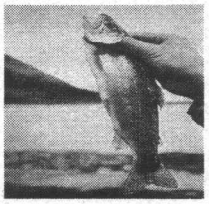
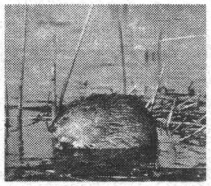
Canada Alberta Northwest Territories

Northern River Basins Study





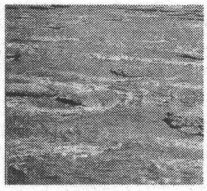



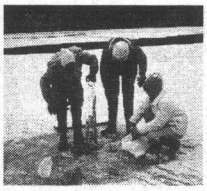


NORTHERN RIVER BASINS STUDY PROJECT REPORT NO. 16

NORTHDAT

AN EFFLUENT DATABASE MANAGEMENT SYSTEM APPLICATION DESCRIPTION






Prepared for the
Northern River Basins Study
under Projects 2111-A1 and 2111-C1

by
Neil McCubbin and Pierre Labrosse
N. McCubbin Consultants Inc.

And

AGRA Earth and Environmental Limited

NORTHERN RIVER BASINS STUDY PROJECT REPORT NO. 16

NORTHDAT
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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.

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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 — 26 August 1993
(Dr. F.J. Wrona, Ph.D., Science Director) (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 — Sept. 8/93
(Dr. P. A. Larkin, Ph.D., Chair) (Date)

Whereas it is the duty of the Operations Committee to attend to the day-to-day management of the Study on behalf of the Study Board,
IT IS THEREFORE RECOMMENDED BY THE OPERATIONS COMMITTEE THAT;
this publication be released to the public and it is reported that
THIS PUBLICATION HAS BEEN REVIEWED BY THE HEALTH ASSESSMENT COMMITTEE AND SUBSEQUENTLY FORWARDED TO APPROPRIATE HEALTH AUTHORITIES: [ ] Yes [✓] No

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**

Bev Burns — 93/09/20
(Bev Burns, Co-chair) (Date)

NRBS.005

NORTHDAT: AN EFFLUENT DATABASE MANAGEMENT SYSTEM, APPLICATION DESCRIPTION

STUDY PERSPECTIVE

Key to understanding the potential impacts of point source discharges to the northern rivers is the characterization of the types, amounts, timing and duration of effluent discharges. Considerable amounts of data exist regarding pulp mill effluent quality, both for Alberta mills and elsewhere. These data were available in a combination of electronic and paper formats that needed to be compiled into a comprehensive, well organized computer-stored database. This would allow ready access of water quality and contaminant data by NRBS scientists.

The NORTHDAT database for pulp mill effluents in the Peace and Athabasca River drainages was developed in 1993 by N. McCubbin Consultants Inc. for the Northern River Basins Study. This database included more than 100 parameters routinely reported to Alberta Environmental Protection by the six Alberta pulp mills under provincial regulatory requirements at that time. It includes information from 1990 and 1991. Less extensive information was presented for the three pulp mills located in the Peace River basin of British Columbia. The present database uses the same program written by N. McCubbin. However, these data were updated from January, 1970 to December, 1993 for Alberta mills and from January, 1988 to December, 1993 for B.C. mills. In addition to updating the effluent data, the parameter lists were increased substantially.

Related Study Questions

2)	*What is the current state of water quality in the Peace, Athabasca and Slave river basins, including the Peace-Athabasca Delta?*
4a)	*What are the contents and nature of the contaminants entering the system and what is their distribution and toxicity in the aquatic ecosystem with particular reference to water, sediment and biota?*
4b)	*Are toxins such as dioxins, furans, mercury, etc. increasing or decreasing and what is their rate of change?*
5)	*Are the substances added to the rivers by natural and man-made discharges likely to cause deterioration of water quality?*
8)	*Recognizing that people drink water and eat fish from these river systems, what is the current concentration of contaminants in water and edible fish tissue and how are these levels changing through time and by location?*

The present database includes the following pulp mills: Weldwood at Hinton; Daishowa at Peace River; Weyerhaeuser at Grande Prairie; Slave Lake Pulp at Slave Lake; Alberta Newsprint at Whitecourt; Millar Western at Whitecourt; Alberta-Pacific at Athabasca; Fiberco at Taylor, B.C.; Fletcher Challenge at Mackenzie, B.C. and Finlay Forest Products at Mackenzie, B.C. The database of more than 300 parameters includes a variety of measurements and compounds such as, production data, toxicity tests, nutrients, dioxins and furans, resin and fatty acids, chlorinated phenolics and metals.

This project has made available to the Northern River Basins Study all relevant government and industry data on pulp mill effluent discharges. The electronic database and user's guide will allow access of this information by scientists, engineers and managers having limited skills with spreadsheet software and database management. The program NORTHDAT was written for this purpose and is described in this report. This document describes the overall organization of the database, the file structures used and the custom program written to access the database. This manual and database will assist other NRBS scientists studying contaminant fate and food chain modelling, nutrient loading and dissolved oxygen modelling, and overall ecosystem health and integrity assessment.

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FOREWORD

The NORTHDAT database for pulp and paper mill effluents in the Peace River and Athabasca River drainages was developed by N. McCubbin Consultants Inc. in 1993. The test data were taken from six mills in Alberta for the period January 1, 1990 to December 31, 1992.

The present database uses the same program written by N. McCubbin Consultants Inc. The data were updated from the beginning of mill operation for Alberta mills and from January 1, 1988, for B.C. mills to December 31, 1993. As well as updating the data, the parameter lists were substantially increased. This upgrade was completed by AGRA Earth & Environmental Limited of Calgary, Alberta.

The present database includes the following mills:

- Weldwood, Hinton, Alberta
- Daishowa, Peace River, Alberta
- Weyerhaeuser, Grande Prairie, Alberta
- Slave Lake Pulp, Slave Lake, Alberta
- Alberta Newsprint, Whitecourt, Alberta
- Millar Western, Whitecourt, Alberta
- Alberta Pacific, Athabasca, Alberta
- Fiberco, Taylor, British Columbia
- Fletcher Challenge, Mackenzie, British Columbia
- Finlay Forest Products, Mackenzie, British Columbia

This database does not include provision for the storage of data for the following:

- person or organization taking sample;
- whether sample was grab or composite;
- location of sample collection;
- analytical method; and
- laboratory doing analysis.

It is known for example that several parameters (especially the dioxins and furans) contain analyses from several methods and several laboratories under one parameter name.

Because of the above, caution is recommended when using these data.

1.0 INTRODUCTION

This report documents an effluent database management system developed by N. McCubbin Consultants Inc. (modified by AGRA Earth & Environmental Limited) for the seven mills in the pulp and paper industrial sector of the Province of Alberta and three mills in the Province of British Columbia. This document describes the overall organization of the database, the file structures used and the custom program written to access the database.

How to Read this Report in Minimum Time: **Page**

1.1 OBJECTIVES

To make all relevant data on pulp mill effluent discharges available to the Northern River Basins Study. It is intended to assist engineers and scientists who have some skills with spreadsheet software, and none with database management. The program NORTHDAT was written for this purpose, and is described below.

To make the data available for processing with advanced analytical tools by those with the skills to use them.

1.2 MILLS IN NORTHERN RIVER BASINS

The pulp mills in the basins are listed in Table 1. Extensive data are available on the effluent from the Alberta mills, and are included in the database. These data include over 290 parameters, monitored at frequencies ranging from daily to bi-annually.

For the BC mills fewer parameters are monitored (for example, flow, mill production, BOD, TSS, AOX, and toxicity).

1.3 SOURCES OF DATA

The data available on the characteristics of the effluent from the pulp and paper mills must be considered in two categories. The primary data have been entered monthly in the Alberta Industrial Effluent Database and in hard copy for the B.C. mills, while the secondary data have been recorded only in paper form and are filed at the Standards and Approvals Branch, Alberta Environmental Protection and B.C. Environment in Prince George, British Columbia.

TABLE 1
Mills in Northern River Basins

Company	Town	Short Name	Filename Root*
Alberta Mills			
Daishowa	Peace River	Peace River	PEAC
Weyerhaeuser	Grande Prairie	Grande Prairie	GPE
Weldwood	Hinton	Hinton	HINT
Alberta Newsprint	Whitecourt	Whitecourt News	WHITN
Millar Western	Whitecourt	Whitecourt CTMP	WHITP
Slave Lake Pulp	Slave Lake	Slave Lake	SLAV
Alberta Pacific	Athabasca	NPAC	ALPAC
BC Mills			
Fletcher Challenge	Mackenzie	Mackenzie Kraft	MACP
Fiberco	Taylor	Taylor	TAYL
Finlay Forest Products	Mackenzie	Mackenzie News	MACN

*"Filename Root" refers to the root of all database file names referring to the mill. Individual files are identified by adding suffixes. Filename extensions are the normal defaults for the relevant software, such as WK1 for Lotus, except that the source data files (dBASE III format) have extensions .DBP and .DBA. Note that mills are generally referred to by location rather than ownership since the latter changes from time to time.

1.3.1 Principal Data Files

These include all final effluent parameters that are monitored weekly, or more frequently. Some other parameters are also included. Refer to Table 3 for a complete list.

For the Alberta mills, these data are key punched into the Alberta Industrial Effluent Database each month when received from the mills. Data for the Alberta pulp and paper mills have been extracted by an in-house program and transferred to dBASE format files that were used as the source for NORTHDAT data files (*.DBP).

1.3.2 Auxiliary Data Files

Most of these parameters in the auxiliary data files are monitored only twice per year, and more than half of the substances are rarely detected in the mill effluents. These include the Organic Priority Pollutant list, individual resin and fatty acids and most of the dioxin and furan congeners. These data have been entered to a secondary file for each mill, as listed in Table 2.

QA/QC data, results of analysis of split samples etc., are not included in the database. Non-routine testing carried out by Alberta Environment or other bodies will not be included either,

since it is relatively infrequent and not necessarily in a convenient form. These latter data will serve as a second independent level of quality assurance.

1.3.3 Database Capacity

Raw data are stored in standard dBASE file format, so that there will be no practical limits in the volume of data which can be assembled, and the data can be manipulated by any IBM-PC compatible computer with a hard disc. The data is stored by date, with the intention that new data can simply be appended as it becomes available to create an on-going record.

1.3.4 Time Span

At the time of writing, the database and NORTHDAT software reflect the time span from the beginning of mill operation until December 31, 1993, for Alberta mills, and from 1988 or the beginning of mill operation until December 31, 1993, for the B.C. mills. The software will operate with future data as long as the format of the source files is unchanged.

2.0 DATABASE DESCRIPTION

2.1 DATA FILES

The source files are the principal and auxiliary files listed in Table 2. These are in dBASE III format. The primary files have one record per day since the beginning of mill operation to December 1993 for Alberta Mills, and from January 1988 to December 1993 for B.C. mills. There is one file of each type for each mill, as listed in Table 2.

TABLE 2
Names of Source Files

Abbreviated Mill Name*	Principal Effluent File	Auxiliary Effluent File
Peace River	PEACE.DBP	PEACE.DBA
Hinton	HINTE.DBP	HINTE.DBA
Grande Prairie	GPE.DBP	GPE.DBA
Whitecourt News	WHITNE.DBP	WHITNE.DBA
Whitecourt CTMP	WHITPE.DBP	WHITPE.DBA
Slave Lake	SLAVE.DBP	SLAVE.DBA
ALPAC	ALPAC.DBP	ALPAC.DBA
Finlay Forest Products	MACNE.DBP	MACPE.DBA
Fletcher Challenge	MACPE.DBP	MACPE.DBA
Fiberco	TAYLE.DBP	TESTJUNK.DBA
Trial File for Practice	TESTJUNK.DBP	

*Refer to Table 1 for full mill names.

The files listed in Table 2 are in standard dBASE III format, but have been assigned the non-standard extensions shown to minimize the risk of being overwritten or modified accidentally by users unfamiliar with dBASE and computers.

The auxiliary effluent files are named as shown in Table 2, under the heading "Auxiliary effluent file". The structure of these files differs from the principal effluent file, since the data are relatively sparse, and a field for each parameter would require inefficient use of computer resources. There is one record per analysis, which contains the parameter name, units, sample date and values, as described in detail in Table 5 at the end of this report.

In the event that new mills are built, each will have its own files. NORTHDAT can be modified by non-programmers to process data from additional mills or supplementary files for existing mills.

Why Two Data Files for Each Mill?

There are two data files for each mill discharge because the nature of the established practices for reporting and recording data for the frequently reported parameters is inappropriate for the rarely reported parameters. Attempts at using the established practice for the large (and increasing) number of parameters that are reported infrequently would be frustrated by computer limitations and lead to poor performance.

NORTHDAT will recognize any parameter defined by the user and extract it as required without the user having to be aware of which file the data are stored in. Should there be different values for the same parameter on the same day for one mill in the two files, then the value in the principal file will be ignored by NORTHDAT when extracting data.

2.1.1 Principal Effluent File

The principal effluent file for each mill has one record per day, and field names P1, P2 ..... These names are NOT consistent across the files[1]. The significance of each field name is defined in Table 3. This table also includes the names and units to be written out by NORTHDAT to the LOTUS and dBASE format files.

Field names containing XXXX in Table 3 appear to be inconsistent references to the same parameter. They correspond to the permits issued to each mill. This inconsistency in naming effluent parameters is an inconvenience in handling this database, but will not cause errors. In all cases, users must be familiar with the relevant mill permit to be able to interpret the data on parameters listed in Table 3 at the end of this report.

---

[1]Programmers note that the order of the fields in this file is more important than the field names for the purposes of NORTHDAT's procedures for extracting data in response to user requests.

2.1.2 Auxiliary Effluent File

There is one auxiliary data file for each mill, containing the data for effluent parameters which are monitored relatively infrequently. These files were created by, and are maintained by NORTHDAT. These files have one record for each effluent sample tested. Each record includes the date of the sample, the value determined (or non-detect if appropriate) and the detection limit of the analytical procedure used.

The auxiliary effluent data files are in dBASE III format with fields as shown in Table 4.

TABLE 4
Fields in Auxiliary Effluent Data Files

Field Name	Type	Width	Function
Name	Character	40	Name of parameter in full.
Title	Character	10	Abbreviated name for parameter (used for field names in output dBASE files and column headings for Lotus files).
Date	Date	--	Date of sample.
Unit	Character	8	Units used for RESULT.
Result	Character	12	Value for parameter concerned. May be entered as an actual value, or as text (normally "ND" for non-detect), or as a negative value to represent ND at a known limit. The data extraction routine will report accordingly.
Sort	Numeric	3	Sort order for.

The parameters included and their standard (to NORTHDAT) abbreviations are defined in Table 5. The abbreviated names are used as field names in dBASE or column headings to serve as range names in LOTUS format output files where appropriate.

2.1.3 Other Files

The names of the mills in the database, along with the codes used by NORTHDAT to extract data, are in file MILL.DBD.

The names of the effluent parameters in the database, along with the codes used by NORTHDAT to extract data, are in file PARAMETE.DBD.

The file GENERAL.DBF is used for a simple password protection to minimize access to administration functions by casual users. If it is desired to distribute NORTHDAT to users but prevent them from modifying the database content, or organization, then the Administration function should be commented out by a programmer, or a password built in to the program.

2.2 UNITS

Each parameter will be stored only once in the source database. The units for the principal data file are shown in Table 3, and those for the auxiliary file in Table 5 (at end of this report).

In the primary data file, the source retains data with two decimals, regardless of the normal range of values. In the auxiliary data file, five digits are retained after the decimal, since up to five may exist in the raw data. It is assumed that the user has sufficient professional judgment to recognize that trailing decimals do not imply greater precision than would be normal for the analysis concerned.

The user of NORTHDAT can select the number of decimals he wishes to display in the LOTUS and dBASE output files, up to the maximum recorded in the source database.

3.0 SOFTWARE FOR EXTRACTION OF DATA

This chapter describes the program (NORTHDAT.EXE) used for extraction of data from the principal and auxiliary data files according to user choices.

Refer to page 11 for simplified user instructions for NORTHDAT.

3.1 CONCEPT

It is anticipated that most of the analysis of the data will be carried out by engineers and scientists using LOTUS, EXCEL, Quattro or similar spreadsheet software, since it is generally easier to use for such purposes than database management software. These spreadsheet programs have sufficient graphics capabilities for many purposes. More sophisticated statistical analysis packages can also use files in LOTUS format.

A program called NORTHDAT is therefore provided to allow users to extract sub-sets of data from the main database in a format that can be utilized by any spreadsheet software that can read LOTUS or dBASE format files. Microsoft DOS, Windows or Macintosh spreadsheets can use NORTHDAT output, but the NORTHDAT program itself runs only on PC compatible hardware. The user can modify the default parameters to display, number of decimals printed for each parameter and can add new files and/or mills to the list of files from the source database that are supported, without programming.

NORTHDAT is a Clipper compiled dBASE program, written on the assumption that most users would not want to modify it, but that some who are competent with dBASE and Clipper will

do so. Source code is provided, with comments, so that an experienced programmer can modify it without having to resort to the original programmer.

3.2 PROGRAM OUTPUT

The NORTHDAT user has the choice of extracting data for any number of parameters for one or several mills, of his choice.

NORTHDAT generates two files each time it is run, one in dBASE III format (*yourname*.DBF), and the other in LOTUS format (*yourname*.WK1), where "*yourname*" is a filename selected by the user. Both files contain essentially the same data, but the LOTUS file will be more convenient to read since it includes a descriptive header. Both the Lotus (.WK1) and the dBASE file (.DBF) output have the date in the first column, and the effluent flow in the second column. The user has the choice of having a record included for every day, or only for those days on which there is some data in the source file in addition to the flow and production data that are present for almost every day.

3.2.1 dBASE Formatted Output

The dBASE formatted output will be a simple file with the date in the first field, using the field name DATE.

The data concerning the first mill selected by the user would follow, identified by field names for each parameter taken from Table 3 or Table 5, with the suffix "1" added.

Data for the second and subsequent mills would follow, using the same field names, but distinguished by the suffix "2" for the second mill, "3" for the third and so on. The mills would be presented in the order defined by the user, and would have names shown in the "file" column of Table 1. a sample of NORTHDAT's dBASE format output when requested for TCDD and TCDF concentrations in the effluents from the three Alberta kraft mills is shown in Figure 1. In this case the user had limited the dates of interest to 1990, and had requested omission of days without data for any of the mills.

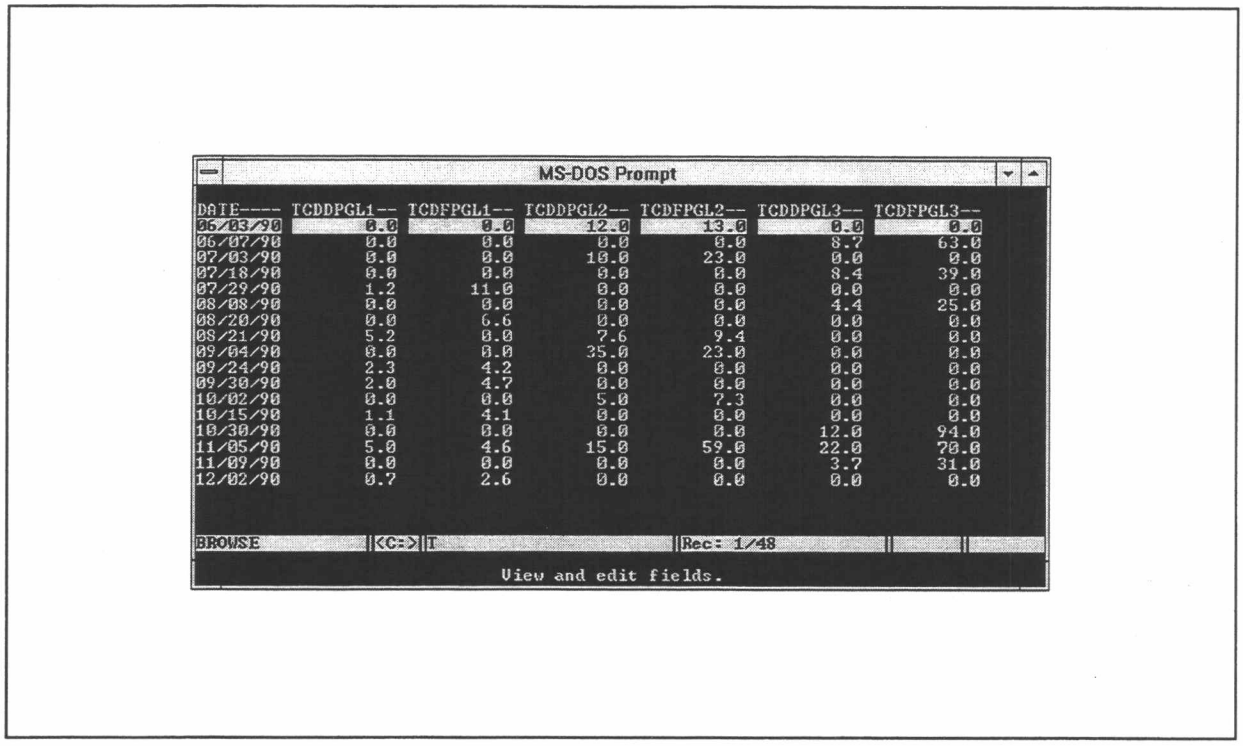


Figure 1: Sample Output in dBASE Format

3.2.2 Spreadsheet Formatted Output

The spreadsheet formatted output is in LOTUS.WK1 format, and would include all the same data as the above dBASE file, and also have a file header defining the date of extraction and the name(s) of the source file(s) (Figure 2). The header information in the spreadsheet formatted output is more extensive than is practical in a dBASE file. The first field (column) is the date. The subsequent fields contain the data the user has requested, with headings on each column to identify the mill and the parameter concerned. The columns are grouped by mill, if the user has requested data on more than one mill.

Example of Lotus File for Parameter Oriented Mode

LAST_RUN						
Mill(s)	Peace River	Hinton	Grande Prair			
From	90.01.01	To	93.02.08			
Data	extracted	from file(s)	PEACE	HINTE	GPE	
Date of	extraction	93.02.08				
Sample	2,3,7,8	2,3,7,8	2,3,7,8	2,3,7,8	2,3,7,8	2,3,7,8
Date	-TCDD	-TCDF	-TCDD	-TCDF	-TCDD	-TCDF
	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L
	Peace River	Peace River	Hinton	Hinton	Grande Prair	Grande Prair
	1	2	1	2	1	2
DATE	TCDDPGL	TCDFPGL	TCDDPGL	TCDFPGL	TCDDPGL	TCDFPGL
3-Jun-90	n/a	n/a	12.0	13.0	n/a	n/a
7-Jun-90	n/a	n/a	n/a	n/a	8.7	63.0
3-Jul-90	n/a	n/a	10.0	23.0	n/a	n/a
18-Jul-90	n/a	n/a	n/a	n/a	8.4	39.0
29-Jul-90	1.2	11.0	n/a	n/a	n/a	n/a
8-Aug-90	n/a	n/a	n/a	n/a	4.4	25.0
20-Aug-90	n/a	6.6	n/a	n/a	n/a	n/a
21-Aug-90	5.2	n/a	7.6	9.4	n/a	n/a
4-Sep-90	n/a	n/a	35.0	23.0	n/a	n/a
24-Sep-90	2.3	4.2	n/a	n/a	n/a	n/a
30-Sep-90	2.0	4.7	n/a	n/a	n/a	n/a
2-Oct-90	n/a	n/a	5.0	7.3	n/a	n/a
15-Oct-90	1.1	4.1	n/a	n/a	n/a	n/a
30-Oct-90	n/a	n/a	n/a	n/a	12.0	94.0
5-Nov-90	5.0	4.6	15.0	59.0	22.0	70.0
9-Nov-90	n/a	n/a	n/a	n/a	3.7	31.0
2-Dec-90	0.7	2.6	n/a	n/a	n/a	n/a

Figure 2: Sample Output in Spreadsheet Format

3.3 USER INTERFACE

The user first chooses between extracting data or performing utility/maintenance functions, such as entering data.

3.3.1 Extracting Data

The user is then asked to define the first and last day of interest. The default start date would be January 1, 1990, and the default last date is the current date, which would provide all data available, to the end of the source data file.

The user can specify whether he wishes a record in the output file for every day in the range of dates he has defined, or only for days on which there are data. In this context, days for which there is only a date, effluent flow and a production rate are considered to be days without data.

NORTHDAT first asks the user to pick which mills he wishes data for. The order that the mill data will be presented in the output files is set by the user entering numbers for all mills of interest. These

numbers need not be consecutive. NORTHDAT will process the lowest number first, then the second lowest, etc., until data for all mills requested by the user have been processed.

NORTHDAT then gives the user the choice of effluent parameters to be written to the output files. He will be presented with a list of effluent parameters so that he can then define the parameters he wishes, and the order he wishes them in, by assigning a number to each.

The user is also asked to specify an output filespec. This should be one file name, including drive and directory (default is the current directory), but without extension. NORTHDAT adds DBF and WK1 to build the full filespec.

4.0 USING NORTHDAT

If NORTHDAT is not already installed on your computer, refer to Section 6.0 (Installing NORTHDAT).

4.1 STARTING NORTHDAT

To start the program, enter NORTHDAT from the DOS prompt[2]. If you wish to run NORTHDAT under Microsoft's WINDOWS, open a DOS window and give the command. NORTHDAT can run full screen or in a window as desired.

A screen similar to Figure 3 will be presented. The user can make five choices by moving the menu bar with the "up" and "down" arrow keys. The bottom line of the screen provides further information on the current selection.

The example in Figure 3 shows the "Data extraction" option as the current selection, with the menu bar located on the words "Data extraction". "Exit" simply terminates the program, and the other choices are discussed below.

---

[2]NORTHDAT and the source files for effluent data must be in the current directory. Depending on your computer installation, you may wish to write a short DOS command file to change directories automatically.

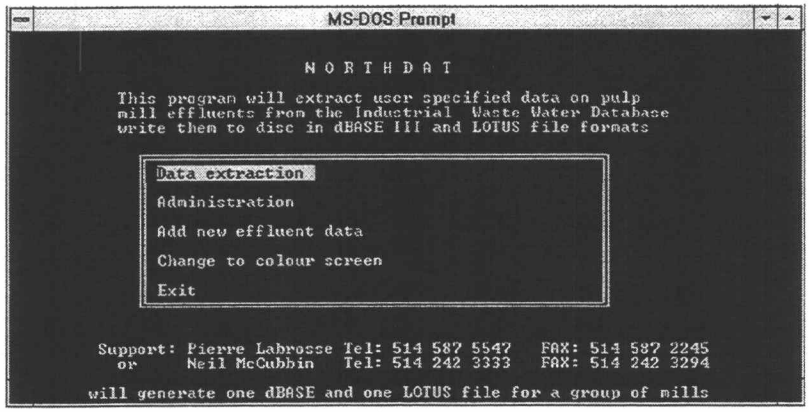


Figure 3: NORTHDAT Main Menu

4.1.1 Colour Versus Monochrome or Laptop Screens

If you wish to change the screen mode from black and white to colour, or vice versa, place the menu bar over the appropriate command and press the "Enter" key. The black and white mode is intended primarily for laptop displays.

4.2 DATA EXTRACTION

You cannot damage the database by experimenting with data extraction, so feel free to experiment. The administration and data entry modules discussed in other chapters can damage data, and therefor require more care. A pseudo mill, called TEXTJUNK is included in the database. This allows experimenting with any aspect of the operation without risk of damaging real data.

Enter the "range of dates" you wish data to be extracted from in the format "Year.Month.Day". Pressing the "Enter" key will accept the defaults[3].

---

[3]To navigate between fields in any one screen, use the "Down arrow" key to move forwards and "Up arrow" to move backwards.

Decide whether you wish a record for every day in the range you have specified or only for days with data for the parameters you have requested by responding "Y" or "N" to the prompt.

```
Do you wish a record for every day ?  (Y/N)
```

In this context, days for which there is only a date, effluent flow and a production rate, are considered to be days without data.

Pick the mills of interest from the list presented by locating the menu bar over the mill and pressing "Enter". A number will appear, which will define the order in which the mills will appear in the output files. Either press "Enter" to accept it, or modify it as you wish. The numbers should be integers, but need not be consecutive. When all the mills of interest have been selected, press "Esc" to continue.

Pick the effluent parameters of interest from the list presented by locating the menu bar over each parameter of interest[4], and pressing "Enter". A number will appear, which will define the order in which the parameters will appear in the output files. Either press "Enter" to accept it, or modify it as you wish. The numbers should be integers, but need not be consecutive.

The complete list contains approximately 300 effluent parameters. You can navigate with the "Up", "Down", "Page Up" and "Page Down" keys.

The top part of the list of available parameters is shown in Figure 4.

In the example shown, the effluent flow will be in the first[5] column (field) of the output file, 2,3,7,8 TCDD in the second, 2,3,7,8 TCDF in the third and total pulp production in the fourth. There is a minus sign on the numbers for 2,3,7,8 TCDD and 2,3,7,8 TCDF (-2 & -3). This will cause NORTHDAT to skip dates for which there is no data for these parameters. The purpose of this is to avoid producing large files with mostly blank records. Virtually all records in the data files for all mills have data for effluent flow and the production rate, so these values are ignored by NORTHDAT when considering whether the record is empty or not.

---

[4]Up to 125 parameters may be selected.
[5]The date of effluent sampling is considered to be column zero, and is at the extreme left of output files. NORTHDAT makes no provision for relocating it.

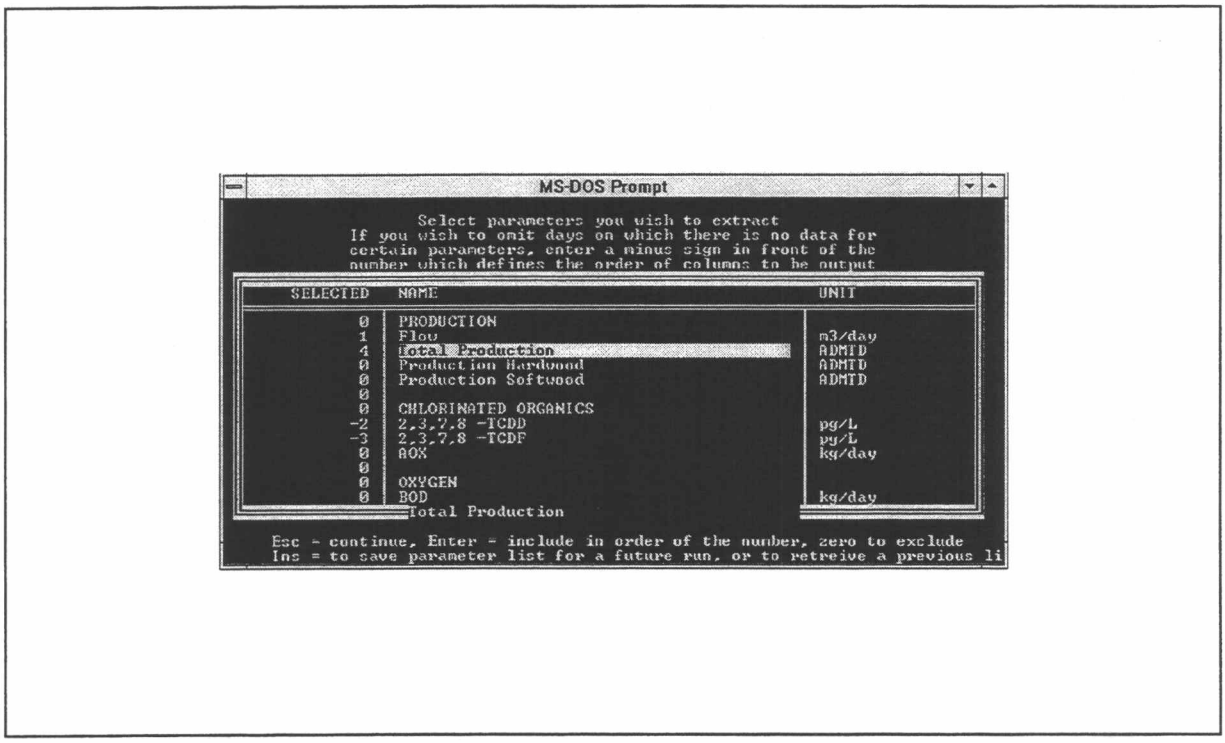


Figure 4: Selection of Effluent Parameters

To recall a previous list of effluent parameters that you have used, press the "Ins" key and follow the instructions on the screen. The selection set from the last run on NORTHDAT on your computer is automatically saved under the name LAST_RUN. Other runs are saved only when requested by the user, as discussed below. After a selection set is recalled, you can use it as it is, or modify as required and run NORTHDAT.

To save your current selection set for future runs, press the "Ins" key and follow the instructions displayed on your screen. The description can be any text that fits the space available on the screen. Examples could include "AOX for all kraft mills" or "Nutrients for all mills" or "BOD, TSS and flow for the Weyerhaeuser mill". There is no limit with NORTHDAT to the number of selection sets that you can save, but if the number becomes very large, it would be a nuisance finding a particular one[6], it is best to save only frequently used or very complex selection sets.

Enter a description for the heading of the table in the Lotus format output file. NORTHDAT will prompt for a description of your request for data. You may enter any test that fits the space offered. This will

---

[6]The past selection sets are saved in a file called OLDRUNS.DBD. It can be modified by dBASE III or IV. If it becomes too large, records can be deleted by dBASE. Do NOT modify PASTRUNS.DBD with LOTUS or other programs that cannot process dBASE memo files. If renaming this file, note that the associated files PASTRUNS.DBT and PASTRUNS.NDT must also be renamed.

be printed at the head of the output file, and will be used to identify the search criteria for future runs if you choose to save it as mentioned below. Possible responses could include "Summary AOX and Dioxin data for Ralph Klein" or "BOD and TSS for all mills, by JBH"

Specify the name you wish for the output files. This should be one file name, including drive and directory (default is the current directory), but without extension. NORTHDAT adds DBF and WK1 to build the full filespec. You may enter drive names and/or a path to the directory you wish to store the output file in. If you enter the name of a file that exists already, NORTHDAT will give you the choice of over-writing it or entering a different filename. It is easy to generate many output files and consume disc space. It is often best to store output files on a RAM disc, and save them to the hard disc only after inspecting and modifying them as desired.

Define your preference for processing "non-detect" values. Where the source data files show a value as "non-detect", NORTHDAT can either insert "n/a" in the output file, or the detection limit (if known) as a negative number. (Example, if the parameter concerned is "ND @ 0.1 mg/L", NORTHDAT can insert either "n/a" or "-0.1" in the output file. Respond to the "Y/N" prompt according to your needs.

NORTHDAT will then process the requested files, displaying messages indicating progress.
In the LOTUS format output file, the date is displayed as an integer, following the convention that day zero was January 1, 1900. This can be converted to any of LOTUS standard date formats, and is understood by any spreadsheet software. Note that in the Macintosh version 6 of EXCEL, it may be necessary to reset the basis date from the MAC convention of considering day zero as being 1904.

4.3 ADDITION OF NEW DATA

The main menu of NORTHDAT provides the user the option of adding new data. This is for the auxiliary data files (*.DBA) only. Data for the principal data files is extracted from the Alberta Industrial Effluent Database.

If this option is selected, you are offered a list of available files, normally one for each mill, as listed in Table 1 on page 8[7]. After selecting the mill of interest with the arrow keys, press "Enter" and a screen similar to Figure 5 will be presented[8].

---

[7]If this is the first time you have entered data with this software, it is recommended that you first practice with mill "TESTJUNK".

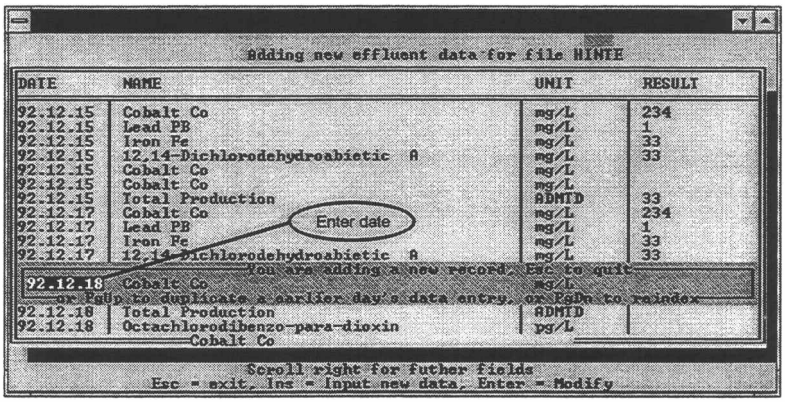
[8]If your screen does NOT show past values, then the index file for the mill's auxiliary data is probably missing or corrupted. To rectify this, press the "Ins" key and a screen similar to Figure 6 will appear. Re-index the file by pressing the "Page Down" key.

Figure 5: Data Input Screen, Showing Parameters Entered Previously

To enter new data, press the "Ins" key, as suggested at the foot of the screen, the screen will change as shown in Figure 6.

Enter the date (in Year.Month.Day format) of the effluent sample for which you wish to enter data, then press the "Enter" key[9].

Figure 6: Data Input Screen Showing Parameter Entry Sub-screen



[9]If the date displayed is already correct, simply press the "Enter" key.

The screen will change as indicated in Figure 7 (the example shows the cursor on thallium). Scroll up or down until the cursor is on the parameter of interest[10], then press the "Enter key". You will return to a screen similar to Figure 6, but with the parameter you have selected displayed instead of "Cobalt", and the field to the right, for the analytical value, highlighted.

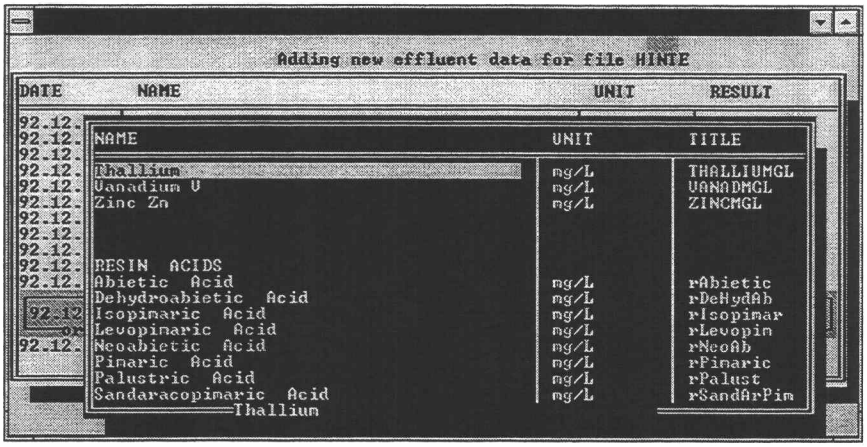


Figure 7: Data Input Screen Showing List of Parameters for Selection

Enter the value for the analysis[11], verifying that the units correspond to those shown on the screen, and press Enter. If the test result was "non detect", then enter "ND" followed by the detection limit. You may enter "ND" with no value for the detection limit. This is accepted by NORTHDAT, but not helpful to the ultimate users of the data. Entering "ND" without the detection limit will cause the detection limit to be presented as "9999" in NORTHDAT's output files. If there is a value available for the analysis

[10]The arrow keys, "Page Up" and "Page Down" keys all function as they do in most PC software. "Ctrl Page Up" for top of list, and "Ctrl Page Down" for the end.

[11]Some interpretation of the data to be entered may be required. Where two analyses are conducted on the same day and reported together, the results should be averaged manually, if reasonable. If there is an unacceptable discrepancy, then this should be resolved prior to entering the data. (If you enter two values for the same date, the second will overwrite the first.

which exceeds the detection limit, **AND** a detection limit is also indicated on the paper copy, then ignore the detection limit.[12]

After entering all the data from a page of paper copy, check it visually against the values on the screen, scrolling back up with the arrow key if necessary. Errors can be corrected by locating the cursor on the field in question, pressing the "Enter" key and typing in the correct value, followed by the "Enter" key again.

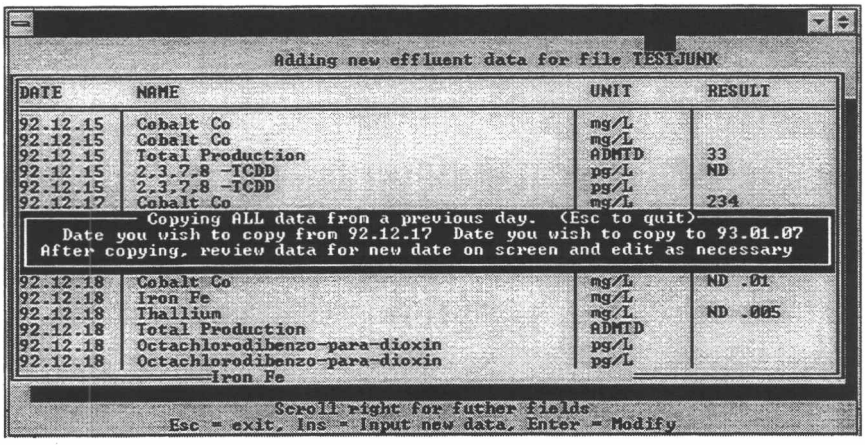
NORTHDAT automatically sorts data by date.

You may repeat the process, starting with the "Ins" key, for as many new data as you wish. When completed, the "Esc" key returns to the previous menu.

4.3.1 Copying Data From A Previous Date

If the data to be entered are identical to, or very similar to the data from a previous date, NORTHDAT can copy the old data to the new date for editing, instead of re-entering all values. To use this feature, start with the data input screen, showing parameters entered previously (Figure 5). Position the cursor on any data from the previous date of interest, press the "Ins" key, and the data entry sub-screen shown in Figure 6 will be displayed. Press the "Page Up" key, to call the screen shown in Figure 8.

Figure 8: Data Input Screen Showing Option to Copy Previous Data



[12]In some laboratory reports, the detection limit is shown as a note once per page, or on an accompanying page.

Change the highlighted dates for the source and destination of the data as desired, then press "Enter". This will copy ALL data in the active file (TESTJUNK.DBA in Figure 8) for the **first date** (92.12.17 in example) to the **second date** (93.01.07 in example). You should then review the data and ensure that it is correct before proceeding. Changes can be made by locating the cursor on the data to be modified, pressing "Enter", typing the corrections, then pressing "Enter" again.

5.0 ADMINISTRATION OF NORTHDAT

The NORTHDAT program itself should not require modification, unless user requirements are changed. Source codes are available, and any programmer experienced with Clipper can modify it.

If new or modified parameters are added to the principal data files, then the necessary changes can be made by non-programmers by using the Administration sub-menu, which is available from the main menu screen of NORTHDAT. These administration functions are tools to facilitate modifying the files MILL.DBD and PARAMETE.DBD.

WARNING

The administration functions provide considerable flexibility to the user, but can also be dangerous if mis-used. Whatever damage is done can be rectified by copying correct versions of MILL.DBD and/or PARAMET.DBD over the corrupted ones. It is therefore recommended to make back-up copies of these files before attempting modifications.
The administration functions include the capability of re-mapping the field names in the original source data file (P1, P2 etc., represented in NORTHDAT by 1, 2, 3.....) to NORTHDAT's output. If this is incorrectly carried out, then the names heading the columns of data on the outputs will be wrong, leading to incorrect reporting of results. **Users should not normally have to change the values originally supplied, unless the source data file structure is amended.**

If the "Administration" option is selected from the main menu of NORTHDAT, you will be requested to enter the administration password[13]. If you enter the correct password, a screen similar to Figure 9 will be presented.

The desired option is selected with the arrow keys and initiated it by pressing the "enter" key. the individual options are discussed below.

[13]The password is "admin" for the version of NORTHDAT published with this report.

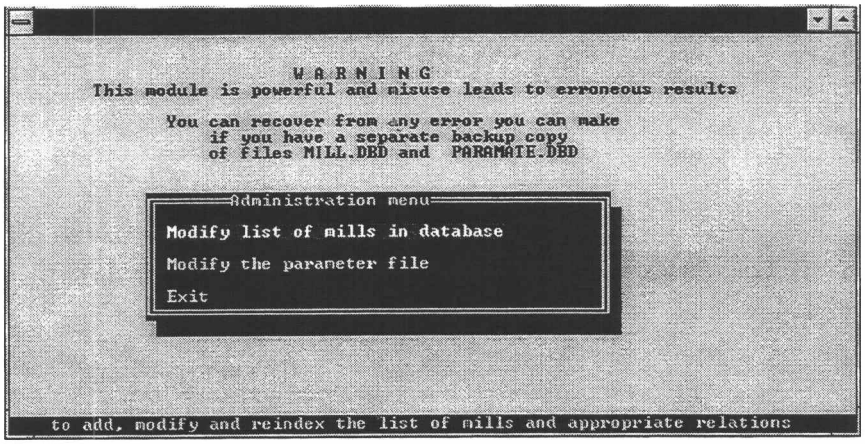


Figure 9: Database Administration Menu

5.1 MILL FILE

The mill file contains the names and locations of the mills, and the "Mill Number" that is used to identify the mill within NORTHDAT. There will normally be a "principal" data file (e.g. "HINTE.DBP" for **HINT** on **E**ffluent **D**ata**B**ase **P**rincipal). and one auxiliary data file (e.g. HINTE.DBA for **HINT** on **E**ffluent **D**ata**B**ase **A**ux.). If it is desired to add further source data files for a mill (such as for stormwater effluent, or untreated mill effluent), then each must have a separate name and number.

The menu for modification of the names of mills in the database is shown in Figure 10. To modify a field, select the field[14] then press the Enter key and enter the new information, then press "Enter" again.

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14 Place the curser on the field with the arrows.

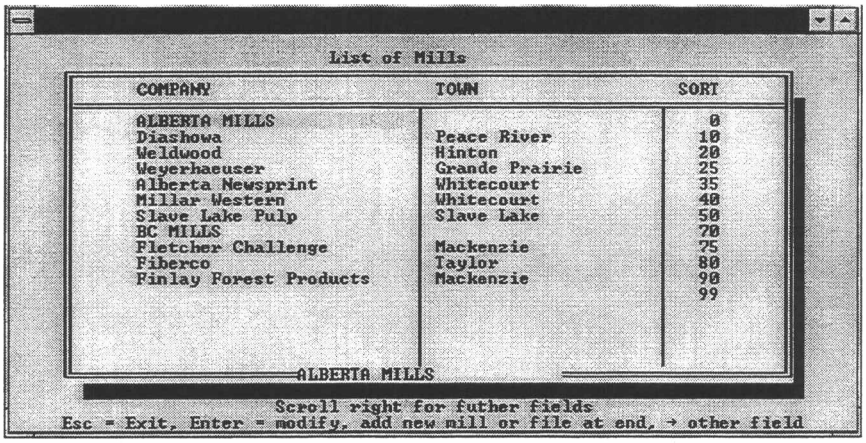

Figure 10: Menu for Administration of Mills in Database

You can access any field of the file by using the arrow left and right, and any mill by the arrows up, down, page Up and page Down. Notice that the file is much wider than a standard computer screen, so it is necessary to scroll across with the arrow keys to see it all.
To modify the name of a mill or town, type over the old one, following the instructions on the screen.

The column headed "SORT" defines the order in which the mills will appear on the mill selection menu. Any two digit integer can be entered.

The remaining fields can be modified as desired, with careful reference to Table 6.

To add a mill, go to the end of the file with the "Ctrl" and "Page Down" keys and then push down one more record to a blank, and then enter the information to all the fields. For records that represent an actual mill, all fields except SELECTED must contain appropriate data.

TABLE 6
Fields in the Mill File (MIL.DBD)

COMPANY	Name of company.
TOWN	Location of the mill. If this field is empty, a blank line will be presented on the screen.
SORT	A number to control the order in which the mills are displayed to the user. Each time a new mill is added to NORTHDAT, the value in this sort field is zero, and the new mill appears at the top of the mill list. The user should change the field to the number he/she wishes to see the data appear.
SHORT_NM	Short name to print as title on the spreadsheet.
FILE_NM	Name of the source data file. This file must be in the same directory as NORTHDAT.
SELECTED	This field is changed automatically by a number each time the user selects a mill in the execution of the program. Any changes by users will be ignored.
COMP_NUM	A number from 1 to 99 to uniquely identify one particular effluent sampling point. At the time of writing the software, there was one sample point (the process effluent discharge) for each of the six Alberta mills. There is unlikely to be any reason to change this number, but new numbers may be required if new mils or effluent sampling points are added. Refer to discussion below on the relationship between files MILL.DBD and PARAMETE.DBD.

5.2 PARAMETER FILE (PARAMETE.DBD)

This file, along with the file MILL.DBD discussed above, determines the relationship between the data, mills and names of effluent parameters. The file can be modified under the control of NORTHDAT by selecting the Administration option on the main menu.

As you scroll across this file, the name of the parameter will scroll off the screen. However, the name of the currently active parameter is also displayed in the lower centre of the on-screen box.

The parameter file is modified in the same way as the mill file, discussed above, referring carefully to Table 7 for the significance of each field.

To modify a field, use the same procedures described above for the mill file. Notice that the file is much wider than a standard computer screen, so it is necessary to scroll across with the arrow keys to see it all. To modify a field, it is necessary to press "Enter" to activate a field for modification, and "Enter" again when finished.

To add a parameter, go to the end of the file with the "Ctrl PgDn" key and then press down one more record to a blank record and add the information to all the fields necessary. For parameters which are in the principal mill effluent data files, the appropriate values must be entered for COMP_1, COMP_2 etc. Users are unlikely to add parameters for this circumstance. For parameters which are in the auxiliary mill effluent data files, zeros should be entered for COMP_1, COMP_2 etc. Users are likely to wish to add parameters to the auxiliary files.

5.3 RELATIONSHIP BETWEEN MILL AND PARAMETER FILES

One function of these two files is to point to the appropriate fields in the principal mill effluent database files. The meaning of the fields COMP_NUM and COMP_1, 2, 3 etc. can best be described by an example.

Consider the following extract from MILL.DBD:

SHORT_NM	FILE_NM	COMP_NUM
Peace River	PEACE	2
Hinton	HINTE	1
Grande Prairie	GPE	3
Whitecourt News	WHITNE	5
Whitecourt CTMP	WHITPE	6
Slave Lake	SLAVE	4

TABLE 7
Field Names in PARAMETE.DBD

NAME	Name of the parameter (e.g. BOD, AOX, pH).
UNIT	Unit to print on the output file (this is just a label, changing it will NOT affect the output value).
TITLE	Short name to print as a single cell title on the spreadsheet output, or field name in DBF. (This field must be limited to nine characters long.)
FLD_LENGTH	Length of the field (ex 12 for 999999999.99) to be inserted in LOTUS format output file. Value must include integers, decimal point and digits following point. Normally 12 is a suitable value, so that even erroneously high values will be readable.
FLD_DEC	The number of decimal digits to write to the spreadsheet file This should reflect scientific judgment on the probably accuracy of the analytical procedure concerned.
DEFAULT_ON	Default status of each parameter when the parameter selection screen is presented to the user. (the value in column headed "SELECTED" in Figure 4) By default, each parameter except flow and production have a zero value for DEFAULT_ON. User may change if different defaults are preferred.
SORT	A number to control the order in which the parameters appear to the user. Each time a new parameter is created, its sort field is zero, and the new parameter appears at the top of the list of parameter names. Change that field to an appropriate number to make it appear at the desired location in the screen menus.
SELECTED	This field is changed automatically by NORTHDAT each time the user selects a parameter in the execution of the program. Any changes by users will be ignored.
COMP_1	Defines the position of a parameter in the principal data file (ex. HINTE.DBF) for the mill for which COMP_NB field = 1. Refer to discussion below on the relationship between files MILL.DBD and PARAMETE.DBD.
DATA_ENTRY	Field to determine whether the parameter is displayed for entry of data to the auxiliary data files in the data entry module. Positive values cause display, zero or negative suppress display.

The foregoing indicates that for the Hinton mill, the primary data file has the root name HINTE, and the Hinton mill discharge is considered by NORTHDAT to be company 1 (COMP_NUM = 1). The full name of the principal data file is HINTE.DBP.

Consider also the following extract from PARAMETE.DBD:

Title	COMP_1	COMP_2	COMP_3	COMP_4	COMP_5	COMP_6	COMP_7	COMP_8	COMP_9
	0	0	0	0	0	0	0	0	0
FLOW3DAY	13	19	12	15	11	14	0	0	0
ADMTDTOT	23	40	21	24	19	23	0	0	0
ADMTDHWD	0	30	0	0	0	0	0	0	0
ADMTDSWD	0	31	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
TCDD PGL	1	1	1	0	0	0	0	0	0
TCDF PGL	2	2	2	0	0	0	0	0	0
AOXKGD	4	5	4	0	0	0	0	0	0

The value of 13 in row FLOWM3DAY. in the column COMP_1, indicates to NORTHDAT that in the flow for the mill COMP_1 (mill 1) is in the thirteenth column after the date of the source data file. Reference to the extract from MILL.DBD above shows that the mill with mill number 1 is Hinton, and that the principal mill effluent data file is HINTE.DBP.

The values of 4, 5 and 4 for AOX in columns COMP_1, COMP_2, and COMP_3 indicate that the AOX data for companies 1, 2 and 3 is in columns 4, 5 and 4 of the respective data files. The zero values in columns COMP_7, COMP_8, and COMP_9 indicate that there are no data in the principal data files for these mills. (these are the three BC mills).

The zero values for AOXKGD for mills COMP_4, COMP_5 and COMP_6 indicate that there are no AOX data in the principal data files for these mills. (they are all mechanical mills that use no chlorinated bleaching compounds.).

Modifications to files MILL.DBD and PARAMETE.DBD should be carried out by the administration module of NORTHDAT.

5.4 PARAMETERS IN PRINCIPAL DATA FILES (*.DBP)

The parameters in the principal data files (HINTE.DBP etc.) have been discussed on page 12. Only maintenance and administrative aspects are discussed here.

The files are generated by software that is part of the Alberta Industrial Effluent Database, and include one record for each calendar day. The first field is the date, and the subsequent fields (up to about 40) are named P1, P2 etc., as listed in Table 3 and 4. It is essential that any changes in the format of these files be accompanied by a corresponding change in the file PARAMETE.DBD, using the administration module of NORTHDAT, as described above. For NORTHDAT, the order of the fields in the principal data files critical, while the field names are of little importance.

5.5 PARAMETERS IN AUXILIARY DATA FILES (*.DBA)

The auxiliary data files, those with extension ".DBA", are quite simple in structure, and there are no program driven capabilities provided for modifying the structure. Data are added to these files by the keyboard, under the control of NORTHDAT.

The auxiliary files use one record for each analysis of each effluent sample. Each record is dated and includes the capability of recording non detects. The structure of the auxiliary files is shown in Table 5.

5.6 PARAMETERS ACCESSIBLE FROM DATA ENTRY MODULE

In principle, any effluent parameters can be entered to the auxiliary data file for any mill by using the data entry module, selected from the main menu shown in Figure 3. However, some parameters, particularly those measured more frequently than once per month are normally stored in the principal data files, so it would be redundant to re-enter them.

The list of parameters displayed for data entry (Figure 7) is therefore restricted to those likely to be of interest. The field "DATA_ENTRY" in the file PARAMETE.DBD determines which parameters are displayed for data entry. Display is suppressed for zero or negative values for this field. It can be modified by scrolling.

6.0 INSTALLING NORTHDAT ON A PC

NORTHDAT will run on any IBM PC compatible computer with a hard disc containing 18M of available space and 640K RAM installed.

NORTHDAT is provided on a disk bound with Appendix B, Installation Procedure. To install NORTHDAT on a microcomputer follow the instructions provided in Appendix B.

It is recommended that NORTHDAT be installed its own directory. The following files are provided with NORTHDAT and must be in the same directory.

NORTHDAT.EXE	The executable program NORTHDAT itself.
PARAMET.DBD	List of effluent parameters and the position in which NORTHDAT must look for them in the source data file.
MILL.DBD	List of mills for which data can be processed, including the mill number and other information required by NORTHDAT. If there is more than one source data file for a mill, it appears in MILLS.DBF under a different name (eg. Hinton effluent, Hinton influent etc.).
Effluent data files (*.DBP and *.DBA)	The effluent data files for the mills of interest must be in the same directory. There are two sets of files, the "Principal files" and the "Auxiliary files", as listed in Table 2.

Installing NORTHDAT will also result in four files in the directory with extension .PRG. These are the Clipper source codes; they are only useful if it is necessary to change the functions of the executable program. To do this will require the ability to program in Clipper.

To run NORTHDAT, enter the NORTHDAT directory and type NORTHDAT <Enter>.

7.0 QA/QC FOR DATA

Once the data had been entered into the original NORTHDAT data base, quality control procedures were used to detect errors in data entry. These procedures were as follows.

7.1 PRIMARY DATA FILES

1. A graph of parameter concentration versus time was made for each parameter and every mill in the database.

2. The outlier data points (those greater than 10 times the average) were checked against the hard copy data files for accuracy. If the data were incorrectly entered, changes were made to the primary data file.

3. The QC procedures were used on the data entered by AGRA Earth & Environmental Limited and the data provided by Albert Environmental Protection in electronic format.

7.2 AUXILIARY DATA FILES

1. For each auxiliary data file, a list was made of all parameters contained in the file, the total number of analysis for each parameter, and the number of analysis that detected a greater than detection limit value.

2. A series of files was extracted from each mill's database as follows:

    - Metals
    - Chlorinated Phenolics
    - Resin and Fatty Acids
    - Dioxins and Furans (if they were present)
    - Nutrients (if they were present)

3. The extracted data were compared to the list prepared in (1) above and to a series of three data sets from the hard data files. If more than one discrepancy was found between the random hard data files and the extracted data, then further comparisons were made between the hard data files and the extracted data. Errors noted on all checks were corrected.

7.3 GENERAL QA/QC RESULTS

In general, the primary data files showed few outlier values during the QC procedures. All of the values were checked and corrected.

The QC procedures showed a significant level of error in the dioxin and furan data in all the bleached kraft mills from 1990 to 1992. To correct these errors, all the dioxin and furan data were re-entered into the auxiliary data files.

In addition to the above, no auxiliary data file data existed for the Daishowa mill in Peace River for the period May to December 1992. These data were added to the database.

For data from the Alberta Newsprint mill in Whitecourt, the resin and fatty acid data were not reported if all values were below the detection limit. The months which this occurred are outlined in Table 8.

Finally, in the data prior to 1988, there were several periods for which no data could be found. These were:

Weldwood, Hinton	Proctor & Gamble, Grande Prairie
July, 1974	June, 1975
November, 1974	June, 1976
June, 1976	July, 1976
All of 1984	All of 1984
May to December, 1987	

The production data for the Grande Prairie mill was supplied as monthly averages of the daily production for the period 1974 to 1987. The monthly averages are supplied in a separate file in Lotus format (*.WK1) called GPPROD.WK1.

7.4 GENERAL DATA QUALITY

Although the QC program detected and corrected many data entry errors, caution should be exercised in using the data. In the case of the metals, dioxins and furans, resin and fatty acids, and chlorinated phendics, at least three different laboratories have been used in the analysis and this database provides no method for distinguishing between different analytical methods or laboratories. The lumping of these data under one parameter name, results in the possibility of misleading interpretation. This situation also applies to nutrient data.

Another weakness of the data is the ability to differentiate between analyses performed on composite samples, grab samples and continuous monitors. Again, the data does not allow for these categories of samples, and care should be exercised in using the data.

TABLE 8
Dates when there were No Detected Resin And Fatty Acids at the Alberta Newsprint Mill in Whitecourt

September 9, 1991
October 7, 1991
November 7, 1991
April 16, 1992
May 5, 1992
September 8, 1992
December 7, 1992
January 4, 1993
April 2, 1993
May 3, 1993
June 7, 1993
September 7, 1993
October 4, 1993

TABLE 3
Names of Fields for Principal Mill Effluent Data Files

NAME	UNIT	TITLE	Weldwood	Daishowa	Weyerhaeuser	Slave Lake	ANC	Millar Western	Fiberco	Finlay	Fletcher Challenge	ALPAC
PRODUCTION												
Flow	m3/day	FLOWM3DA	P14	P18	P20	P16	P13	P13	P19	P1	P2	P16
Total Production	ADMTD	ADMTDTOT	P25		P36	P28	P19	P23	P20	P15	P1	
Production Hardwood	ADMTD	ADMTDHWD		P31								P25
Production Softwood	ADMTD	ADMTDSWD		P32								P26
CHLORINATED ORGANICS												
2,3,7,8 TCDD	pg/L	TCDDPGL	P1	P43	P2							P37
2,3,7,8 TCDF	pg/L	TCDFPGL	P2	P44	P3							P38
AOX	kg/day	AOXKGD	P4	P3	P6						P3	P2
OXYGEN												
BOD	kg/day	BODKGD	P5	P5	P7	P5	P2	P3		P8		P3
BOD	mg/L	BODMGL	P34	P6	P48				P4	P7	P9	
COD	kg/day	CODKGD			P9							P4
COD	mg/L	CODMGL	P36		P51	P7						
Dissolved Oxygen	mg/L	DOAVGMGL				P13	P7	P10	P6	P6	P5	
Dissolved Oxygen Max	mg/L	DOMAXMGL										
Dissolved Oxygen Min	mg/L	DOMINMGL										
CHELATING AGENTS												
Chelants	mg/L	CELANMGL										
DTPA EDTA	mg/L	CELAN2MGL					P9					
BACTERIA												
Fecal coliform	#/100 ml	FCOLINUM	P12			P14	P10					P14
Klebsiella	#/100 ml	KLESINUM										P18

NAME	UNIT	TITLE	Weldwood	Daishowa	Weyerhaeuser	Slave Lake	ANC	Millar Western	Fiberco	Finlay	Fletcher Challenge	ALPAC
TOXICITY												
Daphnia magna	Fail/Pass	DAPHF/P	P10	P15	P17	P14	P4		P18	P10		P10
Ceriodaphnia dubia	%	CERIODAF			P28							
Fathead Minnow	%	FAT H			P29							
Selanastrium c.	%	SELAN			P30							
Fish Bioassay	Fail/Pass	FISHF/P	P13	P17	P19	P15	P11	P12	P17	P9		P15
Fish Bioassay II	Fail/Pass	FISHF/P2			P4		P12					
NUTRIENTS												
Ammonia-Nitrogen NH3-N	mg/L	NH3NMGL	P3	P2	P5	P2	P1	P1	P12			P1
Kjeldahl Nitrogen	kg/day	TKNKGD										
Kjeldahl Nitrogen	mg/L	TKNMGL	P15	P19	P21		P14	P33	P9			
Dissolved TKN	mg/L	DTKNMGL					P5					P11
Dissolved Kjeldahl Nitrogen	mg/L	DISSTKN										
Total Kjeldahl Nitrogen (TKN)	mg/L	TKN	P30	P38		P36						P32
Nitrate	mg/L	NO3MGL										
Nitrate- Nitrogen NO3- N	mg/L	XXXXN1	P16	P25	P26	P23			P10			P19
Nitrate and Nitrite N	mg/L	XXXXN2					P15	P20				
Nitrite- Nitrogen	mg/L	NO2NMGL	P17	P26	P27	P24			P11			P20
Total Nitrogen N	mg/L	TOTNMGL						P34				
Dissolved Phosphorus	mg/L	PDISSMGL	P11	P16	P18		P8	P11				P13
Phosphate PO4	mg/L	PO4MGL	P23		P35	P27						
Phosphorus P	ppm	XXXXP1	P24									
Ortho-Phosphorus	mg/L	OPMGL		P27					P13			P21
Total Organic Phosphorus	mg/L	TOPMGL				P37						
Total Organic Carbon	mg/L	TOCMGL					P24					P33
Dissolved Organic Carbon	mg/L	DOCMGL					P6					P12
Organic Phosphorus	mg/L	OrPO4										
Ortho-Phosphate	mg/L	ORTHPO4										
Total Dissolved Phosphorus	mg/L	XXXXP2				P35	P23		P15			

NAME	UNIT	TITLE	Weldwood	Daishowa	Weyerhaeuser	Slave Lake	ANC	Millar Western	Fiberco	Finlay	Fletcher Challenge	ALPAC
Total Phosphorus P	mg/L	XXXXP3	P31	P39	P42	P38	P25	P35	P14			P34
pH												
pH	units	PH	P19		P31	P25		P21	P7	P4	P4	
pH Max	units	PHMAX	P21	P28	P32		P16					P22
pH Min	units	PHMIN	P20	P29	P33		P17					P23
PHENOLS (principal source files)												
Chlorinated Phenols	mg/L	CLPHENMGL	P7	P9	P11							P6
Phenols	mg/L	PHENMGL	P22	P30	P34	P26	P18	P22	P16			P24
RFAs (from principal source files)												
Resin Acids	mg/L	XXXXR1	P26	P33								
Resin and Fatty Acids	mg/L	XXXXR2				P29	P20			P16	P11	P27
Total Resin Acids	mg/L	XXXXR3			P43			P36	P5			
MISCELLANEOUS												
Arsenic As	mg/L	ASMGL				P3		P2				
Colour	kg/day	COLOURKGD	P9	P13	P15	P10	P3	P7				P9
True Colour	mg/L	COLOURMGL	P33		P45	P40	P27		P8	P11	P6	P36
Conductivity	mS/cm	CONDMSCM						P8				
Selenium Se	mg/L	SELENMGL						P24				
Silicate	mg/L	XXXXS1						P26				
Silicon	mg/L	XXXXS2				P30						
Sulphate SO4	mg/L	SO4MGL				P33	P22	P29				
Sulphide	mg/L	SULPHMGL	P27	P35	P38							P28
Temperature	deg C	TEMPDEGC	P28		P39			P30	P1	P5	P10	P29
Oil and Grease	mg/L	O&GMGL	P18									
2,4 D	mg/L	24D			P1							
Threshold Odour Nb TON	Units	ODOURNUM	P29	P37	P40	P34		P31				P30

NAME	UNIT	TITLE	Weldwood	Daishowa	Weyerhaeuser	Slave Lake	ANC	Millar Western	Fiberco	Finlay	Fletcher Challenge	ALPAC
Chlorate	mg/L	CLO2MGL	P6	P8	P10							P5
Chlorite	mg/L	CLOMGL	P8	P10	P12							P7
SOLIDS												
Settleable Solids	mg/L	STSSMGL						P25				
Total Dissolved Solids	mg/L	TDSMGL	P37		P41					P2		
Total Dissolved Solids TDS	kg/day	TDSKGD	P38					P32		P3		
Total Suspended Solids TSS	kg/day	TSSKGD	P32	P40	P44	P39	P26	P37				P35
Total Suspended Solids	mg/L	TSSMGL	P35		P52				P2		P7	
Total Volitol Suspended Solids	mg/L	VSSMGL							P3		P8	
Total Suspended Solids Volume	kg/day	VSSKGD						P38				
METALS												
Aluminum Al	mg/L	ALUMMGL		P1		P1						
Antimony Sb	mg/L	ANTIMGL										
Beryllium Be	mg/L	BERYMGL		P4		P4						
Cadmium Cd	mg/L	CADMIUMGL		P7	P8	P6		P4				
Chromium Cr	mg/L	CHROMMGL		P11	P13	P8		P5				
Cobalt Co	mg/L	COBALTMGL		P12	P14	P9		P6				
Copper Cu	mg/L	COPPERMGL		P14	P16	P11		P9				
Iron Fe	mg/L	IRONMGL				P17		P14				
Lead Pb	mg/L	LEADMGL		P20	P22	P18		P15				
Manganese Mg	mg/L	MANGANMGL		P21	P23	P19		P16				
Magnesium Mg	mg/L	MAGNESMGL										
Mercury Hg	mg/L	MERCURMGL		P22		P20		P17				
Molybdenum Mo	mg/L	MOLYBMGL		P23	P24	P21		P18				
Nickel Ni	mg/L	NICKELMGL		P24	P25	P22		P19				
Silver Ag	mg/L	SILVERMGL		P34	P37	P31		P27				
Sodium Na	mg/L	SODIUMMGL				P32	P21	P28				
Thallium Tl	mg/L	THALLIMGL		P36								

NAME	UNIT	TITLE	Weldwood	Daishowa	Weyerhaeuser	Slave Lake	ANC	Millar Western	Fiberco	Finlay	Fletcher Challenge	ALPAC
Titanium Ti	mg/L	TITMGL										
Vanadium V	mg/L	VANADMGL		P41	P46	P41		P39				
Uranium U	mg/L	URMGL										
Zinc Zn	mg/L	ZINCMGL		P42	P47	P42		P40				

TABLE 5
Effluent Parameters Stored in Auxilliry Data File

NAME	UNIT	TITLE
METALS		
Alumimun Al	mg/L	ALUMMGL
Antimony Sb	mg/L	ATMGL
Barium Ba	mg/L	BARIUMGL
Beryllium Be	mg/L	BERYMGL
Cadmium Cd	mg/L	CADMIUMGL
Chromium Cr	mg/L	CHROMMGL
Copper Cu	mg/L	COPPERMGL
Iron Fe	mg/L	IRONMGL
Lead Pb	mg/L	LEADMGL
Lithium Li	mg/L	LITHIUMGL
Manganese Mn	mg/L	MANGANMGL
Magnesium Mg	mg/L	MAGNEMGL
Mercury Hg	mg/L	MERCURMGL
Molybdenum Mo	mg/L	MOLYBMGL
Nickel Ni	mg/L	NICKELMGL
Silver Ag	mg/L	SILVERMGL
Sodium Na	mg/L	SODIUMMGL
Thallium Tl	mg/L	THALLIUMMGL
Titanium Ti	mg/L	TITANMGL
Vanadium V	mg/L	VANADMGL
Uranium U	mg/L	URANIUMGL
Zinc Zn	mg/L	ZINCMGL
RESIN ACIDS (from auxiliary files)		
Abietic Acid	mg/L	rAbietic
Dehydroabietic Acid	mg/L	rDeHydAb
Isopimaric Acid	mg/L	rIsopimar
Levopimaric Acid	mg/L	rLevopim
Neoabietic Acid	mg/L	rNeoAb
Pimaric Acid	mg/L	rPimaric
Palustric Acid	mg/L	rPalust
Sandaracopimaric Acid	mg/L	rSandaPim
12-Chlorodehydroabietic Acid	mg/L	r12CDHyAb
14-Chlorodehydroabietic Acid	mg/L	r14CDHyAb
12,14-Dichlorodehydroabietic Acid	mg/L	r1214CDHA
FATTY ACIDS (from auxiliary files)		
Arachidic Acid	mg/L	fArachdic
Myristic Acid	mg/L	fMyristic
Palmitic Acid	mg/l	fPalmitic

NAME	UNIT	TITLE
Linolenic Acid	mg/L	fLinlenic
Linoleic Acid	m g/L	fLinleic
Oleic Acid	mg/L	fOleic
Stearic Acid	mg/L	fStearic
9,10-Dichlorostearic Acid	mg/L	f910ClStr
DIOXINS AND FURANS		
2,3,7,8-tetrachlorodibenzo-p-dioxin	pg/L	d2378TCDD
Total tetrachlorodibenzo-p-dioxin	pg/L	dTotTCDD
Total pentachlorodibenzo-p-dioxin	pg/L	dTotPnCDD
Total hexachlorodibenzo-p-dioxin	pg/L	dTotHxCDD
Total heptachlorodibenzo-p-dioxin	pg/L	dTotHpCDD
Octachlorodibenzo-p-dioxin	pg/L	dOctaCDD
2,3,7,8-tetrachlorodibenzofuran	pg/L	d2378TCDF
Total tetrachlorodibenzofuran	pg/L	dTotTCDF
Total pentachlorodibenzofuran	pg/L	dTotPnCDF
Total hexachlorodibenzofuran	pg/L	dTotHxCDF
Total heptachlorodibenzofuran	pg/L	dTotHpCDF
Octachlorodibenzofuran	pg/L	dOctaCDF
1,2,3,4,6,7,8-heptachlorodibenzo-p-doxin	pg/L	D1234678D
1,2,3,4,6,7,8-heptachlorodibenzofuran	pg/L	F1234678F
1,2,3,4,7,8,9-heptachlorodibenzofuran	pg/L	F1234789F
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	pg/L	D123478D
1,2,3,4,7,8-hexachlorodibenzofuran	pg/L	F123478F
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	pg/L	D123678D
1,2,3,6,7,8-hexachlorodibenzofuran	pg/L	F123678F
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	pg/L	D123789D
1,2,3,7,8,9-hexachlorodibenzofuran	pg/L	F123789F
1,2,3,7,8-pentachlorodibenzo-p-dioxin	pg/L	D12378D
1,2,3,7,8-pentachlorodibenzofuran	pg/L	F12378F
2,3,4,6,7,8-hexachlorodibenzofuran	pg/L	F234678F
2,3,4,7,8-pentachlorodibenzo-p-dioxin	pg/L	D23478D
2,3,4,7,8-pentachlorodibenzofuran	pg/L	F23478F
Dioxins	pg/L	dDion
Furans	pg/L	pFuran
CHLORINATED PHENOLICS, POLYNUCLEAR AROMATIC HYDROCARBONS, AND OTHERS		
2-Chlorophenol	ug/L	p2ClPhen
2,4-Dichlorophenol	ug/L	p24ClPhen
2,4,6-Trichlorophenol	ug/L	p246CPhen
2,3,4,6-Tetrachlorophenol	ug/L	p2346CPhe
Pentachlorophenol	ug/l	pPenCPhen

NAME	UNIT	TITLE
4-Chlorocatechol	ug/L	p4ClCat
3,4-Dichlorocatechol	ug/L	p34ClCat
3,5-Dichlorocatechol	ug/L	p35ClCat
4,5-Dichlorocatechol	ug/L	p45ClCat
3,4,5-Trichlorocatechol	ug/L	p345ClCat
3,4,6-Trichlorocatechol	ug/L	p346ClCat
Tetrachlorocatechol	ug/L	pTetClCat
4-Chloroguaiacol	ug/L	p4ClGua
3,4-Dichloroguaiacol	ug/L	p34ClGua
4,5-Dichloroguaiacol	ug/L	p45ClGua
4,6-Dichloroguaiacol	ug/L	p46ClGua
3,4,5-Trichloroguaiacol	ug/L	p345ClGua
3,4,6-Trichloroguaiacol	ug/L	p346ClGua
4,5,6-Trichloroguaiacol	ug/L	p456ClGua
Tetrachloroguaiacol	ug/L	pTetClGua
4,5-Dichloroveratrole	ug/L	p45ClVer
3,4,5-Trichloroveratrole	ug/L	p345ClVer
Tetrachloroveratrole	ug/L	pTetClVer
4,5,6-Trichlorosyringol	ug/L	p456ClSyr
6-Chlorovanillin	ug/L	p6ClVan
5,6-Dichlorovanillin	ug/L	p56ClVan
4,5,6-Trichlorotrimethoxybenzene	ug/L	p456CMeOB
Chloroform	ug/L	pChlform
1,1-Dichloroethane	ug/L	p11ClEth
1,2-Dichloroethane	ug/L	p12ClEth
1,1,1-Trichloroethane	ug/L	p111ClEth
1,1,2,-Trichloroethane	ug/L	p112ClEth
1,1,2,2-Tetrachloroethane	ug/L	p1122ClEth
1,1-Dichloroethylene	ug/L	p11ClEthy
1,2-Dichlorobenzene	ug/L	p12ClBenz
1,3-Dichlorobenzene	ug/L	p13ClBenz
1,4-Dichlorobenzene	ug/L	p14ClBenz
1,2,3-Trichlorobenzene	ug/L	p123ClBenz
1,2,4-Trichlorobenzene	ug/L	p124ClBenz
1,2,4,5-Tetrachlorobenzene	ug/L	p1245ClBenz
1,2-Dichloropropane	ug/L	p12ClProp
1,2-Diphenylhydrazine	ug/L	p12PhyHyd
1,3,5-Trinitrobenzene	ug/L	p135NitBen
1,4-Dichloro-2-butene	ug/L	p14Cl2But
1,4-difluorobenzene	ug/L	p14FlBenz
1,4-Naphthoquinone	ug/L	p14NapQu
1-Methyl-2 (1-methylethyl) benzene	ug/L	p1MetBenz
1-Naphthylamine	ug/L	p1NapAm

NAME	UNIT	TITLE
2-Naphthylamine	ug/L	p2NapAm
2,2,3-Trimethylhexane	ug/L	p223MetHex
2,6-Dichlorophenol	ug/L	p26ClPhen
2,4,5-Trichlorophenol	ug/L	p245ClPhen
2,4,6-Trichlorophenol	ug/L	p246ClPhen
2,4,5,6-Tetrachlorophenol	ug/L	p2456ClPhen
2,4-Dimethylphenol	ug/L	p14MetPhen
2-Nitrophenol	ug/L	p2NitPhen
2,4-Dinitrophenol	ug/L	p24NitPhen
2,4-Dinitrotoluene	ug/L	p24NitTol
2,4-Nitrotoluene	ug/L	p24NitTol
2,6-Dinitrotoluene	ug/L	p26NitTol
2-Chlorosyringaldeyde	ug/L	p2ClSyrAld
2,6-Dichlorosyringaldeyde	ug/L	p26ClSyrAld
2-Acetylaminofluorene	ug/L	p2AceAmiFl
2-Butanone	ug/L	p2Butan
2-Butanone (MEK)	ug/L	p2ButMek
2-Chloroethoxyethylene	ug/L	p2ClEtEthy
2-Chloroethyl vinyl ether	ug/L	p2ClEtVEtr
2-Chloronaphthalene	ug/L	p2ClNap
2-Hexanone	ug/L	p2Hxan
2-Methyl-6-dinitrophenol	ug/L	p2Mt6NtPh
2-Methylnaphthalene	ug/L	p2MtNap
2_methylphenol	ug/L	p2MtPhen
3-Methylphenol	ug/L	p3MtPhen
2-Nitroaniline	ug/L	p2NitAnl
3-Nitroaniline	ug/L	p3NitAnl
2-Pentylfuran	ug/L	p2PenFur
2-Picoline	ug/L	p2Picol
3,3'-Dichlorobenzidine	ug/L	p33ClBenzi
3,3'-dimethylphenethylamine	ug/L	p33MtPhAm
3-Methylcholanthrene	ug/L	p3MtChlAnt
3-Phenol-2-propenoic acid	ug/L	p3Ph2ProA
4,6-Dinitro-2-Methylphenol	ug/L	p46Nit2MtPh
4,6-Dinitro-o-cresol	ug/L	p26NitCres
4-(1-methylethyl benzoic acid)	ug/L	p4MtNBenzocA
4-Aminobiphenyl	ug/L	p4AminPhen
4-Bromo-phenyl phenyl ether	ug/L	p4BroPhPhEth
4-Bromoflurobenzene	ug/L	p4BroFlBenz
4-Bromophenylphenyl ether	ug/L	p4BroPhPhEth
4-Chloro-3-methylphenol	ug/L	p4Cl3MtPh
4-Chloroaniline	ug/L	p4ClAnl
4-Chlorophenol	ug/l	p4ClPhen

NAME	UNIT	TITLE
4-Chlorophenylphenylether	ug/L	p4ClPhPhEth
4-Ethyl phenol	ug/L	p4EthPhen
4-Hydroxy-3-methoxy-benzaldehyde	ug/L	p4Hyd3MBenz
4-Isopropylbenzoic acid	ug/L	p4PropBenzA
4-Methyl-2-pentanone	ug/L	p4Met2Pent
4-Methyl-2-pentanone (MIBK)	ug/l	p4Mt2PentMi
4-Methylphenol	ug/L	p4MetPhen
4-Nitroaniline	ug/L	p4NitAnl
4-Nitrophenol	ug/L	p4NitPhen
4-nitroquinoline-1-oxide	ug/L	p4NitQuin1Ox
5,6-Dichlorovanillin	ug/L	p56ClVan
5-Chlorovanillin	ug/L	p5ClVan
5-Nitro-o-toluidine	ug/L	p5NitTolu
5-Nonen-2-one	ug/L	p5Non2On
6-Chlorovanillin	ug/L	p6ClVan
7,12-Dimethyl benz(a) anthracene	ug/L	p712MtBenAnt
9,12-Octadecadienoic acid	mg/L	r912Odec
9,5-Dichlorostearic acid C18	mg/L	r95ClSta
9,10-Dichlorodehydroabietic acid	mg/L	r910ClHyAb
a,a-Dimethylphenethylamine	ug/L	paaMtPhAm
Acenaphthylene	ug/L	pAcen
Acetone	ug/L	pAcet
Acetophenone	ug/L	pAcetph
Acrolein	ug/L	pAcro
Acrylonitrile	ug/L	pAcry
alpha-4-Trimethyl-3-cyclohexene-1-methane	ug/L	pCyclhexMet
alpha-Pinene and Isomers	ug/L	pPinene
Anthracene	ug/L	pAnth
Behenic acid	mg/L	pBeh
Benzaldehyde	ug/L	pBenzAld
Benzene	ug/L	pBenz
Benzeneacetic acid	mg/L	pBenzAcet
Benzenepropanoic acid	ug/L	pBenzProp
Benzidine	ug/L	pBenzid
Benzo(a)anthracene	ug/L	pBenzoAnt
Benzo(a)anthracene/chrysene	ug/L	pBenzoAntChr
Benzo(a)pyrene	ug/L	pBenzPyr
Benzo(b)fluoranthene	ug/L	pBenzFl
Benzo(ghi)perylene	ug/L	pBenzPery
Benzo(k)fluoranthene	ug/L	pBenzFlAnt
Benzoic acid	ug/L	pBenzoAc
Benzyl alcohol	ug/L	pBenzAch
Bis(2-chloroethoxy)methane	ug/l	pClEthMth

NAME	UNIT	TITLE
Bis(2-chloroethyl)ether	ug/L	pClEthEthr
Bis(2-chloroisopropyl)ether	ug/L	pClPropEth
Bis(2-ethylhexyl)phthalate	ug/L	pEthyPhth
Boron B	mg/L	BORONMGL
Bromochloromethane	ug/L	pBrClMth
Bromodichloromethane	ug/L	pBr2ClMth
Bromoform	ug/L	pBform
Bromomethane	ug/L	pBrMeth
Butanoic acid	ug/L	pButac
Butylbenzylphthalate	ug/L	pButBenzPhth
Calcium Ca	mg/L	CALCIUMGL
Camphor	ug/L	pCamph
Camphor (2 isomers)	ug/L	pCamph2
Carbon disulfide	ug/L	C2S
Carbontetrachloride	ug/L	pCTC
Chlorobenzene	ug/L	pClBenz
Chlorodehydroabietic acid	mg/L	pClDHyAba
Chlorodibromomethane	ug/L	pCl2BrMth
Chloroethane	ug/L	pClEth
Chloromethane	ug/L	pClMeth
Chrysene	ug/L	pChry
cis-1,3-Dichloropropene	ug/L	p13ClPrope
cis-1,3-Dichloropropylene	ug/L	p13ClPropy
Cyanide	mg/L	CYANMGL
Decanoic acid C10	mg/L	rDecan10
Decanoic acid C13	mg/L	rDecan13
Decanoic acid C200	mg/L	rDecan200
Di-n-butylphthalate	ug/L	pButPhth
Di-n-octylphthalate	ug/L	pOctPhth
Dibenzo(ah)anthracene	ug/L	pBenzAnth
Dibromochloromethane	ug/L	pBrClMth
Dibutylphthalate	ug/L	pButPhth
Dichlorobromomethane	ug/L	pClBrMth
Dichlorodehydroabietic acid	mg/L	rClDehyAb
dichlordifluoromethane	ug/L	pClFlMth
Diethylphthalate	ug/L	pEthPhth
Dimethyldisulfide	ug/L	pMthSul
Dimethylphthalate	ug/L	pMthPhth
Dimethyltrisulfide	ug/L	pMthTrSul
Dinoseb (DNBP)	ug/L	pDnbp
Diphenylamine	ug/L	pPhenAm
Docosanoic acid C22	mg/L	rDocos22
Dodecanoic acid C12	mg/L	rDodec12

NAME	UNIT	TITLE
Eicosanoic acid C20	mg/L	rEicos20
Eicosanoic acid C22	mg/L	rEicos22
Ethanol	ug/L	pEthol
Ethyl methacrylate	ug/L	pEthMthArc
Ethyl Methanesulfonate	ug/L	pEthMthSfn
Ethylbenzene	ug/L	pEthBenz
Fish Bioassay	ug/L	LC50 TROUT
Fluoranthene	ug/L	pFlAnt
Fluorene	ug/L	pFlor
Heptadecenoic acid	mg /L	pHpDecen
Hexachlorobenzene	ug/L	pHxClBenz
Hexachlorobutadiene	ug/L	pHxClButad
Hexachlorocyclopentadiene	ug/L	pHxClCPent
Hexachloroethane	ug/L	pHxClEth
Hexachlorophene	ug/L	pHsclPhen
Hexachloropropene	ug/L	pHxclPrope
Hexadecanoic acid	mg/L	pHxDecen
Hexadecanoic acid C16	mg/L	pHxDecen16
Hexanal	ug/L	pHxal
Indeno(1,2,3-c,d)pyrene	ug/L	pIndoPyr
Iodomethane	ug/L	piodoMth
Isophorone	ug/L	pIsoph
Isosafrole	ug/L	pIsoSaf
Lauric acid	mg/L	rLaur
Lignoceric acid	mg/L	rLigno
Linoleic acid C18:2	mg/L	fLinleic18
Linolenic acid C18:3	mg/L	fLinlenic18
Iodomethane	ug/L	plodoMth
m,p-Xylene	ug/L	pMPXyl
m-dinitrobenzene	ug/L	pMNitBenz
m-Xylene	ug/L	pMXyl
Methyl methanesulfonate	ug/L	pMthMthnSul
Methyl pentane	ug/L	pMthPent
Methylbenzene methanol	ug/L	pMthBenzMal
Methylene chloride	ug/L	pMthCl
Methylene cyclohexane	ug/L	pMthCyclHex
Monoterpenoids	ug/L	pMTerp
N-nitrosodi-n-butylamine	ug/L	pNtBytAm
N-nitrosodi-n-propylamine	ug/L	pNtPropAm
N-nitrosodiethylamine	ug/L	pNtEthAm
N-nitrosodimethylamine	ug/L	pNtMthAm
N-nitrosodimethylethylamine	ug/L	pNtMthEthAm
N-nitrosodiphenylamine	ug/l	pNtPhenAm

NAME	UNIT	TITLE
N-nitrosomorpholine	ug/L	pNtMorph
N-nitrosopipendine	ug/L	pNtPipen
N-nitrosopyrrolidine	ug/L	pNtPyrl
Naphthalene	ug/L	pNaphth
Nitrobenzene	ug/L	pNitBenz
o-Toluidine	ug/L	pOtolu
o-Xylene	ug/L	pOxyl
Octadecanoic acid C18	mg/L	rOctDecen
Oil and Grease	mg/L	OilGre
Oxybenzene	ug/L	pOxBenz
p-(dimethylamino) azobenzene	ug/L	pAmBenz
p-Chloro-m-cresol	ug/L	pClCres
p-Cumene	ug/L	pCum
p-Cymen-8-ol	ug/L	pCym8
p-Phenylenediamine	ug/L	pPhelAm
p-Xylene	ug/L	pPXyl
Palustric/levopimaric acid	mg/L	rPalustLev
Penanthrene	ug/L	pPenan
Pentachlorobenzene	ug/L	pPCB
Pentachloroethane	ug/L	pPCE
Pentachloronitrobenzene	ug/L	pPCNitBenz
Pentachlorophenol	ug/L	pPCPhen
Pentanoic acid	ug/L	rPentan
Perylene	ug/L	pPyrl
Phenacetin	ug/L	pPhenac
Phenanthracene	ug/L	pPhanc
Phenanthrene	ug/L	pPhant
Pyrene	ug/L	pPyr
Pyridine	ug/L	pPyrid
Safrol	ug/L	pSaf
Styrene	ug/L	pStyr
Sulphite	mg/L	Sulf
Terpenoids	ug/L	pTerpen
Tetrachloroethene	ug/L	pTClEth
Tetrachloroethylene	ug/L	pTClEthy
Tetradecanoic acid C14	mg/L	rTDecen14
Toluene	ug/L	pTolu
Total acids	mg/L	rTotal
Total phenol	mg/L	pTotPhen
Total resin and fatty acids	mg/L	rTotR&F
Total cold vapo	mg/L	tCV
Toluene	ug/L	pTolu
trans-1,2-Dichloroethylene	ug/l	p12tClEthy

NAME	UNIT	TITLE
trans-1,3-Dichloropropylene	ug/L	p13tClProp
Trichloroethene	ug/L	pTrClEth
Trichloroethylene	ug/L	pTrClEthy
Trichlorofluoromethane	ug/L	pTrClFlMth
Trichlorotrimethoxybenzene	ug/L	pTClTMthoBenz
Tridecanoic acid	mg/L	rTrDecen
Trimethyl dimethylethyl ethylbenzene met	ug/L	pTDEM
Undecanoic acid C11	mg/L	rUnDecen11
Unidentified cyclic alcohols	ug/L	uCA
Unidentified cyclic ketones	ug/L	uCK
Unidentified fatty acids	mg/L	uFA
Unidentified methoxybenzenes MW204	ug/L	uMB204
Unidentified methoxybenzenes MW218	ug/L	uMB218
Unidentified sterols	ug/L	uS
Unidentified terpenoids	ug/L	uT
Unidentified phenols, MW 192,216,256	ug/L	uPh
Vanillin	mg/L	pVan
Vinyl acetate	ug/L	pVnAcet
Vinyl chloride	ug/L	pVCl
Xylenes	ug/l	pXyl

APPENDIX A

TERMS OF REFERENCE

This document was originally provided to satisfy part "2. Data Compilation", of the Terms of Reference for project 2111-A1. The document as well as the database were updated under project 2111-C1.

NORTHERN RIVER BASINS STUDY

SCHEDULE OF TERMS OF REFERENCE

PROJECT 2111-A1: EFFLUENT CHARACTERIZATION, PULP MILL DATA REVIEW

1. LITERATURE REVIEW

Objective

The general objective is to prepare a concise overview of generic CTMP and Kraft pulp mill effluent quality which will serve as a reference document for the Northern River Basins Study.

Requirements

1. Consider recent significant reviews of pulp mill effluent quality, particularly those of McLeay; Bonsor, Sprague, McCubbin; Procter and Gamble; PAPRICAN/Voss et al.; Kringstad, McKague.

2. Review pertinent scientific papers and ongoing research that provide relevant information more recent than the above reviews.

3. Prepare a concise overview of CTMP and kraft pulp mill effluent quality, based on the above, which organizes the information around pertinent subjects including (but not necessarily limited to):

   - effluent constituents/parameters
   - type of mill, production level, $CL0_2$ substitution level, wood furnish, etc.
   - volume of effluent
   - effluent treatment characteristics, including type of process, hydraulic retention time, etc.

4. Submit a draft report by April 30, 1992. Prepare a final report incorporating review comments three weeks after receipt of the reviewed draft report. Supply ten (10) copies and the camera ready original of the final report.

2. DATA COMPILATION

Objective

The general objective is to compile recent, pertinent data held by Alberta Environment, Environment Canada, and Fisheries and Oceans Canada on the quality and quantity of pulp mill effluents in the Peace and Athabasca River Basins.

Requirements

1. Assemble pulp mill effluent data, whether electronic or hard copy, held by Alberta Environment and Environment Canada. Focus on data obtained since mill start-up, expansion, or upgrade (about 1990 for most mills).

2. Enter all data for a selected pulp mill in Lotus 1-2-3 format, and prepare tables, graphs and statistics of the data. Review this output with the Project Manager.

3. Modify the data system as agreed with the Project Manager. Enter all remaining data for pulp mills and prepare appropriate tables, graphs and statistics.

4. Assess the data and provide a brief interpretation of any key points and findings.

5. Prepare a concise technical report on the data system including a guide for users, dictionary, and any other pertinent specifications of the electronic data submission. Submit this report plus compiled data, tables, graphs and statistics and interpretations in draft form by May 30, 1992. Prepare a final report incorporating review comments three weeks after receipt of the reviewed draft report. Supply ten (10) copies and the camera-ready original of the final report.

3. QUALITY ASSURANCE

Objective

The Contractor will prepare a document or guide containing all of the information and procedures for sampling, analysing and reporting to ensure consistent, reliable data on effluent quality is generated by industry.

Requirements

Prepare a procedures manual for pulp mill effluent sampling, analysis and reporting, which includes (at a minimum):

1. Layouts for each mill clearly identifying the sampling locations specific to each parameter to be sampled (plant-size layout information is obtainable from Alberta Environment).

2. Listing of each parameter to be sampled, the location to sample, the type of sample (grab or composite), sample volume, preservation techniques, sample transport, maximum storage time, labelling and any other information. This should be broken down on a mill specific basis - reflecting the different parameter requirements of each mill.

3. Example chain of custody form and checklist to be used for those samples (chlorinated phenolics, dioxins, etc.) where it would be deemed necessary.

4. Appendices clearly outlining and containing the lab methods and protocol to be used for each parameter and any specific conditions to ensure consistent results.

5. The type of data reporting format and data checking/verifying to be performed on all data.

6. The type of lab QA/QC information which should accompany each data report.

7. The protocol that should be followed for those samples or analysis that fail QA/QC specifications.

8. The protocol that should be used for split sampling between industry and government.

9. The procedures to follow up and resolve inconsistent split sample results.

Submit a draft report by April 30, 1992. Prepare a final report incorporating review comments three weeks after receipt of the reviewed draft report. Supply ten (10) copies and the camera-ready original of the final report.

The Department will attempt to obtain and provide access to information requested and/or required by the Contractor which is, or will be, held by Alberta Environment, Environment Canada and the Northwest Territories.

NORTHERN RIVER BASINS STUDY

TERMS OF REFERENCE

Project 2111-C1: Pulp Mill Effluents Database Upgrade

I. Introduction

In 1991, the Northern River Basins Study contracted N. McCubbin Consultants Inc. to develop a comprehensive database pertaining to effluent discharges for pulp mills located in the Peace and Athabasca river basins of Alberta and British Columbia (McCubbin 1993). This database includes over 100 parameters routinely reported to Alberta Environmental Protection by the Alberta pulp mills under provincial regulatory requirements. It includes information from 1990 and 1991. Less extensive information is presented for the three pulp mills located in the Peace River basin of British Columbia.

The purpose of this project is fourfold:

1) to update the database to the present date, including information for the Alpac mill;
2) to backdate the database to include all data for the mills from before 1990;
3) to increase the extent of data in the database pertaining to British Columbia mills; and
4) to verify the accuracy of the existing data in the McCubbin database.

II. Requirements

The contractor will perform the following tasks:

1) Update the McCubbin database to include effluent data for the pulp mills in the Peace and Athabasca river basins of Alberta, including Alpac, from 1991 to the present. Most of the effluent parameters that are monitored on a weekly or more frequent basis are contained in the Industrial Water Quality Database, developed by Standards and Approvals Division, Alberta Environmental Protection, Edmonton (contact Ian MacKenzie) (McCubbin 1993: Tables 3 & 4). This data can be transferred electronically into the McCubbin database. However, the contractor will be expected to implement Quality Assurance/Quality Control measures to ensure the accuracy of the electronic data being transferred to the McCubbin database. The contractor will be expected to work out of either the office of Alberta Environmental Protection or the Northern River Basins Study to perform this task.

The remaining parameters for the Alberta mills are reported only twice a year (McCubbin 1993: Tables 4 & 6) and are contained in hardcopy form at the offices of Standards and Approvals Division, Alberta Environmental Protection, Edmonton. The contractor will be expected to work out of the Edmonton office of Alberta Environmental Protection while entering this data. The contractor is also expected to develop and implement Quality Assurance/Quality Control measures to ensure the accuracy of data entered from hardcopy sources into the database.

2) Enter all available effluent data for the Alberta mills from before 1990. Most of the effluent parameters that are monitored on a weekly or more frequent basis are contained in the Industrial Water Quality Database, Standards and Approvals Division, Alberta Environmental Protection, Edmonton back to 1988. This data can be transferred electronically into the McCubbin database. However, the contractor will be expected to implement Quality Assurance/Quality Control measures to ensure the accuracy of the electronic data being transferred to the McCubbin database. The contractor will be expected to work out of either the office of Alberta Environmental Protection or the Northern River Basins Study to perform this task.

Parameters not included in the Industrial Water Quality Database and from before 1988 exist only as hardcopy records. The contractor will be expected to work out of the Edmonton office of Alberta Environmental Protection while entering this data. The contractor is also expected to develop and implement Quality Assurance/Quality Control measures to ensure the accuracy of data entered from hardcopy sources into the database. The contractor should note that data for the Weldwood mill at Hinton exists back to 1957, however, comprehensive records only exist back to the 1970s. Data for the Procter and Gamble (now Weyerhaeuser Canada) mill near Grande Prairie dates back to 1973. All other Alberta pulp mills began operations after 1987.

3) Enter all available historic effluent data reported to provincial and federal regulatory authorities for the three pulp mills located in the Peace River basin of British Columbia. In recent history this has included the regular reporting of up to 44 parameters. Data reported to provincial regulatory authorities is believed to exist only in hardcopy form. The contractor will be expected to obtain this information from the British Columbia Ministry of Environment for entry into the database. Specific information regarding the extent of information can be obtained from Steve Hunsberger ([604] 565-6451), B. C. Ministry of Environment, Prince George for the Fiberco mill and from Del Reinheimer ([604] 565-6447), B. C. Ministry of Environment, Prince George, for the Fletcher Challenge and Finlay Forest Products mills at MacKenzie. The contractor should be aware that application may have to be made under British Columbia freedom of information legislation to obtain this data (contact Kim St. Peter ([604] 565-4138, B. C. Ministry of Environment, Prince George). The contractor is

expected to develop and implement Quality Assurance/Quality Control measures to ensure the accuracy of data entered from hardcopy sources into the database.

The contractor will also enter all data reported to federal regulatory authorities by the B. C. mills since December 1992. This data exists only in hardcopy form. The hardcopy records will be supplied to the contractor by the Northern River Basins Study. The contractor is expected to develop and implement Quality Assurance/Quality Control measures to ensure the accuracy of data entered from hardcopy sources into the database.

4) Develop and implement Quality Assurance/Quality Control measures for ensuring the accuracy of the existing data in the McCubbin database. In verifying the values in the McCubbin database indicate the frequency of errors found in both the principal and auxiliary files. The contractor should be aware that errors have already been detected in the McCubbin database by researchers affiliated with the NRBS. Some of these errors have been corrected in Standard and Approval's Industrial Water Quality Database, but as of yet have not been corrected in the McCubbin database. Ian MacKenzie should be contacted to identify the corrections that have been made to the Industrial Water Quality Database and which need to be made to the existing data in the McCubbin database.

5) Based on the changes made in 1-4, above, make appropriate changes to the NORTHDAT manual. This is to include a section outlining the quality control/quality assurance measures imposed on the data in the database.

6) For the purposes of this project all data reported in hardcopy form to regulatory authorities by the pulp mills is assumed to be correct.

7) The consultant is required to supply computers and any other equipment required to complete this project.

III. Reporting Requirements

Various tasks related to this contract are to be completed as outlined in Schedule A.

Draft copies of the database upgrade and updated users manual are to be submitted to the component coordinator by March 31st, 1994. Three weeks after the receipt of review comments on the database and database manual, the contractor is to supply the following to the component coordinator:

1) two unbound, camera-ready copies of the final database manual;
2) ten cerlox bound copies of the final database manual;
3) an electronic copy of the final database manual (Word Perfect 5.1 format);

4) an electronic copy of the final upgraded version of the McCubbin database.

The form and style of the database manual should conform to the specifications identified in the NRBS Style Manual.

IV. Contract Administration

This contract is being carried out under the Contaminants Component of the Northern River Basins Study. The Scientific Authority on this project is:

Ian MacKenzie
Standards and Approvals Division
Alberta Environmental Protection
4th Floor, Oxbridge Place
9820 - 106th Street
Edmonton, Alberta T5K 2J6
phone: (403) 427-5888 fax: (403) 422-4192

Questions of a technical nature should be directed towards him.

The component coordinator on this project is:

Greg Wagner
Northern River Basins Study
690 Standard Life Centre
10405 Jasper Avenue
Edmonton, Alberta T5J 3N4
phone: (403) 427-1742 fax: (403) 422-3055

Questions of an administrative nature should be directed towards him.

V. Literature Cited

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

NORTHERN RIVER BASINS STUDY

SCHEDULE A
DUE DATES FOR DELIVERABLES

Project 2111-C1: Pulp Mill Effluents Database Upgrade

The contractor is to provide the component coordinator with documentation that the following tasks have been completed by the following dates:

1) The McCubbin database is to be updated with information from 1990 to December 1993 for all Alberta Mills, including Alpac, by March 14, 1994. This is to include verification that appropriate Quality Assurance/Quality Control methods have been imposed to ensure the accuracy of data entered into the McCubbin database.

2) Data from before 1990 is to be entered into the McCubbin database for all Alberta Mills by March 23, 1994. This is to include verification that appropriate Quality Assurance/Quality Control methods have been imposed to ensure the accuracy of data entered into the McCubbin database.

3) Data for the B. C. mills is to be entered into the McCubbin database by March 28, 1994. This is to include verification that appropriate Quality Assurance/Quality Control methods have been imposed to ensure the accuracy of data entered into the McCubbin database.

4) The accuracy of existing data in the McCubbin data is to be verified with appropriate Quality Assurance/Quality Control measures by March 29, 1994.

5) The database manual for the McCubbin database is to be updated by March 31, 1994.

APPENDIX B

INSTALLATION PROCEDURE

NORTHDAT is provided on the disk bound with this Appendix.

The disk contains four files, using 1,178,094 bytes.

1. DISCLAIM.TXT; being 747 bytes in size.
2. INSTALL.BAT; being 96 bytes in size.
3. PKUNZIP.EXE; being 29,378 bytes in size.
4. NORTHDAT.ZIP; being 1,147,875 bytes in size.

To install the database copy the four files on this disk to a director on your hard drive, which you have made for this purpose, and type install. The result will be 35 files totalling 17,280,521 bytes.

There is no warranty expressed or implied for the use of this data or the programs; the Northern River Basins Study does not guarantee the accuracy of the data or the correctness of the programs. The NRBS does not assume any liability for actions or consequences resulting from the use of the data or the programs; individuals using the database do so entirely at their own risk. Neither the NRBS nor the authors will update the data or modify the programs except as deemed necessary for their own purposes. Permission is granted to modify the programs providing the NRBS is properly acknowledged and the authors are properly credited.