Property of
Flood Control District of MC Library
Please Return to
2801 W. Durango
Phoenix, AZ 85009

PPM
REVIEW
7/14/95

Design Concept Report for the Tenth Street Wash Detention Basin No. 2

Prepared for:

Flood Control District of Maricopa County
2801 W. Durango
Phoenix, Arizona 85009

June 1995

QUALITY
INTEGRITY
CREATIVITY
RESPONSIVENESS

Registered Professional Engineer
CERTIFICATE NO. 28940
FRANK E. HENDERSON III
Date Signed 6/27/95
ARIZONA, U.S.A.

Frank Henderson III

RUST ENVIRONMENT & INFRASTRUCTURE

FLOOD CONTROL DISTRICT
RECEIVED
JUN 2 9 1995

	CHENG		P & PM
	DEF		REG
	ADMIN		LMGT
	FINANCE		FILE
	O & M		
	ENGR		

REMARKS

TABLE OF CONTENTS

Chapter **Page**

1 INTRODUCTION 1

2 DESCRIPTION OF PROJECT SITE 2

3 UTILITIES 3

4 EXISTING WATERSHED HYDROLOGY 4

5 GENERAL DESIGN CRITERIA 5

6 EVALUATION OF BASIN ALTERNATIVES 6
BASIN ALTERNATIVE 1 6
BASIN ALTERNATIVE 2 7
BASIN ALTERNATIVE 3 7
SELECTED ALTERNATIVE 8

7 EVALUATION OF ALTERNATIVE INLET/OUTLET STRUCTURES 9
INLET/OUTLET ALTERNATIVE A 9
INLET/OUTLET ALTERNATIVE B 9
INLET/OUTLET ALTERNATIVE C, C-1, and C-1A 10

8 SITE REQUIREMENTS 12
EMERGENCY OUTLET SPILLWAY 12
PALMA PARK TRIBUTARY 12
TENTH STREET WASH CHANNEL MODIFICATIONS 12
FUTURE CHANNEL IMPROVEMENTS 15
TOWNLEY AVENUE 15
ALICE AVENUE 15
MAINTENANCE ACCESS 16
LANDSCAPE TREATMENT 16
SAFETY ISSUES 16
TRASH RACK/ACCESS GRATE 16

9 COST ESTIMATES 18

10 HEC-I MODEL RESULTS 19

11 REFERENCES 20

LIST OF FIGURES

Figure		Follows Page
1	Location Map	1
2	Utilities	3
3	Watershed Boundary Map	4
4	Alternative 1	6
5	Basin Cross Sections	6
6	Alternative 2	7
7	Alternative 3	7
8	Selected Basin Plan	8
9	Inlet/Outlet Alternative A	9
10	Inlet Cross Section A-A'	9
11	Inlet Cross Section B-B'	9
12	Inlet Cross Section C-C'	9
13	Profile of Basin Outlet Pipes	10
14	Inlet/Outlet Alternative B	10
15	Inlet Cross Section D-D'	10
16	Inlet/Outlet Alternative C	10
16A	Inlet/Outlet Alternative C-1	10
16B	Inlet/Outlet Alternative C-1A	10
17	Palma Park Tributary Inlet	12
18	Townley Avenue Profile	15

LIST OF TABLES

Table		Follows Page
1	Summary of Existing Conditions Peak Discharge Rates	4
2	Summary of Downstream Discharge Rates for Each Alternative	6
3	Landscape Cost Estimate	16
4	Project Cost Estimates	18

LIST OF APPENDICES

Appendix

A HEC-I Model for Existing Conditions
B HEC-I Model for Alternative 1
C HEC-I Model for Alternative 2
D HEC-I Model for Alternative 3
E Hydraulic Computations
F Cost Estimates
G Geotechnical Report
H Landscape Concept Report

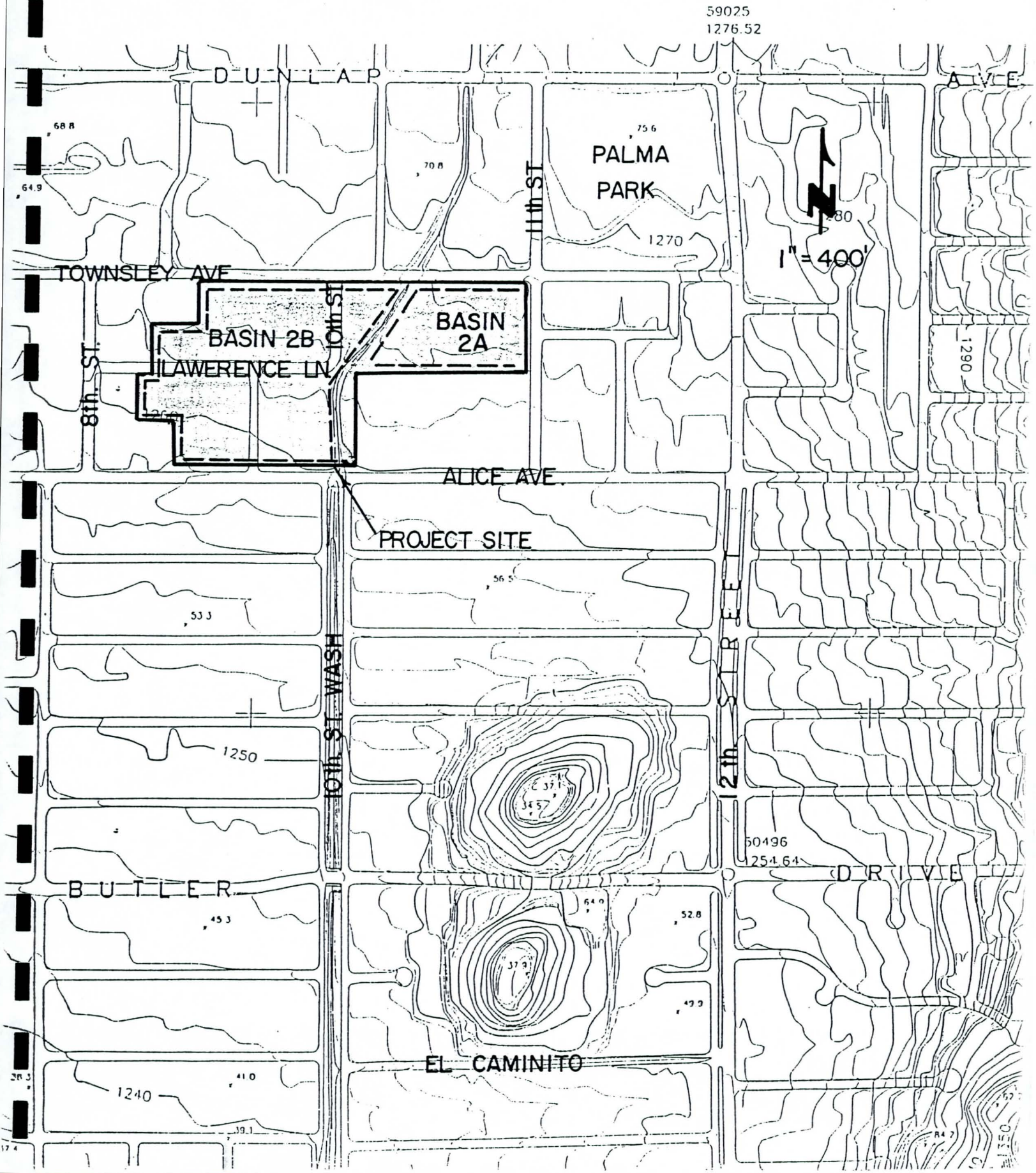
CHAPTER 1

INTRODUCTION

This report presents the results of a design concept study for the Tenth Street Wash Detention Basin No. 2. Rust Environment & Infrastructure (Rust E&I) was contracted by the Flood Control District of Maricopa County (FCDMC) to develop and evaluate alternative plans for the Tenth Street Wash Detention Basin No. 2 drainage improvement facilities. The scope of work for this study included hydrologic and hydraulic modeling of the Tenth Street Wash watershed to evaluate the impacts of various alternatives upon downstream flooding conditions. Results of these analyses were presented to the FCDMC and the Citizen's Advisory Committee (CAC) for selection of a preferred plan. The design concept report investigates basin alternatives which maximize the detention storage in accordance with FCDMC's design requirements and, at the same time, addressing the long-term interests of the neighborhood community who hope to use the basin for recreational facilities. The FCDMC is working closely with the City of Phoenix and community representatives to develop a plan that will facilitate future use of the basin as a recreational facility. Two public meetings were held during the course of this study to present alternatives to the Citizen's Advisory Committee and to incorporate their input.

The Tenth Street Wash Detention Basin No. 2 site is located on a parcel of land bounded on the north by Townley Avenue, on the south by Alice Avenue, on the west by Eighth Street, and the east by Eleventh Street. The site was previously occupied by a residential subdivision which experienced periodic flooding during large flows from the Tenth Street Wash. These homes have been acquired and removed by the FCDMC for construction of the detention basin facilities. A location map is given on **Figure 1**.

FIGURE I - LOCATION MAP



CHAPTER 2

DESCRIPTION OF PROJECT SITE

The project site (land acquired by the FCDMC) has a total area of approximately 12.2 acres. Of this total, 3.2 acres are located on the east side of the current Tenth Street Wash channel. The remainder of the property (approximately 9.0 acres) is located on the west side of the Tenth Street Wash Channel.

The existing alignment of the Tenth Street Wash Channel relative to the boundaries of the project site requires that the project site be divided into two separate detention basins. A preliminary review was made by the FCDMC and Rust E&I to assess the possibility of realigning the Tenth Street Wash channel, or developing a concept which would facilitate a single storage area. This assessment determined that the site constraints require the project area remain divided into two separate storage basins. The area east of the Tenth Street Wash Channel alignment is identified in the remainder of this report as Basin 2A. The area west of the current Tenth Street Wash channel alignment is identified as Basin 2B. Basin 2A and Basin 2B are identified on **Figure 1**.

The existing topography across the project site is relatively flat. The average slope from north to south is about 1.2 percent. The elevation change from the north side to the south side of Basin 2A is 3 feet. The elevation change from north to south across the Basin 2B site is 7 feet.

There is one public street within the project boundaries. This street is the Lawrence Lane/Tenth Street Loop Road which cuts through the center of the Basin 2B area. The right-of-way for these streets will be abandoned as a part of project implementation.

CHAPTER 3

UTILITIES

The project site utilities include City of Phoenix water and sewer, telephone service, natural gas, and electric service located in the existing street rights-of-way. A 230KV underground electric line is located along the Tenth Street Wash banks and crosses the existing channel approximately 200 feet south of Townley Avenue. The 230KV cable will remain in place. **Figure 2** shows utility locations in the project area.

The water and sewer pipes in Lawrence Lane, Tenth Street, and Ninth Street will be abandoned, and removed as part of basin construction. The water main will be capped at the following locations:

- North of the existing valve in the Alice Avenue and Ninth Street intersection
- South of the existing valve in the Townley Avenue and Tenth Street intersection
- Approximately 110 feet east of the existing valve in the Lawrence Lane and Eighth Street intersection

The sewer will be plugged at the following locations:

- North of the existing manhole in the Alice Avenue and Tenth Street location
- Approximately 160 feet east of the existing manhole in the Lawrence Lane and Eighth Street intersection

The underground natural gas, electric, and telephone in Lawrence Lane, Ninth Street, and Tenth Street will be removed to the project limits as a minimum. Continuing service requirements will be coordinated with the utility companies during the design process to finalize utility removal locations. An abandoned underground line which parallels the wash channel and Tenth Street will be removed. The overhead electric cable along Ninth Street, Lawrence Lane and Tenth Street which will be removed.

The existing water main and valves conflict with the culvert crossing from Palma Park in the intersection of Townley Avenue and Eleventh Street. The existing ACP water main will be replaced with dip and lowered to approximate invert elevation 1252.5 to clear the bottom of the proposed culverts.

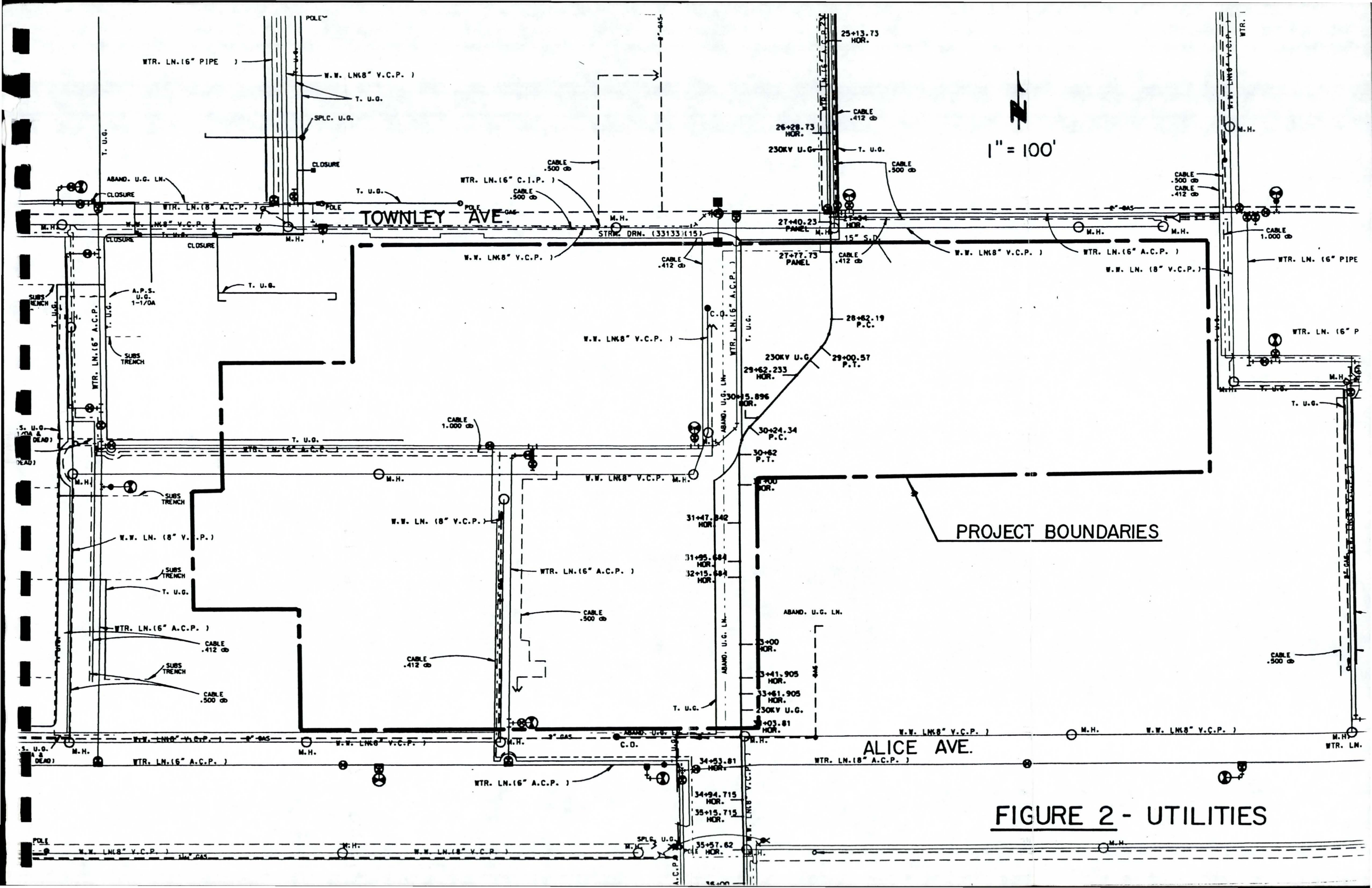


FIGURE 2 - UTILITIES

CHAPTER 4

EXISTING WATERSHED HYDROLOGY

The existing conditions hydrologic analysis of the Tenth Street Wash watershed area was prepared by Kaminski-Hubbard Engineering Inc. (KHE) for the FCDMC as a part of the *Arizona Canal Diversion Channel (ACDC) Area Drainage Master Study, Phase I*. The procedure used in this study for determination of peak flow rates was the U.S. Army Corps of Engineers' flood hydrograph package, HEC-I, Version 4.0, September 1990. A detailed description of the methodology and results is presented in reference 1.

The HEC-I model prepared by KHE was subsequently modified by Stanley Consultants, Inc. Tenth Street Wash Detention Basin No. 1 design. The revisions incorporated into the model by Stanley Consultants, Inc. included a routine for routing the Tenth Street Wash hydrograph through Detention Basin No. 1. The model utilized by Rust E&I for evaluation of the Detention Basin No. 2 alternatives is based upon the original KHE model with the revisions/additions made by Stanley Consultants, Inc. include Detention Basin No. 1. **Table 1** of this report summarizes the results of the previously-completed hydrologic modeling for Tenth Street Wash at the points of concentration immediately upstream and downstream of the Detention Basin No. 2 site. The two primary points of concentration affecting the Tenth Street Wash Detention Basin No. 2 are located on the main stem Tenth Street Wash channel at Townley Avenue and at the intersection of Townley Avenue with Eleventh Street. The 100-year discharge for the main stem Tenth Street Wash channel at Townley Avenue was determined to be 1220 cfs. The tributary flows arriving at the intersection of Townley Avenue and Eleventh Street originate from the Palma Park tributary. The drainage area and 100-year peak discharge for this tributary are 0.47 sq.mi. and 615 cfs, respectively. A very small portion of the Palma Park tributary flow drains through an existing 18-inch pipe at the southeast corner of Palma Park to the Tenth Street Wash. The remainder of the flow drains within the public streets and through the adjoining subdivision areas to Alice Avenue where it then drains to the Tenth Street Wash channel. The drainage area and 100-year peak discharge for Tenth Street Wash at a point downstream of the Palma Park tributary are 2.29 sq.mi. and 1835 cfs, respectively.

There is an additional point of concentration for tributary flows at the ACDC confluence. A tributary watershed area of 0.55 sq.mi. drains to the Tenth Street Wash channel between El Caminito Street and the ACDC confluence. This tributary adds an additional 786 cfs, bringing the total Tenth Street Wash flow at the ACDC confluence to 2621 cfs. Runoff originating from this tributary area south of Alice Avenue will not be regulated by the proposed Tenth Street Wash Detention Basin No. 2.

A map showing the overall watershed boundaries for the Tenth Street Wash watershed is provided on **Figure 3** of this report. **Appendix A** contains a copy of the input and output for the existing conditions HEC-I model which was used as a basis of evaluating the Tenth Street Wash Detention Basin No. 2 alternatives.

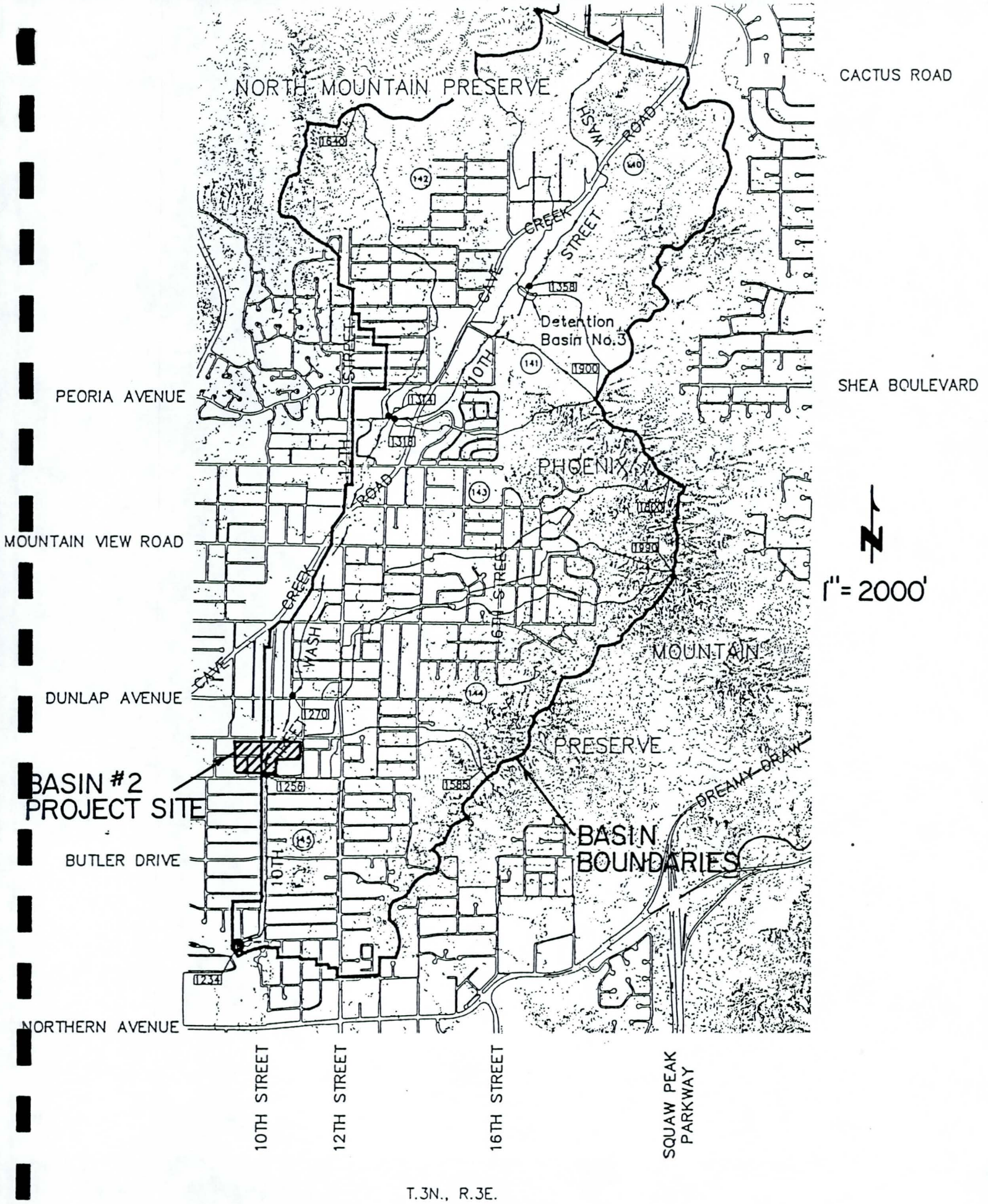


FIGURE 3 - WATERSHED BOUNDARY MAP

TABLE 1

SUMMARY OF EXISTING CONDITIONS PEAK DISCHARGE RATES

HEC-1 ID. Point	LOCATION	Drainage Area	100 Year Discharge (cfs)
RM 143	10th St. Wash & Townley Avenue	1.82 sq.mi.	1220
144S	Palma Park Tributary	0.47 sq.mi.	615
HC144	10th St. Wash @ Alice Avenue	2.29 sq.mi.	1835
145S	ACDC Tributary	0.55 sq.mi.	786
HC145	10th St. Wash @ ACDC	2.84 sq.mi.	2621

184/TBL110TH

CHAPTER 5

GENERAL DESIGN CRITERIA

The FCDMC provided Rust E&I with an outline of the general design criteria and constraints to which the alternatives developed as a part of this study were to comply. These criteria are:

1. capacity of the proposed detention facilities be approximately 75 acre-feet,
2. target discharge for the low-flow bypass facilities be approximately 500 cfs,
3. proposed inlet to collect flows in the Palma Park area be designed to capture 350 cfs and convey the flows to Basin 2A,
4. detention basin side slopes be a maximum of 4 horizontal to 1 vertical (4:1),
5. Basin 2B be designed as the secondary overflow facility so that periodic inundation will not disrupt use of the area as a recreational facility on a frequent basis,
6. boundaries of the project and any applicable design features be located so as not to require relocation of the existing 230KV electrical line, and
7. provide positive basin drainage with maximum 36-hour drain time after the end of the rainfall event.

CHAPTER 6

EVALUATION OF DETENTION BASIN ALTERNATIVES

BASIN ALTERNATIVE 1

Alternative 1 proposes maximum utilization of the land area acquired by the FCDMC and proposes the maximum possible basin depth while still providing sufficient grade to daylight an outlet pipe at the ACDC confluence. A plan view drawing of Alternative 1 is given on **Figure 4**.

Alternative 1 has a total capacity of 117 acre-feet. Basin 2A has a total volume of 20.2 acre-feet. The volume in Basin 2B is 96.8 acre-feet. This is based upon a bottom elevation of 1240 and a maximum water surface elevation of 1259.0. The basin bottoms will be sloped 0.5% for positive drainage of nuisance flows and residual storage to the outlet points. The depth of the basin along its north boundary is 25 feet. The depth of the basin on the south side is 20 feet. Typical cross sections of Basins 2A and 2B running north/south and east/west are provided on **Figure 5**. A 12-foot wide bench about mid-way up the basin side slope has been included for the purpose of maintenance and for providing a possible recreational trail around the perimeters of Basin 2B.

This alternative proposes maximizing the allowable area of Basin 2A by relocating the northern 1/2 of the Tenth Street Wash channel westerly to follow along the alignment of the existing 230KV line. This would not require relocation of the 230KV line as the channel would be concrete-lined and placed over the underground electrical conduit.

Table 2 of this report lists the discharge rates at three downstream concentration points for Alternative 1. These discharges represent the downstream flood peak rates that would occur given implementation of the Alternative 1 plan. The bypass discharge for Alternative 1 is 185 cfs. This combines with 265 cfs not collected from the Palma Park tributary, bringing the total flow at Alice Avenue to 450 cfs.

An assessment was made to determine the basin depth required to retain 100% of the upstream runoff and reduce the basin outflow rates to a zero-discharge level. Results of this analysis determined that the required basin bottom elevation would be 1225.0, which gives a minimum basin depth of 35 feet. This basin depth is larger than that allowable for providing a downstream outlet to the ACDC channel; therefore, runoff held in the lower elevations of the basin would not have an outlet and would be held in retention for percolation into the ground or evaporated. This basin design would not comply with City of Phoenix requirements which specify that the basin must drain within a 36-hour period.

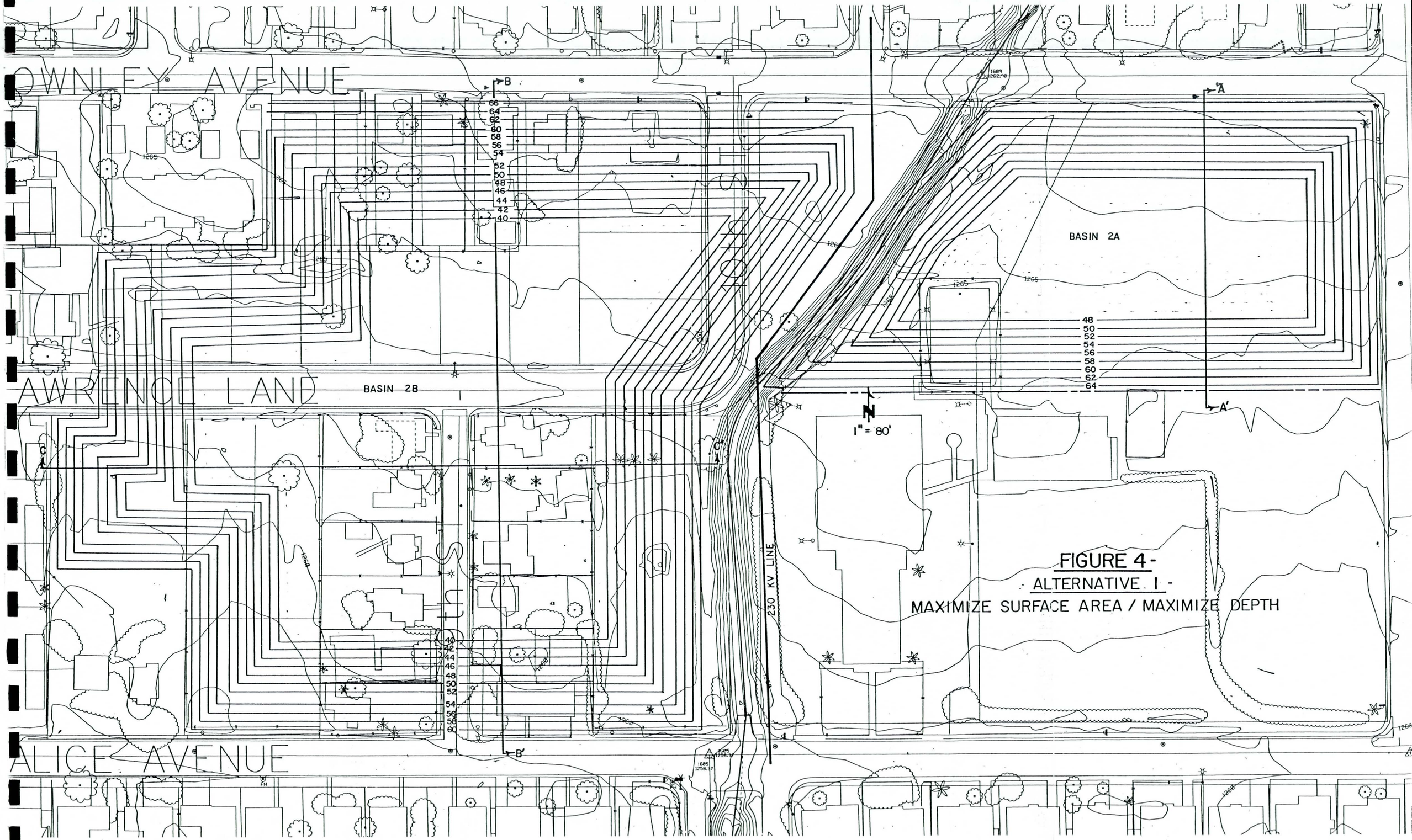
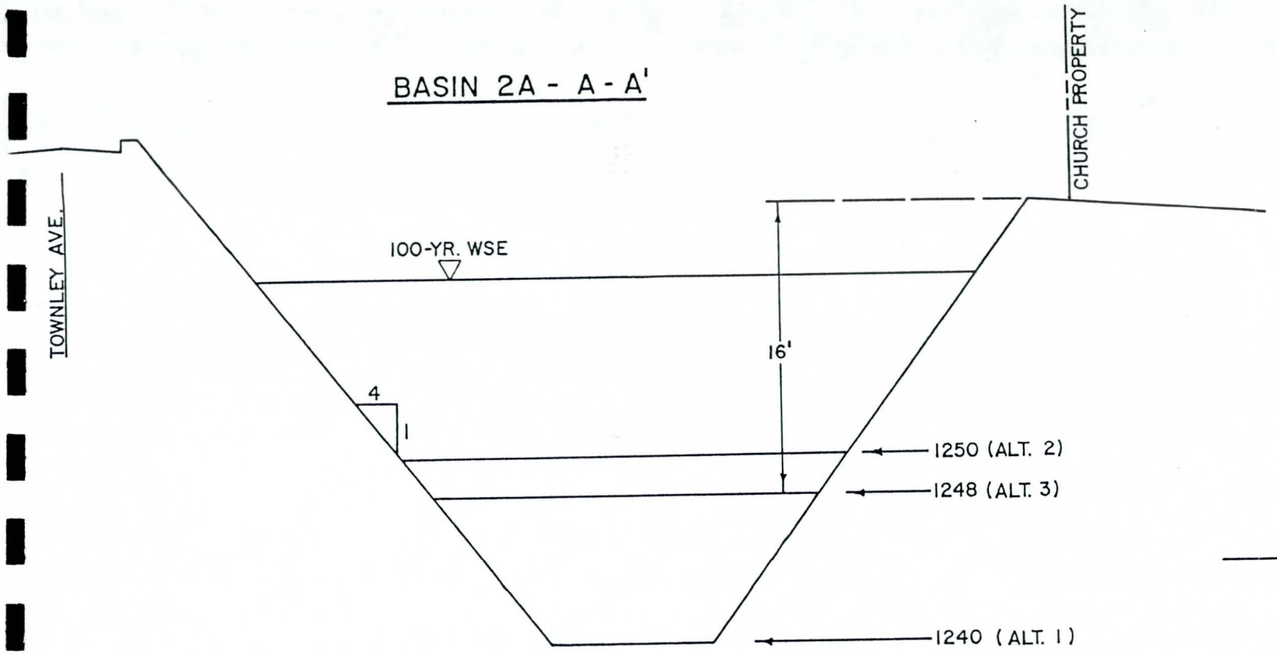


FIGURE 4 -
ALTERNATIVE I -
MAXIMIZE SURFACE AREA / MAXIMIZE DEPTH

BASIN 2A - A - A'



4:1 SIDESLOPE AT TRUE SCALE

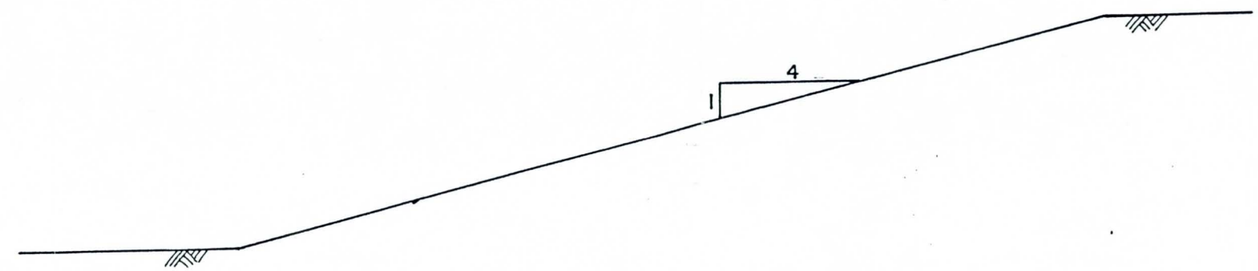
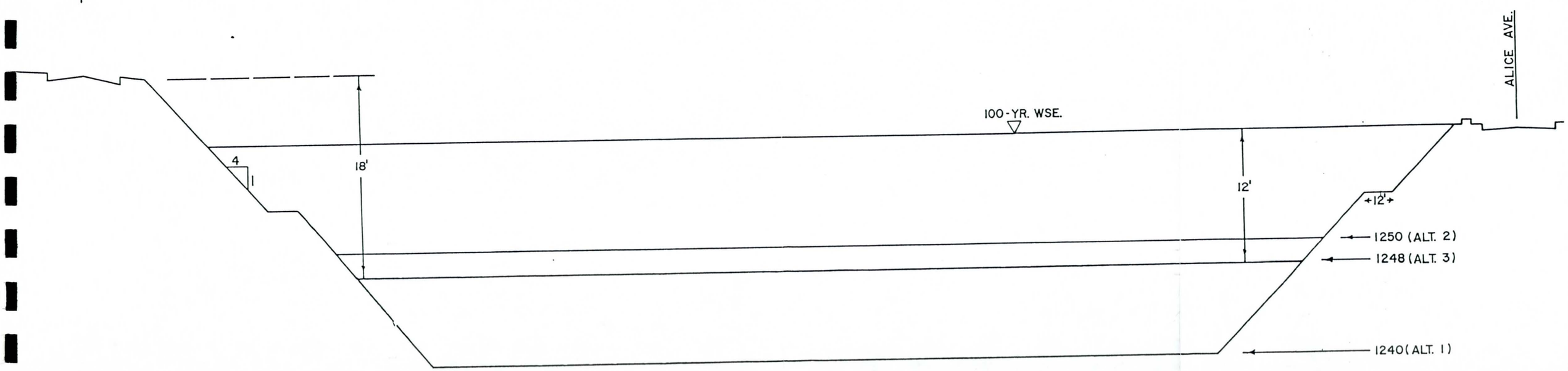


FIGURE 5 -
BASIN CROSS-SECTIONS
PAGE 1/2

BASIN 2B - B - B'



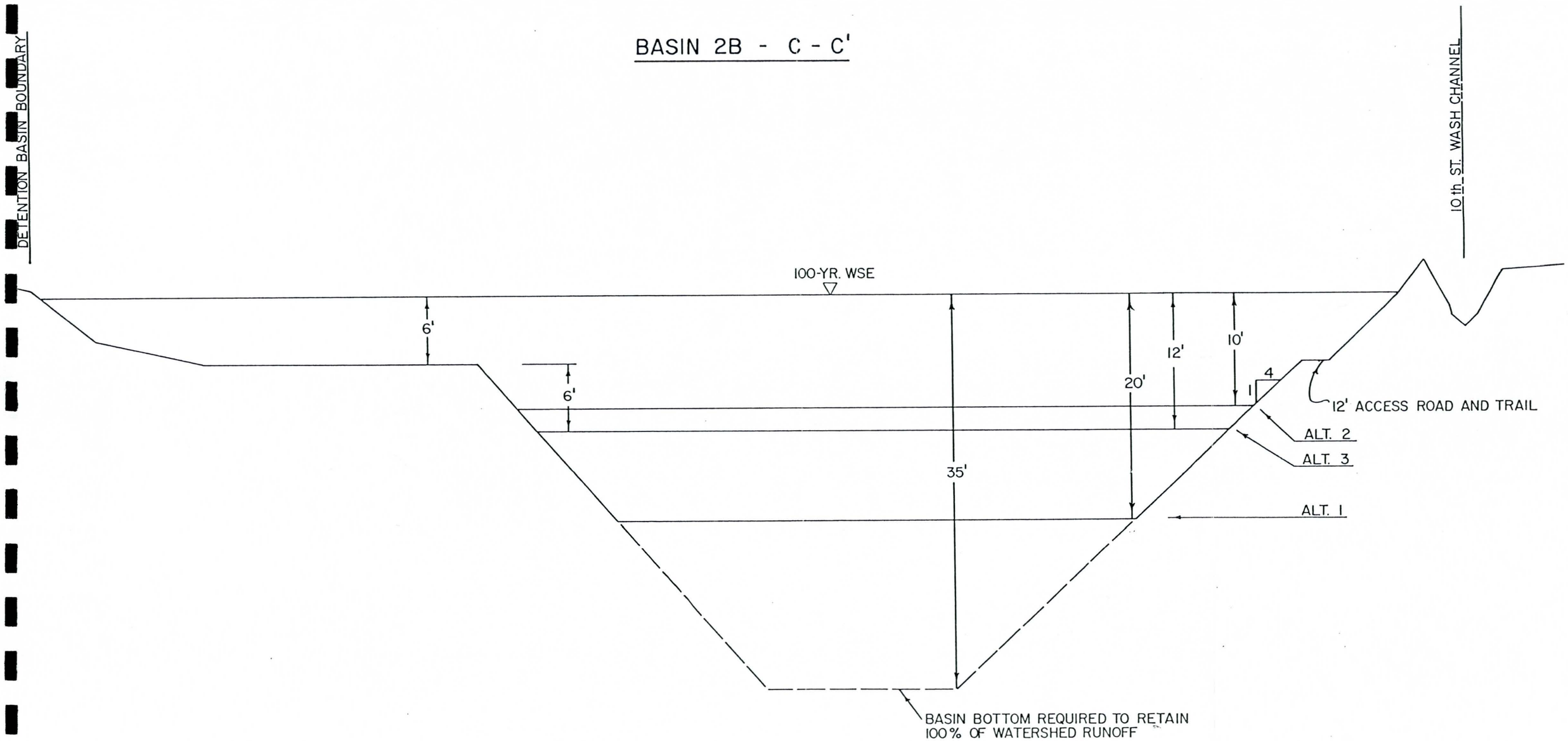


FIGURE 5 -

BASIN CROSS-SECTIONS

PAGE 2/2

TABLE 2

SUMMARY OF DOWNSTREAM DISCHARGE RATES FOR EACH BASIN ALTERNATIVE

HEC-1 Model ID. Point	LOCATION	Discharge Rates		
		Alternative 1 (CFS)	Alternative 2 (CFS)	Alternative 3 (CFS)
COMB2	Alice Avenue	450	765	745
HC145A	El Caminito	710	1025	1003
HC145	ACDC Confluence	1175	1495	1474

184/TBL210TH

BASIN ALTERNATIVE 2

Alternative 2 proposes maximum utilization of the project area without relocation of the Tenth Street Wash channel and minimizes the basin depth while providing for a maximum bypass discharge of 500 cfs. A plan view drawing for Alternative 2 is provided on **Figure 6** of this report. Basin 2A has a depth of 16 feet and a total capacity of 17.9 acre-feet. This is based upon a basin bottom elevation of 1250.0. The basin bottoms will be sloped 0.5% for positive drainage of nuisance flows and residual storage to the outlet points.

Basin 2B has a depth of 16 feet relative to the north boundary and a depth of 10 feet relative to the south boundary. The total capacity of Basin 2B is 60.4 acre-feet. The combined capacity of Basins 2A and 2B is 78.3 acre-feet based upon a basin bottom elevation of 1250.0. This alternative proposes a benched area along the west side of the basin with an elevation of 1254.0. The purpose of this bench is to provide an area for park amenities within Basin 2B boundaries which is elevated enough to prevent frequent flood inundation. Typical cross sections running north/south and east/west through Basins 2A and 2B are provided on **Figure 5** of this report. Alternative 2 would also incorporate the benched area about mid-way up the basin side slope for maintenance and a recreational trail.

Table 2 lists the downstream peak discharge rates for Alternative 2 at Alice Avenue, El Caminito Street, and the ACDC confluence. The bypass discharge for Alternative 2 is 500 cfs. This combines with 265 cfs not collected from the Palma Park tributary, bringing the total flow at Alice Avenue to 765 cfs.

BASIN ALTERNATIVE 3

Alternative 3 proposes excluding the triangular area between Tenth Street and the west bank of the Tenth Street Wash channel from the detention storage area. The purpose of doing this is to leave an area of high ground available for park amenities such as a parking lot or restrooms. A plan view drawing for Alternative 3 is shown on **Figure 7**. This, along with a basin bottom elevation of 1248.0, are the only differences between Alternative 2 and Alternative 3. Alternative 3 also proposes the benched area along the west side of Basin 2B to allow an area to place some park amenities which would be subject to flood inundation but on a less frequent basis. The basin bottoms will be sloped 0.5% for positive drainage of nuisance flows and residual storage to the outlet points.

The capacity of Basin 2A is 14.8 acre-feet. The capacity of Basin 2B is 62.6 acre-feet. The combined capacity of Basins 2A and 2B is 77.4 acre-feet.

Table 2 lists the downstream peak flow rates for Alternative 3 at Alice Avenue, El Caminito Street, and the ACDC confluence. The bypass discharge for Alternative 3 is 500 cfs. This combines with 265 cfs not collected from the Palma Park tributary, bringing the total flow at Alice Avenue to 745 cfs.

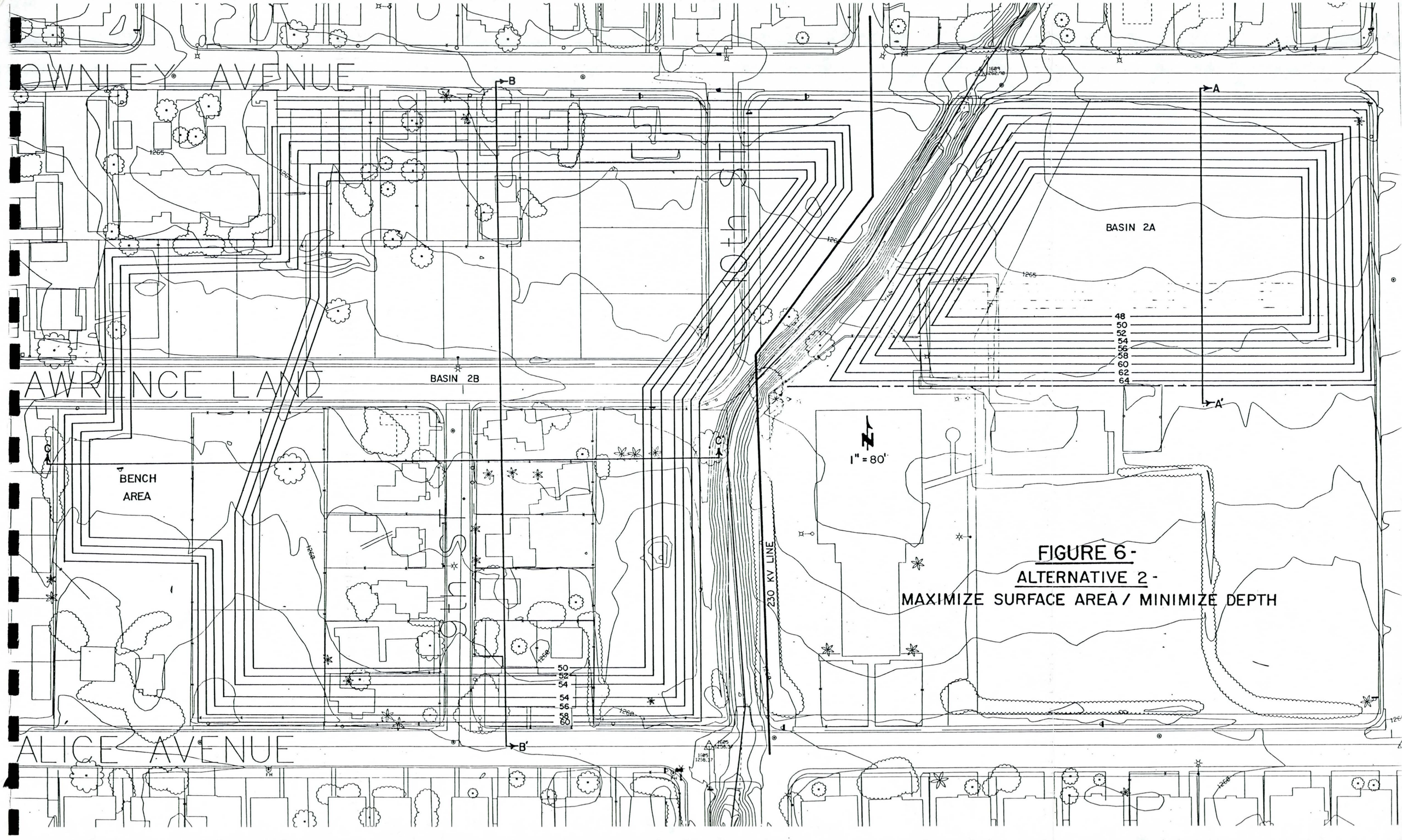


FIGURE 6 -
ALTERNATIVE 2 -
MAXIMIZE SURFACE AREA / MINIMIZE DEPTH

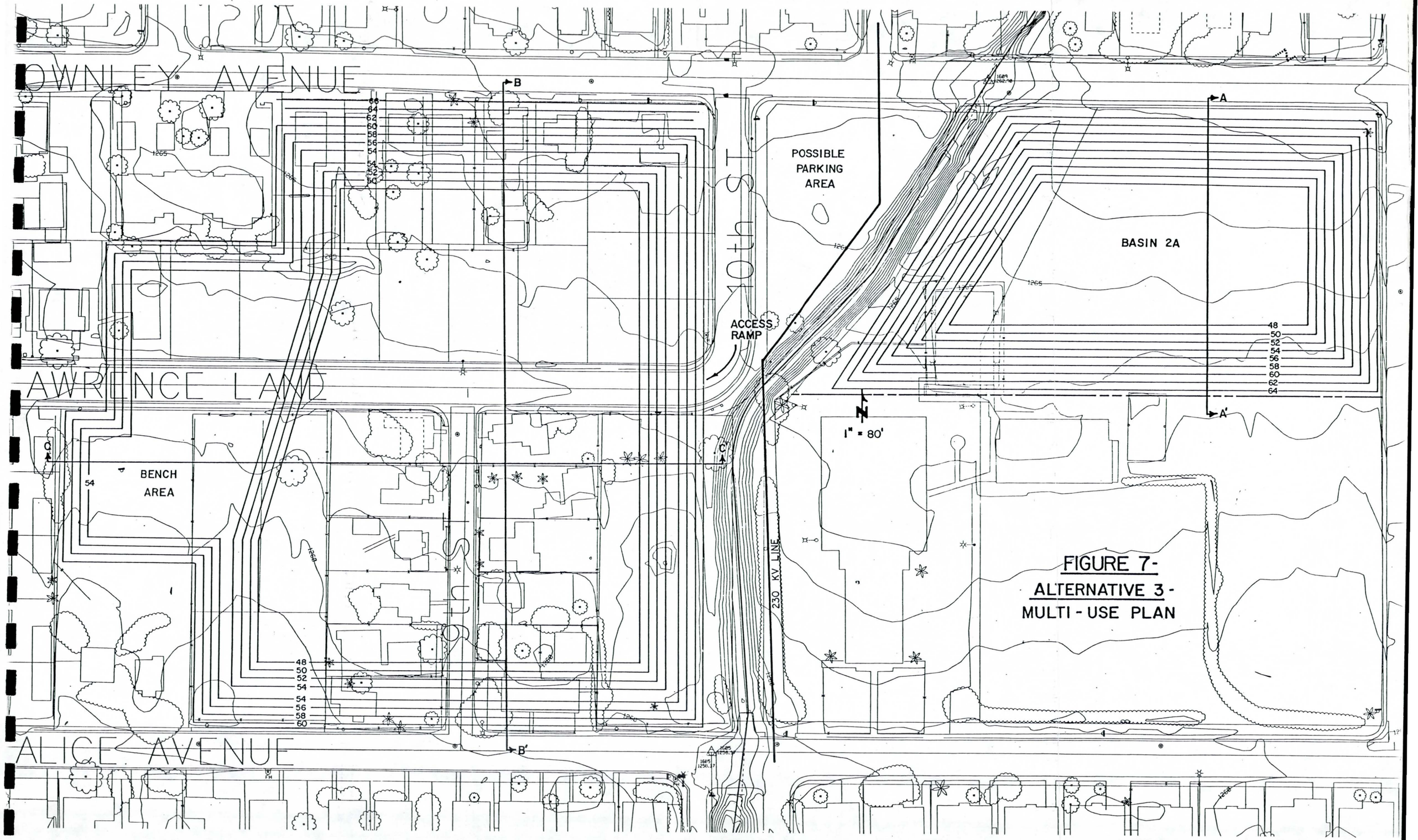


FIGURE 7-
ALTERNATIVE 3 -
MULTI - USE PLAN

TABLE 2

SUMMARY OF DOWNSTREAM DISCHARGE RATES FOR EACH BASIN ALTERNATIVE

HEC-1 Model ID. Point	LOCATION	Discharge Rates		
		Alternative 1 (CFS)	Alternative 2 (CFS)	Alternative 3 (CFS)
COMB2	Alice Avenue	450	765	745
HC145A	El Caminito	710	1025	1003
HC145	ACDC Confluence	1175	1495	1474

184/TBL210TH

BASIN ALTERNATIVE 2

Alternative 2 proposes maximum utilization of the project area without relocation of the Tenth Street Wash channel and minimizes the basin depth while providing for a maximum bypass discharge of 500 cfs. A plan view drawing for Alternative 2 is provided on **Figure 6** of this report. Basin 2A has a depth of 16 feet and a total capacity of 17.9 acre-feet. This is based upon a basin bottom elevation of 1250.0. The basin bottoms will be sloped 0.5% for positive drainage of nuisance flows and residual storage to the outlet points.

Basin 2B has a depth of 16 feet relative to the north boundary and a depth of 10 feet relative to the south boundary. The total capacity of Basin 2B is 60.4 acre-feet. The combined capacity of Basins 2A and 2B is 78.3 acre-feet based upon a basin bottom elevation of 1250.0. This alternative proposes a benched area along the west side of the basin with an elevation of 1254.0. The purpose of this bench is to provide an area for park amenities within Basin 2B boundaries which is elevated enough to prevent frequent flood inundation. Typical cross sections running north/south and east/west through Basins 2A and 2B are provided on **Figure 5** of this report. Alternative 2 would also incorporate the benched area about mid-way up the basin side slope for maintenance and a recreational trail.

Table 2 lists the downstream peak discharge rates for Alternative 2 at Alice Avenue, El Caminito Street, and the ACDC confluence. The bypass discharge for Alternative 2 is 500 cfs. This combines with 265 cfs not collected from the Palma Park tributary, bringing the total flow at Alice Avenue to 765 cfs.

BASIN ALTERNATIVE 3

Alternative 3 proposes excluding the triangular area between Tenth Street and the west bank of the Tenth Street Wash channel from the detention storage area. The purpose of doing this is to leave an area of high ground available for park amenities such as a parking lot or restrooms. A plan view drawing for Alternative 3 is shown on **Figure 7**. This, along with a basin bottom elevation of 1248.0, are the only differences between Alternative 2 and Alternative 3. Alternative 3 also proposes the benched area along the west side of Basin 2B to allow an area to place some park amenities which would be subject to flood inundation but on a less frequent basis. The basin bottoms will be sloped 0.5% for positive drainage of nuisance flows and residual storage to the outlet points.

The capacity of Basin 2A is 14.8 acre-feet. The capacity of Basin 2B is 62.6 acre-feet. The combined capacity of Basins 2A and 2B is 77.4 acre-feet.

Table 2 lists the downstream peak flow rates for Alternative 3 at Alice Avenue, El Caminito Street, and the ACDC confluence. The bypass discharge for Alternative 3 is 500 cfs. This combines with 265 cfs not collected from the Palma Park tributary, bringing the total flow at Alice Avenue to 745 cfs.

SELECTED ALTERNATIVE

On September 19, 1994, a meeting was held with the Tenth Street Wash Citizen's Advisory Committee (CAC). The purpose of this meeting was to present the basin alternatives and to receive the group's input before selecting a preferred plan. The CAC agreed to select Alternative 3 with the following modifications:

1. move the 12-foot wide path and access road from mid-way up the basin side slopes to the top of side slope. This establishes a setback distance from the adjoining road right-of-way which is greater than the 4 feet used in the preliminary analysis;
2. contour the basin side slopes in an irregular shape to create more landscape architectural interest rather than the straight side slopes shown on the concept drawings; and
3. move the bench area along the west side of the basin farther west to facilitate a soccer field and a little league baseball field in the basin bottom.

A concept plan drawing for the selected alternative which incorporates the CAC's requests is shown on **Figure 8** of this report. Concept grading and landscape plans incorporating the CAC's requests were presented to the CAC on October 26, 1994. The CAC agreed to the "soft" contours and landscape concept. The CAC requested existing plants along the proposed top of basin be incorporated into the landscape plan. The CAC discussion focused on the intended use of the west bench area near the existing condominiums. A third CAC meeting was held on January 10, 1995 to finalize CAC input. The CAC concurred with the updated grading and landscape plan. After much discussion, the CAC and the City of Phoenix Parks Department agreed to minimize the bench area along the west side of Basin 2B. The west bench area will only accommodate a pedestrian resting area and the access drive to the basin bottom. An equivalent land area will be incorporated into the northeast corner of Basin 2B that can be used as a sport court area. A sport court area in the northeast corner would remove loud park use from the west basin side and incorporate the court use with the proposed pavilion area.

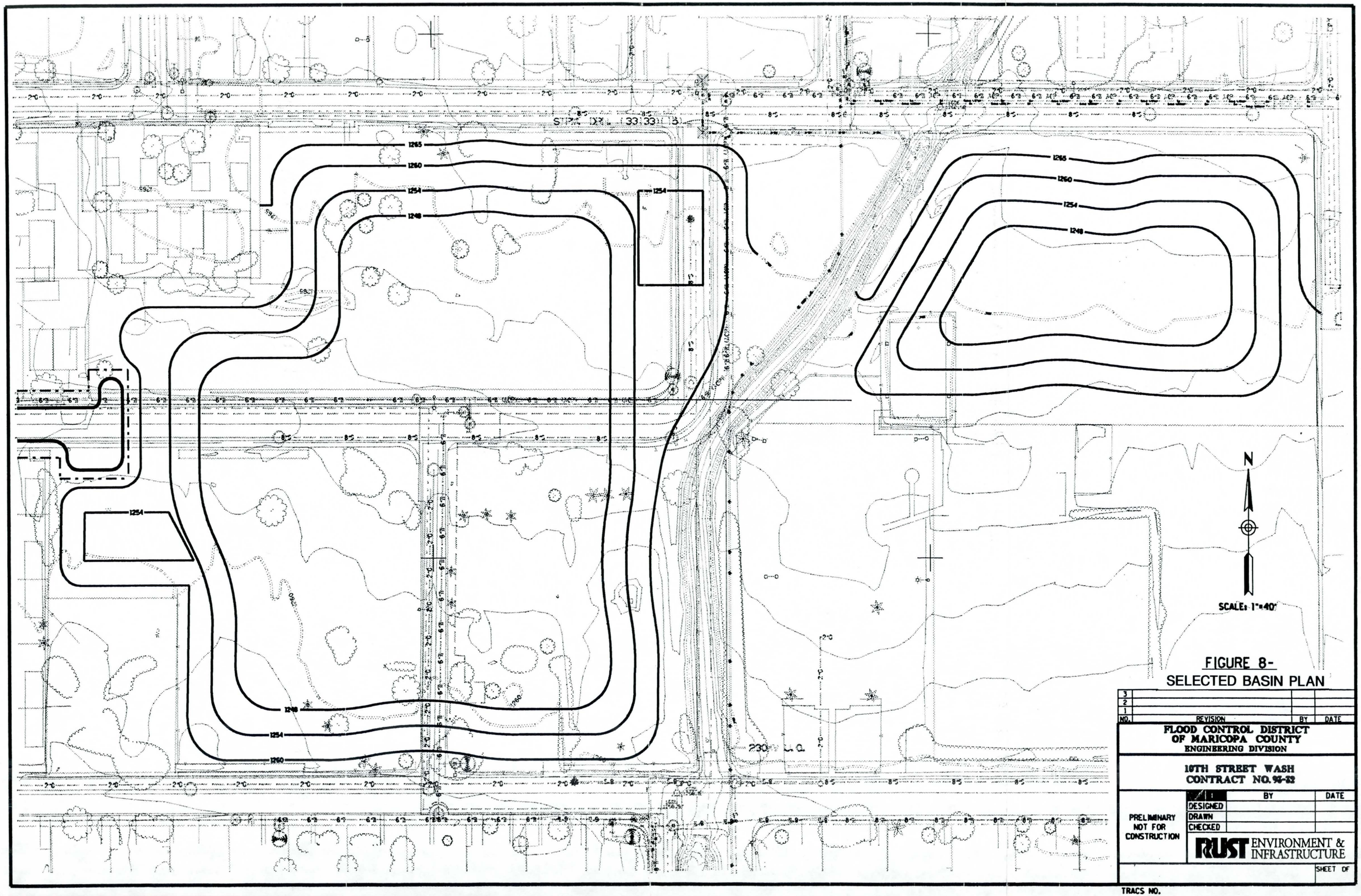


FIGURE 8-
SELECTED BASIN PLAN

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

10TH STREET WASH
CONTRACT NO. 96-32

	BY	DATE
DESIGNED		
DRAWN		
CHECKED		

PRELIMINARY NOT FOR CONSTRUCTION

RUST ENVIRONMENT & INFRASTRUCTURE

SHEET OF

TRACS NO.

CHAPTER 7

EVALUATION OF ALTERNATIVE INLET/OUTLET STRUCTURES

Three different alternatives for the detention basin inlet and outlet structures were evaluated as a part of this study. A description of these alternatives is provided in the following subsections of this report. Hydraulic computation sheets for each approach are included in **Appendix E**.

INLET/OUTLET ALTERNATIVE A

Alternative A proposes a stilling basin with two 66-inch diameter pipes (or 2- 6' x 4' box culverts) which bypass 500 cfs to the downstream channel (see **Figure 9**). The stilling basin is located at a point approximately 80 feet south of Townley Avenue immediately adjoining Basin 2A. The inlet to Detention Basin 2A is a 50-foot long spillway on the east side of the stilling basin. This spillway passes flow into the Basin 2A bottom. Typical cross sections of the stilling basin and spillway are provided on **Figures 10** and **11** of this report. The location of these cross sections is shown on **Figure 9**.

The inlet to Basin 2B is two 72-inch diameter pipes connecting Basin 2A to Basin 2B. The flow line elevation of these pipes is 1248.0, which is equivalent to the basin bottom elevation in both storage areas. A stilling basin with a crest elevation of 1256.0 will be constructed in Basin 2B at the west end of the 72-inch pipes. The stilling basin will prevent floodwater from entering Basin 2B until the stage in Basin 2A reaches elevation 1256.0. The purpose of this stilling basin is to reduce the frequency of flows into Basin 2B. A typical cross section of the 72-inch pipes and the Basin 2B stilling basin is provided on **Figure 12**. The Basin 2A outlet will be a 24-inch pipe which connects to the two 66-inch pipes (or 2- 6' x 4' box culverts) serving as the bypass system. This 24-inch pipe has adequate capacity to drain Basin 2A within a 36-hour period. A flapgate with a manway access will be installed to prevent backflow through the 24-inch pipe to Basin 2A.

The Basin 2B outlet is a 30-inch pipe located in the southeast corner of Basin 2B (see **Figure 9**). This 30-inch pipe, along with the two 66-inch pipes, (or 2- 6' x 4' box culverts) low-flow bypass pipes, outlet into the existing Tenth Street Wash channel 360 feet downstream of Alice Avenue.

INLET/OUTLET ALTERNATIVE B

Alternative B proposes a stilling basin with two 66-inch pipes (or 2- 6' x 4' box culverts) which serve as the low-flow bypass, and a side spillway which discharges into Basin 2B. The elevation of the spillway discharging into Basin 2B is set at elevation 1256.0. Two 66-inch pipes set at elevation 1248.0 will pass flow into Basin 2A. A control weir with top elevation of 1255.0 will be set in front of the 66-inch pipes to Basin 2A. The control weir will prevent water from entering Basin 2A until the water elevation in the stilling basin reaches 1255.0. This alternative

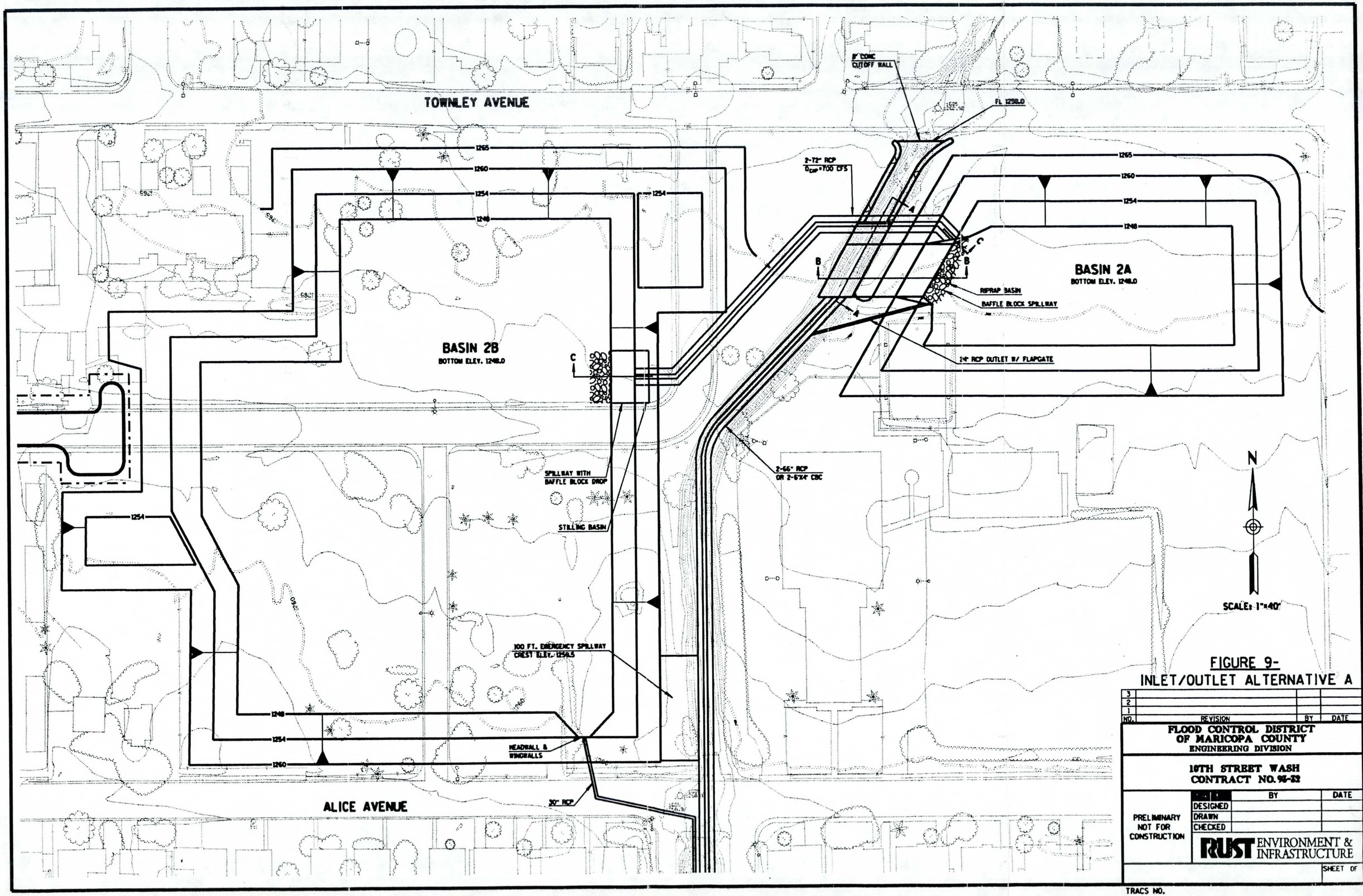


FIGURE 9-
INLET/OUTLET ALTERNATIVE A

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

10TH STREET WASH
CONTRACT NO. 96-22

	BY	DATE
DESIGNED		
DRAWN		
CHECKED		

PRELIMINARY
NOT FOR
CONSTRUCTION

RUST ENVIRONMENT & INFRASTRUCTURE

SHEET OF

TRACS NO.

FIGURE 12- INLET CROSS-SECTION C-C'
ALTERNATIVE A

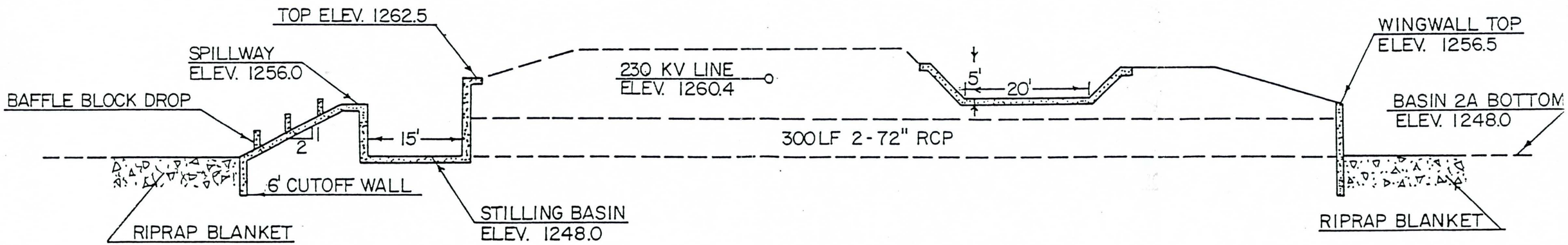


FIGURE 10 - INLET CROSS-SECTION A-A'
ALTERNATIVE A

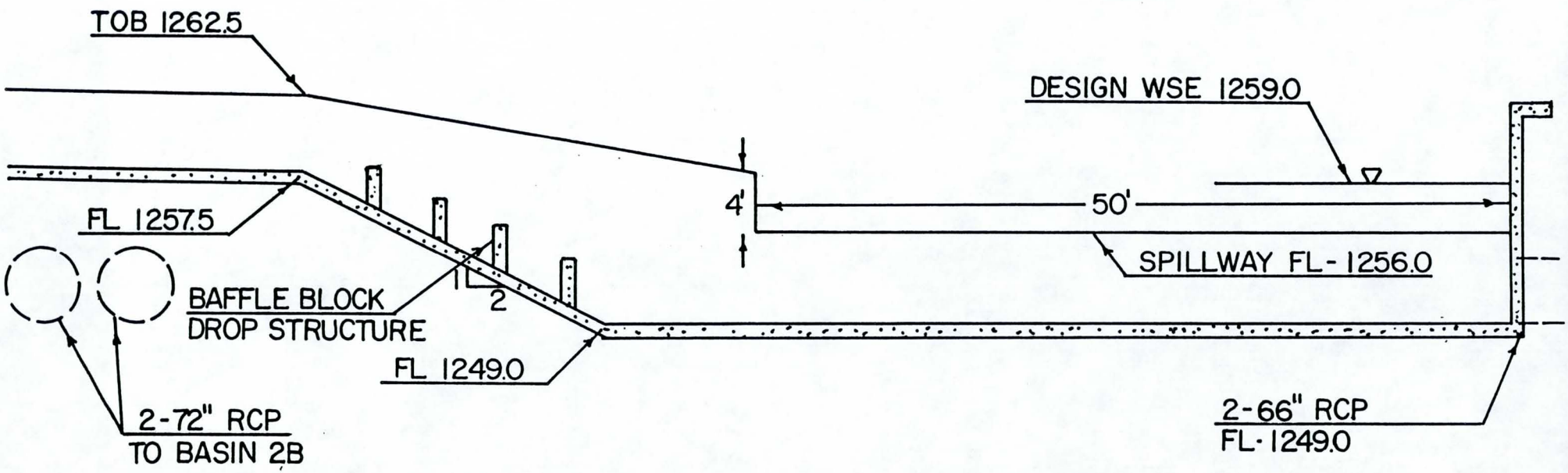
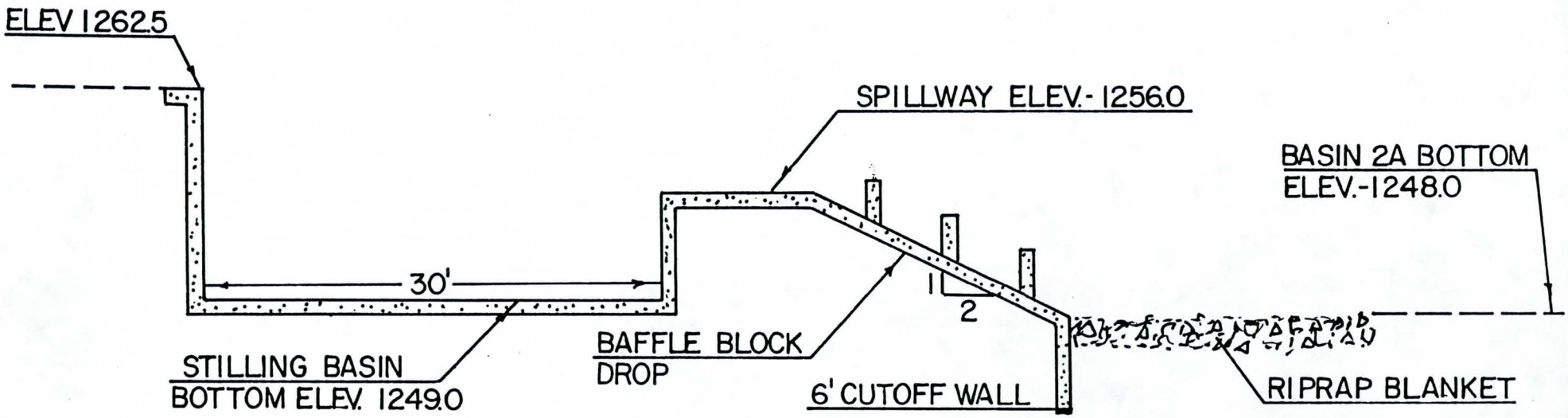


FIGURE 11 - INLET CROSS-SECTION B-B'
ALTERNATIVE A



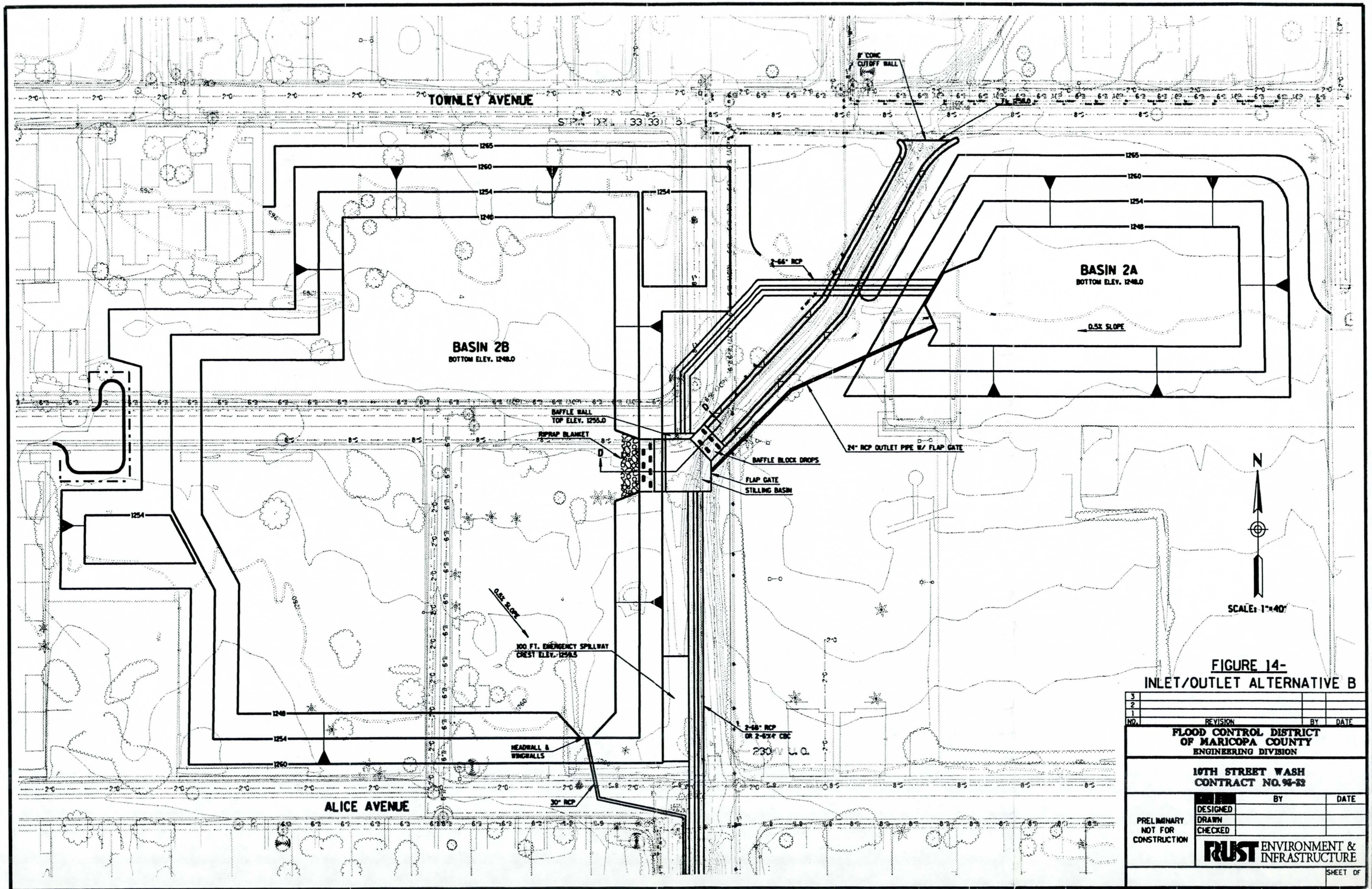


FIGURE 14-
INLET/OUTLET ALTERNATIVE B

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

10TH STREET WASH
CONTRACT NO. 96-52

PRELIMINARY
NOT FOR
CONSTRUCTION

	BY	DATE
DESIGNED		
DRAWN		
CHECKED		

RUST ENVIRONMENT & INFRASTRUCTURE

SHEET OF

TRACS NO.

will fill Basin 2A to elevation 1256.0 prior to water discharge over the 1256.0 side spillway into Basin 2B.

The outlet structures from the stilling basin and Detention Basin 2B are the same as for Alternative A. These include the two 66-inch pipes (or 2- 6' x 4' box culverts) which convey the bypass flows runoff under Alice Avenue and daylight to the existing Tenth Street Channel approximately 360 feet downstream of Alice Avenue. The Basin 2B outlet is a 30-inch pipe which is set at the basin bottom elevation of 1248.0. The Basin 2A outlet is a 24-inch pipe to the stilling basin. A flap gate will be placed on the 24-inch pipe at the stilling basin to prevent low flows entering Basin 2A through the 24-inch pipe.

A profile of the two 66-inch pipes and the 30-inch pipe is provided on **Figure 13**. A plan view drawing of Alternative B is provided on **Figure 14**. **Figure 15** provides a typical cross section through the inlet spillways and the stilling basin.

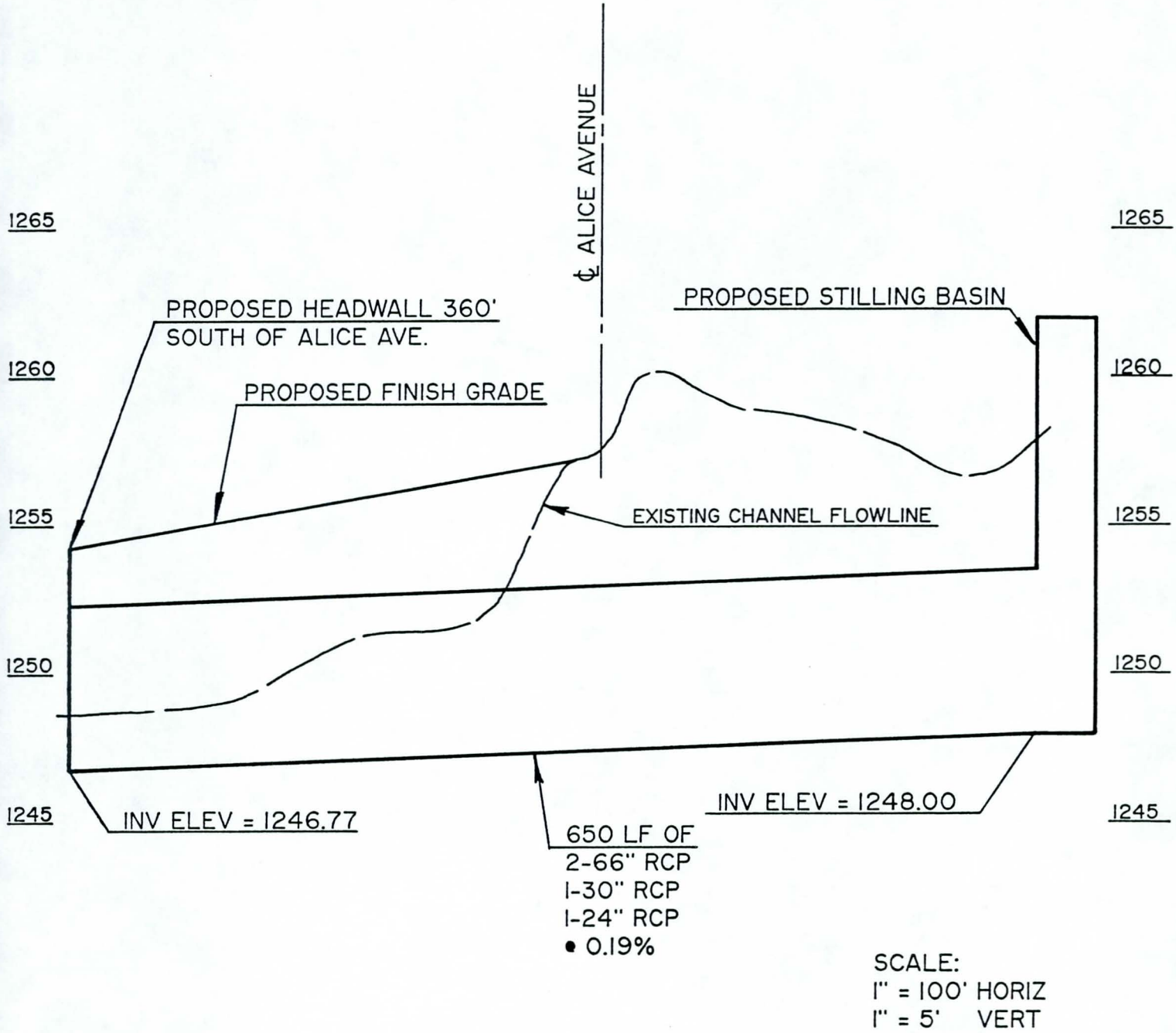
INLET/OUTLET ALTERNATIVE C, C-1, and C-1A

Alternative C proposes construction of an open channel between Townley Avenue and Alice Avenue with a 200-foot side weir to Basin 2B located at the southeast corner of the basin. Alternative C-1 also proposes construction of an open channel between Townley Avenue and Alice Avenue, except the 142-foot side weir is located immediately south of Townley Avenue and bypass flows occur to Basin 2A first. Alternative C-1A is the same concept as Alternative C-1 except the open channel is replaced with buried piping south of the side flow weir. A plan view drawing of Alternative C is provided on **Figure 16**. A plan view drawing of Alternative C-1 is provided on **Figure 16A.** A plan view drawing of Alternative C-1A is provided on **Figure 16B**.

The weir elevation for 500 cfs channel flow is approximately 2.3 feet above channel flow line. The proposed channel cross section past the side flow weir is 40 feet wide with a 30 foot bottom width, 1:1 side slopes, 5-foot depth, and 0.2 percent channel slope. The channel must be concrete lined past the side weir to preserve the staged discharge relationship for the side spillway structure.

A subcritical flow condition along the side weir reach is necessary for predictable side flow weir operation. The 100-year flow across Townley Avenue is flowing super critical. As a result, it is necessary to slow velocity to subcritical. A hydraulic jump combined with a channel slope of 0.2 percent or less will create subcritical flow. A concrete ramp with a 4:1 slope will be constructed immediately south of Townley Avenue. The next 40 feet of channel bottom will consist of grouted riprap to create the hydraulic jump for subcritical flow.

Alternative C has no direct inlet from the Tenth Street Wash channel to Basin 2A. Basin 2A collects runoff only from the Palma Park tributary. Two 66-inch pipes are proposed between Basin 2A and 2B at the basin flow line elevation to balance storage and water surface elevations.



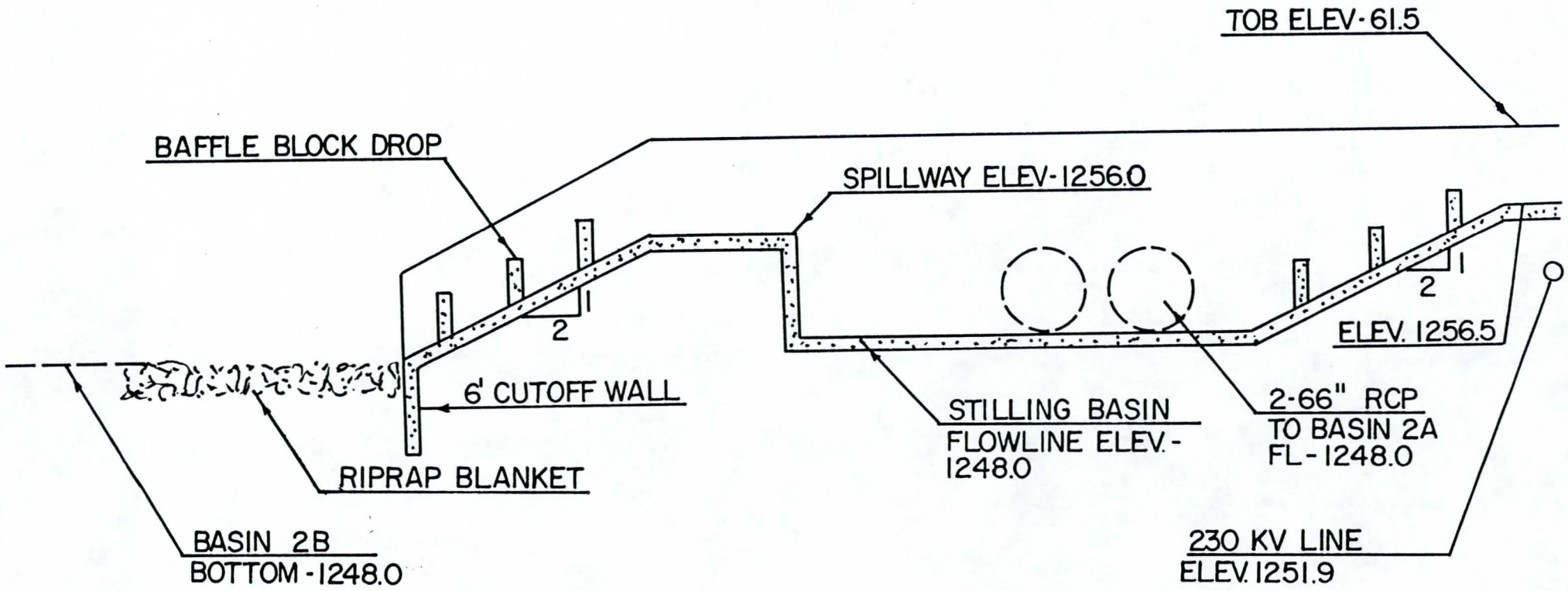
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

10TH STREET WASH
CONTRACT NO. 93-32

RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 13
BASIN OUTLET PIPE PROFILE

FIGURE 15 - INLET CROSS-SECTION D-D'
ALTERNATIVE B



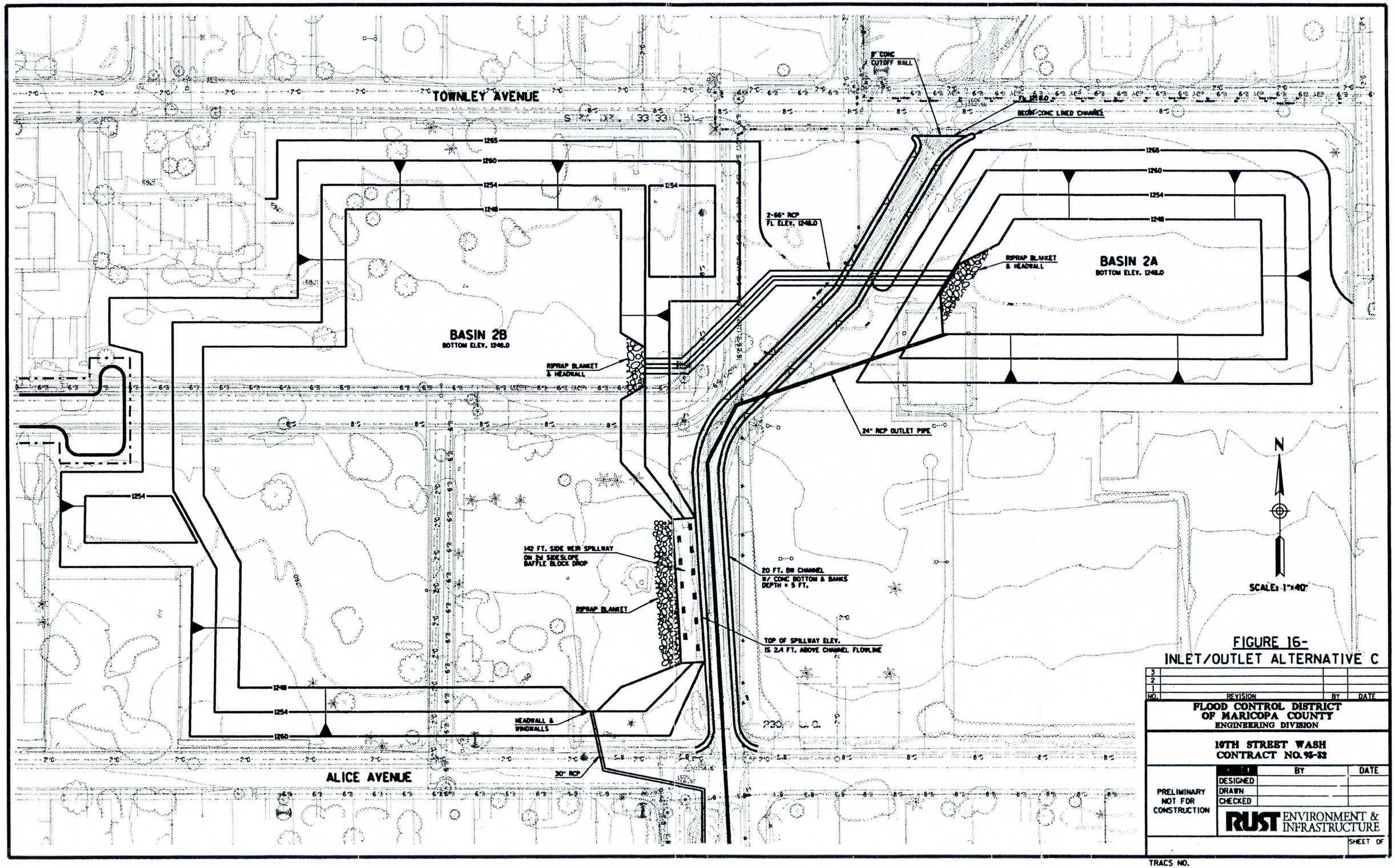


FIGURE 16-
INLET/OUTLET ALTERNATIVE C

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

16TH STREET WASH
CONTRACT NO. 95-32

		BY	DATE
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED		
	DRAWN		
	CHECKED		

RUST ENVIRONMENT & INFRASTRUCTURE

SHEET OF

TRACS NO.

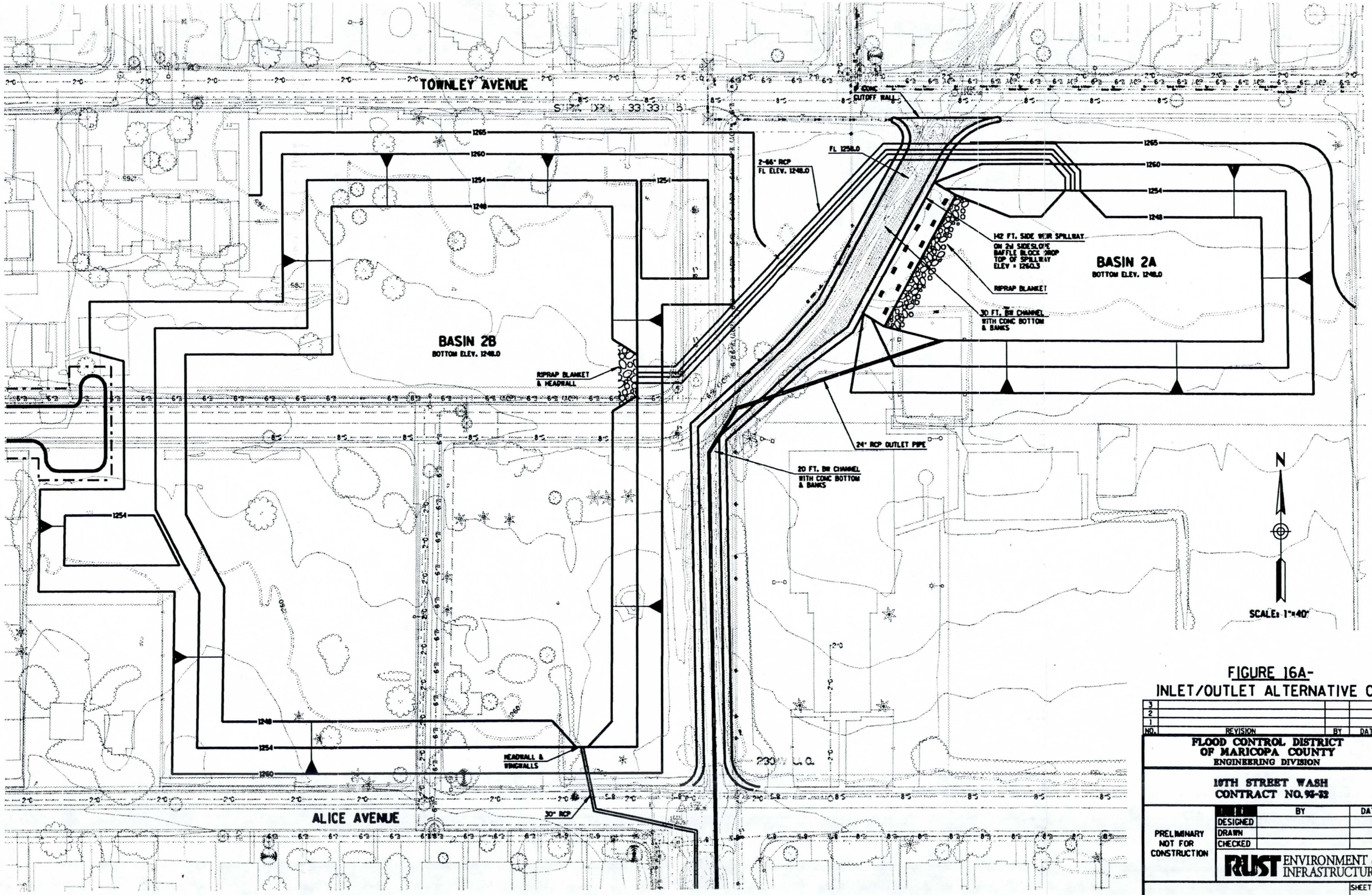


FIGURE 16A-
INLET/OUTLET ALTERNATIVE C-1

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

10TH STREET WASH
CONTRACT NO. 92-32

		BY	DATE
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED		
	DRAWN		
	CHECKED		

RUST ENVIRONMENT & INFRASTRUCTURE

SHEET OF

TRACS NO.

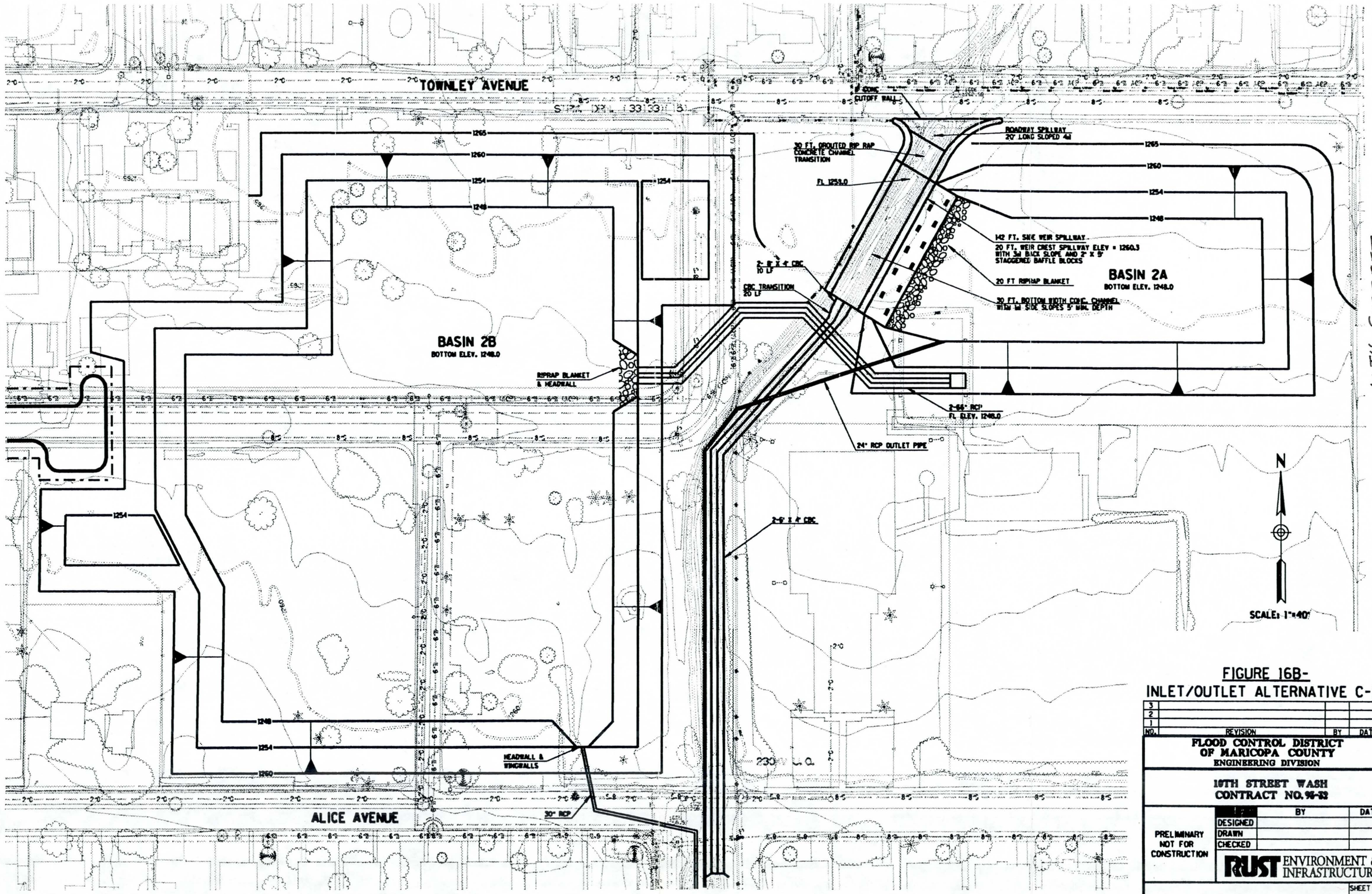


FIGURE 16B-
INLET/OUTLET ALTERNATIVE C-1A

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

10TH STREET WASH
CONTRACT NO. 96-32

	BY	DATE
DESIGNED		
DRAWN		
CHECKED		

PRELIMINARY NOT FOR CONSTRUCTION

RUST ENVIRONMENT & INFRASTRUCTURE

SHEET OF

TRACS NO.

The proposed outlet for Basin 2A is a 24-inch diameter pipe in the southwest corner of the basin. The Basin 2B outlet will be a 30-inch diameter pipe in the southeast basin corner. Both outlet pipe inverts will be set at elevation 1248.0 and daylight in the existing Tenth Street Wash Channel approximately 350 feet downstream of Alice Avenue. Alternatives A, C-1, and C-1A have no direct inlets from the Tenth Street Wash Channel to Basin 2B. Two 66-inch equalizer pipes will be placed between Basin 2A and 2B to balance storage and water surface elevations. The equalizer pipe inlet is a 15 feet by 15 feet vertical structure from the equalizer pipe invert to the basin sideslope. The top of the inlet structure will match the 4:1 basin side slope from elevation 1256.0 to elevation 1260.0. The 1256.0 inlet structure elevation will provide first flow detention in Basin 2A prior to initiation of flows into Basin 2B. The pipe inverts in Basin 2A would be approximately one foot higher than the Basin 2B inverts for positive pipe drainage.

CHAPTER 8

SITE REQUIREMENTS

EMERGENCY OUTLET SPILLWAY

A 100-foot wide spillway is located at the southeast corner of Basin 2B for Alternatives A, B, and C-1A. The emergency spillway elevation will be set at 1259.5, which allows approximately .5 foot freeboard above the high water surface elevation. Emergency spillways are not required for Alternatives C and C-1 because they are open channel options. The Basin 2B emergency spillway will be lined for erosion control. A stage/discharge curve for the emergency outlet spillways (based upon the weir flow equation) is provided in **Appendix E** of this report. Finish grades will provide sheet flow between the diversion structure and Alice Avenue to direct surface drainage and any overflows which may occur.

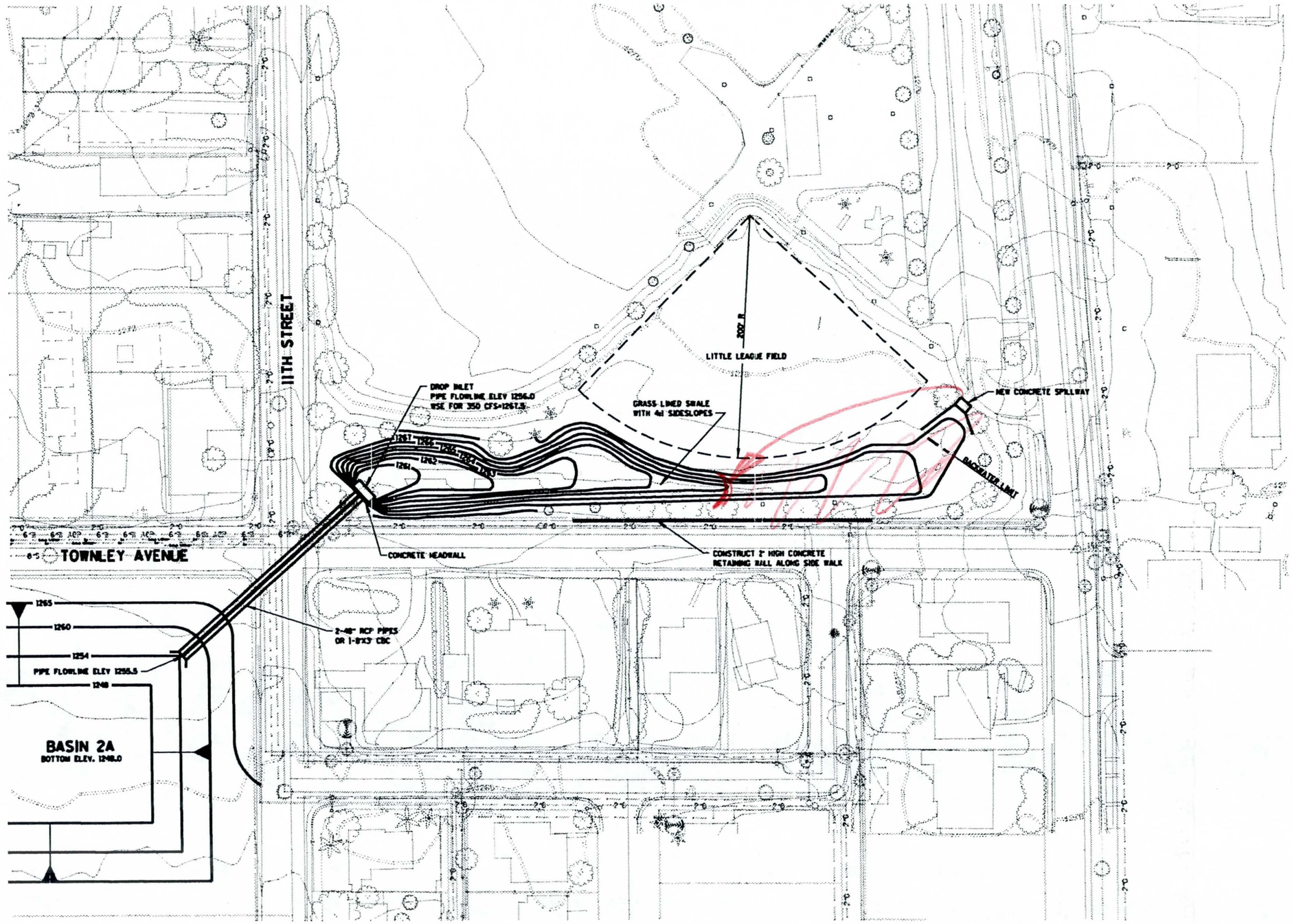
PALMA PARK TRIBUTARY

The primary tributary entering Tenth Street Wash within the vicinity of the project site drains through Palma Park. The 100-year peak discharge generated by this tributary area is 615 cfs. This flow enters Palma Park through its northeast corner, draining south along the east side of the park then west along the south side of the park toward the project site. The design concept provides for a maximum of 350 cfs of this flow (10-year event flow). A new swale along the south edge of Palma Park will direct flow to the culvert inlet at the southwest corner of the park. The 350 cfs maximum capacity will require either two 48-inch pipes or 1- 8' x 3' box culvert. The culvert inlet invert elevation is 1256.0 and the outlet invert elevation is 1255.5. The inlet water surface elevation at 615 cfs is 1267.5 which overtops Townley Avenue.

Figure 17 shows a concept plan for the collector swale and pipe culvert system for the Palma Park tributary flows. The concept shown on **Figure 17** proposes grading a meandering swale from the southeast corner of Palma Park to the southwest corner. The swale depth will vary from 1 foot at the southeast corner of the park to 7 feet at the southwest corner of the park. The swale will be grass-lined to provide consistency with existing landscape and allows for a future Little League field with a 200 foot radius. Townley Avenue overflow will be minimized by installing approximately 250 feet of nonmountable curb to elevation 1268 along the sidewalk.

TENTH STREET WASH CHANNEL MODIFICATIONS

The channel improvements are divided into three reaches. The first reach begins at Townley Avenue and ends at the floodwater diversion structure. The second reach of the improved channel begins at the downstream side of the diversion structure and ends on the south side of



N

SCALE: 1"=40'

FIGURE 17-
PALMA PARK TRIBUTARY INLET

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

10TH STREET WASH
CONTRACT NO. 92-32

		BY	DATE
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED		
	DRAWN		
	CHECKED		

RUST ENVIRONMENT & INFRASTRUCTURE

SHEET OF

TRACS NO.

Alice Avenue. The last reach of channel improvements start at the south side of Alice Avenue and ends approximately 350 feet downstream of Alice Avenue.

Townley Avenue to Diversion Structure

Each inlet/outlet alternative requires a concrete lined channel from Townley Avenue to the basin diversion structure. The concrete lined channel is necessary to transmit the 100-year flow and to ensure consistent, predictable and controllable hydraulic characteristics. It is critical to this project to maintain subcritical velocity at the diversion structure so that flood waters are diverted into the basins. The proposed concrete channel has a 30 feet wide bottom and 5 feet wide side slopes (1:1 slope for 5 feet deep channel). The 40 feet wide channel provides the capacity necessary to transmit the 100-year flow condition. Fence is required along the channel top to prevent pedestrian access.

Diversion Structure to Alice Avenue

Several channel improvement options were evaluated. The evaluation process included hydraulic control of bypass floodwater, aesthetic features, available land area, pedestrian access, construction cost, operation and maintenance cost and eliminating the Alice Avenue dip section. The channel improvement options are:

- Earthen channel
- Lined channel bottom and side slopes
- Buried box culverts or pipes

Earthen or grass lined channels are not hydraulically predictable due to uncertain Manning's roughness "n" coefficient. Earthen channel side slope must be no steeper than 4:1 for stability and maintenance reasons. The total earthen channel section required to convey 500 cfs is 80 feet wide which includes a 40 feet wide channel bottom and 20 feet wide side slopes. This alternative adversely affects Basin 2B since the east edge of Basin 2B will move approximately 10 feet west to accommodate the earthen channel width. Regular maintenance of the channel will be required for mowing and vegetation removal. However, there is no maintenance access area available along the top of channel.

Lining the channel with interlocking "grass crete" blocks decreases the total channel width to 65 feet. This channel alternative consists of a 25 feet wide channel bottom and 20 feet wide side slopes. The earthen requires 4:1 side slopes for stability, flow conveyance and to promote vegetative growth. This channel alternative will fit within the 70 feet available between the church property line and the top of Basin 2B. Since vegetative growth will occur for this scenario, regular maintenance will be required for mowing and channel cleaning. Although vegetative growth will occur, high intensity rain events will strip the channel and vegetation re-establishment will be required.

The preferred engineered channel section is a concrete lined channel with a 20 feet wide bottom and 1:1 side slopes. A concrete lined channel provides reliable hydraulic control. The total channel width is 30 feet. However, fencing is required as a safety precaution along both sides of the channel. The concrete lined channel is not aesthetically attractive and is conducive to graffiti and vandalism. Graffiti cleanup is a required maintenance task for this option.

Buried box culverts or pipes were also evaluated as an option for the bypass flows. Buried piping will provide controlled, predictable hydraulics. Buried piping is a compromise between aesthetics, hydraulic requirements and elimination of the Alice Avenue dip crossing. The buried piping option eliminates fence requirements, allows pedestrian and public use of the piping corridor and requires minimal maintenance within the existing wash north of Alice Avenue, ~~and requires minimal maintenance~~.

Eliminating the Alice Avenue dip section is not required for inlet/outlet control Alternatives C, C-1 and C-1A. Open channel and buried box culvert or pipe options can be terminated immediately upstream Alice Avenue by matching the proposed channel or piping inverts to the existing wash elevation. Several box culvert and round pipe configurations were evaluated which daylight either upstream or downstream of Alice Avenue.

The preferred option is buried piping which daylights immediately south of Alice Avenue. This option, though more expensive, eliminates the Alice Avenue dip crossing and the visual impacts and safety concerns of large pipes discharging immediately upstream Alice Avenue.

In Alternatives C, C-1, and C-1A, the bypass pipes will terminate approximately 60 feet south of the centerline of Alice Avenue. The discharge pipe invert elevation will match the existing channel grade. Channel excavating and reshaping is required for headwall construction.

South of Alice Avenue

Inlet/outlet Alternatives A and B require installation of buried piping for bypass flows approximately 360 feet south of Alice Avenue. Installation of the bypass pipes for Alternatives A and B would require extensive excavation in the wash.

The 24-inch and 30-inch basin drain pipes must cross Alice Avenue and daylight approximately 350 feet south of Alice Avenue for all alternatives. The drain pipes cannot daylight until the wash bottom elevation is approximately 1246 due to the 1248 basin invert elevation. Construction activities in the channel excavation are required to install the drain pipes. The pipe trench will be backfilled to match existing wash bottom elevation and all disturbed areas will be hydroseeded.

FUTURE CHANNEL IMPROVEMENTS

The channel improvements between Townley Avenue and Alice Avenue will be unaffected by future 10th Street Wash improvements. Wash improvements immediately upstream of Townley Avenue require coordination with the future Townley Avenue box culverts and the lined channel constructed by this project. It is critical the channel flow characteristics be maintained in the subcritical region to ensure proper operation of the side flow weir. The bypass pipe outlet and basin drain pipe outlet headwalls constructed by this project can be modified, removed, or incorporated into any wash improvements south of Alice Avenue.

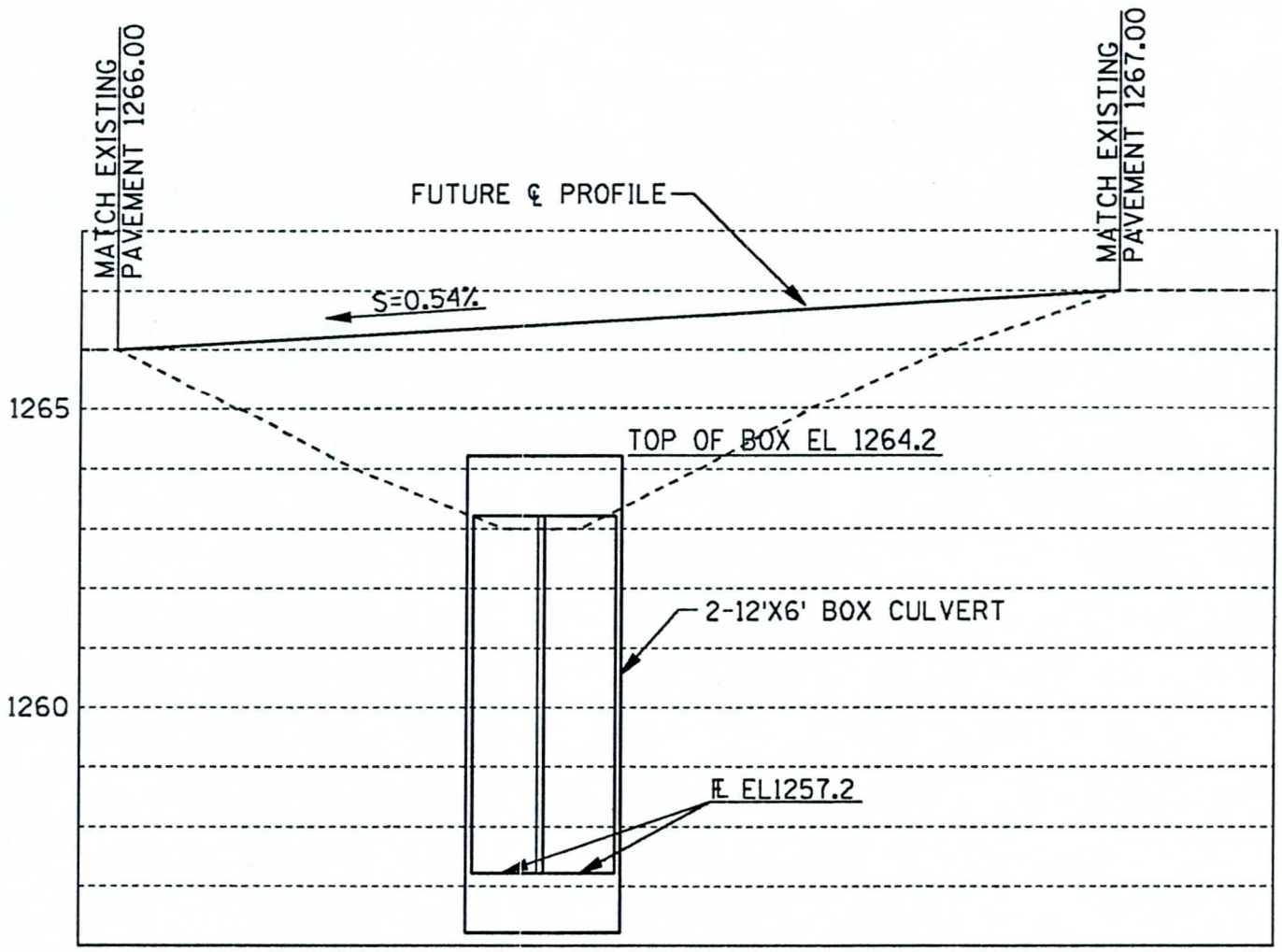
TOWNLEY AVENUE

Proposed future Tenth Street Wash improvements will require box culverts beneath Townley Avenue centered on the existing wash. The Townley Avenue culverts will be constructed as part of future channel improvements. Two 12 foot by 6 foot box culverts will pass the 100-year flow of 1220 cfs at a velocity of 14.05 fps which is supercritical velocity. Since the side flow weir requires subcritical flow, a hydraulic jump created by the riprap placed downstream of Townley Avenue will be installed. The riprap must remain in place after installation of the 12 foot by 6 foot box culverts. The future box culverts will eliminate the dip section and provide all-weather access across on Townley Avenue. A proposed Townley Avenue cross section is shown on **Figure 18**. A drop inlet is required upstream of Townley Avenue to match existing channel flowline. Box culverts installation combined with upstream wash improvements will require property acquisition from the landowners north of Townley Avenue.

ALICE AVENUE

The runoff bypass system and the outlet structures offered by Alternatives A, B, and C-1A will eliminate floodwater across the Alice Avenue dip section. This will provide an all-weather access across the existing dip section. Alternatives A, B, and C-1A include pipe placement across Alice Avenue. The top of pipe elevation at Alice Avenue for the 66″ pipes is approximately 1253. Since Alice Avenue elevation is 1257, regrading the Alice Avenue dip crossing is not required for Alternatives A or B. The top of pipe elevation for Alternative C-1A is approximately 1257. Alice Avenue will require regrading to elevation 1258.5 to provide cover over the box culverts for Alternative C-1A.

Alternative C and C-1 provide an open channel bypass which will continue to discharge approximately 500 cfs across Alice Avenue. Therefore, the frequency of large flows across the Alice Avenue dip section will not be decreased by Alternative C or C-1.



RUST ENVIRONMENT & INFRASTRUCTURE

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

10TH ST WASH
CONTRACT NO 93-32
TOWNLEY CROSS SECTION

APRIL 1995
PROJECT NO. 89932

FIGURE 18

MAINTENANCE ACCESS

Vehicle and pedestrian access will be provided to each basin for maintenance and recreational purposes. The dual purpose, 12-foot wide access will be sloped to meet ADA requirements. Basin 2A access will be at the southwest basin corner. A vehicle access will be located along the south property line from Twelfth Street to the southwest corner of Basin 2A. Primary access to Basin 2B will be from Lawrence Lane. Lawrence Lane will become a dead end street at the west edge of Basin 2B. The City of Phoenix has agreed to a modified hammerhead design for the dead end. The dual purpose access to the Basin 2B bottom will be integrated with the west basin side slope. The access will allow a pedestrian resting area at the middle bench. Vehicle access will be provided along the west edge of Basin 2B between the top of slope and the property line. A second access to Basin 2B will be located in the southeast corner.

LANDSCAPE TREATMENT

A landscape theme was developed for the basins throughout the planning and public involvement process. The landscape theme does not include reuse of existing vegetation, except vegetation located along the basin perimeter. Existing plants which can be included with the soft contours and dual purpose access way will be identified during the design process. The overall landscape theme was developed in compliance with the District's "Aesthetic Treatment and Landscaping of Flood Control Projects." The four different treatments for the bottom, side slope, street frontage and neighborhood frontage are detailed in "Logan, Simpson & Dye's Landscape Concept" contained in **Appendix H**. The estimated cost for the landscape theme is shown on **Table 3**.

Ongoing discussions with the City of Phoenix Parks, Recreation and Library and the CAC will establish the recreational park uses. The recreational uses may revise one landscape concept to include a grass bottom. The final landscape requirements will be determined during the design process as part of the District's negotiations with the City of Phoenix Parks, Recreation and Library.

SAFETY ISSUES

Handrail or steel fence will be installed along both sides of the lined channel and around the stilling basins. All inlet and outlet headwalls which enter, exit, or connect the detention basins will have an at-grade safety barricade to limit human access.

TRASH RACK/ACCESS GRATE

All pipe openings will be covered with metal racks for debris collection and to restrict human access. The inlet grate will also accumulate debris during storm events to prevent pipe clogging. Normal maintenance will remove the debris after storm events or during regular cleaning. The inlet trash racks will be inclined to promote self cleaning. A 50% clogging factor is included to

TABLE 3

CONCEPT LANDSCAPE COST ESTIMATE

ITEM	QUANTITY	UNIT PRICE	TOTAL
24" Box Tree	25	$425.00	$10,625.00
15 Gallon Tree	87	$60.00	$5,220.00
1 Gallon Shrub	125	$6.50	$812.50
Native Shrub & Groundcover Seed Mix in Rock Mulch	3.5	$1,400.00	$4,900.00
Irrigation	1	$25,000.00	$25,000.00
10% Contingency	1	$4,655.75	$4,655.75
		TOTAL	**$51,213.25**

184/TBL310TH

account for debris accumulation during the rain event. A trash rack with a surface area twice the pipe end area accommodates a 50% blockage leaving an equivalent pipe surface area for free flow. Debris accumulation is not anticipated at the pipe outlets and is not included. Each inlet and outlet pipe grate area must include an additional allowance equivalent to the grate metal area.

CHAPTER 9

COST ESTIMATES

Summary cost estimates for the selected basin alternative combined with each of the inlet/ outlet alternatives is provided in **Table 4** of this report. Several different alternative culvert structures were evaluated for each of the inlet and outlet improvements. The costs presented in **Table 4** are the lowest cost alternative for the pipe culvert alternatives. Detailed cost estimates for each alternative are provided in **Appendix F**.

TABLE 4

ALTERNATIVE		PRELIMINARY ENGINEERING * ESTIMATE
A	with Pipe Outlet from Stilling Basin (SB)	$1,845,700
A	with Box Culvert Outlet from SB	$2,049,900
B	with Pipe Outlet from SB	$1,872,300
B	with Box Culvert Outlet from SB	$1,924,000
C	Side Flow Weir into 2B & Open Channel	$1,871,300
C-1	Side Flow Weir into 2A & Open CONCRETE Channel	$1,862,000
	w/ GRASS 1,848,000	
	w/ CONCRETE 2,064,000	
C-1A	Side Flow Weir into 2A & Box Culverts	$2,018,400

* Back-up Documentation is Attached in Appendix F

184/TBL410TH

CHAPTER 10

HEC-I MODEL RESULTS

Table 2 contains the HEC-I modeling results for basin Alternatives 1, 2, and 3. HEC-I model inputs and outputs for each basin alternative is provided in **Appendices B** through **D**.

CHAPTER 11

REFERENCES

1. Kaminski-Hubbard Engineering, Inc., *Hydrology Report ACDC/ADMS Phase I, Volume 1-9, Tenth Street Wash Watershed*, June 11, 1992.

2. U.S. Army Corps of Engineers, The Hydrologic Design Center, *HEC-I Flood Hydrograph Package Users Manual*, September, 1990.

3. U.S. Department of Transportation, Federal Highway Administration, *Hydraulic Design of Highway Culverts, Hydraulic Design Series No. 5*, September, 1985.

4. Maricopa County Flood Control District, *Policy for Aesthetic Treatment and Landscaping of Flood Control Projects*, December 16, 1992.

APPENDIX A

HEC-I MODEL FOR EXISTING CONDITIONS

```
1****************************************                    ***********************************
*                                      *                    *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *   U.S. ARMY CORPS OF ENGINEERS
*          SEPTEMBER 1990              *                    *   HYDROLOGIC ENGINEERING CENTER
*           VERSION 4.0                *                    *         609 SECOND STREET
*                                      *                    *      DAVIS, CALIFORNIA 95616
*  RUN DATE  02/03/1995  TIME  11:46:54 *                    *          (916) 756-1104
*                                      *                    *
****************************************                    ***********************************

                                        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
        2           ID        FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
        3           ID        TENTH STREET WASH DETENTION BASIN NO 1  (FCD 93-31)
        4           ID        STANLEY CONSULTANTS, INC.  (SCI JOB # 12183)
        5           ID        HEC-1 INPUT FILENAME :  12183C
        6           ID
        7           ID        ***********************************************************************
        8           ID        THIS MODEL REPRESENTS THE PROPOSED 10TH STREET WASH DETENTION BASIN #1.
        9           ID        THE FOLLOWING BASIN CHARACTERISTICS ARE EVALUATED:
       10           ID          1. INLET CONFIGURATION 1, INLET 1 CONSISTS OF A SIDE OVERFLOW WEIR
       11           ID             CONFIGURATION (100' WEIR 3.34' ABOVE FLOWLINE) FOR THE WEST TRIB
       12           ID             AND A WEIR INLET (30' WEIR AT CREST ELEV. 1321) FOR THE EAST TRIB.
       13           ID             INLET CONTROL CONDITIONS ASSUMED.
       14           ID          2. BASIN CONFIGURATION 1, 3:1 SIDES ON 3 SIDES AND A VERTICAL
       15           ID             RETAINING WALL ON THE WEST SIDE, A BOTTOM ELEVATION OF 1306, AND
       16           ID             25' ADDITIONAL R.O.W. ALONG THE SOUTH BASIN PARCEL BOUNDARY.
       17           ID          3. OUTLET CONFIGURATION 1, UTILIZING A 30" RCP TO CHASE GRADE AS THE
       18           ID             LOW FLOW AND PRINCIPAL OUTLET.
       19           ID        ************************************************************************
       20           ID
       21           ID        ***********************************************************************
       22           ID        THIS HEC-1 MODEL IS BASED ON THE KAMINSKI-HUBBARD ACDC ADMS AS MODIFIED
       23           ID        BY FCD TO REFLECT TWO HYPOTHETICAL DETENTION BASINS (NUMBERS 1 AND 2).
       24           ID        THE DIFFERENCES BETWEEN THIS MODEL AND THE ORIGINAL MODEL TRANSMITTED
       25           ID        BY FCD TO SCI AT THE PROJECT KICKOFF MEETING ARE AS FOLLOWS:
       26           ID          1. USE OF THE HEC-1 DATA STORAGE SYSTEM OPTION HAS BEEN DELETED;
       27           ID          2. THE TWO HYPOTHETICAL DETENTION BASINS 1 AND 2 HAVE BEEN DELETED;
       28           ID          3. THE CROSS SECTIONAL AREA OF THE PRINCIPAL SPILLWAY OUTLET PIPE OF
```

```
 29          ID            THE EXISTING CITY OF PHOENIX DET BASIN NO. 3 HAS BEEN CHANGED FROM
 30          ID            4.91 SQFT (WHICH CORRESPONDS TO AN OUTLET PIPE DIAM OF 30") TO
 31          ID            1.36 SQFT CORRESPONDING TO THE 14" X 14" STEEL ORIFICE PLATE WHICH
 32          ID            WAS ORIGINALLY DESIGNED AND INSTALLED.
 33          ID       ***********************************************************************
 34          ID
 35          ID   ACDC AREA DRAINAGE MASTER STUDY
 36          ID   10TH STREET WASH WATERSHED
 37          ID   FILENAME:  TEN36.DAT     KHE JOB NO. 0146
 38          ID   100-YEAR 6-HOUR DURATION STORM
             *
             *  Based on FCDMC comments dated March 17,1992 we adjusted the Mannings "n"
             *  coefficient to reflect weighted averaging in lieu of log averaging.
             *  We also changed the S-graph from Phoenix Mountain to Phoenix Valley.
             *
             *DIAGRAM
 39          IT       3                    300
 40          IO       5

 41          KK    140S
 42          KM   RUNOFF GENERATED ON SUB-BASIN 140
 43          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 44          KM    L= 1.22 mi.  Lca= 0.51 mi.  S= 162 ft/mi.  Kn= .050  LAG= 22.87 min.
 45          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 46          BA    .516
 47          IN      15
 48          KM   RAINFALL DEPTH OF 3.00 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
```



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

 49          KM   AN AREAL REDUCTION COEFFICIENT OF .975 WAS USED
 50          PB  2.9200
 51          KM   THE FOLLOWING PC RECORD USED A 6-HOUR RAINFALL WITH PATTERN NO. 2.01
 52          PC    .000    .009    .016    .025    .034    .042    .051    .059    .067    .076
 53          PC    .087    .100    .120    .163    .252    .451    .694    .837    .900    .938
 54          PC    .950    .963    .975    .988   1.000
 55          LG    .145    .339    4.25    .488   20.44
 56          UI     76.    119.    294.    391.    468.    577.    793.    930.    712.    588.
 57          UI    474.    381.    274.    154.    127.     90.     76.     26.     23.     23.
 58          UI     23.     23.      0.      0.      0.      0.      0.      0.      0.      0.
 59          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 60          KK   DT140
 61          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.0 AC-FT FROM SUB-BASIN 140
 62          KM                                              (Hydrograph identified as OR140)
 63          KM                                            2) Balance of runoff continues on.
 64          KM                                              (Hydrograph identified as DT140)
 65          DT   OR140     2.0
 66          DI       0   10000
 67          DQ       0   10000
 68          KM   ******************************************************************************
 69          KM    KK 140RR
 70          KM    KM ROUTE FLOW THROUGH NORTH MOUNTAIN DETENTION NO.3
 71          KM    RS     1    ELEV    55.9
 72          KM    SV     0     .06    1.52    6.32   17.42   35.46   60.34   95.64
 73          KM    SE  55.9      58      62      66      70      74      78      82
 74          KM    SL 57.15    4.91      .6      .5
 75          KM       ***********************************************************************
 76          KM    THE SL RECORD (LOW-LEVEL OUTLET) SECOND FIELD (ORIFICE AREA) VALUE HAS
 77          KM    BEEN CHANGED BY SCI FROM 4.91 sq.ft. TO 1.36 sq.ft. (14"x14" INLET)
 78          KM       ***********************************************************************
 79          KM    SS 79.66     100     3.0     1.5
 80          KM   ******************************************************************************

 81          KK   140RR
```

```
 82          KM   ROUTE FLOW THROUGH NORTH MOUNTAIN DETENTION NO.3
 83          RS       1    ELEV    55.9
 84          SV       0     .06    1.52    6.32   17.42   35.46   60.34   95.64
 85          SE    55.9      58      62      66      70      74      78      82
 86          SL   56.43    1.36      .6      .5
 87          SS   80.00     100     3.0     1.5

 88          KK   RM140
 89          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM DETENTION BASIN THROUGH SUB-BASIN 141
 90          KM           1) Reach Length = 3600 ft.
 91          RD
 92          RC    .045    .045    .045    3600   .0108
 93          RX       0       0    46.5    76.4    79.9   110.2   160.2   160.2
 94          RY      16    12.6     7.3       0       0     9.9    15.9      16
                                          HEC-1 INPUT                                                    PAGE  3

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


 95          KK    141S
 96          KM   RUNOFF GENERATED ON SUB-BASIN 141
 97          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 98          KM    L= 0.83 mi.  Lca= 0.57 mi.  S= 315 ft/mi.  Kn= .042  LAG= 15.26 min.
 99          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
100          BA    .187
101          LG    .126    .303    3.61    .313   38.57
102          UI     41.    136.    222.    297.    467.    414.    304.    220.    131.     70.
103          UI     47.     23.     13.     13.     13.      0.      0.      0.      0.      0.
104          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

105          KK   DT141
106          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.4 AC-FT FROM SUB-BASIN 141
107          KM                                              (Hydrograph identified as OR141)
108          KM                                           2) Balance of runoff continues on.
109          KM                                              (Hydrograph identified as DT141)
110          DT   OR141     2.4
111          DI       0   10000
112          DQ       0   10000

113          KK   HC141
114          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 141 WITH ROUTED FLOW FROM DETENTION
115          HC       2
116          KM   ******************************************************************************

117          KK  DVT141   SPLIT HYDROGRAPH 141 TO DET142 AND HC142
118          KM           DI-DQ BASED ON HYDRAULIC RATING CURVE FOR PROPOSED INLET AND
119          KM           EXISTING 30" PIPE.  WEIR LENGTH IS 30' WEIR CREST IS ELEV 1321.
120          KM           DQ IS AMOUNT DIVERTED AROUND DETENTION BASIN DOWNSTREAM.
121          KM           DI-DQ DIFFERENCE IS ROUTED THRU THE PROPOSED DETENTION BASIN
122          DT  DVT141
123          DI       0      12      50     114     196     294
124          DQ       0      12      15      18      20      22
125          KM   ******************************************************************************

126          KK    142S
127          KM   RUNOFF GENERATED ON SUB-BASIN 142
128          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
129          KM    L= 1.16 mi.  Lca= 0.75 mi.  S= 257 ft/mi.  Kn= .042  LAG= 19.99 min.
130          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
131          BA    .512
132          LG    .127    .309    4.12    .267   34.03
133          UI     86.    178.    377.    488.    608.    839.   1049.    795.    637.    498.
134          UI    380.    210.    146.    107.     80.     26.     26.     26.     26.      0.
135          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
136          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
```

```
 137          KK   DT142
 138          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 3.6 AC-FT FROM SUB-BASIN 142
 139          KM                                              (Hydrograph identified as OR142)
 140          KM                                            2) Balance of runoff continues on.
 141          KM                                              (Hydrograph identified as DT142)
 142          DT   OR142     3.6
 143          DI       0   10000
```



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

 144          DQ       0   10000
 145          KM   ******************************************************************************

 146          KK  DVT142   SPLIT HYDROGRAPH DVT142 TO DET142 AND HC142
 147          KM           DI-DQ BASED ON HYDRAULIC RATING CURVE FOR PROPOSED INLET AND
 148          KM           IMPROVED WASH CROSS SECTION.  WEIR LENGTH IS 100' WEIR CREST ELEV IS
 149          KM           3.34' ABOVE WASH FLOWLINE.
 150          KM           DQ IS AMOUNT DIVERTED AROUND DETENTION BASIN DOWNSTREAM.
 151          KM           DI-DQ DIFFERENCE IS ROUTED THRU THE PROPOSED DETENTION BASIN
 152          DT  DVT142
 153          DI       0     280     300     350     400     450     500     550     600     672
 154          DQ       0     280     295     312     317     319     318     317     313     307

 155          KK  ADD142
 156          KM   COMBINE HYDROGRAPHS FROM (DI-DQ) FROM DVT141 WITH (DI-DQ) FROM DVT142
 157          HC       2

 158          KK  DET142   ROUTE HYDROGRAPH ADD142 THRU DET BASIN 142
 159          KM           1-30" RCP  AS LOW FLOW AND PRINCIPAL OUTLET (INV. EL. 1306)
 160          RS       1    STOR      -1
 161          SV     .00   0.060   0.460   1.470   3.040   4.890   6.850   8.910   11.08   13.36
 162          SV   15.74   18.23   20.83   23.53   26.33
 163          SQ       0     4.5    15.9    29.0    37.0    44.0    50.0    55.0    60.0    65.0
 164          SQ      70      72      78      80      84
 165          SE    1306    1307    1308    1309    1310    1311    1312    1313    1314    1315
 166          SE    1316    1317    1318    1319    1320

 167          KK  DVT141    RETRIEVE PREVIOUSLY SPLIT HYDROGRAPH FROM SUB-BASIN 141
 168          DR  DVT141

 169          KK  DVT142    RETRIEVE PREVIOUSLY SPLIT HYDROGRAPH FROM SUB-BASIN 142
 170          DR  DVT142

 171          KK   HC142
 172          KM   COMBINE HYDROGRAPHS (DQ) FROM DVT142, (DQ) FROM DVT141 AND DET142 OUTFLOW
 173          HC       3
 174          KM   ******************************************************************************

 175          KK   RM142
 176          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASINS 141/142 THROUGH 143
 177          KM            1) Reach Length = 5140 ft.
 178          RD
 179          RC    .050    .045    .050    5140   .0086
 180          RX       0       0    43.8    61.3    67.4    78.3    89.8    89.8
 181          RY    10.8     9.4     9.4       0       0     5.4     8.8    10.8

 182          KK    143S
 183          KM   RUNOFF GENERATED ON SUB-BASIN 143
 184          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 185          KM    L= 1.64 mi.  Lca= 0.88  S= 273 ft/mi.  Kn= .035  LAG= 19.96 min.
 186          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 187          BA    .604
 188          LG    .115    .279    4.12    .269   49.66
 189          UI    102.    212.    446.    577.    720.    994.   1238.    937.    750.    586.
 190          UI    447.    244.    173.    125.     93.     31.     31.     31.     31.      0.
```

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

 191          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 192          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 193          KK   DT143
 194          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 5.7 AC-FT FROM SUB-BASIN 143
 195          KM                                               (Hydrograph identified as OR143)
 196          KM                                            2) Balance of runoff continues on.
 197          KM                                               (Hydrograph identified as DT143)
 198          DT   OR143     5.7
 199          DI       0   10000
 200          DQ       0   10000

 201          KK   HC143
 202          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 143 WITH ROUTED FLOW FROM 141/142
 203          HC       2

 204          KK   RM143
 205          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASIN 143 THROUGH 144
 206          KM            1) Reach Length = 1400 ft.
 207          RD
 208          RC    .040    .035    .030    1400   .0100
 209          RX       0       0    77.8    88.3    96.6   112.8   161.3   161.3
 210          RY      10     6.2     6.2       0       0     6.3     6.9      10

 211          KK    144S
 212          KM   RUNOFF GENERATED ON SUB-BASIN 144
 213          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 214          KM    L= 1.80 mi.  Lca= 1.11 mi.  S= 291 ft/mi.  Kn= .036  LAG= 22.95 min.
 215          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 216          BA    .475
 217          LG    .118    .280    3.61     .32   43.17
 218          UI     70.    108.    269.    357.    428.    527.    721.    857.    657.    543.
 219          UI    437.    353.    256.    145.    117.     85.     70.     26.     21.     21.
 220          UI     21.     21.      0.      0.      0.      0.      0.      0.      0.      0.
 221          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 222          KK   DT144
 223          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.1 AC-FT FROM SUB-BASIN 144
 224          KM                                               (Hydrograph identified as OR144)
 225          KM                                            2) Balance of runoff continues on.
 226          KM                                               (Hydrograph identified as DT144)
 227          DT   OR144     2.1
 228          DI       0   10000
 229          DQ       0   10000

 230          KK   HC144
 231          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 144 WITH ROUTED FLOW FROM 143
 232          HC       2

 233          KK   RM144
 234          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASIN 144 THROUGH 145
 235          KM            1) Reach Length = 3000 ft.
 236          RD
 237          RC    .035    .035    .030    3000   .0073
 238          RX       0       0    36.6      52    64.9    79.8   107.8   107.8
```



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

 239          RY      11     7.7     7.4       0       0     8.3     8.5      11

 240          KK    145S
```

```
241          KM   RUNOFF GENERATED ON SUB-BASIN 145
242          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
243          KM    L= 1.37 mi.  Lca= 0.86 mi.  S= 242 ft/mi.  Kn= .032  LAG= 17.28 min.
244          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
245          BA    .548
246          LG    .105    .265    5.67    .210   44.60
247          UI    107.    287.    526.    678.    922.   1303.    982.    755.    568.    378.
248          UI    186.    145.     98.     33.     33.     33.     33.      0.      0.      0.
249          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

250          KK   HC145
251          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 145 WITH ROUTED FLOW FROM 144
252          KM   ALSO DETERMINES 10TH STREET WASH DISCHARGE INTO ACDC
253          HC       2
254          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
INPUT
 LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

   41       140S
                .
                .
   65           .-------->   OR140
   60      DT140
                V
                V
   81      140RR
                V
                V
   88      RM140
                .
                .
   95           .        141S
                .           .
                .           .
  110           .           .-------->   OR141
  105           .       DT141
                .           .
                .           .
  113      HC141............
                .
                .
  122           .-------->  DVT141
  117     DVT141
                .
                .
  126           .        142S
                .           .
                .           .
  142           .           .-------->   OR142
  137           .       DT142
                .           .
                .           .
  152           .           .-------->  DVT142
  146           .      DVT142
                .           .
                .           .
  155     ADD142............
                V
                V
  158     DET142
                .
                .
```

```
168          .           .<-------  DVT141
167          .      DVT141
             .           .
             .           .
170          .           .           .<-------  DVT142
169          .           .      DVT142
             .           .           .
             .           .           .
171      HC142.......................
             V
             V
175      RM142
             .
             .
182          .        143S
             .           .
             .           .
198          .           .------->   OR143
193          .       DT143
             .           .
             .           .
201      HC143............
             V
             V
204      RM143
             .
             .
211          .        144S
             .           .
             .           .
227          .           .------->   OR144
222          .       DT144
             .           .
             .           .
230      HC144............
             V
             V
233      RM144
             .
             .
240          .        145S
             .           .
             .           .
250      HC145............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1****************************************                    ***********************************
*                                      *                    *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *    U.S. ARMY CORPS OF ENGINEERS
*            SEPTEMBER 1990            *                    *    HYDROLOGIC ENGINEERING CENTER
*             VERSION 4.0              *                    *          609 SECOND STREET
*                                      *                    *       DAVIS, CALIFORNIA 95616
*  RUN DATE  02/03/1995  TIME  11:46:54 *                    *           (916) 756-1104
*                                      *                    *
****************************************                    ***********************************
```

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
TENTH STREET WASH DETENTION BASIN NO 1 (FCD 93-31)
STANLEY CONSULTANTS, INC. (SCI JOB # 12183)
HEC-1 INPUT FILENAME : 12183C

```
*********************************************************************
THIS MODEL REPRESENTS THE PROPOSED 10TH STREET WASH DETENTION BASIN #1.
THE FOLLOWING BASIN CHARACTERISTICS ARE EVALUATED:
  1. INLET CONFIGURATION 1, INLET 1 CONSISTS OF A SIDE OVERFLOW WEIR
     CONFIGURATION (100' WEIR 3.34' ABOVE FLOWLINE) FOR THE WEST TRIB
     AND A WEIR INLET (30' WEIR AT CREST ELEV. 1321) FOR THE EAST TRIB.
     INLET CONTROL CONDITIONS ASSUMED.
  2. BASIN CONFIGURATION 1, 3:1 SIDES ON 3 SIDES AND A VERTICAL
     RETAINING WALL ON THE WEST SIDE, A BOTTOM ELEVATION OF 1306, AND
     25' ADDITIONAL R.O.W. ALONG THE SOUTH BASIN PARCEL BOUNDARY.
  3. OUTLET CONFIGURATION 1, UTILIZING A 30" RCP TO CHASE GRADE AS THE
     LOW FLOW AND PRINCIPAL OUTLET.
*********************************************************************

*********************************************************************
THIS HEC-1 MODEL IS BASED ON THE KAMINSKI-HUBBARD ACDC ADMS AS MODIFIED
BY FCD TO REFLECT TWO HYPOTHETICAL DETENTION BASINS (NUMBERS 1 AND 2).
THE DIFFERENCES BETWEEN THIS MODEL AND THE ORIGINAL MODEL TRANSMITTED
BY FCD TO SCI AT THE PROJECT KICKOFF MEETING ARE AS FOLLOWS:
  1. USE OF THE HEC-1 DATA STORAGE SYSTEM OPTION HAS BEEN DELETED;
  2. THE TWO HYPOTHETICAL DETENTION BASINS 1 AND 2 HAVE BEEN DELETED;
  3. THE CROSS SECTIONAL AREA OF THE PRINCIPAL SPILLWAY OUTLET PIPE OF
     THE EXISTING CITY OF PHOENIX DET BASIN NO. 3 HAS BEEN CHANGED FROM
     4.91 SQFT (WHICH CORRESPONDS TO AN OUTLET PIPE DIAM OF 30") TO
     1.36 SQFT CORRESPONDING TO THE 14" X 14" STEEL ORIFICE PLATE WHICH
     WAS ORIGINALLY DESIGNED AND INSTALLED.
*********************************************************************

                ACDC AREA DRAINAGE MASTER STUDY
                10TH STREET WASH WATERSHED
                FILENAME:  TEN36.DAT     KHE JOB NO. 0146
                100-YEAR 6-HOUR DURATION STORM

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

   IT        HYDROGRAPH TIME DATA
                 NMIN          3  MINUTES IN COMPUTATION INTERVAL
                IDATE      1   0  STARTING DATE
                ITIME       0000  STARTING TIME
                   NQ        300  NUMBER OF HYDROGRAPH ORDINATES
               NDDATE      1   0  ENDING DATE
               NDTIME       1457  ENDING TIME
               ICENT         19  CENTURY MARK

            COMPUTATION INTERVAL     .05 HOURS
                 TOTAL TIME BASE   14.95 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

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

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

HYDROGRAPH AT	140S	496.	4.25	69.	28.	28.	.52		
DIVERSION TO	OR140	20.	4.25	4.	2.	2.	.52		
HYDROGRAPH AT	DT140	496.	4.25	65.	26.	26.	.52		
ROUTED TO	140RR	26.	5.10	25.	18.	18.	.52	72.36	5.15
ROUTED TO	RM140	26.	5.45	25.	18.	18.	.52		
HYDROGRAPH AT	141S	263.	4.10	38.	15.	15.	.19		
DIVERSION TO	OR141	57.	4.10	5.	2.	2.	.19		
HYDROGRAPH AT	DT141	263.	4.10	33.	13.	13.	.19		
2 COMBINED AT	HC141	275.	4.10	56.	31.	31.	.70		
DIVERSION TO	DVT141	22.	4.10	14.	10.	10.	.70		
HYDROGRAPH AT	DVT141	253.	4.10	41.	20.	20.	.70		
HYDROGRAPH AT	142S	671.	4.15	100.	40.	40.	.51		
DIVERSION TO	OR142	45.	4.15	7.	3.	3.	.51		
HYDROGRAPH AT	DT142	671.	4.15	93.	37.	37.	.51		
DIVERSION TO	DVT142	319.	4.15	65.	26.	26.	.51		
HYDROGRAPH AT	DVT142	364.	4.15	28.	11.	11.	.51		
2 COMBINED AT	ADD142	614.	4.15	70.	32.	32.	1.21		
ROUTED TO	DET142	80.	4.60	62.	32.	32.	1.21	1318.97	4.60
HYDROGRAPH AT	DVT141	22.	4.10	14.	10.	10.	.00		
HYDROGRAPH AT	DVT142	319.	4.45	65.	26.	26.	.00		
3 COMBINED AT	HC142	417.	4.45	138.	68.	68.	1.21		

ROUTED TO	RM142	416.	4.60	138.	67.	67.	1.21
HYDROGRAPH AT	143S	841.	4.15	136.	55.	55.	.60
DIVERSION TO	OR143	58.	4.15	11.	5.	5.	.60
HYDROGRAPH AT	DT143	841.	4.15	125.	50.	50.	.60
2 COMBINED AT	HC143	1221.	4.15	258.	117.	117.	1.82
ROUTED TO	RM143	1220.	4.20	258.	117.	117.	1.82
HYDROGRAPH AT	144S	615.	4.20	100.	40.	40.	.47
DIVERSION TO	OR144	14.	4.20	4.	2.	2.	.47
HYDROGRAPH AT	DT144	615.	4.20	96.	38.	38.	.47
2 COMBINED AT	HC144	1835.	4.20	350.	156.	156.	2.29
ROUTED TO	RM144	1831.	4.25	350.	155.	155.	2.29
HYDROGRAPH AT	145S	786.	4.10	121.	49.	49.	.55
2 COMBINED AT	HC145	2558.	4.20	461.	204.	204.	2.84

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	INTERPOLATED TO COMPUTATION INTERVAL DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)
RM140	MANE	3.00	26.07	330.00	.79	3.00	26.07	330.00	.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2263E+02 EXCESS= .0000E+00 OUTFLOW= .2176E+02 BASIN STORAGE= .6323E+00 PERCENT ERROR=

RM142	MANE	3.00	415.54	276.00	1.28	3.00	415.54	276.00	1.28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8393E+02 EXCESS= .0000E+00 OUTFLOW= .8311E+02 BASIN STORAGE= .9764E+00 PERCENT ERROR=

RM143	MANE	2.19	1220.60	252.19	1.49	3.00	1220.23	252.00	1.49

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1450E+03 EXCESS= .0000E+00 OUTFLOW= .1449E+03 BASIN STORAGE= .2244E+00 PERCENT ERROR=

```
RM144  MANE        3.00   1830.68    255.00      1.57      3.00   1830.68    255.00        1.57

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1923E+03 EXCESS= .0000E+00 OUTFLOW= .1919E+03 BASIN STORAGE= .6055E+00 PERCENT ERROR=


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

APPENDIX B

HEC-I MODEL FOR ALTERNATIVE 1

MARICOPA COUNTY DETENTION
ALTERNATIVE 1 - MAXIMIZE SURFACE AREA/MAXIMIZE DEPTH

BASIN 2A

EVEL (FT)	AREA (AC)	H (FT)	INC. VOL (AC-FT)	TOT. VOL (AC-FT)
48	1.04			
50	1.21	2	2.26	2.26
52	1.56	2	2.78	5.04
54	1.66	2	3.22	8.26
56	1.86	2	3.52	11.78
58	2.1	2	3.96	15.74
60	2.34	2	4.44	20.18

BASIN 2B

EVEL (FT)	AREA (AC)	H (FT)	INC. VOL (AC-FT)	TOT. VOL (AC-FT)
40	2.85			
42	3.3	2	6.15	6.15
44	3.58	2	6.88	13.03
46	4	2	7.53	20.61
48	4.33	2	8.33	28.94
50	4.7	2	9.03	37.97
52	5.15	2	9.85	47.82
54	5.53	2	10.68	58.5
56	6.12	2	11.65	70.15
58	6.82	2	12.94	83.09
60	6.94	2	13.76	96.85

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*          SEPTEMBER 1990              *
*           VERSION 4.0                *
*                                      *
*  RUN DATE  02/03/1995  TIME  11:37:16 *
*                                      *
****************************************
```

```
*********************************
*                               *
*   U.S. ARMY CORPS OF ENGINEERS
*   HYDROLOGIC ENGINEERING CENTER
*         609 SECOND STREET
*      DAVIS, CALIFORNIA 95616
*          (916) 756-1104
*                               *
*********************************
```

```
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
   2          ID        FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
   3          ID        TENTH STREET WASH DETENTION BASIN NO 1  (FCD 93-31)
   4          ID        STANLEY CONSULTANTS, INC.  (SCI JOB # 12183)
   5          ID        AMENDED BY RUST E & I TO INCLUDE BASINS 2A & 2B (2/1/95)
   6          ID        DCR ALTTERNATIVE 1
   7          ID        HEC-1 INPUT FILENAME :  10WALT1.HC1
   8          ID                                .
   9          ID        ************************************************************************
  10          ID        THIS MODEL REPRESENTS THE PROPOSED 10TH STREET WASH DETENTION BASIN #1.
  11          ID        THE FOLLOWING BASIN CHARACTERISTICS ARE EVALUATED:
  12          ID          1. INLET CONFIGURATION 1, INLET 1 CONSISTS OF A SIDE OVERFLOW WEIR
  13          ID             CONFIGURATION (100' WEIR 3.34' ABOVE FLOWLINE) FOR THE WEST TRIB
  14          ID             AND A WEIR INLET (30' WEIR AT CREST ELEV. 1321) FOR THE EAST TRIB.
  15          ID             INLET CONTROL CONDITIONS ASSUMED.
  16          ID          2. BASIN CONFIGURATION 1, 3:1 SIDES ON 3 SIDES AND A VERTICAL
  17          ID             RETAINING WALL ON THE WEST SIDE, A BOTTOM ELEVATION OF 1306, AND
  18          ID             25' ADDITIONAL R.O.W. ALONG THE SOUTH BASIN PARCEL BOUNDARY.
  19          ID          3. OUTLET CONFIGURATION 1, UTILIZING A 30" RCP TO CHASE GRADE AS THE
  20          ID             LOW FLOW AND PRINCIPAL OUTLET.
  21          ID        ************************************************************************
  22          ID
  23          ID        ************************************************************************
  24          ID        THIS HEC-1 MODEL IS BASED ON THE KAMINSKI-HUBBARD ACDC ADMS AS MODIFIED
  25          ID        BY FCD TO REFLECT TWO HYPOTHETICAL DETENTION BASINS (NUMBERS 1 AND 2).
  26          ID        THE DIFFERENCES BETWEEN THIS MODEL AND THE ORIGINAL MODEL TRANSMITTED
  27          ID        BY FCD TO SCI AT THE PROJECT KICKOFF MEETING ARE AS FOLLOWS:
  28          ID          1. USE OF THE HEC-1 DATA STORAGE SYSTEM OPTION HAS BEEN DELETED;
```

```
 29          ID          2. THE TWO HYPOTHETICAL DETENTION BASINS 1 AND 2 HAVE BEEN DELETED;
 30          ID          3. THE CROSS SECTIONAL AREA OF THE PRINCIPAL SPILLWAY OUTLET PIPE OF
 31          ID             THE EXISTING CITY OF PHOENIX DET BASIN NO. 3 HAS BEEN CHANGED FROM
 32          ID             4.91 SQFT (WHICH CORRESPONDS TO AN OUTLET PIPE DIAM OF 30") TO
 33          ID             1.36 SQFT CORRESPONDING TO THE 14" X 14" STEEL ORIFICE PLATE WHICH
 34          ID             WAS ORIGINALLY DESIGNED AND INSTALLED.
 35          ID        ***********************************************************************
 36          ID
 37          ID   ACDC AREA DRAINAGE MASTER STUDY
 38          ID   10TH STREET WASH WATERSHED
 39          ID   FILENAME:  TEN36.DAT     KHE JOB NO. 0146
 40          ID   100-YEAR 6-HOUR DURATION STORM
             *
             *  Based on FCDMC comments dated March 17,1992 we adjusted the Mannings "n"
             *  coefficient to reflect weighted averaging in lieu of log averaging.
             *  We also changed the S-graph from Phoenix Mountain to Phoenix Valley.
             *
             *DIAGRAM
 41          IT       3                    300
 42          IO       5

 43          KK    140S
 44          KM   RUNOFF GENERATED ON SUB-BASIN 140
 45          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 46          KM    L= 1.22 mi.  Lca= 0.51 mi.  S= 162 ft/mi.  Kn= .050  LAG= 22.87 min.
 47          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 48          BA    .516
```



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

 49          IN      15
 50          KM   RAINFALL DEPTH OF 3.00 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
 51          KM   AN AREAL REDUCTION COEFFICIENT OF .975 WAS USED
 52          PB  2.9200
 53          KM   THE FOLLOWING PC RECORD USED A 6-HOUR RAINFALL WITH PATTERN NO. 2.01
 54          PC    .000    .009    .016    .025    .034    .042    .051    .059    .067    .076
 55          PC    .087    .100    .120    .163    .252    .451    .694    .837    .900    .938
 56          PC    .950    .963    .975    .988   1.000
 57          LG    .145    .339    4.25    .488   20.44
 58          UI     76.    119.    294.    391.    468.    577.    793.    930.    712.    588.
 59          UI    474.    381.    274.    154.    127.     90.     76.     26.     23.     23.
 60          UI     23.     23.      0.      0.      0.      0.      0.      0.      0.      0.
 61          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 62          KK   DT140
 63          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.0 AC-FT FROM SUB-BASIN 140
 64          KM                                               (Hydrograph identified as OR140)
 65          KM                                            2) Balance of runoff continues on.
 66          KM                                               (Hydrograph identified as DT140)
 67          DT   OR140     2.0
 68          DI       0   10000
 69          DQ       0   10000
 70          KM   ***************************************************************************
 71          KM    KK 140RR
 72          KM    KM ROUTE FLOW THROUGH NORTH MOUNTAIN DETENTION NO.3
 73          KM    RS     1    ELEV    55.9
 74          KM    SV     0     .06    1.52    6.32   17.42   35.46   60.34   95.64
 75          KM    SE  55.9      58      62      66      70      74      78      82
 76          KM    SL 57.15    4.91      .6      .5
 77          KM        ***********************************************************************
 78          KM    THE SL RECORD (LOW-LEVEL OUTLET) SECOND FIELD (ORIFICE AREA) VALUE HAS
 79          KM    BEEN CHANGED BY SCI FROM 4.91 sq.ft. TO 1.36 sq.ft. (14"x14" INLET)
 80          KM        ***********************************************************************
 81          KM    SS 79.66     100     3.0     1.5
 82          KM   ***************************************************************************
```

```
 83          KK   140RR
 84          KM   ROUTE FLOW THROUGH NORTH MOUNTAIN DETENTION NO.3
 85          RS       1    ELEV    55.9
 86          SV       0     .06    1.52    6.32   17.42   35.46   60.34   95.64
 87          SE    55.9      58      62      66      70      74      78      82
 88          SL   56.43    1.36      .6      .5
 89          SS   80.00     100     3.0     1.5

 90          KK   RM140
 91          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM DETENTION BASIN THROUGH SUB-BASIN 141
 92          KM            1) Reach Length = 3600 ft.
 93          RD
 94          RC    .045    .045    .045    3600   .0108
 95          RX       0       0    46.5    76.4    79.9   110.2   160.2   160.2
 96          RY      16    12.6     7.3       0       0     9.9    15.9      16
```



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

 97          KK    141S
 98          KM   RUNOFF GENERATED ON SUB-BASIN 141
 99          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
100          KM    L= 0.83 mi.  Lca= 0.57 mi.  S= 315 ft/mi.  Kn= .042  LAG= 15.26 min.
101          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
102          BA    .187
103          LG    .126    .303    3.61    .313   38.57
104          UI     41.    136.    222.    297.    467.    414.    304.    220.    131.     70.
105          UI     47.     23.     13.     13.     13.      0.      0.      0.      0.      0.
106          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

107          KK   DT141
108          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.4 AC-FT FROM SUB-BASIN 141
109          KM                                              (Hydrograph identified as OR141)
110          KM                                            2) Balance of runoff continues on.
111          KM                                              (Hydrograph identified as DT141)
112          DT   OR141     2.4
113          DI       0   10000
114          DQ       0   10000

115          KK   HC141
116          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 141 WITH ROUTED FLOW FROM DETENTION
117          HC       2
118          KM   ******************************************************************************

119          KK  DVT141   SPLIT HYDROGRAPH 141 TO DET142 AND HC142
120          KM           DI-DQ BASED ON HYDRAULIC RATING CURVE FOR PROPOSED INLET AND
121          KM           EXISTING 30" PIPE.  WEIR LENGTH IS 30' WEIR CREST IS ELEV 1321.
122          KM           DQ IS AMOUNT DIVERTED AROUND DETENTION BASIN DOWNSTREAM.
123          KM           DI-DQ DIFFERENCE IS ROUTED THRU THE PROPOSED DETENTION BASIN
124          DT  DVT141
125          DI       0      12      50     114     196     294
126          DQ       0      12      15      18      20      22
127          KM   ******************************************************************************

128          KK    142S
129          KM   RUNOFF GENERATED ON SUB-BASIN 142
130          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
131          KM    L= 1.16 mi.  Lca= 0.75 mi.  S= 257 ft/mi.  Kn= .042  LAG= 19.99 min.
132          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
133          BA    .512
134          LG    .127    .309    4.12    .267   34.03
135          UI     86.    178.    377.    488.    608.    839.   1049.    795.    637.    498.
136          UI    380.    210.    146.    107.     80.     26.     26.     26.     26.      0.
137          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
```

```
138          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

139          KK   DT142
140          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 3.6 AC-FT FROM SUB-BASIN 142
141          KM                                              (Hydrograph identified as OR142)
142          KM                                            2) Balance of runoff continues on.
143          KM                                              (Hydrograph identified as DT142)
144          DT   OR142     3.6
145          DI       0   10000
```



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

146          DQ       0   10000
147          KM   ******************************************************************************

148          KK  DVT142   SPLIT HYDROGRAPH DVT142 TO DET142 AND HC142
149          KM           DI-DQ BASED ON HYDRAULIC RATING CURVE FOR PROPOSED INLET AND
150          KM           IMPROVED WASH CROSS SECTION.  WEIR LENGTH IS 100' WEIR CREST ELEV IS
151          KM           3.34' ABOVE WASH FLOWLINE.
152          KM           DQ IS AMOUNT DIVERTED AROUND DETENTION BASIN DOWNSTREAM.
153          KM           DI-DQ DIFFERENCE IS ROUTED THRU THE PROPOSED DETENTION BASIN
154          DT  DVT142
155          DI       0     280     300     350     400     450     500     550     600     672
156          DQ       0     280     295     312     317     319     318     317     313     307

157          KK  ADD142
158          KM   COMBINE HYDROGRAPHS FROM (DI-DQ) FROM DVT141 WITH (DI-DQ) FROM DVT142
159          HC       2

160          KK  DET142   ROUTE HYDROGRAPH ADD142 THRU DET BASIN 142
161          KM           1-30" RCP  AS LOW FLOW AND PRINCIPAL OUTLET (INV. EL. 1306)
162          RS       1    STOR      -1
163          SV     .00   0.060   0.460   1.470   3.040   4.890   6.850   8.910   11.08   13.36
164          SV   15.74   18.23   20.83   23.53   26.33
165          SQ       0     4.5    15.9    29.0    37.0    44.0    50.0    55.0    60.0    65.0
166          SQ      70      72      78      80      84
167          SE    1306    1307    1308    1309    1310    1311    1312    1313    1314    1315
168          SE    1316    1317    1318    1319    1320

169          KK  DVT141    RETRIEVE PREVIOUSLY SPLIT HYDROGRAPH FROM SUB-BASIN 141
170          DR  DVT141

171          KK  DVT142    RETRIEVE PREVIOUSLY SPLIT HYDROGRAPH FROM SUB-BASIN 142
172          DR  DVT142

173          KK   HC142
174          KM   COMBINE HYDROGRAPHS (DQ) FROM DVT142, (DQ) FROM DVT141 AND DET142 OUTFLOW
175          HC       3
176          KM   ******************************************************************************

177          KK   RM142
178          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASINS 141/142 THROUGH 143
179          KM            1) Reach Length = 5140 ft.
180          RD
181          RC    .050    .045    .050    5140   .0086
182          RX       0       0    43.8    61.3    67.4    78.3    89.8    89.8
183          RY    10.8     9.4     9.4       0       0     5.4     8.8    10.8

184          KK    143S
185          KM   RUNOFF GENERATED ON SUB-BASIN 143
186          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
187          KM    L= 1.64 mi.  Lca= 0.88  S= 273 ft/mi.  Kn= .035  LAG= 19.96 min.
188          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
189          BA    .604
190          LG    .115    .279    4.12    .269   49.66
```

```
 191          UI    102.    212.    446.    577.    720.    994.   1238.    937.    750.    586.
 192          UI    447.    244.    173.    125.     93.     31.     31.     31.     31.      0.
                                          HEC-1 INPUT                                          PAGE  5

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

 193          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 194          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 195          KK   DT143
 196          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 5.7 AC-FT FROM SUB-BASIN 143
 197          KM                                               (Hydrograph identified as OR143)
 198          KM                                            2) Balance of runoff continues on.
 199          KM                                               (Hydrograph identified as DT143)
 200          DT   OR143     5.7
 201          DI       0   10000
 202          DQ       0   10000

 203          KK   HC143
 204          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 143 WITH ROUTED FLOW FROM 141/142
 205          HC       2

 206          KK   RM143
 207          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASIN 143 THROUGH 144
 208          KM            1) Reach Length = 1400 ft.
 209          RD
 210          RC    .040    .035    .030    1400   .0100
 211          RX       0       0    77.8    88.3    96.6   112.8   161.3   161.3
 212          RY      10     6.2     6.2       0       0     6.3     6.9      10

 213          KK    144S
 214          KM   RUNOFF GENERATED ON SUB-BASIN 144
 215          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 216          KM    L= 1.80 mi.  Lca= 1.11 mi.  S= 291 ft/mi.  Kn= .036  LAG= 22.95 min.
 217          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 218          BA    .475
 219          LG    .118    .280    3.61     .32   43.17
 220          UI     70.    108.    269.    357.    428.    527.    721.    857.    657.    543.
 221          UI    437.    353.    256.    145.    117.     85.     70.     26.     21.     21.
 222          UI     21.     21.      0.      0.      0.      0.      0.      0.      0.      0.
 223          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 224          KK   DT144
 225          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.1 AC-FT FROM SUB-BASIN 144
 226          KM                                               (Hydrograph identified as OR144)
 227          KM                                            2) Balance of runoff continues on.
 228          KM                                               (Hydrograph identified as DT144)
 229          DT   OR144     2.1
 230          DI       0   10000
 231          DQ       0   10000

 232          KK   DIV1P    DIVERT PALMA PARK FLOWS OVER 350 CFS
 233          KM   DIVERSION REPRESENTS LOSS OF FLOW NOT ACCEPTED BY THE PALMA PARK INLET
 234          DT   DIV1P
 235          DI       0     350     351     615    1000
 236          DQ       0       0       1     265     650
                                          HEC-1 INPUT                                          PAGE  6

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


 237          KK   HC144
 238          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 144 WITH ROUTED FLOW FROM 143
 239          HC       2

 240          KK    DIV2    DIVERT INCHANNEL FLOWS AROUND DETENTION FACILITY
```

```
241          KM   DIVERSION REPRESENTS  CULVERT (600' LONG) THRU BASIN CAPACITY=500 CFS
242          DT   DIV-2
243          DI       0     325     326     540     860    1280
244          DQ       0     325     325     390     435     500

245          KK   SITE2   DETENTION BASIN AT SITE 2A & 2B *************************
246          KM        ALTERNATIVE 1
247          RS       1    STOR       0
248          SV       0    6.15   13.03   20.61   28.94   40.23   52.86   66.76   81.93   98.83
249          SV   107.3   117.03
250          SE    1240    1242    1244    1246    1248    1250    1252    1254    1256    1258
251          SE    1259    1260
252          SQ       0       0       0       0       0      16      36      50      60      70
253          SQ      75     320

254          KK   RET-2    RETRIEVE DIVERTED INCHANNEL FLOWS
255          DR   DIV-2

256          KK   RET1P    RETRIEVE DIVERTED PALMA PARK FLOW
257          DR   DIV1P

258          KK   COMB2   RECOMBINE INCHANNEL FLOWS WITH OUTFLOW FROM DETENTION BASIN 2
259          KO       1
260          HC       3

261          KK   RM144
262          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASIN 144 THROUGH 145
263          KM            1) Reach Length = 3000 ft.
264          RD
265          RC    .035    .035    .030    3000   .0073
266          RX       0       0    36.6      52    64.9    79.8   107.8   107.8
267          RY      11     7.7     7.4       0       0     8.3     8.5      11

268          KK    145S
269          KM   RUNOFF GENERATED ON SUB-BASIN 145
270          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
271          KM    L= 1.37 mi.  Lca= 0.86 mi.  S= 242 ft/mi.  Kn= .032  LAG= 17.28 min.
272          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
273          BA    .548
274          LG    .105    .265    5.67    .210   44.60
275          UI    107.    287.    526.    678.    922.   1303.    982.    755.    568.    378.
276          UI    186.    145.     98.     33.     33.     33.     33.      0.      0.      0.
277          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
```



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

278          KK   HC145
279          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 145 WITH ROUTED FLOW FROM 144
280          KM   ALSO DETERMINES 10TH STREET WASH DISCHARGE INTO ACDC
281          HC       2
282          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

  43         140S
               .
               .
  67           .------->   OR140
  62        DT140
               V
```

```
            V
 83       140RR
            V
            V
 90       RM140
            .
            .
 97         .        141S
            .           .
            .           .
112         .           .-------->   OR141
107         .       DT141
            .           .
            .           .
115       HC141............
            .
            .
124         .-------->  DVT141
119      DVT141
            .
            .
128         .        142S
            .           .
            .           .
144         .           .-------->   OR142
139         .       DT142
            .           .
            .           .
154         .           .-------->  DVT142
148         .      DVT142
            .           .
            .           .
157      ADD142............
            V
            V
160      DET142
            .
            .
170         .           .<--------  DVT141
169         .      DVT141
            .           .
            .           .
172         .           .           .<--------  DVT142
171         .           .      DVT142
            .           .           .
            .           .           .
173       HC142........................
            V
            V
177       RM142
            .
            .
184         .        143S
            .           .
            .           .
200         .           .-------->   OR143
195         .       DT143
            .           .
            .           .
203       HC143............
            V
            V
206       RM143
            .
            .
213         .        144S
```

E-3: Capacity Quality Control Checks

RUST ENVIRONMENT & INFRASTRUCTURE

CALCULATION SHEET

PROJECT NO. 89932

CLIENT FCDMC

PROJECT 10th St. Wash

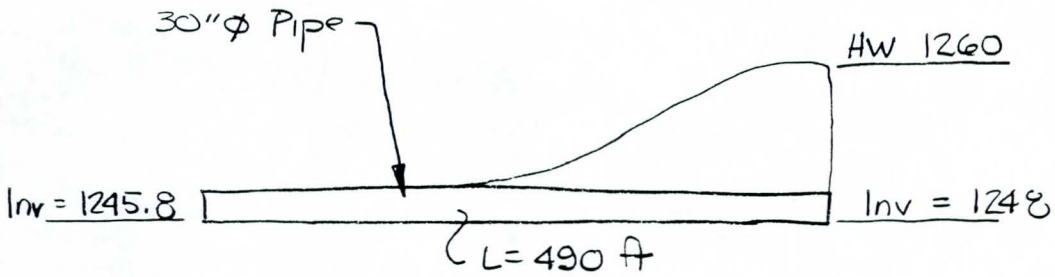
SUBJECT hand Check - Basin drain pipes

Prepared By DCM Date 11/22/94

Reviewed By _____ Date _____

Approved By _____ Date _____

Basin 2B - 30-in Outlet w/ High Water El = 1260.0



$$A_{30} = \frac{(2.5)^2}{4}\pi = 4.9\ ft^2$$

$$Q = AV$$

need hydraulic slope to calc V

$$V = \frac{1.486}{n} R^{2/3} S^{1/2}$$

$$S = \frac{1260 - 1245.8}{490} = \frac{14.2}{490} = 0.029 \qquad S^{1/2} = 0.17$$

$$V = \frac{1.486\left(\frac{2.5}{4}\right)^{2/3}(.17)}{0.013} = 14.2\ fps$$

$$Q = (4.9\ ft^2)(14.2\ fps) = 69.8\ cfs$$

checks w/ Flowmaster calc.

See following page.

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: 2b30inch

Comment: Basin 2B - 30-in Outlet w/ HW= 1260.0

Solve For Actual Discharge

Given Input Data:

Diameter.....	2.50 ft
Slope.....	0.0290 ft/ft
Manning's n.....	0.013
Depth.....	2.50 ft

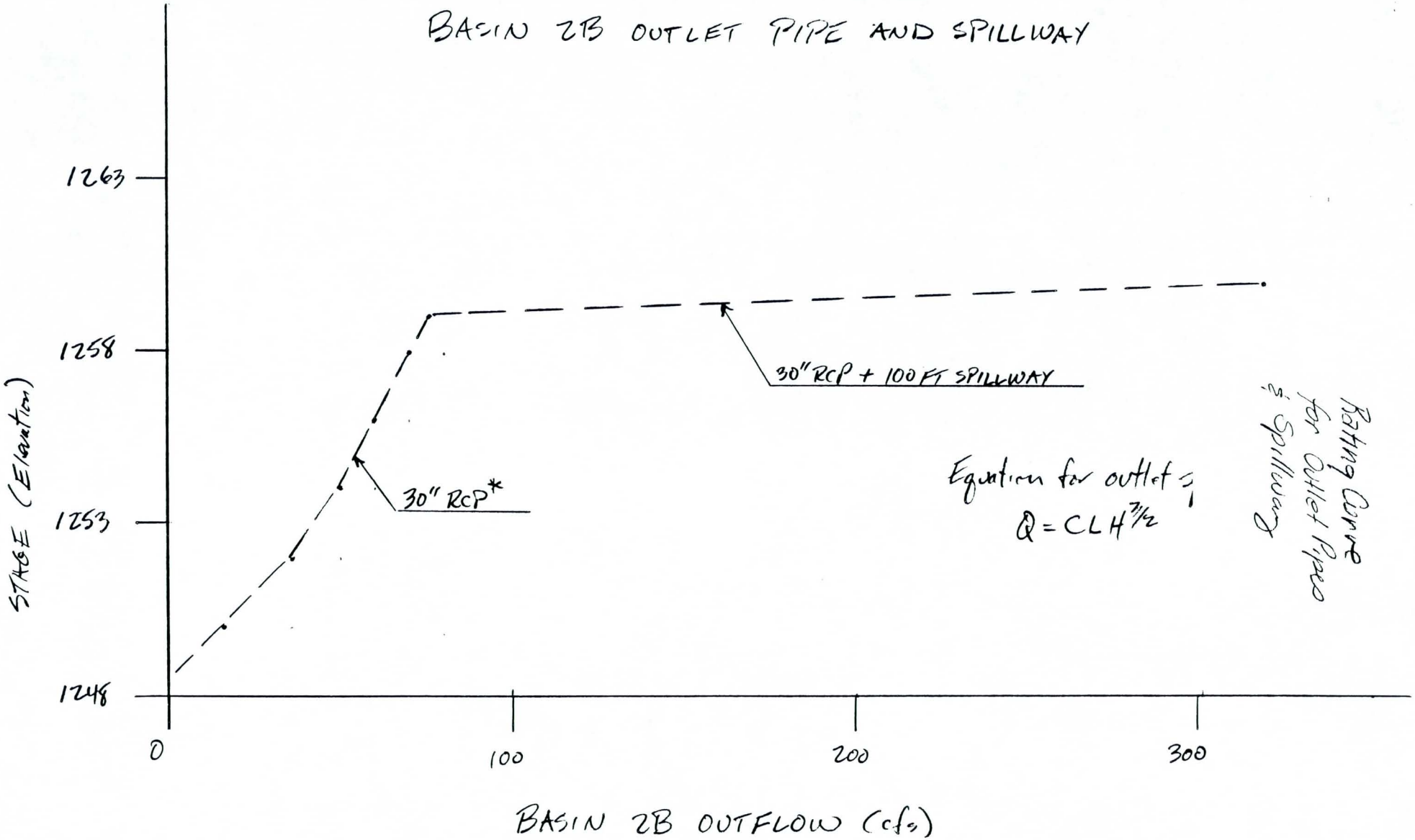
Computed Results:

Discharge.....	69.85 cfs
Velocity.....	14.23 fps
Flow Area.....	4.91 sf
Critical Depth....	2.44 ft
Critical Slope....	0.0258 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	69.85 cfs
QMAX @.94D.....	75.14 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

RATING CURVE FOR

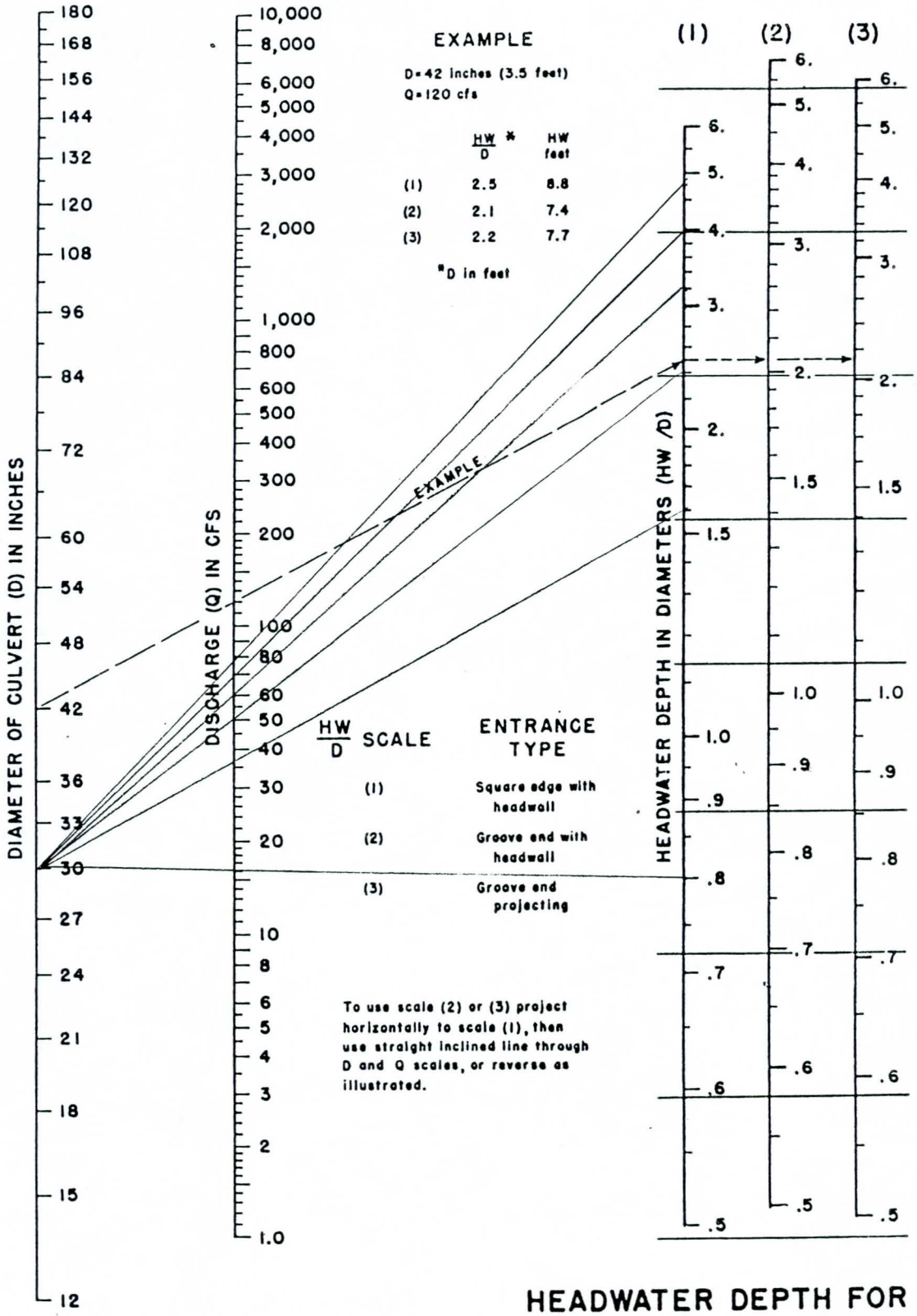
BASIN 2B OUTLET PIPE AND SPILLWAY



* derived from inlet control nomographs

Basin 2B- 30" RCP outlet pipe

3-4.1 Concrete Pipe (Inlet Control Nomograph)

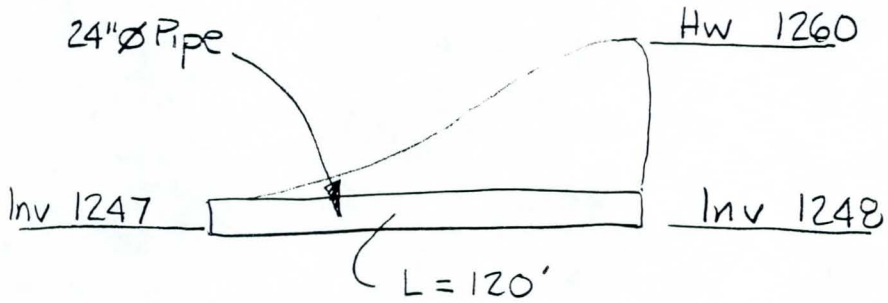


HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

Basin 2A - 24-in Outlet w/ High Water El = 1260.0



$A_{24} = 3.14\ ft^2$

$Q = AV$

Calculate hydraulic Slope

$S = \frac{60-47}{120} = \frac{13}{120} = 0.1083 \qquad S^{1/2} = 0.33$

$V = \frac{1.486}{0.013}\left(\frac{2}{4}\right)^{2/3}(0.33) = 23.7\ fps$

$Q = AV = (3.14)(23.7) = 74.4\ cfs$ √'s w/ Flowmaster,

See following page.

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: 2a30inch

Comment: Basin 2A - 24-in Outlet w/ HW= 1260.0

Solve For Actual Discharge

Given Input Data:

Diameter.....	2.00 ft
Slope.....	0.1083 ft/ft
Manning's n.....	0.013
Depth.....	2.00 ft

Computed Results:

Discharge.....	74.45 cfs
Velocity.....	23.70 fps
Flow Area.....	3.14 sf
Critical Depth....	2.00 ft
Critical Slope....	0.1042 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	74.45 cfs
QMAX @.94D.....	80.08 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: TENTH

Comment: TENTH ST WASH UPSTREAM OF BOX CULVERT

Solve For Depth

Given Input Data:

Bottom Width.....	5.00 ft
Left Side Slope..	2.50:1 (H:V)
Right Side Slope.	2.50:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0167 ft/ft
Discharge.....	1250.00 cfs

Computed Results:

Depth.....	5.66 ft
Velocity.....	11.55 fps
Flow Area.....	108.26 sf
Flow Top Width...	33.28 ft
Wetted Perimeter.	35.46 ft
Critical Depth...	5.98 ft
Critical Slope...	0.0129 ft/ft
Froude Number....	1.13 (flow is Supercritical)

Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: TRAP10

Comment: TENTH ST. WASH DOWNSTREAM OF ALICE AVE

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0070 ft/ft
Discharge.....	500.00 cfs

Computed Results:

Depth.....	4.08 ft
Velocity.....	6.75 fps
Flow Area.....	74.03 sf
Flow Top Width...	26.31 ft
Wetted Perimeter.	28.24 ft
Critical Depth...	3.38 ft
Critical Slope...	0.0145 ft/ft
Froude Number....	0.71 (flow is Subcritical)

Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: TENTH

Comment: TENTH ST. WASH CHANNEL DEPTHS

Solve For Depth

Given Input Data:

Bottom Width.....	20.00 ft
Left Side Slope..	1.00:1 (H:V)
Right Side Slope.	1.00:1 (H:V)
Manning's n.....	0.016
Channel Slope....	0.0043 ft/ft
Discharge.....	1250.00 cfs

Computed Results:

Depth.....	4.03 ft
Velocity.....	12.91 fps
Flow Area.....	96.86 sf
Flow Top Width...	28.06 ft
Wetted Perimeter.	31.40 ft
Critical Depth...	4.57 ft
Critical Slope...	0.0028 ft/ft
Froude Number....	1.22 (flow is Supercritical)

Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: TRAP10

Comment: TENTH ST. WASH DOWNSTREAM OF BOX CULVERT

Solve For Depth

Given Input Data:

Bottom Width.....	20.00 ft
Left Side Slope..	1.00:1 (H:V)
Right Side Slope.	1.00:1 (H:V)
Manning's n.....	0.016
Channel Slope....	0.0028 ft/ft
Discharge.....	1250.00 cfs

Computed Results:

Depth.....	4.57 ft
Velocity.....	11.13 fps
Flow Area.....	112.27 sf
Flow Top Width...	29.14 ft
Wetted Perimeter.	32.92 ft
Critical Depth...	4.57 ft
Critical Slope...	0.0028 ft/ft
Froude Number....	1.00 (flow is Critical)

Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

U S E R' S M A N U A L

FlowMaster I

(C) Copyright 1990 Haestad Methods, Inc.

FlowMaster I

User's Manual

(C) Copyright 1990 Haestad Methods, Inc.

Haestad Methods' FlowMaster is a powerful, yet easy-to-use program that automates many of the hydraulics calculations you perform every day.

All units in the manual's working equations are expressed in US Customary for clarity. The equivalent metric units apply in metric mode. Metric mode is set via the Setup_Units_Metric option.

DISPLAYING HELP WITH <F1> KEY

Every menu and worksheet function has context sensitive help. To display help on any item, highlight it with the selection bar, and press the <F1> key.

WORKING WITH FlowMaster I

When a hydraulics option is selected from the "Calculate" menu, you will be prompted to enter a worksheet name (or select an existing worksheet if one exists). After the name is specified, the first of two screens (a worksheet) will be displayed.

Each option in the calculate menu consists of two screens. The first screen is a worksheet that solves for any given variable. The second screen computes rating tables. To view the second screen, press PgDn. To view the first screen again, press the PgUp key.

```
                 .---------------------.
                 |                     |
    Press PgUp   |                     |
    to view      |      Press <Esc>    |---.
    Screen 1     |       to exit.      |   |
                 |                     |   |
                 |                     |   |
                 | WORKSHEET   1 of 2  |   |
                 '---------------------'   |     Press PgDn
                    |                      |     to view
                    | RATING TABLES  2 of 2 |    Screen 2
                    '----------------------'
```

Circular Channel -- Kutter's Equation

SUMMARY

The worksheet lets you enter Diameter, Slope, Manning's n, Discharge, and Depth for a circular channel and solve for one unknown using the Kutter's formula. This open channel equation will solve for the full and partial flow conditions and is typically applied in the design of sanitary sewer collection systems. You can compute Velocity, Capacity, Flow Area, Critical Slope, Critical Depth, Percent Full, and Froude Number. You can generate a rating table by pressing PageDown while the worksheet is onscreen.

INSTRUCTIONS

Select a design unknown by toggling through the "Solve For..." parameters using the SpaceBar or left/right arrow keys. The parameters to be computed will be generated when you have input all other known values. The worksheet will automatically compute or update the unknown field and all additionally computed parameters with each modification of any input field in the worksheet. You may freely change the "Solve For..." parameter and modify your worksheet values at anytime. You can generate rating tables which compute the "Solve For..." value against an incremental range of any one or more remaining parameters by pressing the PgDn key. Worksheet values can be optionally saved for later modification when you exit the worksheet.

ACTIVE KEYS

The following special keys are active while you are in this worksheet:

F1 - Access Help
F2 - Print worksheet results to printer or screen
F3 - Pop Up Calculator (Lets you make side calculations, the results of which you can "paste" into this worksheet.)
PgDn - Displays data entry screen for rating table computations
esc - Exits worksheet

WORKING EQUATIONS

All equations are shown using "Calculator" equation notation.

The Kutter's formula as implemented in this worksheet is,

C1 = 1.81 / n + 41.67 + 0.0028 / S (Eq. k1)

C2 = 1 + n / sqrt(A / WP) * (41.67 + 0.0028 / S) (Eq. k2)

Q = 448.83 * C1 / C2 * sqrt((A / WP) * S) * A (Eq. k3)

where: Q = Discharge (gpm);
A = Flow area (sf)
WP = Wetted perimeter (ft)

S = Channel slope (ft/ft)
n = Manning's n

A and WP are a function of pipe flow depth and are computed using circular channel element equations (ref. V. T. Chow, Open Channel Hydraulics, Table 2-1, p. 21). Discharges are computed explicitly. Other variables are computed iteratively using the working equation,

1 - Q * C2 / (C1 * A * sqrt((A/WP) * S)) = 0 (Eq. k4)

Critical depth, DC, is calculated by iteratively varying DC until,

1 - (Q^2 * TOP / (32.16 * A^3)) = 0 (Eq. k5)

where: TOP = Flow top width

Froude Number, FN, is calculated using the equation,

FN = sqrt(V^2 / (32.16 * A / TOP)) (Eq. k6)

where: V = Velocity = Q / A

Note that FN is undefined for the full flow condition (TOP = 0) and under full flow conditions a message is displayed. The FN is a dimensionless parameter which is used to determine flow type. If FN is less than one for subcritical flow, equals one at critical flow, and is greater than one for supercritical flow.

Circular Channel -- Manning's Equation
SUMMARY

The worksheet lets you enter Diameter, Slope, Manning's n, Discharge, and Depth for a circular channel and solve for one unknown using the Manning's formula. This open channel equation will solve for the full and partial flow conditions and is an accepted standard for use in the design of storm drainage and sanitary sewer collection systems. You can compute Velocity, Capacity, Flow Area, Critical Slope, Critical Depth, Percent Full, and Froude Number. You can generate a rating table by pressing PageDown while the worksheet is onscreen.

INSTRUCTIONS

Select a design unknown by toggling through the "Solve For..." parameters using the SpaceBar or left/right arrow keys. The parameters to be computed will be generated when you have input all other known values. The worksheet will automatically compute or update the unknown field and all additionally computed parameters with each modification of any input field in the worksheet. You may freely change the "Solve For..." parameter and modify your worksheet values at anytime. You can generate rating tables which compute the "Solve For..." value against an

incremental range of any one or more remaining parameters by pressing the PgDn key. Worksheet values can be optionally saved for later modification when you exit the worksheet.

ACTIVE KEYS

The following special keys are active while you are in this worksheet:

F1 - Access Help
F2 - Print worksheet results to printer or screen
F3 - Pop Up Calculator (Lets you make side calculations, the results of which you can "paste" into this worksheet.)
PgDn - Displays data entry screen for rating table computations
esc - Exits worksheet

WORKING EQUATIONS

All equations are shown using "Calculator" equation notation.

The Mannings formula as implemented in this worksheet is,

Q = 1.486 * A^5/3 * sqrt(S) / (n * WP^2/3) (Eq. c1)

where: Q = Discharge (cfs);
A = Flow area (sf)
WP = Wetted perimeter (ft)
S = Channel slope (ft/ft)
n = Manning's n

A and WP are a function of pipe flow depth and are computed using circular channel element equations (ref. V. T. Chow, Open Channel Hydraulics, Table 2-1, p. 21). Full pipe flow, slope, Manning's n, and discharge solutions are solved explicitly. Partial (normal) depth, Y, is calculated by iteratively varying Y until,

1 - (Q * n * WP^2/3 / (1.486 * A^5/3 * sqrt(S)) = 0 (Eq. c2)

Critical depth, DC, is calculated by iteratively varying DC until,

1 - (Q^2 * TOP / (32.16 * A^3)) = 0 (Eq. c3)

where: TOP = Flow topwidth

Froude Number, FN, is calculated using the equation,

FN = sqrt(V^2 / (32.16 * A / TOP)) (Eq. c4)

where: V = Velocity = Q / A

Note that FN is undefined for the full flow condition (TOP = 0) and under full flow conditions a message is displayed. The FN is a dimensionless parameter which is used to determine flow type. If FN is less than one for subcritical flow, equals one at critical

flow, and is greater than one for supercritical flow.

Pressure Pipe
SUMMARY

This Worksheet lets you enter Elevations, Pressures, Diameter, Hazen-William's C, Discharge, and Length for a circular pipe and solve for one unknown using Bernoulli's and Hazen-Williams formulae. You can compute Velocity, Head Loss, Energy Grades, and Energy Slopes. You can generate a rating table by pressing PageDown while the worksheet is onscreen.

INSTRUCTIONS

Select a design unknown by toggling through the "Solve For..." parameters using the SpaceBar or left/right arrow keys. The parameters to be computed will be generated when you have input all other known values. The worksheet will automatically compute or update the unknown field and all additionally computed parameters with each modification of any input field in the worksheet. You may freely change the "Solve For..." parameter and modify your worksheet values at anytime. You can generate rating tables which compute the "Solve For..." value against an incremental range of any one or more remaining parameters by pressing the PageDown key. Worksheet values can be optionally saved for later modification when you exit the worksheet.

ACTIVE KEYS

The following special keys are active while you are in this worksheet:

F1 - Access Help
F2 - Print worksheet results to printer or screen
F3 - Pop Up Calculator (Lets you make side calculations, the results of which you can "paste" into this worksheet.)
PgDn - Opens page for rating table computations
esc - Exits worksheet

WORKING EQUATIONS

(All equations are shown using "Calculator" equation notation. See Calculator Help for further information.)

Bernoulli's formula as implemented in this worksheet is,

EG1 = V1^2 / 2g + P1 * 2.307 + E1 (Eq. p1)

EG2 = V2^2 / 2g + P2 * 2.307 + E2 (Eq. p2)

$EG1 = EG2 + Hf$ (Eq. p3)

where: EG1, EG2 = Energy grades @ Locs. 1 & 2, respectively (ft)
V1, V2 = Velocities @ Locs. 1 & 2 (fps)
P1, P2 = Pressures @ Locs. 1 & 2 (psig)
E1, E2 = Elevations of pipes @ Locs. 1 & 2 (ft)
Hf = Head loss due to pipe friction (ft)
g = gravitational constant = 32.16 ft/s/s

The Head loss due to pipe friction is computed using the basic Hazen - Williams formula and hydraulic continuity,

$Q = V*A$ (continuity) (Eq. p4)

$V = 1.318 * C * R^{0.63} * S^{0.54}$ (Hazen-Williams) (Eq. p5)

where: V = velocity (fps)
Q = discharge (cfs)
A = pipe area (sf)
C = Hazen-Williams Coefficient
R = Hydraulic radius (ft)
S = Friction slope (ft/ft)

Substituting,

$R = D/4$ where: D = Pipe diameter (ft) (Eq. p6)
$S = Hf / L$ L = Pipe length (ft) (Eq. p7)

and rearranging, with unit conversions, yields the final working equation,

$Hf = 10.438 * L * Q^{1.852} / (C^{1.852} * D^{4.87})$ (Eq. p8)

where: Q = Pipe discharge (gpm)
Hf = Head loss (ft)
C = Hazen-Williams Coefficient
L = Pipe length (ft)
D = Pipe diameter (in)

TIP: Hf = E1 if P1, P2, & E2 are equal to zero.

IMPORTANT NOTE: FlowMaster adopts a flow direction convention which assumes flow from Location 1 to Location 2 as being positive. Should computations result in negative head losses, velocities, and discharges, then you are modeling a reverse flow situation. This is acceptable computationally, but FlowMaster will not allow the user to input a discharge which is contrary to the system direction established by the energy grades at each end of the pipe. FlowMaster will automatically reverse the sign of the discharge to conform with the given system pressures and elevations.

Trapezoidal, Rectangular, and Triangular Channels

INSTRUCTIONS

Select a design unknown by toggling through the "Solve For..." parameters using the SpaceBar or left right arrow keys. The parameters to be computed will be generated when you have input all other known values. The worksheet will automatically compute or update the unknown field and all additionally computed parameters with each modification of any input field in the worksheet. You may freely change the "Solve For..." parameter and modify your worksheet values at anytime. You can generate rating tables which compute the "Solve For..." value against an incremental range of any one or more remaining parameters by pressing the PageDown key. Worksheet values can be optionally saved for later modification when you exit the worksheet.

ACTIVE KEYS

The following special keys are active while you are in this worksheet:

F1 - Access Help
F2 - Print worksheet results to printer or screen
F3 - Pop Up Calculator (Lets you make side calculations, the results of which you can "paste" into this worksheet.)
PgDn - Opens page for rating table computations
esc - Exits worksheet

WORKING EQUATIONS

(All equations are shown using "Calculator" equation notation. See Calculator Help for further information.)

The Mannings equation as implemented in this worksheet is,

Q = 1.486 * A^5/3 * sqrt(S) / (n * WP^2/3) (Eq. m1)

where: Q = Discharge (cfs);
A = Flow area (sf)
WP = Wetted perimeter (ft)
S = Channel slope (ft/ft)
n = Manning's n

A and WP are a function of channel flow depth and are computed using channel element equations (ref. V. T. Chow, Open Channel Hydraulics, Table 2-1, p. 21). Manning's n, channel slope, and discharge are solved explicitly. The remaining unknowns are calculated by iteratively varying the unknown variable until,

1 - (Q * n * WP^2/3 / (1.486 * A^5/3 * sqrt(S)) = 0 (Eq. m2)

Critical depth, DC, is calculated by iteratively varying DC until,

1 - (Q^2 * TOP / (32.16 * A^3)) = 0 (Eq. m3)

where: TOP = Flow topwidth

Froude Number, FN, is calculated using the equation,

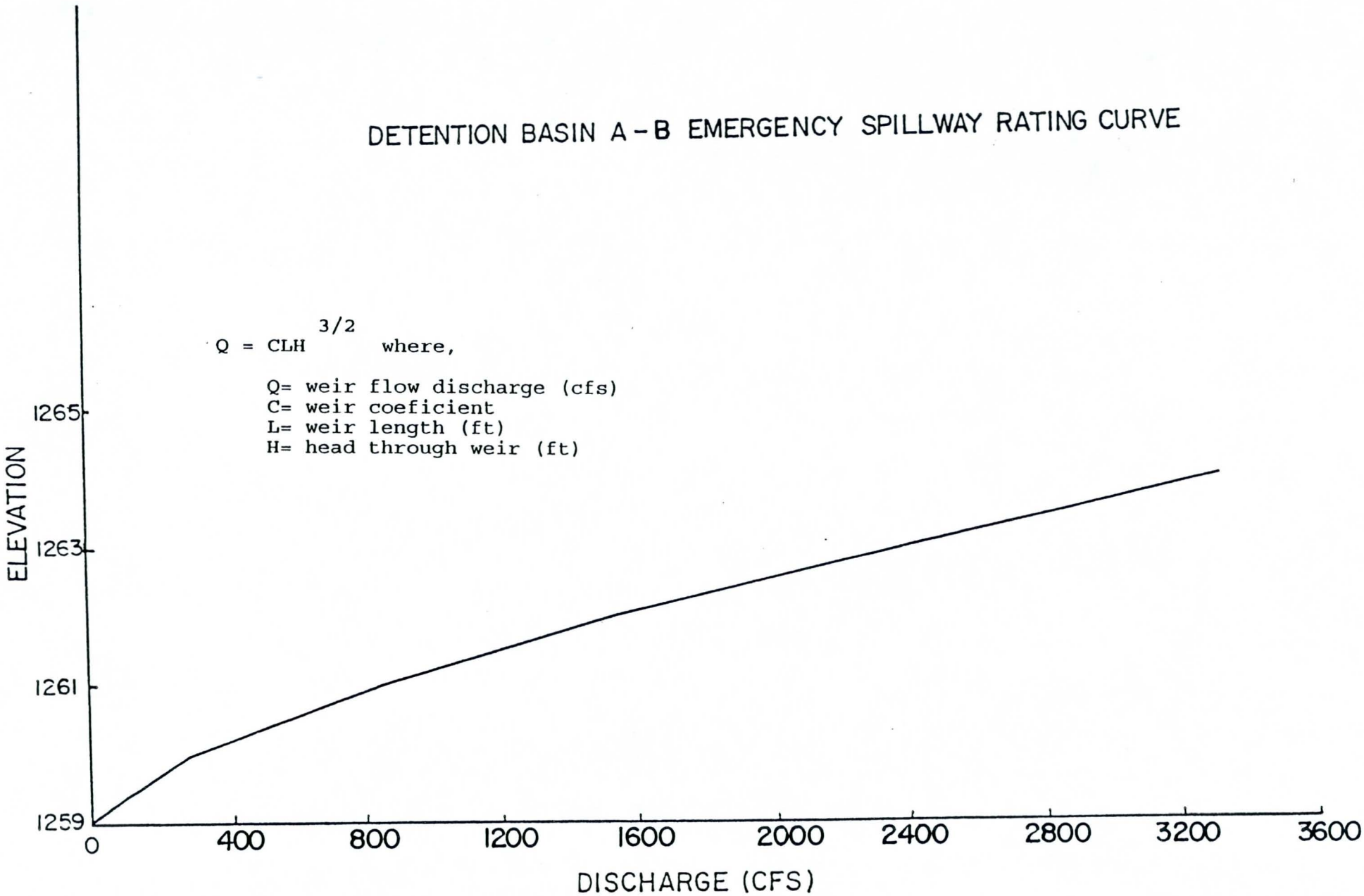
FN = sqrt(V^2 / (32.16 * A / TOP)) (Eq. m4)

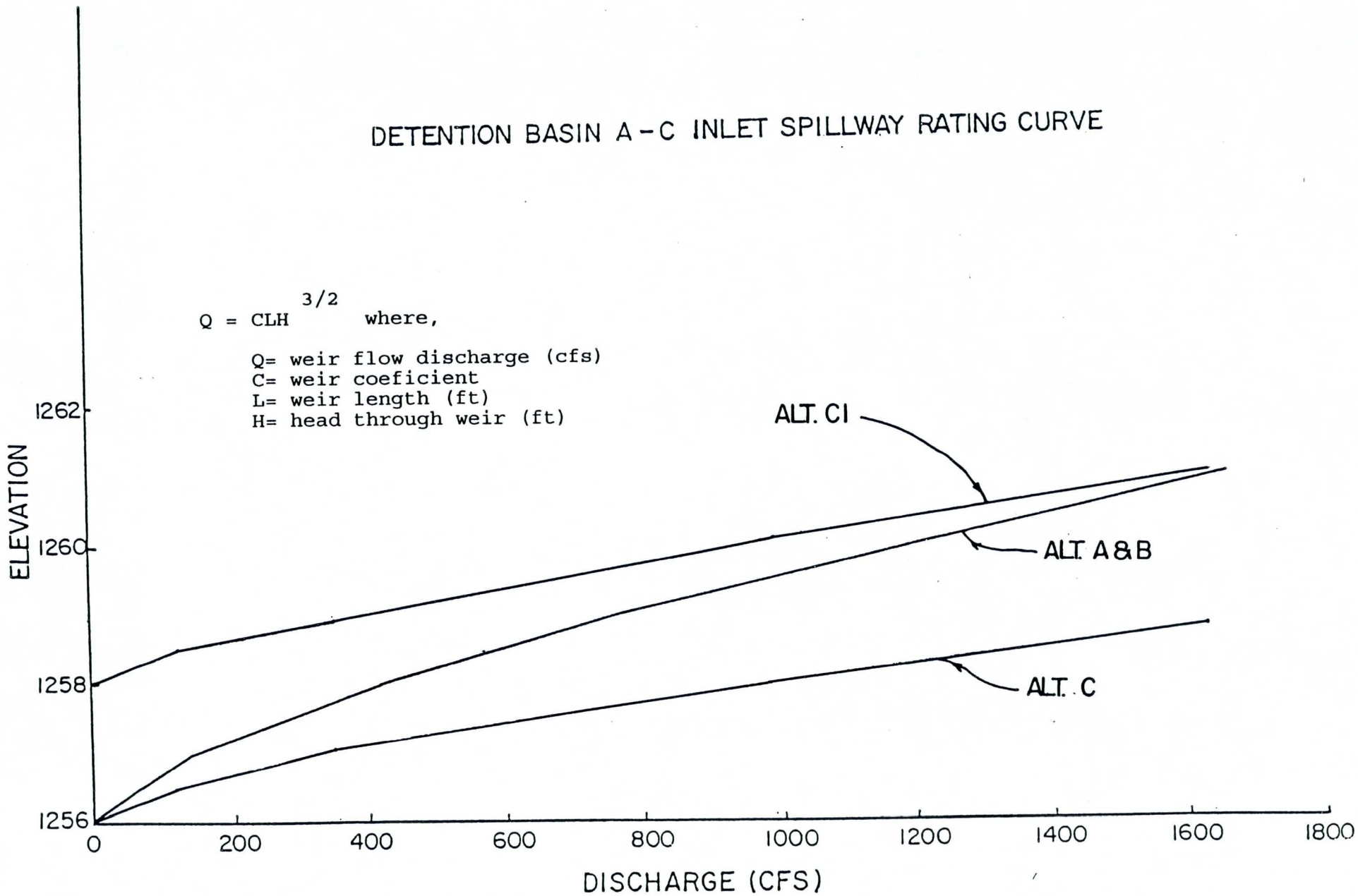
where: V = Velocity = Q / A

The FN is a dimensionless parameter which is used to determine the type of flow. If FN is less than one for subcritical flow, equals one at critical flow, and is greater than one for supercritical flow.

End of FlowMaster I Manual

E-4: Emergency Spillway


DETENTION BASIN A-B EMERGENCY SPILLWAY RATING CURVE
Q = CLH^3/2 where,
Q= weir flow discharge (cfs)
C= weir coeficient
L= weir length (ft)
H= head through weir (ft)
ELEVATION
1265
1263
1261
1259
0
400
800
1200
1600
2000
2400
2800
3200
3600
DISCHARGE (CFS)


DETENTION BASIN A-C INLET SPILLWAY RATING CURVE
Q = CLH^3/2 where,
Q= weir flow discharge (cfs)
C= weir coeficient
L= weir length (ft)
H= head through weir (ft)
ALT. C1
ALT. A & B
ALT. C
ELEVATION
1262
1260
1258
1256
0
200
400
600
800
1000
1200
1400
1600
1800
DISCHARGE (CFS)

E-5: Inlet/Outlet Alternatives C & C-1
Channel and Weir Calculations

10 th st. wash detention basin project
CROSS-SECTION - typical subcritical flow channel

STA:	.00	5.00	35.00	40.00
ELEV:	5.00	.00	.00	5.00

DISCHARGE = 350. WSEL = 1.87 SLOPE = .0020

SECTION AND SUBSECTION HYDRAULIC DATA

	TOTAL SECTION	SUBSECTION #: 1
DISCHARGE (CFS) =	350.17	350.17
VELOCITY (FT/S) =	5.89	5.89
AREA (SQUARE FT) =	59.50	59.50
TOPWIDTH (FT) =	33.73	33.73
DEPTH (FT) =	1.87	1.87
HYD. DEPTH (FT) =	1.76	1.76
WET. PERIM. (FT) =	35.28	35.28
HYD. RADIUS (FT) =	1.69	1.69
FROUDE NUMBER =	.78	.78
MANNINGS N VALUE =	.0160	.0160

SUBSECTION 1 = STATION .00 TO STATION 40.00

10 th st. wash detention basin project
CROSS-SECTION - typical subcritical flow channel

STA:	.00	5.00	35.00	40.00
ELEV:	5.00	.00	.00	5.00

DISCHARGE = 500. WSEL = 2.31 SLOPE = .0020

SECTION AND SUBSECTION HYDRAULIC DATA

	TOTAL SECTION	SUBSECTION #: 1
DISCHARGE (CFS) =	500.03	500.03
VELOCITY (FT/S) =	6.69	6.69
AREA (SQUARE FT) =	74.71	74.71
TOPWIDTH (FT) =	34.62	34.62
DEPTH (FT) =	2.31	2.31
HYD. DEPTH (FT) =	2.16	2.16
WET. PERIM. (FT) =	36.54	36.54
HYD. RADIUS (FT) =	2.04	2.04
FROUDE NUMBER =	.80	.80
MANNINGS N VALUE =	.0160	.0160

SUBSECTION 1 = STATION .00 TO STATION 40.00

10 th st. wash detention basin project
CROSS-SECTION - typical subcritical flow channel

STA:	.00	5.00	35.00	40.00
ELEV:	5.00	.00	.00	5.00

DISCHARGE = 1200. WSEL = 3.90 SLOPE = .0020

SECTION AND SUBSECTION HYDRAULIC DATA

		TOTAL SECTION	SUBSECTION #: 1
DISCHARGE (CFS)	=	1200.01	1200.01
VELOCITY (FT/S)	=	9.07	9.07
AREA (SQUARE FT)	=	132.32	132.32
TOPWIDTH (FT)	=	37.81	37.81
DEPTH (FT)	=	3.90	3.90
HYD. DEPTH (FT)	=	3.50	3.50
WET. PERIM. (FT)	=	41.04	41.04
HYD. RADIUS (FT)	=	3.22	3.22
FROUDE NUMBER	=	.85	.85
MANNINGS N VALUE	=	.0160	.0160

SUBSECTION 1 = STATION .00 TO STATION 40.00

10 th st. wash detention basin project
CROSS-SECTION - typical subcritical flow channel ('N' VALUE SENSITIVITY)

STA:	.00	5.00	35.00	40.00
ELEV:	5.00	.00	.00	5.00

DISCHARGE = 1200. WSEL = 4.19 SLOPE = .0020

SECTION AND SUBSECTION HYDRAULIC DATA

		TOTAL SECTION	SUBSECTION #: 1
DISCHARGE (CFS)	=	1200.24	1200.24
VELOCITY (FT/S)	=	8.39	8.39
AREA (SQUARE FT)	=	143.13	143.13
TOPWIDTH (FT)	=	38.37	38.37
DEPTH (FT)	=	4.19	4.19
HYD. DEPTH (FT)	=	3.73	3.73
WET. PERIM. (FT)	=	41.84	41.84
HYD. RADIUS (FT)	=	3.42	3.42
FROUDE NUMBER	=	.77	.77
MANNINGS N VALUE	=	.0180	.0180

SUBSECTION 1 = STATION .00 TO STATION 40.00

10 th st. wash detention basin project
CROSS-SECTION - typical subcritical flow channel (N' VALUE SENSITIVITY)

STA:	.00	5.00	35.00	40.00
ELEV:	5.00	.00	.00	5.00

DISCHARGE = 1200. WSEL = 3.29 SLOPE = .0020

SECTION AND SUBSECTION HYDRAULIC DATA

		TOTAL SECTION	SUBSECTION #: 1
DISCHARGE (CFS)	=	1200.18	1200.18
VELOCITY (FT/S)	=	10.97	10.97
AREA (SQUARE FT)	=	109.45	109.45
TOPWIDTH (FT)	=	36.58	36.58
DEPTH (FT)	=	3.29	3.29
HYD. DEPTH (FT)	=	2.99	2.99
WET. PERIM. (FT)	=	39.30	39.30
HYD. RADIUS (FT)	=	2.78	2.78
FROUDE NUMBER	=	1.12	1.12
MANNINGS N VALUE	=	.0120	.0120

SUBSECTION 1 = STATION .00 TO STATION 40.00

Determination of Weir Length for Alternative C - Side Weir Inlet

1) Solve for critical depth in circ. line channel

$$Q_c = 5.671\left([b + zy]y\right)^{1.5} / (b + 2zy)^{.5}$$ where

Q_c = discharge (cfs) = 12200 cfs
b = channel bottom width = 30 ft
z = channel side slopes = 1.1
y = critical depth (ft):

Iterative solution yields y = 3.54 ft

2) Determine weir flow coefficient (c)

$$C = 4.15 - \frac{1.81\,y_c}{y} - \frac{0.14\,y_c}{L}$$ where

C = weir coefficient
y_c = critical depth (ft)
y = normal depth (ft)

Note: this equation is from Henderson - Open Channel Flow equation 7-54

$$C = 4.15 - \frac{1.81 \times 3.54}{3.90} - \frac{0.14 \times 3.54}{142\,ft}$$

C = 2.50

3) Determine weir length

$$Q = CLH^{3/2}$$ where

Q = side weir discharge (cfs) (720 cfs)
C = weir coefficient (2.5)
L = weir length (142 ft)
H = head through weir (ft)

Transposing equation to solve for L

$$Q = CLH^{3/2} \rightarrow L = Q/CH^{3/2}$$

$$L = 720/2.5(3.9-2.3)^{3/2}$$

$$L = 142 \text{ ft}$$

```
STORM DRAIN ANALYSIS PLUS                    HYDRAULIC JUMP CALCULATIONS
                                   (Existing condition w/Dip across Townley)

Original version by Los Angeles County Public Works
Portions Copyrighted by CIVILSOFT, 1986, 1987, 1989

Version
Serial Number

Jun 23, 1995  12: 8:52

Input file : towndip.dat
Output file: towndip.out


                                   INPUT FILE LISTING



T1 TENTH STREET WASH     FILE NAME: TOWNDIP
T2 ALTERNATIVE B FLOW ANALYSIS
T3 FROM BYPASS FLOW CULVERT TO UPSTREAM OF TOWNLEY, NO BOX UNDER TOWNLEY
SO    775.00  56.65  1                          62.00
R     917.00  56.93  1      .016
TS    917.00  56.93  2      .040
R     947.00  57.00  2      .040
TS    977.00  62.00  3      .025
R    1027.00  63.00  3      .025
TS   1047.00  62.00  4      .030
R    1077.00  62.50  4      .030
SH                   4
1                                                   SP
                                 WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING                          PAGE    1
0 CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
  CODE   NO   TYPE  PIERS   WIDTH    DIAMETER  WIDTH              DROP

  CD      1    1      0       .00      7.00   30.00   1.00  1.00   .00
  CD      2    1      0       .00      7.00   30.00   1.00  1.00   .00
  CD      3    1      0       .00      3.00   15.00  20.00 20.00   .00
  CD      4    1      0       .00     10.00    5.00   3.00  2.00   .00
1                                                                                                   PAGE NO   1
0                          WATER SURFACE PROFILE - TITLE CARD LISTING
0HEADING LINE NO 1 IS -
0                            TENTH STREET WASH     FILE NAME: TOWNDIP
0HEADING LINE NO 2 IS -
0                            ALTERNATIVE B FLOW ANALYSIS
0HEADING LINE NO 3 IS -
0                            FROM BYPASS FLOW CULVERT TO UPSTREAM OF TOWNLEY, NO BOX UNDER TOWNLEY
1                                                                                                   PAGE NO   2
0                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO   1 IS A SYSTEM OUTLET     *         *     *
                     U/S DATA   STATION    INVERT  SECT                                  W S ELEV
                                   775.00   56.65    1                                     62.00
0 ELEMENT NO   2 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                           RADIUS  ANGLE  ANG PT  MAN H
                                   917.00   56.93    1             .016                            .00    .00     .00     0
0 ELEMENT NO   3 IS A TRANSITION        *         *     *
                     U/S DATA   STATION    INVERT  SECT              N
                                   917.00   56.93    2             .040
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
0 ELEMENT NO   4 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                           RADIUS  ANGLE  ANG PT  MAN H
                                   947.00   57.00    2             .040                            .00    .00     .00     0
0 ELEMENT NO   5 IS A TRANSITION        *         *     *
                     U/S DATA   STATION    INVERT  SECT              N
                                   977.00   62.00    3             .025
```

```
0 ELEMENT NO   6 IS A REACH              *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
                                 1027.00   63.00    3              .025                                 .00    .00     .00      0
0 ELEMENT NO   7 IS A TRANSITION         *         *     *
                    U/S DATA   STATION    INVERT  SECT              N
                                 1047.00   62.00    4              .030
 THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
0 ELEMENT NO   8 IS A REACH              *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
                                 1077.00   62.50    4              .030                                 .00    .00     .00      0
0 ELEMENT NO   9 IS A SYSTEM HEADWORKS                   *                    *
                    U/S DATA   STATION    INVERT  SECT                                     W S ELEV
                                 1077.00   62.50    4                                          .00
 NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

 ** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
1                                                                                                                          PAGE    1
                                                WATER SURFACE PROFILE LISTING
                        TENTH STREET WASH     FILE NAME: TOWNDIP
                        ALTERNATIVE B FLOW ANALYSIS
                        FROM BYPASS FLOW CULVERT TO UPSTREAM OF TOWNLEY, NO BOX UNDER TOWNLEY
0 STATION    INVERT   DEPTH     W.S.        Q       VEL     VEL     ENERGY   SUPER  CRITICAL          HGT/   BASE/    ZL   NO  AVBPR
              ELEV   OF FLOW    ELEV                        HEAD   GRD.EL.   ELEV   DEPTH             DIA    ID NO.       PIER
0 L/ELEM      SO                                          SF AVE     HF                   NORM DEPTH                    ZR
*****************************************************************************************************************************
0   775.00    56.65     5.35    62.00    1220.0    6.45     .65    62.65    .00    3.57             7.00   30.00   1.00   0    .00
0   126.86   .00197                                      .00077     .10                     3.96                     1.00
0   901.86    56.90     5.13    62.03    1220.0    6.77     .71    62.74    .00    3.57             7.00   30.00   1.00   0    .00
0    15.14   .00197                                      .00083     .01                     3.96                     1.00
0   917.00    56.93     5.11    62.04    1220.0    6.80     .72    62.76    .00    3.57             7.00   30.00   1.00   0    .00
0TRANS STR   .00000                                      .00522     .00                                              1.00
0   917.00    56.93     5.11    62.04    1220.0    6.80     .72    62.76    .00    3.57             7.00   30.00   1.00   0    .00
0    18.07   .00233                                      .00510     .09                     6.47                     1.00
0   935.07    56.97     5.18    62.15    1220.0    6.70     .70    62.85    .00    3.57             7.00   30.00   1.00   0    .00
0HYDRAULIC JUMP                                                                                                        1.00
0   935.07    56.97     2.32    59.29    1220.0   16.30    4.13    63.42    .00    3.57             7.00   30.00   1.00   0    .00
0      .09   .00233                                      .07413     .01                     6.47                     1.00
0   935.17    56.97     2.31    59.29    1220.0   16.32    4.14    63.42    .00    3.57             7.00   30.00   1.00   0    .00
0     4.02   .00233                                      .08019     .32                     6.47                     1.00
0   939.19    56.98     2.21    59.20    1220.0   17.11    4.55    63.75    .00    3.57             7.00   30.00   1.00   0    .00
0     3.95   .00233                                      .09303     .37                     6.47                     1.00
0   943.14    56.99     2.12    59.11    1220.0   17.95    5.01    64.11    .00    3.57             7.00   30.00   1.00   0    .00
0     3.86   .00233                                      .10797     .42                     6.47                     1.00
0   947.00    57.00     2.02    59.02    1220.0   18.82    5.51    64.53    .00    3.57             7.00   30.00   1.00   0    .00
0TRANS STR   .16667                                      .03879    1.16                                              1.00
0   977.00    62.00     1.95    63.95    1220.0   11.59    2.09    66.04    .00    2.62             3.00   15.00   ****   0    .00
0TRANS STR   .16667                                      .03226     .00                                              ****
1                                                                                                                          PAGE    2
                                                WATER SURFACE PROFILE LISTING
                        TENTH STREET WASH     FILE NAME: TOWNDIP
                        ALTERNATIVE B FLOW ANALYSIS
                        FROM BYPASS FLOW CULVERT TO UPSTREAM OF TOWNLEY, NO BOX UNDER TOWNLEY
0 STATION    INVERT   DEPTH     W.S.        Q       VEL     VEL     ENERGY   SUPER  CRITICAL          HGT/   BASE/    ZL   NO  AVBPR
              ELEV   OF FLOW    ELEV                        HEAD   GRD.EL.   ELEV   DEPTH             DIA    ID NO.       PIER
0 L/ELEM      SO                                          SF AVE     HF                   NORM DEPTH                    ZR
*****************************************************************************************************************************
0   977.00    62.00     1.95    63.95    1220.0   11.59    2.09    66.04    .00    2.62             3.00   15.00   ****   0    .00
0     2.01   .02000                                      .03262     .07                     2.16                     ****
0   979.01    62.04     1.94    63.98    1220.0   11.69    2.12    66.10    .00    2.62             3.00   15.00   ****   0    .00
0    10.44   .02000                                      .03524     .37                     2.16                     ****
0   989.45    62.25     1.89    64.14    1220.0   12.26    2.33    66.47    .00    2.62             3.00   15.00   ****   0    .00
0     9.06   .02000                                      .04005     .36                     2.16                     ****
0   998.51    62.43     1.84    64.27    1220.0   12.85    2.57    66.83    .00    2.62             3.00   15.00   ****   0    .00
0     8.08   .02000                                      .04552     .37                     2.16                     ****
0  1006.59    62.59     1.78    64.38    1220.0   13.48    2.82    67.20    .00    2.62             3.00   15.00   ****   0    .00
0     7.35   .02000                                      .05174     .38                     2.16                     ****
```

```
0  1013.94    62.74     1.74     64.47    1220.0    14.14     3.11     67.58    .00     2.62              3.00    15.00  ****   0    .00
0     6.77   .02000                                          .05881      .40                    2.16                     ****
0  1020.71    62.87     1.69     64.56    1220.0    14.83     3.42     67.98    .00     2.62              3.00    15.00  ****   0    .00
0     6.29   .02000                                          .06685      .42                    2.16                     ****
0  1027.00    63.00     1.64     64.64    1220.0    15.55     3.76     68.40    .00     2.62              3.00    15.00  ****   0    .00
0TRANS STR  -.05000                                          .05844     1.17                                              ****
0  1047.00    62.00     5.41     67.41    1220.0    12.19     2.31     69.72    .00     5.91             10.00     5.00  3.00   0    .00
0TRANS STR  -.05000                                          .01446      .00                                              2.00
0  1047.00    62.00     5.41     67.41    1220.0    12.19     2.31     69.72    .00     5.91             10.00     5.00  3.00   0    .00
0     7.19   .01667                                          .01423      .10                    5.24                     2.00
0  1054.19    62.12     5.44     67.56    1220.0    12.04     2.25     69.82    .00     5.91             10.00     5.00  3.00   0    .00
0    15.18   .01667                                          .01316      .20                    5.24                     2.00
1                                                                                                                    PAGE    3
```

WATER SURFACE PROFILE LISTING

TENTH STREET WASH FILE NAME: TOWNDIP

ALTERNATIVE B FLOW ANALYSIS

FROM BYPASS FLOW CULVERT TO UPSTREAM OF TOWNLEY, NO BOX UNDER TOWNLEY

```
0 STATION    INVERT   DEPTH     W.S.       Q       VEL      VEL     ENERGY   SUPER  CRITICAL            HGT/   BASE/    ZL   NO  AVBPR
           ELEV    OF FLOW    ELEV                         HEAD    GRD.EL.   ELEV    DEPTH              DIA    ID NO.        PIER
0 L/ELEM     SO                                          SF AVE     HF                     NORM DEPTH                ZR
*****************************************************************************************************************************
0  1069.37    62.37     5.60     67.97    1220.0    11.48     2.05     70.02    .00     5.91             10.00     5.00  3.00   0    .00
0     6.07   .01667                                          .01159      .07                    5.24                     2.00
0  1075.44    62.47     5.75     68.22    1220.0    10.95     1.86     70.09    .00     5.91             10.00     5.00  3.00   0    .00
0     1.56   .01667                                          .01020      .02                    5.24                     2.00
0  1077.00    62.50     5.91     68.41    1220.0    10.44     1.69     70.10    .00     5.91             10.00     5.00  3.00   0    .00
1
```

```
STORM DRAIN ANALYSIS PLUS                          HYDRAULIC JUMP CALCULATIONS
                                                 (Future box culvert at Townley)

Original version by Los Angeles County Public Works
Portions Copyrighted by CIVILSOFT, 1986, 1987, 1989

Jun 23, 1995  12: 6:40

Input file : townbox.dat
Output file: townbox.out

                                    INPUT FILE LISTING


T1 TENTH STREET WASH     FILE NAME: TOWNBOX
T2 ALTERNATIVE B FLOW ANALYSIS   FROM BYPASS FLOW BOX CULVERT
T3 TO UPSTREAM OF TOWNLEY, WITH BOX CULVERT UNDER TOWNLEY
SO    775.00  56.65  1                          62.00
R     917.00  56.93  1      .016
TS    917.00  56.93  2      .040
R     947.00  57.00  2      .040
TS    957.00  57.02  3      .016
R    1027.00  57.42  3      .016
TS   1027.00  57.42  4      .040
R    1047.00  57.44  4      .040
TS   1047.00  62.00  5      .030
R    1077.00  62.50  5      .030
SH                   5
1                                                   SP
                                WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING                          PAGE    1
0 CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
  CODE   NO   TYPE  PIERS   WIDTH    DIAMETER  WIDTH              DROP

  CD      1    1      0       .00      7.00   30.00   1.00  1.00   .00
  CD      2    1      0       .00      7.00   30.00   1.00  1.00   .00
  CD      3    3      0      1.00      6.00   25.00    .00   .00   .00
  CD      4    2      0       .00     10.00   25.00                .00
  CD      5    1      0       .00     10.00    5.00   3.00  2.00   .00
1                                                                                                          PAGE NO   1
0                          WATER SURFACE PROFILE - TITLE CARD LISTING
0HEADING LINE NO 1 IS -
0                            TENTH STREET WASH     FILE NAME: TOWNBOX
0HEADING LINE NO 2 IS -
0                            ALTERNATIVE B FLOW ANALYSIS   FROM BYPASS FLOW BOX CULVERT
0HEADING LINE NO 3 IS -
0                            TO UPSTREAM OF TOWNLEY, WITH BOX CULVERT UNDER TOWNLEY
1                                                                                                          PAGE NO   2
0                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO   1 IS A SYSTEM OUTLET     *         *     *
                     U/S DATA   STATION    INVERT  SECT                                  W S ELEV
                                  775.00   56.65    1                                      62.00
0 ELEMENT NO   2 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
                                  917.00   56.93    1              .016                                  .00    .00     .00      0
0 ELEMENT NO   3 IS A TRANSITION        *         *     *
                     U/S DATA   STATION    INVERT  SECT              N
                                  917.00   56.93    2              .040
 THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
0 ELEMENT NO   4 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
                                  947.00   57.00    2              .040                                  .00    .00     .00      0
0 ELEMENT NO   5 IS A TRANSITION        *         *     *
                     U/S DATA   STATION    INVERT  SECT              N
                                  957.00   57.02    3              .016
```

```
0 ELEMENT NO   6 IS A REACH              *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
                                 1027.00   57.42    3              .016                                  .00    .00     .00      0
0 ELEMENT NO   7 IS A TRANSITION         *         *     *
                     U/S DATA   STATION    INVERT  SECT              N
                                 1027.00   57.42    4              .040
 THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
0 ELEMENT NO   8 IS A REACH              *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
                                 1047.00   57.44    4              .040                                  .00    .00     .00      0
0 ELEMENT NO   9 IS A TRANSITION         *         *     *
                     U/S DATA   STATION    INVERT  SECT              N
                                 1047.00   62.00    5              .030
0 ELEMENT NO  10 IS A REACH              *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
                                 1077.00   62.50    5              .030                                  .00    .00     .00      0
 0 ELEMENT NO  11 IS A SYSTEM HEADWORKS                  *                    *
                     U/S DATA   STATION    INVERT  SECT                                     W S ELEV
                                 1077.00   62.50    5                                          .00
 NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
 ** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
1                                                                                                                                PAGE    1
                                                WATER SURFACE PROFILE LISTING
                          TENTH STREET WASH      FILE NAME: TOWNBOX
                          ALTERNATIVE B FLOW ANALYSIS   FROM BYPASS FLOW BOX CULVERT
                          TO UPSTREAM OF TOWNLEY, WITH BOX CULVERT UNDER TOWNLEY
0 STATION    INVERT   DEPTH     W.S.        Q       VEL     VEL     ENERGY   SUPER  CRITICAL          HGT/   BASE/    ZL   NO  AVBPR
              ELEV   OF FLOW    ELEV                         HEAD   GRD.EL.   ELEV    DEPTH            DIA    ID NO.        PIER
0 L/ELEM      SO                                           SF AVE     HF                     NORM DEPTH                  ZR
*****************************************************************************************************************************
0   775.00    56.65     5.35     62.00    1220.0    6.45     .65    62.65    .00     3.57             7.00   30.00   1.00   0   .00
0   126.86   .00197                                       .00077     .10                      3.96                     1.00
0   901.86    56.90     5.13     62.03    1220.0    6.77     .71    62.74    .00     3.57             7.00   30.00   1.00   0   .00
0    15.14   .00197                                       .00083     .01                      3.96                     1.00
0   917.00    56.93     5.11     62.04    1220.0    6.80     .72    62.76    .00     3.57             7.00   30.00   1.00   0   .00
0TRANS STR   .00000                                       .00522     .00                                               1.00
0   917.00    56.93     5.11     62.04    1220.0    6.80     .72    62.76    .00     3.57             7.00   30.00   1.00   0   .00
0    17.16   .00233                                       .00511     .09                      6.47                     1.00
0   934.16    56.97     5.18     62.15    1220.0    6.70     .70    62.84    .00     3.57             7.00   30.00   1.00   0   .00
0HYDRAULIC JUMP                                                                                                          1.00
0   934.16    56.97     2.32     59.29    1220.0   16.29    4.12    63.41    .00     3.57             7.00   30.00   1.00   0   .00
0     1.06   .00233                                       .07523     .08                      6.47                     1.00
0   935.22    56.97     2.29     59.27    1220.0   16.48    4.22    63.49    .00     3.57             7.00   30.00   1.00   0   .00
0     4.01   .00233                                       .08273     .33                      6.47                     1.00
0   939.23    56.98     2.19     59.17    1220.0   17.28    4.64    63.82    .00     3.57             7.00   30.00   1.00   0   .00
0     3.93   .00233                                       .09599     .38                      6.47                     1.00
0   943.16    56.99     2.10     59.09    1220.0   18.13    5.11    64.19    .00     3.57             7.00   30.00   1.00   0   .00
0     3.84   .00233                                       .11142     .43                      6.47                     1.00
0   947.00    57.00     2.00     59.00    1220.0   19.01    5.62    64.62    .00     3.57             7.00   30.00   1.00   0   .00
0TRANS STR   .00200                                       .01622     .16                                               1.00
0   957.00    57.02     2.69     59.71    1220.0   18.17    5.13    64.83    .00     4.20             6.00   25.00    .00   0  1.00
0    27.70   .00571                                       .01391     .39                      3.54                      .00
1                                                                                                                                PAGE    2
                                                WATER SURFACE PROFILE LISTING
                          TENTH STREET WASH      FILE NAME: TOWNBOX
                          ALTERNATIVE B FLOW ANALYSIS   FROM BYPASS FLOW BOX CULVERT
                          TO UPSTREAM OF TOWNLEY, WITH BOX CULVERT UNDER TOWNLEY
0 STATION    INVERT   DEPTH     W.S.        Q       VEL     VEL     ENERGY   SUPER  CRITICAL          HGT/   BASE/    ZL   NO  AVBPR
              ELEV   OF FLOW    ELEV                         HEAD   GRD.EL.   ELEV    DEPTH            DIA    ID NO.        PIER
0 L/ELEM      SO                                           SF AVE     HF                     NORM DEPTH                  ZR
*****************************************************************************************************************************
0   984.70    57.18     2.61     59.79    1220.0   18.70    5.44    65.22    .00     4.20             6.00   25.00    .00   0  1.00
0    42.30   .00571                                       .01569     .66                      3.54                      .00
0  1027.00    57.42     2.49     59.91    1220.0   19.61    5.98    65.89    .00     4.20             6.00   25.00    .00   0  1.00
0TRANS STR   .00000                                       .10535     .00                                                .00
0  1027.00    57.42     2.49     59.91    1220.0   19.62    5.98    65.89    .00     4.20            10.00   25.00    .00   0   .00
```

```
0TRANS STR   .00000                                          .10537     .00                                                  .00
0  1027.00   57.42    2.49    59.91   1220.0   19.62    5.98    65.89    .00    4.20          10.00   25.00   .00   0    .00
0     4.01   .00100                                       .11325     .45                12.31                              .00
0  1031.01   57.42    2.38    59.80   1220.0   20.51    6.54    66.34    .00    4.20          10.00   25.00   .00   0    .00
0     4.18   .00100                                       .13085     .55                12.31                              .00
0  1035.20   57.43    2.27    59.70   1220.0   21.52    7.19    66.89    .00    4.20          10.00   25.00   .00   0    .00
0     4.07   .00100                                       .15189     .62                12.31                              .00
0  1039.26   57.43    2.16    59.59   1220.0   22.57    7.91    67.51    .00    4.20          10.00   25.00   .00   0    .00
0     3.94   .00100                                       .17638     .69                12.31                              .00
0  1043.20   57.44    2.06    59.50   1220.0   23.67    8.70    68.20    .00    4.20          10.00   25.00   .00   0    .00
0     3.80   .00100                                       .20490     .78                12.31                              .00
0  1047.00   57.44    1.97    59.41   1220.0   24.82    9.57    68.98    .00    4.20          10.00   25.00   .00   0    .00
0TRANS STR   .00000                                       .06917     .00                                                  .00
0  1047.00   62.00    5.41    67.41   1220.0   12.19    2.31    69.72    .00    5.91          10.00    5.00  3.00   0    .00
0TRANS STR   .00000                                       .01446     .00                                                 2.00
0  1047.00   62.00    5.41    67.41   1220.0   12.19    2.31    69.72    .00    5.91          10.00    5.00  3.00   0    .00
0     7.19   .01667                                       .01423     .10                 5.24                               2.00
1                                                                                                                      PAGE    3
```

WATER SURFACE PROFILE LISTING

TENTH STREET WASH FILE NAME: TOWNBOX

ALTERNATIVE B FLOW ANALYSIS FROM BYPASS FLOW BOX CULVERT

TO UPSTREAM OF TOWNLEY, WITH BOX CULVERT UNDER TOWNLEY

```
0 STATION    INVERT   DEPTH     W.S.       Q      VEL     VEL     ENERGY   SUPER  CRITICAL          HGT/   BASE/    ZL   NO  AVBPR
              ELEV   OF FLOW    ELEV                      HEAD   GRD.EL.   ELEV   DEPTH              DIA   ID NO.        PIER
0 L/ELEM      SO                                        SF AVE     HF                   NORM DEPTH                ZR
*****************************************************************************************************************************
0  1054.19   62.12    5.44    67.56   1220.0   12.04    2.25    69.82    .00    5.91          10.00    5.00  3.00   0    .00
0    15.18   .01667                                       .01316     .20                 5.24                               2.00
0  1069.37   62.37    5.60    67.97   1220.0   11.48    2.05    70.02    .00    5.91          10.00    5.00  3.00   0    .00
0     6.07   .01667                                       .01159     .07                 5.24                               2.00
0  1075.44   62.47    5.75    68.22   1220.0   10.95    1.86    70.09    .00    5.91          10.00    5.00  3.00   0    .00
0     1.56   .01667                                       .01020     .02                 5.24                               2.00
0  1077.00   62.50    5.91    68.41   1220.0   10.44    1.69    70.10    .00    5.91          10.00    5.00  3.00   0    .00
1
```

E-6: Inlet/Outlet Alternatives C-1A
HEC-1, Box Culverts and Equalizer Pipe Calculations

```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*            SEPTEMBER 1990            *
*             VERSION 4.0              *
*                                      *
*  RUN DATE  05/31/1995  TIME  16:07:45 *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
```

ALTERNATIVE C-1A

```
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


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

  1           ID
  2           ID        FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  3           ID        TENTH STREET WASH DETENTION BASIN NO 1  (FCD 93-31)
  4           ID        STANLEY CONSULTANTS, INC.  (SCI JOB # 12183)
  5           ID        AMENDED BY RUST E & I TO INCLUDE BASINS 2A & 2B (5/95)
  6           ID        DCR ALTTERNATIVE 3
  7           ID        HEC-1 INPUT FILENAME :  ALTC1R.HC1
  8           ID
  9           ID        ************************************************************************
 10           ID        THIS MODEL REPRESENTS THE PROPOSED 10TH STREET WASH DETENTION BASIN #1.
 11           ID        THE FOLLOWING BASIN CHARACTERISTICS ARE EVALUATED:
 12           ID          1. INLET CONFIGURATION 1, INLET 1 CONSISTS OF A SIDE OVERFLOW WEIR
 13           ID             CONFIGURATION (100' WEIR 3.34' ABOVE FLOWLINE) FOR THE WEST TRIB
 14           ID             AND A WEIR INLET (30' WEIR AT CREST ELEV. 1321) FOR THE EAST TRIB.
 15           ID             INLET CONTROL CONDITIONS ASSUMED.
 16           ID          2. BASIN CONFIGURATION 1, 3:1 SIDES ON 3 SIDES AND A VERTICAL
 17           ID             RETAINING WALL ON THE WEST SIDE, A BOTTOM ELEVATION OF 1306, AND
 18           ID             25' ADDITIONAL R.O.W. ALONG THE SOUTH BASIN PARCEL BOUNDARY.
 19           ID          3. OUTLET CONFIGURATION 1, UTILIZING A 30" RCP TO CHASE GRADE AS THE
 20           ID             LOW FLOW AND PRINCIPAL OUTLET.
 21           ID        ************************************************************************
 22           ID
```

```
 23          ID        ***********************************************************************
 24          ID        THIS HEC-1 MODEL IS BASED ON THE KAMINSKI-HUBBARD ACDC ADMS AS MODIFIED
 25          ID        BY FCD TO REFLECT TWO HYPOTHETICAL DETENTION BASINS (NUMBERS 1 AND 2).
 26          ID        THE DIFFERENCES BETWEEN THIS MODEL AND THE ORIGINAL MODEL TRANSMITTED
 27          ID        BY FCD TO SCI AT THE PROJECT KICKOFF MEETING ARE AS FOLLOWS:
 28          ID          1. USE OF THE HEC-1 DATA STORAGE SYSTEM OPTION HAS BEEN DELETED;
 29          ID          2. THE TWO HYPOTHETICAL DETENTION BASINS 1 AND 2 HAVE BEEN DELETED;
 30          ID          3. THE CROSS SECTIONAL AREA OF THE PRINCIPAL SPILLWAY OUTLET PIPE OF
 31          ID             THE EXISTING CITY OF PHOENIX DET BASIN NO. 3 HAS BEEN CHANGED FROM
 32          ID             4.91 SQFT (WHICH CORRESPONDS TO AN OUTLET PIPE DIAM OF 30") TO
 33          ID             1.36 SQFT CORRESPONDING TO THE 14" X 14" STEEL ORIFICE PLATE WHICH
 34          ID             WAS ORIGINALLY DESIGNED AND INSTALLED.
 35          ID        ***********************************************************************
 36          ID
 37          ID   ACDC AREA DRAINAGE MASTER STUDY
 38          ID   10TH STREET WASH WATERSHED
 39          ID   FILENAME:  TEN36.DAT     KHE JOB NO. 0146
 40          ID   100-YEAR 6-HOUR DURATION STORM
             *
             *  Based on FCDMC comments dated March 17,1992 we adjusted the Mannings "n"
             *  coefficient to reflect weighted averaging in lieu of log averaging.
             *  We also changed the S-graph from Phoenix Mountain to Phoenix Valley.
             *
             *DIAGRAM
 41          IT       3                    300
 42          IO       5

 43          KK    140S
 44          KM   RUNOFF GENERATED ON SUB-BASIN 140
 45          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 46          KM    L= 1.22 mi.  Lca= 0.51 mi.  S= 162 ft/mi.  Kn= .050  LAG= 22.87 min.
 47          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 48          BA    .516
```



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

 49          IN      15
 50          KM   RAINFALL DEPTH OF 3.00 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
 51          KM   AN AREAL REDUCTION COEFFICIENT OF .975 WAS USED
 52          PB  2.9200
 53          KM   THE FOLLOWING PC RECORD USED A 6-HOUR RAINFALL WITH PATTERN NO. 2.01
 54          PC    .000    .009    .016    .025    .034    .042    .051    .059    .067    .076
 55          PC    .087    .100    .120    .163    .252    .451    .694    .837    .900    .938
 56          PC    .950    .963    .975    .988   1.000
 57          LG    .145    .339   4.25    .488   20.44
 58          UI     76.    119.    294.    391.    468.    577.    793.    930.    712.    588.
 59          UI    474.    381.    274.    154.    127.     90.     76.     26.     23.     23.
 60          UI     23.     23.      0.      0.      0.      0.      0.      0.      0.      0.
 61          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 62          KK   DT140
 63          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.0 AC-FT FROM SUB-BASIN 140
 64          KM                                              (Hydrograph identified as OR140)
 65          KM                                            2) Balance of runoff continues on.
 66          KM                                              (Hydrograph identified as DT140)
 67          DT   OR140     2.0
 68          DI       0   10000
 69          DQ       0   10000
 70          KM   ***************************************************************************
```

```
 71          KM    KK 140RR
 72          KM    KM ROUTE FLOW THROUGH NORTH MOUNTAIN DETENTION NO.3
 73          KM    RS     1    ELEV    55.9
 74          KM    SV     0     .06    1.52    6.32   17.42   35.46   60.34   95.64
 75          KM    SE  55.9      58      62      66      70      74      78      82
 76          KM    SL 57.15    4.91      .6      .5
 77          KM        ***********************************************************************
 78          KM    THE SL RECORD (LOW-LEVEL OUTLET) SECOND FIELD (ORIFICE AREA) VALUE HAS
 79          KM    BEEN CHANGED BY SCI FROM 4.91 sq.ft. TO 1.36 sq.ft. (14"x14" INLET)
 80          KM        ***********************************************************************
 81          KM    SS 79.66     100     3.0     1.5
 82          KM   ******************************************************************************

 83          KK   140RR
 84          KM   ROUTE FLOW THROUGH NORTH MOUNTAIN DETENTION NO.3
 85          RS       1    ELEV    55.9
 86          SV       0     .06    1.52    6.32   17.42   35.46   60.34   95.64
 87          SE    55.9      58      62      66      70      74      78      82
 88          SL   56.43    1.36      .6      .5
 89          SS   80.00     100     3.0     1.5

 90          KK   RM140
 91          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM DETENTION BASIN THROUGH SUB-BASIN 141
 92          KM           1) Reach Length = 3600 ft.
 93          RD
 94          RC    .045    .045    .045    3600   .0108
 95          RX       0       0    46.5    76.4    79.9   110.2   160.2   160.2
 96          RY      16    12.6     7.3       0       0     9.9    15.9      16
```



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

 97          KK    141S
 98          KM   RUNOFF GENERATED ON SUB-BASIN 141
 99          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
100          KM    L= 0.83 mi.  Lca= 0.57 mi.  S= 315 ft/mi.  Kn= .042  LAG= 15.26 min.
101          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
102          BA    .187
103          LG    .126    .303    3.61    .313   38.57
104          UI     41.    136.    222.    297.    467.    414.    304.    220.    131.     70.
105          UI     47.     23.     13.     13.     13.      0.      0.      0.      0.      0.
106          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

107          KK   DT141
108          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.4 AC-FT FROM SUB-BASIN 141
109          KM                                              (Hydrograph identified as OR141)
110          KM                                            2) Balance of runoff continues on.
111          KM                                              (Hydrograph identified as DT141)
112          DT   OR141     2.4
113          DI       0   10000
114          DQ       0   10000

115          KK   HC141
116          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 141 WITH ROUTED FLOW FROM DETENTION
117          HC       2
118          KM   ******************************************************************************

119          KK  DVT141   SPLIT HYDROGRAPH 141 TO DET142 AND HC142
120          KM           DI-DQ BASED ON HYDRAULIC RATING CURVE FOR PROPOSED INLET AND
```

```
121        KM          EXISTING 30" PIPE.  WEIR LENGTH IS 30' WEIR CREST IS ELEV 1321.
122        KM          DQ IS AMOUNT DIVERTED AROUND DETENTION BASIN DOWNSTREAM.
123        KM          DI-DQ DIFFERENCE IS ROUTED THRU THE PROPOSED DETENTION BASIN
124        DT  DVT141
125        DI       0      12      50     114     196     294
126        DQ       0      12      15      18      20      22
127        KM   ******************************************************************************

128        KK    142S
129        KM   RUNOFF GENERATED ON SUB-BASIN 142
130        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
131        KM    L= 1.16 mi.  Lca= 0.75 mi.  S= 257 ft/mi.  Kn= .042  LAG= 19.99 min.
132        KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
133        BA    .512
134        LG    .127    .309    4.12    .267   34.03
135        UI     86.    178.    377.    488.    608.    839.   1049.    795.    637.    498.
136        UI    380.    210.    146.    107.     80.     26.     26.     26.     26.      0.
137        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
138        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

139        KK   DT142
140        KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 3.6 AC-FT FROM SUB-BASIN 142
141        KM                                              (Hydrograph identified as OR142)
142        KM                                            2) Balance of runoff continues on.
143        KM                                              (Hydrograph identified as DT142)
144        DT   OR142     3.6
145        DI       0   10000
```



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

146        DQ       0   10000
147        KM   ******************************************************************************

148        KK  DVT142   SPLIT HYDROGRAPH DVT142 TO DET142 AND HC142
149        KM          DI-DQ BASED ON HYDRAULIC RATING CURVE FOR PROPOSED INLET AND
150        KM          IMPROVED WASH CROSS SECTION.  WEIR LENGTH IS 100' WEIR CREST ELEV IS
151        KM          3.34' ABOVE WASH FLOWLINE.
152        KM          DQ IS AMOUNT DIVERTED AROUND DETENTION BASIN DOWNSTREAM.
153        KM          DI-DQ DIFFERENCE IS ROUTED THRU THE PROPOSED DETENTION BASIN
154        DT  DVT142
155        DI       0     280     300     350     400     450     500     550     600     672
156        DQ       0     280     295     312     317     319     318     317     313     307

157        KK  ADD142
158        KM   COMBINE HYDROGRAPHS FROM (DI-DQ) FROM DVT141 WITH (DI-DQ) FROM DVT142
159        HC       2

160        KK  DET142   ROUTE HYDROGRAPH ADD142 THRU DET BASIN 142
161        KM          1-30" RCP  AS LOW FLOW AND PRINCIPAL OUTLET (INV. EL. 1306)
162        RS       1    STOR      -1
163        SV     .00   0.060   0.460   1.470   3.040   4.890   6.850   8.910   11.08   13.36
164        SV   15.74   18.23   20.83   23.53   26.33
165        SQ       0     4.5    15.9    29.0    37.0    44.0    50.0    55.0    60.0    65.0
166        SQ      70      72      78      80      84
167        SE    1306    1307    1308    1309    1310    1311    1312    1313    1314    1315
168        SE    1316    1317    1318    1319    1320

169        KK  DVT141    RETRIEVE PREVIOUSLY SPLIT HYDROGRAPH FROM SUB-BASIN 141
170        DR  DVT141
```

```
171          KK  DVT142    RETRIEVE PREVIOUSLY SPLIT HYDROGRAPH FROM SUB-BASIN 142
172          DR  DVT142

173          KK   HC142
174          KM   COMBINE HYDROGRAPHS (DQ) FROM DVT142, (DQ) FROM DVT141 AND DET142 OUTFLOW
175          HC       3
176          KM   ******************************************************************************

177          KK   RM142
178          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASINS 141/142 THROUGH 143
179          KM            1) Reach Length = 5140 ft.
180          RD
181          RC    .050    .045    .050    5140   .0086
182          RX       0       0    43.8    61.3    67.4    78.3    89.8    89.8
183          RY    10.8     9.4     9.4       0       0     5.4     8.8    10.8

184          KK    143S
185          KM   RUNOFF GENERATED ON SUB-BASIN 143
186          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
187          KM    L= 1.64 mi.  Lca= 0.88  S= 273 ft/mi.  Kn= .035  LAG= 19.96 min.
188          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
189          BA    .604
190          LG    .115    .279    4.12    .269   49.66
191          UI    102.    212.    446.    577.    720.    994.   1238.    937.    750.    586.
192          UI    447.    244.    173.    125.     93.     31.     31.     31.     31.      0.
                                           HEC-1 INPUT                                          PAGE  5

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

193          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
194          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

195          KK   DT143
196          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 5.7 AC-FT FROM SUB-BASIN 143
197          KM                                              (Hydrograph identified as OR143)
198          KM                                            2) Balance of runoff continues on.
199          KM                                              (Hydrograph identified as DT143)
200          DT   OR143     5.7
201          DI       0   10000
202          DQ       0   10000

203          KK   HC143
204          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 143 WITH ROUTED FLOW FROM 141/142
205          HC       2

206          KK   RM143
207          KO       1
208          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASIN 143 THROUGH 144
209          KM            1) Reach Length = 1400 ft.
210          RD
211          RC    .040    .035    .030    1400   .0100
212          RX       0       0    77.8    88.3    96.6   112.8   161.3   161.3
213          RY      10     6.2     6.2       0       0     6.3     6.9      10

214          KK  BYPASS   IN CHANNEL FLOWS AROUND DETENTION FACILITY NO. 2
215          KO       1
216          KM   BYPASS FLOW THROUGH  CULVERT (600' LONG) THRU BASIN CAPACITY=500 CFS
217          DT   DIV 2
218          DI       0     356     360     511     744     990    1233
```

```
DQ       0       0       4     108     272     472     673

KK  DIV 2A    RETRIEVE DIVERTED FLOW TO BASIN 2A
DR   DIV 2

KK    144S
KM   RUNOFF GENERATED ON SUB-BASIN 144
KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
KM    L= 1.80 mi.  Lca= 1.11 mi.  S= 291 ft/mi.  Kn= .036  LAG= 22.95 min.
KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
BA    .475
LG    .118    .280    3.61     .32   43.17
UI     70.    108.    269.    357.    428.    527.    721.    857.    657.    543.
UI    437.    353.    256.    145.    117.     85.     70.     26.     21.     21.
UI     21.     21.      0.      0.      0.      0.      0.      0.      0.      0.
UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

KK   DT144
KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.1 AC-FT FROM SUB-BASIN 144
KM                                              (Hydrograph identified as OR144)
KM                                            2) Balance of runoff continues on.
KM                                              (Hydrograph identified as DT144)
DT   OR144     2.1
DI       0   10000
DQ       0   10000
```



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

KK   DIV1P    DIVERT PALMA PARK FLOWS OVER 350 CFS
KM   DIVERSION REPRESENTS LOSS OF FLOW NOT ACCEPTED BY THE PALMA PARK INLET
DT   DIV1P
DI       0     350     351     615    1000
DQ       0       0       1     265     650

KK  SITE2A
KM   COMBINE HYDROGRAPH FROM SUB-BASIN 144 WITH FLOW DIVERTED INTO BASIN 2A
HC       2
KO       1

KK  SITE2A   DETENTION BASIN AT SITE 2A **************************
KM        ALTERNATIVE 3  SPILLWAY TO BASIN 2B AT ELEV. 1256
KM        FLOW IS CONVEYED THROUGH 2 @ 60-INCH PIPES
KO       1       2
RS       1    STOR       0
SV       0    1.61    3.59    5.90    8.50   11.44   14.80   18.60   22.80
SE    1248    1250    1252    1254    1256    1258    1260    1262    1264
SQ       0      24      34      44      55      72     103     293     439     715
SQ     803     868
SE    1248    1250    1252    1254    1256  1256.5    1257 1258.85  1259.9    1262
SE    1260  1262.8

KK  60INCH    OVERFLOW INTO BASIN 2B THROUGH TWIN 60-INCH PIPES
KO       1
KM            DIVERT BASIN 2A LOW FLOW OUTLET (24" RCP)
KM            DIVERSION OF BASIN 2A 24" RCP OUTLET AWAY FROM BASIN 2B
DT  2AOUTL
DI       0      55     868
DQ       0      55      77
```

```
268          KK  SITE2B    DETENTION BASIN AT SITE 2B **************************
269          KM            ALTERNATIVE 3
270          KO       1       2
271          RS       1    STOR       0
272          SV       0    7.28   15.19   23.89   36.03   49.05   62.55
273          SE    1248    1250    1252    1254    1256    1258    1260
274          SQ       0      17      33      60      71      82      92

275          KK   RET1P    RETRIEVE DIVERTED PALMA PARK FLOW
276          DR   DIV1P

277          KK  2A RET    RETRIEVE BASIN 2A OUTFLOW FROM 24" RCP
278          DR  2AOUTL

279          KK   COMB2   RECOMBINE IN CHANNEL FLOW WITH OUTFLOW FROM DETENTION BASIN 2
280          KM           AND PALMA PARK FLOW
281          KO       1
282          HC       4
```



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


283          KK   RM144
284          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASIN 144 THROUGH 145
285          KM           1) Reach Length = 3000 ft.
286          RD
287          RC    .035    .035    .030    3000   .0073
288          RX       0       0    36.6      52    64.9    79.8   107.8   107.8
289          RY      11     7.7     7.4       0       0     8.3     8.5      11

290          KK    145S
291          KM   RUNOFF GENERATED ON SUB-BASIN 145
292          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
293          KM    L= 1.37 mi.  Lca= 0.86 mi.  S= 242 ft/mi.  Kn= .032  LAG= 17.28 min.
294          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
295          BA    .548
296          LG    .105    .265    5.67    .210   44.60
297          UI    107.    287.    526.    678.    922.   1303.    982.    755.    568.    378.
298          UI    186.    145.     98.     33.     33.     33.     33.      0.      0.      0.
299          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

300          KK   HC145
301          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 145 WITH ROUTED FLOW FROM 144
302          KM   ALSO DETERMINES 10TH STREET WASH DISCHARGE INTO ACDC
303          HC       2
304          ZZ
1
     SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

   43       140S
              .
              .
   67         .------->   OR140
   62      DT140
```

```
            V
            V
 83      140RR
            V
            V
 90      RM140
            .
            .
 97         .        141S
            .          .
            .          .
112         .          .-------->   OR141
107         .      DT141
            .          .
            .          .
115      HC141............
            .
            .
124         .-------->  DVT141
119     DVT141
            .
            .
128         .        142S
            .          .
            .          .
144         .          .-------->   OR142
139         .      DT142
            .          .
            .          .
154         .          .-------->  DVT142
148         .     DVT142
            .          .
            .          .
157     ADD142............
            V
            V
160     DET142
            .
            .
170         .          .<--------  DVT141
169         .     DVT141
            .          .
            .          .
172         .          .           .<--------  DVT142
171         .          .      DVT142
            .          .           .
            .          .           .
173      HC142........................
            V
            V
177      RM142
            .
            .
184         .        143S
            .          .
            .          .
200         .          .-------->   OR143
195         .      DT143
            .          .
            .          .
```

```
203      HC143............
             V
             V
206      RM143
             .
             .
217          .------->   DIV 2
214     BYPASS
             .
             .
221          .          .<-------   DIV 2
220          .      DIV 2A
             .          .
             .          .
222          .          .        144S
             .          .          .
             .          .          .
238          .          .          .------->   OR144
233          .          .       DT144
             .          .          .
             .          .          .
243          .          .          .------->   DIV1P
241          .          .       DIV1P
             .          .          .
             .          .          .
246          .      SITE2A............
             .          V
             .          V
250          .      SITE2A
             .          .
             .          .
265          .          .------->  2AOUTL
261          .      60INCH
             .          V
             .          V
268          .      SITE2B
             .          .
             .          .
276          .          .          .<-------   DIV1P
275          .          .       RET1P
             .          .          .
             .          .          .
278          .          .          .          .<-------  2AOUTL
277          .          .          .      2A RET
             .          .          .          .
             .          .          .          .
279      COMB2.................................
             V
             V
283      RM144
             .
             .
290          .        145S
             .          .
             .          .
300      HC145............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1********** **********

* * * *

```
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*            SEPTEMBER 1990             *
*             VERSION 4.0               *
*                                       *
* RUN DATE  05/31/1995  TIME  16:07:45 *
*                                       *
*****************************************
```

```
*    U.S. ARMY CORPS OF ENGINEERS     *
*    HYDROLOGIC ENGINEERING CENTER    *
*          609 SECOND STREET          *
*       DAVIS, CALIFORNIA 95616       *
*           (916) 756-1104            *
*                                     *
***************************************
```

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
TENTH STREET WASH DETENTION BASIN NO 1 (FCD 93-31)
STANLEY CONSULTANTS, INC. (SCI JOB # 12183)
AMENDED BY RUST E & I TO INCLUDE BASINS 2A & 2B (5/95)
DCR ALTTERNATIVE 3
HEC-1 INPUT FILENAME : ALTC1R.HC1

```
************************************************************************
THIS MODEL REPRESENTS THE PROPOSED 10TH STREET WASH DETENTION BASIN #1.
THE FOLLOWING BASIN CHARACTERISTICS ARE EVALUATED:
  1. INLET CONFIGURATION 1, INLET 1 CONSISTS OF A SIDE OVERFLOW WEIR
     CONFIGURATION (100' WEIR 3.34' ABOVE FLOWLINE) FOR THE WEST TRIB
     AND A WEIR INLET (30' WEIR AT CREST ELEV. 1321) FOR THE EAST TRIB.
     INLET CONTROL CONDITIONS ASSUMED.
  2. BASIN CONFIGURATION 1, 3:1 SIDES ON 3 SIDES AND A VERTICAL
     RETAINING WALL ON THE WEST SIDE, A BOTTOM ELEVATION OF 1306, AND
     25' ADDITIONAL R.O.W. ALONG THE SOUTH BASIN PARCEL BOUNDARY.
  3. OUTLET CONFIGURATION 1, UTILIZING A 30" RCP TO CHASE GRADE AS THE
     LOW FLOW AND PRINCIPAL OUTLET.
************************************************************************

************************************************************************
THIS HEC-1 MODEL IS BASED ON THE KAMINSKI-HUBBARD ACDC ADMS AS MODIFIED
BY FCD TO REFLECT TWO HYPOTHETICAL DETENTION BASINS (NUMBERS 1 AND 2).
THE DIFFERENCES BETWEEN THIS MODEL AND THE ORIGINAL MODEL TRANSMITTED
BY FCD TO SCI AT THE PROJECT KICKOFF MEETING ARE AS FOLLOWS:
  1. USE OF THE HEC-1 DATA STORAGE SYSTEM OPTION HAS BEEN DELETED;
  2. THE TWO HYPOTHETICAL DETENTION BASINS 1 AND 2 HAVE BEEN DELETED;
  3. THE CROSS SECTIONAL AREA OF THE PRINCIPAL SPILLWAY OUTLET PIPE OF
     THE EXISTING CITY OF PHOENIX DET BASIN NO. 3 HAS BEEN CHANGED FROM
     4.91 SQFT (WHICH CORRESPONDS TO AN OUTLET PIPE DIAM OF 30") TO
     1.36 SQFT CORRESPONDING TO THE 14" X 14" STEEL ORIFICE PLATE WHICH
     WAS ORIGINALLY DESIGNED AND INSTALLED.
************************************************************************
```

ACDC AREA DRAINAGE MASTER STUDY
10TH STREET WASH WATERSHED
FILENAME: TEN36.DAT   KHE JOB NO. 0146
100-YEAR 6-HOUR DURATION STORM

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

   IT        HYDROGRAPH TIME DATA
                    NMIN          3  MINUTES IN COMPUTATION INTERVAL
```

```
                IDATE      1    0  STARTING DATE
                ITIME        0000  STARTING TIME
                   NQ         300  NUMBER OF HYDROGRAPH ORDINATES
              NDDATE      1    0  ENDING DATE
              NDTIME        1457  ENDING TIME
              ICENT           19  CENTURY MARK

          COMPUTATION INTERVAL     .05 HOURS
               TOTAL TIME BASE   14.95 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


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


       **************
       *            *
206 KK *     RM143  *
       *            *
       **************

207 KO       OUTPUT CONTROL VARIABLES
                 IPRNT           1  PRINT CONTROL
                 IPLOT           0  PLOT CONTROL
                 QSCAL          0.  HYDROGRAPH PLOT SCALE
                    MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASIN 143 THROUGH 144
                             1) Reach Length = 1400 ft.

         HYDROGRAPH ROUTING DATA

210 RD       MUSKINGUM-CUNGE CHANNEL ROUTING

211 RC       NORMAL DEPTH CHANNEL
                  ANL        .040  LEFT OVERBANK N-VALUE
                 ANCH        .035  MAIN CHANNEL N-VALUE
                  ANR        .030  RIGHT OVERBANK N-VALUE
                RLNTH       1400.  REACH LENGTH
                  SEL       .0100  ENERGY SLOPE
                ELMAX          .0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                   CROSS-SECTION DATA
                     --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
213 RY     ELEVATION     10.00      6.20      6.20       .00       .00      6.30      6.90     10.00
212 RX     DISTANCE        .00       .00     77.80     88.30     96.60    112.80    161.30    161.30

                                                  ***

                                   COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

       STORAGE        .00       .16       .36       .59       .87      1.18      1.53      1.91      2.34      2.80
       OUTFLOW        .00     12.58     41.94     87.02    148.56    227.67    325.56    443.47    582.63    744.26
```

ELEVATION	.00	.53	1.05	1.58	2.11	2.63	3.16	3.68	4.21	4.74
STORAGE	3.30	3.84	4.71	7.00	9.72	12.45	15.18	17.91	20.64	23.36
OUTFLOW	929.56	1139.70	1390.17	1866.93	2579.43	3481.11	4542.46	5746.71	7081.82	8538.41
ELEVATION	5.26	5.79	6.32	6.84	7.37	7.89	8.42	8.95	9.47	10.00

COMPUTED MUSKINGUM-CUNGE PARAMETERS

COMPUTATION TIME STEP

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN			2.19	700.00	1220.60	252.19	1.49	10.64

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN			3.00		1220.23	252.00	1.49

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1450E+03 EXCESS= .0000E+00 OUTFLOW= .1449E+03 BASIN STORAGE= .2244E+00 PERCENT ERROR= .0

****

HYDROGRAPH AT STATION RM143

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0345	76	294.	1		0730	151	76.	1		1115	226	44.
1		0003	2	0.	1		0348	77	375.	1		0733	152	76.	1		1118	227	43.
1		0006	3	0.	1		0351	78	516.	1		0736	153	76.	1		1121	228	43.
1		0009	4	0.	1		0354	79	680.	1		0739	154	75.	1		1124	229	43.
1		0012	5	0.	1		0357	80	834.	1		0742	155	75.	1		1127	230	42.
1		0015	6	0.	1		0400	81	980.	1		0745	156	74.	1		1130	231	42.
1		0018	7	0.	1		0403	82	1094.	1		0748	157	74.	1		1133	232	41.
1		0021	8	0.	1		0406	83	1172.	1		0751	158	73.	1		1136	233	40.
1		0024	9	0.	1		0409	84	1209.	1		0754	159	73.	1		1139	234	39.
1		0027	10	0.	1		0412	85	1220.	1		0757	160	72.	1		1142	235	39.
1		0030	11	0.	1		0415	86	1215.	1		0800	161	72.	1		1145	236	38.
1		0033	12	0.	1		0418	87	1188.	1		0803	162	72.	1		1148	237	37.
1		0036	13	0.	1		0421	88	1136.	1		0806	163	71.	1		1151	238	37.
1		0039	14	0.	1		0424	89	1071.	1		0809	164	71.	1		1154	239	36.
1		0042	15	0.	1		0427	90	1011.	1		0812	165	70.	1		1157	240	35.
1		0045	16	0.	1		0430	91	952.	1		0815	166	70.	1		1200	241	35.
1		0048	17	0.	1		0433	92	891.	1		0818	167	69.	1		1203	242	34.
1		0051	18	0.	1		0436	93	826.	1		0821	168	69.	1		1206	243	34.
1		0054	19	0.	1		0439	94	762.	1		0824	169	69.	1		1209	244	33.
1		0057	20	0.	1		0442	95	705.	1		0827	170	68.	1		1212	245	33.
1		0100	21	0.	1		0445	96	650.	1		0830	171	68.	1		1215	246	32.
1		0103	22	0.	1		0448	97	593.	1		0833	172	67.	1		1218	247	32.
1		0106	23	0.	1		0451	98	530.	1		0836	173	67.	1		1221	248	31.
1		0109	24	0.	1		0454	99	467.	1		0839	174	67.	1		1224	249	31.
1		0112	25	0.	1		0457	100	410.	1		0842	175	66.	1		1227	250	31.
1		0115	26	0.	1		0500	101	360.	1		0845	176	66.	1		1230	251	30.
1		0118	27	0.	1		0503	102	319.	1		0848	177	65.	1		1233	252	30.

1	0121	28	0.	*	1	0506	103	283.	*	1	0851	178	65.	*	1	1236	253	30.
1	0124	29	0.	*	1	0509	104	252.	*	1	0854	179	65.	*	1	1239	254	29.
1	0127	30	0.	*	1	0512	105	226.	*	1	0857	180	64.	*	1	1242	255	29.
1	0130	31	0.	*	1	0515	106	205.	*	1	0900	181	64.	*	1	1245	256	28.
1	0133	32	0.	*	1	0518	107	188.	*	1	0903	182	63.	*	1	1248	257	28.
1	0136	33	0.	*	1	0521	108	176.	*	1	0906	183	63.	*	1	1251	258	28.
1	0139	34	0.	*	1	0524	109	166.	*	1	0909	184	63.	*	1	1254	259	27.
1	0142	35	0.	*	1	0527	110	157.	*	1	0912	185	62.	*	1	1257	260	27.
1	0145	36	0.	*	1	0530	111	151.	*	1	0915	186	62.	*	1	1300	261	26.
1	0148	37	0.	*	1	0533	112	146.	*	1	0918	187	61.	*	1	1303	262	26.
1	0151	38	0.	*	1	0536	113	142.	*	1	0921	188	61.	*	1	1306	263	26.
1	0154	39	0.	*	1	0539	114	140.	*	1	0924	189	60.	*	1	1309	264	25.
1	0157	40	0.	*	1	0542	115	138.	*	1	0927	190	60.	*	1	1312	265	25.
1	0200	41	0.	*	1	0545	116	136.	*	1	0930	191	59.	*	1	1315	266	25.
1	0203	42	0.	*	1	0548	117	135.	*	1	0933	192	59.	*	1	1318	267	25.
1	0206	43	0.	*	1	0551	118	134.	*	1	0936	193	59.	*	1	1321	268	25.
1	0209	44	0.	*	1	0554	119	134.	*	1	0939	194	58.	*	1	1324	269	24.
1	0212	45	0.	*	1	0557	120	133.	*	1	0942	195	58.	*	1	1327	270	24.
1	0215	46	0.	*	1	0600	121	132.	*	1	0945	196	57.	*	1	1330	271	24.
1	0218	47	0.	*	1	0603	122	132.	*	1	0948	197	57.	*	1	1333	272	24.
1	0221	48	0.	*	1	0606	123	131.	*	1	0951	198	56.	*	1	1336	273	24.
1	0224	49	0.	*	1	0609	124	129.	*	1	0954	199	56.	*	1	1339	274	24.
1	0227	50	0.	*	1	0612	125	127.	*	1	0957	200	55.	*	1	1342	275	24.
1	0230	51	0.	*	1	0615	126	125.	*	1	1000	201	55.	*	1	1345	276	24.
1	0233	52	0.	*	1	0618	127	122.	*	1	1003	202	54.	*	1	1348	277	23.
1	0236	53	0.	*	1	0621	128	118.	*	1	1006	203	54.	*	1	1351	278	23.
1	0239	54	0.	*	1	0624	129	114.	*	1	1009	204	54.	*	1	1354	279	23.
1	0242	55	0.	*	1	0627	130	109.	*	1	1012	205	53.	*	1	1357	280	23.
1	0245	56	0.	*	1	0630	131	105.	*	1	1015	206	53.	*	1	1400	281	23.
1	0248	57	0.	*	1	0633	132	102.	*	1	1018	207	52.	*	1	1403	282	23.
1	0251	58	0.	*	1	0636	133	98.	*	1	1021	208	52.	*	1	1406	283	23.
1	0254	59	0.	*	1	0639	134	95.	*	1	1024	209	51.	*	1	1409	284	23.
1	0257	60	0.	*	1	0642	135	92.	*	1	1027	210	51.	*	1	1412	285	23.
1	0300	61	0.	*	1	0645	136	89.	*	1	1030	211	51.	*	1	1415	286	23.
1	0303	62	0.	*	1	0648	137	87.	*	1	1033	212	50.	*	1	1418	287	23.
1	0306	63	0.	*	1	0651	138	85.	*	1	1036	213	50.	*	1	1421	288	23.
1	0309	64	0.	*	1	0654	139	84.	*	1	1039	214	49.	*	1	1424	289	23.
1	0312	65	0.	*	1	0657	140	83.	*	1	1042	215	49.	*	1	1427	290	23.
1	0315	66	0.	*	1	0700	141	82.	*	1	1045	216	48.	*	1	1430	291	23.
1	0318	67	0.	*	1	0703	142	81.	*	1	1048	217	48.	*	1	1433	292	23.
1	0321	68	2.	*	1	0706	143	80.	*	1	1051	218	47.	*	1	1436	293	23.
1	0324	69	37.	*	1	0709	144	80.	*	1	1054	219	47.	*	1	1439	294	22.
1	0327	70	85.	*	1	0712	145	79.	*	1	1057	220	46.	*	1	1442	295	22.
1	0330	71	101.	*	1	0715	146	79.	*	1	1100	221	46.	*	1	1445	296	22.
1	0333	72	119.	*	1	0718	147	78.	*	1	1103	222	46.	*	1	1448	297	22.
1	0336	73	145.	*	1	0721	148	78.	*	1	1106	223	45.	*	1	1451	298	22.
1	0339	74	184.	*	1	0724	149	77.	*	1	1109	224	45.	*	1	1454	299	22.
1	0342	75	234.	*	1	0727	150	77.	*	1	1112	225	44.	*	1	1457	300	22.
				*					*					*				

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	14.95-HR
(CFS)	(HR)					
		(CFS)				
+ 1220.	4.20		258.	117.	117.	117.
		(INCHES)	1.319	1.493	1.493	1.493
		(AC-FT)	128.	145.	145.	145.

CUMULATIVE AREA = 1.82 SQ MI

*** ***

```
          **************
          *            *
214 KK    *   BYPASS   *        IN CHANNEL FLOWS AROUND DETENTION FACILITY NO. 2
          *            *
          **************

215 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           1  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
                        BYPASS FLOW THROUGH  CULVERT (600' LONG) THRU BASIN CAPACITY=500 CFS

   DT           DIVERSION
                     ISTAD       DIV 2  DIVERSION HYDROGRAPH IDENTIFICATION

   DI              INFLOW         .00    356.00    360.00    511.00    744.00    990.00   1233.00

   DQ        DIVERTED FLOW        .00       .00      4.00    108.00    272.00    472.00    673.00

                                                          ***
```

****

DIVERSION HYDROGRAPH DIV 2

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0345	76	0.	1		0730	151	0.	1		1115	226	0.
1		0003	2	0.	1		0348	77	14.	1		0733	152	0.	1		1118	227	0.
1		0006	3	0.	1		0351	78	111.	1		0736	153	0.	1		1121	228	0.
1		0009	4	0.	1		0354	79	227.	1		0739	154	0.	1		1124	229	0.
1		0012	5	0.	1		0357	80	345.	1		0742	155	0.	1		1127	230	0.
1		0015	6	0.	1		0400	81	464.	1		0745	156	0.	1		1130	231	0.
1		0018	7	0.	1		0403	82	558.	1		0748	157	0.	1		1133	232	0.
1		0021	8	0.	1		0406	83	622.	1		0751	158	0.	1		1136	233	0.
1		0024	9	0.	1		0409	84	653.	1		0754	159	0.	1		1139	234	0.
1		0027	10	0.	1		0412	85	662.	1		0757	160	0.	1		1142	235	0.
1		0030	11	0.	1		0415	86	658.	1		0800	161	0.	1		1145	236	0.
1		0033	12	0.	1		0418	87	636.	1		0803	162	0.	1		1148	237	0.
1		0036	13	0.	1		0421	88	593.	1		0806	163	0.	1		1151	238	0.
1		0039	14	0.	1		0424	89	539.	1		0809	164	0.	1		1154	239	0.
1		0042	15	0.	1		0427	90	489.	1		0812	165	0.	1		1157	240	0.
1		0045	16	0.	1		0430	91	441.	1		0815	166	0.	1		1200	241	0.
1		0048	17	0.	1		0433	92	392.	1		0818	167	0.	1		1203	242	0.
1		0051	18	0.	1		0436	93	338.	1		0821	168	0.	1		1206	243	0.
1		0054	19	0.	1		0439	94	286.	1		0824	169	0.	1		1209	244	0.
1		0057	20	0.	1		0442	95	244.	1		0827	170	0.	1		1212	245	0.
1		0100	21	0.	1		0445	96	206.	1		0830	171	0.	1		1215	246	0.
1		0103	22	0.	1		0448	97	165.	1		0833	172	0.	1		1218	247	0.
1		0106	23	0.	1		0451	98	122.	1		0836	173	0.	1		1221	248	0.
1		0109	24	0.	1		0454	99	78.	1		0839	174	0.	1		1224	249	0.

1	0112	25	0.	*	1	0457	100	38.	*	1	0842	175	0.	*	1	1227	250	0.
1	0115	26	0.	*	1	0500	101	4.	*	1	0845	176	0.	*	1	1230	251	0.
1	0118	27	0.	*	1	0503	102	0.	*	1	0848	177	0.	*	1	1233	252	0.
1	0121	28	0.	*	1	0506	103	0.	*	1	0851	178	0.	*	1	1236	253	0.
1	0124	29	0.	*	1	0509	104	0.	*	1	0854	179	0.	*	1	1239	254	0.
1	0127	30	0.	*	1	0512	105	0.	*	1	0857	180	0.	*	1	1242	255	0.
1	0130	31	0.	*	1	0515	106	0.	*	1	0900	181	0.	*	1	1245	256	0.
1	0133	32	0.	*	1	0518	107	0.	*	1	0903	182	0.	*	1	1248	257	0.
1	0136	33	0.	*	1	0521	108	0.	*	1	0906	183	0.	*	1	1251	258	0.
1	0139	34	0.	*	1	0524	109	0.	*	1	0909	184	0.	*	1	1254	259	0.
1	0142	35	0.	*	1	0527	110	0.	*	1	0912	185	0.	*	1	1257	260	0.
1	0145	36	0.	*	1	0530	111	0.	*	1	0915	186	0.	*	1	1300	261	0.
1	0148	37	0.	*	1	0533	112	0.	*	1	0918	187	0.	*	1	1303	262	0.
1	0151	38	0.	*	1	0536	113	0.	*	1	0921	188	0.	*	1	1306	263	0.
1	0154	39	0.	*	1	0539	114	0.	*	1	0924	189	0.	*	1	1309	264	0.
1	0157	40	0.	*	1	0542	115	0.	*	1	0927	190	0.	*	1	1312	265	0.
1	0200	41	0.	*	1	0545	116	0.	*	1	0930	191	0.	*	1	1315	266	0.
1	0203	42	0.	*	1	0548	117	0.	*	1	0933	192	0.	*	1	1318	267	0.
1	0206	43	0.	*	1	0551	118	0.	*	1	0936	193	0.	*	1	1321	268	0.
1	0209	44	0.	*	1	0554	119	0.	*	1	0939	194	0.	*	1	1324	269	0.
1	0212	45	0.	*	1	0557	120	0.	*	1	0942	195	0.	*	1	1327	270	0.
1	0215	46	0.	*	1	0600	121	0.	*	1	0945	196	0.	*	1	1330	271	0.
1	0218	47	0.	*	1	0603	122	0.	*	1	0948	197	0.	*	1	1333	272	0.
1	0221	48	0.	*	1	0606	123	0.	*	1	0951	198	0.	*	1	1336	273	0.
1	0224	49	0.	*	1	0609	124	0.	*	1	0954	199	0.	*	1	1339	274	0.
1	0227	50	0.	*	1	0612	125	0.	*	1	0957	200	0.	*	1	1342	275	0.
1	0230	51	0.	*	1	0615	126	0.	*	1	1000	201	0.	*	1	1345	276	0.
1	0233	52	0.	*	1	0618	127	0.	*	1	1003	202	0.	*	1	1348	277	0.
1	0236	53	0.	*	1	0621	128	0.	*	1	1006	203	0.	*	1	1351	278	0.
1	0239	54	0.	*	1	0624	129	0.	*	1	1009	204	0.	*	1	1354	279	0.
1	0242	55	0.	*	1	0627	130	0.	*	1	1012	205	0.	*	1	1357	280	0.
1	0245	56	0.	*	1	0630	131	0.	*	1	1015	206	0.	*	1	1400	281	0.
1	0248	57	0.	*	1	0633	132	0.	*	1	1018	207	0.	*	1	1403	282	0.
1	0251	58	0.	*	1	0636	133	0.	*	1	1021	208	0.	*	1	1406	283	0.
1	0254	59	0.	*	1	0639	134	0.	*	1	1024	209	0.	*	1	1409	284	0.
1	0257	60	0.	*	1	0642	135	0.	*	1	1027	210	0.	*	1	1412	285	0.
1	0300	61	0.	*	1	0645	136	0.	*	1	1030	211	0.	*	1	1415	286	0.
1	0303	62	0.	*	1	0648	137	0.	*	1	1033	212	0.	*	1	1418	287	0.
1	0306	63	0.	*	1	0651	138	0.	*	1	1036	213	0.	*	1	1421	288	0.
1	0309	64	0.	*	1	0654	139	0.	*	1	1039	214	0.	*	1	1424	289	0.
1	0312	65	0.	*	1	0657	140	0.	*	1	1042	215	0.	*	1	1427	290	0.
1	0315	66	0.	*	1	0700	141	0.	*	1	1045	216	0.	*	1	1430	291	0.
1	0318	67	0.	*	1	0703	142	0.	*	1	1048	217	0.	*	1	1433	292	0.
1	0321	68	0.	*	1	0706	143	0.	*	1	1051	218	0.	*	1	1436	293	0.
1	0324	69	0.	*	1	0709	144	0.	*	1	1054	219	0.	*	1	1439	294	0.
1	0327	70	0.	*	1	0712	145	0.	*	1	1057	220	0.	*	1	1442	295	0.
1	0330	71	0.	*	1	0715	146	0.	*	1	1100	221	0.	*	1	1445	296	0.
1	0333	72	0.	*	1	0718	147	0.	*	1	1103	222	0.	*	1	1448	297	0.
1	0336	73	0.	*	1	0721	148	0.	*	1	1106	223	0.	*	1	1451	298	0.
1	0339	74	0.	*	1	0724	149	0.	*	1	1109	224	0.	*	1	1454	299	0.
1	0342	75	0.	*	1	0727	150	0.	*	1	1112	225	0.	*	1	1457	300	0.
				*					*					*				

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	14.95-HR
(CFS)	(HR)					
		(CFS)				
+ 662.	4.20		74.	30.	30.	30.
		(INCHES)	.379	.379	.379	.379

(AC-FT) 37. 37. 37. 37.

CUMULATIVE AREA = 1.82 SQ MI

****

HYDROGRAPH AT STATION BYPASS

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0345	76	294.	1		0730	151	76.	1		1115	226	44.
1		0003	2	0.	1		0348	77	361.	1		0733	152	76.	1		1118	227	43.
1		0006	3	0.	1		0351	78	404.	1		0736	153	76.	1		1121	228	43.
1		0009	4	0.	1		0354	79	453.	1		0739	154	75.	1		1124	229	43.
1		0012	5	0.	1		0357	80	489.	1		0742	155	75.	1		1127	230	42.
1		0015	6	0.	1		0400	81	516.	1		0745	156	74.	1		1130	231	42.
1		0018	7	0.	1		0403	82	536.	1		0748	157	74.	1		1133	232	41.
1		0021	8	0.	1		0406	83	549.	1		0751	158	73.	1		1136	233	40.
1		0024	9	0.	1		0409	84	556.	1		0754	159	73.	1		1139	234	39.
1		0027	10	0.	1		0412	85	558.	1		0757	160	72.	1		1142	235	39.
1		0030	11	0.	1		0415	86	557.	1		0800	161	72.	1		1145	236	38.
1		0033	12	0.	1		0418	87	552.	1		0803	162	72.	1		1148	237	37.
1		0036	13	0.	1		0421	88	543.	1		0806	163	71.	1		1151	238	37.
1		0039	14	0.	1		0424	89	532.	1		0809	164	71.	1		1154	239	36.
1		0042	15	0.	1		0427	90	522.	1		0812	165	70.	1		1157	240	35.
1		0045	16	0.	1		0430	91	511.	1		0815	166	70.	1		1200	241	35.
1		0048	17	0.	1		0433	92	500.	1		0818	167	69.	1		1203	242	34.
1		0051	18	0.	1		0436	93	487.	1		0821	168	69.	1		1206	243	34.
1		0054	19	0.	1		0439	94	475.	1		0824	169	69.	1		1209	244	33.
1		0057	20	0.	1		0442	95	460.	1		0827	170	68.	1		1212	245	33.
1		0100	21	0.	1		0445	96	444.	1		0830	171	68.	1		1215	246	32.
1		0103	22	0.	1		0448	97	427.	1		0833	172	67.	1		1218	247	32.
1		0106	23	0.	1		0451	98	409.	1		0836	173	67.	1		1221	248	31.
1		0109	24	0.	1		0454	99	389.	1		0839	174	67.	1		1224	249	31.
1		0112	25	0.	1		0457	100	371.	1		0842	175	66.	1		1227	250	31.
1		0115	26	0.	1		0500	101	356.	1		0845	176	66.	1		1230	251	30.
1		0118	27	0.	1		0503	102	319.	1		0848	177	65.	1		1233	252	30.
1		0121	28	0.	1		0506	103	283.	1		0851	178	65.	1		1236	253	30.
1		0124	29	0.	1		0509	104	252.	1		0854	179	65.	1		1239	254	29.
1		0127	30	0.	1		0512	105	226.	1		0857	180	64.	1		1242	255	29.
1		0130	31	0.	1		0515	106	205.	1		0900	181	64.	1		1245	256	28.
1		0133	32	0.	1		0518	107	188.	1		0903	182	63.	1		1248	257	28.
1		0136	33	0.	1		0521	108	176.	1		0906	183	63.	1		1251	258	28.
1		0139	34	0.	1		0524	109	166.	1		0909	184	63.	1		1254	259	27.
1		0142	35	0.	1		0527	110	157.	1		0912	185	62.	1		1257	260	27.
1		0145	36	0.	1		0530	111	151.	1		0915	186	62.	1		1300	261	26.
1		0148	37	0.	1		0533	112	146.	1		0918	187	61.	1		1303	262	26.
1		0151	38	0.	1		0536	113	142.	1		0921	188	61.	1		1306	263	26.
1		0154	39	0.	1		0539	114	140.	1		0924	189	60.	1		1309	264	25.
1		0157	40	0.	1		0542	115	138.	1		0927	190	60.	1		1312	265	25.
1		0200	41	0.	1		0545	116	136.	1		0930	191	59.	1		1315	266	25.
1		0203	42	0.	1		0548	117	135.	1		0933	192	59.	1		1318	267	25.
1		0206	43	0.	1		0551	118	134.	1		0936	193	59.	1		1321	268	25.
1		0209	44	0.	1		0554	119	134.	1		0939	194	58.	1		1324	269	24.
1		0212	45	0.	1		0557	120	133.	1		0942	195	58.	1		1327	270	24.
1		0215	46	0.	1		0600	121	132.	1		0945	196	57.	1		1330	271	24.
1		0218	47	0.	1		0603	122	132.	1		0948	197	57.	1		1333	272	24.

1	0221	48	0.	*	1	0606	123	131.	*	1	0951	198	56.	*	1	1336	273	24.
1	0224	49	0.	*	1	0609	124	129.	*	1	0954	199	56.	*	1	1339	274	24.
1	0227	50	0.	*	1	0612	125	127.	*	1	0957	200	55.	*	1	1342	275	24.
1	0230	51	0.	*	1	0615	126	125.	*	1	1000	201	55.	*	1	1345	276	24.
1	0233	52	0.	*	1	0618	127	122.	*	1	1003	202	54.	*	1	1348	277	23.
1	0236	53	0.	*	1	0621	128	118.	*	1	1006	203	54.	*	1	1351	278	23.
1	0239	54	0.	*	1	0624	129	114.	*	1	1009	204	54.	*	1	1354	279	23.
1	0242	55	0.	*	1	0627	130	109.	*	1	1012	205	53.	*	1	1357	280	23.
1	0245	56	0.	*	1	0630	131	105.	*	1	1015	206	53.	*	1	1400	281	23.
1	0248	57	0.	*	1	0633	132	102.	*	1	1018	207	52.	*	1	1403	282	23.
1	0251	58	0.	*	1	0636	133	98.	*	1	1021	208	52.	*	1	1406	283	23.
1	0254	59	0.	*	1	0639	134	95.	*	1	1024	209	51.	*	1	1409	284	23.
1	0257	60	0.	*	1	0642	135	92.	*	1	1027	210	51.	*	1	1412	285	23.
1	0300	61	0.	*	1	0645	136	89.	*	1	1030	211	51.	*	1	1415	286	23.
1	0303	62	0.	*	1	0648	137	87.	*	1	1033	212	50.	*	1	1418	287	23.
1	0306	63	0.	*	1	0651	138	85.	*	1	1036	213	50.	*	1	1421	288	23.
1	0309	64	0.	*	1	0654	139	84.	*	1	1039	214	49.	*	1	1424	289	23.
1	0312	65	0.	*	1	0657	140	83.	*	1	1042	215	49.	*	1	1427	290	23.
1	0315	66	0.	*	1	0700	141	82.	*	1	1045	216	48.	*	1	1430	291	23.
1	0318	67	0.	*	1	0703	142	81.	*	1	1048	217	48.	*	1	1433	292	23.
1	0321	68	2.	*	1	0706	143	80.	*	1	1051	218	47.	*	1	1436	293	23.
1	0324	69	37.	*	1	0709	144	80.	*	1	1054	219	47.	*	1	1439	294	22.
1	0327	70	85.	*	1	0712	145	79.	*	1	1057	220	46.	*	1	1442	295	22.
1	0330	71	101.	*	1	0715	146	79.	*	1	1100	221	46.	*	1	1445	296	22.
1	0333	72	119.	*	1	0718	147	78.	*	1	1103	222	46.	*	1	1448	297	22.
1	0336	73	145.	*	1	0721	148	78.	*	1	1106	223	45.	*	1	1451	298	22.
1	0339	74	184.	*	1	0724	149	77.	*	1	1109	224	45.	*	1	1454	299	22.
1	0342	75	234.	*	1	0727	150	77.	*	1	1112	225	44.	*	1	1457	300	22.
				*					*					*				

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	14.95-HR
		(CFS)				
+ 558.	4.20		184.	87.	87.	87.
		(INCHES)	.941	1.114	1.114	1.114
		(AC-FT)	91.	108.	108.	108.

CUMULATIVE AREA = 1.82 SQ MI

*** ***

```
          **************
          *            *
246 KK    *   SITE2A   *
          *            *
          **************
```

249 KO OUTPUT CONTROL VARIABLES

IPRNT	1	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

248 HC HYDROGRAPH COMBINATION

ICOMP	2	NUMBER OF HYDROGRAPHS TO COMBINE

***

HYDROGRAPH AT STATION SITE2A
SUM OF 2 HYDROGRAPHS

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0345	76	211.	1		0730	151	0.	1		1115	226	0.
1		0003	2	0.	1		0348	77	271.	1		0733	152	0.	1		1118	227	0.
1		0006	3	0.	1		0351	78	427.	1		0736	153	0.	1		1121	228	0.
1		0009	4	0.	1		0354	79	577.	1		0739	154	0.	1		1124	229	0.
1		0012	5	0.	1		0357	80	695.	1		0742	155	0.	1		1127	230	0.
1		0015	6	0.	1		0400	81	814.	1		0745	156	0.	1		1130	231	0.
1		0018	7	0.	1		0403	82	908.	1		0748	157	0.	1		1133	232	0.
1		0021	8	0.	1		0406	83	972.	1		0751	158	0.	1		1136	233	0.
1		0024	9	0.	1		0409	84	1003.	1		0754	159	0.	1		1139	234	0.
1		0027	10	0.	1		0412	85	1012.	1		0757	160	0.	1		1142	235	0.
1		0030	11	0.	1		0415	86	1008.	1		0800	161	0.	1		1145	236	0.
1		0033	12	0.	1		0418	87	986.	1		0803	162	0.	1		1148	237	0.
1		0036	13	0.	1		0421	88	943.	1		0806	163	0.	1		1151	238	0.
1		0039	14	0.	1		0424	89	889.	1		0809	164	0.	1		1154	239	0.
1		0042	15	0.	1		0427	90	839.	1		0812	165	0.	1		1157	240	0.
1		0045	16	0.	1		0430	91	791.	1		0815	166	0.	1		1200	241	0.
1		0048	17	0.	1		0433	92	742.	1		0818	167	0.	1		1203	242	0.
1		0051	18	0.	1		0436	93	666.	1		0821	168	0.	1		1206	243	0.
1		0054	19	0.	1		0439	94	558.	1		0824	169	0.	1		1209	244	0.
1		0057	20	0.	1		0442	95	475.	1		0827	170	0.	1		1212	245	0.
1		0100	21	0.	1		0445	96	402.	1		0830	171	0.	1		1215	246	0.
1		0103	22	0.	1		0448	97	331.	1		0833	172	0.	1		1218	247	0.
1		0106	23	0.	1		0451	98	259.	1		0836	173	0.	1		1221	248	0.
1		0109	24	0.	1		0454	99	192.	1		0839	174	0.	1		1224	249	0.
1		0112	25	0.	1		0457	100	135.	1		0842	175	0.	1		1227	250	0.
1		0115	26	0.	1		0500	101	86.	1		0845	176	0.	1		1230	251	0.
1		0118	27	0.	1		0503	102	68.	1		0848	177	0.	1		1233	252	0.
1		0121	28	0.	1		0506	103	56.	1		0851	178	0.	1		1236	253	0.
1		0124	29	0.	1		0509	104	46.	1		0854	179	0.	1		1239	254	0.
1		0127	30	0.	1		0512	105	39.	1		0857	180	0.	1		1242	255	0.
1		0130	31	0.	1		0515	106	34.	1		0900	181	0.	1		1245	256	0.
1		0133	32	0.	1		0518	107	29.	1		0903	182	0.	1		1248	257	0.
1		0136	33	0.	1		0521	108	25.	1		0906	183	0.	1		1251	258	0.
1		0139	34	0.	1		0524	109	24.	1		0909	184	0.	1		1254	259	0.
1		0142	35	0.	1		0527	110	22.	1		0912	185	0.	1		1257	260	0.
1		0145	36	0.	1		0530	111	22.	1		0915	186	0.	1		1300	261	0.
1		0148	37	0.	1		0533	112	21.	1		0918	187	0.	1		1303	262	0.
1		0151	38	0.	1		0536	113	20.	1		0921	188	0.	1		1306	263	0.
1		0154	39	0.	1		0539	114	20.	1		0924	189	0.	1		1309	264	0.
1		0157	40	0.	1		0542	115	20.	1		0927	190	0.	1		1312	265	0.
1		0200	41	0.	1		0545	116	19.	1		0930	191	0.	1		1315	266	0.
1		0203	42	0.	1		0548	117	19.	1		0933	192	0.	1		1318	267	0.
1		0206	43	0.	1		0551	118	19.	1		0936	193	0.	1		1321	268	0.
1		0209	44	0.	1		0554	119	19.	1		0939	194	0.	1		1324	269	0.
1		0212	45	0.	1		0557	120	19.	1		0942	195	0.	1		1327	270	0.
1		0215	46	0.	1		0600	121	19.	1		0945	196	0.	1		1330	271	0.
1		0218	47	0.	1		0603	122	19.	1		0948	197	0.	1		1333	272	0.
1		0221	48	3.	1		0606	123	19.	1		0951	198	0.	1		1336	273	0.

1	0224	49	13.	*	1	0609	124	18.	*	1	0954	199	0.	*	1	1339	274	0.
1	0227	50	14.	*	1	0612	125	17.	*	1	0957	200	0.	*	1	1342	275	0.
1	0230	51	14.	*	1	0615	126	15.	*	1	1000	201	0.	*	1	1345	276	0.
1	0233	52	15.	*	1	0618	127	13.	*	1	1003	202	0.	*	1	1348	277	0.
1	0236	53	15.	*	1	0621	128	11.	*	1	1006	203	0.	*	1	1351	278	0.
1	0239	54	16.	*	1	0624	129	9.	*	1	1009	204	0.	*	1	1354	279	0.
1	0242	55	16.	*	1	0627	130	6.	*	1	1012	205	0.	*	1	1357	280	0.
1	0245	56	17.	*	1	0630	131	5.	*	1	1015	206	0.	*	1	1400	281	0.
1	0248	57	17.	*	1	0633	132	3.	*	1	1018	207	0.	*	1	1403	282	0.
1	0251	58	18.	*	1	0636	133	2.	*	1	1021	208	0.	*	1	1406	283	0.
1	0254	59	19.	*	1	0639	134	2.	*	1	1024	209	0.	*	1	1409	284	0.
1	0257	60	20.	*	1	0642	135	1.	*	1	1027	210	0.	*	1	1412	285	0.
1	0300	61	21.	*	1	0645	136	1.	*	1	1030	211	0.	*	1	1415	286	0.
1	0303	62	23.	*	1	0648	137	1.	*	1	1033	212	0.	*	1	1418	287	0.
1	0306	63	25.	*	1	0651	138	0.	*	1	1036	213	0.	*	1	1421	288	0.
1	0309	64	28.	*	1	0654	139	0.	*	1	1039	214	0.	*	1	1424	289	0.
1	0312	65	32.	*	1	0657	140	0.	*	1	1042	215	0.	*	1	1427	290	0.
1	0315	66	35.	*	1	0700	141	0.	*	1	1045	216	0.	*	1	1430	291	0.
1	0318	67	40.	*	1	0703	142	0.	*	1	1048	217	0.	*	1	1433	292	0.
1	0321	68	46.	*	1	0706	143	0.	*	1	1051	218	0.	*	1	1436	293	0.
1	0324	69	54.	*	1	0709	144	0.	*	1	1054	219	0.	*	1	1439	294	0.
1	0327	70	63.	*	1	0712	145	0.	*	1	1057	220	0.	*	1	1442	295	0.
1	0330	71	72.	*	1	0715	146	0.	*	1	1100	221	0.	*	1	1445	296	0.
1	0333	72	87.	*	1	0718	147	0.	*	1	1103	222	0.	*	1	1448	297	0.
1	0336	73	106.	*	1	0721	148	0.	*	1	1106	223	0.	*	1	1451	298	0.
1	0339	74	137.	*	1	0724	149	0.	*	1	1109	224	0.	*	1	1454	299	0.
1	0342	75	172.	*	1	0727	150	0.	*	1	1112	225	0.	*	1	1457	300	0.
				*					*					*				

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	14.95-HR
		(CFS)				
+ 1012.	4.20		150.	60.	60.	60.
		(INCHES)	2.942	2.942	2.942	2.942
		(AC-FT)	75.	75.	75.	75.

CUMULATIVE AREA = .47 SQ MI

*** ***

```
          **************
          *            *
250 KK    *   SITE2A   *      DETENTION BASIN AT SITE 2A *************************
          *            *
          **************

253 KO         OUTPUT CONTROL VARIABLES
                     IPRNT          1  PRINT CONTROL
                     IPLOT          2  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE

           HYDROGRAPH ROUTING DATA

254 RS         STORAGE ROUTING
```

NSTPS	1	NUMBER OF SUBREACHES
ITYP	STOR	TYPE OF INITIAL CONDITION
RSVRIC	.00	INITIAL CONDITION
X	.00	WORKING R AND D COEFFICIENT

255 SV	STORAGE	.0	1.6	3.6	5.9	8.5	11.4	14.8	18.6	22.8	
256 SE	ELEVATION	1248.00	1250.00	1252.00	1254.00	1256.00	1258.00	1260.00	1262.00	1264.00	
257 SQ	DISCHARGE	0.	24.	34.	44.	55.	72.	103.	293.	439.	715.
		803.	868.								
259 SE	ELEVATION	1248.00	1250.00	1252.00	1254.00	1256.00	1256.50	1257.00	1258.85	1259.90	1262.00
		1260.00	1262.80								

***

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	1.61	3.59	5.90	8.50	9.23	9.97	11.44	12.87	14.63
OUTFLOW	.00	24.00	34.00	44.00	55.00	72.00	103.00	205.70	293.00	439.00
ELEVATION	1248.00	1250.00	1252.00	1254.00	1256.00	1256.50	1257.00	1258.00	1258.85	1259.90

STORAGE	14.80	18.60	20.28	22.80
OUTFLOW	452.14	715.00	868.00	895.86
ELEVATION	1260.00	1262.00	1262.80	1264.00

****

HYDROGRAPH AT STATION SITE2A

****

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	1248.0	*	1		0500	101	282.	12.7	1258.7	*	1		1000	201	2.	.2	1248.2
1		0003	2	0.	.0	1248.0	*	1		0503	102	236.	11.9	1258.3	*	1		1003	202	2.	.1	1248.2
1		0006	3	0.	.0	1248.0	*	1		0506	103	196.	11.3	1257.9	*	1		1006	203	2.	.1	1248.2
1		0009	4	0.	.0	1248.0	*	1		0509	104	159.	10.8	1257.5	*	1		1009	204	2.	.1	1248.2
1		0012	5	0.	.0	1248.0	*	1		0512	105	130.	10.4	1257.3	*	1		1012	205	2.	.1	1248.2
1		0015	6	0.	.0	1248.0	*	1		0515	106	106.	10.0	1257.0	*	1		1015	206	2.	.1	1248.1
1		0018	7	0.	.0	1248.0	*	1		0518	107	93.	9.7	1256.8	*	1		1018	207	2.	.1	1248.1
1		0021	8	0.	.0	1248.0	*	1		0521	108	83.	9.5	1256.7	*	1		1021	208	2.	.1	1248.1
1		0024	9	0.	.0	1248.0	*	1		0524	109	73.	9.3	1256.5	*	1		1024	209	1.	.1	1248.1
1		0027	10	0.	.0	1248.0	*	1		0527	110	68.	9.1	1256.4	*	1		1027	210	1.	.1	1248.1
1		0030	11	0.	.0	1248.0	*	1		0530	111	64.	8.9	1256.3	*	1		1030	211	1.	.1	1248.1
1		0033	12	0.	.0	1248.0	*	1		0533	112	60.	8.7	1256.1	*	1		1033	212	1.	.1	1248.1
1		0036	13	0.	.0	1248.0	*	1		0536	113	56.	8.6	1256.0	*	1		1036	213	1.	.1	1248.1
1		0039	14	0.	.0	1248.0	*	1		0539	114	55.	8.4	1255.9	*	1		1039	214	1.	.1	1248.1
1		0042	15	0.	.0	1248.0	*	1		0542	115	54.	8.3	1255.8	*	1		1042	215	1.	.1	1248.1
1		0045	16	0.	.0	1248.0	*	1		0545	116	53.	8.1	1255.7	*	1		1045	216	1.	.1	1248.1
1		0048	17	0.	.0	1248.0	*	1		0548	117	53.	8.0	1255.6	*	1		1048	217	1.	.1	1248.1
1		0051	18	0.	.0	1248.0	*	1		0551	118	52.	7.9	1255.5	*	1		1051	218	1.	.1	1248.1
1		0054	19	0.	.0	1248.0	*	1		0554	119	52.	7.7	1255.4	*	1		1054	219	1.	.1	1248.1
1		0057	20	0.	.0	1248.0	*	1		0557	120	51.	7.6	1255.3	*	1		1057	220	1.	.0	1248.1
1		0100	21	0.	.0	1248.0	*	1		0600	121	51.	7.5	1255.2	*	1		1100	221	1.	.0	1248.1
1		0103	22	0.	.0	1248.0	*	1		0603	122	50.	7.3	1255.1	*	1		1103	222	1.	.0	1248.1
1		0106	23	0.	.0	1248.0	*	1		0606	123	49.	7.2	1255.0	*	1		1106	223	1.	.0	1248.1
1		0109	24	0.	.0	1248.0	*	1		0609	124	49.	7.1	1254.9	*	1		1109	224	1.	.0	1248.0
1		0112	25	0.	.0	1248.0	*	1		0612	125	48.	6.9	1254.8	*	1		1112	225	1.	.0	1248.0

1	0115	26	0.	.0	1248.0	*	1	0615	126	48.	6.8	1254.7	*	1	1115	226	1.	.0	1248.0
1	0118	27	0.	.0	1248.0	*	1	0618	127	47.	6.7	1254.6	*	1	1118	227	0.	.0	1248.0
1	0121	28	0.	.0	1248.0	*	1	0621	128	47.	6.5	1254.5	*	1	1121	228	0.	.0	1248.0
1	0124	29	0.	.0	1248.0	*	1	0624	129	46.	6.4	1254.4	*	1	1124	229	0.	.0	1248.0
1	0127	30	0.	.0	1248.0	*	1	0627	130	45.	6.2	1254.2	*	1	1127	230	0.	.0	1248.0
1	0130	31	0.	.0	1248.0	*	1	0630	131	45.	6.1	1254.1	*	1	1130	231	0.	.0	1248.0
1	0133	32	0.	.0	1248.0	*	1	0633	132	44.	5.9	1254.0	*	1	1133	232	0.	.0	1248.0
1	0136	33	0.	.0	1248.0	*	1	0636	133	43.	5.7	1253.8	*	1	1136	233	0.	.0	1248.0
1	0139	34	0.	.0	1248.0	*	1	0639	134	42.	5.6	1253.7	*	1	1139	234	0.	.0	1248.0
1	0142	35	0.	.0	1248.0	*	1	0642	135	42.	5.4	1253.6	*	1	1142	235	0.	.0	1248.0
1	0145	36	0.	.0	1248.0	*	1	0645	136	41.	5.2	1253.4	*	1	1145	236	0.	.0	1248.0
1	0148	37	0.	.0	1248.0	*	1	0648	137	40.	5.1	1253.3	*	1	1148	237	0.	.0	1248.0
1	0151	38	0.	.0	1248.0	*	1	0651	138	40.	4.9	1253.1	*	1	1151	238	0.	.0	1248.0
1	0154	39	0.	.0	1248.0	*	1	0654	139	39.	4.7	1253.0	*	1	1154	239	0.	.0	1248.0
1	0157	40	0.	.0	1248.0	*	1	0657	140	38.	4.6	1252.8	*	1	1157	240	0.	.0	1248.0
1	0200	41	0.	.0	1248.0	*	1	0700	141	38.	4.4	1252.7	*	1	1200	241	0.	.0	1248.0
1	0203	42	0.	.0	1248.0	*	1	0703	142	37.	4.3	1252.6	*	1	1203	242	0.	.0	1248.0
1	0206	43	0.	.0	1248.0	*	1	0706	143	36.	4.1	1252.4	*	1	1206	243	0.	.0	1248.0
1	0209	44	0.	.0	1248.0	*	1	0709	144	36.	4.0	1252.3	*	1	1209	244	0.	.0	1248.0
1	0212	45	0.	.0	1248.0	*	1	0712	145	35.	3.8	1252.2	*	1	1212	245	0.	.0	1248.0
1	0215	46	0.	.0	1248.0	*	1	0715	146	34.	3.7	1252.1	*	1	1215	246	0.	.0	1248.0
1	0218	47	0.	.0	1248.0	*	1	0718	147	34.	3.5	1251.9	*	1	1218	247	0.	.0	1248.0
1	0221	48	0.	.0	1248.0	*	1	0721	148	33.	3.4	1251.8	*	1	1221	248	0.	.0	1248.0
1	0224	49	1.	.0	1248.1	*	1	0724	149	32.	3.3	1251.7	*	1	1224	249	0.	.0	1248.0
1	0227	50	1.	.1	1248.1	*	1	0727	150	32.	3.1	1251.5	*	1	1227	250	0.	.0	1248.0
1	0230	51	2.	.1	1248.2	*	1	0730	151	31.	3.0	1251.4	*	1	1230	251	0.	.0	1248.0
1	0233	52	3.	.2	1248.2	*	1	0733	152	30.	2.9	1251.3	*	1	1233	252	0.	.0	1248.0
1	0236	53	4.	.2	1248.3	*	1	0736	153	30.	2.7	1251.1	*	1	1236	253	0.	.0	1248.0
1	0239	54	4.	.3	1248.4	*	1	0739	154	29.	2.6	1251.0	*	1	1239	254	0.	.0	1248.0
1	0242	55	5.	.3	1248.4	*	1	0742	155	29.	2.5	1250.9	*	1	1242	255	0.	.0	1248.0
1	0245	56	6.	.4	1248.5	*	1	0745	156	28.	2.4	1250.8	*	1	1245	256	0.	.0	1248.0
1	0248	57	6.	.4	1248.5	*	1	0748	157	27.	2.3	1250.7	*	1	1248	257	0.	.0	1248.0
1	0251	58	7.	.5	1248.6	*	1	0751	158	27.	2.2	1250.6	*	1	1251	258	0.	.0	1248.0
1	0254	59	8.	.5	1248.6	*	1	0754	159	26.	2.1	1250.4	*	1	1254	259	0.	.0	1248.0
1	0257	60	8.	.6	1248.7	*	1	0757	160	26.	1.9	1250.3	*	1	1257	260	0.	.0	1248.0
1	0300	61	9.	.6	1248.8	*	1	0800	161	25.	1.8	1250.2	*	1	1300	261	0.	.0	1248.0
1	0303	62	10.	.7	1248.8	*	1	0803	162	25.	1.7	1250.1	*	1	1303	262	0.	.0	1248.0
1	0306	63	11.	.7	1248.9	*	1	0806	163	24.	1.6	1250.0	*	1	1306	263	0.	.0	1248.0
1	0309	64	12.	.8	1249.0	*	1	0809	164	23.	1.5	1249.9	*	1	1309	264	0.	.0	1248.0
1	0312	65	13.	.9	1249.1	*	1	0812	165	22.	1.4	1249.8	*	1	1312	265	0.	.0	1248.0
1	0315	66	14.	.9	1249.2	*	1	0815	166	20.	1.4	1249.7	*	1	1315	266	0.	.0	1248.0
1	0318	67	15.	1.0	1249.3	*	1	0818	167	19.	1.3	1249.6	*	1	1318	267	0.	.0	1248.0
1	0321	68	17.	1.1	1249.4	*	1	0821	168	18.	1.2	1249.5	*	1	1321	268	0.	.0	1248.0
1	0324	69	19.	1.3	1249.6	*	1	0824	169	17.	1.1	1249.4	*	1	1324	269	0.	.0	1248.0
1	0327	70	21.	1.4	1249.8	*	1	0827	170	16.	1.1	1249.3	*	1	1327	270	0.	.0	1248.0
1	0330	71	24.	1.6	1250.0	*	1	0830	171	15.	1.0	1249.2	*	1	1330	271	0.	.0	1248.0
1	0333	72	25.	1.8	1250.2	*	1	0833	172	14.	.9	1249.2	*	1	1333	272	0.	.0	1248.0
1	0336	73	27.	2.1	1250.5	*	1	0836	173	13.	.9	1249.1	*	1	1336	273	0.	.0	1248.0
1	0339	74	29.	2.5	1250.9	*	1	0839	174	12.	.8	1249.0	*	1	1339	274	0.	.0	1248.0
1	0342	75	31.	3.0	1251.4	*	1	0842	175	12.	.8	1249.0	*	1	1342	275	0.	.0	1248.0
1	0345	76	34.	3.7	1252.1	*	1	0845	176	11.	.7	1248.9	*	1	1345	276	0.	.0	1248.0
1	0348	77	38.	4.5	1252.8	*	1	0848	177	10.	.7	1248.9	*	1	1348	277	0.	.0	1248.0
1	0351	78	44.	5.8	1253.9	*	1	0851	178	10.	.6	1248.8	*	1	1351	278	0.	.0	1248.0
1	0354	79	52.	7.7	1255.4	*	1	0854	179	9.	.6	1248.8	*	1	1354	279	0.	.0	1248.0
1	0357	80	105.	10.0	1257.0	*	1	0857	180	9.	.6	1248.7	*	1	1357	280	0.	.0	1248.0
1	0400	81	262.	12.4	1258.5	*	1	0900	181	8.	.5	1248.7	*	1	1400	281	0.	.0	1248.0
1	0403	82	427.	14.5	1259.8	*	1	0903	182	8.	.5	1248.6	*	1	1403	282	0.	.0	1248.0
1	0406	83	559.	16.3	1260.8	*	1	0906	183	7.	.5	1248.6	*	1	1406	283	0.	.0	1248.0
1	0409	84	666.	17.9	1261.6	*	1	0909	184	7.	.4	1248.6	*	1	1409	284	0.	.0	1248.0
1	0412	85	761.	19.1	1262.2	*	1	0912	185	6.	.4	1248.5	*	1	1412	285	0.	.0	1248.0

```
1    0415  86    840.    20.0  1262.7 *  1    0915 186    6.     .4  1248.5 *  1    1415 286    0.     .0  1248.0
1    0418  87    871.    20.6  1262.9 *  1    0918 187    6.     .4  1248.5 *  1    1418 287    0.     .0  1248.0
1    0421  88    875.    20.9  1263.1 *  1    0921 188    5.     .4  1248.4 *  1    1421 288    0.     .0  1248.0
1    0424  89    877.    21.1  1263.2 *  1    0924 189    5.     .3  1248.4 *  1    1424 289    0.     .0  1248.0
1    0427  90    877.    21.0  1263.2 *  1    0927 190    5.     .3  1248.4 *  1    1427 290    0.     .0  1248.0
1    0430  91    874.    20.8  1263.0 *  1    0930 191    4.     .3  1248.4 *  1    1430 291    0.     .0  1248.0
1    0433  92    869.    20.4  1262.8 *  1    0933 192    4.     .3  1248.3 *  1    1433 292    0.     .0  1248.0
1    0436  93    823.    19.8  1262.6 *  1    0936 193    4.     .3  1248.3 *  1    1436 293    0.     .0  1248.0
1    0439  94    756.    19.0  1262.2 *  1    0939 194    4.     .2  1248.3 *  1    1439 294    0.     .0  1248.0
1    0442  95    687.    18.2  1261.8 *  1    0942 195    3.     .2  1248.3 *  1    1442 295    0.     .0  1248.0
1    0445  96    625.    17.3  1261.3 *  1    0945 196    3.     .2  1248.3 *  1    1445 296    0.     .0  1248.0
1    0448  97    560.    16.4  1260.8 *  1    0948 197    3.     .2  1248.3 *  1    1448 297    0.     .0  1248.0
1    0451  98    494.    15.4  1260.3 *  1    0951 198    3.     .2  1248.2 *  1    1451 298    0.     .0  1248.0
1    0454  99    423.    14.4  1259.8 *  1    0954 199    3.     .2  1248.2 *  1    1454 299    0.     .0  1248.0
1    0457 100    347.    13.5  1259.2 *  1    0957 200    2.     .2  1248.2 *  1    1457 300    0.     .0  1248.0
                                       *                                          *
*****************************************************************************************************************************

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR     14.95-HR
  (CFS)       (HR)
                        (CFS)
   877.       4.40                149.        60.         60.         60.
                      (INCHES)    2.911       2.942       2.942       2.942
                       (AC-FT)     74.         75.         75.         75.

PEAK STORAGE  TIME                          MAXIMUM AVERAGE STORAGE
                                   6-HR       24-HR       72-HR     14.95-HR
+ (AC-FT)     (HR)
    21.       4.40                  7.          3.          3.          3.

PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                   6-HR       24-HR       72-HR     14.95-HR
  (FEET)      (HR)
 1263.19      4.40              1253.98     1250.45     1250.45     1250.45

                       CUMULATIVE AREA =     .47 SQ MI

1                                                   STATION   SITE2A

                       (I) INFLOW,   (O) OUTFLOW
       0.      200.     400.     600.     800.    1000.    1200.       0.       0.       0.       0.       0.       0.
                                                                      (S) STORAGE
       0.        0.       0.       0.       0.       0.       0.      10.      20.      30.       0.       0.       0.
DAHRMN PER
 10000   1I---------.---------.---------.---------.---------.---------S---------.---------.---------.---------.---------.---------.
 10003   2I         .         .         .         .         .         S         .         .         .         .         .         .
 10006   3I         .         .         .         .         .         S         .         .         .         .         .         .
 10009   4I         .         .         .         .         .         S         .         .         .         .         .         .
 10012   5I         .         .         .         .         .         S         .         .         .         .         .         .
 10015   6I         .         .         .         .         .         S         .         .         .         .         .         .
 10018   7I         .         .         .         .         .         S         .         .         .         .         .         .
 10021   8I         .         .         .         .         .         S         .         .         .         .         .         .
 10024   9I         .         .         .         .         .         S         .         .         .         .         .         .
 10027  10I         .         .         .         .         .         S         .         .         .         .         .         .
 10030  11I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
 10033  12I         .         .         .         .         .         S         .         .         .         .         .         .
 10036  13I         .         .         .         .         .         S         .         .         .         .         .         .
 10039  14I         .         .         .         .         .         S         .         .         .         .         .         .
 10042  15I         .         .         .         .         .         S         .         .         .         .         .         .
```

```
10045  16I          .         .         .         .         .         S         .         .         .         .         .         .
10048  17I          .         .         .         .         .         S         .         .         .         .         .         .
10051  18I          .         .         .         .         .         S         .         .         .         .         .         .
10054  19I          .         .         .         .         .         S         .         .         .         .         .         .
10057  20I          .         .         .         .         .         S         .         .         .         .         .         .
10100  21I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
10103  22I          .         .         .         .         .         S         .         .         .         .         .         .
10106  23I          .         .         .         .         .         S         .         .         .         .         .         .
10109  24I          .         .         .         .         .         S         .         .         .         .         .         .
10112  25I          .         .         .         .         .         S         .         .         .         .         .         .
10115  26I          .         .         .         .         .         S         .         .         .         .         .         .
10118  27I          .         .         .         .         .         S         .         .         .         .         .         .
10121  28I          .         .         .         .         .         S         .         .         .         .         .         .
10124  29I          .         .         .         .         .         S         .         .         .         .         .         .
10127  30I          .         .         .         .         .         S         .         .         .         .         .         .
10130  31I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
10133  32I          .         .         .         .         .         S         .         .         .         .         .         .
10136  33I          .         .         .         .         .         S         .         .         .         .         .         .
10139  34I          .         .         .         .         .         S         .         .         .         .         .         .
10142  35I          .         .         .         .         .         S         .         .         .         .         .         .
10145  36I          .         .         .         .         .         S         .         .         .         .         .         .
10148  37I          .         .         .         .         .         S         .         .         .         .         .         .
10151  38I          .         .         .         .         .         S         .         .         .         .         .         .
10154  39I          .         .         .         .         .         S         .         .         .         .         .         .
10157  40I          .         .         .         .         .         S         .         .         .         .         .         .
10200  41I . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
10203  42I          .         .         .         .         .         S         .         .         .         .         .         .
10206  43I          .         .         .         .         .         S         .         .         .         .         .         .
10209  44I          .         .         .         .         .         S         .         .         .         .         .         .
10212  45I          .         .         .         .         .         S         .         .         .         .         .         .
10215  46I          .         .         .         .         .         S         .         .         .         .         .         .
10218  47I          .         .         .         .         .         S         .         .         .         .         .         .
10221  48I          .         .         .         .         .         S         .         .         .         .         .         .
10224  490I         .         .         .         .         .         S         .         .         .         .         .         .
10227  500I         .         .         .         .         .         S         .         .         .         .         .         .
10230  510I. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
10233  520I         .         .         .         .         .         S         .         .         .         .         .         .
10236  530I         .         .         .         .         .         S         .         .         .         .         .         .
10239  540I         .         .         .         .         .         S         .         .         .         .         .         .
10242  550I         .         .         .         .         .         S         .         .         .         .         .         .
10245  560I         .         .         .         .         .         S         .         .         .         .         .         .
10248  570I         .         .         .         .         .         S         .         .         .         .         .         .
10251  580I         .         .         .         .         .         S         .         .         .         .         .         .
10254  590I         .         .         .         .         .         .S        .         .         .         .         .         .
10257  600I         .         .         .         .         .         .S        .         .         .         .         .         .
10300  610I. . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
10303  620I         .         .         .         .         .         .S        .         .         .         .         .         .
10306  63.I         .         .         .         .         .         .S        .         .         .         .         .         .
10309  64.I         .         .         .         .         .         .S        .         .         .         .         .         .
10312  65.0I        .         .         .         .         .         .S        .         .         .         .         .         .
10315  66.0I        .         .         .         .         .         .S        .         .         .         .         .         .
10318  67.0I        .         .         .         .         .         .S        .         .         .         .         .         .
10321  68.0I        .         .         .         .         .         .S        .         .         .         .         .         .
10324  69.0 I       .         .         .         .         .         .S        .         .         .         .         .         .
10327  70.0 I       .         .         .         .         .         .S        .         .         .         .         .         .
10330  71.0. I . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
10333  72.0  I      .         .         .         .         .         . S       .         .         .         .         .         .
10336  73.0   I     .         .         .         .         .         . S       .         .         .         .         .         .
10339  74.0     I   .         .         .         .         .         .  S      .         .         .         .         .         .
10342  75. 0      I.         .         .         .         .         .  S      .         .         .         .         .         .
```

```
10345  76. O      .I      .       .       .       .       .  S    .       .       .       .       .       .
10348  77. O      .  I    .       .       .       .       .  S    .       .       .       .       .       .
10351  78. O      .       .I      .       .       .       .   S   .       .       .       .       .       .
10354  79.  O     .       .       I.      .       .       .    S  .       .       .       .       .       .
10357  80.   O    .       .       .   I   .       .       .     S       .       .       .       .       .
10400  81. . . . . .O. . . . . . . . . . . . . . .I. . . . . . . . . . . . . . . . . . S . . . . . .
10403  82.        .       .O      .       .   I   .       .       .  S    .       .       .       .       .
10406  83.        .       .     O .       .       I.      .       .   S   .       .       .       .       .
10409  84.        .       .       . O     .       I       .       .    S  .       .       .       .       .
10412  85.        .       .       .     O .       .I      .       .     S.       .       .       .       .
10415  86.        .       .       .       . O     I       .       .      S       .       .       .       .
10418  87.        .       .       .       .  O    I.      .       .       .S      .       .       .       .
10421  88.        .       .       .       .  O  I .       .       .       .S      .       .       .       .
10424  89.        .       .       .       .  I    .       .       .       .S      .       .       .       .
10427  90.        .       .       .       . I O   .       .       .       .S      .       .       .       .
10430  91. . . . . . . . . . . . . . . . . . I . O . . . . . . . . . . . . . . . . . . .S. . . . . .
10433  92.        .       .       .     I . O     .       .       .       S       .       .       .       .
10436  93.        .       .       . I     .O      .       .       .       S       .       .       .       .
10439  94.        .       .     I .       O .     .       .       .      S.       .       .       .       .
10442  95.        .       .  I    .  O    .       .       .       .     S  .       .       .       .       .
10445  96.        .       I       .O      .       .       .       .    S   .       .       .       .       .
10448  97.        .    I  .     O .       .       .       .       .   S   .       .       .       .       .
10451  98.        . I     .   O   .       .       .       .       .  S    .       .       .       .       .
10454  99.        I       .O      .       .       .       .       .  S    .       .       .       .       .
10457 100.     I  .     O  .       .       .       .       .       .  S    .       .       .       .       .
10500 101. . I . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . .
10503 102.  I     . O     .       .       .       .       .       . S     .       .       .       .       .
10506 103.  I     O       .       .       .       .       .       .S      .       .       .       .       .
10509 104. I    O .       .       .       .       .       .       .S      .       .       .       .       .
10512 105. I   O  .       .       .       .       .       .       S       .       .       .       .       .
10515 106. I  O   .       .       .       .       .       .       S       .       .       .       .       .
10518 107.I   O   .       .       .       .       .       .       S       .       .       .       .       .
10521 108.I  O    .       .       .       .       .       .      S.       .       .       .       .       .
10524 109.I  O    .       .       .       .       .       .      S.       .       .       .       .       .
10527 110.I O     .       .       .       .       .       .      S.       .       .       .       .       .
10530 111.I.O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . .
10533 112.I O     .       .       .       .       .       .      S.       .       .       .       .       .
10536 113.I O     .       .       .       .       .       .      S.       .       .       .       .       .
10539 114.I O     .       .       .       .       .       .     S .       .       .       .       .       .
10542 115.I O     .       .       .       .       .       .     S .       .       .       .       .       .
10545 116.I O     .       .       .       .       .       .     S .       .       .       .       .       .
10548 117.I O     .       .       .       .       .       .     S .       .       .       .       .       .
10551 118.I O     .       .       .       .       .       .     S .       .       .       .       .       .
10554 119.I O     .       .       .       .       .       .     S .       .       .       .       .       .
10557 120.I O     .       .       .       .       .       .     S .       .       .       .       .       .
10600 121.I.O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . .
10603 122.I O     .       .       .       .       .       .    S  .       .       .       .       .       .
10606 123.IO      .       .       .       .       .       .    S  .       .       .       .       .       .
10609 124.IO      .       .       .       .       .       .    S  .       .       .       .       .       .
10612 125.IO      .       .       .       .       .       .    S  .       .       .       .       .       .
10615 126.IO      .       .       .       .       .       .    S  .       .       .       .       .       .
10618 127.IO      .       .       .       .       .       .    S  .       .       .       .       .       .
10621 128.IO      .       .       .       .       .       .    S  .       .       .       .       .       .
10624 129I O      .       .       .       .       .       .   S   .       .       .       .       .       .
10627 130I O      .       .       .       .       .       .   S   .       .       .       .       .       .
10630 131I O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . .
10633 132I O      .       .       .       .       .       .   S   .       .       .       .       .       .
10636 133I O      .       .       .       .       .       .   S   .       .       .       .       .       .
10639 134I O      .       .       .       .       .       .   S   .       .       .       .       .       .
10642 135I O      .       .       .       .       .       .  S    .       .       .       .       .       .
```

```
10645 136I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10648 137I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10651 138I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10654 139I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10657 140I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10700 141I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10703 142I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10706 143I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10709 144I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10712 145I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10715 146I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10718 147I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10721 148I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10724 149I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10727 150I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10730 151I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10733 152I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10736 153I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10739 154I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10742 155I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10745 156I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10748 157I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10751 158I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10754 159I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10757 160I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10800 161I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10803 162I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10806 163I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10809 164I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10812 165I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10815 166I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10818 167I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10821 168I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10824 169I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10827 170I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10830 171I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10833 172I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10836 173I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10839 174I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10842 175I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10845 176I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10848 177I O      .         .         .         .         .         .         S         .         .         .         .         .         .
10851 178I        .         .         .         .         .         .         S         .         .         .         .         .         .
10854 179I        .         .         .         .         .         .         S         .         .         .         .         .         .
10857 180I        .         .         .         .         .         .         S         .         .         .         .         .         .
10900 181I        .         .         .         .         .         .         S         .         .         .         .         .         .
10903 182I        .         .         .         .         .         .         S         .         .         .         .         .         .
10906 183I        .         .         .         .         .         S         .         .         .         .         .         .         .
10909 184I        .         .         .         .         .         S         .         .         .         .         .         .         .
10912 185I        .         .         .         .         .         S         .         .         .         .         .         .         .
10915 186I        .         .         .         .         .         S         .         .         .         .         .         .         .
10918 187I        .         .         .         .         .         S         .         .         .         .         .         .         .
10921 188I        .         .         .         .         .         S         .         .         .         .         .         .         .
10924 189I        .         .         .         .         .         S         .         .         .         .         .         .         .
10927 190I        .         .         .         .         .         S         .         .         .         .         .         .         .
10930 191I        .         .         .         .         .         S         .         .         .         .         .         .         .
10933 192I        .         .         .         .         .         S         .         .         .         .         .         .         .
10936 193I        .         .         .         .         .         S         .         .         .         .         .         .         .
10939 194I        .         .         .         .         .         S         .         .         .         .         .         .         .
10942 195I        .         .         .         .         .         S         .         .         .         .         .         .         .
```

10945 196I . . . . . S . . . . . .
10948 197I . . . . . S . . . . . .
10951 198I . . . . . S . . . . . .
10954 199I . . . . . S . . . . . .
10957 200I . . . . . S . . . . . .
11000 201I . . . . . S . . . . . .
11003 202I . . . . . S . . . . . .
11006 203I . . . . . S . . . . . .
11009 204I . . . . . S . . . . . .
11012 205I . . . . . S . . . . . .
11015 206I . . . . . S . . . . . .
11018 207I . . . . . S . . . . . .
11021 208I . . . . . S . . . . . .
11024 209I . . . . . S . . . . . .
11027 210I . . . . . S . . . . . .
11030 211I . . . . . S . . . . . .
11033 212I . . . . . S . . . . . .
11036 213I . . . . . S . . . . . .
11039 214I . . . . . S . . . . . .
11042 215I . . . . . S . . . . . .
11045 216I . . . . . S . . . . . .
11048 217I . . . . . S . . . . . .
11051 218I . . . . . S . . . . . .
11054 219I . . . . . S . . . . . .
11057 220I . . . . . S . . . . . .
11100 221I . . . . . S . . . . . .
11103 222I . . . . . S . . . . . .
11106 223I . . . . . S . . . . . .
11109 224I . . . . . S . . . . . .
11112 225I . . . . . S . . . . . .
11115 226I . . . . . S . . . . . .
11118 227I . . . . . S . . . . . .
11121 228I . . . . . S . . . . . .
11124 229I . . . . . S . . . . . .
11127 230I . . . . . S . . . . . .
11130 231I . . . . . S . . . . . .
11133 232I . . . . . S . . . . . .
11136 233I . . . . . S . . . . . .
11139 234I . . . . . S . . . . . .
11142 235I . . . . . S . . . . . .
11145 236I . . . . . S . . . . . .
11148 237I . . . . . S . . . . . .
11151 238I . . . . . S . . . . . .
11154 239I . . . . . S . . . . . .
11157 240I . . . . . S . . . . . .
11200 241I . . . . . S . . . . . .
11203 242I . . . . . S . . . . . .
11206 243I . . . . . S . . . . . .
11209 244I . . . . . S . . . . . .
11212 245I . . . . . S . . . . . .
11215 246I . . . . . S . . . . . .
11218 247I . . . . . S . . . . . .
11221 248I . . . . . S . . . . . .
11224 249I . . . . . S . . . . . .
11227 250I . . . . . S . . . . . .
11230 251I . . . . . S . . . . . .
11233 252I . . . . . S . . . . . .
11236 253I . . . . . S . . . . . .
11239 254I . . . . . S . . . . . .
11242 255I . . . . . S . . . . . .

```
11245 256I        .         .         .         .         .         S         .         .         .         .         .         .
11248 257I        .         .         .         .         .         S         .         .         .         .         .         .
11251 258I        .         .         .         .         .         S         .         .         .         .         .         .
11254 259I        .         .         .         .         .         S         .         .         .         .         .         .
11257 260I        .         .         .         .         .         S         .         .         .         .         .         .
11300 261I . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11303 262I        .         .         .         .         .         S         .         .         .         .         .         .
11306 263I        .         .         .         .         .         S         .         .         .         .         .         .
11309 264I        .         .         .         .         .         S         .         .         .         .         .         .
11312 265I        .         .         .         .         .         S         .         .         .         .         .         .
11315 266I        .         .         .         .         .         S         .         .         .         .         .         .
11318 267I        .         .         .         .         .         S         .         .         .         .         .         .
11321 268I        .         .         .         .         .         S         .         .         .         .         .         .
11324 269I        .         .         .         .         .         S         .         .         .         .         .         .
11327 270I        .         .         .         .         .         S         .         .         .         .         .         .
11330 271I . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11333 272I        .         .         .         .         .         S         .         .         .         .         .         .
11336 273I        .         .         .         .         .         S         .         .         .         .         .         .
11339 274I        .         .         .         .         .         S         .         .         .         .         .         .
11342 275I        .         .         .         .         .         S         .         .         .         .         .         .
11345 276I        .         .         .         .         .         S         .         .         .         .         .         .
11348 277I        .         .         .         .         .         S         .         .         .         .         .         .
11351 278I        .         .         .         .         .         S         .         .         .         .         .         .
11354 279I        .         .         .         .         .         S         .         .         .         .         .         .
11357 280I        .         .         .         .         .         S         .         .         .         .         .         .
11400 281I . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11403 282I        .         .         .         .         .         S         .         .         .         .         .         .
11406 283I        .         .         .         .         .         S         .         .         .         .         .         .
11409 284I        .         .         .         .         .         S         .         .         .         .         .         .
11412 285I        .         .         .         .         .         S         .         .         .         .         .         .
11415 286I        .         .         .         .         .         S         .         .         .         .         .         .
11418 287I        .         .         .         .         .         S         .         .         .         .         .         .
11421 288I        .         .         .         .         .         S         .         .         .         .         .         .
11424 289I        .         .         .         .         .         S         .         .         .         .         .         .
11427 290I        .         .         .         .         .         S         .         .         .         .         .         .
11430 291I . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
11433 292I        .         .         .         .         .         S         .         .         .         .         .         .
11436 293I        .         .         .         .         .         S         .         .         .         .         .         .
11439 294I        .         .         .         .         .         S         .         .         .         .         .         .
11442 295I        .         .         .         .         .         S         .         .         .         .         .         .
11445 296I        .         .         .         .         .         S         .         .         .         .         .         .
11448 297I        .         .         .         .         .         S         .         .         .         .         .         .
11451 298I        .         .         .         .         .         S         .         .         .         .         .         .
11454 299I        .         .         .         .         .         S         .         .         .         .         .         .
11457 300I---------.---------.---------.---------.---------.---------S---------.---------.---------.---------.---------.---------.
1


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


          **************
          *            *
261 KK    *    60INCH  *        OVERFLOW INTO BASIN 2B THROUGH TWIN 60-INCH PIPES
          *            *
          **************


262 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           1  PRINT CONTROL
```

```
                IPLOT          0  PLOT CONTROL
                QSCAL         0.  HYDROGRAPH PLOT SCALE
                          DIVERT BASIN 2A LOW FLOW OUTLET (24" RCP)
                          DIVERSION OF BASIN 2A 24" RCP OUTLET AWAY FROM BASIN 2B

DT          DIVERSION
                ISTAD      2AOUTL  DIVERSION HYDROGRAPH IDENTIFICATION

DI            INFLOW        .00     55.00    868.00

DQ      DIVERTED FLOW       .00     55.00     77.00

                                                  ***
```

****

DIVERSION HYDROGRAPH 2AOUTL

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0345	76	34.	1		0730	151	31.	1		1115	226	1.
1		0003	2	0.	1		0348	77	38.	1		0733	152	30.	1		1118	227	0.
1		0006	3	0.	1		0351	78	44.	1		0736	153	30.	1		1121	228	0.
1		0009	4	0.	1		0354	79	52.	1		0739	154	29.	1		1124	229	0.
1		0012	5	0.	1		0357	80	56.	1		0742	155	29.	1		1127	230	0.
1		0015	6	0.	1		0400	81	61.	1		0745	156	28.	1		1130	231	0.
1		0018	7	0.	1		0403	82	65.	1		0748	157	27.	1		1133	232	0.
1		0021	8	0.	1		0406	83	69.	1		0751	158	27.	1		1136	233	0.
1		0024	9	0.	1		0409	84	72.	1		0754	159	26.	1		1139	234	0.
1		0027	10	0.	1		0412	85	74.	1		0757	160	26.	1		1142	235	0.
1		0030	11	0.	1		0415	86	76.	1		0800	161	25.	1		1145	236	0.
1		0033	12	0.	1		0418	87	77.	1		0803	162	25.	1		1148	237	0.
1		0036	13	0.	1		0421	88	77.	1		0806	163	24.	1		1151	238	0.
1		0039	14	0.	1		0424	89	77.	1		0809	164	23.	1		1154	239	0.
1		0042	15	0.	1		0427	90	77.	1		0812	165	22.	1		1157	240	0.
1		0045	16	0.	1		0430	91	77.	1		0815	166	20.	1		1200	241	0.
1		0048	17	0.	1		0433	92	77.	1		0818	167	19.	1		1203	242	0.
1		0051	18	0.	1		0436	93	76.	1		0821	168	18.	1		1206	243	0.
1		0054	19	0.	1		0439	94	74.	1		0824	169	17.	1		1209	244	0.
1		0057	20	0.	1		0442	95	72.	1		0827	170	16.	1		1212	245	0.
1		0100	21	0.	1		0445	96	70.	1		0830	171	15.	1		1215	246	0.
1		0103	22	0.	1		0448	97	69.	1		0833	172	14.	1		1218	247	0.
1		0106	23	0.	1		0451	98	67.	1		0836	173	13.	1		1221	248	0.
1		0109	24	0.	1		0454	99	65.	1		0839	174	12.	1		1224	249	0.
1		0112	25	0.	1		0457	100	63.	1		0842	175	12.	1		1227	250	0.
1		0115	26	0.	1		0500	101	61.	1		0845	176	11.	1		1230	251	0.
1		0118	27	0.	1		0503	102	60.	1		0848	177	10.	1		1233	252	0.
1		0121	28	0.	1		0506	103	59.	1		0851	178	10.	1		1236	253	0.
1		0124	29	0.	1		0509	104	58.	1		0854	179	9.	1		1239	254	0.
1		0127	30	0.	1		0512	105	57.	1		0857	180	9.	1		1242	255	0.
1		0130	31	0.	1		0515	106	56.	1		0900	181	8.	1		1245	256	0.
1		0133	32	0.	1		0518	107	56.	1		0903	182	8.	1		1248	257	0.
1		0136	33	0.	1		0521	108	56.	1		0906	183	7.	1		1251	258	0.
1		0139	34	0.	1		0524	109	55.	1		0909	184	7.	1		1254	259	0.
1		0142	35	0.	1		0527	110	55.	1		0912	185	6.	1		1257	260	0.
1		0145	36	0.	1		0530	111	55.	1		0915	186	6.	1		1300	261	0.
1		0148	37	0.	1		0533	112	55.	1		0918	187	6.	1		1303	262	0.
1		0151	38	0.	1		0536	113	55.	1		0921	188	5.	1		1306	263	0.

1	0154	39	0.	*	1	0539	114	55.	*	1	0924	189	5.	*	1	1309	264	0.
1	0157	40	0.	*	1	0542	115	54.	*	1	0927	190	5.	*	1	1312	265	0.
1	0200	41	0.	*	1	0545	116	53.	*	1	0930	191	4.	*	1	1315	266	0.
1	0203	42	0.	*	1	0548	117	53.	*	1	0933	192	4.	*	1	1318	267	0.
1	0206	43	0.	*	1	0551	118	52.	*	1	0936	193	4.	*	1	1321	268	0.
1	0209	44	0.	*	1	0554	119	52.	*	1	0939	194	4.	*	1	1324	269	0.
1	0212	45	0.	*	1	0557	120	51.	*	1	0942	195	3.	*	1	1327	270	0.
1	0215	46	0.	*	1	0600	121	51.	*	1	0945	196	3.	*	1	1330	271	0.
1	0218	47	0.	*	1	0603	122	50.	*	1	0948	197	3.	*	1	1333	272	0.
1	0221	48	0.	*	1	0606	123	49.	*	1	0951	198	3.	*	1	1336	273	0.
1	0224	49	1.	*	1	0609	124	49.	*	1	0954	199	3.	*	1	1339	274	0.
1	0227	50	1.	*	1	0612	125	48.	*	1	0957	200	2.	*	1	1342	275	0.
1	0230	51	2.	*	1	0615	126	48.	*	1	1000	201	2.	*	1	1345	276	0.
1	0233	52	3.	*	1	0618	127	47.	*	1	1003	202	2.	*	1	1348	277	0.
1	0236	53	4.	*	1	0621	128	47.	*	1	1006	203	2.	*	1	1351	278	0.
1	0239	54	4.	*	1	0624	129	46.	*	1	1009	204	2.	*	1	1354	279	0.
1	0242	55	5.	*	1	0627	130	45.	*	1	1012	205	2.	*	1	1357	280	0.
1	0245	56	6.	*	1	0630	131	45.	*	1	1015	206	2.	*	1	1400	281	0.
1	0248	57	6.	*	1	0633	132	44.	*	1	1018	207	2.	*	1	1403	282	0.
1	0251	58	7.	*	1	0636	133	43.	*	1	1021	208	2.	*	1	1406	283	0.
1	0254	59	8.	*	1	0639	134	42.	*	1	1024	209	1.	*	1	1409	284	0.
1	0257	60	8.	*	1	0642	135	42.	*	1	1027	210	1.	*	1	1412	285	0.
1	0300	61	9.	*	1	0645	136	41.	*	1	1030	211	1.	*	1	1415	286	0.
1	0303	62	10.	*	1	0648	137	40.	*	1	1033	212	1.	*	1	1418	287	0.
1	0306	63	11.	*	1	0651	138	40.	*	1	1036	213	1.	*	1	1421	288	0.
1	0309	64	12.	*	1	0654	139	39.	*	1	1039	214	1.	*	1	1424	289	0.
1	0312	65	13.	*	1	0657	140	38.	*	1	1042	215	1.	*	1	1427	290	0.
1	0315	66	14.	*	1	0700	141	38.	*	1	1045	216	1.	*	1	1430	291	0.
1	0318	67	15.	*	1	0703	142	37.	*	1	1048	217	1.	*	1	1433	292	0.
1	0321	68	17.	*	1	0706	143	36.	*	1	1051	218	1.	*	1	1436	293	0.
1	0324	69	19.	*	1	0709	144	36.	*	1	1054	219	1.	*	1	1439	294	0.
1	0327	70	21.	*	1	0712	145	35.	*	1	1057	220	1.	*	1	1442	295	0.
1	0330	71	24.	*	1	0715	146	34.	*	1	1100	221	1.	*	1	1445	296	0.
1	0333	72	25.	*	1	0718	147	34.	*	1	1103	222	1.	*	1	1448	297	0.
1	0336	73	27.	*	1	0721	148	33.	*	1	1106	223	1.	*	1	1451	298	0.
1	0339	74	29.	*	1	0724	149	32.	*	1	1109	224	1.	*	1	1454	299	0.
1	0342	75	31.	*	1	0727	150	32.	*	1	1112	225	1.	*	1	1457	300	0.
				*					*					*				

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	14.95-HR
		(CFS)				
+ 77.	4.40		41.	17.	17.	17.
		(INCHES)	.798	.829	.829	.829
		(AC-FT)	20.	21.	21.	21.

CUMULATIVE AREA = .47 SQ MI

****

HYDROGRAPH AT STATION 60INCH

****

DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0345	76	0.	*	1		0730	151	0.	*	1		1115	226	0.

1	0003	2	0.	*	1	0348	77	0.	*	1	0733	152	0.	*	1	1118	227	0.
1	0006	3	0.	*	1	0351	78	0.	*	1	0736	153	0.	*	1	1121	228	0.
1	0009	4	0.	*	1	0354	79	0.	*	1	0739	154	0.	*	1	1124	229	0.
1	0012	5	0.	*	1	0357	80	49.	*	1	0742	155	0.	*	1	1127	230	0.
1	0015	6	0.	*	1	0400	81	201.	*	1	0745	156	0.	*	1	1130	231	0.
1	0018	7	0.	*	1	0403	82	362.	*	1	0748	157	0.	*	1	1133	232	0.
1	0021	8	0.	*	1	0406	83	490.	*	1	0751	158	0.	*	1	1136	233	0.
1	0024	9	0.	*	1	0409	84	594.	*	1	0754	159	0.	*	1	1139	234	0.
1	0027	10	0.	*	1	0412	85	687.	*	1	0757	160	0.	*	1	1142	235	0.
1	0030	11	0.	*	1	0415	86	764.	*	1	0800	161	0.	*	1	1145	236	0.
1	0033	12	0.	*	1	0418	87	794.	*	1	0803	162	0.	*	1	1148	237	0.
1	0036	13	0.	*	1	0421	88	798.	*	1	0806	163	0.	*	1	1151	238	0.
1	0039	14	0.	*	1	0424	89	800.	*	1	0809	164	0.	*	1	1154	239	0.
1	0042	15	0.	*	1	0427	90	799.	*	1	0812	165	0.	*	1	1157	240	0.
1	0045	16	0.	*	1	0430	91	797.	*	1	0815	166	0.	*	1	1200	241	0.
1	0048	17	0.	*	1	0433	92	792.	*	1	0818	167	0.	*	1	1203	242	0.
1	0051	18	0.	*	1	0436	93	747.	*	1	0821	168	0.	*	1	1206	243	0.
1	0054	19	0.	*	1	0439	94	682.	*	1	0824	169	0.	*	1	1209	244	0.
1	0057	20	0.	*	1	0442	95	615.	*	1	0827	170	0.	*	1	1212	245	0.
1	0100	21	0.	*	1	0445	96	555.	*	1	0830	171	0.	*	1	1215	246	0.
1	0103	22	0.	*	1	0448	97	492.	*	1	0833	172	0.	*	1	1218	247	0.
1	0106	23	0.	*	1	0451	98	427.	*	1	0836	173	0.	*	1	1221	248	0.
1	0109	24	0.	*	1	0454	99	358.	*	1	0839	174	0.	*	1	1224	249	0.
1	0112	25	0.	*	1	0457	100	284.	*	1	0842	175	0.	*	1	1227	250	0.
1	0115	26	0.	*	1	0500	101	220.	*	1	0845	176	0.	*	1	1230	251	0.
1	0118	27	0.	*	1	0503	102	176.	*	1	0848	177	0.	*	1	1233	252	0.
1	0121	28	0.	*	1	0506	103	137.	*	1	0851	178	0.	*	1	1236	253	0.
1	0124	29	0.	*	1	0509	104	101.	*	1	0854	179	0.	*	1	1239	254	0.
1	0127	30																

0.	*	1	0512	105		73.	*	1	0857	180		0.	*	1	1242	255		0.			
1	0130	31		0.	*	1	0515	106		50.	*	1	0900	181		0.	*	1	1245	256	0.
1	0133	32		0.	*	1	0518	107		37.	*	1	0903	182		0.	*	1	1248	257	0.
1	0136	33		0.	*	1	0521	108		27.	*	1	0906	183		0.	*	1	1251	258	0.
1	0139	34		0.	*	1	0524	109		18.	*	1	0909	184		0.	*	1	1254	259	0.
1	0142	35		0.	*	1	0527	110		13.	*	1	0912	185		0.	*	1	1257	260	0.
1	0145	36		0.	*	1	0530	111		9.	*	1	0915	186		0.	*	1	1300	261	0.
1	0148	37		0.	*	1	0533	112		5.	*	1	0918	187		0.	*	1	1303	262	0.
1	0151	38		0.	*	1	0536	113		1.	*	1	0921	188		0.	*	1	1306	263	0.
1	0154	39		0.	*	1	0539	114		0.	*	1	0924	189		0.	*	1	1309	264	0.
1	0157	40		0.	*	1	0542	115		0.	*	1	0927	190		0.	*	1	1312	265	0.
1	0200	41		0.	*	1	0545	116		0.	*	1	0930	191		0.	*	1	1315	266	0.
1	0203	42		0.	*	1	0548	117		0.	*	1	0933	192		0.	*	1	1318	267	0.
1	0206	43		0.	*	1	0551	118		0.	*	1	0936	193		0.	*	1	1321	268	0.
1	0209	44		0.	*	1	0554	119		0.	*	1	0939	194		0.	*	1	1324	269	0.
1	0212	45		0.	*	1	0557	120		0.	*	1	0942	195		0.	*	1	1327	270	0.
1	0215	46		0.	*	1	0600	121		0.	*	1	0945	196		0.	*	1	1330	271	

0.

1	0218	47	0.	*	1	0603	122	0.	*	1	0948	197	0.	*	1	1333	272	0.
1	0221	48	0.	*	1	0606	123	0.	*	1	0951	198	0.	*	1	1336	273	0.
1	0224	49	0.	*	1	0609	124	0.	*	1	0954	199	0.	*	1	1339	274	0.
1	0227	50	0.	*	1	0612	125	0.	*	1	0957	200	0.	*	1	1342	275	0.
1	0230	51	0.	*	1	0615	126	0.	*	1	1000	201	0.	*	1	1345	276	0.
1	0233	52	0.	*	1	0618	127	0.	*	1	1003	202	0.	*	1	1348	277	0.
1	0236	53	0.	*	1	0621	128	0.	*	1	1006	203	0.	*	1	1351	278	0.
1	0239	54	0.	*	1	0624	129	0.	*	1	1009	204	0.	*	1	1354	279	0.
1	0242	55	0.	*	1	0627	130	0.	*	1	1012	205	0.	*	1	1357	280	0.
1	0245	56	0.	*	1	0630	131	0.	*	1	1015	206	0.	*	1	1400	281	0.
1	0248	57	0.	*	1	0633	132	0.	*	1	1018	207	0.	*	1	1403	282	0.
1	0251	58	0.	*	1	0636	133	0.	*	1	1021							

208		0.	*	1	1406	283		0.														
	1	0254	59		0.	*	1	0639	134		0.	*	1	1024	209		0.	*	1	1409	284		0.
	1	0257	60		0.	*	1	0642	135		0.	*	1	1027	210		0.	*	1	1412	285		0.
	1	0300	61		0.	*	1	0645	136		0.	*	1	1030	211		0.	*	1	1415	286		0.
	1	0303	62		0.	*	1	0648	137		0.	*										

1	1033	212	0.	*	1	1418	287	0.												
1	0306	63	0.	*	1	0651	138	0.	*	1	1036	213	0.	*	1	1421	288	0.		
1	0309	64	0.	*	1	0654	139	0.	*	1	1039	214	0.	*	1	1424	289	0.		
1	0312	65	0.	*	1	0657	140	0.	*	1	1042	215	0.	*	1	1427	290	0.		
1	0315	66	0.	*	1	0700	141													

```
0.   *   1     1045  216        0.   *   1     1430  291        0.
  1     0318  67        0.   *   1     0703  142        0.   *   1     1048  217        0.   *   1     1433  292        0.
  1     0321  68        0.   *   1     0706  143        0.   *   1     1051  218        0.   *   1     1436  293        0.
  1     0324  69        0.   *   1     0709  144        0.   *   1     1054  219        0.   *   1     1439  294        0.
  1     0327  70        0.   *   1     0712  145        0.   *   1     1057  220        0.   *   1     1442  295        0.
  1     0330  71        0.   *   1     0715  146        0.   *   1     1100  221        0.   *   1     1445  296        0.
  1     0333  72        0.   *   1     0718  147        0.   *   1     1103  222        0.   *   1     1448  297        0.
  1     0336  73        0.   *   1     0721  148        0.   *   1     1106  223        0.   *   1     1451  298        0.
  1     0339  74        0.   *   1     0724  149        0.   *   1     1109  224        0.   *   1     1454  299        0.
  1     0342  75        0.   *   1     0727  150        0.   *   1     1112  225        0.   *   1     1457  300        0.
                                 *                                 *                                 *
*****************************************************************************************************************************

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR       72-HR     14.95-HR
   (CFS)       (HR)
                            (CFS)
+    800.      4.40                108.         43.         43.         43.
                          (INCHES)    2.113       2.113       2.113       2.113
                           (AC-FT)     54.         54.         54.         54.

                          CUMULATIVE AREA =     .47 SQ MI


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

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

              **************
              *            *
268 KK        *   SITE2B   *        DETENTION BASIN AT SITE 2B *************************
              *            *
              **************

270 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          1  PRINT CONTROL
                      IPLOT          2  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

                HYDROGRAPH ROUTING DATA

271 RS          STORAGE ROUTING
                      NSTPS          1  NUMBER OF SUBREACHES
                       ITYP       STOR  TYPE OF INITIAL CONDITION
                     RSVRIC        .00  INITIAL CONDITION
                          X        .00 WORKING R AND D COEFFICIENT

272 SV            STORAGE          .0       7.3      15.2      23.9      36.0      49.0      62.5

273 SE          ELEVATION     1248.00   1250.00   1252.00   1254.00   1256.00   1258.00   1260.00

274 SQ          DISCHARGE         0.       17.       33.       60.       71.       82.       92.

                                                                  ***

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

                                                HYDROGRAPH AT STATION   SITE2B

*****************************************************************************************************************************
                                                 *                                                 *
DA MON HRMN ORD  OUTFLOW  STORAGE   STAGE * DA MON HRMN ORD  OUTFLOW  STORAGE   STAGE * DA MON HRMN ORD  OUTFLOW  STORAGE   STAGE
                                                 *                                                 *
 1    0000   1      0.       .0  1248.0 *  1    0500 101      80.      46.2  1257.6 *  1    1000 201      51.      21.0  1253.3
 1    0003   2      0.       .0  1248.0 *  1    0503 102      80.      46.7  1257.6 *  1    1003 202      50.      20.7  1253.3
 1    0006   3      0.       .0  1248.0 *  1    0506 103      80.      47.0  1257.7 *  1    1006 203      50.      20.5  1253.2
 1    0009   4      0.       .0  1248.0 *  1    0509 104      80.      47.2  1257.7 *  1    1009 204      49.      20.3  1253.2
 1    0012   5      0.       .0  1248.0 *  1    0512 105      80.      47.2  1257.7 *  1    1012 205      48.      20.1  1253.1
 1    0015   6      0.       .0  1248.0 *  1    0515 106      80.      47.1  1257.7 *  1    1015 206      48.      19.9  1253.1
 1    0018   7      0.       .0  1248.0 *  1    0518 107      80.      47.0  1257.7 *  1    1018 207      47.      19.7  1253.0
 1    0021   8      0.       .0  1248.0 *  1    0521 108      80.      46.8  1257.7 *  1    1021 208      47.      19.5  1253.0
 1    0024   9      0.       .0  1248.0 *  1    0524 1
```

09 80. 46.5 1257.6 * 1 1024 209 46. 19.4 1253.0

1	0027	10	0.	.0	1248.0 *	1	0527	110	80.	46.3	1257.6 *	1	1027	210	45.	19.2	1252.9
1	0030	11	0.	.0	1248.0 *	1	0530	111	79.	46.0	1257.5 *	1	1030	211	45.	19.0	1252.9
1	0033	12	0.	.0	1248.0 *	1	0533	112	79.	45.7	1257.5 *	1	1033	212	44.	18.8	1252.8
1	0036	13	0.	.0	1248.0 *	1	0536	113	79.	45.4	1257.4 *	1	1036	213	44.	18.6	1252.8
1	0039	14	0.	.0	1248.0 *	1	0539	114	79.	45.1	1257.4 *	1	1039	214	43.	18.4	1252.7
1	0042	15	0.	.0	1248.0 *	1	0542	115	78.	44.7	1257.3 *	1	1042	215	43.	18.3	1252.7
1	0045	16	0.	.0	1248.0 *	1	0545	116	78.	44.4	1257.3 *	1	1045	216	42.	18.1	1252.7
1	0048	17	0.	.0	1248.0 *	1	0548	117	78.	44.1	1257.2 *	1	1048	217	41.	17.9	1252.6
1	0051	18	0.	.0	1248.0 *	1	0551	118	78.	43.8	1257.2 *	1	1051	218	41.	17.7	1252.6
1	0054	19	0.	.0	1248.0 *	1	0554	119	77.	43.4	1257.1 *	1	1054	219	40.	17.6	1252.5
1	0057	20	0.	.0	1248.0 *	1	0557	120	77.	43.1	1257.1 *	1	1057	220	40.	17.4	1252.5
1	0100	21	0.	.0	1248.0 *	1	0600	121	77.	42.8	1257.0 *	1	1100	221	39.	17.2	1252.5
1	0103	22	0.	.0	1248.0 *	1	0603	122	76.	42.5	1257.0 *	1	1103	222	39.	17.1	1252.4
1	0106	23	0.	.0	1248.0 *	1	0606	123	76.	42.2	1256.9 *	1	1106	223	38.	16.9	1252.4
1	0109	24	0.	.0	1248.0 *	1	0609	124	76.	41.9	1256.9 *	1	1109	224	38.	16.8	1252.4
1	0112	25	0.	.0	1248.0 *	1	0612	125	76.	41.5	1256.8 *	1	1112	225	37.	16.6	1252.3
1	0115	26	0.	.0	1248.0 *	1	0615	126	75.	41.2	1256.8 *	1	1115	226	37.	16.5	1252.3
1	0118	27	0.	.0	1248.0 *	1	0618	127	75.	40.9	1256.8 *	1	1118	227	36.	16.3	1252.3
1	0121	28	0.	.0	1248.0 *	1	0621	128	75.	40.6	1256.7 *	1	1121	228	36.	16.2	1252.2
1	0124	29	0.	.0	1248.0 *	1	0624	129	75.	40.3	1256.7 *	1	1124	229	36.	16.0	1252.2
1	0127	30	0.	.0	1248.0 *	1	0627	130	74.	40.0	1256.6 *	1	1127	230	35.	15.9	1252.2
1	0130	31	0.	.0	1248.0 *	1	0630	131	74.	39.7	1256.6 *	1	1130	231	35.	15.7	1252.1
1	0133	32	0.	.0	1248.0 *	1	0633	132	74.	39.4	1256.5 *	1	1133	232	34.	15.6	1252.1
1	0136	33	0.	.0	1248.0 *	1	0636	133	74.	39.1	1256.5 *	1	1136	233	34.	15.4	1252.1
1	0139	34	0.	.0	1248.0 *	1	0639	134	73.	38.8	1256.4 *	1	1139	234	33.	15.3	1252.0
1	0142	35	0.	.0	1248.0 *	1	0642	135	73.	38.5	1256.4 *	1	1142	235	33.	15.2	1252.0
1	0145	36	0.	.0	1248.0 *	1	0645	136	73.	38.2	1256.3 *	1	1145	236	33.	15.0	1252.0
1	0148	37	0.	.0	1248.0 *	1	0648	137	73.	37.9	1256.3 *	1	1148	237	32.	14.9	1251.9
1	0151	38	0.	.0	1248.0 *	1	0651	138	72.	37.6	1256.2 *	1	1151	238	32.	14.8	1251.9
1	0154	39	0.	.0	1248.0 *	1	0654	139	72.	37.3	1256.2 *	1	1154	239	32.	14.6	1251.9
1	0157	40	0.	.0	1248.0 *	1	0657	140	72.	37.0	1256.1 *	1	1157	240	32.	14.5	1251.8
1	0200	41	0.	.0	1248.0 *	1	0700	141	72.	36.7	1256.1 *	1	1200	241	31.	14.4	1251.8
1	0203	42	0.	.0	1248.0 *	1	0703	142	71.	36.4	1256.1 *	1	1203	242	31.	14.2	1251.8
1	0206	43	0.	.0	1248.0 *	1	0706	143	71.	36.1	1256.0 *	1	1206	243	31.	14.1	1251.7
1	0209	44	0.	.0	1248.0 *	1	0709	144	71.	35.8	1256.0 *	1	1209	244	31.	14.0	1251.7
1	0212	45	0.	.0	1248.0 *	1	0712	145	71.	35.5	1255.9 *	1	1212	245	30.	13.9	1251.7
1	0215	46	0.	.0	1248.0 *	1	0715	146	70.	35.2	1255.9 *	1	1215	246	30.	13.7	1251.6
1	0218	47	0.	.0	1248.0 *	1	0718	147	70.	34.9	1255.8 *	1	1218	247	30.	13.6	1251.6
1	0221	48	0.	.0	1248.0 *	1	0721	148	70.	34.6	1255.8 *	1	1221	248	30.	13.5	1251.6
1	0224	49	0.	.0	1248.0 *	1	0724	149	69.	34.3	1255.7 *	1	1224	249	29.	13.4	1251.5
1	0227	50	0.	.0	1248.0 *	1	0727	150	69.	34.1	1255.7 *	1	1227	250	29.	13.2	1251.5
1	0230	51	0.	.0	1248.0 *	1	0730	151	69.	33.8	1255.6 *	1	1230	251	29.	13.1	1251.5
1	0233	52	0.	.0	1248.0 *	1	0733	152	69.	33.5	1255.6 *	1	1233	252	29.	13.0	1251.4
1	0236	53	0.	.0	1248.0 *	1	0736	153	68.	33.2	1255.5 *	1	1236	253	28.	12.9	1251.4
1	0239	54	0.	.0	1248.0 *	1	0739	154	68.	32.9	1255.5 *	1	1239	254	28.	12.8	1251.4
1	0242	55	0.	.0	1248.0 *	1	0742	155	68.	32.6	1255.4 *	1	1242	255	28.	12.7	1251.4
1	0245	56	0.	.0	1248.0 *	1	0745	156	68.	32.4	1255.4 *	1	1245	256	28.	12.5	1251.3
1	0248	57	0.	.0	1248.0 *	1	0748	157	67.	32.1	1255.4 *	1	1248	257	27.	12.4	1251.3
1	0251	58	0.	.0	1248.0 *	1	0751	158	67.	31.8	1255.3 *	1	1251	258	27.	12.3	1251.3
1	0254	59	0.	.0	1248.0 *	1	0754	159	67.	31.5	1255.3 *	1	1254	259	27.	12.2	1251.2
1	0257	60	0.	.0	1248.0 *	1	0757	160	67.	31.3	1255.2 *	1	1257	260	27.	12.1	1251.2
1	0300	61	0.	.0	1248.0 *	1	0800	161	66.	31.0	1255.2 *	1	1300	261	27.	12.0	1251.2
1	0303	62	0.	.0	1248.0 *	1	0803	162	66.	30.7	1255.1 *	1	1303	262	26.	11.9	1251.2
1	0306	63	0.	.0	1248.0 *	1	0806	163	66.	30.4	1255.1 *	1	1306	263	26.	11.8	1251.1
1	0309	64	0.	.0	1248.0 *	1	0809	164	66.	30.2	1255.0 *	1	1309	264	26.	11.7	1251.1
1	0312	65	0.	.0	1248.0 *	1	0812	165	65.	29.9	1255.0 *	1	1312	265	26.	11.5	1251.1
1	0315	66	0.	.0	1248.0 *	1	0815	166	65.	29.6	1254.9 *	1	1315	266	25.	11.4	1251.1
1	0318	67	0.	.0	1248.0 *	1	0818	167	65.	29.4	1254.9 *	1	1318	267	25.	11.3	1251.0
1	0321	68	0.	.0	1248.0 *	1	0821	168	65.	29.1	1254.9 *	1	1321	268	25.	11.2	1251.0

1	0324	69	0.	.0	1248.0	*	1	0824	169	64.	28.8	1254.8	*	1	1324	269	25.	11.1	1251.0
1	0327	70	0.	.0	1248.0	*	1	0827	170	64.	28.6	1254.8	*	1	1327	270	25.	11.0	1250.9
1	0330	71	0.	.0	1248.0	*	1	0830	171	64.	28.3	1254.7	*	1	1330	271	24.	10.9	1250.9
1	0333	72	0.	.0	1248.0	*	1	0833	172	64.	28.0	1254.7	*	1	1333	272	24.	10.8	1250.9
1	0336	73	0.	.0	1248.0	*	1	0836	173	64.	27.8	1254.6	*	1	1336	273	24.	10.7	1250.9
1	0339	74	0.	.0	1248.0	*	1	0839	174	63.	27.5	1254.6	*	1	1339	274	24.	10.6	1250.8
1	0342	75	0.	.0	1248.0	*	1	0842	175	63.	27.2	1254.6	*	1	1342	275	24.	10.5	1250.8
1	0345	76	0.	.0	1248.0	*	1	0845	176	63.	27.0	1254.5	*	1	1345	276	23.	10.4	1250.8
1	0348	77	0.	.0	1248.0	*	1	0848	177	63.	26.7	1254.5	*	1	1348	277	23.	10.3	1250.8
1	0351	78	0.	.0	1248.0	*	1	0851	178	62.	26.5	1254.4	*	1	1351	278	23.	10.2	1250.7
1	0354	79	0.	.0	1248.0	*	1	0854	179	62.	26.2	1254.4	*	1	1354	279	23.	10.1	1250.7
1	0357	80	0.	.1	1248.0	*	1	0857	180	62.	25.9	1254.3	*	1	1357	280	23.	10.1	1250.7
1	0400	81	1.	.6	1248.2	*	1	0900	181	62.	25.7	1254.3	*	1	1400	281	22.	10.0	1250.7
1	0403	82	4.	1.8	1248.5	*	1	0903	182	61.	25.4	1254.3	*	1	1403	282	22.	9.9	1250.7
1	0406	83	8.	3.5	1249.0	*	1	0906	183	61.	25.2	1254.2	*	1	1406	283	22.	9.8	1250.6
1	0409	84	13.	5.7	1249.6	*	1	0909	184	61.	24.9	1254.2	*	1	1409	284	22.	9.7	1250.6
1	0412	85	19.	8.3	1250.3	*	1	0912	185	61.	24.7	1254.1	*	1	1412	285	22.	9.6	1250.6
1	0415	86	25.	11.2	1251.0	*	1	0915	186	60.	24.4	1254.1	*	1	1415	286	22.	9.5	1250.6
1	0418	87	31.	14.3	1251.8	*	1	0918	187	60.	24.2	1254.0	*	1	1418	287	21.	9.4	1250.5
1	0421	88	40.	17.4	1252.5	*	1	0921	188	60.	23.9	1254.0	*	1	1421	288	21.	9.3	1250.5
1	0424	89	50.	20.5	1253.2	*	1	0924	189	59.	23.7	1254.0	*	1	1424	289	21.	9.2	1250.5
1	0427	90	59.	23.6	1253.9	*	1	0927	190	59.	23.4	1253.9	*	1	1427	290	21.	9.2	1250.5
1	0430	91	63.	26.7	1254.5	*	1	0930	191	58.	23.2	1253.8	*	1	1430	291	21.	9.1	1250.5
1	0433	92	65.	29.7	1255.0	*	1	0933	192	57.	23.0	1253.8	*	1	1433	292	20.	9.0	1250.4
1	0436	93	68.	32.6	1255.4	*	1	0936	193	56.	22.7	1253.7	*	1	1436	293	20.	8.9	1250.4
1	0439	94	70.	35.3	1255.9	*	1	0939	194	56.	22.5	1253.7	*	1	1439	294	20.	8.8	1250.4
1	0442	95	72.	37.6	1256.2	*	1	0942	195	55.	22.3	1253.6	*	1	1442	295	20.	8.7	1250.4
1	0445	96	74.	39.8	1256.6	*	1	0945	196	54.	22.0	1253.6	*	1	1445	296	20.	8.7	1250.3
1	0448	97	76.	41.6	1256.9	*	1	0948	197	54.	21.8	1253.5	*	1	1448	297	20.	8.6	1250.3
1	0451	98	77.	43.2	1257.1	*	1	0951	198	53.	21.6	1253.5	*	1	1451	298	19.	8.5	1250.3
1	0454	99	78.	44.5	1257.3	*	1	0954	199	52.	21.4	1253.4	*	1	1454	299	19.	8.4	1250.3
1	0457	100	79.	45.5	1257.5	*	1	0957	200	52.	21.2	1253.4	*	1	1457	300	19.	8.3	1250.3
						*							*						

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	14.95-HR
+ (CFS)	(HR)					
		(CFS)				
80.	5.20		68.	37.	37.	37.
		(INCHES)	1.322	1.784	1.784	1.784
		(AC-FT)	33.	45.	45.	45.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	14.95-HR
+ (AC-FT)	(HR)				
47.	5.20	33.	18.	18.	18.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	14.95-HR
(FEET)	(HR)				
1257.72	5.20	1255.51	1252.13	1252.13	1252.13

CUMULATIVE AREA = .47 SQ MI

1 STATION SITE2B

(I) INFLOW, (O) OUTFLOW

0. 100. 200. 300. 400. 500. 600. 700. 800. 0. 0. 0. 0.

(S) STORAGE

		0.	0.	0.	0.	0.	0.	0.	20.	40.	60.	0.	0.	0.
DAHRMN	PER													
10000	1I							S						
10003	2I							S						
10006	3I							S						
10009	4I							S						
10012	5I							S						
10015	6I							S						
10018	7I							S						
10021	8I							S						
10024	9I							S						
10027	10I							S						
10030	11I							S						
10033	12I							S						
10036	13I							S						
10039	14I							S						
10042	15I							S						
10045	16I							S						
10048	17I							S						
10051	18I							S						
10054	19I							S						
10057	20I							S						
10100	21I							S						
10103	22I							S						
10106	23I							S						
10109	24I							S						
10112	25I							S						
10115	26I							S						
10118	27I							S						
10121	28I							S						
10124	29I							S						
10127	30I							S						
10130	31I							S						
10133	32I							S						
10136	33I							S						
10139	34I							S						
10142	35I							S						
10145	36I							S						
10148	37I							S						
10151	38I							S						
10154	39I							S						
10157	40I							S						
10200	41I							S						
10203	42I							S						
10206	43I							S						
10209	44I							S						
10212	45I							S						
10215	46I							S						
10218	47I							S						
10221	48I							S						
10224	49I							S						
10227	50I							S						
10230	51I							S						
10233	52I							S						
10236	53I							S						
10239	54I							S						
10242	55I							S						
10245	56I							S						
10248	57I							S						
10251	58I							S						

```
10254  591          .         .         .         .         .         S         .         .         .         .         .         .
10257  601          .         .         .         .         .         S         .         .         .         .         .         .
10300  611 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
10303  621          .         .         .         .         .         S         .         .         .         .         .         .
10306  631          .         .         .         .         .         S         .         .         .         .         .         .
10309  641          .         .         .         .         .         S         .         .         .         .         .         .
10312  651          .         .         .         .         .         S         .         .         .         .         .         .
10315  661          .         .         .         .         .         S         .         .         .         .         .         .
10318  671          .         .         .         .         .         S         .         .         .         .         .         .
10321  681          .         .         .         .         .         S         .         .         .         .         .         .
10324  691          .         .         .         .         .         S         .         .         .         .         .         .
10327  701          .         .         .         .         .         S         .         .         .         .         .         .
10330  711 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
10333  721          .         .         .         .         .         S         .         .         .         .         .         .
10336  731          .         .         .         .         .         S         .         .         .         .         .         .
10339  741          .         .         .         .         .         S         .         .         .         .         .         .
10342  751          .         .         .         .         .         S         .         .         .         .         .         .
10345  761          .         .         .         .         .         S         .         .         .         .         .         .
10348  771          .         .         .         .         .         S         .         .         .         .         .         .
10351  781          .         .         .         .         .         S         .         .         .         .         .         .
10354  791          .         .         .         .         .         S         .         .         .         .         .         .
10357  800    I     .         .         .         .         .         S         .         .         .         .         .         .
10400  810 . . . . . . . . . I . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
10403  820          .         .         .         I         .         .S        .         .         .         .         .         .
10406  83.0         .         .         .         .         .I        . S       .         .         .         .         .         .
10409  84.0         .         .         .         .         .         I. S      .         .         .         .         .         .
10412  85. 0        .         .         .         .         .         . S   I.  .         .         .         .         .         .
10415  86. 0        .         .         .         .         .         .  S  .   I .         .         .         .         .         .
10418  87.  0       .         .         .         .         .         .   S .     I.        .         .         .         .         .
10421  88.   0      .         .         .         .         .         .    S.     I         .         .         .         .         .
10424  89.    0     .         .         .         .         .         .     S     I         .         .         .         .         .
10427  90.     0    .         .         .         .         .         .      . S  I         .         .         .         .         .
10430  91. . . 0 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . I . . . . . . . . . . . . . . . . . . . . . . . . . .
10433  92.      0   .         .         .         .         .         .        . S  I.      .         .         .         .         .
10436  93.      0   .         .         .         .         .         .        . IS  .      .         .         .         .         .
10439  94.      0   .         .         .         .         .         .     I . S.         .         .         .         .         .
10442  95.      0   .         .         .         .         .         . I     . S.         .         .         .         .         .
10445  96.      0   .         .         .         .         .I        .       . S          .         .         .         .         .
10448  97.       0  .         .         .         .         .I        .       .S           .         .         .         .         .
10451  98.       0  .         .         .         .I        .         .       . S          .         .         .         .         .
10454  99.       0  .         .         .         I         .         .       . S          .         .         .         .         .
10457 100.       0  .         .         I         .         .         .       . S          .         .         .         .         .
10500 101. . . . 0 . . . . . . . I . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . . . .
10503 102.       0  .         I         .         .         .         .       . S          .         .         .         .         .
10506 103.       0  . I       .         .         .         .         .       .  S         .         .         .         .         .
10509 104.       0 I          .         .         .         .         .       .  S         .         .         .         .         .
10512 105.      I0  .         .         .         .         .         .       .  S         .         .         .         .         .
10515 106.    I  0  .         .         .         .         .         .       .  S         .         .         .         .         .
10518 107.   I   0  .         .         .         .         .         .       . S          .         .         .         .         .
10521 108.  I    0  .         .         .         .         .         .       . S          .         .         .         .         .
10524 109. I     0  .         .         .         .         .         .       . S          .         .         .         .         .
10527 110.I      0  .         .         .         .         .         .       . S          .         .         .         .         .
10530 111.I. . . 0 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . . . . . . .
10533 112I       0  .         .         .         .         .         .       . S          .         .         .         .         .
10536 113I       0  .         .         .         .         .         .       . S          .         .         .         .         .
10539 114I       0  .         .         .         .         .         .       . S          .         .         .         .         .
10542 115I       0  .         .         .         .         .         .       .S           .         .         .         .         .
10545 116I       0  .         .         .         .         .         .       .S           .         .         .         .         .
10548 117I       0  .         .         .         .         .         .       .S           .         .         .         .         .
10551 118I       0  .         .         .         .         .         .       .S           .         .         .         .         .
```

```
10554 119I       0 .         .         .         .         .         .         .         . S       .         .         .         .
10557 120I       0 .         .         .         .         .         .         .         . S       .         .         .         .
10600 121I . . . 0 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . .
10603 122I       0 .         .         .         .         .         .         .         .S        .         .         .         .
10606 123I       0 .         .         .         .         .         .         .         .S        .         .         .         .
10609 124I       0 .         .         .         .         .         .         .         .S        .         .         .         .
10612 125I       0 .         .         .         .         .         .         .         .S        .         .         .         .
10615 126I       0 .         .         .         .         .         .         .         .S        .         .         .         .
10618 127I       0 .         .         .         .         .         .         .         S         .         .         .         .
10621 128I      0  .         .         .         .         .         .         .         S         .         .         .         .
10624 129I      0  .         .         .         .         .         .         .         S         .         .         .         .
10627 130I      0  .         .         .         .         .         .         .         S         .         .         .         .
10630 131I . . .0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . .
10633 132I      0  .         .         .         .         .         .         .         S         .         .         .         .
10636 133I      0  .         .         .         .         .         .         .         S         .         .         .         .
10639 134I      0  .         .         .         .         .         .         .        S.         .         .         .         .
10642 135I      0  .         .         .         .         .         .         .        S.         .         .         .         .
10645 136I      0  .         .         .         .         .         .         .        S.         .         .         .         .
10648 137I      0  .         .         .         .         .         .         .        S.         .         .         .         .
10651 138I      0  .         .         .         .         .         .         .        S.         .         .         .         .
10654 139I      0  .         .         .         .         .         .         .        S.         .         .         .         .
10657 140I      0  .         .         .         .         .         .         .       S .         .         .         .         .
10700 141I . . .0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . .
10703 142I      0  .         .         .         .         .         .         .       S .         .         .         .         .
10706 143I      0  .         .         .         .         .         .         .       S .         .         .         .         .
10709 144I      0  .         .         .         .         .         .         .       S .         .         .         .         .
10712 145I      0  .         .         .         .         .         .         .       S .         .         .         .         .
10715 146I      0  .         .         .         .         .         .         .       S .         .         .         .         .
10718 147I      0  .         .         .         .         .         .         .      S  .         .         .         .         .
10721 148I      0  .         .         .         .         .         .         .      S  .         .         .         .         .
10724 149I      0  .         .         .         .         .         .         .      S  .         .         .         .         .
10727 150I      0  .         .         .         .         .         .         .      S  .         .         .         .         .
10730 151I . . .0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . .
10733 152I      0  .         .         .         .         .         .         .      S  .         .         .         .         .
10736 153I      0  .         .         .         .         .         .         .      S  .         .         .         .         .
10739 154I      0  .         .         .         .         .         .         .     S   .         .         .         .         .
10742 155I      0  .         .         .         .         .         .         .     S   .         .         .         .         .
10745 156I      0  .         .         .         .         .         .         .     S   .         .         .         .         .
10748 157I      0  .         .         .         .         .         .         .     S   .         .         .         .         .
10751 158I      0  .         .         .         .         .         .         .     S   .         .         .         .         .
10754 159I      0  .         .         .         .         .         .         .     S   .         .         .         .         .
10757 160I      0  .         .         .         .         .         .         .     S   .         .         .         .         .
10800 161I . . .0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . .
10803 162I      0  .         .         .         .         .         .         .    S    .         .         .         .         .
10806 163I      0  .         .         .         .         .         .         .    S    .         .         .         .         .
10809 164I      0  .         .         .         .         .         .         .    S    .         .         .         .         .
10812 165I      0  .         .         .         .         .         .         .    S    .         .         .         .         .
10815 166I      0  .         .         .         .         .         .         .    S    .         .         .         .         .
10818 167I     0   .         .         .         .         .         .         .    S    .         .         .         .         .
10821 168I     0   .         .         .         .         .         .         .    S    .         .         .         .         .
10824 169I     0   .         .         .         .         .         .         .   S     .         .         .         .         .
10827 170I     0   .         .         .         .         .         .         .   S     .         .         .         .         .
10830 171I . . 0 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . .
10833 172I     0   .         .         .         .         .         .         .   S     .         .         .         .         .
10836 173I     0   .         .         .         .         .         .         .   S     .         .         .         .         .
10839 174I     0   .         .         .         .         .         .         .   S     .         .         .         .         .
10842 175I     0   .         .         .         .         .         .         .   S     .         .         .         .         .
10845 176I     0   .         .         .         .         .         .         .  S      .         .         .         .         .
10848 177I     0   .         .         .         .         .         .         .  S      .         .         .         .         .
10851 178I     0   .         .         .         .         .         .         .  S      .         .         .         .         .
```

```
10854 179I     O  .         .         .         .         .         .         .  S      .         .         .         .         .
10857 180I     O  .         .         .         .         .         .         .  S      .         .         .         .         .
10900 181I  . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S. . . . . .
10903 182I     O  .         .         .         .         .         .         .  S      .         .         .         .         .
10906 183I     O  .         .         .         .         .         .         .  S      .         .         .         .         .
10909 184I     O  .         .         .         .         .         .         .  S      .         .         .         .         .
10912 185I     O  .         .         .         .         .         .         .  S      .         .         .         .         .
10915 186I     O  .         .         .         .         .         .         .  S      .         .         .         .         .
10918 187I     O  .         .         .         .         .         .         .  S      .         .         .         .         .
10921 188I     O  .         .         .         .         .         .         .  S      .         .         .         .         .
10924 189I     O  .         .         .         .         .         .         .  S      .         .         .         .         .
10927 190I     O  .         .         .         .         .         .         .  S      .         .         .         .         .
10930 191I  . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . .
10933 192I     O  .         .         .         .         .         .         S.        .         .         .         .         .
10936 193I     O  .         .         .         .         .         .         S.        .         .         .         .         .
10939 194I     O  .         .         .         .         .         .         S.        .         .         .         .         .
10942 195I     O  .         .         .         .         .         .         S.        .         .         .         .         .
10945 196I     O  .         .         .         .         .         .         S.        .         .         .         .         .
10948 197I     O  .         .         .         .         .         .         S.        .         .         .         .         .
10951 198I     O  .         .         .         .         .         .         S.        .         .         .         .         .
10954 199I     O  .         .         .         .         .         .         S.        .         .         .         .         .
10957 200I     O  .         .         .         .         .         .         S.        .         .         .         .         .
11000 201I  . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . .
11003 202I     O  .         .         .         .         .         .         S         .         .         .         .         .
11006 203I     O  .         .         .         .         .         .         S         .         .         .         .         .
11009 204I     O  .         .         .         .         .         .         S         .         .         .         .         .
11012 205I     O  .         .         .         .         .         .         S         .         .         .         .         .
11015 206I     O  .         .         .         .         .         .         S         .         .         .         .         .
11018 207I     O  .         .         .         .         .         .         S         .         .         .         .         .
11021 208I     O  .         .         .         .         .         .         S         .         .         .         .         .
11024 209I     O  .         .         .         .         .         .         S         .         .         .         .         .
11027 210I     O  .         .         .         .         .         .         S         .         .         .         .         .
11030 211I  . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . .
11033 212I     O  .         .         .         .         .         .         S.        .         .         .         .         .
11036 213I     O  .         .         .         .         .         .         S.        .         .         .         .         .
11039 214I     O  .         .         .         .         .         .         S.        .         .         .         .         .
11042 215I     O  .         .         .         .         .         .         S.        .         .         .         .         .
11045 216I     O  .         .         .         .         .         .         S.        .         .         .         .         .
11048 217I     O  .         .         .         .         .         .         S.        .         .         .         .         .
11051 218I     O  .         .         .         .         .         .         S.        .         .         .         .         .
11054 219I     O  .         .         .         .         .         .         S.        .         .         .         .         .
11057 220I     O  .         .         .         .         .         .         S.        .         .         .         .         .
11100 221I  . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . .
11103 222I     O  .         .         .         .         .         .         S.        .         .         .         .         .
11106 223I     O  .         .         .         .         .         .        S .        .         .         .         .         .
11109 224I     O  .         .         .         .         .         .        S .        .         .         .         .         .
11112 225I     O  .         .         .         .         .         .        S .        .         .         .         .         .
11115 226I     O  .         .         .         .         .         .        S .        .         .         .         .         .
11118 227I     O  .         .         .         .         .         .        S .        .         .         .         .         .
11121 228I     O  .         .         .         .         .         .        S .        .         .         .         .         .
11124 229I     O  .         .         .         .         .         .        S .        .         .         .         .         .
11127 230I     O  .         .         .         .         .         .        S .        .         .         .         .         .
11130 231I  .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . .
11133 232I     O  .         .         .         .         .         .        S .        .         .         .         .         .
11136 233I     O  .         .         .         .         .         .        S .        .         .         .         .         .
11139 234I     O  .         .         .         .         .         .        S .        .         .         .         .         .
11142 235I     O  .         .         .         .         .         .        S .        .         .         .         .         .
11145 236I     O  .         .         .         .         .         .        S .        .         .         .         .         .
11148 237I     O  .         .         .         .         .         .       S  .        .         .         .         .         .
11151 238I     O  .         .         .         .         .         .       S  .        .         .         .         .         .
```

```
11154 239I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11157 240I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11200 241I .O.     .      .      .      .      .      .      .S.     .      .      .      .      .      .
11203 242I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11206 243I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11209 244I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11212 245I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11215 246I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11218 247I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11221 248I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11224 249I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11227 250I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11230 251I .O.     .      .      .      .      .      .      .S.     .      .      .      .      .      .
11233 252I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11236 253I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11239 254I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11242 255I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11245 256I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11248 257I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11251 258I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11254 259I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11257 260I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11300 261I .O.     .      .      .      .      .      .      .S.     .      .      .      .      .      .
11303 262I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11306 263I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11309 264I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11312 265I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11315 266I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11318 267I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11321 268I  O      .      .      .      .      .      .      S      .      .      .      .      .      .
11324 269I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11327 270I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11330 271I O .     .      .      .      .      .      .      .S.     .      .      .      .      .      .
11333 272I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11336 273I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11339 274I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11342 275I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11345 276I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11348 277I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11351 278I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11354 279I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11357 280I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11400 281I O .     .      .      .      .      .      .      .S.     .      .      .      .      .      .
11403 282I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11406 283I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11409 284I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11412 285I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11415 286I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11418 287I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11421 288I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11424 289I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11427 290I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11430 291I O .     .      .      .      .      .      .      .S.     .      .      .      .      .      .
11433 292I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11436 293I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11439 294I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11442 295I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11445 296I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11448 297I O       .      .      .      .      .      .      S      .      .      .      .      .      .
11451 298I O       .      .      .      .      .      .      S      .      .      .      .      .      .
```

```
11454 299I O       .         .         .         .         .         .  S      .         .         .         .         .         .
11457 300I-O-------.---------.---------.---------.---------.---------.---S-----.---------.---------.---------.---------.---------.
```

*** ***

```
          **************
          *            *
279 KK    *     COMB2  *        RECOMBINE IN CHANNEL FLOW WITH OUTFLOW FROM DETENTION BASIN 2
          *            *
          **************

281 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           1  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE

282 HC          HYDROGRAPH COMBINATION
                     ICOMP           4  NUMBER OF HYDROGRAPHS TO COMBINE
```

***

****

HYDROGRAPH AT STATION COMB2
SUM OF 4 HYDROGRAPHS

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0345	76	328.	1		0730	151	176.	1		1115	226	81.
1		0003	2	0.	1		0348	77	399.	1		0733	152	175.	1		1118	227	80.
1		0006	3	0.	1		0351	78	448.	1		0736	153	174.	1		1121	228	80.
1		0009	4	0.	1		0354	79	541.	1		0739	154	172.	1		1124	229	79.
1		0012	5	0.	1		0357	80	640.	1		0742	155	171.	1		1127	230	78.
1		0015	6	0.	1		0400	81	725.	1		0745	156	170.	1		1130	231	77.
1		0018	7	0.	1		0403	82	795.	1		0748	157	169.	1		1133	232	76.
1		0021	8	0.	1		0406	83	856.	1		0751	158	167.	1		1136	233	74.
1		0024	9	0.	1		0409	84	897.	1		0754	159	166.	1		1139	234	73.
1		0027	10	0.	1		0412	85	916.	1		0757	160	165.	1		1142	235	72.
1		0030	11	0.	1		0415	86	923.	1		0800	161	164.	1		1145	236	71.
1		0033	12	0.	1		0418	87	911.	1		0803	162	162.	1		1148	237	70.
1		0036	13	0.	1		0421	88	880.	1		0806	163	161.	1		1151	238	69.
1		0039	14	0.	1		0424	89	826.	1		0809	164	159.	1		1154	239	68.
1		0042	15	0.	1		0427	90	777.	1		0812	165	157.	1		1157	240	67.
1		0045	16	0.	1		0430	91	725.	1		0815	166	155.	1		1200	241	66.
1		0048	17	0.	1		0433	92	670.	1		0818	167	153.	1		1203	242	65.
1		0051	18	0.	1		0436	93	631.	1		0821	168	152.	1		1206	243	65.
1		0054	19	0.	1		0439	94	620.	1		0824	169	150.	1		1209	244	64.
1		0057	20	0.	1		0442	95	605.	1		0827	170	148.	1		1212	245	63.
1		0100	21	0.	1		0445	96	589.	1		0830	171	147.	1		1215	246	62.
1		0103	22	0.	1		0448	97	572.	1		0833	172	145.	1		1218	247	62.
1		0106	23	0.	1		0451	98	553.	1		0836	173	144.	1		1221	248	61.
1		0109	24	0.	1		0454	99	533.	1		0839	174	142.	1		1224	249	60.
1		0112	25	0.	1		0457	100	513.	1		0842	175	141.	1		1227	250	60.
1		0115	26	0.	1		0500	101	497.	1		0845	176	139.	1		1230	251	59.

1	0118	27	0.	*	1	0503	102	458.	*	1	0848	177	138.	*	1	1233	252	59.
1	0121	28	0.	*	1	0506	103	422.	*	1	0851	178	137.	*	1	1236	253	58.
1	0124	29	0.	*	1	0509	104	390.	*	1	0854	179	136.	*	1	1239	254	57.
1	0127	30	0.	*	1	0512	105	364.	*	1	0857	180	135.	*	1	1242	255	57.
1	0130	31	0.	*	1	0515	106	342.	*	1	0900	181	133.	*	1	1245	256	56.
1	0133	32	0.	*	1	0518	107	325.	*	1	0903	182	132.	*	1	1248	257	56.
1	0136	33	0.	*	1	0521	108	311.	*	1	0906	183	131.	*	1	1251	258	55.
1	0139	34	0.	*	1	0524	109	301.	*	1	0909	184	130.	*	1	1254	259	54.
1	0142	35	0.	*	1	0527	110	292.	*	1	0912	185	129.	*	1	1257	260	53.
1	0145	36	0.	*	1	0530	111	285.	*	1	0915	186	128.	*	1	1300	261	53.
1	0148	37	0.	*	1	0533	112	280.	*	1	0918	187	127.	*	1	1303	262	52.
1	0151	38	0.	*	1	0536	113	276.	*	1	0921	188	126.	*	1	1306	263	52.
1	0154	39	0.	*	1	0539	114	273.	*	1	0924	189	125.	*	1	1309	264	51.
1	0157	40	0.	*	1	0542	115	270.	*	1	0927	190	123.	*	1	1312	265	51.
1	0200	41	0.	*	1	0545	116	268.	*	1	0930	191	122.	*	1	1315	266	50.
1	0203	42	0.	*	1	0548	117	266.	*	1	0933	192	120.	*	1	1318	267	50.
1	0206	43	0.	*	1	0551	118	264.	*	1	0936	193	119.	*	1	1321	268	50.
1	0209	44	0.	*	1	0554	119	263.	*	1	0939	194	117.	*	1	1324	269	49.
1	0212	45	0.	*	1	0557	120	261.	*	1	0942	195	116.	*	1	1327	270	49.
1	0215	46	0.	*	1	0600	121	260.	*	1	0945	196	115.	*	1	1330	271	49.
1	0218	47	0.	*	1	0603	122	258.	*	1	0948	197	113.	*	1	1333	272	48.
1	0221	48	0.	*	1	0606	123	256.	*	1	0951	198	112.	*	1	1336	273	48.
1	0224	49	1.	*	1	0609	124	254.	*	1	0954	199	111.	*	1	1339	274	48.
1	0227	50	1.	*	1	0612	125	252.	*	1	0957	200	109.	*	1	1342	275	47.
1	0230	51	2.	*	1	0615	126	248.	*	1	1000	201	108.	*	1	1345	276	47.
1	0233	52	3.	*	1	0618	127	245.	*	1	1003	202	107.	*	1	1348	277	47.
1	0236	53	4.	*	1	0621	128	240.	*	1	1006	203	106.	*	1	1351	278	46.
1	0239	54	4.	*	1	0624	129	234.	*	1	1009	204	105.	*	1	1354	279	46.
1	0242	55	5.	*	1	0627	130	229.	*	1	1012	205	103.	*	1	1357	280	46.
1	0245	56	6.	*	1	0630	131	224.	*	1	1015	206	102.	*	1	1400	281	46.
1	0248	57	6.	*	1	0633	132	219.	*	1	1018	207	101.	*	1	1403	282	45.
1	0251	58	7.	*	1	0636	133	215.	*	1	1021	208	100.	*	1	1406	283	45.
1	0254	59	8.	*	1	0639	134	211.	*	1	1024	209	99.	*	1	1409	284	45.
1	0257	60	8.	*	1	0642	135	207.	*	1	1027	210	98.	*	1	1412	285	45.
1	0300	61	9.	*	1	0645	136	203.	*	1	1030	211	97.	*	1	1415	286	44.
1	0303	62	10.	*	1	0648	137	200.	*	1	1033	212	96.	*	1	1418	287	44.
1	0306	63	11.	*	1	0651	138	197.	*	1	1036	213	95.	*	1	1421	288	44.
1	0309	64	12.	*	1	0654	139	195.	*	1	1039	214	93.	*	1	1424	289	44.
1	0312	65	13.	*	1	0657	140	193.	*	1	1042	215	92.	*	1	1427	290	43.
1	0315	66	14.	*	1	0700	141	191.	*	1	1045	216	91.	*	1	1430	291	43.
1	0318	67	15.	*	1	0703	142	189.	*	1	1048	217	90.	*	1	1433	292	43.
1	0321	68	19.	*	1	0706	143	188.	*	1	1051	218	89.	*	1	1436	293	43.
1	0324	69	56.	*	1	0709	144	186.	*	1	1054	219	88.	*	1	1439	294	43.
1	0327	70	106.	*	1	0712	145	185.	*	1	1057	220	87.	*	1	1442	295	42.
1	0330	71	125.	*	1	0715	146	183.	*	1	1100	221	86.	*	1	1445	296	42.
1	0333	72	144.	*	1	0718	147	182.	*	1	1103	222	85.	*	1	1448	297	42.
1	0336	73	172.	*	1	0721	148	181.	*	1	1106	223	84.	*	1	1451	298	42.
1	0339	74	212.	*	1	0724	149	179.	*	1	1109	224	83.	*	1	1454	299	42.
1	0342	75	265.	*	1	0727	150	178.	*	1	1112	225	82.	*	1	1457	300	41.
				*					*					*				

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	14.95-HR
		(CFS)				
923.	4.25		304.	149.	149.	149.
		(INCHES)	1.234	1.503	1.503	1.503
		(AC-FT)	151.	184.	184.	184.

CUMULATIVE AREA = 2.29 SQ MI

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

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	140S	496.	4.25	69.	28.	28.	.52		
DIVERSION TO	OR140	20.	4.25	4.	2.	2.	.52		
HYDROGRAPH AT	DT140	496.	4.25	65.	26.	26.	.52		
ROUTED TO	140RR	26.	5.10	25.	18.	18.	.52	72.36	5.15
ROUTED TO	RM140	26.	5.45	25.	18.	18.	.52		
HYDROGRAPH AT	141S	263.	4.10	38.	15.	15.	.19		
DIVERSION TO	OR141	57.	4.10	5.	2.	2.	.19		
HYDROGRAPH AT	DT141	263.	4.10	33.	13.	13.	.19		
2 COMBINED AT	HC141	275.	4.10	56.	31.	31.	.70		
DIVERSION TO	DVT141	22.	4.10	14.	10.	10.	.70		
HYDROGRAPH AT	DVT141	253.	4.10	41.	20.	20.	.70		
HYDROGRAPH AT	142S	671.	4.15	100.	40.	40.	.51		
DIVERSION TO	OR142	45.	4.15	7.	3.	3.	.51		
HYDROGRAPH AT	DT142	671.	4.15	93.	37.	37.	.51		
DIVERSION TO	DVT142	319.	4.15	65.	26.	26.	.51		
HYDROGRAPH AT	DVT142	364.	4.15	28.	11.	11.	.51		

2 COMBINED AT	ADD142	614.	4.15	70.	32.	32.	1.21		
ROUTED TO	DET142	80.	4.60	62.	32.	32.	1.21	1318.97	4.60
HYDROGRAPH AT	DVT141	22.	4.10	14.	10.	10.	.00		
HYDROGRAPH AT	DVT142	319.	4.45	65.	26.	26.	.00		
3 COMBINED AT	HC142	417.	4.45	138.	68.	68.	1.21		
ROUTED TO	RM142	416.	4.60	138.	67.	67.	1.21		
HYDROGRAPH AT	143S	841.	4.15	136.	55.	55.	.60		
DIVERSION TO	OR143	58.	4.15	11.	5.	5.	.60		
HYDROGRAPH AT	DT143	841.	4.15	125.	50.	50.	.60		
2 COMBINED AT	HC143	1221.	4.15	258.	117.	117.	1.82		
ROUTED TO	RM143	1220.	4.20	258.	117.	117.	1.82		
DIVERSION TO	DIV 2	662.	4.20	74.	30.	30.	1.82		
HYDROGRAPH AT	BYPASS	558.	4.20	184.	87.	87.	1.82		
HYDROGRAPH AT	DIV 2A	662.	4.20	74.	30.	30.	.00		
HYDROGRAPH AT	144S	615.	4.20	100.	40.	40.	.47		
DIVERSION TO	OR144	14.	4.20	4.	2.	2.	.47		
HYDROGRAPH AT	DT144	615.	4.20	96.	38.	38.	.47		
DIVERSION TO	DIV1P	265.	3.90	20.	8.	8.	.47		
HYDROGRAPH AT	DIV1P	350.	3.90	76.	31.	31.	.47		
2 COMBINED AT	SITE2A	1012.	4.20	150.	60.	60.	.47		

```
ROUTED TO
                SITE2A      877.   4.40       149.       60.       60.       .47
                                                                                  1263.19       4.40

DIVERSION TO
                2AOUTL       77.   4.40        41.       17.       17.       .47

HYDROGRAPH AT
                60INCH      800.   4.40       108.       43.       43.       .47

ROUTED TO
                SITE2B       80.   5.20        68.       37.       37.       .47
                                                                                  1257.72       5.20

HYDROGRAPH AT
                 RET1P      265.   4.20        20.        8.        8.       .00

HYDROGRAPH AT
                2A RET       77.   4.40        41.       17.       17.       .00

4 COMBINED AT
                 COMB2      923.   4.25       304.      149.      149.      2.29

ROUTED TO
+                RM144      919.   4.30       304.      148.      148.      2.29

HYDROGRAPH AT
+                 145S      786.   4.10       121.       49.       49.       .55

2 COMBINED AT
+                HC145     1635.   4.20       412.      197.      197.      2.84
```

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	INTERPOLATED TO COMPUTATION INTERVAL DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)
RM140	MANE	3.00	26.07	330.00	.79	3.00	26.07	330.00	.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2263E+02 EXCESS= .0000E+00 OUTFLOW= .2176E+02 BASIN STORAGE= .6323E+00 PERCENT ERROR= 1.1

RM142	MANE	3.00	415.54	276.00	1.28	3.00	415.54	276.00	1.28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8393E+02 EXCESS= .0000E+00 OUTFLOW= .8311E+02 BASIN STORAGE= .9764E+00 PERCENT ERROR= -.2

RM143	MANE	2.19	1220.60	252.19	1.49	3.00	1220.23	252.00	1.49

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1450E+03 EXCESS= .0000E+00 OUTFLOW= .1449E+03 BASIN STORAGE= .2244E+00 PERCENT ERROR= .0

```
RM144  MANE        3.00    918.73    258.00     1.50     3.00    918.73    258.00       1.50

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1840E+03 EXCESS= .0000E+00 OUTFLOW= .1833E+03 BASIN STORAGE= .8961E+00 PERCENT ERROR=   -.1


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

HYDRAULIC CALCULATIONS FOR DOUBLE 6'x 4' BOXES
DOWNSTREAM OF THE SIDE FLOW WEIR
ALTERNATIVE C-1A

STORM DRAIN ANALYSIS PLUS

Original version by Los Angeles County Public Works
Portions Copyrighted by CIVILSOFT, 1986, 1987, 1989

Jun 23, 1995 12:23: 7

Input file : tenthc1.dat
Output file: tenthc1.out

INPUT FILE LISTING

```
T1 TENTH STREET WASH    FILE NAME: TENTHC1.DAT
T2 ALTERNATIVE C1a FLOW ANALYSIS
T3 FROM DOWNSTREAM OF ALICE AVE TO BEGINNING OF BOX CULVERTS
SO    100.00  51.10  1                        53.25
R     160.00  51.60  1      .030
TS    160.00  51.60  2      .055
R     190.00  51.84  2      .050
TS    200.00  51.92  3      .013
R     575.00  55.01  3      .013
R     725.00  56.24  3      .013                          43.
TS    745.00  56.40  4      .013
R     765.00  56.57  4      .013                          11.25
R     775.00  56.65  4      .013
SH                   4
1                                                  SP
                          WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING                          PAGE    1
0 CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
  CODE   NO   TYPE  PIERS   WIDTH    DIAMETER  WIDTH              DROP

  CD      1    1      0       .00      7.00   12.00   2.00  4.00   .00
  CD      2    2      0       .00      7.00   13.00                .00
  CD      3    3      0      1.00      4.00   13.00    .00   .00   .00
  CD      4    3      0      1.00      4.00   21.00    .00   .00   .00
1                                                                                                   PAGE NO   1
0                         WATER SURFACE PROFILE - TITLE CARD LISTING
0HEADING LINE NO 1 IS -
0                          TENTH STREET WASH    FILE NAME: TENTHC1.DAT
0HEADING LINE NO 2 IS -
0                          ALTERNATIVE C FLOW ANALYSIS
0HEADING LINE NO 3 IS -
0                          FROM DOWNSTREAM OF ALICE AVE TO BEGINNING OF BOX CULVERT
1                                                                                                   PAGE NO   2
0                         WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO   1 IS A SYSTEM OUTLET     *        *     *
                      U/S DATA   STATION    INVERT  SECT                                  W S ELEV
                                   100.00   51.10    1                                      53.25
0 ELEMENT NO   2 IS A REACH             *        *     *
                      U/S DATA   STATION    INVERT  SECT              N                RADIUS  ANGLE  ANG PT  MAN H
                                   160.00   51.60    1             .030                   .00    .00     .00     0
0 ELEMENT NO   3 IS A TRANSITION        *        *     *
                      U/S DATA   STATION    INVERT  SECT              N
                                   160.00   51.60    2             .055
 THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
0 ELEMENT NO   4 IS A REACH             *        *     *
                      U/S DATA   STATION    INVERT  SECT              N                RADIUS  ANGLE  ANG PT  MAN H
                                   190.00   51.84    2             .050                   .00    .00     .00     0
0 ELEMENT NO   5 IS A TRANSITION        *        *     *
                      U/S DATA   STATION    INVERT  SECT              N
                                   200.00   51.92    3             .013
0 ELEMENT NO   6 IS A REACH             *        *     *
```

```
                    U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
                               575.00     55.01    3              .013                                 .00    .00     .00      0
0 ELEMENT NO   7 IS A REACH          *         *    *
                    U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
                               725.00     56.24    3              .013                                 .00  43.00     .00      0
0 ELEMENT NO   8 IS A TRANSITION     *         *    *
                    U/S DATA   STATION    INVERT  SECT              N
                               745.00     56.40    4              .013
0 ELEMENT NO   9 IS A REACH          *         *    *
                    U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
                               765.00     56.57    4              .013                                 .00  11.25     .00      0
0 ELEMENT NO  10 IS A REACH          *         *    *
                    U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
                               775.00     56.65    4              .013                                 .00    .00     .00      0
0 ELEMENT NO  11 IS A SYSTEM HEADWORKS                 *                    *
                    U/S DATA   STATION    INVERT  SECT                                   W S ELEV
                               775.00     56.65    4                                        .00
 NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

 ** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
1                                                                                                                          PAGE    1
                                        WATER SURFACE PROFILE LISTING
                     TENTH STREET WASH    FILE NAME: TENTHC1.DAT
                     ALTERNATIVE C FLOW ANALYSIS
                     FROM DOWNSTREAM OF ALICE AVE TO BEGINNING OF BOX CULVERT
0 STATION    INVERT   DEPTH     W.S.        Q       VEL     VEL     ENERGY   SUPER  CRITICAL          HGT/   BASE/    ZL   NO  AVBPR
             ELEV   OF FLOW    ELEV                        HEAD   GRD.EL.   ELEV   DEPTH             DIA    ID NO.        PIER
0 L/ELEM     SO                                          SF AVE     HF                   NORM DEPTH                ZR
*****************************************************************************************************************************
0   100.00   51.10     2.82     53.92    500.0    8.65    1.16    55.09    .00    2.94             7.00   12.00   2.00   0   .00
0   100.00   51.10     2.82     53.92    500.0    8.65    1.16    55.09    .00    2.94             7.00   12.00   2.00   0   .00
0     3.85  .00833                                       .01350     .05                    3.14                   4.00
0   103.85   51.13     2.74     53.87    500.0    9.03    1.27    55.14    .00    2.94             7.00   12.00   2.00   0   .00
0     5.05  .00833                                       .01532     .08                    3.14                   4.00
0   108.90   51.17     2.65     53.82    500.0    9.47    1.39    55.22    .00    2.94             7.00   12.00   2.00   0   .00
0     5.52  .00833                                       .01749     .10                    3.14                   4.00
0   114.42   51.22     2.56     53.78    500.0    9.94    1.53    55.31    .00    2.94             7.00   12.00   2.00   0   .00
0     5.75  .00833                                       .01997     .11                    3.14                   4.00
0   120.18   51.27     2.47     53.74    500.0   10.42    1.69    55.43    .00    2.94             7.00   12.00   2.00   0   .00
0     5.86  .00833                                       .02281     .13                    3.14                   4.00
0   126.03   51.32     2.39     53.70    500.0   10.93    1.86    55.56    .00    2.94             7.00   12.00   2.00   0   .00
0     5.87  .00833                                       .02605     .15                    3.14                   4.00
0   131.90   51.37     2.31     53.67    500.0   11.46    2.04    55.71    .00    2.94             7.00   12.00   2.00   0   .00
0     5.83  .00833                                       .02977     .17                    3.14                   4.00
0   137.73   51.41     2.23     53.64    500.0   12.02    2.25    55.89    .00    2.94             7.00   12.00   2.00   0   .00
0     5.75  .00833                                       .03402     .20                    3.14                   4.00
0   143.48   51.46     2.15     53.61    500.0   12.61    2.47    56.08    .00    2.94             7.00   12.00   2.00   0   .00
0     5.64  .00833                                       .03889     .22                    3.14                   4.00
0   149.11   51.51     2.07     53.58    500.0   13.23    2.72    56.30    .00    2.94             7.00   12.00   2.00   0   .00
0     5.51  .00833                                       .04447     .25                    3.14                   4.00
1                                                                                                                          PAGE    2
                                        WATER SURFACE PROFILE LISTING
                     TENTH STREET WASH    FILE NAME: TENTHC1.DAT
                     ALTERNATIVE C FLOW ANALYSIS
                     FROM DOWNSTREAM OF ALICE AVE TO BEGINNING OF BOX CULVERT
0 STATION    INVERT   DEPTH     W.S.        Q       VEL     VEL     ENERGY   SUPER  CRITICAL          HGT/   BASE/    ZL   NO  AVBPR
             ELEV   OF FLOW    ELEV                        HEAD   GRD.EL.   ELEV   DEPTH             DIA    ID NO.        PIER
0 L/ELEM     SO                                          SF AVE     HF                   NORM DEPTH                ZR
*****************************************************************************************************************************
0   154.63   51.56     2.00     53.56    500.0   13.87    2.99    56.55    .00    2.94             7.00   12.00   2.00   0   .00
0     5.37  .00833                                       .05086     .27                    3.14                   4.00
0   160.00   51.60     1.93     53.53    500.0   14.55    3.29    56.82    .00    2.94             7.00   12.00   2.00   0   .00
0TRANS STR  .00000                                       .11711     .00                                           4.00
0   160.00   51.60     3.58     55.18    500.0   10.74    1.79    56.97    .00    3.58             7.00   13.00    .00   0   .00
0      .37  .00800                                       .04004     .01                    6.57                    .00
0   160.37   51.60     3.76     55.36    500.0   10.24    1.63    56.99    .00    3.58             7.00   13.00    .00   0   .00
```

```
0     1.31   .00800                                    .03497     .05                    6.57                  .00
0   161.68   51.61    3.94    55.55    500.0    9.76    1.48   57.03     .00    3.58            7.00   13.00   .00   0    .00
0     2.56   .00800                                    .03055     .08                    6.57                  .00
0   164.24   51.63    4.13    55.77    500.0    9.31    1.35   57.11     .00    3.58            7.00   13.00   .00   0    .00
0     4.24   .00800                                    .02672     .11                    6.57                  .00
0   168.48   51.67    4.33    56.00    500.0    8.87    1.22   57.23     .00    3.58            7.00   13.00   .00   0    .00
0     6.52   .00800                                    .02338     .15                    6.57                  .00
0   175.00   51.72    4.55    56.27    500.0    8.46    1.11   57.38     .00    3.58            7.00   13.00   .00   0    .00
0     9.68   .00800                                    .02047     .20                    6.57                  .00
0   184.68   51.80    4.77    56.57    500.0    8.07    1.01   57.58     .00    3.58            7.00   13.00   .00   0    .00
0     4.74   .00800                                    .01870     .09                    6.57                  .00
0   189.42   51.84    4.85    56.68    500.0    7.94     .98   57.66     .00    3.58            7.00   13.00   .00   0    .00
OHYDRAULIC JUMP                                                                                                   .00
0   189.42   51.84    2.56    54.39    500.0   15.04    3.52   57.91     .00    3.58            7.00   13.00   .00   0    .00
0      .58   .00800                                    .11631     .07                    6.57                  .00
1                                                                                                          PAGE    3
```

WATER SURFACE PROFILE LISTING

TENTH STREET WASH FILE NAME: TENTHC1.DAT

ALTERNATIVE C FLOW ANALYSIS

FROM DOWNSTREAM OF ALICE AVE TO BEGINNING OF BOX CULVERT

```
0 STATION    INVERT   DEPTH     W.S.       Q      VEL     VEL    ENERGY   SUPER  CRITICAL          HGT/   BASE/    ZL   NO  AVBPR
           ELEV   OF FLOW    ELEV                        HEAD   GRD.EL.   ELEV    DEPTH            DIA    ID NO.        PIER
0 L/ELEM     SO                                        SF AVE     HF                    NORM DEPTH                ZR
*****************************************************************************************************************************
0   190.00   51.84    2.52    54.36    500.0   15.24    3.61   57.97     .00    3.58            7.00   13.00   .00   0    .00
OTRANS STR   .00800                                    .00802     .08                                              .00
0   200.00   51.92    2.52    54.44    500.0   15.25    3.61   58.05     .00    3.58            4.00   13.00   .00   0   1.00
OTRANS STR   .00800                                    .00802     .00                                              .00
0   200.00   51.92    2.52    54.44    500.0   15.25    3.61   58.05     .00    3.58            4.00   13.00   .00   0   1.00
0   242.60   .00824                                    .00768    1.86                    2.50                  .00
0   442.60   53.92    2.60    56.52    500.0   14.80    3.40   59.92     .00    3.58            4.00   13.00   .00   0   1.00
0   132.40   .00824                                    .00686     .91                    2.50                  .00
0   575.00   55.01    2.73    57.74    500.0   14.11    3.09   60.83     .00    3.58            4.00   13.00   .00   0   1.00
0    52.10   .00820                                    .00607     .32                    2.50                  .00
0   627.10   55.44    2.82    58.26    500.0   13.63    2.89   61.15     .00    3.58            4.00   13.00   .00   0   1.00
0    44.42   .00820                                    .00539     .24                    2.50                  .00
0   671.52   55.80    2.96    58.76    500.0   13.00    2.62   61.39     .00    3.58            4.00   13.00   .00   0   1.00
0    26.84   .00820                                    .00469     .13                    2.50                  .00
0   698.37   56.02    3.10    59.13    500.0   12.39    2.39   61.51     .00    3.58            4.00   13.00   .00   0   1.00
0    15.90   .00820                                    .00409     .06                    2.50                  .00
0   714.27   56.15    3.26    59.41    500.0   11.81    2.17   61.58     .00    3.58            4.00   13.00   .00   0   1.00
0     8.26   .00820                                    .00356     .03                    2.50                  .00
0   722.52   56.22    3.41    59.63    500.0   11.26    1.97   61.61     .00    3.58            4.00   13.00   .00   0   1.00
0     2.48   .00820                                    .00310     .01                    2.50                  .00
0   725.00   56.24    3.58    59.82    500.0   10.74    1.79   61.61     .00    3.58            4.00   13.00   .00   0   1.00
OTRANS STR   .00800                                    .00213     .04                                              .00
1                                                                                                          PAGE    4
```

WATER SURFACE PROFILE LISTING

TENTH STREET WASH FILE NAME: TENTHC1.DAT

ALTERNATIVE C FLOW ANALYSIS

FROM DOWNSTREAM OF ALICE AVE TO BEGINNING OF BOX CULVERT

```
0 STATION    INVERT   DEPTH     W.S.       Q      VEL     VEL    ENERGY   SUPER  CRITICAL          HGT/   BASE/    ZL   NO  AVBPR
           ELEV   OF FLOW    ELEV                        HEAD   GRD.EL.   ELEV    DEPTH            DIA    ID NO.        PIER
0 L/ELEM     SO                                        SF AVE     HF                    NORM DEPTH                ZR
*****************************************************************************************************************************
0   745.00   56.40    4.83    61.23    500.0    5.97     .55   61.78     .00    2.60            4.00   21.00   .00   0   1.00
0    20.00   .00850                                    .00137     .03                    1.73                  .00
0   765.00   56.57    4.72    61.29    500.0    5.97     .55   61.85     .00    2.60            4.00   21.00   .00   0   1.00
0    10.00   .00800                                    .00137     .01                    1.77                  .00
0   775.00   56.65    4.66    61.31    500.0    5.97     .55   61.86     .00    2.60            4.00   21.00   .00   0   1.00
1
```

Flood Control District of Maricopa County
10th Street Wash
Hydraulic Analysis - Mannings Equation
60-inch Basin Equalizer Pipe Flow Calculations
ALTERNATIVE C-1A
V=1.486/n*R^.67*S^.5 n= 0.013

Calc. Point	Water Surface Elevations Basin 2A	Water Surface Elevations 2B	Water Surface Differential	Length of Pipe (ft)	Pipe Diameter (in)	Area (ft^2)	Friction Losses (ft)	Hydraulic Slope w/ Losses	Velocity (fps)	Estimated Cap. Single Culvert (cfs)	Capacity Double Culv. (cfs)
1	1263.2	1253.2	10.0	350	60	19.63	1.56	0.0241	20.61	404	809
2	1260.8	1256.9	3.9	350	60	19.63	0.61	0.0094	12.87	253	505
3	1258.7	1257.6	1.1	350	60	19.63	0.17	0.0027	6.84	134	268
4	1257.9	1257.7	0.2	350	60	19.63	0.03	0.0005	2.91	57	114

Footnotes:
1. Point 1 checks 60 inch pipe capacity for peak flow of 800 cfs at time 424.
2. Point 2 checks 60 inch pipe capacity for 492 cfs at time 448 as Basin 2B is within 2 foot of high water elevation.
3. Point 3 checks 60 inch capacity for 220 cfs at time 500 as Basin 2B is nearly full.
4. Point 4 checks 60 inch capacity for 137 cfs at time 506 when Basins are at equilibrium elevation.

APPENDIX F

COST ESTIMATES

Flood Control District of Maricopa County
10th Street Wash Detention Basin No. 2
Preliminary Construction Estimates - Design Concept Alternatives
Alternative A - Pipe Outlet from Stilling Basin

Item	Description	Quantity	Units	Unit Price	Total Price
1	NPDES/SWPPP Permits	1	L.S.	$14,945	$14,945
2	Mobilization	1	L.S.	$44,834	$44,834
3	Pavement Removal	5,200	S.Y.	$2.50	$13,000
4	Lawrence Ave. Deadend - AC Pavement (C-3/4)	76	TONS	$30.00	$2,280
5	Lawrence Ave. Deadend - Pavement Base (ABC)	200	TONS	$15.00	$3,000
6	Lawrence Ave. Deadend Curb & Gutter	200	L.F.	$10.00	$2,000
7	Excavation - East Basin	25,000	C.Y	$5.50	$137,500
8	Excavation - West Basin	96,000	C.Y	$5.50	$528,000
9	Channel Excavation	440	C.Y	$10.00	$4,400
10	Concrete Channel Lining	95	C.Y	$160.00	$15,200
11	East Spillway - Structural Excavation	1,000	C.Y	$10.00	$10,000
12	East Spillway - Concrete w/Steel	150	C.Y	$350.00	$52,500
13	West Spillway - Structural Excavation	800	C.Y	$10.00	$8,000
14	West Spillway - Concrete w/Steel	120	C.Y	$350.00	$42,000
15	Emergency Spillway Concrete	100	C.Y	$160.00	$16,000
16	Wrought Iron Fencing around Channel & Stilling Basi	220	L.F.	$30.00	$6,600
17	72-inch RCP - Basin Connection	780	L.F.	$200.00	$156,000
18	East Basin Riprap	235	C.Y	$56.00	$13,170
19	West Basin Riprap	220	C.Y	$56.00	$12,310
20	66-inch RCP - Stilling Basin Outlet	1,870	L.F.	$180.00	$336,600
21	Alice Avenue Outlet Headwall - Concrete w/Steel	5	C.Y	$350.00	$1,750
22	West Basin Outlet Pipe - 30-inch RCP	500	L.F.	$100.00	$50,000
23	30-in Inlet Headwall - Concrete w/Steel	3	C.Y	$350.00	$1,050
24	East Basin Outlet Pipe - 24-in RCP	90	L.F.	$100.00	$9,000
25	Maintenance Road - 4" DG - 12-ft x 1160-ft	320	TONS	$30.00	$9,600
26	Maintenance Road - 4" DG - 8-ft x 2200-ft	400	TONS	$30.00	$12,000
27	Palma Park Channel Excavation	1,465	C.Y	$10.00	$14,650
28	Palma Park Culvert 48-in RCP	400	L.F.	$135.00	$54,000
29	Palma Park Culvert Headwall	6	C.Y	$350.00	$2,100
30	6" Waterline Cut & Plug	3	EA.	$500.00	$1,500
31	8" Sewer Cut & Plug	1	EA.	$300.00	$300
32	48" Sanitary Manhole	1	EA.	$1,200.00	$1,200
		Subtotal			$1,495,400
		Contingency @ 20%			$299,100
		Total - 1995 Dollars			$1,794,500
		Landscaping Dollars			$51,200
		Total w/ Landscaping			**$1,845,700**

Inflationary Increase @ 5% - 1996	$1,938,000
Inflationary Increase @ 5% - 1997	$2,034,900
Inflationary Increase @ 5% - 1998	$2,136,600

184dcm/TENTHASP

Flood Control District of Maricopa County
10th Street Wash Detention Basin No. 2
Preliminary Construction Estimates - Design Concept Alternatives
Alternative A - Box Culvert Outlet from Stilling Basin

Item	Description	Quantity	Units	Unit Price	Total Price
1	NPDES/SWPPP Permits	1	L.S.	$17,000	$17,000
2	Mobilization	1	L.S.	$51,000	$51,000
3	Pavement Removal	5,200	S.Y.	$2.50	$13,000
4	Lawrence Ave. Deadend - AC Pavement (C-3/4)	76	TONS	$30.00	$2,280
5	Lawrence Ave. Deadend - Pavement Base (ABC)	200	TONS	$15.00	$3,000
6	Lawrence Ave. Deadend Curb & Gutter	200	L.F.	$10.00	$2,000
7	Excavation - East Basin	25,000	C.Y	$5.50	$137,500
8	Excavation - West Basin	96,000	C.Y	$5.50	$528,000
9	Channel Excavation	440	C.Y	$10.00	$4,400
10	Concrete Channel Lining	95	C.Y	$160.00	$15,200
11	East Spillway - Structural Excavation	1,000	C.Y	$10.00	$10,000
12	East Spillway - Concrete w/Steel	150	C.Y	$350.00	$52,500
13	West Spillway - Structural Excavation	800	C.Y	$10.00	$8,000
14	West Spillway - Concrete w/Steel	120	C.Y	$350.00	$42,000
15	Emergency Spillway Concrete	100	C.Y	$160.00	$16,000
16	Wrought Iron Fencing around Channel & Spillway	220	L.F.	$30.00	$6,600
17	72-inch RCP - Basin Connection	780	L.F.	$200.00	$156,000
18	East Basin Riprap	235	C.Y	$56.00	$13,170
19	West Basin Riprap	220	C.Y	$56.00	$12,310
20	Double Barrel 6' x 4' Box Culvert	930	L.F.	$450.00	$418,500
21	Alice Avenue Outlet Headwall - Concrete w/Steel	5	C.Y	$350.00	$1,750
22	West Basin Outlet Pipe - 30-inch RCP	500	L.F.	$100.00	$50,000
23	30-in Inlet Headwall - Concrete w/Steel	3	C.Y	$350.00	$1,050
24	East Basin Outlet Pipe - 24-in RCP	90	L.F.	$100.00	$9,000
25	Maintenance Road - 4" DG - 12-ft x 1160-ft	320	TONS	$30.00	$9,600
26	Maintenance Road - 4" DG - 8-ft x 2200-ft	400	TONS	$30.00	$12,000
27	Palma Park Channel Excavation	1,465	C.Y	$10.00	$14,650
28	Palma Park Culvert 48-in RCP	400	L.F.	$135.00	$54,000
29	Palma Park Culvert Headwall	6	C.Y	$350.00	$2,100
30	6" Waterline Cut & Plug	3	EA.	$500.00	$1,500
31	8" Sewer Cut & Plug	1	EA.	$300.00	$300
32	48" Sanitary Manhole	1	EA.	$1,200.00	$1,200
		Subtotal			$1,665,600
		Contingency @ 20%			$333,100
		Total - 1995 Dollars			$1,998,700
		Landscaping Dollars			$51,200
		Total w/ Landscaping			**$2,049,900**

Inflationary Increase @ 5% - 1996	$2,152,400
Inflationary Increase @ 5% - 1997	$2,260,000
Inflationary Increase @ 5% - 1998	$2,373,000

184dcm/TENTHA$B

Flood Control District of Maricopa County
10th Street Wash Detention Basin No. 2
Preliminary Construction Estimates - Design Concept Alternatives
Alternative B - Pipe Outlet from Stilling Basin

Item	Description	Quantity	Units	Unit Price	Total Price
1	NPDES/SWPPP Permits	1	L.S.	$16,000	$16,000
2	Mobilization	1	L.S.	$48,000	$48,000
3	Pavement Removal	5,200	S.Y.	$2.50	$13,000
4	Lawrence Ave. Deadend - AC Pavement (C-3/4)	76	TONS	$30.00	$2,280
5	Lawrence Ave. Deadend - Pavement Base (ABC)	200	TONS	$15.00	$3,000
6	Lawrence Ave. Deadend Curb & Gutter	200	L.F.	$10.00	$2,000
7	Excavation - East Basin	25,000	C.Y	$5.50	$137,500
8	Excavation - West Basin	96,000	C.Y	$5.50	$528,000
9	Channel Excavation	1,620	C.Y	$10.00	$16,200
10	Concrete Channel Lining	300	C.Y	$160.00	$48,000
11	West Stilling Basin - Structural Excavation	1,200	C.Y	$10.00	$12,000
12	West Stilling Basin - Concrete w/Steel	200	C.Y	$350.00	$70,000
13	Emergency Spillway Concrete	100	C.Y	$160.00	$16,000
14	Wrought Iron Fencing around Channel & Stilling Basi	880	L.F.	$30.00	$26,400
15	66-inch RCP - Basin Connection	680	L.F.	$180.00	$122,400
16	East Basin Inlet Headwall - Concrete w/Steel	20	C.Y	$350.00	$7,000
17	East Basin Riprap	176	C.Y	$56.00	$9,870
18	West Basin Riprap	230	C.Y	$56.00	$12,880
19	Channel Riprap	80	C.Y	$56.00	$4,490
20	66-inch RCP - Stilling Basin Outlet	1,380	L.F.	$180.00	$248,400
21	Alice Avenue Outlet Headwall - Concrete w/Steel	5	C.Y	$350.00	$1,750
22	West Basin Outlet Pipe - 30-inch RCP	500	L.F.	$100.00	$50,000
23	30-in Inlet Headwall - Concrete w/Steel	3	C.Y	$350.00	$1,050
24	East Basin Outlet Pipe - 24-in RCP	260	L.F.	$100.00	$26,000
25	Maintenance Road - 4" DG - 12-ft x 1160-ft	320	TONS	$30.00	$9,600
26	Maintenance Road - 4" DG - 8-ft x 2200-ft	400	TONS	$30.00	$12,000
27	Palma Park Channel Excavation	1,465	C.Y	$10.00	$14,650
28	Palma Park Culvert 48-in RCP	400	L.F.	$135.00	$54,000
29	Palma Park Culvert Headwall	6	C.Y	$350.00	$2,100
30	6" Waterline Cut & Plug	3	EA.	$500.00	$1,500
31	8" Sewer Cut & Plug	1	EA.	$300.00	$300
32	48" Sanitary Manhole	1	EA.	$1,200.00	$1,200
		Subtotal			$1,517,600
		Contingency @ 20%			$303,500
		Total - 1995 Dollars			$1,821,100
		Landscaping Dollars			$51,200
		Total w/ Landscaping			**$1,872,300**

Inflationary Increase @ 5% - 1996	$1,965,900
Inflationary Increase @ 5% - 1997	$2,064,200
Inflationary Increase @ 5% - 1998	$2,167,400

184dcm/TENTHBSP

Flood Control District of Maricopa County
10th Street Wash Detention Basin No. 2
Preliminary Construction Estimates - Design Concept Alternatives: Preferred Alternative
Alternative B - Box Culvert Outlet from Stilling Basin

Item	Description	Quantity	Units	Unit Price	Total Price
1	NPDES/SWPPP Permits	1	L.S.	$15,000	$15,000
2	Mobilization	1	L.S.	$45,000	$45,000
3	Pavement Removal	5,200	S.Y.	$2.50	$13,000
4	Lawrence Ave. Deadend - AC Pavement (C-3/4)	76	TONS	$30.00	$2,280
5	Lawrence Ave. Deadend - Pavement Base (ABC)	200	TONS	$15.00	$3,000
6	Lawrence Ave. Deadend Curb & Gutter	200	L.F.	$10.00	$2,000
7	Excavation - East Basin	25,000	C.Y	$5.50	$137,500
8	Excavation - West Basin	96,000	C.Y	$5.50	$528,000
9	Channel Excavation	1,620	C.Y	$10.00	$16,200
10	Concrete Channel Lining	300	C.Y	$160.00	$48,000
11	West Stilling Basin - Structural Excavation	1,200	C.Y	$10.00	$12,000
12	West Stilling Basin - Concrete w/Steel	200	C.Y	$350.00	$70,000
13	Emergency Spillway Concrete	100	C.Y	$160.00	$16,000
14	Wrought Iron Fencing around Channel & Stilling Basi	880	L.F.	$30.00	$26,400
15	66-inch RCP - Basin Connection	680	L.F.	$180.00	$122,400
16	East Basin Inlet Headwall - Concrete w/Steel	20	C.Y	$350.00	$7,000
17	East Basin Riprap	176	C.Y	$56.00	$9,870
18	West Basin Riprap	230	C.Y	$56.00	$12,880
19	Channel Riprap	80	C.Y	$56.00	$4,490
20	Double Barrel 6' x 4' Box Culvert	690	L.F.	$450.00	$310,500
21	Alice Avenue Outlet Headwall - Concrete w/Steel	5	C.Y	$350.00	$1,750
22	West Basin Outlet Pipe - 30-inch RCP	500	L.F.	$100.00	$50,000
23	30-in Inlet Headwall - Concrete w/Steel	3	C.Y	$350.00	$1,050
24	East Basin Outlet Pipe - 24-in RCP	260	L.F.	$100.00	$26,000
25	Maintenance Road - 4" DG - 12-ft x 1160-ft	320	TONS	$30.00	$9,600
26	Maintenance Road - 4" DG - 8-ft x 2200-ft	400	TONS	$30.00	$12,000
27	Palma Park Channel Excavation	1,465	C.Y	$10.00	$14,650
28	Palma Park Culvert 48-in RCP	400	L.F.	$135.00	$54,000
29	Palma Park Culvert Headwall	6	C.Y	$350.00	$2,100
30	6" Waterline Cut & Plug	3	EA.	$500.00	$1,500
31	8" Sewer Cut & Plug	1	EA.	$300.00	$300
32	48" Sanitary Manhole	1	EA.	$1,200.00	$1,200
		Subtotal			$1,560,700
		Contingency @ 20%			$312,100
		Total - 1995 Dollars			$1,872,800
		Landscaping Dollars			$51,200
		Total w/ Landscaping			**$1,924,000**

Inflationary Increase @ 5% - 1996	$2,020,200
Inflationary Increase @ 5% - 1997	$2,121,200
Inflationary Increase @ 5% - 1998	$2,227,300

184dcm/TENTHBSB

Flood Control District of Maricopa County

10th Street Wash Detention Basin No. 2

Preliminary Construction Estimates - Design Concept Alternatives

Alternative C - Side Flow Weir 2B and Open Channel Flow to Alice Ave

Item	Description	Quantity	Units	Unit Price	Total Price
1	NPDES/SWPPP Permits	1	L.S.	$14,000	$14,000
2	Mobilization	1	L.S.	$42,000	$42,000
3	Pavement Removal	5,200	S.Y.	$2.50	$13,000
4	Lawrence Ave. Deadend - AC Pavement (C-3/4)	76	TONS	$30.00	$2,280
5	Lawrence Ave. Deadend - Pavement Base (ABC)	200	TONS	$15.00	$3,000
6	Lawrence Ave. Deadend Curb & Gutter	200	L.F.	$10.00	$2,000
7	Excavation - East Basin	25,000	C.Y	$5.50	$137,500
8	Excavation - West Basin	96,000	C.Y	$5.50	$528,000
9	Channel Excavation	3,200	C.Y	$10.00	$32,000
10	Concrete Channel Lining	600	C.Y	$160.00	$96,000
11	Concrete Cutoff Wall at Townley	7	C.Y	$350.00	$2,450
12	Emergency Spillway Concrete	100	C.Y	$160.00	$16,000
13	Wrought Iron Fencing	1,200	L.F.	$30.00	$36,000
14	66-inch RCP - Basin Connection	1,070	L.F.	$180.00	$192,600
15	West Basin Inlet Headwall - Concrete w/Steel	20	C.Y	$350.00	$7,000
16	West Basin Riprap	220	C.Y	$56.00	$12,290
17	East Basin Inlet Headwall - Concrete w/Steel	20	C.Y	$350.00	$7,000
18	East Basin Riprap	260	C.Y	$56.00	$14,530
19	West Basin Side Flow Weir - 200 L.F.	230	C.Y	$350.00	$80,500
20	Side Flow Weir Riprap	900	C.Y	$56.00	$50,400
21	West Basin Outlet Pipe - 30-inch RCP	500	L.F.	$100.00	$50,000
22	West Basin Outlet - 30-in Inlet Headwall	3	C.Y	$350.00	$1,050
23	East Basin Outlet Pipe - 24-in RCP	950	L.F.	$85.00	$80,750
24	East Basin Outlet - 24-in Inlet Headwall	3	C.Y	$350.00	$1,050
25	Maintenance Road - 4" DG - 12-ft x 1160-ft	320	TONS	$30.00	$9,600
26	Maintenance Road - 4" DG - 8-ft x 2200-ft	400	TONS	$30.00	$12,000
27	Palma Park Channel Excavation	1,465	C.Y	$10.00	$14,650
28	Palma Park Culvert 48-in RCP	400	L.F.	$135.00	$54,000
29	Palma Park Culvert Headwall	6	C.Y	$350.00	$2,100
30	6" Waterline Cut & Plug	3	EA.	$500.00	$1,500
31	8" Sewer Cut & Plug	1	EA.	$300.00	$300
32	48" Sanitary Manhole	1	EA.	$1,200.00	$1,200
		Subtotal			$1,516,750
		Contingency @ 20%			$303,350
		Total - 1995 Dollars			$1,820,100
		Landscaping Dollars			$51,200
		Total w/ Landscaping			**$1,871,300**

Inflationary Increase @ 5% - 1996	$1,964,900
Inflationary Increase @ 5% - 1997	$2,063,200
Inflationary Increase @ 5% - 1998	$2,166,400

184dcm/TENTHC$

Flood Control District of Maricopa County
10th Street Wash Detention Basin No. 2
Preliminary Construction Estimates - Design Concept Alternatives
Alternative C-1 - Side Flow Weir 2A and Open Channel Flow to Alice Ave

Item	Description	Quantity	Units	Unit Price	Total Price
1	NPDES/SWPPP Permits	1	L.S.	$14,000	$14,000
2	Mobilization	1	L.S.	$42,000	$42,000
3	Pavement Removal	5,200	S.Y.	$2.50	$13,000
4	Lawrence Ave. Deadend - AC Pavement (C-3/4)	76	TONS	$30.00	$2,280
5	Lawrence Ave. Deadend - Pavement Base (ABC)	200	TONS	$15.00	$3,000
6	Lawrence Ave. Deadend Curb & Gutter	200	L.F.	$10.00	$2,000
7	Excavation - East Basin	25,000	C.Y	$5.50	$137,500
8	Excavation - West Basin	96,000	C.Y	$5.50	$528,000
9	Channel Excavation	3,200	C.Y	$10.00	$32,000
10	Diversion Channel Concrete Lining	280	C.Y	$160.00	$44,800
11	Bypass Channel Concrete Lining	545	C.Y	$160.00	$87,200
12	Emergency Spillway Concrete	100	C.Y	$160.00	$16,000
13	Wrought Iron Fencing	1,200	L.F.	$30.00	$36,000
14	66-inch RCP - Basin Connection	1,070	L.F.	$180.00	$192,600
15	East Basin Side Flow Weir - 140 L.F.	160	C.Y	$350.00	$56,000
16	Side Flow Weir Riprap	600	C.Y	$56.00	$33,600
17	West Basin Inlet Headwall - Concrete w/Steel	20	C.Y	$350.00	$7,000
18	West Basin Riprap	220	C.Y	$56.00	$12,290
19	East Basin Inlet Headwall - Concrete w/Steel	20	C.Y	$350.00	$7,000
20	East Basin Riprap	260	C.Y	$56.00	$14,530
21	West Basin Outlet Pipe - 30-inch RCP	500	L.F.	$100.00	$50,000
22	West Basin Outlet - 30-in Inlet Headwall	3	C.Y	$350.00	$1,050
23	East Basin Outlet Pipe - 24-in RCP	950	L.F.	$85.00	$80,750
24	East Basin Outlet - 24-in Inlet Headwall	3	C.Y	$350.00	$1,050
25	Maintenance Road - 4" DG - 12-ft x 1160-ft	320	TONS	$30.00	$9,600
26	Maintenance Road - 4" DG - 8-ft x 2200-ft	400	TONS	$30.00	$12,000
27	Palma Park Channel Excavation	1,465	C.Y	$10.00	$14,650
28	Palma Park Culvert 48-in RCP	400	L.F.	$135.00	$54,000
29	Palma Park Culvert Headwall	6	C.Y	$350.00	$2,100
30	6" Waterline Cut & Plug	3	EA.	$500.00	$1,500
31	8" Sewer Cut & Plug	1	EA.	$300.00	$300
32	48" Sanitary Manhole	1	EA.	$1,200.00	$1,200
		Subtotal			$1,509,000
		Contingency @ 20%			$301,800
		Total - 1995 Dollars			$1,810,800
		Landscaping Dollars			$51,200
		Total w/ Landscaping			**$1,862,000**

Inflationary Increase @ 5% - 1996	$1,955,100
Inflationary Increase @ 5% - 1997	$2,052,900
Inflationary Increase @ 5% - 1998	$2,155,500

**If earthen bypass channel is installed, 1995 construction cost decreases $14,800
**If grasscrete bypass channel is selected, 1995 construction cost increases ~~$202,600~~ $118,810 +
@ $7/SF
ADD'L EXCA.

184dcm/TENTHC1$

Flood Control District of Maricopa County
10th Street Wash Detention Basin No. 2
Preliminary Construction Estimates - Design Concept Alternatives
Alternative C-1A - Side Flow Weir 2A and Box Culverts to Alice Ave

Item	Description	Quantity	Units	Unit Price	Total Price
1	NPDES/SWPPP Permits	1	L.S.	$14,000	$14,000
2	Mobilization	1	L.S.	$42,000	$42,000
3	Pavement Removal	5,200	S.Y.	$2.50	$13,000
4	Lawrence Ave. Deadend - AC Pavement (C-3/4)	76	TONS	$30.00	$2,280
5	Lawrence Ave. Deadend - Pavement Base (ABC)	200	TONS	$15.00	$3,000
6	Lawrence Ave. Deadend Curb & Gutter	200	L.F.	$10.00	$2,000
7	Alice Ave. - AC Pavement (C-3/4)	95	TONS	$30.00	$2,850
8	Alice Ave. - Pavement Base (ABC)	246	TONS	$15.00	$3,690
9	Excavation - East Basin	25,000	C.Y	$5.50	$137,500
10	Excavation - West Basin	96,000	C.Y	$5.50	$528,000
11	Channel Excavation	1,435	C.Y	$10.00	$14,350
12	Diversion Channel Concrete Lining	280	C.Y	$160.00	$44,800
13	Emergency Spillway Concrete	100	C.Y	$160.00	$16,000
14	Bypass Inlet Headwall	11	C.Y.	$350.00	$3,850
15	Bypass 8' x 4' Box Culvert	15	C.Y.	$350.00	$5,250
16	Bypass 6' x 4' Box Culvert	560	C.Y.	$350.00	$196,000
17	Bypass Outlet Headwall	12	C.Y.	$350.00	$4,200
18	Wrought Iron Fencing	440	L.F.	$30.00	$13,200
19	66-inch RCP - Basin Connection	1,070	L.F.	$180.00	$192,600
20	East Basin Side Flow Weir - 140 L.F.	160	C.Y	$350.00	$56,000
21	Side Flow Weir Riprap	600	C.Y	$56.00	$33,600
22	West Basin Inlet Headwall - Concrete w/Steel	20	C.Y	$350.00	$7,000
23	West Basin Riprap	220	C.Y	$56.00	~~$12,290~~ 12,320
24	East Basin Drop Inlet - Concrete w/ Steel	22	C.Y	$350.00	$7,700
25	East Basin Riprap	260	C.Y	$56.00	~~$14,530~~ 14,560
26	West Basin Outlet Pipe - ~~24~~ 30-inch RCP	110	L.F.	$85.00	$9,350
27	West Basin Outlet - ~~24~~ 30-in Inlet Headwall	3	C.Y	$350.00	$1,050
28	East Basin Outlet Pipe - ~~30~~ 24-in RCP	770	L.F.	$100.00	$77,000
29	East Basin Outlet - ~~30~~ 24-in Inlet Headwall	3	C.Y	$350.00	$1,050
30	Combined Basin Outlet Pipe - ~~42~~ 36-in RCP	560	L.F.	$140.00	$78,400
31	Combined Basin Outlet Pipe Headwall	4	C.Y	$350.00	$1,400
32	Maintenance Road - 4" DG - 12-ft x 1160-ft	320	TONS	$30.00	$9,600
33	Maintenance Road - 4" DG - 8-ft x 2200-ft	400	TONS	$30.00	$12,000
34	Palma Park Channel Excavation	1,465	C.Y	$10.00	$14,650
35	Palma Park Culvert 48-in RCP	400	L.F.	$135.00	$54,000
36	Palma Park Culvert Headwall	6	C.Y	$350.00	$2,100
37	6" Waterline Cut & Plug	3	EA.	$500.00	$1,500
38	8" Sewer Cut & Plug	1	EA.	$300.00	$300
39	48" Manhole (Sanitary & Basin Outlet)	6	EA.	$1,200.00	$7,200
		Subtotal			$1,639,300
		Contingency @ 20%			$327,900
		Total - 1995 Dollars			$1,967,200
		Landscaping Dollars			$51,200
		Total w/ Landscaping			**$2,018,400**

Inflationary Increase @ 5% - 1996	$2,119,300
Inflationary Increase @ 5% - 1997	$2,225,300
Inflationary Increase @ 5% - 1998	$2,336,600

184dcm/TENTHC1S

APPENDIX G

GEOTECHNICAL REPORT

ATL JOB NO. 194043

March 29, 1995
Revision 1

GEOTECHNICAL INVESTIGATION

REPORT FOR

RUST ENVIRONMENT & INFRASTRUCTURE

10TH STREET WASH DETENTION BASIN NO. 2
MARICOPA COUNTY FLOOD CONTROL DISTRICT
CONTRACT NO. 93-32
ATL JOB NO. 194043

Reviewed By:

Registered Professional Engineer (Civil)
CERTIFICATE NO.
22719
David Preston Hayes
Date Signed
ARIZONA U.S.A.

David P. Hayes, P.E.
Executive Vice President

Thomas W. Deibert, E.I.T.
Project Engineer

ATL, INC.
CONSTRUCTION QUALITY CONTROL
GEOTECHNICAL CONSULTANTS

March 29, 1995
Revision 1

Mr. Frank Henderson, PE
Rust Environment & Infrastructure
5343 16th Street, Suite 400
Phoenix, Arizona 85016

Re: Final Geotechnical Investigation Report
10th Street Wash Detention Basin No. 2
Maricopa County Flood Control District
Contract No. FCD 93-32
ATL Job No. 194043

Dear Mr Reynolds:

This final report presents the results of a geotechnical investigation for the design of a Detention Basin at the referenced site and incorporates the comments by Maricopa County Flood Control District on ATL's February 3, 1995 submittal. Presented are the results of the field exploration, laboratory tests, and engineering analysis. ATL's work was performed in accordance with ATL Proposal No. P93411 dated May 3, 1994 to Rust Environment.

The investigation consists of drilling ten (10) borings to depths ranging between 20 and 25.5 feet, evaluating the material for use as a liner and backfill, evaluating the box culvert slab, performing a seepage analysis and providing, construction specification recommendations.

ATL has appreciated the opportunity to be of service to Rust Environment on this project and looks forward to a continued association on future projects. Should any questions arise, please do not hesitate to contact us at your earliest convenience.

Very truly yours,

Registered Professional Engineer (Civil)
CERTIFICATE NO. 22719
David Preston Hayes
Date Signed 3/29/95
ARIZONA U.S.A.

Thomas W. Deibert, E.I.T.
Project Engineer

David P. Hayes, P.E.
Executive Vice President

2912 W. CLARENDON
PHOENIX, AZ 85017
TELEPHONE (602) 241-1097
FAX (602) 277-1306

820 E. 47TH STREET, SUITE B-1
TUCSON, AZ 85713
TELEPHONE (520) 623-4547
FAX (520) 623-4603

1400½ NORTH BROAD
GLOBE, AZ 85502
TELEPHONE (520) 425-8999
FAX (520) 425-9597

TABLE OF CONTENTS

Page

1.0 PROJECT DESCRIPTION 1
2.0 LOCATION AND SITE DESCRIPTION 2
3.0 SCOPE OF WORK 2
4.0 DRILLING AND SAMPLING PROCEDURES 3
5.0 LABORATORY TESTING 4
6.0 SUMMARY OF EXISTING SUBSURFACE CONDITIONS 5
7.0 DISCUSSION AND RECOMMENDATIONS 5
7.1 Subsurface Soil Data 5
7.2 Native Material 6
7.3 Box Culvert Slab Evaluation 7
7.4 Construction Specification Recommendations 8
8.0 ADDITIONAL SERVICES 8

PLATES

PLATE NO. 1 GUIDELINES IN THE USE AND INTERPRETATION OF THIS GEOTECHNICAL REPORT

PLATE NO. 2 SOIL CLASSIFICATION AND TERMINOLOGY

PLATE NO. 3 VICINITY MAP

PLATE NO. 4 BORING LOCATIONS

PLATE NO. 5 PROFILE - WESTERN BASIN AREA AND DIVERSION STRUCTURE

PLATE NO. 6 PROFILE - EASTERN BASIN AREA

PLATE NO. 7 PROFILE - STRUCTURES

APPENDICES

Page

APPENDIX A BORING LOGS . . . . . A1 - A10

APPENDIX B LABORATORY TEST RESULTS

TABULATION OF INDEX TEST RESULTS B1

STANDARD PROCTOR B12

CONTROL SWELL TEST RESULTS B13

CONSOLIDATION TEST RESULTS . . . . . B14 - B16

FIELD PERMEABILITY TEST RESULTS B17

pH TEST RESULTS B18

RESISTIVITY TEST RESULTS B19

Registered Professional Engineer (Civil)
CERTIFICATE NO. 22719
David Preston Hayes
Date Signed 3/29/95
ARIZONA, U.S.A.

GEOTECHNICAL INVESTIGATION

REPORT FOR

RUST ENVIRONMENT & INFRASTRUCTURE

PROJECT

10TH STREET WASH DETENTION BASIN NO. 2
MARICOPA COUNTY FLOOD CONTROL DISTRICT
CONTRACT NO. FCD 93-32
ATL JOB NO. 194043

1.0 PROJECT DESCRIPTION

The project consists of constructing a detention basin along the 10th Street Wash, downstream between Townly Avenue and Alice Avenue. The basin will intercept and detain portions of the 100-year storm runoff from the 10th Street Wash watershed, thereby reducing the flooding potential.

2.0 LOCATION AND SITE DESCRIPTION

The 10th Street Wash Detention Basin is located along the 10th Street Wash, bounded by Alice Avenue, 11th Street, Townley Avenue, and 9th Street. The general location of the project is shown on the Vicinity Map, Plate 3.

3.0 SCOPE OF WORK

The purpose of this project is to attenuate runoff from the 100-year event and reduce the flooding potential along the 10th Street Wash, downstream of Alice Avenue. This is to be accomplished by constructing Detention Basin No. 2 along the Wash. This detention Basin is to be located between Townley and Alice Avenues and between 8th and 11th Streets. The Basin will be designed to intercept and detain portions of the 100-year storm runoff from the 10th Street watershed that is north of Townley Avenue.

ATL submitted a boring location plan dated November 18, 1994 that was reviewed and modified by both Rust E & I and the Maricopa County Flood Control District. Borings were drilled at the box culvert locations, the structure locations, and throughout the two (2) detention basin areas as follows:

Boring No.	Location	Depth
1	S. Culvert Outfall	20 feet
2	Diversion Structure	25 feet
3	(2) 6'x 4' Box Culverts	25 feet
4	(2) 12'x 6' Box Culverts	25 feet
5	Small Detention Basin	20 feet
6	Small Detention Basin	20 feet
7	SW Large Detention Basin	20 feet
8	W Large Detention Basin	20 feet
9	N Large Detention Basin	20 feet
10	SW City of Phoenix Park	20 feet

Bulk samples were taken in order to determine the index properties of the soil and to determine the suitability of the material for re-use as structural fill of embankment within the project limits. "Ring samples were taken to determine in-situ properties of the soil for supporting various structures.

The field investigation and laboratory testing were performed to complete the following tasks:

1. Determine the Allowable Bearing Capacity within an acceptable settlement range for the box culvert and diversion structures.

2. Analyze the seepage rates within the two (2) detention Basins.

3. Evaluate the native material for use as basin liner and as backfill within the site.

4. Provide Construction Specification Recommendations.

4.0 DRILLING AND SAMPLING PROCEDURES

Ten (10) boreholes were advanced at the 10 th Street Wash Detention Basin No. 2 site. The boreholes were advanced to depths between twenty (20) and twenty-five and one half (25.5) feet.

A Mobile B-50 drill rig with an eight (8) inch outside diameter hollow stem continuous flight auger was utilized to penetrate the subsoil and sample the material. Standard Penetration Test (SPT) values were obtained at five (5) foot intervals using a split-spoon sampler, driven 18 inches with a 140-pound hammer. Sampling of the subsurface was obtained using a standard split spoon sampler driven with a 140-pound hammer falling thirty inches, in accordance with ASTM Standard D-1586. Bulk samples of the existing native material were selectively sampled off the auger flights and returned to the laboratory for analysis. Except for Boring No.'s 5 and 9, each borehole was immediately returned to its original state by backfilling excess cuttings into the borehole. The boreholes at locations at 5 and 9 were used to

conduct in-place percolation tests at depths of approximately twelve (12) feet from existing grade. The boreholes were pre-soaked for twenty-four (24) hours prior to performing the percolation tests. The boreholes were backfilled after testing was completed.

Boring locations and a general plan of the site are presented on Plate 4. Edited borings logs are presented in Appendix A.

5.0 LABORATORY TESTING

Representative bulk samples of the subgrade were collected at each boring location for soil classification purposes.

Visual field classifications were supplemented by index tests such as Sieve Analysis and Atterberg Limits on representative samples. Moisture Content tests were performed to determine the amount of water present in the soil at the time of sampling. In addition, Standard Proctor, Control Swell, Consolidation, Field Percolation, pH, and Resistivity tests were performed to determine the physical characteristics of the soil in order to determine support capability, swell tendencies, permeability and corossive potential.

The following table lists the types and quantities of tests performed to provide the project design information:

TEST	NUMBER OF TEST PERFORMED
Sieve Analysis	10
Atterberg Limit	10
Moisture Content	10
Proctor	2
Expansion/Swell	2
Consolidation	2
Field Percolation Tests	2
pH	4
Resistivity	4

All laboratory test were conducted in accordance with ASTM/AASHTO published Standards, and are summarized in Appendix B, "Laboratory Test Results". The soil shown on the edited boring logs are classified using the Unified Soils Classification System (USCS).

Please note that the soil samples will be stored for 60 days after the issuance of this report before they are discarded.

6.0 SUMMARY OF EXISTING CONDITIONS

The soil encountered at the proposed site consists of silty sand (SM), silty gravel (GM), and clayey sand (SC). The letters in parentheses represent the USCS classification symbols. Specifically, the silty sand (SM) was encountered at Boring No's. 1, 3, 5, and 10 at a depth between zero (0) and twenty (20) feet. A clayey sand (SC) was encountered at Boring No. 4 at a depth between the bottom of the pavement and twenty (20) feet and in Boring No. 2 at a depth between zero (0) and nine (9) feet. Sandy gravel (GS) was encountered in Boring No. 9 at a depth between zero (0) and twenty (20) feet and in Boring No. 2 at a depth between nine (9) and twenty-one (21) feet. Groundwater was not encountered in the boreholes at the time of sampling.

7.0 DISCUSSIONS AND RECOMMENDATIONS

7.1 Subsurface Soil Data

Two (2) Standard Proctor tests were performed on material from Boring No's. 4 and 9 to determine the maximum dry density and optimum moisture content. The soil had a maximum dry density of 130.4 pcf for Boring No. 4 and 122.3 pcf for Boring No. 9. Optimum moisture for the soil was determined to be 10.0 percent for Boring No. 4 and 10.8 percent for Boring No. 9. At these locations, the soils will potentially be reused as fill and/or subgrade and because compaction data will be required, this test was performed on these soils.

Material within twenty-five (25) feet of the surface was examined to determine the in-situ moisture content and plasticity index (PI). The in-situ moisture content for the borings was determined to be between 1.5 and 10.7 percent. This is in most cases below the Standard Proctor Optimum Moisture Content of 10.0 and 10.8 percent. The same soil layers exhibited a Plasticity Index (PI) between NP and 15 (The letters NP represent a non plastic material).

Controlled Swell tests were conducted for Boring No's. 2 and 4 to assess the soil swell potential at these locations. Boring No. 2 required 950 psf to control the swell of the soil. Boring No. 4 required 150 psf to control the swell of the soil. Both test samples were conducted with a in-situ moisture content close to the optimum.

Consolidation tests were conducted on material from Boring No's. 2 and 4 at the anticipated invert depths at the proposed structures. These tests provided information on the potential settlement or consolidation of the material under varying loads. Graphical representatives are presented for both borings on pages B15 and B16 of Appendix B.

Resistivity tests were performed on material from Boring No.'s 2, 7, 8, and 10 to define any area of low resistivity. pH tests were also conducted on soil from Boring No.'s 1, 2, 9, and 10 at a depth between zero (0) and sixteen and one-half (16.5) feet. The soil layers exhibited a resistivity between 1001 and 1534 ohms/cm^3 and a pH between 7.3 and 8.0 respectivly. Current practices suggest that resistivity levels should fall above 1500 ohms/cm^3 and pH levels should fall between 5.0 and 9.0 (City of Phoenix and ADOT). Boring No.'s 1 and 7 exhibited a resistivity below 1500 ohms per cubic centimeter, therefore non-corrosive metal pipe should be considered for box culverts in this area.

7.2 Native Material Evaluation

The existing or native material that will be excavated for the construction of the basins, the box culverts and outfall structures is generally re-usable as backfill, both for embankments and structures. However, in its native state, it generally does

not conform to MAG requirement Section 702 for Aggregate Base course (ABC) and therefore ABC for the concrete slabs and roadway will have to be obtained from a commercial plant.

The insitu percolation test indicated that the native material at its in-place density will perk at a rate of about 6 minutes per inc. The average permeability of the material is $7x10^{-3}$ cm/sec. If a decrease in permeability is desired, the native material will require an additive, such as Bentonite.

7.3 Box Culvert Slab Evaluation

The native material is suitable as a subsoil for the construction of concrete box culverts. The allowable bearing capacity for the native material is 2,500 psf and when compacted as recommended in Section 7.4, should not settle more than a ½ inch.

Aggregate Base Course (ABC) should be compacted prior to placing the portland cement concrete slab. A six-inch (6) thick layer should be sufficient at all locations.

Because the excavation in one case will be greater than six (6) feet, the cut walls in the native material should be sloped and as benched in accordance with OSHA requirements. Sheeting and shoring may be incorporated and a trench box utilized if concrete pipe is substituted for the box culvert.

Native material my be used as backfill against the box culvert walls. The following equivalent fluid pressures are present:

Active:	49 pcf
Passive:	430 pcf
At Rest:	72 pcf

This is based on a soil unit weight of 143.4 pcf and an approximate internal friction angle of 30 degrees.

7.4 Construction Material Recommendations

Specifications developed by the Maricopa Association of government (MAG) should be used to determine the quality of the following materials proposed for use on this project:

Embankment
Structural Fill
Aggregate Base Course
Portland Cement Concrete
Asphaltic Concrete
Reinforcing Steel

ATL recommends that for all structural fill the following compaction specifications be utilized:

1. Dry density no less than 95% of the ASTM D698 maximum dry density.

2. Moisture Content within ± 2% of the Optimum as determined by ASTM D698.

For Aggregate Base Course used beneath the concrete slabs and as roadway base, the following compaction specifications should be utilized:

1. Dry Density no less than 100% of the ASTM D698 maximum dry density.

2. Moisture content within ± 2% of the optimum as determined by ASTM D698.

8.0 ADDITIONAL SERVICES

It is recommended that ATL be retained to provide materials testing services during construction. Our staff of experienced technicians and field engineers can provide competent and reliable testing services. In addition, geotechnical expertise is readily available if needed.

It has been ATL's pleasure to serve Rust Environment & Infrastructure on this project. ATL has in-house expertise in a variety of geotechnical related areas and the firm looks forward to working with Rust Environment & Infrastructure in the near future.

PLATES

GUIDELINES IN THE USE AND INTERPRETATION

OF THIS GEOTECHNICAL REPORT

ATL Job No. 194043

Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

The geotechnical report was prepared for the use of the Owner in the design of the subject facility and should be made available to potential contractors and/or the Contractor for information on factual data only. This report should not be used for contractual purposes as a warranty of interpreted subsurface conditions such as those indicated by the interpretive boring and test pit logs, cross sections, or discussion of subsurface conditions contained herein.

The analyses, conclusions and recommendations contained in the report are based on site conditions as they presently exist and assume that the exploratory borings, test pits, and/or probes are representative of the subsurface conditions of the site. If, during construction, subsurface conditions are found which are significantly different from those observed in the exploratory borings and test pits, or assumed to exist in the excavations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. If there is a substantial lapse of time between the submission of this report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, this report should be reviewed to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse.

The Summary Boring Logs are our opinion of the subsurface conditions revealed by periodic sampling of the ground as the borings progressed. The soil descriptions and interfaces between strata are interpretive and actual changes may be gradual.

The boring logs and related information depict subsurface conditions only at these specific locations and at the particular time designated on the logs. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the soil conditions at these boring locations.

Groundwater levels often vary seasonally. Groundwater levels reported on the boring logs or in the body of the report are factual data only for the dates shown.

Unanticipated soil conditions are commonly encountered on construction sites and cannot be fully anticipated by merely taking soil samples, borings or test pits. Such unexpected conditions frequently require that additional expenditures be made to attain a properly constructed project. It is recommended that the Owner consider providing a contingency fund to accommodate such potential extra costs.

This firm cannot be responsible for any deviation from the intent of this report including, but not restricted to, any changes to the scheduled time of construction, the nature of the project or the specific construction methods or means indicated in this report; nor can our firm be responsible for any construction activity on sites other than the specific site referred to in this report.

SOIL CLASSIFICATION & TERMINOLOGY

GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES
	GW	Well graded gravels, gravel - sand mixtures, or sand - gravel - cobble mixtures.
	GP	Poorly graded gravels, gravel - sand mixtures, or sand - gravel - cobble mixtures.
	GM	Silty gravels, gravel - sand - silt mixtures.
	GC	Clayey gravels, gravel - sand - clay mixtures.
	SW	Well graded sands, gravelly sands.
	SP	Poorly graded sands, gravelly sands.
	SM	Silty sands, sand - silt mixtures
	SC	Clayey sands, sand - clay mixtures
	ML	Inorganic silts, clayey silts with slight plasticity
	MH	Inorganic silts, micaceous or diatomaceous silty soils, elastic silts.
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
	CH	Inorganic clays of high plasticity, fat clays, sandy clays of high plasticity.

1. Relative Density. Terms for description of relative density of cohesionless, uncemented sands and sand - gravel mixtures,

N	Relative Density
0 - 4	Very loose
5 - 10	Loose
11 - 30	Medium dense
31 - 50	Dense
50	Very dense

2. Relative Consistency. Terms for description of clays which are saturated or near saturation.

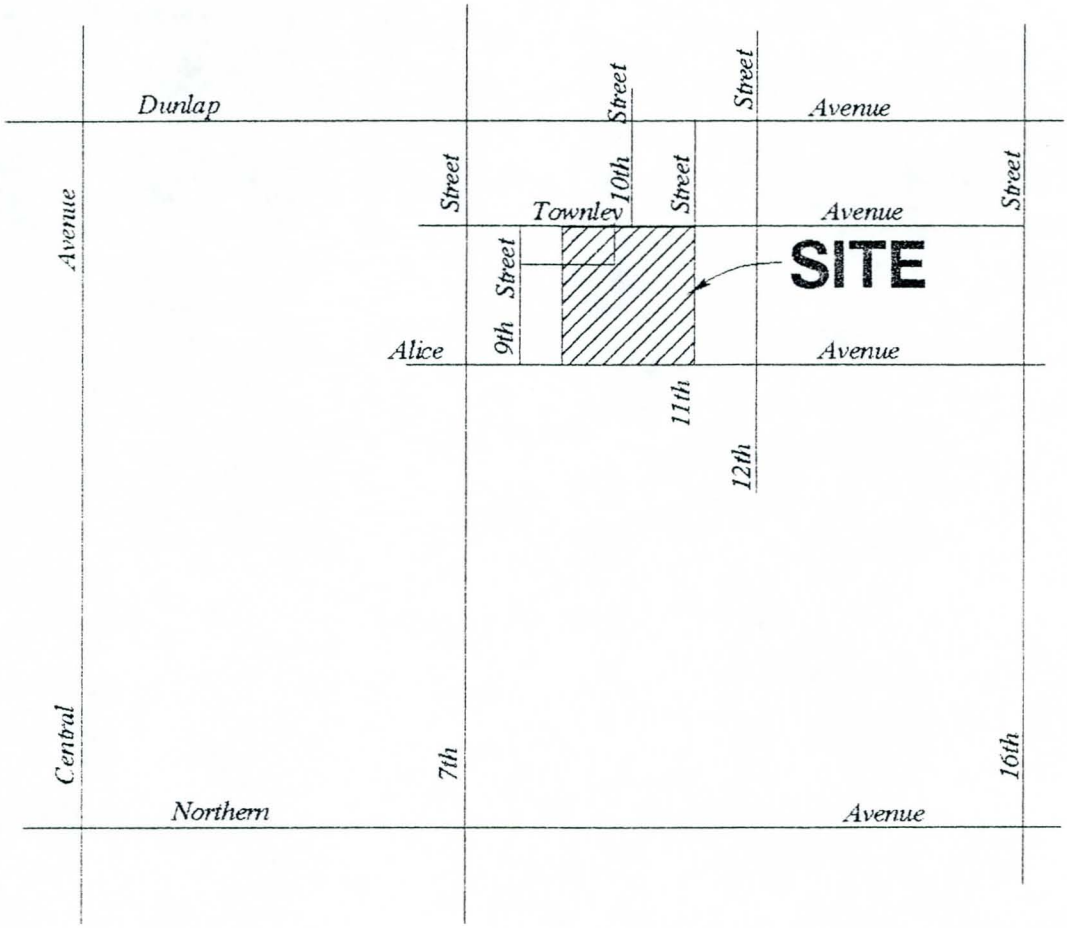
N	Relative Consistency	Remarks
0 - 4	Very soft	Easily penetrated several inches with fist.
3 - 4	Soft	Easily penetrated several inches with thumb.
5 - 8	Medium stiff	Can be penetrated several inches with thumb with moderate effort.
9 - 15	Stiff	Readily indented with thumb, but penetrated only with great effort.
16 - 30	Very stiff	Readily indented with thumb-nail.
30 +	Hard	Indented only with difficulty by thumbnail.

3. Relative Firmness. Terms for description of partially saturated and / or cemented soils which commonly occur in the Southwest including clays, cemented granular materials, silts and silty and clayey granular soils.

N	Relative Firmness
0 - 4	Very soft
5 - 8	Soft
9 - 15	Moderately firm
16 - 30	Firm
31 - 50	Very firm
50 +	Hard

DEFINITIONS OF SOIL FRACTIONS

SOIL COMPONENT	PARTICLE SIZE RANGE
Cobbles	Above 3 inches
Gravel	3 inches to No. 4 sieve
Coarse gravel	3 inches to 3/4 inch
Fine gravel	3/4 inch to No. 4 sieve
Sand	No. 4 sieve to No. 200
Coarse	No. 4 sieve to No. 10
Medium	No. 10 sieve to No. 40
Fine	No. 40 sieve to No. 200
Fines (silt or clay)	Below No. 200 sieve



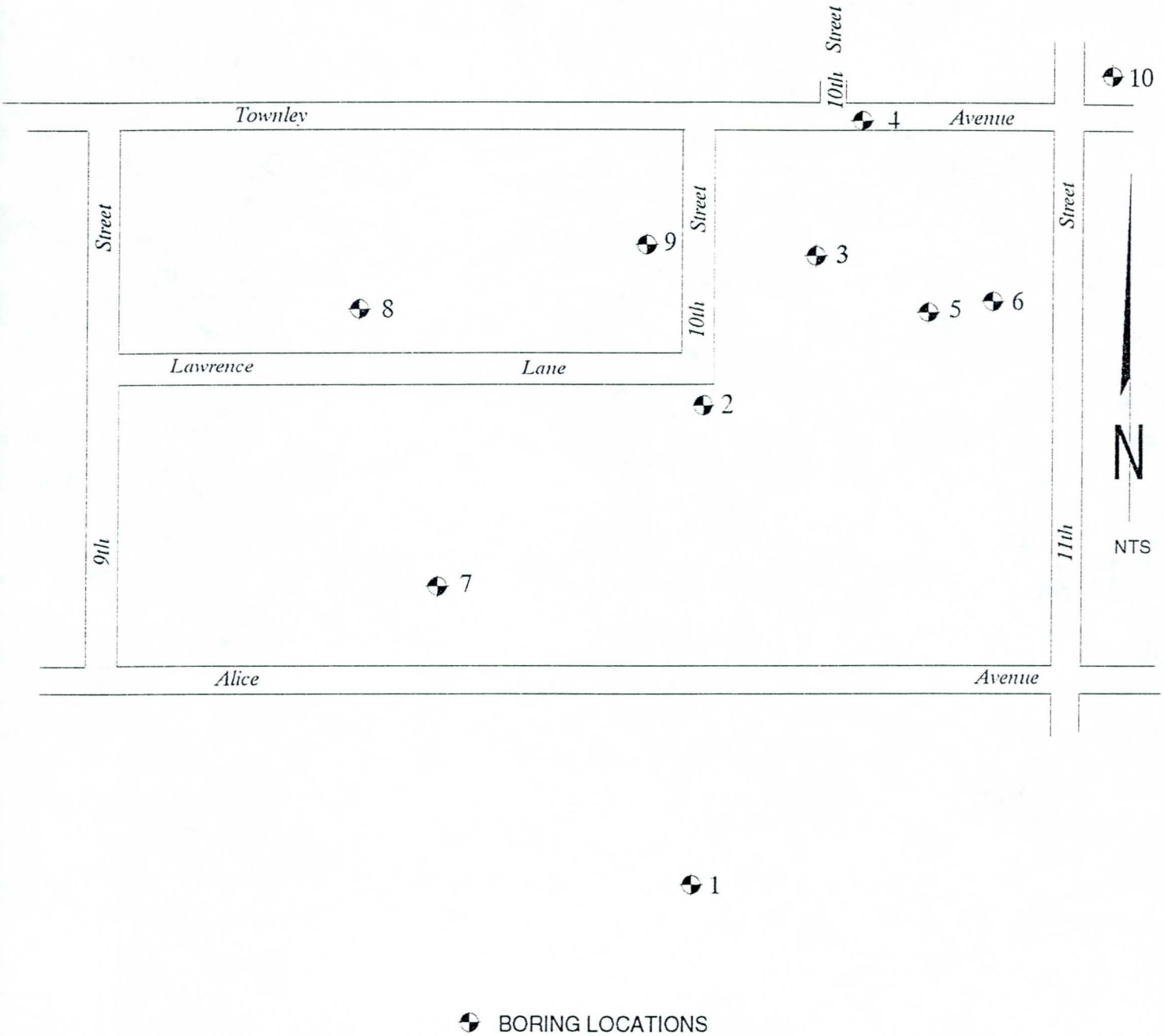
VICINITY MAP

10th STREET DETENTION BASIN NO. 2

MARICOPA COUNTY FLOOD CONTROL DISTRICT

ATL JOB NO. 194043

PLATE 3



BORING LOCATIONS

10th STREET DETENTION BASIN NO. 2

MARICOPA COUNTY FLOOD CONTROL DISTRICT

ATL JOB NO. 194043

PLATE 4

APPENDIX A

BORING LOGS

10th STREET WASH DETENTION BASIN

ATL Job No. *194043*

Boring No. *1*

Boring Location: *350 Feet South of Alice C/L in Existing Drainage Channel*

Boring Equipment: *Mobile B-50 With 8 -Inch Diameter Auger*

Date of Boring: *12/20/94*

Elevation of Boring: *Existing Grade*

Driller: *J. Cowell* Logger: *J. Cowell* Reviewed By: *D.Hayes*

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
		Light brown silty SAND (SM) with gravel to 3 - inch size, Moist				
					8.9	
	5		*35*			
	10		*40*			
	15		*40*			
	20		*65*			
		Bottom of boring at 21.5 feet				
	25					

Boring Stopped at *21.5* Feet Below Existing Grade

Groundwater	Initial Depth	Hour	24 Hour Depth
	None		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

A1

10th STREET WASH DETENTION BASIN

ATL Job No. 194043

Boring No. 2

Boring Location: *10 Feet West of 10th Street C/L*
30 Feet South of Lawrence C/L

Boring Equipment: *Mobile B-50 With 8 -Inch Diameter Auger*

Date of Boring: *12/20/94* Elevation of Boring: *1263.5*

Driller: *J. Cowell* Logger: *J. Cowell* Reviewed By: *D.Hayes*

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
		Brown clayey SAND, (SC), Moist				
		Clayey SAND with gravel to 3 - inch size, (SC)				
	5		24			
		Less gravel				
		Increase in gravel				
	10	*Silty, sandy GRAVEL to 2 - inch size, (GM)*	40			
					3.9	
	15		35			
	20		25			
		Bottom at 21.5 feet				
	25					

Boring Stopped at *21.5* Feet Below Existing Grade

Groundwater	Initial Depth	Hour	24 Hour Depth
	None		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

A2

10th STREET WASH DETENTION BASIN

ATL Job No. 194043

Boring No. 3

Boring Location: *175 Feet South of Townley Avenue and 150 Feet East of 10th Street in Channel Bottom*

Boring Equipment: *Mobile B-50 With 8 -Inch Diameter Auger*

Date of Boring: *12/20/94* Elevation of Boring: *1257.0*

Driller: *J. Cowell* Logger: *J. Cowell* Reviewed By: *D.Hayes*

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
		Silty SAND with gravel to 2 - inch size, (SM), Moist				
					10.7	
	5		*50/4"*			
	10		*51*			
	15		*49*			
		Increase in gravel % and size to small cobbles				
	20	*Decrease in gravel*	*20*			
		Bottom of boring at 21.5 feet				
	25					

Boring Stopped at *21.5* Feet Below Existing Grade

Groundwater	Initial Depth	Hour	24 Hour Depth
	None		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

A3

10th STREET WASH DETENTION BASIN

ATL Job No. 194043

Boring No. 4

Boring Location: *100 Feet East of 10th Street North C/L, 2 Feet North of South Curb of Townley Avenue*

Boring Equipment: *Mobile B-50 With 8 -Inch Diameter Auger*

Date of Boring: *12/20/94* Elevation of Boring: *1263.0*

Driller: *J. Cowell* Logger: *J. Cowell* Reviewed By: *D.Hayes*

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
		3 inches AC, 6 inches AB, 5 inches sand				
		Light brown clayey SAND with gravel to 2 - inch size, (SC), Moist				
	5		45		9.2	
		Increasing gravel % and size to 3 inches				
	10		25			
	15		50/4"			
		Increase in gravel % and size to small cobbles				
	20		50/5"			
	25	*Bottom of boring at 25.5 feet*	50/5"			

Boring Stopped at 25.5 Feet Below Existing Grade

Groundwater	Initial Depth	Hour	24 Hour Depth
	None		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

A4

10th STREET WASH DETENTION BASIN

ATL Job No. 194043

Boring No. 5

Boring Location: 200 Feet South of Townley Avenue
270 Feet West of 11th Street

Boring Equipment: Mobile B-50 With 8 -Inch Diameter Auger

Date of Boring: 12/15/94 Elevation of Boring: 1265.3

Driller: J. Cowell Logger: J. Cowell Reviewed By: D.Hayes

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
		Tan silty gravelly SAND with gravel to 2 - inch size, (SM), Damp			4.7	
	5	Tan silty SAND and gravel to 3 - inch size, (SM), Damp			1.5	
		Tan silty SAND with gravel to 3 - inch size, (SM), Damp				
	10				3.4	
	15					
		Bottom of boring at 20 feet				
	20					
	25					

Boring Stopped at 20 Feet Below Existing Grade

Groundwater	Initial Depth	Hour	24 Hour Depth
	None		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

10th STREET WASH DETENTION BASIN

ATL Job No. 194043

Boring No. 6

Boring Location: 170 Feet South of Townley Avenue
150 Feet West of 11th Street

Boring Equipment: Mobile B-50 With 8 -Inch Diameter Auger

Date of Boring: 12/15/94 Elevation of Boring: 1265.4

Driller: J. Cowell Logger: J. Cowell Reviewed By: D.Hayes

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
		Tan clayey gravelly SAND, (SC), Moist				
	5	Tan clayey SAND with gravel, (SC), Damp				
	10					
	15	Tan clayey SAND with gravel and small cobbles, (SC), Damp				
		Tan clayey SAND with gravel, (SC), Damp	57			
	20	Bottom of boring at 20 feet				
	25					

Boring Stopped at 20 Feet Below Existing Grade

Groundwater	Initial Depth	Hour	24 Hour Depth
	None		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

A6

10th STREET WASH DETENTION BASIN

ATL Job No. *194043*

Boring No. *7*

Boring Location: *150 Feet West of 9th Street, 115 Feet North of Alice Avenue*

Boring Equipment: *Mobile B-50 With 8 -Inch Diameter Auger*

Date of Boring: *12/15/94* Elevation of Boring: *1259.3*

Driller: *J. Cowell* Logger: *J. Cowell* Reviewed By: *D.Hayes*

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
		Light brown clayey SAND with trace of gravel, (SC), Moist				
	5	*Tan clayey SAND with gravel, (SC), Damp*				
	10					
	15					
		Bottom of boring at 20 feet				
	20					
	25					

Boring Stopped at 20 Feet Below Existing Grade	Groundwater	Initial Depth	Hour	24 Hour Depth
		None		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

10th STREET WASH DETENTION BASIN

ATL Job No. *194043*

Boring No. *8*

Boring Location: *275 Feet East of 9th Street, 65 Feet North of Lawrence Avenue*

Boring Equipment: *Mobile B-50 With 8 -Inch Diameter Auger*

Date of Boring: *12/20/94* Elevation of Boring: *1262.7*

Driller: *J. Cowell* Logger: *J. Cowell* Reviewed By: *D.Hayes*

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
	5	*Light brown clayey SAND with trace of fine gravel, (SC), Moist*				
	10	*Tan clayey SAND with gravel to 2 - inch size, (SC), Moist*				
	15	*Tan clayey SAND with some fine gravel , (SC), Moist*				
	20	*Tan clayey SAND with gravel to 3 - inch size, (SC), Moist* *Bottom of boring at 20 feet*				
	25					

Boring Stopped at 20 Feet Below Existing Grade

Groundwater	Initial Depth	Hour	24 Hour Depth
	None		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

10th STREET WASH DETENTION BASIN

ATL Job No. 194043

Boring No. 9

Boring Location: *120 Feet West of 10th Street, 145 Feet North of Lawrence Avenue*

Boring Equipment: *Mobile B-50 With 8 -Inch Diameter Auger*

Date of Boring: *12/15/94* Elevation of Boring: *1264.5*

Driller: *J. Cowell* Logger: *J. Cowell* Reviewed By: *D.Hayes*

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
		Silty sandy GRAVEL, (GM), Moist				
					5.3	
	5					
	10					
		Silty sandy GRAVEL to 3 - inch size, (GM), Moist				
					8.8	
	15					
		Bottom of boring at 20 feet				
	20					
	25					

Boring Stopped at 20 Feet Below Existing Grade

Groundwater	Initial Depth	Hour	24 Hour Depth
	None		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

10th STREET WASH DETENTION BASIN

ATL Job No. 194043

Boring No. 10

Boring Location: 50 Feet North of Townley Avenue C/L
70 Feet East of 11th Street C/L

Boring Equipment: Mobile B-50 With 8 -Inch Diameter Auger

Date of Boring: 12/20/94 Elevation of Boring: 1269.0

Driller: J. Cowell Logger: J. Cowell Reviewed By: D.Hayes

Graphical Log	Depth (Feet)	SOIL DESCRIPTION	SPT Blows/Ft	Ring Blows/Ft	Water Content %	Dry Density (PCF)
		2 inches Sod				
		Brown silty SAND with gravel to 2 - inch size, (SM), Moist				
	5					
			20		9.4	
	10		14			
	15	Increase in gravel size to 3 inches	15			
	20	Bottom of boring at 20.5 feet	50/5"			
	25					

Boring Stopped at 20.5 Feet Below Existing Grade

Groundwater	Initial Depth	Hour	24 Hour Depth
	None		

NOTE: THE ABOVE DATA FOR DESIGN PURPOSES ONLY.

APPENDIX B

LABORATORY TEST RESULTS

SUMMARY OF LABORATORY ANALYSIS

PROJECT: 10th STREET DETENTION BASIN DATE: 01-09-95

LOCATION: 10th STREET & TOWNLEY, PHOENIX, ARIZONA

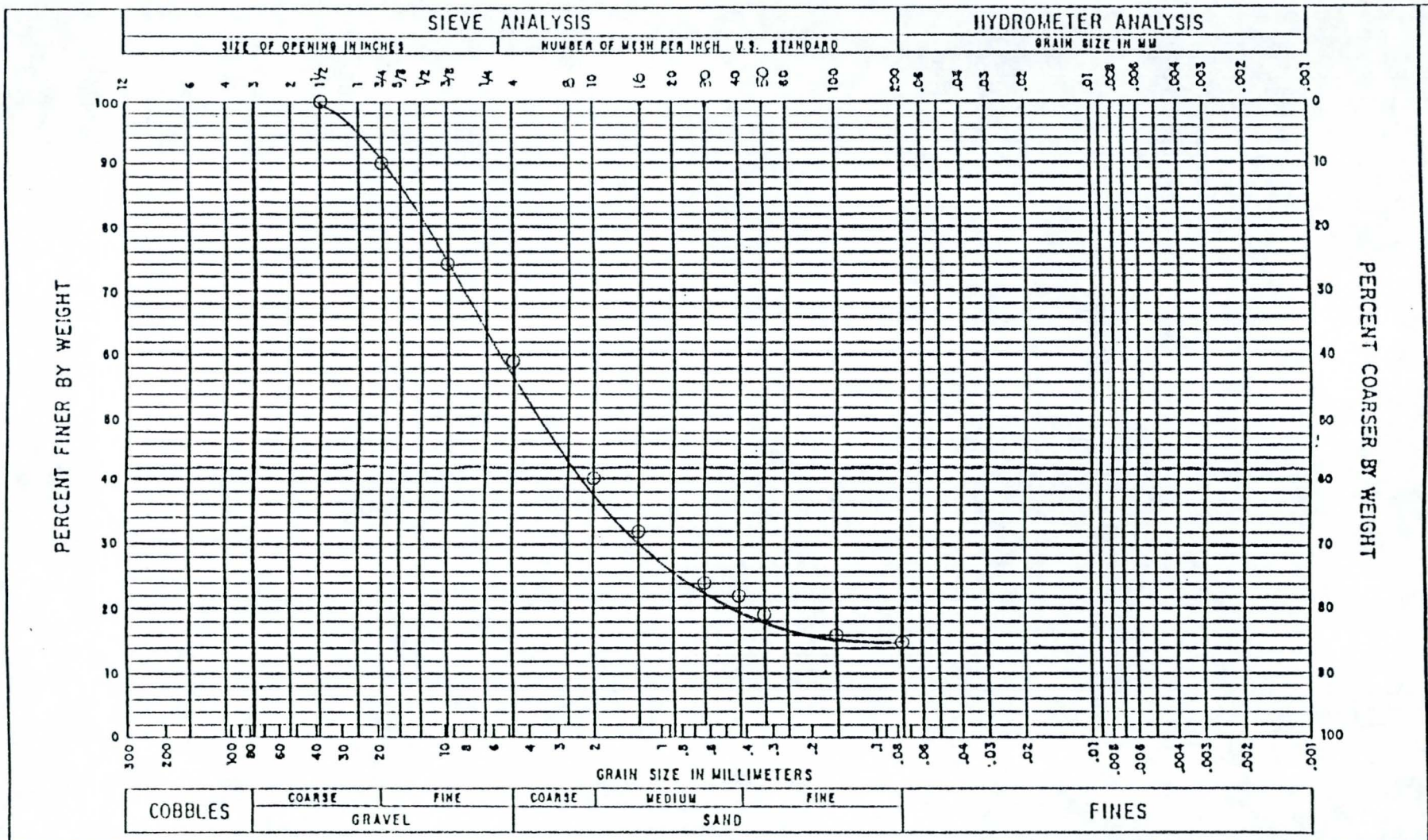
MATERIAL: BOREHOLE SAMPLES SAMPLING DATE: 12-15-94

REQUESTED BY: J. COWELL ATL JOB NO: 194043

LOG NO.	DEPTH (FT)	MOIST (%)	USCS	LL	PI	SIEVE ANALYSIS - PERCENT PASSING											
						200	100	50	40	30	16	10	4	3/8	3/4	1 1/2	3
1	0.0 - 10.0	8.9	SM	38	10	14.2	16	19	22	24	32	40	59	74	90	100	
2	10.0 - 25.0	3.9	GM		NP	14.9	18	21	23	25	30	34	45	57	72	88	92
3	0.0 - 10.0	10.7	SM	42	9	18.1	21	24	26	29	38	48	61	79	91	100	
4	2.0 - 15.0	9.2	SC	35	11	18.7	21	25	28	31	41	49	64	80	91	100	
5	0.0 - 5.0	4.7	SM		NP	25.3	28	32	35	38	46	53	63	75	88	96	100
5	5.0 - 8.5	1.5	SM		NP	12.1	15	17	18	19	24	31	50	71	86	92	100
5	8.5 - 20.0	3.4	SM		NP	15.1	18	21	23	25	30	36	53	71	82	87	91
9	0.0 - 11.0	5.3	GM	30	5	21.8	27	30	32	34	38	42	48	59	71	89	100
9	15.0 - 20.0	8.8	GM	43	15	19.1	22	25	27	29	33	38	47	65	83	97	100
10	5.0 - 10.0	9.4	SM	35	10	26.6	36	42	45	48	56	63	74	86	97	100	

ATL Inc.
Geotechnical and Material Consultants
6922 West Clarendon, Phoenix, Arizona 85017 — Telephone (602) 241-1097 / Fax (602) 241-0699
16921 S. Western Ave., Suite 109, Gardena, California 90247 — Telephone (310) 538-3757 / Fax (310) 538-0725

JOB NO. 194043

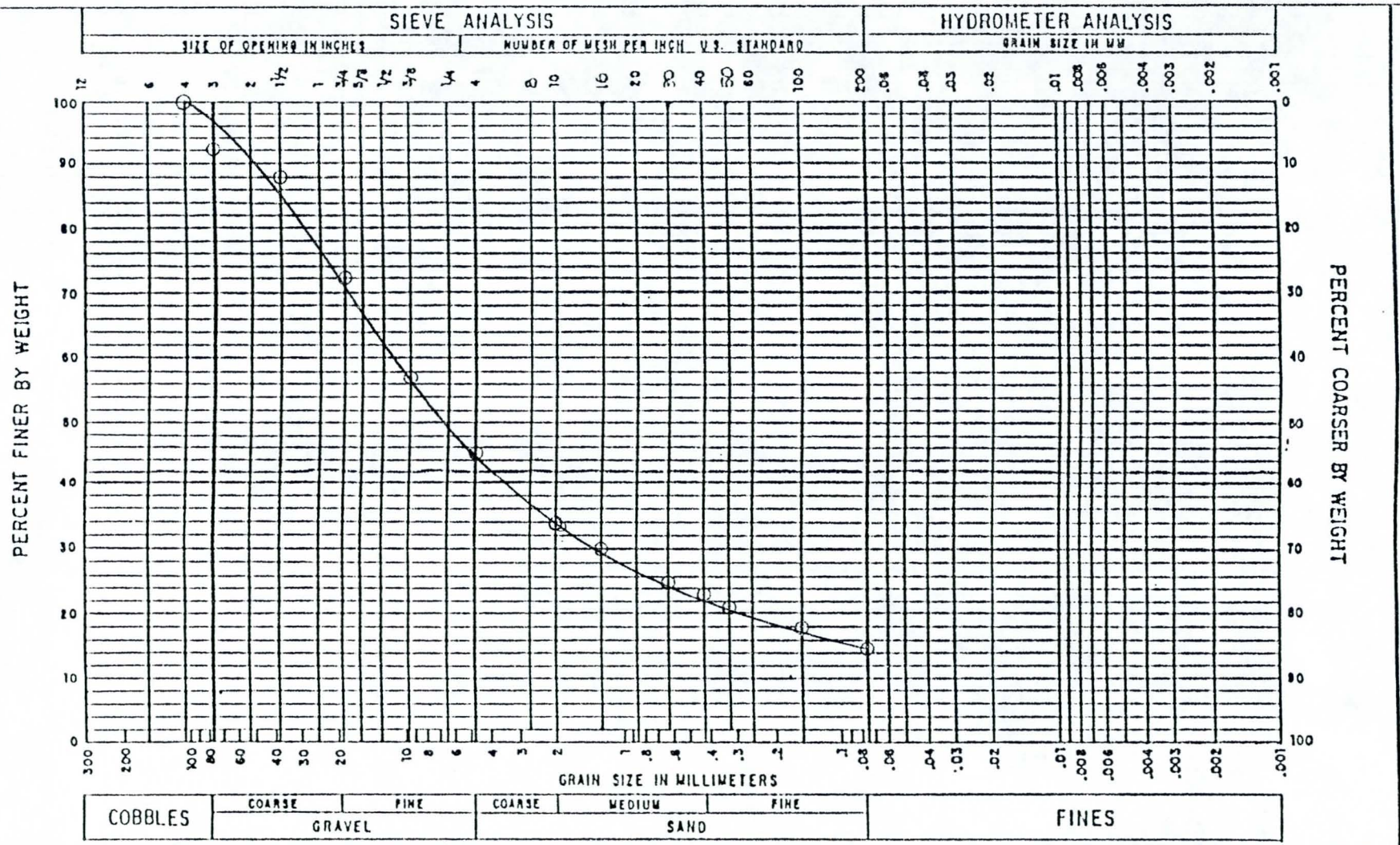


GRADATION CURVES

SAMPLE NO.	BORING NO.	DEPTH FT.	CLASSIFICATION	NAT. W.C.	PI	LL	PL	
	1	0-10.0	USCS = SM SILTY SAND	8.9	10	38	28	

ATL inc.
Geotechnical and Materials Consultants
9222 WEST CLARENDON, PHOENIX, ARIZONA 85017 — TELEPHONE (602) 241-1097 / FAX (602) 234-0699
16921 S. WESTERN AVE., SUITE 109, GARDENA, CALIFORNIA 90247 — TELEPHONE (310) 538-3757 / FAX (310) 538-0725

JOB NO: 194043

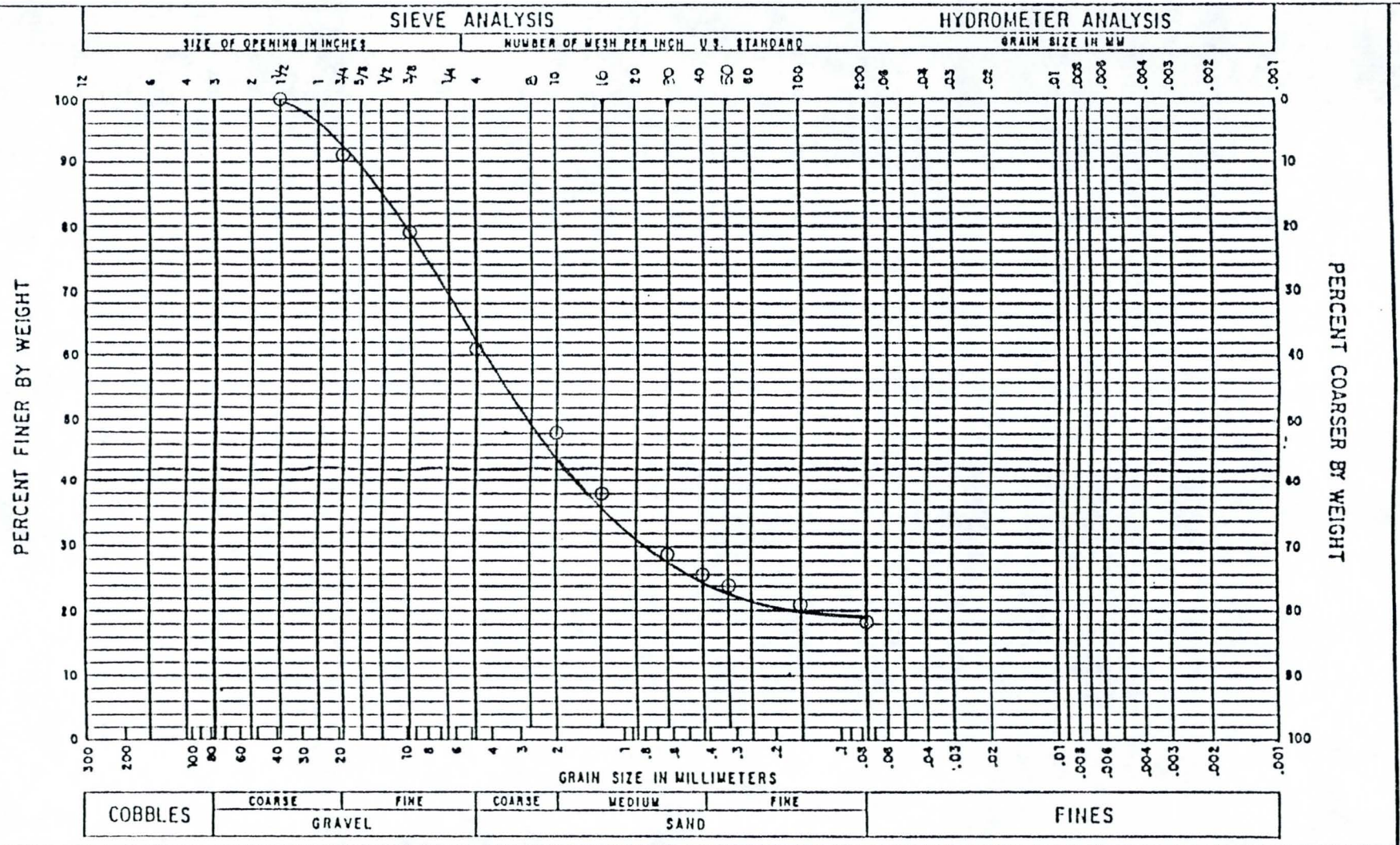


GRADATION CURVES

SAMPLE NO.	BORING NO.	DEPTH FT.	CLASSIFICATION	NAT. W.C.	PI	LL	PL	
	2	10-25.0	USCS = GM	3.9	NP			

ATL Inc.
Geotechnical and Material Consultants
9022 West Clarendon, Phoenix, Arizona 85017, Telephone (602) 241-1097 / Fax (602) 231-0699
16921 S. Western Ave., Suite 109, Gardena, California 90247, Telephone (310) 538-3757 / Fax (310) 538-0725

JOB NO: 194043

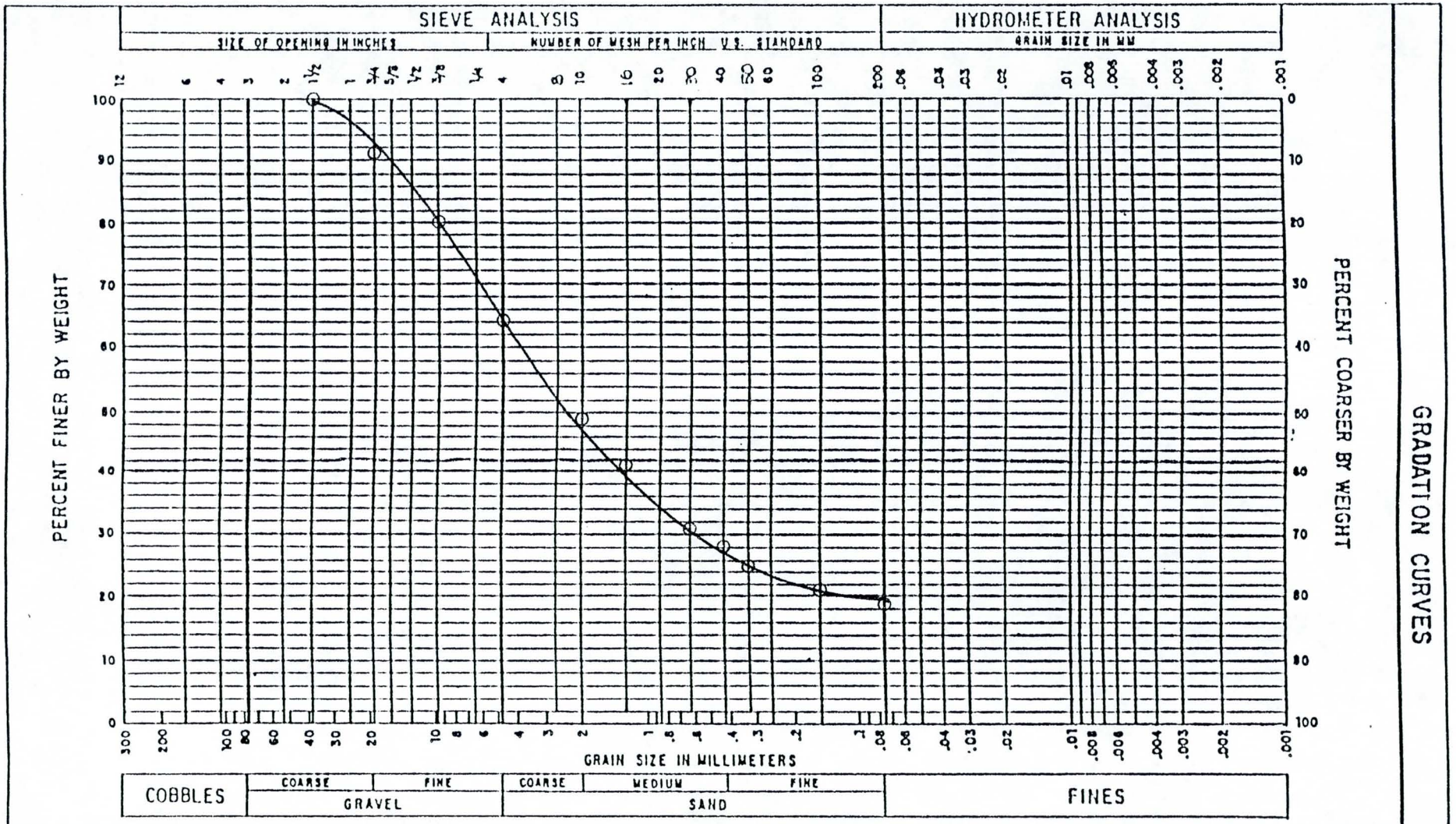


GRADATION CURVES

SAMPLE NO.	BORING NO.	DEPTH FT.	CLASSIFICATION	NAT. W.C.	PI	LL	PL	
	3	0-10.0	USCS = SM SILTY SAND	10.7	9	42	33	

ATL Inc.
Geotechnical Analytical Material Consultants
2022 WEST CLARENDON
16021 S WESTERN AVE., SUITE 109
PHOENIX, ARIZONA 85017
GARDENA, CALIFORNIA 90247
TELEPHONE (602) 241-1097 / FAX (602) 234-0699
TELEPHONE (310) 538-3757 / FAX (310) 538-0725

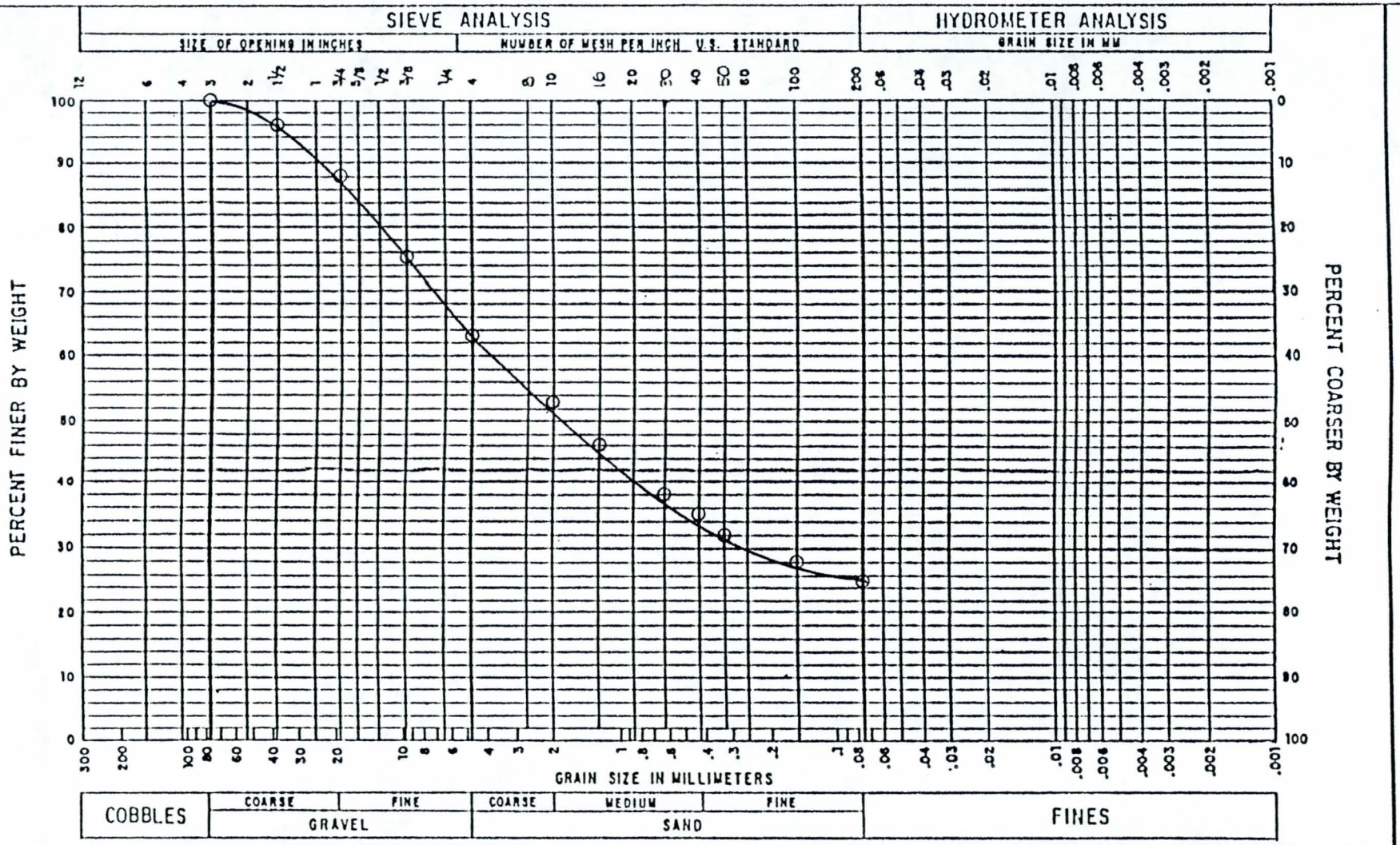
JOB NO: 194043



SAMPLE NO.	BORING NO.	DEPTH FT.	CLASSIFICATION	NAT. W.C.	PI	LL	PL	
	4	2.0-15.0	USCS = SC CLAYEY SAND	9.2	11	35	24	

ATL Inc.
Geotechnical and Material Consultants
2922 WEST CLARENDON, PHOENIX, ARIZONA 85017, TELEPHONE (602) 241-1097 / FAX (602) 234-0699
16921 S. WESTERN AVE., SUITE 109, GARDENA, CALIFORNIA 90247, TELEPHONE (310) 538-3757 / FAX (310) 538-0725

JOB NO. 104043

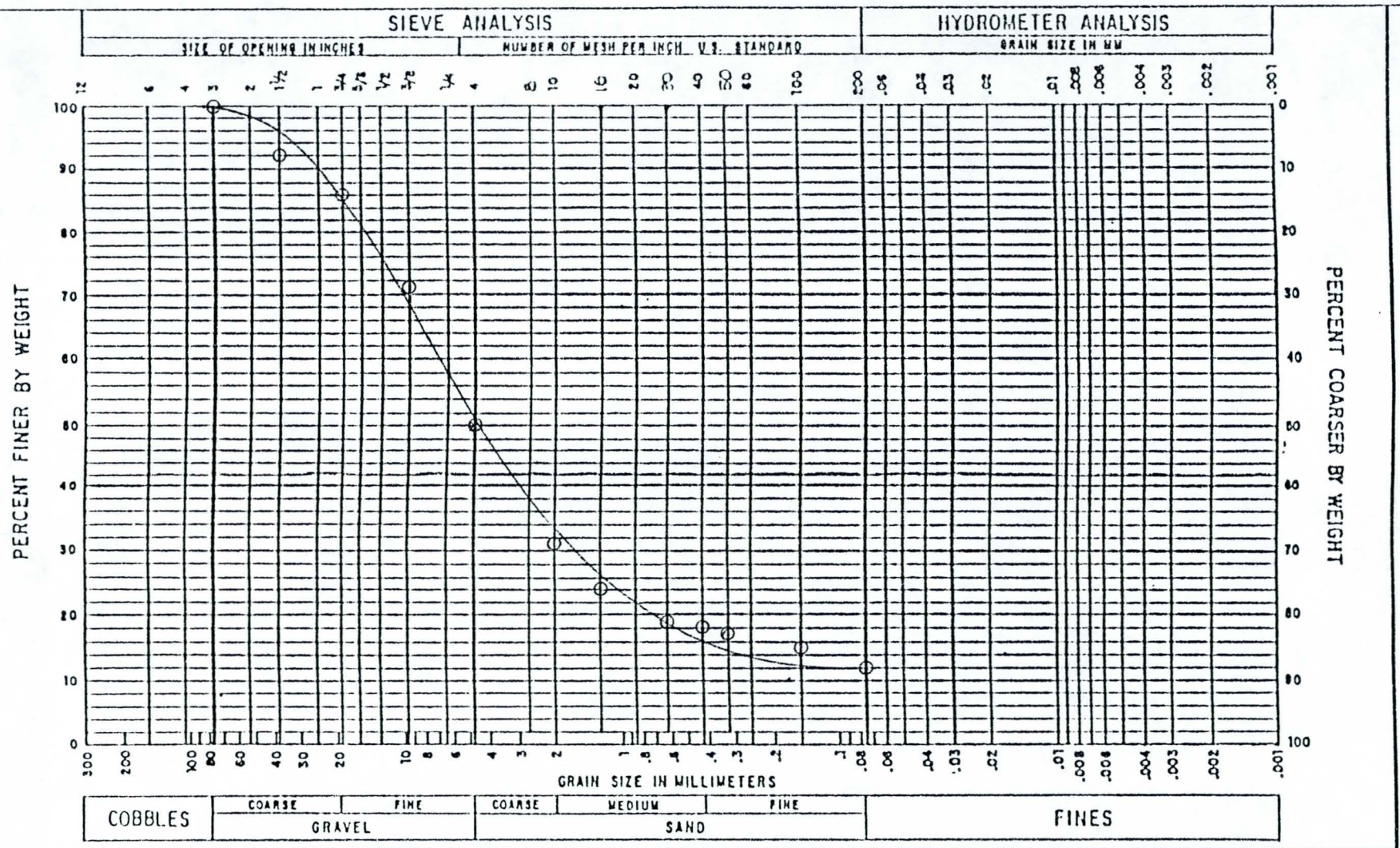


GRADATION CURVES

SAMPLE NO.	BORING NO.	DEPTH FT.	CLASSIFICATION	NAT. W.C.	PI	LL	PL	
	5	0-5.0	USCS = SM SILTY SAND	4.7	NP			

ATL Inc.
Geotechnical and Material Consultants
9922 WEST CLARENDON
PHOENIX, ARIZONA 85017
TELEPHONE (602) 241-1097 / FAX (602) 234-0699
16921 S. WESTERN AVE., SUITE 109
GARDENA, CALIFORNIA 90247
TELEPHONE (310) 538-3757 / FAX (310) 538-0725

JOB NO. 194043

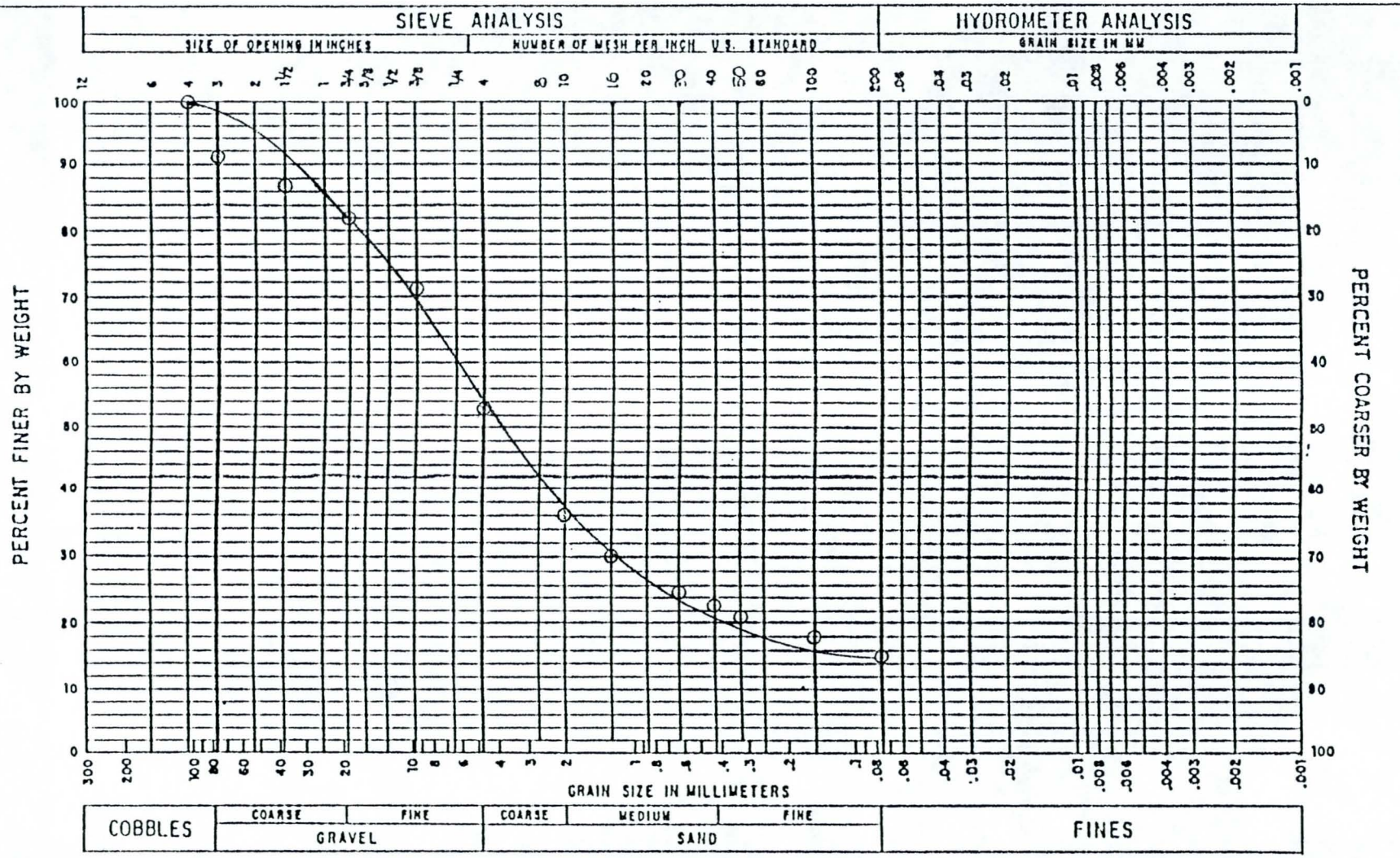


GRADATION CURVES

SAMPLE NO.	BORING NO.	DEPTH FT.	CLASSIFICATION	NAT. W.C.	PI	LL	PL	
	5	5-8.5	USCS = SM SILTY SAND	1.5	NP			

ATL inc.
Geotechnical and Materials Consultants
2922 WEST CLARENDON
PHOENIX, ARIZONA 85017
TELEPHONE (602) 241-1097 / FAX (602) 234-0699
16921 S. WESTERN AVE., SUITE 109
GARDENA, CALIFORNIA 90247
TELEPHONE (310) 538-3757 / FAX (310) 538-0725

JOB NO. 194043

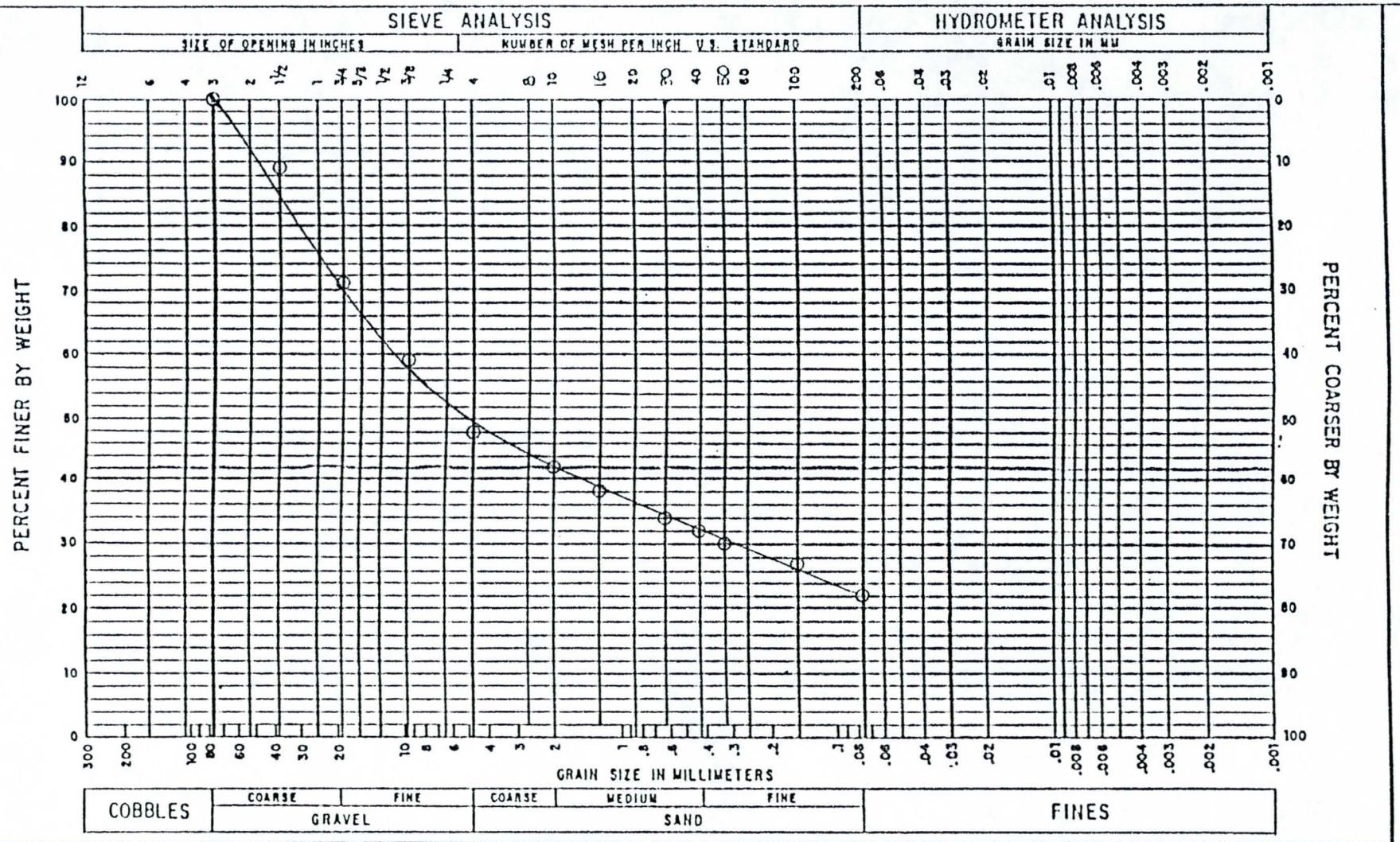


GRADATION CURVES

SAMPLE NO.	BORING NO.	DEPTH FT.	CLASSIFICATION	NAT. W.C.	PI	LL	PL	
	5	8.5-20.0	USCS = SM SILTY SAND	3.4	NP			

ATL Inc.
Geotechnical and Material Consultants
2922 West Clarendon
1692 E. Western Ave., Suite 109
Phoenix, Arizona 85017
Gardena, California 90247
Telephone (602) 241-1097 / Fax (602) 234-0699
Telephone (310) 538-3757 / Fax (310) 538-0725

JOB NO. 194043

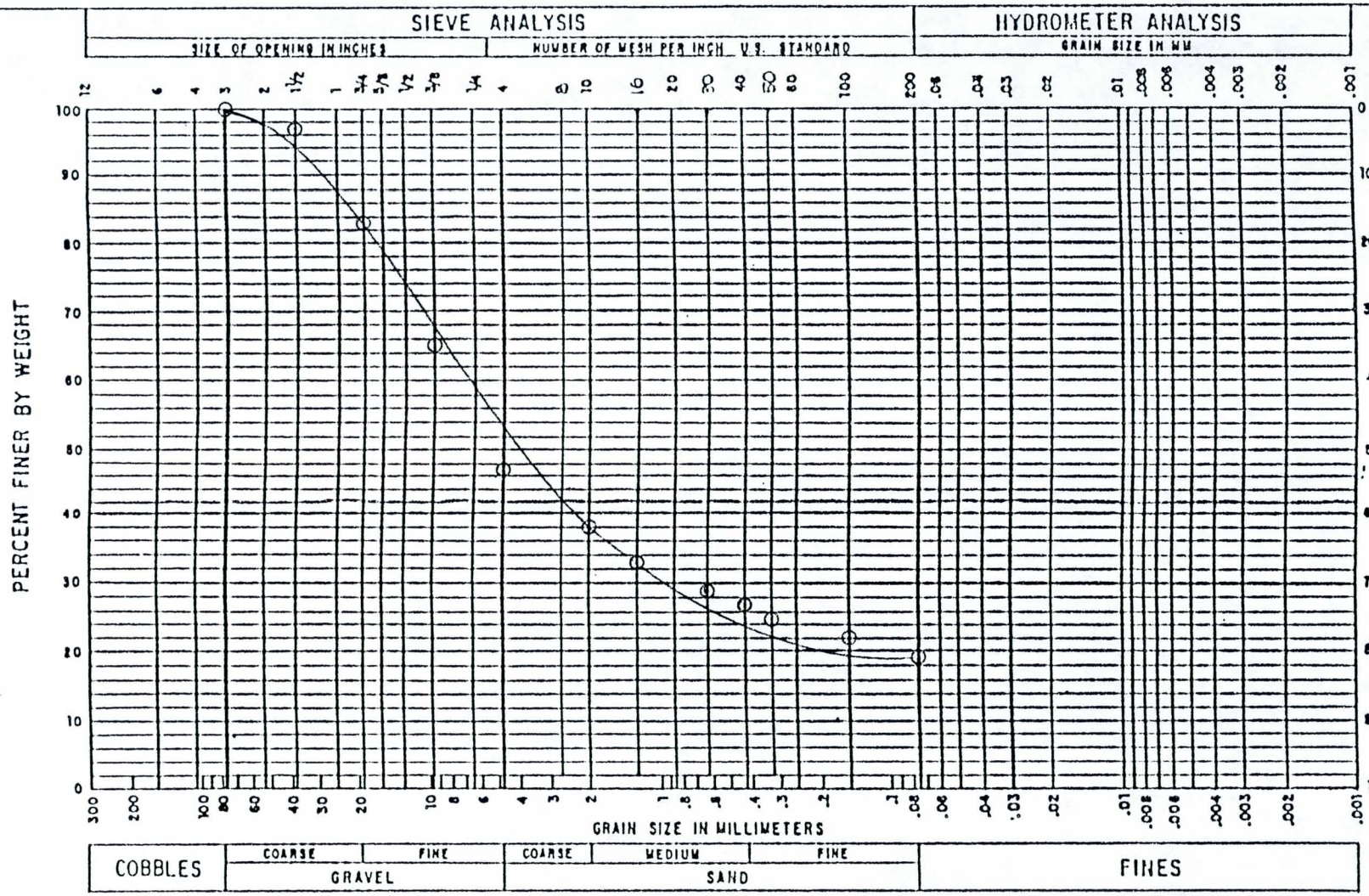


GRADATION CURVES

SAMPLE NO.	BORING NO.	DEPTH FT.	CLASSIFICATION	NAT. W.C.	PI	LL	PL	
	9	0-11.0	USCS = GM SILTY GRAVEL	5.3	5	30	25	

ATL INC.
GEOTECHNICAL AND MATERIAL CONSULTANTS
2022 WEST CLARENDON, PHOENIX, ARIZONA 85017, TELEPHONE (602) 241-1097 / FAX (602) 231-0699
16921 S. WESTERN AVE., SUITE 109, GARDENA, CALIFORNIA 90247, TELEPHONE (310) 538-3757 / FAX (310) 538-0725

JOB NO. 194043

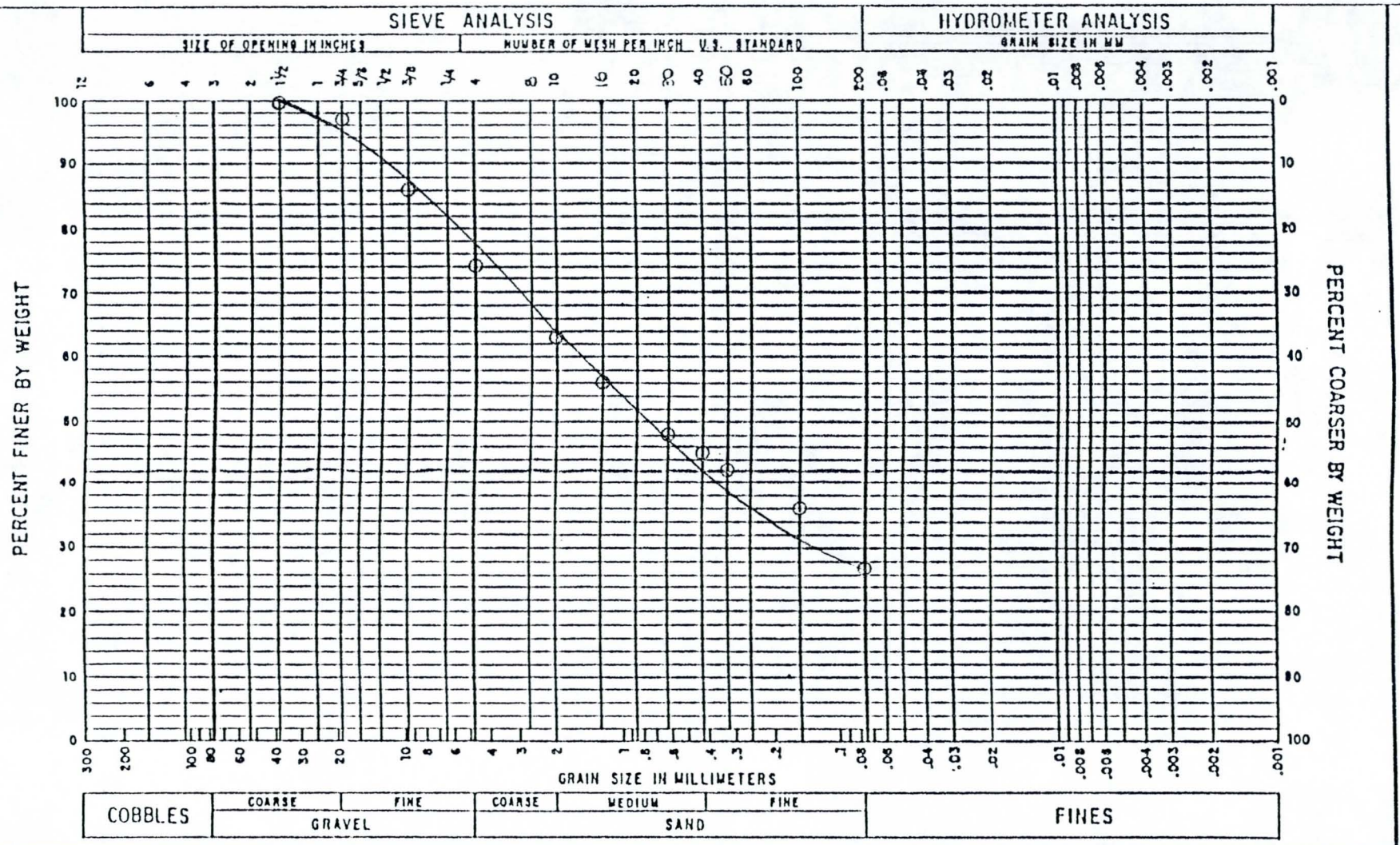


GRADATION CURVES

SAMPLE NO.	BORING NO.	DEPTH FT.	CLASSIFICATION	NAT. W.C.	PI	LL	PL	
	9	15.0- 20.0	USCS = GM SILTY GRAVEL	8.8	15	43	28	

ATL Inc.
Geotechnical and Material Consultants
2922 WEST CLARENDON, PHOENIX, ARIZONA 85017, TELEPHONE (602) 241-1097 / FAX (602) 234-0699
16921 S. WESTERN AVE., SUITE 109, GARDENA, CALIFORNIA 90247, TELEPHONE (310) 538-3757 / FAX (310) 538-0725

JOB NO: 194043



GRADATION CURVES

SAMPLE NO.	BORING NO.	DEPTH FT.	CLASSIFICATION	NAT. W.C.	PI	LL	PL	
	10	5.0-10.0	USCS = SM SILTY SAND	9.4	10	35	25	

10 TH STREET WASH DETENTION BASIN
MARICOPA COUNTY FLOOD CONTROL DISTRICT
PHOENIX, ARIZONA
ATL JOB NO. 194043

STANDARD PROCTOR TEST (ASTM D698)

Boring No.	Sample Depth (ft)	USCS	Maximum Density (pcf)	Optimum Moisture (%)
4	5.0-8.0	SC	130.4	10.0
9	15.0-20.0	GM	122.3	10.8

10 TH STREET WASH DETENTION BASIN
MARICOPA COUNTY FLOOD CONTROL DISTRICT
PHOENIX, ARIZONA
ATL JOB NO. 194043

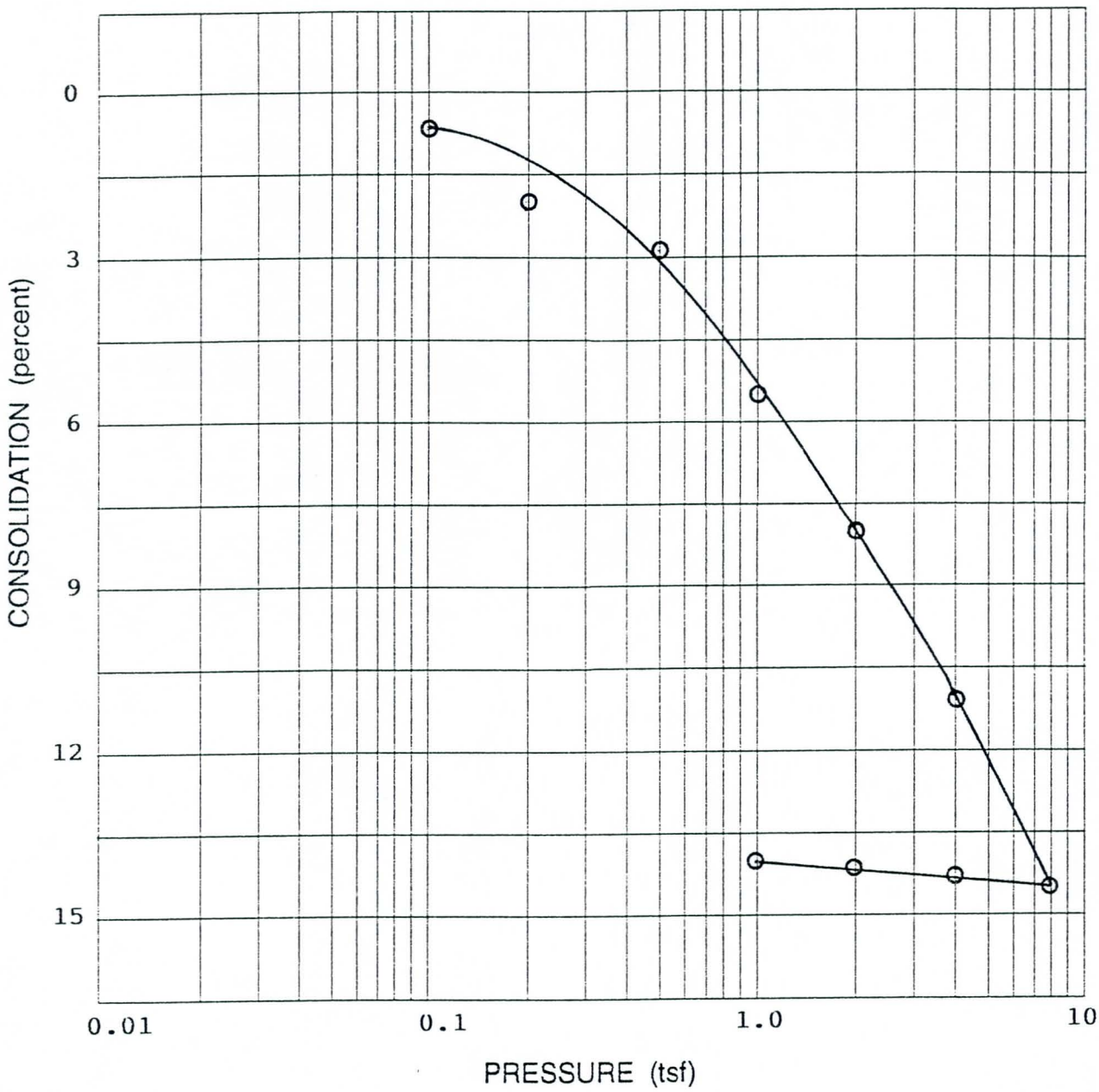
CONTROL SWELL TEST

Boring No.	Sample Depth (in)	USCS	Load to Control SWELL (psf)	Dry Density pcf)	Moisture (%)
2	13.5-15.0	GM	950	105.0	8.9
4	5.0-6.5	SC	150	110.1	8.7

10 TH STREET WASH DETENTION BASIN
MARICOPA COUNTY FLOOD CONTROL DISTRICT
PHOENIX, ARIZONA
ATL JOB NO. 194043

CONSOLIDATION TEST

Boring No.	Sample Depth (ft)	USCS	Density (pcf)	Liquid Limit	Plastic Limit
2	13.5-15.0	GM	96.4	-	NP
4	5.0-6.5	SC	112.1	35	24



Key	Boring No.	Depth (ft.)	Soil Description	Liquid Limit (%)	Plastic Limit (%)	Moisture Content (%)		Dry Density (pcf)
						Before	After	
	2	13.5-15.0	USCS= GM		NP	9.1	26.4	96.4

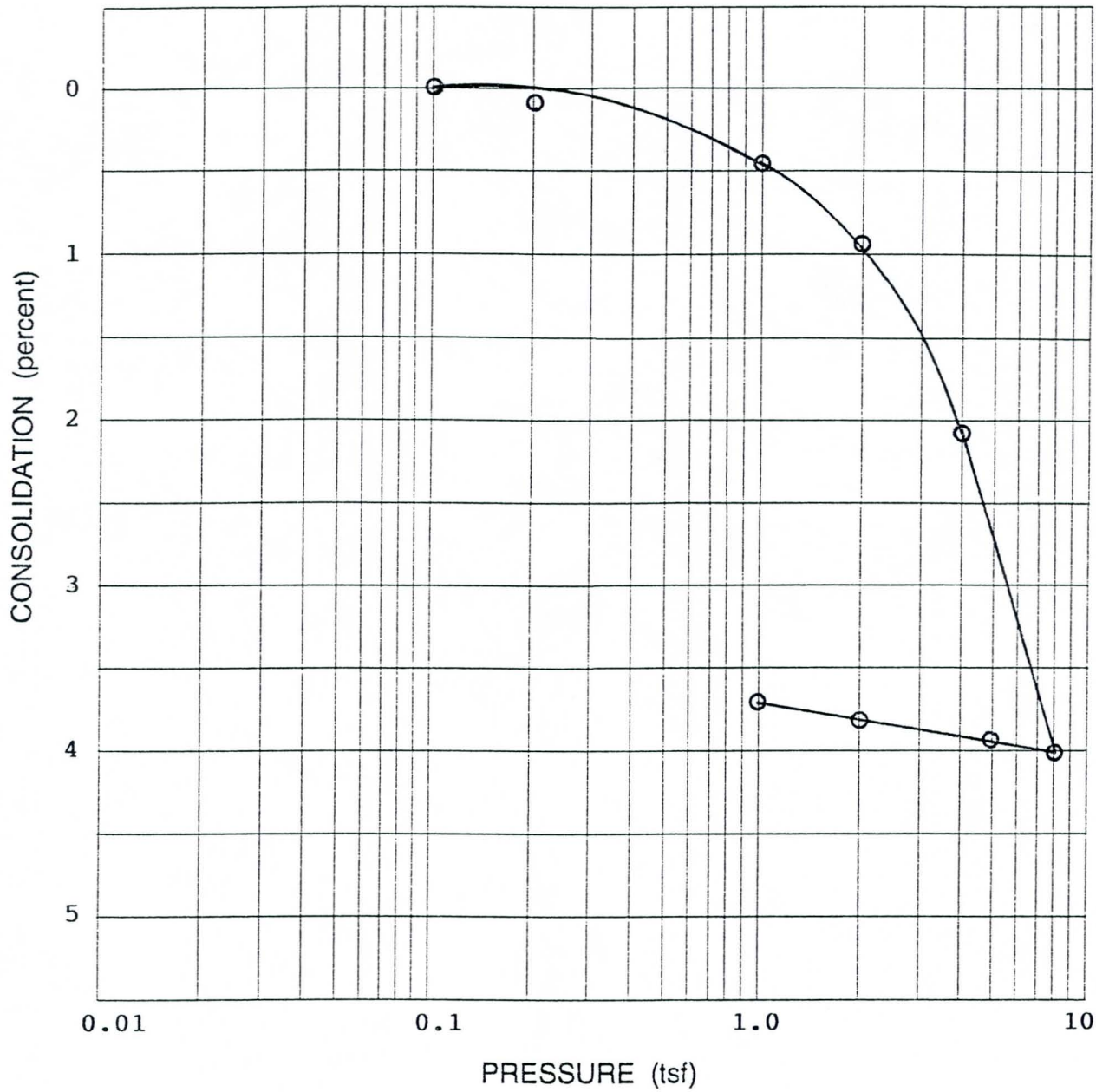
ATL Testing Laboratories

CONSOLIDATION TEST DATA

Project No. 194043

Date 1/13/95

ATL INC.



Key	Boring No.	Depth (ft.)	Soil Description	Liquid Limit (%)	Plastic Limit (%)	Moisture Content (%)		Dry Density (pcf)
						Before	After	
	4	5.0-6.5	USCS=SC Clayey Sand	35	24	8.6	18.2	112.1

ATL Testing Laboratories

CONSOLIDATION TEST DATA

Project No. 194043

Date 1/13/95

10 TH STREET WASH DETENTION BASIN
MARICOPA COUNTY FLOOD CONTROL DISTRICT
PHOENIX, ARIZONA
ATL JOB NO. 194043

FIELD PERCOLATION TESTS

Boring No.	Test Elevation	Permeability (cm/sec)	Percolation Rate (min/in)
5	1253 to 1245	7.62×10^{-3}	5.5
9	1253 to 1244	6.10×10^{-3}	6.9

10 TH STREET WASH DETENTION BASIN
MARICOPA COUNTY FLOOD CONTROL DISTRICT
PHOENIX, ARIZONA
ATL JOB NO. 194043

pH TEST RESULTS

Boring No.	Depth (ft)	pH
1	10.0 - 11.5	8.0
2	15.0 - 16.5	7.4
9	0 - 11.0	7.3
10	5.0 - 10.0	7.3

10 TH STREET WASH DETENTION BASIN
MARICOPA COUNTY FLOOD CONTROL DISTRICT
PHOENIX, ARIZONA
ATL JOB NO. 194043

RESISTIVITY TEST RESULTS

Boring No.	Depth (ft)	Resistivity (ohm/cm^3)
2	10.0 - 25.0	1201
7	4.5 - 20.0	1001
8	10.5 - 17.0	1534
10	0 - 5.0	2068

APPENDIX H

LANDSCAPE CONCEPT REPORT

COVER PAGE

10th Street Wash Landscape Concept

10th Street Wash is located on the north side of Phoenix in the community of Sunnyslope. Sunnyslope is one of the older communities of Phoenix and thus has a mature landscape throughout. The existing plant palette for this area is comprised mainly of lush green plant material that is considered to be exotic species by the Flood Control District. Large Mondel and Allepo Pines, Mexican Fan Palms and various species of Eucalyptus are the major canopy trees. Some Mesquite and Palo Verdes are located along the wash. Shrub material, like the canopy trees, are also predominantly lush green and considered to be exotic species by the Flood Control District. Oleander appears to be the prevalent shrub specie in the area. Turf is widely used in the neighborhoods, apartment complexes and commercial developments. The terrain of the area is relatively flat with the only noticeable change in elevation occurring at the wash. Views in the area are mainly into the surrounding neighborhood. The view to the east is the most dramatic. Residential housing and commercial development can be seen but it is dominated by Squaw Peak as a backdrop.

Four different landscape treatments have been proposed to help blend the detention basins into the surrounding community. The concepts were developed to be compatible with existing surrounding vegetation as well as future basin uses. Coordination meetings with the Flood Control District, Phoenix Parks and Recreation and the Sunnyslope Community Action Committee have identified a multi-recreational use for the detention basins. The four landscape treatments that have been developed are as follows:

Treatment #1 - Detention Basin Bottom and Terrace Level

The bottom of the basins and terrace level will receive only canopy trees (see appendix). These trees will be placed in close proximity to the toe of slope. By placing the trees around the edges unobstructed open space will be provided. This will enable the basins to provide multi-recreational uses in the future. The ground surface will be native soil.

Treatment #2 - Side Slope

The second type of treatment will occur along the slopes of the basin. This treatment will consist of a native shrub and groundcover seed mix (see appendix) that is consistent with the Sonoran Desert. The seeds will be mulched with gravel to provide a seedbed. These shrubs and groundcovers will help stabilize the slopes and minimize erosion. This is the only area located within the project that will receive a rock mulch. All other surfaces in the project will be native soil.

Treatment #3 - Top of Basin Street Frontage

The third type of treatment will be the most visible to the passing public. It is the area located along the top of the basins adjacent to the existing roadways. The landscape character along the street frontage will be a formal, urban look consisting of lush green plant material that blends with the surrounding residential neighborhood. Large canopy trees (at maturity) evenly spaced with colorful shrubs on the ground plane will be placed adjacent to the roadway. The plant material selected for this treatment will consist largely of plant material that is considered exotic by Flood Control District. Examples of this material include Bottle Tree, Texas Mountain Laurel, Mondel Pine, Cassia, Texas Ranger, and Bush Lantana. An eight foot (8') stabilized decomposed granite path will meander along the top of the basin. This path will be used by pedestrians and Flood Control maintenance vehicles.

Treatment #4 - Top of Basin Neighborhood Frontage

The fourth type of treatment occurs in the areas along the top of the basin that do not have street frontage. The landscape character for this area will be an informal, Sonoran Desert look. The plant material selected for this area will be consistent with the Sonoran Desert. Examples of this plant material include Palo Verde, Mesquite, Desert Willow, Hesperaloe, Chuparosa, Fairy Duster and Salvia. The path located in this area will be a twelve foot (12') stabilized decomposed granite path. This path will also double as the maintenance path for the Flood Control District. The stabilized decomposed granite path will meander along the top as much as possible with informal groupings ofnative trees and shrubs.

Open Space Between Basins

The triangular piece of land located between the basins will have only canopy trees installed. These trees will be located along the edges. In this way, future development (neighborhood park) can occur without having to remove vegetation.

Wash Restoration

The wash located south of Alice Drive will be restored. Restoration of the wash will be accomplished by hydro-seeding the side slopes. The hydro-seed mix will consist of a native shrub and groundcover mix (see appendix) that is consistent with the Sonoran Desert. In addition to the hydro-seed mix, one gallon container plants will be used in certain locations of the wash. Irrigation will not be provided to either the hydro-seeded areas or the containerized plants. These plantings will be dependant upon natural rainfall and weather conditions.

Irrigation System

The irrigation system will be efficient, site specific and will respond to three of the four landscape treatments. An automatic drip irrigation system will be provided that will promote the conservation of water in the desert environment of Maricopa County. The Sonoran Desert plant material that will be installed will not be self-sustaining after an establishment period of two to three years. The amount of water that will be delivered to each plant may be able to be reduced in the future, but that will have to be determined at that time. In any case the irrigation system will never be able to be completely turned off. The plant material identified as being located along the street frontage will require the irrigation to remain at a constant level indefinitely. The only area that will require no irrigation is the native seed mix located on the side slope. These plantings will be dependant upon natural rainfall and weather conditions.

A budget of $25,000 has been identified for materials and the installation of this irrigation system. This $25,000 includes the water tap, piping and water meter, Reduced Presure Backflow Preventer, Gate Valves, Drip Valves, Pressure Regulators and Wye-Starainers, Emitters, appropriate sized lateral Pipe, and irrigation Controller.

Handicap Accessibility

All surfaces and grades will be designed to be ADA acceptable. The maintenance path will be stabilized decomposed granite and will provide a handicap accessible route around and into the basins. The grades of the pathway will not exceed five (5) percent in slope. This will include the access ways into the bottom of the basins.

Cost

The cost-ceiling set for this project has been identified as $198,00.00. This cost-ceiling was derived from Table 1 and Table 2 of *Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects* dated December 16, 1992 and published by the Flood Control District of Maricopa County. The costs to be included in this number include plantings, irrigation, seeding, general system costs and labor.

A. Plant Palette

Botanical Name	Common Name
Trees	
Acacia spp.	Acacia
Brachychiton populneus	Bottle Tree
Cercidium spp.	Palo Verde
Chilopsis linearis	Desert Willow
Fraxinus velutina	Arizona Ash
Pinus brutia	Mondel Pine
Prosopis spp.	Mesquite
Sophora secundiflora	Texas Mountain Laurel
Shrubs	
Acacia spp.	Acacia
Agave spp.	Agave
Calliandra spp.	Fairy Duster
Cassia spp.	Cassia
Cordia parvifolia	Little Leaf Cordia
Dasylirion spp.	Desert Spoon
Hesperaloe spp.	Hesperaloe
Justicia spp.	Chuparosa
Nerium oleander var.	Oleander
Ruellia spp.	Ruellia
Salvia spp.	Salvia
Groundcover	
Dalea greggii	Trailing Indigo Bush
Gazania spp.	Gazania
Lantana camara	Bush Lantana

B. Native Shrub and Groundcover Seed Mix

Botanical Name	Common Name
Encelia farinosa	Brittlebush
Ambrosia spp.	Bursage
Atriplex polycarpa	Desert Saltbush
Atriplex lentiformis	Quailbush
Larrea tridentata	Creosote
Baileya multiradiata	Desert Marigold
Bouteloua aristidoides	Needle Grama
Aristida purpurea	Purple Three Awn
Plantago insularis	Indian Wheat
Sporobolis cryptandrus	Sand Dropseed

MARICOPA COUNTY DETENTION
ALTERNATIVE 3

BASIN 2A

ELEV (FT)	AREA(AC)	H (FT)	INC. VOL (AC-FT)	TOT. VO
48	0.724			
50	0.885	2	1.61	1.61
52	1.09	2	1.976	3.59
54	1.227	2	2.318	5.9
56	1.368	2	2.596	8.5
58	1.569	2	2.938	11.44
60	1.794	2	3.364	14.8

BASIN 2B

ELEV (FT)	AREA(AC)	H (FT)	INC. VOL (AC-FT)	TOT. VO
48	3.54			
50	3.74	2	7.28	7.28
52	4.17	2	7.91	15.19
54	4.53	2	8.7	23.89
54	5.7	2		
56	6.44	2	12.14	36.03
58	6.58	2	13.02	49.05
60	6.92	2	13.5	62.55

APPENDIX D

HEC-I MODEL FOR ALTERNATIVE 3

```
1****************************************                    ***********************************
 *                                      *                    *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *    U.S. ARMY CORPS OF ENGINEERS
 *          SEPTEMBER 1990              *                    *    HYDROLOGIC ENGINEERING CENTER
 *           VERSION 4.0                *                    *          609 SECOND STREET
 *                                      *                    *       DAVIS, CALIFORNIA 95616
 *  RUN DATE  02/03/1995  TIME  11:14:06 *                    *          (916) 756-1104
 *                                      *                    *
 ****************************************                    ***********************************

                                        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
        2           ID        FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
        3           ID        TENTH STREET WASH DETENTION BASIN NO 1  (FCD 93-31)
        4           ID        STANLEY CONSULTANTS, INC.  (SCI JOB # 12183)
        5           ID        AMENDED BY RUST E & I TO INCLUDE BASINS 2A & 2B (2/1/95)
        6           ID        DCR ALTTERNATIVE 3
        7           ID        HEC-1 INPUT FILENAME :  10WALT3.HC1
        8           ID
        9           ID        ************************************************************************
       10           ID        THIS MODEL REPRESENTS THE PROPOSED 10TH STREET WASH DETENTION BASIN #1.
       11           ID        THE FOLLOWING BASIN CHARACTERISTICS ARE EVALUATED:
       12           ID          1. INLET CONFIGURATION 1, INLET 1 CONSISTS OF A SIDE OVERFLOW WEIR
       13           ID             CONFIGURATION (100' WEIR 3.34' ABOVE FLOWLINE) FOR THE WEST TRIB
       14           ID             AND A WEIR INLET (30' WEIR AT CREST ELEV. 1321) FOR THE EAST TRIB.
       15           ID             INLET CONTROL CONDITIONS ASSUMED.
       16           ID          2. BASIN CONFIGURATION 1, 3:1 SIDES ON 3 SIDES AND A VERTICAL
       17           ID             RETAINING WALL ON THE WEST SIDE, A BOTTOM ELEVATION OF 1306, AND
       18           ID             25' ADDITIONAL R.O.W. ALONG THE SOUTH BASIN PARCEL BOUNDARY.
       19           ID          3. OUTLET CONFIGURATION 1, UTILIZING A 30" RCP TO CHASE GRADE AS THE
       20           ID             LOW FLOW AND PRINCIPAL OUTLET.
       21           ID        ************************************************************************
       22           ID
       23           ID        ************************************************************************
       24           ID        THIS HEC-1 MODEL IS BASED ON THE KAMINSKI-HUBBARD ACDC ADMS AS MODIFIED
       25           ID        BY FCD TO REFLECT TWO HYPOTHETICAL DETENTION BASINS (NUMBERS 1 AND 2).
       26           ID        THE DIFFERENCES BETWEEN THIS MODEL AND THE ORIGINAL MODEL TRANSMITTED
       27           ID        BY FCD TO SCI AT THE PROJECT KICKOFF MEETING ARE AS FOLLOWS:
       28           ID          1. USE OF THE HEC-1 DATA STORAGE SYSTEM OPTION HAS BEEN DELETED;
```

```
 29          ID          2. THE TWO HYPOTHETICAL DETENTION BASINS 1 AND 2 HAVE BEEN DELETED;
 30          ID          3. THE CROSS SECTIONAL AREA OF THE PRINCIPAL SPILLWAY OUTLET PIPE OF
 31          ID             THE EXISTING CITY OF PHOENIX DET BASIN NO. 3 HAS BEEN CHANGED FROM
 32          ID             4.91 SQFT (WHICH CORRESPONDS TO AN OUTLET PIPE DIAM OF 30") TO
 33          ID             1.36 SQFT CORRESPONDING TO THE 14" X 14" STEEL ORIFICE PLATE WHICH
 34          ID             WAS ORIGINALLY DESIGNED AND INSTALLED.
 35          ID        ***********************************************************************
 36          ID
 37          ID   ACDC AREA DRAINAGE MASTER STUDY
 38          ID   10TH STREET WASH WATERSHED
 39          ID   FILENAME:  TEN36.DAT     KHE JOB NO. 0146
 40          ID   100-YEAR 6-HOUR DURATION STORM
             *
             *  Based on FCDMC comments dated March 17,1992 we adjusted the Mannings "n"
             *  coefficient to reflect weighted averaging in lieu of log averaging.
             *  We also changed the S-graph from Phoenix Mountain to Phoenix Valley.
             *
             *DIAGRAM
 41          IT       3                    300
 42          IO       5

 43          KK    140S
 44          KM   RUNOFF GENERATED ON SUB-BASIN 140
 45          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 46          KM    L= 1.22 mi.  Lca= 0.51 mi.  S= 162 ft/mi.  Kn= .050  LAG= 22.87 min.
 47          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 48          BA    .516
```



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

 49          IN      15
 50          KM   RAINFALL DEPTH OF 3.00 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
 51          KM   AN AREAL REDUCTION COEFFICIENT OF .975 WAS USED
 52          PB  2.9200
 53          KM   THE FOLLOWING PC RECORD USED A 6-HOUR RAINFALL WITH PATTERN NO. 2.01
 54          PC    .000    .009    .016    .025    .034    .042    .051    .059    .067    .076
 55          PC    .087    .100    .120    .163    .252    .451    .694    .837    .900    .938
 56          PC    .950    .963    .975    .988   1.000
 57          LG    .145    .339    4.25    .488   20.44
 58          UI     76.    119.    294.    391.    468.    577.    793.    930.    712.    588.
 59          UI    474.    381.    274.    154.    127.     90.     76.     26.     23.     23.
 60          UI     23.     23.      0.      0.      0.      0.      0.      0.      0.      0.
 61          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 62          KK   DT140
 63          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.0 AC-FT FROM SUB-BASIN 140
 64          KM                                               (Hydrograph identified as OR140)
 65          KM                                             2) Balance of runoff continues on.
 66          KM                                               (Hydrograph identified as DT140)
 67          DT   OR140     2.0
 68          DI       0   10000
 69          DQ       0   10000
 70          KM   ******************************************************************************
 71          KM    KK 140RR
 72          KM    KM ROUTE FLOW THROUGH NORTH MOUNTAIN DETENTION NO.3
 73          KM    RS      1    ELEV    55.9
 74          KM    SV      0     .06    1.52    6.32   17.42   35.46   60.34   95.64
 75          KM    SE  55.9      58      62      66      70      74      78      82
 76          KM    SL 57.15    4.91      .6      .5
 77          KM        ***********************************************************************
 78          KM    THE SL RECORD (LOW-LEVEL OUTLET) SECOND FIELD (ORIFICE AREA) VALUE HAS
 79          KM    BEEN CHANGED BY SCI FROM 4.91 sq.ft. TO 1.36 sq.ft. (14"x14" INLET)
 80          KM        ***********************************************************************
 81          KM    SS 79.66     100     3.0     1.5
 82          KM   ******************************************************************************
```

```
 83          KK   140RR
 84          KM   ROUTE FLOW THROUGH NORTH MOUNTAIN DETENTION NO.3
 85          RS       1    ELEV    55.9
 86          SV       0     .06    1.52    6.32   17.42   35.46   60.34   95.64
 87          SE    55.9      58      62      66      70      74      78      82
 88          SL   56.43    1.36      .6      .5
 89          SS   80.00     100     3.0     1.5

 90          KK   RM140
 91          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM DETENTION BASIN THROUGH SUB-BASIN 141
 92          KM            1) Reach Length = 3600 ft.
 93          RD
 94          RC    .045    .045    .045    3600   .0108
 95          RX       0       0    46.5    76.4    79.9   110.2   160.2   160.2
 96          RY      16    12.6     7.3       0       0     9.9    15.9      16
```



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

 97          KK    141S
 98          KM   RUNOFF GENERATED ON SUB-BASIN 141
 99          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
100          KM    L= 0.83 mi.  Lca= 0.57 mi.  S= 315 ft/mi.  Kn= .042  LAG= 15.26 min.
101          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
102          BA    .187
103          LG    .126    .303    3.61    .313   38.57
104          UI     41.    136.    222.    297.    467.    414.    304.    220.    131.     70.
105          UI     47.     23.     13.     13.     13.      0.      0.      0.      0.      0.
106          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

107          KK   DT141
108          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.4 AC-FT FROM SUB-BASIN 141
109          KM                                              (Hydrograph identified as OR141)
110          KM                                            2) Balance of runoff continues on.
111          KM                                              (Hydrograph identified as DT141)
112          DT   OR141     2.4
113          DI       0   10000
114          DQ       0   10000

115          KK   HC141
116          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 141 WITH ROUTED FLOW FROM DETENTION
117          HC       2
118          KM   ******************************************************************************

119          KK  DVT141   SPLIT HYDROGRAPH 141 TO DET142 AND HC142
120          KM           DI-DQ BASED ON HYDRAULIC RATING CURVE FOR PROPOSED INLET AND
121          KM           EXISTING 30" PIPE.  WEIR LENGTH IS 30' WEIR CREST IS ELEV 1321.
122          KM           DQ IS AMOUNT DIVERTED AROUND DETENTION BASIN DOWNSTREAM.
123          KM           DI-DQ DIFFERENCE IS ROUTED THRU THE PROPOSED DETENTION BASIN
124          DT  DVT141
125          DI       0      12      50     114     196     294
126          DQ       0      12      15      18      20      22
127          KM   ******************************************************************************

128          KK    142S
129          KM   RUNOFF GENERATED ON SUB-BASIN 142
130          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
131          KM    L= 1.16 mi.  Lca= 0.75 mi.  S= 257 ft/mi.  Kn= .042  LAG= 19.99 min.
132          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
133          BA    .512
134          LG    .127    .309    4.12    .267   34.03
135          UI     86.    178.    377.    488.    608.    839.   1049.    795.    637.    498.
136          UI    380.    210.    146.    107.     80.     26.     26.     26.     26.      0.
137          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
```

```
138          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

139          KK   DT142
140          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 3.6 AC-FT FROM SUB-BASIN 142
141          KM                                              (Hydrograph identified as OR142)
142          KM                                            2) Balance of runoff continues on.
143          KM                                              (Hydrograph identified as DT142)
144          DT   OR142     3.6
145          DI       0   10000
```



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

146          DQ       0   10000
147          KM   ******************************************************************************

148          KK  DVT142   SPLIT HYDROGRAPH DVT142 TO DET142 AND HC142
149          KM           DI-DQ BASED ON HYDRAULIC RATING CURVE FOR PROPOSED INLET AND
150          KM           IMPROVED WASH CROSS SECTION.  WEIR LENGTH IS 100' WEIR CREST ELEV IS
151          KM           3.34' ABOVE WASH FLOWLINE.
152          KM           DQ IS AMOUNT DIVERTED AROUND DETENTION BASIN DOWNSTREAM.
153          KM           DI-DQ DIFFERENCE IS ROUTED THRU THE PROPOSED DETENTION BASIN
154          DT  DVT142
155          DI       0     280     300     350     400     450     500     550     600     672
156          DQ       0     280     295     312     317     319     318     317     313     307

157          KK  ADD142
158          KM   COMBINE HYDROGRAPHS FROM (DI-DQ) FROM DVT141 WITH (DI-DQ) FROM DVT142
159          HC       2

160          KK  DET142   ROUTE HYDROGRAPH ADD142 THRU DET BASIN 142
161          KM           1-30" RCP  AS LOW FLOW AND PRINCIPAL OUTLET (INV. EL. 1306)
162          RS       1    STOR      -1
163          SV     .00   0.060   0.460   1.470   3.040   4.890   6.850   8.910   11.08   13.36
164          SV   15.74   18.23   20.83   23.53   26.33
165          SQ       0     4.5    15.9    29.0    37.0    44.0    50.0    55.0    60.0    65.0
166          SQ      70      72      78      80      84
167          SE    1306    1307    1308    1309    1310    1311    1312    1313    1314    1315
168          SE    1316    1317    1318    1319    1320

169          KK  DVT141    RETRIEVE PREVIOUSLY SPLIT HYDROGRAPH FROM SUB-BASIN 141
170          DR  DVT141

171          KK  DVT142    RETRIEVE PREVIOUSLY SPLIT HYDROGRAPH FROM SUB-BASIN 142
172          DR  DVT142

173          KK   HC142
174          KM   COMBINE HYDROGRAPHS (DQ) FROM DVT142, (DQ) FROM DVT141 AND DET142 OUTFLOW
175          HC       3
176          KM   ******************************************************************************

177          KK   RM142
178          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASINS 141/142 THROUGH 143
179          KM           1) Reach Length = 5140 ft.
180          RD
181          RC    .050    .045    .050    5140   .0086
182          RX       0       0    43.8    61.3    67.4    78.3    89.8    89.8
183          RY    10.8     9.4     9.4       0       0     5.4     8.8    10.8

184          KK    143S
185          KM   RUNOFF GENERATED ON SUB-BASIN 143
186          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
187          KM    L= 1.64 mi.  Lca= 0.88  S= 273 ft/mi.  Kn= .035  LAG= 19.96 min.
188          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
189          BA    .604
190          LG    .115    .279    4.12    .269   49.66
```

```
 191          UI    102.    212.    446.    577.    720.    994.   1238.    937.    750.    586.
 192          UI    447.    244.    173.    125.     93.     31.     31.     31.     31.      0.
                                          HEC-1 INPUT                                          PAGE  5

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

 193          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 194          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 195          KK   DT143
 196          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 5.7 AC-FT FROM SUB-BASIN 143
 197          KM                                              (Hydrograph identified as OR143)
 198          KM                                            2) Balance of runoff continues on.
 199          KM                                              (Hydrograph identified as DT143)
 200          DT   OR143     5.7
 201          DI       0   10000
 202          DQ       0   10000

 203          KK   HC143
 204          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 143 WITH ROUTED FLOW FROM 141/142
 205          HC       2

 206          KK   RM143
 207          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASIN 143 THROUGH 144
 208          KM            1) Reach Length = 1400 ft.
 209          RD
 210          RC    .040    .035    .030    1400   .0100
 211          RX       0       0    77.8    88.3    96.6   112.8   161.3   161.3
 212          RY      10     6.2     6.2       0       0     6.3     6.9      10

 213          KK    144S
 214          KM   RUNOFF GENERATED ON SUB-BASIN 144
 215          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 216          KM    L= 1.80 mi.  Lca= 1.11 mi.  S= 291 ft/mi.  Kn= .036  LAG= 22.95 min.
 217          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 218          BA    .475
 219          LG    .118    .280    3.61     .32   43.17
 220          UI     70.    108.    269.    357.    428.    527.    721.    857.    657.    543.
 221          UI    437.    353.    256.    145.    117.     85.     70.     26.     21.     21.
 222          UI     21.     21.      0.      0.      0.      0.      0.      0.      0.      0.
 223          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 224          KK   DT144
 225          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.1 AC-FT FROM SUB-BASIN 144
 226          KM                                              (Hydrograph identified as OR144)
 227          KM                                            2) Balance of runoff continues on.
 228          KM                                              (Hydrograph identified as DT144)
 229          DT   OR144     2.1
 230          DI       0   10000
 231          DQ       0   10000

 232          KK   DIV1P    DIVERT PALMA PARK FLOWS OVER 350 CFS
 233          KM   DIVERSION REPRESENTS LOSS OF FLOW NOT ACCEPTED BY THE PALMA PARK INLET
 234          DT   DIV1P
 235          DI       0     350     351     615    1000
 236          DQ       0       0       1     265     650
                                          HEC-1 INPUT                                          PAGE  6

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

 237          KK   HC144
 238          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 144 WITH ROUTED FLOW FROM 143
 239          HC       2

 240          KK    DIV2    DIVERT INCHANNEL FLOWS AROUND DETENTION FACILITY
```

```
241          KM   DIVERSION REPRESENTS  CULVERT (600' LONG) THRU BASIN CAPACITY=500 CFS
242          DT   DIV-2
243          DI       0     325     326     540     860    1280
244          DQ       0     325     325     390     435     500

245          KK   SITE2   DETENTION BASIN AT SITE 2A & 2B *************************
246          KM        ALTERNATIVE 3
247          RS       1    STOR       0
248          SV       0    8.89   18.78   29.79   44.53   60.49   68.69   77.35
249          SE    1248    1250    1252    1254    1256    1258    1259    1260
250          SQ       0      16      36      50      60      70      75     320

251          KK   RET-2    RETRIEVE DIVERTED INCHANNEL FLOWS
252          DR   DIV-2

253          KK   RET1P    RETRIEVE DIVERTED PALMA PARK FLOW
254          DR   DIV1P

255          KK   COMB2   RECOMBINE INCHANNEL FLOWS WITH OUTFLOW FROM DETENTION BASIN 2
256          KO       1
257          HC       3

258          KK   RM144
259          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASIN 144 THROUGH 145
260          KM            1) Reach Length = 3000 ft.
261          RD
262          RC    .035    .035    .030    3000   .0073
263          RX       0       0    36.6      52    64.9    79.8   107.8   107.8
264          RY      11     7.7     7.4       0       0     8.3     8.5      11

265          KK    145S
266          KM   RUNOFF GENERATED ON SUB-BASIN 145
267          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
268          KM    L= 1.37 mi.  Lca= 0.86 mi.  S= 242 ft/mi.  Kn= .032  LAG= 17.28 min.
269          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
270          BA    .548
271          LG    .105    .265    5.67    .210   44.60
272          UI    107.    287.    526.    678.    922.   1303.    982.    755.    568.    378.
273          UI    186.    145.     98.     33.     33.     33.     33.      0.      0.      0.
274          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

275          KK   HC145
276          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 145 WITH ROUTED FLOW FROM 144
277          KM   ALSO DETERMINES 10TH STREET WASH DISCHARGE INTO ACDC
278          HC       2
279          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

   43        140S
                .
                .
   67           .------->   OR140
   62       DT140
                V
                V
   83       140RR
                V
                V
   90       RM140
                .
                .
```

```
 97          .        141S
             .           .
             .           .
112          .           .-------->   OR141
107          .       DT141
             .           .
             .           .
115      HC141............
             .
             .
124          .-------->  DVT141
119     DVT141
             .
             .
128          .        142S
             .           .
             .           .
144          .           .-------->   OR142
139          .       DT142
             .           .
             .           .
154          .           .-------->  DVT142
148          .      DVT142
             .           .
             .           .
157     ADD142............
            V
            V
160     DET142
             .
             .
170          .           .<--------  DVT141
169          .      DVT141
             .           .
             .           .
172          .           .           .<--------  DVT142
171          .           .      DVT142
             .           .           .
             .           .           .
173      HC142........................
            V
            V
177      RM142
             .
             .
184          .        143S
             .           .
             .           .
200          .           .-------->   OR143
195          .       DT143
             .           .
             .           .
203      HC143............
            V
            V
206      RM143
             .
             .
213          .        144S
             .           .
             .           .
229          .           .-------->   OR144
224          .       DT144
             .           .
             .           .
234          .           .-------->   DIV1P
```

```
232          .       DIV1P
             .           .
             .           .
237      HC144............
             .
             .
242          .-------->   DIV-2
240       DIV2
             V
             V
245      SITE2
             .
             .
252          .           .<-------   DIV-2
251          .       RET-2
             .           .
             .           .
254          .           .           .<-------   DIV1P
253          .           .       RET1P
             .           .           .
             .           .           .
255      COMB2........................
             V
             V
258      RM144
             .
             .
265          .        145S
             .           .
             .           .
275      HC145............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************                    ***********************************
*                                      *                    *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *    U.S. ARMY CORPS OF ENGINEERS
*            SEPTEMBER 1990            *                    *    HYDROLOGIC ENGINEERING CENTER
*             VERSION 4.0              *                    *          609 SECOND STREET
*                                      *                    *       DAVIS, CALIFORNIA 95616
*  RUN DATE  02/03/1995  TIME  11:14:06 *                    *          (916) 756-1104
*                                      *                    *
****************************************                    ***********************************
```

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
TENTH STREET WASH DETENTION BASIN NO 1 (FCD 93-31)
STANLEY CONSULTANTS, INC. (SCI JOB # 12183)
AMENDED BY RUST E & I TO INCLUDE BASINS 2A & 2B (2/1/95)
DCR ALTTERNATIVE 3
HEC-1 INPUT FILENAME : 10WALT3.HC1

****
THIS MODEL REPRESENTS THE PROPOSED 10TH STREET WASH DETENTION BASIN #1.
THE FOLLOWING BASIN CHARACTERISTICS ARE EVALUATED:

1. INLET CONFIGURATION 1, INLET 1 CONSISTS OF A SIDE OVERFLOW WEIR CONFIGURATION (100' WEIR 3.34' ABOVE FLOWLINE) FOR THE WEST TRIB AND A WEIR INLET (30' WEIR AT CREST ELEV. 1321) FOR THE EAST TRIB. INLET CONTROL CONDITIONS ASSUMED.
2. BASIN CONFIGURATION 1, 3:1 SIDES ON 3 SIDES AND A VERTICAL RETAINING WALL ON THE WEST SIDE, A BOTTOM ELEVATION OF 1306, AND 25' ADDITIONAL R.O.W. ALONG THE SOUTH BASIN PARCEL BOUNDARY.
3. OUTLET CONFIGURATION 1, UTILIZING A 30" RCP TO CHASE GRADE AS THE

```
                    LOW FLOW AND PRINCIPAL OUTLET.
                ***********************************************************************

                ***********************************************************************
                THIS HEC-1 MODEL IS BASED ON THE KAMINSKI-HUBBARD ACDC ADMS AS MODIFIED
                BY FCD TO REFLECT TWO HYPOTHETICAL DETENTION BASINS (NUMBERS 1 AND 2).
                THE DIFFERENCES BETWEEN THIS MODEL AND THE ORIGINAL MODEL TRANSMITTED
                BY FCD TO SCI AT THE PROJECT KICKOFF MEETING ARE AS FOLLOWS:
                  1. USE OF THE HEC-1 DATA STORAGE SYSTEM OPTION HAS BEEN DELETED;
                  2. THE TWO HYPOTHETICAL DETENTION BASINS 1 AND 2 HAVE BEEN DELETED;
                  3. THE CROSS SECTIONAL AREA OF THE PRINCIPAL SPILLWAY OUTLET PIPE OF
                     THE EXISTING CITY OF PHOENIX DET BASIN NO. 3 HAS BEEN CHANGED FROM
                     4.91 SQFT (WHICH CORRESPONDS TO AN OUTLET PIPE DIAM OF 30") TO
                     1.36 SQFT CORRESPONDING TO THE 14" X 14" STEEL ORIFICE PLATE WHICH
                     WAS ORIGINALLY DESIGNED AND INSTALLED.
                ***********************************************************************

            ACDC AREA DRAINAGE MASTER STUDY
            10TH STREET WASH WATERSHED
            FILENAME:  TEN36.DAT     KHE JOB NO. 0146
            100-YEAR 6-HOUR DURATION STORM

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

    IT          HYDROGRAPH TIME DATA
                       NMIN           3  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      1    0  ENDING DATE
                     NDTIME        1457  ENDING TIME
                     ICENT          19  CENTURY MARK

                 COMPUTATION INTERVAL     .05 HOURS
                      TOTAL TIME BASE   14.95 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


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


          **************
          *            *
 255 KK   *     COMB2  *        RECOMBINE INCHANNEL FLOWS WITH OUTFLOW FROM DETENTION BASIN 2
          *            *
          **************

 256 KO         OUTPUT CONTROL VARIABLES
                      IPRNT           1  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

 257 HC         HYDROGRAPH COMBINATION
                      ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE
```

***

HYDROGRAPH AT STATION COMB2
SUM OF 3 HYDROGRAPHS

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FL
1		0000	1	0.	1		0345	76	380.	1		0730	151	139.	1		1115	226	9
1		0003	2	0.	1		0348	77	405.	1		0733	152	138.	1		1118	227	9
1		0006	3	0.	1		0351	78	435.	1		0736	153	138.	1		1121	228	9
1		0009	4	0.	1		0354	79	505.	1		0739	154	137.	1		1124	229	9
1		0012	5	0.	1		0357	80	592.	1		0742	155	137.	1		1127	230	9
1		0015	6	0.	1		0400	81	673.	1		0745	156	136.	1		1130	231	9
1		0018	7	0.	1		0403	82	741.	1		0748	157	135.	1		1133	232	9
1		0021	8	0.	1		0406	83	800.	1		0751	158	135.	1		1136	233	9
1		0024	9	0.	1		0409	84	839.	1		0754	159	134.	1		1139	234	8
1		0027	10	0.	1		0412	85	854.	1		0757	160	134.	1		1142	235	8
1		0030	11	0.	1		0415	86	859.	1		0800	161	133.	1		1145	236	8
1		0033	12	0.	1		0418	87	843.	1		0803	162	132.	1		1148	237	8
1		0036	13	0.	1		0421	88	806.	1		0806	163	132.	1		1151	238	8
1		0039	14	0.	1		0424	89	747.	1		0809	164	131.	1		1154	239	8
1		0042	15	0.	1		0427	90	692.	1		0812	165	131.	1		1157	240	8
1		0045	16	0.	1		0430	91	639.	1		0815	166	130.	1		1200	241	8
1		0048	17	0.	1		0433	92	586.	1		0818	167	130.	1		1203	242	8
1		0051	18	0.	1		0436	93	546.	1		0821	168	129.	1		1206	243	8
1		0054	19	0.	1		0439	94	529.	1		0824	169	128.	1		1209	244	8
1		0057	20	0.	1		0442	95	515.	1		0827	170	128.	1		1212	245	8
1		0100	21	0.	1		0445	96	502.	1		0830	171	127.	1		1215	246	7
1		0103	22	0.	1		0448	97	490.	1		0833	172	127.	1		1218	247	7
1		0106	23	0.	1		0451	98	478.	1		0836	173	126.	1		1221	248	7
1		0109	24	0.	1		0454	99	466.	1		0839	174	125.	1		1224	249	7
1		0112	25	0.	1		0457	100	451.	1		0842	175	125.	1		1227	250	7
1		0115	26	0.	1		0500	101	431.	1		0845	176	124.	1		1230	251	7
1		0118	27	0.	1		0503	102	415.	1		0848	177	124.	1		1233	252	7
1		0121	28	0.	1		0506	103	400.	1		0851	178	123.	1		1236	253	7
1		0124	29	0.	1		0509	104	369.	1		0854	179	123.	1		1239	254	7
1		0127	30	0.	1		0512	105	336.	1		0857	180	122.	1		1242	255	7
1		0130	31	0.	1		0515	106	309.	1		0900	181	122.	1		1245	256	7
1		0133	32	0.	1		0518	107	288.	1		0903	182	121.	1		1248	257	7
1		0136	33	0.	1		0521	108	271.	1		0906	183	120.	1		1251	258	7
1		0139	34	0.	1		0524	109	259.	1		0909	184	120.	1		1254	259	7
1		0142	35	0.	1		0527	110	249.	1		0912	185	119.	1		1257	260	7
1		0145	36	0.	1		0530	111	242.	1		0915	186	119.	1		1300	261	6
1		0148	37	0.	1		0533	112	236.	1		0918	187	118.	1		1303	262	6
1		0151	38	0.	1		0536	113	231.	1		0921	188	117.	1		1306	263	6
1		0154	39	0.	1		0539	114	228.	1		0924	189	117.	1		1309	264	6
1		0157	40	0.	1		0542	115	226.	1		0927	190	116.	1		1312	265	6
1		0200	41	0.	1		0545	116	224.	1		0930	191	116.	1		1315	266	6
1		0203	42	0.	1		0548	117	223.	1		0933	192	115.	1		1318	267	6
1		0206	43	0.	1		0551	118	222.	1		0936	193	114.	1		1321	268	6
1		0209	44	0.	1		0554	119	221.	1		0939	194	114.	1		1324	269	6
1		0212	45	0.	1		0557	120	220.	1		0942	195	113.	1		1327	270	6
1		0215	46	0.	1		0600	121	219.	1		0945	196	113.	1		1330	271	6
1		0218	47	0.	1		0603	122	218.	1		0948	197	112.	1		1333	272	6
1		0221	48	3.	1		0606	123	217.	1		0951	198	111.	1		1336	273	6
1		0224	49	13.	1		0609	124	214.	1		0954	199	111.	1		1339	274	6
1		0227	50	14.	1		0612	125	211.	1		0957	200	110.	1		1342	275	6
1		0230	51	14.	1		0615	126	207.	1		1000	201	110.	1		1345	276	6
1		0233	52	15.	1		0618	127	202.	1		1003	202	109.	1		1348	277	6
1		0236	53	15.	1		0621	128	196.	1		1006	203	108.	1		1351	278	6
1		0239	54	16.	1		0624	129	189.	1		1009	204	108.	1		1354	279	6

1	0242	55	16.	*	1	0627	130	182.	*	1	1012	205	107.	*	1	1357	280	6
1	0245	56	17.	*	1	0630	131	176.	*	1	1015	206	107.	*	1	1400	281	6
1	0248	57	17.	*	1	0633	132	171.	*	1	1018	207	106.	*	1	1403	282	6
1	0251	58	18.	*	1	0636	133	166.	*	1	1021	208	105.	*	1	1406	283	6
1	0254	59	19.	*	1	0639	134	162.	*	1	1024	209	105.	*	1	1409	284	6
1	0257	60	20.	*	1	0642	135	158.	*	1	1027	210	104.	*	1	1412	285	6
1	0300	61	21.	*	1	0645	136	155.	*	1	1030	211	104.	*	1	1415	286	6
1	0303	62	23.	*	1	0648	137	153.	*	1	1033	212	103.	*	1	1418	287	6
1	0306	63	25.	*	1	0651	138	151.	*	1	1036	213	103.	*	1	1421	288	6
1	0309	64	28.	*	1	0654	139	149.	*	1	1039	214	102.	*	1	1424	289	6
1	0312	65	32.	*	1	0657	140	147.	*	1	1042	215	101.	*	1	1427	290	6
1	0315	66	35.	*	1	0700	141	146.	*	1	1045	216	101.	*	1	1430	291	5
1	0318	67	40.	*	1	0703	142	145.	*	1	1048	217	100.	*	1	1433	292	5
1	0321	68	48.	*	1	0706	143	144.	*	1	1051	218	99.	*	1	1436	293	5
1	0324	69	91.	*	1	0709	144	144.	*	1	1054	219	99.	*	1	1439	294	5
1	0327	70	148.	*	1	0712	145	143.	*	1	1057	220	98.	*	1	1442	295	5
1	0330	71	173.	*	1	0715	146	142.	*	1	1100	221	98.	*	1	1445	296	5
1	0333	72	205.	*	1	0718	147	142.	*	1	1103	222	97.	*	1	1448	297	5
1	0336	73	251.	*	1	0721	148	141.	*	1	1106	223	96.	*	1	1451	298	5
1	0339	74	321.	*	1	0724	149	140.	*	1	1109	224	96.	*	1	1454	299	5
1	0342	75	349.	*	1	0727	150	140.	*	1	1112	225	95.	*	1	1457	300	5
				*					*					*				

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	14.95-HR
		(CFS)				
859.	4.25		271.	141.	141.	141.
		(INCHES)	1.097	1.424	1.424	1.424
		(AC-FT)	134.	174.	174.	174.

CUMULATIVE AREA = 2.29 SQ MI

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 MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	140S	496.	4.25	69.	28.	28.	.52		
DIVERSION TO	OR140	20.	4.25	4.	2.	2.	.52		
HYDROGRAPH AT	DT140	496.	4.25	65.	26.	26.	.52		
ROUTED TO	140RR	26.	5.10	25.	18.	18.	.52	72.36	5.15
ROUTED TO	RM140	26.	5.45	25.	18.	18.	.52		
HYDROGRAPH AT	141S	263.	4.10	38.	15.	15.	.19		
DIVERSION TO	OR141	57.	4.10	5.	2.	2.	.19		
HYDROGRAPH AT									

+		DT141	263.	4.10	33.	13.	13.	.19	
	2 COMBINED AT								
		HC141	275.	4.10	56.	31.	31.	.70	
	DIVERSION TO								
		DVT141	22.	4.10	14.	10.	10.	.70	
	HYDROGRAPH AT								
		DVT141	253.	4.10	41.	20.	20.	.70	
	HYDROGRAPH AT								
+		142S	671.	4.15	100.	40.	40.	.51	
	DIVERSION TO								
+		OR142	45.	4.15	7.	3.	3.	.51	
	HYDROGRAPH AT								
		DT142	671.	4.15	93.	37.	37.	.51	
	DIVERSION TO								
		DVT142	319.	4.15	65.	26.	26.	.51	
	HYDROGRAPH AT								
		DVT142	364.	4.15	28.	11.	11.	.51	
	2 COMBINED AT								
+		ADD142	614.	4.15	70.	32.	32.	1.21	
	ROUTED TO								
+		DET142	80.	4.60	62.	32.	32.	1.21	
+									1318.97 4.60
	HYDROGRAPH AT								
+		DVT141	22.	4.10	14.	10.	10.	.00	
	HYDROGRAPH AT								
		DVT142	319.	4.45	65.	26.	26.	.00	
	3 COMBINED AT								
		HC142	417.	4.45	138.	68.	68.	1.21	
	ROUTED TO								
		RM142	416.	4.60	138.	67.	67.	1.21	
	HYDROGRAPH AT								
+		143S	841.	4.15	136.	55.	55.	.60	
	DIVERSION TO								
+		OR143	58.	4.15	11.	5.	5.	.60	
	HYDROGRAPH AT								
		DT143	841.	4.15	125.	50.	50.	.60	
	2 COMBINED AT								
		HC143	1221.	4.15	258.	117.	117.	1.82	
	ROUTED TO								
		RM143	1220.	4.20	258.	117.	117.	1.82	
	HYDROGRAPH AT								
+		144S	615.	4.20	100.	40.	40.	.47	
	DIVERSION TO								
+		OR144	14.	4.20	4.	2.	2.	.47	

```
HYDROGRAPH AT
+                    DT144      615.    4.20         96.        38.        38.        .47
DIVERSION TO
+                    DIV1P      265.    3.90         20.         8.         8.        .47
HYDROGRAPH AT
                     DIV1P      350.    3.90         76.        31.        31.        .47
2 COMBINED AT
                     HC144     1570.    4.20        330.       148.       148.       2.29
DIVERSION TO
                     DIV-2      545.    4.20        195.        93.        93.       2.29
HYDROGRAPH AT
+                     DIV2     1025.    4.20        136.        55.        55.       2.29
ROUTED TO
+                    SITE2       71.    5.00         63.        40.        40.       2.29
                                                                                  1258.20        5.00
HYDROGRAPH AT
+                    RET-2      545.    4.20        195.        93.        93.        .00
HYDROGRAPH AT
+                    RET1P      265.    4.20         20.         8.         8.        .00
3 COMBINED AT
                     COMB2      859.    4.25        271.       141.       141.       2.29
ROUTED TO
                     RM144      856.    4.30        270.       140.       140.       2.29
HYDROGRAPH AT
+                     145S      786.    4.10        121.        49.        49.        .55
2 COMBINED AT
+                    HC145     1578.    4.20        379.       189.       189.       2.84
```

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	INTERPOLATED TO COMPUTATION INTERVAL DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)
RM140	MANE	3.00	26.07	330.00	.79	3.00	26.07	330.00	.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2263E+02 EXCESS= .0000E+00 OUTFLOW= .2176E+02 BASIN STORAGE= .6323E+00 PERCENT ERROR=

RM142	MANE	3.00	415.54	276.00	1.28	3.00	415.54	276.00	1.28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8393E+02 EXCESS= .0000E+00 OUTFLOW= .8311E+02 BASIN STORAGE= .9764E+00 PERCENT ERROR=

RM143	MANE	2.19	1220.60	252.19	1.49	3.00	1220.23	252.00	1.49

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1450E+03 EXCESS= .0000E+00 OUTFLOW= .1449E+03 BASIN STORAGE= .2244E+00 PERCENT ERROR=

```
          RM144  MANE         3.00    855.86    258.00      1.42      3.00    855.86    258.00        1.42

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1743E+03 EXCESS= .0000E+00 OUTFLOW= .1734E+03 BASIN STORAGE= .1129E+01 PERCENT ERROR=

                                                    HEC-1 INPUT                                          PAGE  1

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

*** WARNING *** ZZ-CARD MISSING
           1
           2           ZZ
****************************************                                    ***********************************
*                                      *                                    *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                    *    U.S. ARMY CORPS OF ENGINEERS
*           SEPTEMBER 1990             *                                    *    HYDROLOGIC ENGINEERING CENTER
*            VERSION 4.0               *                                    *          609 SECOND STREET
*                                      *                                    *       DAVIS, CALIFORNIA 95616
*  RUN DATE  02/03/1995  TIME  11:14:06 *                                    *           (916) 756-1104
*                                      *                                    *
****************************************                                    ***********************************


*** HEC-1 ERROR 1 *** INVALID CARD IDENTIFICATION CODE OR CARD OUT OF SEQUENCE
    CARD NO.    1

    IT          HYDROGRAPH TIME DATA
                      NMIN           3  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1    0  STARTING DATE
                     ITIME        0000  STARTING TIME
                        NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      1    0  ENDING DATE
                    NDTIME        1457  ENDING TIME
                     ICENT          19  CENTURY MARK

                 COMPUTATION INTERVAL     .05 HOURS
                      TOTAL TIME BASE   14.95 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

              SUBBASIN RUNOFF DATA

   0 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .00  SUBBASIN AREA

                 PRECIPITATION DATA

   0 PB               STORM         .00  BASIN TOTAL PRECIPITATION

   0 PI            INCREMENTAL PRECIPITATION PATTERN


   0 UI          INPUT UNITGRAPH,   0 ORDINATES,  VOLUME =  .00
```

***

HYDROGRAPH AT STATION HC145

DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q	DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q
1		0000	1	.00	.00	.00	0.	1		0730	151	.00	.00	.00	141.
1		0003	2	.00	.00	.00	0.	1		0733	152	.00	.00	.00	140.
1		0006	3	.00	.00	.00	1.	1		0736	153	.00	.00	.00	139.
1		0009	4	.00	.00	.00	2.	1		0739	154	.00	.00	.00	139.
1		0012	5	.00	.00	.00	4.	1		0742	155	.00	.00	.00	138.
1		0015	6	.00	.00	.00	6.	1		0745	156	.00	.00	.00	138.
1		0018	7	.00	.00	.00	9.	1		0748	157	.00	.00	.00	137.
1		0021	8	.00	.00	.00	11.	1		0751	158	.00	.00	.00	136.
1		0024	9	.00	.00	.00	13.	1		0754	159	.00	.00	.00	136.
1		0027	10	.00	.00	.00	14.	1		0757	160	.00	.00	.00	135.
1		0030	11	.00	.00	.00	14.	1		0800	161	.00	.00	.00	135.
1		0033	12	.00	.00	.00	14.	1		0803	162	.00	.00	.00	134.
1		0036	13	.00	.00	.00	14.	1		0806	163	.00	.00	.00	133.
1		0039	14	.00	.00	.00	14.	1		0809	164	.00	.00	.00	133.
1		0042	15	.00	.00	.00	14.	1		0812	165	.00	.00	.00	132.
1		0045	16	.00	.00	.00	14.	1		0815	166	.00	.00	.00	132.
1		0048	17	.00	.00	.00	15.	1		0818	167	.00	.00	.00	131.
1		0051	18	.00	.00	.00	16.	1		0821	168	.00	.00	.00	131.
1		0054	19	.00	.00	.00	16.	1		0824	169	.00	.00	.00	130.
1		0057	20	.00	.00	.00	16.	1		0827	170	.00	.00	.00	129.
1		0100	21	.00	.00	.00	16.	1		0830	171	.00	.00	.00	129.
1		0103	22	.00	.00	.00	16.	1		0833	172	.00	.00	.00	128.
1		0106	23	.00	.00	.00	16.	1		0836	173	.00	.00	.00	128.
1		0109	24	.00	.00	.00	16.	1		0839	174	.00	.00	.00	127.
1		0112	25	.00	.00	.00	16.	1		0842	175	.00	.00	.00	126.
1		0115	26	.00	.00	.00	16.	1		0845	176	.00	.00	.00	126.
1		0118	27	.00	.00	.00	16.	1		0848	177	.00	.00	.00	125.
1		0121	28	.00	.00	.00	15.	1		0851	178	.00	.00	.00	125.
1		0124	29	.00	.00	.00	15.	1		0854	179	.00	.00	.00	124.
1		0127	30	.00	.00	.00	15.	1		0857	180	.00	.00	.00	124.
1		0130	31	.00	.00	.00	16.	1		0900	181	.00	.00	.00	123.
1		0133	32	.00	.00	.00	16.	1		0903	182	.00	.00	.00	123.
1		0136	33	.00	.00	.00	16.	1		0906	183	.00	.00	.00	122.
1		0139	34	.00	.00	.00	16.	1		0909	184	.00	.00	.00	121.
1		0142	35	.00	.00	.00	16.	1		0912	185	.00	.00	.00	121.
1		0145	36	.00	.00	.00	16.	1		0915	186	.00	.00	.00	120.
1		0148	37	.00	.00	.00	15.	1		0918	187	.00	.00	.00	120.
1		0151	38	.00	.00	.00	15.	1		0921	188	.00	.00	.00	119.
1		0154	39	.00	.00	.00	15.	1		0924	189	.00	.00	.00	118.
1		0157	40	.00	.00	.00	15.	1		0927	190	.00	.00	.00	118.
1		0200	41	.00	.00	.00	15.	1		0930	191	.00	.00	.00	117.
1		0203	42	.00	.00	.00	15.	1		0933	192	.00	.00	.00	117.
1		0206	43	.00	.00	.00	15.	1		0936	193	.00	.00	.00	116.
1		0209	44	.00	.00	.00	15.	1		0939	194	.00	.00	.00	115.
1		0212	45	.00	.00	.00	15.	1		0942	195	.00	.00	.00	115.
1		0215	46	.00	.00	.00	15.	1		0945	196	.00	.00	.00	114.
1		0218	47	.00	.00	.00	16.	1		0948	197	.00	.00	.00	114.
1		0221	48	.00	.00	.00	16.	1		0951	198	.00	.00	.00	113.
1		0224	49	.00	.00	.00	17.	1		0954	199	.00	.00	.00	113.
1		0227	50	.00	.00	.00	17.	1		0957	200	.00	.00	.00	112.
1		0230	51	.00	.00	.00	19.	1		1000	201	.00	.00	.00	111.
1		0233	52	.00	.00	.00	24.	1		1003	202	.00	.00	.00	111.
1		0236	53	.00	.00	.00	28.	1		1006	203	.00	.00	.00	110.
1		0239	54	.00	.00	.00	32.	1		1009	204	.00	.00	.00	110.

1	0242	55	.00	.00	.00	34.	*	1	1012	205	.00	.00	.00	109.
1	0245	56	.00	.00	.00	35.	*	1	1015	206	.00	.00	.00	108.
1	0248	57	.00	-.01	.01	37.	*	1	1018	207	.00	.00	.00	108.
1	0251	58	.00	-.01	.01	39.	*	1	1021	208	.00	.00	.00	107.
1	0254	59	.00	-.01	.01	41.	*	1	1024	209	.00	.00	.00	107.
1	0257	60	.00	-.01	.01	43.	*	1	1027	210	.00	.00	.00	106.
1	0300	61	.00	-.01	.01	46.	*	1	1030	211	.00	.00	.00	105.
1	0303	62	.00	-.01	.01	49.	*	1	1033	212	.00	.00	.00	105.
1	0306	63	.00	-.01	.01	54.	*	1	1036	213	.00	.00	.00	104.
1	0309	64	.00	-.01	.01	60.	*	1	1039	214	.00	.00	.00	104.
1	0312	65	.00	-.01	.01	66.	*	1	1042	215	.00	.00	.00	103.
1	0315	66	.00	-.01	.01	74.	*	1	1045	216	.00	.00	.00	103.
1	0318	67	.00	-.02	.02	86.	*	1	1048	217	.00	.00	.00	102.
1	0321	68	.00	-.03	.03	99.	*	1	1051	218	.00	.00	.00	101.
1	0324	69	.00	-.03	.03	115.	*	1	1054	219	.00	.00	.00	101.
1	0327	70	.00	-.03	.03	133.	*	1	1057	220	.00	.00	.00	100.
1	0330	71	.00	-.03	.03	158.	*	1	1100	221	.00	.00	.00	99.
1	0333	72	.00	-.10	.10	231.	*	1	1103	222	.00	.00	.00	99.
1	0336	73	.00	-.10	.10	338.	*	1	1106	223	.00	.00	.00	98.
1	0339	74	.00	-.10	.10	427.	*	1	1109	224	.00	.00	.00	98.
1	0342	75	.00	-.10	.10	533.	*	1	1112	225	.00	.00	.00	97.
1	0345	76	.00	-.10	.10	667.	*	1	1115	226	.00	.00	.00	97.
1	0348	77	.00	-.12	.12	814.	*	1	1118	227	.00	.00	.00	96.
1	0351	78	.00	-.13	.13	918.	*	1	1121	228	.00	.00	.00	95.
1	0354	79	.00	-.13	.13	1018.	*	1	1124	229	.00	.00	.00	95.
1	0357	80	.00	-.13	.13	1117.	*	1	1127	230	.00	.00	.00	94.
1	0400	81	.00	-.13	.13	1240.	*	1	1130	231	.00	.00	.00	94.
1	0403	82	.00	-.07	.07	1375.	*	1	1133	232	.00	.00	.00	93.
1	0406	83	.00	-.07	.07	1480.	*	1	1136	233	.00	.00	.00	93.
1	0409	84	.00	-.07	.07	1545.	*	1	1139	234	.00	.00	.00	92.
1	0412	85	.00	-.07	.07	1578.	*	1	1142	235	.00	.00	.00	91.
1	0415	86	.00	-.07	.07	1570.	*	1	1145	236	.00	.00	.00	90.
1	0418	87	.00	-.02	.02	1509.	*	1	1148	237	.00	.00	.00	89.
1	0421	88	.00	-.02	.02	1441.	*	1	1151	238	.00	.00	.00	88.
1	0424	89	.00	-.02	.02	1354.	*	1	1154	239	.00	.00	.00	87.
1	0427	90	.00	-.02	.02	1248.	*	1	1157	240	.00	.00	.00	86.
1	0430	91	.00	-.02	.02	1130.	*	1	1200	241	.00	.00	.00	85.
1	0433	92	.00	-.01	.01	1005.	*	1	1203	242	.00	.00	.00	85.
1	0436	93	.00	-.01	.01	899.	*	1	1206	243	.00	.00	.00	84.
1	0439	94	.00	-.01	.01	806.	*	1	1209	244	.00	.00	.00	83.
1	0442	95	.00	-.01	.01	734.	*	1	1212	245	.00	.00	.00	82.
1	0445	96	.00	-.01	.01	684.	*	1	1215	246	.00	.00	.00	81.
1	0448	97	.00	.00	.00	644.	*	1	1218	247	.00	.00	.00	81.
1	0451	98	.00	.00	.00	608.	*	1	1221	248	.00	.00	.00	80.
1	0454	99	.00	.00	.00	578.	*	1	1224	249	.00	.00	.00	79.
1	0457	100	.00	.00	.00	553.	*	1	1227	250	.00	.00	.00	78.
1	0500	101	.00	.00	.00	527.	*	1	1230	251	.00	.00	.00	78.
1	0503	102	.00	.00	.00	499.	*	1	1233	252	.00	.00	.00	77.
1	0506	103	.00	.00	.00	471.	*	1	1236	253	.00	.00	.00	76.
1	0509	104	.00	.00	.00	448.	*	1	1239	254	.00	.00	.00	76.
1	0512	105	.00	.00	.00	426.	*	1	1242	255	.00	.00	.00	75.
1	0515	106	.00	.00	.00	398.	*	1	1245	256	.00	.00	.00	75.
1	0518	107	.00	.00	.00	365.	*	1	1248	257	.00	.00	.00	74.
1	0521	108	.00	.00	.00	337.	*	1	1251	258	.00	.00	.00	74.
1	0524	109	.00	.00	.00	315.	*	1	1254	259	.00	.00	.00	73.
1	0527	110	.00	.00	.00	298.	*	1	1257	260	.00	.00	.00	72.
1	0530	111	.00	.00	.00	285.	*	1	1300	261	.00	.00	.00	72.
1	0533	112	.00	.00	.00	275.	*	1	1303	262	.00	.00	.00	71.
1	0536	113	.00	.00	.00	266.	*	1	1306	263	.00	.00	.00	70.
1	0539	114	.00	.00	.00	260.	*	1	1309	264	.00	.00	.00	70.
1	0542	115	.00	.00	.00	255.	*	1	1312	265	.00	.00	.00	69.
1	0545	116	.00	.00	.00	252.	*	1	1315	266	.00	.00	.00	69.
1	0548	117	.00	.00	.00	250.	*	1	1318	267	.00	.00	.00	68.
1	0551	118	.00	.00	.00	248.	*	1	1321	268	.00	.00	.00	68.
1	0554	119	.00	.00	.00	247.	*	1	1324	269	.00	.00	.00	67.
1	0557	120	.00	.00	.00	245.	*	1	1327	270	.00	.00	.00	67.

1	0600	121	.00	.00	.00	244.	*	1	1330	271	.00	.00	.00	66.
1	0603	122	.00	.00	.00	243.	*	1	1333	272	.00	.00	.00	66.
1	0606	123	.00	.00	.00	241.	*	1	1336	273	.00	.00	.00	65.
1	0609	124	.00	.00	.00	238.	*	1	1339	274	.00	.00	.00	65.
1	0612	125	.00	.00	.00	235.	*	1	1342	275	.00	.00	.00	65.
1	0615	126	.00	.00	.00	229.	*	1	1345	276	.00	.00	.00	64.
1	0618	127	.00	.00	.00	222.	*	1	1348	277	.00	.00	.00	64.
1	0621	128	.00	.00	.00	215.	*	1	1351	278	.00	.00	.00	64.
1	0624	129	.00	.00	.00	209.	*	1	1354	279	.00	.00	.00	63.
1	0627	130	.00	.00	.00	201.	*	1	1357	280	.00	.00	.00	63.
1	0630	131	.00	.00	.00	194.	*	1	1400	281	.00	.00	.00	63.
1	0633	132	.00	.00	.00	186.	*	1	1403	282	.00	.00	.00	63.
1	0636	133	.00	.00	.00	180.	*	1	1406	283	.00	.00	.00	62.
1	0639	134	.00	.00	.00	174.	*	1	1409	284	.00	.00	.00	62.
1	0642	135	.00	.00	.00	169.	*	1	1412	285	.00	.00	.00	62.
1	0645	136	.00	.00	.00	165.	*	1	1415	286	.00	.00	.00	61.
1	0648	137	.00	.00	.00	161.	*	1	1418	287	.00	.00	.00	61.
1	0651	138	.00	.00	.00	157.	*	1	1421	288	.00	.00	.00	61.
1	0654	139	.00	.00	.00	154.	*	1	1424	289	.00	.00	.00	61.
1	0657	140	.00	.00	.00	152.	*	1	1427	290	.00	.00	.00	60.
1	0700	141	.00	.00	.00	150.	*	1	1430	291	.00	.00	.00	60.
1	0703	142	.00	.00	.00	148.	*	1	1433	292	.00	.00	.00	60.
1	0706	143	.00	.00	.00	147.	*	1	1436	293	.00	.00	.00	60.
1	0709	144	.00	.00	.00	146.	*	1	1439	294	.00	.00	.00	59.
1	0712	145	.00	.00	.00	145.	*	1	1442	295	.00	.00	.00	59.
1	0715	146	.00	.00	.00	144.	*	1	1445	296	.00	.00	.00	59.
1	0718	147	.00	.00	.00	143.	*	1	1448	297	.00	.00	.00	59.
1	0721	148	.00	.00	.00	143.	*	1	1451	298	.00	.00	.00	59.
1	0724	149	.00	.00	.00	142.	*	1	1454	299	.00	.00	.00	58.
1	0727	150	.00	.00	.00	141.	*	1	1457	300	.00	.00	.00	58.
							*							

****

TOTAL RAINFALL = .00, TOTAL LOSS = -2.06, TOTAL EXCESS = 2.06

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	14.95-HR
		(CFS)				
1578.	4.20		379.	189.	189.	189.
		(INCHES)	1.240	1.539	1.539	1.539
		(AC-FT)	188.	233.	233.	233.

CUMULATIVE AREA = 2.84 SQ MI

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 MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	HC145	1578.	4.20	379.	189.	189.	2.84		

*** 1 ERROR(S) DETECTED BY HEC-1 ***

1**********
* *
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* SEPTEMBER 1990 *
* VERSION 4.0 *
* *

****
*
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616

APPENDIX C

HEC-I MODEL FOR ALTERNATIVE 2

MARICOPA COUNTY DETENTION
ALTERNATIVE 2 - MAXIMIZE SURFACE AREA/MINIMIZE DEPTH

BASIN 2A

EVEL (FT)	AREA (AC)	H (FT)	INC. VOL (AC-FT)	TOT. VOL (AC-FT)
48	0.94			
50	1.09	2	2.03	2.03
52	1.29	2	2.38	4.41
54	1.5	2	2.79	7.2
56	1.68	2	3.18	10.38
58	1.89	2	3.57	13.95
60	2.08	2	3.97	17.92

BASIN 2B

EVEL (FT)	AREA (AC)	H (FT)	INC. VOL (AC-FT)	TOT. VOL (AC-FT)
50	4.23			
52	4.59	2	8.82	8.82
54	4.92	2	9.52	18.34
54	6.39	2		
56	6.98	2	13.37	31.71
58	7.14	2	14.12	45.83
60	7.38	2	14.52	60.35

```
****************************************                                    ***********************************
*                                      *                                    *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                    *    U.S. ARMY CORPS OF ENGINEERS
*          SEPTEMBER 1990              *                                    *    HYDROLOGIC ENGINEERING CENTER
*           VERSION 4.0                *                                    *          609 SECOND STREET
*                                      *                                    *       DAVIS, CALIFORNIA 95616
*  RUN DATE  02/03/1995  TIME  11:43:44 *                                   *          (916) 756-1104
*                                      *                                    *
****************************************                                    ***********************************
```

```
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


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

   1          ID
   2          ID        FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
   3          ID        TENTH STREET WASH DETENTION BASIN NO 1  (FCD 93-31)
   4          ID        STANLEY CONSULTANTS, INC.  (SCI JOB # 12183)
   5          ID        AMENDED BY RUST E & I TO INCLUDE BASINS 2A & 2B (2/1/95)
   6          ID        DCR ALTTERNATIVE 2
   7          ID        HEC-1 INPUT FILENAME :  10WALT2.HC1
   8          ID
   9          ID        ************************************************************************
  10          ID        THIS MODEL REPRESENTS THE PROPOSED 10TH STREET WASH DETENTION BASIN #1.
  11          ID        THE FOLLOWING BASIN CHARACTERISTICS ARE EVALUATED:
  12          ID          1. INLET CONFIGURATION 1, INLET 1 CONSISTS OF A SIDE OVERFLOW WEIR
  13          ID             CONFIGURATION (100' WEIR 3.34' ABOVE FLOWLINE) FOR THE WEST TRIB
  14          ID             AND A WEIR INLET (30' WEIR AT CREST ELEV. 1321) FOR THE EAST TRIB.
  15          ID             INLET CONTROL CONDITIONS ASSUMED.
  16          ID          2. BASIN CONFIGURATION 1, 3:1 SIDES ON 3 SIDES AND A VERTICAL
  17          ID             RETAINING WALL ON THE WEST SIDE, A BOTTOM ELEVATION OF 1306, AND
  18          ID             25' ADDITIONAL R.O.W. ALONG THE SOUTH BASIN PARCEL BOUNDARY.
  19          ID          3. OUTLET CONFIGURATION 1, UTILIZING A 30" RCP TO CHASE GRADE AS THE
  20          ID             LOW FLOW AND PRINCIPAL OUTLET.
  21          ID        ************************************************************************
  22          ID
  23          ID        ************************************************************************
  24          ID        THIS HEC-1 MODEL IS BASED ON THE KAMINSKI-HUBBARD ACDC ADMS AS MODIFIED
  25          ID        BY FCD TO REFLECT TWO HYPOTHETICAL DETENTION BASINS (NUMBERS 1 AND 2).
  26          ID        THE DIFFERENCES BETWEEN THIS MODEL AND THE ORIGINAL MODEL TRANSMITTED
  27          ID        BY FCD TO SCI AT THE PROJECT KICKOFF MEETING ARE AS FOLLOWS:
  28          ID          1. USE OF THE HEC-1 DATA STORAGE SYSTEM OPTION HAS BEEN DELETED;
```

```
 29          ID          2. THE TWO HYPOTHETICAL DETENTION BASINS 1 AND 2 HAVE BEEN DELETED;
 30          ID          3. THE CROSS SECTIONAL AREA OF THE PRINCIPAL SPILLWAY OUTLET PIPE OF
 31          ID             THE EXISTING CITY OF PHOENIX DET BASIN NO. 3 HAS BEEN CHANGED FROM
 32          ID             4.91 SQFT (WHICH CORRESPONDS TO AN OUTLET PIPE DIAM OF 30") TO
 33          ID             1.36 SQFT CORRESPONDING TO THE 14" X 14" STEEL ORIFICE PLATE WHICH
 34          ID             WAS ORIGINALLY DESIGNED AND INSTALLED.
 35          ID        ************************************************************************
 36          ID
 37          ID   ACDC AREA DRAINAGE MASTER STUDY
 38          ID   10TH STREET WASH WATERSHED
 39          ID   FILENAME:  TEN36.DAT     KHE JOB NO. 0146
 40          ID   100-YEAR 6-HOUR DURATION STORM
             *
             *  Based on FCDMC comments dated March 17,1992 we adjusted the Mannings "n"
             *  coefficient to reflect weighted averaging in lieu of log averaging.
             *  We also changed the S-graph from Phoenix Mountain to Phoenix Valley.
             *
             *DIAGRAM
 41          IT       3                    300
 42          IO       5

 43          KK    140S
 44          KM   RUNOFF GENERATED ON SUB-BASIN 140
 45          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 46          KM    L= 1.22 mi.  Lca= 0.51 mi.  S= 162 ft/mi.  Kn= .050  LAG= 22.87 min.
 47          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 48          BA    .516
```



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

 49          IN      15
 50          KM   RAINFALL DEPTH OF 3.00 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
 51          KM   AN AREAL REDUCTION COEFFICIENT OF .975 WAS USED
 52          PB  2.9200
 53          KM   THE FOLLOWING PC RECORD USED A 6-HOUR RAINFALL WITH PATTERN NO. 2.01
 54          PC    .000    .009    .016    .025    .034    .042    .051    .059    .067    .076
 55          PC    .087    .100    .120    .163    .252    .451    .694    .837    .900    .938
 56          PC    .950    .963    .975    .988   1.000
 57          LG    .145    .339    4.25    .488   20.44
 58          UI     76.    119.    294.    391.    468.    577.    793.    930.    712.    588.
 59          UI    474.    381.    274.    154.    127.     90.     76.     26.     23.     23.
 60          UI     23.     23.      0.      0.      0.      0.      0.      0.      0.      0.
 61          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 62          KK   DT140
 63          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.0 AC-FT FROM SUB-BASIN 140
 64          KM                                               (Hydrograph identified as OR140)
 65          KM                                            2) Balance of runoff continues on.
 66          KM                                               (Hydrograph identified as DT140)
 67          DT   OR140     2.0
 68          DI       0   10000
 69          DQ       0   10000
 70          KM   ******************************************************************************
 71          KM    KK 140RR
 72          KM    KM ROUTE FLOW THROUGH NORTH MOUNTAIN DETENTION NO.3
 73          KM    RS     1    ELEV    55.9
 74          KM    SV     0     .06    1.52    6.32   17.42   35.46   60.34   95.64
 75          KM    SE  55.9      58      62      66      70      74      78      82
 76          KM    SL 57.15    4.91      .6      .5
 77          KM        ***********************************************************************
 78          KM    THE SL RECORD (LOW-LEVEL OUTLET) SECOND FIELD (ORIFICE AREA) VALUE HAS
 79          KM    BEEN CHANGED BY SCI FROM 4.91 sq.ft. TO 1.36 sq.ft. (14"x14" INLET)
 80          KM        ***********************************************************************
 81          KM    SS 79.66     100     3.0     1.5
 82          KM   ******************************************************************************
```

```
 83          KK   140RR
 84          KM   ROUTE FLOW THROUGH NORTH MOUNTAIN DETENTION NO.3
 85          RS       1    ELEV    55.9
 86          SV       0     .06    1.52    6.32   17.42   35.46   60.34   95.64
 87          SE    55.9      58      62      66      70      74      78      82
 88          SL   56.43    1.36      .6      .5
 89          SS   80.00     100     3.0     1.5

 90          KK   RM140
 91          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM DETENTION BASIN THROUGH SUB-BASIN 141
 92          KM            1) Reach Length = 3600 ft.
 93          RD
 94          RC    .045    .045    .045    3600   .0108
 95          RX       0       0    46.5    76.4    79.9   110.2   160.2   160.2
 96          RY      16    12.6     7.3       0       0     9.9    15.9      16
```



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

 97          KK    141S
 98          KM   RUNOFF GENERATED ON SUB-BASIN 141
 99          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
100          KM    L= 0.83 mi.  Lca= 0.57 mi.  S= 315 ft/mi.  Kn= .042  LAG= 15.26 min.
101          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
102          BA    .187
103          LG    .126    .303    3.61    .313   38.57
104          UI     41.    136.    222.    297.    467.    414.    304.    220.    131.     70.
105          UI     47.     23.     13.     13.     13.      0.      0.      0.      0.      0.
106          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

107          KK   DT141
108          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.4 AC-FT FROM SUB-BASIN 141
109          KM                                              (Hydrograph identified as OR141)
110          KM                                            2) Balance of runoff continues on.
111          KM                                              (Hydrograph identified as DT141)
112          DT   OR141     2.4
113          DI       0   10000
114          DQ       0   10000

115          KK   HC141
116          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 141 WITH ROUTED FLOW FROM DETENTION
117          HC       2
118          KM   ******************************************************************************

119          KK  DVT141   SPLIT HYDROGRAPH 141 TO DET142 AND HC142
120          KM           DI-DQ BASED ON HYDRAULIC RATING CURVE FOR PROPOSED INLET AND
121          KM           EXISTING 30" PIPE.  WEIR LENGTH IS 30' WEIR CREST IS ELEV 1321.
122          KM           DQ IS AMOUNT DIVERTED AROUND DETENTION BASIN DOWNSTREAM.
123          KM           DI-DQ DIFFERENCE IS ROUTED THRU THE PROPOSED DETENTION BASIN
124          DT  DVT141
125          DI       0      12      50     114     196     294
126          DQ       0      12      15      18      20      22
127          KM   ******************************************************************************

128          KK    142S
129          KM   RUNOFF GENERATED ON SUB-BASIN 142
130          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
131          KM    L= 1.16 mi.  Lca= 0.75 mi.  S= 257 ft/mi.  Kn= .042  LAG= 19.99 min.
132          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
133          BA    .512
134          LG    .127    .309    4.12    .267   34.03
135          UI     86.    178.    377.    488.    608.    839.   1049.    795.    637.    498.
136          UI    380.    210.    146.    107.     80.     26.     26.     26.     26.      0.
137          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
```

```
138          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

139          KK   DT142
140          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 3.6 AC-FT FROM SUB-BASIN 142
141          KM                                              (Hydrograph identified as OR142)
142          KM                                            2) Balance of runoff continues on.
143          KM                                              (Hydrograph identified as DT142)
144          DT   OR142     3.6
145          DI       0   10000
```



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

146          DQ       0   10000
147          KM   ****************************************************************************

148          KK  DVT142   SPLIT HYDROGRAPH DVT142 TO DET142 AND HC142
149          KM           DI-DQ BASED ON HYDRAULIC RATING CURVE FOR PROPOSED INLET AND
150          KM           IMPROVED WASH CROSS SECTION.  WEIR LENGTH IS 100' WEIR CREST ELEV IS
151          KM           3.34' ABOVE WASH FLOWLINE.
152          KM           DQ IS AMOUNT DIVERTED AROUND DETENTION BASIN DOWNSTREAM.
153          KM           DI-DQ DIFFERENCE IS ROUTED THRU THE PROPOSED DETENTION BASIN
154          DT  DVT142
155          DI       0     280     300     350     400     450     500     550     600     672
156          DQ       0     280     295     312     317     319     318     317     313     307

157          KK  ADD142
158          KM   COMBINE HYDROGRAPHS FROM (DI-DQ) FROM DVT141 WITH (DI-DQ) FROM DVT142
159          HC       2

160          KK  DET142   ROUTE HYDROGRAPH ADD142 THRU DET BASIN 142
161          KM           1-30" RCP  AS LOW FLOW AND PRINCIPAL OUTLET (INV. EL. 1306)
162          RS       1    STOR      -1
163          SV     .00   0.060   0.460   1.470   3.040   4.890   6.850   8.910   11.08   13.36
164          SV   15.74   18.23   20.83   23.53   26.33
165          SQ       0     4.5    15.9    29.0    37.0    44.0    50.0    55.0    60.0    65.0
166          SQ      70      72      78      80      84
167          SE    1306    1307    1308    1309    1310    1311    1312    1313    1314    1315
168          SE    1316    1317    1318    1319    1320

169          KK  DVT141    RETRIEVE PREVIOUSLY SPLIT HYDROGRAPH FROM SUB-BASIN 141
170          DR  DVT141

171          KK  DVT142    RETRIEVE PREVIOUSLY SPLIT HYDROGRAPH FROM SUB-BASIN 142
172          DR  DVT142

173          KK   HC142
174          KM   COMBINE HYDROGRAPHS (DQ) FROM DVT142, (DQ) FROM DVT141 AND DET142 OUTFLOW
175          HC       3
176          KM   ****************************************************************************

177          KK   RM142
178          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASINS 141/142 THROUGH 143
179          KM            1) Reach Length = 5140 ft.
180          RD
181          RC    .050    .045    .050    5140   .0086
182          RX       0       0    43.8    61.3    67.4    78.3    89.8    89.8
183          RY    10.8     9.4     9.4       0       0     5.4     8.8    10.8

184          KK    143S
185          KM   RUNOFF GENERATED ON SUB-BASIN 143
186          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
187          KM    L= 1.64 mi.  Lca= 0.88  S= 273 ft/mi.  Kn= .035  LAG= 19.96 min.
188          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
189          BA    .604
190          LG    .115    .279    4.12    .269   49.66
```

```
191          UI    102.    212.    446.    577.    720.    994.   1238.    937.    750.    586.
192          UI    447.    244.    173.    125.     93.     31.     31.     31.     31.      0.
                                          HEC-1 INPUT                                          PAGE  5

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

193          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
194          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

195          KK   DT143
196          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 5.7 AC-FT FROM SUB-BASIN 143
197          KM                                              (Hydrograph identified as OR143)
198          KM                                            2) Balance of runoff continues on.
199          KM                                              (Hydrograph identified as DT143)
200          DT   OR143     5.7
201          DI       0   10000
202          DQ       0   10000

203          KK   HC143
204          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 143 WITH ROUTED FLOW FROM 141/142
205          HC       2

206          KK   RM143
207          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASIN 143 THROUGH 144
208          KM            1) Reach Length = 1400 ft.
209          RD
210          RC    .040    .035    .030    1400   .0100
211          RX       0       0    77.8    88.3    96.6   112.8   161.3   161.3
212          RY      10     6.2     6.2       0       0     6.3     6.9      10

213          KK    144S
214          KM   RUNOFF GENERATED ON SUB-BASIN 144
215          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
216          KM    L= 1.80 mi.  Lca= 1.11 mi.  S= 291 ft/mi.  Kn= .036  LAG= 22.95 min.
217          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
218          BA    .475
219          LG    .118    .280    3.61     .32   43.17
220          UI     70.    108.    269.    357.    428.    527.    721.    857.    657.    543.
221          UI    437.    353.    256.    145.    117.     85.     70.     26.     21.     21.
222          UI     21.     21.      0.      0.      0.      0.      0.      0.      0.      0.
223          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

224          KK   DT144
225          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.1 AC-FT FROM SUB-BASIN 144
226          KM                                              (Hydrograph identified as OR144)
227          KM                                            2) Balance of runoff continues on.
228          KM                                              (Hydrograph identified as DT144)
229          DT   OR144     2.1
230          DI       0   10000
231          DQ       0   10000

232          KK   DIV1P    DIVERT PALMA PARK FLOWS OVER 350 CFS
233          KM   DIVERSION REPRESENTS LOSS OF FLOW NOT ACCEPTED BY THE PALMA PARK INLET
234          DT   DIV1P
235          DI       0     350     351     615    1000
236          DQ       0       0       1     265     650
                                          HEC-1 INPUT                                          PAGE  6

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

237          KK   HC144
238          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 144 WITH ROUTED FLOW FROM 143
239          HC       2

240          KK    DIV2    DIVERT INCHANNEL FLOWS AROUND DETENTION FACILITY
```

```
241          KM   DIVERSION REPRESENTS  CULVERT (600' LONG) THRU BASIN CAPACITY=500 CFS
242          DT   DIV-2
243          DI       0     325     326     540     860    1280
244          DQ       0     325     325     390     435     500

245          KK   SITE2   DETENTION BASIN AT SITE 2A & 2B *************************
246          KM        ALTERNATIVE 2
247          RS       1    STOR       0
248          SV       0    2.03   13.23   25.54   42.09   59.78   68.80   78.27
249          SE    1248    1250    1252    1254    1256    1258    1259    1260
250          SQ       0       0      16      36      50      60      70     315

251          KK   RET-2    RETRIEVE DIVERTED INCHANNEL FLOWS
252          DR   DIV-2

253          KK   RET1P    RETRIEVE DIVERTED PALMA PARK FLOW
254          DR   DIV1P

255          KK   COMB2   RECOMBINE INCHANNEL FLOWS WITH OUTFLOW FROM DETENTION BASIN 2
256          KO       1
257          HC       3

258          KK   RM144
259          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASIN 144 THROUGH 145
260          KM            1) Reach Length = 3000 ft.
261          RD
262          RC    .035    .035    .030    3000   .0073
263          RX       0       0    36.6      52    64.9    79.8   107.8   107.8
264          RY      11     7.7     7.4       0       0     8.3     8.5      11

265          KK    145S
266          KM   RUNOFF GENERATED ON SUB-BASIN 145
267          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
268          KM    L= 1.37 mi.  Lca= 0.86 mi.  S= 242 ft/mi.  Kn= .032  LAG= 17.28 min.
269          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
270          BA    .548
271          LG    .105    .265    5.67    .210   44.60
272          UI    107.    287.    526.    678.    922.   1303.    982.    755.    568.    378.
273          UI    186.    145.     98.     33.     33.     33.     33.      0.      0.      0.
274          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

275          KK   HC145
276          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 145 WITH ROUTED FLOW FROM 144
277          KM   ALSO DETERMINES 10TH STREET WASH DISCHARGE INTO ACDC
278          HC       2
279          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

   43        140S
                .
                .
   67           .-------->   OR140
   62       DT140
                V
                V
   83       140RR
                V
                V
   90       RM140
                .
                .
```

```
 97          .        141S
             .           .
             .           .
112          .           .-------->   OR141
107          .       DT141
             .           .
             .           .
115      HC141............
             .
             .
124          .-------->  DVT141
119     DVT141
             .
             .
128          .        142S
             .           .
             .           .
144          .           .-------->   OR142
139          .       DT142
             .           .
             .           .
154          .           .-------->  DVT142
148          .      DVT142
             .           .
             .           .
157     ADD142............
             V
             V
160     DET142
             .
             .
170          .           .<--------  DVT141
169          .      DVT141
             .           .
             .           .
172          .           .           .<--------  DVT142
171          .           .      DVT142
             .           .           .
             .           .           .
173      HC142........................
             V
             V
177      RM142
             .
             .
184          .        143S
             .           .
             .           .
200          .           .-------->   OR143
195          .       DT143
             .           .
             .           .
203      HC143............
             V
             V
206      RM143
             .
             .
213          .        144S
             .           .
             .           .
229          .           .-------->   OR144
224          .       DT144
             .           .
             .           .
234          .           .-------->   DIV1P
```

```
232          .       DIV1P
             .           .
             .           .
237      HC144............
             .
             .
242          .------->   DIV-2
240       DIV2
             V
             V
245      SITE2
             .
             .
252          .           .<-------   DIV-2
251          .       RET-2
             .           .
             .           .
254          .           .           .<-------   DIV1P
253          .           .       RET1P
             .           .           .
             .           .           .
255      COMB2........................
             V
             V
258      RM144
             .
             .
265          .        145S
             .           .
             .           .
275      HC145............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*           SEPTEMBER 1990             *
*            VERSION 4.0               *
*                                      *
*  RUN DATE  02/03/1995  TIME  11:43:44 *
*                                      *
****************************************
```

```
***********************************
*                                 *
*    U.S. ARMY CORPS OF ENGINEERS
*    HYDROLOGIC ENGINEERING CENTER
*          609 SECOND STREET
*       DAVIS, CALIFORNIA 95616
*           (916) 756-1104
*                                 *
***********************************
```

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
TENTH STREET WASH DETENTION BASIN NO 1 (FCD 93-31)
STANLEY CONSULTANTS, INC. (SCI JOB # 12183)
AMENDED BY RUST E & I TO INCLUDE BASINS 2A & 2B (2/1/95)
DCR ALTTERNATIVE 2
HEC-1 INPUT FILENAME : 10WALT2.HC1

****
THIS MODEL REPRESENTS THE PROPOSED 10TH STREET WASH DETENTION BASIN #1.
THE FOLLOWING BASIN CHARACTERISTICS ARE EVALUATED:

1. INLET CONFIGURATION 1, INLET 1 CONSISTS OF A SIDE OVERFLOW WEIR CONFIGURATION (100' WEIR 3.34' ABOVE FLOWLINE) FOR THE WEST TRIB AND A WEIR INLET (30' WEIR AT CREST ELEV. 1321) FOR THE EAST TRIB. INLET CONTROL CONDITIONS ASSUMED.
2. BASIN CONFIGURATION 1, 3:1 SIDES ON 3 SIDES AND A VERTICAL RETAINING WALL ON THE WEST SIDE, A BOTTOM ELEVATION OF 1306, AND 25' ADDITIONAL R.O.W. ALONG THE SOUTH BASIN PARCEL BOUNDARY.
3. OUTLET CONFIGURATION 1, UTILIZING A 30" RCP TO CHASE GRADE AS THE

```
                    LOW FLOW AND PRINCIPAL OUTLET.
                ***********************************************************************

                ***********************************************************************
                THIS HEC-1 MODEL IS BASED ON THE KAMINSKI-HUBBARD ACDC ADMS AS MODIFIED
                BY FCD TO REFLECT TWO HYPOTHETICAL DETENTION BASINS (NUMBERS 1 AND 2).
                THE DIFFERENCES BETWEEN THIS MODEL AND THE ORIGINAL MODEL TRANSMITTED
                BY FCD TO SCI AT THE PROJECT KICKOFF MEETING ARE AS FOLLOWS:
                  1. USE OF THE HEC-1 DATA STORAGE SYSTEM OPTION HAS BEEN DELETED;
                  2. THE TWO HYPOTHETICAL DETENTION BASINS 1 AND 2 HAVE BEEN DELETED;
                  3. THE CROSS SECTIONAL AREA OF THE PRINCIPAL SPILLWAY OUTLET PIPE OF
                     THE EXISTING CITY OF PHOENIX DET BASIN NO. 3 HAS BEEN CHANGED FROM
                     4.91 SQFT (WHICH CORRESPONDS TO AN OUTLET PIPE DIAM OF 30") TO
                     1.36 SQFT CORRESPONDING TO THE 14" X 14" STEEL ORIFICE PLATE WHICH
                     WAS ORIGINALLY DESIGNED AND INSTALLED.
                ***********************************************************************

            ACDC AREA DRAINAGE MASTER STUDY
            10TH STREET WASH WATERSHED
            FILENAME:  TEN36.DAT     KHE JOB NO. 0146
            100-YEAR 6-HOUR DURATION STORM

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

    IT        HYDROGRAPH TIME DATA
                   NMIN          3  MINUTES IN COMPUTATION INTERVAL
                  IDATE      1   0  STARTING DATE
                  ITIME       0000  STARTING TIME
                     NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE      1   0  ENDING DATE
                 NDTIME       1457  ENDING TIME
                 ICENT         19  CENTURY MARK

              COMPUTATION INTERVAL     .05 HOURS
                   TOTAL TIME BASE   14.95 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


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


          **************
          *            *
255 KK    *     COMB2  *        RECOMBINE INCHANNEL FLOWS WITH OUTFLOW FROM DETENTION BASIN 2
          *            *
          **************

256 KO        OUTPUT CONTROL VARIABLES
                  IPRNT          1  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE

257 HC        HYDROGRAPH COMBINATION
                  ICOMP          3  NUMBER OF HYDROGRAPHS TO COMBINE
```

***

HYDROGRAPH AT STATION COMB2
SUM OF 3 HYDROGRAPHS

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FL
1		0000	1	0.	1		0345	76	379.	1		0730	151	132.	1		1115	226	8
1		0003	2	0.	1		0348	77	403.	1		0733	152	131.	1		1118	227	8
1		0006	3	0.	1		0351	78	432.	1		0736	153	130.	1		1121	228	8
1		0009	4	0.	1		0354	79	501.	1		0739	154	130.	1		1124	229	8
1		0012	5	0.	1		0357	80	587.	1		0742	155	129.	1		1127	230	8
1		0015	6	0.	1		0400	81	666.	1		0745	156	129.	1		1130	231	8
1		0018	7	0.	1		0403	82	732.	1		0748	157	128.	1		1133	232	8
1		0021	8	0.	1		0406	83	790.	1		0751	158	128.	1		1136	233	8
1		0024	9	0.	1		0409	84	829.	1		0754	159	127.	1		1139	234	8
1		0027	10	0.	1		0412	85	846.	1		0757	160	126.	1		1142	235	8
1		0030	11	0.	1		0415	86	849.	1		0800	161	126.	1		1145	236	8
1		0033	12	0.	1		0418	87	833.	1		0803	162	125.	1		1148	237	8
1		0036	13	0.	1		0421	88	798.	1		0806	163	125.	1		1151	238	7
1		0039	14	0.	1		0424	89	739.	1		0809	164	124.	1		1154	239	7
1		0042	15	0.	1		0427	90	683.	1		0812	165	124.	1		1157	240	7
1		0045	16	0.	1		0430	91	631.	1		0815	166	123.	1		1200	241	7
1		0048	17	0.	1		0433	92	577.	1		0818	167	123.	1		1203	242	7
1		0051	18	0.	1		0436	93	537.	1		0821	168	122.	1		1206	243	7
1		0054	19	0.	1		0439	94	520.	1		0824	169	121.	1		1209	244	7
1		0057	20	0.	1		0442	95	506.	1		0827	170	121.	1		1212	245	7
1		0100	21	0.	1		0445	96	493.	1		0830	171	120.	1		1215	246	7
1		0103	22	0.	1		0448	97	482.	1		0833	172	120.	1		1218	247	7
1		0106	23	0.	1		0451	98	470.	1		0836	173	119.	1		1221	248	7
1		0109	24	0.	1		0454	99	459.	1		0839	174	119.	1		1224	249	7
1		0112	25	0.	1		0457	100	443.	1		0842	175	118.	1		1227	250	7
1		0115	26	0.	1		0500	101	424.	1		0845	176	118.	1		1230	251	7
1		0118	27	0.	1		0503	102	407.	1		0848	177	117.	1		1233	252	7
1		0121	28	0.	1		0506	103	392.	1		0851	178	117.	1		1236	253	7
1		0124	29	0.	1		0509	104	361.	1		0854	179	116.	1		1239	254	7
1		0127	30	0.	1		0512	105	328.	1		0857	180	116.	1		1242	255	6
1		0130	31	0.	1		0515	106	302.	1		0900	181	115.	1		1245	256	6
1		0133	32	0.	1		0518	107	280.	1		0903	182	115.	1		1248	257	6
1		0136	33	0.	1		0521	108	263.	1		0906	183	114.	1		1251	258	6
1		0139	34	0.	1		0524	109	251.	1		0909	184	114.	1		1254	259	6
1		0142	35	0.	1		0527	110	241.	1		0912	185	113.	1		1257	260	6
1		0145	36	0.	1		0530	111	233.	1		0915	186	112.	1		1300	261	6
1		0148	37	0.	1		0533	112	227.	1		0918	187	112.	1		1303	262	6
1		0151	38	0.	1		0536	113	223.	1		0921	188	111.	1		1306	263	6
1		0154	39	0.	1		0539	114	220.	1		0924	189	111.	1		1309	264	6
1		0157	40	0.	1		0542	115	217.	1		0927	190	110.	1		1312	265	6
1		0200	41	0.	1		0545	116	215.	1		0930	191	110.	1		1315	266	6
1		0203	42	0.	1		0548	117	214.	1		0933	192	109.	1		1318	267	6
1		0206	43	0.	1		0551	118	213.	1		0936	193	109.	1		1321	268	6
1		0209	44	0.	1		0554	119	212.	1		0939	194	108.	1		1324	269	6
1		0212	45	0.	1		0557	120	212.	1		0942	195	107.	1		1327	270	6
1		0215	46	0.	1		0600	121	211.	1		0945	196	107.	1		1330	271	6
1		0218	47	0.	1		0603	122	210.	1		0948	197	106.	1		1333	272	6
1		0221	48	3.	1		0606	123	208.	1		0951	198	105.	1		1336	273	6
1		0224	49	13.	1		0609	124	206.	1		0954	199	105.	1		1339	274	6
1		0227	50	14.	1		0612	125	203.	1		0957	200	104.	1		1342	275	6
1		0230	51	14.	1		0615	126	199.	1		1000	201	104.	1		1345	276	6
1		0233	52	15.	1		0618	127	194.	1		1003	202	103.	1		1348	277	6
1		0236	53	15.	1		0621	128	188.	1		1006	203	102.	1		1351	278	6
1		0239	54	16.	1		0624	129	180.	1		1009	204	102.	1		1354	279	6

1	0242	55	16.	*	1	0627	130	174.	*	1	1012	205	101.	*	1	1357	280	6
1	0245	56	17.	*	1	0630	131	168.	*	1	1015	206	100.	*	1	1400	281	6
1	0248	57	17.	*	1	0633	132	163.	*	1	1018	207	100.	*	1	1403	282	6
1	0251	58	18.	*	1	0636	133	158.	*	1	1021	208	99.	*	1	1406	283	6
1	0254	59	19.	*	1	0639	134	154.	*	1	1024	209	99.	*	1	1409	284	5
1	0257	60	20.	*	1	0642	135	150.	*	1	1027	210	98.	*	1	1412	285	5
1	0300	61	21.	*	1	0645	136	147.	*	1	1030	211	98.	*	1	1415	286	5
1	0303	62	23.	*	1	0648	137	145.	*	1	1033	212	97.	*	1	1418	287	5
1	0306	63	25.	*	1	0651	138	143.	*	1	1036	213	96.	*	1	1421	288	5
1	0309	64	28.	*	1	0654	139	141.	*	1	1039	214	96.	*	1	1424	289	5
1	0312	65	32.	*	1	0657	140	140.	*	1	1042	215	95.	*	1	1427	290	5
1	0315	66	35.	*	1	0700	141	138.	*	1	1045	216	94.	*	1	1430	291	5
1	0318	67	40.	*	1	0703	142	137.	*	1	1048	217	94.	*	1	1433	292	5
1	0321	68	48.	*	1	0706	143	137.	*	1	1051	218	93.	*	1	1436	293	5
1	0324	69	91.	*	1	0709	144	136.	*	1	1054	219	93.	*	1	1439	294	5
1	0327	70	148.	*	1	0712	145	135.	*	1	1057	220	92.	*	1	1442	295	5
1	0330	71	173.	*	1	0715	146	135.	*	1	1100	221	91.	*	1	1445	296	5
1	0333	72	205.	*	1	0718	147	134.	*	1	1103	222	91.	*	1	1448	297	5
1	0336	73	251.	*	1	0721	148	133.	*	1	1106	223	90.	*	1	1451	298	5
1	0339	74	321.	*	1	0724	149	133.	*	1	1109	224	90.	*	1	1454	299	5
1	0342	75	349.	*	1	0727	150	132.	*	1	1112	225	89.	*	1	1457	300	5
				*					*					*				

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	14.95-HR
		(CFS)				
849.	4.25		263.	136.	136.	136.
		(INCHES)	1.068	1.378	1.378	1.378
		(AC-FT)	131.	169.	169.	169.

CUMULATIVE AREA = 2.29 SQ MI

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

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	140S	496.	4.25	69.	28.	28.	.52		
DIVERSION TO	OR140	20.	4.25	4.	2.	2.	.52		
HYDROGRAPH AT	DT140	496.	4.25	65.	26.	26.	.52		
ROUTED TO	140RR	26.	5.10	25.	18.	18.	.52	72.36	5.15
ROUTED TO	RM140	26.	5.45	25.	18.	18.	.52		
HYDROGRAPH AT	141S	263.	4.10	38.	15.	15.	.19		
DIVERSION TO	OR141	57.	4.10	5.	2.	2.	.19		
HYDROGRAPH AT									

	DT141	263.	4.10	33.	13.	13.	.19		
2 COMBINED AT									
	HC141	275.	4.10	56.	31.	31.	.70		
DIVERSION TO									
	DVT141	22.	4.10	14.	10.	10.	.70		
HYDROGRAPH AT									
+	DVT141	253.	4.10	41.	20.	20.	.70		
HYDROGRAPH AT									
+	142S	671.	4.15	100.	40.	40.	.51		
DIVERSION TO									
	OR142	45.	4.15	7.	3.	3.	.51		
HYDROGRAPH AT									
	DT142	671.	4.15	93.	37.	37.	.51		
DIVERSION TO									
	DVT142	319.	4.15	65.	26.	26.	.51		
HYDROGRAPH AT									
+	DVT142	364.	4.15	28.	11.	11.	.51		
2 COMBINED AT									
+	ADD142	614.	4.15	70.	32.	32.	1.21		
ROUTED TO									
	DET142	80.	4.60	62.	32.	32.	1.21		
+								1318.97	4.60
HYDROGRAPH AT									
+	DVT141	22.	4.10	14.	10.	10.	.00		
HYDROGRAPH AT									
	DVT142	319.	4.45	65.	26.	26.	.00		
3 COMBINED AT									
	HC142	417.	4.45	138.	68.	68.	1.21		
ROUTED TO									
	RM142	416.	4.60	138.	67.	67.	1.21		
HYDROGRAPH AT									
+	143S	841.	4.15	136.	55.	55.	.60		
DIVERSION TO									
+	OR143	58.	4.15	11.	5.	5.	.60		
HYDROGRAPH AT									
	DT143	841.	4.15	125.	50.	50.	.60		
2 COMBINED AT									
	HC143	1221.	4.15	258.	117.	117.	1.82		
ROUTED TO									
	RM143	1220.	4.20	258.	117.	117.	1.82		
HYDROGRAPH AT									
+	144S	615.	4.20	100.	40.	40.	.47		
DIVERSION TO									
+	OR144	14.	4.20	4.	2.	2.	.47		

HYDROGRAPH AT	DT144	615.	4.20	96.	38.	38.	.47		
DIVERSION TO	DIV1P	265.	3.90	20.	8.	8.	.47		
HYDROGRAPH AT	DIV1P	350.	3.90	76.	31.	31.	.47		
2 COMBINED AT	HC144	1570.	4.20	330.	148.	148.	2.29		
DIVERSION TO	DIV-2	545.	4.20	195.	93.	93.	2.29		
HYDROGRAPH AT	DIV2	1025.	4.20	136.	55.	55.	2.29		
ROUTED TO	SITE2	63.	5.00	55.	35.	35.	2.29	1258.35	5.00
HYDROGRAPH AT	RET-2	545.	4.20	195.	93.	93.	.00		
HYDROGRAPH AT	RET1P	265.	4.20	20.	8.	8.	.00		
3 COMBINED AT	COMB2	849.	4.25	263.	136.	136.	2.29		
ROUTED TO	RM144	847.	4.30	263.	136.	136.	2.29		
HYDROGRAPH AT	145S	786.	4.10	121.	49.	49.	.55		
2 COMBINED AT	HC145	1567.	4.20	372.	184.	184.	2.84		

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	INTERPOLATED TO COMPUTATION INTERVAL DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)
RM140	MANE	3.00	26.07	330.00	.79	3.00	26.07	330.00	.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2263E+02 EXCESS= .0000E+00 OUTFLOW= .2176E+02 BASIN STORAGE= .6323E+00 PERCENT ERROR=

RM142	MANE	3.00	415.54	276.00	1.28	3.00	415.54	276.00	1.28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8393E+02 EXCESS= .0000E+00 OUTFLOW= .8311E+02 BASIN STORAGE= .9764E+00 PERCENT ERROR=

RM143	MANE	2.19	1220.60	252.19	1.49	3.00	1220.23	252.00	1.49

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1450E+03 EXCESS= .0000E+00 OUTFLOW= .1449E+03 BASIN STORAGE= .2244E+00 PERCENT ERROR=

```
          RM144  MANE         3.00    846.85    258.00      1.37      3.00    846.85    258.00        1.37


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1687E+03 EXCESS= .0000E+00 OUTFLOW= .1678E+03 BASIN STORAGE= .1104E+01 PERCENT ERROR=


                                                    HEC-1 INPUT                                                PAGE  1

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

*** WARNING *** ZZ-CARD MISSING
            1
            2           ZZ
****************************************                                                  ***********************************
*                                      *                                                  *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS
*           SEPTEMBER 1990             *                                                  *    HYDROLOGIC ENGINEERING CENTER
*            VERSION 4.0               *                                                  *          609 SECOND STREET
*                                      *                                                  *       DAVIS, CALIFORNIA 95616
*  RUN DATE  02/03/1995  TIME  11:43:44 *                                                  *           (916) 756-1104
*                                      *                                                  *
****************************************                                                  ***********************************



*** HEC-1 ERROR 1 *** INVALID CARD IDENTIFICATION CODE OR CARD OUT OF SEQUENCE
    CARD NO.    1

    IT          HYDROGRAPH TIME DATA
                      NMIN           3  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1    0  STARTING DATE
                     ITIME        0000  STARTING TIME
                        NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      1    0  ENDING DATE
                    NDTIME        1457  ENDING TIME
                    ICENT           19  CENTURY MARK

                COMPUTATION INTERVAL     .05 HOURS
                     TOTAL TIME BASE   14.95 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

            SUBBASIN RUNOFF DATA

  0 BA        SUBBASIN CHARACTERISTICS
                  TAREA          .00  SUBBASIN AREA

              PRECIPITATION DATA

  0 PB            STORM          .00  BASIN TOTAL PRECIPITATION

  0 PI          INCREMENTAL PRECIPITATION PATTERN


  0 UI        INPUT UNITGRAPH,   0 ORDINATES,  VOLUME =  .00
```

***

HYDROGRAPH AT STATION HC145

DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q	*	DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q
1		0000	1	.00	.00	.00	0.	*	1		0730	151	.00	.00	.00	133.
1		0003	2	.00	.00	.00	0.	*	1		0733	152	.00	.00	.00	133.
1		0006	3	.00	.00	.00	1.	*	1		0736	153	.00	.00	.00	132.
1		0009	4	.00	.00	.00	2.	*	1		0739	154	.00	.00	.00	131.
1		0012	5	.00	.00	.00	4.	*	1		0742	155	.00	.00	.00	131.
1		0015	6	.00	.00	.00	6.	*	1		0745	156	.00	.00	.00	130.
1		0018	7	.00	.00	.00	9.	*	1		0748	157	.00	.00	.00	130.
1		0021	8	.00	.00	.00	11.	*	1		0751	158	.00	.00	.00	129.
1		0024	9	.00	.00	.00	13.	*	1		0754	159	.00	.00	.00	129.
1		0027	10	.00	.00	.00	14.	*	1		0757	160	.00	.00	.00	128.
1		0030	11	.00	.00	.00	14.	*	1		0800	161	.00	.00	.00	127.
1		0033	12	.00	.00	.00	14.	*	1		0803	162	.00	.00	.00	127.
1		0036	13	.00	.00	.00	14.	*	1		0806	163	.00	.00	.00	126.
1		0039	14	.00	.00	.00	14.	*	1		0809	164	.00	.00	.00	126.
1		0042	15	.00	.00	.00	14.	*	1		0812	165	.00	.00	.00	125.
1		0045	16	.00	.00	.00	14.	*	1		0815	166	.00	.00	.00	125.
1		0048	17	.00	.00	.00	15.	*	1		0818	167	.00	.00	.00	124.
1		0051	18	.00	.00	.00	16.	*	1		0821	168	.00	.00	.00	124.
1		0054	19	.00	.00	.00	16.	*	1		0824	169	.00	.00	.00	123.
1		0057	20	.00	.00	.00	16.	*	1		0827	170	.00	.00	.00	122.
1		0100	21	.00	.00	.00	16.	*	1		0830	171	.00	.00	.00	122.
1		0103	22	.00	.00	.00	16.	*	1		0833	172	.00	.00	.00	121.
1		0106	23	.00	.00	.00	16.	*	1		0836	173	.00	.00	.00	121.
1		0109	24	.00	.00	.00	16.	*	1		0839	174	.00	.00	.00	120.
1		0112	25	.00	.00	.00	16.	*	1		0842	175	.00	.00	.00	120.
1		0115	26	.00	.00	.00	16.	*	1		0845	176	.00	.00	.00	119.
1		0118	27	.00	.00	.00	16.	*	1		0848	177	.00	.00	.00	119.
1		0121	28	.00	.00	.00	15.	*	1		0851	178	.00	.00	.00	118.
1		0124	29	.00	.00	.00	15.	*	1		0854	179	.00	.00	.00	118.
1		0127	30	.00	.00	.00	15.	*	1		0857	180	.00	.00	.00	117.
1		0130	31	.00	.00	.00	16.	*	1		0900	181	.00	.00	.00	117.
1		0133	32	.00	.00	.00	16.	*	1		0903	182	.00	.00	.00	116.
1		0136	33	.00	.00	.00	16.	*	1		0906	183	.00	.00	.00	116.
1		0139	34	.00	.00	.00	16.	*	1		0909	184	.00	.00	.00	115.
1		0142	35	.00	.00	.00	16.	*	1		0912	185	.00	.00	.00	115.
1		0145	36	.00	.00	.00	16.	*	1		0915	186	.00	.00	.00	114.
1		0148	37	.00	.00	.00	15.	*	1		0918	187	.00	.00	.00	114.
1		0151	38	.00	.00	.00	15.	*	1		0921	188	.00	.00	.00	113.
1		0154	39	.00	.00	.00	15.	*	1		0924	189	.00	.00	.00	112.
1		0157	40	.00	.00	.00	15.	*	1		0927	190	.00	.00	.00	112.
1		0200	41	.00	.00	.00	15.	*	1		0930	191	.00	.00	.00	111.
1		0203	42	.00	.00	.00	15.	*	1		0933	192	.00	.00	.00	111.
1		0206	43	.00	.00	.00	15.	*	1		0936	193	.00	.00	.00	110.
1		0209	44	.00	.00	.00	15.	*	1		0939	194	.00	.00	.00	110.
1		0212	45	.00	.00	.00	15.	*	1		0942	195	.00	.00	.00	109.
1		0215	46	.00	.00	.00	15.	*	1		0945	196	.00	.00	.00	108.
1		0218	47	.00	.00	.00	16.	*	1		0948	197	.00	.00	.00	108.
1		0221	48	.00	.00	.00	16.	*	1		0951	198	.00	.00	.00	107.
1		0224	49	.00	.00	.00	17.	*	1		0954	199	.00	.00	.00	107.
1		0227	50	.00	.00	.00	17.	*	1		0957	200	.00	.00	.00	106.
1		0230	51	.00	.00	.00	19.	*	1		1000	201	.00	.00	.00	105.
1		0233	52	.00	.00	.00	24.	*	1		1003	202	.00	.00	.00	105.
1		0236	53	.00	.00	.00	28.	*	1		1006	203	.00	.00	.00	104.
1		0239	54	.00	.00	.00	32.	*	1		1009	204	.00	.00	.00	104.

1	0242	55	.00	.00	.00	34.	*	1	1012	205	.00	.00	.00	103.
1	0245	56	.00	.00	.00	35.	*	1	1015	206	.00	.00	.00	102.
1	0248	57	.00	-.01	.01	37.	*	1	1018	207	.00	.00	.00	102.
1	0251	58	.00	-.01	.01	39.	*	1	1021	208	.00	.00	.00	101.
1	0254	59	.00	-.01	.01	41.	*	1	1024	209	.00	.00	.00	101.
1	0257	60	.00	-.01	.01	43.	*	1	1027	210	.00	.00	.00	100.
1	0300	61	.00	-.01	.01	46.	*	1	1030	211	.00	.00	.00	99.
1	0303	62	.00	-.01	.01	49.	*	1	1033	212	.00	.00	.00	99.
1	0306	63	.00	-.01	.01	54.	*	1	1036	213	.00	.00	.00	98.
1	0309	64	.00	-.01	.01	60.	*	1	1039	214	.00	.00	.00	98.
1	0312	65	.00	-.01	.01	66.	*	1	1042	215	.00	.00	.00	97.
1	0315	66	.00	-.01	.01	74.	*	1	1045	216	.00	.00	.00	96.
1	0318	67	.00	-.02	.02	86.	*	1	1048	217	.00	.00	.00	96.
1	0321	68	.00	-.03	.03	99.	*	1	1051	218	.00	.00	.00	95.
1	0324	69	.00	-.03	.03	115.	*	1	1054	219	.00	.00	.00	95.
1	0327	70	.00	-.03	.03	133.	*	1	1057	220	.00	.00	.00	94.
1	0330	71	.00	-.03	.03	158.	*	1	1100	221	.00	.00	.00	93.
1	0333	72	.00	-.10	.10	231.	*	1	1103	222	.00	.00	.00	93.
1	0336	73	.00	-.10	.10	338.	*	1	1106	223	.00	.00	.00	92.
1	0339	74	.00	-.10	.10	427.	*	1	1109	224	.00	.00	.00	91.
1	0342	75	.00	-.10	.10	533.	*	1	1112	225	.00	.00	.00	91.
1	0345	76	.00	-.10	.10	667.	*	1	1115	226	.00	.00	.00	90.
1	0348	77	.00	-.12	.12	814.	*	1	1118	227	.00	.00	.00	90.
1	0351	78	.00	-.13	.13	917.	*	1	1121	228	.00	.00	.00	89.
1	0354	79	.00	-.13	.13	1016.	*	1	1124	229	.00	.00	.00	89.
1	0357	80	.00	-.13	.13	1113.	*	1	1127	230	.00	.00	.00	88.
1	0400	81	.00	-.13	.13	1235.	*	1	1130	231	.00	.00	.00	87.
1	0403	82	.00	-.07	.07	1369.	*	1	1133	232	.00	.00	.00	87.
1	0406	83	.00	-.07	.07	1472.	*	1	1136	233	.00	.00	.00	86.
1	0409	84	.00	-.07	.07	1536.	*	1	1139	234	.00	.00	.00	86.
1	0412	85	.00	-.07	.07	1567.	*	1	1142	235	.00	.00	.00	85.
1	0415	86	.00	-.07	.07	1560.	*	1	1145	236	.00	.00	.00	84.
1	0418	87	.00	-.02	.02	1500.	*	1	1148	237	.00	.00	.00	83.
1	0421	88	.00	-.02	.02	1431.	*	1	1151	238	.00	.00	.00	82.
1	0424	89	.00	-.02	.02	1344.	*	1	1154	239	.00	.00	.00	81.
1	0427	90	.00	-.02	.02	1240.	*	1	1157	240	.00	.00	.00	80.
1	0430	91	.00	-.02	.02	1122.	*	1	1200	241	.00	.00	.00	80.
1	0433	92	.00	-.01	.01	997.	*	1	1203	242	.00	.00	.00	79.
1	0436	93	.00	-.01	.01	891.	*	1	1206	243	.00	.00	.00	78.
1	0439	94	.00	-.01	.01	797.	*	1	1209	244	.00	.00	.00	77.
1	0442	95	.00	-.01	.01	726.	*	1	1212	245	.00	.00	.00	77.
1	0445	96	.00	-.01	.01	675.	*	1	1215	246	.00	.00	.00	76.
1	0448	97	.00	.00	.00	635.	*	1	1218	247	.00	.00	.00	75.
1	0451	98	.00	.00	.00	599.	*	1	1221	248	.00	.00	.00	75.
1	0454	99	.00	.00	.00	570.	*	1	1224	249	.00	.00	.00	74.
1	0457	100	.00	.00	.00	545.	*	1	1227	250	.00	.00	.00	73.
1	0500	101	.00	.00	.00	519.	*	1	1230	251	.00	.00	.00	73.
1	0503	102	.00	.00	.00	491.	*	1	1233	252	.00	.00	.00	72.
1	0506	103	.00	.00	.00	464.	*	1	1236	253	.00	.00	.00	72.
1	0509	104	.00	.00	.00	440.	*	1	1239	254	.00	.00	.00	71.
1	0512	105	.00	.00	.00	418.	*	1	1242	255	.00	.00	.00	71.
1	0515	106	.00	.00	.00	390.	*	1	1245	256	.00	.00	.00	70.
1	0518	107	.00	.00	.00	357.	*	1	1248	257	.00	.00	.00	70.
1	0521	108	.00	.00	.00	330.	*	1	1251	258	.00	.00	.00	69.
1	0524	109	.00	.00	.00	308.	*	1	1254	259	.00	.00	.00	69.
1	0527	110	.00	.00	.00	291.	*	1	1257	260	.00	.00	.00	68.
1	0530	111	.00	.00	.00	277.	*	1	1300	261	.00	.00	.00	68.
1	0533	112	.00	.00	.00	267.	*	1	1303	262	.00	.00	.00	67.
1	0536	113	.00	.00	.00	258.	*	1	1306	263	.00	.00	.00	66.
1	0539	114	.00	.00	.00	252.	*	1	1309	264	.00	.00	.00	66.
1	0542	115	.00	.00	.00	247.	*	1	1312	265	.00	.00	.00	65.
1	0545	116	.00	.00	.00	243.	*	1	1315	266	.00	.00	.00	65.
1	0548	117	.00	.00	.00	241.	*	1	1318	267	.00	.00	.00	65.
1	0551	118	.00	.00	.00	239.	*	1	1321	268	.00	.00	.00	64.
1	0554	119	.00	.00	.00	238.	*	1	1324	269	.00	.00	.00	64.
1	0557	120	.00	.00	.00	237.	*	1	1327	270	.00	.00	.00	63.

1	0600	121	.00	.00	.00	236.	*	1	1330	271	.00	.00	.00	63.
1	0603	122	.00	.00	.00	234.	*	1	1333	272	.00	.00	.00	63.
1	0606	123	.00	.00	.00	233.	*	1	1336	273	.00	.00	.00	63.
1	0609	124	.00	.00	.00	230.	*	1	1339	274	.00	.00	.00	62.
1	0612	125	.00	.00	.00	226.	*	1	1342	275	.00	.00	.00	62.
1	0615	126	.00	.00	.00	221.	*	1	1345	276	.00	.00	.00	62.
1	0618	127	.00	.00	.00	214.	*	1	1348	277	.00	.00	.00	61.
1	0621	128	.00	.00	.00	207.	*	1	1351	278	.00	.00	.00	61.
1	0624	129	.00	.00	.00	201.	*	1	1354	279	.00	.00	.00	61.
1	0627	130	.00	.00	.00	193.	*	1	1357	280	.00	.00	.00	61.
1	0630	131	.00	.00	.00	186.	*	1	1400	281	.00	.00	.00	61.
1	0633	132	.00	.00	.00	178.	*	1	1403	282	.00	.00	.00	60.
1	0636	133	.00	.00	.00	172.	*	1	1406	283	.00	.00	.00	60.
1	0639	134	.00	.00	.00	166.	*	1	1409	284	.00	.00	.00	60.
1	0642	135	.00	.00	.00	161.	*	1	1412	285	.00	.00	.00	60.
1	0645	136	.00	.00	.00	157.	*	1	1415	286	.00	.00	.00	60.
1	0648	137	.00	.00	.00	153.	*	1	1418	287	.00	.00	.00	59.
1	0651	138	.00	.00	.00	149.	*	1	1421	288	.00	.00	.00	59.
1	0654	139	.00	.00	.00	146.	*	1	1424	289	.00	.00	.00	59.
1	0657	140	.00	.00	.00	144.	*	1	1427	290	.00	.00	.00	59.
1	0700	141	.00	.00	.00	142.	*	1	1430	291	.00	.00	.00	59.
1	0703	142	.00	.00	.00	141.	*	1	1433	292	.00	.00	.00	58.
1	0706	143	.00	.00	.00	139.	*	1	1436	293	.00	.00	.00	58.
1	0709	144	.00	.00	.00	138.	*	1	1439	294	.00	.00	.00	58.
1	0712	145	.00	.00	.00	137.	*	1	1442	295	.00	.00	.00	57.
1	0715	146	.00	.00	.00	136.	*	1	1445	296	.00	.00	.00	57.
1	0718	147	.00	.00	.00	136.	*	1	1448	297	.00	.00	.00	57.
1	0721	148	.00	.00	.00	135.	*	1	1451	298	.00	.00	.00	57.
1	0724	149	.00	.00	.00	134.	*	1	1454	299	.00	.00	.00	56.
1	0727	150	.00	.00	.00	134.	*	1	1457	300	.00	.00	.00	56.
							*							

****

TOTAL RAINFALL = .00, TOTAL LOSS = -2.06, TOTAL EXCESS = 2.06

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	14.95-HR
		(CFS)				
1567.	4.20		372.	184.	184.	184.
		(INCHES)	1.217	1.502	1.502	1.502
		(AC-FT)	184.	228.	228.	228.

CUMULATIVE AREA = 2.84 SQ MI

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 MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	HC145	1567.	4.20	372.	184.	184.	2.84		

*** 1 ERROR(S) DETECTED BY HEC-1 ***

APPENDIX E

HYDRAULIC COMPUTATIONS

E-1: Culvert Hydraulics

CURRENT DATE: 06-16-1995
CURRENT TIME: 14:48:28

FILE DATE: 06-16-1995
FILE NAME: TOWNLEY

2-12'x6' CBC @ TOWNLEY AVE

FHWA CULVERT ANALYSIS
HY-8, VERSION 3.2

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1257.40	1257.00	50.00	2 RCB	12.00	6.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

FILE: TOWNLEY CULVERT HEADWATER ELEVATION (FT) DATE: 06-16-1995

DISCHARGE	1	2	3	4	5	6	ROADWAY
0	1257.40	0.00	0.00	0.00	0.00	0.00	1265.30
140	1260.53	0.00	0.00	0.00	0.00	0.00	1265.68
280	1260.90	0.00	0.00	0.00	0.00	0.00	1265.90
420	1261.26	0.00	0.00	0.00	0.00	0.00	1266.08
560	1261.63	0.00	0.00	0.00	0.00	0.00	1266.25
700	1262.04	0.00	0.00	0.00	0.00	0.00	1266.40
840	1262.59	0.00	0.00	0.00	0.00	0.00	1266.54
980	1263.18	0.00	0.00	0.00	0.00	0.00	1266.68
1120	1263.79	0.00	0.00	0.00	0.00	0.00	1266.80
1220	1264.24	0.00	0.00	0.00	0.00	0.00	1266.89
1400	1265.11	0.00	0.00	0.00	0.00	0.00	1267.04

CURRENT DATE: 06-16-1995
CURRENT TIME: 14:48:28

FILE DATE: 06-16-1995
FILE NAME: TOWNLEY

CULVERT # 1

PERFORMANCE CURVE FOR 2 BARREL(S)

Q (cfs)	HWE (ft)	TWE (ft)	ICH (ft)	OCH (ft)	FLOW TYPE	CCE (ft)	FCE (ft)	TCE (ft)	VO (fps)
0	1257.40	1256.90	0.00	-0.40	0-NF	0.00	1257.40	0.00	0.00
140	1260.53	1257.74	1.56	3.13	6-FF	0.00	0.00	0.00	5.71
280	1260.90	1258.17	2.47	3.50	6-FF	0.00	0.00	0.00	7.20
420	1261.26	1258.53	3.24	3.86	6-FF	0.00	0.00	0.00	8.24
560	1261.63	1258.83	3.94	4.23	6-FF	0.00	0.00	0.00	9.07
700	1262.04	1259.11	4.58	4.64	6-FF	0.00	0.00	0.00	9.77
840	1262.59	1259.37	5.19	5.07	6-FF	0.00	0.00	0.00	12.67
980	1263.18	1259.61	5.78	5.53	6-FF	0.00	0.00	0.00	13.21
1120	1263.79	1259.83	6.39	6.03	6-FF	0.00	0.00	0.00	13.71
1220	1264.24	1259.98	6.84	6.41	6-FF	0.00	0.00	0.00	14.05
1400	1265.11	1260.25	7.71	7.15	6-FF	0.00	0.00	0.00	14.58

El. inlet face invert 1257.40 ft El. outlet invert 1257.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	1257.40
OUTLET STATION (FT)	50.00
OUTLET ELEVATION (FT)	1257.00
NUMBER OF BARRELS	2.00
SLOPE (V-FT/H-FT)	0.0080
CULVERT LENGTH ALONG SLOPE (FT)	50.00

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	BOX
BARREL SPAN	12.00 FT
BARREL RISE	6.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE (30-75 DEG. FLARE)
INLET DEPRESSION	NONE

CURRENT DATE: 06-16-1995
CURRENT TIME: 14:48:28

FILE DATE: 06-16-1995
FILE NAME: TOWNLEY

TAILWATER

******* REGULAR CHANNEL CROSS SECTION **********

BOTTOM WIDTH (FT)	30.00
SIDE SLOPE H/V (X:1)	1.0
CHANNEL SLOPE V/H (FT/FT)	0.004
MANNING'S N (.01-0.1)	0.015
CHANNEL INVERT ELEVATION (FT)	1256.90
CULVERT NO.1 OUTLET INVERT ELEVATION	1257.00 FT

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	VEL. (FPS)	SHEAR (PSF)
0.00	1256.90	0.000	0.00	0.00
140.00	1257.74	1.038	5.40	0.21
280.00	1258.17	1.096	7.02	0.32
420.00	1258.53	1.128	8.16	0.41
560.00	1258.83	1.149	9.07	0.48
700.00	1259.11	1.165	9.83	0.55
840.00	1259.37	1.177	10.49	0.62
980.00	1259.61	1.187	11.08	0.68
1120.00	1259.83	1.195	11.61	0.73
1220.00	1259.98	1.200	11.96	0.77
1400.00	1260.25	1.207	12.54	0.84

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	50.00
CREST LENGTH (FT)	200.00
OVERTOPPING CREST ELEVATION (FT)	1265.30

CURRENT DATE: 04-04-1995
CURRENT TIME: 17:12:57

FILE DATE: 10-04-1994
FILE NAME: PALMA1(54)

2-48" RCP Palma Park w/ TW = 1254

FHWA CULVERT ANALYSIS
HY-8, VERSION 3.2

CULV #	SITE DATA: INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	56.00	55.50	200.00	2 RCP	4.00	4.00	.013	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: PALMA1 DATE: 10-04-1994

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
56.00	0	0	0	0	0	0	0	0	1
58.53	62	62	0	0	0	0	0	0	1
59.79	123	123	0	0	0	0	0	0	1
61.00	185	185	0	0	0	0	0	0	1
61.42	200	200	0	0	0	0	0	0	1
65.12	308	308	0	0	0	0	0	0	1
67.09	369	353	0	0	0	0	0	15	5
67.24	431	357	0	0	0	0	0	72	5
67.36	492	359	0	0	0	0	0	131	4
67.46	554	361	0	0	0	0	0	191	4
67.55	615	363	0	0	0	0	0	247	3
67.00	351	351	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: PALMA1 DATE: 10-04-1994

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
56.00	0.00	0	0	0.00
58.53	0.00	62	0	0.00
59.79	0.00	123	0	0.00
61.00	0.00	185	0	0.00
61.42	0.00	200	0	0.00
65.12	0.00	308	0	0.00
67.09	-0.00	369	1	0.15
67.24	-0.01	431	2	0.45
67.36	-0.01	492	2	0.49
67.46	-0.01	554	2	0.28
67.55	-0.00	615	4	0.72

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 04-04-1995
CURRENT TIME: 17:12:57

FILE DATE: 10-04-1994
FILE NAME: PALMA1(54)

CULVERT # 1

PERFORMANCE CURVE FOR 2 BARREL(S)

Q (cfs)	HWE (ft)	TWE (ft)	ICH (ft)	OCH (ft)	FLOW TYPE	CCE (ft)	FCE (ft)	TCE (ft)	VO (fps)
0	56.00	54.00	0.00	-0.50	0-NF	0.00	56.00	0.00	0.00
62	58.53	54.00	2.34	2.53	2-M2	0.00	0.00	0.00	6.35
123	59.79	54.00	3.59	3.79	2-M2	0.00	0.00	0.00	7.97
185	61.00	54.00	4.84	5.00	2-M2	0.00	0.00	0.00	9.46
200	61.42	54.00	5.20	5.42	2-M2	0.00	0.00	0.00	9.85
308	65.12	54.00	8.59	9.12	7-FF	0.00	0.00	0.00	12.81
353	67.09	54.00	10.50	11.09	7-FF	0.00	0.00	0.00	14.29
357	67.24	54.00	10.66	11.24	7-FF	0.00	0.00	0.00	14.39
359	67.36	54.00	10.78	11.36	7-FF	0.00	0.00	0.00	14.47
361	67.46	54.00	10.88	11.46	7-FF	0.00	0.00	0.00	14.54
363	67.55	54.00	10.97	11.55	7-FF	0.00	0.00	0.00	14.60

El. inlet face invert 56.00 ft El. outlet invert 55.50 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	56.00
OUTLET STATION (FT)	200.00
OUTLET ELEVATION (FT)	55.50
NUMBER OF BARRELS	2.00
SLOPE (V-FT/H-FT)	0.0025
CULVERT LENGTH ALONG SLOPE (FT)	200.00

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	4.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.013
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 04-04-1995
CURRENT TIME: 17:12:57

FILE DATE: 10-04-1994
FILE NAME: PALMA1(54)

TAILWATER

CONSTANT WATER SURFACE ELEVATION
54.00

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	60.00
CREST LENGTH (FT)	200.00
OVERTOPPING CREST ELEVATION (FT)	67.00

CURRENT DATE: 04-04-1995
CURRENT TIME: 17:17:56

FILE DATE: 10-04-1994
FILE NAME: PALMA1(59)

2-48" RCP Palma Park w/ TW = 1259

FHWA CULVERT ANALYSIS
HY-8, VERSION 3.2

CULV #	SITE DATA: INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	56.00	55.50	200.00	2 RCP	4.00	4.00	.013	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: PALMA1 DATE: 10-04-1994

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
59.00	0	0	0	0	0	0	0	0	1
59.28	62	62	0	0	0	0	0	0	1
60.03	123	123	0	0	0	0	0	0	1
61.00	185	185	0	0	0	0	0	0	1
61.42	200	200	0	0	0	0	0	0	1
65.12	308	308	0	0	0	0	0	0	1
67.09	369	353	0	0	0	0	0	15	5
67.24	431	357	0	0	0	0	0	72	5
67.36	492	359	0	0	0	0	0	131	4
67.46	554	361	0	0	0	0	0	191	4
67.55	615	363	0	0	0	0	0	247	3
67.00	351	351	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: PALMA1 DATE: 10-04-1994

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
59.00	0.00	0	0	0.00
59.28	0.00	62	0	0.00
60.03	0.00	123	0	0.00
61.00	0.00	185	0	0.00
61.42	0.00	200	0	0.00
65.12	0.00	308	0	0.00
67.09	-0.00	369	1	0.15
67.24	-0.01	431	2	0.45
67.36	-0.01	492	2	0.49
67.46	-0.01	554	2	0.28
67.55	-0.00	615	4	0.72

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 04-04-1995
CURRENT TIME: 17:17:56

FILE DATE: 10-04-1994
FILE NAME: PALMA1(59)

CULVERT # 1

PERFORMANCE CURVE FOR 2 BARREL(S)

Q (cfs)	HWE (ft)	TWE (ft)	ICH (ft)	OCH (ft)	FLOW TYPE	CCE (ft)	FCE (ft)	TCE (ft)	VO (fps)
0	59.00	59.00	0.00	3.00	0-NF	0.00	56.00	0.00	0.00
62	59.28	59.00	2.34	3.28	3-M1	0.00	0.00	0.00	2.64
123	60.03	59.00	3.59	4.03	3-M1	0.00	0.00	0.00	5.29
185	61.00	59.00	4.84	5.00	3-M2	0.00	0.00	0.00	7.93
200	61.42	59.00	5.20	5.42	3-M2	0.00	0.00	0.00	8.60
308	65.12	59.00	8.59	9.12	7-FF	0.00	0.00	0.00	12.81
353	67.09	59.00	10.50	11.09	7-FF	0.00	0.00	0.00	14.29
357	67.24	59.00	10.66	11.24	7-FF	0.00	0.00	0.00	14.39
359	67.36	59.00	10.78	11.36	7-FF	0.00	0.00	0.00	14.47
361	67.46	59.00	10.88	11.46	7-FF	0.00	0.00	0.00	14.54
363	67.55	59.00	10.97	11.55	7-FF	0.00	0.00	0.00	14.60

El. inlet face invert 56.00 ft El. outlet invert 55.50 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	56.00
OUTLET STATION (FT)	200.00
OUTLET ELEVATION (FT)	55.50
NUMBER OF BARRELS	2.00
SLOPE (V-FT/H-FT)	0.0025
CULVERT LENGTH ALONG SLOPE (FT)	200.00

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	4.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.013
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 04-04-1995
CURRENT TIME: 17:17:56

FILE DATE: 10-04-1994
FILE NAME: PALMA1(59)

TAILWATER

CONSTANT WATER SURFACE ELEVATION
59.00

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	60.00
CREST LENGTH (FT)	200.00
OVERTOPPING CREST ELEVATION (FT)	67.00

CURRENT DATE: 04-04-1995
CURRENT TIME: 17:46:46

FILE DATE: 10-04-1994
FILE NAME: PALMABX (54)

8'x3' CBC Palma Park w/ TW = 1254

FHWA CULVERT ANALYSIS
HY-8, VERSION 3.2

CULV #	SITE DATA: INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	56.00	55.00	200.00	1 RCB	8.00	3.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: PALMABX DATE: 10-04-1994

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
56.00	0	0	0	0	0	0	0	0	1
58.07	62	62	0	0	0	0	0	0	1
59.32	123	123	0	0	0	0	0	0	1
60.71	185	185	0	0	0	0	0	0	1
61.13	200	200	0	0	0	0	0	0	1
65.00	308	308	0	0	0	0	0	0	1
67.10	369	348	0	0	0	0	0	19	8
67.26	431	351	0	0	0	0	0	78	5
67.37	492	353	0	0	0	0	0	137	4
67.47	554	354	0	0	0	0	0	194	3
67.56	615	356	0	0	0	0	0	254	3
67.00	346	346	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: PALMABX DATE: 10-04-1994

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
56.00	0.00	0	0	0.00
58.07	0.00	62	0	0.00
59.32	0.00	123	0	0.00
60.71	0.00	185	0	0.00
61.13	0.00	200	0	0.00
65.00	0.00	308	0	0.00
67.10	-0.01	369	2	0.62
67.26	-0.01	431	2	0.43
67.37	-0.01	492	2	0.46
67.47	-0.01	554	6	1.00
67.56	-0.01	615	5	0.86

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 04-04-1995
CURRENT TIME: 17:46:46

FILE DATE: 10-04-1994
FILE NAME: PALMABX(54)

CULVERT # 1

PERFORMANCE CURVE FOR 1 BARREL(S)

Q (cfs)	HWE (ft)	TWE (ft)	ICH (ft)	OCH (ft)	FLOW TYPE	CCE (ft)	FCE (ft)	TCE (ft)	VO (fps)
0	56.00	54.00	0.00	-1.00	0-NF	0.00	56.00	0.00	0.00
62	58.07	54.00	2.07	1.34	6-FF	0.00	0.00	0.00	7.64
123	59.32	54.00	3.32	2.39	6-FF	0.00	0.00	0.00	9.61
185	60.71	54.00	4.71	3.84	6-FF	0.00	0.00	0.00	10.90
200	61.13	54.00	5.13	4.27	6-FF	0.00	0.00	0.00	10.91
308	65.00	54.00	9.00	7.72	4-FF	0.00	0.00	0.00	12.81
348	67.10	54.00	11.10	9.32	4-FF	0.00	0.00	0.00	14.49
351	67.26	54.00	11.26	9.44	4-FF	0.00	0.00	0.00	14.61
353	67.37	54.00	11.37	9.53	4-FF	0.00	0.00	0.00	14.70
354	67.47	54.00	11.47	9.60	4-FF	0.00	0.00	0.00	14.77
356	67.56	54.00	11.56	9.67	4-FF	0.00	0.00	0.00	14.84

El. inlet face invert 56.00 ft El. outlet invert 55.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	56.00
OUTLET STATION (FT)	200.00
OUTLET ELEVATION (FT)	55.00
NUMBER OF BARRELS	1.00
SLOPE (V-FT/H-FT)	0.0050
CULVERT LENGTH ALONG SLOPE (FT)	200.00

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	BOX
BARREL SPAN	8.00 FT
BARREL RISE	3.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE (90-45 DEG.)
INLET DEPRESSION	NONE

CURRENT DATE: 04-04-1995
CURRENT TIME: 17:46:46

FILE DATE: 10-04-1994
FILE NAME: PALMABX(54)

TAILWATER

CONSTANT WATER SURFACE ELEVATION
54.00

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	60.00
CREST LENGTH (FT)	200.00
OVERTOPPING CREST ELEVATION (FT)	67.00

CURRENT DATE: 04-04-1995
CURRENT TIME: 17:48:12

FILE DATE: 10-04-1994
FILE NAME: PALMABX(59)

8'x3' CBC Palma Park w7 TW = 1259

FHWA CULVERT ANALYSIS
HY-8, VERSION 3.2

CULV #	SITE DATA: INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	56.00	55.00	200.00	1 RCB	8.00	3.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: PALMABX DATE: 10-04-1994

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
59.00	0	0	0	0	0	0	0	0	1
59.15	62	62	0	0	0	0	0	0	1
59.92	123	123	0	0	0	0	0	0	1
61.06	185	185	0	0	0	0	0	0	1
61.42	200	200	0	0	0	0	0	0	1
65.00	308	308	0	0	0	0	0	0	1
67.10	369	348	0	0	0	0	0	19	8
67.26	431	351	0	0	0	0	0	78	5
67.37	492	353	0	0	0	0	0	137	4
67.47	554	354	0	0	0	0	0	194	3
67.56	615	356	0	0	0	0	0	254	3
67.00	346	346	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: PALMABX DATE: 10-04-1994

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
59.00	0.00	0	0	0.00
59.15	0.00	62	0	0.00
59.92	0.00	123	0	0.00
61.06	0.00	185	0	0.00
61.42	0.00	200	0	0.00
65.00	0.00	308	0	0.00
67.10	-0.01	369	2	0.62
67.26	-0.01	431	2	0.43
67.37	-0.01	492	2	0.46
67.47	-0.01	554	6	1.00
67.56	-0.01	615	5	0.86

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 04-04-1995
CURRENT TIME: 17:48:12

FILE DATE: 10-04-1994
FILE NAME: PALMABX(59)

CULVERT # 1

PERFORMANCE CURVE FOR 1 BARREL(S)

Q (cfs)	HWE (ft)	TWE (ft)	ICH (ft)	OCH (ft)	FLOW TYPE	CCE (ft)	FCE (ft)	TCE (ft)	VO (fps)
0	59.00	59.00	0.00	3.00	0-NF	0.00	56.00	0.00	0.00
62	59.23	59.00	2.07	3.23	4-FF	0.00	0.00	0.00	2.56
123	59.92	59.00	3.32	3.92	4-FF	0.00	0.00	0.00	5.13
185	61.06	59.00	4.71	5.06	4-FF	0.00	0.00	0.00	7.69
200	61.42	59.00	5.13	5.42	4-FF	0.00	0.00	0.00	8.33
308	65.00	59.00	9.00	8.72	4-FF	0.00	0.00	0.00	12.81
348	67.10	59.00	11.10	10.32	4-FF	0.00	0.00	0.00	14.49
351	67.26	59.00	11.26	10.44	4-FF	0.00	0.00	0.00	14.61
353	67.37	59.00	11.37	10.53	4-FF	0.00	0.00	0.00	14.70
354	67.47	59.00	11.47	10.60	4-FF	0.00	0.00	0.00	14.77
356	67.56	59.00	11.56	10.67	4-FF	0.00	0.00	0.00	14.84

El. inlet face invert 56.00 ft El. outlet invert 55.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

```
***** SITE DATA ***** CULVERT INVERT **************
      INLET STATION (FT)                        0.00
      INLET ELEVATION (FT)                     56.00
      OUTLET STATION (FT)                     200.00
      OUTLET ELEVATION (FT)                    55.00
      NUMBER OF BARRELS                         1.00
      SLOPE (V-FT/H-FT)                         0.0050
      CULVERT LENGTH ALONG SLOPE (FT)         200.00

***** CULVERT DATA SUMMARY ************************
      BARREL SHAPE          BOX
      BARREL SPAN             8.00 FT
      BARREL RISE             3.00 FT
      BARREL MATERIAL       CONCRETE
      BARREL MANNING'S N    0.012
      INLET TYPE            CONVENTIONAL
      INLET EDGE AND WALL   SQUARE EDGE  (90-45 DEG.)
      INLET DEPRESSION      NONE
```

CURRENT DATE: 04-04-1995
CURRENT TIME: 17:48:12

FILE DATE: 10-04-1994
FILE NAME: PALMABX(59)

TAILWATER

CONSTANT WATER SURFACE ELEVATION
59.00

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	60.00
CREST LENGTH (FT)	200.00
OVERTOPPING CREST ELEVATION (FT)	67.00

E-2: Inlet/Outlet Alternatives Channel Hydraulics with Hand calculation checks and computer model documentation

STORM DRAIN ANALYSIS PLUS

Original version by Los Angeles County Public Works
Portions Copyrighted by CIVILSOFT, 1986, 1987, 1989

Version
Serial Number

Oct 5, 1994 9:12:56

Alternative A - with 66-in Pipes for Stilling Basin Outlet

Input file : TENA1.DAT
Output file: TENA1.OUT

INPUT FILE LISTING

```
T1 TENTH STREET WASH    FILE NAME: TENA1.DAT
T2 ALTERNATIVE A FLOW ANALYSIS - FROM DOWNSTREAM OF STILLING BASIN
T3 TO DOWNSTREAM OF ALICE AVE ANALYSIS
SO   1000.00  44.29  1                          48.37
R    1100.00  45.00  1      .030
TS   1110.00  45.11  2      .040
R    1195.00  46.00  2      .040
JX   1200.00  46.04  3  4   .012   250.          46.50        45.
R    2480.00  49.00  3      .012
SH                   3
1                                                 SP
                                WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING                          PAGE    1
 CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE   ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
 CODE   NO   TYPE  PIERS   WIDTH    DIAMETER  WIDTH              DROP

 CD      1    1      0       .00      7.00   10.00   2.00  2.00   .00
 CD      2    1      0       .00      7.00   12.00   2.00  2.00   .00
 CD      3    4                       5.50
 CD      4    4                       5.50
1                                                                                                          PAGE NO   1
                          WATER SURFACE PROFILE - TITLE CARD LISTING
HEADING LINE NO 1 IS -
0                           TENTH STREET WASH    FILE NAME: TENA1.DAT
HEADING LINE NO 2 IS -
                            ALTERNATIVE A FLOW ANALYSIS - FROM DOWNSTREAM OF STILLING BASIN
HEADING LINE NO 3 IS -
0                           TO DOWNSTREAM OF ALICE AVE ANALYSIS
                                                                                                           PAGE NO   2
                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO   1 IS A SYSTEM OUTLET     *         *     *
                     U/S DATA   STATION    INVERT  SECT                                W S ELEV
                                 1000.00   44.29    1                                   48.37
 ELEMENT NO   2 IS A REACH            *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                           RADIUS  ANGLE  ANG PT  MAN H
                                 1100.00   45.00    1             .030                              .00    .00     .00     0
 ELEMENT NO   3 IS A TRANSITION       *         *     *
                     U/S DATA   STATION    INVERT  SECT              N
                                 1110.00   45.11    2             .040
 ELEMENT NO   4 IS A REACH            *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                           RADIUS `ANGLE  ANG PT  MAN H
                                 1195.00   46.00    2             .040                              .00    .00     .00     0
0 ELEMENT NO   5 IS A JUNCTION       *         *     *     *                 *                 *              *
                     U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3       Q4    INVERT-3 INVERT-4  PHI 3   PHI 4
                                 1200.00   46.04    3     4     0   .012   250.0       .0    46.50      .00  45.00     .00
0 ELEMENT NO   6 IS A REACH          *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                           RADIUS  ANGLE  ANG PT  MAN H
                                 2480.00   49.00    3             .012                              .Q0    .00     .00     0
 ELEMENT NO   7 IS A SYSTEM HEADWORKS                *                     *
                     U/S DATA   STATION    INVERT  SECT                                W S ELEV
```

2480.00 49.00 3 .00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

WATER SURFACE PROFILE LISTING

TENTH STREET WASH FILE NAME: TENA1.DAT

ALTERNATIVE A FLOW ANALYSIS - FROM DOWNSTREAM OF STILLING BASIN

TO DOWNSTREAM OF ALICE AVE ANALYSIS

STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH	NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
1000.00	44.29	4.08	48.37	500.0	6.75	.71	49.08	.00	3.38		7.00	10.00	2.00	0	.00
38.21	.00710					.00549	.21			3.76			2.00		
1038.21	44.56	3.95	48.51	500.0	7.08	.78	49.29	.00	3.38		7.00	10.00	2.00	0	.00
60.25	.00710					.00626	.38			3.76			2.00		
1098.46	44.99	3.82	48.81	500.0	7.42	.86	49.66	.00	3.38		7.00	10.00	2.00	0	.00
1.54	.00710					.00667	.01			3.76			2.00		
1100.00	45.00	3.82	48.82	500.0	7.43	.86	49.67	.00	3.38		7.00	10.00	2.00	0	.00
TRANS STR	.01100					.00928	.09						2.00		
1110.00	45.11	4.14	49.25	500.0	5.97	.55	49.80	.00	3.15		7.00	12.00	2.00	0	.00
25.03	.01047					.00717	.18			3.68			2.00		
1135.03	45.37	4.00	49.37	500.0	6.26	.61	49.98	.00	3.15		7.00	12.00	2.00	0	.00
31.42	.01047					.00817	.26			3.68			2.00		
1166.46	45.70	3.86	49.57	500.0	6.56	.67	50.23	.00	3.15		7.00	12.00	2.00	0	.00
HYDRAULIC JUMP													2.00		
1166.46	45.70	2.51	48.21	500.0	11.70	2.13	50.34	.00	3.15		7.00	12.00	2.00	0	.00
2.86	.01047					.04659	.13			3.68			2.00		
1169.31	45.73	2.44	48.17	500.0	12.17	2.30	50.47	.00	3.15		7.00	12.00	2.00	0	.00
3.34	.01047					.05272	.18			3.68			2.00		
1172.66	45.77	2.35	48.11	500.0	12.76	2.53	50.64	.00	3.15		7.00	12.00	2.00	0	.00
3.35	.01047					.06038	.20			3.68			2.00		
1176.01	45.80	2.26	48.06	500.0	13.38	2.78	50.85	.00	3.15		7.00	12.00	2.00	0	.00
3.32	.01047					.06918	.23			3.68			2.00		
1179.33	45.84	2.18	48.01	500.0	14.04	3.06	51.08	.00	3.15		7.00	12.00	2.00	0	.00
3.28	.01047					.07929	.26			3.68			2.00		
1182.60	45.87	2.10	47.97	500.0	14.72	3.37	51.34	.00	3.15		7.00	12.00	2.00	0	.00
3.22	.01047					.09091	.29			3.68			2.00		
1185.82	45.90	2.02	47.92	500.0	15.44	3.70	51.63	.00	3.15		7.00	12.00	2.00	0	.00
3.14	.01047					.10426	.33			3.68			2.00		
1188.96	45.94	1.94	47.88	500.0	16.19	4.07	51.96	.00	3.15		7.00	12.00	2.00	0	.00
3.06	.01047					.11962	.37			3.68			2.00		
1192.02	45.97	1.87	47.84	500.0	16.98	4.48	52.32	.00	3.15		7.00	12.00	2.00	0	.00
2.98	.01047					.13729	.41			3.68			2.00		
1195.00	46.00	1.80	47.80	500.0	17.81	4.93	52.73	.00	3.15		7.00	12.00	2.00	0	.00
JUNCT STR	.00800					.00906	.05						2.00		
1200.00	46.04	4.41	50.45	250.0	12.24	2.33	52.78	.00	4.41		5.50	.00	.00	0	.00
10.59	.00231					.00470	.05			5.50			.00		
1210.59	46.06	4.65	50.71	250.0	11.67	2.12	52.83	.00	4.41		5.50	.00	.00	0	.00
45.39	.00231					.00433	.20			5.50			.00		
1255.98	46.17	4.93	51.10	250.0	11.13	1.93	53.03	.00	4.41		5.50	.00	.00	0	.00
125.21	.00231					.00416	.52			5.50			.00		
1381.19	46.46	5.34	51.80	250.0	10.61	1.75	53.55	.00	4.41		5.50	.00	.00	0	.00
63.02	.00231					.00441	.28			5.50			.00		
1444.21	46.60	5.50	52.10	250.0	10.52	1.72	53.83	.00	4.41		5.50	.00	.00	0	.00
1035.79	.00231					.00470	4.86			5.50			.00		
2480.00	49.00	8.00	57.00	250.0	10.52	1.72	58.72	.00	4.41		5.50	.00	.00	0	.00

STORM DRAIN ANALYSIS PLUS

Original version by Los Angeles County Public Works
Portions Copyrighted by CIVILSOFT, 1986, 1987, 1989

Version
Serial Number

Oct 5, 1994 9:49:56

Alternative A - with 66-in Pipes for Stilling Basin Outlet

Input file : TENA2.DAT
Output file: TENA2.OUT

INPUT FILE LISTING

```
T1 TENTH STREET WASH     FILE NAME: TENA2
T2 ALTERNATIVE A FLOW ANALYSIS - UPSTREAM OF STILLING BASIN
T3 TOWNLEY BOX CULVERT TO STILLING BASIN
SO   2480.00  49.00  1                    57.00
R    2520.00  49.02  1      .016
R    2540.00  56.50  1      .050
TS   2545.00  56.51  2      .050
R    2640.00  57.90  2      .016
JX   2650.00  58.00  3  5   .016    30.          61.50        45.
R    2700.00  58.20  3      .016
TS   2710.00  58.40  4      .035
R    2730.00  58.60  4      .035
SH                   4
1                                                  SP
                                WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING                          PAGE    1
 CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
 CODE   NO   TYPE  PIERS   WIDTH    DIAMETER  WIDTH              DROP

 CD      1    2      0       .00     10.00   35.00               .00
 CD      2    1      0       .00      5.00   20.00   1.00  1.00  .00
 CD      3    3      1      1.50      6.00   25.00    .00   .00  .00
 CD      4    1      0       .00      8.00   10.00   2.00  2.00  .00
 CD      5    4                       3.00
                                                                                                          PAGE NO    1
0                           WATER SURFACE PROFILE - TITLE CARD LISTING
0HEADING LINE NO 1 IS -
                              TENTH STREET WASH     FILE NAME: TENA2
0HEADING LINE NO 2 IS -
0                             ALTERNATIVE A FLOW ANALYSIS - UPSTREAM OF STILLING BASIN
0HEADING LINE NO 3 IS -
                              TOWNLEY BOX CULVERT TO STILLING BASIN
                                                                                                          PAGE NO    2
0                           WATER SURFACE PROFILE - ELEMENT CARD LISTING
 ELEMENT NO   1 IS A SYSTEM OUTLET     *         *     *
                     U/S DATA   STATION    INVERT  SECT                                  W S ELEV
                                 2480.00   49.00    1                                     57.00
0 ELEMENT NO   2 IS A REACH            *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                   RADIUS  ANGLE  ANG PT  MAN H
                                 2520.00   49.02    1              .016                      .00    .00     .00     0
0 ELEMENT NO   3 IS A REACH            *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                   RADIUS  ANGLE  ANG PT  MAN H
                                 2540.00   56.50    1              .050                      .00    .00     .00     0
0 ELEMENT NO   4 IS A TRANSITION       *         *     *
                     U/S DATA   STATION    INVERT  SECT              N
                                 2545.00   56.51    2              .050
 ELEMENT NO   5 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                   RADIUS  ANGLE  ANG PT  MAN H
                                 2640.00   57.90    2              .016                      .00    .00     .00     0
```

```
0 ELEMENT NO   6 IS A JUNCTION          *         *     *     *                 *                 *              *
                    U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3       Q4    INVERT-3 INVERT-4  PHI 3   PHI 4
                                2650.00   58.00    3     5     0   .016    30.0       .0    61.50      .00  45.00     .00
0 ELEMENT NO   7 IS A REACH             *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
                                2700.00   58.20    3              .016                                   .00    .00     .00      0
0 ELEMENT NO   8 IS A TRANSITION        *         *     *
                    U/S DATA   STATION    INVERT  SECT              N
                                2710.00   58.40    4              .035
0 ELEMENT NO   9 IS A REACH             *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
                                2730.00   58.60    4              .035                                   .00    .00     .00      0
0 ELEMENT NO  10 IS A SYSTEM HEADWORKS                  *                    *
                    U/S DATA   STATION    INVERT  SECT                                     W S ELEV
                                2730.00   58.60    4                                          .00
NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

PAGE 1                                                                                                                      PAGE
                                                WATER SURFACE PROFILE LISTING
                        TENTH STREET WASH     FILE NAME: TENA2
                        ALTERNATIVE A FLOW ANALYSIS
                        TOWNLEY BOX CULVERT TO STILLING BASIN
 STATION    INVERT   DEPTH     W.S.        Q       VEL     VEL     ENERGY   SUPER  CRITICAL          HGT/   BASE/    ZL   NO  AVBPR
            ELEV   OF FLOW    ELEV                        HEAD   GRD.EL.   ELEV   DEPTH              DIA    ID NO.        PIER
0 L/ELEM     SO                                         SF AVE     HF                   NORM DEPTH                ZR
*****************************************************************************************************************************
  2480.00   49.00     8.00    57.00   1250.0    4.46     .31    57.31    .00    3.41          10.00   35.00   .00   0    .00
0   40.00  .00050                                      .00024     .01                  6.22                     .00
0 2520.00   49.02     7.99    57.01   1250.0    4.47     .31    57.32    .00    3.41          10.00   35.00   .00   0    .00
     .92  .37400                                      .00251     .00                  1.55                     .00
0 2520.92   49.36     7.62    56.98   1250.0    4.69     .34    57.32    .00    3.41          10.00   35.00   .00   0    .00
0    .86  .37400                                      .00289     .00                  1.55                     .00
  2521.78   49.69     7.26    56.95   1250.0    4.92     .38    57.32    .00    3.41          10.00   35.00   .00   0    .00
     .81  .37400                                      .00333     .00                  1.55                     .00
0 2522.59   49.99     6.92    56.91   1250.0    5.16     .41    57.33    .00    3.41          10.00   35.00   .00   0    .00
0    .76  .37400                                      .00383     .00                  1.55                     .00
  2523.35   50.27     6.60    56.88   1250.0    5.41     .45    57.33    .00    3.41          10.00   35.00   .00   0    .00
     .71  .37400                                      .00441     .00                  1.55                     .00
0 2524.06   50.54     6.30    56.83   1250.0    5.67     .50    57.33    .00    3.41          10.00   35.00   .00   0    .00
0    .37  .37400                                      .00491     .00                  1.55                     .00
  2524.43   50.68     6.13    56.81   1250.0    5.82     .53    57.34    .00    3.41          10.00   35.00   .00   0    .00
HYDRAULIC JUMP                                                                                                   .00
0 2524.43   50.68     1.66    52.33   1250.0   21.55    7.22    59.55    .00    3.41          10.00   35.00   .00   0    .00
0    2.49  .37400                                      .29574     .74                  1.55                     .00
  2526.92   51.61     1.68    53.29   1250.0   21.25    7.02    60.31    .00    3.41          10.00   35.00   .00   0    .00
     5.28  .37400                                      .26861    1.42                  1.55                     .00
0 2532.19   53.58     1.76    55.34   1250.0   20.26    6.38    61.72    .00    3.41          10.00   35.00   .00   0    .00
     3.44  .37400                                      .23049     .79                  1.55                     .00
  2535.64   54.87     1.85    56.72   1250.0   19.32    5.80    62.52    .00    3.41          10.00   35.00   .00   0    .00
0    2.48  .37400                                      .19783     .49                  1.55                     .00
0 2538.12   55.80     1.94    57.73   1250.0   18.42    5.27    63.01    .00    3.41          10.00   35.00   .00   0    .00
     1.88  .37400                                      .16985     .32                  1.55                     .00
  2540.00   56.50     2.03    58.53   1250.0   17.56    4.79    63.33    .00    3.41          10.00   35.00   .00   0    .00
                                                                                                                 PAGE    2
                                                WATER SURFACE PROFILE LISTING
                        TENTH STREET WASH     FILE NAME: TENA2
                        ALTERNATIVE A FLOW ANALYSIS
                        TOWNLEY BOX CULVERT TO STILLING BASIN
0 STATION    INVERT   DEPTH     W.S.        Q       VEL     VEL     ENERGY   SUPER  CRITICAL          HGT/   BASE/    ZL   NO  AVBPR
            ELEV   OF FLOW    ELEV                        HEAD   GRD.EL.   ELEV   DEPTH              DIA    ID NO.        PIER
0 L/ELEM     SO                                         SF AVE     HF                   NORM DEPTH                ZR
*****************************************************************************************************************************
TRANS STR   .00200                                     .12160     .61                                          .00
  2545.00   56.51     3.26    59.77   1250.0   16.48    4.22    63.99    .00    4.57           5.00   20.00  1.00   0    .00
0   23.98  .01463                                      .00849     .20                  2.81                    1.00
0 2568.98   56.86     3.34    60.20   1250.0   16.04    4.00    64.20    .00    4.57           5.00   20.00  1.00   0    .00
```

```
0    31.56   .01463                                  .00761     .24                    2.81                  1.00
0  2600.53   57.32    3.48    60.80   1250.0   15.29    3.63   64.44    .00    4.57            5.00   20.00  1.00   0    .00
0    22.84   .01463                                  .00661     .15                    2.81                  1.00
0  2623.38   57.66    3.63    61.29   1250.0   14.58    3.30   64.59    .00    4.57            5.00   20.00  1.00   0    .00
0    16.62   .01463                                  .00575     .10                    2.81                  1.00
0  2640.00   57.90    3.78    61.68   1250.0   13.90    3.00   64.68    .00    4.57            5.00   20.00  1.00   0    .00
0JUNCT STR   .01000                                  .00645     .06                                          1.00
0  2650.00   58.00    3.72    61.72   1220.0   13.97    3.03   64.75    .00    4.38            6.00   25.00   .00   1   1.50
0    18.00   .00400                                  .00786     .14                    4.67                   .00
0  2668.00   58.07    3.62    61.69   1220.0   14.35    3.20   64.89    .00    4.38            6.00   25.00   .00   1   1.50
0    32.00   .00400                                  .00875     .28                    4.67                   .00
0  2700.00   58.20    3.45    61.65   1220.0   15.05    3.52   65.17    .00    4.38            6.00   25.00   .00   1   1.50
0TRANS STR   .02000                                  .02881     .29                                           .00
```


WATER SURFACE PROFILE LISTING

TENTH STREET WASH FILE NAME: TENA2

ALTERNATIVE A FLOW ANALYSIS

TOWNLEY BOX CULVERT TO STILLING BASIN

```
 STATION    INVERT   DEPTH     W.S.       Q      VEL     VEL    ENERGY   SUPER  CRITICAL          HGT/   BASE/    ZL   NO  AVBPR
            ELEV   OF FLOW    ELEV                       HEAD   GRD.EL.   ELEV   DEPTH            DIA    ID NO.        PIER
0 L/ELEM     SO                                       SF AVE     HF                    NORM DEPTH                ZR
*****************************************************************************************************************************
  2710.00   58.40    5.44    63.84   1220.0   10.73    1.79   65.63    .00    5.44            8.00   10.00  2.00   0    .00
0    4.72   .01000                                  .01216     .06                    5.79                  2.00
0  2714.72   58.45    5.62    64.06   1220.0   10.23    1.63   65.69    .00    5.44            8.00   10.00  2.00   0    .00
    15.28   .01000                                  .01096     .17                    5.79                  2.00
0  2730.00   58.60    5.72    64.32   1220.0    9.95    1.54   65.86    .00    5.44            8.00   10.00  2.00   0    .00
1
```

STORM DRAIN ANALYSIS PLUS

Original version by Los Angeles County Public Works
Portions Copyrighted by CIVILSOFT, 1986, 1987, 1989

Version
Serial Number

Oct 4, 1994 10:43: 4

Input file : TENTH1.DAT
Output file: TENTH1.OUT

Alternative B - with 66-Pipe Outlet from Stilling Basin

INPUT FILE LISTING

```
T1 TENTH STREET WASH    FILE NAME: TENTH1.DAT
T2 ALTERNATIVE B FLOW ANALYSIS - DOWNSTREAM OF STILLING BASIN
T3 TO DOWNSTREAM OF ALICE AVE ANALYSIS
SO   1000.00  44.29  1                        48.37
R    1100.00  45.00  1      .030
TS   1110.00  45.11  2      .040
R    1195.00  46.00  2      .040
JX   1200.00  46.04  3  4   .012   250.          46.50        45.
R    2240.00  48.00  3      .012
SH                   3
1                                                   SP
                                WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING                          PAGE    1
 CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
 CODE   NO   TYPE  PIERS   WIDTH    DIAMETER  WIDTH          .  DROP

 CD      1    1      0       .00      7.00   10.00   2.00  2.00   .00
 CD      2    1      0       .00      7.00   12.00   2.00  2.00   .00
 CD      3    4                       5.50
 CD      4    4                       5.50
                                                                                                          PAGE NO   1
                          WATER SURFACE PROFILE - TITLE CARD LISTING
0HEADING LINE NO 1 IS -
0                           TENTH STREET WASH    FILE NAME: TENTH1.DAT
HEADING LINE NO 2 IS -
                            ALTERNATIVE B FLOW ANALYSIS - DOWNSTREAM OF STILLING BASIN
0HEADING LINE NO 3 IS -
0                           TO DOWNSTREAM OF ALICE AVE ANALYSIS
                                                                                                          PAGE NO   2
                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO   1 IS A SYSTEM OUTLET     *        *     *
                    U/S DATA   STATION    INVERT  SECT                                W S ELEV
                                 1000.00   44.29    1                                   48.37
0 ELEMENT NO   2 IS A REACH             *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                           RADIUS  ANGLE  ANG PT  MAN H
                                 1100.00   45.00    1             .030                            .00    .00     .00     0
 ELEMENT NO   3 IS A TRANSITION         *        *     *
                    U/S DATA   STATION    INVERT  SECT              N
                                 1110.00   45.11    2             .040
 ELEMENT NO   4 IS A REACH              *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                           RADIUS  ANGLE  ANG PT  MAN H
                                 1195.00   46.00    2             .040                            .00    .00     .00     0
 ELEMENT NO   5 IS A JUNCTION           *        *     *     *                *                *              *
                    U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2  N      Q3       Q4    INVERT-3 INVERT-4  PHI 3   PHI 4
                                 1200.00   46.04    3     4     0  .012   250.0       .0    46.50      .00  45.00     .00
0 ELEMENT NO   6 IS A REACH             *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                           RADIUS  ANGLE  ANG PT  MAN H
                                 2240.00   48.00    3             .012                            .00    .00     .00     0
0 ELEMENT NO   7 IS A SYSTEM HEADWORKS                 *                    *
                    U/S DATA   STATION    INVERT  SECT                                W S ELEV
```

2240.00 48.00 3 .00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

WATER SURFACE PROFILE LISTING

TENTH STREET WASH FILE NAME: TENTH1.DAT

ALTERNATIVE B FLOW ANALYSIS - DOWNSTREAM OF STILLING BASIN

TO DOWNSTREAM OF ALICE AVE ANALYSIS

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
O L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1000.00	44.29	4.08	48.37	500.0	6.75	.71	49.08	.00	3.38		7.00	10.00	2.00	0	.00
0 38.21	.00710					.00549	.21			3.76			2.00		
0 1038.21	44.56	3.95	48.51	500.0	7.08	.78	49.29	.00	3.38		7.00	10.00	2.00	0	.00
60.25	.00710					.00626	.38			3.76			2.00		
1098.46	44.99	3.82	48.81	500.0	7.42	.86	49.66	.00	3.38		7.00	10.00	2.00	0	.00
0 1.54	.00710					.00667	.01			3.76			2.00		
1100.00	45.00	3.82	48.82	500.0	7.43	.86	49.67	.00	3.38		7.00	10.00	2.00	0	.00
TRANS STR	.01100					.00928	.09						2.00		
1110.00	45.11	4.14	49.25	500.0	5.97	.55	49.80	.00	3.15		7.00	12.00	2.00	0	.00
0 25.03	.01047					.00717	.18			3.68			2.00		
1135.03	45.37	4.00	49.37	500.0	6.26	.61	49.98	.00	3.15		7.00	12.00	2.00	0	.00
31.42	.01047					.00817	.26			3.68			2.00		
0 1166.46	45.70	3.86	49.57	500.0	6.56	.67	50.23	.00	3.15		7.00	12.00	2.00	0	.00
OHYDRAULIC JUMP													2.00		
1166.46	45.70	2.51	48.21	500.0	11.70	2.13	50.34	.00	3.15		7.00	12.00	2.00	0	.00
2.86	.01047					.04659	.13			3.68			2.00		
0 1169.31	45.73	2.44	48.17	500.0	12.17	2.30	50.47	.00	3.15		7.00	12.00	2.00	0	.00
0 3.34	.01047					.05272	.18			3.68			2.00		
1172.66	45.77	2.35	48.11	500.0	12.76	2.53	50.64	.00	3.15		7.00	12.00	2.00	0	.00
3.35	.01047					.06038	.20			3.68			2.00		
0 1176.01	45.80	2.26	48.06	500.0	13.38	2.78	50.85	.00	3.15		7.00	12.00	2.00	0	.00
3.32	.01047					.06918	.23			3.68			2.00		
1179.33	45.84	2.18	48.01	500.0	14.04	3.06	51.08	.00	3.15		7.00	12.00	2.00	0	.00
0 3.28	.01047					.07929	.26			3.68			2.00		
0 1182.60	45.87	2.10	47.97	500.0	14.72	3.37	51.34	.00	3.15		7.00	12.00	2.00	0	.00
3.22	.01047					.09091	.29			3.68			2.00		
1185.82	45.90	2.02	47.92	500.0	15.44	3.70	51.63	.00	3.15		7.00	12.00	2.00	0	.00
0 3.14	.01047					.10426	.33			3.68			2.00		
0 1188.96	45.94	1.94	47.88	500.0	16.19	4.07	51.96	.00	3.15		7.00	12.00	2.00	0	.00
3.06	.01047					.11962	.37			3.68			2.00		
1192.02	45.97	1.87	47.84	500.0	16.98	4.48	52.32	.00	3.15		7.00	12.00	2.00	0	.00
0 2.98	.01047					.13729	.41			3.68			2.00		
0 1195.00	46.00	1.80	47.80	500.0	17.81	4.93	52.73	.00	3.15		7.00	12.00	2.00	0	.00
JUNCT STR	.00800					.00906	.05						2.00		
1200.00	46.04	4.41	50.45	250.0	12.24	2.33	52.78	.00	4.41		5.50	.00	.00	0	.00
0 8.99	.00189					.00470	.04			5.50			.00		
1208.99	46.06	4.65	50.70	250.0	11.67	2.12	52.82	.00	4.41		5.50	.00	.00	0	.00
37.45	.00189					.00433	.16			5.50			.00		
0 1246.44	46.13	4.93	51.06	250.0	11.13	1.93	52.98	.00	4.41		5.50	.00	.00	0	.00
0 101.76	.00189					.00416	.42			5.50			.00		
1348.20	46.32	5.34	51.66	250.0	10.61	1.75	53.41	.00	4.41		5.50	.00	.00	0	.00
52.38	.00189					.00441	.23			5.50			.00		
0 1400.58	46.42	5.50	51.92	250.0	10.52	1.72	53.64	.00	4.41		5.50	.00	.00	0	.00
0 839.42	.00189					.00470	3.94			5.50			.00		
2240.00	48.00	7.88	55.88	250.0	10.52	1.72	57.60	.00	4.41		5.50	.00	.00	0	.00

STORM DRAIN ANALYSIS PLUS

Original version by Los Angeles County Public Works
Portions Copyrighted by CIVILSOFT, 1986, 1987, 1989

Version
Serial Number

Oct 4, 1994 11:24:38

Alternative B - with 66-Pipe Outlet from Stilling Basin

Input file : TENTH2.DAT
Output file: TENTH2.OUT

INPUT FILE LISTING

```
T1 TENTH STREET WASH     FILE NAME: TENTH2     66-INCH PIPES
T2 ALTERNATIVE B FLOW ANALYSIS- UPSTREAM OF STILLING BASIN
T3 STILLING BASIN TO TOWNLEY BOX CULVERT
SO   2240.00  47.99  1                        55.88
R    2280.00  48.01  1      .016
R    2300.00  56.50  1      .050
TS   2305.00  56.51  2      .050
R    2640.00  57.90  2      .016
JX   2650.00  58.00  3  5   .016    30.          61.50        45.
R    2700.00  58.20  3      .016
TS   2710.00  58.40  4      .035
R    2730.00  58.60  4      .035
SH                   4
                                                  SP
                                WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING                          PAGE    1
0 CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
  CODE   NO   TYPE  PIERS   WIDTH    DIAMETER  WIDTH              DROP

  CD      1    2      0       .00     10.00   35.00               .00
  CD      2    1      0       .00      5.00   20.00   1.00  1.00  .00
  CD      3    3      1      1.50      6.00   25.00    .00   .00  .00
  CD      4    1      0       .00      8.00   10.00   2.00  2.00  .00
  CD      5    4                       3.00
1
0                         WATER SURFACE PROFILE - TITLE CARD LISTING
0HEADING LINE NO 1 IS -
0                         TENTH STREET WASH     FILE NAME: TENTH2  66-INCH PIPES
0HEADING LINE NO 2 IS -
0                         ALTERNATIVE B FLOW ANALYSIS - UPSTREAM OF STILLING BASIN
0HEADING LINE NO 3 IS -
0                         STILLING BASIN TO TOWNLEY BOX CULVERT
1
0                         WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO   1 IS A SYSTEM OUTLET     *         *     *
                     U/S DATA   STATION    INVERT  SECT                                    W S ELEV
                                 2240.00   47.99    1                                        55.88
0 ELEMENT NO   2 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                     RADIUS  ANGLE  ANG PT  MAN H
                                 2280.00   48.01    1             .016                        .00    .00     .00      0
0 ELEMENT NO   3 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                     RADIUS  ANGLE  ANG PT  MAN H
                                 2300.00   56.50    1             .050                        .00    .00     .00      0
0 ELEMENT NO   4 IS A TRANSITION        *         *     *
                     U/S DATA   STATION    INVERT  SECT              N
                                 2305.00   56.51    2             .050
0 ELEMENT NO   5 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                     RADIUS  ANGLE  ANG PT  MAN H
                                 2640.00   57.90    2             .016                        .00    .00     .00      0

0 ELEMENT NO   6 IS A JUNCTION          *         *     *     *                 *                 *              *
```

```
                    U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3       Q4    INVERT-3 INVERT-4  PHI 3   PHI 4
                               2650.00    58.00    3     5     0   .016    30.0       .0    61.50      .00   45.00     .00
ELEMENT NO   7 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
                               2700.00    58.20    3              .016                                  .00    .00     .00      0
0 ELEMENT NO   8 IS A TRANSITION     *         *     *
                    U/S DATA   STATION    INVERT  SECT              N
                               2710.00    58.40    4              .035
0 ELEMENT NO   9 IS A REACH          *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
                               2730.00    58.60    4              .035                                  .00    .00     .00      0
ELEMENT NO  10 IS A SYSTEM HEADWORKS                  *                    *
                    U/S DATA   STATION    INVERT  SECT                                   W S ELEV
                               2730.00    58.60    4                                        .00
NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
```


1

WATER SURFACE PROFILE LISTING

TENTH STREET WASH FILE NAME: TENTH2 66-INCH PIPES

ALTERNATIVE B FLOW ANALYSIS - UPSTREAM OF STILLING BASIN

STILLING BASIN TO TOWNLEY BOX CULVERT

STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH	NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
2240.00	47.99	7.89	55.88	1250.0	4.53	.32	56.20	.00	3.41		10.00	35.00	.00	0	.00
40.00	.00050					.00025	.01			6.22			.00		
2280.00	48.01	7.88	55.89	1250.0	4.53	.32	56.21	.00	3.41		10.00	35.00	.00	0	.00
.79	.42450					.00262	.00			1.49			.00		
2280.79	48.35	7.51	55.86	1250.0	4.75	.35	56.21	.00	3.41		10.00	35.00	.00	0	.00
.75	.42450					.00301	.00			1.49			.00		
2281.54	48.66	7.16	55.83	1250.0	4.99	.39	56.21	.00	3.41		10.00	35.00	.00	0	.00
.70	.42450					.00346	.00			1.49			.00		
2282.24	48.96	6.83	55.79	1250.0	5.23	.42	56.22	.00	3.41		10.00	35.00	.00	0	.00
.65	.42450					.00399	.00			1.49			.00		
2282.89	49.24	6.51	55.75	1250.0	5.48	.47	56.22	.00	3.41		10.00	35.00	.00	0	.00
.54	.42450					.00456	.00			1.49			.00		
2283.44	49.47	6.24	55.71	1250.0	5.72	.51	56.22	.00	3.41		10.00	35.00	.00	0	.00
HYDRAULIC JUMP													.00		
2283.44	49.47	1.61	51.08	1250.0	22.13	7.61	58.69	.00	3.41		10.00	35.00	.00	0	.00
1.11	.42450					.32514	.36			1.49			.00		
2284.54	49.94	1.63	51.57	1250.0	21.95	7.49	59.05	.00	3.41		10.00	35.00	.00	0	.00
4.75	.42450					.29800	1.42			1.49			.00		
2289.29	51.96	1.71	53.66	1250.0	20.93	6.81	60.47	.00	3.41		10.00	35.00	.00	0	.00
3.17	.42450					.25567	.81			1.49			.00		
2292.46	53.30	1.79	55.09	1250.0	19.95	6.19	61.28	.00	3.41		10.00	35.00	.00	0	.00
2.32	.42450					.21940	.51			1.49			.00		
2294.78	54.28	1.88	56.16	1250.0	19.02	5.62	61.79	.00	3.41		10.00	35.00	.00	0	.00
1.78	.42450					.18833	.33			1.49			.00		
2296.56	55.04	1.97	57.01	1250.0	18.14	5.11	62.12	.00	3.41		10.00	35.00	.00	0	.00
1.40	.42450					.16171	.23			1.49			.00		
2297.96	55.63	2.07	57.70	1250.0	17.29	4.65	62.35	.00	3.41		10.00	35.00	.00	0	.00
1.13	.42450					.13888	.16			1.49			.00		
2299.09	56.11	2.17	58.28	1250.0	16.49	4.23	62.50	.00	3.41		10.00	35.00	.00	0	.00
.91	.42450					.11931	.11			1.49			.00		

WATER SURFACE PROFILE LISTING

TENTH STREET WASH FILE NAME: TENTH2 66-INCH PIPES

ALTERNATIVE B FLOW ANALYSIS - UPSTREAM OF STILLING BASIN

STILLING BASIN TO TOWNLEY BOX CULVERT

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
O L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
2300.00	56.50	2.27	58.77	1250.0	15.72	3.84	62.61	.00	3.41		10.00	35.00	.00	0	.00
TRANS STR	.00200					.07584	.38						.00		
O 2305.00	56.51	4.05	60.56	1250.0	12.84	2.56	63.12	.00	4.57		5.00	20.00	1.00	0	.00
199.79	.00415					.00444	.89			4.07			1.00		
2504.79	57.34	3.94	61.28	1250.0	13.26	2.73	64.01	.00	4.57		5.00	20.00	1.00	0	.00
135.21	.00415					.00500	.68			4.07			1.00		
O 2640.00	57.90	3.78	61.68	1250.0	13.90	3.00	64.68	.00	4.57		5.00	20.00	1.00	0	.00
JUNCT STR	.01000					.00645	.06						1.00		
2650.00	58.00	3.72	61.72	1220.0	13.97	3.03	64.75	.00	4.38		6.00	25.00	.00	1	1.50
18.00	.00400					.00786	.14			4.67			.00		
O 2668.00	58.07	3.62	61.69	1220.0	14.35	3.20	64.89	.00	4.38		6.00	25.00	.00	1	1.50
32.00	.00400					.00875	.28			4.67			.00		
2700.00	58.20	3.45	61.65	1220.0	15.05	3.52	65.17	.00	4.38		6.00	25.00	.00	1	1.50
OTRANS STR	.02000					.02881	.29						.00		
2710.00	58.40	5.44	63.84	1220.0	10.73	1.79	65.63	.00	5.44		8.00	10.00	2.00	0	.00
4.72	.01000					.01216	.06			5.79			2.00		
2714.72	58.45	5.62	64.06	1220.0	10.23	1.63	65.69	.00	5.44		8.00	10.00	2.00	0	.00
O 15.28	.01000					.01096	.17			5.79			2.00		
2730.00	58.60	5.72	64.32	1220.0	9.95	1.54	65.86	.00	5.44		8.00	10.00	2.00	0	.00

STORM DRAIN ANALYSIS PLUS

Original version by Los Angeles County Public Works
Portions Copyrighted by CIVILSOFT, 1986, 1987, 1989

Version
Serial Number

Oct 4, 1994 11: 1:53

Alternative B - with Box Culvert Outlet from Stilling Basin

Input file : TENTHB.DAT
Output file: TENTHB.OUT

INPUT FILE LISTING

```
T1 TENTH STREET WASH    FILE NAME: TENTHB.DAT
T2 ALTERNATIVE B FLOW ANALYSIS - BOX FROM STILLING BASIN
T3 TO DOWNSTREAM OF ALICE AVE ANALYSIS
SO   1000.00  44.29  1                        48.37
R    1100.00  45.00  1      .030
TS   1110.00  45.11  2      .040
R    1195.00  46.00  2      .040
TS   1200.00  46.04  3      .016
R    2240.00  48.00  3      .016
SH                   3
                                                SP
                                WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING                          PAGE    1
0 CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
  CODE   NO   TYPE  PIERS   WIDTH    DIAMETER  WIDTH              DROP

  CD      1    1      0       .00      7.00   10.00   2.00  2.00   .00
  CD      2    1      0       .00      7.00   12.00   2.00  2.00   .00
  CD      3    3      1      1.00      4.00   13.00    .00   .00   .00
                                                                                                   PAGE NO    1
0                          WATER SURFACE PROFILE - TITLE CARD LISTING
0HEADING LINE NO 1 IS -
                             TENTH STREET WASH    FILE NAME: TENTHB.DAT
HEADING LINE NO 2 IS -
0                            ALTERNATIVE B FLOW ANALYSIS - BOX FROM STILLING BASIN
0HEADING LINE NO 3 IS -
                             TO DOWNSTREAM OF ALICE AVE ANALYSIS

0                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO   1 IS A SYSTEM OUTLET      *         *     *
                     U/S DATA   STATION    INVERT  SECT                                W S ELEV
                                 1000.00   44.29    1                                   48.37
0 ELEMENT NO   2 IS A REACH              *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                          RADIUS  ANGLE  ANG PT  MAN H
                                 1100.00   45.00    1              .030                            .00    .00     .00     0
0 ELEMENT NO   3 IS A TRANSITION         *         *     *
                     U/S DATA   STATION    INVERT  SECT              N
                                 1110.00   45.11    2              .040
  ELEMENT NO   4 IS A REACH              *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                          RADIUS  ANGLE  ANG PT  MAN H
                                 1195.00   46.00    2              .040                            .00    .00     .00     0
  ELEMENT NO   5 IS A TRANSITION         *         *     *
                     U/S DATA   STATION    INVERT  SECT              N
                                 1200.00   46.04    3              .016
0 ELEMENT NO   6 IS A REACH              *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                          RADIUS  ANGLE  ANG PT  MAN H
                                 2240.00   48.00    3              .016                            .00    .00     .00     0
0 ELEMENT NO   7 IS A SYSTEM HEADWORKS                 *                    *
                     U/S DATA   STATION    INVERT  SECT                                W S ELEV
                                 2240.00   48.00    3                                     .00
 NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
```

WATER SURFACE PROFILE LISTING

TENTH STREET WASH FILE NAME: TENTHB.DAT

ALTERNATIVE B FLOW ANALYSIS - BOX FROM STILLING BASIN

TO DOWNSTREAM OF ALICE AVE ANALYSIS

O	STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
	L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
0	1000.00	44.29	4.08	48.37	500.0	6.75	.71	49.08	.00	3.38		7.00	10.00	2.00	0	.00
	38.21	.00710					.00549	.21			3.76			2.00		
	1038.21	44.56	3.95	48.51	500.0	7.08	.78	49.29	.00	3.38		7.00	10.00	2.00	0	.00
	60.25	.00710					.00626	.38			3.76			2.00		
0	1098.46	44.99	3.82	48.81	500.0	7.42	.86	49.66	.00	3.38		7.00	10.00	2.00	0	.00
	1.54	.00710					.00667	.01			3.76			2.00		
	1100.00	45.00	3.82	48.82	500.0	7.43	.86	49.67	.00	3.38		7.00	10.00	2.00	0	.00
O	TRANS STR	.01100					.00928	.09						2.00		
0	1110.00	45.11	4.14	49.25	500.0	5.97	.55	49.80	.00	3.15		7.00	12.00	2.00	0	.00
	25.03	.01047					.00717	.18			3.68			2.00		
	1135.03	45.37	4.00	49.37	500.0	6.26	.61	49.98	.00	3.15		7.00	12.00	2.00	0	.00
0	31.96	.01047					.00818	.26			3.68			2.00		
0	1166.99	45.71	3.86	49.57	500.0	6.56	.67	50.24	.00	3.15		7.00	12.00	2.00	0	.00
	10.51	.01047					.00885	.09			3.68			2.00		
	1177.50	45.82	3.83	49.65	500.0	6.63	.68	50.33	.00	3.15		7.00	12.00	2.00	0	.00
O	HYDRAULIC JUMP													2.00		
	1177.50	45.82	2.53	48.35	500.0	11.56	2.08	50.43	.00	3.15		7.00	12.00	2.00	0	.00
	.91	.01047					.04319	.04			3.68			2.00		
0	1178.41	45.83	2.51	48.34	500.0	11.68	2.12	50.46	.00	3.15		7.00	12.00	2.00	0	.00
0	3.31	.01047					.04698	.16			3.68			2.00		
	1181.72	45.86	2.42	48.28	500.0	12.25	2.33	50.62	.00	3.15		7.00	12.00	2.00	0	.00
	3.35	.01047					.05380	.18			3.68			2.00		
0	1185.07	45.90	2.33	48.23	500.0	12.85	2.57	50.80	.00	3.15		7.00	12.00	2.00	0	.00
0	3.34	.01047					.06162	.21			3.68			2.00		
	1188.42	45.93	2.25	48.18	500.0	13.48	2.82	51.00	.00	3.15		7.00	12.00	2.00	0	.00
	3.32	.01047					.07060	.23			3.68			2.00		
0	1191.73	45.97	2.17	48.13	500.0	14.14	3.11	51.24	.00	3.15		7.00	12.00	2.00	0	.00
0	3.27	.01047					.08092	.26			3.68			2.00		
	1195.00	46.00	2.09	48.09	500.0	14.83	3.42	51.50	.00	3.15		7.00	12.00	2.00	0	.00
O	TRANS STR	.00800					.01047	.05						2.00		
0	1200.00	46.04	3.78	49.82	500.0	11.03	1.89	51.71	.00	3.78		4.00	13.00	.00	1	1.00
	2.61	.00189					.00669	.02			4.00			.00		
	1202.61	46.04	3.96	50.01	500.0	10.52	1.72	51.73	.00	3.78		4.00	13.00	.00	1	1.00
0	1.22	.00189					.00621	.01			4.00			.00		
0	1203.84	46.05	4.00	50.05	500.0	10.42	1.69	51.73	.00	3.78		4.00	13.00	.00	1	1.00
	1036.16	.00189					.00613	6.36			4.00			.00		
	2240.00	48.00	4.00	52.00	500.0	10.42	1.69	53.69	.00	3.78		4.00	13.00	.00	1	1.00

1

STORM DRAIN ANALYSIS PLUS

Original version by Los Angeles County Public Works
Portions Copyrighted by CIVILSOFT, 1986, 1987, 1989

Version
Serial Number

Oct 4, 1994 11:28: 3

Alternative B - with Box Culvert Outlet from Stilling Basin

Input file : TENTHB2.DAT
Output file: TENTHB2.OUT

INPUT FILE LISTING

```
T1 TENTH STREET WASH     FILE NAME: TENTHB2
T2 ALTERNATIVE B FLOW ANALYSIS - BOX CULVERT DOWNSTREAM OF STILLING BASIN
T3 STILLING BASIN TO TOWNLEY BOX CULVERT
SO   2240.00  47.99  1                          52.00
R    2280.00  48.01  1      .016
R    2300.00  56.50  1      .050
TS   2305.00  56.51  2      .050
R    2640.00  57.90  2      .016
JX   2650.00  58.00  3  5   .016    30.           61.50        45.
R    2700.00  58.20  3      .016
TS   2710.00  58.40  4      .035
R    2730.00  58.60  4      .035
SH                   4
                                                   SP
                                WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING                          PAGE    1
0 CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
  CODE   NO   TYPE  PIERS   WIDTH    DIAMETER  WIDTH              DROP

  CD      1    2      0       .00     10.00   35.00               .00
  CD      2    1      0       .00      5.00   20.00   1.00  1.00  .00
  CD      3    3      1      1.50      6.00   25.00    .00   .00  .00
  CD      4    1      0       .00      8.00   10.00   2.00  2.00  .00
  CD      5    4                       3.00
1                                                                                                          PAGE NO   1
0                         WATER SURFACE PROFILE - TITLE CARD LISTING
HEADING LINE NO 1 IS -
                          TENTH STREET WASH     FILE NAME: TENTHB2
0HEADING LINE NO 2 IS -
                          ALTERNATIVE B FLOW ANALYSIS - BOX CULVERT DOWNSTREAM OF STILLING BASIN
HEADING LINE NO 3 IS -
0                         STILLING BASIN TO TOWNLEY BOX CULVERT
1                                                                                                          PAGE NO   2
                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
 ELEMENT NO   1 IS A SYSTEM OUTLET     *         *     *
                     U/S DATA   STATION    INVERT  SECT                                  W S ELEV
                                 2240.00   47.99    1                                      52.00
 ELEMENT NO   2 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                          RADIUS  ANGLE  ANG PT  MAN H
                                 2280.00   48.01    1             .016                           .00    .00     .00     0
0 ELEMENT NO   3 IS A REACH            *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                          RADIUS  ANGLE  ANG PT  MAN H
                                 2300.00   56.50    1             .050                           .00    .00     .00     0
0 ELEMENT NO   4 IS A TRANSITION       *         *     *
                     U/S DATA   STATION    INVERT  SECT              N
                                 2305.00   56.51    2             .050
0 ELEMENT NO   5 IS A REACH            *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                          RADIUS  ANGLE  ANG PT  MAN H
                                 2640.00   57.90    2             .016                           .00    .00     .00     0
 ELEMENT NO   6 IS A JUNCTION          *         *     *     *                 *                 *       *
                     U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2  N      Q3       Q4    INVERT-3 INVERT-4  PHI 3   PHI 4
                                 2650.00   58.00    3     5     0   .016     30.0      .0    61.50     .00   45.00     .00
```

ELEMENT NO 7 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2700.00	58.20	3	.016	.00	.00	.00	0

ELEMENT NO 8 IS A TRANSITION * * *

U/S DATA	STATION	INVERT	SECT	N
	2710.00	58.40	4	.035

ELEMENT NO 9 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2730.00	58.60	4	.035	.00	.00	.00	0

ELEMENT NO 10 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	2730.00	58.60	4	.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

WATER SURFACE PROFILE LISTING

TENTH STREET WASH FILE NAME: TENTHB2

ALTERNATIVE B FLOW ANALYSIS - BOX CULVERT DOWNSTREAM OF STILLING BASIN

STILLING BASIN TO TOWNLEY BOX CULVERT

STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH	NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
2240.00	47.99	1.74	49.73	1250.0	20.53	6.55	56.28	.00	3.41		10.00	35.00	.00	0	.00
2240.00	47.99	1.74	49.73	1250.0	20.53	6.55	56.28	.00	3.41		10.00	35.00	.00	0	.00
.13	.00050					.02651	.00			6.22			.00		
2240.13	47.99	1.74	49.73	1250.0	20.54	6.55	56.28	.00	3.41		10.00	35.00	.00	0	.00
20.35	.00050					.02873	.58			6.22			.00		
2260.48	48.00	1.66	49.66	1250.0	21.54	7.21	56.87	.00	3.41		10.00	35.00	.00	0	.00
19.52	.00050					.03349	.65			6.22			.00		
2280.00	48.01	1.58	49.59	1250.0	22.59	7.93	57.52	.00	3.41		10.00	35.00	.00	0	.00
4.54	.42450					.33644	1.53			1.49			.00		
2284.54	49.94	1.63	51.57	1250.0	21.95	7.49	59.05	.00	3.41		10.00	35.00	.00	0	.00
4.75	.42450					.29800	1.42			1.49			.00		
2289.29	51.96	1.71	53.66	1250.0	20.93	6.81	60.47	.00	3.41		10.00	35.00	.00	0	.00
3.17	.42450					.25567	.81			1.49			.00		
2292.46	53.30	1.79	55.09	1250.0	19.95	6.19	61.28	.00	3.41		10.00	35.00	.00	0	.00
2.32	.42450					.21940	.51			1.49			.00		
2294.78	54.28	1.88	56.16	1250.0	19.02	5.62	61.79	.00	3.41		10.00	35.00	.00	0	.00
1.78	.42450					.18833	.33			1.49			.00		
2296.56	55.04	1.97	57.01	1250.0	18.14	5.11	62.12	.00	3.41		10.00	35.00	.00	0	.00
1.40	.42450					.16171	.23			1.49			.00		
2297.96	55.63	2.07	57.70	1250.0	17.29	4.65	62.35	.00	3.41		10.00	35.00	.00	0	.00
1.13	.42450					.13888	.16			1.49			.00		
2299.09	56.11	2.17	58.28	1250.0	16.49	4.23	62.50	.00	3.41		10.00	35.00	.00	0	.00
.91	.42450					.11931	.11			1.49			.00		
2300.00	56.50	2.27	58.77	1250.0	15.72	3.84	62.61	.00	3.41		10.00	35.00	.00	0	.00
TRANS STR	.00200					.07584	.38						.00		
2305.00	56.51	4.05	60.56	1250.0	12.84	2.56	63.12	.00	4.57		5.00	20.00	1.00	0	.00
199.79	.00415					.00444	.89			4.07			1.00		
2504.79	57.34	3.94	61.28	1250.0	13.26	2.73	64.01	.00	4.57		5.00	20.00	1.00	0	.00
135.21	.00415					.00500	.68			4.07			1.00		
2640.00	57.90	3.78	61.68	1250.0	13.90	3.00	64.68	.00	4.57		5.00	20.00	1.00	0	.00
JUNCT STR	.01000					.00645	.06						1.00		
2650.00	58.00	3.72	61.72	1220.0	13.97	3.03	64.75	.00	4.38		6.00	25.00	.00	1	1.50
18.00	.00400					.00786	.14			4.67			.00		
2668.00	58.07	3.62	61.69	1220.0	14.35	3.20	64.89	.00	4.38		6.00	25.00	.00	1	1.50
32.00	.00400					.00875	.28			4.67			.00		
2700.00	58.20	3.45	61.65	1220.0	15.05	3.52	65.17	.00	4.38		6.00	25.00	.00	1	1.50
TRANS STR	.02000					.02881	.29						.00		
2710.00	58.40	5.44	63.84	1220.0	10.73	1.79	65.63	.00	5.44		8.00	10.00	2.00	0	.00
4.72	.01000					.01216	.06			5.79			2.00		

STORM DRAIN ANALYSIS PLUS

Original version by Los Angeles County Public Works
Portions Copyrighted by CIVILSOFT, 1986, 1987, 1989

Version
Serial Number

Oct 4, 1994 12:57:16

Alternative B - Townley Box Culvert to Stilling Basin w/Tail Water El. = 1260.0

Input file : TENTH3.DAT
Output file: TENTH3.OUT

INPUT FILE LISTING

```
T1 TENTH STREET WASH     FILE NAME: TENTH3
T2 ALTERNATIVE B FLOW ANALYSIS - UPSTREAM OF STILLING BASIN WITH 59 TAILWATER ELEV.
T3 STILLING BASIN TO TOWNLEY BOX CULVERT
SO   2240.00  47.99  1                          59.00
R    2280.00  48.01  1      .016
R    2300.00  56.50  1      .050
TS   2305.00  56.51  2      .050
R    2640.00  57.90  2      .016
JX   2650.00  58.00  3  5   .016    30.          61.50        45.
R    2700.00  58.20  3      .016
TS   2710.00  58.40  4      .035
R    2730.00  58.60  4      .035
SH                   4
                                                 SP
                                WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING                          PAGE    1
0 CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR    INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
  CODE   NO   TYPE  PIERS   WIDTH    DIAMETER  WIDTH              DROP

  CD      1    2      0       .00     10.00   35.00                .00
  CD      2    1      0       .00      5.00   20.00   1.00  1.00   .00
  CD      3    3      1      1.50      6.00   25.00    .00   .00   .00
  CD      4    1      0       .00      8.00   10.00   2.00  2.00   .00
  CD      5    4                       3.00
1
                          WATER SURFACE PROFILE - TITLE CARD LISTING
HEADING LINE NO 1 IS -    TENTH STREET WASH     FILE NAME: TENTH3
0HEADING LINE NO 2 IS -   ALTERNATIVE B FLOW ANALYSIS - UPSTREAM OF STILLING BASIN WITH 59 TAILWATER ELEV
0HEADING LINE NO 3 IS -   STILLING BASIN TO TOWNLEY BOX CULVERT

                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO   1 IS A SYSTEM OUTLET     *         *     *
                      U/S DATA   STATION    INVERT  SECT                                    W S ELEV
                                  2240.00   47.99    1                                        59.00
0 ELEMENT NO   2 IS A REACH             *         *     *
                      U/S DATA   STATION    INVERT  SECT              N                   RADIUS  ANGLE  ANG PT  MAN H
                                  2280.00   48.01    1             .016                      .00    .00     .00     0
  ELEMENT NO   3 IS A REACH             *         *     *
                      U/S DATA   STATION    INVERT  SECT              N                   RADIUS  ANGLE  ANG PT  MAN H
                                  2300.00   56.50    1             .050                      .00    .00     .00     0
  ELEMENT NO   4 IS A TRANSITION        *         *     *
                      U/S DATA   STATION    INVERT  SECT              N
                                  2305.00   56.51    2             .050
0 ELEMENT NO   5 IS A REACH             *         *     *
                      U/S DATA   STATION    INVERT  SECT              N                   RADIUS  ANGLE  ANG PT  MAN H
                                  2640.00   57.90    2             .016                      .00    .00     .00     0
```

```
0 ELEMENT NO   6 IS A JUNCTION          *         *     *     *                 *                 *              *
                    U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3       Q4    INVERT-3 INVERT-4  PHI 3   PHI 4
                                 2650.00   58.00    3     5     0  .016     30.0       .0    61.50      .00  45.00     .00
  ELEMENT NO   7 IS A REACH             *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
                                 2700.00   58.20    3              .016                                   .00    .00     .00      0
  ELEMENT NO   8 IS A TRANSITION        *         *     *
                    U/S DATA   STATION    INVERT  SECT              N
                                 2710.00   58.40    4              .035
0 ELEMENT NO   9 IS A REACH             *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
                                 2730.00   58.60    4              .035                                   .00    .00     .00      0
0 ELEMENT NO  10 IS A SYSTEM HEADWORKS                *                    *
                    U/S DATA   STATION    INVERT  SECT                                   W S ELEV
                                 2730.00   58.60    4                                       .00
NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
1                                                                                                                   PAGE    2
```

WATER SURFACE PROFILE LISTING

TENTH STREET WASH FILE NAME: TENTH3

ALTERNATIVE B FLOW ANALYSIS - UPSTREAM OF STILLING BASIN WITH 59 TAILWATER ELEV.

STILLING BASIN TO TOWNLEY BOX CULVERT

	STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
	L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
0	2240.00	47.99	11.01	59.00	1250.0	3.24	.16	59.16	.00	3.41		10.00	35.00	.00	0	.00
0	40.00	.00050					.00010	.00			6.22			.00		
	2280.00	48.01	10.99	59.00	1250.0	3.25	.16	59.17	.00	3.41		10.00	35.00	.00	0	.00
0	1.17	.42450					.00100	.00			1.49			.00		
0	2281.17	48.51	10.48	58.99	1250.0	3.41	.18	59.17	.00	3.41		10.00	35.00	.00	0	.00
	1.11	.42450					.00115	.00			1.49			.00		
	2282.28	48.98	9.99	58.97	1250.0	3.57	.20	59.17	.00	3.41		10.00	35.00	.00	0	.00
0	1.05	.42450					.00132	.00			1.49			.00		
0	2283.33	49.42	9.53	58.95	1250.0	3.75	.22	59.17	.00	3.41		10.00	35.00	.00	0	.00
	1.00	.42450					.00151	.00			1.49			.00		
	2284.33	49.85	9.09	58.93	1250.0	3.93	.24	59.17	.00	3.41		10.00	35.00	.00	0	.00
0	.94	.42450					.00173	.00			1.49			.00		
0	2285.27	50.25	8.66	58.91	1250.0	4.12	.26	59.17	.00	3.41		10.00	35.00	.00	0	.00
	.89	.42450					.00199	.00			1.49			.00		
	2286.16	50.63	8.26	58.89	1250.0	4.32	.29	59.18	.00	3.41		10.00	35.00	.00	0	.00
0	.84	.42450					.00228	.00			1.49			.00		
0	2287.00	50.98	7.88	58.86	1250.0	4.53	.32	59.18	.00	3.41		10.00	35.00	.00	0	.00
	.79	.42450					.00262	.00			1.49			.00		
0	2287.80	51.32	7.51	58.83	1250.0	4.76	.35	59.18	.00	3.41		10.00	35.00	.00	0	.00
0	.75	.42450					.00301	.00			1.49			.00		
	2288.54	51.64	7.16	58.80	1250.0	4.99	.39	59.18	.00	3.41		10.00	35.00	.00	0	.00
	.70	.42450					.00347	.00			1.49			.00		
0	2289.24	51.93	6.83	58.76	1250.0	5.23	.43	59.19	.00	3.41		10.00	35.00	.00	0	.00
0	.65	.42450					.00399	.00			1.49			.00		
	2289.90	52.21	6.51	58.72	1250.0	5.49	.47	59.19	.00	3.41		10.00	35.00	.00	0	.00
	.61	.42450					.00460	.00			1.49			.00		
0	2290.51	52.47	6.21	58.68	1250.0	5.76	.51	59.19	.00	3.41		10.00	35.00	.00	0	.00
0	.57	.42450					.00531	.00			1.49			.00		
	2291.07	52.71	5.92	58.63	1250.0	6.04	.57	59.19	.00	3.41		10.00	35.00	.00	0	.00
0	.02	.42450					.00570	.00			1.49			.00		
0	2291.09	52.72	5.91	58.63	1250.0	6.05	.57	59.19	.00	3.41		10.00	35.00	.00	0	.00

WATER SURFACE PROFILE LISTING

TENTH STREET WASH FILE NAME: TENTH3

ALTERNATIVE B FLOW ANALYSIS - UPSTREAM OF STILLING BASIN WITH 59 TAILWATER ELEV.

STILLING BASIN TO TOWNLEY BOX CULVERT

O STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH	NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
HYDRAULIC JUMP													.00		
2291.09	52.72	1.75	54.47	1250.0	20.42	6.48	60.95	.00	3.41		10.00	35.00	.00	0	.00
1.37	.42450					.24521	.34			1.49			.00		
2292.46	53.30	1.79	55.09	1250.0	19.95	6.19	61.28	.00	3.41		10.00	35.00	.00	0	.00
2.32	.42450					.21940	.51			1.49			.00		
2294.78	54.28	1.88	56.16	1250.0	19.02	5.62	61.79	.00	3.41		10.00	35.00	.00	0	.00
1.78	.42450					.18833	.33			1.49			.00		
2296.56	55.04	1.97	57.01	1250.0	18.14	5.11	62.12	.00	3.41		10.00	35.00	.00	0	.00
1.40	.42450					.16171	.23			1.49			.00		
2297.96	55.63	2.07	57.70	1250.0	17.29	4.65	62.35	.00	3.41		10.00	35.00	.00	0	.00
1.13	.42450					.13888	.16			1.49			.00		
2299.09	56.11	2.17	58.28	1250.0	16.49	4.23	62.50	.00	3.41		10.00	35.00	.00	0	.00
.91	.42450					.11931	.11			1.49			.00		
2300.00	56.50	2.27	58.77	1250.0	15.72	3.84	62.61	.00	3.41		10.00	35.00	.00	0	.00
TRANS STR	.00200					.07584	.38						.00		
2305.00	56.51	4.05	60.56	1250.0	12.84	2.56	63.12	.00	4.57		5.00	20.00	1.00	0	.00
199.79	.00415					.00444	.89			4.07			1.00		
2504.79	57.34	3.94	61.28	1250.0	13.26	2.73	64.01	.00	4.57		5.00	20.00	1.00	0	.00
135.21	.00415					.00500	.68			4.07			1.00		
2640.00	57.90	3.78	61.68	1250.0	13.90	3.00	64.68	.00	4.57		5.00	20.00	1.00	0	.00
JUNCT STR	.01000					.00645	.06						1.00		
2650.00	58.00	3.72	61.72	1220.0	13.97	3.03	64.75	.00	4.38		6.00	25.00	.00	1	1.50
18.00	.00400					.00786	.14			4.67			.00		
2668.00	58.07	3.62	61.69	1220.0	14.35	3.20	64.89	.00	4.38		6.00	25.00	.00	1	1.50
32.00	.00400					.00875	.28			4.67			.00		
2700.00	58.20	3.45	61.65	1220.0	15.05	3.52	65.17	.00	4.38		6.00	25.00	.00	1	1.50
TRANS STR	.02000					.02881	.29						.00		
2710.00	58.40	5.44	63.84	1220.0	10.73	1.79	65.63	.00	5.44		8.00	10.00	2.00	0	.00
4.72	.01000					.01216	.06			5.79			2.00		
2714.72	58.45	5.62	64.06	1220.0	10.23	1.63	65.69	.00	5.44		8.00	10.00	2.00	0	.00
15.28	.01000					.01096	.17			5.79			2.00		
2730.00	58.60	5.72	64.32	1220.0	9.95	1.54	65.86	.00	5.44		8.00	10.00	2.00	0	.00

RUST ENVIRONMENT & INFRASTRUCTURE

CALCULATION SHEET

PAGE 1 OF ___
PROJECT NO. ___

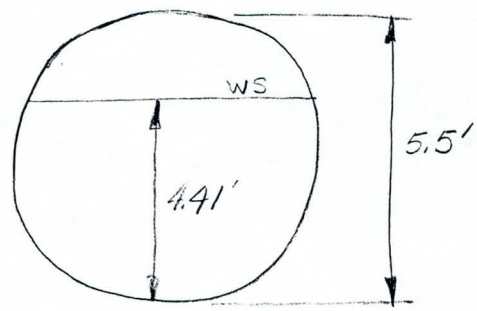
CLIENT FCDMC
PROJECT 10th Street Wash

SUBJECT Computer Calc - Hand Check

Prepared By DCM Date 4/3/95
Reviewed By ___ Date ___
Approved By ___ Date ___

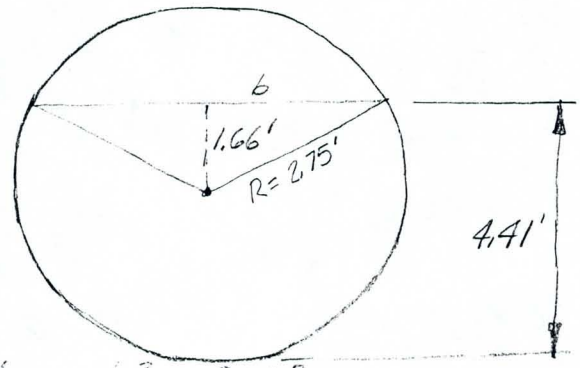
W.S. Elev @ Sta 12+00 = 50.45
Invert of 66" pipes @ Sta 12+00 = 46.04
4.41

66" Dia Pipe



1) Calculate the Hydraulic Radius.

Hyd Rad = $\frac{\text{Wet Perim}}{\text{Cross area}}$



HP 41CV Survey Pac
2b = C = 4.38
R = 2.75
D = 2083.295
Δ = 105.34
L = 5.07'
T = 3.62'
C = 4.38'
M = 1.09'
E = 1.80'
Sec = 6.97
Seg = 3.32
F/l = 2.99

Find b based on $h^2 = a^2 + b^2$
h = 2.75
a = 1.66

$$b = \sqrt{h^2 - a^2} = \sqrt{2.75^2 - 1.66^2} = 2.19'$$

2b = C (Chord Length) = 4.38'
R = 2.75

Using HP 41CV Survey Pac to calc arc length & seg. area based on water depth of 4.08', L = 5.07' & Seg = 3.32 ft²

Perimeter = $2\pi R$ = $2\pi(3.14)$ = 17.28 ft

Cross area = πR^2 = 23.76 ft²

$$\text{Hyd. Rad} = \frac{17.28 - 5.07}{23.76 - 3.32} = \frac{12.21}{20.44} = 0.598$$

RUST ENVIRONMENT & INFRASTRUCTURE

CALCULATION SHEET

PAGE 2 OF ___
PROJECT NO. ___

CLIENT FCDMC
PROJECT 10th St. Wash

SUBJECT Computer calc
hand check

Prepared By ___ Date ___
Reviewed By ___ Date ___
Approved By ___ Date ___

2) Calculate velocity within 66" pipe @ Sta 12+00

Given

Flow (1 pipe) = 250 cfs

depth = 4.41

hyd. Radius, R = 1.5975

$$\text{Slope} = \frac{49.00 - 46.04}{2480 - 1200} = \frac{2.96}{1280} = 0.0023$$

n = 0.013

area = 20.44 ft²

$V = Q/A = 250 \text{ cfs}/20.44 \text{ ft}^2 = 12.23 \text{ fps}$

Model velocity @ Sta 12+00 = 12.24 fps checks

3) Calculate hyd. radius & velocity @ Sta 14+44.21

d = 5.5 (full pipe) hyd Rad = d/4 = 1.375

Velocity = Q/A = 250/23.76 = 10.52 checks

4) Calculate Friction Slope between Sta 12+00 and 24+80

WS elev @	24+80	57.00
WS elev @	12+00	50.45
	1280'	6.55

Slope = 6.55 / 1280 = 0.0051 computed SF Ave = 0.0047 close.

5) Calculate velocity in trapezoidal channel @ Sta 10+38

Given:

Q = 500

n = 0.030

S = 0.0071 (Channel)

d = 4.08 (Flowmaster Tailwater depth)

RUST ENVIRONMENT & INFRASTRUCTURE

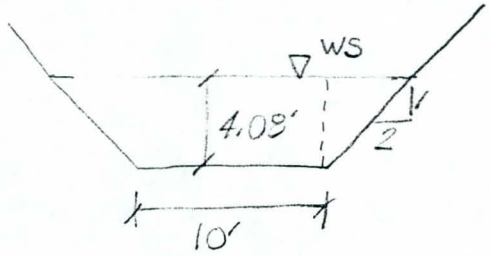
CALCULATION SHEET

PAGE 3 OF ___
PROJECT NO. ___

CLIENT FCDMC
PROJECT 10th St. Wash

SUBJECT Computer Calc
hand Check

Prepared By ___ Date ___
Reviewed By ___ Date ___
Approved By ___ Date ___



$h = \sqrt{4.08^2 + 8.16^2}$
$= 9.12$ ft

Area = $(10 \times 4.08) + (4.08' \times 8.16')/2 \times 2 = 74.09\ ft^2$ (✓'s)
Wetted perimeter = $10 + 2 \times 9.12 = 28.25$ ft (✓'s)

$V = Q/A = 500/74.09 = 6.75$ fps (✓'s)

Velocity checks w/ both StormPlus & Flowmaster computer models.

- See attached copies of computer runs.

RESEARCH ENGINEERS, INC.

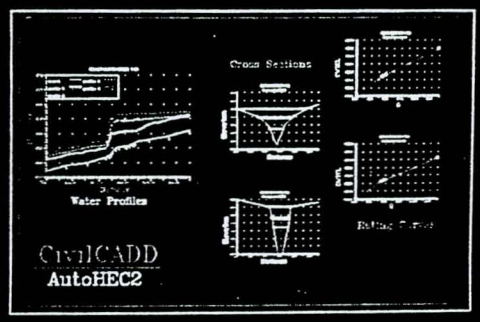
A reputation you can build on.

CIVILSOFT

CIVILSOFT

Advanced Designer Series

STORM Plus



STORM Plus is based on the original computer program F0515P
and was developed in April 1979

STORM Plus

Storm Drain Analysis Program

Hydraulic Analysis System

Los Angeles County Flood Control District
A. E. Bruington, Chief Engineer

STORM Plus

Storm Drain Analysis Program

Hydraulic Analysis System

The STORM Plus MANUAL is the result of a collaborative effort. It would be ungracious to observe the anonymity of those who contributed substantially to the completion of the manual. Therefore, we give special thanks to the following persons:

Saman J. Shahin & Garvin J. Pederson of Design Systems & Standards Group - Design Division

and

Richard A. Schaeffer of the Business and Fiscal Division

April 1979

INTRODUCTION

Program Description

This program is a hydraulic analysis system developed by the Design Systems and Standards Group of the Design Division and the Data Processing Section of the Business and Fiscal Division of the Los Angeles County Flood Control District.

The program computes and plots uniform and nonuniform steady flow water surface profiles and pressure gradients in open channels or closed conduits with irregular or regular sections. The flow in a system may alternate between super critical, subcritical or pressure flow in any sequence. The program will also analyze natural river channels although the principle use of the program is intended for determining profiles in improved flood control systems.

Size Restrictions

1) A maximum of 200 elements are allowed per run.

2) A maximum of 50 intermediate points can be computed in a reach element.

3) Critical depth cannot exceed 100 feet.

4) Program will not compute the water surface profile when the friction slope is at one or greater.

5) Open channel processing is limited to a depth ten feet above the height of the described element.

6) Undulating bottoms cannot be calculated properly in an irregular shaped section unless the depth of flow is above the undulations.

7) The program will not accept vertical drops in invert elevations.

8) Calculations in the Water Surface profile print out may be slightly inaccurate (to .001) due to rounding variables to be contained on the U/S and D/S data files.

GENERAL PROGRAM DESCRIPTION

Basic Theory

The computational procedure is based on solving Bernoulli's equation for the total energy at each section and Manning's formula for friction loss between the sections in a reach. The open channel flow procedure utilizes the standard step method. Confluences and bridge piers are analyzed using pressure and momentum theory.

The program uses basic mathematical and hydraulic principles to calculate all such data as cross sectional area, wetted perimeter, normal depth, critical depth, pressure, and momentum.

Computational Procedure

1) Input Preparation

The channel or conduit system is initially subdivided into the following elements: system outlet, reach, transition, confluence (junction), bridge exit, bridge entrance, wall entrance (sudden contraction), wall exit (sudden expansion), and sytem headworks. Each element is internally assigned a number. The input data must consist of a minimum of three elements (system outlet, system headwork and any other element) and is limited to a maximum of 200 elements. A greater number of elements will require a breakup into two or more systems.

2) Flow Rates

The starting flow rate (Q) at the upstream terminus of a system is specified on a "Q" record. The flow rate (Q) is increased at the desired locations by specifying lateral inflow rates on the "JX" data records. The flow rate can be reduced by using a negative lateral Q, this reduction is intended to account for channel storage. If it is used in cases where the channel or conduit branches it should be understood no loss is computed.

3) Multiple Profiles

To obtain additional watersurface or pressure gradient profiles for different flow rates in the system, additional Q records may be supplied. The only limitation on the number of profiles that may be run at one time is the limit

on the program execution time which is set by the computer center.

4) Manning's "n"

The program uses the Manning formula for the friction loss in all types of conduits or natural channels. The program can only take one "n" value per element, however, the "n" value can change at subsequent elements. If a section has a lining composed of different roughness coefficients a composite "n" based on anticipated depth of flow should be hand computed. If an "n" value is not specified with the input data, the program uses a value of .014.

5) Water Surface Controls

Water surface controls at the downstream terminus (System Outlet S.O.) or the upstream terminus (System Headworks S.H.) are optional input values. If watersurface controls are not given the program will use critical depth controls.

6) Critical and Normal Depths

Critical depth is computed for every section for the given Q utilizing the "Specific Energy Equation".

Normal depth is computed in every reach element on a positive slope for the specified Q.

The velocity head (Hy) is computed using the mean velocity of the section. This may not be accurate in the case of a complex section such as one with shallow flow in the horizontal overbank area where velocity distribution is not uniform. If the program is to be used in this situation the user should be aware that some error may be introduced in the results. A check on the magnitude of the error can be made by the user utilizing the parabolic method to determine specific energy (see Appendix).

7) Water surface Stages

The lower stage w.s. profile begins at the system headworks and ends at the system outlet. The computation will proceed downstream in every consecutive element as long as energy is available to maintain flow in the supercritical stage. When energy becomes expended at any point in an element, the lower stage profile will be discontinued from that point to the downstream end of that element. Then computation will resume in the next element with a critical depth control until the system outlet is analyzed.

The upper stage w.s. profile, begins at the system outlet, and ends at the headworks. Computation proceeds upstream in every element as long as the water surface at the downstream end of any two adjacent points can support the moving mass of water to flow at the critical or subcritical depth. Otherwise, computation will be discontinued from the downstream point to the upstream end of that element. Then computation will resume at the downstream end of the next element with critical depth control, provided no depth less than critical depth has been computed at that point on the lower stage profile. Then computation will proceed upstream until the system headworks is analyzed. Note that if the computed depth of flow in any open section exceeds the given section height the program will assume an additional 10-feet of vertical wall except for Channel Type 1 where the side slopes are extended outward until the 10-feet vertical height is reached.

The jump routine begins at the system outlet and ends at the headworks. It searches the lower stage and the upper stage profiles for points of equal energy. If a jump is encountered, it will be approximately located; and data on either the upper stage or lower stage not consistent with the greater energy theory will be deleted from every element. The final profile will be a composite of upper stage and lower stage with hydraulic jumps in between.

Data Processing System Description

STORM Plus requires the use of an input media (such as a data record), temporary disk storage, and a printer. This program is designed to run in batch mode.

Required input to the system consists of:

1. Job Description data record
2. Title information
3. Channel element definitions
4. Cross section definition
5. Cross section points definition
6. Q record, of which the first is required and the subsequent Q records are optional for change of flow rate in the system.

The entire input is thoroughly scanned for required information and range values of optional information before processing begins. If any errors are detected, processing will stop. Warnings may be issued, but they will not prevent processing.

Processing consists of three phases: Analysis of the system in the downstream direction (phase I), analysis of the system in the upstream direction (Phase II), and analysis of the downstream profile (from Phase I) and the upstream profile (from Phase II) to obtain a composite profile (Phase III). The processing was designed to continue calculation unless gross errors are encountered. Warning messages may be issued concerning tolerance levels not being reached on an iterative approximation. These may or may not effect the overall solution to the problem; however, processing continues. If gross erros are encountered, an error message will be issued and processing will stop.

Output of the system consists of the following:

1. A listing of input with edit scanning messages

2. A w.s. profile listing of the composite profile obtained in Phase III of processing

3. A profile plot of watersurface and channel geometry

APPENDIX

This Appendix contains the computational symbols, methods, procedures, and equations used in the program.

Table of Contents **Page**

1. Symbol Definitions 9-2
2. Irregular Section Definitions 9-4
3. Conduit Section Geometry Equations 9-6
   - Flow Area 9-6
   - Wetted Perimeter 9-7
   - Hydrostatic Pressure 9-8
   - Depth of Flow 9-9
4. Computational Procedures 9-10
   - Basic Equations of Steady Flow 9-10
   - Reach Analysis 9-11
   - Transition Analysis 9-12
   - Junction Analysis 9-12
   - Pier Analysis 9-13
   - Wall Entrance Analysis 9-14
   - Wall Exit 9-14
5. References 9-15

SYMBOL DEFINITIONS

Symbol	Definition
A	Cross sectional area of flow
Ap	Cross sectional area of pier
b	Base width of channel
bnet	Net base width of channel
bp	Average base width of piers
D	Depth of flow
Dc	Critical depth
Δ L	Length between two stations
Δ H	Drop in invert between two points
DH	Maximum open flow depth in a section: Ten feet above channel in closed section, Height of channel in closed section
DN	Normal depth
E	Specific Energy
EGL	Energy Grade Line elevation
e	Invert cross fall in inches
F	Force
g	Gravitational constant (32.2 ft/sec/sec)
HAPT	Head loss due to angle point
HB	Head loss due to bend or curve
HF	Head loss due to friction
HJ	Head loss in a junction
HMH	Head loss in a manhole
Ht	Head loss in a transition
HV	Velocity head
INV	Invert elevation in a channel section
M	Momentum
n	Manning's n, coefficient of roughness
No P	Number of piers in a section (max. of 10)
P	Hydrostatic Pressure
Q	Flow Rate
R	Radius of pipe
RH	Hydraulic radius
r	Radius of curve on horizontal alignment
SF	Friction slope (energy loss per foot)
Sc	Critical slope (slope at critical depth)
So	Invert slope
SE	Super elevation
STA	Station
V	Velocity
WP	Wetted perimeter
WS/HGL	Water Surface or Hydraulic Grade Line Elevation
ZL	Left side slope
ZR	Right side slope

These variables may have one of two suffixes

1. Identifies the variable at the upstream end of an element.
2. Identifies the variable at the downstream end of an element.

Example: V1: is velocity at the upstream end
V2: is velocity at the downstream end.

Throughout this program: U/S is the upstream end
D/S is the downstream end

IRREGULAR SECTION DEFINITIONS

Points i(X,Y) from i = 1 to i = n, in counter clockwise direction ($3 \leq n \leq 99$) define an irregular cross section.

X(i) : X coordinate of point(i)

Y(i) : Y coordinate of point(i)

Y(p) : Y coordinate of base of pier, from P = 1 to P = n given from left to right ($0 \leq n \leq 10$)

$\Delta X(i)$ = X(i) - X(i-1)

$\Delta Y(i)$ = Y(i) - Y(i-1)

Ymin = The least Y(i)

Y(i) = Y(i)-Ymin, subtract Ymin from every Y(i) on file

Y(P) = Y(P)-Ymin, subtract Ymin from every Y(P) on file

Ymax : Maximum open flow depth in a cross section
All points whose Y(i)> Ymax will be dropped from file

Y(D) : Depth of flow in a section part full or under pressure

DH = Ymax + 1Ø' in an open top section

DH = Ymax in a covered section

Point iBEG(X,Y): Contact Point of W.S. and the left bank.

If [Y(D)$\geq$Ymax] then Y(iBEG) = Ymax

and X(iBEG) is least X for Ymax

If [Y(D)<Ymax] then Y(iBEG) = Y(D)

$$X(iBEG) = [\Delta X(i+1) / \Delta Y(i+1)] [Y(D) - Y(i)] + X(i)$$

where Y(i) and Y(i+1) are the domain of Y(D) from Y(1) to Ymin.

<u>Point iEND (X,Y):</u> Contact Point of W.S. and the right bank.

If [Y(D) $\geq$ Ymax] then Y(iEND) = Ymax

and X(iEND) is the maximum X with Ymax.

If [Y(D) < Ymax] then Y(iEND) = Y(D)

$$X(iEND) = [\Delta X(i+1) / \Delta Y(i+1)] [Y(D) - Y(i)] + X(i)$$

where Y(i-1) and Y(i) are the domain of Y(D) from Ymin to Y(n).

Let Point 1 (X,Y) = Point iBEG (X,Y)

where X(1) = X(iBEG)
Y(1) = Y(iBEG)

Let Point n (X,Y) = Point iEND (X,Y)

where X(n) = X(iEND)
Y(n) = Y(iEND)

Also Point n+1 (X,Y) = Point 1 (X,Y)

where X(n+1) = X(1)
Y(n+1) = Y(1)

Conduit Section Geometry Equations

Flow AREA (A)

The Area (A) of flow is a function of the depth of flow and the geometry of the channel or conduit section.

1. CHAN. TYPE 1:

   $A = D\,[bnet + 0.5\,D\,(ZL+ZR)] - [e \cdot bnet/24]$

2. CHAN. TYPE 2:

   $A = [D \cdot bnet] - [e \cdot bnet/24]$

3. CHAN. TYPE 3:

   If D is less than Chan. height (H) see Process 1. Otherwise:

   $A = H\,[bnet + 0.5\,H\,(ZL+ZR)] - [e \cdot bnet/24] - [0.25\,(1 + NOP)]$

4. CHAN. TYPE 4:

   If D is equal or greater than Diameter

   $A = \pi\,(R)^2$

   otherwise

   $A = (D-R)\sqrt{2RD - (D)^2} + [\pi\,(R)^2/180]\,[\mathrm{Arcsin}\,((D-R)/R)] + \pi\,(R)^2/2$

5. CHAN. TYPE 5:

   $$A = \sum_{i=2}^{i=n+1} \Delta X(i)\,[Y(D) - Y(i)] + 0.5[\Delta X(i) - \Delta Y(i)] - \sum_{P=1}^{P=n} (bp)\,[Y(D) - Y(P)]$$

6. CHAN. TYPE 6:

   See Process 5.

WETTED PERIMETER (WP)

WP is a function of the depth of flow and the geometry of the conduit or channel section.

1. CHAN. TYPE 1:

$$WP = D\left[\sqrt{1 + (ZL)^2} + \sqrt{1 + (ZR)^2} + (2 \cdot NOP)\right] + bnet$$

2. CHAN. TYPE 2:

$$WP = 2\ D\ (1 + NOP) + bnet$$

3. CHAN. TYPE 3:

If D is less than chan. height (H) see Process 1. Otherwise:

$$WP = D\left[\sqrt{1 + (ZL)^2} + \sqrt{1 + (ZR)^2} + (2 \cdot NOP)\right] + [2bnet] + [H\ (ZL + ZR)]$$

4. CHAN. TYPE 4:

If D is equal or greater than pipe diameter (2R) then

$$WP = 2\pi R$$

Otherwise

$$WP = [\pi R/90]\ [\mathrm{ARCCOS}\ ((R-D)/R)]$$

5. CHAN. TYPE 5:

$$WP = \sum_{i=2}^{i=n} \sqrt{[\Delta X(i)]^2 + [\Delta Y(i)]^2} + \sum_{P=1}^{P=n} 2\ [Y(D) - Y(P)] - bp$$

6. CHAN. TYPE 6:

If D is less than Ymax see Process 5. Otherwise

$$WP = \sum_{i=2}^{i=n+1} \sqrt{[\Delta X(i)]^2 + [\Delta Y(i)]^2} + \sum_{P=1}^{P=n} 2\ [Y(D) - Y(P)] - bp$$

HYDROSTATIC PRESSURE (P)

Pressure is a function of the depth of flow and the geometry of the conduit or channel section.

1. CHAN. TYPE 1:

$$P = 0.5\ (D)^2\ [bnet + D\ (ZL + ZR)/3]$$
where $bnet = b - (NOP \cdot bp)$

2. CHAN. TYPE 2:

$$P = 0.5\ [bnet\ (D)^2\ ]$$

3. CHAN. TYPE 3:

If D is not greater than chan. height (H) see Process 1. Otherwise:

$$P = 0.5\ (D)^2\ [bnet + D\ (ZL + ZR)/3] - 0.5\ (D-H)^2\ [(1/3)(ZL + ZR)2H + D) + bnet]$$

4. CHAN. TYPE 4:

If D is equal or greater than the pipe diameter then

$$P = (D-R)\ \pi\ (R)^2$$

Otherwise: $C = (D/R)$ and:

$$P = (R^3/3)\{[(C)^2 - (2C) + 3]\sqrt{2C - (C)^2} + [\tfrac{\pi}{60}\ (C-1)]\ [90 + ARCSIN\ (C-1)]\}$$

5. CHAN. TYPE 5:

$$P = 0.5\sum_{i=2}^{i=n+1} \Delta X(i)\ [D - Y(i)]^2 + \Delta X(i)\,\Delta Y(i)\ [D - Y(i) + Y(i)/3] - \sum_{P=1}^{P=n} 0.5\ bp\ [D - Y(P)]^2$$

6. CHAN. TYPE 6:

If D is not greater than Ymax see Process 5. Otherwise:

$$P = \sum_{i=2}^{i=n+1} 0.5\,\Delta X(i)\ [D-Y(i))]^2 + 0.5\,\Delta X(i)\,\Delta Y(i)\ [\ D - Y(i) + Y(i)/3] - \sum_{P=1}^{P=n} bp\ [Ymax - Y(P)]\ [D - 0.5\ Ymax - 0.5\ Y(P)]$$

DEPTH OF FLOW (D)

Depth computation when area of flow is known.

1. CHAN. TYPE 1:

$$D = \frac{1}{Z_L + Z_R}\{-bnet + \sqrt{(bnet)^2 + 2(ZL + ZR)\ [A + (e \cdot bnet/24)]}\}$$

2. CHAN. TYPE 2:

$$D = (1/bnet)\ [A + (e \cdot bnet/24)]$$

3. CHAN. TYPE 3:

Compute AH (The Full Area of a closed section).

If A is less than AH see Process 1. Otherwise:

D = HGL - Inv.

4. CHAN. TYPE 4:

Compute AH.

If A is not less than AH

D = HGL - Inv.

Otherwise

Find D by trial and error from Area of part full pipe.

5. CHAN. TYPE 5:

Find D by trial and error from Area of part full section.

6. CHAN. TYPE 6:

Compute AH

If A is not less than AH then

D = HGL - Inv.

Otherwise:

Find D by iteration from Area of part full irregular section.

COMPUTATIONAL PROCEDURES

Assumptions are: Steady one dimentional flow and incompressible fluids.

BASIC EQUATIONS OF STEADY FLOW

a) Equation of Continuity

$A1.V1 = A2.V2 = Q$

b) Manning's Formula (friction slope)

$Sf = \{Qn/[1.486\ A\ (RH)^{2/3}\ ]\}^2$

c) Bernoulli's Equation (open flow)

$D2 + HV2 + \Delta L\ Sfav + D1 + HV1 + \Delta L$ So where $HV = V/2g$

d) Bernoulli's Equation (pressure flow)

$D2 + HV2 + \Delta L\ Sfav + Hm = D1 + HV1 + \Delta L$ So

where Hm is miscel.losses.

e) Angle Point Loss

$Hapt = 0.0033\ \theta\ HV$

Where θ is deflection angle in degrees. The District recommends not to exceed 6 .

f) Bend Loss

$HB = 0.2\ HV \sqrt{\Delta/90}$

where Δ is central angle of bend in degrees.

g) Manhole Loss

$Hmh = 0.05\ HV\ (No.\ MN)$ where No. MH is number of manhole in a reach

h) Specific Energy

$E = D + HV$

i) Pressure - Momentum

$P2 + M2 = P1 + M1 = F$

where $M = (Q)^2 / (Ag)$

j) Critical Depth Dc

Dc is the depth of flow at minimum energy, to find Dc by parabolic method see References 12.6.4 otherwise iterate for Dc in the specific energy equat.

$Ec = f(Dc) = Dc + HVC$

k) Normal Depth Dn

Dn is the depth of uniform and is found by iteration from Manning's formula

$A(RH)^{2/3} = f(Dn) = [Qn] / [1.486\ So^{1/2}]$

REACH ANALYSIS

a) OPEN FLOW

Intermediate points are computed on the W.S. profile in a reach using the standard step method. The difference in velocity head between two adjacent points is held to a maximum of ten percent.

$\Delta L = (E2 - E1) / (So - Sfav)$

b) Pressure Flow

$EGL\ 1 = EGL\ 2 + Hf + Hm$

$D1 = EGL\ 1 - HV1 - INV.\ 1$

If W.S. profile rises to the soffit of a conduit before the end of the reach or if the H.G.L. breaks seal before the end of the reach, minor losses are adjusted to reflect only the portion of the reach under pressure.

Super Elevation (S.E.)

Super elevation is computed in curving channels as follows:

CHAN. TYPE 1: (Trap. Sect.)

Subcritical flow: S.E. = 1.15 [HV/r] [b + D (ZL + ZR)]

Supercritical flow: S.E. = 2.6 [HV/r] [b + D (ZL + ZR)]

CHAN. TYPE 2: (Rect. Sect.)

Subcritical flow: S.E. = HV b/r

Supercritical flow: S.E. = 2 HV b/r

TRANSITION ANALYSIS

If V2 is greater than V1 then

Ht = 0.1 [HV2 - HV1]

otherwise:

Ht = 0.2 [HV1 - HV2]

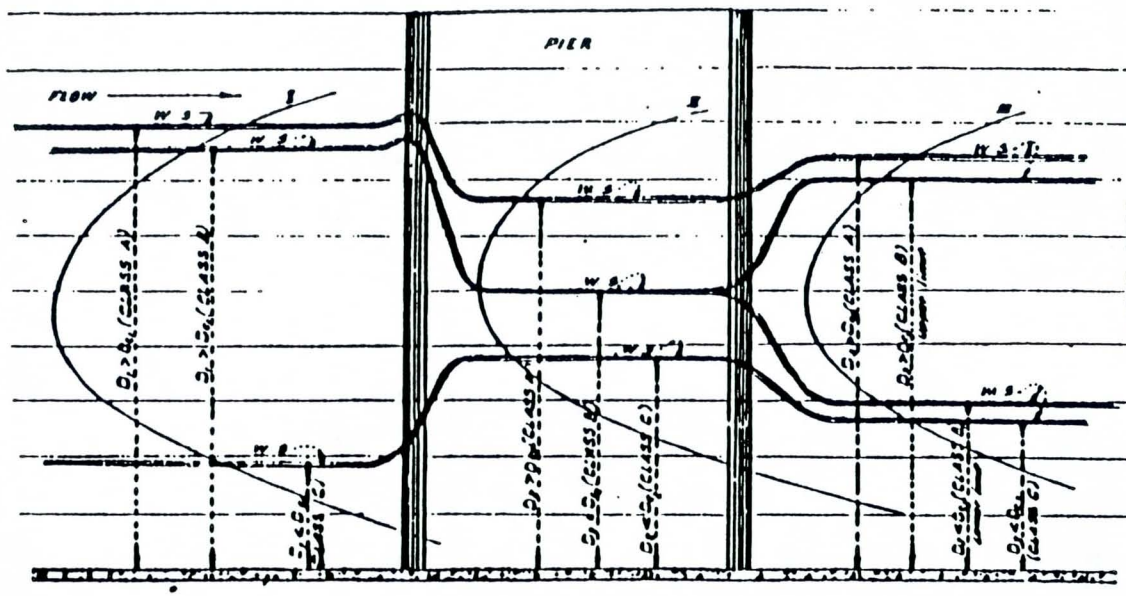
JUNCTION ANALYSIS

ΔY = [(Q2.V2) - (Q1.V1) - (Q3.V3.COSO3) (1/g) (1/A ave)] + ΔL Sf av

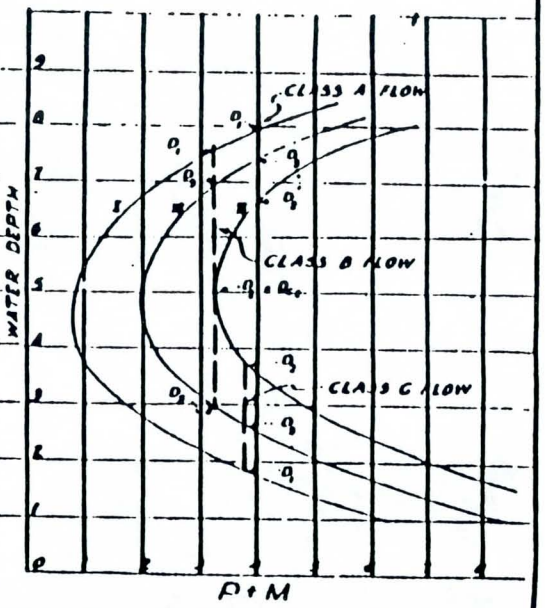
where A ave = [(A1 + A2)/2]

and ΔY = D1 + ΔH - D2

HJ = ΔY + HV1 - HV2



LONGITUDINAL PROFILE



PRESSURE+MOMENTUM CURVES

GENERAL MOMENTUM EQUATION:

$$\underbrace{P_1 - P_p + \frac{Q^2}{gA_1}(A_1 - A_p)}_{I} = \underbrace{P_1 - P_p + \frac{Q^2}{g(A_1 - A_p)}}_{II} = \underbrace{P_p - P_p + \frac{Q^2}{gA_p}}_{III}$$

NOTATIONS

I, II, III = P+M forces upstream inside and downstream of bridge respectively

D_1, D_p, D_2 = Water depths upstream, inside and downstream of bridge respectively

D_{cp} = Critical depth within bridge.

W = Channel width

P_1 = P = Hydrostatic pressure in unobstructed channel.

P_p = Hydrostatic pressure of bridge piers.

A_1, A_2 = Area of unobstructed channel in sq ft

A_p = Area of bridge piers in sq ft

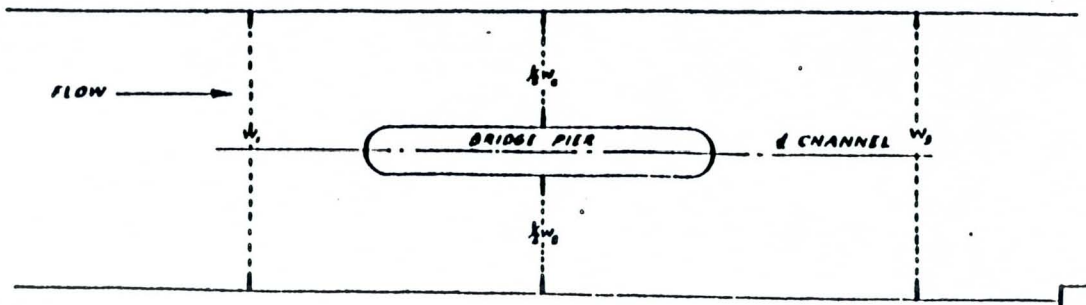
Q = Discharge in c.f.s

g = Gravitational constant

D_{c1} = D_{c2} = Critical in unobstructed channel

* Use $\frac{1}{2} A_p$ for round nose piers

Los Angeles County Flood Control District



PLAN

BRIDGE PIER LOSSES BY THE MOMENTUM METHOD

WALL ENTRANCE ANALYSIS (Sudden Contraction)

Lower Stage Profile (U/S Control)

Find depth at the D/S end by iteration in the equation.

M2 + P2 = M1 [(A1-A1WALL) / A1] + P1 - P1 walls

where A1 wall is the area of the obstructed part of A1. And P1 wall is the pressure on the obstructed part of A1

Upper Stage Profile (D/S Control)

If the control depth is less than the conduit height find the depth at the U/S end from

M2 + P2 = M1 [(A1-A1WALL) / A1] + P1 - P1 wall

otherwise find D1 by iteration from the following equation:

D2 = HV2 = Kc ABS [HV2 - HV1] = D1 + HV1

where Kc ABS [HV2 - HV1] is the head loss at WE.

Kc = Ø.5 unless given otherwise

ABS = the absolute value

WALL EXIT (Sudden Expansion)

Energy loss in a wall exit = 1.0 ABS [HV2 - HV1]

In WX find D1 or D2 by iteration in the following

D2 = HV2 = 1.Ø ABS [HV2 - HV1] = D1 + HV1

REFERENCES

1. Hydraulic Design Manual, L.A.C.F.C.D. (1970)

2. Handbook of Hydraulics, E. F. Brater and H. W. King

3. Hydraulic Analysis of Junctions, City of L. A. Office Std. No. 115 (1968)

4. Critical Water Surface by Minimum Specific Energy Using the Parabolic Method, Hydrologic Engineering Center, U.S. Army Corps of Engineers, Eichert, Bill S.

```
                .           .
                .           .
229             .           .-------->   OR144
224             .       DT144
                .           .
                .           .
234             .           .-------->   DIV1P
232             .       DIV1P
                .           .
                .           .
237         HC144............
                .
                .
242             .-------->   DIV-2
240          DIV2
                V
                V
245         SITE2
                .
                .
255             .           .<--------   DIV-2
254             .       RET-2
                .           .
                .           .
257             .           .           .<--------   DIV1P
256             .           .       RET1P
                .           .           .
                .           .           .
258         COMB2........................
                V
                V
261         RM144
                .
                .
268             .        145S
                .           .
                .           .
278         HC145............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************                    ***********************************
*                                      *                    *                                 *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *   U.S. ARMY CORPS OF ENGINEERS  *
*            SEPTEMBER 1990            *                    *   HYDROLOGIC ENGINEERING CENTER *
*             VERSION 4.0              *                    *         609 SECOND STREET       *
*                                      *                    *      DAVIS, CALIFORNIA 95616    *
*  RUN DATE  02/03/1995  TIME  11:37:16 *                    *          (916) 756-1104         *
*                                      *                    *                                 *
****************************************                    ***********************************
```

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
TENTH STREET WASH DETENTION BASIN NO 1 (FCD 93-31)
STANLEY CONSULTANTS, INC. (SCI JOB # 12183)
AMENDED BY RUST E & I TO INCLUDE BASINS 2A & 2B (2/1/95)
DCR ALTTERNATIVE 1
HEC-1 INPUT FILENAME : 10WALT1.HC1

****
THIS MODEL REPRESENTS THE PROPOSED 10TH STREET WASH DETENTION BASIN #1.
THE FOLLOWING BASIN CHARACTERISTICS ARE EVALUATED:
  1. INLET CONFIGURATION 1, INLET 1 CONSISTS OF A SIDE OVERFLOW WEIR

```
                    CONFIGURATION (100' WEIR 3.34' ABOVE FLOWLINE) FOR THE WEST TRIB
                    AND A WEIR INLET (30' WEIR AT CREST ELEV. 1321) FOR THE EAST TRIB.
                    INLET CONTROL CONDITIONS ASSUMED.
                  2. BASIN CONFIGURATION 1, 3:1 SIDES ON 3 SIDES AND A VERTICAL
                    RETAINING WALL ON THE WEST SIDE, A BOTTOM ELEVATION OF 1306, AND
                    25' ADDITIONAL R.O.W. ALONG THE SOUTH BASIN PARCEL BOUNDARY.
                  3. OUTLET CONFIGURATION 1, UTILIZING A 30" RCP TO CHASE GRADE AS THE
                    LOW FLOW AND PRINCIPAL OUTLET.
                ***********************************************************************

                ***********************************************************************
                THIS HEC-1 MODEL IS BASED ON THE KAMINSKI-HUBBARD ACDC ADMS AS MODIFIED
                BY FCD TO REFLECT TWO HYPOTHETICAL DETENTION BASINS (NUMBERS 1 AND 2).
                THE DIFFERENCES BETWEEN THIS MODEL AND THE ORIGINAL MODEL TRANSMITTED
                BY FCD TO SCI AT THE PROJECT KICKOFF MEETING ARE AS FOLLOWS:
                  1. USE OF THE HEC-1 DATA STORAGE SYSTEM OPTION HAS BEEN DELETED;
                  2. THE TWO HYPOTHETICAL DETENTION BASINS 1 AND 2 HAVE BEEN DELETED;
                  3. THE CROSS SECTIONAL AREA OF THE PRINCIPAL SPILLWAY OUTLET PIPE OF
                    THE EXISTING CITY OF PHOENIX DET BASIN NO. 3 HAS BEEN CHANGED FROM
                    4.91 SQFT (WHICH CORRESPONDS TO AN OUTLET PIPE DIAM OF 30") TO
                    1.36 SQFT CORRESPONDING TO THE 14" X 14" STEEL ORIFICE PLATE WHICH
                    WAS ORIGINALLY DESIGNED AND INSTALLED.
                ***********************************************************************

            ACDC AREA DRAINAGE MASTER STUDY
            10TH STREET WASH WATERSHED
            FILENAME:  TEN36.DAT     KHE JOB NO. 0146
            100-YEAR 6-HOUR DURATION STORM

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

   IT       HYDROGRAPH TIME DATA
                 NMIN          3  MINUTES IN COMPUTATION INTERVAL
                IDATE      1   0  STARTING DATE
                ITIME       0000  STARTING TIME
                   NQ        300  NUMBER OF HYDROGRAPH ORDINATES
               NDDATE      1   0  ENDING DATE
               NDTIME       1457  ENDING TIME
               ICENT         19  CENTURY MARK

             COMPUTATION INTERVAL     .05 HOURS
                  TOTAL TIME BASE   14.95 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


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


          **************
          *            *
258 KK    *     COMB2  *        RECOMBINE INCHANNEL FLOWS WITH OUTFLOW FROM DETENTION BASIN 2
          *            *
          **************
```

```
259 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          1  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

260 HC          HYDROGRAPH COMBINATION
                      ICOMP          3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                    ***
```

****

HYDROGRAPH AT STATION COMB2
SUM OF 3 HYDROGRAPHS

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FL
1		0000	1	0.	1		0345	76	379.	1		0730	151	116.	1		1115	226	6
1		0003	2	0.	1		0348	77	403.	1		0733	152	115.	1		1118	227	6
1		0006	3	0.	1		0351	78	431.	1		0736	153	115.	1		1121	228	6
1		0009	4	0.	1		0354	79	497.	1		0739	154	114.	1		1124	229	6
1		0012	5	0.	1		0357	80	579.	1		0742	155	113.	1		1127	230	6
1		0015	6	0.	1		0400	81	654.	1		0745	156	113.	1		1130	231	6
1		0018	7	0.	1		0403	82	715.	1		0748	157	112.	1		1133	232	6
1		0021	8	0.	1		0406	83	767.	1		0751	158	112.	1		1136	233	6
1		0024	9	0.	1		0409	84	799.	1		0754	159	111.	1		1139	234	6
1		0027	10	0.	1		0412	85	810.	1		0757	160	110.	1		1142	235	6
1		0030	11	0.	1		0415	86	811.	1		0800	161	110.	1		1145	236	6
1		0033	12	0.	1		0418	87	798.	1		0803	162	109.	1		1148	237	6
1		0036	13	0.	1		0421	88	765.	1		0806	163	109.	1		1151	238	6
1		0039	14	0.	1		0424	89	709.	1		0809	164	108.	1		1154	239	5
1		0042	15	0.	1		0427	90	657.	1		0812	165	107.	1		1157	240	5
1		0045	16	0.	1		0430	91	608.	1		0815	166	107.	1		1200	241	5
1		0048	17	0.	1		0433	92	557.	1		0818	167	106.	1		1203	242	5
1		0051	18	0.	1		0436	93	518.	1		0821	168	106.	1		1206	243	5
1		0054	19	0.	1		0439	94	502.	1		0824	169	105.	1		1209	244	5
1		0057	20	0.	1		0442	95	489.	1		0827	170	105.	1		1212	245	5
1		0100	21	0.	1		0445	96	477.	1		0830	171	104.	1		1215	246	5
1		0103	22	0.	1		0448	97	466.	1		0833	172	103.	1		1218	247	5
1		0106	23	0.	1		0451	98	455.	1		0836	173	103.	1		1221	248	5
1		0109	24	0.	1		0454	99	443.	1		0839	174	102.	1		1224	249	5
1		0112	25	0.	1		0457	100	428.	1		0842	175	102.	1		1227	250	5
1		0115	26	0.	1		0500	101	408.	1		0845	176	101.	1		1230	251	5
1		0118	27	0.	1		0503	102	392.	1		0848	177	100.	1		1233	252	5
1		0121	28	0.	1		0506	103	377.	1		0851	178	100.	1		1236	253	5
1		0124	29	0.	1		0509	104	346.	1		0854	179	99.	1		1239	254	5
1		0127	30	0.	1		0512	105	313.	1		0857	180	98.	1		1242	255	5
1		0130	31	0.	1		0515	106	287.	1		0900	181	98.	1		1245	256	4
1		0133	32	0.	1		0518	107	265.	1		0903	182	97.	1		1248	257	4
1		0136	33	0.	1		0521	108	248.	1		0906	183	97.	1		1251	258	4
1		0139	34	0.	1		0524	109	236.	1		0909	184	96.	1		1254	259	4
1		0142	35	0.	1		0527	110	226.	1		0912	185	95.	1		1257	260	4
1		0145	36	0.	1		0530	111	219.	1		0915	186	95.	1		1300	261	4
1		0148	37	0.	1		0533	112	213.	1		0918	187	94.	1		1303	262	4
1		0151	38	0.	1		0536	113	208.	1		0921	188	93.	1		1306	263	4
1		0154	39	0.	1		0539	114	205.	1		0924	189	93.	1		1309	264	4
1		0157	40	0.	1		0542	115	203.	1		0927	190	92.	1		1312	265	4
1		0200	41	0.	1		0545	116	201.	1		0930	191	91.	1		1315	266	4
1		0203	42	0.	1		0548	117	200.	1		0933	192	91.	1		1318	267	4
1		0206	43	0.	1		0551	118	199.	1		0936	193	90.	1		1321	268	4
1		0209	44	0.	1		0554	119	198.	1		0939	194	89.	1		1324	269	4
1		0212	45	0.	1		0557	120	197.	1		0942	195	89.	1		1327	270	4
1		0215	46	0.	1		0600	121	196.	1		0945	196	88.	1		1330	271	4
1		0218	47	0.	1		0603	122	195.	1		0948	197	88.	1		1333	272	4

1	0221	48	3.	*	1	0606	123	194.	*	1	0951	198	87.	*	1	1336	273	4
1	0224	49	13.	*	1	0609	124	191.	*	1	0954	199	86.	*	1	1339	274	4
1	0227	50	14.	*	1	0612	125	188.	*	1	0957	200	85.	*	1	1342	275	4
1	0230	51	14.	*	1	0615	126	184.	*	1	1000	201	85.	*	1	1345	276	4
1	0233	52	15.	*	1	0618	127	179.	*	1	1003	202	84.	*	1	1348	277	4
1	0236	53	15.	*	1	0621	128	173.	*	1	1006	203	84.	*	1	1351	278	4
1	0239	54	16.	*	1	0624	129	165.	*	1	1009	204	83.	*	1	1354	279	4
1	0242	55	16.	*	1	0627	130	159.	*	1	1012	205	82.	*	1	1357	280	4
1	0245	56	17.	*	1	0630	131	153.	*	1	1015	206	82.	*	1	1400	281	4
1	0248	57	17.	*	1	0633	132	148.	*	1	1018	207	81.	*	1	1403	282	4
1	0251	58	18.	*	1	0636	133	143.	*	1	1021	208	80.	*	1	1406	283	4
1	0254	59	19.	*	1	0639	134	139.	*	1	1024	209	80.	*	1	1409	284	4
1	0257	60	20.	*	1	0642	135	135.	*	1	1027	210	79.	*	1	1412	285	4
1	0300	61	21.	*	1	0645	136	132.	*	1	1030	211	79.	*	1	1415	286	4
1	0303	62	23.	*	1	0648	137	130.	*	1	1033	212	78.	*	1	1418	287	4
1	0306	63	25.	*	1	0651	138	127.	*	1	1036	213	77.	*	1	1421	288	4
1	0309	64	28.	*	1	0654	139	126.	*	1	1039	214	77.	*	1	1424	289	4
1	0312	65	32.	*	1	0657	140	124.	*	1	1042	215	76.	*	1	1427	290	3
1	0315	66	35.	*	1	0700	141	123.	*	1	1045	216	75.	*	1	1430	291	3
1	0318	67	40.	*	1	0703	142	122.	*	1	1048	217	75.	*	1	1433	292	3
1	0321	68	48.	*	1	0706	143	121.	*	1	1051	218	74.	*	1	1436	293	3
1	0324	69	91.	*	1	0709	144	120.	*	1	1054	219	73.	*	1	1439	294	3
1	0327	70	148.	*	1	0712	145	120.	*	1	1057	220	73.	*	1	1442	295	3
1	0330	71	173.	*	1	0715	146	119.	*	1	1100	221	72.	*	1	1445	296	3
1	0333	72	205.	*	1	0718	147	118.	*	1	1103	222	72.	*	1	1448	297	3
1	0336	73	251.	*	1	0721	148	118.	*	1	1106	223	71.	*	1	1451	298	3
1	0339	74	321.	*	1	0724	149	117.	*	1	1109	224	70.	*	1	1454	299	3
1	0342	75	349.	*	1	0727	150	116.	*	1	1112	225	70.	*	1	1457	300	3
				*					*					*				

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	14.95-HR
		(CFS)				
811.	4.25		248.	123.	123.	123.
		(INCHES)	1.005	1.245	1.245	1.245
		(AC-FT)	123.	152.	152.	152.

CUMULATIVE AREA = 2.29 SQ MI

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

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	140S	496.	4.25	69.	28.	28.	.52		
DIVERSION TO	OR140	20.	4.25	4.	2.	2.	.52		
HYDROGRAPH AT	DT140	496.	4.25	65.	26.	26.	.52		
ROUTED TO	140RR	26.	5.10	25.	18.	18.	.52	72.36	5.15
ROUTED TO	RM140	26.	5.45	25.	18.	18.	.52		

HYDROGRAPH AT								
+	141S	263.	4.10	38.	15.	15.	.19	
DIVERSION TO								
+	OR141	57.	4.10	5.	2.	2.	.19	
HYDROGRAPH AT								
+	DT141	263.	4.10	33.	13.	13.	.19	
2 COMBINED AT								
+	HC141	275.	4.10	56.	31.	31.	.70	
DIVERSION TO								
+	DVT141	22.	4.10	14.	10.	10.	.70	
HYDROGRAPH AT								
+	DVT141	253.	4.10	41.	20.	20.	.70	
HYDROGRAPH AT								
+	142S	671.	4.15	100.	40.	40.	.51	
DIVERSION TO								
+	OR142	45.	4.15	7.	3.	3.	.51	
HYDROGRAPH AT								
+	DT142	671.	4.15	93.	37.	37.	.51	
DIVERSION TO								
+	DVT142	319.	4.15	65.	26.	26.	.51	
HYDROGRAPH AT								
+	DVT142	364.	4.15	28.	11.	11.	.51	
2 COMBINED AT								
+	ADD142	614.	4.15	70.	32.	32.	1.21	
ROUTED TO								
+	DET142	80.	4.60	62.	32.	32.	1.21	1318.97 4.60
HYDROGRAPH AT								
+	DVT141	22.	4.10	14.	10.	10.	.00	
HYDROGRAPH AT								
+	DVT142	319.	4.45	65.	26.	26.	.00	
3 COMBINED AT								
+	HC142	417.	4.45	138.	68.	68.	1.21	
ROUTED TO								
+	RM142	416.	4.60	138.	67.	67.	1.21	
HYDROGRAPH AT								
+	143S	841.	4.15	136.	55.	55.	.60	
DIVERSION TO								
+	OR143	58.	4.15	11.	5.	5.	.60	
HYDROGRAPH AT								
+	DT143	841.	4.15	125.	50.	50.	.60	
2 COMBINED AT								
+	HC143	1221.	4.15	258.	117.	117.	1.82	
ROUTED TO								
+	RM143	1220.	4.20	258.	117.	117.	1.82	

HYDROGRAPH AT	144S	615.	4.20	100.	40.	40.	.47		
DIVERSION TO	OR144	14.	4.20	4.	2.	2.	.47		
HYDROGRAPH AT	DT144	615.	4.20	96.	38.	38.	.47		
DIVERSION TO	DIV1P	265.	3.90	20.	8.	8.	.47		
HYDROGRAPH AT	DIV1P	350.	3.90	76.	31.	31.	.47		
2 COMBINED AT	HC144	1570.	4.20	330.	148.	148.	2.29		
DIVERSION TO	DIV-2	545.	4.20	195.	93.	93.	2.29		
HYDROGRAPH AT	DIV2	1025.	4.20	136.	55.	55.	2.29		
ROUTED TO	SITE2	48.	5.05	39.	22.	22.	2.29	1253.74	5.05
HYDROGRAPH AT	RET-2	545.	4.20	195.	93.	93.	.00		
HYDROGRAPH AT	RET1P	265.	4.20	20.	8.	8.	.00		
3 COMBINED AT	COMB2	811.	4.25	248.	123.	123.	2.29		
ROUTED TO	RM144	810.	4.30	248.	123.	123.	2.29		
HYDROGRAPH AT	145S	786.	4.10	121.	49.	49.	.55		
2 COMBINED AT	HC145	1541.	4.20	357.	171.	171.	2.84		

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	INTERPOLATED TO COMPUTATION INTERVAL DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)
RM140	MANE	3.00	26.07	330.00	.79	3.00	26.07	330.00	.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2263E+02 EXCESS= .0000E+00 OUTFLOW= .2176E+02 BASIN STORAGE= .6323E+00 PERCENT ERROR=

RM142	MANE	3.00	415.54	276.00	1.28	3.00	415.54	276.00	1.28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8393E+02 EXCESS= .0000E+00 OUTFLOW= .8311E+02 BASIN STORAGE= .9764E+00 PERCENT ERROR=

```
          RM143  MANE         2.19   1220.60    252.19      1.49      3.00   1220.23    252.00        1.49

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1450E+03 EXCESS= .0000E+00 OUTFLOW= .1449E+03 BASIN STORAGE= .2244E+00 PERCENT ERROR=

          RM144  MANE         3.00    810.43    258.00      1.24      3.00    810.43    258.00        1.24

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1523E+03 EXCESS= .0000E+00 OUTFLOW= .1517E+03 BASIN STORAGE= .8422E+00 PERCENT ERROR=

                                                    HEC-1 INPUT                                                PAGE  1

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

*** WARNING *** ZZ-CARD MISSING
          1
          2           ZZ
****************************************                                                  **********************************
*                                      *                                                  *                                *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *   U.S. ARMY CORPS OF ENGINEERS
*           SEPTEMBER 1990             *                                                  *   HYDROLOGIC ENGINEERING CENTER
*            VERSION 4.0               *                                                  *         609 SECOND STREET
*                                      *                                                  *      DAVIS, CALIFORNIA 95616
*  RUN DATE  02/03/1995  TIME  11:37:16 *                                                  *          (916) 756-1104
*                                      *                                                  *                                *
****************************************                                                  **********************************

*** HEC-1 ERROR 1 *** INVALID CARD IDENTIFICATION CODE OR CARD OUT OF SEQUENCE
    CARD NO.    1

    IT          HYDROGRAPH TIME DATA
                      NMIN           3  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1    0  STARTING DATE
                     ITIME        0000  STARTING TIME
                        NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      1    0  ENDING DATE
                    NDTIME        1457  ENDING TIME
                     ICENT          19  CENTURY MARK

                COMPUTATION INTERVAL     .05 HOURS
                     TOTAL TIME BASE   14.95 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

             SUBBASIN RUNOFF DATA

  0 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .00  SUBBASIN AREA

                PRECIPITATION DATA
```

0 PB STORM .00 BASIN TOTAL PRECIPITATION

0 PI INCREMENTAL PRECIPITATION PATTERN

0 UI INPUT UNITGRAPH, 0 ORDINATES, VOLUME = .00

***

HYDROGRAPH AT STATION HC145

DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q	*	DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q
1		0000	1	.00	.00	.00	0.	*	1		0730	151	.00	.00	.00	118.
1		0003	2	.00	.00	.00	0.	*	1		0733	152	.00	.00	.00	117.
1		0006	3	.00	.00	.00	1.	*	1		0736	153	.00	.00	.00	116.
1		0009	4	.00	.00	.00	2.	*	1		0739	154	.00	.00	.00	116.
1		0012	5	.00	.00	.00	4.	*	1		0742	155	.00	.00	.00	115.
1		0015	6	.00	.00	.00	6.	*	1		0745	156	.00	.00	.00	115.
1		0018	7	.00	.00	.00	9.	*	1		0748	157	.00	.00	.00	114.
1		0021	8	.00	.00	.00	11.	*	1		0751	158	.00	.00	.00	113.
1		0024	9	.00	.00	.00	13.	*	1		0754	159	.00	.00	.00	113.
1		0027	10	.00	.00	.00	14.	*	1		0757	160	.00	.00	.00	112.
1		0030	11	.00	.00	.00	14.	*	1		0800	161	.00	.00	.00	112.
1		0033	12	.00	.00	.00	14.	*	1		0803	162	.00	.00	.00	111.
1		0036	13	.00	.00	.00	14.	*	1		0806	163	.00	.00	.00	110.
1		0039	14	.00	.00	.00	14.	*	1		0809	164	.00	.00	.00	110.
1		0042	15	.00	.00	.00	14.	*	1		0812	165	.00	.00	.00	109.
1		0045	16	.00	.00	.00	14.	*	1		0815	166	.00	.00	.00	109.
1		0048	17	.00	.00	.00	15.	*	1		0818	167	.00	.00	.00	108.
1		0051	18	.00	.00	.00	16.	*	1		0821	168	.00	.00	.00	107.
1		0054	19	.00	.00	.00	16.	*	1		0824	169	.00	.00	.00	107.
1		0057	20	.00	.00	.00	16.	*	1		0827	170	.00	.00	.00	106.
1		0100	21	.00	.00	.00	16.	*	1		0830	171	.00	.00	.00	106.
1		0103	22	.00	.00	.00	16.	*	1		0833	172	.00	.00	.00	105.
1		0106	23	.00	.00	.00	16.	*	1		0836	173	.00	.00	.00	105.
1		0109	24	.00	.00	.00	16.	*	1		0839	174	.00	.00	.00	104.
1		0112	25	.00	.00	.00	16.	*	1		0842	175	.00	.00	.00	103.
1		0115	26	.00	.00	.00	16.	*	1		0845	176	.00	.00	.00	103.
1		0118	27	.00	.00	.00	16.	*	1		0848	177	.00	.00	.00	102.
1		0121	28	.00	.00	.00	15.	*	1		0851	178	.00	.00	.00	102.
1		0124	29	.00	.00	.00	15.	*	1		0854	179	.00	.00	.00	101.
1		0127	30	.00	.00	.00	15.	*	1		0857	180	.00	.00	.00	100.
1		0130	31	.00	.00	.00	16.	*	1		0900	181	.00	.00	.00	100.
1		0133	32	.00	.00	.00	16.	*	1		0903	182	.00	.00	.00	99.
1		0136	33	.00	.00	.00	16.	*	1		0906	183	.00	.00	.00	99.
1		0139	34	.00	.00	.00	16.	*	1		0909	184	.00	.00	.00	98.
1		0142	35	.00	.00	.00	16.	*	1		0912	185	.00	.00	.00	97.
1		0145	36	.00	.00	.00	16.	*	1		0915	186	.00	.00	.00	97.
1		0148	37	.00	.00	.00	15.	*	1		0918	187	.00	.00	.00	96.
1		0151	38	.00	.00	.00	15.	*	1		0921	188	.00	.00	.00	95.
1		0154	39	.00	.00	.00	15.	*	1		0924	189	.00	.00	.00	95.
1		0157	40	.00	.00	.00	15.	*	1		0927	190	.00	.00	.00	94.
1		0200	41	.00	.00	.00	15.	*	1		0930	191	.00	.00	.00	93.
1		0203	42	.00	.00	.00	15.	*	1		0933	192	.00	.00	.00	93.
1		0206	43	.00	.00	.00	15.	*	1		0936	193	.00	.00	.00	92.
1		0209	44	.00	.00	.00	15.	*	1		0939	194	.00	.00	.00	91.
1		0212	45	.00	.00	.00	15.	*	1		0942	195	.00	.00	.00	91.
1		0215	46	.00	.00	.00	15.	*	1		0945	196	.00	.00	.00	90.
1		0218	47	.00	.00	.00	16.	*	1		0948	197	.00	.00	.00	90.

1	0221	48	.00	.00	.00	16.	*	1	0951	198	.00	.00	.00	89.
1	0224	49	.00	.00	.00	17.	*	1	0954	199	.00	.00	.00	88.
1	0227	50	.00	.00	.00	17.	*	1	0957	200	.00	.00	.00	88.
1	0230	51	.00	.00	.00	19.	*	1	1000	201	.00	.00	.00	87.
1	0233	52	.00	.00	.00	24.	*	1	1003	202	.00	.00	.00	86.
1	0236	53	.00	.00	.00	28.	*	1	1006	203	.00	.00	.00	86.
1	0239	54	.00	.00	.00	32.	*	1	1009	204	.00	.00	.00	85.
1	0242	55	.00	.00	.00	34.	*	1	1012	205	.00	.00	.00	84.
1	0245	56	.00	.00	.00	35.	*	1	1015	206	.00	.00	.00	84.
1	0248	57	.00	-.01	.01	37.	*	1	1018	207	.00	.00	.00	83.
1	0251	58	.00	-.01	.01	39.	*	1	1021	208	.00	.00	.00	82.
1	0254	59	.00	-.01	.01	41.	*	1	1024	209	.00	.00	.00	82.
1	0257	60	.00	-.01	.01	43.	*	1	1027	210	.00	.00	.00	81.
1	0300	61	.00	-.01	.01	46.	*	1	1030	211	.00	.00	.00	81.
1	0303	62	.00	-.01	.01	49.	*	1	1033	212	.00	.00	.00	80.
1	0306	63	.00	-.01	.01	54.	*	1	1036	213	.00	.00	.00	79.
1	0309	64	.00	-.01	.01	60.	*	1	1039	214	.00	.00	.00	79.
1	0312	65	.00	-.01	.01	66.	*	1	1042	215	.00	.00	.00	78.
1	0315	66	.00	-.01	.01	74.	*	1	1045	216	.00	.00	.00	78.
1	0318	67	.00	-.02	.02	86.	*	1	1048	217	.00	.00	.00	77.
1	0321	68	.00	-.03	.03	99.	*	1	1051	218	.00	.00	.00	76.
1	0324	69	.00	-.03	.03	115.	*	1	1054	219	.00	.00	.00	76.
1	0327	70	.00	-.03	.03	133.	*	1	1057	220	.00	.00	.00	75.
1	0330	71	.00	-.03	.03	158.	*	1	1100	221	.00	.00	.00	74.
1	0333	72	.00	-.10	.10	231.	*	1	1103	222	.00	.00	.00	74.
1	0336	73	.00	-.10	.10	338.	*	1	1106	223	.00	.00	.00	73.
1	0339	74	.00	-.10	.10	427.	*	1	1109	224	.00	.00	.00	72.
1	0342	75	.00	-.10	.10	533.	*	1	1112	225	.00	.00	.00	72.
1	0345	76	.00	-.10	.10	667.	*	1	1115	226	.00	.00	.00	71.
1	0348	77	.00	-.12	.12	814.	*	1	1118	227	.00	.00	.00	71.
1	0351	78	.00	-.13	.13	917.	*	1	1121	228	.00	.00	.00	70.
1	0354	79	.00	-.13	.13	1015.	*	1	1124	229	.00	.00	.00	69.
1	0357	80	.00	-.13	.13	1112.	*	1	1127	230	.00	.00	.00	69.
1	0400	81	.00	-.13	.13	1230.	*	1	1130	231	.00	.00	.00	68.
1	0403	82	.00	-.07	.07	1360.	*	1	1133	232	.00	.00	.00	68.
1	0406	83	.00	-.07	.07	1458.	*	1	1136	233	.00	.00	.00	67.
1	0409	84	.00	-.07	.07	1516.	*	1	1139	234	.00	.00	.00	67.
1	0412	85	.00	-.07	.07	1541.	*	1	1142	235	.00	.00	.00	66.
1	0415	86	.00	-.07	.07	1528.	*	1	1145	236	.00	.00	.00	65.
1	0418	87	.00	-.02	.02	1463.	*	1	1148	237	.00	.00	.00	64.
1	0421	88	.00	-.02	.02	1395.	*	1	1151	238	.00	.00	.00	63.
1	0424	89	.00	-.02	.02	1311.	*	1	1154	239	.00	.00	.00	62.
1	0427	90	.00	-.02	.02	1209.	*	1	1157	240	.00	.00	.00	61.
1	0430	91	.00	-.02	.02	1094.	*	1	1200	241	.00	.00	.00	60.
1	0433	92	.00	-.01	.01	972.	*	1	1203	242	.00	.00	.00	60.
1	0436	93	.00	-.01	.01	869.	*	1	1206	243	.00	.00	.00	59.
1	0439	94	.00	-.01	.01	778.	*	1	1209	244	.00	.00	.00	58.
1	0442	95	.00	-.01	.01	708.	*	1	1212	245	.00	.00	.00	57.
1	0445	96	.00	-.01	.01	659.	*	1	1215	246	.00	.00	.00	57.
1	0448	97	.00	.00	.00	619.	*	1	1218	247	.00	.00	.00	56.
1	0451	98	.00	.00	.00	584.	*	1	1221	248	.00	.00	.00	55.
1	0454	99	.00	.00	.00	554.	*	1	1224	249	.00	.00	.00	55.
1	0457	100	.00	.00	.00	529.	*	1	1227	250	.00	.00	.00	54.
1	0500	101	.00	.00	.00	504.	*	1	1230	251	.00	.00	.00	54.
1	0503	102	.00	.00	.00	476.	*	1	1233	252	.00	.00	.00	53.
1	0506	103	.00	.00	.00	449.	*	1	1236	253	.00	.00	.00	53.
1	0509	104	.00	.00	.00	425.	*	1	1239	254	.00	.00	.00	52.
1	0512	105	.00	.00	.00	404.	*	1	1242	255	.00	.00	.00	52.
1	0515	106	.00	.00	.00	376.	*	1	1245	256	.00	.00	.00	51.
1	0518	107	.00	.00	.00	343.	*	1	1248	257	.00	.00	.00	51.
1	0521	108	.00	.00	.00	315.	*	1	1251	258	.00	.00	.00	50.
1	0524	109	.00	.00	.00	294.	*	1	1254	259	.00	.00	.00	50.
1	0527	110	.00	.00	.00	276.	*	1	1257	260	.00	.00	.00	49.
1	0530	111	.00	.00	.00	263.	*	1	1300	261	.00	.00	.00	49.
1	0533	112	.00	.00	.00	253.	*	1	1303	262	.00	.00	.00	48.
1	0536	113	.00	.00	.00	244.	*	1	1306	263	.00	.00	.00	47.

1	0539	114	.00	.00	.00	237.	*	1	1309	264	.00	.00	.00	47.
1	0542	115	.00	.00	.00	233.	*	1	1312	265	.00	.00	.00	46.
1	0545	116	.00	.00	.00	229.	*	1	1315	266	.00	.00	.00	46.
1	0548	117	.00	.00	.00	227.	*	1	1318	267	.00	.00	.00	45.
1	0551	118	.00	.00	.00	225.	*	1	1321	268	.00	.00	.00	45.
1	0554	119	.00	.00	.00	224.	*	1	1324	269	.00	.00	.00	45.
1	0557	120	.00	.00	.00	222.	*	1	1327	270	.00	.00	.00	44.
1	0600	121	.00	.00	.00	221.	*	1	1330	271	.00	.00	.00	44.
1	0603	122	.00	.00	.00	220.	*	1	1333	272	.00	.00	.00	44.
1	0606	123	.00	.00	.00	218.	*	1	1336	273	.00	.00	.00	43.
1	0609	124	.00	.00	.00	215.	*	1	1339	274	.00	.00	.00	43.
1	0612	125	.00	.00	.00	212.	*	1	1342	275	.00	.00	.00	43.
1	0615	126	.00	.00	.00	207.	*	1	1345	276	.00	.00	.00	43.
1	0618	127	.00	.00	.00	200.	*	1	1348	277	.00	.00	.00	42.
1	0621	128	.00	.00	.00	193.	*	1	1351	278	.00	.00	.00	42.
1	0624	129	.00	.00	.00	186.	*	1	1354	279	.00	.00	.00	42.
1	0627	130	.00	.00	.00	179.	*	1	1357	280	.00	.00	.00	42.
1	0630	131	.00	.00	.00	171.	*	1	1400	281	.00	.00	.00	42.
1	0633	132	.00	.00	.00	164.	*	1	1403	282	.00	.00	.00	41.
1	0636	133	.00	.00	.00	157.	*	1	1406	283	.00	.00	.00	41.
1	0639	134	.00	.00	.00	152.	*	1	1409	284	.00	.00	.00	41.
1	0642	135	.00	.00	.00	146.	*	1	1412	285	.00	.00	.00	41.
1	0645	136	.00	.00	.00	142.	*	1	1415	286	.00	.00	.00	41.
1	0648	137	.00	.00	.00	138.	*	1	1418	287	.00	.00	.00	40.
1	0651	138	.00	.00	.00	134.	*	1	1421	288	.00	.00	.00	40.
1	0654	139	.00	.00	.00	132.	*	1	1424	289	.00	.00	.00	40.
1	0657	140	.00	.00	.00	129.	*	1	1427	290	.00	.00	.00	40.
1	0700	141	.00	.00	.00	127.	*	1	1430	291	.00	.00	.00	40.
1	0703	142	.00	.00	.00	125.	*	1	1433	292	.00	.00	.00	40.
1	0706	143	.00	.00	.00	124.	*	1	1436	293	.00	.00	.00	39.
1	0709	144	.00	.00	.00	123.	*	1	1439	294	.00	.00	.00	39.
1	0712	145	.00	.00	.00	122.	*	1	1442	295	.00	.00	.00	39.
1	0715	146	.00	.00	.00	121.	*	1	1445	296	.00	.00	.00	39.
1	0718	147	.00	.00	.00	120.	*	1	1448	297	.00	.00	.00	39.
1	0721	148	.00	.00	.00	120.	*	1	1451	298	.00	.00	.00	39.
1	0724	149	.00	.00	.00	119.	*	1	1454	299	.00	.00	.00	39.
1	0727	150	.00	.00	.00	118.	*	1	1457	300	.00	.00	.00	38.
							*							

****

TOTAL RAINFALL = .00, TOTAL LOSS = -2.06, TOTAL EXCESS = 2.06

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	14.95-HR
		(CFS)				
+ 1541.	4.20		357.	171.	171.	171.
		(INCHES)	1.168	1.396	1.396	1.396
		(AC-FT)	177.	212.	212.	212.

CUMULATIVE AREA = 2.84 SQ MI

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

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT									
	HC145	1541.	4.20	357.	171.	171.	2.84		

*** 1 ERROR(S) DETECTED BY HEC-1 ***