FINAL DRAINAGE REPORT

I-10/SUPERSTITION FREEWAY TRAFFIC INTERCHANGE
I-10/BASELINE ROAD TRAFFIC INTERCHANGE

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ARIZONA DEPARTMENT OF TRANSPORTATION

APRIL 1992

STANLEY CONSULTANTS

FINAL DRAINAGE REPORT

CONTRACT NO. 87-55
PROJECT NO. IR-10-3 (311) PE
I-10/SUPERSTITION FREEWAY TRAFFIC INTERCHANGE
I-10/BASELINE ROAD TRAFFIC INTERCHANGE

PROJECT NO. NH-10-3 (310) C (UNIT ONE)
PROJECT NO. NH-10-3 (317) C (UNIT TWO)
TRACS NO. 010 MA 154 H014202D; H014204C (UNIT ONE)
TRACS NO. 010 MA 154 H014202D; H203501C (UNIT TWO)

PREPARED BY

STANLEY CONSULTANTS, INC.
3117 NORTH 16TH STREET
PHOENIX, ARIZONA 85016

APRIL, 1992

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO.
21007
ROBERT E.
JACOBS
Date Signed 4-7-92
ARIZONA, U.S.A.

ARIZONA
DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

SECTION BRIDGE DRAINAGE SECTION

☐ PROJECT NO. IR-10-3(311)PE

☐ PERMIT NO: I-10
☐ ENCROACHMENT-USE
☐ OUTDOOR ADVERTISING MP 154.0

☐ PARCEL NO:

☐ OTHER I-10/SUPERSTITION, I-10/BASELINE T.I.s

†• 62-4304 R3/86

FINAL DRAINAGE REPORT

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SCALE: 1"=20'

I-10 FREEWAY

N. 00°33'15"E.

331.63'

608.83'

278.00'

APPROX R/W

APPROX INSIDE FACE OF BARRIER WALL

HIGH WATER ELEV 85.20

WEST LINE LIMITED ACCESS HIGHWAY

EXST R/W

NEW DRYWELL FINISHED GRADE 82.2 RIM 82.50

TEMPORARY CONSTRUCTION EASEMENT

REMOVE EXST PVMT & CURB. REPLACE PVMT & CURB TO MATCH EXST. RAISE NE CORNER FROM 83.90 TO 84.90

NEW DRYWELL FINISHED GRADE 82.7 RIM 83.00

DRYWELL GRATE

RET. AREA F.G. 84.0

RET. AREA F.G. 83.0

RET. AREA #5 F.G. 83.0 H.W. 84.14

RET. AREA #4

RET. AREA H.W. 86.0

LAKE W.S. 85.0 BTM 83.0

LAKE W.S. 87.5 BTM 85.5

LAKE W.S. 87.0 BTM 85.0

LAKE W.S. 86.0 BTM 84.0

BUILDING A F.F. 90.20

BUILDING B-1 F.F. 88.20

LOT 7

LOT 6

UNSUBDIVIDED

N. 89°00'00"E.

391.60'

324.99'

609.99'

285.00'

NORTH

WENDLER DRIVE

GARDNER

MATCH LINE

SHEET 3

PROPOSED 8" A.C.P.

PROPOSED WATER EASMT

H.W. 85.20

NOTE:

PROPOSED I-10 RETAINING/BARRIER WALL AND RIGHT-OF-WAY SHOWN AT NE CORNER OF THIS SHEET IS PRELIMINARY. GRADING SHOWN IS CONCEPT ONLY AND WAS PREPARED BY STANLEY CONSULTANTS AS AN EXHIBIT WHICH OVERLAYS THE ORIGINAL DESIGN PREPARED BY O'NEILL-MOREA-HALL ENGINEERING.

REMOVE 40 L.F. OF C&G & 160 S.F. OF S.W. & CONST. 30' DRIVEWAY W/ 5' WINGS PER M.A.G. STD. DET. 250. SAWCUT, REMOVE & REPLACE 1" MIN. A.C. PVMT REPLACE IN KIND (45 S.Y.)

REMOVE 40 L.F. OF C&G & 160 S.F. OF S.W. & CONST. 30' DRIVEWAY WITH 5' WINGS PER M.A.G. STD. DET. 250. SAWCUT REMOVE & REPLACE 1" MIN. A.C. PVMT REPLACE IN KIND (45 S.Y.)

FND. BRASS CAP IN H.H.

FND. BRASS CAP (FLUSH) @ INT. GARDNER & WENDLER

EXIST. 4' SIDEWALK

8" PUE

GUY WIRE

REVISED 11-29-84

O'NEILL-MOREA-HALL engineering, inc

5225 N. 19th Avenue
Suite Number 214
Phoenix, Arizona 85015
Phone (602) 246-8989

CIVIL • SANITARY • STRUCTURAL • SURVEY

GRADING & DRAINAGE PLAN

SOUTH MOUNTAIN CORPORATE CENTER

Design	T.H.O.
Drn.	ARVID
Scale	1"=20'
Date	AUGUST 1984
Job No.	1866
Sheet	3 of 3

1. INTRODUCTION

1A. Introduction and Purpose

This report presents the final results of the hydrologic and hydraulic investigation, analysis and design of the drainage system and associated improvements planned for the Interstate 10/Superstition Freeway and Interstate 10/Baseline Road Traffic Interchanges. This final report was preceded by two initial report submittals prepared by Stanley Consultants for this project. The first initial submittal was made in October 1990 to accompany the first 30 percent submittal of roadway plans.

The second initial report was submitted in July 1991 to go along with a second 30 percent roadway plan submittal. The second submittal was requested by ADOT Consultant Management because of significant changes in ramp and roadway alignments profiles and configurations which were made subsequent to the first submittal. These changes involved the realignment of the Superstition Freeway (also known as State Route 360 or SR 360), changes in Baseline Road ramp alignments and profiles, inclusion of Ramp W-S with a left hand exit and deletion of main lane improvements south of the Baseline Road ramps.

In addition to the modifications described above, a half-diamond interchange for SR 360 has been developed at Priest Drive. This was done subsequent to the second initial submittal. On and off ramps, roadway widening and associated drainage plans for this additional construction are being prepared by Parsons, Brinckerhoff, Quade and Douglas in coordination with Stanley Consultants and ADOT. This proposal has further modified the horizontal and vertical

alignment, extent of roadway improvements and drainage on SR 360 under Stanley Consultants' original scope.

This report was prepared in accordance with current ADOT and FHWA criteria. It is in general conformance with previous studies and is compatible with existing adjacent ADOT and other local drainage improvements. The completed project will generally improve drainage in the area by controlling and containing flow that presently discharges from ADOT right-of-way. This will be accomplished through a system of on-site catch basins, storm drains, channels, detention basins and bleed off pipes; all designed to current standards.

The total roadway and drainage improvements proposed in the project design scope are broken into two basic phases referred to as Unit 1 and Unit 2. In addition to these phases, there will be other future roadway and drainage improvements. All together, Unit 1, Unit 2 and the future improvements form the "ultimate" design. The present scope of this project includes design plans for Units 1 and 2 but not the other future improvements. In addition to presenting the drainage design for specific improvements proposed in Units 1 and 2, this report will also consider future roadway improvements. This applies to design of the Interstate 10 (I-10) storm drain trunkline, detention and bleedoff system and the new SR 360 trunkline.

This final report incorporates all the basic hydrologic and hydraulic concepts, methods and design criteria presented in the second initial report. It addresses all prior drainage review comments from ADOT and all the drainage issues discussed with ADOT, the City of Tempe and the Salt River Project subsequent to the second initial report. Finally, it coordinates the drainage of SR 360 under Stanley Consultants' scope with the drainage design effort by

Parsons, Brinckerhoff, Quade and Douglas on the addition of the Priest Drive half diamond interchange.

1B. Project Location

The proposed project is located in Maricopa County, Arizona, more specifically within Sections 29, 32 and 33 of Township 1 North, Range 4 East and Section 5 of Township 1 South, Range 4 East. Figure 1, page 4, shows the project location within the State of Arizona. Figure 2, page 5, shows the location of the project within the Phoenix metropolitan area. Figure 3 on page 6 is a recent aerial photograph of the project area.

The majority of the project lies within the incorporated limits of the City of Tempe. The portion of Interstate 10 from Baseline Road to Guadalupe Road is bounded on the west by the City of Phoenix and on the east by the Town of Guadalupe. Construction of the proposed eastbound lanes of I-10 and corresponding ramp connections to SR 360 begin approximately 1750 feet north of Southern Avenue. Eastbound and westbound construction of I-10 will continue to approximately 2,000 feet south of Baseline Road.

State Route 360 improvements will proceed east from its interchange with I-10. Under the original scope of work, roadway improvements essentially ended at Hardy Drive. With the addition of the half diamond interchange at Priest Drive, roadway widening will extend east to about Mill Avenue.

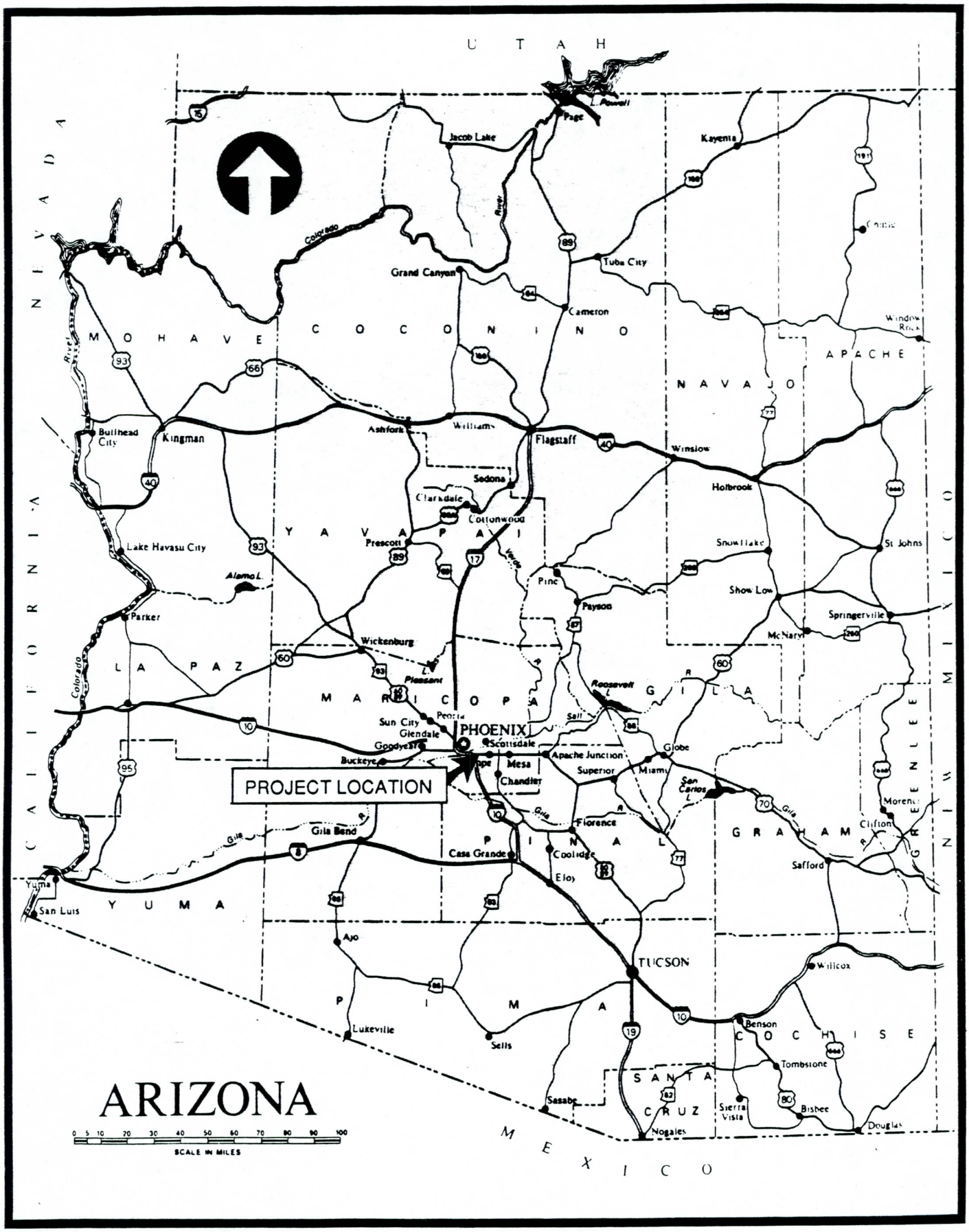


FIGURE 1 **VICINITY MAP - STATE**

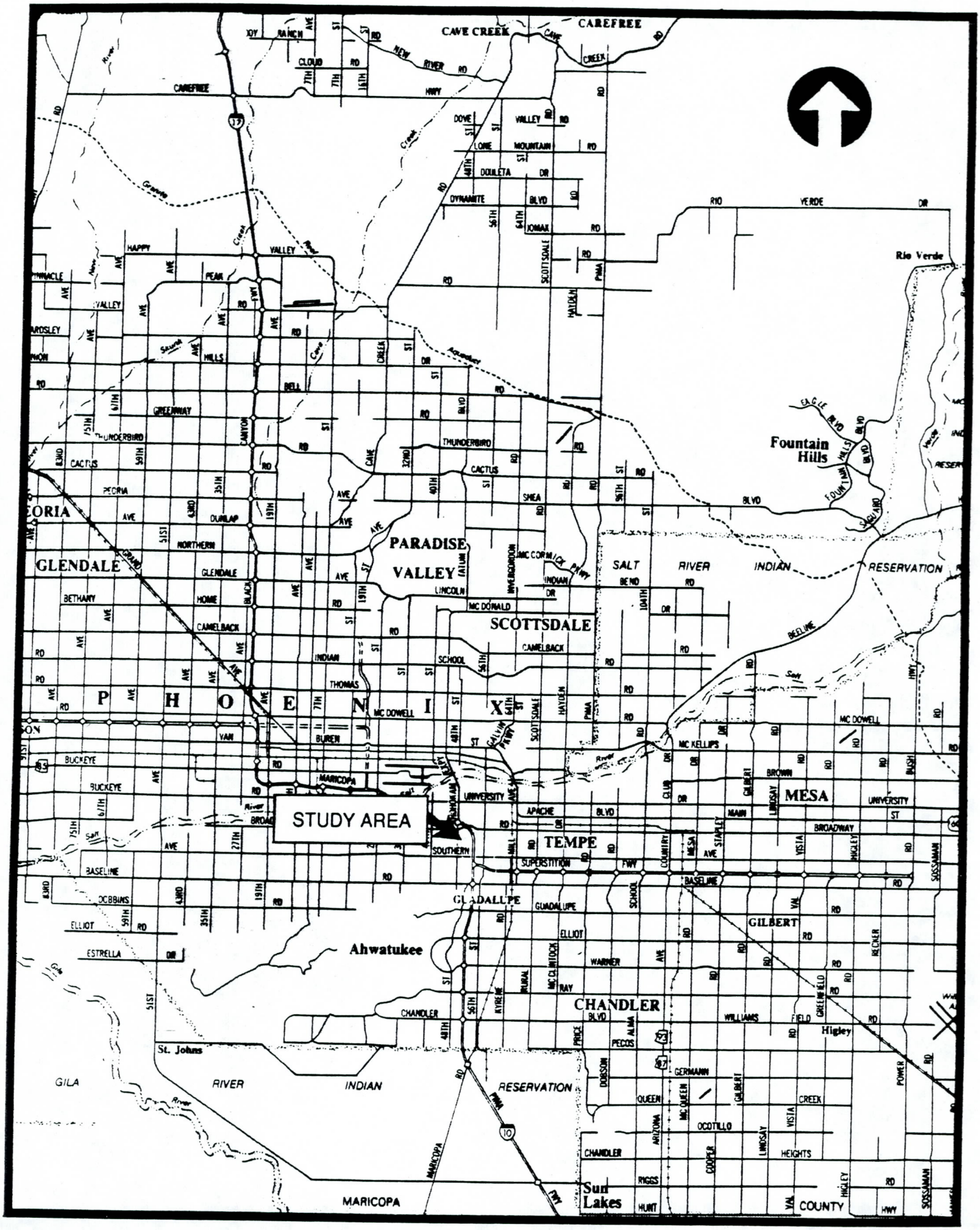


FIGURE 2 **VICINITY MAP - PHOENIX**

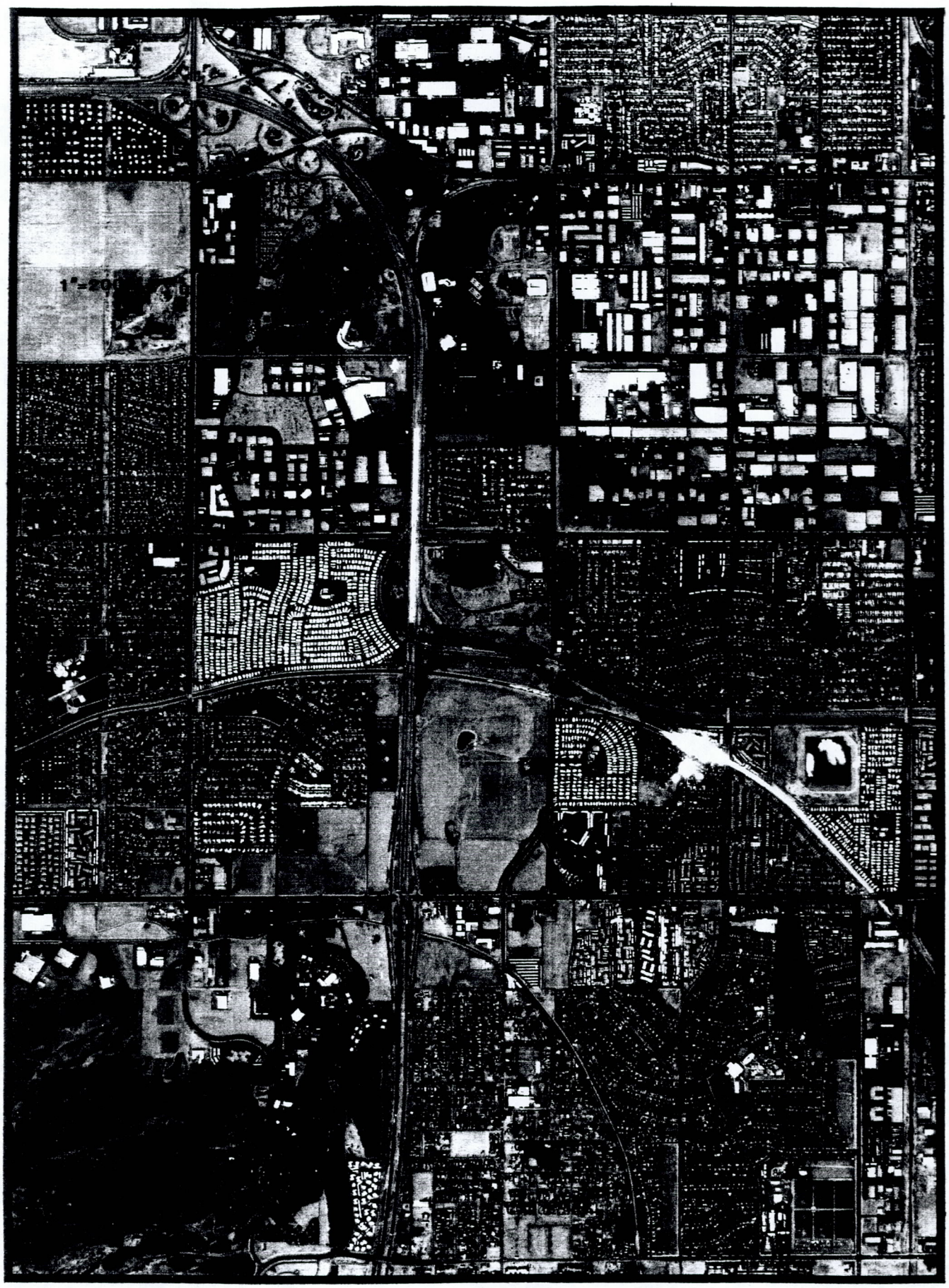


FIGURE 3 **AERIAL PHOTOGRAPH**

2. EXISTING AND PROPOSED ROADWAY IMPROVEMENTS

2A. Existing Roadway

The existing I-10 roadway improvements were initially constructed in the mid to late 1960's. State Route 360 and its interchange with I-10 was constructed shortly afterward. Existing roadway improvements on I-10 south of the SR 360 interchange consist essentially of two lanes in each direction with paved shoulders divided by an earth median. North of the interchange, a number of lanes have been added, the median is paved and there is a concrete traffic barrier down the center. State Route 360 in the project area essentially consists of three lanes each direction with paved shoulders, paved median and a concrete traffic barrier down the center.

The I-10/SR 360 interchange currently allows full traffic movement in all directions. On and off ramps at Baseline Road allow full access to I-10 in both directions. There is no access to I-10 at Southern Avenue or to State Route 360 at Priest or Hardy Drives. I-10 within the project area is generally at or above grade. State Route 360 is above grade from I-10 going east past Priest Drive and then transitions to a depressed section.

A number of improvements are under construction on I-10 north of and immediately adjacent to the project area. Plans for these improvements were prepared by Daniel Mann Johnson & Mendenhall (DMJM) Engineers. Improvements include additional lanes and associated drainage facilities. Although construction of these improvements is not complete at this time, it will be complete prior to this project and is therefore considered existing for the purpose of this report.

2B. Proposed Roadway

Unit 1 will include construction of a new Ramp S-E which will run slightly outside the alignment of the existing ramp. A new Ramp N-E will also be constructed. It too will run slightly outside the alignment of the existing ramp. The two new ramps will join to form the beginning of SR 360 eastbound in an alignment slightly south of the present alignment. SR 360 eastbound realignment will continue east about 1/4 mile beyond Priest Drive where it will tie into the existing SR 360. Also included in Unit 1 will be re-construction of the I-10 westbound off and on ramps at Baseline Road, the reconstruction of Baseline Road east of I-10 and the construction of new I-10 westbound CD lanes from the Baseline Road off ramp north to the SR 360 interchange.

Unit 2 will include re-construction of I-10 eastbound and westbound main travel lanes from the SR 360 interchange to about 2000 feet south of Baseline Road. Baseline Road west of I-10 and through the traffic interchange will be reconstructed along with the eastbound I-10 off and on ramps at Baseline Road. The eastbound I-10 off ramp to Baseline Road (Ramp T-4) begins in the middle of the I-10/SR 360 interchange. A portion of I-10 eastbound C-D lanes between the SR 360 interchange and Baseline Road will be constructed.

Unit 2 will also include construction of new Ramps W-S and W-N from SR 360 to I-10. This will involve realignment of westbound SR 360 beginning about 1/4 mile east of Priest Drive parallel to the eastbound lanes constructed in Unit 1. Ramp W-S will be a high fly-over ramp with a left hand exit from SR 360. Ramp W-N is an interim ramp which would be re-aligned in construction of the ultimate phase.

The half diamond interchange at Priest Drive and associated lane widening will be incorporated with both Unit 1 and Unit 2 construction. Roadway widening in the depressed section of SR 360 will encroach into the existing landscaped slope. This will involve construction of a retaining wall on both sides of SR 360.

The ultimate phase of construction may not take place for a number of years. It would include completion of I-10 eastbound and westbound C-D lanes. It would also include construction of Ramp T-3 which connects eastbound C-D lanes to Ramp S-E (Unit 1) and Ramp Westbound T-2 which connects Ramp W-N (Unit 2) to westbound C-D lanes. And finally, as mentioned, the ultimate phase would include realignment of interim Ramp W-N (Unit 2).

3. EXISTING DRAINAGE AND PREVIOUS STUDIES

3A. Existing Drainage Conditions

Guadalupe Road is the south limit of the study area covered in this report. It is essentially on the divide between the Salt River and Gila River drainage basins. The project area generally drains from south to north with eventual outfall to the Salt River via the Tempe Drain.

The Tempe Drain was originally an irrigation tailwater ditch constructed along the low points of a wide shallow drainage way which parallels the Salt River. It drains from east to west and is located between Interstate 10 and University Drive. From 52nd Street to the Salt River, it is an improved open channel. Its present function is primarily to carry drainage and storm runoff. Discharge into the Tempe Drain is controlled by intergovernmental agreements. This will be discussed in more detail in later sections of the report.

Land slope in the project area ranges from roughly 0.5 percent to several percent. Drainage slope measured along existing roadway and canal alignments can be virtually flat in some areas. There are several locations along raised roadway and canal embankments where runoff ponds because there is no outfall.

Two irrigation canals, the Western Canal and the Highline Canal traverse the project area carrying irrigation water from east to west. The area north of these canals was formerly irrigated agricultural land with scattered residences. The area south of the Highline Canal was formerly unimproved desert. The Town of Guadalupe is immediately south of the Highline Canal.

Nearly all of the project study area has been urbanized to some degree with residential and commercial development. Several vacant parcels adjoin the project area, the largest of which is the former University of Arizona Experimental Farm located along the east side of Interstate 10 between Baseline Road and the Western Canal. This parcel is in the planning phase for a future shopping mall.

Natural drainage in the area has been impacted first by agricultural improvements and subsequently by urbanization and roadway improvements. When Interstate 10 was initially constructed in the mid-1960's, the area was still largely agricultural. The current design standards and concepts of stormwater detention and separation of roadway and agricultural drainage had not yet evolved.

The basic roadway/drainage design concept at that time was to simply pass the onsite and offsite drainage downstream. This drainage, in many instances was discharged directly to existing irrigation canals and ditches. Along with a change in drainage standards and policies, over the years, there have come a number of detention basin, dam, storm drain and drainage channel projects in the study area.

Existing drainage in the project area can be divided into the following primary sub-basins:

Interstate 10 from Guadalupe Road to approximately 2000 feet south of Baseline Road.

This section of Interstate 10 is protected from offsite flows by the Guadalupe Flood Retarding Structure. This is a combination earth dam and diversion structure constructed in the mid-1970's by the Soil Conservation Service in conjunction with ADOT and the Flood Control

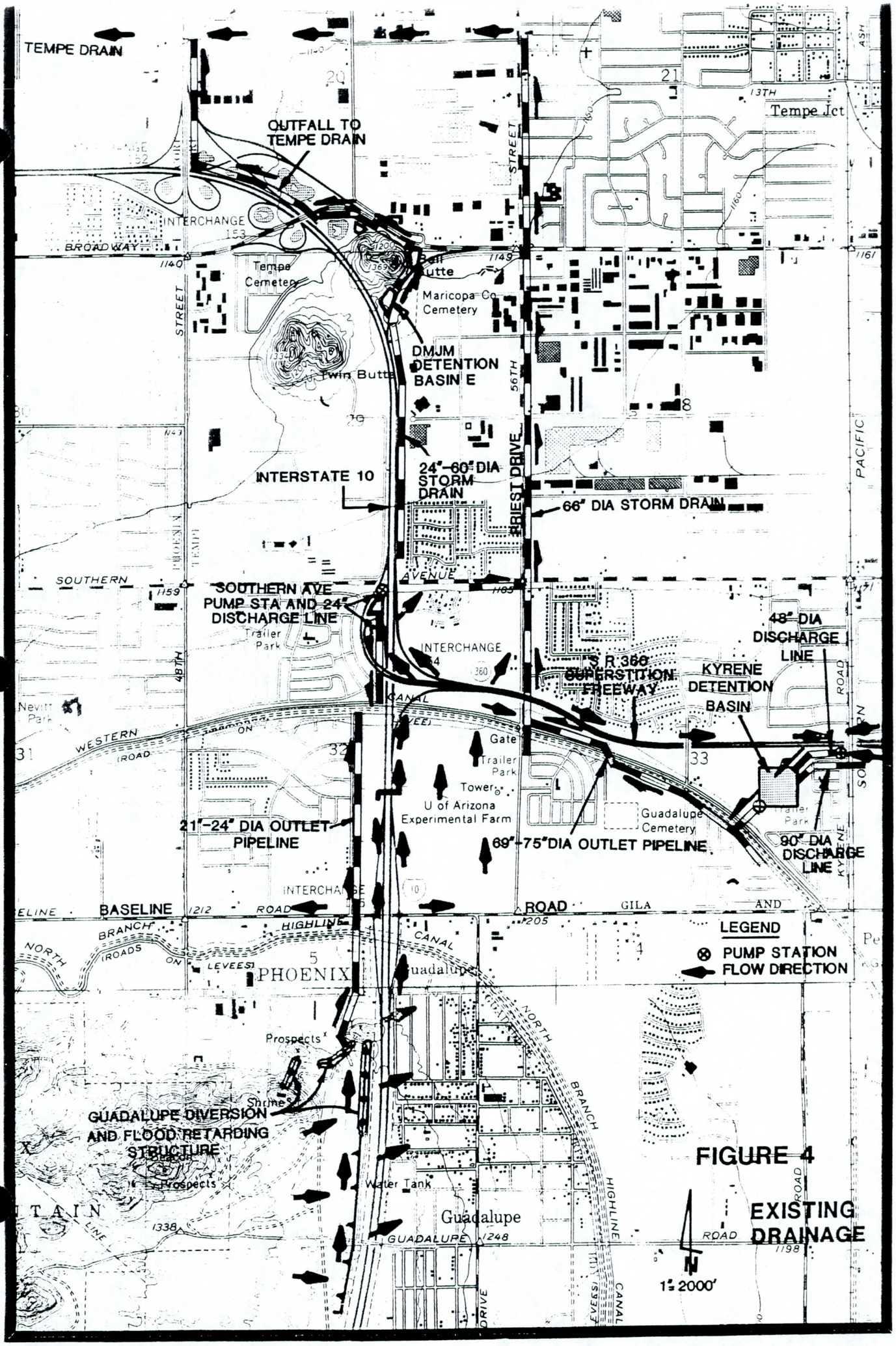


FIGURE 4

EXISTING DRAINAGE

District of Maricopa County. It extends approximately 3300 feet north from Guadalupe Road along the west side of Interstate 10. The dam was designed for a 100-year storm plus sediment storage with a total capacity of 290 acre feet. The principal spillway outlet consists of a 21 to 24 inch diameter gravity pipeline which discharges to the Western Canal about a mile to the north. This line follows the 52nd Street (Wendler Drive) alignment and discharges a maximum un-gated release of 23 cfs for the 100-year event.

In addition to protecting the adjacent section of Interstate 10, the Guadalupe Structure also provides a great deal of flood protection to the Town of Guadalupe. However, drainage still discharges from the Interstate 10 right-of-way itself to the Town via median drains and culverts that existed prior to construction of the Guadalupe Structure. Although flows have been greatly reduced, they still pose a problem downstream because there is no adequate means to convey them through the town.

Interstate 10 at the Highline Canal.

The Highline Canal passes under Interstate 10 via single 6 foot wide by 4 foot high concrete box culvert at a point about 400 feet south of Baseline Road. I-10 median drainage from about 2,200 feet south to about 300 feet north of the canal drains directly into the Highline culvert via median inlet. In addition, I-10 drainage from outside of the Baseline Road on/off ramps south of the canal surface drains directly into the canal.

Interstate 10 at Baseline Road.

Existing catch basins intercept drainage from Baseline Road and adjoining on/off ramps and infield areas. These catch basins are not designed to current standards and some of the surface inlets in landscaped areas are clogged with sediment and vegetation. Any flow not picked up by these catch basins would continue east in Baseline Road. The drainage that is intercepted is discharged north to earth ditches on either side of the I-10 main lanes.

Interstate 10 Baseline Road to Western Canal.

Interstate 10 main travel lanes drain outward to the earth ditches mentioned above. About halfway between Baseline Road and the Western Canal, the west side drainage crosses under the interstate in an existing 24 inch diameter culvert pipe where it joins the east side drainage. Median drainage originating from the overpass at Baseline Road is also picked up by an inlet to this culvert. The combined flow travels north to the Western Canal. There it would pond to a depth of 1 to 2 feet before overflowing into the canal. The canal passes under the interstate in a double 5 foot high by 14 foot wide concrete box culvert.

Interstate 10 Western Canal to Southern Avenue (including Southern Avenue and the Interstate 10/State Route 360 Traffic Interchange).

The I-10 eastbound travel lanes and the ramps and infield areas to the west of them drain to an existing landscaped detention basin just south of Southern Avenue. This runoff drains via surface inlet and 18 inch diameter pipe to the depressed Southern Avenue underpass. In addition, the area between existing Ramp S-E and the Meadows Mobile Home Park to the west surface drains to the underpass. The combined flow at the underpass is pumped about 2000

feet south to the Western Canal via 24 inch diameter pipe. Discharge to the canal is under permit by the Salt River Project.

Drainage from the I-10 median, westbound travel lanes and the ramps and infield areas to the east drains via surface inlets and 18 to 24 inch diameter pipe to an earth ditch along the east right-of-way. This drainage flows north to Southern Avenue where it turns east. It passes under Southern Avenue in an existing 24 to 30 inch diameter pipe culvert located approximately 900 feet east of the interstate. Discharge from this culvert enters a long narrow detention/retention basin along the north side of Southern Avenue. This basin would fill to a depth of about 2 feet at which point discharge would begin into an existing 24 inch diameter City of Tempe storm drain running east in Southern Avenue. This storm drain joins another City of Tempe line, 66 inches in diameter, which runs north in Priest Drive to the Tempe Drain.

State Route 360 from Interstate 10 Traffic Interchange to approximately 1/4 mile east of Priest Drive.

State Route 360 main lanes drain eastward from the Interstate 10 traffic interchange to Kyrene Road. From the traffic interchange to about 1/4 mile east of Priest Drive, the roadway is elevated above grade. From 1/4 mile east of Priest Drive to Kyrene Road and beyond, it is depressed below grade.

Drainage from the elevated roadway and embankment collecting along the south side of the State Route is funneled to Priest Drive via earth ditch. At Priest Drive it enters the roadway and flows north. Drainage from the north side of SR 360 west of Priest Drive sheet flows

northeasterly across a vacant parcel toward Priest Drive. Drainage east of Priest Drive and north of SR 360 collects in an adjacent residential alley, then drains north.

A portion of the flow from the above areas is intercepted by existing inlets and catch basins along Priest Drive. There are 2 existing irrigation headwall and 18 inch diameter pipe inlets on the west side of Priest Drive; one just south of the SR 360 and the other about 400 feet north. These drain to an existing 42 inch diameter SRP irrigation pipe along the east side of Priest running north.

In addition, there are two 10 foot long curb opening catch basins on the east side of Priest about 300 feet north of the SR 360. These catch basins feed the 66 inch diameter City of Tempe storm drain mentioned previously.

State Route 360 from 1/4 mile east of Priest Drive to Hardy Drive.

As mentioned previously, this section of State Route is depressed below grade. It drains east past Hardy Drive about 1/2 mile to Kyrene Road. Here, the drainage is collected and pumped via 48 inch diameter pipe to the Kyrene detention basin south of SR 360 and west of Kyrene Road. This basin also receives inflow from a 90 inch diameter storm drain jointly used by ADOT and the City of Tempe.

Runoff detained in the Kyrene basin is pumped via 69 inch diameter pipe under the Western Canal to a 69 inch diameter City of Tempe storm drain flowing west parallel to the canal. This line increases in diameter to 75 inches and passes back under the canal to the north side between Hardy and Priest Drives. At Priest Drive, this line connects to the 66 inch diameter

line which drains to the Tempe Drain. Apparently, discharge from the Kyrene Basin is controlled by an intergovernmental or joint-use agreement between ADOT and the City of Tempe. A copy of this agreement has not been located.

3B. Previous Studies

The following drainage studies have been provided by ADOT. They were the basis for design of existing adjacent drainage improvements and also as the basis for the design concepts presented here. All reports share the same basic design criteria. Although study methods, assumptions, rainfall distributions and design frequencies may vary slightly among reports, we believe that all reports are reasonably compatible and consistent with each other.

Final Drainage Report Volume II

I-10 Corridor Study 40th Street to Baseline Road

Prepared by DMJM in association with Jack E. Leisch & Associates, March 1988

This report evaluates existing drainage and proposes an ultimate drainage system for Interstate 10 from 40th Street to about 2000 feet south of Baseline Road. Runoff hydrographs, peak flows and volumes were generated using the SCS TR-20 computer program. A 24 hour rainfall distribution was developed based on ADOT procedure of April 17, 1987, then truncated to the middle 8 hour period. The 10-year and 50-year frequency events were evaluated. Rainfall totals were 2.29 inches for the 10-year event and 3.20 inches for the 50-year event.

Final Drainage Report Volumes 1 and 2

I-10/44th Street - Superstition T.I.

I-10/40th Street - Southern Avenue

Prepared by DMJM April 1990

and

Addendum to Final Drainage Report, November 1990, Revised February 1991.

This report analyzes drainage for the roadway and interchange improvements currently under construction adjacent to and immediately downstream of this project. It is based on the ultimate system proposed in the March 1988 corridor study and establishes maximum flow rates that can discharge to Detention Basin "E" and not exceed downstream limits set by the Tempe Drain Intergovernmental Agreement. Detention Basin "E" is the primary outfall for I-10 drainage from the I-10/SR 360/Baseline Road project. It is located just south of Bell Butte on the east side of I-10.

Runoff hydrographs were generated and routed using the Corps of Engineers HEC-1 computer program. A rational unit graph methodology was used along with a 90 minute rainfall distribution. The 10-year and 50-year frequency events were evaluated with rainfall totals of 1.80 inches and 2.67 inches respectively.

Drainage Report

I-10 Corridor Study 40th Street to Baseline Road

Prepared by DMJM in association with Jack E. Leisch & Associates, June 1986

and

Addendum to the Drainage Report, October 1986

This report, among other things, evaluates the drainage on State Route 360 from Priest Drive to Rural Road and the impact of additional lane width in this depressed section on the capacity of the existing Kyrene Detention Basin, collection and pumping system. It recommends an increase in the number of catch basin inlets and an increase in the capacity of the pump and delivery system to the basin. It concludes that the extra runoff volume due to added lanes would increase the high water elevation in the Kyrene Basin by 0.12 feet in a 50-year storm, thus reducing the freeboard from 1 foot to 0.88 feet.

I-10 Corridor Study

Superstition Retention/Detention Basin

Prepared by DMJM, November 1987

This report evaluates the existing Kyrene detention basin capacity of 241 acre-feet in relation to a 100-year 24-hour storm estimated to produce about 415 acre-feet. It proposes an enlargement in the present basin volume by expanding the sides while retaining existing bottom elevation of 1149.0 and high water elevation of 1170.5. Existing outlet pumps and present property boundaries would also be retained.

Design Frequency:	10-year for pavement flow spread design
	For catch basin and storm drain design:
	10-year (roadway on grade)
	50-year (depressed roadway)
	50-year for storm water detention
	100-year for detention freeboard, floodplain considerations and impacts on adjacent property
Rainfall (I):	ADOT procedure of 4-17-87 in Appendix B.
	1 hour duration used in estimating rational intensities
	10 year - 1.60" 50 year - 2.35" 100 year - 2.70"
	6 hour duration used in HEC-1
	10 year - 2.05" 50 year - 2.95" 100 year - 3.35"
Runoff Coefficient (C):	pavement (impervious) - 0.95
	right-of-way (pervious) - 0.50
	(HEC-1 uses a weighted C times the area at an assumed 100% impervious)
Detention Bleedoff:	maximum disposal time = 36 hours

The project limits fall within the City of Tempe. Although Tempe standards do not apply within ADOT right-of-way, they were considered in the preliminary evaluation of drainage impacts on the existing Fairmont Commerce and South Mountain Corporate Centers adjacent to I-10. These two commercial parcels are considered in more detail in Appendix L.

The basic Tempe drainage criteria is summarized as follows:

Runoff Method:	rational Q=CIA
Rainfall:	100-year, 1-hour depth of 2.40 inches for retention design
Runoff Coefficient:	C=0.95 for areas requiring retention
Retention Bleedoff:	maximum disposal time = 36 hours
Retention Vol. Required:	Vol. = rainfall x C x area
Maximum Retention Depth:	3 feet

The 50-year 6-hour rainfall used for design of detention basins in this report is 2.95 inches. This is greater than the 2.40 inches used by the City of Tempe and the 2.67 inches used by DMJM in their I-10/44th Street - Superstition T.I., I-10/40th Street - Southern Avenue drainage report. The Tempe Drain Intergovernmental Agreement referred to earlier which limits inflows from different sources does not associate these inflows with any particular storm frequency, duration or method of calculation. The 6-hour storm duration applies here (as opposed to the 24-hour) because the entire contributing area is less than one square mile. The 6-hour duration also applies to the 100-year storm used in checking detention freeboard.

The 100-year return frequency has also been considered in the general design concept of roadside ditches. The basic roadway drainage system is designed for 10 and 50 year flows. However, it is ADOT's desire to contain its discharge within the right of way up to the 100-year frequency.

Although it is the general intent to contain 100-year onsite flows within the right-of-way, there are a few instances where, for example, a narrow strip of right-of-way just outside a retaining

wall will drain offsite. This occurrence is kept to a minimum and when considered with the general overall improvement over existing drainage, it is typically of minor consequence.

5. STUDY METHODS

5A. Hydrology

There are two basic hydrologic rainfall-runoff models used in this report; the rational method and the SCS dimensionless unit hydrograph option of HEC-1. The rational method is used on drainage sub-basins of up to 80 acres to estimate design flow rates for roadway drainage. HEC-1 is used to generate hydrographs for routing through proposed detention basins. Reasonably close agreement in peak flows has resulted between the two models.

The rational method is the standard Q=CIA. In this report, it is the backbone of drainage design for gutter flow, pavement spread, catch basin size and spacing, ditch and channel flow and storm drain trunkline and lateral sizing. It is applied on the basis of accumulated upstream contributing drainage area. With a few exceptions, catch basins (which are covered under Hydraulic Modeling) are generally designed for 100% interception with little or no flow-by. Therefore, the contributing area for a catch basin in series will generally extend only to the next upstream catch basin. Conversely, for storm drains, the contributing area at any point will be an accumulated total of all upstream sub-areas with an accumulated runoff coefficient, time of concentration and area.

Runoff coefficients are area-weighted based on the following accumulated components:

roadways, paved shoulders, sidewalks, etc. - C = 0.95

graded or landscaped areas - C = 0.50

These components are also referred to as impervious and pervious respectively. Runoff coefficients are taken from ADOT criteria.

Time of concentration is based on the accumulated length and estimated average flow velocities for the following basic components of that length:

sheet flow/overland flow = 1-3 ft/sec

gutter flow = 2-4 ft/sec

channel flow/ditch flow = 3-5 ft/sec

storm drain pipe flow = 5-10 ft/sec

The method of estimating time of concentration is based on SCS TR-55. The velocity range of 1-3 ft/sec for sheetflow/overland flow is also based on TR-55. The velocity ranges for gutter, channel and storm drain flow are based on hydraulic calculations contained in this report. For the most part, times of concentration are based on an assumed average velocity at the mid point of the stated ranges unless otherwise noted. The minimum time of concentration is 10 minutes according to ADOT criteria.

Rainfall intensities are based on a duration corresponding to the time of concentration, the 1-hour point precipitation for various design frequencies, and the Standard Duration Rainfall Intensity Curves found in Appendix B. The contributing area is simply the total area draining to the point of concentration.

Runoff calculations are presented in Appendix E. A spread sheet type of format has been used to assemble and organize input data. Peak flow rates are shown on the spread sheet. Drainage sub-basins and points of concentration are shown on exhibits in Appendix H.

HEC-1 is used in conjunction with the rational method which is suitable for estimating peak flows but is not generally accepted for producing hydrographs. HEC-1 generates and routes hydrographs and is used in the design and evaluation of detention basins.

HEC-1 contains a number of optional hydrograph methods. The method chosen here is the SCS dimensionless unit hydrograph which is based on the SCS National Engineering Handbook, Section 4, Hydrology. It is essentially the same methodology as the SCS TR-20 computer program. It was chosen because of its general acceptability, ease of use and in this case, reasonable agreement to rational method peak flows.

It's application in this report uses a basin lag time which is 60 percent of the corresponding rational method time of concentration. For basin area, the product of rational method runoff coefficient times area was used at an assumed 100 percent impervious instead of the total area and runoff curve number. This is in accordance with ADOT's memo of December 11, 1990. Also in accordance with that memo is the use of a PH hypothetical, symmetrical rainfall distribution and 2 minute time interval. Storage routing through detention basins was modeled using the RS modified Puls routing option. Stage, storage and discharge data used in this routing are contained in Appendix H. Assumptions regarding discharge calculations are also contained in that Appendix. The HEC-1 printout is contained in Appendix I.

5B. Hydraulics

A number of different hydraulic analyses are used in this report to evaluate gutter, ditch, catch basin and storm drain pipe flow. The Manning Equation is used as the basis for open channel and pipe hydraulics. Hydraulic Engineering Circular No. 12 (HEC-12) Drainage of Highway Pavements is used as the basis for gutter and catch basin hydraulics. It uses a modified Manning equation for gutter flow and a combination of weir, orifice and empirical relationships for catch basin hydraulics.

Roadside ditch hydraulics are based primarily on Hydraulic Design Circular No. 4 Design of Roadside Drainage Channels. Criteria for minimum slope, maximum velocity, freeboard, etc. reference the ADOT Project Design Guidelines and the Design Procedures Manual mentioned earlier in this report. The Manning Equation is used to analyze ditch hydraulics.

Calculations for storm drain, catch basin, gutter and channel flow are contained in Appendix F. These calculations are done in part by hand and in part by computer. ADOT's CB 2 computer program which is based on HEC 12 was used extensively in gutter and catch basin hydraulics. Each basic operation in CB 2 used in this report has been verified by hand for correlation with HEC 12. A spread sheet has also been used to assemble and summarize input and results of the hydraulic analysis.

Catch basins are sized and spaced given several considerations and criteria. Catch basins are located at all points of vertical pavement sag and sized for 100 percent interception at acceptable ponding depth and pavement flow spread. Roadway catch basins on grade are

located to meet acceptable ponding depth and spread and, as mentioned in the Hydrologic Modeling section, generally are sized for 100 percent interception. This holds true for both 10 and 50 year design frequencies. Roadway catch basins are also located at the beginning of transitions to pavement rollover and at intersections and gore areas.

Catch basins for roadside drainage ditches and open landscaped areas are located in conjunction with roadway catch basin and storm drain lateral locations and where physical constraints dictate. Consideration is also given to location in order to limit flow rates and velocities in roadside ditches, and thus limit erosion and scour. Clogging factors for catch basins are taken from the Arizona Statewide Management Program, Project Design Guidelines.

Hydraulic grade line analysis is performed for all storm drain trunklines and major laterals for Unit 1 and Unit 2 and for the I-10 trunkline using ultimate condition flow rates. This analysis is based on a 50-year return frequency. The procedure is essentially that presented in ADOT's Hydrologic and Hydraulic Training Session, Section F. Calculation sheets along with an explanation of assumptions are contained in Appendix E.

6. PROPOSED DRAINAGE IMPROVEMENTS

6A. General Discussion

In the proposed design, the general drainage concepts are as follows:

- Collect all drainage from ADOT right of way, detain it and bleed it off at controlled rates to acceptable existing facilities downstream.

- Convey irrigation flows of the Western and Highline Canals across ADOT right of way and eliminate existing ADOT drainage discharge to these canals.

- Plan for future discharge from ultimate roadway improvements including future median paving and lane widening along I-10 between Baseline Road and Guadalupe Road and future SR 360 roadway improvements to 5 lanes in each direction.

- Mitigate impacts of proposed roadway improvements on existing drainage and retention facilities of adjacent commercial and residential development.

- Minimize the impacts of proposed roadway improvements on existing delineated floodplains.

- Design new roadway improvements to meet current ADOT and FHWA drainage standards.

- Evaluate existing drainage facilities using current ADOT and FHWA drainage standards and retrofit where appropriate.

- Consider phasing of proposed improvements and the requirements for interim drainage facilities to temporarily handle certain drainage until the next phase of construction.

- Design an economical, functional and safe drainage system.

The drainage system will include a new storm drain line and laterals for I-10. The trunkline will run along the east side of I-10. At the upstream end, it begins just south of the westbound Baseline Road off-ramp. It discharges to the proposed Detention Basin 1 on the west side of I-10 immediately south of the Western Canal. The trunkline ranges in size from 42 inch diameter at its upstream end to 66 inch diameter at Detention Basin 1. It will be constructed with Unit 1. Laterals are generally 24 inch in diameter. Catch basins will be located along the way to remove drainage from the pavement and to intercept drainage that normally discharges to the Highline and Western Canals. The I-10 storm drain system is designed to convey ultimate condition flow rates.

Discharge from Detention Basin 1 will pass under the Western Canal at a much reduced flow rate to Detention Basins 2A and 2B which are located in the infield area on the west side of I-10 main lanes south of Southern Avenue. Detention Basin 2B will also receive pumped discharge from the Southern Avenue depressed section. Drainage from the Southern Avenue depressed section is covered in more detail later in this report.

Drainage from the area north of the Western Canal from Priest Drive to I-10 including part of SR 360 will drain to Detention Basins 3A, and 3B located in the infield areas east of I-10 main

lanes south of Southern Avenue. Combined discharge from the I-10 and SR 360 drainage systems south of Southern Avenue and west of Priest Drive is limited to 15 cfs. This flow will travel north via a 24 inch diameter storm drain pipe to the existing storm drain and detention basin system designed by DMJM. The ultimate outfall for this drainage will be the Tempe Drain which was mentioned earlier. Detention and detention bleedoff are covered in more detail in the following section.

Drainage on SR 360 east of Priest Drive will continue to drain east to the existing pump station at Kyrene Road. A new storm drain trunkline will be constructed along the south side of the main lanes. It will receive drainage from roadway main lane improvements designed by Stanley Consultants as well as drainage from the Priest Drive on and off ramps designed by Parsons, Brinckerhoff, Quade and Douglas. However, the new trunkline will tie into the existing trunkline running in the median just east of Hardy Drive. The existing trunkline has inadequate capacity under current design standards and, as mentioned previously, the pump station at Kyrene Road is also inadequate. Upgrading of these aspects of SR 360 drainage are beyond the current scope of work and will be done at a future date by ADOT.

Baseline Road and Priest Drive introduce cross drainage to I-10 and SR 360 respectively. The areas contributing to this cross drainage were not analyzed in detail for this report. The offsite area contributing to Baseline Road is relatively small. New catch basins to be installed in Baseline are designed, using ADOT criteria, to intercept only the amount of drainage produced by those areas improved under Unit 1 and Unit 2 plans. However, since the catch basins are not selective of contributing area, they will intercept all drainage, both onsite and offsite, up

to a certain capacity. Cross drainage in excess of this will continue flowing east in Baseline Road.

Priest Drive potentially receives drainage from several hundred acres extending south past Baseline Road. The existing storm drain in Priest Drive will only handle minor storms. The City of Tempe will not permit the addition of any new catch basins to the existing storm drain. Because of the limited improvements proposed in Priest Drive under Unit 1 and 2 plans, the overall improvement of drainage in the area due to I-10/SR 360 construction and because of the lack of viable outfall, the City of Tempe has agreed to allow Priest Drive improvements to simply drain north much as it does now.

6B. Detention Basins

Essentially, SR 360 west of Priest Drive and all of I-10 within the project area including the Southern Avenue depressed section, will drain to a new system of detention basins around and within the I-10/Superstition interchange. Currently, there is no significant stormwater detention for this area of the project. Refer to Appendix H for a Unit 1 - Unit 2 schematic of I-10/SR 360 TI detention basins showing their location and flow routing. SR 360 from about Priest Drive to the east will drain to the existing Kyrene pump station and detention basin much the same as it does now.

Construction sequencing will result in some temporary aspects to the specific Unit 1 and Unit 2 detention design in and around the I-10/Superstition traffic interchange. A brief summary of these aspects follows:

- Detention Basin 1 in Unit 1 will be overexcavated for earthwork borrow during Unit 1 construction and filled partially back in during Unit 2 for earthwork disposal.

- Detention Basins 2A and 2B in Unit 1 are separated by exiting Ramp W-S. In Unit 2, Ramp W-S is removed and Basin 2B is reconfigured. Basin 2A is also reconfigured and Basins 2A and 2B remain separated, only the separation is created by Eastbound T-4.

- Detention Basin 3C in Unit 1 will discharge to the existing ditch along the east side of existing Ramp W-N and I-10 main lanes much the same as it does now. In Unit 2, this basin is combined with Basin 3B and reconfigured to form a revised Basin 3B. This revised basin will discharge under I-10 main lanes to Basin 2A in Unit 2.

Essentially, drainage from the entire project area will be detained in basins and bled off at controlled rates. The basis for design of stormwater detention facilities is the 50 yr. - 6 hr. rainfall of 2.95 inches. The 50-year, 6-hour high water elevation in TI detention basins will be no higher than the adjacent roadway subgrade elevation in final Unit 2 construction. Proposed detention basins in and around the I-10/Superstition TI will be checked for 100 yr.-6 hr. freeboard capacity to ensure there will be no breakouts or overtopping of undesirable consequence.

Appendix H contains a preliminary schematic of the proposed detention basin layout, routing and stage-discharge-volume characteristics for detention around and within the I-10/Superstition TI. Generally, basins will be designed with side slopes of 4H:1V and range in depth from about a foot to over 10 feet. The existing detention basin on the north side of Southern Avenue east of I-10 will remain essentially as it is now.

Detention Basins 1 and 3A in Unit 1 will require pumps to discharge their water until Unit 2 is constructed. With Unit 2 construction, all detention basin bleedoff will be accomplished by gravity pipe system. Interim pumps in Unit 1 will be provided by the construction contractor under special provision in the contract documents. Pumping will be coordinated with ADOT.

The Kyrene detention basin is jointly used by ADOT and the City of Tempe. Discharging into the basin are 2 pipes, 48 inches and 90 inches in diameter. The 48 inch pipe discharges only pumped drainage from ADOT right-of-way. The contributing area consists of SR 360 from about Priest Drive to just east of Mill Avenue. The 90 inch line discharges pumped drainage from the SR 360 depressed interchanges at Rural, McClintock and Price Roads as well as gravity discharge from four City of Tempe storm drains located between Kyrene and Price Roads.

According to previous drainage reports prepared by DMJM, the present capacity of the Kyrene basin is 241 acre feet at a high water elevation of 1170.5. The DMJM report estimates a total contributing area of 2244 acres to the Kyrene basin. Of this total area, only about 189 acres, (or a little over 8%), is ADOT right-of-way. This right-of-way was estimated to produce a little

over 11% of the total runoff volume. In terms of the present capacity of the Kyrene basin, this equates to about 27 acre feet out of the total 241 acre feet.

It is unclear what storm criteria was used to design the present detention basin. Based on DMJM's estimated contributing areas and curve number rainfall losses, we estimate the present basin capacity of 241 acre feet equates to about 2.58 inches of rainfall over the contributing area. This is almost but not quite the 50-year, 6-hour rainfall of 2.95 inches.

Roadway improvements proposed in the I-10/Superstition/Baseline project will result in an increase in runoff volume contributing to the Kyrene Detention Basin. This is due to an increase of both impervious surface and contributing drainage area. The increase in volume is estimated at 2.18 acre feet. Calculations for this volume estimate are contained in Appendix H.

DMJM, in their 1986 addendum to the I-10 Corridor Study drainage report, estimated that future roadway improvements would create an additional 84,400 cubic feet (or 1.94 acre feet) of runoff that would need to be held in the Kyrene Basin. They estimated that this would result in a rise of 0.12 feet above the basin's design water surface of 1170.5 and reduce the 1 foot of design freeboard to 0.88 feet. This increase was not considered significant and it was suggested that an expansion of the basin volume may not be warranted.

An extensive search was conducted by Stanley Consultants to find any kind of intergovernmental or joint use agreement governing use of the Kyrene Basin. This search included ADOT, the City of Tempe and the Flood Control District of Maricopa County. No

The analysis indicates that hydraulic grade line rises above proposed finished grade at DMJM Manhole #'s 130, 131, 132 and 133. This condition occurs primarily because of the local contributing area with the assumption of future CD lanes and 50-year storm. The addition of TI basin bleedoff has relatively little impact on hydraulic grades. Since nearly all of the runoff peak is produced from local areas with short response times, excessive hydraulic grade will be relatively short in duration. Nearly all of the TI basin evacuation time will occur when there is no concurrent local flow north of Southern Avenue.

The analysis also indicates that the hydraulic grade line potentially rises above the new surface inlet grate at the west end of the existing Southern Avenue basin. This is only for a short duration and the hydraulic grade is lower than the basin overflow elevation.

The hydraulic grade line analysis also indicates the potential for surcharge affect on the TI basin discharge system since the hydraulic grade will be higher than the bottom of the lowest basins. This is caused by short duration local inflow downstream of the TI basins. During downstream concurrent flow, TI basin discharge may be inhibited. However, the lowest TI basins are designed to hold the entire contributing volume while the surcharge is occurring. After concurrent downstream flow recedes, the TI basins will discharge freely.

The 24-inch diameter storm drain discharge pipe from Detention Basin 2B is modeled in HEC-1 assuming inlet control using the Bureau of Public Roads headwater depth nomograph, Chart 2. At a depth of 2 feet, which is equal to the pipe diameter, the inlet capacity is about 13 cfs. This also corresponds to the friction slope of the pipe just flowing full assuming outlet control. The hydraulic grade line used in design of the discharge pipe connecting to DMJM Manhole

documents were found. On the basis of volume estimated by both Stanley Consultants and DMJM, it is evident that impacts of proposed construction on the Kyrene Basin are minimal. It was mutually agreed between ADOT, the City of Tempe and Stanley Consultants that no modifications are warranted at this time, either physical or operational.

6C. Detention Bleedoff

There will be two primary discharge locations from the I-10/Superstition project; one from the existing Kyrene Detention Basin and the other from proposed basins at the I-10/Superstition TI. The Kyrene discharge will continue as it has in the past. The slight increase in ponding volume and water surface in the Kyrene Basin due to proposed SR 360 improvements is not, in itself, significant enough to warrant any change in design or operation as just discussed.

Discharge from the proposed TI basins will be in accordance with the Tempe Drain IGA and previous drainage reports prepared by DMJM. The maximum discharge assumed by DMJM from the proposed TI basins to their Detention Basin "E" at Bell Butte is 10 cfs for a 10-year storm and 15 cfs for a 50-year storm. These assumed inflows were added by DMJM to the local flow contributing to Basin "E" and routed through the rest of their HEC-1 model to the Tempe Drain. This model shows that the 93 cfs inflow limitation to the Tempe Drain is not exceeded.

As mentioned previously, the Tempe Drain IGA does not associate the 93 cfs inflow limitation with any specific return frequency or duration. DMJM's design storm has a 50-year frequency and 90 minute duration. This appears to be acceptable to all concerned so we have adopted the 50-year, 15 cfs limitation from DMJM as our 50-year discharge limit. The fact that the Stanley Consultant's 50-year storm has a 6-hour duration should be of no consequence to DMJM's

HEC-1 model because DMJM entered the assumed 15 cfs into their model as a constant from beginning to end of a 36 hour period. We treat it as an absolute maximum peak regardless of when it occurs and what duration the storm is. Hydraulically and hydrologically speaking, the DMJM HEC-1 model makes no assumption as to how the TI basin discharge gets to Basin "E".

Flow contributed by catch basins to be constructed north of Southern Avenue under Stanley Consultants' plans are not included in the 15 cfs discharge limitations. This contributing area is already included in the DMJM model.

The means by which the TI basin discharge is conveyed from its outlet to Basin "E" requires, among other things, consideration of alignment, utility conflicts, future roadway improvements, maintenance, right of way, local drainage and hydraulics. Discharge from the TI basins will be conveyed by a new 24" diameter concrete pipe under Southern Avenue east of I-10 then north along existing I-10 westbound main lanes where it will connect to DMJM's existing Manhole #135. This new storm drain will be constructed in Unit 1. A preliminary plan and profile for this is illustrated in Appendix J. It is hydraulically very similar to the actual design.

DMJM Manhole #135 is at the upper end of the existing storm drain trunkline which picks up I-10 drainage between Southern Avenue and Bell Butte and discharges to Basin "E". It increases in size from 24 inch diameter at Manhole #135 to 60 inch diameter at Basin "E". It has been hydraulically sized to convey a 10-year storm from the area it drains. This area includes provision for future CD lanes on either side of I-10 from Southern Avenue to Bell Butte.

Presently, the existing DMJM trunkline is located just east of the existing travel lanes and shoulder of westbound I-10. However, this storm drain is aligned under one of the future westbound CD travel lanes. This situation will require some consideration when the ultimate CD lanes are constructed since maintenance access will be affected by traffic. For now, the proposed bleedoff of TI basins utilizing the existing DMJM trunkline is the most economical solution.

There are a number of utility crossings in the proposed alignment from the TI basins to DMJM Manhole #135. These include telephone, natural gas, sewer, and water. Pothole surveys have been done at crossing points to minimize conflicts. The proposed alignment will also necessitate crossing of Southern Avenue. This will occur about 400 feet east of the I-10 centerline.

The existing 24 to 30 inch diameter culvert pipe under Southern Avenue east of the new line will continue to function much the same as it currently does. The current flow rate at this culvert will be reduced with construction of Unit 1 and further reduced in Unit 2. The existing detention basin along the north side of Southern Avenue will remain as is. However, in addition to the existing 16 inch outlet pipe at its east end, there will be a new surface grate inlet at its west end to allow flows to enter the I-10 24" storm drain constructed in Unit 1. This new grate inlet will be about a half foot lower in elevation than the existing 16 inch outlet pipe at the east end of the basin. This inlet grate will be blocked off until Unit 2 is constructed.

The possible concurrence in flows within the DMJM trunkline between the local contributing area and the bleedoff from the proposed TI basins has also been considered. Stanley HEC-1

models 50 Unit 1 and 50 Unit 2 for the proposed I-10 drainage system include the local flows contributing to the existing DMJM trunkline. Local flow rates are based on original DMJM ultimate condition area, time of concentration and runoff coefficients. The analysis was based on a 50-year, 6-hour storm.

Although the maximum bleedoff from proposed TI basins is 15 cfs, it is estimated that this will add no more than about 8 cfs to local flows because of the different timing of hydrograph peaks. The greatest relative concurrence is at DMJM Manhole #135 where the 50-year ultimate condition local peak is about 8 cfs. With the concurrent TI basin bleedoff, the peak at Manhole #135 would be about 16 cfs. At DMJM Basin "E", the ultimate condition 50-year 6-hour storm is about 200 cfs. Therefore, an addition of concurrent flow is almost negligible.

A preliminary hydraulic grade line was estimated for the entire length of the bleedoff line based on the following assumptions:

- 50-year, 6-hour design storm
- Starting 50-year water surface in DMJM Basin "E" is 1148.98 based on the DMJM revised addendum to their original drainage report.
- Flow rates reflect ultimate condition contributing lower area plus ultimate condition bleedoff from proposed TI basins.
- Existing pipe profile is from DMJM design plans since as-builts of the trunkline are not yet available.

#135 assumes a maximum flow rate of 15 cfs and no concurrence of flow with local tributary areas north of Southern Avenue. With these assumptions, HEC-1 hydrograph modeling indicates that the maximum discharge of the combined I-10/Superstition drainage and detention system does not exceed 15 cfs in the 50-year, 6-hour storm for Unit 1, Unit 2 or the ultimate condition.

Estimation of the time to bleed off detained runoff is included in Appendix J. The estimate assumes an average pipe discharge of 7.5 cfs for the total required detention volume plus an infiltration/percolation rate of 0.50 cfs per wetted detention basin acre. The wetted acreage assumes Detention Basin 2B only which has a bottom area of about 3.8 acres. This analysis indicates that detention bleedoff will be accomplished in less than 36 hours.

6D. Southern Avenue Depressed Section

Southern Avenue passes under I-10 in a depressed section as mentioned in the introduction. Runoff from Southern Avenue drains to a low point in the roadway profile via gutter and storm drain where it is picked up by pump system.

Drainage from I-10 right-of-way south of Southern Avenue also drains to the depressed section as described in the Existing Drainage section. This drainage was not anticipated in the original design. Drainage pumped from the Southern Avenue depression discharges to the Western Canal via 24-inch diameter reinforced concrete pipe. A concrete weir structure near the canal prevents canal water from backflowing into the discharge pipe. This discharge is under license by the Salt River Project (SRP License to Use Project Right-of-Way, C.S.R. No. 95195-6, License No. 15191, March 10, 1966).

The vertical difference between the normal water surface in the Western Canal (approx. elevation 1179.3) and the lowest pump switch-off elevation (1141.15) is a little over 38 feet. The water remaining in the 24 inch discharge pipe after pump switch-off is bled through a 2 inch diameter pipe to a concrete box just south of Southern Avenue. This box is drained by a gravity 8 inch diameter AC pipe west to an existing buried SRP irrigation line.

A visual inspection of the pump house, inlet, pump and discharge system indicates that construction of the pump station was essentially as originally designed. A few modifications have been made which will be addressed later in this section.

Existing roadway and drainage improvements were constructed in the mid-1960's under criteria which differs slightly from today's standards. The basic drainage design was as follows:

drainage area	-	3.8 acres
impervious	-	all
storm frequency	-	25 years
collection time	-	less than 5 minutes
intensity, 10 minute	-	4.6 inches per hour
Phoenix formula	-	Q=0.9 (4.6 - 0.2)
		= 3.96 cfs/acre
total flow	-	3.96 cfs/acre x 3.8 acres
		= 15.05 cfs
two pumps @ 3500 gpm	-	= 15.6 cfs

The above information was taken from sheet 1 of 9, Southern Avenue Pump House Plans, Project Number I-10-3 (51) dated December 15, 1965. Design criteria for allowable pavement flow spread was not included on this plan. The total contributing area of 3.8 acres is apparently only for Southern Avenue right-of-way and does not consider any area from I-10. The I-10 drainage was added in later improvements, apparently without consideration to Southern Avenue pump station capacity. Despite this, according to ADOT District Maintenance, the existing pump station has a satisfactory performance record.

There are two identical pumps which discharge drainage from the Southern Avenue depression. They operate in overlapping parallel. According to original design, pump #1 turns on at elevation 1143.65 and off at elevation 1141.15. Pump #2 turns on at elevation 1146.15 and off at elevation 1143.15. The original float and float rod switch system has been replaced by a pressure switch system.

On May 14, 1991, a flow test was conducted on the pump station. The return valve on the #1 pump was opened and the sump pit was allowed to fill with dead storage water from the 24 inch discharge line until pump #1 turned on. The pump was allowed to warm up and run several minutes, then the valve was closed. The turn on and turn off elevations observed appeared to be very close to original design elevations and the pump operation appeared satisfactory. No apparent cavitation occurred. ADOT maintenance personnel present indicated the pumps had both recently been serviced and tested. Based on this information, it was considered unnecessary to test pump #2.

Immediately following the flow test, a continuity test was made on the 24 inch discharge line because it was thought by ADOT maintenance personnel that it no longer discharged to the Western Canal. A tanker truck pumped water into the pump side of the weir box near the Western Canal while an observer watched for it to flow from the 2 inch bleedoff line near Southern Avenue. The water did arrive confirming that the 24" line is still connected as originally designed.

Each of the 2 pumps is manifolded to the 24 inch discharge line by a short section of 12 inch diameter steel or cast iron pipe. The pumps are driven by natural gas engines. According to Gilbert Pump and Equipment, the original installer, the pumps were Fairbanks-Morse Model #C-K2K2030497 2-stage pumps, each rated at 3500 gpm at 48 feet total dynamic head. A performance curve was acquired from the manufacturer and is included in Appendix K. However, the target duty point of 48' @ 3,500 gpm does not fall on the curve and we have been informed (by Gilbert) that propeller alterations were utilized to match the specific duty point.

In addition, according to ADOT maintenance personnel, the original pumps were replaced several years ago by new pumps. The manufacturer was Cascade. The installer was not Gilbert Pump but a different company which is no longer in business. No record is available of the particular Cascade model or serial number. However, ADOT maintenance and Gilbert Pump both agreed that the replacement pumps would have been selected with performance characteristics as close as possible to the original design. The result of all this is that we do not have a specific performance curve for the existing pumps at Southern Avenue.

The ultimate roadway and drainage improvements will bring about two major changes in Southern Avenue drainage. First, pump discharge to the Western Canal will no longer be licensed by SRP. Discharge will instead be directed to the proposed Detention Basin 2B immediately south of Southern Avenue. This will result in a reduction in total dynamic head since the pipe will be much shorter and have less rise. The reduction in vertical lift will be on the order of 10 feet.

The second change will be a reduction in the contributing drainage area. The areas south of Southern Avenue will no longer contribute and in the ultimate condition, there will be a number of additional ramp and CD road bridge structures over Southern that will intercept rainfall and carry it north. In the ultimate condition, the total contributing area will be on the order of 3.8 acres which returns to the original design. Under current criteria and ultimate roadway improvements, this area produces a 50 year flow rate of 20.4 cfs. This is about 30% greater than the original design of 15.6 cfs.

The existing roadway section and storm drain system was analyzed for flow spread, interception capacity and hydraulic grade line for the ultimate condition under current ADOT criteria. The analysis indicates that allowable flow spread will be exceeded at the lowest point in the depressed section. This can be remedied by increasing the capacity of the four outermost catch basins (concentration points 1, 2, 3 & 4) so that they have 100% intercept. This can be accomplished by the addition of slotted drain upstream of each of the four catch basins. The roadway and collection system would then meet current ADOT drainage criteria.

Roadway ponding was also analyzed assuming ultimate condition contributing drainage and complete pump failure to see what the ponding depth would be and whether the pump house machine floor would be flooded. The analysis indicates a depth of ponding of about 2.5 feet above the low point in Southern Avenue which is well below the pump house machine floor.

Hydraulic analysis of the pump station and revised discharge system based on preliminary schematic are included in Appendix K. System head curves illustrating the system operating range, for the revised piping conditions, overlayed with the pump performance curves for the original Fairbanks-Morse and ADOT standard pumps are shown for analysis.

The methodology used to determine the system head curves shown include calculation of Total System Dynamic Headloss (TDH). The TDH is estimated by determining the total equivalent pipe length and assigning a roughness coefficient to that length representative of the pipe's interior condition. The total equivalent length of pipe includes the straight reaches of pipe plus the equivalent pipe length for each fitting detailed (i.e. valves, elbows, etc.). Roughness coefficients usually fall within a range of values, especially when 30 year old steel or cast iron pipe is considered. Therefore, end values defined by the range chosen (83-120 steel pipe) were investigated prior to plotting the system head curve shown. Results of our preliminary analysis indicates that the capacity of the pump station system under both existing and proposed conditions is deficient for the ultimate 50-year inflow rate of 20.4 cfs.

Results of our preliminary analysis indicate that because of a reduction in TDH, the capacity of the pump station under proposed conditions is slightly greater than the original design flow of 3500 GPM for each pump. However, the total discharge capacity even under ideal conditions

is about 18.5 cfs. This is less than the ultimate 50 year inflow of 20.4 cfs. Ideal conditions involve alternations to the proposed discharge system that would minimize head loss. These alterations include up-sizing the discharge lines or, perhaps, eliminating the manifold and giving each pump its own separate line.

Also, with the drop in TDH, the operating efficiency of the existing pumps will drop from about 80% to about 60%. Although the pumps will continue to operate, this is not an ideal design condition and the reduction in efficiency may result in excessive wear and shorter life. We do not expect a problem in cavitation to develop with the reduction in TDH under the proposed condition with the existing pumps.

After review and consideration by ADOT, the following changes to the Southern Avenue collection, pump station and discharge systems will be made.

- Slotted drain will be added to the upstream and of each of the four outermost catch basins in Southern Avenue to reduce flow spread at the low point.

- The existing 24-inch discharge manifold will be removed (in addition to the discharge line and weir box) and each of the two 12-inch discharge pipes will be extended individually to a new concrete discharge structure at Detention Basin 2B. The revised discharge scheme will bring the system to near current standards.

A copy of the detail sheet covering the changes to the pump discharge is included in Appendix K. In addition to these changes, the existing surface inlet draining the infield area just south of Southern Avenue will be removed and the existing 18 inch diameter pipe it feeds will be plugged.

6E. Western and Highline Canals

The Western and Highline Canals traverse the project area as mentioned in the introduction. They follow essentially parallel to contours and have very flat longitudinal grades. The banks of the Western Canal are elevated above adjacent grade by about 1 to 2 feet. The banks of the Highline Canal are essentially at grade. These canals are owned and operated by the Salt River Project (SRP). With the exception of scheduled annual maintenance dry-ups, these canals flow year round.

Generally, ponding of runoff occurs along the canals when banks are elevated above grade. This condition has been mapped by the Federal Emergency Management Agency (FEMA) on the Flood Insurance Rate Map for Maricopa County and Incorporated Areas. Figure 5 shows these areas. They are designated as flood insurance Zone "A". According to the City of Tempe, they are established on an approximate basis assuming a maximum water surface equal to the highest adjacent canal bank elevation. The ponding limits, then, are a horizontal projection of this elevation. There is no flow velocity associated with these zones.

Proposed roadway improvements will encroach into the Western Canal flood zone on both sides of I-10. This encroachment will displace a portion of the existing storage volume in these zones but will not increase the ponding water surface for two basic reasons. First, the assumed

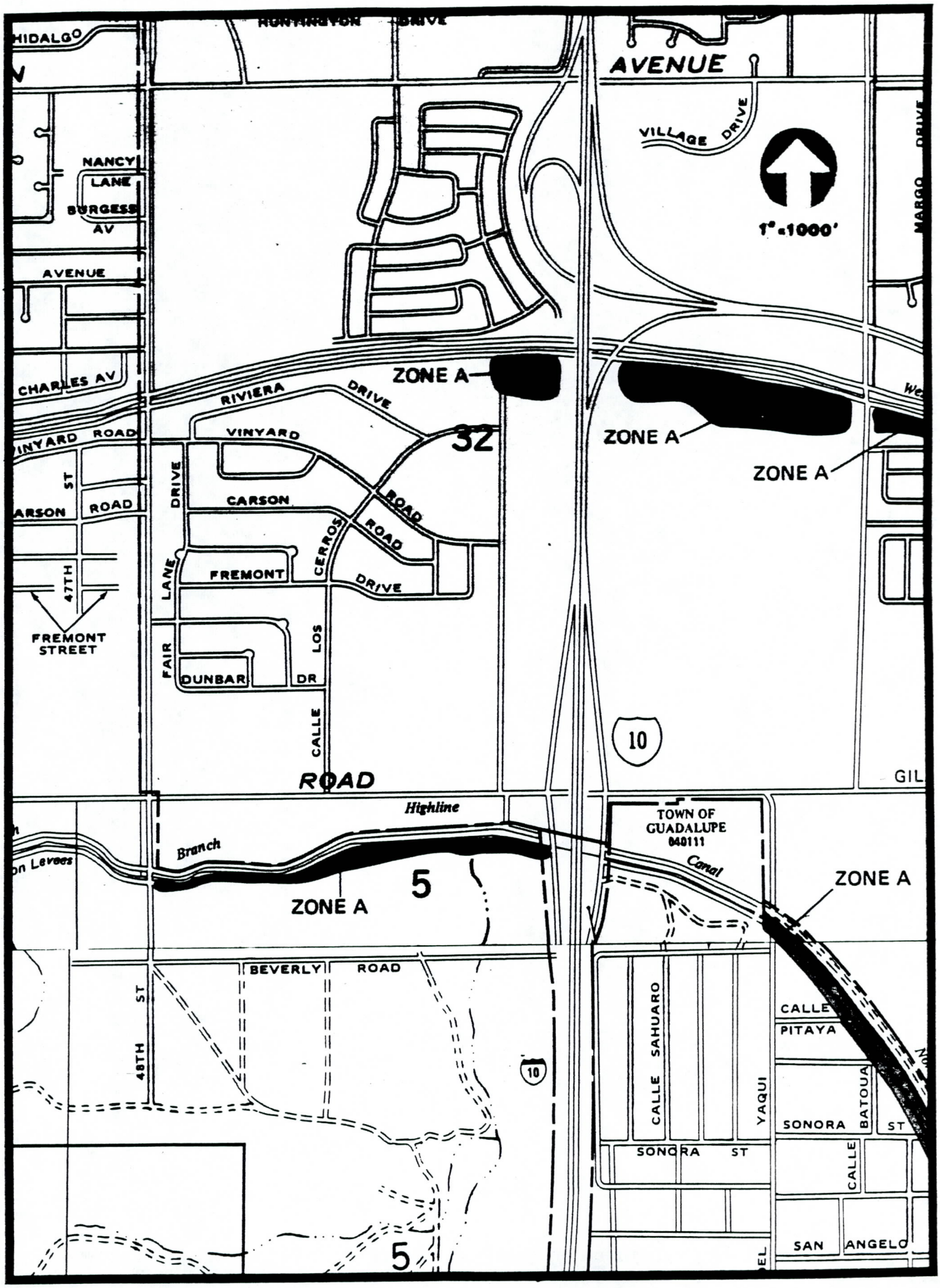


FIGURE 5 **FEMA FLOODPLAIN MAP**

existing water surface, as stated above, is tied to canal bank elevation and not to storage volume. Second, with proposed I-10 drainage improvements, runoff will no longer discharge from ADOT right-of-way to these flood zones but will discharge to proposed detention basins. The displacement in volume from encroachment is more than compensated by a reduction in contributing runoff based on the calculations which immediately follow this section.

Proposed roadway improvements will not encroach into any Highline Canal flood zones. Although the flood insurance map shows a flood zone extending within the right-of-way, a review of existing topography indicates that ponding is not possible there. We consider this to be an error in flood zone mapping.

Proposed roadway improvements will require an extension of the existing box culvert for the Western Canal. It's present length is about 385 feet. Ultimately, it will need to be extended about 350 feet to the west and about 100 feet to the east to accommodate new ramps and CD lanes. In addition, a bridge structure will be constructed to carry Ramp N-E across the canal. The west culvert extension may require a temporary canal diversion since the associated construction may take longer than the annual dry-up.

The existing maintenance road along the north side of the canal will dip under Ramp N-E with an equipment underpass. Drainage of this underpass will be handled by pump with automatic controls. Discharge will drain to the new ADOT storm drain system with outfall to TI Detention Basin 3B.

Preliminary hydraulic analysis for the Western Canal culvert extension was performed in January 1991 by Stanley Consultants and submitted to ADOT and SRP for review. SRP will do the final hydraulic analysis, final design and construction plans and the construction itself with SRP crews under agreement with ADOT. Construction may include a new trash rack upstream of the east culvert extension and a maintenance vehicle turn around area.

The existing Highline Canal culvert under I-10 will also be extended. The extension will be on both sides of I-10 out to the existing right-of-way alignment. This amounts to a distance of about 60 feet on the west side and about 40 feet on the east side. Plans and construction are being handled by SRP.

Drainage from I-10 right-of-way which presently discharges into the Highline Canal will be eliminated. The existing median drain into the culvert will be blocked off and all future drainage will be picked up by storm drain lateral and delivered to the proposed storm drain trunkline running along the east side of I-10.

As of this writing, design plans and hydraulic analysis for canal culvert extensions have not been completed by SRP. When complete, these plans will be reviewed by ADOT and Stanley Consultants.

Special coordination will be required for the proposed storm drains where they pass under the Western and Highline Canals and proposed culvert extensions. Size and grade for the trunkline is shown on the plans and these plans have been transmitted to SRP.

Proposed canal construction is potentially exposed to local runoff during construction. As mentioned, this construction is outside of the Stanley Consultant's Unit 1 and Unit 2 scope. We recommend that temporary measures be considered to protect against local runoff during construction.

DESIGNED BY LSS DATE 5-24-91 SHEET NO. PAGE NO. 53
CHECKED BY WHH DATE 21 JUN 91 OF JOB NO. 1259.1
REVIEWED BY DATE SUBJECT:
APPROVED BY DATE

WESTERN CANAL FLOOD ZONE @ I-10
VOLUME COMPENSATION CALCULATIONS

EXISTING VOLUME DISPLACED EAST OF I-10:
ASSUME: 1. PONDING ELEVATION OF 1180.5
2. EAST ENCROACHMENT LIMIT IS 50 FT OUTSIDE OF PROPOSED RAMP N-E ALIGNMENT

ELEV	AREA	AVG AREA	ΔH	ΔVOL	ΣVOL
78.0	11400	—	—	—	0
79.0	82700	47050	1.0	47050	47050
80.0	145500	114100	1.0	114100	161150
80.5	158800	152150	0.5	76075	237225
					(5.46 ACFT)

EXISTING VOLUME DISPLACED WEST OF I-10:
ASSUME: 1. PONDING ELEVATION OF 1180.0
2. WEST ENCROACHMENT LIMIT IS WENDLER DR.

ELEV	AREA	AVG AREA	ΔH	ΔVOL	ΣVOL
78.0	2500	—	—	—	0
79.0	76750	39625	1.0	39625	39625
80.0	168600	122675	1.0	122675	162300
					(3.73 ACFT)

TOTAL VOL DISPLACED = 5.46 + 3.73 = 9.19 ACFT

TOTAL ESTIMATED I-10 R/W SOUTH OF WESTERN CANAL = 70 AC ±
ASSUME: 50 YR 6HR RAINFALL = 2.95"
ASSUME: ΣCA = 58.36 (ULTIMATE CONDITION)

VOL = 58.36 × 2.95/12 = 14.35 ACFT → TO DETENTION BASINS

CONCLUDE:
VOLUME TO BE DETAINED WILL NO LONGER CONTRIBUTE TO CANAL BANK FLOOD ZONE.
THE CONTRIBUTING VOL REDUCED (14.35 ACFT) IS MORE THAN THE VOL DISPLACED (9.19 ACFT) BY I-10 CONSTRUCTION.

6F. Roadside Ditches

Roadside ditches are found throughout the project area. Their basic function is to collect drainage and direct it to a catch basin, detention basin or some other appropriate outfall. In areas where the roadway section is at or above grade, these ditches are typically situated just inside the right-of-way. They are intended to contain runoff generated by ADOT right-of-way and prevent discharge of onsite flows to adjacent properties. On portions of SR-360 where the roadway is depressed below grade, ditches are found along the top of proposed retaining walls. They prevent runoff generated by landscaped slopes above them from cascading uncontrolled over the retaining wall.

There is no specific design frequency for these ditches. Generally they are a product of design judgement and the surrounding physical slope and grade constraints. They are reflected on cross sections, typically at 100 foot stations, and on plan sheets which typically include flow line elevations. Hydraulically, their design is covered in Appendix F. This appendix contains typical hydraulic sections used in ditch design. Typically, ditch sections have either a "V" bottom or a flat bottom with 4 to 1 side slopes. All ditches have earth sides and bottom.

Hydraulically, the most significant roadside ditches occur along either side of I-10 south of the Baseline Road on/off ramps. Here, there is no curb and gutter along the main travel lanes so drainage is free to sheet flow directly off the pavement and shoulder. Drainage flows from south to north. At somewhat regular intervals, drainage from the west side will pass under I-10 via exiting cross culvert. The new storm drain trunkline along I-10 begins at a point about 2000 feet south of Baseline Road where the first catch basin inlets will pick up ditch flow generated by I-10 right-of-way to the south.

The drainage ditch located along the east side of I-10 between the I-10/ SR-360 TI and Baseline Road will intercept drainage from the landscaped embankment along the roadway as well as any overflow from the roadway section during the 100-year storm. This drainage is directed to the TI detention basins. Drainage from elevated SR-360 between the I-10/SR-360 TI and Priest Drive will be picked up by catch basin and directed to roadside ditches on both the north and south sides. The south side ditch will discharge to TI Detention Basin 3B. The north side ditch will discharge to Southern Avenue in Unit 1 much as it does currently. In Unit 2, it will discharge to TI Detention Basin 2B.

6G. Fairmont Commerce Center and South Mountain Corporate Center

At ADOT's request, Stanley Consultants reviewed and evaluated the impacts of proposed freeway construction specifically on two existing commercial developments. Related correspondence and exhibits are included in Appendix L. This information has been reviewed by ADOT. Review comments have been reflected on final design plans.

6H. Cross Drainage

Stormwater cross drainage will occur at the Western and Highline Canals, at Baseline Road and at Priest Drive. Cross drainage at the canals occurs when storm runoff enters the canal and is carried with the irrigation water. This is a rather unavoidable occurrence with the amount of stormwater flow passing under the roadway limited because canal culverts are designed for irrigation flows only.

Baseline Road presently receives drainage from the area to its south. This includes some offsite contributing area west of I-10. Baseline Road cross drains from west to east under I-10. Proposed catch basin inlets in Baseline Road have been designed based on a contributing area consisting of the

I-10 right-of-way limits where they cross Baseline Road and do not consider the offsite area. Although these proposed catch basins, by virtue of their location and design, will also tend to receive offsite as well as onsite flows, some flow-by is likely to occur in larger storms. This flow-by will continue on to the east. Flow-by will be significantly less after construction than it currently is due to larger and more numerous catch basins. This will improve drainage downstream of the project.

Priest Drive presently receives offsite drainage from a potentially large contributing area to the south of SR-360. Some of this drainage is from Baseline Road. The existing storm drain in Priest Drive is overtaxed according to the City of Tempe. Tempe will not permit any new connections or additional drainage to the Priest Drive storm drain. Due to vertical constraints and utility conflicts, it is not feasible to convey drainage from Priest Drive to freeway drainage facilities.

With the proposed SR-360 improvements, the amount of drainage contributing to Priest Drive from freeway right-of-way will be significantly reduced. This is intended to compensate for not providing catch basins in Priest Drive for runoff generated within the freeway right-of-way.

7. References

1. Arizona Statewide Management Program, Project Design Guidelines, 2nd Edition, ADOT, July, 1987.

2. Urban Highways Section, Design Procedures Manual, ADOT, 1990.

3. Hydrologic Design for Highway Drainage in Arizona, Arizona Highway Department, Bridge Division, Revised March 1969.

4. Hydrologic and Hydraulic Training Session, Arizona Highway Department, Structures Section, Hydraulics Division, Revised December 1973.

5. State of Arizona Department of Transportation, Construction Division of Highways, Standard Drawings, October 1989, with updates.

6. Base Topography provided by ADOT, Contour Interval 1 foot, Various Flight Dates.

7. Arizona Department of Transportation, Inlet Analysis Program CB 2, Program Version 2.0, December 21, 1990.

8. ADOT Office Memo, George Lopez-Cepero to William Wakefield, dated February 13, 1987, regarding flood frequency analysis and use of rainfall runoff models.

9. ADOT Office Memo, George Lopez-Cepero to Steve Wilcox, dated December 12, 1990, regarding HEC-1 input suggested for this project.

10. ADOT Procedures for Determining Rainfall Distribution, dated April 17, 1987.

11. Handbook of Hydraulics, King and Brater, 6th Edition, 1982.

12. Open Channel Hydraulics, Chow, 1959.

13. National Engineering Handbook, Section 4, Hydrology, U.S. Department of Agriculture, Soil Conservation Service, March 1985.

14. Technical Release 55 (TR-55), Urban Hydrology for Small Watersheds, U.S. Department of Agriculture, Soil Conservation Service, November 1981.

15. Watershed Work Plan - Guadalupe Watershed, Flood Control District of Maricopa County and East Maricopa Soil Conservation District, January 1971.

16. Hec 1 Flood Hydrograph Package, U.S. Army Corps of Engineers, Hydrologic Engineering Center, Version 4.0, September 1990.

17. Hydraulic Design Series No. 4, Design of Roadside Drainage Channels, Bureau of Public Roads, May 1965.

18. Hydraulic Design Series No. 5, Hydraulic Design of Highway Culverts, Federal Highway Administration.

19. Hydraulic Engineering Circular No. 12, Drainage of Highway Pavements, Federal Highway Administration, March 1984.

20. Hydraulic Engineering Circular No. 14, Hydraulic Design of Energy Dissipators for Culverts and Channels, Federal Highway Administration.

21. Hydraulic Engineering Circular No. 15, Design of Stable Channels With Flexible Linings, Federal Highway Administration.

22. Manual for Highway Storm Water Pumping Stations Volumes 1 and 2, Federal Highway Administration, 1982.

23. Federal-Aid Highway Program Manual Volume 6, Chapter 7, Section 3, Subsection 2, Federal Highway Administration, April 1984.

24. Flood Insurance Rate Map for Maricopa County and Incorporated Areas, Panels 04013C2165D and 04013C2630D, September 29, 1989.

25. Geotechnical Report for I-10/Superstition/Baseline project prepared by Thomas-Hartig & Associates, dated November 15, 1990.

26. Final Drainage Report Volume II, I-10 Corridor Study 40th Street to Baseline Road, DMJM in association with Jack E. Leisch & Associates, March 1985.

27. Final Drainage Report Volumes I and II, I-10/44th Street-Superstition TI, I-10/40th Street-Southern Avenue, DMJM April 1990 and Addendum to Final Drainage Report, November 1990, Revised February 1991.

28. Drainage Report, I-10 Corridor Study 40th Street to Baseline Road, DMJM in association with Jack E. Leisch & Associates, June 1986, and Addendum to the Drainage Report, October 1986.

29. I-10 Corridor Study, Superstition Retention/Detention Basin, DMJM, November 1987.

30. Initial Drainage Report, I-10/Superstition Freeway TI, I-10/Baseline Road TI, Stanley Consultants, October 1990.

31. Preliminary Hydraulic Analysis Western Canal Culvert Extension, Stanley Consultants, January 1991.

10. CONTENT OF DESIGN STUDIES

a. *The detail of studies shall be commensurate with the risk associated with the encroachment and with other economic, engineering, social, or environmental concerns.*

b. *Studies by highway agencies shall contain:*

(1) *the hydrologic and hydraulic data and design computations,*

(2) *the analysis required by paragraph 9a, and*

(3) *for proposed direct Federal highway actions, the reasons, when applicable, why FEMA criteria (44 CFR 60.3, formerly 24 CFR 1910.3) are demonstrably inappropriate.*

c. *For encroachment locations, project plans shall show:*

(1) *the magnitude, approximate probability of exceedance and, at appropriate locations, the water surface elevation associated with the overtopping flood or the flood of paragraph 9a(1)(b), and*

(2) *the magnitude and water surface elevation of the base flood, if larger than the overtopping flood.*

RECEIVED
DEC 12 1990
CONSULTANT MANAGEMENT SERVICES

ARIZONA DEPARTMENT OF TRANSPORTATION
OFFICE MEMO
BRIDGE DRAINAGE SERVICES

ARIZONA DEPARTMENT OF TRANSPORTATION
...VICE
RECEIVED:
DISTRIBUTION:
PER:

December 11, 1990

TO: STEVE WILCOX, Project Leader
Consultant Management Services

FROM: GEORGE LOPEZ-CEPERO, Bridge Drainage Engineer-Supervisor
Structures Section

SUBJECT: HEC-1 Input
Project No. IR-10-3(311)PE
TRACS No. 10 MA 154 H 0142 02D
I-10/Superstition Freeway Traffic Interchange

For the analysis of the storm drain system, including the detention basins, please have the consultant use the following methodology in regards to input for the HEC-1 Rainfall/Runoff modeling.

1. Use PH records for input of rainfall duration depths. Leave fields 1 and 2 blank.

2. Use a 6 Hr. storm for drainage basins less than or equal to 1.0 square mile. Use a 24 Hr. storm for drainage basins larger than 1.0 square miles.

3. Use a 2 minute tabulation interval with 181 hydrograph ordinates on the IT records. The use of the IT and PH records should eliminate the need for an IN record.

4. To model the rational runoff coeficients, use the CA of the drainage basin on the BA record and show it to be 100% impervious on the LS records.

After the consultant has had the opportunity to review these comments, we are available to discuss them.

George Lopez-Cepero
GEORGE LOPEZ-CEPERO

GLC:la

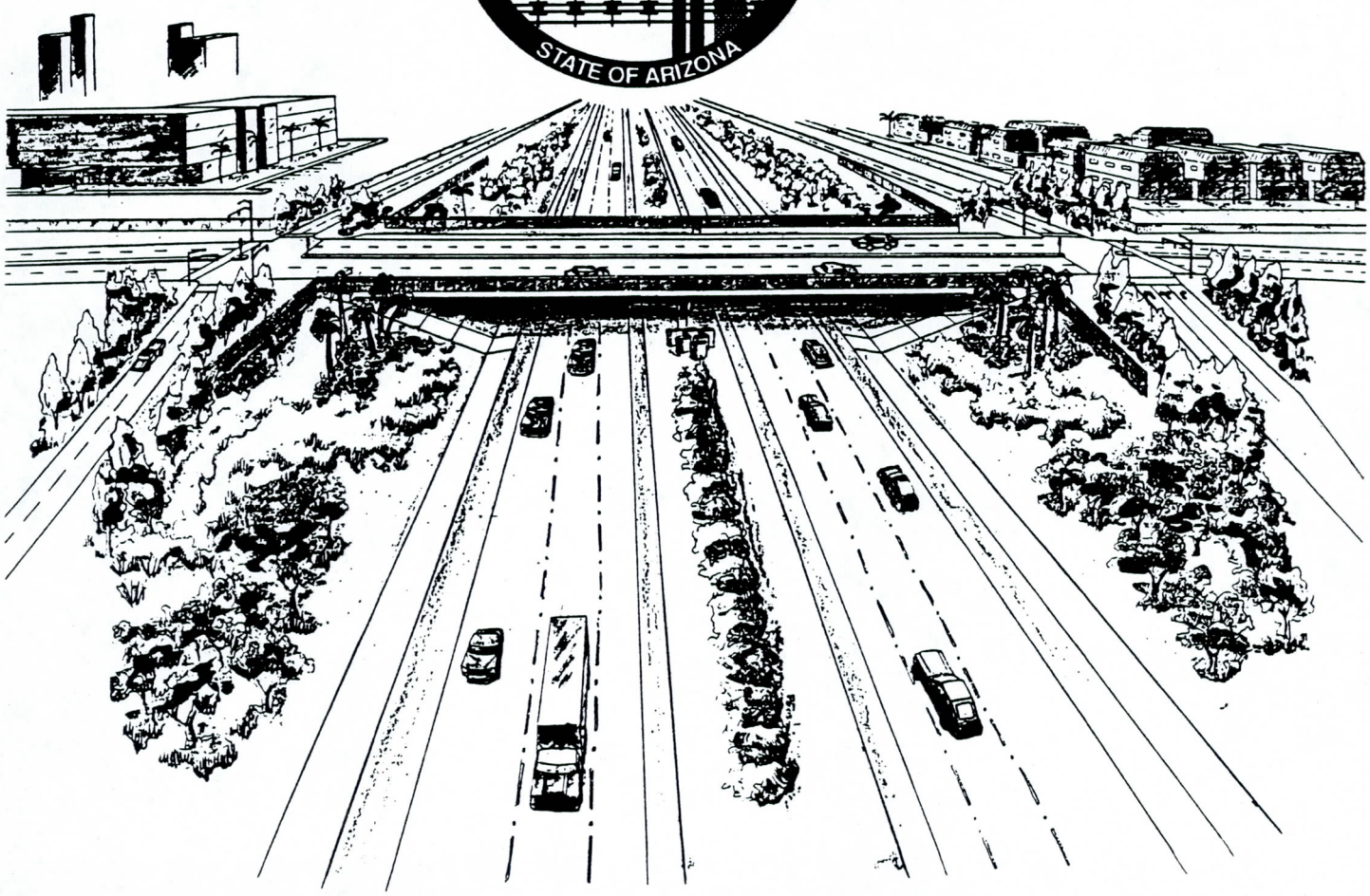
APPENDIX A

DESIGN CRITERIA

URBAN HIGHWAY SECTION

DESIGN PROCEDURES MANUAL

1990 EDITION



ARIZONA DEPARTMENT OF TRANSPORTATION

3.6 DRAINAGE DESIGN

3.6.1 General

Drainage design will include a watershed study, hydrologic analysis, type, size and location study, cost analysis, hydraulic design, sediment and scour analysis, etc. All work items, from data collection in the watershed study to hydraulic computation in final design, are considered equally important during the process of drainage design. Drainage design will be in three stages: conceptual design, final design, (initial, preliminary, final I, and final II) and drainage design summary.

This section provides guidelines for work and materials to be prepared in various review phases. The Management Consultant and individual consultants shall follow the guidelines in carrying out the design process.

3.6.2 Design Process

It is essential that the drainage design effort progresses ahead of the roadway design. The effect that drainage features may have on right-of-way, utilities and roadway geometrics must be established early in the design process in order to avoid inefficient designs or costly last-minute plan modifications.

1. Establish lines of communication with local and regional drainage and flood regulation bodies.

2. Obtain and review past hydrology and hydraulic studies.

3. Develop Existing Condition Hydrology.

   A. Investigate existing drainage systems, flow patterns and drainage problems.

   B. Define project limits and drainage areas contributing to points of interest.

   C. Develop hydrology, including precipitation analysis and development of discharge-frequency curves, or establishment of hydrographs if necessary.

   D. Prepare existing Hydrology Conditions Section of Report.

4. Develop Concept Drainage Plan

   A. Identify drainage problems, and develop conceptual drainage design alternatives.

   B. Evaluate alternatives and recommend an acceptable alternate.

   C. Modify hydrology to reflect accepted alternate.

   D. Establish basic hydraulic analyses for structures at major floodway crossings in conjunction with TS&L plans, if any.

   E. Prepare concept drainage section of the report and combine with the hydrology section to complete the Hydrology and Concept Drainage Report.

- Review and refine the selected alternate based on construction cost and compatibility with roadway design and recommend the most cost-effective plan.

- Confirm that the construction boundary is within right-of-way lines.

- Identify conflicts with existing utilities and propose appropriate resolutions.

- Prepare an initial draft of the Drainage Plans consisting of a layout of the recommended plan, and an outline of the Drainage Report, including descriptions of the recommended plan, supporting calculations, and sample calculations for all drainage elements.

- Submit the draft Drainage Plans and an outline of the Drainage Report for 30 percent review by the Management Consultant and ADOT.

The Management Consultant will review the drainage plans in accordance with the the following checklist:

- Proper sizing of drainage facilities.

- Conformance with overall drainage plan.

- Compatibility with adjacent design sections.

- Adequate right-of-way for the drainage facility.

- Possible alternative(s) to reduce cost of the drainage facility.

- Identification of potential utility conflicts.

- Conformance with and resolution of the 30 percent review comments.
- Proper location and sizing of minor structures.
- Conformance with the design criteria.
- Resolution of conflicts with other highways and utility appurtenances.

3. Final Design I (90%)

Work in this phase involves preparation of the final draft of the drainage plans and drainage report for 95 percent review by the Management Consultant and ADOT. All analyses and designs are assumed to be accepted in previous phases. Work to be accomplished during this phase includes:

- Prepare the final draft of the drainage plans to include design changes to comply with 60% review comments.
- Prepare the final draft of the Drainage Report containing items described in Section 3.6.4.5.
- Submit the final draft of the drainage plans and the final draft of the Drainage Report for 95 percent review by the Management Consultant and ADOT.

The Management Consultant will review the final draft of the drainage plans and drainage report in accordance with the following checklist:

- Completeness, accuracy, and presentation of final design.

GENERAL CONTENTS OF THE DRAINAGE REPORT

I. INTRODUCTION

A. Project Location
B. Description of Improvements
C. Concept Plans
D. Discussion of Drainage Investigations Performed by Consultant
E. Approval of Plans by ADOT

EXHIBITS

Area Map (1" = 2.5 miles, on 11" x 17")

II. DRAINAGE AREA AND HYDROLOGY

A. General Discussion
B. Drainage Area Characteristics
C. Hydrology as Received from Management Consultant
D. Additional Studies by Consultant

EXHIBITS

Drainage Area Map
Hydrographs

APPENDIX

Detailed Calculations and Computer Runs (separate binding)

EXHIBITS

Drainage Plan
Typical Sections
Special Details
Plan of Outfall Structures
Plan of Box Culvert or Bridge Structures
Profile of Channel Showing Original Ground Surface,
Design Channel Bed, and Water Surface Elevations.

APPENDIX

Detailed Calculations
Water Surface Computation or Computer Runs

V. MAJOR STREAM CROSSING

A. General Discussion
B. Hydrology
C. Description of Structural Design
D. Hydraulics or Waterway Opening
E. Sediment Deposit and Scour Analysis
F. Bank Stabilization
G. Coordination with Local Agencies and 404 Permit Process

EXHIBITS

General Plan of Structures
Cross Sections of Watercourse
Photographs of Site

3.6.5 Drainage Design Summary Report

The Drainage Design Summary Report (along with the Hydrology and Concept Drainage Report/Plans and the Final Drainage Report/Plans) will be used by ADOT as the historical record of drainage design, the basis for permit applications, and as source information in the event of drainage litigation.

The purpose of the Drainage Design Summary Report is to reference all drainage design documents and activities leading up to construction and to document all drainage design changes which occur during construction. This is necessary because, frequently, the limits of work covered by the Hydrology and Concept Drainage Report differ from the limits covered by the Final Drainage Report and both may differ from the limits of final construction.

The Management Consultant will prepare the Drainage Design Summary Report upon completion of the construction of each roadway section as determined by ADOT.

The general contents of the Drainage Design Summary Report are listed on the following page. They are subject to change depending on the actual requirements of the particular section under design.

% COMPLETION AND REVIEW	0	30	60	90	100		
		FINAL DESIGN					
PHASE	CONCEPT	INITIAL	PRELIMINARY	FINAL I	FINAL II	CONSTRUCTION	
WORK ITEMS	1 Investigate existing drainage system. 2 Define project limits and drainage areas. 3 Develop hydrology 4 Develop conceptual design alternatives 5 Determine an acceptable design alternate. 6 Establish basic hydraulic analysis for major stream crossing, if any. 7 Prepare report.	1 Review Design Guide-line and Criteria, and Hydrology and Concept Drainage Report. 2 Layout drainage plan, perform basic Hydraulic analyses and determine preliminary type, size, and location of major structures. 3 Recommend a most cost-effective plan. 4 Confirm project boundary within ROW lines. 5 Prepare Initial Drainage Plan and Initial Drainage Report.	1 Accomplish detailed hydrology and hydraulic analyses for all drainage elements. 2 Accomplish detailed layout and design of all drainage elements. 3 Prepare Preliminary Drainage Plan and Draft Drainage Report.	1 Prepare Final Drainage Plan for final review (drafting of final design drawings). 2 Prepare Final Draft Drainage Report.	1 Accomplish Final Drainage Plan. 2 Finalize Drainage Report.		
PERFORMED BY	MC AND SUBCONSULTANT	SDC	SDC	SDC	SDC	MC/SDC	
SUBMITTALS	Hydrology and Concept Drainage Report	1. Initial Drainage Plan 2. Outline of Drainage Report	1. Preliminary Drainage Plan 2. Draft of Drainage Report	1. Final Drainage Plan (for final review) 2. Final Draft of Drainage Report	1. Final Drainage Plans 2. Drainage Report	Drainage Summary Report	
REVIEWED BY	ADOT	MC/ADOT	MC/ADOT	MC/ADOT	MC/ADOT	ADOT	

MC - Management Consultant
SDC - Section Design Consultant

URBAN HIGHWAY
DESIGN PROCEDURES MANUAL
DRAINAGE DESIGN PROCESS

FIGURE 3.6-1

REV. 8/24/89

ARIZONA STATEWIDE MANAGEMENT PROGRAM

PROJECT DESIGN GUIDELINES

Prepared for
ARIZONA DEPARTMENT OF TRANSPORTATION

By
SVERDRUP CORPORATION
ARIZONA STATEWIDE MANAGEMENT CONSULTANT

Second Edition

July 1987

SECTION 102

DRAINAGE DESIGN CRITERIA/GUIDELINE

102.1 DESIGN REFERENCES

American Iron and Steel Institute, "Handbook of Steel Drainage and Highway Construction Products," latest edition.

Arizona Highway Department Bridge Division, "Hydrologic Design for Highway Drainage in Arizona." (ADOT Manual I)

Arizona Highway Department Structures Section Hydraulics, Division, "Hydrologic and Hydraulic Training Session," Revised December 1973. (ADOT Manual II)

Federal Highway Administration, "Federal-Aid Highway Program Manual," Volume 6, Chapter 7, Section 3, Subsection 2, April, 1984.

Federal Highways Administration, "Guidelines for Erosion and Sediment Control Planning and Implementation," October, 1974.

Federal Highway Administration, "Suggestions for Temporary Erosion and Siltation Control Measures," 1973.

State of Arizona Department of Transportation, "Construction Division of Highways Standard Drawings," June 1986. (ADOT Standards C-__.__)

State of Arizona Department of Transportation, Highways Division, Structures Section, "Drainage Manual," Volume I, Policy, August 1987.

U.S. Department of Transportation, Federal Highway Administration, "Design of Stable Channels with Flexible Linings," Hydraulic Engineering Circular No. 15, latest edition. (HEC No. 15).

U.S. Department of Transportation, Federal Highway Administration, "Hydraulic Design of Highway Culverts," Hydraulic Design Series No. 5, latest edition (HDS No. 5).

U.S. Department of Transportation, Federal Highways Administration, "Hydraulic Design of Energy Dissipators for Culverts and Channels," Hydraulic Engineering Circular No. 14, latest edition. (HEC No. 14)

b) In cases where the highway encroaches into a regulatory floodway, the 100 year design frequency shall be used.

c) The design frequencies shall be reviewed to assure compliance with Federal Highway Program Manual, Volume 6, Chapter 7, Section 3, Subsection 2.

102.3 PAVEMENT DESIGN

This section is limited to the drainage of pavements where an underground sewer system is not required and where pavement runoff must be concentrated at the roadway shoulder to prevent erosion of the embankment face.

1. Storm frequency shall be in accordance with criteria in Section 1.2, Design Frequency, ADOT Manual I, pages 1 and 2.

2. Storm runoff shall be calculated by the Rational Method.

3. Allowable ponding widths shall be as follows:

Roadway Type	Maximum Spread	Frequency
Rural 4-lane divided	Lt. shoulder width Rt. shoulder width plus 1/2 adjacent traffic lane width	10 years
Urban 4 or 6 lane divided by raised median	Lt. gutter width plus any shoulder width Rt. shoulder, parking or distress lane width plus 1/2 adjacent traffic lane width	10 years
4 or 6-lane undivided	Shoulder, parking or distress lane width plus 1/2 adjacent traffic lane width	10 years
2-lane undivided	Gutter and/or shoulder parking or distress lane width	10 years
22′ or 24′ ramps (Incl. accel. & decel. lane)	Left 2′ Right 8′	10 years

4. Embankment curb shall be used at the edge of paved roadways on fills where storm water cannot be permitted to run down and erode the embankment face.

3. Storm runoff shall be calculated by the Rational Method.

4. The maximum allowable ponding depth in the median shall not exceed an elevation of 0.5 feet below the top of the subgrade at the edge of pavement.

5. Median dykes will be required at the downstream side of all median drains except where the inlet is located in a sag. The top of the median dyke should be at least 0.5 feet higher than the design highwater elevation of the inlet.

6. Pave median when velocity is excessive and erosion is a problem.

7. Hydraulic capacity charts have been developed for standard ADOT median inlets and shall be used in the design. Reference ADOT Standards C-15.30 (Formerly C-15.08), C-15.80 (Formerly C-15.09) and C-15.90 (Formerly C-15.10).

   The hydraulic capacity charts for these standards have the clogging factors incorporated into them and no additional reduction should be made.

8. All computations are to be performed on ADOT Median Drainage Design Sheets contained in the ADOT Manuals.

102.5 STORM SEWER SYSTEM

1. The storm sewer system shall consist of a system of inlets, conduits and other appurtenances which are designed to collect and convey storm runoff from the roadways and adjacent contributory drainage areas to an outlet.

2. Storm frequency shall be in accordance with criteria in Section 1.2, Design Frequency, ADOT Manual I, pages 1 and 2, with the exception of underpasses or other depressed roadways where ponded water can be removed only through a storm sewer system. For this exception, the storm frequency shall be 50 years.

3. Storm runoff shall be calculated by the Rational Method.

4. The allowable ponding width shall be in accordance with criteria in Section 2.2, Pavement Design, Item 3 of part 102.3 of this section.

5. Hydraulic capacities of the standard ADOT inlets shall be determined utilizing the general equations.

6. The following factors shall be applied to grate, curb opening and combination inlets due to clogging:

   a) Grates

(2) Continuous Grade Conditions

(a) Parallel to Flow - actual length of opening = 1.5 x required length

(b) Perpendicular to Flow - do not use

7. Urban and freeway closed drainage systems shall be designed for reinforced concrete pipe. An 18-inch minimum pipe size shall be used for laterals and a 24-inch minimum pipe size shall be used for trunk lines. A hydraulic profile of the storm sewer system shall be required to assure the system will perform as designed. At all inlet locations the hydraulic grade line shall be at least 0.5 feet below the bottom of the inlet or grate.

8. Catch Basins

a) All catch basins and grates shall conform with ADOT Standards, C-15.10 thru C-15.90.

b) Catch basins shall be spaced such that curbs are not overtopped and the pavement spread remains within the specified limits.

9. All computations shall be shown on ADOT standard design forms contained in ADOT Manuals.

a) Runoff Calculation Sheet - all design data and hydrologic calculations

b) Inlet Calculations Sheet - all inlet design data and calculations

c) Storm Sewer Calculation Sheet - all storm sewer design data and calculations

10. Depressed Roadways

a) Design the storm sewer for a 50-year frequency.

b) Determine the elevation of the 50-year hydraulic grade line (HGL) and check to see that the HGL is at least 0.5 feet below the bottom of the inlet or grate at all roadway inlets.

c) If the 50-year HGL elevation is less than 0.5 feet below the elevation of the bottom of the inlet or grate of any roadway inlet, adjust the conduit sizes or flow line elevations as necessary to lower the HGL elevation at that point.

Ratio of Outlet Velocity to Natural Stream Velocity	Outlet Protection
Less than 1.5	No protection required
1.5 to 2.0 with outlet velocity less than 10 fps	Dumped rock riprap
1.5 to 2.5 with outlet velocity between 10 and 15 fps	Wire-tied rock riprap
Greater than 2.5 or outlet velocity greater than 15 fps	Energy dissipator or consider larger culvert

Use rock density of 140 lb/cu. ft. in the design of graded riprap. The dumped rock riprap shall be designed in accordance with HEC No. 15.

d) For outlet flow velocities greater than either 2.5 times the natural stream velocity or 15 feet per second, an energy dissipator should be considered. The design shall be in accordance with HEC No. 14.

7. The 100-year event shall be analyzed for potential damage to upstream property, roadway, and channel erosion for all crossroad culverts.

102.7 CHANNEL AND DITCH

1. Hydraulic design shall be in accordance with ADOT manuals, Hydraulic Engineering Circulars prepared by the Federal Highway Administration, and sound engineering practice.

2. The suggested minimum freeboard for improved channels shall be as follows:

   a) For channels with flows having a Froude Number equal to or greater than 0.86, use 0.20 x (depth + $V^2/2g$)

   b) No freeboard less than 1.0 foot

3. Paving shall be used where necessary for erosion protection.

102.8 EROSION CONTROL

1. Temporary erosion control methods shall be employed during construction to control erosion and sediment until the permanent protection is provided. The types of protection are generally as follows:

   a) Direct Protection of Ground Surface - ground cover, soil stabilization or riprap

102.11 CATTLE AND/OR VEHICLE PASSES

1. The use of a cattle and/or vehicle pass for a drainage structure is permissible.

2. When the design is a multi-barrel structure and is used for drainage purposes, at least one barrel must meet the requirement of a passageway as follows:

TYPE	SIZE
Stock pass	Min. 120" dia. structural plate or min. 10′ x 8" box culvert
Vehicle pass	Min. 144" dia. structural plate or min. 10′ x 10′ box culvert

3. The desirable maximum length for a stock pass is 250 feet.

4. Bridge design should incorporate the same requirements.

5. Design and details shall be in accordance with ADOT Standards.

U. S. DEPARTMENT OF TRANSPORTATION

FEDERAL HIGHWAY ADMINISTRATION

FEDERAL-AID HIGHWAY PROGRAM MANUAL

VOLUME	6	ENGINEERING AND TRAFFIC OPERATIONS
CHAPTER	7	BRIDGES, STRUCTURES AND HYDRAULICS
SECTION	3	HYDRAULICS, EROSION CONTROL AND WATER QUALITY
SUBSECTION	2	LOCATION AND HYDRAULIC DESIGN OF ENCROACHMENTS ON FLOOD PLAINS

Transmittal 374
April 24, 1984
HNG-31

Par. 1. Purpose
2. Authority
3. Policy
4. Definitions
5. Applicability
6. Public Involvement
7. Location Hydraulic Studies
8. Only Practicable Alternative Finding
9. Design Standards
10. Content of Design Studies

1. PURPOSE. **To prescribe Federal Highway Administration (FHWA) policies and procedures for the location and hydraulic design of highway encroachments on flood plains, including direct Federal highway projects administered by the FHWA.*

2. AUTHORITY. *23 U.S.C. 109(a) and 315, 23 CFR 1.32, 49 CFR 1.48(b), Executive Order 11988 - Floodplain Management, May 24, 1977 (42 FR 26951), and Department of Transportation Order 5650.2, April 26, 1979 (44 FR 24678).*

3. POLICY. *It is the policy of the FHWA:*

*Italicized material is published in 23 CFR 650A.

e. *Encroachment* - *an action within the limits of the base flood plain.*

f. *Floodproof* - *to design and construct individual buildings, facilities, and their sites to protect against structural failure, to keep water out or to reduce the effects of water entry.*

g. *Freeboard* - *the vertical clearance of the lowest structural member of the bridge superstructure above the water surface elevation of the overtopping flood.*

h. *Minimize* - *to reduce to the smallest practicable amount or degree.*

i. *Natural and Beneficial Flood-plain Values* -*include but are not limited to fish, wildlife, plants, open space, natural beauty, scientific study, outdoor recreation, agriculture, aquaculture, forestry, natural moderation of floods, water quality maintenance, and groundwater recharge.*

j. *Overtopping Flood* - *the flood described by the probability of exceedance and water surface elevation at which flow occurs over the highway, over the watershed divide, or through structure(s) provided for emergency relief.*

k. *Practicable* - *capable of being done within reasonable natural, social, or economic constraints.*

l. *Preserve* - *to avoid modification to the functions of the natural flood-plain environment or to maintain it as closely as practicable in its natural state.*

m. *Regulatory Floodway* - *the flood-plain area that is reserved in an open manner by Federal, State or local requirements, i.e., unconfined or unobstructed either horizontally or vertically, to provide for the discharge of the base flood so that the cumulative increase in water surface elevation is no more than a designated amount (not to exceed 1 foot as established by the Federal*

(3) *Freeboard shall be provided, where practicable, to protect bridge structures from debris- and scour-related failure.*

(4) *The effect of existing flood control channels, levees, and reservoirs shall be considered in estimating the peak discharge and stage for all floods considered in the design.*

(5) *The design of encroachments shall be consistent with standards established by the FEMA, State, and local governmental agencies for the administration of the National Flood Insurance Program for:*

(a) *all direct Federal highway actions, unless the standards are demonstrably inappropriate, and*

(b) *Federal-aid highway actions where a regulatory floodway has been designated or where studies are underway to establish a regulatory floodway.*

b. *Rest area buildings and related water supply and waste treatment facilities shall be located outside the base flood plain, where practicable. Rest area buildings which are located on the base flood plain shall be floodproofed against damage from the base flood.*

c. *Where highway fills are to be used as dams to permanently impound water more than 50 acre-feet (6.17×10^4 cubic metres) in volume or 25 feet (7.6 metres) deep, the hydrologic, hydraulic, and structural design of the fill and appurtenant spillways shall have the approval of the State or Federal agency responsible for the safety of dams or like structures within the State, prior to authorization by the Division Administrator to advertise for bids for construction.*

5. APPLICABILITY

a. *The provisions of this directive shall apply to all encroachments and to all actions which affect base flood plains, except for repairs made with emergency funds (FHPM 6-9-16-1 and 2, 23 CFR 668) during or immediately following a disaster.*

b. *The provisions of this directive shall not apply to or alter approvals or authorizations which were given by FHWA pursuant to directives in effect before the effective date of this directive.*

6. PUBLIC INVOLVEMENT

a. *Procedures which have been established to meet the public involvement requirements of FHPM 7-7-1 (23 CFR 771) and FHPM 7-7-5 (23 CFR 790) shall be used to provide opportunity for early public review and comment on alternatives which contain encroachments.*

b. *Public notices issued in accordance with the above procedures shall make reference to significant encroachments which are contained in alternatives under consideration.*

c. *Public hearing presentations shall include identification of encroachments.*

7. LOCATION HYDRAULIC STUDIES

a. *National Flood Insurance Program (NFIP) maps or information developed by the highway agency, if NFIP maps are not available, shall be used to determine whether a highway location alternative will include an encroachment.*

b. *Location studies shall include evaluation and discussion of the practicability of alternatives to any longitudinal encroachments.*

c. *Location studies shall include discussion of the following items, commensurate with the significance of the risk or environmental impact, for all alternatives containing encroachments and for*

APPENDIX C

EXHIBIT "B"

FROM THE TEMPE DRAIN

INTERGOVERNMENTAL AGREEMENT

Project No. IR-10-3(311)PE
I-10/SUPER/BASELINE

Station _____

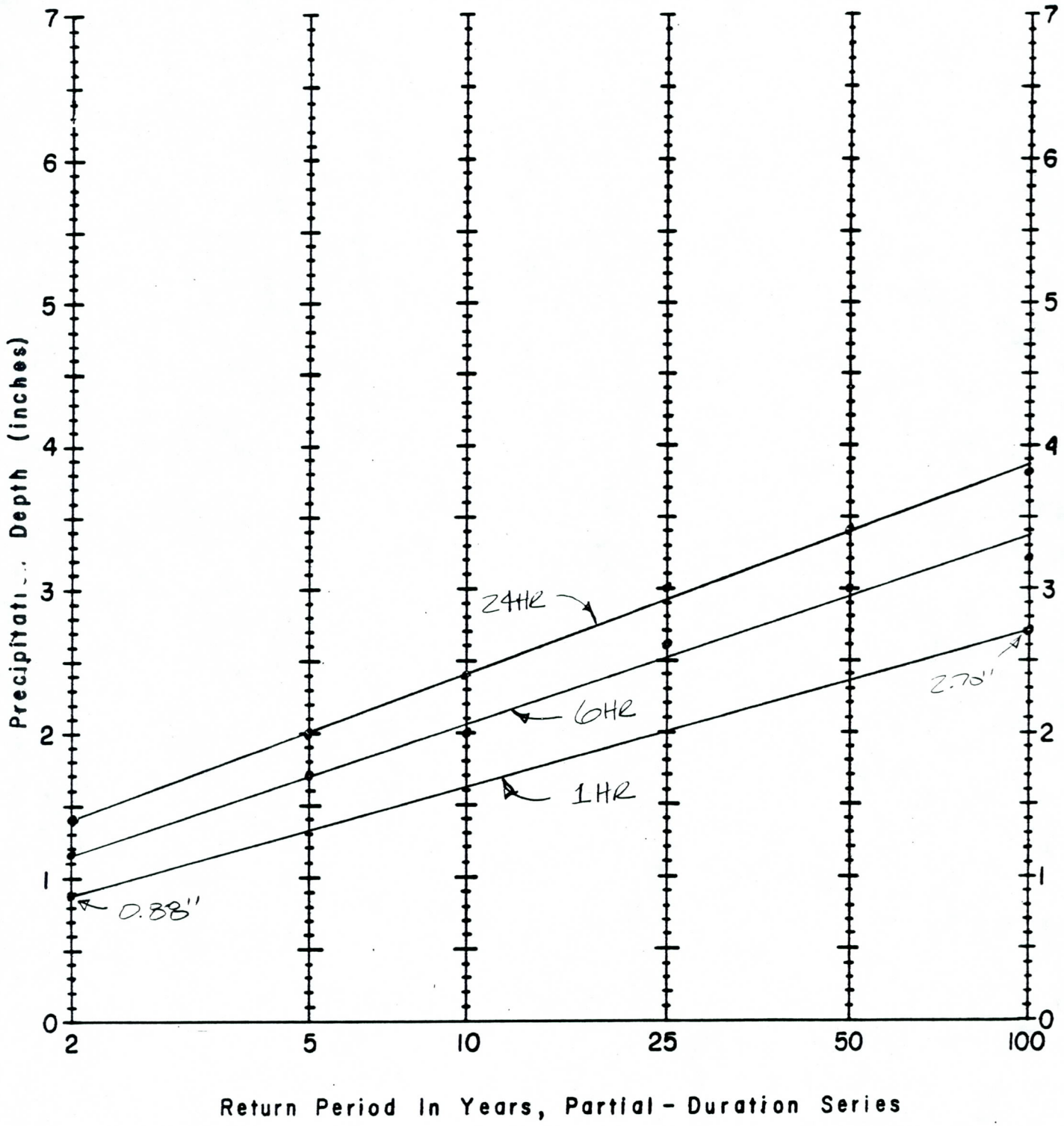


Figure 1 Precipitation Depth Versus Return Period for Partial-Duration Series

ADDENDUM to "HYDROLOGIC DESIGN FOR HIGHWAY DRAINAGE IN ARIZONA" April 1975

Steps to be used to determine precipitation values for various durations and return periods.

STEP 1. From the precipitation maps in the manual "Hydrologic Design for Highway Drainage in Arizona", determine the precipitation values for the 6 and 24 hour duration storms for return periods of 2, 5, 10, 25, 50 and 100 years. Tabulate these values in Table 1 in the column headed 'Map Values'

I-10/SUPER, RA 03 UNIT
IR-10-3(311) PCE
GSB JAN 91

TABLE 1

Return Period (Years)	Precipitation Values (inches)			
	6 hour duration		24 hour duration	
	Map Value	Corrected Value	Map Value	Corrected Value
2	1.15	1.15	1.40	1.40
5	1.70	1.70	2.00	2.00
10	2.00	2.05	2.40	2.40
25	2.60	2.50	3.00	2.90
50	3.00	2.95	3.40	3.40
100	3.20	3.35	3.80	3.35

NOTE: There is a possibility of making an error while reading the maps because, (1) a site is not easy to locate precisely on a series of 12 maps, (2) there may be some slight registration differences in printing, and (3) precise interpolation between isolines is difficult. In order to minimize any errors in reading the maps, these values should be plotted on the diagram "Precipitation Depth versus Return Period" Fig. 1.

APPENDIX B

RAINFALL AMOUNT, INTENSITY, DISTRIBUTION

PROCEDURES FOR DETERMINING RAINFALL DISTRIBUTION

The rainfall distribution values for use in COE HEC-1 or SCS TR-20 shall be computed from the NOAA Precipitation Maps using the following procedure. The maps needed are for the 6-Hour and 24-Hour precipitation values.

Step 1. Determine the precipitation values for the 6-hour and 24-hour duration storms for return periods of 2yr., 5yr., 10yr., 25yr., 50yr., and 100 years.

Step 2. Plot these values on the form "Precipitation Depth versus Return Period for Partial-Duration Series".

Step 3. Draw best fit lines through the plotted 6-hour and 24-hour precipitation values.

Step 4. Select the best fit 6-hour and 24-hour precipitation values for the 2 year and 100 year return periods.

Step 5. Compute the 1-hour 2 year and 100 year precipitation value from the following formulae:

$$P_{1,2} = -0.011 + 0.942(P_{6,2})^2/(P_{24,2})$$

$$P_{1,100} = 0.494 + 0.755(P_{6,100})^2/(P_{24,100})$$

Step 6. Plot the 1-hour 2 year and 100 year values on the form "Precipitation Depth versus Return Period for Partial-Duration Series".

Step 7. Select the 1-hour, 6-hour and 24-hour precipitation values for the design frequency.

Step 8. Compute the 2-hour, 3-hour and 12-hour precipitation values as follows:

2-Hour: $P_2 = 0.341\ P_6 + 0.659\ P_1$
3-Hour: $P_3 = 0.569\ P_6 + 0.431\ P_1$
12-Hour: $P_{12} = 0.49\ P_{24} + 0.51\ P_6$

Step 9. Compute precipitation values for duration times less than 1-hour using the attached chart.

duration t mins.	%, of 1 hour
5	29
10	45
15	56
20	65
30	79

Step 10. Rainfall distribution:

The rainfall distribution is assumed to be symmetrical about the 12th hour, i.e., 50% of the rainfall falls in each 12-hour interval. The rainfall for any time interval falls at an average intensity for 1/2 the time on either side of the 12th hour.

0.0 hour : $P = 0$

6.0	hour:	$(P_{24}-P_{12})/2$	18.0	hour:	$(P_{24}+P_{12})/2$
9.0	hour:	$(P_{24}-P_{6})/2$	15.0	hour:	$(P_{24}+P_{6})/2$
10.5	hour:	$(P_{24}-P_{3})/2$	13.5	hour:	$(P_{24}+P_{3})/2$
11.0	hour:	$(P_{24}-P_{2})/2$	13.0	hour:	$(P_{24}+P_{2})/2$
11.5	hour:	$(P_{24}-P_{1})/2$	12.5	hour:	$(P_{24}+P_{1})/2$
11.75	hour:	$(P_{24}-P_{0.5})/2$	12.25	hour:	$(P_{24}+P_{0.5})/2$
11.90	hour:	$(P_{24}-P_{0.2})/2$	12.10	hour:	$(P_{24}+P_{0.2})/2$
11.95	hour:	$(P_{24}-P_{0.1})/2$	12.05	hour:	$(P_{24}+P_{0.1})/2$

12.0 hour : $(P_{24})/2$

STANLEY

JOB I-3/SIMEL/BASELINE IR-3-3, 3, FE
SHEET NO 1 OF 2
CALCULATED BY GSB DATE JAN 91
CHECKED BY WHH DATE 19 JULY 91
SCALE

RAINFALL CALCULATIONS
AMOUNT, INTENSITY, DISTRIBUTION

REFER TO ADOT "PROCEDURES FOR DETERMINING RAINFALL DISTRIBUTIONS" DATED APRIL 17, 1987

STEPS 1 THRU 4 REFER TO TABLE 1 AND FIGURE 1

STEP 5: 1HR VALUES

$$P_{1HR,2YR} = -0.011 + 0.942(P_{6HR,2YR})^2/(P_{24HR,2YR})$$

$$= -0.011 + 0.942(1.15)^2/(1.40) = \boxed{0.88}$$

$$P_{1HR,100YR} = 0.494 + 0.755(P_{6HR,100YR})^2/(P_{24HR,100YR})$$

$$= 0.494 + 0.755(3.35)^2/3.85 = \boxed{2.70}$$

STEP 6: REFER TO FIGURE 1

STEP 7: REFER TO FIGURE 1

	10 YR	50 YR	100 YR
1HR	1.60"	2.35"	2.70"
6HR	2.05"	2.95"	3.35"
24HR	2.40"	3.40"	3.85"

STEP 8: $P_{2HR} = 0.341(P_{6HR}) + 0.659(P_{1HR})$

$P_{3HR} = 0.569(P_{6HR}) + 0.431(P_{1HR})$

$P_{12HR} = 0.490(P_{24HR}) + 0.510(P_{6HR})$

	10 YR	50 YR	100 YR
2HR	1.75"	2.55"	2.92"
3HR	1.86"	2.69"	3.07"
12HR	2.22"	3.17"	3.60"

PRODUCT 205-1 NEBS Inc., Groton, Mass. 01471. To Order PHONE TOLL FREE 1-800-225-6380

STANLEY

JOB I-10/SUPER/BASELINE C-3-213 PE
SHEET NO. 2 OF 2
CALCULATED BY LSB DATE JAN 91
CHECKED BY WHH DATE 19 JUL 91
SCALE

STEP 9: DURATIONS LESS THAN 1 HR

DURATION (MIN)	% OF 1 HR	10YR (1HR=1.60")	50YR (1HR=2.35")	100YR (1HR=2.70")
5	29	0.46"	0.68"	0.78"
10	45	0.72"	1.06"	1.22"
15	56	0.90"	1.32"	1.51"
20	65	1.04"	1.53"	1.76"
30	79	1.26"	1.86"	2.13"

STEP 10: RAINFALL DISTRIBUTION

SUMMARY OF RAINFALL AMOUNTS –

DURATION	10-YEAR	50-YEAR	100-YEAR
5 MIN	0.46"	0.68"	0.78"
10 "	0.72"	1.06"	1.22"
15 "	0.90"	1.32"	1.51"
20 "	1.04"	1.53"	1.76"
30 "	1.26"	1.86"	2.13"
1 HR	1.60"	2.35"	2.70"
2 "	1.75"	2.55"	2.92"
3 "	1.86"	2.69"	3.07"
6 "	2.05"	2.95"	3.35"
12 "	2.22"	3.17"	3.60"
24 "	2.40"	3.40"	3.85"

6HR RAINFALL DISTRIBUTION FOR HEC 1 PH RECORD –

	5MIN	15MIN	1HR	2HR	3HR	6HR
PH 10YR	0.46"	0.90"	1.60"	1.75"	1.86"	2.05"
PH 50YR	0.68"	1.32"	2.35"	2.55"	2.69"	2.95"
PH 100YR	0.78"	1.51"	2.70"	2.92"	3.07"	3.35"

PRODUCT 205-1 NEBS Inc., Groton, Mass. 01471. To Order PHONE TOLL FREE 1-800-225-6380

No. 4021
FILED WITH SECRETARY OF STATE
Date Filed 12-19-77
Secretary of State

Contract 1178

19012

AGREEMENT FOR THE RECONSTRUCTION OF JOINT USE STORM DRAINAGE AND IRRIGATION WASTE FACILITIES

DEC 20 1977

THIS AGREEMENT, made and entered as of the 19th day of December, 1977, by and between the State of Arizona, acting by and through its Department of Transportation, hereinafter called "STATE", and the City of Tempe, Arizona, a municipal corporation, acting by and through its Mayor, hereinafter called "TEMPE", and the City of Phoenix, Arizona, a municipal corporation, acting by and through its City Manager, hereinafter called "PHOENIX", and the Salt River Valley Water User's Association, an Arizona corporation, hereinafter called "ASSOCIATION", and the Flood Control District of Maricopa County, a political subdivision of the State of Arizona and a municipal corporation, hereinafter called "DISTRICT".

WITNESSETH:

WHEREAS, the parties hereto, with the exception of PHOENIX, have previously entered into an Intergovernmental Agreement for the reconstruction of joint use storm drainage and irrigation waste facilities on February 9, 1966, as amended by Addendum dated November 24, 1969, and

WHEREAS, the parties to this Agreement (including PHOENIX) desire to set forth their understanding and agreements relating to the reconstruction and maintenance of said storm drainage and irrigation waste facility, and

WHEREAS, the aforementioned facilities accommodating storm, flood and irrigation waste waters will hereinafter be referred to as "The Channel", and

WHEREAS, TEMPE, PHOENIX and DISTRICT desire to reconstruct The Channel, commonly referred to as Tempe Drainage District No. 2 - Ditch, and generally commencing at the West right-of-way line of the Hohokam Expressway and terminating at or near 34th Street and the Salt River, as shown on Exhibit B of the Agreement of February 9, 1966, which includes a combination irrigation waste ditch, storm drain and flood control channel, to reduce flood damage to the citizens of PHOENIX and TEMPE, and

LAW OFFICES OF
ARRY J. RICHMOND P.C.
[illegible] FLOOR
[illegible] NORTH FIRST AVENUE
PHOENIX, ARIZONA [illegible]
TELEPHONE [illegible]

Exhibit "B"

Agricultural Improvement and Power District. The easement is more particularly described in the indenture attached to the Agreement dated the 9th day of February, 1966, and entitled "State-City-Water Users' and Maricopa County Flood Control District Agreement for the Construction of Joint Use Storm Drainage and Irrigation Waste Facilities, 279-66-1, Interstate Project 1-10-3-133, 40th Street-Broadway." The State, City of Tempe, and District do hereby consent to the City of Phoenix' joint use of the storm drainage and irrigation waste facilities as described in this agreement, and hereby grant the City of Phoenix the right to use said facilities in common with the District, Tempe and State.

2. Upon the execution of a construction agreement between TEMPE, PHOENIX and DISTRICT, the respective parties pursuant to the terms of said construction agreement and at their sole and joint expense, shall reconstruct The Channel in accordance with those certain plans and specifications on file with the Tempe Public Works Director and captioned, "City of Tempe Project No. 75032." All parties to this Agreement agree that the Plans and Specifications for Project No. 75032 will be reviewed and approved prior to actual reconstruction of the aforementioned Channel.

3. STATE, DISTRICT, ASSOCIATION and PHOENIX assume no liability for the engineering and reconstruction of The Channel by TEMPE and any damage arising out of any aspect of the work embraced in said engineering and reconstruction shall be solely the liability of TEMPE. TEMPE agrees to totally save, hold harmless and indemnify the other parties to this Agreement and any of their departments, agencies, officers or employees from all costs and damages, direct or indirect, incurred by any engineering and reconstruction of the aforesaid Channel and, in addition, TEMPE agrees to totally save, hold harmless and indemnify the other parties to this Agreement from any and all costs and damages whatsoever which may be incurred by said other parties to any person or property whatsoever, by virtue of any activity, condition or event arising out of the performance or non-performance of any aspect of the engineering and reconstruction of the aforesaid Channel by TEMPE, any of its agents, or any of its independent

LAW OFFICES OF
LARRY J. RICHMOND P.C.
PHOENIX, ARIZONA

Exhibit B
3 of 17

connection with the operation of The Channel; provided however, the parties mutually agree that the DISTRICT'S obligation to totally save, hold harmless and indemnify the other parties to this Agreement shall be contingent upon the parties seeking enforcement of the hold harmless and indemnification provision not being in breach of this Agreement at the time the obligation or responsibility arose.

The DISTRICT further agrees to totally save, hold harmless and indemnify all other parties to this Agreement and any of their departments, agencies, officers or employees from any and all costs and damages, direct or indirect, to any person or property whatsoever, which is caused by any activity, condition or event arising out of the performance on non-performance of any maintenance obligation assumed hereunder by the DISTRICT, any of its agents, or any of its independent contractors. Costs which may be incurred by STATE, ASSOCIATION, PHOENIX or TEMPE, or any of their departments, agencies, officers or employees, shall include, but not be limited to, court costs, expenses of litigation and reasonable attorney's fees.

7. Execution of this Agreement shall in no way be construed to in any way impair or relinquish the rights, obligations and possible liabilities, known or unknown, arising between the parties by virtue of the terms of the Intergovernmental Agreement of February 9, 1966, as amended by Addendum dated November 24, 1969.

8. The obligation of TEMPE, PHOENIX and DISTRICT, as more particularly set forth in Paragraphs 2 and 3 above, with respect to the reconstruction of The Channel shall terminate upon completion of all work called for under City of Tempe Project No. 75032 and acceptance by TEMPE. The duration of this Agreement shall be until such time as same is partially or completely terminated by the consent of all parties hereto.

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed and same shall become effective as of the date it is filed with the Secretary of State pursuant to A.R.S. §11-952 (E) (33rd Legislature, Chapter 133, Section 2).

DATE FILED WITH THE SECRETARY OF STATE December 19, 1972.

LAW OFFICES OF
JERRY J. RICHMOND P.C.

KNOW ALL MEN BY THESE PRESENTS:

That the SALT RIVER PROJECT AGRICULTURAL IMPROVEMENT AND POWER DISTRICT, a political subdivision of the State of Arizona, for and in consideration of the sum of One Dollar, and other valuable consideration, receipt of which is hereby acknowledged, without warranty of the right, title and interest held by it do hereby grant to the CITY OF PHOENIX, a municipal coporation, the right, easement, and privilege to construct, reconstruct, operate, maintain and use for a combination storm drain, irrigation waste ditch and flood control channel that portion of a certain drainage ditch known as Drainage Ditch of Drainage District No. 2, Maricopa County which lies within the North half of Section 19, Township 1 North, Range 4 East and within Section 24, Township 1 North, Range 3 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

It being understood that the Grantor herein reserves unto itself the right to continue its use of said drainage ditch for irrigation and electric utility purposes.

The GRANTEE shall at all times have the right of full and free ingress and egress to said easement for the purpose heretofore specified.

In the event the right, privilege and easement herein granted shall be abandoned and permanently cease to be used for the purpose herein granted, all rights herein granted shall cease and revert to the grantors, their heirs or assigns.

The covenants and agreements herein set forth shall extend and inure in favor and to benefit of and shall be binding on the heirs, successors in ownership and estate, assigns and lessees of the respective parties hereto.

IN WITNESS WHEREOF, the SALT RIVER PROJECT AGRICULTURAL IMPROVEMENT AND POWER DISTRICT, has caused its corporate name to be signed and its corporate seal to be affixed by the undersigned officers thereunto duly authorized this 8th day of NOVEMBER, 1977.

ATTEST: Paul D. Rice
Secretary

Karl F. Abel
President

STATE OF ARIZONA }
County of Maricopa } ss.

On this the 8th day of NOVEMBER, 1977, before me DON E. SMITH the undersigned officer, personally appeared KARL F. ABEL and PAUL D. RICE, who acknowledged themselves to be the President and Assistant Secretary of the Salt River Project Agricultural Improvement and Power District and that they as such officers respectively being authorized so to do, executed the same for the purpose therein contained by signing the name of said corporation by themselves as such officers respectively.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

My Commission Expires:
[illegible] 3, 1979

D. E. Smith
Notary Public

EXHIBIT C

Exhibit B
7 of 17

OFFICE OF THE BOARD OF SUPERVISORS

MARICOPA COUNTY
602 County Administration Bldg. 111 S. 3rd Avenue, Phoenix, Arizona 85003

HENRY H. HAWS District 1 | GEORGE L. CAMPBELL District 2 | BOB CORBIN District 3 | HAWLEY ATKINSON District 4 | ED PASTOR District 5

MEMO TO: Herbert Donald, Chief Engineer and General Manager of the Flood Control District

FROM: Rhea Woodall, Clerk of the Board

DATE: August 17, 1977

The Board of Supervisors in formal session August 15 approved Intergovernmental Agreement No. C-3881 with the State of Arizona, Cities of Tempe and Phoenix, and the Salt River Valley Water Users' Association providing for the City of Tempe to increase the capacity of 48th Street Drain.

Accordingly, we are returning 6 executed copies of said agreement for further processing, after which please return a fully executed copy for recording and our permanent file.

Rhea Woodall, Clerk

lb

Exhibit B
9 of 17

STATE OF ARIZONA)
) ss
COUNTY OF MARICOPA)

I, Deborah Paglia, the duly appointed, qualified and acting Deputy City Clerk of the City of Phoenix, County of Maricopa, State of Arizona, do hereby certify and attest the attached to be a true and correct copy of the Minutes of the meeting of the Council of the City of Phoenix held on the 6th day of September, 1977, authorizing the execution of an Agreement for reconstruction of joint use storm drainage and irrigation waste facilities all as appears of record in the office of the City Clerk.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the official seal of the City of Phoenix to be affixed hereunto this 14th day of October, 1977.

Deborah Paglia
DEPUTY CITY CLERK

(SEAL)

Exhibit B
11 of 17

September 6, 1977

AUTHORIZATION TO EXECUTE AN AGREEMENT FOR RECONSTRUCTION OF JOINT USE STORM DRAINAGE AND IRRIGATION WASTE FACILITIES - AGREEMENT NO. 19012 - F-4697 AND F-1917

The Council heard request to authorize the City Manager to execute an agreement for the reconstruction of joint use storm drainage and irrigation waste facilities located between 48th and 30th Streets along Superior Street alignment. This agreement has been negotiated among the State, the City of Tempe, the Flood Control District, the Salt River Project and Phoenix to give Phoenix a legal right to discharge storm water into an enlarged channel.

MAJOR STREET PROJECT NO. P-72-225.01 - AGREEMENT NO. 19013 - F-4775

The Council heard request to authorize the City Manager to enter into a letter agreement for the installation of a new pipeline in Central Avenue from Grand Canal to Highland Avenue. This is a cooperative project between the City and Salt River Project to replace a badly leaking pipeline which is causing damage to the pavement along the west side of Central Avenue. The Salt River Project will do the installation and the costs will be shared on a 50-50 basis.

AIRPORT PROJECT NO. A-72-249.00 - AGREEMENT NO. 14158 - F-4496

The Council heard request to authorize the City Manager to execute a supplemental agreement with Wadsworth, Jensen & Associates, Consulting Engineers, to revise the project documents for Sky Harbor Boulevard West and provide project documents for the signing and graphics for the entire roadway system.

AIRPORT PROJECT NO. A-76-128.00 - AGREEMENT NO. 18222 - F-4297

The Council heard request to authorize the City Manager to execute a supplemental agreement with Magadini-Alagia Associates, Structural Engineers, Inc., for design of nine additional pre-engineered metal executive hangars and one large hangar to be located at the northwest corner of Sky Harbor International Airport. The work also includes review and approval of shop drawings submitted by the building manufacturer, relocation of one existing "T" hangar, site survey and review of buildings adjacent to proposed hangars for effect of added seismic and vertical loads.

MAJOR STORM SEWER PROJECT - 23RD AVENUE, MCDOWELL ROAD TO CAMPBELL AVENUE - PROJECT NO. ST-74-205.02 - AGREEMENT NO. 19014 - F-4695

The Council heard request to authorize the City Manager to enter into a license agreement with Atchison, Topeka & Santa Fe Railway Company, for the right to install a 78" storm sewer across railroad property at 23rd Avenue and Encanto Boulevard. This license also authorizes the City's future contractor to work within the railroad right of way.

MAJOR STREET PROJECT NO. P-74-241.00 - AGREEMENT NO. 19015 - F-4760

The Council heard request to authorize the City Manager to enter into a letter agreement with the Salt River Project (Power) for the relocation of certain power poles along 19th Avenue between Glendale Avenue and Dunlap Avenue.

OFFICE OF THE
Attorney General

BRUCE E. BABBITT
ATTORNEY GENERAL

INTERGOVERNMENTAL AGREEMENT

DETERMINATION

A. G. Contract No. 77-823 which is an agreement between public agencies has been reviewed pursuant to A.R.S. §11-952, as amended, by the undersigned Assistant Attorney General who has determined that it is in proper form and is within the powers and authority granted to the State or its agencies under the laws of the State of Arizona.

No opinion is expressed as to the authority of the remaining parties, other than the State or its agencies, to enter into said contract.

DATED this 7th day of ~~November~~ DECEMBER, 1977.

BRUCE E. BABBITT
The Attorney General

James L. Hohnbaum

JAMES L. HOHNBAUM
Assistant Attorney General

Exhibit B
15 of 17

APPROVAL OF TEMPE CITY ATTORNEY

I hereby state that I have reviewed the proposed intergovernmental agreement, between the STATE OF ARIZONA, CITY OF PHOENIX, SALT RIVER VALLEY WATER USER'S ASSOCIATION, FLOOD CONTROL DISTRICT OF MARICOPA COUNTY, and the CITY OF TEMPE, and declare the agreement to be in proper form and within the powers and authority granted to the City under the laws of the State of Arizona.

No opinion is expressed as to the authority of the remaining parties, other than the City, to enter into said agreement.

DATED this 6th day of December, 1977.

David R. Merkel

DAVID R. MERKEL
City Attorney

APPENDIX D

DRAINAGE AREA DATA

Unit 1 Drainage Area Summation

DRAINAGE BASIN NO.	PERVIOUS AREA (ACRES)	IMPERVIOUS AREA (ACRES)	*TOTAL CA (ACRES)	CUMULATIVE CA (ACRES)	COMMENTS
DA23	0.8209	-	0.4105	0.4105	Drains median between 8231+00 to 8236+85.
DA24	15.6635	5.5582	13.1120	13.5225	Drains the existing roadway from Guadalupe to 8231+00 exclusive of DA23.
DA25	-	1.1525	1.0949	14.6174	Drains the westbound mainlanes between 8229+50 and 8231+00.
DA26	0.9183	-	0.4592	15.0765	Drains areas adjacent to and east of Ramp A between mainlane station 8231+00 and Ramp A station 5+62.
DA27	-	0.6055	0.5752	0.5752	Drains the westbound mainlanes between 8229+50 and Ramp WBC-D 8218+85.
DA320	-	0.2545	0.2418	0.2418	An existing and reconnected structure which drains the westbound mainlane pavement between 8211+80 and 8214+12.
DA28	-	0.6175	0.5866	0.8284	Drains Ramp WBC-D between stations 8212+85 and 8218+85.
DA321	-	0.6850	0.6508	0.6508	An existing and reconnected structure which drains the westbound mainlane pavement between 8214+12 and 8222+34.
DA322	0.8705	-	0.4353	2.4896	Drains the infield area between Ramp A and Ramp WBC-D from Ramp A stations 3+00 to 13+00.
DA29	0.0518	-	0.0259	2.5155	Drains the infield area between Ramp A and Ramp WBC-D south of Baseline Rd. to Ramp A station 3+00.
DA30	-	1.2385	1.1766	1.1766	Drains Ramp A between mainlane station 8229+50 and Ramp A station 3+00.
DA31	0.3891	-	0.1946	18.9632	Drains areas adjacent to and east of Ramp A between Ramp A stations 0+74 and 5+62.
DA54	-	1.0000	0.9500	0.9500	Drains the eastbound lanes of Baseline Rd. between stations 21+35 and 28+20.
DA55	0.3624	1.0408	1.1700	2.1200	Drains the westbound lanes of Baseline Rd. between stations 21+35 and 27+09.

UNIT-ONE DRAINAGE AREA BREAKOUTS

DRAINAGE BASIN NO.	PERVIOUS AREA (ACRES)	IMPERVIOUS AREA (ACRES)	*TOTAL CA (ACRES)	CUMULATIVE CA (ACRES)	COMMENTS
DA58	0.5045	-	0.2523	0.2523	Drains the infield area north of Baseline Rd. between Ramp D and Ramp WBC-D.
DA64	0.0947	0.4293	0.4552	0.4552	Drains the westbound I-10 mainlanes between stations 8206+00 and 8211+60.
DA65	-	0.6336	0.6019	1.0571	Drains Ramp WBC-D between stations 8206+88 and 8212+85.
DA66	-	0.3025	0.2874	1.3445	Drains Ramp WBC-D between stations 8204+15 and 8206+88.
DA67	-	0.5813	0.5522	0.5522	Drains part of Ramp D and Ramp WBCD between stations 8200+88 and 8204+15.
DA405	1.3053	-	0.6527	23.8847	Drains the area east of Ramp D between Baseline Rd. Ramp WBC-D station 8200+88.
DA68	0.9711	-	0.4856	0.4856	Drains the area east of Ramp D between Ramp WBCD stations 8194+88 and 8200+88.
DA78	0.2962	1.0789	1.1731	1.1731	Drains the westbound I-10 mainlanes between stations 8194+00 and 8206+00.
DA79	-	0.7869	0.7476	26.2909	Drains Ramp WBC-D between stations 8194+88 and 8200+89.
DA401	0.0775	0.5062	0.5196	0.5196	Drains the westbound I-10 mainlanes between stations 8188+80 and 8194+00.
DA80	-	0.5544	0.5267	1.0463	Drains Ramp WBC-D between stations 8189+66 and 8194+88.
DA69	0.9910	-	0.4955	27.8327	Drains the area east of Ramp WBC-D between Ramp WBC-D stations 8189+66 and 8194+88.

The total area contributing to Detention Basin #1 through the Unit 1 stormdrain is CA=27.8327 acres.
Additional contributions to Detention Basin #1 resulting from the direct runoff of adjacent pavements and off-roadway areas (including the detention basin itself) consists of 0.6990 acres of impervious and 6.0239 acres of pervious surface area.
Thus, the sum total CA value of all runoff leaving Detention Basin #1 is: CA=27.8327+(0.5*6.0239)+(0.95*0.6990)=31.5807 acres.

The total area contributing to the ditch connecting Detention Basin 1 with the existing stormdrain at I-10 station 8172+80 ,128' rt. (including sheet flow contributions from adjacent areas)is calculated as follows:

Contribution from I-10 mainlanes (Pavement 8174+00 to 8177+25);	CA=0.1886
Ramp SE bridge drainage (from scupper inlets 218 and 219);	CA=1.1232
Infield area between existing Ramps C and D and Western Canal;	CA=1.6647
Subtotal	CA=34.5572

The total area contributing to Detention Basin 2A through the stormdrain and from overland flows is calculated as follows:

Contribution from I-10 mainlanes (Pavement 8165+00 to 8174+00);	CA=0.9465
Infield area between existing Ramps C and D and the I-10 mainlanes;	CA=1.8200
Contribution from "Ramp C";	CA=0.5071
Subtotal	CA=37.8308

DRAINAGE BASIN NO.	PERVIOUS AREA (ACRES)	IMPERVIOUS AREA (ACRES)	*TOTAL CA (ACRES)	CUMULATIVE CA (ACRES)	COMMENTS
DA160	6.6469	-	3.3235	3.3235	Drains the area west of Ramp S-E between stations 87+67 and 97+55.
DA114	-	0.9843	0.9351	0.9351	Drains Ramp S-E between stations 87+67 and 94+86. Discharges to Detention Basin 2C.
DA116	1.8836	-	0.9418	0.9418	Drains the area west of Ramp S-E between stations 83+00 and 87+67.
DA118	-	0.5295	0.5030	0.5030	Drains Ramp S-E between 84+25 and 87+67. Discharges to Detention Basin 2B.
			Subtotal	CA=5.7034	

The total area contributing to Detention Basin 2B through the stormdrain and from overland flows is calculated as follows:

Contribution from I-10 mainlanes (Pavement 8157+65 to 8165+00);	CA=0.8376
Contribution from the existing median (8157+65 to 8171+75);	CA=0.9711
Contribution from "Ramp D";	CA=1.6051
Infield area between existing Ramps C and D;	CA=0.6066
Contribution from sub-basins 114,116,118,160;	CA=5.7033
Infield area between existing Ramps C,D and the mainlanes;	CA=1.5542
Total contribution from the Southern Ave. lift station;	CA=3.2415
Subtotal	CA=52.3502

DRAINAGE BASIN NO.	PERVIOUS AREA (ACRES)	IMPERVIOUS AREA (ACRES)	*TOTAL CA (ACRES)	CUMULATIVE CA (ACRES)	COMMENTS
DA150	10.1745	1.7144	6.7159	6.7159	Drains the area along the existing 'Ramp A' and the west-bound SR360 from Priest through the culvert under Southern.
DA155	-	1.1685	1.1101	1.1101	Drains the eastbound mainlanes and Ramp S-E between stations 69+25 and 75+75.
DA156	0.7874	-	0.3937	0.3937	Drains the infield area between Ramp S-E and the eastbound mainlanes north of Southern Ave.
DA157	-	0.9022	0.8571	2.3609	Drains the eastbound mainlanes of I-10 between 8145+50 and 8152+00.

The sum of the CA at the east side DMJM tie-in at 8152+00 is calculated as CA=6.7159+2.3609+52.3502=61.4270

DA152	-	1.4210	1.3500	1.3500	Drains the eastbound mainlanes of I-10 and Ramp SE between I-10 stations 8145+50 and 8152+25.
DA154	0.2984	-	0.1492	0.1492	Drains the infield area west of Ramp SE between

The sum of the CA at the west side DMJM tie-in at 8141+00 is calculated as CA=1.3500+0.1492=1.4992

DA200	7.0521	2.3959	5.8022	5.8022	Drains the infield area between the westbound mainlanes of I-10 and interim Ramp WBC-D from I-10 station 8179+50 to 8188+80.

The pervious figure contains 6.2598 acres and the impervious figure contains 1.0698 acres of unadjusted runoff attributable to the existing eastbound I-10 pavement and adjacent off-roadway areas between stations 8184+00 and 8195+00 that are conveyed through the culvert shown crossing I-10 to the east at 8184+00.

DA203	-	0.7326	0.6960	6.4981	Drains Ramp N-E betqween stations Ramp N-E 14+50 and Ramp WBC-D 8189+66.
DA204	-	0.4025	0.3824	6.8805	Drains Ramp N-E between Ramp N-E stations 8+23.8 and 14+50.
DA205	1.8308	-	0.9154	7.7959	Drains the right-of-way area east of and along Ramp N-E between stations 10+00 and 18+00.

The sum of the CA conveyed to Detention Basin #3A through the Unit 1 stormdrain is CA=7.7959 acres.
Additional contributions to Detention Basin #3A resulting from the direct runoff of adjacent pavements and off-roadway areas (including the detention basin itself) consists of 0.3930 acres of impervious and 3.6516 acres of pervious surface area.
Thus, the sum total CA value of all runoff leaving Detention Basin #3A is: CA=7.7959+(0.5x3.6516)+(0.95x0.3930)=9.9951 acres.

DA230	-	0.4477	0.4253	0.4253	Drains Ramp S-E 117+50 to 119+66.
-	-	1.7241	1.6379	2.0632	Existing drainage from the westbound SR360 mainlanes.
DA231	5.1888	-	2.5944	4.6576	Drains area bounded by Priest Dr.,the Western Canal, Ramp S-E and Ramp N-E.
DA213	-	0.6191	0.5881	5.2458	Drains Ramp N-E and part of Ramp S-E between Ramp S-E 117+50 AND Ramp N-E 8+23.8
-	2.0363	-	1.0182	1.0182	Temporary drainage for infield area between Ramp S-E and the existing eastbound S.R. 360 west of Priest Dr.

DA210	-	0.5211	0.4950	0.4950	Drains Ramp S-E between stations 106+50 and 109+50.
DA211	-	1.3625	1.2944	1.7894	Drains Ramp S-E between stations 109+50 and 117+50.
DA212	0.4046	-	0.2023	1.9917	Drains the infield area between Ramps SE and NE from Ramp SE station 109+27 to 114+00.

The sum of CA conveyed to Detention Basin #3B through the stormdrain and from overland flows is calculated as follows:

Contribution from DA230-1;	CA=5.2458
Contribution from DA210-2;	CA=1.9917
Ramp SE bridge drainage (from scupper inlet 217);	CA=0.7050
Contribution from Detention Basin 3A;	CA=9.9951
Contribution from I-10 mainlanes;	CA=0.3432
Contribution from infield area between Ramps S-E,N-E and mainlanes;	CA=1.5037
Contribution for infield area be- Ramp S-E,I-10,and SR 360;	CA=1.0182
Contribution from SRP equipment underpass;	CA=0.0963
Subtotal	CA=20.8990

The sum of CA conveyed from Detention Basin #3C:

Contribution from I-10 median through the culvert at 8171+75;	CA=0.8437
Contribution from I-10 mainlanes;	CA=0.7920

UNIT-ONE DRAINAGE AREA BREAKOUTS

Contribution from infield area; CA=3.0200

Subtotal CA=25.5547

DRAINAGE BASIN NO.	PERVIOUS AREA (ACRES)	IMPERVIOUS AREA (ACRES)	*TOTAL CA (ACRES)	CUMULATIVE CA (ACRES)	COMMENTS
DA318	-	1.1085	1.0531	1.0531	Drains Ramp S-E from 119+66 to 125+00.
DA316	-	1.2615	1.1984	1.1984	Drains Ramp S-E between 125+00 and 132+50.
PART TWO	-	-	4.1900	6.4415	Contibutions by others.
DA314	0.4402	1.1972	1.3574	7.7989	Drains Ramp S-E between 132+50 and 138+80.
DA312	0.9315	1.2976	1.6985	9.4974	Drains Ramp S-E and adjacent off-roadway areas between stations 139+32 and 145+20.
MH55	0.3787	-	0.1894	9.6868	Drains the area behind the retaining wall between Ramp SE station 144+75 and the Hardy overpass.
DA310	0.4798	-	0.2399	0.2399	Drains the area behind the retaining wall between SR360 stations 154+00 and 157+00.
MH56	0.5464	-	0.2732	0.5131	Drains the area behind the retaining wall between SR360 stations 150+00 and 154+00.
DA304	0.2273	-	0.1137	0.6268	Drains the area behind the retaining wall between SR360 station 150+00 and the Hardy overpass.
-	-	0.1500	0.1425	0.1425	Contribution from the inlet draining Hardy Dr.

Total CA contribution to SR360 trunkline; 10.4560

UNIT-TWO DRAINAGE AREA BREAKOUTS

Unit 2 Drainage Area Summation

DRAINAGE BASIN NO.	PERVIOUS AREA (ACRES)	IMPERVIOUS AREA (ACRES)	TOTAL CA (ACRES)	CUMULATIVE CA (ACRES)	COMMENTS
DA22	2.2854	0.8006	1.9033	1.9033	Drains the eastbound mainlanes of I-10 and adjoining off-road areas between stations 8230+00 and 8237+00.
DA23	0.8209	-	0.4105	2.3137	Drains the median between 8231+00 and 8236+85.
DA24	7.8318	2.7791	6.5560	8.8698	Drains the existing roadway south of station 8231+00. (Represents a 50% reduction over the Unit 1 area.)
Unit 1 Drainage (Drainage Areas 22-31,320,322)			5.4409	14.3107	Drainage areas from Unit 1
DA32	-	1.9284	1.8320	1.8320	Drains I-10 median between 8217+00 and 8231+00.
DA33	-	1.3774	1.3085	1.3085	Drains I-10 median between 8212+00 and 8217+00.
DA34	-	0.9160	0.8702	2.1787	Drains I-10 eastbound between 8212+00 and 8217+00.
DA35	-	1.1014	1.0463	2.8783	Drains I-10 eastbound between 8217+00 and 8225+00.
DA36	1.5180	-	0.7590	0.7590	Drains the area west of Ramp B between Ramp B 3+65 and I-10 station 8230+50.
DA324	-	0.6164	0.5856	0.5856	Drains I-10 eastbound between 8226+00 and 8230+00.
DA37	-	0.9384	0.8915	2.2361	Drains Ramp B between stations 5+67 and 18+49.84 (including the eastbound I-10 lanes between 8225+00 and 8230+50).
DA38	0.2330	-	0.1165	0.1165	Drains the remaining off-road area west of Ramp B.
DA39	1.6781	-	0.8391	8.2487	Drains the infield area between the mainlanes and Ramp B.

UNIT-TWO DRAINAGE AREA BREAKOUTS

DRAINAGE BASIN NO.	PERVIOUS AREA (ACRES)	IMPERVIOUS AREA (ACRES)	TOTAL CA (ACRES)	CUMULATIVE CA (ACRES)	COMMENTS
DA40	-	0.4362	0.4144	0.4144	Drains the intersection of Ramp B and Baseline Rd.
DA41	-	0.2771	0.2632	0.2632	Drains Ramp B between stations 2+00 and 5+67.
DA42	0.8965	-	0.4483	0.9520	Drains the infield area between Ramp C and I-10.
DA43	-	0.5303	0.5038	0.5038	Drains Ramp C between 10+65 and 15+54.
DA47	-	0.5154	0.4896	1.4417	Drains the intersection of Ramp C and Baseline Rd.
DA45	0.0356	0.7013	0.6840	0.6840	Drains the south side of Baseline Rd. between Wendler Dr. and I-10.
DA46	0.1492	0.6508	0.6929	0.6929	Drains the north side of Baseline Rd. between Wendler Dr. and I-10.
DA48	-	0.0953	0.0905	0.0905	Drains the eastbound lanes of Baseline Rd. between 18+40 and 21+30.
DA49	-	0.1423	0.1352	0.1352	Drains the westbound lanes of Baseline Rd. between 18+40 and 21+50.
Drainage from Ramps B,C and Baseline Rd.(West).				11.9706	Drainage areas 32-49.
DA54	-	0.9447	0.8975	0.8975	Drains the eastbound lanes of Baseline Rd. between stations 21+35 and 28+20 (see Unit 1).
DA55	0.4198	1.4818	1.6176	2.5151	Drains the westbound lanes of Baseline Rd. between stations 21+35 and 27+09 (see Unit 1).
DA56	-	0.4563	0.4335	0.4335	Drains the intersection of Ramp A and the eastbound lanes of Baseline Rd.
DA58	0.5045	-	0.2523	0.2523	Drains the infield area north of Baseline Rd. between Ramp D and Ramp WBC-D.
DA59	0.0918	0.3065	0.3371	0.5893	Drains Ramp D between stations 5+00 and 10+15.
Drainage from Ramps A,D and Baseline Rd.(East).				3.5379	Drainage areas 54-59.

DA60	-	0.6876	0.6532	0.6532	Drains I-10 eastbound between 8208+50 and 8212+00.

DRAINAGE BASIN NO.	PERVIOUS AREA (ACRES)	IMPERVIOUS AREA (ACRES)	TOTAL CA (ACRES)	CUMULATIVE CA (ACRES)	COMMENTS
DA61	-	0.1636	0.1554	0.8086	Drains Ramp W-S between 62+10 and 64+60.
DA62	-	0.3535	0.3358	1.1445	Drains I-10 eastbound between 8206+00 and 8208+50.
DA63	-	0.8264	0.7851	1.9295	Drains I-10 median between 8206+00 and 8212+00.
DA64	-	0.6657	0.6324	2.5620	Drains westbound I-10 between 8206+00 and 8211+80.
Unit 1 Drainage (Drainage Areas 65-6)			0.8893	0.8893	Drainage areas from Unit 1
Total Unit 2 Drainage at JCT 11				33.2704	All drainage areas to this point.
DA405	1.3053	-	0.6527	0.6527	Drains the area east of Ramp D between Baseline Rd. and Ramp WBC-D station 8200+88.
DA67	-	0.5813	0.5522	1.2049	Drains Ramp WBC-D between stations 8200+88 and 8204+15.
DA70	-	0.3547	0.3370	0.3370	Drains Ramp W-S between 57+50 and 62+10.
DA71	-	0.1940	0.1843	0.5213	Drains Ramp C between 8+56 and 10+65.
DA72	0.7455	-	0.3728	0.8940	Drains the area west of Ramp C between 6+15 and Baseline Rd.
DA73	0.3375	-	0.1688	1.0628	Drains the area west of Ramp W-S between 50+60 and 55+10.
DA74	0.0947	-	0.0474	1.1101	Drains the area west of Ramp W-S between 49+60 and 50+60.
DA75	-	0.9883	0.9389	2.0490	Drains Ramp W-S between 50+10 and 57+50.

UNIT-TWO DRAINAGE AREA BREAKOUTS

DRAINAGE BASIN NO.	PERVIOUS AREA (ACRES)	IMPERVIOUS AREA (ACRES)	TOTAL CA (ACRES)	CUMULATIVE CA (ACRES)	COMMENTS
DA76	-	1.7080	1.6226	3.6716	Drains the eastbound mainlanes between 8194+00 and 8206+00.
DA77	-	1.6529	1.5703	5.2419	Drains the I-10 median between 8194+00 and 8206+00.
DA78	-	1.3751	1.3063	6.5482	Drains the westbound I-10 mainlanes between stations 8194+00 and 8206+00.
DA79	-	0.7869	0.7476	7.2958	Drains Ramp WBC-D between stations 8194+88 and 8201+89.
DA68	0.9711	-	0.4856	8.9862	Drains the area east of Ramp WBCD between stations 8194+88 and 8200+88.
DA81	-	0.5280	0.5016	0.5016	Drains westbound I-10 between stations 8188+80 and 8194+00.
DA401	0.0775	-	0.0388	0.0388	Drains the westbound I-10 mainlanes between stations 8188+80 and 8194+00.
DA80	-	0.5544	0.5267	1.0670	Drains Ramp WBC-D between stations 8189+66 and 8194+88.
DA69	0.9910	-	0.4955	10.5487	Drains the area east of Ramp WBC-D between Ramp WBC-D stations 8189+66 and 8195+89.
DA88	-	0.6916	0.6570	0.6570	Drains Ramp WS between stations 45+00 and 50+10.
DA85	-	0.0970	0.0922	11.2979	Drains Ramp W-S between stations 43+08 and 45+00.
DA86	-	0.7254	0.6891	11.9870	Drains the Ramp W-S/EBT-4 gore area between Ramp W-S 38+25/EBT-4 23+28 and Ramp W-S 50+10.
DA87	-	0.4371	0.4152	12.4023	Drains eastbound I-10 mainlanes between 8183+00 and 8189+00.
Bridge Decks	-	0.5052	0.4800	0.4800	Drains the Ramp W-S bridge deck between stations 30+91.50 and 37+62.

Subtotal CA= 46.1526

The sum of CA conveyed to Detention Basin #1 through the Unit 2 stormdrain is CA=46.1526 acres.
Additional contributions to Detention Basin #1 resulting from the direct runoff of adjacent pavements and off-roadway areas (including the detention basin itself) consists of 4.8014 acres of pervious surface area.The sum total CA value of all runoff entering Detention Basin #1 is: CA=46.1526+(0.5*4.8014)=48.5533 acres.

DA149	-	0.1022	0.0971	0.0971	Drains Ramp EBT-4 between stations 21+50 and 23+28.
DA(MH 22)	2.2125	0.7810	1.8482	50.4986	Drains the infield area between I-10, the Western Canal and Ramp EBT-4 including the I-10 pavement section from 8189+00 to 8194+00.
DA100	-	0.1722	0.1636	0.1636	Drains Ramp EBT-4 between 18+50 and 21+50.
DA102	0.3926	-	0.1963	0.1963	Drains the area between the noise wall, the Western Canal, and Ramp EBT-4.

Subtotal CA= 50.8585

DRAINAGE BASIN NO.	PERVIOUS AREA (ACRES)	IMPERVIOUS AREA (ACRES)	TOTAL CA (ACRES)	CUMULATIVE CA (ACRES)	COMMENTS
DA198	-	0.3062	0.2909	0.2909	Drains the westbound I-10 between stations 8178+25 and 8181+00.
DA199	-	1.1746	1.1159	1.4068	Drains the westbound I-10 between stations 8181+00 and 8188+80.
DA200	1.0990	-	0.5495	1.9563	Drains the infield area between the westbound mainlanes of I-10 and Ramp WBC-D from I-10 station 8178+00 to 8190+00.
DA202	-	0.5647	0.5365	2.4927	Drains Ramp WBCD between stations 8181+25 and 8189+66.
DA203-5	-	-	1.9938	4.4865	Drainage from inlets 203-5. (see Unit 1)

The sum of CA conveyed to Detention Basin #3A through the Unit 1 stormdrain is CA=4.4865 acres.
Additional contributions to Detention Basin #3A resulting from the direct runoff of adjacent pavements and off-roadway areas (including the detention basin itself) consists of 3.2828 acres

of pervious surface area.
Thus, the sum total CA value of all runoff leaving Detention Basin #3A is: CA=4.4865+(0.5x3.2828)=6.1279 acres.

DA229	0.0184	0.2525	0.2491	0.2491	Drains Ramp W-N from station 118+00 to 119+45.
DA228	-	0.5068	0.4815	0.7305	Drains Ramp W-S between stations 12+26 and 19+00.
DA230	-	0.4477	0.4253	1.1559	Drains Ramp S-E 117+50 to 119+66.
DA231	5.1888	-	2.5944	3.7503	Drains area bounded by Priest Dr.,the Western Canal, Ramp S-E and Ramp N-E.
DA226	-	1.1708	1.1123	1.1123	Drains Ramp W-N between stations 109+75 and 118+20.
DA210-3	-	-	2.5798	2.5798	Drainage from inlets 210-2. (see Unit 1)

The sum of CA conveyed to Detention Basin #3B through the stormdrain and from overland flows is calculated as follows:

Contribution from DA226,228-31,210-13;	CA=7.4424
Contribution from Detention Basin 3A;	CA=6.1279
Contribution from I-10 mainlanes(CB 122-3);	CA=1.3795
Contribution from infield area between Ramps W-S,N-E,Canal and mainlanes;	CA=4.3305
Contribution for infield area between Ramps W-S,W-N and I-10;	CA=3.9520
Contribution from Ramp W-S bridge scuppers (CB223-5);	CA=0.6240
Contribution from SRP equipment underpass;	CA=0.0963
Ramp SE bridge drainage (from scupper inlet 217,see Unit 1);	CA=0.7050
Subtotal	CA=24.6576

The sum of CA conveyed to Detention Basin #2A through #2B is;

Contribution from Detention Basin #1,DA100,102;	CA=	50.8585
Contribution from Detention Basin 3B;	CA=	24.6576
Contribution from DA 103;	CA=	2.7480
Contribution from EBT-4 curb-cut;	CA=	0.3555
Contribution from Detention Basin #2A infield;	CA=	2.3772
	Subtotal CA=	80.9968

Drains Ramp EBT-4 between 11+98 and 18+50.

DRAINAGE BASIN NO.	PERVIOUS AREA (ACRES)	IMPERVIOUS AREA (ACRES)	TOTAL CA (ACRES)	CUMULATIVE CA (ACRES)	COMMENTS
DA131	-	1.2121	1.1515	1.1515	Drains Ramp W-N between stations 101+00 and 109+77.
DA128	0.5647	1.0836	1.3118	2.4633	Drains the Ramp W-N between 94+92 and 101+00 and adjacent off-roadway areas.
DA129	7.8539	-	3.9270	6.3902	Drains the off-roadway area between Priest Dr. and Southern Ave. between Ramp W-N and the ROW.
DA126	-	0.7805	0.7415	7.1317	Drains the mainlanes and Ramp W-N between stations Ramp W-N 94+92 and I-10 8159+90.
DA125	-	1.8302	1.7387	8.8704	Drains the I-10 median between stations 8159+90 and 8173+00.
DA124	-	0.5978	0.5679	9.4383	Drains the eastbound I-10 mainlanes from stations 8159+90 and 8164+00.
DA106	-	0.3352	0.3184	0.3184	Drains Ramp EBT-4 from station 6+69 to 10+05.
DA148	-	0.1981	0.1882	0.1882	Drains Ramp EBT-4 from station 10+05 to 11+98.

DA107	-	2.2314	2.1198	2.1198	Drains the eastbound I-10 between stations 8165+00 and 8183+03.
DA108	-	0.2330	0.2214	2.3412	Drains Ramp EBT-4 and parts of the eastbound mainlanes between Ramp EBT4 station 6+69 and I-10 station 8163+80.
DA160	6.6469	-	3.3235	3.3235	Drains the area west of Ramp S-E between stations 87+67 and 97+55.
DA114	-	0.9843	0.9351	4.2585	Drains Ramp S-E between stations 87+67 and 94+86.
DA116	1.8836	-	0.9418	0.9418	Drains the area west of Ramp S-E between stations 83+00 and 87+67.
DA118	-	0.5295	0.5030	1.4448	Drains Ramp S-E between 84+25 and 87+67.

The total runoff volume leaving Detention Basin #2B through HDW2 is;

Contribution from DA124-31;	CA=	9.4383
Contribution from DA114,116,118,and 160;	CA=	5.7033
Contribution from lift station;	CA=	3.2415
Contribution from DA106-8,148;	CA=	2.8478
Contribution from Detention Basin #2A;	CA=	80.9968
Contribution from Detention Basin #2B infield area;	CA=	4.0766
	Subtotal CA=	106.3043

DA150-7	-	-	3.2350	3.2350	Drainage from inlets 150-7. (2.3609+0.8741 from Unit 1 and reduced DA150)

The sum of the CA at the east side DMJM tie-in at 8152+00 is calculated as CA=103.0628+3.2350=106.2978

DA315	0.2043	1.6012	1.6233	1.6233	Drains Ramp WN between stations 127+50 and 135+80.

UNIT-TWO DRAINAGE AREA BREAKOUTS

DA317	0.2020	1.5915	1.6129	1.6129	Drains Ramp WN between stations 119+45 and 127+50.

Total contribution to others;

CA=3.2362

APPENDIX E

STORM DRAIN HYDRAULIC GRADE LINE ANALYSIS

LOCATION DATA
Highway: Superstition/I-10 (UNIT 1)
Location: Maricopa Co.
Project No.: IR-10-3(310)

DESIGN DATA
Frequency: 50 years
P6= 2.95 in. P24= 3.40 in. P1= 2.35 in.
Outlet TW Elev.= 1177.00 (Crown Elevation of the Discharging Pipe into Dtn. Basin 1)**
Pipe n = 0.012

ARIZONA DEPARTMENT OF TRANSPORTATION
STORM SEWER CAPACITY CALCULATION RECORD

DESIGN: WHH 4/1992
REVISED: WHH 9/1992
CHECKED: GSB 9/1992

SEWER CALCULATIONS

Location		Drainage Area			Time of Flow, Min.			I	Q	Sewer Profile				Sewer Design			Hydraulic Grade Line			
Line No.	From - To	No.	Increm. CA	Sum. CA	Inlet	Sewer	Design	in./hr.	cfs	Crown Elevation Inlet	Crown Elevation Outlet	Length ft.	Slope ft./ft.	Diam. In.	Q full cfs	V f.p.s.	S ft./ft.	h ft.	Elevation Inlet	Elevation Outlet
A3	CB23 - MH1		0.41	0.41	10.00	0.90	10.00	6.30	2.58	1242.52	1242.29	138	0.0017	24	10.10	3.22	0.0001	0.23	1243.49	1243.26
B2	CB24 - MH1		13.11	13.11	14.00	---	14.00	5.50	72.11	1243.53	1243.26	10	0.0270	30	72.34	14.76	+0.0866	0.87	1244.13	1243.26
A4	MH1 - MH2		0.00	13.52	----	1.10	14.00	5.50	74.36	1243.79	1243.27	600	0.0009	42	32.70	3.41	+0.0047	1.02	1243.79	1242.77
B3	CB25 - MH2		1.09	1.09	10.00	---	10.00	6.30	6.87	1242.48	1241.77	6	0.1183	24	144.37	45.95	0.0008	0.71	1242.48	1241.77
A5	MH2 - MH3		0.00	14.61	----	0.30	15.10	5.25	76.70	1242.77	1237.68	301	0.0169	42	141.70	14.73	0.0050	5.09	1242.77	1237.68
A6	MH3 - MH4		0.00	14.61	----	0.50	15.40	5.20	75.97	1237.68	1219.50	521	0.0349	42	203.62	21.16	0.0049	18.18	1237.67	1219.49
B4	CB26 - JCT2		0.46	0.46	10.00	---	10.00	6.30	2.90	1218.25	1215.99	5	0.4520	24	164.78	52.45	0.0001	2.24	1218.25	1216.01
B5	CB30 - JCT3		1.18	1.18	10.00	---	10.00	6.30	7.43	1214.24	1207.75	29	0.2238	24	116.92	37.22	0.0009			
A7,A40	MH4 - MH6		0.00	16.25	----	0.30	15.90	5.20	84.50	1219.50	1207.41	384	0.0315	42	193.44	20.11	0.0060			
T1	CB320 - CB28		0.24	0.24	10.00	0.50	10.00	6.30	1.51	1231.29	1231.19	67	0.0015	24	9.49	3.02	0.0000			
D1	CB28 - MH5		0.59	0.83	10.00	1.40	10.50	6.30	5.23	1231.19	1230.73	270	0.0017	24	10.10	3.22	0.0005			
T2	CB321 - MH5		0.65	0.65	10.00	0.40	10.00	6.30	4.10	1233.97	1233.82	79	0.0019	24	10.40	3.31	0.0003			
D2	CB27 - MH5		0.58	0.58	10.00	0.80	10.00	6.30	3.65	1239.72	1234.17	330	0.0168	24	31.77	10.11	0.0002			
D3	MH5 - CB322		0.00	2.06	----	---	10.80	6.15	12.67	1217.00	1216.97	18	0.0017	24	10.10	3.22	+0.0027			
D4	CB322 - CB29		0.03	2.09	10.00	0.40	10.80	6.15	12.85	1216.00	1210.00	268	0.0224	24	36.68	11.67	0.0027			
D5	CB29 - CB31		0.44	2.53	10.00	0.20	11.20	6.00	15.18	1207.42	1206.07	90	0.0150	24	30.02	9.55	0.0038			
D6	CB31 - JCT31		0.19	2.72	10.00	---	11.40	6.00	16.32	1206.07	1205.92	10	0.0150	24	30.02	9.55	0.0044			
A9	MH6 - MH13		0.00	18.97	----	0.40	16.20	5.20	98.64	1207.41	1206.10	264	0.0050	48	110.04	8.76	0.0040			
E17	CB54 - MH11		0.95	0.95	10.00	0.20	10.00	6.30	5.98	1206.95	1206.68	47	0.0057	24	18.34	5.84	0.0006			
E19	CB55 - JCT8		1.17	1.17	10.00	0.20	10.00	6.30	7.37	1206.83	1206.34	68	0.0072	24	20.80	6.62	0.0009			
E18	MH11 - MH12		0.00	2.12	----	1.10	10.20	6.30	13.36	1206.68	1205.87	300	0.0027	24	12.73	4.05	0.0030			
E20	MH12 - MH13		0.00	2.12	----	1.00	11.30	6.10	12.93	1205.87	1205.14	283	0.0026	24	12.50	3.98	+0.0028			
G1	CB58 - CB59		0.25	0.25	10.00	0.20	10.00	6.30	1.58	1205.93	1204.99	57	0.0165	24	31.48	10.02	0.0000			
G2	CB59 - JCT10		0.00	0.25	----	---	10.60	6.30	1.58	1204.99	1204.06	21	0.0443	24	32.97	10.49	0.0000			
H5	CB64 - CB65		0.46	0.46	10.00	0.10	10.00	6.30	2.90	1224.57	1223.79	47	0.0166	24	31.48	10.02	0.0001			
H6	CB65 - CB66		0.60	1.06	10.00	0.60	10.10	6.30	6.68	1223.79	1219.29	273	0.0165	24	31.48	10.02	0.0007			
H7	CB66 - MH16		0.29	0.29	10.00	---	10.00	6.30	1.83	1219.29	1219.03	16	0.0162	24	31.48	10.02	0.0000			
H8	MH16 - JCT11		0.00	1.35	10.00	---	10.70	6.10	8.24	1211.95	1197.43	63	0.2305	24	118.86	37.03	0.0011			

LOCATION DATA
Highway: Superstition/I-10 (UNIT 1)
Location: Maricopa Co.
Project No.: IR-10-3(310)

DESIGN DATA
Frequency: 50 years
P6= 2.95 in. P24= 3.40 in. P1= 2.35 in.
Outlet TW Elev.= 1177.00 (Crown Elevation of the Discharging Pipe into Dtn. Basin 1)**
Pipe n = 0.012

ARIZONA DEPARTMENT OF TRANSPORTATION
STORM SEWER CAPACITY CALCULATION RECORD

DESIGN: WHH 4/1992
REVISED: WHH 9/1992
CHECKED: GSB 9/1992

SEWER CALCULATIONS

Location		Drainage Area			Time of Flow, Min.			I	Q	Sewer Profile				Sewer Design			Hydraulic Grade Line			
			Increm.	Sum.						Crown Elevation		Length	Slope	Diam.	Q full	V	S	h	Elevation	
Line No.	From - To	No.	CA	CA	Inlet	Sewer	Design	in./hr.	cfs	Inlet	Outlet	ft.	ft./ft.	In.	cfs	f.p.s.	ft./ft.	ft.	Inlet	Outlet
A3	CB23 - MH1		0.41	0.41	10.00	0.90	10.00	6.30	2.58	1242.52	1242.29	138	0.0017	24	10.10	3.22	0.0001	0.23	1243.49	1243.26
B2	CB24 - MH1		13.11	13.11	14.00	---	14.00	5.50	72.11	1243.53	1243.26	10	0.0270	30	72.34	14.76	+0.0866	0.87	1244.13	1243.26
A4	MH1 - MH2		0.00	13.52	----	1.10	14.00	5.50	74.36	1243.79	1243.27	600	0.0009	42	32.70	3.41	+0.0047	1.02	1243.79	1242.77
B3	CB25 - MH2		1.09	1.09	10.00	---	10.00	6.30	6.87	1242.48	1241.77	6	0.1183	24	144.37	45.95	0.0008	0.71	1242.48	1241.77
A5	MH2 - MH3		0.00	14.61	----	0.30	15.10	5.25	76.70	1242.77	1237.68	301	0.0169	42	141.70	14.73	0.0050	5.09	1242.77	1237.68
A6	MH3 - MH4		0.00	14.61	----	0.50	15.40	5.20	75.97	1237.68	1219.50	521	0.0349	42	203.62	21.16	0.0049	18.18	1237.67	1219.49
B4	CB26 - JCT2		0.46	0.46	10.00	---	10.00	6.30	2.90	1218.25	1215.99	5	0.4520	24	164.78	52.45	0.0001	2.24	1218.25	1216.01
B5	CB30 - JCT3		1.18	1.18	10.00	---	10.00	6.30	7.43	1214.24	1207.75	29	0.2238	24	116.92	37.22	0.0009	6.49	1214.24	1207.75
A7,A40	MH4 - MH6		0.00	16.25	----	0.30	15.90	5.20	84.50	1219.50	1207.41	384	0.0315	42	193.44	20.11	0.0060	12.10	1219.50	1207.40
T1	CB320 - CB28		0.24	0.24	10.00	0.50	10.00	6.30	1.51	1231.29	1231.19	67	0.0015	24	9.49	3.02	0.0000	0.10	1231.28	1231.18
D1	CB28 - MH5		0.59	0.83	10.00	1.40	10.50	6.30	5.23	1231.19	1230.73	270	0.0017	24	10.10	3.22	0.0005	0.46	1231.18	1230.72
T2	CB321 - MH5		0.65	0.65	10.00	0.40	10.00	6.30	4.10	1233.97	1233.82	79	0.0019	24	10.40	3.31	0.0003	0.15	1233.97	1233.82
D2	CB27 - MH5		0.58	0.58	10.00	0.80	10.00	6.30	3.65	1239.72	1234.17	330	0.0168	24	31.77	10.11	0.0002	5.54	1239.72	1234.18
D3	MH5 - CB322		0.00	2.06	----	---	10.80	6.15	12.67	1217.00	1216.97	18	0.0017	24	10.10	3.22	+0.0027	0.03	1218.02	1217.99
D4	CB322 - CB29		0.03	2.09	10.00	0.40	10.80	6.15	12.85	1216.00	1210.00	268	0.0224	24	36.68	11.67	0.0027	6.00	1216.00	1210.00
D5	CB29 - CB31		0.44	2.53	10.00	0.20	11.20	6.00	15.18	1207.42	1206.07	90	0.0150	24	30.02	9.55	0.0038	1.35	1207.42	1206.07
D6	CB31 - JCT31		0.19	2.72	10.00	---	11.40	6.00	16.32	1206.07	1205.92	10	0.0150	24	30.02	9.55	0.0044	0.15	1206.07	1205.92
A9	MH6 - MH13		0.00	18.97	----	0.40	16.20	5.20	98.64	1207.41	1206.10	264	0.0050	48	110.04	8.76	0.0040	1.32	1207.41	1206.09
E17	CB54 - MH11		0.95	0.95	10.00	0.20	10.00	6.30	5.98	1206.95	1206.68	47	0.0057	24	18.34	5.84	0.0006	0.26	1206.95	1206.69
E19	CB55 - JCT8		1.17	1.17	10.00	0.20	10.00	6.30	7.37	1206.83	1206.34	68	0.0072	24	20.80	6.62	0.0009	0.49	1206.83	1206.34
E18	MH11 - MH12		0.00	2.12	----	1.10	10.20	6.30	13.36	1206.68	1205.87	300	0.0027	24	12.73	4.05	0.0030	0.81	1206.68	1205.87
E20	MH12 - MH13		0.00	2.12	----	1.00	11.30	6.10	12.93	1205.87	1205.14	283	0.0026	24	12.50	3.98	+0.0028	0.74	1205.87	1205.13
G1	CB58 - CB59		0.25	0.25	10.00	0.20	10.00	6.30	1.58	1205.93	1204.99	57	0.0165	24	31.48	10.02	0.0000	0.94	1205.93	1204.99
G2	CB59 - JCT10		0.00	0.25	----	---	10.60	6.30	1.58	1204.99	1204.06	21	0.0443	24	32.97	10.49	0.0000	0.93	1204.99	1204.06
H5	CB64 - CB65		0.46	0.46	10.00	0.10	10.00	6.30	2.90	1224.57	1223.79	47	0.0166	24	31.48	10.02	0.0001	0.78	1224.57	1223.79
H6	CB65 - CB66		0.60	1.06	10.00	0.60	10.10	6.30	6.68	1223.79	1219.29	273	0.0165	24	31.48	10.02	0.0007	4.50	1223.79	1219.29
H7	CB66 - MH16		0.29	0.29	10.00	---	10.00	6.30	1.83	1219.29	1219.03	16	0.0162	24	31.48	10.02	0.0000	0.26	1219.29	1219.03
H8	MH16 - JCT11		0.00	1.35	10.00	---	10.70	6.10	8.24	1211.95	1197.43	63	0.2305	24	118.86	37.03	0.0011	14.52	1212.00	1197.48

Location		Drainage Area			Time of Flow, Min.			I	Q	Sewer Profile				Sewer Design			Hydraulic Grade Line			
Line No.	From - To	No.	Increm. CA	Sum. CA	Inlet	Sewer	Design	in./hr.	cfs	Crown Elevation Inlet	Crown Elevation Outlet	Length ft.	Slope ft./ft.	Diam. In.	Q full cfs	V f.p.s.	S ft./ft.	h ft.	Crown Elevation Inlet	Crown Elevation Outlet
A10	MH13 - MH15		0.00	21.34	----	0.70	16.60	5.10	108.83	1206.10	1202.94	436	0.0072	54	110.04	8.76	0.0049	3.14	1206.10	1202.96
A11	MH15 - MH17		0.00	22.69	----	0.60	17.30	5.00	113.45	1202.94	1194.12	598	0.0147	54	258.29	16.24	0.0028	8.79	1202.94	1194.15
I1	CB67 - MH17		0.55	0.55	10.00	---	10.00	6.30	3.47	1213.45	1205.05	23	0.3652	24	148.99	47.43	0.0002	8.40	1213.50	1205.10
I2	CB405 - MH17		0.65	0.65	10.00	---	10.00	6.30	4.10	1192.68	1192.62	42	0.0014	24	9.49	3.02	0.0003	0.06	1192.68	1192.62
A12	MH17 - MH19		0.00	23.89	----	---	17.90	4.90	117.06	1194.12	1187.33	600	0.0113	60	299.93	15.28	0.0017	6.78	1194.12	1187.34
J10	CB78/9 - MH19		1.92	1.92	10.00	---	10.00	6.30	12.10	1187.69	1187.27	82	0.0051	36	51.60	7.30	0.0003	0.42	1187.69	1187.27
J11	CB68 - MH19		0.49	0.49	10.00	---	10.00	6.30	3.09	1186.32	1186.27	28	0.0018	24	10.40	3.31	0.0002	0.05	1186.32	1186.27
A13	MH19 - MH80		0.00	26.30	----	0.60	17.90	4.90	128.87	1187.33	1181.28	532	0.0114	60	119.70	6.10	0.0021	6.06	1187.33	1181.27
I5	CB401 - CB80		0.52	0.52	10.00	0.10	10.00	6.30	3.28	1188.00	1186.88	56	0.0200	24	34.66	11.03	0.0002	1.12	1188.00	1186.88
I4	CB80 - MH80		0.53	1.05	10.00	---	10.10	6.30	6.62	1186.88	1181.92	14	0.3543	24	187.21	59.59	0.0007	4.96	1186.88	1181.92
I3	CB69 - MH80		0.50	0.50	10.00	---	10.00	6.30	3.15	1181.00	1180.60	15	0.0267	24	40.05	12.75	0.0002	0.40	1181.00	1180.60
A16	MH80 - MH20		0.00	27.85	----	0.50	18.50	4.80	133.68	1181.28	1180.54	248	0.0030	66	199.26	8.39	0.0014	0.74	1181.28	1180.54
A17	MH20 - MH21		0.00	27.85	----	1.00	19.00	4.70	130.90	1180.54	1178.83	570	0.0030	66	199.26	8.39	0.0013	1.71	1180.54	1178.83
A20	MH21 - HDW4		0.00	27.85	----	0.20	20.00	4.60	128.11	1178.83	1177.00	155	0.0118	66	395.18	16.63	0.0012	1.83	1178.83	**1177.00
A21	HDW9 - MH22		0.00	31.58	20.00	0.40	20.00	4.30	135.79	1172.50	1171.58	140	0.0066	24	20.36	6.48	0.0003	0.92	1172.50	1171.58
W40	MH22 - CUT		0.00	31.58	----	0.75	20.40	4.30	135.79	1171.58	1171.56	8	0.0025	24	12.26	3.90	0.0003	0.01	1171.58	1171.57
W42	CUT - ES10		0.00	31.58	----	0.75	20.40	4.30	135.79	1171.34	1171.31	18	0.0017	24	10.10	3.21	0.0003	0.03	1171.34	1171.31
M2	CB200 -CB202		5.80	5.80	20.00	0.20	25.00	4.10	23.78	1176.85	1176.48	124	0.0030	24	12.73	4.05	+0.0094	1.17	1179.51	1178.34
M3	CB202 - MH30		0.00	5.80	----	0.40	25.20	4.10	23.78	1176.48	1176.04	110	0.0040	24	15.69	5.00	+0.0094	1.03	1178.34	1177.31
M4	CB203 - MH30		0.70	0.70	10.00	---	10.00	6.30	4.41	1177.55	1176.04	36	0.0419	24	50.17	15.97	0.0003	0.01	1177.32	1177.31
M5	MH30 - JCT20		0.00	6.50	----	0.60	25.60	4.00	26.00	1176.04	1174.70	225	0.0060	24	18.98	6.04	+0.0113	2.55	1177.31	1174.76
M6	CB205 - CB204		0.92	0.92	10.00	0.20	10.00	6.30	5.80	1175.00	1174.82	46	0.0039	24	15.30	4.87	0.0006	0.03	1175.40	1175.37
M7	CB204 - ES30		0.98	8.40	10.00	0.40	25.60	4.00	33.60	1174.82	1174.39	110	0.0039	24	15.30	4.87	+0.0188	2.07	1175.37	1173.30
N5	CB114 - MH65		0.94	0.94	10.00	0.10	10.00	6.30	5.92	1186.45	1177.55	100	0.0890	24	73.52	23.40	0.0006	8.90	1186.50	1177.60
N6	CB160 - MH65		3.33	3.33	10.00	0.50	10.00	6.30	20.98	1163.00	1162.03	156	0.0062	24	18.50	5.89	+0.0073	0.97	1163.00	1162.03
N7	MH65 - ES16		0.00	4.27	10.00	0.70	10.50	6.10	26.05	1162.03	1160.59	249	0.0058	24	18.50	5.89	+0.0113	1.44	1162.03	1160.59
N10	CB118 - MH67		0.50	0.50	10.00	---	10.00	6.30	3.15	1179.95	1169.55	65	0.1600	24	98.49	31.35	0.0002	10.40	1180.00	1169.60
N11	CB116 - MH67		0.94	1.44	10.00	0.40	10.00	6.30	9.07	1162.50	1162.21	96	0.0030	24	13.42	4.27	0.0014	0.29	1162.50	1162.21
N12	MH67 - ES18		0.00	1.44	10.00	0.70	10.40	6.20	8.93	1162.21	1161.64	187	0.0030	24	13.42	4.27	0.0013	0.56	1162.21	1161.65
W10	CB211-CB210		0.50	0.50	10.00	1.90	10.00	6.30	3.15	1200.00	1198.50	310	0.0048	24	16.98	5.40	0.0002	1.50	1200.00	1198.50
W11	CB212 - MH35		1.29	1.79	10.00	0.80	11.90	5.90	10.56	1175.00	1173.01	50	0.0398	24	48.90	15.56	0.0019	1.99	1175.00	1173.01
W12	CB210 - MH35		0.20	1.99	10.00	0.10	12.70	5.80	11.54	1198.45	1186.05	53	0.2340	24	119.02	37.88	0.0022	12.50	1198.50	1186.00

Location		Drainage Area			Time of Flow, Min.			I	Q	Sewer Profile				Sewer Design			Hydraulic Grade Line			
			Increm.	Sum.						Crown Elevation		Length	Slope	Diam.	Q full	V	S	h	Crown Elevation	
Line No.	From - To	No.	CA	CA	Inlet	Sewer	Design	in./hr.	cfs	Inlet	Outlet	ft.	ft./ft.	In.	cfs	f.p.s.	ft./ft.	ft.	Inlet	Outlet
W7	CB231-MH34		2.69	2.69	10.00	0.30	10.00	6.30	16.95	1173.74	1173.32	282	0.0015	24	9.49	3.02	+0.0048	0.42	1173.74	1173.32
W8	MH34 - MH35		0.00	2.69	----	1.50	10.30	6.10	16.41	1173.22	1173.01	204	0.0010	24	7.75	2.47	+0.0045	0.21	1173.22	1173.01
W13	MH35-MH36		0.00	4.69	----	0.40	12.80	5.70	26.73	1173.01	1168.34	173	0.0270	24	40.27	12.82	0.0119	4.67	1173.01	1168.34
W30	ES31 - CUT		10.58	10.58	10.00	0.40	10.00	6.30	66.65	1171.57	1170.84	58	0.0126	24	27.62	8.79	***0.0740	2.46	1173.30	1170.84
W32	CUT - MH36		10.58	10.58	10.00	0.40	10.00	6.30	66.65	1169.52	1168.34	93	0.0127	24	27.62	8.79	***0.0740	1.18	1169.52	1168.34
W15	MH36-ES32		0.00	15.27	----	0.40	13.20	5.70	87.04	1168.34	1165.00	207	0.0161	24	31.10	9.90	+0.1261	3.34	1168.34	1165.00
S5	CB154 - MH60		0.15	0.15	10.00	0.25	10.00	6.30	0.95	1152.22	1152.15	46	0.0015	24	9.49	3.02	0.0000	0.07	1152.22	1152.15
S4	CB152 - MH60		1.35	1.35	10.00	0.10	10.00	6.30	8.51	1152.17	1152.15	12	0.0017	24	9.49	3.02	0.0012	0.02	1152.17	1152.15
S3	MH60 - MH61		0.00	1.50	----	1.20	10.25	6.10	9.15	1152.15	1151.83	210	0.0015	24	9.49	3.02	0.0014	0.31	1152.15	1151.84
S2	MH61 - TIE-IN		0.00	1.50	----	1.30	11.45	5.95	8.93	1151.83	1151.47	240	0.0015	24	9.49	3.02	0.0013	0.36	1151.83	1151.47
S6	CB155 - MH62		1.11	1.11	10.00	0.30	10.00	6.30	6.99	1155.98	1155.85	69	0.0019	24	10.68	3.40	0.0008	0.13	1155.98	1155.85
S7	CB156 - MH62		0.39	0.39	10.00	0.90	10.00	6.30	2.46	1156.15	1155.85	175	0.0017	24	10.11	3.22	0.0001	0.30	1156.15	1155.85
S8	MH62 - CB157		0.00	1.50	----	----	10.90	6.00	9.00	1155.85	1155.83	13	0.0015	24	10.68	3.40	0.0013	0.02	1155.85	1155.83
S9	CB157 - MH63		0.86	2.36	10.00	0.50	10.90	6.00	14.16	1155.83	1154.52	198	0.0066	24	19.76	6.29	0.0033	1.31	1155.83	1154.52
X1	CB318 - KK		1.05	1.05	10.00	----	10.00	6.30	6.62	1195.38	1180.00	46	0.3343	24	143.29	45.61	0.0007	15.38	1195.38	1180.00
X4	CB316 - MH50		1.20	1.20	10.00	----	10.00	6.30	7.56	1172.48	1170.93	97	0.0160	24	39.21	12.48	0.0010	1.55	1172.48	1170.93
X5	MH50 - MH51		1.05	6.44	10.00	0.50	10.00	6.30	40.57	1170.50	1164.92	339	0.0165	30	57.08	11.63	0.0083	5.58	1170.50	1164.92
X6	MH51 - MH52		0.00	6.44	10.00	0.50	10.50	6.20	39.93	1164.92	1159.43	332	0.0165	30	57.08	11.63	0.0081	5.49	1164.92	1159.43
X8	CB314 - MH52		1.36	1.36	10.00	0.20	10.00	6.30	8.57	1156.82	1155.49	109	0.0122	30	50.66	10.32	0.0004	1.33	1156.82	1155.49
X9	MH52 - MH53		0.00	7.80	10.00	1.20	11.00	6.00	46.80	1155.99	1154.38	436	0.0037	36	43.95	6.22	0.0042	1.61	1155.99	1154.38
X10	MH53 - MH54		0.00	7.80	10.00	1.50	12.20	5.80	45.24	1154.38	1152.00	202	0.0118	36	78.49	11.10	0.0039	2.38	1154.38	1152.00
X11	CB312 - MH54		1.70	1.70	10.00	0.25	10.00	6.30	10.71	1152.26	1152.00	84	0.0031	36	39.58	5.60	0.0002	0.26	1152.26	1152.00
X13	MH54 - MH66		0.00	9.50	10.00	0.40	13.70	5.60	53.20	1152.00	1148.49	291	0.0121	36	79.15	11.20	0.0054	3.51	1152.00	1148.49
X21	MH66 - MH58		0.00	9.69	10.00	0.30	14.10	5.50	53.29	1148.49	1146.08	200	0.0121	36	81.75	11.57	0.0054	2.41	1148.49	1146.08
X16	MH55 - MH66		0.19	0.19	10.00	----	10.00	6.30	1.20	1148.19	1147.99	21	0.0095	24	24.51	7.80	0.0000	0.20	1148.19	1147.99
X14	CB310 - MH56		0.24	0.24	10.00	1.70	10.00	6.30	1.51	1155.50	1154.80	350	0.0020	24	10.96	3.49	0.0000	0.70	1155.50	1154.80
X15	MH56 - MH57		0.27	0.51	10.00	1.70	11.70	5.90	3.01	1154.80	1154.10	350	0.0020	24	10.96	3.49	0.0002	0.70	1154.80	1154.10
X18	CB304 - MH57		0.11	0.11	10.00	----	10.00	6.30	0.69	1159.50	1159.40	8	0.0125	24	27.40	8.72	0.0000	0.10	1159.50	1159.40
X19	MH57 - MH58		0.26	0.88	10.00	----	13.40	5.40	4.75	1146.23	1146.08	22	0.0068	36	60.45	8.55	0.0000	0.15	1146.23	1146.08
X20	MH58 - 150+05		0.00	10.57	10.00	0.20	13.40	5.40	57.08	1146.08	1145.51	81	0.0070	36	60.45	8.55	0.0062	0.57	1146.08	1145.51

NOTES:

1. HYDRAULIC GRADE ELEV. AT CONNECTION TO EXISTING TRUNKLINE IN SR 360 AT STA. 150+05 ASSUMED EQUAL TO RIM OF EXISTING MANHOLE AT POINT OF CONNECTION.
2. SEWER DESIGN VELOCITY REFLECTS PIPE THEORETICALLY FLOWING FULL. THE HYDRAULIC GRADE LINE SLOPE REFLECTS EITHER THE DESIGN SLOPE OF THE PIPE IF FLOWING PARTIALLY FULL OR THE ACTUAL FRICTION SLOPE IF FLOWING FULL OR UNDER PRESSURE.
3. IN THOSE CASES WHERE THE FULL FLOW DISCHARGE IS SIGNIFICANTLY DIFFERENT FROM THAT REQUIRED BY THE DESIGN, THE DIFFERENCE RESULTS FROM PHYSICAL RESTRAINTS IMPOSED BY THE PROFILE LAYOUT.

***THIS IS THE SLOPE CALCULATED USING THE 50 YEAR BASIN STAGES SHOWN IN APPENDIX I.

+ B2,GRATE ELEV. CB24 = 1247.50

A4,RIM ELEV. MH1 = 1251.00

D3,GRATE ELEV. CB322 = 1222.00

E20,RIM ELEV. MH12 = 1212.05

+ M2,GRATE ELEV. CB200 = 1179.50

M3,GRATE ELEV. CB200 = 1179.50

M5,RIM ELEV. MH30 = 1184.00

M7,GRATE ELEV. CB204 = 1183.64

+ N6,GRATE ELEV. CB160 = 1164.50

N7,GRATE ELEV. CB160 = 1164.50

W7,GRATE ELEV. CB231 = 1175.50

W8,RIM ELEV. MH34 = 1194.00

+ W15,RIM ELEV. MH36 = 1180.00

*

LOCATION DATA
Highway: Superstition/I-10 (UNIT 2)
Location: Maricopa Co.
Project No.: IR-10-3(310)

DESIGN DATA
Frequency: 50 years
P6= 2.95 in. P24= 3.40 in. P1= 2.35 in.
Outlet TW Elev.= 1177.00 (Crown Elevation of the Discharging Pipe into Dtn. Basin 1)**
Pipe n = 0.012

ARIZONA DEPARTMENT OF TRANSPORTATION
STORM SEWER CAPACITY CALCULATION RECORD

DESIGN: WHH 4/1992
REVISED: WHH 9/1992
CHECKED: GSB 9/1992

SEWER CALCULATIONS

Location		Drainage Area			Time of Flow, Min.			I	Q	Sewer Profile				Sewer Design			Hydraulic Grade Line			
			Increm.	Sum.						Crown Elevation		Length	Slope	Diam.	Q full	V	S	h	Elevation	
Line No.	From - To	No.	CA	CA	Inlet	Sewer	Design	in./hr.	cfs	Inlet	Outlet	ft.	ft./ft.	In.	cfs	f.p.s.	ft./ft.	ft.	Inlet	Outlet
A2	CB22 - MH0		2.31	2.31	10.00	----	10.00	6.30	14.55	1247.00	1246.99	6	0.0017	24	10.11	3.22	+0.0035	0.02	1246.03	1246.01
A3	MH0 - PLUG		----	2.31	----	0.60	10.00	6.30	14.55	1243.00	1242.52	110	0.0044	24	16.25	5.17	+0.0035	1.09	1246.01	1244.92
B2	CB24 - MH1		6.56	6.56	10.00	----	10.00	6.30	41.33	1243.53	1243.26	10	0.0270	30	72.34	14.76	+0.0086	0.27	1245.19	1244.92
A4	MH1 - MH2		----	8.87	----	1.30	10.60	6.20	54.99	1243.79	1243.27	600	0.0009	42	32.70	3.40	+0.0025	1.50	1244.92	1243.42
B3	CB25 - MH2		1.09	1.09	10.00	----	10.00	6.30	6.87	1242.48	1241.77	5	0.1420	24	92.40	29.40	0.0008	3.47	1242.48	1239.01
A5	MH2 - MH3		----	9.96	----	0.30	11.90	5.95	59.26	1242.77	1237.67	301	0.0169	42	141.70	14.73	0.0030	5.09	1243.42	1238.33
A6	MH3 - MH4		----	9.96	----	1.20	12.20	5.80	57.77	1237.67	1219.50	521	0.0349	42	203.62	21.16	0.0028	18.18	1238.33	1220.15
B4	CB26 - JCT2		0.46	0.46	10.00	----	10.00	6.30	2.90	1218.25	1215.99	5	0.4520	24	164.04	52.21	0.0001	0.42	1218.25	1217.83
B5	CB30 - JCT3		1.18	1.18	10.00	----	10.00	6.30	7.43	1214.24	1207.75	29	0.2238	24	116.92	37.22	0.0009	6.37	1214.24	1207.87
A7,A40	MH4 - MH6		----	11.60	----	0.30	13.40	5.60	64.96	1219.50	1207.41	384	0.0315	42	193.44	20.11	0.0036	12.10	1220.15	1208.05
T1	CB320 - CB28		0.24	0.24	----	0.30	10.00	6.30	1.51	1231.19	1230.73	270	0.0017	24	10.10	3.22	0.0005	0.46	1231.19	1230.73
D1	CB28 - MH5		1.24	1.48	10.00	1.20	10.30	6.25	9.25	1233.97	1233.82	79	0.0019	24	10.68	3.40	0.0014	0.15	1234.32	1234.17
D2	CB27 - MH5		0.58	0.58	10.00	0.80	10.00	6.30	3.65	1239.72	1234.17	330	0.0168	24	31.77	10.11	0.0002	5.55	1239.72	1234.17
D3	MH5 - CB322		----	2.06	----	----	11.50	6.00	12.36	1217.00	1216.97	18	0.0017	24	10.10	3.22	0.0025	0.03	1215.09	1215.06
D4	CB322 - CB29		0.44	2.50	10.00	0.40	11.50	6.00	15.00	1216.00	1210.00	268	0.0224	24	36.68	11.68	0.0026	6.00	1215.06	1209.06
D5	CB29 - CB31		0.03	2.53	10.00	0.20	11.90	5.90	14.93	1207.42	1206.07	90	0.0150	24	30.00	9.55	0.0037	1.35	1209.06	1207.71
D6	CB31 - JCT31		0.19	2.72	10.00	----	12.10	5.90	16.05	1206.07	1205.92	10	0.0150	24	30.00	9.55	0.0043	0.15	1207.71	1207.56
F1	CB56 - JCT4		0.44	0.44	10.00	0.10	10.00	6.30	2.77	1209.67	1205.62	51	0.0794	24	69.06	21.98	0.0001	4.05	1211.46	1207.41
A9	MH6 - MH13		----	14.76	----	0.40	13.70	5.50	81.18	1207.41	1206.10	264	0.0050	48	110.03	8.76	0.0027	1.32	1208.05	1206.73
C1	CB32 - CB35		1.83	1.83	10.00	0.20	10.00	6.30	11.53	1239.21	1238.41	100	0.0080	24	22.19	7.07	0.0022	0.80	1239.21	1238.41
C2	CB33 - CB34		1.31	1.31	10.00	0.50	10.00	6.30	8.25	1235.98	1235.80	108	0.0017	24	10.10	3.22	0.0011	0.18	1236.09	1235.91
C3	CB34 - MH7		0.87	2.18	10.00	1.30	10.50	6.25	13.63	1235.80	1234.98	330	0.0025	24	12.26	3.90	+0.0031	0.93	1235.91	1234.98
C4	CB35 - MH7		1.05	2.88	10.00	0.30	10.20	6.25	18.00	1238.41	1234.98	170	0.0202	24	34.84	11.09	0.0054	3.43	1238.41	1234.98
C5	MH7 - MH8		----	5.06	----	0.10	11.80	5.90	29.85	1226.75	1223.50	78	0.0417	24	50.05	15.93	0.0148	3.25	1226.75	1223.50
C7	CB36,37 - MH8		2.24	2.24	10.00	0.10	10.00	6.30	14.11	1217.70	1215.62	84	0.0248	24	50.41	16.04	0.0033	2.08	1218.84	1216.76

Location		Drainage Area			Time of Flow, Min.			I	Q	Sewer Profile				Sewer Design			Hydraulic Grade Line			
			Increm.	Sum.						Crown Elevation		Length	Slope	Diam.	Q full	V	S	h	Elevation	
Line No.	From - To	No.	CA	CA	Inlet	Sewer	Design	in./hr.	cfs	Inlet	Outlet	ft.	ft./ft.	In.	cfs	f.p.s.	ft./ft.	ft.	Inlet	Outlet
C8	MH8 - CB39		----	7.30	----	0.50	11.90	5.90	43.07	1215.62	1210.71	334	0.0147	30	53.88	10.98	0.0126	4.91	1216.76	1211.85
C10	CB38 - CB41		0.12	0.12	10.00	0.50	10.00	6.30	0.76	1210.82	1210.74	54	0.0015	24	9.49	3.02	0.0001	0.08	1211.96	1211.88
C11	CB41 - CB39		0.26	0.38	10.00	----	10.50	6.30	2.39	1210.74	1210.71	18	0.0017	24	10.10	3.22	0.0001	0.03	1211.88	1211.85
C12	CB40 - JCT5		0.41	0.41	10.00	0.10	10.00	6.30	2.58	1208.94	1208.54	36	0.0111	24	25.80	8.22	0.0001	0.41	1210.31	1209.90
C13	CB39 - MH10		0.84	8.93	10.00	0.30	12.40	5.90	52.69	1210.71	1207.57	210	0.0150	30	54.43	11.09	0.0141	3.15	1211.85	1208.70
E1	CB46 - MH9		0.69	0.69	10.00	0.10	10.00	6.30	4.35	1210.04	1209.08	60	0.0160	24	31.00	9.87	0.0003	0.96	1211.17	1210.21
E2	CB45 - MH9		0.68	0.68	10.00	0.40	10.00	6.30	4.28	1209.19	1209.08	75	0.0015	24	9.49	3.02	0.0003	0.11	1210.32	1210.21
E3	MH9 - MH10		----	1.37	----	0.40	10.40	6.20	8.49	1209.08	1207.57	180	0.0084	24	22.46	7.15	0.0012	1.51	1210.21	1208.70
E5	CB43 - CB42		0.50	0.50	10.00	----	10.00	6.30	3.15	1207.51	1207.48	17	0.0018	24	10.68	3.40	0.0002	0.03	1209.03	1209.00
E6	CB42 - CB47		0.45	0.95	10.00	0.60	10.00	6.30	5.98	1207.48	1207.20	142	0.0020	24	10.96	3.49	0.0006	0.20	1209.00	1208.80
E7	CB47 - MH10		0.49	1.44	10.00	0.30	10.60	6.20	8.93	1207.20	1207.07	66	0.0020	24	10.96	3.49	0.0013	0.10	1208.80	1208.70
E13	CB48 - JCT6		0.09	0.09	10.00	0.30	10.00	6.30	0.57	1206.59	1205.61	61	0.0161	24	31.10	9.90	----	1.23	1208.46	1207.23
E15	CB49 - JCT7		0.14	0.14	10.00	0.30	10.00	6.30	0.88	1206.58	1205.26	67	0.0197	24	34.40	10.95	----	1.32	1208.49	1207.17
E12	MH10 - MH13		----	11.97	----	0.60	10.90	6.20	74.21	1207.57	1205.60	387	0.0051	42	67.19	6.98	0.0046	1.97	1208.70	1206.73
E17	CB54 - MH11		0.90	0.90	10.00	0.10	10.00	6.30	5.67	1206.95	1206.68	48	0.0056	24	18.34	5.84	0.0006	0.27	1209.36	1209.09
E19	CB55 - JCT8		1.62	2.52	10.00	0.20	10.00	6.30	15.88	1206.83	1206.34	68	0.0072	24	20.80	6.62	0.0017	0.49	1209.06	1208.57
E18	MH11 - MH12		----	2.52	----	1.10	10.10	6.30	15.88	1206.68	1205.87	300	0.0027	24	12.74	4.05	+0.0042	1.26	1209.09	1207.83
E20	MH12 - MH13		----	2.52	----	1.00	11.20	6.10	15.37	1205.87	1205.14	283	0.0026	24	12.50	3.98	+0.0039	1.10	1207.83	1206.73
G1	CB58 - CB59		0.25	0.25	10.00	0.10	10.00	6.30	1.58	1205.93	1204.99	57	0.0165	24	31.48	10.02	----	0.94	1207.80	1206.86
G2	CB59 - JCT10		0.34	0.59	10.00	----	10.10	6.30	3.72	1204.99	1204.06	21	0.0443	24	31.48	10.02	0.0002	0.93	1206.86	1205.93
A10	MH13 - MH15		----	29.84	----	0.50	14.10	5.50	164.12	1206.10	1202.94	436	0.0072	54	180.74	11.37	0.0059	3.14	1206.73	1203.59
H1	CB60 - CB61		0.65	0.65	10.00	0.60	10.00	6.30	4.10	1231.93	1227.84	248	0.0165	24	31.40	10.02	0.0003	4.09	1231.93	1227.84
H2	CB61 - CB62		0.16	0.81	10.00	0.10	10.60	6.20	5.02	1227.84	1227.31	32	0.0166	24	31.40	10.02	0.0004	0.53	1227.84	1227.31
H3	CB62 - CB63		0.34	1.15	10.00	0.20	10.70	6.20	7.13	1227.31	1225.84	89	0.0165	24	31.40	10.02	0.0008	1.47	1227.31	1225.84
H4	CB63 - CB64		0.79	1.94	10.00	0.10	10.90	6.15	11.93	1225.84	1224.57	77	0.0165	24	31.40	10.02	0.0024	1.27	1225.84	1224.57
H5	CB64 - CB65		0.63	2.57	10.00	0.10	11.00	6.10	15.68	1224.57	1223.79	47	0.0166	24	31.58	10.05	0.0041	0.78	1224.57	1223.79
H6	CB65 - CB66		0.60	3.17	10.00	0.50	11.10	6.10	19.34	1223.79	1219.29	273	0.0165	24	31.40	10.02	0.0062	4.76	1223.79	1219.03
H7	CB66 - MH16		0.29	3.46	10.00	----	11.60	6.00	20.76	1219.29	1219.03	16	0.0162	24	31.40	10.02	0.0072	0.26	1219.29	1219.03
H8	MH16 - JCT11		----	3.46	----	----	11.60	5.90	20.41	1211.95	1197.43	63	0.2305	24	118.87	37.83	0.0069	14.52	1213.82	1199.30
A11	MH15 - MH17		----	33.30	----	0.60	14.60	5.40	179.82	1202.94	1194.12	598	0.0147	54	258.25	16.24	0.0041	8.79	1203.59	1194.80
I1	CB67 - MH17		0.55	0.55	10.00	----	10.00	6.30	3.47	1213.45	1205.05	23	0.3652	24	149.00	47.42	0.0002	8.22	1203.02	1194.80
I2	CB405 - MH17		0.65	0.65	10.00	----	10.00	6.30	4.10	1192.68	1192.62	42	0.0014	24	9.49	3.02	0.0003	0.06	1194.86	1194.80
A12	MH17 - MH19		----	34.50	----	0.60	15.20	5.30	182.85	1194.12	1187.33	600	0.0113	60	299.93	15.28	0.0042	6.78	1194.80	1188.02

Location		Drainage Area			Time of Flow, Min.			I	Q	Sewer Profile				Sewer Design			Hydraulic Grade Line			
Line No.	From - To	No.	Increm. CA	Sum. CA	Inlet	Sewer	Design	in./hr.	cfs	Crown Elevation Inlet	Crown Elevation Outlet	Length ft.	Slope ft./ft.	Diam. in.	Q full cfs	V f.p.s.	S ft./ft.	h ft.	Elevation Inlet	Elevation Outlet
J1	CB70 - MH50		0.34	0.34	10.00	----	10.00	6.30	2.14	1213.04	1213.00	14	0.0029	24	13.20	4.20	----	0.04	1213.04	1213.00
J2	CB71 - MH50		0.18	0.52	10.00	----	10.00	6.30	3.28	1213.04	1213.00	14	0.0029	24	13.20	4.20	0.0002	0.04	1213.04	1213.00
J3	MH50 - ES2		----	0.52	----	0.20	10.00	6.30	3.28	1202.88	1201.00	84	0.0224	24	31.39	9.90	0.0002	1.38	1202.88	1201.50
J5	CB72 - MH18		0.37	0.89	10.03	0.50	10.00	6.30	5.61	1193.00	1191.05	200	0.0098	24	24.26	7.72	0.0005	1.96	1193.75	1191.79
J6	MH18 - CB73		----	0.89	----	0.50	10.50	6.20	5.52	1191.05	1189.09	200	0.0098	24	24.26	7.72	0.0005	1.96	1191.79	1189.83
J7	CB73 - CB74		0.17	1.06	10.00	1.00	11.00	6.10	6.47	1189.09	1188.79	200	0.0015	24	9.49	3.02	0.0007	0.30	1189.83	1189.53
J9/J10	CB74 - MH19		6.23	7.29	10.00	0.60	12.00	6.00	43.74	1188.79	1187.27	298	0.0051	36	51.60	7.30	0.0037	1.51	1189.53	1188.02
J11	CB68 - MH19		0.49	0.49	10.00	0.10	10.00	6.30	3.09	1186.32	1186.27	28	0.0018	24	10.40	3.31	0.0002	0.05	1188.07	1188.02
A13	MH19 - MH80		----	42.28	----	0.50	15.80	5.20	219.86	1187.33	1181.28	532	0.0114	60	301.25	16.90	0.0061	6.06	1188.02	1181.96
I7	CB81 - CB401		0.50	0.50	10.00	----	10.00	6.30	3.15	1190.93	1188.00	10	0.2930	24	132.67	42.23	0.0002	2.93	1190.97	1188.04
I5	CB401 - CB80		0.04	0.54	10.00	0.10	10.00	6.30	3.40	1188.00	1186.88	56	0.0200	24	34.66	11.03	0.0002	1.12	1188.04	1186.92
I4	CB80 - MH80		0.53	1.07	10.00	----	10.10	6.30	6.74	1186.88	1181.92	9	0.5511	24	187.22	59.59	0.0008	4.96	1186.92	1181.96
I3	DA69 - MH80		0.50	0.50	10.00	----	10.00	6.30	3.15	1181.00	1180.60	15	0.0267	24	40.05	12.75	0.0002	0.40	1182.36	1181.96
A16	MH80 - MH20		----	43.85	----	0.40	16.30	4.65	203.90	1181.28	1180.54	248	0.0030	66	199.26	8.39	0.0032	0.79	1181.96	1181.17
I10	CB88 - CB85		0.66	0.66	10.00		10.00	6.30	4.16	1183.72	1182.25	100	0.0147	24	29.72	9.46	0.0003	1.47	1183.72	1182.25
I9	CB86 - JCT86		0.69	0.69	10.00	0.10	10.00	6.30	4.35	1182.51	1178.28	54	0.0783	24	71.30	22.69	0.0003	4.22	1184.69	1180.47
I8	CB85 - JCT85		0.09	0.75	10.00	0.10	10.00	6.30	4.73	1182.25	1178.56	52	0.0710	24	68.67	21.86	0.0004	3.69	1184.54	1180.85
A17	MH20 - MH21		----	45.26	----	1.00	16.70	5.10	230.83	1180.54	1178.83	570	0.0030	66	199.26	8.39	0.0041	2.34	1181.17	1178.83
I11	CB87 - MH21		0.42	0.42	10.00	----	10.00	6.30	2.65	1184.81	1178.81	16	0.3750	24	150.08	47.77	0.0001	6.00	1184.83	1178.83
A20	MH21 - HDW4		----	45.68	----	0.10	17.70	5.00	228.40	1178.83	1177.00	155	0.0118	66	395.19	16.63	0.0039	1.83	1178.83	**1177.00
A21	HDW9 - MH22		2.88	48.56	20.00	0.40	20.00	4.30	208.81	1172.50	1171.58	140	0.0066	24	20.36	6.48	***0.0332	4.73	1175.13	1170.40
W40	MH22 - CUT		1.95	50.51	----	0.75	20.40	4.30	217.19	1171.58	1171.56	8	0.0025	24	9.49	3.02	***0.0332	0.25	1170.40	1170.15
W42	CUT - ES10		----	50.51	----	0.75	20.40	4.30	217.19	1171.34	1171.31	****18	0.0015	24	9.49	3.02	***0.0332	5.29	1170.15	**1164.57
K11	CB198 - CB199		0.29	0.29	10.00	0.30	10.00	6.30	1.83	1182.30	1179.33	175	0.0170	24	31.96	10.17	0.0001	2.70	1182.20	1179.50
K12	CB199 - MH200		1.12	1.41	10.00	0.30	10.30	6.30	8.88	1179.33	1176.53	182	0.0154	24	30.42	9.68	0.0008	2.80	1179.50	1176.70
K13	MH200 - CB202		0.55	1.96	----	0.10	10.60	6.20	12.15	1176.53	1176.48	21	0.0024	24	12.01	3.82	0.0017	0.05	1176.70	1176.65
M3	CB202 - MH30		0.54	2.50	10.00	0.40	10.70	6.20	15.50	1176.48	1176.04	108	0.0041	24	15.69	5.00	0.0030	0.44	1176.65	1176.21
M4	CB203 - MH30		0.70	0.70	10.00	---	10.00	6.30	4.41	1177.55	1176.04	36	0.0419	24	50.17	15.97	0.0003	1.51	1177.72	1176.21
M5	MH30 - JCT20		----	3.20	----	0.60	11.10	6.10	19.52	1176.04	1174.70	225	0.0060	24	18.98	6.04	0.0051	1.42	1176.21	1174.79
M6	CB205 - CB204		0.92	0.92	10.00	0.20	10.00	6.30	5.80	1175.00	1174.82	46	0.0039	24	15.30	4.87	0.0006	0.18	1175.42	1175.24
M7	CB204 - ES30		0.38	4.50	10.00	0.40	11.70	6.10	27.45	1174.82	1174.39	110	0.0039	24	15.30	4.87	+0.0141	1.38	1175.24	1173.86
W10	CB211 - CB210		1.29	1.29	10.00	1.90	10.00	6.30	8.13	1200.00	1198.50	310	0.0048	24	9.49	3.02	0.0002	1.50	1200.00	1198.50
W11	CB212 - MH35		0.20	0.20	10.00	0.80	11.90	5.90	1.18	1175.00	1173.01	50	0.0398	24	131.73	41.93	0.0019	1.99	1175.00	1173.01
W12	CB210 - MH35		0.50	1.79	10.00	0.10	12.70	5.80	10.38	1198.45	1186.00	53	0.2349	24	69.10	22.00	0.0022	12.50	1198.50	1186.00
W1	CB229 - CB228		0.25	0.25	10.00	---	10.00	6.30	1.58	1198.00	1197.62	24	0.0158	24	30.80	9.80	0.0000	0.38	1198.00	1197.62
W2	CB228 - MH31		0.48	0.73	10.00	---	10.00	6.30	4.60	1197.62	1197.56	6	0.0100	24	24.51	7.80	0.0004	0.06	1197.62	1197.56
W3	MH31 - CB230		----	0.73	----	---	10.00	6.30	4.60	1197.56	1196.58	98	0.0100	24	24.51	7.80	0.0004	0.98	1197.56	1196.58
W4	CB230 - KK		0.43	1.16	10.00	---	10.00	6.30	7.31	1196.53	1180.53	57	0.2807	24	24.51	7.80	0.0009	16.00	1196.53	1180.53

Location		Drainage Area			Time of Flow, Min.			I	Q	Sewer Profile				Sewer Design			Hydraulic Grade Line			
										Crown Elevation		Length	Slope	Diam.	Q full	V	S	h	Elevation	
Line No.	From - To	No.	Increm. CA	Sum. CA	Inlet	Sewer	Design	in./hr.	cfs	Inlet	Outlet	ft.	ft./ft.	In.	cfs	f.p.s.	ft./ft.	ft.	Inlet	Outlet
W7	CB213/31-MH34		3.18	4.34	10.00	0.30	10.00	6.30	27.34	1173.74	1173.32	282	0.0015	24	9.49	3.02	0.0048	0.42	1173.74	1173.32
W8	MH34 - MH35		----	4.34	----	1.50	10.30	6.10	26.47	1173.32	1173.01	204	0.0015	24	9.49	3.02	0.0045	0.31	1173.32	1173.01
W13	MH35 - MH36		----	6.33	----	0.40	12.80	5.70	36.08	1173.01	1168.34	173	0.0270	24	31.48	10.02	0.0119	4.67	1173.01	1168.34
W30	ES31 - CUT		1.64	6.14	60.00	0.40	60.00	2.35	14.43	1171.57	1170.84	58	0.0126	24	9.49	3.02	0.0034	0.73	1171.57	1170.84
W32	CUT - MH36		----	6.14	60.00	0.40	60.00	2.35	14.43	1169.52	1168.34	93	0.0127	24	9.49	3.02	0.0034	1.18	1169.52	1168.34
W15	MH36 - ES32		----	12.47	----	0.40	60.00	2.35	29.30	1168.34	1165.00	207	0.0161	24	31.10	9.90	0.0142	3.34	1168.34	1165.00
K10	CB122 - CB123		0.19	0.19	10.00	1.00	10.00	6.30	1.20	1168.72	1168.45	180	0.0015	24	9.49	3.02	----	0.27	1168.72	1168.45
K8	CB123 - ES22		1.56	1.75	10.00	0.20	11.00	6.10	10.67	1168.45	1167.88	34	0.0168	24	31.76	10.11	0.0019	0.57	1168.45	1167.88
K7	ES32 - ES13		24.66	24.66	60.00	0.30	60.00	2.35	57.95	1164.50	1164.00	306	0.0016	24	9.80	3.12	***0.0559	0.03	1164.60	1164.57
K5	CB100 - ES11		0.29	0.29	10.00	---	10.00	6.30	1.83	1180.36	1164.50	103	0.1540	24	96.17	30.61	0.1540	15.86	1180.43	1164.57
N20	CB149 - ES51		0.10	0.10	10.00	---	10.00	6.30	0.63	1191.00	1188.00	65	0.0462	24	52.68	16.77	0.0462	3.00	1191.00	1188.00
N21	CB148 - ES50		0.19	0.19	10.00	---	10.00	6.30	1.20	1161.95	1159.50	178	0.0138	24	28.79	9.16	0.0138	2.45	1161.95	1159.50
N1	MDW1 - CB106		81.00	81.00	60.00	---	60.00	2.35	190.35	1165.00	1162.35	60	0.0442	36	152.60	21.58	***0.0812	3.12	1164.57	1161.45
N2	CB106 - ES14		0.32	84.28	60.00	---	60.00	2.35	198.06	1162.35	1160.50	42	0.0440	36	152.60	21.58	***0.0862	2.28	1161.45	1159.17
N3	CB107 - CB108		2.12	2.12	10.00	0.20	10.00	6.30	13.36	1165.07	1164.31	46	0.0165	24	31.48	10.02	0.0030	0.76	1165.07	1164.31
N4	CB108 - ES15		0.22	2.34	10.00	0.20	10.20	6.30	14.74	1160.16	1159.50	46	0.0143	24	29.30	9.30	0.0036	0.76	1160.26	1159.50
N5	CB114 - MH65		0.94	0.94	10.00	0.10	10.00	6.30	5.92	1186.50	1177.50	100	0.0900	24	73.52	23.40	0.0006	9.00	1186.50	1177.50
N6	CB160 - MH65		3.33	3.33	10.00	0.50	10.00	6.30	20.98	1163.00	1162.03	156	0.0062	24	18.50	5.89	+0.0073	0.97	1163.00	1162.03
N7	MH65 - ES16		0.00	4.27	10.00	0.70	10.50	6.10	26.05	1162.03	1160.59	249	0.0058	24	18.50	5.89	+0.0113	1.44	1162.03	1160.59
N10	CB118 - MH67		0.50	0.50	10.00	---	10.00	6.30	3.15	1180.00	1169.50	65	0.1615	24	98.49	31.35	0.0002	10.50	1180.00	1169.50
N11	CB116 - MH67		0.94	1.44	10.00	0.40	10.00	6.30	9.07	1162.50	1162.21	96	0.0030	24	13.42	4.27	0.0014	0.29	1162.50	1162.21
N12	MH67 - ES18		0.00	1.44	10.00	0.70	10.40	6.20	8.93	1162.21	1161.64	187	0.0030	24	13.42	4.27	0.0013	0.57	1162.21	1161.64
P3	CB131 - CB128		1.15	1.15	10.00	1.10	10.00	6.30	7.24	1162.26	1161.73	266	0.0020	30	19.87	4.05	0.0003	0.53	1162.99	1162.46
P4	CB128 - MH38		1.31	2.46	10.00	0.30	11.10	6.10	15.01	1161.73	1161.60	66	0.0020	30	19.87	4.05	0.0011	0.13	1162.46	1162.33
P5	MH38 - CB129		0.00	2.46	10.00	0.60	11.40	6.00	14.76	1161.60	1161.31	144	0.0020	30	19.87	4.05	0.0011	0.29	1162.33	1162.04
P6	CB129 - CB126		3.93	6.39	15.00	0.50	15.00	5.30	33.87	1161.31	1161.05	128	0.0020	30	19.87	4.05	+0.0058	0.74	1162.04	1161.30
P7	CB126 - ES17		3.05	9.44	10.00	1.00	15.50	5.25	49.56	1161.05	1160.50	276	0.0020	36	32.32	4.57	+0.0047	1.30	1161.30	1160.00
S5	CB154 - MH60		0.15	0.15	10.00	0.25	10.00	6.30	0.95	1152.22	1152.15	46	0.0015	24	9.49	3.02	0.0015	0.07	1152.22	1152.15
S4	CB152 - MH60		1.35	1.35	10.00	0.10	10.00	6.30	8.51	1152.17	1152.15	12	0.0017	24	9.49	3.02	0.0015	0.02	1152.17	1152.15
S3	MH60 - MH61		0.00	1.50	----	1.20	10.25	6.10	9.15	1152.15	1151.83	210	0.0015	24	9.49	3.02	0.0015	0.32	1152.15	1151.84
S2	MH61 - TIE-IN		0.00	1.50	----	1.30	11.45	5.95	8.93	1151.83	1151.47	240	0.0015	24	9.49	3.02	0.0015	0.36	1151.83	1151.47
S6	CB155 - MH62		1.11	1.11	10.00	0.30	10.00	6.30	6.99	1155.98	1155.85	69	0.0019	24	10.68	3.40	0.0019	0.13	1155.98	1155.85
S7	CB156 - MH62		0.39	0.39	10.00	0.90	10.00	6.30	2.46	1156.15	1155.85	175	0.0017	24	10.11	3.22	0.0017	0.30	1156.15	1155.85
S8	MH62 - CB157		0.00	1.50	----	----	10.90	6.00	9.00	1155.85	1155.83	13	0.0015	24	10.68	3.40	0.0019	0.02	1155.85	1155.83
S9	CB157 - MH63		0.86	2.36	10.00	0.50	10.90	6.00	14.16	1155.83	1154.54	198	0.0065	24	19.76	6.29	0.0065	1.29	1155.83	1154.54

Location		Drainage Area			Time of Flow, Min.			I	Q	Sewer Profile				Sewer Design			Hydraulic Grade Line			
Line No.	From - To	No.	Increm. CA	Sum. CA	Inlet	Sewer	Design	in./hr.	cfs	Crown Elevation Inlet	Crown Elevation Outlet	Length ft.	Slope ft./ft.	Diam. In.	Q cfs	V f.p.s.	S ft./ft.	h ft.	Crown Elevation Inlet	Crown Elevation Outlet
X1	CB318 - KK		1.05	1.05	10.00	----	10.00	6.30	6.62	1195.38	1180.00	46	0.3343	24	143.29	45.61	0.3418	15.72	1195.38	1179.66
X4	CB316 - MH50		1.20	1.20	10.00	----	10.00	6.30	7.56	1172.48	1170.93	97	0.0160	24	39.21	12.48	0.0160	1.55	1172.48	1170.93
X5	MH50 - MH51		1.05	6.44	10.00	0.50	10.00	6.30	40.57	1170.50	1164.92	339	0.0165	30	57.08	11.63	0.0165	5.59	1170.50	1164.91
X6	MH51 - MH52		0.00	6.44	10.00	0.50	10.50	6.20	39.93	1164.92	1159.43	332	0.0165	30	57.08	11.63	0.0165	5.48	1164.92	1159.44
X8	CB314 - MH52		1.36	1.36	10.00	0.20	10.00	6.30	8.57	1156.82	1155.49	109	0.0122	30	50.66	10.32	0.0122	1.33	1156.82	1155.49
X9	MH52 - MH53		0.00	7.80	10.00	1.20	11.00	6.00	46.80	1155.99	1154.38	436	0.0037	36	43.95	6.22	0.0037	1.61	1155.99	1154.38
X10	MH53 - MH54		0.00	7.80	10.00	1.50	12.20	5.80	45.24	1154.38	1152.00	202	0.0118	36	78.49	11.10	0.0118	2.38	1154.38	1152.00
X11	CB312 - MH54		1.70	1.70	10.00	0.25	10.00	6.30	10.71	1152.26	1152.00	84	0.0031	36	39.58	5.60	0.0031	0.26	1152.26	1152.00
X13	MH54 - MH66		0.00	9.50	10.00	0.40	13.70	5.60	53.20	1152.00	1148.49	291	0.0121	36	79.15	11.20	0.0121	3.52	1152.00	1148.48
X21	MH66 - MH58		0.00	9.69	10.00	0.30	14.10	5.50	53.29	1148.49	1146.08	200	0.0121	36	81.75	11.57	0.0121	2.42	1148.49	1146.07
X16	MH55 - MH66		0.19	0.19	10.00	----	10.00	6.30	1.20	1148.19	1147.99	21	0.0095	24	24.51	7.80	0.0095	0.20	1148.19	1147.99
X14	CB310 - MH56		0.24	0.24	10.00	1.70	10.00	6.30	1.51	1155.50	1154.80	350	0.0020	24	10.96	3.49	0.0020	0.70	1155.50	1154.80
X15	MH56 - MH57		0.27	0.51	10.00	1.70	11.70	5.90	3.01	1154.80	1154.10	350	0.0020	24	10.96	3.49	0.0020	0.70	1154.80	1154.10
X18	CB304 - MH57		0.11	0.11	10.00	----	10.00	6.30	0.69	1159.50	1159.40	8	0.0125	24	27.40	8.72	0.0125	0.10	1159.50	1159.40
X19	MH57 - MH58		0.26	0.88	10.00	----	13.40	5.40	4.75	1146.23	1146.08	22	0.0068	36	60.45	8.55	0.0070	0.15	1146.23	1146.08
X20	MH58 - 150+05		0.00	10.57	10.00	0.20	13.40	5.40	57.08	1146.08	1145.51	81	0.0070	36	60.45	8.55	0.0070	0.57	1146.08	1145.51

NOTES:

1. HYDRAULIC GRADE ELEV. AT CONNECTION TO EXISTING TRUNKLINE IN SR 360 AT STA. 150+05 ASSUMED EQUAL TO RIM OF EXISTING MANHOLE AT POINT OF CONNECTION.
2. THE HYDRAULIC GRADE CALCULATIONS FOR THE PROPOSED SR360 TRUNKLINE SHOWN IN UNIT 1 HAVE NOT BEEN ADJUSTED IN UNIT 2 TO REFLECT CONTRIBUTIONS FROM OTHERS.
3. SEWER DESIGN VELOCITY REFLECTS PIPE THEORETICALLY FLOWING FULL. THE HYDRAULIC GRADE LINE SLOPE REFLECTS EITHER THE DESIGN SLOPE OF THE PIPE IF FLOWING PARTIALLY FULL OR THE ACTUAL FRICTION SLOPE IF FLOWING FULL OR UNDER PRESSURE.
4. IN THOSE CASES WHERE THE FULL FLOW DISCHARGE IS SIGNIFICANTLY DIFFERENT FROM THAT REQUIRED BY THE DESIGN, THE DIFFERENCE RESULTS FROM PHYSICAL RESTRAINTS IMPOSED BY THE PROFILE LAYOUT.

** ALTHOUGH THE BASIN HIGH WATER ELEVATION IS LOWER,THE MOST CONSERVATIVE STARTING ELELEVATION FOR THE HGL IS MEASURED FROM THE CROWN OF THE OUTFALL PIPE (I.E.1177.00)

***THIS IS THE SLOPE CALCULATED USING THE 50 YEAR BASIN STAGES SHOWN IN APPENDIX I.

****DOES NOT INCLUDE 152' FOR THE BORE AND JACK SECTION.

+ A2,GRATE ELEV. CB22 = 1250.00
A3,GRATE ELEV. CB23 = 1250.00
B2,GRATE ELEV. CB24 = 1247.50
A4,RIM ELEV. MH1 = 1251.00

+ C3,GRATE ELEV. CB34 = 1238.81
E18,RIM ELEV. MH11 = 1211.02
E20,RIM ELEV. MH12 = 1212.05
M7,GRATE ELEV. CB204 = 1183.64

+ N6,GRATE ELEV. CB160 = 1164.50
N7,RIM ELEV. MH65 = 1180.70
P6,GRATE ELEV. CB129 = 1162.50
P7,GRATE ELEV. CB126 = 1168.31

APPENDIX F

CATCH BASIN, ROADWAY AND DITCH HYDRAULICS

SUMMARY OF INLET SPACING RESULTS (50 YEAR EVENT)

STRUCTURE	DESCRIPTION	REQUIRED CAPACITY (CFS)	FLOW INTERCEPTED (PERCENT)	CARRYOVER (CFS)	ALLOWABLE SPREAD (FT.)	SPREAD (FT.)	ALLOWABLE DEPTH (IN.)	DEPTH (IN.)	COMMENTS
CB22	ADOT STD. C-15.30 & 15.70, OFF-RDWY. I-10 STA.8231+00,136'RT.	12.00	100	-	N/A	N/A	N/A	N/A	UNIT 2 CONSTRUCTION
CB23	MEDIAN FLUSH CATCH BASIN I-10 STA.8231+00.	2.75	100	-	N/A	N/A	N/A	N/A	UNIT 1/2 CONSTRUCTION
CB24	ADOT STD. C-15.30 & 15.70, OFF-RDWY. I-10 STA.8231+00,128'LT.	72.11 (41.33)	94 (94)	4.33 (2.48)	N/A	N/A	N/A	N/A	UNIT 1 CONSTRUCTION (SEE CB26 FOR CARRYOVER)
CB25	ADOT STD. C-15.91, TYPE C CURB & GUTTER WITH 20' SLOTTED DRAIN I-10 STA. 8225+00, 120.56' LT.	7.00	100	-	15.50	14.00	5.00	4.75	UNIT 1 CONSTRUCTION
CB26	ADOT STD. C-15.30 & 15.70, OFF-RDWY. RAMP A STA.5+62,53.5'LT.	7.23 (5.38)	68 (68)	2.34 (1.74)	N/A	N/A	N/A	N/A	UNIT 1 CONSTRUCTION (SEE CB31 FOR CARRYOVER)
CB27	ADOT STD. C-15.92, BARRIER WALL WITH 15' SLOTTED DRAIN RAMP WBCD STA.8218+85,12'LT.	3.00	100	-	15.50	13.13	5.00	4.50	UNIT 1 CONSTRUCTION
CB320	EXISTING ADOT DOWNDRAIN INLET RAMP WBCD STA.8212+43.63,40.9'RT.	N/A	100 (ASSUMED)	N/A	N/A	N/A	N/A	N/A	EXISTING
CB28	ADOT STD. C-15.92, BARRIER WALL RAMP WBCD STA.8212+85,12'LT.	3.75	92.53	0.28	12.00	11.75	4.25	4.25	UNIT 1 CONSTRUCTION
CB321	EXISTING ADOT DOWNDRAIN INLET I-10 STA.8214+01,79.3'LT.	N/A	100 (ASSUMED)	N/A	N/A	N/A	N/A	N/A	EXISTING
CB322	ADOT STD. C-15.30 & 15.70, OFF-RDWY. RAMP WBCD STA.8215+55,25'LT.	0.20	80	0.04	-	N/A	N/A	N/A	UNIT 1 CONSTRUCTION (SEE CB29 FOR CARRYOVER)
CB29	ADOT STD. C-15.30 & 15.70, OFF-RDWY. RAMP A STA.1+70,29.5'RT.	2.81	100	-	-	N/A	N/A	N/A	UNIT 1 CONSTRUCTION

SUMMARY OF INLET SPACING RESULTS (50 YEAR EVENT)

STRUCTURE	DESCRIPTION	REQUIRED CAPACITY (CFS)	FLOW INTERCEPTED (PERCENT)	CARRYOVER (CFS)	ALLOWABLE SPREAD (FT.)	SPREAD (FT.)	ALLOWABLE DEPTH (IN.)	DEPTH (IN.)	COMMENTS
*CB30	ADOT STD. C-15.91, TYPE C CURB & GUTTER WITH 30' SLOTTED DRAIN RAMP A STA.3+00,38'LT.	7.40 (5.25)	100 (100)	- -	10.50 (10.50)	11.00 (9.50)	4.00 (4.00)	4.00 (3.75)	UNIT 1 CONSTRUCTION
CB31	ADOT STD. C-15.30 & 15.70, OFF-RDWY. RAMP A STA.1+70,60'LT.	3.54 (2.94)	100	-	-	N/A	N/A	N/A	UNIT 1 CONSTRUCTION
*CB32	ADOT STD. C-15.92, BARRIER WALL WITH 2-15' SLOTTED DRAIN I-10 STA. 8217+00	5.75 (4.00)	100 (100)	- -	15.00 (15.00)	15.75 (13.50)	5.25 (5.25)	5.25 (4.75)	UNIT 2 CONSTRUCTION
CB33	ADOT STD. C-15.92, BARRIER WALL WITH 2-25' SLOTTED DRAIN I-10 STA. 8212+00	4.25	100	-	15.00	12.00	5.50	4.25	UNIT 2 CONSTRUCTION
CB34	ADOT STD. C-15.92, BARRIER WALL I-10 STA.8212+00,109.5'RT.	5.50	100	-	18.00	13.50	6.25	4.75	UNIT 2 CONSTRUCTION
CB35	ADOT STD. C-15.92, BARRIER WALL WITH 20' SLOTTED DRAIN I-10 STA.8217+00,98'RT.	6.75	100	-	18.00	16.75	6.25	5.50	UNIT 2 CONSTRUCTION
CB36	ADOT STD. C-15.30 & 15.70, OFF-RDWY. RAMP B STA.5+86,41'RT.	14.11	83	2.43	-	N/A	N/A	N/A	UNIT 2 CONSTRUCTION
CB324	ADOT STD. C-15.92, BARRIER WALL I-10 STA.8226+00,111'RT.	3.75	99.6	0.02	18.00	10.50	6.50	4.00	UNIT 2 CONSTRUCTION (SEE CB37 FOR CARRYOVER)
CB37	ADOT STD. C-15.92, BARRIER WALL WITH 25' SLOTTED DRAIN RAMP B STA.5+67,14.66'RT.	5.75	100	-	10.50	10.50	4.25	3.75	UNIT 2 CONSTRUCTION
CB38	ADOT STD. C-15.30 & 15.70, OFF-RDWY. RAMP B STA.1+70,33'RT.	3.59	100	-	-	N/A	N/A	N/A	UNIT 2 CONSTRUCTION
CB39	ADOT STD. C-15.30 & 15.70, OFF-RDWY. RAMP B STA.2+08,32'LT.	5.29	100	-	-	N/A	N/A	N/A	UNIT 2 CONSTRUCTION
CB40	ADOT STD. C-15.30 RAMP B STA.0+80.54,14'LT.	2.75	100	-	10.50	10.50	4.25	3.75	UNIT 2 CONSTRUCTION
*CB41	ADOT STD. C-15.91 RAMP B STA.1+98.3,14.5' LT.	1.75 (1.25)	100 (100)	- -	4.50 (4.50)	5.25 (4.00)	2.50 (2.50)	2.75 (2.50)	UNIT 2 CONSTRUCTION

SUMMARY OF INLET SPACING RESULTS (50 YEAR EVENT)

STRUCTURE	DESCRIPTION	REQUIRED CAPACITY (CFS)	FLOW INTERCEPTED (PERCENT)	CARRYOVER (CFS)	ALLOWABLE SPREAD (FT.)	SPREAD (FT.)	ALLOWABLE DEPTH (IN.)	DEPTH (IN.)	COMMENTS
CB42	ADOT STD. C-15.30 & 15.70, OFF-RDWY. RAMP C STA.15+54,42.5'LT.	2.84	100	-	N/A	N/A	N/A	N/A	UNIT 2 CONSTRUCTION
CB43	ADOT STD. C-15.30 RAMP C STA.15+54,26' LT.	3.25	N/A	N/A	10.50	8.75	4.25	3.50	UNIT 2 CONSTRUCTION
CB45	ADOT STD. C-15.20 WITH 17' WING BASIN BASELINE RD. STA.16+70,74.5'RT.	4.50	100	-	26.50	15.00	7.75	5.00	UNIT 2 CONSTRUCTION
CB46	ADOT STD. C-15.20 WITH 17' WING BASIN BASELINE RD. STA.16+70,60.16'LT.	4.50	100	-	21.00	15.00	6.50	5.00	UNIT 2 CONSTRUCTION
CB47	ADOT STD. C-15.30 BASELINE RD. STA.18+50,63.5'LT.	3.25	80.8	0.63	15.50	13.00	5.75	4.75	UNIT 2 CONSTRUCTION (SEE CB49 FOR CARRYOVER)
CB48	ADOT STD. C-15.30 BASELINE RD. STA.21+38,63.5'RT.	0.50	100	-	15.50	5.00	5.75	2.75	UNIT 2 CONSTRUCTION
CB49	ADOT STD. C-15.30 BASELINE RD. STA.21+57,63.5'LT.	1.50	100	-	15.50	9.25	5.75	3.75	UNIT 2 CONSTRUCTION
*CB54	ADOT STD. C-15.40,70/MAG STD. 220 WITH 17' WINGBASIN BASELINE RD. STA.28+20,51.98'RT.	5.75 (4.00)	100 (100)	- -	15.50 (15.50)	16.00 (13.75)	5.25 (5.25)	5.50 5.25	UNIT 1 CONSTRUCTION
*CB55	ADOT STD. C-15.40,70/MAG STD. 220 WITH 17' WINGBASIN BASELINE RD. STA.26+95.82,63.5'LT.	8.25 (5.75)	100 (100)	- -	16.00 (16.00)	19.00 (16.00)	5.75 (5.75)	6.00 (5.75)	UNIT 1 CONSTRUCTION
CB56	ADOT STD. C-15.91 RAMP A STA. 1+40,38'LT.	2.75	93.0	0.19	10.50	7.75	4.00	3.50	UNIT 2 CONSTRUCTION (SEE CB54 FOR CARRYOVER)
CB58	ADOT STD. C-15.30 & 15.70, OFF-RDWY. RAMP D STA.10+20,35'RT.	1.60	100	-	-	N/A	N/A	N/A	UNIT 1 CONSTRUCTION

SUMMARY OF INLET SPACING RESULTS (50 YEAR EVENT)

STRUCTURE	DESCRIPTION	REQUIRED CAPACITY (CFS)	FLOW INTERCEPTED (PERCENT)	CARRYOVER (CFS)	ALLOWABLE SPREAD (FT.)	SPREAD (FT.)	ALLOWABLE DEPTH (IN.)	DEPTH (IN.)	COMMENTS
CB59	ADOT STD. C-15.30 RAMP D STA.10+15,22'LT.	2.25	100	-	10.50	6.50	4.00	3.00	UNIT 1/2 CONSTRUCTION
CB60	ADOT STD. C-15.92, BARRIER WALL RAMP W-S STA.64+58,10'RT.	4.00	100	-	10.50	6.50	4.00	3.75	UNIT 2 CONSTRUCTION
CB61	ADOT STD. C-15.92, BARRIER WALL RAMP WS STA.62+10,10'RT.	1.00	100	-	10.50	4.00	4.00	2.50	UNIT 2 CONSTRUCTION
CB62	ADOT STD. C-15.92, BARRIER WALL I-10 STA.8206+00,89'RT.	2.25	100	-	18.00	7.00	6.25	3.00	UNIT 2 CONSTRUCTION
CB63	ADOT STD. C-15.92, BARRIER WALL WITH 2-15' SLOTTED DRAIN I-10 STA.8206+00	2.50	100	-	12.92	7.50	4.75	3.25	UNIT 2 CONSTRUCTION
CB64	ADOT STD. C-15.92, BARRIER WALL WITH 20' SLOTTED DRAIN I-10 STA.8206+00,77.5'LT.	4.00	100	-	18.00	9.50	6.25	3.75	UNIT 1/2 CONSTRUCTION (SLOTTED DRAIN IN UNIT2)
CB65	ADOT STD. C-15.92, BARRIER WALL WITH 20' SLOTTED DRAIN RAMP WBCD STA.8206+88,12'LT.	4.25	100	-	12.00	10.00	4.75	3.75	UNIT 1 CONSTRUCTION (SEE CB28 FOR CARRYOVER)
CB66	ADOT STD. C-15.92, BARRIER WALL RAMP WBCD STA.8204+15,12'LT.	2.00	100	-	12.00	5.50	4.75	2.75	UNIT 1 CONSTRUCTION
CB67	ADOT STD. C-15.92, BARRIER WALL RAMP WBCD STA.8200+88,28'LT.	3.50	100	-	12.00	8.25	4.75	3.50	UNIT 1 CONSTRUCTION
CB405	ADOT STD. C-15.30 & 15.70, OFF-RDWY. RAMP WBCD STA.8200+88,103'LT.	4.10	81	0.81	-	N/A	N/A	N/A	UNIT 1 CONSTRUCTION (SEE CB68 FOR CARRYOVER)
CB70	ADOT STD. C-15.92, BARRIER WALL RAMP WS STA.57+50,10'RT.	2.25	100	-	10.50	6.50	4.00	3.00	UNIT 2 CONSTRUCTION
*CB71	ADOT STD. C-15.91, TYPE C CURB & GUTTER,RAMP C STA.8+56,26'LT.	1.25 (1.00)	100 (100)	- -	6.00 (6.00)	7.00 (5.75)	2.50 (2.50)	2.50 (2.50)	UNIT 2 CONSTRUCTION
CB72	ADOT STD. C-15.30 & 15.70, OFF-RDWY. RAMP C STA.7+16,48'RT.	2.33	83	0.40	-	N/A	N/A	N/A	UNIT 2 CONSTRUCTION (SEE CB73 FOR CARRYOVER)

SUMMARY OF INLET SPACING RESULTS (50 YEAR EVENT)

STRUCTURE	DESCRIPTION	REQUIRED CAPACITY (CFS)	FLOW INTERCEPTED (PERCENT)	CARRYOVER (CFS)	ALLOWABLE SPREAD (FT.)	SPREAD (FT.)	ALLOWABLE DEPTH (IN.)	DEPTH (IN.)	COMMENTS
CB73	ADOT STD. C-15.30 & 15.70, OFF-RDWY. RAMP C STA.3+15,34'RT.	1.47	83	0.25	-	N/A	N/A	N/A	UNIT 2 CONSTRUCTION (SEE CB74 FOR CARRYOVER)
CB74	ADOT STD. C-15.30 & 15.70, OFF-RDWY. RAMP W-S STA. 50+10,31'RT.	0.57	100	-	-	N/A	N/A	N/A	UNIT 2 CONSTRUCTION
*CB75	ADOT STD. C-15.92, BARRIER WALL RAMP W-S STA. 50+10,19.5'RT.	6.00 (4.25)	94.3 (100)	0.34 -	10.50 (10.50)	10.75 (9.00)	4.00 (4.00)	4.00 (3.50)	UNIT 2 CONSTRUCTION (SEE CB88 FOR CARRYOVER)
CB76	ADOT STD. C-15.92, BARRIER WALL WITH 30' SLOTTED DRAIN I-10 STA.8194+00,89.76'RT.	10.25	100	-	18.00	14.50	6.25	5.00	UNIT 2 CONSTRUCTION
CB77	ADOT STD. C-15.92, BARRIER WALL WITH 2-20' SLOTTED DRAIN I-10 STA.8194+00	5.00	100	-	12.92	10.50	4.75	4.00	UNIT 2 CONSTRUCTION
CB78	ADOT STD. C-15.92, BARRIER WALL I-10 STA.8194+00,77.5'LT.	8.25	77.2	1.88	18.00	13.00	6.25	4.50	UNIT 1/2 CONSTRUCTION (SEE CB81 FOR CARRYOVER)
CB79	ADOT STD. C-15.92, BARRIER WALL WITH 20' SLOTTED DRAIN RAMP WBCD STA.8194+88,14.66'LT.	4.75	100	-	12.00	9.50	4.75	3.75	UNIT 1 CONSTRUCTION
CB68	ADOT STD. C-15.30 & 15.70, OFF-RDWY. RAMP WBCD STA.8194+88,67.5'LT.	3.96	81	0.76	-	N/A	N/A	N/A	UNIT 1 CONSTRUCTION (SEE CB69 FOR CARRYOVER)
CB69	ADOT STD. C-15.30 & 15.70, OFF-RDWY. RAMP WBCD STA.8189+56,37.5'LT.	3.91	81	0.75	-	N/A	N/A	N/A	UNIT 1 CONSTRUCTION (SEE CB205 FOR CARRYOVER)
CB401	ADOT STD. C-15.30 & 15.70, OFF-RDWY. I-10 STA.8188+80,88'LT.	3.28	100	-	-	N/A	N/A	N/A	UNIT 1 CONSTRUCTION
CB80	ADOT STD. C-15.92, BARRIER WALL RAMP WBCD STA.8189+66,14.5'LT.	3.50	100	-	12.00	9.50	4.75	3.75	UNIT 1 CONSTRUCTION
CB81	ADOT STD. C-15.92, BARRIER WALL WITH 20' SLOTTED DRAIN I-10 STA.8188+80,78.5'LT.	3.25	100	-	18.00	12.00	6.25	4.50	UNIT 2 CONSTRUCTION

SUMMARY OF INLET SPACING RESULTS (50 YEAR EVENT)

STRUCTURE	DESCRIPTION	REQUIRED CAPACITY (CFS)	FLOW INTERCEPTED (PERCENT)	CARRYOVER (CFS)	ALLOWABLE SPREAD (FT.)	SPREAD (FT.)	ALLOWABLE DEPTH (IN.)	DEPTH (IN.)	COMMENTS
CB85	ADOT STD. C-15.92, BARRIER WALL RAMP WS STA.44+00,22'RT.	1.00	100	-	10.50	4.50	4.00	2.50	UNIT 2 CONSTRUCTION
*CB86	ADOT STD. C-15.92, BARRIER WALL WITH 15' SLOTTED DRAIN RAMP WS STA.43+08,22'RT.	4.50 (3.25)	100 (100)	- -	10.50 (10.50)	12.00 (10.25)	4.00 (4.00)	4.25 (4.00)	UNIT 2 CONSTRUCTION
CB87	ADOT STD. C-15.91, TYPE C CURB & GUTTER,I-10 8183+03,80.5'RT.	2.75	100	-	12.50	10.00	4.50	3.75	UNIT 2 CONSTRUCTION
*CB88	ADOT STD. C-15.92, BARRIER WALL RAMP WS STA.45+00,22'RT.	4.50 (3.00)	91.0 (100)	0.41 -	10.50 (10.50)	11.75 (9.50)	4.00 (4.00)	4.25 (3.75)	UNIT 2 CONSTRUCTION (SEE CB85 FOR CARRYOVER)
CB100	ADOT STD. C-15.91, L2.2 GRATE RAMP EBT-4 STA.18+50,16.5'LT.	2.00	100	-	4.50	3.25	2.50	2.75	UNIT 2 CONSTRUCTION
*CB103	ADOT STD. C-15.92, BARRIER WALL WITH 2-25' SLOTTED DRAIN I-10 STA.8173+00	8.75 (6.25)	100 (100)	- -	12.92 (12.92)	15.00 (13.00)	(4.50) (4.50)	5.00 (4.50)	UNIT 2 CONSTRUCTION
CB106	ADOT STD. C-15.91, TYPE C CURB & RAMP EBT-4 STA.10+05,10'RT.	2.00	100	-	10.50	7.75	4.75	4.00	UNIT 2 CONSTRUCTION
*CB107	ADOT STD. C-15.91, TYPE C CURB & GUTTER,WITH 35' SLOTTED DRAIN I-10 STA.8165+00,48.5'RT.	13.50 (9.50)	100 (100)	- -	20.00 (20.00)	22.25 (19.00)	6.25 (6.25)	6.75 (6.25)	UNIT 2 CONSTRUCTION
CB108	ADOT STD. C-15.91, TYPE C CURB & RAMP EBT-4 STA.6+69,10'RT.	1.50	100	-	10.50	4.50	4.75	3.75	UNIT 2 CONSTRUCTION
CB114	ADOT STD. C-15.92, BARRIER WALL WITH 25' SLOTTED DRAIN RAMP SE STA.87+67,12'LT.	6.00	100	-	18.00	5.25	6.25	5.00	UNIT 1 CONSTRUCTION
CB116	ADOT STD. C-15.30 & 15.70, OFF-RDWY. RAMP SE STA.83+95,155'RT.	6.00	100	-	-	N/A	N/A	N/A	UNIT 1 CONSTRUCTION
CB118	ADOT STD. C-15.92, BARRIER WALL RAMP SE STA.84+25,10'LT.	3.25	100	-	18.00	10.75	6.25	3.25	UNIT 1 CONSTRUCTION

SUMMARY OF INLET SPACING RESULTS (50 YEAR EVENT)

*CB123	ADOT STD. C-15.91, TYPE C CURB & I-10 STA.8168+65,80.79'LT.	16.75 (11.75)	100 (100)	- -	20.00 (20.00)	20.75 (18.00)	5.75 (5.75)	6.50 (5.75)	UNIT 2 CONSTRUCTION
STRUCTURE	DESCRIPTION	REQUIRED CAPACITY (CFS)	FLOW INTERCEPTED (PERCENT)	CARRYOVER (CFS)	ALLOWABLE SPREAD (FT.)	SPREAD (FT.)	ALLOWABLE DEPTH (IN.)	DEPTH (IN.)	COMMENTS
*CB124	ADOT STD. C-15.91, TYPE C CURB & GUTTER,I-10 STA.8163+80,114.21'RT.	3.75 (2.50)	100 (100)	- -	10.50 (10.50)	13.00 (10.50)	4.00 (4.00)	4.50 (4.00)	UNIT 2 CONSTRUCTION
*CB125	ADOT STD. C-15.92, BARRIER WALL WITH 2-25' SLOTTED DRAIN I-10 STA.8163+80	5.50 (4.00)	100 (100)	N/A (SAG)	12.92 (12.92)	14.75 (11.00)	4.75 (4.75)	5.50 (4.00)	UNIT 2 CONSTRUCTION
CB126	ADOT STD. C-15.91, TYPE C CURB & GUTTER,WITH 15' SLOTTED DRAIN RAMP WN STA.94+92,12.5'LT.	4.75	100	-	18.00	13.00	4.50	4.50	UNIT 2 CONSTRUCTION
MH38	ADOT STD. C-18.10 RAMP WN STA.97+65,27'LT.	5.25	100	-	-	N/A	N/A	N/A	UNIT 2 CONSTRUCTION
CB128	ADOT STD. C-15.91, TYPE C CURB & GUTTER,WITH 2-25' SLOTTED DRAIN RAMP WN STA.98+30,12.5'LT.	8.25	100	-	12.50	6.50	13.00	6.50	UNIT 2 CONSTRUCTION
CB129	ADOT STD. C-15.30 & 15.70, OFF-RDWY. DOUBLE GRATE RAMP WN STA.96+17.18,43.7'LT.	7.25	100	-	-	N/A	N/A	N/A	UNIT 2 CONSTRUCTION
CB131	ADOT STD. C-15.91, TYPE C CURB & WITH 30' SLOTTED DRAIN GUTTER,RAMP WN STA.101+00,12.5'LT.	18.00	100	-	12.50	7.25	13.00	7.25	UNIT 2 CONSTRUCTION
CB150	ADOT STD. C-15.30 & 15.70, OFF-RDWY. I-10 STA.8156+30,175'LT.	42.50	100	-	N/A	N/A	N/A	N/A	UNIT 1 CONSTRUCTION
*CB152	ADOT STD. C-15.92, BARRIER WALL WITH 20' SLOTTED DRAIN I-10 STA.8145+50,124'RT.	8.50 (6.00)	100 (100)	- -	18.00 (18.00)	18.25 (16.00)	5.75 (5.75)	5.75 (5.25)	UNIT 1 CONSTRUCTION
CB154	ADOT STD. C-15.30 & 15.70, OFF-RDWY. I-10 STA.8145+50,170'RT.	1.00	100	-	-	N/A	N/A	N/A	UNIT 1 CONSTRUCTION
CB155	ADOT STD. C-15.92, BARRIER WALL RAMP SE STA.75+74,12'RT.	4.90	100	-	12.00	7.25	8.75	5.25	UNIT 1 CONSTRUCTION
CB156	ADOT STD. C-15.30 & 15.70, OFF-RDWY. I-10 STA.8154+00,102'RT.	2.46	100	-	N/A	N/A	N/A	N/A	UNIT 1 CONSTRUCTION

SUMMARY OF INLET SPACING RESULTS (50 YEAR EVENT)

STRUCTURE	DESCRIPTION	REQUIRED CAPACITY (CFS)	FLOW INTERCEPTED (PERCENT)	CARRYOVER (CFS)	ALLOWABLE SPREAD (FT.)	SPREAD (FT.)	ALLOWABLE DEPTH (IN.)	DEPTH (IN.)	COMMENTS
CB157	ADOT STD. C-15.91, TYPE C CURB & GUTTER,WITH 20' SLOTTED DRAIN I-10 STA.8152+25,78.5'RT.	5.50	100	-	18.00	11.75	5.75	4.25	UNIT 1 CONSTRUCTION
CB160	ADOT STD. C-15.30 & 15.70, OFF-RDWY. RAMP SE 87+67,240'RT.	21.00	100	-	-	N/A	N/A	N/A	UNIT 1 CONSTRUCTION
CB200	ADOT STD. C-15.30 & 15.70, OFF-RDWY. I-10 STA.8184+00,117'LT.	23.78	100	-	-	N/A	N/A	N/A	UNIT 1 CONSTRUCTION
*CB202	ADOT STD. C-15.91, TYPE C CURB & GUTTER,RAMP WBCD STA.8183+65,18'RT.	3.50 (2.50)	100 (100)	N/A (SAG)	8.50 (8.50)	8.75 (4.00)	5.50 (5.50)	5.75 (3.00)	UNIT 2 CONSTRUCTION
CB203	ADOT STD. C-15.92, BARRIER WALL WITH 20' SLOTTED DRAIN RAMP NE STA.16+72,10'LT.	4.50	100	-	8.00	6.00	7.25	4.50	UNIT 1 CONSTRUCTION
CB204	ADOT STD. C-15.92, BARRIER WALL WITH 20' SLOTTED DRAIN RAMP NE STA.14+50,10'LT.	2.39	100	-	8.00	6.00	11.25	6.25	UNIT 1 CONSTRUCTION
CB205	ADOT STD. C-15.30 & 15.70, OFF-RDWY. RAMP NE STA.14+50,56'LT.	6.55	100	-	-	N/A	N/A	N/A	UNIT 1 CONSTRUCTION
CB210	ADOT STD. C-15.92, BARRIER WALL WITH 15' SLOTTED DRAIN RAMP SE STA.106+50,60'RT.	3.25	100	-	18.00	13.50	6.50	4.75	UNIT 1 CONSTRUCTION
CB211	ADOT STD. C-15.92, BARRIER WALL WITH 20' SLOTTED DRAIN RAMP SE STA.109+60,60'RT.	8.25	100	-	18.00	20.00	6.50	6.25	UNIT 1 CONSTRUCTION
CB212	ADOT STD. C-15.30 & 15.70, OFF-RDWY. RAMP SE STA.109+69.86,168.8'RT.	1.27	100	-	-	N/A	N/A	N/A	UNIT 1 CONSTRUCTION
CB213	ADOT STD. C-15.92, BARRIER WALL WITH 15' SLOTTED DRAIN RAMP N-E STA. 8+23.8,10' LT.	3.72	100	-	8.00	6.00	11.25	6.25	UNIT 1 CONSTRUCTION
CB217-9 220-5	BRIDGE DECK SCUPPER INLETS (VARIOUS LOCATIONS ON RAMP WS,SE)	VARIES	N/A	N/A	N/A	N/A	N/A	N/A	UNIT 2 CONSTRUCTION

SUMMARY OF INLET SPACING RESULTS (50 YEAR EVENT)

CB226	ADOT STD. C-15.91, TYPE C CURB & GUTTER,WITH 25' SLOTTED DRAIN RAMP WN STA.109+77,12.5'LT.	7.00	100	-	12.00	12.00	4.50	4.50	UNIT 2 CONSTRUCTION
STRUCTURE	DESCRIPTION	REQUIRED CAPACITY (CFS)	FLOW INTERCEPTED (PERCENT)	CARRYOVER (CFS)	ALLOWABLE SPREAD (FT.)	SPREAD (FT.)	ALLOWABLE DEPTH (IN.)	DEPTH (IN.)	COMMENTS
*CB228	ADOT STD. C-15.92, BARRIER WALL WITH 15' SLOTTED DRAIN RAMP WS STA.12+27,8'LT.	3.00 (2.25)	100 (100)	- -	10.50 (10.50)	10.75 (9.50)	4.00 (4.00)	4.00 (3.75)	UNIT 2 CONSTRUCTION
CB229	ADOT STD. C-15.92, BARRIER WALL RAMP WN STA.119+50,47.06'RT.	1.75	100	-	18.00	7.25	5.75	4.00	UNIT 2 CONSTRUCTION
CB230	ADOT STD. C-15.92, BARRIER WALL RAMP SE STA.119+66,80.96'RT.	2.75	100	-	18.00	8.00	8.50	4.25	UNIT 1 CONSTRUCTION
CB231	ADOT STD. C-15.30 & 15.70, OFF-RDWY. RAMP SE STA.111+28,210'RT.	16.50	100	-	-	N/A	N/A	N/A	UNIT 1 CONSTRUCTION
CB304	ADOT STD. C-15.30 & 15.70, OFF-RDWY. SR360 STA.150+00,95'RT.	0.70	100	-	N/A	N/A	N/A	N/A	UNIT 1 CONSTRUCTION
MH55	ADOT STD. C-18.10 (MANHOLE WITH SLOTTED GRATE INLET) SR360 STA. 148+00,104' RT.	0.19	100	-	N/A	N/A	N/A	N/A	UNIT 1 CONSTRUCTION
CB310	ADOT STD. C-15.30 & 15.70, OFF-RDWY. SR360 STA.157+00,81'RT.	1.58	100	-	N/A	N/A	N/A	N/A	UNIT 1 CONSTRUCTION
CB312	ADOT STD. C-15.92, BARRIER WALL WITH 25' SLOTTED DRAIN RAMP SE STA.145+20,11.1'LT.	12.25	100	-	18.00	8.75	6.25	6.25	UNIT 1 CONSTRUCTION
CB314	ADOT STD. C-15.92, BARRIER WALL RAMP SE STA.138+80,12'LT.(UNIT1) RAMP WN STA. 138+71.57,62.7'RT. (UNIT2)	8.75	83	1.45	18.00	7.00	12.75	5.25	UNIT 1 CONSTRUCTION (SEE CB312 FOR CARRYOVER)
CB315	ADOT STD. C-15.91, TYPE C CURB & GUTTER,WITH 25' SLOTTED DRAIN RAMP WN STA.135+80,24'LT.	10.25	100	-	18.00	7.50	12.75	5.50	UNIT 2 CONSTRUCTION
*CB316	ADOT STD. C-15.91, TYPE C CURB & WITH 30' SLOTTED DRAIN GUTTER RAMP SE STA.132+50,58'RT.	7.50 (5.50)	100 (100)	- -	18.00 (18.00)	21.25 (18.00)	3.50 (3.50)	3.75 (3.50)	UNIT 1 CONSTRUCTION

SUMMARY OF INLET SPACING RESULTS (50 YEAR EVENT)

STRUCTURE	DESCRIPTION	REQUIRED CAPACITY (CFS)	FLOW INTERCEPTED (PERCENT)	CARRYOVER (CFS)	ALLOWABLE SPREAD (FT.)	SPREAD (FT.)	ALLOWABLE DEPTH (IN.)	DEPTH (IN.)	COMMENTS
CB317	ADOT STD. C-15.92, BARRIER WALL WITH 30' SLOTTED DRAIN RAMP WN STA.127+50,56'RT.	10.25	100	-	18.00	11.50	7.00	5.00	UNIT 2 CONSTRUCTION
CB308	ADOT STD. C-15.91, TYPE C CURB & GUTTER RAMP WN STA.132+50,24'LT.								UNIT 2 CONSTRUCTION
CB318	ADOT STD. C-15.92, BARRIER WALL WITH 25' SLOTTED DRAIN RAMP SE STA.125+00,70.28'RT.	6.75	100	-	N/A	N/A	N/A	N/A	UNIT 1 CONSTRUCTION

RATING TABLES FOR ROADSIDE DITCHES

V-Bottom Ditch with 3:1 Sideslopes.

DEPTH (FT)	LEFT SIDESLOPE (FT/FT)	RIGHT SIDESLOPE (FT/FT)	AREA (SF)	PERIMETER (FT)	HYDRAULIC RADIUS	Q/(S^1/2)	V/(S^1/2)
0.25	3.00	3.00	0.19	1.58	0.24	2.67	14.25
0.50	3.00	3.00	0.75	3.16	0.38	17.00	22.67
0.75	3.00	3.00	1.69	4.74	0.50	50.19	29.74
1.00	3.00	3.00	3.00	6.32	0.61	108.19	36.06
1.25	3.00	3.00	4.69	7.91	0.70	196.30	41.88
1.50	3.00	3.00	6.75	9.49	0.80	319.41	47.32
1.75	3.00	3.00	9.19	11.07	0.88	482.05	52.47
2.00	3.00	3.00	12.00	12.65	0.97	688.54	57.38
2.25	3.00	3.00	15.19	14.23	1.04	942.99	62.09
2.50	3.00	3.00	18.75	15.81	1.12	1249.34	66.63
2.75	3.00	3.00	22.69	17.39	1.19	1611.39	71.03
3.00	3.00	3.00	27.00	18.97	1.27	2032.80	75.29

V-Bottom Ditch with 4:1 Sideslopes.

DEPTH (FT)	LEFT SIDESLOPE (FT/FT)	RIGHT SIDESLOPE (FT/FT)	AREA (SF)	PERIMETER (FT)	HYDRAULIC RADIUS	Q/(S^1/2)	V/(S^1/2)
0.25	4.00	4.00	0.25	2.06	0.24	3.62	14.46
0.50	4.00	4.00	1.00	4.12	0.39	23.01	23.01
0.75	4.00	4.00	2.25	6.18	0.51	67.93	30.19
1.00	4.00	4.00	4.00	8.25	0.62	146.43	36.61
1.25	4.00	4.00	6.25	10.31	0.72	265.69	42.51
1.50	4.00	4.00	9.00	12.37	0.81	432.31	48.03
1.75	4.00	4.00	12.25	14.43	0.90	652.44	53.26
2.00	4.00	4.00	16.00	16.49	0.98	931.92	58.24
2.25	4.00	4.00	20.25	18.55	1.06	1276.31	63.03
2.50	4.00	4.00	25.00	20.62	1.14	1690.94	67.64
2.75	4.00	4.00	30.25	22.68	1.21	2180.96	72.10
3.00	4.00	4.00	36.00	24.74	1.29	2751.33	76.43

V-Bottom Ditch with 6:1 Sideslopes.

DEPTH (FT)	LEFT SIDESLOPE (FT/FT)	RIGHT SIDESLOPE (FT/FT)	AREA (SF)	PERIMETER (FT)	HYDRAULIC RADIUS	Q/(S^1/2)	V/(S^1/2)
0.25	6.00	6.00	0.38	3.04	0.25	5.48	14.62
0.50	6.00	6.00	1.50	6.08	0.39	34.90	23.27

0.75	6.00	6.00	3.38	9.12	0.51	103.03	30.53
1.00	6.00	6.00	6.00	12.17	0.62	222.10	37.02
1.25	6.00	6.00	9.38	15.21	0.72	403.00	42.99
1.50	6.00	6.00	13.50	18.25	0.82	655.72	48.57
1.75	6.00	6.00	18.38	21.29	0.91	989.61	53.86
2.00	6.00	6.00	24.00	24.33	0.99	1413.53	58.90
2.25	6.00	6.00	30.38	27.37	1.07	1935.89	63.73
2.50	6.00	6.00	37.50	30.41	1.15	2564.80	68.39
2.75	6.00	6.00	45.38	33.46	1.23	3308.05	72.90
3.00	6.00	6.00	54.00	36.50	1.30	4173.18	77.28

V-Bottom Ditch with 4:1 and 6:1 Sideslopes.

DEPTH (FT)	LEFT SIDESLOPE (FT/FT)	RIGHT SIDESLOPE (FT/FT)	AREA (SF)	PERIMETER (FT)	HYDRAULIC RADIUS	Q/(S^1/2)	V/(S^1/2)
0.25	4.00	6.00	0.31	2.55	0.24	4.55	14.56
0.50	4.00	6.00	1.25	5.10	0.39	28.95	23.16
0.75	4.00	6.00	2.81	7.65	0.51	85.48	30.39
1.00	4.00	6.00	5.00	10.21	0.62	184.26	36.85
1.25	4.00	6.00	7.81	12.76	0.72	334.33	42.79
1.50	4.00	6.00	11.25	15.31	0.81	543.99	48.35
1.75	4.00	6.00	15.31	17.86	0.90	821.00	53.62
2.00	4.00	6.00	20.00	20.41	0.99	1172.68	58.63
2.25	4.00	6.00	25.31	22.96	1.07	1606.04	63.45
2.50	4.00	6.00	31.25	25.51	1.15	2127.79	68.09
2.75	4.00	6.00	37.81	28.07	1.22	2744.40	72.58
3.00	4.00	6.00	45.00	30.62	1.29	3462.13	76.94

V-Bottom Ditch with 10:1 Sideslopes.

DEPTH (FT)	LEFT SIDESLOPE (FT/FT)	RIGHT SIDESLOPE (FT/FT)	AREA (SF)	PERIMETER (FT)	HYDRAULIC RADIUS	Q/(S^1/2)	V/(S^1/2)
0.25	10.00	10.00	0.63	5.02	0.25	9.19	14.71
0.50	10.00	10.00	2.50	10.05	0.39	58.50	23.40
0.75	10.00	10.00	5.63	15.07	0.52	172.72	30.71
1.00	10.00	10.00	10.00	20.10	0.63	372.34	37.23
1.25	10.00	10.00	15.63	25.12	0.73	675.60	43.24
1.50	10.00	10.00	22.50	30.15	0.82	1099.27	48.86
1.75	10.00	10.00	30.63	35.17	0.91	1659.02	54.17
2.00	10.00	10.00	40.00	40.20	1.00	2369.69	59.24
2.25	10.00	10.00	50.63	45.22	1.08	3245.40	64.11
2.50	10.00	10.00	62.50	50.25	1.16	4299.73	68.80
2.75	10.00	10.00	75.63	55.27	1.23	5545.74	73.33
3.00	10.00	10.00	90.00	60.30	1.31	6996.08	77.73

Trapezoidal Ditch (5ft. Wide) with 4:1 Sideslopes.

DEPTH (FT)	SIDESLOPE (FT/FT)	AREA (SF)	PERIMETER (FT)	HYDRAULIC RADIUS	Q/(S^1/2)	V/(S^1/2)
0.25	4.00	1.50	7.06	0.35	31.58	21.05
0.50	4.00	3.50	4.12	0.90	186.41	53.26
0.75	4.00	6.00	6.18	0.98	349.47	58.24
1.00	4.00	9.00	8.25	1.06	567.25	63.03
1.25	4.00	12.50	11.81	1.04	771.91	61.75
1.50	4.00	16.50	15.87	1.03	1006.71	61.01
1.75	4.00	21.00	20.43	1.02	1271.43	60.54
2.00	4.00	26.00	25.49	1.01	1565.99	60.23
2.25	4.00	31.50	31.05	1.01	1890.34	60.01
2.50	4.00	37.50	37.12	1.01	2244.44	59.85
2.75	4.00	44.00	43.68	1.00	2628.30	59.73
3.00	4.00	51.00	50.74	1.00	3041.89	59.64

Trapezoidal Ditch (10ft. Wide) with 4:1 Sideslopes.

DEPTH (FT)	SIDESLOPE (FT/FT)	AREA (SF)	PERIMETER (FT)	HYDRAULIC RADIUS	Q/(S^1/2)	V/(S^1/2)
0.25	4.00	2.75	12.06	0.37	60.70	22.07
0.50	4.00	6.00	14.12	0.56	200.97	33.50
0.75	4.00	9.75	16.18	0.71	412.68	42.33
1.00	4.00	14.00	18.25	0.84	696.83	49.77
1.25	4.00	18.75	20.31	0.95	1056.47	56.35
1.50	4.00	24.00	22.37	1.05	1495.42	62.31
1.75	4.00	29.75	24.43	1.14	2017.82	67.83
2.00	4.00	36.00	26.49	1.23	2627.92	73.00
2.25	4.00	42.75	28.55	1.31	3330.01	77.89
2.50	4.00	50.00	30.62	1.39	4128.36	82.57
2.75	4.00	57.75	32.68	1.46	5027.22	87.05
3.00	4.00	66.00	34.74	1.54	6030.77	91.38

Trapezoidal Ditch (15ft. Wide) with 4:1 Sideslopes.

DEPTH (FT)	SIDESLOPE (FT/FT)	AREA (SF)	PERIMETER (FT)	HYDRAULIC RADIUS	Q/(S^1/2)	V/(S^1/2)
0.25	4.00	4.00	17.06	0.38	89.96	22.49
0.50	4.00	8.50	19.12	0.58	293.47	34.53
0.75	4.00	13.50	21.18	0.74	593.34	43.95
1.00	4.00	19.00	23.25	0.87	986.60	51.93

RATING TABLES FOR ROADSIDE DITCHES

Trapezoidal Ditch (10ft. Wide) with 6:1 Sideslopes.

DEPTH (FT)	SIDESLOPE (FT/FT)	AREA (SF)	PERIMETER (FT)	HYDRAULIC RADIUS	Q/(S^1/2)	V/(S^1/2)
0.25	6.00	2.88	13.04	0.36	62.05	21.58
0.50	6.00	6.50	16.08	0.54	210.56	32.39
0.75	6.00	10.88	19.12	0.69	442.85	40.72
1.00	6.00	16.00	22.17	0.80	764.46	47.78
1.25	6.00	21.88	25.21	0.91	1182.43	54.05
1.50	6.00	28.50	28.25	1.01	1704.14	59.79
1.75	6.00	35.88	31.29	1.10	2337.02	65.14
2.00	6.00	44.00	34.33	1.18	3088.41	70.19
2.25	6.00	52.88	37.37	1.26	3965.50	75.00
2.50	6.00	62.50	40.41	1.34	4975.35	79.61
2.75	6.00	72.88	43.46	1.41	6124.87	84.05
3.00	6.00	84.00	46.50	1.49	7420.84	88.34

Trapezoidal Ditch (15ft. Wide) with 6:1 Sideslopes.

DEPTH (FT)	SIDESLOPE (FT/FT)	AREA (SF)	PERIMETER (FT)	HYDRAULIC RADIUS	Q/(S^1/2)	V/(S^1/2)
0.25	6.00	4.13	18.04	0.37	91.23	22.12
0.50	6.00	9.00	21.08	0.57	302.44	33.60
0.75	6.00	14.63	24.12	0.72	621.65	42.51
1.00	6.00	21.00	27.17	0.84	1050.49	50.02
1.25	6.00	28.13	30.21	0.95	1593.65	56.66
1.50	6.00	36.00	33.25	1.05	2256.93	62.69
1.75	6.00	44.63	36.29	1.15	3046.63	68.27
2.00	6.00	54.00	39.33	1.24	3969.21	73.50
2.25	6.00	64.13	42.37	1.32	5031.17	78.46
2.50	6.00	75.00	45.41	1.40	6239.00	83.19
2.75	6.00	86.63	48.46	1.48	7599.15	87.72
3.00	6.00	99.00	51.50	1.55	9117.97	92.10

Trapezoidal Ditch (20ft. Wide) with 6:1 Sideslopes.

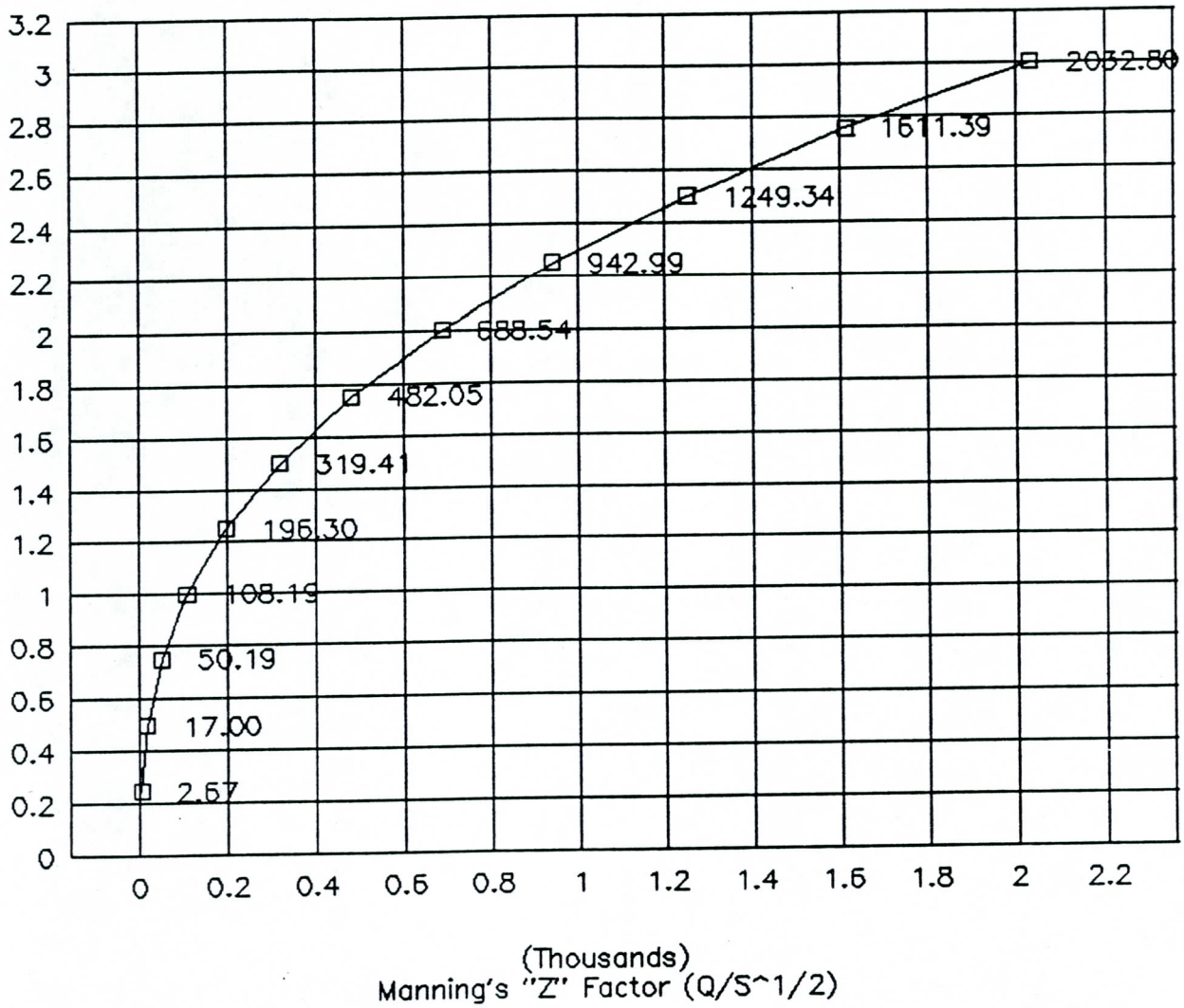
DEPTH (FT)	SIDESLOPE (FT/FT)	AREA (SF)	PERIMETER (FT)	HYDRAULIC RADIUS	Q/(S^1/2)	V/(S^1/2)
0.25	6.00	5.38	23.04	0.38	120.48	22.42

0.50	6.00	11.50	26.08	0.58	394.90	34.34
0.75	6.00	18.38	29.12	0.73	802.21	43.66
1.00	6.00	26.00	32.17	0.87	1340.09	51.54
1.25	6.00	34.38	35.21	0.98	2010.77	58.50
1.50	6.00	43.50	38.25	1.09	2818.42	64.79
1.75	6.00	53.38	41.29	1.19	3768.07	70.60
2.00	6.00	64.00	44.33	1.28	4865.25	76.02
2.25	6.00	75.38	47.37	1.37	6115.70	81.14
2.50	6.00	87.50	50.41	1.45	7525.30	86.00
2.75	6.00	100.38	53.46	1.53	9099.98	90.66
3.00	6.00	114.00	56.50	1.60	10845.64	95.14

The preceding calculations have been determined from Manning's equation for open-channel flow conditions using n=0.025.

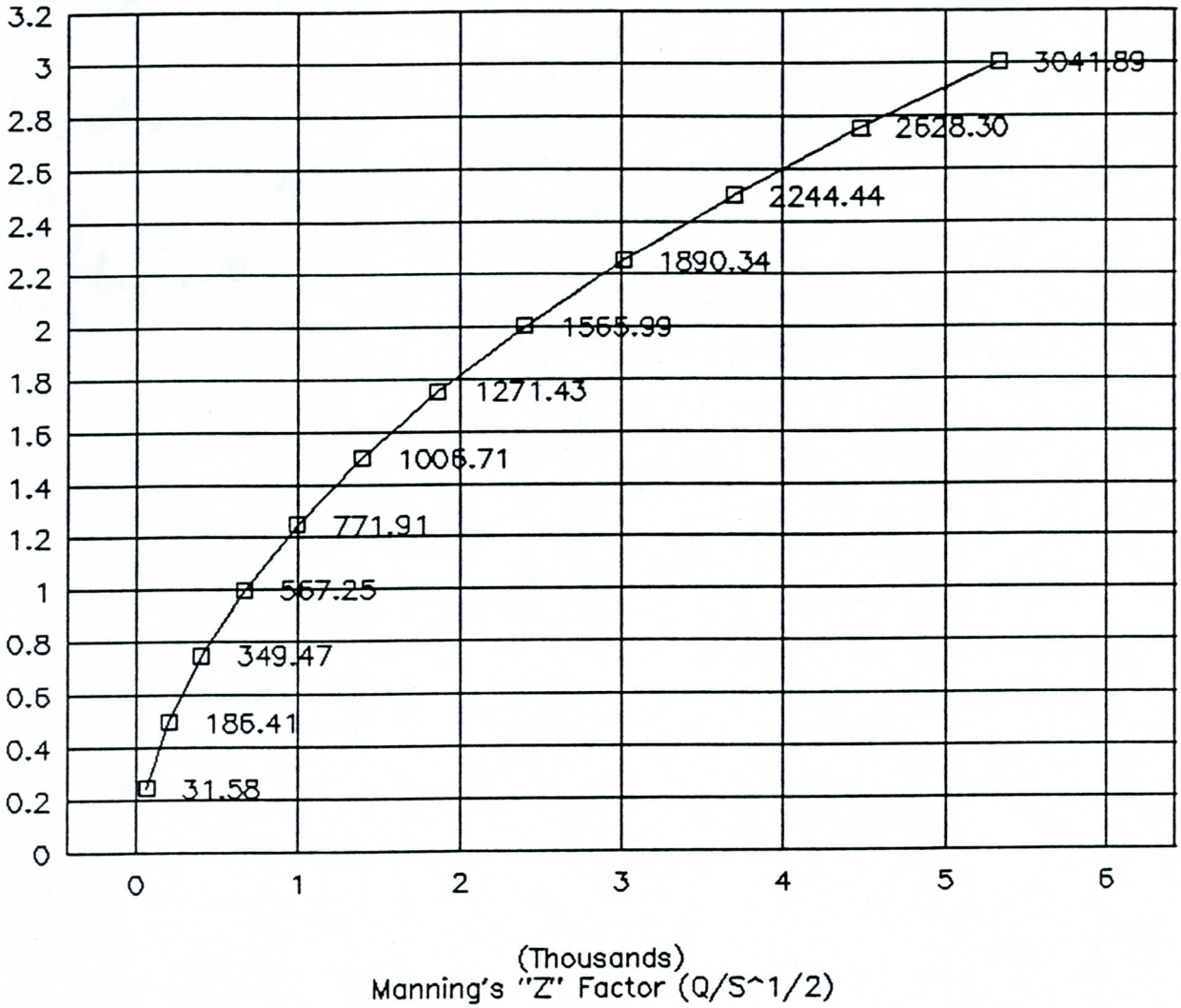
DITCH SIZING CURVE

FOR V-BOTTOM WITH 3:1 SIDESLOPES



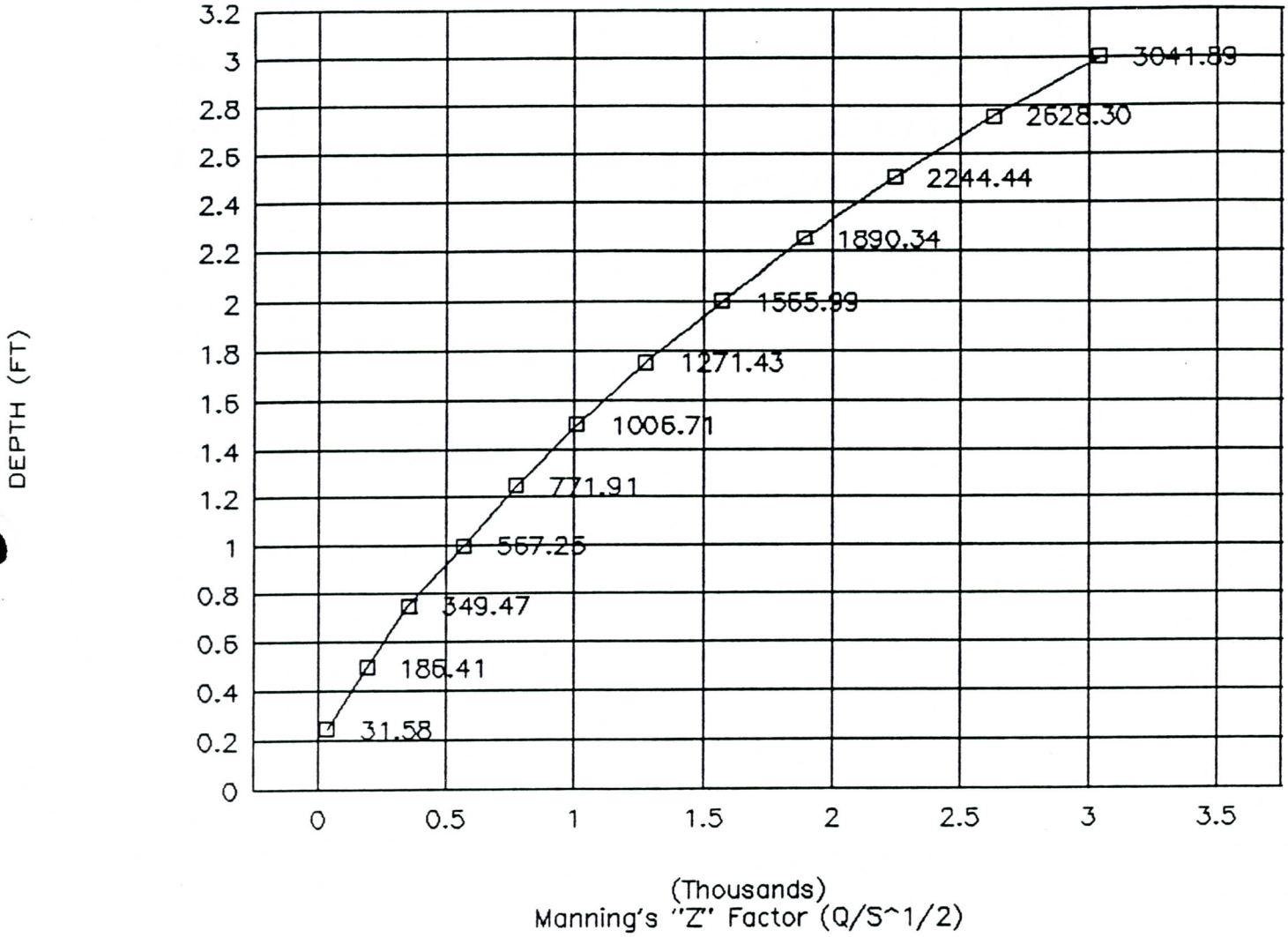
DITCH SIZING CURVE FOR TRAPEZOIDAL

DITCH (10'BOTTOM AND 3:1 SIDESLOPES)



DITCH SIZING CURVE FOR TRAPEZOIDAL

DITCH (5'BOTTOM AND 4:1 SIDESLOPES)



APPENDIX G

UNIT 1, UNIT 2 AND ULTIMATE DRAINAGE PLANS AND CONTRIBUTING DRAINAGE AREAS

See Plans

APPENDIX H

DETENTION BASINS AND HEC-1 INPUT DATA

SUMMARY OF DETENTION BASIN RESULTS

UNIT1

FACILITY NO.	TOP ELEVATION	BOTTOM ELEVATION	MAXIMUM VOLUME	50 YR./6 HR. EVENT Stage	Storage	Peak Discharge	100 YR./6 HR. EVENT Stage	Storage	Peak Discharge
	(ft.)	(ft.)	(cf.)	(ft.)	(cf.)	(cfs.)	(ft.)	(cf.)	(cfs.)
1	1180.00	1150.00	1,945,330	1161.08	291,611	3	1161.92	337,023	3
2A	1169.00	1167.00	173,450	1167.87	73,241	7	1167.95	80,085	8
2B	1169.00	1157.00	898,709	1159.46*	124,569	13	1159.77	143,980	14
3A	1180.00	1171.00	427,926	1173.30	62,216	16	1173.55	71,011	18
3B	1176.00	1163.00	360,580	1171.55	175,711	2	1172.26	219,332	2
3C	1170.50	1168.50	63,338	1170.31	57,195	7	1170.43	61,075	8

UNIT 2

FACILITY NO.	TOP ELEVATION	BOTTOM ELEVATION	MAXIMUM VOLUME	50 YR./6 HR. EVENT Stage	Storage	Peak Discharge	100 YR./6 HR. EVENT Stage	Storage	Peak Discharge
	(ft.)	(ft.)	(cf.)	(ft.)	(cf.)	(cfs.)	(ft.)	(cf.)	(cfs.)
1	1180.00	1171.00	1,014,975	1175.13	402,170	28	1174.93	379,615	28
2A	1165.50	1162.00	355,039	1164.57	257,436	30	1164.64	264,782	31
2B	1164.00	1157.00	1,361,675	1159.17*	380,957	13	1159.35	413,896	13
3A	1180.00	1171.00	427,926	1172.64	33,550	10	1172.84	41,628	11
3B	1170.00	1162.50	1,012,560	1164.60	200,408	15	1164.85	228,572	17

*The elevation shown on the detention facility grading plans (i.e.1160.80 ft.) has been used as a highwater elevation based on an outlet control, hydraulic grade analysis of the downstream or tie-in system.

DESIGNED BY GSB DATE 4-23-92 SHEET NO. 1 PAGE NO.
CHECKED BY WHH DATE 4-29-92 OF 4 JOB NO.
REVIEWED BY DATE SUBJECT: I-10/SUPER/BASELINE
APPROVED BY DATE

RATING TABLE FOR DISCHARGE FROM EXISTING DETENTION BASIN ALONG NORTH SIDE OF SOUTHERN AVENUE EAST OF I-10

GIVEN: TWO OUTLETS; ONE @ EACH END OF BASIN

→ @ EAST END IS EXIST 16" DIAM CONC PIPE W/ INVERT ELEV 59.03 (SAY 59.0). THIS PIPE IS CONNECTED TO CITY OF TEMPE STORM DRAIN SYSTEM.

→ @ WEST END IS PROPOSED SURFACE GRATE INLET (CB150 CONNECTED TO MH 43 ON I-10/SUPERSTITION TI 24" DETENTION BASIN BLEED OFF LINE). THIS WILL BE AN ADOT LW 2.2 GRATE. CB150 WILL BE INSTALLED IN UNIT 1 BUT GRATE WILL BE BLOCKED OFF UNTIL UNIT 2 IS CONSTRUCTED. GRATE ELEV IS 58.50.

FOR 16" PIPE, ASSUME INLET CONTROL AND USE BPR NOMOGRAPH

ELEV	HW	HW/D	Q
58.5	0	0	0
59.0	0	0	0
60.0	1.0	0.75	3.0
61.0	2.0	1.50	7.0
62.0	3.0	2.25	10.0
63.0	4.0	3.00	12.0

FOR CB150 SURFACE GRATE, CONSIDER POSSIBILITY OF BOTH WIER FLOW OR ORIFICE FLOW AND ASSUME CLOGGING FACTOR OF 50%

ELEV	DEPTH	PERIM	AREA	$Q=3PD^{3/2}$	$Q=5.37AD^{1/2}$	SELECTED Q
58.5	0	$\frac{(2\times3)+(2\times1.5)}{2}$	3.60/2	0	0	0
59.0	0.5	= 4.5	= 1.80	5.0	6.8	5.0
60.0	1.5	"	"	25	12.0	12.0
61.0	2.5	"	"	55	15.0	15.0
62.0	3.5	"	"	—	18.0	18.0
63.0	4.5	"	"	—	21.0	21.0

SC 3020

DESIGNED BY GSB DATE 4-23-92 SHEET NO. 2 PAGE NO.
CHECKED BY WHH DATE 4-29-92 OF 4 JOB NO.
REVIEWED BY DATE SUBJECT: I-10/SUPER/BASELINE
APPROVED BY DATE

COMBINED RATING TABLE FOR DISCHARGE FROM BOTH OUTLETS:

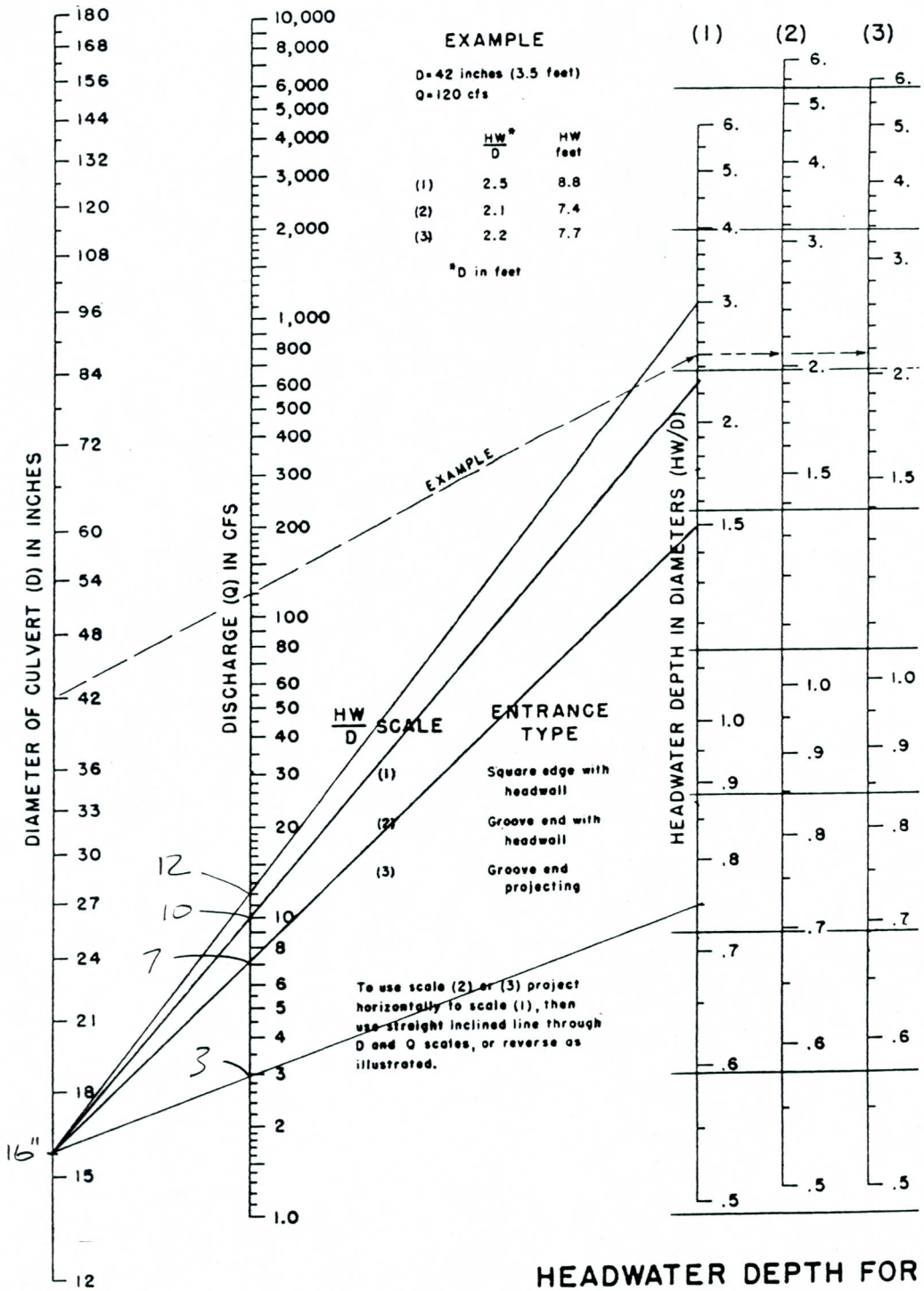
ELEV	Q_{GRATE}	Q_{PIPE}	Q_{TOTAL}
58.5	0	0	0
59.0	5.0	0	5.0
60.0	12.0	3.0	15.0
61.0	15.0	7.0	22.0
62.0	18.0	10.0	28.0
63.0	21.0	12.0	33.0

NOTES: 1. DISCHARGE FROM BOTH OUTLETS OCCURS ONLY AFTER UNIT 2 IS CONSTRUCTED

2. HEC 1 MODELS IN APPENDIX I ASSUME THAT ALL SURFACE FLOW CONTRIBUTING TO THE SOUTHERN AVENUE DETENTION BASIN IS ABLE TO PASS THROUGH THE EXISTING PIPE CULVERT UNDER SOUTHERN AVE WHICH IS PARTIALLY BLOCKED WITH SILT.

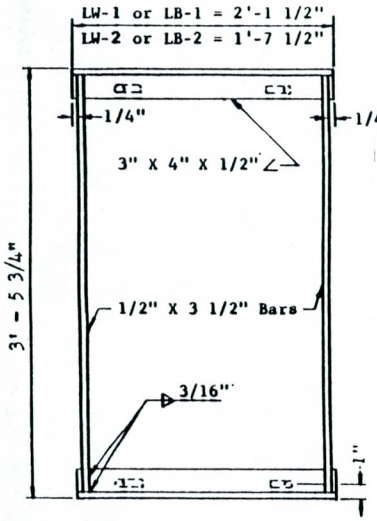
GSB/4-28-92 3/4

CHART 2

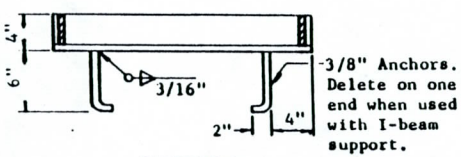


HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

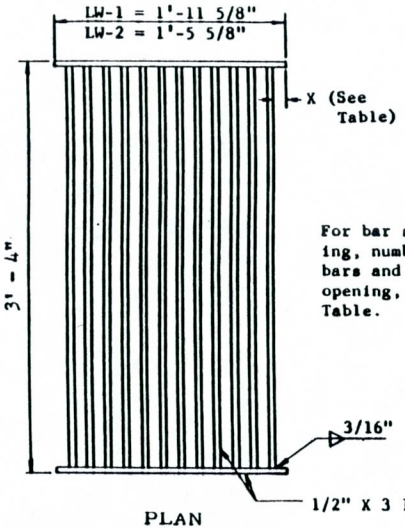


PLAN



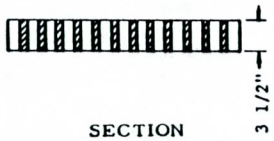
SECTION

FRAME



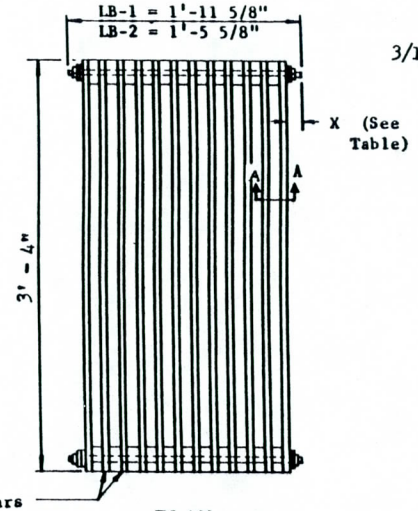
PLAN

For bar spacing, number of bars and grate opening, see Table.

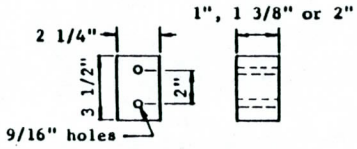


SECTION

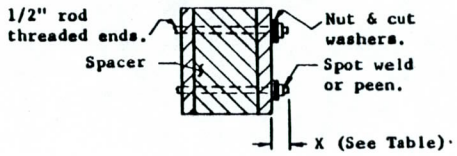
GRATES TYPE LW & EF
Restrict to slopes of 3% or less.



PLAN

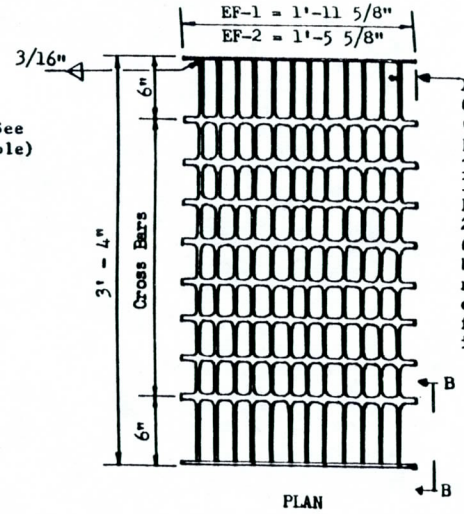


BAR SPACER DETAIL
Cast iron, cast steel or steel bar stock.

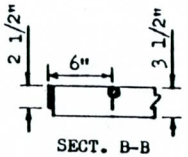


SECTION A-A'

GRATES TYPE LB
Use on longitudinal grades in excess of 3% or as an alternate to Types LW or EF on grades of 3% or less.



PLAN



SECT. B-B

GENERAL NOTES

LW indicates longitudinal welded.
LB indicates longitudinal bolted.
EF indicates electroforged.

Grating units and frames shall be fabricated from structural steel ASTM A 36 except as noted.

All welding shall be in accordance with Standard Welding Specifications.

The completed assembly shall be given one shop coat of No. 1 paint.

Frames and grates shall fit to a maximum rock of 0.093" at any point.

GRATE TYPE	CLEAR BAR SPACING	NO. BARS	X	GRATE OPENING SQ. FT.
LW or LB - 1.0	1"	16	5/16"	3.97
" " - 1.1	1 3/8"	13	5/16"	4.34
" " - 1.2	2"	9	1 9/16"	4.84
EF - 1	1 5/8"	13	7/16"	4.66
LW or LB - 2.0	1"	12	5/16"	2.98
" " - 2.1	1 3/8"	9	1 1/16"	3.35
" " - 2.2	2"	7	1 1/16"	3.60
EF - 2	1 5/8"	10	1/4"	3.48

DESIGN APPROVED

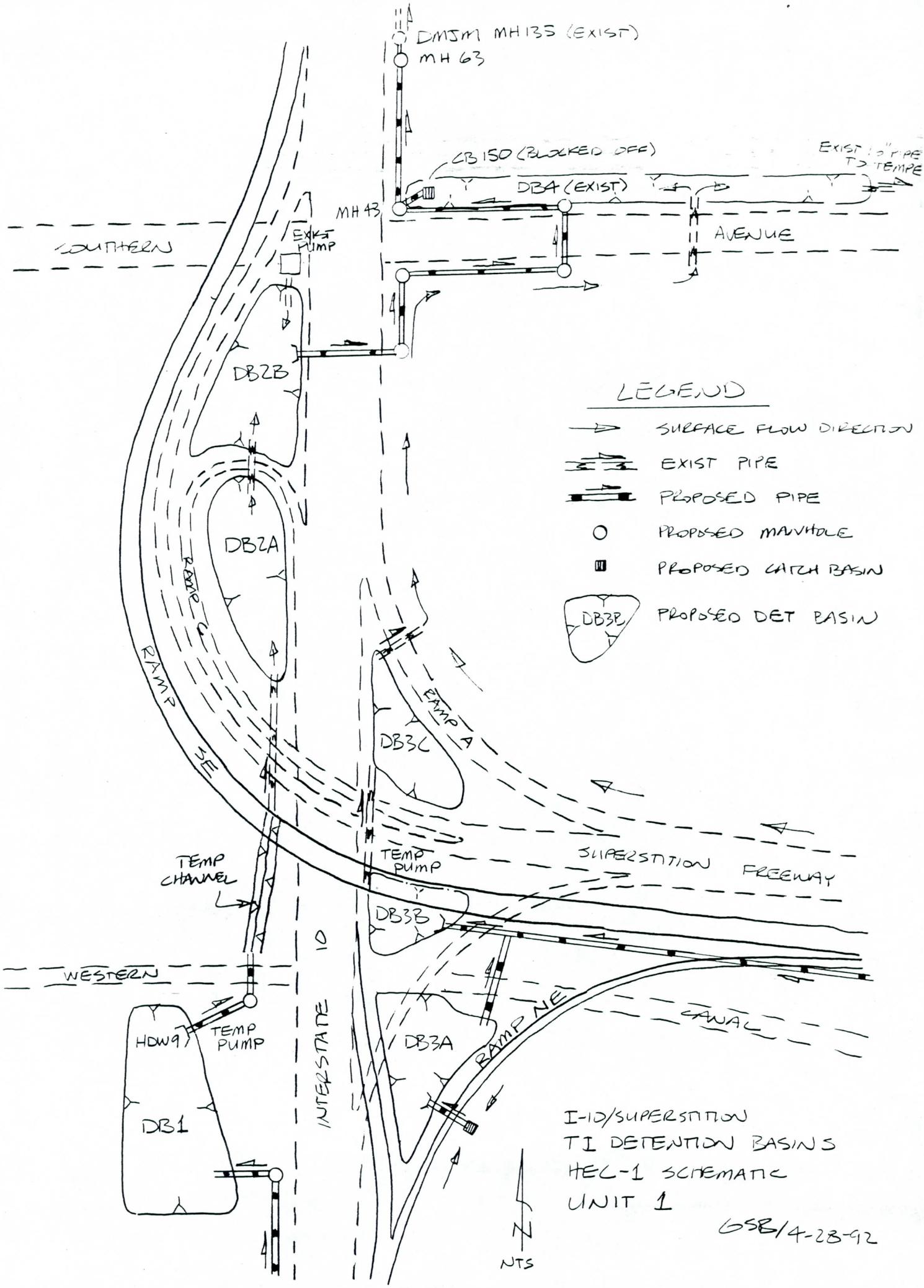
APPROVED FOR DISTRIBUTION

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

CATCH BASIN, GRATES, LONGITUDINAL BARS

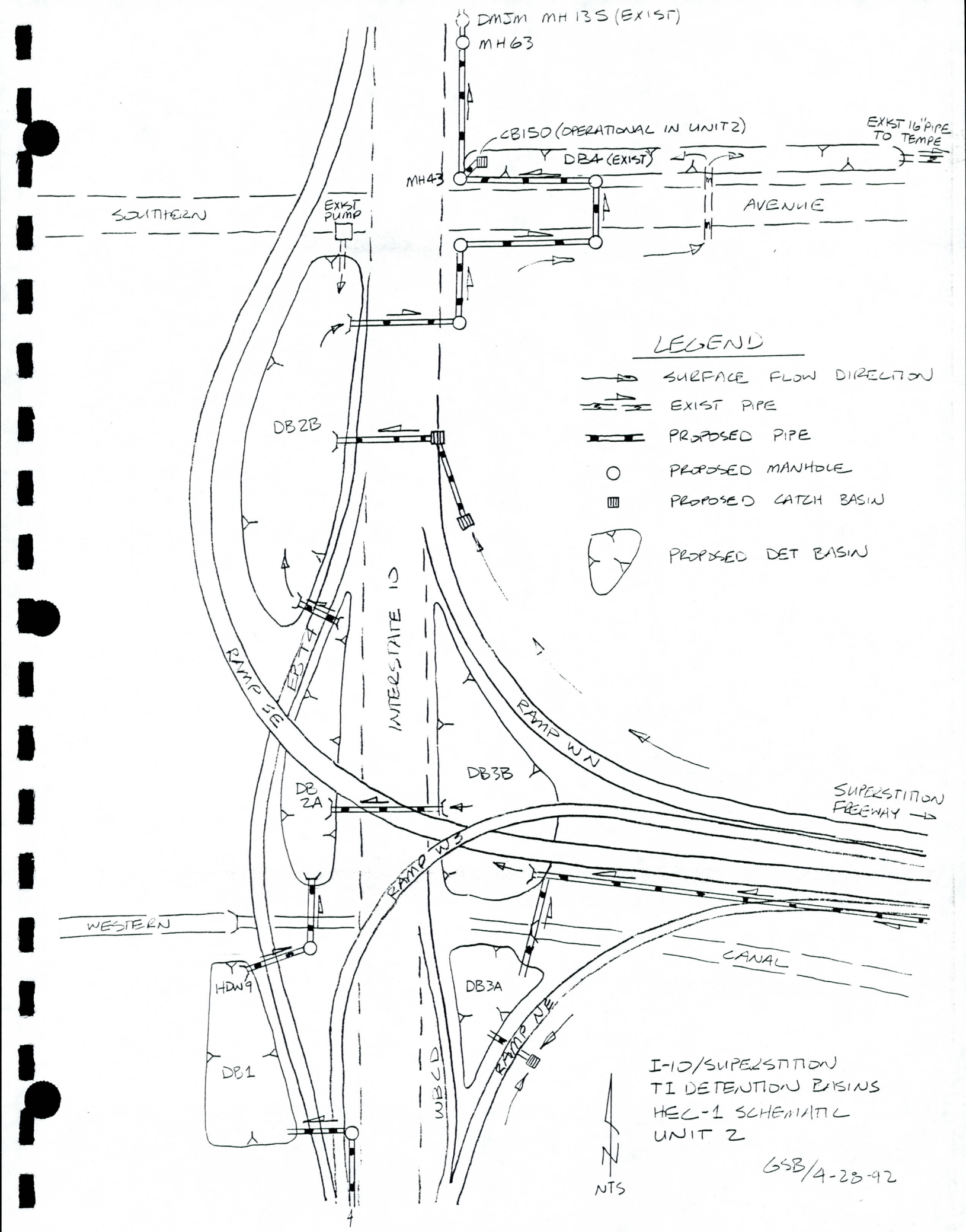
REV 1/83

DRAWING NO. C-15.50



I-10/SUPERSTITION
TI DETENTION BASINS
HEC-1 SCHEMATIC
UNIT 1

GSB/4-28-92


DMJM MH 135 (EXIST)
MH63
CB150 (OPERATIONAL IN UNIT2)
EXIST 16" PIPE TO TEMPE
DB4 (EXIST)
MH43
SOUTHERN
AVENUE
EXIST PUMP
LEGEND
SURFACE FLOW DIRECTION
EXIST PIPE
PROPOSED PIPE
PROPOSED MANHOLE
PROPOSED CATCH BASIN
PROPOSED DET BASIN
DB2B
INTERSTATE 10
RAMP SE
EB14
RAMP WN
DB3B
DB 2A
SUPERSTITION FREEWAY
RAMP WS
WESTERN
CANAL
HDW9
DB3A
DB1
WBCD
RAMP NE
N
NTS
I-10/SUPERSTITION
TI DETENTION BASINS
HEC-1 SCHEMATIC
UNIT 2
GSB/4-28-92

DMJM

I-10 CORRIDOR STUDY
SUPERSTITION RETENTION/DETENTION BASIN

November 1987

Submitted By:

DMJM
300 WEST CLARENDON AVENUE
SUITE 400
PHOENIX, ARIZONA 85013
(602) 264-1397

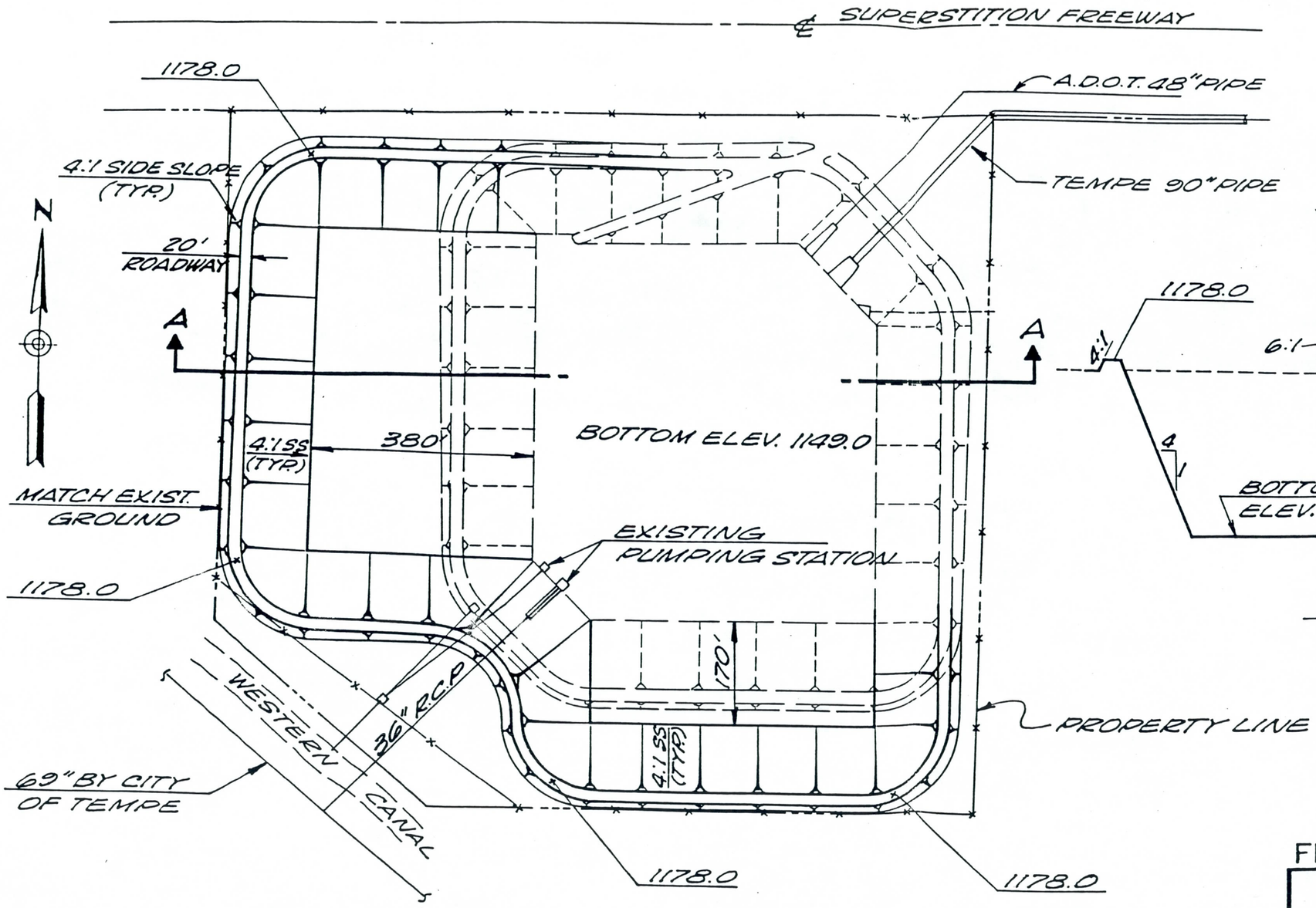
1.25	4.00	25.00	25.31	0.99	1473.87	58.95
1.50	4.00	31.50	27.37	1.10	2057.27	65.31
1.75	4.00	38.50	29.43	1.20	2739.68	71.16
2.00	4.00	46.00	31.49	1.29	3524.41	76.62
2.25	4.00	54.00	33.55	1.38	4414.97	81.76
2.50	4.00	62.50	35.62	1.46	5415.02	86.64
2.75	4.00	71.50	37.68	1.54	6528.27	91.30
3.00	4.00	81.00	39.74	1.61	7758.47	95.78

Trapezoidal Ditch (20ft. Wide) with 4:1 Sideslopes.

DEPTH (FT)	SIDESLOPE (FT/FT)	AREA (SF)	PERIMETER (FT)	HYDRAULIC RADIUS	Q/(S^1/2)	V/(S^1/2)
0.25	4.00	5.25	22.06	0.38	119.26	22.72
0.50	4.00	11.00	24.12	0.59	386.34	35.12
0.75	4.00	17.25	26.18	0.76	775.22	44.94
1.00	4.00	24.00	28.25	0.90	1279.05	53.29
1.25	4.00	31.25	30.31	1.02	1896.00	60.67
1.50	4.00	39.00	32.37	1.13	2626.44	67.34
1.75	4.00	47.25	34.43	1.24	3471.96	73.48
2.00	4.00	56.00	36.49	1.33	4434.83	79.19
2.25	4.00	65.25	38.55	1.42	5517.75	84.56
2.50	4.00	75.00	40.62	1.51	6723.69	89.65
2.75	4.00	85.25	42.68	1.59	8055.79	94.50
3.00	4.00	96.00	44.74	1.67	9517.31	99.14

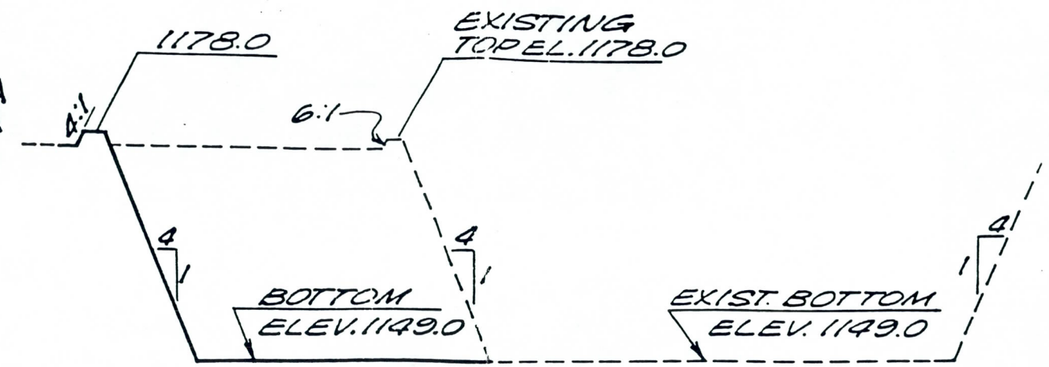
Trapezoidal Ditch (5ft. Wide) with 6:1 Sideslopes.

DEPTH (FT)	SIDESLOPE (FT/FT)	AREA (SF)	PERIMETER (FT)	HYDRAULIC RADIUS	Q/(S^1/2)	V/(S^1/2)
0.25	6.00	1.63	8.04	0.34	33.09	20.36
0.50	6.00	4.00	6.08	0.76	179.54	44.89
0.75	6.00	7.13	9.12	0.85	358.84	50.36
1.00	6.00	11.00	12.17	0.93	611.18	55.56
1.25	6.00	15.63	16.83	0.95	883.59	56.55
1.50	6.00	21.00	22.25	0.96	1200.87	57.18
1.75	6.00	27.13	28.41	0.97	1562.91	57.62
2.00	6.00	34.00	35.33	0.97	1969.63	57.93
2.25	6.00	41.63	43.00	0.98	2421.00	58.16
2.50	6.00	50.00	51.41	0.98	2916.99	58.34
2.75	6.00	59.13	60.58	0.98	3457.60	58.48
3.00	6.00	69.00	70.50	0.99	4042.82	58.59



EXISTING STORAGE =
241 A-F @ ELEV. 1170.5

FUTURE STORAGE FOR THE 100 YR. 24 HR. STORM EVENT =
413 A-F @ ELEV. 1170.5



SECTION A-A

HOR. 1" = 200'
VER. 1" = 20'

DMJM

FIGURE 1

I-10 CORRIDOR STUDY

PROPOSED ENLARGEMENT OF SUPERSTITION DETENTION / RETENTION BASIN

DMJM SCALE : 1" = 200'

```
                *            *
134 KK          *     MH63   *          Route SUM43 to DMJM tie-in at 8152+00,119'lt.
                *            *
                **************

            HYDROGRAPH ROUTING DATA

136 RK          KINEMATIC WAVE STREAM ROUTING
                          L        299.  CHANNEL LENGTH
                          S       .0040  SLOPE
                          N        .012  CHANNEL ROUGHNESS COEFFICIENT
                         CA         .00  CONTRIBUTING AREA
                      SHAPE        CIRC  CHANNEL SHAPE
                         WD        2.00  BOTTOM WIDTH OR DIAMETER
                          Z         .00  SIDE SLOPE
                     NDXMIN           2  MINIMUM NUMBER OF DX INTERVALS

                                                  ***
                                COMPUTED KINEMATIC PARAMETERS
                                     VARIABLE TIME STEP
                                   (DT SHOWN IS A MINIMUM)

                 ELEMENT    ALPHA       M        DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                              PEAK                  CELERITY
                                                (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

                 MAIN         4.76      1.25       .28     99.67     13.47   220.29       .44       7.32

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3113E+01  EXCESS= .0000E+00 OUTFLOW= .3106E+01 BASIN STORAGE= .6519E-02 PERCENT ERROR=    .0

                                     INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                 MAIN         4.76      1.25      2.00              13.47   220.00       .44

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

                     HYDROGRAPH AT STATION     MH63

 PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
  (CFS)        (HR)
                          (CFS)
+    13.      3.67                     6.          6.          6.          6.
                        (INCHES)     .440        .440        .440        .440
                         (AC-FT)       3.          3.          3.          3.

                        CUMULATIVE AREA =     .13 SQ MI


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


                **************
                *            *
137 KK          *    SUB135  *       Runoff from sub-basin 135
                *            *
                **************

            SUBBASIN RUNOFF DATA

138 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .00  SUBBASIN AREA

                PRECIPITATION DATA

25 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .68    1.32    2.35    2.55    2.69    2.95     .00     .00     .00     .00     .00     .00

                                                STORM AREA =     .00

139 LS          SCS LOSS RATE
                      STRTL         .00  INITIAL ABSTRACTION
                     CRVNBR      100.00  CURVE NUMBER
```

```
                    RTIMP      100.00  PERCENT IMPERVIOUS AREA

140 UD          SCS DIMENSIONLESS UNITGRAPH
                      TLAG         .10  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                          17 END-OF-PERIOD ORDINATES
              1.        5.        8.        8.        6.        4.        2.        2.        1.        1.
              0.        0.        0.        0.        0.        0.        0.

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

                     HYDROGRAPH AT STATION   SUB135

  TOTAL RAINFALL =    2.95, TOTAL LOSS =     .00, TOTAL EXCESS =    2.95

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
  (CFS)       (HR)
                        (CFS)
     8.       3.13                     1.          1.          1.          1.
                      (INCHES)      2.941       2.941       2.941       2.941
                       (AC-FT)         0.          0.          0.          0.

                      CUMULATIVE AREA =     .00 SQ MI


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


          **************
          *            *
141 KK    *    SUM135  *          Sum hydrographs SUB135 and MH63
          *            *
          **************

  HC          HYDROGRAPH COMBINATION
                    ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                    ***

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

                     HYDROGRAPH AT STATION   SUM135

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
  (CFS)       (HR)
                        (CFS)
    16.       3.17                     7.          7.          7.          7.
                      (INCHES)       .477        .477        .477        .477
                       (AC-FT)         3.          3.          3.          3.

                      CUMULATIVE AREA =     .13 SQ MI


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


          **************
          *            *
143 KK    *      RCHE  *          Route SUM135 to DMJM det basin E near Bell Butte
          *            *
          **************

             HYDROGRAPH ROUTING DATA

  RK          KINEMATIC WAVE STREAM ROUTING
                        L       1442.  CHANNEL LENGTH
                        S      .0010  SLOPE
                        N       .012  CHANNEL ROUGHNESS COEFFICIENT
                       CA        .00  CONTRIBUTING AREA
                    SHAPE       CIRC  CHANNEL SHAPE
                       WD       5.00  BOTTOM WIDTH OR DIAMETER
```

```
                Z          .00  SIDE SLOPE
           NDXMIN            2  MINIMUM NUMBER OF DX INTERVALS

                                                  ***
                          COMPUTED KINEMATIC PARAMETERS
                               VARIABLE TIME STEP
                             (DT SHOWN IS A MINIMUM)

          ELEMENT    ALPHA       M        DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                       PEAK                  CELERITY
                                             (MIN)     (FT)     (CFS)    (MIN)      (IN)      (FPS)

          MAIN         2.77     1.25       1.71    480.67     16.05   194.28       .47      4.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3419E+01  EXCESS= .0000E+00 OUTFLOW= .3366E+01 BASIN STORAGE= .5141E-01 PERCENT ERROR=    .0

                                  INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

          MAIN         2.77     1.25       2.00              16.03   194.00       .47

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

                 HYDROGRAPH AT STATION     RCHE

PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
 (CFS)        (HR)
                        (CFS)
   16.        3.23                 7.          7.          7.          7.
                     (INCHES)     .469        .469        .469        .469
                      (AC-FT)      3.          3.          3.          3.

                     CUMULATIVE AREA =     .13 SQ MI


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

        **************
        *            *
152 KK  *      SUBE  *      RUNOFF FROM SUB-BASIN E
        *            *
        **************

           SUBBASIN RUNOFF DATA

153 BA       SUBBASIN CHARACTERISTICS
                  TAREA         .06  SUBBASIN AREA

             PRECIPITATION DATA

 25 PH                          DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
             ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
             5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
               .68    1.32    2.35    2.55    2.69    2.95     .00     .00     .00     .00     .00     .00

                                                STORM AREA =     .06

154 LS       SCS LOSS RATE
                  STRTL         .00  INITIAL ABSTRACTION
                 CRVNBR      100.00  CURVE NUMBER
                  RTIMP      100.00  PERCENT IMPERVIOUS AREA

155 UD       SCS DIMENSIONLESS UNITGRAPH
                   TLAG         .20  LAG

                                                  ***

                                          UNIT HYDROGRAPH
                                     32 END-OF-PERIOD ORDINATES
          10.      28.      58.      98.     128.     142.     142.     130.     113.      90.
          67.      52.      40.      32.      25.      19.      15.      12.       9.       7.
           5.       4.       3.       3.       2.       2.       1.       1.       1.       1.
           0.       0.
```

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

                    HYDROGRAPH AT STATION     SUBE

TOTAL RAINFALL =    2.95, TOTAL LOSS =     .00, TOTAL EXCESS =    2.95

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
(CFS)         (HR)
                          (CFS)
  185.        3.23                20.         20.         20.         20.
                        (INCHES)  2.931       2.931       2.931       2.931
                         (AC-FT)  10.         10.         10.         10.

                       CUMULATIVE AREA =     .06 SQ MI
```

*** ***

```
          **************
          *            *
156 KK    *     SUME   *          Sum hydrographs SUBE and RCHE
          *            *
          **************

157 HC          HYDROGRAPH COMBINATION
                     ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE
                                                          ***

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

                    HYDROGRAPH AT STATION     SUME

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
(CFS)         (HR)
                          (CFS)
  201.        3.23                27.         27.         27.         27.
                        (INCHES)  1.264       1.264       1.264       1.264
                         (AC-FT)  13.         13.         13.         13.

                       CUMULATIVE AREA =     .20 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	SB1	125.	3.30	16.	16.	16.	.05		
ROUTED TO	DB1	3.	.03	3.	3.	3.	.05	1161.08	5.67
ROUTED TO	CP2A	3.	.07	3.	3.	3.	.05		
HYDROGRAPH AT	SB2A	41.	3.10	3.	3.	3.	.01		
2 COMBINED AT	SUM2A	44.	3.10	6.	6.	6.	.06		
ROUTED TO	DB2A	7.	3.57	3.	3.	3.	.06	1167.87	3.57
ROUTED TO	CP2B	7.	3.57	3.	3.	3.	.06		
HYDROGRAPH AT									

	SB2B	91.	3.10	7.	7.	7.	.02		
2 COMBINED AT	SUM2B	94.	3.10	10.	10.	10.	.08		
ROUTED TO	DB2B	13.	3.63	6.	6.	6.	.08	1159.46	3.63
ROUTED TO	MH43	13.	3.63	6.	6.	6.	.08		
HYDROGRAPH AT	SB3A	56.	3.17	5.	5.	5.	.02		
ROUTED TO	DB3A	16.	3.50	5.	5.	5.	.02	1173.30	3.50
ROUTED TO	CP3B	16.	3.50	5.	5.	5.	.02		
HYDROGRAPH AT	SB3B	60.	3.13	5.	5.	5.	.02		
2 COMBINED AT	SUM3B	70.	3.13	10.	10.	10.	.03		
ROUTED TO	DB3B	2.	.03	2.	2.	2.	.03	1171.55	6.00
HYDROGRAPH AT	SB3C	34.	3.03	2.	2.	2.	.01		
2 COMBINED AT	SUM3C	37.	3.03	5.	5.	5.	.04		
ROUTED TO	DB3C	7.	3.47	3.	3.	3.	.04	1170.31	3.47
ROUTED TO	CPDB4	7.	3.53	3.	3.	3.	.04		
HYDROGRAPH AT	RampA	32.	3.20	3.	3.	3.	.01		
2 COMBINED AT	SUMDB4	37.	3.23	6.	6.	6.	.05		
ROUTED TO	DB4	7.	4.00	3.	3.	3.	.05	1161.06	4.03
DIVERSION TO	TEMPE	7.	.03	3.	3.	3.	.05		
HYDROGRAPH AT	DVTDB4	0.	.03	0.	0.	0.	.05		
2 COMBINED AT	SUM43	13.	3.63	6.	6.	6.	.13		
ROUTED TO	MH63	13.	3.67	6.	6.	6.	.13		
HYDROGRAPH AT	SUB135	8.	3.13	1.	1.	1.	.00		
2 COMBINED AT	SUM135	16.	3.17	7.	7.	7.	.13		
ROUTED TO	RCHE	16.	3.23	7.	7.	7.	.13		
HYDROGRAPH AT	SUBE	185.	3.23	20.	20.	20.	.06		
2 COMBINED AT									

```
                    SUME      201.    3.23        27.        27.        27.        .20
+
1
                                SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                    (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                    INTERPOLATED TO
                                                                  COMPUTATION INTERVAL
        ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                  PEAK                                    PEAK

                            (MIN)     (CFS)     (MIN)      (IN)     (MIN)     (CFS)     (MIN)       (IN)

           CP2A   MANE        .44      2.60      3.97       .49      2.00      2.60      4.00        .49

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1286E+01 EXCESS= .0000E+00 OUTFLOW= .1281E+01 BASIN STORAGE= .4518E-02 PERCENT ERROR=    .0

           CP2B   MANE        .26      6.85    214.54       .48      2.00      6.85    214.00        .48

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1524E+01 EXCESS= .0000E+00 OUTFLOW= .1521E+01 BASIN STORAGE= .2208E-02 PERCENT ERROR=    .0

           MH43   MANE        .27     13.47    218.64       .71      2.00     13.47    220.00        .71

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3120E+01 EXCESS= .0000E+00 OUTFLOW= .3115E+01 BASIN STORAGE= .5172E-02 PERCENT ERROR=    .0

           CP3B   MANE        .20     16.05    210.13      2.76      2.00     16.05    210.00       2.76

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2426E+01 EXCESS= .0000E+00 OUTFLOW= .2425E+01 BASIN STORAGE= .7259E-03 PERCENT ERROR=    .0

           CPDB4  MANE       1.83      6.75    212.76       .60      2.00      6.75    212.00        .60

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1299E+01 EXCESS= .0000E+00 OUTFLOW= .1275E+01 BASIN STORAGE= .2484E-01 PERCENT ERROR=   -.1

           MH63   MANE        .28     13.47    220.29       .44      2.00     13.47    220.00        .44

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3113E+01 EXCESS= .0000E+00 OUTFLOW= .3106E+01 BASIN STORAGE= .6519E-02 PERCENT ERROR=    .0

           RCHE   MANE       1.71     16.05    194.28       .47      2.00     16.03    194.00        .47

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3419E+01 EXCESS= .0000E+00 OUTFLOW= .3366E+01 BASIN STORAGE= .5141E-01 PERCENT ERROR=    .0


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

```
PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
 (CFS)        (HR)
                        (CFS)
   37.        3.23                  6.          6.          6.          6.
                      (INCHES)    1.084       1.084       1.084       1.084
                       (AC-FT)       3.          3.          3.          3.

                     CUMULATIVE AREA =     .05 SQ MI


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


          **************
          *            *
118 KK    *     DB4    *          Route combined flow through Southern Ave. det basin
          *            *
          **************
                                   (Elev - disch based on combined capacities of existing 16 inch
                                   pipe at east end of basin and proposed surface inlet grate at
                                   west end)

          HYDROGRAPH ROUTING DATA

122 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

123 SA            AREA          .0        .3        .7       1.2       1.6       2.0

124 SE        ELEVATION     1158.50   1159.00   1160.00   1161.00   1162.00   1163.00

125 SQ        DISCHARGE          0.        0.        3.        7.       10.       12.

                                                                ***

                                          COMPUTED STORAGE-ELEVATION DATA

          STORAGE        .00       .07       .53      1.45      2.82      4.65
        ELEVATION    1158.50   1159.00   1160.00   1161.00   1162.00   1163.00

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

                     HYDROGRAPH AT STATION      DB4

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
 (CFS)        (HR)
                        (CFS)
    7.        4.00                  3.          3.          3.          3.
                      (INCHES)     .618        .618        .618        .618
                       (AC-FT)       2.          2.          2.          2.

PEAK STORAGE  TIME                          MAXIMUM AVERAGE STORAGE
                                   6-HR       24-HR       72-HR      6.00-HR
 (AC-FT)      (HR)
    2.        3.97                  1.          1.          1.          1.

PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                   6-HR       24-HR       72-HR      6.00-HR
 (FEET)       (HR)
 1161.06      4.03               1159.89     1159.89     1159.89     1159.89

                     CUMULATIVE AREA =     .05 SQ MI


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


          **************
          *            *
126 KK    *   DVTDB4   *          Split hydrograph DB4.
          *            *
```

DMJM

November 1987

SUPERSTITION RETENTION/DETENTION BASIN

The existing Superstition Retention/Detention Basin located south of Superstition Freeway and west of Kyrene Road presently has an existing storage capacity of 241 A-F with a contributing area of approximately 3.51 square miles.

Analysis of the Superstition Retention/Detention Basin in order to store the 100-year, 24-hour storm event (precipitation = 3.64 inches).

Presented in Table 1 are the different types of land uses encountered within the contributing area and the projected storage volume requirement for each type of land use. The total required storage at the Superstition Retention/Detention basin for the 100-year, 24-hour storm event is estimated at 415 A-f. Figure 1 shows the existing layout of Superstition Detention/Retention Basin and the proposed expansion to provide the 415 A-F of storage. The proposed enlargement is based on retaining the current basin bottom elevation, avoiding modification to the outlet structures, remaining with the present property boundaries, and maintaining a maximum storage elevation below 1170.5.

DMJM

I-10 CORRIDOR STUDY
SUPERSTITION RETENTION/DETENTION BASIN

November 1987

TABLE 1. PROPOSED STORAGE REQUIREMENTS FOR KYRENE ROAD RETENTION/DETENTION BASIN (BASED ON LAND USAGE).

Type of Land Use	Area (Acres)	Runoff (Inches)	Storage Required (A-F)
Streets & Roads	130.3	3.41	37.0
Freeway (including ROW)	189.4	2.97	46.9
Cyrus Estate	14.7	2.40	2.9
Commercial/ Subdivision	792.0	2.40	158.4
Area w/On-Site Retention (50-year, 1-hour)	753.9	2.05	128.8
Area w/On-Site Retention (100-year, 1-hour)	363.7	1.35	40.9
TOTAL AREA	2244.0 (Acres)	Storage	414.9 A-F

DMJM

I-10 CORRIDOR STUDY
SUPERSTITION RETENTION/DETENTION BASIN

November 1987

SUPPORTING CALCULATIONS

STORAGE BASED ON THE 100-YR. 24 HOUR STORM EVENT

PRECIP. = 3.64 INCHES

1. STREETS AND ROADS:

AREA = 130.3 ACRES

CN = 98 (TR-55)

$S = \frac{1000}{98} - 10 = 0.2041$ INCHES

$Q = \frac{(3.64 - 0.2(0.204))^2}{3.64 + 0.8(0.204)} = 3.41$ INCHES (RUNOFF)

STORAGE VOLUME REQUIREMENT: 3.41 IN/12 IN./FT × 130.3 ACRES = 37.0 A

2. FREEWAY (INCLUDING R.O.W.):

AREA = 189.4 ACRES

CN: PAVEMENT = 98

VEGETATION (HSG=C) = 89

APPROXIMATELY HALF PAVEMENT HALF VEGETATION

$CN = \frac{98+89}{2} = 94$

$S = \frac{1000}{94} - 10 = 0.64$ INCHES

$Q = \frac{(3.64 - 0.2(0.64))^2}{3.64 + 0.8(0.64)} = 2.97$ INCHES (RUNOFF)

VOLUME OF STORAGE REQUIRED: 2.97 INCHES/12 IN/FT × 189.4 ACRES = 46.9 A-F

3. CYPRUS ESTATE:

AREA = 14.7 ACRES

CN = 88 (BASED ON ZONING)

$S = \frac{1000}{88} - 10 = 1.36$ INCHES

$Q = \frac{(3.64 - 0.2(1.36))^2}{3.64 + 0.8(1.36)} = 2.40$ INCHES (RUNOFF)

VOLUME OF STORAGE REQUIRED: 2.40 IN/12 IN/FT × 14.7 ACRES = 2.9 A-F

4. COMMERCIAL/SUBDIVISION (ONSITE RETENTION NOT PROVIDED)

AREA = 792 ACRES
CURVE NO. = 88 (BASED ON ZONING)
S = 1.36 INCHES
Q = 2.40 INCHES (RUNOFF)

VOLUME OF STORAGE REQUIRED: 2.40 IN/12 IN/FT × 792 ACRES = 158.4 A-F

5. AREA WITH ONSITE RETENTION PROVIDED (5-YR 1-HR STORM EVENT)

PRECIPITATION = 1.15 INCHES (5-YR 1-HOUR)
AREA = 753.9 ACRES
CN = 88
S = 1.36

5-YR 1-HR STORM EVENT

$$Q = \frac{(1.15 - 0.2(1.36))^2}{1.15 + 0.8(1.36)} = 0.35 \text{ INCHES (RUNOFF RETAINED ON SITE}$$

100-YR 24-HR STORM EVENT

Q = 2.40 INCHES (RUNOFF)

∴ RUNOFF FROM SITE:

2.40 − 0.35 = 2.05 INCHES (RUNOFF)

VOLUME OF STORAGE REQUIRED: 2.05 IN/12 IN/FT × 753.9 ACRES = 128.8

6. AREA WITH ONSITE RETENTION (100-YR 1-HOUR STORM):

100 YR-1HR = 2.10 INCHES
AREA = 363.7 ACRES
CN = 88
S = 1.36

100-YR 1-HR STORM EVENT

$$Q = \frac{(2.10 - 0.2(1.36))^2}{2.10 + 0.8(1.36)} = 1.05 \text{ INCHES (RUNOFF RETAINED ONSITE)}$$

100-YR 24-HR STORM EVENT

Q = 2.40 INCHES (RUNOFF)

∴ RUNOFF FROM SITE

2.40 − 1.05 = 1.35 INCHES

VOLUME OF STORAGE REQUIRED: 1.35 IN/12 IN/FT × 363.7 ACRES = 40.9 A-F

TOTAL STORAGE REQUIREMENT: 414.9 A-F

ESTIMATE THE AMOUNT OF RAINFALL EQUIVILENT TO 241 AC FT IN THE KYRENE BASIN OVER THE ENTIRE CONTRIBUTING DRAINAGE AREA.

TABLE 1. PROPOSED STORAGE REQUIREMENTS FOR KYRENE ROAD RETENTION/DETENTION BASIN (BASED ON LAND USAGE).

Type of Land Use	Area (Acres)	Runoff (Inches)	Storage Required (A-F)
Streets & Roads	130.3	3.41 CN 98	37.0
Freeway (including ROW)	189.4	2.97 CN 94	46.9
Cyrus Estate	14.7	2.40 CN 88	2.9
Commercial/ Subdivision	792.0	2.40 CN 88	158.4
Area w/On-Site Retention (50-year, 1-hour)	753.9	2.05 CN 84	128.8
Area w/On-Site Retention (100-year, 1-hour)	363.7	1.35 CN 74	40.9
TOTAL AREA	2244.0 (Acres)	Storage	414.9 A-F

100 YR 24 HR RAIN TOTAL FROM DMJM REPORT SUPPORT CALCULATIONS = 2.64"

WEIGHTED CURVE NUMBER FROM ABOVE TABLE –

$$\frac{(130.3 \times 98) + (189.4 \times 94) + (14.7 \times 88) + (792 \times 88) + (753.9 \times 84) + (363.7 \times 74)}{2244} = 85.5$$

EXIST STORAGE VOLUME = 241 acft

$\frac{241 \text{ acft}}{2244 \text{ ac}} \times 12''/\text{ft} = 1.29''$ RUNOFF OVER ENTIRE CONTRIB AREA

RAINFALL CORRESPONDING TO WEIGHTED CN OF 85.5 AND 1.29" OF RUNOFF – 2.53"

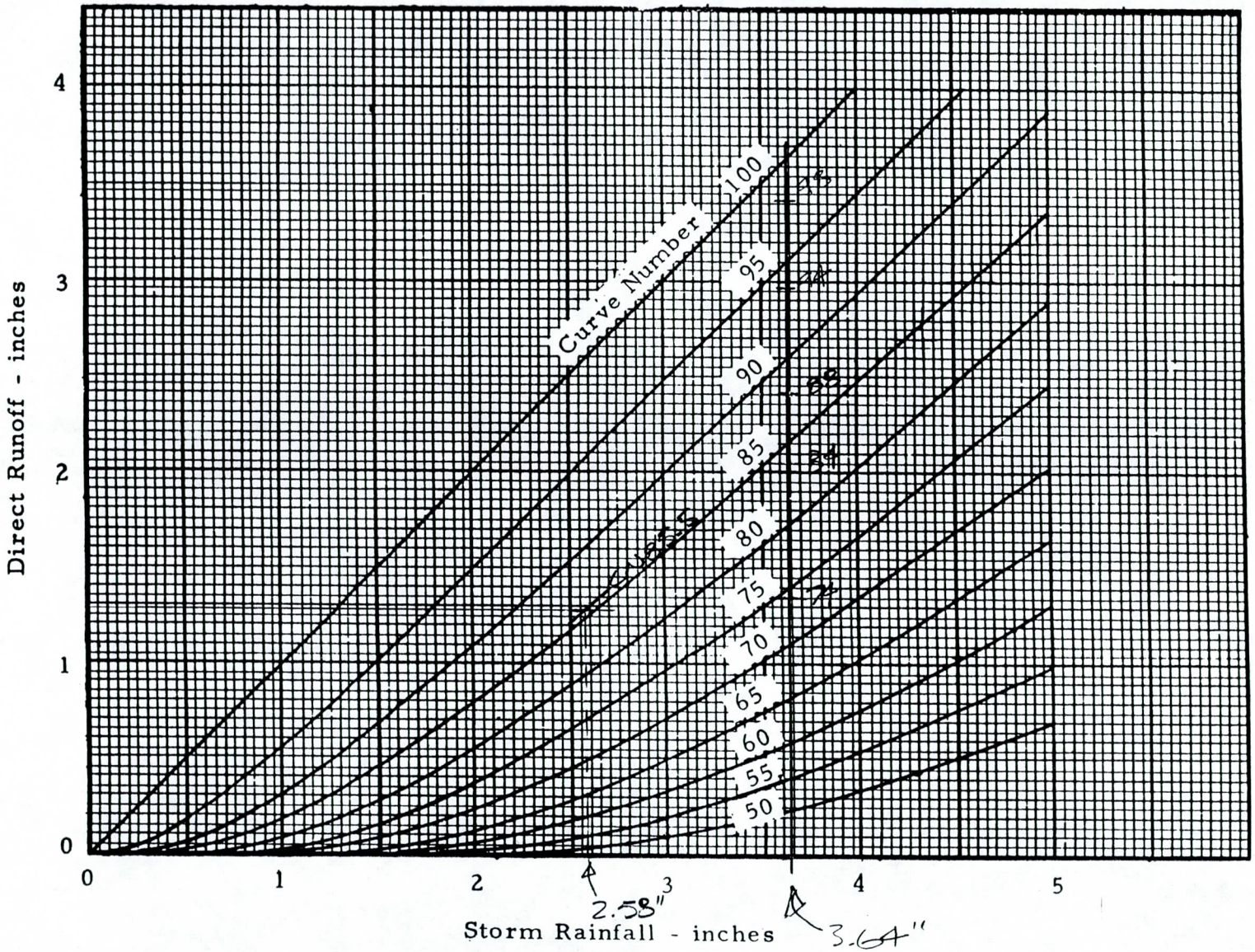


Fig. 2-4

SOLUTION OF
RAINFALL - RUNOFF EQUATION

Soil Conservation Service

DESIGNED BY GRB DATE SHEET NO. PAGE NO.
CHECKED BY WHH DATE 21 July 91 OF JOB NO. 10591
REVIEWED BY DATE SUBJECT: I-10 SUPER/BASELINE
APPROVED BY DATE

INCREASE IN CONTRIBUTING VOLUME TO KYRENE DETENTION BASIN

	PERVIOUS AREA (C=0.5)	IMPERVIOUS AREA (C=0.95)	TOTAL AREA	WEIGHTED C	50% 6HR RAINFALL	RUNOFF VOL
EXIST	250,000 FT²	306,000 FT²	556,000 FT²	0.75	2.95"	102,500 FT³
PROPOSED	684,000	480,000	1,164,000	0.69	2.95"	197,500 FT³

DIFFERENCE - 95,000 FT³

=2.18 AC FT

AREAS ABOVE ARE BASED ON:

1. ULTIMATE R/W ACQUISITION
2. NO PRIEST DRIVE ON/OFF RAMPS
3. NO CHANGES IN EXISTING IMPROVEMENTS EAST OF HARDY DRIVE – THE AREA CONSIDERED HERE IS FROM HARDY DRIVE WEST.

FUTURE PRIEST DR. ON/OFF RAMPS WILL INCREASE THE RATIO OF IMPERVIOUS TO PERVIOUS AREA BUT WILL NOT INCREASE TOTAL AREA. FUTURE RAMPS WILL RESULT IN A SLIGHT ADDITIONAL INCREASE IN RUNOFF TO KYRENE BASIN.

APPENDIX I

HEC-1 HYDROGRAPH MODEL PRINTOUTS

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                    HYDROGRAPH AT STATION     SB3C

  TOTAL RAINFALL =    2.95, TOTAL LOSS =     .00, TOTAL EXCESS =    2.95

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
  (CFS)       (HR)
                         (CFS)
+    34.      3.03                     2.          2.          2.          2.
                       (INCHES)     2.947       2.947       2.947       2.947
                        (AC-FT)        1.          1.          1.          1.

                      CUMULATIVE AREA =     .01 SQ MI


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


          **************
          *            *
102 KK    *    SUM3C   *          Add routed flow and runoff from Dtn. Basin 3c
          *            *
          **************

103 HC          HYDROGRAPH COMBINATION
                     ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

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

                    HYDROGRAPH AT STATION     SUM3C

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
+ (CFS)       (HR)
                         (CFS)
    37.      3.03                     5.          5.          5.          5.
                       (INCHES)     1.063       1.063       1.063       1.063
                        (AC-FT)        2.          2.          2.          2.

                      CUMULATIVE AREA =     .04 SQ MI


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


          **************
          *            *
104 KK    *     DB3C   *          Route combined flow through Dtn. Basin 3C
          *            *
          **************
                                  (Elev - disch based on BPR inlet control nomograph)

            HYDROGRAPH ROUTING DATA

106 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

107 SA              AREA          .7        .7        .7        .7        .7        .7        .8        .8        .8

108 SE          ELEVATION     1168.50   1168.75   1169.00   1169.25   1169.50   1169.75   1170.00   1170.25   1170.50

109 SQ          DISCHARGE          0.        0.        0.        1.        2.        3.        4.        6.        9.

                                                          ***

                                          COMPUTED STORAGE-ELEVATION DATA

          STORAGE        .00       .17       .35       .53       .71       .90      1.08      1.27      1.47
        ELEVATION    1168.50   1168.75   1169.00   1169.25   1169.50   1169.75   1170.00   1170.25   1170.50

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

HYDROGRAPH AT STATION DB3C

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	6.00-HR
7.	3.47	(CFS)	3.	3.	3.	3.
		(INCHES)	.610	.610	.610	.610
		(AC-FT)	1.	1.	1.	1.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	6.00-HR
1.	3.43	1.	1.	1.	1.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	6.00-HR
1170.31	3.47	1169.51	1169.51	1169.51	1169.51

CUMULATIVE AREA = .04 SQ MI

*** ***

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**************
*            *
*     CPDB4  *
*            *
**************
```

110 KK Route DB3C to DB4

HYDROGRAPH ROUTING DATA

111 RK KINEMATIC WAVE STREAM ROUTING

L	950.	CHANNEL LENGTH
S	.0050	SLOPE
N	.025	CHANNEL ROUGHNESS COEFFICIENT
CA	.00	CONTRIBUTING AREA
SHAPE	TRAP	CHANNEL SHAPE
WD	5.00	BOTTOM WIDTH OR DIAMETER
Z	4.00	SIDE SLOPE
NDXMIN	2	MINIMUM NUMBER OF DX INTERVALS

***

COMPUTED KINEMATIC PARAMETERS
VARIABLE TIME STEP
(DT SHOWN IS A MINIMUM)

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	1.41	1.36	1.83	316.67	6.75	212.76	.60	2.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1299E+01 EXCESS= .0000E+00 OUTFLOW= .1275E+01 BASIN STORAGE= .2484E-01 PERCENT ERROR= -.1

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	1.41	1.36	2.00	6.75	212.00	.60

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

HYDROGRAPH AT STATION CPDB4

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	6.00-HR
7.	3.53	(CFS)	3.	3.	3.	3.
		(INCHES)	.597	.597	.597	.597
		(AC-FT)	1.	1.	1.	1.

CUMULATIVE AREA = .04 SQ MI

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

              **************
              *            *
112 KK        *    RampA   *          Runoff from existing SR360 westbound and existing "Ramp A"
              *            *
              **************

                 SUBBASIN RUNOFF DATA

113 BA             SUBBASIN CHARACTERISTICS
                        TAREA          .01  SUBBASIN AREA

                   PRECIPITATION DATA

 25 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                   ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                   5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                     .68    1.32    2.35    2.55    2.69    2.95     .00     .00     .00     .00     .00     .00

                                                   STORM AREA =      .01

114 LS             SCS LOSS RATE
                        STRTL          .00  INITIAL ABSTRACTION
                       CRVNBR       100.00  CURVE NUMBER
                        RTIMP       100.00  PERCENT IMPERVIOUS AREA

115 UD             SCS DIMENSIONLESS UNITGRAPH
                         TLAG          .19  LAG

                                                      ***

                                                UNIT HYDROGRAPH
                                          30 END-OF-PERIOD ORDINATES
                   2.       6.      12.      19.      24.      25.      24.      21.      17.      13.
                  10.       7.       6.       4.       3.       3.       2.       1.       1.       1.
                   1.       1.       0.       0.       0.       0.       0.       0.       0.       0.

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

                        HYDROGRAPH AT STATION    RampA

   TOTAL RAINFALL =    2.95, TOTAL LOSS =     .00, TOTAL EXCESS =    2.95

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR      72-HR      6.00-HR
+  (CFS)       (HR)
                          (CFS)
    32.        3.20                    3.         3.         3.         3.
                         (INCHES)    2.933      2.933      2.933      2.933
                          (AC-FT)      2.         2.         2.         2.

                        CUMULATIVE AREA =     .01 SQ MI


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

              **************
              *            *
116 KK        *   SUMDB4   *          Add RampA and CPDB4
              *            *
              **************

117 HC             HYDROGRAPH COMBINATION
                        ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                      ***

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

                        HYDROGRAPH AT STATION   SUMDB4
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**************
                    NOTE - New inlet grate at west end of Southern Ave det basin
                           is blocked off until Unit 2 is constructed.

DT          DIVERSION
                 ISTAD      TEMPE  DIVERSION HYDROGRAPH IDENTIFICATION

DI             INFLOW        .00       .00       3.00       7.00      10.00      12.00

DQ      DIVERTED FLOW        .00       .00       3.00       7.00      10.00      12.00

                                                                  ***

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

                    DIVERSION HYDROGRAPH    TEMPE

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
+ (CFS)       (HR)
                        (CFS)
+    7.       4.00                 3.          3.          3.          3.
                      (INCHES)    .618        .618        .618        .618
                       (AC-FT)     2.          2.          2.          2.

                     CUMULATIVE AREA =     .05 SQ MI

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

                    HYDROGRAPH AT STATION   DVTDB4

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
+ (CFS)       (HR)
                        (CFS)
+    0.        .03                 0.          0.          0.          0.
                      (INCHES)    .000        .000        .000        .000
                       (AC-FT)     0.          0.          0.          0.

                     CUMULATIVE AREA =     .05 SQ MI


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


          **************
          *            *
132 KK    *     SUM43  *          Sum hydrographs MH43 and DVTDB4
          *            *
          **************

133 HC          HYDROGRAPH COMBINATION
                     ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

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

                    HYDROGRAPH AT STATION    SUM43

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
+ (CFS)       (HR)
                        (CFS)
+   13.       3.63                 6.          6.          6.          6.
                      (INCHES)    .441        .441        .441        .441
                       (AC-FT)     3.          3.          3.          3.

                     CUMULATIVE AREA =     .13 SQ MI


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


          **************
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```
95 SA          AREA          .2        .3        .3        .4        .5        .5       1.4

96 SE     ELEVATION     1163.00   1164.40   1165.80   1167.20   1168.60   1170.00   1176.00

97 SQ     DISCHARGE          2.        2.        2.        2.        2.        2.        2.

                                                   ***

                                   COMPUTED STORAGE-ELEVATION DATA

        STORAGE        .00       .34       .77      1.28      1.87      2.55      8.06
      ELEVATION    1163.00   1164.40   1165.80   1167.20   1168.60   1170.00   1176.00

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

                    HYDROGRAPH AT STATION     DB3B

PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                   6-HR      24-HR      72-HR     6.00-HR
  (CFS)       (HR)
                          (CFS)
     2.        .03                2.         2.         2.         2.
                        (INCHES)  .642       .642       .642       .642
                         (AC-FT)   1.         1.         1.         1.

PEAK STORAGE  TIME                        MAXIMUM AVERAGE STORAGE
                                   6-HR      24-HR      72-HR     6.00-HR
  (AC-FT)     (HR)
     4.      6.00                2.         2.         2.         2.

PEAK STAGE    TIME                        MAXIMUM AVERAGE STAGE
                                   6-HR      24-HR      72-HR     6.00-HR
  (FEET)      (HR)
 1171.55     6.00             1166.82    1166.82    1166.82    1166.82

                        CUMULATIVE AREA =     .03 SQ MI
```

*** ***

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          **************
          *            *
98 KK     *     SB3C   *          Runoff from Dtn.basin 3C
          *            *
          **************

             SUBBASIN RUNOFF DATA

99 BA          SUBBASIN CHARACTERISTICS
                     TAREA          .01  SUBBASIN AREA

               PRECIPITATION DATA

25 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
               ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
               5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                 .68    1.32    2.35    2.55    2.69    2.95     .00     .00     .00     .00     .00     .00

                                                  STORM AREA =     .01

100 LS         SCS LOSS RATE
                     STRTL          .00  INITIAL ABSTRACTION
                    CRVNBR       100.00  CURVE NUMBER
                     RTIMP       100.00  PERCENT IMPERVIOUS AREA

101 UD         SCS DIMENSIONLESS UNITGRAPH
                      TLAG          .03  LAG

                                                   ***

                                              UNIT HYDROGRAPH
                                          7 END-OF-PERIOD ORDINATES
             54.       58.       20.        7.        2.        1.        0.

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

```
87 UD          SCS DIMENSIONLESS UNITGRAPH
                     TLAG          .11  LAG

                                                   ***

                                                UNIT HYDROGRAPH
                                           18 END-OF-PERIOD ORDINATES
            10.       34.       59.       62.       52.       34.       21.       14.        9.        6.
             4.        2.        2.        1.        1.        0.        0.        0.

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

                     HYDROGRAPH AT STATION     SB3B

  TOTAL RAINFALL =    2.95, TOTAL LOSS =     .00, TOTAL EXCESS =    2.95

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
+  (CFS)      (HR)
                        (CFS)
+    60.      3.13                     5.          5.          5.          5.
                      (INCHES)      2.940       2.940       2.940       2.940
                       (AC-FT)        3.          3.          3.          3.

                      CUMULATIVE AREA =     .02 SQ MI


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


          **************
          *            *
88 KK     *     SUM3B  *          Add routed flow and runoff from SB3B
          *            *
          **************

9 HC           HYDROGRAPH COMBINATION
                    ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                   ***

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

                     HYDROGRAPH AT STATION    SUM3B

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
+  (CFS)      (HR)
                        (CFS)
+    70.      3.13                    10.         10.         10.         10.
                      (INCHES)      2.847       2.847       2.847       2.847
                       (AC-FT)        5.          5.          5.          5.

                      CUMULATIVE AREA =     .03 SQ MI


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


          **************
          *            *
90 KK     *     DB3B   *          Route combined flow through Dtn. Basin 3B
          *            *
          **************
                                   (Pump discharge of 2.25 cfs is the rate necessary to dispose
                                   of stored vol in 36 hours. It is assumed to begin immediatly
                                   after runoff occurs.)

          HYDROGRAPH ROUTING DATA

94 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
```

```
81 KK      *      CP3B  *          Route flow from Basin 3A to 3B
           *            *
           **************

              HYDROGRAPH ROUTING DATA

3 RK            KINEMATIC WAVE STREAM ROUTING
                         L        222.  CHANNEL LENGTH
                         S       .0165  SLOPE
                         N        .012  CHANNEL ROUGHNESS COEFFICIENT
                        CA         .00  CONTRIBUTING AREA
                     SHAPE        CIRC  CHANNEL SHAPE
                        WD        2.00  BOTTOM WIDTH OR DIAMETER
                         Z         .00  SIDE SLOPE
                    NDXMIN           2  MINIMUM NUMBER OF DX INTERVALS

                                                  ***
                                  COMPUTED KINEMATIC PARAMETERS
                                       VARIABLE TIME STEP
                                    (DT SHOWN IS A MINIMUM)

                 ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                              PEAK                  CELERITY
                                                   (MIN)     (FT)     (CFS)    (MIN)      (IN)      (FPS)

                 MAIN         9.66      1.25        .20     74.00     16.05   210.13      2.76     13.37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2426E+01  EXCESS= .0000E+00 OUTFLOW= .2425E+01 BASIN STORAGE= .7259E-03 PERCENT ERROR=    .0

                                       INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                 MAIN         9.66      1.25       2.00              16.05   210.00      2.76

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

                     HYDROGRAPH AT STATION     CP3B

AK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
+  (CFS)    (HR)
                      (CFS)
+    16.    3.50                     5.          5.          5.          5.
                    (INCHES)      2.756       2.756       2.756       2.756
                     (AC-FT)         2.          2.          2.          2.

                    CUMULATIVE AREA =     .02 SQ MI


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

           **************
           *            *
84 KK      *      SB3B  *          Runoff from Dtn. Basin 3B
           *            *
           **************

              SUBBASIN RUNOFF DATA

85 BA           SUBBASIN CHARACTERISTICS
                      TAREA         .02  SUBBASIN AREA

                PRECIPITATION DATA

25 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .68    1.32    2.35    2.55    2.69    2.95     .00     .00     .00     .00     .00     .00

                                                STORM AREA =     .02

86 LS           SCS LOSS RATE
                      STRTL         .00  INITIAL ABSTRACTION
                     CRVNBR      100.00  CURVE NUMBER
                      RTIMP      100.00  PERCENT IMPERVIOUS AREA
```

HYDROGRAPH AT STATION SB3A

TOTAL RAINFALL = 2.95, TOTAL LOSS = .00, TOTAL EXCESS = 2.95

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	6.00-HR
		(CFS)				
56.	3.17		5.	5.	5.	5.
		(INCHES)	2.937	2.937	2.937	2.937
		(AC-FT)	3.	3.	3.	3.

CUMULATIVE AREA = .02 SQ MI

*** ***

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              **************
              *            *
75 KK         *     DB3A   *        Route flow through Dtn. Basin 3A
              *            *
              **************
                                     (Elev - disch based on BPR inlet control nomograph)
```

HYDROGRAPH ROUTING DATA

77 RS	STORAGE ROUTING		
	NSTPS	1	NUMBER OF SUBREACHES
	ITYP	STOR	TYPE OF INITIAL CONDITION
	RSVRIC	-1.00	INITIAL CONDITION
	X	.00	WORKING R AND D COEFFICIENT

78 SA	AREA	.3	.8	1.0	1.2	1.5	1.7
79 SE	ELEVATION	1171.00	1172.80	1174.60	1176.40	1178.20	1180.00
SQ	DISCHARGE	0.	13.	24.	33.	39.	43.

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.92	2.53	4.54	6.96	9.77
ELEVATION	1171.00	1172.80	1174.60	1176.40	1178.20	1180.00

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

HYDROGRAPH AT STATION DB3A

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	6.00-HR
		(CFS)				
16.	3.50		5.	5.	5.	5.
		(INCHES)	2.757	2.757	2.757	2.757
		(AC-FT)	2.	2.	2.	2.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	6.00-HR
1.	3.50	0.	0.	0.	0.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	6.00-HR
1173.30	3.50	1171.68	1171.68	1171.68	1171.68

CUMULATIVE AREA = .02 SQ MI

*** ***

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              **************
              *            *
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NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS

                                                  ***
                          COMPUTED KINEMATIC PARAMETERS
                               VARIABLE TIME STEP
                            (DT SHOWN IS A MINIMUM)

ELEMENT    ALPHA      M        DT        DX       PEAK    TIME TO      VOLUME    MAXIMUM
                                                          PEAK                    CELERITY
                                (MIN)     (FT)     (CFS)   (MIN)        (IN)      (FPS)

MAIN        4.51     1.25       .27     83.33     13.47   218.64        .71       7.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3120E+01  EXCESS= .0000E+00 OUTFLOW= .3115E+01 BASIN STORAGE= .5172E-02 PERCENT ERROR=    .0

                                INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN        4.51     1.25      2.00              13.47   220.00        .71

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

                HYDROGRAPH AT STATION     MH43

PEAK FLOW    TIME                      MAXIMUM AVERAGE FLOW
                                 6-HR      24-HR      72-HR     6.00-HR
+  (CFS)     (HR)
                   (CFS)
   13.       3.63                 6.         6.         6.         6.
                (INCHES)         .713       .713       .713       .713
                 (AC-FT)          3.         3.         3.         3.

                CUMULATIVE AREA =     .08 SQ MI


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


          **************
          *            *
 71 KK    *     SB3A   *        Runoff To Dtn. Basin 3A
          *            *
          **************

          SUBBASIN RUNOFF DATA

 72 BA      SUBBASIN CHARACTERISTICS
                 TAREA          .02  SUBBASIN AREA

            PRECIPITATION DATA

 25 PH                          DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
            ..... HYDRO-35 ......  ............... TP-40 ...............  ........... TP-49 ...........
            5-MIN  15-MIN  60-MIN   2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
              .68    1.32    2.35   2.55    2.69    2.95     .00     .00     .00     .00     .00     .00

                                          STORM AREA =     .02

 73 LS      SCS LOSS RATE
                 STRTL          .00  INITIAL ABSTRACTION
                CRVNBR       100.00  CURVE NUMBER
                 RTIMP       100.00  PERCENT IMPERVIOUS AREA

 74 UD      SCS DIMENSIONLESS UNITGRAPH
                 TLAG          .14  LAG

                                                  ***

                                          UNIT HYDROGRAPH
                                     23 END-OF-PERIOD ORDINATES
            6.      17.      36.      48.      50.      45.      36.      24.      17.      12.
            9.       6.       4.       3.       2.       2.       1.       1.       1.       0.
            0.       0.       0.

***          ***       ***       ***       ***
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*             *
**************
                                NOTE - contrib area includes Southern Ave pump station

          SUBBASIN RUNOFF DATA

 BA          SUBBASIN CHARACTERISTICS
                 TAREA          .02  SUBBASIN AREA

             PRECIPITATION DATA

25 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
             ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
             5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
               .68    1.32    2.35    2.55    2.69    2.95     .00     .00     .00     .00     .00     .00

                                                  STORM AREA =     .02

57 LS        SCS LOSS RATE
                 STRTL          .00  INITIAL ABSTRACTION
                CRVNBR       100.00  CURVE NUMBER
                 RTIMP       100.00  PERCENT IMPERVIOUS AREA

58 UD        SCS DIMENSIONLESS UNITGRAPH
                 TLAG          .09  LAG

                                                     ***

                                                UNIT HYDROGRAPH
                                            15 END-OF-PERIOD ORDINATES
            23.      77.     106.      93.      59.      34.      21.      12.       7.       4.
             3.       1.       1.       1.       0.

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

                 HYDROGRAPH AT STATION     SB2B

  TOTAL RAINFALL =    2.95, TOTAL LOSS =     .00, TOTAL EXCESS =    2.95

 K FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
+ (CFS)     (HR)
                     (CFS)
   91.      3.10                     7.          7.          7.          7.
                   (INCHES)       2.942       2.942       2.942       2.942
                    (AC-FT)          4.          4.          4.          4.

                  CUMULATIVE AREA =     .02 SQ MI


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


          **************
          *            *
59 KK     *     SUM2B  *          Add routed flow and runoff from DB1,DB2A,and DB2B
          *            *
          **************

60 HC        HYDROGRAPH COMBINATION
                 ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                     ***

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

                 HYDROGRAPH AT STATION     SUM2B

PEAK FLOW    TIME                          MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
 (CFS)       (HR)
                     (CFS)
   94.      3.10                    10.         10.         10.         10.
                   (INCHES)       1.167       1.167       1.167       1.167
                    (AC-FT)          5.          5.          5.          5.

                  CUMULATIVE AREA =     .08 SQ MI
```

*** ***

```
              **************
              *            *
61 KK         *     DB2B   *          Route combined flow through Dtn. Basin 2B
              *            *
              **************
                                       (Elev - disch based on outlet control)

                HYDROGRAPH ROUTING DATA

63 RS             STORAGE ROUTING
                       NSTPS          1  NUMBER OF SUBREACHES
                        ITYP       STOR  TYPE OF INITIAL CONDITION
                      RSVRIC      -1.00  INITIAL CONDITION
                           X        .00 WORKING R AND D COEFFICIENT

64 SA                  AREA        1.0       1.3       1.6       1.9       2.1       2.4

65 SE             ELEVATION    1157.00   1159.40   1161.80   1164.20   1166.60   1169.00

66 SQ             DISCHARGE        0.       13.       16.       19.       21.       24.
                                                                  ***

                                                COMPUTED STORAGE-ELEVATION DATA

              STORAGE        .00      2.77      6.21     10.33     15.13     20.61
            ELEVATION    1157.00   1159.40   1161.80   1164.20   1166.60   1169.00

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

                        HYDROGRAPH AT STATION     DB2B

PEAK FLOW     TIME                              MAXIMUM AVERAGE FLOW
                                       6-HR       24-HR       72-HR      6.00-HR
 (CFS)        (HR)
                            (CFS)
     13.      3.63                       6.          6.          6.          6.
                          (INCHES)     .714        .714        .714        .714
                           (AC-FT)       3.          3.          3.          3.

PEAK STORAGE  TIME                              MAXIMUM AVERAGE STORAGE
                                       6-HR       24-HR       72-HR      6.00-HR
 (AC-FT)      (HR)
      3.      3.63                       1.          1.          1.          1.

PEAK STAGE    TIME                              MAXIMUM AVERAGE STAGE
                                       6-HR       24-HR       72-HR      6.00-HR
 (FEET)       (HR)
 1159.46      3.63                  1158.13     1158.13     1158.13     1158.13

                         CUMULATIVE AREA =      .08 SQ MI
```

*** ***

```
              **************
              *            *
67 KK         *     MH43   *          Route flow from Basin 2B to MH43
              *            *
              **************

                HYDROGRAPH ROUTING DATA

70 RK             KINEMATIC WAVE STREAM ROUTING
                           L        250.  CHANNEL LENGTH
                           S       .0036  SLOPE
                           N        .012  CHANNEL ROUGHNESS COEFFICIENT
                          CA         .00  CONTRIBUTING AREA
                       SHAPE        CIRC  CHANNEL SHAPE
                          WD        2.00  BOTTOM WIDTH OR DIAMETER
                           Z         .00  SIDE SLOPE
```

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	6.00-HR
2.	3.57	1.	1.	1.	1.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	6.00-HR
1167.87	3.57	1167.47	1167.47	1167.47	1167.47

CUMULATIVE AREA = .06 SQ MI

*** ***

```
              **************
              *            *
52 KK         *     CP2B   *        Route flow from Basin 2A to 2B
              *            *
              **************
```

HYDROGRAPH ROUTING DATA

53 RK KINEMATIC WAVE STREAM ROUTING

L	94.	CHANNEL LENGTH
S	.0021	SLOPE
N	.024	CHANNEL ROUGHNESS COEFFICIENT
CA	.00	CONTRIBUTING AREA
SHAPE	CIRC	CHANNEL SHAPE
WD	2.00	BOTTOM WIDTH OR DIAMETER
Z	.00	SIDE SLOPE
NDXMIN	2	MINIMUM NUMBER OF DX INTERVALS

***

COMPUTED KINEMATIC PARAMETERS
VARIABLE TIME STEP
(DT SHOWN IS A MINIMUM)

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	1.72	1.25	.26	31.33	6.85	214.54	.48	2.84

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1524E+01 EXCESS= .0000E+00 OUTFLOW= .1521E+01 BASIN STORAGE= .2208E-02 PERCENT ERROR= .0

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	1.72	1.25	2.00	6.85	214.00	.48

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

HYDROGRAPH AT STATION CP2B

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	6.00-HR
		(CFS)				
7.	3.57		3.	3.	3.	3.
		(INCHES)	.483	.483	.483	.483
		(AC-FT)	2.	2.	2.	2.

CUMULATIVE AREA = .06 SQ MI

*** ***

```
              **************
              *            *
54 KK         *     SB2B   *        Runoff to Dtn. Basin 2B
```

```
                    (AC-FT)        2.          2.          2.          2.

                    CUMULATIVE AREA =     .01 SQ MI


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


          **************
          *            *
 44 KK    *     SUM2A  *          Add routed flow and runoff from sub-basins 23-80,DB1,DB2A
          *            *
          **************

 45 HC          HYDROGRAPH COMBINATION
                     ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE
                                                                  ***

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

                      HYDROGRAPH AT STATION    SUM2A

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
+  (CFS)      (HR)
                        (CFS)
    44.      3.10                   6.          6.          6.          6.
                     (INCHES)      .894        .894        .894        .894
                      (AC-FT)       3.          3.          3.          3.

                    CUMULATIVE AREA =     .06 SQ MI


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


          **************
          *            *
 46 KK    *      DB2A  *          Route combined flow through Dtn. Basin 2A
          *            *
          **************
                                   (Elev - disch based on BPR inlet control nomograph)

            HYDROGRAPH ROUTING DATA

 48 RS          STORAGE ROUTING
                     NSTPS           1  NUMBER OF SUBREACHES
                      ITYP        STOR  TYPE OF INITIAL CONDITION
                    RSVRIC       -1.00  INITIAL CONDITION
                         X         .00 WORKING R AND D COEFFICIENT

 49 SA              AREA         1.9         1.9         2.0         2.0         2.1

 50 SE          ELEVATION     1167.00     1167.50     1168.00     1168.50     1169.00

 51 SQ          DISCHARGE          0.          2.          9.         13.         17.
                                                                  ***

                                                COMPUTED STORAGE-ELEVATION DATA

          STORAGE        .00         .95        1.94        2.95        3.98
        ELEVATION    1167.00     1167.50     1168.00     1168.50     1169.00

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

                      HYDROGRAPH AT STATION     DB2A

K FLOW        TIME                          MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
  (CFS)       (HR)
                        (CFS)
+     7.      3.57                   3.          3.          3.          3.
                     (INCHES)      .484        .484        .484        .484
                      (AC-FT)       2.          2.          2.          2.
```

```
                                                (MIN)      (FT)     (CFS)     (MIN)       (IN)      (FPS)

                MAIN          3.41      1.25       .44     73.20      2.60      3.97       .49      4.03

TINUITY SUMMARY (AC-FT) - INFLOW= .1286E+01  EXCESS= .0000E+00 OUTFLOW= .1281E+01 BASIN STORAGE= .4518E-02 PERCENT ERROR=    .0

                                        INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                MAIN          3.41      1.25      2.00                2.60      4.00       .49
   ***            ***            ***            ***            ***

                    HYDROGRAPH AT STATION     CP2A

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
+  (CFS)      (HR)
                        (CFS)
     3.       .07                   3.          3.          3.          3.
                      (INCHES)     .487        .487        .487        .487
                       (AC-FT)      1.          1.          1.          1.

                      CUMULATIVE AREA =     .05 SQ MI


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

          **************
          *            *
 40 KK    *     SB2A   *          Runoff from sub-basin between existing 'Ramp C' and I-10
          *            *
          **************

            SUBBASIN RUNOFF DATA

 41 BA        SUBBASIN CHARACTERISTICS
                    TAREA         .01  SUBBASIN AREA

              PRECIPITATION DATA

 25 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
              ..... HYDRO-35 ......  ............... TP-40 ...............  ........... TP-49 ...........
              5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                .68    1.32    2.35    2.55    2.69    2.95     .00     .00     .00     .00     .00     .00

                                                STORM AREA =     .01

 42 LS        SCS LOSS RATE
                    STRTL         .00  INITIAL ABSTRACTION
                   CRVNBR      100.00  CURVE NUMBER
                    RTIMP      100.00  PERCENT IMPERVIOUS AREA

 43 UD        SCS DIMENSIONLESS UNITGRAPH
                     TLAG         .07  LAG

                                                  ***

                                              UNIT HYDROGRAPH
                                          12 END-OF-PERIOD ORDINATES
            16.       50.       53.       34.       17.        9.        5.        3.        1.        1.
             0.        0.

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

                    HYDROGRAPH AT STATION     SB2A

 TOTAL RAINFALL =    2.95, TOTAL LOSS =     .00, TOTAL EXCESS =    2.95

AK FLOW       TIME                          MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
 (CFS)        (HR)
                        (CFS)
+    41.      3.10                  3.          3.          3.          3.
                      (INCHES)    2.944       2.944       2.944       2.944
```

```
LENGTH, ELEVATION      FEET
FLOW                   CUBIC FEET PER SECOND
STORAGE VOLUME         ACRE-FEET
SURFACE AREA           ACRES
TEMPERATURE            DEGREES FAHRENHEIT
```

*** ***

```
              **************
              *            *
23 KK         *     SB1    *        Runoff from sub-basins 23-80 @ HDW9
              *            *
              **************

          SUBBASIN RUNOFF DATA

24 BA        SUBBASIN CHARACTERISTICS
                 TAREA          .05  SUBBASIN AREA

             PRECIPITATION DATA

25 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
             ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
             5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
               .68    1.32    2.35    2.55    2.69    2.95     .00     .00     .00     .00     .00     .00

                                                STORM AREA =     .05

26 LS        SCS LOSS RATE
                 STRTL          .00  INITIAL ABSTRACTION
                CRVNBR       100.00  CURVE NUMBER
                 RTIMP       100.00  PERCENT IMPERVIOUS AREA

27 UD        SCS DIMENSIONLESS UNITGRAPH
                 TLAG           .26  LAG

                                                  ***

                                              UNIT HYDROGRAPH
                                         41 END-OF-PERIOD ORDINATES
             4.      12.      23.      38.      57.      73.      82.      86.      85.      80.
            72.      63.      52.      41.      33.      27.      23.      19.      16.      13.
            10.       9.       7.       6.       5.       4.       3.       3.       2.       2.
             1.       1.       1.       1.       1.       1.       0.       0.       0.       0.
             0.

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

                  HYDROGRAPH AT STATION      SB1

  TOTAL RAINFALL =    2.95, TOTAL LOSS =     .00, TOTAL EXCESS =    2.95

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
 (CFS)        (HR)
                          (CFS)
+   125.      3.30                    16.         16.         16.         16.
                         (INCHES)   2.926       2.926       2.926       2.926
                          (AC-FT)      8.          8.          8.          8.

                         CUMULATIVE AREA =     .05 SQ MI
```

*** ***

```
              **************
              *            *
8 KK          *     DB1    *        Route combined flow through Dtn. Basin 1 (ASSUMED PUMP)
              *            *
              **************

                               (Pump discharge of 2.6 cfs is the rate necessary to dispose
                               of stored vol in 36 hours. It is assumed to begin immediatly
                               after runoff occurs.)
```

```
158          ZZ
1
     SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
LINE  (V) ROUTING          (--->) DIVERSION OR PUMP FLOW
NO.   (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW
 23      SB1
          V
          V
 28      DB1
          V
          V
 36     CP2A
         .
         .
 40      .        SB2A
         .          .
         .          .
 44    SUM2A............
          V
          V
 46     DB2A
          V
          V
 52     CP2B
         .
         .
 54      .        SB2B
         .          .
         .          .
 59    SUM2B............
          V
          V
 61     DB2B
          V
          V
 67     MH43
         .
         .
 71      .        SB3A
         .          V
         .          V
 75      .        DB3A
         .          V
         .          V
 81      .        CP3B
         .          .
         .          .
 84      .          .        SB3B
         .          .          .
         .          .          .
 88      .      SUM3B............
         .          V
         .          V
 90      .        DB3B
         .          .
         .          .
 98      .          .        SB3C
         .          .          .
         .          .          .
102      .      SUM3C............
         .          V
         .          V
104      .        DB3C
         .          V
         .          V
110      .      CPDB4
         .          .
         .          .
112      .          .       RampA
         .          .          .
         .          .          .
 6       .     SUMDB4............
         .          V
         .          V
118      .         DB4
         .          .
         .          .
```

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*          SEPTEMBER 1990               *
*           VERSION 4.0                 *
*                                       *
*  RUN DATE  04/28/1992  TIME  13:04:55 *
*                                       *
*****************************************
```

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

HEC-1 INPUT PAGE 1

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

  1           ID
  2           ID        I-10/SUPERSTITION/BASELINE  UNIT 1
  3           ID        STANLEY CONSULTANTS # 10591
  4           ID        FILENAME : 50UNIT1     DATE : 28 APR 1992
  5           ID        DESIGN FREQUENCY = 50YR
  6           ID        SCS DIMENSIONLESS UNIT HYDROGRAPH
  7           ID        AREAS TAKEN FROM STANLEY FINAL REPORT
  8           ID        TC FROM ASSUMED FLOW VEL AND INLET TIME AS FOLLOWS:
  9           ID            *Sheet/Overland Flow = 1-3 fps
 10           ID            *Gutter Flow = 2-4 fps
 11           ID            *Channel/Ditch Flow = 3-5 fps
 12           ID            *Pipe Flow = 5-10 fps
 13           ID            *No assumed inlet time
 14           ID            *Min TC in Corresponding Rational Analysis = 10 mins.
 15           ID        LAG TIME = 0.6 * TIME OF CONCENTRATION
 16           ID        ADOT LETTER OF 12-12-90:
 17           ID            * 6HR RAINFALL DISTRIBUTION USING PH RECORD
 18           ID            * TABULATION INTERVAL = 2MIN; 181 HYDROGRAPH ORDINATES
 19           ID            * BASIN AREA = C * A; 100% IMPERVIOUS
 20           ID
              *DIAGRAM
 21           IT       2                    181
 22           IO       3

 23           KK     SB1     Runoff from sub-basins 23-80 @ HDW9
 24           BA  0.0493
 25           PH                    .68    1.32    2.35    2.55    2.69    2.95
 26           LS             100    100
 27           UD  0.2602

 28           KK     DB1     Route combined flow through Dtn. Basin 1 (ASSUMED PUMP)
 29           KM             (Pump discharge of 2.6 cfs is the rate necessary to dispose
 30           KM             of stored vol in 36 hours. It is assumed to begin immediatly
 31           KM             after runoff occurs.)
 32           RS       1    STOR      -1
 33           SA  0.1210  0.5690  1.0171  1.4650  1.9131  2.1834  2.4538  2.7241  2.9945  3.2648
 34           SE    1150 1155.25  1160.5 1165.75    1171  1172.8  1174.6  1176.4  1178.2    1180
 35           SQ     2.6     2.6     2.6     2.6     2.6     2.6     2.6     2.6     2.6     2.6

 36           KK    CP2A     Route to Dtn.Basin 2A
 37           RK     282  0.0027   0.012            CIRC       2
 38           RK     400  0.0006   0.030            TRAP       3
```

```
 39          RK     366  0.0082   0.024            CIRC       2

 40          KK    SB2A     Runoff from sub-basin between existing 'Ramp C' and I-10
 41          BA  0.0098
 42          LS             100     100
 43          UD  0.0694

 44          KK   SUM2A     Add routed flow and runoff from sub-basins 23-80,DB1,DB2A
 45          HC
                                          HEC-1 INPUT                                          PAGE  2

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


 46          KK    DB2A     Route combined flow through Dtn. Basin 2A
 47          KM             (Elev - disch based on BPR inlet control nomograph)
 48          RS       1    STOR      -1
 49          SA  1.8825  1.9367  1.9909  2.0452  2.0994
 50          SE    1167  1167.5    1168  1168.5    1169
 51          SQ       0       2     8.5   12.75      17

 52          KK    CP2B     Route flow from Basin 2A to 2B
 53          RK      94  0.0021   0.024            CIRC       2

 54          KK    SB2B     Runoff to Dtn. Basin 2B
 55          KM             NOTE - contrib area includes Southern Ave pump station
 56          BA  0.0228
 57          LS             100     100
 58          UD  0.0872

 59          KK   SUM2B     Add routed flow and runoff from DB1,DB2A,and DB2B
 60          HC

 61          KK    DB2B     Route combined flow through Dtn. Basin 2B
 62          KM             (Elev - disch based on outlet control)
 63          RS       1    STOR      -1
 64          SA  1.0147  1.2965  1.5784  1.8602  2.1421  2.4239
 65          SE    1157  1159.4  1161.8  1164.2  1166.6    1169
 66          SQ       0    13.4    16.1    18.7    21.4    24.0

 67          KK    MH43     Route flow from Basin 2B to MH43
 68          RK     455  0.0015   0.012            CIRC       2
 69          RK     404  0.0030   0.012            CIRC       2
 70          RK     250  0.0036   0.012            CIRC       2

 71          KK    SB3A     Runoff To Dtn. Basin 3A
 72          BA  0.0165
 73          LS             100     100
 74          UD  0.1416

 75          KK    DB3A     Route flow through Dtn. Basin 3A
 76          KM             (Elev - disch based on BPR inlet control nomograph)
 77          RS       1    STOR      -1
 78          SA  0.2732  0.7886  1.0101  1.2317  1.4532  1.6749
 79          SE    1171  1172.8  1174.6  1176.4  1178.2    1180
 80          SQ       0      13      24    32.5      39    42.5

 81          KK    CP3B     Route flow from Basin 3A to 3B
 82          RK     260  0.0160   0.012            CIRC       2
 83          RK     222  0.0165   0.012            CIRC       2

 84          KK    SB3B     Runoff from Dtn. Basin 3B
 85          BA  0.0161
 86          LS             100     100
 87          UD  0.1070
                                          HEC-1 INPUT                                          PAGE  3

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


 88          KK   SUM3B     Add routed flow and runoff from SB3B
 89          HC

 90          KK    DB3B     Route combined flow through Dtn. Basin 3B
 91          KM             (Pump discharge of 2.25 cfs is the rate necessary to dispose
 92          KM             of stored vol in 36 hours. It is assumed to begin immediatly
 93          KM             after runoff occurs.)
 94          RS       1    STOR
 95          SA  0.2134  0.2741  0.3347  0.3954  0.4561  0.5168  1.3906
 96          SE    1163  1164.4  1165.8  1167.2  1168.6    1170    1176
```

```
129          .          .-------->   TEMPE
126          .      DVTDB4
             .          .
             .          .
132      SUM43............
             V
             V
134      MH63
             .
             .
137          .      SUB135
             .          .
             .          .
141     SUM135............
             V
             V
143      RCHE
             .
             .
152          .        SUBE
             .          .
             .          .
156      SUME............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*          SEPTEMBER 1990              *
*           VERSION 4.0                *
*                                      *
*  RUN DATE  04/28/1992  TIME  13:04:55 *
*                                      *
****************************************
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*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
```

```
I-10/SUPERSTITION/BASELINE  UNIT 1
STANLEY CONSULTANTS # 10591
FILENAME : 50UNIT1     DATE : 28 APR 1992
DESIGN FREQUENCY = 50YR
SCS DIMENSIONLESS UNIT HYDROGRAPH
AREAS TAKEN FROM STANLEY FINAL REPORT
TC FROM ASSUMED FLOW VEL AND INLET TIME AS FOLLOWS:
    *Sheet/Overland Flow = 1-3 fps
    *Gutter Flow = 2-4 fps
    *Channel/Ditch Flow = 3-5 fps
    *Pipe Flow = 5-10 fps
    *No assumed inlet time
    *Min TC in Corresponding Rational Analysis = 10 mins.
LAG TIME = 0.6 * TIME OF CONCENTRATION
ADOT LETTER OF 12-12-90:
    * 6HR RAINFALL DISTRIBUTION USING PH RECORD
    * TABULATION INTERVAL = 2MIN; 181 HYDROGRAPH ORDINATES
    * BASIN AREA = C * A; 100% IMPERVIOUS
```

```
22 IO          OUTPUT CONTROL VARIABLES
                     IPRNT           3  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE

   IT          HYDROGRAPH TIME DATA
                      NMIN           2  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1    0  STARTING DATE
                     ITIME        0000  STARTING TIME
                        NQ         181  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      1    0  ENDING DATE
                    NDTIME        0600  ENDING TIME
                     ICENT          19  CENTURY MARK

              COMPUTATION INTERVAL     .03 HOURS
                   TOTAL TIME BASE    6.00 HOURS

        ENGLISH UNITS
            DRAINAGE AREA          SQUARE MILES
            PRECIPITATION DEPTH    INCHES
```

```
 97          SQ    2.25    2.25    2.25    2.25    2.25    2.25    2.25

 98          KK    SB3C     Runoff from Dtn.basin 3C
 99          BA  0.0073
100          LS             100     100
101          UD  0.0333

102          KK   SUM3C     Add routed flow and runoff from Dtn. Basin 3c
103          HC

104          KK    DB3C     Route combined flow through Dtn. Basin 3C
105          KM             (Elev - disch based on BPR inlet control nomograph)
106          RS       1    STOR
107          SA  0.6936  0.7033  0.7130  0.7228  0.7325  0.7422  0.7522  0.7622  0.7722
108          SE  1168.5 1168.75    1169 1169.25  1169.5 1169.75 1170.00 1170.25 1170.50
109          SQ       0       0       0       1       2       3    4.25    6.25    8.50

110          KK   CPDB4     Route DB3C to DB4
111          RK     950   0.005   0.025            TRAP       5       4

112          KK   RampA     Runoff from existing SR360 westbound and existing "Ramp A"
113          BA  0.0105
114          LS             100     100
115          UD  0.1850

116          KK  SUMDB4     Add RampA and CPDB4
117          HC

118          KK     DB4     Route combined flow through Southern Ave. det basin
119          KM             (Elev - disch based on combined capacities of existing 16 inch
120          KM             pipe at east end of basin and proposed surface inlet grate at
121          KM             west end)
122          RS       1    STOR
123          SA  0.0356  0.2594  0.7071  1.1548  1.6024  2.0500
124          SE  1158.5    1159    1160    1161    1162    1163
125          SQ       0       0       3       7      10      12

126          KK  DVTDB4     Split hydrograph DB4.
127          KM             NOTE - New inlet grate at west end of Southern Ave det basin
128          KM                    is blocked off until Unit 2 is constructed.
129          DT   TEMPE
130          DI       0       0       3       7      10      12
131          DQ       0       0       3       7      10      12
```



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

132          KK   SUM43     Sum hydrographs MH43 and DVTDB4
133          HC

134          KK    MH63     Route SUM43 to DMJM tie-in at 8152+00,119'lt.
135          RK     124  0.0037   0.012            CIRC     2.0
136          RK     299  0.0040   0.012            CIRC     2.0

137          KK  SUB135  Runoff from sub-basin 135
138          BA   0.002
139          LS             100     100
140          UD    0.10

141          KK  SUM135     Sum hydrographs SUB135 and MH63
142          HC

143          KK    RCHE     Route SUM135 to DMJM det basin E near Bell Butte
144          RK     300  0.0030   0.012            CIRC     2.0
145          RK     350  0.0030   0.012            CIRC     2.5
146          RK     450  0.0030   0.012            CIRC     2.5
147          RK     246  0.0020   0.012            CIRC     4.0
148          RK     331  0.0010   0.012            CIRC     4.0
149          RK     361  0.0010   0.012            CIRC     4.5
150          RK     322  0.0025   0.012            CIRC     5.0
151          RK    1442  0.0010   0.012            CIRC     5.0

152          KK    SUBE  RUNOFF FROM SUB-BASIN E
153          BA   0.064
154          LS             100     100
155          UD    0.20

156          KK    SUME     Sum hydrographs SUBE and RCHE
157          HC
```

HYDROGRAPH ROUTING DATA

```
32 RS        STORAGE ROUTING
                  NSTPS          1  NUMBER OF SUBREACHES
                   ITYP       STOR  TYPE OF INITIAL CONDITION
                 RSVRIC      -1.00  INITIAL CONDITION
                      X        .00  WORKING R AND D COEFFICIENT

33 SA           AREA          .1       .6      1.0      1.5      1.9      2.2      2.5      2.7      3.0      3.3

34 SE        ELEVATION     1150.00  1155.25  1160.50  1165.75  1171.00  1172.80  1174.60  1176.40  1178.20  1180.00

35 SQ        DISCHARGE        3.       3.       3.       3.       3.       3.       3.       3.       3.       3.
```

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	1.67	5.77	12.25	21.09	24.78	28.95	33.61	38.75	44.38
ELEVATION	1150.00	1155.25	1160.50	1165.75	1171.00	1172.80	1174.60	1176.40	1178.20	1180.00

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

HYDROGRAPH AT STATION DB1

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	6.00-HR
		(CFS)				
+ 3.	.03		3.	3.	3.	3.
		(INCHES)	.489	.489	.489	.489
		(AC-FT)	1.	1.	1.	1.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	6.00-HR
6.	5.60	3.	3.	3.	3.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	6.00-HR
1161.08	5.67	1155.16	1155.16	1155.16	1155.16

CUMULATIVE AREA = .05 SQ MI

*** ***

```
             **************
             *            *
36 KK        *     CP2A   *        Route to Dtn.Basin 2A
             *            *
             **************
```

HYDROGRAPH ROUTING DATA

```
39 RK        KINEMATIC WAVE STREAM ROUTING
                       L       366.  CHANNEL LENGTH
                       S      .0082  SLOPE
                       N       .024  CHANNEL ROUGHNESS COEFFICIENT
                      CA        .00  CONTRIBUTING AREA
                   SHAPE       CIRC  CHANNEL SHAPE
                      WD       2.00  BOTTOM WIDTH OR DIAMETER
                       Z        .00  SIDE SLOPE
                  NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS
```

***

COMPUTED KINEMATIC PARAMETERS
VARIABLE TIME STEP
(DT SHOWN IS A MINIMUM)

ELEMENT	ALPHA	M	DT	DX	PEAK	TIME TO PEAK	VOLUME	MAXIMUM CELERITY

```
                .          .          .
 84             .       SUM3B............
                .          V
                .          V
 86             .        DB3B
                .          .
                .          .
 94             .          .        SB3C
                .          .          .
                .          .          .
 98             .       SUM3C............
                .          V
                .          V
100             .        DB3C
                .          V
                .          V
106             .       CPDB4
                .          .
                .          .
108             .          .       RampA
                .          .          .
                .          .          .
112             .      SUMDB4............
                .          V
                .          V
114             .         DB4
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*            SEPTEMBER 1990            *
*             VERSION 4.0              *
*                                      *
*  RUN DATE  04/28/1992  TIME  13:15:01 *
*                                      *
****************************************
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****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
```

```
I-10/SUPERSTITION/BASELINE  UNIT 1
STANLEY CONSULTANTS # 10591
FILENAME : 100UNIT1     DATE : 28 APR 1992
DESIGN FREQUENCY = 100YR
SCS DIMENSIONLESS UNIT HYDROGRAPH
AREAS TAKEN FROM STANLEY FINAL REPORT
TC FROM ASSUMED FLOW VEL AND INLET TIME AS FOLLOWS:
    *Sheet/Overland Flow = 1-3 fps
    *Gutter Flow = 2-4 fps
    *Channel/Ditch Flow = 3-5 fps
    *Pipe Flow = 5-10 fps
    *No assumed inlet time
    *Min TC in Corresponding Rational Analysis = 10 mins.
LAG TIME = 0.6 * TIME OF CONCENTRATION
ADOT LETTER OF 12-12-90:
    * 6HR RAINFALL DISTRIBUTION USING PH RECORD
    * TABULATION INTERVAL = 2MIN; 181 HYDROGRAPH ORDINATES
    * BASIN AREA = C * A; 100% IMPERVIOUS
```

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

   IT          HYDROGRAPH TIME DATA
                      NMIN          2  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1    0  STARTING DATE
                     ITIME       0000  STARTING TIME
                        NQ        181  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      1    0  ENDING DATE
                    NDTIME       0600  ENDING TIME
                     ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL     .03 HOURS
                     TOTAL TIME BASE    6.00 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

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	SB1	144.	3.30	18.	18.	18.	.05		
ROUTED TO	DB1	3.	.03	3.	3.	3.	.05	1161.92	5.90
ROUTED TO	CP2A	3.	.07	3.	3.	3.	.05		
HYDROGRAPH AT	SB2A	47.	3.10	4.	4.	4.	.01		
2 COMBINED AT	SUM2A	50.	3.10	6.	6.	6.	.06		
ROUTED TO	DB2A	8.	3.57	3.	3.	3.	.06	1167.95	3.57
ROUTED TO	CP2B	8.	3.57	3.	3.	3.	.06		
HYDROGRAPH AT	SB2B	104.	3.10	8.	8.	8.	.02		
2 COMBINED AT	SUM2B	108.	3.10	12.	12.	12.	.08		
ROUTED TO	DB2B	14.	3.67	7.	7.	7.	.08	1159.77	3.67
HYDROGRAPH AT	SB3A	64.	3.17	6.	6.	6.	.02		
ROUTED TO	DB3A	18.	3.50	6.	6.	6.	.02	1173.55	3.50
ROUTED TO	CP3B	18.	3.50	6.	6.	6.	.02		
HYDROGRAPH AT	SB3B	69.	3.13	6.	6.	6.	.02		
2 COMBINED AT	SUM3B	81.	3.13	11.	11.	11.	.03		
ROUTED TO	DB3B	2.	.03	2.	2.	2.	.03	1172.26	5.97
HYDROGRAPH AT	SB3C	39.	3.03	3.	3.	3.	.01		
2 COMBINED AT	SUM3C	42.	3.03	5.	5.	5.	.04		
ROUTED TO	DB3C	8.	3.43	3.	3.	3.	.04	1170.43	3.43

ROUTED TO	CPDB4	8.	3.50	3.	3.	3.	.04		
HYDROGRAPH AT	RampA	36.	3.20	4.	4.	4.	.01		
2 COMBINED AT	SUMDB4	43.	3.23	7.	7.	7.	.05		
ROUTED TO	DB4	8.	4.03	4.	4.	4.	.05	1161.24	4.07

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)
CP2A	MANE	.44	2.60	3.97	.49	2.00	2.60	4.00	.49

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1286E+01 EXCESS= .0000E+00 OUTFLOW= .1281E+01 BASIN STORAGE= .4518E-02 PERCENT ERROR= .0

CP2B	MANE	.26	7.84	214.39	.53	2.00	7.84	214.00	.53

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1687E+01 EXCESS= .0000E+00 OUTFLOW= .1684E+01 BASIN STORAGE= .2318E-02 PERCENT ERROR= .0

CP3B	MANE	.11	17.57	210.19	3.12	2.00	17.57	210.00	3.12

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2751E+01 EXCESS= .0000E+00 OUTFLOW= .2750E+01 BASIN STORAGE= .1020E-02 PERCENT ERROR= .0

CPDB4	MANE	1.77	7.88	210.31	.66	2.00	7.88	210.00	.66

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1435E+01 EXCESS= .0000E+00 OUTFLOW= .1412E+01 BASIN STORAGE= .2552E-01 PERCENT ERROR= -.1

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

```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*          SEPTEMBER 1990              *
*           VERSION 4.0                *
*                                      *
*  RUN DATE  09/09/1992  TIME  10:50:58 *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    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        I10/SUPERSTITION/BASELINE
  3           ID        STANLEY CONSULTANTS # 10591
  4           ID        FILENAME : 50UNIT2     DATE : 9 SEPT 1992
  5           ID        DESIGN FREQUENCY = 50YR
  6           ID        SCS DIMENSIONLESS UNIT HYDROGRAPH
  7           ID        AREAS TAKEN FROM STANLEY FINAL DESIGN
  8           ID        TC FROM ASSUMED FLOW VEL AND INLET TIME AS FOLLOWS:
  9           ID            *Sheet/Overland Flow = 1-3 fps
 10           ID            *Gutter Flow = 2-4 fps
 11           ID            *Channel/Ditch Flow = 3-5 fps
 12           ID            *Pipe Flow = 5-10 fps
 13           ID            *No assumed inlet time
 14           ID            *Min TC in Corresponding Rational Analysis = 10 mins.
 15           ID        LAG TIME = 0.6 * TIME OF CONCENTRATION
 16           ID        ADOT LETTER OF 12-12-90:
 17           ID            * 6HR RAINFALL DISTRIBUTION USING PH RECORD
 18           ID            * TABULATION INTERVAL = 2MIN; 181 HYDROGRAPH ORDINATES
 19           ID            * BASIN AREA = C * A; 100% IMPERVIOUS
 20           ID
              *DIAGRAM
 21           IT       2                    181
 22           IO       3

 23           KK     SB1     Runoff from sub-basins 22-87,Dtn.Basin 1 @ HDW9
 24           BA  0.0795
 25           PH                   .68    1.32    2.35    2.55    2.69    2.95
 26           LS             100    100
 27           UD  0.2601

 28           KK     DB1     Route flow through Dtn. Basin 1
 29           KM             (Elev - disch based on BPR inlet control nomograph)
 30           RS       1    STOR      -1
 31           SA  1.9131  2.5139  3.2648
 32           SE    1171    1175    1180
 33           SQ       0      28      45

 34           KK    CP2A     Route flow from Basin 1 to Basin 2A
 35           RK     140  0.0066   0.012           CIRC     2.0
 36           RK     178  0.0015   0.012           CIRC     2.0

 37           KK    SB2A     Runoff into and from Dtn.Basin 2A
```

```
38          BA  0.0086
39          LS              100      100
40          UD  0.0955

41          KK    SB3A      Runoff at Dtn. Basin 3A
42          BA  0.0096
43          LS              100      100
44          UD  0.0723
```



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

45          KK    DB3A      Route flow through Dtn. Basin 3A
46          KM              (Elev - disch based on BPR inlet control nomograph)
47          RS       1    STOR      -1
48          SA  0.2732  0.7886  1.0101  1.2317  1.4532  1.6749
49          SE    1171  1172.8  1174.6  1176.4  1178.2    1180
50          SQ       0      11      24    32.5      40      43

51          KK    CP3B      Route flow from Basin 3A to Basin 3B
52          RK     255  0.0127   0.012            CIRC     2.0
53          RK     207  0.0161   0.012            CIRC     2.0

54          KK    SB3B      Runoff from Dtn. Basin 3B
55          BA  0.0290
56          LS              100      100
57          UD  0.1387

58          KK   SUM3B      Add routed flow and runoff from sub-basin SB3B
59          HC

60          KK    DB3B      Route combined flow through Dtn. Basin 3B
61          KM              (Elev - disch based on BPR inlet control nomograph)
62          KM              (See line K7,24" RCP)
63          RS       1    STOR      -1
64          SA       0  1.9216  2.1740  2.3423  2.5105  2.6788  2.8470  3.0994
65          SE  1162.5    1163  1164.5  1165.5  1166.5  1167.5  1168.5    1170
66          SQ       0    4.25      14      22      29      33      38      45

67          KK   SUM2A      Add routed flow and runoff from sub-basin DB2A
68          HC       3

69          KK    DB2A      Route combined flow through Dtn. Basin 2A
70          KM              (Elev - disch based on BPR inlet control nomograph)
71          KM              (See lines N1,N2,36" RCP)
72          RS       1    STOR      -1
73          SA  2.0960  2.1830  2.2700  2.4093  2.7052
74          SE    1162  1162.5    1163  1163.8  1165.5
75          SQ       0       4       7      16      46

76          KK   SB131      Runoff from Sub-basins 124-31
77          BA  0.0147
78          LS              100      100
79          UD  0.0542

80          KK    SB2B      Runoff from Dtn.Basin 2B
81          KM              NOTE-contrib area includes Southern Ave pump station
82          BA  0.0248
83          LS              100      100
84          UD  0.1691
```



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

85          KK   SUM2B      Add routed and local flows
86          HC       3

87          KK    DB2B      Route combined flow through Dtn. Basin 2B
88          KM              (Elev - disch based on outlet control)
89          RS       1    STOR      -1
90          SA  3.8039  3.9930  4.1821  4.3711  4.5602  4.7493  4.9383  5.1274
91          SE    1157    1158    1159    1160    1161    1162    1163    1164
92          SQ       0     4.5      13      14    15.1    16.2    17.3    18.4

93          KK    MH43      Route flow from Basin 2B to MH43
94          RK     262  0.0021   0.012            CIRC     2.0
95          RK     836  0.0027   0.012            CIRC     2.0
```

```
 96          KK    SB43     Runoff from off-roadway areas to Southern Ave basin
 97          BA  0.0014
 98          LS             100     100
 99          UD  0.0392

100          KK     DB4     Route flow through Southern Ave. det basin
101          KM             (Elev - disch based on combined capacities of existing 16 inch
102          KM             pipe at east end of basin and proposed surface inlet grate at
103          KM             west end)
104          RS       1    STOR      -1
105          SA  0.0356  0.2594  0.7071  1.1548  1.6024  2.0500
106          SE  1158.5    1159    1160    1161    1162    1163
107          SQ       0       5      15      22      28      33

108          KK  DVTDB4     Split hydrograph DB4.
109          KM             NOTE - New inlet grate at west end of Southern Ave det basin
110          KM                    is opened up after Unit 2 is constructed.
111          DT   TEMPE
112          DI       0       5      15      22      28      33
113          DQ       0       0       3       7      10      12

114          KK   SUM43     Sum hydrographs MH43 and DVTDB4
115          HC

116          KK    MH63     Route SUM43 to DMJM tie-in at 8152+00,119'lt.
117          RK     124  0.0027   0.012            CIRC     2.0
118          RK     299  0.0028   0.012            CIRC     2.0

119          KK  SUB135     Runoff from sub-basin 135 (DMJM)
120          BA   0.002
121          LS             100     100
122          UD    0.10

123          KK  SUM135     Sum hydrographs SUB135 and MH63
124          HC
```



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

125          KK    RCHE     Route SUM135 to DMJM det basin E near Bell Butte
126          RK     300  0.0030   0.012            CIRC     2.0
127          RK     350  0.0030   0.012            CIRC     2.5
128          RK     450  0.0030   0.012            CIRC     2.5
129          RK     246  0.0020   0.012            CIRC     4.0
130          RK     331  0.0010   0.012            CIRC     4.0
131          RK     361  0.0010   0.012            CIRC     4.5
132          RK     322  0.0025   0.012            CIRC     5.0
133          RK    1442  0.0010   0.012            CIRC     5.0

134          KK    SUBE  RUNOFF FROM SUB-BASIN E
135          BA   0.064
136          LS             100     100
137          UD    0.20

138          KK    SUME     Sum hydrographs SUBE and RCHE
139          HC
140          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

 23        SB1
            V
            V
 28        DB1
            V
            V
 34       CP2A
            .
            .
            .        SB2A
            .           .
            .           .
 41         .           .        SB3A
            .           .           V
            .           .           V
```

```
 45          .           .        DB3A
             .           .           V
             .           .           V
 51          .           .        CP3B
             .           .           .
             .           .           .
 54          .           .           .        SB3B
             .           .           .           .
             .           .           .           .
 58          .           .       SUM3B............
             .           .           V
             .           .           V
 60          .           .        DB3B
             .           .           .
             .           .           .
 67      SUM2A......................
             V
             V
 69      DB2A
             .
             .
 76          .       SB131
             .           .
             .           .
 80          .           .        SB2B
             .           .           .
             .           .           .
 85      SUM2B......................
             V
             V
 87      DB2B
             V
             V
 93      MH43
             .
             .
 96          .        SB43
             .           V
             .           V
 0           .         DB4
             .           .
             .           .
111          .           .-------> TEMPE
108          .      DVTDB4
             .           .
             .           .
114      SUM43............
             V
             V
116      MH63
             .
             .
119          .      SUB135
             .           .
             .           .
123     SUM135............
             V
             V
125      RCHE
             .
             .
134          .        SUBE
             .           .
             .           .
138      SUME............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*          SEPTEMBER 1990               *
*           VERSION 4.0                 *
*                                       *
*  IN DATE  09/09/1992  TIME  10:50:58  *
*                                       *
*****************************************
```

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

```
                    I10/SUPERSTITION/BASELINE
                    STANLEY CONSULTANTS # 10591
                    FILENAME : 50UNIT2     DATE : 9 SEPT 1992
                    DESIGN FREQUENCY = 50YR
                    SCS DIMENSIONLESS UNIT HYDROGRAPH
                    AREAS TAKEN FROM STANLEY FINAL DESIGN
                    TC FROM ASSUMED FLOW VEL AND INLET TIME AS FOLLOWS:
                        *Sheet/Overland Flow = 1-3 fps
                        *Gutter Flow = 2-4 fps
                        *Channel/Ditch Flow = 3-5 fps
                        *Pipe Flow = 5-10 fps
                        *No assumed inlet time
                        *Min TC in Corresponding Rational Analysis = 10 mins.
                    LAG TIME = 0.6 * TIME OF CONCENTRATION
                    ADOT LETTER OF 12-12-90:
                        * 6HR RAINFALL DISTRIBUTION USING PH RECORD
                        * TABULATION INTERVAL = 2MIN; 181 HYDROGRAPH ORDINATES
                        * BASIN AREA = C * A; 100% IMPERVIOUS


22 IO        OUTPUT CONTROL VARIABLES
                   IPRNT          3  PRINT CONTROL
                   IPLOT          0  PLOT CONTROL
                   QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT        HYDROGRAPH TIME DATA
                    NMIN          2  MINUTES IN COMPUTATION INTERVAL
                   IDATE      1   0  STARTING DATE
                   ITIME       0000  STARTING TIME
                      NQ        181  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE      1   0  ENDING DATE
                  NDTIME       0600  ENDING TIME
                   ICENT         19  CENTURY MARK

             COMPUTATION INTERVAL     .03 HOURS
                  TOTAL TIME BASE    6.00 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


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


          **************
          *            *
23 KK     *      SB1   *          Runoff from sub-basins 22-87,Dtn.Basin 1 @ HDW9
          *            *
          **************

             SUBBASIN RUNOFF DATA

24 BA        SUBBASIN CHARACTERISTICS
                   TAREA        .08  SUBBASIN AREA

             PRECIPITATION DATA

25 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
             ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
             5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
               .68    1.32    2.35    2.55    2.69    2.95     .00     .00     .00     .00     .00     .00

                                                STORM AREA =     .08

   LS        SCS LOSS RATE
                   STRTL        .00  INITIAL ABSTRACTION
                  CRVNBR     100.00  CURVE NUMBER
                   RTIMP     100.00  PERCENT IMPERVIOUS AREA

27 UD        SCS DIMENSIONLESS UNITGRAPH
                    TLAG        .26  LAG
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***

UNIT HYDROGRAPH
41 END-OF-PERIOD ORDINATES

6.	19.	37.	61.	92.	117.	133.	138.	138.	129.
117.	102.	83.	66.	54.	44.	36.	30.	25.	20.
17.	14.	11.	9.	8.	6.	5.	4.	4.	3.
2.	2.	2.	1.	1.	1.	1.	1.	0.	0.
0.									

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

HYDROGRAPH AT STATION SB1

TOTAL RAINFALL = 2.95, TOTAL LOSS = .00, TOTAL EXCESS = 2.95

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	6.00-HR
+ (CFS)	(HR)	(CFS)				
202.	3.30		25.	25.	25.	25.
		(INCHES)	2.925	2.925	2.925	2.925
		(AC-FT)	12.	12.	12.	12.

CUMULATIVE AREA = .08 SQ MI

*** ***

```
**************
*            *
*      DB1   *
*            *
**************
```

28 KK Route flow through Dtn. Basin 1

(Elev - disch based on BPR inlet control nomograph)

HYDROGRAPH ROUTING DATA

30 RS	STORAGE ROUTING			
	NSTPS	1	NUMBER OF SUBREACHES	
	ITYP	STOR	TYPE OF INITIAL CONDITION	
	RSVRIC	-1.00	INITIAL CONDITION	
	X	.00	WORKING R AND D COEFFICIENT	
31 SA	AREA	1.9	2.5	3.3
32 SE	ELEVATION	1171.00	1175.00	1180.00
33 SQ	DISCHARGE	0.	28.	45.

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	8.83	23.23
ELEVATION	1171.00	1175.00	1180.00

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

HYDROGRAPH AT STATION DB1

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	6.00-HR
(CFS)	(HR)	(CFS)				
+ 28.	3.93		12.	12.	12.	12.
		(INCHES)	1.444	1.444	1.444	1.444
		(AC-FT)	6.	6.	6.	6.

STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	6.00-HR
(AC-FT)	(HR)				
9.	3.93	4.	4.	4.	4.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	6.00-HR

```
+  (FEET)      (HR)
   1175.13     3.93                1172.77     1172.77     1172.77     1172.77

                     CUMULATIVE AREA =     .08 SQ MI


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


          **************
          *            *
 34 KK    *     CP2A   *          Route flow from Basin 1 to Basin 2A
          *            *
          **************

             HYDROGRAPH ROUTING DATA

 36 RK          KINEMATIC WAVE STREAM ROUTING
                          L        178.  CHANNEL LENGTH
                          S       .0015  SLOPE
                          N        .012  CHANNEL ROUGHNESS COEFFICIENT
                         CA         .00  CONTRIBUTING AREA
                      SHAPE        CIRC  CHANNEL SHAPE
                         WD        2.00  BOTTOM WIDTH OR DIAMETER
                          Z         .00  SIDE SLOPE
                     NDXMIN           2  MINIMUM NUMBER OF DX INTERVALS

                                                  ***
                                  COMPUTED KINEMATIC PARAMETERS
                                       VARIABLE TIME STEP
                                    (DT SHOWN IS A MINIMUM)

                 ELEMENT    ALPHA       M        DT        DX       PEAK    TIME TO      VOLUME    MAXIMUM
                                                                             PEAK                   CELERITY
                                                (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

                 MAIN         2.91      1.25       .25     59.33     28.43   236.24       1.44       5.74

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6124E+01  EXCESS= .0000E+00 OUTFLOW= .6114E+01 BASIN STORAGE= .8988E-02 PERCENT ERROR=    .0

                                     INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                 MAIN         2.91      1.25      2.00              28.43   236.00       1.44

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

                     HYDROGRAPH AT STATION     CP2A

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     6.00-HR
+  (CFS)       (HR)
                          (CFS)
    28.        3.93                  12.         12.         12.         12.
                        (INCHES)    1.441       1.441       1.441       1.441
                         (AC-FT)      6.          6.          6.          6.

                     CUMULATIVE AREA =     .08 SQ MI


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


          **************
          *            *
 37 KK    *     SB2A   *          Runoff into and from Dtn.Basin 2A
          *            *
          **************

             SUBBASIN RUNOFF DATA

 38 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .01  SUBBASIN AREA
```

```
            PRECIPITATION DATA

25 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
            ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
            5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
              .68    1.32    2.35    2.55    2.69    2.95     .00     .00     .00     .00     .00     .00

                                                STORM AREA =     .01

39 LS       SCS LOSS RATE
                 STRTL         .00  INITIAL ABSTRACTION
               CRVNBR      100.00  CURVE NUMBER
                RTIMP      100.00  PERCENT IMPERVIOUS AREA

40 UD       SCS DIMENSIONLESS UNITGRAPH
                 TLAG         .10  LAG

                                                  ***

                                              UNIT HYDROGRAPH
                                          16 END-OF-PERIOD ORDINATES
            7.      24.      36.      35.      26.      15.       9.       6.       4.       2.
            1.       1.       1.       0.       0.       0.

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

                 HYDROGRAPH AT STATION     SB2A

  TOTAL RAINFALL =    2.95, TOTAL LOSS =     .00, TOTAL EXCESS =    2.95

PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
+  (CFS)      (HR)
                     (CFS)
   33.       3.10                   3.          3.          3.          3.
                   (INCHES)      2.941       2.941       2.941       2.941
                   (AC-FT)        1.          1.          1.          1.

                  CUMULATIVE AREA =     .01 SQ MI


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


        **************
        *            *
41 KK   *     SB3A   *          Runoff at Dtn. Basin 3A
        *            *
        **************

           SUBBASIN RUNOFF DATA

42 BA        SUBBASIN CHARACTERISTICS
                TAREA         .01  SUBBASIN AREA

             PRECIPITATION DATA

25 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
            ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
            5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
              .68    1.32    2.35    2.55    2.69    2.95     .00     .00     .00     .00     .00     .00

                                                STORM AREA =     .01

43 LS        SCS LOSS RATE
                 STRTL         .00  INITIAL ABSTRACTION
               CRVNBR      100.00  CURVE NUMBER
                RTIMP      100.00  PERCENT IMPERVIOUS AREA

44 UD        SCS DIMENSIONLESS UNITGRAPH
                 TLAG         .07  LAG

                                                  ***

                                              UNIT HYDROGRAPH
                                          13 END-OF-PERIOD ORDINATES
            15.      45.      51.      35.      18.      10.       5.       3.       2.       1.
            0.        0.       0.
```

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

                    HYDROGRAPH AT STATION     SB3A

TOTAL RAINFALL =    2.95, TOTAL LOSS =     .00, TOTAL EXCESS =    2.95

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
+  (CFS)      (HR)
                         (CFS)
    40.       3.10                    3.          3.          3.          3.
                       (INCHES)     2.943       2.943       2.943       2.943
                        (AC-FT)        2.          2.          2.          2.

                      CUMULATIVE AREA =     .01 SQ MI


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


          **************
          *            *
 45 KK    *     DB3A   *          Route flow through Dtn. Basin 3A
          *            *
          **************
                                  (Elev - disch based on BPR inlet control nomograph)

          HYDROGRAPH ROUTING DATA

 47 RS          STORAGE ROUTING
                     NSTPS          1  NUMBER OF SUBREACHES
                      ITYP       STOR  TYPE OF INITIAL CONDITION
                    RSVRIC      -1.00  INITIAL CONDITION
                         X        .00 WORKING R AND D COEFFICIENT

 48 SA              AREA          .3        .8       1.0       1.2       1.5       1.7

    SE          ELEVATION     1171.00   1172.80   1174.60   1176.40   1178.20   1180.00

 50 SQ          DISCHARGE          0.       11.       24.       33.       40.       43.
                                                                  ***

                                          COMPUTED STORAGE-ELEVATION DATA

          STORAGE        .00       .92      2.53      4.54      6.96      9.77
        ELEVATION    1171.00   1172.80   1174.60   1176.40   1178.20   1180.00

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

                    HYDROGRAPH AT STATION     DB3A

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
 (CFS)        (HR)
                         (CFS)
+    10.      3.37                    3.          3.          3.          3.
                       (INCHES)     2.715       2.715       2.715       2.715
                        (AC-FT)        1.          1.          1.          1.

PEAK STORAGE  TIME                          MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR      6.00-HR
 (AC-FT)      (HR)
     1.       3.37                    0.          0.          0.          0.

PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR      6.00-HR
 (FEET)       (HR)
 1172.64      3.37                 1171.46     1171.46     1171.46     1171.46

                      CUMULATIVE AREA =     .01 SQ MI


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

```
              **************
              *            *
 51 KK        *     CP3B   *          Route flow from Basin 3A to Basin 3B
              *            *
              **************

            HYDROGRAPH ROUTING DATA

 53 RK        KINEMATIC WAVE STREAM ROUTING
                        L        207.  CHANNEL LENGTH
                        S       .0161  SLOPE
                        N        .012  CHANNEL ROUGHNESS COEFFICIENT
                       CA         .00  CONTRIBUTING AREA
                    SHAPE        CIRC  CHANNEL SHAPE
                       WD        2.00  BOTTOM WIDTH OR DIAMETER
                        Z         .00  SIDE SLOPE
                   NDXMIN           2  MINIMUM NUMBER OF DX INTERVALS

                                                    ***
                              COMPUTED KINEMATIC PARAMETERS
                                   VARIABLE TIME STEP
                                (DT SHOWN IS A MINIMUM)

              ELEMENT    ALPHA       M        DT        DX      PEAK    TIME TO      VOLUME    MAXIMUM
                                                                          PEAK                   CELERITY
                                                  (MIN)     (FT)    (CFS)    (MIN)      (IN)      (FPS)

              MAIN         9.54     1.25       .23     69.00    10.00   202.03      2.71      12.04

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1390E+01  EXCESS= .0000E+00 OUTFLOW= .1389E+01 BASIN STORAGE= .4420E-03 PERCENT ERROR=    .0

                                   INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

              MAIN         9.54     1.25      2.00              10.00   202.00      2.71

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

                     HYDROGRAPH AT STATION     CP3B

 PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
 +  (CFS)      (HR)
                        (CFS)
     10.       3.37                 3.          3.          3.          3.
                      (INCHES)    2.713       2.713       2.713       2.713
                       (AC-FT)       1.          1.          1.          1.

                      CUMULATIVE AREA =     .01 SQ MI


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


              **************
              *            *
 54 KK        *     SB3B   *          Runoff from Dtn. Basin 3B
              *            *
              **************

            SUBBASIN RUNOFF DATA

 55 BA        SUBBASIN CHARACTERISTICS
                   TAREA         .03  SUBBASIN AREA

              PRECIPITATION DATA

 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
              ..... HYDRO-35 ......  ............... TP-40 ...............  ........... TP-49 ...........
              5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                .68    1.32    2.35    2.55    2.69    2.95     .00     .00     .00     .00     .00     .00

                                                STORM AREA =     .03

 56 LS        SCS LOSS RATE
```

```
                STRTL        .00  INITIAL ABSTRACTION
                CRVNBR     100.00  CURVE NUMBER
                RTIMP      100.00  PERCENT IMPERVIOUS AREA

57 UD        SCS DIMENSIONLESS UNITGRAPH
                TLAG        .14  LAG

                                                  ***

                                              UNIT HYDROGRAPH
                                          23 END-OF-PERIOD ORDINATES
          10.      32.      66.      87.      90.      78.      61.      40.      28.      20.
          14.      10.       7.       5.       4.       2.       2.       1.       1.       1.
           0.       0.       0.

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

                  HYDROGRAPH AT STATION     SB3B

  TOTAL RAINFALL =    2.95, TOTAL LOSS =     .00, TOTAL EXCESS =    2.95

PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
+  (CFS)      (HR)
                     (CFS)
    98.      3.17                   9.          9.          9.          9.
                   (INCHES)      2.937       2.937       2.937       2.937
                    (AC-FT)        5.          5.          5.          5.

                  CUMULATIVE AREA =     .03 SQ MI


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

          **************
          *            *
58 KK     *     SUM3B  *          Add routed flow and runoff from sub-basin SB3B
          *            *
          **************

59 HC        HYDROGRAPH COMBINATION
                ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                  ***

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

                  HYDROGRAPH AT STATION    SUM3B

PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
  (CFS)      (HR)
                     (CFS)
   107.      3.17                  12.         12.         12.         12.
                   (INCHES)      2.882       2.882       2.882       2.882
                    (AC-FT)        6.          6.          6.          6.

                  CUMULATIVE AREA =     .04 SQ MI


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

          **************
          *            *
60 KK     *      DB3B  *          Route combined flow through Dtn. Basin 3B
          *            *
          **************
                                   (Elev - disch based on BPR inlet control nomograph)
                                   (See line K7,24" RCP)

          HYDROGRAPH ROUTING DATA

63 RS        STORAGE ROUTING
                NSTPS          1  NUMBER OF SUBREACHES
```

```
                    ITYP        STOR  TYPE OF INITIAL CONDITION
                  RSVRIC       -1.00  INITIAL CONDITION
                       X         .00 WORKING R AND D COEFFICIENT

 64 SA              AREA          .0       1.9       2.2       2.3       2.5       2.7       2.8       3.1
    SE           ELEVATION    1162.50   1163.00   1164.50   1165.50   1166.50   1167.50   1168.50   1170.00
 66 SQ           DISCHARGE         0.        4.       14.       22.       29.       33.       38.       45.
                                                                  ***

                                                COMPUTED STORAGE-ELEVATION DATA

            STORAGE        .00       .32      3.39      5.65      8.07     10.67     13.43     17.89
          ELEVATION    1162.50   1163.00   1164.50   1165.50   1166.50   1167.50   1168.50   1170.00

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

                        HYDROGRAPH AT STATION     DB3B

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
 +  (CFS)      (HR)
                          (CFS)
     15.       3.77                    7.          7.          7.          7.
                         (INCHES)    1.739       1.739       1.739       1.739
                          (AC-FT)       4.          4.          4.          4.

 PEAK STORAGE  TIME                          MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR      6.00-HR
  (AC-FT)      (HR)
      4.       3.77                    2.          2.          2.          2.

 PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR      6.00-HR
   (FEET)      (HR)
  1164.60      3.77                 1163.50     1163.50     1163.50     1163.50

                        CUMULATIVE AREA =      .04 SQ MI


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


            **************
            *            *
 67 KK      *     SUM2A  *          Add routed flow and runoff from sub-basin DB2A
            *            *
            **************

 68 HC           HYDROGRAPH COMBINATION
                      ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE
                                                                  ***

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

                        HYDROGRAPH AT STATION    SUM2A

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
 +  (CFS)      (HR)
                          (CFS)
     50.       3.13                   22.         22.         22.         22.
                         (INCHES)    1.634       1.634       1.634       1.634
                          (AC-FT)      11.         11.         11.         11.

                        CUMULATIVE AREA =      .13 SQ MI


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


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

```
69 KK      *      DB2A  *          Route combined flow through Dtn. Basin 2A
           *            *
           **************
                                    (Elev - disch based on BPR inlet control nomograph)
                                    (See lines N1,N2,36" RCP)

              HYDROGRAPH ROUTING DATA

72 RS           STORAGE ROUTING
                     NSTPS          1  NUMBER OF SUBREACHES
                      ITYP       STOR  TYPE OF INITIAL CONDITION
                    RSVRIC      -1.00  INITIAL CONDITION
                         X        .00 WORKING R AND D COEFFICIENT

73 SA                AREA        2.1       2.2       2.3       2.4       2.7

74 SE           ELEVATION    1162.00   1162.50   1163.00   1163.80   1165.50

75 SQ           DISCHARGE         0.        4.        7.       16.       46.
                                                                ***

                                                COMPUTED STORAGE-ELEVATION DATA

            STORAGE        .00      1.07      2.18      4.05      8.40
          ELEVATION    1162.00   1162.50   1163.00   1163.80   1165.50

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

                        HYDROGRAPH AT STATION     DB2A

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
+  (CFS)      (HR)
                          (CFS)
    30.      6.00                   10.         10.         10.         10.
                        (INCHES)    .744        .744        .744        .744
                         (AC-FT)      5.          5.          5.          5.

  STORAGE    TIME                          MAXIMUM AVERAGE STORAGE
                                   6-HR       24-HR       72-HR      6.00-HR
+ (AC-FT)    (HR)
      6.     6.00                    2.          2.          2.          2.

PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                   6-HR       24-HR       72-HR      6.00-HR
+  (FEET)     (HR)
  1164.57    6.00              1163.00     1163.00     1163.00     1163.00

                        CUMULATIVE AREA =     .13 SQ MI


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


           **************
           *            *
76 KK      *     SB131  *          Runoff from Sub-basins 124-31
           *            *
           **************

              SUBBASIN RUNOFF DATA

77 BA           SUBBASIN CHARACTERISTICS
                     TAREA         .01  SUBBASIN AREA

                PRECIPITATION DATA

25 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 .....  ............... TP-40 ...............  ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .68    1.32    2.35    2.55    2.69    2.95     .00     .00     .00     .00     .00     .00

                                                STORM AREA =     .01

78 LS           SCS LOSS RATE
                     STRTL         .00  INITIAL ABSTRACTION
                    CRVNBR      100.00  CURVE NUMBER
```

```
                    RTIMP      100.00  PERCENT IMPERVIOUS AREA

79 UD          SCS DIMENSIONLESS UNITGRAPH
                     TLAG         .05  LAG

                                                  ***

                                                UNIT HYDROGRAPH
                                          10 END-OF-PERIOD ORDINATES
            43.      100.       77.       34.       16.        8.        4.        2.        1.        0.

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

                    HYDROGRAPH AT STATION    SB131

  TOTAL RAINFALL =    2.95, TOTAL LOSS =     .00, TOTAL EXCESS =    2.95

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
 (CFS)        (HR)
                      (CFS)
   66.       3.07                     5.          5.          5.          5.
                    (INCHES)       2.945       2.945       2.945       2.945
                     (AC-FT)          2.          2.          2.          2.

                    CUMULATIVE AREA =     .01 SQ MI


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

          **************
          *            *
80 KK     *     SB2B   *          Runoff from Dtn.Basin 2B
          *            *
          **************
                                 NOTE-contrib area includes Southern Ave pump station

          SUBBASIN RUNOFF DATA

82 BA          SUBBASIN CHARACTERISTICS
                     TAREA         .02  SUBBASIN AREA

               PRECIPITATION DATA

25 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
               ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
               5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                 .68    1.32    2.35    2.55    2.69    2.95     .00     .00     .00     .00     .00     .00

                                                STORM AREA =     .02

83 LS          SCS LOSS RATE
                     STRTL         .00  INITIAL ABSTRACTION
                    CRVNBR      100.00  CURVE NUMBER
                     RTIMP      100.00  PERCENT IMPERVIOUS AREA

84 UD          SCS DIMENSIONLESS UNITGRAPH
                     TLAG         .17  LAG

                                                  ***

                                                UNIT HYDROGRAPH
                                          27 END-OF-PERIOD ORDINATES
             6.       17.       35.       54.       64.       64.       57.       48.       35.       25.
            19.       14.       11.        8.        6.        4.        3.        2.        2.        1.
             1.        1.        1.        0.        0.        0.        0.

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

                    HYDROGRAPH AT STATION     SB2B

  TOTAL RAINFALL =    2.95, TOTAL LOSS =     .00, TOTAL EXCESS =    2.95

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
 (CFS)        (HR)
                      (CFS)
```

```
+    77.      3.20                    8.         8.         8.         8.
                          (INCHES)   2.934      2.934      2.934      2.934
                           (AC-FT)     4.         4.         4.         4.

                         CUMULATIVE AREA =     .02 SQ MI


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


            **************
            *            *
 85 KK      *     SUM2B  *          Add routed and local flows
            *            *
            **************

 86 HC          HYDROGRAPH COMBINATION
                     ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

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

                       HYDROGRAPH AT STATION    SUM2B

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
   (CFS)       (HR)
                          (CFS)
    127.       3.10                    23.         23.         23.         23.
                          (INCHES)   1.265       1.265       1.265       1.265
                           (AC-FT)     11.         11.         11.         11.

                         CUMULATIVE AREA =     .17 SQ MI


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


            **************
            *            *
 87 KK      *      DB2B  *          Route combined flow through Dtn. Basin 2B
            *            *
            **************
                                     (Elev - disch based on outlet control)

            HYDROGRAPH ROUTING DATA

 89 RS          STORAGE ROUTING
                     NSTPS           1  NUMBER OF SUBREACHES
                      ITYP        STOR  TYPE OF INITIAL CONDITION
                    RSVRIC       -1.00  INITIAL CONDITION
                         X         .00 WORKING R AND D COEFFICIENT

 90 SA              AREA        3.8       4.0       4.2       4.4       4.6       4.7       4.9       5.1

 91 SE          ELEVATION     1157.00   1158.00   1159.00   1160.00   1161.00   1162.00   1163.00   1164.00

 92 SQ          DISCHARGE         0.        5.       13.       14.       15.       16.       17.       18.

                                                          ***

                                          COMPUTED STORAGE-ELEVATION DATA

            STORAGE        .00      3.90      7.99     12.26     16.73     21.38     26.22     31.26
          ELEVATION    1157.00   1158.00   1159.00   1160.00   1161.00   1162.00   1163.00   1164.00

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

                       HYDROGRAPH AT STATION     DB2B

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
+  (CFS)       (HR)
                          (CFS)
     13.       6.00                     5.          5.          5.          5.
```

```
                    (INCHES)      .284        .284        .284        .284
                     (AC-FT)       3.          3.          3.          3.

PEAK STORAGE   TIME                        MAXIMUM AVERAGE STORAGE
                                   6-HR       24-HR       72-HR      6.00-HR
  C-FT)        (HR)
    9.         6.00                3.          3.          3.          3.

PEAK STAGE     TIME                        MAXIMUM AVERAGE STAGE
                                   6-HR       24-HR       72-HR      6.00-HR
+  (FEET)      (HR)
 1159.17       6.00             1157.85     1157.85     1157.85     1157.85

                    CUMULATIVE AREA =     .17 SQ MI


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


          **************
          *            *
 93 KK    *     MH43   *          Route flow from Basin 2B to MH43
          *            *
          **************

             HYDROGRAPH ROUTING DATA

 95 RK         KINEMATIC WAVE STREAM ROUTING
                         L        836.  CHANNEL LENGTH
                         S       .0027  SLOPE
                         N        .012  CHANNEL ROUGHNESS COEFFICIENT
                        CA         .00  CONTRIBUTING AREA
                     SHAPE        CIRC  CHANNEL SHAPE
                        WD        2.00  BOTTOM WIDTH OR DIAMETER
                         Z         .00  SIDE SLOPE
                    NDXMIN           2  MINIMUM NUMBER OF DX INTERVALS

                                                  ***
                                COMPUTED KINEMATIC PARAMETERS
                                     VARIABLE TIME STEP
                                  (DT SHOWN IS A MINIMUM)

                ELEMENT    ALPHA       M        DT        DX       PEAK    TIME TO      VOLUME    MAXIMUM
                                                                            PEAK                   CELERITY
                                                (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

                MAIN         3.91      1.25       .88    278.67     13.21   360.40        .28      6.23

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2518E+01  EXCESS= .0000E+00 OUTFLOW= .2492E+01 BASIN STORAGE= .2663E-01 PERCENT ERROR=    .0

                                INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                MAIN         3.91      1.25      2.00                13.19   360.00        .28

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

                    HYDROGRAPH AT STATION     MH43

PEAK FLOW      TIME                        MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
  (CFS)        (HR)
                     (CFS)
    13.        6.00                5.          5.          5.          5.
                    (INCHES)      .280        .280        .280        .280
                     (AC-FT)       2.          2.          2.          2.

                    CUMULATIVE AREA =     .17 SQ MI


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


          **************
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```
          *            *
96 KK     *     SB43   *          Runoff from off-roadway areas to Southern Ave basin
          *            *
          **************

             SUBBASIN RUNOFF DATA

97 BA          SUBBASIN CHARACTERISTICS
                    TAREA          .00  SUBBASIN AREA

               PRECIPITATION DATA

25 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
               ..... HYDRO-35 ......  ............... TP-40 ...............  ........... TP-49 ...........
               5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                 .68    1.32    2.35    2.55    2.69    2.95     .00     .00     .00     .00     .00     .00

                                                STORM AREA =     .00

98 LS          SCS LOSS RATE
                    STRTL          .00  INITIAL ABSTRACTION
                   CRVNBR       100.00  CURVE NUMBER
                    RTIMP       100.00  PERCENT IMPERVIOUS AREA

99 UD          SCS DIMENSIONLESS UNITGRAPH
                     TLAG          .04  LAG

                                                     ***

                                                UNIT HYDROGRAPH
                                            8 END-OF-PERIOD ORDINATES
               8.       11.        5.        2.        1.        0.        0.        0.

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

                     HYDROGRAPH AT STATION     SB43

  TOTAL RAINFALL =    2.95, TOTAL LOSS =     .00, TOTAL EXCESS =    2.95

 K FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR      6.00-HR
+ (CFS)     (HR)
                        (CFS)
    7.      3.07                     0.          0.          0.          0.
                      (INCHES)    2.946       2.946       2.946       2.946
                       (AC-FT)       0.          0.          0.          0.

                     CUMULATIVE AREA =     .00 SQ MI


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


          **************
          *            *
100 KK    *     DB4    *          Route flow through Southern Ave. det basin
          *            *
          **************
                                   (Elev - disch based on combined capacities of existing 16 inch
                                   pipe at east end of basin and proposed surface inlet grate at
                                   west end)

             HYDROGRAPH ROUTING DATA

104 RS         STORAGE ROUTING
                     NSTPS            1  NUMBER OF SUBREACHES
                      ITYP         STOR  TYPE OF INITIAL CONDITION
                    RSVRIC        -1.00  INITIAL CONDITION
                         X          .00 WORKING R AND D COEFFICIENT

105 SA               AREA          .0        .3        .7       1.2       1.6       2.0

    SE         ELEVATION      1158.50   1159.00   1160.00   1161.00   1162.00   1163.00

107 SQ         DISCHARGE          0.        5.       15.       22.       28.       33.

                                                     ***
```

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.07	.53	1.45	2.82	4.65
ELEVATION	1158.50	1159.00	1160.00	1161.00	1162.00	1163.00

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

HYDROGRAPH AT STATION DB4

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	6.00-HR
		(CFS)				
4.	3.13		0.	0.	0.	0.
		(INCHES)	2.935	2.935	2.935	2.935
		(AC-FT)	0.	0.	0.	0.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	6.00-HR
+ 0.	3.13	0.	0.	0.	0.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	6.00-HR
+ 1158.91	3.13	1158.54	1158.54	1158.54	1158.54

CUMULATIVE AREA = .00 SQ MI

*** ***

```
          **************
          *            *
108 KK    *   DVTDB4   *        Split hydrograph DB4.
          *            *
          **************
```

NOTE - New inlet grate at west end of Southern Ave det basin is opened up after Unit 2 is constructed.

DT	DIVERSION ISTAD	TEMPE	DIVERSION HYDROGRAPH IDENTIFICATION				
DI	INFLOW	.00	5.00	15.00	22.00	28.00	33.00
DQ	DIVERTED FLOW	.00	.00	3.00	7.00	10.00	12.00

***

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

DIVERSION HYDROGRAPH TEMPE

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	6.00-HR
		(CFS)				
+ 0.	.03		0.	0.	0.	0.
		(INCHES)	.000	.000	.000	.000
		(AC-FT)	0.	0.	0.	0.

CUMULATIVE AREA = .00 SQ MI

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

HYDROGRAPH AT STATION DVTDB4

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	6.00-HR
		(CFS)				
4.	3.13		0.	0.	0.	0.
		(INCHES)	2.935	2.935	2.935	2.935
		(AC-FT)	0.	0.	0.	0.

CUMULATIVE AREA = .00 SQ MI

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

          **************
          *            *
114 KK    *     SUM43  *          Sum hydrographs MH43 and DVTDB4
          *            *
          **************

115 HC          HYDROGRAPH COMBINATION
                     ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

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

                       HYDROGRAPH AT STATION    SUM43

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
+  (CFS)       (HR)
                          (CFS)
     13.       6.00                   5.          5.          5.          5.
                         (INCHES)    .302        .302        .302        .302
                         (AC-FT)      3.          3.          3.          3.

                        CUMULATIVE AREA =     .17 SQ MI


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

          **************
          *            *
KK        *     MH63   *          Route SUM43 to DMJM tie-in at 8152+00,119'lt.
          *            *
          **************

             HYDROGRAPH ROUTING DATA

118 RK          KINEMATIC WAVE STREAM ROUTING
                          L        299.  CHANNEL LENGTH
                          S       .0028  SLOPE
                          N        .012  CHANNEL ROUGHNESS COEFFICIENT
                         CA         .00  CONTRIBUTING AREA
                      SHAPE        CIRC  CHANNEL SHAPE
                         WD        2.00  BOTTOM WIDTH OR DIAMETER
                          Z         .00  SIDE SLOPE
                     NDXMIN           2  MINIMUM NUMBER OF DX INTERVALS

                                                          ***
                                   COMPUTED KINEMATIC PARAMETERS
                                        VARIABLE TIME STEP
                                     (DT SHOWN IS A MINIMUM)

                 ELEMENT    ALPHA       M         DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                              PEAK                  CELERITY
                                                   (MIN)     (FT)     (CFS)    (MIN)      (IN)      (FPS)

                 MAIN         3.98      1.25        .33     99.67     13.24   359.94       .30       6.33

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2704E+01  EXCESS= .0000E+00 OUTFLOW= .2697E+01 BASIN STORAGE= .8901E-02 PERCENT ERROR=   -.1

                                   INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                 MAIN         3.98      1.25       2.00              13.23   360.00       .30

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

                       HYDROGRAPH AT STATION     MH63
```

```
 97          UD  0.0333

 98          KK   SUM3C     Add routed flow and runoff from Dtn. Basin 3c
 99          HC

100          KK    DB3C     Route combined flow through Dtn. Basin 3C
101          KM             (Elev - disch based on BPR inlet control nomograph)
102          RS        1    STOR
103          SA   0.6936  0.7033  0.7130  0.7228  0.7325  0.7422  0.7522  0.7622  0.7722
104          SE   1168.5 1168.75    1169 1169.25  1169.5 1169.75 1170.00 1170.25 1170.50
105          SQ        0       0       0       1       2       3    4.25    6.25    8.50

106          KK   CPDB4     Route DB3C to DB4
107          RK     950   0.005   0.025            TRAP       5       4

108          KK   RampA     Runoff from existing SR360 westbound and existing "Ramp A"
109          BA   0.0105
110          LS             100     100
111          UD   0.1850

112          KK  SUMDB4     Add RampA and CPDB4
113          HC

114          KK     DB4     Route combined flow through Southern Ave. det basin
115          KM             (Elev - disch based on combined capacities of existing 16 inch
116          KM             pipe at east end of basin and proposed surface inlet grate at
117          KM             west end)
118          RS        1    STOR
119          SA   0.0356  0.2594  0.7071  1.1548  1.6024  2.0500
120          SE   1158.5    1159    1160    1161    1162    1163
121          SQ        0       0       3       7      10      12
122          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

 23         SB1
             V
             V
 28         DB1
             V
             V
 36        CP2A
            .
            .
 40         .        SB2A
            .           .
            .           .
 44      SUM2A............
             V
             V
 46        DB2A
             V
             V
 52        CP2B
            .
            .
 54         .        SB2B
            .           .
            .           .
 59      SUM2B............
             V
             V
 61        DB2B
            .
            .
 67         .        SB3A
            .           V
            .           V
 71         .        DB3A
            .           V
            .           V
 77         .        CP3B
            .           .
            .           .
 80         .           .        SB3B
            .           .           .
```

```
 39          RK     366  0.0082   0.024            CIRC       2

 40          KK    SB2A     Runoff from sub-basin between existing 'Ramp C' and I-10
 41          BA  0.0098
 42          LS             100      100
 43          UD  0.0694

 44          KK   SUM2A     Add routed flow and runoff from sub-basins 23-80,DB1,DB2A
 45          HC
                                          HEC-1 INPUT                                          PAGE  2

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


 46          KK    DB2A     Route combined flow through Dtn. Basin 2A
 47          KM             (Elev - disch based on BPR inlet control nomograph)
 48          RS       1    STOR      -1
 49          SA  1.8825  1.9367  1.9909  2.0452  2.0994
 50          SE    1167  1167.5    1168  1168.5    1169
 51          SQ       0       2     8.5   12.75      17

 52          KK    CP2B     Route flow from Basin 2A to 2B
 53          RK      94  0.0021   0.024            CIRC       2

 54          KK    SB2B     Runoff to Dtn. Basin 2B
 55          KM             NOTE - contrib area includes Southern Ave pump station
 56          BA  0.0228
 57          LS             100      100
 58          UD  0.0872

 59          KK   SUM2B     Add routed flow and runoff from DB1,DB2A,and DB2B
 60          HC

 61          KK    DB2B     Route combined flow through Dtn. Basin 2B
 62          KM             (Elev - disch based on outlet control)
 63          RS       1    STOR      -1
 64          SA  1.0147  1.2965  1.5784  1.8602  2.1421  2.4239
 65          SE    1157  1159.4  1161.8  1164.2  1166.6    1169
 66          SQ       0    13.4    16.1    18.7    21.4    24.0

 67          KK    SB3A     Runoff To Dtn. Basin 3A
 68          BA  0.0165
 69          LS             100      100
 70          UD  0.1416

 71          KK    DB3A     Route flow through Dtn. Basin 3A
 72          KM             (Elev - disch based on BPR inlet control nomograph)
 73          RS       1    STOR      -1
 74          SA  0.2732  0.7886  1.0101  1.2317  1.4532  1.6749
 75          SE    1171  1172.8  1174.6  1176.4  1178.2    1180
 76          SQ       0      13      24    32.5      39    42.5

 77          KK    CP3B     Route flow from Basin 3A to 3B
 78          RK     260  0.0160   0.012            CIRC       2
 79          RK     222  0.0165   0.012            CIRC       2

 80          KK    SB3B     Runoff from Dtn. Basin 3B
 81          BA  0.0161
 82          LS             100      100
 83          UD  0.1070

 84          KK   SUM3B     Add routed flow and runoff from SB3B
 85          HC
                                          HEC-1 INPUT                                          PAGE  3

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


 86          KK    DB3B     Route combined flow through Dtn. Basin 3B
 87          KM             (Pump discharge of 2.25 cfs is the rate necessary to dispose
 88          KM             of stored vol in 36 hours. It is assumed to begin immediatly
 89          KM             after runoff occurs.)
 90          RS       1    STOR
 91          SA  0.2134  0.2741  0.3347  0.3954  0.4561  0.5168  1.3906
 92          SE    1163  1164.4  1165.8  1167.2  1168.6    1170    1176
 93          SQ    2.25    2.25    2.25    2.25    2.25    2.25    2.25

 94          KK    SB3C     Runoff from Dtn.basin 3C
 95          BA  0.0073
 96          LS             100      100
```

```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*          SEPTEMBER 1990              *
*           VERSION 4.0                *
*                                      *
* RUN DATE  04/28/1992  TIME  13:15:01 *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    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        I-10/SUPERSTITION/BASELINE  UNIT 1
  3           ID        STANLEY CONSULTANTS # 10591
  4           ID        FILENAME : 100UNIT1     DATE : 28 APR 1992
  5           ID        DESIGN FREQUENCY = 100YR
  6           ID        SCS DIMENSIONLESS UNIT HYDROGRAPH
  7           ID        AREAS TAKEN FROM STANLEY FINAL REPORT
  8           ID        TC FROM ASSUMED FLOW VEL AND INLET TIME AS FOLLOWS:
  9           ID            *Sheet/Overland Flow = 1-3 fps
 10           ID            *Gutter Flow = 2-4 fps
 11           ID            *Channel/Ditch Flow = 3-5 fps
 12           ID            *Pipe Flow = 5-10 fps
 13           ID            *No assumed inlet time
 14           ID            *Min TC in Corresponding Rational Analysis = 10 mins.
 15           ID        LAG TIME = 0.6 * TIME OF CONCENTRATION
 16           ID        ADOT LETTER OF 12-12-90:
 17           ID            * 6HR RAINFALL DISTRIBUTION USING PH RECORD
 18           ID            * TABULATION INTERVAL = 2MIN; 181 HYDROGRAPH ORDINATES
 19           ID            * BASIN AREA = C * A; 100% IMPERVIOUS
 20           ID
              *DIAGRAM
 21           IT       2                    181
 22           IO       5

 23           KK     SB1     Runoff from sub-basins 23-80 @ HDW9
 24           BA  0.0493
 25           PH                     .78    1.51    2.70    2.92    3.07    3.35
 26           LS             100     100
 27           UD  0.2602

 28           KK     DB1     Route combined flow through Dtn. Basin 1 (ASSUMED PUMP)
 29           KM             (Pump discharge of 2.6 cfs is the rate necessary to dispose
 30           KM             of stored vol in 36 hours. It is assumed to begin immediatly
 31           KM             after runoff occurs.)
 32           RS       1    STOR      -1
 33           SA  0.1210  0.5690  1.0171  1.4650  1.9131  2.1834  2.4538  2.7241  2.9945  3.2648
 34           SE    1150 1155.25  1160.5 1165.75    1171  1172.8  1174.6  1176.4  1178.2    1180
 35           SQ     2.6     2.6     2.6     2.6     2.6     2.6     2.6     2.6     2.6     2.6

 36           KK    CP2A     Route to Dtn.Basin 2A
 37           RK     282  0.0027   0.012            CIRC       2
 38           RK     400  0.0006   0.030            TRAP       3
```

```
*                                        *                                  *      DAVIS, CALIFORNIA 95616      *
*  RUN DATE  04/30/1992  TIME  13:17:23 *                                  *         (916) 756-1104            *
*                                        *                                  *                                  *
******************************************                                  ************************************
```

```
                    I10/SUPERSTITION/BASELINE
                    STANLEY CONSULTANTS # 10591
                    FILENAME : ULT50       DATE : 28 APR 1992
                    DESIGN FREQUENCY = 50YR
                    SCS DIMENSIONLESS UNIT HYDROGRAPH
                    AREAS TAKEN FROM STANLEY FINAL DESIGN
                    TC FROM ASSUMED FLOW VEL AND INLET TIME AS FOLLOWS:
                        *Sheet/Overland Flow = 1-3 fps
                        *Gutter Flow = 2-4 fps
                        *Channel/Ditch Flow = 3-5 fps
                        *Pipe Flow = 5-10 fps
                        *No assumed inlet time
                        *Min TC in Corresponding Rational Analysis = 10 mins.
                    LAG TIME = 0.6 * TIME OF CONCENTRATION
                    ADOT LETTER OF 12-12-90:
                        * 6HR RAINFALL DISTRIBUTION USING PH RECORD
                        * TABULATION INTERVAL = 2MIN; 181 HYDROGRAPH ORDINATES
                        * BASIN AREA = C * A; 100% IMPERVIOUS

                    ************************************************************
                    THIS RUN IDENTICAL TO 50UNIT2 WITH ONE PRIMARY EXCEPTION :
                    THE SUM OF C*A FOR ALL DRAINAGE SUB-AREAS HAS BEEN INCREASED
                    BY 16 PERCENT TO ACCOUNT FOR FUTURE ULTIMATE CONDITION
                    ROADWAY IMPROVEMENTS. THE INCREASE IN C*A REFLECTS BOTH AN
                    INCREASE IN CONTRIBUTING AREA AND AN INCREASE IN PERCENT
                    IMPERVIOUS. THE ESTIMATED 16 PERCENT IS BASED ON THE PRELIM
                    ULTIMATE ROADWAY PLANS CONTAINED IN THIS REPORT.
                    ************************************************************

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

IT          HYDROGRAPH TIME DATA
                  NMIN          2  MINUTES IN COMPUTATION INTERVAL
                 IDATE      1   0  STARTING DATE
                 ITIME       0000  STARTING TIME
                    NQ        181  NUMBER OF HYDROGRAPH ORDINATES
                NDDATE      1   0  ENDING DATE
                NDTIME       0600  ENDING TIME
                 ICENT         19  CENTURY MARK

          COMPUTATION INTERVAL     .03 HOURS
               TOTAL TIME BASE    6.00 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

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	SB1	265.	3.30	33.	33.	33.	.10		
ROUTED TO	DB1	29.	4.00	13.	13.	13.	.10	1175.41	4.00

ROUTED TO	CP2A	29.	4.00	13.	13.	13.	.10		
HYDROGRAPH AT	SB2A	55.	3.10	5.	5.	5.	.01		
2 COMBINED AT	SUM2A	64.	3.13	18.	18.	18.	.12		
ROUTED TO	DB2A	18.	6.00	6.	6.	6.	.12	1165.17	6.00
HYDROGRAPH AT	SB3A	40.	3.10	3.	3.	3.	.01		
ROUTED TO	DB3A	10.	3.37	3.	3.	3.	.01	1172.64	3.37
ROUTED TO	CP3B	10.	3.37	3.	3.	3.	.01		
HYDROGRAPH AT	SB3B	118.	3.17	11.	11.	11.	.03		
2 COMBINED AT	SUM3B	127.	3.17	14.	14.	14.	.04		
ROUTED TO	DB3B	37.	3.57	13.	13.	13.	.04	1168.93	3.57
HYDROGRAPH AT	SB131	73.	3.07	5.	5.	5.	.02		
HYDROGRAPH AT	SB2B	70.	3.20	7.	7.	7.	.02		
4 COMBINED AT	SUM2B	154.	3.10	32.	32.	32.	.20		
ROUTED TO	DB2B	14.	6.00	7.	7.	7.	.20	1160.08	6.00
ROUTED TO	MH43	14.	5.97	6.	6.	6.	.20		
HYDROGRAPH AT	SB43	7.	3.07	1.	1.	1.	.00		
ROUTED TO	DB4	5.	3.13	1.	1.	1.	.00	1158.97	3.13
DIVERSION TO	TEMPE	0.	3.13	0.	0.	0.	.00		
HYDROGRAPH AT	DVTDB4	5.	3.13	1.	1.	1.	.00		
2 COMBINED AT	SUM43	14.	5.97	7.	7.	7.	.20		
ROUTED TO	MH63	14.	5.97	7.	7.	7.	.20		
HYDROGRAPH AT	SUB135	8.	3.13	1.	1.	1.	.00		
2 COMBINED AT	SUM135	16.	3.13	8.	8.	8.	.21		
ROUTED TO	RCHE	16.	3.20	7.	7.	7.	.21		
HYDROGRAPH AT	SUBE	185.	3.23	20.	20.	20.	.06		

2 COMBINED AT

SUME	201.	3.23	28.	28.	28.	.27

+
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)
CP2A	MANE	.36	29.38	240.24	1.19	2.00	29.38	240.00	1.19

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6633E+01 EXCESS= .0000E+00 OUTFLOW= .6626E+01 BASIN STORAGE= .1169E-01 PERCENT ERROR= -.1

CP3B	MANE	.22	10.00	202.20	2.71	2.00	10.00	202.00	2.71

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1390E+01 EXCESS= .0000E+00 OUTFLOW= .1389E+01 BASIN STORAGE= .4917E-03 PERCENT ERROR= .0

MH43	MANE	.31	14.09	359.73	.30	2.00	14.08	358.00	.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3225E+01 EXCESS= .0000E+00 OUTFLOW= .3216E+01 BASIN STORAGE= .6119E-02 PERCENT ERROR= .1

MH63	MANE	.36	14.15	357.96	.32	2.00	14.15	358.00	.32

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3465E+01 EXCESS= .0000E+00 OUTFLOW= .3457E+01 BASIN STORAGE= .6728E-02 PERCENT ERROR= .0

RCHE	MANE	1.64	16.43	192.56	.34	2.00	16.38	192.00	.34

TINUITY SUMMARY (AC-FT) - INFLOW= .3767E+01 EXCESS= .0000E+00 OUTFLOW= .3691E+01 BASIN STORAGE= .7269E-01 PERCENT ERROR= .1

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

```
PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
  (CFS)       (HR)
                         (CFS)
    13.       6.00                    5.          5.          5.          5.
                       (INCHES)     .301        .301        .301        .301
                        (AC-FT)       3.          3.          3.          3.

                       CUMULATIVE AREA =     .17 SQ MI


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


            **************
            *            *
119 KK      *   SUB135   *          Runoff from sub-basin 135 (DMJM)
            *            *
            **************

               SUBBASIN RUNOFF DATA

120 BA           SUBBASIN CHARACTERISTICS
                      TAREA          .00  SUBBASIN AREA

                 PRECIPITATION DATA

 25 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .68    1.32    2.35    2.55    2.69    2.95     .00     .00     .00     .00     .00     .00

                                                     STORM AREA =     .00

121 LS           SCS LOSS RATE
                      STRTL          .00  INITIAL ABSTRACTION
                     CRVNBR       100.00  CURVE NUMBER
                      RTIMP       100.00  PERCENT IMPERVIOUS AREA

122 UD           SCS DIMENSIONLESS UNITGRAPH
                       TLAG          .10  LAG

                                                   ***

                                                UNIT HYDROGRAPH
                                           17 END-OF-PERIOD ORDINATES
                 1.       5.       8.       8.       6.       4.       2.       2.       1.       1.
                 0.       0.       0.       0.       0.       0.       0.

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

                       HYDROGRAPH AT STATION   SUB135

   TOTAL RAINFALL =    2.95, TOTAL LOSS =     .00, TOTAL EXCESS =    2.95

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
+  (CFS)      (HR)
                         (CFS)
     8.       3.13                    1.          1.          1.          1.
                       (INCHES)    2.941       2.941       2.941       2.941
                        (AC-FT)       0.          0.          0.          0.

                       CUMULATIVE AREA =     .00 SQ MI


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


            **************
            *            *
125 KK      *   SUM135   *          Sum hydrographs SUB135 and MH63
            *            *
            **************

124 HC           HYDROGRAPH COMBINATION
```

```
                    ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE
                                                          ***

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

                    HYDROGRAPH AT STATION   SUM135

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
 +  (CFS)      (HR)
                         (CFS)
 +    15.      3.13                  6.          6.          6.          6.
                       (INCHES)     .332        .332        .332        .332
                        (AC-FT)      3.          3.          3.          3.

                      CUMULATIVE AREA =     .17 SQ MI


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


          **************
          *            *
 125 KK   *     RCHE   *          Route SUM135 to DMJM det basin E near Bell Butte
          *            *
          **************

            HYDROGRAPH ROUTING DATA

 133 RK          KINEMATIC WAVE STREAM ROUTING
                          L       1442.  CHANNEL LENGTH
                          S      .0010  SLOPE
                          N       .012  CHANNEL ROUGHNESS COEFFICIENT
                         CA        .00  CONTRIBUTING AREA
                      SHAPE       CIRC  CHANNEL SHAPE
                         WD       5.00  BOTTOM WIDTH OR DIAMETER
                          Z        .00  SIDE SLOPE
                     NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS
                                                          ***
                                  COMPUTED KINEMATIC PARAMETERS
                                       VARIABLE TIME STEP
                                    (DT SHOWN IS A MINIMUM)

                 ELEMENT    ALPHA       M        DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                             PEAK                  CELERITY
                                                (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

                 MAIN         2.77      1.25      1.80    480.67     14.41   191.22       .33       4.83

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3005E+01  EXCESS= .0000E+00 OUTFLOW= .2961E+01 BASIN STORAGE= .6621E-01 PERCENT ERROR=   -.7

                                  INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                 MAIN         2.77      1.25      2.00               14.35   192.00       .32

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

                    HYDROGRAPH AT STATION     RCHE

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
 +  (CFS)      (HR)
                         (CFS)
 +    14.      3.20                  6.          6.          6.          6.
                       (INCHES)     .324        .324        .324        .324
                        (AC-FT)      3.          3.          3.          3.

                      CUMULATIVE AREA =     .17 SQ MI


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

```
                **************
                *            *
134 KK          *     SUBE   *      RUNOFF FROM SUB-BASIN E
                *            *
                **************

            SUBBASIN RUNOFF DATA

135 BA          SUBBASIN CHARACTERISTICS
                      TAREA          .06  SUBBASIN AREA

                PRECIPITATION DATA

 25 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......  ............... TP-40 ...............  ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .68    1.32    2.35    2.55    2.69    2.95     .00     .00     .00     .00     .00     .00

                                                   STORM AREA =     .06

136 LS          SCS LOSS RATE
                      STRTL          .00  INITIAL ABSTRACTION
                     CRVNBR       100.00  CURVE NUMBER
                      RTIMP       100.00  PERCENT IMPERVIOUS AREA

137 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG          .20  LAG

                                                        ***

                                                   UNIT HYDROGRAPH
                                             32 END-OF-PERIOD ORDINATES
            10.      28.      58.      98.     128.     142.     142.     130.     113.      90.
            67.      52.      40.      32.      25.      19.      15.      12.       9.       7.
             5.       4.       3.       3.       2.       2.       1.       1.       1.       1.
             0.       0.

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

                     HYDROGRAPH AT STATION     SUBE

  TOTAL RAINFALL =    2.95, TOTAL LOSS =     .00, TOTAL EXCESS =    2.95

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
  (CFS)       (HR)
                        (CFS)
   185.       3.23                   20.         20.         20.         20.
                     (INCHES)       2.931       2.931       2.931       2.931
                      (AC-FT)        10.         10.         10.         10.

                     CUMULATIVE AREA =     .06 SQ MI


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


                **************
                *            *
138 KK          *     SUME   *  —      Sum hydrographs SUBE and RCHE
                *            *
                **************

139 HC          HYDROGRAPH COMBINATION
                      ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                        ***

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

                     HYDROGRAPH AT STATION     SUME

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR      6.00-HR
  (CFS)       (HR)
                        (CFS)
```

199.	3.23		26.	26.	26.	26.
		(INCHES)	1.038	1.038	1.038	1.038
		(AC-FT)	13.	13.	13.	13.

CUMULATIVE AREA = .23 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	SB1	202.	3.30	25.	25.	25.	.08		
ROUTED TO	DB1	28.	3.93	12.	12.	12.	.08	1175.13	3.93
ROUTED TO	CP2A	28.	3.93	12.	12.	12.	.08		
HYDROGRAPH AT	SB2A	33.	3.10	3.	3.	3.	.01		
HYDROGRAPH AT	SB3A	40.	3.10	3.	3.	3.	.01		
ROUTED TO	DB3A	10.	3.37	3.	3.	3.	.01	1172.64	3.37
ROUTED TO	CP3B	10.	3.37	3.	3.	3.	.01		
HYDROGRAPH AT	SB3B	98.	3.17	9.	9.	9.	.03		
2 COMBINED AT	SUM3B	107.	3.17	12.	12.	12.	.04		
ROUTED TO	DB3B	15.	3.77	7.	7.	7.	.04	1164.60	3.77
3 COMBINED AT	SUM2A	50.	3.13	22.	22.	22.	.13		
ROUTED TO	DB2A	30.	6.00	10.	10.	10.	.13	1164.57	6.00
HYDROGRAPH AT	SB131	66.	3.07	5.	5.	5.	.01		
HYDROGRAPH AT	SB2B	77.	3.20	8.	8.	8.	.02		
3 COMBINED AT	SUM2B	127.	3.10	23.	23.	23.	.17		
ROUTED TO	DB2B	13.	6.00	5.	5.	5.	.17	1159.17	6.00
ROUTED TO	MH43	13.	6.00	5.	5.	5.	.17		
HYDROGRAPH AT	SB43	7.	3.07	0.	0.	0.	.00		
ROUTED TO	DB4	4.	3.13	0.	0.	0.	.00	1158.91	3.13
DIVERSION TO	TEMPE	0.	3.13	0.	0.	0.	.00		

HYDROGRAPH AT	DVTDB4	4.	3.13	0.	0.	0.	.00
2 COMBINED AT	SUM43	13.	6.00	5.	5.	5.	.17
ROUTED TO	MH63	13.	6.00	5.	5.	5.	.17
HYDROGRAPH AT	SUB135	8.	3.13	1.	1.	1.	.00
2 COMBINED AT	SUM135	15.	3.13	6.	6.	6.	.17
ROUTED TO	RCHE	14.	3.20	6.	6.	6.	.17
HYDROGRAPH AT	SUBE	185.	3.23	20.	20.	20.	.06
2 COMBINED AT	SUME	199.	3.23	26.	26.	26.	.23

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)
CP2A	MANE	.25	28.43	236.24	1.44	2.00	28.43	236.00	1.44

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6124E+01 EXCESS= .0000E+00 OUTFLOW= .6114E+01 BASIN STORAGE= .8988E-02 PERCENT ERROR= .0

CP3B	MANE	.23	10.00	202.03	2.71	2.00	10.00	202.00	2.71

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1390E+01 EXCESS= .0000E+00 OUTFLOW= .1389E+01 BASIN STORAGE= .4420E-03 PERCENT ERROR= .0

MH43	MANE	.88	13.21	360.40	.28	2.00	13.19	360.00	.28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2518E+01 EXCESS= .0000E+00 OUTFLOW= .2492E+01 BASIN STORAGE= .2663E-01 PERCENT ERROR= .0

MH63	MANE	.33	13.24	359.94	.30	2.00	13.23	360.00	.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2704E+01 EXCESS= .0000E+00 OUTFLOW= .2697E+01 BASIN STORAGE= .8901E-02 PERCENT ERROR= -.1

RCHE	MANE	1.80	14.41	191.22	.33	2.00	14.35	192.00	.32

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3005E+01 EXCESS= .0000E+00 OUTFLOW= .2961E+01 BASIN STORAGE= .6621E-01 PERCENT ERROR= -.7

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

```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*          SEPTEMBER 1990              *
*           VERSION 4.0                *
*                                      *
*  RUN DATE  09/09/1992  TIME  10:52:59 *
*                                      *
****************************************
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****************************************
*                                      *
*    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

HEC-1 INPUT PAGE 1

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

  1           ID
  2           ID        I10/SUPERSTITION/BASELINE
  3           ID        STANLEY CONSULTANTS # 10591
  4           ID        FILENAME : 100UNIT2     DATE : 9 SEPT 1992
  5           ID        DESIGN FREQUENCY = 100YR
  6           ID        SCS DIMENSIONLESS UNIT HYDROGRAPH
  7           ID        AREAS TAKEN FROM STANLEY FINAL DESIGN
  8           ID        TC FROM ASSUMED FLOW VEL AND INLET TIME AS FOLLOWS:
  9           ID            *Sheet/Overland Flow = 1-3 fps
 10           ID            *Gutter Flow = 2-4 fps
 11           ID            *Channel/Ditch Flow = 3-5 fps
 12           ID            *Pipe Flow = 5-10 fps
 13           ID            *No assumed inlet time
 14           ID            *Min TC in Corresponding Rational Analysis = 10 mins.
 15           ID        LAG TIME = 0.6 * TIME OF CONCENTRATION
 16           ID        ADOT LETTER OF 12-12-90:
 17           ID            * 6HR RAINFALL DISTRIBUTION USING PH RECORD
 18           ID            * TABULATION INTERVAL = 2MIN; 181 HYDROGRAPH ORDINATES
 19           ID            * BASIN AREA = C * A; 100% IMPERVIOUS
 20           ID
              *DIAGRAM
 21           IT       2                    181
 22           IO       5

 23           KK     SB1     Runoff from sub-basins 22-87,Dtn.Basin 1 @ HDW9
 24           BA  0.0795
 25           PH                   .78    1.51    2.70    2.92    3.07    3.35
 26           LS             100     100
 27           UD  0.2601

 28           KK     DB1     Route flow through Dtn. Basin 1
 29           KM             (Elev - disch based on BPR inlet control nomograph)
 30           RS       1    STOR      -1
 31           SA  1.9131  2.5139  3.2648
 32           SE    1170    1175    1180
 33           SQ       0      28      45

 34           KK    CP2A     Route flow from Basin 1 to Basin 2A
 35           RK     140  0.0066   0.012            CIRC     2.0
 36           RK     178  0.0015   0.012            CIRC     2.0

 37           KK    SB2A     Runoff into and from Dtn.Basin 2A
```

```
 38          BA  0.0086
 39          LS              100      100
 40          UD  0.0955

 41          KK    SB3A      Runoff at Dtn. Basin 3A
 42          BA  0.0096
 43          LS              100      100
 44          UD  0.0723
```



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

 45          KK    DB3A      Route flow through Dtn. Basin 3A
 46          KM              (Elev - disch based on BPR inlet control nomograph)
 47          RS       1    STOR      -1
 48          SA  0.2732  0.7886  1.0101  1.2317  1.4532  1.6749
 49          SE    1171  1172.8  1174.6  1176.4  1178.2    1180
 50          SQ       0      11      24    32.5      40      43

 51          KK    CP3B      Route flow from Basin 3A to Basin 3B
 52          RK     255  0.0127   0.012            CIRC     2.0
 53          RK     207  0.0161   0.012            CIRC     2.0

 54          KK    SB3B      Runoff from Dtn. Basin 3B
 55          BA  0.0290
 56          LS              100      100
 57          UD  0.1387

 58          KK   SUM3B      Add routed flow and runoff from sub-basin SB3B
 59          HC

 60          KK    DB3B      Route combined flow through Dtn. Basin 3B
 61          KM              (Elev - disch based on BPR inlet control nomograph)
 62          KM              (See line K7,24" RCP)
 63          RS       1    STOR      -1
 64          SA       0  1.9216  2.1740  2.3423  2.5105  2.6788  2.8470  3.0994
 65          SE  1162.5    1163  1164.5  1165.5  1166.5  1167.5  1168.5    1170
 66          SQ       0    4.25      14      22      29      33      38      45

 67          KK   SUM2A      Add routed flow and runoff from sub-basin DB2A
 68          HC       3

 69          KK    DB2A      Route combined flow through Dtn. Basin 2A
 70          KM              (Elev - disch based on BPR inlet control nomograph)
 71          KM              (See lines N1,N2,36" RCP)
 72          RS       1    STOR      -1
 73          SA  2.0960  2.1830  2.2700  2.4093  2.7052
 74          SE    1162  1162.5    1163  1163.8  1165.5
 75          SQ       0       4       7      16      46

 76          KK   SB131      Runoff from Sub-basins 124-31
 77          BA  0.0147
 78          LS              100      100
 79          UD  0.0542

 80          KK    SB2B      Runoff from Dtn.Basin 2B
 81          KM              NOTE-contrib area includes Southern Ave pump station
 82          BA  0.0248
 83          LS              100      100
 84          UD  0.1691
```



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

 85          KK   SUM2B      Add routed and local flows
 86          HC       3

 87          KK    DB2B      Route combined flow through Dtn. Basin 2B
 88          KM              (Elev - disch based on outlet control)
 89          RS       1    STOR      -1
 90          SA  3.8039  3.9930  4.1821  4.3711  4.5602  4.7493  4.9383  5.1274
 91          SE    1157    1158    1159    1160    1161    1162    1163    1164
 92          SQ       0     4.5      13      14    15.1    16.2    17.3    18.4
 93          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

 23        SB1
            V
            V
 28        DB1
            V
            V
 34       CP2A
            .
            .
 37         .        SB2A
            .           .
            .           .
 41         .           .        SB3A
            .           .           V
            .           .           V
 45         .           .        DB3A
            .           .           V
            .           .           V
 51         .           .        CP3B
            .           .           .
            .           .           .
 54         .           .           .        SB3B
            .           .           .           .
            .           .           .           .
 58         .           .       SUM3B............
            .           .           V
            .           .           V
 60         .           .        DB3B
            .           .           .
            .           .           .
 67      SUM2A........................
            V
            V
 69       DB2A
            .
            .
 76         .       SB131
            .           .
            .           .
 80         .           .        SB2B
            .           .           .
            .           .           .
 85      SUM2B........................
            V
            V
 87       DB2B
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*          SEPTEMBER 1990              *
*           VERSION 4.0                *
*                                      *
*  RUN DATE  09/09/1992  TIME  10:52:59 *
*                                      *
****************************************
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****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*          (916) 756-1104              *
*                                      *
****************************************
```

I10/SUPERSTITION/BASELINE
STANLEY CONSULTANTS # 10591
FILENAME : 100UNIT2 DATE : 9 SEPT 1992
DESIGN FREQUENCY = 100YR
SCS DIMENSIONLESS UNIT HYDROGRAPH
AREAS TAKEN FROM STANLEY FINAL DESIGN
TC FROM ASSUMED FLOW VEL AND INLET TIME AS FOLLOWS:
*Sheet/Overland Flow = 1-3 fps
*Gutter Flow = 2-4 fps
*Channel/Ditch Flow = 3-5 fps
*Pipe Flow = 5-10 fps
*No assumed inlet time
*Min TC in Corresponding Rational Analysis = 10 mins.
LAG TIME = 0.6 * TIME OF CONCENTRATION

ADOT LETTER OF 12-12-90:
* 6HR RAINFALL DISTRIBUTION USING PH RECORD
* TABULATION INTERVAL = 2MIN; 181 HYDROGRAPH ORDINATES
* BASIN AREA = C * A; 100% IMPERVIOUS

IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

NMIN		2	MINUTES IN COMPUTATION INTERVAL
IDATE	1	0	STARTING DATE
ITIME		0000	STARTING TIME
NQ		181	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	1	0	ENDING DATE
NDTIME		0600	ENDING TIME
ICENT		19	CENTURY MARK

COMPUTATION INTERVAL .03 HOURS
TOTAL TIME BASE 6.00 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

*** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION= 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	SB1	232.	3.30	28.	28.	28.	.08		
ROUTED TO	DB1	28.	3.97	12.	12.	12.	.08	1174.93	3.97
ROUTED TO	CP2A	28.	3.97	12.	12.	12.	.08		
HYDROGRAPH AT	SB2A	38.	3.10	3.	3.	3.	.01		
HYDROGRAPH AT	SB3A	46.	3.10	3.	3.	3.	.01		
ROUTED TO	DB3A	11.	3.37	3.	3.	3.	.01	1172.84	3.37
ROUTED TO	CP3B	11.	3.37	3.	3.	3.	.01		
HYDROGRAPH AT	SB3B	113.	3.17	10.	10.	10.	.03		
2 COMBINED AT	SUM3B	122.	3.17	14.	14.	14.	.04		
ROUTED TO	DB3B	17.	3.77	8.	8.	8.	.04	1164.85	3.77
3 COMBINED AT	SUM2A	55.	3.13	23.	23.	23.	.13		

ROUTED TO	DB2A	31.	6.00	11.	11.	11.	.13	1164.64	6.00
HYDROGRAPH AT	SB131	75.	3.07	5.	5.	5.	.01		
HYDROGRAPH AT	SB2B	89.	3.20	9.	9.	9.	.02		
3 COMBINED AT	SUM2B	145.	3.10	25.	25.	25.	.17		
ROUTED TO	DB2B	13.	6.00	6.	6.	6.	.17	1159.35	6.00

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)
CP2A	MANE	.17	27.62	238.29	1.40	2.00	27.62	238.00	1.40

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5958E+01 EXCESS= .0000E+00 OUTFLOW= .5946E+01 BASIN STORAGE= .1110E-01 PERCENT ERROR= .0

CP3B	MANE	.22	11.31	202.06	3.09	2.00	11.31	202.00	3.08

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1580E+01 EXCESS= .0000E+00 OUTFLOW= .1580E+01 BASIN STORAGE= .4829E-03 PERCENT ERROR= .0

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

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1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*          SEPTEMBER 1990              *
*           VERSION 4.0                *
*                                      *
*  RUN DATE  04/30/1992  TIME  13:17:23 *
*                                      *
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****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
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```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX
```

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

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT 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        I10/SUPERSTITION/BASELINE
  3           ID        STANLEY CONSULTANTS # 10591
  4           ID        FILENAME : ULT50       DATE : 28 APR 1992
  5           ID        DESIGN FREQUENCY = 50YR
  6           ID        SCS DIMENSIONLESS UNIT HYDROGRAPH
  7           ID        AREAS TAKEN FROM STANLEY FINAL DESIGN
  8           ID        TC FROM ASSUMED FLOW VEL AND INLET TIME AS FOLLOWS:
  9           ID            *Sheet/Overland Flow = 1-3 fps
 10           ID            *Gutter Flow = 2-4 fps
 11           ID            *Channel/Ditch Flow = 3-5 fps
 12           ID            *Pipe Flow = 5-10 fps
 13           ID            *No assumed inlet time
 14           ID            *Min TC in Corresponding Rational Analysis = 10 mins.
 15           ID        LAG TIME = 0.6 * TIME OF CONCENTRATION
 16           ID        ADOT LETTER OF 12-12-90:
 17           ID            * 6HR RAINFALL DISTRIBUTION USING PH RECORD
 18           ID            * TABULATION INTERVAL = 2MIN; 181 HYDROGRAPH ORDINATES
 19           ID            * BASIN AREA = C * A; 100% IMPERVIOUS
 20           ID
 21           ID        ************************************************************
 22           ID        THIS RUN IDENTICAL TO 50UNIT2 WITH ONE PRIMARY EXCEPTION :
 23           ID        THE SUM OF C*A FOR ALL DRAINAGE SUB-AREAS HAS BEEN INCREASED
 24           ID        BY 16 PERCENT TO ACCOUNT FOR FUTURE ULTIMATE CONDITION
 25           ID        ROADWAY IMPROVEMENTS. THE INCREASE IN C*A REFLECTS BOTH AN
 26           ID        INCREASE IN CONTRIBUTING AREA AND AN INCREASE IN PERCENT
 27           ID        IMPERVIOUS. THE ESTIMATED 16 PERCENT IS BASED ON THE PRELIM
 28           ID        ULTIMATE ROADWAY PLANS CONTAINED IN THIS REPORT.
 29           ID        ************************************************************
 30           ID
              *DIAGRAM
 31           IT      2                    181
 32           IO      5

 33           KK     SB1     Runoff from sub-basins 22-87,Dtn.Basin 1 @ HDW9
 34           BA   0.104
 35           PH                   .68    1.32    2.35    2.55    2.69    2.95
 36           LS              100     100
 37           UD  0.2601

 38           KK     DB1     Route flow through Dtn. Basin 1
 39           KM             (Elev - disch based on BPR inlet control nomograph)
```

```
 40          RS       1    STOR      -1
 41          SA  2.0432  2.5195  3.2197
 42          SE    1170    1175    1180
 43          SQ       0      28      45

 44          KK    CP2A     Route flow from Basin 1 to Basin 2A
 45          RK     282  0.0027   0.012            CIRC     2.0
                                   HEC-1 INPUT                                                    PAGE  2

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

 46          KK    SB2A     Runoff into and from Dtn.Basin 2A
 47          BA  0.0145
 48          LS             100     100
 49          UD  0.0955

 50          KK   SUM2A     Add routed flow and runoff from sub-basin DB2A
 51          HC

 52          KK    DB2A     Route combined flow through Dtn. Basin 2A
 53          KM             (Elev - disch based on BPR inlet control nomograph)
 54          RS       1    STOR      -1
 55          SA  1.9261  2.0156  2.1947  2.3737  2.5528
 56          SE  1162.5    1163    1164    1165    1166
 57          SQ       0       2       8      17      22

 58          KK    SB3A     Runoff at Dtn. Basin 3A
 59          BA  0.0096
 60          LS             100     100
 61          UD  0.0723

 62          KK    DB3A     Route flow through Dtn. Basin 3A
 63          KM             (Elev - disch based on BPR inlet control nomograph)
 64          RS       1    STOR      -1
 65          SA  0.2732  0.7886  1.0101  1.2317  1.4532  1.6749
 66          SE    1171  1172.8  1174.6  1176.4  1178.2    1180
 67          SQ       0      11      24    32.5      40      43

 68          KK    CP3B     Route flow from Basin 3A to Basin 3B
 69          RK     260  0.0160   0.012            CIRC     2.0
 70          RK     222  0.0165   0.012            CIRC     2.0

 71          KK    SB3B     Runoff from Dtn. Basin 3B
 72          BA  0.0348
 73          LS             100     100
 74          UD  0.1387

 75          KK   SUM3B     Add routed flow and runoff from sub-basin SB3B
 76          HC

 77          KK    DB3B     Route combined flow through Dtn. Basin 3B
 78          KM             (Elev - disch based on BPR inlet control nomograph)
 79          RS       1    STOR      -1
 80          SA  0.1700  0.2134  0.2741  0.3347  0.3954  1.1500  1.1865  1.2590
 81          SE    1162    1163  1164.4  1165.8  1167.2  1168.5    1169 1169.75
 82          SQ       0     4.5      16      24      30      35      37      40

 83          KK   SB131     Runoff from Sub-basins 124-31
 84          BA  0.0164
 85          LS             100     100
 86          UD  0.0542
                                   HEC-1 INPUT                                                    PAGE  3

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

 87          KK    SB2B     Runoff at Dtn.Basin 2B
 88          KM             NOTE - contrib area includes Southern Ave pump station
 89          BA  0.0225
 90          LS             100     100
 91          UD  0.1691

 92          KK   SUM2B     Add routed and local flows
 93          HC       4

 94          KK    DB2B     Route combined flow through Dtn. Basin 2B
 95          KM             (Elev - disch based on outlet control)
 96          RS       1    STOR      -1
 97          SA  3.7764  3.9830  4.1896  4.3962  4.6028  4.8095  5.0275  5.2456
```

```
                .
                .
 46             .        SB2A
                .          .
                .          .
 50         SUM2A............
                V
                V
 52          DB2A
                .
                .
 58             .        SB3A
                .          V
                .          V
 62             .        DB3A
                .          V
                .          V
 68             .        CP3B
                .          .
                .          .
 71             .          .        SB3B
                .          .          .
                .          .          .
 75             .      SUM3B............
                .          V
                .          V
 77             .       DB3B
                .          .
                .          .
 83             .          .       SB131
                .          .          .
                .          .          .
 87             .          .          .        SB2B
                .          .          .          .
                .          .          .          .
 92         SUM2B.................................
                V
                V
 94          DB2B
                V
                V
100          MH43
                .
                .
104             .        SB43
                .          V
                .          V
108             .         DB4
                .          .
                .          .
119             .          .-------->   TEMPE
116             .      DVTDB4
                .          .
                .          .
122         SUM43............
                V
                V
124          MH63
                .
                .
127             .      SUB135
                .          .
                .          .
131        SUM135............
                V
                V
133          RCHE
                .
                .
142             .        SUBE
                .          .
                .          .
146          SUME............
```

*) RUNOFF ALSO COMPUTED AT THIS LOCATION

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*************************************
*                                   *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*          SEPTEMBER 1990           *
*           VERSION 4.0             *
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*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
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```
 98          SE    1157    1158    1159    1160    1161    1162    1163    1164
 99          SQ       0     4.5      13      14    15.1    16.2    17.3    18.4

100          KK    MH43     Route flow from Basin 2B to MH43
101          RK     455  0.0015   0.012            CIRC     2.0
102          RK     404  0.0030   0.012            CIRC     2.0
103          RK     250  0.0036   0.012            CIRC     2.0

104          KK    SB43     Runoff from off-roadway areas to Southern Ave basin
105          BA  0.0016
106          LS             100     100
107          UD  0.0392

108          KK     DB4     Route flow through Southern Ave. det basin
109          KM             (Elev - disch based on combined capacities of existing 16 inch
110          KM             pipe at east end of basin and proposed surface inlet grate at
111          KM             west end)
112          RS       1    STOR      -1
113          SA  0.0356  0.2594  0.7071  1.1548  1.6024  2.0500
114          SE  1158.5    1159    1160    1161    1162    1163
115          SQ       0       5      15      22      28      33

116          KK  DVTDB4     Split hydrograph DB4.
117          KM             NOTE - New inlet grate at west end of Southern Ave det basin
118          KM                    is opened up after Unit 2 is constructed.
119          DT   TEMPE
120          DI       0       5      15      22      28      33
121          DQ       0       0       3       7      10      12

122          KK   SUM43     Sum hydrographs MH43 and DVTDB4
123          HC

124          KK    MH63     Route SUM43 to DMJM tie-in at 8152+00,119'lt.
125          RK     124  0.0037   0.012            CIRC     2.0
126          RK     299  0.0040   0.012            CIRC     2.0
```



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

127          KK  SUB135     Runoff from sub-basin 135 (DMJM)
128          BA   0.002
129          LS             100     100
130          UD    0.10

131          KK  SUM135     Sum hydrographs SUB135 and MH63
132          HC

133          KK    RCHE     Route SUM135 to DMJM det basin E near Bell Butte
134          RK     300  0.0030   0.012            CIRC     2.0
135          RK     350  0.0030   0.012            CIRC     2.5
136          RK     450  0.0030   0.012            CIRC     2.5
137          RK     246  0.0020   0.012            CIRC     4.0
138          RK     331  0.0010   0.012            CIRC     4.0
139          RK     361  0.0010   0.012            CIRC     4.5
140          RK     322  0.0025   0.012            CIRC     5.0
141          RK    1442  0.0010   0.012            CIRC     5.0

142          KK    SUBE  RUNOFF FROM SUB-BASIN E
143          BA   0.064
144          LS             100     100
145          UD    0.20

146          KK    SUME     Sum hydrographs SUBE and RCHE
147          HC
148          ZZ
```

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

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

 33        SB1
            V
            V
 38        DB1
            V
            V
 44       CP2A
```

DESIGNED BY GSB	DATE 4-21-93	SHEET NO. 1	PAGE NO.
CHECKED BY WHH	DATE	OF 1	JOB NO. 10591
REVIEWED BY	DATE	SUBJECT: UNIT 2 DETENTION BLEEDOFF	
APPROVED BY	DATE		

DISPOSAL OF DETAINED RUNOFF:

TOTAL VOL TO BE DISPOSED IS UNIT 2 Σ CA FOR 50-YR, 6HR STORM =

$$109.1 \text{ AC} \times 2.95 \tfrac{1}{12}'' = 26.81 \text{ ACFT}$$

ASSUMED DISCHARGE RATES ARE 7.5 CFS AVG FOR 24" DISCHARGE PIPE AND 0.5 CFS PER WETTED ACRE INFILTRATION AND PERCOLATION @ DETENTION BASIN BOTTOM. ASSUME WETTED AREA TO BE THE BOTTOM OF DETENTION BASIN 2B IN UNIT 2 = 3.77 ACRES. ASSUME MAXIMUM DISPOSAL TIME IS 36 HOURS.

VOL DISCHARGED BY PIPE:

$$\frac{7.5 \text{ CFS} \times 3600 \text{ SEC/HR} \times 36 \text{ HRS}}{43{,}560 \text{ FT}^3/\text{ACFT}} = 22.31 \text{ ACFT}$$

VOL DISCHARGED THRU INFILTRATION/PERCOLATION:

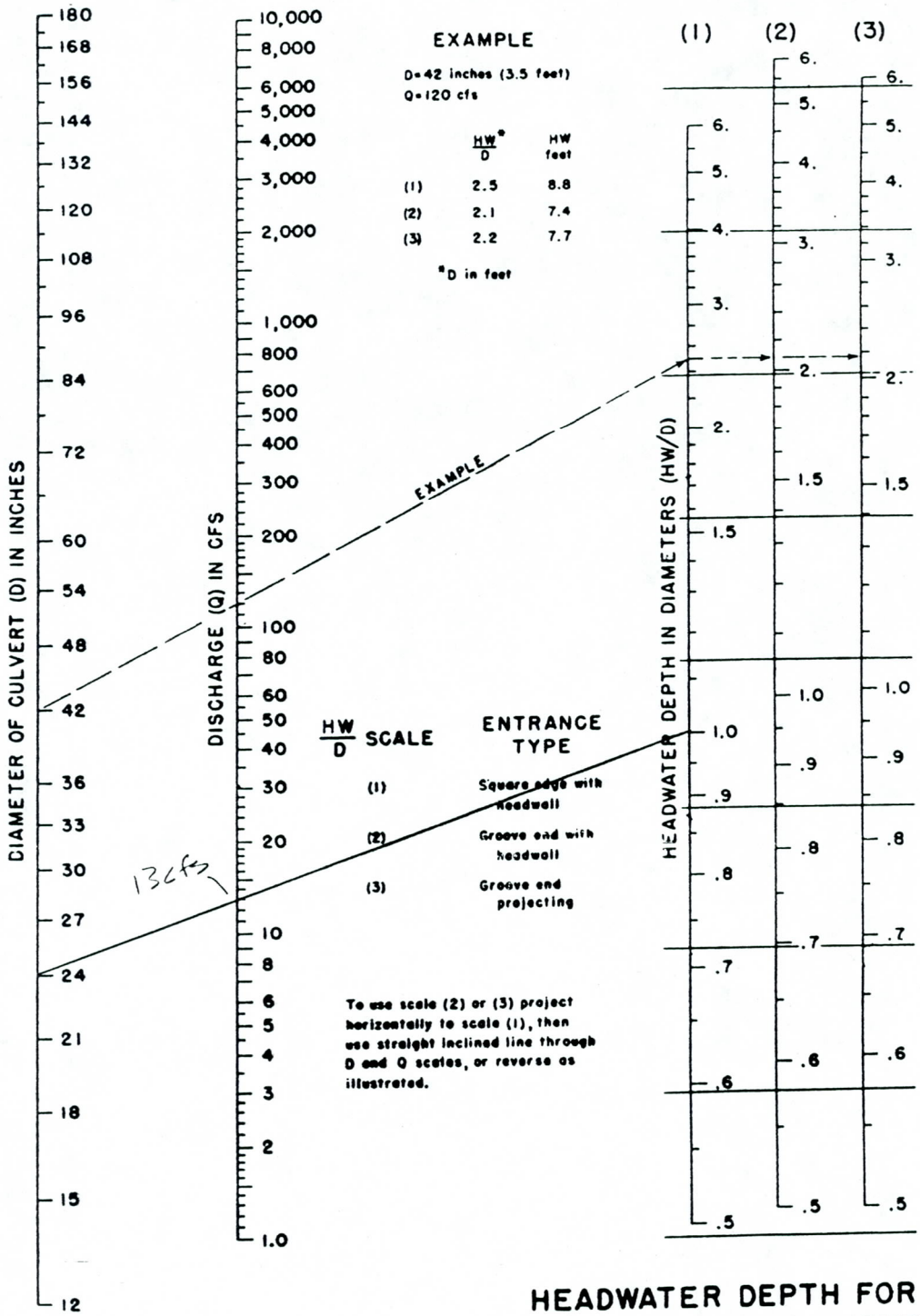
$$\frac{0.5 \text{ CFS/AC} \times 3.77 \text{ AC} \times 3600 \text{ SEC/HR} \times 36 \text{ HRS}}{43560 \text{ FT}^3/\text{ACFT}} = 5.61 \text{ ACFT}$$

TOTAL VOL IN 36 HRS — $\boxed{27.92 \text{ ACFT}}$

$\therefore$ VOL DISPOSED > VOL DETAINED

SC 3020

CHART 2



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

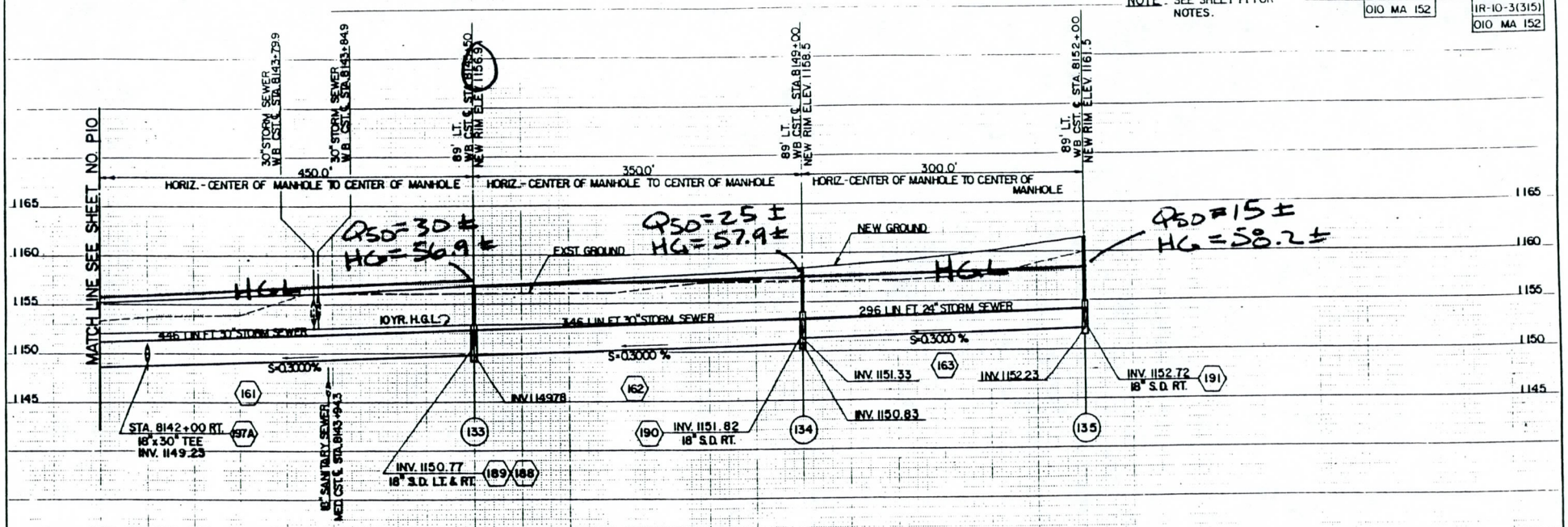
BUREAU OF PUBLIC ROADS JAN. 1963

GSB/SCI/JUL 91

APPROX ~~HGL~~ HYDRAULIC GRADE LINE (SCI)

FHWA REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	I-10-3(309)	219	569	
		010 MA 152			IR-10-3(315) 010 MA 152

NOTE: SEE SHEET P1 FOR NOTES.



REDUCED SIZE
DO NOT SCALE

HORIZ: 1" = 50' 0 25 50 100 150

VERT: 1" = 5' 0 5 10 15

	NAME	DATE
DESIGN	R.L.O.	6/89
DRAWN	T.H. & T.D.N.	7/89
CHECKED	T.D.E.	7/89

DMJM
Dames, Moore, Johnson, & Mendenhall

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

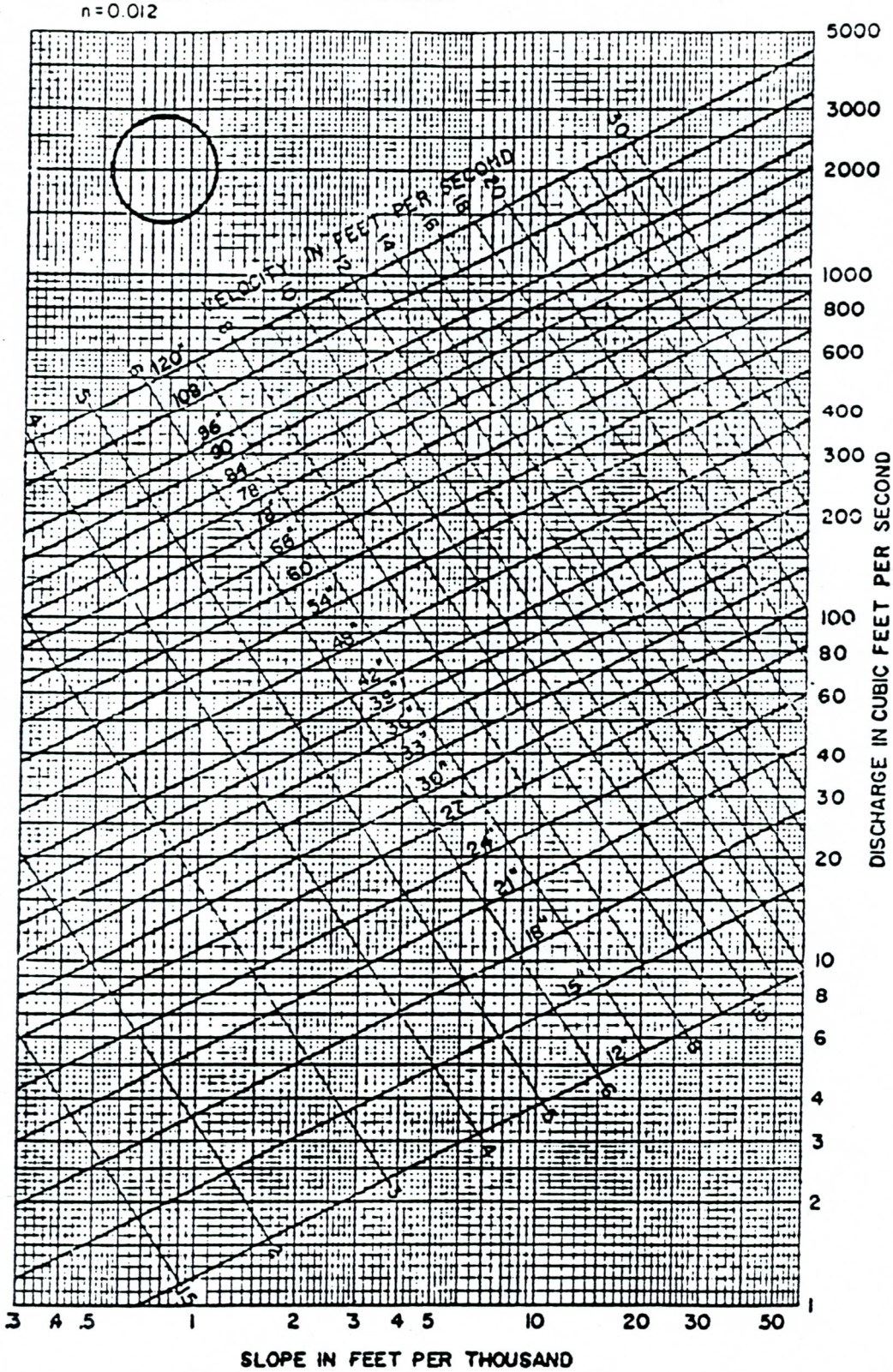
DRAINAGE PROFILES

ROUTE	HIGHWAY	LOCATION
I-10	152.28 TO 154.57	44TH ST - SUPERSTITION T.I.

SHEET P11 OF ___ OF ___

TRACS NO. H2190 01C & H2036 01C

COMPUTED FROM MANNING'S FORMULA
n = 0.012



PIPE CAPACITIES FLOWING FULL

ARIZONA HIGHWAY DEPARTMENT
STRUCTURES SECTION
HYDRAULICS BRANCH

STORM SEWER SYSTEM DESIGN: SEWER CALCULATION SHEET

DMJM

LOCATION DATA
Highway 48TH STREET & BROADWAY RD. T.I.S.
Location PHOENIX, ARIZONA
Project No. I-10 3(309)

DESIGN DATA
Frequency 10 years
P_6 = 2.0 in. P_{24} = 2.4 in. P_1 = 1.5 in.
Outlet TW Elev. = 1148.2
Pipe n = 0.012

SEWER CALCULATIONS

Location		Drainage Area			Time of Flow, Min.			I	Q	Sewer Profile				Sewer Design			Hydraulic Grade Line			
Line No.	From - To **	No.	Increm. CA	Σ CA	Inlet	Sewer	Design	in./hr	cfs	Crown Elevation Inlet	Crown Elevation Outlet	Length ft.	Slope ft./ft.	Diam. in.	Q_{full} cfs	V f.p.s.	S_f ft./ft.	h_L ft.	Elevation Inlet	Elevation Outlet
		—	0.51*																	
		—	0.48*	35.08		0.69	18.80	3.10	108.75											
155	8125+00-8121+00									1148.56	1148.15	411.02	0.0010	60	89.21	5.54	0.0015	0.62	1150.08	1149.46
		139	0.91																	
		138	0.94																	
		—	0.53*																	
		—	0.49*																	
		171	0.38	38.33		1.24	20.04	3.0	114.99											
154	8121+00-8117+00									1148.15	1147.73	417.16	0.0010	60	89.21	5.86	0.0017	0.71	1149.46	1148.75
		137	1.20																	
		136	1.39																	
		—	0.61*																	
		—	0.64*	42.17		1.19	21.23	2.85	120.19											
153	8117+00-8114+00									1145.10	1144.12	290.13	0.0010	60	89.21	6.12	0.0019	0.55	1148.75	1148.20
	DET FASILITY 'E'					0.79	22.02													

F-115

Computed by: RLD Checked by: MAF Date: SEPT 18, 1989

* ** } SEE NOTES PAGES 1 & 2

GSR/SCI/JUL 91

APPROX ~~HGL~~ HYDRAULIC GRADE LINE (SCI)

F.A.R.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	I-10-3(309)	218	569	
		010 MA 152			IR-10-3(315) 010 MA 152

NOTE: SEE SHEET P1 FOR NOTES.

256' LT. WB ℄ STA. 8114+88.46

130' LT. WB ℄ STA. 8117+37.40 NEW RIM ELEV. 1151.5

77' LT. WB ℄ STA. 8121+40.54 NEW RIM ELEV. 1163.2

77' LT. WB ℄ STA. 8125+43.68 NEW RIM ELEV. 1162.2

290.13' HORIZ.- FACE OF HEADWALL TO CENTER OF MANHOLE

417.16' HORIZ.- CENTER OF MANHOLE TO CENTER OF MANHOLE

411.02' HORIZ.- CENTER OF MANHOLE TO CENTER OF MANHOLE

338.68' HORIZ.- CENTER OF MANHOLE TO CENTER OF MANHOLE

HEADWALL A.D.O.T. C-16.10

50 YR. WSL 1148.2

DETENTION FACILITY

43.93

Q50=180± HG=50.1±

Q50=170± HG=51.6±

30" CASING W/ 6" ELECTRIC CONDUIT EB CST. ℄ STA. 8122+80.81

NEW GROUND

EXISTING GROUND

Q50=160± HG=53.0±

HGL

10 YR. H.G.L.

206.13 LIN. FT. 60" STORM SEWER

413.16 LIN. FT. 60" STORM SEWER

407.02 LIN. FT. 60" STORM SEWER

334.68 LIN. FT. 60" STORM SEWER

S = 0.1000 % (153)

S = 0.1007 % (154)

S = 0.0998 % (155)

S = 0.1004 % (156)

INV. 1142.44

INV. 1142.44

(164) INV. 1143.60 18" S.D. RT.

INV. 1142.73

(192) INV. 1144.69 18" S.D. LT.

(166) INV. 1144.69 18" S.D. RT.

INV. 1143.15

(168) INV. 1145.61 18" S.D. RT.

(194) INV. 1145.51

INV. 1143.56

(125) (126) (127)

WB ℄ STA. 8127+45.25 18"x60" PREFAB. TEE (194A)

MATCH LINE SEE BELOW LEFT

77' LT. WB ℄ STA. 8128+75.82 NEW RIM ELEV. 1161.2

77' LT. WB ℄ STA. 8131+97.87 NEW RIM ELEV. 1159.5

78' LT. WB ℄ STA. 8135+82.74 NEW RIM ELEV. (1158.10)

78' LT. WB ℄ STA. 8138+97.84 NEW RIM ELEV. (1155.42)

89' LT. WB ℄ STA. 8141+47.84 NEW RIM ELEV. 1156.23

338.68' HORIZ.- CENTER OF MANHOLE TO CENTER OF MANHOLE

326.00' HORIZ.- CENTER OF MANHOLE TO CENTER OF MANHOLE

364.99' HORIZ.- CENTER OF MANHOLE TO CENTER OF MANHOLE

335.06' HORIZ.- CENTER OF MANHOLE TO CENTER OF MANHOLE

250.29' HORIZ.- CENTER OF MANHOLE TO CENTER OF MANHOLE

450.0'

Q50=140± HG=53.8

EXISTING AND RELOCATED 24" CASING W/ 0.8" HIGH WIRE HOUSING MED. CST. ℄ STA. 8130+65 ±

24" STORM SEWER MED. CST. ℄ STA. 8130+82±

Q50=125± HG=54.4±

EXISTING GROUND

NEW GROUND

Q50=85± HG=55.4

Q50=105± HG=55.1±

Q50=70± HG=55.2

REDUCED SIZE DO NOT SCALE

MATCH LINE SEE ABOVE RIGHT

MATCH LINE SEE SHEET NO. P11

322.00 LIN. FT. 60" STORM SEWER

360.99 LIN. FT. 54" STORM SEWER

331.06 LIN. FT. 48" STORM SEWER

246.29' LIN. FT. 48" STORM SEWER

S = 0.1004 % (156)

S = 0.2546 % (157)

S = 0.0986 % (158)

S = 0.1015 % (159)

S = 0.1998 % (160)

S = 3.000% (161)

INV. 1143.90

15" SS MED. CST. ℄ STA. 8130+59±

INV. 1146.20 18" S.D. RT. (170)

EXISTING & RELOCATED 30" CASING W/ 18" WATER MED. CST. ℄ STA. 8130+69

INV. 1147.02 18" S.D. RT. (172)

(199A) WB ℄ STA. 8132+50 18"x54" PREFAB. TEE

INV. 1146.78 (199)

INV. 1145.23

INV. 1144.73

(175) INV. 1147.42 24" S.D. RT.

INV. 1145.59

INV. 1146.09

INV. 1147.48

WB ℄ STA. 8137+00 18"x48" PREFAB. TEE (181A)

(181)

(182) INV. 1148.95 18" S.D. RT.

INV. 1146.43

(187) INV. 1147.62 24" S.D. RT.

INV. 1146.93

INV. 1148.43

(128) (129) (130) (131) (132)

HORIZ. 1" = 50' 0 50 100 150

VERT. 1" = 5' 0 5 10 15

DESIGN	R.L.D.		6/89
DRAWN	J.W.T. & T.D.N.		6/89
CHECKED	T.D.E.		6/89

DMJM Dowl, Mann, Johnson, & Associates

ARIZONA DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION

DRAINAGE PROFILES

ROUTE I-10 MILEPOST 152.8 TO 154.57 LOCATION 44TH ST. - SUPERSTITION T.I.

SHEET P10 OF ___ OF ___

TRACS NO. H2190, OIC & H2036 OIC

Memo

To: Steve Wilcox, Arizona Department of Transportation

From: Scott Buchanan, Stanley Consultants GSB Date: January 23, 1991

Re: Interim Bleedoff of Detained Storm Runoff

Project: Phoenix-Casa Grande highway
I-10/Superstition TI, Baseline Road TI
Contract #87-55
IR-10-3(311) PE

Certain detention basins or portions of basins are to be overexcavated (deepened) in Unit 1 to obtain additional embankment material. This will create the possibility of dead storage ponding below the ultimate gravity outfall which would necessitate occasional interim pumping for disposal. It was suggested by ADOT at the design progress meeting of January 9, 1991 that Stanley Consultants obtain a copy of Tempe's drainage criteria to use as a guide in estimating required bleedoff rates and required disposal time.

Tempe's drainage criteria requires disposal within a maximum of 36 hours. Their required detention volume is based on a 100 year - 1 hour storm of 2.40 inches. Using an estimated overall contributing area of 173 acres, an estimated weighted runoff coefficient of 0.75 and a 100 year - 1 hour rainfall of 2.40 inches, we estimate a total volume of 26 ac ft.

Assuming that the entire volume is below the ultimate gravity outfall, 26 ac ft would require a constant pumping rate of about 9 cfs (or about 4000 gpm) to dispose of the entire amount within 36 hours. This rate should be well within reasonable available pump capacities.

It should be noted that ADOT's design requirement for detention volume on this project is based on a 50 year - 6 hour storm with a total of 2.95 inches of rain which is greater than Tempe's requirement. It should also be noted that the assumed maximum disposal rate for the ultimate design is 15 cfs. This is dictated by DMJM's assumptions downstream from this project which are based on a limitation of inflow to the Tempe Drain.

SC/tlb:JAN052

cc: Robert Jacobs, Stanley Consultants
Michael Chase, Stanley Consultants
Bill Hiatt, Stanley Consultants

ARIZONA HIGHWAY DEPARTMENT
STRUCTURES SECTION
HYDRAULICS BRANCH

STORM SEWER SYSTEM DESIGN: SEWER CALCULATION SHEET

DMJM

LOCATION DATA
Highway 48TH STREET & BROADWAY RD. T.I.S
Location PHOENIX, ARIZONA
Project No. I-10 3(309)

DESIGN DATA
Frequency 10 years
P_6 = 2.0 in. P_{24} = 2.4 in. P_1 = 1.5 in.
Outlet TW Elev. = 1148.20
Pipe n = 0.012

SEWER CALCULATIONS

Location		Drainage Area			Time of Flow, Min.			I	Q	Sewer Profile				Sewer Design			Hydraulic Grade Line			
Line No.	From - To	No.	Increm.		Inlet	Sewer	Design	in./hr	cfs	Crown Elevation		Length	Slope	Diam.	Q full	V	S_f	h_L	Elevation	
										Inlet	Outlet	ft.	ft./ft.	in.	cfs	f.p.s.	ft./ft.	ft.	Inlet	Outlet
	* *	DA-	CA	Σ CA																
		—	0.45*	21.32		0.67	15.62	3.44	73.34											
158	8135+1494-8132+50									1150.09	1149.83	264.94	0.001	54	67.39	4.61	0.0012	0.32	1151.22	1150.90
		173	0.70	22.02		0.96	16.58	3.30	72.67											
158	8132+50 - 8131+50									1149.83	1149.73	100.05	0.001	54	67.39	4.57	0.0012	0.12	1150.90	1150.78
		146	0.22																	
		146A	0.22																	
		—	0.13*																	
		—	0.13*																	
		***	3.50	26.22		0.37	16.95	3.28	86.00											
157	8131+50-8128+29.55									1149.73	1148.90	326.0	0.00254	60	142.34	7.60	0.0009	0.29	1150.78	1150.49
		145	0.50																	
		143	0.76																	
		144	0.50																	
		142	0.76																	
		—	0.43*																	
		—	0.28*																	
		—	0.43*																	
		—	0.28*	30.16		0.71	17.66	3.22	97.12											
156	8128+29.55-8127+00									1148.90	1148.77	133.17	.0010	60	89.21	4.95	0.00118	0.16	1150.49	1150.33
		172	0.38	30.54		0.45	18.11	3.20	97.73											
156	8127+00 - 8125+00									1148.77	1148.56	205.58	.0010	60	89.21	4.98	0.00119	0.25	1150.33	1150.08
		176	1.70																	
		141	0.91																	
		140	0.94																	

F-115

Computed by: RLD Checked by: MAF Date: SEPT. 18, 1989

* } SEE NOTES PAGES 1 & 2
**

*** } CA = 3.50 ADDED HERE TO ACCOUNT FOR POTENTIAL INFLOWS FROM CITY OF TEMPE (COT.) SUBDIVISION AT ALEMEDA. C.O.T. HAD NO RECORDS ESTIMATING RUNOFF. 18" PIPE CAPACITY IS ≈ 14.8 CFS USING AN I = 4.2 IN/hr YIELDS A CA = 3.5 (AN 18" LATERAL WITH A DOUBLE C.B INLET WAS PROVIDED)

APPENDIX J

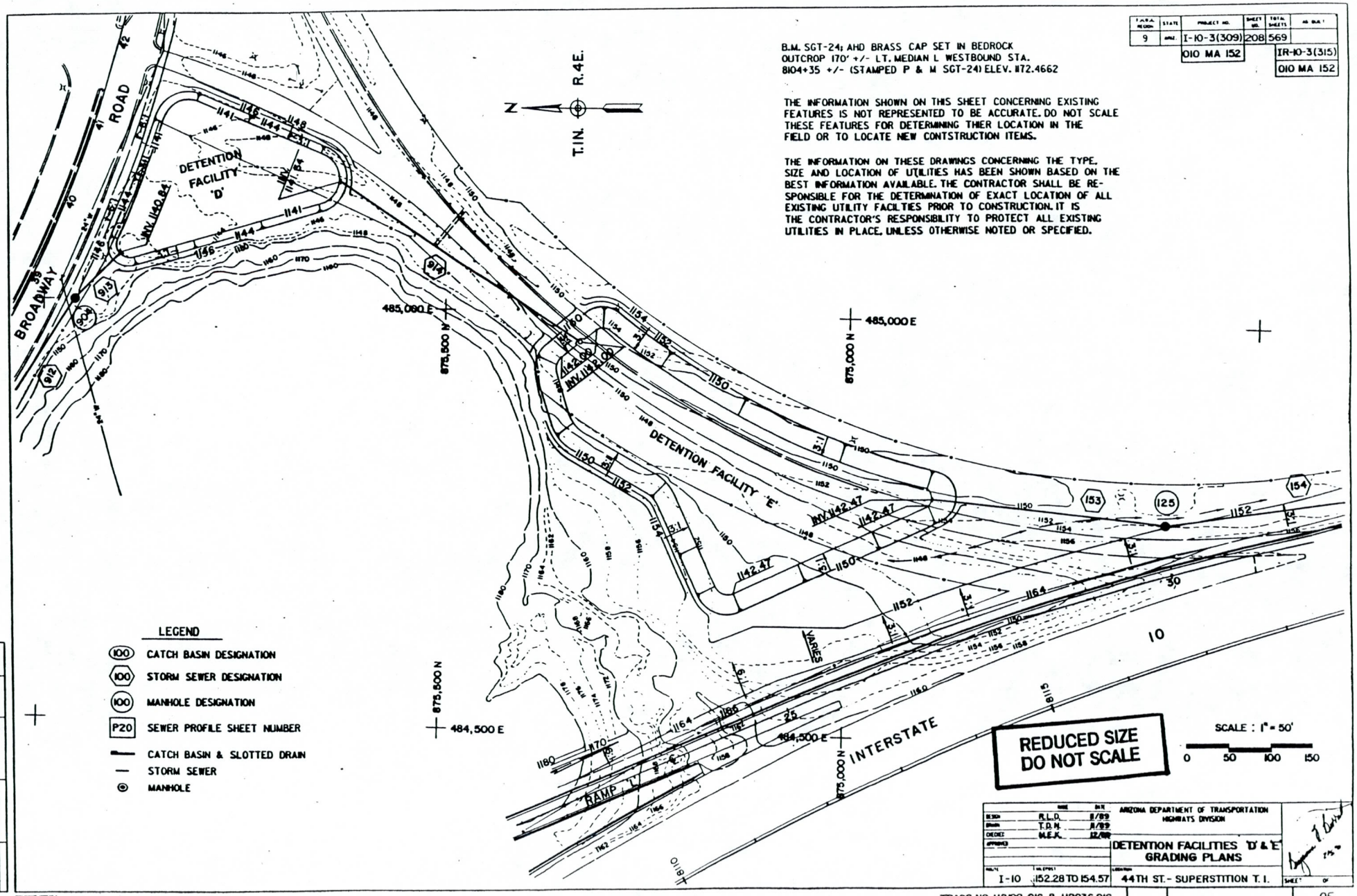
DETENTION BLEEDOFF

F.A.P.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	I-10-3(309)	208	569	
		010 MA 152			IR-10-3(315) 010 MA 152

B.M. SGT-24; AHD BRASS CAP SET IN BEDROCK OUTCROP 170' +/- LT. MEDIAN L WESTBOUND STA. 8104+35 +/- (STAMPED P & M SGT-24) ELEV. 1172.4662

THE INFORMATION SHOWN ON THIS SHEET CONCERNING EXISTING FEATURES IS NOT REPRESENTED TO BE ACCURATE. DO NOT SCALE THESE FEATURES FOR DETERMINING THIER LOCATION IN THE FIELD OR TO LOCATE NEW CONTSTRUCTION ITEMS.

THE INFORMATION ON THESE DRAWINGS CONCERNING THE TYPE, SIZE AND LOCATION OF UTILITIES HAS BEEN SHOWN BASED ON THE BEST INFORMATION AVAILABLE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DETERMINATION OF EXACT LOCATION OF ALL EXISTING UTILITY FACILTIES PRIOR TO CONSTRUCTION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROTECT ALL EXISTING UTILITIES IN PLACE, UNLESS OTHERWISE NOTED OR SPECIFIED.



	NAME	DATE
DESIGN	R.L.D.	8/89
DRAWN	T.D.N.	8/89
CHECKED	M.E.K.	12/89
APPROVED		

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DETENTION FACILITIES 'D' & 'E'
GRADING PLANS

I-10 | 152.28 TO 154.57 | 44TH ST. - SUPERSTITION T. I.

SHEET ___ OF ___

TRACS NO. H2190-01C & H2036 01C

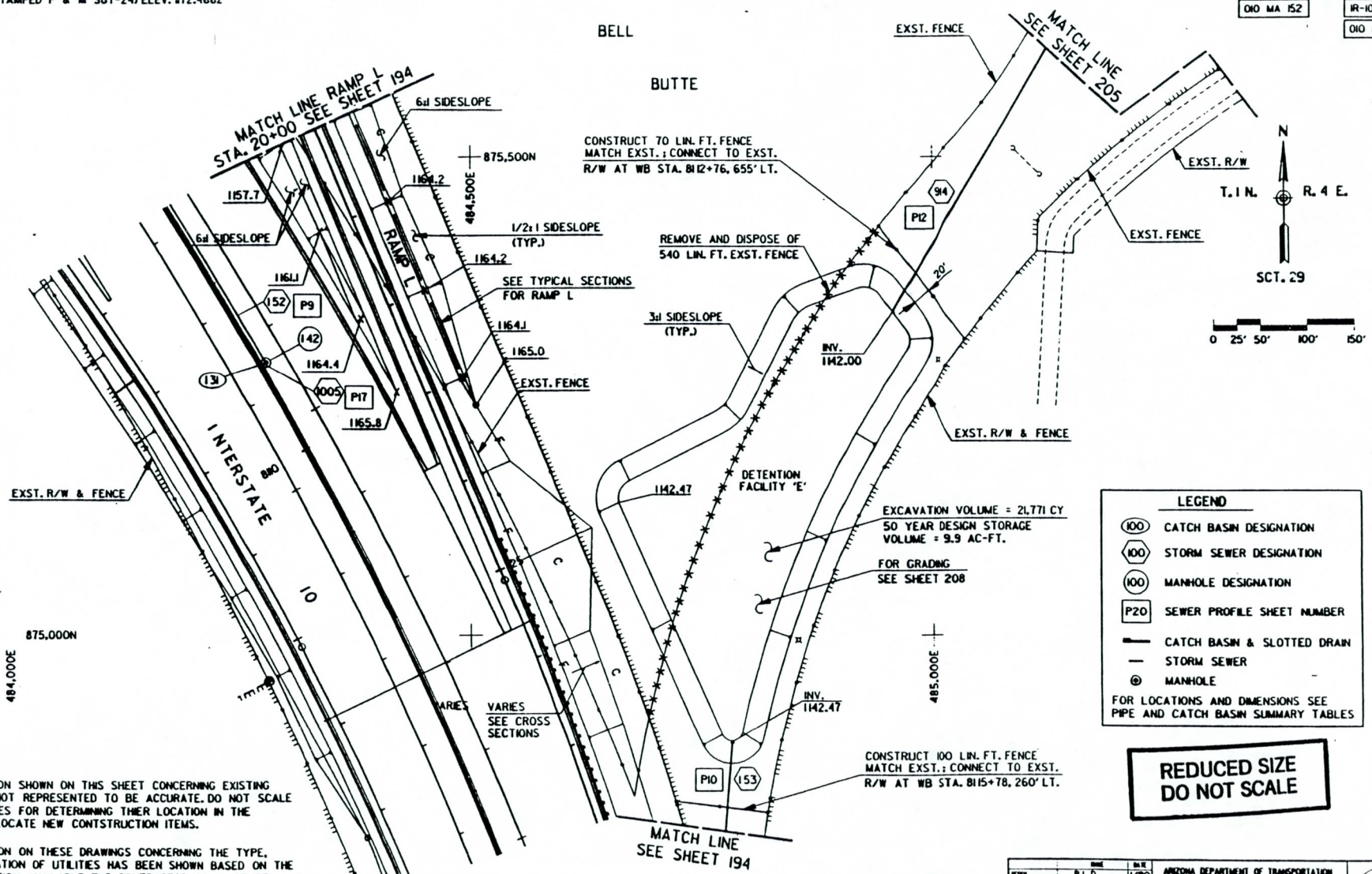
F.A.R.S. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	I-10-3(309)	206	569	

010 MA 152

IR-10-3(315)

010 MA 152

B.M. SGT-24; AHD BRASS CAP SET IN BEDROCK OUTCROP 170' +/- LT. MEDIAN L WESTBOUND STA. 8104+35 +/- (STAMPED P & M SGT-24) ELEV. 1172.4662



REDUCED SIZE DO NOT SCALE

THE INFORMATION SHOWN ON THIS SHEET CONCERNING EXISTING FEATURES IS NOT REPRESENTED TO BE ACCURATE. DO NOT SCALE THESE FEATURES FOR DETERMINING THIER LOCATION IN THE FIELD OR TO LOCATE NEW CONTSTRUCTION ITEMS.

THE INFORMATION ON THESE DRAWINGS CONCERNING THE TYPE, SIZE AND LOCATION OF UTILITIES HAS BEEN SHOWN BASED ON THE BEST INFORMATION AVAILABLE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DETERMINATION OF EXACT LOCATION OF ALL EXISTING UTILITY FACILTIES PRIOR TO CONSTRUCTION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROTECT ALL EXISTING UTILITIES IN PLACE, UNLESS OTHERWISE NOTED OR SPECIFIED.

	NAME	DATE
DESIGN	R.L.D.	1/90
DRAWN	F.E.H.	1/90
CHECKED	M.E.K.	1/90

DMJM Daniel, Mann, Johnson & Mendenhall

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN
RAMP L

ROUTE I-10 MILEPOST 152.28 TO 154.57 LOCATION 44TH ST. - SUPERSTITION T.I.

SHEET ___ OF ___

DR.27

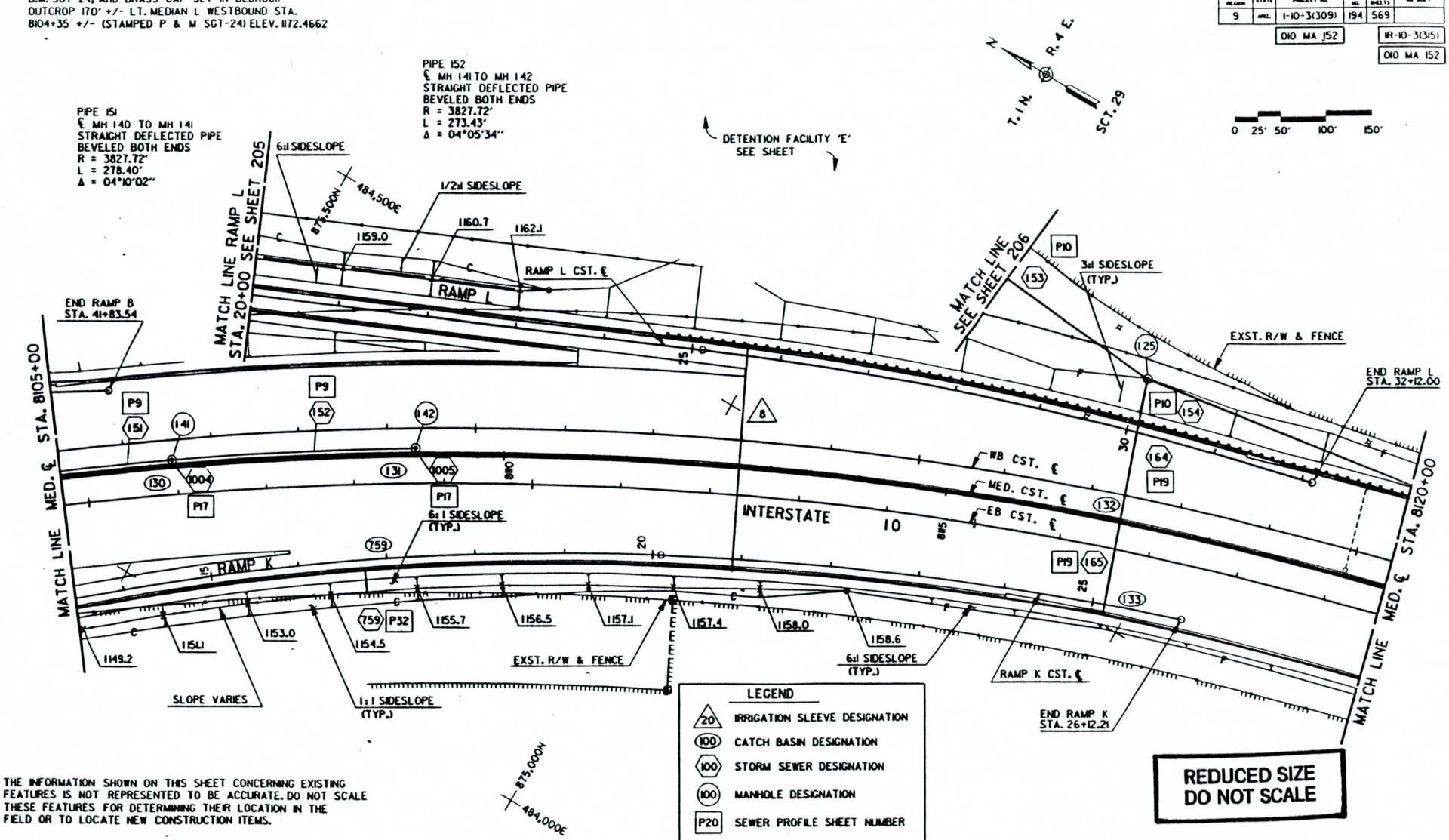
TRACS NO. H2190 01C & H2036 01C

___ OF ___

F.A.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	I-10-3(309)	194	569	

010 MA 152 | IR-10-3(315) | 010 MA 152

B.M. SGT-24; AHD BRASS CAP SET IN BEDROCK OUTCROP 170' +/- LT. MEDIAN L WESTBOUND STA. 8104+35 +/- (STAMPED P & M SGT-24) ELEV. 1172.4662



THE INFORMATION SHOWN ON THIS SHEET CONCERNING EXISTING FEATURES IS NOT REPRESENTED TO BE ACCURATE. DO NOT SCALE THESE FEATURES FOR DETERMINING THEIR LOCATION IN THE FIELD OR TO LOCATE NEW CONSTRUCTION ITEMS.

THE INFORMATION ON THESE DRAWINGS CONCERNING THE TYPE, SIZE AND LOCATION OF UTILITIES HAS BEEN SHOWN BASED ON THE BEST INFORMATION AVAILABLE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DETERMINATION OF EXACT LOCATION OF ALL EXISTING UTILITY FACILTIES PRIOR TO CONSTRUCTION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROTECT ALL EXISTING UTILITIES IN PLACE, UNLESS OTHERWISE NOTED OR SPECIFIED.

LEGEND

- 20 — IRRIGATION SLEEVE DESIGNATION
- 100 — CATCH BASIN DESIGNATION
- 100 — STORM SEWER DESIGNATION
- 100 — MANHOLE DESIGNATION
- P20 — SEWER PROFILE SHEET NUMBER
- CATCH BASIN & SLOTTED DRAIN
- STORM SEWER
- MANHOLE

FOR LOCATIONS AND DIMENSIONS SEE PIPE AND CATCH BASIN SUMMARY TABLES

REDUCED SIZE DO NOT SCALE

	NAME	DATE
DESIGN	R.L.D.	1/90
DRAWN	F.E.H.	1/90
CHECKED	M.E.E.	1/90

DMJM Dames, Berry, Jennings & Mendenhall

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN

ROUTE: I-10 | MILEPOST: 152.28 TO 154.57 | LOCATION: 44TH ST. - SUPERSTITION T.I.

SHEET ___ OF ___

DR.16

TRACS NO. H2190; 01C & H2036 01C

F.A.P.M.A. REVISION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	I-10-3(309)	195	569	

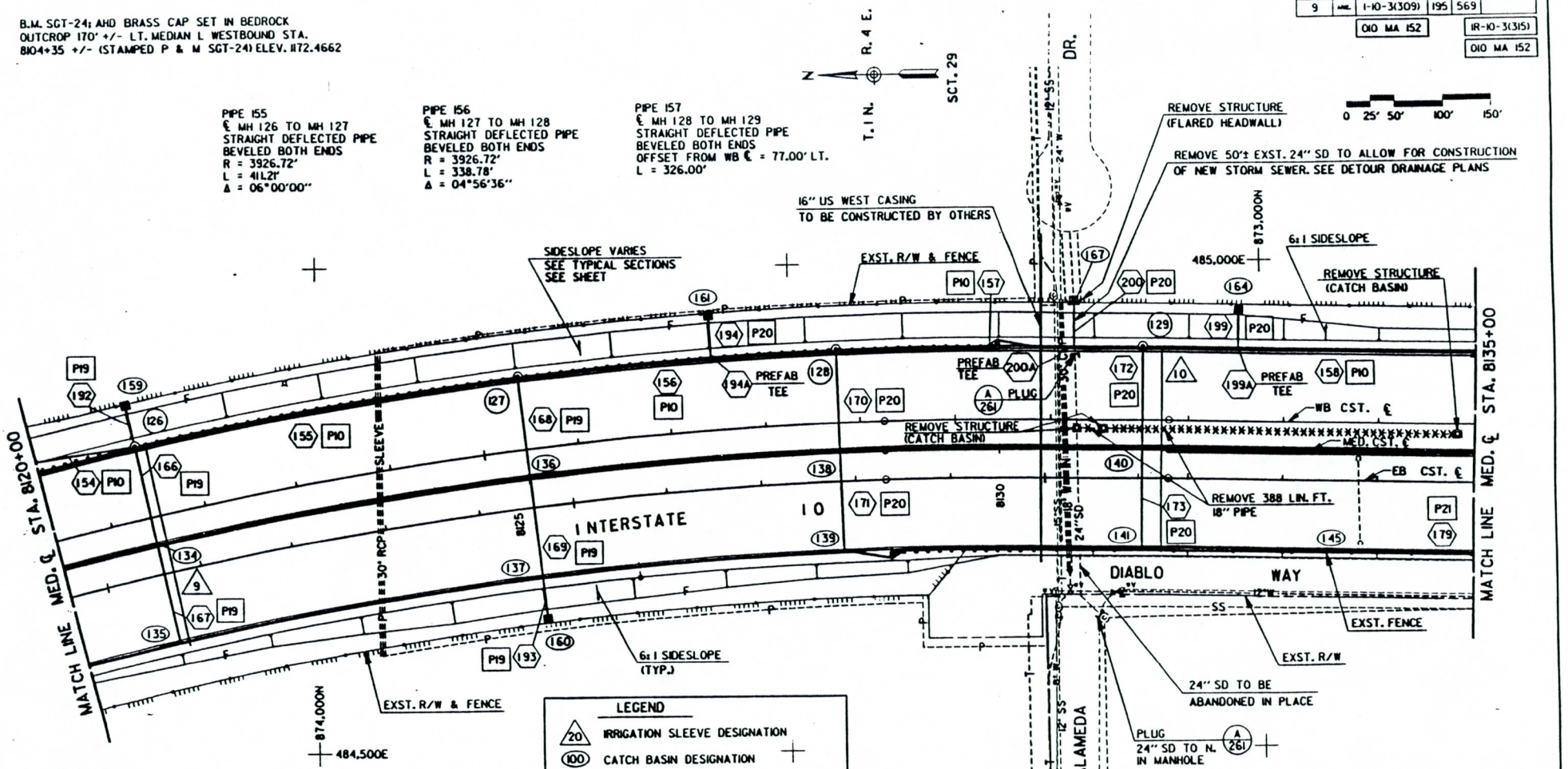
010 MA 152 | IR-10-3(315) | 010 MA 152

B.M. SGT-24; AHD BRASS CAP SET IN BEDROCK OUTCROP 170' +/- LT. MEDIAN L WESTBOUND STA. 8104+35 +/- (STAMPED P & M SGT-24) ELEV. 1172.4662

PIPE 155
℄ MH 126 TO MH 127
STRAIGHT DEFLECTED PIPE
BEVELED BOTH ENDS
R = 3926.72'
L = 411.21'
Δ = 06°00'00"

PIPE 156
℄ MH 127 TO MH 128
STRAIGHT DEFLECTED PIPE
BEVELED BOTH ENDS
R = 3926.72'
L = 338.78'
Δ = 04°56'36"

PIPE 157
℄ MH 128 TO MH 129
STRAIGHT DEFLECTED PIPE
BEVELED BOTH ENDS
OFFSET FROM WB ℄ = 77.00' LT.
L = 326.00'



THE INFORMATION SHOWN ON THIS SHEET CONCERNING EXISTING FEATURES IS NOT REPRESENTED TO BE ACCURATE. DO NOT SCALE THESE FEATURES FOR DETERMINING THEIR LOCATION IN THE FIELD OR TO LOCATE NEW CONSTRUCTION ITEMS.

THE INFORMATION ON THESE DRAWINGS CONCERNING THE TYPE, SIZE AND LOCATION OF UTILITIES HAS BEEN SHOWN BASED ON THE BEST INFORMATION AVAILABLE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DETERMINATION OF EXACT LOCATION OF ALL EXISTING UTILITY FACILITIES PRIOR TO CONSTRUCTION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROTECT ALL EXISTING UTILITIES IN PLACE, UNLESS OTHERWISE NOTED OR SPECIFIED.

LEGEND

- 20 — IRRIGATION SLEEVE DESIGNATION
- 100 — CATCH BASIN DESIGNATION
- 100 — STORM SEWER DESIGNATION
- 100 — MANHOLE DESIGNATION
- P20 — SEWER PROFILE SHEET NUMBER
- CATCH BASIN & SLOTTED DRAIN
- INFIELD CATCH BASIN WITH CONC. APRON
- STORM SEWER
- MANHOLE

FOR LOCATIONS AND DIMENSIONS SEE PIPE AND CATCH BASIN SUMMARY TABLES

REDUCED SIZE DO NOT SCALE

	NAME	DATE
DESIGN	R.L.D.	1/90
DRAWN	F.E.H.	1/90
CHECKED	M.E.K.	1/90

DMJM Dames, Moore, Johnson & Mendenhall

ARIZONA DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION

DRAINAGE PLAN

ROUTE: I-10 | SECTION: 152.28 TO 154.571 | LOCATION: 44TH ST. - SUPERSTITION T.I.

SHEET ___ OF ___

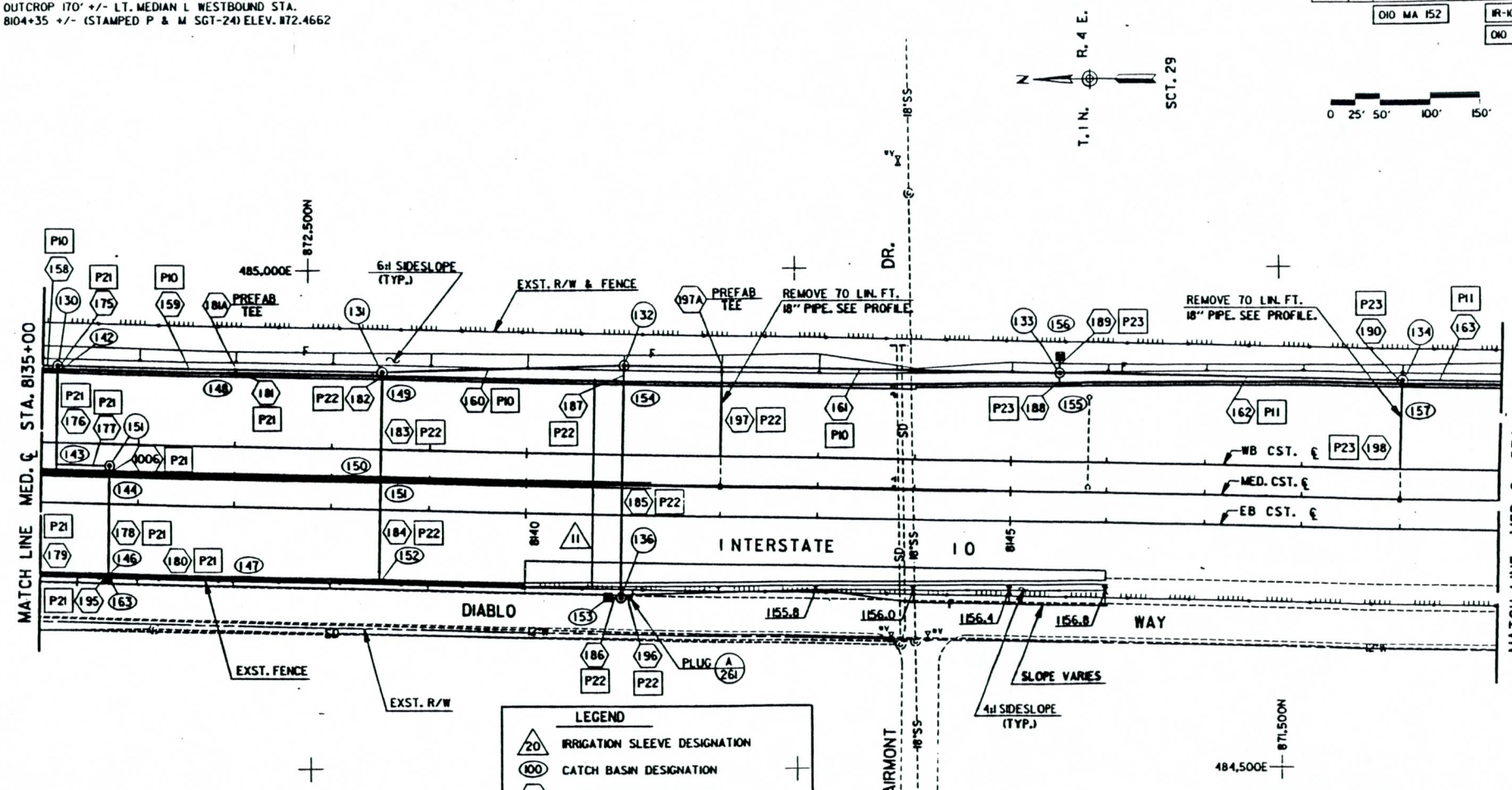
TRACS NO. H2190 01C & H2036 01C

DR.17

F.A.P.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	I-10-3(309)	196	569	

010 MA 152 | IR-10-3(315) | 010 MA 152

B.M. SGT-24: AHD BRASS CAP SET IN BEDROCK OUTCROP 170' +/- LT. MEDIAN L WESTBOUND STA. 8104+35 +/- (STAMPED P & M SGT-24) ELEV. 872.4662



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LEGEND

- 20 — IRRIGATION SLEEVE DESIGNATION
- 100 — CATCH BASIN DESIGNATION
- 100 — STORM SEWER DESIGNATION
- 100 — MANHOLE DESIGNATION
- P20 — SEWER PROFILE SHEET NUMBER
- CATCH BASIN & SLOTTED DRAIN
- INFIELD CATCH BASIN WITH CONC. APRON
- STORM SEWER
- MANHOLE

FOR LOCATIONS AND DIMENSIONS SEE PIPE AND CATCH BASIN SUMMARY TABLES

REDUCED SIZE DO NOT SCALE

	NAME	DATE
DESIGN	R.L.D.	1/90
DRAWN	F.E.H.	1/90
CHECKED	M.E.K.	1/90

DMJM Barnard, Burns, Jennison & Wentworth

ARIZONA DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION

DRAINAGE PLAN

I-10 | 152.28 TO 154.57 | 44TH ST. - SUPERSTITION T.I.

SHEET OF

DRJ8

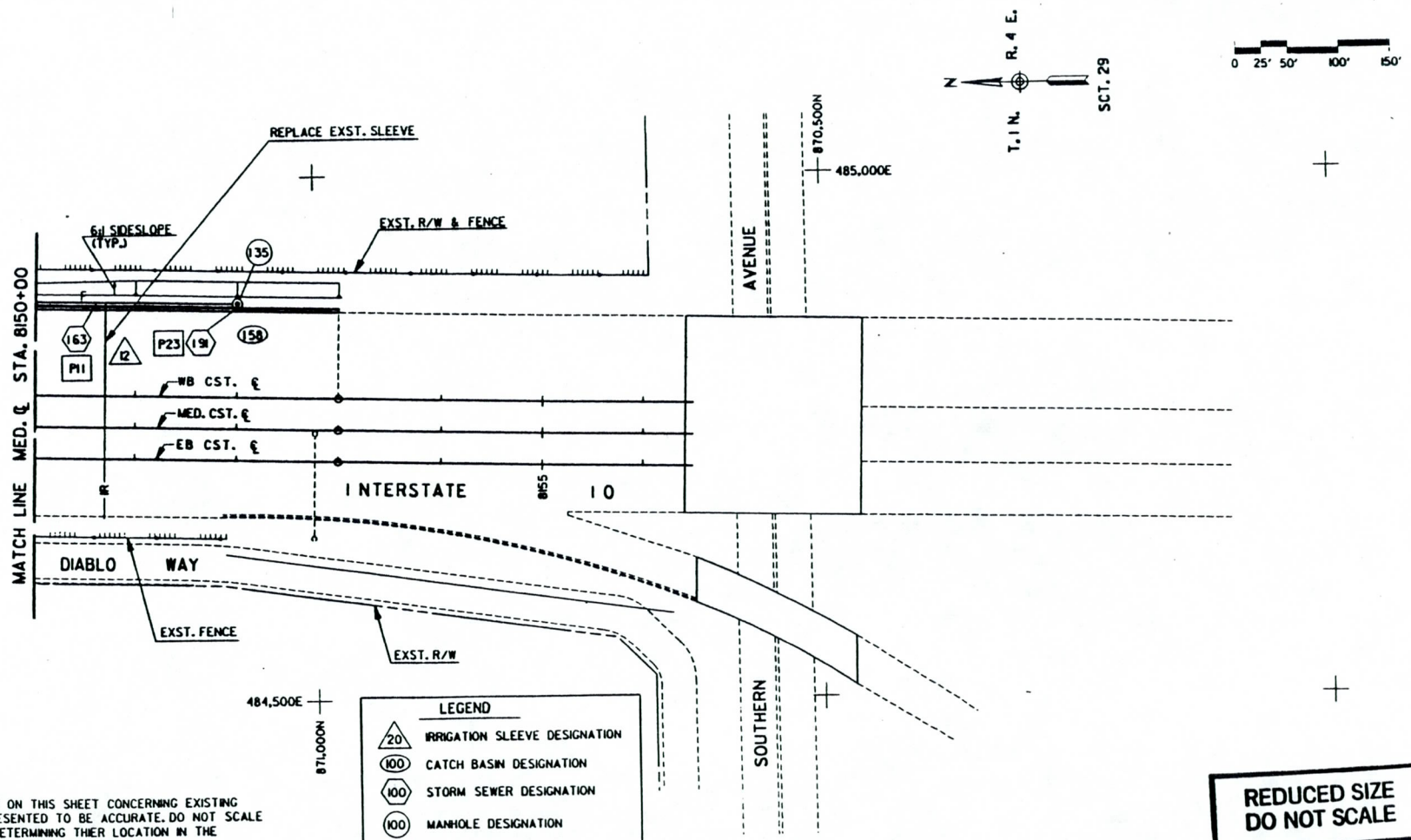
TRACS NO. H2190 01C & H2036 01C

SHEET OF

F.A.R.S. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	I-10-3(309)	197	569	

010 MA 152 | IR-10-3(315) | 010 MA 152

B.M. SGT-24; AHD BRASS CAP SET IN BEDROCK OUTCROP 170' +/- LT. MEDIAN L WESTBOUND STA. 8104+35 +/- (STAMPED P & M SGT-24) ELEV. 872.4662



LEGEND

- 20 IRRIGATION SLEEVE DESIGNATION
- 100 CATCH BASIN DESIGNATION
- 100 STORM SEWER DESIGNATION
- 100 MANHOLE DESIGNATION
- P20 SEWER PROFILE SHEET NUMBER
- CATCH BASIN & SLOTTED DRAIN
- STORM SEWER
- MANHOLE

FOR LOCATIONS AND DIMENSIONS SEE PIPE AND CATCH BASIN SUMMARY TABLES

THE INFORMATION SHOWN ON THIS SHEET CONCERNING EXISTING FEATURES IS NOT REPRESENTED TO BE ACCURATE. DO NOT SCALE THESE FEATURES FOR DETERMINING THIER LOCATION IN THE FIELD OR TO LOCATE NEW CONTSTRUCTION ITEMS.

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REDUCED SIZE
DO NOT SCALE

	NAME	DATE
DESIGN	R.L.D.	1/90
DRAWN	F.E.H.	1/90
CHECKED	M.E.F.	1/90

DMJM
Dameron, Morris, Johnson & Mandelstaff

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE PLAN

ROUTE I-10 | MILEPOST 152.28 TO 154.57 | LOCATION 44TH ST. - SUPERSTITION T.I.

SHEET ___ OF ___

TRACS NO. H2190 01C & H2036 01C

DR.29

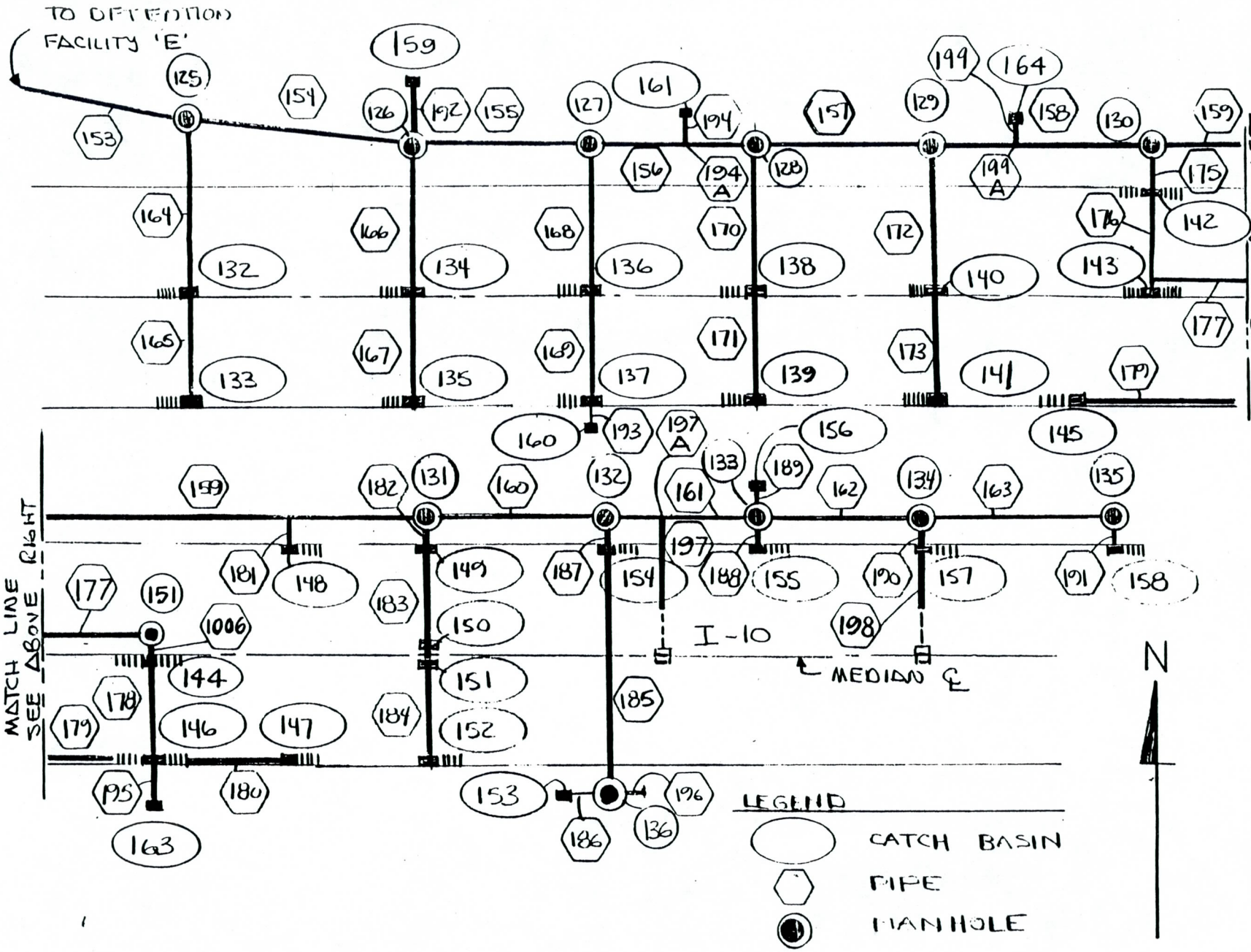


FIGURE . SCHEMATIC OF NEW DRAINAGE SYSTEM FOR I-10 SOUTH OF BELL BUTTE

DMJM

SUBJECT I-10 SOUTH OF BELL BUTTE

PROJECT 44TH. ST. - SUPERSTITION T.I.

PROJECT NO: I-10-E(309)

BY: CNJ

DATE: JULY 8, 99

CKD: T.N. 2-90

PAGE

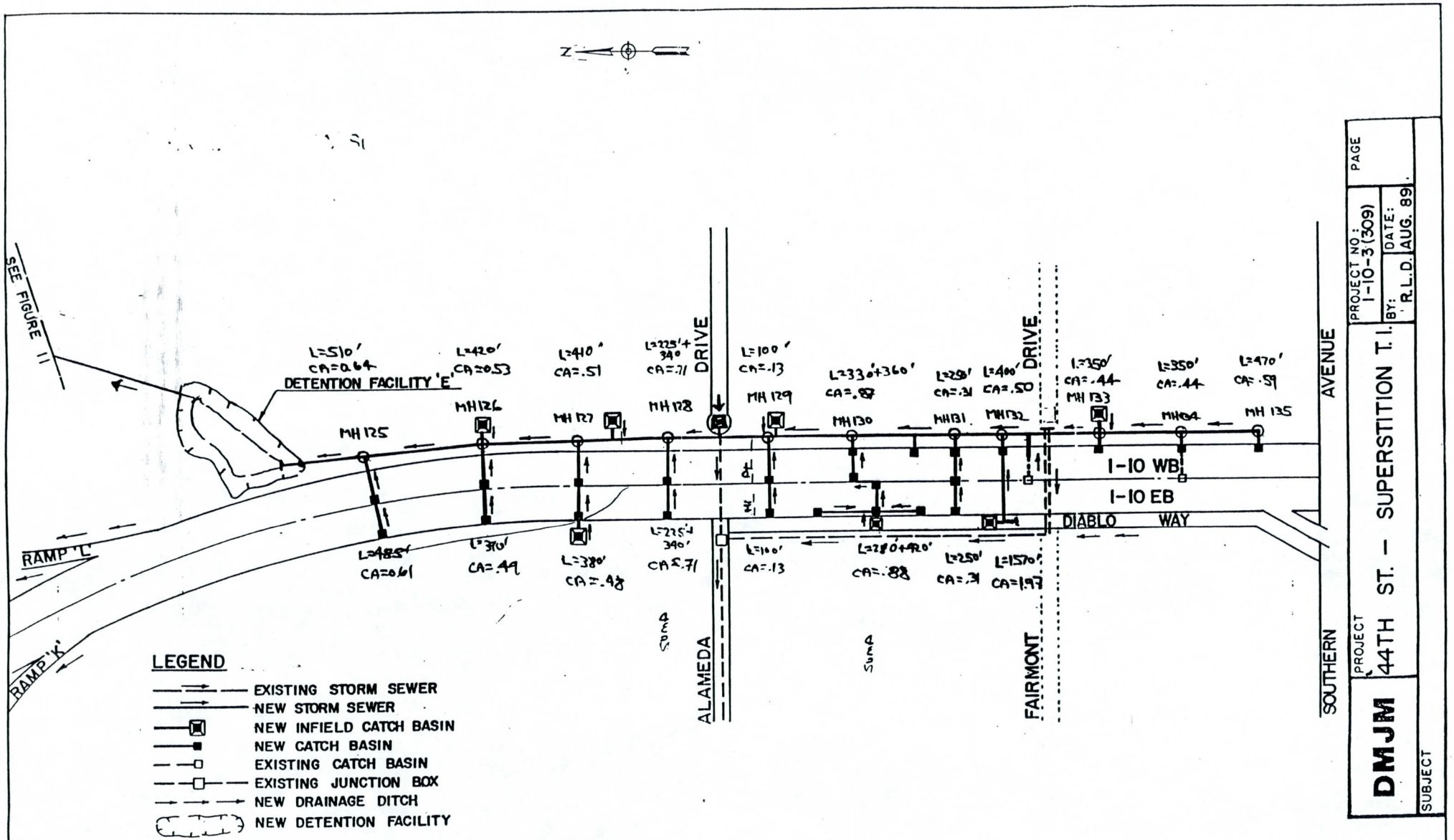


FIGURE 12. SCHEMATIC OF PROPOSED DRAINAGE SYSTEM FOR SUBAREA 3 OF DRAINAGE AREA 'B'

SHEET 2 OF 2

NOTE [illegible] LOWANCES FOR TRUNKLINE INTO DETENTION FACIL[illegible] 'E'

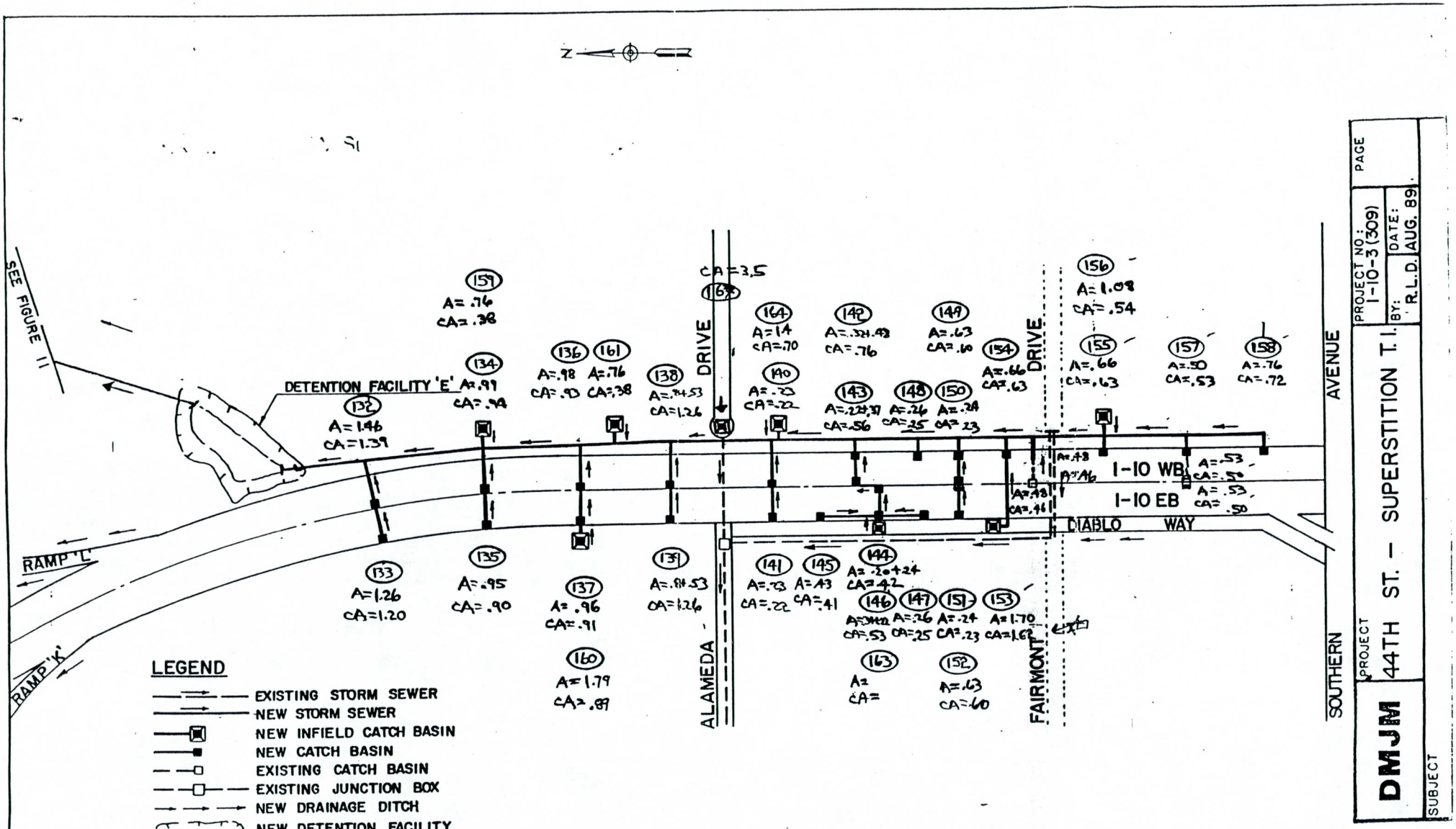


FIGURE 12. SCHEMATIC OF PROPOSED DRAINAGE SYSTEM FOR SUBAREA 3 OF DRAINAGE AREA 'B'

SHEET 2 OF 2

9/27/89 R

NOTE AREA SHOWN THIS SHEET DO NOT INCLUDE C-D ALLOWANC

ARIZONA HIGHWAY DEPARTMENT
STRUCTURES SECTION
HYDRAULICS BRANCH

DMJM

STORM SEWER SYSTEM DESIGN: SEWER CALCULATION SHEET

LOCATION DATA
Highway 48TH STREET & BROADWAY RD. I.I.S
Location PHOENIX, ARIZONA
Project No. I-10-3(209)

DESIGN DATA
Frequency 10 years
P_6 = 2.0 in. P_{24} = 2.4 in. P_1 = 1.5 in.
Outlet TW Elev. = 1148.2
Pipe n = 0.012

SEWER CALCULATIONS

Location		Drainage Area			Time of Flow, Min.			I	Q	Sewer Profile				Sewer Design			Hydraulic Grade Line			
Line No.	From - To	No.	Increm.		Inlet	Sewer	Design	in./hr	cfs	Crown Elevation		Length ft.	Slope ft./ft.	Diam. in.	Q full cfs	V f.p.s.	S_f ft./ft.	h_L ft.	Elevation	
⬡	**	DA-	CA	Σ CA						Inlet	Outlet								Inlet	Outlet
					10															
		170	0.72																	
		—	0.59*	1.31			10	4.2	5.5											
163	8152+00-8149+00									1154.22	1153.33	300.0	0.003	24	13.42	4.07	0.003	0.90	1154.10	1153.20
		167	0.48																	
		—	0.44*																	
		168	0.50																	
		169	0.50																	
		—	0.44*	3.67																
						1.23	11.23	3.9	14.31											
162	8149+00-8145+50									1153.33	1152.28	350.0	0.003	30	24.32	5.17	0.001	0.35	1153.20	1152.85
		166	0.63																	
		175	0.54																	
		—	0.44*	5.28		1.13	12.36	3.85	20.33											
161	8145+50-8141+00									1152.28	1150.93	450.0	0.0030	30	24.32	5.56	0.0020	0.90	1152.85	1151.95
		163	0.46																	
		164	0.46																	
		—	0.50																	
		162	0.63																	
		179	1.62																	
		—	1.97																	
		165	2.35	13.27		1.35	13.71	3.62	48.04											
160	8141+00-8138+50									1150.93	1150.43	250.29	0.0020	48	69.59	5.99	0.0010	0.25	1151.95	1151.70
		158	0.43																	

F-45

Computed by: RLD Checked by: MAF Date: SEPT 18, 1989

* INCLUDES FUTURE COLLECTOR-DISTRIBUTOR ROADS AS PROPOSED IN ALTERNATIVE C-1 OF THE I-10 CORRIDOR REFINEMENT STUDY, BY DMJM & JACK LEISCH & ASSOCIATES, APRIL 1988.

** MEDIAN STATIONING UNLESS OTHERWISE NOTED.

ARIZONA HIGHWAY DEPARTMENT
STRUCTURES SECTION
HYDRAULICS BRANCH

STORM SEWER SYSTEM DESIGN: SEWER CALCULATION SHEET

DMJM

LOCATION DATA
Highway 48 TH STREET & BROADWAY RD. T.I. 5
Location PHOENIX, ARIZONA
Project No. I-10 3(309)

DESIGN DATA
Frequency 10 years
P_6 = 2.0 in. P_{24} = 3.4 in. P_1 = 1.5 in.
Outlet TW Elev. = 1148.20
Pipe n = 0.012

SEWER CALCULATIONS

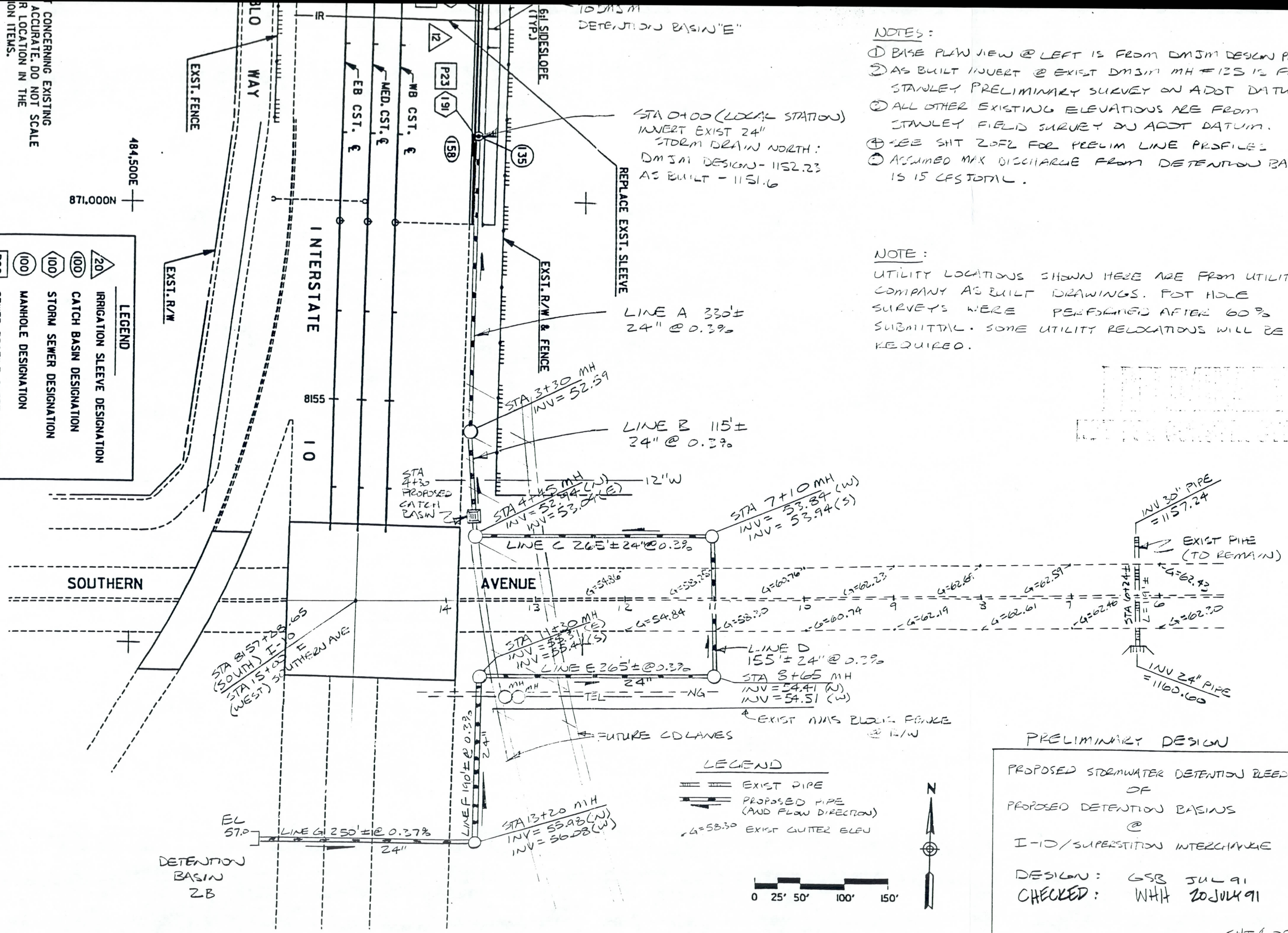
Location		Drainage Area			Time of Flow, Min.			I	Q	Sewer Profile				Sewer Design			Hydraulic Grade Line			
Line No.	From - To	No.	Increm.		Inlet	Sewer	Design	in./hr	cfs	Crown Elevation		Length	Slope	Diam.	Q full	V	S_f	h_L	Elevation	
⬡	**	DA-	CA	Σ CA						Inlet	Outlet	ft.	ft./ft.	in.	cfs	f.p.s.	ft./ft.	ft.	Inlet	Outlet
		159	0.23																	
		160	0.23																	
		161	0.41																	
		—	0.44*																	
		178	1.08																	
		—	0.31*	16.40		0.70	14.41	3.55	58.22											
159	8138+50-8137+00									1150.43	1150.28	149.48	.0010	48	49.21	4.63	0.00143	0.21	1151.70	1151.49
		156	0.25	16.65		0.54	14.95	3.50	58.28											
159	8137+00-8135+14.94									1150.28	1150.09	185.58	.0010	48	49.21	4.64	0.00143	0.27	1151.49	1151.22
		148	0.46																	
		152	0.30																	
		149	0.35																	
		153	0.21																	
		150	0.23																	
		154	0.19																	
		151	0.32																	
		147	0.41																	
		155	0.21																	
		157	0.25																	
		—	0.35*																	
		—	0.53*																	
		—	0.41*																	

F-115

Computed by: RLD Checked by: MAF Date: SEPT. 18, 1989

*INCLUDES FUTURE COLLECTOR-DISTRIBUTOR ROADS AS PROPOSED IN ALTERNATIVE C-1 OF THE I-10 CORRIDOR REFINEMENT STUDY, BY DMJM & JACK LEISCH & ASSOCIATES, APRIL 1988.

** MEDIAN STATIONING UNLESS OTHERWISE NOTED.



NOTES:

1. BASE PLAN VIEW @ LEFT IS FROM DMJM DESIGN PLANS.
2. AS BUILT INVERT @ EXIST DMJM MH #135 IS FROM STANLEY PRELIMINARY SURVEY ON ADOT DATUM.
3. ALL OTHER EXISTING ELEVATIONS ARE FROM STANLEY FIELD SURVEY ON ADOT DATUM.
4. SEE SHT 2 OF 2 FOR PRELIM LINE PROFILES
5. ASSUMED MAX DISCHARGE FROM DETENTION BASINS IS 15 CFS TOTAL.

NOTE:

UTILITY LOCATIONS SHOWN HERE ARE FROM UTILITY COMPANY AS BUILT DRAWINGS. POT HOLE SURVEYS WERE PERFORMED AFTER 60% SUBMITTAL. SOME UTILITY RELOCATIONS WILL BE REQUIRED.

CONCERNING EXISTING ACCURATE. DO NOT SCALE R LOCATION IN THE ION ITEMS.

CONCERNING THE TYPE, EEN SHOWN BASED ON THE TRACTOR SHALL BE RE- EXACT LOCATION OF ALL ONSTRUCTION. IT IS PROTECT ALL EXISTING NOTED OR SPECIFIED.

LEGEND

- 20 — IRRIGATION SLEEVE DESIGNATION
- 100 — CATCH BASIN DESIGNATION
- 100 — STORM SEWER DESIGNATION
- 100 — MANHOLE DESIGNATION
- P20 — SEWER PROFILE SHEET NUMBER
- CATCH BASIN & SLOTTED DRAIN
- STORM SEWER
- MANHOLE

FOR LOCATIONS AND DIMENSIONS SEE PIPE AND CATCH BASIN SUMMARY TABLES

PRELIMINARY DESIGN

PROPOSED STORMWATER DETENTION BLEED OFF OF PROPOSED DETENTION BASINS @ I-10/SUPERSTITION INTERCHANGE

DESIGN: GSB JUL 91
CHECKED: WHH 20 JULY 91

SHT 1 OF 2

DMJM
Dorfel Myers Johnson & Wendorf

		NAME
DESIGN		R.L.D.
DRAWN		F.E.H.
CHECKED		W.E.K.

PROJECT 1-10 SUPERSTITION INTERCHANGE
SHEET 1 OF 28 TO 15

DESIGNED BY LSB	DATE MAR 91	SHEET NO. 7	PAGE NO.
CHECKED BY WHH	DATE 19 July 91	OF 7	JOB NO.
REVIEWED BY	DATE	SUBJECT: I-10/SUPER/BASELINE	
APPROVED BY	DATE	IR-10-3(311) PE	

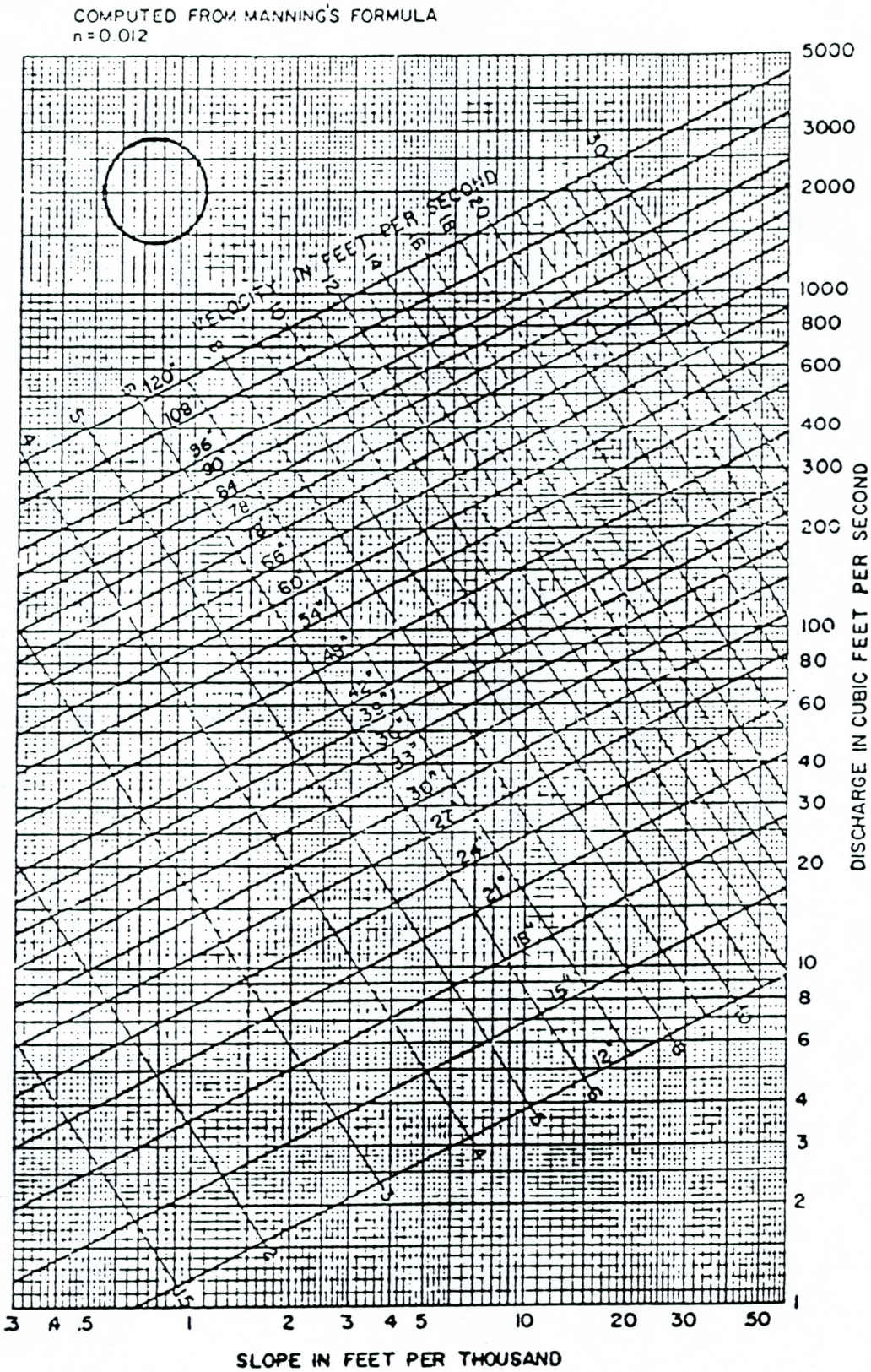
HYDRAULIC GRADE LINE FOR STORM DRAIN SYSTEM IN SOUTHERN AVENUE DEPRESSED SECTION

ASSUMPTIONS -

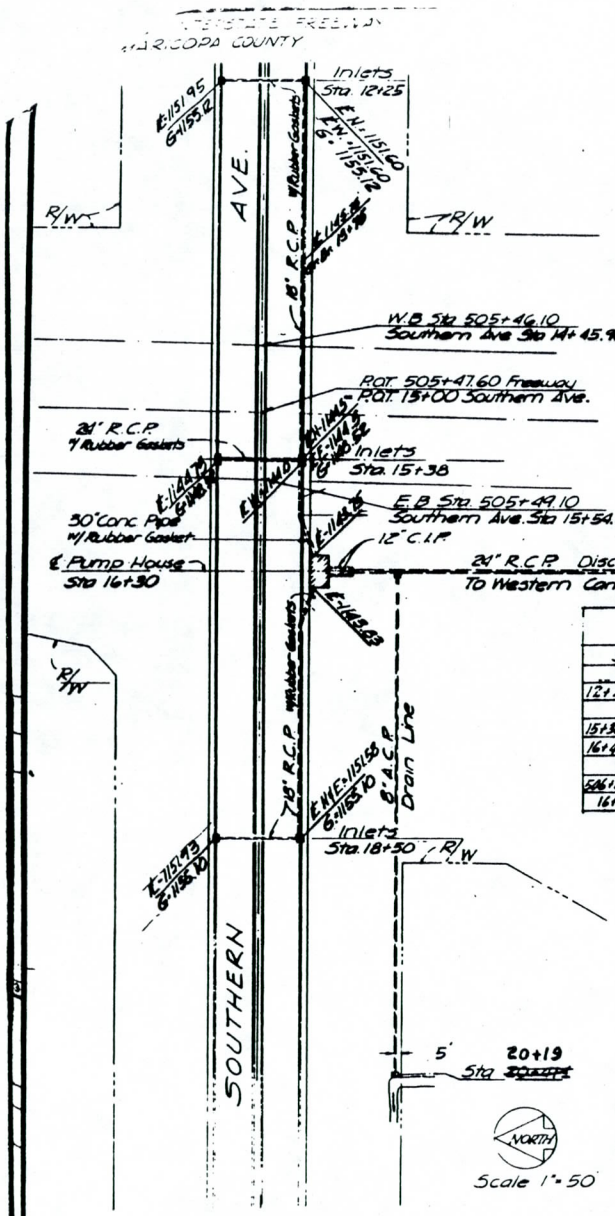
1. DESIGN FREQUENCY : 50 YEAR
2. AS BUILT ELEVATIONS AND PIPE SIZES PER I-10-3(51)
3. STARTING WATER SURFACE @ PUMP HOUSE IS ELEV 46.15 CORRESPONDING TO DESIGN PUMP #2 SWITCH ON ELEV
4. FRICTION SLOPE PER CHART "PIPE CAPACITIES FLOWING FULL" ("n" = 0.012)
5. DESIGN FLOW RATES PER ULTIMATE CONDITION HYDROLOGY
6. DISREGARD MINOR LOSSES CONTRACTION, EXPANSION BENDS ETC.

CONCLUSIONS -

1. ALL PIPE SECTIONS HAVE SIGNIFICANTLY GREATER DESIGN SLOPE THAN FRICTION SLOPE
2. PIPES IN A SUBSTANTIAL PORTION OF THE STORM DRAIN SYSTEM WILL BE FLOWING ONLY PARTIALLY FULL
3. HYDRAULIC GRADE LINE ESSENTIALLY IS NO HIGHER THAN INSIDE TOP OF PIPE.
4. HYDRAULIC GRADE LINE MEETS OR EXCEEDS ADOT STANDARDS



PIPE CAPACITIES FLOWING FULL



LOCATION MAP

PUMP HOUSE AND CATCH BASIN APPROXIMATE QUANTITIES							
Item	Sta.	Sh No.	Str Ex CY	Spec Comp CY	Class A Conc CY	Reinf Steel Lbs	Pump Unit C.I.P
Pump House	16+30	Shwn		50	[illegible]	[illegible]	2
Catch Basin #1	12+25 18+50	2			1.9 Ea.	50 Ea	
Catch Basin #2	15+38	2			3.3 Ea.	130 Ea	
W'er Box	526+26.8	8			[illegible]	[illegible]	
Drain Box	16+[illegible]	7			[illegible]	135	
Drain Box	20+[illegible]	9			[illegible]	135	

Grates, iron work, doors, miscellaneous items of work, not separately itemized

~ NOTE ~

Pumps, pump discharge piping, valves, and miscellaneous fittings, riser, not separately shown.

NEW REINFORCED CONCRETE PIPE ~ Rubber Gasket Joints.								
Station	Size	Length	Installation	Bedding	Class	Struct. Excav.	Spec. Comp.	Remarks
12+25	18"	[illegible]	Type 3	C	III	[illegible] CY	40 CY	Between catch basins Rt. & Lt.
12+25 to 15+38	18"	310'	"	"	"	[illegible] CY	210 CY	" " " Lt.
15+38	24"	[illegible]	"	"	"	[illegible] CY	45 CY	" " " Rt. & Lt.
15+38 to 16+20	30"	[illegible]	"	"	"	[illegible] CY	55 CY	Catch basin to pump house Lt.
16+40 to 18+50	18"	[illegible]	"	"	"	[illegible] CY	140 CY	" " " " "
18+50	18"	[illegible]	"	"	"	[illegible] CY	40 CY	Between catch basins Rt. & Lt.
526+25 to 526+26	24"	[illegible]	Good for 45# pressure			[illegible] CY	~	Pump house to Western Canal
16+30 to [illegible]	8"	[illegible]	Asbestos Cement Pipe			[illegible] CY	~	Pump house to drain box.
[illegible]		[illegible]			1466.2	182.6		

GENERAL HYDRAULICS

Drainage Area — 3.8 Acres
Impervious — All
Storm Frequency — 25 Years
Collection Time — Less than 5 minutes
Intensity, 10 minutes — 4.6" per hr.
Phoenix Formula — Q = 0.9(4.6·0.2) = c.f.s/acre
(includes allowance for infiltration & Storage) = 3.96 c.f.s/acre
Quantity, rate = 15.05 c.f.s.
Two Pumps @ 3500 g.p.m. ea. = 15.6 c.f.s.

NOTES

(1) Alternate design with 100% run off factor of 4.6 c.f.s/acre required storage 17.5 - 15.6 = 1.9 c.f.s or 855 gpm for 10 minutes which would be furnished by 3.4" depth in 14 ft x 24 ft. pit :: Design is near the 25 year Storm rate.
(2) With pump failure it would require over 6" of rain to submerge the engine room floor.

GENERAL NOTES

Construction - Std. Specs. Arizona Highway Dept. Edition 1960
Design - A.A.S.H.O. Specs. 1961 - Revised to Date & A.C.I. Specs. 1956
Allowable Stresses - f'c = 1000#/in² n = 12 fs 20,000#/in²
Structural Steel - shall conform to A.S.T.M. Spec. A-36 fs = 20,000#/in²
Reinforcing Steel - shall be intermediate grade & shall conform to A.A.S.H.O. A-15 or A-305
Welding shall conform to A.W.S. Specs. for welded Hwy and Railway Bridges, **Edition of 1963.**
Paint and Painting shall conform to Std. Specs.
Shop - One coat paint #1A or #1B. Field - 1st Coat #3, 2nd #9
The pumps shall be high capacity - low head type - 2nd stage 1770 R.P.M. - 3500 gpm. capacity each @ a total dynamic head of 48' exclusive of column & entrance losses - Vertical propeller - 12" dia surface discharge. Enclosed elec provisions. The pumping installation is to be completely automatic with each pumping unit starting & stopping @ the water level called for on the plans. See special Provisions for Specifications covering the pumping equipment.
All fittings, fixtures, & materials in the pump house shall be furnished & installed in accordance with the Phoenix City Bldg Code & The National Board of Fire Underwriters Code
Instructions for the manual operation of the equipment shall be placed in a frame under glass & secured to the wall
The concrete of all exposed vertical surfaces of the pump house shall be formed with textured panels with vertical striations
Live load shall not be placed on the pump house roof.
The contractor shall be responsible for the natural gas and electric service to the pump house. The installation shall be made with the cooperation of the Utility Co. involved.
C.O. #12 was written to install natural gas main to Pumphouse at cost of $1,805.50.
See Item #93A — Natural Gas Main.

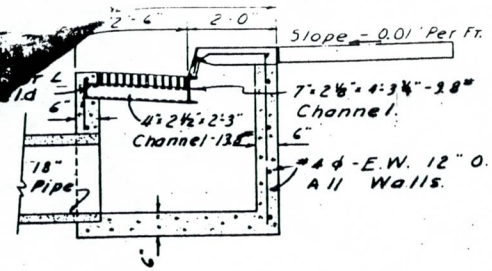
REDUCED PLAN DO NOT SCALE

REGISTERED CIVIL ENGINEER LEIGH D. GARDNER ARIZONA U.S.A.

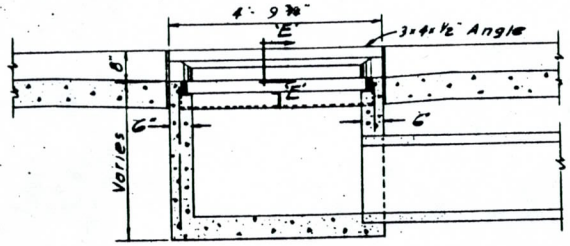
YOST AND GARDNER ENGINEERS
PHOENIX, ARIZONA
Y&G JOB NO. 4337
DRAWN BY L.K.P.
CHECKED BY L.D.G.
DATE 12-15-65

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION
SOUTHERN AVENUE
PUMP HOUSE LOCATION PLAN AND GENERAL NOTES
1 - 9

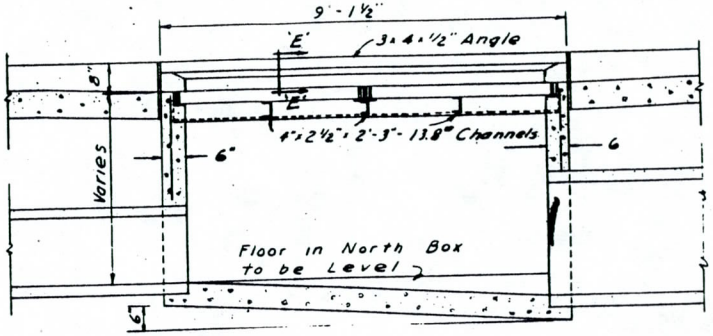
I-10-3 (51)



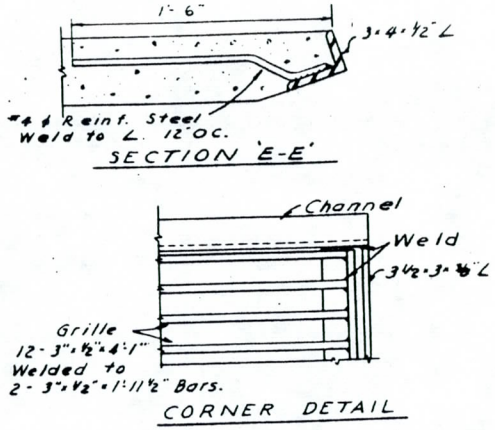
SECTION B-B



SECTION A-A



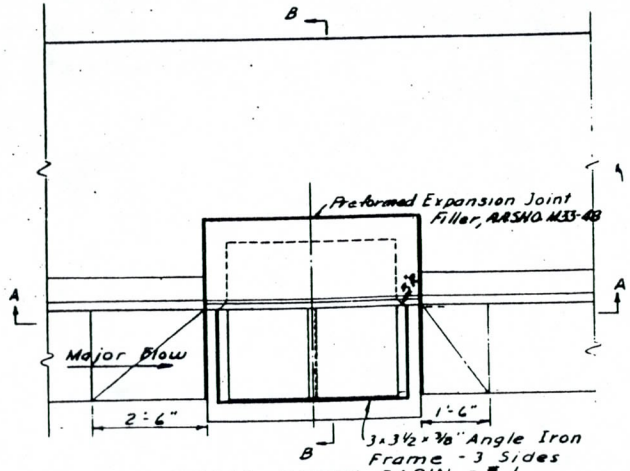
SECTION C-C



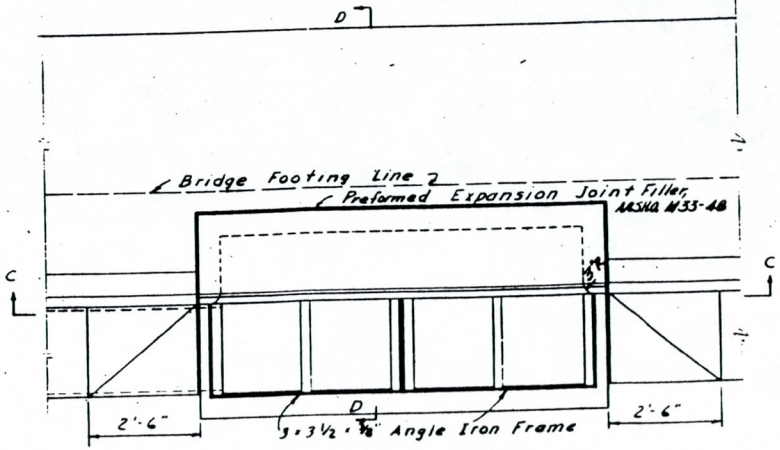
SECTION E-E

CORNER DETAIL

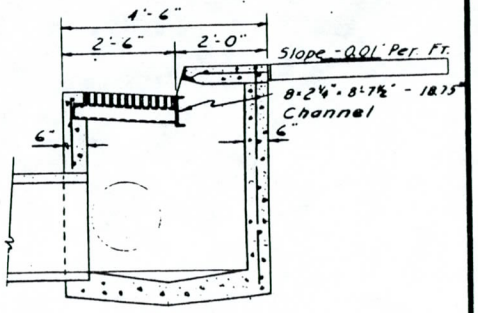
REDUCED SIZE
DO NOT SCALE



SINGLE CATCH BASIN - #1
3/4" = 1'-0"



DOUBLE CATCH BASIN - #2
3/4" = 1'-0"



SECTION D-D

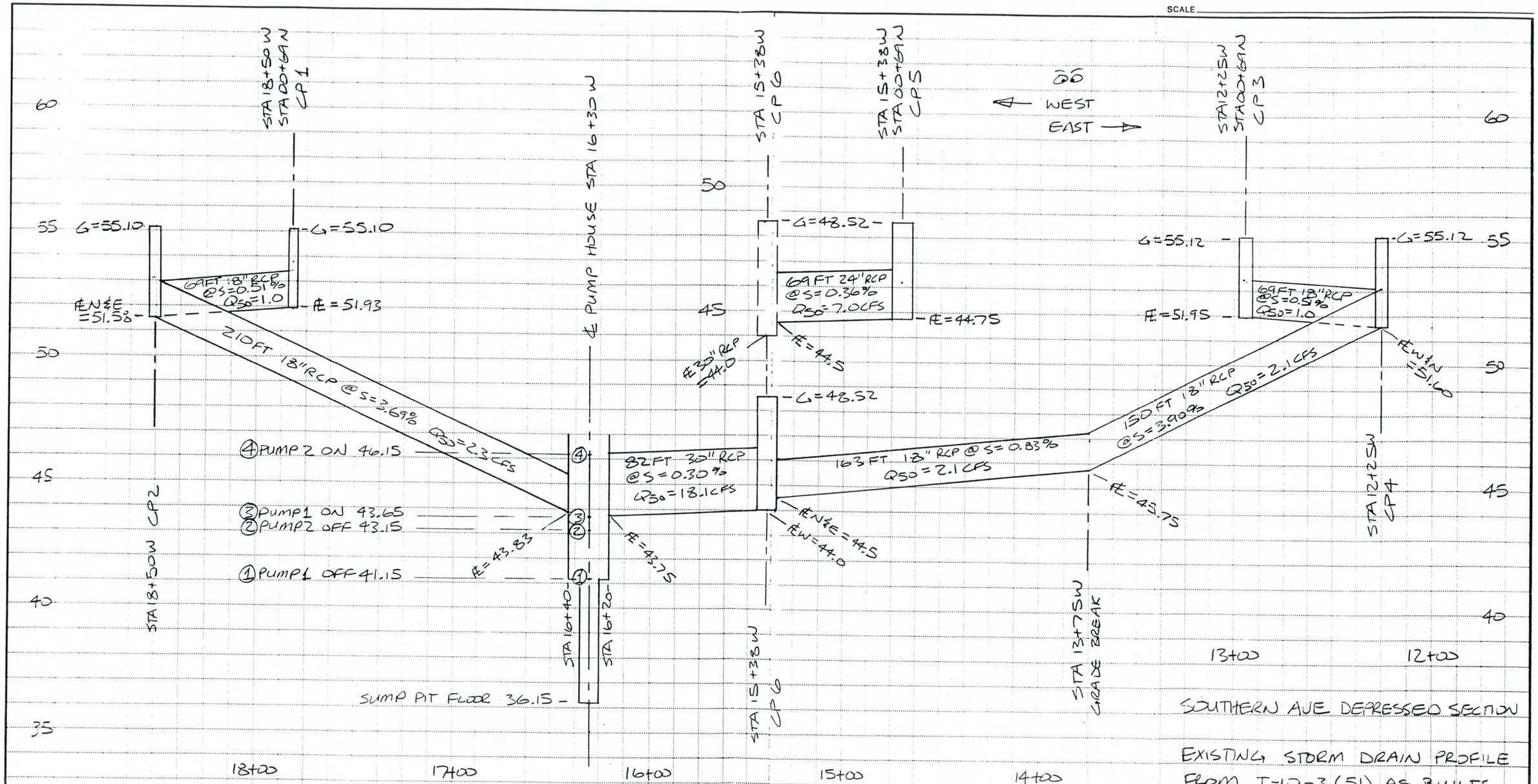
NOTE: All concrete shall be class 'A'

REGISTERED CIVIL ENGINEER LEIGH D. GARDNER ARIZONA, U.S.A.	YOST AND GARDNER ENGINEERS PHOENIX, ARIZONA Y&G JOB NO. 4337 DRAWN BY G.C.B CHECKED BY L.D.G DATE 12-15-65	LAYOUT / DESIGN / CONSTRUCTION / DRAWN / TRACED / CHECKED / 2/1/66 / F.E.G. / SHEET 2 - 9	ARIZONA HIGHWAY DEPARTMENT BRIDGE DIVISION SOUTHERN AVENUE CATCH BASIN DETAILS

I-10-3 (51)

STANLEY

JOB I-10/SUPER/BASELINE IR-10-3(311)PE
SHEET NO. 6 OF 7
CALCULATED BY LSB DATE MAR 91
CHECKED BY WHH DATE 19 July 91
SCALE



NOTE: STATIONING AND ELEVATIONS ARE FROM I-10-3(51) PLANS

SOUTHERN AVE DEPRESSED SECTION

EXISTING STORM DRAIN PROFILE FROM I-10-3(51) AS BUILTS

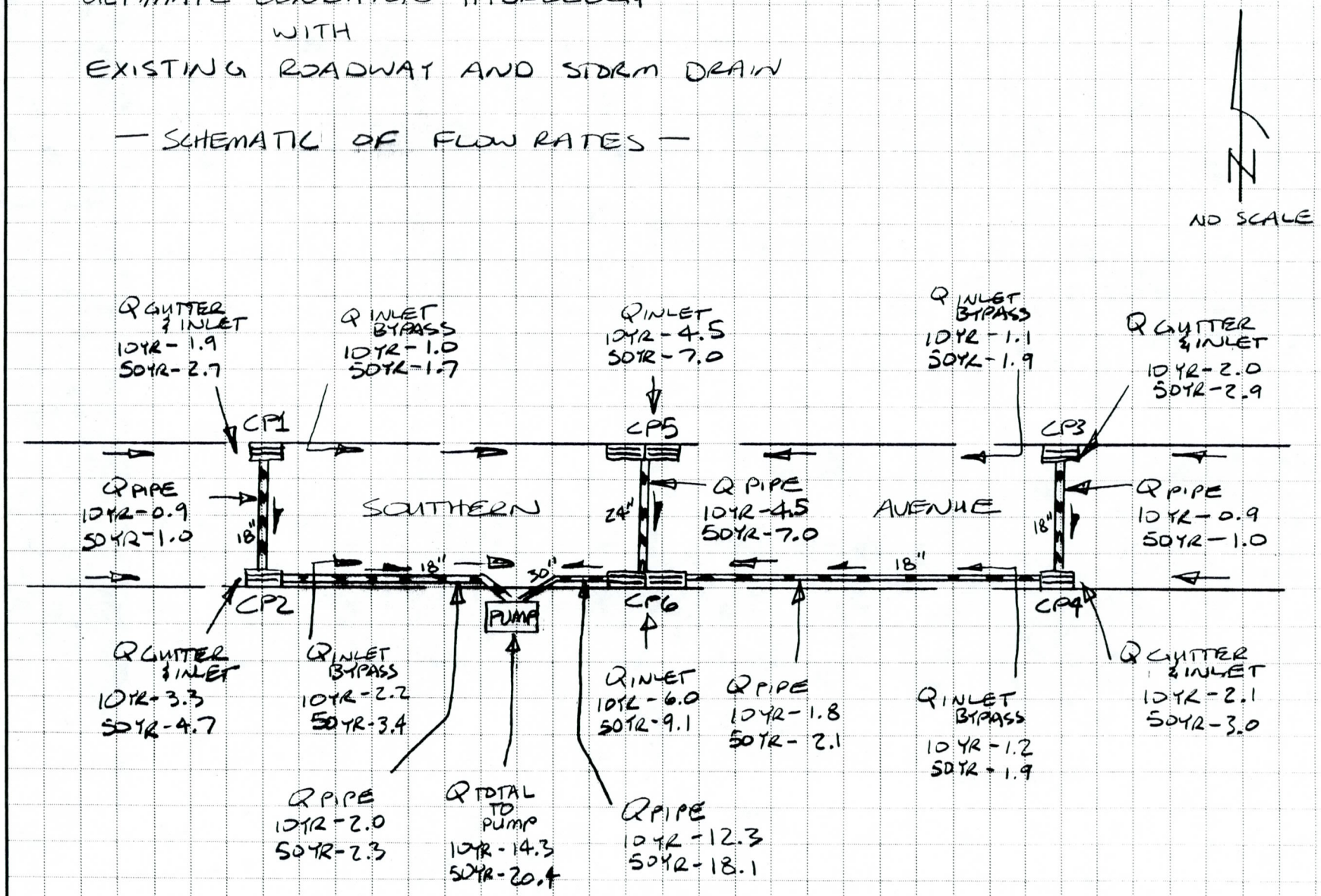
ULTIMATE CONDITION 50-YEAR FLOW RATES

PRODUCT 205-1 NEBS Inc., Groton, Mass. 01471. To Order PHONE TOLL FREE 1-800-225-6380

PRODUCT 205-1 NEBS Inc., Groton, Mass. 01471. To Order PHONE TOLL FREE 1-800-225-6380

ULTIMATE CONDITION HYDROLOGY
WITH
EXISTING ROADWAY AND STORM DRAIN

— SCHEMATIC OF FLOW RATES —



STANLEY

JOB I-10/SUPER/BASELINE 1R-15-3(2)PE
SHEET NO. 5 OF 7
CALCULATED BY GSB DATE MAR 91
CHECKED BY WHH DATE 19 July 91
SCALE

PRODUCT 305-1 ACSE Inc., Groton, Mass. 01471. To Order PHONE TOLL FREE 1-800-225-6380

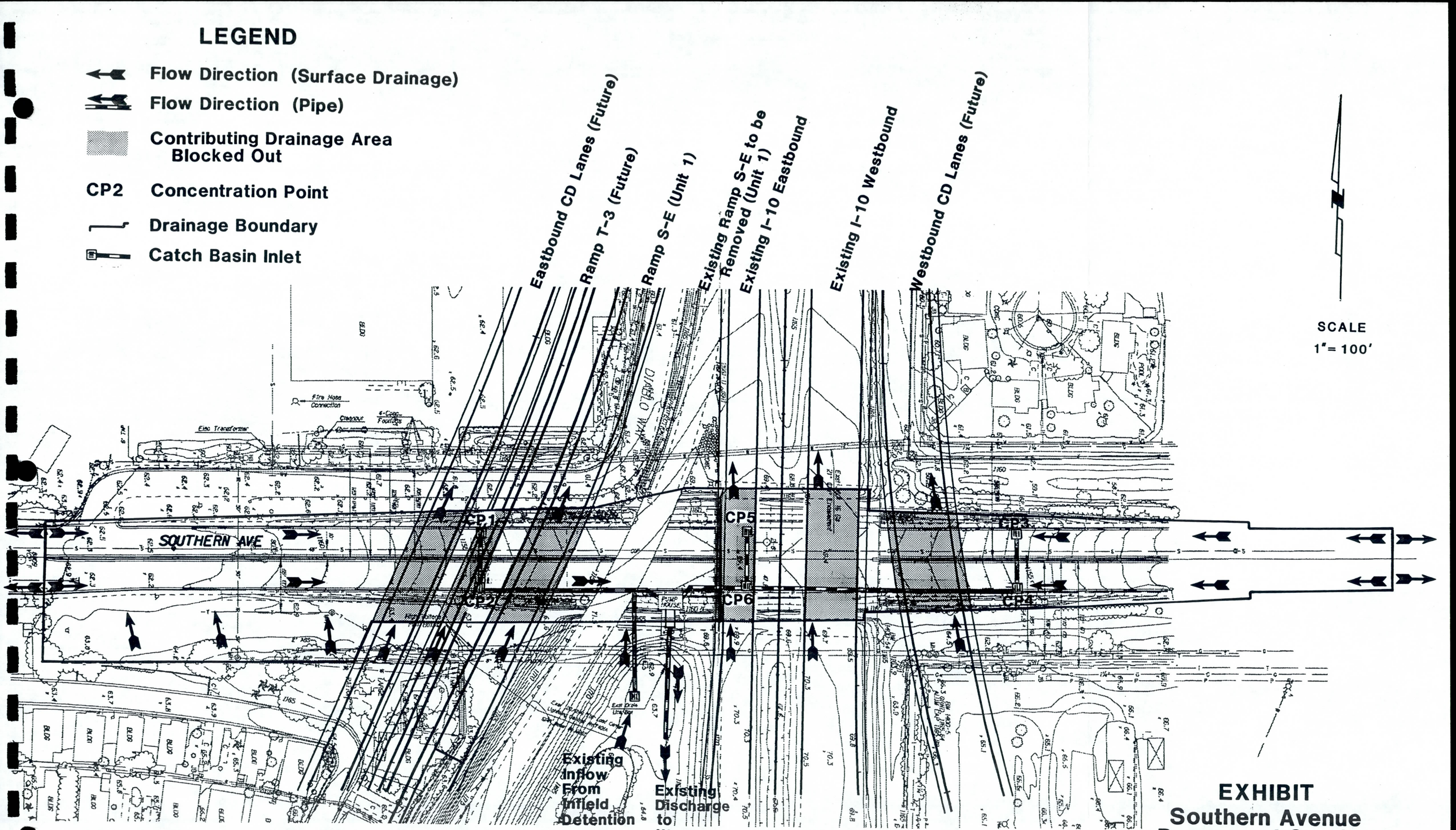


EXHIBIT
Southern Avenue Depressed Section
ULTIMATE DRAINAGE

APPENDIX K

SOUTHERN AVENUE DEPRESSED SECTION

STANLEY

JOB I-10/SUPER BASELINE IR-10-3(311)PE
SHEET NO. 1 OF 7
CALCULATED BY GSB DATE MAR 91
CHECKED BY WHH DATE 19 July 91
SCALE

SOUTHERN AVENUE DEPRESSED SECTION

CRITERIA FROM ARIZONA STATEWIDE MANAGEMENT PROGRAM PROJECT DESIGN GUIDELINES

FLOW SPREAD –
→ 10 YEAR DESIGN FREQUENCY
→ ALLOWABLE SPREAD IS SHOULDER WIDTH PLUS HALF OF ADJACENT TRAVEL LANE. ORIGINAL DESIGN SHOWS 8 FT PAVED SHOULDER & 12 FT ADJ. TRAVEL LANE FOR A TOTAL SPREAD OF 14 FT ALLOWABLE.

CATCH BASIN –
→ 10 YEAR DESIGN FREQUENCY
→ ALL CATCH BASINS ARE COMBINATION GRATE AND CURB OPENING. ON GRADE, DISREGARD CAPACITY OF GRATE AND USE CLOGGING FACTOR OF 1.0 ON CURB OPENING. IN SUMP, DISREGARD CAPACITY OF CURB OPENING AND USE CLOGGING FACTOR OF 1.0 ON GRATE

STORM DRAIN –
→ 50 YEAR DESIGN FREQUENCY FOR PIPE SIZING
→ 50 YEAR HYDRAULIC GRADE LINE MAXIMUM OF 0.5 FT BELOW BOTTOM OF INLET GRATE.

CATCH BASIN INLET DATA –

	GRATE				CURB OPENING
	LENGTH	WIDTH	EFFECTIVE PERIM	NET OPENING	LENGTH
SINGLE	3.8'	2.0'	7.8'	5.7 FT²	3.8'
DOUBLE	7.6'	2.0'	11.6'	11.4 FT²	8.1'

THE ABOVE DATA IS BASED ON AS-BUILTS FROM PROJECT I-10-3(51)

PRODUCT 205-1 NEBS Inc., Groton, Mass. 01471. To Order PHONE TOLL FREE 1-800-225-6380

STANLEY

JOB I-10/SUPER/BASELINE IR-10-3(311)PE
SHEET NO. 2 OF 7
CALCULATED BY GSB DATE MAR 91
CHECKED BY WHH DATE 19 July 91
SCALE

SOUTHERN AVENUE EXISTING
CURB, GUTTER & ROADWAY DATA (FROM AS-BUILTS)

@ CATCH BASIN		ROADWAY GRADE	ROADWAY CROSS SLOPE
#1	ON GRADE	3.5%	1.5%
#2	"	"	"
#3	"	"	"
#4	"	"	"
#5	IN SUMP	0.1%	1.0%
#6	"	"	"

GUTTER WIDTH	2.0'
NORMAL DEPRESSION	2.0"
GUTTER CROSS SLOPE (S_W)	0.083 FT/FT
LOCAL DEPRESSION	1.0"
CURB HEIGHT	7.0"
MANNING ROUGHNESS "n"	0.016

PRODUCT 205-1 NEBS Inc., Groton, Mass. 01471. To Order PHONE TOLL FREE 1-800-225-6380

SOUTHERN AVENUE ULTIMATE CONDITION HYDROLOGY
WITH EXISTING ROADWAY AND STORM DRAIN

— SUMMARY OF DRAINAGE DATA AND FLOWS —

POINT OF CONCENTRATION	IMPERV. AREA @ C=0.95	PERV. AREA @ C=0.50	ΣC×A	LOCAL Q10/Q50	+ * FLOWBY Q10/Q50	= TOTAL Q10/Q50
1	0.45 AC	—	0.43	1.9/2.7	—	1.9/2.7
2	0.45	0.65 AC	0.75	3.3/4.7	—	3.3/4.7
3	0.48	—	0.46	2.0/2.9	—	2.0/2.9
4	0.49	—	0.47	2.1/3.0	—	2.1/3.0
5 EAST	0.26	—	0.25	1.1/1.6	1.1/1.9	2.2/3.5
5 WEST	0.31	—	0.29	1.3/1.8	1.0/1.7	2.3/3.5
5 E+W	0.57	—	0.54	2.4/3.4	2.1/3.6	4.5/7.0
6 EAST	0.24	—	0.23	1.0/1.4	1.2/1.9	2.2/3.3
6 WEST	0.39	—	0.37	1.6/2.3	2.2/3.4	3.8/5.7
6 E+W	0.63	—	0.60	2.6/3.8	3.4/5.3	6.0/9.1
3,4,5E+W,6E+W	2.17	—	2.06	9.1/13.0	3.2/5.1	12.3/18.1
TOTAL AREA	3.07	0.65	3.24	14.3/20.4	—	14.3/20.4
1+2 Q CAPTURE	—	—	—	—	—	2.0/2.3

MINIMUM TIME OF CONCENTRATION = 10 MIN
i_{10} = 4.4 INCHES/HOUR i_{50} = 6.3 INCHES/HOUR

* FLOW-BY IS CALCULATED BY ADOT CB2 USING PREVIOUSLY STATED DATA AND ASSUMPTIONS

STANLEY

JOB I-10/SUNNER/BASELINE IR-10-3(311)AE
SHEET NO. 4 OF 7
CALCULATED BY GRB DATE MAR 91
CHECKED BY WHH DATE 19 July 91
SCALE

PRODUCT 205-1 (NEBS) Inc., Groton, Mass. 01471. To Order PHONE TOLL FREE 1-800-225-6380

3. Provide an outfall as in Alternate 2 above but set the elevation slightly lower than the existing high water elevation of 1285.20 for Area 6. This would also not compensate for displaced volume but would be intended to hold the high water to the existing calculated maximum. This alternate would accept offsite flow into the ADOT system but at a significantly lesser amount than Alternate 2.

In all of the options above, it is probably important that the 14 foot wide maintenance and access area remain free of any significant ponding. The 20 foot wide temporary construction easement shown on Exhibit A would correspond to Alternates 2 and 3 but may not be adequate for Alternate 1 if parking is affected.

Please review these concept alternatives and the attachments and feel free to call with any questions or comments.

Sincerely,

STANLEY CONSULTANTS, INC.

Robert E. Jacobs, P.E.

Enclosures

REJ/tlb:MAR041

STANLEY CONSULTANTS, INC.

3117 North 16th Street • Phoenix, AZ 85016 Tel: 602/279-0901 • Fax: 602/230-7655

May 13, 1991

Mr. Steve Wilcox
ARIZONA DEPARTMENT OF TRANSPORTATION
Engineering Consultant Services
205 South 17th Avenue, Room 222E
Phoenix, Arizona 85007

RE: South Mountain Corporate Center
Drainage and Stormwater Retention
Conflict with Proposed Alignment

CONTRACT NO. 87-55
PROJECT NO. IR-10-3(311) PE
TRACS NO. 10 MA 154 H-0142-01D
I-10/SUPERSTITION FREEWAY TRAFFIC INTERCHANGE
I-10/BASELINE ROAD TRAFFIC INTERCHANGE
PROJECT NO. IR-10-3(310)C (Unit 1)
PROJECT NO. IR-10-3(317)C (Unit 2)
TRACS NO. 10 MA 154 H-0142-02D, 04C, 05C (Unit 1)
TRACS NO. 10 MA 154 H-0142-02D, H-1035-01C, 02D (Unit 2)

Dear Mr. Wilcox:

This is a follow-up to our letter of March 19, 1991 in which we discussed the impacts of proposed I-10 construction and right-of-way acquisition on the existing South Mountain Corporate Center. A copy of that letter is attached. Subsequent to that letter, the alignment of Ramp W-S has shifted to the west. Construction now will encroach into the existing Area 6 retention basin.

To minimize impacts on the Corporate Center, a retaining wall is proposed along the outer edge of roadway improvements in the area where encroachment occurs. A traffic barrier wall will be placed on top of the retaining wall. Proposed right-of-way along this area has been set at one foot from the outer-most edge of the retaining wall footing. A typical section is illustrated in an attached exhibit.

We have estimated the retention volume in the landscaped area between the existing parking lot and the existing right-of-way at about 12,700 cubic feet based on the original grading and drainage design. Please recall from our March 19 letter that one of the landscaped basins was not constructed. Subsequent to that letter, we have also noted, based on our survey information, that the outfall elevation for Areas 5 and 6 at the northern most driveway to Wendler Drive was constructed about a half foot lower than the original design. This would limit the high water for Area 5 and 6 retention at about elevation 1184.7 resulting in significantly less volume being provided.

We have estimated the volume lost due to I-10 encroachment at about 4,000 cubic feet based on the revised alignment and the original retention design. Attached is a print of Sheet 3 of 3 of the original grading and drainage design by O'Neill-Morea-Hall Engineering on which we have shown the proposed I-10 alignment and conceptual grading and drainage.

The proposed retention concept is based on the same high water elevation, bottom elevation and side slopes as the original design. The 4000 cubic feet lost to encroachment has been recovered and the volume provided is very nearly the same as the previously estimated 12,700 cubic feet. The existing drywell has been relocated and an additional drywell provided. A portion of the parking lot would be regraded but no parking spaces are lost. We also show a proposed 30 foot temporary construction easement adjacent to the parking lot.

This concept would maintain the current separation of ADOT and Corporate Center drainage and should provide a quicker disposal time with the additional drywell. Maintenance access for the outside of the retaining/barrier wall would need to be thru right of entry agreements or by bucket truck from the roadway shoulder.

Please review these concept alternatives and the attachments. If there are any questions, please call me.

Sincerely,

STANLEY CONSULTANTS, INC.

Robert E. Jacobs

Robert E. Jacobs, P.E.
Project Manager

REJ/tlb:MAY019

SCALE 1" = 20'

N. 00°33'15"E.

331.83'

RET. AREA F.G. 830

S=0.54%

S=0.44%

DRYWELL GRATE

391.60'

N. 89°00'00"E.

S=0.60%

H.W. 85.20

RET. AREA

PROPOSED WATER ESM'T

PROPOSED 8" A.C.P.

S=0.72%

DRYWELL GRATE 83.20

RET. AREA #5

S=0.77%

S=0.50%

RET. AREA #5 F.G. 83.0 H.W. 84.14

324.99'

NORTH

GUY WIRE

8' P.U.E.

EXIST. 4' SIDEWALK

30' D.W.Y.

FND. BRASS CAP IN H.H.

REMOVE 40 L.F. OF C&G. & 160 S.F. OF S.W. & CONST. 30' DRIVEWAY W/ 5' WINGS PER M.A.G. STD. DET. 250. SAWCUT, REMOVE & REPLACE A.C. PVM'T. REPLACE IN KIND (4.5")

WENDLER DRI

10 FREEWAY

WEST LINE LIMITED ACCESS HIGHWAY

609.83'

278.00

RET AREA FG. 840

LAKE WS 850 BTM 830

RET. AREA H.W. 86.0

DRYWELL GRATE 85.2

LAKE WS 875 BTM 85.5

LAKE WS 870 BTM 85.0

LAKE WS 860 BTM 840

BUILDING A F.F. 90.20

BUILDING B-1 F.F. 88.20

LOT 6

RET. AREA #4

DRYWELL GRATE 85.90

S=0.50%

285.00'

609.99'

30' DW

SHEET 3

MATCH LINE

GARDNER

FND. BRASS CAP (FLUSH) @ INT. GARDNER & WENDLER

NORTH

REMOVE 40 L.F. OF C.&G. & 160 S.F. OF S.W. & CONST. 30' DRIVEWAY WITH 5' WINGS PER M.A.G. STD. DET. 250. S.W. CUT REMOVE & REPLACE 1" MIN. A.C. PVMT. REPLACE IN KIND (4 S.S.Y.)

REVISED 6-29-84

REVISED 6-29-84

O'NEILL · MOREA · HALL engineering, inc.
5225 N. 19th Avenue
Suite Number 214
Phoenix, Arizona 85015
Phone: (602) 246-8989
CIVIL · SANITARY · STRUCTURAL · SURVEY

GRADING & DRAINAGE PLAN

SOUTH MOUNTAIN CORPORATE CENTER

Design	T.H.O.
Drn.	ARVID
Scale	1" = 20'
Date	AUGUST 1984
Job No	1866
Sheet	3 of 3

Previously, there was a net gain of 1 parking space under the interim plan and a loss of 48 spaces under the ultimate plan. Currently, there will be a loss of 46 spaces under both the interim and the ultimate plans. At this point, we have not evaluated any preliminary design to recover these lost spaces on the vacant parcel ADOT will be acquiring to the south. There will likely be additional provisions necessary for stormwater retention from this parking.

Proposed re-grading of the existing retention basin at the north end of Fairmont Commerce Center in the ultimate plan gains back nearly all of the existing retention volume lost due to encroachment of the proposed cul-de-sac and driveway. The proposed Fairmont Drive cul-de-sac, in addition to affecting grades in Fairmont Commerce Center, will also affect the existing parcel to the north. It will extend into an existing landscaped retention area and may affect some parking and driveway. At this point, we have not evaluated any of the potential impacts on this parcel.

Please review the revised exhibits and call if you have any questions or comments.

Sincerely,

STANLEY CONSULTANTS, INC.

Robert E Jacobs

Robert E. Jacobs, P.E.
Project Manager

REJ/tlb:AUG037
SCI10591

Enclosures

STANLEY CONSULTANTS, INC.

3117 North 16th Street • Phoenix, AZ 85016 Tel: 602/279-0901 • Fax: 602/230-7655

March 19, 1991

Mr. Steve Wilcox
ARIZONA DEPARTMENT OF TRANSPORTATION
Engineering Consultant Services
205 South 17th Avenue, Room 222E
Phoenix, Arizona 85007

RE: South Mountain Corporate Center
Drainage and Stormwater Retention
Conflict with Proposed Alignment

CONTRACT NO. 87-55
PROJECT NO. IR-10-3(311) PE
TRACS NO. 10 MA 154 H-0142-01D
I-10/SUPERSTITION FREEWAY TRAFFIC INTERCHANGE
I-10/BASELINE ROAD TRAFFIC INTERCHANGE
PROJECT NO. IR-10-3(310)C (Unit 1)
PROJECT NO. IR-10-3(317)C (Unit 2)
TRACS NO. 10 MA 154 H-0142-02D, 04C, 05C (Unit 1)
TRACS NO. 10 MA 154 H-0142-02D, H-1035-01C, 02D (Unit 2)

Dear Mr. Wilcox:

The South Mountain Corporate Center is an existing office complex located along the west side of I-10 about half way between the Superstition and Baseline Road T.I.'s. Grading and drainage for the project was based on plans prepared in October 1984 by the engineering firm of O'Neill-Morea-Hall. A set of these plans is attached.

Retention design in the Corporate Center is based on City of Tempe criteria. This criteria is summarized as follows:

Rainfall:	100-year, 1-hour depth of 2.40 inches
Runoff Coefficient:	C=0.95 for commercial areas
Bleedoff:	Drywells acceptable, maximum disposal time is 36 hours
Volume Required:	Volume = rainfall x C x area
Depth:	Maximum retention depth = 3 feet

Retention volume required and volume provided calculations are included on Sheet 1 of the Corporate Center Grading and Drainage Plans. Disposal calculations are not included on those plans nor are the boundaries of contributing sub-areas shown. Volume provided calculations only delineate between types of retention; i.e. parking vs. landscape. They do not include calculation breakdowns for each individual retention basin.

The I-10 alignment including C-D lane and Ramp W-S (refer to Exhibit A attached) will displace a portion of the existing Corporate Center retention. This displacement is primarily limited to Area 6 of the calculations at the north end of the Corporate Center along the interstate. The amount of displacement will depend on the extent of grading necessary outside the existing right-of-way. Although the alignment affects landscaping south of Area 6, it does not appear to affect drainage and retention significantly.

The boundary of Area 6 has been approximated on Exhibit A. According to the Corporate Center retention calculations, Area 6 also receives some overflow from Area 5 to the west.

Overall, the reduction in Corporate Center site area due to the acquisition of additional I-10 right-of-way will result in a slight decrease in retention volume required. However, in Area 6, the displacement of existing retention volume due to I-10 construction will more than likely exceed this reduction in volume required.

It appears that the Corporate Center grading and drainage plans and the I-10 base topography are on the same vertical datum. It should be noted that the Corporate Center retention appears to have been constructed fairly close to plan with the exception of the landscape retention basin in Area 6 between I-10 and the parking lot at the south end of the lot. This basin was not constructed.

The following are possible alternate concepts to mitigate the drainage impacts caused by additional improvements and right-of-way on Area 6:

1. Physically re-grade the existing retention in Area 6 to compensate on a volume per volume basis for the displaced amount. This may involve construction of a new drywell for disposal and loss of a number of existing parking spaces. This alternate would maintain the current separation of ADOT and Corporate Center drainage.

2. Provide an outfall for Area 6 drainage to the proposed I-10 drainage system. This might be in the form of either a graded ditch or a catch basin inlet. Outfall elevation would be set at the existing low grade in the north east corner of Area 6. This option would not involve compensation for displaced volume but rather would accept all drainage from Area 6. The added volume to ADOT's future drainage system would be roughly 30,000 cubic feet based on a runoff coefficient of 0.75 and a 50-year, 6-hour rainfall of 2.95 inches.

STANLEY CONSULTANTS, INC.

3117 North 16th Street • Phoenix, AZ 85016 Tel: 602/279-0901 • Fax: 602/230-7655

May 13, 1991

Mr. Steve Wilcox
ARIZONA DEPARTMENT OF TRANSPORTATION
Engineering Consultant Services
205 South 17th Avenue, Room 222E
Phoenix, Arizona 85007

RE: Fairmont Commerce Center
Drainage and Stormwater Retention
Conflict with Proposed Alignment

CONTRACT NO. 87-55
PROJECT NO. IR-10-3(311) PE
TRACS NO. 10 MA 154 H-0142-01D
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PROJECT NO. IR-10-3(317)C (Unit 2)
TRACS NO. 10 MA 154 H-0142-02D, 04C, 05C (Unit 1)
TRACS NO. 10 MA 154 H-0142-02D, H-1035-01C, 02D (Unit 2)

Dear Mr. Wilcox:

In accordance with your comments on our letter of April 23, 1991, we have prepared an additional exhibit (Exhibit B) showing only the effects of Unit 1 and 2 improvements on Fiarmont Commerce Center drainage and retention. The previous exhibit showing ultimate improvements including future CD lanes we have designated as Exhibit A. Also enclosed is a copy of the April 23, 1991 letter.

Existing Diablo Way north of Fairmont Drive will remain after Unit 1 and 2 construction. South of Fairmont Drive, Diablo Way will be removed along with the two existing Commerce Center driveways as before. This will necessitate a new driveway on Fairmont Drive, also as before. Please recall from our April 23rd letter that this new driveway results in a loss of about 1500 cubic feet of retention volume.

The primary difference is in the impact on parking. With the future CD lanes and required truck access around the southeast corner of the existing building, there was a loss of about 48 parking spaces. Without the CD lanes, there is a loss of only 6 spaces. However, it is possible to gain back a total of 7 spaces at the two former driveways on Diablo Way for a net gain of 1 parking space. This is illustrated on Exhibit B.

May 13, 1991
Contract No. 87-555
Fairmont Commerce Center

It is our understanding that ADOT will acquire ultimate right-of-way at this time for future CD lanes. The Commerce Center will be permitted to use this right-of-way for landscaping and parking essentially as it exists now until the CD lanes are built. In the interim, ADOT right-of-way in the form of Commerce Center landscaping and parking will drain essentially as it does now to the primary on-site retention basin at approximately the same volume as now. The 1500 cubic foot loss in volume mentioned earlier due to the new driveway on Fairmont would result in roughly a half inch rise in the ponding water surface. If necessary, this loss in volume could be gained back in regrading of landscaped areas.

The area of Diablo Way to be removed south of Fairmont Drive will be graded and drained north to Fairmont where it will overflow the new curb. This flow will be minor and less than it currently is. It will continue to drain north as it currently does.

Please review this evaluation and feel free to call with any questions or comments.

Sincerely,

STANLEY CONSULTANTS, INC.

Robert E. Jacobs

Robert E. Jacobs, P.E.
Project Manager

REJ/tlb:MAY021

Enclosures

STANLEY CONSULTANTS, INC.

3117 North 16th Street • Phoenix, AZ 85016 Tel: 602/279-0901 • Fax: 602/230-7655

August 29, 1991

Mr. Steve Wilcox
ARIZONA DEPARTMENT OF TRANSPORTATION
Engineering Consultant Services
205 South 17th Avenue, Room 222E
Phoenix, Arizona 85007

RE: Fairmont Commerce Center
Drainage and Stormwater Retention
Conflict with Proposed Alignment

CONTRACT NO. 87-55
PROJECT NO. IR-10-3(311) PE
TRACS NO. 10 MA 154 H-0142-01D
I-10/SUPERSTITION FREEWAY TRAFFIC INTERCHANGE
I-10/BASELINE ROAD TRAFFIC INTERCHANGE
PROJECT NO. IR-10-3(310)C (Unit 1)
PROJECT NO. IR-10-3(317)C (Unit 2)
TRACS NO. 10 MA 154 H-0142-02D, 04C, 05C (Unit 1)
TRACS NO. 10 MA 154 H-0142-02D, H-1035-01C, 02D (Unit 2)

Dear Mr. Wilcox:

We have made revisions to the proposed drainage of Fairmont Commerce Center in accordance with your comments and the review by the City of Tempe on our letter and exhibits from this past April and May. Enclosed are the red-line markups from Tempe's review, our previous letters of April 23 and May 13 and revised Exhibits A and B showing interim and ultimate drainage.

On Exhibit A, the interim plan, we have revised the driveway and parking scheme in the southeast corner of the Commerce Center. Proposed ADOT right-of-way will not be leased back to the Commerce Center for parking. Instead, this area will be graded and landscaped. The remaining driveway and parking in this area will not be further affected by ultimate completion of future adjacent C-D lanes.

The new driveway proposed on Fairmont Drive is essentially the same concept as before in the interim plan. However, the ultimate plan includes a cul-de-sac at the end of Fairmont Drive when the remainder of Diablo Way is demolished. This affects the previous design grades and drainage scheme at the proposed driveway. The interim driveway is designed so that it can be sawcut at the north parking curb line in the ultimate plan so that remaining parking and driveways will not be further affected.

APPENDIX L

FAIRMONT COMMERCE AND SOUTH MOUNTAIN CORPORATE CENTERS

STANLEY CONSULTANTS, INC.

3117 North 16th Street • Phoenix, AZ 85016 Tel: 602/279-0901 • Fax: 602/230-7655

April 23, 1991

Mr. Steve Wilcox
ARIZONA DEPARTMENT OF TRANSPORTATION
Engineering Consultant Services
205 South 17th Avenue, Room 222E
Phoenix, Arizona 85007

RE: Fairmont Commmerce Center
Drainage and Stormwater Retention
Conflict with Proposed Alignment

CONTRACT NO. 87-55
PROJECT NO. IR-10-3(311) PE
TRACS NO. 10 MA 154 H-0142-01D
I-10/SUPERSTITION FREEWAY TRAFFIC INTERCHANGE
I-10/BASELINE ROAD TRAFFIC INTERCHANGE
PROJECT NO. IR-10-3(310)C (Unit 1)
PROJECT NO. IR-10-3(317)C (Unit 2)
TRACS NO. 10 MA 154 H-0142-02D, 04C, 05C (Unit 1)
TRACS NO. 10 MA 154 H-0142-02D, H-1035-01C, 02D (Unit 2)

Dear Mr. Wilcox:

In response to your request, we have evaluated the impact of proposed I-10 improvements on grading and drainage in the Fairmont Commerce Center. This is an existing light industrial complex located on the southwest corner of I-10 and Fairmont Drive in Tempe. Grading and drainage for Fairmont Commerce Center was constructed from plans prepared in 1981 by American Engineering Company. (See attached grading plan sheet 1 of 2.)

Retention calculations are not included on sheet 1 of the grading plan but volumes provided and high water elevations are shown. The following is a summary of Tempe's basic drainage criteria:

Rainfall:	100-year, 1-hour depth of 2.40 inches
Runoff Coefficient:	C=0.95 for commercial areas
Bleedoff:	Drywells are acceptable, maximum disposal time is 36 hours
Volume Required:	Volume = Rainfall x C x Area
Depth:	Maximum retention depth = 3 feet

The grading plan prepared by American Engineering shows 3 basic retention basins. The basin on the west (back) side of the building fills to elevation 1156.6, at which point it would overflow south around the south end of the building. This overflow would add to the volume in the primary basin which takes up most of the main parking lot along the Diablo Way frontage.

The main basin is supposed to be connected to the third basin which is located along the north side of the building via 6" equalizer pipe under the driveway to Fairmont Drive. This pipe was either not constructed or has since been buried. With the pipe, the primary and third basins share a common high water elevation of 1155.4. Without it, the high water in the primary basin will be slightly higher. Other than the equalizer pipe, site retention appears to have been generally constructed to plan.

The proposed alignment of the future eastbound CD lanes encroaches the frontage of the site and will cut off 2 existing driveways on Diablo Way. (See attached Exhibit A.) The CD lanes themselves do not encroach significantly into the existing retention. However, it is proposed to replace the 2 lost driveways on Diablo Way with a new driveway on Fairmont Drive.

This new driveway and other associated grading and paving will reduce the retention volume in the primary basin. Our preliminary estimate, based on tentative grades shown on Exhibit A, indicates a loss in volume on the order of 1,500 cubic feet. The total design volume provided in the primary basin is about 48,000 cubic feet.

Although there is a reduction of 1,500 cubic feet in volume provided, it is more than offset by a reduction in volume produced. This results from a reduction in site area due to acquisition of right-of-way. If the proposed right-of-way follows the outside limit of the future CD lanes and shoulder, we estimate a total taking of about 26,000 square feet. Using current Tempe criteria, the volume of runoff this area would theoretically produce is about 4,900 cubic feet, more than three times the amount lost due to encroachment.

However, another consideration here is the loss in parking spaces due to proposed highway improvements. We estimate a loss of about 48 existing spaces based on the tentative layout in Exhibit A. We have considered the possibility of using the vacant parcel to the south to replace these lost spaces.

Runoff generated by these spaces would have to be retained. If the volume did not exceed the difference between the 4900 cubic feet reduced and the 1500 cubic feet encroached and grades permitted, it could possibly be retained in the primary basin on site. Another possibility might be to provide separate retention volume and drywell disposal for these 48 spaces on the parcel to the south.

Please review this evaluation. Keep in mind that the layout and grades in Exhibit A are tentative. Please feel free to call with any questions or comments.

Sincerely,

STANLEY CONSULTANTS, INC.

Robert E. Jacobs

Robert E. Jacobs, P.E.

REJ/tlb:APR020

Enclosures

DESIGNED BY GAB DATE 10-30-91 SHEET NO. 1 PAGE NO.
CHECKED BY WHH DATE 4-28-92 OF 3 JOB NO. 10591
REVIEWED BY DATE SUBJECT: SOUTHERN AVE PUMP
APPROVED BY DATE ROADWAY PONDING DEPTHS

ELEVATION - VOLUME CURVE FOR SOUTHERN AVE DEPRESSED SECTION

ASSUME:

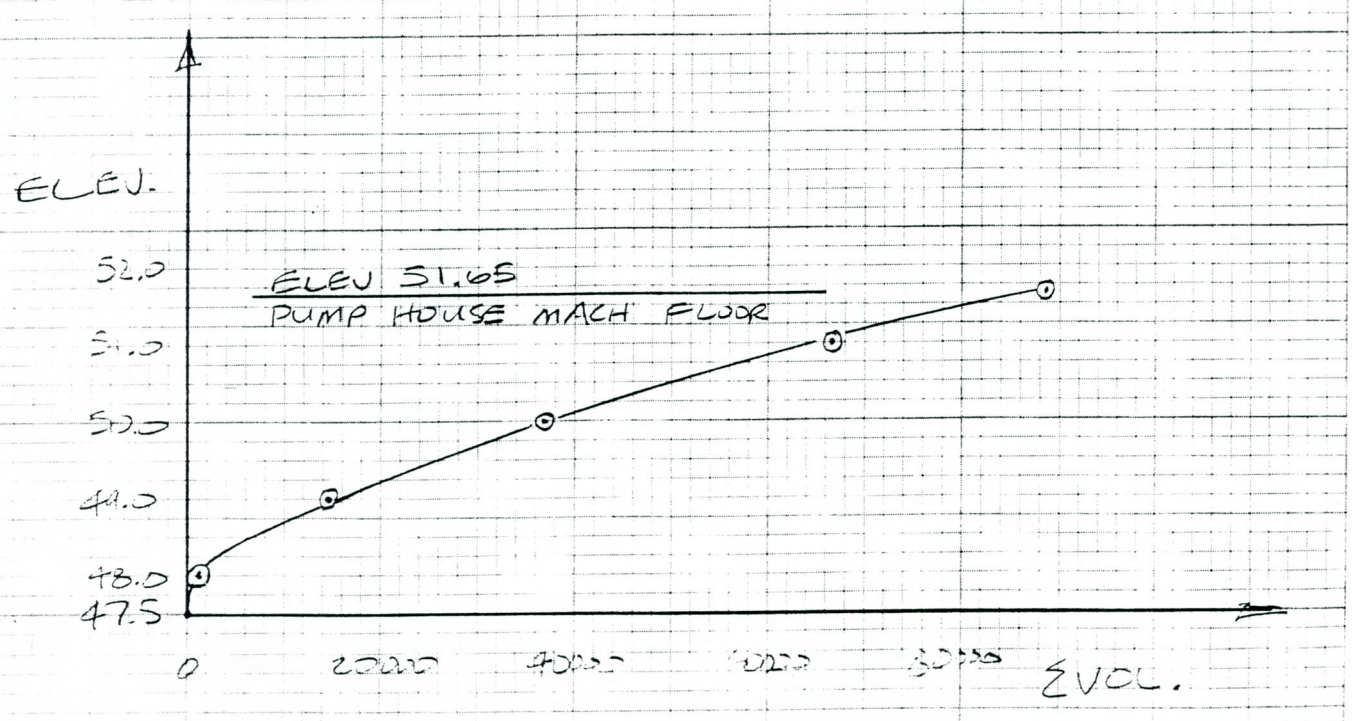
→ VERT DIFF BETWEEN SCI TOPO AND ORIG SOUTHERN AVE PUMP PLANS IS ABOUT 1 FT:
ORIGINAL PLANS — 1FT = SCI TOPO

→ VOL DISPLACED BY MEDIAN ISLAND AND BRIDGE PIERS IS OFFSET BY ADTL. VOL. BEHIND THE CURB WHICH WAS NOT CONSIDERED.

→ DISREGARD VOLUME IN STORM DRAIN COLLECTION PIPE AND IN PUMP WET WELL.

→ MAXIMUM ALLOWABLE WATER SURFACE IS AT ELEVATION 51.65 WHICH WOULD CORRESPOND TO PUMP HOUSE MACHINE FLOOR.

EL	AREA	(FT²) AVG AREA	(FT) Δd	(FT³) VOL	ΣVOL
47.5	0	0	0	0	0
48.0	7900	7900	2.5/3	1300	1300
49.0	18600	13250	1.0	13250	14550
50.0	26200	22400	1.0	22400	36950
51.0	32400	29300	1.0	29300	66250
51.65	35800	34100	0.65	22150	88400



SC 3020

DESIGNED BY GSB DATE 10-30-91 SHEET NO. 2 PAGE NO.
CHECKED BY WHH DATE 4-28-92 OF 3 JOB NO. 10591
REVIEWED BY DATE SUBJECT: SOUTHERN AVE PUMP ROADWAY PONDING DEPTHS
APPROVED BY DATE

ESTIMATE HIGH WATER ELEVATIONS —

ASSUMPTION #1:

→ ESTIMATE VOL BASED ON THE DIFFERENCE BETWEEN THE PEAK INFLOW OF 20.4 CFS FOR ULTIMATE CONDITIONS AND THE MAXIMUM PUMP DISCHARGE CAPACITY OF 18.5 CFS -- SAY, 2 CFS.

→ ASSUME THIS EXCESS OCCURS FOR A PERIOD OF 30 MINUTES.

→ ASSUME THAT THE EXCESS VOLUME CREATED BY THIS 2 CFS FOR 30 MINUTES WOULD POND IN THE SOUTHERN AVE DEPRESSED SECTION ACCORDING TO THE ELEV-VOL CURVE ON SHT 1.

$$2\,CFS \times 30\,MIN \times 60\,SEC/MIN = 3600\,FT^3$$

CONCLUSION: A VOL OF 3600 FT³ CORRESPONDS TO A PONDING DEPTH OF LESS THAN 1 FT ON THE ROADWAY IN A 50-YEAR STORM

ASSUMPTION #2:

→ ESTIMATE THE VOLUME OF RUNOFF FROM A 50-YEAR STORM

→ ASSUME THE ULTIMATE CONTRIBUTING DRAINAGE AREA IS 3.3 AC

→ ASSUME THAT PUMPS FAIL COMPLETELY AND THE RESULTING VOLUME PONDS IN THE SOUTHERN AVE DEPRESSED SECTION ACCORDING TO THE ELEV-VOL CURVE ON SHT 1.

→ ASSUME A RUNOFF COEFFICIENT OF 0.90

$$3.3\,AC \times 43560\,FT^2/AC \times 2.45\,IN\ RAIN \div 12\,IN/FT \times 0.90$$
$$= 36{,}600\,FT^3$$

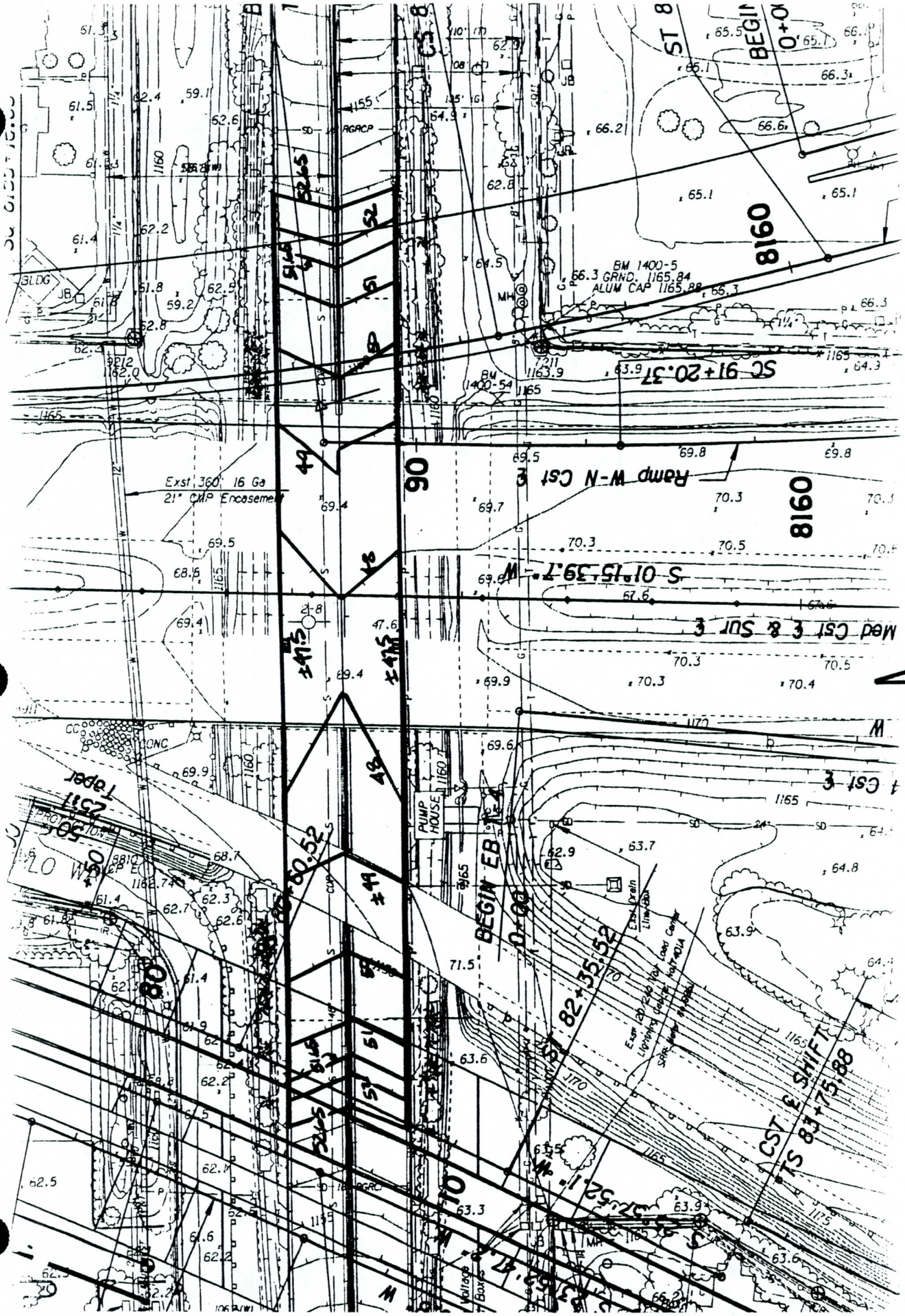
CONCLUSIONS:

A. A VOL OF 36,600 FT³ CORRESPONDS TO A PONDING DEPTH OF ABOUT 2.5 FT ON THE ROADWAY IN A 50-YEAR STORM.

B. THE SOUTHERN AVE PUMP HOUSE MACHINE FLOOR IS MORE THAN 1.5 FT HIGHER THAN THE "TOTAL FAILURE" PONDING SURFACE.

SCI # 10591

GSB



N
NO SCALE

SHT 3 OF 3

SOUTHERN AVENUE PUMP
ROADWAY PONDING DEPTHS

PHONE 276-5599

I-10/SUPER/BASELINE
IR-10-3(311)PE

Gilbert PUMP AND EQUIPMENT COMPANY

P. O. Box 20216
1475 East Elwood Street
Phoenix, Arizona 85036

FACSIMILE TRANSMITTAL FORM

DATE: 6-18-91

2 PAGES INCLUDING COVER SHEET

TO: SCOTT BUCHANAN
STANLEY CONSULTANTS INC

FROM: MARION MILLER

RE: ADOT Pump
SN K2K2030497

FAX #: 230-7655

VOICE #:

COMMENTS ATTACHED IS A CURVE SHEET FOR THE RE: Pump. SORRY WE DID NOT RECEIVE MORE INFO.
CALL ME IF WE MAY ASSIST YOU FURTHER

Marion

REPLY TO FAX NUMBER (602) 276-5592

VOICE NUMBER (602) 276-5599

ARIZONA STATE CONTRACTOR'S LICENSES · L-11 NO. 070152 · L-29 NO. 070153
ARIZONA STATE CONTRACTOR'S LICENSES · A-12 NO. 070150 · A-16 NO. 070151
ARIZONA STATE CONTRACTOR'S LICENSES · C-29 NO. 018210-001 · C-11 NO. 018209-006

October 9, 1991

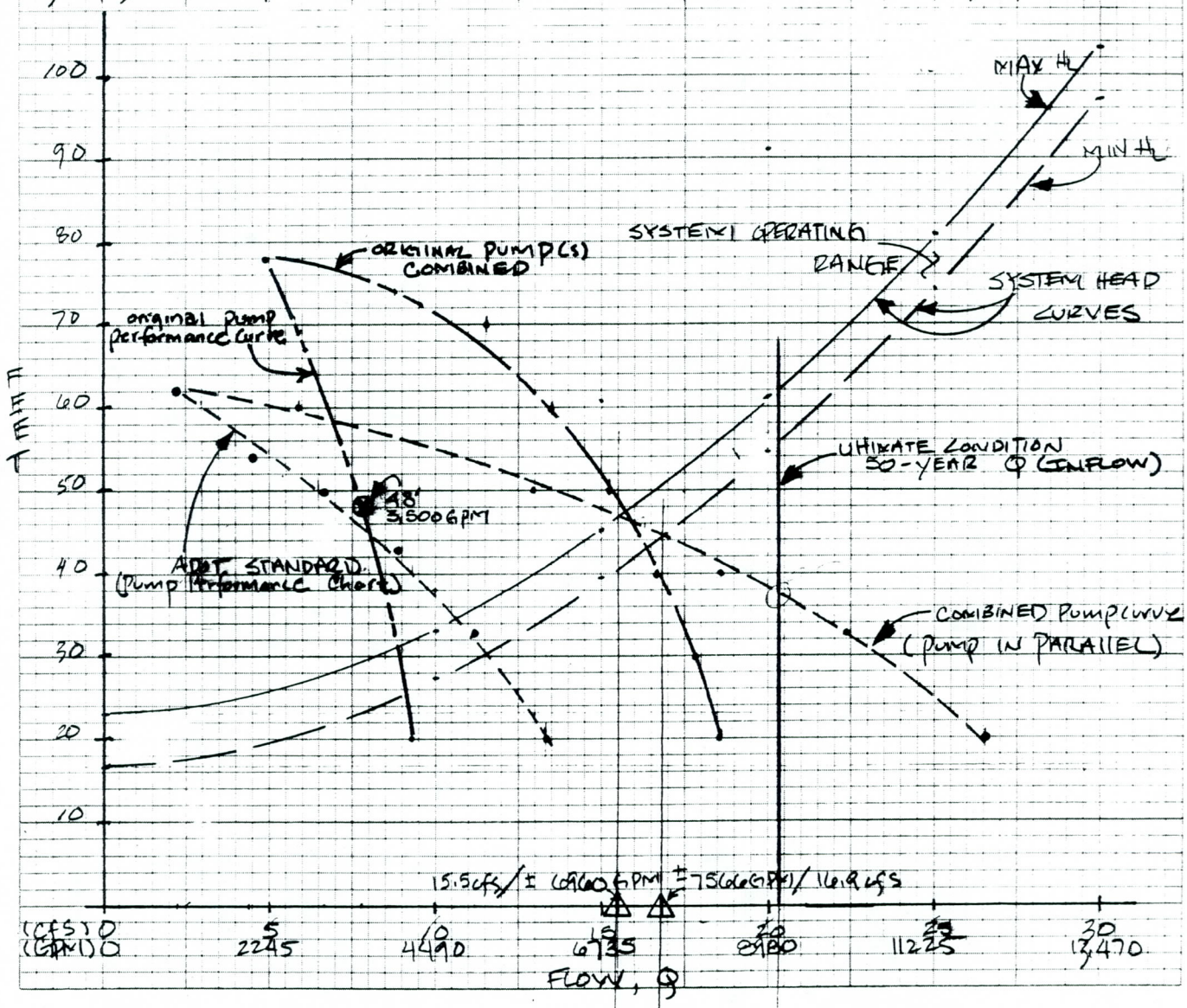
SOUTHERN AVENUE PUMPS
I-10/SUPERSTITION/BASELINE
PROJECT NO. IR-10-3(311) PE

	Contributing Area	Maximum Inflow	Maximum Pump Capacity
Original Design	3.8 AC (C x A)	15.1 CFS (25 Yr)	15.6 CFS
Present Condition	3.8 (0riginal) 15.8 (I-10) 19.6 AC Total	30 CFS (25 Yr)	15.6 CFS
Ultimate Design	3.8 AC Total	20.4 CFS (50 Yr)	16.9 CFS to 18.5 CFS

DESIGNED BY M.S. Fleming DATE 7.16.91 SHEET NO. 2 PAGE NO.
CHECKED BY WAH DATE 19 July 91 OF JOB NO. 10591
REVIEWED BY DATE SUBJECT: F-10 / Southern Ave. Depressed
APPROVED BY DATE Section - Pump Station

II. SECOND CASE SCENARIO - 5 yr. old "C" value Equivalent Due to Amount of USEAGE storm pipe vs. supply PIPE (water, sewer)

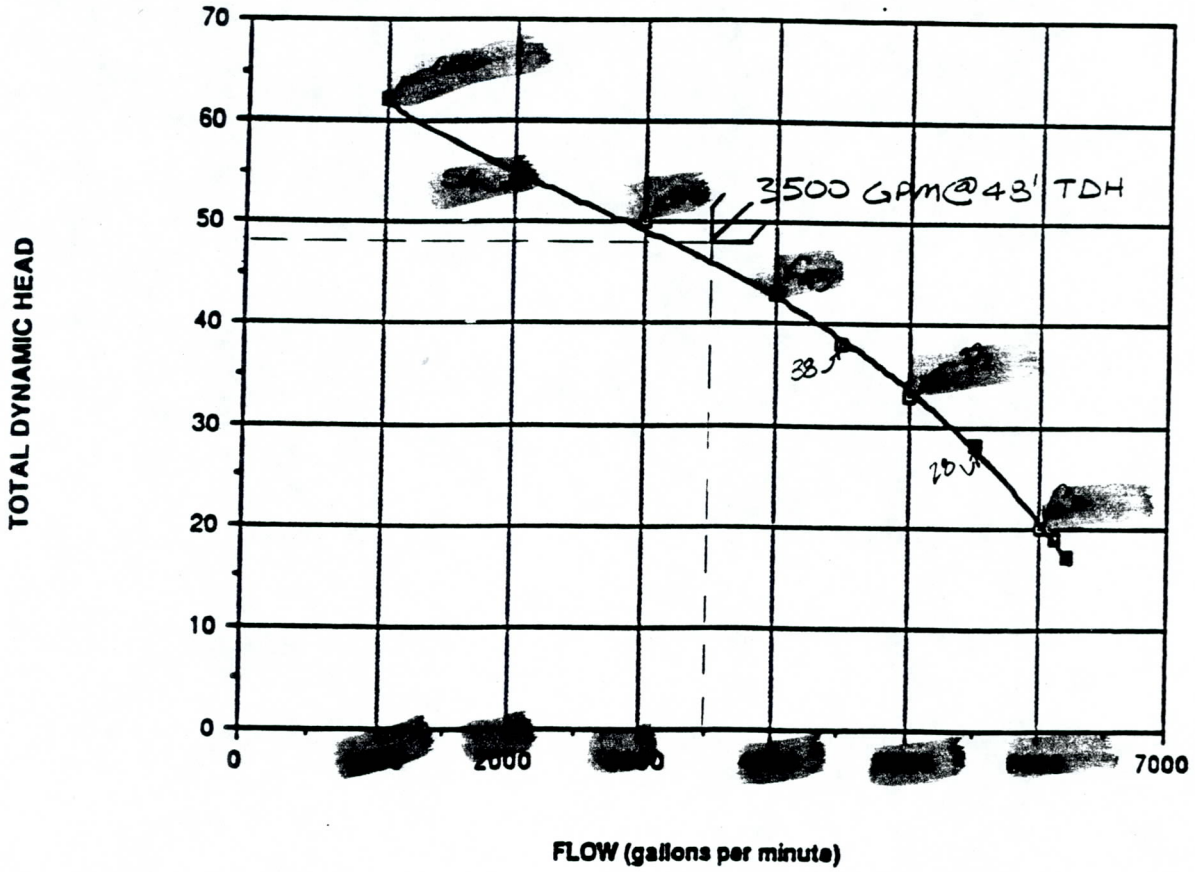
Q CFS	Q GPM	STATIC HEAD MIN	STATIC HEAD MAX	Steel "L"	Conc. "L"	Hf Roughness Steel 120	Hf Roughness Conc. 130	DYN. HLOSS SYSTEM	TOTAL LOSS MIN	TOTAL LOSS MAX
0	0	16.35	22.85	270	60	0	0	0	16.35	22.85
10	4490	"	"	"	"	10.5	0.1	10.6	27	33.5
15	6735	"	"	"	"	22.2	0.2	22.4	38.8	45.3
20	8980	"	"	"	"	37.8	0.3	38.1	54.5	61.
25	11,225	"	"	"	"	57.2	0.5	57.7	74.1	80.6
30	13,470	"	"	"	"	80.10	0.6	80.7	97.1	103.6



SC 3020

FIGURE 3.7-10

PUMP PERFORMANCE CHART



NOTE:
THIS PERFORMANCE CHART IS A GENERAL STANDARD. IT IS NOT SPECIFIC TO THE EXISTING PUMPS AT SOUTHERN AVE & I-10. THE CURVE, HOWEVER, DOES PASS RELATIVELY CLOSE TO THE ORIGINAL DESIGN POINT OF 3500 GPM @ 43 FT TDH.

I-10/SUPERSTITION
IR-10-3(211)PE

NOTE:

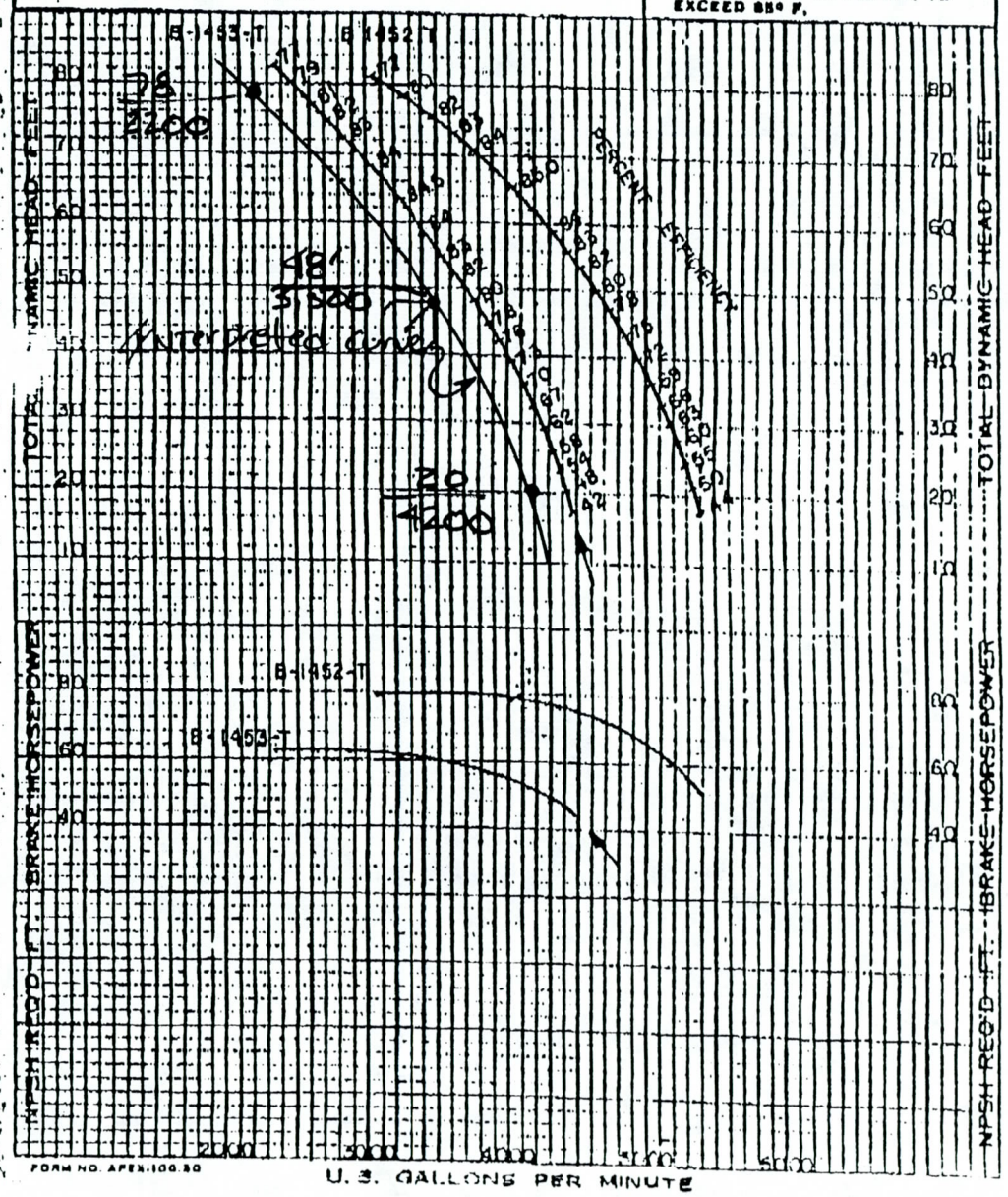
THIS PERFORMANCE CHART APPLIES TO THE ORIGINAL INSTALLATION AT SOUTHERN AND I-10. IT WAS OBTAINED FROM THE ORIGINAL MANUFACTURER, FAIRBANKS-MORSE, THRU THE ORIGINAL INSTALLER, GILBERT PUMP AND EQUIPMENT CO. IT DOES NOT INCLUDE A SPECIFIC CURVE FOR THE PUMPS ORIGINALLY INSTALLED. NOTE THERE IS ALSO NO NPSH CURVE INCLUDED. IN ADDITION, THE ORIGINAL PUMPS HAVE APPARENTLY BEEN REPLACED BY NEWER PUMPS. THE NEW PUMPS ARE THOUGHT TO HAVE SIMILAR OPERATING CHARACTERISTICS TO THE ORIGINALS.

April 16, 1962 C-K2-2030497 NEW PAGE

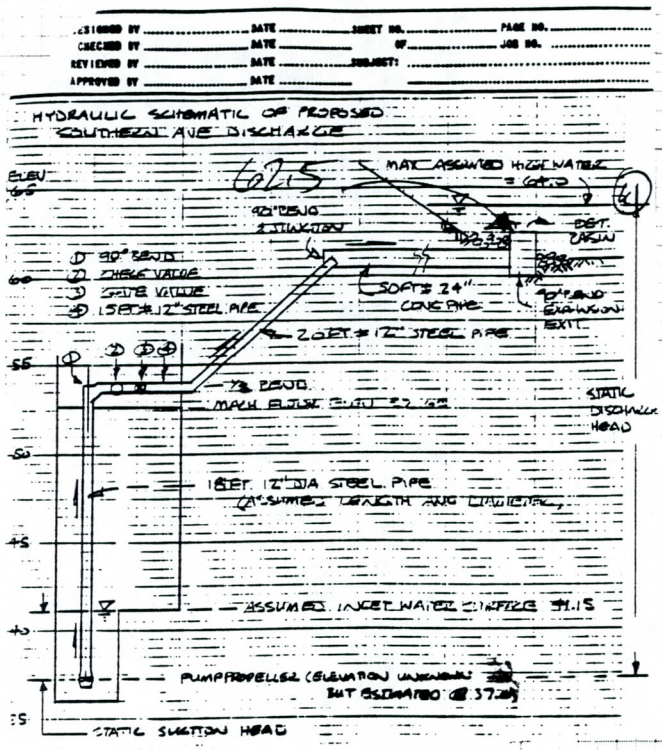
2 STAGE PERFORMANCE No. 10 FIG. 6360 12" COLUMN 1770 RPM

1. The propeller pump performance shown is obtained by testing pumps with 10 feet of column including enclosed discharge elbow with head measurements taken in a horizontal discharge pipe at least three pipe diameters beyond the elbow flange.
2. Additional column losses should be added when settings are deeper than 10 feet, and/or for other discharge arrangements.
3. For velocity head, refer to data page.

HYDRAULIC PERFORMANCE IS CONTINGENT ON FURNISHING THE PUMP WITH SPECIFIED AMOUNT OF CLEAR, FRESH, NON-AERATED WATER NOT TO EXCEED 85° F.



DESIGNED BY M. S. Fleming DATE 7/16/91 SHEET NO. 1 PAGE NO.
CHECKED BY WAH DATE 19 July 91 OF JOB NO. 10591
REVIEWED BY DATE SUBJECT: Southern Ave. Depressed Section – PUMP STATION
APPROVED BY DATE



* CONTROL/COMPARISON – CALCULATIONS

$$H_{L(DYN)} = \frac{10.57\,(Q)^{1.85}\,(L)}{(C)^{1.85}\,(D)^{4.87}}$$

where: Q = [GPM] – Flow
L = [Ft.] – Length
C = Roughness coeff.
(D) = Dia. [INCHES]

* REF: Pump Handbook A-8, Table 3
* where "C" = 83 → 30 year old Steel WELDED ±
"C" = 130 → ±

N. FIRST-CASE SENARIO

CONVESION cfs = GPM/449

Equivalent pipe length (per Fitting Type) → REF: Pg. 3-53 CIVIL ENG. REF. MAN.
* NOTE: Velocity Head considered NOT SIGNIFICANT

(FLANGED)

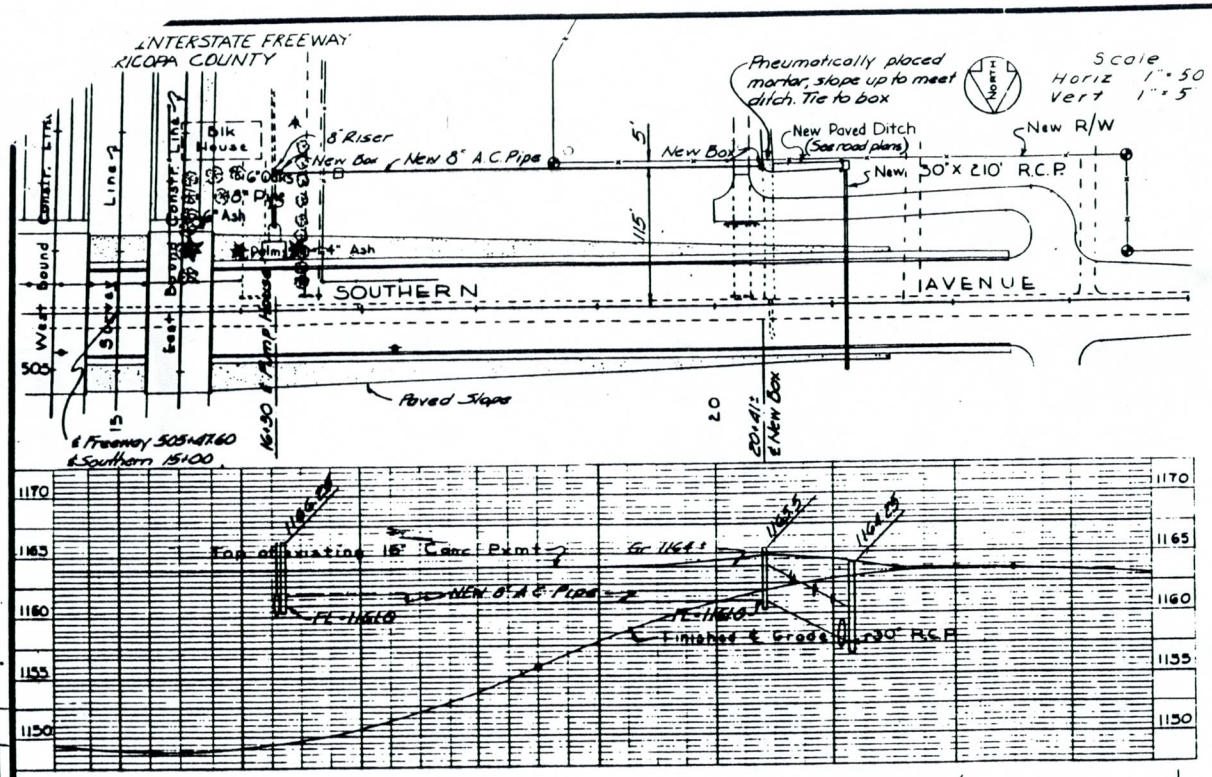
	Fittings	SIZE	Eq. Length	COMMENTS
STEEL	– 90° Bend x 2	12"	~~17~~ 34	
	– Check Valve	12"	140'	
	– Gate Valve	12"	3.2'	
	– 22½° Bend	12"	5.5'	~~200~~ – USE 45° Elbow value/2 – Guest
CONC	– 90° Bend 24" → USE 10'		165.7	USE ~~160~~ FEET TOTAL

Q CFS	Q GPM	STATIC HEAD MIN.	STATIC HEAD MAX.	STEEL PIPE total "L"	CONC. PIPE TOTAL "L"	DYN. LOSS Steel	DYN. LOSS Conc.	* Total Head Loss MIN	* Total Head Loss MAX
0	0	62.5 – 46.15 = 16.35	64 – 41.15 = 22.85	~~160~~ 200 + 20 = ~~180~~ 220	50 + 10 = 60'	Ø	Ø	16.35	22.85
10	4490	"	"	~~180~~ 220	60'	21	0.10	38.4	44
15	6735	"	"	~~180~~ 220	60'	44	0.20	60.0	67.1
20	8980	"	"	~~180~~ 220	60'	75'	0.30	91.7	98.2
25	11,225	"	"	~~180~~ 220	60'	113'	0.50	129.9	136.4
30	13,470	"	"	~~180~~ 220	60'	158'	0.60	175	181.5

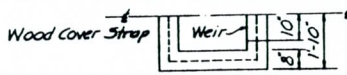
STATEMENT – These values were calculated to target an upper limit. The Actual Headloss should be less because of the actual useage of the Extremain over the 30-year period.

SC 3020

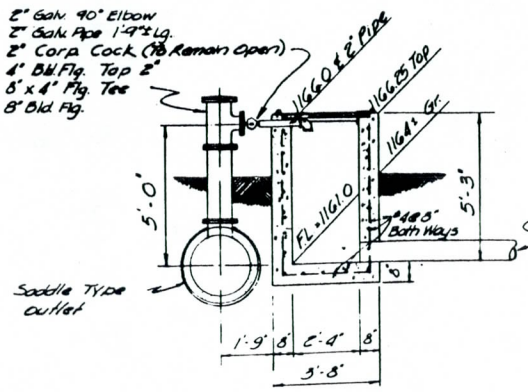
7		I-10-3(51)	38	41	[redacted]



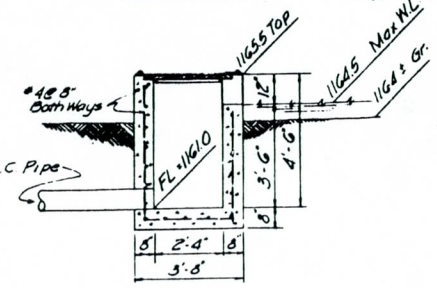
REDUCED SIZE
DO NOT SCALE



HALF PLAN

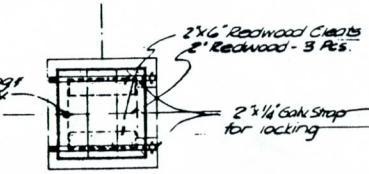


SECTION



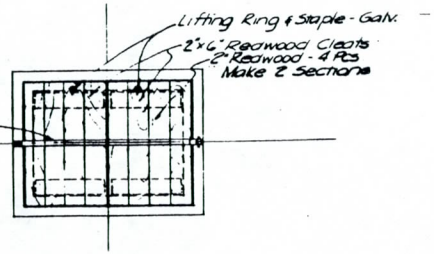
SECTION

DETAILS OF DRAIN LINE BOXES
SCALE 1/2" = 1'-0"



REDWOOD COVER FOR WEST DRAIN LINE BOX
Scale 1/2" = 1'-0"

NOTE: Cover on East Drain Line Box similar except use only one 2"x1/4" Strap at center.



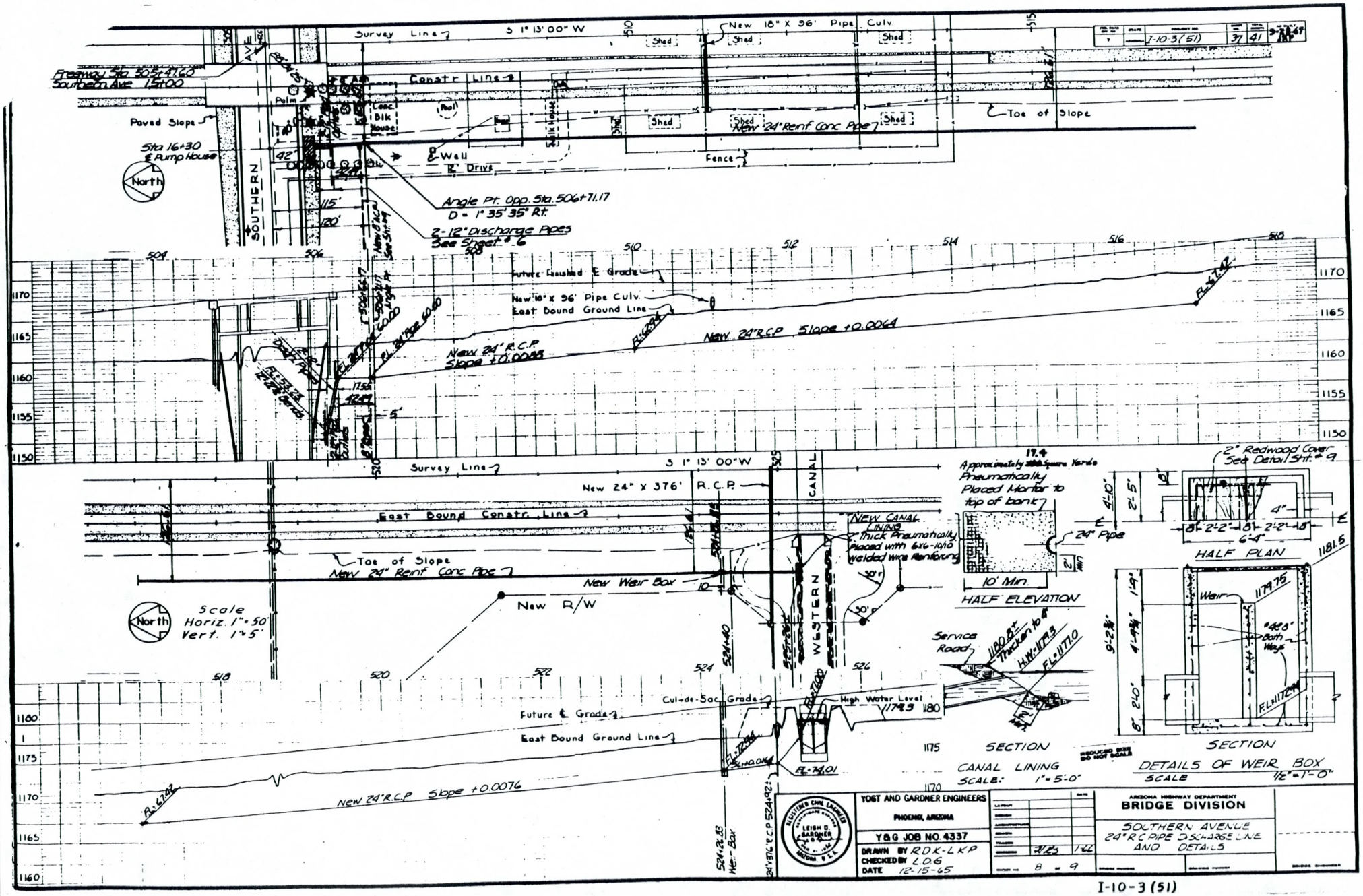
REDWOOD COVER FOR WEIR BOX
Scale 1/2" = 1'-0"

YOST AND GARDNER ENGINEERS PHOENIX, ARIZONA	LAYOUT		DATE
Y&G JOB NO. 4337	DESIGN		
DRAWN BY R.D.K./J.D./L.K.P.	CHECKED		
CHECKED BY L.C.G.	TRACED		
DATE: 12-15-65	REVIEWED	3-23	1-66
SHEET NO. 9 OF 9			

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION
SOUTHERN AVENUE
8" A.C. PIPE DRAIN LINE
AND DETAILS

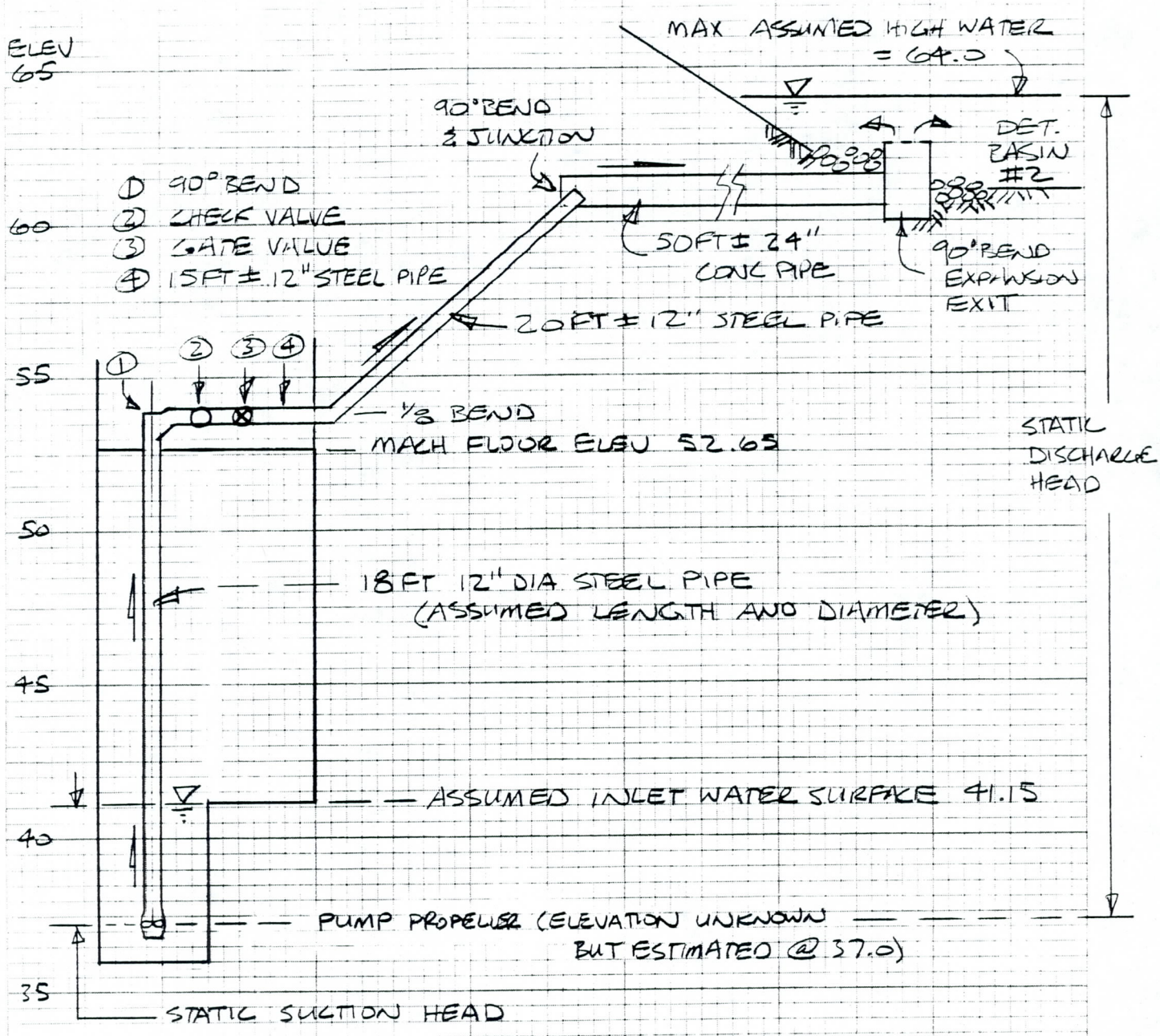
BRIDGE ENGINEER

I-10-3 (51)


Survey Line
S 1° 13' 00" W
New 18" X 36' Pipe Culv.
Shed
Freeway Sta. 30+41.60
Southern Ave 15+00
Constr. Line
Paved Slope
Sta 16+30
℄ Pump House
North
Palm
Well
Fence
Toe of Slope
New 24" Reinf. Conc. Pipe
SOUTHERN
Angle Pt. Opp. Sta. 506+71.17
D = 1° 35' 35" Rt.
2-12" Discharge Pipes
See Sheet # 6
Future Finished ℄ Grade
New 18" X 36' Pipe Culv.
East Bound Ground Line
New 24" R.C.P. Slope +0.0064
New 24" R.C.P. Slope +0.0066
New 24" X 376' R.C.P.
CANAL
East Bound Constr. Line
Toe of Slope
New 24" Reinf. Conc. Pipe
New Weir Box
New R/W
Scale
Horiz. 1" = 50'
Vert. 1" = 5'
WESTERN
Cul-de-Sac Grade
High Water Level
Future ℄ Grade
East Bound Ground Line
New 24" R.C.P. Slope +0.0076
New CANAL LINING
Thick Pneumatically Placed with 6x6-10/10 Welded Wire Reinforcing
Approximately 17.4 Square Yards
Pneumatically Placed Mortar to top of bank
24" Pipe
10' Min.
HALF ELEVATION
Service Road
SECTION
CANAL LINING
SCALE: 1" = 5'-0"
2" Redwood Cover
See Detail Sht. # 9
HALF PLAN
Weir
Both Ways
SECTION
DETAILS OF WEIR BOX
SCALE 1/2" = 1'-0"
YOST AND GARDNER ENGINEERS
PHOENIX, ARIZONA
Y&G JOB NO. 4337
DRAWN BY RDK-LKP
CHECKED BY LDG
DATE 12-15-65
ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION
SOUTHERN AVENUE
24" R.C. PIPE DISCHARGE LINE
AND DETAILS
8 - 9
I-10-3 (51)

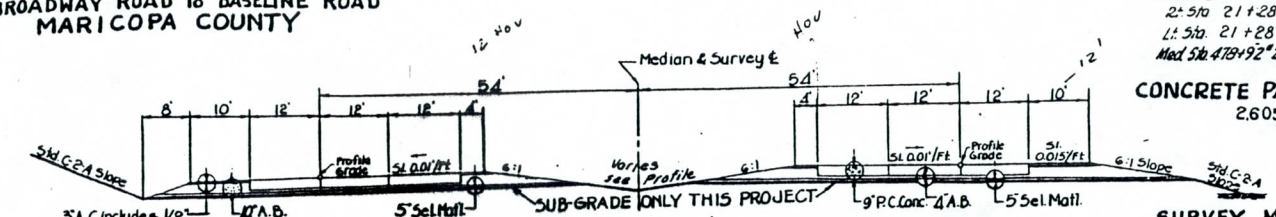
DESIGNED BY LSB	DATE JUL. 91	SHEET NO.	PAGE NO.
CHECKED BY WHH	DATE 19 July 91	OF	JOB NO.
REVIEWED BY	DATE	SUBJECT: I-10/SUPER/BASELINE	
APPROVED BY	DATE	IR-10-3(311) PE	

HYDRAULIC SCHEMATIC OF PROPOSED SOUTHERN AVE DISCHARGE

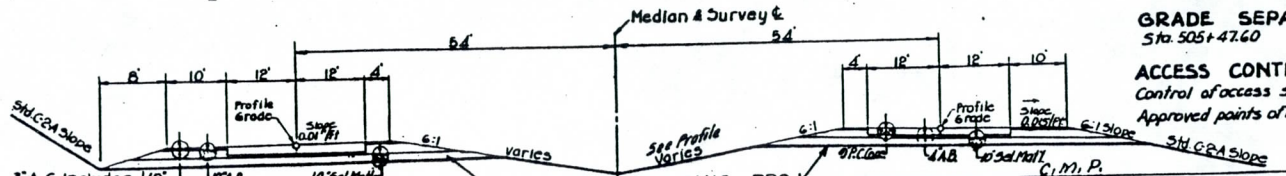


SC 3020

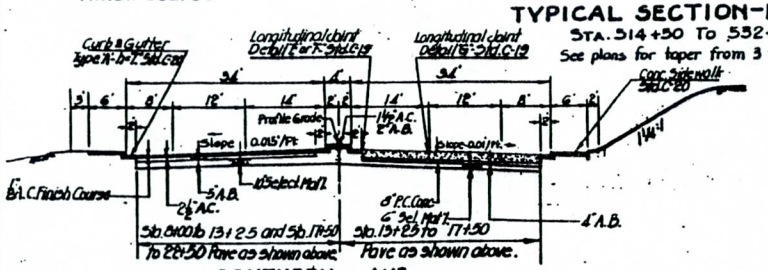
PHOENIX INTERSTATE FREEWAY
BROADWAY ROAD To BASELINE ROAD
MARICOPA COUNTY



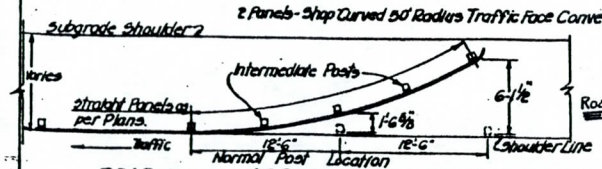
TYPICAL SECTION-FREEWAY
STA. 470+00 To 514+50



TYPICAL SECTION-FREEWAY
STA. 514+50 To 532+50
See plans for taper from 3 to 2 lanes

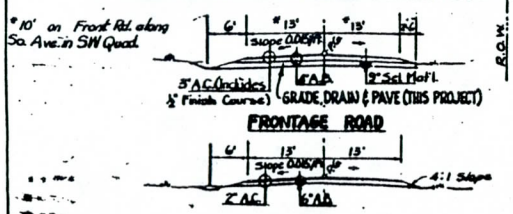


SOUTHERN AVE.
GRADE, DRAIN & PAVE (THIS PROJECT)

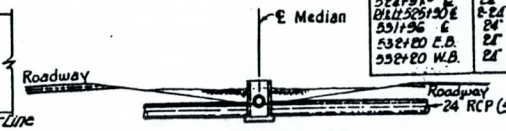


2 Panels - Shop Curved 50' Radius Traffic Face Convex

ROAD GUARD-APPROACH END INSTALLATION



DETOUR AT SOUTHERN AVE.



CROSS SECTION

DETAIL OF MEDIAN DRAIN
STA. 478+92

IRRIGATION STRUCTURE
2+5 to 21+28 - 2 New Hdwl.
Lt. Sta. 21+28 - New Hdwl. & Trash Rack.
Med. Sta. 478+92 #2 Standpipe - No Gate Std. C-31

CONCRETE PAVEMENT REMOVAL
2,605 Sq. Yds.

SURVEY MONUMENT & COVER (Std. C-1)
1 - Reqd. Sta. 521+~~96.96~~ 29.90 Freeway
1 - Reqd. Sta. 20+99.41 Southern Ave.

GRADE SEPARATION
Sta. 505+47.60 Southern Ave.

ACCESS CONTROL DATA
Control of access shown thus
Approved points of access - revocable - none

NEW ~~PIPE~~ CULVERT
C.M.P.

Station	Size	Lgth.	Gauge	Install.	Bedding	Class	Remarks
478+92 Med.	2-15"	2-8'	16	Type 3	C	II	See Detail
478+25 Front Rd.	12"	20'	"	"	"	"	Stub Connect to 2-12" C.P.
12+05 Southern	18"	70'					~~From C.B. to G.B.~~
11+25 to 10+45	18"	80'					~~From C.B. to Pump~~
11+25 to 10+50	10"	310'					
18+80	18"	70'					~~From C.B. to G.B.~~
511+00 Med.	15"	95'	"	"	"	"	
6+20 Southern	24"	70'	"	"	"	"	In waste ditch.

NEW CORRUGATED METAL PIPE
2120 Lin. Ft. Perforated - 6" C.M.P. (French Drain) 16 Ga.
20 Lin. Ft. Non Perforated - 6" C.M.P.

REINFORCED CONCRETE PIPES
See Sheet 1 of 9 - Pump House Plans for additional Reinf. Concrete Pipes

	Station	Size	Length	Installation	Bedding	Class	Remarks
	~~473+05 Med.~~	~~24"~~	~~304'~~	~~Type 3~~	~~C~~	~~II~~	Rubber Gasked Joints - 2 Str. Hdwls
	~~475+05 Med.~~	~~24"~~	~~304'~~	"	"	"	
	~~477+35 Med.~~	~~24"~~	~~304'~~	"	"	"	
C.O. #1	478+92 Med.	24"	300' 297'	"	"	"	Rubber Gasked Joints, 2 Str. Hdwls. - Dyke.
479+00	492+00 ℄	30"	294'	"	"	III	2 Hdwls. - See details.
	21+28	30"	218' 207'	"	"	II	12-24" x 4' connections.
	524+87.5 ℄	24"	346' 329'	"	"	"	
	511+50.5 ℄	2-24"	2-188' 149'	"	"	"	2 Str. Hdwls. Dyke over Pipe.
	531+96 ℄	24"	346' 337'	"	"	"	
	532+20 E.B.	24"	98' 91'	"	"	"	
	532+20 W.B.	24"	188' 121'	"	"	"	

R/W MARKERS
37 ea. Required - Std. C-1

PNEUMATICALLY PLACED MORTAR
5420 S.Y. (Incl. 3,000 S.Y. under Bridges)

ROAD GUARD
C.O. #14 750 ~~749~~ Straight (Temporary)
413 ~~425~~ Straight
C.O. #13 ~~75~~ Shop Curved, Concave, 50' Rad.
25' " " " 50' Rad.
Std. C-7-1, Type "A" or "B"

CONC. CURB & GUTTER
5662 ~~5675~~ Lin. Ft. Type "A" Curb & Gutter - h-7" Std. C-20
110 ~~108~~ Lin. Ft. Req. Type "E" Single Curb. Std. C-20

CONC. SIDEWALK
15,375 Sq. Ft. Req. Std. C-20
15,345

LINE FENCE & GATES
~~14,802~~ Lin. Ft. New 5 Wire Line Fence - Std. C-16
14,1~~98~~ 3 New Type 1 Gates.

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LENGTH OF PROJECT
W.B. Sta. 470+74.15 to Sta. 480+86.69 Bk. = 1012.54'
Sta. 480+00.68 to Sta. 532+50 = 5,249.32'
Total = 6,261.86'
Net Gross Length = 1.186 Miles
E.B. Sta. 469+25.86 to Sta. 479+14.49 Bk. = 988.63'
Sta. 480+00.68 to Sta. 532+50 = 5,249.32'
Total = 6,237.95'
Net and Gross Length = 1.182 Miles
Average Length = 1.184 Miles
Mile Post 154.1 to Mile Post 155.3

INDEX OF SHEETS

SHEET NO.	SHEET TYPE
1	Face Sheet
2	Summary Sheet - This Sheet
3	Detail Sheet
4 to 11	Plan & Profile Sheets
12 & 13	Flashers & Overpass Lighting.
14 to 21	Southern Ave. Overpass - E.B.
22 to 29	" " " - W.B.
30 to 38	" " Drains & Pumphouse.
39 to 41	" " Planter Boxes.

(Handrail Standard H-2-1)

NOTE
This Project is for Grading only, except Frontage Road and Southern Ave. which will be completed. Select material, A.B., P.C. Conc. Paving, A.C. on main roadways, and Road Guard to be on Future Project.

REDUCED SIDE DO NOT SCALE

ROADWAY STANDARDS
C-1 C-2 C-2A C-3 C-4 C-7-1 C-8-2
C-9 C-13 C-16 C-27-1
C-31 C-32 C-33-1 C-38 C-43

NOTE
Remove all concrete slabs, drives, abandoned pipes, ribbons, sidewalks, foundations, trees, shrubs and hedges within R/W limits.

GENERAL NOTES
R/W encroachments shall be removed by order of the State unless otherwise noted.

All R/W provisions shall be complied with before job acceptance.

Utilities disturbed by new construction shall be reset or replaced by the interested Utility.

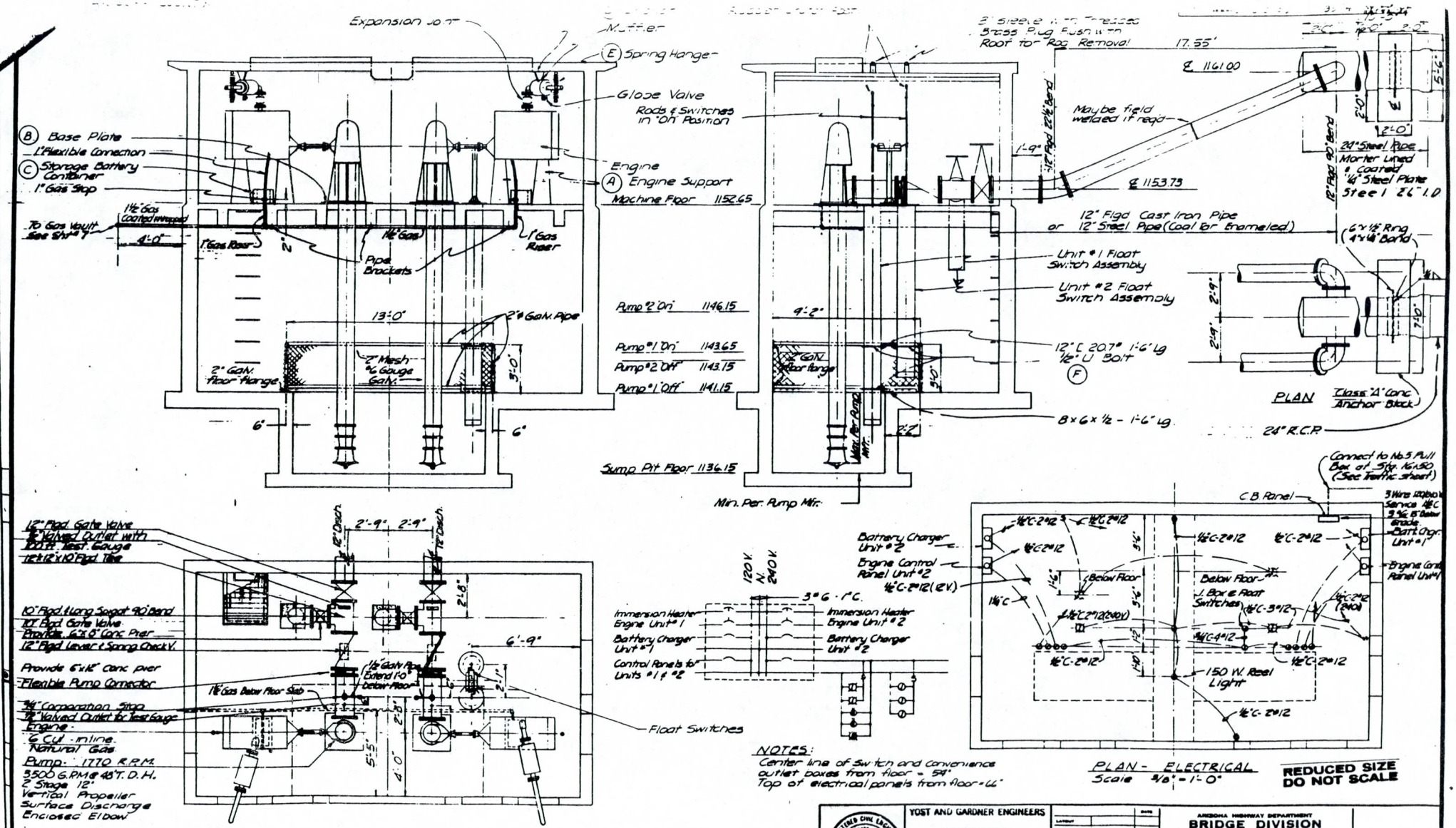
Natural vegetation outside of staked areas shall be preserved.

Bench Markers will be furnished by the State and placed by the Contractor. Standard C-38.

R/W Markers shall be furnished and placed by the Contractor as directed by the Engineer. Standard C-1.

Mile Post Markers will be furnished by the State and placed by the Engineer. Detail - M9-5.

Striping of finished roadway shall be for Std. 4 lane operation.


Expansion Joint
Muffler
(E) Spring Hanger
Globe Valve
Rods & Switches in "On" Position
(B) Base Plate
1" Flexible Connection
(C) Storage Battery Container
1" Gas Stop
Engine
(A) Engine Support
Machine Floor 1152.65
To Gas Vault See Sht #7
1½" Gas coated & wrapped
4'-0"
1" Gas Riser
1½" Gas
1" Gas Riser
Pipe Brackets
13'-0"
2" Galv. Pipe
2" Mesh 16 Gauge Galv.
2" Galv. Floor Flange
5'-0"
6'
6'
Pump #2 "On" 1146.15
Pump #1 "On" 1143.65
Pump #2 "Off" 1143.15
Pump #1 "Off" 1141.15
Sump Pit Floor 1136.15
Min. Per Pump Mfr.
9'-2"
2" Galv. Floor Flange
3'-0"
2'-2"
Min. Per Pump Mfr.
Sleeve with Threaded Brass Plug Flush with Roof for Rod Removal
17.55'
℄ 1161.00
Maybe field welded if req'd
1'-9"
12" Flgd 22½° bend
℄ 1153.73
12" Flgd Cast Iron Pipe or 12" Steel Pipe (Coal Tar Enameled)
Unit #1 Float Switch Assembly
Unit #2 Float Switch Assembly
12" [20.7# 1'-6" lg
½" U Bolt
(F)
8 x 6 x ½ - 1'-6" lg.
2'-9"
2'-9"
7'-0"
PLAN
Class "A" Conc Anchor Block
24" R.C.P.
6 x ½ Ring (4 x ¼ Band)
2'-0"
2'-0"
12" Flgd 90° bend
24" Steel Pipe Mortar Lined & Coated ¼" Steel Plate Steel 26" I.D.
12" Flgd. Gate Valve
¾" Valved Outlet with Tap for Test Gauge
12" x 12" x 10" Flgd Tee
10" Flgd Long Sweep 90° Bend
10" Flgd Gate Valve
Provide 6'x6' Conc pier
12" Flgd Lever & Spring Check V.
Provide 6'x6' Conc pier
Flexible Pump Connector
¾" Compression Stop
¾" Valved Outlet for Test Gauge
Engine:
6 Cyl - in line
Natural Gas
Pump: 1770 R.P.M.
3500 G.P.M. @ 48' T.D.H.
2 Stage 12"
Vertical Propeller
Surface Discharge
Enclosed Elbow
12" Disch.
2'-9"
2'-9"
12" Disch.
2'-8"
6'-9"
1½" Galv. Pipe Extend 10" below Floor
1½" Gas Below Floor Slab
2'-1"
2'-8"
5'-5"
4'-0"
Float Switches
MACHINE FLOOR PLAN
SCALE ¼" = 1'-0"
120 V.
N
240 V.
3" G - 1" C.
Immersion Heater Engine Unit #1
Battery Charger Unit #1
Control Panels for Units #1 & #2
Immersion Heater Engine Unit #2
Battery Charger Unit #2
Battery Charger Unit #2
Engine Control Panel Unit #2
¼" C-2#12 (EV)
¼" C-2#12
¼" C-2#12
1¼" C
1¼" C
(Below Floor)
¼" C-2#12 (240V)
¼" C-2#12
C.B. Panel
Connect to No. 5 Pull Box at Sta. 16+50 (See Traffic sheet)
3 Wire 120/240 V Service ¼" C 2 ⅜ 8' Below Grade
Batt. Chgr. Unit #1
Engine Cont. Panel Unit #1
¼" C-2#12
¼" C-2#12
¼" C-2#12
¼" C-2#12
¼" C-2#12
¼" C-2#12 (240V)
¼" C-3#12
¼" C-4#12
¼" C-2#12
¼" C-2#12
¼" C-2#12
Below Floor
J. Box & Float Switches
150 W. Reel Light
5'-6"
5'-6"
1'-6"
1'-2"
1'-0"
PLAN - ELECTRICAL
Scale ⅜" = 1'-0"
NOTES:
Center line of switch and convenience outlet boxes from floor = 54"
Top of electrical panels from floor = 66"
REDUCED SIZE DO NOT SCALE
REGISTERED CIVIL ENGINEER LEIGH D. GARDNER ARIZONA U.S.A.
YOST AND GARDNER ENGINEERS
PHOENIX, ARIZONA
Y&G JOB NO. 4337
DRAWN BY L.K.P.
CHECKED BY L.O.G.
DATE 12-15-65
ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION
SOUTHERN AVENUE PUMP HOUSE ELECTRICAL & MECHANICAL
SHEET NO. 6 - 9

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