Documentation of Software for Tracking Phosphorus Loads from the C139 Basin

prepared for

Department of Everglades Regulation
South Florida Water Management District

by

William W. Walker, Jr., Ph.D.
Environmental Engineer
1127 Lowell Road
Concord MA 01742-5522
Tel. 978-369-8061, Fax. -4230
e-mail: wwwalker@shore.net

April 3, 2001

Table of Contents

List of Tables

1.0   Introduction

To facilitate implementation of the C139 Regulatory Rule (40E-63), software has been developed for tracking basin runoff and phosphorus loads.   This report provides guidance for future use and maintenance of the software by SFWMD staff.   It is anticipated that the procedures will be executed at a quarterly frequency to provide current information on phosphorus load reductions and compliance with the Rule. Some evolution of the software is expected to reflect changing conditions in the C139 (new inflows, outflows, measurement locations, etc.) and to reflect needs for any new software features that may become apparent as the methodology is applied in the future. This report provides basic information on program structures, data structures, and updating procedures.   All software has been developed for application on IBM PC-compatible computers with Microsoft Excel-2000 software. Descriptions of the algorithm for calculating basin loads and the models/equations used for testing compliance are contained in the Rule and in the following technical documents:

- Walker, W.W., "Models for Tracking Runoff & Phosphorus Loads from the C139 Basin", Draft, July 2000.
- Walker, W.W., "Models for Tracking Runoff & Phosphorus Loads from the C139 Basin", Final Report, November 2000.

To supplement this report, many comment statements have been added to the workbooks and Fortran programs used in the calculations.

2.0   Overview

The Rule was originally developed and tested using historical runoff and phosphorus data for October 1978 through April 2000.   Regression models relating load, flow, and concentration to rainfall were calibrated to data from the legal base period (Water Years 1980 through 1988, or May 1979 through April 1988).   Data between May 1988 and April 2000 were used for model testing.   Both monthly and yearly summaries of these data are stored in the C139 tracking workbook (C139.xls) for reference purposes. Yearly values are listed in Table 1.

The updating procedure retrieves data and computes loads for months starting in May 1995 and ending in the latest month with complete data. May 1995 is specified as the first month to include the entire record with G136 composite samples. A complete record is desirable for accurate computation of the composite/grab sample concentration used to compute loads from grab samples on (rare) days when composite samples are missing. Historical values for rainfall, flow, and/or concentration in the District's databases may change in the future as a consequence of QA/QC procedures. Therefore, flows, loads, and rainfall values retrieved in the future may differ somewhat from those listed in Table 1.   In the C139.xls workbook, data prior to May 1995 are "frozen" at

values used in developing the Rule equations (Table 1). With each update, the flows, load, and rainfall values derived from the most recent data download are appended to the pre May 1995 values. The freezing date can be changed from the program menu (see below).

Table 2 lists and describes data files and programs involved in updating the basin flow and load calculations. Primary steps include:

1. Data Retrieval. Daily flow, daily rainfall, and phosphorus concentration data are extracted from databases maintained by SFWMD. Data-retrieval programs written in SQL are provided to extract the required data (Table 3). The files are downloaded to a PC for subsequent processing. As discussed above, the update files include all data collected after April 1995.

2. Phosphorus Load Calculations. A Fortran program (C139TPLD.FOR) calculates monthly flows and phosphorus loads at outflow points from the basin. The algorithm and code were originally patterned after software used in the EAA Regulatory Rule. In developing the C139 Rule, the EAA algorithm was modified specifically to improve load estimates for periods with long data gaps. While still present in the software, these modifications are likely to be irrelevant to future updates because long gaps are not anticipated. The program has also been modified to provide additional documentation (comment lines and additional output formats). The Fortran code is listed in the Appendix.

3. Compliance Calculations. An Excel 2000workbook (C139.XLS) calculates loads and tests for compliance. Monthly load and rainfall files generated in previous steps are accessed in these calculations. Several tabular and graphic output formats summarize current and historical results. Workbook contents are outlined in Table 4.

Once update files have been downloaded, all calculations are controlled from within the C139.XLS workbook.

3.0 Installing Software

To install the software on a PC, create a new disk directory and copy all files to that directory. The software and data files require approximately 4 megabytes of disk space. Run Excel & load the C139.XLS workbook. The 'Menu' page appears (see Table 5). Enter the name of the disk directory containing the Basin software and data files (e.g., "C:\C139") at the top of the 'Menu' page. Save the workbook.

Supporting macros are stored as Visual Basic Code attached to C139.XLS workbook.

These are transparent to the user. To view the code, select "Tools Macros VisualBasicEditor", then select 'Modules/Module1' under VBA Project C139.XLS from the Project window in the upper left corner of the screen.

4.0   Updating Data Files

Periodic updates of basin calculations will normally involve the following procedures:

1. Submit retrieval programs (C139HYD.SQL, C139TP.SQL) to the SFWMD mainframe and download the corresponding output files (C139HYD.SPL & C139TP.SPL, respectively). These programs are configured to retrieve all relevant flow, rainfall, and phosphorus data reported after April 1995. The data files should be placed in the PC disk directory containing C139 software and data files.

2. Run Excel & load the C139.XLS workbook. The 'Menu' page appears (see Table 5).   If not performed during the installation step (see above), enter the name of the disk directory containing the Basin software and data files (e.g., "C:\C139BASIN") at the top of the 'Menu' page. Pressing 'Ctrl-m' will return to the Menu page from other locations in the workbook.

3. The workbook contains a sheet labeled 'Areas'. This sheet, a remnant from EAA basin software, could be used to specify any reductions in basin drainage area. Compliance calculations are based upon measured loads per unit of drainage area. Since the C139 Rule contains no provision for considering reductions in drainage area, a need to modify this sheet is not anticipated. The code is present in the workbook, however, should such a provision be added in the future.

4. Click the "Update Files" button located on the Menu page . This executes a DOS batch program (GO.BAT) which updates data files and calculates monthly basin loads (Table 6).   Alternatively, this step can be conducted from the DOS command prompt by entering ">GO".   The batch procedure will terminate early if errors are encountered in updating data files.   The batch procedure produces a log file "C139.LOG" that traces the load calculations for each station. If difficulties are encountered, this file can be examined to help identify error sources. When the batch program is completed, the DOS window must be closed manually to return to the workbook.   The load computations will stop automatically at the end of the last month with a complete flow record.   The user should check manually to see that the concentration record is complete through that date.

5. Click the "Update Workbook" button on the 'Menu' page. Compliance calculations, output tables, and charts in the workbook are updated. Six files

produced in the previous steps are stored in the following pages of the workbook:

C139R_MO - monthly rainfall   RainUpdate
C139.TOT - monthly flows and loadsLoadUpdate
C139MO.PRN – structure flows & loads   StructureData
C139HYD.SPL – daily hydrologic data   HydroData
C139TP.SPL – downloaded sample data   TPData
C139SAM.PRN – samples used in load calcs Samples

6. Click the "Reports" button to see results for any 12-month period, up to & including the most recent 12 months with complete data.

7. Select a sheet name from the drop-down menu and click the "GotoSheet" button to view any output table or graph. Output formats are listed in Table 4. Hit 'Ctrl-m' to return to the Menu page from any location in the workbook.

8. For QA/QC purposes, the workbook contains all of the daily hydrologic & phosphorus data used to update the calculations   Cross-tabs summarize the data in various ways (Sheets labeled XTAB_…, Table 4).

The above procedures can be followed to obtain routine updates.   As summary of results for any 12-month period is contained on the 'Reports' page (Table 11).

If an error in the calculations is encountered during any of the macro steps, execution will stop and the Visual Basic code window will appear. The location of the error (breakpoint) will be highlighted in yellow. Note the error location. Reset the program by selecting 'Run Reset' from the Visual Basic menu. Return to Excel via the Windows Task Bar (bottom of screen).

5.0   Data File Structures

Load & compliance calculations are based upon rainfall, flow, and phosphorus data files with the .FIX extension (Table 1). File structures are illustrated in Table 9. These files must be sorted by date. This condition is satisfied by output sort statements in the SQL data-retrieval programs. The load-computation program (C139TPLD) checks for missing flow data and automatically stops on the last date with a flow record for each structure listed in the control file (C139.JOB). Missing values are allowed in the daily rainfall data file (C139RAIN.FIX), but compliance calculations performed in C139.XLS automatically stop at the last month with complete flow & rainfall records.

In the *.FIX files, dates are stored in YYMMDD format. For example, April 20, 2000 is stored as 420; April 5, 1999 is stored as 990405. The software recognizes this format and translates it into a date sequence number (days from January 1, 1900) in performing load computations.

6.0 Adding or Modifying Stations

In the event that basin outlet monitoring locations are changed or new outlets are created, the following steps can be taken to update the load calculation procedure:

1. Identify the appropriate DBKEY for flow data.

2. Edit C139HYD.SQL (Table 3) to include the new DBKEY.

3. Add a line at the end of C139FLOW.DAT (Table 7) to reflect the new DBKEY and a new flow station label.   If this is a new monitoring station, specify the first date with flow data in YYMMDD format.   Set the last date to 0 to indicate an active station. The software automatically assigns zero flows for dates outside of the specified range.

4. If a flow station (DBKEY) is abandoned, change the ending date in C139FLOW.DAT from 0 to the last date with data.   Keep the line in the file, so that historical data for the defined period of record will be retrieved and loads computed for that structure with each update, despite the fact that the station is no longer operational.

5. Identify appropriate station and project codes for water quality data.

6. Edit C139TP.SQL to include the new station and project codes.

7. Add a line to the C139.JOB file (Table 8) to reflect the new station. Set the flow sign ("qsign") to 1 if positive flows stored in the DBKEY are to be used or to -1 if negative flows are to be used.   Set the term sign ("tsign") to 1 for an outflow term or to -1 for an inflow/thruflow term. Set the composite sample flag ("compos") to 1 if composite samples are collected at the station or to 0, otherwise. Separate water quality station codes can be specified for composite & grab samples. The flow station code should be referenced to the code assigned in C139FLOW.DAT (Table 7). Water quality station codes should be referenced in the data query file C139TP.SQL (Table 3).

8. For documentation purposes, edit the list of station codes contained on the 'Notes' page of C139.XLS to any changes.

Once these steps are completed, follow the normal updating procedures describe above.

The load calculation control file (C139.JOB, Table 8) contains lines that specify type codes for grab and composite samples. Any records in the downloaded data file (C139TP.SPL, Table 3) with type codes other than those specified in C139.JOB are ignored. No warning message is issued, so the C139TP.SPL file should be checked independently for valid station codes. The C139.XLS workbook contains a listing of the sample data (sheet TPData) & a sample inventory by station & type code (sheet XTAB_TPData).

7.0   Freezing Basin Results

Most of the compliance calculations are performed on the 'Monthly' page of the C139.XLS workbook. There is one row below the heading for each month after September 1978. Columns B-G contain input values for the month identified in Column A; these are retrieved from other pages of the workbook. The remaining columns are computed from the values in Columns B-G. The last column (AZ) indicates whether the corresponding row is frozen (1) or thawed (0). When the workbook is updated, new rows are appended to the monthly table using formulas stored in Row 120 (hidden from view). The 'freeze'operation described below converts formulas is specified rows of this sheet to constants, so that they will not change with future file updates.

When results for a recent water year (through April) have been certified, it is necessary to "freeze" the results.   This operation ensures that previously-certified results do not change with future file updates. Small variations in historical load estimates might otherwise occur at stations relying on grab samples or when historical databases are changed. Such variations reflect the following characteristics of the load-calculation algorithm:

1. interpolation based upon date to estimate grab-sample concentrations between sampling dates; and

2. adjustment of grab-sample loads based upon the ratio of average grab-sample load to the average composite-sample load calculated from all data collected after April 1995.

Freezing is accomplished by converting formula cells in appropriate rows on the 'Monthly' page to fixed values.

The procedure of freezing results is located on the 'Freeze' page (Table 10). The user enters a water year in the indicated cell; all results up to and including April of the specified year will be frozen. Clicking on the "Freeze Results" button completes the

operation by converting all of the corresponding rows on the 'Monthly' page to fixed values. Formulas are retained in rows after April of the specified year.

To preserve results for the dataset used in model development & testing, the specified year must be greater than or equal to 1995. Should it become desirable to remove this constraint, the Visual Basic code must be modified (see 'Freeze' procedure).

In the event that results are frozen by mistake, results can be "thawed" by specifying an earlier year in the indicated cell. All results after April of the specified year will be thawed.   This converts fixed values back to formulas, so that results will change with current and future file updates.

Freeze operations should be conducted by SFWMD staff on an annual basis after certification of results for a given water year.   It will not be necessary to include the required macros in versions of the workbook distributed to the public. Once results have been certified and frozen, the 'Freeze' page can be deleted (optionally) from copies of the workbook distributed to the public containing certified results through the current year.

List of Tables

Table 1: Yearly Rainfall, Flows, & Phosphorus Loads Used in Model Calibration & Testing

YrMo	Rainfall Inches	Flows (1000 acre-feet) L3	G136	G342	Basin	Phosphorus Loads (metric tons) L3	G136	G342	Basin	Basin P Conc ppb
	1088.7	2624.5	346.5	8.4	2979.4	620.87	76.91	4.14	701.91	191
1980	56.4	171.54	0.00	0.00	171.54	34.67	0.00	0.00	34.67	164
1981	31.1	51.20	0.00	0.00	51.20	4.14	0.00	0.00	4.14	66
1982	38.6	43.88	0.00	0.00	43.88	6.14	0.00	0.00	6.14	113
1983	72.0	289.83	54.63	0.00	344.46	134.61	13.45	0.00	148.06	348
1984	47.2	121.82	33.80	0.00	155.62	31.87	8.48	0.00	40.35	210
1985	46.9	56.00	7.11	0.00	63.11	12.84	1.78	0.00	14.62	188
1986	46.7	91.95	18.35	0.00	110.30	14.43	2.59	0.00	17.03	125
1987	60.2	110.49	38.79	0.00	149.28	28.25	9.49	0.00	37.74	205
1988	48.0	82.35	11.57	0.00	93.91	24.64	3.51	0.00	28.15	243
1989	40.7	64.85	7.96	0.00	72.81	12.21	1.95	0.00	14.16	158
1990	39.6	44.39	1.25	0.00	45.64	5.30	0.17	0.00	5.48	97
1991	47.5	41.84	3.50	0.00	45.34	4.66	0.33	0.00	4.99	89
1992	51.0	91.30	8.48	0.00	99.79	11.27	1.00	0.00	12.27	100
1993	55.5	125.62	11.67	0.00	137.29	24.06	2.21	0.00	26.28	155
1994	52.0	116.36	20.11	0.00	136.47	18.80	2.95	0.00	21.75	129
1995	59.8	236.27	35.99	0.00	272.25	56.34	5.55	0.00	61.89	184
1996	60.0	214.97	20.79	0.00	235.76	45.05	3.44	0.00	48.49	167
1997	55.7	151.44	13.09	0.00	164.53	42.61	2.47	0.00	45.08	222
1998	56.6	149.15	20.78	0.00	169.93	30.24	5.39	0.00	35.63	170
1999	51.4	122.06	13.73	0.00	135.79	31.40	4.18	0.00	35.58	212
2000	54.4	168.78	24.86	8.42	202.06	41.22	7.96	4.14	53.31	214
1980-1988	49.7	113.23	18.25	0.00	131.48	32.40	4.37	0.00	36.77	227
1989-1996	50.8	116.95	13.72	0.00	130.67	22.21	2.20	0.00	24.41	151
1997-2000	54.5	147.86	18.12	2.10	168.08	36.37	5.00	1.03	42.40	204
Oct 78 - Sep 88	49.2	115.05	17.22	0.00	132.27	30.90	4.13	0.00	35.03	215

Table 2:   **File Index**

File Name	Extension	Size (bytes)	Type	Description
GO	BAT	1,799	Batch	Batch File for Updating Load Calcs
C139	JOB	1,874	Control	Control File for Load Computations
C139FLOW	DAT	419	Control	Flow Station Specifications
C139RAIN	DAT	270	Control	Rainfall Station Specifications
C139FLOW	FIX	170,067	Data	Flow Data File
C139R_MO	FIX	3,721	Data	Monthly Rainfall Data File
C139RAIN	FIX	88,449	Data	Daily Rainfall Data File
C139TP	FIX	58,034	Data	Phosphorus Data File
C139HYD	SPL	1,016,550	Input	Downloaded Rainfall & Flow Data
C139TP	SPL	111,780	Input	Downloaded Phosphorus Data
C139	LOG	99,733	Output	Load Computation Log File
C139	TOT	3,019	Output	Basin Monthly Loads
C139FLOW	SCN	692	Output	Inventory of Daily Flow File
C139FLOW	XTB	7,264	Output	Crosstab of Monthly Flows by Structure
C139LOAD	XTB	7,265	Output	Crosstab of Monthly Loads by Structure
C139MO	PRN	26,778	Output	Output - Monthly Flows & Load by Structure
C139R_MO	SCN	464	Output	Inventory of Monthly Load File
C139RAIN	SCN	388	Output	Inventory of Daily Rainfall File
C139SAM	PRN	91,451	Output	Listing of Samples Used in Load Computation
C139TP	SCN	471	Output	Inventory of Phosphorus Data File
C139	XLS	6,657,536	Program	Excel Workbook
C139HYD	SQL	620	Program	Data Retrieval
C139TP	SQL	751	Program	Data Retrieval
C139TPLD	EXE	63,986	Program	Load Computation Executable File
C139TPLD	FOR	32,779	Program	Load Computation Program Source Code
COPYFX	EXE	21,572	Utility*	Strip Download File - Executable
COPYFX	FOR	587	Utility*	Strip Download FILe - Source Code
HYDTAB	EXE	34,824	Utility*	Parse Hydrologic Data - Executable
HYDTAB	FOR	3,539	Utility*	Parse Hydrologic Data - Source Code
MTOTAL	EXE	40,918	Utility*	Compute Monthly Total Rainfall - Executable
MTOTAL	FOR	1,572	Utility*	Compute Monthly Total Rainfall - Source Code
RDTP	EXE	34,386	Utility*	Parse Phosphorus Data - Executable
RDTP	FOR	1,634	Utility*	Parse Phosphorus Data - Source Code
SCAN	EXE	41,914	Utility*	File Inventory - Executable
SCAN	FOR	2,242	Utility*	File Inventory - Source Code
Total		8,629,348		

* Utilility programs are identical to those used in EAA basin calculations

Table 3: Data Retrieval Programs

Flow & Rainfall Data: File C139HYD.SQL

```
col daily_date format a8;
col value format 9999.99;
set pagesize 0;
set feedback off;
set termout off;
spool c139hyd.spl;
select to_char(daily_date,'yyyymmdd') daily_date,
dbkey, value from dm_daily_data
where dbkey in (
'KQ646','15195','J6398','J6405','J6406','J6407','JU789',
'15197','IV150','IV151' )
/*  Flows:   C139DFC, G136, G342B, G342D, G342A, G342C G406*/
/*  Rainfall: ALICO DEVILS PAIGE    */
and daily_date between to_date ('19950501','yyyymmdd')
and to_date ('20201231','yyyymmdd')
order by daily_date, dbkey;
spool off;
termout on;
quit;
```

Phosphorus Data: File C139TP.SQL

```
col date_collected format a8;
col TPO4  format 990.999;
col sample_type format a3;
set pagesize 0;
set feedback off;
set termout off;
spool c139tp.spl;
select station_id, project_code,
to_char(date_collected,'yyyymmdd') date_collected,
to_char(sample_type,'099'),
value TPO4 from wqdora.sample
where project_code in
('X', 'CAMB', 'R','STA5','C139')
and station_id in
('C139DFC','L3','G136','G342A','G342B','G342C','G342D','G406')
and date_collected between
to_date ('19950501','yyyymmdd')
and to_date ('20201231','yyyymmdd')
and test_number = 25
and sample_type not in (1,9)
and flag is null
order by date_collected, station_id;
spool off;
quit;
```

Table 4: **Contents of C139.XLS Workbook**

Sheet	Description	Type
Menu	Menu	Control
Notes	Notes	Documentation
Freeze	Freeze/Thaw Monthly Results	Control
Report	List Results Through Specified Month	Output
Monthly	Monthly Calculations	Calculations
Yearly	Yearly Calculations	Calculations & Output
Areas	Basin Drainage Areas	Input
LoadUpdate	Monthly Flow & Load Updates for Basin	Data
RainUpdate	Monthly Rainfall Updates	Data
Calib_Data_Monthly	Monthly Data Used in Rule Development	Documentation
Calib_Data_Yearly	Yearly Data Used in Rule Development	Documentation
Structure_Data *	Monthly Flows & Loads by Structure	Output / QAQC
XTAB_Flows	Monthly Flows by Structure	Output / QAQC
XTAB_Loads	Monthly Loads by Structure	Output / QAQC
XTAB_Concs	Monthly Concentrations by Structure	Output / QAQC
XTAB_Samples	Raw Sample Data by Station, Type, & Date	Output / QAQC
XTAB_TPData	Sample Inventory by Station & Type Code	Output / QAQC
XTAB_HydroData	Daily Flows & Rainfall by DBKEY	Output / QAQC
HydroData	Downloaded Daily Flow & Rainfall Data	Output / QAQC
TPData	Raw Sample Data Listing	Output / QAQC
Samples	List of Samples Used in Load Calculations	Output / QAQC
Coefficients	Model Coefficients	Data
Calcs	Calculations	Calculations
C_TargLim	Chart - Yearly Load Target, Limit, & Observed	Chart
C_All	Chart - Yearly Load, Runoff & Conc.	Chart
C_Rain	Chart - Yearly Rainfall	Chart
C_Loads	Chart - Yearly Loads	Chart
C_Flows	Chart - Yearly Runoff	Chart
C_Concs	Chart - Yearly Concs	Chart
C_Load12	Chart - 12-Month Rolling Average Load	Chart
C_Flow12	Chart - 12-Month Rolling Average Flow	Chart
C_Conc12	Chart - 12-Month Rolling Average Conc	Chart
C_Rain_M	Chart - Monthly Rainfall	Chart
C_Load_M	Chart - Monthly Load	Chart
C_Flow_M	Chart - Monthly Flow	Chart
C_Conc_M	Chart - Monthly Concentration	Chart
C_10Yr	Chart - 10-Year Rolling Averages	Chart

* Sheet 'Structure_Data' is referenced by Regional Mass-Balance Workbook 'EAABAL.XLS'

Table 5

Compliance Calculations - C139 Basin Rule   Version: **April 3, 2001**

W. Walker, prepared for South Florida Water Management District

User Inputs are in Blue

Disk Directory----------------->   **e:\sfwmd\c139**   contains this workbook & data files

Update Files

<-- Press Here to Update Source Data Files
        Updates Rainfall, Flow, & Phosphorus Data
        Executes C139TPLD to Update Monthly Load File

Update Workbook

<-- Press Here to Update Workbook

Data Base:	Workbook	Rainfall	Loads		FrozenThru
Last Month:	200012	200012	200012		199504

Report

<-- Press Here to View Results for Specified Period

Goto Worksheet

Select a Worksheet:

Monthly Concentrations by Structure   ▼

Press Ctrl-m to Return to Menu

Table 6: Data Processing Batch Procedure (GO.BAT)

```
echo off
cls
echo.
echo Batch Procedure to Update C139 Flow, Rainfall, & Phosphorus Data Files
echo.
echo requires the following files downloaded from SFWMD computer:
echo.
echo    C139HYD.SPL    daily rainfall & flow update
echo    C139TP.SPL      phosphorus conc update
echo.
echo Press Ctrl-C to abort, other key to continue
pause
if NOT Exist c139tp.spl   goto zip
if NOT exist c139hyd.spl goto zip
if exist c139rain.fix del c139rain.fix
if exist c139tp.fix del c139tp.fix
if exist c139.tot del c139.tot
echo.
echo archive current file versions
if not exist .\archive md .\archive
copy *.fix .\archive
echo.
echo update daily rainfall file
echo.
copyfx c139hyd.spl c139hyd.spc
hydtab c139rain.dat c139hyd.spc
if NOT exist c139rain.fix goto abort
echo.
echo summarize daily rainfall file
echo.
scan c139rain.fix c139rain.scn
pause
echo.
echo calculate monthly total rainfall
mtotal c139rain.fix c139r_mo.fix
echo summarize monthly rainfall file
scan c139r_mo.fix c139r_mo.scn
pause
echo.
echo update p concentration file
echo.
copyfx c139tp.spl c139tp.spc
rdtp c139tp.spc c139tp.fix
if NOT exist c139tp.fix goto abort
echo summarize p concentration file
scan c139tp.fix c139tp.scn
pause
echo.
echo update daily flow file
echo.
hydtab c139flow.dat c139hyd.spc
if NOT exist c139flow.fix goto abort
echo summarize daily flow file
scan c139flow.fix c139flow.scn
pause
echo.
echo updating load calculations
echo.
echo detailed results listed in file 'C139.LOG'
c139tpld c139.job >c139.log
echo.
echo *** file updates & load calculations completed
goto next
:zip
echo *** .SPL file missing
:abort
echo *** File Update Aborted
:next
echo *** close window & return to C139.XLS workbook
:end
```

Table 7:   Files for Parsing Daily Flow & Rainfall Data

File: C139RAIN.DAT

```
'C139 Daily Rainfall'
'c139rain.fix'    'output file'
-999.999         'missing value'
0                'stop on first missing date 1=yes 0=no'
'DBKEY  STRUCTURE    FIRSTDATE LASTDATE'
'15197' 'ALICO'       0 0
'IV150'  'DEVILS'      0 0
'IV151' 'PAIGE'       0 0
```

File: C139FLOW.DAT

```
'C139 Daily Flows'
'c139flow.fix'   'output file name'
-999.999        'missing value code'
1               'stop on first missing value 0=no 1=yes'
'DBKEY  STRUCTURE    FIRSTDATE LASTDATE'
'KQ646' 'C139DFC'    950501    000626
'15195' 'G136'       0         0
'J6406' 'G342A'       991001 0
'J6398' 'G342B'       991001 0
'J6407' 'G342C'       991001 0
'J6405' 'G342D'       991001 0
'JU789' 'G406'        000626 0
```

Table 8: Control File for Load Calculations - C139.JOB

```
'P Load Calcs - C139 Basin'
'c139flow.fix'       'input flow file'
'c139tp.fix'        'input concentration file'
14                  'nmaxc = composite sample interval days'
19781001            'first date of baseline period yyyymmdd'
19950430            'last date of baseline period  yyyymmdd this has no effect if data update starts in May 1995'
.0                  'sig = significance level for outlier screening in base pd - no screening'
3                   'grab/compos option 0=each pd, 1=base pd, 2= set to 1.0, 3 use 1 ratio for entire record'
19950501            'first date for load calcs yyyymmdd'
20200430            'last date  for load calcs yyyymmdd'
199505              'first yyyymm in monthly output files'
'TP'                'concentration variable'
1000                'concentration scale factor - convert to ppb'
20                  'max interpolation interval for grab samples (days)'
9999                'minimum samples for conc vs. flow regression'
2  7 24             'number of valid composite sample type codes, then values'
2  0  19            'number of valid grab sample codes, then values'
'c139sam.prn'       'output sample file (optional)'
' '                 'daily output file (optional)'
'c139mo.prn'        'monthly output file (flow, load, conc by term/mo) (optional)'
'C139FLOW.xtb'      'output flow cross-tabulation term x month (optional)'
'C139LOAD.xtb'      'output load cross-tabulation term x month (optional)'
'C139.tot'          'output total flow, load, conc by month'
'term,   comp_station, grab_station,flow label, qsign, compos,tsign'
'L3'       'C139DFC'  'L3'   'C139DFC'      1   1      1
'G136'     'G136'      'G136'  'G136'        1   1      1
'G342A'    'G342A'     'G342A' 'G342A'       1   1      1
'G342B'    'G342B'     'G342B' 'G342B'       1   1      1
'G342C'    'G342C'     'G342C' 'G342C'       1   1      1
'G342D'    'G342D'     'G342D' 'G342D'       1   1      1
'G406'     'G406'      'G406'  'G406'        1   1      1
```

Table 9: Data File Structures

File:	**C139RAIN.FIX**			**created from file C139HYD.SPL**

C139 Daily Rainfall				title
4				number of fields
-999.999				missing value code
YYMMDD	ALICO	DEVILS	PAIGE	variable names
950501	0	0	0	data…
950502	0	0	0	
950503	0	0	0	
950504	0.52	0	0.82	
950505	0	0.1	0	
950506	0	0	0	
950507	0	0	0	
950508	0	0	0	

File:	**C139FLOWS.FIX**							**created from file C139HYD.SPL**

C139 Daily Flows								title
7								number of fields
-999.999								missing value code
YYMMDD	C139DFC	G136	G342A	G342B	G342C	G342D	G406	variable names
950501	30	8.31	0	0	0	0	0	data…
950502	30	7.31	0	0	0	0	0	
950503	30	3.92	0	0	0	0	0	
950504	30	2.38	0	0	0	0	0	
950505	30	0.3	0	0	0	0	0	
950506	30	0	0	0	0	0	0	
950507	30	0	0	0	0	0	0	
950508	30	0	0	0	0	0	0	
950509	30	0	0	0	0	0	0	
etc…								

File:	**C139TP.FIX**			**created from file C139TP.SPL**

C139 Phosphorus Data				title
4				number of fields
-999.999				missing value code
STATION	YYMMDD	TYPE	TP	variable names
C139DFC	950511	24	0.03	data…
G136	950511	0	0.027	
L3	950511	0	0.06	
C139DFC	950517	24	0.05	
G136	950517	24	0.028	
C139DFC	950524	24	0.075	
G136	950524	0	0.029	
G136	950524	24	0.024	
L3	950524	0	0.072	
etc…				

Table 10 : Freeze Results

FREEZING converts calculated monthly values to constants, so that they won't change with future file updates
Normally, this would be done once results for current water year have been certified.

Enter Water Year (YYYY)------> | **1995** | results will be frozen through April of this year
>= 1995 | & thawed after April of this year
Value must be between 1995 & last water year
with complete data = 2000

| Freeze Results | **<-- Press Here to Freeze Results**

Modifies rows in Monthly Worksheet. Frozen Rows have black text. Thawed Rows have red text.

Workbook Updated Thru	200012
Results Currently Frozen Thru	199504
Number of Frozen Rows	199
Number of Active Rows	68
Total Number of Valid Rows	267

Table 11: Output Report
Basin Compliance Calculations - C139 Rule
South Florida Water Management District   04/03/01

Date Interval for Report

Enter Last Year ------>   2000

Enter Last Month ---->   12

Date Intervals	First	to	Last
Current Results	200001	to	200012
Rainfall Data Base	199505	to	200012
Load Data Base	199505	to	200012

Results	Units	Value	
Current Watershed Area	acres	169500	
Observed Flow	kac-ft	67.7	
Predicted Flow (50%)	kac-ft	58.2	
Predicted Flow (5%)	kac-ft	38.1	
Predicted Flow (95%)	kac-ft	89.0	
Observed Load	mtons	19.4	> Limit
Target Load	mtons	7.7	
Limit Load (90th Percentile)	mtons	13.8	
10th Percentile Load	mtons	4.3	
Adjusted Load	mtons	56.4	
Load Adjustment Factor	-	2.91	
Basin Compliance		YES	Most Recent Water Yr
Total Rainfall	inches	37.34	
Average Runoff	inches	4.8	
Unit Area Load	lbs/acre	0.251	
Adjusted Unit Area Load	lbs/acre	0.732	
Flow-Wtd-Mean Conc	ppm	231.7	
Load Reduction	%	-152%	Last 12 Months
Load Reduction	%	-23%	Last 36 Months
Load Reduction	%	-46%	Last Water Year
Load Reduction	%	-15%	Last 3 Water Years

Forward

Backward

Current

Menu

Basin Load Reductions vs. Water Year

Water Year	One-Year Average	Three Year Average
1991	76%	41%
1992	56%	61%
1993	33%	51%
1994	28%	38%
1995	-15%	11%
1996	11%	5%
1997	-14%	-5%
1998	16%	5%
1999	-24%	-5%
2000	-46%	-15%