STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
P.O. Box 94245
Baton Rouge, Louisiana 70804-9245

USER'S MANUAL FOR HYDRAULICS PROGRAMS

METRIC / ENGLISH VERSION
(JULY 1997)

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Introduction

To the

HYDR Programs

July 1997

METRIC / ENGLISH HYDRAULIC PROGRAMS

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WELCOME

Welcome to the HYDR program series. These programs are based on the guidelines and procedures described in the LA DOTD Hydraulics Manual. This new set of programs works in much the same way as our previous hydraulic programs. The HYDR programs have been rewritten in order to assist the LA DOTD in their transfer of designing in English units to designing in Metric units. The metric conversion factor used internally by the programs is based on 1″ = 25 mm.

These programs will **not** convert English units to Metric units or Metric units to English units! They will, however, enable you to work in either set of units depending on your design needs.

The HYDR program series is available in either a DOS only format or a Windows format. The windows version is called HYDRWIN and it requires Windows 3.1 or higher.

Before proceeding with running any of the programs, please read all of the Introduction Section and the appropriate section for the programs that were purchased, i.e., either the DOS Only Version section or the Windows Version (HYDRWIN) section. These programs are described and documented in this manual. The examples provided in this manual are presented in the DOS only format using Metric units, but the data input fields are also described in English units. The Windows programs require the same data input fields. The programs and manual are available through the General Files Section, Room 100 Headquarters, (504) 379-1107.

The Water Surface Profile Program (WSPRO or HY-7) and its corresponding manual are also available through The General Files Section. This program was developed by the Federal Highway Administration and LA DOTD is not responsible for any programming errors.

RESTRICTIONS AND DISCLAIMER

The HYDR Programs (and HYDRWIN) have been developed by the Louisiana Department of Transportation and Development (LA DOTD) for the design of projects conducted by the department. They are in accordance with the guidelines set in LA DOTD Hydraulics Manual. They are available upon request to consultants under contract with LA DOTD.

Neither the Louisiana Department of Transportation and Development nor the programmers shall bear any responsibility for any errors that may occur in the use of these programs other than for state projects under contract with the department.

The LA DOTD also retains the right to revise, replace, or terminate the use of these programs at any time.

The LA DOTD Hydraulics Section will assist you in the use of our programs only. If you choose to use a different editor from the one provided or not use the HYDRMENU program, then you should consult with your firm's computer support section if any problems arise. If there are any questions or problems with the HYDR Programs or HYDRWIN, please contact the Hydraulics Section at (504) 379-1306.

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Instructions

For the

HYDR Programs
(DOS Only Format)

July 1997

METRIC / ENGLISH HYDRAULIC PROGRAMS

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INSTALLATION

A batch file named INSTALL.BAT, included in the package, may be used to install the programs onto your hard drive. This batch file will put all the programs into a directory entitled "C:\#HYDR".

To use the install program, type *a:install* at the command prompt, (*i.e.*, C:\>a:install).

Optionally, you may create your own hard drive directory and copy into it all the files on the diskette.

ABOUT THE HYDR PROGRAMS

The HYDR programs have been rewritten to make them more user friendly. To do this, an editor named HYDREDIT is provided with the package. Descriptions of some of the HYDREDIT features follows.

Comment cards have been added to the data input files to assist the user in the data entry. The comment cards have an abbreviated heading of what needs to be coded in the program. All comments are preceded by an '*'. The only comment card that may be changed is the REMARKS line, (*Remarks: ...). Except for the REMARKS line, all other comments are ignored by the programs.

The programs are no longer column specific. That is, data does not have to be coded into a specific column, but each data entry must be separated a space. Except for the "Designer Name" and "Remarks" fields, all data fields should be continuous. For example, the "Project Number" may be entered as 999-99-9999 or 999999999 or 99A; it **may not**, however, be coded as **999 99 9999**. The program will read the latter as three separate data entries instead of one because of the spaces between the numbers. Subsequently, the program will not run properly and an error message will occur. To assist the user, the data entry lines on the input screen have been divided into individual fields. A '|' is used to separate the fields. Using the [TAB] key will enable you to move forward from field to field. Pressing the [SHIFT] key along with the [TAB] key allows you to move backwards from field to field. Other specific key functions are listed on the following page.

ABOUT THE HYDR PROGRAMS CONTD.

Key Functions:

[F1] = HELP

Pressing this key will bring up a description, including data entries needed, for the current program being used.

[F2] = SAVEAS/END

This key enables the user to change the name of the data input file. The computer will then exit the data input screen, run the program and display the output to the screen. Be sure to keep the correct extension on the file name.

[F3] = SAVE/END

Pressing this key will save the program under the current name and then exit the data input screen, run the program and display the output to the screen.

[F4] = CANCEL

This key cancels the changes made to the data input screen and then exits.

[F5] = REPEAT LINE

This key repeats the line the cursor is on.

[F6] = DELETE LINE

This key deletes the line the cursor is on.

[F7] = COPY LINE TO SCRATCHPAD (see F8 description)

[F8] = PASTE LINE FROM SCRATCHPAD AFTER THIS LINE

To copy a line to another place in the data file, position the cursor on the line you want to copy and press [F7]. Next move the cursor to the line you want to copy it after and press [F8].

Two sample input files are provided for each program, one in English (*e.g.*, EXAMPLEE.110) and one in metric (*e.g.*, EXAMPLEM.110). You may select one of the existing files or enter a new file name. If you select one of the example files, you may rename it using the SAVEAS/END command.

Please note that all the programs are designed to look for a unique extension on the data input file name that is associated with the individual program. For example, all HYDR112A data input files should have the extension ".12A" on them. When a new data input file is created, the correct extension will automatically be put on the new name. Make sure you do not change this extension. Otherwise, the programs will not be able to read the data input file.

EXECUTING THE PROGRAMS

Included in the package is a menu program entitled HYDRMENU. This program provides an easy way to edit the HYDR data input files and execute the programs. Below are a list of instructions on how to use this menu.

1. After all the programs have been installed to your hard drive, access the menu program by first changing the directory to *C:\#HYDR*.

2. At the command prompt type *hydrmenu* and press [ENTER].
   The following menu will be displayed.

```
            LADOTD HYDRAULICS PROGRAMS

              PROGRAMS AVAILABLE:
         a. HYDR1110 - Normal Water Surface
         b. HYDR112A - Hydraulic Analysis of Culverts Types 1,2,3,4,8
         c. HYDR112B - Hydraulic Analysis of Culverts Type 5
         e. HYDR113A - SCS Peak Runoff
         f. HYDR113B - USGS Peak Runoff
         g. HYDR1140 - Open Channel Flow
         h. HYDR213A - SCS Hydrograph - Types 1 & 2
         i. HYDR213B - SCS Hydrograph - Type  3
         j. HYDR6000 - Inlet Spacing
         k. HYDR6020 - Storm Sewer Design
         x. STOP

            ENTER PROGRAM LETTER: _

F1=HELP
```

3. To run the individual programs, type the letter corresponding to the program you want to execute.

4. A file menu will then appear. All the data input files associated with the program you selected will be displayed. You may select one of the existing files, or enter a new data input file name. To select a file from the list, use the up [↑] or down [↓] arrow keys to highlight a file and then press [ENTER]. If you type in a new data input file name, HYDRMENU will copy model data for the program you selected into that file.

EXECUTING THE PROGRAMS CONTD.

NOTE: The input file extension will tell you which program the files are associated with. For example, all input files for HYDR1110 will have an extension of ".110".

5. If you choose to create a new file name, the computer will prompt you to specify English units or Metric units. Type either *e* or *m*.

6. Edit the input data. HYDREDIT is the default editor for the programs. HYDREDIT will provide formatted fields for some of the input data.

7. Press [F3] to save the data or [F2] to save the data under a different name. The program will then be executed and the output displayed on the monitor. Use the arrow keys or [PAGE UP]/[PAGE DOWN] keys to scroll through the output. The [HOME] key will bring you to the beginning of the output and the [END] key to the end of the output.

8. To get out of the output screen, press the [ESC] key. HYDRMENU will then ask you if you want the output printed. Type *y* or *n*. Any other letter will be read like an [N] by the computer.

ALTERNATE EXECUTION

A file named HYDRMENU.INI, which is provided with this package, is used by HYDRMENU to determine which editor to use. If you want to use your own editor, you may substitute that editor program name in the first line of HYDRMENU.INI.

When the input data is saved, the program will run and the output data will be displayed. Press escape to terminate display of the output data. Initially, the data will be displayed by the BROWSE2 program. You may substitute your own program name in the second line of HYDRMENU.INI.

ALTERNATE EXECUTION CONTD.

To execute a program without using HYDRMENU:

1. You may execute the programs directly from the floppy disk or you may copy them to a hard disk. No special installation procedures are required.

2. Create an input file. You may use any other word-processing program or editor that will create an ASCII text file. Note that the input data should follow exactly the format explained in the user manual for the program. A good way to start is to copy one of the example files as a model.

3. Execute the program by entering
   A. The program name
   B. The input file name
   C. The print file name

   For example, if you have the program diskette in drive A and you want to run the Storm Sewer Program (HYDR6020) using the input data file "HYDR6020.IN" on the diskette in drive B and then send the output to the printer, type:

   A>HYDR6020 B:HYDR6020.IN PRN

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Instructions

For

HYDRWIN
(Windows Format)

July 1997

METRIC / ENGLISH HYDRAULIC PROGRAMS

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INSTALLATION

To install HYDRWIN, go to the Program Manager in Windows. Select "File", then "Run" and type *a:\setup* at the command line.

The setup program will copy several files to a directory named "HYDRWIN". The default drive for the programs will be drive C, but you may use any drive you wish. The setup program should create an icon (Windows 3.1) or an application (Windows 95) named "HYDRWIN". If it does not, you may create one yourself, or you may run the program from the Program Manager: "C:\HYDRWIN\HYDRWIN.EXE".

ABOUT HYDRWIN

HYDRWIN was developed to make the LA DOTD hydraulics programs easier to use. Descriptions of some of the HYDRWIN features follows.

Key Functions:

[TAB] - Moves the cursor to the next field.
[Arrows] - Moves the cursor within a field.
MOUSE POINTER - May be used to position the cursor on an item.

Menu Choices:

FILE - choose file options
- NEW - start a new file
- OPEN - open an existing file
- SAVE - Save the data entered so far
- SAVE AS - Save an existing file under another name
- EXIT - Exit the program and return to the menu

RUN - Run the program to do the calculations.
- RUN - All calculations will be performed and the output displayed.
- CANCEL - Cancels the run.

ABOUT HYDRWIN CONTD.

Key Functions Contd.:

PRINT - Print the results of RUN.
- OK - The output will be sent to the printer.
- CANCEL - Cancels the print job.
- SETUP - Allows selection and format of printer.

EDIT - Will allow you to insert and delete lines for items which have a scroll bar.
- INSERT - Will insert a line before the line in which the cursor is positioned.
- DELETE - Will delete the line in which the cursor is positioned.

HELP - Will display the help information.

EXECUTING THE PROGRAMS

Input Files:

To run HYDRWIN, double-click on the HYDRWIN program icon. The disclaimer and general information about running the programs will come up. Click on the "OK" and the list of available programs will appear. To open a specific program, click the button for that program. The first thing each program does is display a "File Selection" menu. The program will look for files with an extension which matches the program number. For example, program HYDR1110 looks for files which end in ".110". Select a file by double clicking on it or create a new file by typing a new name in the "File Name" box.

Two sample input files are provided for each program, one in English (*e.g.*, ENGLISH.110) and one in metric (*e.g.*, METRIC.110). You may select one of the existing files or enter a new file name. Please note that whatever file name you choose, HYDRWIN will put the proper extension on it, whether you want it to or not. If you select one of the example files, you may rename it using the "saveas" option from the menu.

Once in an input file, to choose English units or Metric units simply click inside the circle of the one desired. These programs will not convert from English to Metric or Metric to English.

EXECUTING THE PROGRAMS CONTD.

Input Files Contd.:

Except for the "Designer Name", "Project Number" and "Remarks" fields, all data fields should be continuous. For example, the "Station Number" may be entered as 1+500 or 1+500.000 or 15R or Sum_creek; it **may not**, however, be coded as **1 500**. The program will read the latter example as two separate data entries instead of one because of the space between the numbers. Subsequently, the program will not run properly and an error message will occur.

Run:

The run option on the menu will take the input data you have entered on the screen and process it using the appropriate hydraulics program. The results will be displayed in a window. You may scroll up and down to view the results.

Print:

The print option will copy the results of the "Run" option to the printer. You must "Run" before you print.

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HYDR1110

Normal Water Surface Program

July 1997

METRIC / ENGLISH HYDRAULIC PROGRAMS

HYDR1110 is a computer program which computes the normal water surface elevation, area of opening, and average velocity for a given channel cross-section as outlined in Chapter I of the LA DOTD Hydraulics Manual.

EXAMPLE INPUT

An example of the input screen and data for running the program is:

```
      LADOTD HYDRAULICS DATA EDITOR - EXAMPLEM.110
F1=HELP F2=SAVEAS/END F3=SAVE/END  F4=CANCEL  F5=REPEAT LINE F6=DELETE LINE
F7=COPY LINE TO SCRATCHPAD   F8=PASTE LINE FROM SCRATCHPAD AFTER THIS LINE.
--------------------------------------------------------------------------------
*HYDR1110 METRIC ************************************************
*** INPUT DATA FOR HYDR1110 - NORMAL WATER SURFACE
*** NOTE THAT LINES WITH '*' IN COLUMN 1 ARE COMMENTS.
*************************************************************************
DOTD ENGINEER           * Designer Name     * METRIC
000-00-0000 *           * Project Number
*Remarks: Sample data
*************************************************************************
* Station   * Number of * Discharge * Channel slope *
* Number    *  Points   *  (m3/s)   *     (m/m)     *
*************************************************
1+000.00    |8          |28.32      |0.0050
*************************************************
* Distance * Elevation *  Roughness *
*   (m)    *    (m)    *    Coeff.  *
************************************
 4.572      |21.946     |0.060
 6.096      |20.726     |0.060
 7.620      |19.507     |0.060
11.582      |17.678     |0.030
15.850      |17.678     |0.030
16.764      |19.507     |0.060
18.288      |20.117     |0.060
19.202      |21.946     |
*
```

LINE 1
LINE 2
LINE 3
LINE 4
LINE 5

DATA FIELDS

The input data fields are described below. Each field must have a value in it. The program will not run if any of them are left blank.

Line 1
- Designer's Name
  - Code in to the left of the ★ and the words "Designer Name".

Line 2
- State Project Number
  - This should be in the format 999-99-9999

DATA FIELDS CONTD.

Line 3
- Remarks
  - A one line description of the project may be put here

Line 4
- Station Number
- Number of Points in the Channel Cross-Section
  - The maximum number of points allowed in the channel section is 25.
  - [For the Windows version, the number of cross section points are not entered. HYDRWIN counts them instead.]
- Design Discharge (m^3/s) or {cfs}
- Channel Slope (m/m) or {ft/ft}

Line 5

NOTE: **One line for each cross section point**
- Distance (m) or {ft}
  - Distances should be in increasing order.
- Elevation (m) or {ft}
  - The first point should be the highest left bank elevation. The last point should be the highest right bank elevation. Elevations may increase and decrease as long as a given discharge is contained in a single channel section. When this criterion is violated, the "divided flow" error message will be given.
- Roughness Coefficient
  - $0.000 < n < 0.250$
  - The n value is for the area between the line it is coded on and the next line. Therefore, the roughness coefficient field on the last line should be left blank.

NOTE: Multiple sets of data may be entered for several cross-sections. Each set of data must begin with the DESIGNER NAME line.

EXAMPLE OUTPUT

An example of the program output for a normal water surface determination is on the following pages. The data input is shown on page 20.

EXAMPLE OUTPUT CONTD.

```
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT      HYDR1110-061197
HYDRAULICS SECTION
DESIGNER: DOTD ENGINEER                 DATE: 06/13/1997
Remarks: Sample data


                  STATE PROJECT NUMBER   000-00-0000

                     NORMAL WATER SURFACE PROGRAM

*************************************************************************

          STATION                                    1+000.00
          NUMBER OF POINTS                                 8
          DESIGN DISCHARGE (m3/s)                      28.32
          CHANNEL SLOPE (m/m)                          .00500
OUTPUT:
          NORMAL WATER SURFACE ELEVATION               19.489
          AREA OF OPENING (m2)                         12.10
          AVERAGE VELOCITY (m/s)                        2.34

*************************************************************************

CHANNEL CROSS-SECTION:

    DISTANCE (m)         ELEVATION     ROUGHNESS COEFFICIENT

          4.572           21.946
                                                    .060
          6.096           20.726
                                                    .060
          7.620           19.507
                                                    .060
         11.582           17.678
                                                    .030
         15.850           17.678
                                                    .030
         16.764           19.507
                                                    .060
         18.288           20.117
                                                    .060
         19.202           21.946

*************************************************************
```

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EXAMPLE OUTPUT CONTD.

STAGE	Q
20.117	50.68
19.812	39.06
19.507	28.89
19.202	21.04
18.898	14.34
18.593	8.79
18.288	4.44
17.983	1.39
17.678	.00

Page 1 - Part 2

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HYDR1120

Culvert Analysis Program

July 1997

METRIC / ENGLISH HYDRAULIC PROGRAMS

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HYDR1120 is a computer program which computes headwater, outlet velocity, and depth of scour for reinforced concrete pipes, corrugated metal pipes, reinforced concrete pipe arches, corrugated metal pipe arches, plastic pipes and reinforced concrete boxes as outlined in Chapter 1 of the LA DOTD Hydraulics Manual.

For the DOS only version, HYDR1120 has been divided into two different programs, (HYDR112A and HYDR112B), based on the type of culvert to be analyzed. This was done in order to make the coding easier using our HYDREDIT program. Each of the programs is described in detail on the following pages.

In the Windows version of the program, the data input fields will change after the type of culvert has been selected. However, to obtain detail explanations of the data input fields, refer to both HYDR112A and HYDR112B of this manual.

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HYDR112A

Culvert Analysis Program
(Round / Arch Pipes)

July 1997

METRIC / ENGLISH HYDRAULIC PROGRAMS

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HYDR112A is a computer program which computes headwater, outlet velocity, and depth of scour for reinforced concrete pipes, corrugated metal pipes, reinforced concrete pipe arches, corrugated metal pipe arches, and plastic pipes as outlined in Chapter I of the LA DOTD Hydraulics Manual.

EXAMPLE INPUT

An example of the input screen and data for running the program is:

```
      LADOTD HYDRAULICS DATA EDITOR - EXAMPLEM.12A
F1=HELP F2=SAVEAS/END F3=SAVE/END  F4=CANCEL  F5=REPEAT LINE F6=DELETE LINE
F7=COPY LINE TO SCRATCHPAD   F8=PASTE LINE FROM SCRATCHPAD AFTER THIS LINE.
================================================================================
*HYDR112A METRIC*************************************************************
*** INPUT DATA FOR HYDR112A - CULVERT ANALYSIS (ROUND/ARCH PIPES)
*** NOTE THAT LINES WITH '*' IN COLUMN 1 ARE COMMENTS.
********************************************************************************
LINE 1  DOTD ENGINEER           * Designer Name     * METRIC
LINE 2  *Remarks: Sample data for type 1 - reinforced concrete pipe
********************************************************************************
        * Project    * Number of  *
        * Number     * Culverts   *
        ***************************
LINE 3  000-00-0000 |1
********************************************************************************
        *** CULVERT OPTIONS 1,2,3,4, OR 8 INPUT                                 *
        *                                                                       *
        *          Type Inl Corr  Num          Diam   Runoff    Tailw   Length   Slope
        * Station  Culv Cd   Cd  Lines  (0)   (mm)   (m3/s)     (m)      (m)     (m/m)
        *************************************************************************
LINE 4  1+000.00  |1   |0   |0   |1   |   0   |1500  |3.68   |-1.00   |30.5   |0.0030
        *************************************************************************
        *** TAILWATER CARD - USED WHEN TAILWATER = -1.00, OTHERWISE IGNORED      *
        *** THE TAILWATER CARD MUST FOLLOW IMMEDIATELY AFTER THE CULVERT CARD IF USED. *
        *                                                                       *
        *                        Roughness  L-Side  Bottom      R-Side  Bottom  *
        *                         Coeff.    Ratio   Width (m)   Ratio   Slope (m/m)  *
        *************************************************************************
LINE... TW                     |0.050     |3.00    |1.219     |3.00    |0.0030
        *************************************************************************
        *
```

DATA FIELDS

The input data fields are described below. Each field must have a value in it. The program will not run if any of them are left blank.

Line 1
- Designer's Name
  - Code in to the left of the ★ and the words "Designer Name".

DATA FIELDS CONTD.

Line 2
- Remarks
  - A one line description of the project may be put here.

Line 3
- State Project Number
  - This should be in the format 999-99-9999.
- Number of Culverts to Analyze
  - [For the Windows version, there is no culvert number entry. This field indicates which culvert data set is currently displayed on the screen. Only one culvert may be coded at a time. To analyze another culvert, choose [NEXT CULVERT] at the bottom of the screen.]

Line 4

NOTE: **One line for each culvert**
- Station
- Option Code:
  - 1 = reinforced concrete pipe
  - 2 = corrugated metal pipe
  - 3 = reinforced concrete pipe arch
  - 4 = corrugated metal pipe arch
  - 8 = plastic pipe
- Inlet Code:
  - 0 = projecting
  - 1 = headwall (square-edge)
  - 2 = mitered
- Corrugation Code:
  - 0 = concrete or plastic
  - 1 = 2 2/3″ x 1/2″
  - 2 = 3″ x 1″
- Number of Lines of Culverts
- Span = 0
- Pipe Diameter (mm) or {in.}
  - For arch pipe, code in the round equivalent (mm) or {in.}
- Estimated Runoff (m^3/s) or {cfs}
- Tailwater (m) or {ft}
  - If a -1.00 is entered, the program will compute the tailwater for the channel cross-section given on the TW card described in the next section.
- Length of Culvert (m) or {ft}
- Culvert Slope (m/m) or {ft/ft}

DATA FIELDS CONTD.

Tailwater Section

This section contains a description of the input for the outfall channel.

✎ *NOTE:* This card must follow the culvert section line when the tailwater value is -1.00. Otherwise, the tailwater card described below will not be used by the program.

Line ...
- TW
- Roughness Coefficient
- Side Ratio - Left (m : 1) or {ft : 1}
- Bottom Width (m) or {ft}
- Side Ratio - Right (m : 1) or {ft : 1}
- Bottom Channel Slope (m/m) or {ft/ft}

EXAMPLE OUTPUT

An example of the program output for a pipe design analysis follows.
The data input is shown on page 30.

EXAMPLE OUTPUT CONTD.

```
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT      HYDR1120-052797
HYDRAULICS SECTION          METRIC
DESIGNER: DOTD ENGINEER                DATE: 06/04/1997
REMARKS :  Sample data for type 1 - reinforced concrete pipe


                STATE PROJECT NUMBER   000-00-0000

          REINFORCED CONCRETE PIPE ( INLET TYPE: 0-PROJECTING )
**************************************************************************
          STATION                                    1+000.00
          NUMBER OF PIPES                                   1
          DIAMETER (mm)                                  1500
          DESIGN DISCHARGE (m3/s)                        3.68
          TAILWATER (m)                                 1.072
          LENGTH (m)                                    30.50
          SLOPE (m/m)                                  .00300
**************************************************************************

          HEADWATER (OUTLET)                            1.513  m
          OUTLET VELOCITY                                2.69  m/s
          DEPTH OF SCOUR FOR TYPE A SOIL                 .976  m

**************************************************************************


CHANNEL CROSS-SECTION:

     SIDE SLOPE RATIO,  LEFT (m:1)                       3.00
     CHANNEL BOTTOM WIDTH (m)                           1.219
     SLOPE OF CHANNEL BOTTOM (m/m)                     .00300
     SIDE SLOPE RATIO, RIGHT (m:1)                       3.00
     ROUGHNESS COEFFICIENT                               .050

**************************************************************************
```

STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
P.O. Box 94245
Baton Rouge, Louisiana 70804-9245

HYDR112B

Culvert Analysis Program (Reinforced Concrete Box)

July 1997

METRIC / ENGLISH HYDRAULIC PROGRAMS

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HYDR112B is a computer program which computes headwater, outlet velocity, and depth of scour for a reinforced concrete box as outlined in Chapter I of the LA DOTD Hydraulics Manual.

EXAMPLE INPUT

An example of the input screen and data for running the program is:

```
      LADOTD HYDRAULICS DATA EDITOR - EXAMPLEM.12B
F1=HELP F2=SAVEAS/END F3=SAVE/END  F4=CANCEL  F5=REPEAT LINE F6=DELETE LINE
F7=COPY LINE TO SCRATCHPAD   F8=PASTE LINE FROM SCRATCHPAD AFTER THIS LINE.
------------------------------------------------------------------------------
*HYDR112B METRIC*********************************************************
*** INPUT DATA FOR HYDR112B - CULVERT ANALYSIS (REINFORCED CONCRETE BOX)
*** NOTE THAT LINES WITH '*' IN COLUMN 1 ARE COMMENTS.
************************************************************************
LINE 1  DOTD ENGINEER           * Designer Name     * METRIC
LINE 2  *Remarks: Sample data for type 5 - reinforced concrete box
************************************************************************
        * Project    * Number of  *
        * Number     * Culverts   *
        ***************************
LINE 3  000-00-0000 |1
************************************************************************************
*** CULVERT OPTION 5 INPUT                                                        *
*                                                                                 *
*           Type Inl Corr  Num   Span   Rise   Runoff   Tailw   Length   Slope
* Station  Culv Cd   Cd  Lines  (mm)   (mm)   (m3/s)    (m)      (m)     (m/m)
************************************************************************************
LINE 4  5+000.00  |5   |1  |0   |1   |1500   |1500  |3.68   |1.219   |30.5   |0.0030
************************************************************************************
*** TAILWATER CARD - USED WHEN TAILWATER = -1.00, OTHERWISE IGNORED                *
*** THE TAILWATER CARD MUST FOLLOW IMMEDIATELY AFTER THE CULVERT CARD IF USED.    *
*                                                                                 *
*                        Roughness  L-Side  Bottom      R-Side  Bottom           *
*                         Coeff.    Ratio   Width (m)   Ratio   Slope (m/m)     *
************************************************************************************
LINE... TW                      |0.050     |3.00    |1.219      |3.00    |0.0030
************************************************************************************
*
```

DATA FIELDS

The input data fields are described below. Each field must have a value in it. The program will not run if any of them are left blank.

Line 1
- Designer's Name
  - Code in to the left of the ★ and the words "Designer Name".

DATA FIELDS CONTD.

Line 2
- Remarks
  - This should be in the format 999-99-9999.

Line 3
- State Project Number
- Number of Culverts to Analyze
  - [For the Windows version, there is no culvert number entry. This field indicates which culvert data set is currently displayed on the screen. Only one culvert may be coded at a time. To analyze another culvert, choose [NEXT CULVERT] at the bottom of the screen.]

Line 4
- *NOTE*: **One line for each culvert**
- Station
- Option Code:
  - 5 = reinforced concrete box
- Inlet Code:
  - 0 = projecting
  - 1 = headwall (square-edge)
  - 2 = mitered
  - 3 = bevel-edge headwalls
- Corrugation Code:
  - 0 = concrete
- Number of Lines of Culverts
- Span (mm) or {ft}
- Rise (mm) or {ft}
- Estimated Runoff (m^3/s) or {cfs}
- Tailwater - (m) or {ft}
  - If a -1.00 is entered, the program will compute the tailwater for the channel cross-section given on the TW card described in the next section.
- Length of Culvert (m) or {ft}
- Culvert Slope (m/m) or {ft/ft}

Tailwater Section

This section contains a description of the input for the outfall channel.

NOTE: This card must follow the culvert section line when the tailwater value is -1.00. Otherwise, the tailwater card described below will not be used by the program.

Line ...
- TW
- Roughness Coefficient
- Side Ratio - Left (m : 1) or {ft : 1}

DATA FIELDS CONTD.

Tailwater Section Contd.

- Bottom Width (m) or {ft}
- Side Ratio - Right (m : 1) or {ft : 1}
- Bottom Channel Slope (m/m) or {ft/ft}

EXAMPLE OUTPUT

An example of the program output for a box culvert design analysis follows.
The data input is shown on page 36.

```
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT      HYDR1120-052797
HYDRAULICS SECTION          METRIC
DESIGNER: DOTD ENGINEER                 DATE: 06/04/1997
REMARKS :  Sample data for type 5 - reinforced concrete box


                STATE PROJECT NUMBER   000-00-0000

        REINFORCED CONCRETE BOX ( SQUARE-EDGE STRAIGHT HEADWALLS )
*************************************************************************
        STATION                                        5+000.00
        NUMBER OF BOXES                                       1
        SPAN (mm)                                          1500
        HEIGHT (mm)                                        1500
        DESIGN DISCHARGE (m3/s)                            3.68
        TAILWATER (m)                                     1.219
        LENGTH (m)                                        30.50
        SLOPE (m/m)                                      .00300
*************************************************************************

        HEADWATER (OUTLET)                                1.489  m
        OUTLET VELOCITY                                    1.99  m/s
        DEPTH OF SCOUR FOR TYPE A SOIL                     .820  m

*************************************************************************
```

STATE OF LOUISIANA
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HYDR1130

Peak Runoff Program

July 1997

METRIC / ENGLISH HYDRAULIC PROGRAMS

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HYDR1130 is a computer program which computes peak rate of runoff by the Soil Conservation Service (SCS) and the United States Geological Service (USGS) methods as outlined in Chapter I of the LA DOTD Hydraulics Manual.

For the DOS only version, HYDR1130 has been divided into two different programs, (HYDR113A and HYDR113B), based on which method is to be used. This was done in order to make the coding easier using our HYDREDIT program. Each of the programs is described in detail.

In the Windows version of the program, there is a place to choose either the SCS method or the USGS method. The data input fields will change depending on the method selected. However, to obtain detail explanations of the data input fields, refer to both HYDR113A and HYDR113B of this manual.

STATE OF LOUISIANA
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HYDR113A

Peak Runoff Program
(Soil Conservation Service)

July 1997

METRIC / ENGLISH HYDRAULIC PROGRAMS

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HYDR113A is a computer program which computes peak rate of runoff by the Soil Conservation Service (SCS) method as outlined in Chapter I of the LA DOTD Hydraulics Manual.

EXAMPLE INPUT

An example of the input screen and data for running the program is:

```
      LADOTD HYDRAULICS DATA EDITOR - EXAMPLEM.13A
F1=HELP F2=SAVEAS/END F3=SAVE/END  F4=CANCEL  F5=REPEAT LINE F6=DELETE LINE
F7=COPY LINE TO SCRATCHPAD   F8=PASTE LINE FROM SCRATCHPAD AFTER THIS LINE.
================================================================================
*HYDR113A METRIC************************************************************
*** INPUT DATA FOR HYDR113A - SCS PEAK RUNOFF PROGRAM
*** NOTE THAT LINES WITH '*' IN COLUMN 1 ARE COMMENTS.
********************************************************************************
LINE 1  DOTD ENGINEER          * Designer Name     * METRIC
LINE 2  *Remarks: Sample data for SCS Peak Runoff
********************************************************************************
        * Project    * Number of *
        * Number     * Sections  *
        ************************
LINE 3  000-00-0000  |1
        ********************************************************************************
        * Station          Drain Area  Hyd Len  Curve    24-hr       Slope    Peak Adj *
        * Number    Opt       (ha)       (m)    Number   Rain (mm)   (%)      Factor   *
        ********************************************************************************
LINE 4  1+000.00    |1    |40.5      |1219.2   |80.00     |254       |0.20      |1.00
        *
```

DATA FIELDS

The input data fields are described below. Each field must have a value in it. The program will not run if any of them are left blank.

Line 1
- Designer's Name
  - Code in to the left of the ★ and the words "Designer Name".

Line 2
- Remarks
  - A one line description of the project may be put here.

Line 3
- State Project Number
  - This should be in the format 999-99-9999.
- Number of Runoff Sections
  - ▣ [This field is not in the Windows version.]

DATA FIELDS CONTD.

Line 4 ✐ *NOTE*: **One line for each site**

- Station Number
- Option Number = 1
  - ▣ [This field is not in the Windows version.]
- Drainage Area (hectares) or {acres}
- Hydraulic Length of Watershed (m) or {ft}
- Curve Number
- 24-Hour Rainfall (mm) or {in.}
- Slope of the Watershed (%)
  - Minimum slope is 0.1%
- Peak Adjustment Factor

EXAMPLE OUTPUT

An example of the program output for a runoff estimation by the SCS method follows. The data input is shown on page 44.

```
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT      HYDR1130-052797
HYDRAULICS SECTION          METRIC
DESIGNER: DOTD ENGINEER                DATE: 06/04/1997
REMARKS: Sample data for SCS Peak Runoff


                STATE PROJECT NUMBER  000-00-0000

                        SCS PEAK DISCHARGE
*********************************************************************
         STATION                                        1+000.00
         DRAINAGE AREA (hectares)                            40.50
         HYDRAULIC LENGTH (meters)                         1219.20
         CURVE NUMBER                                        80.00
         RAINFALL (mm)                                      254.00
         SLOPE (PERCENT)                                       .20
         PEAK ADJUSTMENT FACTOR                               1.00
*********************************************************************
         PEAK DISCHARGE (m3/s)                                4.15
*********************************************************************
```

Page 1 of 1

STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
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HYDR113B

Peak Runoff Program
(U. S. Geological Service)

July 1997

METRIC / ENGLISH HYDRAULIC PROGRAMS

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HYDR113B is a computer program which computes peak rate of runoff by the United States Geological Service (USGS) method as outlined in Chapter I of the LA DOTD Hydraulics Manual.

EXAMPLE INPUT

An example of the input screen and data for running the program is:

```
        LADOTD HYDRAULICS DATA EDITOR - EXAMPLEM.13B
F1=HELP F2=SAVEAS/END F3=SAVE/END  F4=CANCEL  F5=REPEAT LINE F6=DELETE LINE
F7=COPY LINE TO SCRATCHPAD   F8=PASTE LINE FROM SCRATCHPAD AFTER THIS LINE.
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
*HYDR113B METRIC*****************************************************
*** INPUT DATA FOR HYDR113B - USGS PEAK RUNOFF PROGRAM
*** NOTE THAT LINES WITH '*' IN COLUMN 1 ARE COMMENTS.
*********************************************************************
LINE 1  DOTD ENGINEER            * Designer Name     * METRIC
LINE 2  *Remarks: Sample data for USGS Peak Runoff
*********************************************************************
* Project    * Number of *
* Number     * Sections  *
************************
LINE 3  000-00-0000 |2
*************************************************************************
* Station          Drain Area                    Mean Annu  Slope    Urban  *
* Number     Opt    (km2)       (0)       (0)    Rain (mm)  (m/km)   Factor *
*************************************************************************
LINE 4  2+000.00   |2   |13.0     |  0.00   |  0.00   |1397     |0.9     |1.00
        3+000.00   |2   |25.9     |  0.00   |  0.00   |1270     |0.7     |1.50
        *
```

DATA FIELDS

The input data fields are described below. Each field must have a value in it. The program will not run if any of them are left blank.

Line 1
- Designer's Name
  - Code in to the left of the ★ and the words "Designer Name".

Line 2
- Remarks
  - A one line description of the project may be put here.

Line 3
- State Project Number
  - This should be in the format of 999-99-9999.
- Number of Runoff Sections
  - [This field is not in the Windows version.]

DATA FIELDS CONTD.

Line 4 ✎ ***NOTE*: One line for each site**

- Station Number
- Option Number = 2
  - ▣ [This field is not in the Windows version.]
- Drainage Area (km^2) or {mi^2}
- Hydraulic Length of Watershed = 0
  - ▣ [This field is not in the Windows version.]
- Curve Number = 0
  - ▣ [This field is not in the Windows version.]
- Mean Annual Rainfall (mm) or {in.}
- Slope of the Watershed (m/km) or {ft/mi}
- Urbanization Factor [default = 1.00]

EXAMPLE OUTPUT

An example of the program output for a runoff estimation by the USGS method follows. The data input is shown on page 48.

EXAMPLE OUTPUT CONTD.

```
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT      HYDR1130-052797
HYDRAULICS SECTION          METRIC
DESIGNER: DOTD ENGINEER                DATE: 06/04/1997
REMARKS: Sample data for USGS Peak Runoff


                STATE PROJECT NUMBER  000-00-0000

                        USGS PEAK DISCHARGE
*********************************************************************
        STATION                                  2+000.00
        DRAINAGE AREA (sq km)                         13.00
        URBAN ADJUSTMENT RATIO                         1.00
        SLOPE (m/km)                                    .90
        MEAN ANNUAL PRECIPITATION (mm)              1397.00
*********************************************************************
        Q2 (m3/s)                                      9.82
        Q5 (m3/s)                                     15.87
        Q10 (m3/s)                                    20.78
        Q25 (m3/s)                                    28.86
        Q50 (m3/s)                                    32.18
        Q100 (m3/s)                                   35.62
*********************************************************************

                        USGS PEAK DISCHARGE
*********************************************************************
        STATION                                  3+000.00
        DRAINAGE AREA (sq km)                         25.90
        URBAN ADJUSTMENT RATIO                         1.50
        SLOPE (m/km)                                   3.70
        MEAN ANNUAL PRECIPITATION (mm)              1270.00
*********************************************************************
        Q2 (m3/s)                                     16.32
        Q5 (m3/s)                                     24.70
        Q10 (m3/s)                                    30.68
        Q25 (m3/s)                                    38.07
        Q50 (m3/s)                                    42.88
        Q100 (m3/s)                                   48.36
*********************************************************************
```

STATE OF LOUISIANA
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HYDR1140

Open Channel Design Program

July 1997

METRIC / ENGLISH HYDRAULIC PROGRAMS

HYDR1140 is a computer program which computes the normal depth of water, bottom width or design discharge for a given channel cross-section as outlined in Chapter I of the LA DOTD Hydraulics Manual.

EXAMPLE INPUT

An example of the input screen and data for running the program is:

```
      LADOTD HYDRAULICS DATA EDITOR - EXAMPLEM.140
F1=HELP F2=SAVEAS/END F3=SAVE/END  F4=CANCEL  F5=REPEAT LINE F6=DELETE LINE
F7=COPY LINE TO SCRATCHPAD   F8=PASTE LINE FROM SCRATCHPAD AFTER THIS LINE.
--------------------------------------------------------------------------------
*HYDR1140 METRIC*************************************************************
*** INPUT DATA FOR HYDR1140 - OPEN CHANNEL DESIGN
*** NOTE THAT LINES WITH '*' IN COLUMN 1 ARE COMMENTS.
*******************************************************************************
LINE 1  DOTD ENGINEER          * Designer Name     * METRIC
LINE 2  *Remarks: Sample data
*******************************************************************************
        * Project    * Number of *
        * Number     * Sections  *
        ************************
LINE 3  000-00-0000 |3
*******************************************************************************
        * Station   Discharge   Width    Depth   Slope-L Slope-R  Rough  Slope-Chann *
        * Number      (m3/s)      (m)      (m)     (m/m)   (m/m)   Coeff     (m/m)     *
        *************************************************************************
LINE 4  1+000.00  |5.66      |1.219     |0.000    |3.0    |3.0    |0.022   |0.0030
        2+000.00  |0.00      |1.219     |0.905    |3.0    |3.0    |0.022   |0.0030
        3+000.00  |5.66      |0.000     |0.905    |3.0    |3.0    |0.022   |0.0030
        *
```

DATA FIELDS

The input data fields are described below. Each field must have a value in it. The program will not run if any of them are left blank.

Line 1
- Designer's Name
  - Code in to the left of the ★ and the words "Designer Name".

Line 2
- Remarks
  - A one line description of the project may be put here.

Line 3
- State Project Number
  - This should be in the format of 999-99-9999.
- Number of Channel Sections
  - [This field is not in the Windows version.]

DATA FIELDS CONTD.

Line 4 ✎ ***NOTE*: One line for each channel section**

✎ ***NOTE:*** **A 0.00 value should be coded in for the item that is to be computed, (*i.e.* the design discharge, width of channel bottom, or depth of flow).**

- Station Number
- Design Discharge (m^3/s) or {cfs}
- Channel Bottom Width (m) or {ft}
- Depth of Flow (m) or {ft}
- Side Slope Ratio - Left Side (m:1) or {ft:1}
- Side Slope Ratio - Right Side (m:1) or {ft:1}
- Roughness Coefficient
- Channel Slope (m/m) or {ft/ft}

EXAMPLE OUTPUT

An example of the program output for an open channel design follows. The data input is shown on page 52.

```
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT      HYDR1140-052797
HYDRAULICS SECTION

DESIGNER: DOTD ENGINEER                 DATE: 06/04/1997
REMARKS:  Sample data


                STATE PROJECT NUMBER  000-00-0000


                        OPEN CHANNEL DESIGN

**************************************************************************

STATION                                              1+000.00
DESIGN DISCHARGE (m3/s)                                  5.66
WIDTH OF CHANNEL BOTTOM (m)                             1.219
DEPTH OF FLOW (m)                                        .904
SIDE SLOPE RATIO, LEFT (m:1)                              3.0
SIDE SLOPE RATIO, RIGHT (m:1)                             3.0
ROUGHNESS COEFFICIENT                                    .022
SLOPE OF CHANNEL BOTTOM (m/m)                          .00300

**************************************************************************
```

EXAMPLE OUTPUT CONTD.

```
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT        HYDR1140-052797
HYDRAULICS SECTION

DESIGNER: DOTD ENGINEER                  DATE: 06/04/1997
REMARKS:  Sample data

                  STATE PROJECT NUMBER  000-00-0000

                          OPEN CHANNEL DESIGN

*************************************************************************

STATION                                              2+000.00
DESIGN DISCHARGE (m3/s)                                  5.68
WIDTH OF CHANNEL BOTTOM (m)                             1.219
DEPTH OF FLOW (m)                                        .905
SIDE SLOPE RATIO, LEFT (m:1)                             3.0
SIDE SLOPE RATIO, RIGHT (m:1)                            3.0
ROUGHNESS COEFFICIENT                                    .022
SLOPE OF CHANNEL BOTTOM (m/m)                          .00300

*************************************************************************
```

Page 2 of 3

```
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT        HYDR1140-052797
HYDRAULICS SECTION

DESIGNER: DOTD ENGINEER                  DATE: 06/04/1997
REMARKS:  Sample data

                  STATE PROJECT NUMBER  000-00-0000

                          OPEN CHANNEL DESIGN

*************************************************************************

STATION                                              3+000.00
DESIGN DISCHARGE (m3/s)                                  5.66
WIDTH OF CHANNEL BOTTOM (m)                             1.208
DEPTH OF FLOW (m)                                        .905
SIDE SLOPE RATIO, LEFT (m:1)                             3.0
SIDE SLOPE RATIO, RIGHT (m:1)                            3.0
ROUGHNESS COEFFICIENT                                    .022
SLOPE OF CHANNEL BOTTOM (m/m)                          .00300

*************************************************************************
```

Page 3 of 3

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HYDR2130

Runoff Hydrograph Program

July 1997

METRIC / ENGLISH HYDRAULIC PROGRAMS

HYDR2130 is a computer program which generates runoff hydrographs by the Soil Conservation Service (SCS) method. Composite runoff hydrographs for as many as five drainage areas may be generated.

For the DOS only version, HYDR2130 has been divided into two different programs, (HYDR213A and HYDR213B), based on the type of runoff to be generated. This was done in order to make the coding easier using our HYDREDIT program. Each of the programs is described in detail.

In the Windows version of the program, the data input fields will change after the type of culvert has been selected. However, to obtain detail explanations of the data input fields, refer to both HYDR213A and HYDR213B of this manual.

STATE OF LOUISIANA
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HYDR213A

Runoff Hydrograph Program
(SCS Runoff Hydrograph Program)

July 1997

METRIC / ENGLISH HYDRAULIC PROGRAMS

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HYDR213A is a computer program which generates runoff hydrographs by the Soil Conservation Service (SCS) method. Composite runoff hydrographs for as many as five drainage areas may be generated.

EXAMPLE INPUT

An example of the input screen and data for running the program is:

```
      LADOTD HYDRAULICS DATA EDITOR - EXAMPLEM.23A
F1=HELP F2=SAVEAS/END F3=SAVE/END  F4=CANCEL  F5=REPEAT LINE F6=DELETE LINE
F7=COPY LINE TO SCRATCHPAD   F8=PASTE LINE FROM SCRATCHPAD AFTER THIS LINE.
--------------------------------------------------------------------------------
*HYDR213A METRIC*************************************************
*** INPUT DATA FOR HYDR2130 - RUNOFF HYDROGRAPH
*** NOTE THAT LINES WITH '*' IN COLUMN 1 ARE COMMENTS.
*****************************************************************
DOTD ENGINEER          * Designer Name     * METRIC
*Remarks: Sample data
*****************************************************************
* Project   *  Station   *          * Number of *
* Number    *  Number    * Option  *  Basins   *
*******************************************
000-00-0000 |1+000.00     |1         |1
*****************************************************************************
* Len  Slope      Area       Curve    Rain   Time     Lag Fac Lag Fac        *
* (m)   (%)       (ha)       Number   (mm)   Step(hr) Imprv   Length        *
*****************************************************************************
762    |1.50    |4.0         |80.0     |254     |0.15    |1.00    |1.00     *
END
```

LINE 1
LINE 2
LINE 3
LINE 4
LINE 5

DATA FIELDS

The input data fields are described below. Each field must have a value in it. The program will not run if any of them are left blank.

Line 1
- Designer's Name
  - Code in to the left of the ★ and the words "Designer Name".

Line 2
- Remarks
  - A one line description of the project may be put here.

Line 3
- State Project Number
  - This should be in the format 999-99-9999.

DATA FIELDS CONTD.

Line 3 Contd.

- Station Count
  - ▣ [This only applies to the Windows version. There is no entry, but this field indicates which station is currently displayed on the screen.]
- Station Number
- Option (1 or 2)
  - 1 = runoff hydrograph by SCS method
  - 2 = composite runoff hydrograph by SCS method (maximum of 5 watersheds)
- Number of Drainage Basins
  - Enter 1 for option 1
  - Enter 1 - 5 for option 2

Line 4 ✎ ***NOTE*: One line for each watershed section**

- Hydraulic Length of Watershed (m) or {ft}
- Average Watershed Land Slope (%)
- Drainage Area (hectares) or {acres}
- Curve Number
- Rainfall (mm) or {in.}
- User-Specified Time Step
  - This value should be the same for all watersheds in option 2
- Urban Adjustment Lag Factor For Impervious Areas
  - Use between 0.5-1.0
    - [refer to Chapter II - "Inflow Hydrograph" of the LA DOTD Hydraulics Manual]
- Urban Adjustment Lag Factor For Modified Hydraulic Length
  - Use between 0.5-1.0
    - [refer to Chapter II - "Inflow Hydrograph" of the LA DOTD Hydraulics Manual]

Line 5

- END
  - An "END" line must be placed at the end of the data set.
  - ▣ [This field is not in the Windows version.]

✎ ***NOTE:*** Other sets of data may be entered after the END line. All data sets must begin with the DESIGNER NAME line.

- ▣ [For the Windows version, only one station may be coded at a time. To analyze another station, choose [NEXT STATION] at the bottom of the screen.]

EXAMPLE OUTPUT

The program output for the sample input on page 60 follows.

```
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT      HYDR2130-063097
HYDRAULICS SECTION
DESIGNER: DOTD ENGINEER                 DATE: 06/30/1997
REMARKS :  Sample data

                STATE PROJECT NUMBER  000-00-0000

                        SCS RUNOFF HYDROGRAPH
*********************************************************************

         STATION                                          1+000.00
         DRAINAGE AREA (hectares)                             4.00
         HYDRAULIC LENGTH OF WATERSHED (meters)                762
         CURVE NUMBER                                         80.0
         RAINFALL (mm)                                       254.0
         AVERAGE WATERSHED LAND SLOPE (PERCENT)               1.50
         URBAN ADJUSTMENT FACTOR FOR IMPERVIOUS AREA          1.00
         URBAN ADJUSTMENT FACTOR FOR HYDRAULIC LENGTH         1.00
         USER-SPECIFIED TIME STEP (HOUR)                       .15
         COMPUTED TIME STEP (HOUR)                             .12

*********************************************************************

     TIME (HOUR)    DISCHARGE (m3/s)

          7.50           .01
          7.65           .02
          7.80           .02
          7.95           .02
          8.10           .02
          8.25           .02
          8.40           .02
          8.55           .02
          8.70           .02
          8.85           .03
          9.00           .03
          9.15           .03
          9.30           .03
          9.45           .03
          9.60           .04
          9.75           .04
          9.90           .04
         10.05           .04
         10.20           .05
         10.35           .05
```

SCS Runoff Hydrograph - Option 1

EXAMPLE OUTPUT CONTD.

10.50	.05
10.65	.06
10.80	.06
10.95	.07
11.10	.08
11.25	.09
11.40	.10
11.55	.11
11.70	.14
11.85	.18
12.00	.27
12.15	.48
12.30	.79
12.45	1.07
12.60	1.17
12.75	1.07
12.90	.89
13.05	.69
13.20	.54
13.35	.43
13.50	.35
13.65	.29
13.80	.24
13.95	.20
14.10	.18
14.25	.16
14.40	.14
14.55	.13
14.70	.11
14.85	.10
15.00	.09
15.15	.09
15.30	.09
15.45	.08
15.60	.08
15.75	.08
15.90	.08
16.05	.08
16.20	.08
16.35	.08
16.50	.08
16.65	.07
16.80	.06
16.95	.06
17.10	.06
17.25	.05
17.40	.05

EXAMPLE OUTPUT CONTD.

17.55	.05
17.70	.05
17.85	.05
18.00	.05
18.15	.05
18.30	.05
18.45	.05
18.60	.05
18.75	.05
18.90	.05
19.05	.05
19.20	.05
19.35	.05
19.50	.05
19.65	.05
19.80	.05
19.95	.05
20.10	.05
20.25	.05
20.40	.05
20.55	.05
20.70	.04
20.85	.04
21.00	.04
21.15	.04
21.30	.03
21.45	.03
21.60	.03
21.75	.03
21.90	.03
22.05	.03
22.20	.03
22.35	.03
22.50	.03
22.65	.03
22.80	.03
22.95	.03
23.10	.03
23.25	.03
23.40	.03
23.55	.03
23.70	.03
23.85	.03
24.00	.03
24.15	.03
24.30	.03
24.45	.03
24.60	.02
24.75	.02

STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
P.O. Box 94245
Baton Rouge, Louisiana 70804-9245

HYDR213B

Runoff Hydrograph Program
(Composite Hydrograph - Time To Peak Input)

July 1997

METRIC / ENGLISH HYDRAULIC PROGRAMS

HYDR213B is a computer program which generates a composite runoff hydrograph by the Soil Conservation Service (SCS) method. This program allows the time to peak to be coded into the program. Composite runoff hydrographs for as many as five drainage areas can be generated.

EXAMPLE INPUT

An example of the input screen and data for running the program is:

```
      LADOTD HYDRAULICS DATA EDITOR - EXAMPLEM.23B
F1=HELP F2=SAVEAS/END F3=SAVE/END  F4=CANCEL  F5=REPEAT LINE F6=DELETE LINE
F7=COPY LINE TO SCRATCHPAD   F8=PASTE LINE FROM SCRATCHPAD AFTER THIS LINE.
================================================================================
*HYDR213B METRIC************************************************************
*** INPUT DATA FOR HYDR2130 - RUNOFF HYDROGRAPH
*** NOTE THAT LINES WITH '*' IN COLUMN 1 ARE COMMENTS.
*******************************************************************************
LINE 1  DOTD ENGINEER          * Designer Name     METRIC
LINE 2  *Remarks: Sample data
        ********************************************
        * Project   *  Station    *         * Number of *
        * Number    *  Number     * Option  * Basins    *
        ********************************************
LINE 3  000-00-0000 |3+000.00     |3        |2
        *******************************************************************************
        * Time to       Area       Curve    Rain    Time     Lag Fac Lag Fac         *
        * Peak (min)    (ha)       Number   (mm)    Step(hr) Imprv   Length         *
        *******************************************************************************
LINE 4  600           |4.0         |80.0    |279.4  |0.15     |0.00   |0.00    *
        500           |2.0         |80.0    |279.4  |0.15     |0.00   |0.00    *
LINE 5  END
        *
```

DATA FIELDS

The input data fields are described below. Each field must have a value in it. The program will not run if any of them are left blank.

Line 1
- Designer's Name
  - Code in to the left of the ★ and the words "Designer Name".

Line 2
- Remarks
  - A one line description of the project may be put here.

Line 3
- State Project Number
  - This should be in the format 999-99-9999.

DATA FIELDS CONTD.

Line 3 Contd.

- Station Count
  - ▣ [This only applies to the Windows version. There is no entry, but this field indicates which station is currently displayed on the screen.]
- Station Number
- Option Number
  - 3 = composite runoff hydrograph by SCS method with time to peak input (maximum of 5 watersheds)
- Number of Drainage Basins
  - Enter 1 - 5

Line 4 ✎ ***NOTE*: One line for each watershed section**

- User-Specified Time to Peak (minutes)
- Drainage Area (hectares) or {acres}
- Curve Number
- Rainfall (mm) or {in.}
- User-Specified Time Step
  - This value should be the same for all watersheds
- Urban Adjustment Lag Factor For Impervious Areas
  - Enter 0.00
- Urban Adjustment Lag Factor For Modified Hydraulic Length
  - Enter 0.00

Line 5

- END
  - An "END" line must be placed at the end of the data set.
  - ▣ [This field is not in the Windows version.]

✎ ***NOTE:*** Other sets of data may be entered after the END line. All data sets must begin with the DESIGNER NAME line.

- ▣ [For the Windows version, only one station may be coded at a time. To analyze another station, choose [NEXT STATION] at the bottom of the screen.]

EXAMPLE OUTPUT

The program output for the sample input on page 66 is found on the following pages. Since the output is very long, only a portion of it is shown in this manual. To see the complete output, run "examplem.23b" through the program HYDR213B.

EXAMPLE OUTPUT CONTD.

```
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT      HYDR2130-063097
HYDRAULICS SECTION
DESIGNER: DOTD ENGINEER                 DATE: 06/30/1997
REMARKS :  Sample data

                STATE PROJECT NUMBER  000-00-0000

                      COMPOSITE RUNOFF HYDROGRAPH
*************************************************************************

        DRAINAGE AREA NUMBER                                        1
        STATION                                              3+000.00
        DRAINAGE AREA (hectares)                                4.00
        CURVE NUMBER                                            80.0
        RAINFALL (mm)                                          279.4
        USER-SPECIFIED TIME TO PEAK (MIN.)                     600.00
        USER-SPECIFIED TIME STEP (HOUR)                           .15

*************************************************************************
```

Page 1 - SCS Composite Hydrograph (Option 3)

```
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT      HYDR2130-063097
HYDRAULICS SECTION
DESIGNER: DOTD ENGINEER                 DATE: 06/30/1997
REMARKS :  Sample data

                STATE PROJECT NUMBER  000-00-0000

                      COMPOSITE RUNOFF HYDROGRAPH
*************************************************************************

        DRAINAGE AREA NUMBER                                        2
        STATION                                              3+000.00
        DRAINAGE AREA (hectares)                                2.00
        CURVE NUMBER                                            80.0
        RAINFALL (mm)                                          279.4
        USER-SPECIFIED TIME TO PEAK (MIN.)                     500.00
        USER-SPECIFIED TIME STEP (HOUR)                           .15

*************************************************************************
```

Page 2 - SCS Composite Hydrograph (Option 3)

EXAMPLE OUTPUT CONTD.

FLOOD HYDROGRAPH ORDINATES (m3/s)

TIME (HOUR)	WATERSHED NO. 1	WATERSHED NO. 2	WATERSHED NO. 3	WATERSHED NO. 4	WATERSHED NO. 5	COMPOSITE	TIME (HOUR)
4.05	.00	.00	.00	.00	.00	.00	4.05
4.20	.00	.00	.00	.00	.00	.00	4.20
4.35	.00	.00	.00	.00	.00	.00	4.35
4.50	.00	.00	.00	.00	.00	.00	4.50
4.65	.00	.00	.00	.00	.00	.00	4.65
4.80	.00	.00	.00	.00	.00	.00	4.80
4.95	.00	.00	.00	.00	.00	.00	4.95
5.10	.00	.00	.00	.00	.00	.00	5.10
5.25	.00	.00	.00	.00	.00	.00	5.25
5.40	.00	.00	.00	.00	.00	.00	5.40
5.55	.00	.00	.00	.00	.00	.00	5.55
5.70	.00	.00	.00	.00	.00	.00	5.70
5.85	.00	.00	.00	.00	.00	.00	5.85
6.00	.00	.00	.00	.00	.00	.00	6.00
6.15	.00	.00	.00	.00	.00	.00	6.15
6.30	.00	.00	.00	.00	.00	.00	6.30
6.45	.00	.00	.00	.00	.00	.00	6.45
6.60	.00	.00	.00	.00	.00	.00	6.60
6.75	.00	.00	.00	.00	.00	.00	6.75
6.90	.00	.00	.00	.00	.00	.00	6.90
7.05	.00	.00	.00	.00	.00	.00	7.05
7.20	.00	.00	.00	.00	.00	.00	7.20
7.35	.00	.00	.00	.00	.00	.00	7.35
7.50	.00	.00	.00	.00	.00	.00	7.50
7.65	.00	.00	.00	.00	.00	.00	7.65
7.80	.00	.00	.00	.00	.00	.00	7.80
7.95	.00	.00	.00	.00	.00	.00	7.95
8.10	.00	.00	.00	.00	.00	.00	8.10
8.25	.00	.00	.00	.00	.00	.00	8.25
8.40	.00	.00	.00	.00	.00	.00	8.40
8.55	.00	.00	.00	.00	.00	.00	8.55
8.70	.00	.00	.00	.00	.00	.00	8.70
8.85	.00	.00	.00	.00	.00	.00	8.85
9.00	.00	.00	.00	.00	.00	.00	9.00
9.15	.00	.00	.00	.00	.00	.00	9.15
9.30	.00	.00	.00	.00	.00	.00	9.30
9.45	.00	.00	.00	.00	.00	.00	9.45
9.60	.00	.00	.00	.00	.00	.00	9.60
9.75	.00	.00	.00	.00	.00	.00	9.75
9.90	.00	.00	.00	.00	.00	.00	9.90
10.05	.00	.00	.00	.00	.00	.00	10.05
10.20	.00	.00	.00	.00	.00	.00	10.20
10.35	.00	.00	.00	.00	.00	.00	10.35

Page 3- SCS Composite Hydrograph (Option 3)

STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
P.O. Box 94245
Baton Rouge, Louisiana 70804-9245

HYDR6000

Inlet Spacing and Selection Program

July 1997

METRIC / ENGLISH HYDRAULIC PROGRAMS

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HYDR6000 is a computer program which calculates the width of flooding for urban roadways with curb and gutter by the Rational Method as outlined in Chapter II of the LA DOTD Hydraulics Manual.

EXAMPLE INPUT

An example of the input screen and data for running the program is:

```
      LADOTD HYDRAULICS DATA EDITOR - EXAMPLEM.600
F1=HELP F2=SAVEAS/END F3=SAVE/END  F4=CANCEL  F5=REPEAT LINE F6=DELETE LINE
F7=COPY LINE TO SCRATCHPAD   F8=PASTE LINE FROM SCRATCHPAD AFTER THIS LINE.
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
*HYDR6000 METRIC*******************************************************
*** INPUT DATA FOR HYDR6000 - INLET SPACING AND SELECTION
*** NOTE THAT LINES WITH '*' IN COLUMN 1 ARE COMMENTS.
*********************************************************************
LINE 1  DOTD ENGINEER            * Designer Name     * METRIC
LINE 2  *Remarks: Sample data
*******************************************************************************
* Project   Rain Return Rd Wdth Num  Begin     Begin    End         End       *
* Number    Reg  Year    (ft)   VC   Station   Grade(%) Station     Grade (%) *
*******************************************************************************
LINE 3  000-00-0000 |1  |10    |10.668 |02 |3+017.52  |-1.000  |3+291.84   |-0.400
*******************************************************************************
***    VERTICAL CURVE DATA - ONE LINE PER VERTICAL CURVE                      *
*                                                                             *
*      PI Station          PI Elevation (m)      Curve Length  (m)            *
*********************************************************************
LINE 4  3+108.96                |36.576                |121.920                 *
        3+230.88                |37.795                |121.920                 *
*********************************************************************
***    CATCH BASIN DATA -  ONE LINE FOR EACH CATCH BASIN                      *
*                                                                             *
*                  Catch Basin  Drain Len    Slope                            *
*Num   Station         Type        (m)         (%)       Runoff Coeff.        *
*********************************************************************
LINE 5  001  |3+048.00   |CB06       |30.5       |0.30       |0.50
        002  |3+080.00   |CB06       | 0.0       |0.00       |0.00
        003  |3+108.96   |CB08       |22.9       |0.30       |0.50
        004  |3+137.92   |CB06       | 0.0       |0.00       |0.05
        005  |3+169.92   |CB06       |15.2       |0.30       |0.50
        006  |3+215.64   |CB06       | 7.6       |0.30       |0.50
        007  |3+291.84   |CB06       | 7.6       |0.30       |0.50
LINE 6  STOP
*
```

DATA FIELDS

The input data fields are described on the following page. Each field must have a value in it. The program will not run if any of them are left blank.

DATA FIELDS CONTD.

Line 1
- Designer's Name
  - Code in to the left of the ★ and the words "Designer Name".

Line 2
- Remarks
  - A one line description may be put here.

Line 3
- State Project Number
  - This should be in the format 999-99-9999.
- The Rainfall Region
  - Should be a 1, 2 or 3 [refer to the LA DOTD Hydraulics Manual]
- The Return Year Period
  - Should be 2, 5, 10, 25, 50, or 100
  - If one of the above years is not specified, a 10 year return will be used.
- Roadway Width (m) or {ft}
  - Measured from the crown to the gutter
  - A runoff coefficient of 0.95 is used for paved roadways
- Number of Vertical Curves
  - ▣ [This field is not in the Windows version.]
- Beginning Station
- Beginning Grade (%)
- Ending Station
- Ending Grade (%)

Line 4
- ✎ ***NOTE*: One line for each vertical curve section**
- PI Station
- PI Elevation (m) or {ft}
- Length of the Vertical Curve (m) or {ft}

Line 5
- ✎ ***NOTE*: One line for each catch basin section**
- Catch Basin Number
- Station of the Catch Basin
- Catch Basin Type
  - CB0(6, 7, 8 or 9)
- Drainage Length (m) or {ft}
  - Distance perpendicular to the roadway (sides of a rectangle made with the roadway).
  - If the input value is equal to 0, the roadway width is used.
- Slope of the Drainage Basin (%)
  - If the input value is equal to 0, the longitudinal slope of the roadway is used with the exception of low points where a default of 0.5% is used.
- Runoff Coefficient
  - A runoff coefficient of 0.95 is used for paved roadways.

DATA FIELDS CONTD.

Line 6
- STOP
  - The word "STOP" must be placed at the end of each data set.
    - ▣ [This field is not in the Windows version.]

✎ ***NOTE:*** Other sets of data may be entered after the STOP line. All data sets must begin with the DESIGNER NAME line.
- ▣ [For the Windows version, this does not apply. To analyze another data set, you will need to create another file name.]

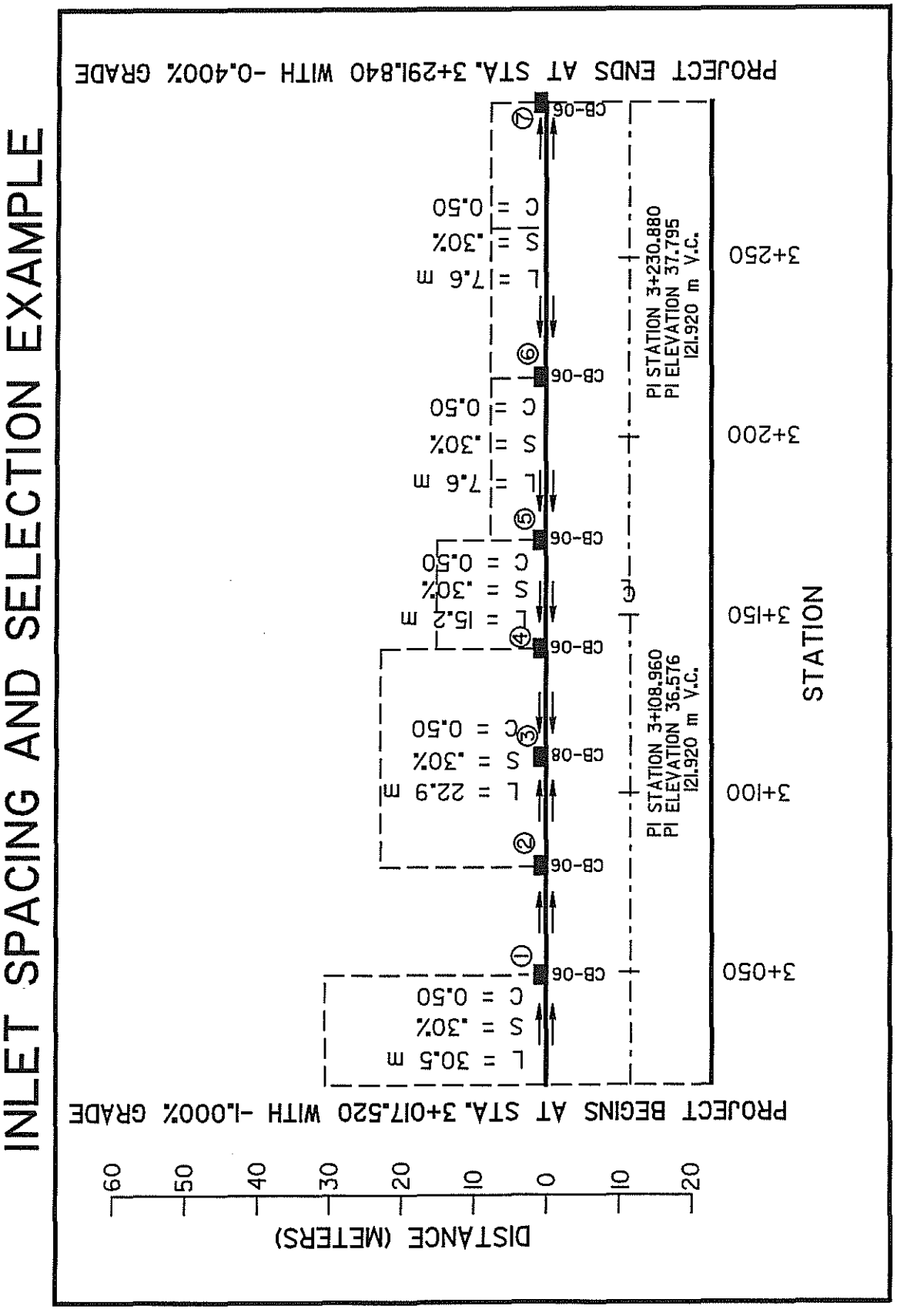
▣ **For The Windows Version Only:**
- PRINT COLUMNS
  - Choice of two different output styles.
  - The 80 column option prints the output in a portrait orientation.
  - The 132 column option prints the output in a landscape orientation.
  - To select, use the mouse and click inside the circle of the one desired.

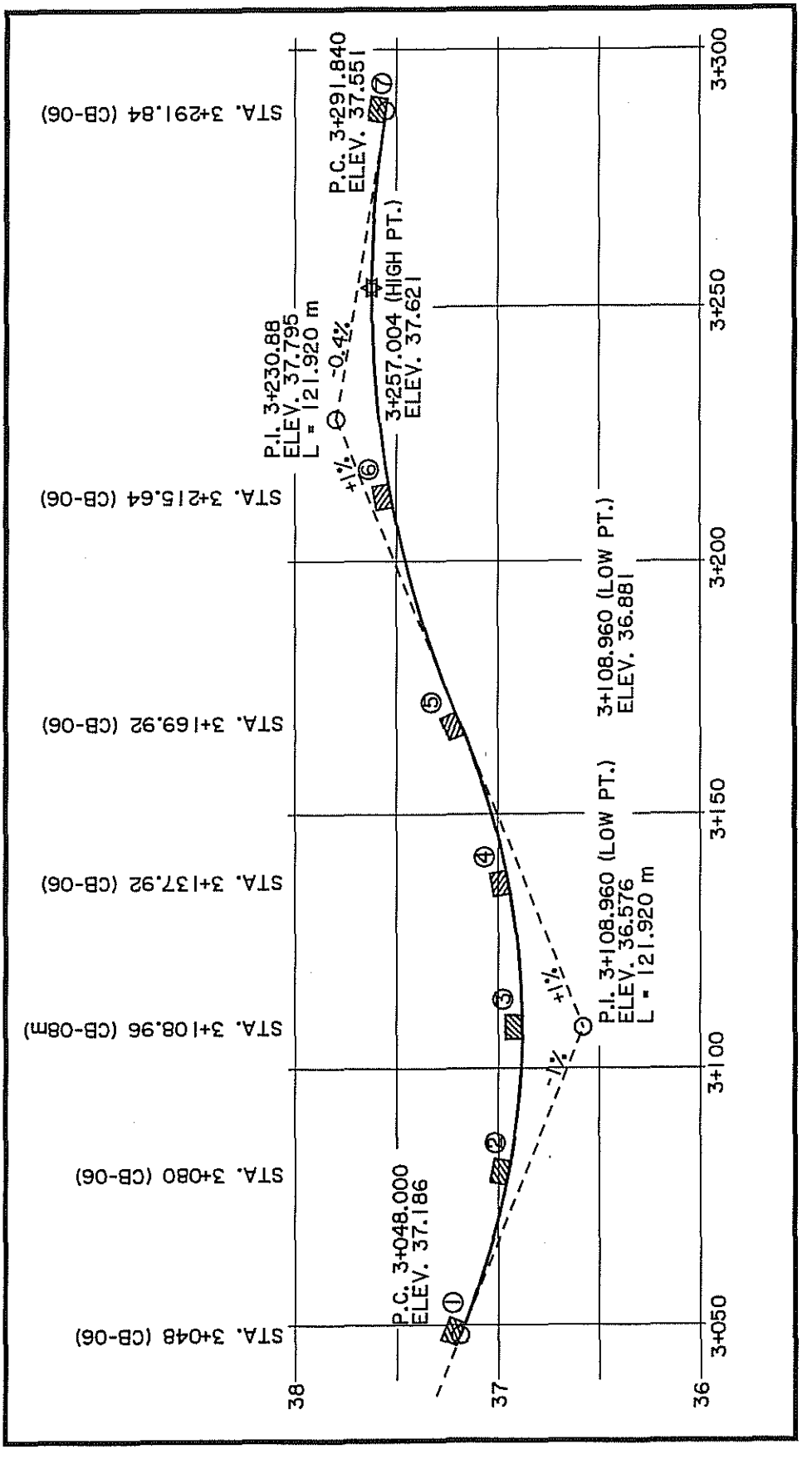
PROGRAM OUTPUT REMARKS

1. Q?	- Gutter flow exceeds (0.283 m^3/s) or {10 cfs}
2. Width flood?	- Width of flooding exceeds (2.438 m) or {8 ft}
3. Long. Slope?	- Longitudinal slope is < 0.40 or > 10.00 percent
4. Bypass to ?	- Q bypass at the last or first catch basin > (0.00028 m^3/s) or {0.01 cfs}
5. Spacing ?	- Catch basin spacing exceeds (60.96 m) or {200 ft} criterion
6. Inter ratio?	- Interception ratio is less than 0.3

EXAMPLE OUTPUT

Design sketches of the plan and profile views for the example input on page 72 is on the following pages. Output for the example on page 72 follows the sketches.


INLET SPACING AND SELECTION EXAMPLE
PROJECT ENDS AT STA. 3+291.840 WITH -0.400% GRADE
CB-06
L = 7.6 m
S = .30%
C = 0.50
PI STATION 3+230.880
PI ELEVATION 37.795
121.920 m V.C.
3+250
3+200
L = 15.2 m
PI STATION 3+108.960
PI ELEVATION 36.576
121.920 m V.C.
3+150
L = 22.9 m
3+100
L = 30.5 m
3+050
STATION
PROJECT BEGINS AT STA. 3+017.520 WITH -1.000% GRADE
60 50 40 30 20 10 0 10 20
DISTANCE (METERS)
PLAN


INLET SPACING AND SELECTION EXAMPLE
PROFILE
STA. 3+048 (CB-06)
STA. 3+080 (CB-06)
STA. 3+108.96 (CB-08m)
STA. 3+137.92 (CB-06)
STA. 3+169.92 (CB-06)
STA. 3+215.64 (CB-06)
STA. 3+291.84 (CB-06)
P.C. 3+048.000
ELEV. 37.186
P.I. 3+108.960 (LOW PT.)
ELEV. 36.576
L = 121.920 m
P.I. 3+108.960 (LOW PT.)
ELEV. 36.881
P.I. 3+230.88
ELEV. 37.795
L = 121.920 m
3+257.004 (HIGH PT.)
ELEV. 37.621
P.C. 3+291.840
ELEV. 37.551
+1½
-1½
-0.4%
38
37
36
3+050
3+100
3+150
3+200
3+250
3+300

EXAMPLE OUTPUT CONTD.

```
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT        HYDR6000-052797
HYDRAULICS SECTION                                             PAGE    1

DESIGNER: DOTD ENGINEER              DATE: 06/04/1997          METRIC
STATE PROJECT NUMBER   000-00-0000     REGION: 1
REMARKS :  Sample data


INPUT:

REGION                        = 1
DESIGN STORM (YEARS)          =     10
NO. OF VERTICAL CURVES        =      2
ROADWAY WIDTH  (m)            =  10.67
PROJECT BEGIN AT  STATION =          3+017.520
PROJECT END AT STATION    =          3+291.840
GRADE AT THE BEGINNING OF THE PROJECT=     -1.000    PERCENT
GRADE AT THE END OF THE PROJECT      =      -.400    PERCENT


| CURVE  |      PI      |       PI       |
| NUMBER |   STATION    |   ELEVATION    |

     1        3+108.960        36.576
     2        3+230.880        37.795


|---- CATCH BASIN -----|---------- DRAINAGE BASIN ----------|

| NUMBER |    STATION    | TYPE | LENGTH | SLOPE |     RUNOFF    |

|        |               |      |  (m)   |  (%)  | COEFFICIENT |


   001        3+048.000   CB06     30.50     .300         .50
   002        3+080.000   CB06       .00     .000         .00
   003        3+108.960   CB08     22.90     .300         .50
   004        3+137.920   CB06       .00     .000         .05
   005        3+169.920   CB06     15.20     .300         .50
   006        3+215.640   CB06      7.60     .300         .50
   007        3+291.840   CB06      7.60     .300         .50
```

EXAMPLE OUTPUT CONTD.

```
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT        HYDR6000-052797
HYDRAULICS SECTION                                            PAGE    2

DESIGNER: DOTD ENGINEER              DATE: 06/04/1997        METRIC
STATE PROJECT NUMBER   000-00-0000    REGION: 1
REMARKS :  Sample data

                  ROADWAY PROFILE
NO. OF VERTICAL CURVES     =      2
ROADWAY WIDTH  (m)         =  10.67
PROJECT BEGIN AT  STATION =        3+017.520
PROJECT END AT STATION     =       3+291.840
GRADE AT THE BEGINNING OF THE PROJECT=     -1.000   PERCENT
GRADE AT THE END OF THE PROJECT       =     -.400   PERCENT


 VERTICAL CURVE DATA:

CURVE  | LENGTH |    PC      |       PI          |   PT       |   G1     |    G2
NUMBER |  (m)   |  STATION   | STATION   ELEV.   | STATION    |(PERCENT)|(PERCENT

   1    121.920   3+048.000   3+108.960  36.576   3+169.920    -1.000     1.000
   2    121.920   3+169.920   3+230.880  37.795   3+291.840     1.000     -.400

CURVE  | LENGTH |    PI      |      HIGH POINT       |      LOW POINT        |
NUMBER |  (m)   |  STATION   |  STATION   ELEVATION  |  STATION  ELEVATION   |

   1    121.920    3+108.960                          3+108.965    36.881
   2    121.920    3+230.880   3+257.002    37.621
```

EXAMPLE OUTPUT CONTD.

```
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT      HYDR6000-052797
HYDRAULICS SECTION                                          PAGE    3

DESIGNER: DOTD ENGINEER              DATE: 06/04/1997       METRIC
STATE PROJECT NUMBER   000-00-0000    REGION: 1
REMARKS :  Sample data

                                        INLET SPACING AND SELECTION
                                         DESIGN STORM =    10 YEARS
 RUNOFF COMPUTATIONS:
```

INLET NO.	INLET TYPE	STATION	DRAINAGE BASIN LENGTH (m)	DRAINAGE BASIN WIDTH (m)	DRAINAGE BASIN SLOPE (%)	DRAINAGE BASIN AREA (ha)	DRAINAGE BASIN RUNOFF COEFF.	TOTAL AREA (ha)
001	CB06	3+048.000	30.50	30.48	.300	.093	.50	.125
002	CB06	3+080.000	10.67	32.00	.475	.034	.95	.034
003	CB08	3+108.960	22.90	57.92	.300	.133	.50	.194
004	CB06	3+137.920	10.67	32.00	.475	.034	.95	.034
005	CB06	3+169.920	15.20	45.72	.300	.069	.50	.118
006	CB06	3+215.640	7.60	41.36	.300	.031	.50	.076
007	CB06	3+291.840	7.60	34.84	.300	.026	.50	.064

INLET NO.	INLET TYPE	STATION	TOTAL AREA X COEF.	HYDRAULIC LENGTH (m)	TIME OF CONC. (MIN.)	RAINFALL INTENSITY (mm/HR)	Q (m3/s)
001	CB06	3+048.000	.077	43.12	13.62	161.35	.034
002	CB06	3+080.000	.032	33.73	5.46	201.70	.018
003	CB08	3+108.960	.125	36.92	12.82	164.53	.057
004	CB06	3+137.920	.032	33.73	5.46	201.70	.018
005	CB06	3+169.920	.081	48.18	14.22	159.05	.036
006	CB06	3+215.640	.058	42.05	13.49	161.87	.026
007	CB06	3+291.840	.049	35.66	12.64	165.23	.022

EXAMPLE OUTPUT CONTD.

LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT HYDR6000-052797
HYDRAULICS SECTION PAGE 4

DESIGNER: DOTD ENGINEER DATE: 06/04/1997 METRIC
STATE PROJECT NUMBER 000-00-0000 REGION: 1
REMARKS : Sample data

INLET SPACING AND SELECTION
DESIGN STORM = 10 YEARS

INLET SPACING AND SELECTION:

INLET NO.	INLET TYPE	STATION	Q (m3/s)	Q+QBYPASS (m3/s)	LONGITUDINAL SLOPE (PERCENT)	WIDTH OF FLOODING (m)	INTERCEPTION RATIO
001	CB06	3+048.000	.034	.034	-1.000	2.01	.75
002	CB06	3+080.000	.018	.026	-.475	2.09	1.00
003	CB08	3+108.960	.057	.057	.000	2.01	1.00
004	CB06	3+137.920	.018	.027	.475	2.11	1.00
005	CB06	3+169.920	.036	.036	1.000	2.03	.75
006	CB06	3+215.640	.026	.026	.475	2.07	1.00
007	CB06	3+291.840	.022	.022	-.400	2.02	1.00

INLET NO.	INLET TYPE	STATION	BYPASS Q (m3/s)	BYPASS TO INLET NO.	PROFILE GUTTER ELEV.	REMARKS
001	CB06	3+048.000	.008	002	36.919	
002	CB06	3+080.000	.000	003	36.683	
003	CB08	3+108.960	.000	---	36.614	
004	CB06	3+137.920	.000	003	36.683	
005	CB06	3+169.920	.009	004	36.919	
006	CB06	3+215.640	.000	005	37.256	
007	CB06	3+291.840	.000	---	37.284	

RUNOFF COEFFICIENT OF 0.95 WAS USED FOR PAVED ROADWAYS.

STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
P.O. Box 94245
Baton Rouge, Louisiana 70804-9245

HYDR6020

Storm Sewer Design Program

July 1997

METRIC / ENGLISH HYDRAULIC PROGRAMS

HYDR6020 is a computer program which calculates the size of storm sewer pipes and the hydraulic grade line by the Rational Method as outlined in Chapter II of the LA DOTD Hydraulics Manual.

EXAMPLE INPUT

An example of the input screen and data for running the program is:

```
        LADOTD HYDRAULICS DATA EDITOR - EXAMPLEM.620
F1=HELP F2=SAVEAS/END F3=SAVE/END  F4=CANCEL  F5=REPEAT LINE F6=DELETE LINE
F7=COPY LINE TO SCRATCHPAD   F8=PASTE LINE FROM SCRATCHPAD AFTER THIS LINE.
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
*HYDR6020 METRIC*****************************************************
*** INPUT DATA FOR HYDR6020 - STORM SEWER DESIGN.
*** NOTE THAT LINES WITH '*' IN COLUMN 1 ARE COMMENTS.
*********************************************************************
LINE 1  DOTD ENGINEER            * Designer Name     * METRIC
LINE 2  *Remarks: Sample data
*********************************************************************
* Project   Rain Return Water Surface   Roadway    Vel Head *
* Number    Reg  Year   Elevation (m)   Thick(mm)  Coeff    *
*********************************************************
LINE 3  000-00-0000 |1  |10    |17.13          |500       |1.00
*******************************************************************************
*Lin Up  Low Len  Dist Slope  Area Coef  Time  Slope  Diam  Up El  Lo El Street*
*Num End End (m)   (m)  (%)  (hect)     (min)  (m/m)  (mm)   (m)    (m)  El (m)*
*******************************************************************************
LINE 4   2 | 1 |  7|30.5 |61   |1.0 |0.607|0.60|  0  |0.0030|0    |0    |16.855|18.349
         4 | 3 |  5|21.3 |61   |1.0 |0.405|0.60|  0  |0.0030|375  |0    |16.993|18.349
         6 | 5 |  7|30.5 |61   |2.5 |0.506|0.80|  0  |0.0020|0    |0    |16.703|18.288
         8 | 7 | 11|30.5 |30.5 |2.0 |0.324|0.50|  0  |0.0020|0    |0    |16.490|18.288
        10 | 9 | 11|21.3 |45.7 |3.0 |0.405|0.60|  0  |0.0040|0    |0    |16.551|18.227
        12 |11 | 13|30.5 |30.5 |2.0 |0.587|0.80|  0  |0.0020|0    |0    |16.276|18.227
        14 | 0 | 13| 3.7 |0    |0.  |1.538|0.80|12.0 |0.0030|0    |0    |16.124|18.288
        15 |13 |999|30.5 |0    |0.  |0.000|0.00|  0  |0.0020|1050 |0    |16.063|18.288
LINE 5  *
```

DATA FIELDS

The input data fields are described below. Each field must have a value in it. The program will not run if any of them are left blank.

Line 1 ○ Designer's Name
- Code in to the left of the ★ and the words "Designer Name".

Line 2 ○ Remarks
- A one line description of the project may be put here.

DATA FIELDS CONTD.

Line 3
- State Project Number
  - This should be in the format 999-99-9999.
- The Rainfall Region
  - Should be a 1, 2 or 3 [refer to the LA DOTD Hydraulics Manual]
- The Return Year Period
  - Should be 2, 5, 10, 25, 50, or 100
  - If one of the above years is not specified, a 10 year return will be used.
- Water Surface Elevation of the Outfall For the Specified Return Period (m) or {ft}
- Thickness of the Roadway (mm) or {in.}
  - If entered as 0.0, (500 mm) or {20"} will be used
- Velocity Head Coefficient.
  - Used to determine junction loss.
  - If $1 < VHCOEF \leq 0$, one velocity head is used for junction loss.

Line 4

✎ ***NOTE*: One line for each pipe**
- Line Number of Pipe
  - May be from 1 to 999
  - Pipes should be entered in the order of flow
- Upper End Node Number of Pipe
  - A stub-in pipe should have an upper end node number of 0.
  - All other nodes should be from 1 to 998
- Lower End Node Number of Pipe
  - The outfall pipe should have a lower end node number of 999
  - All other nodes should be from 1 to 998
  - There may be a maximum of four lines leading into a manhole. That is, no more than four lines may have the same lower end node number. Also, only one line may leave a manhole.
- Length of Pipe (m) or {ft}
  - (Rounded to the nearest ½ meter and not exceeding 305 m)
  - {Whole feet, must not be > 1000 ft}
- Hydraulic Length (m) or {ft} *[see note ❶ on p. 76]*
- Drainage Slope (%) *[see note ❶ on p. 76]*
- Drainage Area (ha) or {acres}
- Coefficient of Runoff For Drainage Area
- Time of Concentration (minutes)
  - It will be calculated by the program if a value of 0 is entered. Otherwise, the given time of concentration will be compared to the computer generated time of concentration and the greater of the two used in the calculations.
- Construction Slope (m/m) or {ft/ft}

DATA FIELDS CONTD.

Line 4 Contd.

- Pipe Diameter (mm) or {in.}
  - If 0 is entered, the pipe size will be computed by the program. Otherwise, the entry must be a valid pipe size. The minimum pipe size is (375 mm) or {15"} and the maximum pipe size is (3600 mm) or {144"}
  - To code in a double line of pipe, the pipe diameter should be preceded by *2-*. *(e.g.,* to use two 750 mm pipes, specify the pipe size as *2-750.)*
  - Three or more pipes in a line is not accepted by this program.
- Upper Flow Line Elevation (m) or {ft} *[see note ❷ below]*
- Lower Flow Line Elevation (m) or {ft} *[see note ❷ below]*
- Street Elevation At Upper End of Pipe (m) or {ft}
  - Normally this is the finished gutter elevation.

Line 5 ✎ ***NOTE:*** Multiple sets of data may be entered as long as each data set begins with the DESIGNER NAME line and ends with an END line.

▣ [For the Windows version, this does not apply. To analyze another data set, you will need to create a new file.]

▣ **For The Windows Version Only:**

- PRINT COLUMNS
  - Choice of two different output styles.
  - The 80 column option prints the output in a portrait orientation.
  - The 132 column option prints the output in a landscape orientation.
  - To select, use the mouse and click inside the circle of the one desired.

❶ The hydraulic length and the drainage slope may not be 0 unless values for the drainage area and the time of concentration are given.

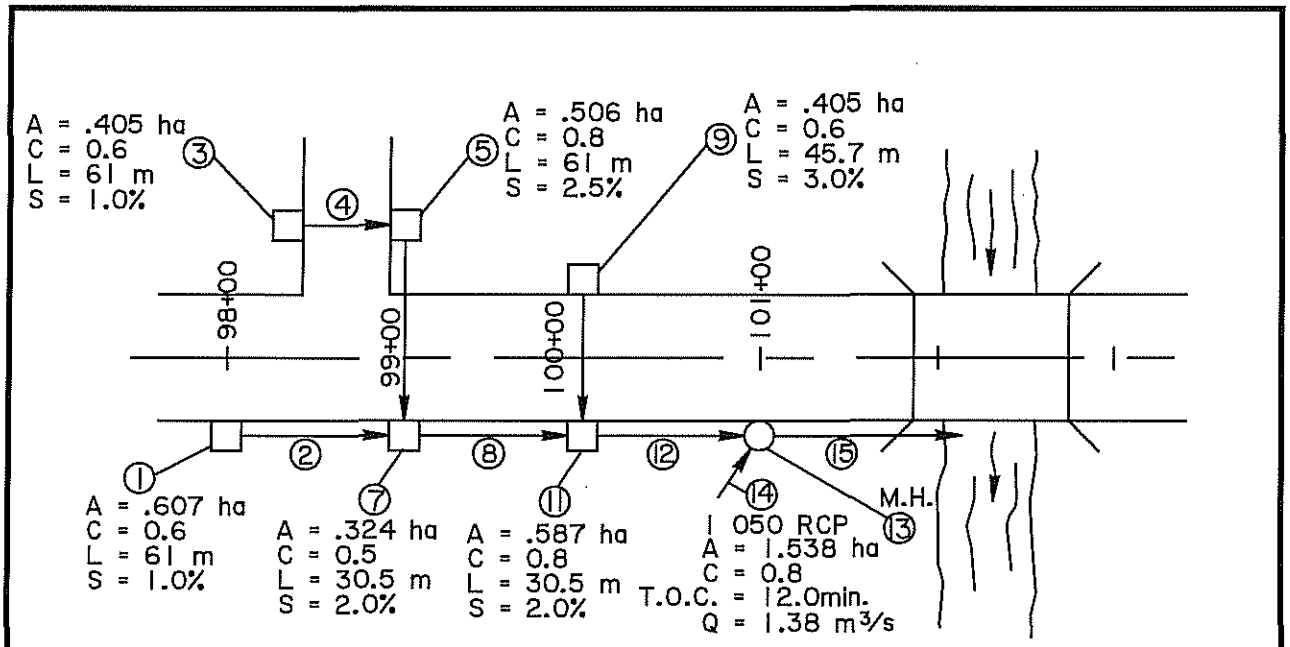
❷ Either upper or lower flow line elevations must be given, but not both. An elevation may be specified for one or more pipes. (At least one elevation must be given for the system). Any elevations that are not specified (that is, are equal to 0), will be computed by the program by matching the centerline of the pipes. (If you need to specify an elevation of 0, use 0.1 instead.)

PROGRAM OUTPUT REMARKS

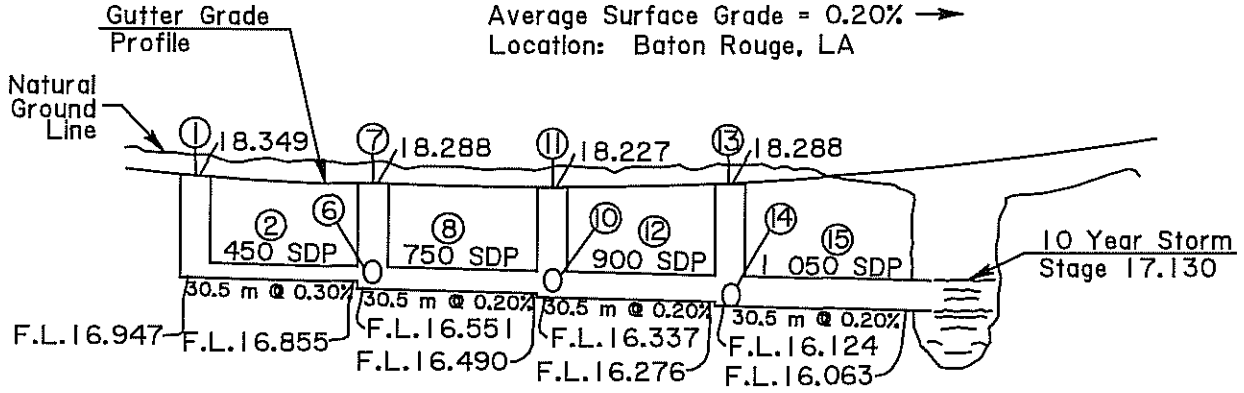
1. Part Full - Pipe is not flowing full
2. Street Elev? - Street elevation was not given
3. Hyd. Len.? - Hydraulic length is > (305 m) or {1000 ft}
4. Conc. Time? - Time of concentration is > 120 min.
5. Pipe Diam.? - The outflow pipe diameter is smaller than the pipe leading into it. If there are two pipes in a line, the areas are compared rather than the diameters.
6. Flow Line ? - The flow line elevation of the outflow pipe is higher than the flow line of the pipe leading into it.
7. Drain Slope? - Drainage slope is < 0.1 or > 20%
8. Const Clear? - Minimum construction clearance is violated. (200 mm for pipes < 2200 mm and 300 mm for pipes ≥ 3600 mm) or {9″ for pipes < 90″ and 12″ for pipes ≥ 90″}

EXAMPLE OUTPUT

A sketch of the plan and profile views for the example on page 82 is on the following page. Output for the example on page 82 follows the sketch.



PLAN



PROFILE

EXAMPLE OUTPUT CONTD.

LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT HYDR6020-052797
HYDRAULICS SECTION PAGE 1

DESIGNER: DOTD ENGINEER DATE: 06/04/1997
REMARKS : Sample data

STATE PROJECT NUMBER 000-00-0000 REGION: 1

STORM SEWER DESIGN
DESIGN STORM = 10 YEARS
DESIGN STAGE ELEVATION AT OUTFALL = 17.130 METRIC

INPUT DATA:

LIN NUM	UPP END	LOW END	PIPE LEN. (m)	DRAINAGE HYDL (m)	DRAINAGE SLOP (%)	DRAINAGE AREA (ha)	RUN OFF COEF	TIME OF CONC	CONST SLOPE (m/m)	PIPE DIAM (mm)	FLOW LINE ELEVATION UPPER	FLOW LINE ELEVATION LOWER	STREET ELEV. (m)
2	1	7	30.5	61.0	1.0	.607	.60	.0	.0030	0	.000	16.855	18.349
4	3	5	21.3	61.0	1.0	.405	.60	.0	.0030	375	.000	16.993	18.349
6	5	7	30.5	61.0	2.5	.506	.80	.0	.0020	0	.000	16.703	18.288
8	7	11	30.5	30.5	2.0	.324	.50	.0	.0020	0	.000	16.490	18.288
10	9	11	21.3	45.7	3.0	.405	.60	.0	.0040	0	.000	16.551	18.227
12	11	13	30.5	30.5	2.0	.587	.80	.0	.0020	0	.000	16.276	18.227
14	0	13	3.7	.0	.0	1.538	.80	12.0	.0030	0	.000	16.124	18.288
15	13	999	30.5	.0	.0	.000	.00	.0	.0020	1050	.000	16.063	18.288

EXAMPLE OUTPUT CONTD.

```
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT      HYDR6020-052797
HYDRAULICS SECTION                                          PAGE    2

DESIGNER: DOTD ENGINEER              DATE: 06/04/1997
REMARKS :  Sample data

            STATE PROJECT NUMBER  000-00-0000    REGION: 1

                        STORM SEWER DESIGN
                    DESIGN STORM =  10 YEARS
              DESIGN STAGE ELEVATION AT OUTFALL = 17.130     METRIC

 OUTPUT RESULTS - PART 1

     |--STRUCTURE-| PIPE |-------DRAINAGE AREA--------|       | AREA X COEFF |
LINE |UPPER LOWER |LENGTH|  DIST   SLOPE   INCR.  TOTAL|RUNOFF|              |
 NO. | END   END  |  (m) |  (m)     (%)    (ha)   (ha) |COEFF.| INCR.  TOTAL |

   2      1     7    30.5   61.0   1.00   .607   .607    .60    .364   .364
   4      3     5    21.3   61.0   1.00   .405   .405    .60    .243   .243
   6      5     7    30.5   61.0   2.50   .506   .911    .80    .405   .648
   8      7    11    30.5   30.5   2.00   .324  1.842    .50    .162  1.174
  10      9    11    21.3   45.7   3.00   .405   .405    .60    .243   .243
  12     11    13    30.5   30.5   2.00   .587  2.834    .80    .470  1.887
  14      0    13     3.7     .0    .00  1.538  1.538    .80   1.230  1.230
  15     13   999    30.5     .0    .00   .000  4.372    .00    .000  3.117

 OUTPUT RESULTS - PART 2

     |--STRUCTURE-|TRAVEL | TIME  |  RAIN- | CONST.| REQD. |   Q   | CONST
LINE |UPPER LOWER | TIME  |  OF   |  FALL  | SLOPE | HYDR. | CAPAC.| CLEAR
 NO. | END   END  |IN PIPE|CONCEN.| INTENS.| (m/m) | SLOPE | (m3/s)|  (m)

   2      1     7     .47   10.00     177     .0030   .0030    .176    .369
   4      3     5     .34   10.00     177     .0030   .0036    .109    .335
   6      5     7     .47   10.34     175     .0020   .0020    .310    .338
   8      7    11     .41   10.81     173     .0020   .0020    .563    .373
  10      9    11     .32    7.18     191     .0040   .0042    .125    .634
  12     11    13     .38   11.23     171     .0020   .0019    .915    .374
  14      0    13     .05   12.00     168     .0030   .0020    .689    .789
  15     13   999     .32   12.05     168     .0020   .0022   1.380    .470
```

EXAMPLE OUTPUT CONTD.

LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT HYDR6020-052797
HYDRAULICS SECTION PAGE 3

DESIGNER: DOTD ENGINEER DATE: 06/04/1997
REMARKS : Sample data

STATE PROJECT NUMBER 000-00-0000 REGION: 1

STORM SEWER DESIGN
DESIGN STORM = 10 YEARS
DESIGN STAGE ELEVATION AT OUTFALL = 17.130 METRIC

OUTPUT RESULTS - PART 3

LINE NO.	-STRUCTURE- UPPER END	LOWER END	Q (m3/s)	PIPE DIAM (mm)	V (m/s)	VELOC. HEAD (m)	FRICT. LOSS (m)	JUNCTION LOSS (m)	HYDRAULIC GRADE LINE ELEVATION UPPER	LOWER
2	1	7	.177	450	1.08	.06	.09	.09	17.931	17.750
4	3	5	.118	375	1.04	.05	.08	.08	18.029	17.870
6	5	7	.313	600	1.07	.06	.06	.06	17.812	17.750
8	7	11	.560	750	1.23	.08	.06	.08	17.673	17.612
10	9	11	.128	375	1.12	.06	.09	.10	17.798	17.612
12	11	13	.890	900	1.36	.09	.06	.09	17.519	17.461
14	0	13	.569	750	1.25	.08	.01	.04	17.508	17.461
15	13	999	1.440	1050	1.61	.13	.07	.13	17.329	17.262

OUTPUT RESULTS - PART 4

LINE NO.	-STRUCTURE- UPPER END	LOWER END	FLOW LINE ELEVATION UPPER	LOWER	STREET ELEV (m)	HYDRAULIC CLEARANCE (m)	REMARKS
2	1	7	16.946	16.855	18.349	.418	
4	3	5	17.057	16.993	18.349	.320	
6	5	7	16.764	16.703	18.288	.476	
8	7	11	16.551	16.490	18.288	.615	
10	9	11	16.636	16.551	18.227	.429	
12	11	13	16.337	16.276	18.227	.708	
14	0	13	16.135	16.124	18.288	.780	
15	13	999	16.124	16.063	18.288	.959	

EXIT LOSS = .13
MANNING'S ROUGHNESS COEFFICIENT OF .012 USED.
1.0 VELOCITY HEAD WAS USED FOR LOSSES AT MANHOLES.
ROADWAY THICKNESS= 500.0 mm