NORTHERN/ORANGEWOOD

STORM DRAIN PROJECT

SUBPHASES "B" AND "C"

EAST BASIN DESIGN CONCEPT

WOOD/PATEL

WP#94153.04

WOOD/PATEL TRANSMITTAL

FCD #94-12

Northern/Orangewood Storm Drain Project

TO:

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Table 2A East Basin Elevation, Area, & Volume Relationship

Elevation (ft)	Area (ft^2)	Diff-Z (ft)	Diff-V (ft^3)	Volume (ft^3)	Volume (A-F)
1127.25	0	0	0	0	0.00
1128	211575	0.75	79340.625	79340.625	1.82
1129	432400	1	321987.5	401328.125	9.21
1130	883500	1	657950	1059278.13	24.32
1131	902400	1	892950	1952228.13	44.82
1132	921500	1	911950	2864178.13	65.75
1133	940800	1	931150	3795328.13	87.13
1134	960300	1	950550	4745878.13	108.95
1135	980000	1	970150	5716028.13	131.22
1136	999900	1	989950	6705978.13	153.95
1137	1020000	1	1009950	7715928.13	177.13
1138	1040300	1	1030150	8746078.13	200.78
1139	1060800	1	1050550	9796628.13	224.90
1140	1081500	1	1071150	10867778.1	249.49
1141	1102400	1	1091950	11959728.1	274.56
1142	1123500	1	1112950	13072678.1	300.11
1143	1144800	1	1134150	14206828.1	326.14
1144	1166300	1	1155550	15362378.1	352.67

Table 2B West Basin Elevation, Area, & Volume Relationship

Elevation Z (ft)	Area (ft^2)	Difference (ft)	D-Volume (ft^3)	C-Volume (ft^3)	C-Volume (A-F)
1115.5	0	0	0.0	0.0	0.00
1116.0	14450	0.5	3612.5	3612.5	0.08
1116.5	51520	0.5	16492.5	20105.0	0.46
1117.0	180350	0.5	57967.5	78072.5	1.79
1117.5	213900	0.5	57087.5	135160.0	3.10
1118.0	213900	0.5	106950.0	242110.0	5.56
1119.0	222306	1	218103.0	460213.0	10.57
1120.0	239604	1	230955.0	691168.0	15.87
1121.0	257550	1	248577.0	939745.0	21.57
1122.0	276144	1	266847.0	1206592.0	27.70
1123.0	295386	1	285765.0	1492357.0	34.26
1124.0	315276	1	305331.0	1797688.0	41.27
1125.0	335814	1	325545.0	2123233.0	48.74
1126.0	357000	1	346407.0	2469640.0	56.70
1127.0	378834	1	367917.0	2837557.0	65.14

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NORTHERN/ORANGEWOOD

STORM DRAIN PROJECT

SUBPHASES "B" AND "C"

EAST BASIN DESIGN CONCEPT

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10512
ASHOK C.
PATEL
Date Signed 5/5/98
ARIZONA, U.S.A.

May 5, 1998
WP #94153.06

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NORTHERN/ORANGEWOOD STORM DRAIN PROJECT
PHASE II, SUB-PHASES "B" & "C"
EAST BASIN DESIGN CONCEPT

I. INTRODUCTION

The purpose of this report is to present the modeling results of the East Basin design concept for the Northern Orangewood Phase II, Sub-phases "B" and "C".

Ultimately, two detention basins were included in this alignment after numerous alternative analyses and comparisons. The West Basin is located on the northeast corner of 71st Avenue and Orangewood Avenue. The East Basin is located on the east side of Grand Avenue between 65th and 63rd Avenues immediately south of Northern Avenue. The analysis included proposed improvements for the entire Orangewood Avenue and Glendale Avenue alignment from Grand Avenue near 63rd Avenue to the proposed outfall at the Agua Fria Freeway (AFF) channel.

The basins were originally designed as off-line surge basins, i.e., no storage routing was modeled. In that scenario, it was assumed that the detained flood water would be released after a runoff event by means of an uncontrolled outlet. Recently, the FCDMC suggested that Wood/Patel review several different basin modeling concepts, more specifically, as to the hydraulic functioning of the basin outlets. This report summarizes the options analysis and modeling results.

II. MODELING CRITERIA AND RESULTS

The base design criterion for the entire alignment is the 10-year 6-hour storm. Although not required in our current scope of work, storms for 25-year, 50-year, and 100-year return periods were also modeled as part of the analysis for the East Basin portion of the study area. The modeling results were summarized in Table 1, and the HEC-1 input and output files for the 10-year 6-hour design storm are included in Appendix A.

The selection criterion for different alternatives is to minimize the total cost of the alignment while meeting the flood design criterion.

Table 1. Modeling Results of the East Basin as an Off-Line Basin

HEC-1 File Name			10-Yr N O-ph2	25-Yr PH2-25	50-Yr PH2-50	100-Yr PH2-100
Rainfall Depth	PB	(in)	1.92	2.36	2.68	3.00
East Basin Inflow Peak	Qp	(cfs)	1041	1340	1556	1773
Total Inflow Volume	Vol	(A-F)	209	268	312	357
Max SD By-Pass Flow	Qm	(cfs)	108	100	95	90
Total By-Pass Volume	Vp	(A-F)	60	60	60	60
East Basin Storage	SV	(A-F)	149	208	252	297
East Basin Surge Flow	Qs	(cfs)	933	1240	1461	1683
East Basin Area	A	(acre)	15	20	23	27
East Basin Max. WSEL	WSEL	(ft)	1142	1142	1142	1142
West Basin Storage	Vw	(A-F)	39	42	44	45

III. ALTERNATIVE ANALYSIS

Based on the Northern/Orangewood Concept Routing Study, the West Basin has a storage capacity of 40 acre-ft at a water surface elevation of approximately 1123.5 ft. The maximum basin bypass flow has been limited to 50 cfs in order to minimize the cost of the downstream storm drain system. The East Basin design allows for some variation in size and can detain up to 300 acre-ft with a maximum opening surface area of 27 acres. HEC-1 modeling results show that the total peak flow into the West Basin is dominated by local flow as long as the bypass flow from the East Basin is less than 130 cfs. On the other hand, the total volume flowing into the West Basin is determined by the bypass flow rate from the East Basin if the bypass flow rate is greater than about 100 cfs. Based on these conditions, several alternatives were modeled and the results were summarized as follows:

1. Both the East and West Basins were modeled as on-line basins, and all of the flood water from the East Basin will flow directly into the West Basin after a short routing period. If the West Basin bypass flow is maintained at 50 cfs, the West Basin has insufficient volume.

2. The East Basin was modeled as an on-line basin and the West Basin was removed, in that case, the entire storm drain system downstream has to be upsized significantly which is not cost-effective.

3. The West Basin was modeled as an on-line basin and the East Basin was modeled as an off-line basin up to a water surface elevation of 1133 ft. Above this elevation, the basin was modeled as an on-line basin. The maximum bypass flow equals 108 cfs. Therefore, no flap gate is needed to detain flows above the 1133 ft. elevation. Only one mechanical gate will be required to bleed-off storage below 1133 ft. after the end of a run-off event when capacity is available in the downstream storm drain system. The peak flow will overspill into the basin via a weir constructed inside a junction structure at an elevation of 1133 ft. The peak stage in the basin can be as high as 1135 ft. Using this alternative, the West Basin maximum bypass flow is increased from 50 cfs to 74 cfs. The peak storage required is 41 acre-ft, and peak stage is estimated to be 1123.6 ft.

   The cost increase for upsizing the downstream storm drain pipes for this alternative is approximately $600,000.

4. The West Basin was modeled as an on-line basin and the East Basin was modeled as an off-line basin. In this alternative, there is no storage routing from the East Basin, i.e., flood water in the East Basin will not be released until capacity is available in the downstream storm drain system. The East Basin bleed-off rate should be approximately that of the bypass capacity for the West Basin. This alternative needs both a mechanic gate for bleed-off and flap gates to divert flow into the East Basin. The design water surface elevation of the East Basin would be raised to 1141 ft from 1135 ft in order to maximize the storage capacity benefits of the East Basin. The negative effect of this alternative is that as the water surface elevation in the East Basin rises, the storm drain capacity for the Grand Avenue ADOT areas will be reduced and possibly blocked from flowing into the basin. This alternative was modeled in detail in the following sections.

IV. DESIGN OF THE EAST BASIN

The alternative analysis results show that East Basin design is the key element for the entire storm drain system.

1. Determination of the Basin Bottom Elevation

   The East Basin should be designed in the way such that gravity bleed-off of the entire basin is possible. Based on the hydraulic grade line calculations from the outfall to the East Basin, the minimum bottom elevation for the basin is anticipated to be 1127.25 ft.

2. Determination of the Maximum Water Surface Elevation

   As mentioned previously, the design criterion is to minimize the total cost for the entire storm drain system. Therefore, the best use of East Basin is to set the design water surface elevation as high as possible in order to minimize the basin surface area required. However, when the water surface elevation in East Basin rises to some point the storm drain capacity for ADOT areas along Grand Avenue will be reduced and eventually blocked from flowing into the basin. The control factors for the East Basin maximum water surface elevation are the hydraulic grade line elevations near 67th Avenue and 63rd Avenue at Grand Avenue. The existing ground surface elevation at southwest corner of the basin should also be considered. The fundamental criterion for the maximum design water surface elevation in the East Basin is that it should have no backwater effect upstream of 67th Avenue and 63rd Avenue at Grand Avenue. Taking all of these factors into account, 1141 ft was determined to be the appropriate design water surface elevation for the East Basin.

3. Determination of the Maximum Storage Volume

   The maximum storage volume required for the East Basin is a function of the total inflow hydrograph volume and the maximum bypass flow rate which the downstream storm drain system can accept. The West Basin will be designed with a maximum bypass flow rate of 50 cfs and a limited storage of 40 acre-ft at water surface elevation of about 1123.5 ft. The maximum bypass flow for the East Basin is limited to 108 cfs in order to minimize the pipe cost of the downstream storm drain system. Therefore, the required storage volume for the East Basin calculated from the total inflow hydrograph is about 150 acre-ft. The total inflow hydrograph to the East Basin, the bypass flow hydrograph, and the water surface elevation changes are shown in Figure 1.

4. Determination of the Basin Side Slopes

   For the purposes of safety and multiple uses of the basin, a side slope of 5:1 (horizontal to vertical) was used. After the minimum bottom elevation, the maximum water surface elevation, the maximum storage volume, and the side slope were determined, the basin can be sized based on the panel's shape and land availability. The East Basin elevation, surface area, and storage volume relationships are shown in Figure 2. Note that the East Basin is also check to see its volume capacity to handle the 100-year 6-hour storm from the east portion of the drainage area.

5. Determination of the Maximum Bypass Flow Rate

As discussed in the determination of the maximum storage volume requirement for the East Basin, the maximum bypass flow rate is controlled by the downstream storm drain system capacity which is determined by minimizing the total system cost. For the 10-year 6-hour storm, 108 cfs is determined to be the appropriate bypass flow rate for the East Basin.

6. Determination of the Surge Spillway Elevation and Locations

The surge spillway elevation is determined based on the design bypass flow rate hydraulic grade line elevation near the basin on the southwest corner which is approximately 1132.5 ft, above which the flood water will start to spill into the basin. On the northeast corner, the surge spillway elevation is about 1143.5 ft. The hydraulic grade line calculations for the storm drain system are shown in Appendix B.

The majority of the inflows to the East Basin comes from the northeast corner where a large surge spillway structure will be constructed. The second largest quantity of flow waters at the NW corner of the basin. This flow is contributed by the drainage areas along 67th Avenue north of Northern Avenue. The remaining flows come from Grand Avenue from ADOT storm drains, surface sheet flow from east, and pipe flow from north, and the concentration point is at the southwest corner of the basin. Therefore, at least one surge structure should be constructed there.

7. Design Concept of the Surge Flap Gates

The purpose of the flap gate is to allow flood water flowing into the basin once the inflow is greater than the bypass capacity and block water flowing out of the basin when the hydraulic grade line in the storm drain is lower than the water surface elevation in the basin . The majority of the inflows to the East Basin comes from the northeast corner where high invert elevation does not require any flap gate. But on the southwest corner, at least one flap gate should be constructed in order to make the East Basin function as an off-line basin. A schematic of the flap gate is shown in Figure 3a.

8. Design Concept of the Bleed-off Mechanical Gate

The purpose of the mechanical gate is to block flood water flowing out of the basin during a storm and to drain the basin at high flow rate after the storm. A mechanical gate is required for the East Basin and can be constructed in conjunction with the flap gate. A schematic of the mechanical gate is shown in Figure 3a.

V. GRAND AVENUE STORM DRAIN SIMULATION

As mentioned earlier, the major concern of raising the design water surface elevation for the East Basin is that there is a small potential of preventing ADOT area storm water along Grand Avenue from flowing into the basin when the water surface elevation in the basin is high. The purpose of this section is to simulate this scenario and determine the impact to the ADOT storm drain and to evaluate the potential to use the East Basin to store flood water for higher than 10-year return period storms. The simulated results are shown in Figure 4.

Note that the inflow hydrographs from ADOT areas along Grand Avenue (ADOT NW flow and ADOT SE flow in Figure 4) are the HEC-1 modeling results. However, the storm drain pipes were sized by the ADOT consultants based on Rational Method results by which the peak flows are much higher than those computed by the HEC-1 model. Based on the selected pipe sizes and with different East Basin water surface elevations, the simulated storm drain capacities are shown as NW pipe capacity (corresponding to ADOT NW inflow hydrograph) and SE pipe capacity (corresponding to ADOT SE inflow hydrograph) in Figure 4. Figure 4 shows that the pipe capacities for ADOT areas along Grand Avenue are greater than the inflow hydrographs all the time, which indicates that all of the flood water will be able to flow into the East Basin in which the maximum water surface elevation is about 1135.8 ft.

Note also that the designed hydraulic grade line near the East Basin is about 1132 ft, and the pipe flow capacities were designed based on this hydraulic grade line elevation. In practice, the pipe flow capacities are higher than the designed flow capacities when the water surface elevation in the basin is lower than 1132 ft in the early time period of a storm as shown in Figure 4. Because the runoff concentration time from the ADOT areas along Grand Avenue is much shorter than that for the runoff coming from east portion of the drainage area, the designed storm drains for the ADOT area can handle storms with higher than 10-year return periods.

The designed East Basin outlet/surge structure will operate in four different stages during a storm event with return period equal to or higher than 10 years as follows:

1. Rising Low Flow Stage

   When the combined total inflow near the surge structure is equal to or less than the storm drain bypass flow capacity, the storm drain will convey all of the flow to downstream. With the hydraulic grade line lower than or equal to the crest elevation of the surge spillway, no flow will enter into the East Basin, and both the mechanical gate and flap gate are closed (see Figure 3a).

2. High Flow Stage

   When the total inflow near the surge structure is greater than the storm drain bypass flow capacity and the hydraulic grade line is higher than the designed crest elevation of the surge spillway, flood water spills over the spillway, opens the flap gate, and flows into the East Basin until the total inflow is less than or equal to the storm drain bypass capacity (see Figure 3b).

3. Receding Low Flow Stage

With the total inflow decrease and equal to the storm drain bypass capacity, the water surface elevation in the East Basin reaches its highest level and the hydraulic grade line in the pipe starts to be lower than the water surface elevation in the basin, the flap gate is closed. No more water exchanges between the storm drain and the basin, all of the inflow goes into the bypass storm drain (see Figure 3c).

4. Basin Bleed-off Stage

At the end of the storm event, when capacity is available in the downstream storm drain system, the mechanical gate is opened and all of the water in the East Basin is drained within 36 hours (see Figure 3d).

VI. CONCLUSIONS AND RECOMMENDATIONS

Based on the HEC-1 modeling and alternative analysis results, we conclude that:

1. The West Basin can function as an on-line basin with a maximum storage of 40 acre-ft at water surface elevation of 1123.5 ft, and bypass flow rate of 50 cfs;

2. The East Basin should be designed as an off-line basin with a maximum bypass flow rate of 108 cfs and maximum water surface elevation of 1141 ft at which it has potential to store flood water from east portion drainage area for higher than 10-year return period storms.

3. Grand Avenue storm drain simulation shows that the sized pipe capacities for ADOT areas are greater than the inflow hydrographs the majority of the time and most of the flood water along Grand Avenue will be able to flow into the East Basin.

report-94153-06-northern-orangewood-east-basin-m1

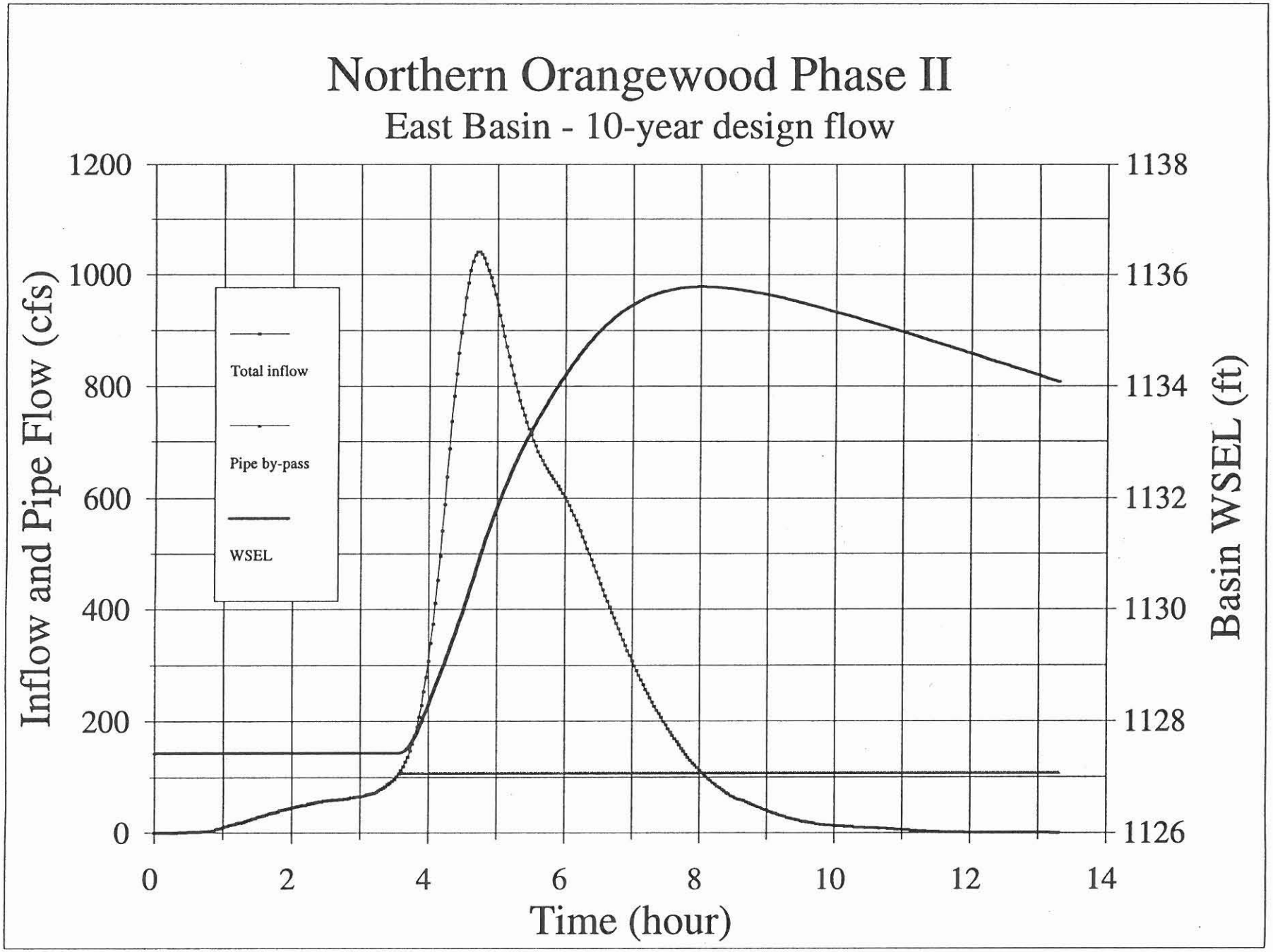
Northern Orangewood Phase II
East Basin - 10-year design flow
Inflow and Pipe Flow (cfs)
Basin WSEL (ft)
Time (hour)
Total inflow
Pipe by-pass
WSEL
0
200
400
600
800
1000
1200
1126
1128
1130
1132
1134
1136
1138
0
2
4
6
8
10
12
14

Fig. 1

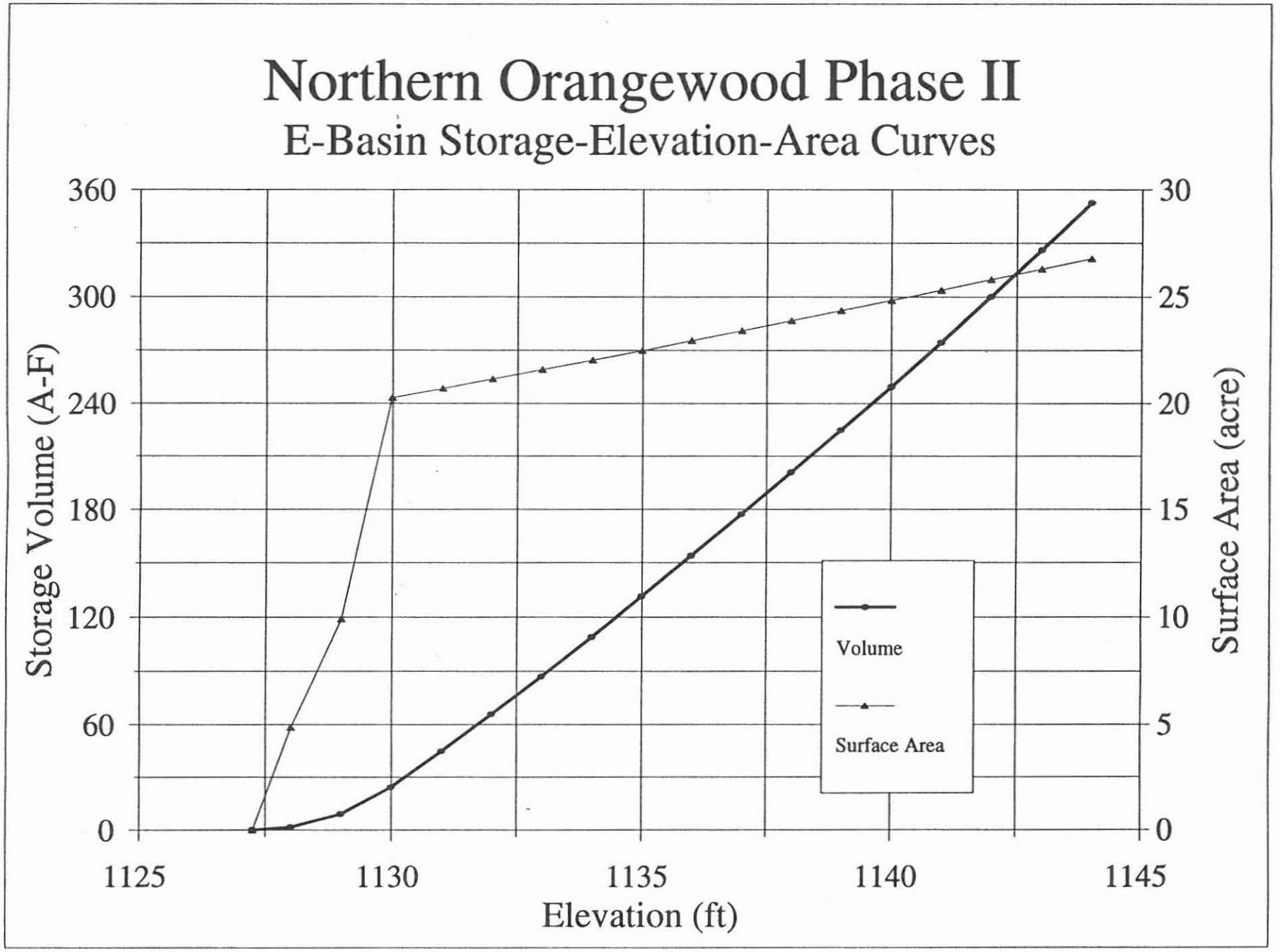
Northern Orangewood Phase II
E-Basin Storage-Elevation-Area Curves
Storage Volume (A-F)
360
300
240
180
120
60
0
Surface Area (acre)
30
25
20
15
10
5
0
1125
1130
1135
1140
1145
Elevation (ft)
Volume
Surface Area

Fig. 2

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PROJECT Northern Orangewood phase II

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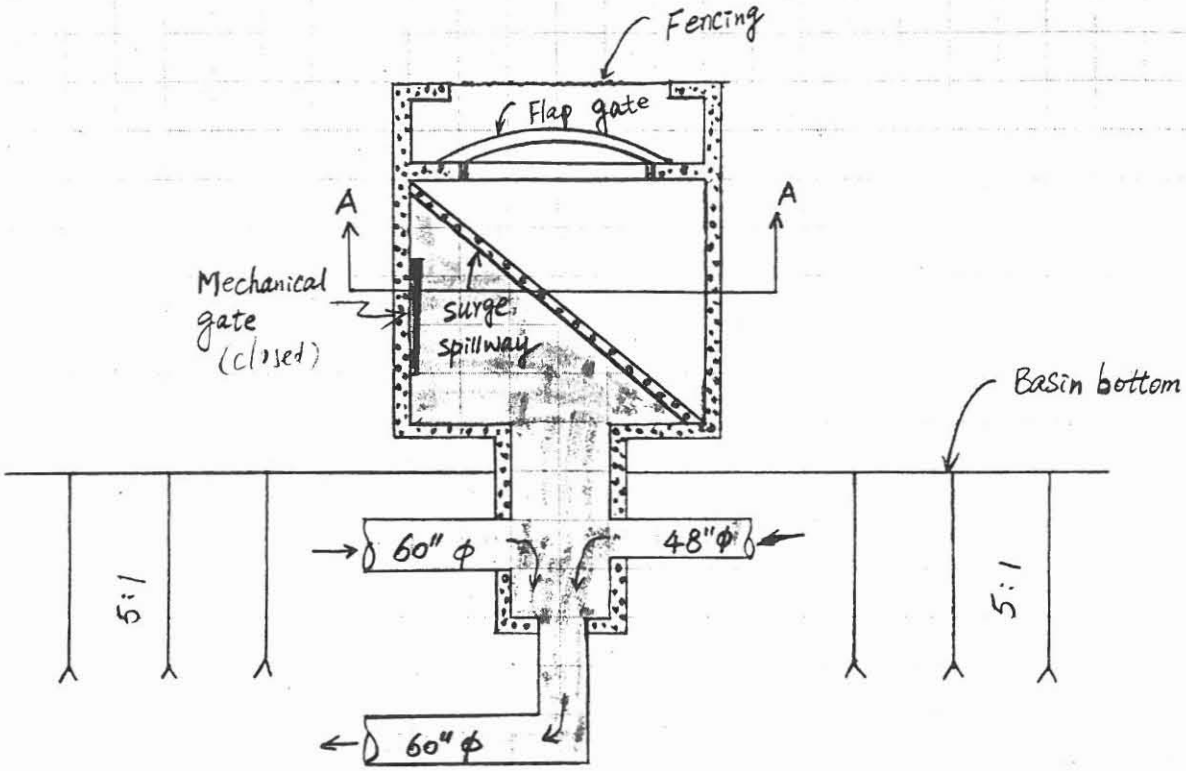
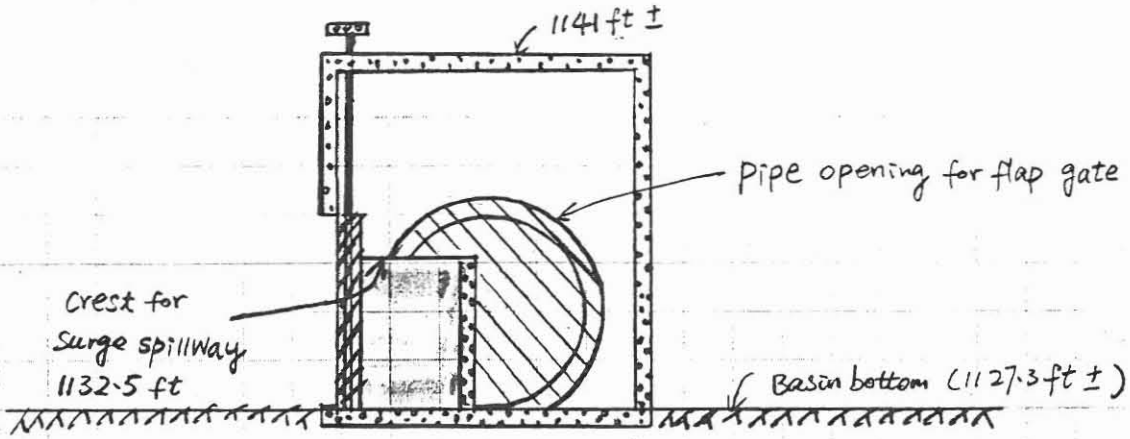
CALCULATED BY _____ DATE _____ CHECKED BY _____ DATE _____



Plan View, NTS



Section A-A
Elevation, NTS
(Flow condition at begining of storm)

Fig. 3a. A schematic of the Flap Gate and spillway

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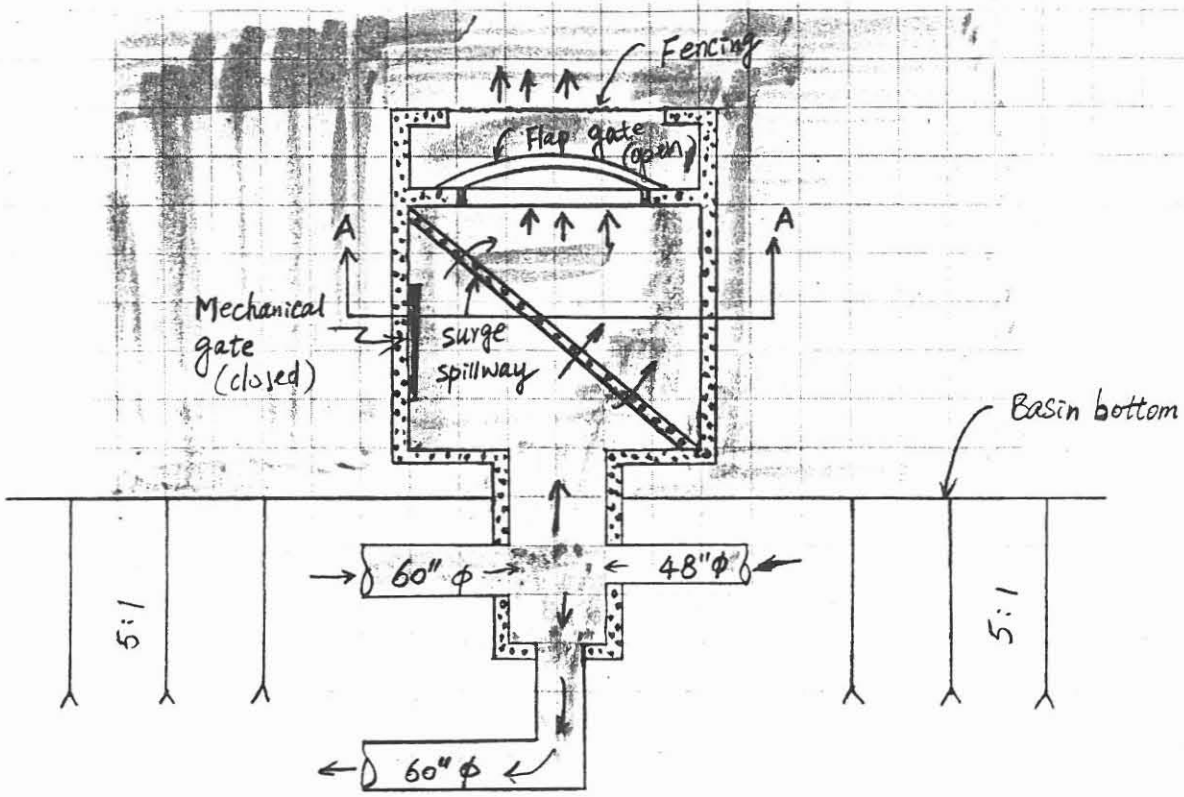
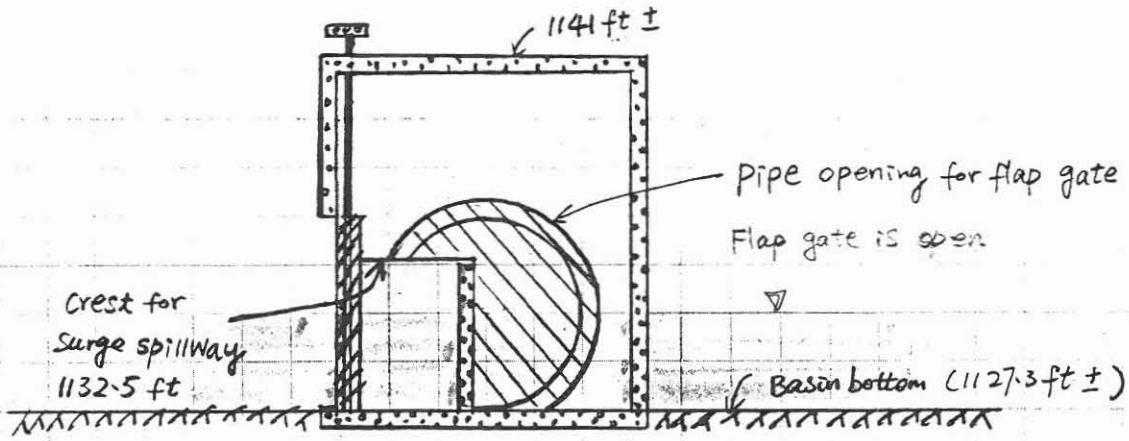


Plan View, NTS



Section A-A
Elevation, NTS

Fig. 3b. High Flow Stage

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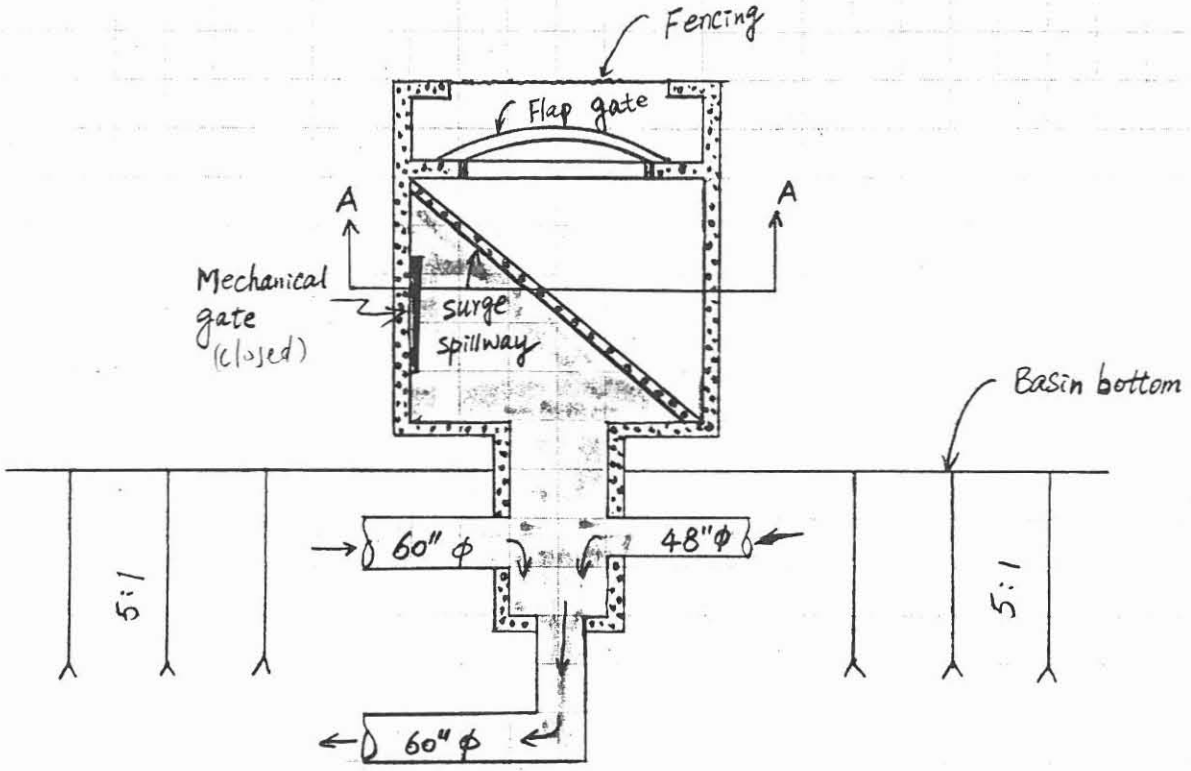
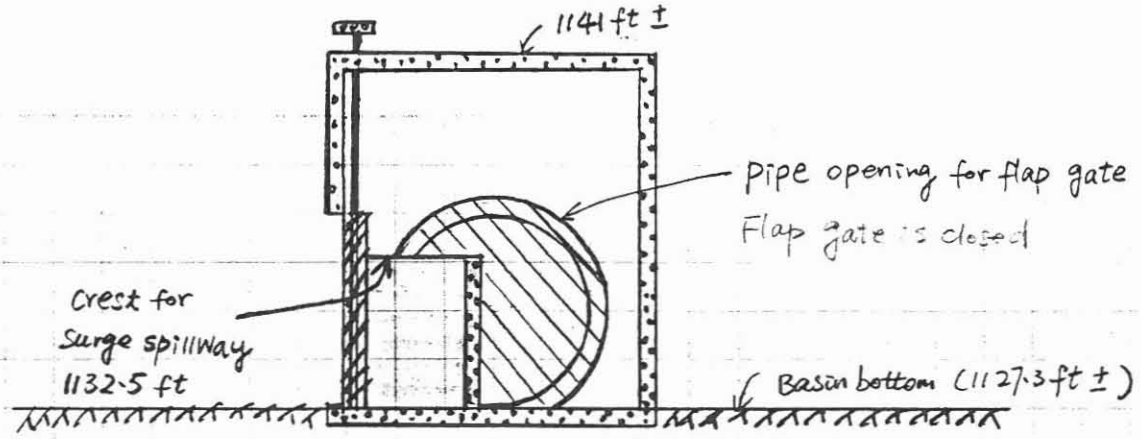


Plan View, NTS



Section A-A
Elevation, NTS

Fig. 3c. Receding Low Flow Stage

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PROJECT Northern Orangewood phase II

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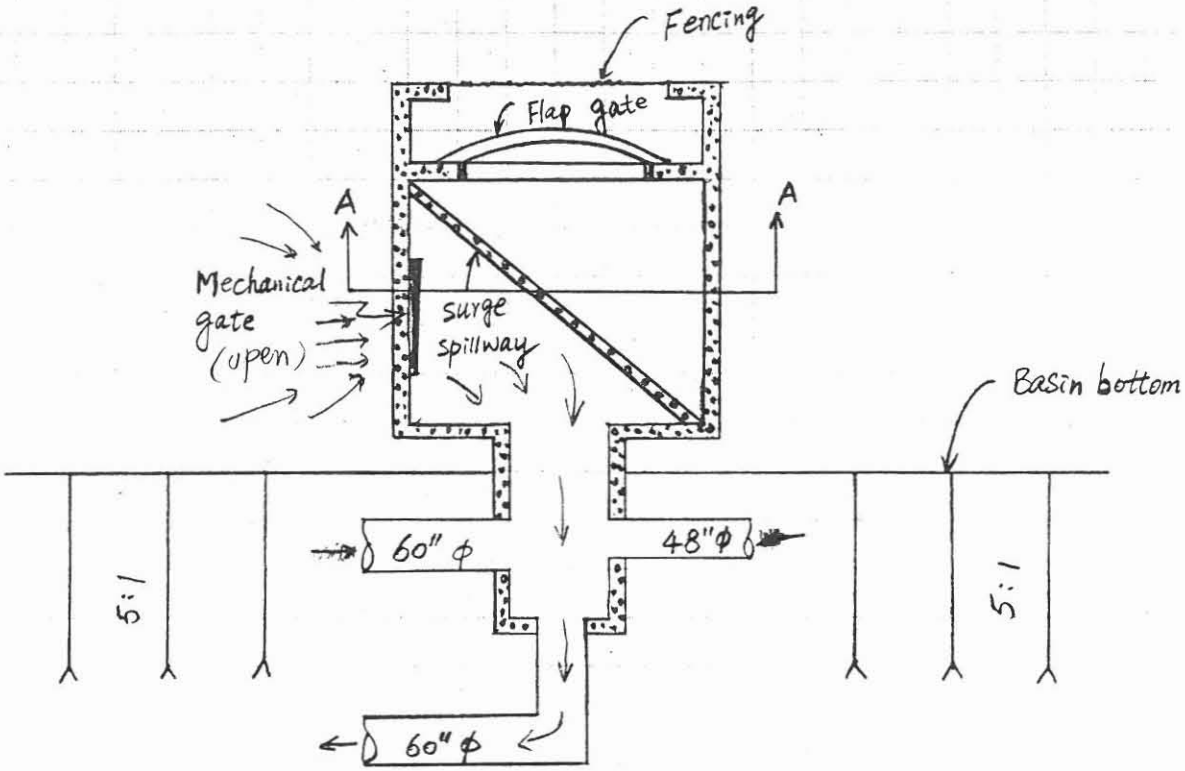
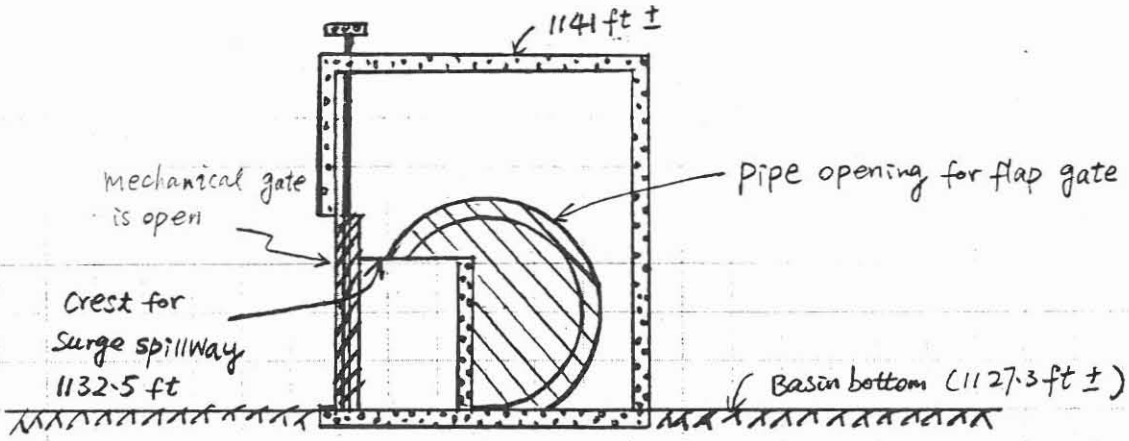


Plan View, NTS



Section A-A
Elevation, NTS

Fig. 3d. Basin Bleed-off Stage

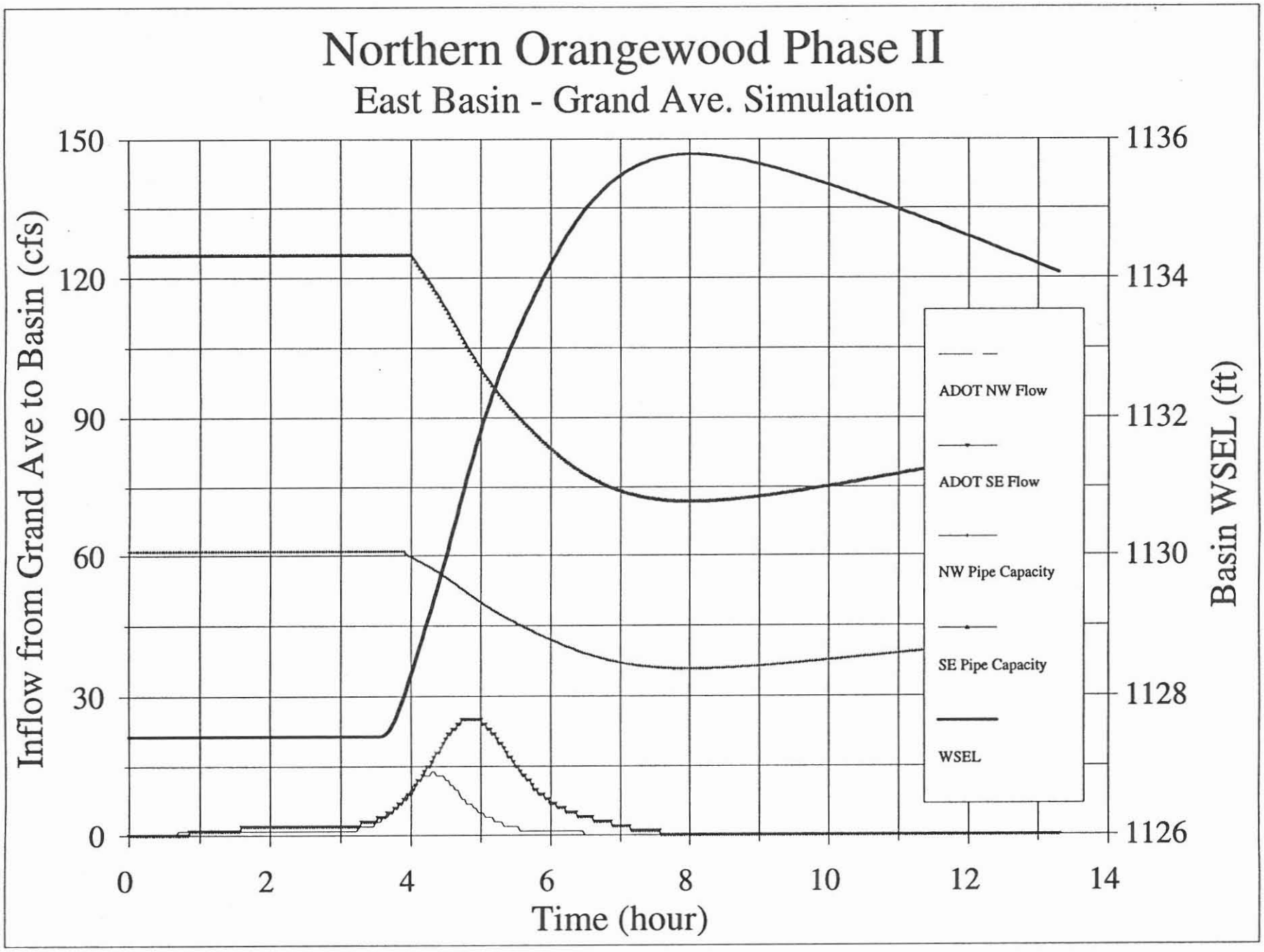

Northern Orangewood Phase II
East Basin - Grand Ave. Simulation
Inflow from Grand Ave to Basin (cfs)
Basin WSEL (ft)
Time (hour)
150
120
90
60
30
0
1136
1134
1132
1130
1128
1126
0
2
4
6
8
10
12
14
ADOT NW Flow
ADOT SE Flow
NW Pipe Capacity
SE Pipe Capacity
WSEL

Fig. 4

APPENDIX A.

HEC-1 Input and Output Files for the 10-Year 6-Hour Design Storm

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1*****************************************          ****************************************
 *                                       *          *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *          *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN 09 1992              *          *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.0.3E             *          *          609 SECOND STREET           *
 *                                       *          *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE  04/21/98  TIME  08:11:04   *          *           (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 STRUCTURE.
            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   NORTHERN-ORANGEWOOD STORM DRAIN PROJECT
             2          ID   GLENDALE WATERSHED
             3          ID   FUTURE CONDITION
             4          ID   10-YEAR, 6-HOUR STORM
             5          ID   PHOENIX VALLEY S-GRAPH UNIT HYDROGRAPH
             6          ID   GREEN-AMPT RAINFALL LOSSES
             7          ID   KINEMATIC WAVE ROUTING
             8          ID   **
             9          ID   ** MODEL CALIBRATED BY ADJUSTING Kn VALUES SO THAT LAG TIMES USING CORPS
            10          ID   ** LAG EQUATION MATCH THOSE OBTAINED BY HAND CALCULATION OF STREET VELOCITIES
            11          ID   **
            12          ID   ** AREAS OF FUTURE DEVELOPMENT ARE MODELED AS 10 PERCENT OF THEIR ACTUAL LAND
            13          ID   ** AREA, WITH THAT 10 PERCENT CONTRIBUTING 95 PERCENT (RTIMP = 95 PERCENT)
            14          ID   **
            15          ID   ** CONCEPT/ROUTING STUDY
            16          ID   ** EAST AND WEST DETENTION/SURGE BASINS, GLENDALE AVENUE STORM DRAIN
            17          ID   ** ALIGNMENT; 50 cfs WEST BASIN BYPASS
            18          ID   **
            19          ID   ** APRIL 5, 1996
            20          ID   **
            21          ID   ** FILE GLW-E50
            22          ID   **
                        *
                        * ***************************************************************************
                        *
                        *       East Basin Was Modeled as an Off-Line Basin - No Storage Routing, i.e.,
                        *       Flood Water in East Basin Will Not Be Released until West Basin Is
                        *       Available and the Bleed-off Rate Should Not Be Much Greater Than the
                        *       By-Pass Pipe Capacity for the West Basin.
                        *       West Basin Was Modeled as an On-Line Basin-Storage Routing Was Modeled.
                        *       Modified in April 9, 1998, by Shimin Zou.
                        *       File Location: H\Northern\Phase2\N_O-PH2.DAT
                        *
                        * ***************************************************************************
                        *
            23          IT       2                    1000
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 24          IO       5
             *DIAGRAM

 25          KK     10S
 26          KM   BASIN 10
 27          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 28          KM    L=    .9470  Lca=    .4640   S=  15.95  Kn=.0551  LAG= 34.30
 29          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 30          KM    ACTUAL BASIN AREA IS 0.2154 SQ MI
 31          BA   .2029
 32          IN      15
 33          KM   RAINFALL DEPTH OF 2.00 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
 34          KM   AN AREAL REDUCTION COEFFICIENT OF .959 WAS USED
 35          PB    1.92
 36          KM   THE FOLLOWING PC RECORD USED A 6-HOUR RAINFALL WITH PATTERN NO. 2.36
 37          PC    .000    .011    .017    .027    .039    .050    .060    .070    .081    .092
 38          PC    .104    .119    .140    .184    .271    .459    .685    .822    .888    .929
 39          PC    .949    .962    .974    .988   1.000
 40          LG    .149     .25    6.00    .164   55.99
1                                         HEC-1 INPUT
PAGE  2

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

 41          UI      20      20      20      22      65      75      89      99     109     116
 42          UI     127     140     152     170     202     242     260     224     198     179
 43          UI     165     153     138     125     116     102      95      82      65      52
 44          UI      35      35      33      33      25      20      20      20      11       6
 45          UI       6       6       6       6       6       6       6       6       6       6
 46          UI       6       0       0       0       0       0       0       0       0       0

 47          KK     10D
 48          KM   DIVERT 50 PERCENT OF FLOW FROM 10S SOUTH ON 47TH AVENUE
 49          DT   10DIV
 50          DI       0    1000
 51          DQ       0     500

 52          KK   10AR1
 53          KM   ROUTE FLOW WEST IN FUTURE BUTLER AVENUE STORM DRAIN
 54          RK    1320   .0038    .013            CIRC       5

 55          KK     20S
 56          KM   BASIN 20
 57          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 58          KM    L=    .9091  Lca=    .4545   S=  15.18  Kn=.0550  LAG= 33.79
 59          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 60          KM    ACTUAL BASIN AREA IS 0.2500 SQ MI
 61          BA   .2265
 62          LG    .149    .150    7.30    .099   56.75
 63          UI      23      23      23      28      74      86     103     113     124     134
 64          UI     145     161     175     198     246     279     285     245     217     198
 65          UI     183     168     151     138     125     113     104      86      65      48
 66          UI      40      39      37      36      23      23      23      19       7       7
 67          UI       7       7       7       7       7       7       7       7       7       7

 68          KK     20D
 69          KM   DIVERT 70 PERCENT OF FLOW FROM 20S TOWARDS WEST
 70          DT   20DIV
 71          DI       0    1000
 72          DQ       0     700

 73          KK     15C
 74          KM   COMBINE 10AR1 AND 20D
 75          HC       2

 76          KK   10AR2
 77          KM   ROUTE FLOW WEST IN FUTURE BUTLER AVENUE STORM DRAIN
 78          RK    1320   .0038    .013            CIRC       5

 79          KK   20BR1
 80          KM   ROUTE FLOW SOUTH IN FUTURE 51ST AVENUE STORM DRAIN
 81          RK    1320   .0011    .013            CIRC       7

 82          KK     30S
 83          KM   BASIN 30
 84          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 85          KM    L=   1.2595  Lca=    .5871   S=  15.92  Kn=.0552  LAG= 43.94
 86          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 87          BA   .3163
1                                         HEC-1 INPUT
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 88           LG     .15     .25    4.80     .28   53.87
 89           UI      24      24      24      24      24      77      85      95     111     119
 90           UI     129     137     145     154     166     181     190     212     243     281
 91           UI     320     305     269     245     226     210     198     188     171     159
 92           UI     149     140     126     118     111      94      79      70      47      43
 93           UI      43      40      40      40      25      24      24      24      24      10
 94           UI       7       7       7       7       7       7       7       7       7       7
 95           UI       7       7       7       7       7       0       0       0       0       0

 96           KK     30D
 97           KM   DIVERT 50 PERCENT OF FLOW FROM 30S TO WEST
 98           DT   30DIV
 99           DI       0    2000
100           DQ       0    1000

101           KK     25C
102           KM   COMBINE 20BR1 AND 30D
103           HC       2

104           KK   20BR2
105           KM   ROUTE FLOW SOUTH IN FUTURE 51ST AVENUE STORM DRAIN
106           RK    1320   .0011    .013            CIRC       7
              *

107           KK   10DIV
108           KM   RETRIEVE DIVERTED FLOW
109           DR   10DIV

110           KK   10B1R
111           KM   ROUTE FLOW SOUTH ON 47TH AVENUE
112           RK    2640   .0026     .02            TRAP     125     .01

113           KK  10B2R1
114           KM   ROUTE FLOW WEST IN FUTURE NORTHERN AVENUE STORM DRAIN
115           RK    1320   .0019    .013            CIRC       7

116           KK   30DIV
117           KM   RETRIEVE DIVERTED FLOW
118           DR   30DIV

119           KK     16C
120           KM   COMBINE 10B2R1 AND 30DIV
121           HC       2

122           KK  10B2R2
123           KM   ROUTE FLOW WEST IN FUTURE NORTHERN AVENUE STORM DRAIN
124           RK    1320   .0019    .013            CIRC       7

125           KK     30C
126           KM   COMBINE 20BR2 AND 10B2R2
127           HC       2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

128           KK     30R
129           KM   ROUTE 30C2 WEST IN FUTURE NORTHERN AVENUE STORM DRAIN
130           RK    2640   .0045    .012            CIRC       8
              *

131           KK   20DIV
132           KM   RETRIEVE DIVERTED FLOW
133           DR   20DIV

134           KK    20AR
135           KM   ROUTE REMAINING FLOW WEST ON BUTLER AVENUE
136           RK    2640    .004     .02            TRAP     110     .01

137           KK     40S
138           KM   BASIN 40
139           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
140           KM    L=   1.0000  Lca=    .5000   S=  16.70  Kn=.1756  LAG=113.83
141           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
142           BA   .2500
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143          LG     .23     .15    8.40     .06   34.09
144          UI       7       7       7       7       7       7       7       7       7       7
145          UI       7       7       7      23      24      24      24      28      28      28
146          UI      31      34      34      35      36      36      40      40      41      41
147          UI      42      44      44      46      46      48      49      51      52      55
148          UI      55      57      58      59      63      65      58      74      76      84
149          UI      90      83      95     100      99      94      89      85      81      78
150          UI      76      73      71      69      67      65      63      62      61      59
151          UI      58      57      55      53      51      50      48      47      46      45
152          UI      44      43      42      39      39      37      36      36      34      34
153          UI      33      28      28      28      23      21      21      21      20      13
154          UI      13      13      13      13      13      13      12      12      12      12
155          UI      12      12      12      12       8       7       7       7       7       7
156          UI       7       7       7       7       7       7       7       4       2       2
157          UI       2       2       2       2       2       2       2       2       2       2
158          UI       2       2       2       2       2       2       2       2       2       2
159          UI       2       2       2       2       2       2       2       2       2       2
160          UI       2       2       2       2       2       2       2       2       2       0

161          KK     40C
162          KM   COMBINE 20AR AND 40S
163          HC       2

164          KK     40D
165          KM   DIVERT 80 PERCENT OF FLOW WEST ON BUTLER AVENUE
166          DT   40DIV
167          DI       0    2000
168          DQ       0    1600

169          KK    40BR
170          KM   ROUTE REMAINING FLOW SOUTH ON 55TH AVENUE
171          RK    2640    .002     .02            TRAP     110     .01
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                                        HEC-1 INPUT

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

172          KK    45C1
173          KM   COMBINE 30R AND 40BR
174          HC       2

175          KK     60S
176          KM   BASIN 60
177          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
178          KM    L=   1.5000  Lca=    .5606   S=  17.07  Kn=.1798  LAG=141.41
179          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
180          KM    ACTUAL BASIN AREA IS 0.5000 SQ MI
181          BA   .4574
182          LG    .185    .190    6.60    .143   38.79
183          UI      11      11      11      11      11      11      11      11      11      11
184          UI      11      11      11      11      11      11      29      36      36      36
185          UI      36      40      42      42      42      46      50      50      50      53
186          UI      53      53      57      58      58      60      61      61      63      64
187          UI      64      68      68      69      72      72      75      76      79      81
188          UI      82      83      84      86      88      93      95     100     105     109
189          UI     113     123     138     119     131     142     147     147     140     134
190          UI     130     125     120     117     114     110     108     104     102     100
191          UI      97      96      93      93      89      89      86      86      84      83
192          UI      79      78      76      74      73      70      70      67      66      66
193          UI      63      63      62      57      57      57      53      53      53      51
194          UI      50      50      49      42      42      42      42      32      31      31
195          UI      31      31      28      19      19      19      19      19      19      19
196          UI      19      19      18      18      18      18      18      18      18      18
197          UI      18      17      11      11      11      11      11      11      11      11
198          UI      11      11      11      11      11      11      11      11       4       3
199          UI       3       3       3       3       3       3       3       3       3       3
200          UI       3       3       3       3       3       3       3       3       3       3
201          UI       3       3       3       3       3       3       3       3       3       3
202          UI       3       3       3       3       3       3       3       3       3       3
203          UI       3       3       3       3       3       3       3       3       3       3
204          UI       3       3       0       0       0       0       0       0       0       0

205          KK     60D
206          KM   DIVERT 75 PERCENT OF FLOW TOWARDS WEST
207          DT   60DIV
208          DI       0    2000
209          DQ       0    1500

210          KK    45C2
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 211          KM   COMBINE 45C1 AND 60D
 212          HC       2

 213          KK     45R
 214          KM   ROUTE 45C2 WEST IN FUTURE NORTHERN AVENUE STORM DRAIN
 215          RK    2640   .0038    .013            CIRC       8
              *
1                                                HEC-1 INPUT
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      LINE    ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 216          KK   40DIV
 217          KM   RETRIEVE DIVERTED FLOW
 218          DR   40DIV

 219          KK   40AR1
 220          KM   ROUTE REMAINING FLOW WEST IN FUTURE BUTLER AVENUE STORM DRAIN
 221          RK    1320   .0034    .013            CIRC       5

 222          KK     50S
 223          KM   BASIN 50
 224          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 225          KM    L=   1.0000  Lca=    .5000   S=  15.20  Kn=.1599  LAG=105.50
 226          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 227          KM    ACTUAL BASIN AREA IS 0.2500 SQ MI
 228          BA   .1625
 229          LG    .201    .150    8.40    .066   44.65
 230          UI       5       5       5       5       5       5       5       5       5       5
 231          UI       5       5      15      17      17      18      20      20      20      24
 232          UI      24      24      25      25      27      28      29      29      30      31
 233          UI      31      32      33      34      35      36      38      39      40      41
 234          UI      40      44      47      49      52      54      66      57      66      70
 235          UI      69      65      62      59      57      54      52      50      49      47
 236          UI      46      45      44      43      41      41      40      38      37      35
 237          UI      35      33      32      31      31      30      29      27      27      26
 238          UI      25      25      24      24      21      20      20      17      15      15
 239          UI      15      12       9       9       9       9       9       9       9       9
 240          UI       9       9       9       9       9       8       5       5       5       5
 241          UI       5       5       5       5       5       5       5       5       2       2
 242          UI       2       2       2       2       2       2       2       2       2       2
 243          UI       2       2       2       2       2       2       2       2       2       2
 244          UI       2       2       2       2       2       2       2       2       2       2
 245          UI       2       2       2       2       2       2       2       0       0       0

 246          KK     50D
 247          KM   DIVERT 65 PERCENT OF FLOW TOWARDS WEST
 248          DT   50DIV
 249          DI       0    2000
 250          DQ       0    1000

 251          KK     46C
 252          KM   COMBINE 40AR1 AND 50D
 253          HC       2

 254          KK   40AR2
 255          KM   ROUTE FLOW WEST IN FUTURE BUTLER AVENUE STORM DRAIN
 256          RK    1320   .0034    .013            CIRC       5

 257          KK   50BR1
 258          KM   ROUTE FLOW SOUTH IN FUTURE 59TH AVENUE STORM DRAIN
 259          RK    1320   .0027    .013            CIRC       7
1                                                HEC-1 INPUT
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      LINE    ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 260          KK   60DIV
 261          KM   RETRIEVE DIVERTED FLOW
 262          DR   60DIV

 263          KK     55C
 264          KM   COMBINE 60DIV AND 50BR1
 265          HC       2

 266          KK   50BR2
 267          KM   ROUTE FLOW SOUTH IN FUTURE 59TH AVENUE STORM DRAIN
 268          RK    1320   .0027    .013            CIRC       7
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 269          KK     60C
 270          KM   COMBINE 55C AND 50BR2
 271          HC       2

 272          KK    60AR
 273          KM   ROUTE REMAINING FLOW WEST IN FUTURE NORTHERN AVENUE STORM DRAIN
 274          RK    2640   .0038    .013            CIRC       9
              *

 275          KK   50DIV
 276          KM   RETRIEVE DIVERTED FLOW
 277          DR   50DIV

 278          KK    50AR
 279          KM   ROUTE REMAINING FLOW WEST ON BUTLER AVENUE
 280          RK    2640   .0038     .02            TRAP     110     .01

 281          KK     80S
 282          KM   BASIN 80
 283          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 284          KM    L=   1.0000  Lca=    .5000   S=  18.80  Kn=.0544  LAG= 34.50
 285          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 286          KM    ACTUAL BASIN AREA IS 0.2236 SQ MI
 287          BA   .1494
 288          LG    .144    .150    8.80    .055   67.31
 289          UI      15      15      15      16      48      54      65      72      79      85
 290          UI      92     101     111     123     145     175     192     166     146     133
 291          UI     122     114     102      93      86      76      70      62      50      41
 292          UI      26      26      24      24      20      15      15      15      10       4
 293          UI       4       4       4       4       4       4       4       4       4       4
 294          UI       4       0       0       0       0       0       0       0       0       0

 295          KK     80C
 296          KM   COMBINE 50AR AND 80S
 297          HC       2

 298          KK     80D
 299          KM   DIVERT 50 PERCENT OF FLOW WEST IN FUTURE BUTLER AVENUE STORM DRAIN
 300          DT   80DIV
 301          DI       0    2000
 302          DQ       0    1000
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                                        HEC-1 INPUT

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

 303          KK    80BR
 304          KM   ROUTE RETRIEVED FLOW SOUTH ON 63RD AVENUE
 305          RK    2640   .0023     .02            TRAP     100     .01

 306          KK    85C1
 307          KM   COMBINE 60AR AND 80BR
 308          HC       2

 309          KK    100S
 310          KM   BASIN 100
 311          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 312          KM    L=   1.5000  Lca=    .7500   S=  14.47  Kn=.1533  LAG=138.93
 313          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 314          KM    ACTUAL BASIN AREA IS 0.5000 SQ MI
 315          BA   .4076
 316          LG    .147    .150    8.80    .061   51.14
 317          UI      10      10      10      10      10      10      10      10      10      10
 318          UI      10      10      10      10      10      10      32      32      32      32
 319          UI      33      38      38      38      38      45      45      45      47      48
 320          UI      48      49      53      53      54      55      55      57      58      58
 321          UI      60      61      62      65      65      68      69      71      73      74
 322          UI      76      76      78      79      84      86      91      95      99     103
 323          UI     113     123     108     121     130     134     133     126     121     116
 324          UI     113     108     105     103      99      96      95      91      90      87
 325          UI      86      84      83      81      80      78      77      76      74      71
 326          UI      70      67      67      64      63      62      60      60      58      57
 327          UI      57      52      52      52      49      48      48      47      45      45
 328          UI      44      38      38      38      38      29      28      28      28      28
 329          UI      24      17      17      17      17      17      17      17      17      17
 330          UI      16      16      16      16      16      16      16      16      16      12
 331          UI      10      10      10      10      10      10      10      10      10      10
 332          UI      10      10      10      10      10       5       3       3       3       3
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 333          UI       3       3       3       3       3       3       3       3       3       3
 334          UI       3       3       3       3       3       3       3       3       3       3
 335          UI       3       3       3       3       3       3       3       3       3       3
 336          UI       3       3       3       3       3       3       3       3       3       3
 337          UI       3       3       3       3       3       3       3       3       3

 338          KK    100D
 339          KM   DIVERT 60 PERCENT OF 100S TO WEST
 340          DT  100DIV
 341          DI       0    2000
 342          DQ       0    1200

 343          KK    85C2
 344          KM   COMBINE 85C1 AND 100D
 345          HC       2

 346          KK     85D
 347          KM   DIVERT ALL BUT CAPACITY OF FUTURE 42" NORTHERN STORM DRAIN (42 CFS)
 348          DT   85DIV
 349          DI       0      42    1500
 350          DQ       0       0    1458
1                                          HEC-1 INPUT
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 351          KK     85R
 352          KM   ROUTE 85C2 WEST IN FUTURE NORTHERN AVENUE STORM DRAIN
 353          RK    1320   .0008    .013            CIRC       3
              *

 354          KK   80DIV
 355          KM   RETRIEVE DIVERTED FLOW
 356          DR   80DIV

 357          KK     90S
 358          KM   BASIN 90
 359          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 360          KM    L=    .7936  Lca=    .5316   S=  19.78  Kn=.0509  LAG= 29.95
 361          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 362          KM    ACTUAL BASIN AREA IS 0.0525 SQ MI
 363          BA   .0138
 364          LG    .119    .150    8.80    .052   74.33
 365          UI       2       2       2       4       6       7       8       9       9      10
 366          UI      11      13      15      19      20      17      15      13      12      11
 367          UI      10       9       8       7       6       4       3       3       3       3
 368          UI       2       2       2       1       0       0       0       0       0       0

 369          KK    80C2
 370          KM   COMBINE 80DIV AND 90S
 371          HC       2

 372          KK    80AR
 373          KM   ROUTE REMAINING FLOW WEST IN FUTURE BUTLER AVENUE STORM DRAIN
 374          RK    2640   .0028    .013            CIRC       5

 375          KK    90R1
 376          KM   ROUTE 80AR SOUTH IN FUTURE 67TH AVENUE STORM DRAIN
 377          RK    1320   .0011    .013            CIRC      10

 378          KK  100DIV
 379          KM   RETRIEVE DIVERTED FLOW
 380          DR  100DIV

 381          KK     95C
 382          KM   COMBINE 90R1 AND 100DIV
 383          HC       2

 384          KK    90R2
 385          KM   ROUTE 80AR SOUTH IN FUTURE 67TH AVENUE STORM DRAIN
 386          RK    1320   .0011    .013            CIRC      10

 387          KK    111S
 388          KM   BASIN 111
 389          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 390          KM   L=     .3409  Lca=    .1894   S=   7.92  Kn=.0532  LAG= 18.26
 391          KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 392          KM   ACTUAL BASIN AREA = 0.0329 SQ MI
 393          BA   .0144
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 394          LG    .136    .150    9.70    .041   90.72
                                            HEC-1 INPUT
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 395          UI       3       3       8      12      14      17      20      25      34      29
 396          UI      23      20      17      14      11       7       5       4       3       3
 397          UI       2       1       1       1       1       1       1       0       0       0

 398          KK    111C
 399          KM   COMBINE 90R2 AND 111S
 400          HC       2

 401          KK    90R3
 402          KM   ROUTE 111C EAST IN FUTURE NORTHERN AVENUE STORM DRAIN
 403          RK    1320   .0011    .013            CIRC       5

 404          KK     95C
 405          KM   COMBINE 85R AND 90R3
 406          HC       2

 407          KK     95D
 408          KM   DIVERT ALL BUT CAPACITY OF FUTURE 65TH AVENUE STORM DRAIN (71 CFS)
 409          DT   95DIV
 410          DI       0      71    1500
 411          DQ       0       0    1429

 412          KK     96R
 413          KM   ROUTE 95D SOUTH IN FUTURE 65TH AVENUE STORM DRAIN
 414          RK    1350   .0038    .013            CIRC       4

 415          KK    110S
 416          KM   BASIN 110
 417          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 418          KM    L=   1.0227  Lca=    .4167   S=   7.82  Kn=.1272  LAG= 89.59
 419          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 420          KM    ACTUAL BASIN AREA IS 0.4022 SQ MI
 421          BA   .3758
 422          LG    .149    .150    7.60    .095   55.30
 423          UI      14      14      14      14      14      14      14      14      14      14
 424          UI      37      46      46      51      54      54      64      65      68      69
 425          UI      73      76      78      79      82      83      88      90      93      97
 426          UI     100     105     108     110     114     121     130     141     147     175
 427          UI     160     185     191     181     169     160     152     145     139     134
 428          UI     129     125     120     117     114     111     108     102      99      96
 429          UI      91      89      85      83      81      75      74      70      69      66
 430          UI      65      59      54      54      43      41      41      37      25      25
 431          UI      25      25      25      24      23      23      23      23      23      22
 432          UI      14      14      14      14      14      14      14      14      14      14
 433          UI       6       4       4       4       4       4       4       4       4       4
 434          UI       4       4       4       4       4       4       4       4       4       4
 435          UI       4       4       4       4       4       4       4       4       4       4
 436          UI       4       4       4       0       0       0       0       0       0       0

 437          KK     70S
 438          KM   BASIN 70
 439          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 440          KM    L=   1.3636  Lca=    .4545   S=  17.16  Kn=.0456  LAG= 38.21
 441          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 442          KM    ACTUAL BASIN AREA IS 0.2216 SQ MI
                                            HEC-1 INPUT
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 443          BA   .1602
 444          LG    .146    .230    6.20     .15   72.80
 445          UI      14      14      14      14      34      48      55      66      71      77
 446          UI      82      88      96     105     113     129     157     173     182     158
 447          UI     142     129     120     112     104      93      87      80      72      67
 448          UI      59      49      41      28      25      24      23      23      17      14
 449          UI      14      14      11       4       4       4       4       4       4       4
 450          UI       4       4       4       4       4       4       4       0       0       0

 451          KK    70AR
 452          KM   ROUTE 70C WEST ALONG GLENDALE'S G AVENUE
 453          RK    2450   .0036     .02            TRAP     100     .01

 454          KK   70BR1
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455          KM   ROUTE 70AR NORTHWEST IN FUTURE GRAND AVENUE STORM DRAIN
456          RK    1880   .0021    .013            CIRC     4.5

457          KK     76C
458          KM   COMBINE 70BR1 AND 110S
459          HC       2

460          KK    115C
461          KM   COMBINE 76C AND 96R
462          HC       2

463          KK    115D
464          KM   DIVERT ALL BUT CAPACITY OF FUTURE 60" 65TH AVENUE STORM DRAIN INTO EAST
465          KM   BASIN
466          DO       1       2
467          DT  115DIV
468          DI       0     108    2000
469          DQ       0       0    1892

470          KK    112S
471          KM   GRAND AVENUE PAVEMENT RUNOFF
472          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
473          KM    L=       .9  Lca=       .5   S=    8.3  Kn= .041  LAG=  29.5
474          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
             *  KO   1       2
475          BA     .02
476          LG     .05     .15    9.70     .04   95.00
477          UI      2.      2.      2.      4.      6.      8.      9.     10.     10.     12.
478          UI     13.     14.     18.     21.     21.     18.     16.     14.     13.     12.
479          UI     11.      9.      8.      7.      6.      4.      3.      3.      3.      2.
480          UI      2.      2.      2.      1.      1.      1.      1.      1.      1.      1.
481          UI      1.      1.      1.      0.      0.      0.      0.      0.      0.      0.
482          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

483          KK    113S
484          KM   GRAND AVENUE PAVEMENT RUNOFF
485          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
486          KM    L=      2.5  Lca=      1.2   S=    6.4  Kn= .041  LAG=  63.7
487          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
             *  KO     1       2
488          BA     .04
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

489          LG     .05     .15    8.40     .06   95.00
490          UI      2.      2.      2.      2.      2.      2.      2.      5.      7.      7.
491          UI      8.      9.     10.     10.     11.     11.     12.     12.     13.     13.
492          UI     14.     15.     15.     16.     17.     18.     20.     23.     24.     27.
493          UI     27.     25.     23.     22.     20.     19.     18.     18.     17.     16.
494          UI     15.     15.     14.     13.     13.     12.     11.     11.     10.     10.
495          UI      9.      8.      7.      6.      6.      4.      4.      4.      4.      4.
496          UI      3.      3.      3.      3.      2.      2.      2.      2.      2.      2.
497          UI      2.      1.      1.      1.      1.      1.      1.      1.      1.      1.
498          UI      1.      1.      1.      1.      1.      1.      1.      1.      1.      1.
499          UI      1.      1.      1.      1.      1.      0.      0.      0.      0.      0.
500          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

501          KK   115C2
502          KM   COMBINE 112S, 113S, AND 115D
503          HC       3
             *       Retrieve 85DIV, 95DIV, and 115DIV - SZ, April, 98

504          KK   85DIV
505          KM   RETRIEVE DIVERTED FLOW
506          DR   85DIV

507          KK   95DIV
508          KM   RETRIEVE DIVERTED FLOW
509          DR   95DIV

510          KK  115DIV
511          KM   RETRIEVE DIVERTED FLOW
512          DR  115DIV
             *
             *       Combine All Inflows to the East Basin
             *

513          KK  E-BASN
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514          KM        COMBINE 85DIV, 95DIV, 115DIV, AND 115C2 = Total Inflow into E-Basin
515          KO       1
516          HC       4
             *
             *      East Basin Was Modeled as an Off-Line Basin
             *

517          KK   115D2
518          KM       DIVERT ALL BUT CAPACITY (108 cfs) OF FUTURE 60" 65TH AVENUE STORM DRAIN
519          KM       INTO EAST BASIN
520          KO       1
521          DT  115DV2
522          DI       0     108    2000
523          DQ       0       0    1892
             *
1                                                HEC-1 INPUT
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

524          KK    110R
525          KM   ROUTE 115D SOUTH IN FUTURE 65TH AVENUE STORM DRAIN
526          RK    2640   .0034    .013            CIRC       5

527          KK    125S
528          KM   BASIN 125
529          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
530          KM   L=      .4451 Lca=    .3030   S=   20.00 Kn=.0543  LAG= 20.66
531          KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
532          BA   .0268
533          LG    .143    .250    5.70    .170   76.36
534          UI       4       4      11      17      22      25      29      33      41      55
535          UI      50      41      36      31      26      22      18      13       8       7
536          UI       6       4       4       2       1       1       1       1       1       1

537          KK   120C1
538          KM   COMBINE 125S AND 110R
539          HC       2

540          KK    120S
541          KM   BASIN 120
542          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
543          KM    L=    .4830  Lca=    .2178   S=  18.01  Kn=.0544  LAG= 19.21
544          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
545          KM    ACTUAL BASIN AREA = 0.0752 SQ MI
546          BA   .0487
547          LG    .144    .150    8.80    .050   76.21
548          UI       9       9      25      36      45      51      60      72      98     104
549          UI      83      71      60      51      43      34      21      15      14      10
550          UI       9       5       3       3       3       3       3       3       0       0

551          KK   120C2
552          KM   COMBINE 120C1 AND 120S
553          HC       2

554          KK    120R
555          KM   ROUTE FLOW FROM BASIN 120 WESTWARD IN PROPOSED ORANGEWOOD STORM DRAIN
556          RK    1320   .0038    .013            CIRC     6.5

557          KK    130S
558          KM   BASIN 130
559          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
560          KM    L=    .5000  Lca=    .2500   S=  18.60  Kn=.0539  LAG= 20.22
561          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
562          KM    ACTUAL BASIN AREA = .0623 SQ MI
563          BA   .0341
564          LG    .141    .150    8.80    .050   76.83
565          UI       6       6      14      23      29      33      38      44      58      72
566          UI      61      51      45      38      32      27      21      14      10       9
567          UI       7       6       4       2       2       2       2       2       2       2
1                                                HEC-1 INPUT
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

568          KK    130D
569          KM   DIVERT 90 PERCENT OF FLOW TO WEST
570          DT  130DIV
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571          DI       0    1000
572          DQ       0     900

573          KK   130BR
574          KM   ROUTE REMAINING FLOW SOUTH ON 69TH AVENUE
575          RK    1320   .0019    .020            TRAP      90     .01

576          KK    140S
577          KM   BASIN 140
578          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
579          KM    L=    .5000  Lca=    .2500   S=  10.00  Kn=.0552  LAG= 23.29
580          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
581          BA   .0606
582          LG     .15     .15    9.70     .04   75.00
583          UI       9       9      15      31      40      46      52      59      67      81
584          UI     106     107      88      76      68      59      51      44      38      28
585          UI      18      15      14      11       9       9       3       3       3       3
586          UI       3       3       3       3       0       0       0       0       0       0
             *

587          KK    140C
588          KM         COMBINE 130BR, 140S, AND 120R
589          KO       1
590          HC       3
             *
             *       West Basin Was Modeled as an On-Line Basin, 4-8-98.
             *

591          KK  W-BASN
592          KM        West Basin Storage Routing
593          KO       1
594          RS       1    ELEV  1115.5
595          SV     0.0    0.46    3.10    5.61   10.91   16.61   22.74   29.30   36.31   43.78
596          SE  1115.5  1116.6  1117.5  1118.0  1119.0  1120.0  1121.0  1122.0  1123.0  1124.0
597          SQ    0.10   40.51   42.47   43.30   44.82   46.21   47.54   48.85   50.00   50.00
             *

598          KK    140R
599          KM   ROUTE W-BASIN WEST IN FUTURE ORANGEWOOD STORM DRAIN
600          RK    1320   .0038    .013            CIRC     3.5
             *

601          KK  130DIV
602          KM   RETRIEVE DIVERTED FLOW
603          DR  130DIV
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                                        HEC-1 INPUT

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

604          KK   130AR
605          KM   ROUTE RETRIEVED FLOW WEST ON FRIER DRIVE
606          RK    1320   .0034     .02            TRAP      90     .01

607          KK    160S
608          KM   BASIN 160
609          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
610          KM    L=    .5000  Lca=    .2500   S=  15.00  Kn=.0521  LAG= 20.34
611          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
612          KM    ACTUAL BASIN AREA = .0682 SQ MI
613          BA   .0225
614          LG    .127    .150    8.80    .050   79.53
615          UI       4       4       9      15      19      21      25      29      37      47
616          UI      41      34      30      25      21      18      14       9       7       6
617          UI       5       4       3       1       1       1       1       1       1       1

618          KK    160C
619          KM   COMBINE 130AR AND 160S
620          HC       2

621          KK    160R
622          KM   ROUTE 160C SOUTH ON 71ST AVENUE
623          RK    1320   .0019     .02            TRAP     105     .01

624          KK   160RD
625          KM   DIVERT 160R INTO SURGE BASIN
626          DT  160RDV
627          DI       0    1000
628          DQ       0    1000
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629          KK    155C
630          KM   COMBINE 160R AND 150RET
631          HC       2

632          KK    155R
633          KM   ROUTE 155C WEST IN PROPOSED ORANGEWOOD STORM DRAIN
634          RK    1320   .0019    .013            CIRC       7

635          KK    170S
636          KM   BASIN 170
637          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
638          KM    L=   1.0000  Lca=    .5000   S=  13.90  Kn=.0498  LAG= 33.45
639          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
640          KM    ACTUAL BASIN AREA = .25 SQ MI
641          BA   .0556
642          LG    .111    .150    8.80    .050   82.77
643          UI       6       6       6       8      18      21      26      28      31      33
644          UI      36      40      44      51      62      71      69      59      53      48
645          UI      45      41      37      33      30      27      24      20      16      10
646          UI      10       9       9       8       6       6       6       3       2       2
647          UI       2       2       2       2       2       2       2       2       2       0
1                                                HEC-1 INPUT
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

648          KK    170D
649          KM   DIVERT 30 PERCENT OF FLOW TO WEST
650          DT  170DIV
651          DI       0    1000
652          DQ       0     300

653          KK   170BC
654          KM   COMBINE 170D AND 155R
655          HC       2

656          KK   170BR
657          KM   ROUTE 170BC WEST IN PROPOSED ORANGEWOOD STORM DRAIN
658          RK    1320   .0019    .013            CIRC       7

659          KK  170DIV
660          KM   RETRIEVE DIVERTED FLOW
661          DR  170DIV

662          KK   170AR
663          KM   ROUTE RETRIEVED FLOW SOUTH ON 75TH AVENUE
664          RK    1320   .0026     .02            TRAP     125     .01

665          KK    170C
666          KM   COMBINE 170AR AND 170BR
667          HC       2

668          KK    170R
669          KM   ROUTE 170C WEST IN PROPOSED ORANGEWOOD STORM DRAIN
670          RK    1320   .0021    .013            CIRC     7.5

671          KK    180S
672          KM   BASIN 180
673          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
674          KM    L=   1.0000  Lca=    .5000   S=  14.10  Kn=.0520  LAG= 34.81
675          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
676          KM    ACTUAL BASIN AREA = .25 SQ MI
677          BA   .0813
678          LG    .127    .150    8.80    .053   56.54
679          UI       8       8       8       8      26      29      35      38      43      45
680          UI      49      54      59      65      77      92     104      92      81      73
681          UI      67      62      56      51      47      42      39      35      29      23
682          UI      16      14      13      13      12       8       8       8       7       2
683          UI       2       2       2       2       2       2       2       2       2       2
684          UI       2       0       0       0       0       0       0       0       0       0

685          KK    180D
686          KM   DIVERT 55 PERCENT OF FLOW TO WEST
687          DT  180DIV
688          DI       0    1000
689          DQ       0     550
1                                                HEC-1 INPUT
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 690          KK   180BC
 691          KM   COMBINE 180D AND 170R
 692          HC       2

 693          KK   180BR
 694          KM   ROUTE 180BC WEST IN PROPOSED ORANGEWOOD STORM DRAIN
 695          RK    1320   .0021    .013            CIRC     7.5

 696          KK  180DIV
 697          KM   RETRIEVE DIVERTED FLOW
 698          DR  180DIV

 699          KK   180AR
 700          KM   ROUTE RETRIEVED FLOW SOUTH ON 79TH AVENUE
 701          RK    1320   .0017     .02            TRAP     105     .01

 702          KK    180C
 703          KM   COMBINE 180AR AND 180BR
 704          HC       2

 705          KK    180R
 706          KM   ROUTE 180C WEST IN PROPOSED ORANGEWOOD STORM DRAIN
 707          RK    1320   .0019    .013            CIRC     7.5

 708          KK    190S
 709          KM   BASIN 190
 710          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 711          KM    L=   1.0000  Lca=    .5000   S=   7.20  Kn=.0519  LAG= 39.47
 712          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 713          KM    ACTUAL BASIN AREA = .25 SQ MI
 714          BA   .0792
 715          LG    .126    .150    8.00    .072   46.72
 716          UI       7       7       7       7      14      22      26      31      33      36
 717          UI      39      41      44      49      52      57      67      78      90      82
 718          UI      73      66      61      56      53      48      44      41      38      34
 719          UI      32      28      24      19      14      12      12      11      11       9
 720          UI       7       7       7       7       3       2       2       2       2       2
 721          UI       2       2       2       2       2       2       2       2       0       0

 722          KK    190D
 723          KM   DIVERT 100 PERCENT OF FLOW TO WEST
 724          DT  190DIV
 725          DI       0    2000
 726          DQ       0    2000

 727          KK   190BC
 728          KM   COMBINE 190D AND 180R
 729          HC       2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 730          KK   190BR
 731          KM   ROUTE 190BC WEST IN PROPOSED ORANGEWOOD STORM DRAIN
 732          RK    1320   .0019    .013            CIRC     7.5

 733          KK  190DIV
 734          KM   RETRIEVE DIVERTED FLOW
 735          DR  190DIV

 736          KK   190AR
 737          KM   ROUTE RETRIEVED FLOW SOUTH ON 83RD AVENUE
 738          RK    1320   .0015     .02            TRAP     125     .01

 739          KK    190C
 740          KM   COMBINE 190AR AND 190BR
 741          HC       2

 742          KK   190CD
 743          KM   DIVERT 190C SOUTH IN PROPOSED 83RD AVE STORM DRAIN
 744          DT  190CDV
 745          DI       0     380   10000
 746          DQ       0     380     380

 747          KK    190R
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 748          KM   ROUTE 190C WEST ON ORANGEWOOD
 749          RK    1320   .0064    .020            TRAP     105     .01

 750          KK    200S
 751          KM   BASIN 200
 752          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 753          KM    L=   1.0000  Lca=    .5000   S=  12.50  Kn=.0414  LAG= 28.35
 754          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 755          KM    ACTUAL BASIN AREA = .25 SQ MI
 756          BA   .0827
 757          LG     .05    .170    6.80     .11   95.00
 758          UI      10      10      10      26      36      45      50      56      61      69
 759          UI      76      90     112     128     110      95      85      78      69      61
 760          UI      55      49      42      33      24      17      17      16      13      10
 761          UI      10       8       3       3       3       3       3       3       3       3
 762          UI       3       3       0       0       0       0       0       0       0       0

 763          KK    200D
 764          KM   DIVERT 85 PERCENT OF FLOW TO WEST
 765          DT  200DIV
 766          DI       0    2000
 767          DQ       0    1700

 768          KK   200BC
 769          KM   COMBINE 200D AND 190R
 770          HC       2
1                                          HEC-1 INPUT
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 771          KK   200BR
 772          KM   ROUTE 200BC WEST IN PROPOSED ORANGEWOOD STORM DRAIN
 773          RK    1320   .0064    .014            CIRC       6

 774          KK  200DIV
 775          KM   RETRIEVE DIVERTED FLOW
 776          DR  200DIV

 777          KK   200AR
 778          KM   ROUTE RETRIEVED FLOW SOUTH ON 87TH AVENUE
 779          RK    1320   .0008     .02            TRAP     105     .01

 780          KK    200C
 781          KM   COMBINE 200AR AND 200BR
 782          HC       2
              * KK 200CD
              * KM DIVERT 0 PERCENT OF FLOW TO SOUTH ON 87TH AVE
              * DT200CDV
              * DI     0   10000
              * DQ     0       0

 783          KK    200R
 784          KM   ROUTE 200C WEST ON ORANGEWOOD
 785          RK    1320   .0019    .020            TRAP     105     .01

 786          KK    210S
 787          KM   BASIN 210
 788          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 789          KM    L=   1.0000  Lca=    .5000   S=  13.50  Kn=.0414  LAG= 27.94
 790          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 791          KM    ACTUAL BASIN AREA = .25 SQ MI
 792          BA   .0250
 793          LG     .05     .25    5.70     .17   95.00
 794          UI       3       3       3       8      11      14      16      17      19      21
 795          UI      24      29      36      39      33      28      25      23      20      18
 796          UI      16      14      12       9       6       5       5       5       3       3
 797          UI       3       1       1       1       1       1       1       1       1       1
 798          UI       1       0       0       0       0       0       0       0       0       0

 799          KK    210D
 800          KM   DIVERT 24 PERCENT OF FLOW TO WEST
 801          DT  210DIV
 802          DI       0    2000
 803          DQ       0     480

 804          KK   210BC
 805          KM   COMBINE 210D AND 200R
 806          HC       2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 807          KK   210BR
 808          KM   ROUTE 210BC WEST ON ORANGEWOOD
 809          RK    1320   .0019    .020            TRAP     105     .01

 810          KK  210DIV
 811          KM   RETRIEVE DIVERTED FLOW
 812          DR  210DIV

 813          KK   210AR
 814          KM   ROUTE RETRIEVED FLOW SOUTH ON 91ST AVENUE
 815          RK    1320   .0030     .02            TRAP     125     .01

 816          KK    210C
 817          KM   COMBINE 210AR AND 210BR
 818          HC       2

 819          KK   210CD
 820          KM   DIVERT 59 PERCENT OF FLOW SOUTH ON 91ST AVENUE
 821          DT  210CDV
 822          DI       0   10000
 823          DQ       0    5900

 824          KK    210R
 825          KM   ROUTE 210C WEST ON ORANGEWOOD
 826          RK    1320   .0019    .020            TRAP     105     .01

 827          KK    220S
 828          KM   BASIN 220
 829          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 830          KM    L=   1.0000  Lca=    .5000   S=  20.17  Kn=.0414  LAG= 25.89
 831          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 832          KM    ACTUAL BASIN AREA = .25 SQ MI
 833          BA   .0250
 834          LG     .05      .25     5.70      .17    95.00
 835          UI       3        3        3       11       13       16       18       20       22       25
 836          UI      30       38       42       35       30       27       24       21       19       16
 837          UI      14       11        7        6        5        5        3        3        3        1
 838          UI       1        1        1        1        1        1        1        1        0        0

 839          KK    220D
 840          KM   DIVERT 44 PERCENT OF FLOW TO WEST
 841          DT  220DIV
 842          DI       0    2000
 843          DQ       0     880

 844          KK   220BC
 845          KM   COMBINE 220D AND 210R
 846          HC       2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 847          KK   220BR
 848          KM   ROUTE 220BC WEST ON ORANGEWOOD
 849          RK    1320   .0019    .020            TRAP     105     .01

 850          KK  220DIV
 851          KM   RETRIEVE DIVERTED FLOW
 852          DR  220DIV

 853          KK   220AR
 854          KM   ROUTE RETRIEVED FLOW SOUTH ON 95TH AVENUE
 855          RK    1320   .0030     .02            TRAP     105     .01

 856          KK    220C
 857          KM   COMBINE 220AR AND 220BR
 858          HC       2

 859          KK   220CD
 860          KM   DIVERT 74 PERCENT OF FLOW SOUTH ON 95TH AVENUE
 861          DT  220CDV
 862          DI       0   10000
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863          DQ       0    7400

864          KK    220R
865          KM   ROUTE 220C WEST ON ORANGEWOOD
866          RK    1320   .0027    .020            TRAP     105     .01

867          KK    230S
868          KM   BASIN 230
869          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
870          KM    L=    .9167  Lca=    .4167   S=   7.42  Kn=.0414  LAG= 28.26
871          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
872          KM    ACTUAL BASIN AREA = .1269 SQ MI
873          BA   .0127
874          LG     .05     .15    8.00     .07   95.00
875          UI       2       2       2       4       6       7       8       9       9      11
876          UI      12      14      17      20      17      15      13      12      11       9
877          UI       8       7       6       5       4       3       3       2       2       2
878          UI       2       1       0       0       0       0       0       0       0       0

879          KK    230D
880          KM   DIVERT 38 PERCENT OF FLOW TO WEST
881          DT  230DIV
882          DI       0    2000
883          DQ       0     760

884          KK   230BC
885          KM   COMBINE 230D AND 220R
886          HC       2
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                                          HEC-1 INPUT

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

887          KK   230BR
888          KM   ROUTE 230BC WEST ON ORANGEWOOD
889          RK    1320   .0027    .020            TRAP     105     .01

890          KK  230DIV
891          KM   RETRIEVED DIVERTED FLOW
892          DR  230DIV

893          KK    230C
894          KM   COMBINE 230DIV AND 230BR
895          HC       2

896          KK   230CD
897          KM   DIVERT 50 PERCENT OF FLOW TO SOUTH ADJACENT TO AGUA FRIA FRWY
898          DT  230CDV
899          DI       0   10000
900          DQ       0    5000

901          KK    240S
902          KM   BASIN 240
903          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
904          KM    L=       .7  Lca=       .3   S=   22.5  Kn= .054  LAG=  23.9
905          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
906          KM    ACTUAL BASIN AREA = .1368 SQ MI
907          BA     .09
908          LG     .14     .25    5.30     .20   80.64
909          UI     13.     47.     74.    102.    156.    117.     85.     58.     27.     18.
910          UI     10.      4.      4.      4.      0.      0.      0.      0.      0.      0.
911          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

912          KK    240R
913          KM   ROUTE 240S SOUTH ON 67TH AVENUE
914          RK    1320   .0015    .020            TRAP     125     .01

915          KK    250S
916          KM   BASIN 250S
917          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
918          KM    L=      1.0  Lca=       .7   S=   18.6  Kn= .055  LAG=  40.3
919          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
920          KM    ACTUAL BASIN AREA = .21 SQ MI
921          BA     .21
922          LG     .15     .25    5.60     .19   76.29
923          UI     18.     23.     65.     87.    103.    125.    159.    220.    184.    149.
924          UI    124.    101.     82.     56.     31.     29.     19.     18.      6.      5.
925          UI      5.      5.      5.      5.      0.      0.      0.      0.      0.      0.
926          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
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927          KK    250C
928          KM    COMBINE 240R AND 250S
929          HC       2
1                                          HEC-1 INPUT
PAGE 23

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

930          KK   250CD
931          KM   DIVERT 3 % OF FLOW IN EXCESS OF GLENDALE AVE CAPACITY SOUTH ON 67TH AVENUE
932          DT  250CDV
933          DI       0     109     209
934          DQ       0       0       3

935          KK    250R
936          KM   ROUTE 250C WEST ON GLENDALE AVE
937          RK    1320   .0037    .020            TRAP     125     .01

938          KK    260S
939          KM   BASIN 260S
940          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
941          KM    L=      1.0  Lca=       .5   S=   14.3  Kn= .054  LAG=  35.8
942          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
943          KM    ACTUAL BASIN AREA = .24 SQ MI
944          BA     .12
945          LG     .14     .15    9.70     .04   61.07
946          UI     11.     20.     46.     60.     74.     93.    136.    120.     95.     76.
947          UI     61.     46.     25.     19.     14.     11.      4.      3.      3.      3.
948          UI      3.      0.      0.      0.      0.      0.      0.      0.      0.      0.
949          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

950          KK    260D
951          KM   DIVERT 62 PERCENT OF FLOW TO WEST
952          DT  260DIV
953          DI       0   10000
954          DQ       0    6200

955          KK   260BC
956          KM   COMBINE 260D AND 250R
957          HC       2

958          KK   260BR
959          KM   ROUTE 260BC WEST ON GLENDALE AVE
960          RK    1320   .0037    .020            TRAP     125     .01

961          KK  260DIV
962          KM   RETRIEVE DIVERTED FLOW
963          DR  260DIV

964          KK   260AR
965          KM   ROUTE 260DIV SOUTH ON 71ST AVE
966          RK    1320   .0023    .020            TRAP     105     .01

967          KK    260C
968          KM   COMBINE 260AR AND 260BR
969          HC       2
1                                          HEC-1 INPUT
PAGE 24

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

970          KK   260CD
971          KM   DIVERT 17 % OF FLOW IN EXCESS OF GLENDALE AVE CAPACITY SOUTH ON 71ST AVENUE
972          DT  260CDV
973          DI       0      97     297
974          DQ       0       0      34

975          KK    260R
976          KM   ROUTE 260C WEST ON GLENDALE AVE
977          RK    1320   .0029    .020            TRAP     125     .01

978          KK    270S
979          KM   BASIN 270S
980          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
981          KM    L=      1.0  Lca=       .5   S=   13.9  Kn= .051  LAG=  34.3
982          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
983          KM    ACTUAL BASIN AREA = .25 SQ MI
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 984          BA     .07
 985          LG     .12     .15    8.80     .05   66.87
 986          UI      7.     13.     28.     37.     46.     60.     83.     65.     52.     41.
 987          UI     32.     21.     12.     10.      7.      4.      2.      2.      2.      2.
 988          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 989          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 990          KK    270D
 991          KM   DIVERT 46 PERCENT OF FLOW TO WEST
 992          DT  270DIV
 993          DI       0   10000
 994          DQ       0    4600

 995          KK   270BC
 996          KM   COMBINE 270D AND 260R
 997          HC       2

 998          KK   270BR
 999          KM   ROUTE 270BC WEST ON GLENDALE AVE
1000          RK    1320   .0025    .020            TRAP     125     .01

1001          KK  270DIV
1002          KM   RETRIEVE DIVERTED FLOW
1003          DR  270DIV

1004          KK   270AR
1005          KM   ROUTE RETRIEVED FLOW SOUTH ON 75TH AVENUE
1006          RK    1320   .0033    .020            TRAP     125     .01

1007          KK    270C
1008          KM   COMBINE 270AR AND 270BR
1009          HC       2
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                                        HEC-1 INPUT

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

1010          KK   270CD
1011          KM   DIVERT 28 % OF FLOW IN EXCESS OF GLENDALE AVE CAPACITY SOUTH ON 75TH AVENUE
1012          DT  270CDV
1013          DI       0      90     290
1014          DQ       0       0      56

1015          KK    270R
1016          KM   ROUTE 270C WEST ON GLENDALE AVE
1017          RK    1320   .0025    .020            TRAP     125     .01

1018          KK    280S
1019          KM   BASIN 280S
1020          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1021          KM    L=      1.0  Lca=       .5   S=   15.3  Kn= .053  LAG=  35.0
1022          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1023          KM    ACTUAL BASIN AREA = .25 SQ MI
1024          BA     .11
1025          LG     .14     .21    6.40     .14   65.02
1026          UI     10.     19.     43.     56.     69.     89.    128.    105.     84.     67.
1027          UI     53.     37.     20.     17.     11.      8.      3.      3.      3.      3.
1028          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
1029          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

1030          KK    280D
1031          KM   DIVERT 46 PERCENT OF FLOW TO WEST
1032          DT  280DIV
1033          DI       0   10000
1034          DQ       0    4600

1035          KK   280BC
1036          KM   COMBINE 280D AND 270R
1037          HC       2

1038          KK   280BR
1039          KM   ROUTE 280BC WEST ON GLENDALE AVE
1040          RK    1320   .0025    .020            TRAP     125     .01

1041          KK  280DIV
1042          KM   RETRIEVE DIVERTED FLOW
1043          DR  280DIV

1044          KK   280AR
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1045          KM   ROUTE RETRIEVED FLOW SOUTH ON 79TH AVENUE
1046          RK    1320   .0029    .020            TRAP     105     .01

1047          KK    280C
1048          KM   COMBINE 280AR AND 280BR
1049          HC       2
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HEC-1 INPUT

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

1050          KK   280CD
1051          KM   DIVERT 25 % OF FLOW IN EXCESS OF GLENDALE AVE CAPACITY SOUTH ON 79TH AVE
1052          DT  280CDV
1053          DI       0     115     315
1054          DQ       0       0      50

1055          KK    280R
1056          KM   ROUTE 280C WEST ON GLENDALE AVE
1057          RK    1320   .0041    .020            TRAP     125     .01

1058          KK    290S
1059          KM   BASIN 290S
1060          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1061          KM    L=      1.0  Lca=       .5   S=   18.4  Kn= .052  LAG=  33.4
1062          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1063          KM    ACTUAL BASIN AREA = .25 SQ MI
1064          BA     .07
1065          LG     .13     .15    7.60     .09   71.79
1066          UI      7.     15.     32.     41.     51.     71.     89.     68.     54.     42.
1067          UI     32.     18.     12.      9.      7.      2.      2.      2.      2.      0.
1068          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
1069          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

1070          KK    290D
1071          KM   DIVERT 50 PERCENT OF FLOW TO WEST
1072          DT  290DIV
1073          DI       0   10000
1074          DQ       0    5000

1075          KK   290BC
1076          KM   COMBINE 290D AND 280R
1077          HC       2

1078          KK   290BR
1079          KM   ROUTE 290BC WEST ON GLENDALE AVE
1080          RK    1320   .0041    .020            TRAP     125     .01

1081          KK  190CDV
1082          KM   RETRIEVE DIVERTED FLOW
1083          DR  190CDV

1084          KK  190CDR
1085          KM   ROUTE RETRIEVED FLOW SOUTH IN PROPOSED 83RD AVE STORM DRAIN
1086          RK    1320   .0072    .014            CIRC     5.5

1087          KK  290DIV
1088          KM   RETRIEVE DIVERTED FLOW
1089          DR  290DIV
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HEC-1 INPUT

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

1090          KK   290AC
1091          KM   COMBINE 290DIV AND 190CDR
1092          HC       2

1093          KK   290AR
1094          KM   ROUTE FLOW SOUTH IN PROPOSED 83RD AVE STORM DRAIN
1095          RK    1320   .0072    .014            CIRC     5.5

1096          KK    290C
1097          KM   COMBINE 290AR AND 290BR
1098          HC       2

1099          KK    290R
1100          KM   ROUTE 290C WESTWARD IN PROPOSED GLENDALE AVE STORM DRAIN
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1101          RK    1320  .00337    .014            CIRC     7.5

1102          KK    300S
1103          KM   BASIN 300S
1104          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1105          KM    L=      1.0  Lca=       .5   S=   15.9  Kn= .043  LAG=  28.5
1106          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1107          KM    ACTUAL BASIN AREA = .24 SQ MI
1108          BA     .03
1109          LG     .06     .15    7.30     .09   94.23
1110          UI      3.      9.     16.     21.     29.     39.     29.     22.     17.     10.
1111          UI      6.      4.      3.      1.      1.      1.      1.      0.      0.      0.
1112          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

1113          KK    300D
1114          KM   DIVERT 67 PERCENT OF FLOW TO WEST
1115          DT  300DIV
1116          DI       0   10000
1117          DQ       0    6700

1118          KK   300BC
1119          KM   COMBINE 300D AND 290R
1120          HC       2

1121          KK   300BR
1122          KM   ROUTE 300BC WEST IN PROPOSED GLENDALE STORM DRAIN
1123          RK    1320  .00337    .014            CIRC     7.5
              * KK200CDV
              * KK RETRIEVE DIVERTED FLOW
              * DR200CDV
              * KK200CDR
              * KM ROUTE RETRIEVED FLOW SOUTH ON 87TH AVE
              * RK  1320   .0001    .020            TRAP     105     .01

1124          KK  300DIV
1125          KM   RETRIEVE DIVERTED FLOW
1126          DR  300DIV
              * KK 300AC
              * KM COMBINE 200CDR AND 300DIV
              * HC     2
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HEC-1 INPUT

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

1127          KK   300AR
1128          KM   ROUTE 300DIV SOUTH ON 87TH AVE
1129          RK    1320   .0001    .020            TRAP     105     .01

1130          KK    300C
1131          KM   COMBINE 300AR AND 300BR
1132          HC       2

1133          KK    300R
1134          KM   ROUTE 300C WEST IN PROPOSED GLENDALE AVE STORM DRAIN
1135          RK    1320  .00337    .014            CIRC     7.5

1136          KK    310S
1137          KM   BASIN 310S
1138          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1139          KM    L=      1.0  Lca=       .5   S=   11.8  Kn= .049  LAG=  34.1
1140          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1141          KM    ACTUAL BASIN AREA = .25 SQ MI
1142          BA     .05
1143          LG     .11     .15    7.30     .09   83.61
1144          UI      5.     10.     22.     28.     35.     47.     63.     49.     39.     31.
1145          UI     24.     15.      9.      7.      5.      2.      2.      2.      2.      2.
1146          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
1147          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

1148          KK    310D
1149          KM   DIVERT 67 PERCENT OF FLOW TO WEST
1150          DT  310DIV
1151          DI       0   10000
1152          DQ       0    6700

1153          KK   310BC
1154          KM   COMBINE 310D AND 300R
1155          HC       2
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1156          KK   310BR
1157          KM   ROUTE 310BC WEST IN PROPOSED GLENDALE AVE STORM DRAIN
1158          RK    1320  .00337    .014            CIRC     7.5

1159          KK  210CDV
1160          KM   RETRIEVE DIVERTED FLOW
1161          DR  210CDV

1162          KK  210CDR
1163          KM   ROUTE RETRIEVED FLOW SOUTH ON 91ST AVE
1164          RK    1320    .059    .020            TRAP     125     .01

1165          KK  310DIV
1166          KM   RETRIEVE DIVERTED FLOW
1167          DR  310DIV
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1168          KK   310AC
1169          KM   COMBINE 210CDR AND 310DIV
1170          HC       2

1171          KK   310AR
1172          KM   ROUTE 310AC SOUTH ON 91ST AVE
1173          RK    1320   .0059    .020            TRAP     125     .01

1174          KK    310C
1175          KM   COMBINE 310AR AND 310BR
1176          HC       2

1177          KK    310R
1178          KM   ROUTE 310C WEST IN PROPOSED GLENDALE AVE STORM DRAIN
1179          RK    1320  .00337    .014            CIRC       8

1180          KK    320S
1181          KM   BASIN 320S
1182          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1183          KM    L=      1.0  Lca=       .5   S=   18.0  Kn= .041  LAG=  26.5
1184          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1185          KM    ACTUAL BASIN AREA = .25 SQ MI
1186          BA     .03
1187          LG     .05     .21    6.40     .13   95.00
1188          UI      3.     10.     17.     22.     33.     35.     25.     19.     13.      6.
1189          UI      4.      3.      1.      1.      1.      0.      0.      0.      0.      0.
1190          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

1191          KK    320D
1192          KM   DIVERT 44 PERCENT OF FLOW TO WEST
1193          DT  320DIV
1194          DI       0   10000
1195          DQ       0    4400

1196          KK   320BC
1197          KM   COMBINE 320D AND 310R
1198          HC       2

1199          KK   320BR
1200          KM   ROUTE 320BC WEST IN PROPOSED GLENDALE AVE STORM DRAIN
1201          RK    1320  .00337    .014            CIRC       8

1202          KK  220CDV
1203          KM   RETRIEVE DIVERTED FLOW
1204          DR  220CDV

1205          KK  220CDR
1206          KM   ROUTE 220CDV SOUTH ON 95TH AVE
1207          RK    1320   .0047    .020            TRAP     105     .01
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1208          KK  320DIV
1209          KM   RETRIEVE DIVERTED FLOW
1210          DR  320DIV
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1211          KK   320AC
1212          KM   COMBINE 320DIV AND 220CDR
1213          HC       2

1214          KK   320AR
1215          KM   ROUTE 320AC SOUTH ON 95TH AVE
1216          RK    1320   .0047    .020            TRAP     105     .01

1217          KK    320C
1218          KM   COMBINE 320AR AND 320BR
1219          HC       2

1220          KK    320R
1221          KM   ROUTE 320C WEST IN PROPOSED GLENDALE AVE STORM DRAIN
1222          RK    1320   .0019    .014            CIRC      10

1223          KK    330S
1224          KM   BASIN 330S
1225          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1226          KM    L=        .9  Lca=        .5   S=   15.2  Kn= .041  LAG=  25.4
1227          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1228          KM    ACTUAL BASIN AREA = .21 SQ MI
1229          BA     .02
1230          LG     .05     .15    7.30     .09   95.00
1231          UI      3.      9.     15.     20.     32.     28.     20.     15.      9.      5.
1232          UI      3.      2.      1.      1.      1.      0.      0.      0.      0.      0.
1233          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

1234          KK    330D
1235          KM   DIVERT 21 PERCENT OF FLOW TO WEST
1236          DT  330DIV
1237          DI       0   10000
1238          DQ       0    2100

1239          KK   330BC
1240          KM   COMBINE 330D AND 320R
1241          HC       2

1242          KK   330BR
1243          KM   ROUTE 330BC WEST IN PROPOSED GLENDALE AVE STORM DRAIN
1244          RK     730   .0019    .014            CIRC      10

1245          KK  230CDV
1246          KM   RETRIEVE DIVERTED FLOW
1247          DR  230CDV
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HEC-1 INPUT

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

1248          KK  230CDR
1249          KM   ROUTE 230CDV SOUTH THROUGH BASIN 330
1250          RK    1320   .0036    .035            TRAP     100     .01

1251          KK  330DIV
1252          KM   RETRIEVE DIVERTED FLOW
1253          DR  330DIV

1254          KK   330AC
1255          KM   COMBINE 230CDR AND 330DIV
1256          HC       2

1257          KK   330AR
1258          KM   ROUTE 330AC SOUTH THROUGH BASIN 330
1259          RK    1320   .0036    .035            TRAP     100     .01

1260          KK    330C
1261          KM   COMBINE 330AR AND 330BR
1262          HC       2
              *
              *       The Following Operations Were Not Needed Anymore. 4-8-98
              *
              * KK 85DIV
              * KM RETRIEVE DIVERTED FLOW
              * DR 85DIV
              * KK 95DIV
              * KM RETRIEVE DIVERTED FLOW
              * DR 95DIV
```

```
                    * KK115DIV
                    * KM RETRIEVE DIVERTED FLOW
                    * DR115DIV
                    * KK115DV2
                    * KM RETRIEVE DIVERTED FLOW
                    * DR115DV2
                    * KK  116C
                    * KM COMBINE 85DIV, 95DIV, 115DIV, AND 115DV2
                    * KO     1
                    * HC     4
                    * KK150DIV
                    * KM RETRIEVE FLOW DIVERTED INTO WEST SURGE BASIN
                    * KO     1
                    * DR150DIV

1263                KK  160RDV
1264                KM   RETRIEVE DIVERTED FLOW FROM 160RD
1265                DR  160RDV

1266                KK    150S
1267                KM   BASIN 150
1268                KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1269                KM    L=    .5000  Lca=    .2500   S=  12.00  Kn=.0414  LAG= 16.87
1270                KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1271                BA   .0622
1272                LG    .050    .150    8.80    .050   95.00
```



```
                                                HEC-1 INPUT

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

1273                UI      12      14      44      60      71      84     103     145     145     114
1274                UI      96      79      65      52      31      22      20      12      11       4
1275                UI       4       4       4       4       4       0       0       0       0       0

1276                KK  150BAS
1277                KM   COMBINE 160RDV AND 150S
                    *  KO     1
1278                HC       2
                    *
1279                ZZ
```

```
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    25         10S
                .
                .
    49          .------->   10DIV
    47         10D
                V
                V
    52       10AR1
                .
                .
    55          .         20S
                .           .
                .           .
    70          .           .------->   20DIV
    68          .         20D
                .           .
                .           .
    73         15C............
                V
                V
    76       10AR2
                V
                V
    79       20BR1
                .
                .
    82          .         30S
                .           .
                .           .
    98          .           .------->   30DIV
```

```
 96          .         30D
             .           .
             .           .
101        25C............
             V
             V
104      20BR2
             .
             .
109          .           .<-------   10DIV
107          .       10DIV
             .           V
             .           V
110          .       10B1R
             .           V
             .           V
113          .      10B2R1
             .           .
             .           .
118          .           .           .<-------   30DIV
116          .           .       30DIV
             .           .           .
             .           .           .
119          .         16C............
             .           V
             .           V
122          .      10B2R2
             .           .
             .           .
125        30C............
             V
             V
128        30R
             .
             .
133          .           .<-------   20DIV
131          .       20DIV
             .           V
             .           V
134          .        20AR
             .           .
             .           .
137          .           .         40S
             .           .           .
             .           .           .
161          .         40C............
             .           .
             .           .
166          .           .------->   40DIV
164          .         40D
             .           V
             .           V
169          .        40BR
             .           .
             .           .
172       45C1............
             .
             .
175          .         60S
             .           .
             .           .
207          .           .------->   60DIV
205          .         60D
             .           .
             .           .
210       45C2............
             V
             V
213        45R
             .
             .
218          .           .<-------   40DIV
216          .       40DIV
             .           V
             .           V
219          .       40AR1
             .           .
             .           .
222          .           .         50S
             .           .           .
```

```
                .           .           .
248             .           .           .-------->   50DIV
246             .           .        50D
                .           .           .
                .           .           .
251             .        46C............
                .           V
                .           V
254             .      40AR2
                .           V
                .           V
257             .      50BR1
                .           .
                .           .
262             .           .           .<-------   60DIV
260             .           .      60DIV
                .           .           .
                .           .           .
263             .        55C............
                .           V
                .           V
266             .      50BR2
                .           .
                .           .
269           60C............
                V
                V
272          60AR
                .
                .
277             .           .<-------   50DIV
275             .      50DIV
                .           V
                .           V
278             .       50AR
                .           .
                .           .
281             .           .        80S
                .           .           .
                .           .           .
295             .        80C............
                .           .
                .           .
300             .           .-------->   80DIV
298             .        80D
                .           V
                .           V
303             .       80BR
                .           .
                .           .
306          85C1...........
                .
                .
309             .       100S
                .           .
                .           .
340             .           .-------->  100DIV
338             .       100D
                .           .
                .           .
343          85C2...........
                .
                .
348             .-------->   85DIV
346           85D
                V
                V
351           85R
                .
                .
356             .           .<-------   80DIV
354             .      80DIV
                .           .
                .           .
357             .           .        90S
                .           .           .
                .           .           .
369             .       80C2...........
                .           V
                .           V
```

```
372          .        80AR
             .           V
             .           V
375          .        90R1
             .           .
             .           .
380          .           .           .<-------  100DIV
378          .           .      100DIV
             .           .           .
             .           .           .
381          .         95C............
             .           V
             .           V
384          .        90R2
             .           .
             .           .
387          .           .        111S
             .           .           .
             .           .           .
398          .        111C............
             .           V
             .           V
401          .        90R3
             .           .
             .           .
404        95C............
             .
             .
409          .------->   95DIV
407        95D
             V
             V
412        96R
             .
             .
415          .        110S
             .           .
             .           .
437          .           .         70S
             .           .          V
             .           .          V
451          .           .        70AR
             .           .          V
             .           .          V
454          .           .       70BR1
             .           .           .
             .           .           .
457          .         76C............
             .           .
             .           .
460       115C............
             .
             .
467          .------->  115DIV
463       115D
             .
             .
470          .        112S
             .           .
             .           .
483          .           .        113S
             .           .           .
             .           .           .
501      115C2........................
             .
             .
506          .           .<-------   85DIV
504          .       85DIV
             .           .
             .           .
509          .           .           .<-------   95DIV
507          .           .       95DIV
             .           .           .
             .           .           .
512          .           .           .           .<-------  115DIV
510          .           .           .      115DIV
             .           .           .           .
             .           .           .           .
513      E-BASN...................................
             .
```

```
                .
521             .-------> 115DV2
517         115D2
                V
                V
524          110R
                .
                .
527             .        125S
                .           .
                .           .
537         120C1............
                .
                .
540             .        120S
                .           .
                .           .
551         120C2............
                V
                V
554          120R
                .
                .
557             .        130S
                .           .
                .           .
570             .           .-------> 130DIV
568             .        130D
                .           V
                .           V
573             .       130BR
                .           .
                .           .
576             .           .        140S
                .           .           .
                .           .           .
587          140C........................
                V
                V
591        W-BASN
                V
                V
598          140R
                .
                .
603             .           .<------- 130DIV
601             .      130DIV
                .           V
                .           V
604             .       130AR
                .           .
                .           .
607             .           .        160S
                .           .           .
                .           .           .
618             .        160C............
                .           V
                .           V
621             .        160R
                .           .
                .           .
626             .           .-------> 160RDV
624             .       160RD
                .           .
                .           .
629          155C............
                V
                V
632          155R
                .
                .
635             .        170S
                .           .
                .           .
650             .           .-------> 170DIV
648             .        170D
                .           .
                .           .
653         170BC............
                V
```

```
            V
656      170BR
            .
            .
661         .           .<-------  170DIV
659         .      170DIV
            .           V
            .           V
662         .       170AR
            .           .
            .           .
665       170C............
            V
            V
668       170R
            .
            .
671         .        180S
            .           .
            .           .
687         .           .------->  180DIV
685         .        180D
            .           .
            .           .
690      180BC............
            V
            V
693      180BR
            .
            .
698         .           .<-------  180DIV
696         .      180DIV
            .           V
            .           V
699         .       180AR
            .           .
            .           .
702       180C............
            V
            V
705       180R
            .
            .
708         .        190S
            .           .
            .           .
724         .           .------->  190DIV
722         .        190D
            .           .
            .           .
727      190BC............
            V
            V
730      190BR
            .
            .
735         .           .<-------  190DIV
733         .      190DIV
            .           V
            .           V
736         .       190AR
            .           .
            .           .
739       190C............
            .
            .
744         .------->  190CDV
742      190CD
            V
            V
747       190R
            .
            .
750         .        200S
            .           .
            .           .
765         .           .------->  200DIV
763         .        200D
            .           .
            .           .
```

```
768       200BC............
              V
              V
771       200BR
              .
              .
776           .           .<-------  200DIV
774           .      200DIV
              .           V
              .           V
777           .       200AR
              .           .
              .           .
780        200C............
              V
              V
783        200R
              .
              .
786           .        210S
              .           .
              .           .
801           .           .------->  210DIV
799           .        210D
              .           .
              .           .
804       210BC............
              V
              V
807       210BR
              .
              .
812           .           .<-------  210DIV
810           .      210DIV
              .           V
              .           V
813           .       210AR
              .           .
              .           .
816        210C............
              .
              .
821           .------->  210CDV
819       210CD
              V
              V
824        210R
              .
              .
827           .        220S
              .           .
              .           .
841           .           .------->  220DIV
839           .        220D
              .           .
              .           .
844       220BC............
              V
              V
847       220BR
              .
              .
852           .           .<-------  220DIV
850           .      220DIV
              .           V
              .           V
853           .       220AR
              .           .
              .           .
856        220C............
              .
              .
861           .------->  220CDV
859       220CD
              V
              V
864        220R
              .
              .
867           .        230S
```

```
                .           .
                .           .
881             .           .-------> 230DIV
879             .       230D
                .           .
                .           .
884         230BC............
                V
                V
887         230BR
                .
                .
892             .           .<------- 230DIV
890             .      230DIV
                .           .
                .           .
893          230C............
                .
                .
898             .-------> 230CDV
896         230CD
                .
                .
901             .       240S
                .           V
                .           V
912             .       240R
                .           .
                .           .
915             .           .       250S
                .           .           .
                .           .           .
927             .       250C............
                .           .
                .           .
932             .           .-------> 250CDV
930             .      250CD
                .           V
                .           V
935             .       250R
                .           .
                .           .
938             .           .       260S
                .           .           .
                .           .           .
952             .           .           .-------> 260DIV
950             .           .       260D
                .           .           .
                .           .           .
955             .      260BC............
                .           V
                .           V
958             .      260BR
                .           .
                .           .
963             .           .           .<------- 260DIV
961             .           .     260DIV
                .           .           V
                .           .           V
964             .           .      260AR
                .           .           .
                .           .           .
967             .       260C............
                .           .
                .           .
972             .           .-------> 260CDV
970             .      260CD
                .           V
                .           V
975             .       260R
                .           .
                .           .
978             .           .       270S
                .           .           .
                .           .           .
992             .           .           .-------> 270DIV
990             .           .       270D
                .           .           .
                .           .           .
995             .      270BC............
```

```
                .          V
                .          V
 998            .      270BR
                .          .
                .          .
1003            .          .           .<-------  270DIV
1001            .          .      270DIV
                .          .           V
                .          .           V
1004            .          .       270AR
                .          .           .
                .          .           .
1007            .       270C............
                .          .
                .          .
1012            .          .------->  270CDV
1010            .      270CD
                .          V
                .          V
1015            .       270R
                .          .
                .          .
1018            .          .        280S
                .          .           .
                .          .           .
1032            .          .           .------->  280DIV
1030            .          .        280D
                .          .           .
                .          .           .
1035            .      280BC............
                .          V
                .          V
1038            .      280BR
                .          .
                .          .
1043            .          .           .<-------  280DIV
1041            .          .      280DIV
                .          .           V
                .          .           V
1044            .          .       280AR
                .          .           .
                .          .           .
1047            .       280C............
                .          .
                .          .
1052            .          .------->  280CDV
1050            .      280CD
                .          V
                .          V
1055            .       280R
                .          .
                .          .
1058            .          .        290S
                .          .           .
                .          .           .
1072            .          .           .------->  290DIV
1070            .          .        290D
                .          .           .
                .          .           .
1075            .      290BC............
                .          V
                .          V
1078            .      290BR
                .          .
                .          .
1083            .          .           .<-------  190CDV
1081            .          .      190CDV
                .          .           V
                .          .           V
1084            .          .      190CDR
                .          .           .
                .          .           .
1089            .          .           .           .<-------  290DIV
1087            .          .           .      290DIV
                .          .           .           .
                .          .           .           .
1090            .          .       290AC............
                .          .           V
                .          .           V
1093            .          .       290AR
```

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                .          .          .
                .          .          .
1096            .      290C............
                .         V
                .         V
1099            .      290R
                .         .
                .         .
1102            .         .       300S
                .         .          .
                .         .          .
1115            .         .          .-------> 300DIV
1113            .         .       300D
                .         .          .
                .         .          .
1118            .     300BC............
                .         V
                .         V
1121            .     300BR
                .         .
                .         .
1126            .         .          .<------- 300DIV
1124            .         .     300DIV
                .         .          V
                .         .          V
1127            .         .      300AR
                .         .          .
                .         .          .
1130            .      300C............
                .         V
                .         V
1133            .      300R
                .         .
                .         .
1136            .         .       310S
                .         .          .
                .         .          .
1150            .         .          .-------> 310DIV
1148            .         .       310D
                .         .          .
                .         .          .
1153            .     310BC............
                .         V
                .         V
1156            .     310BR
                .         .
                .         .
1161            .         .          .<------- 210CDV
1159            .         .     210CDV
                .         .          V
                .         .          V
1162            .         .     210CDR
                .         .          .
                .         .          .
1167            .         .          .          .<------- 310DIV
1165            .         .          .     310DIV
                .         .          .          .
                .         .          .          .
1168            .         .      310AC............
                .         .          V
                .         .          V
1171            .         .      310AR
                .         .          .
                .         .          .
1174            .      310C............
                .         V
                .         V
1177            .      310R
                .         .
                .         .
1180            .         .       320S
                .         .          .
                .         .          .
1193            .         .          .-------> 320DIV
1191            .         .       320D
                .         .          .
                .         .          .
1196            .     320BC............
                .         V
                .         V
```

```
1199          .       320BR
              .          .
              .          .
1204          .          .          .<-------  220CDV
1202          .          .     220CDV
              .          .          V
              .          .          V
1205          .          .     220CDR
              .          .          .
              .          .          .
1210          .          .          .           .<-------  320DIV
1208          .          .          .     320DIV
              .          .          .           .
              .          .          .           .
1211          .          .      320AC............
              .          .          V
              .          .          V
1214          .          .      320AR
              .          .          .
              .          .          .
1217          .       320C............
              .          V
              .          V
1220          .       320R
              .          .
              .          .
1223          .          .       330S
              .          .          .
              .          .          .
1236          .          .          .------->  330DIV
1234          .          .       330D
              .          .          .
              .          .          .
1239          .       330BC............
              .          V
              .          V
1242          .       330BR
              .          .
              .          .
1247          .          .          .<-------  230CDV
1245          .          .     230CDV
              .          .          V
              .          .          V
1248          .          .     230CDR
              .          .          .
              .          .          .
1253          .          .          .           .<-------  330DIV
1251          .          .          .     330DIV
              .          .          .           .
              .          .          .           .
1254          .          .      330AC............
              .          .          V
              .          .          V
1257          .          .      330AR
              .          .          .
              .          .          .
1260          .       330C............
              .          .
              .          .
1265          .          .          .<-------  160RDV
1263          .          .     160RDV
              .          .          .
              .          .          .
1266          .          .          .       150S
              .          .          .           .
              .          .          .           .
1276          .          .     150BAS............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************                    *****************************************
 *                                       *                    *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *    U.S. ARMY CORPS OF ENGINEERS       *
 *             JUN 09 1992               *                    *    HYDROLOGIC ENGINEERING CENTER      *
 *           VERSION 4.0.3E              *                    *          609 SECOND STREET            *
 *                                       *                    *       DAVIS, CALIFORNIA 95616         *
 *  RUN DATE  04/21/98  TIME  08:11:04   *                    *           (916) 551-1748              *
 *                                       *                    *                                       *
 *****************************************                    *****************************************
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                         NORTHERN-ORANGEWOOD STORM DRAIN PROJECT
                         GLENDALE WATERSHED
                         FUTURE CONDITION
                         10-YEAR, 6-HOUR STORM
                         PHOENIX VALLEY S-GRAPH UNIT HYDROGRAPH
                         GREEN-AMPT RAINFALL LOSSES
                         KINEMATIC WAVE ROUTING
                         **
                         ** MODEL CALIBRATED BY ADJUSTING Kn VALUES SO THAT LAG TIMES USING CORPS
                         ** LAG EQUATION MATCH THOSE OBTAINED BY HAND CALCULATION OF STREET VELOCITIES
                         **
                         ** AREAS OF FUTURE DEVELOPMENT ARE MODELED AS 10 PERCENT OF THEIR ACTUAL LAND
                         ** AREA, WITH THAT 10 PERCENT CONTRIBUTING 95 PERCENT (RTIMP = 95 PERCENT)
                         **
                         ** CONCEPT/ROUTING STUDY
                         ** EAST AND WEST DETENTION/SURGE BASINS, GLENDALE AVENUE STORM DRAIN
                         ** ALIGNMENT; 50 cfs WEST BASIN BYPASS
                         **
                         ** APRIL 5, 1996
                         **
                         ** FILE GLW-E50
                         **

  24 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           2  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1000  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      2    0  ENDING DATE
                      NDTIME        0918  ENDING TIME
                       ICENT          19  CENTURY MARK

                 COMPUTATION INTERVAL    0.03 HOURS
                      TOTAL TIME BASE   33.30 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT
```

1

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 MAX PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	10S	142.	4.40	29.	7.	5.		0.20	
+	DIVERSION TO	10DIV	71.	4.40	15.	4.	3.		0.20	
+	HYDROGRAPH AT	10D	71.	4.40	15.	4.	3.		0.20	
+	ROUTED TO	10AR1	71.	4.43	15.	4.	3.		0.20	
+	HYDROGRAPH AT	20S	175.	4.40	36.	9.	7.		0.23	
+	DIVERSION TO	20DIV	122.	4.40	25.	6.	5.		0.23	
+	HYDROGRAPH AT	20D	52.	4.40	11.	3.	2.		0.23	
+	2 COMBINED AT	15C	123.	4.43	25.	6.	5.		0.43	
+	ROUTED TO	10AR2	123.	4.43	25.	6.	5.		0.43	
+	ROUTED TO	20BR1	123.	4.47	25.	6.	5.		0.43	
+	HYDROGRAPH AT	30S	180.	4.57	42.	11.	8.		0.32	
+	DIVERSION TO	30DIV	90.	4.57	21.	5.	4.		0.32	
+	HYDROGRAPH AT	30D	90.	4.57	21.	5.	4.		0.32	
+	2 COMBINED AT	25C	211.	4.50	46.	12.	8.		0.75	
+	ROUTED TO	20BR2	211.	4.53	46.	12.	8.		0.75	
+	HYDROGRAPH AT	10DIV	71.	4.40	15.	4.	3.		0.00	
+	ROUTED TO	10B1R	71.	4.63	15.	4.	3.		0.00	
+	ROUTED TO	10B2R1	71.	4.67	15.	4.	3.		0.00	
+	HYDROGRAPH AT	30DIV	90.	4.57	21.	5.	4.		0.00	
+	2 COMBINED AT	16C	159.	4.60	35.	9.	6.		0.00	
+	ROUTED TO	10B2R2	159.	4.63	35.	9.	6.		0.00	
+	2 COMBINED AT	30C	367.	4.57	82.	21.	15.		0.75	
+	ROUTED TO	30R	367.	4.60	82.	21.	15.		0.75	
+	HYDROGRAPH AT	20DIV	122.	4.40	25.	6.	5.		0.00	

+	ROUTED TO 20AR	122.	4.53	25.	6.	5.	0.00
+	HYDROGRAPH AT 40S	89.	5.67	34.	9.	6.	0.25
+	2 COMBINED AT 40C	160.	4.60	59.	15.	11.	0.25
+	DIVERSION TO 40DIV	128.	4.60	47.	12.	9.	0.25
+	HYDROGRAPH AT 40D	32.	4.60	12.	3.	2.	0.25
+	ROUTED TO 40BR	32.	4.90	12.	3.	2.	0.25
+	2 COMBINED AT 45C1	389.	4.63	92.	24.	17.	1.00
+	HYDROGRAPH AT 60S	125.	6.13	56.	15.	10.	0.46
+	DIVERSION TO 60DIV	93.	6.13	42.	11.	8.	0.46
+	HYDROGRAPH AT 60D	31.	6.13	14.	4.	3.	0.46
+	2 COMBINED AT 45C2	402.	4.63	104.	27.	20.	1.45
+	ROUTED TO 45R	401.	4.67	104.	27.	20.	1.45
+	HYDROGRAPH AT 40DIV	128.	4.60	47.	12.	9.	0.00
+	ROUTED TO 40AR1	128.	4.60	47.	12.	9.	0.00
+	HYDROGRAPH AT 50S	64.	5.53	24.	6.	4.	0.16
+	DIVERSION TO 50DIV	32.	5.53	12.	3.	2.	0.16
+	HYDROGRAPH AT 50D	32.	5.53	12.	3.	2.	0.16
+	2 COMBINED AT 46C	145.	4.63	59.	15.	11.	0.16
+	ROUTED TO 40AR2	144.	4.67	59.	15.	11.	0.16
+	ROUTED TO 50BR1	144.	4.67	59.	15.	11.	0.16
+	HYDROGRAPH AT 60DIV	93.	6.13	42.	11.	8.	0.00
+	2 COMBINED AT 55C	200.	5.83	100.	26.	19.	0.16
+	ROUTED TO 50BR2	200.	5.83	100.	26.	19.	0.16
+	2 COMBINED AT 60C	583.	4.70	204.	53.	39.	1.62
+	ROUTED TO 60AR	582.	4.73	204.	53.	39.	1.62
+	HYDROGRAPH AT 50DIV	32.	5.53	12.	3.	2.	0.00
+	ROUTED TO 50AR	32.	5.80	12.	3.	2.	0.00

+	HYDROGRAPH AT	80S	121.	4.40	26.	7.	5.	0.15
+	2 COMBINED AT	80C	125.	4.43	36.	10.	7.	0.15
+	DIVERSION TO	80DIV	62.	4.43	18.	5.	3.	0.15
+	HYDROGRAPH AT	80D	62.	4.43	18.	5.	3.	0.15
+	ROUTED TO	80BR	62.	4.63	18.	5.	3.	0.15
+	2 COMBINED AT	85C1	644.	4.70	222.	58.	42.	1.76
+	HYDROGRAPH AT	100S	138.	6.10	62.	16.	12.	0.41
+	DIVERSION TO	100DIV	83.	6.10	37.	10.	7.	0.41
+	HYDROGRAPH AT	100D	55.	6.10	25.	7.	5.	0.41
+	2 COMBINED AT	85C2	668.	4.70	247.	65.	47.	2.17
+	DIVERSION TO	85DIV	626.	3.23	205.	51.	37.	2.17
+	HYDROGRAPH AT	85D	42.	3.23	42.	14.	10.	2.17
+	ROUTED TO	85R	42.	3.30	42.	14.	10.	2.17
+	HYDROGRAPH AT	80DIV	62.	4.43	18.	5.	3.	0.00
+	HYDROGRAPH AT	90S	12.	4.33	3.	1.	0.	0.01
+	2 COMBINED AT	80C2	74.	4.40	21.	5.	4.	0.01
+	ROUTED TO	80AR	74.	4.47	21.	5.	4.	0.01
+	ROUTED TO	90R1	74.	4.50	21.	5.	4.	0.01
+	HYDROGRAPH AT	100DIV	83.	6.10	37.	10.	7.	0.00
+	2 COMBINED AT	95C	104.	4.57	58.	15.	11.	0.01
+	ROUTED TO	90R2	104.	4.60	58.	15.	11.	0.01
+	HYDROGRAPH AT	111S	14.	4.13	3.	1.	1.	0.01
+	2 COMBINED AT	111C	111.	4.57	60.	16.	11.	0.03
+	ROUTED TO	90R3	111.	4.60	60.	16.	12.	0.03
+	2 COMBINED AT	95C	153.	4.60	102.	29.	21.	2.20
+	DIVERSION TO	95DIV	82.	3.77	35.	9.	6.	2.20
+	HYDROGRAPH AT	95D	71.	3.77	67.	21.	15.	2.20

+	ROUTED TO	96R	71.	3.80	67.	21.	15.	2.20
+	HYDROGRAPH AT	110S	170.	5.30	58.	15.	11.	0.38
+	HYDROGRAPH AT	70S	118.	4.47	27.	7.	5.	0.16
+	ROUTED TO	70AR	118.	4.60	27.	7.	5.	0.16
+	ROUTED TO	70BR1	118.	4.63	27.	7.	5.	0.16
+	2 COMBINED AT	76C	239.	4.97	85.	22.	16.	0.54
+	2 COMBINED AT	115C	310.	4.97	150.	42.	31.	2.74
+	DIVERSION TO	115DIV	202.	3.80	56.	14.	10.	2.74
+	HYDROGRAPH AT	115D	108.	3.80	94.	28.	20.	2.74
+	HYDROGRAPH AT	112S	14.	4.33	3.	1.	1.	0.02
+	HYDROGRAPH AT	113S	25.	4.87	8.	2.	1.	0.04
+	3 COMBINED AT	115C2	141.	4.63	104.	31.	22.	2.80
+	HYDROGRAPH AT	85DIV	626.	4.70	205.	51.	37.	0.00
+	HYDROGRAPH AT	95DIV	82.	4.60	35.	9.	6.	0.00
+	HYDROGRAPH AT	115DIV	202.	4.97	56.	14.	10.	0.00
+	4 COMBINED AT	E-BASN	1041.	4.73	400.	105.	76.	2.80
+	DIVERSION TO	115DV2	933.	3.60	300.	75.	54.	2.80
+	HYDROGRAPH AT	115D2	108.	3.60	100.	30.	22.	2.80
+	ROUTED TO	110R	108.	3.67	100.	30.	22.	2.80
+	HYDROGRAPH AT	125S	24.	4.17	5.	1.	1.	0.03
+	2 COMBINED AT	120C1	132.	4.17	104.	31.	23.	2.82
+	HYDROGRAPH AT	120S	47.	4.13	9.	2.	2.	0.05
+	2 COMBINED AT	120C2	179.	4.17	112.	33.	24.	2.87
+	ROUTED TO	120R	179.	4.17	112.	33.	24.	2.87
+	HYDROGRAPH AT	130S	32.	4.17	6.	2.	1.	0.03
+	DIVERSION TO	130DIV	29.	4.17	6.	1.	1.	0.03
+	HYDROGRAPH AT	130D	3.	4.17	1.	0.	0.	0.03

	ROUTED TO							
+		130BR	3.	4.53	1.	0.	0.	0.03
	HYDROGRAPH AT							
+		140S	56.	4.20	11.	3.	2.	0.06
	3 COMBINED AT							
+		140C	235.	4.20	123.	36.	26.	2.97
	ROUTED TO							
+		W-BASN	50.	7.80	50.	36.	26.	2.97
+								1123.41 8.87
	ROUTED TO							
+		140R	50.	7.83	50.	36.	26.	2.97
	HYDROGRAPH AT							
+		130DIV	29.	4.17	6.	1.	1.	0.00
	ROUTED TO							
+		130AR	29.	4.27	6.	1.	1.	0.00
	HYDROGRAPH AT							
+		160S	21.	4.17	4.	1.	1.	0.02
	2 COMBINED AT							
+		160C	50.	4.23	10.	2.	2.	0.02
	ROUTED TO							
+		160R	50.	4.33	10.	2.	2.	0.02
	DIVERSION TO							
+		160RDV	50.	0.00	10.	2.	2.	0.02
	HYDROGRAPH AT							
+		160RD	0.	0.00	0.	0.	0.	0.02
	2 COMBINED AT							
+		155C	50.	7.83	50.	36.	26.	2.99
	ROUTED TO							
+		155R	50.	7.90	50.	36.	26.	2.99
	HYDROGRAPH AT							
+		170S	47.	4.40	11.	3.	2.	0.06
	DIVERSION TO							
+		170DIV	14.	4.40	3.	1.	1.	0.06
	HYDROGRAPH AT							
+		170D	33.	4.40	7.	2.	1.	0.06
	2 COMBINED AT							
+		170BC	79.	4.40	55.	38.	28.	3.05
	ROUTED TO							
+		170BR	79.	4.43	55.	38.	28.	3.05
	HYDROGRAPH AT							
+		170DIV	14.	4.40	3.	1.	1.	0.00
	ROUTED TO							
+		170AR	14.	4.60	3.	1.	1.	0.00
	2 COMBINED AT							
+		170C	92.	4.47	58.	39.	28.	3.05
	ROUTED TO							
+		170R	92.	4.50	58.	39.	28.	3.05
	HYDROGRAPH AT							
+		180S	64.	4.40	13.	3.	2.	0.08
	DIVERSION TO							
+		180DIV	35.	4.40	7.	2.	1.	0.08
	HYDROGRAPH AT							
+		180D	29.	4.40	6.	2.	1.	0.08
	2 COMBINED AT							

+	180BC	120.	4.47	63.	41.	29.	3.13
ROUTED TO +	180BR	120.	4.50	63.	41.	29.	3.13
HYDROGRAPH AT +	180DIV	35.	4.40	7.	2.	1.	0.00
ROUTED TO +	180AR	35.	4.57	7.	2.	1.	0.00
2 COMBINED AT +	180C	155.	4.50	70.	43.	31.	3.13
ROUTED TO +	180R	155.	4.53	70.	43.	31.	3.13
HYDROGRAPH AT +	190S	57.	4.50	12.	3.	2.	0.08
DIVERSION TO +	190DIV	57.	0.00	12.	3.	2.	0.08
HYDROGRAPH AT +	190D	0.	0.00	0.	0.	0.	0.08
2 COMBINED AT +	190BC	155.	4.53	70.	43.	31.	3.21
ROUTED TO +	190BR	155.	4.57	70.	43.	31.	3.21
HYDROGRAPH AT +	190DIV	57.	4.50	12.	3.	2.	0.00
ROUTED TO +	190AR	57.	4.63	12.	3.	2.	0.00
2 COMBINED AT +	190C	212.	4.57	82.	46.	33.	3.21
DIVERSION TO +	190CDV	212.	0.00	82.	46.	33.	3.21
HYDROGRAPH AT +	190CD	0.	0.00	0.	0.	0.	3.21
ROUTED TO +	190R	0.	0.00	0.	0.	0.	3.21
HYDROGRAPH AT +	200S	75.	4.30	17.	4.	3.	0.08
DIVERSION TO +	200DIV	64.	4.30	14.	4.	3.	0.08
HYDROGRAPH AT +	200D	11.	4.30	2.	1.	0.	0.08
2 COMBINED AT +	200BC	11.	4.30	2.	1.	0.	3.29
ROUTED TO +	200BR	11.	4.33	2.	1.	0.	3.29
HYDROGRAPH AT +	200DIV	64.	4.30	14.	4.	3.	0.00
ROUTED TO +	200AR	63.	4.43	14.	4.	3.	0.00
2 COMBINED AT +	200C	74.	4.43	16.	4.	3.	3.29
ROUTED TO +	200R	74.	4.53	16.	4.	3.	3.29
HYDROGRAPH AT +	210S	22.	4.30	5.	1.	1.	0.03

+	DIVERSION TO	210DIV	5.	4.30	1.	0.	0.	0.03
+	HYDROGRAPH AT	210D	17.	4.30	4.	1.	1.	0.03
+	2 COMBINED AT	210BC	88.	4.47	20.	5.	4.	3.31
+	ROUTED TO	210BR	88.	4.57	20.	5.	4.	3.31
+	HYDROGRAPH AT	210DIV	5.	4.30	1.	0.	0.	0.00
+	ROUTED TO	210AR	5.	4.60	1.	0.	0.	0.00
+	2 COMBINED AT	210C	94.	4.57	21.	5.	4.	3.31
+	DIVERSION TO	210CDV	55.	4.57	12.	3.	2.	3.31
+	HYDROGRAPH AT	210CD	38.	4.57	9.	2.	2.	3.31
+	ROUTED TO	210R	38.	4.70	9.	2.	2.	3.31
+	HYDROGRAPH AT	220S	23.	4.23	5.	1.	1.	0.03
+	DIVERSION TO	220DIV	10.	4.23	2.	1.	0.	0.03
+	HYDROGRAPH AT	220D	13.	4.23	3.	1.	1.	0.03
+	2 COMBINED AT	220BC	46.	4.63	11.	3.	2.	3.34
+	ROUTED TO	220BR	46.	4.73	11.	3.	2.	3.34
+	HYDROGRAPH AT	220DIV	10.	4.23	2.	1.	0.	0.00
+	ROUTED TO	220AR	10.	4.47	2.	1.	0.	0.00
+	2 COMBINED AT	220C	54.	4.73	13.	3.	2.	3.34
+	DIVERSION TO	220CDV	40.	4.73	10.	3.	2.	3.34
+	HYDROGRAPH AT	220CD	14.	4.73	3.	1.	1.	3.34
+	ROUTED TO	220R	14.	4.90	3.	1.	1.	3.34
+	HYDROGRAPH AT	230S	12.	4.30	3.	1.	0.	0.01
+	DIVERSION TO	230DIV	4.	4.30	1.	0.	0.	0.01
+	HYDROGRAPH AT	230D	7.	4.30	2.	0.	0.	0.01
+	2 COMBINED AT	230BC	17.	4.83	5.	1.	1.	3.35
+	ROUTED TO	230BR	17.	5.03	5.	1.	1.	3.35
+	HYDROGRAPH AT	230DIV	4.	4.30	1.	0.	0.	0.00

+	2 COMBINED AT	230C	18.	5.00	6.	2.	1.	3.35
+	DIVERSION TO	230CDV	9.	5.00	3.	1.	1.	3.35
+	HYDROGRAPH AT	230CD	9.	5.00	3.	1.	1.	3.35
+	HYDROGRAPH AT	240S	38.	4.03	7.	2.	1.	0.09
+	ROUTED TO	240R	38.	4.17	7.	2.	1.	0.09
+	HYDROGRAPH AT	250S	78.	4.10	14.	4.	3.	0.21
+	2 COMBINED AT	250C	115.	4.13	21.	5.	4.	0.30
+	DIVERSION TO	250CDV	0.	4.13	0.	0.	0.	0.30
+	HYDROGRAPH AT	250CD	115.	4.13	21.	5.	4.	0.30
+	ROUTED TO	250R	115.	4.20	21.	5.	4.	0.30
+	HYDROGRAPH AT	260S	48.	4.07	8.	2.	1.	0.12
+	DIVERSION TO	260DIV	30.	4.07	5.	1.	1.	0.12
+	HYDROGRAPH AT	260D	18.	4.07	3.	1.	1.	0.12
+	2 COMBINED AT	260BC	132.	4.17	24.	6.	4.	0.42
+	ROUTED TO	260BR	131.	4.23	24.	6.	4.	0.42
+	HYDROGRAPH AT	260DIV	30.	4.07	5.	1.	1.	0.00
+	ROUTED TO	260AR	29.	4.20	5.	1.	1.	0.00
+	2 COMBINED AT	260C	161.	4.23	29.	7.	5.	0.42
+	DIVERSION TO	260CDV	11.	4.23	1.	0.	0.	0.42
+	HYDROGRAPH AT	260CD	150.	4.23	28.	7.	5.	0.42
+	ROUTED TO	260R	150.	4.30	28.	7.	5.	0.42
+	HYDROGRAPH AT	270S	27.	4.07	5.	1.	1.	0.07
+	DIVERSION TO	270DIV	13.	4.07	2.	1.	0.	0.07
+	HYDROGRAPH AT	270D	15.	4.07	3.	1.	0.	0.07
+	2 COMBINED AT	270BC	161.	4.27	31.	8.	6.	0.49
+	ROUTED TO	270BR	161.	4.33	31.	8.	6.	0.49
+	HYDROGRAPH AT	270DIV	13.	4.07	2.	1.	0.	0.00

+	ROUTED TO	270AR	13.	4.27	2.	1.	0.	0.00
+	2 COMBINED AT	270C	173.	4.33	33.	8.	6.	0.49
+	DIVERSION TO	270CDV	23.	4.33	2.	0.	0.	0.49
+	HYDROGRAPH AT	270CD	150.	4.33	31.	8.	6.	0.49
+	ROUTED TO	270R	149.	4.40	31.	8.	6.	0.49
+	HYDROGRAPH AT	280S	40.	4.07	7.	2.	1.	0.11
+	DIVERSION TO	280DIV	19.	4.07	3.	1.	1.	0.11
+	HYDROGRAPH AT	280D	22.	4.07	4.	1.	1.	0.11
+	2 COMBINED AT	280BC	163.	4.37	35.	9.	6.	0.60
+	ROUTED TO	280BR	162.	4.43	35.	9.	6.	0.60
+	HYDROGRAPH AT	280DIV	19.	4.07	3.	1.	1.	0.00
+	ROUTED TO	280AR	19.	4.23	3.	1.	1.	0.00
+	2 COMBINED AT	280C	178.	4.40	38.	10.	7.	0.60
+	DIVERSION TO	280CDV	16.	4.40	1.	0.	0.	0.60
+	HYDROGRAPH AT	280CD	162.	4.40	36.	9.	7.	0.60
+	ROUTED TO	280R	162.	4.47	36.	9.	7.	0.60
+	HYDROGRAPH AT	290S	29.	4.07	5.	1.	1.	0.07
+	DIVERSION TO	290DIV	14.	4.07	3.	1.	0.	0.07
+	HYDROGRAPH AT	290D	14.	4.07	3.	1.	0.	0.07
+	2 COMBINED AT	290BC	169.	4.43	39.	10.	7.	0.67
+	ROUTED TO	290BR	169.	4.47	39.	10.	7.	0.67
+	HYDROGRAPH AT	190CDV	212.	4.57	82.	46.	33.	0.00
+	ROUTED TO	190CDR	211.	4.60	82.	46.	33.	0.00
+	HYDROGRAPH AT	290DIV	14.	4.07	3.	1.	0.	0.00
+	2 COMBINED AT	290AC	216.	4.57	84.	46.	33.	0.00
+	ROUTED TO	290AR	216.	4.60	84.	46.	33.	0.00
+	2 COMBINED AT	290C	382.	4.53	123.	56.	41.	0.67

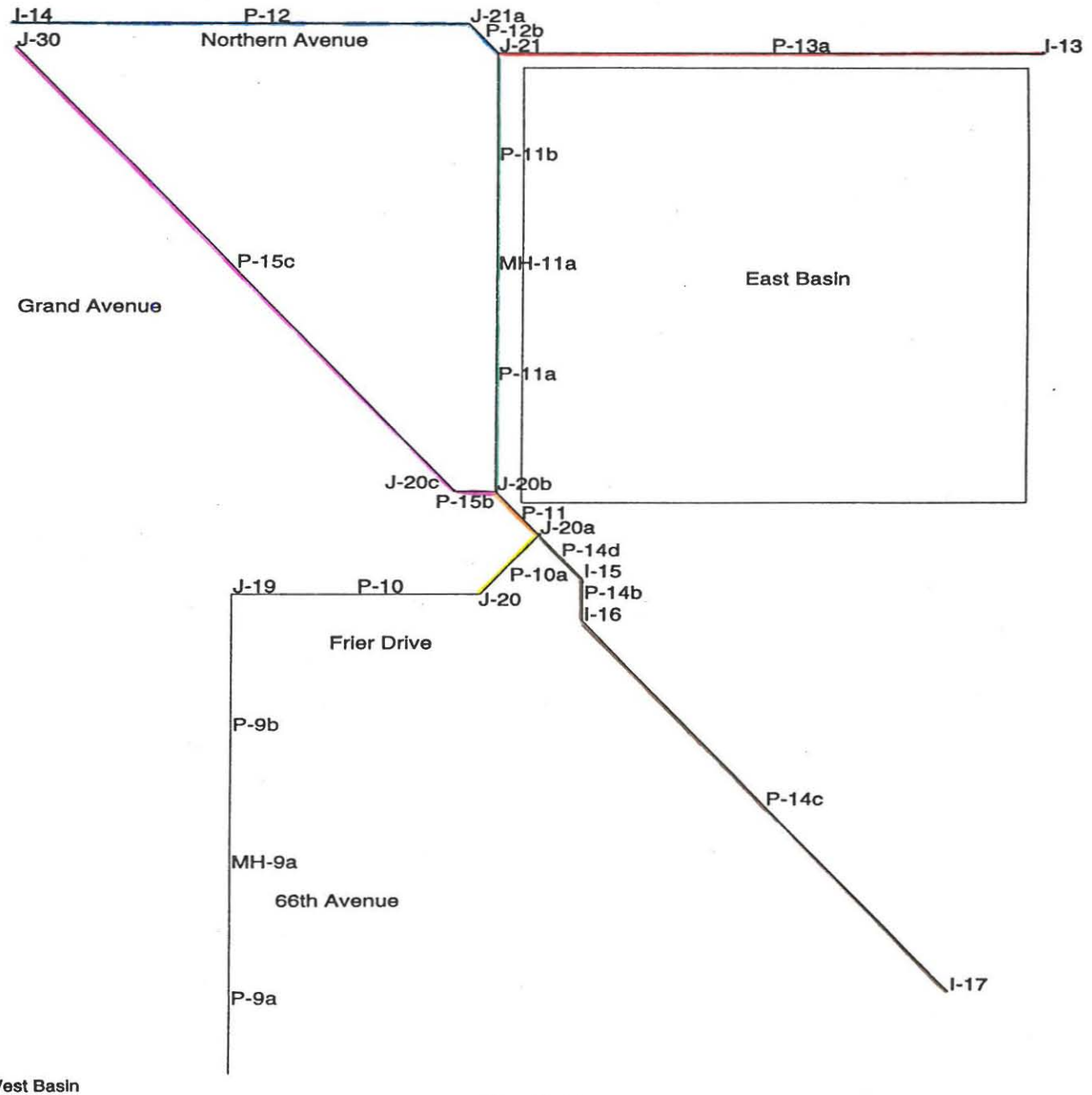
+	ROUTED TO 290R	382.	4.57	123.	56.	41.	0.67
+	HYDROGRAPH AT 300S	12.	4.03	2.	1.	0.	0.03
+	DIVERSION TO 300DIV	8.	4.03	1.	0.	0.	0.03
+	HYDROGRAPH AT 300D	4.	4.03	1.	0.	0.	0.03
+	2 COMBINED AT 300BC	383.	4.57	124.	56.	41.	0.70
+	ROUTED TO 300BR	383.	4.57	124.	56.	41.	0.70
+	HYDROGRAPH AT 300DIV	8.	4.03	1.	0.	0.	0.00
+	ROUTED TO 300AR	8.	4.77	1.	0.	0.	0.00
+	2 COMBINED AT 300C	389.	4.60	125.	57.	41.	0.70
+	ROUTED TO 300R	389.	4.63	125.	57.	41.	0.70
+	HYDROGRAPH AT 310S	21.	4.07	4.	1.	1.	0.05
+	DIVERSION TO 310DIV	14.	4.07	3.	1.	0.	0.05
+	HYDROGRAPH AT 310D	7.	4.07	1.	0.	0.	0.05
+	2 COMBINED AT 310BC	391.	4.63	126.	57.	41.	0.75
+	ROUTED TO 310BR	390.	4.63	126.	57.	41.	0.75
+	HYDROGRAPH AT 210CDV	55.	4.57	12.	3.	2.	0.00
+	ROUTED TO 210CDR	55.	4.60	13.	3.	2.	0.00
+	HYDROGRAPH AT 310DIV	14.	4.07	3.	1.	0.	0.00
+	2 COMBINED AT 310AC	60.	4.57	15.	4.	3.	0.00
+	ROUTED TO 310AR	60.	4.63	15.	4.	3.	0.00
+	2 COMBINED AT 310C	450.	4.63	141.	61.	44.	0.75
+	ROUTED TO 310R	450.	4.67	141.	61.	44.	0.75
+	HYDROGRAPH AT 320S	11.	4.03	2.	0.	0.	0.03
+	DIVERSION TO 320DIV	5.	4.03	1.	0.	0.	0.03
+	HYDROGRAPH AT 320D	6.	4.03	1.	0.	0.	0.03
+	2 COMBINED AT 320BC	451.	4.67	142.	61.	44.	0.78
+	ROUTED TO 320BR	451.	4.67	142.	61.	44.	0.78

+	HYDROGRAPH AT	220CDV	40.	4.73	10.	3.	2.	0.00
+	ROUTED TO	220CDR	40.	4.80	10.	3.	2.	0.00
+	HYDROGRAPH AT	320DIV	5.	4.03	1.	0.	0.	0.00
+	2 COMBINED AT	320AC	41.	4.80	11.	3.	2.	0.00
+	ROUTED TO	320AR	41.	4.90	11.	3.	2.	0.00
+	2 COMBINED AT	320C	482.	4.70	153.	64.	46.	0.78
+	ROUTED TO	320R	481.	4.73	153.	64.	46.	0.78
+	HYDROGRAPH AT	330S	9.	4.03	2.	0.	0.	0.02
+	DIVERSION TO	330DIV	2.	4.03	0.	0.	0.	0.02
+	HYDROGRAPH AT	330D	7.	4.03	1.	0.	0.	0.02
+	2 COMBINED AT	330BC	483.	4.73	154.	64.	46.	0.80
+	ROUTED TO	330BR	483.	4.73	154.	64.	46.	0.80
+	HYDROGRAPH AT	230CDV	9.	5.00	3.	1.	1.	0.00
+	ROUTED TO	230CDR	9.	5.30	3.	1.	1.	0.00
+	HYDROGRAPH AT	330DIV	2.	4.03	0.	0.	0.	0.00
+	2 COMBINED AT	330AC	9.	5.30	3.	1.	1.	0.00
+	ROUTED TO	330AR	9.	5.60	3.	1.	1.	0.00
+	2 COMBINED AT	330C	485.	4.73	157.	65.	47.	0.80
+	HYDROGRAPH AT	160RDV	50.	4.33	10.	2.	2.	0.00
+	HYDROGRAPH AT	150S	63.	4.10	13.	3.	2.	0.06
+	2 COMBINED AT	150BAS	107.	4.20	22.	6.	4.	0.06

*** NORMAL END OF HEC-1 ***

APPENDIX B.

Hydraulic Grade Line Calculations for the Storm Drain System



StormCAD files

- P-12
- P-13a
- P-11b
- P-15
- P-11
- P-10a
- P-14c

Project Title: N/O East Basin to West Basin

Wood/Patel

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Project Engineer: Wood/Patel
StormCAD v1.5 [158]

Pipe Report

Pipe	Upstream Node	Downstream Node	System Intensity (in/hr)	Discharge (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Roughness	Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Upstream Cover (ft)	Downstream Cover (ft)	Upstream HGL (ft)	Downstream HGL (ft)	Description
P-10a	J-20a	J-20	0.00	108.00	200.00	0.002500	60 inch	0.013	130.21	1,126.00	1,125.50	1,142.00	1,142.00	11.00	11.50	1,130.51	1,130.24	

Pipe Report

Pipe	Upstream Node	Downstream Node	System Intensity (in/hr)	Discharge (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Roughness	Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Upstream Cover (ft)	Downstream Cover (ft)	Upstream HGL (ft)	Downstream HGL (ft)	Description
P-11	J-20b	J-20a	0.00	103.00	150.00	0.000800	60 inch	0.013	73.66	1,126.12	1,126.00	1,142.00	1,142.00	10.88	11.00	1,131.26	1,131.03	

Pipe Report

Pipe	Upstream Node	Downstream Node	System Intensity (in/hr)	Discharge (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Roughness	Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Upstream Cover (ft)	Downstream Cover (ft)	Upstream HGL (ft)	Downstream HGL (ft)	Description
P-15c	J-30	J-20c	0.00	32.00	100.00	0.007727	48 inch	0.013	126.26	1,135.50	1,127.00	1,142.80	1,142.00	3.30	11.00	1,137.18	1,131.64	
P-15b	J-20c	J-20b	0.00	32.00	100.00	0.008800	48 inch	0.013	134.74	1,127.00	1,126.12	1,142.00	1,142.00	11.00	11.88	1,131.61	1,131.56	

Pipe Report

Pipe	Upstream Node	Downstream Node	System Intensity (in/hr)	Discharge (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Roughness	Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Upstream Cover (ft)	Downstream Cover (ft)	Upstream HGL (ft)	Downstream HGL (ft)	Description
P-11b	J-21	MH-11a	0.00	71.00	500.00	0.004880	48 inch	0.013	100.34	1,131.00	1,128.56	1,143.20	1,142.60	8.20	10.04	1,133.55	1,132.78	
P-11a	MH-11a	J-20b	0.00	71.00	500.00	0.004880	48 inch	0.013	100.34	1,128.56	1,126.12	1,142.60	1,142.00	10.04	11.88	1,132.78	1,131.56	

Pipe Report

Pipe	Upstream Node	Downstream Node	System Intensity (in/hr)	Discharge (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Roughness	Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Upstream Cover (ft)	Downstream Cover (ft)	Upstream HGL (ft)	Downstream HGL (ft)	Description
P-12	I-14	J-21a	0.00	111.00	000.00	0.003750	54 inch	0.013	120.42	1,135.50	1,131.75	1,142.80	1,143.90	2.80	7.65	1,138.91	1,135.31	
P-12b	J-21a	J-21	0.00	111.00	104.00	0.007212	54 inch	0.013	166.99	1,131.75	1,131.00	1,143.90	1,143.20	7.65	7.70	1,134.85	1,134.32	

Pipe Report

Pipe	Upstream Node	Downstream Node	System Intensity (in/hr)	Discharge (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Roughness	Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Upstream Cover (ft)	Downstream Cover (ft)	Upstream HGL (ft)	Downstream HGL (ft)	Description
P-13a	I-13	J-21	0.00	42.00	320.00	0.000758	36 inch	0.013	18.36	1,132.00	1,131.00	1,148.60	1,143.20	13.60	9.20	1,139.55	1,134.32	

Pipe Report

Pipe	Upstream Node	Downstream Node	System Intensity (in/hr)	Discharge (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Roughness	Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Upstream Cover (ft)	Downstream Cover (ft)	Upstream HGL (ft)	Downstream HGL (ft)	Description
P-14c	I-17	I-16	0.00	79.00	050.00	0.001541	60 inch	0.013	102.22	1,134.18	1,126.40	1,148.00	1,143.00	8.82	11.60	1,137.48	1,131.40	
P-14b	I-16	I-15	0.00	79.00	100.00	0.002000	60 inch	0.013	116.47	1,126.40	1,126.20	1,143.00	1,143.00	11.60	11.80	1,131.33	1,131.24	
P-14c	I-15	J-20a	0.00	79.00	150.00	0.001333	60 inch	0.013	95.10	1,126.20	1,126.00	1,143.00	1,142.00	11.80	11.00	1,131.16	1,131.03	

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY DATA PROVIDED BY KAMINSKI-HUBBARD ENGINEERING INC. AND PROJECT ENGINEERING CONSULTANTS, LTD.

☐ REMOVE ☐

NOTE: BASIN DESIGN CONCEPT HAS BEEN MODIFIED ON 5/5/98. THIS SKETCH DOES NOT REFLECT CONCEPT MODIFICATIONS

◯ CONSTRUCT ◯

Notes:

1. The preliminary basin and channel as shown hereon is based upon detention volume requirements only.
2. The basin geometry, side slopes, and channel alignment may be revised as long as the detention volume is not diminished.
3. Input from the city including items concerning mixed use planning, landscaping and maintenance will be incorporated into the final basin design.

N

50 0 50 100
Scale in Feet

Two working days before you dig, CALL FOR THE BLUE STAKES 263-1100 Blue Stake Center CALL COLLECT

NO.	REVISION		DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

NORTHERN/ORANGEWOOD STORM DRAIN PROJECT
FCD 94-12
CONSTRUCTION PHASING PLAN

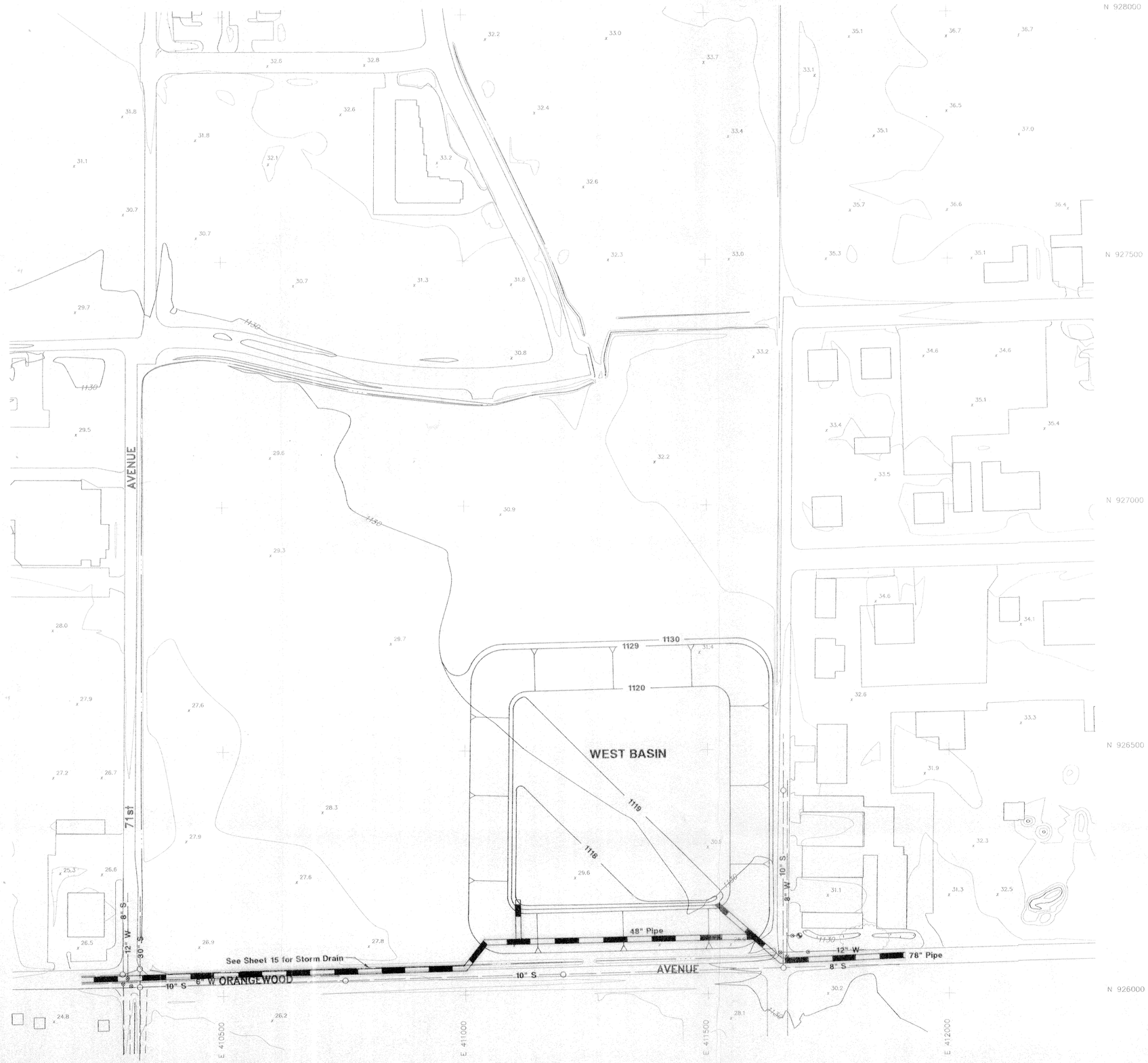
	BY	DATE
DESIGNED	JGT	8/96
DRAWN	R REED	8/96
CHECKED	ACP	8/96

WOOD, PATEL & ASSOCIATES, INC.
1550 EAST MISSOURI, SUITE 203
PHOENIX, ARIZONA (602)234-1344

WOOD/PATEL PROJECT NO. 94153.00

SHEET 21

MAY 05 1998



THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS
1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY
DATA PROVIDED BY KAMINSKI-HUBBARD ENGINEERING INC. AND PROJECT ENGINEERING CONSULTANTS, LTD.

☐ REMOVE ☐

Concept Modified on 5/5/98
Not reflected on this sketch

○ CONSTRUCT ○

Notes:

1. The preliminary basin and channel as shown hereon is based upon detention volume requirements only.
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Blue Stake Center
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NO.	REVISION		DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
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SHEET 22

MAY 05 1998