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January 2001

Final Drainage Report

51st Avenue Overpass at Bethany Home Road/ (US 60)

Grand Avenue

Project No. 060-B-500
TRACS No. 060 MA 157 H 5532 01D

Contract No. 00-56

Arizona Department of Transportation
Intermodal Transportation Division
Valley Project Management Group

Prepared by

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Phoenix, Arizona

Library
~~Mr. Russ Miracle~~
Flood Control District of Maricopa County
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Final Drainage Report

Grand Avenue

51st Avenue Overpass at Bethany Home Road/US60

Arizona Department of Transportation

January 2001

SECTION 1.0 INTRODUCTION

This report has been prepared to document the assumptions, calculations and procedures used to design the drainage improvements for the Grand Avenue (US 60) Intersection of 51st Avenue and Bethany Home Road. A grade separation for 51st Avenue is being designed at this intersection. The total project consists of the design of a new five-lane 51st Avenue bridge (3-lane northbound and 2-lane southbound), improvements to 52nd Avenue and five detention basins. The impact of the improved intersection on the offsite drainage flow is documented within the report. Pavement drainage and detention basin calculations are also included.

SECTION 2.0 PROJECT AREA

The project area is within Maricopa County and the City of Glendale (See Figure 1, Vicinity Map). The project is to design a grade separation for 51st Avenue at the intersection of Grand Avenue and Bethany Home Road. The project limits are along 51st Avenue from approximately Marlette Avenue to Montebello Avenue. The project area encompasses approximately 24.79 acres.

SECTION 3.0 EXISTING DRAINAGE CONDITION

The land use within the study area is primarily urbanized single-family residential with commercial and industrial land use bordering the Burlington Northern Santa Fe Railroad (BNSF) and Grand Avenue. The natural drainage of the area is generally from the northeast to the southwest toward Grand Avenue at approximately 0.4 percent. The flow generally follows the street alignments until the capacity of the streets is exceeded. The flow then overtops the curbs and sheet flows through the area. This flow is blocked by the elevated railroad tracks (BNSF Railroad) along Grand Avenue. A high point at the intersection of Grand Avenue and Bethany Home Road creates a ponding area between Grand Avenue and 51st Avenue. Water is diverted at the intersection of Grand Avenue and Bethany Home Road to flow southeast along Grand Avenue.

There is a history of flooding along the railroad paralleling Grand Avenue in the vicinity of 51st Avenue and Bethany Home Road. A FEMA floodplain is designated along Grand Avenue and for an area south of Bethany Home Road and east of Grand Avenue. A copy of the FEMA Flood Insurance Rate Map (FIRM) is provided in Appendix E. The reconstruction of the intersection will not impact the FEMA floodplain.

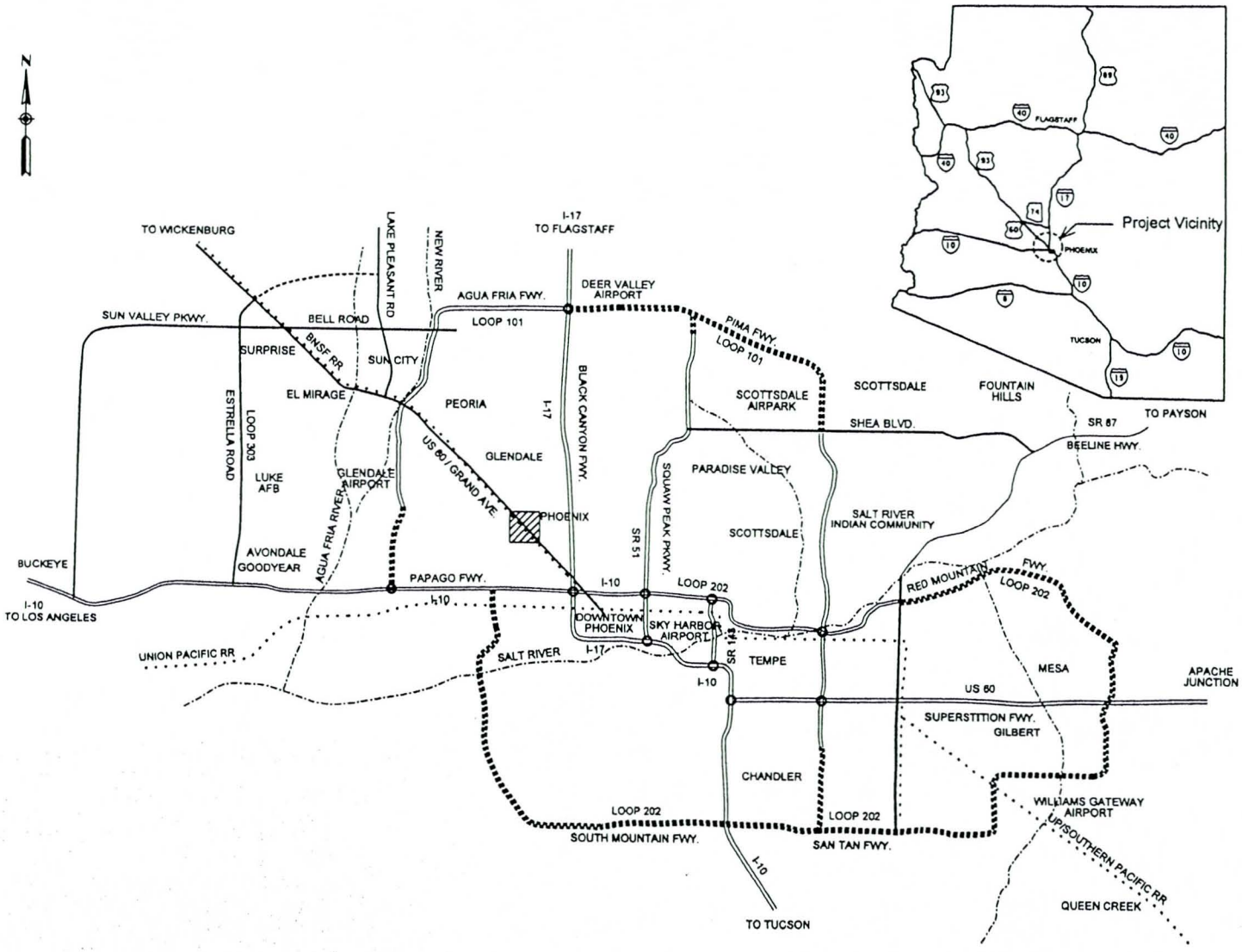


FIGURE 1
VICINITY MAP

There is no existing storm drain system along 51st Avenue and Bethany Home Road near the intersection with Grand Avenue.

A QuikTrip Store has been constructed at the southeast corner of Bethany Home Road and Grand Avenue within the FEMA floodplain.

SECTION 4.0 ADOT / CITY OF GLENDALE DESIGN CRITERIA

The drainage design will have to address offsite flows and show that no increase of flows or ponding occurs to adjacent properties for the 50-year and 100-year storms. The offsite drainage criteria will follow Chapter 600, Highway Drainage Design, ADOT Roadway Design Guidelines (Reference 1). Since the retention basins will be maintained by the City of Glendale (COG) the drainage criteria will follow COG's Design Guidelines (Reference 2).

4.1 OFFSITE DRAINAGE CRITERIA

The following criteria have been established by ADOT for off-site drainage design:

Design Storm Frequency:	50-yr storm
Rainfall Duration:	6-hour duration for total watershed area less than 1.0 square mile; 24-hour duration for total watershed areas larger than 1.0 square mile.
Hydrologic Methods:	HEC-1 model for watershed area larger than 160 acres; Rational Method for watershed areas less than 160 acres and for pavement drainage.

4.2 ROADWAY DRAINAGE CRITERIA (COG)

Design Storm Frequency	10-year storm
Ponding Depth	Cannot exceed the height of the curb for 10-year storm.
Flow Spread	
(Major Arterial)	For 10-year storm: carry a 10-year flow between the curbs and maintain a 12-foot dry lane in each direction.
	For 100-year storm: the flow contained within the right-of-way. On the overpass, the 100-year flow will be contained within the curbs.
(Collector Streets)	For 10-year storm: the flow will be contained within the curbs.
	For the 50-year storm: the flow will be contained between the property lines.
Storm Drain	The hydraulic grade line for the design storm (10-year) may be above the pipe, provided that it remains at least one foot below the ground elevation at all manholes, catch

basins, inlets, etc.

SECTION 5.0 HYDROLOGY

The hydrology prepared for this report follows the methodologies outlined in ADOT's *Roadway Design Guidelines* (Reference 1) and *Highway Drainage Design Manual, Hydrology* (Reference 3).

ADOT's requirement for determining discharges is to use HEC-1 for drainage areas larger than 160 acres. Since the drainage area for this project exceeds 160 acres, HEC-1 was used for the hydrologic modeling.

The project area was previously analyzed and modeled as part of the Maryvale Area Drainage Master Study (ADMS) for the Flood Control District of Maricopa County in February 1997 (Reference 4). The HEC-1 Hydrologic Model developed for the Maryvale ADMS was utilized in establishing the offsite flows for the project area. The Maryvale HEC-1 topographic mapping was based on NGVD, 1929 datum. The hydrology for the Maryvale study was developed for the 100-year, 24-hour storm.

The Flood Control District of Maricopa County prepared the Maryvale ADMS Floodplain Mitigation Study (Reference 5) in November 1997 that recommended design solutions to the flooding problems in this area. The study recommended a combination detention basin and storm drain system that intercepted and conveyed the 10-year storm to the Bethany Home Road and outfall channel. The recommended future detention basin would store 80 ac-ft and the storm drain along Bethany Home Road would carry 120 cfs. The recommended future detention basin site is a 30-acre site located at the southeast corner of Bethany Home Road and Grand Avenue where the QuikTrip Store is being constructed and a future elementary school is planned.

Hydrology was developed for the existing and proposed scenarios. The rainfall intensity in the model was adjusted to determine the discharge for the 50-year, 24-hour storm and for the 10-year, 24-hour storm. The proposed model included revisions to the drainage area due to the road construction and the addition of the retention basins. The topographic mapping for the ADOT project used NAVD 1988 datum. A conversion factor of -2.2 was used to convert the ADOT mapping to NGVD 1929 for use in the Maryvale HEC-1.

The existing Rose Lane Park basin was added to the existing HEC-1 model (since it was not included in the Maryvale ADMS HEC-1 model) as RES 91. A 15.7 acre-ft retention basin (which included basins 3, 4, and 5) adjacent to Rose Lane Park was added to the proposed HEC-1 model as RES 92. The HEC-1 Schematic is shown in Appendix A. Table 1 shows the results of the HEC-1 models. Printouts of the 51st Avenue and 43rd Avenue HEC-1 Summary and a diskette containing the electronic input/output files are located in Appendix A.

Table 1 Results of the Hydrologic Analyses

Location		10-yr, 24hr discharges (cfs)		50-yr, 24hr discharges (cfs)		100-yr, 24hr discharges (cfs)	
		Proposed	Existing	Proposed	Existing	Proposed	Existing
Ponding Area West of Grand	RES 8	80	127	265	286	368	369
Intersection of 51st & Bethany Home	CBH51	157	221	392	410	495	508

The proposed design will not increase the drainage flows to adjacent properties.

SECTION 6.0 HYDRAULIC DESIGN

6.1 FLOW CAPACITY OF 51ST AVENUE

The proposed road improvements will elevate 51st Avenue over Grand Avenue and Bethany Home Road. This elevation of 51st Avenue will prevent water from continuing to flow south in 51st Avenue to the intersection with Grand Avenue. The flow capacity of 51st Avenue is approximately 24 cfs. Catch basins will be used along 51st Avenue to drain storm water within the street into the proposed detention basins. See the Construction Plans in Appendix F for catch basin locations. These basins will also be used to prevent existing discharges from increasing due to the new construction.

The catch basin and street capacity calculations are shown in Appendix C.

6.2 52ND AVENUE PAVEMENT DRAINAGE

This portion of 52nd Avenue will be constructed as a crowned road with curb and gutter on the northbound lane and no curb on the southbound lane. The drainage on the northbound lane of 52nd Avenue will be collected using catch basins and a storm drain system that will carry the flow to a small retention basin which will be located at the north east corner of the intersection of Montebello Avenue and 52nd Avenue. The flow from the southbound lane will sheet flow to the west onto undeveloped property. When this land is developed, the property owner is required to provide retention for the flow from the southbound lane. Catch basin and storm drain calculations for 52nd Avenue are in Appendix C.

6.3 RETENTION BASINS

Fill is needed to elevate 51st Avenue. Therefore basins will be excavated that will be a source for fill material and will also function as retention basins for drainage. Three proposed retention basins (Basins 3, 4, and 5) are located adjacent to the 51st Avenue and Rose Lane Park, and will have a combined capacity of approximately 15.7 acre-feet. A small detention basin (Basin 1) located north of Montebello Avenue and east of 52nd Avenue will provide retention for the discharge from the eastern half of 52nd Avenue. This basin has approximately 0.4 acre-feet of volume. Another proposed retention basin (Basin 2) located in an area south of Bethany Home Road, west of Grand Avenue and

east of 51st Avenue has the capacity of approximately 11.7 acre-feet. Per the HEC-1 output, a large amount of flow drains to this area and the basins will not be able to retain all of the flow. When the basins are full, they will overtop and continue to flow in the same drainage pattern that currently exists. These retention basins are shown on the roadway plan sheets in Appendix F. Volume calculations for the basins are in Appendix B.

Catch basins and storm drains will be installed along 51st Avenue to convey the on-site flow to the retention basins (Basins 2, 3, 4, and 5) east of 51st Avenue. Catch basins along the North Service Road will drain to Basins 3 and 5.

COG follows the FCDMC on-site retention requirements of retaining the 100-year, 2-hour storm. For the 51st Avenue project, the retained volume of water needed is 3.5 acre-feet. Calculations are in Appendix B. Since Basins 3, 4, and 5 are connected by culverts the combined volume provided by these basins is approximately 15.7 acre-feet.

Since the retention basins will be maintained by the COG, they must met COG Design Guidelines (Reference 2).

Drywells will be used to drain these retention basins until the future installation of storm drains in 51st Avenue and Bethany Home Road. A shallow percolation test pit has been requested to determine the number of dry wells needed. This information will be included in the Final Drainage Report.

6.4 ROADWAY DRAINAGE

Roadway drainage facilities for this project were designed in accordance with City of Glendale's Design Guidelines.

The objective of highway drainage is to provide the necessary highway drainage facilities to allow the public to use the highway during times of significant runoff, to minimize the potential for adverse effects on adjacent properties, and to maintain existing drainage patterns. The goal in highway drainage is to minimize off-project impacts while maintaining an acceptable frequency of protection for the highway and roadway.

On-site drainage consisting of flows generated from the on-site paved areas was analyzed for a 10-year storm event utilizing the Rational Method.

$$Q = CIA$$

Q = Discharge, cfs

C = Runoff coefficient

I = Rainfall Intensity, inches per hour

A = Area, acres

A runoff coefficient (C) of 0.95 was used for the roadway. A minimum time of concentration of 10 minutes and Figure 3.2 from the FCDMC Hydrology Manual was used in determining a rainfall intensity of 4.50 inches per hour. Figure 3.2 is included in Appendix C. The discharge calculations for the 10-year storm are shown in Appendix C.

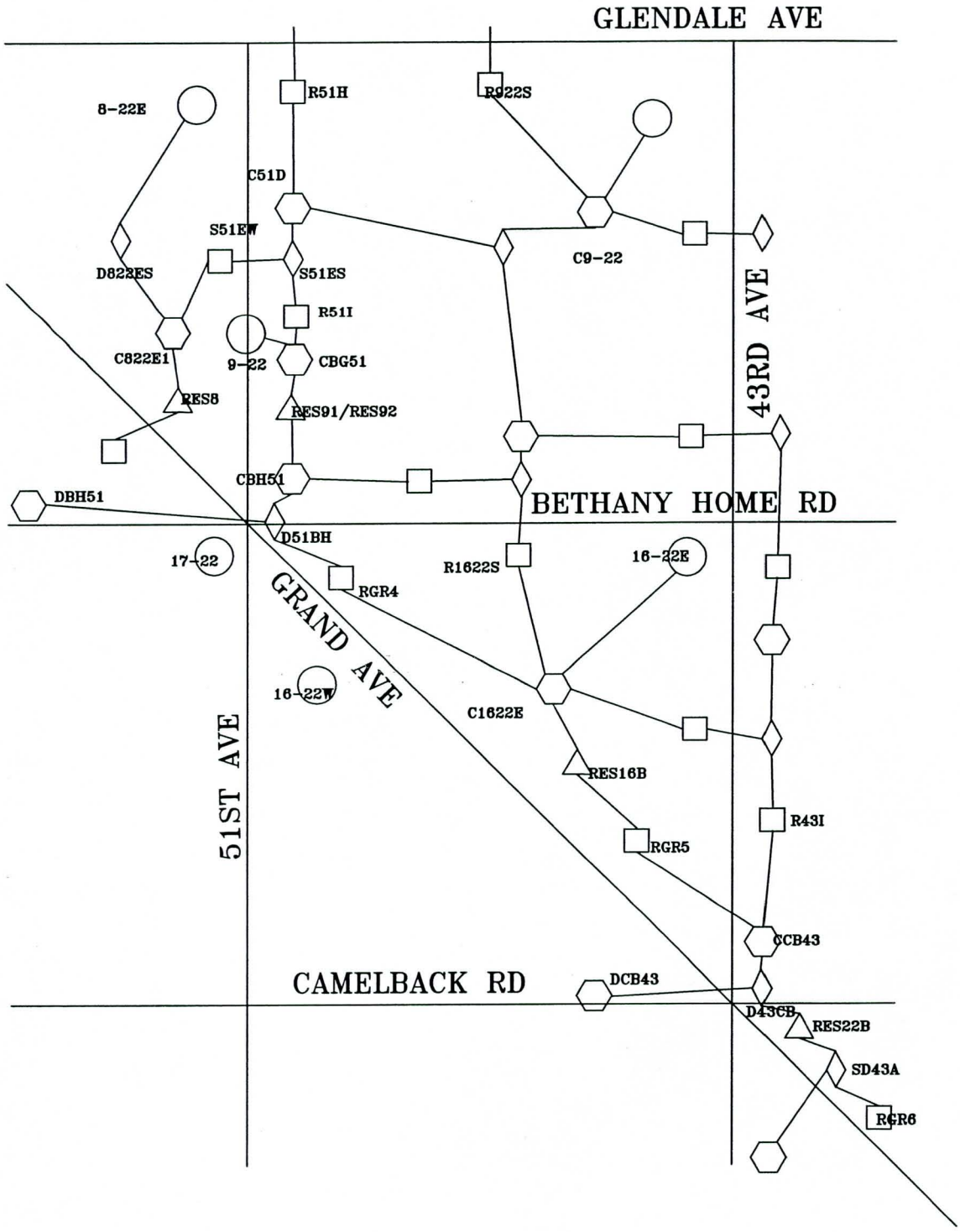
The discharges were determined and catch basins located and sized to control the flow spread within the allowable limits for a 10-year storm event. The flow from a 100-year storm was checked to make sure the flow was contained within the right-of-way. Catch basins were located at sump areas and at superelevation transitions to prevent run off from crossing the travel way. Flow spread and inlet capacities were determined utilizing HEC-22. On-site design calculations are provided in Appendix C.

A storm drain system was designed to convey the pavement drainage to the detention basins. A computer program from Haestad Methods, StormCAD, was used to design the storm drain system. The storm drain system was designed to have the hydraulic grade line for a 10-year storm event at least one-foot below the ground elevation at all manholes, catch basins, inlets, etceteras. The StormCAD results and storm drain schematics are provided in Appendix C.

SECTION 7.0 REFERENCES

1. Arizona Department of Transportation, Roadway Design Guidelines-Metric, May 1996.
2. City of Glendale, Design Guidelines for Site Development and Infrastructure Construction, 1997.
3. Arizona Department of Transportation, Highway Drainage Design Manual, Hydrology, Report Number: FHWA-AZ93-281, March 1993
4. Wood, Patel & Associates, Inc., Maryvale Area Drainage Master Study, Hydrology, FCD #93-29, February 1997.
5. Wood, Patel & Associates, Inc., Maryvale Area Drainage Master Study, Floodplain Mitigation Study, FCD #93-29, November 1997.

HEC-1 SCHEMATIC



APPENDIX A
Hydrologic Computations

1. HEC-1 Disk with input and output
2. HEC-1 Schematic
3. Rainfall Calculations
4. Summary Print Out- Existing & Proposed
   a) 10 - year
   b) 50 - year
   c) 100 - year

*** O U T P U T D A T A ***

REVISED JUNE 1988 TO UPDATE COMPUTATION OF SHORT-DURATION VALUES

PRECIPITATION FREQUENCY VALUES FOR Maryvale ADMS,

PRIMARY ZONE NUMBER= 7

SHORT-DURATION ZONE NUMBER= 8

OPTION NUMBER 2 --- INPUT OF 12 PRECIP VALUES

ELEVATION 1200 FEET

POINT VALUES

RETURN PERIOD

DURATION	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR	
5-MIN	.35	.44	.50	.59	.66	.72	.88	5-MIN
10-MIN	.52	.66	.76	.90	1.00	1.11	1.36	10-MIN
15-MIN	.64	.83	.96	1.14	1.28	1.42	1.75	15-MIN
30-MIN	.84	1.11	1.29	1.54	1.73	1.93	2.38	30-MIN
1-HR	1.03	1.37	1.59	1.92	2.16	2.41	2.98	1-HR
2-HR	1.12	1.47	1.73	2.08	2.36	2.63	3.27	2-HR
3-HR	1.14	1.55	1.82	2.20	2.49	2.78	3.45	3-HR
6-HR	1.23	1.68	1.99	2.41	2.73	3.06	3.81	6-HR
12-HR	1.30	1.82	2.16	2.64	3.01	3.37	4.22	12-HR
24-HR	1.37	1.95	2.34	2.87	3.28	3.69	4.63	24-HR

* IF YOUR SITE IS IN ARIZONA OR NEW MEXICO, PLEASE CONSULT THE FOLLOWING PAPER FOR REVISED DEPTH-AREA VALUES:

DEPTH-AREA RATIOS IN THE SEMI-ARID SOUTHWEST UNITED STATES

NOAA TECHNICAL MEMORANDUM NWS HYDRO-40

ZEHR AND MYERS

AUGUST 1984

INPUT DATA

PROJECT NAME=Maryvale ADMS,

ZONE= 7 SHORT-DURATION ZONE= 8

LATITUDE= .00 LONGITUDE= 100.00 ELEVATION= 1200

12-VALUE PRECIPITATION OPTION

PRECIPITATION VALUE:

1.20	1.70
2.00	2.40
2.80	3.00
1.40	2.00
2.30	2.50
3.20	3.80

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 *             JUN 09 1992              *
 *           VERSION 4.0.3E             *
 *                                      *
 *  RUN DATE  12/29/00  TIME  14:43:01  *
 *                                      *
 ****************************************
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*                           *
*   U.S. ARMY CORPS OF ENGINE
*   HYDROLOGIC ENGINEERING CE
*         609 SECOND STREET
*      DAVIS, CALIFORNIA 9561
*          (916) 551-1748
*                           *
*****************************
```

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X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTU
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1          ID   MBJ modified in July, 2000
   2          ID   MV2410yf.dat
   3          ID   Existing Condition
   4          ID   10Yr-24Hr Event
   5          ID   ****************************************************************************
   6          ID   MARYVALE ADMS - FCD#93-29: CH2M HILL & Wood/Patel & Associates
   7          ID   Model for Entire Study Area (Approximately 100 square miles)
   8          ID   Existing Conditions
   9          ID   100Yr-24Hr Event
  10          ID   Clark Unit Hydrograph
  11          ID   24-Hour SCS TYPE II Rainfall Pattern was used to determine TC & R
  12          ID   Green-Ampt Precipitation Losses
  13          ID   Model Prepared and Checked by David Dust and Jim Geisbush
  14          ID   MV100-24 (BASE79): SWW\132586\HEC-1
  15          ID   January 1997
  16          ID  ******************************************************************************
  17          ID   HEC-1 ELEMENT NOMENCLATURE
  18          ID   SUB-BASIN HYDROGRAPH:
  19          ID      Example: "17-32N": the sub-basin is Section 17, T3N, R2E
  20          ID
  21          ID   SUB-BASIN DIVERSION:
  22          ID      Example: "D1732S": is the southerly component of divert in Section 17
  23          ID
  24          ID   SUB-BASIN ROUTE:
  25          ID      Example: "R1732S": is the southerly flow route through Sec. 17, T3N, R2E
  26          ID
  27          ID   SUB-BASIN RESERVOIR ROUTE OR SURGE BASIN DIVERT:
  28          ID      Example: "RES17": corresponds to a reservoir route or surge basin divert
  29          ID                        in Sub-basin 17-##
  30          ID
  31          ID   RETENTION BASIN DIVERT:
  32          ID      Example: "RET17": corresponds to retention basin divert in
  33          ID                        Sub-Basin 17-##
  34          ID
  35          ID   SUB-BASIN COMBINE:
  36          ID      Example: "C17-32": corresponds to sub-basin combine in Sec. 17, T3N, R2E
  37          ID
  38          ID   STREET ROUTE:
  39          ID      Example: "RPA1": first route for Peoria Avenue
  40          ID      Example" "R67C": third route for 67th Avenue
  41          ID
  42          ID   STREET CAPACITY DIVERSION:
  43          ID      Example: "SPA1S": first diversion from Peoria Avenue to the south
  44          ID
  45          ID   STREET INTERSECTION DIVERSION:
  46          ID      Example: "RPA67": flow component along Peoria Avenue from diversion at
  47          ID                        Peoria Avenue and 67th Avenue
  48          ID      Example: "R67PA": flow component along 67th Avenue from diversion at
  49          ID                        Peoria Avenue and 67th Avenue
  50          ID
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```
 51          ID   STREET INTERSECTION COMBINE:
 52          ID      Example: "CPA67": hydrograph combine at the intersection of Peoria Avenue
 53          ID                        and 67th Avenue
 54          ID
 55          ID   STREET COMBINE:
1                                    HEC-1 INPUT                                                    PAGE  2

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 56          ID      Example: "CPA2": second hydrograph combine along Peoria Avenue
 57          ID
 58          ID   "NULL" COMBINE:
 59          ID      Example: "NULL2": dummy hydrograph combine used to free up a HEC-1
 60          ID                        computational path.  Hence, hydrograph is meaningless.
 61          ID
 62          ID   ****************************************************************************
 63          ID   STREET NAME CODES
 64          ID     Thunderbird Road  = TB
 65          ID     Cactus Road       = CR
 66          ID     Peoria Avenue     = PA
 67          ID     Olive Avenue      = OA
 68          ID     Northern Avenue   = NA
 69          ID     Glendale Avenue   = GA
 70          ID     Bethany Home Road = BH
 71          ID     Camelback Road    = CB
 72          ID     Indian School Road= IS
 73          ID     Thomas Road       = TR
 74          ID     McDowell Road     = MD
 75          ID   ****************************************************************************
 76          ID
             *DIAGRAM
 77          IT       5                    1000
 78          IO       5
 79          IN      15
 80          JD    2.34    0.01
 81          PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
 82          PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
 83          PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
 84          PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
 85          PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
 86          PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
 87          PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
 88          PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
 89          PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
 90          PC    .983    .986    .989    .992    .995    .998   1.000
 91          JD    2.20   10.00
 92          JD    2.11   30.00
 93          JD    2.01   60.00
 94          JD    1.98   90.00
 95          JD    1.95  120.00
 96          JD    1.93  150.00
 97          JD    1.87  300.00
             *
             *   Thunderbird Road Computation Path
             *
1
                                        RUNOFF SUMMARY
                                   FLOW IN CUBIC FEET PER SECOND
                                 TIME IN HOURS,  AREA IN SQUARE MILES

                                 PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME O
      OPERATION        STATION   FLOW    PEAK                                            AREA      STAGE     MAX STA
+                                                    6-HOUR      24-HOUR      72-HOUR
      ROUTED TO
+                       R51H      123.   13.75         54.          18.           6.     8.07
      HYDROGRAPH AT
+                       D922W     180.   13.50         69.          20.           7.    10.10
      2 COMBINED AT
+                       C51D      296.   13.58        123.          38.          13.    10.10
      DIVERSION TO
+                       S51EW     174.   13.58         60.          15.           5.    10.10
      HYDROGRAPH AT
+                       S51ES     122.   13.58         63.          23.           8.    10.10
      ROUTED TO
+                       R51I      120.   13.83         63.          23.           8.    10.10
      ROUTED TO
+                       RES91     114.   14.08         57.          17.           6.    10.10
      2 COMBINED AT
+                       CBH51     221.   13.92         97.          30.          10.    10.10
      DIVERSION TO
```

+		D51BH	221.	13.92	97.	30.	10.	10.10
+	HYDROGRAPH AT	DBH51	0.	0.00	0.	0.	0.	10.10
+	HYDROGRAPH AT	S51EW	174.	13.58	60.	15.	5.	10.10
+	ROUTED TO	R822EW	170.	13.92	60.	15.	5.	10.10
+	HYDROGRAPH AT	D822ES	175.	12.25	68.	21.	7.	12.60
+	2 COMBINED AT	C822E1	261.	13.83	125.	36.	12.	14.60
+	ROUTED TO	RES8	127.	15.17	89.	29.	11.	14.60
+	ROUTED TO	R822WW	127.	15.42	89.	29.	11.	14.60
+	HYDROGRAPH AT	D51BH	221.	13.92	97.	30.	10.	10.10
+	ROUTED TO	RGR4	220.	14.08	97.	30.	10.	10.10
+	HYDROGRAPH AT	SBH2S	296.	13.50	107.	31.	10.	10.10
+	ROUTED TO	R1622S	294.	13.67	107.	31.	10.	10.10
+	HYDROGRAPH AT	16-22E	155.	12.58	49.	16.	5.	0.51
+	HYDROGRAPH AT	S43EW	8.	13.08	1.	0.	0.	6.67
+	ROUTED TO	R1622W	4.	13.67	1.	0.	0.	6.67
+	4 COMBINED AT	C1622E	530.	13.83	243.	75.	25.	11.60
+	ROUTED TO	RGR5	529.	13.92	243.	75.	25.	11.60
+	3 COMBINED AT	CCB43	689.	13.83	341.	109.	37.	11.60
+	DIVERSION TO	D43CB	689.	13.83	341.	109.	37.	11.60
+	HYDROGRAPH AT	DCB43	0.	0.00	0.	0.	0.	11.60
+	HYDROGRAPH AT	D43CB	689.	13.83	341.	109.	37.	11.60
+	DIVERSION TO	SD43AS	165.	12.58	151.	61.	21.	11.60
+	HYDROGRAPH AT	SD43A	524.	13.83	190.	48.	16.	11.60
+	ROUTED TO	RGR6	522.	14.00	190.	48.	16.	11.60

```
1****************************************                                    ******************************
 *                                      *                                    *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                    *    U.S. ARMY CORPS OF ENGINE
 *             JUN 09 1992              *                                    *    HYDROLOGIC ENGINEERING CE
 *           VERSION 4.0.3E             *                                    *          609 SECOND STREET
 *                                      *                                    *       DAVIS, CALIFORNIA 9561
 *  RUN DATE  12/29/00  TIME  14:05:24  *                                    *           (916) 551-1748
 *                                      *                                    *
 ****************************************                                    ******************************
```

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X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTU
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1          ID   MBJ modified in July, 2000
   2          ID   MV2410yt.dat
   3          ID   RETENTION BASINS ADDED IN SUBBASIN 9-22 AND 16-22E
   4          ID   10Yr-24Hr Event
   5          ID   ****************************************************************************
   6          ID   MARYVALE ADMS - FCD#93-29: CH2M HILL & Wood/Patel & Associates
   7          ID   Model for Entire Study Area (Approximately 100 square miles)
   8          ID   Existing Conditions
   9          ID   100Yr-24Hr Event
  10          ID   Clark Unit Hydrograph
  11          ID   24-Hour SCS TYPE II Rainfall Pattern was used to determine TC & R
  12          ID   Green-Ampt Precipitation Losses
  13          ID   Model Prepared and Checked by David Dust and Jim Geisbush
  14          ID   MV100-24 (BASE79): SWW\132586\HEC-1
  15          ID   January 1997
  16          ID  ******************************************************************************
  17          ID   HEC-1 ELEMENT NOMENCLATURE
  18          ID   SUB-BASIN HYDROGRAPH:
  19          ID      Example: "17-32N": the sub-basin is Section 17, T3N, R2E
  20          ID
  21          ID   SUB-BASIN DIVERSION:
  22          ID      Example: "D1732S": is the southerly component of divert in Section 17
  23          ID
  24          ID   SUB-BASIN ROUTE:
  25          ID      Example: "R1732S": is the southerly flow route through Sec. 17, T3N, R2E
  26          ID
  27          ID   SUB-BASIN RESERVOIR ROUTE OR SURGE BASIN DIVERT:
  28          ID      Example: "RES17": corresponds to a reservoir route or surge basin divert
  29          ID                        in Sub-basin 17-##
  30          ID
  31          ID   RETENTION BASIN DIVERT:
  32          ID      Example: "RET17": corresponds to retention basin divert in
  33          ID                        Sub-Basin 17-##
  34          ID
  35          ID   SUB-BASIN COMBINE:
  36          ID      Example: "C17-32": corresponds to sub-basin combine in Sec. 17, T3N, R2E
  37          ID
  38          ID   STREET ROUTE:
  39          ID      Example: "RPA1": first route for Peoria Avenue
  40          ID      Example" "R67C": third route for 67th Avenue
  41          ID
  42          ID   STREET CAPACITY DIVERSION:
  43          ID      Example: "SPA1S": first diversion from Peoria Avenue to the south
  44          ID
  45          ID   STREET INTERSECTION DIVERSION:
  46          ID      Example: "RPA67": flow component along Peoria Avenue from diversion at
  47          ID                        Peoria Avenue and 67th Avenue
  48          ID      Example: "R67PA": flow component along 67th Avenue from diversion at
  49          ID                        Peoria Avenue and 67th Avenue
  50          ID
```

```
 51          ID   STREET INTERSECTION COMBINE:
 52          ID      Example: "CPA67": hydrograph combine at the intersection of Peoria Avenue
 53          ID                        and 67th Avenue
 54          ID
 55          ID   STREET COMBINE:
1                                   HEC-1 INPUT                                                PAGE  2

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 56          ID      Example: "CPA2": second hydrograph combine along Peoria Avenue
 57          ID
 58          ID   "NULL" COMBINE:
 59          ID      Example: "NULL2": dummy hydrograph combine used to free up a HEC-1
 60          ID                        computational path.  Hence, hydrograph is meaningless.
 61          ID
 62          ID   ******************************************************************************
 63          ID   STREET NAME CODES
 64          ID     Thunderbird Road  = TB
 65          ID     Cactus Road       = CR
 66          ID     Peoria Avenue     = PA
 67          ID     Olive Avenue      = OA
 68          ID     Northern Avenue   = NA
 69          ID     Glendale Avenue   = GA
 70          ID     Bethany Home Road = BH
 71          ID     Camelback Road    = CB
 72          ID     Indian School Road= IS
 73          ID     Thomas Road       = TR
 74          ID     McDowell Road     = MD
 75          ID   ******************************************************************************
 76          ID
             *DIAGRAM
 77          IT       5                    1000
 78          IO       5
 79          IN      15
 80          JD    2.34    0.01
 81          PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
 82          PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
 83          PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
 84          PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
 85          PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
 86          PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
 87          PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
 88          PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
 89          PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
 90          PC    .983    .986    .989    .992    .995    .998   1.000
 91          JD    2.20   10.00
 92          JD    2.11   30.00
 93          JD    2.01   60.00
 94          JD    1.98   90.00
 95          JD    1.95  120.00
 96          JD    1.93  150.00
 97          JD    1.87  300.00
             *
             *   Thunderbird Road Computation Path
             *
```

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME O MAX STA
+	ROUTED TO	R51H	123.	13.75	54.	18.	6.	8.07		
+	HYDROGRAPH AT	D922W	180.	13.50	69.	20.	7.	10.10		
+	2 COMBINED AT	C51D	296.	13.58	123.	38.	13.	10.10		
+	DIVERSION TO	S51EW	168.	13.58	59.	15.	5.	10.10		
+	HYDROGRAPH AT	S51ES	127.	13.58	64.	24.	8.	10.10		
+	ROUTED TO	R51I	126.	13.83	64.	24.	8.	10.10		
+	HYDROGRAPH AT	9-22	9.	12.00	1.	0.	0.	0.01		
+	2 COMBINED AT	CBG51	126.	13.83	65.	24.	8.	10.10		
+	ROUTED TO	RES92	87.	14.58	42.	16.	5.	10.10		

+	2 COMBINED AT	CBH51	157.	14.50	80.	28.	9.	10.10
+	DIVERSION TO	D51BH	157.	14.50	80.	28.	9.	10.10
+	HYDROGRAPH AT	DBH51	0.	0.00	0.	0.	0.	10.10
+	HYDROGRAPH AT	S51EW	168.	13.58	59.	15.	5.	10.10
+	ROUTED TO	R822EW	165.	13.92	59.	15.	5.	10.10
+	HYDROGRAPH AT	D822ES	173.	12.25	68.	21.	7.	12.60
+	2 COMBINED AT	C822E1	256.	13.83	124.	35.	12.	14.60
+	ROUTED TO	RES8	80.	15.67	39.	11.	4.	14.60
+	ROUTED TO	R822WW	79.	16.00	38.	11.	4.	14.60
+	HYDROGRAPH AT	D51BH	157.	14.50	80.	28.	9.	10.10
+	ROUTED TO	RGR4	156.	14.75	80.	28.	9.	10.10
+	HYDROGRAPH AT	SBH2S	296.	13.50	107.	31.	10.	10.10
+	ROUTED TO	R1622S	294.	13.67	107.	31.	10.	10.10
+	HYDROGRAPH AT	16-22E	155.	12.58	49.	16.	5.	0.51
+	HYDROGRAPH AT	S43EW	8.	13.08	1.	0.	0.	6.67
+	ROUTED TO	R1622W	4.	13.67	1.	0.	0.	6.67
+	4 COMBINED AT	C1622E	446.	13.67	226.	72.	25.	11.60
+	ROUTED TO	RES16B	289.	15.00	129.	47.	16.	11.60
+	ROUTED TO	RGR5	288.	15.17	128.	47.	16.	11.60
+	3 COMBINED AT	CCB43	399.	15.17	213.	77.	27.	11.60
+	DIVERSION TO	D43CB	399.	15.17	213.	77.	27.	11.60
+	HYDROGRAPH AT	DCB43	0.	0.00	0.	0.	0.	11.60
+	HYDROGRAPH AT	D43CB	399.	15.17	213.	77.	27.	11.60
+	ROUTED TO	RES22B	398.	15.17	212.	76.	26.	11.60
+	DIVERSION TO	SD43AS	165.	13.08	148.	60.	20.	11.60
+	HYDROGRAPH AT	SD43A	233.	15.17	64.	16.	5.	11.60
+	ROUTED TO	RGR6	231.	15.33	64.	16.	5.	11.60

```
1****************************************                                                    ******************************
 *                                      *                                                    *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *   U.S. ARMY CORPS OF ENGINE
 *             JUN 09 1992              *                                                    *   HYDROLOGIC ENGINEERING CE
 *           VERSION 4.0.3E             *                                                    *         609 SECOND STREET
 *                                      *                                                    *      DAVIS, CALIFORNIA 9561
 *  RUN DATE  12/29/00  TIME  14:15:41  *                                                    *          (916) 551-1748
 *                                      *                                                    *
 ****************************************                                                    ******************************

                                                X     X  XXXXXXX   XXXXX          X
                                                X     X  X        X     X        XX
                                                X     X  X        X               X
                                                XXXXXXX  XXXX     X        XXXXX  X
                                                X     X  X        X               X
                                                X     X  X        X     X         X
                                                X     X  XXXXXXX   XXXXX        XXX

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTU
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                                   HEC-1 INPUT                                                    PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1           ID   MBJ modified in July, 2000
            2           ID   MV2450yf.dat
            3           ID   Existing Condition
            4           ID   50Yr-24Hr Event
            5           ID   ****************************************************************************
            6           ID   MARYVALE ADMS - FCD#93-29: CH2M HILL & Wood/Patel & Associates
            7           ID   Model for Entire Study Area (Approximately 100 square miles)
            8           ID   Existing Conditions
            9           ID   100Yr-24Hr Event
           10           ID   Clark Unit Hydrograph
           11           ID   24-Hour SCS TYPE II Rainfall Pattern was used to determine TC & R
           12           ID   Green-Ampt Precipitation Losses
           13           ID   Model Prepared and Checked by David Dust and Jim Geisbush
           14           ID   MV100-24 (BASE79): SWW\132586\HEC-1
           15           ID   January 1997
           16           ID  ******************************************************************************
           17           ID   HEC-1 ELEMENT NOMENCLATURE
           18           ID   SUB-BASIN HYDROGRAPH:
           19           ID      Example: "17-32N": the sub-basin is Section 17, T3N, R2E
           20           ID
           21           ID   SUB-BASIN DIVERSION:
           22           ID      Example: "D1732S": is the southerly component of divert in Section 17
           23           ID
           24           ID   SUB-BASIN ROUTE:
           25           ID      Example: "R1732S": is the southerly flow route through Sec. 17, T3N, R2E
           26           ID
           27           ID   SUB-BASIN RESERVOIR ROUTE OR SURGE BASIN DIVERT:
           28           ID      Example: "RES17": corresponds to a reservoir route or surge basin divert
           29           ID                       in Sub-basin 17-##
           30           ID
           31           ID   RETENTION BASIN DIVERT:
           32           ID      Example: "RET17": corresponds to retention basin divert in
           33           ID                       Sub-Basin 17-##
           34           ID
           35           ID   SUB-BASIN COMBINE:
           36           ID      Example: "C17-32": corresponds to sub-basin combine in Sec. 17, T3N, R2E
           37           ID
           38           ID   STREET ROUTE:
           39           ID      Example: "RPA1": first route for Peoria Avenue
           40           ID      Example" "R67C": third route for 67th Avenue
           41           ID
           42           ID   STREET CAPACITY DIVERSION:
           43           ID      Example: "SPA1S": first diversion from Peoria Avenue to the south
           44           ID
           45           ID   STREET INTERSECTION DIVERSION:
           46           ID      Example: "RPA67": flow component along Peoria Avenue from diversion at
           47           ID                       Peoria Avenue and 67th Avenue
           48           ID      Example: "R67PA": flow component along 67th Avenue from diversion at
           49           ID                       Peoria Avenue and 67th Avenue
           50           ID
```

```
  51          ID   STREET INTERSECTION COMBINE:
  52          ID      Example: "CPA67": hydrograph combine at the intersection of Peoria Avenue
  53          ID                        and 67th Avenue
  54          ID
  55          ID   STREET COMBINE:
1                                        HEC-1 INPUT                                                    PAGE  2

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  56          ID      Example: "CPA2": second hydrograph combine along Peoria Avenue
  57          ID
  58          ID   "NULL" COMBINE:
  59          ID      Example: "NULL2": dummy hydrograph combine used to free up a HEC-1
  60          ID                        computational path.  Hence, hydrograph is meaningless.
  61          ID
  62          ID   ****************************************************************************
  63          ID   STREET NAME CODES
  64          ID     Thunderbird Road  = TB
  65          ID     Cactus Road       = CR
  66          ID     Peoria Avenue     = PA
  67          ID     Olive Avenue      = OA
  68          ID     Northern Avenue   = NA
  69          ID     Glendale Avenue   = GA
  70          ID     Bethany Home Road = BH
  71          ID     Camelback Road    = CB
  72          ID     Indian School Road= IS
  73          ID     Thomas Road       = TR
  74          ID     McDowell Road     = MD
  75          ID   ****************************************************************************
  76          ID
              *DIAGRAM
  77          IT       5                    1000
  78          IO       5
  79          IN      15
  80          JD    3.28    0.01
  81          PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
  82          PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
  83          PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
  84          PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
  85          PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
  86          PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
  87          PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
  88          PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
  89          PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
  90          PC    .983    .986    .989    .992    .995    .998   1.000
  91          JD    3.08   10.00
  92          JD    2.95   30.00
  93          JD    2.82   60.00
  94          JD    2.77   90.00
  95          JD    2.74  120.00
  96          JD    2.70  150.00
  97          JD    2.62  300.00
              *
              *   Thunderbird Road Computation Path
1
                                        RUNOFF SUMMARY
                                   FLOW IN CUBIC FEET PER SECOND
                                 TIME IN HOURS,  AREA IN SQUARE MILES

                                 PEAK   TIME OF    AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME O
        OPERATION        STATION  FLOW    PEAK                                          AREA      STAGE     MAX STA
+                                                   6-HOUR     24-HOUR     72-HOUR

        ROUTED TO
+                         R51H    226.   13.50        87.         28.          9.      8.07

        HYDROGRAPH AT
+                         D922W   355.   13.33       120.         35.         12.     10.10

        2 COMBINED AT
+                         C51D    566.   13.42       206.         62.         21.     10.10

        DIVERSION TO
+                         S51EW   346.   13.42       113.         28.          9.     10.10

        HYDROGRAPH AT
+                         S51ES   220.   13.42        93.         34.         11.     10.10

        ROUTED TO
+                         R51I    218.   13.50        93.         34.         11.     10.10

        ROUTED TO
+                         RES91   204.   13.75        92.         28.          9.     10.10

        2 COMBINED AT
+                         CBH51   410.   13.58       166.         49.         17.     10.10

        DIVERSION TO
```

+		D51BH	410.	13.58	166.	49.	17.	10.10
+	HYDROGRAPH AT	DBH51	0.	0.00	0.	0.	0.	10.10
+	HYDROGRAPH AT	S51EW	346.	13.42	113.	28.	9.	10.10
+	ROUTED TO	R822EW	342.	13.58	113.	28.	9.	10.10
+	HYDROGRAPH AT	D822ES	269.	12.25	113.	35.	12.	12.60
+	2 COMBINED AT	C822E1	522.	13.58	222.	62.	21.	14.60
+	ROUTED TO	RES8	286.	14.67	175.	55.	19.	14.60
+	ROUTED TO	R822WW	285.	14.83	175.	55.	19.	14.60
+	HYDROGRAPH AT	D51BH	410.	13.58	166.	49.	17.	10.10
+	ROUTED TO	RGR4	407.	13.83	165.	49.	17.	10.10
+	HYDROGRAPH AT	SBH2S	577.	13.33	188.	53.	18.	10.10
+	ROUTED TO	R1622S	574.	13.42	188.	53.	18.	10.10
+	HYDROGRAPH AT	16-22E	246.	12.58	76.	24.	8.	0.51
+	HYDROGRAPH AT	S43EW	73.	13.00	12.	3.	1.	6.67
+	ROUTED TO	R1622W	68.	13.33	12.	3.	1.	6.67
+	4 COMBINED AT	C1622E	1087.	13.50	428.	127.	43.	11.60
+	ROUTED TO	RGR5	1083.	13.67	427.	127.	43.	11.60
+	3 COMBINED AT	CCB43	1311.	13.58	555.	171.	58.	11.60
+	DIVERSION TO	D43CB	1311.	13.58	555.	171.	58.	11.60
+	HYDROGRAPH AT	DCB43	0.	0.00	0.	0.	0.	11.60
+	HYDROGRAPH AT	D43CB	1311.	13.58	555.	171.	58.	11.60
+	DIVERSION TO	SD43AS	165.	12.33	160.	72.	25.	11.60
+	HYDROGRAPH AT	SD43A	1146.	13.58	395.	99.	33.	11.60
+	ROUTED TO	RGR6	1144.	13.67	395.	99.	33.	11.60

```
1****************************************
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *             JUN 09 1992              *
 *           VERSION 4.0.3E             *
 *                                      *
 *  RUN DATE  12/29/00  TIME  13:56:25  *
 *                                      *
 ****************************************
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******************************
*
*    U.S. ARMY CORPS OF ENGINE
*    HYDROLOGIC ENGINEERING CE
*          609 SECOND STREET
*       DAVIS, CALIFORNIA 9561
*           (916) 551-1748
*
******************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTU
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1          ID   MBJ modified in July, 2000
   2          ID   MV2450yt.dat
   3          ID   RETENTION BASINS ADDED IN SUBBASIN 9-22 AND 16-22E
   4          ID   50Yr-24Hr Event
   5          ID   ******************************************************************************
   6          ID   MARYVALE ADMS - FCD#93-29: CH2M HILL & Wood/Patel & Associates
   7          ID   Model for Entire Study Area (Approximately 100 square miles)
   8          ID   Existing Conditions
   9          ID   100Yr-24Hr Event
  10          ID   Clark Unit Hydrograph
  11          ID   24-Hour SCS TYPE II Rainfall Pattern was used to determine TC & R
  12          ID   Green-Ampt Precipitation Losses
  13          ID   Model Prepared and Checked by David Dust and Jim Geisbush
  14          ID   MV100-24 (BASE79): SWW\132586\HEC-1
  15          ID   January 1997
  16          ID  ********************************************************************************
  17          ID   HEC-1 ELEMENT NOMENCLATURE
  18          ID   SUB-BASIN HYDROGRAPH:
  19          ID      Example: "17-32N": the sub-basin is Section 17, T3N, R2E
  20          ID
  21          ID   SUB-BASIN DIVERSION:
  22          ID      Example: "D1732S": is the southerly component of divert in Section 17
  23          ID
  24          ID   SUB-BASIN ROUTE:
  25          ID      Example: "R1732S": is the southerly flow route through Sec. 17, T3N, R2E
  26          ID
  27          ID   SUB-BASIN RESERVOIR ROUTE OR SURGE BASIN DIVERT:
  28          ID      Example: "RES17": corresponds to a reservoir route or surge basin divert
  29          ID                        in Sub-basin 17-##
  30          ID
  31          ID   RETENTION BASIN DIVERT:
  32          ID      Example: "RET17": corresponds to retention basin divert in
  33          ID                        Sub-Basin 17-##
  34          ID
  35          ID   SUB-BASIN COMBINE:
  36          ID      Example: "C17-32": corresponds to sub-basin combine in Sec. 17, T3N, R2E
  37          ID
  38          ID   STREET ROUTE:
  39          ID      Example: "RPA1": first route for Peoria Avenue
  40          ID      Example" "R67C": third route for 67th Avenue
  41          ID
  42          ID   STREET CAPACITY DIVERSION:
  43          ID      Example: "SPA1S": first diversion from Peoria Avenue to the south
  44          ID
  45          ID   STREET INTERSECTION DIVERSION:
  46          ID      Example: "RPA67": flow component along Peoria Avenue from diversion at
  47          ID                        Peoria Avenue and 67th Avenue
  48          ID      Example: "R67PA": flow component along 67th Avenue from diversion at
  49          ID                        Peoria Avenue and 67th Avenue
  50          ID
```

```
 51          ID   STREET INTERSECTION COMBINE:
 52          ID      Example: "CPA67": hydrograph combine at the intersection of Peoria Avenue
 53          ID                        and 67th Avenue
 54          ID
 55          ID   STREET COMBINE:
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 56          ID      Example: "CPA2": second hydrograph combine along Peoria Avenue
 57          ID
 58          ID   "NULL" COMBINE:
 59          ID      Example: "NULL2": dummy hydrograph combine used to free up a HEC-1
 60          ID                        computational path.  Hence, hydrograph is meaningless.
 61          ID
 62          ID   ******************************************************************************
 63          ID   STREET NAME CODES
 64          ID     Thunderbird Road  = TB
 65          ID     Cactus Road       = CR
 66          ID     Peoria Avenue     = PA
 67          ID     Olive Avenue      = OA
 68          ID     Northern Avenue   = NA
 69          ID     Glendale Avenue   = GA
 70          ID     Bethany Home Road = BH
 71          ID     Camelback Road    = CB
 72          ID     Indian School Road= IS
 73          ID     Thomas Road       = TR
 74          ID     McDowell Road     = MD
 75          ID   ******************************************************************************
 76          ID
             *DIAGRAM
 77          IT       5                    1000
 78          IO       5
 79          IN      15
 80          JD    3.28    0.01
 81          PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
 82          PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
 83          PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
 84          PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
 85          PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
 86          PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
 87          PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
 88          PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
 89          PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
 90          PC    .983    .986    .989    .992    .995    .998   1.000
 91          JD    3.08   10.00
 92          JD    2.95   30.00
 93          JD    2.82   60.00
 94          JD    2.77   90.00
 95          JD    2.74  120.00
 96          JD    2.70  150.00
 97          JD    2.62  300.00
             *
             *   Thunderbird Road Computation Path
             *
```

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME O MAX STA
+	ROUTED TO	R51H	226.	13.50	87.	28.	9.	8.07		
+	HYDROGRAPH AT	D922W	355.	13.33	120.	35.	12.	10.10		
+	2 COMBINED AT	C51D	566.	13.42	206.	62.	21.	10.10		
+	DIVERSION TO	S51EW	331.	13.42	109.	27.	9.	10.10		
+	HYDROGRAPH AT	S51ES	235.	13.42	97.	35.	12.	10.10		
+	ROUTED TO	R51I	232.	13.50	97.	35.	12.	10.10		
+	HYDROGRAPH AT	9-22	13.	12.00	1.	0.	0.	0.01		
+	2 COMBINED AT	CBG51	233.	13.50	98.	35.	12.	10.10		
	ROUTED TO									

+		RES92	203.	13.92	81.	27.	9.	10.10
+	2 COMBINED AT	CBH51	392.	13.75	152.	48.	16.	10.10
+	DIVERSION TO	D51BH	392.	13.75	152.	48.	16.	10.10
+	HYDROGRAPH AT	DBH51	0.	0.00	0.	0.	0.	10.10
+	HYDROGRAPH AT	S51EW	331.	13.42	109.	27.	9.	10.10
+	ROUTED TO	R822EW	328.	13.58	109.	27.	9.	10.10
+	HYDROGRAPH AT	D822ES	266.	12.25	113.	35.	12.	12.60
+	2 COMBINED AT	C822E1	507.	13.58	218.	61.	20.	14.60
+	ROUTED TO	RES8	265.	14.75	136.	37.	12.	14.60
+	ROUTED TO	R822WW	264.	14.92	135.	37.	12.	14.60
+	HYDROGRAPH AT	D51BH	392.	13.75	152.	48.	16.	10.10
+	ROUTED TO	RGR4	389.	13.92	152.	48.	16.	10.10
+	HYDROGRAPH AT	SBH2S	577.	13.33	188.	53.	18.	10.10
+	ROUTED TO	R1622S	574.	13.42	188.	53.	18.	10.10
+	HYDROGRAPH AT	16-22E	246.	12.58	76.	24.	8.	0.51
+	HYDROGRAPH AT	S43EW	73.	13.00	12.	3.	1.	6.67
+	ROUTED TO	R1622W	68.	13.33	12.	3.	1.	6.67
+	4 COMBINED AT	C1622E	991.	13.67	414.	125.	42.	11.60
+	ROUTED TO	RES16B	961.	13.83	324.	99.	33.	11.60
+	ROUTED TO	RGR5	955.	14.00	322.	99.	33.	11.60
+	3 COMBINED AT	CCB43	1160.	13.92	437.	140.	48.	11.60
+	DIVERSION TO	D43CB	1160.	13.92	437.	140.	48.	11.60
+	HYDROGRAPH AT	DCB43	0.	0.00	0.	0.	0.	11.60
+	HYDROGRAPH AT	D43CB	1160.	13.92	437.	140.	48.	11.60
+	ROUTED TO	RES22B	1160.	13.92	436.	139.	47.	11.60
+	DIVERSION TO	SD43AS	165.	12.75	160.	70.	24.	11.60
+	HYDROGRAPH AT	SD43A	995.	13.92	276.	69.	23.	11.60
+	ROUTED TO	RGR6	986.	14.00	276.	69.	23.	11.60

```
1****************************************
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *             JUN 09 1992              *
 *           VERSION 4.0.3E             *
 *                                      *
 *  RUN DATE  12/29/00  TIME  10:34:41  *
 *                                      *
 ****************************************
```

```
*****************************
*
*    U.S. ARMY CORPS OF ENGINE
*    HYDROLOGIC ENGINEERING CE
*          609 SECOND STREET
*       DAVIS, CALIFORNIA 9561
*          (916) 551-1748
*
*****************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTU
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1          ID   MARYVALE ADMS - FCD#93-29: CH2M HILL & Wood/Patel & Associates
   2          ID   Model for Entire Study Area (Approximately 100 square miles)
   3          ID   Existing Conditions
   4          ID   100Yr-24Hr Event
   5          ID   Clark Unit Hydrograph
   6          ID   24-Hour SCS TYPE II Rainfall Pattern was used to determine TC & R
   7          ID   Green-Ampt Precipitation Losses
   8          ID   Model Prepared and Checked by David Dust and Jim Geisbush
   9          ID   MV100-24 (BASE79): SWW\132586\HEC-1
  10          ID   January 1997
  11          ID  ******************************************************************************
  12          ID   HEC-1 ELEMENT NOMENCLATURE
  13          ID   SUB-BASIN HYDROGRAPH:
  14          ID      Example: "17-32N": the sub-basin is Section 17, T3N, R2E
  15          ID
  16          ID   SUB-BASIN DIVERSION:
  17          ID      Example: "D1732S": is the southerly component of divert in Section 17
  18          ID
  19          ID   SUB-BASIN ROUTE:
  20          ID      Example: "R1732S": is the southerly flow route through Sec. 17, T3N, R2E
  21          ID
  22          ID   SUB-BASIN RESERVOIR ROUTE OR SURGE BASIN DIVERT:
  23          ID      Example: "RES17": corresponds to a reservoir route or surge basin divert
  24          ID                        in Sub-basin 17-##
  25          ID
  26          ID   RETENTION BASIN DIVERT:
  27          ID      Example: "RET17": corresponds to retention basin divert in
  28          ID                        Sub-Basin 17-##
  29          ID
  30          ID   SUB-BASIN COMBINE:
  31          ID      Example: "C17-32": corresponds to sub-basin combine in Sec. 17, T3N, R2E
  32          ID
  33          ID   STREET ROUTE:
  34          ID      Example: "RPA1": first route for Peoria Avenue
  35          ID      Example" "R67C": third route for 67th Avenue
  36          ID
  37          ID   STREET CAPACITY DIVERSION:
  38          ID      Example: "SPA1S": first diversion from Peoria Avenue to the south
  39          ID
  40          ID   STREET INTERSECTION DIVERSION:
  41          ID      Example: "RPA67": flow component along Peoria Avenue from diversion at
  42          ID                        Peoria Avenue and 67th Avenue
  43          ID      Example: "R67PA": flow component along 67th Avenue from diversion at
  44          ID                        Peoria Avenue and 67th Avenue
  45          ID
  46          ID   STREET INTERSECTION COMBINE:
  47          ID      Example: "CPA67": hydrograph combine at the intersection of Peoria Avenue
  48          ID                        and 67th Avenue
  49          ID
  50          ID   STREET COMBINE:
```

```
  51          ID      Example: "CPA2": second hydrograph combine along Peoria Avenue
  52          ID
  53          ID   "NULL" COMBINE:
  54          ID      Example: "NULL2": dummy hydrograph combine used to free up a HEC-1
  55          ID                        computational path.  Hence, hydrograph is meaningless.
1                                           HEC-1 INPUT                                                    PAGE  2

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  56          ID
  57          ID   ******************************************************************************
  58          ID   STREET NAME CODES
  59          ID     Thunderbird Road  = TB
  60          ID     Cactus Road       = CR
  61          ID     Peoria Avenue     = PA
  62          ID     Olive Avenue      = OA
  63          ID     Northern Avenue   = NA
  64          ID     Glendale Avenue   = GA
  65          ID     Bethany Home Road = BH
  66          ID     Camelback Road    = CB
  67          ID     Indian School Road= IS
  68          ID     Thomas Road       = TR
  69          ID     McDowell Road     = MD
  70          ID   ******************************************************************************
  71          ID
              *DIAGRAM
  72          IT       5                    1000
  73          IO       5
  74          IN      15
  75          JD    3.69    0.01
  76          PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
  77          PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
  78          PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
  79          PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
  80          PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
  81          PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
  82          PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
  83          PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
  84          PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
  85          PC    .983    .986    .989    .992    .995    .998   1.000
  86          JD    3.47   10.00
  87          JD    3.32   30.00
  88          JD    3.17   60.00
  89          JD    3.12   90.00
  90          JD    3.08  120.00
  91          JD    3.04  150.00
  92          JD    2.95  300.00
  93          JD    2.88  500.00
              *
              *   Thunderbird Road Computation Path
1
                                          RUNOFF SUMMARY
                                   FLOW IN CUBIC FEET PER SECOND
                                 TIME IN HOURS,  AREA IN SQUARE MILES

                                 PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME O
        OPERATION       STATION  FLOW    PEAK                                            AREA      STAGE     MAX STA
+                                                    6-HOUR      24-HOUR      72-HOUR
                        *
        ROUTED TO
+                         R51H    275.   13.42        102.         32.          11.      8.07
        HYDROGRAPH AT
+                         D922W   435.   13.25        144.         41.          14.     10.10
        2 COMBINED AT
+                         C51D    695.   13.33        245.         73.          25.     10.10
        DIVERSION TO
+                         S51EW   428.   13.33        138.         34.          11.     10.10
        HYDROGRAPH AT
+                         S51ES   267.   13.33        107.         39.          13.     10.10
        ROUTED TO
+                         R51I    264.   13.50        107.         39.          13.     10.10
        ROUTED TO
+                         RES91   255.   13.67        107.         33.          11.     10.10
        2 COMBINED AT
+                         CBH51   508.   13.58        196.         58.          19.     10.10
        DIVERSION TO
+                         D51BH   508.   13.58        196.         58.          19.     10.10
        HYDROGRAPH AT
+                         DBH51     0.    0.00          0.          0.           0.     10.10
```

+	HYDROGRAPH AT	S51EW	428.	13.33	138.	34.	11.	10.10
+	ROUTED TO	R822EW	421.	13.50	138.	34.	11.	10.10
+	HYDROGRAPH AT	D822ES	312.	12.25	135.	41.	14.	12.60
+	2 COMBINED AT	C822E1	649.	13.50	266.	74.	25.	14.60
+	ROUTED TO	RES8	369.	14.50	217.	67.	23.	14.60
+	ROUTED TO	R822WW	368.	14.67	217.	67.	23.	14.60
+	HYDROGRAPH AT	D51BH	508.	13.58	196.	58.	19.	10.10
+	ROUTED TO	RGR4	504.	13.75	196.	58.	19.	10.10
+	HYDROGRAPH AT	SBH2S	705.	13.25	226.	63.	21.	10.10
+	ROUTED TO	R1622S	703.	13.33	226.	63.	21.	10.10
+	HYDROGRAPH AT	16-22E	287.	12.58	89.	28.	9.	0.51
+	HYDROGRAPH AT	S43EW	100.	13.00	18.	4.	1.	6.67
+	ROUTED TO	R1622W	97.	13.25	18.	4.	1.	6.67
+	4 COMBINED AT	C1622E	1345.	13.50	514.	151.	51.	11.60
+	ROUTED TO	RGR5	1343.	13.58	514.	151.	51.	11.60
+	3 COMBINED AT	CCB43	1594.	13.50	653.	200.	67.	11.60
+	DIVERSION TO	D43CB	1594.	13.50	653.	200.	67.	11.60
+	HYDROGRAPH AT	DCB43	0.	0.00	0.	0.	0.	11.60
+	HYDROGRAPH AT	D43CB	1594.	13.50	653.	200.	67.	11.60
+	DIVERSION TO	SD43AS	165.	12.25	162.	77.	26.	11.60
+	HYDROGRAPH AT	SD43A	1429.	13.50	491.	123.	41.	11.60
+	ROUTED TO	RGR6	1427.	13.58	491.	123.	41.	11.60

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *             JUN 09 1992               *
 *           VERSION 4.0.3E              *
 *                                       *
 *  RUN DATE  12/29/00  TIME  13:21:10   *
 *                                       *
 *****************************************
```

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*******************************
*                             *
*    U.S. ARMY CORPS OF ENGINE
*    HYDROLOGIC ENGINEERING CE
*          609 SECOND STREET
*       DAVIS, CALIFORNIA 9561
*           (916) 551-1748
*                             *
*******************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTU
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
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KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1          ID   MBJ modified in July, 2000
   2          ID   MV2400yt.dat
   3          ID   RETENTION BASINS ADDED IN SUBBASIN 9-22 AND 16-22E
   4          ID   100Yr-24Hr Event
   5          ID   ****************************************************************************
   6          ID   MARYVALE ADMS - FCD#93-29: CH2M HILL & Wood/Patel & Associates
   7          ID   Model for Entire Study Area (Approximately 100 square miles)
   8          ID   Existing Conditions
   9          ID   100Yr-24Hr Event
  10          ID   Clark Unit Hydrograph
  11          ID   24-Hour SCS TYPE II Rainfall Pattern was used to determine TC & R
  12          ID   Green-Ampt Precipitation Losses
  13          ID   Model Prepared and Checked by David Dust and Jim Geisbush
  14          ID   MV100-24 (BASE79): SWW\132586\HEC-1
  15          ID   January 1997
  16          ID  ******************************************************************************
  17          ID   HEC-1 ELEMENT NOMENCLATURE
  18          ID   SUB-BASIN HYDROGRAPH:
  19          ID      Example: "17-32N": the sub-basin is Section 17, T3N, R2E
  20          ID
  21          ID   SUB-BASIN DIVERSION:
  22          ID      Example: "D1732S": is the southerly component of divert in Section 17
  23          ID
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  29          ID                        in Sub-basin 17-##
  30          ID
  31          ID   RETENTION BASIN DIVERT:
  32          ID      Example: "RET17": corresponds to retention basin divert in
  33          ID                        Sub-Basin 17-##
  34          ID
  35          ID   SUB-BASIN COMBINE:
  36          ID      Example: "C17-32": corresponds to sub-basin combine in Sec. 17, T3N, R2E
  37          ID
  38          ID   STREET ROUTE:
  39          ID      Example: "RPA1": first route for Peoria Avenue
  40          ID      Example" "R67C": third route for 67th Avenue
  41          ID
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  43          ID      Example: "SPA1S": first diversion from Peoria Avenue to the south
  44          ID
  45          ID   STREET INTERSECTION DIVERSION:
  46          ID      Example: "RPA67": flow component along Peoria Avenue from diversion at
  47          ID                        Peoria Avenue and 67th Avenue
  48          ID      Example: "R67PA": flow component along 67th Avenue from diversion at
  49          ID                        Peoria Avenue and 67th Avenue
  50          ID
```

```
 51          ID   STREET INTERSECTION COMBINE:
 52          ID      Example: "CPA67": hydrograph combine at the intersection of Peoria Avenue
 53          ID                        and 67th Avenue
 54          ID
 55          ID   STREET COMBINE:
1                                   HEC-1 INPUT                                                    PAGE  2

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

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 57          ID
 58          ID   "NULL" COMBINE:
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 62          ID   ******************************************************************************
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 65          ID     Cactus Road       = CR
 66          ID     Peoria Avenue     = PA
 67          ID     Olive Avenue      = OA
 68          ID     Northern Avenue   = NA
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 71          ID     Camelback Road    = CB
 72          ID     Indian School Road= IS
 73          ID     Thomas Road       = TR
 74          ID     McDowell Road     = MD
 75          ID   ******************************************************************************
 76          ID
             *DIAGRAM
 77          IT       5                    400
 78          IO       5
 79          IN      15
 80          JD    3.69    0.01
 81          PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
 82          PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
 83          PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
 84          PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
 85          PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
 86          PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
 87          PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
 88          PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
 89          PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
 90          PC    .983    .986    .989    .992    .995    .998   1.000
 91          JD    3.47   10.00
 92          JD    3.32   30.00
 93          JD    3.17   60.00
 94          JD    3.12   90.00
 95          JD    3.08  120.00
 96          JD    3.04  150.00
 97          JD    2.95  300.00
 98          JD    2.88  500.00
             *
             *   Thunderbird Road Computation Path
1
                                        RUNOFF SUMMARY
                                   FLOW IN CUBIC FEET PER SECOND
                                 TIME IN HOURS,  AREA IN SQUARE MILES

                                PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME O
      OPERATION        STATION  FLOW    PEAK                                           AREA      STAGE     MAX STA
+                                                   6-HOUR     24-HOUR     72-HOUR
                       *
+                        R51H    275.   13.42        102.         32.         24.      8.07
      HYDROGRAPH AT
+                        D922W   435.   13.25        144.         41.         30.     10.10
      2 COMBINED AT
+                        C51D    695.   13.33        245.         73.         53.     10.10
      DIVERSION TO
+                        S51EW   409.   13.33        133.         33.         24.     10.10
      HYDROGRAPH AT
+                        S51ES   286.   13.33        112.         40.         29.     10.10
      ROUTED TO
+                        R51I    283.   13.50        112.         40.         29.     10.10
      HYDROGRAPH AT
+                         9-22    15.   12.00          2.          1.          0.      0.01
      2 COMBINED AT
+                        CBG51   283.   13.50        113.         41.         30.     10.10
      ROUTED TO
```

+		RES92	254.	13.75	99.	32.	23.	10.10
+	2 COMBINED AT	CBH51	495.	13.67	185.	57.	42.	10.10
+	DIVERSION TO	D51BH	495.	13.67	185.	57.	42.	10.10
+	HYDROGRAPH AT	DBH51	0.	0.00	0.	0.	0.	10.10
+	HYDROGRAPH AT	S51EW	409.	13.33	133.	33.	24.	10.10
+	ROUTED TO	R822EW	403.	13.50	133.	33.	24.	10.10
+	HYDROGRAPH AT	D822ES	309.	12.25	134.	41.	29.	12.60
+	2 COMBINED AT	C822E1	631.	13.50	261.	73.	53.	14.60
+	ROUTED TO	RES8	368.	14.50	181.	48.	35.	14.60
+	ROUTED TO	R822WW	366.	14.67	179.	48.	35.	14.60
+	HYDROGRAPH AT	D51BH	495.	13.67	185.	57.	42.	10.10
+	ROUTED TO	RGR4	492.	13.83	185.	57.	42.	10.10
+	HYDROGRAPH AT	SBH2S	705.	13.25	226.	63.	46.	10.10
+	ROUTED TO	R1622S	703.	13.33	226.	63.	46.	10.10
+	HYDROGRAPH AT	16-22E	287.	12.58	89.	28.	20.	0.51
+	HYDROGRAPH AT	S43EW	100.	13.00	18.	4.	3.	6.67
+	ROUTED TO	R1622W	97.	13.25	18.	4.	3.	6.67
+	4 COMBINED AT	C1622E	1299.	13.58	501.	149.	109.	11.60
+	ROUTED TO	RES16B	1274.	13.67	416.	122.	88.	11.60
+	ROUTED TO	RGR5	1266.	13.75	413.	122.	88.	11.60
+	3 COMBINED AT	CCB43	1499.	13.75	539.	168.	124.	11.60
+	DIVERSION TO	D43CB	1499.	13.75	539.	168.	124.	11.60
+	HYDROGRAPH AT	DCB43	0.	0.00	0.	0.	0.	11.60
+	HYDROGRAPH AT	D43CB	1499.	13.75	539.	168.	124.	11.60
+	ROUTED TO	RES22B	1499.	13.75	539.	167.	120.	11.60
+	DIVERSION TO	SD43AS	165.	12.67	162.	73.	53.	11.60
+	HYDROGRAPH AT	SD43A	1334.	13.75	377.	94.	68.	11.60
+	ROUTED TO	RGR6	1334.	13.75	377.	94.	68.	11.60

APPENDIX B
Retention Basins

1. Required Retention Volume Calculations
2. Basin Capacities
3. C-Coefficient Table from FCDMC Hydrology Manual

Project: Grand Avenue -51st Avenue / Bethany Home Road

Subject: Retention Calculations for 100-year, 2-hour Storm

Computed by: FT Date: 12/27/00 Checked by: CWR Date: 1/3/01

Volume, V = 7200CIA (per COG's Design Guidelines)

C =Weighted Runoff Coefficient

10.70 acres -Bare Ground	C = 0.35	From FCDMC
14.09 acres-Pavement	C = 0.95	Hydrology Manual

$$C = \frac{(0.35 \times 10.70) + (0.95 \times 14.09)}{24.79}$$

C = 0.69

$I = \frac{1.25 \text{ in}}{\text{hour}}$ (per COG's Design Guidelines)

A = 24.79 acres

Volume = 153,946 cubic feet or 3.5 acre-feet

Project 51st Avenue Overpass at Bethany Home Road/Grand Avenue

Subject: Ponding area and retention basin volume calculations

Baker

File Name: hhcbup.xls

Computed By: WC **Checked By:** **Date:** 12/29/00

Ponding Area Reduction (N/W corner of Grand Ave and 51st Ave Intersection)

Area	Area	Elev-P*	V	ExistingV	ProposedV	Q out
ft^2	acre	ft	Acre-Feet	Acre-Feet	Acre-Feet	cfs
0	0.00	1148	0	0	0	0
33252	0.76	1149	0.38	14.95	14.57	0.1
80146	1.84	1150	1.68	50.65	48.97	0.2
		1150.5	2.60	78.30	75.70	310
80000	1.84	1151	3.52	116.78	113.26	1070
80000	1.84	1152	5.36	220.43	215.07	4090

*Elev-P Elevation used in HEC-1 model based on NGVD 1929 Datum

Rose Lane Park (used as a detention basin)

Area	Area	V	Elev-P	Q out
ft^2	acre	Acre-Feet	ft	cfs
36300	0.83	0.28	1147.6	0
81335	1.87	2.14	1148.6	0
84635	1.94	3.10	1149.1	0
342292	7.86	10.96	1150.1	0
352202	8.09	14.94	1150.6	0
358817	8.24	19.02	1151.1	221
365432	8.39	23.18	1151.6	713
372047	8.54	27.41	1152.1	1575

Basin 1 (East of 52st Ave north of Montebello Ave)

Area	Area	V	Elev-P	Q out
ft^2	acre	Acre-Feet	ft	cfs
2801	0.06	0.00	1136.6	0
4947	0.11	0.09	1137.6	0
7093	0.16	0.23	1138.6	0
9239	0.21	0.41	1139.6	0

Basin 2 (East of 51st Ave west of Grand Ave)

Area	Area	V	Elev-P	Q out
ft^2	acre	Acre-Feet	ft	cfs
40122	0.92	1.65	1136.6	0
44375	1.02	2.62	1137.6	0
48629	1.12	3.69	1138.6	0
53502	1.23	4.86	1139.6	0
58685	1.35	6.15	1140.6	0
64178	1.47	7.56	1141.6	0
68778	1.58	9.08	1142.6	0
76094	1.75	10.75	1143.6	0
80694	1.85	11.65	1144.1	0
85294	1.96	12.60	1144.6	88

Project 51st Avenue Overpass at Bethany Home Road/Grand Avenue

Subject: Retention basin volume calculations

Baker

File Name: hhcbup.xls

Computed By: WC **Checked By:** **Date:** 12/29/00

Basin 3 at north and east of the North Service Road

Area	Area	V	Elev-P	Q out
ft^2	acre	Acre-Feet	ft	cfs
56396	1.29	0.32	1142.6	0
63568	1.46	1.70	1143.6	0
70740	1.62	3.24	1144.6	0
77928	1.79	4.95	1145.6	0
101524	2.33	7.01	1146.6	0
116446	2.67	9.51	1147.6	0
123906	2.84	12.27	1148.6	0
131367	3.02	13.73	1149.1	0
117740	2.70	15.16	1149.6	20
113370	2.60	16.49	1150.1	300
116024	2.66	17.81	1150.6	900
116024	2.66	19.14	1151.1	2000

Basin 4 at north and east of the North Service Road

A ft^2	A acre	Acre-Feet	Elev-P	Q out
0	0.00	0.00	1142.6	0
0	0.00	0.00	1143.6	0
0	0.00	0.00	1144.6	0
0	0.00	0.00	1145.6	0
0	0.00	0.00	1146.6	0
2776	0.06	0.03	1147.6	0
4014	0.09	0.11	1148.6	0
5684	0.13	0.17	1149.1	0
7353	0.17	0.24	1149.6	20
8888	0.20	0.33	1150.1	300
10423	0.24	0.44	1150.6	900
12176	0.28	0.57	1151.1	2000

Basin 5 at north and east of the North Service Road

Area	Area	V	Elev-P	Q out
ft^2	acre	Acre-Feet	ft	cfs
0	0.00	0.00	1142.6	0
4704	0.11	0.05	1143.6	0
6499	0.15	0.18	1144.6	0
8675	0.20	0.36	1145.6	0
11232	0.26	0.59	1146.6	0
14172	0.33	0.88	1147.6	0
17493	0.40	1.24	1148.6	0
19344	0.44	1.45	1149.1	0
21195	0.49	1.68	1149.6	20
23474	0.54	1.94	1150.1	300
25753	0.59	2.22	1150.6	900
25753	0.59	2.52	1151.1	2000

Project 51st Avenue Overpass at Bethany Home Road/Grand Avenue

Subject: Retention basin volume calculations

Baker

File Name: hhcbup.xls

Computed By: WC **Checked By:** **Date:** 12/29/00

Basin 3 + Basin 4 + Basin 5

Area	Area	V	Elev-P	Q out
ft^2	acre	Acre-Feet	ft	cfs
56396	1.29	0.3	1142.6	0
63568	1.46	1.8	1143.6	0
70740	1.62	3.6	1144.6	0
77928	1.79	5.6	1145.6	0
87881	2.02	7.9	1146.6	0
97834	2.25	10.7	1147.6	0
102811	2.36	13.9	1148.6	0
107787	2.47	15.7	1149.1	0
117740	2.70	17.4	1149.6	20
113370	2.60	19.1	1150.1	300
116024	2.66	20.8	1150.6	900
116024	2.66	22.7	1151.1	2000

Basin 3 + 4 + 5 +Rose Lane Park at east of North Service Road

V	Elev-P	Q out
Acre-Feet	ft	cfs
0.32	1142.6	0
1.83	1143.6	0
3.65	1144.6	0
5.60	1145.6	0
7.89	1146.6	0
11.00	1147.6	0
16.06	1148.6	0
18.75	1149.1	0
24.41	1149.6	20
30.02	1150.1	300
35.71	1150.6	900
41.76	1151.1	2000

Table 3.2
C Coefficients for Use with the Rational Method

Land Use	Return Period			
	2-10 Year	25 Year	50 Year	100 Year
Streets and Roads				
Paved Roads	0.75 – 0.85	0.83 – 0.94	0.90 – 0.95	0.94 – 0.95
Gravel Roadways & Shoulders	0.60 – 0.70	0.66 – 0.77	0.72 – 0.84	0.75 – 0.88
Industrial Areas				
Heavy	0.70 – 0.80	0.77 – 0.88	0.84 – 0.95	0.88 – 0.95
Light	0.60 – 0.70	0.66 – 0.77	0.72 – 0.84	0.75 – 0.88
Business Areas				
Downtown	0.75 – 0.85	0.83 – 0.94	0.90 – 0.95	0.94 – 0.95
Neighborhood	0.55 – 0.65	0.61 – 0.72	0.66 – 0.78	0.69 – 0.81
Residential Areas				
Lawns – Flat	0.10 – 0.25	0.11 – 0.28	0.12 – 0.30	0.13 – 0.31
– Steep	0.25 – 0.40	0.28 – 0.44	0.30 – 0.48	0.31 – 0.50
Suburban	0.30 – 0.40	0.33 – 0.44	0.36 – 0.48	0.38 – 0.50
Single Family	0.45 – 0.55	0.50 – 0.61	0.54 – 0.66	0.56 – 0.69
Multi-Unit	0.50 – 0.60	0.55 – 0.66	0.60 – 0.72	0.63 – 0.75
Apartments	0.60 – 0.70	0.66 – 0.77	0.72 – 0.84	0.75 – 0.88
Parks/Cemetaries	0.10 – 0.25	0.11 – 0.28	0.12 – 0.30	0.13 – 0.31
Playgrounds	0.40 – 0.50	0.44 – 0.55	0.48 – 0.60	0.50 – 0.63
Agricultural Areas	0.10 – 0.20	0.11 – 0.22	0.12 – 0.24	0.13 – 0.25
Bare Ground	0.20 – 0.30	0.22 – 0.33	0.24 – 0.36	0.25 – 0.38
Undeveloped Desert	0.30 – 0.40	0.33 – 0.44	0.36 – 0.48	0.38 – 0.50
Mountain Terrain (Slopes > 10%)	0.60 – 0.80	0.66 – 0.88	0.72 – 0.95	0.75 – 0.95

Note: Values of C for 25, 50 and 100 Year were derived using frequency adjustment factors of 1.10, 1.20, and 1.25, respectively, with an upper limit of 0.95 for C for the 2-10 Year values.

APPENDIX C
Rational Method and Catch Basin Location

1. Rainfall Intensity
2. Figure 3.2 from FCDMC Hydrology Manual
3. Discharge Calculations and Catch Basin Design for:
   a) 51st Avenue (North and Southbound Lanes)
   b) North Service Road
   c) 52nd Avenue

Project:	51st Avenue Overpass at Grand Avenue/Bethany Home Road		Baker
Subject	Development of the rainfall depths of different durations for different recurrence intervals		
		File Name:	Rainfa51.xls
Computed By:	WC **Checked By:**	**Date:**	Dec. 28, 2000

The values of the rainfall depths read from the isopluvial maps at the end of ADOT's hydrology manual are listed in the table below:

Precipitation depths in inches

	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
6-hr	1.20					3.00
24-hr	1.40					3.80

The values of the 1 hour Precipitation depths for the different recurrence intervals were calcualted using the equations listed in the ADOT's hydrology manual.

Precipitation depths in inches

	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1-hr	**0.96**					**2.28**	
Zone							**8**

The values of the rainfall depths for the different recurrence intervals were calcualted using the equations listed in the ADOT's hydrology manual. The isopluvial maps used to generate the input are included at the end of this appendix.

Table A1. Rainfall Depths in Inches for Different Recurrence Intervals

Duration	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
5-min	0.33	0.41	0.47	0.55	0.62	0.68	0.84
10-min	0.49	0.62	0.71	0.85	0.95	1.05	1.29
15-min	0.59	0.77	0.90	1.07	1.21	1.35	1.66
30-min	0.79	1.04	1.21	1.45	1.64	1.83	2.26
1-hr	0.96	1.28	1.50	1.81	2.05	2.28	2.83
2-hr	1.04	1.40	1.65	2.00	2.26	2.53	3.14
3-hr	1.10	1.49	1.75	2.12	2.41	2.69	3.35
6-hr	1.20	1.64	1.94	2.36	2.68	3.00	3.74
12-hr	1.30	1.82	2.17	2.66	3.03	3.40	4.26
24-hr	1.40	2.00	2.40	2.95	3.38	3.80	4.78

Intensity (in/hr) ADOT

Duration	10-yr	25-yr	50-yr	100-yr	500-yr
10-min	**4.28**	5.07	**5.69**	6.30	7.71
15-min	3.60	4.30	4.84	5.39	6.64
30-min	2.42	2.90	3.28	3.65	4.51
1-hr	1.50	1.81	2.05	2.28	2.83

Intensity (in/hr) Maricopa County Standard

Duration	10-yr	25-yr	50-yr	100-yr	
5-min	5.80	7.05	8.10	9.00	
10-min	**4.50**	5.45	**6.20**	**6.95**	
15-min	3.75	4.65	5.30	5.90	
30-min	2.55	3.10	3.55	4.00	

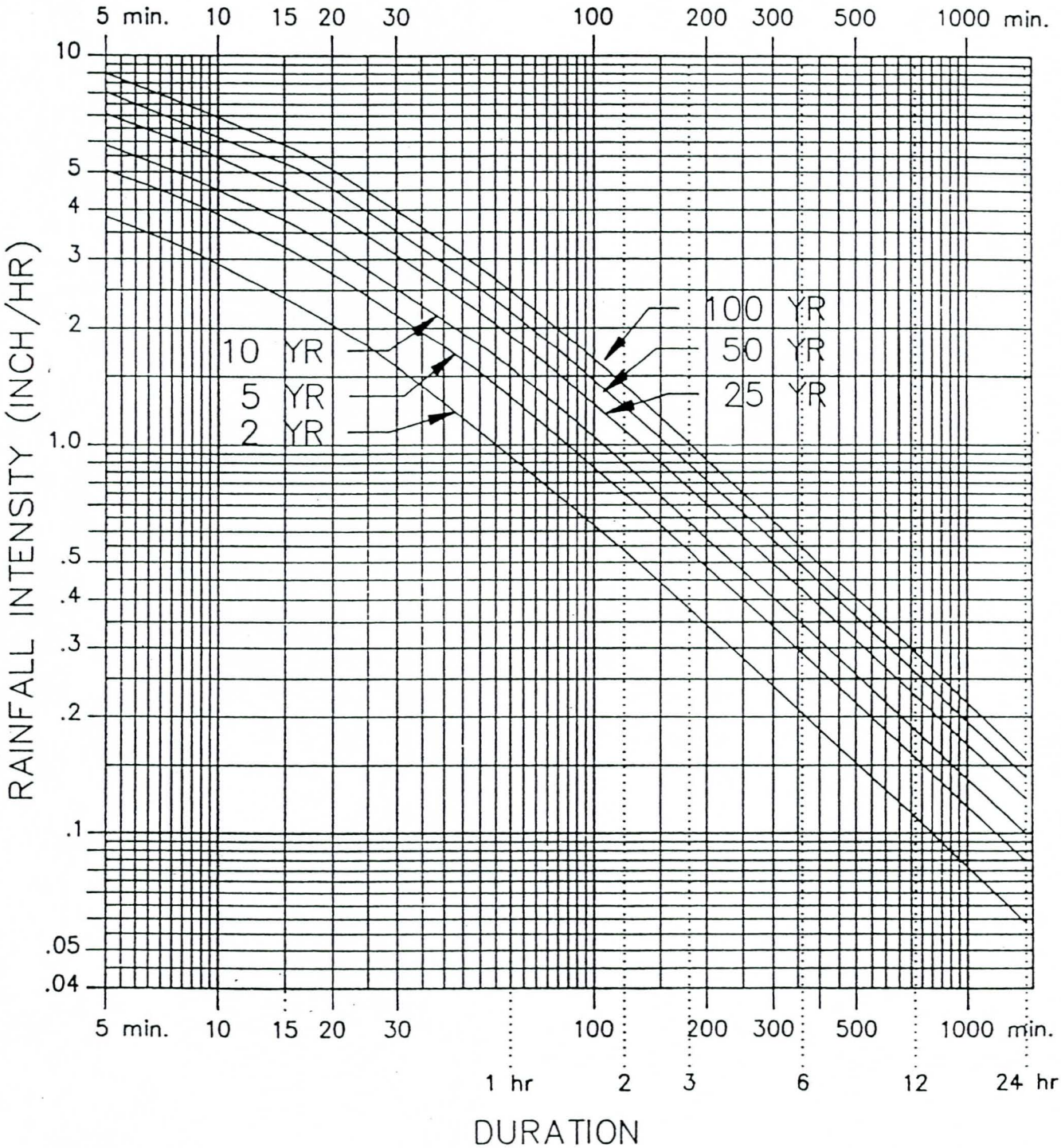

Figure 3.2
Rainfall Intensity-Duration-Frequency Relation
(Phoenix Metro Area)

Calculations for 51st Avenue
10-year Storm

Project:	51st Avenue Overpass at Grand Avenue/Bethany Home Road				Baker
Subject	On-Site Drainage Spread Calc's				
				Filename:	51cbcalc_rev2.xls
Computed By:	WC-GL	**Checked By:**	AGP	**Date:**	December 12, 2000

South Bound Lanes

Station	Width (ft)	Area (acres)	Q10 (cfs)	i_{10} (in/hr)	C
101+10.00	31.00	0.000	0.00	4.50	0.95
100+50.00	31.00	0.043	0.18	4.50	0.95
100+00.00	31.00	0.078	0.33	4.50	0.95
99+50.00	31.00	0.114	0.49	4.50	0.95
99+00.00	31.00	0.149	0.64	4.50	0.95
98+50.00	31.00	0.185	0.79	4.50	0.95
98+00.00	31.00	0.221	0.94	4.50	0.95
97+50.00	31.00	0.256	1.10	4.50	0.95
97+00.00	31.00	0.292	1.25	4.50	0.95
96+50.00	31.00	0.327	1.40	4.50	0.95
96+00.00	31.00	0.363	1.55	4.50	0.95
95+50.00	31.00	0.399	1.70	4.50	0.95
95+00.00	31.00	0.434	1.86	4.50	0.95
94+50.00	31.00	0.470	2.01	4.50	0.95
94+00.00	31.00	0.505	2.16	4.50	0.95
93+40.00	**31.00**	**0.548**	**2.34**	**4.50**	**0.95**
93+00.00	31.00	0.028	0.12	4.50	0.95
92+70.00	31.00	0.050	0.21	4.50	0.95
92+00.00	39.56	0.107	0.46	4.50	0.95
91+35.00	42.96	0.168	0.72	4.50	0.95
91+34.00	42.99	0.169	0.72	4.50	0.95
90+40.00	**45.00**	**0.264**	**1.13**	**4.50**	**0.95**
89+90.00	86.00	0.075	0.32	4.50	0.95
89+75.00	86.00	0.105	0.45	4.50	0.95
89+00.00	86.00	0.253	1.08	4.50	0.95
88+50.00	86.00	0.352	1.50	4.50	0.95
87+80.00	86.00	0.490	2.09	4.50	0.95
87+47.00	**86.00**	**0.555**	**2.37**	**4.50**	**0.95**

Project:	51st Avenue Overpass at Grand Avenue/Bethany Home Road				Baker
Subject	On-Site Drainage Spread Calc's				
				Filename:	51cbcalc_rev2.xls
Computed By:	WC-GL	**Checked By:**	AGP	**Date:**	December 12, 2000

Station	Width (ft)	Area (acres)	Q10 (cfs)	i_{10} (in/hr)	C
South Bound Lanes					
101+10.00	31.00	0.000	0.00	4.50	0.95
102+00.00	31.00	0.064	0.27	4.50	0.95
102+50.00	31.00	0.100	0.43	4.50	0.95
103+00.00	31.00	0.135	0.58	4.50	0.95
103+50.00	31.00	0.171	0.73	4.50	0.95
104+00.00	31.00	0.206	0.88	4.50	0.95
104+50.00	31.00	0.242	1.03	4.50	0.95
105+00.00	31.00	0.278	1.19	4.50	0.95
106+00.00	31.00	0.349	1.49	4.50	0.95
106+50.00	31.00	0.384	1.64	4.50	0.95
107+00.00	31.00	0.420	1.79	4.50	0.95
107+50.00	31.00	0.455	1.95	4.50	0.95
107+98.00	**31.00**	**0.490**	**2.09**	**4.50**	**0.95**
108+00.00	31.00	0.001	0.01	4.50	0.95
109+00.00	31.00	0.073	0.31	4.50	0.95
109+15.00	31.00	0.083	0.36	4.50	0.95
110+00.00	31.00	0.144	0.61	4.50	0.95
110+10.00	31.00	0.151	0.64	4.50	0.95
111+00.00	87.50	0.273	1.17	4.50	0.95
111+15.00	87.50	0.303	1.30	4.50	0.95
111+16.00	87.50	0.305	1.31	4.50	0.95
112+00.00	**87.50**	**0.474**	**2.03**	**4.50**	**0.95**
112+50.00	87.50	0.100	0.43	4.50	0.95
113+25.00	**87.50**	**0.251**	1.07	**4.50**	0.95
113+75.00	**87.50**	**0.100**	**0.43**	**4.50**	**0.95**

Project:	51st Avenue Overpass at Grand Avenue/Bethany Home Road			Baker
Subject	On-Site Drainage Spread Calc's			
			Filename:	51cbcalc_rev2.xls
Computed By:	WC-GL	**Checked By:**	**Date:**	December 12, 2000

North Bound Lanes

Station	Width (ft)	Area (acres)	Q10 (cfs)	i_{10} (in/hr)	C
101+10.00	40.00	0.00	0.00	4.50	0.95
100+00.00	40.00	0.101	0.43	4.50	0.95
99+50.00	40.00	0.147	0.63	4.50	0.95
99+00.00	40.00	0.193	0.82	4.50	0.95
98+50.00	40.00	0.239	1.02	4.50	0.95
98+00.00	40.00	0.285	1.22	4.50	0.95
97+50.00	40.00	0.331	1.41	4.50	0.95
97+00.00	40.00	0.376	1.61	4.50	0.95
96+50.00	40.00	0.422	1.81	4.50	0.95
96+00.00	40.00	0.468	2.00	4.50	0.95
95+50.00	40.00	0.514	2.20	4.50	0.95
95+00.00	40.00	0.560	2.39	4.50	0.95
94+50.00	40.00	0.606	2.59	4.50	0.95
94+00.00	40.00	0.652	2.79	4.50	0.95
93+40.00	**40.00**	**0.707**	**3.02**	**4.50**	0.95
93+00.00	40.00	0.037	0.16	4.50	0.95
92+50.00	40.00	0.083	0.35	4.50	0.95
92+00.00	**40.00**	**0.129**	**0.55**	**4.50**	0.95
91+35.00	40.00	0.060	0.26	4.50	0.95
90+40.00	**40.00**	**0.147**	**0.63**	**4.50**	0.95

Project:	51st Avenue Overpass at Grand Avenue/Bethany Home Road			Baker
Subject	On-Site Drainage Spread Calc's			
			Filename:	51cbcalc_rev2.xls
Computed By:	WC-GL	**Checked By:**	**Date:**	December 12, 2000

North Bound Lanes

North Bound Lanes

Station	Width (ft)	Area (acres)	Q10 (cfs)	i_{10} (in/hr)	C
101+10.00	40.00	0.000	0.00	4.50	0.95
102+00.00	40.00	0.083	0.35	4.50	0.95
102+50.00	40.00	0.129	0.55	4.50	0.95
103+00.00	40.00	0.174	0.75	4.50	0.95
103+50.00	40.00	0.220	0.94	4.50	0.95
104+00.00	40.00	0.266	1.14	4.50	0.95
104+50.00	40.00	0.312	1.33	4.50	0.95
105+00.00	40.00	0.358	1.53	4.50	0.95
105+50.00	40.00	0.404	1.73	4.50	0.95
106+00.00	40.00	0.450	1.92	4.50	0.95
106+50.00	40.00	0.496	2.12	4.50	0.95
107+00.00	40.00	0.542	2.32	4.50	0.95
107+50.00	40.00	0.588	2.51	4.50	0.95
107+98.00	**40.00**	**0.632**	**2.70**	**4.50**	0.95
108+65.00	40.00	0.062	0.26	4.50	0.95
109+00.00	40.00	0.094	0.40	4.50	0.95
109+15.00	40.00	0.107	0.46	4.50	0.95
110+10.00	**50.56**	**0.206**	**0.88**	**4.50**	0.95

Project: 51st Avenue Overpass at Grand Avenue/Bethany Home Road

Subject: Pavement Drainage Analysis

Filename: 51cbcalc_rev2.xls

Computed By: WC-GL **Checked By:** **Date:** December 21,2000

Baker

n = 0.016

10-year Computations

SB Station	Q10 (cfs)	Qinlet (cfs)	So ('/ft)	Sx ('/ft)	Sw ('/ft)	Spread Allow (ft)	Spread Calc (ft)	E	Qi (cfs)	Qb (cfs)	Qtot (cfs)	Depth (in)	V (fps)	Inlet Type	Grate L (ft)	Grate W (ft)	Curb Opening L (ft)
93+40.00	2.34	2.34	0.0370	0.0097	0.0670	0.07	10.26	0.65	1.53	0.80	2.33	2.52	3.74	Grate	3.50	2.00	N/A
90+40.00	1.13	1.93	0.0479	0.0240	0.0670	0.07	3.65	0.96	1.85	0.08	1.93	2.64	5.46	Combination	3.00	2.00	6.00
87+47.00	2.37	2.51	0.0177	0.0240	0.0670	0.07	6.34	1.00	2.51	0.00	2.51	3.36	3.70	Combination	3.00	2.00	10.00
107+98.00	2.09	2.09	0.0331	0.0093	0.0670	13.00	10.19	0.66	1.39	0.69	2.08	2.52	3.48	Grate	3.50	2.00	N/A
112+00.00	2.03	2.72	0.0411	0.0240	0.0670	14.00	5.07	0.84	2.28	0.44	2.72	3.00	5.38	Combination	3.00	2.00	6.00
113+25.00	1.07	1.51	0.0147	0.0240	0.0670	14.00	4.82	0.99	1.50	0.01	1.51	2.88	3.19	Combination	3.00	2.00	6.00
113+75.00	0.43	1.66	0.0000	0.0240	0.0670	14.00	3.94	1.00	1.66	0.00	1.66	4.68		Combination	3.00	2.00	17.00
114+95.00	13.64	13.64	0.0030	0.0240	0.0670	20.83	20.81	0.91	12.42	1.22	13.64	7.56	2.51	Combination	3.00	2.00	17.00

*** Discharge at 114+95 was calculated based on street capacity**

NB Station	Q10 (cfs)	Qinlet (cfs)	So ('/ft)	Sx ('/ft)	Sw ('/ft)	Spread Allow (ft)	Spread Calc (ft)	E	Qi (cfs)	Qb (cfs)	Qtot (cfs)	Depth (in)	V (fps)	Inlet Type	Grate L (ft)	Grate W (ft)	Curb Opening L (ft)
93+40.00	3.02	3.02	0.0370	0.0097	0.0670	24.00	8.93	0.73	2.20	0.82	3.02	3.12	4.67	Combination	3.00	2.00	6.00
92+00.00	0.55	1.37	0.0438	0.0231	0.0670	24.00	4.36	0.84	1.16	0.21	1.37	2.28	4.44	Grate	3.50	2.00	N/A
90+40.00	0.63	0.84	0.0479	0.0240	0.0670	24.00	2.99	0.93	0.78	0.06	0.84	1.92	4.34	Grate	3.50	2.00	N/A
107+98.00	2.70	2.70	0.0331	0.0093	0.0670	24.00	8.72	0.99	2.68	0.02	2.70	3.00	4.40	Combination	3.00	2.00	10.00
110+10.00	0.88	0.90	0.0433	0.0201	0.0670	24.00	3.50	0.93	0.84	0.06	0.90	1.92	4.13	Grate	3.50	2.00	N/A
118+35.00	10.34	10.34	0.0030	0.0091	0.0670	34.00	34.00	0.84	8.67	1.67	10.34	5.76	1.87	Combination	3.00	2.00	17.00

*** Discharge at 118+35 was calculated based on street capacity**

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*****************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
*****************************************************
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: CB100

STATION: 87+47(SB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.018	0.024	0.016	2.51	6.34

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
3.00	0.067	2.00	0.907	0.28	3.70

INLET INTERCEPTION

Inlet Type	LT or W (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb-Opening	11.60	8.00	0.770	1.93	0.58
Reticuline	2.00	1.50	0.980	0.57	0.00
Combination			1.000	2.51	0.00

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
*************************************************
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: CB101

STATION: 90+40(SB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.048	0.024	0.016	1.93	3.65

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
3.00	0.067	2.00	0.996	0.22	5.46

INLET INTERCEPTION

Inlet Type	LT or W (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb-Opening	13.39	4.80	0.390	0.76	1.16
Reticuline	2.00	1.50	0.930	1.07	0.08
Combination			0.959	1.85	0.08

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
*************************************************
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DESIGNER: GL

DATE: 12-20-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: CB104

STATION: 93+40(SB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.037	0.010	0.016	2.34	10.26

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
2.00	0.067	N/A	0.647	0.21	3.74

INLET INTERCEPTION

Inlet Type	L (ft)	W (ft)	E	Qi (cfs)	Qb (cfs)
Reticuline	1.75	2.00	0.650	1.53	0.80

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-20-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: CB106

STATION: 107+98(SB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.033	0.009	0.016	2.09	10.19

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
2.00	0.067	N/A	0.658	0.21	3.48

INLET INTERCEPTION

Inlet Type	L (ft)	W (ft)	E	Qi (cfs)	Qb (cfs)
Reticuline	1.75	2.00	0.660	1.39	0.69

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*****************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: Cb109

STATION: 112+00(SB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.041	0.024	0.016	2.72	5.07

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
3.00	0.067	2.00	0.962	0.25	5.38

INLET INTERCEPTION

Inlet Type	LT or W (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb-Opening	15.03	4.80	0.350	0.97	1.75
Reticuline	2.00	1.50	0.750	1.31	0.44
Combination			0.838	2.28	0.44

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: CB110

STATION: 113+25(SB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.015	0.024	0.016	1.51	4.82

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
3.00	0.067	2.00	0.972	0.24	3.19

INLET INTERCEPTION

Inlet Type	LT or W (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb-Opening	8.57	4.80	0.580	0.87	0.63
Reticuline	2.00	1.50	0.970	0.61	0.01
Combination			0.993	1.50	0.01

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: CB111

STATION: 113+75 (SB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	Sx (ft/ft)	Sw (ft/ft)	n	W (ft)	a (in)
Composite/dep	0.024	0.123	0.016	3.00	2.00

INLET INTERCEPTION

Inlet Type * Sag *	L (ft)	h (in) W (ft)	T (ft)	d (ft)	Qi (cfs)
Curb-Opening	13.60	8.00			
Reticuline	1.50	2.00			
Sweeper Combination			3.94	0.39	1.65

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*****************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
*****************************************************
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51st Ave

PROJECT NO.: 24328

INLET NO.: Cb112

STATION: 114+95(SB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

SUPERELEVATED STREET CAPACITY CALC'S

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.003	0.024	0.016	13.64	20.81

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
3.00	0.067	2.00	0.389	0.63	2.51

INLET INTERCEPTION

Inlet Type	LT or W (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb-Opening	19.86	13.60	0.810	11.12	2.51
Reticuline	2.00	1.50	0.510	1.29	1.22
Combination			0.911	12.42	1.22

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: CB102

STATION: 90+40 (NB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.048	0.024	0.016	0.84	2.99

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
2.00	0.067	N/A	0.981	0.16	4.34

INLET INTERCEPTION

Inlet Type	L (ft)	W (ft)	E	Qi (cfs)	Qb (cfs)
Reticuline	1.75	2.00	0.930	0.78	0.06

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: CB103

STATION: 92+00(NB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.044	0.023	0.016	1.37	4.36

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
2.00	0.067	N/A	0.899	0.19	4.44

INLET INTERCEPTION

Inlet Type	L (ft)	W (ft)	E	Qi (cfs)	Qb (cfs)
Reticuline	1.75	2.00	0.840	1.16	0.21

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*****************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
*****************************************************
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: Cb105

STATION: 93+40(NB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.037	0.010	0.016	3.02	8.93

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
3.00	0.067	2.00	0.885	0.26	4.67

INLET INTERCEPTION

Inlet Type	LT or W (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb-Opening	15.97	4.80	0.340	1.02	2.00
Reticuline	2.00	1.50	0.590	1.18	0.82
Combination			0.728	2.20	0.82

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
*************************************************
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: CB107

STATION: 107+98(NB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.033	0.009	0.016	2.70	8.72

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
3.00	0.067	2.00	0.898	0.25	4.40

INLET INTERCEPTION

Inlet Type	LT or W (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb-Opening	14.64	8.00	0.650	1.76	0.94
Reticuline	2.00	1.50	0.970	0.91	0.02
Combination			0.993	2.68	0.02

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: CB108

STATION: 110+10(NB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.043	0.020	0.016	0.90	3.50

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
2.00	0.067	N/A	0.963	0.16	4.13

INLET INTERCEPTION

Inlet Type	L (ft)	W (ft)	E	Qi (cfs)	Qb (cfs)
Reticuline	1.75	2.00	0.930	0.84	0.06

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: CB113

STATION: 118+35(NB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

½ STREET CAPACITY CALC'S

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.003	0.009	0.016	10.34	34.00

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
3.00	0.067	2.00	0.301	0.48	1.87

INLET INTERCEPTION

Inlet Type	LT or W (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb-Opening	22.01	13.60	0.760	7.88	2.46
Reticuline	2.00	1.50	0.320	0.79	1.67
Combination			0.839	8.67	1.67

Calculations for 51st Avenue 100-year Storm

Project:	51st Avenue Overpass at Grand Avenue/Bethany Home Road				Baker
Subject	On-Site Drainage Spread Calc's				
				Filename:	51cbcalc_rev2.xls
Computed By:	WC-GL	**Checked By:**	AGP	**Date:**	December 12, 2000

South Bound Lanes

Station	Width (ft)	Area (acres)	Q100 (cfs)	i_{100} (in/hr)	C
101+10.00	31.00	0.000	0.00	6.95	0.95
100+50.00	31.00	0.043	0.28	6.95	0.95
100+00.00	31.00	0.078	0.52	6.95	0.95
99+50.00	31.00	0.114	0.75	6.95	0.95
99+00.00	31.00	0.149	0.99	6.95	0.95
98+50.00	31.00	0.185	1.22	6.95	0.95
98+00.00	31.00	0.221	1.46	6.95	0.95
97+50.00	31.00	0.256	1.69	6.95	0.95
97+00.00	31.00	0.292	1.93	6.95	0.95
96+50.00	31.00	0.327	2.16	6.95	0.95
96+00.00	31.00	0.363	2.40	6.95	0.95
95+50.00	31.00	0.399	2.63	6.95	0.95
95+00.00	31.00	0.434	2.87	6.95	0.95
94+50.00	31.00	0.470	3.10	6.95	0.95
94+00.00	31.00	0.505	3.34	6.95	0.95
93+40.00	**31.00**	**0.548**	**3.62**	**6.95**	**0.95**
93+00.00	31.00	0.028	0.19	6.95	0.95
92+70.00	31.00	0.050	0.33	6.95	0.95
92+00.00	39.56	0.107	0.70	6.95	0.95
91+35.00	42.96	0.168	1.11	6.95	0.95
91+34.00	42.99	0.169	1.12	6.95	0.95
90+40.00	**45.00**	**0.264**	**1.74**	**6.95**	**0.95**
89+90.00	86.00	0.075	0.50	6.95	0.95
89+75.00	86.00	0.105	0.69	6.95	0.95
89+00.00	86.00	0.253	1.67	6.95	0.95
88+50.00	86.00	0.352	2.32	6.95	0.95
87+80.00	86.00	0.490	3.23	6.95	0.95
87+47.00	**86.00**	**0.555**	**3.66**	**6.95**	**0.95**

Project:	51st Avenue Overpass at Grand Avenue/Bethany Home Road				Baker
Subject	On-Site Drainage Spread Calc's				
				Filename:	51cbcalc_rev2.xls
Computed By:	WC-GL	**Checked By:**	AGP	**Date:**	December 12, 2000

South Bound Lanes

Station	Width (ft)	Area (acres)	Q100 (cfs)	i_{100} (in/hr)	C
101+10.00	31.00	0.000	0.00	6.95	0.95
102+00.00	31.00	0.064	0.42	6.95	0.95
102+50.00	31.00	0.100	0.66	6.95	0.95
103+00.00	31.00	0.135	0.89	6.95	0.95
103+50.00	31.00	0.171	1.13	6.95	0.95
104+00.00	31.00	0.206	1.36	6.95	0.95
104+50.00	31.00	0.242	1.60	6.95	0.95
105+00.00	31.00	0.278	1.83	6.95	0.95
106+00.00	31.00	0.349	2.30	6.95	0.95
106+50.00	31.00	0.384	2.54	6.95	0.95
107+00.00	31.00	0.420	2.77	6.95	0.95
107+50.00	31.00	0.455	3.01	6.95	0.95
107+98.00	**31.00**	**0.490**	**3.23**	**6.95**	**0.95**
108+00.00	31.00	0.001	0.01	6.95	0.95
109+00.00	31.00	0.073	0.48	6.95	0.95
109+15.00	31.00	0.083	0.55	6.95	0.95
110+00.00	31.00	0.144	0.95	6.95	0.95
110+10.00	31.00	0.151	1.00	6.95	0.95
111+00.00	87.50	0.273	1.80	6.95	0.95
111+15.00	87.50	0.303	2.00	6.95	0.95
111+16.00	87.50	0.305	2.02	6.95	0.95
112+00.00	**87.50**	**0.474**	**3.13**	**6.95**	**0.95**
112+50.00	87.50	0.100	0.66	6.95	0.95
113+25.00	**87.50**	**0.251**	1.66	6.95	0.95
113+75.00	**87.50**	**0.100**	**0.66**	**6.95**	**0.95**

Project:	51st Avenue Overpass at Grand Avenue/Bethany Home Road			Baker
Subject	On-Site Drainage Spread Calc's			
			Filename:	51cbcalc_rev2.xls
Computed By:	WC-GL	**Checked By:**	**Date:**	December 12, 2000

North Bound Lanes

North Bound Lanes

Station	Width (ft)	Area (acres)	Q100 (cfs)	i_{100} (in/hr)	C
101+10.00	40.00	0.00	0.00	6.95	0.95
100+00.00	40.00	0.101	0.67	6.95	0.95
99+50.00	40.00	0.147	0.97	6.95	0.95
99+00.00	40.00	0.193	1.27	6.95	0.95
98+50.00	40.00	0.239	1.58	6.95	0.95
98+00.00	40.00	0.285	1.88	6.95	0.95
97+50.00	40.00	0.331	2.18	6.95	0.95
97+00.00	40.00	0.376	2.49	6.95	0.95
96+50.00	40.00	0.422	2.79	6.95	0.95
96+00.00	40.00	0.468	3.09	6.95	0.95
95+50.00	40.00	0.514	3.40	6.95	0.95
95+00.00	40.00	0.560	3.70	6.95	0.95
94+50.00	40.00	0.606	4.00	6.95	0.95
94+00.00	40.00	0.652	4.30	6.95	0.95
93+40.00	**40.00**	**0.707**	**4.67**	6.95	0.95
93+00.00	40.00	0.037	0.24	6.95	0.95
92+50.00	40.00	0.083	0.55	6.95	0.95
92+00.00	**40.00**	**0.129**	0.85	6.95	0.95
91+35.00	40.00	0.060	0.39	6.95	0.95
90+40.00	**40.00**	**0.147**	**0.97**	6.95	0.95

Project:	51st Avenue Overpass at Grand Avenue/Bethany Home Road			Baker
Subject	On-Site Drainage Spread Calc's			
			Filename:	51cbcalc_rev2.xls
Computed By:	WC-GL	**Checked By:**	**Date:**	December 12, 2000

North Bound Lanes

North Bound Lanes

Station	Width (ft)	Area (acres)	Q100 (cfs)	i_{100} (in/hr)	C
101+10.00	40.00	0.000	0.00	6.95	0.95
102+00.00	40.00	0.083	0.55	6.95	0.95
102+50.00	40.00	0.129	0.85	6.95	0.95
103+00.00	40.00	0.174	1.15	6.95	0.95
103+50.00	40.00	0.220	1.46	6.95	0.95
104+00.00	40.00	0.266	1.76	6.95	0.95
104+50.00	40.00	0.312	2.06	6.95	0.95
105+00.00	40.00	0.358	2.36	6.95	0.95
105+50.00	40.00	0.404	2.67	6.95	0.95
106+00.00	40.00	0.450	2.97	6.95	0.95
106+50.00	40.00	0.496	3.27	6.95	0.95
107+00.00	40.00	0.542	3.58	6.95	0.95
107+50.00	40.00	0.588	3.88	6.95	0.95
107+98.00	**40.00**	**0.632**	**4.17**	6.95	0.95
108+65.00	40.00	0.062	0.41	6.95	0.95
109+00.00	40.00	0.094	0.62	6.95	0.95
109+15.00	40.00	0.107	0.71	6.95	0.95
110+10.00	**50.56**	**0.206**	**1.36**	6.95	0.95

Project: 51st Avenue Overpass at Grand Avenue/Bethany Home Road

Subject: Pavement Drainage Analysis

Filename: 51cbcalc_rev2.xls

Computed By: WC-GL **Checked By:** **Date:** December 21,2000

Baker

100-year Computations

SB Station	Q100 (cfs)	Qinlet (cfs)	So ('/ft)	Sx ('/ft)	Sw ('/ft)	Spread Allow (ft)	Spread Calc (ft)	E	Qi (cfs)	Qb (cfs)	Qtot (cfs)	Depth (in)	V (fps)	Inlet Type	Grate L (ft)	Grate W (ft)	Curb Opening L (ft)
93+40.00	3.62	3.62	0.0370	0.0097	0.0670	31.00	12.76	0.53	1.93	1.68	3.61	2.88	4.00	Grate	3.50	2.00	N/A
90+40.00	1.74	3.42	0.0479	0.0240	0.0670	20.83	5.63	0.76	2.60	0.82	3.42	3.12	5.94	Combination	3.00	2.00	6.00
87+47.00	3.66	4.96	0.0177	0.0240	0.0670	20.83	9.15	1.00	4.96	0.00	4.96	4.20	4.11	Combination	3.00	2.00	17.00
107+98.00	3.23	3.23	0.0331	0.0093	0.0670	31.00	12.72	0.21	0.68	2.54	3.22	2.76	3.71	Grate	3.50	2.00	N/A
112+00.00	3.13	5.67	0.0411	0.0240	0.0670	20.83	7.90	7.90	3.49	2.18	5.67	3.84	5.98	Combination	3.00	2.00	6.00
113+25.00	1.66	3.84	0.0147	0.0240	0.0670	20.83	8.43	0.78	2.99	0.85	3.84	3.96	3.65	Combination	3.00	2.00	6.00
113+75.00	0.66	2.73	0.0000	0.0240	0.0670	20.83	5.49	1.00	2.73	0.00	2.73	5.16		Combination	3.00	2.00	17.00
114+95.00	13.64	13.64	0.0030	0.0240	0.0670	20.83	20.81	0.91	12.42	1.22	13.64	7.56	2.51	Combination	3.00	2.00	17.00

*** Discharge at 114+95 was calculated based on street capacity** - SEE SPREAD CALC'S FOR 114+95

NB Station	Q100 (cfs)	Qinlet (cfs)	So ('/ft)	Sx ('/ft)	Sw ('/ft)	Spread Allow (ft)	Spread Calc (ft)	E	Qi (cfs)	Qb (cfs)	Qtot (cfs)	Depth (in)	V (fps)	Inlet Type	Grate L (ft)	Grate W (ft)	Curb Opening L (ft)
93+40.00	4.67	4.67	0.0370	0.0097	0.0670	38.00	12.22	0.56	2.62	2.05	4.67	3.48	4.75	Combination	3.00	2.00	6.00
92+00.00	0.85	2.90	0.0438	0.0231	0.0670	21.65	6.51	0.66	1.91	0.99	2.90	2.88	4.94	Grate	3.50	2.00	N/A
90+40.00	0.97	1.96	0.0479	0.0240	0.0670	20.83	5.11	0.75	1.48	0.48	1.96	2.52	4.88	Grate	3.50	2.00	N/A
107+98.00	4.17	4.17	0.0331	0.0093	0.0670	38.00	12.07	0.80	3.34	0.83	4.17	3.48	4.44	Combination	3.00	2.00	10.00
110+10.00	1.36	2.19	0.0433	0.0201	0.0670	24.88	6.13	0.72	1.59	0.60	2.19	2.64	4.61	Grate	3.50	2.00	N/A
118+35.00	10.34	10.34	0.0030	0.0091	0.0670	34.00	34.00	0.84	8.67	1.67	10.34	5.76	1.87	Combination	3.00	2.00	17.00

*** Discharge at 118+35 was calculated based on street capacity** SEE SPREAD CALC'S FOR 118+35

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
*************************************************
```

DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51stAve Overpass

PROJECT NO.: 24328

INLET NO.: Cb102

STATION: 90+40(NB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 100Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.048	0.024	0.016	1.96	5.11

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
2.00	0.067	N/A	0.837	0.21	4.88

INLET INTERCEPTION

Inlet Type	L (ft)	W (ft)	E	Qi (cfs)	Qb (cfs)
Reticuline	1.75	2.00	0.750	1.48	0.48

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51stAve Overpass

PROJECT NO.: 24328

INLET NO.: CB103

STATION: 92+00(NB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 100Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.044	0.023	0.016	2.90	6.51

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
2.00	0.067	N/A	0.734	0.24	4.98

INLET INTERCEPTION

Inlet Type	L (ft)	W (ft)	E	Qi (cfs)	Qb (cfs)
Reticuline	1.75	2.00	0.660	1.91	0.99

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*****************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
*****************************************************
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51stAve Overpass

PROJECT NO.: 24328

INLET NO.: Cb105

STATION: 93+40 (NB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 100Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.037	0.010	0.016	4.67	12.22

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
3.00	0.067	2.00	0.760	0.29	4.75

INLET INTERCEPTION

Inlet Type	LT or W (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb-Opening	20.84	4.80	0.260	1.24	3.43
Reticuline	2.00	1.50	0.400	1.38	2.05
Combination			0.561	2.62	2.05

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*****************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: CB107

STATION: 107+98(NB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 100Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.033	0.009	0.016	4.17	12.07

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
3.00	0.067	2.00	0.773	0.29	4.44

INLET INTERCEPTION

Inlet Type	LT or W (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb-Opening	19.05	8.00	0.520	2.20	1.97
Reticuline	2.00	1.50	0.570	1.14	0.83
Combination			0.801	3.34	0.83

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: CB108

STATION: 110+10(NB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 100Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.043	0.020	0.016	2.19	6.13

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
2.00	0.067	N/A	0.781	0.22	4.61

INLET INTERCEPTION

Inlet Type	L (ft)	W (ft)	E	Qi (cfs)	Qb (cfs)
Reticuline	1.75	2.00	0.720	1.59	0.60

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*****************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
*****************************************************
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DESIGNER: gl

DATE: 12-29-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: CB100

STATION: 87+47(SB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 100Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.018	0.024	0.016	4.96	9.15

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
3.00	0.067	2.00	0.759	0.35	4.11

INLET INTERCEPTION

Inlet Type	LT or W (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb-Opening	16.78	13.60	0.890	4.46	0.50
Reticuline	2.00	1.50	0.990	0.49	0.00
Combination			1.000	4.96	0.00

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
*************************************************
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: Cb102

STATION: 90+40(SB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 100Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.048	0.024	0.016	3.42	5.63

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
3.00	0.067	2.00	0.939	0.26	5.94

INLET INTERCEPTION

Inlet Type	LT or W (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb-Opening	17.53	4.80	0.310	1.07	2.34
Reticuline	2.00	1.50	0.640	1.51	0.82
Combination			0.760	2.60	0.82

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: Cb104

STATION: 93+40(SB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 100Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.037	0.010	0.016	3.62	12.76

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
2.00	0.067	N/A	0.537	0.24	4.00

INLET INTERCEPTION

Inlet Type	L (ft)	W (ft)	E	Qi (cfs)	Qb (cfs)
Reticuline	1.75	2.00	0.530	1.93	1.68

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**************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: CB106

STATION: 107+98(SB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 100Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.033	0.009	0.016	3.23	12.72

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
2.00	0.067	N/A	0.546	0.23	3.71

INLET INTERCEPTION

Inlet Type	L (ft)	W (ft)	E	Qi (cfs)	Qb (cfs)
Reticuline	1.75	1.00	0.210	0.68	2.54

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
*************************************************
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: CB109

STATION: 112+00(SB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 100Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.041	0.024	0.016	5.67	7.90

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
3.00	0.067	2.00	0.824	0.32	5.98

INLET INTERCEPTION

Inlet Type	LT or W (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb-Opening	22.02	4.80	0.250	1.43	4.24
Reticuline	2.00	1.50	0.480	2.05	2.18
Combination			0.616	3.49	2.18

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
*************************************************
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: Cb110

STATION: 113+25

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 100Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.015	0.024	0.016	3.84	8.43

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
3.00	0.067	2.00	0.796	0.33	3.65

INLET INTERCEPTION

Inlet Type	LT or W (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb-Opening	13.94	4.80	0.380	1.47	2.36
Reticuline	2.00	1.50	0.630	1.50	0.85
Combination			0.779	2.99	0.85

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 51st Ave Overpass

PROJECT NO.: 24328

INLET NO.: CB111

STATION: 113+75(SB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 100Years

ROADWAY & DISCHARGE DATA

Cross-Slope	Sx (ft/ft)	Sw (ft/ft)	n	W (ft)	a (in)
Composite/dep	0.024	0.123	0.016	3.00	2.00

INLET INTERCEPTION

Inlet Type * Sag *	L (ft)	h (in) W (ft)	T (ft)	d (ft)	Qi (cfs)
Curb-Opening	13.60	8.00			
Reticuline	1.50	2.00			
Sweeper Combination			5.49	0.43	2.72

Calculations for North Service Road
10-year and 50-year Storms

Project:	51st Avenue Overpass at Grand Avenue/Bethany Home Road			Baker
Subject	On-Site Drainage Spread Calc's North Service Road			
			Filename:	51cbcalc_rev2.xls
Computed By:	WC-GL	**Checked By:**	**Date:**	December 14, 2000

South Bound Lanes (East)

Station	Width (ft)	Area (acres)	Q10 (cfs)	i_{10} (in/hr)	C
202+13.79	16.00	0.000	0.00	4.50	0.95
203+00.00	16.00	0.032	0.14	4.50	0.95
204+00.00	16.00	0.068	0.29	4.50	0.95
205+15.00	**16.00**	**0.111**	**0.47**	**4.50**	**0.95**
206+75.00	16.00	0.059	0.25	4.50	0.95
208+00.00	16.00	0.105	0.45	4.50	0.95
208+50.00	16.00	0.123	0.53	4.50	0.95
210+10.00	16.00	0.182	0.78	4.50	0.95
211+60.00	16.00	0.237	1.01	4.50	0.95
212+07.21	**16.00**	**0.254**	**1.09**	**4.50**	**0.95**
213+10.00	**16.00**	**0.038**	**0.16**	**4.50**	**0.95**
202+13.79	16.00	0.000	0.00	4.50	0.95
201+08.00	**16.00**	**0.039**	**0.17**	**4.50**	**0.95**

North Bound Lanes (West)

Station	Width (ft)	Area (acres)	Q10 (cfs)	i_{10} (in/hr)	C
202+13.79	35.53	0.000	0.00	4.50	0.95
203+00.00	35.53	0.070	0.30	4.50	0.95
204+00.00	35.53	0.152	0.65	4.50	0.95
205+15.00	**35.53**	**0.246**	**1.05**	**4.50**	**0.95**
202+13.79	35.53	0.000	0.00	4.50	0.95
201+00.00	35.53	0.093	0.40	4.50	0.95
201+08.00	**35.53**	**0.086**	**0.37**	**4.50**	**0.95**

Project:	51st Avenue Overpass at Grand Avenue/Bethany Home Road		Baker
Subject	On-Site Drainage Spread Calc's North Service Road		
		Filename:	51cbcalc_rev2.xls
Computed By: WC-GL	**Checked By:**	**Date:**	December 14, 2000

South Bound Lanes (East)

Station	Width (ft)	Area (acres)	Q50 (cfs)	i_{50} (in/hr)	C
202+13.79	16.00	0.000	0.00	6.20	0.95
203+00.00	16.00	0.032	0.19	6.20	0.95
204+00.00	16.00	0.068	0.40	6.20	0.95
205+15.00	**16.00**	**0.111**	**0.65**	**6.20**	**0.95**
206+75.00	16.00	0.059	0.35	6.20	0.95
208+00.00	16.00	0.105	0.62	6.20	0.95
208+50.00	16.00	0.123	0.72	6.20	0.95
210+10.00	16.00	0.182	1.07	6.20	0.95
211+60.00	16.00	0.237	1.40	6.20	0.95
212+07.21	**16.00**	**0.254**	**1.50**	**6.20**	**0.95**
213+10.00	**16.00**	**0.038**	**0.22**	**6.20**	**0.95**
202+13.79	16.00	0.000	0.00	6.20	0.95
201+08.00	**16.00**	**0.039**	**0.23**	**6.20**	**0.95**

North Bound Lanes (West)

Station	Width (ft)	Area (acres)	Q50 (cfs)	i_{50} (in/hr)	C
202+13.79	35.53	0.000	0.00	6.20	0.95
203+00.00	35.53	0.070	0.41	6.20	0.95
204+00.00	35.53	0.152	0.89	6.20	0.95
205+15.00	**35.53**	**0.246**	1.45	**6.20**	**0.95**
206+00.00	35.53	0.069	0.41	6.20	0.95
206+75.00	35.53	0.130	0.77	6.20	0.95
208+00.00	35.53	0.232	1.37	6.20	0.95
208+50.00	35.53	0.273	1.61	6.20	0.95
210+10.00	35.53	0.404	2.38	6.20	0.95
211+60.00	35.53	0.526	3.10	6.20	0.95
212+07.21	35.53	0.565	3.33	6.20	0.95
202+13.79	35.53	0.000	0.00	6.20	0.95
201+00.00	35.53	0.093	0.55	6.20	0.95
201+08.00	**35.53**	**0.086**	**0.51**	**6.20**	**0.95**

Project: 51st Avenue Overpass at Grand Avenue/Bethany Home Road

Subject: Pavement Drainage Analysis on North Service Road

Filename: 51cbcalc_rev2.xls

Computed By: WC-GL Checked By: Date: December 14,2000

Baker

n = 0.016

10-year Computations

SB Station	Q10 (cfs)	Qinlet (cfs)	So ('/ft)	Sx ('/ft)	Sw ('/ft)	Spread Allow (ft)	Spread Calc (ft)	E	Qi (cfs)	Qb (cfs)	Qtot (cfs)	Depth (in)	V (fps)	Inlet Type	L (ft)	W (ft)
205+15.00	0.47	0.47	0.0066	0.0200	0.0670	14.00	4.32	0.92	0.43	0.03	0.46	2.16	1.66	Grate	3.50	2.00
212+07.21	1.25	1.28	0.0000	0.0200	0.0670	14.00	8.74	1.00	1.28	0.00	1.28	3.24		Scupper	2x2.5	
200+89.00	0.20	0.20	0.0076	0.0200	0.0670	14.00	1.94	1.00	0.20	0.00	0.20	1.56	1.00 1.49	Grate	3.50	2.00

NB Station	Q10 (cfs)	Qinlet (cfs)	So ('/ft)	Sx ('/ft)	Sw ('/ft)	Allow (ft)	Calc (ft)	E	Qi (cfs)	Qb (cfs)	Qtot (cfs)	Depth (in)	V (fps)	Inlet Type	L (ft)	W (ft)
205+15.00	1.05	1.05	0.0066	0.0200	0.0670	25.00	6.84	0.76	0.80	0.24	1.04	2.76	1.86	Grate	3.50	2.00
200+89.00	0.44	0.44	0.0076	0.0200	0.0670	25.00	3.93	0.94	0.41	0.03	0.44	2.04	1.75	Grate	3.50	2.00

50-year Computations

SB Station	Q50 (cfs)	Qinlet (cfs)	So ('/ft)	Sx ('/ft)	Sw ('/ft)	Spread Allow (ft)	Spread Calc (ft)	E	Qi (cfs)	Qb (cfs)	Qtot (cfs)	Depth (in)	V (fps)	Inlet Type	L (ft)	W (ft)
205+15.00	0.65	0.65	0.0066	0.0200	0.0670	14.00	5.28	0.86	0.56	0.08	0.64	2.40	1.73	Grate	3.50	2.00
212+07.21	1.72	1.80	0.0000	0.0200	0.0670	14.00	10.98	1.00	1.80	0.00	1.80	3.72		Scupper	2x2.5	
200+89.00	0.28	0.28	0.0076	0.0200	0.0670	14.00	2.70	0.99	0.27	0.00	0.27	1.80	1.66	Grate	3.50	2.00

NB Station	Q50 (cfs)	Qinlet (cfs)	So ('/ft)	Sx ('/ft)	Sw ('/ft)	Allow (ft)	Calc (ft)	E	Qi (cfs)	Qb (cfs)	Qtot (cfs)	Depth (in)	V (fps)	Inlet Type	L (ft)	W (ft)
205+15.00	1.45	1.45	0.0066	0.0200	0.0670	25.00	8.02	0.69	1.01	0.44	1.45	3.00	1.96	Grate	3.50	2.00
200+89.00	0.60	0.60	0.0076	0.0200	0.0670	25.00	4.82	0.89	0.53	0.07	0.60	2.28	1.82	Grate	3.50	2.00

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*****************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
*****************************************************
```

DESIGNER: GL

DATE: 12-21-2000

PROJECT: North Service Rd

PROJECT NO.: 24328

INLET NO.: CB202

STATION: 205+15(SB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.007	0.020	0.016	0.47	4.32

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
2.00	0.067	N/A	0.915	0.18	1.66

INLET INTERCEPTION

Inlet Type	L (ft)	W (ft)	E	Qi (cfs)	Qb (cfs)
Reticuline	1.75	2.00	0.920	0.43	0.03

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*****************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: North Service RD

PROJECT NO.: 24328

INLET NO.: Scupper

STATION: 212+07.21(SB

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	Sx (ft/ft)	Sw (ft/ft)	n	W (ft)	a (in)
Composite	0.020	0.067	0.016	2.00	0.00

INLET INTERCEPTION

Inlet Type * Sag *	L (ft)	h (in)	T (ft)	d (ft)	Qi (cfs)
Curb-Opening	4.00	5.50	8.74	0.27	1.28

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*****************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS    *****
*****          ROADWAY DRAINAGE DESIGN         *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: North Service Rd

PROJECT NO.: 24328

INLET NO.: Cb200

STATION: 200+89(SB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.008	0.020	0.016	0.20	1.94

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
2.00	0.067	N/A	1.000	0.13	1.49

INLET INTERCEPTION

Inlet Type	L (ft)	W (ft)	E	Qi (cfs)	Qb (cfs)
Reticuline	1.75	2.00	1.000	0.20	0.00

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: North Service Rd

PROJECT NO.: 24328

INLET NO.: CB203

STATION: 205+15(NB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.007	0.020	0.016	1.05	6.84

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
2.00	0.067	N/A	0.731	0.23	1.86

INLET INTERCEPTION

Inlet Type	L (ft)	W (ft)	E	Qi (cfs)	Qb (cfs)
Reticuline	1.75	2.00	0.760	0.80	0.24

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*****************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: North Service Rd

PROJECT NO.: 24328

INLET NO.: CB201

STATION: 200+89(NB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.008	0.020	0.016	0.44	3.93

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
2.00	0.067	N/A	0.939	0.17	1.75

INLET INTERCEPTION

Inlet Type	L (ft)	W (ft)	E	Qi (cfs)	Qb (cfs)
Reticuline	1.75	2.00	0.940	0.41	0.03

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: North Service Rd

PROJECT NO.: 24328

INLET NO.: CB202

STATION: 205+15(SB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.007	0.020	0.016	0.65	5.28

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
2.00	0.067	N/A	0.845	0.20	1.73

INLET INTERCEPTION

Inlet Type	L (ft)	W (ft)	E	Qi (cfs)	Qb (cfs)
Reticuline	1.75	2.00	0.860	0.56	0.08

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**************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: North Service Rd

PROJECT NO.: 24328

INLET NO.: Scupper

STATION: 212+07.21 SB

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 50-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	Sx (ft/ft)	Sw (ft/ft)	n	W (ft)	a (in)
Composite	0.020	0.067	0.016	2.00	0.00

INLET INTERCEPTION

Inlet Type * Sag *	L (ft)	h (in)	T (ft)	d (ft)	Qi (cfs)
Curb-Opening	4.00	5.50	10.98	0.31	1.80

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: North Service Rd

PROJECT NO.: 24328

INLET NO.: CB200

STATION: 200+89(SB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 50-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.008	0.020	0.016	0.28	2.70

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
2.00	0.067	N/A	0.992	0.15	1.66

INLET INTERCEPTION

Inlet Type	L (ft)	W (ft)	E	Qi (cfs)	Qb (cfs)
Reticuline	1.75	2.00	0.990	0.27	0.00

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: North Service Rd

PROJECT NO.: 24328

INLET NO.: CB203

STATION: 205+15(NB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 50-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.007	0.020	0.016	1.45	8.02

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
2.00	0.067	N/A	0.653	0.25	1.96

INLET INTERCEPTION

Inlet Type	L (ft)	W (ft)	E	Qi (cfs)	Qb (cfs)
Reticuline	1.75	2.00	0.690	1.01	0.44

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: North Service Rd

PROJECT NO.: 24328

INLET NO.: CB201

STATION: 200+89(NB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 50-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.008	0.020	0.016	0.60	4.82

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
2.00	0.067	N/A	0.879	0.19	1.82

INLET INTERCEPTION

Inlet Type	L (ft)	W (ft)	E	Qi (cfs)	Qb (cfs)
Reticuline	1.75	2.00	0.890	0.53	0.07

Calculations for 52nd Avenue 10-year and 50-year Storms

Project:	51st Avenue Overpass at Grand Avenue/Bethany Home Road			**Baker**
Subject	On-Site Drainage Spread Calc's 52nd Ave - South Service Road.			
			Filename:	51cbcalc_rev2.xls
Computed By:	WC-GL	**Checked By:**	**Date:**	December 13, 2000

North Bound Lanes

Station	Width (ft)	Area (acres)	i_{10} (in/hr)	Q10 (cfs)	C
412+98.30	19.84	0.000	4.50	0.00	0.95
411+50.00	19.84	0.068	4.50	0.29	0.95
410+50.00	19.84	0.113	4.50	0.48	0.95
410+00.00	19.84	0.136	4.50	0.58	0.95
409+00.00	19.84	0.181	4.50	0.78	0.95
408+00.00	19.84	0.227	4.50	0.97	0.95
407+50.00	19.84	0.250	4.50	1.07	0.95
406+00.00	19.84	0.318	4.50	1.36	0.95
405+00.00	19.84	0.364	4.50	1.55	0.95
404+50.00	19.84	0.386	4.50	1.65	0.95
403+00.00	19.84	0.455	4.50	1.94	0.95
402+50.00	19.84	0.477	4.50	2.04	0.95
401+30.00	19.84	**0.532**	**4.50**	**2.27**	**0.95**
400+20.00	19.84	0.050	4.50	0.21	0.95

North Bound Lanes

Station	Width (ft)	Area (acres)	i_{50} (in/hr)	Q50 (cfs)	C
412+98.30	19.84	0.000	6.20	0.00	0.95
411+50.00	19.84	0.068	6.20	0.40	0.95
410+50.00	19.84	0.113	6.20	0.67	0.95
410+00.00	19.84	0.136	6.20	0.80	0.95
409+00.00	19.84	0.181	6.20	1.07	0.95
408+00.00	19.84	0.227	6.20	1.34	0.95
407+50.00	19.84	0.250	6.20	1.47	0.95
406+00.00	19.84	0.318	6.20	1.87	0.95
405+00.00	19.84	0.364	6.20	2.14	0.95
404+50.00	19.84	0.386	6.20	2.28	0.95
403+00.00	19.84	0.455	6.20	2.68	0.95
402+50.00	19.84	0.477	6.20	2.81	0.95
401+30.00	**19.84**	**0.532**	**6.20**	**3.13**	**0.95**
400+20.00	19.84	0.050	6.20	0.30	0.95

Project: 51st Avenue Overpass at Grand Avenue/Bethany Home Road

Subject: Pavement Drainage Analysis 52nd Avenue

Filename: 51cbcalc_rev2.xls

Computed By: WC-GL Checked By: Date: December 13,2000

Baker

n = 0.016

10-year Computations

NB Station	Q10 (cfs)	So ('/ft)	Sx ('/ft)	Sw ('/ft)	Spread Allow (ft)	Spread Calc (ft)	E	Qi (cfs)	Qb (cfs)	Qtot (cfs)	Depth (in)	V (fps)	Inlet Type	Grate L (ft)	Grate W (ft)	Curb Opening L (ft)
401+30.00	2.27	0.0030	0.0200	0.0670	14.00	10.69	0.910	2.07	0.20	2.27	3.32	1.66	Combination	3.00	2.00	6.00

50-year Computations

401+30.00	3.13	0.0030	0.0200	0.0670	14.00	12.51	1.000	3.12	0.01	3.13	4.68	1.75	Combination	3.00	2.00	10.00

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
*************************************************
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 52nd Ave

PROJECT NO.: 24328

INLET NO.: CB300

STATION: 401+30(NB)

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 10-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.003	0.020	0.016	2.27	10.69

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
3.00	0.067	2.00	0.711	0.36	1.66

INLET INTERCEPTION

Inlet Type	LT or W (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb-Opening	7.36	4.80	0.650	1.49	0.77
Reticuline	2.00	1.50	0.730	0.56	0.20
Combination			0.912	2.07	0.20

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*************************************************
*****   FHWA URBAN DRAINAGE DESIGN PROGRAMS   *****
*****          ROADWAY DRAINAGE DESIGN        *****
*************************************************
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DESIGNER: GL

DATE: 12-21-2000

PROJECT: 52nd Ave

PROJECT NO.: 24328

INLET NO.: Cb300

STATION: 401+30

DRAINAGE AREA: Acres

DESIGN FREQUENCY: 50-Years

ROADWAY & DISCHARGE DATA

Cross-Slope	S (ft/ft)	Sx (ft/ft)	n	Q (cfs)	T (ft)
Composite	0.003	0.020	0.016	3.13	12.51

GUTTER FLOW

W (ft)	Sw (ft/ft)	a (in)	Eo	d (ft)	V (fps)
3.00	0.067	2.00	0.634	0.39	1.75

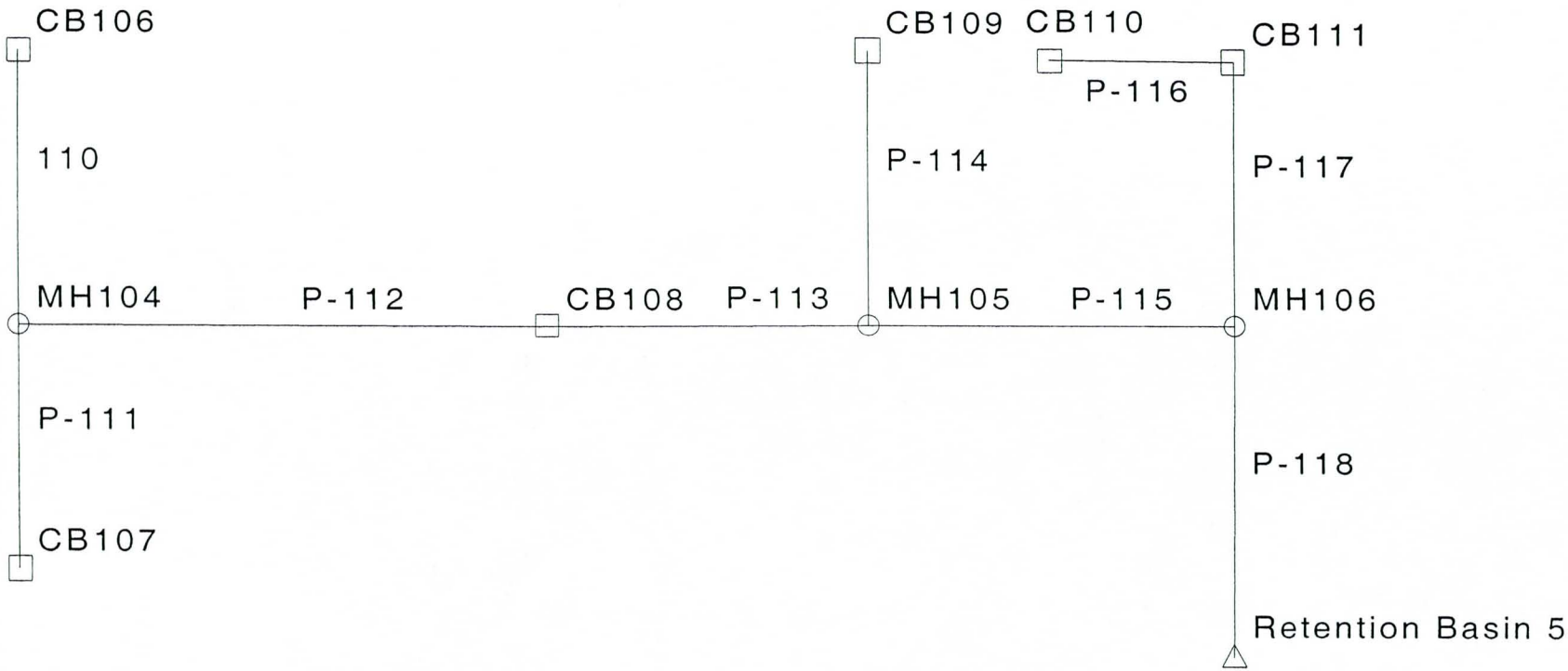
INLET INTERCEPTION

Inlet Type	LT or W (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb-Opening	8.89	8.00	0.900	2.83	0.30
Reticuline	2.00	1.50	0.970	0.29	0.01
Combination			0.997	3.12	0.01

APPENDIX D
Proposed Storm Drain System

1. 51st Avenue Northside of Overpass
   a) Storm Drain Layout
   b) Pipe/Node Report
2. 51st Avenue Southside of Overpass
   a) Storm Drain Layout
   b) Pipe/Node Report
3. North Service Road
   a) Storm Drain Layout
   b) Pipe/Node Report

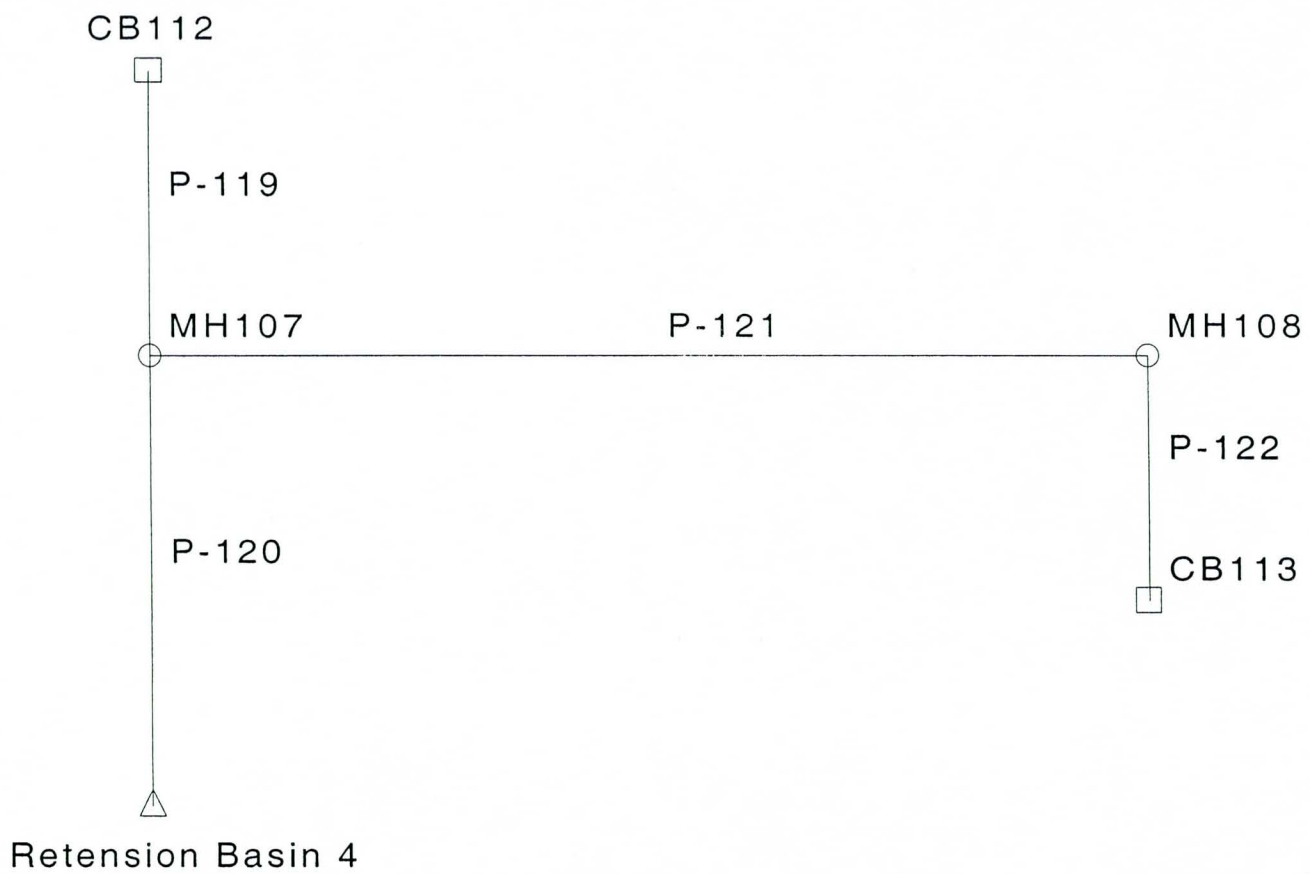
Storm Drain Layout for 51st Ave North Side of Overpass (Sta 107+98 to Sta 113+75)



Combined Pipe/Node Report

Pipe	Upstream Node	Downstream Node	Length (ft)	Section Size	Capacity (cfs)	Discharge (cfs)	Average Velocity (ft/s)	Upstream Ground Elevation (ft)	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Downstream Ground Elevation (ft)	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Constructed Slope (ft/ft)
110	CB106	MH104	10.00	18 inch	23.49	2.09	5.18	1,173.83	1,168.30	1,168.85	1,173.74	1,167.80	1,168.15	0.050000
P-111	CB107	MH104	30.00	18 inch	8.58	2.70	4.09	1,173.49	1,168.00	1,168.62	1,173.74	1,167.80	1,168.38	0.006667
P-112	MH104	CB108	210.00	24 inch	41.30	4.79	3.34	1,173.74	1,167.30	1,168.07	1,165.78	1,160.30	1,161.52	0.033333
P-116	CB110	CB111	50.00	18 inch	10.50	1.51	3.75	1,152.59	1,147.60	1,148.06	1,152.18	1,147.10	1,147.48	0.010000
P-114	CB109	MH105	40.00	18 inch	11.74	2.72	3.52	1,156.12	1,151.00	1,151.63	1,157.08	1,150.50	1,151.24	0.012500
P-113	CB108	MH105	190.00	24 inch	52.67	5.69	3.66	1,165.78	1,160.30	1,161.14	1,157.08	1,150.00	1,151.24	0.054211
P-117	CB111	MH106	40.00	24 inch	31.99	3.17	2.50	1,152.18	1,146.60	1,147.22	1,153.12	1,145.80	1,147.38	0.020000
P-115	MH105	MH106	170.00	24 inch	35.56	8.41	4.14	1,157.08	1,150.00	1,151.03	1,153.12	1,145.80	1,147.38	0.024706
P-118	MH106	Retention Basin 5	68.00	24 inch	22.95	11.58	4.72	1,153.12	1,145.80	1,147.02	1,153.42	1,145.10	1,147.10	0.010294

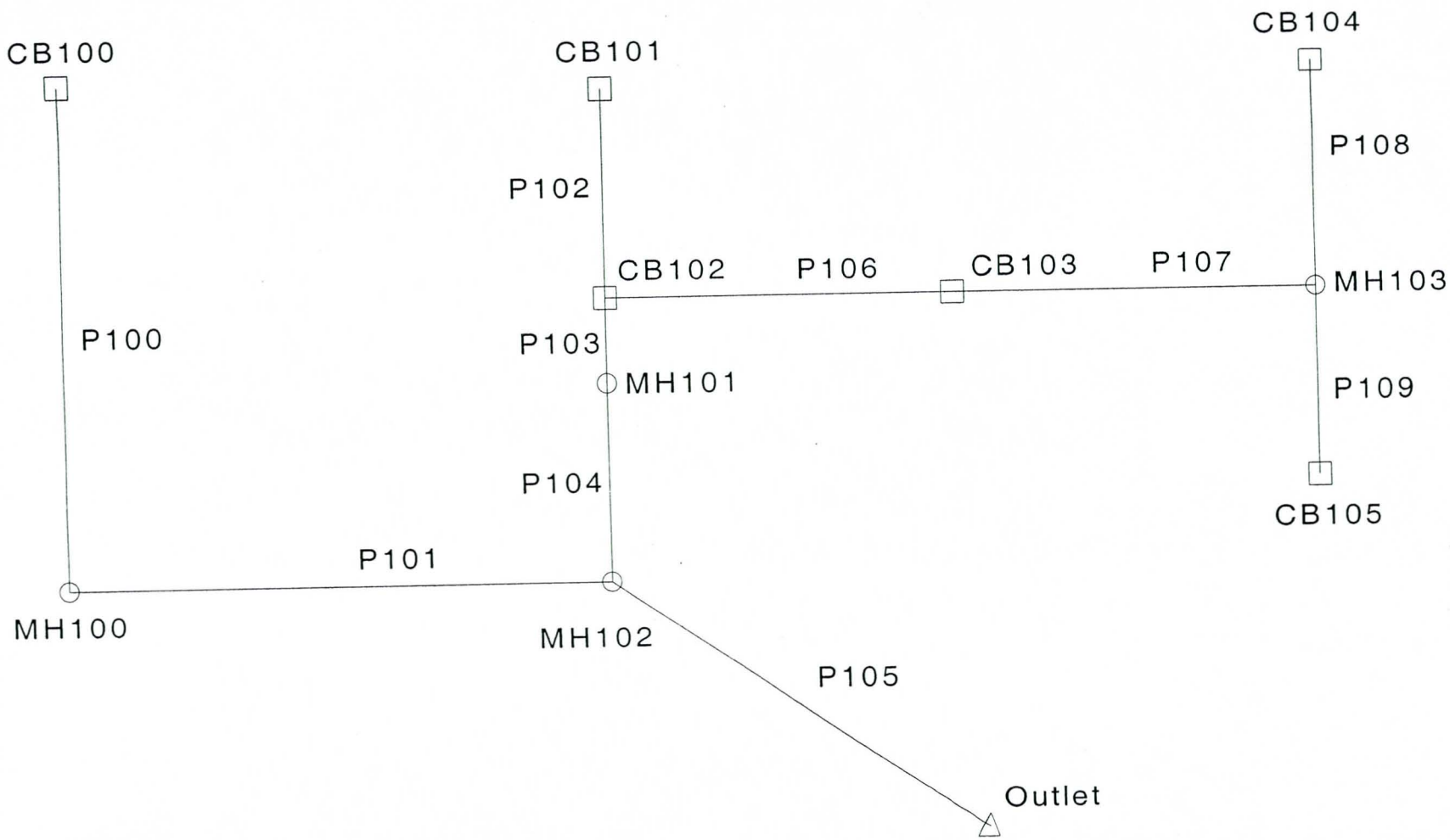
Storm Drain Layout for 51st Ave North Side of Overpass (Sta 113+75 to Sta118+35)



Combined Pipe/Node Report

Pipe	Upstream Node	Downstream Node	Length (ft)	Section Size	Capacity (cfs)	Discharge (cfs)	Average Velocity (ft/s)	Upstream Ground Elevation (ft)	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Downstream Ground Elevation (ft)	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Constructed Slope (ft/ft)
P-122	CB113	MH108	28.00	30 inch	34.66	10.34	4.45	1,153.86	1,148.30	1,149.38	1,154.18	1,148.10	1,149.46	0.007143
P-119	CB112	MH107	40.00	30 inch	41.01	13.64	2.91	1,152.34	1,146.80	1,148.94	1,153.35	1,146.40	1,148.92	0.010000
P-121	MH108	MH107	340.00	30 inch	29.00	10.34	3.61	1,154.18	1,148.10	1,149.18	1,153.35	1,146.40	1,148.92	0.005000
P-120	MH107	Retension Basin 4	89.00	30 inch	30.74	23.98	5.04	1,153.35	1,146.40	1,148.63	1,153.53	1,145.90	1,148.40	0.005618

SOUTHSIDE OF 51ST AVE



Project Title: 51st Avenue
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01/04/01 08:36:10 AM

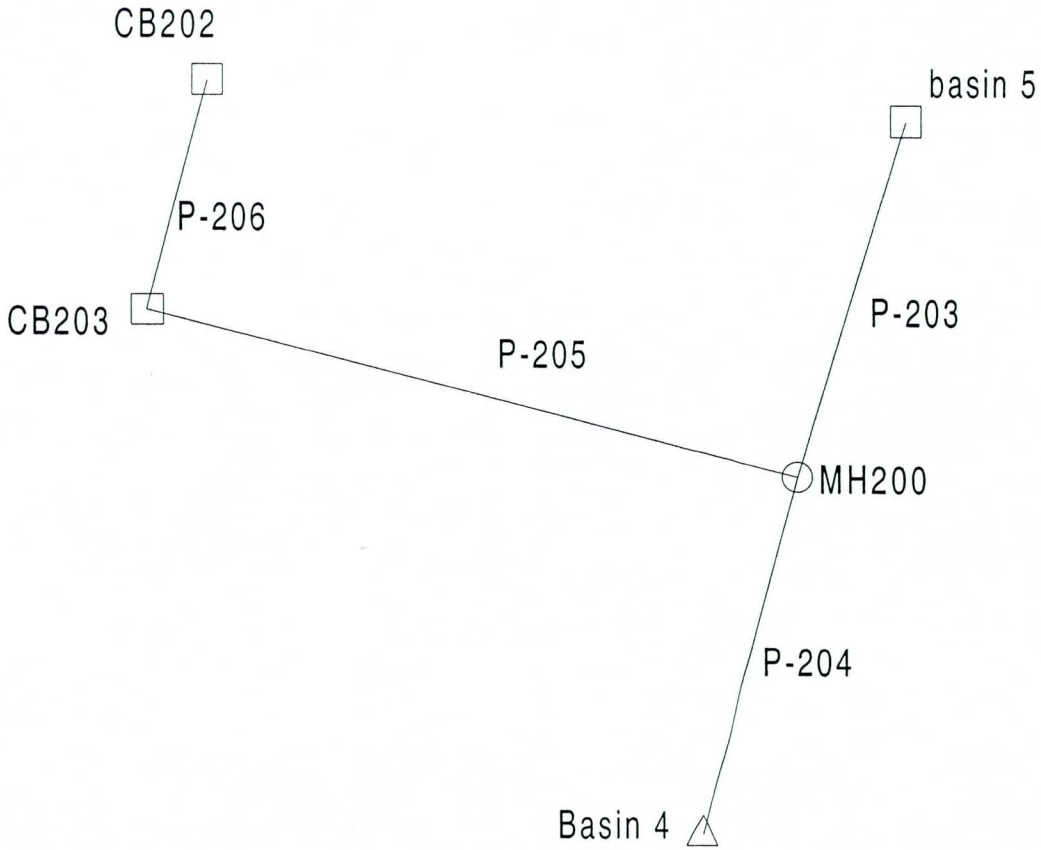
MICHAEL BAKER JR. INC
© Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Project Engineer: Anthony G. Pisano, P.E.
StormCAD v1.5 [158]
Page 1 of 1

Combined Pipe/Node Report

Pipe	Upstream Node	Downstream Node	Length (ft)	Section Size	Capacity (cfs)	Discharge (cfs)	Average Velocity (ft/s)	Upstream Ground Elevation (ft)	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Downstream Ground Elevation (ft)	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Constructed Slope (ft/ft)
P108	CB104	MH103	10.00	18 inch	33.22	2.34	6.18	1,171.00	1,167.00	1,167.58	1,170.91	1,166.00	1,166.32	0.100000
P109	CB105	MH103	28.00	18 inch	15.38	3.02	5.23	1,170.65	1,166.60	1,167.26	1,170.91	1,166.00	1,166.47	0.021429
P107	MH103	CB103	140.00	24 inch	46.04	5.36	3.62	1,170.91	1,165.50	1,166.32	1,165.34	1,159.70	1,160.87	0.041429
P102	CB101	CB102	45.00	18 inch	7.00	1.93	1.93	1,156.76	1,152.70	1,153.45	1,157.88	1,152.50	1,153.44	0.004444
P106	CB103	CB102	160.00	24 inch	49.62	7.62	4.06	1,165.34	1,159.70	1,160.68	1,157.88	1,152.00	1,153.44	0.048125
P100	CB100	MH100	107.00	18 inch	6.42	2.51	3.11	1,145.21	1,140.50	1,141.15	1,145.30	1,140.10	1,140.86	0.003738
P103	CB102	MH101	40.00	24 inch	16.00	10.81	5.54	1,157.88	1,152.00	1,153.20	1,159.14	1,151.80	1,152.98	0.005000
P101	MH100	MH102	299.00	18 inch	6.07	2.51	2.37	1,145.30	1,140.10	1,140.77	1,145.93	1,139.10	1,140.48	0.003344
P104	MH101	MH102	55.00	24 inch	16.71	10.81	3.70	1,159.14	1,138.90	1,140.56	1,145.93	1,138.60	1,140.48	0.005455
P105	MH102	Outlet	118.00	24 inch	16.13	13.32	4.44	1,145.93	1,138.60	1,140.32	1,146.80	1,138.00	1,140.00	0.005085

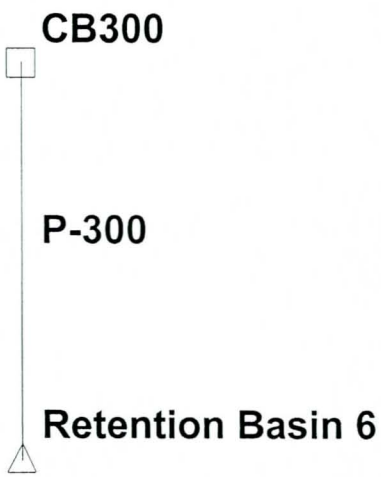
Storm Drain Layout for North Service Road (at CB202)



Combined Pipe/Node Report

Pipe	Upstream Node	Downstream Node	Length (ft)	Section Size	Capacity (cfs)	Discharge (cfs)	Average Velocity (ft/s)	Upstream Ground Elevation (ft)	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Downstream Ground Elevation (ft)	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Constructed Slope (ft/ft)
P-206	CB202	CB203	44.00	18 inch	7.08	0.47	1.09	1,152.47	1,148.40	1,148.77	1,152.40	1,148.20	1,148.76	0.004545
P-205	CB203	MH200	123.00	18 inch	7.34	1.12	3.01	1,152.40	1,148.20	1,148.60	1,154.60	1,147.60	1,148.00	0.004878
P-203	basin 5	MH200	70.00	36 inch	43.66	35.56	5.03	1,153.12	1,145.10	1,148.08	1,154.60	1,144.80	1,147.88	0.004286
P-204	MH200	Basin 4	70.00	36 inch	50.42	36.68	5.29	1,154.60	1,144.80	1,147.56	1,152.50	1,144.40	1,147.40	0.005714

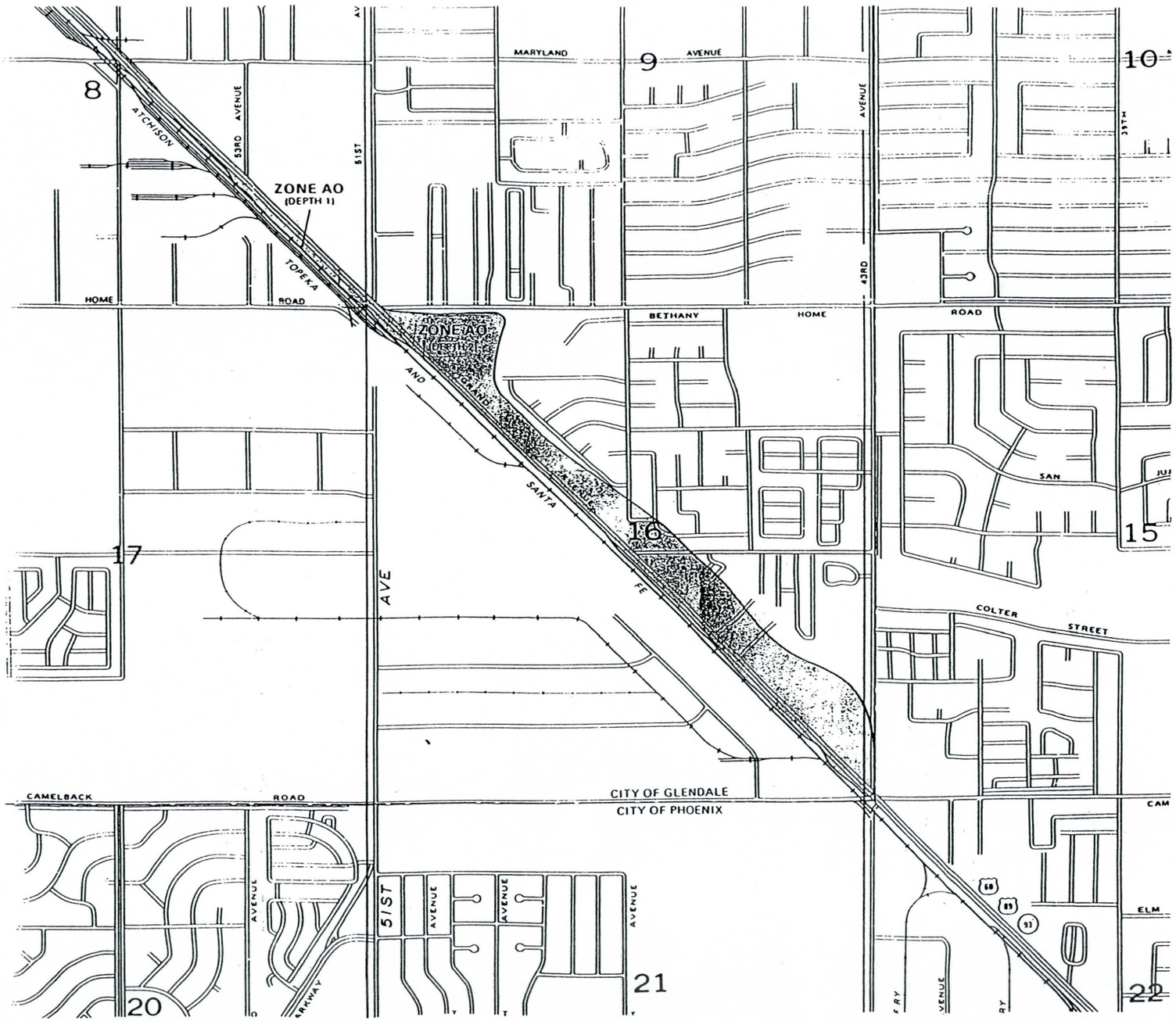
52nd Ave Storm Drain Layout



Combined Pipe/Node Report

Pipe	Upstream Node	Downstream Node	Length (ft)	Section Size	Capacity (cfs)	Discharge (cfs)	Average Velocity (ft/s)	Upstream Ground Elevation (ft)	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Downstream Ground Elevation (ft)	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Constructed Slope (ft/ft)
P-300	CB300	Retention Basin 6	42.00	18 inch	15.33	3.13	2.92	1,143.78	1,138.08	1,138.75	1,144.62	1,137.10	1,138.60	0.021304

APPENDIX E
FEMA Flood Insurance Rate Map



APPROXIMATE SCALE IN FEET
1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY,
ARIZONA AND
INCORPORATED AREAS

PANEL 1645 OF 4350

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
GLENDALE, CITY OF	040045	1645	E
PHOENIX, CITY OF	040051	1645	E

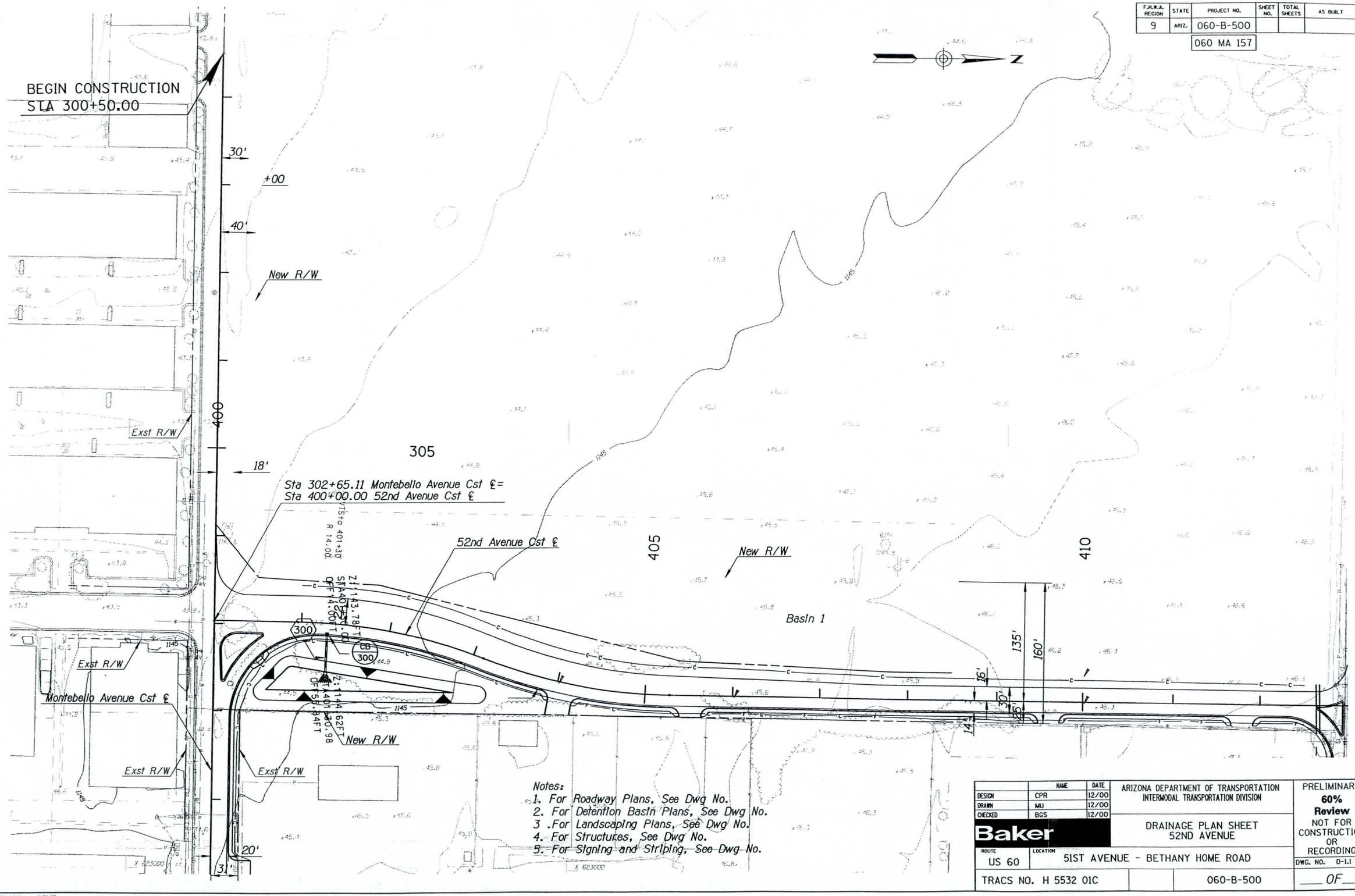
MAP NUMBER
04013C1645 E

MAP REVISED:
SEPTEMBER 30, 1995

Federal Emergency Management Agency

APPENDIX F
Roadway Construction Plans

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	060-B-500			
		060 MA 157			



	NAME	DATE
DESIGN	CPR	12/00
DRAWN	MU	12/00
CHECKED	BGS	12/00

Baker

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION

DRAINAGE PLAN SHEET
52ND AVENUE

ROUTE: US 60

LOCATION: 51ST AVENUE - BETHANY HOME ROAD

TRACS NO. H 5532 01C

060-B-500

PRELIMINARY
60% Review
NOT FOR CONSTRUCTION OR RECORDING

DWG. NO. D-1.1

___ OF ___

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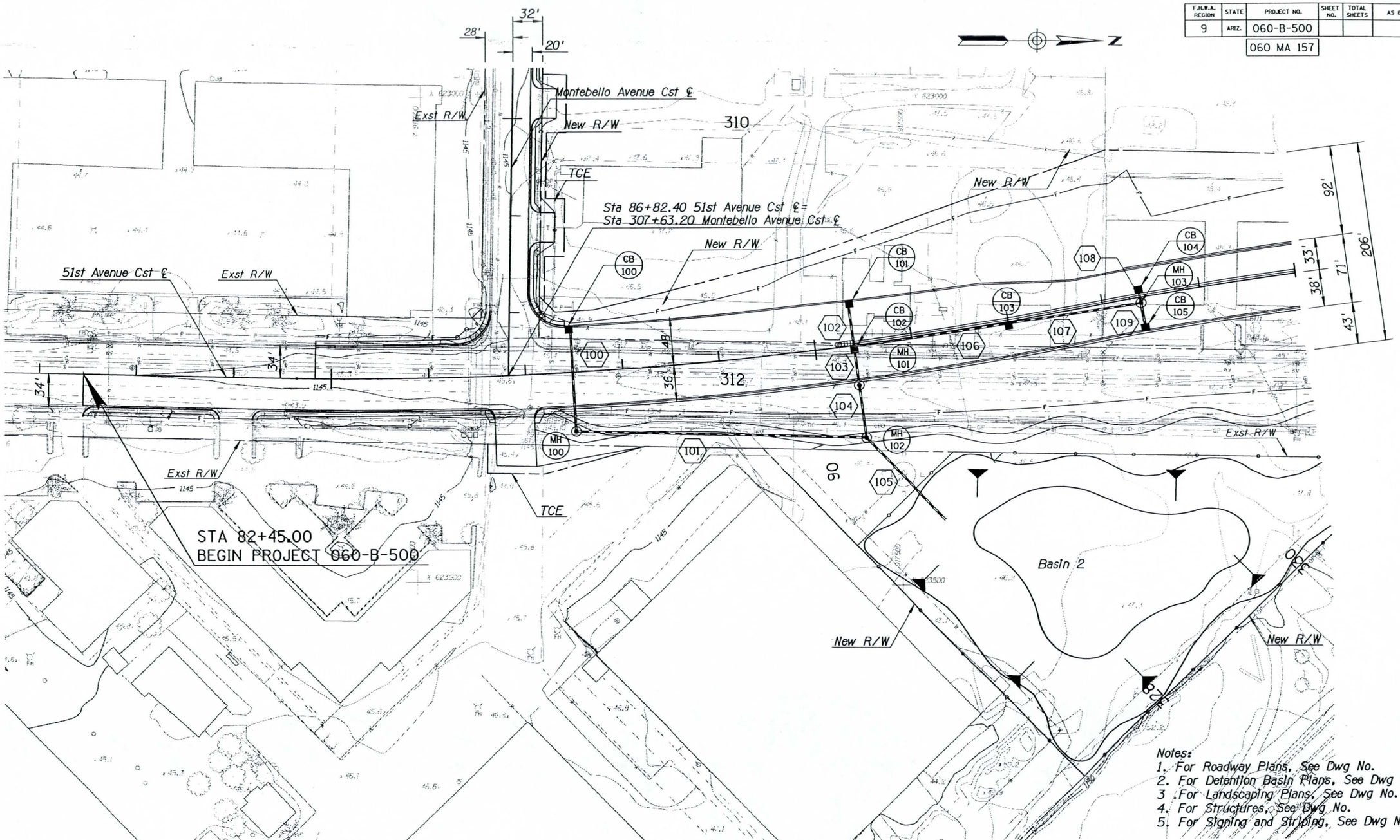
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	060-B-500			
		060 MA 157			



Notes:
1. For Roadway Plans, See Dwg No.
2. For Detention Basin Plans, See Dwg No.
3. For Landscaping Plans, See Dwg No.
4. For Structures, See Dwg No.
5. For Signing and Striping, See Dwg No.

	NAME	DATE
DESIGN	CPR	12/00
DRAWN	MIJ	12/00
CHECKED	BGS	12/00

Baker

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION

DRAINAGE PLAN SHEET
Sta 82+45 to 95+00

ROUTE: US 60
LOCATION: 51ST AVENUE - BETHANY HOME ROAD

TRACS NO. H 5532 01C
060-B-500

PRELIMINARY
60% Review
NOT FOR CONSTRUCTION OR RECORDING

DWG. NO. D-1.2
___ OF ___

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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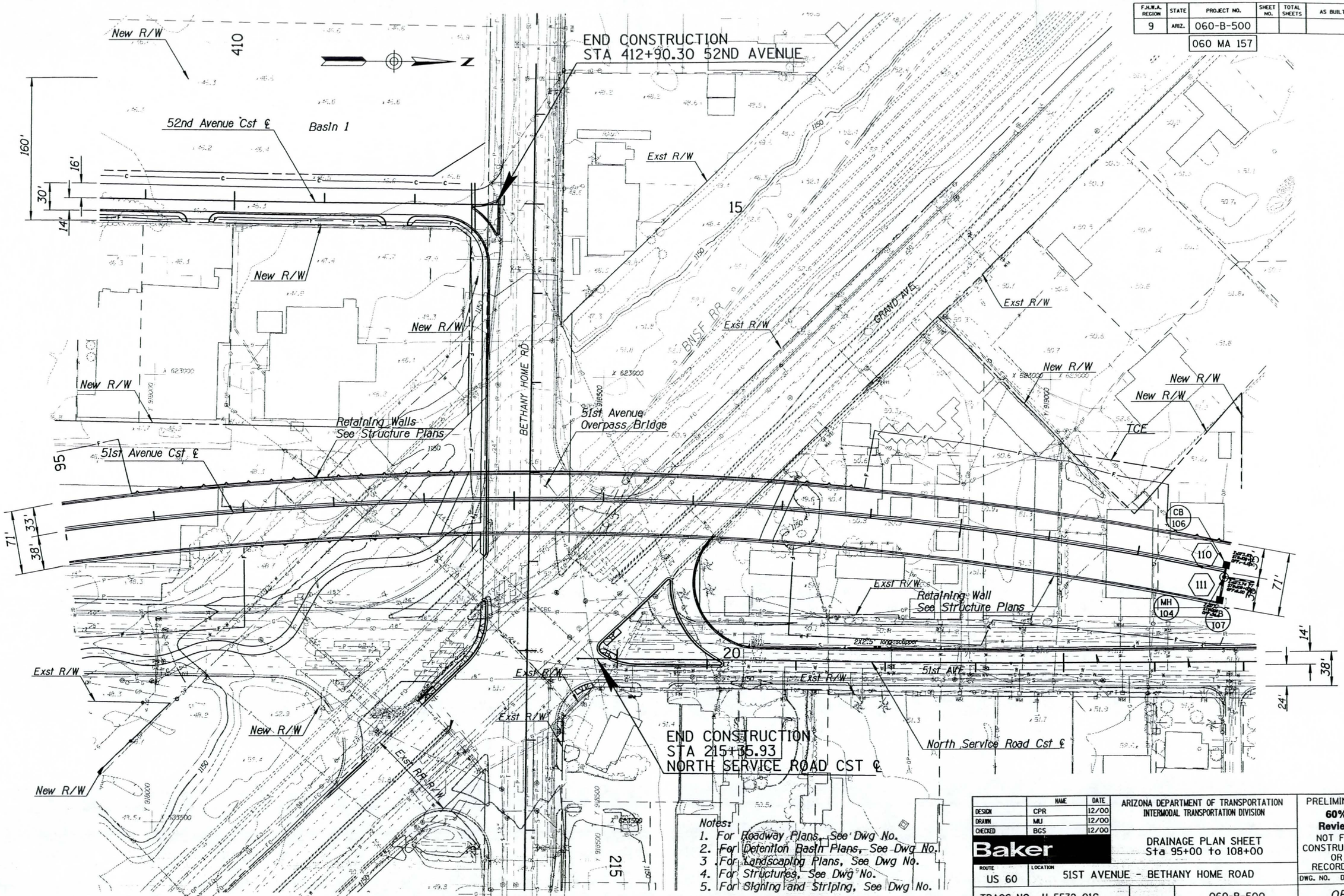
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	060-B-500			
		060 MA 157			



Notes:
1. For Roadway Plans, See Dwg No.
2. For Detention Basin Plans, See Dwg No.
3. For Landscaping Plans, See Dwg No.
4. For Structures, See Dwg No.
5. For Signing and Striping, See Dwg No.

	NAME	DATE
DESIGN	CPR	12/00
DRAWN	MJJ	12/00
CHECKED	BGS	12/00

Baker

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION

DRAINAGE PLAN SHEET
Sta 95+00 to 108+00

ROUTE: US 60
LOCATION: 51ST AVENUE - BETHANY HOME ROAD

TRACS NO. H 5532 01C
060-B-500

PRELIMINARY
60% Review
NOT FOR CONSTRUCTION OR RECORDING

DWG. NO. D-1.3
___ OF ___

FINISHED PLANS- | REVISIONS- | LOCATION- | DATE- | SURVEY NO.

21 DEC 2000 17:03:44
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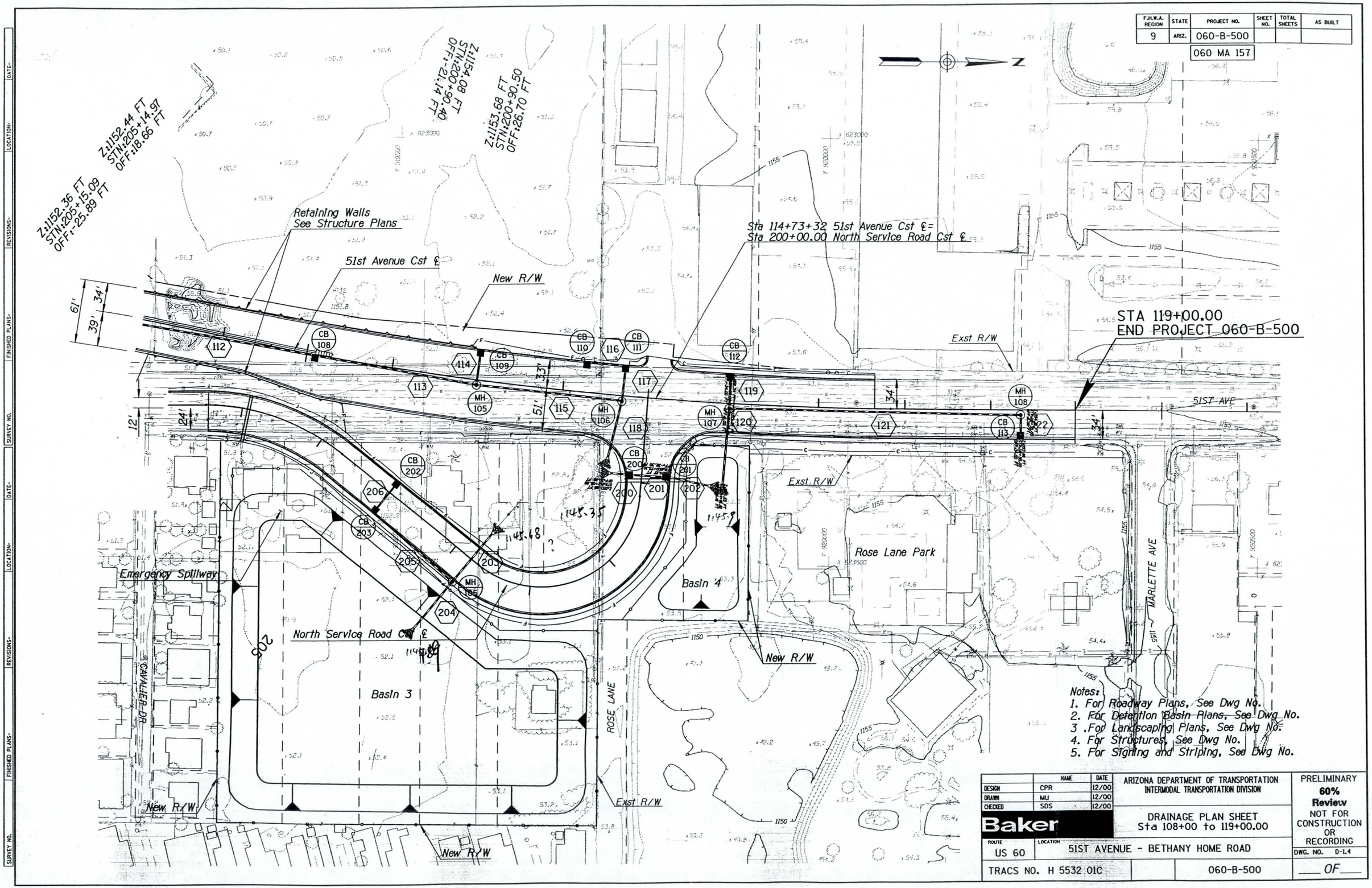
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	060-B-500			
		060 MA 157			



Notes:
1. For Roadway Plans, See Dwg No.
2. For Detention Basin Plans, See Dwg No.
3 .For Landscaping Plans, See Dwg No.
4. For Structures, See Dwg No.
5. For Signing and Striping, See Dwg No.

	NAME	DATE
DESIGN	CPR	12/00
DRAWN	MU	12/00
CHECKED	SDS	12/00

Baker

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION

DRAINAGE PLAN SHEET
Sta 108+00 to 119+00.00

ROUTE: US 60
LOCATION: 51ST AVENUE - BETHANY HOME ROAD

TRACS NO. H 5532 01C
060-B-500

PRELIMINARY
60% Review
NOT FOR CONSTRUCTION OR RECORDING

DWG. NO. D-1.4
___ OF ___

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

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