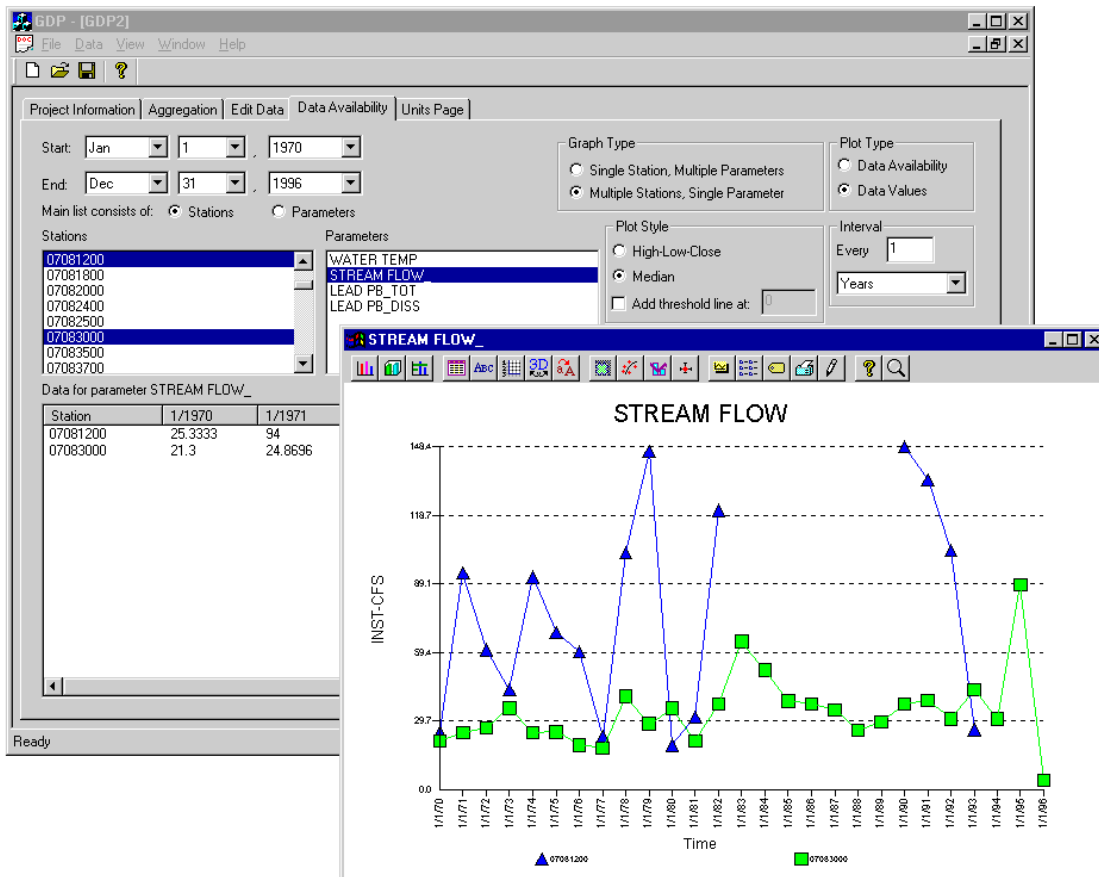


Graphical Data Processor (GDP)

User Manual



Version 1.1

Developed by the Integrated Decision Support Group (IDS) at Colorado State University for The United States Bureau of Reclamation and the Environmental Protection Agency (EPA).



U.S.
Environmental
Protection
Agency

Graphical Data Processor (GDP) User Manual Version 1.1

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Fort Collins, Colorado 80523 USA

About This Document

This document is a user manual for the Graphical Data Processor (GDP) software developed as an analysis aid for the Water Quality Analysis Simulation Program (WASP) Version 5.0. This user manual is parallel to the on-line documentation available from the software. In addition to this user manual there is a programming routine manual that documents the system's current capabilities and describes each of the programming routines developed for this project.

Participation

This project was sponsored and directed by the Department of Interior Bureau of Reclamation (Reclamation), the Environmental Protection Agency (EPA) Office of Science and Technology, and the Integrated Decision Support Group (IDS Group) at Colorado State University (CSU), Fort Collins, Colorado USA. Faculty, staff members, and graduate students from the IDS Group and the Department of Chemical and Bioresource Engineering at CSU served as the principal investigators. IDS is part of the Water Center at Colorado State University in Fort Collins, Colorado, USA.

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1.0 Introduction

Current methods for preparing input files for water models such as WASP5 are cumbersome and often become the major task of water modeling projects. The Graphical Data Processor (GDP) has been designed to receive standard inputs from STORET, WATSTORE, and spreadsheets. GDP can be used to interpolate data for time periods and can be used to combine parameters and/or stations so that they appear as a single entity. Once data has been processed it can be used with WASP Builder to fill parameter values such as flow or constituent amounts, or it can be used for other modeling tasks.

1.1 Hardware Requirements

GDP, the data preprocessor described in this manual, has been designed to run in a Windows 95/98/NT environment with at least a 486 processor and 16 megabytes of RAM.

1.2 WASP Builder

WASP Builder can be used to build input files for the WASP water quality model. Data developed in GDP can be imported into WASP Builder to fill out data cards for WASP.

1.3 WASP Version 5

Water Quality Analysis Simulation Program (WASP) is a generalized framework for modeling water quality and contaminant fate and transport in surface waters. Based on a flexible compartment modeling approach, WASP can be applied in one, two, or three dimensions. WASP is designed to allow substitution of user-written routines into the program structure. Problems that have been studied using the WASP framework include biochemical oxygen demand and dissolved oxygen dynamics, nutrients and eutrophication, bacterial contamination, and organic chemical and heavy metal contamination (EPA, 1995).

WASP has been used to simulate the water quality and pollutant fate for a variety of aquatic systems. It is used primarily to investigate the water quality response to management actions, primarily point and non-point source load reduction. It is presently being distributed by EPA-Office of Research and Development/Center for Exposure Assessment Modeling Athens, GA (CEAM).

The technical contact is:

Robert B. Ambrose, Jr.

Address: U.S. EPA-Center for Exposure Assessment Modeling

960 College Station Road

Athens, GA 30605-2700

1.4 STORET Data Files

STORET is a computerized data base utility maintained by EPA for the STOrage and RETrieval of parametric data pertaining to the quality of the waterways within the contiguous United States (EPA, 1996). STORET includes several individual but related systems, which contain various types of information:

1. Geographical, political, and descriptive information concerning sites where data have been collected. These sites, known as “stations” within STORET, are the base to which data are attached.
2. Measurements of the physical characteristics and chemical composition of water, fish tissue, or sediment sampled at these sites, referred to as “parametric” data in STORET. This system, the Water Quality System, is by far the largest and most widely known facility in STORET.
3. Counts and descriptions of living organisms found at these sites, known as “Biological Field Surveys” in STORET.
4. Stream flow data, obtained from the U.S. Geological Survey, in what is called the “daily values” system.

This project has been designed for the types of data found in the Water Quality System, but may be expanded to include other items. The data contained in STORET are collected, stored, and used by a variety of federal, state, interstate, and local government agencies, and their contractors. For more information, contact:

STORET User Assistance
Mail Stop 4305-F
U. S. Environmental Protection Agency
401 M St., S.W.
Washington, DC, 20460
(800)424-9067
STORET@epamail.epa.gov

1.5 WATSTORE Data Files

The National WATER Data STOrage and RETrieval System (WATSTORE) was established in 1972 to provide an effective and efficient means for the processing and maintenance of water data collected through the activities of the U.S. Geological Survey and to facilitate release of the data to the public. A variety of useful products, ranging from data tables to complex statistical analyses such as log-Pearson Type III, can be produced using WATSTORE. The system resides on the central computer facilities of the U.S. Geological Survey at its National Center in Reston, Virginia, and consists of related files and data bases.

- Station Header File - Contains descriptive information on more than 440,000 sites throughout the United States and its territories where the U.S. Geological Survey collects or has collected data.
- Daily Values File - Contains more than 220 million daily values of streamflows, stages, reservoir contents, water temperatures, specific conductances, sediment concentrations, sediment discharges, and ground-water levels.
- Peak Flow File - Contains approximately 500,000 maximum (peak) streamflow and gage-height values at surface-water sites.
- Water Quality File - Contains approximately 2 million analyses of water samples that describe the chemical, physical, biological, and radiochemical characteristics of both surface and ground water.

- Ground-Water Site Inventory Data Base - Contains inventory data for more than 900,000 wells, springs, and other sources of ground water. The data include site location, geohydrologic characteristics, well-construction history, and one-time field measurements such as water temperature.

In 1976, the U.S. Geological Survey opened WATSTORE to the public for direct access. The signing of a Memorandum of Agreement with the Survey is required to obtain direct access to WATSTORE. Direct access may be obtained by contacting:

U.S. Geological Survey
National Water Data Exchange
421 USGS National Center
Reston, Virginia 20192

Graphical Data Processor (GDP) User Manual

2.0 Getting Started with GDP

GDP provides functions that allow users to combine data from different sources, to aggregate (combine) parameters and stations, and to interpolate values at different time increments. The data can be imported from STORET, WATSTORE, or spreadsheets. Results can be exported to a data file, spreadsheet, or to WASP Builder for assembling input files for WASP.

2.1 Installing GDP

1. In world wide web browser open the following page:
<http://www.ids.colostate.edu/projects/gdp/download.html>
2. To download a zipped file containing the setup files for GDP, click your mouse on the most current version of GDP listed in the table.
3. After selecting the file in your browser, open the file and use the **Install** button in the Winzip program.
4. Follow the setup instructions.

2.2 Starting GDP in Windows

1. Select the **Programs** option from the **Start** menu on the lower left corner of the screen (*Figure 1*).

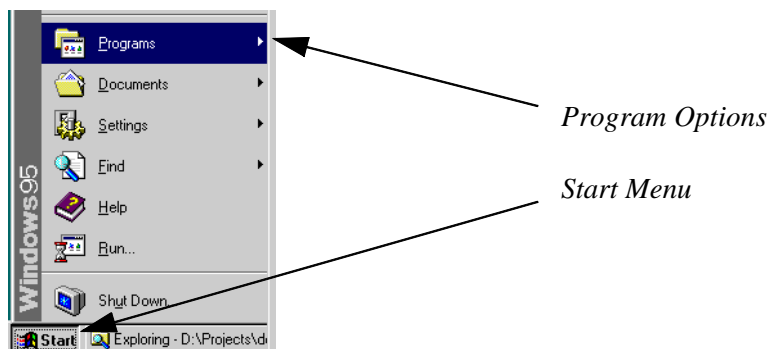


Figure 1: Programs Option in the Start Menu.

2. One of the options will be **WASP AT**. Select the **WASP AT** folder in the program menu and open the **GDP** folder and select the GDP file.

3. The window shown in *Figure 2* will be displayed.

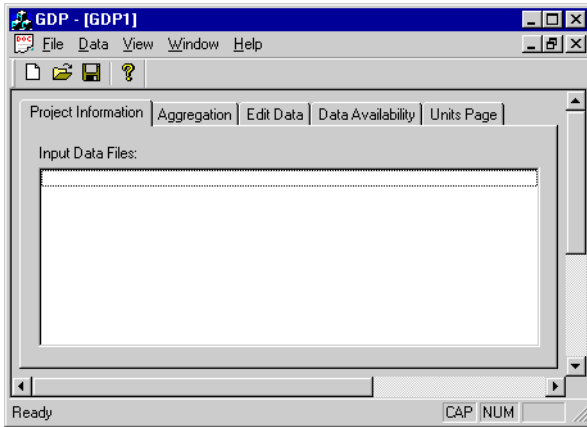


Figure 2: Main Display Window.

2.2.1 Creating a New Project

You can create a new project before you begin working.

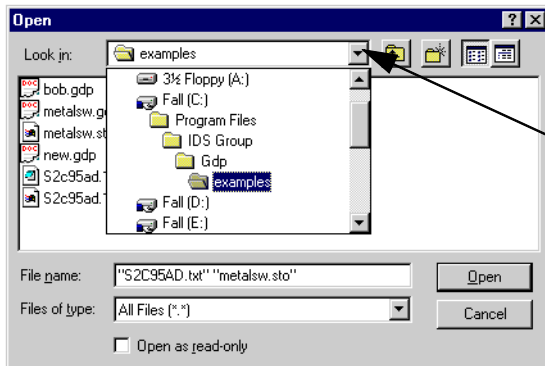
1. To start or create a new project, select the **New** option from the **File** menu.
2. Select a new name and save the file. GDP files have a *.gdp extension.

2.2.2 Loading Parameter Data

You can select STORET, WATSTORE, or spreadsheet files for analysis using the **Data > Add STORET or WATSTORE format** or the **Add from Spreadsheet option**. GDP currently requires STORET and WATSTORE files to be in the standard format and text files to be in supported formats (see Section 5.0: Input File Formats).

When GDP is installed a directory called **Examples** is created that contains example data files. The path for this directory is typically C:/Program Files/WASP AT/GDP/Examples. To import data from STORET or WATSTORE follow these steps:

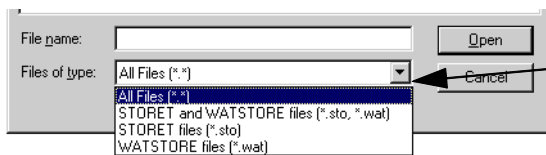
1. Select the **Data > Add STORET or WATSTORE format** option.
2. Use the **Open** window to select the directory that contains the data files (*Figure 3*). If you need to access another disk to get to your data files, you can change the directory by clicking on the scroll list next to the **Look In** field, see *Figure 3*.



Click here to change directories.

Figure 3: Selecting Directories in the Open Window.

3. The **Files of type** field shows the extensions of each file type. Figure 4 illustrates the extensions associated with STORET and WATSTORE.



Click here to show filter options.

Figure 4: Showing Particular File Types in the Open Window

- STORET files must have a “*.sto” extension.
 - WATSTORE files have a “*.wat” extension.
4. Select files individually by holding down the left mouse button and the **Control** key. Hold down the left mouse button and the **Shift** key to select groups of files.
 5. After selecting the files, click on the **Open** button.

2.2.3 Selecting Multiple Items from a List

By using the shift and control keys multiple items from a list can be selected.

- **Control Key** - The control key is used to select multiple items that are not listed in series. Depress the control key and select the desired items with the mouse.
- **Shift Key** - The shift key is used to select multiple items when they appear together in a list and is utilized by depressing the shift key and clicking on the first and last items in the group of items; this will also select all the items between the two.

These features are used when selecting parameters and/or stations when aggregating and also for selecting multiple files.

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3.0 Pull Down Windows

3.1 File Menu

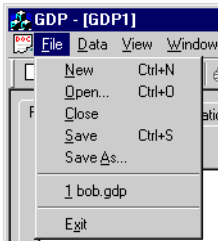


Figure 5: File Pull-Down Menu.

3.1.1 New Projects

The **New** option will create a new GDP project.

3.1.2 Opening Projects

The **Open** option can be used to open GDP project files with a ***.gdp** extension. To import files in another format such as the STORET format use the **Data > Add** options (see Section 3.2: Data Menu).

3.1.3 Closing a Project

The **Close** option will close the current project, but the main window and any other projects will remain open. If the project has been modified since the last save, you will be asked if you want to save the changes.

3.1.4 Saving a Project

There are two options for saving projects. The **Save** option saves the current project with the current file name. The file name is printed in the title bar (i.e. **GDP - [new.gdp]**).

The **Save As** option can be used to save a project with a new name or location. When this option is selected, a window is brought up that can be used to specify the name and location of the GDP file. The **Save in** field shows the current directory and the **File name** field is the name of the file you want to save.

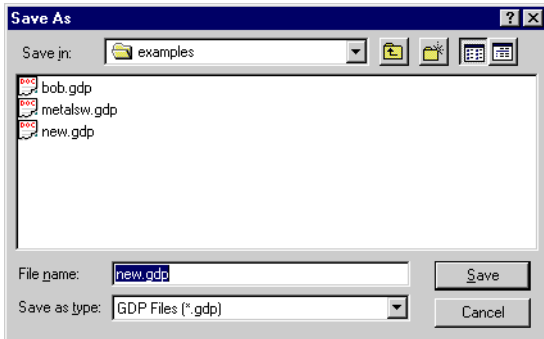


Figure 6: Save As Window

3.1.5 Selecting Other Projects

Most recently used projects can be viewed by selecting them from the list displayed above the **Exit** option in the file menu (Figure 7).

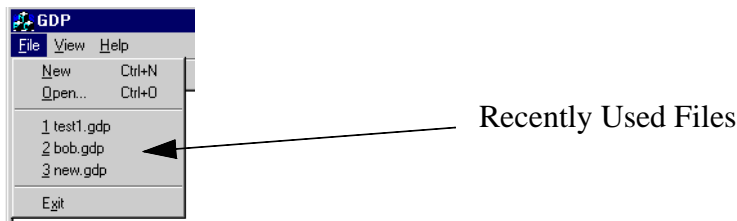



Figure 7: Selecting Recently Used Projects

3.1.6 Exiting the Project

The **Exit** option quits GDP. You will be prompted to save any modified projects. This has the same effect as pressing the  close icon in the upper corner of the main window.

3.2 Data Menu

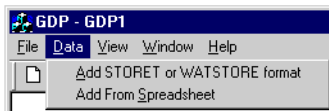


Figure 8: Data Pull-Down Menu

The Data pull-down menu has the following options:

- Add data files from STORET or WATSTORE formats -This option can be used to import data in standard formats from these data sources. For more information see Section 2.2.2: Loading Parameter Data.
- Add data From a Spreadsheet - This option can be used to add data from a spreadsheet program, when the data is in the proper format. For more information see Section 3.2.1: Adding Data from a Spreadsheet.

3.2.1 Adding Data from a Spreadsheet

To use this option, data from a spreadsheet program should be saved as a text file with comma or tab delimiters. The data can also be copied to your computer's clipboard using the copy option in the spreadsheet. Follow these steps to add data from a spreadsheet:

1. Create the data in a spreadsheet according to the following formats:
 - **Single Station** - This format uses four columns: identification, value, the time of the reading, and the date of the reading. Since the program is looking only at the text, you should be careful with the formatting of the dates and times. The dates should have the format of Day-Month-Year or Month/Day/Year as shown in *Figure 9*. Note that all entries use numerical representations except for Day-Month-Year format, which uses the three letter abbreviation of the month.

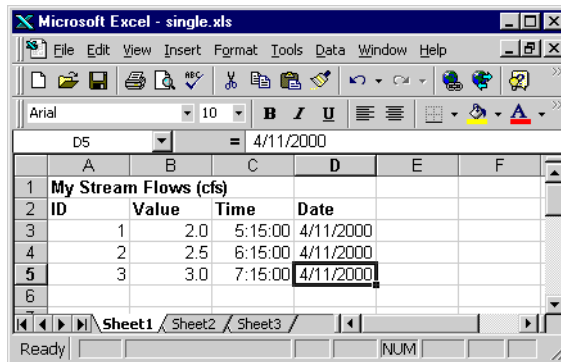


Figure 9: Excel File with Single Station Format

- **Multiple Stations** - This format can include data from multiple stations with a date or a date and a time. To enter a time, enter it in the same cell as the date at the end and enter it in the format hour:minute:second.

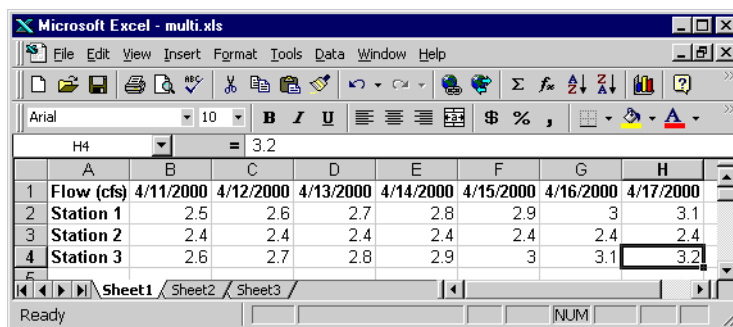


Figure 10: Excel File with Multiple Station Format

2. Save the data to the clipboard using the copy option or save the data as a text file with columns delimited by tabs or commas.
3. Select the **Data > Add From Spreadsheet** option. The window shown in *Figure 11* will be displayed. Select the Location, Separator and Format appropriate to the data you are importing.

4. Add the parameter name and units in the **Choose Spreadsheet Options** window and click on the **Add Parameter** button.

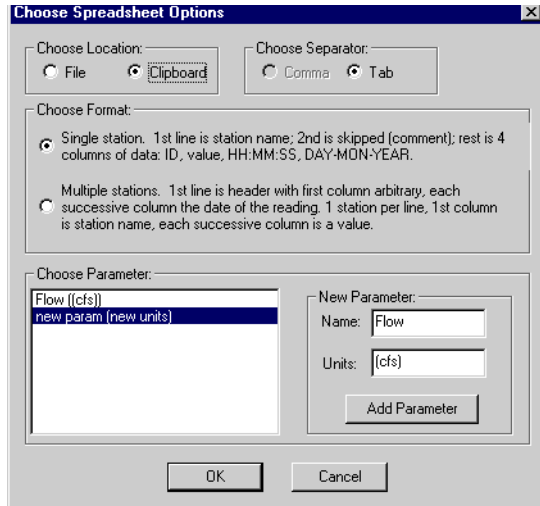


Figure 11: Choose Spreadsheet Options Window

5. Select the **OK** button.
6. Select the **Edit Data** tab to view the results. For more information see Section 4.3: Edit Data Tab.

3.3 View Pull-Down Menu



Figure 12: View Pull-Down Menu

The **View** pull-down menu has two options, that are toggle switches to change the WASP Builder display:

1. **View > Toolbar** - This displays the tool bar with the following options:



Figure 1: GDP Toolbar

- **New GDP File** - Creates a new GDP file, see Section 3.1.1: New Projects.
- **Open GDP File** - Opens a GDP project file, see Section 3.1.2: Opening Projects.
- **Save File** - Saves the current project file, see Section 3.1.4: Saving a Project.
- **About Box** - Displays the About GDP dialog (see Section 3.5.1: GDP Help).

2. **View > Status Bar** - The status bar contains information about the workings of the program and can be displayed or not depending on the setting of the option. It is located in the lower left corner of the main window.

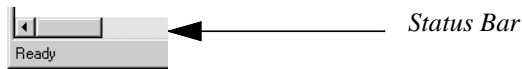


Figure 2: Status Bar

3.4 Window Pull-Down Menu

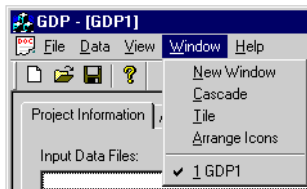



Figure 3: Window Pull-Down Menu

Options for the **Window** pull-down menu:

1. **Window > New Window** - This option creates a new view of the current project.
2. **Window > Cascade** - If there are multiple windows open, this option will cascade the windows in the main window.
3. **Window > Tile** - If there are multiple windows open, this option will tile the windows in the main window.
4. **Window > Arrange Icons** - If there are multiple windows iconified, this option will arrange the icons in the main window.

Note: Input file windows can be iconified, displayed in full-view, or closed using the buttons on the upper right of each window . The horizontal line iconifies a window, the square or double square displays the window in full or partial view, respectively and the “x” symbol closes the window.

Display of Windows Currently Open - The list of windows on the bottom of the **Window** pull-down menu displays all the windows that are currently opened. A window can be brought to the front by clicking on the window in the list. The currently displayed window has a check mark next to it.

3.5 Help Pull-Down Menu



Figure 4: Help Pull-Down Menu

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3.5.1 GDP Help

The WASP Builder help files contain the same information as this document.

3.5.2 About GDP

About GDP displays the version and date of release for GDP.

4.0 Data Tabs

GDP is arranged in tabs that can be used to view, edit and process data.

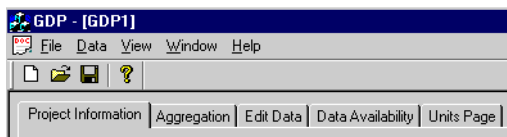


Figure 13: GDP Data Tabs

4.1 Project Information Tab

This data tab displays the full path of any WATSTORE or STORET files the project uses (*Figure 14*).

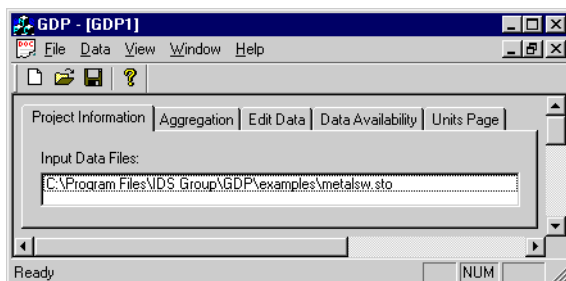


Figure 14: Project Files Data Tab

4.2 Aggregation Tab

This data tab can be used to aggregate or combine stations and parameters for analysis. Data can be aggregated by:


- Stations - Typically locations for collecting data.
- Parameters - Types of measurements with values for stations by date and time.

For example, if one of your data files contains temperatures for different days but the same location as another data file, you can use GDP to combine these two records. Sometimes there are more data sites than you need for a model run, GDP can be used to combine multiple stations to model river reaches. Consider the possibility that you wanted to treat two STORET stations as the same station. There may be data collected as part of each of these stations that could provide a more complete record for a given river reach

when combined. This section will walk you through an example of combining two STORET stations contained in the **metalsw.sto** file in the **Examples** directory.

1. Select the **File > New** option to start a new project
2. Input the STORET data file (i.e. **metalsw.sto**) from the **Examples** directory by using the **Data > Add STORET or WATSTORE format** option.
3. Display the **Data Aggregation** tab and select the stations option, see *Figure 15*.
4. Select the stations or parameters from the list on the left to aggregate. In this case, select item 3 and item 4 from the station list in the left column by clicking on each.

*Note - If you need to do a conversion to aggregate parameters, you should go to the **Units** data tab and do the conversion before aggregating.*

5. Select the right arrow icon .
6. The **Aggregation Name** dialog window will be displayed, *Figure 15*. Give the aggregation a descriptive name (i.e. New Station) and add the selected stations.

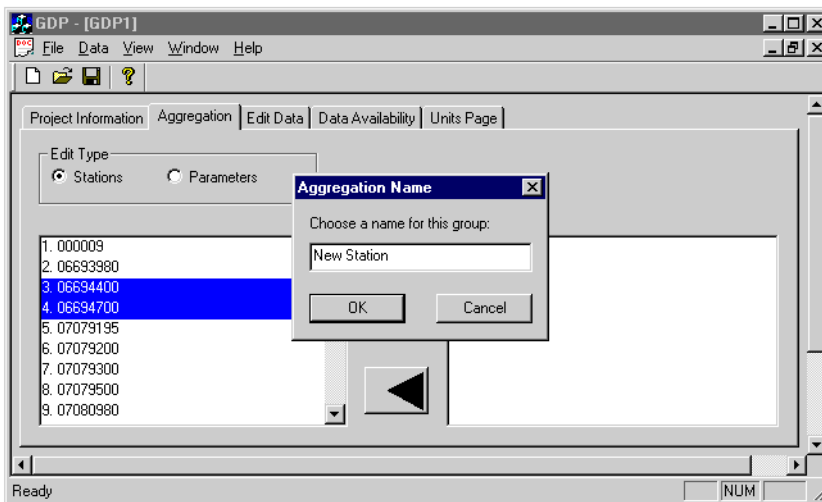



Figure 15: Data Aggregation Tab

Note - If a parameter value occurs at the same time for two stations that are being aggregated, the average of the two values will be used. This will also be the case when a parameter value is calculated over an interval that contains several data points.

7. To remove station(s) or parameter(s) from the aggregation list box on the right, highlight the new station or parameter with the cursor and click with the left mouse button on the  button.

8. This process can be repeated to create other aggregates.

Note - Any stations not aggregated will remain unselected in the list of stations and will retain their individual data.

9. The next step is to see how the data overlaps from the two stations. The **Data Availability** data tab can be used to display and graph the data from the combined stations.

4.3 Edit Data Tab

The **Edit** data tab can be used to enter values for stations and parameters. Data can viewed and edited based on stations or parameters using the **Edit Type** options.

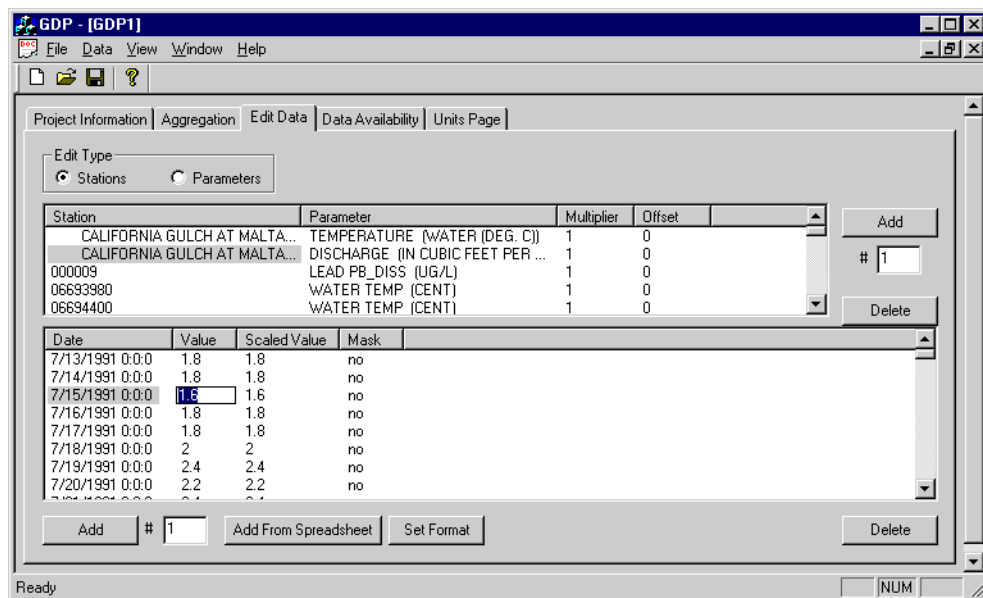


Figure 16: Edit Data Tab

Stations that have multiple parameters will show multiple times in the **Station** list with an entry for each parameter. The parameter associated with the station in the **Station** list can be changed by pressing the left mouse button on the corresponding table entry and selecting the new parameter from the **Parameter** list dialog (*Figure 17*). If values are entered before the parameter is changed, the values will be retained with the new parameter. Therefore, this option should be used with caution.

The entries in the upper table include a multiplier and offset for location-specific conversions. The station's value is first multiplied by the multiplier and then the offset is added; the resultant values are displayed in the **Scaled Value** column in the lower table.

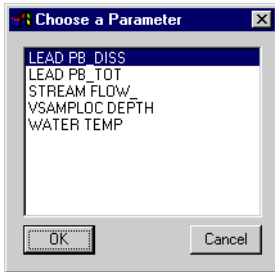


Figure 17: Choose Parameter in the Edit Data Tab

4.3.1 Adding and Deleting Station-Parameter pairs:

1. Select the number of stations to add in the field next to the “?” symbol to the right of the upper display.
2. Select the **Add** button.
3. New values can be entered in the lower window by typing or by pasting from a spreadsheet.
4. Stations can be deleted by pressing the **Delete** button and choosing them from the dialog that pops up. This option should be used with caution since it can not be undone.

4.3.2 Adding Values for Parameters

Values can be entered by typing them into the bottom table or from a spreadsheet.

1. First select the station and parameter pair from the upper table that you want to add values to. If you want to add the values by hand, enter the number to add in the upper table and press the **Add** button on the bottom of the window. New value place holders will be added at the end of the parameter list. The value will be zero and the date will be based either on the current time or the date of the last entry. Edit the date and values by selecting the table cells and typing in the new values.
2. If you have data in a spreadsheet, set the format of the data to be pasted from the spreadsheet by selecting the **Format** button.

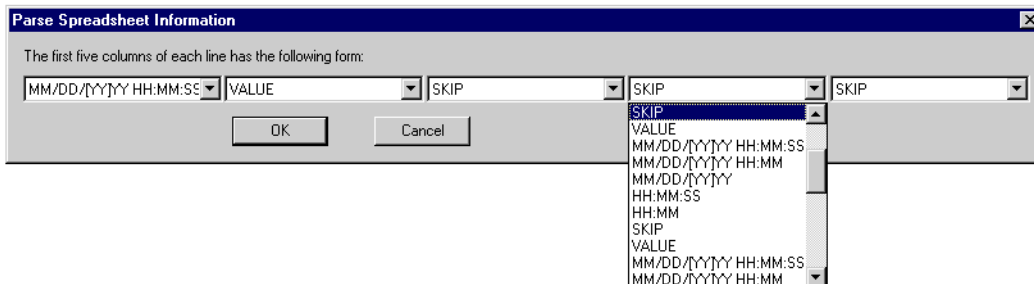


Figure 18: Format of Spreadsheet Data

Each of the fields in the **Parse Spreadsheet Information** window corresponds to a column of data that is separated by tabs. Once the format corresponds to the data you are copying from a spreadsheet select the **OK** button.

3. Make sure the data to be pasted from the spreadsheet is in the correct format. Select the data columns and the **Edit > Copy** command in the spreadsheet program. The data will be saved to your computer's clipboard.
4. Select the **Add from Spreadsheet** button and the data will be added to the lower data table for the station and parameter combination selected.

4.4 Data Availability Tab

This tab is used to plot graphs that show data availability, data values, and to export data. Data availability plots are typically used before data aggregation occurs to determine appropriate station and/or parameter aggregation (see Section 4.4: Data Availability Tab). This tab can also be used to view the results of a data aggregation and to export aggregated data to other programs.

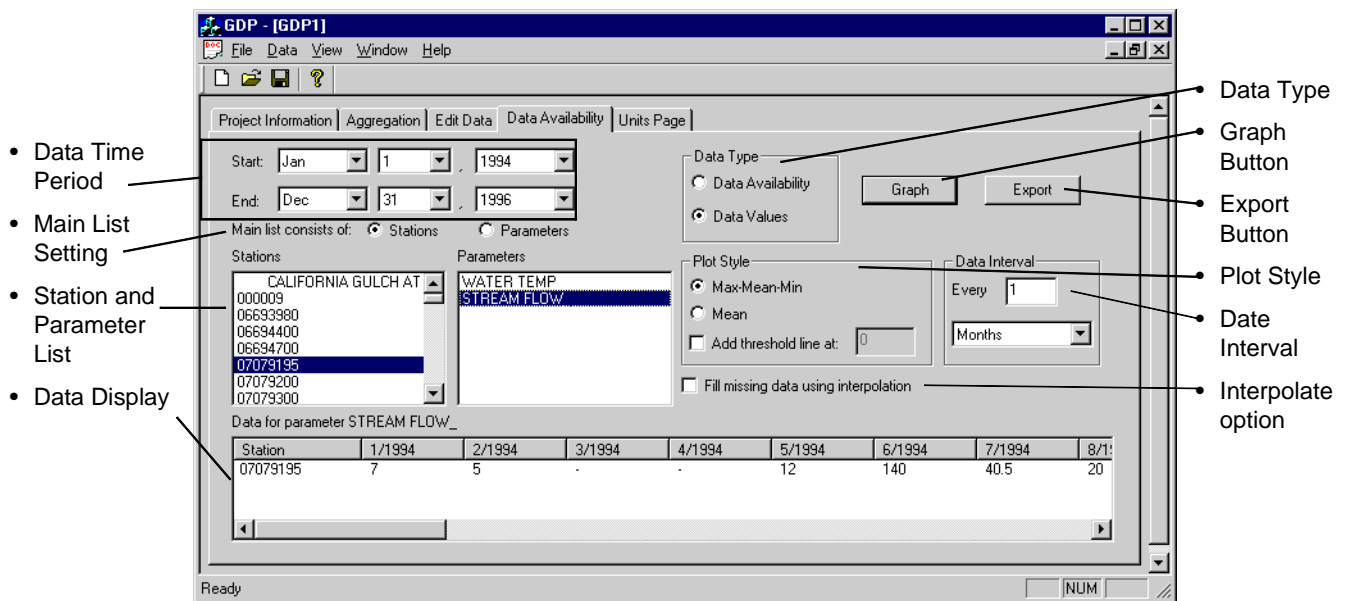


Figure 19: Data Availability Tab

4.4.1 Data Time Period

The data time period is defined by the **Start** and **End** dates. The default start date is the date of the earliest record that appears in any of the selected data files. Similarly, the default end date is date of the last record. You can shorten the period of record by setting new values for the start or end date. You can adjust the start and end dates by selecting the new year, month, and day in the scroll lists to the right of the display.

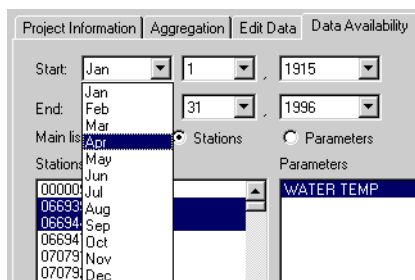


Figure 20: Scroll List for Data Time Periods

4.4.2 Main List Setting

This option is used to switch the order of the **Station** and **Parameter** lists, so that data can be viewed by looking at one parameter at several stations or by looking at several parameters for one station. The right list allows for only one selection, and the list on the left allows for multiple selections.

4.4.3 Station and Parameter Lists

This is a list of all the stations available, if the **Stations** option is selected for the **Main List Setting**. The right list will show all the parameters that are associated with the selected stations. The order can be reversed by selecting the **Parameters** radio button. If you want to make multiple selections for parameters or stations make sure that the group is in the display on the left.

4.4.4 Data Display

Data for the selected stations and parameters will be displayed in this area. The data displayed here will be the same data that is used for the graph and export options.

4.4.5 Data Type

Shows data availability or data values for the selected stations and parameters. When the **Data Availability** option is selected, time periods that have a reading for the selected items will show a value of 1, and periods without data will show a 0 in the **Data Display**.

- **Data Availability** - Displays symbols for the dates when there is a data reading for the given station and parameter.
- **Data Values** - Displays the data values for the parameter specified. This option can only be used for single-parameter selections.

4.4.6 Graph Button

Graphs the data displayed in the lower table. The data availability graph will list the station or parameter names on the left y-axis and use a symbol to indicate if data is available for the period of record that you requested. Otherwise values of a given parameter are on the y-axis and the period of record is on the x-axis on the plots. The plot graph window (*Figure 21*) is displayed when the **Graph** button is selected from the **Data Availability** tab.

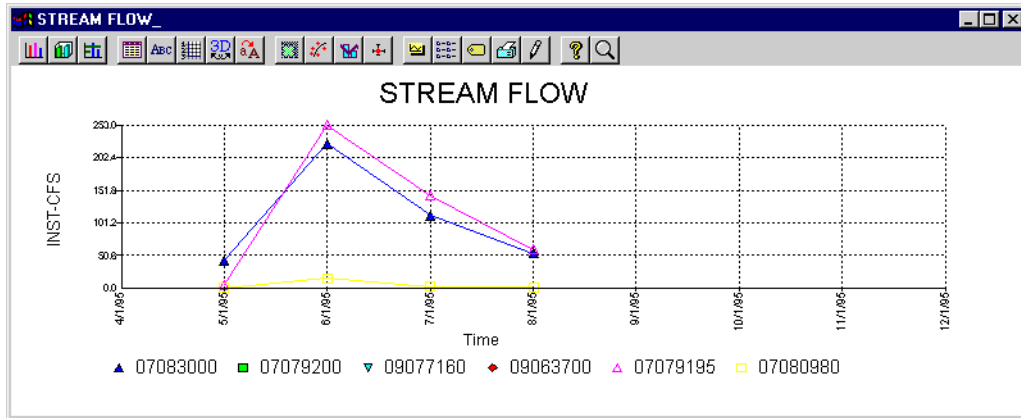



Figure 21: Plot Graph Window

*Note - The graph format can be changed using options in the graph control tabs. For more information on how to use these options, select the help button in the **Graph** window by clicking on the  icon.*

4.4.7 **Export Button**

This option generates a simple report using the contents of the data table. When the **Export** button is selected, the **Export Options** window will be displayed.

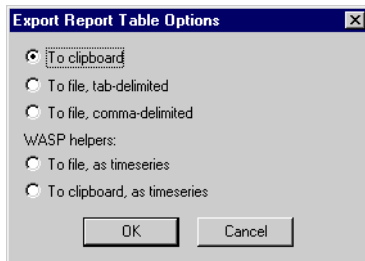


Figure 22: Export Report Table Options

The **Export Report Table** has the following options:

- **To clipboard** - This option saves the information in the data display to the clipboard using tabs for delimiters. The information can then be pasted into a spreadsheet using the **File > Paste** option within the spreadsheet.
- **To file, tab-delimited or comma delimited** - These options bring up a file browser window to specify the name and location of the ASCII data file.
- **WASP Helpers** - These options can be used in conjunction with WASP Builder to populated input data files for the WASP water quality model.

4.4.8 Exporting Data for WASP

To use these option you should have only one station selected. If you have multiple stations selected, a warning box will appear.



Figure 23: WASP Warning Box

The data can be saved to your computer's clipboard and then pasted directly in the correct data tab in WASP Builder, or it can be saved to a file to be imported later. The file option will display a file browser window to specify the name and location of the file to be saved.

Note - To paste or import the file into Wasp Builder see the Wasp Builder User Manual for how to import timeseries data.

4.4.9 Plot Style

This option can be used to plot the data in a graph with different styles. The maximum, mean and minimum of the values in the selected period of record using the **Date Interval** will be displayed if the **Max-Mean-Min** radio button is selected. Otherwise the table entries will represent the mean of the data.

*Note - All **Plot Style** options are active only when the **Data Values** option is set in the **Data Type**.*

The following options are available for plot style:

- **Max-Mean-Min** - This option plots the maximum, mean, and minimum of the data selected.
- **Mean** - This option displays the mean of the data selected for the selected interval.
- **Add threshold line at:** - This option will display a line on the plot at the value entered in the field.

4.4.10 Date Interval

Data can be displayed using different intervals of time. For example, a data reading can be generated for every 10 years starting at the date given in the **Start:** fields by specifying a "10" in the **Every** field and selecting **years** from the scroll list. If multiple data points fall in a given interval, the value generated is the average of the data points.

4.4.11 Interpolate Option

The Interpolate option can be used to fill in missing data. The algorithm fills the beginning and end of the period selected with the first and last values, respectively. For every additional missing value a linear interpolation is done between the nearest values on either side. For example if you had the following data:

```

My Stream Flows (cfs)
ID Value Date
1 --- 4/10/2000
2 2.0 4/11/2000
3 --- 4/12/2000
4 3.0 4/13/2000
5 --- 4/14/2000

```

The value for ID #1 would be 2.0 and 3.0 for ID #5, the values of ID #2 and #4 repeated, respectively. The value for ID #3 is halfway between the values for ID #2 and #4, so therefore 2.5.

4.5 Units Page Tab

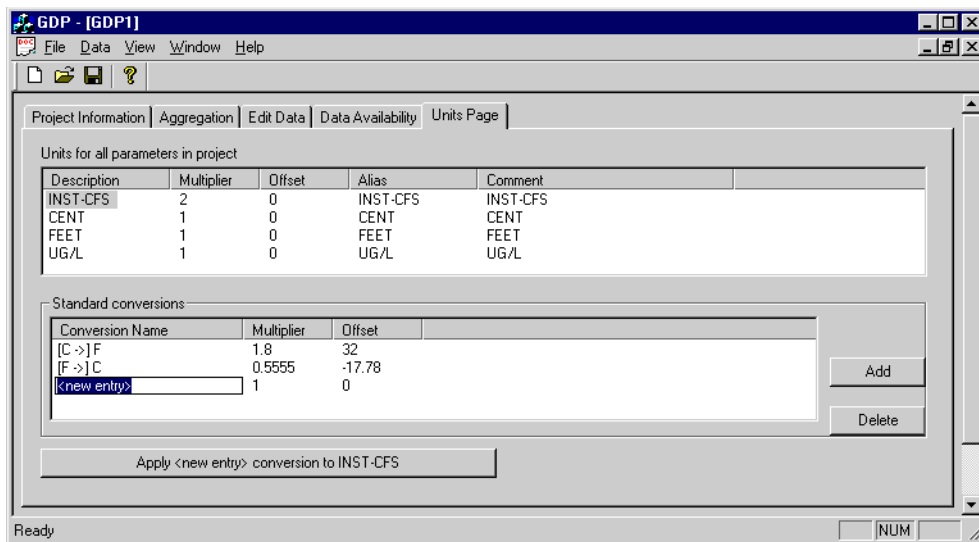


Figure 24: Units Conversion Window

The **Units Page** tab allows you to convert a parameter's units to another type using a pre-defined conversion equation or by defining your own conversion equation. All the units used for your project are displayed in the upper table. The lower table can be used to create standard conversions you may want to use for other projects. For example, Centigrade to Fahrenheit is already provided. When a standard conversion is created, it is saved in a separate program file and will be read by successive projects.

Conversions use a multiplier (i.e. the slope of the relationship) and an offset (i.e. the y-intercept value) allowing for complex unit conversions. The multiplier is multiplied times the original values and the offset is added to the result for every place in the project the units are used.

Graphical Data Processor (GDP) User Manual

5.0 Input File Formats

Input files can be in standard STORET or WATSTORE file formats. This section provides a description of the file formats supported by GDP. Data can also be entered into GDP using a spreadsheet program; the formats used are described in Section 3.2.1: Adding Data from a Spreadsheet and Section 4.3.2: Adding Values for Parameters.

5.1 STORET File Format

STORET retrievals for water quality data include a string indicating the date, time and station name and columns for each parameter with values.

	00003	00010	00061	00003	00010	01051	01049	01055	01056	01045
	VSAMPLOC	WATER	STREAM	VSAMPLOC	WATER	LEAD	LEAD	MANGNESE	MANGNESE	IRON
	DEPTH	TEMP	FLOW_	DEPTH	TEMP	PB_TOT	PB_DISS	MN	MN_DISS	FE_TOT
	FEET	CENT	INST-CFS	FEET	CENT	UG/L	UG/L	UG/L	UG/L	UG/L
19730809-999126901	-9	7.0	-9	-9	7.0	-9	-9	-9	-9	-9
199004181245390009106135001	-9	5.5	-9	-9	5.5	-9	-9	-9	-9	-9
199006061405390009106135001	-9	8.5	84	-9	8.5	-9	-9	-9	-9	-9
199007171840390009106135001	-9	12.5	27	-9	12.5	-9	-9	-9	-9	-9
199008281620390009106135001	-9	13.5	13	-9	13.5	-9	-9	-9	-9	-9
199010310800390009106135001	-9	1.5	7	-9	1.5	-9	-9	-9	-9	-9
199104240835390009106135001	-9	1.5	3	-9	1.5	-9	-9	-9	-9	-9

The second line of the file is the parameter names starting at column 26 at each 8 character spaces. The third line is the continued name of the parameter and is read in the same manner. The fourth line is the Units for the parameter is read in the same way. Successive lines are read for the year first (4 digits), and the month, day, hour, and minutes all 2 digits each. The parameters are read with the value occurring after at least one space. Non-values are stored as “-9”

5.2 WATSTORE File Format

WATSTORE retrieval files typically contain all the details of the data query including the cost, what parameters were found, etc. Next, the data follows listed by station with the parameter values for each date in a table format.

```

1          UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY          PROCESS DATE IS 08-30-96
0  STATION NUMBER 07081800 CALIFORNIA GULCH AT MALTA, CO.          STREAM SOURCE AGENCY USGS
   LATITUDE 391321   LONGITUDE 1062117   DRAINAGE AREA          DATUM          STATE 08 COUNTY 065

          DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992
          MEAN VALUES
0  DAY      OCT      NOV      DEC      JAN      FEB      MAR      APR      MAY      JUN      JUL      AUG      SEP
   1      1.5      1.0      1.0      1.1      1.3      1.6      1.4      1.7      1.5      .89      1.3      2.4
   2      1.3      1.0      1.1      1.1      1.3      1.7      1.5      1.7      1.6      .96      1.4      2.5
   3      .93      1.0      1.2      1.0      1.3      1.5      1.6      1.5      1.5      1.1      1.0      2.4
   .
   .
   .

```

GDP looks for the “UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY” text to know when to start reading data for a station. The next line includes the station number and name, which is read and stored. The next two lines are skipped and the parameter, units and period of record are read. The data is stored by day of the month with the months listed by water year (i.e. October - September). The data is stored in 9 character strings starting at the 20th character. This information is stored for each of the 31 days of the month. After the first set of data values are read, the algorithm searches for the next header string and the next set of values. Non-values are stored using “---”.

6.0 References

Environmental Protection Agency (EPA), 1995. Water Quality Analysis and Simulation Program (WASP5). (URL = <http://www.epa.gov/OWOW/watershed/tools/model.html#29>). Last updated October 2, 1995.

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