

RRB-87-07

**WATERFORD RIVER BASIN
URBAN HYDROLOGY STUDY
HYDROLOGICAL SIMULATION PROGRAM
FORTRAN (HSFF)
A SAMPLE RUN ON CDC CYBER 171
by
H. Ng**

**National Water Research Institute
River Research Branch
Canada Centre for Inland Waters
Burlington, Ontario, L7R 4A6
April 1987
NWRI Contribution #87-101**

MANAGEMENT PERSPECTIVE

The Hydrological Simulation Program - FORTRAN (HSPF) is a mathematical computer model, which simulates the movement of water and pollutants through watersheds and rivers in both natural and man-made water systems.

HSPF is considered to be the most comprehensive management tool presently available for continuous simulation of hydrology and water quality in watersheds.

This document should be useful for users interested in applying HSPF in watershed studies.

PERSPECTIVE - GESTION

Le Programme de simulation hydrologique - FORTRAN (HSPF) est un modèle mathématique sur ordinateur qui simule le mouvement de l'eau et des polluants à l'intérieur des bassins et des rivières, dans des réseaux hydrographiques tant naturels qu'artificiels.

Le HSPF est considéré comme l'outil de gestion le plus complet actuellement disponible pour la simulation continue de l'hydrologie et de la qualité des eaux dans des bassins hydrographiques.

Le présent document devrait être utile aux personnes intéressées à appliquer le HSPF aux études de bassins hydrographiques.

ABSTRACT

The Hydrologic Simulation Program - FORTRAN (HSPF) of the U.S. Environmental Protection Agency has been used for continuous simulation of streamflow in the Waterford River Basin. Details of setting-up and running the model on the NWRI CYBER 171 computer system are presented together with a sample run.

RÉSUMÉ

Le Programme de simulation hydrologique - FORTRAN (HSPF) de l'Agence de protection de l'environnement américaine a été utilisé pour la simulation continue du débit de l'eau dans le bassin de la rivière Waterford. Les détails de la préparation et de l'exécution du modèle sur le système informatique CYBER 171 du NWRI sont exposés, et l'on donne un exemple d'exécution.

INTRODUCTION

The Waterford River Basin Urban Hydrology Study was jointly initiated by the Department of Environment of the Province of Newfoundland and Environment Canada. The main objectives of the study were to examine the urbanization processes leading to changes in the hydrologic and water quality regimes in the Waterford River Basin, to provide a hierarchy of mathematical models describing such processes, and to recommend solutions to specific water management problems in the basin. Watershed modelling was a major component of the study and was done for two different types of catchments - fully urbanized seweried catchments and for the entire urbanizing basin. In each case, it was possible to use the existing models which had been previously selected and recommended by the modelling subcommittee.

The modelling of surface runoff in fully urbanized seweried catchments was done by means of the ILLUDAS (The Illinois Urban Drainage Area Simulator, ref. 8) and SWMM (The Stormwater Management Model of the U.S. Environmental Protection Agency, ref. 4) models. For the entire river basin, it was recommended to model the basin hydrological response at two levels of complexity. At the first level, a relatively simple event model was to be used for the modelling of high flows in the basin. For this purpose, the HYMO model (The Hydrologic Model of the U.S. Department of Agriculture, ref. 10) was used. Such work has been completed and reported elsewhere (6), (7), (9). The report that follows, documents the procedures for the installation and running of the HSPP model, release

7, on the NWRI CYBER 171 computer system. The report should be helpful in the future use of the HSPP model on the NWRI CYBER system.

DESCRIPTION OF HSPP MODULES

HSPP Modules

The HSPP is a set of computer codes that can continuously perform simulation on hydrologic and associated water quality processes in pervious and impervious land surfaces and in streams and well-mixed reservoirs. The HSPP is built on a systematic framework which consists of a set of modules. The modules are arranged in a hierarchical mode that permits continuous simulation of a range of hydrologic and water quality processes. The reduced HSPP version used in the Waterford River Basin contains three application modules and five utility modules.

HSPP Module Functions

The HSPP Module Functions are shown in Figure 1.

HSPP Overview

The HSPP model is controlled by a User's Control Input (UCI) file which specifies the modules (i.e. PERLND, IMPLND, RCHRES, COPY, PLTGEN, DISPLAY, DURANL, GENER) along with hydrologic, hydraulics and

atmospheric parameters required to input to the model. An overview of the HSPP model is shown in Figure 2.

PREPARATION FOR SET-UP OF HSPP MODELS

Source of Program Codes

Prior to set up of a HSPP model run, it is desirable to obtain the current version of the program. The complete HSPP system including the source code, documentation and stand alone programs is available on tape and may be obtained by writing to:

Center for Water Quality Modeling
U.S. Environmental Protection Agency
College Station Road
Athens, GA 30613
U.S.A.

The tape includes the following files as given in (3) and repeated here:

- source code for HSPP
- input sequence to compile HSPP
- object code HSPP
- input sequence to link HSPP
- HSPP Information File (INFOFL)

- HSPF Error File (ERRFL)
- HSPF Warning File (WARNFL)
- HSPF test input
- HSPF test output
- lists of HSPF subroutines (by number and alphabetically)
- HSPF User's Manual (text only)
- HSPF OSV's and data structures
- PERLND variable memory addresses (for use in SPECIAL ACTIONS,
available in Release 8 version)
- source code for NEWTSS
- IBM input sequence to compile and link NEWTSS
- NEWTSS INFOFL
- NEWTSS ERRFL
- NEWTSS test input
- NEWTSS test output
- FTABLE generation program

An example of the files in the distribution tape is shown in Appendix A. The installation instructions for HSPF (The User's Computer System) is given in Appendix B.

HSPF CYBER 171 Version

The HSPF CYBER version is an earlier version of HSPF Release 7(5). The original core storage requirement of 377K of this version was reduced to 177K for CYBER 171 by omitting submodules which simulate water quality. The following submodules for water quality simulation are eliminated in the HSPF CYBER 171 version:

Land Segment

MSTL - simulates the moisture and the fractions of solutes being transported in the soil layers
PEST - simulates pesticide behaviour
NITR - simulates nitrogen behaviour
PHOS - simulates phosphorus behaviour
TRAC - simulates the movement of a conservative tracer

Reach Section

FST - simulates general quality constituents
OXRX - simulates primary DO, BOD balances
NUTR - simulates primary inorganic nitrogen and phosphorus
PLNK - simulates plankton populations and association reaction
pH - simulates pH and carbon species

Subsequently, the example runs of HSPP on Waterford River Basin are limited to simulate water volume on the Land Segments and the streamflow on the Reach Sections.

Modification and Installation of HSPP

The modification of the HSPP model was conducted by the Water Planning and Management Branch (WPMB), IWD, Dartmouth, Nova Scotia and the modified model was installed on the Bedford Institute of

Oceanography (BIO) CDC CYBER 171 Computer. The modified HSPP CYBER 171 version was then transferred to NWRI under the terms of the Waterford River Basin Study.

HSPP Files Arrangement and Description

The modified CYBER version of the HSPP model is stored on the NWRI computing system tape inventory. Some of the file names of the WPMB version have been slightly changed and rearranged, but their basic contents of files remain the same.

The HSPP file arrangements and descriptions for the Waterford River Basin Study are listed below.

DATABASE - sequential file containing records of data to be input into the time series store file

TSSFL - time series store file, read by the HSPP program modules

HSPBINS - DUMPPF file containing the binaries for programs:
 HSPLOTB - plot program
 NEWTSSB - time series store program
 HSPFB - HSPP program

ERRMESS - DUMPPF file containing directories for fatal, informative and warning error messages for the NEWTSS and HSPP programs:
 HSPFERR - error message directory
 HSPFINF - informative message directory

HSPFWRN - warning message directory
NTSERR - error message directory file for NEWTSS
NTSINF - informative message directory for NEWTSS
SBNTSS - submit file for the NEWTSS run, which creates the structure and reserves the space for the TSS file
DAYNTSS - day file of NEWTWSS run
HSPPFMIN - submit file to transfer data set records from DATABASE file to TSSFL
DAYTSS - day file for the run of HSPPFMIN
OUTTSS - output file for the run of HSPPFMIN
HSPDAT - User Control Input (UCI) for the simulation run
HSPLLOT - plot program used to plot simulation results (note this program stores in the HSPBINS DUMPFF file)
HSPROC - procedure file containing the following procedures:
 HSPPFRUN - loads and runs program HSPP
 HSPP - allows the user to edit the UCI, then submit a job that runs the simulation and produce plots and hard copies of simulation results
DAYHSP - dayfile for the simulation run
OUTHSP - output file for the simulation run
REACH - Waterford River Basin user control input file to simulate 29 months of streamflow

As seen from the above listing, it requires more than 20 files in order to run the HSPP model.

DATABASE AND TIME SERIES STORE (TSS)

Time Series Inventory and TSS File Length Estimation

The time series worksheet provides a means of estimation of the TSS file length. Examples are given in Tables 1 and 2.

Dataset Compilation

The dataset for Waterford River Basin Study (1), (2) contains the following seven hydrometeorological parameters:

Dry bulb temperature

Wet bulb temperature

Wind movement

Precipitation

Radiation

Evaporation

Streamflow

Each dataset comprises a time series of hourly values for three years (0100 hour, May 1, 1980 to 2400 hour, May 31, 1983), except the evaporation parameter which is a mean daily value.

Label and Format of Sequential Datasets

The input datasets need to be labelled and formatted according to the HSPP manual specification (5) for transfer of data to or from sequential files.

The above time series datasets are labelled as follows:

HYTMPPF	-	dry bulb temperature (°C)
HYDPTF	-	wet bulb temperature (°C)
HYWNDS	-	wind movement (km/h)
TIPBUC	-	precipitation (mm)
HYDRADL	-	radiation (langley)
DHYLEVF	-	evaporation (mm/d)
HYWATA	-	streamflow (m³/s)

The HSPF Release 7 supported the following formats input:

input of 5 minute data

input of 15 minute data

input of 60 minute data

input of 24 hour data

input of semi-monthly data

input of monthly data

Further details of formats and fields for each of the above data classes can be found in (5). Note also that HSPF supports user's format through FORMAT BLOCK. A typical example of the labelling and formatting of sequential dataset is presented in Appendix C.

TSS SET-UP

Creates Disk Space for the TSS

As mentioned before, the stand alone program NEWTSS has to be run to create the TSS file which is used by the HSPF modules. After the

data set has been compiled, labelled and formatted, there are two steps to be followed in order to create the TSS file (TSSFL). The first step is to create disk space by using a submit file SBNTSS which is shown in Appendix D, along with the output for TSS file space created as shown in Appendix E. Essentially, the SBNTSS inputs four types of information contained in OPNTSS to the binary program NEWTSSB which creates disk space for the TSS file called TSSFL. This information is:

TSS File No.

Record Length

Max. DSNO (Dataset number)

TSS File Length

The files required to run SBNTSS are shown in Figure 3. The second step is to label the datasets and copy them to the TSSFL which is created by the SBNTSS. Examples are given in the following sections.

Labelling and Copying Dataset to TSSFL

A submit file called HSPPMIN takes seven datasets from the database (DATABASE) file, and each dataset is labelled with the following information:

Dataset no. =

Space = "

Name =

Time step =

Compression =

Year or	=
Nmem	=
Station	=
Gap code	=
Unit	=
Member name	=
Ncomp	=
Kind	=
Format	=

The HSPFMIN is then copied from the seven files separately to a tape file (called FORTRAN unit, e.g. Tape 32). The HSPFMIN also copies TSSM and RUN blocks to Tape 5 (located after /EOR). These two blocks will label (TSSM) and copy (RUN) the datasets to TSSFL.

The HSPFMIN calls the procedure file HSPROC to run HSPFRUN file, to process each tape file record and to check out erroneous or missing information before it copies to TSSFL. An example of the HSPFMIN submit file is shown in Appendix F. A schematic of HSPFRUN is presented in Figure 4.

Completion of TSSFL

Once the TSSFL is successfully created, the TSS is ready for HSPF to proceed with simulation, or to display data contained in the TSSFL.

It may be noted that the steps needed to label and copy data to TSSFL were similar to a User Control Input (UCI) file for the HSPF

simulation run (to be discussed in the following sections). The nesting of the RUN and TSSM Blocks is shown in Figure 5.

To this end, unless the user wants to use the commands ADD, UPDATE, SCRATCH, EXTEND, SHOWSPACE, SHOWDSL, or SHOWTSS, the TSSM has completed the run and is usually not used after this point.

USER CONTROL INPUT (UCI) SIMULATION

UCI Set-Up

The User Control Input (UCI) is a collection of text lines into a group. Each group is headed by an operational module. A number of groups are nested within the RUN/END RUN block to form a file. This file is given a file name at user's choice. This file can be an independent submit file or it can be called by a procedure file. It is recommended to use the latter procedure, because it allows more flexibility. An example of groups nested within RUN/ENDRUN is given in Figure 6 and an example of Waterford River Basin User Control Input file is presented in Appendix G.

It should be noted that HSPP System will ignore any line in the UCI which contains three or more consecutive asterisks (****) and blank lines are also ignored, just as a Fortran Compiler bypasses comments "C" in the first column of a line in a source program.

Usually, a RUN of UCI file does not have to include all the modules as given in Figure 6.

Obviously, Figures 5 and 6 are similar in the UCI arrangement, except that the RUN Block in Figure 5 starts after the END TSSM.

Procedure File to Run UCI Job

Submitting an UCI for a HSPF run can be done either by considering the UCI file as a submit file by itself, or as a file to be called by a procedure file depending on the user's preference. The UCI run presented in this report was done using a procedure file. A procedure file job provides a number of advantages. It saves catalogue spaces, eliminates confusion, particularly in the case of a large computer program like HSPF. The files in the catalogue can be individually edited. For most obvious reasons, a procedure file is usually formed by only a few command statements. In the case of the Waterford River Basin study, two procedure files were grouped into one procedure file under the name of HSPROC which supports the HSPPMIN (putting time series data to TSS from DATABASE) and the HSPFRUN (to run HSPF program). Each can be called separately from a calling file within the CYBER system. The HSPROC file is presented in Appendix H.

Submitting an UCI JOB

After all the required files to run HSPF model are created, submission of an UCI job becomes simple. A typical example of submission of an UCI job for a HSPF run is given in Appendix I. The submit file provide an option for user to make any change in the

contents of the UCI before the submission job is complete. A submission job is given in Appendix I with further explanations using the following commands:

get is to get the indirect file call HSPROC
HSPROC is a submit file content information is given in Appendix H
begin procedure file use "begin" instead of "submit"
hspdat = user control input file replaced by another user control
 file input called REACH
plot = 1 for calcomp plotter, if plot = 0, for no plot
print = 1 for print out plotting values, if print = 0 for no print
 out
XEDIT to edit UCI file
??1/00005/locate the line no 00005 contents in the UCI file to be
 changed
00005 start 1981/01/01 End 1983/05/31 line 00005 content information
??m to modify the content of the line 00005
? change of the content of line 00005 as shown

If more lines of the UCI file need to be changed, repeat 1 to locate
the line number, otherwise quit, i.e.

??e,,rl file edition complete and submit the job

Results of the UCI Run

An example of the complete output for November 1-30, 1981 UCI run is presented in Appendix J. The simulation results displayed on a Calcomp plot are shown in Figure 7.

UTILITY MODULES

COPY

This utility module is used to transfer time series data specified in EXT SOURCE or NETWORK Block of the UCI to a target specified in the NETWORK or EXT TARGETS Block. Typical examples can be found in Appendix F, and detailed explanations are given on page 302 of ref. (5).

DISPLAY

This utility module is used to display Time Series in Convenient Tabular Format. The user specifies the time series in the EXT SOURCES or NETWORK Block. The DISPLAY module run can be an individual UCI file (as shown in Appendix K) to display Time Series data from TSS or it can be incorporated in a HSPPF application module run to display the results of the simulation run as shown in Appendix G, line no. 00289.

DURANL

This utility module examines the duration range values of a time series and computes a variety of statistics parameters. Examples are given in ref. (5) pages 309-315. However, this module was not used in the Waterford River Basin HSPF Streamflow Simulation.

FTABLES

The FTABLES are used exclusively in the RCHRES application modules. The FTABLES specify, in discrete form, a fixed numerical relationship between the depth, surface area and volume for a given section of a river reach. Details of the preparation of FTABLES can be found in ref. (5) pages 572 to 573 and examples are given in Appendix G, line nos. 00244 to 00287.

GENER

This utility module is used to generate a Time Series from one or two other time series. Detailed operation of this module is given in ref. (5) page 316. This module was not incorporated in Waterford River Basin HSPF streamflow simulation.

PLTGEN

This utility module prepares one or more time series for display on a plotter. The module directs time series to a disk file, PLOTFL, to be read by a program, HSPLIT. (A separate plot program written for Calcomp plotter on the NWRI CYBER system).

The contents of a sample PLOTFL are given in Ref. (5) on pages 303 and 304. A list of the HSPLIT is shown in Appendix K. A sample of a plot of one month's simulation run is presented in Figure 7.

SUMMARY

The procedure for making HSPF Runs can be summarized in the following steps:

1. NEWTSS Run

The NEWTSS is run first to create the structure and secure the space for the time series (TSS) file. Any changes are made to the input cards following the /EOR for changes to the file structure. The submit file is SBNTSS. The form of run is
/get,SBNTSS

/submit,SBNTSS,B

2. HSPFMIN Run

The second submit file is the first run of the HSPF program. It reads the time series data from the database file, labels the

datasets, and copies them to the TSS file. The submit file is HSPPMIN. The form of run is

/get,HSPPMIN

/submit,HSPPMIN,B

3. HSPF Run

Once the database is in the TSS file, the HSPF program can be run to produce water quantity and quality simulations. The user control input (UCI) controls what the program does by specifying the type of operations to be performed and which datasets of time series are to be used. A plot file can be produced by using PLTGEN Block to be read by the HSPLIT program for Calcomp plots.

The HSPF procedure allows the user to edit the UCI, then submits a job that runs the HSPF simulation and optionally produces plots. The form of run is

/get,HSPROC

/begin,HSPF,HSPROC,HSPDAT=UCI,PLOT=0 or 1,PRINT=0 or 1

where HSPDAT is the file containing the UCI

PLOT = 0 for no plot

PLOT = 1 for Calcomp plots

PRINT= 0 plotting values suppressed

PRINT= 1 printout plotting values on hard copy

CONCLUSIONS

The HSPF program is a structured programming design (5). The program is written in a pseudo code, which is an English-like

noncompilable language describing the program logic. The program is structured into application modules and supporting utility modules. The modules can be grouped together to make a run, or the modules can be run individually, provided that NEWTSS has been run first and the hierarchy of input, process and output are in order.

To modify or to well understand such a large computer program can be frustrating, because it is hard to visualize the relationship between various parts of the program. The "bugs" are difficult to locate. The flow chart resembles a bowl of spaghetti. The user input file represents a number of tables, one after another.

It takes a fair amount of time to set-up the program, in the range of weeks, if not months, particularly with a down-sized computing system, because the problems take a long time to solve.

Running HSPP requires working knowledge in systems programming and disk file management.

Preparation of the UCI file requires working knowledge in hydrologic and hydraulics terminology of water quantity simulation.

If water quality is to be simulated, preparation of the UCI file requires working knowledge not only in hydrologic and hydraulics terminology, but also in chemical terminology.

The HSPP operates in dimensions defined as quantities per unit base. Input or output dimensions of an element need to be converted in order to obtain the absolute value.

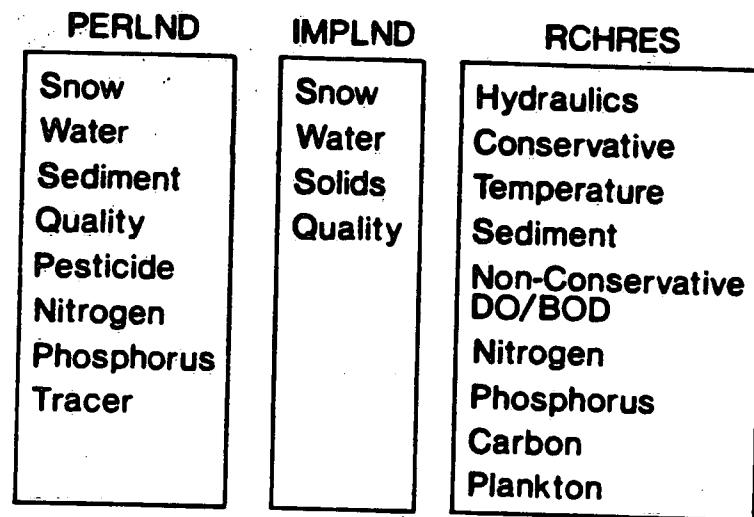
REFERENCES

1. Daurie, Glenn. Waterford River Basin Urban Hydrology Study - HSPF Database Compilation. J.E. Peters Management Limited, Dartmouth, Nova Scotia, Report 1.04, February, 1984.
2. Daurie, Glenn. A Sample Run of the Hydrological Simulation Program FORTRAN (HSPF) using the Waterford River Basin Database. J.E. Peters Management Limited, Dartmouth, Nova Scotia, Report 1.11, March, 1984.
3. Donigian, A.S. Jr., J.C. Imhoff, B.L. Bicknell, J.L. Kittle, Jr. Application Guide for Hydrological Simulation Program - FORTRAN (HSPF). Environmental Research Laboratory, EPA-600/3-84-065, Athens, Georgia, 30613, June, 1984.
4. Huber, W.C., J.P. Heaney, S.J. Nix, R.E. Dickinson and D.J. Polman. 1982. "Storm Water Management Model User Manual - Version III." Department of Environmental Engineering Sciences, University of Florida, Gainesville, Florida, 1982.
5. Johanson, R.D., J.C. Imhoff, Davis H. Harley, Jr. and Hydrocomp Incorporated. Users Manual for Hydrological Simulation Program - FORTRAN (HSPF). Release 7. 1980.
6. Marsalek, J., U. Panu and H.Y.F. Ng. Storm Runoff Study of Newtown Urban Catchment. Hydraulics Division, National Water Research Institute, Canada Centre for Inland Waters, Burlington, Ontario, Canada, March, 1985.

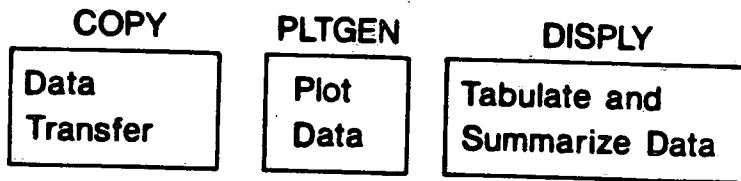
7. Ng, H.Y.F. and J. Marsalek. Streamflow Modelling in the Waterford River Basin. Waterford River Basin Study, NWRI Contribution, 1987.
8. Terstriep, M.L. and J.B. Stall. The Illinois Urban Drainage Area Simulator, ILLUDAS. Illinois State Water Survey Bulletin 58, 1974.
9. Water Planning and Management Branch, IWD, Environment Canada. Waterford River Basin Urban Hydrology Study, Watershed Modelling - HYMO. Atlantic Region, Water Planning and Management Branch, Dartmouth, Nova Scotia, February, 1985.
10. Williams, J.R. 1968. Runoff Hydrographs from Small Texax Blacklands Watersheds. U.S. Department of Agriculture, October, 1968.

Figure 1. HSPF Modules

HSPF APPLICATION MODULES FUNCTION



HSPF UTILITY MODULES FUNCTION



DURANL

GENER

Duration Analysis

Transform or Combine Data

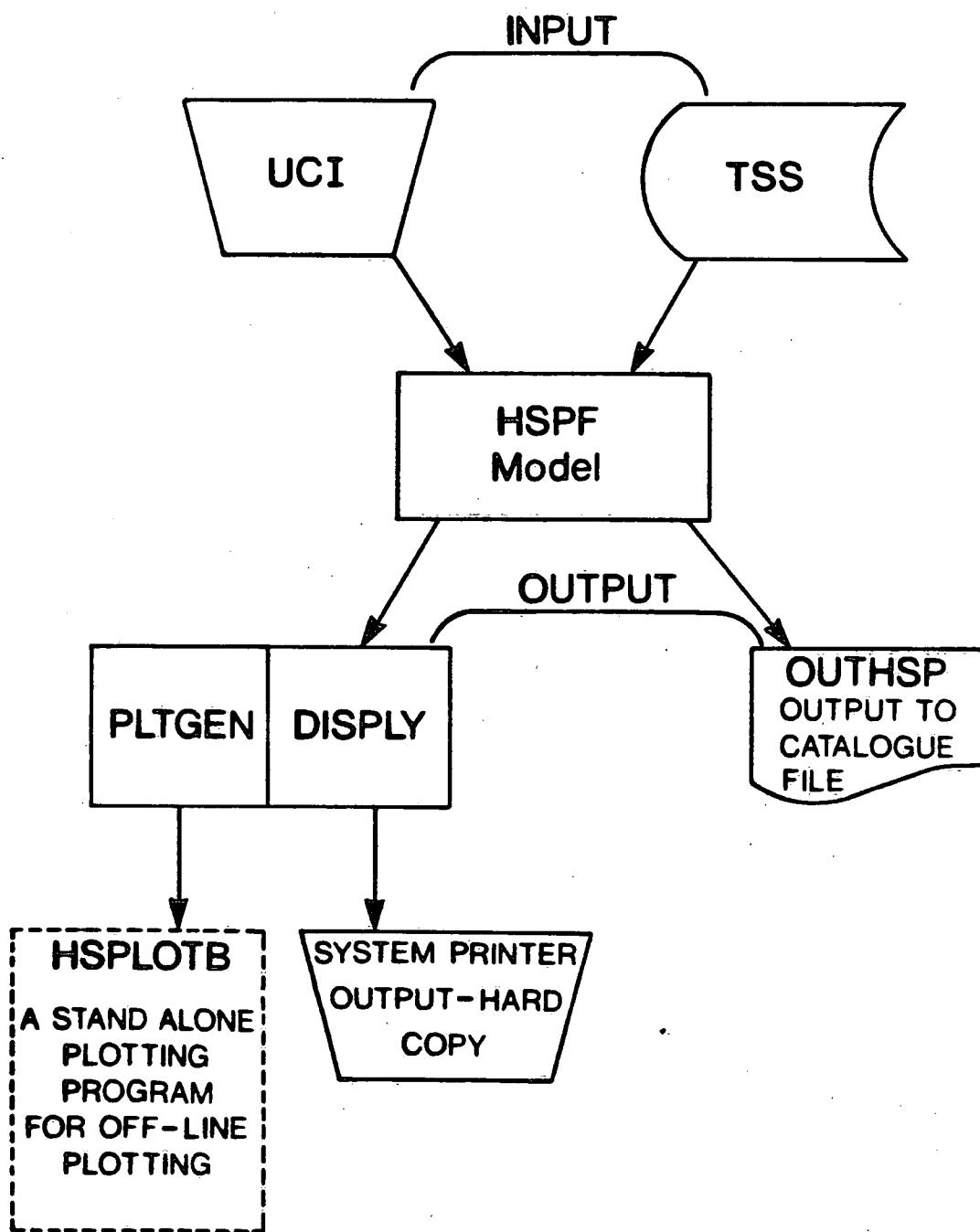
NEWTSS

A stand-alone program which creates or copies a time series store (TSS)

It must be run before a user can perform any HSPF module runs which require data to be stored in or retrieved from the TSS

Figure 2. HSPF OVERVIEW

HSPF OVERVIEW



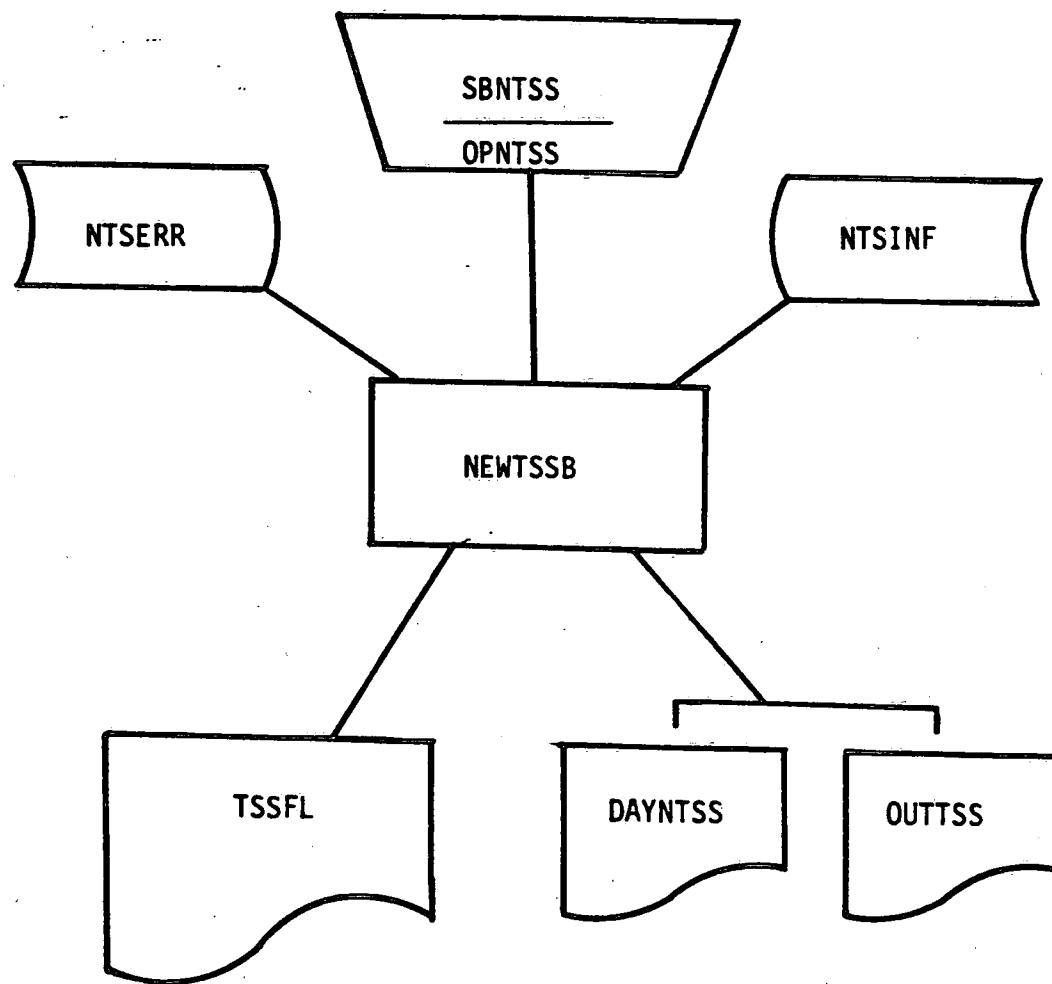
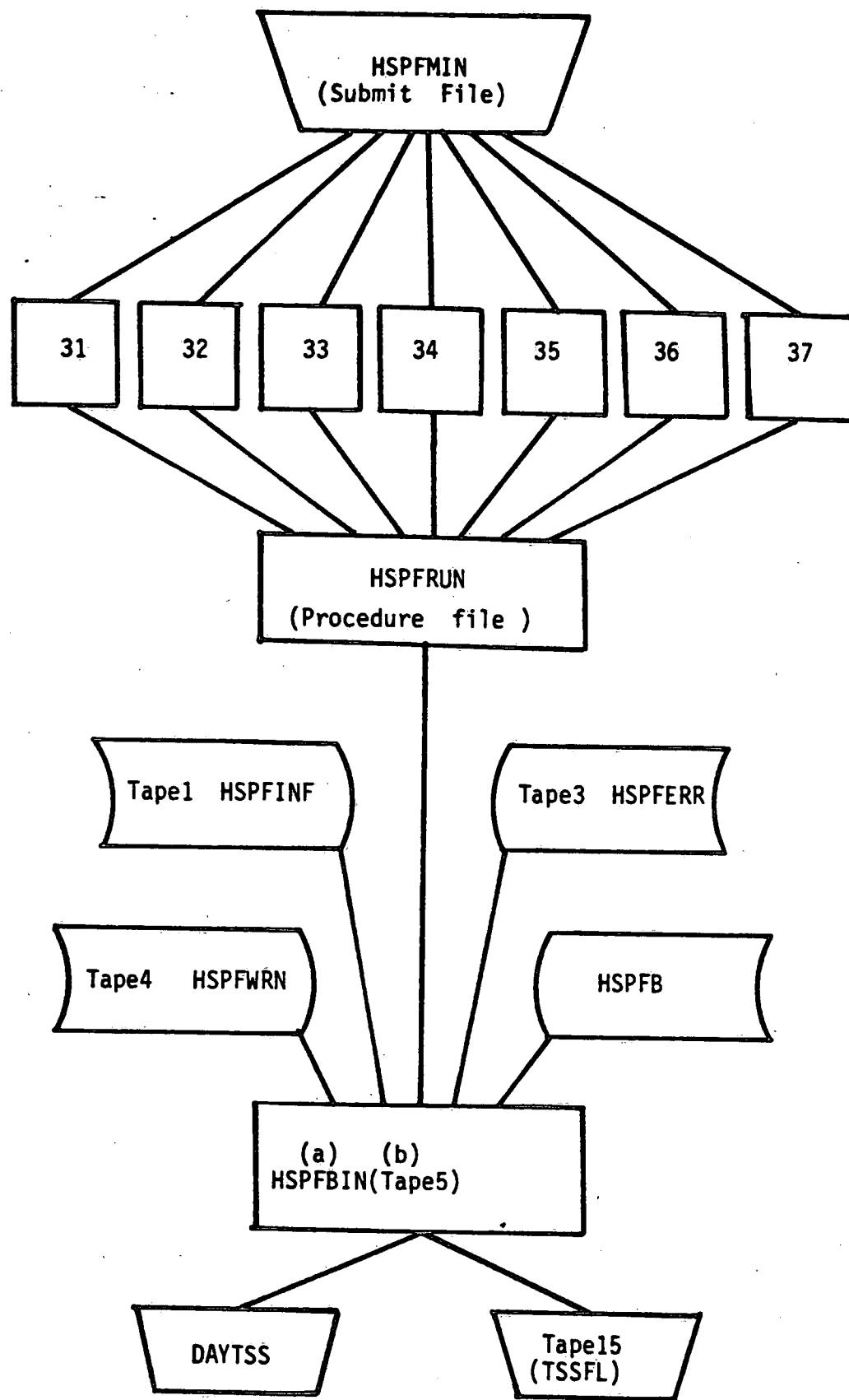


Figure 3. SBNTSS Submit File

Figure 4. Schematic Nesting Diagram to Create TSSFL.



(a) HSPFBIN replaced HSPFB(binary file of HSPF)

(b) Indicates that HSPF to process information of data contain in Tape5.

Figure 5. Nesting of TSSM and RUN Blocks

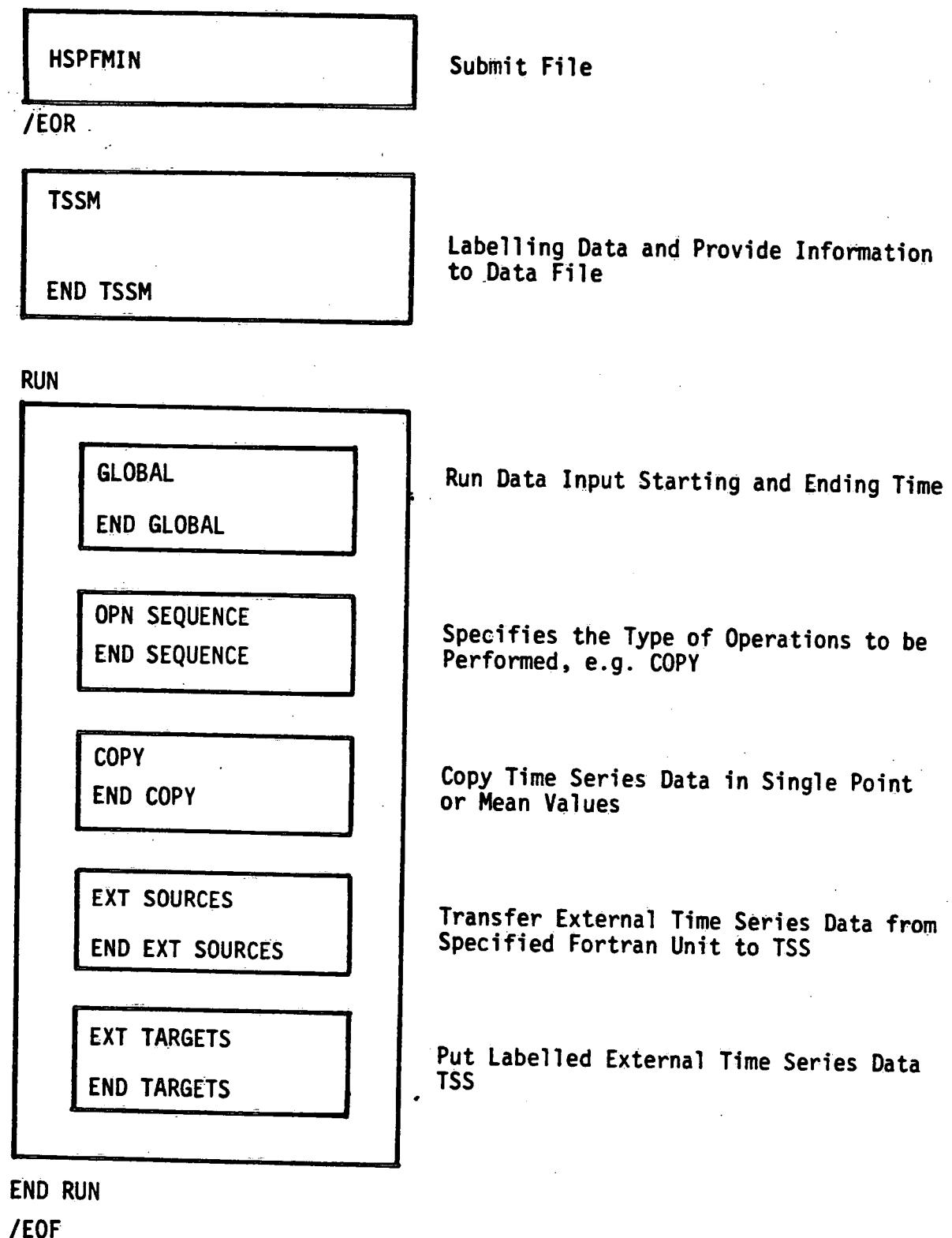
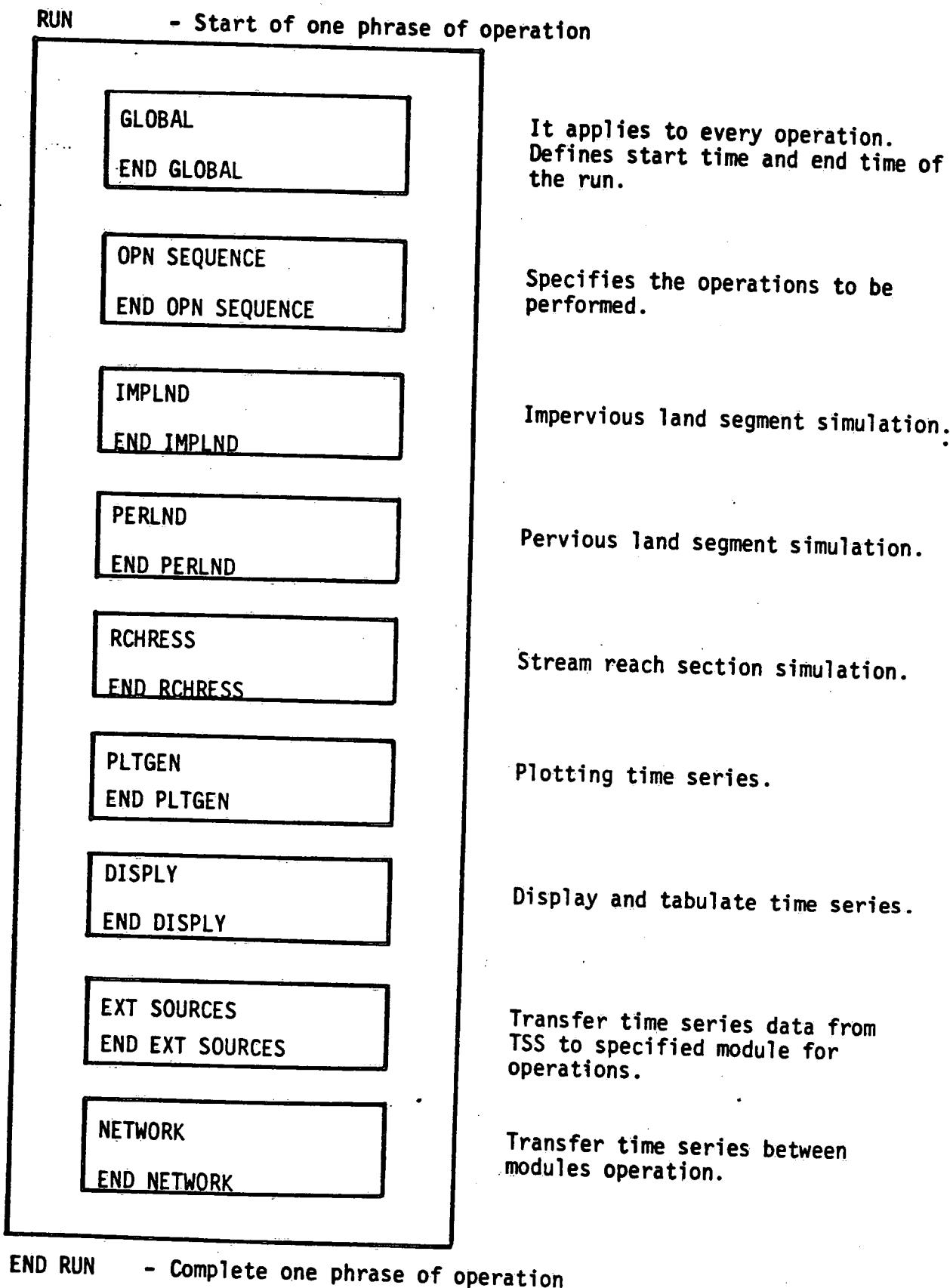


Figure 6. Groups Nesting of UCI File.



SIMULATED AND OBSERVED FLOWS

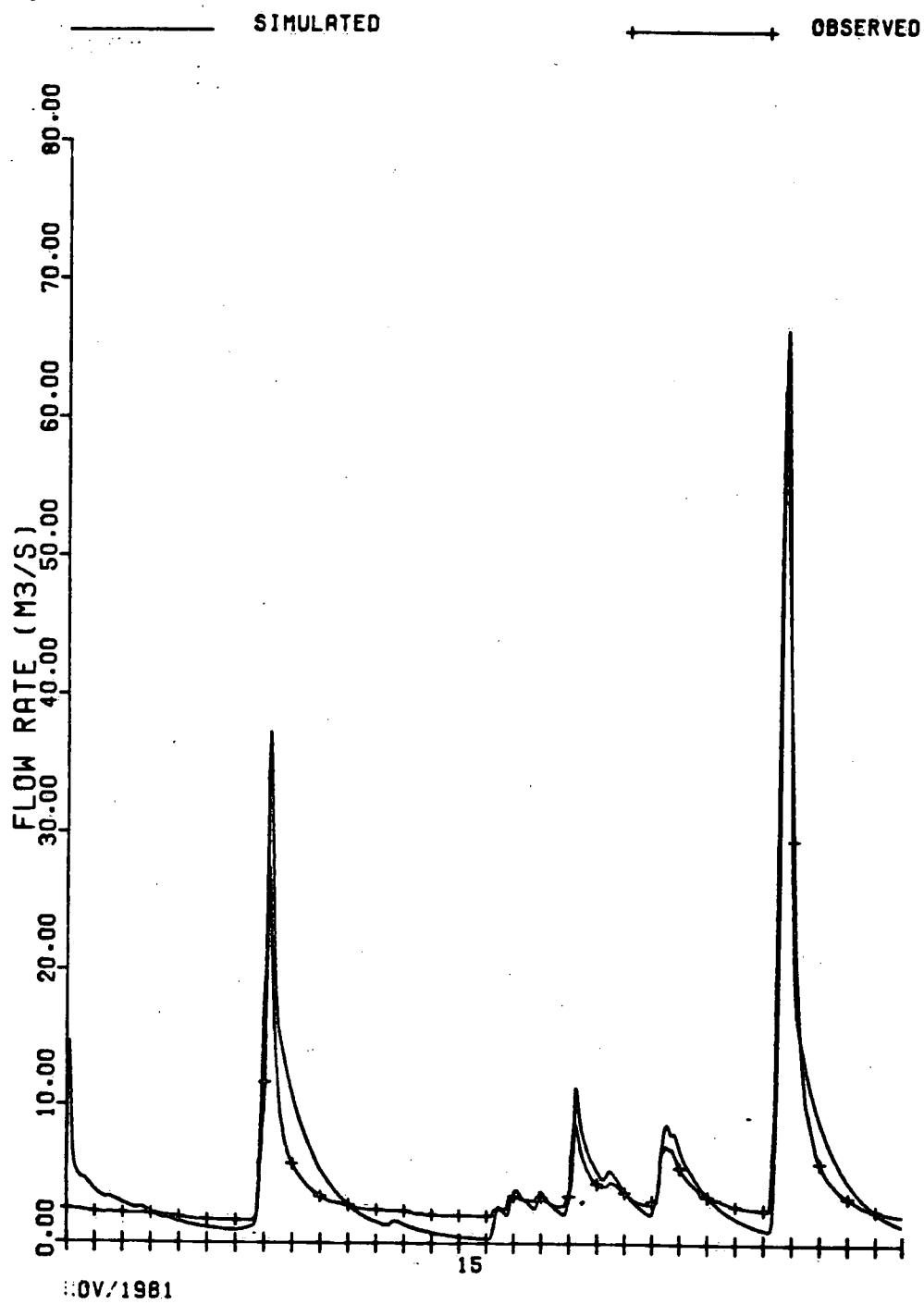


Figure 7. Example of Simulation Results Displayed on Calcomp Plot

TABLE 1. TIME SERIES DATA INVENTORY (TSI) WORKSHEET

APPLICATION : WATERFORD RIVER BASIN STUDY

TYPE (a)	LOCATION (b)	TIME STEP (c)	PERIOD (d)	SOURCE (e)	FORMAT (f)	COMMENTS (g)
HYTMPF	St. John's Airport, NFLD.	HOURLY	01/05/80 -31/05/83	WATER R.BR IWD, HALI FAX, N.S.	HSPF FORMAT	
HYDPTF	"	"	"	"	"	
HYWNDS	"	"	"	"	"	
TIPBUC	CANADA DEPT. OF AGRICULTURE	"	"	"	"	
HYRADL	"	"	"	"	"	
DHYPEVF	"	DAILY	01/05/80 -30/09/83	"	"	
DHYLEVF	"	DAILY	01/05/80 -31/05/83	"	"	
HYWATA	KILBRIDE NEWFOUNDLAND	HOURLY	01/05/80 31/05/83	WSC H02ZM008	"	

Table 2. TSS FILE LENGTH DETERMINATION (TSFLD) WORKSHEET

TIME STEP (a)	TIME STEP ¹ (b)	NUMBER OF CALENDAR YEARS (c)	START END DATA COMPRESS (d)	COMPRESS FRACTION (e)	TOTAL/DATASET (f) $b*(c-d)*e+1$	NUMBER OF DATASETS (g)	TOTAL SPACE (h) (f*g)
60	17.4	4	.92	1	55	1	55
60	17.4	4	.92	1	55	1	55
60	17.4	4	.92	1	55	1	55
60	17.4	4	.92	1	55	1	55
60	17.4	4	.92	1	55	1	55
60	17.4	4	.92	1	55	1	55
1440	.75	4	.67	1	4	1	4
					SUM TOTAL (j)	7 (k)	334

- (m) DIRECTORY SPACE($j*0.0117$) = 1 ** (n) MAX DATA SET NUMBER ($m*85$)= 85
- (p) ESTIMATED TSS FILE LENGTH($k+m$) = 335
- (q) TSS FILE LENGTH= 335
- (r) TSSUN² FOR NEWTSS= 23 (s) TSSFL FOR HSPF = 15

** round up to next integer

1 from ref.(5)

2 TSSUN - TSS unit no.

Appendix A. HSPF Files Contain in Distribution Tape

HSPF RELEASE 8.0 DISTRIBUTION TAPE

1600 BPI, NONLABLED, EBCDIC

FILE	LRECL	BLKSIZE	# RECS	DESCRIPTION
1	80	8000	151	DESCRIPTION OF TAPE CONTENTS
2	80	8000	1633	NEWTSS SOURCE, IBM VS FORTRAN VERSION
3	80	8000	20	IBM JCL TO COMPILE & LINK NEWTSS
4	80	8000	80	NEWTSS INFOFL
5	80	8000	200	NEWTSS ERRFL
6	80	8000	30	IBM JCL TO RUN NEWTSS
7	80	8000	4	NEWTSS TEST INPUT
8	135	8000	54	NEWTSS TEST OUTPUT
9	80	8000	163	HSPF SOURCE - MAIN
10	80	8000	12977	- A - IBM VS FORTRAN VERSION
11	80	8000	12933	- B - IBM VS FORTRAN VERSION
12	80	8000	9213	- C - IBM VS FORTRAN VERSION
13	80	8000	5598	- D - IBM VS FORTRAN VERSION
14	80	8000	8279	- E - IBM VS FORTRAN VERSION
15	80	8000	4928	- F - IBM VS FORTRAN VERSION
16	80	8000	10730	- G - IBM VS FORTRAN VERSION
17	80	8000	7879	- H - IBM VS FORTRAN VERSION
18	80	8000	4746	- I - IBM VS FORTRAN VERSION
19	80	8000	7623	- J - IBM VS FORTRAN VERSION
20	80	8000	10009	- K - IBM VS FORTRAN VERSION
21	80	8000	1950	- L - IBM VS FORTRAN VERSION
22	80	8000	3082	- M - IBM VS FORTRAN VERSION
23	80	8000	18	HSPF SOURCE
24	80	8000	?	IBM JCL TO COMPILE HSPF
25	80	8000	2960	IBM OBJECT CODE FOR HSPF
26	80	8000	8400	IBM JCL TO LINK HSPF
27	80	8000	9250	HSPF INFOFL
28	80	8000	8000	HSPF ERRFL
29	162	8000	750	HSPF WARNFL
30	80	8000	6156	HSPF TESTDATA FOR TEST RUN 3, DSN 91
31	80	8000	157	HSPF TESTDATA FOR TEST RUN 4, DSN 31
32	80	8000	732	HSPF TESTDAH1 FOR TEST RUN 4, DSN 32
33	80	8000	732	HSPF TESTDAH4 FOR TEST RUN 4, DSN 33
34	80	8000	732	HSPF TESTDAH5 FOR TEST RUN 4, DSN 34
35	80	8000	732	HSPF TESTDAH6 FOR TEST RUN 4, DSN 35
36	80	8000	142	HSPF TESTDATA3 FOR TEST RUN 4, DSN 36
37	80	8000	105	HSPF TESTDATA2 FOR TEST RUN 4, DSN 37
38	80	8000	36	HSPF TESTDATA8 FOR TEST RUN 5, DSN 57
39	80	8000	36	HSPF TESTDATA9 FOR TEST RUN 5, DSN 58
40	80	8000	72	IBM JCL TO RUN HSPF
41	80	8000	216	HSPF TEST RUN 2 INPUT
42	80	8000	37	HSPF TEST RUN 3 INPUT
43	80	8000	47	HSPF TEST RUN 4 INPUT
44	80	8000	37	HSPF TEST RUN 5 INPUT
45	80	8000	84	HSPF TEST RUN 6 INPUT
46	80	8000	239	HSPF TEST RUN 7 INPUT
47	80	8000	551	HSPF TEST RUN 8 INPUT
48	80	8000	469	HSPF TEST RUN 9 INPUT
49	80	8000	546	HSPF TEST RUN 10 INPUT
50	80	8000	370	HSPF TEST RUN 11 INPUT
51	80	8000	913	HSPF TEST RUN 12 INPUT
52	135	8000	147	HSPF TEST RUN 13 INPUT
53	135	8000	1172	HSPF TEST RUN 14 INPUT
54	135	8000	120	HSPF TEST RUN 15 OUTPUT
55	135	8000	132	HSPF TEST RUN 16 OUTPUT
56	135	8000	172	HSPF TEST RUN 17 OUTPUT
57	135	8000	604	HSPF TEST RUN 18 OUTPUT
58	135	8000	1266	HSPF TEST RUN 19 OUTPUT (GENERAL)
59	135	8000	2080	HSPF TEST RUN 20 OUTPUT (DISPLAY)
60	135	8000	392	HSPF TEST RUN 21 OUTPUT (GENERAL)
61	135	8000	362	HSPF TEST RUN 22 OUTPUT (PLTGEN)
62	135	8000	7406	HSPF TEST RUN 23 OUTPUT (GENERAL)
63	135	8000	9042	HSPF TEST RUN 24 OUTPUT (PLTGEN)
64	135	8000	2136	HSPF TEST RUN 25 OUTPUT (GENERAL)
65	135	8000	3900	HSPF TEST RUN 26 OUTPUT (PLTGEN)
66	135	8000	9390	HSPF TEST RUN 27 OUTPUT (GENERAL)
67	135	8000	392	HSPF TEST RUN 28 OUTPUT (PLTGEN)
68	135	8000	250	HSPF TEST RUN 29 OUTPUT (DISPLAY)
69	135	8000	2102	HSPF TEST RUN 30 OUTPUT (DISPLAY)
70	80	8000	6020	HSPF OSVS AND DATA STRUCTURES
71	80	8000	8000	EXTERNAL PROGRAM LIST OF SUBROUTINES
72	80	8000	150	EXTERNAL PROGRAM TO MAKE FTABLE FROM HSPX SECT.
73	80	8000	194	EXTERNAL PROGRAM TO CONVERT MAX-MIN TEMP TO HOUR
74	80	8000	210	IBM JCL TO CREATE INTERNAL FILES USED BY HSPF

Appendix B. HSPF Installation Instructions

IBM INSTALLATION INSTRUCTIONS FOR HSPF RELEASE 8.0

NOTE: JCL WILL REQUIRE MODIFICATIONS FOR YOUR SYSTEM.

1. COPY THE FOLLOWING FILES FROM TAPE TO DISK USING IEBGENER OR AN EQUIVALENT UTILITY.

FILE	DESCRIPTION	DISK LRECL	DISK BLKSIZE
4	NEWTSS INFOFL	80	80
5	NEWTSS ERRFL	80	80
26	HSPF INFOFL	84	84
27	HSPF ERRFL	80	80
28	HSPF WARNFL	80	80

THESE FILES ARE USED AS DIRECT ACCESS FILES WITH NEWTSS AND HSPF;
THEREFORE, THEY MUST NOT BE BLOCKED.

2. INSTALL NEWTSS USING SOURCE CODE IN FILE 2 AND JCL IN FILE 3.
EXECUTE A TEST OF NEWTSS USING JCL IN FILE 6 AND INPUT IN FILE 7.
COMPARE OUTPUT WITH TEST OUTPUT IN FILE 8. NEWTSS CREATES A TIME SERIES
STORE (TSS) THAT WILL BE USED BY HSPF.
3. INSTALL HSPF USING OBJECT CODE IN FILE 24 AND JCL IN FILE 25. IF
DESIRED, HSPF MAY BE COMPILED USING THE SOURCE CODE IN FILES 9 THRU 22.
4. CREATE INTERNAL FILES USED BY HSPF USING JCL AND UTILITY PROGRAM IN FILE
74.

5. EXECUTE HSPF USING TEST INPUT IN FILES 40 THRU 51, JCL ON FILE 39, AND
TEST TIMESERIES ON FILES 29 THRU 38. APPENDIX II OF THE USER'S MANUAL
DESCRIBES THE DETAILS OF THE TEST RUNS. COMPARE OUTPUT FROM THE RUNS
WITH THE OUTPUT FOUND ON FILES 52 THRU 68.

EXECUTION TIME AND DISK I/O FOR THE RUNS ON A 370/168 ARE AS FOLLOWS:

RLN	CPU(MIN:SEC)	I/O	NOTES
1	:02	224	NEWTSS
2	:13	6023	
3	:04	554	
4	:20	698	
5	:03	380	
6	:36	2648	
7	1:11	3774	
8	:04	586	
9	3:06	6534	
10	3:48	6981	
11	1:18	3954	
12	9:58	17809	PRODUCES UNDERFLOW WARNINGS
13	1:06	6296	

6. IT MAY BE USEFUL TO PRINT A COPY OF FILE 69 (THE HSPF OSVS AND DATA
STRUCTURES) AND FILE 70 (THE HSPF SUBROUTINE LIST).
7. FILES 71 THRU 73 ARE SMALL EXTERNAL UTILITY PROGRAMS.

Appendix C. Typical Example of Dataset Compilation

```

HYTMPC. B1 1 1 1 -.6 -.8 -1.2 -1.6 -1.9 -1.8 -1.8 -2.0 -2.1 -2.1 -2.3 -2.5
DRY BULB B1 1 1 2 -2.5 -2.1 -2.3 -2.9 -3.4 -3.6 -3.8 -4.2 -4.6 -4.2 -4.4 -4.1
TEMP. B1 1 2 1 -3.9 -3.8 -3.1 -2.9 -3.5 -3.3 -3.0 -2.7 -3.0 -2.4 -1.8 -1.9
DATA. B1 1 2 2 -1.4 -.9 -1.2 -1.6 -2.2 -3.1 -2.7 -2.9 -2.8 -2.6 -2.3 -1.6
B1 1 3 1 1.4 -1.2 -.8 -.5 .1 .8 1.4 1.8 1.6 1.6 1.6 .8
--EOR--
HYDPTF. B1 1 1 1 -7.9 -7.3 -8.8 -9.5 -8.8 -8.6 -8.8 -7.9 -8.2 -7.9 -7.2 -7.8
DEW POINT B1 1 1 2 -7.9 -9.5-10.1 -9.5-10.4-10.5-10.8-10.5-10.4-10.4-10.8-9.7
TEMP. B1 1 2 1 -9.6 -9.4 -9.2 -8.8 -7.9 -7.4 -7.2 -6.8 -6.9 -6.3 -6.1 -6.1
DATA. B1 1 2 2 -6.1 -6.0 -5.7 -5.7 -6.0 -6.7 -6.2 -6.6 -6.4 -6.0 -6.0 -5.5
B1 1 3 1 -5.1 -4.6 -4.1 -3.6 -2.8 -2.8 -1.8 -2.8 -3.5 -2.8 -3.4 -4.4
--EOR--
HYWNDS. B1 1 1 1 31. 35. 41. 33. 31. 26. 22. 28. 28. 28. 22. 30.
WIND B1 1 1 2 28. 30. 30. 22. 19. 20. 15. 22. 9. 9. 9. 9.
SPEED B1 1 2 1 6. 19. 19. 28. 28. 28. 22. 28. 24. 15. 24. 22.
DATA. B1 1 2 2 19. 11. 11. 4. 6. 8. 11. 11. 19. 19. 26. 30.
B1 1 3 1 46. 33. 30. 33. 22. 24. 19. 41. 37. 37. 41. 56.
--EOR--
TIPBUC. B1 1 2 1 0.0 0.0 0.0 .5 2.1 2.1 2.1 3.2 .9 0.0 0.0 0.0
TIPPING B1 1 2 2 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
BUCKET B1 1 3 1 1.1 1.9 .2 .1 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.2
DATA. B1 1 4 1 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.3
B1 1 4 2 1.9 2.0 2.0 2.2 1.5 2.2 .2 0.0 0.0 0.0 0.0 0.0 2.0
--EOR--
HYRALDL. B1 1 1 1 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 .10 1.00 3.11 4.64 5.38
RADIATION B1 1 1 2 6.6413.2913.10 3.73 .19 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
DATA. B1 1 2 1 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 .10 1.72 9.5612.8313.38
B1 1 2 2 215.3013.48 9.82 2.72 .26 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
B1 1 3 1 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 .26 1.72 5.54 0.2015.30
--EOR--
DHYPEUF B1 61 2.9 6.4 4.8 2.5 3.6 5.8 1.8 2.4 2.4 2.4 4.2
OF B1 62 .3 1.9 3.1 4.8 3.8 4.6 4.0 3.2 7.8 3.4
DAILY B1 63 2.6 3.0 5.0 7.2 4.8 4.5 2.0 1.9 8.6 7.1
PAN B1 71 5.1 12.0 7.2 11.4 5.8 .2 3.8 9.0 4.8 7.7
EVAP. B1 72 .4 1.8 3.2 2.2 1.8 7.2 7.2 4.8 4.8 .4
--EOR--
LAKE B1 11 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
EVAP. B1 12 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
DHYLEUF B1 13 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
*ALL B1 21 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
*ALL B1 22 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
--EOR--
HYWATA. B1 1 1 1 4.13 4.13 4.13 4.13 4.13 4.13 4.13 4.13 4.13 4.13 4.13 4.13
STREAM- B1 1 1 2 4.13 4.13 4.13 4.13 4.13 4.13 4.13 4.13 4.13 4.13 4.13 4.13
FLOW B1 1 2 1 2.28 2.28 2.28 2.28 2.28 2.28 2.28 2.28 2.28 2.28 2.28 2.28 2.28
DATA B1 1 2 2 2.28 2.28 2.28 2.28 2.28 2.28 2.28 2.28 2.28 2.28 2.28 2.28 2.28
DLY MNS B1 1 3 1 2.04 2.04 2.04 2.04 2.04 2.04 2.04 2.04 2.04 2.04 2.04 2.04 2.04

```

Appendix D. SBNTSS Submit File to Create Disk Space for TSS by Using NEWTSS Program

```
/JOB
/NDSSEQ
SBNTSS. NG
/READ,ACCOUNT
PURGE,TSSFL/NA.
PURGE,TAPE15/NA.
DEFINE,TAPE15
ATTACH,ERPMESS
LOADFF,B=ERPMESS,L0,L=0,Z./*S,NTSINF,NTSERR
RENAME,TAPE1=NTSINF
RENAME,TAPE2=NTSERR
DEFINE,TAPE23=TSSFL
ATTACH,HSPBINS
LOADPF,B=HSPBINS,L0,L=0,Z./*S,NEWTSSB
NEWTSSB
SKIP,NOerrs.
EXIT
ENDIF,NOerrs.
PURGE,TAPE15/NA.
DAYFILE,DAYNTSS
REPLACE,DAYNTSS
REWIND,OUTPUT
COPYCF,OUTPUT,OUTNTSS
REPLACE,OUTNTSS.
/EOP
@PNTSS
TSS FILE NO= 23
RECORD LENGTH= 512
MAX. DSNO= 85
TSS FILE LENGTH= 319
END
/EOF
```

Appendix E. Disk Space Successfully Created by NEWTSS Program on Unit 23

OPNTSS BLOCK

NSP.FORTRAN.NEUTSS PROGRAM

DECMO USER'S INPUT RECORDS:

0 TSS FILE NO. 23
0 RECORD LENGTH: 512
0 MAX. DSN# 1
0 TSS FILE LENGTH: 319
0 VARIABLE DIR. DSN HAS BEEN DEFAULTED TO 1.
0 TSS DIRECTORY CAPACITY: 05

DTSS SUCCESSFULLY OPENED ON UNIT 23.

0 SUMMARY INFORMATION
0 FILE SIZE: 319
RECORD LENGTH: 512
DIRECTORY NO: 1
MAX. DSN# 05
FREE SPACE: 317 RECORDS.

DEND OPNTSS BLOCK

DEND OF NEUTSS PROGRAM.

Appendix F. HSPFMIN Submit File to Label and Copy Dataset from Database File to TSS

(1)

```

//JDR
/MCSEQ,
HSPFMIN,T1100.
/READ,ACCOUNT,
  EXECUTE,OUTPUT,DEF,DC=LP,UN=UTPRINT,
  ATTACH,DATABASE1,
  COPYBR,DATABASE1,TAPE32.
  *HYTMPPF,
  REWIND,TAPE32,
  COPYBR,DATABASE1,TAPE33.
  *HYDPTF,
  REWIND,TAPE33,
  COPYBR,DATABASE1,TAPE36.
  *HYWINDS,
  REWIND,TAPE36,
  COPYBR,DATABASE1,TAPE31.
  *TIPBUC,
  REWIND,TAPE31,
  COPYBR,DATABASE1,TAPE37.
  *HYRADL,
  REWIND,TAPE37,
  COPYBR,DATABASE1,PANDAT,
  COPYBR,DATABASE1,TAPE35.
  *DHYLEVF,
  REWIND,TAPE35,
  COPYBR,DATABASE1,TAPE34.
  *HYWATA,
  REWIND,TAPE34,
  *TSSM1 RUN(COPY),
  COPYBR,TAPE5,
  REWIND,TAPE5,
  GET,HSPPROC,
  BEGIN,HSPFRUN,HSPPROC,TSSFL,WRITE,
  SKIP,MDERR,
  EXIT,
  ENDIF,MDERR,
  REWIND,OUTPUT,
  COPYBS,OUTPUT,OUTTSS,
  REPLACE,OUTTSS/NA,
  DAYFILE,OUTTSS,
  REPLACE,OUTTSS,
  /FOR
  TSSM          TSSFL= 15
*** CREATES LABELS FOR THE 7 DATASETS IN THE TSS
  ADD
    DATASET NO=
      SPACE=           12
      NAME=            HYTMPPF
      TIMESTEP=        60
      COMPRESSION=     COMPR
      YEAROR=          YES
      NREMS=           1
      STATION=          1
      GAP CODE=         CC
      UNITS=            METRIC
      MEMBER NAME=     HYTMPPF
      NCOMPS=           1
      KIND=             MEAN
      FORMAT=          0
*** LABEL THE DEM PT. TEMP. DATASET
  DATASET NO=
    SPACE=           14
    NAME=            HYDPTF
    TIMESTEP=        60
    COMPRESSION=     COMPR
    YEAROR=          YES
    NREMS=           1
    STATION=          1
    GAP CODE=         CC
    UNITS=            METRIC
    MEMBER NAME=     HYDPTF
    NCOMPS=           1
    KIND=             MEAN
    FORMAT=          0
*** LABEL THE WIND SPEED DATASET
  DATASET NO=          15
  SPACE=              6
  NAME=               HYWINDS
  TIMESTEP=           60
  COMPRESSION=        COMPR
  YEAROR=             YES

```

Cont. Appendix F.

(iv)

COPY 1 OUTPUT MEAN
COPY 1 OUTPUT MEAN
END EXT TARGETS 2
END RUN
/EOF

TSS 17 HYDATA 1 METR
TSS 15 HYWINDS 1 METR
ADD
ADD

Cont. Appendix F.

(iii)

```
OPN SEQUENCE
COPY           1 INDELT 01:00
END OPN SEQUENCE

COPY
TIMESERIES
 0-0000 NPT MNM
 1
END TIMESERIES
END COPY

EXT SOURCES
<EXT-SVOL> <SRCFMT> <SS><SG><-NFACT--><TR> <-INT-TVOLS--> <TGRP> <INT-THEN> 000
SEQ 32 HYDMP METRUNDF          COPY 1 INPUT POINT 1
SEQ 33 HYDHR METRUNDF          COPY 1 INPUT POINT 2
SEQ 31 HYDHR METRZERO          COPY 1 INPUT POINT 3
SEQ 37 HYDHO METRUNDF          COPY 1 INPUT POINT 4
END EXT SOURCES

EXT TARGETS
<INT-SVOL> <SRCFMT> <INT-SHEN><-NFACT--><TR> <EXT-TVOL> <STARFMT> <TS> <TG> <AH>000
COPY 1 OUTPUT POINT 1          TSS 12 HYTMPPF 1 METR ADD
COPY 1 OUTPUT POINT 2          TSS 14 HYDPTF 1 METR ADD
COPY 1 OUTPUT POINT 3          TSS 11 TIPauc 1 METR ADD
COPY 1 OUTPUT POINT 4          TSS 13 HYRADL 1 METR ADD
END EXT TARGETS
END RUN

RUN
GLOBAL
  INPUTTING SEQ EVAP FILE TO DATASET 16
  START 1981/01/01 END 1981/12/31
  RUN INTERP OUTPUT LEVEL 5
  RESUME 0 RUN 1
END GLOBAL

OPN SEQUENCE
COPY           1 INDELT 24:00
END OPN SEQUENCE

COPY
TIMESERIES
 0-0000 NPT MNM
 1
END TIMESERIES
END COPY

EXT SOURCES
<EXT-SVOL> <SRCFMT> <SS><SG><-NFACT--><TR> <-INT-TVOLS--> <TGRP> <INT-THEN> 000
SEQ 35 HYDDAY METRUNDF          COPY 1 INPUT POINT 1
END EXT SOURCES

EXT TARGETS
<EXT-SVOL> <SRCFMT> <SS><SG><-NFACT--><TR> <-INT-TVOLS--> <TGRP> <INT-THEN> 000
COPY 1 OUTPUT POINT 1          TSS 10 OHYLEV 1 METR ADD
END EXT TARGETS
END RUN

RUN
GLOBAL
  INPUTTING SEQ HYDATA AND HYUND TO DATASETS 15, AND 17
  START 1981/01/01 END 1981/12/31
  RUN INTERP OUTPUT LEVEL 5
  RESUME 0 RUN 1
END GLOBAL

OPN SEQUENCE
COPY           1 INDELT 1:00
END OPN SEQUENCE

COPY
TIMESERIES
 0-0000 NPT MNM
 1
END TIMESERIES
END COPY

EXT SOURCES
<EXT-SVOL> <SRCFMT> <SS><SG><-NFACT--><TR> <-INT-TVOLS--> <TGRP> <INT-THEN> 000
SEQ 34 HYDHR METRUNDF          COPY 1 INPUT MEAN 1
SEQ 36 HYDHR METRZERO          COPY 1 INPUT MEAN 2
END EXT SOURCES

EXT TARGETS
<EXT-SVOL> <SRCFMT> <SS><SG><-NFACT--><TR> <-INT-TVOLS--> <TGRP> <INT-THEN> 000
```

Cont. Appendix F.

(ii)

```
NPERS= 1
STATION=
GAP CODE= CC
UNITS=
MEMBER NAME= METRIC
NCOMPS= 1
KIND= MEAN
FORMAT= 0

*** LABEL THE PRECIP. DATASET
DATASET NO= 11
SPACE= 6
NAME= TIPBUC
Timestep= 60
COMPRESSION= COMPR
YEAROR= YES
NMEMS= 1
STATION=
GAP CODE= CC
UNITS=
MEMBER NAME= TIPBUC
NCOMPS= 1
KIND= MEAN
FORMAT= 0

*** LABEL THE RADIATION DATASET
DATASET NO= 13
SPACE= 6
NAME= HYRADL
Timestep= 60
COMPRESSION= COMPR
YEAROR= YES
NMEMS= 1
STATION=
GAP CODE= CC
UNITS=
MEMBER NAME= HYRADL
NCOMPS= 1
KIND= MEAN
FORMAT= 0

*** LABEL THE STREAMFLOW DATASET
DATASET NO= 17
SPACE= 6
NAME= HYDATA
Timestep= 60
COMPRESSION= COMPR
YEAROR= YES
NMEMS= 1
STATION=
GAP CODE= CC
UNITS=
MEMBER NAME= HYDATA
NCOMPS= 1
KIND= MEAN
FORMAT= 0

*** LABEL THE LAKE EVAP. DATASET
DATASET NO= 16
SPACE= 4
NAME= DHYLEV
Timestep= 60
COMPRESSION= COMPR
YEAROR= YES
NMEMS= 1
STATION=
GAP CODE= CC
UNITS=
MEMBER NAME= DHYLEV
NCOMPS= 1
KIND= MEAN
FORMAT= 0

SHOWDSL
SHOWSPCF
SHOWTSS
END TSSM
RUN

GLOBAL
  INPUTTING DATA FROM SEQ FILES TO DATASETS 12, 14, 15, 11, 13
  START 1981/01/01 END 1981/12/31
  RUN INTERP OUTPUT LEVEL 5
  RESUME 0 RUN 1
END GLOBAL
```

Cont. Appendix G.

(v)

```

00331 END CURV-DATA
00332
00333 END PLTGEN
00334
00335      NOTE : MFACT IS AREA OF SEGMENT X CONVERSIO    000
00336          AREA OF SEGMENTS PERLND 1 IS 30.297 SQ KM  000
00337          PERLND 2 IS 20.103 SQ KM  000
00338          IMPLND 1 IS 2.950 SQ KM  000
00339          TOTAL AREA OF BASIN 53.000 SQ KM  000
00340
00341

00342 EXT SOURCES
00343
00344 <000> <VOL> <EXSMEN> <SS><SGP> MFACT PCTR < INT VOLSP STGRPP <INT THEM>
00345 TSS 13 TIPBUC METR 1.0 SAME PERLND 1 1 EXTNL PFEF
00346 TSS 13 HYTRPF METR 1.0 SAME PERLND 1 1 EXTNL GATRP
00347 TSS 13 HYRADL METR 1.0 SAME PERLND 1 1 EXTNL SOLRAD
00348 TSS 14 HYOPTF METR 1.0 SAME PERLND 1 1 EXTNL DTMPG
00349 TSS 15 HYBUDS METR 1.0 SAME PERLND 1 1 EXTNL WJNMOV
00350 TSS 16 DHYLEV METR 0.0292 SAME PERLND 1 1 EXTNL PETINP
00351 TSS 11 TIPBUC METR 1.0 SAME IMPLND 1 1 EXTNL PREC
00352 TSS 12 HYTRPF METR 1.0 SAME IMPLND 1 1 EXTNL GATRP
00353 TSS 13 HYRADL METR 1.0 SAME IMPLND 1 1 EXTNL SOLRAD
00354 TSS 14 HYOPTF METR 1.0 SAME IMPLND 1 1 EXTNL DTMPG
00355 TSS 15 HYBUDS METR 1.0 SAME IMPLND 1 1 EXTNL WJNMOV
00356 TSS 16 DHYLEV METR 0.0292 SAME IMPLND 1 1 EXTNL PETINP
00357 TSS 17 HYDATA METR 1.0 SAME PLTGEN 1 INPUT MEAN 2
00358
00359 TSS 11 TIPBUC METR 1.0 SAME RCHRES 1 EXTNL PREC
00360 TSS 10 DHYLEV METR 0.0292 SAME RCHRES 1 EXTNL POTEV
00361 TSS 11 TIPBUC METR 0.0292 SAME RCHRES 1 EXTNL PREC
00362 TSS 16 DHYLEV METR 0.0292 SAME RCHRES 1 EXTNL POTEV
00363 END EXT SOURCES
00364
00365
00366 NETWORK
00367
00368
00369      THIS BLOCK SPECIFIES ANY TIME SERIES WHICH ARE      000
00370      PASSED BETWEEN OPERATIONS      000
00371 < VOL> < GAP> < MEMBER > < MULT > TRAN < TARGET > VOLSP < GAP> < MEMBER >
00372 < NAME > 0 < SHARE > 0 < -FACTOR-> STAG < NAME > 0 < INPUT > < SHARE >
00373 IMPLND 1 WATER SURD .00265000 RCHRES 1 EXTNL VOL
00374 PERLND 1 WATER PERD .03024700 RCHRES 1 EXTNL VOL
00375 PERLND 2 WATER PERD .02013000 RCHRES 2 EXTNL VOL
00376 RCHRES 1 HYDR ROVL DISPLAY 1 INPUT TISER
00377 RCHRES 2 HYDR RD PLTGEN 1 INPUT MEAN 1
00378 RCHRES 2 HYDR RD
00379 END NETWORK
00380
00381 END RUN

```

Cont. Appendix G.

(iv)

```

00249 DEPTH      SAREA      VOL      DISCH(14)  DISCH(OUT)    000
00250 (ft)       (HA)       (MILL-M3)   (M3/S)      000
00251 0.00       0.000     0.00000     0.00       0.00
00252 0.10       0.400     0.00020     0.10       0.05
00253 0.20       1.900     0.000940    1.50       1.30
00254 0.35       4.700     0.01670     3.60       3.80
00255 1.00       11.700    0.03370     12.20      13.00
00256 1.25       15.500    0.06320     18.00      21.00
00257 1.50       21.000    0.11160     26.00      30.00
00258 1.75       26.300    0.17150     36.00      40.00
00259 2.00       33.600    0.24640     46.00      50.00
00260 2.50       40.900    0.31780     66.00      66.00
00261 3.00       48.300    0.39360     97.00      106.0
00262 3.75       61.800    0.50050     170.00     172.00
00263 4.50       73.400    1.00050     260.00     265.00
00264 END FTABLE100
00265 FTABLE 101
00266 ROWS/COLS 13
00267 REACH DATA FROM MOUNT PEARL TO KILBRIDE    000
00268 13
00269 DEPTH      SAREA      VOL      DISCH    000
00270 (ft)       (HA)       (MILL-M3)   (M3/S)    000
00271 0.00       0.000     0.00000     0.00
00272 0.10       0.400     0.00110     0.20
00273 0.25       1.000     0.01330     3.20
00274 0.50       4.000     0.02460     07.20
00275 1.00       7.400     0.04010     13.00
00276 1.25       10.400    0.06240     16.00
00277 1.50       13.000    0.09170     17.20
00278 1.75       16.000    0.12800     27.20
00279 2.00       19.900    0.17290     37.00
00280 2.50       21.100    0.30040     47.00
00281 3.00       24.600    0.46470     66.00
00282 3.75       34.600    0.76960     98.00
00283 4.50       46.700    1.20420     147.00
00284 END FTABLE101
00285
00286
00287 END FTABLES

00288
00289 DISPLAY
00290
00291 DISPLAY-INFO1
00292
00293 0000 0
00294 1 SIMUL. FLOW AT KILB. (M3/S) TRAN PIVL DIG1 FIL1 PRY DIG1 FIL2 YRND
00295 END DISPLAY-INFO1 AVER 01 2 6 1 2 6 12
00296 END DISPLAY
00297
00298 PLTGEN
00299
00300 PLOTINFO
00301
00302 0000 0 FILE NPT MMN LABL PYR PIV
00303 1 31 2 1 12 01
00304 END PLOTINFO
00305
00306 GEN-LABELS
00307
00308 0000 0-----TITLE----->-----Y AXIS----->
00309 1 GENERAL TITLE          X AXIS-TIME INTERVAL PER INCH
00310 1-----SIMULATED AND OBSERVED FLOWS-----> X AXIS VALUE
00311 END GEN-LABELS          Y AXIS VALUE
00312 FLOW RATE (M3/S)
00313 SCALING
00314
00315 SCALING INFORMATION MINIMUM Y AXIS VALUE    000
00316 MAXIMUM Y AXIS VALUE    000
00317 0000 0 YMIN      YMAX      ZMIN      X AXIS-TIME INTERVAL PER INCH 000
00318 1          0.0       40.0      48.0
00319 END SCALING
00320
00321 CURV-DATA (FIRST CURVE)
00322 0000 0 CURVE LABEL TYPE INTG COLOR
00323 1 SIMULATED          0 TRAN
00324 0000 0 EQUV CODE TRAN
00325 END CURV-DATA
00326
00327 CURV-DATA (SECOND CURVE)
00328 0000 0 CURVE LABEL TYPE INTG COLOR
00329 1 09SEWTR 24 3 1 TRAN
00330

```

Appendix J. Example of HSPF Output from an UCI Run (1)

```
EDIT 3:1.00
END OF FILE
TAPES IS A LOCAL FILE
ooooooooooooooo
*   HYDROLOGICAL SIMULATION PROGRAM - FORTRAN
ooooooooooooooo
DEVELOPED FOR:           DEVELOPED BY:
U.S. ENVIRONMENTAL      HYDROCOMP, INCORPORATED
PROTECTION AGENCY        415-948-3919
OFFICE OF RESEARCH
AND DEVELOPMENT
SOUTHEAST ENVIRONMENTAL
RESEARCH LABORATORY
ATHENS, GA 30601
404-544-3175
MODIFIED BY:
ANDERSON-NICHOLS AND CO., Inc.
415-493-1804
RELEASE 7.0
JUNE 1981
```

START OF JOB

```
PREPROCESSING USER'S CONTROL INPUT.
SEARCHING FOR BOUNDARIES OF NEXT DATA SET IN USER'S CONTROL INPUT.
FOUND RUN
FOUND END RUN
```

INTERPRETING RUN DATA SET IN USER'S CONTROL INPUT

```
FOUND GLOBAL
FOUND END GLOBAL
FOUND OPN SEQUENCE
FOUND END OPN SEQUENCE
FOUND IMPLND
FOUND END IMPLND
FOUND PERLND
FOUND END PERLND
FOUND SCHRRES
FOUND END RCRES
FOUND FTABLES
FOUND END FTABLES
FOUND DISPLAY
```

Cont. Appendix J.

(iii)

```
FTABLE 100  
FTABLES 100 BEACH DATA FROM DUNDONAN TO MOUNT PEARL  
DEPTH  AREA VOL DISCH(IN) DISCH(OUT) 000  
0.00 0.0000 0.0000 0.0000 0.0000  
0.10 0.0000 0.0000 0.0000 0.0000  
0.20 0.0000 0.0000 0.0000 0.0000  
0.30 0.0000 0.0000 0.0000 0.0000  
0.40 0.0000 0.0000 0.0000 0.0000  
0.50 0.0000 0.0000 0.0000 0.0000  
0.60 0.0000 0.0000 0.0000 0.0000  
0.70 0.0000 0.0000 0.0000 0.0000  
0.80 0.0000 0.0000 0.0000 0.0000  
0.90 0.0000 0.0000 0.0000 0.0000  
1.00 0.0000 0.0000 0.0000 0.0000  
1.10 0.0000 0.0000 0.0000 0.0000  
1.20 0.0000 0.0000 0.0000 0.0000  
1.30 0.0000 0.0000 0.0000 0.0000  
1.40 0.0000 0.0000 0.0000 0.0000  
1.50 0.0000 0.0000 0.0000 0.0000  
1.60 0.0000 0.0000 0.0000 0.0000  
1.70 0.0000 0.0000 0.0000 0.0000  
1.80 0.0000 0.0000 0.0000 0.0000  
1.90 0.0000 0.0000 0.0000 0.0000  
2.00 0.0000 0.0000 0.0000 0.0000  
2.10 0.0000 0.0000 0.0000 0.0000  
2.20 0.0000 0.0000 0.0000 0.0000  
2.30 0.0000 0.0000 0.0000 0.0000  
2.40 0.0000 0.0000 0.0000 0.0000  
2.50 0.0000 0.0000 0.0000 0.0000  
2.60 0.0000 0.0000 0.0000 0.0000  
2.70 0.0000 0.0000 0.0000 0.0000  
2.80 0.0000 0.0000 0.0000 0.0000  
2.90 0.0000 0.0000 0.0000 0.0000  
3.00 0.0000 0.0000 0.0000 0.0000  
END FTABLE100  
FTABLE 101  
FTABLES 101 BEACH DATA FROM POINT PEARL TO KILBRIDE  
DEPTH  AREA VOL DISCH 000  
0.00 0.0000 0.0000 0.0000  
0.10 0.0000 0.0000 0.0000  
0.20 0.0000 0.0000 0.0000  
0.30 0.0000 0.0000 0.0000  
0.40 0.0000 0.0000 0.0000  
0.50 0.0000 0.0000 0.0000  
0.60 0.0000 0.0000 0.0000  
0.70 0.0000 0.0000 0.0000  
0.80 0.0000 0.0000 0.0000  
0.90 0.0000 0.0000 0.0000  
1.00 0.0000 0.0000 0.0000  
1.10 0.0000 0.0000 0.0000  
1.20 0.0000 0.0000 0.0000  
1.30 0.0000 0.0000 0.0000  
1.40 0.0000 0.0000 0.0000  
1.50 0.0000 0.0000 0.0000  
1.60 0.0000 0.0000 0.0000  
1.70 0.0000 0.0000 0.0000  
1.80 0.0000 0.0000 0.0000  
1.90 0.0000 0.0000 0.0000  
2.00 0.0000 0.0000 0.0000  
2.10 0.0000 0.0000 0.0000  
2.20 0.0000 0.0000 0.0000  
2.30 0.0000 0.0000 0.0000  
2.40 0.0000 0.0000 0.0000  
2.50 0.0000 0.0000 0.0000  
2.60 0.0000 0.0000 0.0000  
2.70 0.0000 0.0000 0.0000  
2.80 0.0000 0.0000 0.0000  
2.90 0.0000 0.0000 0.0000  
3.00 0.0000 0.0000 0.0000  
END FTABLE101  
END FTABLES  
FTABLE INDEX  
TABNO TABID TABRST TABEND  
1 101 200  
FINISHED PROCESSING FTABLES BLOCK  
*****  
PROCESSING PERLMND BLOCK  
*****  
PROCESSING PREVIOUS LAND-SEGMENT NET 1 TIME STEP(DELT1) 60 MINS  
PROCESSING GENERAL INPUT  
PROCESSING ACTIVITY 1  
AIRTFS SNOWFS PHATFS SEDFG PSTFG PUGFG PAULFG RSTLFG PESTFG NITDFF PHOSFG TRACFG  
FINISHED PROCESSING ENTRIES IN THIS TABLE  
PROCESSING POINT-INFO 1  
ATEMP SNOW PHAT SEDFG PSTL PEST NITD PHOS TRAC PRINT-FILE PRINT-FILE PTFEND  
FINISHED PROCESSING ENTRIES IN THIS TABLE  
PROCESSING GEN-INFO 1  
PERV LAND-SEGMENT 10 MULKS UNIT SYSTEMS UNITS POINT-FILE NES  
LAND SEGMENT 1 1 1 1 1 1  
FINISHED PROCESSING ENTRIES IN THIS TABLE  
ENGLISH 0 PETRIC 0  
FINISHED PROCESSING GENERAL INPUT  
PROCESSING INPUT FOR SECTION ATEMP
```

Cont. Appendix J.

(ii)

FOUND END DISPLAY
FOUND PLTGEN
FOUND END PLTGEN
FOUND EXT SOURCES
FOUND END EXT SOURCES
FOUND NETWORK
FOUND END NETWORK

PROCESSING GLOBAL BLOCK

GENERAL RUN INFORMATION: RUNNING A NETWORK OF 2 LAND-SEGMENTS AND 3 RCHRES'S
START 1981/11/01 END 1981/11/30

START AND END DATE/TIMES TRANSLATE TO THE FOLLOWING, IN INTERNAL FORMAT: 1981/10/31 24:00 1981/11/30 24:00
RUN INTERPRETER OUTPUT LEVEL HAS BEEN SET TO: 4

SYSTEM HAS BEEN ASKED TO INTERPRET AND EXECUTE THE RUN. RUNFGO = 1
TIME SERIES STORE FORTRAN UNIT NO. IS 15

FINISHED PROCESSING GLOBAL BLOCK

PROCESSING OPN SEQUENCE BLOCK

USER'S CONTROL INPUT IS:

OPN SEQUENCE
INGRP INDELT C1:00
 1 1
 2 2
 3 3
 4 4
 5 5
 6 6
 7 7
 8 8
 9 9
 0 0
END INGRP

END OPN SEQUENCE

CONTENTS OF TABLES GENERATED BY SUBROUTINE SEQBLK

EXGROUP TABLE

EXGROUP NO.	FIRST INGRP	LAST INGRP	TIME INTERVAL (MIN)
1	1	1	60

INGROUP TABLE

INGROUP NO.	FIRST OPERATION	LAST OPERATION	TIME INTERVAL (MIN)
1	1	7	60

OPERATION TABLE

OPERATION NO.	OP TYPE	OP-TYPE NO.	OPCODE	EXGROUP NO.	INGROUP NO.
1	IRPLND	1	1	1	1
2	PERLND	2	2	1	1
3	PEPLND	2	2	1	1
4	RCHRES	3	3	1	1
5	RCHRES	3	3	1	1
6	PLTGEN	4	4	1	1
7	DISPLAY	5	5	1	1

FINISHED PROCESSING OPN SEQUENCE BLOCK

PROCESSING FTABLES BLOCK

USER'S CONTROL INPUT IS:
FTABLES

Cont. Appendix J.

(iv)

PROCESSING: ATEMP-DAT 1
INFORMATION NORMALLY CONTAINED IN THIS TABLE HAS NOT BEEN SUPPLIED FOR THIS OPERATION
WILL USE DEFAULT VALUES WHERE POSSIBLE

ELDAT AIRTMP

" DEGC

0. 1.500E+01

FINISHED PROCESSING ENTRIES IN THIS TABLE

FINISHED PROCESSING INPUT FOR SECTION ATEND

PROCESSING INPUT FOR SECTION SNOW

PROCESSING: ICE-FLAG 1

INFORMATION NORMALLY CONTAINED IN THIS TABLE HAS NOT BEEN SUPPLIED FOR THIS OPERATION
WILL USE DEFAULT VALUES WHERE POSSIBLE

ICEFG

0

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: SNOW-PARM1 1

LATITUDE RELEV SHADE SNOWCF COVIND
DEEPEES MM MM MM MM
4.750E+01 1.500E+02 4.000E-01 1.000E+00 2.500E+01

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: SNOW-PARM2 1

PDCSN TSNOW SHDEVN CCFACT MWATER MRELT
1.500E-01 0 DEG C 1.000E-01 2.000E-01 1.000E-02 1.500E+00 MM/DAY

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: SNOW-INIT1 1

PACK-SNOW PACK-ICE PACK-MWTR RDENPF DULL PAKTMR
MM MM MM MM 0.000E+00 2.000E+00 2.000E-01 4.000E+02 0. DEG C

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: SNOW-INIT2 1

COVINX XLNMLT SKYCLR
MM MM MM

1.000E+02 0 5.000E-01

FINISHED PROCESSING ENTRIES IN THIS TABLE

FINISHED PROCESSING INPUT FOR SECTION SNOW

PROCESSING INPUT FOR SECTION PWATER

PROCESSING: PWAT-PARM1 1

CSNDFG RTOPFG UZFG VCSFG VUZFG VNNFG VIFWFG VIRCFG VLEFG
1 1 1 1 1 1 1 1 1
FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: PWAT-PARM2 1

FOREST LZSN INFILT LSUR SLSUR KVAPY AGWRC
3.400E-01 3.000E+01 5.000E-01 1.750E+03 1.500E-02 0. 1/MMS 1/DAY
FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: PWAT-PARM3 1

PETMAX PETMIN INFEXP INFILD DEEPFR BASETP AGWTP
5.500E+00 1.700E+01 2.000E+00 2.000E+00 0. 0. 3.000E-01

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: PWAT-PARM4 1

CEPSC UZSN NSUP INTFW IFC LZETP
1.000E+00 1.000E+01 4.000E-01 7.000E+00 5.000E-01 1.000E-01

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: PWAT-STATE1 1

Cont. Appendix J.

(v)

SEGMENT-WIDE STORAGES (MASI)
FERS¹ SUP² UZS³ IFUS⁴ 6.200E+01 9.000E-02 2.500E-02
2.000E+00 1.500E+01 3.500E+01 0.000E+00 0.000E+00 0.000E+00
FINISHED PROCESSING ENTRIES IN THIS TABLE

FINISHED PROCESSING INPUT FOR SECTION PHATER

FINISHED PROCESSING PREVIOUS LAND-SEGMENT NO. 1

PROCESSING PREVIOUS LAND-SEGMENT NO. 2 TIME STEP/DELTA 60 MINS

PROCESSING GENERAL INPUT

PROCESSING: ACTIVITY 1

AIRTFG	SHOWTG	PWATFG	SEDFG	PSTFG ₀	PNGFG ₀	PAFFG ₀	RSTLFG ₀	PESTFG ₀	NITPG ₀	PMSFG ₀	TRACFG ₀
--------	--------	--------	-------	--------------------	--------------------	--------------------	---------------------	---------------------	--------------------	--------------------	---------------------

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: PRINT-INFO 1

ATEPP	SNOV	PWAT	SEDF	PST	PNG	PAFF	RSTL	PEST	NITP	PMSF	TRAC
PRINT-OUT LEVEL	CLASS	SEQ	PTYPE	REAL	RSTL	PEST	NITP	PHOS	TRAC	PRINT-FILE	PRINT-TREND
ATEPP	SNOV	PWAT	SEDF	PST	PNG	PAFF	RSTL	PEST	NITP	PMSF	TRAC

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: GEN-INFO 1

PREV LAND-SEGMENT ID	MOLKS	WUNITS	UNIT SYSTEMS	DUNITS	PRINT-FILE NOS
LAND SEGMENT	?	?	?	?	ENGLISH 0 PETRIC 6

FINISHED PROCESSING ENTRIES IN THIS TABLE

FINISHED PROCESSING GENERAL INPUT

PROCESSING INPUT FOR SECTION ATEMP

PROCESSING: ATEMP-DAT 1

INFORMATION NORMALLY CONTAINED IN THIS TABLE WAS NOT BEEN SUPPLIED FOR THIS OPERATION
WILL USE DEFAULT VALUES WHERE POSSIBLE

ELDAT	AIRTP	DESF
0	1.500E+01	0

FINISHED PROCESSING ENTRIES IN THIS TABLE

FINISHED PROCESSING INPUT FOR SECTION ATEMP

PROCESSING INPUT FOR SECTION SNOW

PROCESSING: ICE-FLAG 1

INFORMATION NORMALLY CONTAINED IN THIS TABLE WAS NOT BEEN SUPPLIED FOR THIS OPERATION
WILL USE DEFAULT VALUES WHERE POSSIBLE

ICEFG
0

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: SNOW-PARM1 1

LATITUDE	MELEV	SHADE	SNOWCF	COVMO
45.000E+00	1.000E+02	0.000E+00	1.000E+00	2.500E+01

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: SNOW-PARM2 1

RDSH	TSHW	SNOWVP	CCFACT	WWATER	WRFLT	DP/DAY
0	0	0	0	0	0	0
1.500E-01	0	1.000E-01	2.000E-01	1.000E-02	1.500E+00	0

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: SNOW-INIT1 1

PACK-SNOW	PACK-ICE	PACK-WATR	DDENPF	DULL	PAKIPP	DEG C
0	0	0	0	0	0	0
1.500E+01	0	1.000E+00	2.000E-01	4.000E+02	0	0

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: SNOW-INIT2 1

Cont. Appendix J.

(vi)

CCVINS XLMHLY SKYCLR
1.00E+02 0. 5.00E-01
FINISHED PROCESSING ENTRIES IN THIS TABLE

FINISHED PROCESSING INPUT FOR SECTION SNCW

PROCESSING INPUT FOR SECTION PWATER

PROCESSING: PHAT-PARM1 1

CSNFG RTDPFG UZFG VCSFG VUZFG VNNFG VIFWFG VIRCFG VLEFG
FINISHED PROCESSING ENTRIES IN THIS TABLE 0 0 0 0 0 0 0 0 0

PROCESSING: PHAT-PARM2 1

FOREST LZSN INFILT LSUR SLSUR KVARY AGWXC
3.400E-01 3.00E+01 5.00E-01 1.00E+03 1.500E-02 0. 9.800E-01
FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: PHAT-PARM3 1

PETMAX PETMIN INFEXP INFILD DEEPFR BASETP AGWETP
4.500E+00 1.700E+00 2.000E+00 2.000E+00 0. 0. 3.000E-01
FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: PHAT-PARM4 1

CEPSC UZSN NSUR INTFW IRC LZETP
3.00E+00 1.00E+01 4.00E-01 5.00E+00 5.00E-01 1.000E-01
FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: PHAT-STATE1 1

SEGMENT-WIDE STORAGES (MMSS)
CEPS SURS UZS IFWS LZS AGWS GWS
2.000E+00 1.500E+01 3.500E+01 0. 6.200E+01 9.000E-02 2.500E-02
FINISHED PROCESSING ENTRIES IN THIS TABLE

FINISHED PROCESSING INPUT FOR SECTION PWATER

FINISHED PROCESSING PREVIOUS LAND-SEGMENT NO. 2

FINISHED PROCESSING PERLND BLOCK

PROCESSING IMPLND BLOCK

PROCESSING IMPREVIOUS LAND-SEGMENT NO: 1 TIME STEP(DELTA) 60 MINS

PROCESSING GENERAL INPUT

PROCESSING: ACTIVITY 1

AIRTFG SNCWFG IWATFG SLDFG IWFGB IQALFG
FINISHED PROCESSING ENTRIES IN THIS TABLE 0 0 0 0 0

PROCESSING: PRINT-INFO 1

PRINTOUT LEVEL FLAGS PRINT-IVL PRINT-TREND
ATEPP SNOW TSL TWTG IQAL PIVL PYEND
FINISHED PROCESSING ENTRIES IN THIS TABLE 12

PROCESSING: GEN-INFO 1

IMPERV LAND-SEGMENT ID UUNITS UNIT SYSTEMS
WATERFORD R. BASIN 2 UUNITS 2 DUNITS
FINISHED PROCESSING ENTRIES IN THIS TABLE 2 2

PRINT-FILE AUS
ENGLISH 0 METRIC 6
FINISHED PROCESSING GENERAL INPUT

Cont. Appendix J.

(vii)

PROCESSING INPUT FOR SECTION ATEMP

PROCESSING: ATEMP-DAT 1
INFORMATION NORMALLY CONTAINED IN THIS TABLE HAS NOT BEEN SUPPLIED FOR THIS OPERATION
WILL USE DEFAULT VALUES WHERE POSSIBLE

ELDAT AIRTMR

DEGC

0. 1.500E+01

FINISHED PROCESSING ENTRIES IN THIS TABLE

FINISHED PROCESSING INPUT FOR SECTION ATEMP

PROCESSING INPUT FOR SECTION SNOW

PROCESSING: ICE-FLAG 1
INFORMATION NORMALLY CONTAINED IN THIS TABLE HAS NOT BEEN SUPPLIED FOR THIS OPERATION
WILL USE DEFAULT VALUES WHERE POSSIBLE

ICEFG

0

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: SNOW-PARM1 1

LATITUDE DEGREES HELEV SHADE SNOWCF COVIND
4.75E+01 1.100E+02 1.000E-01 1.000E+00 2.500E+01

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: SNOW-PARM2 1

RDCSN TSNOW SNDEVDP CCFACT MWATER MGMLT
1.000E-01 0. 1.000E-01 2.000E-01 1.000E-02 1.500E+00

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: SNOW-INIT1 1

PACK-SNOW PACK-ICE PACK-WATR RDENPF DULL PAKTPP
1.500E+01 2.000E+00 3.000E+00 2.000E-01 4.000E+02 0.

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: SNOW-INIT2 1

CCVINX XLMPLT SKYCLR
1.000E+02 0. 3.000E-01

FINISHED PROCESSING ENTRIES IN THIS TABLE

FINISHED PROCESSING INPUT FOR SECTION SNOW

PROCESSING INPUT FOR SECTION IWATER

PROCESSING: IWAT-PARM1 1

CSNDFG PTOPFG VPSFG VNNFG RTLIFG
1. 1. 0. 0.

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: IWAT-PARM2 1

LSUR SLSUR NSUR MANNING RETSC
1.000E+03 1.000E-02 1.500E-01 3.000E+00

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: IWAT-PARM3 1

PETMAX PETMIN
DEG C DEG C

4.500E+00 1.700E+00

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: IWAT-STATE2 1

STORAGES (MNS):

2.500E-02 2.500E-02

FINISHED PROCESSING ENTRIES IN THIS TABLE

FINISHED PROCESSING INPUT FOR SECTION IWATER

Cont. Appendix J.

(viii)

FINISHED PROCESSING IMPERVIOUS LAND-SEGMENT NO. 1

FINISHED PROCESSING IMPLND BLOCK

PROCESSING RCHRES BLOCK

PROCESSING PCHRES NC: 1 TIME STEP(DELTI) 60 MINS

PROCESSING GENERAL INPUT

PROCESSING: ACTIVITY 1

HYDRFG ADFG CONSGC HTFG SEDFG GQUALFG DXFG NUTFG PLKFG PHFG

FINISHED PROCESSING ENTRIES IN THIS TABLE 0 0 0 0 0 0 0 0 0 0

PROCESSING: PRINT-INFO 1

HYDR ADCA CONS MEAT SED GOL DXBX NUTR PLNK PHCD PRINT-IVL PRINT-TREND
PRINT-IVL PRINT-TREND

FINISHED PROCESSING ENTRIES IN THIS TABLE 0 0 0 0 0 0 0 0 0 0

PROCESSING: GEN-INFO 1

REACH/PRESERVEID NEXITS UNIT SYSTEMS DUNITS PRINT-FILE NOS LAKE-FLAG

REACH 1 UNITS UNITS DUNITS ENGLISH METRIC FLAG

FINISHED PROCESSING ENTRIES IN THIS TABLE 1 1 1 0 0 0

FINISHED PROCESSING GENERAL INPUT

PROCESSING INPUT FOR SECTION HYDR

PROCESSING: HYDR-PARM1 1

VCONFG AUX1FG AUX2FG AUX3FG ODFV-FLAGS FOR EACH POSS. EXIT ODGT-FLAGS FOR POSS. EXIT FUNCT-FLAGS FOR EACH POSS. EXIT

0 0 0 0 5 0 0 0 0 0 0 0 0 0 0

FINISHED PROCESSING ENTRIES IN THIS TABLE 0 0 0 0 0 0 0 0 0 0 0 0 0 0

PROCESSING: HYDR-PARM2 1

FTABNO LEN DELTH STCOR KS DB50

100 3,063 30,700 0,000 0,000 2,500E-01

FINISHED PROCESSING ENTRIES IN THIS TABLE 0 0 0 0 0 0 0 0 0 0 0 0 0 0

PROCESSING FTABLE NO. 100

FINISHED PROCESSING FTABLE NO. 100

PROCESSING: HYDR-INIT 1

INFORMATION NORMALLY CONTAINED IN THIS TABLE HAS NOT BEEN SUPPLIED FOR THIS OPERATION

WILL USE DEFAULT VALUES WHERE POSSIBLE

VOL (MM3) INIT VALUE OF COLIND FOR EACH POSS. EXIT FOR INIT VALUE OF OUTDGT FOR EACH POSS. EXIT (MM3)

0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

FINISHED PROCESSING ENTRIES IN THIS TABLE 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

INITIAL TOTAL OUTFLOW RATE: 0.

FINISHED PROCESSING INPUT FOR SECTION HYDR

FINISHED PROCESSING RCHRES NO. 1

PROCESSING RCHRES NO: 2 TIME STEP(DELTI) 60 MINS

PROCESSING GENPAL INPUT

PROCESSING: ACTIVITY 1

HYDRFG ADFG CONSGC HTFG SEDFG GQUALFG DXFG NUTFG PLKFG PHFG

1 0 0 0 0 0 0 0 0 0 0 0 0 0

Cont. Appendix J.

(ix)

FINISHED PROCESSING ENTRIES IN THIS TABLE
PROCESSING: PRINT-INFO 1

HYDR	ADCA	CONS	MEAT	SEQ	GCL	CPRX	MTR	PLNK	PNCB	PRINT-IVL	PRINT-YEND
9	4	4	4	4	4	4	4	4	4	PIVL	PYEND

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: GEN-INF0 1

REACT/RESERVOIR-ID	NEXITS	UNIT SYSTEMS	DUNITS	PRINT-FILE NCS	LAVE-
REACT	2	1 2 2	2	ENGLISH 0 METRIC 6	FLAG C

FINISHED PROCESSING ENTRIES IN THIS TABLE

FINISHED PROCESSING GENERAL INPUT

PROCESSING INPUT FOR SECTION HYDR

PROCESSING: HYDR-PARM1 2

VCONFIG	AUX1FG	AUX2FG	AUX3FG	DOFV-FLAGS	FOP	CDGT-FLAGS	FOP	FUNCT-FLAGS
0	0	0	0	EACH POSS.	EXIT	0	0	EACH PESS.

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: HYDR-PARM2 1

FTABND	LEN	DEPTH	STCOR	RS	DB50
101	4325	70.800	0.000	.500	2.500E-01

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING FTABLE NO. 101

FINISHED PROCESSING FTABLE NO. 101

PROCESSING: HYDR-INIT 1

INFORMATION NORMALLY CONTAINED IN THIS TABLE HAS NOT BEEN SUPPLIED FOR THIS OPERATION
WILL USE DEFAULT VALUES WHERE POSSIBLE

VOL	INIT VALUE OF COLIND FOR	INIT VALUE OF OUTDGT FOR
(M3)	EACH POSS EXIT	EACH POSS EXIT (M3/S)
0.00	0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0

FINISHED PROCESSING ENTRIES IN THIS TABLE

INITIAL TOTAL OUTFLOW RATE: 0.

FINISHED PROCESSING INPUT FOR SECTION HYDR

FINISHED PROCESSING RCHRES NO. 2

FINISHED PROCESSING RCHRES BLOCK

PROCESSING PLTGEN BLOCK

PROCESSING PLTGEN OPERATION NO. 1

PROCESSING: PLOTINFO 1

PLOTFI	NPT	NNN	LABLFG	PYREN0	PIVL
3	0	2	12	12	1

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: GEN-LABELS 1

GENERAL PLOT TITLE:

SPECIFIED AND OBSERVED FLOWS

FINISHED PROCESSING ENTRIES IN THIS TABLE

Y-AXIS LABEL:
FLOW RATE (M3/S)

PROCESSING: SCALING 1

YMIN	YMAX	IVLIN
		IVL7IN

0. 8.000E+01 1.200E+02

FINISHED PROCESSING ENTRIES IN THIS TABLE

PROCESSING: CURV-DATA 1

Cont. Appendix J.

(x)

```

CURVE LABEL: LINTYP 1 INTEG 1 COLCOP 1 TRAN
FINISHED PROCESSING ENTRIES IN THIS TABLE
PROCESSING1 CURV-DATA 2

CURVE LABEL: LINTYP 3 INTEG 3 COLCOP 1 TRAN
FINISHED PROCESSING ENTRIES IN THIS TABLE
FINISHED PROCESSING PLTGEN OPERATION NO. 1
FINISHED PROCESSING PLTGEN BLOCK
PROCESSING DISPLAY BLOCK
PROCESSING DISPLAY OPERATION NO. 1 TIME INTERVAL 60 MINS
PROCESSING1 DISPLAY-INFO1 1
TITLE OF DISPLAY TRANSFORM CODE DATA FOR SHORT-SPAN DISPLAY
FINISHED DISPLAY-KIND(1) 1 AVER PIVL 1 6 DATA FOR LONG-SPAN DISPLAY
FINISHED PROCESSING ENTRIES IN THIS TABLE 12
PYDFC 1 6 DTYPC 1 2 FILE-NUM 6 PYEND 12
PROCESSING1 DISPLAY-INFO2
INFORMATION NORMALLY CONTAINED IN THIS TABLE HAS NOT BEEN SUPPLIED FOR THIS OPERATION
WILL USE DEFAULT VALUES WHERE POSSIBLE
A 8 THRS1 THRS2
100000000 0
FINISHED PROCESSING ENTRIES IN THIS TABLE
FINISHED PROCESSING DISPLAY OPERATION NO. 1
FINISHED PROCESSING DISPLAY BLOCK
PROCESSING BLOCKS CONTAINING TIME SERIES LINKAGES
USER'S CONTROL INPUT IS1
EXT SOURCES 000 SLEVEL SERIALIZED CDFP>SGRP>RFACT <>TR <> INT TUDLSP <>GRP> SINT TDFP>
11 TIPBUC RETR 0.0 NAME PERLNDO EXTNL PREC
12 HYRADL RETR 0.0 NAME PERLNDO EXTNL GATHP
13 HYDPLF RETR 0.0 NAME PERLNDO EXTNL XOLPAD
14 HYDPLS RETR 0.0 NAME PERLNDO EXTNL DTOPC
15 HYDRES RETR 0.0 NAME PERLNDO EXTNL NWTFD
16 HYDRLC RETR 0.0 NAME PERLNDO EXTNL PREC
17 HYTPPF RETR 0.0 NAME IPPLNDO EXTNL GATHP
18 HYTRDF RETR 0.0 NAME IPPLNDO EXTNL SOLKAD
19 HYTRDS RETR 0.0 NAME IPPLNDO EXTNL DYPG
20 HYTRLEV RETR 0.0240 NAME IPPLNDO EXTNL NWTFD
21 HYDATA RETR 0.0 NAME PLTGEN 1 INPUT MEAN 2
22 TIPBUC RETR 0.0 NAME RCHRES 1 EXTNL PREC
23 DMYLEV RETR 0.0250 NAME RCHRES 1 EXTNL DTEV
24 DMYLEV RETR 0.0262 NAME RCHRES 1 EXTNL PUTEV
END EXT SOURCES
USER'S CONTROL INPUT IS1
NETDPRK 000
THIS BLOCK SPECIFIES ANY TIME SERIES WHICH ARE PASSED BETWEEN OPERATIONS 000
1 VOL*** 1 < CDRP> 1 < MULR > 1 < TGRN > 1 < TARGET > 1 < VOLS> 1 < GPO> 1 < PERIOD >
1 CHARE 1 000 1 CHARE 1 0 < FACTOR-> STRG 1 CHARE 1 0 1 INPUT 1 CHARE >
DEPLND 1 PHATER 1200 000 1 < 26252000 > DEPLND 1 0 EXTNL 1 XVDL
DEPLND 1 PHATER 1400 000 1 < 26254700 > DEPLND 1 0 EXTNL 1 XVEL
DEPLND 1 PHATER 1600 000 1 < 26257300 > DEPLND 1 0 EXTNL 1 XVEL
DEPLND 1 PHATER 1800 000 1 < 262513000 > DEPLND 1 0 EXTNL 1 XVEL
RCHRES 1 HYD0 POVL 1 < 262513000 > RCHRES 1 0 EXTNL 1 XVEL

```

Cont. Appendix J.

(xi)

SCHARES	2	HYDR	PO			DISPLY	1	INPUT	TIMSER	1
SCHARES	2	HYDR	PF			PLTGEN	1	INPUT	PEAK	1
PERLND***	2	WATER	IFWD			COPY	1	INPUT	MEAN	1
COPY ***	1	WATER	MEAN	1	9.5842	COPY	1	INPUT	MEAN	1
PERLND***	1	WATER	PERD	1	1.0	COPY	1	INPUT	MEAN	1
PERLND***	1	WATER	SURD		0.4019	COPY	1	INPUT	MEAN	1
PERLND***	2	WATER	PERD		0.7360	COPY	1	INPUT	MEAN	1
COPY ***	3	WATER	PERD		0.2842	COPY	1	INPUT	PEAK	1
COPY ***	3	WATER	MEAN	1	1.0	PLTGEN	1	INPUT	PEAK	1
END NETWORK						DISPLY	1	INPUT	TIPSER	1

PROCESSING ENTRIES FOR EXGROUP NO. 1

INGRP0P NO. 1 OSVSZ= 2900 INPAD WIDTH= 729 INTERVALS

FINISHED PROCESSING ENTRIES FOR EXGROUP NO. 1

FINISHED PROCESSING BLOCKS CONTAINING TIME SERIES LINKAGES

INTERPRETATION OF RUN DATA SET COMPLETE

COMMENCING EXECUTION

Cont. Appendix J.
(xii)

DAY	AVED	SIPUL. FLOW AT KILO. (EP3/S)												
		SUMMARY FOR MONTH 1081/11/												
		DATA INTERVAL 60 MINS												
		1	2	3	4	5	6	7	8	9	10	11	12	13
1	6.10	6.11	13.69	14.73	12.15	8.95	6.56	2.89	3.17	5.13	5.05	6.91	6.79	
2	3.26	6.70	6.67	3.73	6.65	6.61	6.57	6.50	2.88	3.16	6.07	6.96	3.65	
3	2.55	6.78	6.73	3.91	6.54	6.19	6.25	6.19	6.09	6.60	6.60	6.29	3.27	
4	1.82	6.78	6.73	3.92	6.70	6.73	6.70	6.66	6.44	6.36	6.23	6.20	2.72	
5	1.29	6.70	6.76	3.97	6.73	6.73	6.70	6.66	6.56	6.23	6.20	6.00	1.70	
6	.98	1.09	1.09	1.07	1.06	1.06	1.03	1.02	1.02	1.01	.99	.98	.97	
7	2.01	6.70	6.73	3.92	6.73	6.73	6.70	6.66	6.61	6.59	6.56	6.50	1.12	
8	19.05	6.78	6.73	3.91	6.70	6.73	6.70	6.66	6.60	6.59	6.56	6.53	16.33	
9	7.73	6.78	6.73	3.92	6.70	6.73	6.70	6.66	6.61	6.59	6.56	6.53	15.28	
10	3.92	6.70	6.76	3.97	6.73	6.73	6.70	6.66	6.56	6.37	6.34	6.30	7.64	
11	2.08	6.70	6.73	3.91	6.73	6.73	6.70	6.66	6.61	6.59	6.56	6.53	2.05	
12	1.40	6.78	6.73	3.92	6.70	6.73	6.70	6.66	6.61	6.59	6.56	6.53	1.37	
13	1.02	6.78	6.73	3.91	6.70	6.73	6.70	6.66	6.61	6.59	6.56	6.53	1.02	
14	.99	6.70	6.73	3.97	6.73	6.73	6.70	6.66	6.61	6.59	6.56	6.53	1.01	
15	.38	6.70	6.73	3.97	6.73	6.73	6.70	6.66	6.61	6.59	6.56	6.53	.47	
16	1.88	6.70	6.73	3.91	6.73	6.73	6.70	6.66	6.61	6.59	6.56	6.53	1.80	
17	3.16	6.70	6.73	3.92	6.73	6.73	6.70	6.66	6.61	6.59	6.56	6.53	3.00	
18	2.74	6.78	6.73	3.91	6.70	6.73	6.70	6.66	6.61	6.59	6.56	6.53	2.72	
19	7.10	6.78	6.73	3.92	6.70	6.73	6.70	6.66	6.61	6.59	6.56	6.53	6.98	
20	4.76	6.70	6.73	3.91	6.73	6.73	6.70	6.66	6.61	6.59	6.56	6.53	4.30	
21	2.00	6.70	6.73	3.97	6.73	6.73	6.70	6.66	6.61	6.59	6.56	6.53	2.02	
22	6.44	6.78	6.73	3.92	6.70	6.73	6.70	6.66	6.61	6.59	6.56	6.53	6.70	
23	4.97	6.70	6.76	3.97	6.73	6.73	6.70	6.66	6.61	6.59	6.56	6.53	7.04	
24	2.61	6.70	6.73	3.95	6.73	6.73	6.70	6.66	6.61	6.59	6.56	6.53	2.64	
25	1.45	6.70	6.73	3.99	6.73	6.73	6.70	6.66	6.61	6.59	6.56	6.53	1.42	
26	26.19	6.70	6.73	3.92	6.73	6.73	6.70	6.66	6.61	6.59	6.56	6.53	16.01	
27	13.27	6.70	6.73	3.96	6.73	6.73	6.70	6.66	6.61	6.59	6.56	6.53	13.27	
28	6.44	6.70	6.73	3.97	6.73	6.73	6.70	6.66	6.61	6.59	6.56	6.53	6.38	
29	3.34	6.70	6.73	3.94	6.73	6.73	6.70	6.66	6.61	6.59	6.56	6.53	3.32	
30	1.03	6.70	6.73	3.99	6.73	6.73	6.70	6.66	6.61	6.59	6.56	6.53	1.03	

MONTH AVER: 4.00394E+00

Cont. Appendix J.

(xiii)

DAY	SIMUL. FLOW AT KILB. (M3/S)											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.30
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
AVER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVER OF MONTHLY VALUES	4.00328E-01											

PREPROCESSING USER'S CONTROL INPUT.

SEARCHING FOR BOUNDARIES OF NEXT DATA SET IN USER'S CONTROL INPUT.
END OF JOB

Cont. Appendix J.

(xiv)

1.11100	2.43000
1.08800	2.42000
1.05300	2.41000
1.01800	2.40000
1.03140	2.38000
1.04250	2.36000
1.05470	2.34000
1.07310	2.32000
1.05290	2.30000
1.05570	2.28000
1.07870	2.26000
1.07040	2.24000
1.06670	2.22000
1.06450	2.20000
1.04160	2.18000
1.04950	2.16000
1.03810	2.14000
1.02710	2.12000
1.01750	2.10000
1.00730	2.08000
1.05750	2.06000
1.06640	2.04000
1.07640	2.02000
1.08130	2.00000
1.08610	1.98000
1.09100	1.96000
1.09590	1.94000
1.09980	1.92000
1.10370	1.90000
1.10760	1.88000
1.11150	1.86000
1.11540	1.84000
1.11930	1.82000
1.12320	1.80000
1.12710	1.78000
1.13100	1.76000
1.13490	1.74000
1.13880	1.72000
1.14270	1.70000
1.14660	1.68000
1.15050	1.66000
1.15440	1.64000
1.15830	1.62000
1.16220	1.60000
1.16610	1.58000
1.17000	1.56000
1.17390	1.54000
1.17780	1.52000
1.18170	1.50000
1.18560	1.48000
1.18950	1.46000
1.19340	1.44000
1.19730	1.42000
1.20120	1.40000
1.20510	1.38000
1.20900	1.36000
1.21290	1.34000
1.21680	1.32000
1.22070	1.30000
1.22460	1.28000
1.22850	1.26000
1.23240	1.24000
1.23630	1.22000
1.24020	1.20000
1.24410	1.18000
1.24800	1.16000
1.25190	1.14000
1.25580	1.12000
1.25970	1.10000
1.26360	1.08000
1.26750	1.06000
1.27140	1.04000
1.27530	1.02000
1.27920	1.00000
1.28310	98000
1.28700	96000
1.29090	94000
1.29480	92000
1.29870	90000
1.30260	88000
1.30650	86000
1.31040	84000
1.31430	82000
1.31820	80000
1.32210	78000
1.32600	76000
1.32990	74000
1.33380	72000
1.33770	70000
1.34160	68000
1.34550	66000
1.34940	64000
1.35330	62000
1.35720	60000
1.36110	58000
1.36500	56000
1.36890	54000
1.37280	52000
1.37670	50000
1.38060	48000
1.38450	46000
1.38840	44000
1.39230	42000
1.39620	40000
1.40010	38000
1.40400	36000
1.40790	34000
1.41180	32000
1.41570	30000
1.41960	28000
1.42350	26000
1.42740	24000
1.43130	22000
1.43520	20000
1.43910	18000
1.44300	16000
1.44690	14000
1.45080	12000
1.45470	10000
1.45860	8000
1.46250	6000
1.46640	4000
1.47030	2000
1.47420	0000

Cont. Appendix J.

(xv)

1	785200	2.01000
1	774800	1.99000
1	760300	1.99000
1	742500	1.97000
1	722900	1.95000
1	662000	1.94000
1	652100	1.93000
1	599700	1.93000
1	577100	1.92000
1	520400	1.89000
1	489700	1.88000
1	467200	1.88000
1	449500	1.85000
1	428300	1.84000
1	401400	1.82000
1	375200	1.81000
1	357000	1.79000
1	343400	1.78000
1	328800	1.76000
1	308900	1.75000
1	296200	1.75000
1	279400	1.74000
1	257800	1.74000
1	238800	1.73000
1	223700	1.73000
1	207500	1.72000
1	189200	1.72000
1	169100	1.72000
1	151400	1.71000
1	140800	1.71000
1	130100	1.70000
1	117900	1.70000
1	101200	1.70000
1	978800	1.69000
1	970400	1.69000
1	959100	1.68000
1	945000	1.68000
1	931900	1.68000
1	924100	1.68000
1	915900	1.67000
1	905100	1.67000
1	901670	1.65000
1	979550	1.63000
1	972790	1.64000
1	965780	1.64000
1	956220	1.65000
1	946150	1.65000
1	933640	1.64000
1	928930	1.64000
1	924020	1.64000
1	916300	1.64000
1	910320	1.64000
1	908100	1.64000
1	902780	1.64000
1	897340	1.63000
1	901400	1.63000
1	904700	1.63000
1	907720	1.62000
1	921520	1.62000
1	938130	1.62000
1	951010	1.62000
1	967300	1.61000
1	985790	1.61000
1	1.007600	1.61000
1	1.0321500	1.61000
1	1.091800	1.61000
1	1.231310	1.61000
1	1.354350	1.61000
1	1.484330	1.61000
1	2.104300	1.61000
1	2.383690	1.61000
1	3.483640	1.77000
1	6.802300	2.01000
1	8.95300	2.52000
1	9.50900	3.87000
1	9.236800	5.57000
1	12.56100	7.39000
1	16.35300	9.17000
1	18.71700	9.77000
		11.70000

Cont. Appendix J.
(xvi)

9.63700	17.70000
9.63900	23.60000
9.14500	27.50000
9.720100	29.60000
9.70300	32.50000
9.88600	34.50000
9.08900	37.50000
9.122700	39.50000
9.20400	41.50000
9.28400	43.50000
9.357600	45.50000
9.49800	47.50000
9.45800	49.50000
9.30800	51.50000
9.35800	53.50000
9.16600	55.50000
9.17600	57.50000
9.34200	59.50000
9.19600	61.50000
9.19200	63.50000
9.23300	65.50000
9.08800	67.50000
9.08200	69.50000
9.124200	71.50000
9.546700	73.50000
9.862100	75.50000
9.387100	77.50000
9.12000	79.50000
9.86280	81.50000
9.61270	83.50000
9.37000	85.50000
9.13460	87.50000
9.00610	89.50000
9.08440	91.50000
9.46920	93.50000
9.26000	95.50000
9.06150	97.50000
9.86780	99.50000
9.67710	101.50000
9.49130	103.50000
9.31000	105.50000
9.13540	107.50000
9.96410	109.50000
9.79000	111.50000
9.61540	113.50000
9.44840	115.50000
9.29320	117.50000
9.14560	119.50000
9.00330	121.50000
9.86560	123.50000
9.73150	125.50000
9.60140	127.50000
9.47510	129.50000
9.35240	131.50000
9.23320	133.50000
9.11740	135.50000
9.00930	137.50000
9.89970	139.50000
9.78950	141.50000
9.68650	143.50000
9.58630	145.50000
9.48900	147.50000
9.39450	149.50000
9.30270	151.50000
9.21670	153.50000
9.16030	155.50000
9.08650	157.50000
9.99700	159.50000
9.83040	161.50000
9.75240	163.50000
9.61040	165.50000
9.46090	167.50000
9.47350	169.50000
9.34420	171.50000
9.22220	173.50000
9.10710	175.50000
9.05350	177.50000
9.00550	179.50000
9.06210	181.50000

Cont. Appendix J.

(xvi)

1.91940	2.49000
1.87350	2.47000
1.83160	2.45000
1.78710	2.43000
1.74260	2.41000
1.69620	2.39000
1.65940	2.37000
1.62080	2.35000
1.58130	2.33000
1.54250	2.31000
1.50310	2.29000
1.46370	2.27000
1.42430	2.25000
1.38490	2.23000
1.34550	2.21000
1.30610	2.19000
1.26670	2.17000
1.22730	2.15000
1.18790	2.13000
1.14850	2.11000
1.10910	2.09000
1.06970	2.07000
1.02030	2.05000
1.08090	2.03000
1.04150	2.01000
1.00210	1.99000
1.06270	1.97000
1.02330	1.95000
1.08390	1.93000
1.04450	1.91000
1.00510	1.89000
1.06570	1.87000
1.02630	1.85000
1.08690	1.83000
1.04750	1.81000
1.00810	1.79000
1.06870	1.77000
1.02930	1.75000
1.08990	1.73000
1.05050	1.71000
1.11110	1.69000
1.07170	1.67000
1.13230	1.65000
1.09230	1.63000
1.15290	1.61000
1.11350	1.59000
1.17410	1.57000
1.13470	1.55000
1.19530	1.53000
1.15590	1.51000
1.21650	1.49000
1.17610	1.47000
1.23670	1.45000
1.19670	1.43000
1.25730	1.41000
1.21730	1.39000
1.27790	1.37000
1.23790	1.35000
1.29850	1.33000
1.25850	1.31000
1.31910	1.29000
1.27810	1.27000
1.33870	1.25000
1.29870	1.23000
1.35930	1.21000
1.31930	1.19000
1.37990	1.17000
1.33990	1.15000
1.39050	1.13000
1.35050	1.11000
1.41110	1.09000
1.37110	1.07000
1.43170	1.05000
1.39170	1.03000
1.45230	1.01000
1.41230	0.99000
1.47290	0.97000
1.43290	0.95000
1.49350	0.93000
1.45350	0.91000
1.51410	0.89000
1.47410	0.87000
1.53470	0.85000
1.49530	0.83000
1.55590	0.81000
1.51650	0.79000
1.57710	0.77000
1.53770	0.75000
1.59830	0.73000
1.55830	0.71000
1.61980	0.69000
1.57940	0.67000
1.64030	0.65000
1.60990	0.63000
1.66940	0.61000
1.62990	0.59000
1.68940	0.57000
1.64990	0.55000
1.70940	0.53000
1.66990	0.51000
1.72940	0.49000
1.68990	0.47000
1.74940	0.45000
1.70990	0.43000
1.76940	0.41000
1.72990	0.39000
1.78940	0.37000
1.74990	0.35000
1.80940	0.33000
1.76990	0.31000
1.82940	0.29000
1.78990	0.27000
1.84940	0.25000
1.80990	0.23000
1.86940	0.21000
1.82990	0.19000
1.88940	0.17000
1.84990	0.15000
1.90940	0.13000
1.86990	0.11000
1.92940	0.09000
1.88990	0.07000
1.94940	0.05000
1.90990	0.03000
1.96940	0.01000
1.92990	0.00000

Cont. Appendix J.

(xvii)

00					43651
00					42905
00					42180
00					41470
00					40791
00					40121
00					39481
00					38854
00					38244
00					37652
00					37076
00					36517
00					35933
00					35446
00					34925
00					33950
00					33480
00					33022
00					32578
00					32148
00					31727
00					31319
00					312187
00					35208
00					46401
00					68916
00					50520
00					651960
00					45150
00					509820
00					518880
00					4233910
00					1534710
00					053960
00					03900
00					12190
00					02780
00					04090
00					36780
00					64730
00					00740
00					806240
00					849600
00					796300
00					530900
00					21170
00					19160
00					12640
00					07870
00					02060
00					94470
00					66140
00					69330
00					61630
00					54830
00					541040
00					542640
00					71790
00					09050
00					53730
00					76700
00					73320
00					600920
00					470080
00					340300
00					247600
00					033770
00					94610
00					85720
00					69070
00					53850
00					46710
00					33240

Cont. Appendix J.

(xviii)

1	6 670000
1	6 650000
1	6 690000
1	6 640000
1	6 630000
1	6 590000
1	6 570000
1	6 500000
1	6 490000
1	6 480000
1	6 470000
1	6 460000
1	6 450000
1	6 440000
1	6 430000
1	6 420000
1	6 410000
1	6 400000
1	6 390000
1	6 380000
1	6 370000
1	6 360000
1	6 350000
1	6 340000
1	6 330000
1	6 320000
1	6 310000
1	6 300000
1	6 290000
1	6 280000
1	6 270000
1	6 260000
1	6 250000
1	6 240000
1	6 230000
1	6 220000
1	6 210000
1	6 200000
1	6 190000
1	6 180000
1	6 170000
1	6 160000
1	6 150000
1	6 140000
1	6 130000
1	6 120000
1	6 110000
1	6 100000
1	6 90000
1	6 80000
1	6 70000
1	6 60000
1	6 50000
1	6 40000
1	6 30000
1	6 20000
1	6 10000
1	6 0000

Cont. Appendix J.

(xix)

3.7C90C	3.86000
4.39000C	4.68000
5.58350	5.50000
6.80980	6.37000
7.66970	6.88000
8.26670	6.63000
8.53370	6.04000
8.64090	7.15000
8.65190	7.07000
8.42840	6.99000
8.14840	6.66000
7.95620	6.90000
7.96350	6.92000
8.05000	6.75000
8.06000	6.98000
7.80020	6.40000
7.24860	6.20000
7.28740	6.98000
7.04300	7.40000
6.81410	5.10000
6.59650	2.90000
6.39110	1.90000
6.18960	4.98000
6.98830	4.88000
6.34600	4.78000
4.97200	4.69000
3.36640	4.59000
4.96160	4.41000
4.80340	4.22000
4.68930	4.17000
4.74400	4.09000
4.41460	4.01000
4.29320	4.93000
4.17560	3.90000
4.06170	3.50000
3.95120	3.40000
3.84410	4.49000
3.74040	4.70000
3.59460	4.40000
3.54660	4.10000
3.26520	3.86000
3.18520	3.55000
3.12620	3.20000
3.07000	2.70000
2.93370	2.60000
2.66240	2.10000
2.59380	1.70000
2.37530	1.60000
2.17770	1.30000
1.66800	970000
1.17600	930000
0.72720	690000
0.27720	581000
-1.98090	740000
-1.93530	780000
-1.88740	760000
-1.84720	750000
-1.75300	720000
-1.71000	710000
-1.66820	680000
-1.63020	670000
-1.59430	660000
-1.55215	640000
-1.49160	630000
-1.45172	620000
-1.38420	610000
-1.33840	600000
-1.28190	590000
-1.23600	580000
-1.23990	570000
-1.23990	560000

Cont. Appendix J.

(xx)

0	1.22980	2.55000
0	1.20130	2.43000
0	1.19340	2.20000
0	1.14710	3.50000
0	1.12210	3.00000
0	1.10580	3.00000
0	1.07130	3.00000
0	1.04740	4.80000
0	1.02420	4.70000
0	1.00170	4.60000
0	1.00710	2.70000
0	1.04010	6.80000
0	1.07030	3.80000
0	1.07730	4.00000
0	1.05400	2.00000
0	1.05900	2.20000
0	1.09140	4.94000
0	1.05010	2.80000
0	1.05310	1.00000
0	1.05800	5.00000
0	1.03200	6.70000
0	1.03500	9.00000
0	1.08800	8.00000
0	1.03700	4.00000
0	1.04200	2.00000
0	1.04810	5.00000
0	1.03700	5.00000
0	1.05690	6.00000
0	1.02200	7.00000
0	1.06340	8.00000
0	1.05900	1.00000
0	1.04670	1.00000
0	1.04960	1.00000
0	1.05080	1.00000
0	1.05070	1.00000
0	1.056540	1.00000
0	1.052540	1.00000
0	1.058310	1.00000
0	1.054100	1.00000
0	1.050380	1.00000
0	1.05660	1.00000
0	1.05000	1.00000
0	1.0567000	1.00000
0	1.0576350	1.00000
0	1.0548930	1.00000
0	1.052246200	1.00000
0	1.05673200	1.00000
0	1.05718200	1.00000
0	1.05741500	1.00000
0	1.05701300	1.00000
0	1.05577300	1.00000
0	1.05368300	1.00000
0	1.05166800	1.00000
0	1.05974800	1.00000
0	1.05789300	1.00000
0	1.05599480	1.00000
0	1.05419200	1.00000
0	1.05243800	1.00000
0	1.05073400	1.00000
0	1.05907900	1.00000
0	1.05745900	1.00000
0	1.05581800	1.00000
0	1.05257600	1.00000
0	1.05071160	1.00000
0	1.05837100	1.00000
0	1.05706800	1.00000
0	1.05580300	1.00000
0	1.05557500	1.00000
0	1.05338100	1.00000
0	1.05222200	1.00000
0	1.05100950	1.00000
0	1.05069310	1.00000
0	1.05069380	1.00000
0	1.05079050	1.00000

Cont. Appendix J.

(xxi)

981	11	30	24	0	3.69020	0.04000
981	11	30	24	0	3.92700	0.90000
981	11	30	24	0	4.08000	4.00000
981	11	30	24	0	4.06000	6.40000
981	11	30	24	0	3.16200	7.90000
981	11	30	24	0	1.96200	7.60000
981	11	30	24	0	0.09000	7.30000
981	11	30	24	0	0.03200	7.00000
981	11	30	24	0	0.57400	6.60000
981	11	30	24	0	7.83900	6.30000
981	11	30	24	0	7.12300	6.10000
981	11	30	24	0	6.42370	5.80000
981	11	30	24	0	5.75100	5.30000
981	11	30	24	0	5.09400	5.00000
981	11	30	24	0	4.49500	4.80000
981	11	30	24	0	3.23330	4.60000
981	11	30	24	0	2.64700	4.40000
981	11	30	24	0	2.07400	4.10000
981	11	30	24	0	1.52600	3.90000
981	11	30	24	0	0.98900	3.80000
981	11	30	24	0	0.94600	3.60000
981	11	30	24	0	0.99720	3.40000
981	11	30	24	0	1.95250	3.30000
981	11	30	24	0	1.91260	3.10000
981	11	30	24	0	1.87390	2.90000
981	11	30	24	0	1.83450	2.80000
981	11	30	24	0	1.79420	2.60000
981	11	30	24	0	1.75250	2.40000
981	11	30	24	0	1.71220	2.20000
981	11	30	24	0	1.67260	2.10000
981	11	30	24	0	1.63350	1.60000
981	11	30	24	0	1.59500	1.70000
981	11	30	24	0	1.55740	1.60000
981	11	30	24	0	1.52060	1.40000
981	11	30	24	0	1.48520	1.30000
981	11	30	24	0	1.45050	1.20000
981	11	30	24	0	1.41680	1.10000
981	11	30	24	0	1.38410	0.90000

PLOT 1

SIMULATED AND OBSERVED FLOWS
TIME VS. FLOW RATE (M³/S)
0 POINT-VALUED CURVES
2 MEAN-VALUED CURVES
72C POINTS PER CURVE
Y AXIS 0.0000 TO 80.0000
TIME STEP 1/11/1981 TO 30/11/1981
CURVE 1 SIMULATED
CURVE 2 OBSERVED

Cont. Appendix J.
(xxii)

ADAZ CCIN COMPUTER SVCS INFORMATIQUES CCEI. NOS 2.5.1 670/704. 14.44.52. 07/04/07.

```

14.44.39.GROUP,T1200.
14.44.39.USER,141.
14.44.39.ABSC,18.
14.44.39.CHARGE,MNR,095.
14.44.40.SPRCLOC,PROC1,F$=AD.
14.44.42.BSFETES,PROC1/F$=AD.
14.44.45.PDUL1.
14.44.56.MOTE,OUTPUT./
14.44.56.STSNWS.
14.44.56.IF,OT=140,RUM,BMSCAN.
14.44.57.SPEVENT,CCL.
14.44.57.XEDIT,USER PROLOGUE NOT FOUND.
14.44.58.-XEDIT,00.00.01. 0.073 0.294
14.44.58.GET,HSPROC.
14.44.59-BEGIN,HSPFRUN,HSPROC,TSSFL.
14.44.59.ATTACH,ERMESS.
14.44.61.01. LOADPF,B=EPRESS,L=0,Z./OS,HSPFINF,HSPFERR,HSPFWRN
14.44.61.01. 3 SCANNED - 3 LOADED.
14.44.61.01.RENAME,TAPE1,HSPFINF.
14.44.61.01.RENAME,TAPE1,HSPFERR.
14.44.61.02.RENAME,TAPE4,HSPFWRN.
14.44.61.02.ATTACH,HSPBTMS.
14.44.61.07. LOADPF,L0,B=HSPBINS,L=0,Z./OS,HSPFO.
14.44.61.07. 3 SCANNED - 1 LOADED.
14.44.61.07.LOADPF COMPLETE.
14.44.61.07.RENAME,HSPBINS,HSPFB.
14.44.61.07.ATTACH,TAPE2,TSSFL/R=R.
14.44.61.07.HSPBINS(TAPE3).
14.44.61.09.STOP.
14.44.62.19700 MAXIMUM EXECUTION FL.
14.44.62.19.526 CP SECONDS EXECUTION TIME.
14.44.62.RETURN,TAPE15.
14.44.62.SREVERT,CCL.
14.44.62.PURGE, GROUP/NA.
14.44.62.SET(R1=1)
14.44.62.TEE R1,F0,1,NODERRS.
14.44.62.REWIND,TAPE31.
14.44.62.ATTACH,HSPBINS.
14.44.62.LOADPF,B=HSPBINS,L=0,Z./OS,HSPLOTS.
14.44.62. 1 SCANNED - 1 LOADED.
14.44.62.LOADPF COMPLETE.
14.44.62.GET,PLTSET/UN-LIBRARY.
14.44.62-BEGIN,PLTSET,LSR=141,CH=MNR055,PN=1.
14.44.62.GET,PL08,PLTFIG7/UN-LIBRARY.
14.44.62.1PF,FILE(TAPE10,AS),LB2.
14.44.62.1PF,PL08,LB2.
14.44.62.1PF,SNRP0555.EQ.80008,LB1.
14.44.62.ENDIF,L81.
14.44.62.NOTE,TAPE10,MNR,+ / 241 / MNR055 / N / U / I / BK
14.44.62.PL08(141,N,U)
14.44.62.ENDIF,L82.
14.44.62.RETLM,PL08.
14.44.62.REVERT.
14.44.62.HSPLOTB.
14.44.62. CH L8A+1 =1510058, LOADER USED 1676008
14.44.62. ** PLDT FILE SUCCESSFULLY WRITTEN **
14.44.62. STOP.
14.44.62. 166700 MAXIMUM EXECUTION FL.
14.44.62. 5358 CP SECONDS EXECUTION TIME.
14.44.62.SKIP,NODERRS.
14.44.62.ENDIF,NODERRS.
14.44.62.PURGE, GROUP/NA.
14.44.62.GROUP NOT FOUND.
14.44.62.REWIND,OUTPUT.
14.44.62.COPYCF,OUTPUT,OUTHSP.
14.44.62.EDI ENCONTERED.
14.44.62.*REPLACE,OUTHSP/NA.
14.44.62.DAYFILE,OUTHSP,FB=USED.
14.44.62.USER DAYFILE PROCESSED.
14.44.62.REPLACE,OUTHSP.
14.44.62.UEADP, 0.002KUNS.
14.44.62.UEPFP, 0.142KUNS.
14.44.62.UEMPS, 74.211KUNS.
14.44.62.UFCP, 26.201SECS.
14.44.62.BESP, 59.487UNTS.
14.44.62.SDUT(0,CP=E)
14.44.62.TAPE10 ROUTED. JSN IS ADBH.
14.44.62. 1 FILE PROCESSED.

```

14.44.52.SDAYFILE(OUTPUT, JT=D)
15.33.50.UCLP, 70, 022, 2.040KLN.

Appendix K. Listing of HSPLIT Calcomp Plot Program (1)

```
PROGRAM HSPLIT(INPUT,OUTPUT,TAPE31,TAPE1B=B,TAPE2,
1 TAPE5=INPUT,TAPE6=OUTPUT)
C
C READ A FILE PRODUCED BY PLTGEN MODULE OF HSPF PROGRAM
C AND PLOT CURVES ON THE CALCOMP PLOTTER.
C
C      CHARACTER LINLAB(5)*20
C      DIMENSION IGEN(8),ITITLE(4),IY(2),IDAT(9),XT(4),YT(4)
C      DIMENSION LINTYP(5),INTEQ(5),ICOLCOD(5),TIM(22000),VAL(5)
C      DIMENSION NDAYS(12),MTM(12)
C      DIMENSION YLIN(22000)
C
C      DATA NDAYS/31,28,31,30,31,30,31,31,30,31,30,31/
C      DATA MTM/3HJAN,3HFEB,3HMAR,3HAPR,3HMAY,3HJUN,
1           3HJUL,3HAUG,3HSEP,3HOCT,3HNNOV,3HDEC/
C
C      IF IOPT IS NON-ZERO, ALL THE DATA VALUES ARE PRINTED
C
C      READ(5,'(I2)',END=98) IOPT
98      IF (EOF(5).NE.0) IOPT=0
      IEND=0
      WRITE(6,'(1H1)')
      NPLOT=0
      CALL PLOT(B.,1.,-3)
      READ(31,'(A4)') JPLOTID
C
10      IPLOTID=JPLOTID
      NPLOT=NPLOT+1
      ITU=1
      DO 1 NL=2,25
      READ(31,'(BA10)') (IGEN(I),I=1,8)
      IF (NL.EQ.2) DECODE(30,'(19X,IS,6X)',IGEN(1)) IDELT
      IF (NL.EQ.3) DECODE(70,'(42X,I3,15X,I3,7X)',IGEN(1)) IPU,IMU
      IF (NL.EQ.5) DECODE(60,'(19X,4A10,1X)',IGEN(1)) (ITITLE(I),I=1,4)
      IF (NL.EQ.6) DECODE(40,'(18X,2A10,2X)',IGEN(1)) (IY(I),I=1,2)
      IF (NL.EQ.7) DECODE(40,'(23X,E14.5,3X)',IGEN(1)) YMIN
      IF (NL.EQ.8) DECODE(40,'(23X,F14.5,3X)',IGEN(1)) YMAX
      IF (NL.EQ.9) DECODE(40,'(23X,F14.5,3X)',IGEN(1)) TDELT
      IF (NL.EQ.ITU+11.AND.ITU.LE.IPU+IMU) THEN
          DECODE(60,'(5X,A20,3I10,5X)',IGEN(1)) LINLAB(ITU),LINTYP(ITU),
1           INTEQ(ITU),ICOLCOD(ITU)
          ITU=ITU+1
      ENDIF
      CONTINUE
C
      ITU=ITU-1
      NPT=1
      LMTH=0
      LDAY=0
C      IDELT = TIME INTERVAL OF DATA IN MINUTES
C      TDELT = NUMBER OF TIME INTERVALS PER INCH
C      XDELT = NUMBER OF INCHES/DAY
      XDELT=1440./(IDELT*TDELT)
C
15      READ(31,'(A4,9A10)',END=99) JPLOTID,(IDAT(I),I=1,9)
      IF (JPLOTID.NE.IPLOTID) GO TO 20
      DECODE(90,'(I6,4I3,5F14.5,2X)',IDAT(1)) IYR,IMTH>IDAY,IHR,
1   IMIN,(VAL(J),J=1,ITU)
      IF (NPT.EQ.1.AND.IHR.EQ.24.AND.IMIN.EQ.60) THEN
          IHR=0
          IMIN=0
          IDAY=IDAY+1
          ND=NDAYS(IMTH)
          IF ((MOD(IYR,4).EQ.0.AND.IMTH.EQ.2) ND=29
```

Cont. Appendix K.
(ii)

```
IF (IDAY.GT.ND) THEN
  IMTH=IMTH+1
  IDAY=1
  IF (IMTH.GT.12) THEN
    IYR=IYR+1
    IMTH=1
  ENDIF
ENDIF
C
C DECIDE WHETHER TO USE A DAILY OR MONTHLY X AXIS
C
IF (XDELT.LT.0.5) GO TO 2
IF (NPT.EQ.1) THEN
  TIM(1)=((IHR-1)*60.+(IMIN-1))/(IDELT*TDELT)
  CALL NUMBER(.05,-.20,.10,FLOAT(IDAY),0.,-1)
  LDAY=IDAY
  ENCODE(10,'(A3,1H/,I4,2X)',MY) MTH(IMTH),IYR
  CALL SYMBOL(0.0,-.40,.10,MY,0.,0)
  LMTH=IMTH
  IYRI=IYR
  IMTHI=IMTH
  IDAYI=IDAY
ELSE
  TIM(NPT)=TIM(NPT-1)+1./TDELT
ENDIF
C
IF (IDAY.NE.LDAY) THEN
  CALL NUMBER(TIM(NPT)+.05,-.20,.10,FLOAT(IDAY),0.,-1)
  LDAY=IDAY
ENDIF
GO TO 3
C
2 CONTINUE
IF (NPT.EQ.1) THEN
  IF (IHR.EQ.24) GO TO 15
  TIM(1)=((IDAY-1)*1440+(IHR-1)*60.+IMIN-1)/(IDELT*TDELT)
  LDAY=IDAY
  ENCODE(10,'(A3,1H/,I4,2X)',MY) MTH(IMTH),IYR
  CALL SYMBOL(0.0,-.40,.10,MY,0.,0)
  LMTH=IMTH
  IYRI=IYR
  IMTHI=IMTH
  IDAYI=IDAY
ELSE
  TIM(NPT)=TIM(NPT-1)+1./TDELT
ENDIF
C
IF (IDAY.NE.LDAY) THEN
  IF (IDAY.EQ.15) CALL NUMBER(TIM(NPT),-.20,.10,15.,0.,-1)
  LDAY=IDAY
ENDIF
C
3 CONTINUE
IF (IMTH.NE.LMTH) THEN
  ENCODE(10,'(A3,1H/,I4,2X)',MY) MTH(IMTH),IYR
  CALL SYMBOL(TIM(NPT),-.40,.10,MY,0.,0)
  LMTH=IMTH
ENDIF
C
DO 17 J=1,ITU
IF (VAL(J).LT.YMIN) VAL(J)=YMIN
IF (VAL(J).GT.YMAX) VAL(J)=YMAX
17 CONTINUE
NPT=NPT+1
WRITE(2),(VAL(J),J=1,ITU)
```

Cont. Appendix K.
(iii)

```

        IF (IOPT.NE.0) WRITE(6,'(IX,5I4,5F14.5)') IYR,IMTH,
1  IDAY,IMR,IMIN,(VAL(J),J=1,ITU)
        IF (NPT.GT.22000) STOP 'CANNOT PLOT MORE THAN 22000 PTS PER CURVE'
        GO TO 15
C
C  PLOT CURVES
C
99  IEND=1
    ENDFILE 2
    CALL SYMBOL(X+1.2,B=NPT-2
LINLAB(I),B,.2B)
    X=X+4.
26  CONTINUE
C
C  PLOT THE Y AXIS
C
        YDELT=(YMAX-YMIN)/B.
        CALL AXIS(B.,B.,IY,2B,B.,9B.,YMIN,YDELT)
        TIM(NPT+1)=B.
        TIM(NPT+2)=1.
        YLIN(NPT+1)=YMIN
        YLIN(NPT+2)=YDELT
C
        DO 30 I=1,ITU
        CALL NEWPEN(1)
        IF (ICOLCOD(I).NE.1) CALL NEWPEN(ICOLCOD(I))
        REWIND 2
        DO 32 N=1,NPT
        READ (2) (VAL(J),J=1,ITU)
        YLIN(N)=VAL(I)
32  CONTINUE
        CALL LINE(TIM,YLIN,NPT,1,LINTYP(I),INTEG(I))
38  CONTINUE
        CALL PLOT(TIM(NPT)+5.,B.,-3)
C
        IF (IEND.NE.1) GO TO 18
        CALL PLOT(5.,B.,999)
        STOP
C
        END
        EOJ ENCOUNTERED.
/ CALL SYMBOL(B.,9.5,.14,ITITLE,B.,4B)
        YT(1)=B.8
        YT(2)=B.8
        YT(3)=B.
        YT(4)=1.
        XT(3)=B.
        XT(4)=1.
        X=B.
        DO 26 I=1,ITU
        XT(1)=X
        XT(2)=X+1.
        CALL NEWPEN(1)
        IF (ICOLCOD(I).NE.1) CALL NEWPEN(ICOLCOD(I))
        LT=LINTYP(I)
        IF (LT.GT.1) LT=1
        CALL LINE(XT,YT,2,1,LT,INTEG(I))
        CALL SYMBOL(X+1.2,B.B.,.1B,LINLAB(I),B,.2B)
        X=X+4.
26  CONTINUE
C
C  PLOT THE Y AXIS
C
        YDELT=(YMAX-YMIN)/B.
        CALL AXIS(B.,B.,IY,2B,B.,9B.,YMIN,YDELT)
        TIM(NPT+1)=B.
        TIM(NPT+2)=1.
        YLIN(NPT+1)=YMIN
        YLIN(NPT+2)=YDELT
C
        DO 30 I=1,ITU
        CALL NEWPEN(1)
        IF (ICOLCOD(I).NE.1) CALL NEWPEN(ICOLCOD(I))
        REWIND 2
        DO 32 N=1,NPT
        READ (2) (VAL(J),J=1,ITU)
        YLIN(N)=VAL(I)
32  CONTINUE
        CALL LINE(TIM,YLIN,NPT,1,LINTYP(I),INTEG(I))
38  CONTINUE
        CALL PLOT(TIM(NPT)+5.,B.,-3)
C
        IF (IEND.NE.1) GO TO 18
        CALL PLOT(5.,B.,999)
        STOP
C
        END
        EOJ ENCOUNTERED.
/

```