UTIL INTERFACE
FOR SWAT2000

USER'S GUIDE

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NOVEMBER, 2000

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SECTION 1: INTRODUCTION

Welcome to the SWAT UTIL Interface—a package designed to help you properly format input for SWAT2000. The SWAT UTIL interface runs in an MS/DOS environment. It is the oldest and most versatile of the interfaces available for SWAT.

UTIL, a Universal Text Integration Language, is a data file editor that has been developed to help users of large computer models and other data intensive programs. It is designed to edit any data file with a fixed number of variables, cells or fields, and is very easy to use since it combines command-line and full-screen editing. Each variable or field has provided with it a description, the range limits for the variable and a complete interactive help file that completely explains that variable's usage. There may also be extra commands to load blocks of data from data base files for a particular model or application. This greatly speeds data entry in a large data file. All commands used in UTIL are designed to be entered interactively or to be stored in files to allow groups of commands to be executed in an unattended mode. This technique facilitates the generation of many different scenarios for use in testing computer models. This unique feature also allows UTIL to change any variable in a data file from a DOS batch file.

Current statistics:

Maximum number variables	Limited to space on disk
Maximum lines in a DATASET	800 lines
Maximum line length in DATASET	80 characters
Maximum number of lines of help/VAR	24 lines on the screen/
	500 using scrollable text

SECTION 2: INSTALLING THE UTIL INTERFACE

System Requirements

The UTIL Interface requires:

❖ Personal computer with MS DOS

❖ 8 megabytes free memory on the hard drive

To install the interface

1. Download zipped file containing the interface.

2. Create a directory where you wish to store the interface files. (e.g. C:\Util)

3. Extract the contents of the zipped file to the directory.

4. Download SWAT executable for the PC environment.

If you should encounter problems or have questions, please contact:

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SECTION 3: USING THE UTIL INTERFACE

SWAT dataset files can be separated into four groups: file types that are required for the watershed, i.e. only one file of the type is required for the dataset; file types that are required for each subbasin; file types that are required for each HRU; and file types required for special purposes. The following list summarizes the file types by group. Detailed information about inputs for the various files can be found in the SWAT2000 manual.

Watershed files (1 file per dataset):
    file.cio   .fig
    .cod   .bsn
    .wwq   crop2000.dat
    pest2000.dat   till2000.dat
    fert2000.dat   urban2000.dat (or urb2000.dat)
Subbasin files (1 file per subbasin):
    .sub   .wgn
    .wus   .rte
    .pnd   .swq
HRU files (1 file per HRU):
    .hru   .sol
    .chm   .mgt
    .gw
Miscellaneous files:
    .pcp (up to 18 files per dataset)
    .tmp (up to 18 files per dataset)
    .slr (1 file per dataset)
    .hmd (1 file per dataset)
    .wnd (1 file per dataset)
    .pet (1 file per dataset)
    .res (1 file per routres command in .fig)
    .lwq (1 file per routres command in .fig)
    loading data files (1 file per recday, recmon, recyear, reccnst
                    command in .fig)

UTIL editors have been created for all watershed, subbasin, and HRU file types as well as the .res and .lwq file types. The remainder of the miscellaneous

input files contain daily records and are better generated/edited in a spreadsheet software such as Excel.

To start the UTIL interface:

1. Open a DOS command prompt window.
2. Change to the directory in which the UTIL interface files are located.
3. At the command prompt, type `util` followed by the name of the driver file used to format a particular SWAT input file type. The commands used to start the available drivers are:

```
util cio          (file.cio)
util fig
util cod
util bsn
util wwq
util crop         (crop database)
util pest         (pesticide database)
util fert         (fertilizer database)
util till         (tillage database)
util urban        (urban database)
util sub
util wgn
util wus
util rte
util swq
util pnd
util hru
util sol
util chm
util mgt
util gw
util res
util lwq
```

Other than the database files, the driver names are the file extensions for the different file types used by the model.

4. The UTIL screen will be displayed in the DOS prompt box (Figure 1).
5. The screen is divided into two sections, the top portion of the screen displays the file being edited while the bottom portion displays information about the active input field. The two sections are separated by a maroon line. This line lists the name of the driver (file type) in use, the line number being edited, and the name of the file being edited. The bottom portion of the screen displays the variable name, a short description of the variable, and the typical range in values for the variable.
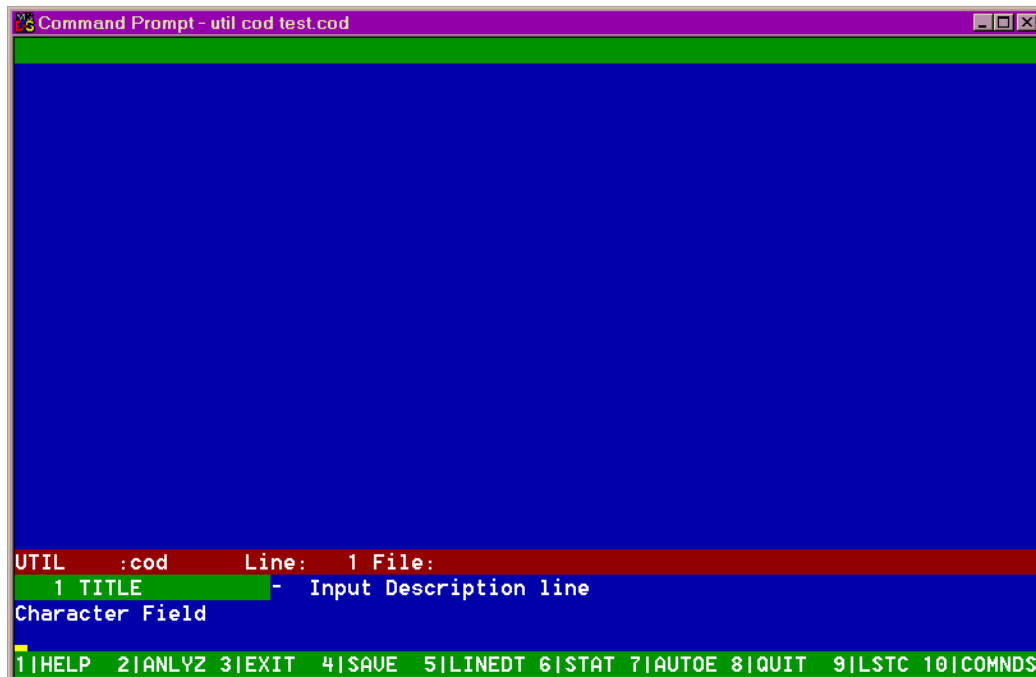
Figure 1: UTIL screen

Accessing Fields in File:

To move between fields in the file, the arrow keys, `page up/page down` keys and `home`/`end` keys may be used. The `home` key will move to the first variable field in the file while the `end` key will move to the last variable field in the file.

As the user moves from field to field, the information in the bottom portion of the screen will change to reflect the active field.

When UTIL is initially started, the cursor is activated in the bottom portion of the screen. To activate the cursor in a variable field, press the `Enter` key on the keyboard (Figure 2).

To move the cursor back to the bottom portion, press the `Enter` key again.

Data may be input to numeric fields with the cursor positioned in the variable field or in the bottom portion of the screen. For character fields, the cursor must be activated in the variable field in the top portion of the screen.

Loading an existing file to edit:

When the UTIL editor for a particular file type is started, the last file edited with the driver is automatically loaded into the editor. There are two ways to load a different file to be edited.

a. Append the file name to the command used to start the UTIL editor (see step 3). (e.g. `util sub nueces1.sub`)

b. If the editor is already running, activate the cursor in the bottom portion of the screen, type `load` `filename`, and press the `Enter` key. The `filename` may include a drive and directory specification if needed.
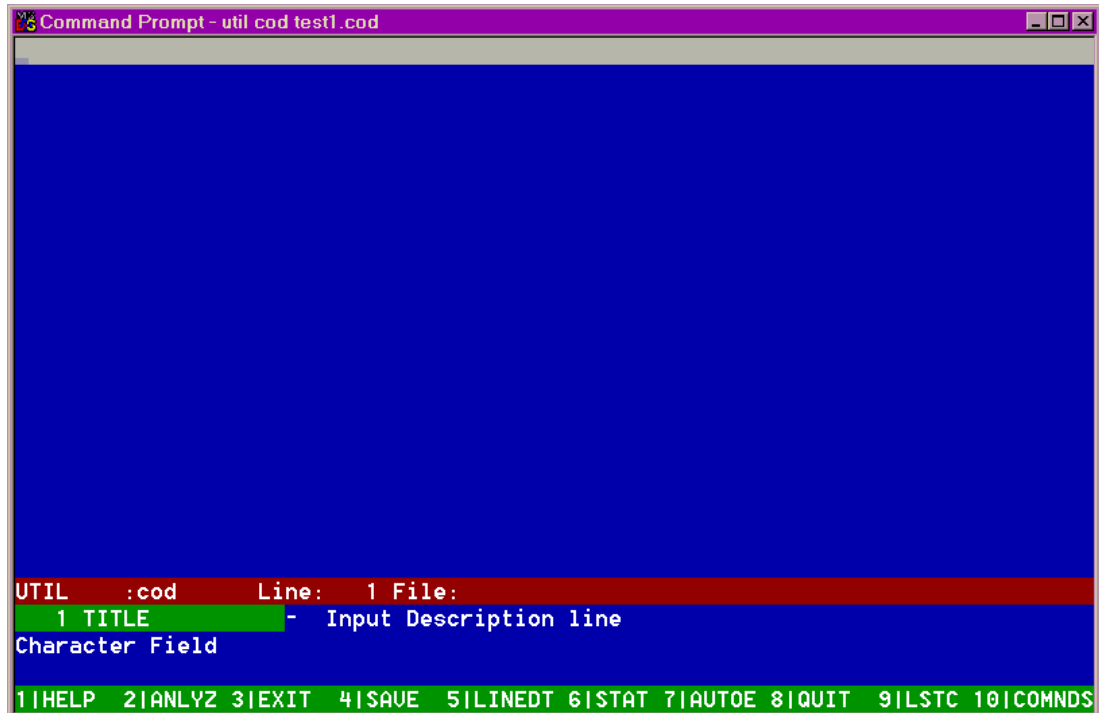

Figure 2: UTIL screen with cursor activated in variable field on first line. Note that the color highlighting the active field changes from green to gray based on the location of the cursor.

Create a new file:

There are two ways to create a new file to be edited.

a. Append the file name to the command used to start the UTIL editor (see step 3). (e.g. `util sub nueces1.sub`)

b. If the editor is already running, activate the cursor in the bottom portion of the screen, type `clearall`, and press the `Enter` key. This removes the current file from the editor and displays blank lines.

Editing a field:

Numeric field:

Type the desired value at the bottom of the screen or in the variable field. Press the `Enter` key to save the data.

Character field:

Activate the cursor in the variable field in the top portion of the screen. Type the desired expression in the field. Press the `Enter` key to save the data.

If a value is typed but an arrow key is hit rather than the `Enter` key, a different

variable field will be activated without saving the typed value. This applies to all variable fields.
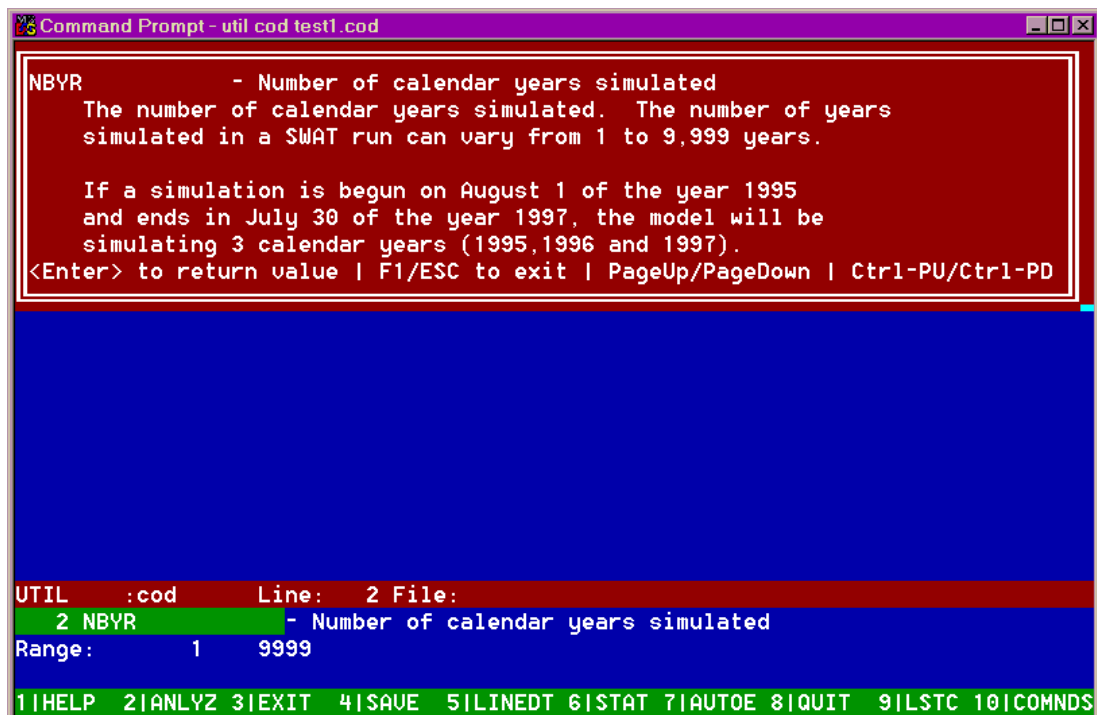
Accessing additional information for variables:

For some variables, the one line description in the bottom portion of the screen may not contain enough information for the user to set an input value. To access a more detailed description, activate the variable of interest and press the `F1` key on the keyboard. Any additional information about the variable will be displayed in a box at the top of the screen (Figure 3).

The information displayed is the full variable description from the manual.

To remove the help screen and return to regular editing, press the `F1` or `Esc` key

For variables with a limited number of input options, the help field will display those options and the user may scroll to the desired input and select it by pressing the `Enter` key (Figure 4).

For variable fields that require an input from a database file, the help screen will contain a link to the database file. To access the link, press `Enter` when the database file name is highlighted (Figure 5). The options available from the database file are displayed (Figure 6). To view parameters for a particular option in the database file, use the arrow keys to activate the option and press the `F1` key (Figure 7). To select the highlighted option, press the `Enter` key.

Figure 3: Help screen displayed when the `F1` key is pressed.

Figure 4: Help screen with scrollable options

Figure 5: Help screen with database file link.

Figure 6: Help screen with database options displayed.

Figure 7: Help screen with parameter information displayed.

When an input value is entered, it is saved to the variable field in the top portion of the screen and the cursor is activated in the same variable field location. To make the cursor automatically advance to the next variable field every time the `Enter` key is pressed, press the `F7` key. To return to the non-advancing mode, press the `F7` key or type `stop` or `quit` and press the `Enter` key when the cursor is activated in the bottom portion of the editor screen.

If the user wishes to edit the entire line as one field, press the `F5` key. The line that is active will be edited as an entire line rather than by fields.

In two of the file editors, the management (mgt) and the watershed configuration (fig), lines are used for multiple inputs. To accommodate these different inputs, loops are incorporated that activate variable fields for one type of command or operation and then loop back to the beginning of the line to activate variable fields for the next type of command. This will continue until variable fields for all the different commands have been displayed. Figure 8 and 9 display the different commands and their variables for the watershed configuration file and the management file.

Watershed configuration (.fig) command formats:

	icode	ihout	inum1	inum2	inum3	rnum1	inum4
	column 1	**column 2**	**column 3**	**column 4**	**column 5**	**column 6**	**column 7**
	space 11-16	space 17-22	space 23-28	space 29-34	space 35-40	space 41-46	space 47-55
subbasin	1	HYD_STOR	SUB_NUM				GIS_CODE
route	2	HYD_STOR	RCH_NUM	HYD_NUM		FLOW_OVN	
routres	3	HYD_STOR	RES_NUM	HYD_NUM			
		FILE.RES		FILE.LWQ			
transfer	4	DEP_TYPE	DEP_NUM	DEST_TYPE	DEST_NUM	TRANS_AMT	TRANS_COD
add	5	HYD_STOR	HYD_NUM1	HYD_NUM2			
recmon	7	HYD_STOR	FILEMON_NUM			DRAINAGE_AREA	
		FILE_MON					
recyear	8	HYD_STOR	FILEYR_NUM			DRAINAGE_AREA	
		FILE_YEAR					
save	9	HYD_NUM					
recday	10	HYD_STOR	FILEDAY_NUM			DRAINAGE_AREA	
		FILE_DAY					
reccnst	11	HYD_STOR	FILECNST_NUM			DRAINAGE_AREA	
		FILE_CNST					
structur	12	HYD_STOR	HYD_NUM			AERATION_COEF	
saveconc	14	HYD_NUM	FILECONC_NUM	PRINT_FREQ			
		FILE_CONC					
finish	0						

Figure 8: Watershed configuration file commands

Management operation formats:

	mon	day	HU	mgt op	mgt1	mgt2i	mgt3	mgt4	mgt5	mgt6i	mgt7	mgt8	mgt9
plant	*	*	*	1	PHU	NCR	HITAR	DMTAR	ALAINIT		DMINIT	CNOP	
irrigate	*	*	*	2			IRR_AMT	IRR_SLT					
fertilizer	*	*	*	3	FRT_LY1	FRT_ID	FRT_KG	FRMINN	FRMINP		FRORGN	FRORGP	FRNH3N
pesticide	*	*	*	4						PST_ID	PST_KG		
harv/kill	*	*	*	5								CNOP	
tillage	*	*	*	6		TILL_ID						CNOP	
harvest	*	*	*	7	HIOVR		HARVEFF						
kill	*	*	*	8									
grazing	*	*	*	9	BMEAT	NDGRZ	BMTRMP		MANUR	IGFTYP			
auto irr	*	*	*	10			A_WSTRS						
auto fert	*	*	*	11	A_NSTR	FRT_ID	A_NMXS	A_NMXA			A_EFF	FRT_LY1	
sweep	*	*		12	SWPEFF		AVWSP						
rel/imp	*	*		13		REL/IMP							

Figure 9: Management operations

Saving input:

To save input and continue editing, press the `F4` key.
To save input and exit the UTIL editor, press the `F3` key.

The default procedure for the interface is to save SWAT dataset files in the same directory that the driver files are located. In order to use the interface for different projects, we recommend that at the beginning of a new project, a directory is created for the specific project and a copy of the UTIL interface files is placed in the project directory for editing that particular dataset.

Exit without saving input:

To exit editor without saving changes made since last save, press the `F8` key. The editor will ask the user to verify quitting without saving changes. To continue with the exit, type `ok` and press the `Enter` key. To abort the exit, press the `Enter` key.

Running SWAT:

Once all input files are created, the user is ready to run the SWAT model and generate output.
a. At the DOS command prompt, type the directory path to the SWAT executable. If the SWAT executable is stored in the same directory as the input files, simply type the name of the SWAT executable, `swat2000.exe`
b. After the simulation is complete, the output files can be loaded into a spreadsheet software package for analysis and generation of plots. The output generated by SWAT is summarized in the SWAT2000 Manual.