	4.0	18-Feb-91	0.0	1-Oct-92	0.0
1-Nov-92	14.0	1-Nov-92	20.5	20-Feb-91	397.5	1-Nov-92	0.0
1-Dec-92	22.2	1-Dec-92	11.6	22-Feb-91	368.0	1-Dec-92	0.0
1-Jan-93	28.8	1-Jan-93	10.1	25-Feb-91	54.0	1-Jan-93	0.0
1-Feb-93	24.7	1-Feb-93	8.1	27-Feb-91	0.0	1-Feb-93	0.0
1-Mar-93	22.5	1-Mar-93	9.3	1-Mar-91	0.0	1-Mar-93	0.0
1-Dec-93	22.5	1-Dec-93	9.3	4-Mar-91	620.0	1-Dec-93	0.0
				6-Mar-91	293.4		
				8-Mar-91	29.2		
				11-Mar-91	0.0		
				13-Mar-91	0.0		
				15-Mar-91	193.8		
				18-Mar-91	411.3		
				20-Mar-91	452.8		
				22-Mar-91	312.0		
				25-Mar-91	615.3		
				27-Mar-91	108.0		
				29-Mar-91	308.0		
				1-Apr-91	0.0		
				3-Apr-91	0.0		
				5-Apr-91	217.2		
				8-Apr-91	543.2		
				10-Apr-91	174.0		
				12-Apr-91	618.8		
				15-Apr-91	0.0		
				17-Apr-91	0.0		
				19-Apr-91	0.0		
				22-Apr-91	0.0		
				24-Apr-91	0.0		
				26-Apr-91	0.0		
				29-Apr-91	0.0		
				1-May-91	0.0		
				3-May-91	0.0		
				6-May-91	0.0		

Table A4. Non Pulp Mill TSS Loads to the Athabasca River.
Source: Sentar 1994

Whitecourt STP		Athabasca STP		Suncor		Fort McMurray STP	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
				8-May-91	0.0		
				10-May-91	0.0		
				13-May-91	0.0		
				15-May-91	0.0		
				17-May-91	0.0		
				20-May-91	0.0		
				22-May-91	0.0		
				24-May-91	0.0		
				27-May-91	0.0		
				29-May-91	0.0		
				31-May-91	0.0		
				3-Jun-91	0.0		
				5-Jun-91	0.0		
				7-Jun-91	0.0		
				10-Jun-91	0.0		
				12-Jun-91	0.0		
				14-Jun-91	0.0		
				17-Jun-91	0.0		
				19-Jun-91	0.0		
				21-Jun-91	0.0		
				24-Jun-91	0.0		
				26-Jun-91	0.0		
				28-Jun-91	0.0		
				1-Jul-91	0.0		
				3-Jul-91	0.0		
				5-Jul-91	0.0		
				8-Jul-91	0.0		
				10-Jul-91	0.0		
				12-Jul-91	0.0		
				15-Jul-91	0.0		
				17-Jul-91	0.0		
				19-Jul-91	0.0		
				22-Jul-91	0.0		
				24-Jul-91	0.0		
				26-Jul-91	0.0		
				29-Jul-91	0.0		
				31-Jul-91	0.0		
				2-Aug-91	0.0		
				5-Aug-91	0.0		
				7-Aug-91	0.0		
				9-Aug-91	0.0		
				12-Aug-91	0.0		
				14-Aug-91	0.0		
				16-Aug-91	0.0		
				19-Aug-91	0.0		
				21-Aug-91	0.0		
				23-Aug-91	0.0		
				26-Aug-91	0.0		
				28-Aug-91	0.0		
				30-Aug-91	0.0		
				2-Sep-91	0.0		
				4-Sep-91	0.0		
				6-Sep-91	0.0		
				9-Sep-91	369.1		
				11-Sep-91	0.0		

Table A4. Non Pulp Mill TSS Loads to the Athabasca River.
Source: Sentar 1994

Whitecourt STP		Athabasca STP		Suncor		Fort McMurray STP	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
				13-Sep-91	0.0		
				16-Sep-91	0.0		
				18-Sep-91	0.0		
				20-Sep-91	0.0		
				23-Sep-91	228.3		
				25-Sep-91	543.4		
				27-Sep-91	0.0		
				30-Sep-91	191.2		
				2-Oct-91	380.8		
				4-Oct-91	138.4		
				7-Oct-91	680.2		
				9-Oct-91	172.0		
				11-Oct-91	102.4		
				14-Oct-91	0.0		
				16-Oct-91	0.0		
				18-Oct-91	0.0		
				21-Oct-91	651.8		
				23-Oct-91	0.0		
				25-Oct-91	47.4		
				28-Oct-91	0.0		
				30-Oct-91	178.7		
				1-Nov-91	0.0		
				4-Nov-91	50.3		
				6-Nov-91	389.9		
				8-Nov-91	182.2		
				11-Nov-91	0.0		
				13-Nov-91	174.6		
				15-Nov-91	556.5		
				18-Nov-91	0.0		
				20-Nov-91	0.0		
				22-Nov-91	0.0		
				25-Nov-91	186.1		
				27-Nov-91	181.7		
				29-Nov-91	31.1		
				2-Dec-91	145.4		
				4-Dec-91	0.0		
				6-Dec-91	190.8		
				9-Dec-91	43.9		
				11-Dec-91	0.0		
				13-Dec-91	0.0		
				16-Dec-91	149.9		
				18-Dec-91	105.6		
				20-Dec-91	0.0		
				23-Dec-91	0.0		
				25-Dec-91	0.0		
				27-Dec-91	0.0		
				30-Dec-91	0.0		
				1-Jan-92	0.0		
				3-Jan-92	722.1		
				6-Jan-92	0.0		
				8-Jan-92	365.4		
				10-Jan-92	0.0		
				13-Jan-92	0.0		
				15-Jan-92	547.4		
				17-Jan-92	0.0		

Table A4. Non Pulp Mill TSS Loads to the Athabasca River.
Source: Sentar 1994

Whitecourt STP		Athabasca STP		Suncor		Fort McMurray STP	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
				20-Jan-92	0.0		
				22-Jan-92	0.0		
				24-Jan-92	0.0		
				27-Jan-92	0.0		
				29-Jan-92	95.6		
				31-Jan-92	125.7		
				3-Feb-92	89.8		
				5-Feb-92	0.0		
				7-Feb-92	0.0		
				10-Feb-92	0.0		
				12-Feb-92	608.4		
				14-Feb-92	0.0		
				17-Feb-92	0.0		
				19-Feb-92	86.1		
				21-Feb-92	695.0		
				24-Feb-92	0.0		
				26-Feb-92	24.6		
				28-Feb-92	60.6		
				2-Mar-92	242.7		
				4-Mar-92	110.0		
				6-Mar-92	182.8		
				9-Mar-92	164.7		
				11-Mar-92	0.0		
				13-Mar-92	327.9		
				16-Mar-92	0.0		
				18-Mar-92	0.0		
				20-Mar-92	0.0		
				23-Mar-92	0.0		
				25-Mar-92	511.0		
				26-Mar-92	0.0		
				30-Mar-92	0.0		
				1-Apr-92	219.6		
				3-Apr-92	92.4		
				6-Apr-92	0.0		
				8-Apr-92	0.0		
				10-Apr-92	0.0		
				13-Apr-92	228.3		
				15-Apr-92	0.0		
				17-Apr-92	0.0		
				20-Apr-92	0.0		
				22-Apr-92	0.0		
				24-Apr-92	0.0		
				27-Apr-92	0.0		
				29-Apr-92	0.0		
				1-May-92	0.0		
				4-May-92	485.1		
				6-May-92	260.1		
				8-May-92	0.0		
				11-May-92	0.0		
				13-May-92	0.0		
				15-May-92	0.0		
				18-May-92	0.0		
				20-May-92	0.0		
				22-May-92	0.0		
				25-May-92	0.0		

Table A4. Non Pulp Mill TSS Loads to the Athabasca River.
Source: Sentar 1994

Whitecourt STP		Athabasca STP		Suncor		Fort McMurray STP	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
				27-May-92	0.0		
				29-May-92	0.0		
				1-Jun-92	0.0		
				3-Jun-92	0.0		
				5-Jun-92	0.0		
				8-Jun-92	0.0		
				10-Jun-92	0.0		
				12-Jun-92	0.0		
				15-Jun-92	0.0		
				17-Jun-92	0.0		
				19-Jun-92	0.0		
				22-Jun-92	0.0		
				24-Jun-92	0.0		
				26-Jun-92	0.0		
				29-Jun-92	0.0		
				1-Jul-92	0.0		
				3-Jul-92	0.0		
				6-Jul-92	0.0		
				8-Jul-92	0.0		
				10-Jul-92	0.0		
				13-Jul-92	622.3		
				15-Jul-92	0.0		
				17-Jul-92	0.0		
				20-Jul-92	0.0		
				22-Jul-92	0.0		
				24-Jul-92	95.0		
				27-Jul-92	0.0		
				29-Jul-92	0.0		
				31-Jul-92	0.0		
				3-Aug-92	0.0		
				5-Aug-92	0.0		
				7-Aug-92	0.0		
				10-Aug-92	0.0		
				12-Aug-92	30.5		
				14-Aug-92	0.0		
				17-Aug-92	0.0		
				19-Aug-92	0.0		
				21-Aug-92	0.0		
				24-Aug-92	0.0		
				26-Aug-92	0.0		
				28-Aug-92	0.0		
				31-Aug-92	654.8		
				2-Sep-92	0.0		
				4-Sep-92	0.0		
				7-Sep-92	0.0		
				9-Sep-92	171.5		
				11-Sep-92	0.0		
				14-Sep-92	0.0		
				16-Sep-92	220.1		
				18-Sep-92	102.2		
				21-Sep-92	0.0		
				23-Sep-92	40.3		
				25-Sep-92	0.0		
				28-Sep-92	0.0		
				30-Sep-92	0.0		

Table A4. Non Pulp Mill TSS Loads to the Athabasca River.
Source: Sentar 1994

Whitecourt STP		Athabasca STP		Suncor		Fort McMurray STP	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
				1-Oct-92	576.3		
				2-Oct-92	0.0		
				5-Oct-92	313.4		
				7-Oct-92	33.5		
				9-Oct-92	0.0		
				12-Oct-92	0.0		
				14-Oct-92	0.0		
				16-Oct-92	28.8		
				19-Oct-92	480.3		
				21-Oct-92	306.6		
				23-Oct-92	0.0		
				26-Oct-92	148.4		
				28-Oct-92	254.4		
				30-Oct-92	0.0		
				2-Nov-92	190.4		
				4-Nov-92	0.0		
				6-Nov-92	0.0		
				9-Nov-92	33.8		
				11-Nov-92	633.0		
				13-Nov-92	158.1		
				16-Nov-92	180.3		
				18-Nov-92	325.7		
				20-Nov-92	0.0		
				23-Nov-92	0.0		
				25-Nov-92	101.1		
				27-Nov-92	484.0		
				30-Nov-92	0.0		
				2-Dec-92	0.0		
				4-Dec-92	120.7		
				7-Dec-92	0.0		
				9-Dec-92	0.0		
				11-Dec-92	390.0		
				14-Dec-92	0.0		
				16-Dec-92	90.4		
				18-Dec-92	1016.9		
				21-Dec-92	817.8		
				23-Dec-92	0.0		
				25-Dec-92	0.0		
				28-Dec-92	0.0		
				30-Dec-92	0.0		
				1-Dec-93	0.0		

Table A5.
Athabasca River upstream Na
Concentrations used for modelling

Date	Na (mg/L)
2/7/91	2
2/7/91	2
2/7/91	2
5/10/91	2.3
8/20/91	0.8
10/17/91	1.44
1/7/92	2.4
1/30/92	3
5/5/92	1.51
7/14/92	0.89
10/8/92	1.28
1/7/93	2.27
3/11/93	2.47
5/11/93	1.88
7/28/93	1.1
10/20/93	1.8

Table A6. Athabasca River Tributary Sodium Concentrations (mg/L) used in modelling.

Date	JDAY	Berland	Oldman	Marsh	Mcleod	Freeman	Pembina	Satwat	LSR	Labiche	Calling	Pelican	House	Muskeg	Ells	Firebag	Clearwat
1-Jan-91	1	7	5	19	25	20	33	27	7	24	21	8	29	15	15	4	42
31-Mar-91	90	7	5	19	25	20	33	27	7	24	21	8	29	15	15	4	42
30-Apr-91	120	3	3	7	8	6	9	8	7	10	5	6	13	8	10	3	20
15-Jun-91	166	3	3	7	8	6	9	8	7	10	5	6	13	8	10	3	20
15-Jul-91	196	5	4	9	10	9	14	10	7	8	5	7	20	11	12	4	30
15-Oct-91	288	5	4	9	10	9	14	10	7	8	5	7	20	11	12	4	30
1-Jan-92	366	7	5	19	25	20	33	27	7	24	21	8	29	15	15	4	42
30-Apr-92	486	7	5	19	25	20	33	27	7	24	21	8	29	15	15	4	42
31-May-92	517	3	3	7	8	6	9	8	7	10	5	6	13	8	10	3	20
15-Jun-92	532	3	3	7	8	6	9	8	7	10	5	6	13	8	10	3	20
1-Jul-92	548	5	4	9	10	9	14	10	7	8	5	7	20	11	12	4	30
15-Oct-92	654	5	4	9	10	9	14	10	7	8	5	7	20	11	12	4	30
1-Jan-93	732	7	5	19	25	20	33	27	7	24	21	8	29	15	15	4	42
30-Apr-93	851	7	5	19	25	20	33	27	7	24	21	8	29	15	15	4	42
31-May-93	882	3	3	7	8	6	9	8	7	10	5	6	13	8	10	3	20
15-Jun-93	897	3	3	7	8	6	9	8	7	10	5	6	13	8	10	3	20
1-Jul-93	913	5	4	9	10	9	14	10	7	8	5	7	20	11	12	4	30
15-Oct-93	1019	5	4	9	10	9	14	10	7	8	5	7	20	11	12	4	30

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent [1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
20-Feb-91	38741	13-Jan-92	2236	24-Feb-92	19176	29-Jan-92	11933
21-Feb-91	38380	20-Jan-92	2246	2-Mar-92	15564	5-Feb-92	4775
22-Feb-91	38760	26-Jan-92	1668	10-Mar-92	19598	11-Feb-92	6655
23-Feb-91	37240	4-Feb-92	1931	16-Mar-92	19638	19-Feb-92	5139
24-Feb-91	36472	10-Feb-92	1981	24-Mar-92	3836	4-Mar-92	7947
25-Feb-91	38418	16-Feb-92	1527	30-Mar-92	17928	11-Mar-92	9831
26-Feb-91	39102	1-Mar-92	1071	6-Apr-92	16553	19-Mar-92	10168
27-Feb-91	37506	8-Mar-92	1074	13-Apr-92	17894	25-Mar-92	11903
28-Feb-91	37506	15-Mar-92	1090	20-Apr-92	18914	1-Apr-92	5635
1-Mar-91	38304	22-Mar-92	1510	5-May-92	14479	8-Apr-92	6052
2-Mar-91	38912	29-Mar-92	1602	11-May-92	12605	14-Apr-92	5770
3-Mar-91	37810	5-Apr-92	1269	18-May-92	12232	22-Apr-92	6693
4-Mar-91	39284	12-Apr-92	1340	26-May-92	9852	1-May-92	7838
5-Mar-91	39452	19-Apr-92	1616	1-Jun-92	19643	8-May-92	3858
6-Mar-91	38456	26-Apr-92	1282	8-Jun-92	23334	14-May-92	9360
7-Mar-91	37240	1-Jun-92	1247	15-Jun-92	16509	22-May-92	6543
8-Mar-91	39330	7-Jun-92	1097	22-Jun-92	21060	28-May-92	5700
9-Mar-91	39900	14-Jun-92	1640	29-Jun-92	16060	2-Sep-92	11345
10-Mar-91	38760	21-Jun-92	1368	6-Jul-92	14709	10-Sep-92	12907
11-Mar-91	37996	28-Jun-92	1560	14-Jul-92	20947	16-Sep-92	8081
12-Mar-91	37992	5-Jul-92	1450	20-Jul-92	17902	24-Sep-92	10167
13-Mar-91	35416	12-Jul-92	2021	27-Jul-92	13067	3-Nov-92	6109
14-Mar-91	36917	2-Aug-92	1879	4-Aug-92	12224	18-Nov-92	3366
15-Mar-91	37992	9-Aug-92	1734	10-Aug-92	17028	6-Jan-93	5249
16-Mar-91	38000	16-Aug-92	1952	17-Aug-92	20080	13-Jan-93	3261
17-Mar-91	37430	23-Aug-92	1561	24-Aug-92	15924	20-Jan-93	6471
18-Mar-91	37620	30-Aug-92	1567	1-Sep-92	20355	27-Jan-93	8204
19-Mar-91	37506	8-Sep-92	1512	7-Sep-92	16202	3-Feb-93	9221
20-Mar-91	38228	13-Sep-92	1213	14-Sep-92	14838	10-Feb-93	8638
21-Mar-91	37544	20-Sep-92	1176	21-Sep-92	17753	16-Feb-93	8792
22-Mar-91	36898	5-Jul-93	1768	29-Sep-92	5163	24-Feb-93	6602
23-Mar-91	36480	4-Dec-93	1004	5-Oct-92	6823	3-Mar-93	8336
24-Mar-91	35872			12-Oct-92	10940	10-Mar-93	7142
25-Mar-91	42560			19-Oct-92	16876	17-Mar-93	7184
26-Mar-91	40850			27-Oct-92	14516	24-Mar-93	9034
27-Mar-91	40850			2-Nov-92	14418	31-Mar-93	7563
28-Mar-91	40280			9-Nov-92	15689	7-Apr-93	6712
29-Mar-91	40090			16-Nov-92	7203	14-Apr-93	3496
30-Mar-91	40204			23-Nov-92	17908	21-Apr-93	5420
31-Mar-91	39786			30-Nov-92	26089	5-May-93	7660
1-Apr-91	39900			7-Dec-92	14716	12-May-93	13074
2-Apr-91	40280			14-Dec-92	14707	18-May-93	9337
3-Apr-91	39596			21-Dec-92	15460	27-May-93	7341
4-Apr-91	38950			29-Dec-92	18001	3-Jun-93	10965
5-Apr-91	39900			6-Jan-93	20043	10-Jun-93	10004
6-Apr-91	41040			11-Jan-93	18297	15-Jun-93	12956
7-Apr-91	40850			18-Jan-93	9185	23-Jun-93	8535
8-Apr-91	41344			26-Jan-93	18311	29-Jun-93	9885
9-Apr-91	39444			1-Feb-93	20900	7-Jul-93	10074
10-Apr-91	34010			8-Feb-93	17481	14-Jul-93	12267

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent [1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
11-Apr-91	34732			15-Feb-93	12714	21-Jul-93	13884
12-Apr-91	37354			22-Feb-93	9461	26-Jul-93	8583
13-Apr-91	39900			1-Mar-93	18262	4-Aug-93	6762
14-Apr-91	38570			8-Mar-93	19656	11-Aug-93	10732
15-Apr-91	38570			16-Mar-93	16712	19-Aug-93	5788
16-Apr-91	39178			23-Mar-93	17462	25-Aug-93	9367
17-Apr-91	39938			29-Mar-93	15367	1-Sep-93	9690
18-Apr-91	41268			5-Apr-93	15840	9-Sep-93	10949
19-Apr-91	40964			12-Apr-93	15685	15-Sep-93	11056
20-Apr-91	40774			20-Apr-93	12981	22-Sep-93	8281
21-Apr-91	40470			26-Apr-93	11326	29-Sep-93	9160
22-Apr-91	40774			3-May-93	15063	6-Oct-93	5087
23-Apr-91	43776			10-May-93	14979	14-Oct-93	8724
24-Apr-91	41420			17-May-93	14383	20-Oct-93	8375
25-Apr-91	40660			24-May-93	14096	27-Oct-93	6310
26-Apr-91	41800			31-May-93	16390	3-Nov-93	8322
27-Apr-91	40660			8-Jun-93	14437	9-Nov-93	9950
28-Apr-91	40812			14-Jun-93	14613	17-Nov-93	5852
29-Apr-91	41306			21-Jun-93	18084	25-Nov-93	7570
30-Apr-91	40736			28-Jun-93	13667	3-Dec-93	6227
1-May-91	38228			6-Jul-93	12782	7-Dec-93	8758
2-May-91	37810			13-Jul-93	15319	17-Dec-93	6744
3-May-91	39900			20-Jul-93	14447	20-Dec-93	5017
4-May-91	42180			27-Jul-93	13442	29-Dec-93	5055
5-May-91	40736			2-Aug-93	17327		
6-May-91	41420			10-Aug-93	16084		
7-May-91	34664			16-Aug-93	13334		
8-May-91	27360			23-Aug-93	14312		
9-May-91	20900			30-Aug-93	18525		
10-May-91	17176			7-Sep-93	17840		
11-May-91	3800			14-Sep-93	17879		
12-May-91	12008			20-Sep-93	14856		
13-May-91	10488			28-Sep-93	13916		
14-May-91	29146			4-Oct-93	11897		
15-May-91	32300			12-Oct-93	6474		
16-May-91	36784			19-Oct-93	13252		
17-May-91	32300			26-Oct-93	10664		
18-May-91	38760			2-Nov-93	9746		
19-May-91	42484			9-Nov-93	9155		
20-May-91	44384			16-Nov-93	9289		
21-May-91	47158			22-Nov-93	13331		
22-May-91	46436			29-Nov-93	13479		
23-May-91	41192			7-Dec-93	6427		
24-May-91	41420			15-Dec-93	11774		
25-May-91	42978			20-Dec-93	6927		
26-May-91	43396			28-Dec-93	9721		
27-May-91	43320						
28-May-91	43396						
29-May-91	44384						
30-May-91	44384						

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent[1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
31-May-91	44270						
1-Jun-91	44840						
2-Jun-91	45562						
3-Jun-91	44764						
4-Jun-91	44764						
5-Jun-91	44650						
6-Jun-91	47082						
7-Jun-91	46702						
8-Jun-91	47006						
9-Jun-91	44840						
10-Jun-91	46512						
11-Jun-91	46360						
12-Jun-91	46740						
13-Jun-91	44954						
14-Jun-91	45828						
15-Jun-91	46436						
16-Jun-91	47120						
17-Jun-91	45182						
18-Jun-91	44764						
19-Jun-91	46360						
20-Jun-91	44650						
21-Jun-91	45790						
22-Jun-91	46132						
23-Jun-91	46588						
24-Jun-91	46702						
25-Jun-91	46930						
26-Jun-91	47006						
27-Jun-91	46740						
28-Jun-91	46170						
29-Jun-91	47880						
30-Jun-91	47120						
1-Jul-91	46968						
2-Jul-91	45980						
3-Jul-91	46284						
4-Jul-91	44935						
5-Jul-91	45714						
6-Jul-91	45714						
7-Jul-91	46835						
8-Jul-91	45828						
9-Jul-91	47405						
10-Jul-91	46360						
11-Jul-91	47880						
12-Jul-91	48640						
13-Jul-91	46702						
14-Jul-91	43339						
15-Jul-91	41116						
16-Jul-91	45904						
17-Jul-91	46322						
18-Jul-91	46835						
19-Jul-91	47120						

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent[1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
20-Jul-91	47082						
21-Jul-91	47424						
22-Jul-91	47481						
23-Jul-91	44460						
24-Jul-91	46284						
25-Jul-91	48564						
26-Jul-91	48944						
27-Jul-91	49780						
28-Jul-91	45980						
29-Jul-91	46740						
30-Jul-91	47044						
31-Jul-91	45600						
1-Aug-91	45847						
2-Aug-91	45619						
3-Aug-91	45619						
4-Aug-91	45315						
5-Aug-91	48735						
6-Aug-91	48944						
7-Aug-91	48735						
8-Aug-91	48735						
9-Aug-91	46968						
10-Aug-91	48032						
11-Aug-91	47842						
12-Aug-91	48621						
13-Aug-91	46474						
14-Aug-91	47994						
15-Aug-91	47880						
16-Aug-91	46664						
17-Aug-91	43225						
18-Aug-91	47272						
19-Aug-91	48602						
20-Aug-91	48488						
21-Aug-91	47044						
22-Aug-91	47196						
23-Aug-91	47880						
24-Aug-91	47044						
25-Aug-91	42978						
26-Aug-91	47405						
27-Aug-91	47158						
28-Aug-91	45486						
29-Aug-91	47139						
30-Aug-91	47842						
31-Aug-91	49400						
1-Sep-91	46208						
2-Sep-91	39805						
3-Sep-91	40850						
4-Sep-91	45581						
5-Sep-91	47272						
6-Sep-91	46436						
7-Sep-91	47500						

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent [1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
8-Sep-91	46740						
9-Sep-91	44935						
10-Sep-91	43320						
11-Sep-91	43282						
12-Sep-91	44745						
13-Sep-91	45315						
14-Sep-91	44878						
15-Sep-91	45980						
16-Sep-91	46094						
17-Sep-91	45790						
18-Sep-91	44802						
19-Sep-91	45220						
20-Sep-91	44270						
21-Sep-91	41800						
22-Sep-91	44916						
23-Sep-91	45068						
24-Sep-91	46360						
25-Sep-91	46208						
26-Sep-91	45600						
27-Sep-91	45600						
28-Sep-91	44650						
29-Sep-91	44080						
30-Sep-91	43890						
1-Oct-91	40337						
2-Oct-91	39615						
3-Oct-91	43624						
4-Oct-91	45030						
5-Oct-91	44384						
6-Oct-91	46360						
7-Oct-91	47215						
8-Oct-91	47101						
9-Oct-91	42826						
10-Oct-91	45600						
11-Oct-91	47234						
12-Oct-91	45372						
13-Oct-91	43168						
14-Oct-91	45030						
15-Oct-91	45790						
16-Oct-91	46778						
17-Oct-91	44194						
18-Oct-91	44042						
19-Oct-91	46474						
20-Oct-91	47120						
21-Oct-91	47310						
22-Oct-91	43738						
23-Oct-91	44460						
24-Oct-91	45562						
25-Oct-91	45030						
26-Oct-91	44764						
27-Oct-91	47804						

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent [1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
28-Oct-91	45904						
29-Oct-91	46018						
30-Oct-91	41648						
31-Oct-91	46550						
1-Nov-91	42750						
2-Nov-91	45600						
3-Nov-91	43282						
4-Nov-91	43206						
5-Nov-91	38661						
6-Nov-91	41420						
7-Nov-91	39140						
8-Nov-91	39140						
9-Nov-91	40660						
10-Nov-91	40584						
11-Nov-91	41534						
12-Nov-91	41762						
13-Nov-91	40280						
14-Nov-91	38646						
15-Nov-91	42256						
16-Nov-91	39900						
17-Nov-91	40356						
18-Nov-91	41762						
19-Nov-91	41116						
20-Nov-91	41914						
21-Nov-91	39558						
22-Nov-91	40280						
23-Nov-91	42180						
24-Nov-91	42180						
25-Nov-91	42218						
26-Nov-91	41838						
27-Nov-91	41800						
28-Nov-91	40204						
29-Nov-91	41534						
30-Nov-91	43738						
1-Dec-91	41496						
2-Dec-91	42256						
3-Dec-91	42218						
4-Dec-91	41724						
5-Dec-91	37924						
6-Dec-91	41800						
7-Dec-91	40280						
8-Dec-91	40280						
9-Dec-91	39976						
10-Dec-91	40850						
11-Dec-91	43244						
12-Dec-91	41002						
13-Dec-91	41496						
14-Dec-91	40508						
15-Dec-91	40888						
16-Dec-91	37430						

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent [1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
17-Dec-91	37202						
18-Dec-91	41230						
19-Dec-91	38912						
20-Dec-91	33782						
21-Dec-91	38038						
22-Dec-91	41230						
23-Dec-91	40926						
24-Dec-91	31578						
25-Dec-91	24510						
26-Dec-91	34086						
27-Dec-91	25612						
28-Dec-91	37392						
29-Dec-91	41002						
30-Dec-91	41648						
31-Dec-91	38380						
1-Jan-92	39862						
2-Jan-92	36100						
3-Jan-92	39444						
4-Jan-92	41230						
5-Jan-92	41382						
6-Jan-92	42218						
7-Jan-92	40432						
8-Jan-92	38760						
9-Jan-92	40318						
10-Jan-92	40736						
11-Jan-92	40812						
12-Jan-92	41040						
13-Jan-92	41572						
14-Jan-92	42142						
15-Jan-92	37126						
16-Jan-92	37772						
17-Jan-92	38190						
18-Jan-92	40394						
19-Jan-92	39368						
20-Jan-92	36670						
21-Jan-92	37316						
22-Jan-92	37278						
23-Jan-92	37810						
24-Jan-92	38646						
25-Jan-92	41344						
26-Jan-92	38570						
27-Jan-92	35910						
28-Jan-92	36138						
29-Jan-92	35568						
30-Jan-92	38038						
31-Jan-92	41116						
1-Feb-92	42674						
2-Feb-92	42864						
3-Feb-92	40242						
4-Feb-92	35834						

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent [1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
5-Feb-92	40432						
6-Feb-92	40660						
7-Feb-92	39938						
8-Feb-92	34314						
9-Feb-92	39900						
10-Feb-92	38000						
11-Feb-92	39216						
12-Feb-92	38456						
13-Feb-92	37848						
14-Feb-92	40622						
15-Feb-92	40318						
16-Feb-92	38418						
17-Feb-92	39178						
18-Feb-92	42218						
19-Feb-92	41648						
20-Feb-92	43396						
21-Feb-92	47272						
22-Feb-92	42066						
23-Feb-92	40508						
24-Feb-92	38114						
25-Feb-92	39178						
26-Feb-92	38266						
27-Feb-92	38608						
28-Feb-92	37316						
29-Feb-92	36632						
1-Mar-92	40698						
2-Mar-92	37582						
3-Mar-92	38874						
4-Mar-92	34846						
5-Mar-92	35302						
6-Mar-92	41078						
7-Mar-92	40774						
8-Mar-92	38228						
9-Mar-92	37050						
10-Mar-92	38418						
11-Mar-92	40964						
12-Mar-92	40812						
13-Mar-92	38608						
14-Mar-92	37810						
15-Mar-92	40774						
16-Mar-92	39406						
17-Mar-92	38950						
18-Mar-92	39140						
19-Mar-92	42180						
20-Mar-92	41420						
21-Mar-92	36252						
22-Mar-92	36138						
23-Mar-92	40052						
24-Mar-92	42940						
25-Mar-92	42940						

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent [1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
26-Mar-92	43320						
27-Mar-92	42940						
28-Mar-92	43700						
29-Mar-92	41990						
30-Mar-92	43320						
31-Mar-92	41344						
1-Apr-92	40470						
2-Apr-92	40204						
3-Apr-92	42256						
4-Apr-92	41420						
5-Apr-92	41648						
6-Apr-92	41192						
7-Apr-92	39444						
8-Apr-92	41268						
9-Apr-92	41154						
10-Apr-92	42674						
11-Apr-92	41268						
12-Apr-92	40774						
13-Apr-92	42864						
14-Apr-92	43586						
15-Apr-92	43700						
16-Apr-92	44308						
17-Apr-92	44004						
18-Apr-92	43510						
19-Apr-92	41306						
20-Apr-92	38912						
21-Apr-92	44536						
22-Apr-92	45296						
23-Apr-92	46968						
24-Apr-92	45448						
25-Apr-92	45600						
26-Apr-92	46056						
27-Apr-92	47044						
28-Apr-92	46550						
29-Apr-92	44650						
30-Apr-92	44612						
1-May-92	42636						
2-May-92	42332						
3-May-92	39406						
4-May-92	30210						
5-May-92	17480						
6-May-92	11590						
9-May-92	10108						
10-May-92	22762						
11-May-92	30286						
12-May-92	34542						
13-May-92	38418						
14-May-92	41230						
15-May-92	42902						
16-May-92	44308						

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent [1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
17-May-92	44764						
18-May-92	46626						
19-May-92	46170						
20-May-92	44042						
21-May-92	45030						
22-May-92	44118						
23-May-92	42028						
24-May-92	43852						
25-May-92	48716						
26-May-92	47576						
27-May-92	43586						
28-May-92	45714						
29-May-92	46968						
30-May-92	45752						
31-May-92	46094						
1-Jun-92	45372						
2-Jun-92	42180						
3-Jun-92	37202						
4-Jun-92	42218						
5-Jun-92	39444						
6-Jun-92	33288						
7-Jun-92	43776						
8-Jun-92	46892						
9-Jun-92	46664						
10-Jun-92	46854						
11-Jun-92	47576						
12-Jun-92	48032						
13-Jun-92	48374						
14-Jun-92	48260						
15-Jun-92	47880						
16-Jun-92	47652						
17-Jun-92	45866						
18-Jun-92	45790						
19-Jun-92	45068						
20-Jun-92	45334						
21-Jun-92	45676						
22-Jun-92	45448						
23-Jun-92	43130						
24-Jun-92	44840						
25-Jun-92	48336						
26-Jun-92	47272						
27-Jun-92	45562						
28-Jun-92	44574						
29-Jun-92	45866						
30-Jun-92	45600						
1-Jul-92	46398						
2-Jul-92	46512						
3-Jul-92	46436						
4-Jul-92	46930						
5-Jul-92	45828						

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent [1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
6-Jul-92	45866						
7-Jul-92	44042						
8-Jul-92	43548						
9-Jul-92	42180						
10-Jul-92	43966						
11-Jul-92	45030						
12-Jul-92	45942						
13-Jul-92	47196						
14-Jul-92	46094						
15-Jul-92	45410						
16-Jul-92	45866						
17-Jul-92	47120						
18-Jul-92	46740						
19-Jul-92	47386						
20-Jul-92	47424						
21-Jul-92	48146						
22-Jul-92	46702						
23-Jul-92	47918						
24-Jul-92	47842						
25-Jul-92	50084						
26-Jul-92	49172						
27-Jul-92	47386						
28-Jul-92	45600						
29-Jul-92	46550						
30-Jul-92	41876						
31-Jul-92	44764						
1-Aug-92	47158						
2-Aug-92	46588						
3-Aug-92	46208						
4-Aug-92	44232						
5-Aug-92	45296						
6-Aug-92	47918						
7-Aug-92	46664						
8-Aug-92	42332						
9-Aug-92	44270						
10-Aug-92	41838						
11-Aug-92	45372						
12-Aug-92	41648						
13-Aug-92	45144						
14-Aug-92	48640						
15-Aug-92	49286						
16-Aug-92	49438						
17-Aug-92	50654						
18-Aug-92	48868						
19-Aug-92	48830						
20-Aug-92	45372						
21-Aug-92	44916						
22-Aug-92	43282						
23-Aug-92	42902						
24-Aug-92	44194						

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent[1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
25-Aug-92	44574						
26-Aug-92	45562						
27-Aug-92	45372						
28-Aug-92	46094						
29-Aug-92	42712						
30-Aug-92	43700						
31-Aug-92	45942						
1-Sep-92	41914						
2-Sep-92	42294						
3-Sep-92	43700						
4-Sep-92	44802						
5-Sep-92	44536						
6-Sep-92	30476						
8-Sep-92	27968						
9-Sep-92	33668						
10-Sep-92	37620						
11-Sep-92	37620						
12-Sep-92	40546						
13-Sep-92	39596						
14-Sep-92	39520						
15-Sep-92	39710						
16-Sep-92	38798						
17-Sep-92	38684						
18-Sep-92	42332						
19-Sep-92	41648						
20-Sep-92	42826						
21-Sep-92	40774						
22-Sep-92	41914						
23-Sep-92	43396						
24-Sep-92	44764						
25-Sep-92	42712						
26-Sep-92	40888						
27-Sep-92	41572						
28-Sep-92	38646						
29-Sep-92	36594						
30-Sep-92	34428						
1-Oct-92	34352						
2-Oct-92	41914						
3-Oct-92	42902						
4-Oct-92	43168						
5-Oct-92	42598						
6-Oct-92	40546						
7-Oct-92	39748						
8-Oct-92	41648						
9-Oct-92	42978						
10-Oct-92	42028						
11-Oct-92	42028						
12-Oct-92	43054						
13-Oct-92	42940						
14-Oct-92	39938						

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent [1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
15-Oct-92	39634						
16-Oct-92	39558						
17-Oct-92	40204						
18-Oct-92	41040						
19-Oct-92	40318						
20-Oct-92	39672						
21-Oct-92	42142						
22-Oct-92	38038						
23-Oct-92	43434						
24-Oct-92	45030						
25-Oct-92	44878						
26-Oct-92	41648						
27-Oct-92	42978						
28-Oct-92	42446						
29-Oct-92	39406						
30-Oct-92	40964						
31-Oct-92	40622						
1-Nov-92	40090						
2-Nov-92	38266						
3-Nov-92	36024						
4-Nov-92	34542						
5-Nov-92	36252						
6-Nov-92	38038						
7-Nov-92	40318						
8-Nov-92	38988						
9-Nov-92	39748						
10-Nov-92	38570						
11-Nov-92	34618						
12-Nov-92	36746						
13-Nov-92	39216						
14-Nov-92	38874						
15-Nov-92	38532						
16-Nov-92	37924						
17-Nov-92	36138						
18-Nov-92	35796						
19-Nov-92	38912						
20-Nov-92	35720						
21-Nov-92	39368						
22-Nov-92	36290						
23-Nov-92	36214						
24-Nov-92	35872						
25-Nov-92	35834						
26-Nov-92	39140						
27-Nov-92	35568						
28-Nov-92	35606						
29-Nov-92	37620						
30-Nov-92	38228						
1-Dec-92	37354						
2-Dec-92	38874						
3-Dec-92	39596						

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent [1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
4-Dec-92	37088						
5-Dec-92	39216						
6-Dec-92	38494						
7-Dec-92	39482						
8-Dec-92	40394						
9-Dec-92	38190						
10-Dec-92	39140						
11-Dec-92	40394						
12-Dec-92	39786						
13-Dec-92	38532						
14-Dec-92	38114						
15-Dec-92	33516						
16-Dec-92	36366						
17-Dec-92	38152						
18-Dec-92	39102						
19-Dec-92	39330						
20-Dec-92	37924						
21-Dec-92	39444						
22-Dec-92	39292						
23-Dec-92	38570						
27-Dec-92	28044						
28-Dec-92	33060						
29-Dec-92	34542						
30-Dec-92	34504						
31-Dec-92	35454						
1-Jan-93	36366						
2-Jan-93	37810						
3-Jan-93	37734						
4-Jan-93	36518						
5-Jan-93	34618						
6-Jan-93	38570						
7-Jan-93	39444						
8-Jan-93	40470						
9-Jan-93	37962						
10-Jan-93	38190						
11-Jan-93	38456						
12-Jan-93	38646						
13-Jan-93	38646						
14-Jan-93	35872						
15-Jan-93	35036						
16-Jan-93	38608						
17-Jan-93	37544						
18-Jan-93	36708						
19-Jan-93	33250						
20-Jan-93	31578						
21-Jan-93	34656						
22-Jan-93	39634						
23-Jan-93	39026						
24-Jan-93	38950						
25-Jan-93	38000						

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent [1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
26-Jan-93	37810						
27-Jan-93	38608						
28-Jan-93	35606						
29-Jan-93	39216						
30-Jan-93	38950						
31-Jan-93	38874						
1-Feb-93	38912						
2-Feb-93	38988						
3-Feb-93	36556						
4-Feb-93	38532						
5-Feb-93	39634						
6-Feb-93	38950						
7-Feb-93	40090						
8-Feb-93	39596						
9-Feb-93	39102						
10-Feb-93	38456						
11-Feb-93	40394						
12-Feb-93	39634						
13-Feb-93	39140						
14-Feb-93	38418						
15-Feb-93	37886						
16-Feb-93	37506						
17-Feb-93	37734						
18-Feb-93	36974						
19-Feb-93	37316						
20-Feb-93	37772						
21-Feb-93	37582						
22-Feb-93	37240						
23-Feb-93	36936						
24-Feb-93	36138						
25-Feb-93	36024						
26-Feb-93	37582						
27-Feb-93	35188						
28-Feb-93	37202						
1-Mar-93	38874						
2-Mar-93	38380						
3-Mar-93	34694						
4-Mar-93	33820						
5-Mar-93	34618						
6-Mar-93	37506						
7-Mar-93	37886						
8-Mar-93	39026						
9-Mar-93	39330						
10-Mar-93	38228						
11-Mar-93	38456						
12-Mar-93	38684						
13-Mar-93	38380						
14-Mar-93	39064						
15-Mar-93	39558						
16-Mar-93	38456						

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent [1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
17-Mar-93	38760						
18-Mar-93	40622						
19-Mar-93	39938						
20-Mar-93	40546						
21-Mar-93	40166						
22-Mar-93	40090						
23-Mar-93	39482						
24-Mar-93	40280						
25-Mar-93	39900						
26-Mar-93	39900						
27-Mar-93	40204						
28-Mar-93	39596						
29-Mar-93	40166						
30-Mar-93	37886						
31-Mar-93	40014						
1-Apr-93	40166						
2-Apr-93	40546						
3-Apr-93	40546						
4-Apr-93	41344						
5-Apr-93	42142						
6-Apr-93	42522						
7-Apr-93	40622						
8-Apr-93	41686						
9-Apr-93	44042						
10-Apr-93	40014						
11-Apr-93	41382						
12-Apr-93	44992						
13-Apr-93	43472						
14-Apr-93	42826						
15-Apr-93	42522						
16-Apr-93	39938						
17-Apr-93	31920						
18-Apr-93	29640						
19-Apr-93	8284						
20-Apr-93	6232						
21-Apr-93	7030						
23-Apr-93	12160						
24-Apr-93	23636						
25-Apr-93	27094						
26-Apr-93	34352						
27-Apr-93	40394						
28-Apr-93	42446						
29-Apr-93	39824						
30-Apr-93	35682						
1-May-93	37848						
2-May-93	40318						
3-May-93	42522						
4-May-93	43776						
5-May-93	44954						
6-May-93	44802						

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent [1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
7-May-93	44536						
8-May-93	42788						
9-May-93	41876						
10-May-93	46056						
11-May-93	45676						
12-May-93	44916						
13-May-93	46702						
14-May-93	45334						
15-May-93	42636						
16-May-93	43662						
17-May-93	43434						
18-May-93	43510						
19-May-93	42864						
20-May-93	42066						
21-May-93	42826						
22-May-93	41724						
23-May-93	42522						
24-May-93	41724						
25-May-93	19722						
26-May-93	35454						
27-May-93	41990						
28-May-93	43852						
29-May-93	43320						
30-May-93	43358						
31-May-93	43434						
1-Jun-93	42218						
2-Jun-93	39064						
3-Jun-93	40242						
4-Jun-93	43016						
5-Jun-93	44878						
6-Jun-93	44118						
7-Jun-93	45106						
8-Jun-93	41572						
9-Jun-93	40508						
10-Jun-93	41724						
11-Jun-93	42598						
12-Jun-93	41648						
13-Jun-93	40204						
14-Jun-93	43662						
15-Jun-93	43168						
16-Jun-93	42180						
17-Jun-93	43434						
18-Jun-93	42370						
19-Jun-93	46474						
20-Jun-93	45676						
21-Jun-93	37582						
22-Jun-93	35378						
23-Jun-93	39786						
24-Jun-93	42294						
25-Jun-93	43814						

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent [1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
26-Jun-93	41990						
27-Jun-93	41306						
28-Jun-93	44498						
29-Jun-93	46816						
30-Jun-93	47082						
1-Jul-93	47690						
2-Jul-93	47766						
3-Jul-93	46702						
4-Jul-93	47196						
5-Jul-93	47918						
6-Jul-93	47956						
7-Jul-93	45638						
8-Jul-93	45866						
9-Jul-93	48108						
10-Jul-93	48298						
11-Jul-93	47614						
12-Jul-93	43244						
13-Jul-93	46208						
14-Jul-93	45144						
15-Jul-93	46018						
16-Jul-93	47006						
17-Jul-93	47310						
18-Jul-93	47880						
19-Jul-93	43168						
20-Jul-93	41800						
21-Jul-93	44764						
22-Jul-93	45182						
23-Jul-93	46018						
24-Jul-93	46854						
25-Jul-93	46512						
26-Jul-93	45638						
27-Jul-93	44422						
28-Jul-93	45448						
29-Jul-93	44498						
30-Jul-93	42902						
31-Jul-93	42256						
1-Aug-93	43092						
2-Aug-93	44726						
3-Aug-93	44954						
4-Aug-93	47614						
5-Aug-93	44498						
6-Aug-93	43130						
7-Aug-93	44574						
8-Aug-93	42864						
9-Aug-93	44270						
10-Aug-93	42826						
11-Aug-93	43510						
12-Aug-93	44384						
13-Aug-93	44346						
14-Aug-93	43320						

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent [1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
15-Aug-93	43776						
16-Aug-93	46056						
17-Aug-93	46892						
18-Aug-93	45220						
19-Aug-93	44802						
20-Aug-93	47880						
21-Aug-93	46816						
22-Aug-93	47196						
23-Aug-93	45562						
24-Aug-93	44840						
25-Aug-93	42484						
26-Aug-93	41914						
27-Aug-93	44042						
28-Aug-93	44308						
29-Aug-93	44764						
30-Aug-93	46132						
31-Aug-93	44992						
1-Sep-93	45106						
2-Sep-93	44878						
3-Sep-93	49324						
4-Sep-93	43624						
5-Sep-93	42484						
6-Sep-93	25270						
7-Sep-93	35492						
8-Sep-93	44156						
9-Sep-93	48678						
10-Sep-93	47500						
11-Sep-93	47842						
12-Sep-93	46740						
13-Sep-93	46094						
14-Sep-93	44840						
15-Sep-93	44460						
16-Sep-93	43358						
17-Sep-93	42560						
18-Sep-93	43282						
19-Sep-93	43548						
20-Sep-93	44878						
21-Sep-93	43814						
22-Sep-93	41762						
23-Sep-93	43662						
24-Sep-93	44878						
25-Sep-93	41724						
26-Sep-93	39520						
27-Sep-93	38342						
28-Sep-93	39596						
29-Sep-93	43282						
30-Sep-93	39140						
1-Oct-93	46170						
2-Oct-93	43244						
3-Oct-93	45030						

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent [1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
4-Oct-93	46778						
5-Oct-93	44422						
6-Oct-93	40698						
7-Oct-93	40698						
8-Oct-93	44840						
9-Oct-93	40774						
10-Oct-93	39444						
11-Oct-93	39254						
12-Oct-93	40242						
13-Oct-93	39596						
14-Oct-93	39292						
15-Oct-93	40622						
16-Oct-93	41306						
17-Oct-93	40166						
18-Oct-93	39976						
19-Oct-93	40128						
20-Oct-93	40166						
21-Oct-93	42788						
22-Oct-93	40508						
23-Oct-93	39976						
24-Oct-93	40242						
25-Oct-93	41838						
26-Oct-93	27550						
27-Oct-93	9234						
28-Oct-93	11248						
29-Oct-93	27626						
30-Oct-93	37278						
31-Oct-93	37772						
1-Nov-93	36860						
2-Nov-93	35682						
3-Nov-93	40356						
4-Nov-93	40318						
5-Nov-93	40014						
6-Nov-93	38190						
7-Nov-93	37012						
8-Nov-93	40090						
9-Nov-93	42218						
10-Nov-93	40242						
11-Nov-93	41610						
12-Nov-93	42294						
13-Nov-93	41420						
14-Nov-93	39520						
15-Nov-93	40964						
16-Nov-93	38722						
17-Nov-93	35112						
18-Nov-93	38684						
19-Nov-93	39558						
20-Nov-93	38874						
21-Nov-93	38912						
22-Nov-93	37772						

Table A7. Mill Sodium Loads to the Athabasca River. Source: Northdat (NRBS 1995)

Hinton Combined Effluent [1]		Alberta Newsprint Effluent		Millar Western Effluent		Slave Lake Pulp Effluent	
DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)	DATE	Load (kg/day)
23-Nov-93	34998						
24-Nov-93	34846						
25-Nov-93	36442						
26-Nov-93	37886						
27-Nov-93	38836						
28-Nov-93	40698						
29-Nov-93	40090						
30-Nov-93	39368						
1-Dec-93	38874						
2-Dec-93	39900						
3-Dec-93	39672						
4-Dec-93	39862						
5-Dec-93	38380						
6-Dec-93	37924						
7-Dec-93	38722						
8-Dec-93	39178						
9-Dec-93	40812						
10-Dec-93	41496						
11-Dec-93	41192						
12-Dec-93	40926						
13-Dec-93	40508						
14-Dec-93	39178						
15-Dec-93	39482						
16-Dec-93	38950						
17-Dec-93	39938						
18-Dec-93	40204						
19-Dec-93	41078						
20-Dec-93	40774						
21-Dec-93	39330						
22-Dec-93	34504						
23-Dec-93	35568						
24-Dec-93	27968						
25-Dec-93	23484						
26-Dec-93	21926						
27-Dec-93	27018						
28-Dec-93	38190						
29-Dec-93	39368						
30-Dec-93	39406						
31-Dec-93	39558						

[1] Hinton Na load generated using a mean Na of 380 mg/L (Source: Alberta Environmental Protection, Jan 20, 1992) and daily flow data

Table A8. Upstream boundary flows used in the Athabasca River modelling
Source: Water Survey of Canada

DATE	Athabasca River At Hinton	Lesser Slave River near the mouth
01/01/91	40.1	20.9
01/02/91	41.4	21
01/03/91	39.5	20.9
01/04/91	38.7	20.7
01/05/91	39.4	20.6
01/06/91	39.7	20.3
01/07/91	39.3	20
01/08/91	38.8	20.3
01/09/91	38.4	19.4
01/10/91	39.4	19.5
01/11/91	42	19.6
01/12/91	43.5	19.3
01/13/91	45.4	19.4
01/14/91	42.6	19.6
01/15/91	40.1	19.4
01/16/91	42.9	19.5
01/17/91	56.4	19.4
01/18/91	48	20.8
01/19/91	43.4	19.5
01/20/91	42.4	21.5
01/21/91	41.3	20.2
01/22/91	40.5	19.8
01/23/91	39.9	18.9
01/24/91	40.3	19.3
01/25/91	41	19.6
01/26/91	41	19.6
01/27/91	41.6	19.3
01/28/91	40.9	17.2
01/29/91	39.7	18.5
01/30/91	40.5	18.1
01/31/91	41.5	17.4
02/01/91	44.1	17.8
02/02/91	51	18
02/03/91	52.8	18.6
02/04/91	53	17.5
02/05/91	56.2	18.6
02/06/91	51.7	17.6
02/07/91	54.9	18.5
02/08/91	50.4	17.9
02/09/91	49.2	17.2
02/10/91	47.7	17.7
02/11/91	46	17.7
02/12/91	45.2	18.2
02/13/91	43.7	17.8
02/14/91	43.5	16.1
02/15/91	48.9	17.4
02/16/91	49	17.2
02/17/91	46.3	17.6
02/18/91	43.3	17.2
02/19/91	40.6	17.5
02/20/91	42.4	17.9
02/21/91	41.1	17.7
02/22/91	39.3	17.7
02/23/91	34.8	18.7

Table A8. Upstream boundary flows used in the Athabasca River modelling
Source: Water Survey of Canada

DATE	Athabasca River At Hinton	Lesser Slave River near the mouth
02/24/91	38	18.3
02/25/91	35.5	18.3
02/26/91	40.3	18.2
02/27/91	43.2	18.1
02/28/91	34.3	18
03/01/91	29.9	16.9
03/02/91	27	15.4
03/03/91	24.5	15.1
03/04/91	26.4	15.3
03/05/91	30.7	15.4
03/06/91	33.1	15.2
03/07/91	35.8	15.7
03/08/91	38.3	15.8
03/09/91	38.9	15.7
03/10/91	39.4	16
03/11/91	37.5	15.3
03/12/91	36.9	15.6
03/13/91	35.5	16.4
03/14/91	36	16.9
03/15/91	37	17.4
03/16/91	37.6	17.3
03/17/91	37.3	17.3
03/18/91	38.2	17.2
03/19/91	41.7	17
03/20/91	41.6	16.9
03/21/91	43.9	16.8
03/22/91	44.4	16.8
03/23/91	42.1	17.2
03/24/91	38.3	17.5
03/25/91	36.4	16.9
03/26/91	31.1	16.7
03/27/91	32.2	17.1
03/28/91	37.2	16.7
03/29/91	39.1	17.6
03/30/91	39.1	17.1
03/31/91	49	16.8
04/01/91	45.4	16.8
04/02/91	44.5	16.6
04/03/91	48.4	16.5
04/04/91	46	16.9
04/05/91	45.3	16.7
04/06/91	46.1	17.1
04/07/91	44.7	16.8
04/08/91	41.9	16.8
04/09/91	41.3	16.8
04/10/91	41.3	17.1
04/11/91	41.8	17
04/12/91	42	17
04/13/91	42.6	17.4
04/14/91	45.1	17.7
04/15/91	48.1	18
04/16/91	48.3	18
04/17/91	47.2	17.9
04/18/91	49.1	18.1

Table A8. Upstream boundary flows used in the Athabasca River modelling
Source: Water Survey of Canada

DATE	Athabasca River At Hinton	Lesser Slave River near the mouth
04/19/91	54.1	18.7
04/20/91	60.1	19.4
04/21/91	67.2	19.2
04/22/91	74	20
04/23/91	83.6	20.4
04/24/91	92.8	20
04/25/91	102	20.6
04/26/91	107	21
04/27/91	99.1	21.3
04/28/91	90.9	21.3
04/29/91	88.7	21.6
04/30/91	88.9	21.9
05/01/91	85.3	22
05/02/91	80.4	21.6
05/03/91	78.5	22
05/04/91	81.4	22.1
05/05/91	86.4	21.6
05/06/91	88.5	21.7
05/07/91	88.6	21.3
05/08/91	92.9	21.5
05/09/91	120	23.7
05/10/91	153	26.2
05/11/91	174	25.1
05/12/91	220	24.9
05/13/91	281	31.2
05/14/91	306	36.5
05/15/91	287	35.2
05/16/91	265	35.2
05/17/91	263	35.8
05/18/91	302	36.7
05/19/91	349	39.1
05/20/91	435	40.3
05/21/91	610	42.4
05/22/91	739	43.7
05/23/91	677	42.5
05/24/91	531	39.5
05/25/91	447	40.3
05/26/91	379	40.5
05/27/91	346	41.5
05/28/91	344	40.5
05/29/91	350	40
05/30/91	385	41.4
05/31/91	436	42.2
06/01/91	478	46.1
06/02/91	512	38.4
06/03/91	517	41.8
06/04/91	481	43.2
06/05/91	423	41.8
06/06/91	381	39.7
06/07/91	397	38.8
06/08/91	461	49.6
06/09/91	525	41.9
06/10/91	552	39.9
06/11/91	602	41.3

Table A8. Upstream boundary flows used in the Athabasca River modelling
Source: Water Survey of Canada

DATE	Athabasca River At Hinton	Lesser Slave River near the mouth
06/12/91	755	55.7
06/13/91	753	53.4
06/14/91	599	46.3
06/15/91	484	47.9
06/16/91	429	45.5
06/17/91	412	47.2
06/18/91	433	47.3
06/19/91	484	47.9
06/20/91	521	47.2
06/21/91	541	46.6
06/22/91	544	48.7
06/23/91	539	49
06/24/91	557	49.7
06/25/91	596	49.5
06/26/91	626	50.7
06/27/91	635	50.2
06/28/91	675	48.3
06/29/91	759	46.9
06/30/91	802	49.6
07/01/91	816	52.4
07/02/91	786	50.2
07/03/91	781	51.5
07/04/91	853	54.1
07/05/91	878	51.5
07/06/91	851	50.6
07/07/91	825	49.8
07/08/91	730	49.8
07/09/91	690	51.8
07/10/91	697	49
07/11/91	717	47.6
07/12/91	725	48.7
07/13/91	744	49
07/14/91	814	55.4
07/15/91	869	50.6
07/16/91	753	48.3
07/17/91	649	52
07/18/91	606	52.8
07/19/91	576	49.2
07/20/91	532	46.7
07/21/91	503	47.9
07/22/91	499	46.2
07/23/91	487	44.8
07/24/91	488	42.7
07/25/91	525	40.7
07/26/91	578	45.2
07/27/91	616	43.9
07/28/91	621	43.5
07/29/91	593	43.9
07/30/91	540	45.7
07/31/91	484	41.8
08/01/91	436	41.3
08/02/91	407	39.7
08/03/91	399	39.3
08/04/91	409	39.3

Table A8. Upstream boundary flows used in the Athabasca River modelling
Source: Water Survey of Canada

DATE	Athabasca River At Hinton	Lesser Slave River near the mouth
08/05/91	433	39.3
08/06/91	461	39.6
08/07/91	484	37.1
08/08/91	504	38.8
08/09/91	516	40.2
08/10/91	555	43.5
08/11/91	701	41.1
08/12/91	769	40.2
08/13/91	814	41
08/14/91	973	40.7
08/15/91	975	40
08/16/91	832	39.8
08/17/91	731	38.7
08/18/91	670	39.7
08/19/91	630	40.2
08/20/91	605	42.2
08/21/91	574	38.4
08/22/91	532	36.8
08/23/91	494	35.5
08/24/91	463	38.1
08/25/91	445	36.4
08/26/91	395	35
08/27/91	349	30.1
08/28/91	331	35.2
08/29/91	331	32.2
08/30/91	321	30.6
08/31/91	334	32.6
09/01/91	406	39.3
09/02/91	498	36.7
09/03/91	444	34.1
09/04/91	366	31.1
09/05/91	325	31.7
09/06/91	311	27.9
09/07/91	314	32.3
09/08/91	328	33.1
09/09/91	330	29.5
09/10/91	306	32
09/11/91	282	31.9
09/12/91	269	29.7
09/13/91	260	34.7
09/14/91	269	34.7
09/15/91	258	31.1
09/16/91	237	33
09/17/91	236	28.1
09/18/91	235	23.6
09/19/91	224	28.5
09/20/91	216	31.9
09/21/91	228	29.9
09/22/91	221	27.5
09/23/91	204	28.5
09/24/91	187	33.3
09/25/91	180	27.6
09/26/91	182	26.8
09/27/91	183	23

Table A8. Upstream boundary flows used in the Athabasca River modelling
Source: Water Survey of Canada

DATE	Athabasca River At Hinton	Lesser Slave River near the mouth
09/28/91	180	29.2
09/29/91	184	30.6
09/30/91	189	28.2
10/01/91	178	30.2
10/02/91	172	26.2
10/03/91	165	27.1
10/04/91	159	22.8
10/05/91	153	22.4
10/06/91	148	23.5
10/07/91	141	30.3
10/08/91	140	28.3
10/09/91	138	23.3
10/10/91	129	25.4
10/11/91	125	22.7
10/12/91	123	33.6
10/13/91	122	24.3
10/14/91	122	22.2
10/15/91	112	24.3
10/16/91	119	23.3
10/17/91	160	24.8
10/18/91	150	20.9
10/19/91	144	22.1
10/20/91	135	23.7
10/21/91	130	19.8
10/22/91	140	21.6
10/23/91	120	20.1
10/24/91	104	20.9
10/25/91	104	20.3
10/26/91	82.6	17.4
10/27/91	74.6	10.1
10/28/91	63.2	13.1
10/29/91	64	14.9
10/30/91	66	13.1
10/31/91	69	16.9
11/01/91	78.6	17.2
11/02/91	79.6	14.8
11/03/91	78.4	15.5
11/04/91	74.8	16.9
11/05/91	69.5	16.6
11/06/91	72.5	15.8
11/07/91	61.1	16.2
11/08/91	82	18
11/09/91	81.5	14.6
11/10/91	90.1	16.4
11/11/91	76.8	15.5
11/12/91	76.4	18.9
11/13/91	71.4	18.1
11/14/91	60.6	18.3
11/15/91	51.6	16.7
11/16/91	65.4	17.7
11/17/91	62.2	18.3
11/18/91	62.8	19
11/19/91	60.9	17.4
11/20/91	56.5	17.7

Table A8. Upstream boundary flows used in the Athabasca River modelling
Source: Water Survey of Canada

DATE	Athabasca River At Hinton	Lesser Slave River near the mouth
11/21/91	60.3	18
11/22/91	61.2	18.1
11/23/91	58.1	16.8
11/24/91	52.7	17
11/25/91	60.2	18
11/26/91	42.5	18.1
11/27/91	47	17.8
11/28/91	47.7	18.3
11/29/91	47.7	16.9
11/30/91	45.8	17.3
12/01/91	39.5	15.3
12/02/91	42.3	17.3
12/03/91	45.9	16.9
12/04/91	49.3	16.9
12/05/91	47	16.6
12/06/91	46	17.6
12/07/91	45	17.6
12/08/91	44	17.7
12/09/91	43	17.7
12/10/91	43	18.3
12/11/91	42.5	18.9
12/12/91	42.3	18.2
12/13/91	41	17.9
12/14/91	40.1	18
12/15/91	39.3	18.8
12/16/91	38.7	18.9
12/17/91	45.3	17.9
12/18/91	38.6	18
12/19/91	43.9	18.9
12/20/91	49.8	17.6
12/21/91	34.7	19.2
12/22/91	43.7	18.3
12/23/91	45.6	18.7
12/24/91	42.1	18.2
12/25/91	37.8	18
12/26/91	35.8	17.7
12/27/91	37.9	17.7
12/28/91	37.6	17.7
12/29/91	41.4	17.9
12/30/91	43.7	18
12/31/91	43.1	17.5
01/01/92	41.5	17.5
01/02/92	43.1	17.6
01/03/92	43.1	17.9
01/04/92	42.3	17.6
01/05/92	37.9	17.3
01/06/92	40.6	17.3
01/07/92	36.1	17.6
01/08/92	29.2	17.4
01/09/92	39.8	17.2
01/10/92	42	17.7
01/11/92	44	18
01/12/92	44	17.8
01/13/92	43.3	17.3

Table A8. Upstream boundary flows used in the Athabasca River modelling
Source: Water Survey of Canada

DATE	Athabasca River At Hinton	Lesser Slave River near the mouth
01/14/92	41.1	16.5
01/15/92	40.5	16.8
01/16/92	39.8	17.1
01/17/92	42.2	16.4
01/18/92	41	16.6
01/19/92	40.5	16.9
01/20/92	40.7	16.9
01/21/92	41	17.2
01/22/92	39.9	17.5
01/23/92	38.5	16.5
01/24/92	37	17.2
01/25/92	36.5	16
01/26/92	37	16.1
01/27/92	37.5	16.9
01/28/92	39.2	16.8
01/29/92	42.8	16.7
01/30/92	47.2	16.4
01/31/92	48	16.6
02/01/92	47.2	16.9
02/02/92	49.2	16.8
02/03/92	52.3	16.1
02/04/92	51.6	16.9
02/05/92	43.3	17
02/06/92	41	16.6
02/07/92	34.4	15.9
02/08/92	31.9	16.7
02/09/92	29.8	15.9
02/10/92	28	15.1
02/11/92	27	15.1
02/12/92	29	15.9
02/13/92	36.4	15.8
02/14/92	41.3	15.8
02/15/92	40.8	15.9
02/16/92	38.9	15.4
02/17/92	37.8	15.9
02/18/92	36	15.9
02/19/92	30.1	16.3
02/20/92	21.9	15.7
02/21/92	23.5	15.6
02/22/92	25.1	15.9
02/23/92	27.6	16.1
02/24/92	34	16.3
02/25/92	40.3	17.1
02/26/92	54.9	18.1
02/27/92	53.1	18.2
02/28/92	42.1	17.9
02/29/92	41.5	18.1
03/01/92	40	18.2
03/02/92	40.5	17.5
03/03/92	41.5	17.9
03/04/92	43.2	17.7
03/05/92	41.7	18.2
03/06/92	41.1	17.5
03/07/92	42.2	18.6

Table A8. Upstream boundary flows used in the Athabasca River modelling
Source: Water Survey of Canada

DATE	Athabasca River At Hinton	Lesser Slave River near the mouth
03/08/92	41.2	18.1
03/09/92	39.6	18
03/10/92	39.2	18.7
03/11/92	40.2	18.6
03/12/92	39.3	19.1
03/13/92	41.4	18.4
03/14/92	43.6	18.2
03/15/92	44.2	18.8
03/16/92	44.2	18.5
03/17/92	45.7	18.2
03/18/92	44.7	18.7
03/19/92	44.4	18.9
03/20/92	43.8	18.7
03/21/92	41.4	19.2
03/22/92	40.6	19.4
03/23/92	39.2	20.6
03/24/92	39.5	19.8
03/25/92	40.3	20
03/26/92	38.5	20.2
03/27/92	39.2	21
03/28/92	41.2	21.5
03/29/92	38.4	20.3
03/30/92	37.4	19.6
03/31/92	38.8	19.7
04/01/92	40	20.1
04/02/92	40.3	20.4
04/03/92	44.6	20.9
04/04/92	51.1	20.8
04/05/92	54.3	21
04/06/92	53	20.9
04/07/92	50.1	21.5
04/08/92	47.2	21.1
04/09/92	47	21.7
04/10/92	44.4	21
04/11/92	43.3	20.6
04/12/92	43.7	20.6
04/13/92	44.1	21.7
04/14/92	44.4	22
04/15/92	44.5	21.4
04/16/92	45.2	21.5
04/17/92	47.4	22.9
04/18/92	50.3	24.2
04/19/92	53.8	22.8
04/20/92	54	23
04/21/92	54.2	24.7
04/22/92	57.4	24.6
04/23/92	60	25
04/24/92	61.4	23.8
04/25/92	60.1	24
04/26/92	59.5	23.6
04/27/92	63.8	27.2
04/28/92	75.6	27.5
04/29/92	97.7	26.7
04/30/92	124	28.7

Table A8. Upstream boundary flows used in the Athabasca River modelling
Source: Water Survey of Canada

DATE	Athabasca River At Hinton	Lesser Slave River near the mouth
05/01/92	165	35.3
05/02/92	174	29.8
05/03/92	153	28.5
05/04/92	140	28.2
05/05/92	140	29.1
05/06/92	175	29.7
05/07/92	260	27.4
05/08/92	319	29
05/09/92	348	29.1
05/10/92	312	28.6
05/11/92	267	31.1
05/12/92	229	29.6
05/13/92	198	32.1
05/14/92	177	32
05/15/92	170	29.4
05/16/92	163	30
05/17/92	153	31.3
05/18/92	151	30.6
05/19/92	171	30.8
05/20/92	189	27.9
05/21/92	188	29.2
05/22/92	175	29.4
05/23/92	161	28.4
05/24/92	156	27.9
05/25/92	171	26.5
05/26/92	212	28.7
05/27/92	368	31.6
05/28/92	443	30.8
05/29/92	408	29.4
05/30/92	390	30.2
05/31/92	386	29.1
06/01/92	396	30.2
06/02/92	486	37.5
06/03/92	590	35.8
06/04/92	513	32.1
06/05/92	428	30.7
06/06/92	382	30.7
06/07/92	372	31.6
06/08/92	397	33.8
06/09/92	441	32.9
06/10/92	507	35.8
06/11/92	551	33
06/12/92	533	33.7
06/13/92	599	34.1
06/14/92	652	33.8
06/15/92	614	32.4
06/16/92	574	34.4
06/17/92	592	38.7
06/18/92	597	33.9
06/19/92	558	32.4
06/20/92	523	37.4
06/21/92	536	38.1
06/22/92	560	36.9
06/23/92	580	37.4

Table A8. Upstream boundary flows used in the Athabasca River modelling
Source: Water Survey of Canada

DATE	Athabasca River At Hinton	Lesser Slave River near the mouth
06/24/92	608	36.4
06/25/92	609	33.6
06/26/92	568	34
06/27/92	554	36.2
06/28/92	573	32.9
06/29/92	571	33.1
06/30/92	541	32.5
07/01/92	477	32.7
07/02/92	419	31.9
07/03/92	383	32.5
07/04/92	360	31.9
07/05/92	350	31.8
07/06/92	353	33.3
07/07/92	373	33.1
07/08/92	404	33.6
07/09/92	470	34
07/10/92	496	33.6
07/11/92	451	34
07/12/92	406	33.2
07/13/92	377	36.2
07/14/92	377	37.9
07/15/92	386	36.8
07/16/92	348	32.7
07/17/92	322	33.1
07/18/92	325	34.6
07/19/92	345	33.2
07/20/92	343	31.6
07/21/92	334	29.9
07/22/92	342	32.3
07/23/92	376	32
07/24/92	378	32.5
07/25/92	360	31.1
07/26/92	353	32.5
07/27/92	354	32.5
07/28/92	340	31
07/29/92	321	30.6
07/30/92	306	30.7
07/31/92	306	30.4
08/01/92	327	29.7
08/02/92	358	27.1
08/03/92	372	27.1
08/04/92	361	28.9
08/05/92	356	27.6
08/06/92	378	26.6
08/07/92	364	30.1
08/08/92	359	31.4
08/09/92	321	32.7
08/10/92	275	27.2
08/11/92	246	25.4
08/12/92	241	25.7
08/13/92	254	25.1
08/14/92	274	26.1
08/15/92	315	27.8
08/16/92	333	26.7

Table A8. Upstream boundary flows used in the Athabasca River modelling
Source: Water Survey of Canada

DATE	Athabasca River At Hinton	Lesser Slave River near the mouth
08/17/92	321	24
08/18/92	304	25.2
08/19/92	311	28.4
08/20/92	316	24.2
08/21/92	278	23.3
08/22/92	245	23.5
08/23/92	206	22.3
08/24/92	177	21
08/25/92	162	20.6
08/26/92	153	23.1
08/27/92	158	30.8
08/28/92	195	29.2
08/29/92	200	22.1
08/30/92	169	20
08/31/92	153	21.4
09/01/92	150	24
09/02/92	164	23.1
09/03/92	181	22.9
09/04/92	163	19.6
09/05/92	176	22.3
09/06/92	196	23.4
09/07/92	191	21.5
09/08/92	152	31.3
09/09/92	152	24.4
09/10/92	143	24.5
09/11/92	142	24.2
09/12/92	171	25.9
09/13/92	193	31.6
09/14/92	186	31.2
09/15/92	170	22.8
09/16/92	159	21.7
09/17/92	140	23.8
09/18/92	139	21.6
09/19/92	131	25
09/20/92	128	28.4
09/21/92	152	21.3
09/22/92	181	21.6
09/23/92	176	22.2
09/24/92	186	26.4
09/25/92	219	29.5
09/26/92	224	24.4
09/27/92	202	23.6
09/28/92	181	21.4
09/29/92	165	22.3
09/30/92	151	23.7
10/01/92	149	23.9
10/02/92	155	23.2
10/03/92	163	24.7
10/04/92	181	28.6
10/05/92	219	25.9
10/06/92	197	24.4
10/07/92	174	23.2
10/08/92	154	26.6
10/09/92	145	27.1

Table A8. Upstream boundary flows used in the Athabasca River modelling
Source: Water Survey of Canada

DATE	Athabasca River At Hinton	Lesser Slave River near the mouth
10/10/92	135	25.9
10/11/92	122	27.2
10/12/92	127	22
10/13/92	126	22.6
10/14/92	117	22
10/15/92	97.8	22.4
10/16/92	80	21
10/17/92	75.2	20
10/18/92	80.2	13.7
10/19/92	84.9	19.3
10/20/92	85.6	15.3
10/21/92	78	20.7
10/22/92	91.3	19.2
10/23/92	91.7	19.2
10/24/92	94.1	24.3
10/25/92	216	22
10/26/92	235	22.2
10/27/92	186	21.2
10/28/92	148	15.8
10/29/92	123	13.8
10/30/92	121	16.7
10/31/92	113	18
11/01/92	102	19.5
11/02/92	95.1	22.5
11/03/92	89.6	19.9
11/04/92	84	15.7
11/05/92	78.9	20.2
11/06/92	76.2	20.2
11/07/92	79.3	19.6
11/08/92	78.3	21.5
11/09/92	76.9	20.5
11/10/92	66.7	23
11/11/92	56.5	28
11/12/92	54.8	17.8
11/13/92	60.7	9.5
11/14/92	77	11.7
11/15/92	72.7	15.9
11/16/92	60.5	17.7
11/17/92	56.6	16.5
11/18/92	53.6	15.8
11/19/92	55.8	15.6
11/20/92	58.2	17.8
11/21/92	54.6	17.2
11/22/92	47.2	17.7
11/23/92	44.2	15.5
11/24/92	35.1	16.4
11/25/92	32.3	16.6
11/26/92	29.7	16.3
11/27/92	36.1	16.8
11/28/92	48.7	16.9
11/29/92	56.2	16.3
11/30/92	54.2	17.9
12/01/92	53.2	18.3
12/02/92	48	17.9

Table A8. Upstream boundary flows used in the Athabasca River modelling
Source: Water Survey of Canada

DATE	Athabasca River At Hinton	Lesser Slave River near the mouth
12/03/92	38.2	16.4
12/04/92	34	16.6
12/05/92	32	17.1
12/06/92	32.3	16.2
12/07/92	34	16.1
12/08/92	38.1	16.5
12/09/92	49.7	16.4
12/10/92	44.9	16.4
12/11/92	41.7	16.6
12/12/92	41.7	16.2
12/13/92	37	15.1
12/14/92	31	16.9
12/15/92	44.7	16.6
12/16/92	52	16.3
12/17/92	45.2	16.6
12/18/92	39.3	15.3
12/19/92	30.9	15.4
12/20/92	30.7	15
12/21/92	34.6	15.4
12/22/92	31.8	15.4
12/23/92	33.1	14.5
12/24/92	34.9	15
12/25/92	30.2	15
12/26/92	28.6	15.4
12/27/92	30.3	15.2
12/28/92	24	15.1
12/29/92	23	15.3
12/30/92	24	15
12/31/92	28.1	14.7
01/01/93	29	15
01/02/93	28.7	15.5
01/03/93	31.1	16
01/04/93	31.9	16.2
01/05/93	35.1	16.8
01/06/93	35.1	16.7
01/07/93	37.1	16
01/08/93	34.1	15.5
01/09/93	38.6	14.8
01/10/93	40.1	15
01/11/93	39	13.4
01/12/93	36.1	15.8
01/13/93	39.9	16.1
01/14/93	38.1	15
01/15/93	40.7	15.2
01/16/93	39.3	15.1
01/17/93	40.1	14.8
01/18/93	41.7	14.5
01/19/93	42.2	13.8
01/20/93	42.6	14
01/21/93	43.5	14.3
01/22/93	44.7	14.1
01/23/93	45.6	14
01/24/93	46.4	13.5
01/25/93	47	15

Table A8. Upstream boundary flows used in the Athabasca River modelling
Source: Water Survey of Canada

DATE	Athabasca River At Hinton	Lesser Slave River near the mouth
01/26/93	48	15.1
01/27/93	48.1	15.3
01/28/93	48.1	15.1
01/29/93	47.6	14.9
01/30/93	49.7	14.7
01/31/93	54.6	14.9
02/01/93	48.2	14.5
02/02/93	40.2	14.3
02/03/93	45.3	14
02/04/93	36.6	13.7
02/05/93	36.6	13
02/06/93	45.2	13.7
02/07/93	41.3	13.9
02/08/93	35.9	14.8
02/09/93	33.5	13.6
02/10/93	28.4	13
02/11/93	27.7	13.2
02/12/93	26.6	13.5
02/13/93	25.6	13.6
02/14/93	25.7	13.7
02/15/93	24.1	13.6
02/16/93	23.6	12.9
02/17/93	22.9	12.9
02/18/93	24.7	13.3
02/19/93	27.3	13
02/20/93	27.3	12.8
02/21/93	25.5	12.6
02/22/93	27.6	12.7
02/23/93	29.2	12.8
02/24/93	27.1	12.8
02/25/93	27.9	12.9
02/26/93	28.3	13.5
02/27/93	27.3	13.7
02/28/93	30.3	13.8
03/01/93	33.7	13.2
03/02/93	32.7	13.7
03/03/93	31	13.2
03/04/93	31.9	12
03/05/93	32	13.4
03/06/93	37.9	13.9
03/07/93	42.3	13.8
03/08/93	35.1	13.5
03/09/93	33.3	13.7
03/10/93	30	13.6
03/11/93	32.2	13.5
03/12/93	28.4	13
03/13/93	29.8	12.8
03/14/93	32.5	13.3
03/15/93	27.4	13.7
03/16/93	27.3	13
03/17/93	28.2	12.8
03/18/93	31.3	13.4
03/19/93	29.4	12.8
03/20/93	29.3	12.7

Table A8. Upstream boundary flows used in the Athabasca River modelling
Source: Water Survey of Canada

DATE	Athabasca River At Hinton	Lesser Slave River near the mouth
03/21/93	31.6	13
03/22/93	42.2	12.8
03/23/93	43.8	13.2
03/24/93	44.3	13.6
03/25/93	39.8	13.2
03/26/93	33.4	13.1
03/27/93	32.6	13.2
03/28/93	31.7	12.8
03/29/93	32.4	12.8
03/30/93	32.8	12.6
03/31/93	33.6	12.5
04/01/93	31	12.8
04/02/93	35.3	12.2
04/03/93	36.1	12.8
04/04/93	36.9	13.2
04/05/93	36.4	13.7
04/06/93	36.4	14.1
04/07/93	34.8	13.9
04/08/93	35.1	12.8
04/09/93	37.2	12
04/10/93	38.3	13
04/11/93	39.4	13.8
04/12/93	38.5	14.1
04/13/93	37.9	14.1
04/14/93	33.9	13.9
04/15/93	33.3	14
04/16/93	33.5	14.2
04/17/93	36.6	14.2
04/18/93	41.5	14.2
04/19/93	44	14.3
04/20/93	47	14.4
04/21/93	50	14.6
04/22/93	52	14.6
04/23/93	54	14.5
04/24/93	54	14
04/25/93	52	14.2
04/26/93	48	14.3
04/27/93	44	14.3
04/28/93	40.6	14.3
04/29/93	38.1	15.3
04/30/93	37.9	15.7
05/01/93	38.4	
05/02/93	38.7	
05/03/93	38.4	
05/04/93	38	
05/05/93	38.1	
05/06/93	45.3	
05/07/93	58.3	
05/08/93	72	
05/09/93	71.8	
05/10/93	65.4	
05/11/93	63.3	
05/12/93	108	
05/13/93	261	

Table A8. Upstream boundary flows used in the Athabasca River modelling
Source: Water Survey of Canada

DATE	Athabasca River At Hinton	Lesser Slave River near the mouth
05/14/93	456	
05/15/93	580	
05/16/93	574	
05/17/93	580	
05/18/93	540	
05/19/93	520	
05/20/93	500	
05/21/93	479	
05/22/93	456	
05/23/93	412	
05/24/93	365	
05/25/93	336	
05/26/93	353	
05/27/93	379	
05/28/93	383	
05/29/93	380	
05/30/93	381	
05/31/93	370	
06/01/93	366	
06/02/93	400	
06/03/93	451	
06/04/93	431	
06/05/93	389	
06/06/93	355	
06/07/93	338	
06/08/93	347	
06/09/93	390	
06/10/93	363	
06/11/93	317	
06/12/93	287	
06/13/93	264	
06/14/93	253	
06/15/93	257	
06/16/93	283	
06/17/93	318	
06/18/93	334	
06/19/93	375	
06/20/93	443	
06/21/93	412	
06/22/93	373	
06/23/93	372	
06/24/93	342	
06/25/93	301	
06/26/93	296	
06/27/93	318	
06/28/93	366	
06/29/93	367	
06/30/93	323	
07/01/93	296	
07/02/93	289	
07/03/93	293	
07/04/93	299	
07/05/93	328	
07/06/93	361	

Table A8. Upstream boundary flows used in the Athabasca River modelling
Source: Water Survey of Canada

DATE	Athabasca River At Hinton	Lesser Slave River near the mouth
07/07/93	392	
07/08/93	405	
07/09/93	430	
07/10/93	429	
07/11/93	382	
07/12/93	348	
07/13/93	320	
07/14/93	305	
07/15/93	300	
07/16/93	310	
07/17/93	310	
07/18/93	311	
07/19/93	313	
07/20/93	314	
07/21/93	325	
07/22/93	351	
07/23/93	365	
07/24/93	352	
07/25/93	339	
07/26/93	336	
07/27/93	325	
07/28/93	324	
07/29/93	331	
07/30/93	368	
07/31/93	377	
08/01/93	327	
08/02/93	292	
08/03/93	283	
08/04/93	281	
08/05/93	288	
08/06/93	298	
08/07/93	325	
08/08/93	362	
08/09/93	340	
08/10/93	335	
08/11/93	374	
08/12/93	385	
08/13/93	346	
08/14/93	329	
08/15/93	322	
08/16/93	298	
08/17/93	296	
08/18/93	296	
08/19/93	297	
08/20/93	297	
08/21/93	302	
08/22/93	320	
08/23/93	326	
08/24/93	338	
08/25/93	352	
08/26/93	299	
08/27/93	277	
08/28/93	288	
08/29/93	310	

Table A8. Upstream boundary flows used in the Athabasca River modelling
Source: Water Survey of Canada

DATE	Athabasca River At Hinton	Lesser Slave River near the mouth
08/30/93	301	
08/31/93	282	
09/01/93	280	
09/02/93	303	
09/03/93	309	
09/04/93	305	
09/05/93	300	
09/06/93	279	
09/07/93	258	
09/08/93	238	
09/09/93	241	
09/10/93	242	
09/11/93	234	
09/12/93	244	
09/13/93	229	
09/14/93	199	
09/15/93	187	
09/16/93	176	
09/17/93	164	
09/18/93	153	
09/19/93	152	
09/20/93	160	
09/21/93	159	
09/22/93	149	
09/23/93	140	
09/24/93	134	
09/25/93	130	
09/26/93	130	
09/27/93	125	
09/28/93	131	
09/29/93	140	
09/30/93	134	
10/01/93	134	

Table A9a. Tributary Flows used in Athabasca River Modelling, Oldman Creek
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
0.1	1	0.1	15	0.1	45	0.1	74
0.1	105	0.54	135	0.14	166	0.08	196
0.08	227	0.06	258	0.19	288	0.19	319
0.15	349	0.1	380	0.1	410	0.1	439
0.1	470	0.54	500	0.14	531	0.08	561
0.08	592	0.06	623	0.19	653	0.19	684
0.15	714	0.1	745	0.1	775	0.1	804
0.1	835	0.54	865	0.14	896	0.08	926
0.08	957	0.06	988	0.19	1018	0.19	1049
0.15	1079						

Table A9b. Tributary Flows used in Athabasca River Modelling, Berland River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
12.2	1	12.2	38	12.2	39	10.9	40
10.9	56	10.9	57	11.3	58	11.6	59
12.2	60	10.4	61	9.89	62	10.2	63
10.1	64	10.4	65	10.7	66	11.1	67
11.5	68	11.9	69	12	70	11.6	71
11.4	72	11.1	73	11.3	74	11.1	75
10.9	76	10.7	77	10.7	78	10.6	79
11.1	80	11.3	81	11.8	82	11.6	83
11.6	84	11.4	85	10.1	86	11	87
10.3	88	10.8	89	11.3	90	12.4	91
13.8	92	14.9	93	15.8	94	18.5	95
22	96	23.1	97	22.4	98	21.8	99
21.1	100	20.7	101	21.8	102	22.8	103
24.5	104	27.8	105	32.7	106	31.6	107
35.5	108	39.4	109	47.4	110	51.4	111
57.5	112	63.2	113	66.5	114	75.9	115
93	116	99.3	117	109	118	113	119
106	120	100	121	91.4	122	81.3	123
75.5	124	70	125	66.6	126	65.8	127
66.7	128	81.5	129	194	130	220	131
182	132	175	133	193	134	167	135
143	136	127	137	117	138	118	139
148	140	170	141	187	142	171	143
158	144	150	145	148	146	142	147
132	148	125	149	120	150	120	151
119	152	117	153	120	154	126	155
121	156	107	157	98.8	158	101	159
103	160	100	161	97.1	162	105	163
107	164	98.2	165	90.5	166	84.9	167
82.2	168	85.9	169	95	170	100	171
97.9	172	93.5	173	89.7	174	89.7	175
98.8	176	108	177	106	178	108	179
110	180	111	181	117	182	127	183
112	184	106	185	98.5	186	144	187
373	188	348	189	286	190	238	191
201	192	172	193	152	194	138	195
124	196	111	197	102	198	93.6	199
85	200	78.8	201	74.5	202	70.5	203
66.3	204	62	205	58.7	206	64.1	207
72.9	208	70.7	209	65.1	210	61.9	211
59	212	53.9	213	51	214	48.4	215
45	216	42.1	217	41.6	218	43	219
41.6	220	39.8	221	38	222	43.7	223
52.1	224	53.6	225	85.7	226	243	227
231	228	179	229	143	230	120	231
104	232	91.1	233	80.8	234	73.4	235
68	236	63.2	237	58.9	238	55.5	239
52.1	240	49.8	241	47.9	242	45.8	243
45.1	244	45.3	245	43.3	246	41.2	247
40.3	248	39.8	249	40.2	250	39.8	251

Table A9b. Tributary Flows used in Athabasca River Modelling, Berland River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
39	252	38.7	253	36.6	254	35	255
33.9	256	33.4	257	32.9	258	32.6	259
32.5	260	32.5	261	32.1	262	30.8	263
29.6	264	28.7	265	28.4	266	27.8	267
27.3	268	26.7	269	26.1	270	25.9	271
25.3	272	24.8	273	24.6	274	24.6	275
24.4	276	24.3	277	24.4	278	24.1	279
23.7	280	23.4	281	23.2	282	23.1	283
22.6	284	22.2	285	21.8	286	21.9	287
22.2	288	23.8	289	25.2	290	22.4	291
24.5	292	25.2	293	29.7	294	37.3	295
27.5	296	28.6	297	29.4	298	26.1	299
19.9	300	16.3	301	15.7	302	17.4	303
18	304	18.7	305	18.6	306	18.4	307
18.1	308	18	309	18.2	310	12.3	311
12.3	365	12.3	366	12.3	367	12.3	395
12.3	396	9.47	397	9.47	419	9.47	420
9.56	421	10.2	422	10.8	423	11.2	424
7.4	425	12.8	426	13.1	427	13	428
13.4	429	12.8	430	12.8	431	12.8	432
13.9	433	15.9	434	17.2	435	18.5	436
19.1	437	20.8	438	22.7	439	25	440
27.5	441	29	442	29	443	28.5	444
28.1	445	27.7	446	27.3	447	26.5	448
26.7	449	26.7	450	26.5	451	25	452
23	453	21.7	454	22.3	455	25.1	456
28.4	457	36.4	458	46.9	459	49.8	460
44.7	461	39	462	32.8	463	30.4	464
25	465	26.2	466	25.3	467	27.8	468
28.5	469	28.9	470	31.4	471	36.5	472
41.6	473	45.2	474	44.8	475	46.2	476
48.9	477	51.7	478	54.4	479	55.7	480
54.6	481	55.2	482	59.4	483	64.5	484
67	485	66	486	62.2	487	56	488
51.7	489	48.7	490	46.2	491	45.3	492
45.7	493	45.2	494	45.8	495	49.5	496
51.2	497	51.5	498	50.5	499	49.3	500
48.9	501	47.9	502	44.2	503	43.3	504
47.1	505	49	506	48.9	507	48.2	508
50.6	509	54.8	510	59.5	511	65.9	512
82.2	513	77.8	514	80.6	515	89.6	516
83.5	517	82	518	88.6	519	86.3	520
78.5	521	73.3	522	68.7	523	65.8	524
63.3	525	61.4	526	60.3	527	57.8	528
57.5	529	59	530	56.5	531	53.1	532
52.9	533	52.7	534	49.5	535	46.3	536
43.2	537	41.1	538	39.6	539	37.8	540
36.1	541	34.8	542	33.4	543	31.8	544
31	545	30.7	546	30.6	547	30.5	548
30.1	549	30.4	550	33.2	551	35.3	552

Table A9b. Tributary Flows used in Athabasca River Modelling, Berland River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
34.5	553	35	554	36.3	555	36.8	556
37	557	35.3	558	33.4	559	32.2	560
31.1	561	29.5	562	29.3	563	29.2	564
28.6	565	27.8	566	27.3	567	26.2	568
25.8	569	25.3	570	25.8	571	26.1	572
26.2	573	26.2	574	25.4	575	25.1	576
24	577	22.7	578	21.6	579	21.8	580
23.3	581	26.5	582	25.7	583	24.9	584
23.6	585	22.8	586	22.1	587	21.3	588
20.6	589	20.2	590	19.7	591	19.2	592
19	593	18.6	594	18.6	595	19.5	596
20	597	21.8	598	22.4	599	22.7	600
22.3	601	21.3	602	20.6	603	20.2	604
20	605	19.9	606	19.7	607	19.6	608
19.9	609	19.8	610	19.4	611	20	612
21.6	613	23.5	614	24.3	615	24.2	616
24.4	617	24.7	618	24.1	619	23.3	620
22.6	621	21.9	622	21.5	623	21.2	624
21.2	625	21.3	626	21.2	627	21	628
20.7	629	20.6	630	20.5	631	20.4	632
20.2	633	20.5	634	21.1	635	21.1	636
20.8	637	20.4	638	20	639	19.7	640
19.4	641	19.3	642	19.1	643	19.1	644
19	645	18.7	646	18.4	647	18.5	648
18.3	649	18	650	18	651	17.8	652
16.4	653	14.2	654	15	655	15.8	656
16.3	657	18.4	658	18.4	659	17.9	660
18.4	661	18.6	662	19.2	663	20.3	664
20.8	665	19.1	666	18	667	18.3	668
18.1	669	17.5	670	16.8	671	17.2	672
7.8	673	7.8	730	7.8	731	7.8	732
7.8	772	7.8	773	7.48	774	7.48	790
7.48	791	7.64	792	7.76	793	7.94	794
8.06	795	8.84	796	8	797	7.73	798
7.55	799	7.52	800	7.49	801	7.43	802
7.34	803	7.26	804	7.2	805	7.03	806
7.03	807	7.09	808	7.34	809	7.52	810
8.54	811	9.38	812	9.17	813	8.9	814
8.75	815	8.57	816	8.63	817	8.66	818
8.75	819	8.81	820	8.96	821	9.2	822
10	823	10.6	824	11.4	825	11.6	826
11.9	827	12.2	828	12.5	829	12.6	830
12.9	831	13.3	832	15.5	833	16.8	834
19	835	21.4	836	20.8	837	22	838
23.9	839	23	840	22.6	841	22.5	842
24.5	843	24.9	844	23.2	845	21.9	846
22.6	847	22.9	848	23.2	849	24	850
23.6	851	23.6	852	23.6	853	22.8	854
22.3	855	23	856	24.8	857	26.6	858
26.9	859	25.4	860	24.3	861	23.9	862

Table A9b. Tributary Flows used in Athabasca River Modelling, Berland River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
27.2	863	43.8	864	61.8	865	58.2	866
49.6	867	42.8	868	39.3	869	37.5	870
36.5	871	37.2	872	37.1	873	38.2	874
41.1	875	40.2	876	48.7	877	53.3	878
47.7	879	43.7	880	40.2	881	37.2	882
36.5	883	35.8	884	34.1	885	31.4	886
29.5	887	28.1	888	26.9	889	26.3	890
27.1	891	26.4	892	25.1	893	24.6	894
24.6	895	25.1	896	30.2	897	51.5	898
47.7	899	44.6	900	42	901	40.5	902
36.8	903	37.7	904	42.6	905	48	906
47.3	907	44.4	908	46.8	909	56.3	910
51.7	911	46.7	912	43.2	913	44.2	914
50.3	915	52.8	916	54.3	917	50.4	918
46.9	919	48.3	920	52.8	921	52.5	922
49.5	923	46.7	924	47.3	925	47	926
48.4	927	72.2	928	79	929	74.1	930
67.9	931	64.5	932	62.7	933	60	934
56.7	935	54.4	936	53.2	937	52.2	938
50.5	939	48.1	940	45.1	941	41.6	942
38.2	943	35.4	944	33.8	945	32.4	946
30.9	947	30.6	948	32.8	949	39.8	950
48.3	951	46.2	952	48	953	49.2	954
45	955	42.8	956	43.1	957	42.7	958
39.8	959	37.2	960	34.9	961	33	962
32	963	34.4	964	36.4	965	35.4	966
34.9	967	34.8	968	35.6	969	37	970
42.9	971	47.5	972	46.6	973	47.8	974
52.4	975	56.6	976	52.7	977	51.7	978
50.9	979	47.2	980	43.6	981	39.7	982
37	983	35.7	984	34.5	985	33.5	986
33.3	987	33.1	988	35.5	989	35.6	990
34.4	991	33.6	992	33.5	993	35.7	994
37.4	995	36.1	996	34.3	997	32.6	998
31	999	29.7	1000	29	1001	27.9	1002
27.4	1003	27.3	1004	26.8	1005	26.1	1006
25.4	1007	24.9	1008	24.6	1009	24.6	1010
24.7	1011	24.2	1012	24.2	1013	23.8	1014
23.3	1015	22.8	1016	22.3	1017	22	1018
21.7	1019	21.4	1020	21	1021	20.7	1022
20.3	1023	19.6	1024	19.7	1025	20.1	1026
19.9	1027	19.8	1028	19.5	1029	19.1	1030
19.6	1031	19.8	1032	19.1	1033	19.5	1034
19.9	1035	19.5	1036	19.5	1037	19.5	1095

Table A9c. Tributary Flows used in Athabasca River Modelling, Sakwatau River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
0.934	1	0.934	43	0.934	44	1.04	45
1.04	50	1.04	51	0.999	52	0.944	53
0.891	54	0.823	55	0.75	56	0.736	57
0.756	58	0.743	59	2.95	60	0.73	61
0.732	62	0.731	63	0.732	64	0.724	65
0.73	66	0.72	67	0.71	68	0.7	69
0.69	70	0.68	71	0.665	72	0.66	73
0.67	74	0.685	75	0.71	76	0.73	77
0.756	78	0.741	79	0.814	80	0.745	81
0.678	82	0.64	83	0.62	84	0.605	85
0.6	86	0.682	87	0.957	88	1.17	89
1.23	90	1.27	91	1.47	92	1.67	93
2.57	94	4.56	95	6.14	96	5.87	97
5.31	98	5.53	99	6.44	100	6.81	101
7.1	102	8.08	103	9.42	104	9.84	105
10	106	9.45	107	11.4	108	14.2	109
17.7	110	20.2	111	24.3	112	28.3	113
29.6	114	38.7	115	53.2	116	54	117
47.8	118	38.6	119	31.3	120	25.7	121
21	122	17.6	123	15.3	124	13.5	125
12.5	126	12.1	127	11.9	128	16.1	129
40.5	130	34.7	131	25.3	132	24.7	133
94.8	134	134	135	60.9	136	38.7	137
28.6	138	22.6	139	20	140	17.7	141
15.1	142	12.8	143	11.1	144	10.3	145
10.4	146	10.1	147	9.87	148	10.4	149
9.6	150	8.41	151	7.53	152	6.77	153
6.67	154	7.29	155	7.62	156	6.72	157
6.01	158	8.81	159	15.1	160	12.7	161
10.3	162	9.13	163	8.22	164	9.67	165
14.6	166	17.7	167	15.9	168	15.7	169
17.7	170	17.1	171	13.2	172	10.8	173
9.44	174	9.31	175	11.3	176	11.3	177
11.3	178	11.5	179	11.3	180	12.3	181
22.9	182	27.2	183	18.6	184	15.6	185
12	186	9.77	187	8.8	188	8.07	189
6.98	190	5.98	191	5.83	192	7.95	193
6.89	194	6.03	195	5.39	196	4.66	197
4.26	198	4.98	199	4.66	200	3.98	201
3.61	202	3.29	203	2.98	204	2.73	205
2.48	206	2.38	207	2.39	208	2.68	209
2.74	210	2.82	211	2.91	212	2.98	213
2.69	214	2.72	215	2.5	216	2.19	217
5.53	218	5.31	219	4.42	220	4.08	221
3.62	222	3.06	223	2.75	224	3.47	225
5.48	226	8.13	227	6.66	228	5.12	229
4.18	230	3.54	231	3.04	232	2.67	233
2.41	234	2.17	235	1.98	236	1.86	237
1.75	238	1.68	239	1.63	240	1.6	241
1.56	242	1.54	243	1.44	244	1.36	245
1.62	246	1.71	247	1.46	248	1.69	249
1.86	250	2.3	251	3.11	252	2.64	253

Table A9c. Tributary Flows used in Athabasca River Modelling, Sakwatau River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
2.28	254	2.05	255	1.91	256	1.8	257
1.8	258	2.32	259	2.55	260	2.53	261
2.39	262	2.19	263	2.02	264	1.87	265
1.84	266	2.02	267	2.05	268	1.91	269
1.79	270	1.68	271	1.58	272	1.52	273
1.45	274	1.44	275	1.5	276	1.7	277
1.76	278	1.76	279	1.74	280	1.68	281
1.62	282	1.61	283	1.58	284	1.62	285
1.66	286	1.63	287	1.63	288	1.93	289
2.17	290	2.01	291	1.97	292	1.97	293
2.05	294	2.2	295	1.74	296	1.79	297
1.72	298	1.58	299	1.14	300	1.37	301
1.46	302	1.38	303	1.33	304	1.27	305
1.28	306	1.3	307	1.33	308	1.35	309
1.37	310	1.36	311	1.36	312	0.634	313
0.634	365	0.634	366	0.634	367	0.634	424
0.634	425	3	426	3.19	427	3.82	428
3.8	429	3.25	430	2.89	431	2.79	432
3.12	433	2.99	434	2.93	435	2.87	436
2.91	437	3.18	438	3.69	439	4.59	440
4.96	441	5.2	442	4.88	443	4.63	444
4.45	445	4.35	446	4.56	447	4.83	448
4.89	449	5.02	450	4.97	451	5.14	452
4.97	453	4.52	454	4.4	455	4.46	456
4.94	457	8.75	458	14	459	13.6	460
11	461	9.16	462	7.71	463	6	464
4.26	465	4.43	466	4.57	467	5.12	468
4.74	469	4.94	470	7.01	471	11.1	472
16.4	473	17.9	474	16.1	475	16.9	476
16.9	477	15.5	478	16	479	14.3	480
12.9	481	12.3	482	12.8	483	13.6	484
14.5	485	14.5	486	12.2	487	9.8	488
8.22	489	7.28	490	6.54	491	6.02	492
5.62	493	5.18	494	4.92	495	5.73	496
8.51	497	9.41	498	10.5	499	12.3	500
11.6	501	9.34	502	7.89	503	7.03	504
6.62	505	6.64	506	6.38	507	5.78	508
5.35	509	4.97	510	4.57	511	4.45	512
4.4	513	4.2	514	4.53	515	5.79	516
5.84	517	5.31	518	6.57	519	7.71	520
8.05	521	7.46	522	6.92	523	5.98	524
5.33	525	4.97	526	4.84	527	4.46	528
3.95	529	3.73	530	3.2	531	2.9	532
2.55	533	2.54	534	2.63	535	2.69	536
3.18	537	3.2	538	2.61	539	2.19	540
1.85	541	1.64	542	1.46	543	1.32	544
1.21	545	1.14	546	1.43	547	1.5	548
1.53	549	1.77	550	1.82	551	1.71	552
2.2	553	3.29	554	3.68	555	4.04	556
3.72	557	2.97	558	2.48	559	2.15	560
2	561	2.33	562	3.05	563	2.75	564
2.86	565	2.71	566	2.42	567	2.02	568

Table A9c. Tributary Flows used in Athabasca River Modelling, Sakwatau River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
1.7	569	1.47	570	1.3	571	1.47	572
2.15	573	4.83	574	3.41	575	2.61	576
2.1	577	1.69	578	1.41	579	1.21	580
1.06	581	1.01	582	1.12	583	1.02	584
1.32	585	1.34	586	1.54	587	1.2	588
1.06	589	0.978	590	0.865	591	0.808	592
0.83	593	0.849	594	0.812	595	1.12	596
1.14	597	2.6	598	3.26	599	3.32	600
2.92	601	2.57	602	2.28	603	2.06	604
1.9	605	1.81	606	1.79	607	2.12	608
2.08	609	2.02	610	3.69	611	3.81	612
8	613	14.1	614	12.1	615	10.8	616
13.1	617	16.1	618	13.1	619	12.2	620
10.9	621	8.93	622	7.41	623	6.41	624
5.85	625	5.69	626	5.73	627	5.87	628
5.76	629	5.27	630	4.89	631	4.79	632
4.8	633	5.2	634	5.06	635	4.89	636
4.8	637	4.51	638	4.16	639	3.8	640
3.65	641	3.53	642	3.37	643	3.26	644
3.05	645	2.93	646	2.86	647	2.87	648
2.82	649	2.73	650	2.6	651	2	652
1.6	653	2.5	654	2.7	655	2.65	656
2.6	657	2.53	658	2.41	659	2.31	660
2.33	661	2.24	662	2.16	663	2.31	664
2.18	665	1.67	666	2.93	667	2.58	668
2.3	669	2.18	670	2.14	671	2.07	672
1	673	0.625	674	0.625	730	0.625	731
0.625	732	0.625	777	0.625	778	0.669	779
0.669	790	0.669	791	0.76	792	0.671	793
0.64	794	0.679	795	0.748	796	0.664	797
0.64	798	0.635	799	0.63	800	0.62	801
0.61	802	0.605	803	0.6	804	0.6	805
0.595	806	0.6	807	0.67	808	0.71	809
0.771	810	0.88	811	0.917	812	0.961	813
0.908	814	0.964	815	0.907	816	0.908	817
0.947	818	0.972	819	0.928	820	0.951	821
0.932	822	0.902	823	0.945	824	1.14	825
1.43	826	2.24	827	4.64	828	5.09	829
5.43	830	6.36	831	7.8	832	10.6	833
11.5	834	13.6	835	13.6	836	14.3	837
13.5	838	11.4	839	11.1	840	9.97	841
10.1	842	10.7	843	11.2	844	9.07	845
7.98	846	8.18	847	8.45	848	8.05	849
7.78	850	7.57	851	7.01	852	6.86	853
6.81	854	6.69	855	6.63	856	21.8	857
41.2	858	27.3	859	19	860	14.3	861
11.5	862	9.95	863	8.96	864	7.87	865
6.73	866	5.76	867	5.06	868	4.45	869
3.95	870	3.83	871	7.64	872	7.28	873
5.85	874	5.06	875	4.63	876	4.55	877
4.31	878	3.9	879	3.52	880	3.15	881
2.83	882	2.54	883	2.32	884	2.06	885

Table A9c. Tributary Flows used in Athabasca River Modelling, Sakwatau River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
1.82	886	1.66	887	1.56	888	1.42	889
1.29	890	1.22	891	1.22	892	1.19	893
1.17	894	1.35	895	1.69	896	1.91	897
1.82	898	1.66	899	1.5	900	1.42	901
1.41	902	1.54	903	2.57	904	52	905
47	906	26.9	907	20.3	908	32.5	909
30.6	910	25.6	911	21.9	912	16.8	913
16.2	914	17.3	915	16.7	916	13.9	917
10.9	918	8.71	919	7.53	920	6.92	921
6.13	922	5.26	923	5.26	924	5.88	925
5.47	926	4.99	927	5.32	928	5.48	929
5.84	930	6.36	931	10.4	932	32	933
29.1	934	30.2	935	38.2	936	26.9	937
19	938	13.8	939	12.8	940	17.6	941
18.2	942	13.8	943	10.3	944	9.14	945
9.82	946	9.82	947	7.85	948	7.33	949
13.8	950	16.7	951	16	952	13.1	953
10.1	954	7.93	955	6.65	956	5.76	957
4.96	958	4.93	959	4.51	960	3.96	961
3.61	962	3.32	963	3.12	964	2.99	965
3.14	966	3.7	967	4.99	968	5.25	969
5.12	970	5.31	971	5.16	972	4.66	973
4.95	974	5.33	975	5.43	976	4.8	977
4.25	978	3.8	979	3.28	980	2.88	981
2.61	982	2.4	983	2.34	984	2.28	985
2.21	986	2.23	987	2.26	988	2.23	989
2.35	990	2.23	991	2.13	992	2.04	993
1.98	994	1.9	995	1.88	996	1.86	997
1.88	998	1.95	999	2.06	1000	2.1	1001
1.99	1002	1.98	1003	1.96	1004	1.99	1005
2.02	1006	2.01	1007	2	1008	2.03	1009
1.98	1010	1.92	1011	1.89	1012	1.86	1013
1.83	1014	1.83	1015	1.83	1016	1.81	1017
1.8	1018	1.8	1019	1.78	1020	1.75	1021
1.76	1022	1.63	1023	1.68	1024	1.75	1025
1.84	1026	2.16	1027	2.36	1028	3.36	1029
3.16	1030	2.95	1031	2.19	1032	3.54	1033
4.12	1034	3.64	1035	3.43	1036	3.19	1037
3.19	1038	3.19	1095				

Table A9d. Tributary Flows used in Athabasca River Modelling, McLeod River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
10.3	1	10.3	43	10.3	44	10.2	45
10.2	50	10.2	51	10.1	52	9.99	53
10	54	9.83	55	9.57	56	9.53	57
9.52	58	9.45	59	16.5	60	9.3	61
9.15	62	9.09	63	8.93	64	8.8	65
8.64	66	8.49	67	8.3	68	8.21	69
8.21	70	8.15	71	8.23	72	8.26	73
8.34	74	8.34	75	8.37	76	8.3	77
8.19	78	8.35	79	8.67	80	9.12	81
9.66	82	9.8	83	10.2	84	10.8	85
10.9	86	11	87	11	88	11.3	89
12	90	13.9	91	20.3	92	30.2	93
36.5	94	40	95	46.3	96	49.1	97
45.3	98	43.8	99	43.9	100	43.1	101
47.5	102	70	103	87.6	104	90	105
103	106	103	107	106	108	111	109
110	110	115	111	121	112	126	113
134	114	146	115	212	116	296	117
309	118	280	119	242	120	225	121
204	122	177	123	158	124	144	125
132	126	125	127	122	128	127	129
180	130	339	131	301	132	269	133
368	134	373	135	298	136	242	137
208	138	193	139	189	140	186	141
196	142	206	143	183	144	172	145
173	146	177	147	165	148	152	149
143	150	136	151	130	152	122	153
114	154	112	155	117	156	109	157
96.8	158	94.9	159	101	160	131	161
114	162	103	163	102	164	95.9	165
85.1	166	76.8	167	71.2	168	68.4	169
103	170	141	171	136	172	121	173
109	174	104	175	115	176	121	177
112	178	104	179	104	180	105	181
103	182	99.3	183	92.4	184	80.2	185
72.2	186	72.5	187	194	188	355	189
267	190	207	191	163	192	137	193
120	194	110	195	97.6	196	87.4	197
76.9	198	69.7	199	63.5	200	56.4	201
51.3	202	47.4	203	46.9	204	44.8	205
40.8	206	39.4	207	37.7	208	43.4	209
44.7	210	42	211	39.6	212	37.4	213
34.9	214	32.3	215	31.1	216	29.4	217
29.6	218	29.9	219	30.5	220	36.4	221
39.6	222	34.3	223	33.7	224	36.9	225
52.1	226	120	227	143	228	129	229
101	230	81.1	231	67.8	232	58.1	233
50.5	234	44.9	235	41.3	236	38	237
36.5	238	35.1	239	32.6	240	29.9	241
28.3	242	27	243	26.3	244	24.9	245

Table A9d. Tributary Flows used in Athabasca River Modelling, McLeod River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
24.8	246	29.8	247	28.4	248	25.4	249
24.4	250	24.3	251	24.9	252	25.2	253
29.8	254	28.8	255	26.1	256	24.2	257
23.2	258	22.5	259	22.4	260	22.4	261
23.6	262	26.8	263	26	264	24	265
22.8	266	22.2	267	21.4	268	20.7	269
19.9	270	19.1	271	18.3	272	17.9	273
17.5	274	16.9	275	16.4	276	16.2	277
16	278	15.9	279	15.8	280	15.7	281
15.2	282	15.1	283	14.9	284	14.4	285
14	286	13.8	287	13.6	288	14.7	289
16.3	290	17.6	291	17.9	292	18.5	293
23.7	294	28.3	295	31.3	296	29.5	297
30.6	298	28.5	299	23.1	300	19.7	301
18.1	302	15.8	303	17.2	304	16.6	305
16.6	306	17.9	307	19.1	308	20.1	309
19.7	310	4.79	311	4.79	365	4.79	366
4.79	367	4.79	424	4.79	425	18	426
19	427	20.6	428	20	429	20.2	430
20.2	431	20.9	432	20.8	433	21	434
21.2	435	21.5	436	23.7	437	26.8	438
31.4	439	40	440	50.3	441	57	442
61.6	443	56.2	444	52.1	445	46	446
42	447	45	448	52	449	48	450
45.6	451	45	452	47	453	49.4	454
50.3	455	48.7	456	47.9	457	49.9	458
59	459	65.3	460	66.7	461	62.7	462
58.1	463	55.7	464	51.1	465	44.9	466
41.4	467	39.9	468	41.3	469	44.4	470
49.7	471	57.5	472	65.5	473	70.4	474
70.7	475	67.5	476	66.2	477	71.1	478
86.6	479	94.4	480	91.9	481	86.6	482
82.8	483	81.6	484	81.5	485	80.4	486
76.8	487	72.2	488	64.7	489	58.9	490
54.3	491	50.5	492	47.9	493	47.8	494
50.8	495	51.3	496	50.6	497	54.5	498
57.5	499	58.5	500	62.4	501	69.8	502
68.9	503	65.6	504	62.8	505	67.2	506
75.9	507	76.5	508	73.2	509	75.9	510
80.9	511	83.4	512	93	513	98.5	514
93.7	515	95.2	516	102	517	93.2	518
86.2	519	83.6	520	78.5	521	72.9	522
68.4	523	65.4	524	63.4	525	59.8	526
54.1	527	50.5	528	47	529	44.7	530
43.9	531	41.8	532	40.1	533	36.6	534
35.7	535	35	536	31.7	537	29.1	538
27.1	539	25.1	540	23.5	541	22.1	542
20.8	543	19.3	544	18.1	545	17.5	546
17.4	547	17.4	548	17.9	549	17.3	550
17.6	551	19.8	552	19.3	553	21.8	554

Table A9d. Tributary Flows used in Athabasca River Modelling, McLeod River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
23.7	555	26	556	31.2	557	43.2	558
37.4	559	32.1	560	29	561	26.5	562
25.6	563	24.7	564	24.5	565	23.3	566
21.6	567	19.9	568	18	569	16.8	570
16.5	571	16	572	15.6	573	14.9	574
14.7	575	15	576	14.9	577	14.2	578
13.6	579	12.7	580	11.8	581	11.2	582
11	583	12	584	13	585	14	586
13.1	587	12.1	588	11.3	589	10.9	590
10.2	591	9.72	592	9.1	593	8.64	594
8.02	595	9.05	596	9.01	597	8.64	598
8.5	599	9.14	600	9.76	601	10.2	602
10.6	603	10.9	604	10.8	605	10.3	606
9.87	607	9.7	608	9.97	609	10.5	610
10.8	611	10.6	612	12.6	613	15.4	614
18.7	615	23.5	616	24.7	617	22.4	618
21.4	619	21.5	620	21.8	621	22	622
22	623	22	624	20.9	625	19.6	626
18.2	627	17.3	628	16.8	629	16.1	630
16	631	16.4	632	16.4	633	16	634
16.2	635	16.9	636	16.9	637	16.8	638
16.4	639	15.8	640	15.2	641	14.5	642
13.9	643	13.5	644	13.1	645	12.6	646
12.4	647	12	648	11.7	649	11.6	650
11.1	651	10.8	652	10.7	653	10.5	654
10.2	655	10	656	9.8	657	10.6	658
11.7	659	14	660	13.5	661	13.4	662
14.3	663	14.4	664	14.9	665	15.9	666
15.8	667	16	668	15.8	669	15.1	670
15.2	671	14.6	672	13.9	673	5.13	674
5.13	730	5.13	731	5.13	732	5.13	777
5.13	778	4.8	779	4.73	780	4.63	781
4.63	782	4.62	783	4.66	784	4.65	785
4.69	786	4.67	787	4.72	788	4.73	789
4.82	790	4.82	791	4.95	792	5.11	793
5.08	794	5	795	5.62	796	5.75	797
7.61	798	8.3	799	8.96	800	7.51	801
6.97	802	6.51	803	6.38	804	6.25	805
6.47	806	6.85	807	7.97	808	8.4	809
8.7	810	9	811	9.5	812	10.2	813
10.5	814	10.8	815	12.1	816	12.8	817
12.7	818	12.3	819	11.8	820	12.5	821
14.3	822	15.6	823	17.4	824	19.1	825
21.2	826	21.7	827	21.3	828	20.2	829
22.9	830	26.2	831	28.7	832	27.8	833
37.9	834	46.5	835	49.9	836	48	837
45.4	838	46.4	839	47.3	840	43.6	841
42.8	842	44.3	843	45.3	844	51.2	845
51.3	846	48.2	847	47.9	848	47.7	849
45.8	850	43.7	851	42	852	40.2	853

Table A9d. Tributary Flows used in Athabasca River Modelling, McLeod River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
39.9	854	37.9	855	35.3	856	35.7	857
38.2	858	46	859	52.2	860	46.6	861
41.3	862	38.7	863	39.9	864	45.2	865
51	866	46.7	867	41.1	868	36.9	869
34.2	870	32.4	871	31.4	872	32	873
30.4	874	31.3	875	35.3	876	38.2	877
39.7	878	46.2	879	43	880	38.7	881
35.4	882	32.4	883	31.7	884	31.2	885
28.3	886	25.9	887	23.4	888	21.3	889
19.8	890	18.5	891	18.1	892	18.1	893
17.9	894	16.7	895	18.6	896	28	897
37.1	898	79.5	899	73.9	900	64.5	901
56.8	902	50.5	903	47.5	904	49.9	905
67.6	906	118	907	97	908	95.7	909
101	910	89	911	75	912	67.4	913
60.9	914	62.2	915	71.8	916	74.9	917
79	918	90.2	919	91.2	920	91.8	921
90.4	922	84	923	75.8	924	75.5	925
79.8	926	81.1	927	77.8	928	71	929
67.3	930	64.5	931	65.8	932	69.2	933
78.6	934	86.9	935	74.2	936	65.6	937
62.1	938	57.3	939	56.9	940	57.7	941
57.1	942	49.8	943	42.7	944	37.1	945
33.3	946	30	947	27.4	948	28.7	949
37.6	950	63.8	951	96.6	952	81	953
86.6	954	87.4	955	73.8	956	65.9	957
66.2	958	62.8	959	55.7	960	49.2	961
43.5	962	39.2	963	36.5	964	35	965
35.4	966	35.7	967	34.7	968	35.1	969
42.6	970	43.6	971	69	972	84.1	973
75.8	974	72.9	975	86.2	976	89.4	977
79.1	978	71.9	979	66.2	980	58.5	981
51.6	982	47.2	983	42.1	984	39.7	985
39.5	986	46.9	987	48.5	988	45.7	989
51	990	51.4	991	47.2	992	45	993
46.4	994	61.4	995	64.5	996	60.7	997
56.8	998	53.2	999	50.4	1000	47.4	1001
44.8	1002	43.8	1003	42	1004	41.4	1005
41.5	1006	39.7	1007	37.5	1008	36.6	1009
35.8	1010	34.7	1011	34.4	1012	33.7	1013
32.7	1014	31.4	1015	30.2	1016	29	1017
28	1018	26.9	1019	26.2	1020	25.9	1021
25.2	1022	24.6	1023	23.8	1024	22.7	1025
21.8	1026	22.8	1027	22.4	1028	21.5	1029
21.2	1030	20.6	1031	20.6	1032	20.1	1033
20.7	1034	20.6	1035	21.3	1036	20.2	1037
20.2	1038	20.2	1095				

Table A9e. Tributary Flows used in Athabasca River Modelling, Freeman River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
0.492	1	0.492	51	0.492	52	0.485	53
0.49	54	0.52	55	0.62	56	0.8	57
0.75	58	0.7	59	2.41	60	0.61	61
0.54	62	0.48	63	0.55	64	0.65	65
0.72	66	0.78	67	0.8	68	0.76	69
0.72	70	0.69	71	0.67	72	0.77	73
0.82	74	0.88	75	0.94	76	0.9	77
0.88	78	0.86	79	0.843	80	0.962	81
0.836	82	0.794	83	0.836	84	0.948	85
1.03	86	0.969	87	0.998	88	1.12	89
1.27	90	1.37	91	1.46	92	1.37	93
1.42	94	1.48	95	1.6	96	1.8	97
2.1	98	2.8	99	6.55	100	12	101
13	102	15.7	103	11.8	104	12.1	105
12.4	106	13	107	11.8	108	13.1	109
13.1	110	27	111	27.7	112	32.9	113
35.3	114	35.5	115	37.9	116	39.7	117
39.9	118	40.4	119	39.7	120	31.9	121
26.3	122	24.3	123	21.3	124	21	125
25	126	21.3	127	21.2	128	27.3	129
77.8	130	59.3	131	50.5	132	45.6	133
97	134	164	135	105	136	60.4	137
46.5	138	35.2	139	28.4	140	24.2	141
18.3	142	17.1	143	17	144	13.4	145
14	146	13.2	147	12.8	148	14.7	149
14.8	150	13.2	151	14.1	152	11.7	153
9.8	154	10.9	155	10.9	156	9.9	157
8.91	158	8.57	159	19.8	160	12.9	161
12.6	162	12.3	163	11.9	164	13	165
18.6	166	26.6	167	25	168	22.7	169
26.8	170	25.3	171	19.5	172	17.9	173
13.6	174	12.8	175	11.7	176	13.6	177
13.8	178	14.9	179	15.3	180	15.5	181
27.2	182	31.9	183	26.5	184	33.6	185
34.8	186	22.8	187	18.5	188	17.6	189
15.6	190	12.6	191	15.6	192	15.9	193
14.4	194	13.2	195	10.9	196	9.52	197
7.77	198	9.61	199	10.5	200	8	201
6.57	202	6.31	203	6.19	204	4.95	205
4.76	206	3.45	207	3.31	208	3.31	209
3.14	210	3.54	211	3.67	212	3.51	213
3.47	214	3.4	215	3.01	216	1.8	217
4	218	10	219	8.57	220	7.7	221
7.04	222	5.37	223	4.79	224	6.06	225
7.62	226	13.1	227	10	228	8.48	229
5.13	230	4.62	231	3.18	232	3.58	233
3.54	234	2.88	235	2.97	236	2.71	237
2.27	238	1.4	239	2.15	240	2.15	241
1.38	242	1.64	243	1.28	244	1.36	245
1.51	246	2.76	247	1.43	248	2.1	249

Table A9e. Tributary Flows used in Athabasca River Modelling, Freeman River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
2.76	250	2.08	251	2.39	252	3.47	253
2.97	254	2.92	255	2.08	256	2	257
2.39	258	2.19	259	2	260	2.51	261
2.67	262	2.08	263	2.27	264	2.31	265
1.73	266	1.83	267	2.04	268	2.08	269
1.51	270	1.51	271	1.42	272	1.38	273
1.38	274	1.38	275	1.59	276	1.59	277
1.83	278	1.93	279	1.8	280	1.9	281
1.7	282	1.67	283	1.7	284	1.67	285
1.73	286	1.56	287	1.38	288	1.4	289
1.4	290	1.4	291	1.42	292	1.42	293
1.42	294	1.38	295	1.36	296	1.32	297
1.28	298	1.27	299	1.25	300	1.23	301
1.21	302	1.19	303	1.18	304	1.16	305
1.15	306	1.19	307	1.23	308	1.26	309
1.3	310	1.35	311	0.505	312	0.505	365
0.505	366	0.505	367	0.505	424	0.505	425
2.41	426	2.41	427	4	428	3.54	429
3.4	430	3.05	431	2.75	432	2.65	433
2.55	434	2.65	435	2.76	436	2.85	437
2.95	438	3.25	439	3.65	440	4.2	441
4.73	442	6.03	443	4.41	444	6.22	445
6.6	446	6.97	447	7.22	448	6.51	449
8	450	6.7	451	7.1	452	7.47	453
7.77	454	6.12	455	5.01	456	5.22	457
8.91	458	14	459	14.5	460	13.3	461
13	462	7.32	463	7.4	464	5.1	465
4.52	466	3.93	467	4.57	468	5.01	469
4.43	470	4.87	471	6.47	472	10.9	473
16.6	474	14.6	475	16.8	476	15.5	477
13.5	478	16.2	479	14.7	480	13.1	481
13.7	482	14.2	483	15	484	16.4	485
17.4	486	17.9	487	13.3	488	11.3	489
9.52	490	8.74	491	8.44	492	8.2	493
7.25	494	6.51	495	8.69	496	11.4	497
14.1	498	16.5	499	18.4	500	18	501
17.3	502	16.5	503	15.5	504	14.7	505
13.8	506	12.9	507	12.1	508	11.4	509
9.03	510	7.88	511	7.73	512	6.22	513
5.9	514	5.78	515	5.66	516	5.6	517
7	518	9.4	519	11.5	520	17	521
22	522	20.5	523	19	524	17.4	525
15.3	526	14.7	527	13	528	9.99	529
8.56	530	8.73	531	7.11	532	6.25	533
6.19	534	5.44	535	6.19	536	6.13	537
7.71	538	6.52	539	6.22	540	5.24	541
4.64	542	4.25	543	3.92	544	3.63	545
3.42	546	3.33	547	3.54	548	3.5	549
3.58	550	4.12	551	4.12	552	3.91	553
5.29	554	12.8	555	13.6	556	11.3	557

Table A9e. Tributary Flows used in Athabasca River Modelling, Freeman River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
8.62	558	6.73	559	5.35	560	4.5	561
4.04	562	4.87	563	5.34	564	4.71	565
4.36	566	4.23	567	3.76	568	3.24	569
2.85	570	2.79	571	3.34	572	3.25	573
7.18	574	7.49	575	5.98	576	4.89	577
3.96	578	3.25	579	2.71	580	2.34	581
2.06	582	1.9	583	1.85	584	1.81	585
1.72	586	1.73	587	1.79	588	1.64	589
1.55	590	1.42	591	1.32	592	1.22	593
1.16	594	1.2	595	1.5	596	1.38	597
2.3	598	3.76	599	3.98	600	4.24	601
3.91	602	3.57	603	3.21	604	2.72	605
2.59	606	2.46	607	3.02	608	3.66	609
3.37	610	4.3	611	7.45	612	10.1	613
23.4	614	20.8	615	17.9	616	17.6	617
25.1	618	22.9	619	20.3	620	18	621
15.7	622	13.5	623	11.5	624	10.2	625
9.26	626	9.26	627	9.01	628	10.1	629
10.7	630	9.82	631	9.53	632	8.98	633
9.95	634	9.91	635	9.15	636	8.54	637
8.1	638	7.53	639	6.9	640	6.48	641
6.02	642	5.81	643	5.69	644	5.3	645
4.94	646	4.71	647	4.62	648	4.55	649
4.38	650	4.28	651	3.25	652	3.1	653
3.45	654	3.5	655	3.65	656	3.7	657
3.75	658	3.55	659	3.25	660	3.25	661
3.3	662	3.1	663	3.2	664	3	665
2.7	666	3.5	667	3.2	668	3	669
2.85	670	2.65	671	2.45	672	2.25	673
1.94	674	0.515	675	0.515	730	0.515	731
0.515	732	0.515	790	0.515	791	0.525	792
0.51	793	0.5	794	0.72	795	0.69	796
0.543	797	0.483	798	0.516	799	0.517	800
0.535	801	0.582	802	0.56	803	0.56	804
0.56	805	0.58	806	0.7	807	0.753	808
0.789	809	0.798	810	0.857	811	0.837	812
0.774	813	0.749	814	0.773	815	0.785	816
0.786	817	0.753	818	0.787	819	0.823	820
0.881	821	0.946	822	1.04	823	1.15	824
1.24	825	1.41	826	1.55	827	1.62	828
2.6	829	2.88	830	3.09	831	3.86	832
5.31	833	8.48	834	9.66	835	7.92	836
8	837	9.79	838	9.66	839	9.33	840
10.2	841	10.6	842	10.3	843	11.6	844
10.9	845	9.76	846	8.84	847	9.84	848
9.83	849	10.4	850	10.3	851	10.4	852
10.3	853	10.5	854	10.5	855	10.3	856
11.4	857	25.7	858	27.6	859	21.2	860
16.6	861	13.8	862	12	863	11.3	864
11	865	9.8	866	8.62	867	7.54	868

Table A9e. Tributary Flows used in Athabasca River Modelling, Freeman River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
6.7	869	5.92	870	5.51	871	5.44	872
6.66	873	6.53	874	5.93	875	5.53	876
5.17	877	5.04	878	5.08	879	4.95	880
4.65	881	4.14	882	3.75	883	3.4	884
3.13	885	2.97	886	2.79	887	2.58	888
2.36	889	2.2	890	2.18	891	2.06	892
2.2	893	2.25	894	2.47	895	2.56	896
3.49	897	4.07	898	3.82	899	3.48	900
3.29	901	3.29	902	3.68	903	4.65	904
0.9	905	4.4	906	1.3	907	5.5	908
6.5	909	8.5	910	3.9	911	30.8	912
29.3	913	32	914	31	915	29.1	916
28.4	917	27.8	918	25.2	919	23.8	920
22.6	921	20.5	922	17.4	923	14.8	924
13.1	925	12.3	926	10.9	927	10.3	928
11.2	929	11.6	930	12.1	931	16.2	932
31.3	933	44.7	934	44.6	935	60.6	936
48.9	937	38.5	938	32.6	939	28.7	940
30.7	941	39.8	942	32.8	943	26.4	944
22.1	945	20.1	946	19.3	947	17.4	948
17.8	949	25.9	950	29.4	951	36.4	952
35.1	953	28.2	954	23.6	955	20.4	956
17.7	957	15.5	958	13.3	959	11.4	960
9.95	961	8.77	962	7.95	963	6.36	964
5.6	965	5.97	966	6.7	967	7.46	968
9.43	969	8.99	970	8.64	971	8.51	972
8.21	973	7.8	974	7.28	975	7.22	976
7.29	977	6.51	978	5.75	979	5.22	980
4.55	981	3.99	982	3.76	983	3.59	984
3.55	985	3.42	986	3.4	987	3.37	988
3.41	989	3.43	990	3.47	991	3.42	992
3.65	993	4.65	994	4.56	995	4.38	996
4.2	997	4.07	998	3.83	999	3.76	1000
3.74	1001	3.63	1002	3.51	1003	3.43	1004
3.49	1005	3.61	1006	3.67	1007	3.6	1008
3.38	1009	3.27	1010	3.04	1011	2.62	1012
2.61	1013	2.61	1014	2.58	1015	2.57	1016
2.47	1017	2.45	1018	2.45	1019	2.51	1020
2.51	1021	2.4	1022	2.29	1023	2.2	1024
2.08	1025	2.06	1026	2.34	1027	2.51	1028
3.15	1029	4.68	1030	4.65	1031	3.91	1032
4.06	1033	5.33	1034	5.35	1035	5.36	1036
5.49	1037	3.72	1038	3.72	1039	3.72	1095

Table A9f. Tributary Flows used in Athabasca River Modelling, Pembina River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
4.7	1	4.68	2	4.66	3	4.64	4
4.62	5	4.6	6	4.6	7	4.57	8
4.58	9	4.58	10	4.59	11	4.6	12
4.61	13	4.63	14	4.65	15	4.68	16
4.71	17	4.74	18	4.77	19	4.8	20
4.83	21	4.86	22	4.89	23	4.92	24
4.95	25	4.98	26	5.01	27	5.04	28
5.07	29	5.1	30	5.13	31	5.18	32
5.22	33	5.27	34	5.32	35	5.36	36
5.4	37	5.44	38	5.48	39	5.52	40
5.56	41	5.6	42	5.64	43	5.68	44
5.72	45	5.74	46	5.76	47	5.78	48
5.8	49	5.82	50	5.76	51	5.7	52
5.66	53	5.62	54	5.6	55	5.58	56
5.56	57	5.54	58	5.52	59	5.1	60
5.42	61	5.4	62	5.39	63	5.38	64
5.39	65	5.4	66	5.42	67	5.44	68
5.46	69	5.48	70	5.52	71	5.56	72
5.6	73	5.65	74	5.7	75	5.75	76
5.8	77	5.86	78	5.93	79	6	80
6.1	81	6.2	82	6.3	83	6.45	84
6.6	85	6.8	86	7.05	87	7.45	88
7.85	89	8.6	90	11.3	91	19	92
45	93	80	94	87.8	95	88.9	96
88.3	97	87.6	98	87.2	99	86.5	100
85.5	101	84.5	102	83.5	103	82.5	104
82	105	80.5	106	80.8	107	81	108
80.7	109	80.3	110	77.8	111	75.2	112
73.6	113	74.1	114	79	115	85.5	116
91	117	119	118	151	119	154	120
147	121	143	122	142	123	137	124
127	125	118	126	111	127	103	128
100	129	96.9	130	97.5	131	95.1	132
104	133	137	134	211	135	287	136
299	137	274	138	236	139	198	140
172	141	154	142	142	143	137	144
130	145	126	146	120	147	116	148
117	149	116	150	110	151	103	152
96.1	153	89.5	154	83.9	155	78.3	156
73.6	157	71.9	158	71.9	159	70.3	160
65.8	161	63.6	162	65.2	163	73.4	164
70.7	165	65.1	166	64	167	61.9	168
57.4	169	53.8	170	51.9	171	53	172
58.9	173	73.9	174	71.5	175	68.5	176
65	177	67.1	178	79.7	179	84.6	180
80.1	181	74.3	182	69.8	183	66.9	184
62.7	185	58.4	186	52.4	187	48.1	188
45.2	189	69.5	190	181	191	182	192
156	193	131	194	111	195	97	196

Table A9f. Tributary Flows used in Athabasca River Modelling, Pembina River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
86.2	197	78.9	198	72.3	199	66	200
59.1	201	53.2	202	49.3	203	45.9	204
42.1	205	36.2	206	36.2	207	34.4	208
31.4	209	28.7	210	28.1	211	27.1	212
34.9	213	32.9	214	29.3	215	26.4	216
24.1	217	23.1	218	22.4	219	22	220
20.4	221	19.1	222	19.4	223	18.8	224
19.1	225	19.7	226	19.3	227	18.1	228
17.6	229	20.2	230	30.5	231	39.5	232
37.1	233	31.7	234	27.4	235	25.2	236
22.6	237	20.6	238	19.2	239	18	240
17.7	241	16.9	242	16.3	243	16.6	244
15.8	245	14.8	246	14	247	13.7	248
13.9	249	13.8	250	14.2	251	15.5	252
15	253	13.5	254	12.9	255	12.7	256
12	257	10.6	258	11.9	259	12.3	260
12.9	261	13	262	12.6	263	12.1	264
11.7	265	11.4	266	11.7	267	12.6	268
13.1	269	12.6	270	12.2	271	12.1	272
11.6	273	11.1	274	10.6	275	10.2	276
10	277	9.78	278	9.7	279	9.81	280
9.61	281	9.49	282	9.28	283	9.05	284
9.04	285	9.06	286	9.09	287	8.94	288
8.82	289	8.71	290	8.59	291	8.47	292
8.36	293	8.24	294	8.13	295	8.01	296
7.89	297	7.78	298	7.66	299	7.54	300
7.43	301	7.31	302	7.19	303	7.07	304
7	305	6.97	306	6.94	307	6.92	308
6.92	309	6.95	310	7	311	7.05	312
7.1	313	7.15	314	7.2	315	7.3	316
7.4	317	7.55	318	7.7	319	7.85	320
8.05	321	8.25	322	8.45	323	8.6	324
8.75	325	8.9	326	9	327	9.06	328
9.12	329	9.1	330	9	331	8.85	332
8.65	333	8.45	334	8.2	335	7.95	336
7.7	337	7.5	338	7.3	339	7.1	340
6.9	341	6.7	342	6.55	343	6.45	344
6.35	345	6.25	346	6.2	347	6.15	348
6.12	349	6.09	350	6.07	351	6.07	352
6.03	353	6	354	5.98	355	5.96	356
5.94	357	5.92	358	5.9	359	5.88	360
5.86	361	5.84	362	5.82	363	5.8	364
5.78	365	5.76	366	5.75	367	5.74	368
5.73	369	5.72	370	5.71	371	5.69	372
5.67	373	5.66	374	5.65	375	5.64	376
5.63	377	5.62	378	5.62	379	5.61	380
5.61	381	5.6	382	5.6	383	5.59	384
5.59	385	5.58	386	5.58	387	5.57	388
5.57	389	5.56	390	5.56	391	5.55	392
5.55	393	5.54	394	5.54	395	5.53	396

Table A9f. Tributary Flows used in Athabasca River Modelling, Pembina River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
5.53	397	5.52	398	5.51	399	5.48	400
5.45	401	5.4	402	5.3	403	5.2	404
5.1	405	5.02	406	4.96	407	4.9	408
4.84	409	4.82	410	4.8	411	4.78	412
4.76	413	4.74	414	4.72	415	4.7	416
4.68	417	4.67	418	4.66	419	4.65	420
4.65	421	4.71	422	4.68	423	4.86	424
1.25	425	5.17	426	8.15	427	21.1	428
33.2	429	32.4	430	34.2	431	35.5	432
31	433	28.5	434	23	435	19	436
16.9	437	17.1	438	22.9	439	36.4	440
46.1	441	48.2	442	42.1	443	37.3	444
35	445	37	446	42.3	447	44.5	448
41.5	449	38.3	450	38.1	451	38.4	452
37	453	36	454	37	455	39.7	456
38.5	457	38	458	36.6	459	33.2	460
31.5	461	32.3	462	34.3	463	35.3	464
34.9	465	33.9	466	33.5	467	32.2	468
30.3	469	27.5	470	25.6	471	24.2	472
25.5	473	28.6	474	30	475	33.4	476
37.7	477	37.7	478	37.4	479	37.1	480
37.8	481	38.5	482	39.5	483	39.2	484
38.1	485	37.4	486	36.4	487	36.3	488
35.9	489	35.7	490	33.4	491	31	492
28.6	493	26.4	494	24.7	495	23.5	496
23	497	22.9	498	23.6	499	25.6	500
25.1	501	25.4	502	25.5	503	25.7	504
28.6	505	31.6	506	31.5	507	29.6	508
28.7	509	28.2	510	29.2	511	29.3	512
28.6	513	28.5	514	29.7	515	30.8	516
30.9	517	34.5	518	39.2	519	48.8	520
47.4	521	43.1	522	39.3	523	37.5	524
37	525	37.2	526	36	527	36.2	528
39.4	529	41.9	530	39.2	531	36.1	532
34.1	533	33	534	28.8	535	24.3	536
22	537	20.8	538	19.4	539	17.5	540
16.3	541	14.5	542	13.4	543	12.3	544
11	545	9.73	546	9.21	547	9.09	548
8.7	549	7.98	550	7.77	551	7.78	552
7.18	553	6.45	554	6.41	555	6.52	556
7.34	557	6.89	558	6.71	559	6.55	560
7.02	561	9.47	562	12	563	12.9	564
11.9	565	11.4	566	10.7	567	10.1	568
9.89	569	9.13	570	8.49	571	8.93	572
9.06	573	8.04	574	7.12	575	6.39	576
5.79	577	5.42	578	5.3	579	5.08	580
4.72	581	4.69	582	4.75	583	5.19	584
5.38	585	5.37	586	5.17	587	4.85	588
4.48	589	4.27	590	4.33	591	4.77	592
4.9	593	4.74	594	4.3	595	4.49	596

Table A9f. Tributary Flows used in Athabasca River Modelling, Pembina River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
4.53	597	4.33	598	4.37	599	4.24	600
4.25	601	3.92	602	3.64	603	3.59	604
3.56	605	3.54	606	3.46	607	3.53	608
3.87	609	4.28	610	4.31	611	4.46	612
4.54	613	4.49	614	4.65	615	4.99	616
5.35	617	6.05	618	6.56	619	6.54	620
8.84	621	9.49	622	9.36	623	8.81	624
8.34	625	8.07	626	8.04	627	7.78	628
7.44	629	7.18	630	7.08	631	6.87	632
6.79	633	6.73	634	6.68	635	6.56	636
6.3	637	6.11	638	6	639	5.61	640
5.27	641	5.57	642	5.78	643	5.73	644
5.7	645	5.38	646	5.18	647	5.05	648
4.85	649	4.79	650	4.49	651	4.37	652
3.8	653	3.5	654	3.2	655	3.1	656
3.1	657	3.3	658	3.7	659	4.13	660
5.12	661	5.64	662	5	663	4.46	664
4.17	665	4.14	666	4.26	667	4.16	668
4.18	669	4.14	670	4.22	671	4.29	672
4.28	673	4.2	674	4.08	675	3.96	676
3.84	677	3.72	678	3.62	679	3.52	680
3.42	681	3.32	682	3.22	683	3.12	684
3.02	685	2.94	686	2.86	687	2.78	688
2.7	689	2.62	690	2.54	691	2.47	692
2.41	693	2.35	694	2.3	695	2.25	696
2.2	697	2.15	698	2.11	699	2.07	700
2.03	701	1.99	702	1.95	703	1.9	704
1.85	705	1.8	706	1.75	707	1.7	708
1.65	709	1.6	710	1.55	711	1.5	712
1.46	713	1.42	714	1.4	715	1.38	716
1.36	717	1.34	718	1.32	719	1.3	720
1.28	721	1.26	722	1.24	723	1.22	724
1.2	725	1.18	726	1.16	727	1.14	728
1.12	729	1.1	730	1.1	731	1.1	732
1.1	733	1.1	734	1.1	735	1.1	736
1.1	737	1.1	738	1.1	739	1.1	740
1.1	741	1.1	742	1.1	743	1.1	744
1.1	745	1.1	746	1.1	747	1.1	748
1.1	749	1.1	750	1.1	751	1.1	752
1.1	753	1.1	754	1.1	755	1.1	756
1.1	757	1.1	758	1.12	759	1.14	760
1.17	761	1.2	762	1.23	763	1.26	764
1.29	765	1.32	766	1.35	767	1.38	768
1.4	769	1.42	770	1.44	771	1.46	772
1.48	773	1.5	774	1.52	775	1.54	776
1.56	777	1.56	778	1.56	779	1.56	780
1.56	781	1.56	782	1.56	783	1.53	784
1.49	785	1.45	786	1.4	787	1.35	788
1.3	789	1.2	790	1.2	791	1.18	792
1.16	793	1.16	794	1.64	795	2.44	796

Table A9f. Tributary Flows used in Athabasca River Modelling, Pembina River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
2.39	797	2.55	798	4.05	799	10	800
6	801	5.6	802	5.2	803	5	804
4.95	805	4.9	806	4.7	807	4.5	808
5.27	809	4.66	810	4.37	811	4.27	812
4.24	813	4.27	814	4.04	815	3.84	816
3.86	817	3.95	818	9.02	819	10.7	820
10.7	821	9.31	822	8.91	823	8.78	824
8.98	825	8.45	826	7.92	827	7.69	828
7.6	829	8.75	830	13.6	831	15.6	832
17.6	833	19.9	834	21.6	835	22.9	836
26.9	837	28.6	838	23.7	839	21.9	840
21.2	841	21.7	842	23.7	843	26.2	844
26.2	845	26.2	846	27.1	847	28.5	848
28.4	849	26	850	24.8	851	24.7	852
24.4	853	22.9	854	21.1	855	20.1	856
20.5	857	20.7	858	19.4	859	18.1	860
18.5	861	20.6	862	24	863	25.3	864
23.3	865	20.9	866	18.9	867	17.3	868
16.5	869	15.9	870	15.6	871	14.8	872
13.9	873	13	874	11.8	875	11.6	876
11.7	877	11.9	878	12.1	879	12.3	880
14	881	15.8	882	17.1	883	18	884
16.8	885	15.4	886	14.6	887	13.9	888
12.6	889	11.7	890	11.1	891	10.5	892
10	893	9.69	894	9.19	895	8.74	896
8.24	897	7.97	898	8.6	899	9.19	900
8.18	901	20.1	902	41.3	903	39.1	904
34.7	905	28.9	906	25	907	23.5	908
35	909	78	910	73.8	911	66.5	912
58.8	913	53.6	914	48	915	41.3	916
37.9	917	34.1	918	31.8	919	31.6	920
31.3	921	31.1	922	33.6	923	33.7	924
33.4	925	30.1	926	26.5	927	24.1	928
23.2	929	23.2	930	26.1	931	29.8	932
27.9	933	25.9	934	37.7	935	53.5	936
61.9	937	69.8	938	76	939	77.2	940
78.4	941	70	942	57.6	943	52	944
43.6	945	37.7	946	32.4	947	27.2	948
24.4	949	22.9	950	19.8	951	18.1	952
16.8	953	16.5	954	20.9	955	30.8	956
31.5	957	35.1	958	35.4	959	30.7	960
28.9	961	30.3	962	27.3	963	24.4	964
20.8	965	18.4	966	17.4	967	16.4	968
16.1	969	15.7	970	15.6	971	16.2	972
16	973	17.3	974	21	975	41.5	976
41.1	977	36.5	978	34.8	979	36.3	980
34.7	981	29.6	982	26.6	983	25.1	984
22.9	985	20.3	986	19	987	17.9	988
16.4	989	15.9	990	17.8	991	20.1	992
19.3	993	18.4	994	18.9	995	18.1	996

Table A9f. Tributary Flows used in Athabasca River Modelling, Pembina River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
16.9	997	16.5	998	20.4	999	22.9	1000
21	1001	19	1002	17.8	1003	18	1004
17.6	1005	16.6	1006	15.5	1007	14.6	1008
14	1009	14.1	1010	14.3	1011	14.4	1012
13.9	1013	13.4	1014	12.8	1015	12.7	1016
12.5	1017	12.3	1018	11.9	1019	11.8	1020
11.6	1021	11.4	1022	11.3	1023	11	1024
10.8	1025	10.8	1026	10.8	1027	10.9	1028
10.9	1029	10.9	1030	10.7	1031	8	1032
8.4	1033	9	1034	9.8	1035	10.6	1036
11	1037	9.92	1038	8.5	1039	8	1040
7.5	1041	7	1042	6.5	1043	6	1044
5.8	1045	5.6	1046	5.4	1047	5.2	1048
5	1049	4.9	1050	4.8	1051	4.7	1052
4.7	1053	4.7	1054	4	1055	3.41	1056
3.18	1057	3.1	1058	3	1059	2.89	1060
3.84	1061	4.11	1062	3.88	1063	3.78	1064
4.04	1065	4.4	1066	4.4	1067	4.22	1068
4.32	1069	4.18	1070	4.35	1071	4.56	1072
4.6	1073	4.58	1074	4.37	1075	4.18	1076
3.9	1077	3.8	1078	3.76	1079	3.74	1080
3.95	1081	4.2	1082	4.25	1083	4.39	1084
4.38	1085	4.34	1086	4.3	1087	4.4	1088
4.47	1089	4.52	1090	4.5	1091	4.42	1092
4.32	1093	4.18	1094	3.93	1095		

Table A9g. Tributary Flows used in Athabasca River Modelling, LaBiche River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
1.73	1	1.71	2	1.69	3	1.67	4
1.65	5	1.63	6	1.61	7	1.59	8
1.55	9	1.48	10	1.43	11	1.39	12
1.35	13	1.33	14	1.27	15	1.31	16
1.32	17	1.31	18	1.3	19	1.33	20
1.52	21	1.55	22	1.73	23	1.72	24
1.72	25	1.72	26	1.72	27	1.77	28
1.72	29	1.63	30	1.62	31	1.63	32
1.6	33	1.54	34	1.53	35	1.53	36
1.5	37	1.52	38	1.55	39	1.49	40
1.43	41	1.39	42	1.43	43	1.4	44
1.43	45	1.51	46	1.63	47	1.59	48
1.63	49	1.57	50	1.49	51	1.48	52
1.51	53	1.5	54	1.57	55	1.6	56
1.61	57	1.61	58	1.59	59	1.81	60
1.67	61	1.71	62	1.68	63	1.64	64
1.62	65	1.7	66	1.7	67	1.68	68
1.7	69	1.61	70	1.67	71	1.67	72
1.66	73	1.65	74	1.62	75	1.63	76
1.6	77	1.62	78	1.64	79	1.76	80
1.88	81	1.95	82	2	83	2.02	84
2.1	85	2.09	86	2.03	87	2.08	88
2.32	89	2.67	90	2.87	91	2.75	92
2.77	93	2.91	94	2.75	95	2.53	96
2.61	97	2.94	98	3.4	99	4.36	100
5.32	101	5.6	102	5.93	103	8.13	104
8.25	105	8.36	106	8.39	107	8.35	108
8.45	109	8.37	110	8.32	111	7.96	112
7.62	113	7.48	114	7.44	115	7.58	116
7.52	117	7.17	118	7.1	119	7.5	120
7.59	121	8.1	122	8.27	123	8.21	124
8.07	125	7.83	126	7.63	127	7.82	128
7.79	129	7.28	130	7.27	131	7.4	132
7.64	133	7.55	134	7.43	135	7.63	136
7.74	137	7.92	138	7.67	139	7.43	140
7.23	141	6.98	142	6.55	143	6.43	144
6.87	145	6.87	146	6.77	147	6.1	148
6.05	149	5.98	150	5.56	151	5.2	152
4.8	153	4.6	154	4.55	155	4.45	156
4.45	157	4.43	158	4.42	159	4.45	160
4.5	161	4.6	162	4.65	163	4.63	164
4.5	165	4.3	166	4.1	167	3.95	168
3.75	169	3.55	170	3.35	171	3.2	172
3.12	173	3.23	174	2.76	175	2.45	176
2.36	177	2.14	178	1.89	179	1.84	180
1.78	181	1.8	182	1.8	183	1.42	184
1.34	185	1.2	186	1.01	187	0.981	188
0.987	189	1.04	190	1.08	191	1.03	192
1.04	193	1.27	194	1.41	195	1.36	196
1.32	197	1.35	198	1.54	199	1.43	200

Table A9g. Tributary Flows used in Athabasca River Modelling, LaBiche River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
1.29	201	1.16	202	1.16	203	1.13	204
1.13	205	1.25	206	1.34	207	1.57	208
1.78	209	1.69	210	1.52	211	1.39	212
1.25	213	1.26	214	1.31	215	1.34	216
1.27	217	1.25	218	1.28	219	1.32	220
1.34	221	1.25	222	1.14	223	1.03	224
0.944	225	0.912	226	0.891	227	0.903	228
0.891	229	0.889	230	0.831	231	0.856	232
0.897	233	0.928	234	0.921	235	1.05	236
1.05	237	1.03	238	0.929	239	0.95	240
1.05	241	1.12	242	1.08	243	1.09	244
1.13	245	1.04	246	0.924	247	0.917	248
0.923	249	1	250	1.08	251	1.11	252
1.02	253	0.966	254	1.14	255	1.27	256
1.14	257	1.07	258	1.02	259	1	260
0.974	261	0.959	262	1.18	263	1.55	264
1.4	265	1.27	266	1.32	267	1.45	268
1.33	269	1.29	270	1.51	271	1.67	272
1.6	273	1.36	274	1.34	275	1.42	276
1.38	277	1.36	278	1.45	279	1.76	280
1.64	281	1.43	282	1.3	283	1.39	284
1.42	285	1.45	286	1.16	287	1.18	288
1.42	289	1.25	290	0.849	291	1.13	292
1.21	293	1.22	294	1.04	295	1.02	296
0.989	297	1.16	298	1.09	299	1.01	300
0.947	301	0.825	302	0.778	303	0.836	304
0.942	305	0.95	306	0.9	307	0.939	308
1.02	309	0.913	310	0.894	311	0.894	312
0.865	313	0.819	314	0.796	315	0.787	316
0.75	317	0.762	318	0.786	319	0.78	320
0.781	321	0.836	322	0.826	323	0.764	324
0.767	325	0.763	326	0.775	327	0.809	328
0.819	329	0.809	330	0.77	331	0.757	332
0.745	333	0.674	334	0.634	335	0.632	336
0.594	337	0.596	338	0.538	339	0.494	340
0.465	341	0.447	342	0.468	343	0.491	344
0.496	345	0.498	346	0.507	347	0.52	348
0.622	349	0.704	350	0.727	351	0.709	352
0.697	353	0.715	354	0.75	355	0.757	356
0.747	357	0.749	358	0.721	359	0.708	360
0.683	361	0.653	362	0.637	363	0.612	364
0.602	365	0.615	366	0.675	367	0.742	368
0.78	369	0.765	370	0.74	371	0.73	372
0.796	373	0.85	374	0.875	375	0.895	376
0.88	377	0.86	378	0.803	379	0.738	380
0.728	381	0.73	382	0.784	383	0.825	384
0.831	385	0.831	386	0.875	387	0.848	388
0.838	389	0.806	390	0.816	391	0.821	392
0.873	393	0.918	394	0.948	395	0.999	396
0.977	397	0.926	398	0.884	399	0.901	400

Table A9g. Tributary Flows used in Athabasca River Modelling, LaBiche River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
0.965	401	0.995	402	0.953	403	0.9	404
0.87	405	0.837	406	0.822	407	0.83	408
0.85	409	0.864	410	0.854	411	0.891	412
0.972	413	0.962	414	0.875	415	0.866	416
0.808	417	0.801	418	0.799	419	0.857	420
0.928	421	1.04	422	1.29	423	1.66	424
1.73	425	1.73	426	1.59	427	1.69	428
1.75	429	1.83	430	1.84	431	1.76	432
1.64	433	1.71	434	1.71	435	1.77	436
1.84	437	2.05	438	2.56	439	2.94	440
3.48	441	4.18	442	4.73	443	5.03	444
5.15	445	5.46	446	6.08	447	5.16	448
5.27	449	4.85	450	4.65	451	4.61	452
4.92	453	5.01	454	5.41	455	5.28	456
5.24	457	5	458	4.93	459	4.92	460
4.71	461	4.66	462	4.44	463	4.25	464
4.03	465	3.95	466	4.11	467	4.23	468
4.5	469	4.68	470	4.74	471	4.72	472
4.21	473	4.12	474	4.77	475	4.75	476
4.49	477	4.42	478	4.39	479	4.32	480
4.54	481	4.33	482	4.03	483	4.18	484
4.44	485	3.92	486	3.58	487	3.91	488
4.15	489	4.26	490	4.06	491	3.95	492
4.57	493	4.72	494	4.58	495	4.67	496
3.89	497	4.24	498	3.68	499	3.33	500
3.64	501	3.56	502	3.18	503	2.94	504
2.8	505	2.93	506	2.98	507	2.85	508
2.74	509	2.68	510	2.73	511	2.57	512
1.99	513	1.81	514	1.9	515	1.76	516
1.7	517	2.23	518	2.24	519	1.48	520
1.24	521	1.21	522	1.27	523	1.43	524
1.35	525	1.18	526	1.09	527	0.963	528
1.08	529	1.15	530	1.15	531	1.11	532
1.1	533	1.09	534	0.935	535	0.816	536
0.988	537	1.05	538	0.835	539	0.612	540
0.527	541	0.465	542	0.413	543	0.411	544
0.43	545	0.364	546	0.328	547	0.385	548
0.386	549	0.368	550	0.345	551	0.368	552
0.464	553	0.481	554	0.464	555	0.434	556
0.381	557	0.313	558	0.289	559	0.284	560
0.297	561	0.313	562	0.338	563	0.426	564
0.493	565	0.499	566	0.427	567	0.379	568
0.38	569	0.42	570	0.489	571	0.606	572
0.743	573	0.84	574	1.04	575	0.949	576
0.764	577	0.623	578	0.537	579	0.48	580
0.431	581	0.404	582	0.41	583	0.441	584
0.458	585	0.399	586	0.38	587	0.342	588
0.321	589	0.304	590	0.299	591	0.348	592
0.359	593	0.356	594	0.368	595	0.374	596
0.425	597	0.477	598	0.476	599	0.386	600

Table A9g. Tributary Flows used in Athabasca River Modelling, LaBiche River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
0.38	601	0.38	602	0.368	603	0.384	604
0.361	605	0.305	606	0.292	607	0.297	608
0.288	609	0.319	610	0.308	611	0.291	612
0.305	613	0.296	614	0.31	615	0.306	616
0.344	617	0.378	618	0.362	619	0.372	620
0.391	621	0.366	622	0.324	623	0.288	624
0.269	625	0.261	626	0.27	627	0.315	628
0.28	629	0.248	630	0.25	631	0.247	632
0.311	633	0.294	634	0.255	635	0.23	636
0.248	637	0.293	638	0.324	639	0.35	640
0.353	641	0.473	642	0.374	643	0.32	644
0.322	645	0.325	646	0.343	647	0.383	648
0.397	649	0.401	650	0.393	651	0.388	652
0.398	653	0.393	654	0.393	655	0.389	656
0.401	657	0.431	658	0.455	659	0.983	660
0.557	661	0.468	662	0.483	663	0.493	664
0.508	665	0.545	666	0.57	667	0.583	668
0.612	669	0.605	670	0.597	671	0.569	672
0.537	673	0.508	674	0.486	675	0.396	676
0.419	677	0.394	678	0.383	679	0.386	680
0.368	681	0.332	682	0.324	683	0.371	684
0.409	685	0.372	686	0.342	687	0.337	688
0.34	689	0.312	690	0.3	691	0.287	692
0.279	693	0.273	694	0.259	695	0.235	696
0.242	697	0.238	698	0.248	699	0.26	700
0.261	701	0.248	702	0.228	703	0.21	704
0.185	705	0.168	706	0.157	707	0.13	708
0.127	709	0.127	710	0.11	711	0.099	712
0.1	713	0.101	714	0.099	715	0.091	716
0.077	717	0.059	718	0.048	719	0.04	720
0.035	721	0.034	722	0.033	723	0.034	724
0.037	725	0.036	726	0.038	727	0.032	728
0.019	729	0.017	730	0.015	731	0.015	732
0.014	733	0.014	734	0.014	735	0.013	736
0.011	737	0.008	738	0.006	739	0.003	740
0.001	741	0.001	742	0.001	743	0.001	746
0.001	747	0.002	748	0.002	749	0.003	750
0.004	751	0.004	752	0.003	753	0.002	754
0.002	755	0.001	756	0.001	757	0.001	758
0.001	793	0.001	794	0.004	795	0.009	796
0.011	797	0.007	798	0.002	799	0.001	800
0.001	810	0.001	811	0.001	812	0.012	813
0.023	814	0.051	815	0.218	816	0.5	817
0.567	818	0.392	819	0.2	820	0.21	821
0.243	822	0.293	823	0.728	824	0.967	825
0.788	826	1.25	827	1.49	828	1.6	829
1.92	830	2.06	831	2.46	832	2.56	833
2.86	834	3.61	835	4.09	836	2.7	837
2.32	838	2.29	839	2.25	840	2.28	841
2.28	842	2.23	843	1.81	844	2.19	845

Table A9g. Tributary Flows used in Athabasca River Modelling, LaBiche River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
2.29	846	2.35	847	2.39	848	2.4	849
2.31	850	2.16	851	2.34	852	1.87	853
1.94	854	2.26	855	2.52	856	2.48	857
2.76	858	3.1	859	4.32	860	4.73	861
4.15	862	3.36	863	2.83	864	2.41	865
2.13	866	1.86	867	1.91	868	1.77	869
1.6	870	1.51	871	0.958	872	0.639	873
0.766	874	0.683	875	0.612	876	0.514	877
0.485	878	0.429	879	0.433	880	0.469	881
0.492	882	0.585	883	0.578	884	0.622	885
0.649	886	0.68	887	0.623	888	0.522	889
0.517	890	0.557	891	0.637	892	0.586	893
0.607	894	0.5	895	0.448	896	0.561	897
0.776	898	0.934	899	0.863	900	0.857	901
0.86	902	0.823	903	0.785	904	0.671	905
0.498	906	0.403	907	0.323	908	0.308	909
0.362	910	0.483	911	0.552	912	0.49	913
0.302	914	0.386	915	0.343	916	0.299	917
0.327	918	0.353	919	0.355	920	0.328	921
0.294	922	0.265	923	0.241	924	0.256	925
0.265	926	0.256	927	0.251	928	0.264	929
0.279	930	0.267	931	0.299	932	0.305	933
0.245	934	0.299	935	0.319	936	0.216	937
0.229	938	0.242	939	0.259	940	0.264	941
0.238	942	0.209	943	0.177	944	0.181	945
0.201	946	0.188	947	0.21	948	0.222	949
0.251	950	0.277	951	0.269	952	0.267	953
0.302	954	0.298	955	0.48	956	0.335	957
0.378	958	0.296	959	0.429	960	0.433	961
0.419	962	0.449	963	0.457	964	1.46	965
0.764	966	0.554	967	0.497	968	0.489	969
0.88	970	1.77	971	2.46	972	2.89	973
3.44	974	3.13	975	2.61	976	2.23	977
1.83	978	1.5	979	1.31	980	1.3	981
1.05	982	0.842	983	0.81	984	0.782	985
0.604	986	0.49	987	0.677	988	0.391	989
0.329	990	0.36	991	0.412	992	0.446	993
0.525	994	0.62	995	0.497	996	0.525	997
0.566	998	0.551	999	0.565	1000	0.556	1001
0.542	1002	0.569	1003	0.641	1004	0.506	1005
0.44	1006	0.46	1007	0.505	1008	0.564	1009
0.533	1010	0.511	1011	0.543	1012	0.555	1013
0.569	1014	0.566	1015	0.574	1016	0.591	1017
0.6	1018	0.623	1019	0.632	1020	0.629	1021
0.669	1022	0.669	1023	0.619	1024	0.621	1025
0.651	1026	0.687	1027	0.711	1028	0.67	1029
0.704	1030	0.696	1031	0.474	1032	0.502	1033
0.63	1034	0.631	1035	0.664	1036	0.678	1037
0.668	1038	0.736	1039	0.627	1040	0.602	1041
0.577	1042	0.568	1043	0.536	1044	0.513	1045

Table A9g. Tributary Flows used in Athabasca River Modelling, LaBiche River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
0.521	1046	0.515	1047	0.485	1048	0.473	1049
0.413	1050	0.386	1051	0.336	1052	0.325	1053
0.364	1054	0.372	1055	0.283	1056	0.284	1057
0.275	1058	0.225	1059	0.21	1060	0.216	1061
0.233	1062	0.24	1063	0.225	1064	0.208	1065
0.216	1066	0.228	1067	0.221	1068	0.213	1069
0.208	1070	0.206	1071	0.208	1072	0.21	1073
0.213	1074	0.22	1075	0.215	1076	0.211	1077
0.207	1078	0.202	1079	0.197	1080	0.2	1081
0.218	1082	0.237	1083	0.264	1084	0.237	1085
0.24	1086	0.259	1087	0.273	1088	0.27	1089
0.238	1090	0.223	1091	0.241	1092	0.267	1093
0.282	1094	0.299	1095				

Table A9h. Tributary Flows used in Athabasca River Modelling, House River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
0.474	1	0.474	51	0.474	52	0.487	53
0.478	54	0.487	55	0.488	56	0.494	57
0.497	58	0.492	59	0.46	60	0.46	61
0.459	62	0.46	63	0.465	64	0.475	65
0.485	66	0.499	67	0.518	68	0.525	69
0.53	70	0.535	71	0.538	72	0.545	73
0.562	74	0.58	75	0.59	76	0.58	77
0.57	78	0.558	79	0.56	80	0.558	81
0.55	82	0.545	83	0.542	84	0.544	85
0.56	86	0.575	87	0.59	88	0.598	89
0.605	90	0.62	91	0.67	92	0.696	93
1.06	94	1.32	95	1.63	96	1.94	97
2.25	98	2.54	99	2.65	100	3.13	101
4.32	102	4.74	103	4.33	104	4.18	105
3.55	106	3.33	107	2.94	108	2.81	109
2.61	110	2.35	111	2.17	112	1.88	113
1.8	114	1.73	115	1.65	116	1.61	117
1.52	118	1.47	119	1.42	120	1.38	121
1.32	122	1.26	123	1.1	124	1.05	125
1.04	126	1.03	127	1.03	128	1.02	129
1.22	130	1.26	131	1.32	132	1.48	133
1.7	134	2.4	135	3.31	136	3.93	137
4.09	138	3.96	139	3.66	140	3.29	141
3.01	142	2.78	143	2.75	144	2.61	145
2.73	146	2.55	147	2.37	148	2.27	149
2.11	150	2.01	151	1.85	152	1.74	153
2.19	154	2.73	155	3.26	156	3.26	157
3.13	158	3.39	159	5.64	160	7.52	161
8.23	162	10.1	163	14.2	164	25.5	165
25.5	166	24.3	167	25.1	168	24.5	169
23.5	170	23.3	171	22.4	172	20.8	173
19.3	174	18.4	175	17.3	176	16.5	177
16.1	178	15.8	179	16.2	180	17.1	181
18.4	182	18.4	183	17.8	184	16.9	185
16	186	14.8	187	13.7	188	12.7	189
11.9	190	11.1	191	10.4	192	9.7	193
8.96	194	8.53	195	8	196	7.48	197
7.03	198	6.65	199	6.13	200	5.78	201
5.19	202	4.76	203	4.29	204	3.63	205
2.92	206	2.56	207	2.43	208	2	209
1.79	210	1.86	211	1.88	212	1.84	213
1.75	214	1.67	215	1.59	216	1.46	217
1.37	218	1.32	219	1.23	220	1.16	221
1.15	222	1.17	223	1.14	224	1.03	225
0.982	226	0.942	227	0.949	228	0.897	229
0.858	230	0.758	231	0.666	232	0.69	233
0.646	234	0.673	235	0.799	236	0.803	237
0.774	238	0.704	239	0.644	240	0.679	241
0.689	242	0.688	243	0.725	244	0.819	245
0.915	246	0.981	247	1.04	248	1.03	249

Table A9h. Tributary Flows used in Athabasca River Modelling, House River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
0.993	250	1	251	1	252	0.984	253
0.926	254	0.895	255	0.884	256	0.844	257
0.836	258	0.875	259	0.894	260	0.888	261
0.89	262	0.861	263	0.855	264	0.856	265
0.854	266	0.857	267	0.823	268	0.848	269
0.835	270	0.789	271	0.781	272	0.766	273
0.8	274	0.845	275	0.846	276	0.847	277
0.859	278	0.876	279	0.877	280	0.894	281
0.864	282	0.856	283	0.846	284	0.833	285
0.823	286	0.831	287	0.894	288	0.899	289
0.803	290	0.71	291	0.63	292	0.57	293
0.592	294	0.55	295	0.532	296	0.518	297
0.5	298	0.485	299	0.467	300	0.458	301
0.45	302	0.443	303	0.439	304	0.233	305
0.233	365	0.233	366	0.233	367	0.233	421
0.233	422	0.256	423	0.305	424	0.258	425
0.57	426	0.7	427	0.62	428	0.55	429
0.525	430	0.545	431	0.525	432	0.5	433
0.496	434	0.499	435	0.505	436	0.54	437
0.62	438	0.695	439	0.985	440	0.952	441
0.945	442	0.868	443	0.803	444	0.699	445
0.7	446	0.782	447	0.83	448	1.06	449
1.31	450	1.41	451	1.67	452	2.09	453
2.28	454	2.26	455	2.12	456	2.13	457
2.39	458	3.05	459	3.22	460	3.7	461
3.15	462	2.78	463	2.53	464	2.4	465
2.41	466	2.47	467	2.58	468	2.68	469
2.87	470	2.98	471	3.22	472	3.24	473
3.45	474	3.56	475	2.95	476	2.13	477
2.07	478	1.95	479	1.84	480	1.82	481
1.81	482	1.9	483	2.04	484	2.1	485
2.55	486	2.96	487	3.14	488	3.2	489
3.21	490	3.11	491	3	492	2.84	493
2.57	494	2.69	495	2.99	496	3.05	497
3.1	498	3.29	499	3.55	500	3.81	501
3.91	502	4	503	3.89	504	3.69	505
3.55	506	3.48	507	3.41	508	3.32	509
3.18	510	3.05	511	2.94	512	2.78	513
2.73	514	2.73	515	2.61	516	2.51	517
2.53	518	3.47	519	4.38	520	6.64	521
8.46	522	7.88	523	6.8	524	5.99	525
5.35	526	4.73	527	4.26	528	3.79	529
3.41	530	2.99	531	2.62	532	2.29	533
2.07	534	1.89	535	1.85	536	1.91	537
1.79	538	1.68	539	1.56	540	1.53	541
1.57	542	1.49	543	1.45	544	1.5	545
1.4	546	1.58	547	1.53	548	1.51	549
1.42	550	1.28	551	1.18	552	1.03	553
0.945	554	0.845	555	0.707	556	0.606	557
0.481	558	0.358	559	0.263	560	0.218	561

Table A9h. Tributary Flows used in Athabasca River Modelling, House River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
0.241	562	0.272	563	0.395	564	0.562	565
0.525	566	0.422	567	0.361	568	0.312	569
0.29	570	0.293	571	0.383	572	0.601	573
0.682	574	0.609	575	0.558	576	0.497	577
0.43	578	0.346	579	0.302	580	0.28	581
0.29	582	0.294	583	0.291	584	0.27	585
0.218	586	0.232	587	0.248	588	0.238	589
0.229	590	0.213	591	0.187	592	0.174	593
0.188	594	0.17	595	0.133	596	0.127	597
0.118	598	0.106	599	0.107	600	0.101	601
0.103	602	0.113	603	0.124	604	0.106	605
0.134	606	0.166	607	0.184	608	0.201	609
0.287	610	0.315	611	0.302	612	0.319	613
0.336	614	0.377	615	0.3	616	0.346	617
0.348	618	0.367	619	0.426	620	0.487	621
0.494	622	0.517	623	0.571	624	0.595	625
0.567	626	0.564	627	0.659	628	0.689	629
0.693	630	0.725	631	0.792	632	1.03	633
1.19	634	1.37	635	1.38	636	1.41	637
1.47	638	1.43	639	1.41	640	1.4	641
1.39	642	1.36	643	1.35	644	1.35	645
1.35	646	1.35	647	1.34	648	1.37	649
1.46	650	1.43	651	1.38	652	1.35	653
1.29	654	1.25	655	1.17	656	1.12	657
1.07	658	1.02	659	1.01	660	1	661
1.01	662	1.02	663	1.04	664	1.07	665
1.1	666	1.1	667	1.09	668	1.07	669
1.01	670	0.999	671	0.965	672	0.945	673
0.935	674	0.252	675	0.252	730	0.252	731
0.252	732	0.252	777	0.252	778	0.25	779
0.25	780	0.249	781	0.249	782	0.248	783
0.248	784	0.247	785	0.248	786	0.248	787
0.249	788	0.25	789	0.26	790	0.26	791
0.261	792	0.26	793	0.258	794	0.258	795
0.27	796	0.3	797	0.348	798	0.369	799
0.388	800	0.315	801	0.277	802	0.23	803
0.198	804	0.178	805	0.169	806	0.161	807
0.152	808	0.15	809	0.16	810	0.185	811
0.22	812	0.24	813	0.282	814	0.299	815
0.32	816	0.36	817	0.39	818	0.432	819
0.683	820	1.95	821	2.01	822	2.11	823
2.2	824	2.24	825	2.6	826	2.93	827
3.09	828	3.06	829	2.75	830	2.54	831
2.54	832	2.97	833	2.92	834	3.71	835
4.83	836	5.19	837	5.8	838	4.28	839
3.74	840	3.3	841	2.49	842	1.81	843
1.63	844	1.5	845	1.38	846	1.53	847
2.06	848	2.56	849	2.71	850	1.99	851
1.86	852	1.84	853	1.84	854	1.95	855
1.87	856	1.87	857	2.69	858	6.24	859

Table A9h. Tributary Flows used in Athabasca River Modelling, House River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
8.72	860	10.6	861	10.8	862	10.4	863
9.27	864	8.22	865	7.48	866	6.87	867
6.56	868	6.11	869	5.72	870	5.42	871
5.13	872	4.89	873	4.63	874	4.34	875
4.04	876	3.83	877	3.57	878	3.37	879
3.13	880	2.84	881	2.68	882	2.5	883
2.43	884	2.24	885	2.09	886	1.94	887
1.78	888	1.59	889	1.4	890	1.33	891
1.27	892	1.17	893	1.19	894	1.34	895
1.35	896	1.16	897	0.986	898	0.825	899
0.69	900	0.55	901	0.494	902	0.777	903
1.45	904	1.59	905	1.8	906	1.82	907
1.73	908	1.62	909	1.56	910	1.77	911
2.17	912	2.68	913	3.36	914	3.65	915
3.64	916	3.42	917	3.06	918	2.88	919
2.92	920	2.98	921	2.87	922	2.7	923
2.6	924	2.56	925	2.52	926	2.58	927
2.68	928	2.9	929	3.11	930	3.27	931
3.42	932	4.63	933	5.59	934	5.91	935
5.91	936	6.37	937	6.87	938	7.45	939
7.77	940	7.27	941	6.6	942	5.98	943
5.55	944	5.21	945	4.98	946	4.76	947
4.63	948	5.46	949	8.09	950	12.3	951
13.5	952	12.4	953	11.1	954	9.91	955
8.8	956	7.8	957	6.86	958	6.08	959
5.45	960	4.79	961	4.26	962	3.89	963
3.57	964	3.22	965	3.18	966	3.29	967
3.23	968	2.93	969	2.67	970	2.54	971
2.37	972	2.23	973	2.12	974	2.07	975
2.07	976	2.01	977	1.96	978	2.01	979
1.89	980	1.88	981	1.93	982	1.92	983
1.85	984	1.82	985	1.72	986	1.67	987
1.69	988	1.67	989	1.61	990	1.59	991
1.56	992	1.48	993	1.38	994	1.34	995
1.28	996	1.29	997	1.44	998	1.54	999
1.65	1000	1.69	1001	1.74	1002	1.78	1003
1.75	1004	1.76	1005	1.73	1006	1.68	1007
1.61	1008	1.56	1009	1.54	1010	1.49	1011
1.46	1012	1.45	1013	1.43	1014	1.4	1015
1.38	1016	1.37	1017	1.35	1018	1.36	1019
1.36	1020	1.33	1021	1.31	1022	1.3	1023
1.3	1024	1.29	1025	1.28	1026	1.26	1027
1.24	1028	1.36	1029	1.3	1030	1.29	1031
1.25	1032	1.23	1033	1.25	1034	1.27	1035
1.29	1036	1.29	1037	1.29	1095		

Table A9i. Tributary Flows used in Athabasca River Modelling, Clearwater River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
45.6	1	45	2	44.3	3	43.8	4
43.2	5	42.6	6	42.3	7	42.2	8
42.2	9	41.9	10	41.6	11	41.3	12
41	13	40.5	14	40.4	15	40.1	16
40.2	17	41.3	18	41.9	19	42.1	20
42.7	21	43	22	42.7	23	42.7	24
43.2	25	43.3	26	43.8	27	43.9	28
43.7	29	43.5	30	43.3	31	43.3	32
43.5	33	43.7	34	43.3	35	43	36
43	37	43.2	38	43.2	39	43.3	40
43	41	43	42	43.1	43	43.4	44
43.3	45	43.2	46	42.9	47	42.9	48
42.8	49	42.7	50	42.5	51	42.2	52
42.1	53	42.2	54	42.4	55	42.8	56
42.8	57	42.4	58	42.3	59	47.5	60
42.1	61	42	62	42.1	63	42	64
41.9	65	41.9	66	41.7	67	41.5	68
41.4	69	41.2	70	41	71	41	72
41.2	73	41.4	74	41.4	75	41.5	76
41.5	77	41.7	78	41.8	79	41.6	80
42.1	81	43.8	82	44.5	83	44.7	84
44.8	85	45.3	86	45.4	87	46.1	88
46.6	89	47.5	90	48.4	91	49.2	92
50.4	93	53.3	94	57.5	95	61.1	96
64.9	97	70.3	98	76.2	99	83.1	100
90	101	99	102	110	103	120	104
134	105	148	106	162	107	164	108
164	109	160	110	159	111	158	112
155	113	151	114	148	115	146	116
144	117	138	118	131	119	128	120
125	121	122	122	120	123	117	124
116	125	114	126	112	127	110	128
109	129	111	130	113	131	117	132
121	133	123	134	125	135	129	136
134	137	137	138	137	139	136	140
135	141	135	142	133	143	130	144
128	145	126	146	123	147	121	148
119	149	117	150	114	151	112	152
109	153	113	154	130	155	143	156
157	157	166	158	178	159	187	160
190	161	189	162	210	163	283	164
326	165	345	166	358	167	356	168
353	169	353	170	349	171	341	172
334	173	338	174	327	175	312	176
297	177	283	178	270	179	260	180
252	181	249	182	245	183	237	184
228	185	229	186	222	187	214	188
207	189	201	190	194	191	187	192
186	193	201	194	205	195	204	196
200	197	197	198	198	199	193	200

Table A9i. Tributary Flows used in Athabasca River Modelling, Clearwater River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
187	201	180	202	173	203	167	204
160	205	154	206	147	207	142	208
139	209	136	210	132	211	128	212
125	213	121	214	118	215	116	216
113	217	110	218	106	219	103	220
100	221	97.5	222	95.4	223	93.1	224
91	225	88.4	226	87	227	85.9	228
84.4	229	82.1	230	80.5	231	79.5	232
78.4	233	76.9	234	75.4	235	74.7	236
75.1	237	73.3	238	71.6	239	70.9	240
69.9	241	69.5	242	69.7	243	74.3	244
80.9	245	80.9	246	78.3	247	77.5	248
77.5	249	77.9	250	78	251	77.8	252
77.2	253	76.7	254	76.1	255	76.2	256
76.7	257	76	258	75.6	259	74.8	260
74.2	261	74.3	262	74	263	73	264
72.9	265	72.3	266	71.8	267	71.5	268
71.3	269	71.4	270	70.6	271	70.3	272
69.4	273	69	274	69.1	275	69.1	276
68.8	277	68.4	278	68.6	279	68.3	280
68.2	281	67	282	66.6	283	66.4	284
66.2	285	66.2	286	65.8	287	66	288
66.1	289	66	290	63.9	291	62.1	292
64	293	63.2	294	62.8	295	62.5	296
63	297	63.6	298	63.8	299	61.5	300
57	301	56.5	302	58	303	60.5	304
62.5	305	66	306	67.5	307	68	308
67.5	309	67	310	66.5	311	66	312
66	313	66.5	314	66.8	315	67.2	316
68	317	70	318	71.5	319	73	320
74	321	73	322	72.5	323	69	324
66	325	64	326	62.5	327	61.5	328
59	329	57.5	330	56.5	331	56	332
55	333	54	334	51.5	335	48	336
47	337	45.8	338	46	339	46.5	340
47	341	48	342	48.7	343	49	344
49.2	345	49.4	346	49.5	347	49.5	348
49.3	349	49.3	350	49.2	351	49.3	352
49.3	353	49.5	354	50.2	355	50.1	356
49.6	357	49.4	358	49.2	359	49.3	360
49.2	361	49.3	362	49.4	363	49.3	364
49.5	365	49	366	49.5	367	49.8	368
49.6	369	49.2	370	49	371	49	372
49	373	49	374	49	375	49.1	376
49.2	377	49.2	378	48.9	379	48.8	380
48.6	381	48.7	382	49	383	49.1	384
49	385	48.8	386	48.6	387	48.4	388
48.3	389	48.4	390	48.5	391	48.6	392
48.6	393	48.4	394	48.6	395	49	396
49	397	48.5	398	48.2	399	48.1	400

Table A9i. Tributary Flows used in Athabasca River Modelling, Clearwater River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
48.1	401	48	402	47.9	403	47.8	404
47.6	405	47.6	406	47.5	407	47.5	408
47.8	409	47.8	410	48	411	48	412
48	413	48	414	48	415	48	416
48	417	48.1	418	48.2	419	48.5	420
48.8	421	49	422	48.8	423	48.4	424
39	425	46.8	426	46	427	45.5	428
44.8	429	44.5	430	44.7	431	44.2	432
44.5	433	44.9	434	45.6	435	45.7	436
45.9	437	46	438	46	439	46	440
46.2	441	46.2	442	46.8	443	47	444
47.2	445	47.2	446	47.2	447	47.5	448
48	449	48.7	450	49.5	451	51	452
56	453	58.2	454	60.8	455	62	456
64	457	66	458	68.2	459	72	460
76	461	80.3	462	83.7	463	85.8	464
88	465	92	466	95	467	98	468
3	469	3	470	7	471	10	472
14	473	18	474	22	475	24	476
28	477	31	478	35	479	40	480
42	481	52	482	58	483	63	484
65	485	69	486	75	487	78	488
80	489	82	490	85	491	83	492
80	493	78	494	75	495	69	496
67	497	65	498	62	499	61	500
56	501	55	502	55	503	52	504
50	505	49	506	48	507	46	508
46	509	45	510	44	511	41	512
38	513	32	514	31	515	29	516
24	517	25	518	49	519	64	520
67	521	69	522	69	523	67	524
65	525	61	526	54	527	49	528
45	529	41	530	35	531	29	532
24	533	22	534	20	535	22	536
37	537	37	538	33	539	30	540
26	541	20	542	20	543	25	544
21	545	17	546	23	547	17	548
8	549	98.5	550	93.3	551	90.7	552
86.6	553	83.1	554	80.7	555	76.9	556
75.4	557	74.6	558	74.5	559	73.3	560
71.2	561	70.8	562	70	563	72.1	564
75.2	565	74.8	566	74.1	567	73.1	568
72.5	569	70.7	570	70	571	69.3	572
71.5	573	72.3	574	69.8	575	68.9	576
67.1	577	65.4	578	66.2	579	64.1	580
67.4	581	65.3	582	60.9	583	60.7	584
61.6	585	61.5	586	61.6	587	58.7	588
57.7	589	57.4	590	56.9	591	56.2	592
54.4	593	53.2	594	52.3	595	53.5	596
55.4	597	55.8	598	56.9	599	56.9	600

Table A9i. Tributary Flows used in Athabasca River Modelling, Clearwater River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
56.8	601	55.8	602	55.1	603	54.8	604
54.3	605	54.2	606	53.6	607	54.4	608
56.5	609	57.5	610	58.6	611	59.5	612
59.2	613	58.3	614	57.5	615	57.8	616
58.9	617	58.9	618	59.6	619	60.3	620
62.8	621	68.8	622	73.5	623	77.5	624
80.2	625	80.7	626	81.4	627	81.9	628
82.3	629	82.8	630	84.1	631	84.5	632
90.8	633	3	634	3	635	5	636
6	637	8	638	8	639	8	640
6	641	4	642	2	643	99.6	644
98.1	645	96.8	646	95.8	647	94.5	648
93.9	649	92.7	650	91.7	651	90.6	652
88.8	653	85.9	654	82.7	655	80	656
80	657	80.5	658	81.8	659	81.9	660
81.9	661	80.5	662	80.2	663	80.9	664
81.5	665	82	666	82.8	667	82	668
82.2	669	80.7	670	80.8	671	80.3	672
80	673	79.2	674	78.7	675	76.1	676
78	677	75.8	678	72.5	679	71	680
68.5	681	66.2	682	65	683	63.5	684
61.9	685	60.5	686	59.4	687	58.7	688
58.2	689	57.9	690	57.1	691	57	692
56	693	55.2	694	54.6	695	54.2	696
54	697	53.8	698	53	699	52	700
51.5	701	51	702	50.7	703	50	704
49.8	705	49	706	48.5	707	48.2	708
48	709	46	710	46.2	711	46.4	712
46.4	713	46	714	45.7	715	45	716
44	717	43	718	43	719	42	720
42.3	721	42	722	41.9	723	41.9	724
41.9	725	42.2	726	42	727	41.9	728
41.8	729	41.7	730	41.8	731	41	732
40.9	733	40.6	734	40.5	735	40.6	736
40	737	39.9	738	39.4	739	38.7	740
38.4	741	38.1	742	38	743	38	744
38.1	745	38.2	746	38.6	747	38.7	748
38.4	749	38.1	750	38.1	751	38	752
38	753	38	754	37.9	755	38	756
38.1	757	38.2	758	38.5	759	38.2	760
38	761	38	762	38	763	37.9	764
37.9	765	38	766	38	767	38.2	768
38.4	769	38.5	770	38.7	771	38.2	772
38.2	773	38.5	774	38.2	775	37.8	776
37.8	777	37.6	778	37.5	779	37.8	780
37.6	781	37.9	782	38	783	38.1	784
38.4	785	38.7	786	39	787	39.2	788
39.2	789	38.9	790	38.9	791	38.7	792
38.6	793	38.5	794	38.6	795	39	796
39.9	797	40.2	798	41.7	799	41.9	800

Table A9i. Tributary Flows used in Athabasca River Modelling, Clearwater River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
42.2	801	43.3	802	43.9	803	44.3	804
44.9	805	45.3	806	45.9	807	46.1	808
46.9	809	47.8	810	48.1	811	49.2	812
49.9	813	50.3	814	51.2	815	52	816
52.6	817	53.5	818	54	819	54.9	820
55.9	821	57.4	822	58.2	823	59	824
60	825	62.6	826	62.9	827	63.7	828
65.2	829	66.5	830	68.2	831	70	832
74	833	83	834	89.9	835	95	836
103	837	114	838	123	839	124	840
123	841	122	842	120	843	118	844
117	845	118	846	119	847	119	848
118	849	118	850	118	851	118	852
118	853	117	854	116	855	115	856
116	857	122	858	133	859	143	860
142	861	144	862	148	863	148	864
145	865	140	866	136	867	131	868
127	869	123	870	120	871	116	872
112	873	110	874	108	875	105	876
104	877	102	878	99.6	879	97.2	880
94.8	881	92.5	882	89.6	883	87.5	884
84.8	885	82.5	886	80.8	887	79.5	888
77.4	889	76.6	890	76.7	891	79.3	892
82	893	83.8	894	83.3	895	81.7	896
80.4	897	79	898	77.4	899	75.4	900
73.8	901	72.1	902	72.6	903	74.4	904
74.1	905	74	906	73.9	907	73.8	908
73	909	71.1	910	71.1	911	73.4	912
78.6	913	82.7	914	83.8	915	83.9	916
82.2	917	80.9	918	79.6	919	79.7	920
79.5	921	79.9	922	80.9	923	81.9	924
81.3	925	81.3	926	80	927	78.9	928
76.8	929	74.8	930	73.8	931	74.7	932
80	933	85.9	934	88.6	935	85.9	936
86.2	937	91.5	938	102	939	109	940
112	941	124	942	133	943	145	944
152	945	156	946	158	947	157	948
159	949	159	950	163	951	166	952
169	953	167	954	167	955	166	956
162	957	161	958	158	959	153	960
149	961	144	962	139	963	136	964
134	965	132	966	132	967	130	968
129	969	128	970	126	971	123	972
121	973	119	974	117	975	116	976
115	977	115	978	115	979	116	980
116	981	116	982	115	983	114	984
111	985	109	986	107	987	106	988
105	989	104	990	103	991	102	992
101	993	99.4	994	98.7	995	97.4	996
97.1	997	99.2	998	101	999	104	1000

Table A9i. Tributary Flows used in Athabasca River Modelling, Clearwater River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
105	1001	106	1002	108	1003	106	1004
107	1005	108	1006	106	1007	105	1008
106	1009	105	1010	104	1011	103	1012
102	1013	102	1014	102	1015	101	1016
100	1017	99.5	1018	99.1	1019	99	1020
98.7	1021	99	1022	98.2	1023	98.1	1024
98.4	1025	97.6	1026	97.2	1027	96.4	1028
95.4	1029	96	1030	95.2	1031	94.9	1032
94.3	1033	89.4	1034	86	1035	85	1036
84	1037	83	1038	82	1039	82	1040
81	1041	81	1042	81.5	1043	82	1044
82.5	1045	83	1046	82	1047	81	1048
80	1049	79	1050	78	1051	76	1052
74	1053	72	1054	68	1055	67	1056
66	1057	66	1058	67	1059	67	1060
67	1061	67	1062	69.5	1063	68	1064
67.5	1065	67	1066	66	1067	65.5	1068
65	1069	65	1070	64	1071	64	1072
63.7	1073	62.4	1074	60.7	1075	60.1	1076
59.5	1077	59.3	1078	59.6	1079	60.1	1080
59.9	1081	59.8	1082	59.5	1083	58.9	1084
58.6	1085	58.4	1086	58.2	1087	57.5	1088
57	1089	56.8	1090	56.2	1091	55.7	1092
55.4	1093	55.1	1094	54.8	1095		

Table A9j. Tributary Flows used in Athabasca River Modelling, Muskeg River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
0.48	1	0.48	59	0.48	60	0.282	61
0.27	62	0.26	63	0.26	64	0.25	65
0.24	66	0.25	67	0.26	68	0.3	69
0.36	70	0.38	71	0.42	72	0.48	73
0.56	74	0.6	75	0.64	76	0.68	77
0.69	78	0.7	79	0.68	80	0.66	81
0.6	82	0.56	83	0.48	84	0.42	85
0.4	86	0.42	87	0.48	88	0.52	89
0.75	90	1	91	1.3	92	1.6	93
2	94	2.2	95	2.45	96	2.74	97
2.9	98	3.1	99	3.35	100	3.65	101
3.88	102	4.1	103	4.38	104	4.6	105
4.75	106	4.97	107	4.79	108	4.77	109
4.91	110	5.16	111	5.29	112	5.43	113
5.44	114	5.49	115	5.52	116	5.4	117
5.24	118	5.16	119	5.01	120	4.78	121
4.51	122	4.31	123	4.19	124	4	125
3.75	126	3.51	127	3.38	128	3.24	129
3.23	130	3.37	131	3.46	132	3.29	133
3.18	134	3.19	135	3.45	136	3.61	137
3.54	138	3.37	139	3.31	140	3.21	141
3.8	142	4.41	143	4.38	144	4.36	145
4.22	146	4.08	147	4.13	148	3.96	149
3.62	150	3.35	151	3.11	152	2.88	153
2.64	154	3.13	155	4.3	156	4.59	157
4.53	158	4.67	159	6.38	160	8.33	161
9.38	162	11.2	163	14.4	164	18.7	165
23.9	166	30.3	167	39	168	45.1	169
46.2	170	44.3	171	41	172	37.3	173
33.3	174	29.4	175	26.4	176	23.7	177
20.8	178	18	179	15.1	180	12.9	181
11.2	182	10.5	183	9.85	184	9.57	185
10.5	186	11.4	187	11.5	188	11.1	189
10.6	190	10.6	191	10.5	192	10	193
9.65	194	10.6	195	11.6	196	11.7	197
11.4	198	11.2	199	11	200	10.8	201
10.2	202	9.49	203	8.94	204	8.22	205
7.47	206	6.63	207	5.92	208	5.32	209
4.61	210	4.02	211	3.58	212	3.12	213
2.74	214	2.53	215	2.28	216	1.98	217
1.71	218	1.5	219	1.36	220	1.2	221
1.07	222	0.962	223	0.932	224	0.819	225
0.733	226	0.635	227	0.612	228	0.978	229
0.847	230	0.781	231	0.712	232	0.634	233
0.621	234	0.583	235	0.539	236	0.5	237
0.485	238	0.455	239	0.469	240	0.513	241
0.515	242	0.489	243	0.65	244	1.87	245
2.91	246	2.65	247	2.33	248	2.12	249
2.2	250	3.54	251	4.06	252	3.84	253
3.66	254	3.7	255	3.87	256	4.01	257

Table A9j. Tributary Flows used in Athabasca River Modelling, Muskeg River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
3.98	258	3.81	259	3.64	260	3.55	261
3.44	262	3.35	263	3.19	264	3.05	265
2.94	266	2.83	267	2.74	268	2.7	269
2.63	270	2.51	271	2.41	272	2.34	273
2.33	274	2.44	275	2.5	276	2.49	277
2.53	278	2.56	279	2.55	280	2.52	281
2.42	282	2.35	283	2.33	284	2.3	285
2.27	286	2.24	287	2.31	288	2.46	289
2.47	290	2.36	291	0.231	292	0.231	365
0.231	366	0.231	367	0.231	424	0.231	425
0.465	426	0.455	427	0.437	428	0.415	429
0.399	430	0.391	431	0.388	432	0.4	433
0.41	434	0.428	435	0.437	436	0.439	437
0.438	438	0.43	439	0.42	440	0.41	441
0.405	442	0.408	443	0.417	444	0.423	445
0.426	446	0.423	447	0.422	448	0.42	449
0.425	450	0.435	451	0.45	452	0.474	453
0.48	454	0.51	455	0.85	456	1.1	457
1.5	458	2.03	459	2.19	460	2.1	461
1.99	462	1.86	463	1.78	464	1.7	465
1.64	466	1.58	467	1.5	468	1.62	469
1.8	470	2.1	471	2.4	472	2.6	473
3.15	474	3.43	475	3.7	476	4.1	477
4.33	478	4.34	479	4.28	480	4.28	481
4.44	482	5.12	483	5.57	484	5.75	485
6.46	486	7.51	487	7.95	488	8.11	489
8.23	490	8.31	491	8.25	492	8.32	493
8.62	494	9.42	495	10.1	496	10.4	497
10.4	498	10.4	499	10.3	500	10.2	501
10.2	502	10.2	503	10.1	504	9.97	505
9.7	506	9.36	507	8.99	508	8.71	509
8.45	510	8.11	511	7.75	512	7.52	513
7.31	514	7.02	515	6.75	516	6.45	517
6.38	518	9.83	519	15.2	520	18.5	521
21.6	522	23.8	523	24.9	524	25.3	525
25.5	526	25.4	527	24.8	528	23.7	529
22.2	530	20.5	531	18.7	532	17.1	533
16.2	534	14.3	535	13.8	536	15.2	537
17.1	538	18.7	539	19.2	540	18.9	541
18	542	16.9	543	16	544	14.8	545
13.7	546	12.2	547	11.4	548	10.6	549
9.95	550	9.03	551	7.97	552	7.14	553
6.42	554	5.79	555	5.13	556	4.55	557
3.89	558	3.41	559	3.03	560	2.72	561
2.47	562	2.32	563	2.2	564	2.2	565
2.24	566	2.06	567	1.86	568	1.74	569
1.89	570	2.01	571	2.01	572	2.13	573
2.34	574	2.34	575	2.19	576	1.96	577
1.77	578	1.67	579	1.59	580	1.52	581
1.37	582	1.31	583	1.22	584	1.14	585

Table A9j. Tributary Flows used in Athabasca River Modelling, Muskeg River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
1.19	586	1.45	587	1.58	588	1.59	589
1.52	590	1.47	591	1.28	592	1.13	593
1.13	594	1.08	595	0.95	596	0.826	597
0.789	598	0.769	599	0.757	600	0.781	601
0.727	602	0.635	603	0.572	604	0.542	605
0.53	606	0.538	607	0.536	608	0.551	609
0.546	610	0.547	611	0.606	612	0.55	613
0.485	614	0.461	615	0.461	616	0.529	617
0.592	618	0.645	619	0.658	620	0.64	621
0.704	622	1.3	623	1.75	624	2.1	625
2.29	626	2.35	627	2.49	628	3.02	629
3.56	630	3.66	631	4.01	632	5.07	633
6.53	634	7.57	635	8.14	636	8.69	637
9.2	638	9.66	639	10	640	10.3	641
10.5	642	10.6	643	10.5	644	10.4	645
10.4	646	10.2	647	10.1	648	9.98	649
9.7	650	9.46	651	9.11	652	8.4	653
7.7	654	7.2	655	6.64	656	0.25	657
0.25	730	0.25	731	0.25	732	0.25	790
0.25	791	0.283	792	0.335	793	0.47	794
0.54	795	0.547	796	0.54	797	0.52	798
0.49	799	0.46	800	0.42	801	0.385	802
0.355	803	0.325	804	0.3	805	0.28	806
0.268	807	0.261	808	0.263	809	0.274	810
0.29	811	0.31	812	0.334	813	0.36	814
0.395	815	0.44	816	0.5	817	0.57	818
0.66	819	0.745	820	0.809	821	0.86	822
0.895	823	0.91	824	0.925	825	0.93	826
0.925	827	0.915	828	0.905	829	0.9	830
0.895	831	0.89	832	0.895	833	0.9	834
0.905	835	0.91	836	0.925	837	0.94	838
0.96	839	0.99	840	1.02	841	1.08	842
1.14	843	1.25	844	1.41	845	1.65	846
1.9	847	2.1	848	2.51	849	2.59	850
2.35	851	2.28	852	2.21	853	2.3	854
2.31	855	2.24	856	2.25	857	3	858
7.77	859	11.8	860	13.6	861	14.5	862
14.4	863	14.1	864	13.7	865	12.8	866
11.9	867	10.9	868	10	869	9.16	870
8.45	871	7.96	872	7.47	873	7.02	874
6.69	875	6.37	876	6.09	877	6.02	878
5.88	879	5.66	880	5.25	881	4.84	882
4.38	883	3.99	884	3.63	885	3.4	886
3.27	887	3.11	888	2.9	889	2.86	890
3.11	891	3.25	892	3.59	893	3.47	894
3.25	895	3.15	896	2.96	897	2.79	898
2.61	899	2.52	900	2.47	901	2.34	902
2.5	903	3.95	904	7.1	905	8.75	906
9	907	8.83	908	8.44	909	8.04	910
7.85	911	8.4	912	9.21	913	9.42	914

Table A9j. Tributary Flows used in Athabasca River Modelling, Muskeg River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
9.35	915	9.05	916	8.42	917	7.74	918
7.25	919	7.46	920	8.13	921	8.41	922
8.25	923	8.01	924	7.84	925	7.6	926
7.36	927	7.01	928	6.69	929	6.4	930
6.19	931	6.13	932	6.96	933	8.06	934
8.53	935	8.62	936	8.5	937	8.7	938
9.95	939	11.7	940	13.1	941	14.8	942
16.1	943	16.7	944	17.3	945	17.9	946
18.3	947	18.3	948	18.2	949	18.8	950
20.3	951	20.8	952	20.5	953	19.6	954
18.3	955	16.9	956	15.7	957	14.8	958
13.8	959	12.6	960	11.3	961	10.3	962
9.56	963	8.86	964	8.16	965	7.48	966
6.9	967	6.32	968	5.76	969	5.31	970
4.86	971	4.57	972	4.53	973	4.49	974
4.39	975	4.32	976	4.36	977	4.34	978
4.16	979	4.05	980	3.9	981	3.7	982
3.6	983	3.42	984	3.26	985	3.12	986
2.94	987	2.81	988	2.76	989	2.73	990
2.65	991	2.57	992	2.49	993	2.45	994
2.36	995	2.31	996	2.29	997	2.42	998
2.87	999	3.15	1000	3.18	1001	3.19	1002
3.21	1003	3.17	1004	3.15	1005	3.1	1006
3.05	1007	3.07	1008	3.19	1009	3.34	1010
3.35	1011	3.38	1012	3.49	1013	3.55	1014
3.59	1015	3.6	1016	3.66	1017	3.7	1018
3.73	1019	3.7	1020	3.64	1021	3.61	1022
3.53	1023	3.45	1024	3.4	1025	3.39	1026
3.38	1027	3.32	1028	3.29	1029	3.22	1030
3.18	1031	3.05	1032	2.94	1033	2.75	1034
2.75	1035	2.75	1095				

Table A9k. Tributary Flows used in Athabasca River Modelling, Ells River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
1.22	1	1.22	15	0.92	45	0.92	74
7.74	105	25.26	135	14.93	166	7.95	196
6.45	227	6.5	258	5.63	288	2.92	319
1.9	349	1.22	380	0.92	410	0.92	439
7.74	470	25.26	500	14.93	531	7.95	561
6.45	592	6.5	623	5.63	653	2.92	684
1.9	714	1.22	745	0.92	775	0.92	804
7.74	835	25.26	865	14.93	896	7.95	926
6.45	957	6.5	988	5.63	1018	2.92	1049
1.9	1079						

Table A9I. Tributary Flows used in Athabasca River Modelling, Firebag River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
10.1	1	10.1	58	10.1	59	11.8	60
9.9	61	9.8	62	9.75	63	9.7	64
9.65	65	9.65	66	9.63	67	9.62	68
9.62	69	9.63	70	9.7	71	9.65	72
9.6	73	9.65	74	9.7	75	9.95	76
10.2	77	10.6	78	10.8	79	11	80
10.8	81	10.4	82	10.2	83	10.1	84
9.95	85	9.9	86	9.85	87	9.95	88
10.3	89	10.8	90	11.4	91	12.3	92
13	93	14.6	94	16	95	18.2	96
20.5	97	23.5	98	26	99	29	100
32.5	101	37.5	102	43.5	103	51	104
60	105	69	106	85	107	96.4	108
99.5	109	89.7	110	85.4	111	82.1	112
80.6	113	78.7	114	76.5	115	74.5	116
72.7	117	70.3	118	67.8	119	65.3	120
63.3	121	60.3	122	57	123	53.9	124
51.2	125	48.9	126	46.5	127	44.7	128
42.9	129	42.1	130	41.4	131	40.8	132
40	133	39.1	134	38.4	135	38.4	136
39.1	137	39.2	138	38.2	139	37.2	140
37.2	141	37	142	37.3	143	36.7	144
36	145	34.8	146	34.8	147	33.7	148
32.9	149	31.4	150	30.2	151	28.8	152
27.2	153	26.6	154	30	155	37.4	156
43	157	44.6	158	51.6	159	63.4	160
68.7	161	70.9	162	76	163	84.4	164
91.2	165	93.9	166	93.2	167	91.6	168
87.4	169	81.8	170	75.2	171	68.7	172
62.7	173	57.5	174	53.5	175	49.4	176
45.1	177	43.6	178	41	179	38.7	180
36.7	181	35.3	182	36.7	183	36.7	184
37.8	185	41.1	186	45.9	187	46.5	188
45.1	189	43.2	190	42	191	40.1	192
38.1	193	36.4	194	36.6	195	37.2	196
37.3	197	37.3	198	39	199	40.6	200
41.4	201	40.8	202	39.4	203	37.8	204
36.2	205	34.1	206	31.1	207	29	208
26.6	209	24.6	210	22.8	211	21.8	212
21.1	213	20.5	214	19.6	215	18.9	216
18.1	217	17.4	218	16.8	219	16.1	220
15.2	221	14.5	222	13.7	223	13	224
12.3	225	11.8	226	11.1	227	11.1	228
11.5	229	10.7	230	10.5	231	11.4	232
11.5	233	11.7	234	12.1	235	13.2	236
13.3	237	13	238	13.3	239	13.5	240
13.4	241	13.4	242	13.2	243	14.8	244
18	245	21.9	246	25.5	247	26.5	248
27	249	28.3	250	30.9	251	33.1	252
34.3	253	34.1	254	33.8	255	33.7	256

Table A9I. Tributary Flows used in Athabasca River Modelling, Firebag River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
33.4	257	32.5	258	32	259	31	260
30.7	261	30.2	262	29.5	263	28.8	264
28.5	265	28.2	266	27.4	267	26.7	268
26.3	269	25.9	270	25.5	271	25.2	272
25	273	24.9	274	24.9	275	25	276
25.1	277	25.1	278	25	279	25	280
24.9	281	24.6	282	24.3	283	24.1	284
23.7	285	23.9	286	24	287	24	288
24.3	289	23	290	6.35	291	6.35	365
6.35	366	6.35	367	6.35	424	6.35	425
11.5	426	11.3	427	11.1	428	10.9	429
10.6	430	10.3	431	10.1	432	10	433
10.1	434	10.3	435	10.5	436	10.8	437
11	438	11.1	439	11.1	440	11	441
11	442	10.9	443	10.9	444	10.9	445
10.9	446	11	447	11	448	11.1	449
11.2	450	11.3	451	11.6	452	12	453
12.5	454	12.9	455	13.5	456	14	457
14.5	458	14.1	459	13.9	460	13.3	461
13.1	462	12.8	463	12.6	464	12.5	465
12.6	466	12.7	467	12.9	468	13.1	469
13.8	470	14.2	471	15	472	15.8	473
17.5	474	20	475	25	476	32.5	477
40	478	50	479	56.5	480	60	481
63.2	482	64.7	483	67.6	484	69.5	485
74.6	486	81.6	487	86.6	488	88.6	489
89.1	490	87.5	491	84.5	492	81.2	493
78.8	494	76.8	495	74	496	71.1	497
68.4	498	65.8	499	63.8	500	62.1	501
60.6	502	59.3	503	57.7	504	55.5	505
53.5	506	51.7	507	50.6	508	49.4	509
47.8	510	46.5	511	44.8	512	43.8	513
42.6	514	41.3	515	39.6	516	38.7	517
38.1	518	51	519	68.5	520	79.5	521
83	522	82.3	523	80	524	76.6	525
72.9	526	69.7	527	66.4	528	62.3	529
57.7	530	52.4	531	47.7	532	44	533
41.2	534	38.9	535	39.1	536	44.1	537
48.8	538	50.7	539	50.8	540	50.2	541
48.1	542	45.4	543	43.5	544	42	545
39.8	546	37.3	547	35.8	548	34.3	549
33.1	550	31.3	551	29.6	552	28.3	553
27.4	554	26.4	555	25.1	556	24.1	557
23	558	21.9	559	21	560	19.9	561
19.4	562	20	563	21.4	564	23.7	565
25.1	566	26	567	24.9	568	24.7	569
23.8	570	23.7	571	23.5	572	23.2	573
22.1	574	20.8	575	20	576	18.8	577
17.8	578	17.2	579	16.7	580	16.7	581
16.7	582	16.3	583	16.1	584	17	585

Table A9I. Tributary Flows used in Athabasca River Modelling, Firebag River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
17.5	586	18	587	18.2	588	18.7	589
19.1	590	18.1	591	17.1	592	16.3	593
15.7	594	15.2	595	14.9	596	14.4	597
14.1	598	14.2	599	14.6	600	14.7	601
14.8	602	14.8	603	14.5	604	14.5	605
14.6	606	14.5	607	14.5	608	14.8	609
14.8	610	14.9	611	14.9	612	14.8	613
14.9	614	14.9	615	15	616	15.4	617
15.4	618	15.4	619	15.9	620	16.4	621
17.8	622	20.4	623	23.2	624	25.8	625
26.7	626	27	627	27.7	628	29.1	629
30.8	630	32.2	631	33.2	632	36.7	633
39.4	634	41.6	635	42.7	636	44.2	637
46	638	47.9	639	47.8	640	46.8	641
45.5	642	43.1	643	40.6	644	38	645
36	646	34.8	647	33.7	648	33	649
32.7	650	31.9	651	30.7	652	27.8	653
24.5	654	20.5	655	17.1	656	6.68	657
6.68	730	6.68	731	6.68	732	6.68	790
6.68	791	7.19	792	7.55	793	8.16	794
10.1	795	8.24	796	8.68	797	8.29	798
8.5	799	7.9	800	7.98	801	8.02	802
8.13	803	7.81	804	7.98	805	6.65	806
6.47	807	7.13	808	8.49	809	8.66	810
10.2	811	10.1	812	9.78	813	8.81	814
8.66	815	8.74	816	9.65	817	11.1	818
12.1	819	13.2	820	13.5	821	15.4	822
15.2	823	16.4	824	16.6	825	16.8	826
16.7	827	16.2	828	15	829	15.1	830
15.3	831	15.3	832	15.7	833	16.1	834
17	835	18.8	836	19.7	837	21.5	838
23.8	839	25.7	840	26.5	841	27.5	842
30	843	29.5	844	28.5	845	34.5	846
37	847	36	848	33.3	849	31.5	850
30.9	851	30	852	30.7	853	30.4	854
30.2	855	30	856	29.9	857	32.8	858
41.5	859	54	860	57.9	861	59.9	862
59.9	863	56.3	864	52.4	865	48	866
43.6	867	40.3	868	37.9	869	35.7	870
33.9	871	32.9	872	32.7	873	32.5	874
31.8	875	31.2	876	30.7	877	30.5	878
30.5	879	30.4	880	29.5	881	28.6	882
27.3	883	25.7	884	24.8	885	23.7	886
23	887	22.8	888	22.3	889	24.4	890
25.6	891	26.4	892	27.2	893	27.2	894
26.5	895	25.2	896	24.1	897	23.4	898
23.1	899	22.9	900	23	901	22.7	902
25	903	31.5	904	39.4	905	44.6	906
46	907	45.3	908	43.3	909	41.1	910
38.8	911	38.4	912	38.5	913	37.7	914

Table A9I. Tributary Flows used in Athabasca River Modelling, Firebag River
Source: Water Survey of Canada
Jday of 1 equals January 1, 1991

Flow	Jday	Flow	Jday	Flow	Jday	Flow	Jday
36.2	915	34	916	32	917	30.6	918
29.8	919	32.5	920	35.7	921	36.6	922
36.3	923	35.7	924	35.2	925	33.9	926
32.4	927	31.2	928	30.4	929	29.5	930
29.2	931	30.7	932	34.8	933	37.5	934
38.1	935	36.9	936	36.4	937	40.9	938
46.9	939	51.5	940	51.7	941	54.1	942
64.4	943	69.1	944	69.9	945	67.7	946
64.5	947	60.8	948	84	949	94.5	950
92.9	951	90.2	952	84.4	953	78.6	954
71.8	955	68	956	64.8	957	61	958
56.2	959	51.2	960	47.7	961	45.2	962
42.6	963	39.8	964	37.6	965	36.8	966
35.3	967	34.2	968	33.3	969	32.6	970
31.9	971	31.3	972	30.4	973	29.8	974
29.4	975	28.9	976	28.5	977	28.1	978
27.8	979	27.3	980	26.9	981	27	982
26.3	983	26	984	25.9	985	25.6	986
25.4	987	24.4	988	23.9	989	23.6	990
23.4	991	22.9	992	22.5	993	22.2	994
21.7	995	21.6	996	21.6	997	22.2	998
23.2	999	24.5	1000	25.6	1001	26.6	1002
27.3	1003	27.1	1004	27	1005	26.5	1006
25.8	1007	26.2	1008	26.5	1009	26.1	1010
25.2	1011	25.2	1012	25.5	1013	25.4	1014
25.6	1015	26.2	1016	26.3	1017	26.4	1018
26.4	1019	26.3	1020	26.1	1021	26.2	1022
26	1023	25.9	1024	26	1025	26.2	1026
26.1	1027	25.5	1028	25.3	1029	24.9	1030
24.4	1031	23.9	1032	23.7	1033	23.6	1034
23.6	1035	23.6	1095				

Table A10. **Fraction of organic carbon in sediment and dissolved organic carbon concentrations used in Athabasca River modelling (Sources: AEP and NRBS)**

Segment Number		Sediment Fraction Organic Carbon		Dissolved Organic Carbon	
Water Column	Bed	Water Column	Bed	Water Column	Bed
52	274	0.03	0.035	4.1	4.1
53	275	0.03	0.035	4.1	4.1
54	276	0.03	0.035	4.2	4.2
55	277	0.03	0.035	4.2	4.2
56	278	0.03	0.035	4.2	4.2
57	279	0.03	0.035	4.2	4.2
58	280	0.03	0.035	4.3	4.3
59	281	0.03	0.035	4.3	4.3
60	282	0.03	0.035	4.3	4.3
61	283	0.03	0.035	4.3	4.3
62	284	0.03	0.035	4.4	4.4
63	285	0.03	0.035	4.4	4.4
64	286	0.03	0.035	4.4	4.4
65	287	0.03	0.035	4.5	4.5
66	288	0.03	0.035	4.5	4.5
67	289	0.03	0.035	4.5	4.5
68	290	0.03	0.035	4.5	4.5
69	291	0.03	0.035	4.6	4.6
70	292	0.03	0.035	4.6	4.6
71	293	0.03	0.035	4.6	4.6
72	294	0.03	0.035	4.7	4.7
73	295	0.03	0.035	4.7	4.7
74	296	0.03	0.035	4.7	4.7
75	297	0.03	0.035	4.8	4.8
76	298	0.03	0.035	4.8	4.8
77	299	0.03	0.035	4.8	4.8
78	300	0.03	0.035	4.9	4.9
79	301	0.03	0.035	4.9	4.9
80	302	0.03	0.035	4.9	4.9
81	303	0.03	0.035	5.0	5.0
82	304	0.03	0.035	5.0	5.0
83	305	0.03	0.035	5.0	5.0
84	306	0.03	0.035	5.0	5.0
85	307	0.03	0.035	5.1	5.1
86	308	0.03	0.035	5.1	5.1
87	309	0.03	0.035	5.1	5.1
88	310	0.03	0.035	5.1	5.1
89	311	0.03	0.035	5.2	5.2
90	312	0.03	0.035	5.2	5.2
91	313	0.03	0.035	5.2	5.2
92	314	0.03	0.035	5.3	5.3
93	315	0.03	0.035	5.3	5.3
94	316	0.03	0.035	5.3	5.3
95	317	0.03	0.035	5.4	5.4
96	318	0.03	0.035	5.4	5.4
97	319	0.03	0.035	5.4	5.4
98	320	0.03	0.035	5.5	5.5
99	321	0.03	0.035	5.5	5.5
100	322	0.03	0.035	5.5	5.5
101	323	0.03	0.035	5.5	5.5
102	324	0.03	0.035	5.6	5.6

Table A10. **Fraction of organic carbon in sediment and dissolved organic carbon concentrations used in Athabasca River modelling (Sources: AEP and NRBS)**

Segment Number		Sediment Fraction Organic Carbon		Dissolved Organic Carbon	
Water Column	Bed	Water Column	Bed	Water Column	Bed
103	325	0.03	0.035	5.6	5.6
104	326	0.03	0.035	5.6	5.6
105	327	0.03	0.035	5.6	5.6
106	328	0.03	0.035	5.7	5.7
107	329	0.03	0.035	5.7	5.7
108	330	0.03	0.035	5.7	5.7
109	331	0.03	0.035	5.7	5.7
110	332	0.03	0.035	5.8	5.8
111	333	0.03	0.035	5.8	5.8
112	334	0.03	0.035	5.8	5.8
113	335	0.03	0.035	5.8	5.8
114	336	0.03	0.035	5.9	5.9
115	337	0.03	0.035	5.9	5.9
116	338	0.03	0.035	5.9	5.9
117	339	0.03	0.035	6.0	6.0
118	340	0.03	0.035	6.0	6.0
119	341	0.03	0.035	6.0	6.0
120	342	0.03	0.035	6.0	6.0
121	343	0.03	0.035	6.1	6.1
122	344	0.03	0.035	6.1	6.1
123	345	0.03	0.035	6.1	6.1
124	346	0.03	0.035	6.2	6.2
125	347	0.03	0.035	6.2	6.2
126	348	0.03	0.035	6.2	6.2
127	349	0.03	0.035	6.3	6.3
128	350	0.03	0.035	6.3	6.3
129	351	0.03	0.035	6.3	6.3
130	352	0.03	0.035	6.4	6.4
131	353	0.03	0.035	6.4	6.4
132	354	0.03	0.035	6.4	6.4
133	355	0.03	0.035	6.5	6.5
134	356	0.03	0.035	6.5	6.5
135	357	0.03	0.035	6.5	6.5
136	358	0.03	0.035	6.5	6.5
137	359	0.03	0.035	6.6	6.6
138	360	0.03	0.035	6.6	6.6
139	361	0.03	0.035	6.6	6.6
140	362	0.03	0.035	6.7	6.7
141	363	0.03	0.035	6.7	6.7
142	364	0.03	0.035	6.7	6.7
143	365	0.03	0.035	6.8	6.8
144	366	0.03	0.035	6.8	6.8
145	367	0.03	0.035	6.8	6.8
146	368	0.03	0.035	6.9	6.9
147	369	0.03	0.035	6.9	6.9
148	370	0.03	0.035	6.9	6.9
149	371	0.03	0.035	6.9	6.9
150	372	0.03	0.035	7.0	7.0
151	373	0.03	0.035	7.0	7.0
152	374	0.03	0.035	7.0	7.0
153	375	0.03	0.035	7.1	7.1

Table A10. **Fraction of organic carbon in sediment and dissolved organic carbon concentrations used in Athabasca River modelling (Sources: AEP and NRBS)**

Segment Number		Sediment Fraction Organic Carbon		Dissolved Organic Carbon	
Water Column	Bed	Water Column	Bed	Water Column	Bed
154	376	0.03	0.035	7.1	7.1
155	377	0.03	0.035	7.1	7.1
156	378	0.03	0.035	7.2	7.2
157	379	0.03	0.035	7.2	7.2
158	380	0.03	0.035	7.2	7.2
159	381	0.03	0.035	7.2	7.2
160	382	0.03	0.035	7.3	7.3
161	383	0.03	0.035	7.3	7.3
162	384	0.03	0.035	7.3	7.3
163	385	0.03	0.035	7.3	7.3
164	386	0.03	0.035	7.4	7.4
165	387	0.03	0.035	7.4	7.4
166	388	0.03	0.035	7.4	7.4
167	389	0.03	0.035	7.4	7.4
168	390	0.03	0.035	7.5	7.5
169	391	0.03	0.035	7.5	7.5
170	392	0.03	0.035	7.5	7.5
171	393	0.03	0.035	7.5	7.5
172	394	0.03	0.035	7.6	7.6
173	395	0.03	0.035	7.6	7.6
174	396	0.03	0.035	7.6	7.6
175	397	0.03	0.035	7.6	7.6
176	398	0.03	0.035	7.6	7.6
177	399	0.03	0.035	7.6	7.6
178	400	0.03	0.035	7.6	7.6
179	401	0.03	0.035	7.6	7.6
180	402	0.03	0.035	7.6	7.6
181	403	0.03	0.035	7.6	7.6
182	404	0.03	0.035	7.6	7.6
183	405	0.03	0.035	7.6	7.6
184	406	0.03	0.035	7.6	7.6
185	407	0.03	0.035	7.6	7.6
186	408	0.03	0.035	7.6	7.6
187	409	0.03	0.035	7.6	7.6
188	410	0.03	0.035	7.6	7.6
189	411	0.03	0.035	7.6	7.6
190	412	0.03	0.035	7.7	7.7
191	413	0.03	0.035	7.7	7.7
192	414	0.03	0.035	7.7	7.7
193	415	0.03	0.035	7.7	7.7
194	416	0.03	0.035	7.7	7.7
195	417	0.03	0.035	7.7	7.7
196	418	0.03	0.035	7.7	7.7
197	419	0.03	0.035	7.7	7.7
198	420	0.03	0.035	7.7	7.7
199	421	0.03	0.035	7.7	7.7
200	422	0.03	0.035	7.7	7.7
201	423	0.03	0.035	7.7	7.7
202	424	0.03	0.035	7.7	7.7
203	425	0.03	0.035	7.7	7.7
204	426	0.03	0.035	7.7	7.7

Table A10. **Fraction of organic carbon in sediment and dissolved organic carbon concentrations used in Athabasca River modelling (Sources: AEP and NRBS)**

Segment Number		Sediment Fraction Organic Carbon		Dissolved Organic Carbon	
Water Column	Bed	Water Column	Bed	Water Column	Bed
205	427	0.03	0.035	7.7	7.7
206	428	0.03	0.035	7.7	7.7
207	429	0.03	0.035	7.7	7.7
208	430	0.03	0.035	7.7	7.7
209	431	0.03	0.035	7.7	7.7
210	432	0.03	0.035	7.7	7.7
211	433	0.03	0.035	13.0	13.0
212	434	0.03	0.035	13.0	13.0
213	435	0.03	0.035	13.1	13.1
214	436	0.03	0.035	13.2	13.2
215	437	0.03	0.035	13.3	13.3
216	438	0.03	0.035	13.3	13.3
217	439	0.03	0.035	13.4	13.4
218	440	0.03	0.035	13.4	13.4
219	441	0.03	0.035	13.5	13.5
220	442	0.03	0.035	13.5	13.5
221	443	0.03	0.035	13.6	13.6
222	444	0.03	0.035	13.6	13.6

Table A11. Estimated bed sediment composition, Athabasca River

Bed Cells	Sediment Distribution (%)		Porosity (percent)	Specific Gravity (kg/L)
	Fine	Course		
223 - 402	15%	85%	37.5%	2.0
403 - 411	70%	30%	37.5%	2.0
412 - 432	95%	5%	37.5%	2.0
433 - 444	15%	85%	37.5%	2.0

Table A12a. **Organic compound loads to the Athabasca River from Weldwood Sources: Northdat, NRBS (rows without flow or concentration)**

DATE	JDAY	Effluent Flow (m^3/day)	2,3,7,8 TCDF Conc. (pg/L)	2,3,7,8 TCDF Load (mg/day)
07-Jan-91	7	103 200	19.000	1.961
04-Feb-91	35	102 000	15.000	1.530
05-Feb-91	36	104 500	15.000	1.568
05-Mar-91	64	103 820	13.000	1.350
07-Mar-91	66	98 000	13.000	1.274
01-Apr-91	91	105 000	9.700	1.019
06-May-91	126	109 000	9.100	0.992
04-Jun-91	155	117 800	9.000	1.060
03-Jul-91	184	121 800	9.000	1.096
06-Aug-91	218	128 800	6.400	0.824
02-Sep-91	245	104 750	7.200	0.754
04-Nov-91	308	113 700	12.000	1.364
05-Nov-91	309	101 740	12.000	1.221
07-Jan-92	372	106 400	1.600	0.170
04-Feb-92	400	94 300	6.400	0.604
02-Mar-92	427	98 900	9.800	0.969
04-Apr-92	460			0.522
06-Apr-92	462	108 400	1.600	0.173
18-May-92	504	122 700	25.000	3.068
01-Jun-92	518	119 400	41.000	4.895
06-Jul-92	553	120 700	20.000	2.414
05-Aug-92	583	119 200	19.000	2.265
10-Aug-92	588	110 100	2.100	0.231
31-Aug-92	609	120 900	2.500	0.302
02-Nov-92	672	100 700	8.400	0.846
07-Dec-92	707	103 900	9.000	0.935
04-Jan-93	735	96 100	26.000	2.499
04-Feb-93	766	101 400	11.000	1.115
11-Feb-93	773			0.276
02-Mar-93	792	101 000	15.000	1.515
06-Apr-93	827	111 900	15.000	1.679
04-May-93	855	115 200	2.600	0.300
09-Jun-93	891	106 600	6.200	0.661
05-Jul-93	917	126 100	5.800	0.731
09-Jul-93	921	126 600	6.600	0.836
20-Oct-93	1024	105 700	3.500	0.370

Table A12a. **Organic compound loads to the Athabasca River from Weldwood Sources: Northdat, AEP (rows without flow or concentration)**

DATE	JDAY	Effluent Flow (m^3/day)	DHA Conc. (ug/L)	DHA Load (kg/day)	12,14 dichloro DHA Conc. (ug/L)	12,14 dichloro DHA Load (kg/day)
30-Jan-91	30	99 900	-0.010	0.500	-0.010	0.500
05-Feb-91	36	104 500	-0.010	0.523	-0.010	0.523
01-Apr-91	91	105 000	-0.010	0.525	-0.010	0.525
01-Oct-91	274	106 150	-0.010	0.531	-0.010	0.531
05-Nov-91	309	101 740	-0.010	0.509	-0.010	0.509
03-Dec-91	337	111 100	-0.010	0.556	-0.010	0.556
07-Jan-92	372	106 400	-0.010	0.532	-0.010	0.532
29-Jan-92	394			0.005		0.178
11-Feb-92	407	103 200	-0.010	0.516	-0.010	0.516
03-Mar-92	428	102 300	-0.010	0.512	-0.010	0.512
07-Apr-92	463	103 800	0.020	2.076	-0.010	0.519
18-May-92	504	122 700	0.020	2.454	-0.010	0.614
02-Jun-92	519	111 000	-0.010	0.555	-0.010	0.555
07-Jul-92	554	115 900	-0.010	0.580	-0.010	0.580
04-Aug-92	582	116 400	-0.010	0.582	-0.010	0.582
01-Sep-92	610	110 300	0.010	1.103	-0.010	0.552
02-Sep-92	611	111 300	-0.010	0.557	-0.010	0.557
06-Oct-92	645	106 700	-0.010	0.534	-0.010	0.534
03-Nov-92	673	94 800	-0.010	0.474	-0.010	0.474
08-Dec-92	708	106 300	-0.010	0.532	-0.010	0.532
06-Jan-93	737	101 500	-0.010	0.508	-0.010	0.508
04-Feb-93	766	101 400	0.030	3.042	-0.010	0.507
16-Feb-93	773			0.005		0.005
21-Feb-93	778	98 700	-0.010	0.494	-0.010	0.494
02-Mar-93	792	101 000	-0.010	0.505	-0.010	0.505
06-Apr-93	827	111 900	-0.010	0.560	-0.010	0.560
04-May-93	855	115 200	-0.010	0.576	-0.010	0.576
07-May-93	858	117 200	-0.010	0.586	-0.010	0.586
08-Jun-93	890	109 400	-0.010	0.547	-0.010	0.547
06-Jul-93	918	126 200	-0.010	0.631	-0.010	0.631
03-Aug-93	946	118 300	-0.010	0.592	-0.010	0.592
07-Sep-93	981	93 400	-0.010	0.467	-0.010	0.467
08-Oct-93	1012	118 000	-0.010	0.590	-0.010	0.590
02-Nov-93	1037	93 900	-0.010	0.470	-0.010	0.470
07-Dec-93	1072	101 900	-0.010	0.510	-0.010	0.510

Table A12a. Organic compound loads to the Athabasca River from Weldwood
Sources: Northdat, AEP (rows without flow or concentration)

DATE	JDAY	Effluent Flow (m^3/day)	3,4,5 TCC Conc. (ug/L)	3,4,5 TCC Load (kg/day)	3,4,5 TCG Conc. (ug/L)	3,4,5 TCG Load (kg/day)	3,4,5 TCV Conc. (ug/L)	3,4,5 TCV Load (kg/day)
29-Jan-91	29	99 400	17.5	1.740	9.5	0.944	1.3	0.124
30-Jan-91	30	99 900	-1.0	0.050	-1.0	0.050	-1.0	0.050
04-Feb-91	35	102 000	21.0	2.142	12.0	1.224	-1.0	0.051
01-Apr-91	91	105 000	2.2	0.231	14.0	1.470	2.3	0.242
03-Jul-91	184	121 800	1.0	0.122	4.8	0.585	-1.0	0.061
27-Sep-91	270	120 000	5.4	0.648	13.8	1.656	0.7	0.079
01-Oct-91	274	106 150	3.8	0.403	6.5	0.690	-1.0	0.053
07-Nov-91	311	103 000	1.5	0.155	1.1	0.113	-1.0	0.052
02-Dec-91	336	111 200	15.0	1.668	13.0	1.446	-1.0	0.056
08-Jan-92	373	102 000	3.0	0.306	10.9	1.112	3.6	0.367
29-Jan-92	394			0.698		3.518		0.137
03-Feb-92	399	105 900	6.9	0.731	19.0	2.012	1.0	0.106
11-Feb-92	407	103 200	1.2	0.124	9.8	1.011	-1.0	0.052
03-Mar-92	428	102 300	9.3	0.951	6.5	0.665	-0.1	0.005
09-Mar-92	434	97 500	6.8	0.663	4.0	0.390	0.5	0.049
16-Mar-92	441	103 700	1.2	0.124	0.4	0.041	0.2	0.021
23-Mar-92	448	105 400	3.0	0.316	6.6	0.696	0.6	0.063
31-Mar-92	456	108 800	13.0	1.414	0.5	0.054	-0.1	0.005
07-Apr-92	463	103 800	8.5	0.882	11.0	1.142	0.8	0.083
18-May-92	504	122 700	23.0	2.822	9.5	1.166	-0.1	0.006
01-Jun-92	518	119 400	4.2	0.501	3.3	0.394	0.2	0.024
06-Jul-92	553	120 700	4.2	0.507	3.3	0.398	0.2	0.024
06-Aug-92	584	126 100	2.7	0.340	9.2	1.160	0.6	0.069
01-Sep-92	610	110 300	3.1	0.342	5.2	0.574	-0.1	0.006
02-Sep-92	611	111 300	-0.1	0.006	-0.1	0.006	-0.1	0.006
06-Oct-92	645	106 700	3.7	0.395	6.0	0.640	-0.1	0.005
03-Nov-92	673	94 800	2.5	0.237	13.0	1.232	-0.1	0.005
08-Dec-92	708	106 300	13.0	1.382	21.0	2.232	1.0	0.106
05-Jan-93	736	91 100	17.0	1.549	13.0	1.184	0.4	0.036
02-Feb-93	764	102 600	7.8	0.800	12.0	1.231	0.5	0.051
03-Feb-93	765	96 200	-0.1	0.005	-0.1	0.005	-0.1	0.005
04-Feb-93	766	101 400	-0.1	0.005	-0.1	0.005	-0.1	0.005
05-Feb-93	767	104 300	-0.1	0.005	-0.1	0.005	-0.1	0.005
07-Feb-93	769	105 500	-0.1	0.005	-0.1	0.005	-0.1	0.005
09-Feb-93	771	102 900	-0.1	0.005	-0.1	0.005	-0.1	0.005
11-Feb-93	773	106 300		3.614		3.721		0.064
14-Feb-93	776	101 100	-0.1	0.005	-0.1	0.005	-0.1	0.005
16-Feb-93	778	98 700	-0.1	0.005	-0.1	0.005	-0.1	0.005
02-Mar-93	792	101 000	4.7	0.475	15.0	1.515	0.4	0.040
09-Mar-93	799	103 500	4.1	0.424	15.0	1.553	0.8	0.083
16-Mar-93	806	101 200	3.4	0.344	11.0	1.113	0.8	0.081
22-Mar-93	812	105 500	1.1	0.116	3.4	0.359	0.5	0.053
23-Mar-93	813	103 900	16.0	1.662	12.0	1.247	0.4	0.042
30-Mar-93	820	99 700	6.5	0.648	8.5	0.847	0.5	0.050
06-Apr-93	827	111 900	21.0	2.350	16.0	1.790	1.0	0.112
04-May-93	855	115 200	5.6	0.645	8.6	0.991	0.5	0.058
08-Jun-93	890	109 400	2.2	0.241	10.0	1.094	0.3	0.033
06-Jul-93	918	126 200	0.4	0.050	4.0	0.505	0.2	0.025
03-Aug-93	946	118 300	-0.1	0.006	-0.1	0.006	-0.1	0.006
07-Sep-93	981	93 400	-0.1	0.005	-0.1	0.005	-0.1	0.005
06-Oct-93	1010	107 100	-0.1	0.005	-0.1	0.005	-0.1	0.005
21-Nov-93	1056	102 400	-0.1	0.005	-0.1	0.005	-0.1	0.005
07-Dec-93	1072	101 900	-0.1	0.005	-0.1	0.005	-0.1	0.005

APPENDIX B: INFORMATION USED IN WAPITI/SMOKY CONTAMINANT FATE MODELLING

APPENDIX B: LIST OF TABLES

Table B1 Upper Boundary TSS Concentrations in Wapiti River at HWY #40
Used in Wapiti/Smoky Rivers Modelling (mg/L)
Source: Naquadat, AEP and model calibration

Date	TSS (mg/L)
1-Jan-89	29
28-Feb-89	10
24-Jul-89	71
12-Oct-89	3.6
30-Oct-89	181
28-Feb-90	12
20-Mar-90	10
16-May-90	376
31-May-90	100
24-Jul-90	71
12-Oct-90	3.6
30-Oct-90	181
9-Jan-91	1.6
6-Feb-91	5.6
28-Feb-91	13
20-Mar-91	15.6
30-Apr-91	205
3-May-91	175
21-May-91	376
15-Jun-91	10
23-Aug-91	7.6
18-Sep-91	5.2
6-Nov-91	35
1-Jan-92	2.4

Table B2 Tributary TSS Concentrations used in Wapiti/Smoky Rivers Modelling (mg/L)

Source: Naquadat, AEP

Jday of 1 equals January 1, 1989 and repeat at Jan.1 of 1990 and 1991 for tributaries other than Smoky River

Tributary	TSS (mg/L)	Jday	TSS (mg/L)	Jday	TSS (mg/L)	Jday	TSS (mg/L)	Jday
Mountain Creek	42	1	42	90	305	275	42	365
Bear Creek	62	1	141	90	141	275	62	365
Smoky River	4	1	25	60	1200	140	150	150
	21.2	275	4	365	26	425	1000	505
	100	515	21.2	640	4	730	20	835
	1200	870	150	880	21.2	1005	4	1095
Simonette River	6	1	150	90	500	140	90	275
	6	365						
Puskwaskau River	16	1	16	90	500	140	64	275
	16	365						
Bad Heart Creek	48	1	48	90	300	140	174	275
	48	365						
Little Smoky River	4.5	1	4.5	90	500	140	24	275
	4.5	365						

Table B3 TSS Loads from Weyerhaeuser Effluent used in Wapiti/Smoky Rivers Modelling (kg/d)
Source: Northdat (NRBS 1995)

	Year		
Date	1989	1990	1991
1-Jan	4659.0	2499.0	3591.0
2-Jan	4206.0	2487.0	2810.0
3-Jan	4951.0	1999.0	2293.0
4-Jan	6579.0	1968.0	3512.0
5-Jan	4335.0	2281.0	2930.0
6-Jan	3632.0	3200.0	3614.0
7-Jan	9770.0	2378.0	2468.0
8-Jan	5177.0	2672.0	3361.0
9-Jan	5155.0	2656.0	3746.0
10-Jan	5694.0	2609.0	3717.0
11-Jan	5155.0	2846.0	2621.0
12-Jan	5358.0	1642.0	2621.0
13-Jan	3678.0	1817.0	2079.0
14-Jan	4331.0	1392.0	2040.0
15-Jan	4612.0	1503.0	2625.0
16-Jan	5178.0	1503.0	3019.0
17-Jan	7620.0	1448.0	2826.0
18-Jan	9615.0	1614.0	2314.0
19-Jan	6096.0	1116.0	1926.0
20-Jan	6579.0	1063.0	2543.0
21-Jan	5759.0	1314.0	3124.0
22-Jan	6986.0	1798.0	2798.0
23-Jan	6212.0	1872.0	2881.0
24-Jan	6276.0	1622.0	2418.0
25-Jan	5558.0	1554.0	2941.0
26-Jan	7829.0	4872.0	2610.0
27-Jan	5486.0	3351.0	3473.0
28-Jan	5053.0	2946.0	3022.0
29-Jan	5629.0	2500.0	2178.0
30-Jan	4931.0	1682.0	2168.0
31-Jan	4130.0	2692.0	2244.0
1-Feb	4253.0	1829.0	3054.0
2-Feb	3513.0	2675.0	3791.0
3-Feb	4206.0	1657.0	2819.0
4-Feb	4816.0	2018.0	3216.0
5-Feb	5632.0	2760.0	2713.0
6-Feb	7936.0	3338.0	2254.0
7-Feb	3790.0	2999.0	3664.0
8-Feb	2798.0	3992.0	2234.0
9-Feb	5494.0	3338.0	2044.0
10-Feb	4883.0	2304.0	1426.0
11-Feb	5290.0	2313.0	1339.0
12-Feb	5765.0	2223.0	1484.0
13-Feb	5426.0	2882.0	2062.0
14-Feb	10272.0	2352.0	4262.0
15-Feb	6240.0	2338.0	3086.0
16-Feb	7620.0	2708.0	1084.0
17-Feb	7832.0	2592.0	2017.0

Table B3 TSS Loads from Weyerhaeuser Effluent used in Wapiti/Smoky Rivers Modelling (kg/d)
Source: Northdat (NRBS 1995)

	Year		
Date	1989	1990	1991
18-Feb	7700.0	2234.0	2594.0
19-Feb	6253.0	2457.0	1198.0
20-Feb	4866.0	2426.0	1241.0
21-Feb	5629.0	2531.0	1637.0
22-Feb	5500.0	1875.0	2000.0
23-Feb	5486.0	2130.0	2256.0
24-Feb	4400.0	2215.0	2376.0
25-Feb	5628.0	2233.0	2779.0
26-Feb	6253.0	2031.0	2224.0
27-Feb	6313.0	2155.0	2224.0
28-Feb	7182.0	2094.0	1701.0
29-Feb	7027.0	2678.0	2553.0
1-Mar	7636.0	3557.0	2569.0
2-Mar	6734.0	2650.0	2806.0
3-Mar	9379.0	4378.0	1884.0
4-Mar	7739.0	4383.0	2100.0
5-Mar	13287.0	4049.0	1923.0
6-Mar	9122.0	4076.0	1673.0
7-Mar	8780.0	3647.0	1535.0
8-Mar	9430.0	4174.0	1306.0
9-Mar	7181.0	3340.0	1524.0
10-Mar	9380.0	2596.0	1037.0
11-Mar	7951.0	3415.0	1495.0
12-Mar	10540.0	4178.0	1799.0
13-Mar	11323.0	4663.0	2336.0
14-Mar	7896.0	3143.0	1228.0
15-Mar	7959.0	2638.0	2149.0
16-Mar	11588.0	1978.0	1646.0
17-Mar	6472.0	1442.0	2705.0
18-Mar	5953.0	2172.0	3367.0
19-Mar	7517.0	2237.0	2280.0
20-Mar	4141.0	4461.0	2634.0
21-Mar	4918.0	2495.0	2236.0
22-Mar	4659.0	2698.0	2221.0
23-Mar	3821.0	2612.0	2453.0
24-Mar	5732.0	2749.0	3069.0
25-Mar	4623.0	3176.0	3091.0
26-Mar	6470.0	1826.0	2781.0
27-Mar	6923.0	1954.0	2166.0
28-Mar	8541.0	2236.0	2324.0
29-Mar	6632.0	2970.0	2199.0
30-Mar	8383.0	2576.0	2055.0
31-Mar	7643.0	2657.0	2424.0
1-Apr	8074.0	2310.0	1965.0
2-Apr	7388.0	3048.0	2080.0
3-Apr	3990.0	3830.0	801.0
4-Apr	n/a	2578.0	441.0
5-Apr	n/a	3116.0	384.0

Table B3 TSS Loads from Weyerhaeuser Effluent used in Wapiti/Smoky Rivers Modelling (kg/d)
Source: Northdat (NRBS 1995)

Date	Year 1989	Year 1990	Year 1991
6-Apr	n/a	3015.0	607.0
7-Apr	n/a	2800.0	665.0
8-Apr	n/a	2812.0	1065.0
9-Apr	669.0	2630.0	3763.0
10-Apr	767.0	2881.0	2877.0
11-Apr	236.0	1723.0	833.0
12-Apr	315.0	2276.0	3273.0
13-Apr	262.0	1943.0	10507.0
14-Apr	357.0	2285.0	3228.0
15-Apr	413.0	1848.0	1579.0
16-Apr	298.0	2560.0	970.0
17-Apr	528.0	3194.0	1553.0
18-Apr	207.0	2992.0	3620.0
19-Apr	355.0	4758.0	2670.0
20-Apr	841.0	4843.0	1330.0
21-Apr	2706.0	4466.0	1297.0
22-Apr	355.0	3188.0	1290.0
23-Apr	742.0	3620.0	504.0
24-Apr	546.0	3495.0	976.0
25-Apr	641.0	3047.0	1447.0
26-Apr	698.0	5580.0	4483.0
27-Apr	504.0	5185.0	3238.0
28-Apr	349.0	4389.0	1689.0
29-Apr	986.0	4460.0	1139.0
30-Apr	316.0	5952.0	2260.0
1-May	247.0	n/a	770.0
2-May	997.0	n/a	1108.0
3-May	2096.0	n/a	1103.0
4-May	2111.0	n/a	791.0
5-May	2169.0	n/a	774.0
6-May	7890.0	3294.0	873.0
7-May	3095.0	7128.0	1014.0
8-May	5622.0	7986.0	1198.0
9-May	3777.0	6466.0	1172.0
10-May	5500.0	4599.0	1402.0
11-May	4684.0	7920.0	1554.0
12-May	4931.0	4304.0	1001.0
13-May	4206.0	10744.0	1296.0
14-May	2590.0	395.0	1572.0
15-May	3365.0	2039.0	1734.0
16-May	10611.0	2311.0	1293.0
17-May	5270.0	3586.0	936.0
18-May	3975.0	3775.0	533.0
19-May	4680.0	7226.0	984.0
20-May	4141.0	6613.0	1639.0
21-May	4006.0	7395.0	3065.0
22-May	3688.0	7117.0	1927.0
23-May	4006.0	8658.0	6276.0

Table B3 TSS Loads from Weyerhaeuser Effluent used in Wapiti/Smoky Rivers Modelling (kg/d)
Source: Northdat (NRBS 1995)

	Year		
Date	1989	1990	1991
24-May	3710.0	7429.0	3694.0
25-May	4070.0	6404.0	1536.0
26-May	3637.0	6149.0	2110.0
27-May	3945.0	4611.0	2087.0
28-May	2465.0	4509.0	2099.0
29-May	8017.0	6728.0	2534.0
30-May	9428.0	7417.0	2859.0
31-May	11194.0	5598.0	1823.0
1-Jun	9641.0	6276.0	2819.0
2-Jun	4918.0	6692.0	4735.0
3-Jun	6361.0	4887.0	3627.0
4-Jun	8780.0	3885.0	3613.0
5-Jun	10611.0	5220.0	2665.0
6-Jun	12164.0	3530.0	3495.0
7-Jun	9224.0	5184.0	2474.0
8-Jun	10581.0	3223.0	2022.0
9-Jun	7421.0	1402.0	2635.0
10-Jun	6715.0	1315.0	2502.0
11-Jun	10038.0	2325.0	6324.0
12-Jun	11869.0	287.0	1517.0
13-Jun	11191.0	192.0	1561.0
14-Jun	9556.0	622.0	1211.0
15-Jun	10866.0	668.0	1569.0
16-Jun	12127.0	1442.0	2313.0
17-Jun	7150.0	1453.0	1837.0
18-Jun	11433.0	716.0	2092.0
19-Jun	11834.0	1134.0	1635.0
20-Jun	12229.0	1294.0	1108.0
21-Jun	11156.0	1247.0	1343.0
22-Jun	10602.0	1634.0	1392.0
23-Jun	10801.0	1181.0	1049.0
24-Jun	9677.0	2330.0	1083.0
25-Jun	14361.0	2351.0	597.0
26-Jun	12310.0	2832.0	1962.0
27-Jun	8439.0	4600.0	1399.0
28-Jun	10677.0	3071.0	1459.0
29-Jun	5054.0	3856.0	940.0
30-Jun	6665.0	3557.0	1049.0
1-Jul	9342.0	3819.0	3360.0
2-Jul	7011.0	5258.0	1613.0
3-Jul	8417.0	6029.0	2235.0
4-Jul	8843.0	5370.0	1850.0
5-Jul	7247.0	4362.0	1696.0
6-Jul	7182.0	4648.0	1497.0
7-Jul	8207.0	7261.0	3179.0
8-Jul	7149.0	6608.0	2488.0
9-Jul	7122.0	6027.0	4766.0
10-Jul	8417.0	6533.0	5171.0

Table B3 TSS Loads from Weyerhaeuser Effluent used in Wapiti/Smoky Rivers Modelling (kg/d)
Source: Northdat (NRBS 1995)

Date	Year 1989	1990	1991
11-Jul	7800.0	8625.0	3968.0
12-Jul	7951.0	5108.0	4776.0
13-Jul	11123.0	7323.0	4589.0
14-Jul	8541.0	6467.0	3510.0
15-Jul	8051.0	5532.0	1929.0
16-Jul	7664.0	6495.0	2313.0
17-Jul	8449.0	7466.0	1714.0
18-Jul	7843.0	8954.0	2203.0
19-Jul	8207.0	6829.0	2220.0
20-Jul	11595.0	5815.0	1440.0
21-Jul	10801.0	5344.0	1841.0
22-Jul	13874.0	7591.0	1319.0
23-Jul	7740.0	7007.0	1885.0
24-Jul	6472.0	5993.0	1494.0
25-Jul	6801.0	4394.0	2455.0
26-Jul	5335.0	4489.0	1836.0
27-Jul	6965.0	4584.0	2141.0
28-Jul	7155.0	5421.0	2311.0
29-Jul	4918.0	3220.0	1792.0
30-Jul	4485.0	5397.0	2513.0
31-Jul	7829.0	4904.0	1433.0
1-Aug	5632.0	4912.0	2610.0
2-Aug	7363.0	3401.0	1637.0
3-Aug	7686.0	3203.0	1646.0
4-Aug	5628.0	5057.0	591.0
5-Aug	2976.0	4651.0	1047.0
6-Aug	3076.0	3479.0	900.0
7-Aug	2875.0	3129.0	841.0
8-Aug	2265.0	2778.0	712.0
9-Aug	1553.0	5045.0	781.0
10-Aug	2404.0	3993.0	817.0
11-Aug	1656.0	4102.0	873.0
12-Aug	2054.0	3292.0	1307.0
13-Aug	2911.0	4084.0	755.0
14-Aug	3553.0	1124.0	1254.0
15-Aug	3778.0	660.0	618.0
16-Aug	4680.0	661.0	694.0
17-Aug	4335.0	241.0	1397.0
18-Aug	5053.0	n/a	1506.0
19-Aug	4869.0	n/a	869.0
20-Aug	4194.0	n/a	626.0
21-Aug	3369.0	n/a	751.0
22-Aug	3693.0	n/a	471.0
23-Aug	3668.0	n/a	536.0
24-Aug	3747.0	n/a	405.0
25-Aug	4066.0	n/a	674.0
26-Aug	5066.0	n/a	954.0
27-Aug	4921.0	n/a	4844.0

Table B3 TSS Loads from Weyerhaeuser Effluent used in Wapiti/Smoky Rivers Modelling (kg/d)
Source: Northdat (NRBS 1995)

Date	Year		
	1989	1990	1991
28-Aug	8056.0	n/a	964.0
29-Aug	6726.0	n/a	1345.0
30-Aug	6966.0	n/a	2344.0
31-Aug	4184.0	n/a	1695.0
1-Sep	4775.0	n/a	1355.0
2-Sep	5042.0	n/a	1271.0
3-Sep	4743.0	n/a	1272.0
4-Sep	1901.0	n/a	813.0
5-Sep	3395.0	n/a	1448.0
6-Sep	6000.0	n/a	1409.0
7-Sep	3300.0	n/a	1138.0
8-Sep	2721.0	n/a	733.0
9-Sep	3859.0	n/a	1197.0
10-Sep	4029.0	n/a	910.0
11-Sep	4008.0	n/a	1418.0
12-Sep	5714.0	465.0	856.0
13-Sep	3748.0	436.0	432.0
14-Sep	2851.0	716.0	402.0
15-Sep	4364.0	514.0	500.0
16-Sep	3113.0	7702.0	1862.0
17-Sep	4164.0	4829.0	706.0
18-Sep	3302.0	3031.0	1233.0
19-Sep	3340.0	2828.0	1097.0
20-Sep	3657.0	5464.0	1500.0
21-Sep	3928.0	4228.0	1005.0
22-Sep	3841.0	4067.0	1036.0
23-Sep	4500.0	5079.0	3396.0
24-Sep	4028.0	7160.0	921.0
25-Sep	8217.0	2242.0	1194.0
26-Sep	5291.0	3166.0	1310.0
27-Sep	7035.0	3235.0	1875.0
28-Sep	3267.0	2231.0	912.0
29-Sep	3474.0	1734.0	775.0
30-Sep	3745.0	1869.0	860.0
1-Oct	3760.0	5990.0	n/a
2-Oct	5176.0	5057.0	n/a
3-Oct	2914.0	4661.0	n/a
4-Oct	4569.0	8873.0	n/a
5-Oct	3427.0	6654.0	n/a
6-Oct	6273.0	4644.0	1252.0
7-Oct	5133.0	3152.0	490.0
8-Oct	3307.0	4887.0	317.0
9-Oct	6273.0	4091.0	108.0
10-Oct	3600.0	7975.0	345.0
11-Oct	3173.0	6970.0	449.0
12-Oct	4313.0	8236.0	282.0
13-Oct	3616.0	5491.0	802.0
14-Oct	3616.0	4644.0	398.0

Table B3 TSS Loads from Weyerhaeuser Effluent used in Wapiti/Smoky Rivers Modelling (kg/d)
Source: Northdat (NRBS 1995)

Date	Year		
	1989	1990	1991
15-Oct	2369.0	4215.0	417.0
16-Oct	1332.0	3731.0	480.0
17-Oct	821.0	2861.0	1353.0
18-Oct	261.0	3687.0	453.0
19-Oct	62.0	2440.0	844.0
20-Oct	8.0	2226.0	912.0
21-Oct	4.0	2930.0	1542.0
22-Oct	8.0	3148.0	923.0
23-Oct	28.0	3242.0	596.0
24-Oct	533.0	3197.0	661.0
25-Oct	183.0	2732.0	937.0
26-Oct	210.0	2891.0	638.0
27-Oct	253.0	2226.0	855.0
28-Oct	242.0	3136.0	1119.0
29-Oct	392.0	2280.0	1537.0
30-Oct	857.0	1912.0	1747.0
31-Oct	943.0	2423.0	5863.0
1-Nov	1066.0	3175.0	3211.0
2-Nov	796.0	3131.0	2736.0
3-Nov	1461.0	2642.0	2163.0
4-Nov	722.0	2057.0	3504.0
5-Nov	1005.0	3536.0	2004.0
6-Nov	825.0	3286.0	1244.0
7-Nov	888.0	3212.0	2020.0
8-Nov	1428.0	8592.0	2261.0
9-Nov	2687.0	3581.0	2138.0
10-Nov	1602.0	7328.0	2909.0
11-Nov	1555.0	4324.0	2259.0
12-Nov	1821.0	3991.0	2375.0
13-Nov	2171.0	5568.0	2127.0
14-Nov	1839.0	2167.0	2915.0
15-Nov	2800.0	2789.0	2174.0
16-Nov	2243.0	3585.0	2643.0
17-Nov	3195.0	1721.0	2485.0
18-Nov	2546.0	2566.0	2944.0
19-Nov	3095.0	3732.0	2682.0
20-Nov	3145.0	2115.0	2260.0
21-Nov	3392.0	2716.0	2544.0
22-Nov	2960.0	6679.0	2043.0
23-Nov	2088.0	4334.0	2062.0
24-Nov	2333.0	5439.0	1836.0
25-Nov	2044.0	2364.0	1745.0
26-Nov	2121.0	2578.0	2474.0
27-Nov	3064.0	4249.0	1541.0
28-Nov	2669.0	3121.0	1882.0
29-Nov	3479.0	2845.0	1411.0
30-Nov	4313.0	3318.0	1785.0
1-Dec	3545.0	1944.0	2063.0

Table B3 TSS Loads from Weyerhaeuser Effluent used in Wapiti/Smoky Rivers Modelling (kg/d)
Source: Northdat (NRBS 1995)

	Year		
Date	1989	1990	1991
2-Dec	3646.0	2975.0	1868.0
3-Dec	4007.0	2154.0	3494.0
4-Dec	2829.0	2323.0	1243.0
5-Dec	3341.0	1376.0	1419.0
6-Dec	4486.0	3006.0	1944.0
7-Dec	3394.0	2318.0	1464.0
8-Dec	2924.0	1587.0	3648.0
9-Dec	2672.0	2931.0	2213.0
10-Dec	2746.0	3724.0	2131.0
11-Dec	2537.0	1224.0	2366.0
12-Dec	4672.0	1802.0	2217.0
13-Dec	5488.0	3129.0	3501.0
14-Dec	2413.0	2641.0	2131.0
15-Dec	2596.0	2249.0	2984.0
16-Dec	2499.0	2571.0	3711.0
17-Dec	2380.0	3720.0	3870.0
18-Dec	2839.0	4036.0	2916.0
19-Dec	1821.0	3271.0	2871.0
20-Dec	2687.0	2659.0	2876.0
21-Dec	2310.0	1650.0	1973.0
22-Dec	3748.0	2738.0	3616.0
23-Dec	2786.0	3055.0	2444.0
24-Dec	3543.0	2851.0	2067.0
25-Dec	2829.0	2614.0	1833.0
26-Dec	2781.0	3419.0	644.0
27-Dec	2628.0	3522.0	700.0
28-Dec	2213.0	3577.0	773.0
29-Dec	2806.0	2268.0	959.0
30-Dec	2684.0	2841.0	1132.0

Table B4 Non Pulp Mill TSS Loads used in Wapiti/Smoky Rivers modelling
Source: Macdonald and Taylor, 1990, and model calibration

Grand Prairie STP			P&G Storm Water	
Date	TSS Load (kg/d)		Date	TSS Load (kg/d)
1-Jan-90	60		1-Jan-90	45
21-Feb-90	56		28-Aug-90	45
2-Oct-90	45.9		2-Oct-90	4065
31-Dec-90	56		31-Dec-90	45
1-Jan-91	60		1-Jan-91	45
21-Feb-91	56		28-Aug-91	45
2-Oct-91	45.9		2-Oct-91	4065
31-Dec-91	56		31-Dec-91	45

Table B5 Upper Boundary Sodium Concentrations in Wapiti River at HWY #40
Used in Wapiti/Smoky Rivers Modelling (mg/L)
Source: Naquadat, AEP and model calibration

Date	Na (mg/L)
1-Jan-89	7.1
28-Feb-89	7.5
24-Jul-89	5.7
12-Oct-89	24.7
30-Oct-89	6
28-Feb-90	7.5
20-Mar-90	7.05
16-May-90	6.6
31-May-90	6.15
24-Jul-90	5.7
12-Oct-90	24.7
30-Oct-90	6
9-Jan-91	7.83
6-Feb-91	9.1
28-Feb-91	7
20-Mar-91	8.85
30-Apr-91	4.75
3-May-91	4.85
21-May-91	2.8
15-Jun-91	2.8
23-Aug-91	2.75
18-Sep-91	4.04
6-Nov-91	5.96
1-Jan-92	6.64

Table B6 Tributary Sodium Concentrations used in Wapiti/Smoky Rivers Modelling (mg/L)

Source: Naquadat, AEP

Jday of 1 equals January 1, 1989 and repeat at Jan.1 of 1990 and 1991

Tributary	Na (mg/L)	Jday	Na (mg/L)	Jday	Na (mg/L)	Jday	Na (mg/L)	Jday
Mountain Creek	47.8	1	47.8	52	8.5	275	47.8	365
Bear Creek	65	1	65	52	22.5	275	65	365
Smoky River	7.6	1	7.6	52	6.3	275	7.6	365
Simonette River	28	1	28	52	8.2	275	28	365
Puskwaskau River	14.4	1	14.4	52	14.4	275	14.4	365
Bad Heart Creek	17.5	1	17.5	52	50.5	275	17.5	365
Little Smoky River	21.3	1	21.3	52	9.3	275	21.3	365

Table B7 Sodium Loads from Weyerhaeuser Effluent used in Wapiti/Smoky Rivers Modelling (kg/d)
Source: Northdat (NRBS 1995)

Date	Year 1989	1990	1991
1-Jan	42057.6	30643.0	41684.5
2-Jan	42057.6	28871.1	40586.0
3-Jan	44086.3	28871.1	40289.6
4-Jan	44086.3	28452.5	38687.4
5-Jan	42057.6	31543.2	39675.4
6-Jan	27138.8	37141.0	38508.6
7-Jan	27138.8	31543.2	36464.4
8-Jan	36184.9	36184.9	44579.0
9-Jan	44086.3	35237.8	42722.6
10-Jan	42057.6	31997.6	39608.4
11-Jan	44086.3	31997.6	37863.8
12-Jan	44086.3	38106.3	41559.1
13-Jan	45113.3	38106.3	42235.1
14-Jan	46149.4	36184.9	41430.4
15-Jan	44086.3	36184.9	41616.9
16-Jan	40064.1	36184.9	40887.0
17-Jan	43067.1	32452.6	41746.3
18-Jan	40064.1	36184.9	36677.6
19-Jan	43067.1	31543.2	33833.8
20-Jan	44086.3	32913.4	36734.1
21-Jan	42057.6	34174.4	41434.3
22-Jan	44086.3	37708.5	40409.2
23-Jan	42057.6	34764.0	41611.1
24-Jan	42057.6	29279.9	40296.1
25-Jan	41056.6	36077.6	40679.6
26-Jan	42057.6	35989.9	39446.6
27-Jan	40064.1	36300.6	42591.9
28-Jan	41056.6	33594.6	40925.3
29-Jan	44086.3	33848.1	35399.7
30-Jan	40064.1	33129.9	29352.7
31-Jan	40064.1	37235.9	37406.9
1-Feb	40064.1	37151.4	41102.1
2-Feb	40064.1	36999.3	40593.2
3-Feb	42057.6	37149.5	41647.5
4-Feb	44086.3	37469.9	42660.2
5-Feb	43067.1	37380.2	43014.4
6-Feb	44086.3	36778.3	41860.7
7-Feb	41056.6	36779.0	39691.0
8-Feb	28871.1	37605.8	37238.5
9-Feb	44086.3	38066.0	33218.3
10-Feb	44086.3	36524.8	40287.7
11-Feb	44086.3	37585.0	41438.2
12-Feb	44086.3	40138.2	38585.3
13-Feb	44086.3	39854.8	41882.1
14-Feb	45113.3	39195.7	41351.1
15-Feb	44086.3	37069.5	41793.7
16-Feb	43067.1	36669.1	41447.3
17-Feb	41056.6	34387.0	39719.6

Table B7 Sodium Loads from Weyerhaeuser Effluent used in Wapiti/Smoky Rivers Modelling (kg/d)
Source: Northdat (NRBS 1995)

	Year		
Date	1989	1990	1991
18-Feb	42057.6	33007.7	39210.6
19-Feb	39080.6	33984.6	40985.8
20-Feb	38106.3	35044.8	40322.1
21-Feb	44086.3	28862.6	39410.8
22-Feb	42057.6	23897.9	40625.0
23-Feb	40064.1	24286.0	39632.5
24-Feb	37141.0	23602.8	39597.4
25-Feb	38106.3	23038.6	40135.6
26-Feb	39080.6	23156.9	41297.8
27-Feb	39080.6	29806.4	41302.3
28-Feb	42059.6	28956.2	38129.7
29-Feb	40064.1	32840.6	37719.5
1-Mar	39080.6	32567.6	37945.7
2-Mar	39080.6	36649.6	38812.2
3-Mar	39080.6	37443.9	39509.6
4-Mar	38106.3	41286.7	41356.3
5-Mar	39080.6	41776.8	35704.5
6-Mar	40064.1	41392.0	38843.4
7-Mar	41056.6	38860.3	41565.6
8-Mar	40064.1	35701.9	42441.1
9-Mar	36184.9	34459.1	43072.3
10-Mar	38106.3	35147.5	42122.6
11-Mar	40064.1	34687.9	42245.5
12-Mar	40064.1	33524.4	41759.3
13-Mar	42057.6	32591.7	46014.2
14-Mar	41056.6	26535.6	29551.6
15-Mar	42057.6	29057.6	43647.5
16-Mar	40064.1	34754.9	42784.3
17-Mar	40064.1	33471.8	43961.5
18-Mar	42057.6	38149.2	44665.4
19-Mar	41056.6	39304.2	44906.6
20-Mar	42057.6	37653.9	42796.7
21-Mar	42057.6	37716.9	44040.8
22-Mar	42057.6	36537.2	45123.7
23-Mar	40064.1	35366.5	43097.0
24-Mar	40064.1	32482.5	44328.7
25-Mar	40064.1	34401.9	44648.5
26-Mar	42057.6	33909.9	45198.4
27-Mar	42057.6	35284.0	43994.0
28-Mar	42057.6	35447.8	43160.0
29-Mar	41056.6	30646.9	43323.2
30-Mar	40064.1	32196.5	43078.8
31-Mar	41056.6	35980.1	43775.6
1-Apr	40064.1	34129.6	42577.0
2-Apr	34300.5	33019.4	43612.4
3-Apr	23793.3	35063.6	43392.7
4-Apr	n/a	34909.6	40973.4
5-Apr	n/a	32154.2	49920.0

Table B7 Sodium Loads from Weyerhaeuser Effluent used in Wapiti/Smoky Rivers Modelling (kg/d)
Source: Northdat (NRBS 1995)

Date	Year		
	1989	1990	1991
6-Apr	n/a	33217.6	49354.5
7-Apr	n/a	34335.6	48016.2
8-Apr	n/a	35155.3	46131.8
9-Apr	6392.8	36372.1	49911.6
10-Apr	6392.8	33443.2	49209.6
11-Apr	8523.5	30266.0	36108.8
12-Apr	8523.5	34402.6	38678.3
13-Apr	8523.5	34138.0	41391.4
14-Apr	9670.7	37126.7	39590.2
15-Apr	13420.6	38742.0	27742.0
16-Apr	16161.0	38700.4	19099.6
17-Apr	19084.0	39165.8	29694.0
18-Apr	19259.5	39683.8	41282.8
19-Apr	28871.1	38184.9	42325.4
20-Apr	42057.6	37033.1	41155.4
21-Apr	39080.6	36283.0	42168.1
22-Apr	28871.1	36350.6	39942.5
23-Apr	22982.1	38576.9	20493.2
24-Apr	22181.3	37243.7	37320.4
25-Apr	19842.6	38086.8	40907.1
26-Apr	20611.5	38998.7	40468.4
27-Apr	19259.5	39648.1	39714.4
28-Apr	20611.5	39078.0	37858.6
29-Apr	40064.1	39715.0	35256.7
30-Apr	41056.6	39079.3	25329.9
1-May	40064.1	n/a	38483.3
2-May	38106.3	n/a	48017.5
3-May	40064.1	n/a	42164.9
4-May	38106.3	n/a	39557.1
5-May	38106.3	n/a	38676.3
6-May	40064.1	23787.4	37842.4
7-May	41056.6	38229.8	34689.2
8-May	45113.3	39928.9	43274.4
9-May	43067.1	41202.9	40084.9
10-May	42057.6	43327.1	43381.0
11-May	40064.1	42477.5	43924.4
12-May	40064.1	41628.0	43363.5
13-May	42057.6	42477.5	38289.6
14-May	41056.6	3593.2	42567.9
15-May	42057.6	20389.2	45087.9
16-May	42057.6	22088.3	44243.6
17-May	50378.3	23787.4	43442.1
18-May	43067.1	32282.9	43277.7
19-May	44086.3	41202.9	42623.8
20-May	42057.6	39079.3	39458.3
21-May	40064.1	39079.3	36225.8
22-May	42057.6	38229.8	37965.9
23-May	40064.1	40778.4	38853.1

Table B7 Sodium Loads from Weyerhaeuser Effluent used in Wapiti/Smoky Rivers Modelling (kg/d)
Source: Northdat (NRBS 1995)

Date	Year 1989	1990	1991
24-May	43067.1	35134.5	39364.0
25-May	44086.3	42477.5	39928.9
26-May	40064.1	41202.9	40338.4
27-May	40064.1	41628.0	39891.8
28-May	40064.1	42477.5	38980.5
29-May	43067.1	37380.2	38299.3
30-May	44086.3	41202.9	37920.4
31-May	42057.6	36028.2	34853.0
1-Jun	42057.6	33995.7	34568.3
2-Jun	42057.6	33719.4	37079.9
3-Jun	43067.1	25011.4	36836.2
4-Jun	41056.6	26580.5	38502.8
5-Jun	38106.3	31709.0	38495.0
6-Jun	42057.6	20484.1	37239.2
7-Jun	44086.3	29049.2	32814.6
8-Jun	44086.3	29503.5	33699.3
9-Jun	43067.1	27622.4	34958.3
10-Jun	44086.3	35608.3	33882.6
11-Jun	44086.3	25184.9	34253.7
12-Jun	44086.3	8870.6	36520.3
13-Jun	44086.3	9613.5	37588.9
14-Jun	38106.3	16171.4	37490.7
15-Jun	43067.1	36207.6	40784.3
16-Jun	41056.6	40741.4	44216.3
17-Jun	40064.1	39355.6	37309.4
18-Jun	42057.6	38795.3	45318.7
19-Jun	40064.1	38799.2	42513.9
20-Jun	42057.6	40039.4	31324.2
21-Jun	40064.1	38599.0	36376.0
22-Jun	40064.1	36619.1	36183.6
23-Jun	41056.6	36548.9	37882.0
24-Jun	40064.1	37856.0	39119.0
25-Jun	40064.1	39176.8	35303.5
26-Jun	42562.7	32868.6	38654.9
27-Jun	41557.1	39341.9	41339.4
28-Jun	42062.2	38392.9	41220.4
29-Jun	40064.1	39165.1	40751.1
30-Jun	42057.6	37901.5	40126.5
1-Jul	43067.1	38783.6	41210.0
2-Jul	41056.6	37146.2	41950.4
3-Jul	39080.6	37322.4	40358.5
4-Jul	41056.6	37534.3	40075.1
5-Jul	42057.6	39378.3	40839.5
6-Jul	42057.6	39235.3	38921.4
7-Jul	44086.3	39659.8	43970.6
8-Jul	45113.3	38693.2	46210.5
9-Jul	44086.3	37308.1	44894.2
10-Jul	39080.6	36296.0	46039.5

Table B7 Sodium Loads from Weyerhaeuser Effluent used in Wapiti/Smoky Rivers Modelling (kg/d)
Source: Northdat (NRBS 1995)

Date	Year 1989	Year 1990	Year 1991
11-Jul	44086.3	35258.0	47764.0
12-Jul	43067.1	31926.1	46334.0
13-Jul	44086.3	34244.0	43232.2
14-Jul	42057.6	34175.1	38667.2
15-Jul	45113.3	35600.5	39176.8
16-Jul	44086.3	35178.7	38550.2
17-Jul	46149.4	34415.6	34825.7
18-Jul	45113.3	34437.7	36721.1
19-Jul	44086.3	33628.4	36996.7
20-Jul	43067.1	29300.7	37443.9
21-Jul	41056.6	30737.2	38597.7
22-Jul	41557.1	39474.5	38979.9
23-Jul	43371.3	40307.8	38295.4
24-Jul	40064.1	40159.6	38833.6
25-Jul	38106.3	38079.6	39894.4
26-Jul	38106.3	36931.7	41158.7
27-Jul	40064.1	37713.7	39765.7
28-Jul	39080.6	36705.5	40604.2
29-Jul	42057.6	38053.0	43142.5
30-Jul	41056.6	38552.8	42986.5
31-Jul	42057.6	36637.3	44360.6
1-Aug	43067.1	36701.6	43497.4
2-Aug	50378.3	37464.1	42565.9
3-Aug	43067.1	36521.6	42785.6
4-Aug	38106.3	37779.3	42695.9
5-Aug	28871.1	37792.3	45374.6
6-Aug	22982.1	38325.3	45002.1
7-Aug	33371.7	35684.4	45552.0
8-Aug	42057.6	36845.9	46306.0
9-Aug	42057.6	36846.6	46139.6
10-Aug	40064.1	33706.4	44233.2
11-Aug	43067.1	34631.4	47304.4
12-Aug	43067.1	32917.3	47212.1
13-Aug	46149.4	19959.6	44639.4
14-Aug	43576.7	12180.4	42900.7
15-Aug	43078.8	8760.1	44644.6
16-Aug	44086.3	8107.5	45102.9
17-Aug	42057.6	4011.8	45386.9
18-Aug	41056.6	n/a	44485.4
19-Aug	40064.1	n/a	43439.5
20-Aug	32452.6	n/a	45177.6
21-Aug	39100.1	n/a	44391.8
22-Aug	38106.3	n/a	43707.3
23-Aug	39080.6	n/a	43582.5
24-Aug	34300.5	n/a	43847.7
25-Aug	34778.3	n/a	43825.0
26-Aug	34300.5	n/a	44314.4
27-Aug	34769.2	n/a	49195.3

Table B7 Sodium Loads from Weyerhaeuser Effluent used in Wapiti/Smoky Rivers Modelling (kg/d)
Source: Northdat (NRBS 1995)

Date	Year		
	1989	1990	1991
28-Aug	34226.4	n/a	44756.4
29-Aug	33371.7	n/a	46001.2
30-Aug	34300.5	n/a	44806.5
31-Aug	31998.2	n/a	45914.1
1-Sep	33371.7	n/a	41945.2
2-Sep	35237.8	n/a	43465.5
3-Sep	37141.0	n/a	43526.0
4-Sep	16044.0	n/a	40654.9
5-Sep	32452.6	n/a	39206.1
6-Sep	37141.0	n/a	38147.2
7-Sep	32997.9	n/a	36974.0
8-Sep	33371.7	n/a	36647.0
9-Sep	33003.8	n/a	37044.8
10-Sep	36376.0	n/a	39433.6
11-Sep	36184.9	n/a	36870.0
12-Sep	37141.0	2990.0	37088.4
13-Sep	33371.7	2600.0	35070.8
14-Sep	21300.5	2600.0	37324.3
15-Sep	33371.7	1908.4	36114.7
16-Sep	34300.5	18337.2	35601.2
17-Sep	33835.8	19619.6	35291.1
18-Sep	36376.0	13585.0	36442.3
19-Sep	36184.9	13130.0	37544.0
20-Sep	37141.0	24495.9	36105.6
21-Sep	38106.3	19084.0	36288.2
22-Sep	36184.9	13420.6	35443.9
23-Sep	40064.1	19084.0	30658.6
24-Sep	39080.6	18691.4	35232.6
25-Sep	42057.6	6392.8	36970.7
26-Sep	39080.6	7430.2	35489.4
27-Sep	38106.3	11489.4	34825.7
28-Sep	40064.1	6904.3	34855.0
29-Sep	41056.6	6630.0	26526.5
30-Sep	32452.6	6392.8	15966.6
1-Oct	40064.1	11318.5	n/a
2-Oct	42057.6	13988.0	n/a
3-Oct	37141.0	20611.5	n/a
4-Oct	39080.6	22181.3	n/a
5-Oct	39080.6	16018.6	n/a
6-Oct	38106.3	18076.5	5771.4
7-Oct	36663.3	16129.8	6119.1
8-Oct	39080.6	21608.0	5569.2
9-Oct	38106.3	24854.1	7002.5
10-Oct	37141.0	35262.5	8613.8
11-Oct	36184.9	35118.2	13902.2
12-Oct	33371.7	37178.1	22887.8
13-Oct	29752.5	38792.0	30650.1
14-Oct	29752.5	41923.7	32355.1

Table B7 Sodium Loads from Weyerhaeuser Effluent used in Wapiti/Smoky Rivers Modelling (kg/d)
Source: Northdat (NRBS 1995)

	Year		
Date	1989	1990	1991
15-Oct	22982.1	42145.4	33852.0
16-Oct	15458.3	39754.0	34676.9
17-Oct	10264.2	42267.6	36656.1
18-Oct	3951.4	42045.9	36814.7
19-Oct	1265.6	36876.5	42200.6
20-Oct	279.5	30788.6	42328.0
21-Oct	169.0	40514.5	40098.5
22-Oct	169.0	40127.1	40000.4
23-Oct	956.2	35721.4	35235.2
24-Oct	4495.4	39213.2	28641.0
25-Oct	7430.2	39463.5	24356.2
26-Oct	8523.5	38345.5	31892.3
27-Oct	9670.7	39098.8	37065.6
28-Oct	12121.2	38459.2	42810.3
29-Oct	13420.6	37054.6	41635.8
30-Oct	16875.3	37664.9	39167.7
31-Oct	30643.0	40378.0	38885.0
1-Nov	28871.1	39689.0	37948.3
2-Nov	25866.8	35704.5	39513.5
3-Nov	27138.8	39032.5	41349.8
4-Nov	29311.8	36140.0	39961.4
5-Nov	31093.4	41788.5	39482.3
6-Nov	31543.2	43589.0	38515.8
7-Nov	28871.1	42614.0	37523.2
8-Nov	31997.6	40176.5	35841.0
9-Nov	30643.0	41567.5	35641.5
10-Nov	29752.5	40709.5	36363.6
11-Nov	28871.1	40735.5	39679.3
12-Nov	28871.1	38148.5	40617.2
13-Nov	27138.8	38096.5	39503.8
14-Nov	30643.0	34352.5	39477.8
15-Nov	28000.1	35548.5	38198.6
16-Nov	29752.5	38836.2	39046.8
17-Nov	32452.6	39963.3	37558.3
18-Nov	32452.6	37902.2	36799.1
19-Nov	32452.6	37902.2	37900.9
20-Nov	32452.6	39273.0	37670.1
21-Nov	32912.1	40118.0	38452.1
22-Nov	31543.2	37427.0	35898.2
23-Nov	28871.1	36588.5	36230.4
24-Nov	27569.8	35353.5	38491.7
25-Nov	30197.7	34918.0	39117.0
26-Nov	30643.0	38077.0	37399.7
27-Nov	30643.0	40027.0	37102.7
28-Nov	31543.2	36231.0	35980.1
29-Nov	29752.5	34892.0	35284.0
30-Nov	33371.7	33702.5	36250.5
1-Dec	32452.6	35093.5	38309.1

Table B7 Sodium Loads from Weyerhaeuser Effluent used in Wapiti/Smoky Rivers Modelling (kg/d)
Source: Northdat (NRBS 1995)

Date	Year		
	1989	1990	1991
2-Dec	32912.1	37914.5	40475.5
3-Dec	30643.0	37843.0	39158.0
4-Dec	30643.0	36835.5	29935.8
5-Dec	29752.5	31947.5	32949.8
6-Dec	28871.1	39877.5	38295.4
7-Dec	30643.0	37674.0	38052.3
8-Dec	27954.6	38194.0	39524.6
9-Dec	27138.8	43296.5	39956.2
10-Dec	29752.5	40345.5	39584.4
11-Dec	27954.6	41886.0	41570.8
12-Dec	33371.7	43387.5	41165.8
13-Dec	34300.5	42367.0	36119.9
14-Dec	33371.7	39929.5	36448.1
15-Dec	32452.6	39507.0	38033.5
16-Dec	30643.0	40755.0	38900.6
17-Dec	29752.5	35041.5	39304.2
18-Dec	27138.8	40989.0	35759.8
19-Dec	28871.1	40891.5	39711.1
20-Dec	30643.0	40196.0	38946.1
21-Dec	28871.1	39721.5	34663.9
22-Dec	28000.1	39546.0	34063.9
23-Dec	24143.0	40527.5	33803.3
24-Dec	31543.2	39432.9	33593.3
25-Dec	30643.0	39507.0	34032.7
26-Dec	30643.0	36432.5	34901.1
27-Dec	28000.1	46717.5	35008.4
28-Dec	27138.8	39412.8	33482.8
29-Dec	31997.6	37792.3	32815.9
30-Dec	32912.1	41030.6	35027.2

Table B8 Non Pulp Mill Sodium Loads used in Wapiti/Smoky Rivers modelling
Source: Macdonald and Taylor, 1990, and model calibration

Grand Prairie STP			P&G Storm Water	
Date	Na Load (kg/d)		Date	Na Load (kg/d)
21-Feb-90	1054		21-Feb-90	50
2-Oct-90	1126		2-Oct-90	35.4
31-Dec-90	1054		31-Dec-90	50
21-Feb-91	1054		21-Feb-91	50
2-Oct-91	1126		2-Oct-91	35.4
31-Dec-91	1054		31-Dec-91	50

Table B9. Flows used in the Wapiti and Smoky Rivers modelling
Source: Water Survey of Canada

Date	Wapiti River at Highway #40	Smoky River near the confluence with Wapiti River
1/1/90	40.7	90.5
1/2/90	35.1	85.4
1/3/90	33.4	83.1
1/4/90	27.6	81.8
1/5/90	27.8	79.9
1/6/90	28	81.6
1/7/90	30	84.3
1/8/90	33.1	88.5
1/9/90	34.3	89.4
1/10/90	33.7	102
1/11/90	33.2	104
1/12/90	31.5	103
1/13/90	29.2	99.8
1/14/90	27.2	93
1/15/90	25.9	92.4
1/16/90	25.7	90.6
1/17/90	25.8	88.4
1/18/90	26.4	92.2
1/19/90	26.6	93.4
1/20/90	26.4	91.8
1/21/90	26	91.2
1/22/90	22	86.6
1/23/90	17	77
1/24/90	19	70.8
1/25/90	17.4	76.8
1/26/90	17	87.1
1/27/90	17.7	80.7
1/28/90	18	72.3
1/29/90	16	68.6
1/30/90	14.5	65.9
1/31/90	15	61.7
2/1/90	16	58.2
2/2/90	14.5	56.1
2/3/90	13	57.6
2/4/90	12	52.7
2/5/90	11.5	43
2/6/90	12	44.2
2/7/90	13	40.8
2/8/90	15.5	41.9
2/9/90	17	61
2/10/90	16.5	65.5
2/11/90	15.5	65.4
2/12/90	13.4	64.7
2/13/90	13	60.4
2/14/90	13.2	58.3
2/15/90	13.4	57.8
2/16/90	13.2	56.1
2/17/90	13.4	53.4
2/18/90	13.6	47.6
2/19/90	12	47
2/20/90	11.5	49.2
2/21/90	12	51.3
2/22/90	13.2	52.2
2/23/90	12.2	52.7
2/24/90	12	55.1
2/25/90	12.8	58.4
2/26/90	12.8	58.4
2/27/90	13.6	59.4
2/28/90	13.3	62.8
3/1/90	13.1	64.6
3/2/90	13.7	65.8
3/3/90	15.1	67.6
3/4/90	18.4	71
3/5/90	21	73.4
3/6/90	22.6	77
3/7/90	23.1	78.6
3/8/90	23.4	81.6
3/9/90	21.5	82
3/10/90	21.2	81
3/11/90	20.4	83.8
3/12/90	18.3	83.2
3/13/90	17.5	81.4

Table B9. Flows used in the Wapiti and Smoky Rivers modelling
Source: Water Survey of Canada

Date	Wapiti River at Highway #40	Smoky River near the confluence with Wapiti River
3/14/90	16.5	71.6
3/15/90	16.5	70.6
3/16/90	15.4	76
3/17/90	20.5	83.6
3/18/90	22.6	95.2
3/19/90	29.9	111
3/20/90	28.8	116
3/21/90	27	112
3/22/90	24.1	110
3/23/90	22.2	99
3/24/90	21.5	94.5
3/25/90	21.4	91
3/26/90	21.2	88.6
3/27/90	24	89.2
3/28/90	31.6	89.8
3/29/90	38.7	110
3/30/90	45.8	140
3/31/90	47	180
4/1/90	47.2	190
4/2/90	48.6	195
4/3/90	48.9	200
4/4/90	48.3	201
4/5/90	51.7	230
4/6/90	45.8	239
4/7/90	43.2	231
4/8/90	43.5	214
4/9/90	39.6	201
4/10/90	36.6	173
4/11/90	33.5	156
4/12/90	30.5	145
4/13/90	30.5	132
4/14/90	38.3	126
4/15/90	42.6	138
4/16/90	46	152
4/17/90	49.7	164
4/18/90	53.3	176
4/19/90	60.3	181
4/20/90	72.8	210
4/21/90	91.1	256
4/22/90	110	304
4/23/90	112	342
4/24/90	120	357
4/25/90	150	403
4/26/90	147	526
4/27/90	125	542
4/28/90	106	438
4/29/90	89.6	419
4/30/90	81.6	361
5/1/90	82	319
5/2/90	87.5	306
5/3/90	91.9	313
5/4/90	104	323
5/5/90	128	332
5/6/90	173	363
5/7/90	228	457
5/8/90	194	613
5/9/90	167	561
5/10/90	156	498
5/11/90	155	474
5/12/90	152	473
5/13/90	152	470
5/14/90	168	490
5/15/90	168	514
5/16/90	162	520
5/17/90	165	511
5/18/90	185	520
5/19/90	216	578
5/20/90	231	637
5/21/90	247	671
5/22/90	257	722
5/23/90	252	747
5/24/90	253	732

Table B9.

Flows used in the Wapiti and Smoky Rivers modelling
Source: Water Survey of Canada

Date	Wapiti River at Highway #40	Smoky River near the confluence with Wapiti River
5/25/90	279	770
5/26/90	409	901
5/27/90	480	1290
5/28/90	470	1370
5/29/90	460	1300
5/30/90	477	1320
5/31/90	625	1500
6/1/90	503	2260
6/2/90	596	2230
6/3/90	461	1880
6/4/90	480	1630
6/5/90	573	1720
6/6/90	502	1790
6/7/90	424	1600
6/8/90	377	1430
6/9/90	362	1320
6/10/90	346	1260
6/11/90	540	1270
6/12/90	4400	3850
6/13/90	3660	8620
6/14/90	1900	7180
6/15/90	1240	4140
6/16/90	1000	2750
6/17/90	818	2190
6/18/90	643	1960
6/19/90	534	1410
6/20/90	459	1450
6/21/90	417	1270
6/22/90	403	1160
6/23/90	389	1110
6/24/90	380	1110
6/25/90	339	1130
6/26/90	308	1020
6/27/90	292	916
6/28/90	256	849
6/29/90	239	785
6/30/90	223	740
7/1/90	219	700
7/2/90	226	720
7/3/90	240	700
7/4/90	474	915
7/5/90	388	110
7/6/90	336	1010
7/7/90	333	997
7/8/90	292	1120
7/9/90	273	999
7/10/90	265	917
7/11/90	240	856
7/12/90	226	777
7/13/90	218	732
7/14/90	215	729
7/15/90	186	699
7/16/90	157	638
7/17/90	141	590
7/18/90	130	540
7/19/90	126	500
7/20/90	118	460
7/21/90	106	430
7/22/90	97.5	400
7/23/90	95.3	375
7/24/90	95.9	355
7/25/90	95.3	340
7/26/90	96.7	340
7/27/90	94.2	350
7/28/90	92.4	364
7/29/90	86.3	357
7/30/90	84.1	334
7/31/90	82.5	313
8/1/90	78.3	315
8/2/90	78.5	309
8/3/90	74.5	307
8/4/90	71.3	287

Table B9. Flows used in the Wapiti and Smoky Rivers modelling
Source: Water Survey of Canada

Date	Wapiti River at Highway #40	Smoky River near the confluence with Wapiti River
8/5/90	67.1	258
8/6/90	62.8	246
8/7/90	58.7	250
8/8/90	55.7	256
8/9/90	52.5	253
8/10/90	49.7	231
8/11/90	48	222
8/12/90	48.8	218
8/13/90	48	217
8/14/90	51.4	221
8/15/90	51.3	232
8/16/90	50.7	242
8/17/90	48.5	241
8/18/90	52.1	236
8/19/90	52.3	236
8/20/90	49.2	229
8/21/90	45.2	213
8/22/90	43.1	202
8/23/90	44.4	200
8/24/90	43.7	200
8/25/90	43.2	203
8/26/90	40	186
8/27/90	37	170
8/28/90	35	159
8/29/90	33.1	151
8/30/90	32.2	146
8/31/90	34.6	148
9/1/90	41.4	162
9/2/90	46.5	204
9/3/90	46.4	207
9/4/90	43.7	205
9/5/90	39.7	197
9/6/90	37	177
9/7/90	35.2	162
9/8/90	34.2	155
9/9/90	33.3	149
9/10/90	32.2	148
9/11/90	31.2	142
9/12/90	30.6	136
9/13/90	29.8	134
9/14/90	29.7	133
9/15/90	29.4	131
9/16/90	29.3	124
9/17/90	29.2	128
9/18/90	32.5	144
9/19/90	34	229
9/20/90	32.3	208
9/21/90	30.6	186
9/22/90	29	169
9/23/90	28	157
9/24/90	27.4	154
9/25/90	27.2	150
9/26/90	27	153
9/27/90	26.9	152
9/28/90	26.7	146
9/29/90	26.2	136
9/30/90	25.3	127
10/1/90	25.4	122
10/2/90	25.5	120
10/3/90	24.7	116
10/4/90	26.5	112
10/5/90	28.6	113
10/6/90	28.6	115
10/7/90	27.6	115
10/8/90	26.4	114
10/9/90	26	110
10/10/90	25.9	108
10/11/90	31.5	107
10/12/90	39.1	112
10/13/90	35.8	126
10/14/90	33.5	125
10/15/90	31.9	120

Table B9. Flows used in the Wapiti and Smoky Rivers modelling
Source: Water Survey of Canada

Date	Wapiti River at Highway #40	Smoky River near the confluence with Wapiti River
10/16/90	30.2	118
10/17/90	28.6	116
10/18/90	27.5	108
10/19/90	27.2	103
10/20/90	26.4	101
10/21/90	26.1	102
10/22/90	26.3	99.1
10/23/90	25.9	97.9
10/24/90	25.3	101
10/25/90	25.8	98.3
10/26/90	33.2	99.9
10/27/90	42.7	107
10/28/90	40.6	122
10/29/90	38.9	138
10/30/90	38.6	132
10/31/90	37.8	131
11/1/90	34.5	128
11/2/90	30	120
11/3/90	25.4	109
11/4/90	21.5	100
11/5/90	20.5	84.8
11/6/90	19.3	57.6
11/7/90	17.5	61.2
11/8/90	17	66.4
11/9/90	16.5	68
11/10/90	16	63.8
11/11/90	16	72.8
11/12/90	16.5	67.8
11/13/90	16.5	62.4
11/14/90	15.2	69
11/15/90	15.6	67.6
11/16/90	17.6	64.8
11/17/90	19	73
11/18/90	19.8	73.6
11/19/90	17.8	74.6
11/20/90	18.4	73.8
11/21/90	18.3	72.8
11/22/90	17.5	72
11/23/90	15.6	71
11/24/90	15.7	70.2
11/25/90	16	69
11/26/90	16.2	64.4
11/27/90	16.4	64
11/28/90	17	64
11/29/90	17	64.4
11/30/90	17.5	67
12/1/90	17.8	66
12/2/90	17.4	66.6
12/3/90	17.1	64.6
12/4/90	18	68.4
12/5/90	18.6	65.2
12/6/90	18.5	65.2
12/7/90	18.5	66.4
12/8/90	18	64.4
12/9/90	18.5	62.8
12/10/90	19	59.2
12/11/90	19.2	62.8
12/12/90	19	62
12/13/90	19.1	61.2
12/14/90	19.5	57.6
12/15/90	18.6	56.6
12/16/90	18.3	56.1
12/17/90	20.3	58
12/18/90	20	56
12/19/90	18.1	58.8
12/20/90	18.4	58
12/21/90	15.9	58.8
12/22/90	14.3	56.3
12/23/90	14.9	53.9
12/24/90	16.5	46.8
12/25/90	17.5	45
12/26/90	17.9	49.4

Table B9. Flows used in the Wapiti and Smoky Rivers modelling
Source: Water Survey of Canada

Date	Wapiti River at Highway #40	Smoky River near the confluence with Wapiti River
12/27/90	17.9	49.4
12/28/90	18.1	48
12/29/90	17.8	48.3
12/30/90	16.8	47.1
12/31/90	15.8	46.1
1/1/91	15.3	45.2
1/2/91	15.4	42.3
1/3/91	15.3	40.7
1/4/91	15.2	40.1
1/5/91	14.7	39.9
1/6/91	14.4	42.2
1/7/91	14.1	43.2
1/8/91	13.8	42.4
1/9/91	13.5	41.4
1/10/91	13.2	41.1
1/11/91	12.8	40.8
1/12/91	12.5	40.1
1/13/91	12.4	39.3
1/14/91	12.5	38.2
1/15/91	12.8	37.8
1/16/91	13	36.4
1/17/91	13.3	38.3
1/18/91	13.5	39.1
1/19/91	13.6	39.2
1/20/91	14	39.2
1/21/91	13.7	37.7
1/22/91	13.7	41
1/23/91	13.3	40.8
1/24/91	13.1	38.8
1/25/91	13.3	38.2
1/26/91	12.8	36
1/27/91	12.3	36.1
1/28/91	12.3	37
1/29/91	12.2	36
1/30/91	12	35.3
1/31/91	11.8	36.4
2/1/91	11.1	36.6
2/2/91	10.8	36.1
2/3/91	10.8	34.5
2/4/91	11.3	32.9
2/5/91	11.9	33.4
2/6/91	12.4	34.4
2/7/91	14	36.5
2/8/91	15.1	38.4
2/9/91	16.9	40.7
2/10/91	17.9	44.3
2/11/91	17.7	46.6
2/12/91	17.4	49.2
2/13/91	17	49.3
2/14/91	17	47.5
2/15/91	16.9	46.9
2/16/91	16.6	47.2
2/17/91	16.3	47.9
2/18/91	16.2	47.4
2/19/91	16.3	47
2/20/91	16.1	47.3
2/21/91	15.9	48.4
2/22/91	16.1	47.1
2/23/91	15.5	45.1
2/24/91	15	46.9
2/25/91	15.2	46.5
2/26/91	15.9	45.3
2/27/91	15.7	44.3
2/28/91	14.9	44.7
3/1/91	14.4	43.9
3/2/91	14	44.3
3/3/91	12.5	43.6
3/4/91	11.3	42.3
3/5/91	10.3	39.5
3/6/91	11.8	34.9
3/7/91	12.9	32.4
3/8/91	13.1	29.7

Table B9. Flows used in the Wapiti and Smoky Rivers modelling
Source: Water Survey of Canada

Date	Wapiti River at Highway #40	Smoky River near the confluence with Wapiti River
3/9/91	13.2	32.2
3/10/91	13	38.8
3/11/91	12.6	42
3/12/91	12.5	45
3/13/91	12.2	46
3/14/91	12	46.4
3/15/91	12.1	45.6
3/16/91	11.9	44.3
3/17/91	11.8	44.2
3/18/91	11.4	44.9
3/19/91	11.1	49.5
3/20/91	11.2	56.5
3/21/91	11.4	62.4
3/22/91	12.3	67.2
3/23/91	13.1	69.3
3/24/91	13.3	61.5
3/25/91	12.8	60.8
3/26/91	12	57.8
3/27/91	11.4	57.2
3/28/91	11.4	54.9
3/29/91	11.2	55.7
3/30/91	12.4	61.6
3/31/91	13.8	73.4
4/1/91	26.4	96.2
4/2/91	30	119
4/3/91	34	134
4/4/91	37.1	157
4/5/91	39.2	172
4/6/91	42.2	188
4/7/91	43.4	202
4/8/91	44.8	205
4/9/91	42.2	209
4/10/91	40.1	208
4/11/91	39.2	187
4/12/91	40.1	185
4/13/91	42.8	190
4/14/91	50.7	215
4/15/91	61.4	284
4/16/91	66	315
4/17/91	69.9	324
4/18/91	79.1	348
4/19/91	93.4	380
4/20/91	116	420
4/21/91	149	471
4/22/91	188	543
4/23/91	236	613
4/24/91	254	675
4/25/91	282	723
4/26/91	363	921
4/27/91	339	1350
4/28/91	300	1230
4/29/91	267	1070
4/30/91	237	954
5/1/91	221	873
5/2/91	213	791
5/3/91	213	711
5/4/91	216	659
5/5/91	218	624
5/6/91	221	599
5/7/91	234	582
5/8/91	263	593
5/9/91	322	643
5/10/91	931	1350
5/11/91	752	2520
5/12/91	665	2020
5/13/91	623	1880
5/14/91	629	1860
5/15/91	534	2000
5/16/91	450	1860
5/17/91	414	1520
5/18/91	418	1310
5/19/91	468	1250

Table B9. Flows used in the Wapiti and Smoky Rivers modelling
Source: Water Survey of Canada

Date	Wapiti River at Highway #40	Smoky River near the confluence with Wapiti River
5/20/91	537	1460
5/21/91	532	1650
5/22/91	462	1340
5/23/91	382	1290
5/24/91	320	1070
5/25/91	277	921
5/26/91	241	800
5/27/91	229	712
5/28/91	257	682
5/29/91	296	721
5/30/91	334	806
5/31/91	363	901
6/1/91	374	974
6/2/91	342	994
6/3/91	298	934
6/4/91	262	836
6/5/91	236	765
6/6/91	215	701
6/7/91	234	663
6/8/91	296	707
6/9/91	328	850
6/10/91	295	893
6/11/91	387	827
6/12/91	407	1030
6/13/91	348	1100
6/14/91	307	951
6/15/91	285	838
6/16/91	276	809
6/17/91	339	867
6/18/91	371	1010
6/19/91	369	1070
6/20/91	355	1090
6/21/91	349	1060
6/22/91	350	1030
6/23/91	337	965
6/24/91	327	945
6/25/91	322	919
6/26/91	311	924
6/27/91	298	890
6/28/91	296	876
6/29/91	312	892
6/30/91	312	992
7/1/91	311	977
7/2/91	289	972
7/3/91	283	921
7/4/91	286	933
7/5/91	261	937
7/6/91	235	944
7/7/91	241	865
7/8/91	215	979
7/9/91	201	892
7/10/91	193	833
7/11/91	181	814
7/12/91	171	756
7/13/91	167	704
7/14/91	163	689
7/15/91	164	689
7/16/91	150	670
7/17/91	131	607
7/18/91	121	562
7/19/91	116	520
7/20/91	109	490
7/21/91	99.2	460
7/22/91	88.6	440
7/23/91	81.3	420
7/24/91	77.6	408
7/25/91	82	395
7/26/91	87.9	395
7/27/91	89.4	411
7/28/91	81.9	443
7/29/91	76.1	434
7/30/91	72.6	408

Table B9. Flows used in the Wapiti and Smoky Rivers modelling
Source: Water Survey of Canada

Date	Wapiti River at Highway #40	Smoky River near the confluence with Wapiti River
7/31/91	48.2	394
8/1/91	41.6	366
8/2/91	56.7	326
8/3/91	53.9	304
8/4/91	52	290
8/5/91	52.9	284
8/6/91	54.1	287
8/7/91	55.3	305
8/8/91	62.1	325
8/9/91	61.7	338
8/10/91	61.5	341
8/11/91	71.8	364
8/12/91	67.8	468
8/13/91	72.3	431
8/14/91	81.5	444
8/15/91	105	1060
8/16/91	93.3	925
8/17/91	80.7	760
8/18/91	71.6	632
8/19/91	43.8	545
8/20/91	59.8	479
8/21/91	57.4	434
8/22/91	54.7	400
8/23/91	50.4	358
8/24/91	46.3	318
8/25/91	43.5	291
8/26/91	40.8	270
8/27/91	39.1	248
8/28/91	41.2	228
8/29/91	43.8	218
8/30/91	48.5	222
8/31/91	50.7	224
9/1/91	109	239
9/2/91	110	403
9/3/91	99.6	378
9/4/91	84.6	342
9/5/91	72.5	301
9/6/91	63.5	269
9/7/91	63.2	259
9/8/91	65.3	260
9/9/91	63.5	281
9/10/91	56.3	274
9/11/91	51.5	242
9/12/91	47.7	223
9/13/91	47.1	213
9/14/91	50.2	204
9/15/91	56.6	206
9/16/91	54.1	212
9/17/91	51.6	201
9/18/91	51.6	200
9/19/91	48.3	205
9/20/91	45	192
9/21/91	42.8	183
9/22/91	40.5	180
9/23/91	38.8	170
9/24/91	36.8	160
9/25/91	35.3	153
9/26/91	34.9	146
9/27/91	34.5	144
9/28/91	33.3	144
9/29/91	32.2	140
9/30/91	31.7	136
10/1/91	30.2	138
10/2/91	29.3	134
10/3/91	32.8	126
10/4/91	31.4	125
10/5/91	29.4	124
10/6/91	28.2	119
10/7/91	27.1	115
10/8/91	26.2	112
10/9/91	26	110
10/10/91	25.2	113

Table B9. Flows used in the Wapiti and Smoky Rivers modelling
Source: Water Survey of Canada

Date	Wapiti River at Highway #40	Smoky River near the confluence with Wapiti River
10/11/91	25.8	109
10/12/91	53.4	105
10/13/91	47.4	133
10/14/91	49	137
10/15/91	43.9	140
10/16/91	52.7	134
10/17/91	52.8	145
10/18/91	44.6	170
10/19/91	39	163
10/20/91	42	148
10/21/91	44.9	147
10/22/91	50.2	153
10/23/91	42.7	204
10/24/91	41	192
10/25/91	35.8	165
10/26/91	30	156
10/27/91	25	128
10/28/91	21.5	95.8
10/29/91	18.6	79.8
10/30/91	22.2	65.2
10/31/91	22.2	65.8
11/1/91	24.8	77.8
11/2/91	23.2	89.8
11/3/91	25.1	93
11/4/91	27	99.4
11/5/91	29.2	109
11/6/91	28	113
11/7/91	27	115
11/8/91	26.5	120
11/9/91	26.7	118
11/10/91	26.3	119
11/11/91	28.2	122
11/12/91	30.3	125
11/13/91	32.3	128
11/14/91	31.7	139
11/15/91	30.1	131
11/16/91	28.9	131
11/17/91	27	128
11/18/91	25.8	115
11/19/91	25	113
11/20/91	24.6	111
11/21/91	24.2	105
11/22/91	23.8	95.4
11/23/91	23.6	93.5
11/24/91	23.5	93.6
11/25/91	23	90.6
11/26/91	22.8	85.9
11/27/91	22.5	87.3
11/28/91	21.7	92.3
11/29/91	21	97.3
11/30/91	20.5	93.9
12/1/91	19.5	85.8
12/2/91	19	83.6
12/3/91	19.4	83.8
12/4/91	19.6	83
12/5/91	20	79.8
12/6/91	21	83.6
12/7/91	22	82.6
12/8/91	23	80.7
12/9/91	23.6	76.8
12/10/91	23.8	83.3
12/11/91	23.8	82.8
12/12/91	23.5	84.8
12/13/91	23	84.6
12/14/91	22.8	85.6
12/15/91	22.5	84.6
12/16/91	22	84.4
12/17/91	21.8	80.1
12/18/91	21.5	80.4
12/19/91	21	82.8
12/20/91	21.5	80.4
12/21/91	21	84

Table B9. Flows used in the Wapiti and Smoky Rivers modelling
Source: Water Survey of Canada

Date	Wapiti River at Highway #40	Smoky River near the confluence with Wapiti River
12/22/91	21	90
12/23/91	21.4	78
12/24/91	22	83
12/25/91	22.4	86
12/26/91	23	84
12/27/91	22.6	80
12/28/91	22.1	78
12/29/91	21.4	78
12/30/91	21.9	77
12/31/91	22.1	77

Table B10a Flows of Simonette River near Goodwin used in Wapiti/Smoky Rivers modelling

Date	1990 Flow (m^3/s)	1991 Flow (m^3/s)	1992 Flow (m^3/s)
18-Feb			3.30
19-Feb			3.29
20-Feb	2.65		3.28
21-Feb	2.80		3.29
22-Feb	2.88		3.31
23-Feb	2.94		3.36
24-Feb	3.00		3.41
25-Feb	3.04		3.44
26-Feb	3.08		3.49
27-Feb	3.10	3.62	4.16
28-Feb	3.14	3.64	5.91
1-Mar	3.18	3.62	10.60
2-Mar	3.28	3.50	13.50
3-Mar	3.42	3.20	11.60
4-Mar	3.56	2.80	14.70
5-Mar	3.74	2.30	15.60
6-Mar	3.84	2.35	16.60
7-Mar	3.90	2.40	16.60
8-Mar	3.96	2.60	15.90
9-Mar	3.90	2.75	15.50
10-Mar	3.82	2.70	15.00
11-Mar	3.76	2.60	14.80
12-Mar	3.72	2.50	16.40
13-Mar	3.68	2.40	17.70
14-Mar	3.96	2.35	21.80
15-Mar	4.32	2.40	26.10
16-Mar	4.64	2.50	30.00
17-Mar	5.16	2.75	34.90
18-Mar	6.00	2.90	44.00
19-Mar	7.28	3.08	46.10
20-Mar	7.10	3.24	43.10
21-Mar	7.00	3.44	42.90
22-Mar	6.85	3.68	43.80
23-Mar	6.70	3.86	45.80
24-Mar	6.30	3.95	52.00
25-Mar	6.13	3.94	51.10
26-Mar	6.03	3.71	47.20
27-Mar	6.43	3.44	47.70
28-Mar	7.55	3.32	47.70
29-Mar	9.70	3.56	47.80
30-Mar	11.50	3.74	45.00
31-Mar	13.50	3.93	39.70
1-Apr	20.00	6.00	38.50
2-Apr	23.00	7.99	40.50
3-Apr	23.40	12.00	49.90
4-Apr	23.50	16.90	75.80
5-Apr	22.00	23.00	88.00
6-Apr	21.00	33.60	74.40
7-Apr	19.50	34.00	62.50

Table B10a Flows of Simonette River near Goodwin used in Wapiti/Smoky Rivers modelling

Date	1990 Flow (m^3/s)	1991 Flow (m^3/s)	1992 Flow (m^3/s)
8-Apr	18.00	32.50	54.30
9-Apr	16.50	30.70	47.40
10-Apr	16.00	30.70	42.30
11-Apr	15.50	29.80	35.80
12-Apr	16.00	34.70	29.30
13-Apr	16.90	40.80	31.70
14-Apr	17.50	51.30	30.50
15-Apr	19.10	58.10	30.80
16-Apr	22.60	58.00	32.00
17-Apr	21.70	58.70	34.80
18-Apr	22.20	64.30	39.80
19-Apr	26.80	69.60	48.90
20-Apr	39.20	76.50	55.00
21-Apr	45.00	86.80	52.80
22-Apr	46.50	94.40	51.70
23-Apr	46.70	106.00	52.00
24-Apr	48.60	114.00	61.40
25-Apr	74.20	123.00	93.70
26-Apr	106.00	301.00	87.50
27-Apr	90.00	271.00	75.70
28-Apr	60.00	214.00	70.00
29-Apr	48.00	170.00	67.10
30-Apr	33.00	141.00	65.30
1-May	35.00	125.00	63.90
2-May	37.00	107.00	63.40
3-May	39.00	92.00	58.20
4-May	40.00	84.20	50.30
5-May	42.00	76.70	44.70
6-May	43.00	70.60	40.20
7-May	44.00	69.90	37.10
8-May	41.00	71.90	34.50
9-May	37.00	76.90	32.00
10-May	43.00	344.00	29.90
11-May	46.00	326.00	28.80
12-May	46.00	217.00	29.20
13-May	45.00	174.00	41.80
14-May	44.60	168.00	48.70
15-May	50.20	139.00	47.30
16-May	49.30	107.00	46.50
17-May	46.80	85.10	45.80
18-May	44.20	71.80	42.10
19-May	47.80	64.20	37.60
20-May	49.20	60.70	34.40
21-May	46.60	56.00	32.60
22-May	49.20	49.40	32.00
23-May	55.40	44.50	31.00
24-May	52.20	39.90	31.00
25-May	49.00	36.20	33.00
26-May	74.60	33.10	37.20

Table B10a Flows of Simonette River near Goodwin used in Wapiti/Smoky Rivers modelling

Date	1990 Flow (m^3/s)	1991 Flow (m^3/s)	1992 Flow (m^3/s)
27-May	120.00	31.40	37.70
28-May	91.90	29.50	36.00
29-May	64.30	27.90	34.10
30-May	54.20	25.40	31.50
31-May	97.90	23.10	29.90
1-Jun	221.00	21.70	37.50
2-Jun	148.00	19.90	45.10
3-Jun	107.00	19.70	38.20
4-Jun	88.70	20.80	46.80
5-Jun	135.00	26.50	61.90
6-Jun	190.00	27.50	53.20
7-Jun	127.00	24.00	44.90
8-Jun	88.00	20.30	38.70
9-Jun	70.20	18.00	34.00
10-Jun	61.10	16.50	32.20
11-Jun	66.40	15.20	29.30
12-Jun	551.00	15.10	30.40
13-Jun	845.00	19.30	30.00
14-Jun	494.00	20.80	26.90
15-Jun	334.00	29.10	23.70
16-Jun	223.00	45.00	20.80
17-Jun	159.00	53.60	18.20
18-Jun	115.00	69.10	16.40
19-Jun	87.60	82.00	15.30
20-Jun	70.40	66.40	14.20
21-Jun	57.80	53.60	12.90
22-Jun	49.80	44.00	11.60
23-Jun	42.90	37.30	10.70
24-Jun	38.60	32.70	9.86
25-Jun	34.30	30.20	8.94
26-Jun	31.70	29.10	8.35
27-Jun	29.10	26.20	7.88
28-Jun	28.40	24.60	7.37
29-Jun	25.90	25.90	6.91
30-Jun	24.20	28.10	6.45
1-Jul	23.00	27.60	6.06
2-Jul	21.70	29.80	5.86
3-Jul	22.60	29.90	5.79
4-Jul	39.30	26.10	6.08
5-Jul	68.20	23.70	6.14
6-Jul	53.90	21.00	6.78
7-Jul	84.30	27.50	6.79
8-Jul	76.40	67.10	6.55
9-Jul	54.10	51.00	6.85
10-Jul	41.40	41.00	8.27
11-Jul	32.90	33.60	7.72
12-Jul	27.00	28.20	10.50
13-Jul	23.60	27.50	11.00
14-Jul	19.80	29.40	9.09

Table B10a Flows of Simonette River near Goodwin used in Wapiti/Smoky Rivers modelling

Date	1990 Flow (m^3/s)	1991 Flow (m^3/s)	1992 Flow (m^3/s)
15-Jul	17.90	25.70	8.02
16-Jul	16.30	22.90	7.75
17-Jul	15.60	19.80	7.37
18-Jul	14.40	18.40	7.46
19-Jul	13.40	18.30	6.97
20-Jul	12.90	16.40	6.27
21-Jul	11.90	14.50	5.95
22-Jul	11.10	12.90	5.77
23-Jul	10.40	11.80	5.41
24-Jul	9.83	10.80	5.01
25-Jul	9.57	10.10	4.65
26-Jul	9.23	10.30	4.49
27-Jul	8.97	18.40	4.81
28-Jul	8.72	26.00	4.76
29-Jul	8.40	20.70	4.94
30-Jul	8.04	16.90	5.83
31-Jul	7.84	16.40	5.80
1-Aug	7.43	15.90	5.08
2-Aug	7.05	14.10	4.49
3-Aug	7.52	12.20	4.11
4-Aug	7.18	11.20	3.78
5-Aug	6.76	10.30	3.57
6-Aug	6.35	9.18	3.34
7-Aug	5.86	8.54	3.14
8-Aug	5.64	8.71	3.56
9-Aug	5.43	8.71	3.68
10-Aug	5.21	10.90	3.45
11-Aug	5.02	11.70	4.13
12-Aug	4.79	19.10	3.92
13-Aug	4.60	22.00	3.56
14-Aug	4.39	145.00	3.21
15-Aug	4.31	220.00	3.04
16-Aug	4.37	110.00	2.77
17-Aug	5.15	69.30	2.54
18-Aug	5.37	51.90	2.49
19-Aug	7.25	41.10	2.65
20-Aug	7.40	32.70	3.14
21-Aug	7.01	26.90	3.90
22-Aug	6.06	22.60	5.02
23-Aug	5.33	18.90	8.77
24-Aug	5.13	16.40	8.56
25-Aug	4.95	14.40	9.35
26-Aug	4.78	13.00	8.76
27-Aug	4.82	11.90	7.47
28-Aug	4.89	10.90	6.32
29-Aug	4.86	10.10	5.51
30-Aug	5.30	9.57	5.13
31-Aug	5.96	9.44	4.94
1-Sep	6.01	9.73	4.76

Table B10a Flows of Simonette River near Goodwin used in Wapiti/Smoky Rivers modelling

Date	1990 Flow (m^3/s)	1991 Flow (m^3/s)	1992 Flow (m^3/s)
2-Sep	8.58	9.80	5.01
3-Sep	11.10	9.86	5.04
4-Sep	9.62	10.50	4.94
5-Sep	8.35	9.65	5.78
6-Sep	7.29	9.41	6.39
7-Sep	6.36	11.00	6.50
8-Sep	5.78	11.50	8.08
9-Sep	5.51	12.30	9.50
10-Sep	5.27	12.80	9.67
11-Sep	4.94	11.00	11.20
12-Sep	4.71	9.75	11.50
13-Sep	4.55	9.29	10.50
14-Sep	4.42	9.12	9.19
15-Sep	4.72	8.93	8.05
16-Sep	5.24	9.28	7.44
17-Sep	5.51	11.60	6.98
18-Sep	5.37	11.70	6.88
19-Sep	17.20	12.10	6.74
20-Sep	15.00	11.10	6.84
21-Sep	11.90	10.10	7.25
22-Sep	10.00	9.23	7.48
23-Sep	8.79	8.53	8.09
24-Sep	7.79	7.99	7.90
25-Sep	7.05	7.81	8.37
26-Sep	6.42	7.62	8.11
27-Sep	6.06	7.28	8.13
28-Sep	5.67	7.04	8.43
29-Sep	5.40	6.68	8.75
30-Sep	5.10	6.52	9.35
1-Oct	4.97	6.39	9.40
2-Oct	4.92	6.27	9.36
3-Oct	4.85	6.17	8.78
4-Oct	4.77	6.14	8.25
5-Oct	4.92	6.12	8.01
6-Oct	4.95	6.10	7.80
7-Oct	5.15	6.08	9.04
8-Oct	5.44	5.91	9.61
9-Oct	5.49	5.86	8.75
10-Oct	5.49	5.90	7.96
11-Oct	5.61	5.81	7.51
12-Oct	6.30	5.72	7.14
13-Oct	7.36	5.63	6.87
14-Oct	7.24	5.57	6.59
15-Oct	6.82	5.52	6.41
16-Oct	6.45	5.65	5.84
17-Oct	6.00	6.49	3.98
18-Oct	5.37	7.62	3.76
19-Oct	5.11	8.03	4.06
20-Oct	5.05	7.61	4.30

Table B10a Flows of Simonette River near Goodwin used in Wapiti/Smoky Rivers modelling

Date	1990 Flow (m^3/s)	1991 Flow (m^3/s)	1992 Flow (m^3/s)
21-Oct	5.03	7.40	6.10
22-Oct	5.03	7.70	6.12
23-Oct	4.58	8.02	6.39
24-Oct	4.45	7.58	6.71
25-Oct	4.85	7.05	6.74
26-Oct	5.03	6.65	6.93
27-Oct	6.16	5.68	7.44
28-Oct	6.65	4.58	9.85
29-Oct	6.76	4.00	10.70
30-Oct	6.58	4.10	9.57
31-Oct	6.37	4.50	8.29
1-Nov	5.80		7.79
2-Nov			8.25
3-Nov			7.40
4-Nov			

Table B10b Flows in Little Smoky River near Guy used in Wapiti/Smoky Rivers modelling

Date	1990 Flow (m^3/s)	1991 Flow (m^3/s)	1992 Flow (m^3/s)
1-Jan	14.50	5.07	6.41
2-Jan	14.20	4.93	6.46
3-Jan	14.00	5.00	6.51
4-Jan	13.60	4.84	6.69
5-Jan	13.50	4.83	6.60
6-Jan	13.10	4.88	6.50
7-Jan	13.00	4.90	6.80
8-Jan	12.80	4.89	6.75
9-Jan	12.50	5.02	6.57
10-Jan	12.10	5.13	6.43
11-Jan	12.30	5.38	6.31
12-Jan	11.80	5.41	6.28
13-Jan	11.80	5.34	6.26
14-Jan	11.80	5.19	6.65
15-Jan	11.40	5.29	6.49
16-Jan	11.50	5.13	6.37
17-Jan	11.30	5.01	6.52
18-Jan	10.80	5.03	6.50
19-Jan	10.70	5.13	6.37
20-Jan	10.20	5.11	6.35
21-Jan	9.89	4.86	6.31
22-Jan	9.64	4.90	6.34
23-Jan	9.56	5.08	6.65
24-Jan	9.58	4.99	6.67
25-Jan	9.46	4.95	6.44
26-Jan	9.72	4.90	6.21
27-Jan	9.52	4.97	6.38
28-Jan	9.61	5.22	6.34
29-Jan	9.64	5.08	6.47
30-Jan	9.44	5.14	6.39
31-Jan	9.16	5.28	6.31
1-Feb	9.08	5.04	6.24
2-Feb	8.97	5.01	6.24
3-Feb	8.77	5.04	6.23
4-Feb	8.59	5.02	6.39
5-Feb	8.08	4.90	6.37
6-Feb	7.74	4.91	6.45
7-Feb	7.62	4.98	6.55
8-Feb	7.50	5.02	6.54
9-Feb	7.40	5.08	6.47
10-Feb	7.05	4.90	6.90
11-Feb	6.93	5.03	7.04
12-Feb	7.11	5.25	7.03

Table B10b Flows in Little Smoky River near Guy used in Wapiti/Smoky Rivers modelling

Date	1990 Flow (m^3/s)	1991 Flow (m^3/s)	1992 Flow (m^3/s)
13-Feb	7.12	5.34	6.99
14-Feb	7.04	5.38	6.94
15-Feb	7.12	5.28	6.98
16-Feb	7.34	5.15	6.97
17-Feb	7.30	5.07	6.91
18-Feb	7.05	4.94	6.97
19-Feb	6.86	4.81	7.15
20-Feb	6.56	4.96	7.31
21-Feb	6.40	4.95	7.28
22-Feb	6.44	4.79	7.03
23-Feb	6.75	4.68	7.05
24-Feb	6.89	4.63	7.00
25-Feb	6.87	4.63	7.19
26-Feb	7.44	4.51	14.10
27-Feb	7.76	4.44	23.60
28-Feb	8.03	4.59	34.00
1-Mar	7.96	4.81	27.90
2-Mar	7.66	4.77	21.90
3-Mar	7.90	4.80	20.20
4-Mar	8.21	4.59	18.80
5-Mar	8.42	4.78	18.50
6-Mar	9.21	5.10	18.30
7-Mar	10.40	5.31	17.40
8-Mar	11.90	5.49	16.70
9-Mar	12.40	5.64	16.90
10-Mar	13.50	5.89	17.50
11-Mar	13.70	6.06	17.80
12-Mar	12.70	6.09	18.50
13-Mar	11.70	6.07	20.70
14-Mar	11.10	6.09	25.20
15-Mar	11.90	6.15	28.20
16-Mar	13.30	6.23	30.00
17-Mar	14.50	6.22	27.20
18-Mar	16.30	6.20	28.50
19-Mar	17.80	6.66	29.10
20-Mar	17.40	7.02	37.80
21-Mar	16.80	7.60	43.40
22-Mar	15.90	8.24	46.90
23-Mar	15.30	8.23	49.30
24-Mar	14.90	7.60	59.00
25-Mar	14.70	6.78	54.00
26-Mar	14.70	6.64	53.10
27-Mar	14.40	6.57	53.70

Table B10b Flows in Little Smoky River near Guy used in Wapiti/Smoky Rivers modelling

Date	1990 Flow (m^3/s)	1991 Flow (m^3/s)	1992 Flow (m^3/s)
28-Mar	16.00	6.47	54.20
29-Mar	19.70	6.57	54.80
30-Mar	26.70	7.03	56.00
31-Mar	39.10	8.35	54.70
1-Apr	47.10	11.30	54.50
2-Apr	52.10	15.40	53.10
3-Apr	55.10	20.00	58.60
4-Apr	53.70	30.40	71.70
5-Apr	53.20	57.70	71.20
6-Apr	47.80	71.50	99.80
7-Apr	47.80	76.10	109.00
8-Apr	50.60	71.30	104.00
9-Apr	56.20	69.10	90.10
10-Apr	52.40	71.90	79.10
11-Apr	46.60	66.70	70.90
12-Apr	42.40	68.80	59.90
13-Apr	42.30	70.00	45.60
14-Apr	39.60	89.40	49.00
15-Apr	41.90	114.00	51.50
16-Apr	42.10	111.00	48.10
17-Apr	41.80	114.00	46.90
18-Apr	42.70	127.00	47.90
19-Apr	48.80	136.00	56.80
20-Apr	55.30	139.00	73.20
21-Apr	69.40	150.00	87.70
22-Apr	80.60	167.00	90.80
23-Apr	83.10	179.00	91.40
24-Apr	85.50	193.00	96.30
25-Apr	102.00	189.00	101.00
26-Apr	120.00	224.00	124.00
27-Apr	132.00	320.00	133.00
28-Apr	123.00	380.00	125.00
29-Apr	105.00	390.00	117.00
30-Apr	89.00	391.00	113.00
1-May	77.70	370.00	109.00
2-May	73.10	319.00	108.00
3-May	71.90	272.00	113.00
4-May	71.00	234.00	110.00
5-May	69.70	206.00	98.30
6-May	68.10	185.00	86.20
7-May	67.20	169.00	76.20
8-May	67.10	157.00	67.90
9-May	66.90	152.00	62.00

Table B10b Flows in Little Smoky River near Guy used in Wapiti/Smoky Rivers modelling

Date	1990 Flow (m^3/s)	1991 Flow (m^3/s)	1992 Flow (m^3/s)
10-May	66.30	159.00	58.40
11-May	66.00	311.00	55.50
12-May	64.20	354.00	53.00
13-May	62.00	311.00	53.70
14-May	59.40	324.00	73.90
15-May	57.70	614.00	98.50
16-May	59.60	482.00	105.00
17-May	62.90	390.00	111.00
18-May	62.50	320.00	110.00
19-May	60.40	260.00	98.90
20-May	59.20	230.00	85.30
21-May	59.00	185.00	75.40
22-May	62.20	160.00	67.00
23-May	69.30	150.00	62.50
24-May	80.00	135.00	60.40
25-May	88.90	115.00	59.00
26-May	84.10	100.00	56.80
27-May	93.10	90.00	53.60
28-May	114.00	79.30	51.50
29-May	108.00	76.00	48.20
30-May	96.00	71.00	45.20
31-May	84.50	68.10	43.50
1-Jun	79.00	63.20	42.30
2-Jun	114.00	59.20	44.00
3-Jun	144.00	56.10	55.40
4-Jun	133.00	53.50	58.80
5-Jun	116.00	56.30	61.70
6-Jun	119.00	65.50	77.50
7-Jun	161.00	69.20	87.30
8-Jun	156.00	64.00	83.30
9-Jun	132.00	57.40	74.20
10-Jun	114.00	52.30	68.10
11-Jun	109.00	54.50	64.20
12-Jun	219.00	53.30	58.10
13-Jun	648.00	50.90	56.80
14-Jun	727.00	49.50	55.50
15-Jun	585.00	52.00	50.30
16-Jun	459.00	75.90	45.10
17-Jun	370.00	117.00	41.10
18-Jun	287.00	127.00	35.80
19-Jun	220.00	134.00	32.50
20-Jun	174.00	131.00	28.20
21-Jun	148.00	126.00	25.40

Table B10b Flows in Little Smoky River near Guy used in Wapiti/Smoky Rivers modelling

Date	1990 Flow (m^3/s)	1991 Flow (m^3/s)	1992 Flow (m^3/s)
22-Jun	128.00	107.00	22.50
23-Jun	111.00	88.70	21.10
24-Jun	97.30	74.60	19.20
25-Jun	89.90	64.50	17.60
26-Jun	82.30	64.10	16.20
27-Jun	73.60	67.60	14.70
28-Jun	65.50	65.00	13.30
29-Jun	61.20	63.10	12.00
30-Jun	57.40	62.50	11.10
1-Jul	55.30	60.80	10.30
2-Jul	54.30	61.90	9.53
3-Jul	53.30	89.50	9.40
4-Jul	53.40	81.50	8.98
5-Jul	101.00	71.50	8.65
6-Jul	176.00	62.20	8.37
7-Jul	165.00	52.30	8.95
8-Jul	152.00	47.10	10.40
9-Jul	159.00	48.00	12.30
10-Jul	141.00	75.50	11.90
11-Jul	119.00	80.20	12.10
12-Jul	98.80	66.80	15.00
13-Jul	82.10	56.40	18.60
14-Jul	70.00	48.50	18.90
15-Jul	61.10	40.00	17.70
16-Jul	53.90	34.00	16.50
17-Jul	49.60	31.00	14.50
18-Jul	45.20	30.60	13.80
19-Jul	41.70	26.10	14.20
20-Jul	38.80	24.00	16.50
21-Jul	36.40	22.00	16.10
22-Jul	35.00	19.50	14.40
23-Jul	33.60	19.00	13.40
24-Jul	30.00	17.30	13.40
25-Jul	28.10	15.90	12.30
26-Jul	26.10	14.80	11.00
27-Jul	24.30	14.20	10.20
28-Jul	22.90	13.60	9.56
29-Jul	21.80	13.70	9.29
30-Jul	21.30	20.40	9.86
31-Jul	23.40	25.40	22.30
1-Aug	23.40	23.90	21.00
2-Aug	20.90	22.00	17.40
3-Aug	19.10	20.60	14.60

Table B10b Flows in Little Smoky River near Guy used in Wapiti/Smoky Rivers modelling

Date	1990 Flow (m^3/s)	1991 Flow (m^3/s)	1992 Flow (m^3/s)
4-Aug	17.80	19.40	12.50
5-Aug	17.30	17.40	10.80
6-Aug	16.50	15.80	9.29
7-Aug	15.50	14.20	8.27
8-Aug	14.90	13.00	7.73
9-Aug	14.30	12.30	7.51
10-Aug	13.20	13.00	7.43
11-Aug	12.20	11.90	7.41
12-Aug	11.60	12.50	7.93
13-Aug	11.10	12.30	9.79
14-Aug	10.60	12.10	10.00
15-Aug	9.95	13.20	9.08
16-Aug	9.67	60.00	8.00
17-Aug	10.40	61.40	7.15
18-Aug	10.70	50.80	6.55
19-Aug	10.70	43.30	6.10
20-Aug	11.10	34.70	6.43
21-Aug	11.40	27.90	6.61
22-Aug	15.90	23.00	6.14
23-Aug	15.90	20.10	6.45
24-Aug	14.70	16.90	8.68
25-Aug	13.80	14.70	14.20
26-Aug	11.80	13.30	18.30
27-Aug	10.60	12.10	19.30
28-Aug	9.95	11.20	17.50
29-Aug	10.10	10.50	15.70
30-Aug	10.60	9.84	14.00
31-Aug	11.90	9.52	12.60
1-Sep	11.20	9.42	11.70
2-Sep	11.90	9.08	11.30
3-Sep	19.40	8.66	11.10
4-Sep	31.30	8.51	11.70
5-Sep	27.70	8.35	12.40
6-Sep	23.60	8.51	16.00
7-Sep	20.20	9.42	21.60
8-Sep	17.60	10.20	39.50
9-Sep	15.70	10.30	63.50
10-Sep	14.00	10.30	65.20
11-Sep	12.60	11.80	64.30
12-Sep	11.30	13.80	71.90
13-Sep	10.60	12.70	70.10
14-Sep	10.00	11.90	62.10
15-Sep	9.44	11.00	53.90

Table B10b Flows in Little Smoky River near Guy used in Wapiti/Smoky Rivers modelling

Date	1990 Flow (m^3/s)	1991 Flow (m^3/s)	1992 Flow (m^3/s)
16-Sep	9.16	10.30	47.40
17-Sep	9.66	9.94	42.20
18-Sep	9.15	9.56	37.60
19-Sep	8.95	9.55	34.00
20-Sep	9.33	10.30	32.30
21-Sep	10.00	11.30	33.80
22-Sep	12.00	11.30	36.30
23-Sep	14.50	10.70	36.90
24-Sep	14.80	10.20	35.90
25-Sep	14.00	9.72	35.60
26-Sep	12.70	9.29	33.30
27-Sep	11.50	8.85	32.10
28-Sep	10.70	8.57	30.90
29-Sep	9.62	8.48	32.50
30-Sep	9.19	7.91	33.10
1-Oct	8.91	7.74	33.60
2-Oct	8.62	7.61	33.30
3-Oct	8.46	7.53	32.00
4-Oct	8.29	7.39	29.50
5-Oct	8.60	7.08	27.70
6-Oct	8.76	7.09	26.00
7-Oct	8.81	6.77	24.50
8-Oct	9.01	6.91	23.90
9-Oct	9.27	7.05	23.00
10-Oct	10.20	7.84	21.60
11-Oct	10.60	7.60	20.10
12-Oct	10.30	7.27	19.20
13-Oct	10.70	7.45	18.50
14-Oct	11.70	7.08	17.90
15-Oct	14.70	6.92	17.20
16-Oct	14.80	7.15	16.50
17-Oct	14.20	7.20	14.80
18-Oct	13.60	7.32	10.10
19-Oct	12.90	7.59	8.20
20-Oct	11.90	7.97	9.67
21-Oct	10.90	9.24	10.50
22-Oct	11.40	9.38	11.60
23-Oct	12.90	8.48	12.30
24-Oct	12.00	7.98	13.00
25-Oct	11.50	8.01	13.60
26-Oct	11.80	8.97	13.90
27-Oct	12.10	10.00	13.70
28-Oct	13.00	6.44	14.00

Table B10b Flows in Little Smoky River near Guy used in Wapiti/Smoky Rivers modelling

Date	1990 Flow (m^3/s)	1991 Flow (m^3/s)	1992 Flow (m^3/s)
29-Oct	13.00	8.76	13.90
30-Oct	13.60	8.48	14.70
31-Oct	13.80	8.85	14.10
1-Nov	12.90	9.26	13.40
2-Nov	11.60	9.38	15.00
3-Nov	9.14	7.98	15.80
4-Nov	7.86	8.17	15.60
5-Nov	7.26	8.44	15.20
6-Nov	6.15	8.72	14.40
7-Nov	5.99	9.91	11.20
8-Nov	5.99	10.30	9.18
9-Nov	6.21	10.50	9.86
10-Nov	6.05	10.90	8.52
11-Nov	6.38	10.60	7.83
12-Nov	6.15	10.30	6.80
13-Nov	5.79	10.40	6.05
14-Nov	6.15	10.10	5.73
15-Nov	7.52	9.55	5.66
16-Nov	7.79	9.59	5.76
17-Nov	7.86	9.63	5.66
18-Nov	7.33	9.46	5.43
19-Nov	7.41	9.09	5.18
20-Nov	7.41	9.26	4.75
21-Nov	7.16	9.42	4.75
22-Nov	6.96	9.46	4.61
23-Nov	6.93	8.97	4.75
24-Nov	6.77	8.60	4.88
25-Nov	6.77	8.35	4.86
26-Nov	6.57	7.90	4.69
27-Nov	6.67	7.75	4.55
28-Nov	6.31	7.30	4.47
29-Nov	6.67	7.30	4.42
30-Nov	6.73	7.45	4.50
1-Dec	6.69	7.41	4.53
2-Dec	6.92	7.26	4.42
3-Dec	7.10	6.83	4.30
4-Dec	6.79	6.80	4.11
5-Dec	6.91	6.70	4.06
6-Dec	6.69	6.60	4.02
7-Dec	6.61	6.57	3.97
8-Dec	6.42	6.38	3.90
9-Dec	6.25	6.31	3.81
10-Dec	6.09	6.34	3.74

Table B10b Flows in Little Smoky River near Guy used in Wapiti/Smoky Rivers modelling

Date	1990 Flow (m^3/s)	1991 Flow (m^3/s)	1992 Flow (m^3/s)
11-Dec	5.99	6.41	3.67
12-Dec	6.23	6.38	3.60
13-Dec	6.23	6.41	3.51
14-Dec	6.25	6.21	3.58
15-Dec	6.36	6.21	3.65
16-Dec	6.48	6.25	3.48
17-Dec	6.29	6.31	3.34
18-Dec	6.60	6.36	3.30
19-Dec	6.51	6.49	3.25
20-Dec	6.19	6.53	3.23
21-Dec	5.96	6.57	3.18
22-Dec	5.82	6.52	3.23
23-Dec	5.81	6.47	3.27
24-Dec	6.08	6.55	3.30
25-Dec	6.05	6.57	3.25
26-Dec	5.62	6.57	3.21
27-Dec	5.83	6.51	3.14
28-Dec	5.65	6.34	3.07
29-Dec	5.21	6.47	3.00
30-Dec	5.08	6.36	3.00
31-Dec	5.26	6.34	3.02

Table B11 Distributions of Dissolved Organic Carbon used in the Wapiti/Smoky Rivers Modelling
Source: Naquadat, AEP

Segment No.		Cummulative Distance	
Water Column	Bed	from upper boundary (km)	DOC (mg/L)
1	96	2	2.30
2	97	4.01	2.43
3	98	6.02	2.57
4	99	8.03	2.70
5	100	10.05	2.40
6	101	12.19	6.35
7	102	14.33	12.00
8	103	16.47	12.08
9	104	18.61	12.15
10	105	20.75	12.23
11	106	22.89	12.30
12	107	25.03	12.20
13	108	27.18	12.10
14	109	29.33	12.08
15	110	31.48	12.06
16	111	33.63	12.04
17	112	35.78	12.02
18	113	37.93	12.00
19	114	40.08	11.90
20	115	43.78	11.80
21	116	47.62	3.95
22	117	50.12	4.04
23	118	52.62	4.14
24	119	55.12	4.23
25	120	57.62	4.33
26	121	60.12	4.42
27	122	62.62	4.52
28	123	65.12	4.61
29	124	67.62	4.71
30	125	70.44	4.80
31	126	73.26	4.90
32	127	76.08	4.99
33	128	78.9	5.09
34	129	81.72	5.18
35	130	84.54	5.28
36	131	87.36	5.37
37	132	90.18	5.47
38	133	93	5.56
39	134	95.82	5.66
40	135	98.64	5.75
41	136	101.46	5.78
42	137	104.28	5.81
43	138	107.1	5.85
44	139	109.92	5.88
45	140	112.74	5.91
46	141	115.56	5.94
47	142	118.38	5.98
48	143	121.2	6.01

Table B11 Distributions of Dissolved Organic Carbon used in the Wapiti/Smoky Rivers Modelling
Source: Naquadat, AEP

Segment No.		Cummulative Distance	
Water Column	Bed	from upper boundary (km)	DOC (mg/L)
49	144	124.02	6.04
50	145	126.84	6.07
51	146	129.66	6.11
52	147	132.48	6.14
53	148	135.3	6.17
54	149	138.12	6.20
55	150	140.94	6.24
56	151	143.76	6.27
57	152	146.58	6.30
58	153	149.4	6.35
59	154	152.22	6.40
60	155	155.04	6.45
61	156	157.86	6.50
62	157	160.68	6.55
63	158	163.5	6.60
64	159	166.32	6.65
65	160	169.14	6.70
66	161	172.09	6.75
67	162	175.04	6.80
68	163	177.99	6.85
69	164	180.94	6.90
70	165	183.89	6.95
71	166	186.84	6.95
72	167	189.79	6.94
73	168	192.74	6.94
74	169	195.69	6.93
75	170	198.64	6.93
76	171	201.59	6.93
77	172	204.54	6.92
78	173	207.49	6.92
79	174	210.44	6.91
80	175	213.39	6.91
81	176	216.34	6.91
82	177	219.29	6.90
83	178	222.24	6.90
84	179	225.19	6.89
85	180	228.14	6.89
86	181	231.09	6.89
87	182	234.04	6.88
88	183	236.99	6.88
89	184	239.94	6.87
90	185	241.75	6.87
91	186	243.56	6.87
92	187	245.37	6.86
93	188	247.18	6.86
94	189	248.99	6.85
95	190	250.8	6.85

Table B12 Fraction Organic Carbon used in the Wapiti/Smoky Rivers Modelling
Source: Naquadat, AEP and Swnson et al. 1993

Segment No.		Cummulative Distance	Fraction Organic Carbon (FOC)	
Water Column	Bed	from upper boundary (km)	Water Column	Bed
1	96	2	0.0115	0.0351
2	97	4.01	0.0091	0.0350
3	98	6.02	0.0067	0.0349
4	99	8.03	0.0044	0.0348
5	100	10.05	0.0020	0.0347
6	101	12.19	0.0270	0.0227
7	102	14.33	0.0520	0.0107
8	103	16.47	0.0438	0.0177
9	104	18.61	0.0472	0.0148
10	105	20.75	0.0506	0.0119
11	106	22.89	0.0540	0.0090
12	107	25.03	0.0512	0.0106
13	108	27.18	0.0484	0.0121
14	109	29.33	0.0457	0.0137
15	110	31.48	0.0429	0.0152
16	111	33.63	0.0401	0.0168
17	112	35.78	0.0373	0.0183
18	113	37.93	0.0346	0.0199
19	114	40.08	0.0318	0.0214
20	115	43.78	0.0290	0.0230
21	116	47.62	0.0291	0.0233
22	117	50.12	0.0293	0.0236
23	118	52.62	0.0294	0.0239
24	119	55.12	0.0295	0.0242
25	120	57.62	0.0297	0.0245
26	121	60.12	0.0298	0.0248
27	122	62.62	0.0299	0.0251
28	123	65.12	0.0300	0.0254
29	124	67.62	0.0302	0.0257
30	125	70.44	0.0303	0.0260
31	126	73.26	0.0304	0.0263
32	127	76.08	0.0306	0.0266
33	128	78.9	0.0307	0.0269
34	129	81.72	0.0308	0.0272
35	130	84.54	0.0310	0.0275
36	131	87.36	0.0311	0.0278
37	132	90.18	0.0312	0.0281
38	133	93	0.0313	0.0284
39	134	95.82	0.0315	0.0287
40	135	98.64	0.0316	0.0290
41	136	101.46	0.0317	0.0293
42	137	104.28	0.0319	0.0296
43	138	107.1	0.0320	0.0299
44	139	109.92	0.0321	0.0302
45	140	112.74	0.0323	0.0305
46	141	115.56	0.0324	0.0308
47	142	118.38	0.0325	0.0311
48	143	121.2	0.0326	0.0315

Table B12 Fraction Organic Carbon used in the Wapiti/Smoky Rivers Modelling

Source: Naquadat, AEP and Swnson et al. 1993

Segment No.		Cummulative Distance	Fraction Organic Carbon (FOC)	
Water Column	Bed	from upper boundary (km)	Water Column	Bed
49	144	124.02	0.0328	0.0318
50	145	126.84	0.0329	0.0321
51	146	129.66	0.0330	0.0324
52	147	132.48	0.0332	0.0327
53	148	135.3	0.0333	0.0330
54	149	138.12	0.0334	0.0333
55	150	140.94	0.0336	0.0336
56	151	143.76	0.0337	0.0339
57	152	146.58	0.0338	0.0342
58	153	149.4	0.0339	0.0345
59	154	152.22	0.0341	0.0348
60	155	155.04	0.0342	0.0351
61	156	157.86	0.0343	0.0354
62	157	160.68	0.0345	0.0357
63	158	163.5	0.0348	0.0347
64	159	166.32	0.0352	0.0338
65	160	169.14	0.0356	0.0328
66	161	172.09	0.0360	0.0318
67	162	175.04	0.0364	0.0309
68	163	177.99	0.0367	0.0299
69	164	180.94	0.0371	0.0290
70	165	183.89	0.0375	0.0280
71	166	186.84	0.0379	0.0270
72	167	189.79	0.0383	0.0261
73	168	192.74	0.0386	0.0251
74	169	195.69	0.0390	0.0242
75	170	198.64	0.0394	0.0232
76	171	201.59	0.0398	0.0222
77	172	204.54	0.0402	0.0213
78	173	207.49	0.0405	0.0203
79	174	210.44	0.0409	0.0194
80	175	213.39	0.0413	0.0184
81	176	216.34	0.0417	0.0174
82	177	219.29	0.0421	0.0165
83	178	222.24	0.0424	0.0155
84	179	225.19	0.0428	0.0146
85	180	228.14	0.0432	0.0136
86	181	231.09	0.0436	0.0126
87	182	234.04	0.0440	0.0117
88	183	236.99	0.0443	0.0107
89	184	239.94	0.0447	0.0098
90	185	241.75	0.0451	0.0088
91	186	243.56	0.0455	0.0078
92	187	245.37	0.0459	0.0069
93	188	247.18	0.0462	0.0059
94	189	248.99	0.0466	0.0050
95	190	250.8	0.0470	0.0040

Table B13 Estimated Bed Sediment Composition

- River name: Wapiti/Smoky Rivers
- Range : Wapiti River @ Hwy 40 to the Smoky River mouth
- Fine sediment (mud, %): 20.0
- Course sediment (Larger, %): 80.0
- Porewater by volume (%): 35.0
- Sediment gravity (kg/L): 2.0

Table B14 Organic Compound Loads to Wapiti River from Weyerhaeuser Pulp Mill (kg/d)

Date	2378TCDF	345TCC	345TCG	345TCV	DHA	r1214CDHA
1-Jun-89	N/A	N/A	N/A	N/A	2.912E+03	N/A
26-Apr-90	N/A	N/A	N/A	N/A	6.000E-01	N/A
6-Jun-90	1.985E-06	N/A	N/A	N/A	N/A	N/A
17-Jul-90	2.065E-06	N/A	N/A	N/A	N/A	N/A
7-Aug-90	1.372E-06	N/A	N/A	N/A	N/A	N/A
12-Aug-90	N/A	N/A	N/A	N/A	2.532E-01	2.532E-01
29-Oct-90	5.359E-06	N/A	N/A	N/A	N/A	N/A
4-Nov-90	3.892E-06	N/A	N/A	N/A	N/A	N/A
8-Nov-90	1.916E-06	N/A	N/A	N/A	N/A	N/A
3-Dec-90	N/A	N/A	N/A	N/A	2.911E-01	N/A
13-Dec-90	N/A	N/A	N/A	N/A	3.259E-01	3.259E-01
7-Jan-91	1.372E-06	N/A	N/A	N/A	1.372E+00	N/A
4-Feb-91	4.500E-07	9.265E+00	1.654E-01	5.096E-02	4.632E+00	N/A
4-Mar-91	1.591E-06	N/A	N/A	N/A	1.909E+00	N/A
1-Apr-91	7.860E-07	N/A	N/A	N/A	4.585E+00	N/A
6-May-91	9.897E-07	N/A	N/A	N/A	1.164E+00	N/A
3-Jun-91	1.757E-06	6.234E-01	2.834E-02	4.364E-02	4.534E+00	N/A
2-Jul-91	1.097E-06	2.601E+00	3.227E-02	4.970E-02	1.291E+00	9.681E-01
10-Aug-91	2.722E-08	8.166E-01	7.486E-01	5.240E-02	3.403E-01	N/A
2-Sep-91	1.739E-06	6.018E-01	3.344E-02	3.344E-01	3.344E-01	N/A
30-Sep-91	5.158E-07	4.667E-01	6.387E-02	1.891E-02	2.456E-01	N/A
2-Nov-91	8.511E-07	N/A	N/A	N/A	N/A	N/A
3-Nov-91	N/A	N/A	N/A	N/A	N/A	N/A
4-Nov-91	N/A	N/A	N/A	N/A	N/A	N/A
5-Nov-91	N/A	8.504E-01	7.896E-01	4.677E-02	6.074E-01	3.037E-01
2-Dec-91	1.245E-06	2.179E+00	3.300E-01	4.795E-02	3.114E-01	3.114E-01

APPENDIX C: TERMS OF REFERENCE

NORTHERN RIVER BASINS STUDY

SCHEDULE A - TERMS OF REFERENCE

Project 2381-D1: Contaminant Fate and Food Chain Model Development and Implementation

I. Background and Objectives

One of the major objectives of the Northern River Basins Study (NRBS) is to develop predictive tools to determine the cumulative effects of man-made discharges on the aquatic environment (Study Board Question 13a) and predictive models to provide an ongoing assessment of the state of the aquatic ecosystem (Study Board Question 14). The Contaminants Component of the NRBS assumed the task of modelling the fate, accumulation and effects of contaminants released into the aquatic environment. A modelling sub-committee was formed and, in April 1993, the sub-committee hosted a contaminant fate and food chain modelling workshop (NRBS Projects 2381-C1-C4) to provide direction for future modelling initiatives (Brownlee and Muir 1994). The workshop was attended by government representatives, members of the academic community, environmental consultants, representative from resource-based industries in the northern river basins and NRBS-affiliated research scientists. Based on presentations and discussions at the workshop, the sub-committee decided to utilize the WASP IV model, developed by the U.S. Environmental Protection Agency, and the Thomann/Connolly and Gobas food chain models to model the fate and bioaccumulation of point-source contaminants entering the Athabasca River system.

Late in 1993, a consultant was selected to review existing Northern River Basins Study data and to meet with the modelling sub-committee to develop a strategy for modelling the fate and bioaccumulation of specific organic compounds associated with point source releases during fiscal 1994/95 (Project 2381-C6). A six point plan was formulated at the meeting for the implementation and development of contaminant fate and food chain modelling for the Athabasca River. The plan calls for the involvement of members of the modelling sub-committee and other NRBS-affiliated research scientists at all decision points related to model development. The-plan also calls for the development of user-friendly interfaces for the model so that it can be handed off to NRBS researchers and government agencies for future use.

Contaminant fate and food chain model development is to be based on previous contaminant fate modelling carried out in the Athabasca River Basin (Macdonald and Radermacher 1992) and Wapiti-Smoky rivers (HydroQual 1990). These models will also incorporate historic contaminants data collected by Alberta Environmental Protection, Environment Canada and industry in the Athabasca River and Wapiti-Smoky rivers, and recent data collected by the NRBS. Results from the 1992 and 1993 NRBS Reach Specific Study and the February/March 1993 NRBS/Alberta Environmental Protection winter synoptic survey will be of particular significance for contaminant fate and food chain modelling. The Hydrology/Hydraulics Component of the NRBS will also be supplying the contractor with algorithms for the WASP model that deal with the shear stress and erodibility of flocculated sediments (Project 1332-D1) and will identify sediment depositional areas in the Athabasca River and Wapiti-Smoky rivers.

This project has been established to develop and implement the contaminant fate and food chain modelling of the six-point plan during fiscal 1994/95. The results of the modelling exercise will be used to direct the collection of additional data for model refinement in the last year of the Study. If modelling is successful, it will represent a major initiative to determine the cumulative effects of point source discharges on the aquatic environment of the Northern River Basins.

II. General Requirements

The objective of this project is to set-up and calibrate a set of models that will enable the NRBS to describe linkages between contaminant sources and:

1) contaminant exposure concentrations in the water column;
2) contaminant exposure concentrations on suspended sediments;
3) contaminant exposure concentrations in bottom sediments;
4) contaminant tissue concentrations in biofilm;
5) contaminant tissue concentrations in invertebrates; and
6) contaminant tissue concentrations in fish.

All available, relevant information collected by the NRBS, Alberta Environmental Protection, Environment Canada and industry sources within the basins are to be used in the development of the models. The models are to be developed in association with NRBS scientists who will assist in defining pathways, reviewing and compiling data and who will be the end users of the model. All aspects of the calibrations are to be open to external scientific review. Results of the review may be used to focus future modelling activities.

Contaminant fate and food chain modelling is to consider (1) the Athabasca River, from Hinton to, but not including, the Peace-Athabasca Delta, and (2) the Wapiti and Smoky rivers from Grande Prairie to the confluence with the Peace River.

III. Specific Requirements

1. Task 1 - Information Review and Compilation

This task is to develop the information base required for the model calibration and will include the following:

a. Dr. Brian Brownlee will lead the review of the Northern River Basins Study data and will supply an electronically compiled dataset, including sample date, location (in UTMs), and medium sampled, in addition to the chemical, physical or biological values measured for each sample. The specific data formats will be determined by the contractor in consultation with Dr. Brownlee. Particular emphasis will be placed on Reach Specific Survey data collected by the NRBS for the Athabasca River. Included in the review/compilation will be all source data (effluent) collected and/or compiled by Alberta Environmental Protection (including the winter synoptic surveys) and identified in the NORTHDAT database (McCubbin 1993), and municipal and non-pulp mill industry database (Project 2112-B1/C1) prepared for the NRBS.

The contractor should be aware that the McCubbin database on pulp mill effluents is currently being updated with data to December 1993 and with all historic data before 1990.
This information will be provided to the contractor when available (probably August/September 1994).. All data collected or compiled by the NRBS will be supplied to the contractor by the Study Office.

b. As appropriate, the contractor will review and synthesize multi-media chemical data prepared by industries located on the Athabasca River and the Wapiti-Smoky rivers. In particular, Alberta Pacific and Weyerhaeuser have receiving environment data that is to be reviewed with the intent of incorporating it into the fate models. **However, before it can be used all industry data sets must be reviewed by the modelling sub-committee and/or NRBS affiliated scientists to determine the validity of the data.**

2. Task 2 - Model Configuration

a. If necessary, modify the reach structure of the existing WASP configuration (Macdonald and Radermacher 1992) to ensure comparability with chemical monitoring data.

b. Set-up the models to simulate river hydrology for 1992 and 1993 as a daily time-series using Water Survey of Canada stream gauge data and, where relevant, Alberta Environmental Protection, Hydrology Branch data.

c. Confirm the mass balance calibration of the models using conservative parameters such as sodium, chloride and zinc derived from water column and effluent monitoring data from Alberta Environmental Protection and summarized in NORTHDAT.

d. Calibrate water column concentrations of TSS using Alberta Environmental Protection and NORTHDAT data. The objective of the calibration will be to create a reasonably accurate time-series of water column TSS concentrations as well as sediment loss to and gain from the river bottom.

e. The proposed equations governing contaminant processes intended for exposure modelling are also to be defined so as to enable review by the modelling sub-committee and other scientists affiliated with the Northern River Basins Study.

f. Define the critical receptors and predator-prey relationships. Based on the information reviewed and compiled in Task 1 for the reaches, respective environmental concentrations and the representative food chain to be modelled will be coordinated by Derek Muir in consultation with CanTox and other NRBS Groups. For this study the food chain will be modelled for steady-state species, and will be restricted to four (4) trophic levels and no more than three (3) species of fish.

CanTox will prepare an initial list of information requirements and will specify the format of the data required for input to the models. Derek Muir will ensure that the data are provide to CanTox in the required format.

3. Task 3 - Rate Coefficient Compilation

Compile a table of published physical and chemical rate coefficients and constants for use in the WASP IV and food chain models. Necessary coefficients and constants will depend on the definition for the controlling processes identified under Task 2. The contractor and CanTox will begin the task by compiling a list of coefficient and constant information requirements from in-office available sources (CanTox for the food chain models and Golder for the WASP model). Upon completion, the tables will be circulated to Dr. Brian Brownlee, Dr. Derek Muir and any other scientist who may have information in their personal library and that they would be willing to contribute. All values added to the tables must include a valid reference. The end objective will be to describe each rate constant as a range and a most probable value. Final coefficient selection and editing of the tables will be directed by Dr. Brian Brownlee.

4. Task 4 - Simulation and Calibration of Contaminant Fate

a. Using only effluent and background concentration data, the calibrated physical model structure defined in Task 2, and the most probable rate coefficients and constants defined in Task 3, run WASP IV to simulate contaminant concentrations in the water column (dissolved and associated with particulates), and in the sediments. The contaminants to be modelled include:

   i) 2,3,7,8-tetrachlorodibenzofuran (2378 TCDF);
   ii) dehydroabietic acid (DHA);
   iii) chlorinated dehydroabietic acid (12/14-monochloro and/or 12, 14-dichloro);
   iv) phenanthrene;
   v) 3,4,5-tetrachlorocatechol (345TCC);
   vi) 3,4,5-tetrachloroguaiacol (345TCG); and
   vii) 3,4,5-tetrachloroveratole (345TCV).

b. Graphically compare these results to measured concentrations (as outlined under Task 1). This information will be circulated to the modelling sub-committee and CanTox as preliminary results.

c. Based upon the results from 4b, above, proceed to make modifications to the modelling assumptions if a better match between observed and simulated conditions is required. All modifications will be recorded along with the rationale for the changes. Results for the "best" calibration as compared with observed will then be graphed and circulated for review with the modelling sub-committee and CanTox.

d. CanTox will conduct an initial simulation of the food chain using the feeding structure and biological information determined in Task 2, and the constants and coefficients determined in Task 3. The first model simulations will be based upon the most probable coefficients derived in Task 3 and the field measured chemical-specific dissolved concentration in the water column (Task 1).

Simulation results will then be graphically compared with field measured tissue concentrations from Task 1; results will be circulated within the modelling sub-committee. In the event that data are lacking for certain chemical-specific parameters, the comparison of model predictions with field measured data will be used to determine the most representative values.

CanTox will run both the Thomann and Connolly model, and Gobas model simultaneously. This will determine whether there are any significant differences between the models, and will link these observations with the data requirements and theory of the two models.

e. The contractor will provide CanTox with model output from the best calibration of the exposure models (WASP) (Task 4c) for input into the best calibration of the food chain models (Task 4d). Results from both the contaminant fate models and food chain models will be integrated and presented graphically against measured concentrations in all mediums. By way of comparison, CanTox will also run Frank Gobas' food chain model for both the Athabasca and Wapiti-Smoky river systems. Results from the two river systems will be graphically compared and circulated to members of the modelling sub-committee for review.

f. Sensitivity analysis is to be carried out on the final configuration of the models to identify key process rates.

5. Task 5 - Technical Review Meeting

The contractor, in conjunction with CanTox and members of the modelling sub-committee, will identify and contact a few key individuals, external to the NRBS, who may be willing to provide expert review of the modelling efforts. Once confirmed, these external reviewers will be sent copies of the Task 4 document for review. They will also be requested to attend a two-day review meeting in late January 1994 where the modelling will be critically reviewed, alternative calibrations tested using the models in real-time, and details regarding potential improvements to the model and the information base discussed. Prior to the meeting, external reviewers will be asked to provide the contractor, CanTox and the modelling sub-committee with review comments. At the meeting, external reviewers will be asked to make a brief presentation which is to include direction for future model development. Costs for external reviewers and meeting facilities are not included in this contract.

6. Task 6 - User Interface and User Training

a. The contractor will expand upon the WASP interface currently being developed for Alberta Environmental Protection, to accommodate the Athabasca River configuration and the needs of the NRBS. This is to include the ability of the models to:

- handle time series data;
- change key input values, such as source rates, rate coefficients, etc.;
- graphically compare model results to measured values;
- provide easy output of results for use in the food chain models.

b. The contractor, in association with CanTox Inc. will provide a two-day user training course for key NRBS scientists. The focus of the course will be using the calibrated models to predict chemical concentrations in all mediums (water, sediment, biota).

IV. Reporting Requirements

General

1. The Contractor is to provide draft and final reports in the style and format outlined in the NRBS document, "A Guide for the Preparation of Reports," which will be supplied upon execution of the contract.

   The final report is to include the following: an acknowledgement section that indicates any local involvement in the project, Report Summary, Table of Contents, List of Tables, List of Figures and an Appendix with the Terms of Reference for this project.

   Text for the report should be set up in the following format:

   a) Times Roman 12 point (Pro) or Times New Roman (WPWIN60) font.
   b) Margins: are 1" at top and bottom, 7/8" on left and right.
   c) Headings; in the report body are labelled with hierarchical decimal Arabic numbers.
   d) Text; is presented with full justification; that is, the text aligns on both left and right margins.
   e) Page numbers; are Arabic numerals for the body of the report, centred at the bottom of each page and bold.

   - If photographs are to be included in the report text they should be high contrast black and white.
   - All tables and figures in the report should be clearly reproducible by a black and white photocopier.
   - Along with copies of the final report, the Contractor is to supply an electronic version of the report in Word Perfect 5.1 or Word Perfect for Windows Version 6.0 format.

- Electronic copies of tables, figures and data appendices in the report are also to be submitted to the Project Liaison Officer along with the final report. These should be submitted in a spreadsheet (Quattro Pro preferred, but also Excel or Lotus) or database (dBase IV) format. Where appropriate, data in tables, figures and appendices should be geo-referenced.

2. All figures and maps are to be delivered in both hard copy (paper) and digital formats. Acceptable formats include: DXF, uncompressed E00, VEC/VEH, Atlas and ISIF. All digital maps must be properly geo-referenced.

3. All sampling locations presented in report and electronic format should be geo-referenced. This is to include decimal latitudes and longitudes (to six decimal places) and UTM coordinates. The first field for decimal latitudes / longitudes should be latitudes (10 spaces wide). The second field should be longitude (11 spaces wide).

4. Six to ten 35 mm slides that can be used at public meetings to summarize the project, methods and key findings. The package of slides is to be comprised of one original and four duplicates of each slide.

Task 1 - Information Review and Compilation

Prepare a summary report indicating locations, mediums, chemical parameters, ranges of values, number of samples, etc. of the chemical information to be used for the modelling. This report is to be completed and submitted to the component coordinator by September 30, 1994.

Task 2 - Model Configuration

A summary report describing the work done under Task 2 is to be prepared and submitted to the component coordinator by October 30, 1994. The summary report is to include:

1) an outline of the reach structure to be used in the WASP IV models, including the rationale for selecting each reach in the Athabasca River and Wapiti-Smoky rivers;
2) a graphical representation of daily time-series hydrology for selected reaches of the Athabasca River and Wapiti-Smoky rivers for 1992 and 1993;
3) a discussion, and, as appropriate, graphical presentation confirming the mass balance of each model using sodium, chloride and zinc in the water column and effluent as derived from existing water quality data;
4) a discussion, and, as appropriate, graphical presentation of attempts to calibrate water column concentrations of TSS using existing water quality data; and

5) tables outlining the proposed equations governing contaminant processes intended for use in the WASP IV models.
6) description of the defined aquatic food chain for the Athabasca and Wapiti River. The report will also provide estimates of the percent time each species spends in each river reach, as well as the rationale behind each of the estimates.

Task 3 - Rate Coefficient Compilation

Compile tables of published physical and chemical rate coefficients and constants for use in each of the WASP IV model, Thomann/Connolly food chain model, and the Gobas food chain model. These tables are to be submitted to the component coordinator by September 15, 1994.

Task 4 - Simulation and Calibration of Contaminant Fate

In coordination with CanTox, prepare and submit a draft report detailing the results, methods, data sources, assumptions and modifications made to the WASP and Food Chain Modelling calibrations (Tasks 1-4 inclusive). The report is to be submitted to the component coordinator by January 15, 1994.

Task 5 - Technical Review Meeting

In conjunction with CanTox., the contractor is to prepare a workshop proceedings document incorporating reviewer comments and meeting conclusions. A draft of the workshop proceedings is to be submitted to the component coordinator by February 20, 1994. Three weeks after the receipt of review comments on the draft workshop proceedings, the contractor is to submit ten (10) cerlox bound copies, two unbound, camera ready copies and an electronic copy (in Word Perfect 6.0 format) to the component coordinator. The style and format of the final report is to follow that outlined in the NRBS style manual. A copy of the NRBS style manual will be supplied to the contractor by the NRBS.

Task 6 - User Interface and User Training

In conjunction with CanTox., the contractor is to prepare an electronic interface program for the WASP model. The contractor is also to prepare written instructions on how to install the WASP program and models on personal computers, and comprehensive WASP and food chain model users manuals. This material is to be submitted to the component coordinator by February 28, 1995.

Final Project Report

In conjunction with CanTox Inc., the contractor is to prepare a final project report outlining the work carried out under Tasks 1-4 and making reference to the work and documents and computer programs prepared under Task 5 and 6. Ten cerlox bound copies of the draft project report are to be submitted to the component coordinator by March 31, 1995. Three weeks after receipt of review comments, the contractor is to submit ten cerlox bound copies, two unbound camera ready copies and an electronic copy (in Word Perfect 6.0 format) of the final project report to the component coordinator. The style and format of the final project report are to conform to that outlined in the NRBS style manual.

V. Deliverables

The following is a summary of the deliverables to be submitted to the Study Office in accordance with the requirements and dates specified in section IV above.

1. A summary report of the chemical information base to be used for the modelling.
2. A summary report describing the contaminant fate and food chain model configurations.
3. Tables of published rate coefficients and constants to be used in each model.
4. A draft report detailing the simulations and calibrations of the WASP IV and Food Chain models.
5. A workshop proceedings document resulting from the technical review meeting.
6. An electronic interface program for the WASP model, and installation instructions and users manuals for the WASP and Food Chain models.
7. A final project report.
8. A package of 35 mm slides (originals plus four duplicate copies) for presentations.

VI. Contract Administration

This project is being coordinated by the modelling sub-committee of the Contaminants Component of the Northern River Basins Study. The Scientific Authorities for this project are:

Dr. Brian Brownlee
National Water Research Institute
867 Lakeshore Road.
P.O. Box 5050
Burlington, Ontario
L7R 4A6
phone: (905) 336-4706
fax: (905) 336-4972.

Questions of a scientific nature related to the <u>contaminant fate model</u> should be directed to him.

Dr. Derek Muir
Fisheries and Oceans Canada
Fresh Water Institute
501 University Crescent
Winnipeg, Manitoba
R3T 2N6
phone: (204) 983-5168
fax: (204) 984-2403

Questions of a scientific nature related to the <u>food chain model</u> should be directed to him.

Members of the modelling sub-committee include:
Dr. Brian Brownlee, National Water Research Institute, Burlington - Contaminant fate
Dr. Anne-Marie Anderson, Alberta Environmental Protection, Edmonton - Benthos
Bob Crosley, Environment Canada, Calgary - Water and sediment
Dr. Mike MacKinnon, Syncrude Research, Edmonton - Oil sands
Dr. Derek Muir, Fisheries and Oceans Canada, Winnipeg - Food chain
Leigh Noton, Alberta Environmental Protection, Edmonton - Pulp mills

They will have direct input with the contractor in the development of the model. The leaders of other Northern River Basins Study components will also have direct input into the development of the model. These include: Dr. Terry Prowse - Hydrology/Hydraulics Component; Dr. Patricia Chambers - Nutrients Component; Mr. Tom Mill - Food Chain Component (interim leader, wiht Dr. Ray Hesslein as Scientific Advisor).

The Component Coordinator for this project is:

Richard Chabaylo
Northern River Basins Study
690 Standard Life Centre
10405 Jasper Avenue
Edmonton, Alberta
T5J 3M4
phone: (403) 427-1742
fax: (403) 422-3055

Questions of an administrative nature should be directed to him.

VII. Literature Cited

Brownlee, B. and D. Muir. 1994. Proceedings of the Contaminants Fate and Food Chain Modelling Workshop. Draft report submitted to the Northern River Basins Study.

HydroQual Canada Limited. 1990. Implementation of Water Quality Models for the Wapiti-Smoky and Peace River Systems. Report prepared for Alberta Environment, Standards and Approvals Division, Edmonton.

Macdonald, G. and A. Radermacher. 1992 (May). Athabasca River Water Quality Modelling - 1990 Update. Prepared for: Standards and Approvals Division, Alberta Environment, Edmonton. Prepared by: Environmental Management Associates, Calgary.

McCubbin, N. 1993. NORTHDAT: An Effluent Database Management System, Application Description. Northern River Basins Study Project Report No. 16. Prepared by: N. McCubbin Consultants Inc., Hull, Quebec.

APPENDIX D: DISKETTES

APPENDIX D: LIST OF DISKETTES

Disk 1	Appendix A & B Files
Disk 2	Athabasca and Wapiti/Smoky River Water Quality Data Base Files
Disk 3	WASP Input Files

APPENDIX D: CONTAMINANT FATE MODELLING DATA AND PREPO SOFTWARE OPERATING PROGRAM - DISKETTES

The disks provided in the sleeves as the last pages of this report contains the PrePo Software Operating Program (Disks 1 and 2) and the Contaminant Fate Modelling Data (Disks 3, 4 and 5) as supplied by the author and can be installed on your computer by following the instructions in the README file on Disk 1. In order to access the Modelling data, users are required to install the PrePo Operating Program.

List of Diskettes:

Disk 1	PrePo Program, Version 1.5, Install Disk
Disk 2	PrePo Program, Version 1.5, WASP Program, Example Files
Disk 3	Appendix A & B Files
Disk 4	Athabasca and Wapiti/Smoky River Water Quality Database Files
Disk 5	WASP Input Files

There is no warranty expressed or implied for the use of this program and database; the Northern River Basins Study does not guarantee the accuracy of the program and data. The NRBS does not assume any liability for actions or consequences resulting from the use of the program and data; individuals using this program and data do so entirely at their own risk. The NRBS will not update the data or revise the program except as deemed necessary for its own purposes.