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Publication Procedures for the Historical Water Levels Summary

First Edition

Canada

**INLAND WATERS DIRECTORATE
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Publication Procedures for the Historical Water Levels Summary

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1. INTRODUCTION

This manual was prepared by Mr. J.L. McIlhinney, Programmer-Analyst, Mr. D.R. Swan, Computer Programmer, Mr. D.W. Kirk, Data Review Engineer, and Mr. M. Krol, Systems Analyst and approved by Mr. W.J. Ozga, Head, Data Control Section, Water Survey of Canada Division. It contains detailed procedures for the automated preparation of camera-ready manuscripts for the Historical Water Levels Summary publications, including a description of the various computer programs and instructions for setting up computer runs on the CDC CYBER 74 at the Department of Energy, Mines and Resources, Ottawa.

The Historical Water Levels Summary publication contains a summary of monthly and annual mean water levels, annual maximum instantaneous water levels and annual maximum and minimum daily water levels in metres, using the following data files: HYDEX (gauging station description) REMARKS (remarks for publication), LEVELS (daily water levels), and PEAKS (annual maximum instantaneous water levels). The first edition included data to 1976 for all stations with at least one complete month of water levels. Data are published in eight volumes by province or Region, as for the annual Surface Water Data publications. Commencing with the 1979 publications, data are presented in the International System of Units (SI) and future editions will be published every five years. The latest edition supersedes all previous editions since it contains any corrections or additions since the last publication.

There are three distinct phases in the publication process after data verification has been completed:

- (a) Data pages for individual publications are produced from data files as line images on magnetic tape, using computer programs; this tape includes an alphabetical index of gauging stations which is also produced automatically. This tape (which is created on the CDC CYBER 74 computer) is used as input to the Alphatext system where a cathode ray tube printer operates with an IBM 370 computer, exposing character images onto photosensitive paper to produce camera-ready pages suitable for photo-offset lithography.
- (b) Introductory text material is prepared through a special typesetter (IBM Mag Card Composer) by the Editorial and Publications Division. Once the material has been proofread, only the changes or additions have to be typed, such as the year or names of agencies. Camera-ready copies are produced at about the same time as the data pages.
- (c) Manuscript material (including artwork for the title page) is assembled by the Editorial and Publications Division and then sent for printing under a pre-arranged contract.

This is the first edition of a manual of "Publication Procedures for the Historical Water Levels Summary" and is subject to revision as new or improved procedures are developed.

1.1 Revisions

A number of corrections or revisions have been made to previously published data. Many of these were required because of typographical or computational errors which were exposed when daily water levels were stored on magnetic tape and monthly means were re-calculated by computer. Other errors were discovered or different interpretations of basic data were made during a periodic review of historical water level data, for example, these revisions may have been justified because a different distribution of the gauge datum elevations had been made. Those stations where a systematic review of hydrometric data has been conducted are identified in the Surface Water Data Reference Index publication.

All revisions to data in the Historical Water Levels Summary publication will be indicated by the symbol "R" which is explained in detail further on in this publication.

2. PROGRAM DESCRIPTIONS

Five computer programs are used in the preparation of the data (and index) pages of Historical Water Levels Summary publications, not including the system SORT/MERGE program which is also used to rearrange the retrieved data in publication sequence. All five programs are written in COBOL and run on the CYBER 74. These programs are as follows:

- MEANS RETRIEVAL Program - used to produce line images (on tape or printer output) of monthly and annual mean water level data.
- EXTREMES RETRIEVAL Program - used to produce line images (on tape or printer output) of annual extremes.
- PUBLICATION SEQUENCE Program - used to establish the sequence in which the line images will appear in the publications.
- MEANS AND EXTREMES MERGE Program - used to merge the two types of line images and assign sorting keys.
- PAGING Program - used to produce the final publication tape from the merged line images, including an index of gauging stations.

Except for the PUBLICATION SEQUENCE program, each program contains two versions, one to produce English pages and the other to produce French pages (for the Quebec publication only). All source programs and their object modules are stored on disk on indirect permanent files (IPF) as follows:

Source programs: Permanent file name = LEVELS, ID = SOURCE
Object modules : Permanent file name = LEVELS, ID = OBJECT

<u>Indirect file name</u>	<u>Description</u>
EXT .HST	EXTREMES RETRIEVAL Program
EXTF .HST	EXTREMES RETRIEVAL Program (French version)
MEANS .HST	MEANS RETRIEVAL Program
MEANSF .HST	MEANS RETRIEVAL Program (French version)
MREXME .HST	EXTREMES AND MEANS MERGE Program
MREXMEF .HST	EXTREMES AND MEANS MERGE Program (French version)
PAGE .HST	PAGING Program
PAGEF .HST	PAGING Program (French version)

Source programs: Permanent file name = HYDEX, ID = SOURCE
Object modules : Permanent file name = HYDEX, ID = OBJECT

<u>Indirect file name</u>	<u>Description</u>
HYDSEQ .HST	PUBLICATION SEQUENCE Program

2.1 MEANS RETRIEVAL Program

The MEANS RETRIEVAL program produces English or French line images (on tape or printer output) containing the monthly and annual means for the period of record for each retrieved station. A sample of the printed output from this program is given in section 3.1.1 of this manual.

2.1.1 Program Description

The MEANS RETRIEVAL program requires approximately 45 000 octal words of central memory on the CYBER 74. Three input files are required for retrieval: The program reads the TOTLEV file from which it computes monthly and annual means; the HYDEX file from which it gathers information about the station such as station number, name, location, drainage area, etc.; and the REMARKS file from which an explanatory remark is supplied.

This program can be used to produce line images on computer printouts for verification (Form II), or line images on tape to be used for publication (Alphatext). The line images produced on tape are the same as those produced on computer printouts except for the following differences:

- (a) The date, page number and Region or province name at the upper left of the page are omitted since this information does not appear in the publication text.
- (b) The station name and number are centered on the first line image for each station.
- (c) The station number is repeated at the left of the first line image of each station. This will ease the search for the station number in the MEANS and EXTREMES MERGE program. The repeated station number will then be dropped after the MEANS line images have been merged with the EXTREMES line images.
- (d) The change-over to metric has required the use of metric symbols which are not available on the standard ASCII 64-character set therefore the normal character set is used for line images on computer printouts (Form II) but a special set of symbols were used for producing line images on tape (Alphatext). These symbols are converted at Alphatext to the appropriate metric symbol. The special symbols are:

METRIC SYMBOL	SYMBOL USED FOR PRINTED OUTPUT (FORM II)	SPECIAL SYMBOL USED FOR TAPE OUTPUT (ALPHATEXT)
superscript "2"	"2"	"J"
superscript "3"	"3"	"["
lower case "m"	"M"	"\$"
lower case "k"	"K"	"!"
lower case "d"	"D"	" "
lower case "a"	"A"	"@"
lower case "s"	"S"	" "
		" -"

Monthly means are shown for complete months only. Each day in a month must contain a value or the symbol "DRY". If values are available for every day, then a monthly mean value will be computed. If the symbol "DRY" is

available for every day, then the monthly mean will be indicated as "DRY". If a complete month contains both values and the symbol "DRY", then the monthly mean will be indicated as "****".

Each monthly mean value is computed as the sum of each daily figure (or the unrounded total for the month) divided by the number of days in the month and then rounded according to the decimal indicator, i.e. either two or three decimal places.

If the monthly mean exists and there was at least one revised day within that month then an "R" symbol is inserted immediately after the value.

Annual means are shown for complete years only. Each day in a year must contain a value or the symbol "DRY". If values are available for every day, then the annual mean value will be computed. If the symbol "DRY" is available for every day, then the annual mean will be indicated as "DRY". If a complete year contains both values and the symbol "DRY", then the annual mean will be indicated as "****".

Each annual mean value is computed as the sum of each monthly total divided by the number of days in the year. This value is rounded to two decimal places if all monthly total values are two decimal places, otherwise, it is rounded to three decimal places.

If any of the monthly means have an "R" symbol after it then the "R" symbol is also inserted after the annual mean if one is computed.

The mean monthly water levels (mean of all the monthly means) and mean annual water level (mean of all the annual means) for the entire period of record (shown at the bottom of each column) are simply the mean values of the figures appearing in each column. These values are rounded using the same convention as explained for the annual means above. If the mean(s) shown in a column contain at least one "****" or "DRY", but not all "DRY", then the mean for that column will contain the symbol "****". If all the mean(s) shown in a column contain "DRY", then the mean for that column contains the symbol "DRY".

If any of the means in a column have a corresponding "R" symbol then the mean value for that column will also have an "R" symbol inserted after it.

Note: On the French version the symbol "TARIS" replaces the symbol "DRY".

2.1.2 Control Card Description

There are two types of control cards for this program: a "Date" card and a "Station Request" card. Only one "Date" card is required for each run. More than one "Station Request" card can be used in a single run provided that the station ranges on each card are in ascending order by province or Region and station number and are mutually exclusive with respect to station number.

"Date" Card

<u>Column(s)</u>	<u>Description</u>
1-4	"DATE"
5	blank
6-16	the date of the run in the form MMM DD YYYY, e.g. 'JAN 01 1980'
17-80	blank.

"Station Request" Card

<u>Column(s)</u>	<u>Description</u>
1-5	"WSC01"
6	blank
7	indicates the type of retrieval. Blank for retrieval by station, "D" for retrieval by Region and "P" for retrieval by province
8-9	code for the Region or province requested, e.g. "02" for Vancouver, "03" for British Columbia
10	blank
11-17	station - from
18-24	station - to
25	blank
26	output type indicator. "L" if printer output is requested, "T" if tape output is requested
27-80	blank.

2.2 EXTREMES RETRIEVAL Program

The EXTREMES RETRIEVAL program produces English or French line images (on tape or printer output) containing the maximum instantaneous water level and the maximum and minimum daily water level for the period of record of each retrieved station. A sample of the printed output from this program is given in section 3.2.1 of this manual.

2.2.1 Program Description

The EXTREMES RETRIEVAL program requires approximately 35 000 octal words of central memory on the CYBER 74. Three input files are required for retrieval: The program reads the PEAKS file from which it acquires the maximum instantaneous water level for the requested stations; the HYDEX file from which it acquires information about the station, such as the station name, the datum name, etc.; and the LEVELS file from which it computes the maximum and minimum daily water level for each requested station.

Like the MEANS RETRIEVAL program, the EXTREMES RETRIEVAL program can be used to produce line images on computer printouts for verification, or line images on tape to be used for publication. The same differences outlined in section 2.1.1 of this manual exist between the line images produced on printed output and those produced on tape output, with the following addition:

The record length of each line image is increased from 134 to 148 characters to include sort keys. The sort keys are: station, province and sequence number which are used to make all line images on tape in station number order within province.

Maximum instantaneous water level figures are shown for every station-year present on the PEAKS file. After the maximum daily water level figure has been extracted from the LEVELS file, the EXTREMES RETRIEVAL program will then check the maximum daily figure against the maximum instantaneous figure. If the maximum instantaneous water level is found to be less than the maximum daily water level, an appropriate error message will be printed identifying the station and year where the error has occurred. For printer output, this

message will appear directly under the line of data for the erroneous station-year. For tape output, the message will appear only in the run log summary.

The extraction of maximum and minimum daily water levels is controlled by a code stored on the HYDEX file and a code stored on the LEVELS file. The code on the HYDEX file applies only to station-years with complete records for the year. Under normal circumstances, both the maximum and minimum daily water levels are extracted if the year is complete. However, for some stations, only one or none of the extremes are to be shown and this is accomplished by inserting a code of "H" (maximum only), "L" (minimum only) or "N" (none) on the HYDEX file.

The code on the LEVELS file applies to station-years with both complete or incomplete records for the year. Under normal circumstances, the maximum and minimum daily water levels are not extracted for station-years with incomplete records for the year. However, some station-years with incomplete records have been identified on the LEVELS file as having valid extremes by inserting codes of "H" (maximum valid), "L" (minimum valid) or "B" (both maximum and minimum valid). Moreover, some station-years with complete records for stations which were coded on the HYDEX file as maximum only (H), minimum only (L), or neither (N), have codes on the LEVELS file indicating a valid maximum (H), valid minimum (L) or both (B), and this code on the LEVELS file is then used to override the action specified on the HYDEX file.

The table that follows summarizes the action taken by the EXTREMES RETRIEVAL program with the 32 possible combinations of codes on the LEVELS and HYDEX files:

<u>Code on LEVELS file</u>	<u>Code on HYDEX file</u>	<u>Year</u>	<u>Extreme(s) Extracted</u>
blank	blank	complete	both max. and min.
blank	H	complete	max. only
blank	L	complete	min. only
blank	N	complete	none
H, L, or B	blank	complete	both max. and min.
H	H, L, or N	complete	max. only
L	H, L, or N	complete	min. only
B	H, L, or N	complete	both max. and min.
blank	blank, H, L, or N	incomplete	none
H	blank, H, L, or N	incomplete	max. only
L	blank, H, L, or N	incomplete	min. only
B	blank, H, L, or N	incomplete	both max. and min.

Both the LEVELS and PEAKS files are checked for symbols and revisions by the EXTREMES RETRIEVAL program when extracting the maximum and minimum and maximum instantaneous water level values. Any of the following symbols found by the EXTREMES RETRIEVAL program will be inserted in the first column after the appropriate value on the EXTREMES listing.

- A - Manual Gauge
- B - Ice Conditions
- E - Estimated

Any revision found by the EXTREMES RETRIEVAL program will be inserted in the second column after the appropriate value.

2.2.2 Control Card Description

The control cards used for the EXTREMES RETRIEVAL program are exactly the same as those used for the MEANS RETRIEVAL program; a "Date" card and one or more "Station Request" cards. These card formats are described in section 2.1.2 of this manual.

2.3 PUBLICATION SEQUENCE Program

The purpose of the PUBLICATION SEQUENCE program is to produce a condensed HYDEX file, henceforth referred to as the HYDSEQ file, containing the station number, province code and publication sequence number for every station appearing on the HYDEX file. This publication sequence number will be added onto each of the line images in the MEANS and EXTREMES MERGE program and will be used as the sorting key to rearrange the line images in alphabetical sequence (i.e. in station name order) before the final PAGING program is run to produce a tape for publication.

2.3.1 Program Description

The PUBLICATION SEQUENCE program requires approximately 11 000 octal words of central memory on the CYBER 74. The program reads the HYDEX file which must first be sorted by province as major key and station name as minor key, and produces 15-character records for each record on the HYDEX file containing the station number, province code and a 6-digit publication sequence number, initialized to zero for each province and incremented by two for each station. The program also ensures that the province codes on the HYDEX file are valid and prints out an appropriate error message if invalid province codes are encountered.

2.4 MEANS and EXTREMES MERGE Program

The purpose of the MEANS and EXTREMES MERGE program is to merge the two tape files containing MEANS line images and EXTREMES line images, to rearrange the two types of line images for publication, and to add to each line image a sequence number to be used as the sorting key in directing the output in alphabetical sequence.

2.4.1 Program Description

The MEANS and EXTREMES MERGE program requires approximately 14 000 octal words of central memory on the CYBER 74. The program requires three input files: a file containing MEANS line images; a file containing EXTREMES line images and the HYDSEQ file which must have been previously sorted by province and station number order. The program aligns the stations on each input file and produces an output file containing the combined line images with the following changes:

- (a) At present, EXTREMES line images are dropped if there are no MEANS line images available for the entire station.

However, this will be modified for the next publication to include those stations for which at least one EXTREME is available even though there are no MEANS.

- (b) When means data are available for a given year and extremes data are not present, an extremes padding line is inserted for that year showing the year and dashes for the unavailable data. The reverse is also done when extremes data are available, but no means data.
- (c) Sorting sequence numbers consisting of the province code, the station sequence number from the HYDSEQ file and a line number generated by the MEANS and EXTREMES MERGE program are inserted on each line image. The 3-digit line numbers of the MEANS line images are assigned lower values than those of the EXTREMES line images so that they will precede the EXTREMES line images after sorting.
- (d) The extra station number output by the MEANS RETRIEVAL and the extra station number and added sort keys output by the EXTREMES RETRIEVAL programs is dropped because it will no longer be required.
- (e) A blank line is inserted when the difference between the year of data to be printed and the previous year of data printed is greater than one, e.g. 1972 was printed and 1974 is to be printed next (no 1973 data), or the year to be printed is divisible by 5 (e.g. 1960 or 1975).
- (f) Those stations which have more than 95 years of data (i.e. 120 line images) are split, at the closest year to the 95th year which is divisible by 5 (e.g. 1960 or 1975), to make 2 pages. The word "CONTINUED" is written at the bottom centre of the first page. The headings of the first page are duplicated with "(CONTINUED)" added to the end of the station name and written out to create the second page along with the remaining years for that station. This is done at the same year for both the MEANS and EXTREMES files.

2.4.2 Control Card Description

Only one control card is required for the MEANS and EXTREMES MERGE program. This card contains the code(s) for the province(s) to be processed. If more than one province is to be processed, then the codes are punched in columns 1-2, 3-4, 5-6, etc. of this card and must be in the same order of province as the means data.

2.5 PAGING Program

The purpose of the PAGING program is to further process the file containing MEANS and EXTREMES line images, now sorted in alphabetical order within each province, i.e. in station name order, so that the data will now appear in the province order required for publication, to rearrange the pages of data so that each page will contain up to a maximum of 126 lines, to separate each station with dashed lines and to generate an index of all gauging stations to be contained in the publication.

2.5.1 Program Description

The PAGING program requires approximately 16 000 octal words of central memory on the CYBER 74. The input file to this program is now sorted in alphabetical order and each station can now be separated into two blocks of data; one containing means data and the other containing extremes data. The PAGING program reads the input file block by block, removes all unwanted carriage control characters, and rearranges these blocks of data on pages containing at most 126 lines, with 4 blank lines between each block of data and a dashed line separating each station. If two or more blocks of means or extremes data cannot be contained entirely on one page, then the last block is transferred to the next page and the remainder of the current page is blank filled. The program generates page numbers at the top of each new page on the output file (odd numbers to the right, even to the left) and inserts the name of the province on the first line of each new page for multi-province publications. The PAGING program also keeps track of each new station and the page number on which it appears and generates an index of all stations at the end of the publication text. Finally, when all line images have been written onto the output file, including the index, the program will dump the output file so that a final verification of the text can be made before the output tape is sent to Alphatext.

2.5.2 Control Card Description

Only one control card is required for the PAGING program. This card contains the code(s) for the province(s) to be processed, in the order in which they are to appear in the publication. Hence, for multi-province publications, the code for the province to appear first in the publication is punched in columns 1-2, the second in columns 3-4, etc.

3. VERIFICATION OF DATA

As mentioned earlier, the first task in producing Historical Water Levels Summary publications consists of producing the data on computer printouts for cursory visual examination at the Region or at Ottawa for "unusual" anomalies (such as missing data) or format irregularities; a detailed check of the data is not required. Assuming that a TOTLEV file containing monthly total data for all three LEVELS tapes has been created, all that is required is: (a) to run the MEANS RETRIEVAL program for all Regions and all stations on the TOTLEV file, (b) to run the EXTREMES RETRIEVAL program for all stations of each of the three LEVELS file tapes, (c) to retain a copy of the printed output for the Ottawa Office and (d) to forward the other copy to each corresponding Regional Office. If the TOTLEV file has not yet been created, refer to section 4.4 of this manual where the job set-up for the creation of the TOTLEV file is described.

The remainder of this phase involves the updating of the LEVELS, HYDEX, REMARKS and PEAKS files where necessary, and is not the subject of this documentation.

3.1 MEANS RETRIEVAL (Printer Output)

For this type of retrieval, the "L" option on the "Station Request" card is used to produce printer output. Retrieval is usually requested by Region so that the Region name will appear at the upper left of each page. Although the MEANS RETRIEVAL program would allow retrieval for all Regions and all stations in one job submission, it is recommended to retrieve the means data pages one Region at a time because of the large volume of printer output created (at least two pages per stations with a double copy) and the time required for retrieval (approximately 2.0 CP seconds per station).

Printer output is produced in English for each Region except Region 6 (Montreal) which is produced in French, without accents.

Job Set-up

K9999,CM60000,P2,T500,NT1.	
ACCOUNT,XXXX.LEVELS MEANS RETRIEVAL (PRINTER OUTPUT)	
MOUNT, VSN=EMR107,SN=AHD.	
SETNAME,AHD.	
ATTACH(LGO,LEVELS,ID=MEANS,CY=1,MR=1)	See note 3
ATTACH(HYDEX,HYDEX,ID=DATA,MR=1)	See note 1
LABEL(TOTLEV,R,L=TOTLEV,F=S,X=SV,VSN=ERXXXX,D=PE,N=EB)	TOTLEV file
ATTACH,REMARKS,ID=DATA,MR=1.	
LGO.	
REWIND(OUTPUT)	
COPYCF(OUTPUT,DUM)	See note 2
REWIND(DUM)	See note 2
COPYCF(DUM,OUTPUT)	See note 2
7/8/9	Multi-punch in col. 1
DATE JAN 01 1980	See note 3
WSC01 D07 01AA00199ZZ999 L	See note 3
6/7/8/9	Multi-punch in col. 1

Note 1 - In this example and in examples to follow, the HYDEX file is attached from disk. If the HYDEX file is to be accessed from tape, the "ATTACH" card can be replaced by the following three cards:

```
LABEL,HYDEX,R,L=HYDEX,F=S,X=SV,D=PE,NE=EB,VS=ERXXXX.  
FILE,HYDEX,RT=F,BT=K,FL=300,RB=5,MBL=1500,CM=YES.  
LDSET(FILE=HYDEX)
```

In such a case however, the "NT" parameter on the "Job" card must be incremented by one.

Note 2 - These four cards will produce an extra copy of the output.

Note 3 - To produce French output for Region 6 (Montreal) change:

```
"ID=MEANS"  
"JAN 01"  
"D07"
```

```
To: "ID=MEANSF"  
"01 JAN"  
"D06"
```

3.1.1 Sample of "Means" Listing (English and French version)

WATER SURVEY OF CANADA
MAR 13 1981 PAGE 1
REGINA, SASK

EASTEND RESERVOIR

STATION NO. 11AC055

MONTHLY AND ANNUAL MEAN WATER LEVELS IN METRES FOR THE PERIOD OF RECORD													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1947	---	---	---	---	---	917.904	---	---	---	---	---	---	---
1952	---	---	915.376	---	---	---	---	---	---	---	---	---	---
1953	---	---	915.394	915.570	917.321	917.572	917.367	916.926	916.659	916.889	---	---	---
1954	---	---	915.301	916.369	917.841	917.882	917.559	916.014	915.492	915.493	---	---	---
1955	---	---	915.413	916.131	916.961	917.529	917.474	916.758	915.467	915.406	---	---	---
1956	---	---	915.448	916.417	917.787	917.758	917.556	916.959	916.314	915.383	---	---	---
1957	---	---	915.421	916.281	917.671	917.213	917.104	916.124	915.336	915.380	---	---	---
1958	---	---	915.412	917.111	917.724	916.916	916.512	916.083	915.797	915.817	---	---	---
1959	---	---	915.428	917.166	917.813	916.781	917.666	916.488	915.977	915.767	---	---	---
1960	---	---	915.752	917.566	917.933	917.319	916.313	916.169	915.505	915.255	---	---	---
1961	---	---	915.603	917.128	917.511	916.445	916.883	914.666	915.431	915.452	---	---	---
1962	---	---	---	918.091	---	---	---	---	---	---	---	---	---
1964	---	---	---	917.816	918.131	---	---	---	---	---	---	---	---
1966	---	---	---	917.803	---	---	918.090	---	---	---	---	---	---
1967	---	---	---	---	---	917.638	---	---	---	---	---	---	---
1968	---	---	917.288	917.956	---	---	---	---	---	---	---	---	---
1969	---	---	915.546	917.375	918.056	916.984	917.997	917.266	915.919	915.703	---	---	---
1970	---	---	915.514	916.195	918.080	918.132	918.068	916.730	---	---	---	---	---
1971	---	---	---	915.969	918.083	917.369	917.280	916.120	916.309	915.880	---	---	---
1972	---	---	915.629	916.504	918.058	918.155	917.831	915.910	915.986	915.827	---	---	---
1973	---	---	---	918.261	917.772	917.223	917.903	---	---	---	---	---	---
1974	---	---	915.500	917.758	918.217	917.952	917.007	916.387	915.569	915.489	---	---	---
1975	---	---	915.497	915.984	917.980	917.959	918.125	917.075	916.707	915.825	---	---	---
1976	---	---	916.219	918.006	917.851	917.342	918.193	916.539	915.717	915.456	---	---	---
1977	---	---	915.487	915.827	917.444	917.569	917.393	---	---	---	---	---	---
1978	---	---	915.512	917.939	918.276	917.865	918.229	917.185	917.095	916.125	---	---	---
1979	---	---	915.723	916.277	917.967	917.013	917.631	916.171	916.370	916.651	---	---	---
MEAN	---	---	915.623	---	---	---	---	---	---	---	---	---	---

WATER LEVELS REFERRED TO GEODETIC SURVEY OF CANADA DATUM

LOCATION - LAT 49 30 22 N
LONG 108 51 05 W

REGULATED

INTERNATIONAL GAUGING STATION

*** - MEAN IS NOT COMPUTED DUE TO DRY PERIODS WITHIN THE MONTH

REMARKS - DAILY WATER LEVELS FOR THE PERIOD 1953-61 WERE DERIVED BY DIGITIZING A PLOT OF MANUAL READINGS

DIVISION DES RELEVÉS HYDROLOGIQUES
MAR 13 1981 PAGE 1
MONTREAL, QUE

SAINT-LAURENT (PLEUVE) AU PONT MERCIER

STATION NO. 020A017

NIVEAUX MOYENS MENSUELS ET ANNUELS EN METRES POUR TOUTE LA PERIODE D'OBSERVATION													
ANNEE	JAN	FEB	MAR	AVR	MAI	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MOYEN
1954	---	---	---	---	---	---	---	---	1.414	1.663	1.699	1.632	---
1955	1.639	1.482	1.755	2.518	1.943	1.698	1.534	1.417	1.327	1.343	1.561	1.465	1.640
1956	1.433	1.266	1.302	1.893	2.024	1.874	1.628	1.521	1.565	1.477	1.309	1.272	1.547
1957	1.460	1.318	1.429	1.466	1.474	1.399	1.634	1.276	1.235	1.202	1.269	1.278	1.371
1958	1.276	1.179	1.258	1.719	1.326	1.260	1.231	1.008	1.037	1.081	0.973	0.886	1.186
1959	0.720	0.891	0.929	1.572	1.455	1.297	1.064	0.838	0.763	0.714	0.920	1.179	1.028
1960	1.361	1.291	1.249	1.938	2.036	1.598	1.767	1.497	1.202	0.913	0.970	1.024	1.404
1961	1.389	1.188	1.099	1.400	1.605	1.776	1.642	1.443	1.382	1.238	1.052	1.139	1.364
1962	1.246	1.224	1.126	1.386	1.264	1.045	1.006	1.034	0.997	0.996	1.013	1.019	1.112
1963	1.194	1.122	0.943	1.298	0.981	0.956	0.939	0.963	0.970	0.945	0.966	1.208	1.040
1964	1.311	1.086	1.019	1.008	0.895	0.907	0.856	0.866	0.858	0.867	0.827	0.827	0.944
1965	0.990	0.986	0.729	0.923	0.934	0.771	0.807	0.919	1.000	1.279	1.245	1.320	0.992
1966	1.459	1.409	1.635	1.627	1.305	1.187	1.052	1.078	1.065	1.045	1.123	1.449	1.285
1967	1.349	1.457	1.145	1.714	1.608	1.429	1.308	1.250	1.210	1.514	1.993	1.852	1.485
1968	1.549	1.633	1.579	1.949	1.486	1.322	1.490	1.488	1.552	1.464	1.439	1.423	1.530
1969	1.659	1.608	1.579	2.090	2.087	1.956	1.861	1.824	1.620	1.425	1.517	1.461	1.724
1970	1.509	1.414	1.359	1.721	1.828	1.631	1.613	1.618	1.490	1.567	1.642	1.628	1.586
1971	1.628	1.570	1.619	2.181	2.243	1.694	1.486	1.447	1.476	1.420	1.288	1.277	1.610
1972	1.332	1.427	1.487	2.087	2.426	2.105	2.174	2.089	2.003	1.957	2.041	1.753	1.908
1973	1.700	1.883	2.362	2.527	2.497	2.412	2.284	2.038	1.959	1.929	1.828	1.686	2.093
1974	1.774	1.803	2.080	2.471	2.759	2.501	2.236	2.045	1.891	1.835	1.763	1.825	2.083
1975	1.619	1.545	1.882	2.173	2.062	2.014	1.727	1.606	1.624	1.716	1.764	1.665	1.784
1976	1.631	1.757	2.100	2.676	2.519	2.268	2.216	2.008	1.876	1.875	1.782	1.451	2.013
1977	1.738	1.328	1.807	2.181	1.855	1.467	1.339	1.416	1.597	1.940	1.882	1.701	1.690
1978	1.832	1.998	1.922	2.377	2.273	1.946	1.713	1.591	1.525	1.509	1.374	1.173	1.767
1979	1.549	1.697	1.978	2.306	2.420	1.964	1.698	1.620	1.744	1.898	1.979	2.069	1.911
MOYEN	1.454	1.422	1.495	1.888	1.812	1.619	1.532	1.436	1.399	1.416	1.432	1.410	1.524

PLAN DE REFERENCE - ARBITRAIRE

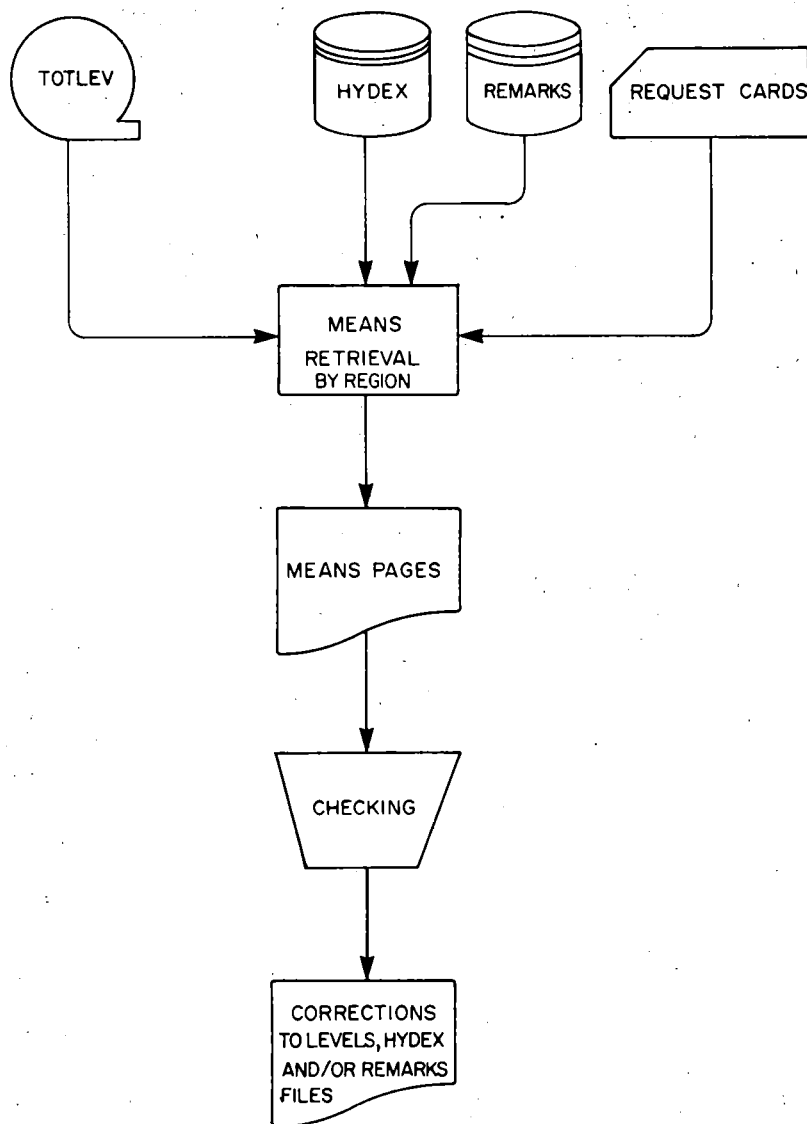
AJOUTER 18.000 M POUR OBTENIR LES COTES INTERNATIONAL DES GRANDES LACS

LOCATION - LAT 45 25 13
LONG 73 39 07

REGULARISE

REMARKS - DONNEES DE 1954 A 1962 FOURNIES PAR LE SERVICE HYDROGRAPHIQUE DU CANADA

3.1.2 Flowchart



3.2 EXTREMES RETRIEVAL (Printer Output)

Similar to the MEANS RETRIEVAL program for printer output, the "L" option is used and retrieval is usually requested by Region. Eight job submissions are used to produce extremes listings for all of Canada since the EXTREMES RETRIEVAL program is run to produce only one Region of printer output in one submission. Approximately 1.5 CP seconds are required for each station retrieved.

Printer output is produced in English for each Region except Region 6 (Montreal) which is produced in French, without accents.

Job Set-up

```
K9999,CM70000,P2,T500,GE1.
ACCOUNT,XXXXX.LEVELS EXTREMES RETRIEVAL (PRINTER OUTPUT)
MOUNT,VSN=EMR107,SN=AHD.
SETNAME,AHD.
ATTACH(LGO,LEVELS,ID=EXTREMES,CY=1,MR=1)
ATTACH(PEAKS,PEAKS,ID=DATA,MR=1)
ATTACH(HYDEX,HYDEX,ID=DATA,MR=1)
LABEL(LEVELS,R,L=HISTLEV,F=S,X=SV,VSN=ERXXXX,D=GE,N=EB) LEVELS file
LGO.
REWIND(OUTPUT)
COPYCF(OUTPUT,DUM)
REWIND(DUM)
COPYCF(DUM,OUTPUT)
7/8/9
DATE JAN 01 1980
WSC01 D07 01AA00199ZZ999 L
6/7/8/9
```

See note 1
See note 2
See note 2
See note 2
See note 2
Multi-punch in col. 1
See note 3
See note 3
Multi-punch in col. 1

Note 1 - For the HYDEX file on disk only. See Note 1, Section 3.1.2.

Note 2 - These four cards will produce an extra copy of the output.

Note 3 - To produce French listings for Region 6 (Montreal) change:

"ID=EXTREMES"
"JAN 01"
"D07"

To: "ID=EXTREMESF"
"01 JAN"
"D06"

3.2.1 Sample of "Extremes" Listing (English and French version)

WATER SURVEY OF CANADA
MAR 13 1981 PAGE 1
REGINA, SASK

EASTEND RESERVOIR

STATION NO. 11AC055

ANNUAL EXTREMES OF WATER LEVELS IN METRES FOR THE PERIOD OF RECORD				
YEAR	MAXIMUM INSTANTANEOUS WATER LEVEL	MAXIMUM DAILY WATER LEVEL	MINIMUM DAILY WATER LEVEL	YEAR
1946	---	917.875 ON APR 10	---	1946
1947	---	917.936 ON JUN 8	---	1947
1948	---	918.103 ON MAY 24	---	1948
1949	---	917.811 ON APR 26	---	1949
1950	---	917.863 ON MAY 13	---	1950
1951	---	917.905 ON JUN 10	---	1951
1952	---	917.875 ON APR 15	DRY ON APR 22 *	1952
1953	---	917.847 ON MAY 26	---	1953
1954	---	918.027 ON JUN 2	915.071 ON MAR 5	1954
1955	---	917.811 ON JUL 12	915.369 ON MAR 25	1955
1956	---	917.991 ON JUN 4	915.366 ON OCT 5	1956
1957	---	917.835 ON MAY 14	915.177 ON AUG 30	1957
1958	---	917.844 ON APR 18	915.391 ON MAR 1	1958
1959	---	917.966 ON MAY 2	---	1959
1960	---	918.048 ON MAY 3	915.074 ON OCT 10	1960
1961	---	917.863 ON MAY 9	913.851 ON AUG 29	1961
1962	---	918.283 ON APR 17	---	1962
1963	---	918.301 ON APR 7	DRY ON SEP 4	1963
1964	---	918.265 ON APR 12	---	1964
1965	---	918.240 ON MAY 28	---	1965
1966	---	918.256 ON APR 25	---	1966
1967	---	917.972 ON JUN 7	---	1967
1968	---	918.183 ON MAR 26	---	1968
1969	---	918.192 ON MAY 3	---	1969
1970	---	918.304 ON JUN 17	DRY ON SEP 4	1970
1971	---	918.353 ON MAY 20	---	1971
1972	---	918.475 ON APR 26 *	---	1972
1973	---	918.332 ON APR 26	---	1973
1974	918.350 AT 1530 CST ON APR 28	918.320 ON APR 28	---	1974
1975	---	918.405 ON JUN 23	915.476 ON MAR 20	1975
1976	918.362 AT 1800 CST ON APR 1	918.335 ON JUN 15	915.430 ON SEP 21	1976
1977	---	918.155 ON JUL 1	DRY ON AUG 21	1977
1978	918.457 AT 0700 CST ON MAY 12 *	918.442 ON MAY 12	---	1978
1979	---	918.199E ON MAY 28	---	1979

WATER LEVELS REFERRED TO GEODETIC SURVEY OF CANADA DATUM

E - ESTIMATED

* - EXTREME RECORDED FOR THE PERIOD OF RECORD

DIVISION DES RELEVÉS HYDROLOGIQUES SAINT-LAURENT (FLEUVE) AU PONT MERCIER
MAR 13 1981 PAGE 1
MONTREAL, QUE

STATION NO. 020A017

NIVEAUX EXTREMES ANNUELS EN METRES POUR TOUTE LA PERIODE D'OBSERVATION				
ANNEE	NIVEAU MAXIMUM INSTANTANE	NIVEAU MAXIMUM QUOTIDIEN	NIVEAU MINIMUM QUOTIDIEN	ANNEE
1954	---	---	1.318 LE 14 SEP	1954
1955	2.809 LE 7 AVR A 2300 HNE	2.732 LE 23 AVR	1.190 LE 6 OCT	1955
1956	2.253 LE 17 AVR A 2000 HNE	2.223 LE 1 MAI	0.940 LE 31 DEC	1956
1957	1.967 LE 6 JUL A 1600 HNE	1.919 LE 6 JUL	0.956 LE 18 DEC	1957
1958	1.989 LE 30 MAR A 2100 HNE	1.928 LE 5 AVR	0.544 LE 12 DEC	1958
1959	1.955 LE 11 AVR A 2100 HNE	1.885 LE 12 AVR	0.306 LE 10 JAN *	1959
1960	2.574 LE 24 AVR A 0030 HNE	2.495 LE 24 AVR	0.800A LE 18 OCT	1960
1961	1.885 LE 17 JUN A 0005 HNE	1.846 LE 16 JUN	0.304 LE 20 MAR	1961
1962	2.047 LE 9 AVR A 2231 HNE	1.906E LE 10 AVR	0.834A LE 28 MAI	1962
1963	---	1.839E LE 5 AVR	0.730E LE 17 MAR	1963
1964	---	1.696E LE 2 JAN	0.623E LE 20 DEC	1964
1965	1.577 LE 31 DEC A 2359 HNE	1.471 LE 31 DEC	0.450 LE 28 MAR	1965
1966	1.940 LE 26 MAR A 0520 HNE	1.891 LE 25 MAR	0.962 LE 9 OCT	1966
1967	---	2.092E LE 16 NOV	0.803 LE 26 MAR	1967
1968	2.233 LE 2 AVR A 1610 HNE	2.214 LE 2 AVR	0.943 LE 18 DEC	1968
1969	2.367 LE 24 AVR A 2130 HNE	2.330 LE 24 AVR	1.254 LE 25 DEC	1969
1970	2.016 LE 16 AVR A 2230 HNE	1.998 LE 7 MAI	1.056 LE 22 MAR	1970
1971	2.891 LE 23 AVR A 0525 HNE	2.864 LE 22 AVR	1.087 LE 6 DEC	1971
1972	2.757A LE 7 MAI	2.757A LE 7 MAI	1.087 LE 16 JAN	1972
1973	2.970 LE 19 MAR A 0430 HNE	2.952 LE 19 MAR	1.312 LE 25 DEC	1973
1974	2.967 LE 23 MAI A 1905 HNE	2.943 LE 23 MAI	1.486 LE 1 FEV	1974
1975	2.772 LE 21 AVR A 1419 HNE	2.751 LE 21 AVR	1.257 LE 27 JAN	1975
1976	3.159 LE 2 AVR A 0812 HNE *	3.123 LE 2 AVR *	1.184 LE 14 DEC	1976
1977	2.598 LE 16 MAR A 1845 HNE	2.556 LE 16 MAR	0.946 LE 27 FEV	1977
1978	2.833 LE 14 AVR A 2300 HNE	2.732 LE 15 AVR	0.885 LE 20 DEC	1978
1979	2.696 LE 26 MAR A 2212 HNE	2.647 LE 2 MAI	1.269 LE 1 JAN	1979

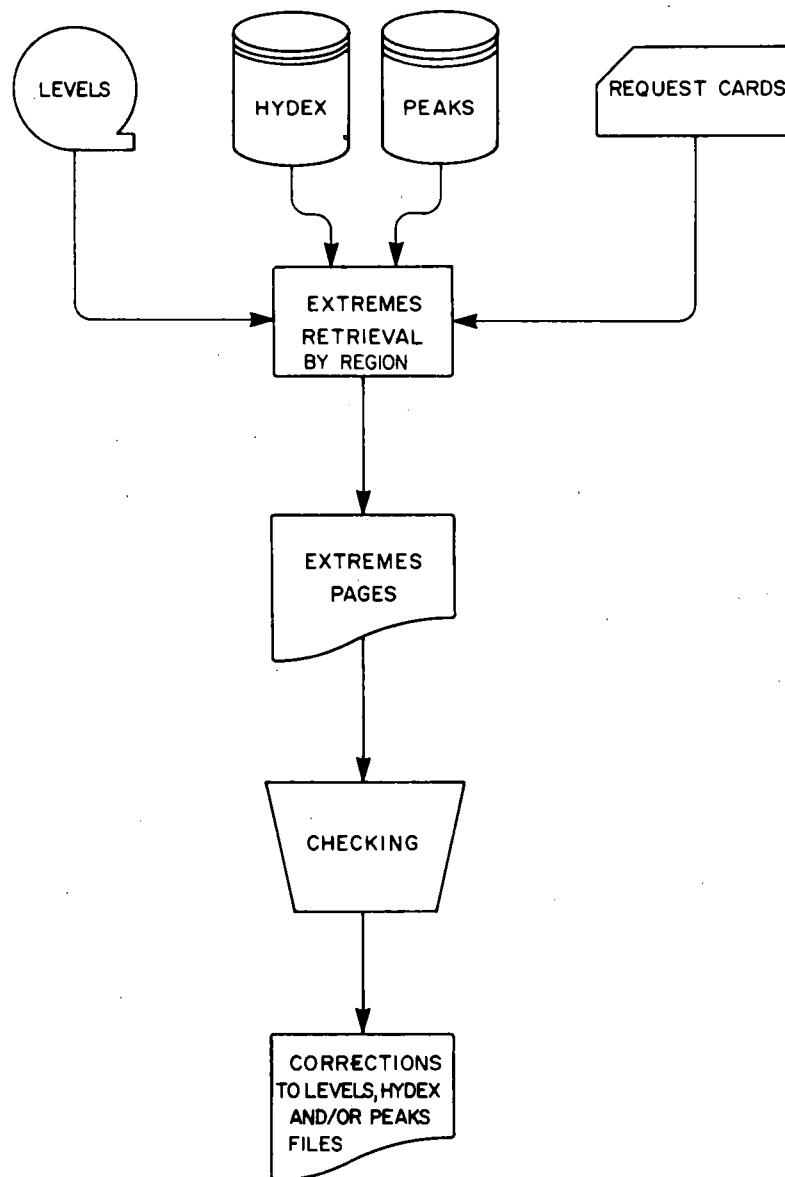
PLAN DE REFERENCE - ARBITRAIRE
AJOUTER 18.000 M POUR OBTENIR LES COTES INTERNATIONAL DES GRANDS LACS

A - JAUGE MANUELLE
(VOIR INDEX DE REFERENCE)

E - ESTIMATIVE

* - EXTREMES ENREGISTRES POUR TOUTE LA PERIODE D'OBSERVATION

3.2.2 Flowchart



4. PRODUCTION PHASE

Because of the flexibility of the retrieval programs involved, the preparation of eight tape files containing Historical Water Levels Summary data for all of Canada can be accomplished using several different sequences of computer runs. The fact that the LEVELS file consists of three tape files with the data stored in Region and station number order and that the publication data are to appear by province and station name order does not suggest any simple system configuration. Most of the programs used can process the data files in station number, Region or province sequence, and hence the efficiency of the system will depend on where in the system the data files are to be converted from one sequence to the other.

Ideally, the process would not begin until the data on all three LEVELS file tapes have been verified and are ready for publication. Such a system would consist of the creation of a TOTLEV file paralleled by the creation of a file containing EXTREMES line images (3 EXTREMES RETRIEVAL runs sorted together for the English publications and one EXTREMES RETRIEVAL run for the French publication), two MEANS RETRIEVAL runs, two MEANS and EXTREMES MERGE runs, two SORT/MERGE runs and eight runs of the PAGING program to produce the eight publication tapes. However, there is usually a time lag of one month or more between the verification of the data from the first Region to the last Region and hence such a system would delay some of the publications by as much as one month.

On the other hand, the process could begin as soon as all data for one given province are ready for publication, regardless of whether or not the remainder of the data for the Region(s) concerned have been completely verified. This system would not reflect any time delay from the time the data for the province(s), to be processed, have been verified and the time the preparation of the publication tape file is begun. However, this system requires many more runs: 12 MEANS RETRIEVAL runs, 17 EXTREMES RETRIEVAL runs, 12 MEANS and EXTREMES MERGE runs, 9 SORT/MERGE runs and 8 runs of the PAGING program. This system requires a large amount of duplication of effort and has proven to be quite lengthy, especially when a publication has to be started over again because more corrections were found on the final verification.

The system described in the text that follows is a compromise between the two systems described above. It has only one limitation, being that all the data on the LEVELS file tape(s) to be used for the publication being prepared, be verified and ready for publication. This system avoids most of the duplication of effort, requires fewer computer runs and does not cause any substantial delay of the publication.

4.1 System Description

The system can be broken down in two distinct phases. The first phase consists of creating a TOTLEV file, paralleled by the creation of a tape file containing EXTREMES line images, as the Region on the LEVELS file becomes available for publication. The second phase can branch off at any step in Phase 1 and begins when the TOTLEV file and the file of EXTREMES line images contain all the data to be included in the publication to be processed. This phase consists of the creation of a file containing MEANS line images for the province(s) concerned, followed by the merging of the two line image files, a

SORT/MERGE and the final PAGING process. This phase is usually accomplished in two job submissions.

The TOTLEV and EXTREMES RETRIEVAL runs in the first phase are always requested to include all stations on the tape retrieved. The MEANS RETRIEVAL run in the second phase is always requested to include only the province(s) to be included in the publication concerned. The MEANS and EXTREMES MERGE program in Phase 2 will delete all EXTREMES line images for any station which does not have at least one month of MEANS line images during its period of record.

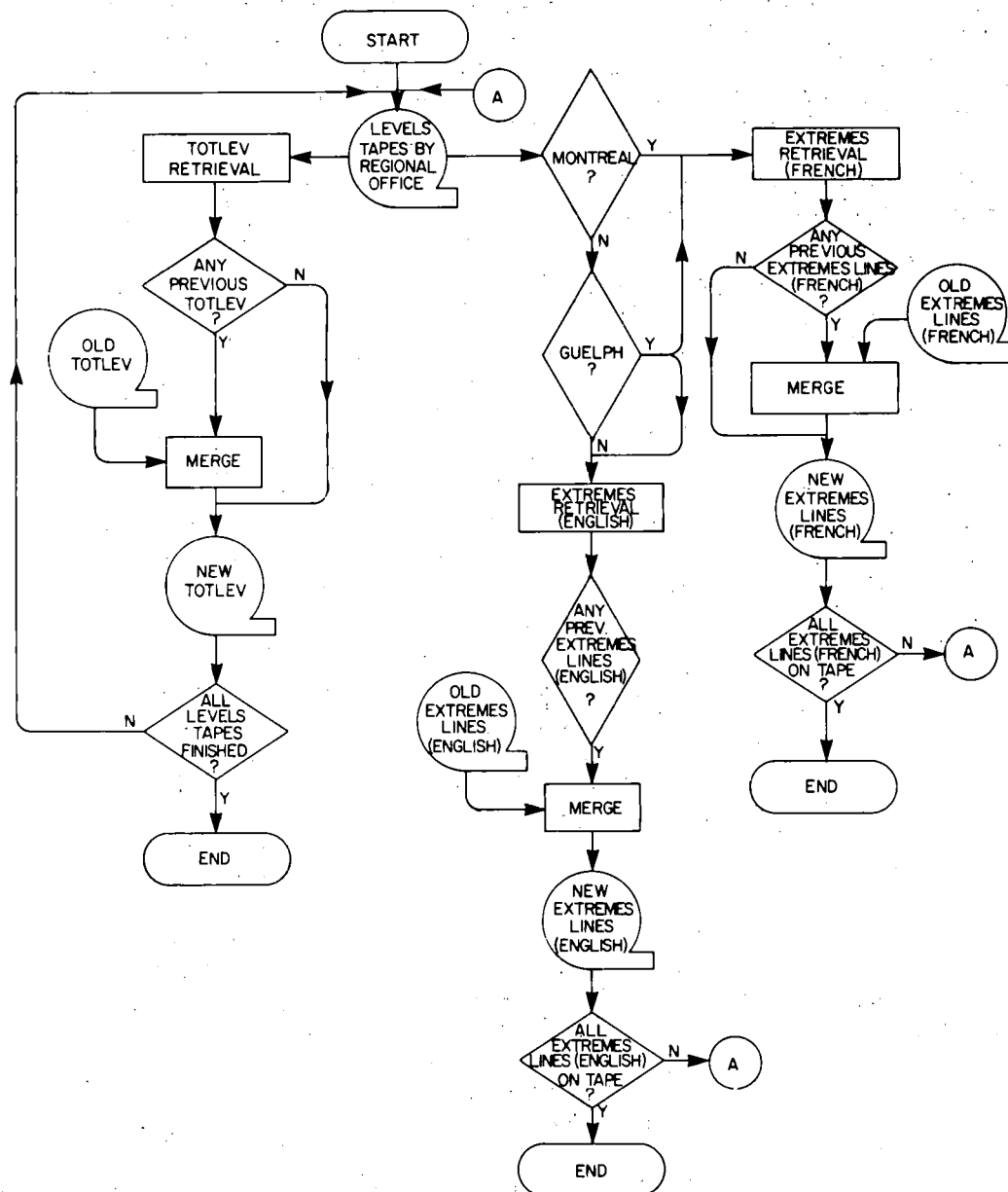
The table below shows the distribution by province on all tapes included in the LEVELS file.

<u>Publication</u>	<u>Province(s) Included</u>	<u>Distribution on LEVELS file</u>
- Yukon and Northwest Territories	- Yukon	- Vancouver
	- Northwest Territories	- Calgary - Winnipeg
- British Columbia	- British Columbia	- Vancouver
- Alberta	- Alberta	- Calgary - Regina
- Saskatchewan	- Saskatchewan	- Winnipeg - Regina
- Manitoba	- Manitoba	- Winnipeg
- Ontario	- Ontario	- Winnipeg - Guelph
- Quebec	- Quebec	- Montreal - Guelph
- Atlantic Provinces	- New Brunswick	- Halifax
	- Nova Scotia	- Halifax
	- Prince Edward Island	- Halifax
	- Newfoundland	- Halifax

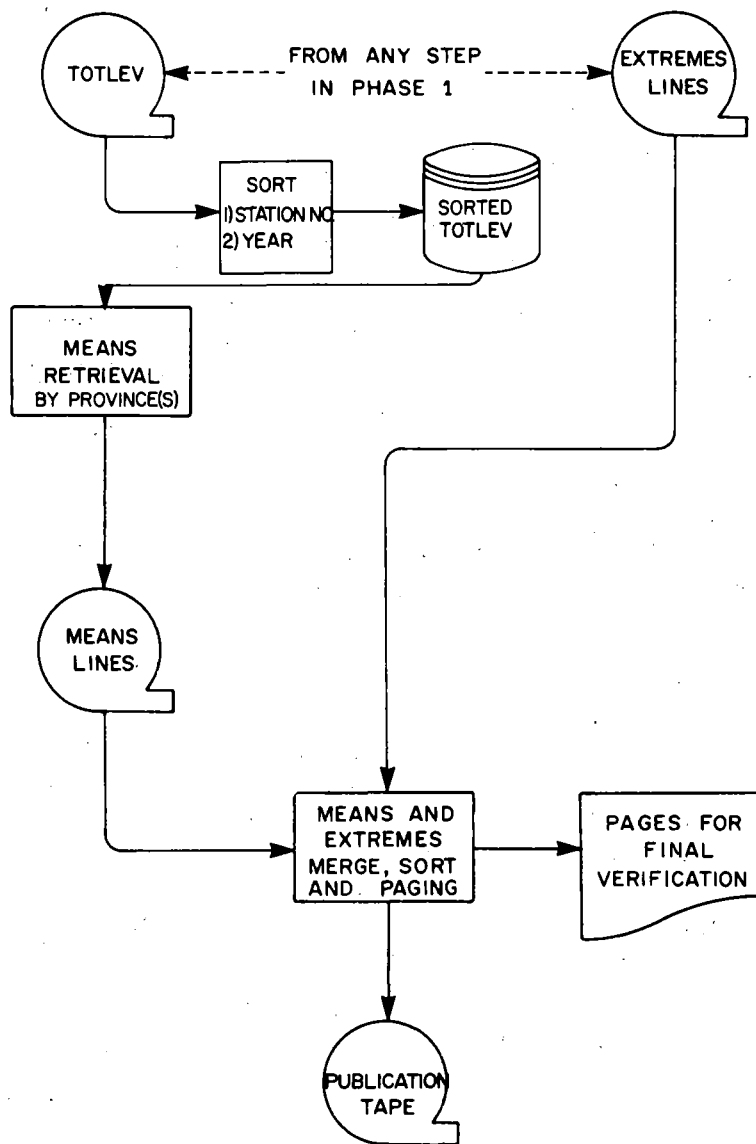
Hence Phase 2 for the Atlantic Provinces publication can begin as soon as the Halifax LEVELS file is ready for publication and has been processed in Phase 1. Likewise, Phase 2 for the British Columbia publication can begin as soon as the Vancouver LEVELS file have been processed in Phase 1. However, for the Alberta publication for example, Phase 2 cannot begin until the Calgary and Regina LEVELS files are ready for publication.

4.2 System Flowchart

Phase 1



Phase 2



4.3 Establishing Alphabetical Sequence

There are three steps involved in producing a condensed HYDEX file that contains the key to the alphabetical sequence for publications:

- (a) The HYDEX file is sorted by province and station name.
- (b) The sorted HYDEX file is read by the PUBLICATION SEQUENCE program which assigns sequence numbers to all stations within each province and produces a condensed HYDEX file, referred to as the HYDSEQ file, containing the station number, province code and sequence number.
- (c) The HYDSEQ file is then sorted by province and station number and catalogued on disk for later access by the MEANS and EXTREMES MERGE program.

Job Set-up

```
K9999,CM60000,P2,T100.
ACCOUNT,XXXXX. CREATION OF HYDSEQ FILE
MOUNT,VSN=EMR107,SN=AHD.
SETNAME,AHD.
REQUEST,DISK2,SN.
ATTACH(DISK1,HYDEX,ID=DATA,MR=1)
FILE(DISK1,RT=F,BT=C,FO=SQ,FL=300,CM=YES)
FILE(HYDEX,RT=F,BT=C,FO=SQ,FL=300,CM=YES)
SORTMRG.
ATTACH,X,HYDEX,ID=OBJECT,MR=1.
IGET,LGO=HYDSEQ.HST/X.
LGO.
REWIND,HYDSEQ.
FILE(HYDSEQ,RT=F,FO=SQ,BT=C,FL=15,CM=YES)
FILE(DISK2,RT=F,FO=SQ,BT=C,FL=15,CM=YES)
SORTMRG.
CATALOG(DISK2,HISTPUB,ID=HYDSEQ,RP=999)
PURGALL,OLDPUB,HISTPUB,ID=HYDSEQ,KP=1.
7/8/9
SORT
FILE,INPUT=DISK1(C),OUTPUT=HYDEX(R)
FIELD,PROV(32,2,DISPLAY),NAME(201,70,DISPLAY)
KEY,PROV(A,DISPLAY),NAME(A,COBOL6)
EQUATE,DISPLAY( ,0)
END
7/8/9
SORT
FILE,INPUT=HYDSEQ(C),OUTPUT=DISK2(R)
FIELD,PROV(8,2,DISPLAY),STNO(1,7,DISPLAY)
KEY,PROV(A,DISPLAY),STNO(A,DISPLAY)
EQUATE,DISPLAY( ,0)
END
6/7/8/9
```

See note 1

See note 1
See note 2
Multi-punch in col. 1

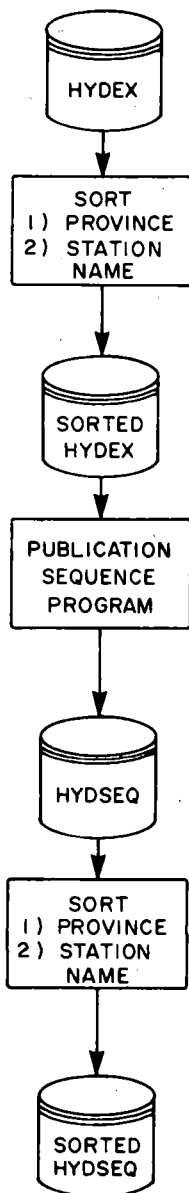
Multi-punch in col. 1

Multi-punch in col. 1

Note 1 - The HYDSEQ file is stored on disk with file name HISTPUB and ID=HYDSEQ. If at some time during the preparation of the publication data, stations on the HYDEX file are deleted or new stations added, then the HYDSEQ file must be re-created.

Note 2 - The lowest cycle(s) of the file HISTPUB, ID=HYDSEQ should be purged so that only one cycle will exist at all times. This can be accomplished by inserting a "PURGALL" card after the "CATALOG" card as illustrated.

4.3.1 Flowchart



4.4 Creation of TOTLEV File

Although the creation and maintenance of the TOTLEV file is not the subject of this documentation, the job set-up is given here for reference since the TOTLEV file must be created in parallel with the file containing EXTREMES line images.

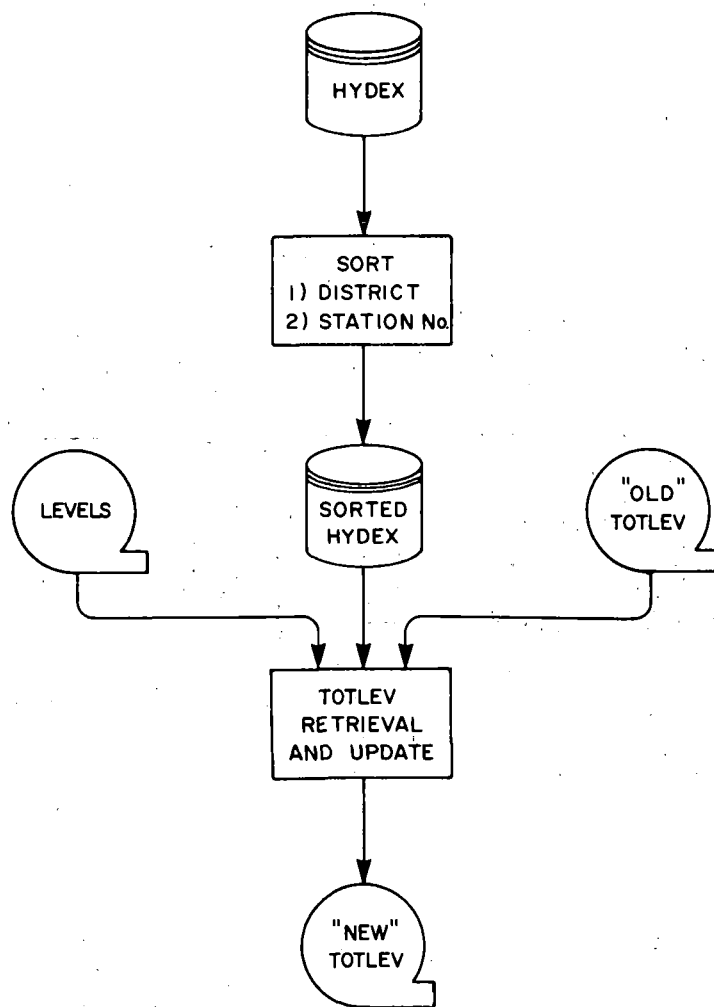
Job Set-up

```
K9999,CM70000,P2,T400,NT2,GE1.
ACCOUNT,XXXXX. LEVELS TOTLEV EDIT AND UPDATE
MOUNT,VSN=EMR107,SN=AHD.
SETNAME,AHD.
ATTACH(HYDISK,HYDEX,ID=DATA,MR=1)
FILE(HYDISK,RT=F,BT=C,FL=300,FO=SQ,CM=YES)
FILE(TAPE33,RT=F,BT=C,FL=300,FO=SQ,CM=YES)
SORTMRG.
ATTACH,X,LEVELS,ID=OBJECT,MR=1.
IGET,LGO=TOTLEV/X.
LABEL(TAPE30,R,L=TOTLEV,F=S,X=SV,VSN=ER1111,D=PE,N=EB) "OLD" TOTLEV file
LABEL(TAPE32,R,L=HISTLEV,F=S,X=SV,VSN=ER2222,D=GE,N=EB) LEVELS file
LABEL(TAPE31,W,L=TOTLEV,F=S,X=SV,T=999,D=DE,N=EB) "NEW" TOTLEV file
LGO.
7/8/9 Multi-punch in col. 1
SORT
FILE,INPUT=HYDISK(C),OUTPUT=TAPE33(R)
FIELD,DIST(8,1,DIPSLAY),STANO(1,7,DISPLAY)
KEY,DIST(A,DISPLAY),STANO(A,DISPLAY)
EQUATE,DISPLAY( ,0)
END
7/8/9 Multi-punch in col. 1
DATE JAN 01 1980 "DATE" card
OLDWSC-9201-01 See notes 1 and 2
NEWWSC-9201-01 See note 1
HYDWSC-1201-01 See note 1
LEVELSSC-6201-29 See note 1
6/7/8/9 Mutli-punch in col. 1
```

Note 1 - A file identification card is needed for each file and must appear in the above order. The file number in columns 8 to 14 is the WSC file number on the "Header" record of each file. The tape volume serial number is optional and begins in column 16.

Note 2 - If the TOTLEV file must be created from scratch, i.e. if an "OLD" TOTLEV file does not exist or is out of date, then the "LABEL" card for the "OLD" TOTLEV file is omitted, and the file identification card is left blank, i.e. only the word "OLD" appears in columns 1 to 3. The number of tape drives requested must be changed on the "Job" card by replacing NT2 with NT1.

4.4.1 Flowchart



4.5 Creation of EXTREMES Line Images

The creation of a file containing EXTREMES line images is usually executed in parallel with the creation of a TOTLEV file. Retrieval is always requested by Region for all stations on the LEVELS file tape being processed, except for those in the province of Quebec which are retrieved by province.

Job Set-up

```
K9999,CM70000,P2,T400,GE1,NT1.
ACCOUNT.XXXXX. LEVELS EXTREMES SORT-MERGE ON TAPE
MOUNT,VSN=EMR107,SN=ABD.
SETNAME,ABD.
ATTACH(LGO,LEVELS,ID=EXTREMES,CY=1,MR=1)      See note 3
ATTACH(HYDEX,HYDEX,ID=DATA,MR=1)             HYDEX file
ATTACH(PEAKS,PEAKS,ID=DATA,MR=1)             PEAKS file
LABEL(LEVELS,L=HISTLEV,F=S,X=SV,VSN=ER1111,D=GE,N=EB) LEVELS file
LGO.
REWIND,PRTAPE.
UNLOAD,LEVELS.
LABEL(MRGIN,R,L=EXTREMES,F=S,X=SV,D=PE,N=EB,VSN=ER2222) See note 1
LABEL(MRGOUT,W,L=EXTREMES,F=S,X=SV,D=PE,N=EB,T=30)      New EXTREMES lines
FILE,PRTAPE,RT=F,BT=K,FL=148,RB=20,MBL=2960,CM=YES.
FILE,MRGIN,RT=F,BT=K,FL=148,RB=20,MBL=2960,CM=YES.
FILE,MRGOUT,RT=F,BT=K,FL=148,RB=20,MBL=2960,CM=YES.
SORTMRG,RT=F,BT=K,FL=148,RB=20,MBL=2960,CM=YES.
7/8/9                                                  Multi-punch in col. 1
DATE JAN 01 1980
WSC01 D07 01AA00199ZZ999 T                          See notes 2 and 3
7/8/9                                                  Multi-punch in col. 1
SORT
FILE,INPUT=PRTAPE(R),MRGIN(R),OUTPUT=MRGOUT(R)
FIELD,A1(135,14,DISPLAY)
KEY,A1(A,DISPLAY)
EQUATE,DISPLAY( ,0)
END
6/7/8/9                                                  Multi-punch in col. 1
```

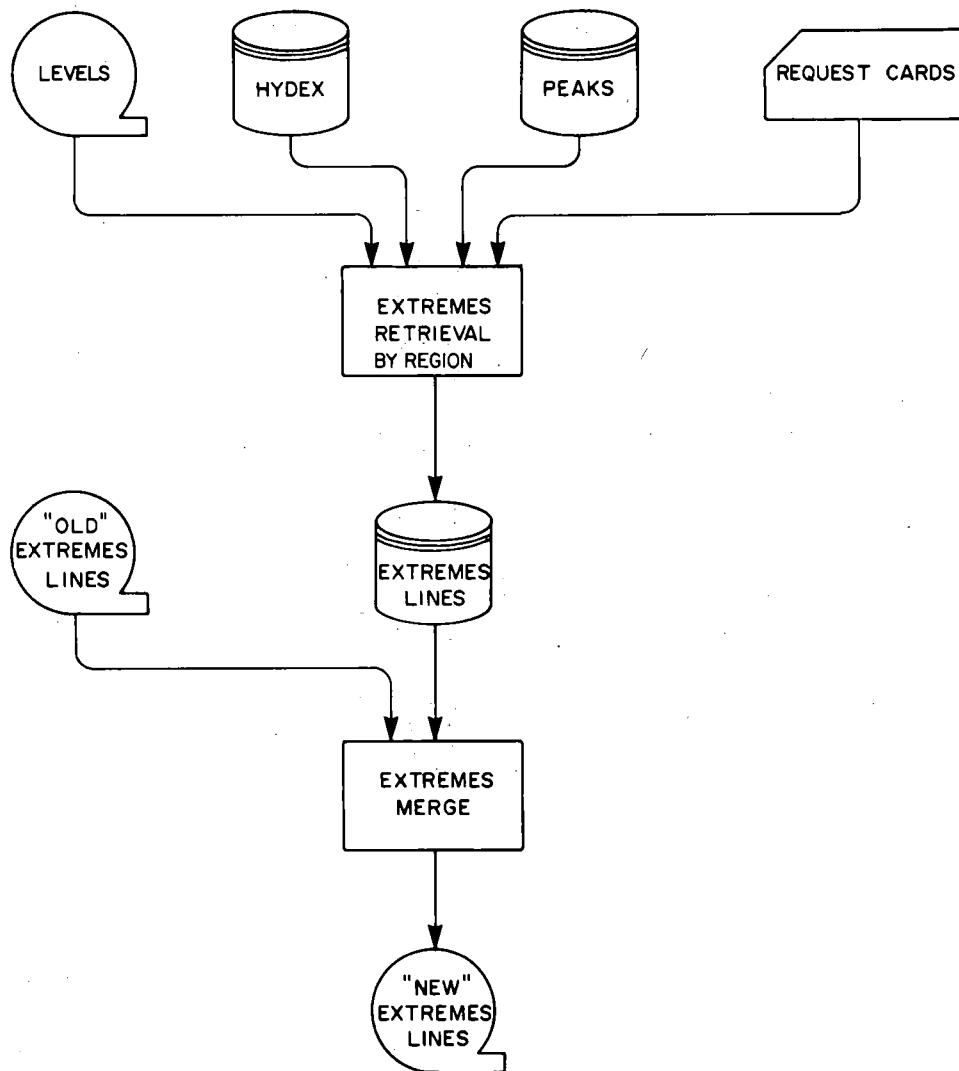
Note 1 - For the initial retrieval there is no OLD EXTREMES file therefore this LABEL card must be left out and the NT1 parameter dropped from the Job Card.

Note 2 - This is the "Station-Request" card used for retrieving from the Halifax tape. Note that the station range includes all stations on the tape and that the "T" option is used.

Note 3 - To produce French EXTREMES line images for the province of Quebec change:

"ID=EXTREMES"	To: "ID=EXTREMESF"
"D07"	"P08"

4.5.1 Flowchart



4.6 Creation of MEANS Line Images

The creation of a file containing MEANS line images marks the beginning of Phase 2 and is not initiated until all the data for the province(s) required are contained on the TOTLEV file. Retrieval is always requested by province with an inclusive station range. For multi-province publications, all provinces concerned are retrieved in the same computer run. Because the output is to be retrieved in province order, the TOTLEV file must first be sorted in station number order before executing the MEANS RETRIEVAL program. The CP time limit to be used will vary according to the size of the publication and the number of records on the TOTLEV file with a maximum of approximately 700 octal seconds for the British Columbia publication and a minimum of approximately 100 octal seconds for the Atlantic Provinces publication. All MEANS line images are in English except those for the province of Quebec which are in French.

Job Set-up

```
K9999,CM70000,P2,T300,NT2.
ACCOUNT,XXXXX. TOTLEV SORT/MERGE AND MEANS RETRIEVAL
MOUNT,VSN=EMR107,SN=AND.
SETNAME,AHD.
LABEL(TOTAP,R,L=TOTLEV,F=S,X=SV,VSN=ER1111,D=PE,N=EB)           See notes 1&2
LABEL,TOTLEV,W,L=TOTLEV,F=S,X=SV,D=PE,B=EB,T=10.               See note 2
FILE(TOTAP,RT=F,FO=SQ,BT=K,FL=180,RB=10,MRL=180,MBL=1800,CM=YES) See note 2
SORTMRG.
UNLOAD,TOTAP.                                                    See note 2
REWIND,TOTLEV.
ATTACH(LGO,LEVELS,CY=1,ID=MEANS,MR=1)                            See note 4
ATTACH(HYDEX,HYDEX,ID=DATA,MR=1)
ATTACH,REMARKS,ID=DATA,MR=1).
LABEL(PRTAPE,W,L=MEANS,F=S,X=SV,D=PE,N=EB,T=30)
LGO.
7/8/9                                                            Multi-punch in col. 1
SORT                                                            See note 2
FILE,INPUT=TOTAP(U),OUTPUT=TOTLEV(R)                            See note 2
FIELD, STAT(2,7,DISPLAY),YEAR(9,3,DISPLAY)                      See note 2
KEY, STAT(A,DISPLAY),YEAR(A,DISPLAY)                            See note 2
END                                                            See note 2
7/8/9                                                            Multi-punch in col. 1
DATE JAN 01 1975
WSC01 P09 01AA00199ZZ999 T                                       See notes 3 and 4
WSC01 P10 01AA00199ZZ999 T                                       See notes 3 and 4
WSC01 P11 01AA00199ZZ999 T                                       See notes 3 and 4
WSC01 P12 01AA00199ZZ999 T                                       See notes 3 and 4
6/7/8/9                                                         Multi-punch in col. 1
```

Note 1 - This is the label card for the TOTLEV file on tape. On the initial MEANS retrieval this TOTLEV file must be sorted by station number order. For subsequent MEANS retrieval runs the volume serial number (VSN) of this tape will be that of the sorted TOTLEV file.

Note 2 - All cards indicated by (See note 2) are only required for the initial MEANS retrieval or if the initial TOTLEV file has been altered or added to since it was initially sorted.

If no changes have been made in the TOTLEV file since it was created and sorted for the initial MEANS retrieval then all cards indicated by (See note 2) should be left out.

Note 3 - This example shows the "Station Request" cards required for the Atlantic Provinces retrieval. Note that the "T" option is used and that retrieval is requested in ascending order of province codes.

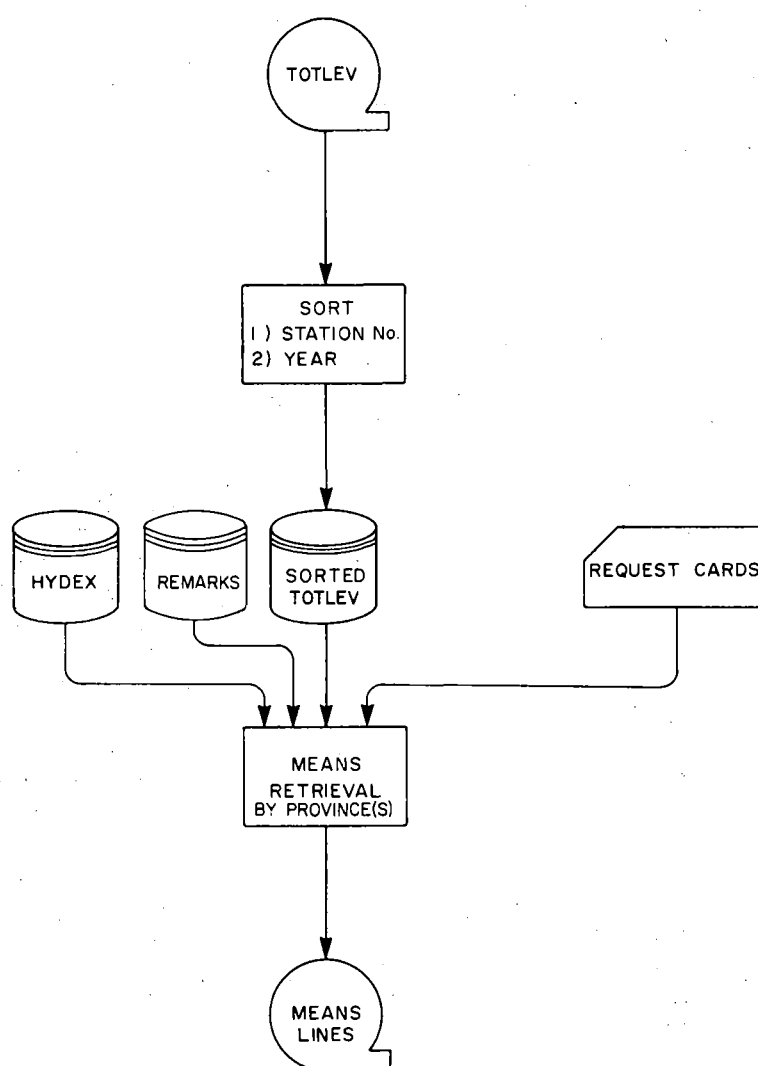
Note 4 - To produce French MEANS line images for the province of Quebec change:

"ID=MEANS"

To: "ID=MEANSF"

replace the 4 input cards explained in note 3 with "WSC01 P08 01AA00199ZZ999 T"

4.6.1 Flowchart



4.7 MEANS and EXTREMES MERGE, SORT and PAGING

The final three steps of Phase 2 include the merging of both files of line images, followed by a sort and the paging process. All three steps are usually executed in one job submission. The PAGING program will produce an output tape which can then be used for printer simulation, along with a dump of the tape file for the final verification of the data. The CP time limit required for the run will depend on the number of pages appearing in the publication being processed with a maximum of approximately 700 octal seconds for the British Columbia publication and a minimum of approximately 100 octal seconds for the Atlantic Provinces publication.

Job Set-up

```
K9999,CM70000,P2,T300,NT2.
ACCOUNT,XXXXX.  EXTREMES AND MEANS MERGE, SORT AND PAGING
MOUNT,V SN=EMR107,SN=AHD.
SETNAME,AHD.
ATTACH,X,LEVELS,ID=OBJECT,MR=1.
IGET,LGO1=MREXME.HST/X.
ATTACH(HYDSEQ,HISTPUB,ID=HYDSEQ,MR=1)
LABEL(MEANS,R,L=MEANS,F=S,X=SV,D=PE,N=EB,VSN=ER1111)
LABEL(PEAKS,R,L=EXTREMES,F=S,X=SV,D=PE,N=EB,VSN=ER2222)
LGO1.
UNLOAD,MEANS,PEAKS.
FILE(PUBTAP,RT=F,FO=SQ,BT=C,FL=142,CM=YES)
FILE(TAPE01,RT=F,FO=SQ,BT=C,FL=142,CM=YES)
SORTMRG.
IGET,LGO2=PAGE.HST/X.
LABEL(TAPE02,W,L=WSC,F=S,X=SV,D=PE,N=EB,T=30)
LGO2.
7/8/9
09101112
7/8/9
SORT
FILE,INPUT=PUBTAP(C),OUTPUT=TAPE01(R)
FIELD,PROV(134,2,DISPLAY),STAT(136,4,DISPLAY),SEQ(140,3,DISPLAY)
KEY,PROV(A,DISPLAY),STAT(A,DISPLAY),SEQ(A,DISPLAY)
EQUATE,DISPLAY(,0)
END
7/8/9
12091011
6/7/8/9
```

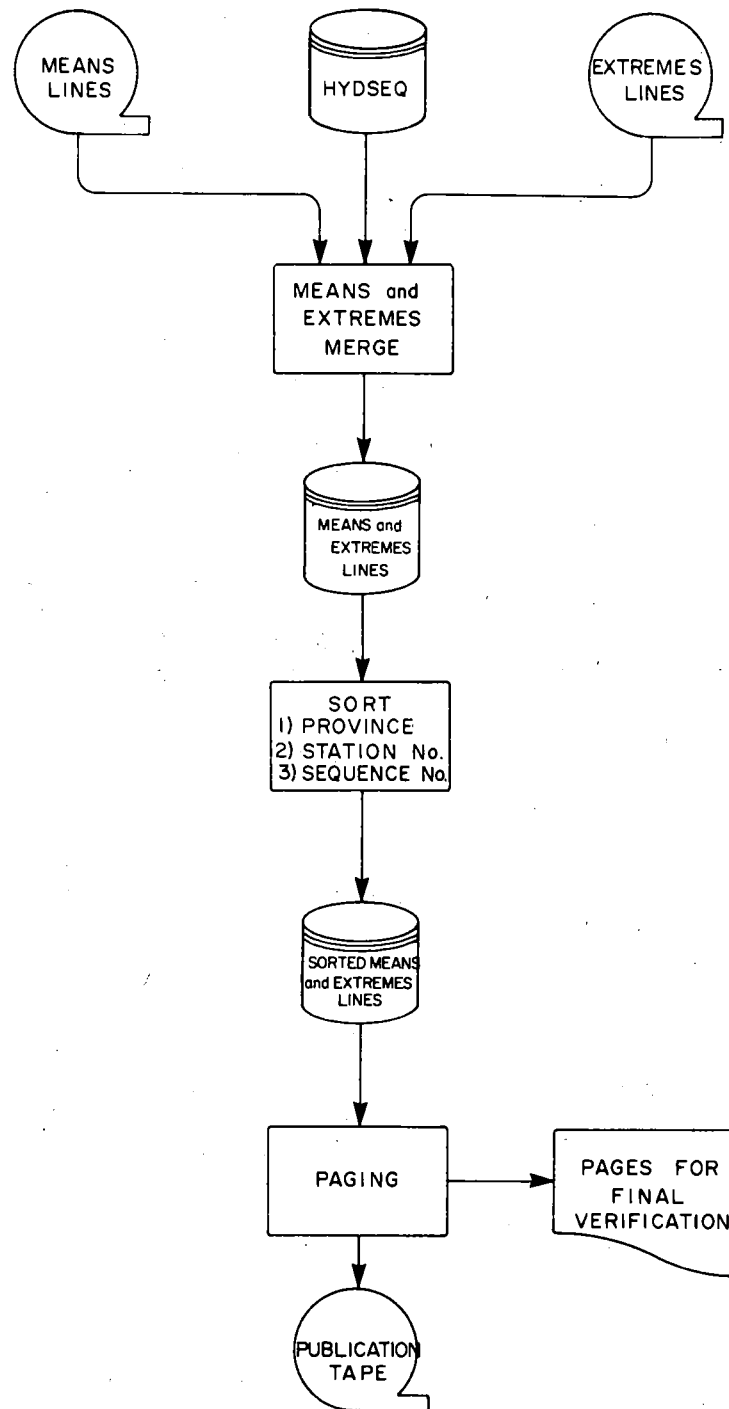
See note 2
HYDSEQ file
File of MEANS line
File of EXTREMES lines
See note 2
Publication tape
Multi-punch in col. 1
See note 1
Multi-punch in col. 1
Multi-punch in col. 1
See note 1
Multi-punch in col. 1

Note 1 - The order of the province codes has changed for the PAGING program. This example illustrates the job set-up for the Atlantic Provinces publication where the order in which the provinces appear in the publication is not the same as in order in which they appear on the line images files.

Note 2 - To produce a French publication tape for the province of Quebec change:

"MREXME.HST"	To: "MREXMEF.HST"
"PAGE.HST"	"PAGEF.HST"

4.7.1 Flowchart



4.8 General Remarks

Should errors in the data originating from the LEVELS, HYDEX, REMARKS or PEAKS file be detected only during the final verification of the data pages, a complete re-execution of Phase 2 and part of Phase 1 will have to be initiated. In such a case all files in Phase 2 can be released since they cannot be updated with the programs described in this documentation. The files created in Phase 1 can still be of use provided that the file contains no station(s) being modified. Once the LEVELS, HYDEX, REMARKS or PEAKS file has been updated to resolve the error(s) found in the final verification, the TOTLEV file must be recreated from the point at which the station(s) being modified was added. Any errors originating from the LEVELS, HYDEX or PEAKS files and found only on the final verification in Phase 2 should not however, delay the production of any subsequent publication since any given station can appear only in one publication.

Quality control checking has not been discussed in this documentation, mainly because the programs described will output an appropriate error message if errors are detected and because most of the errors encountered in the production of Historical Water Levels Summary publication tapes, other than those originating from the LEVELS, HYDEX, REMARKS, or PEAKS files, are reflective upon the NOS/BE system or hardware errors. The only assurance that the programs described in the production phase have been executed successfully is that the message "END of JOB" appears on the output listing and that the dayfile does not indicate any system or hardware errors. One important note to remember: The final product to be sent to Alphatext must be written on tape by either our program or a FORM run, because the Alphatext system does not register the end-of-file mark on the tape written out by the copy utilities of EMR.

The publication tapes thus produced are forwarded to Alphatext where they are processed as printer simulation to produce photocomposite documents for each page of publication data. As the final dump will show, the data pages on these tape files contain up to a maximum of 126 line images and in most cases occupy two full pages of computer printout.

Refer to section 5.2 for the procedure for submitting the tape to Alphatext to produce the camera-ready copies.

5. ASSEMBLING MANUSCRIPT FOR PUBLICATION

Camera-ready copies of manuscript material are obtained from the Alphatext system by alphanumeric photocomposition. A cathode ray tube printer operates as a high speed output device (6 sec./page) with an IBM 370 computer, exposing character images onto photosensitive paper. Input to the Alphatext system, which is in Ottawa, is by line images on a 1600 bpi magnetic tape which is created on EMR's CYBER 74 computer.

The introductory text material is prepared through a special typesetter (IBM Mag Card Composer) by the Editorial and Publications Division. The main advantage of their system is that once it has been proofread, only the changes or additions have to be typed, which can be done "in shop". A number of different type fonts are used for the introductory text material for the data publications.

The turnaround time for this service is less than 24 hours if numeric data are submitted on 1600 bpi magnetic tape and 2-3 days for text material (after initial preparation).

5.1 Introductory Text Material

This refers to the twelve pages which precede the data pages. They contain the preface, table of contents, history and an explanation of the data tabulations. The last six pages are identical in seven of the publications and contain the explanation.

These pages are produced using the IBM Mag Card Composer and cannot be completed until the page number on which data tabulations for the province(s) involved is available as well as the page number on which the index starts is known; these page numbers are not available until the PAGING program has been run. However, all other corrections can be entered before this, e.g. year of publication and name changes.

The manuscript for the text pages are "made-up" manually by the Editorial and Publications Division by splicing together the English and French texts and cutting-in the "i" page numbers at the bottom of the pages. The heading "WATER LEVELS DATA/DONNEES SUR LES NIVEAUX D'EAU" is also cut in manually at the top of page 1 of the data pages.

5.2 Data and Index Pages

These pages are produced by Alphatext from the 1600 bpi tape of line images produced by the PAGING program (see section 4.7) on the CDC CYBER 74 computer.

When this tape is forwarded to Alphatext, the following information must be filled out under the appropriate heading on the Alphatext job submission form.

JOB RELATED INFORMATION:

- Job Number: "WSC0285-XXXXXX" where XXXXXX is a 6-character code identifying the job (e.g. ATL79H for Atlantic Provinces publication to 1979)
- Control Program: "CP5B"
- ID: "ERXXXX" volume serial number (VSN) of the tape being submitted.

INFORMATION PERTAINING TO DATA:

- DSN: "WSC"
- VOLSER: "ERXXXX" volume serial number (VSN) of tape being submitted
- Tape Description: "LABELLED, 133-character records, blocked 10"

COMMENTS:

- Approximate number of pages: "XXX" where XXX is the page number of the last index page.

5.3 Submission for Printing

The introductory text pages and the data and index pages are prepared simultaneously. Another activity that has to be completed at the same time is the preparation of the artwork for the title pages - this is done by the Editorial and Publications Division.

The manuscript is assembled by the Editorial and Publications Division and along with printing specifications is submitted to DSS who ensure that a catalogue number has been assigned and submit it for printing. Prior to printing, a copy of the manuscript is forwarded to the Metric Screening Office of the Canadian General Standards Board for review to see that all metric units and symbols are shown in accordance with the "CSA Standard CAN3-Z234.2-76, The International System of Units (SI)" and all rules concerning metric data, as specified in the "CSA Standard CAN3-Z234.1-79, Canadian Metric Practice Guide" manuals. Upon approval for adherence to standards, the copy is then sent to Metric Commission Canada for final approval to use the National Symbol for Metric Conversion on the title page of the publication.

Normal printing time for data publications under a pre-arranged contract is from 18-25 working days. Allowing for checking of proofs and transportation time for proofs and finished publications, the total elapsed time from submission of manuscript for printing to delivery of books is about 6 weeks. Assuming 4-6 weeks for computer processing in Ottawa, verification by the Region, and packaging and mailing, data in published form should be available to the user not later than 3 months after the annual data have been published.

5.4 Samples of Publication Pages

5.4.1 Introductory Text (reduced from publication size)

CONTENTS	PAGE
Preface	iii
Introduction	iv
Organization and History of Hydrometric Survey Operations	v
Co-operation and Acknowledgments	v
Conversion Factors	vi
Publication of Surface Water and Sediment Data	vi
Explanation of Historical Water Levels Summary Publication	
General Description	viii
Method of Tabulation of Data	ix
Revisions	x
Accuracy of Hydrometric Data	x
Metric Conversion	xi
Water Level Data, Gauging Stations in Alphabetical Order	1
Index of Gauging Stations	55

INTRODUCTION

The Water Resources Branch of the Department of the Environment herein presents the second edition of a summary of monthly and annual mean water levels and annual extremes of water levels for lakes and rivers in Saskatchewan for which water level data to 1979 inclusive have been collected by the Water Survey of Canada. This edition supersedes the first edition.

This is the first year that data are being published in the International System of Units (SI).

A program for the collection and publication of Surface Water Data has been carried on across Canada for over 70 years. The results of these hydrometric survey investigations have been published annually.

Water level data are available on punched cards or magnetic tape for computer processing. These data and details on individual stations and related records, as well as recent data which have not yet been published may be obtained upon application to:

Regional Chief,
Water Survey of Canada,
Water Resources Branch,
Department of the Environment,
G.M.C. Building,
1102-8th Avenue,
Regina, Saskatchewan.
S4R 1C9

or to the Director, Water Resources Branch, Department of the Environment, Ottawa, Ontario, K1A 0E7.

TABLE DES MATIÈRES	PAGE
Préface	iii
Introduction	iv
Organisation et historique des relevés hydrométriques	v
Coopération et remerciements	v
Facteurs de conversion	vi
Publication des données sur les eaux de surface et les sédiments	vi
Explication du <i>Sommaire chronologique des niveaux d'eau</i>	
Description générale	viii
Présentation sous forme de tableaux des données	ix
Révisions	x
Exactitude des données hydrométriques	x
Conversion au système métrique	xi
Données sur les niveaux d'eau — Stations de jaugeage énumérées dans l'ordre alphabétique	1
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INTRODUCTION

La Direction des ressources en eau du ministère de l'Environnement présente la deuxième édition d'un sommaire des moyennes mensuelles et annuelles des niveaux d'eau et des extrêmes annuels de lacs et de cours d'eau du Saskatchewan, pour lesquels la Division des relevés hydrologiques du Canada a obtenu des données jusqu'en 1979 inclusivement. La présente publication annule la première édition.

Pour la première fois, les données sont fournies dans le Système international d'unités (SI).

La cueillette et la publication de données sur les eaux de surface sont en oeuvre depuis plus de 70 années au Canada. Les données obtenues à partir des relevés hydrométriques sont publiées annuellement.

On peut se procurer les données sur les niveaux d'eau sous forme de cartes perforées ou de rubans magnétiques pour traitement sur ordinateur. En s'adressant aux endroits ci-après, on peut obtenir ces données, des renseignements supplémentaires sur certaines stations particulières et divers relevés ainsi que des données récentes non encore publiées:

Chef régional
Division des relevés hydrologiques du Canada
Direction des ressources en eau
Ministère de l'Environnement
Édifice G.M.C.
1102, Huitième avenue
Regina (Saskatchewan)
S4R 1C9

ou au Directeur, Direction des ressources en eau, ministère de l'Environnement, Ottawa (Ontario), K1A 0E7.

5.4.2 Data: English Version (reduced from publication size)

18

EASTEND RESERVOIR - STATION NO. 11AC055

MONTHLY AND ANNUAL MEAN WATER LEVELS IN METRES FOR THE PERIOD OF RECORD

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN	YEAR
1946	---	---	---	---	---	---	---	---	---	---	---	---	---	1946
1947	---	---	---	---	---	917.904	---	---	---	---	---	---	---	1947
1948	---	---	---	---	---	---	---	---	---	---	---	---	---	1948
1949	---	---	---	---	---	---	---	---	---	---	---	---	---	1949
1950	---	---	---	---	---	---	---	---	---	---	---	---	---	1950
1951	---	---	---	---	---	---	---	---	---	---	---	---	---	1951
1952	---	---	915.376	---	---	---	---	---	---	---	---	---	---	1952
1953	---	---	915.394	915.570	917.321	917.572	917.367	916.926	916.659	916.889	---	---	---	1953
1954	---	---	915.301	916.369	917.841	917.882	917.559	916.014	915.492	915.493	---	---	---	1954
1955	---	---	915.413	916.131	916.961	917.529	917.474	916.758	915.467	915.406	---	---	---	1955
1956	---	---	915.448	916.417	917.787	917.758	917.556	916.959	916.314	915.383	---	---	---	1956
1957	---	---	915.421	916.281	917.671	917.213	917.104	916.124	915.336	915.380	---	---	---	1957
1958	---	---	915.412	917.111	917.724	916.916	916.512	916.083	915.797	915.817	---	---	---	1958
1959	---	---	915.428	917.166	917.813	916.781	917.666	916.488	915.977	915.767	---	---	---	1959
1960	---	---	915.752	917.566	917.933	917.319	916.313	916.169	915.505	915.255	---	---	---	1960
1961	---	---	915.603	917.128	917.511	916.445	916.883	914.666	915.431	915.452	---	---	---	1961
1962	---	---	---	918.091	---	---	---	---	---	---	---	---	---	1962
1963	---	---	---	---	---	---	---	---	---	---	---	---	---	1963
1964	---	---	---	917.816	918.131	---	---	---	---	---	---	---	---	1964
1965	---	---	---	---	---	---	---	---	---	---	---	---	---	1965
1966	---	---	---	917.803	---	---	918.090	---	---	---	---	---	---	1966
1967	---	---	---	---	---	917.638	---	---	---	---	---	---	---	1967
1968	---	---	917.288	917.956	---	---	---	---	---	---	---	---	---	1968
1969	---	---	915.546	917.375	918.056	916.984	917.997	917.266	915.919	915.703	---	---	---	1969
1970	---	---	915.514	916.195	918.080	918.132	918.068	916.730	---	---	---	---	---	1970
1971	---	---	---	915.969	918.083	917.369	917.280	916.120	916.309	915.880	---	---	---	1971
1972	---	---	915.629	916.504	918.058	918.155	917.831	915.910	915.986	915.827	---	---	---	1972
1973	---	---	---	918.261	917.772	917.223	917.903	---	---	---	---	---	---	1973
1974	---	---	915.500	917.758	918.217	917.952	917.007	916.387	915.569	915.489	---	---	---	1974
1975	---	---	915.497	915.984	917.980	917.959	918.125	917.075	916.707	915.825	---	---	---	1975
1976	---	---	916.219	918.006	917.851	917.342	918.193	916.539	915.717	915.456	---	---	---	1976
1977	---	---	---	915.487	915.827	917.444	917.569	917.393	---	---	---	---	---	1977
1978	---	---	915.512	917.939	918.276	917.865	918.229	917.185	917.095	916.125	---	---	---	1978
1979	---	---	915.723	916.277	917.967	917.013	917.631	916.171	916.370	916.651	---	---	---	1979
MEAN	---	---	915.623	---	---	---	---	---	---	---	---	---	---	MEAN

WATER LEVELS REFERRED TO GEODETIC SURVEY OF CANADA DATUM

LOCATION - LAT 49 30 22 N LONG 108 51 05 W REGULATED INTERNATIONAL GAUGING STATION

*** - MEAN IS NOT COMPUTED DUE TO DRY PERIODS WITHIN THE MONTH

REMARKS - DAILY WATER LEVELS FOR THE PERIOD 1953-61 WERE DERIVED BY DIGITIZING A PLOT OF MANUAL READINGS

EASTEND RESERVOIR - STATION NO. 11AC055

ANNUAL EXTREMES OF WATER LEVELS IN METRES FOR THE PERIOD OF RECORD

YEAR	MAXIMUM INSTANTANEOUS WATER LEVEL	MAXIMUM DAILY WATER LEVEL	MINIMUM DAILY WATER LEVEL	YEAR
1946	---	917.875 ON APR 10	---	1946
1947	---	917.936 ON JUN 8	---	1947
1948	---	918.103 ON MAY 24	---	1948
1949	---	917.811 ON APR 26	---	1949
1950	---	917.863 ON MAY 13	---	1950
1951	---	917.905 ON JUN 10	---	1951
1952	---	917.875 ON APR 15	DRY ON APR 22 *	1952
1953	---	917.847 ON MAY 26	---	1953
1954	---	918.027 ON JUN 2	915.071 ON MAR 5	1954
1955	---	917.811 ON JUL 12	915.369 ON MAR 25	1955
1956	---	917.991 ON JUN 4	915.366 ON OCT 5	1956
1957	---	917.835 ON MAY 14	915.177 ON AUG 30	1957
1958	---	917.844 ON APR 18	915.391 ON MAR 1	1958
1959	---	917.966 ON MAY 2	---	1959
1960	---	918.048 ON MAY 3	915.074 ON OCT 10	1960
1961	---	917.863 ON MAY 9	913.851 ON AUG 29	1961
1962	---	918.283 ON APR 17	---	1962
1963	---	918.301 ON APR 7	DRY ON SEP 4	1963
1964	---	918.265 ON APR 12	---	1964
1965	---	918.240 ON MAY 28	---	1965
1966	---	918.256 ON APR 25	---	1966
1967	---	917.972 ON JUN 7	---	1967
1968	---	918.183 ON MAR 26	---	1968
1969	---	918.192 ON MAY 3	---	1969
1970	---	918.304 ON JUN 17	DRY ON SEP 4	1970
1971	---	918.353 ON MAY 20	---	1971
1972	---	918.875 ON APR 26 *	---	1972
1973	---	918.332 ON APR 26	---	1973
1974	918.350 AT 1530 CST ON APR 28	918.320 ON APR 28	---	1974
1975	---	918.405 ON JUN 23	915.476 ON MAR 20	1975
1976	918.362 AT 1800 CST ON APR 1	918.335 ON MAY 15	915.430 ON SEP 21	1976
1977	---	918.155 ON JUL 1	DRY ON AUG 21	1977
1978	918.457 AT 0700 CST ON MAY 12 *	918.442 ON MAY 12	---	1978
1979	---	918.199E ON MAY 28	---	1979

WATER LEVELS REFERRED TO GEODETIC SURVEY OF CANADA DATUM

E - ESTIMATED

* - EXTREME RECORDED FOR THE PERIOD OF RECORD

French Version (reduced from Publication size)

24

SAINT-LAURENT (FLEUVE) AU PONT MERCIER - STATION NO. 020A017

NIVEAUX MOYENS MENSUELS ET ANNUELS EN METRES POUR TOUTE LA PERIODE D'OBSERVATION

ANNEE	JAN	FEV	MAR	AVR	MAI	JUN	JUL	AOU	SEP	OCT	NOV	DEC	MOYEN	ANNEE
1954	---	---	---	---	---	---	---	---	1.414	1.663	1.699	1.632	---	1954
1955	1.639	1.482	1.755	2.518	1.943	1.698	1.534	1.417	1.327	1.343	1.561	1.465	1.640	1955
1956	1.433	1.266	1.302	1.893	2.024	1.874	1.628	1.521	1.565	1.477	1.309	1.272	1.547	1956
1957	1.460	1.318	1.429	1.466	1.474	1.399	1.634	1.276	1.235	1.202	1.269	1.278	1.371	1957
1958	1.276	1.179	1.258	1.719	1.326	1.260	1.231	1.008	1.037	1.081	0.973	0.886	1.186	1958
1959	0.720	0.891	0.929	1.572	1.455	1.297	1.064	0.838	0.763	0.714	0.920	1.179	1.028	1959
1960	1.361	1.291	1.249	1.938	2.036	1.598	1.767	1.497	1.202	0.913	0.970	1.024	1.404	1960
1961	1.389	1.188	1.099	1.400	1.605	1.776	1.642	1.443	1.382	1.238	1.052	1.139	1.364	1961
1962	1.246	1.224	1.126	1.386	1.264	1.045	1.006	1.034	0.997	0.996	1.013	1.019	1.112	1962
1963	1.194	1.122	0.943	1.298	0.981	0.956	0.939	0.963	0.970	0.945	0.966	1.208	1.040	1963
1964	1.311	1.086	1.019	1.008	0.895	0.907	0.856	0.866	0.858	0.867	0.827	0.827	0.944	1964
1965	0.990	0.986	0.729	0.923	0.934	0.771	0.807	0.919	1.000	1.279	1.245	1.320	0.992	1965
1966	1.459	1.409	1.635	1.627	1.305	1.187	1.052	1.078	1.065	1.045	1.123	1.449	1.285	1966
1967	1.349	1.457	1.145	1.714	1.608	1.429	1.308	1.250	1.210	1.514	1.993	1.852	1.485	1967
1968	1.549	1.633	1.579	1.949	1.486	1.322	1.490	1.488	1.552	1.464	1.449	1.423	1.530	1968
1969	1.659	1.608	1.579	2.090	2.087	1.956	1.861	1.824	1.620	1.425	1.517	1.461	1.724	1969
1970	1.509	1.414	1.359	1.721	1.828	1.631	1.613	1.618	1.490	1.567	1.642	1.628	1.586	1970
1971	1.628	1.570	1.619	2.181	2.243	1.694	1.486	1.447	1.476	1.420	1.288	1.277	1.610	1971
1972	1.332	1.427	1.487	2.087	2.426	2.105	2.174	2.089	2.003	1.957	2.041	1.753	1.908	1972
1973	1.700	1.883	2.362	2.527	2.497	2.412	2.284	2.038	1.959	1.929	1.828	1.686	2.093	1973
1974	1.774	1.803	2.080	2.471	2.759	2.501	2.236	2.045	1.891	1.835	1.763	1.825	2.083	1974
1975	1.619	1.545	1.882	2.173	2.062	2.014	1.727	1.606	1.624	1.716	1.764	1.665	1.784	1975
1976	1.631	1.757	2.100	2.676	2.519	2.268	2.216	2.008	1.876	1.875	1.782	1.651	2.013	1976
1977	1.738	1.328	1.807	2.181	1.855	1.467	1.339	1.416	1.597	1.940	1.882	1.701	1.690	1977
1978	1.832	1.998	1.922	2.377	2.273	1.946	1.713	1.591	1.525	1.509	1.374	1.173	1.767	1978
1979	1.549	1.697	1.978	2.306	2.420	1.964	1.698	1.620	1.744	1.898	1.979	2.069	1.911	1979
MOYEN	1.454	1.422	1.495	1.888	1.812	1.619	1.532	1.436	1.399	1.416	1.432	1.410	1.524	MOYEN

PLAN DE REFERENCE - ARBITRAIRE

AJOUTER 18.000 m POUR OBTENIR LES COTES INTERNATIONAL DES GRANDS LACS

LOCATION - LAT 45 25 13
LONG 73 39 07

REGULARISE

REMARQUES - DONNEES DE 1954 A 1962 FOURNIES PAR LE SERVICE HYDROGRAPHIQUE DU CANADA

SAINT-LAURENT (FLEUVE) AU PONT MERCIER - STATION NO. 020A017

NIVEAUX EXTREMES ANNUELS EN METRES POUR TOUTE LA PERIODE D'OBSERVATION

ANNEE	NIVEAU MAXIMUM INSTANTANE	NIVEAU MAXIMUM QUOTIDIEN	NIVEAU MINIMUM QUOTIDIEN	ANNEE
1954	---	---	1.318 LE 10 SEP	1954
1955	2.809 LE 7 AVR A 2300 HNE	2.732 LE 23 AVR	1.190 LE 6 OCT	1955
1956	2.263 LE 17 AVR A 2000 HNE	2.223 LE 1 MAI	0.940 LE 31 DEC	1956
1957	1.967 LE 6 JUL A 1600 HNE	1.919 LE 6 JUL	0.956 LE 18 DEC	1957
1958	1.989 LE 30 MAR A 2100 HNE	1.928 LE 5 AVR	0.544 LE 12 DEC	1958
1959	1.955 LE 11 AVR A 2100 HNE	1.885 LE 12 AVR	0.306 LE 10 JAN	1959
1960	2.574 LE 24 AVR A 0030 HNE	2.495 LE 24 AVR	0.800A LE 18 OCT	1960
1961	1.885 LE 17 JUN A 0005 HNE	1.846 LE 16 JUN	0.904 LE 20 MAR	1961
1962	2.047 LE 9 AVR A 2231 HNE	1.906E LE 10 AVR	0.834A LE 28 MAI	1962
1963	---	1.839E LE 5 AVR	0.730E LE 17 MAR	1963
1964	---	1.696E LE 2 JAN	0.623E LE 20 DEC	1964
1965	1.577 LE 31 DEC A 2359 HNE	1.471 LE 31 DEC	0.450 LE 28 MAR	1965
1966	1.940 LE 26 MAR A 0520 HNE	1.891 LE 25 MAR	0.962 LE 9 OCT	1966
1967	---	2.092E LE 16 NOV	0.803 LE 26 MAR	1967
1968	2.233 LE 2 AVR A 1610 HNE	2.214 LE 2 AVR	0.943 LE 18 DEC	1968
1969	2.367 LE 24 AVR A 2130 HNE	2.330 LE 24 AVR	1.254 LE 25 DEC	1969
1970	2.016 LE 16 AVR A 2230 HNE	1.998 LE 7 MAI	1.056 LE 22 MAR	1970
1971	2.891 LE 23 AVR A 0525 HNE	2.864 LE 22 AVR	1.087 LE 6 DEC	1971
1972	2.757A LE 7 MAI	2.757A LE 7 MAI	1.087 LE 16 JAN	1972
1973	2.970 LE 19 MAR A 0430 HNE	2.952 LE 19 MAR	1.312 LE 25 DEC	1973
1974	2.967 LE 23 MAI A 1905 HNE	2.943 LE 23 MAI	1.486 LE 1 FEV	1974
1975	2.772 LE 21 AVR A 1419 HNE	2.751 LE 21 AVR	1.257 LE 27 JAN	1975
1976	3.159 LE 2 AVR A 0812 HNE	3.123 LE 2 AVR	1.184 LE 14 DEC	1976
1977	2.598 LE 16 MAR A 1845 HNE	2.556 LE 16 MAR	0.946 LE 27 FEV	1977
1978	2.833 LE 14 AVR A 2300 HNE	2.732 LE 15 AVR	0.885 LE 20 DEC	1978
1979	2.696 LE 26 MAR A 2212 HNE	2.647 LE 2 MAI	1.269 LE 1 JAN	1979

PLAN DE REFERENCE - ARBITRAIRE

AJOUTER 18.000 m POUR OBTENIR LES COTES INTERNATIONAL DES GRANDS LACS

A - JAUGE MANUELLE
(VOIR INDEX DE REFERENCE)

E - ESTIMATIVE

* - EXTREMES ENREGISTRES POUR TOUTE LA PERIODE D'OBSERVATION

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