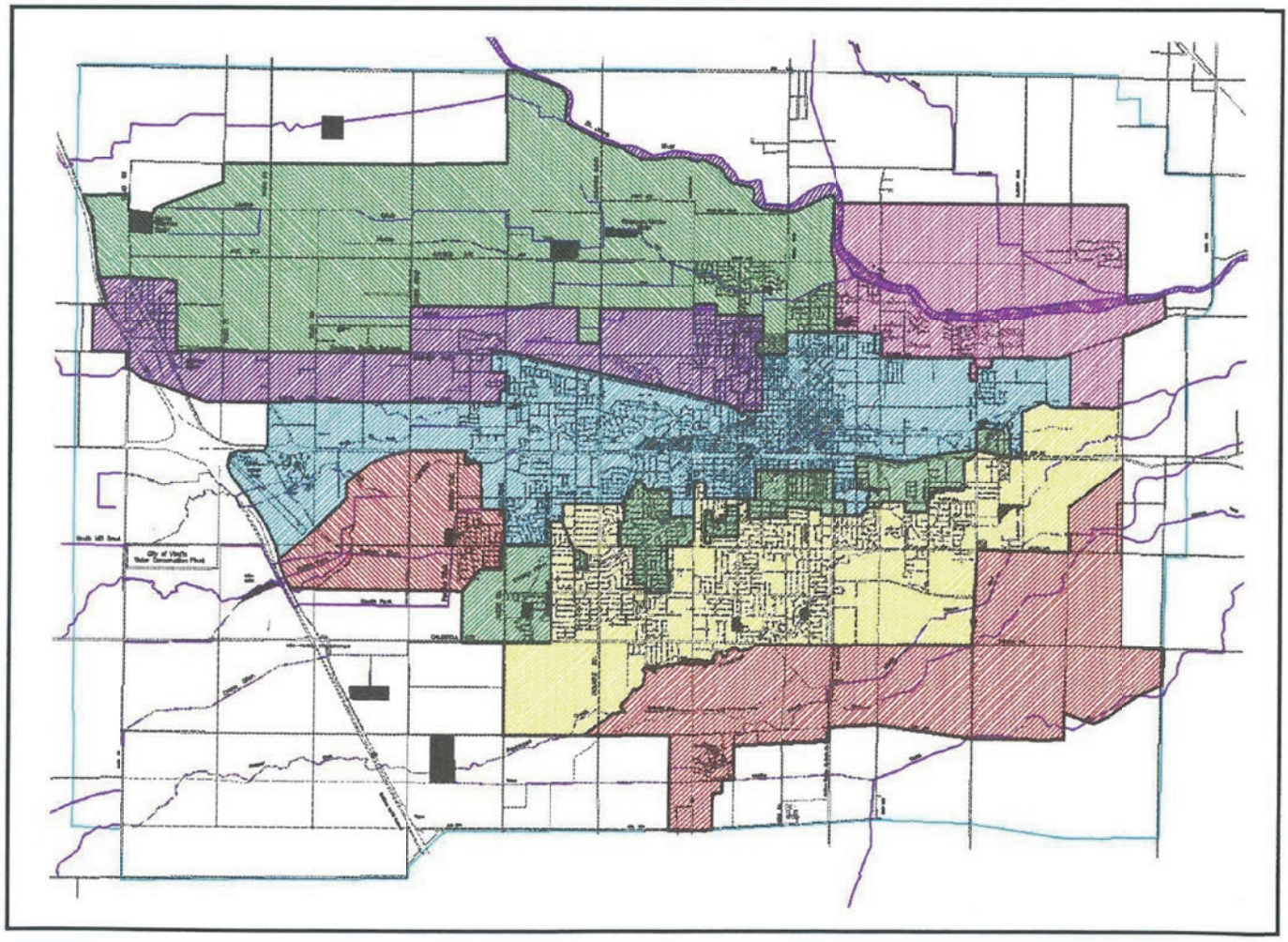
City of Visalia

Storm Water Master Plan
and Management Program

VOLUME 3
USER'S MANUAL



Boyle Engineering Corporation

City of Visalia
Storm Water Master Plan
and
Management Program

USER'S MANUAL

Final Draft

March 1993

PREFACE

In July, 1991, the City of Visalia contracted with Boyle Engineering Corporation to review and update a Storm Water Master Plan developed in 1987 and develop a computerized Facility Management System for the entire City. The results of the study are presented in the following documents:

Storm Water Master Plan	Contains a discussion of the existing conditions, basis of design, alternatives, proposed improvements including cost estimates, a capital improvement plan and water quality measures.
Basin Reports	Contains all reports generated by the Storm Water Facilities Management System.
Storm Water Atlas Sheets	Provides digitized maps of existing storm water facilities.
User's Manual	Documents the use of the Storm Water Facilities Management System.

This document is the **User's Manual.**

Table of Contents

1. INTRODUCTION

SYSTEM OVERVIEW

This integrated Storm Water Facilities Management System has been developed on a Personal Computer (PC) to consolidate all information required in the preparation, analysis and generation of results for a Storm Water Master Plan and Management Program. The system integrates AutoCAD, Facility Mapping System for AutoCAD (FMS/AC) and the Corps of Engineers Hydrology Model HEC-1 through a menu driven application written in dBASE IV.

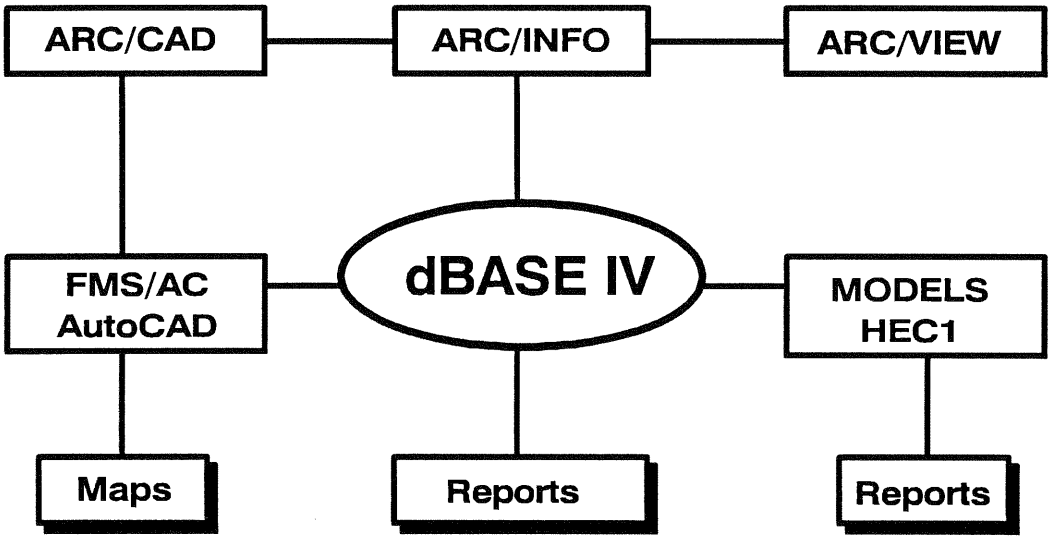


Figure 1.1 System Integration

The purpose of implementing an integrated Storm Water Facilities Management System is to consolidate all information necessary for analyzing and managing the Storm Water System and provide a mechanism for updating graphic and non graphic data.

By managing all graphics in an AutoCAD environment through the use of FMS/AC, graphic and non graphic data on existing and newly installed storm water facilities can be updated and new maps and facility reports can be produced. Further, by managing all data necessary for analyzing the drainage system, including hydrologic and hydraulic modeling, unit cost rates and year of proposed works, systems can be analyzed as conditions change and revised facility upgrades, cost estimates and capital improvement programs can be generated.

A major consideration in the use of the Storm Water Facilities Management System is its integration with a central Geographic Information System (GIS). Data available on a central system can be downloaded for use in the Storm Water Facilities Management System and results generated by the Management System can be uploaded to the central system.

The integrated Storm Water Facilities Management System, written in dBASE IV, has an open environment. As new analysis is required, additional databases can be prepared and linked to current data. These could include storm water maintenance activities or analysis for EPA's National Pollutant Discharge Elimination System (NPDES) requirements.

The Storm Water Facilities Management System provides a user-friendly environment that allows users with varying levels of experience to access existing information and analyze new conditions. To update the graphics, the user requires some AutoCAD experience and to run the hydrologic model, the user should have an understanding of HEC-1. A number of reports have been automated in the application, however an experienced dBASE user can generate an infinite number of reports from data contained in the system.

The intention of this Manual is to provide the user instructions on how to use the Storm Water Facilities Management System. For detailed instructions on how to use the integrated software, including AutoCAD, FMS/AC, HEC-1 and dBASE IV, the user is directed to the software's respective manual.

MANUAL ORGANIZATION

1. Introduction	Presents the purposes and advantages of implementing an integrated Storm Water Facilities Management System and the manual's organization.
2. Getting Started	Steps to install the Storm Water Facilities Management System.
3. Facilities Mapping	A description of the Facilities Mapping software and its use in the Storm Water Facilities Management System.
4. Relational Databases	A description of the relational databases used in the Storm Water Facilities Management System.
5. Engineering Models	A description of the engineering models used in the Storm Water Facilities Management System.
6. Tutorial - Database	A guide to editing data, printing reports and running the model developed for the Storm Water Facilities Management System.

2. GETTING STARTED

The software used in the Storm Water Facilities Management system includes:

- AutoCAD Release 11 (Graphics)
- dBASE IV Version 1.5 (Relational Database)
- FMS/AC Version 3.0 (Facilities Mapping)
- VISDPLAN Version 1.0 (dBASE integrated application by Boyle)
- HEC-1 Version 4.0 (Hydrology Model)

AutoCAD, dBASE and FMS/AC should be installed in accordance with instructions from the respective software.

A typical directory for the remaining software used in the Management System is as follows:

D:\VISDPLAN	(all application program files)
D:\VISDPLAN\MODELS	(HEC-1 Model program files)
D:\VISDPLAN\RUNDATA	(HEC-1 Model input and output data runs)
D:\VISDPLAN\AMFMPLAN	(FMS/AC PLANNING and STORM files for proposed system)
D:\VISDPLAN\AMFMEXIS	(FMS/AC STORM files for existing facilities)

The above directory paths must be included in the "Edit System Setup" in the MAINTENANCE module of the application (see Tutorial).

The program and database files for VISDPLAN are contained on the disks provided with this manual. They can be copied directly to the appropriate directory.

A batch file has been provided to start the program. Go to directory D:\VISDPLAN and type MDP (for Master Drainage Plan).

3. FACILITIES MAPPING

There are two basic components to the Facilities Mapping System. They are:

- Graphic Database
- Non-graphic Database

All graphic information is provided in AutoCAD format and non-graphic data is in dBASE files. The linkage between the two, together with pre-programmed templates is provided by FMS/AC. FMS/AC templates used for this study include PLANNING and STORM.

GRAPHIC DATABASES

The mapping of the City of Visalia Storm Water Master Plan and Management Program is contained in layers as shown in Table 3.1.

Table 3.1 Mapping Configuration

DRAWING NAME: TITLED.DWG (Exhibit 1, Drainage Basins)

LAYER	STATUS	COLOR	LINETYPE	DESCRIPTION
0	On	7	CONTINUOUS	Base Layer
CC-HATCH	On	1	CONTINUOUS	Cammron Creek Hatching
ED-HATCH	On	3	CONTINUOUS	Evan's Ditch Hatching
FF*	On	10	CONTINUOUS	Basin Spatial Overlays
GB-HATCH	On	5	CONTINUOUS	Goshen Basin Hatching
MC-HATCH	On	4	CONTINUOUS	Mill Creek Hatching
MD-HATCH	On	3	CONTINUOUS	Modoc Ditch Hatching
PC-HATCH	On	2	CONTINUOUS	Packwood Creek Hatching
PLNHATCH	On	1	CONTINUOUS	FMS/AC Layer
PW-HATCH	On	1	CONTINUOUS	Persian Watson Ditch Hatching
SJ-HATCH	On	6	CONTINUOUS	St. Johns Hatching
* TITLEBOX	On	7	CONTINUOUS	Title Block Information
VIEWS	Frozen	2	CONTINUOUS	Paper Space Views

Reference Files: VIS_SECT.DWG (base map)

DRAWING NAME: TITLELU.DWG (Exhibit 2, Land Use)

LAYER	STATUS	COLOR	LINETYPE	DESCRIPTION
0	On	7	CONTINUOUS	Base Layer
AA*	On	6	CONTINUOUS	Land Use Hatchings
PLNHATCH	On	1	CONTINUOUS	FMS/AC Layer
TITLEBOX	On	7	CONTINUOUS	Title Block Layer
VIEWS	Frozen	2	CONTINUOUS	Paper Space Views

Reference Files: VIS_SECT.DWG (base map), AA-OVL (Landuse Spatial Overlay)

Table 3.1 Mapping Configuration cont'd

DRAWING NAME: TITLESL.DWG (Exhibit 3, Soil Map)

LAYER	STATUS	COLOR	LINETYPE	DESCRIPTION
0	On	7	CONTINUOUS	Base Layer
JJ*	On	1	CONTINUOUS	Soil Type Spatial Overlay
PLNHATCH	On	1	CONTINUOUS	Soil Hatching
TITLEBOX	On	7	CONTINUOUS	Title Block Layer
VIEWS	Frozen	2	CONTINUOUS	Paper Space Views

Reference Files: VIS_SECT.DWG (base map)

DRAWING NAME: TITLESP.DWG (Exhibit 4, Street Ponding)

LAYER	STATUS	COLOR	LINETYPE	DESCRIPTION
0	On	7	CONTINUOUS	Base Layer & Hatchings
* TITLEBOX	On	7	CONTINUOUS	Title Block Layer
VIEWS	Frozen	2	CONTINUOUS	Paper Space Views

Reference Files: VIS_SECT.DWG (base map)

DRAWING NAME: VIS_SECT.DWG (Base Map)

LAYER	STATUS	COLOR	LINETYPE	DESCRIPTION
0	On	7	CONTINUOUS	Base Layer
200TITLE	Frozen	3	CONTINUOUS	200 Scale Title Border
BORDER	Frozen	8	CONTINUOUS	Other Borders
DETENTION	On	7	CONTINUOUS	Existing Detention Ponds
DRAINS	On	5	CONTINUOUS	Streams & Ditchs
PLOT	Frozen	3	CONTINUOUS	Plotting Views
ROW1	On	8	CONTINUOUS	NW Quadrant Base
ROW2	On	8	CONTINUOUS	NE Quadrant Base
ROW3	On	8	CONTINUOUS	SW Quadrant Base
ROW4	On	8	CONTINUOUS	SE Quadrant Base
RW1TXT200	On	7	CONTINUOUS	NW Quadrant 200' Text
RW1TXT25	Frozen	7	CONTINUOUS	NW Quadrant 25' Text
RW2TXT200	On	7	CONTINUOUS	NE Quadrant 200' Text
RW2TXT25	Frozen	7	CONTINUOUS	NE Quadrant 25' Text
RW3TXT200	On	7	CONTINUOUS	SW Quadrant 200' Text
RW3TXT25	Frozen	7	CONTINUOUS	SW Quadrant 25' Text
RW4TXT200	On	7	CONTINUOUS	SE Quadrant 200' Text
RW4TXT25	Frozen	7	CONTINUOUS	SE Quadrant 25' Text
SEC-CORNER	Frozen	3	CONTINUOUS	Section Corners
SEC-LINE	Frozen	3	CONTINUOUS	Section Lines
TAG	On	7	CONTINUOUS	Detention Basins
Information Blocks				
TITLEBOX	Frozen	6	CONTINUOUS	Title Block Layer
URBANAREA	On	4	CONTINUOUS	Urban Area Boundary

DRAWING NAME: VIS_CONT.DWG (Contour Base)

LAYER	STATUS	COLOR	LINETYPE	DESCRIPTION
0	On	7	CONTINUOUS	Base Layer
CITY	On	7	CONTINUOUS	City Contours
QUAD	On	7	CONTINUOUS	USGS Quad Contours

Table 3.1 Mapping Configuration cont'd

DRAWING NAME: BASINHM.DWG (Hydrology Map)
BASINPI.DWG (Proposed Improvement Map)
BASINEX.DWG (Existing Facilities Map)

LAYER	STATUS	COLOR	LINETYPE	DESCRIPTION
0	On	7	CONTINUOUS	Base Layer
DET-BDY	On	9	CONTINUOUS	Detention Basin Boundaries
DETENTION	On	9	CONTINUOUS	Existing Detention Basins
DRAINS	Frozen	5	CONTINUOUS	Streams & Ditchs
FF*	On	12	CONTINUOUS	Drainage Basin Spatial Overlays
PBASIN	On	1	CONTINUOUS	Proposed Detention Basins
PUMPS	On	9	CONTINUOUS	Existing Pump Locations
ROW*	On	8	CONTINUOUS	Base Map Layers
RW*TXT200	On	7	CONTINUOUS	Base Map Text
SEC-LINE	On	3	CONTINUOUS	Section Lines
SEC-NUMBER	On	3	CONTINUOUS	Section Numbers
STORM	Frozen	4	CONTINUOUS	FMS/AC Storm Nodes
STORM-CHANN	On	4	1CHANN	FMS/AC Storm Channels
STORM-PIPE	On	2	1PIPE	FMS/AC Storm Pipes
STORM-PT	On	3	CONTINUOUS	Analysis Point Loctions
TITLEBOX	On	6	CONTINUOUS	Title Block Layer
URBANAREA	On	14	CONTINUOUS	Urban Development Boundries

Reference Files for Existing Facility Map:
*-DT.DWG (FMS/AC Existing Facility Pipeline Drawings)
VIS_CONT.DWG (Contour base map)

NON-GRAPHIC DATABASES

The non-graphic databases described in this section are the databases provided by FMS/AC that are linked to the graphics in the Storm Water Facilities Management System. They are:

- PLANNING.DBF
- STORM.DBF

Two copies of STORM.DBF are used. The first is for the existing facilities and is contained in sub-directory D:\VISDPLAN\AMFMEXIS. The second is for the planned facilities and together with the PLANNING.DBF database is contained in sub-directory D:\VISDPLAN\AMFMPLAN.

The Facilities Management System uses data generated in the FMS/AC database files as follows:

- All data from D:\VISDPLAN\AMFMPLAN\PLANNING.DBF is copied to LANDDATA.DBF
- Some data from D:\VISDPLAN\AMFMPLAN\STORM.DBF is copied to HYDDATA.DBF
- All data from D:\VISDPLAN\AMFMEXIS\STORM.DBF is copied to DGEDATA.DBF

The structure of these databases have not been changed however the use of the fields have been modified. The new use of the fields is provided in Table 3.2 (PLANNING) and Table 3.3 (STORM).

Table 3.2 FMS/AC Database - PLANNING.DBF

Field	Name	Type	Width	Dec	Index	Description
1	ID	Character	12		N	Polygon Identification Number
2	AR	Numeric	11		N	Area (square feet)
3	AA	Character	12		N	Land use code
4	BB	Character	12		N	Storage areas
5	CC	Character	12		N	
6	DD	Character	17		N	
7	EE	Character	7		N	
8	FF	Character	12		N	
9	GG	Character	7		N	
10	HH	Character	7		N	
11	II	Character	17		N	
12	JJ	Character	12		N	Hydrologic soil group
13	KK	Character	17		N	Sub basin drainage area ID's
14	LL	Character	12		N	
15	MM	Character	12		N	
16	NN	Character	16		N	
17	X	Numeric	11	2	N	Easting Coordinate
18	Y	Numeric	10	2	N	Northing Coordinate
19	HANDLE	Character	16		N	
20	MERGE_FL	Logical	1		N	
21	COMP_WT	Numeric	6		N	
22	REGIME	Numeric	1		N	

Table 3.3 FMS/AC Database - STORM.DBF

Field	Name	Type	Width	Dec	Index	Description
1	ID	Character	15		N	ID
2	SI	Character	10		N	Street Name
3	SZ	Numeric	10	1	N	Size
4	SF	Character	10		N	
5	BN	Character	11		N	Block Name
6	MA	Character	7		N	
7	EL	Numeric	7	1	N	
8	IA	Numeric	7	1	N	
9	IB	Numeric	7	1	N	
10	LR	Numeric	7		N	
11	LI	Numeric	7		N	
12	YR	Numeric	2		N	
13	RC	Character	2		N	
14	NM	Character	7		N	
15	LN	Numeric	7	1	N	Conduit Length
16	FA	Character	17		N	
17	FB	Character	17		N	
18	FC	Character	17		N	
19	BO	Numeric	5		N	Orientation
20	EA	Numeric	11	2	N	Easting Coordinate
21	NO	Numeric	10	2	N	Northing Coordinate
22	HANDLE	Character	16		N	AutoCAD Handle
23	MERGE_FL	Logical	1		N	Logical Operator

4. RELATIONAL DATABASES

Table 4-1 provides a list and description of the databases that make up the Storm Water Facilities Management System. Tables 4-2 to 4-14 present the structure and field descriptions for each of the permanent thirteen databases in the system.

Table 4-1 Databases Used in Storm Water Master Plan

BASINS.DBF	Drainage basin names for Visalia
CNDATA	CN and percent impervious values for each land use and hydrologic soil group.
CSTDATA	Unit cost rates for developing cost estimates and capital improvement plan.
DBDATA	File names for database files.
DGEDATA	Existing drainage facility data that was digitized for the Atlas maps. This database is the same as FMS/AC's STORM.DBF in the Existing Facility Files sub-directory (D:\VISDPLAN\AMFMEXIS).
FLOWDATA	Includes the overland flow parameters used in the HEC-1 model.
HEC-1DATA	Includes all data to run the HEC-1 model except the rainfall and some lead in model run descriptions. A field for the major basin and counter is also included.
HELPDATA	Contains help descriptions for input forms.
HGYDATA	This database is a calculation database used to generate composite values used in the HEC-1 model.
HGYRES	Contains the peak discharge and basin volumes from the HEC-1 model runs.
HYDDATA	Contains data on existing and proposed pipes, channels, storage basins and pumps.
LANDDATA	Contains square footage results of spatial analysis of land use, hydrologic soil group, drainage area and storage area overlays. This database is the same as FMS/AC's PLANNING.DBF in the Master Plan Files sub-directory (D:\VISDPLAN\AMFMPLAN).
RAINDATA	Contains the precipitation-duration values for use in the HEC-1 model.
SETUP	Used to setup printer codes and paths for application and model.

Table 4-2 Basin Names - BASINS.DBF

Field	Name	Type	Width	Dec	Index	Description
1	BASIN	Character	20		N	Basin Name
2	CODE	Character	2		Y	Basin Code for planned system
3	CODEEXIS	Character	2		Y	Basin Code for existing system

Table 4-3 CN and Percent Impervious - CNDATA.DBF

Field	Name	Type	Width	Dec	Index	Description
1	GROUP	Character	25		N	Land use group
2	LANDUSE	Character	30		N	Land use description
3	CODE	Character	6		N	Land use code
4	SOIL	Character	1		N	Hydrologic soil group
5	IMP	Numeric	3		N	Percent Impervious
6	CN	Numeric	3		N	CN value

Table 4-4 Unit Cost rates - CSTDATA.DBF

Field	Name	Type	Width	Dec	Index	Description
1	CST_GROUP	Character	15		N	Group for print sort
2	CST_CODE	Numeric	4		Y	Unit rate cost code
3	CST_DESC	Character	20		N	Unit rate description
4	CST_UNIT	Character	4		N	Unit description
5	CST_RATE	Numeric	9	2	N	Unit rate
6	CST_YEAR	Numeric	4		N	Year of unit rate

Table 4-5 Existing Facilities - DGEDATA.DBF

Field	Name	Type	Width	Dec	Index	Description
1	ID	Character	15		Y	ID
2	SI	Character	10		N	Street Name
3	SZ	Numeric	10	1	N	Size
4	SF	Character	10		N	
5	BN	Character	11		N	Block Name
6	MA	Character	7		N	
7	EL	Numeric	7	1	N	
8	IA	Numeric	7	1	N	
9	IB	Numeric	7	1	N	
10	LR	Numeric	7		N	
11	LI	Numeric	7		N	
12	YR	Numeric	2		N	
13	RC	Character	2		N	
14	NM	Character	7		N	
15	LN	Numeric	7	1	N	Conduit Length
16	FA	Character	17		N	
17	FB	Character	17		N	
18	FC	Character	17		N	
19	BO	Numeric	5		N	Orientation
20	EA	Numeric	11	2	N	Easting Coordinate
21	NO	Numeric	10	2	N	Northing Coordinate
22	HANDLE	Character	16		N	AutoCAD Handle
23	MERGE_FL	Logical	1		N	Logical Operator

Table 4-6 Overland Flow Data - FLOWDATA.DBF

Field	Name	Type	Width	Dec	Index	Description
1	GROUP	Numeric	5		Y	Land use group
2	CODES	Character	35		N	Land use code
3	PERV_LTH	Numeric	10		N	Pervious length
4	PERV_MAN_N	Numeric	10	5	N	Pervious N
5	IMP_LTH	Numeric	10		N	Impervious length
6	IMP_MAN_N	Numeric	10	5	N	Impervious N

Table 4-7 HEC-1 Input Data - HEC-1DATA.DBF

Field	Name	Type	Width	Dec	Index	Description
1	F0	Character	2		N	Field 0 HEC-1 Code
2	F1	Character	6		N	Field 1 HEC-1 Code
3	F2	Character	8		N	Field 2 HEC-1 Code
4	F3	Character	8		N	Field 3 HEC-1 Code
5	F4	Character	8		N	Field 4 HEC-1 Code
6	F5	Character	8		N	Field 5 HEC-1 Code
7	F6	Character	8		N	Field 6 HEC-1 Code
8	F7	Character	8		N	Field 7 HEC-1 Code
9	F8	Character	8		N	Field 8 HEC-1 Code
10	F9	Character	8		N	Field 9 HEC-1 Code
11	F10	Character	8		N	Field 10 HEC-1 Code
12	MB	Character	2		N	Major Basin ID
13	COUNTER	Character	6		N	Counter

Table 4-8 Help Descriptions for Forms - HELPDATA.DBF

Field	Name	Type	Width	Dec	Index	Description
1	HELPCODE	Character	2		Y	Code
2	HELP	Character	33		N	Help description

Table 4-9 Hydrology Calculation Database - HGYDATA.DBF

Field	Name	Type	Width	Dec	Index	Description
1	ID	Character	10		Y	Sub basin drainage area ID
2	AREA	Numeric	10	5	N	Sub basin drainage area
3	PCT_PERV	Numeric	5		N	Calculated percent pervious for area
4	CN_PERV	Numeric	5		N	Calculated CN for pervious area
5	PCT_IMP	Numeric	5		N	Calculated percent impervious for area
6	CN_IMP	Numeric	5		N	Calculated CN for impervious area
7	AR_TYPE1	Numeric	10	3	N	Total area for group 1
8	AR_TYPE2	Numeric	10	3	N	Total area for group 2
9	AR_TYPE3	Numeric	10	3	N	Total area for group 3
10	AR_TYPE4	Numeric	10	3	N	Total area for group 4
11	AR_TYPE5	Numeric	10	3	N	Total area for group 5
12	AR_TYPE6	Numeric	10	3	N	Total area for group 6
13	SEL_LAND	Numeric	5		N	Selected land use group

Table 4-10 Hydrology Results Database - HGYRES.DBF

Field	Name	Type	Width	Dec	Index	Description
1	ID	Character	10		Y	Sub basin drainage area or pipe ID
2	QPEAK	Numeric	10		N	Peak discharge
3	VOL	Numeric	10		N	Storage basin volume
4	MB	Character	2		N	Major basin ID
5	RUN	Character	3		N	Rainfall return period
6	ID2	Character	10		Y	Storage basin ID

Table 4-11 Hydraulics Database - HYDDATA.DBF

Field	Name	Type	Width	Dec	Index	Description
1	ID	Character	15		Y	ID
2	MAIN	Character	10		N	Collector, Main Drain, Basin or Pump
3	LN	Numeric	10		N	Conveyance length (feet)
4	TYPE	Character	15		N	Existing conveyance type
5	REQUIRE	Character	21		N	Why required
6	SLOPE	Numeric	6	4	N	Existing conveyance slope (ft/ft)
7	MN	Numeric	5	3	N	Existing Manning's N
8	PS	Numeric	3		N	Existing pipe size (inches)
9	AR	Numeric	6	1	N	Existing cross section area (sq feet)
10	WP	Numeric	6	1	N	Existing wetted perimeter (feet)
11	Q2	Numeric	6		N	2 year design discharge (cfs)
12	Q10	Numeric	6		N	10 year design discharge (cfs)
13	Q50	Numeric	6		N	50 year design discharge (cfs)
14	TYPEN	Character	15		N	Proposed basin or conveyance type
15	SLOPEN	Numeric	6	4	N	Proposed conveyance slope (ft/ft)
16	MNN	Numeric	5	3	N	Proposed Manning's N
17	PSN	Numeric	3		N	Proposed pipe size (inches)
18	BASE	Numeric	6	1	N	Proposed base width (feet)
19	DEPTH	Numeric	6	1	N	Proposed channel depth (feet)
20	ROW_COST	Numeric	6		N	ROW cost ($/acre)
21	YEAR	Numeric	4		N	Year of proposed works
22	EA	Numeric	11	2	N	Easterly coordinate
23	NO	Numeric	10	2	N	Northerly coordinate
24	SBQ2V	Numeric	6	1	N	2 year design basin volume (acre-feet)
25	SBQ10V	Numeric	6	1	N	10 year design basin volume (acre-feet)
26	SBQ50V	Numeric	6	1	N	50 year design basin volume (acre-feet)
27	SBVOLE	Numeric	6	1	N	Existing basin volume (acre-feet)
28	SBVOLP	Numeric	6	1	N	Proposed basin volume (acre-feet)
29	SBTYPEE	Character	2		N	Existing basin type
30	SBTYPEP	Character	2		N	Proposed basin type
31	SBPUMPE	Numeric	4	1	N	Existing pump capacity (cfs)
32	SBPUMPP	Numeric	4	1	N	Proposed pump capacity (cfs)
33	SBAREAE	Numeric	4	1	N	Existing basin area (acres)
34	SBAREAP	Numeric	4	1	N	Proposed basin area (acres)
35	SBLANDRATE	Numeric	5		N	Proposed basin land cost ($/acre)
36	NM	Character	3		N	Sorting field if required

Table 4-12 Land Use Database - LANDDATA.DBF

Field	Name	Type	Width	Dec	Index	Description
1	ID	Character	12		N	Polygon Identification Number
2	AR	Numeric	11		N	Area (square feet)
3	AA	Character	12		N	Land use code
4	BB	Character	12		N	Storage areas
5	CC	Character	12		N	
6	DD	Character	17		N	
7	EE	Character	7		N	
8	FF	Character	12		N	
9	GG	Character	7		N	
10	HH	Character	7		N	
11	II	Character	17		N	
12	JJ	Character	12		N	Hydrologic soil group
13	KK	Character	17		N	Sub basin drainage area ID's
14	LL	Character	12		N	
15	MM	Character	12		N	
16	NN	Character	16		N	
17	X	Numeric	11	2	N	Easting Coordinate
18	Y	Numeric	10	2	N	Northing Coordinate
19	HANDLE	Character	16		N	
20	MERGE_FL	Logical	1		N	
21	COMP_WT	Numeric	6		N	
22	REGIME	Numeric	1		N	

Table 4-13 Precipitation Values Database - RAINDATA.DBF

Field	Name	Type	Width	Dec	Index	Description
1	RUN	Character	3		Y	Rainfall return period
2	P1	Numeric	6	3	N	
3	P2	Numeric	8	3	N	
4	P3	Numeric	8	3	N	5 minute precipitation
5	P4	Numeric	8	3	N	15 minute precipitation
6	P5	Numeric	8	3	N	60 minute precipitation
7	P6	Numeric	8	3	N	2 hour precipitation
8	P7	Numeric	8	3	N	3 hour precipitation
9	P8	Numeric	8	3	N	6 hour precipitation
10	P9	Numeric	8	3	N	12 hour precipitation
11	P10	Numeric	8	3	N	24 hour precipitation
12	P11	Numeric	8	3	N	2 day precipitation
13	P12	Numeric	8	3	N	4 day precipitation
14	P13	Numeric	8	3	N	7 day precipitation
15	P14	Numeric	8	3	N	10 day precipitation

Table 4-14 System Setup Database - SETUP.DBF

Field	Name	Type	Width	Dec	Index	Description
1	PRINTER	Character	10		Y	Printer type
2	DRIVER1	Character	18		N	dBASE printer driver
3	PORTRAIT	Character	30		N	Portrait code
4	LANDSCAPE	Character	30		N	Landscape code
5	PITCH	Character	11		N	
6	MARGINP	Numeric	2		N	
7	MARGINL	Numeric	2		N	
8	PAGELENP	Numeric	2		N	
9	PAGELENL	Numeric	2		N	
10	PAGENO	Numeric	1		N	
11	PAGEEJECT	Character	8		N	
12	DRIVPLAN	Character	29		N	Path for application
13	DRIVCAD	Character	29		N	
14	DRIVDRAW	Character	29		N	
15	DRIVMODL	Character	29		N	Path for model
16	DRIVPLOT	Character	29		N	
17	DRIVFMS	Character	29		N	
18	DRAWPREFIX	Character	5		N	
19	RESFILES	Character	29		N	Path for model results
20	PRTPORT	Character	4		N	Printer port
21	DRIVMASTER	Character	29		N	Path for FMS/AC master plan files
22	DRIVEXIS	Character	29		N	Printer port

5. ENGINEERING MODELS

The engineering models used in the Storm Water Facilities Management System calculate the design runoff (hydrology), system capacity (hydraulics) and cost estimates.

HYDROLOGY

Hydrologic modeling of the City of Visalia was performed using the U.S. Army Corps of Engineers Flood Hydrograph Package (HEC-1). The SCS Curve Number approach has been adopted to estimate losses and the kinematic wave overland flow plane methodology was used to compute sub basin runoff. Channel routing used the kinematic wave option. Details on the HEC-1 model are contained in the HEC-1 Manual.

For this application a significant amount of data to run the model was derived from spatial analysis techniques. These included drainage areas, composite CN values and representative overland flow parameters for each drainage area. Table 5.1 shows values in the HEC-1 input file for Evans Ditch drainage area ED02. The entry of all of these data elements is automated.

Table 5.1 Drainage Area Data in HEC-1 File

KK	ED02	BASIN				
BA	0.159					
LS	0	75	0	0	98	0
UK	150	0.0010	0.30	39		
UK	50	0.0010	0.10	61		

Table 5.2 shows the results of the automation. This report can be generated from the HEC-1 Reports Menu (see section 6). The second and fourth fields on the UK cards in Table 5.1 are derived by "looking up" data in the Overland Flow Database (FLOWDATA) for the selected group (last column in Table 5.2). The basin area (BA) card), composite CN (LS card) and the percent pervious and impervious (UK cards) are derived as shown in Table 5.3.

Table 5.2 Drainage Area Model Data

City of Visalia
Storm Water Master Plan and Management Program
EVANS DITCH DRAINAGE BASIN

Page 1 — DRAINAGE AREA MODEL DATA — 03/25/93

Drainage Area ID	Drainage Area (sq mi)	Percent Pervious	Percent Impervious	CN Pervious	CN Impervious	Group Areas for Overland Flow Parameters 1	2	3	4	5	6	Selected Group
ED01	0.09661	56	44	74	98	7	45	8	2	0	0	2
ED02	0.15916	39	61	75	98	6	52	29	15	0	0	2
ED03	0.36663	40	60	75	98	23	91	106	15	0	0	3
ED04	0.41279	46	54	74	98	11	143	40	0	70	0	2
ED05	0.09079	60	40	74	98	8	42	4	0	4	0	2
ED06	0.37817	55	45	74	98	17	187	18	0	19	0	2
ED07	0.16496	58	42	76	98	4	102	0	0	0	0	2
ED08	0.02378	63	37	67	98	3	13	0	0	0	0	2
ED09	0.53528	54	46	77	98	55	177	20	0	90	0	2
ED10	0.10678	82	18	76	98	63	0	0	0	0	6	1
ED11	0.18636	57	43	79	98	13	106	0	0	0	0	2

Boyle Engineering Corporation — (hgyrep1)

Table 5.3 Composite CN and Percent Impervious Calculation

Land Use Code A	Drainage Area B	Soil Group C	Percent Impervious D	Pervious CN E	Impervious CN F	Impervious Area G	Pervious Area H	Composite CN J	(2) x (9) Area K
LDR	176,579	C	43	84	98	75,929	100,650	73	12,967,714
LDR	2,044,482	C	43	84	98	879,127	1,165,355	73	150,143,889
LDR	58	C	43	84	98	25	33	73	4,259
MDR	35,647	C	70	91	98	24,953	10,694	75	2,661,643
MDR	18,143	C	70	91	98	12,700	5,443	75	1,354,677
CSO	8,956	C	80	93	98	7,165	1,791	73	653,788
CSO	191,394	C	80	93	98	153,115	38,279	73	13,971,762
CSO	404,697	C	80	93	98	323,758	80,939	73	29,542,881
CSO	125,891	C	80	93	98	100,713	25,178	73	9,190,043
CSO	3,218	C	80	93	98	2,574	644	73	234,914
CH	123,637	C	95	97	98	117,455	6,182	78	9,643,686
CH	520,077	C	95	97	98	494,073	26,004	78	40,566,006
CS	8,882	C	95	97	98	8,438	444	78	692,796
CS	61,162	C	95	97	98	58,104	3,058	78	4,770,636
CS	471,256	C	95	97	98	447,693	23,563	78	36,757,968
OSC	26,732	C	1	79	98	267	26,465	79	2,106,698
OSC	216,200	C	1	79	98	2,162	214,038	79	17,038,307
A79-1036.xls	4,437,011					2,708,252	1,728,759		332,301,667

Columns A,B and C — Spatially processed data for Evan's Ditch drainage area ED02.

Columns D and E — Values from CNDATA for the land use code and soil group.

Column F — Default CN value for impervious areas (98).

Column G — Impervious area = B x D/100

Column H — Pervious area = B x (1-D/100)

Column J — Composite CN = (((-F x (D/100)) + E) / (1-(D/100))) x B

Column K — Area x Composite CN = B x J

Total Drainage Area = — 4,437,011 / (43,560 x 640) = 0.15916

Composite CN = — 332,301,667 / 4,437,011 = 75

Percent Impervious = — 2,708,252 / 4,437,011 = 61

Percent Pervious = — 1,728,759 / 4,437,011 = 39

HYDRAULICS

All hydraulic calculations for channel and pipe capacity were performed using Manning's equation as follows:

$$Q = (1.486/n)(A)(R^{2/3})(S^{1/2})$$

where: n = Manning's roughness factor
A = Area in square feet
R = Hydraulic radius (area/wetted perimeter) in feet
S = Slope in feet/feet

For proposed improvement hydraulic computations for pipes and channels, the following was assumed:

- Conveyance systems are flowing full with no freeboard.
- Conveyance slopes are 0.001
- Pipes have a Manning's n of 0.013.
- Unlined open channels have a side slope of 3:1 and a Manning's n of 0.030.
- Lined channels have a side slope of 1:1 and a Manning's n of 0.015

COST ESTIMATES

Pipes and Channels

For proposed improvement cost calculations for pipes and channels, the following was assumed:

- Channel lining is 4 inch thick concrete.
- Right of way for open channels is top width of channel + 20 feet.
- Unit rates for pipe include all necessary work.

Land (open channel)	ROW width x length x unit rate for ROW.
Earthworks (open channel)	Cross section area x length x unit rate for channel earthworks
Lining (open channel)	Wetted perimeter x length x thickness x unit rate for lining
Pipe	Length of pipe x unit rate for pipe
Contingency	Total cost of above x contingency rate
Total	Total cost of all of the above

Storage Basins and Pumps

Volume and area formulas for the various type basins are shown in Table 5.4. Asssumed layouts of the basins follow:

Table 5.4 Basin Volume and Area Formulas

Basin	Volume (acre-feet)	Area (acres)
A1	$20W^2 - 2300W + 51{,}000$	$3W^2/43{,}560$
A2	$20W^2 - 2300W + 51{,}000$	$2W^2/43{,}560$
B	$7W^2 - 1440W + 46{,}500$	$W^2/43{,}560$
C	$15W^2 - 1800W + 40{,}500$	$W^2/43{,}560$
X1	$16W^2$	$3W^2/43{,}560$
(W is in feet)		

Pump — Unit rate for pump capacity.

Land — Area x unit rate for ROW.

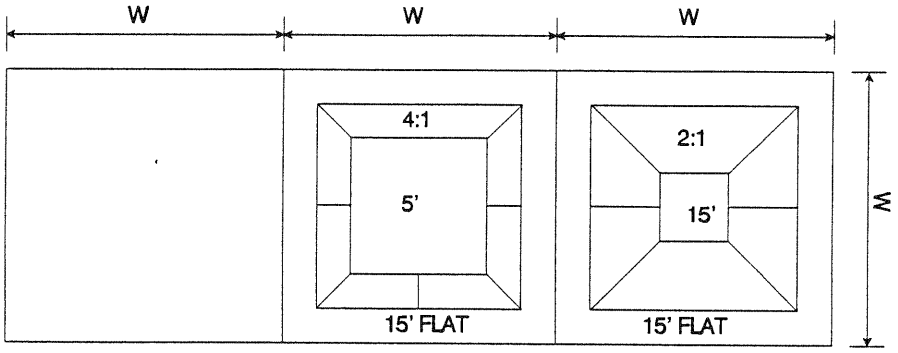
Landscape — Area x unit rate for landscaping (type A1, A2 and B).
For Type C, a 15' strip was assumed.
For Type X1, no landscaping costs were developed.

Earthworks — Volume x unit rate for basin earthworks.

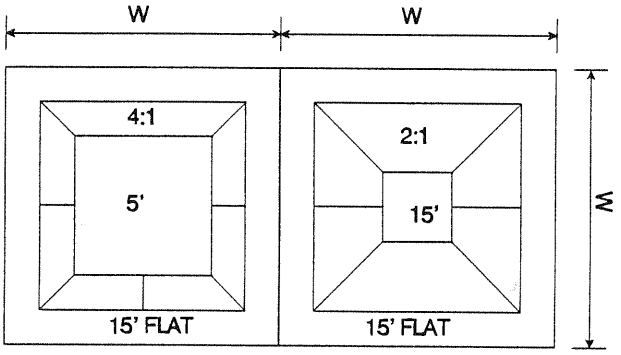
Contingency — Total cost of above x contingency rate

Total — Total cost of all of the above

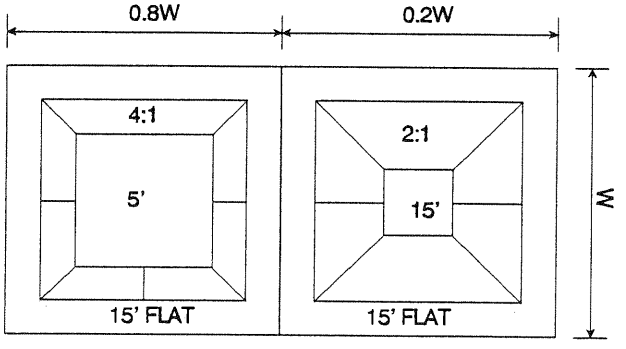
Table 5.5 Basin Configurations



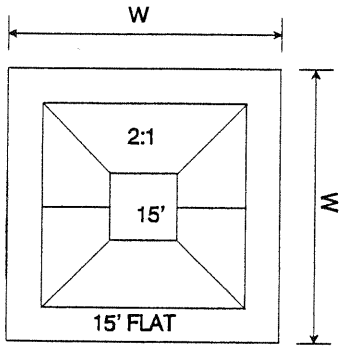
Type A1



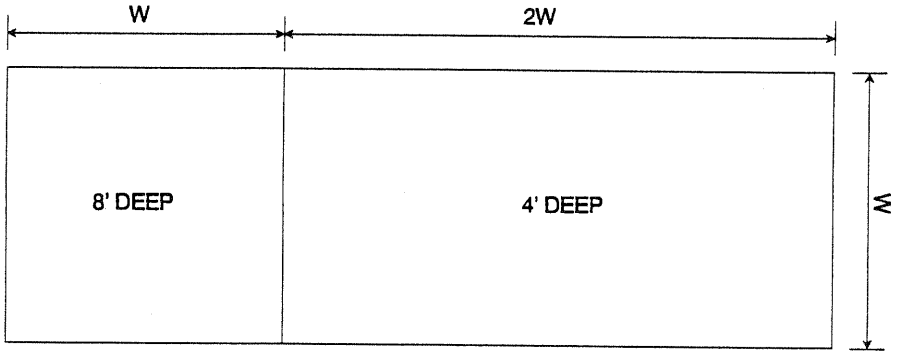
Type A2



Type B (not to scale)



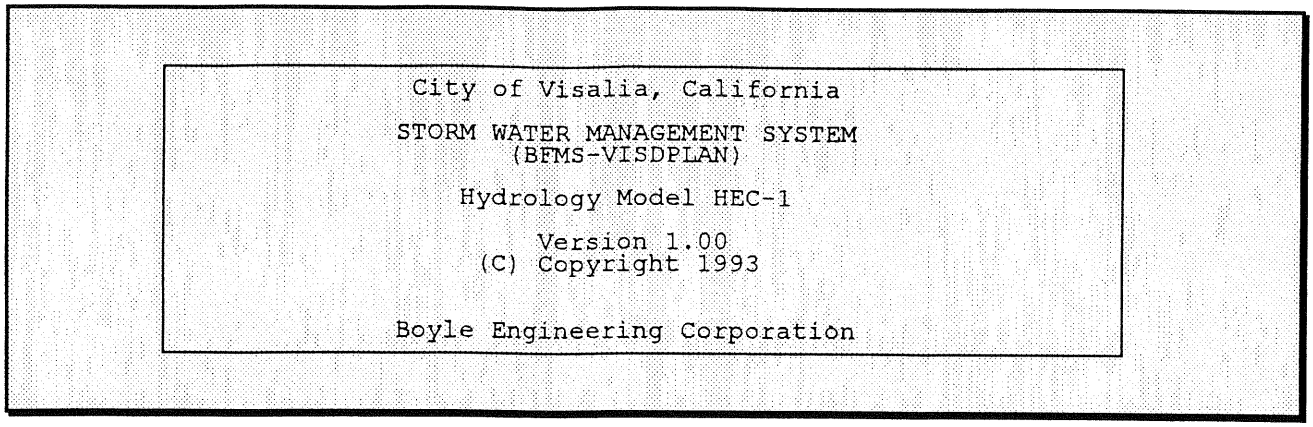
Type C



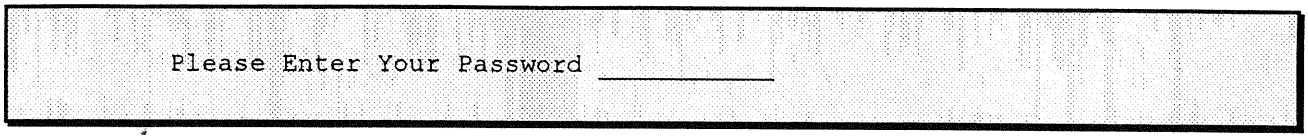
Type X1 (Terminal Basin)

6. TUTORIAL - DATABASE

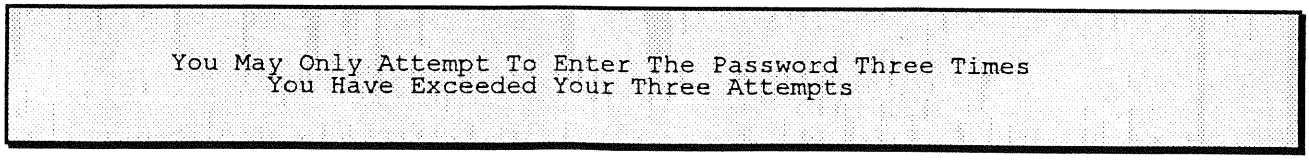
The Storm Water Facilities Management System can be accessed by typing: MDP in the application's directory. The following comes to the screen:



If a password is used, then the following comes to the screen:

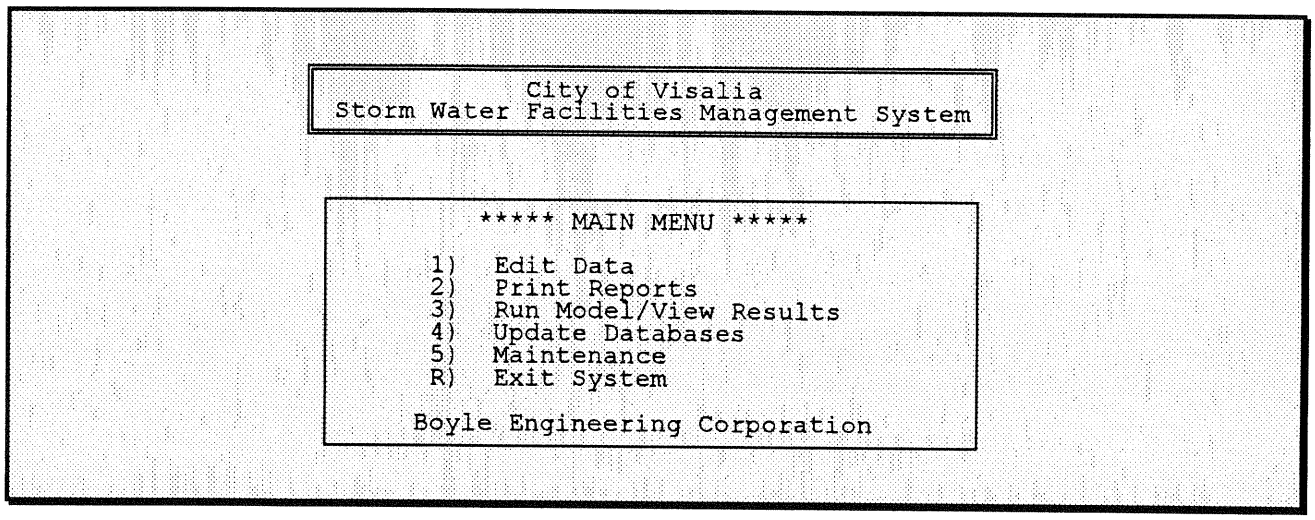


Enter your password to access the system. If you enter the wrong password three times the following comes to the screen:



If this happens and you cannot remember the password, see your supervisor.

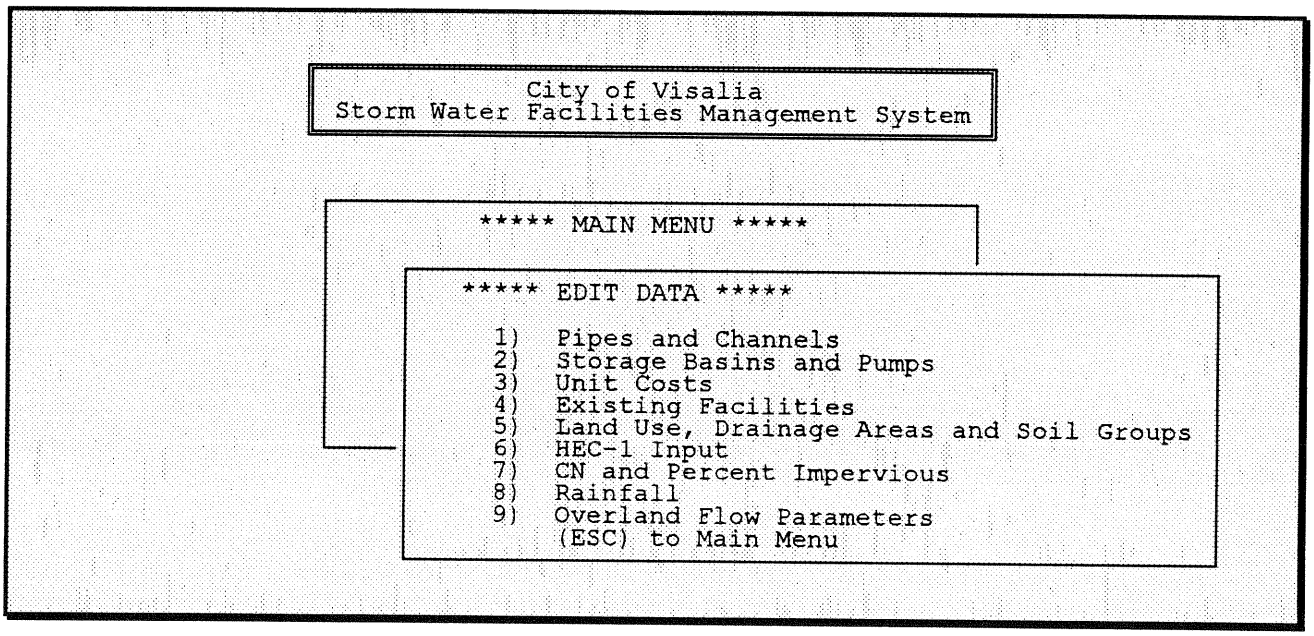
When the password has been entered correctly, the **MAIN MENU** comes to the screen:



Each of the options shown in the **MAIN MENU** can be accessed by highlighting the option with the arrow key, or by typing the associated number.

EDIT DATA

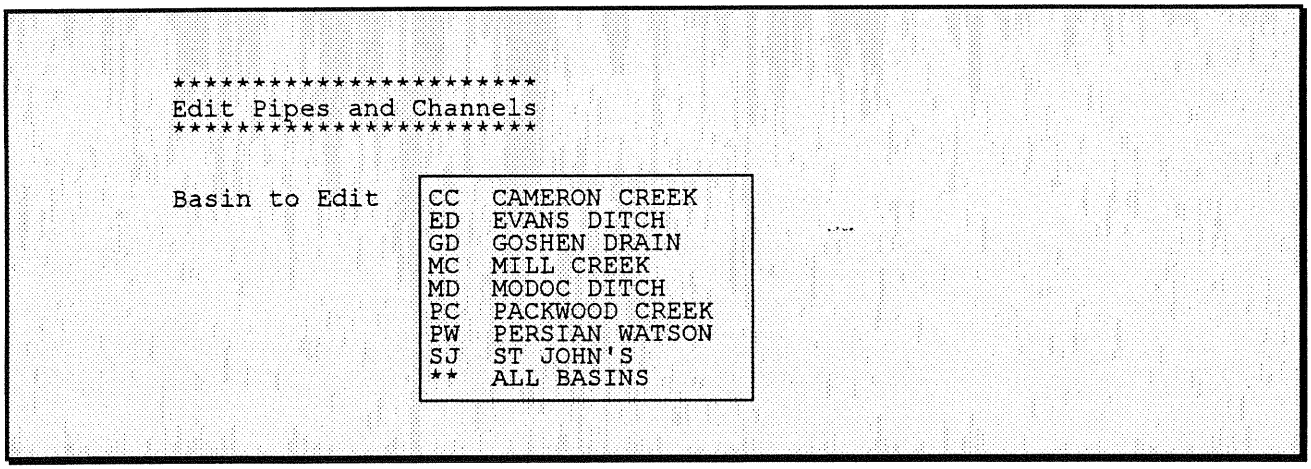
The EDIT option is used when entering new data or editing existing data. The options are:



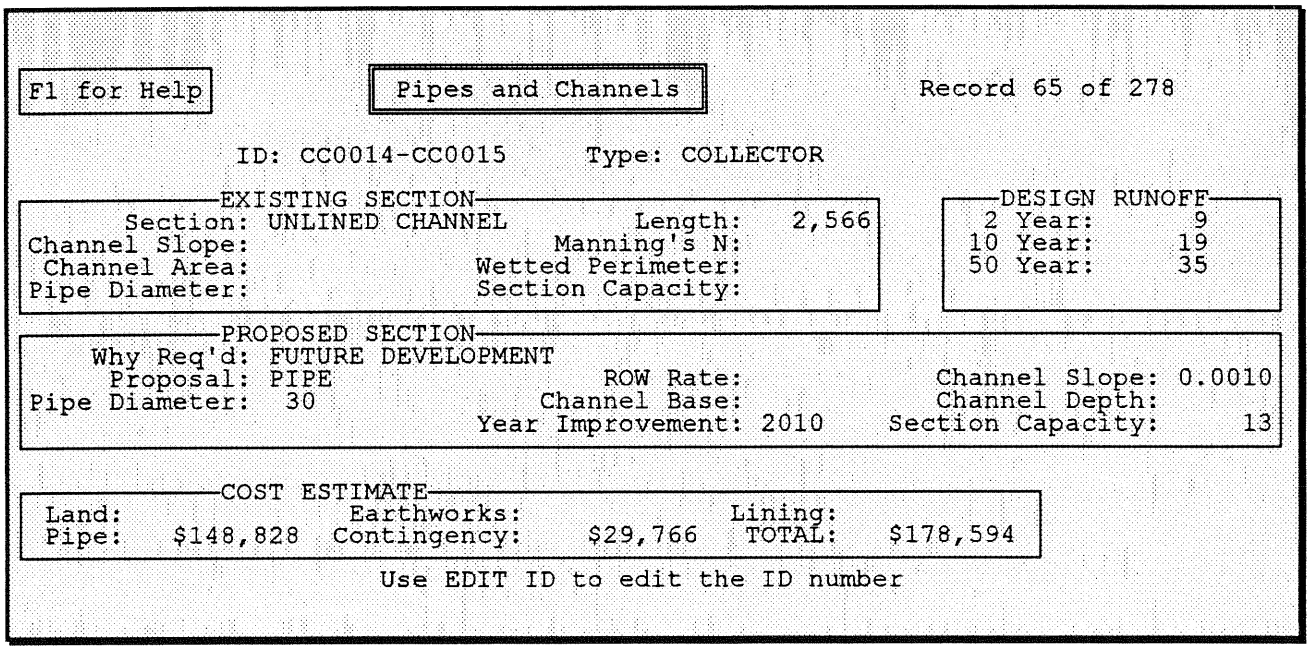
Each of the options shown in the **EDIT DATA MENU** can be accessed by highlighting the option with the arrow key, or by typing the associated number.

Edit Pipes and Channels

When **1) Pipes and Channels** is selected, the following comes to the screen:



Highlight the appropriate basin to edit and the following data form comes to the screen:



ID: A unique drainage section. Typically an upstream manhole (or node) to a downstream manhole (or node). To edit this field set *Type* to EDIT ID.

Type: Press space bar for following selections: MAIN DRAIN, COLLECTOR or EDIT ID.

EXISTING SECTION

Section: Press space bar for following selections: UNLINED CHANNEL, LINED CHANNEL, OVERLAND FLOW or PIPE.

Length: Conveyance length in feet. Data is automatically loaded through the Update Hyraulics Database option in the UPDATE DATABASES MENU. Data is shown in red - cannot be edited here. If changes are required, they need to be made to the FMS/AC file: D:\VISDPLAN\AMFMPLAN\STORM.DBF

Channel Slope: Enter the conveyance slope in feet/feet.

Manning's N: Enter the Manning's N for the section.

Channel Area: If the cross section is not uniform, enter the cross sectional area in square feet.

Wetted Perimeter: If the cross section is not uniform, enter the wetted perimeter in feet.

Pipe Diameter: Enter the pipe diameter in inches.

Section Capacity: Calculates the section capacity. Shown in red - cannot be edited.

DESIGN RUNOFF

2 Year: Data is automatically loaded through the Update Hydraulics Database option in the UPDATE DATABASES menu. Data is shown in red - cannot be edited.

10 Year: As above.

50 Year: As above.

PROPOSED SECTION

Why Req'd: Press space bar for following selections: NOT REQUIRED, EXISTING DEFICIENCIES or FUTURE DEVELOPMENT. This field is used to differentiate cost estimates.

Proposal: Press space bar for following selections: NO PROPOSAL, PIPE, UNLINED CHANNEL or LINED CHANNEL.

ROW Rate: Enter the cost rate for ROW in $/acre. Used for open channels.

Channel Slope: Enter the conveyance slope in feet/feet.

Pipe Diameter: Enter the pipe diameter in inches.

Channel Base: Enter the base width of a trapezoidal channel in feet.

Channel Depth: Enter the channel depth in feet.

Year Improvement: Enter the year of the proposed improvement. This is used for the Capital Improvement Plan report.

Section Capacity: Calculates the section capacity. For formulas, see Chapter 5. This field is shown in red - cannot be edited.

COST ESTIMATE

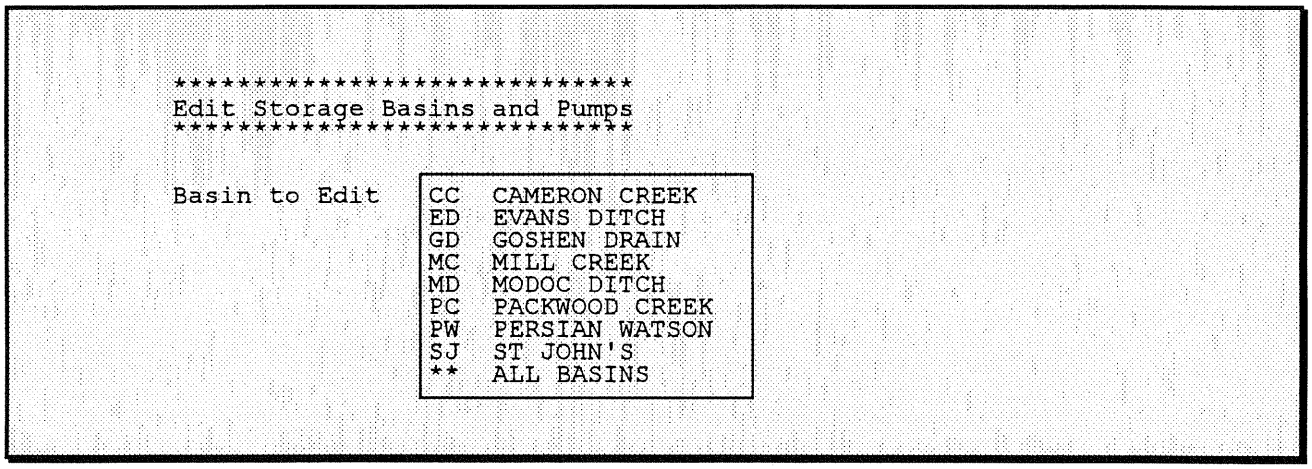
Land: Calculates the land cost based on the ROW unit rate. For formulas, see Chapter 5. This field is shown in red - cannot be edited.

Earthworks: Calculates the earthwork cost for open channels based on the formula shown in Chapter 5 and the unit rate for earthworks in the Unit Costs database. This field is shown in red - cannot be edited.

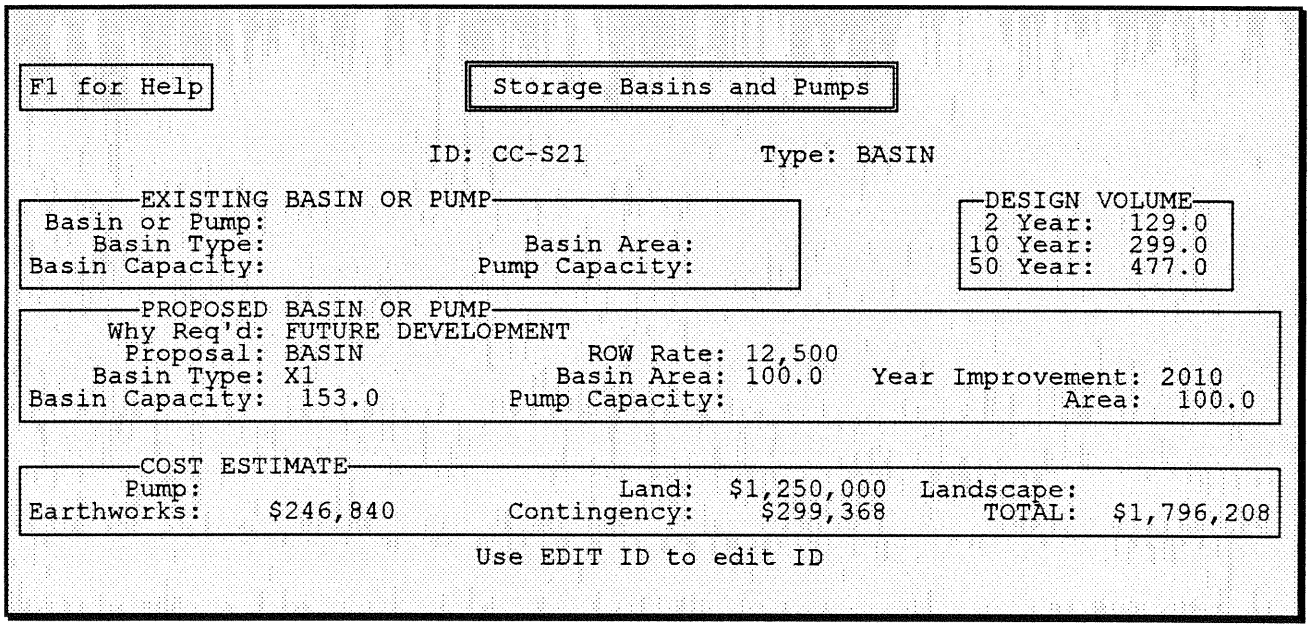
Lining: As above, except for lining.
Pipe: As above, except for pipes
Contingency: As above, except for contingency.
TOTAL: As above, except for total costs.

Edit Storage Basins and Pumps

When **2) Storage Basins and Pumps** is selected, the following comes to the screen:



Highlight the appropriate basin to edit and the following data form comes to the screen:



ID: A unique basin or pump location. To edit this field set *Type* to EDIT ID.

Type: Press space bar for following selections: BASIN, PUMP or EDIT ID.

EXISTING BASIN OR PUMP

Basin or Pump: Press space bar for following selections: (blank), BASIN or PUMP.

Basin Type: Press space bar fo following selections: (blank), A1, A2, B, C or X1.

Basin Area: Enter basin area in acres.

Basin Capacity: Enter basin capacity in acre-feet.

Pump Capacity: Enter pump capacity in cubic feet per second (cfs).

DESIGN VOLUME

2 Year: Data, in acre-feet, is automatically loaded through the Update Hydraulics Database option in the UPDATE DATABASES menu. Data is shown in red - cannot be edited.

10 Year: As above.

50 Year: As above.

PROPOSED BASIN OR PUMP

Why Req'd: Press space bar for following selections: NOT REQUIRED, EXISTING DEFICIENCIES or FUTURE DEVELOPMENT. This field is used to differentiate cost estimates.

Proposal: Press space bar for following selections: NO PROPOSAL, BASIN or PUMP.

ROW Rate: Enter a cost for ROW in $/acre. Used for storage basins.

Basin Type: Press space bar for following selections: (blank), A1, A2, B, C or X1.

Basin Area: Enter basin area in acres. If nothing is entered then the proposed area defaults to a calculated area as provided in Chapter 5.

Year Improvement: Enter the year of the proposed improvement. This is used for the Capital Improvement Plan report.

Basin Capacity: Enter basin capacity in acre-feet.

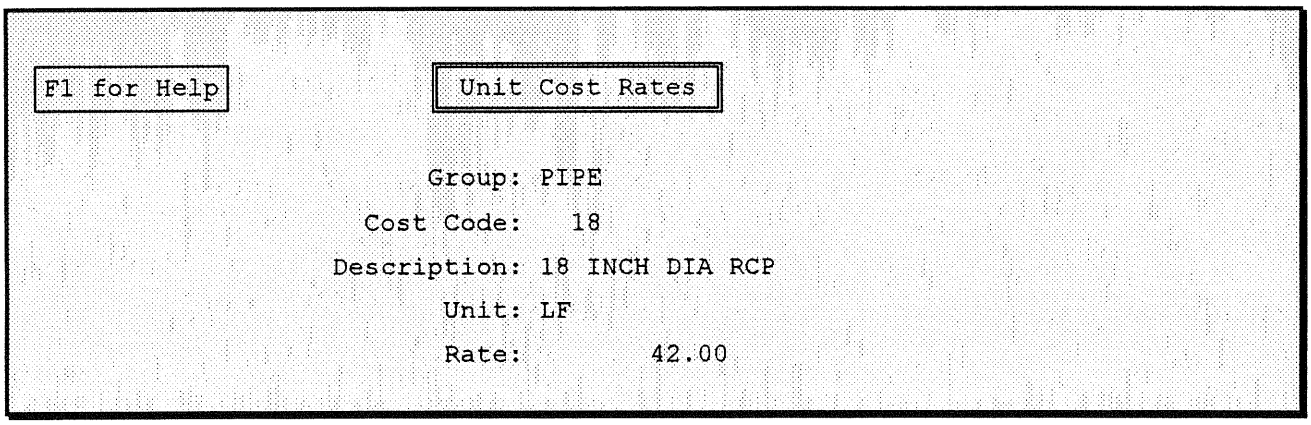
Pump Capacity: Enter pump capacity in cubic feet per second (cfs).

Area: Uses Basin Area (see above) if Basin Area is not zero. Otherwise the area is calculates. See Chapter 5 for details. Data is shown in red - cannot be edited.

COST ESTIMATE	Calculates the section costs.
Pump:	Calculates the pump cost based on the unit rate in the Unit Costs database. This field is shown in red - cannot be edited.
Land:	Calculates the land cost based on the ROW unit rate. For formulas, see Chapter 5. This field is shown in red - cannot be edited.
Landscape:	Calculates the landscape cost for basins based on the formula shown in Chapter 5 and the unit rate for landscape in the Unit Costs database. This field is shown in red - cannot be edited.
Earthworks:	As above, except for earthworks.
Contingency:	As above, except for contingency.
TOTAL:	As above, except for total costs.

Edit Unit Costs

When **3) Unit Costs** is selected, the following comes to the screen:



The only data that can be edited in this database are the unit rates. All other items are hard coded for the Visalia Storm Water Master Plan. The data can be viewed more easily in the BROWSE mode by pressing the F2 key.

Group: Used for sorting reports. Shown in red - cannot be edited.

Cost Code: Index code for data element. Shown in red - cannot be edited.

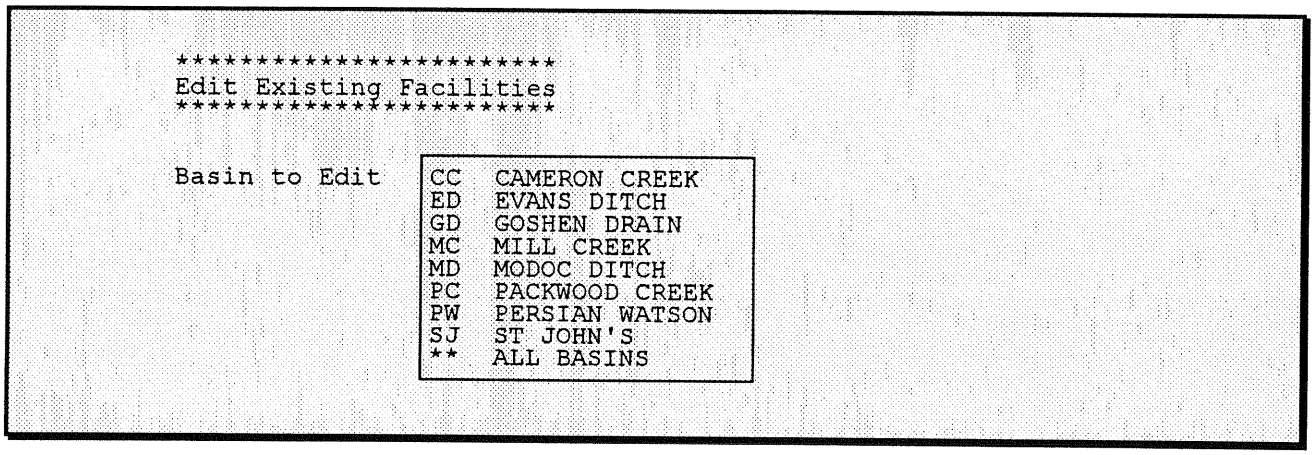
Description: Description of item. Shown in red - cannot be edited.

Unit: Unit for cost rate. Shown in red - cannot be edited.

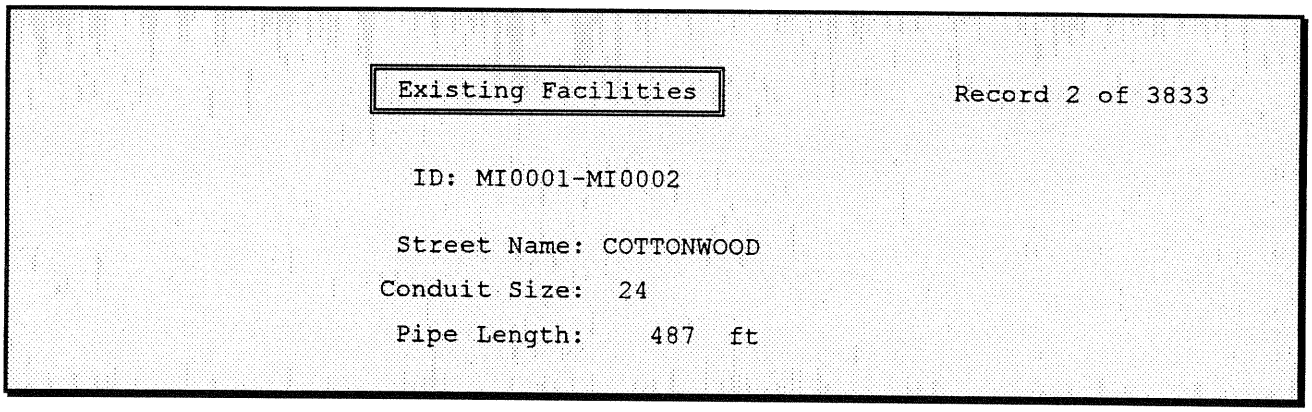
Rate: Unit rate entered in dollars.

Edit Existing Facilities

When **4) Existing Facilities** is selected, the following comes to the screen:



Highlight the appropriate basin to edit and the following data form comes to the screen:



The data in this database cannot be edited and all fields are shown in red. The data comes from the Update Existing Facilities Database option in the UPDATE DATABASES MENU. If changes are required, they need to be made to the FMS/AC file: D:\VISDPLAN\AMFMEXIS\STORM.DBF

ID: These are the ID's used in preparing the existing facilities for the City of Visalia. Atlas maps were generated and submitted under separate cover. Some of the prefixes are different from the master plan prefixes. For example Mill Creek is MC in the planning system but MI in this database.

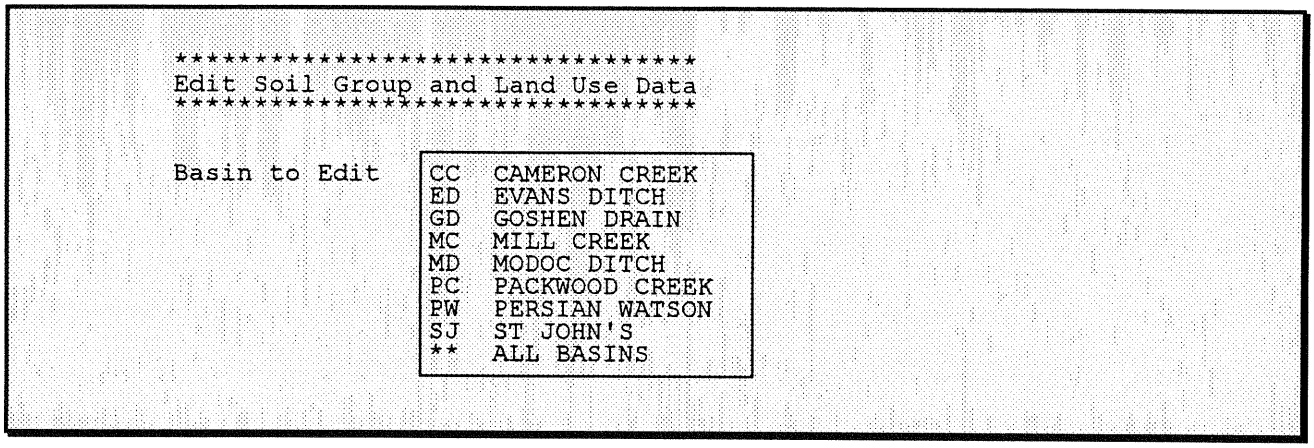
Street Name: Street name.

Conduit Size: Size of the conduit in inches.

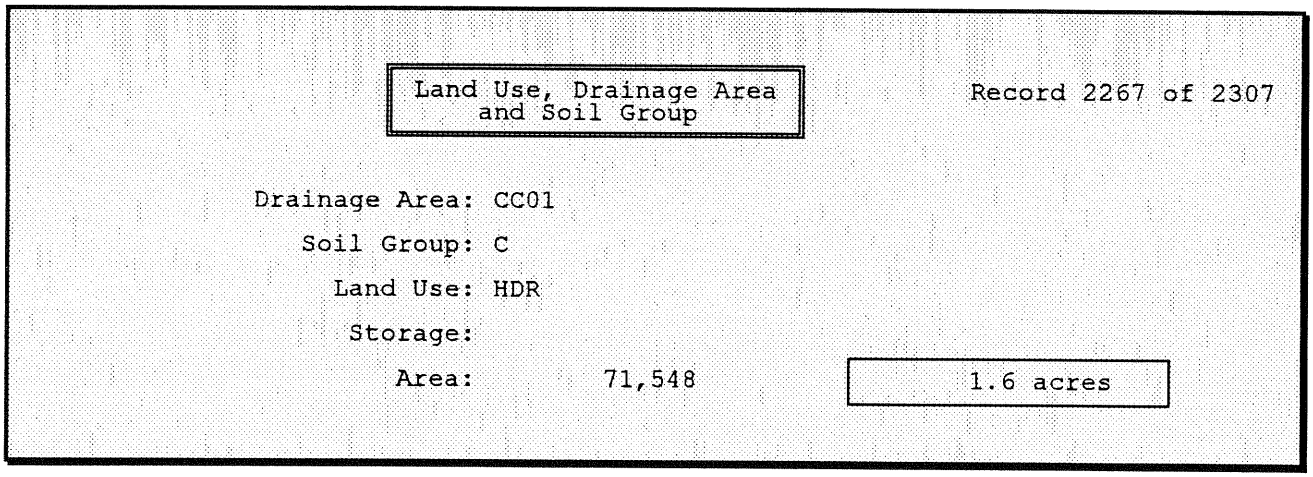
Length: Length of the conduit in feet.

Edit Land Use, Drainage Areas and Soil Groups

When **5) Land Use, Drainage Areas and Soil Groups** is selected, the following comes to the screen:



Highlight the appropriate basin to edit and the following data form comes to the screen:



All of the data in this database was derived from the spatial analysis of the Drainage Areas, Land Use, Soils and Storage overlays in FMS/AC (D:\VISDPLAN\AMFMPLAN\PLANNING.DBF). If changes are made to the graphics, then this database can be revised using the Update Land Use option in the UPDATE DATABASES MENU.

Drainage Area: Drainage area name (KK in in FMS/AC)

Soil Group: *Hydrologic soil group for HEC-1 model (JJ in FMS/AC).*

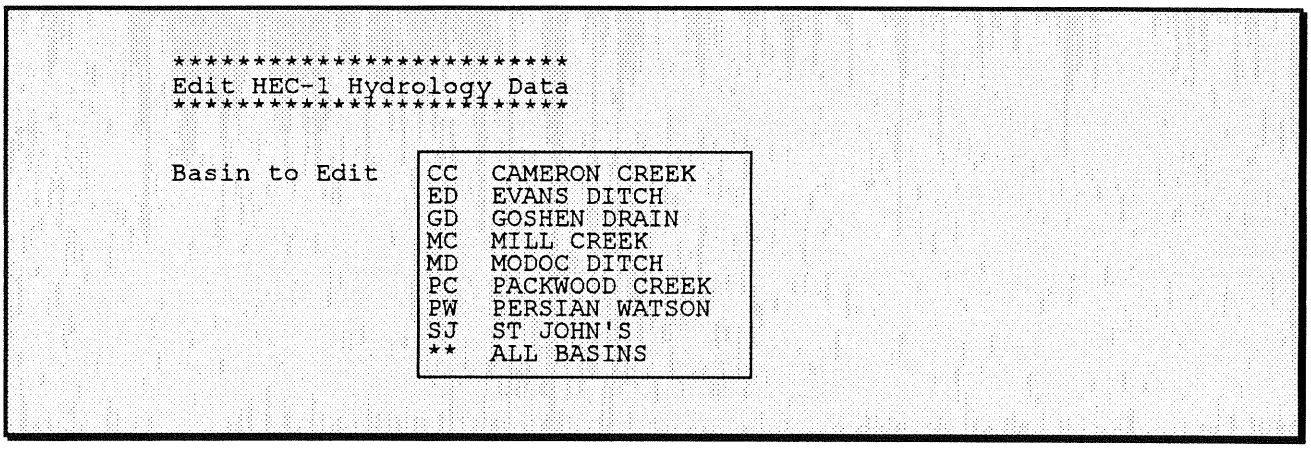
Land Use: *Land use code (AA in FMS/AC).*

Storage: *Areas with predominant on-site storage (BB in FMS/AC).*

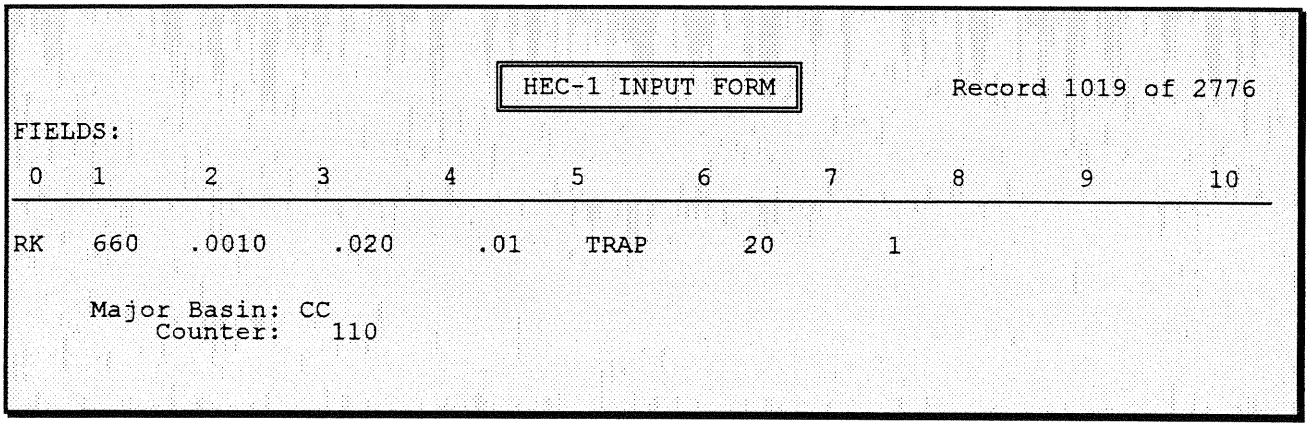
Area: *Calculated area in square feet (AR in FMS/AC).*

Edit HEC-1 Input

When **6) HEC-1 Input** is selected, the following comes to the screen:



Highlight the appropriate basin to edit and the following data form comes to the screen:



The data can be viewed more easily in the BROWSE mode by pressing the F2 key.

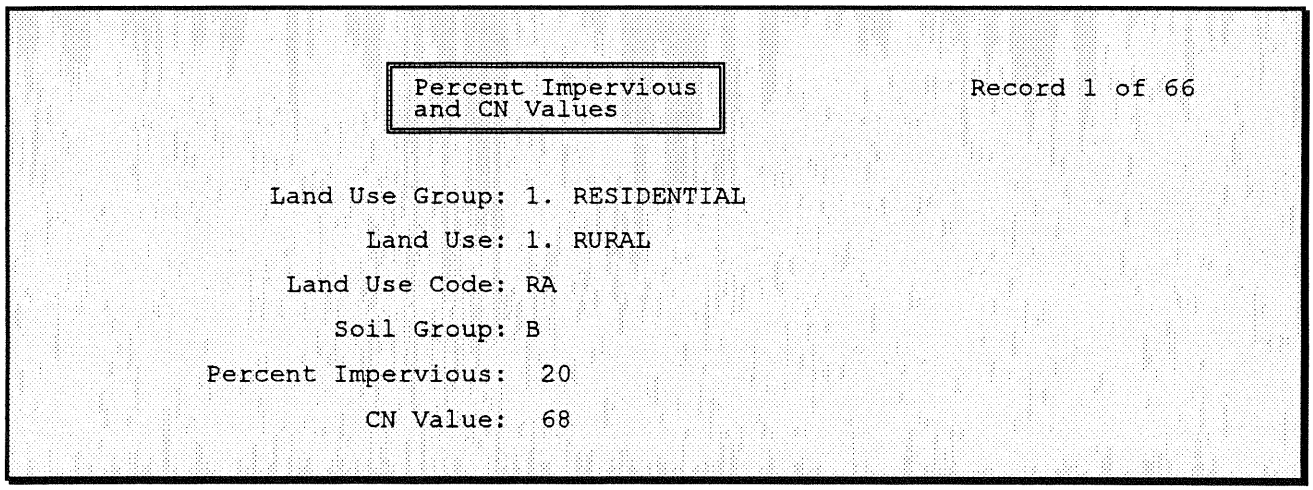
Fields 0-10: Correspond to fields 0-10 in the HEC-1 model input data form. Please refer to the HEC-1 Manual.

Major Basin: Major Basin two digit code.

Counter: Each line in the data is increased by 10. If new data has to be entered, use numbers between the respective two lines. The entire database can the be renumbered using the Reorder HEC-1 Input File in the UPDATE DATABASES MENU.

Edit CN and Percent Impervious

When **7) CN and Percent Impervious** is selected, the following comes to the screen:



The data can be viewed more easily in the BROWSE mode by pressing the F2 key.

Land Use Group: A grouping code for report sorting.

Land Use: Land use description.

Land Use Code: Land use code established by the City of Visalia.

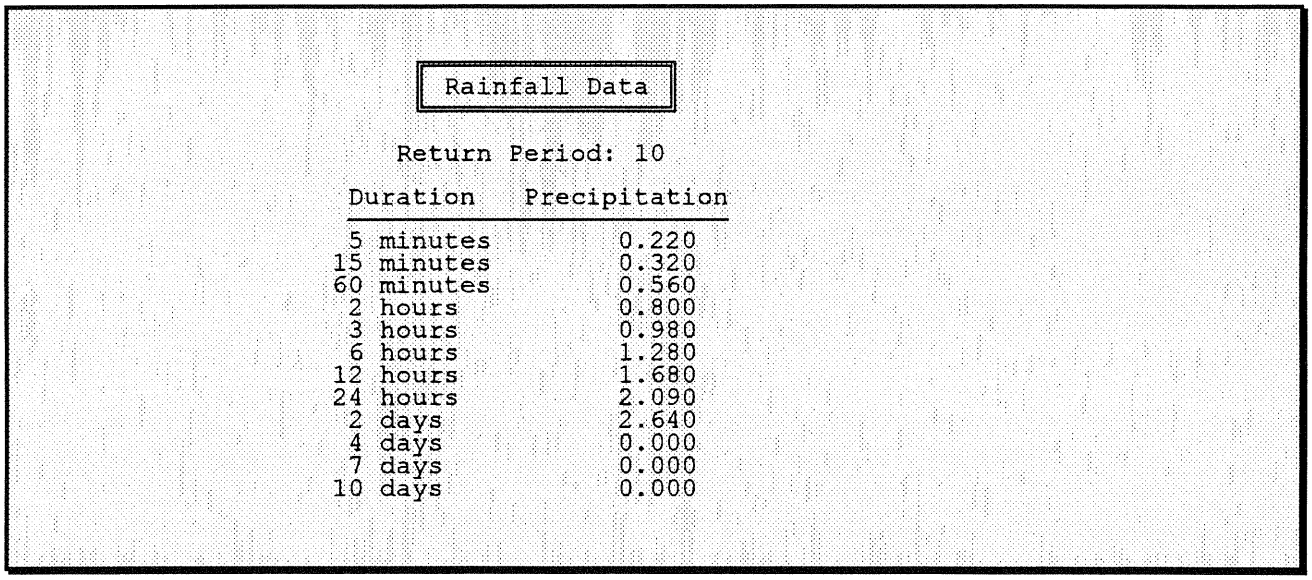
Soil Group: Hydrologic soil group.

Percent Impervious: Percent impervious for land use for use in the HEC-1 model. Refer to Chapter 5 for calculations.

CN Value: CN value for use in the HEC-1 model. Refer to Chapter 5 for calculations.

Edit Rainfall

When **8) Rainfall** is selected, the following comes to the screen:



Rainfall Data

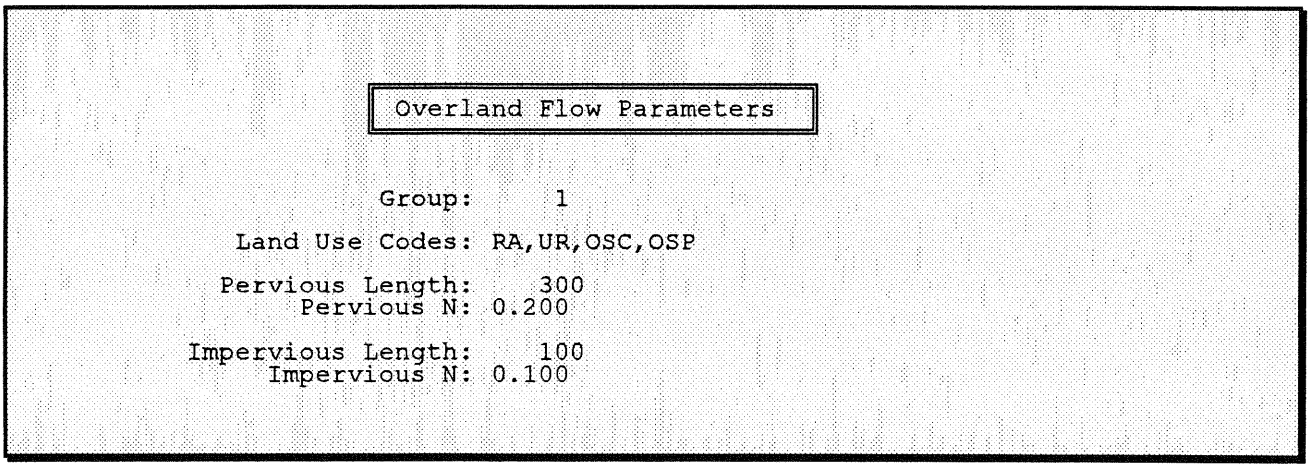
Return Period: 10

Duration	Precipitation
5 minutes	0.220
15 minutes	0.320
60 minutes	0.560
2 hours	0.800
3 hours	0.980
6 hours	1.280
12 hours	1.680
24 hours	2.090
2 days	2.640
4 days	0.000
7 days	0.000
10 days	0.000

The time periods shown above conform to the input data requirements for the HEC-1 model. The rainfall entered is in inches for the respective time period.

Edit Overland Flow Parameters

When **9) Overland Flow Parameters** is selected, the following comes to the screen:



Overland flow parameters for the HEC-1 model have been standardized for land use groups.

Group: A grouping code for consolidating land use.

Land Use Codes: Land use classifications to be included in this group.

Pervious Length: Length of pervious section in this group for use in the HEC-1 model.

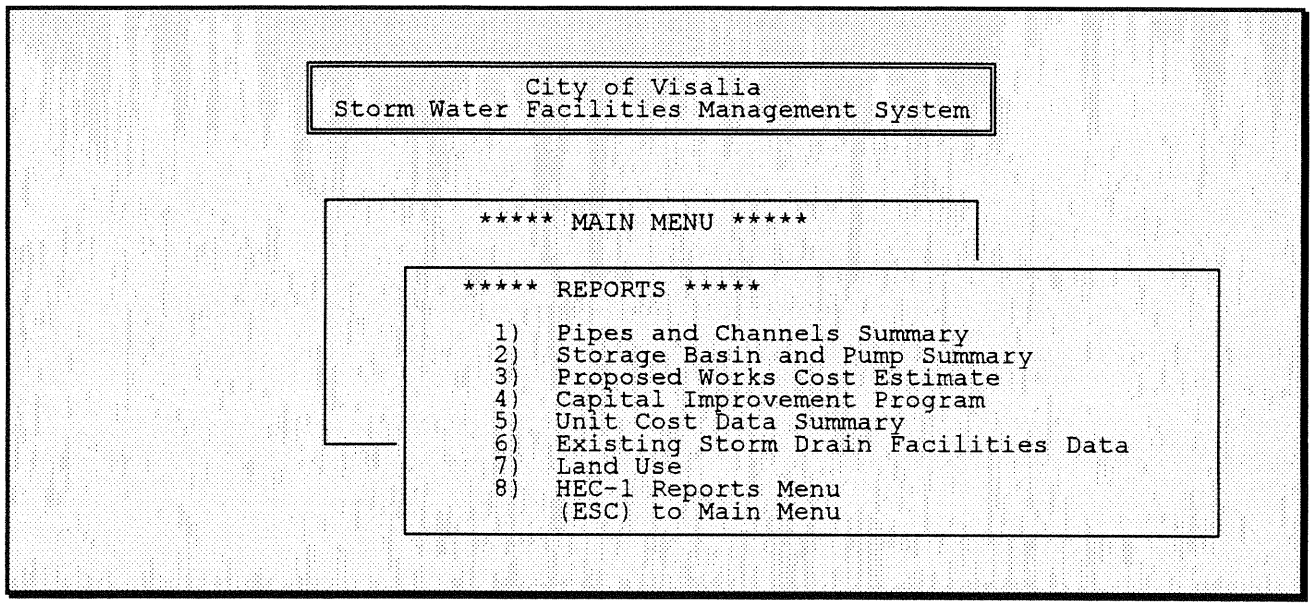
Pervious N: N value for the pervious area of this group for use in the HEC-1 model.

Impervious Length: Length of impervious section in this group for use in the HEC-1 model.

Impervious N: N value for the impervious area of this group for use in the HEC-1 model.

PRINT REPORTS

The **PRINT REPORTS** option is used when printing reports from the system. The options are:

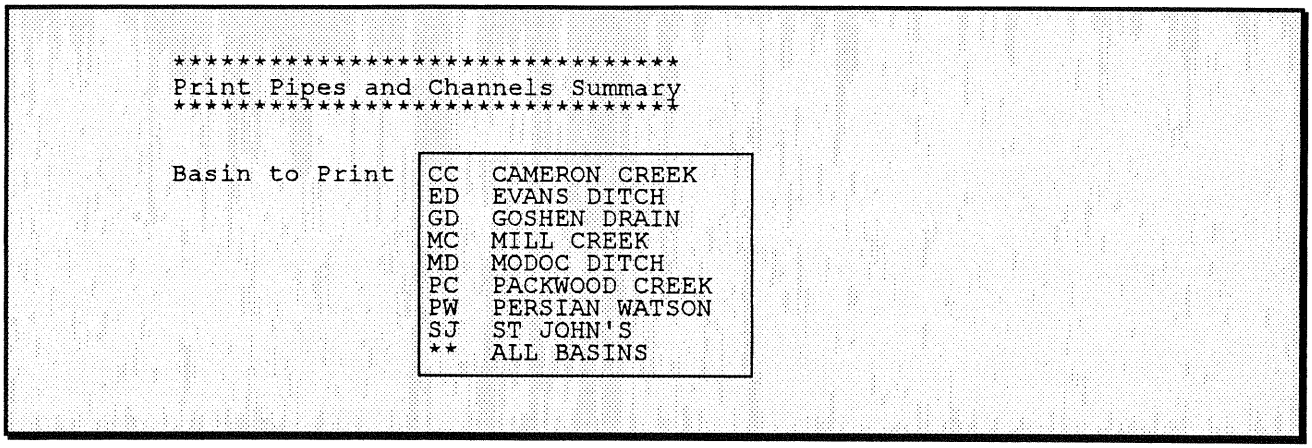


Each of the options shown in the **PRINT REPORTS MENU** can be accessed by highlighting the option with the arrow key, or by typing the associated number.

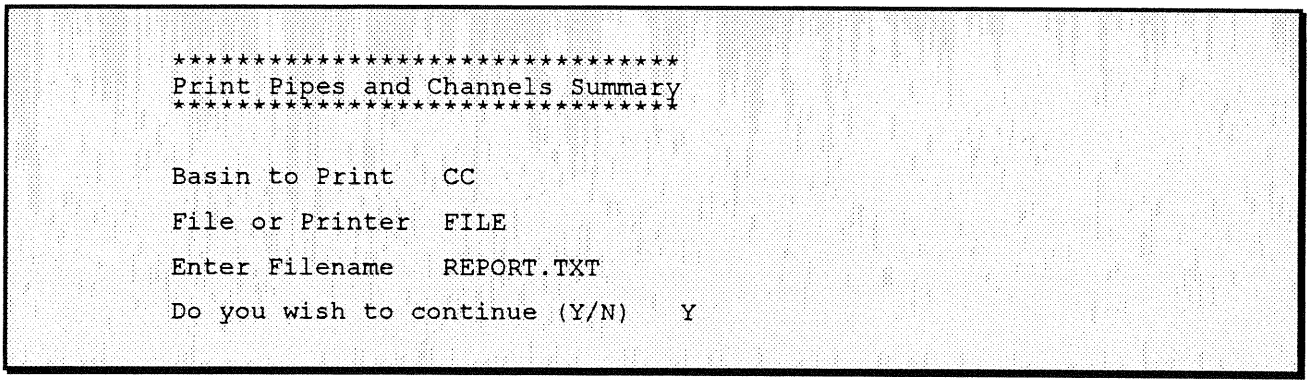
Printing the reports either to a printer or to an ASCII file is self explanatory from the screens. Examples of all of the reports are provided in the Basin Reports document of this study. The following reports are basically the same:

1) Pipes and Channels Summary
2) Storage Basin and Pumps Summary
3) Proposed Works Cost Estimate
5) Unit Cost Data Summary
6) Existing Storm Drain Facilities Data
7) Land Use

When any of the above are selected, the following comes to the screen (using the Pipes and Summary Report as an example):



Highlight the appropriate basin (or all basins) to print and the following comes to the screen:



Basin to Print: Automatically selected by highlighting a basin in the previous screen.

File or Printer: Press the space bar for following selections: FILE or PRINTER.

Enter Filename: Enter any appropriate DOS filename. System defaults to REPORT.TXT

Wish to continue (Y/N): Type Y (or y) to continue. Any other key will stop the printing.

Capital Improvement Plan

When **4) Capital Improvement Plan** is selected, the following comes to the screen:

```
********************************
Print Proposed CIP Cost Estimate
********************************
First Year of CIP          1993
Last Year of CIP           2020
Base Year of Analysis      1992
% Inflation (ie 4.0)       4.0
Detailed or Summary        SUMMARY
File or Printer            FILE
Enter Filename             REPORT.TXT
Do you wish to continue (Y/N)   Y
```

First Year of CIP: Enter the first year (ie year 1993).

Last Year of CIP: Enter last year of CIP (ie 2020)

Base Year of Analysis: Year unit rates are valid. Use for cost in future dollars.

% Inflation: Enter a percent inflation for future dollar calculations.

Detailed or Summary: Press space bar for following selections: DETAILED or SUMMARY.

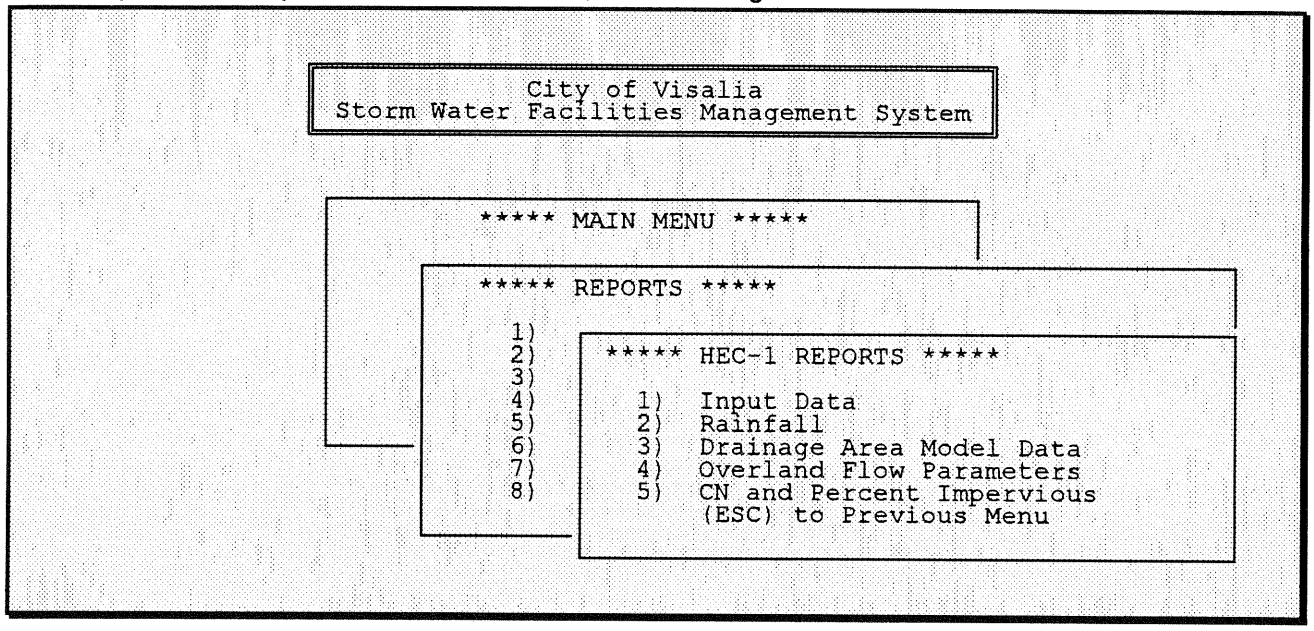
File or Printer: Press the space bar for following selections: FILE or PRINTER.

Enter Filename: Enter any appropriate DOS filename. System defaults to REPORT.TXT

Wish to continue (Y/N): Type Y (or y) to continue. Any other key will stop the printing.

HEC-1 Reports Menu

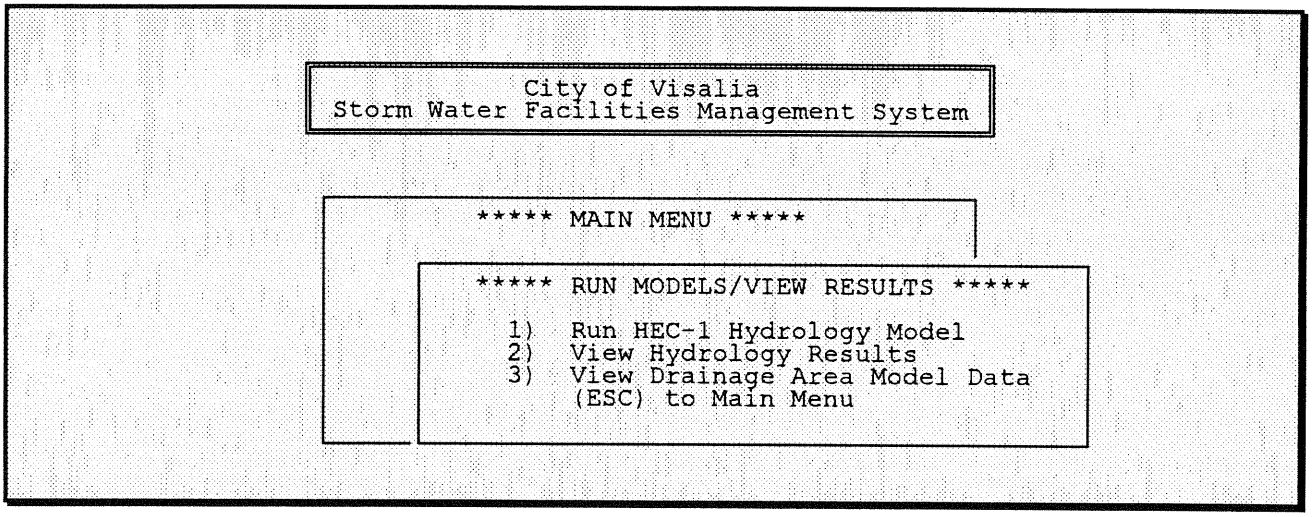
When **8) HEC-1 Reports Menu** is selected, the following menu comes to the screen:



All of the above reports can be printed in a manner similar to the first report in the REPORTS MENU.

RUN MODEL/VIEW RESULTS

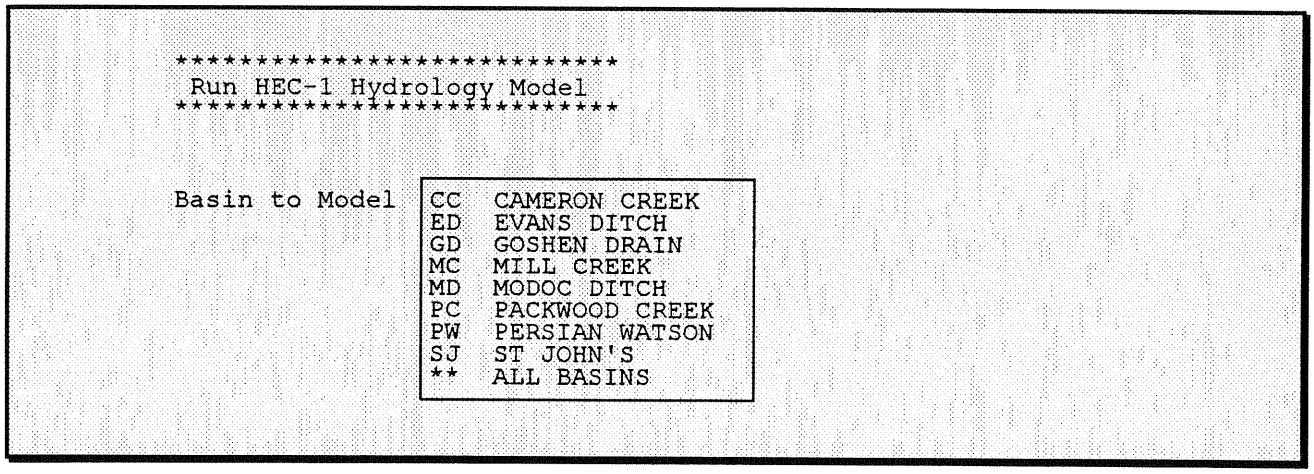
The **RUN MODEL/VIEW RESULTS** option is used when running the HEC-1 model or viewing the drainage area input data or hydrology results. The options are:



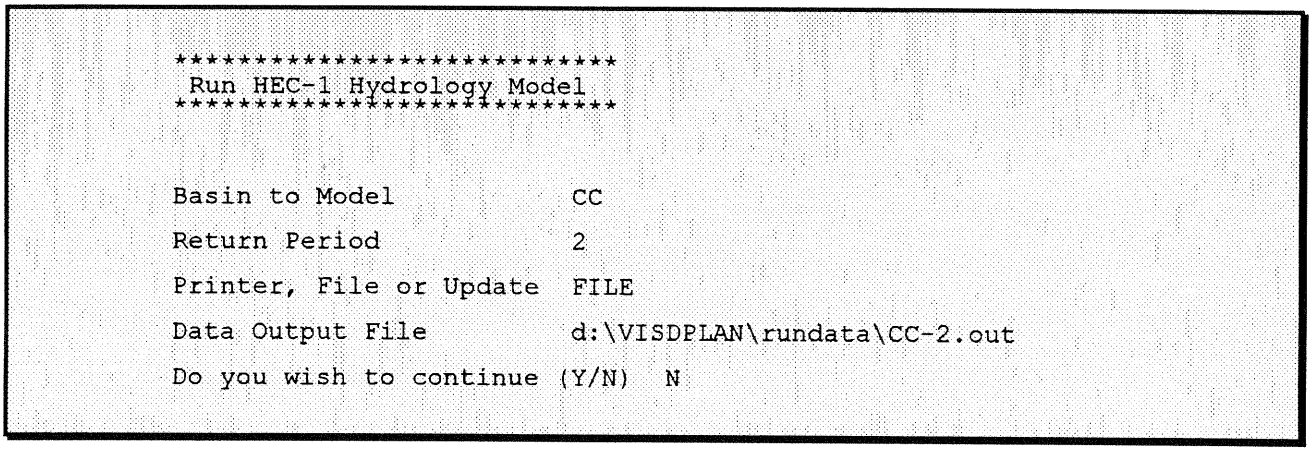
Each of the options shown in the RUN MODEL/VIEW RESULTS MENU can be accessed by highlighting the option with the arrow key, or by typing the associated number.

Run HEC-1 Hydrology Model

When **1) Run HEC-1 Hydrology Model** is selected, the following comes to the screen:



Highlight the appropriate basin to model and the following comes to the screen:



Basin to Model: Automatically selected by highlighting a basin in the previous screen.

Return Period: Press space bar for following selection: 2, 10 or 50 years.

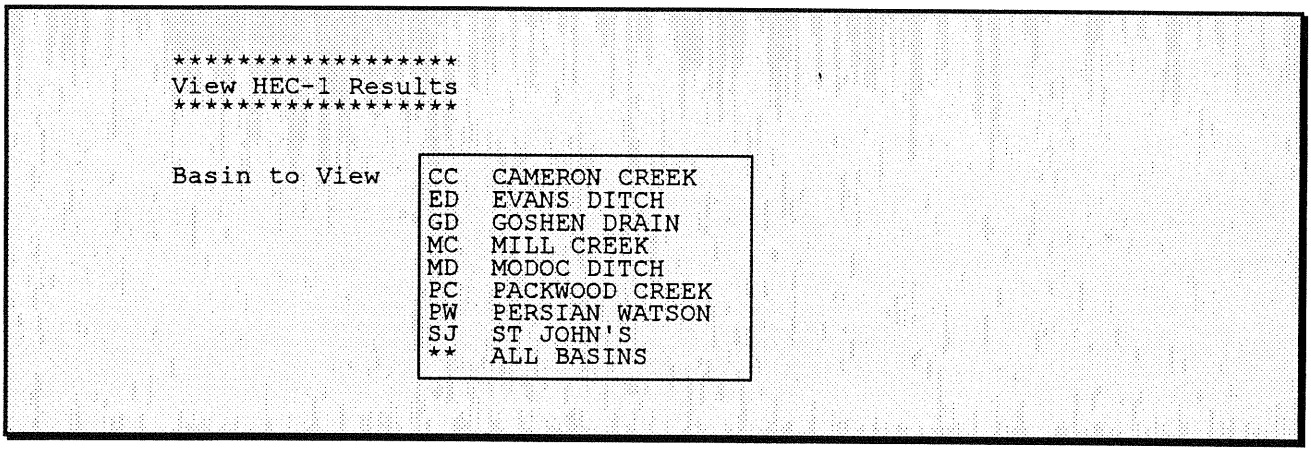
Printer, File or Update Press space bar for following selection: PRINTER, FILE or UPDATE. If UPDATE is selected, the results are imported back into the hydrology results database.

Data Ouput File: The output result filename is automated. The path is selected from the Setup option in the MAINTENANCE MENU.

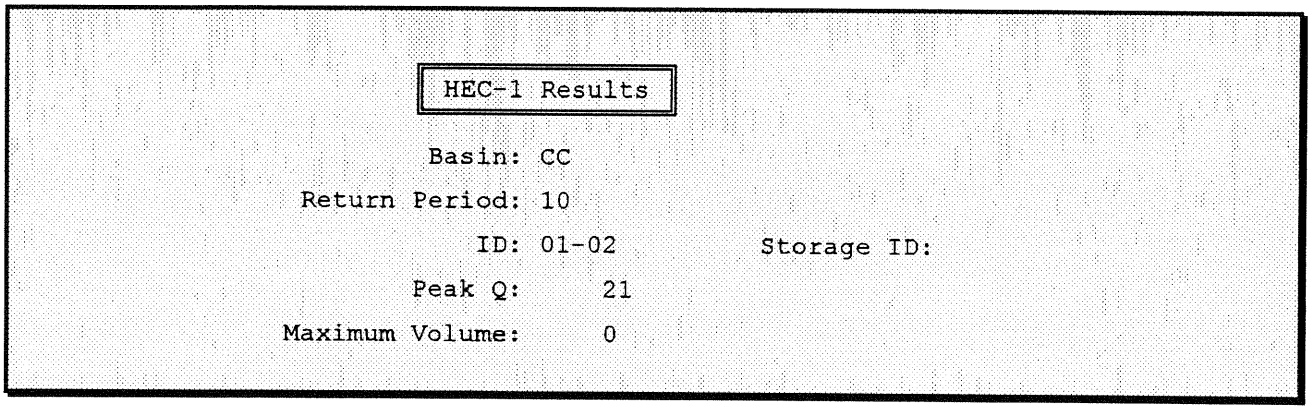
Wish to continue (Y/N): Type Y (or y) to continue. Any other key will stop the printing.

View Hydrology Results

When **2) View Hydrology Results** is selected, the following comes to the screen:



Highlight the appropriate basin to view and the following comes to the screen:

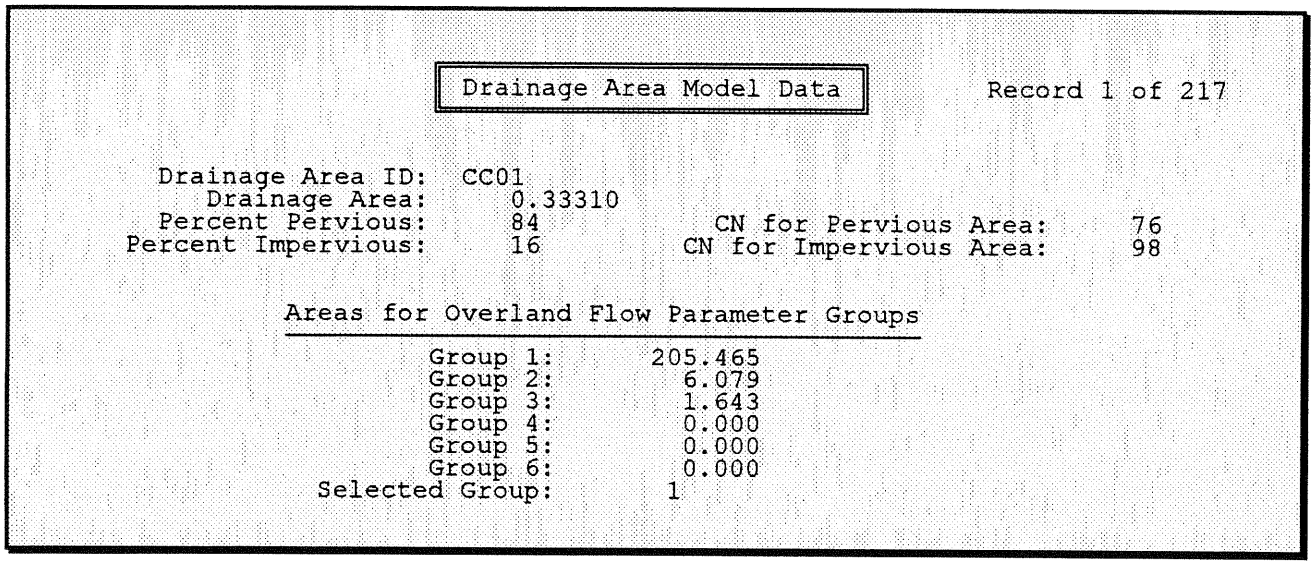


All of the data in this database has been entered automatically by selecting the UPDATE option when running the HEC-1 model. No fields should be edited.

Basin:	Basin ID code.
Return Period:	Rainfall return period modeled. Shown in red - cannot be edited.
Printer, File or Update	Section ID in the HEC-1 model. Shown in red - cannot be edited.
Storage ID:	Modified from HEC-1 model to match hydraulics model. Shown in red - cannot be edited.
Peak Q	Design discharge in cfs. Shown in red - cannot be edited.
Maximum Volume:	Maximum volume for storage basins in (acre-feet). Shown in red - cannot be edited.

View Drainage Area Model Data

When **3) View Drainage Area Model Data** is selected, a request for the basin to view comes to the screen similar to the previous example. Following selection of a basin to view, the following form comes to the screen:



All of the data in this database has been entered automatically by selecting Update HEC-1 Input Data in the UPDATE DATABASES MENU. No fields in this form should be edited.

Drainage Area ID: Drainage area ID in the HEC-1 model.

Drainage Area: Drainage area in square miles. Shown in red - cannot be edited.

Percent Pervious Composite percent pervious for the area. Shown in red - cannot be edited.

CN for Pervious Area Composite CN value for pervious area. Shown in red - cannot be edited.

Percent Impervious Composite percent impervious for the area. Shown in red - cannot be edited.

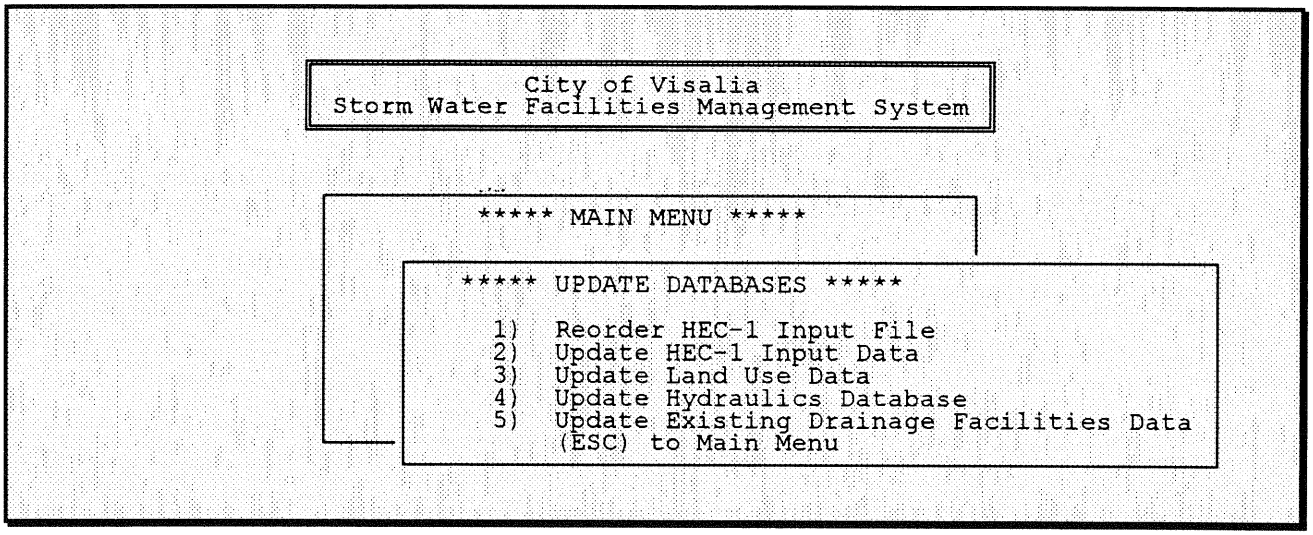
CN for Impervious Area Composite CN value for impervious area. Shown in red - cannot be edited.

Groups 1-6: Areas in acres. Used to select dominant group. Shown in red - cannot be edited.

Selected Group Dominant group for selection of overland flow parameters. Shown in red - cannot be edited.

UPDATE DATABASES

The **UPDATE DATABASES** option is to automatically update data when conditions have changed. The options are:

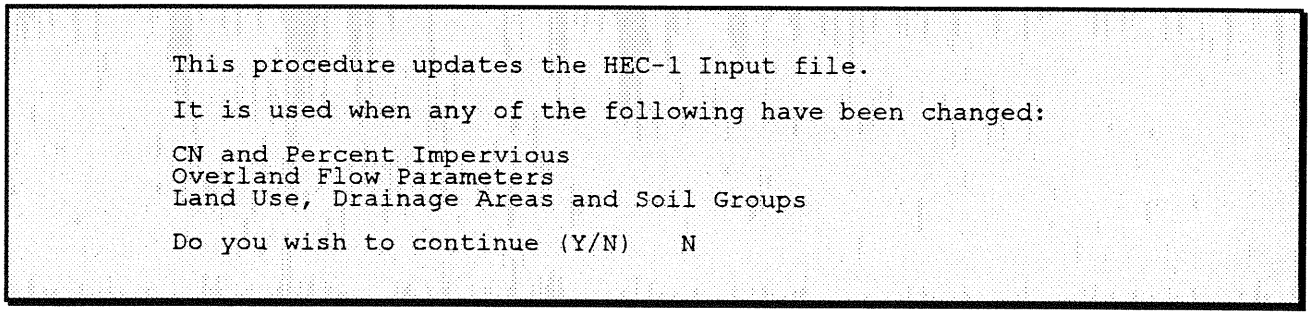


Reorder HEC-1 Input File

This choice is selected when additional code is added to the HEC-1 input file. There is a line counter in the database that enables new code to be entered. Basically each line increments by 10. This provides up to 9 lines of additional code to be placed between two existing lines. If more are required, this reorder option can be done more than once. A request for the basin to reorder is made, similar to previous examples.

Update HEC-1 Input File

When this option is selected, the following self explanatory screen comes to view:



Update Land Use Data

When this option is selected, the following self explanatory screen comes to view:

```
This procedure is carried out when either the
land use or drainage areas are changed in the
graphics and the layers are reprocessed using
polygon processing.

The results of polygon processing in FMS/AC are
placed in a file called PLANNING.DBF.

This procedure copies PLANNING.DBF to LANDDATA.DBF
and modifies land use codes for storage.

Do you wish to continue (Y/N)   N
```

Update Hydraulics Database

When this option is selected, the following self explanatory screen comes to view:

```
This procedure updates the east and north coordinates and
drainage length from the proposed works STORM.DBF and
the design runoffs from HGYRES.DBF

It is used when either the proposed works graphics have
been changed or HEC-1 input parameters have been changed
and the hydrology model has been re-run.

Do you wish to continue (Y/N)   N
```

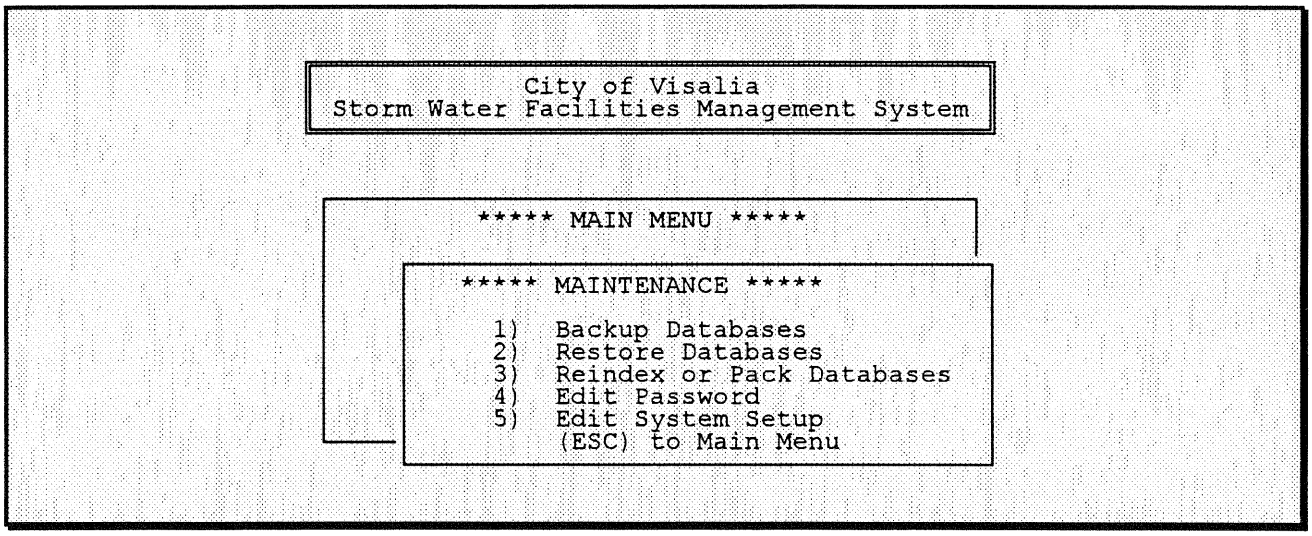
Update Existing Drainage Facilities Data

When this option is selected, the following self explanatory screen comes to view:

```
This procedure is carried out when the existing
facilities have been modified in FMS/AC.

This procedure copies D:\VISDPLAN\AMFMEXIS\STORM.DBF

to D:\VISDPLAN\DGEDATA.DBF


Do you wish to continue (Y/N)   N
```

MAINTENANCE

The **MAINTENANCE** option is to selected to carry out the functions on the following menu:



Backup and Restore Databases

The selection of either **1) Backup Databases** or **2) Restore Databases** from the above menu will backup (to floppies) or restore (from floppies) all database files (*.dbf) and index files (*.mdx) using the DOS backup and restore commands.

Reindex or Pack Databases

A choice of database files to reindex or pack is provided in a similar manner as past examples. When **reindexing** is chosen, the sytem re-builds the indexes developed for this master plan. If additional indexes are developed, they will not reindex using this option and will have to be done manually.

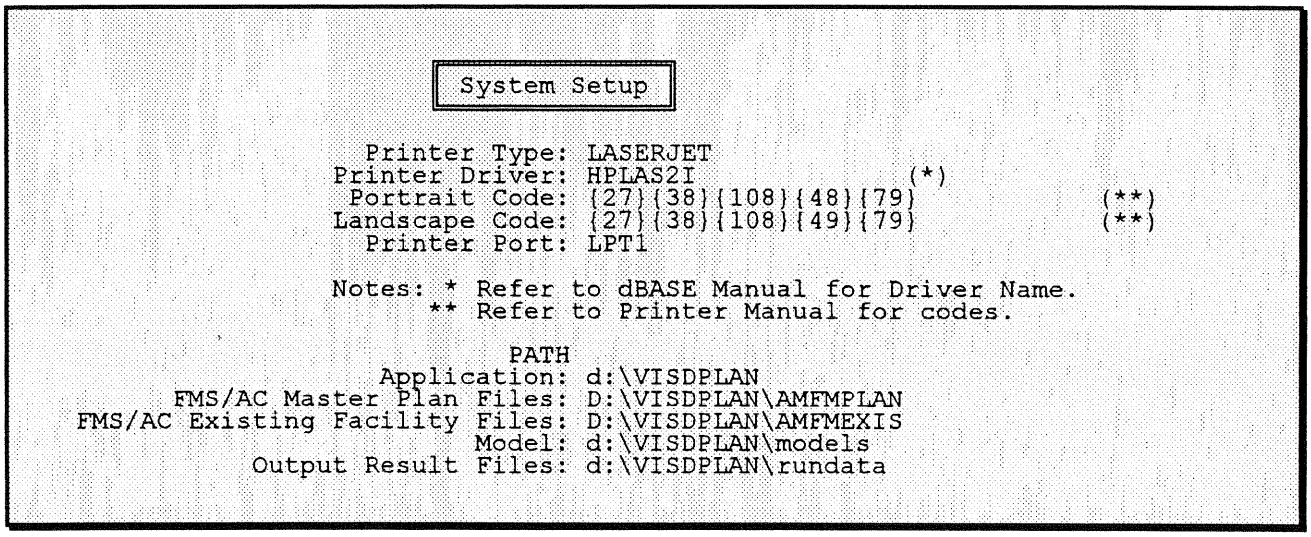
When a record is deleted from a database, it is only marked for deletion. To actually remove the record from the database it is necessaary to **pack** the database.

Edit Password

The selection of **Edit Password** allows the user to change the password required to enter the system. Using the letter N eliminates the need for entering a password when accessing the system. If the password cannot be identified, see the section supervisor for instructions, or call Boyle Engineering at (602) 943-6800.

Edit System Setup

When this option is selected, the following form comes to view:



Printer Type:	Enter the type of printer. This field is for information only.
Printer Driver:	Refer to dBASE manual for driver names.
Portrait Code	Code for portrait in printer manual.
Landscape Code	Code for landscape in printer manual.
Printer Port:	Printer port (ie LPT1, COM1....).
PATH	
Application	The path for this application.
FMS/AC Master Plan Files:	The path for the STORM and PLANNING files for the master plan.
FMS/AC Existing Files:	The path for the STORM files for the existing system.
Model:	The path for the HEC-1 model.
Output Result Files:	The path for the HEC-1 output results files.