Elkhorn Springs and Buffalo Drive Storm Drain Sy







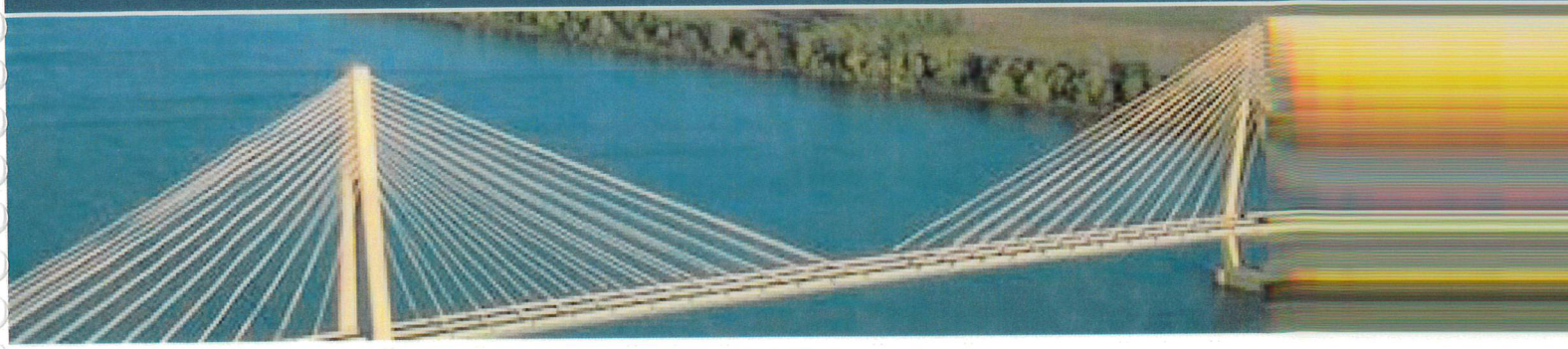
Ju

Prepared For:

City of Las Vegas

Parsons Brinckerh
3930 Howard Hughes Parkway, Suite
Las Vegas, NV 89

TEL: (702) 697-8
FAX: (702) 697-8



Preliminary Drainage Study

For the
Elkhorn Springs and Buffalo Drive Storm Drain System

July 2008

Prepared for:
City of Las Vegas

Sign Final

Prepared By:

Parsons Brinckerhoff
3930 Howard Hughes Parkway
Suite 300
Las Vegas, NV 89169
TEL: 702-697-8100
FAX: 702-697-8170

PROFESSIONAL ENGINEER - STATE OF NEVADA
SHOU-CHING HSU
Exp 06/30/07
CIVIL
No. 14707



TABLE OF CONTENTS

1.0 INTRODUCTION 5
1.1 LOCATION 5
1.2 PROJECT DESCRIPTION 5
2.0 GENERAL DRAINAGE DESCRIPTION 6
2.1 MASTER PLAN 6
2.2 FEMA FLOOD INSURANCE RATE MAPS 6
2.3 HYDROLOGIC METHOD 6
2.4 CURVE NUMBER, SOIL TYPES AND LAND USE 6
2.5 RAINFALL AREA AND INTENSITIES 7
2.6 TIME OF CONCENTRATION AND LAG TIME 7
2.7 REFERENCE STUDIES 7
2.8 UTILITY INFORMATION 7
2.9 ELKHORN SPRINGS DETENTION BASIN 8
2.10 PERMITS 8
3.0 EXISTING CONDITION 9
3.1 HYDROLOGY 9
3.2 HYDRAULICS 10
4.0 PROPOSED CONDITION 14
4.1 HYDROLOGY 14
4.2 HYDRAULICS 15
4.2.1 PROPOSED STORM DRAIN ALIGNMENT 15
4.2.2 FARM ROAD STORM DRAIN SYSTEM 16
4.2.3 BUFFALO DR STORM DRAIN SYSTEM 17
4.2.4 DROP INLET ANALYSIS 17
4.2.5 ELKHORN SPRINGS DETENTION BASIN ANALYSIS 18
4.2.6 OUTLET FROM ELKHORN SPRINGS DETENTION BASIN 18
4.3 STREET CAPACITY CALCULATIONS 19
5.0 COST ESTIMATION 21
6.0 CONCLUSION 22
7.0 REFERENCE 23

LIST OF TABLES

Table 1: Comparison of Detention Basin Flows 8
Table 2: Existing Drop Inlets Flow Summary 12
Table 3: Flow Split Calculations- Summary 13
Table 4: WSPG Results of Outlet Pipe - Existing Condition Q-137 cfs 14
Table 5: Proposed Drop Inlets Flow Summary 18
Table 6: Detention Basin- Proposed Condition 18
Table 7: WSPG Results for Outlet Pipe 19
Table 8: Street Capacity Calculations 20
Table 9: Cost Estimation Calculations 21

APPENDICIES

Appendix A:

- Figure 1-Vicinity Map
- Figure 2- Existing SD System Exhibit
- Figure 3-Draft 2008 MPU Facilities Map
- Figure 3A-Draft 2008 MPU Facility Inventory
- Figure 4- FEMA FIRM Panels
- Figure 5- Existing Condition Basin Map
- Figure 5A- Proposed Condition Basin Map
- Figure 6- Draft 2008 MPU Hydrologic Map
- Figure 7-McCarran Airport Rainfall Area - HCDDM Fig 513
- Figure 8 -Depth-Duration-Frequency-Values – HCDDM Fig 503
- Figure 8A -Depth-Duration-Frequency-Values – HCDDM Fig 506
- Figure 8B -Adjusted Rainfall Depths – HCDDM Table 501
- Figure 9-SDN3-HCDDM Table 503

Appendix B:

- Hydrology
  - Curve Number Calculations
  - Standard Form 4
  - Rainfall Intensity
  - HEC-1 Output
    - Existing Condition 10 Year
    - Existing Condition 100 Year
    - Proposed Condition Option 1- 10 Year
    - Proposed Condition Option 1- 100 Year
    - Proposed Condition Option 2- 10 Year
    - Proposed Condition Option 2- 100 Year
- Hydraulics
  - Drop Inlet Inventory and FlowMaster Calculations
  - Street Capacity Calculations
  - Flow Split Calculations
  - WSPG Calculations
    - 60-inch Proposed Storm Drain System
    - Outlet Pipe- Q80
    - Outlet Pipe- Q137
    - Outlet Pipe- Q152
  - Stage Storage
    - Stage vs. Storage
    - Stage vs. Surface Area
    - Stage vs. Low Level Discharge- Option 1
    - Stage vs. Low Level Discharge- Option 2
    - Volume and Discharge Table

Appendix C:

- Table 1: Drainage Study Data Collector
- Table 2: Utility Matrix
- As-Builts
  - 18" Storm Drain System in Buffalo Drive and Storm Drain at Detention Basin Outlet
  - 36" HDPE Storm Drain System in Buffalo Drive North of Farm Road
  - 36" HDPE Storm Drain System in Farm Road
- Proposed Plan and Profile Sheets

Appendix D:

- Construction Schedule
- Geotechnical Engineering Report

1.0 INTRODUCTION

The purpose of this technical report is to provide a hydrologic and hydraulic analysis involved in the design of the storm drain system along Buffalo Drive between Farm Road and Sunny Springs Lane, and along Farm Road between Palm Grove Lane and Buffalo Drive within the jurisdiction of City of Las Vegas. This storm drain system is proposed to convey flows to the Elkhorn Springs Detention Basin, located west of Buffalo Drive between Sunny Springs Lane and Eagle Talon Avenue. The report also provides recommendations to minimize the outflow from the detention basin to reduce the impact on the downstream storm drain system and to utilize the detention basin capacity.

The limits of this study are Elkhorn Road on the south, Whispering Sands Drive on the north, Highway US-95 on the west, and Buffalo Drive on the east. Per the project progress meeting held on April 28th 2008, with City of Las Vegas (CLV), it was concluded that this project will follow the Draft 2008 Las Vegas Valley Flood Control Master Plan Update (MPU), drainage patterns, and shall calculate ultimate flows only. Thus the onsite drainage pattern analysis, flow rate calculations, and recommendations provided for proposed drainage facilities, are all performed for the ultimate developed conditions. Per the MPU, the flow from the existing culverts under US-95 is cutoff due to the proposed MPU facility CN95. Hence, the study does not account for the flows discharged from the culverts under US -95.

1.1 LOCATION

The proposed improvements are within the City of Las Vegas on Buffalo Drive and Farm Road. The project site is partly located within the McCarran Airport Rainfall Area. More details on the Rainfall Area are provided in section 2.5 of this report. Refer to Figure 1 in Appendix A for the Vicinity Map.

1.2 PROJECT DESCRIPTION

Currently, there are existing storm drains in Buffalo Drive, Sunny Springs Lane and Elkhorn Road that convey storm water runoff to the detention basin. The detention basin outlets to the storm drain system in Bridlehorne Way located to the east of the basin. The outflow is eventually conveyed to the Las Vegas Wash. Refer to Figure 2 in Appendix A for an exhibit showing the existing storm drain system.

There is an existing 18-inch RCP storm drain system within Buffalo Drive between Farm Road and Sunny Springs Lane. Proposed improvements include upsizing this 18-inch RCP to accommodate more flows and conveying them to the detention basin. The 18-inch RCP storm drain plan and profile are included in Appendix C. According to the Draft 2008 MPU the 18-inch RCP is proposed to be upsized to an 84-inch RCP. However, per the current hydrologic analysis, a 60-inch RCP would be sufficient to collect and convey additional flows to the detention basin.

There is an existing 36-inch HDPE storm drain system in Farm Road between Cimarron Road and Palm Grove Lane. The system, which was built as part of the residential

development- Lamplight Village Unit -1 at Centennial Springs, terminates at Palm Grove Lane with a 42-inch stub for future extensions. The storm drain plan and profile are included in Appendix C. Proposed improvements include extending this storm drain system to Buffalo Drive and connecting to the proposed 60-inch RCP storm drain system in Buffalo Drive.

There is an existing 36-inch HDPE storm drain system in Buffalo Drive which begins at the intersection of Zepplin Avenue. This system extends south on Buffalo Drive and turns east on Farm Road. The system was built as a part of the Tenaya Farms development. The storm drain plan and profile are included in Appendix C. Proposed improvements include tying this storm drain system into the proposed 60-inch storm drain system in Buffalo Drive. The remaining portion of the storm drain system on Farm Road functions as it had previously.

2.0 GENERAL DRAINAGE DESCRIPTION

2.1 MASTER PLAN UPDATE

The Clark County Regional Flood Control District's (CCRFCD) 2008 Draft MPU shows existing regional facilities EKDB 0700, EKDB 0049 and proposed regional facility EKBU 0000 located adjacent to the project site. Descriptions of nearby regional facilities are shown on the MPU. Refer to Figures 3 and 3A (F-Map), in Appendix A.

2.2 FEMA FLOOD INSURANCE RATE MAPS

The Special Flood Hazard Areas (SFHA) for the City of Las Vegas are outlined in the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map, dated September 27, 2002. Upon reviewing the Community Panel No. 32003 C1745 E, the proposed site lies within a FEMA designated Zone "X". This area is described to be outside of the 0.2% annual chance of flood. Refer to Figure 4, flood zone map 1745 in Appendix A.

2.3 HYDROLOGIC METHOD

The design events evaluated for this project were the 10-year and 100-year storms for a 6-hour return period. These frequencies were selected based on design criteria set forth in the Clark County Hydrologic Criteria and Drainage Design Manual (HCDDM). The US Army Corps of Engineers computer software HEC-1 Flood Hydrograph Package (USACOE, 1998) was used to develop peak flows for existing and developed conditions. The Soil Conservation Service (SCS) Curve Number and Unit Hydrograph Methods were used in accordance with Section 606 of the HCDDM.

2.4 CURVE NUMBER, SOIL TYPES AND LAND USE

Precipitation losses were determined using the SCS Curve Number Method in accordance with Section 606 of HCDDM. The curve number is a parameter assigned to the drainage basin and used in the HEC-1 model to estimate rainfall loss. For urban areas, the value of the curve number is based on the basin land use, soil type, and antecedent moisture

CN #'s Compare with MPU

condition (AMC). AMC II, representing average conditions, was assumed for this project.

The Hydrologic Soil Groups and Land Use Classifications are taken from the latest revision of the Draft 2008 MPU. Refer to Figure 6 (H-map), in Appendix A.

Composite Curve Numbers are calculated for the basins that have multiple land use categories or soil types. Composite Curve Numbers are calculated where required, in accordance with Clark County HCDDM. Refer to the Curve Number Calculations presented in Appendix B.

2.5 RAINFALL AREA AND INTENSITIES

The project site is located within McCarran Airport Rainfall Area, in Sections 15 and 16, Township 19 south, Range 60 east, Clark County, Nevada. However some of the off-site basins delineated for this project are in Sections 17 and 20, Township 19 south, Range 60 east, which are partially outside of the McCarran Airport Rainfall Area. Refer to Figure 7 in Appendix A for the McCarran Rainfall Area maps of the project site.

The Depth-Duration-Frequency curves from Figures 503 and 506 of HCDDM are used to obtain the rainfall depths. Refer to Figures 8 and 8A in Appendix A. Precipitation adjustment ratios from Table 501 of HCDDM were applied to the rainfall depths for sub-basins located outside of the McCarran Airport Rainfall Area. Refer to Figures 8B in Appendix A. The total adjusted rainfall depths obtained for the areas within and outside of McCarran Rainfall Area are used in the HEC-1 input for the sub-basins accordingly. Please refer Appendix B for the rainfall intensities used in HEC-1.

2.6 TIME OF CONCENTRATION AND LAG TIME

Time of concentration and lag time calculations are performed based on the methodology described in Section 606 of the HCDDM. Standard Form 4 was used to develop the times of concentration which were then adjusted to lag times and used in the HEC-1 analysis. Time of concentration and lag time calculations are provided in Appendix B of this report.

2.7 REFERENCE STUDIES

Approved drainage studies within the project's watershed area were obtained from CLV. However, this study does not directly reference flow values from these drainage studies because the studies are more than 5 years old. The grading plans were referenced for flow patterns and slopes. The existing drop inlets and storm drain information is obtained from reference studies. Please refer to Table 1 in Appendix C for all studies used to obtain referenced information. Plan and profile sheets for specific storm drain systems are also included in Appendix C.

2.8 UTILITY INFORMATION

Existing utilities located along Buffalo Drive and Farm Road, within the project site limits, were obtained by contacting the utility companies. Please refer to Table 2 in Appendix C for the utility matrix. Based upon as-builts provided by the agencies, the

existing water, sewer, storm drain, electrical, and gas pipes were drafted in AutoCAD. The proposed storm drain pipes, laterals, manholes, and drop inlets were then designed and drafted in AutoCAD. Several critical points of interest influenced the storm drain design, based upon the required vertical clearance between the utility lines. One location is at the intersection of Buffalo Drive and Sunny Springs Lane where the proposed 60-inch storm drain pipe crosses under a 12" existing water pipe. This clearance limits the size and slope of the storm drain at this location. Another critical point is at the intersection of Farm and Buffalo, for the vertical clearance between a 36" storm drain pipe and an existing 8" sewer pipe.

The storm drain design will be finalized after the review of the 30% submittal. Pothole information will be requested at critical utility crossing locations to ensure that minimum clearance requirements are met.

2.9 ELKHORN SPRINGS DETENTION BASIN

Elkhorn Springs Detention Basin and the storm drain systems that convey flow to the basin have been developed under different projects at different time frames. The detention basin and the storm drain systems which convey flow to it were proposed and constructed as part of Elkhorn Springs Phase II project in 1996, while a portion of the detention basin was developed into a park as a part of Elkhorn Springs Neighborhood Park project in 2000.

The detention basin has been analyzed by more than one study. In addition to the Elkhorn Springs Phase-II and Elkhorn Springs Neighborhood Park projects, the detention basin has been analyzed by the Draft 2008 MPU and the northwest Neighborhood Study Phase-II. The following table summarizes the detention basin hydrology and hydraulics from different studies. Section 4.2.5 of this report discusses in detail the detention basin analysis performed in the current study.

Table 1: Comparison of Detention Basin Flows

Study Name	Year of Study	Q100-in	Q100-out	WSE	Time to Peak (hrs)	*Freeboard
MPU-Master Plan Update	2008	701	127	2399.54	5.50	0.46
SWE-Southwest Engineering	1996	569	125	2399.31	5.83	0.69
NWNS-Northwest Neighborhood Study	1998	771	124	2399.09	5.42	0.91
Lochsa Engineering	2001	569	159	2398.80	5.58	1.20

Note: *Freeboard is the difference between the water surface elevation in the detention basin and the highest contour at basin outlet above which flow spills out from the basin.

2.10 PERMITS

During the initial screening process, no permits were required. The project being located amid a completely urbanized area, no environmental issues are recognized at this stage.

Additional screening will be performed by the next design phase to ensure that no additional permitting is required for the project.

3.0 EXISTING CONDITION

3.1 HYDROLOGY

According to the Draft 2008 MPU, the existing drainage pattern is generally from west to east in the project area. The MPU basins NW134-C and NW133-C contribute flows to the Elkhorn Springs Detention Basin. Refer to Figure 6 (H-map) in Appendix A to locate the basins. Per one of the project progress meetings, it was determined that the northwest portion of basin NW134-C, north of Durango Drive does not contribute flow to the Elkhorn Springs detention basin. Thus Durango Drive is taken as the northwest boundary of the watershed area draining to the detention basin.

A total of twenty-one (21) sub-basins were delineated within the watershed between US-95 and Buffalo Drive and between Farm Road and Elkhorn Road which are used to define the proposed project site. Technical drainage studies collected for the project were referred to delineate the sub-basins, in order to match the existing flow patterns. The slopes for the sub-basins are obtained from the 1-foot contours available from the topographic maps. The sub-basins are delineated within the boundaries of the two MPU basins that contribute flows to the project site. Refer to Figure 5 in Appendix A for the Existing Condition Basin Map.

The existing condition hydrology performed in this study analyzes the current flow discharged into the detention basin. The watershed area contributing flow to the detention basin is very well developed. Thus the curve numbers used in this study reflect the developed conditions of the watershed. Since the land use is considered the same for the existing condition and proposed condition in this study, the same curve numbers are used for both of the conditions. Refer to the Curve Number calculations presented in Appendix B.

Drainage basins OFF-1 and OFF-4 discharge flows into Farm Road. There are five (5) drop inlets on Farm Road which drain into an existing 36-inch HDPE. The storm drain system was proposed as a part of the residential development, Lamplight Village Unit-1 improvements. This system terminates at the intersection of Farm Road and Palm Grove Lane with a 42-inch RCP stub for future extensions. No specific information is available about how this system functions without a potential outlet. Hence, in the current study, the flow generated by basin OFF-1 is used to calculate the flow intercepted by the existing drop inlets in Farm Road. However, the flow discharged into Farm Road is not routed to the detention basin due to the lack of an adequately sized storm drain system between Palm Grove Avenue and Buffalo Drive.

The flow generated by basins OFF-3, OFF-6 and OFF-7 is discharged into Sunny Springs Lane. This flow is intercepted by five (5) drop inlets in Sunny Springs Lane. The flow

from the drop inlets is conveyed to the detention basin through an existing storm drain system in Sunny Springs Lane.

Drainage basins OFF-2, OFF-8 and OFF-9 discharge flow into Elkhorn Road. There are six (6) drop inlets on Elkhorn Road which intercept the flow from these basins. The flow intercepted by these drop inlets is conveyed into an existing storm drain system in Elkhorn Road. This system turns north at the intersection of Elkhorn Road and Buffalo Drive and turns west at the intersection of Buffalo Drive and Golden Talon Avenue before discharging flow into the detention basin.

The flow generated by basin OFF-11 drains into the drop inlets located on Golden Talon Avenue. Basins OFF-12 and ON1 include the area within the detention basin.

Flow split calculations are performed as a part of the hydraulic calculations for the existing condition. More detail on the flow split calculations are provided in Section 3.2 of this report.

The HEC-1 analysis for the existing condition accounts for the flow intercepted by the drop inlets and the flow resulting from the flow split calculations. Per the existing condition HEC-1 analysis, the peak 100-year flow discharged into the detention basin is 476 cfs which results in a water a surface elevation of 2394.50 ft and an outflow of 137 cfs. Refer to the HEC-1 output for the existing condition hydrology, provided in Appendix B.

3.2 HYDRAULICS

There are existing storm drain systems in Buffalo Drive, Sunny Springs Lane, Golden Talon Avenue, and Elkhorn Road that currently convey flows to the detention basin. The existing storm drain system in Buffalo Drive is an 18-inch RCP that conveys flows from Buffalo Drive to the detention basin. A 48-inch RCP in Buffalo Drive conveys the flows from Elkhorn Road to the detention basin. The storm drain system in Sunny Springs Lane is a 24-inch RCP at its intersection with Cimarron Road and transforms to a 48-inch RCP at the intersection with Buffalo Drive. The storm drain system in Golden Talon Avenue is a 48-inch RCP. The existing system in Elkhorn Road starts as a 21-inch RCP at Cimarron Road and transforms to a 36-inch RCP at the intersection with Buffalo Drive. There is an existing 36-inch HDPE storm drain system that starts at the intersection of Buffalo Drive and Zepplin Avenue, which turns east on Farm Road. Refer to Figure 2 in Appendix A for a map of the existing storm drain system.

The existing drop inlets are analyzed to calculate the flow intercepted by them. FlowMaster software is used to analyze the drop inlets. Results for the FlowMaster calculations on the existing drop inlets are included in Appendix B. The drop inlet sizes used for the analysis are obtained from various drainage studies. Table 1 provided in Appendix C lists the names of studies from which the sizes of drop inlets are referenced. Refer to the Drop Inlet Inventory Table included in Appendix B for the sizes and

inventory of drop inlets. Table 2 summarizes the drop inlet flows in 100-year and 10-year storm events.

Table 2: Existing Drop Inlets Flow Summary

Inlet ID	Location	Source of flow	100-yr Flows (cfs)		10-yr Flows (cfs)	
			Q Intercepted	Q Bypass	Q Intercepted	Q Bypass
FDI-1	Farm Rd	OFF-1	45	134	29	43
FDI-2	Farm Rd	Q bypass from FDI-1	40	94	20	23
FDI-3	Farm Rd	Flow in Farm Rd after split at Cimarron Rd	21	31	11	7
FDI-4	Farm Rd	Q bypass from FDI-3	16	15	5	2
FDI-5	Farm Rd	Q bypass from FDI-4	10	5	2	0
FDI-10	Farm Rd	Q bypass from FDI-9	4	1	4	1
SSDI-1	Sunny Springs Ln	Flow in Sunny Springs after split at Cimarron Rd	15	93	10	22
SSDI-2	Sunny Springs Ln	Q bypass from SSDI-1	12	81	8	14
SSDI-3	Sunny Springs Ln	Q bypass from SSDI-2 & Q from OFF6	75	31	19	3
SSDI-4	Sunny Springs Ln	1/2 of (Q bypass from SSDI-3 & Q from OFF7)	42	3	11	0
SSDI-5	Sunny Springs Ln	1/2 of (Q bypass from SSDI-3 & Q from OFF7)	42	3	11	0
EDI-1	Elkhorn Rd	1/2 of (CP8)	51	46	26	13
EDI-2	Elkhorn Rd	1/2 of (CP8)	29	68	18	21
EDI-3	Elkhorn Rd	1/2 of (Q bypass from EDI-1 & 2)	25	32	11	6
EDI-4	Elkhorn Rd	1/2 of (Q bypass from EDI-1 & 2)	22	35	10	7
EDI-5	Elkhorn Rd	1/2 of (Q bypass from EDI-3 & 4)	10	24	5	2
EDI-6	Elkhorn Rd	1/2 of (Q bypass from EDI-3 & 4)	10	24	5	2
GTDI-1	Golden Talon Ave	1/2 of OFF-11	20	10	8	2
GTDI-2	Golden Talon Ave	1/2 of OFF-11	19	11	8	2
BDI-1	Buffalo Dr	Q bypass from FDI-8 & 9	4	2	0	0
BDI-2	Buffalo Dr	1/2 of (Q bypass from GTDI-1 & 2, BDI-1 & 4)	13	-	2	-
BDI-3	Buffalo Dr	1/2 of (Q bypass from GTDI-1 & 2, BDI-1 & 4)	13	-	2	-
BDI-4	Buffalo Dr	Flow from split flow at Elkhorn Rd and Buffalo Dr	13	3	1	0

Flow split calculations are performed at four cross street intersections within the watershed area to determine the actual flow contributed by each street to the detention basin. The flow split calculations are performed according to the method specified in the Standards Manual for Drainage Design and Floodplain Management in Tucson, Arizona. Relevant portions of the manual are included in Appendix B. Table 3 below summarizes the results of the flow split calculations. Detailed flow split calculations are included in Appendix B.

Table 3: Flow Split Calculations- Summary

FLOW SPLIT LOCATION / INTERSECTION	Flow Before Split			Flow in Main Rd			Flow in Lateral Rd		
	Street	Q_{100}	Q_{10}	Street	Q_{100}	Q_{10}	Street	Q_{100}	Q_{10}
Farm Rd and Cimarron Rd	Farm Rd	94	62	Farm Rd	52	49	Cimarron Rd	42	13
Sunny Springs Ln and Cimarron Rd	Sunny Springs Ln	182	49	Sunny Springs Ln	108	32	Cimarron Rd	74	17
Elkhorn Rd and Cimarron Rd	Elkhorn Rd	195	67	Elkhorn Rd	135	51	Cimarron Rd	60	16
Elkhorn Rd and Buffalo Dr	Elkhorn Rd	48	2	Elkhorn Rd	32	1	Buffalo Dr	16	1

In the existing condition, the Elkhorn Springs Detention Basin outlets into two (2) 27-inch RCPs which eventually transforms to a 60-inch RCP in Bridlehorne Avenue. The stage storage curves are developed for the detention basin based on the topographic maps. The basin has a volume of 40.5 acre-ft. Refer to Appendix B for stage storage curves for the existing condition.

As stated in Section 3.1, HEC-1 analysis for the existing condition results in a total outflow of 137 cfs from the detention basin outlet. The outlet pipe of the basin is analyzed using Water Surface Profile Gradient (WSPG) to ensure that the system can handle the outflow from the detention basin. Refer to Appendix B for the results of the WSPG analysis for the existing condition flows. The WSPG results show that the outlet pipe is pressurized for the flow of 137cfs. Table 4 on page 13 summarizes the results of the WSPG analysis.

Table 4: WSPG Results of Outlet Pipe - Existing Condition Q-137 cfs

Stationing		Pipe Size (in)	*Structure ID	Invert Elevation (ft)	HGL (ft)	Finished Grade (ft)	Difference FG-HGL (ft)
On Plans	WSPG Model						
"Bridlehorne" 23+24.94,	234.86	60	SDMH-18	2378.87	2384.81	2385.90	1.08
"Bridlehorne" 25+39.95, 14.00' LT	724.86	60	SDMH-14	2379.51	2386.16	2394.40	8.24
"Bridlehorne" 28+24.86, 8.00' LT	1008.83	60	SDMH-10	2378.88	2386.95	2400.20	13.25

Note: * Structure ID can be read from the as builts for the outlet storm drain system included in Appendix: C

4.0 PROPOSED CONDITION

4.1 HYDROLOGY

As the drainage basins in the contributing watershed area are completely developed, the curve numbers and the flow patterns remain the same as the existing condition. However, the current study proposes to upsize the existing 18-inch storm drain system in Buffalo Drive to a 60-inch RCP. Thus, the proposed condition is analyzed for all possible flows that may be diverted to the proposed 60-inch system in Buffalo Drive.

There is a low point on Buffalo Drive at Zepplin Avenue, about 390 feet north of the Buffalo Drive and Farm Road intersection. An existing 36-inch HDPE storm drain system collects flows from the low point. This system turns east at the intersection of Farm Road and Buffalo Drive. Proposed improvements include connecting a portion of this system, to the proposed 60-inch in Buffalo Drive.

The 36-inch HDPE storm drain system on Farm Road, which terminates at Palm Grove Lane is proposed to be extended and connected to the proposed 60-inch storm drain system in Buffalo Drive.

With the above mentioned storm drain improvements, flow generated by drainage basins OFF-1, OFF-4 and OFF-5 can be routed to the detention basin. The proposed HEC-1 analysis includes the flow conveyed by the proposed storm drain systems. Per the proposed condition HEC-1 analysis, the peak 100-year flow discharged into the detention basin is 683 cfs. Thus with the proposed improvements an additional flow of 207 cfs may be routed to the detention basin. Refer to Appendix B for the proposed HEC-1 model output and Appendix A for Figure 5A, Proposed Condition Basin Map.

Per the HEC-1 results for the detention basin, it is concluded that the basin has adequate capacity to accommodate the additional flows. However the outlet of the detention basin

does not. The outlet facility includes two (2) 27-inch RCP storm drain systems in Bridlehorne Avenue. During the project progress meeting held on June 17th, 2008 it was concluded that the outflow from the detention basin should be no more than the outflow specified in the Draft 2008 MPU, which is 127 cfs. With two (2) 27-inch RCPs the outflow from the detention basin is 152 cfs. Moreover, this results in pressurized flow conditions in the outlet storm drain system.

Hence, as an option, it is proposed in this study that one (1) of the two (2) 27-inch RCPs be plugged. This reduces the impact on the storm drain system in Bridlehorne Avenue and also decreases the outflow to 80 cfs which is well lower than the outflow specified by the MPU.

4.2 HYDRAULICS

The storm drain system for this project is designed per the elevations obtained from an engineering survey on the existing storm drain system. Based on these elevations, the proposed storm drain systems are designed to accommodate adequate clearances, from any utility lines crossing the storm drain systems. Several as-built plans were also referred to obtain the elevations of existing storm drain systems. However it is observed that the storm drain elevations obtained from the engineering survey are higher by approximately 1.5 feet to 2.0 feet than the elevations obtained from the as-built plans. Since the survey information is latest and more credible, the proposed storm drain design is based on the elevations obtained from the engineering survey rather than as-built information.

The sizes of the existing storm drain systems are obtained from approved drainage studies. The 18-inch storm drain information on Buffalo Drive is referenced from "Elkhorn Springs Phase II" storm drain plans. The 36-inch storm drain information on Farm Road is referenced from residential development study- "Lamplight Village Unit-1" improvement plans. The 36-inch storm drain information on Buffalo Drive is referenced from "Tenaya Farms" improvement plans. Excerpts from the reference studies are included in Appendix C.

4.2.1 PROPOSED STORM DRAIN ALIGNMENT

The existing 36-inch storm drain system in Farm Road which terminates at Palm Grove Lane is connected to the proposed 60-inch storm drain in Buffalo Drive through a 48-inch RCP. Four (4) new drop inlets are proposed within Farm Road between Palm Grove Lane and Buffalo Drive. The hydraulics of the storm drain system and the drop inlets are provided in Sections 4.2.2 and 4.2.4 respectively of this report.

The existing 18-inch storm drain system in Buffalo Drive is being upsized to a 60-inch storm drain system. The existing 18-inch storm drain system in Buffalo Drive turns west on Sunny Springs Lane and connects to a 48-inch RCP on Sunny Springs Lane which discharges flow to the detention basin. However it is not feasible to connect the proposed 60-inch RCP to the existing 48-inch RCP in Sunny Springs Lane since the 48-inch RCP would not be adequate to convey the flows discharged by the 60-inch RCP.

Also, upsizing the 48-inch RCP system is not an option, since the change leads to utility conflicts and will result in disturbing a 60-foot long drop inlet in the south half of Sunny Springs Lane, which would result in high costs for the project. Thus the 60-inch RCP is proposed to follow a different alignment as it approaches the detention basin. More detailed hydraulics of the proposed 60-inch storm drain system is presented in section 4.2.3 of this report.

The outlet of the 60-inch storm drains system is connected to the stilling basin located at the north end of the detention basin. Thus, the stilling basin at the north end may need to be redesigned to accommodate the proposed storm drain system. The design of the stilling basin will be addressed at the next design phase. Please refer to Appendix C for storm drain plan and profiles.

4.2.2 FARM ROAD STORM DRAIN SYSTEM

A 48-inch RCP storm drain system at a slope of 2.41% is proposed within Farm Road. This system starts at the end of existing 36-inch HDPE at station 33+05.53 on Farm Road and extends to the proposed manhole (SDMH #6), located at the intersection of Farm Road and Buffalo Drive. The system collects bypass flow from the existing upstream drop inlets and the flow captured by four (4) proposed drop inlets in Farm Road.

All of the proposed drop inlets are Type "DM" inlets. One of the proposed drop inlets replaces the existing drop inlet FDI-10 in Farm Road. The proposed drop inlets are connected to the 48-inch RCP storm drain system, via 18-inch RCP lateral connections. In addition, there are four (4) proposed 60-inch Type-III Manholes within the storm drain system. Refer to the plan and profile sheets SD-1, SD-2 in Appendix C for the proposed storm drain system in Farm Road.

Since the proposed 48-inch storm drain system in Farm Road is aligned to tie into the proposed 60-inch storm drain system in Buffalo Drive, the existing 18-inch RCP that connects the existing drop inlet FDI-10 to the existing 18-inch RCP in Buffalo Drive will be removed.

The 48-inch system in Farm Road is designed to convey flows from a 100-year storm. The system receives a total of 132 cfs in a 100-year storm as the bypass flow from the existing upstream drop inlets. The four proposed drop inlets in Farm Road contribute a total flow of 34 cfs in 100-year to the storm drain system. Thus, the proposed 48-inch storm drain in Farm Road is designed to convey a total flow of 166 cfs in 100-year storm.

The hydraulic capacity of the 48-inch RCP is analyzed using WSPG accounting for junction losses. It is to be noted that the WSPG model is run utilizing the flows obtained from the HEC-1 analysis of the detention basin. These flows might be different from the actual flows generated by the drainage basins, since the HEC-1 model accounts for the lag time involved in the travel time of the flow. The results of the WSPG model show that the storm drain is adequately sized to convey the proposed flows, without any negative impact. The flow depth is within the pipe and thus the pipe is not under pressure.

Refer to Appendix B for WSPG results. The Hydraulic Grade Line (HGL) is shown on the profile sheets for the 48-inch RCP in Farm Road.

4.2.3 BUFFALO DRIVE STORM DRAIN SYSTEM

The existing curved 18-inch storm drain system in Buffalo drive will be removed and replaced with the proposed 60-inch RCP storm drain system. The proposed 60-inch storm drain system follows the same alignment as the existing 18-inch storm drain system with slight modifications to eliminate curved pipes. The proposed manhole SDMH #6 connects the proposed 48-inch RCP storm drain system in Farm Road to the proposed 60-inch RCP storm drain system in Buffalo Drive.

There is an existing 36-inch HDPE storm drain system that starts at the intersection of Buffalo Drive and Zeppelin Avenue, which turns east on Farm Road. This system is proposed to tie into the proposed 60-inch RCP at the proposed manhole SDMH #6 via a proposed 36-inch RCP. The existing 36-inch HDPE in Farm Road will be plugged just east if SDMH #6.

The existing drop inlet BDI-1 in Buffalo Drive will be connected to the 60-inch system, via the existing 18-inch lateral connection. The existing manholes in Buffalo Drive are being replaced with six (6) 60-inch Type III manholes in order to provide maintenance access to the proposed system in Buffalo Drive. Refer to plan and profile sheets SD-3 and SD-4 in Appendix C for the proposed storm drain system in Buffalo Drive.

As discussed in section 4.2.1, the 60-inch storm drain system will be designed to tie into the existing stilling basin located north of the detention basin, instead of connecting to the existing 48-inch RCP in Sunny Springs Lane. The existing 18-inch RCP in Sunny Springs Lane that connects to the existing 18-inch RCP in Buffalo Drive will be terminated and plugged, thus avoiding any connection to the proposed 60-inch RCP.

The 60-inch RCP in Buffalo Drive is designed to collect flows from the existing 36-inch HDPE in Buffalo Drive and the flows from the 48-inch RCP in Farm Road. The system receives a total of 38 cfs in a 100-yr storm from the existing 36-inch HDPE and 156 cfs from the 48-inch RCP in Farm Road respectively. The hydraulic capacity of the 60-inch RCP is analyzed using WSPG. It is to be noted that the WSPG model is run utilizing the flows obtained from the HEC-1 analysis of the detention basin. These flows might be different from the actual flows generated by the drainage basins, since the HEC-1 model accounts for the lag time involved in the travel time of the flow. The results of the WSPG model show that the storm drain is adequately sized to convey the proposed flows without any negative impact. The computed HGL is at least 1-foot below the finished grade except at the storm drain outlet. Refer to Appendix B for the WSPG results. The HGL is shown on the profile sheets for the 60-inch RCP in Buffalo Drive.

4.2.4 DROP INLET ANALYSIS

The four (4) drop inlets proposed in Farm Road are "Type DM" drop inlets and are numbered, FDI-6 through FDI-9. All four drop inlets will be located on Farm Road. The existing drop inlet, FDI-10, is removed and replaced. Refer to the plan and profile sheets

SD-1 and SD-2 in Appendix C for the location of the proposed drop inlets. The dimensions and intercepted flows of the proposed drop inlets are provided in the Drop Inlet Inventory Table in Appendix B. The proposed drop inlets are sized to capture the bypass flow from existing upstream inlets and from basin OFF-4. The drop inlets were analyzed and sized using FlowMaster. The proposed drop inlets account for a 50% clogging factor by being analyzed in FlowMaster at half of their actual size. Since the basin hydrology remains the same as in the existing condition, the existing drop inlet analysis does not change. The following table summarizes the proposed drop inlet hydraulic results. Note that the drop inlets and the 18-inch laterals connecting the inlets to the trunk line are sized for peak 100-year flows. Refer to Appendix B for the drop inlet analysis.

Table 5: Proposed Drop Inlets Flow Summary

Inlet ID	Location	Source of Flow	100-yr Flows (cfs)		10-yr Flows (cfs)	
			Q Intercepted	Q Bypass	Q Intercepted	Q Bypass
FDI-6	Farm Rd	1/2 of (CP1)	11	8	5	1
FDI-7	Farm Rd	1/2 of (CP1)	11	8	5	1
FDI-8	Farm Rd	Q bypass from FDI-6	6	2	1	0
FDI-9	Farm Rd	Q bypass from FDI-7	6	2	1	0

4.2.5 ELKHORN SPRINGS DETENTION BASIN ANALYSIS

No improvements are proposed within the detention basin except for a 60-inch storm drain system which is a sub-surface facility. Thus, the basin capacity remains unaltered. As mentioned in section 4.2.1, the north stilling basin has to be redesigned in the next phase of design. The redesigned stilling basin shall not impact the detention basin capacity. Per the proposed HEC-1 analysis, the basin has adequate capacity to accommodate the additional flow added into the basin. Table 6 on page 18, summarizes the detention basin hydrology and hydraulics.

4.2.6 OUTLET FROM ELKHORN SPRINGS DETENTION BASIN

The detention basin outlets into two (2) 27-inch RCPs which eventually transform to a 60-inch RCP storm drain system in Bridlehorne Avenue. The current study proposes two design options for the outlet pipe of the detention basin. Both of the models are analyzed using HEC-1. Option 1 analyzes detention basin considering two (2) 27-inch RCPs as the outlet facility, with a total outflow of 152 cfs. Option 2 analyzes the detention basin with one (1) 27-inch RCP as the outlet facility. Since one of the pipes is plugged, the outflow is now reduced to 80 cfs.

Table 6: Detention Basin- Proposed Condition

Study name	Year of Study	Q100-in	Q100-out	WSE	Time to Peak (hrs)	*Freeboard
MPU-Master Plan Update	2008	701	127	2399.54	5.50	0.46
SWE-Southwest Engineering	1996	569	125	2399.31	5.83	0.69
NWNS-Northwest Neighborhood Study	1998	771	124	2399.09	5.42	0.91
Lochsa Engineering	2001	569	159	2398.80	5.58	1.20
PB-Parsons Brinckerhoff						
Existing Condition	2008	476	137	2394.50	4.17	5.50
Proposed Condition-Option 1	2008	683	152	2397.10	5.00	2.90
Proposed Condition-Option 2	2008	683	80	2398.89	5.25	1.11

Note: *Freeboard is the difference between the water surface elevation in the detention basin and the highest contour at basin outlet above which flow spills out from the basin.

Options 1 and 2 have been analyzed using WSPG to review the hydraulic capacities of the outlet system in both scenarios. The following table summarizes the outlet storm drain system hydraulics for the two alternatives. Refer to Appendix B for the detailed WSPG results for the proposed options.

Table 7: WSPG Results for Outlet Pipe

Hydrologic Condition Existing/Proposed	Outlet Facility Size (in inches)	Outflow (in cfs)	WSPG Analysis Comments
Existing	2-27" RCPs	137	Pressurized flow
Proposed-Option 1	2-27" RCPs	152	Pressurized flow
Proposed-Option 2	1-27" RCP	80	Open Channel flow

Based on the hydraulic analysis of the outlet system, plugging one of the two 27-inch RCPs reduces the impact on the 60-inch RCP outlet facility in Bridlehorne Avenue. It also helps to utilize the basin capacity to the greatest possible extent and decreases the impact on the downstream facilities in Bridlehorne Avenue. Moreover, the outflow from the basin is much lower than the outflow specified in Draft 2008 MPU. Regardless of whichever option is finalized at the next design phase, the proposed storm drain design for Farm Road and Buffalo Drive will remain unchanged.

4.3 STREET CAPACITY CALCULATIONS

The proposed improvements are in Farm Road and Buffalo Drive. Thus the Street capacity calculations for these two streets are performed using FlowMaster to verify the normal depth for the proposed flows. Both the streets meet dry lane requirements in the

10-year storm event and the D_{100} X V_{100} criteria in the 100-year storm event. These standards are verified in accordance with the Clark County HCDDM. The following table summarizes the results of street capacity calculations. Refer to the Street Capacity Calculations provided in Appendix B.

Table 8: Street Capacity Calculations

Street Name	10 Year		100 Year			
	Q10 (cfs)	Dry Lane	Q100 (cfs)	D100 (ft)	V100 (ft/s)	D100*V100
Farm Road	11	Satisfied	38	0.49	4.76	2.33<8
Buffalo Drive	0	Satisfied	6	0.34	1.84	0.62<8

5.0 COST ESTIMATION

Table 9 summarizes the total estimated cost for the proposed drainage improvements.

Table 9: Cost Estimation Calculations

Item Number	Item Description	Approx. Quantity	Unit	Unit Price	Total
202.01	REMOVAL OF STORM DRAIN PIPE	891	L.F.	$20.00	$17,820.00
202.02	REMOVAL OF MANHOLE	6	EA.	$1,200.00	$7,200.00
202.03	REMOVAL OF 42-INCH RCP STUB	13	L.F.	$20.00	$250.00
202.04	REMOVAL OF DROP INLET	1	EA.	$1,500.00	$1,500.00
203	STRUCTURE EXCAVATION	17237	CUYD	$10.00	$172,369.39
207	GRANULAR BACKFILL	14682	CUYD	$20.00	$293,648.42
609.02	60-INCH TYPE III MANHOLE	11	EA.	$7,000.00	$77,000.00
609.03	TYPE "DM" DROP INLET	4	EA.	$8,000.00	$32,000.00
603.01	18-INCH CLASS IV RCP	153	L.F.	$180.00	$27,540.00
603.02	36-INCH CLASS IV RCP	41	L.F.	$200.00	$8,200.00
603.03	48-INCH CLASS IV RCP	1402	L.F.	$250.00	$350,500.00
603.04	60-INCH CLASS IV RCP	1056	L.F.	$325.00	$343,200.00
603.05	RCP PLUG	2	EA.	$100.00	$200.00
				Sub-total	**$1,331,427.80**
				20% Contingencies	**$266,285.56**
				TOTAL	**$1,597,713.37**

6.0 CONCLUSION

The hydrologic and hydraulic analysis has been performed based on the Clark County HCDDM. The proposed storm drain system conveys about 200 cfs of additional flow to the detention basin. Per the hydraulic analysis, the computed HGL is consistently 1-foot below the street grade except at the outlet location. The plan and profile of the proposed storm drain system are included in Appendix C.

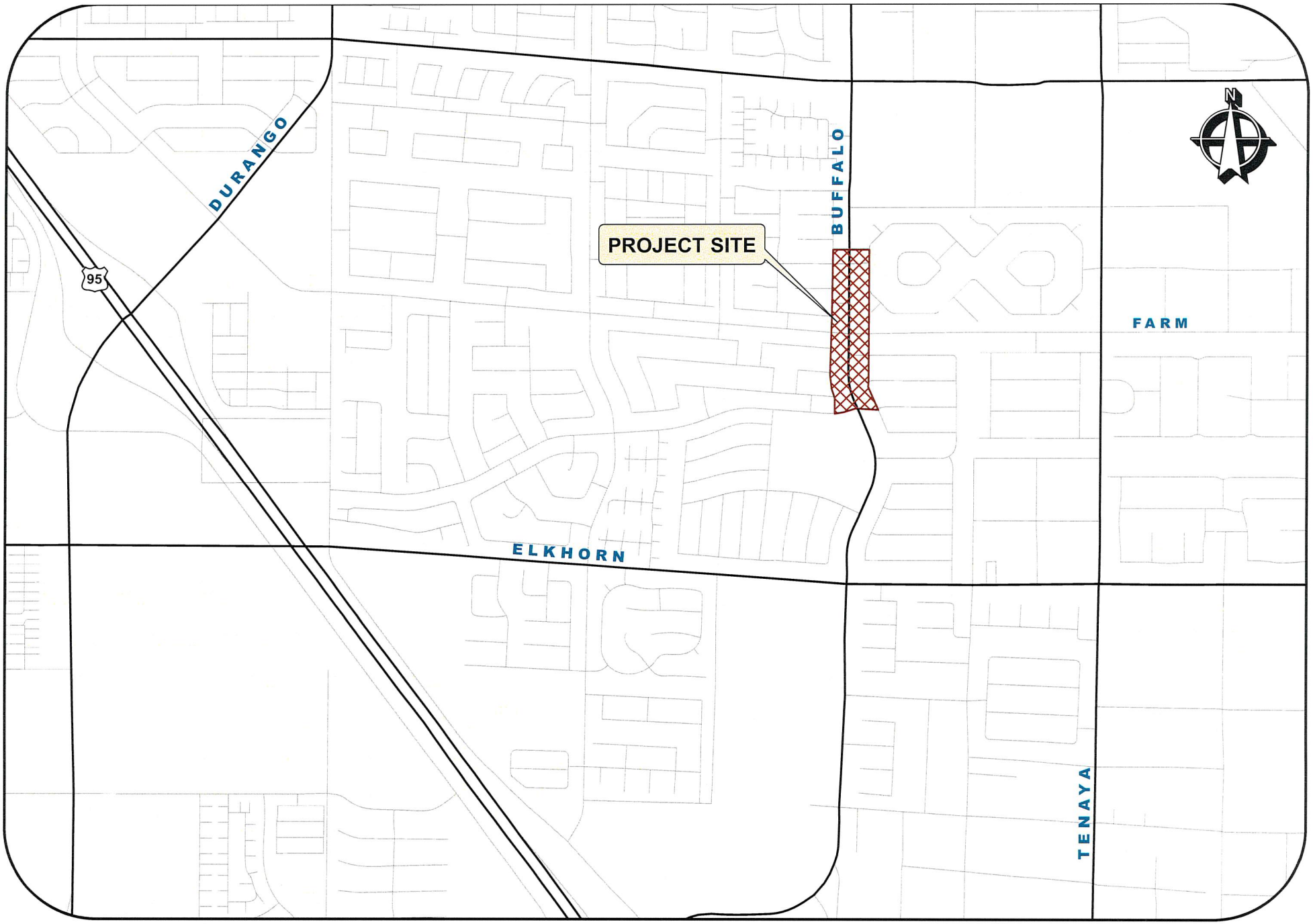
The detention basin can adequately accommodate the additional flows conveyed to it due to the proposed storm drain improvements.

With the additional flows routed to the detention basin, the outlet flow from detention basin increases. To reduce the impacts of the increased flows on the outlet storm drain system one of the outlet pipes can be plugged. The detention basin can accommodate the flows in spite of plugging one of the outlet pipes.

With the proposed storm drain improvements the detention basin's capacity can be utilized better without impacting any of the adjacent developments.

LIST OF FIGURES

- Figure 1-Vicinity Map
- Figure 2- Existing SD System Exhibit
- Figure 3-Draft 2008 MPU Facilities Map
- Figure 3A-Draft 2008 MPU Facility Inventory
- Figure 4- FEMA FIRM Panels
- Figure 5- Existing Condition Basin Map
- Figure 5A- Proposed Condition Basin Map
- Figure 6- Draft 2008 MPU Hydrologic Map
- Figure 7-McCarran Airport Rainfall Area - HCDDM Fig 513
- Figure 8 -Depth-Duration-Frequency-Values – HCDDM Fig 503
- Figure 8A -Depth-Duration-Frequency-Values – HCDDM Fig 506
- Figure 8B -Adjusted Rainfall Depths – HCDDM Table 501
- Figure 9-SDN3-HCDDM Table 503



VICINITY MAP

N.T.S.

City of Las Vegas

CITY - WIDE HYDROLOGY ANALYSIS

LEGEND

- EXISTING REGIONAL DETENTION BASING
- PROPOSED REGIONAL DETENTION BASING
- EXISTING LOCAL DETENTION BASING
- EXISTING REGIONAL BRIDGES
- PROPOSED REGIONAL BRIDGES
- EXISTING LOCAL BRIDGES
- EXISTING REGIONAL CULVERT
- PROPOSED REGIONAL CULVERT
- EXISTING LOCAL CULVERT
- EXISTING REGIONAL PIPELINE
- PROPOSED REGIONAL PIPELINE
- EXISTING LOCAL PIPELINE
- EXISTING REGIONAL CHANNEL
- PROPOSED REGIONAL CHANNEL
- EXISTING LOCAL CHANNEL
- EXISTING REGIONAL DIKE/LEVEE
- PROPOSED REGIONAL DIKE/LEVEE
- EXISTING LOCAL DIKE/LEVEE
- EXISTING STORM WATER PUMPING STATION
- PROPOSED BELTWAY ALIGNMENT

FIGURE F-3

1	2					
3	4					
5	6					
7	8	9	10			
11	12	13	14	14a	15	
	16	17	18	19		

N / W / E / S

Scale: 1 inch = 1600 feet

FLOOD CONTROL FACILITIES

PBSJ
601 North Green Valley Parkway, Suite 100
Henderson, Nevada 89014-0139
Phone: 702/263-7275
Fax: 702/263-7200
ENGINEERING PLANNING GIS SURVEYING CONSTRUCTION SERVICES

RCHB 0312
RCHB 0227
RCHO 0239
RCHO 0097
RCHB 0066
RCHB 0000
RCHO 0061
RCHO 0056
RCHO 0028
GOJN 0174
GOJN 0128
GOJN 0100
GOJN 0076
GOJN 0051
GOJN 0026
GOJN 0000
GOEC 0176
GOEC 0152
GOEC 0126
GOEC 0100
PMD 200
ELKHORN SPRINGS DETENTION BASIN
RANCHO DETENTION BASIN
CMR 100
CRC 100
ECG 000
SPD 000
BELTWAY ALIGNMENT
DEER SPRINGS
CENTENNIAL
AZURE
TROPICAL
EL CAMPO GRANDE
ALPINE RIDGE
HUALAPAI
GRAND CANYON
FT APACHE
CAMPBELL
DURANGO
BUFFALO
ELKHORN
FARM
CCN
ANN

REGIONAL FLOOD CONTROL DISTRICT

2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE H- 13
HYDROLOGIC SUMMARY

LEGEND

- Ultimate Development Boundary
- Watershed Boundary
- Subarea Boundary
- Drought Ordinance Boundary
- Flow Arrows

Flood Control Facilities

- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Category A Remove & Replace/ Parallel Facilities
- Category B Remove & Replace/ Parallel Facilities

Type Hydrologic Soil Groups

- A Low Runoff Potential
- B Moderately Low Runoff Potential
- C Moderately High Runoff Potential
- D High Runoff Potential/Rock Outcrops

Typical Land Use

- 1 Undeveloped Land, Open Desert
- 2 Parks, Golf Courses
- 3 Rural (0.5 - 1 unit)
- 4 / 14* Low Density Residential (1 - 2 units)
- 5 / 15* Medium Density Residential (2 - 4 units)
- 6 / 16* High Density (4 - 8 units)
- 7 / 17* Public Facility, Residential (8 - 12 units)
- 8 / 18* Residential (12 or > units)
- 9 / 19* Commerical, Retail, Casino, High Rise Condominiums
- 10 / 20* Light Industrial
- 11 / 21* Heavy Industrial
- 12 / 22* Schools
- 13 Lakes

* Drought Ordinance Applied

N

0 500 1,000 2,000 3,000
Feet
Scale: 1 inch = 2,000 feet

US95 I-15 I-215

1	2	3				
4	5	6				
7	8	9	10			
11	12	13	14	15	16	17
18	19	20	21	22	23	
24	25	26	27	28		
29	30	31	32	33	34	
35	36	37	38	39	40	
41	42	43	44	45	46	
47	48	49	50	51	52	
53	54	55	56			
57	58	59				

PBS&J PB

Aerial Source: Clark County, Spring 2007

REGIONAL FLOOD CONTROL DISTRICT

2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE F- 13
FLOOD CONTROL FACILITIES

LEGEND

- Ultimate Development Boundary
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Local Existing Facilities
- Local Proposed Facilities
- Detention Basin
- Culvert or Bridge Crossing
- Stormdrain
- Lined Channel
- Unlined Channel
- Levee/Dike
- Natural Wash/Floodway
- ID-Mile Separator

Remove & Replace/Parallel Facilities

Category A	Category B
Channel	Channel
Stormdrain	Stormdrain
Crossing	Crossing

Draft

N

0 500 1,000 2,000 3,000
Feet

Scale: 1 inch = 2,000 feet

US95 I-15 I-215

		1	2	3								
		4	5	6								
			7	8	9	10						
11	12	13	14	15	16	17						
		18	19	20	21	22	23					
		24	25	26	27	28						
		29	30	31	32	33	34					
		35	36	37	38	39	40					
		41	42	43	44	45	46					
		47	48	49	50	51	52					
		53	54	55	56							
		57	58	59								

PBS&J PB

Aerial Source: Clark County, Spring 2007

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
BCHU		**BELTWAY CHANNEL - HUALAPAI**						
0000	E	12' X 5' RCAP	853	501	CBA3-C	WEST3	0.84	1.11
0017	E	8' X 5' RCAP	1216	501	CBA3-C	WEST3	0.84	1.33
0040	E	66" RCP	60	222	DNW26-C	WEST3	0.51	1.04
0042	E	60" RCP	615	222	DNW26-C	WEST3	0.51	1.42
0054	E	54" RCP	770	222	DNW26-C	WEST3	0.51	1.23
BRDB		**BRENT DRAINAGE SYSTEM**						
0000	P1	7' X 7' RCB with 18" Orifice Plate	1790	37	BRDB	WEST3	2.48	0.70
0031	P1	45,080 cfs PMF Spillway		45080	CBRDB	WEST3	2.48	
0032	P1	450 ac-ft South Environmental Enhancement Area		1905	CBRDB	WEST3	2.48	
0033	P1	Energy Dissipator	100	953	CNW113-C	WEST3	1.58	
0043	P1	8' X 6' RCB	2920	953	CNW113-C	WEST3	1.58	2.10
0107	P1	8' X 6' RCB	2660	953	CNW113-C	WEST3	1.58	2.40
0157	P1	12' X 6' RCB	1260	744	CNW96-C	WEST3	0.95	0.25
CN95		**CENTENNIAL PKWY CHANNEL WEST / U.S 95 BRANCH**						
0000	P2	Conc Chnl 22'W 10'D 0:1 SS	2690	3325	CNWBB3-C	WEST3	3.36	2.17
0068	P1	3: 8' X 7' RCB	3380	3209	CNW103-C	WEST3	3.05	2.12
0102	P1	3: 8' X 6' RCB	1710	2874	2CNW89-C	WEST3	2.66	2.09
0167	P1	2: 10' X 6' RCB	1580	2128	2CNW71-E	WEST3	1.64	1.50
0199	P3	Conc Chnl 15'W 11'D 0:1 SS	1015	1599	2CNW72-C	WEST3	1.17	0.82
0218	P3	16' X 8' RCB	556	1599	2CNW72-C	WEST3	1.17	0.77
0257	P3	Transition Structure	100	1599	2CNW72-C	WEST3	1.17	0.77
0259	P3	16' X 8' RCB	2848	674	CNW74-C	WEST3	0.45	2.06
0313	P3	Transition Structure	240	674	CNW74-C	WEST3	0.45	1.50
0318	P3	14' X 6' RCB	797	333	NW62-S	WEST3	0.21	1.47
0333	P3	12' X 6' RCB	300	333	NW62-S	WEST3	0.21	5.50
CNGT		**CENTENNIAL PKWY CHANNEL WEST / GRAND TETON BRANCH**						
0000	P3	10' X 5' RCB	2290	580	CNW71-E	WEST3	0.47	2.63
0043	P0	6' X 6' RCB	3980	580	CNW71-E	WEST3	0.47	3.00
0118	E	6' X 5' RCAP	5472	363	KYLEDET	KYLEDB	57.73	3.72
CNKC		**CENTENNIAL PKWY CHANNEL WEST / KYLE CANYON BRANCH**						
0000	E	12' X 4' RCB	377	990	CNW72-C	WEST3	0.71	4.58
0007	E	10' X 5' RCB	874	990	CNW72-C	WEST3	0.71	3.28
0024	E	8' X 5' RCB	1385	990	CNW72-C	WEST3	0.71	2.40
0050	P0	6' X 6' RCB	2830	990	CNW72-C	WEST3	0.71	3.00
0104	P0	6' X 5' RCB	565	435	NW45-S	WEST3	0.27	3.00
0115	P0	72" RCP	1513	435	NW45-S	WEST3	0.27	3.00
CNWE		**CENTENNIAL PKWY CHANNEL WEST**						
0150	P2	Conc Chnl 42'W 10'D 0:1 SS	720	4230	CNW3B3-C	WEST3	5.64	0.40
0173	P2	42' X 10' RCBC @ Torrey Pines	190	4230	CNW3B3-C	WEST3	5.64	0.40
0176	P2	Conc Chnl 32'W 12'D 0:1 SS	795	4230	CNW3B3-C	WEST3	5.64	0.40
0189	P2	Conc Chnl 32'W 10'D 0:1 SS	1845	4048	CNW2D4-C	WEST3	5.15	0.54
0226	P2	Conc Chnl 12'W 12'D 2:1 SS	1165	4048	CNW2D4-C	WEST3	5.15	1.00
0251	P2	Conc Chnl 12'W 12'D 2:1 SS	1135	3949	CNW2D3-C	WEST3	4.65	0.59
0271	P2	Conc Chnl 32'W 10'D 0:1 SS	185	3949	CNW2D3-C	WEST3	4.65	0.59
0274	E	32' X 10' RCBC @ Tenaya	130	3949	CNW2D3-C	WEST3	4.65	0.45
0277	P2	Conc Chnl 13'W 10'D 2:1 SS	590	3949	CNW2D3-C	WEST3	4.65	0.45
0287	P2	Conc Chnl 13'W 10'D 2:1 SS	605	3596	CNW2B2-C	WEST3	3.84	1.19
0301	P2	Conc Chnl 32'W 10'D 0:1 SS	235	3596	CNW2B2-C	WEST3	3.84	1.19
0304	P2	32' X 10' RCB	6510	3596	CNW2B2-C	WEST3	3.84	1.75
EKBU		**ELKHORN SPRINGS AND BUFFALO**						
0000	P1	84" RCP	860	440	NW134-C	WEST3	0.54	1.00
EKDB		**ELKHORN SPRINGS DETENTION BASIN**						
0000	E	Grass Chnl 15'W 5.8'D 3.5:1 SS	2575	245	CNW150-C	WEST3	1.49	0.39
0025	E	4' X 3' RCBC @ Tenaya	160	127	ELKBASIN	WEST3	0.91	0.50
0026	E	48" RCP	1270	127	ELKBASIN	WEST3	0.91	1.23
0049	E	60" RCP	1095	127	ELKBASIN	WEST3	0.91	0.13
0070	E	48 ac-ft Elkhorn Springs Detention Basin		701	CNW133-C	WEST3	0.91	
EKHU		**ELKHORN AND HUALAPAI**						
0000	E	6' X 5' RCB Overflow Structure	48	637	CNW26-C	WEST3	0.51	0.91
0001	E	6' X 5' RCAP	72	637	CNW26-C	WEST3	0.51	0.91

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
EKHU		**ELKHORN AND HUALAPAI**						
0003	E	6' X 4' RCAP	980	637	CNW26-C	WEST3	0.51	3.61
0020	E	6' X 5' RCAP	150	637	CNW26-C	WEST3	0.51	3.61
0023	E	8' X 5' RCAP	1200	637	CNW26-C	WEST3	0.51	0.90
GOEC		**GOWAN NORTH - EL CAPITAN BRANCH**						
0176	P1	78" RCP	1320	363	CCPFR-C	GW3SC	0.46	1.15
GONO		**GOWAN NORTH SYSTEM**						
0511	P1	7' X 6' RCB	1320	545	CCPHW-C	GW3SC	0.60	1.14
LVMD		**LAS VEGAS WASH - MIDDLE**						
2490	P2	2: 13' X 7' RCB	2555	2224	CNW168-C	CWEST3	4.62	0.40
2507	P3	2: 13' X 9' RCB	2831	2224	CNW168-C	CWEST3	4.62	0.36
2525	P1	21' X 6' RCB	1140	1849	CNW159-C	CWEST3	3.84	0.40
2550	P1	21' X 6' RCB	1445	1593	CD161-C	CWEST3	3.34	0.40
2574	P1	21' X 6' RCB	1430	1593	CD161-C	CWEST3	3.34	0.60
2599	P2	Conc Chnl 30'W 5'D 2:1 SS	1577	1516	CNW162-C	CWEST3	3.01	0.40
2632	P1	13' X 5' RCB	1580	883	CNW138-C	WEST3	1.09	0.59
2661	P1	11' X 5' RCB	2640	883	CNW138-C	WEST3	1.09	1.00
2711	P1	8' X 5' RCB	1320	883	CNW138-C	WEST3	1.09	1.80
2737	P1	8' X 5' RCB	1320	731	CNW139-C	WEST3	0.86	1.81
2763	P1	78" RCP	1320	731	CNW139-C	WEST3	0.86	2.40
MOFA		**MOCCASIN - FORT APACHE**						
0024	P0	12' X 6' RCB	1520	383	DNW100-W	LOWER3	0.46	0.25
0053	P0	10' X 6' RCB	1345	258	DNW78-C	LOWER3	0.24	0.25
MOKY		**MOCCASIN - KYLE CANYON BRANCH**						
0078	P0	2: 13' X 7' RCB	965	1180	CNW50-E	LOWER3	1.06	0.40
0096	P0	2: 13' X 7' RCBC @ US 95	210	1043	CNW35-C	LOWER3	0.89	1.70
0100	P0	2: 13' X 7' RCB	1515	1043	CNW35-C	LOWER3	0.89	0.40
0129	P0	2: 11' X 7' RCB	675	756	CNW33-C	LOWER3	0.64	0.40
0142	P0	2: 9' X 7' RCB	430	756	CNW33-C	LOWER3	0.64	0.40
MSNV		**MOUNTAIN SPA/VISTA RANCH**						
0000	E	6: 12' X 5' RCBC @ Grand Teton	273	679	CNW163-C	CWEST3	1.67	0.40
0005	E	Grass Chnl 100'W 4.5'D 10:1 SS	6325	679	CNW163-C	CWEST3	1.67	0.40
0125	E	Grass Chnl 100'W 4.5'D 10:1 SS	1185	116	CNW147E	WEST3	1.54	0.40
RACO		**RACEL STREET COLLECTOR**						
0000	P1	72" RCP	3075	499	CNW111S	WEST3	0.55	2.20
0064	P1	66" RCP	2700	423	DNW111S	WEST3	0.44	2.40
RCBC		**RANCHO ROAD SYSTEM - BELTWAY CHANNEL**						
0000	E	76 ac-ft Fort Apache Detention Basin		1255	FADBIN	WEST3	1.60	
0001	E	2,341 cfs PMF Spillway		2341	FADBIN	WEST3	1.60	
0002	E	54" RCP Outlet with 41" Orifice	503	222	FADB	WEST3	1.60	2.38
0003	E	6' X 5' RCB	1062	222	FADB	WEST3	1.60	1.04
0007	E	Energy Dissipator	100	1255	FADBIN	WEST3	1.60	
0009	E	12' X 6' RCBC @ Fort Apache Detention Basin	133	1255	FADBIN	WEST3	1.60	1.79
0012	E	Conc Chnl 12'W 6'-7'D 0:1 SS	1937	1255	FADBIN	WEST3	1.60	3.15
0048	E	12' X 6' RCBC @ Grand Canyon	140	1040	CMNA1	WEST3	1.32	3.15
0051	E	Conc Chnl 12'W 6'-8'D 0:1 SS	2660	1040	CMNA1	WEST3	1.32	3.44
0096	E	1: 10' X 6' and 1: 6' X 6' RCBC @ Hualapai Way	190	1040	CMNA1	WEST3	1.32	1.93
0100	E	Conc Chnl 12'W 5.5'D 0:1 SS	2085	598	CDMNA1	WEST3	0.48	2.88
0140	E	Conc Chnl 10'W 5'D 0:1 SS	2155	598	CDMNA1	WEST3	0.48	1.65
RCHB		**RANCHO ROAD SYSTEM - BELTWAY CHANNEL**						
0034	E	Conc Chnl 21'W 8'D 0:1 SS	1000	2615	CNW1C-W	WEST3	4.68	1.19
0053	E	2: 12' X 8' RCBC @ South Ramp Connector	85	2301	CDW1C1	WEST3	4.31	1.40
0054	E	Conc Chnl 21'W 8'D 0:1 SS	432	2301	CDW1C1	WEST3	4.31	1.51
0062	E	Transition Structure	130	2301	CDW1C1	WEST3	4.31	1.51
0065	E	24' X 7' RCB	480	2301	CDW1C1	WEST3	4.31	0.30
0074	E	24' X 6' RCB	50	2222	CNWBC6-C	WEST3	4.17	0.30
0075	E	20' X 6' RCBC @ Beltway	428	2222	CNWBC6-C	WEST3	4.17	2.81
0083	P2	20' X 6' RCB	950	2222	CNWBC6-C	WEST3	4.17	2.49
0101	P2	Conc Chnl 20'W 7'D 0:1 SS	980	2222	CNWBC6-C	WEST3	4.17	2.38
0120	E	20' X 6' RCBC @ Grand Montecito	120	2222	CNWBC6-C	WEST3	4.17	1.00
0122	P2	Conc Chnl 16'-20'W 6'D 0:1 SS	350	2222	CNWBC6-C	WEST3	4.17	1.84

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
RCHB		**RANCHO ROAD SYSTEM - BELTWAY CHANNEL**						
0130	P2	Conc Chnl 16'W 6'D 0:1 SS	1012	2222	CNWBC6-C	WEST3	4.17	2.67
0149	P2	Conc Chnl 16'W 6'-7'D 0:1 SS	87	1885	CNWBC3	WEST3	3.75	2.27
0151	P2	Conc Chnl 16'W 7'D 0:1 SS	1255	1885	CNWBC3	WEST3	3.75	2.65
0171	E	16' X 6' RCBC @ El Capitan Way	234	1885	CNWBC3	WEST3	3.75	1.75
0175	E	Conc Chnl 14'W 7'D 0:1 SS	1220	1885	CNWBC3	WEST3	3.75	2.93
0198	E	Conc Chnl 14'W 7'D 0:1SS	225	1391	CNWBA6-C	WEST3	3.61	2.93
0227	P1	11' X 8' RCB	1885	1391	CNWBA6-C	WEST3	3.61	2.17
0250	P1	11' X 8' RCB	3200	1391	CNWBA6-C	WEST3	3.61	1.06
0295	P1	8' X 5' RCB	5525	968	CNW66-C	WEST3	1.75	3.30
TSDB		**TULE SPRINGS DRAINAGE SYSTEM**						
0000	P1	2: 10' X 4' RCB	180	26	TULEDB	WEST3	1.35	0.25
0003	E	2: 10' X 4' RCBC @ Echo Grande	100	26	TULEDB	WEST3	1.35	1.04
0005	P1	36" RCP with 22" Orifice Plate	360	26	TULEDB	WEST3	1.35	0.25
0010	P1	14,031 cfs PMF Spillway		14031	CTULEDB	WEST3	1.35	
0011	P1	117 ac-ft North Environmental Enhancement Area		804	CTULEDB	WEST3	1.35	
0012	P1	Energy Dissipator	100	377	CNW148-C	WEST3	0.52	
0023	P1	84" RCP	1600	377	CNW148-C	WEST3	0.52	0.80
0059	P1	78" RCP	2640	377	CNW148-C	WEST3	0.52	1.03

** The HEC-1 node shown identifies the controlling concentration point for the associated facility and is located upstream of this facility due to decreasing peak flow with increasing tributary area caused by storm distribution transitions, depth area reduction factors, or attenuation of flow from routing.*

*** As-built or design slopes were used when available. All other slopes are based on existing topography. The user should verify the facility slope listed prior to performing any facility specific analysis.*

^ For parallel facilities, the existing facility flow equals its capacity, and the proposed parallel facility flow equals the remaining flow (i.e., HEC-1 Node flow = existing facility capacity + proposed parallel facility flow).

REGIONAL FLOOD CONTROL DISTRICT

2008 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE

FACILITY INVENTORY FIGURE F - 13

LEGEND

Street Name Designator AABB
Parent Stream Name
Stream Name
ID / River Mile 0000
Distance Above Confluence with Parent Stream
Miles in Hundredths

Existing Facility..... E
Proposed or Modified Facility..... P
Contingency Level
Category B..... P0
Master Plan..... P1
Preliminary Design..... P2
Design..... P3

Bottom Width..... W
Depth..... D
Side Slope, H:V..... SS

Construction Features

Cast in Place Concrete Pipe..... CIPCP
Corrugated Metal Arch Pipe Culvert..... CMAP
Corrugated Metal Pipe Culvert..... CMPC
High Density Polyethylene..... HDPE
Helical Elliptical Reinforced Concrete Pipe..... HERCP
Reinforced Concrete Arch Pipe..... RCAP
Reinforced Concrete Arch Culvert..... RCAC
Reinforced Concrete Box..... RCB
Reinforced Concrete Box Culvert..... RCBC
Reinforced Concrete Pipe..... RCP
Reinforced Concrete Pipe Culvert..... RCPC
Storm Sewer Pipe..... SSP

PBS&J PB

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevation (BFEs) and/or floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevation (BFEs) shown on this map apply only landward of 0.0° North American Vertical Datum (NAVD). Users of this FIRM should be aware that coastal flood elevations may also be provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction, and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures in this jurisdiction.

The **projection** used in the preparation of this map is Universal Transverse Mercator (UTM) Zone 11. The **horizontal** datum is NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

Vertical Network Branch, N/CG13
National Geodetic Survey, NOAA
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit their website at www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by Clark County Regional Flood Control District. This information was converted using Orthophotography, dated 1998 or newer, and GBF/DIME data. Segments were digitized off of the orthophotography based on center of pavement.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a listing of communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

An accompanying Flood Insurance Study report, Letters of Map Revision or Letters of Map Amendment revising portions of this panel, and digital versions of this PANEL may be available. Contact the **FEMA Map Service Center** at the following phone numbers and Internet address for information on all related products available from FEMA:

Phone: 800-358-9616
FAX: 800-358-9620
www.fema.gov/msc

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at www.fema.gov.

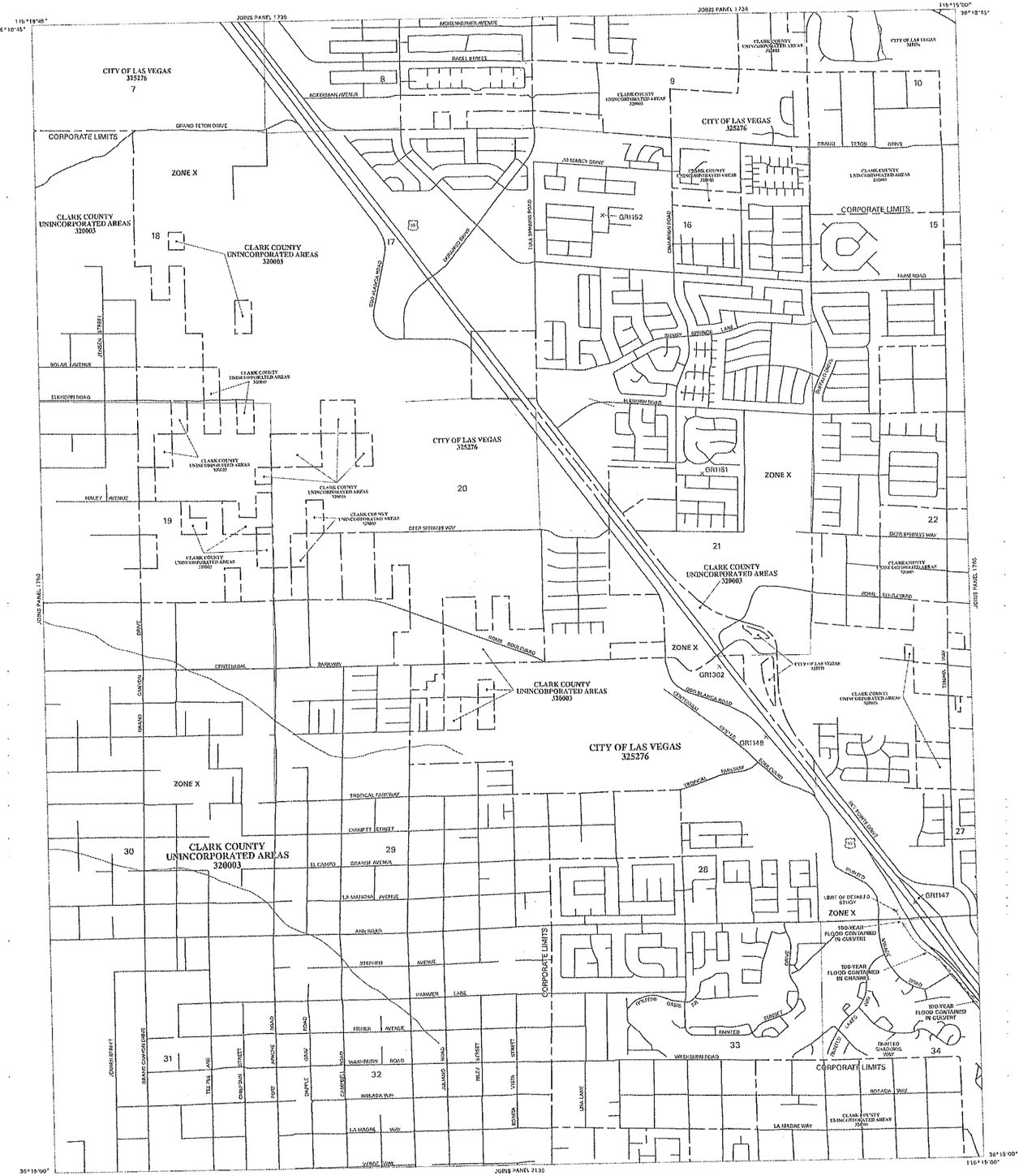
This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report may reflect stream channel distances that differ from what is shown on this map.

This Digital Flood Insurance Rate Map (DFIRM) was produced through a unique partnership between Clark County and the Federal Emergency Management Agency (FEMA). Clark County has developed a long-term approach of floodplain management to decrease the costs associated with flooding. This is demonstrated by the Clark County commitment to share and maintain floodplain layers within their Geographic Information System Management Office (GISMO).

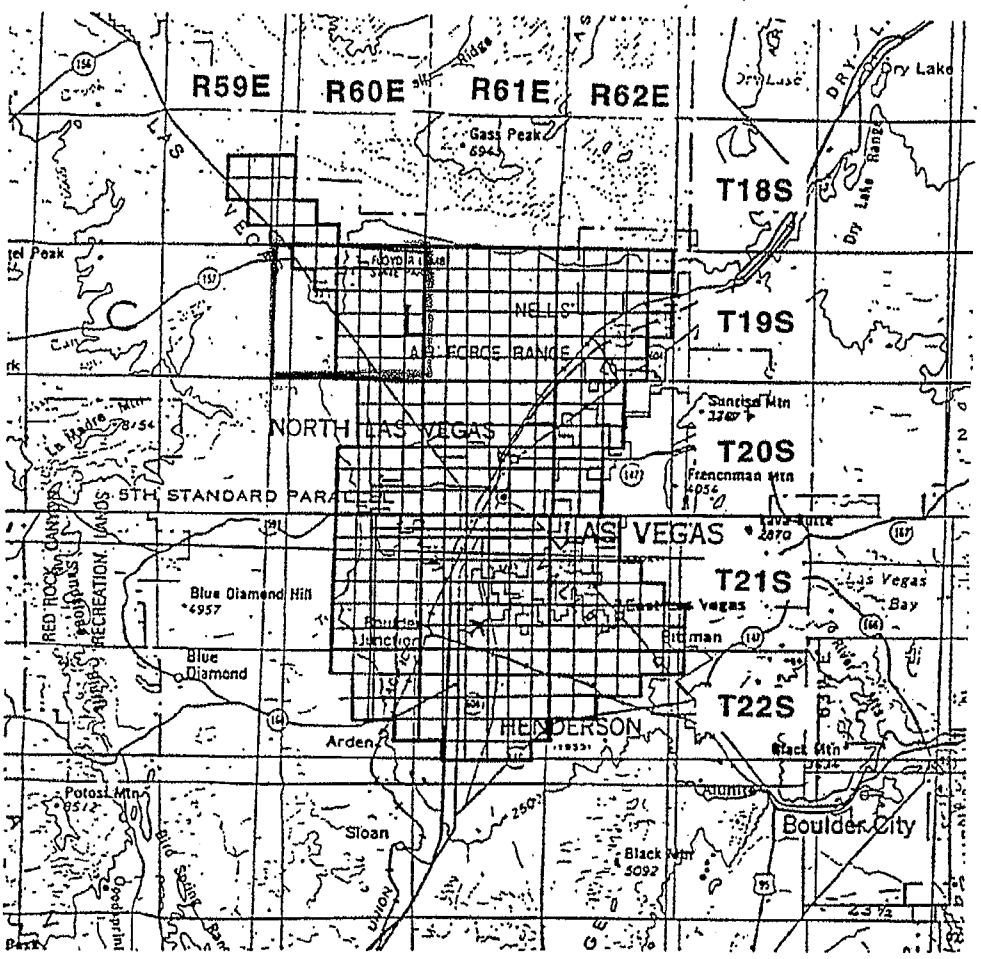
This DFIRM reflects several innovative features. Those include: + Southern Nevada GIS – Cooperation among local governmental agencies throughout Clark County. The foundation of cooperation is the GIS Interlocal Agreements formed between fourteen regional participants. In part, the agreements specify that the Clark County GIS Management Office (GISMO) will be responsible for maintaining a GIS data warehouse and associated Southern Nevada GIS Metadata.

+ The GISMO's responsibilities go beyond maintaining the GIS data warehouse. GISMO also maintains the Street Centerline Database used by 911 dispatch services. This centerline database serves as the base map for this DFIRM.

DIGITAL DATA AVAILABILITY: http://www.co.clark.nv.us/cell/gismo/gismo.htm


JOINS PANEL 1735
JOINS PANEL 1750
JOINS PANEL 2130
JOINS PANEL 1765
36°18'45"
115°19'00"
36°15'00"
115°15'00"
CITY OF LAS VEGAS
325276
CLARK COUNTY
UNINCORPORATED AREAS
320003
CORPORATE LIMITS
ZONE X
ACKERMAN AVENUE
RAGEL STREET
GRAND TETON DRIVE
ST MARCY DRIVE
CHEYENNE AVENUE
FARM ROAD
SUNNY GRANGE LANE
ELKHORN ROAD
SOLAR AVENUE
JOSEPH STREET
HALEY AVENUE
DEER SPRINGS WAY
ROMA BOULEVARD
CENTENNIAL PARKWAY
TROPICAL PARKWAY
CHERRY STREET
EL CAMPO GRANDE AVENUE
LA MADRINA AVENUE
ANN ROAD
STEPHEN AVENUE
HAMMER LANE
FRENCH AVENUE
WASHBURN ROAD
ROSADA WAY
LA MADRE WAY
VERDE WAY
DEER SPRINGS ROAD
DURANGO DRIVE
TORREY PINES DRIVE
GRAND CANYON DRIVE
JONES BOULEVARD
DECATUR BOULEVARD
RAINBOW BOULEVARD
SKY PILOT DRIVE
PURITAN AVENUE
PAINTED DESERT DRIVE
UNITED SKATEWAY
GR1152
GR1151
GR1302
GR1148
GR1147
100-YEAR FLOOD CONTAINED IN CULVERT
100-YEAR FLOOD CONTAINED IN CHANNEL
LIMIT OF DETAILED STUDY
CLARK COUNTY UNINCORPORATED AREAS 320003
CITY OF LAS VEGAS 325276
CITY OF LAS VEGAS 320276
CLARK COUNTY UNINCORPORATED AREAS 320003
CLARK COUNTY UNINCORPORATED AREAS 320003
CLARK COUNTY UNINCORPORATED AREAS 320003

McCARRAN AIRPORT RAINFALL AREA



TOWNSHIP	RANGE	SECTIONS	TOWNSHIP	RANGE	SECTIONS
18 South	59 East	13-15,22-26,36	20 South	62 East	4-9,16-20,29-32
18 South	60 East	30-32	21 South	60 East	1-4,9-16,21-28,33-36
19 South	60 East	1-6,8-16,21-28,33-36	21 South	61 East	ALL SECTIONS
19 South	61 East	ALL SECTIONS	21 South	62 East	4-9,15-23, 25-36
19 South	62 East	2-11,14-23,27-34	22 South	60 East	1-4,10-15,24
20 South	60 East	1-3,10-15,21-28,33-36	22 South	61 East	1-24,26-29
20 South	61 East	ALL SECTIONS	22 South	62 East	1-10,17-18

Notes:
1. Refer to Table 505 and Figure 516 Depth-Duration- Frequency values in the McCarran Airport Rainfall Area.
2. Refer to Table 506 and Figure 517 for Time-Intensity-Frequency values on the McCarran Airport Rainfall Area.

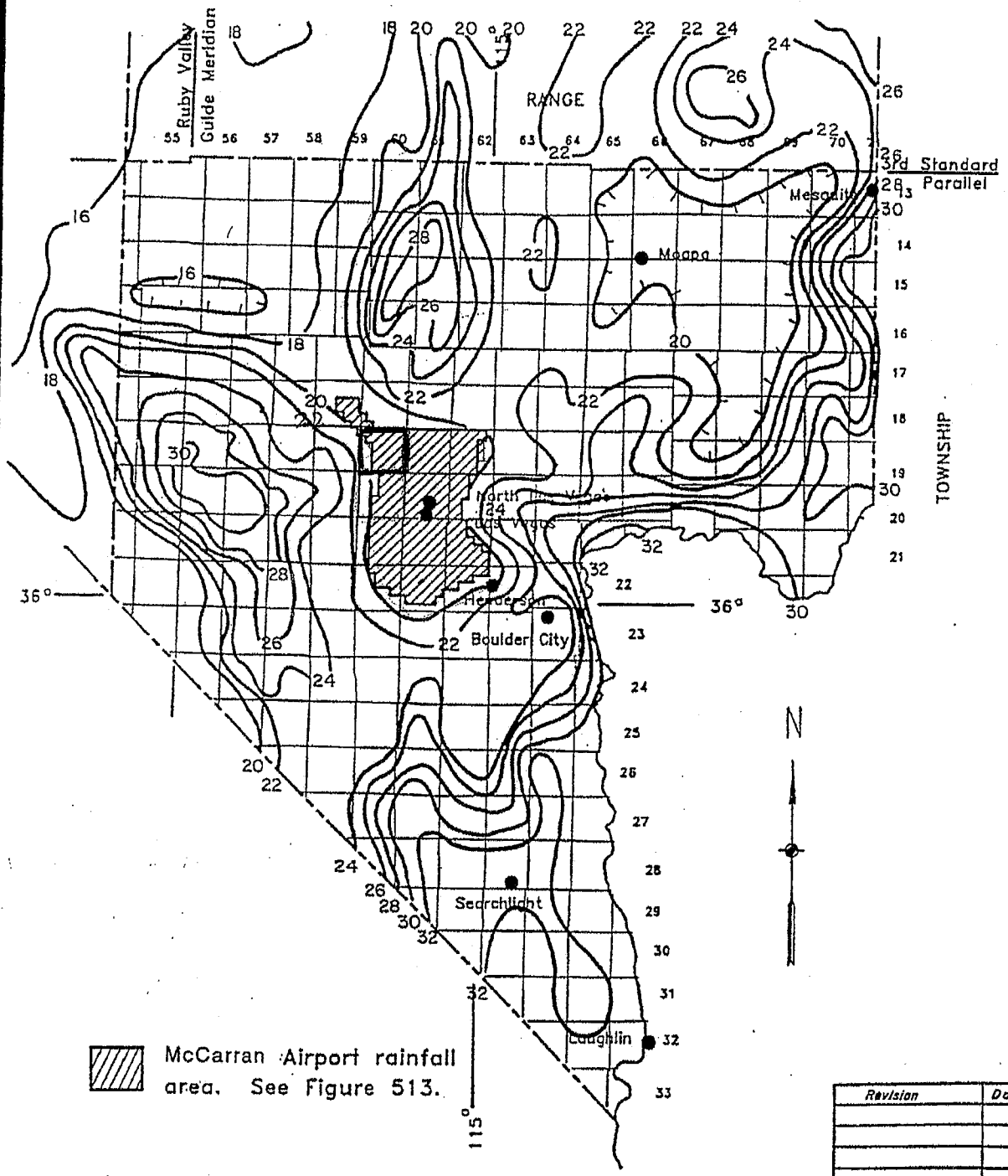
Revision	Date

WRC ENGINEERING

REFERENCE:
USACE, Los Angeles District, 1988

FIGURE 513

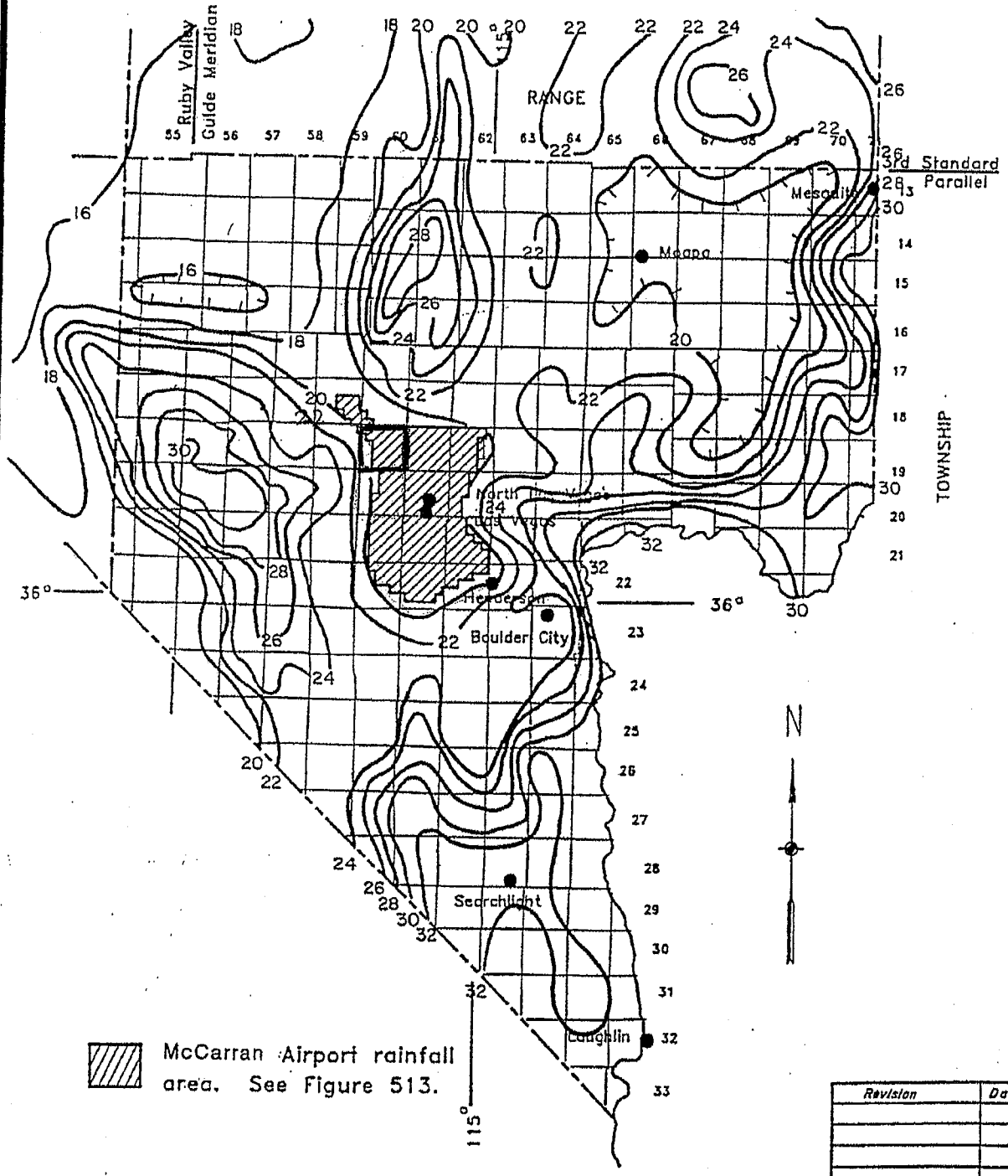
RAINFALL DEPTH-DURATION-FREQUENCY
100-YEAR, 6-HOUR
(DEPTHS IN TENTHS OF INCHES)



Revision	Date

WRC ENGINEERING	REFERENCE: NOAA ATLAS 2, VOLUME VII NEVADA, 1973	FIGURE 506

RAINFALL DEPTH-DURATION-FREQUENCY
100-YEAR, 6-HOUR
(DEPTHS IN TENTHS OF INCHES)



Revision	Date

WRC ENGINEERING	REFERENCE: NOAA ATLAS 2, VOLUME VII NEVADA, 1973	FIGURE 506

PRECIPITATION ADJUSTMENT RATIOS

Recurrence Interval	Ratio to NOAA Atlas 2
2-year	1.00
5-year	1.16
10-year	1.24
25-year	1.33
50-year	1.39
100-year	1.43

NOTE:
1. Multiply the values obtained from the NOAA Atlas 2 by the above ratios to obtain the adjusted precipitation values.
2. NOAA Atlas 2 values for use with TR-55 shall not be adjusted by the above ratios.
3. Tables 505 and 506 require no adjustments.

Revision	Date

SIX-HOUR STORM DISTRIBUTIONS

Storm Time (In Minutes)	Percent of Total Storm Depth SDN3	SDN4	SDN5	Storm Time (In Minutes)	Percent of Total Storm Depth SDN3	SDN4	SDN5
0	0.0	0.0	0.0	185	32.2	37.6	43.0
5	2.0	2.0	2.0	190	35.2	41.5	47.7
10	5.7	5.8	5.9	195	40.9	46.2	51.4
15	7.0	7.5	8.0	200	49.9	53.0	56.1
20	8.7	9.9	11.0	205	59.0	61.0	63.0
25	10.8	12.6	14.4	210	71.0	71.0	71.0
30	12.4	13.7	15.0	215	74.4	73.2	72.0
35	13.0	14.5	16.0	220	78.1	75.6	73.1
40	13.0	14.9	16.8	225	81.2	78.2	75.2
45	13.0	15.1	17.1	230	81.9	79.9	77.9
50	13.0	15.5	18.0	235	83.5	81.3	79.0
55	13.0	15.6	18.2	240	85.1	82.3	79.5
60	13.0	15.9	18.7	245	85.6	83.0	80.4
65	13.3	16.2	19.0	250	86.0	83.5	81.0
70	14.0	16.9	19.7	255	86.8	84.4	82.0
75	14.2	17.2	20.2	260	87.6	85.1	82.6
80	14.8	17.9	21.0	265	88.8	86.4	84.0
85	15.8	18.9	22.0	270	91.0	88.5	85.9
90	17.2	20.1	23.0	275	92.6	90.8	88.9
95	18.1	21.1	24.1	280	93.7	92.4	91.0
100	19.0	22.0	25.0	285	95.0	94.4	93.8
105	19.7	22.8	25.9	290	97.0	96.8	96.6
110	19.9	23.2	26.5	295	97.6	97.3	97.0
115	20.0	24.0	28.0	300	98.2	97.8	97.4
120	20.1	24.6	29.0	305	98.5	98.2	97.9
125	20.4	25.2	30.0	310	98.7	98.4	98.1
130	21.4	26.0	30.5	315	98.9	98.6	98.3
135	22.9	26.9	30.9	320	99.0	98.8	98.5
140	24.1	27.6	31.0	325	99.3	99.1	98.9
145	24.9	28.3	31.7	330	99.3	99.2	99.0
150	25.1	28.6	32.1	335	99.4	99.3	99.2
155	25.6	29.2	32.7	340	99.5	99.4	99.3
160	27.0	30.2	33.3	345	99.8	99.7	99.6
165	27.8	31.2	34.6	350	99.8	99.8	99.7
170	28.1	32.1	36.1	355	99.9	99.9	99.9
175	28.3	33.2	38.1	360	100.0	100.0	100.0
180	29.5	35.2	40.8				

Notes:
1. For drainage areas less than 8 square miles in size, use SDN 3.
2. For drainage areas greater than or equal to 8 square miles and less than 12 square miles in size, use SDN 4.
3. For drainage areas greater than or equal to 12 square miles, use SDN 5.
4. A graphical representation of these values is presented on **Figure 515.**

Revision	Date

REFERENCE:

TABLE 503

HYDROLOGY

- Curve Number Calculations
- Standard Form 4
- Rainfall Intensity
- HEC-1 Output
  - Existing Condition 10 Year
  - Existing Condition 100 Year
  - Proposed Condition Option 1-10 Year
  - Proposed Condition Option 1- 100 Year
  - Proposed Condition Option 2- 10 Year
  - Proposed Condition Option 2- 100 Year

HYDRAULICS

- Drop Inlet Inventory and FlowMaster Calculations
- Street Capacity Calculations
- Flow Split Calculations
- WSPG Calculations
  - 60-inch Proposed Storm Drain System
  - Outlet Pipe- Q80
  - Outlet Pipe- Q137
  - Outlet Pipe- Q152
- Stage Storage
  - Stage vs. Storage
  - Stage vs. Surface Area
  - Stage vs. Low Level Discharge- Option 1
  - Stage vs. Low Level Discharge- Option 2
  - Volume and Discharge Table

CURVE NUMBER CALCULATIONS

PB 100 YEARS ®

ELKHORN SPRINGS AND BUFFALO STORM DRAIN SYSTEM

CURVE NUMBER CALCULATIONS

Project #: 31678A
Made by: SK
Date: 04/30/08
Checked by: KS
Date: 06/27/08

Basin ID	Total Basin Area	Total Basin Area	Commercial, Retail, Casino, High Rise Condominiums				Public facility,Residential (8-12 units)				High Density Residential (4-8 units)				Parks, Golf Courses				Impervious Paved Areas	Composite Curve Number
	Sq.ft	Acres	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D		
			89	92	94	95	89	92	94	95	73	82	88	90	68	79	86	89	98	
OFF-1	5500857.0	126.3		30.3	23.5				15.7			56.8								88
OFF-2	4978224.0	114.3		35.1				5.9	17.6			55.7								87
OFF-3	4599022.0	105.6										105.6								82
OFF-4	857550.9	19.7										19.7								82
OFF-5	1530023.5	35.1										35.1								82
OFF-6	801032.8	18.4										18.4								82
OFF-7	1860492.8	42.7										42.7								82
OFF-8	786134.5	18.0										18.0								82
OFF-9	795274.0	18.3										21.7								97
OFF-10	930134.2	21.4										21.4								82
OFF-11	1826272.4	41.9										41.9								82
OFF-12	434050.4	10.0						8.4											1.5	93
ON-1	541378.6	12.4														12.4				79

STANDARD FORM 4

PB 100 YEARS ®

ELKHORN SPRINGS AND BUFFALO DRIVE STORM DRAIN SYSTEM

TIME OF CONCENTRATION CALCULATION - STANDARD FORM 4 - (CRFCCD 1999, FIGURE 608)

Project #:	31678A
Made by:	KS
Date:	04/30/08
Checked by:	SK
Date:	06/19/08

Sub-Basin Data							Initial/Overland Time (T_i)			Travel Time (T_t)						Tc Check (Urbanized Basins)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Basin	Developed/ Undeveloped	C	CN	K	Area	Area	Initial Length, Lo	Slope	T_i	Travel Length	Slope	Velocity, V1	Velocity, V2	T_t	Total length	T_c check	Final Tc	T lag =0.6Tc/60
					(Acres)	(sq mi)	(ft)	(%)	(Min)	(ft)	(ft/ft)	(fps)	(fps)	(Min)	(ft)	(Min)	(Min)	(hours)
	D or U			(2)	(3)		(4)	(5)	(6)	(7)	(8)	(9a)	(9b)	(10)		(14)	(13)	
OFF-1	D	0.90	88.14	0.773	126.28	0.1973	458	1.00	12.58	4175	0.021	2.93	4.43	16.66	4633	35.74	29.24	0.292
OFF-2	D	0.90	87.44	0.764	114.28	0.1786	500	1.00	13.52	4642	0.017	2.59	3.93	20.77	5142	38.57	34.29	0.343
OFF-3	D	0.90	82.02	0.693	105.58	0.1650	269	1.00	12.03	2823	0.018	2.69	4.07	12.61	3092	27.18	24.64	0.246
OFF-4	D	0.90	82.00	0.692	19.69	0.0308	85	1.00	6.76	850	0.018	2.73	4.13	4.47	935	15.19	11.24	0.112
OFF-5	D	0.90	82.00	0.692	35.12	0.0549	110	1.00	7.69	885	0.013	2.29	3.46	5.50	995	15.53	13.19	0.132
OFF-6	D	0.90	82.05	0.693	18.39	0.0287	195	1.00	10.23	2284	0.013	2.31	3.50	12.09	2479	23.77	22.32	0.223
OFF-7	D	0.90	81.98	0.692	42.71	0.0667	172	1.00	9.63	2767	0.018	2.71	4.11	12.28	2939	26.33	21.91	0.219
OFF-8	D	0.90	81.79	0.690	18.05	0.0282	100	1.00	7.39	600	0.020	2.86	4.33	3.30	700	13.89	10.69	0.107
OFF-9	D	0.90	97.46	0.897	18.26	0.0285	102	1.00	3.70	1195	0.005	1.43	2.16	11.19	1297	17.21	14.89	0.149
OFF-10	D	0.90	82.18	0.695	21.35	0.0334	300	1.00	12.63	1746	0.011	2.12	3.21	10.40	2046	21.37	21.37	0.214
OFF-11	D	0.90	81.95	0.692	41.93	0.0655	342	1.00	13.59	1613	0.013	2.33	3.53	8.83	1955	20.86	20.86	0.209
OFF-12	D	0.90	92.92	0.837	9.96	0.0156	268	1.86	6.31	676	0.014	2.39	3.62	4.30	944	15.24	10.61	0.106
ON-1	D	0.90	78.82	0.650	12.43	0.0194	500	1.00	18.10	1145	0.012	2.21	3.35	6.97	1645	19.14	19.14	0.191

ELKHORN SPRINGS AND BUFFALO DRIVE STORM DRAIN SYSTEM

TIME OF CONCENTRATION CALCULATION - STANDARD FORM 4 - (CRFCCD 1999, FIGURE 608)

Project #: 31678A
Made by: KS
Date: 04/30/08
Checked by: SK
Date: 06/19/08

Column		Equations Used
2	Dev./ Un.	Developed or Undeveloped condition of the basin
3	C	Run off coefficient cvalue, C depends on the developed or undeveloped condition of the basin area C for paved/developed use 10- year runoff coefficient- 0.9 from CCRFCD, 1999 - Table 601 C for dirt areas/Undeveloped, use 10-year runoff coefficient - 0.6 interpretted from LBG's Standard Form 4 of the Preliminary study
4	CN	For soil group B, use 92 from CCRFCD, 1999 Table 602, 1 of 4 — The project site land use is "Commercial, retail and casino" For soil group C, use 94 from CCRFCD, 1999 Table 602, 1 of 4 — The project site land use is "Commercial, retail and casino"
5	K	K= 0.0132CN-0.39 From CCRFCD, 1999- Equation 603 — Use this equation since this project uses HEC-1 to calculate flows.
10	Ti	Ti =1.8(1.1-K)L^0.5/S^0.3 From CCRFCD, 1999 - Equation 602
13	V1	$V1=CS^{1/2}$ - 1ST 500-FT where C= 14.80 (for Non-Urbanized Areas); C= 20.20 (for Urbanized Areas) — From page 606, paragraph 2 of the Design Manual
14	V2	$V2=CS^{1/2}$ - AFTER 500-FT where C= 29.40 (for Non-Urbanized Areas); C= 30.60 (for Urbanized Areas) If C is equal to 0.9, then use C=20.20 to calculate V1; If C is not equal to 0.9, then use C=14.80 to calculate V1 If C is equal to 0.9, then use C=30.60 to calculate V2; If C is not equal to 0.9, then use C=29.40 to calculate V2
15	Tt	Length/Velocity Con.1+ Con.2 Con. 1 Tt for L<= 500ft, use V1 Con. 2 Tt for L >= 500ft, use V2 for L-500
17	Tc check	$T_c=(L/180)+10$ From CCRFCD, 1999 - Equation 604 — T_c check is for urbanized areas only L = Lo + Travel length
18	Final Tc	If Tc check <= Ti+Tt, use TC check If Tc check > Ti+Tt, use Ti+Tt If Tc Min for paved/ urbanized areas, is less than 5 min, use 5 min If Tc Min for unpaved/non-urbanized areas, is less than 10 min, use 10 min The minimum tc recommended for non-urban watersheds is 10 minutes. (CCRFCD, 1999 - Page 605) The minimum tc recommended for urbanized areas is 5 minutes. (CCRFCD, 1999 - Page 606)
19	T lag	T lag = 0.6Tc/60

RAINFALL INTENSITY

ELKHORN SPRINGS AND BUFFALO DRIVE RAINFALL INTENSITIES

Project #: 31678A
Made by: KS
Date: 06/16/08
Checked by: SK
Date: 06/27/08

Values Need to be Higher than McCarran

Basin ID	Section	Range	Section	Mc Carran Rainfall Area	10 Yr Depth	100 Yr Depth	Adjusted 10-yr depth	Adjusted 100-yr depth	Ratio
OFF1	19S	60E	17&18	Partially	-	-	1.45	2.52	0.58
OFF2	19S	60E	17&19	Partially	-	-	1.37	2.26	0.61
OFF3	19S	60E	17	Yes	-	-	1.58	2.77	0.57
OFF4	19S	60E	17	Yes	-	-	1.58	2.77	0.57
OFF5	19S	60E	16	Yes	-	-	1.58	2.77	0.57
OFF6	19S	60E	17	Yes	-	-	1.58	2.77	0.57
OFF7	19S	60E	18	Yes	-	-	1.58	2.77	0.57
OFF8	19S	60E	19	Yes	-	-	1.58	2.77	0.57
OFF9	19S	60E	20	Yes	-	-	1.58	2.77	0.57
OFF10	19S	60E	21	Yes	-	-	1.58	2.77	0.57
OFF11	19S	60E	22	Yes	-	-	1.58	2.77	0.57
OFF12	19S	60E	23	Yes	-	-	1.58	2.77	0.57
ON-1	19S	60E	24	Yes	-	-	1.58	2.77	0.57

EXITING CONDITION HEC-1
10-YEAR STORM EVENT

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JAN   1997              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   27JUN08  TIME  09:00:09   *
*                                       *
*****************************************
```

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


```
          LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
                    *DIAGRAM
*** FREE ***
               1    ID   ****************************************************************
               2    ID   * ------------------------------------------------------------ *
               3    ID   * |                                                          | *
               4    ID   * |   ELKHORN SPRINGS AND BUFFALO DRIVE STORM DRAIN          | *
               5    ID   * |                  CITY OF LAS VEGAS                       | *
               6    ID   * |                EXISTING CONDITIONS                       | *
               7    ID   * |                                                          | *
               8    ID   * |..........................................................| *
               9    ID   * |                                                          | *
              10    ID   * |         CLIENT--------------CITY OF LAS VEGAS            | *
              11    ID   * |         RETURN PERIOD-------100-YEAR                     | *
              12    ID   * |         DISTRIBUTUION-------6-HOUR SDN3                  | *
              13    ID   * |         PROJECT NO----------31678A                       | *
              14    ID   * |         FILENAME------------EI-10.DAT                   | *
              15    ID   * |         REV. DATE-----------06/17/08                     | *
              16    ID   * |                                                          | *
              17    ID   * |..........................................................| *
              18    ID   * |                                                          | *
              19    ID   * |                    AREA     DARF                         | *
              20    ID   * |                   (sq.mi.)                               | *
              21    ID   * |                 0.00-0.50  1.000                         | *
              22    ID   * |                 0.50-0.75  0.975                         | *
              23    ID   * |                 0.75-1.00  0.970                         | *
              24    ID   * |                                                          | *
              25    ID   * |  MODELED BY: Parsons Brinckerhoff                        | *
              26    ID   * ------------------------------------------------------------ *
              27    ID   ****************************************************************
              28    ID
              29    ID
              30    IT       5       0       0     300
              31    IO       5       0       0
              32    IN       5       0       0
              33    JR    PREC    1.00   0.975   0.970
                    *
              34    KK    OFF1
              35    BA  0.1973
              36    PB    1.45
              37    PC   0.000   0.020   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
              38    PC   0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
              39    PC   0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
```

```
 40          PC   0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
 41          PC   0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
 42          PC   0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
 43          PC   0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
 44          PC   0.998   0.999   1.000
 45          LS       0   88.14
 46          UD   0.292
             *
```



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

 47          KK  DIV1FD
 48          KM   DIVERT FLOWS INTO DROP INLETS FDI-1 & FDI-2 LOCATED NWC OF FARM ROAD
 49          KM   AND CIMARRON ROAD
 50          DT   FDI12
 51          DI       0      72
 52          DQ       0      49
             *

 53          KK  SPLIT1
 54          KM   FLOW SPLIT ON CIMARRON ROAD AND FARM ROAD
 55          DT    CIM1
 56          DI       0      23
 57          DQ       0       5
             *

 58          KK  DIV2FD
 59          KM   DIVERT FLOWS INTO DROP INLETS FDI-3,FDI-4 & FDI-5 LOCATED ON FARM ROAD
 60          KM   BETWEEN CIMARRON ROAD & PALM GROVE
 61          DT  FDI345
 62          DI       0      18
 63          DQ       0      18
             *

 64          KK    OFF4
 65          BA  0.0308
 66          PB    1.58
 67          LS       0   82.00
 68          UD   0.112
             *

 69          KK     CP1
 70          KM   COMBINE OFF4 AND BY PASS FLOW FROM INLETS ON FARM ROAD
 71          HC       2
             *

 72          KK   FDI12
 73          KM   RECALL FLOW COLLECTED BY EXISTING STORM DRIAN SYSTEM(PLUGGED)ON FARM ROAD
 74          KM   WEST OF CIMARRON ROAD
 75          DR   FDI12
             *

 76          KK  FDI345
 77          KM   RECALL FLOW COLLECTED BY EXISTING STORM DRIAN SYSTEM(PLUGGED)ON FARM ROAD
 78          KM   BETWEEN CIMARRON ROAD AND PALM GROOVE LANE
 79          DR  FDI345
             *

 80          KK     CP2
 81          KM   COMBINE FD12 AND FD345 TO CALCULATED FLOW COLLECTED BY THE EXISTING
 82          KM   STORM DRAIN SYSTEM ON FARM ROAD (CURRENTLY PLUGGED)
 83          HC       2
             *
```



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

 84          KK    OFF5
 85          KM   SUBBASIN OFF5
 86          BA  0.0549
 87          LS       0   82.00
 88          UD   0.132
             *

 89          KK    OFF3
 90          KM   SUBBASIN OFF3
 91          BA   0.165
 92          LS       0   82.02
```

```
 93          UD   0.246
             *

 94          KK    CIM1
 95          KM   RECALL FLOW SPLIT AT CIMMARON AND FARM ROAD ON CIMARRON ROAD
 96          DR    CIM1
             *

 97          KK     CP4
 98          KM   COMBINE OFF3 AND CIM1
 99          HC       2
             *

100          KK  SPLIT2
101          KM   FLOW SPLIT ON CIMARRON ROAD AND SUNNY SPRINGS LANE
102          DT    CIM2
103          DI       0      49
104          DQ       0      17
             *

105          KK    OFF6
106          KM   SUBBASIN OFF6
107          BA  0.0287
108          LS       0   82.05
109          UD   0.223
             *

110          KK    OFF7
111          KM   SUBBASIN OFF7
112          BA  0.0667
113          LS       0   81.98
114          UD   0.219
             *

115          KK     CP5
116          KM   COMBINE OFF6,OFF7 AND REMAINING FLOW IN SUNNY SPRINGS LANE AFTER FLOW SPLIT
117          HC       3
             *
1                                        HEC-1 INPUT                                    PAGE  4

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

118          KK    OFF2
119          KM   SUBBASIN OFF2
120          BA  0.1786
121          PB    1.37
122          LS       0   87.44
123          UD   0.343
             *

124          KK    CIM2
125          KM   RECALL FLOW SPLIT AT CIMMARON AND SUNNY SPRINGS LANE ON CIMARRON ROAD
126          DR    CIM2
             *

127          KK     CP6
128          KM   COMBINE OFF2 & CIM2
129          HC       2
             *

130          KK  SPLIT3
131          KM   FLOW SPLIT ON CIMARRON ROAD AND ELKHORN ROAD
132          DT    CIM3
133          DI       0      67
134          DQ       0      16
             *

135          KK    OFF8
136          KM   SUBBASIN OFF8
137          BA  0.0282
138          PB    1.58
139          LS       0   81.79
140          UD   0.107
             *

141          KK     CP7
142          KM   COMBINE OFF8 AND REMAINING FLOW IN ELKHORN ROAD
143          HC       2
             *
```

```
 144          KK    OFF9
 145          BA  0.0285
 146          LS       0   97.46
 147          UD   0.149
              *

 148          KK     CP8
 149          KM   COMBINE OFF8,OFF9 AND REMAINING FLOW IN ELKHORN ROAD
 150          HC       2
              *
```



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

 151          KKDIV3E123
 152          KM   DIVERT FLOWS TO EXISTIGN DIs IN ELKHORN ROAD (6 DIs TOTAL)
 153          DT   BUFF1
 154          DI       0      77
 155          DQ       0       2
              *

 156          KK     CP9
 157          KM   COMBINE CP5 AND FLOW INTERCEPTED BY DIs IN ELKHORN ROAD
 158          HC       2
              *

 159          KK   BUFF1
 160          KM   RECALL FLOW BYPASSED BY DROP INLETS IN ELKHORN ROAD
 161          DR   BUFF1
              *

 162          KK  SPLIT4
 163          KM   FLOW SPLIT AT ELKHORN ROAD AND BUFFALO DRIVE
 164          DT   BUFF2
 165          DI       0      48
 166          DQ       0      32
              *

 167          KK   OFF11
 168          KM   SUBBASIN OFF11
 169          BA  0.0655
 170          LS       0   81.95
 171          UD   0.209
              *

 172          KK    CP10
 173          KM   COMBINE BUFF1 & BUFF2
 174          HC       2
              *

 175          KK   OFF10
 176          KM   SUBBASIN OFF10
 177          BA  0.0334
 178          LS       0   82.18
 179          UD   0.214
              *

 180          KK   OFF12
 181          KM   SUBBASIN OFF12
 182          BA  0.0156
 183          LS       0   92.92
 184          UD   0.106
              *
```



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

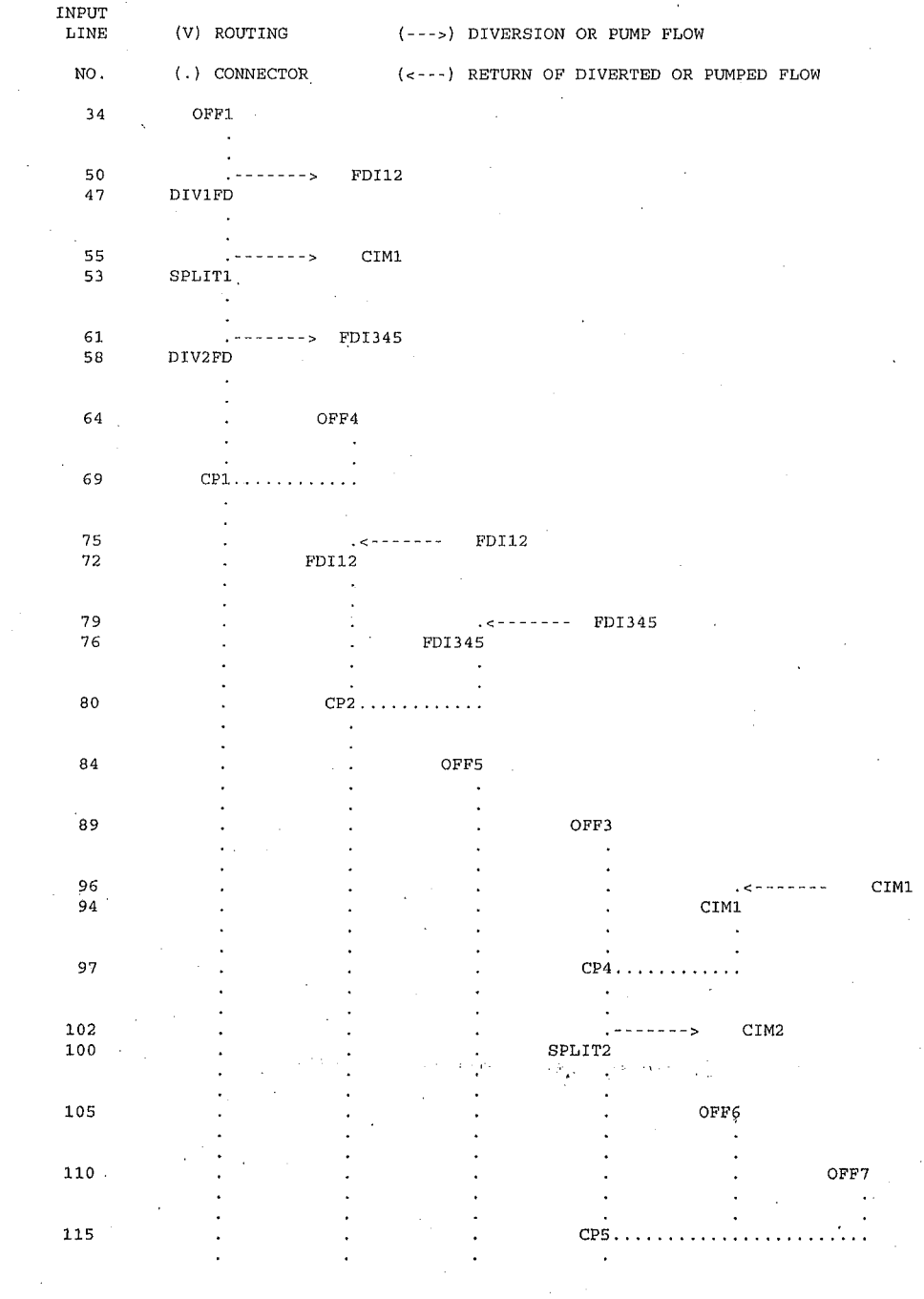
 185          KK    ON-1
 186          KM   ON SITE SUBBASIN
 187          BA  0.0194
 188          LS       0   78.82
 189          UD   0.191
              *

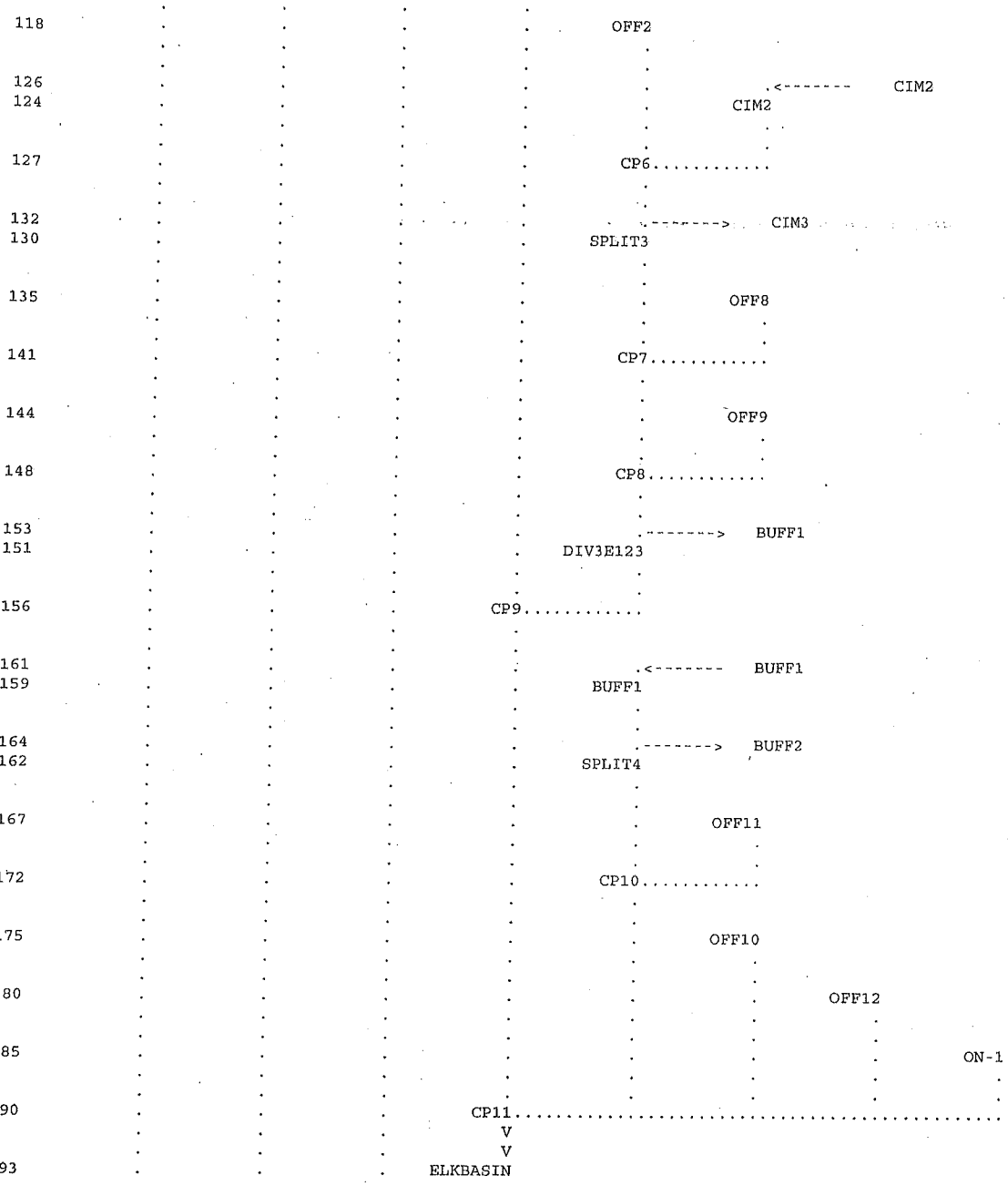
 190          KK    CP11
 191          KM   COMBINE OFF12,OFF-10,CP-10,CP-9 AND ON-1
 192          HC       5
              *
```

```
193          KKELKBASIN
194          KM    FACILITY = ELKHORN SPRINGS DETENTION BASIN
195          KM    FACILITY ID-MILE = EKDB 0070
196          KM    STORAGE VOLUME = 48 ACRE-FEET
197          KM    OUTLET = 2-27 inch RCPs transition to 60" RCP
198          KM    SPILLWAY LENGTH =
199          KM    SPILLWAY HEIGHT =
             *  KO       3
200          RS       1    STOR      -1
201          SV    0.04    0.07    0.41    1.41    3.24    5.71    8.57    11.8    15.3    19.0
202          SV    22.9    27.0    31.3    35.8    40.5
203          SE    2386    2387    2388    2389    2390    2391    2392    2393    2394    2395
204          SE    2396    2397    2398    2399    2400
205          SQ       0       0       0       0    65.5    92.7  113.53   128.0   134.2   140.1
206          SQ   145.7   151.2   156.4   161.5   166.4
207          KO       1
208          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK





(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1**

*

* FLOOD HYDROGRAPH PACKAGE (HEC-1) *

* JAN 1997 *

* VERSION 4.1 *

*

* RUN DATE 27JUN08 TIME 09:00:09 *

*

****

****

*

* U.S. ARMY CORPS OF ENGINEERS *

* HYDROLOGIC ENGINEERING CENTER *

* 609 SECOND STREET *

* DAVIS, CALIFORNIA 95616 *

* (916) 756-1104 *

*

****

```
**************************************************************
* ---------------------------------------------------------- *
* |                                                        | *
* |   ELKHORN SPRINGS AND BUFFALO DRIVE STORM DRAIN        | *
* |                  CITY OF LAS VEGAS                     | *
* |                 EXISTING CONDITIONS                    | *
* |                                                        | *
* |........................................................| *
* |                                                        | *
* |         CLIENT-------------CITY OF LAS VEGAS            | *
* |         RETURN PERIOD-------100-YEAR                   | *
* |         DISTRIBUTUION-------6-HOUR SDN3                | *
* |         PROJECT NO----------31678A                     | *
* |         FILENAME-----------EI-10.DAT                   | *
* |         REV. DATE----------06/17/08                    | *
* |                                                        | *
* |........................................................| *
* |                                                        | *
* |                   AREA     DARF                        | *
* |                  (sq.mi.)                              | *
* |                0.00-0.50  1.000                        | *
* |                0.50-0.75  0.975                        | *
* |                0.75-1.00  0.970                        | *
* |                                                        | *
* |  MODELED BY: Parsons Brinckerhoff                      | *
* ---------------------------------------------------------- *
**************************************************************
```

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

    IT          HYDROGRAPH TIME DATA
                       NMIN           5  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      2    0  ENDING DATE
                     NDTIME        0055  ENDING TIME
                     ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL      .08 HOURS
                       TOTAL TIME BASE   24.92 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

    JP          MULTI-PLAN OPTION
                    NPLAN           1  NUMBER OF PLANS

    JR          MULTI-RATIO OPTION
                   RATIOS OF PRECIPITATION
                  1.00       .98       .97
```

*** ***

```
              **************
              *            *
 193 KK       *  ELKBASIN  *
              *            *
              **************

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

             HYDROGRAPH ROUTING DATA
```

```
200 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

201 SV          STORAGE          .0        .1        .4       1.4       3.2       5.7       8.6      11.8      15.3      19.0
                               22.9      27.0      31.3      35.8      40.5

203 SE          ELEVATION     2386.00   2387.00   2388.00   2389.00   2390.00   2391.00   2392.00   2393.00   2394.00   2395.00
                              2396.00   2397.00   2398.00   2399.00   2400.00

205 SQ          DISCHARGE        0.        0.        0.        0.       66.       93.      114.      128.      134.      140.
                               146.      151.      156.      162.      166.

                                                                ***
```

****

HYDROGRAPH AT STATION ELKBASIN
PLAN 1, RATIO = 1.00

****

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	1.4	2389.0	1		0820	101	0.	1.4	2389.0	1		1640	201	0.	1.4	2389.0
1		0005	2	0.	1.4	2389.0	1		0825	102	0.	1.4	2389.0	1		1645	202	0.	1.4	2389.0
1		0010	3	0.	1.4	2389.0	1		0830	103	0.	1.4	2389.0	1		1650	203	0.	1.4	2389.0
1		0015	4	0.	1.4	2389.0	1		0835	104	0.	1.4	2389.0	1		1655	204	0.	1.4	2389.0
1		0020	5	0.	1.4	2389.0	1		0840	105	0.	1.4	2389.0	1		1700	205	0.	1.4	2389.0
1		0025	6	0.	1.4	2389.0	1		0845	106	0.	1.4	2389.0	1		1705	206	0.	1.4	2389.0
1		0030	7	1.	1.4	2389.0	1		0850	107	0.	1.4	2389.0	1		1710	207	0.	1.4	2389.0
1		0035	8	1.	1.4	2389.0	1		0855	108	0.	1.4	2389.0	1		1715	208	0.	1.4	2389.0
1		0040	9	1.	1.5	2389.0	1		0900	109	0.	1.4	2389.0	1		1720	209	0.	1.4	2389.0
1		0045	10	1.	1.5	2389.0	1		0905	110	0.	1.4	2389.0	1		1725	210	0.	1.4	2389.0
1		0050	11	1.	1.4	2389.0	1		0910	111	0.	1.4	2389.0	1		1730	211	0.	1.4	2389.0
1		0055	12	1.	1.4	2389.0	1		0915	112	0.	1.4	2389.0	1		1735	212	0.	1.4	2389.0
1		0100	13	1.	1.4	2389.0	1		0920	113	0.	1.4	2389.0	1		1740	213	0.	1.4	2389.0
1		0105	14	1.	1.4	2389.0	1		0925	114	0.	1.4	2389.0	1		1745	214	0.	1.4	2389.0
1		0110	15	1.	1.4	2389.0	1		0930	115	0.	1.4	2389.0	1		1750	215	0.	1.4	2389.0
1		0115	16	1.	1.4	2389.0	1		0935	116	0.	1.4	2389.0	1		1755	216	0.	1.4	2389.0
1		0120	17	1.	1.4	2389.0	1		0940	117	0.	1.4	2389.0	1		1800	217	0.	1.4	2389.0
1		0125	18	1.	1.4	2389.0	1		0945	118	0.	1.4	2389.0	1		1805	218	0.	1.4	2389.0
1		0130	19	1.	1.4	2389.0	1		0950	119	0.	1.4	2389.0	1		1810	219	0.	1.4	2389.0
1		0135	20	1.	1.4	2389.0	1		0955	120	0.	1.4	2389.0	1		1815	220	0.	1.4	2389.0
1		0140	21	2.	1.5	2389.0	1		1000	121	0.	1.4	2389.0	1		1820	221	0.	1.4	2389.0
1		0145	22	2.	1.5	2389.0	1		1005	122	0.	1.4	2389.0	1		1825	222	0.	1.4	2389.0
1		0150	23	2.	1.5	2389.0	1		1010	123	0.	1.4	2389.0	1		1830	223	0.	1.4	2389.0
1		0155	24	2.	1.5	2389.0	1		1015	124	0.	1.4	2389.0	1		1835	224	0.	1.4	2389.0
1		0200	25	2.	1.5	2389.0	1		1020	125	0.	1.4	2389.0	1		1840	225	0.	1.4	2389.0
1		0205	26	2.	1.5	2389.0	1		1025	126	0.	1.4	2389.0	1		1845	226	0.	1.4	2389.0
1		0210	27	1.	1.5	2389.0	1		1030	127	0.	1.4	2389.0	1		1850	227	0.	1.4	2389.0
1		0215	28	2.	1.5	2389.0	1		1035	128	0.	1.4	2389.0	1		1855	228	0.	1.4	2389.0
1		0220	29	2.	1.5	2389.0	1		1040	129	0.	1.4	2389.0	1		1900	229	0.	1.4	2389.0
1		0225	30	2.	1.5	2389.0	1		1045	130	0.	1.4	2389.0	1		1905	230	0.	1.4	2389.0
1		0230	31	3.	1.5	2389.0	1		1050	131	0.	1.4	2389.0	1		1910	231	0.	1.4	2389.0
1		0235	32	3.	1.5	2389.0	1		1055	132	0.	1.4	2389.0	1		1915	232	0.	1.4	2389.0
1		0240	33	3.	1.5	2389.0	1		1100	133	0.	1.4	2389.0	1		1920	233	0.	1.4	2389.0
1		0245	34	3.	1.5	2389.0	1		1105	134	0.	1.4	2389.0	1		1925	234	0.	1.4	2389.0
1		0250	35	3.	1.5	2389.0	1		1110	135	0.	1.4	2389.0	1		1930	235	0.	1.4	2389.0
1		0255	36	3.	1.5	2389.0	1		1115	136	0.	1.4	2389.0	1		1935	236	0.	1.4	2389.0
1		0300	37	3.	1.5	2389.0	1		1120	137	0.	1.4	2389.0	1		1940	237	0.	1.4	2389.0
1		0305	38	3.	1.5	2389.1	1		1125	138	0.	1.4	2389.0	1		1945	238	0.	1.4	2389.0
1		0310	39	4.	1.5	2389.1	1		1130	139	0.	1.4	2389.0	1		1950	239	0.	1.4	2389.0
1		0315	40	7.	1.6	2389.1	1		1135	140	0.	1.4	2389.0	1		1955	240	0.	1.4	2389.0
1		0320	41	12.	1.7	2389.2	1		1140	141	0.	1.4	2389.0	1		2000	241	0.	1.4	2389.0
1		0325	42	22.	2.0	2389.3	1		1145	142	0.	1.4	2389.0	1		2005	242	0.	1.4	2389.0
1		0330	43	39.	2.5	2389.6	1		1150	143	0.	1.4	2389.0	1		2010	243	0.	1.4	2389.0
1		0335	44	62.	3.1	2389.9	1		1155	144	0.	1.4	2389.0	1		2015	244	0.	1.4	2389.0
1		0340	45	72.	3.8	2390.2	1		1200	145	0.	1.4	2389.0	1		2020	245	0.	1.4	2389.0
1		0345	46	79.	4.5	2390.5	1		1205	146	0.	1.4	2389.0	1		2025	246	0.	1.4	2389.0
1		0350	47	85.	5.0	2390.7	1		1210	147	0.	1.4	2389.0	1		2030	247	0.	1.4	2389.0
1		0355	48	89.	5.4	2390.9	1		1215	148	0.	1.4	2389.0	1		2035	248	0.	1.4	2389.0
1		0400	49	91.	5.5	2390.9	1		1220	149	0.	1.4	2389.0	1		2040	249	0.	1.4	2389.0
1		0405	50	91.	5.5	2390.9	1		1225	150	0.	1.4	2389.0	1		2045	250	0.	1.4	2389.0
1		0410	51	90.	5.4	2390.9	1		1230	151	0.	1.4	2389.0	1		2050	251	0.	1.4	2389.0
1		0415	52	87.	5.2	2390.8	1		1235	152	0.	1.4	2389.0	1		2055	252	0.	1.4	2389.0
1		0420	53	85.	5.0	2390.7	1		1240	153	0.	1.4	2389.0	1		2100	253	0.	1.4	2389.0
1		0425	54	81.	4.7	2390.6	1		1245	154	0.	1.4	2389.0	1		2105	254	0.	1.4	2389.0
1		0430	55	78.	4.4	2390.5	1		1250	155	0.	1.4	2389.0	1		2110	255	0.	1.4	2389.0

1	0435	56	76.	4.2	2390.4	*	1	1255	156	0.	1.4	2389.0	*	1	2115	256	0.	1.4	2389.0
1	0440	57	74.	4.0	2390.3	*	1	1300	157	0.	1.4	2389.0	*	1	2120	257	0.	1.4	2389.0
1	0445	58	73.	3.9	2390.3	*	1	1305	158	0.	1.4	2389.0	*	1	2125	258	0.	1.4	2389.0
1	0450	59	72.	3.8	2390.2	*	1	1310	159	0.	1.4	2389.0	*	1	2130	259	0.	1.4	2389.0
1	0455	60	71.	3.7	2390.2	*	1	1315	160	0.	1.4	2389.0	*	1	2135	260	0.	1.4	2389.0
1	0500	61	69.	3.6	2390.1	*	1	1320	161	0.	1.4	2389.0	*	1	2140	261	0.	1.4	2389.0
1	0505	62	68.	3.5	2390.1	*	1	1325	162	0.	1.4	2389.0	*	1	2145	262	0.	1.4	2389.0
1	0510	63	66.	3.3	2390.0	*	1	1330	163	0.	1.4	2389.0	*	1	2150	263	0.	1.4	2389.0
1	0515	64	60.	3.1	2389.9	*	1	1335	164	0.	1.4	2389.0	*	1	2155	264	0.	1.4	2389.0
1	0520	65	52.	2.9	2389.8	*	1	1340	165	0.	1.4	2389.0	*	1	2200	265	0.	1.4	2389.0
1	0525	66	45.	2.7	2389.7	*	1	1345	166	0.	1.4	2389.0	*	1	2205	266	0.	1.4	2389.0
1	0530	67	38.	2.5	2389.6	*	1	1350	167	0.	1.4	2389.0	*	1	2210	267	0.	1.4	2389.0
1	0535	68	33.	2.3	2389.5	*	1	1355	168	0.	1.4	2389.0	*	1	2215	268	0.	1.4	2389.0
1	0540	69	27.	2.2	2389.4	*	1	1400	169	0.	1.4	2389.0	*	1	2220	269	0.	1.4	2389.0
1	0545	70	23.	2.1	2389.4	*	1	1405	170	0.	1.4	2389.0	*	1	2225	270	0.	1.4	2389.0
1	0550	71	20.	2.0	2389.3	*	1	1410	171	0.	1.4	2389.0	*	1	2230	271	0.	1.4	2389.0
1	0555	72	17.	1.9	2389.3	*	1	1415	172	0.	1.4	2389.0	*	1	2235	272	0.	1.4	2389.0
1	0600	73	14.	1.8	2389.2	*	1	1420	173	0.	1.4	2389.0	*	1	2240	273	0.	1.4	2389.0
1	0605	74	12.	1.8	2389.2	*	1	1425	174	0.	1.4	2389.0	*	1	2245	274	0.	1.4	2389.0
1	0610	75	11.	1.7	2389.2	*	1	1430	175	0.	1.4	2389.0	*	1	2250	275	0.	1.4	2389.0
1	0615	76	9.	1.7	2389.1	*	1	1435	176	0.	1.4	2389.0	*	1	2255	276	0.	1.4	2389.0
1	0620	77	8.	1.6	2389.1	*	1	1440	177	0.	1.4	2389.0	*	1	2300	277	0.	1.4	2389.0
1	0625	78	6.	1.6	2389.1	*	1	1445	178	0.	1.4	2389.0	*	1	2305	278	0.	1.4	2389.0
1	0630	79	5.	1.6	2389.1	*	1	1450	179	0.	1.4	2389.0	*	1	2310	279	0.	1.4	2389.0
1	0635	80	4.	1.5	2389.1	*	1	1455	180	0.	1.4	2389.0	*	1	2315	280	0.	1.4	2389.0
1	0640	81	3.	1.5	2389.1	*	1	1500	181	0.	1.4	2389.0	*	1	2320	281	0.	1.4	2389.0
1	0645	82	3.	1.5	2389.0	*	1	1505	182	0.	1.4	2389.0	*	1	2325	282	0.	1.4	2389.0
1	0650	83	2.	1.5	2389.0	*	1	1510	183	0.	1.4	2389.0	*	1	2330	283	0.	1.4	2389.0
1	0655	84	2.	1.5	2389.0	*	1	1515	184	0.	1.4	2389.0	*	1	2335	284	0.	1.4	2389.0
1	0700	85	1.	1.4	2389.0	*	1	1520	185	0.	1.4	2389.0	*	1	2340	285	0.	1.4	2389.0
1	0705	86	1.	1.4	2389.0	*	1	1525	186	0.	1.4	2389.0	*	1	2345	286	0.	1.4	2389.0
1	0710	87	1.	1.4	2389.0	*	1	1530	187	0.	1.4	2389.0	*	1	2350	287	0.	1.4	2389.0
1	0715	88	1.	1.4	2389.0	*	1	1535	188	0.	1.4	2389.0	*	1	2355	288	0.	1.4	2389.0
1	0720	89	0.	1.4	2389.0	*	1	1540	189	0.	1.4	2389.0	*	2	0000	289	0.	1.4	2389.0
1	0725	90	0.	1.4	2389.0	*	1	1545	190	0.	1.4	2389.0	*	2	0005	290	0.	1.4	2389.0
1	0730	91	0.	1.4	2389.0	*	1	1550	191	0.	1.4	2389.0	*	2	0010	291	0.	1.4	2389.0
1	0735	92	0.	1.4	2389.0	*	1	1555	192	0.	1.4	2389.0	*	2	0015	292	0.	1.4	2389.0
1	0740	93	0.	1.4	2389.0	*	1	1600	193	0.	1.4	2389.0	*	2	0020	293	0.	1.4	2389.0
1	0745	94	0.	1.4	2389.0	*	1	1605	194	0.	1.4	2389.0	*	2	0025	294	0.	1.4	2389.0
1	0750	95	0.	1.4	2389.0	*	1	1610	195	0.	1.4	2389.0	*	2	0030	295	0.	1.4	2389.0
1	0755	96	0.	1.4	2389.0	*	1	1615	196	0.	1.4	2389.0	*	2	0035	296	0.	1.4	2389.0
1	0800	97	0.	1.4	2389.0	*	1	1620	197	0.	1.4	2389.0	*	2	0040	297	0.	1.4	2389.0
1	0805	98	0.	1.4	2389.0	*	1	1625	198	0.	1.4	2389.0	*	2	0045	298	0.	1.4	2389.0
1	0810	99	0.	1.4	2389.0	*	1	1630	199	0.	1.4	2389.0	*	2	0050	299	0.	1.4	2389.0
1	0815	100	0.	1.4	2389.0	*	1	1635	200	0.	1.4	2389.0	*	2	0055	300	0.	1.4	2389.0

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 91.	4.08		29.	7.	7.	7.
		(INCHES)	.428	.431	.431	.431
		(AC-FT)	14.	14.	14.	14.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
6.	4.08	2.	2.	2.	2.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
2390.93	4.08	2389.52	2389.13	2389.13	2389.13

CUMULATIVE AREA = .63 SQ MI

HYDROGRAPH AT STATION ELKBASIN
PLAN 1, RATIO = .98

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	1.4	2389.0	*	1		0820	101	0.	1.4	2389.0	*	1		1640	201	0.	1.4	2389.0
1		0005	2	0.	1.4	2389.0	*	1		0825	102	0.	1.4	2389.0	*	1		1645	202	0.	1.4	2389.0
1		0010	3	0.	1.4	2389.0	*	1		0830	103	0.	1.4	2389.0	*	1		1650	203	0.	1.4	2389.0

1	0015	4	0.	1.4	2389.0	*	1	0835	104	0.	1.4	2389.0	*	1	1655	204	0.	1.4	2389.0				
1	0020	5	0.	1.4	2389.0	*	1	0840	105	0.	1.4	2389.0	*	1	1700	205	0.	1.4	2389.0				
1	0025	6	0.	1.4	2389.0	*	1	0845	106	0.	1.4	2389.0	*	1	1705	206	0.	1.4	2389.0				
1	0030	7	1.	1.4	2389.0	*	1	0850	107	0.	1.4	2389.0	*	1	1710	207	0.	1.4	2389.0				
1	0035	8	1.	1.4	2389.0	*	1	0855	108	0.	1.4	2389.0	*	1	1715	208	0.	1.4	2389.0				
1	0040	9	1.	1.4	2389.0	*	1	0900	109	0.	1.4	2389.0	*	1	1720	209	0.	1.4	2389.0				
1	0045	10	1.	1.4	2389.0	*	1	0905	110	0.	1.4	2389.0	*	1	1725	210	0.	1.4	2389.0				
1	0050	11	1.	1.4	2389.0	*	1	0910	111	0.	1.4	2389.0	*	1	1730	211	0.	1.4	2389.0				
1	0055	12	1.	1.4	2389.0	*	1	0915	112	0.	1.4	2389.0	*	1	1735	212	0.	1.4	2389.0				
1	0100	13	1.	1.4	2389.0	*	1	0920	113	0.	1.4	2389.0	*	1	1740	213	0.	1.4	2389.0				
1	0105	14	1.	1.4	2389.0	*	1	0925	114	0.	1.4	2389.0	*	1	1745	214	0.	1.4	2389.0				
1	0110	15	1.	1.4	2389.0	*	1	0930	115	0.	1.4	2389.0	*	1	1750	215	0.	1.4	2389.0				
1	0115	16	1.	1.4	2389.0	*	1	0935	116	0.	1.4	2389.0	*	1	1755	216	0.	1.4	2389.0				
1	0120	17	1.	1.4	2389.0	*	1	0940	117	0.	1.4	2389.0	*	1	1800	217	0.	1.4	2389.0				
1	0125	18	1.	1.4	2389.0	*	1	0945	118	0.	1.4	2389.0	*	1	1805	218	0.	1.4	2389.0				
1	0130	19	1.	1.4	2389.0	*	1	0950	119	0.	1.4	2389.0	*	1	1810	219	0.	1.4	2389.0				
1	0135	20	1.	1.4	2389.0	*	1	0955	120	0.	1.4	2389.0	*	1	1815	220	0.	1.4	2389.0				
1	0140	21	2.	1.5	2389.0	*	1	1000	121	0.	1.4	2389.0	*	1	1820	221	0.	1.4	2389.0				
1	0145	22	2.	1.5	2389.0	*	1	1005	122	0.	1.4	2389.0	*	1	1825	222	0.	1.4	2389.0				
1	0150	23	2.	1.5	2389.0	*	1	1010	123	0.	1.4	2389.0	*	1	1830	223	0.	1.4	2389.0				
1	0155	24	2.	1.5	2389.0	*	1	1015	124	0.	1.4	2389.0	*	1	1835	224	0.	1.4	2389.0				
1	0200	25	2.	1.5	2389.0	*	1	1020	125	0.	1.4	2389.0	*	1	1840	225	0.	1.4	2389.0				
1	0205	26	2.	1.5	2389.0	*	1	1025	126	0.	1.4	2389.0	*	1	1845	226	0.	1.4	2389.0				
1	0210	27	1.	1.4	2389.0	*	1	1030	127	0.	1.4	2389.0	*	1	1850	227	0.	1.4	2389.0				
1	0215	28	1.	1.5	2389.0	*	1	1035	128	0.	1.4	2389.0	*	1	1855	228	0.	1.4	2389.0				
1	0220	29	2.	1.5	2389.0	*	1	1040	129	0.	1.4	2389.0	*	1	1900	229	0.	1.4	2389.0				
1	0225	30	2.	1.5	2389.0	*	1	1045	130	0.	1.4	2389.0	*	1	1905	230	0.	1.4	2389.0				
1	0230	31	2.	1.5	2389.0	*	1	1050	131	0.	1.4	2389.0	*	1	1910	231	0.	1.4	2389.0				
1	0235	32	3.	1.5	2389.0	*	1	1055	132	0.	1.4	2389.0	*	1	1915	232	0.	1.4	2389.0				
1	0240	33	3.	1.5	2389.0	*	1	1100	133	0.	1.4	2389.0	*	1	1920	233	0.	1.4	2389.0				
1	0245	34	3.	1.5	2389.0	*	1	1105	134	0.	1.4	2389.0	*	1	1925	234	0.	1.4	2389.0				
1	0250	35	3.	1.5	2389.0	*	1	1110	135	0.	1.4	2389.0	*	1	1930	235	0.	1.4	2389.0				
1	0255	36	3.	1.5	2389.0	*	1	1115	136	0.	1.4	2389.0	*	1	1935	236	0.	1.4	2389.0				
1	0300	37	3.	1.5	2389.0	*	1	1120	137	0.	1.4	2389.0	*	1	1940	237	0.	1.4	2389.0				
1	0305	38	3.	1.5	2389.0	*	1	1125	138	0.	1.4	2389.0	*	1	1945	238	0.	1.4	2389.0				
1	0310	39	4.	1.5	2389.1	*	1	1130	139	0.	1.4	2389.0	*	1	1950	239	0.	1.4	2389.0				
1	0315	40	6.	1.6	2389.1	*	1	1135	140	0.	1.4	2389.0	*	1	1955	240	0.	1.4	2389.0				
1	0320	41	11.	1.7	2389.2	*	1	1140	141	0.	1.4	2389.0	*	1	2000	241	0.	1.4	2389.0				
1	0325	42	20.	2.0	2389.3	*	1	1145	142	0.	1.4	2389.0	*	1	2005	242	0.	1.4	2389.0				
1	0330	43	36.	2.4	2389.6	*	1	1150	143	0.	1.4	2389.0	*	1	2010	243	0.	1.4	2389.0				
1	0335	44	58.	3.0	2389.9	*	1	1155	144	0.	1.4	2389.0	*	1	2015	244	0.	1.4	2389.0				
1	0340	45	70.	3.7	2390.2	*	1	1200	145	0.	1.4	2389.0	*	1	2020	245	0.	1.4	2389.0				
1	0345	46	77.	4.3	2390.4	*	1	1205	146	0.	1.4	2389.0	*	1	2025	246	0.	1.4	2389.0				
1	0350	47	83.	4.8	2390.6	*	1	1210	147	0.	1.4	2389.0	*	1	2030	247	0.	1.4	2389.0				
1	0355	48	86.	5.1	2390.8	*	1	1215	148	0.	1.4	2389.0	*	1	2035	248	0.	1.4	2389.0				
1	0400	49	88.	5.2	2390.8	*	1	1220	149	0.	1.4	2389.0	*	1	2040	249	0.	1.4	2389.0				
1	0405	50	88.	5.2	2390.8	*	1	1225	150	0.	1.4	2389.0	*	1	2045	250	0.	1.4	2389.0				
1	0410	51	86.	5.1	2390.8	*	1	1230	151	0.	1.4	2389.0	*	1	2050	251	0.	1.4	2389.0				
1	0415	52	84.	4.9	2390.7	*	1	1235	152	0.	1.4	2389.0	*	1	2055	252	0.	1.4	2389.0				
1	0420	53	81.	4.7	2390.6	*	1	1240	153	0.	1.4	2389.0	*	1	2100	253	0.	1.4	2389.0				
1	0425	54	78.	4.4	2390.5	*	1	1245	154	0.	1.4	2389.0	*	1	2105	254	0.	1.4	2389.0				
1	0430	55	76.	4.2	2390.4	*	1	1250	155	0.	1.4	2389.0	*	1	2110	255	0.	1.4	2389.0				
1	0435	56	73.	3.9	2390.3	*	1	1255	156	0.	1.4	2389.0	*	1	2115	256	0.	1.4	2389.0				
1	0440	57	71.	3.8	2390.2	*	1	1300	157	0.	1.4	2389.0	*	1	2120	257	0.	1.4	2389.0				
1	0445	58	70.	3.7	2390.2	*	1	1305	158	0.	1.4	2389.0	*	1	2125	258	0.	1.4	2389.0				
1	0450	59	69.	3.5	2390.1	*	1	1310	159	0.	1.4	2389.0	*	1	2130	259	0.	1.4	2389.0				
1	0455	60	68.	3.5	2390.1	*	1	1315	160	0.	1.4	2389.0	*	1	2135	260	0.	1.4	2389.0				
1	0500	61	67.	3.4	2390.0	*	1	1320	161	0.	1.4	2389.0	*	1	2140	261	0.	1.4	2389.0				
1	0505	62	65.	3.2	2390.0	*	1	1325	162	0.	1.4	2389.0	*	1	2145	262	0.	1.4	2389.0				
1	0510	63	59.	3.1	2389.9	*	1	1330	163	0.	1.4	2389.0	*	1	2150	263	0.	1.4	2389.0				
1	0515	64	53.	2.9	2389.8	*	1	1335	164	0.	1.4	2389.0	*	1	2155	264	0.	1.4	2389.0				
1	0520	65	47.	2.7	2389.7	*	1	1340	165	0.	1.4	2389.0	*	1	2200	265	0.	1.4	2389.0				
1	0525	66	41.	2.5	2389.6	*	1	1345	166	0.	1.4	2389.0	*	1	2205	266	0.	1.4	2389.0				
1	0530	67	35.	2.4	2389.5	*	1	1350	167	0.	1.4	2389.0	*	1	2210	267	0.	1.4	2389.0				
1	0535	68	30.	2.2	2389.5	*	1	1355	168	0.	1.4	2389.0	*	1	2215	268	0.	1.4	2389.0				
1	0540	69	25.	2.1	2389.4	*	1	1400	169	0.	1.4	2389.0	*	1	2220	269	0.	1.4	2389.0				
1	0545	70	21.	2.0	2389.3	*	1	1405	170	0.	1.4	2389.0	*	1	2225	270	0.	1.4	2389.0				
1	0550	71	18.	1.9	2389.3	*	1	1410	171	0.	1.4	2389.0	*	1	2230	271	0.	1.4	2389.0				
1	0555	72	16.	1.8	2389.2	*	1	1415	172	0.	1.4	2389.0	*	1	2235	272	0.	1.4	2389.0				
1	0600	73	13.	1.8	2389.2	*	1	1420	173	0.	1.4	2389.0	*	1	2240	273	0.	1.4	2389.0				
1	0605	74	12.	1.7	2389.2	*	1	1425	174	0.	1.4	2389.0	*	1	2245	274	0.	1.4	2389.0				
1	0610	75	10.	1.7	2389.2	*	1	1430	175	0.	1.4	2389.0	*	1	2250	275	0.	1.4	2389.0				
1	0615	76	8.	1.6	2389.1	*	1	1435	176	0.	1.4	2389.0	*	1	2255	276	0.	1.4	2389.0				
1	0620	77	7.	1.6	2389.1	*	1	1440	177	0.	1.4	2389.0	*	1	2300	277	0.	1.4	2389.0				
1	0625	78	6.	1.6	2389.1	*	1	1445	178	0.	1.4	2389.0	*	1	2305	278	0.	1.4	2389.0				
1	0630	79	5.	1.5	2389.1	*	1	1450	179	0.	1.4	2389.0	*	1	2310	279	0.	1.4	2389.0				
1	0635	80	4.	1.5	2389.1	*	1	1455	180	0.	1.4	2389.0	*	1	2315	280	0.	1.4	2389.0				
1	0640	81	3.	1.5	2389.0	*	1	1500	181	0.	1.4	2389.0	*	1	2320	281	0.	1.4	2389.0				
1	0645	82	2.	1.5	2389.0	*	1	1505	182	0.	1.4	2389.0	*	1	2325	282	0.	1.4	2389.0				
1	0650	83	2.	1.5	2389.0	*	1	1510	183	0.	1.4	2389.0	*	1	2330	283	0.	1.4	2389.0				
1	0655	84	2.	1.5	2389.0	*	1	1515	184	0.	1.4	2389.0	*	1	2335	284	0.	1.4	2389.0				

1	0700	85	1.	1.4	2389.0	*	1	1520	185	0.	1.4	2389.0	*	1	2340	285	0.	1.4	2389.0
1	0705	86	1.	1.4	2389.0	*	1	1525	186	0.	1.4	2389.0	*	1	2345	286	0.	1.4	2389.0
1	0710	87	1.	1.4	2389.0	*	1	1530	187	0.	1.4	2389.0	*	1	2350	287	0.	1.4	2389.0
1	0715	88	1.	1.4	2389.0	*	1	1535	188	0.	1.4	2389.0	*	1	2355	288	0.	1.4	2389.0
1	0720	89	0.	1.4	2389.0	*	1	1540	189	0.	1.4	2389.0	*	2	0000	289	0.	1.4	2389.0
1	0725	90	0.	1.4	2389.0	*	1	1545	190	0.	1.4	2389.0	*	2	0005	290	0.	1.4	2389.0
1	0730	91	0.	1.4	2389.0	*	1	1550	191	0.	1.4	2389.0	*	2	0010	291	0.	1.4	2389.0
1	0735	92	0.	1.4	2389.0	*	1	1555	192	0.	1.4	2389.0	*	2	0015	292	0.	1.4	2389.0
1	0740	93	0.	1.4	2389.0	*	1	1600	193	0.	1.4	2389.0	*	2	0020	293	0.	1.4	2389.0
1	0745	94	0.	1.4	2389.0	*	1	1605	194	0.	1.4	2389.0	*	2	0025	294	0.	1.4	2389.0
1	0750	95	0.	1.4	2389.0	*	1	1610	195	0.	1.4	2389.0	*	2	0030	295	0.	1.4	2389.0
1	0755	96	0.	1.4	2389.0	*	1	1615	196	0.	1.4	2389.0	*	2	0035	296	0.	1.4	2389.0
1	0800	97	0.	1.4	2389.0	*	1	1620	197	0.	1.4	2389.0	*	2	0040	297	0.	1.4	2389.0
1	0805	98	0.	1.4	2389.0	*	1	1625	198	0.	1.4	2389.0	*	2	0045	298	0.	1.4	2389.0
1	0810	99	0.	1.4	2389.0	*	1	1630	199	0.	1.4	2389.0	*	2	0050	299	0.	1.4	2389.0
1	0815	100	0.	1.4	2389.0	*	1	1635	200	0.	1.4	2389.0	*	2	0055	300	0.	1.4	2389.0

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 88.	4.08		28.	7.	7.	7.
		(INCHES)	.406	.409	.409	.409
		(AC-FT)	14.	14.	14.	14.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
5.	4.08	2.	2.	2.	2.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
2390.81	4.08	2389.48	2389.12	2389.12	2389.12

CUMULATIVE AREA = .63 SQ MI

HYDROGRAPH AT STATION ELKBASIN
PLAN 1, RATIO = .97

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	1.4	2389.0	*	1		0820	101	0.	1.4	2389.0	*	1		1640	201	0.	1.4	2389.0
1		0005	2	0.	1.4	2389.0	*	1		0825	102	0.	1.4	2389.0	*	1		1645	202	0.	1.4	2389.0
1		0010	3	0.	1.4	2389.0	*	1		0830	103	0.	1.4	2389.0	*	1		1650	203	0.	1.4	2389.0
1		0015	4	0.	1.4	2389.0	*	1		0835	104	0.	1.4	2389.0	*	1		1655	204	0.	1.4	2389.0
1		0020	5	0.	1.4	2389.0	*	1		0840	105	0.	1.4	2389.0	*	1		1700	205	0.	1.4	2389.0
1		0025	6	0.	1.4	2389.0	*	1		0845	106	0.	1.4	2389.0	*	1		1705	206	0.	1.4	2389.0
1		0030	7	1.	1.4	2389.0	*	1		0850	107	0.	1.4	2389.0	*	1		1710	207	0.	1.4	2389.0
1		0035	8	1.	1.4	2389.0	*	1		0855	108	0.	1.4	2389.0	*	1		1715	208	0.	1.4	2389.0
1		0040	9	1.	1.4	2389.0	*	1		0900	109	0.	1.4	2389.0	*	1		1720	209	0.	1.4	2389.0
1		0045	10	1.	1.4	2389.0	*	1		0905	110	0.	1.4	2389.0	*	1		1725	210	0.	1.4	2389.0
1		0050	11	1.	1.4	2389.0	*	1		0910	111	0.	1.4	2389.0	*	1		1730	211	0.	1.4	2389.0
1		0055	12	1.	1.4	2389.0	*	1		0915	112	0.	1.4	2389.0	*	1		1735	212	0.	1.4	2389.0
1		0100	13	1.	1.4	2389.0	*	1		0920	113	0.	1.4	2389.0	*	1		1740	213	0.	1.4	2389.0
1		0105	14	1.	1.4	2389.0	*	1		0925	114	0.	1.4	2389.0	*	1		1745	214	0.	1.4	2389.0
1		0110	15	1.	1.4	2389.0	*	1		0930	115	0.	1.4	2389.0	*	1		1750	215	0.	1.4	2389.0
1		0115	16	1.	1.4	2389.0	*	1		0935	116	0.	1.4	2389.0	*	1		1755	216	0.	1.4	2389.0
1		0120	17	1.	1.4	2389.0	*	1		0940	117	0.	1.4	2389.0	*	1		1800	217	0.	1.4	2389.0
1		0125	18	1.	1.4	2389.0	*	1		0945	118	0.	1.4	2389.0	*	1		1805	218	0.	1.4	2389.0
1		0130	19	1.	1.4	2389.0	*	1		0950	119	0.	1.4	2389.0	*	1		1810	219	0.	1.4	2389.0
1		0135	20	1.	1.4	2389.0	*	1		0955	120	0.	1.4	2389.0	*	1		1815	220	0.	1.4	2389.0
1		0140	21	2.	1.5	2389.0	*	1		1000	121	0.	1.4	2389.0	*	1		1820	221	0.	1.4	2389.0
1		0145	22	2.	1.5	2389.0	*	1		1005	122	0.	1.4	2389.0	*	1		1825	222	0.	1.4	2389.0
1		0150	23	2.	1.5	2389.0	*	1		1010	123	0.	1.4	2389.0	*	1		1830	223	0.	1.4	2389.0
1		0155	24	2.	1.5	2389.0	*	1		1015	124	0.	1.4	2389.0	*	1		1835	224	0.	1.4	2389.0
1		0200	25	2.	1.5	2389.0	*	1		1020	125	0.	1.4	2389.0	*	1		1840	225	0.	1.4	2389.0
1		0205	26	2.	1.5	2389.0	*	1		1025	126	0.	1.4	2389.0	*	1		1845	226	0.	1.4	2389.0
1		0210	27	1.	1.4	2389.0	*	1		1030	127	0.	1.4	2389.0	*	1		1850	227	0.	1.4	2389.0
1		0215	28	1.	1.5	2389.0	*	1		1035	128	0.	1.4	2389.0	*	1		1855	228	0.	1.4	2389.0
1		0220	29	2.	1.5	2389.0	*	1		1040	129	0.	1.4	2389.0	*	1		1900	229	0.	1.4	2389.0
1		0225	30	2.	1.5	2389.0	*	1		1045	130	0.	1.4	2389.0	*	1		1905	230	0.	1.4	2389.0
1		0230	31	2.	1.5	2389.0	*	1		1050	131	0.	1.4	2389.0	*	1		1910	231	0.	1.4	2389.0
1		0235	32	2.	1.5	2389.0	*	1		1055	132	0.	1.4	2389.0	*	1		1915	232	0.	1.4	2389.0

1	0240	33	2.	1.5	2389.0	*	1	1100	133	0.	1.4	2389.0	*	1	1920	233	0.	1.4	2389.0
1	0245	34	3.	1.5	2389.0	*	1	1105	134	0.	1.4	2389.0	*	1	1925	234	0.	1.4	2389.0
1	0250	35	3.	1.5	2389.0	*	1	1110	135	0.	1.4	2389.0	*	1	1930	235	0.	1.4	2389.0
1	0255	36	3.	1.5	2389.0	*	1	1115	136	0.	1.4	2389.0	*	1	1935	236	0.	1.4	2389.0
1	0300	37	3.	1.5	2389.0	*	1	1120	137	0.	1.4	2389.0	*	1	1940	237	0.	1.4	2389.0
1	0305	38	3.	1.5	2389.0	*	1	1125	138	0.	1.4	2389.0	*	1	1945	238	0.	1.4	2389.0
1	0310	39	4.	1.5	2389.1	*	1	1130	139	0.	1.4	2389.0	*	1	1950	239	0.	1.4	2389.0
1	0315	40	6.	1.6	2389.1	*	1	1135	140	0.	1.4	2389.0	*	1	1955	240	0.	1.4	2389.0
1	0320	41	11.	1.7	2389.2	*	1	1140	141	0.	1.4	2389.0	*	1	2000	241	0.	1.4	2389.0
1	0325	42	20.	2.0	2389.3	*	1	1145	142	0.	1.4	2389.0	*	1	2005	242	0.	1.4	2389.0
1	0330	43	36.	2.4	2389.5	*	1	1150	143	0.	1.4	2389.0	*	1	2010	243	0.	1.4	2389.0
1	0335	44	57.	3.0	2389.9	*	1	1155	144	0.	1.4	2389.0	*	1	2015	244	0.	1.4	2389.0
1	0340	45	70.	3.7	2390.2	*	1	1200	145	0.	1.4	2389.0	*	1	2020	245	0.	1.4	2389.0
1	0345	46	77.	4.3	2390.4	*	1	1205	146	0.	1.4	2389.0	*	1	2025	246	0.	1.4	2389.0
1	0350	47	82.	4.7	2390.6	*	1	1210	147	0.	1.4	2389.0	*	1	2030	247	0.	1.4	2389.0
1	0355	48	85.	5.0	2390.7	*	1	1215	148	0.	1.4	2389.0	*	1	2035	248	0.	1.4	2389.0
1	0400	49	87.	5.2	2390.8	*	1	1220	149	0.	1.4	2389.0	*	1	2040	249	0.	1.4	2389.0
1	0405	50	87.	5.2	2390.8	*	1	1225	150	0.	1.4	2389.0	*	1	2045	250	0.	1.4	2389.0
1	0410	51	86.	5.1	2390.7	*	1	1230	151	0.	1.4	2389.0	*	1	2050	251	0.	1.4	2389.0
1	0415	52	84.	4.9	2390.7	*	1	1235	152	0.	1.4	2389.0	*	1	2055	252	0.	1.4	2389.0
1	0420	53	81.	4.6	2390.6	*	1	1240	153	0.	1.4	2389.0	*	1	2100	253	0.	1.4	2389.0
1	0425	54	78.	4.4	2390.5	*	1	1245	154	0.	1.4	2389.0	*	1	2105	254	0.	1.4	2389.0
1	0430	55	75.	4.1	2390.3	*	1	1250	155	0.	1.4	2389.0	*	1	2110	255	0.	1.4	2389.0
1	0435	56	73.	3.9	2390.3	*	1	1255	156	0.	1.4	2389.0	*	1	2115	256	0.	1.4	2389.0
1	0440	57	71.	3.7	2390.2	*	1	1300	157	0.	1.4	2389.0	*	1	2120	257	0.	1.4	2389.0
1	0445	58	70.	3.6	2390.1	*	1	1305	158	0.	1.4	2389.0	*	1	2125	258	0.	1.4	2389.0
1	0450	59	68.	3.5	2390.1	*	1	1310	159	0.	1.4	2389.0	*	1	2130	259	0.	1.4	2389.0
1	0455	60	67.	3.4	2390.1	*	1	1315	160	0.	1.4	2389.0	*	1	2135	260	0.	1.4	2389.0
1	0500	61	66.	3.3	2390.0	*	1	1320	161	0.	1.4	2389.0	*	1	2140	261	0.	1.4	2389.0
1	0505	62	64.	3.2	2390.0	*	1	1325	162	0.	1.4	2389.0	*	1	2145	262	0.	1.4	2389.0
1	0510	63	58.	3.0	2389.9	*	1	1330	163	0.	1.4	2389.0	*	1	2150	263	0.	1.4	2389.0
1	0515	64	52.	2.9	2389.8	*	1	1335	164	0.	1.4	2389.0	*	1	2155	264	0.	1.4	2389.0
1	0520	65	46.	2.7	2389.7	*	1	1340	165	0.	1.4	2389.0	*	1	2200	265	0.	1.4	2389.0
1	0525	66	40.	2.5	2389.6	*	1	1345	166	0.	1.4	2389.0	*	1	2205	266	0.	1.4	2389.0
1	0530	67	34.	2.4	2389.5	*	1	1350	167	0.	1.4	2389.0	*	1	2210	267	0.	1.4	2389.0
1	0535	68	29.	2.2	2389.4	*	1	1355	168	0.	1.4	2389.0	*	1	2215	268	0.	1.4	2389.0
1	0540	69	25.	2.1	2389.4	*	1	1400	169	0.	1.4	2389.0	*	1	2220	269	0.	1.4	2389.0
1	0545	70	21.	2.0	2389.3	*	1	1405	170	0.	1.4	2389.0	*	1	2225	270	0.	1.4	2389.0
1	0550	71	18.	1.9	2389.3	*	1	1410	171	0.	1.4	2389.0	*	1	2230	271	0.	1.4	2389.0
1	0555	72	15.	1.8	2389.2	*	1	1415	172	0.	1.4	2389.0	*	1	2235	272	0.	1.4	2389.0
1	0600	73	13.	1.8	2389.2	*	1	1420	173	0.	1.4	2389.0	*	1	2240	273	0.	1.4	2389.0
1	0605	74	11.	1.7	2389.2	*	1	1425	174	0.	1.4	2389.0	*	1	2245	274	0.	1.4	2389.0
1	0610	75	10.	1.7	2389.1	*	1	1430	175	0.	1.4	2389.0	*	1	2250	275	0.	1.4	2389.0
1	0615	76	8.	1.6	2389.1	*	1	1435	176	0.	1.4	2389.0	*	1	2255	276	0.	1.4	2389.0
1	0620	77	7.	1.6	2389.1	*	1	1440	177	0.	1.4	2389.0	*	1	2300	277	0.	1.4	2389.0
1	0625	78	6.	1.6	2389.1	*	1	1445	178	0.	1.4	2389.0	*	1	2305	278	0.	1.4	2389.0
1	0630	79	5.	1.5	2389.1	*	1	1450	179	0.	1.4	2389.0	*	1	2310	279	0.	1.4	2389.0
1	0635	80	4.	1.5	2389.1	*	1	1455	180	0.	1.4	2389.0	*	1	2315	280	0.	1.4	2389.0
1	0640	81	3.	1.5	2389.0	*	1	1500	181	0.	1.4	2389.0	*	1	2320	281	0.	1.4	2389.0
1	0645	82	2.	1.5	2389.0	*	1	1505	182	0.	1.4	2389.0	*	1	2325	282	0.	1.4	2389.0
1	0650	83	2.	1.5	2389.0	*	1	1510	183	0.	1.4	2389.0	*	1	2330	283	0.	1.4	2389.0
1	0655	84	2.	1.5	2389.0	*	1	1515	184	0.	1.4	2389.0	*	1	2335	284	0.	1.4	2389.0
1	0700	85	1.	1.4	2389.0	*	1	1520	185	0.	1.4	2389.0	*	1	2340	285	0.	1.4	2389.0
1	0705	86	1.	1.4	2389.0	*	1	1525	186	0.	1.4	2389.0	*	1	2345	286	0.	1.4	2389.0
1	0710	87	1.	1.4	2389.0	*	1	1530	187	0.	1.4	2389.0	*	1	2350	287	0.	1.4	2389.0
1	0715	88	1.	1.4	2389.0	*	1	1535	188	0.	1.4	2389.0	*	1	2355	288	0.	1.4	2389.0
1	0720	89	0.	1.4	2389.0	*	1	1540	189	0.	1.4	2389.0	*	2	0000	289	0.	1.4	2389.0
1	0725	90	0.	1.4	2389.0	*	1	1545	190	0.	1.4	2389.0	*	2	0005	290	0.	1.4	2389.0
1	0730	91	0.	1.4	2389.0	*	1	1550	191	0.	1.4	2389.0	*	2	0010	291	0.	1.4	2389.0
1	0735	92	0.	1.4	2389.0	*	1	1555	192	0.	1.4	2389.0	*	2	0015	292	0.	1.4	2389.0
1	0740	93	0.	1.4	2389.0	*	1	1600	193	0.	1.4	2389.0	*	2	0020	293	0.	1.4	2389.0
1	0745	94	0.	1.4	2389.0	*	1	1605	194	0.	1.4	2389.0	*	2	0025	294	0.	1.4	2389.0
1	0750	95	0.	1.4	2389.0	*	1	1610	195	0.	1.4	2389.0	*	2	0030	295	0.	1.4	2389.0
1	0755	96	0.	1.4	2389.0	*	1	1615	196	0.	1.4	2389.0	*	2	0035	296	0.	1.4	2389.0
1	0800	97	0.	1.4	2389.0	*	1	1620	197	0.	1.4	2389.0	*	2	0040	297	0.	1.4	2389.0
1	0805	98	0.	1.4	2389.0	*	1	1625	198	0.	1.4	2389.0	*	2	0045	298	0.	1.4	2389.0
1	0810	99	0.	1.4	2389.0	*	1	1630	199	0.	1.4	2389.0	*	2	0050	299	0.	1.4	2389.0
1	0815	100	0.	1.4	2389.0	*	1	1635	200	0.	1.4	2389.0	*	2	0055	300	0.	1.4	2389.0

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 87.	4.08		27.	7.	7.	7.
		(INCHES)	.402	.405	.405	.405
		(AC-FT)	14.	14.	14.	14.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR

+ (AC-FT)	(HR)				
5.	4.08	2.	2.	2.	2.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
2390.79	4.08	2389.47	2389.12	2389.11	2389.11

CUMULATIVE AREA = .63 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1	RATIO 2	RATIO 3
					1.00	.98	.97
HYDROGRAPH AT							
+	OFF1	.20	1	FLOW	72.	68.	68.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	FDI12	.20	1	FLOW	49.	47.	46.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	DIV1FD	.20	1	FLOW	23.	22.	22.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	CIM1	.20	1	FLOW	5.	5.	5.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	SPLIT1	.20	1	FLOW	18.	17.	17.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	FDI345	.20	1	FLOW	18.	17.	17.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	DIV2FD	.20	1	FLOW	0.	0.	0.
				TIME	.00	.00	.00
HYDROGRAPH AT							
+	OFF4	.03	1	FLOW	11.	10.	10.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP1	.23	1	FLOW	11.	10.	10.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	FDI12	.00	1	FLOW	49.	47.	46.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	FDI345	.00	1	FLOW	18.	17.	17.
				TIME	3.75	3.75	3.75
2 COMBINED AT							
+	CP2	.00	1	FLOW	67.	64.	63.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF5	.05	1	FLOW	19.	18.	18.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	OFF3	.17	1	FLOW	44.	42.	41.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	CIM1	.00	1	FLOW	5.	5.	5.
				TIME	3.75	3.75	3.75

2 COMBINED AT							
+	CP4	.17	1	FLOW	49.	46.	46.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	CIM2	.17	1	FLOW	17.	16.	16.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	SPLIT2	.17	1	FLOW	32.	30.	30.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF6	.03	1	FLOW	8.	8.	8.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF7	.07	1	FLOW	19.	18.	17.
				TIME	3.67	3.67	3.67
3 COMBINED AT							
+	CP5	.26	1	FLOW	59.	55.	54.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF2	.18	1	FLOW	50.	48.	47.
				TIME	3.83	3.83	3.83
HYDROGRAPH AT							
+	CIM2	.00	1	FLOW	17.	16.	16.
				TIME	3.75	3.75	3.75
2 COMBINED AT							
+	CP6	.18	1	FLOW	67.	63.	62.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	CIM3	.18	1	FLOW	16.	15.	15.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	SPLIT3	.18	1	FLOW	51.	48.	48.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF8	.03	1	FLOW	10.	9.	9.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP7	.21	1	FLOW	57.	54.	53.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF9	.03	1	FLOW	28.	28.	27.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP8	.24	1	FLOW	77.	73.	73.
				TIME	3.67	3.67	3.67
DIVERSION TO							
+	BUFF1	.24	1	FLOW	2.	2.	2.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	DIV3E123	.24	1	FLOW	75.	71.	71.
				TIME	3.67	3.67	3.67
2 COMBINED AT							
+	CP9	.50	1	FLOW	134.	126.	125.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	BUFF1	.00	1	FLOW	2.	2.	2.
				TIME	3.67	3.67	3.67
DIVERSION TO							
+	BUFF2	.00	1	FLOW	1.	1.	1.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							

+	SPLIT4	.00	1	FLOW	1.	1.	1.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF11	.07	1	FLOW	19.	18.	18.
				TIME	3.67	3.67	3.67
2 COMBINED AT							
+	CP10	.07	1	FLOW	20.	18.	18.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF10	.03	1	FLOW	10.	9.	9.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF12	.02	1	FLOW	13.	12.	12.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ON-1	.02	1	FLOW	4.	4.	4.
				TIME	3.67	3.67	3.67
5 COMBINED AT							
+	CP11	.63	1	FLOW	176.	166.	164.
				TIME	3.67	3.67	3.67
ROUTED TO							
+	ELKBASIN	.63	1	FLOW	91.	88.	87.
				TIME	4.08	4.08	4.08

** PEAK STAGES IN FEET **

1	STAGE	2390.93	2390.81	2390.79
	TIME	4.08	4.08	4.08

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

EXITING CONDITION HEC-1
100-YEAR STORM EVENT

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JAN   1997              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   27JUN08  TIME  09:00:20   *
*                                       *
*****************************************
```

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


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

                    *DIAGRAM
 *** FREE ***
               1    ID   ********************************************************************
               2    ID   * ---------------------------------------------------------------- *
               3    ID   * |                                                              | *
               4    ID   * |   ELKHORN SPRINGS AND BUFFALO DRIVE STORM DRAIN              | *
               5    ID   * |                  CITY OF LAS VEGAS                           | *
               6    ID   * |                 EXISTING CONDITIONS                          | *
               7    ID   * |                                                              | *
               8    ID   * |..............................................................| *
               9    ID   * |                                                              | *
              10    ID   * |         CLIENT-------------CITY OF LAS VEGAS                 | *
              11    ID   * |         RETURN PERIOD-------100-YEAR                         | *
              12    ID   * |         DISTRIBUTUION-------6-HOUR SDN3                      | *
              13    ID   * |         PROJECT NO----------31678A                           | *
              14    ID   * |         FILENAME------------EI-100.DAT                       | *
              15    ID   * |         REV. DATE-----------06/17/08                         | *
              16    ID   * |                                                              | *
              17    ID   * |..............................................................| *
              18    ID   * |                                                              | *
              19    ID   * |          .          AREA     DARF                            | *
              20    ID   * |                    (sq.mi.)                                  | *
              21    ID   * |                  0.00-0.50  1.000                            | *
              22    ID   * |                  0.50-0.75  0.975                            | *
              23    ID   * |                  0.75-1.00  0.970                            | *
              24    ID   * |                                                              | *
              25    ID   * |  MODELED BY: Parsons Brinckerhoff                            | *
              26    ID   * ---------------------------------------------------------------- *
              27    ID   ********************************************************************
              28    ID
              29    ID
              30    IT       5       0       0     300
              31    IO       5       0       0
              32    IN       5       0       0
              33    JR    PREC    1.00   0.975   0.970
                    *
              34    KK    OFF1
              35    BA  0.1973
              36    PB    2.52
              37    PC   0.000   0.020   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
              38    PC   0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
              39    PC   0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
```

Min 2.86 for area Outside McCallan

```
 40          PC   0.251  0.256  0.270  0.278  0.281  0.283  0.295  0.322  0.352  0.409
 41          PC   0.499  0.590  0.710  0.744  0.781  0.812  0.819  0.835  0.851  0.856
 42          PC   0.860  0.868  0.876  0.888  0.910  0.926  0.937  0.950  0.970  0.976
 43          PC   0.982  0.985  0.987  0.989  0.990  0.993  0.993  0.994  0.995  0.998
 44          PC   0.998  0.999  1.000
 45          LS       0  88.14
 46          UD   0.292
             *
```



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

 47          KK  DIV1FD
 48          KM   DIVERT FLOWS INTO DROP INLETS FDI-1 & FDI-2 LOCATED NWC OF FARM ROAD
 49          KM   AND CIMARRON ROAD
 50          DT   FDI12
 51          DI       0     100     179
 52          DQ       0    48.0      85
             *

 53          KK  SPLIT1
 54          KM   FLOW SPLIT ON CIMARRON ROAD AND FARM ROAD
 55          DT    CIM1
 56          DI       0      50      94
 57          DQ       0    22.3      42
             *

 58          KK  DIV2FD
 59          KM   DIVERT FLOWS INTO DROP INLETS FDI-3,FDI-4 & FDI-5 LOCATED ON FARM ROAD
 60          KM   BETWEEN CIMARRON ROAD & PALM GROVE
 61          DT  FDI345
 62          DI       0      52
 63          DQ       0      47
             *

 64          KK   OFF4
 65          BA  0.0308
 66          PB   2.77
 67          LS       0   82.00
 68          UD   0.112
             *

 69          KK     CP1
 70          KM   COMBINE OFF4 AND BY PASS FLOW FROM INLETS ON FARM ROAD
 71          HC       2
             *

 72          KK   FDI12
 73          KM   RECALL FLOW COLLECTED BY EXISTING STORM DRIAN SYSTEM(PLUGGED)ON FARM ROAD
 74          KM   WEST OF CIMARRON ROAD
 75          DR   FDI12
             *

 76          KK  FDI345
 77          KM   RECALL FLOW COLLECTED BY EXISTING STORM DRIAN SYSTEM(PLUGGED)ON FARM ROAD
 78          KM   BETWEEN CIMARRON ROAD AND PALM GROOVE LANE
 79          DR  FDI345
             *

 80          KK     CP2
 81          KM   COMBINE FD12 AND FD345 TO CALCULATED FLOW COLLECTED BY THE EXISTING
 82          KM   STORM DRAIN SYSTEM ON FARM ROAD (CURRENTLY PLUGGED)
 83          HC       2
             *
```



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

 84          KK   OFF5
 85          KM   SUBBASIN OFF5
 86          BA  0.0549
 87          LS       0   82.00
 88          UD   0.132
             *

 89          KK    OFF3
 90          KM   SUBBASIN OFF3
 91          BA   0.165
 92          LS       0   82.02
```

```
 93          UD   0.246
             *

 94          KK    CIM1
 95          KM   RECALL FLOW SPLIT AT CIMMARON AND FARM ROAD ON CIMARRON ROAD
 96          DR    CIM1
             *

 97          KK     CP4
 98          KM   COMBINE OFF3 AND CIM1
 99          HC       2
             *

100          KK  SPLIT2
101          KM   FLOW SPLIT ON CIMARRON ROAD AND SUNNY SPRINGS LANE
102          DT    CIM2
103          DI       0     100     182
104          DQ       0    40.6      74
             *

105          KK    OFF6
106          KM   SUBBASIN OFF6
107          BA  0.0287
108          LS       0   82.05
109          UD   0.223
             *

110          KK    OFF7
111          KM   SUBBASIN OFF7
112          BA  0.0667
113          LS       0   81.98
114          UD   0.219
             *

115          KK     CP5
116          KM   COMBINE OFF6,OFF7 AND REMAINING FLOW IN SUNNY SPRINGS LANE AFTER FLOW SPLIT
117          HC       3
             *
```



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

118          KK    OFF2
119          KM   SUBBASIN OFF2
120          BA  0.1786
121          PB    2.26
122          LS       0   87.44
123          UD   0.343
             *

124          KK    CIM2
125          KM   RECALL FLOW SPLIT AT CIMMARON AND SUNNY SPRINGS LANE ON CIMARRON ROAD
126          DR    CIM2
             *

127          KK     CP6
128          KM   COMBINE OFF2 & CIM2
129          HC       2
             *

130          KK  SPLIT3
131          KM   FLOW SPLIT ON CIMARRON ROAD AND ELKHORN ROAD
132          DT    CIM3
133          DI       0      50     195
134          DQ       0    15.3      60
             *

135          KK    OFF8
136          KM   SUBBASIN OFF8
137          BA  0.0282
138          PB    2.77
139          LS       0   81.79
140          UD   0.107
             *

141          KK     CP7
142          KM   COMBINE OFF8 AND REMAINING FLOW IN ELKHORN ROAD
143          HC       2
             *
```

Min 2.86

```
 144          KK    OFF9
 145          BA  0.0285
 146          LS       0   97.46
 147          UD   0.149
              *

 148          KK     CP8
 149          KM   COMBINE OFF8,OFF9 AND REMAINING FLOW IN ELKHORN ROAD
 150          HC       2
              *
```



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

 151          KKDIV3E123
 152          KM   DIVERT FLOWS TO EXISTIGN DIs IN ELKHORN ROAD (6 DIs TOTAL)
 153          DT   BUFF1
 154          DI       0      50     193
 155          DQ       0    22.8      48
              *

 156          KK     CP9
 157          KM   COMBINE CP5 AND FLOW INTERCEPTED BY DIs IN ELKHORN ROAD
 158          HC       2
              *

 159          KK   BUFF1
 160          KM   RECALL FLOW BYPASSED BY DROP INLETS IN ELKHORN ROAD
 161          DR   BUFF1
              *

 162          KK  SPLIT4
 163          KM   FLOW SPLIT AT ELKHORN ROAD AND BUFFALO DRIVE
 164          DT   BUFF2
 165          DI       0      48
 166          DQ       0      32
              *

 167          KK   OFF11
 168          KM   SUBBASIN OFF11
 169          BA  0.0655
 170          LS       0   81.95
 171          UD   0.209
              *

 172          KK    CP10
 173          KM   COMBINE BUFF1 & BUFF2
 174          HC       2
              *

 175          KK   OFF10
 176          KM   SUBBASIN OFF10
 177          BA  0.0334
 178          LS       0   82.18
 179          UD   0.214
              *

 180          KK   OFF12
 181          KM   SUBBASIN OFF12
 182          BA  0.0156
 183          LS       0   92.92
 184          UD   0.106
              *
```



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

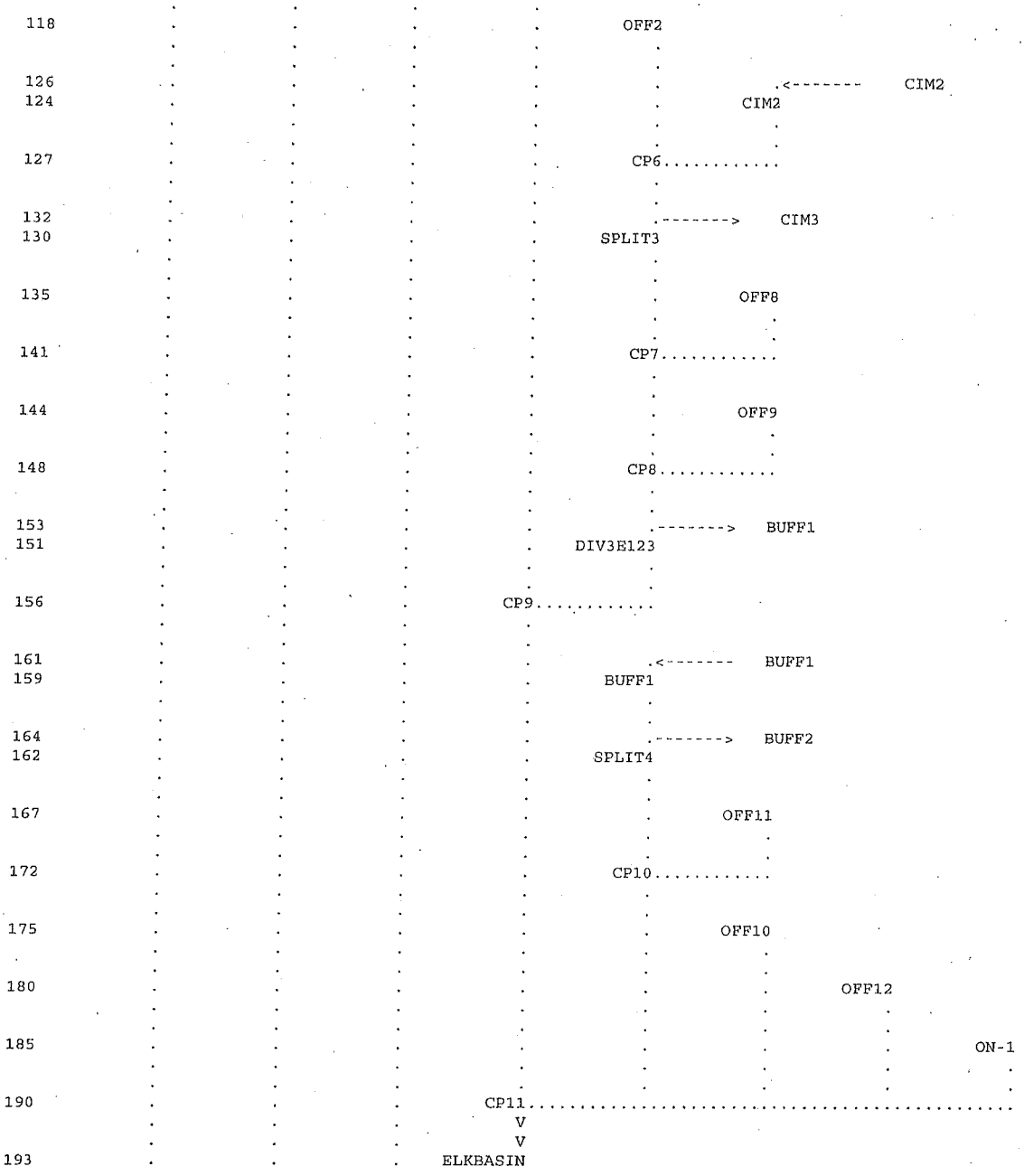
 185          KK    ON-1
 186          KM   ON SITE SUBBASIN
 187          BA  0.0194
 188          LS       0   78.82
 189          UD   0.191
              *

 190          KK    CP11
 191          KM   COMBINE OFF12,OFF-10,CP-10,CP-9 AND ON-1
 192          HC       5
              *
```

```
193           KKELKBASIN
194           KM    FACILITY = ELKHORN SPRINGS DETENTION BASIN
195           KM    FACILITY ID-MILE = EKDB 0070
196           KM    STORAGE VOLUME = 48 ACRE-FEET
197           KM    OUTLET = 2-27 inch RCPs transition to 60" RCP
198           KM    SPILLWAY LENGTH =
199           KM    SPILLWAY HEIGHT =
              *  KO       3
200           RS       1    STOR      -1
201           SV    0.04    0.07    0.41    1.41    3.24    5.71    8.57    11.8    15.3    19.0
202           SV    22.9    27.0    31.3    35.8    40.5
203           SE    2386    2387    2388    2389    2390    2391    2392    2393    2394    2395
204           SE    2396    2397    2398    2399    2400
205           SQ       0       0       0       0    65.5    92.7  113.53   128.0   134.2   140.1
206           SQ   145.7   151.2   156.4   161.5   166.4
207           KO       1
208           ZZ
1
                    SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING           (--->) DIVERSION OR PUMP FLOW

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

    34        OFF1
                .
                .
    50          .-------->   FDI12
    47      DIV1FD
                .
                .
    55          .-------->    CIM1
    53      SPLIT1
                .
                .
    61          .-------->  FDI345
    58      DIV2FD
                .
                .
    64          .        OFF4
                .          .
                .          .
    69        CP1.............
                .
                .
    75          .           .<--------   FDI12
    72          .       FDI12
                .          .
                .          .
    79          .          .        .<--------  FDI345
    76          .          .     FDI345
                .          .          .
                .          .          .
    80          .        CP2.............
                .          .
                .          .
    84          .          .       OFF5
                .          .          .
                .          .          .
    89          .          .          .       OFF3
                .          .          .          .
                .          .          .          .
    96          .          .          .          .           .<--------    CIM1
    94          .          .          .          .       CIM1
                .          .          .          .          .
                .          .          .          .          .
    97          .          .          .        CP4.............
                .          .          .          .
                .          .          .          .
   102          .          .          .          .-------->    CIM2
   100          .          .          .      SPLIT2
                .          .          .          .
                .          .          .          .
   105          .          .          .          .       OFF6
                .          .          .          .          .
                .          .          .          .          .
   110          .          .          .          .          .       OFF7
                .          .          .          .          .          .
                .          .          .          .          .          .
   115          .          .          .        CP5.........................
                .          .          .          .
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1**********

* *
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JAN 1997 *
* VERSION 4.1 *
* *
* RUN DATE 27JUN08 TIME 09:00:20 *
* *

****

****

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

****

****

* *
* ELKHORN SPRINGS AND BUFFALO DRIVE STORM DRAIN *
* *

****

```
*  |                    CITY OF LAS VEGAS                          |  *
*  |                   EXISTING CONDITIONS                         |  *
*  |                                                               |  *
*  |...............................................................|  *
*  |                                                               |  *
*  |          CLIENT--------------CITY OF LAS VEGAS                |  *
*  |          RETURN PERIOD-------100-YEAR                         |  *
*  |          DISTRIBUTUION-------6-HOUR SDN3                      |  *
*  |          PROJECT NO----------31678A                           |  *
*  |          FILENAME------------EI-100.DAT                       |  *
*  |          REV. DATE-----------06/17/08                         |  *
*  |                                                               |  *
*  |...............................................................|  *
*  |                                                               |  *
*  |                     AREA      DARF                            |  *
*  |                    (sq.mi.)                                   |  *
*  |                  0.00-0.50  1.000                             |  *
*  |                  0.50-0.75  0.975                             |  *
*  |                  0.75-1.00  0.970                             |  *
*  |                                                               |  *
*  |  MODELED BY: Parsons Brinckerhoff                             |  *
*  ----------------------------------------------------------------  *
*****************************************************************
```

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

    IT          HYDROGRAPH TIME DATA
                       NMIN           5  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME         0000  STARTING TIME
                         NQ          300  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      2    0  ENDING DATE
                     NDTIME         0055  ENDING TIME
                     ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL      .08 HOURS
                       TOTAL TIME BASE   24.92 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

    JP          MULTI-PLAN OPTION
                      NPLAN           1  NUMBER OF PLANS

    JR          MULTI-RATIO OPTION
                    RATIOS OF PRECIPITATION
                   1.00       .98       .97
```

*** ***

```
            **************
            *            *
193 KK      *  ELKBASIN  *
            *            *
            **************

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

               HYDROGRAPH ROUTING DATA

200 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

201 SV	STORAGE	.0	.1	.4	1.4	3.2	5.7	8.6	11.8	15.3	19.0
		22.9	27.0	31.3	35.8	40.5					
203 SE	ELEVATION	2386.00	2387.00	2388.00	2389.00	2390.00	2391.00	2392.00	2393.00	2394.00	2395.00
		2396.00	2397.00	2398.00	2399.00	2400.00					
205 SQ	DISCHARGE	0.	0.	0.	0.	66.	93.	114.	128.	134.	140.
		146.	151.	156.	162.	166.					

***

HYDROGRAPH AT STATION ELKBASIN
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	1.4	2389.0	*	1		0820	101	0.	1.4	2389.0	*	1		1640	201	0.	1.4	2389.0
1		0005	2	0.	1.4	2389.0	*	1		0825	102	0.	1.4	2389.0	*	1		1645	202	0.	1.4	2389.0
1		0010	3	0.	1.4	2389.0	*	1		0830	103	0.	1.4	2389.0	*	1		1650	203	0.	1.4	2389.0
1		0015	4	0.	1.4	2389.0	*	1		0835	104	0.	1.4	2389.0	*	1		1655	204	0.	1.4	2389.0
1		0020	5	1.	1.4	2389.0	*	1		0840	105	0.	1.4	2389.0	*	1		1700	205	0.	1.4	2389.0
1		0025	6	1.	1.5	2389.0	*	1		0845	106	0.	1.4	2389.0	*	1		1705	206	0.	1.4	2389.0
1		0030	7	2.	1.5	2389.0	*	1		0850	107	0.	1.4	2389.0	*	1		1710	207	0.	1.4	2389.0
1		0035	8	3.	1.5	2389.0	*	1		0855	108	0.	1.4	2389.0	*	1		1715	208	0.	1.4	2389.0
1		0040	9	4.	1.5	2389.1	*	1		0900	109	0.	1.4	2389.0	*	1		1720	209	0.	1.4	2389.0
1		0045	10	4.	1.5	2389.1	*	1		0905	110	0.	1.4	2389.0	*	1		1725	210	0.	1.4	2389.0
1		0050	11	3.	1.5	2389.0	*	1		0910	111	0.	1.4	2389.0	*	1		1730	211	0.	1.4	2389.0
1		0055	12	3.	1.5	2389.0	*	1		0915	112	0.	1.4	2389.0	*	1		1735	212	0.	1.4	2389.0
1		0100	13	2.	1.5	2389.0	*	1		0920	113	0.	1.4	2389.0	*	1		1740	213	0.	1.4	2389.0
1		0105	14	2.	1.5	2389.0	*	1		0925	114	0.	1.4	2389.0	*	1		1745	214	0.	1.4	2389.0
1		0110	15	2.	1.5	2389.0	*	1		0930	115	0.	1.4	2389.0	*	1		1750	215	0.	1.4	2389.0
1		0115	16	2.	1.5	2389.0	*	1		0935	116	0.	1.4	2389.0	*	1		1755	216	0.	1.4	2389.0
1		0120	17	2.	1.5	2389.0	*	1		0940	117	0.	1.4	2389.0	*	1		1800	217	0.	1.4	2389.0
1		0125	18	2.	1.5	2389.0	*	1		0945	118	0.	1.4	2389.0	*	1		1805	218	0.	1.4	2389.0
1		0130	19	2.	1.5	2389.0	*	1		0950	119	0.	1.4	2389.0	*	1		1810	219	0.	1.4	2389.0
1		0135	20	3.	1.5	2389.0	*	1		0955	120	0.	1.4	2389.0	*	1		1815	220	0.	1.4	2389.0
1		0140	21	4.	1.5	2389.1	*	1		1000	121	0.	1.4	2389.0	*	1		1820	221	0.	1.4	2389.0
1		0145	22	5.	1.5	2389.1	*	1		1005	122	0.	1.4	2389.0	*	1		1825	222	0.	1.4	2389.0
1		0150	23	6.	1.6	2389.1	*	1		1010	123	0.	1.4	2389.0	*	1		1830	223	0.	1.4	2389.0
1		0155	24	6.	1.6	2389.1	*	1		1015	124	0.	1.4	2389.0	*	1		1835	224	0.	1.4	2389.0
1		0200	25	7.	1.6	2389.1	*	1		1020	125	0.	1.4	2389.0	*	1		1840	225	0.	1.4	2389.0
1		0205	26	6.	1.6	2389.1	*	1		1025	126	0.	1.4	2389.0	*	1		1845	226	0.	1.4	2389.0
1		0210	27	6.	1.6	2389.1	*	1		1030	127	0.	1.4	2389.0	*	1		1850	227	0.	1.4	2389.0
1		0215	28	7.	1.6	2389.1	*	1		1035	128	0.	1.4	2389.0	*	1		1855	228	0.	1.4	2389.0
1		0220	29	8.	1.6	2389.1	*	1		1040	129	0.	1.4	2389.0	*	1		1900	229	0.	1.4	2389.0
1		0225	30	10.	1.7	2389.2	*	1		1045	130	0.	1.4	2389.0	*	1		1905	230	0.	1.4	2389.0
1		0230	31	12.	1.7	2389.2	*	1		1050	131	0.	1.4	2389.0	*	1		1910	231	0.	1.4	2389.0
1		0235	32	14.	1.8	2389.2	*	1		1055	132	0.	1.4	2389.0	*	1		1915	232	0.	1.4	2389.0
1		0240	33	15.	1.8	2389.2	*	1		1100	133	0.	1.4	2389.0	*	1		1920	233	0.	1.4	2389.0
1		0245	34	16.	1.9	2389.2	*	1		1105	134	0.	1.4	2389.0	*	1		1925	234	0.	1.4	2389.0
1		0250	35	17.	1.9	2389.3	*	1		1110	135	0.	1.4	2389.0	*	1		1930	235	0.	1.4	2389.0
1		0255	36	18.	1.9	2389.3	*	1		1115	136	0.	1.4	2389.0	*	1		1935	236	0.	1.4	2389.0
1		0300	37	19.	1.9	2389.3	*	1		1120	137	0.	1.4	2389.0	*	1		1940	237	0.	1.4	2389.0
1		0305	38	20.	2.0	2389.3	*	1		1125	138	0.	1.4	2389.0	*	1		1945	238	0.	1.4	2389.0
1		0310	39	23.	2.1	2389.4	*	1		1130	139	0.	1.4	2389.0	*	1		1950	239	0.	1.4	2389.0
1		0315	40	31.	2.3	2389.5	*	1		1135	140	0.	1.4	2389.0	*	1		1955	240	0.	1.4	2389.0
1		0320	41	48.	2.8	2389.7	*	1		1140	141	0.	1.4	2389.0	*	1		2000	241	0.	1.4	2389.0
1		0325	42	70.	3.6	2390.2	*	1		1145	142	0.	1.4	2389.0	*	1		2005	242	0.	1.4	2389.0
1		0330	43	86.	5.1	2390.8	*	1		1150	143	0.	1.4	2389.0	*	1		2010	243	0.	1.4	2389.0
1		0335	44	104.	7.3	2391.6	*	1		1155	144	0.	1.4	2389.0	*	1		2015	244	0.	1.4	2389.0
1		0340	45	119.	9.7	2392.4	*	1		1200	145	0.	1.4	2389.0	*	1		2020	245	0.	1.4	2389.0
1		0345	46	128.	12.0	2393.1	*	1		1205	146	0.	1.4	2389.0	*	1		2025	246	0.	1.4	2389.0
1		0350	47	132.	14.0	2393.6	*	1		1210	147	0.	1.4	2389.0	*	1		2030	247	0.	1.4	2389.0
1		0355	48	134.	15.4	2394.0	*	1		1215	148	0.	1.4	2389.0	*	1		2035	248	0.	1.4	2389.0
1		0400	49	136.	16.3	2394.3	*	1		1220	149	0.	1.4	2389.0	*	1		2040	249	0.	1.4	2389.0
1		0405	50	137.	16.9	2394.4	*	1		1225	150	0.	1.4	2389.0	*	1		2045	250	0.	1.4	2389.0
1		0410	51	137.	17.1	2394.5	*	1		1230	151	0.	1.4	2389.0	*	1		2050	251	0.	1.4	2389.0
1		0415	52	137.	17.1	2394.5	*	1		1235	152	0.	1.4	2389.0	*	1		2055	252	0.	1.4	2389.0
1		0420	53	137.	16.9	2394.4	*	1		1240	153	0.	1.4	2389.0	*	1		2100	253	0.	1.4	2389.0
1		0425	54	136.	16.6	2394.3	*	1		1245	154	0.	1.4	2389.0	*	1		2105	254	0.	1.4	2389.0
1		0430	55	136.	16.2	2394.2	*	1		1250	155	0.	1.4	2389.0	*	1		2110	255	0.	1.4	2389.0
1		0435	56	135.	15.9	2394.2	*	1		1255	156	0.	1.4	2389.0	*	1		2115	256	0.	1.4	2389.0
1		0440	57	135.	15.7	2394.1	*	1		1300	157	0.	1.4	2389.0	*	1		2120	257	0.	1.4	2389.0
1		0445	58	135.	15.6	2394.1	*	1		1305	158	0.	1.4	2389.0	*	1		2125	258	0.	1.4	2389.0
1		0450	59	134.	15.5	2394.0	*	1		1310	159	0.	1.4	2389.0	*	1		2130	259	0.	1.4	2389.0

| | | |

1	0035	8	3.	1.5	2389.0	*	1	0855	108	0.	1.4	2389.0	*	1	1715	208	0.	1.4	2389.0
1	0040	9	3.	1.5	2389.1	*	1	0900	109	0.	1.4	2389.0	*	1	1720	209	0.	1.4	2389.0
1	0045	10	3.	1.5	2389.1	*	1	0905	110	0.	1.4	2389.0	*	1	1725	210	0.	1.4	2389.0
1	0050	11	3.	1.5	2389.0	*	1	0910	111	0.	1.4	2389.0	*	1	1730	211	0.	1.4	2389.0
1	0055	12	3.	1.5	2389.0	*	1	0915	112	0.	1.4	2389.0	*	1	1735	212	0.	1.4	2389.0
1	0100	13	2.	1.5	2389.0	*	1	0920	113	0.	1.4	2389.0	*	1	1740	213	0.	1.4	2389.0
1	0105	14	2.	1.5	2389.0	*	1	0925	114	0.	1.4	2389.0	*	1	1745	214	0.	1.4	2389.0
1	0110	15	1.	1.5	2389.0	*	1	0930	115	0.	1.4	2389.0	*	1	1750	215	0.	1.4	2389.0
1	0115	16	1.	1.5	2389.0	*	1	0935	116	0.	1.4	2389.0	*	1	1755	216	0.	1.4	2389.0
1	0120	17	2.	1.5	2389.0	*	1	0940	117	0.	1.4	2389.0	*	1	1800	217	0.	1.4	2389.0
1	0125	18	2.	1.5	2389.0	*	1	0945	118	0.	1.4	2389.0	*	1	1805	218	0.	1.4	2389.0
1	0130	19	2.	1.5	2389.0	*	1	0950	119	0.	1.4	2389.0	*	1	1810	219	0.	1.4	2389.0
1	0135	20	3.	1.5	2389.0	*	1	0955	120	0.	1.4	2389.0	*	1	1815	220	0.	1.4	2389.0
1	0140	21	4.	1.5	2389.1	*	1	1000	121	0.	1.4	2389.0	*	1	1820	221	0.	1.4	2389.0
1	0145	22	5.	1.5	2389.1	*	1	1005	122	0.	1.4	2389.0	*	1	1825	222	0.	1.4	2389.0
1	0150	23	5.	1.6	2389.1	*	1	1010	123	0.	1.4	2389.0	*	1	1830	223	0.	1.4	2389.0
1	0155	24	6.	1.6	2389.1	*	1	1015	124	0.	1.4	2389.0	*	1	1835	224	0.	1.4	2389.0
1	0200	25	6.	1.6	2389.1	*	1	1020	125	0.	1.4	2389.0	*	1	1840	225	0.	1.4	2389.0
1	0205	26	6.	1.6	2389.1	*	1	1025	126	0.	1.4	2389.0	*	1	1845	226	0.	1.4	2389.0
1	0210	27	6.	1.6	2389.1	*	1	1030	127	0.	1.4	2389.0	*	1	1850	227	0.	1.4	2389.0
1	0215	28	6.	1.6	2389.1	*	1	1035	128	0.	1.4	2389.0	*	1	1855	228	0.	1.4	2389.0
1	0220	29	7.	1.6	2389.1	*	1	1040	129	0.	1.4	2389.0	*	1	1900	229	0.	1.4	2389.0
1	0225	30	9.	1.7	2389.1	*	1	1045	130	0.	1.4	2389.0	*	1	1905	230	0.	1.4	2389.0
1	0230	31	11.	1.7	2389.2	*	1	1050	131	0.	1.4	2389.0	*	1	1910	231	0.	1.4	2389.0
1	0235	32	13.	1.8	2389.2	*	1	1055	132	0.	1.4	2389.0	*	1	1915	232	0.	1.4	2389.0
1	0240	33	14.	1.8	2389.2	*	1	1100	133	0.	1.4	2389.0	*	1	1920	233	0.	1.4	2389.0
1	0245	34	15.	1.8	2389.2	*	1	1105	134	0.	1.4	2389.0	*	1	1925	234	0.	1.4	2389.0
1	0250	35	16.	1.9	2389.2	*	1	1110	135	0.	1.4	2389.0	*	1	1930	235	0.	1.4	2389.0
1	0255	36	17.	1.9	2389.3	*	1	1115	136	0.	1.4	2389.0	*	1	1935	236	0.	1.4	2389.0
1	0300	37	17.	1.9	2389.3	*	1	1120	137	0.	1.4	2389.0	*	1	1940	237	0.	1.4	2389.0
1	0305	38	18.	1.9	2389.3	*	1	1125	138	0.	1.4	2389.0	*	1	1945	238	0.	1.4	2389.0
1	0310	39	22.	2.0	2389.3	*	1	1130	139	0.	1.4	2389.0	*	1	1950	239	0.	1.4	2389.0
1	0315	40	30.	2.2	2389.5	*	1	1135	140	0.	1.4	2389.0	*	1	1955	240	0.	1.4	2389.0
1	0320	41	45.	2.7	2389.7	*	1	1140	141	0.	1.4	2389.0	*	1	2000	241	0.	1.4	2389.0
1	0325	42	68.	3.5	2390.1	*	1	1145	142	0.	1.4	2389.0	*	1	2005	242	0.	1.4	2389.0
1	0330	43	84.	4.9	2390.7	*	1	1150	143	0.	1.4	2389.0	*	1	2010	243	0.	1.4	2389.0
1	0335	44	102.	7.0	2391.4	*	1	1155	144	0.	1.4	2389.0	*	1	2015	244	0.	1.4	2389.0
1	0340	45	117.	9.3	2392.2	*	1	1200	145	0.	1.4	2389.0	*	1	2020	245	0.	1.4	2389.0
1	0345	46	127.	11.5	2392.9	*	1	1205	146	0.	1.4	2389.0	*	1	2025	246	0.	1.4	2389.0
1	0350	47	131.	13.3	2393.4	*	1	1210	147	0.	1.4	2389.0	*	1	2030	247	0.	1.4	2389.0
1	0355	48	133.	14.7	2393.8	*	1	1215	148	0.	1.4	2389.0	*	1	2035	248	0.	1.4	2389.0
1	0400	49	135.	15.5	2394.1	*	1	1220	149	0.	1.4	2389.0	*	1	2040	249	0.	1.4	2389.0
1	0405	50	135.	16.0	2394.2	*	1	1225	150	0.	1.4	2389.0	*	1	2045	250	0.	1.4	2389.0
1	0410	51	136.	16.2	2394.3	*	1	1230	151	0.	1.4	2389.0	*	1	2050	251	0.	1.4	2389.0
1	0415	52	136.	16.2	2394.2	*	1	1235	152	0.	1.4	2389.0	*	1	2055	252	0.	1.4	2389.0
1	0420	53	135.	16.0	2394.2	*	1	1240	153	0.	1.4	2389.0	*	1	2100	253	0.	1.4	2389.0
1	0425	54	135.	15.6	2394.1	*	1	1245	154	0.	1.4	2389.0	*	1	2105	254	0.	1.4	2389.0
1	0430	55	134.	15.3	2394.0	*	1	1250	155	0.	1.4	2389.0	*	1	2110	255	0.	1.4	2389.0
1	0435	56	134.	15.0	2393.9	*	1	1255	156	0.	1.4	2389.0	*	1	2115	256	0.	1.4	2389.0
1	0440	57	133.	14.8	2393.8	*	1	1300	157	0.	1.4	2389.0	*	1	2120	257	0.	1.4	2389.0
1	0445	58	133.	14.6	2393.8	*	1	1305	158	0.	1.4	2389.0	*	1	2125	258	0.	1.4	2389.0
1	0450	59	133.	14.5	2393.8	*	1	1310	159	0.	1.4	2389.0	*	1	2130	259	0.	1.4	2389.0
1	0455	60	132.	14.3	2393.7	*	1	1315	160	0.	1.4	2389.0	*	1	2135	260	0.	1.4	2389.0
1	0500	61	132.	14.2	2393.7	*	1	1320	161	0.	1.4	2389.0	*	1	2140	261	0.	1.4	2389.0
1	0505	62	132.	13.9	2393.6	*	1	1325	162	0.	1.4	2389.0	*	1	2145	262	0.	1.4	2389.0
1	0510	63	131.	13.6	2393.5	*	1	1330	163	0.	1.4	2389.0	*	1	2150	263	0.	1.4	2389.0
1	0515	64	130.	13.1	2393.4	*	1	1335	164	0.	1.4	2389.0	*	1	2155	264	0.	1.4	2389.0
1	0520	65	129.	12.6	2393.2	*	1	1340	165	0.	1.4	2389.0	*	1	2200	265	0.	1.4	2389.0
1	0525	66	128.	11.9	2393.0	*	1	1345	166	0.	1.4	2389.0	*	1	2205	266	0.	1.4	2389.0
1	0530	67	126.	11.2	2392.8	*	1	1350	167	0.	1.4	2389.0	*	1	2210	267	0.	1.4	2389.0
1	0535	68	122.	10.5	2392.6	*	1	1355	168	0.	1.4	2389.0	*	1	2215	268	0.	1.4	2389.0
1	0540	69	119.	9.8	2392.4	*	1	1400	169	0.	1.4	2389.0	*	1	2220	269	0.	1.4	2389.0
1	0545	70	116.	9.1	2392.2	*	1	1405	170	0.	1.4	2389.0	*	1	2225	270	0.	1.4	2389.0
1	0550	71	113.	8.4	2392.0	*	1	1410	171	0.	1.4	2389.0	*	1	2230	271	0.	1.4	2389.0
1	0555	72	108.	7.8	2391.7	*	1	1415	172	0.	1.4	2389.0	*	1	2235	272	0.	1.4	2389.0
1	0600	73	103.	7.1	2391.5	*	1	1420	173	0.	1.4	2389.0	*	1	2240	273	0.	1.4	2389.0
1	0605	74	98.	6.5	2391.3	*	1	1425	174	0.	1.4	2389.0	*	1	2245	274	0.	1.4	2389.0
1	0610	75	94.	5.9	2391.1	*	1	1430	175	0.	1.4	2389.0	*	1	2250	275	0.	1.4	2389.0
1	0615	76	88.	5.3	2390.8	*	1	1435	176	0.	1.4	2389.0	*	1	2255	276	0.	1.4	2389.0
1	0620	77	82.	4.7	2390.6	*	1	1440	177	0.	1.4	2389.0	*	1	2300	277	0.	1.4	2389.0
1	0625	78	76.	4.2	2390.4	*	1	1445	178	0.	1.4	2389.0	*	1	2305	278	0.	1.4	2389.0
1	0630	79	71.	3.7	2390.2	*	1	1450	179	0.	1.4	2389.0	*	1	2310	279	0.	1.4	2389.0
1	0635	80	66.	3.3	2390.0	*	1	1455	180	0.	1.4	2389.0	*	1	2315	280	0.	1.4	2389.0
1	0640	81	52.	2.9	2389.8	*	1	1500	181	0.	1.4	2389.0	*	1	2320	281	0.	1.4	2389.0
1	0645	82	41.	2.5	2389.6	*	1	1505	182	0.	1.4	2389.0	*	1	2325	282	0.	1.4	2389.0
1	0650	83	32.	2.3	2389.5	*	1	1510	183	0.	1.4	2389.0	*	1	2330	283	0.	1.4	2389.0
1	0655	84	25.	2.1	2389.4	*	1	1515	184	0.	1.4	2389.0	*	1	2335	284	0.	1.4	2389.0
1	0700	85	19.	2.0	2389.3	*	1	1520	185	0.	1.4	2389.0	*	1	2340	285	0.	1.4	2389.0
1	0705	86	15.	1.8	2389.2	*	1	1525	186	0.	1.4	2389.0	*	1	2345	286	0.	1.4	2389.0
1	0710	87	12.	1.7	2389.2	*	1	1530	187	0.	1.4	2389.0	*	1	2350	287	0.	1.4	2389.0
1	0715	88	9.	1.7	2389.1	*	1	1535	188	0.	1.4	2389.0	*	1	2355	288	0.	1.4	2389.0

1	0720	89	7.	1.6	2389.1	*	1	1540	189	0.	1.4	2389.0	*	2	0000	289	0.	1.4	2389.0
1	0725	90	6.	1.6	2389.1	*	1	1545	190	0.	1.4	2389.0	*	2	0005	290	0.	1.4	2389.0
1	0730	91	4.	1.5	2389.1	*	1	1550	191	0.	1.4	2389.0	*	2	0010	291	0.	1.4	2389.0
1	0735	92	3.	1.5	2389.1	*	1	1555	192	0.	1.4	2389.0	*	2	0015	292	0.	1.4	2389.0
1	0740	93	3.	1.5	2389.0	*	1	1600	193	0.	1.4	2389.0	*	2	0020	293	0.	1.4	2389.0
1	0745	94	2.	1.5	2389.0	*	1	1605	194	0.	1.4	2389.0	*	2	0025	294	0.	1.4	2389.0
1	0750	95	2.	1.5	2389.0	*	1	1610	195	0.	1.4	2389.0	*	2	0030	295	0.	1.4	2389.0
1	0755	96	1.	1.4	2389.0	*	1	1615	196	0.	1.4	2389.0	*	2	0035	296	0.	1.4	2389.0
1	0800	97	1.	1.4	2389.0	*	1	1620	197	0.	1.4	2389.0	*	2	0040	297	0.	1.4	2389.0
1	0805	98	1.	1.4	2389.0	*	1	1625	198	0.	1.4	2389.0	*	2	0045	298	0.	1.4	2389.0
1	0810	99	1.	1.4	2389.0	*	1	1630	199	0.	1.4	2389.0	*	2	0050	299	0.	1.4	2389.0
1	0815	100	0.	1.4	2389.0	*	1	1635	200	0.	1.4	2389.0	*	2	0055	300	0.	1.4	2389.0

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 136.	4.17		70.	18.	17.	17.
		(INCHES)	1.034	1.043	1.043	1.043
		(AC-FT)	35.	35.	35.	35.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)					
16.	4.17		7.	3.	3.	3.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)					
2394.26	4.17		2391.07	2389.52	2389.50	2389.50

CUMULATIVE AREA = .63 SQ MI

****

HYDROGRAPH AT STATION ELKBASIN
PLAN 1, RATIO = .97

****

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	1.4	2389.0	*	1		0820	101	0.	1.4	2389.0	*	1		1640	201	0.	1.4	2389.0
1		0005	2	0.	1.4	2389.0	*	1		0825	102	0.	1.4	2389.0	*	1		1645	202	0.	1.4	2389.0
1		0010	3	0.	1.4	2389.0	*	1		0830	103	0.	1.4	2389.0	*	1		1650	203	0.	1.4	2389.0
1		0015	4	0.	1.4	2389.0	*	1		0835	104	0.	1.4	2389.0	*	1		1655	204	0.	1.4	2389.0
1		0020	5	1.	1.4	2389.0	*	1		0840	105	0.	1.4	2389.0	*	1		1700	205	0.	1.4	2389.0
1		0025	6	1.	1.4	2389.0	*	1		0845	106	0.	1.4	2389.0	*	1		1705	206	0.	1.4	2389.0
1		0030	7	2.	1.5	2389.0	*	1		0850	107	0.	1.4	2389.0	*	1		1710	207	0.	1.4	2389.0
1		0035	8	3.	1.5	2389.0	*	1		0855	108	0.	1.4	2389.0	*	1		1715	208	0.	1.4	2389.0
1		0040	9	3.	1.5	2389.1	*	1		0900	109	0.	1.4	2389.0	*	1		1720	209	0.	1.4	2389.0
1		0045	10	3.	1.5	2389.1	*	1		0905	110	0.	1.4	2389.0	*	1		1725	210	0.	1.4	2389.0
1		0050	11	3.	1.5	2389.0	*	1		0910	111	0.	1.4	2389.0	*	1		1730	211	0.	1.4	2389.0
1		0055	12	3.	1.5	2389.0	*	1		0915	112	0.	1.4	2389.0	*	1		1735	212	0.	1.4	2389.0
1		0100	13	2.	1.5	2389.0	*	1		0920	113	0.	1.4	2389.0	*	1		1740	213	0.	1.4	2389.0
1		0105	14	2.	1.5	2389.0	*	1		0925	114	0.	1.4	2389.0	*	1		1745	214	0.	1.4	2389.0
1		0110	15	1.	1.5	2389.0	*	1		0930	115	0.	1.4	2389.0	*	1		1750	215	0.	1.4	2389.0
1		0115	16	1.	1.5	2389.0	*	1		0935	116	0.	1.4	2389.0	*	1		1755	216	0.	1.4	2389.0
1		0120	17	2.	1.5	2389.0	*	1		0940	117	0.	1.4	2389.0	*	1		1800	217	0.	1.4	2389.0
1		0125	18	2.	1.5	2389.0	*	1		0945	118	0.	1.4	2389.0	*	1		1805	218	0.	1.4	2389.0
1		0130	19	2.	1.5	2389.0	*	1		0950	119	0.	1.4	2389.0	*	1		1810	219	0.	1.4	2389.0
1		0135	20	3.	1.5	2389.0	*	1		0955	120	0.	1.4	2389.0	*	1		1815	220	0.	1.4	2389.0
1		0140	21	4.	1.5	2389.1	*	1		1000	121	0.	1.4	2389.0	*	1		1820	221	0.	1.4	2389.0
1		0145	22	4.	1.5	2389.1	*	1		1005	122	0.	1.4	2389.0	*	1		1825	222	0.	1.4	2389.0
1		0150	23	5.	1.6	2389.1	*	1		1010	123	0.	1.4	2389.0	*	1		1830	223	0.	1.4	2389.0
1		0155	24	6.	1.6	2389.1	*	1		1015	124	0.	1.4	2389.0	*	1		1835	224	0.	1.4	2389.0
1		0200	25	6.	1.6	2389.1	*	1		1020	125	0.	1.4	2389.0	*	1		1840	225	0.	1.4	2389.0
1		0205	26	6.	1.6	2389.1	*	1		1025	126	0.	1.4	2389.0	*	1		1845	226	0.	1.4	2389.0
1		0210	27	5.	1.6	2389.1	*	1		1030	127	0.	1.4	2389.0	*	1		1850	227	0.	1.4	2389.0
1		0215	28	6.	1.6	2389.1	*	1		1035	128	0.	1.4	2389.0	*	1		1855	228	0.	1.4	2389.0
1		0220	29	7.	1.6	2389.1	*	1		1040	129	0.	1.4	2389.0	*	1		1900	229	0.	1.4	2389.0
1		0225	30	9.	1.7	2389.1	*	1		1045	130	0.	1.4	2389.0	*	1		1905	230	0.	1.4	2389.0
1		0230	31	11.	1.7	2389.2	*	1		1050	131	0.	1.4	2389.0	*	1		1910	231	0.	1.4	2389.0
1		0235	32	12.	1.8	2389.2	*	1		1055	132	0.	1.4	2389.0	*	1		1915	232	0.	1.4	2389.0
1		0240	33	13.	1.8	2389.2	*	1		1100	133	0.	1.4	2389.0	*	1		1920	233	0.	1.4	2389.0
1		0245	34	15.	1.8	2389.2	*	1		1105	134	0.	1.4	2389.0	*	1		1925	234	0.	1.4	2389.0
1		0250	35	16.	1.9	2389.2	*	1		1110	135	0.	1.4	2389.0	*	1		1930	235	0.	1.4	2389.0
1		0255	36	17.	1.9	2389.3	*	1		1115	136	0.	1.4	2389.0	*	1		1935	236	0.	1.4	2389.0

1	0300	37	17.	1.9	2389.3	*	1	1120	137	0.	1.4	2389.0	*	1	1940	237	0.	1.4	2389.0
1	0305	38	18.	1.9	2389.3	*	1	1125	138	0.	1.4	2389.0	*	1	1945	238	0.	1.4	2389.0
1	0310	39	22.	2.0	2389.3	*	1	1130	139	0.	1.4	2389.0	*	1	1950	239	0.	1.4	2389.0
1	0315	40	29.	2.2	2389.4	*	1	1135	140	0.	1.4	2389.0	*	1	1955	240	0.	1.4	2389.0
1	0320	41	45.	2.7	2389.7	*	1	1140	141	0.	1.4	2389.0	*	1	2000	241	0.	1.4	2389.0
1	0325	42	68.	3.5	2390.1	*	1	1145	142	0.	1.4	2389.0	*	1	2005	242	0.	1.4	2389.0
1	0330	43	84.	4.9	2390.7	*	1	1150	143	0.	1.4	2389.0	*	1	2010	243	0.	1.4	2389.0
1	0335	44	101.	6.9	2391.4	*	1	1155	144	0.	1.4	2389.0	*	1	2015	244	0.	1.4	2389.0
1	0340	45	116.	9.2	2392.2	*	1	1200	145	0.	1.4	2389.0	*	1	2020	245	0.	1.4	2389.0
1	0345	46	126.	11.4	2392.9	*	1	1205	146	0.	1.4	2389.0	*	1	2025	246	0.	1.4	2389.0
1	0350	47	130.	13.2	2393.4	*	1	1210	147	0.	1.4	2389.0	*	1	2030	247	0.	1.4	2389.0
1	0355	48	133.	14.5	2393.8	*	1	1215	148	0.	1.4	2389.0	*	1	2035	248	0.	1.4	2389.0
1	0400	49	134.	15.4	2394.0	*	1	1220	149	0.	1.4	2389.0	*	1	2040	249	0.	1.4	2389.0
1	0405	50	135.	15.9	2394.2	*	1	1225	150	0.	1.4	2389.0	*	1	2045	250	0.	1.4	2389.0
1	0410	51	135.	16.1	2394.2	*	1	1230	151	0.	1.4	2389.0	*	1	2050	251	0.	1.4	2389.0
1	0415	52	135.	16.0	2394.2	*	1	1235	152	0.	1.4	2389.0	*	1	2055	252	0.	1.4	2389.0
1	0420	53	135.	15.8	2394.1	*	1	1240	153	0.	1.4	2389.0	*	1	2100	253	0.	1.4	2389.0
1	0425	54	134.	15.4	2394.0	*	1	1245	154	0.	1.4	2389.0	*	1	2105	254	0.	1.4	2389.0
1	0430	55	134.	15.1	2393.9	*	1	1250	155	0.	1.4	2389.0	*	1	2110	255	0.	1.4	2389.0
1	0435	56	133.	14.8	2393.8	*	1	1255	156	0.	1.4	2389.0	*	1	2115	256	0.	1.4	2389.0
1	0440	57	133.	14.6	2393.8	*	1	1300	157	0.	1.4	2389.0	*	1	2120	257	0.	1.4	2389.0
1	0445	58	133.	14.4	2393.7	*	1	1305	158	0.	1.4	2389.0	*	1	2125	258	0.	1.4	2389.0
1	0450	59	132.	14.3	2393.7	*	1	1310	159	0.	1.4	2389.0	*	1	2130	259	0.	1.4	2389.0
1	0455	60	132.	14.1	2393.7	*	1	1315	160	0.	1.4	2389.0	*	1	2135	260	0.	1.4	2389.0
1	0500	61	132.	14.0	2393.6	*	1	1320	161	0.	1.4	2389.0	*	1	2140	261	0.	1.4	2389.0
1	0505	62	131.	13.7	2393.5	*	1	1325	162	0.	1.4	2389.0	*	1	2145	262	0.	1.4	2389.0
1	0510	63	131.	13.4	2393.4	*	1	1330	163	0.	1.4	2389.0	*	1	2150	263	0.	1.4	2389.0
1	0515	64	130.	12.9	2393.3	*	1	1335	164	0.	1.4	2389.0	*	1	2155	264	0.	1.4	2389.0
1	0520	65	129.	12.3	2393.2	*	1	1340	165	0.	1.4	2389.0	*	1	2200	265	0.	1.4	2389.0
1	0525	66	128.	11.7	2393.0	*	1	1345	166	0.	1.4	2389.0	*	1	2205	266	0.	1.4	2389.0
1	0530	67	125.	11.0	2392.8	*	1	1350	167	0.	1.4	2389.0	*	1	2210	267	0.	1.4	2389.0
1	0535	68	122.	10.3	2392.6	*	1	1355	168	0.	1.4	2389.0	*	1	2215	268	0.	1.4	2389.0
1	0540	69	118.	9.6	2392.3	*	1	1400	169	0.	1.4	2389.0	*	1	2220	269	0.	1.4	2389.0
1	0545	70	115.	8.9	2392.1	*	1	1405	170	0.	1.4	2389.0	*	1	2225	270	0.	1.4	2389.0
1	0550	71	111.	8.3	2391.9	*	1	1410	171	0.	1.4	2389.0	*	1	2230	271	0.	1.4	2389.0
1	0555	72	106.	7.6	2391.7	*	1	1415	172	0.	1.4	2389.0	*	1	2235	272	0.	1.4	2389.0
1	0600	73	102.	7.0	2391.4	*	1	1420	173	0.	1.4	2389.0	*	1	2240	273	0.	1.4	2389.0
1	0605	74	97.	6.3	2391.2	*	1	1425	174	0.	1.4	2389.0	*	1	2245	274	0.	1.4	2389.0
1	0610	75	93.	5.7	2391.0	*	1	1430	175	0.	1.4	2389.0	*	1	2250	275	0.	1.4	2389.0
1	0615	76	87.	5.2	2390.8	*	1	1435	176	0.	1.4	2389.0	*	1	2255	276	0.	1.4	2389.0
1	0620	77	81.	4.6	2390.6	*	1	1440	177	0.	1.4	2389.0	*	1	2300	277	0.	1.4	2389.0
1	0625	78	75.	4.1	2390.3	*	1	1445	178	0.	1.4	2389.0	*	1	2305	278	0.	1.4	2389.0
1	0630	79	70.	3.6	2390.2	*	1	1450	179	0.	1.4	2389.0	*	1	2310	279	0.	1.4	2389.0
1	0635	80	63.	3.2	2390.0	*	1	1455	180	0.	1.4	2389.0	*	1	2315	280	0.	1.4	2389.0
1	0640	81	49.	2.8	2389.8	*	1	1500	181	0.	1.4	2389.0	*	1	2320	281	0.	1.4	2389.0
1	0645	82	38.	2.5	2389.6	*	1	1505	182	0.	1.4	2389.0	*	1	2325	282	0.	1.4	2389.0
1	0650	83	30.	2.3	2389.5	*	1	1510	183	0.	1.4	2389.0	*	1	2330	283	0.	1.4	2389.0
1	0655	84	24.	2.1	2389.4	*	1	1515	184	0.	1.4	2389.0	*	1	2335	284	0.	1.4	2389.0
1	0700	85	18.	1.9	2389.3	*	1	1520	185	0.	1.4	2389.0	*	1	2340	285	0.	1.4	2389.0
1	0705	86	14.	1.8	2389.2	*	1	1525	186	0.	1.4	2389.0	*	1	2345	286	0.	1.4	2389.0
1	0710	87	11.	1.7	2389.2	*	1	1530	187	0.	1.4	2389.0	*	1	2350	287	0.	1.4	2389.0
1	0715	88	9.	1.7	2389.1	*	1	1535	188	0.	1.4	2389.0	*	1	2355	288	0.	1.4	2389.0
1	0720	89	7.	1.6	2389.1	*	1	1540	189	0.	1.4	2389.0	*	2	0000	289	0.	1.4	2389.0
1	0725	90	5.	1.6	2389.1	*	1	1545	190	0.	1.4	2389.0	*	2	0005	290	0.	1.4	2389.0
1	0730	91	4.	1.5	2389.1	*	1	1550	191	0.	1.4	2389.0	*	2	0010	291	0.	1.4	2389.0
1	0735	92	3.	1.5	2389.0	*	1	1555	192	0.	1.4	2389.0	*	2	0015	292	0.	1.4	2389.0
1	0740	93	3.	1.5	2389.0	*	1	1600	193	0.	1.4	2389.0	*	2	0020	293	0.	1.4	2389.0
1	0745	94	2.	1.5	2389.0	*	1	1605	194	0.	1.4	2389.0	*	2	0025	294	0.	1.4	2389.0
1	0750	95	2.	1.5	2389.0	*	1	1610	195	0.	1.4	2389.0	*	2	0030	295	0.	1.4	2389.0
1	0755	96	1.	1.4	2389.0	*	1	1615	196	0.	1.4	2389.0	*	2	0035	296	0.	1.4	2389.0
1	0800	97	1.	1.4	2389.0	*	1	1620	197	0.	1.4	2389.0	*	2	0040	297	0.	1.4	2389.0
1	0805	98	1.	1.4	2389.0	*	1	1625	198	0.	1.4	2389.0	*	2	0045	298	0.	1.4	2389.0
1	0810	99	1.	1.4	2389.0	*	1	1630	199	0.	1.4	2389.0	*	2	0050	299	0.	1.4	2389.0
1	0815	100	0.	1.4	2389.0	*	1	1635	200	0.	1.4	2389.0	*	2	0055	300	0.	1.4	2389.0
						*							*							

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 135.	4.17		69.	18.	17.	17.
		(INCHES)	1.025	1.034	1.034	1.034
		(AC-FT)	34.	35.	35.	35.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
16.	4.17	7.	3.	3.	3.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE

		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
2394.21	4.17	2391.04	2389.51	2389.49	2389.49

CUMULATIVE AREA = .63 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1	RATIO 2	RATIO 3
					1.00	.98	.97
HYDROGRAPH AT							
+	OFF1	.20	1	FLOW	179.	173.	171.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	FDI12	.20	1	FLOW	85.	82.	81.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	DIV1FD	.20	1	FLOW	94.	91.	90.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	CIM1	.20	1	FLOW	42.	40.	40.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	SPLIT1	.20	1	FLOW	52.	50.	50.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	FDI345	.20	1	FLOW	47.	45.	45.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	DIV2FD	.20	1	FLOW	5.	5.	5.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF4	.03	1	FLOW	34.	32.	32.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP1	.23	1	FLOW	38.	36.	36.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	FDI12	.00	1	FLOW	85.	82.	81.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	FDI345	.00	1	FLOW	47.	45.	45.
				TIME	3.75	3.75	3.75
2 COMBINED AT							
+	CP2	.00	1	FLOW	132.	127.	126.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF5	.05	1	FLOW	59.	56.	56.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	OFF3	.17	1	FLOW	141.	135.	133.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	CIM1	.00	1	FLOW	42.	40.	40.
				TIME	3.75	3.75	3.75
2 COMBINED AT							
+	CP4	.17	1	FLOW	182.	174.	173.
				TIME	3.67	3.67	3.67

DIVERSION TO							
+	CIM2	.17	1	FLOW	74.	71.	70.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	SPLIT2	.17	1	FLOW	108.	103.	103.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF6	.03	1	FLOW	25.	24.	24.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF7	.07	1	FLOW	59.	57.	56.
				TIME	3.67	3.67	3.67
3 COMBINED AT							
+	CP5	.26	1	FLOW	193.	185.	183.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF2	.18	1	FLOW	123.	118.	117.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	CIM2	.00	1	FLOW	74.	71.	70.
				TIME	3.67	3.67	3.67
2 COMBINED AT							
+	CP6	.18	1	FLOW	195.	187.	185.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	CIM3	.18	1	FLOW	60.	58.	57.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	SPLIT3	.18	1	FLOW	135.	129.	128.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF8	.03	1	FLOW	30.	29.	29.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP7	.21	1	FLOW	152.	146.	145.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF9	.03	1	FLOW	52.	50.	50.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP8	.24	1	FLOW	193.	186.	184.
				TIME	3.67	3.67	3.67
DIVERSION TO							
+	BUFF1	.24	1	FLOW	48.	47.	46.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	DIV3E123	.24	1	FLOW	145.	139.	138.
				TIME	3.67	3.67	3.67
2 COMBINED AT							
+	CP9	.50	1	FLOW	338.	323.	321.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	BUFF1	.00	1	FLOW	48.	47.	46.
				TIME	3.67	3.67	3.67
DIVERSION TO							
+	BUFF2	.00	1	FLOW	32.	31.	31.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	SPLIT4	.00	1	FLOW	16.	16.	15.
				TIME	3.67	3.67	3.67

HYDROGRAPH AT

+	OFF11	.07	1	FLOW	59.	56.	56.
				TIME	3.67	3.67	3.67
2 COMBINED AT							
+	CP10	.07	1	FLOW	75.	72.	71.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF10	.03	1	FLOW	30.	29.	29.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF12	.02	1	FLOW	27.	26.	26.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ON-1	.02	1	FLOW	15.	14.	14.
				TIME	3.67	3.67	3.67
5 COMBINED AT							
+	CP11	.63	1	FLOW	476.	456.	452.
				TIME	3.67	3.67	3.67
ROUTED TO							
+	ELKBASIN	.63	1	FLOW	137.	136.	135.
				TIME	4.17	4.17	4.17

** PEAK STAGES IN FEET **

1	STAGE	2394.50	2394.26	2394.21
	TIME	4.17	4.17	4.17

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

PROPOSED CONDITION HEC-1
10-YEAR STORM EVENT

OPTION-1
OUTLET OF DETENTION BASIN WITH 2-27" RCPs

```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              JAN   1997              *
*            VERSION 4.1               *
*                                      *
*  RUN DATE   27JUN08  TIME  09:32:00  *
*                                      *
****************************************
```

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


```
          LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
                    *DIAGRAM
*** FREE ***
               1    ID   ********************************************************************
               2    ID   * ---------------------------------------------------------------- *
               3    ID   * |                                                              | *
               4    ID   * |   ELKHORN SPRINGS AND BUFFALO DRIVE STORM DRAIN              | *
               5    ID   * |                  CITY OF LAS VEGAS                           | *
               6    ID   * |                 PROPOSED CONDITIONS                          | *
               7    ID   * |                                                              | *
               8    ID   * |..............................................................| *
               9    ID   * |                                                              | *
              10    ID   * |         CLIENT-------------CITY OF LAS VEGAS                 | *
              11    ID   * |         RETURN PERIOD-------10-YEAR                          | *
              12    ID   * |         DISTRIBUTUION-------6-HOUR SDN3                      | *
              13    ID   * |         PROJECT NO----------31678A                           | *
              14    ID   * |         FILENAME------------PI-10-OPT1.DAT                   | *
              15    ID   * |         REV. DATE-----------06/17/08                         | *
              16    ID   * |                                                              | *
              17    ID   * |..............................................................| *
              18    ID   * |                                                              | *
              19    ID   * |                    AREA      DARF                            | *
              20    ID   * |                   (sq.mi.)                                   | *
              21    ID   * |                 0.00-0.50   1.000                            | *
              22    ID   * |                 0.50-0.75   0.975                            | *
              23    ID   * |                 0.75-1.00   0.970                            | *
              24    ID   * |                                                              | *
              25    ID   * |  MODELED BY: Parsons Brinckerhoff                            | *
              26    ID   * ---------------------------------------------------------------- *
              27    ID   ********************************************************************
              28    ID
              29    ID
              30    IT       5       0       0     300
              31    IO       5       0       0
              32    IN       5       0       0
              33    JR    PREC    1.00   0.975   0.970
                    *
              34    KK    OFF1
              35    BA  0.1973
              36    PB    1.45
              37    PC   0.000   0.020   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
              38    PC   0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
              39    PC   0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
```

```
 40          PC   0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
 41          PC   0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
 42          PC   0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
 43          PC   0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
 44          PC   0.998   0.999   1.000
 45          LS       0   88.14
 46          UD   0.292
             *
```



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

 47          KK  DIV1FD
 48          KM   DIVERT FLOWS INTO DROP INLETS FDI-1 & FDI-2 LOCATED NWC OF FARM ROAD
 49          KM   AND CIMARRON ROAD
 50          DT   FDI12
 51          DI       0     100     179
 52          DQ       0    48.0      85
             *

 53          KK  SPLIT1
 54          KM   FLOW SPLIT ON CIMARRON ROAD AND FARM ROAD
 55          DT    CIM1
 56          DI       0      50      94
 57          DQ       0    22.3      42
             *

 58          KK  DIV2FD
 59          KM   DIVERT FLOWS INTO DROP INLETS FDI-3,FDI-4 & FDI-5 LOCATED ON FARM ROAD
 60          KM   BETWEEN CIMARRON ROAD & PALM GROVE
 61          DT  FDI345
 62          DI       0      52
 63          DQ       0      47
             *

 64          KK    OFF4
 65          BA  0.0308
 66          PB    1.58
 67          LS       0   82.00
 68          UD   0.112
             *

 69          KK     CP1
 70          KM   COMBINE OFF4 AND BY PASS FLOW FROM INLETS ON FARM ROAD
 71          HC       2
             *

 72          KK   FDI12
 73          KM   RECALL FLOW COLLECTED BY EXISTING STORM DRIAN SYSTEM(PLUGGED)ON FARM ROAD
 74          KM   WEST OF CIMARRON ROAD
 75          DR   FDI12
             *

 76          KK  FDI345
 77          KM   RECALL FLOW COLLECTED BY EXISTING STORM DRIAN SYSTEM(PLUGGED)ON FARM ROAD
 78          KM   BETWEEN CIMARRON ROAD AND PALM GROOVE LANE
 79          DR  FDI345
             *

 80          KK     CP2
 81          KM   COMBINE FD12 AND FD345 TO CALCULATED FLOW COLLECTED BY THE EXISTING
 82          KM   STORM DRAIN SYSTEM ON FARM ROAD (CURRENTLY PLUGGED)
 83          HC       2
             *
```



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

 84          KK    OFF5
 85          KM   SUBBASIN OFF5
 86          BA  0.0549
 87          LS       0   82.00
 88          UD   0.132
             *

 89          KK     CP3
 90          KM   COMBINE cp-1,CP-2 AND OFF5
 91          HC       3
             *
```

```
 92          KK    OFF3
 93          KM   SUBBASIN OFF3
 94          BA   0.165
 95          LS       0   82.02
 96          UD   0.246
             *

 97          KK    CIM1
 98          KM   RECALL FLOW SPLIT AT CIMMARON AND FARM ROAD ON CIMARRON ROAD
 99          DR    CIM1
             *

100          KK     CP4
101          KM   COMBINE OFF3 AND CIM1
102          HC       2
             *

103          KK  SPLIT2
104          KM   FLOW SPLIT ON CIMARRON ROAD AND SUNNY SPRINGS LANE
105          DT    CIM2
106          DI       0     100     182
107          DQ       0    40.6      74
             *

108          KK    OFF6
109          KM   SUBBASIN OFF6
110          BA  0.0287
111          LS       0   82.05
112          UD   0.223
             *

113          KK    OFF7
114          KM   SUBBASIN OFF7
115          BA  0.0667
116          LS       0   81.98
117          UD   0.219
             *
```



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

118          KK     CP5
119          KM   COMBINE OFF6,OFF7 AND REMAINING FLOW IN SUNNY SPRINGS LANE AFTER FLOW SPLIT
120          HC       3
             *

121          KK    OFF2
122          KM   SUBBASIN OFF2
123          BA  0.1786
124          PB    1.37
125          LS       0   87.44
126          UD   0.343
             *

127          KK    CIM2
128          KM   RECALL FLOW SPLIT AT CIMMARON AND SUNNY SPRINGS LANE ON CIMARRON ROAD
129          DR    CIM2
             *

130          KK     CP6
131          KM   COMBINE OFF2 & CIM2
132          HC       2
             *

133          KK  SPLIT3
134          KM   FLOW SPLIT ON CIMARRON ROAD AND ELKHORN ROAD
135          DT    CIM3
136          DI       0      50     195
137          DQ       0    15.3      60
             *

138          KK    OFF8
139          KM   SUBBASIN OFF8
140          BA  0.0282
141          PB    1.58
142          LS       0   81.79
143          UD   0.107
             *
```

```
 144          KK     CP7
 145          KM   COMBINE OFF8 AND REMAINING FLOW IN ELKHORN ROAD
 146          HC       2
              *

 147          KK    OFF9
 148          BA  0.0285
 149          LS       0   97.46
 150          UD   0.149
              *
```



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

 151          KK     CP8
 152          KM   COMBINE OFF8,OFF9 AND REMAINING FLOW IN ELKHORN ROAD
 153          HC       2
              *

 154          KKDIV3E123
 155          KM   DIVERT FLOWS TO EXISTIGN DIs IN ELKHORN ROAD (6 DIs TOTAL)
 156          DT   BUFF1
 157          DI       0      50     193
 158          DQ       0    22.8      48
              *

 159          KK     CP9
 160          KM   COMBINE CP5 AND FLOW INTERCEPTED BY DIs IN ELKHORN ROAD
 161          HC       2
              *

 162          KK   BUFF1
 163          KM   RECALL FLOW BYPASSED BY DROP INLETS IN ELKHORN ROAD
 164          DR   BUFF1
              *

 165          KK  SPLIT4
 166          KM   FLOW SPLIT AT ELKHORN ROAD AND BUFFALO DRIVE
 167          DT   BUFF2
 168          DI       0      48
 169          DQ       0      32
              *

 170          KK   OFF11
 171          KM   SUBBASIN OFF11
 172          BA  0.0655
 173          LS       0   81.95
 174          UD   0.209
              *

 175          KK    CP10
 176          KM   COMBINE BUFF1 & BUFF2
 177          HC       2
              *

 178          KK   OFF10
 179          KM   SUBBASIN OFF10
 180          BA  0.0334
 181          LS       0   82.18
 182          UD   0.214
              *

 183          KK   OFF12
 184          KM   SUBBASIN OFF12
 185          BA  0.0156
 186          LS       0   92.92
 187          UD   0.106
              *
```



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

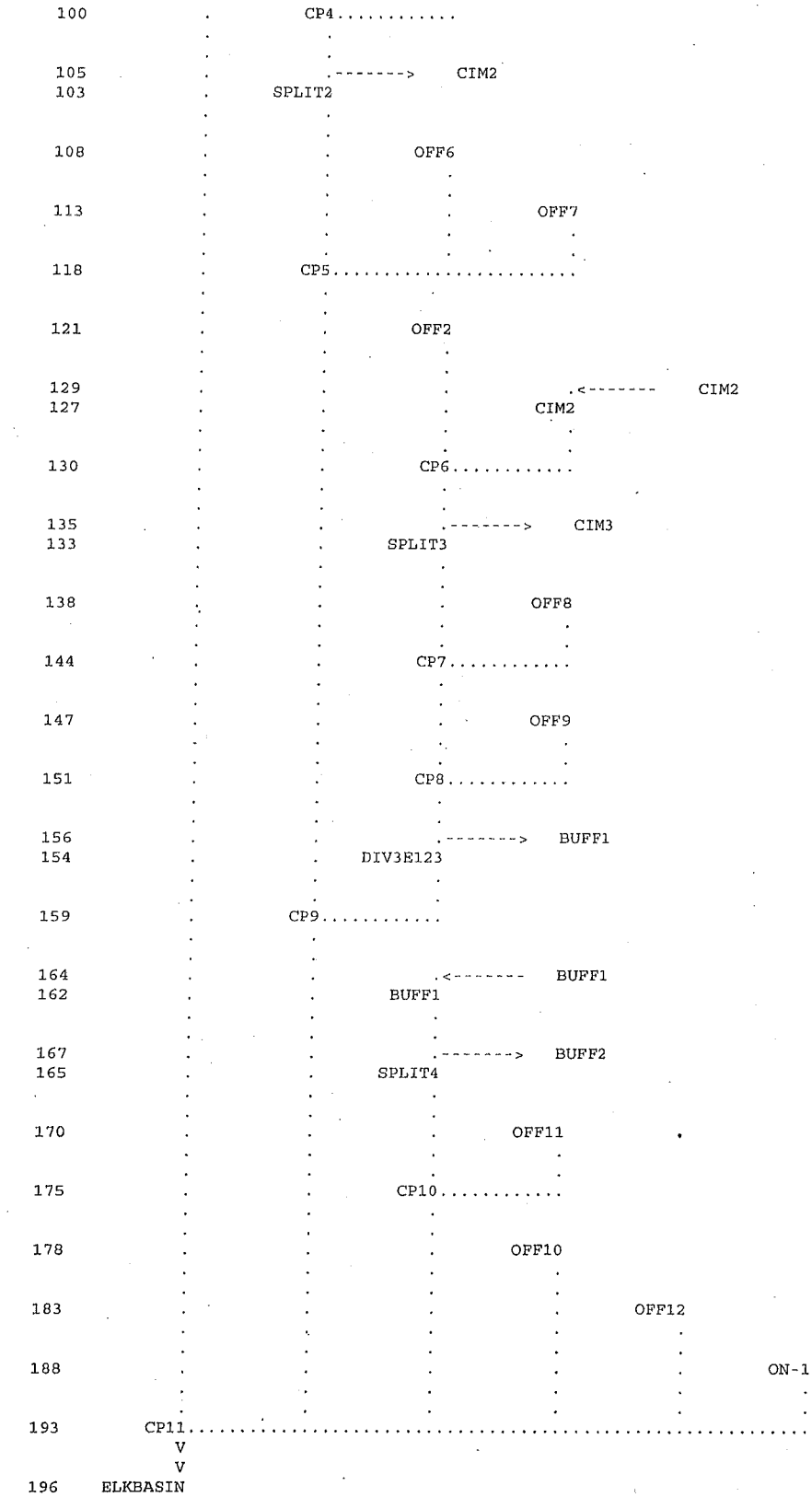
 188          KK    ON-1
 189          KM   ON SITE SUBBASIN
 190          BA  0.0194
 191          LS       0   78.82
 192          UD   0.191
              *
```

```
 193            KK    CP11
 194            KM   COMBINE OFF12,OFF-10,CP-10,CP-9 AND ON-1
 195            HC       6
                *
 196            KKELKBASIN
 197            KM    FACILITY = ELKHORN SPRINGS DETENTION BASIN
 198            KM    FACILITY ID-MILE = EKDB 0070
 199            KM    STORAGE VOLUME = 48 ACRE-FEET
 200            KM    OUTLET = 2-27 inch RCPs transition to 60" RCP
 201            KM    SPILLWAY LENGTH =
 202            KM    SPILLWAY HEIGHT =
                *  KO       3
 203            RS       1    STOR      -1
 204            SV    0.04    0.07    0.41    1.41    3.24    5.71    8.57    11.8    15.3    19.0
 205            SV    22.9    27.0    31.3    35.8    40.5
 206            SE    2386    2387    2388    2389    2390    2391    2392    2393    2394    2395
 207            SE    2396    2397    2398    2399    2400
                *  2-27 inches low level outlet release rate
 208            SQ       0       0       0       0    65.5    92.7  113.53   128.0   134.2   140.1
 209            SQ   145.7   151.2   156.4   161.5   166.4
                *  Outflow release rate - combine 48-inch debris riser orifice and
                *  1-27 inches low level outlet release rate
                *  open channel flow at the existing 60-inch RCP at 0.0013 slope
                *  SQ       0    40.9    45.6    49.8    53.7    57.3    60.8    64.0
                *  SQ    67.1    70.0    72.9    75.6    78.2    80.7    83.2
 210            KO       1
                *
 211            ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

  34          OFF1
                .
                .
  50            .-------->   FDI12
  47        DIV1FD
                .
                .
  55            .-------->    CIM1
  53        SPLIT1
                .
                .
  61            .-------->  FDI345
  58        DIV2FD
                .
                .
  64            .         OFF4
                .           .
                .           .
  69          CP1............
                .
                .
  75            .           .<-------   FDI12
  72            .       FDI12
                .           .
                .           .
  79            .           .          .<--------  FDI345
  76            .           .      FDI345
                .           .           .
                .           .           .
  80            .         CP2............
                .           .
                .           .
  84            .           .        OFF5
                .           .           .
                .           .           .
  89          CP3.....................
                .
                .
  92            .        OFF3
                .           .
                .           .
  99            .           .           .<--------    CIM1
  97            .           .        CIM1
                .           .           .
                .           .           .
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JAN  1997                *
*            VERSION 4.1                *
*                                       *
* RUN DATE   27JUN08  TIME  09:32:00    *
*                                       *
*****************************************
```


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


```
*************************************************************
* ----------------------------------------------------------- *
* |                                                         | *
* |   ELKHORN SPRINGS AND BUFFALO DRIVE STORM DRAIN         | *
* |                  CITY OF LAS VEGAS                      | *
* |                PROPOSED CONDITIONS                      | *
* |                                                         | *
* |.........................................................| *
* |                                                         | *
* |         CLIENT--------------CITY OF LAS VEGAS           | *
* |         RETURN PERIOD-------10-YEAR                     | *
* |         DISTRIBUTUION-------6-HOUR SDN3                 | *
* |         PROJECT NO----------31678A                      | *
* |         FILENAME------------PI-10-OPT1.DAT              | *
* |         REV. DATE-----------06/17/08                    | *
* |                                                         | *
* |.........................................................| *
* |                                                         | *
* |                   AREA      DARF                        | *
* |                  (sq.mi.)                               | *
* |                0.00-0.50   1.000                        | *
* |                0.50-0.75   0.975                        | *
* |                0.75-1.00   0.970                        | *
* |                                                         | *
* |  MODELED BY: Parsons Brinckerhoff                       | *
* ----------------------------------------------------------- *
*************************************************************
```

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

    IT          HYDROGRAPH TIME DATA
                      NMIN           5  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1    0  STARTING DATE
                     ITIME         0000  STARTING TIME
                        NQ          300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      2    0  ENDING DATE
                    NDTIME        0055  ENDING TIME
                     ICENT          19  CENTURY MARK

                  COMPUTATION INTERVAL      .08 HOURS
                       TOTAL TIME BASE   24.92 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

    JP          MULTI-PLAN OPTION
                     NPLAN           1  NUMBER OF PLANS

    JR          MULTI-RATIO OPTION
                    RATIOS OF PRECIPITATION
                   1.00       .98       .97
```

*** *** *** *

```
          **************
          *            *
196 KK    *  ELKBASIN  *
          *            *
          **************

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

                HYDROGRAPH ROUTING DATA

203 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

204 SV            STORAGE         .0        .1        .4       1.4       3.2       5.7       8.6      11.8      15.3      19.0
                                 22.9      27.0      31.3      35.8      40.5

206 SE            ELEVATION   2386.00   2387.00   2388.00   2389.00   2390.00   2391.00   2392.00   2393.00   2394.00   2395.00
                              2396.00   2397.00   2398.00   2399.00   2400.00

208 SQ            DISCHARGE       0.        0.        0.        0.       66.       93.      114.      128.      134.      140.
                                146.      151.      156.      162.      166.

                                                          ***
```

HYDROGRAPH AT STATION ELKBASIN
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	1.4	2389.0	1		0820	101	0.	1.4	2389.0	1		1640	201	0.	1.4	2389.0
1		0005	2	0.	1.4	2389.0	1		0825	102	0.	1.4	2389.0	1		1645	202	0.	1.4	2389.0
1		0010	3	0.	1.4	2389.0	1		0830	103	0.	1.4	2389.0	1		1650	203	0.	1.4	2389.0
1		0015	4	0.	1.4	2389.0	1		0835	104	0.	1.4	2389.0	1		1655	204	0.	1.4	2389.0
1		0020	5	0.	1.4	2389.0	1		0840	105	0.	1.4	2389.0	1		1700	205	0.	1.4	2389.0
1		0025	6	0.	1.4	2389.0	1		0845	106	0.	1.4	2389.0	1		1705	206	0.	1.4	2389.0
1		0030	7	1.	1.4	2389.0	1		0850	107	0.	1.4	2389.0	1		1710	207	0.	1.4	2389.0
1		0035	8	1.	1.4	2389.0	1		0855	108	0.	1.4	2389.0	1		1715	208	0.	1.4	2389.0
1		0040	9	1.	1.4	2389.0	1		0900	109	0.	1.4	2389.0	1		1720	209	0.	1.4	2389.0
1		0045	10	1.	1.4	2389.0	1		0905	110	0.	1.4	2389.0	1		1725	210	0.	1.4	2389.0
1		0050	11	1.	1.4	2389.0	1		0910	111	0.	1.4	2389.0	1		1730	211	0.	1.4	2389.0
1		0055	12	1.	1.4	2389.0	1		0915	112	0.	1.4	2389.0	1		1735	212	0.	1.4	2389.0
1		0100	13	1.	1.4	2389.0	1		0920	113	0.	1.4	2389.0	1		1740	213	0.	1.4	2389.0
1		0105	14	1.	1.4	2389.0	1		0925	114	0.	1.4	2389.0	1		1745	214	0.	1.4	2389.0
1		0110	15	0.	1.4	2389.0	1		0930	115	0.	1.4	2389.0	1		1750	215	0.	1.4	2389.0
1		0115	16	0.	1.4	2389.0	1		0935	116	0.	1.4	2389.0	1		1755	216	0.	1.4	2389.0
1		0120	17	1.	1.4	2389.0	1		0940	117	0.	1.4	2389.0	1		1800	217	0.	1.4	2389.0
1		0125	18	1.	1.4	2389.0	1		0945	118	0.	1.4	2389.0	1		1805	218	0.	1.4	2389.0
1		0130	19	1.	1.4	2389.0	1		0950	119	0.	1.4	2389.0	1		1810	219	0.	1.4	2389.0
1		0135	20	1.	1.4	2389.0	1		0955	120	0.	1.4	2389.0	1		1815	220	0.	1.4	2389.0
1		0140	21	1.	1.4	2389.0	1		1000	121	0.	1.4	2389.0	1		1820	221	0.	1.4	2389.0
1		0145	22	1.	1.4	2389.0	1		1005	122	0.	1.4	2389.0	1		1825	222	0.	1.4	2389.0
1		0150	23	2.	1.5	2389.0	1		1010	123	0.	1.4	2389.0	1		1830	223	0.	1.4	2389.0
1		0155	24	2.	1.5	2389.0	1		1015	124	0.	1.4	2389.0	1		1835	224	0.	1.4	2389.0
1		0200	25	1.	1.4	2389.0	1		1020	125	0.	1.4	2389.0	1		1840	225	0.	1.4	2389.0
1		0205	26	1.	1.4	2389.0	1		1025	126	0.	1.4	2389.0	1		1845	226	0.	1.4	2389.0
1		0210	27	1.	1.4	2389.0	1		1030	127	0.	1.4	2389.0	1		1850	227	0.	1.4	2389.0
1		0215	28	1.	1.4	2389.0	1		1035	128	0.	1.4	2389.0	1		1855	228	0.	1.4	2389.0
1		0220	29	2.	1.5	2389.0	1		1040	129	0.	1.4	2389.0	1		1900	229	0.	1.4	2389.0
1		0225	30	2.	1.5	2389.0	1		1045	130	0.	1.4	2389.0	1		1905	230	0.	1.4	2389.0
1		0230	31	2.	1.5	2389.0	1		1050	131	0.	1.4	2389.0	1		1910	231	0.	1.4	2389.0
1		0235	32	3.	1.5	2389.0	1		1055	132	0.	1.4	2389.0	1		1915	232	0.	1.4	2389.0
1		0240	33	3.	1.5	2389.0	1		1100	133	0.	1.4	2389.0	1		1920	233	0.	1.4	2389.0
1		0245	34	3.	1.5	2389.0	1		1105	134	0.	1.4	2389.0	1		1925	234	0.	1.4	2389.0
1		0250	35	3.	1.5	2389.1	1		1110	135	0.	1.4	2389.0	1		1930	235	0.	1.4	2389.0
1		0255	36	4.	1.5	2389.1	1		1115	136	0.	1.4	2389.0	1		1935	236	0.	1.4	2389.0
1		0300	37	4.	1.5	2389.1	1		1120	137	0.	1.4	2389.0	1		1940	237	0.	1.4	2389.0
1		0305	38	4.	1.5	2389.1	1		1125	138	0.	1.4	2389.0	1		1945	238	0.	1.4	2389.0
1		0310	39	5.	1.6	2389.1	1		1130	139	0.	1.4	2389.0	1		1950	239	0.	1.4	2389.0
1		0315	40	8.	1.6	2389.1	1		1135	140	0.	1.4	2389.0	1		1955	240	0.	1.4	2389.0
1		0320	41	15.	1.8	2389.2	1		1140	141	0.	1.4	2389.0	1		2000	241	0.	1.4	2389.0

1	0325	42	28.	2.2	2389.4	*	1	1145	142	0.	1.4	2389.0	*	1	2005	242	0.	1.4	2389.0
1	0330	43	51.	2.8	2389.8	*	1	1150	143	0.	1.4	2389.0	*	1	2010	243	0.	1.4	2389.0
1	0335	44	71.	3.7	2390.2	*	1	1155	144	0.	1.4	2389.0	*	1	2015	244	0.	1.4	2389.0
1	0340	45	83.	4.8	2390.6	*	1	1200	145	0.	1.4	2389.0	*	1	2020	245	0.	1.4	2389.0
1	0345	46	94.	5.8	2391.0	*	1	1205	146	0.	1.4	2389.0	*	1	2025	246	0.	1.4	2389.0
1	0350	47	100.	6.7	2391.3	*	1	1210	147	0.	1.4	2389.0	*	1	2030	247	0.	1.4	2389.0
1	0355	48	104.	7.3	2391.5	*	1	1215	148	0.	1.4	2389.0	*	1	2035	248	0.	1.4	2389.0
1	0400	49	106.	7.6	2391.7	*	1	1220	149	0.	1.4	2389.0	*	1	2040	249	0.	1.4	2389.0
1	0405	50	107.	7.7	2391.7	*	1	1225	150	0.	1.4	2389.0	*	1	2045	250	0.	1.4	2389.0
1	0410	51	107.	7.6	2391.7	*	1	1230	151	0.	1.4	2389.0	*	1	2050	251	0.	1.4	2389.0
1	0415	52	105.	7.5	2391.6	*	1	1235	152	0.	1.4	2389.0	*	1	2055	252	0.	1.4	2389.0
1	0420	53	103.	7.2	2391.5	*	1	1240	153	0.	1.4	2389.0	*	1	2100	253	0.	1.4	2389.0
1	0425	54	101.	6.9	2391.4	*	1	1245	154	0.	1.4	2389.0	*	1	2105	254	0.	1.4	2389.0
1	0430	55	99.	6.6	2391.3	*	1	1250	155	0.	1.4	2389.0	*	1	2110	255	0.	1.4	2389.0
1	0435	56	97.	6.3	2391.2	*	1	1255	156	0.	1.4	2389.0	*	1	2115	256	0.	1.4	2389.0
1	0440	57	96.	6.1	2391.1	*	1	1300	157	0.	1.4	2389.0	*	1	2120	257	0.	1.4	2389.0
1	0445	58	94.	5.9	2391.1	*	1	1305	158	0.	1.4	2389.0	*	1	2125	258	0.	1.4	2389.0
1	0450	59	93.	5.8	2391.0	*	1	1310	159	0.	1.4	2389.0	*	1	2130	259	0.	1.4	2389.0
1	0455	60	93.	5.7	2391.0	*	1	1315	160	0.	1.4	2389.0	*	1	2135	260	0.	1.4	2389.0
1	0500	61	91.	5.6	2390.9	*	1	1320	161	0.	1.4	2389.0	*	1	2140	261	0.	1.4	2389.0
1	0505	62	89.	5.4	2390.9	*	1	1325	162	0.	1.4	2389.0	*	1	2145	262	0.	1.4	2389.0
1	0510	63	87.	5.2	2390.8	*	1	1330	163	0.	1.4	2389.0	*	1	2150	263	0.	1.4	2389.0
1	0515	64	83.	4.9	2390.7	*	1	1335	164	0.	1.4	2389.0	*	1	2155	264	0.	1.4	2389.0
1	0520	65	80.	4.5	2390.5	*	1	1340	165	0.	1.4	2389.0	*	1	2200	265	0.	1.4	2389.0
1	0525	66	76.	4.2	2390.4	*	1	1345	166	0.	1.4	2389.0	*	1	2205	266	0.	1.4	2389.0
1	0530	67	72.	3.8	2390.2	*	1	1350	167	0.	1.4	2389.0	*	1	2210	267	0.	1.4	2389.0
1	0535	68	68.	3.4	2390.1	*	1	1355	168	0.	1.4	2389.0	*	1	2215	268	0.	1.4	2389.0
1	0540	69	60.	3.1	2389.9	*	1	1400	169	0.	1.4	2389.0	*	1	2220	269	0.	1.4	2389.0
1	0545	70	49.	2.8	2389.7	*	1	1405	170	0.	1.4	2389.0	*	1	2225	270	0.	1.4	2389.0
1	0550	71	40.	2.5	2389.6	*	1	1410	171	0.	1.4	2389.0	*	1	2230	271	0.	1.4	2389.0
1	0555	72	33.	2.3	2389.5	*	1	1415	172	0.	1.4	2389.0	*	1	2235	272	0.	1.4	2389.0
1	0600	73	28.	2.2	2389.4	*	1	1420	173	0.	1.4	2389.0	*	1	2240	273	0.	1.4	2389.0
1	0605	74	23.	2.1	2389.4	*	1	1425	174	0.	1.4	2389.0	*	1	2245	274	0.	1.4	2389.0
1	0610	75	19.	1.9	2389.3	*	1	1430	175	0.	1.4	2389.0	*	1	2250	275	0.	1.4	2389.0
1	0615	76	16.	1.9	2389.2	*	1	1435	176	0.	1.4	2389.0	*	1	2255	276	0.	1.4	2389.0
1	0620	77	13.	1.8	2389.2	*	1	1440	177	0.	1.4	2389.0	*	1	2300	277	0.	1.4	2389.0
1	0625	78	11.	1.7	2389.2	*	1	1445	178	0.	1.4	2389.0	*	1	2305	278	0.	1.4	2389.0
1	0630	79	9.	1.6	2389.1	*	1	1450	179	0.	1.4	2389.0	*	1	2310	279	0.	1.4	2389.0
1	0635	80	7.	1.6	2389.1	*	1	1455	180	0.	1.4	2389.0	*	1	2315	280	0.	1.4	2389.0
1	0640	81	5.	1.6	2389.1	*	1	1500	181	0.	1.4	2389.0	*	1	2320	281	0.	1.4	2389.0
1	0645	82	4.	1.5	2389.1	*	1	1505	182	0.	1.4	2389.0	*	1	2325	282	0.	1.4	2389.0
1	0650	83	3.	1.5	2389.1	*	1	1510	183	0.	1.4	2389.0	*	1	2330	283	0.	1.4	2389.0
1	0655	84	3.	1.5	2389.0	*	1	1515	184	0.	1.4	2389.0	*	1	2335	284	0.	1.4	2389.0
1	0700	85	2.	1.5	2389.0	*	1	1520	185	0.	1.4	2389.0	*	1	2340	285	0.	1.4	2389.0
1	0705	86	2.	1.5	2389.0	*	1	1525	186	0.	1.4	2389.0	*	1	2345	286	0.	1.4	2389.0
1	0710	87	1.	1.4	2389.0	*	1	1530	187	0.	1.4	2389.0	*	1	2350	287	0.	1.4	2389.0
1	0715	88	1.	1.4	2389.0	*	1	1535	188	0.	1.4	2389.0	*	1	2355	288	0.	1.4	2389.0
1	0720	89	1.	1.4	2389.0	*	1	1540	189	0.	1.4	2389.0	*	2	0000	289	0.	1.4	2389.0
1	0725	90	1.	1.4	2389.0	*	1	1545	190	0.	1.4	2389.0	*	2	0005	290	0.	1.4	2389.0
1	0730	91	0.	1.4	2389.0	*	1	1550	191	0.	1.4	2389.0	*	2	0010	291	0.	1.4	2389.0
1	0735	92	0.	1.4	2389.0	*	1	1555	192	0.	1.4	2389.0	*	2	0015	292	0.	1.4	2389.0
1	0740	93	0.	1.4	2389.0	*	1	1600	193	0.	1.4	2389.0	*	2	0020	293	0.	1.4	2389.0
1	0745	94	0.	1.4	2389.0	*	1	1605	194	0.	1.4	2389.0	*	2	0025	294	0.	1.4	2389.0
1	0750	95	0.	1.4	2389.0	*	1	1610	195	0.	1.4	2389.0	*	2	0030	295	0.	1.4	2389.0
1	0755	96	0.	1.4	2389.0	*	1	1615	196	0.	1.4	2389.0	*	2	0035	296	0.	1.4	2389.0
1	0800	97	0.	1.4	2389.0	*	1	1620	197	0.	1.4	2389.0	*	2	0040	297	0.	1.4	2389.0
1	0805	98	0.	1.4	2389.0	*	1	1625	198	0.	1.4	2389.0	*	2	0045	298	0.	1.4	2389.0
1	0810	99	0.	1.4	2389.0	*	1	1630	199	0.	1.4	2389.0	*	2	0050	299	0.	1.4	2389.0
1	0815	100	0.	1.4	2389.0	*	1	1635	200	0.	1.4	2389.0	*	2	0055	300	0.	1.4	2389.0
						*							*						

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 107.	4.08		39.	10.	9.	9.
		(INCHES)	.393	.395	.395	.395
		(AC-FT)	19.	19.	19.	19.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
8.	4.08	3.	2.	2.	2.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
2391.69	4.08	2389.80	2389.20	2389.19	2389.19

CUMULATIVE AREA = .91 SQ MI

HYDROGRAPH AT STATION ELKBASIN
PLAN 1, RATIO = .98

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	1.4	2389.0	1		0820	101	0.	1.4	2389.0	1		1640	201	0.	1.4	2389.0
1		0005	2	0.	1.4	2389.0	1		0825	102	0.	1.4	2389.0	1		1645	202	0.	1.4	2389.0
1		0010	3	0.	1.4	2389.0	1		0830	103	0.	1.4	2389.0	1		1650	203	0.	1.4	2389.0
1		0015	4	0.	1.4	2389.0	1		0835	104	0.	1.4	2389.0	1		1655	204	0.	1.4	2389.0
1		0020	5	0.	1.4	2389.0	1		0840	105	0.	1.4	2389.0	1		1700	205	0.	1.4	2389.0
1		0025	6	0.	1.4	2389.0	1		0845	106	0.	1.4	2389.0	1		1705	206	0.	1.4	2389.0
1		0030	7	1.	1.4	2389.0	1		0850	107	0.	1.4	2389.0	1		1710	207	0.	1.4	2389.0
1		0035	8	1.	1.4	2389.0	1		0855	108	0.	1.4	2389.0	1		1715	208	0.	1.4	2389.0
1		0040	9	1.	1.4	2389.0	1		0900	109	0.	1.4	2389.0	1		1720	209	0.	1.4	2389.0
1		0045	10	1.	1.4	2389.0	1		0905	110	0.	1.4	2389.0	1		1725	210	0.	1.4	2389.0
1		0050	11	1.	1.4	2389.0	1		0910	111	0.	1.4	2389.0	1		1730	211	0.	1.4	2389.0
1		0055	12	1.	1.4	2389.0	1		0915	112	0.	1.4	2389.0	1		1735	212	0.	1.4	2389.0
1		0100	13	1.	1.4	2389.0	1		0920	113	0.	1.4	2389.0	1		1740	213	0.	1.4	2389.0
1		0105	14	1.	1.4	2389.0	1		0925	114	0.	1.4	2389.0	1		1745	214	0.	1.4	2389.0
1		0110	15	0.	1.4	2389.0	1		0930	115	0.	1.4	2389.0	1		1750	215	0.	1.4	2389.0
1		0115	16	0.	1.4	2389.0	1		0935	116	0.	1.4	2389.0	1		1755	216	0.	1.4	2389.0
1		0120	17	0.	1.4	2389.0	1		0940	117	0.	1.4	2389.0	1		1800	217	0.	1.4	2389.0
1		0125	18	1.	1.4	2389.0	1		0945	118	0.	1.4	2389.0	1		1805	218	0.	1.4	2389.0
1		0130	19	1.	1.4	2389.0	1		0950	119	0.	1.4	2389.0	1		1810	219	0.	1.4	2389.0
1		0135	20	1.	1.4	2389.0	1		0955	120	0.	1.4	2389.0	1		1815	220	0.	1.4	2389.0
1		0140	21	1.	1.4	2389.0	1		1000	121	0.	1.4	2389.0	1		1820	221	0.	1.4	2389.0
1		0145	22	1.	1.4	2389.0	1		1005	122	0.	1.4	2389.0	1		1825	222	0.	1.4	2389.0
1		0150	23	1.	1.5	2389.0	1		1010	123	0.	1.4	2389.0	1		1830	223	0.	1.4	2389.0
1		0155	24	1.	1.5	2389.0	1		1015	124	0.	1.4	2389.0	1		1835	224	0.	1.4	2389.0
1		0200	25	1.	1.4	2389.0	1		1020	125	0.	1.4	2389.0	1		1840	225	0.	1.4	2389.0
1		0205	26	1.	1.4	2389.0	1		1025	126	0.	1.4	2389.0	1		1845	226	0.	1.4	2389.0
1		0210	27	1.	1.4	2389.0	1		1030	127	0.	1.4	2389.0	1		1850	227	0.	1.4	2389.0
1		0215	28	1.	1.4	2389.0	1		1035	128	0.	1.4	2389.0	1		1855	228	0.	1.4	2389.0
1		0220	29	1.	1.4	2389.0	1		1040	129	0.	1.4	2389.0	1		1900	229	0.	1.4	2389.0
1		0225	30	2.	1.5	2389.0	1		1045	130	0.	1.4	2389.0	1		1905	230	0.	1.4	2389.0
1		0230	31	2.	1.5	2389.0	1		1050	131	0.	1.4	2389.0	1		1910	231	0.	1.4	2389.0
1		0235	32	2.	1.5	2389.0	1		1055	132	0.	1.4	2389.0	1		1915	232	0.	1.4	2389.0
1		0240	33	3.	1.5	2389.0	1		1100	133	0.	1.4	2389.0	1		1920	233	0.	1.4	2389.0
1		0245	34	3.	1.5	2389.0	1		1105	134	0.	1.4	2389.0	1		1925	234	0.	1.4	2389.0
1		0250	35	3.	1.5	2389.0	1		1110	135	0.	1.4	2389.0	1		1930	235	0.	1.4	2389.0
1		0255	36	3.	1.5	2389.1	1		1115	136	0.	1.4	2389.0	1		1935	236	0.	1.4	2389.0
1		0300	37	3.	1.5	2389.1	1		1120	137	0.	1.4	2389.0	1		1940	237	0.	1.4	2389.0
1		0305	38	4.	1.5	2389.1	1		1125	138	0.	1.4	2389.0	1		1945	238	0.	1.4	2389.0
1		0310	39	5.	1.5	2389.1	1		1130	139	0.	1.4	2389.0	1		1950	239	0.	1.4	2389.0
1		0315	40	8.	1.6	2389.1	1		1135	140	0.	1.4	2389.0	1		1955	240	0.	1.4	2389.0
1		0320	41	14.	1.8	2389.2	1		1140	141	0.	1.4	2389.0	1		2000	241	0.	1.4	2389.0
1		0325	42	26.	2.1	2389.4	1		1145	142	0.	1.4	2389.0	1		2005	242	0.	1.4	2389.0
1		0330	43	47.	2.7	2389.7	1		1150	143	0.	1.4	2389.0	1		2010	243	0.	1.4	2389.0
1		0335	44	69.	3.6	2390.1	1		1155	144	0.	1.4	2389.0	1		2015	244	0.	1.4	2389.0
1		0340	45	80.	4.6	2390.5	1		1200	145	0.	1.4	2389.0	1		2020	245	0.	1.4	2389.0
1		0345	46	91.	5.5	2390.9	1		1205	146	0.	1.4	2389.0	1		2025	246	0.	1.4	2389.0
1		0350	47	97.	6.3	2391.2	1		1210	147	0.	1.4	2389.0	1		2030	247	0.	1.4	2389.0
1		0355	48	101.	6.8	2391.4	1		1215	148	0.	1.4	2389.0	1		2035	248	0.	1.4	2389.0
1		0400	49	103.	7.1	2391.5	1		1220	149	0.	1.4	2389.0	1		2040	249	0.	1.4	2389.0
1		0405	50	104.	7.2	2391.5	1		1225	150	0.	1.4	2389.0	1		2045	250	0.	1.4	2389.0
1		0410	51	103.	7.2	2391.5	1		1230	151	0.	1.4	2389.0	1		2050	251	0.	1.4	2389.0
1		0415	52	102.	7.0	2391.4	1		1235	152	0.	1.4	2389.0	1		2055	252	0.	1.4	2389.0
1		0420	53	100.	6.7	2391.4	1		1240	153	0.	1.4	2389.0	1		2100	253	0.	1.4	2389.0
1		0425	54	98.	6.4	2391.2	1		1245	154	0.	1.4	2389.0	1		2105	254	0.	1.4	2389.0
1		0430	55	96.	6.1	2391.1	1		1250	155	0.	1.4	2389.0	1		2110	255	0.	1.4	2389.0
1		0435	56	94.	5.8	2391.0	1		1255	156	0.	1.4	2389.0	1		2115	256	0.	1.4	2389.0
1		0440	57	92.	5.7	2391.0	1		1300	157	0.	1.4	2389.0	1		2120	257	0.	1.4	2389.0
1		0445	58	91.	5.5	2390.9	1		1305	158	0.	1.4	2389.0	1		2125	258	0.	1.4	2389.0
1		0450	59	89.	5.4	2390.9	1		1310	159	0.	1.4	2389.0	1		2130	259	0.	1.4	2389.0
1		0455	60	88.	5.3	2390.8	1		1315	160	0.	1.4	2389.0	1		2135	260	0.	1.4	2389.0
1		0500	61	87.	5.2	2390.8	1		1320	161	0.	1.4	2389.0	1		2140	261	0.	1.4	2389.0
1		0505	62	85.	5.0	2390.7	1		1325	162	0.	1.4	2389.0	1		2145	262	0.	1.4	2389.0
1		0510	63	82.	4.8	2390.6	1		1330	163	0.	1.4	2389.0	1		2150	263	0.	1.4	2389.0
1		0515	64	79.	4.5	2390.5	1		1335	164	0.	1.4	2389.0	1		2155	264	0.	1.4	2389.0
1		0520	65	76.	4.2	2390.4	1		1340	165	0.	1.4	2389.0	1		2200	265	0.	1.4	2389.0
1		0525	66	72.	3.8	2390.2	1		1345	166	0.	1.4	2389.0	1		2205	266	0.	1.4	2389.0
1		0530	67	68.	3.5	2390.1	1		1350	167	0.	1.4	2389.0	1		2210	267	0.	1.4	2389.0
1		0535	68	62.	3.1	2389.9	1		1355	168	0.	1.4	2389.0	1		2215	268	0.	1.4	2389.0
1		0540	69	51.	2.8	2389.8	1		1400	169	0.	1.4	2389.0	1		2220	269	0.	1.4	2389.0
1		0545	70	42.	2.6	2389.6	1		1405	170	0.	1.4	2389.0	1		2225	270	0.	1.4	2389.0

1	0550	71	35.	2.4	2389.5	*	1	1410	171	0.	1.4	2389.0	*	1	2230	271	0.	1.4	2389.0
1	0555	72	29.	2.2	2389.4	*	1	1415	172	0.	1.4	2389.0	*	1	2235	272	0.	1.4	2389.0
1	0600	73	24.	2.1	2389.4	*	1	1420	173	0.	1.4	2389.0	*	1	2240	273	0.	1.4	2389.0
1	0605	74	20.	2.0	2389.3	*	1	1425	174	0.	1.4	2389.0	*	1	2245	274	0.	1.4	2389.0
1	0610	75	17.	1.9	2389.3	*	1	1430	175	0.	1.4	2389.0	*	1	2250	275	0.	1.4	2389.0
1	0615	76	14.	1.8	2389.2	*	1	1435	176	0.	1.4	2389.0	*	1	2255	276	0.	1.4	2389.0
1	0620	77	12.	1.7	2389.2	*	1	1440	177	0.	1.4	2389.0	*	1	2300	277	0.	1.4	2389.0
1	0625	78	10.	1.7	2389.1	*	1	1445	178	0.	1.4	2389.0	*	1	2305	278	0.	1.4	2389.0
1	0630	79	8.	1.6	2389.1	*	1	1450	179	0.	1.4	2389.0	*	1	2310	279	0.	1.4	2389.0
1	0635	80	6.	1.6	2389.1	*	1	1455	180	0.	1.4	2389.0	*	1	2315	280	0.	1.4	2389.0
1	0640	81	5.	1.5	2389.1	*	1	1500	181	0.	1.4	2389.0	*	1	2320	281	0.	1.4	2389.0
1	0645	82	4.	1.5	2389.1	*	1	1505	182	0.	1.4	2389.0	*	1	2325	282	0.	1.4	2389.0
1	0650	83	3.	1.5	2389.0	*	1	1510	183	0.	1.4	2389.0	*	1	2330	283	0.	1.4	2389.0
1	0655	84	2.	1.5	2389.0	*	1	1515	184	0.	1.4	2389.0	*	1	2335	284	0.	1.4	2389.0
1	0700	85	2.	1.5	2389.0	*	1	1520	185	0.	1.4	2389.0	*	1	2340	285	0.	1.4	2389.0
1	0705	86	2.	1.5	2389.0	*	1	1525	186	0.	1.4	2389.0	*	1	2345	286	0.	1.4	2389.0
1	0710	87	1.	1.4	2389.0	*	1	1530	187	0.	1.4	2389.0	*	1	2350	287	0.	1.4	2389.0
1	0715	88	1.	1.4	2389.0	*	1	1535	188	0.	1.4	2389.0	*	1	2355	288	0.	1.4	2389.0
1	0720	89	1.	1.4	2389.0	*	1	1540	189	0.	1.4	2389.0	*	2	0000	289	0.	1.4	2389.0
1	0725	90	1.	1.4	2389.0	*	1	1545	190	0.	1.4	2389.0	*	2	0005	290	0.	1.4	2389.0
1	0730	91	0.	1.4	2389.0	*	1	1550	191	0.	1.4	2389.0	*	2	0010	291	0.	1.4	2389.0
1	0735	92	0.	1.4	2389.0	*	1	1555	192	0.	1.4	2389.0	*	2	0015	292	0.	1.4	2389.0
1	0740	93	0.	1.4	2389.0	*	1	1600	193	0.	1.4	2389.0	*	2	0020	293	0.	1.4	2389.0
1	0745	94	0.	1.4	2389.0	*	1	1605	194	0.	1.4	2389.0	*	2	0025	294	0.	1.4	2389.0
1	0750	95	0.	1.4	2389.0	*	1	1610	195	0.	1.4	2389.0	*	2	0030	295	0.	1.4	2389.0
1	0755	96	0.	1.4	2389.0	*	1	1615	196	0.	1.4	2389.0	*	2	0035	296	0.	1.4	2389.0
1	0800	97	0.	1.4	2389.0	*	1	1620	197	0.	1.4	2389.0	*	2	0040	297	0.	1.4	2389.0
1	0805	98	0.	1.4	2389.0	*	1	1625	198	0.	1.4	2389.0	*	2	0045	298	0.	1.4	2389.0
1	0810	99	0.	1.4	2389.0	*	1	1630	199	0.	1.4	2389.0	*	2	0050	299	0.	1.4	2389.0
1	0815	100	0.	1.4	2389.0	*	1	1635	200	0.	1.4	2389.0	*	2	0055	300	0.	1.4	2389.0

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 104.	4.08		37.	9.	9.	9.
		(INCHES)	.373	.375	.375	.375
		(AC-FT)	18.	18.	18.	18.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
7.	4.08	3.	2.	2.	2.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
2391.53	4.08	2389.74	2389.19	2389.18	2389.18

CUMULATIVE AREA = .91 SQ MI

****

HYDROGRAPH AT STATION ELKBASIN
PLAN 1, RATIO = .97

****

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	1.4	2389.0	*	1		0820	101	0.	1.4	2389.0	*	1		1640	201	0.	1.4	2389.0
1		0005	2	0.	1.4	2389.0	*	1		0825	102	0.	1.4	2389.0	*	1		1645	202	0.	1.4	2389.0
1		0010	3	0.	1.4	2389.0	*	1		0830	103	0.	1.4	2389.0	*	1		1650	203	0.	1.4	2389.0
1		0015	4	0.	1.4	2389.0	*	1		0835	104	0.	1.4	2389.0	*	1		1655	204	0.	1.4	2389.0
1		0020	5	0.	1.4	2389.0	*	1		0840	105	0.	1.4	2389.0	*	1		1700	205	0.	1.4	2389.0
1		0025	6	0.	1.4	2389.0	*	1		0845	106	0.	1.4	2389.0	*	1		1705	206	0.	1.4	2389.0
1		0030	7	1.	1.4	2389.0	*	1		0850	107	0.	1.4	2389.0	*	1		1710	207	0.	1.4	2389.0
1		0035	8	1.	1.4	2389.0	*	1		0855	108	0.	1.4	2389.0	*	1		1715	208	0.	1.4	2389.0
1		0040	9	1.	1.4	2389.0	*	1		0900	109	0.	1.4	2389.0	*	1		1720	209	0.	1.4	2389.0
1		0045	10	1.	1.4	2389.0	*	1		0905	110	0.	1.4	2389.0	*	1		1725	210	0.	1.4	2389.0
1		0050	11	1.	1.4	2389.0	*	1		0910	111	0.	1.4	2389.0	*	1		1730	211	0.	1.4	2389.0
1		0055	12	1.	1.4	2389.0	*	1		0915	112	0.	1.4	2389.0	*	1		1735	212	0.	1.4	2389.0
1		0100	13	1.	1.4	2389.0	*	1		0920	113	0.	1.4	2389.0	*	1		1740	213	0.	1.4	2389.0
1		0105	14	1.	1.4	2389.0	*	1		0925	114	0.	1.4	2389.0	*	1		1745	214	0.	1.4	2389.0
1		0110	15	0.	1.4	2389.0	*	1		0930	115	0.	1.4	2389.0	*	1		1750	215	0.	1.4	2389.0
1		0115	16	0.	1.4	2389.0	*	1		0935	116	0.	1.4	2389.0	*	1		1755	216	0.	1.4	2389.0
1		0120	17	0.	1.4	2389.0	*	1		0940	117	0.	1.4	2389.0	*	1		1800	217	0.	1.4	2389.0
1		0125	18	1.	1.4	2389.0	*	1		0945	118	0.	1.4	2389.0	*	1		1805	218	0.	1.4	2389.0

1	0130	19	1.	1.4	2389.0	*	1	0950	119	0.	1.4	2389.0	*	1	1810	219	0.	1.4	2389.0
1	0135	20	1.	1.4	2389.0	*	1	0955	120	0.	1.4	2389.0	*	1	1815	220	0.	1.4	2389.0
1	0140	21	1.	1.4	2389.0	*	1	1000	121	0.	1.4	2389.0	*	1	1820	221	0.	1.4	2389.0
1	0145	22	1.	1.4	2389.0	*	1	1005	122	0.	1.4	2389.0	*	1	1825	222	0.	1.4	2389.0
1	0150	23	1.	1.5	2389.0	*	1	1010	123	0.	1.4	2389.0	*	1	1830	223	0.	1.4	2389.0
1	0155	24	1.	1.4	2389.0	*	1	1015	124	0.	1.4	2389.0	*	1	1835	224	0.	1.4	2389.0
1	0200	25	1.	1.4	2389.0	*	1	1020	125	0.	1.4	2389.0	*	1	1840	225	0.	1.4	2389.0
1	0205	26	1.	1.4	2389.0	*	1	1025	126	0.	1.4	2389.0	*	1	1845	226	0.	1.4	2389.0
1	0210	27	1.	1.4	2389.0	*	1	1030	127	0.	1.4	2389.0	*	1	1850	227	0.	1.4	2389.0
1	0215	28	1.	1.4	2389.0	*	1	1035	128	0.	1.4	2389.0	*	1	1855	228	0.	1.4	2389.0
1	0220	29	1.	1.4	2389.0	*	1	1040	129	0.	1.4	2389.0	*	1	1900	229	0.	1.4	2389.0
1	0225	30	2.	1.5	2389.0	*	1	1045	130	0.	1.4	2389.0	*	1	1905	230	0.	1.4	2389.0
1	0230	31	2.	1.5	2389.0	*	1	1050	131	0.	1.4	2389.0	*	1	1910	231	0.	1.4	2389.0
1	0235	32	2.	1.5	2389.0	*	1	1055	132	0.	1.4	2389.0	*	1	1915	232	0.	1.4	2389.0
1	0240	33	3.	1.5	2389.0	*	1	1100	133	0.	1.4	2389.0	*	1	1920	233	0.	1.4	2389.0
1	0245	34	3.	1.5	2389.0	*	1	1105	134	0.	1.4	2389.0	*	1	1925	234	0.	1.4	2389.0
1	0250	35	3.	1.5	2389.0	*	1	1110	135	0.	1.4	2389.0	*	1	1930	235	0.	1.4	2389.0
1	0255	36	3.	1.5	2389.1	*	1	1115	136	0.	1.4	2389.0	*	1	1935	236	0.	1.4	2389.0
1	0300	37	3.	1.5	2389.1	*	1	1120	137	0.	1.4	2389.0	*	1	1940	237	0.	1.4	2389.0
1	0305	38	4.	1.5	2389.1	*	1	1125	138	0.	1.4	2389.0	*	1	1945	238	0.	1.4	2389.0
1	0310	39	5.	1.5	2389.1	*	1	1130	139	0.	1.4	2389.0	*	1	1950	239	0.	1.4	2389.0
1	0315	40	7.	1.6	2389.1	*	1	1135	140	0.	1.4	2389.0	*	1	1955	240	0.	1.4	2389.0
1	0320	41	13.	1.8	2389.2	*	1	1140	141	0.	1.4	2389.0	*	1	2000	241	0.	1.4	2389.0
1	0325	42	26.	2.1	2389.4	*	1	1145	142	0.	1.4	2389.0	*	1	2005	242	0.	1.4	2389.0
1	0330	43	46.	2.7	2389.7	*	1	1150	143	0.	1.4	2389.0	*	1	2010	243	0.	1.4	2389.0
1	0335	44	69.	3.6	2390.1	*	1	1155	144	0.	1.4	2389.0	*	1	2015	244	0.	1.4	2389.0
1	0340	45	80.	4.5	2390.5	*	1	1200	145	0.	1.4	2389.0	*	1	2020	245	0.	1.4	2389.0
1	0345	46	90.	5.5	2390.9	*	1	1205	146	0.	1.4	2389.0	*	1	2025	246	0.	1.4	2389.0
1	0350	47	97.	6.2	2391.2	*	1	1210	147	0.	1.4	2389.0	*	1	2030	247	0.	1.4	2389.0
1	0355	48	100.	6.8	2391.4	*	1	1215	148	0.	1.4	2389.0	*	1	2035	248	0.	1.4	2389.0
1	0400	49	102.	7.0	2391.5	*	1	1220	149	0.	1.4	2389.0	*	1	2040	249	0.	1.4	2389.0
1	0405	50	103.	7.1	2391.5	*	1	1225	150	0.	1.4	2389.0	*	1	2045	250	0.	1.4	2389.0
1	0410	51	103.	7.1	2391.5	*	1	1230	151	0.	1.4	2389.0	*	1	2050	251	0.	1.4	2389.0
1	0415	52	101.	6.9	2391.4	*	1	1235	152	0.	1.4	2389.0	*	1	2055	252	0.	1.4	2389.0
1	0420	53	99.	6.6	2391.3	*	1	1240	153	0.	1.4	2389.0	*	1	2100	253	0.	1.4	2389.0
1	0425	54	97.	6.3	2391.2	*	1	1245	154	0.	1.4	2389.0	*	1	2105	254	0.	1.4	2389.0
1	0430	55	95.	6.0	2391.1	*	1	1250	155	0.	1.4	2389.0	*	1	2110	255	0.	1.4	2389.0
1	0435	56	93.	5.8	2391.0	*	1	1255	156	0.	1.4	2389.0	*	1	2115	256	0.	1.4	2389.0
1	0440	57	91.	5.6	2390.9	*	1	1300	157	0.	1.4	2389.0	*	1	2120	257	0.	1.4	2389.0
1	0445	58	90.	5.4	2390.9	*	1	1305	158	0.	1.4	2389.0	*	1	2125	258	0.	1.4	2389.0
1	0450	59	88.	5.3	2390.8	*	1	1310	159	0.	1.4	2389.0	*	1	2130	259	0.	1.4	2389.0
1	0455	60	87.	5.2	2390.8	*	1	1315	160	0.	1.4	2389.0	*	1	2135	260	0.	1.4	2389.0
1	0500	61	86.	5.1	2390.7	*	1	1320	161	0.	1.4	2389.0	*	1	2140	261	0.	1.4	2389.0
1	0505	62	84.	4.9	2390.7	*	1	1325	162	0.	1.4	2389.0	*	1	2145	262	0.	1.4	2389.0
1	0510	63	82.	4.7	2390.6	*	1	1330	163	0.	1.4	2389.0	*	1	2150	263	0.	1.4	2389.0
1	0515	64	79.	4.4	2390.5	*	1	1335	164	0.	1.4	2389.0	*	1	2155	264	0.	1.4	2389.0
1	0520	65	75.	4.1	2390.4	*	1	1340	165	0.	1.4	2389.0	*	1	2200	265	0.	1.4	2389.0
1	0525	66	71.	3.8	2390.2	*	1	1345	166	0.	1.4	2389.0	*	1	2205	266	0.	1.4	2389.0
1	0530	67	68.	3.4	2390.1	*	1	1350	167	0.	1.4	2389.0	*	1	2210	267	0.	1.4	2389.0
1	0535	68	60.	3.1	2389.9	*	1	1355	168	0.	1.4	2389.0	*	1	2215	268	0.	1.4	2389.0
1	0540	69	50.	2.8	2389.8	*	1	1400	169	0.	1.4	2389.0	*	1	2220	269	0.	1.4	2389.0
1	0545	70	41.	2.6	2389.6	*	1	1405	170	0.	1.4	2389.0	*	1	2225	270	0.	1.4	2389.0
1	0550	71	34.	2.4	2389.5	*	1	1410	171	0.	1.4	2389.0	*	1	2230	271	0.	1.4	2389.0
1	0555	72	28.	2.2	2389.4	*	1	1415	172	0.	1.4	2389.0	*	1	2235	272	0.	1.4	2389.0
1	0600	73	24.	2.1	2389.4	*	1	1420	173	0.	1.4	2389.0	*	1	2240	273	0.	1.4	2389.0
1	0605	74	20.	2.0	2389.3	*	1	1425	174	0.	1.4	2389.0	*	1	2245	274	0.	1.4	2389.0
1	0610	75	17.	1.9	2389.3	*	1	1430	175	0.	1.4	2389.0	*	1	2250	275	0.	1.4	2389.0
1	0615	76	14.	1.8	2389.2	*	1	1435	176	0.	1.4	2389.0	*	1	2255	276	0.	1.4	2389.0
1	0620	77	11.	1.7	2389.2	*	1	1440	177	0.	1.4	2389.0	*	1	2300	277	0.	1.4	2389.0
1	0625	78	9.	1.7	2389.1	*	1	1445	178	0.	1.4	2389.0	*	1	2305	278	0.	1.4	2389.0
1	0630	79	8.	1.6	2389.1	*	1	1450	179	0.	1.4	2389.0	*	1	2310	279	0.	1.4	2389.0
1	0635	80	6.	1.6	2389.1	*	1	1455	180	0.	1.4	2389.0	*	1	2315	280	0.	1.4	2389.0
1	0640	81	5.	1.5	2389.1	*	1	1500	181	0.	1.4	2389.0	*	1	2320	281	0.	1.4	2389.0
1	0645	82	4.	1.5	2389.1	*	1	1505	182	0.	1.4	2389.0	*	1	2325	282	0.	1.4	2389.0
1	0650	83	3.	1.5	2389.0	*	1	1510	183	0.	1.4	2389.0	*	1	2330	283	0.	1.4	2389.0
1	0655	84	2.	1.5	2389.0	*	1	1515	184	0.	1.4	2389.0	*	1	2335	284	0.	1.4	2389.0
1	0700	85	2.	1.5	2389.0	*	1	1520	185	0.	1.4	2389.0	*	1	2340	285	0.	1.4	2389.0
1	0705	86	1.	1.5	2389.0	*	1	1525	186	0.	1.4	2389.0	*	1	2345	286	0.	1.4	2389.0
1	0710	87	1.	1.4	2389.0	*	1	1530	187	0.	1.4	2389.0	*	1	2350	287	0.	1.4	2389.0
1	0715	88	1.	1.4	2389.0	*	1	1535	188	0.	1.4	2389.0	*	1	2355	288	0.	1.4	2389.0
1	0720	89	1.	1.4	2389.0	*	1	1540	189	0.	1.4	2389.0	*	2	0000	289	0.	1.4	2389.0
1	0725	90	1.	1.4	2389.0	*	1	1545	190	0.	1.4	2389.0	*	2	0005	290	0.	1.4	2389.0
1	0730	91	0.	1.4	2389.0	*	1	1550	191	0.	1.4	2389.0	*	2	0010	291	0.	1.4	2389.0
1	0735	92	0.	1.4	2389.0	*	1	1555	192	0.	1.4	2389.0	*	2	0015	292	0.	1.4	2389.0
1	0740	93	0.	1.4	2389.0	*	1	1600	193	0.	1.4	2389.0	*	2	0020	293	0.	1.4	2389.0
1	0745	94	0.	1.4	2389.0	*	1	1605	194	0.	1.4	2389.0	*	2	0025	294	0.	1.4	2389.0
1	0750	95	0.	1.4	2389.0	*	1	1610	195	0.	1.4	2389.0	*	2	0030	295	0.	1.4	2389.0
1	0755	96	0.	1.4	2389.0	*	1	1615	196	0.	1.4	2389.0	*	2	0035	296	0.	1.4	2389.0
1	0800	97	0.	1.4	2389.0	*	1	1620	197	0.	1.4	2389.0	*	2	0040	297	0.	1.4	2389.0
1	0805	98	0.	1.4	2389.0	*	1	1625	198	0.	1.4	2389.0	*	2	0045	298	0.	1.4	2389.0
1	0810	99	0.	1.4	2389.0	*	1	1630	199	0.	1.4	2389.0	*	2	0050	299	0.	1.4	2389.0

```
    1      0815 100        0.       1.4   2389.0 *  1      1635 200        0.       1.4   2389.0 *  2      0055 300        0.       1.4   2389.0
                                                  *                                                 *
*****************************************************************************************************************************************************
```

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 103.	4.08		36.	9.	9.	9.
		(INCHES)	.369	.371	.371	.371
		(AC-FT)	18.	18.	18.	18.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
7.	4.08	3.	2.	2.	2.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
2391.50	4.08	2389.73	2389.18	2389.18	2389.18

CUMULATIVE AREA = .91 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 1.00	RATIO 2 .98	RATIO 3 .97
HYDROGRAPH AT							
+	OFF1	.20	1	FLOW	72.	68.	68.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	FDI12	.20	1	FLOW	34.	33.	33.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	DIV1FD	.20	1	FLOW	37.	36.	35.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	CIM1	.20	1	FLOW	17.	16.	16.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	SPLIT1	.20	1	FLOW	21.	20.	20.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	FDI345	.20	1	FLOW	19.	18.	18.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	DIV2FD	.20	1	FLOW	2.	2.	2.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF4	.03	1	FLOW	11.	10.	10.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP1	.23	1	FLOW	13.	12.	12.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	FDI12	.00	1	FLOW	34.	33.	33.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	FDI345	.00	1	FLOW	19.	18.	18.
				TIME	3.75	3.75	3.75
2 COMBINED AT							
+	CP2	.00	1	FLOW	53.	51.	50.

				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF5	.05	1	FLOW	19.	18.	18.
				TIME	3.58	3.58	3.58
3 COMBINED AT							
+	CP3	.28	1	FLOW	77.	74.	73.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF3	.17	1	FLOW	44.	42.	41.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	CIM1	.00	1	FLOW	17.	16.	16.
				TIME	3.75	3.75	3.75
2 COMBINED AT							
+	CP4	.17	1	FLOW	61.	58.	57.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	CIM2	.17	1	FLOW	25.	23.	23.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	SPLIT2	.17	1	FLOW	36.	34.	34.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF6	.03	1	FLOW	8.	8.	8.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF7	.07	1	FLOW	19.	18.	17.
				TIME	3.67	3.67	3.67
3 COMBINED AT							
+	CP5	.26	1	FLOW	62.	59.	58.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF2	.18	1	FLOW	50.	48.	47.
				TIME	3.83	3.83	3.83
HYDROGRAPH AT							
+	CIM2	.00	1	FLOW	25.	23.	23.
				TIME	3.75	3.75	3.75
2 COMBINED AT							
+	CP6	.18	1	FLOW	74.	70.	70.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	CIM3	.18	1	FLOW	23.	22.	21.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	SPLIT3	.18	1	FLOW	52.	49.	48.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF8	.03	1	FLOW	10.	9.	9.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP7	.21	1	FLOW	58.	55.	54.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF9	.03	1	FLOW	28.	28.	27.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP8	.24	1	FLOW	78.	74.	74.
				TIME	3.67	3.67	3.67
DIVERSION TO							
+	BUFF1	.24	1	FLOW	28.	27.	27.
				TIME	3.67	3.67	3.67

HYDROGRAPH AT							
+	DIV3E123	.24	1	FLOW	50.	47.	47.
				TIME	3.67	3.67	3.67
2 COMBINED AT							
+	CP9	.50	1	FLOW	113.	106.	105.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	BUFF1	.00	1	FLOW	28.	27.	27.
				TIME	3.67	3.67	3.67
DIVERSION TO							
+	BUFF2	.00	1	FLOW	18.	18.	18.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	SPLIT4	.00	1	FLOW	9.	9.	9.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF11	.07	1	FLOW	19.	18.	18.
				TIME	3.67	3.67	3.67
2 COMBINED AT							
+	CP10	.07	1	FLOW	28.	27.	26.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF10	.03	1	FLOW	10.	9.	9.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF12	.02	1	FLOW	13.	12.	12.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ON-1	.02	1	FLOW	4.	4.	4.
				TIME	3.67	3.67	3.67
6 COMBINED AT							
+	CP11	.91	1	FLOW	241.	228.	225.
				TIME	3.67	3.67	3.67
ROUTED TO							
+	ELKBASIN	.91	1	FLOW	107.	104.	103.
				TIME	4.08	4.08	4.08

** PEAK STAGES IN FEET **

1	STAGE	2391.69	2391.53	2391.50
	TIME	4.08	4.08	4.08

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

PROPOSED CONDITION HEC-1
100-YEAR STORM EVENT

OPTION-1
OUTLET OF DETENTION BASIN WITH 2-27" RCPs

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JAN   1997               *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   27JUN08  TIME  09:32:18   *
*                                       *
*****************************************
```

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


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

                    *DIAGRAM
*** FREE ***
               1    ID   ************************************************************
               2    ID   * ---------------------------------------------------------- *
               3    ID   * |                                                        | *
               4    ID   * |   ELKHORN SPRINGS AND BUFFALO DRIVE STORM DRAIN        | *
               5    ID   * |                  CITY OF LAS VEGAS                     | *
               6    ID   * |                PROPOSED CONDITIONS                     | *
               7    ID   * |                                                        | *
               8    ID   * |........................................................| *
               9    ID   * |                                                        | *
              10    ID   * |         CLIENT--------------CITY OF LAS VEGAS          | *
              11    ID   * |         RETURN PERIOD-------100-YEAR                   | *
              12    ID   * |         DISTRIBUTUION-------6-HOUR SDN3                | *
              13    ID   * |         PROJECT NO----------31678A                     | *
              14    ID   * |         FILENAME------------PI-100-OPT1.DAT            | *
              15    ID   * |         REV. DATE-----------06/17/08                   | *
              16    ID   * |                                                        | *
              17    ID   * |........................................................| *
              18    ID   * |                                                        | *
              19    ID   * |                   AREA     DARF                        | *
              20    ID   * |                  (sq.mi.)                              | *
              21    ID   * |                 0.00-0.50  1.000                       | *
              22    ID   * |                 0.50-0.75  0.975                       | *
              23    ID   * |                 0.75-1.00  0.970                       | *
              24    ID   * |                                                        | *
              25    ID   * |  MODELED BY: Parsons Brinckerhoff                      | *
              26    ID   * ---------------------------------------------------------- *
              27    ID   ************************************************************
              28    ID
              29    ID
              30    IT       5       0       0     300
              31    IO       5       0       0
              32    IN       5       0       0
              33    JR    PREC    1.00   0.975   0.970
                    *
              34    KK    OFF1
              35    BA  0.1973
              36    PB    2.52
              37    PC   0.000   0.020   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
              38    PC   0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
              39    PC   0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
```

low

```
 40          PC   0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
 41          PC   0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
 42          PC   0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
 43          PC   0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
 44          PC   0.998   0.999   1.000
 45          LS      0   88.14
 46          UD   0.292
             *
```



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

 47          KK  DIV1FD
 48          KM   DIVERT FLOWS INTO DROP INLETS FDI-1 & FDI-2 LOCATED NWC OF FARM ROAD
 49          KM   AND CIMARRON ROAD
 50          DT   FDI12
 51          DI      0     100     179
 52          DQ      0    48.0      85
             *

 53          KK  SPLIT1
 54          KM   FLOW SPLIT ON CIMARRON ROAD AND FARM ROAD
 55          DT    CIM1
 56          DI       0      50      94
 57          DQ       0    22.3      42
             *

 58          KK  DIV2FD
 59          KM   DIVERT FLOWS INTO DROP INLETS FDI-3,FDI-4 & FDI-5 LOCATED ON FARM ROAD
 60          KM   BETWEEN CIMARRON ROAD & PALM GROVE
 61          DT  FDI345
 62          DI       0      52
 63          DQ       0      47
             *

 64          KK    OFF4
 65          BA  0.0308
 66          PB    2.77
 67          LS       0   82.00
 68          UD   0.112
             *

 69          KK     CP1
 70          KM   COMBINE OFF4 AND BY PASS FLOW FROM INLETS ON FARM ROAD
 71          HC       2
             *

 72          KK   FDI12
 73          KM   RECALL FLOW COLLECTED BY EXISTING STORM DRIAN SYSTEM(PLUGGED)ON FARM ROAD
 74          KM   WEST OF CIMARRON ROAD
 75          DR   FDI12
             *

 76          KK  FDI345
 77          KM   RECALL FLOW COLLECTED BY EXISTING STORM DRIAN SYSTEM(PLUGGED)ON FARM ROAD
 78          KM   BETWEEN CIMARRON ROAD AND PALM GROOVE LANE
 79          DR  FDI345
             *

 80          KK     CP2
 81          KM   COMBINE FD12 AND FD345 TO CALCULATED FLOW COLLECTED BY THE EXISTING
 82          KM   STORM DRAIN SYSTEM ON FARM ROAD (CURRENTLY PLUGGED)
 83          HC       2
             *
```



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

 84          KK    OFF5
 85          KM   SUBBASIN OFF5
 86          BA  0.0549
 87          LS       0   82.00
 88          UD   0.132
             *

 89          KK     CP3
 90          KM   COMBINE cp-1,CP-2 AND OFF5
 91          HC       3
             *
```

```
 92          KK    OFF3
 93          KM   SUBBASIN OFF3
 94          BA   0.165
 95          LS       0   82.02
 96          UD   0.246
             *

 97          KK    CIM1
 98          KM   RECALL FLOW SPLIT AT CIMMARON AND FARM ROAD ON CIMARRON ROAD
 99          DR    CIM1
             *

100          KK     CP4
101          KM   COMBINE OFF3 AND CIM1
102          HC       2
             *

103          KK  SPLIT2
104          KM   FLOW SPLIT ON CIMARRON ROAD AND SUNNY SPRINGS LANE
105          DT    CIM2
106          DI       0     100     182
107          DQ       0    40.6      74
             *

108          KK    OFF6
109          KM   SUBBASIN OFF6
110          BA  0.0287
111          LS       0   82.05
112          UD   0.223
             *

113          KK    OFF7
114          KM   SUBBASIN OFF7
115          BA  0.0667
116          LS       0   81.98
117          UD   0.219
             *
1                                        HEC-1 INPUT                                    PAGE  4

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

118          KK     CP5
119          KM   COMBINE OFF6,OFF7 AND REMAINING FLOW IN SUNNY SPRINGS LANE AFTER FLOW SPLIT
120          HC       3
             *

121          KK    OFF2
122          KM   SUBBASIN OFF2
123          BA  0.1786
124          PB    2.26
125          LS       0   87.44
126          UD   0.343
             *

127          KK    CIM2
128          KM   RECALL FLOW SPLIT AT CIMMARON AND SUNNY SPRINGS LANE ON CIMARRON ROAD
129          DR    CIM2
             *

130          KK     CP6
131          KM   COMBINE OFF2 & CIM2
132          HC       2
             *

133          KK  SPLIT3
134          KM   FLOW SPLIT ON CIMARRON ROAD AND ELKHORN ROAD
135          DT    CIM3
136          DI       0      50     195
137          DQ       0    15.3      60
             *

138          KK    OFF8
139          KM   SUBBASIN OFF8
140          BA  0.0282
141          PB    2.77
142          LS       0   81.79
143          UD   0.107
             *
```

Low

```
 144          KK     CP7
 145          KM    COMBINE OFF8 AND REMAINING FLOW IN ELKHORN ROAD
 146          HC       2
              *

 147          KK    OFF9
 148          BA  0.0285
 149          LS       0    97.46
 150          UD   0.149
              *
```



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

 151          KK     CP8
 152          KM    COMBINE OFF8,OFF9 AND REMAINING FLOW IN ELKHORN ROAD
 153          HC       2
              *

 154          KKDIV3E123
 155          KM    DIVERT FLOWS TO EXISTIGN DIs IN ELKHORN ROAD (6 DIs TOTAL)
 156          DT    BUFF1
 157          DI       0      50     193
 158          DQ       0    22.8      48
              *

 159          KK     CP9
 160          KM    COMBINE CP5 AND FLOW INTERCEPTED BY DIs IN ELKHORN ROAD
 161          HC       2
              *

 162          KK    BUFF1
 163          KM    RECALL FLOW BYPASSED BY DROP INLETS IN ELKHORN ROAD
 164          DR    BUFF1
              *

 165          KK  SPLIT4
 166          KM    FLOW SPLIT AT ELKHORN ROAD AND BUFFALO DRIVE
 167          DT    BUFF2
 168          DI       0      48
 169          DQ       0      32
              *

 170          KK    OFF11
 171          KM    SUBBASIN OFF11
 172          BA  0.0655
 173          LS       0    81.95
 174          UD   0.209
              *

 175          KK     CP10
 176          KM    COMBINE BUFF1 & BUFF2
 177          HC       2
              *

 178          KK    OFF10
 179          KM    SUBBASIN OFF10
 180          BA  0.0334
 181          LS       0    82.18
 182          UD   0.214
              *

 183          KK    OFF12
 184          KM    SUBBASIN OFF12
 185          BA  0.0156
 186          LS       0    92.92
 187          UD   0.106
              *
```



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

 188          KK     ON-1
 189          KM    ON SITE SUBBASIN
 190          BA  0.0194
 191          LS       0    78.82
 192          UD   0.191
              *
```

```
193           KK    CP11
194           KM   COMBINE OFF12,OFF-10,CP-10,CP-9 AND ON-1
195           HC       6
              *

196           KKELKBASIN
197           KM    FACILITY = ELKHORN SPRINGS DETENTION BASIN
198           KM    FACILITY ID-MILE = EKDB 0070
199           KM    STORAGE VOLUME = 48 ACRE-FEET
200           KM    OUTLET = 2-27 inch RCPs transition to 60" RCP
201           KM    SPILLWAY LENGTH =
202           KM    SPILLWAY HEIGHT =
              *  KO       3
203           RS       1    STOR      -1
204           SV    0.04    0.07    0.41    1.41    3.24    5.71    8.57    11.8    15.3    19.0
205           SV    22.9    27.0    31.3    35.8    40.5
206           SE    2386    2387    2388    2389    2390    2391    2392    2393    2394    2395
207           SE    2396    2397    2398    2399    2400
              *  2-27 inches low level outlet release rate
208           SQ       0       0       0       0    65.5    92.7  113.53   128.0   134.2   140.1
209           SQ   145.7   151.2   156.4   161.5   166.4
              *  Outflow release rate - combine 48-inch debris riser orifice and
              *  1-27 inches low level outlet release rate
              *  open channel flow at the existing 60-inch RCP at 0.0013 slope
              *  SQ       0    40.9    45.6    49.8    53.7    57.3    60.8    64.0
              *  SQ    67.1    70.0    72.9    75.6    78.2    80.7    83.2
210           KO       1
              *
211           ZZ
```

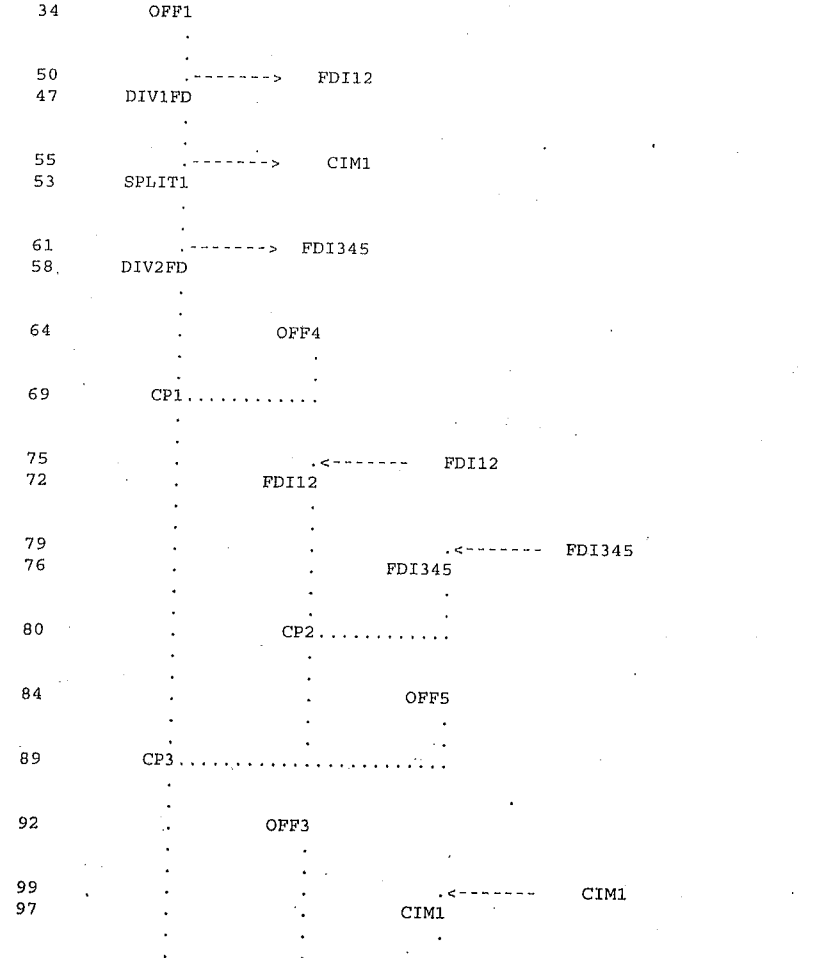
1

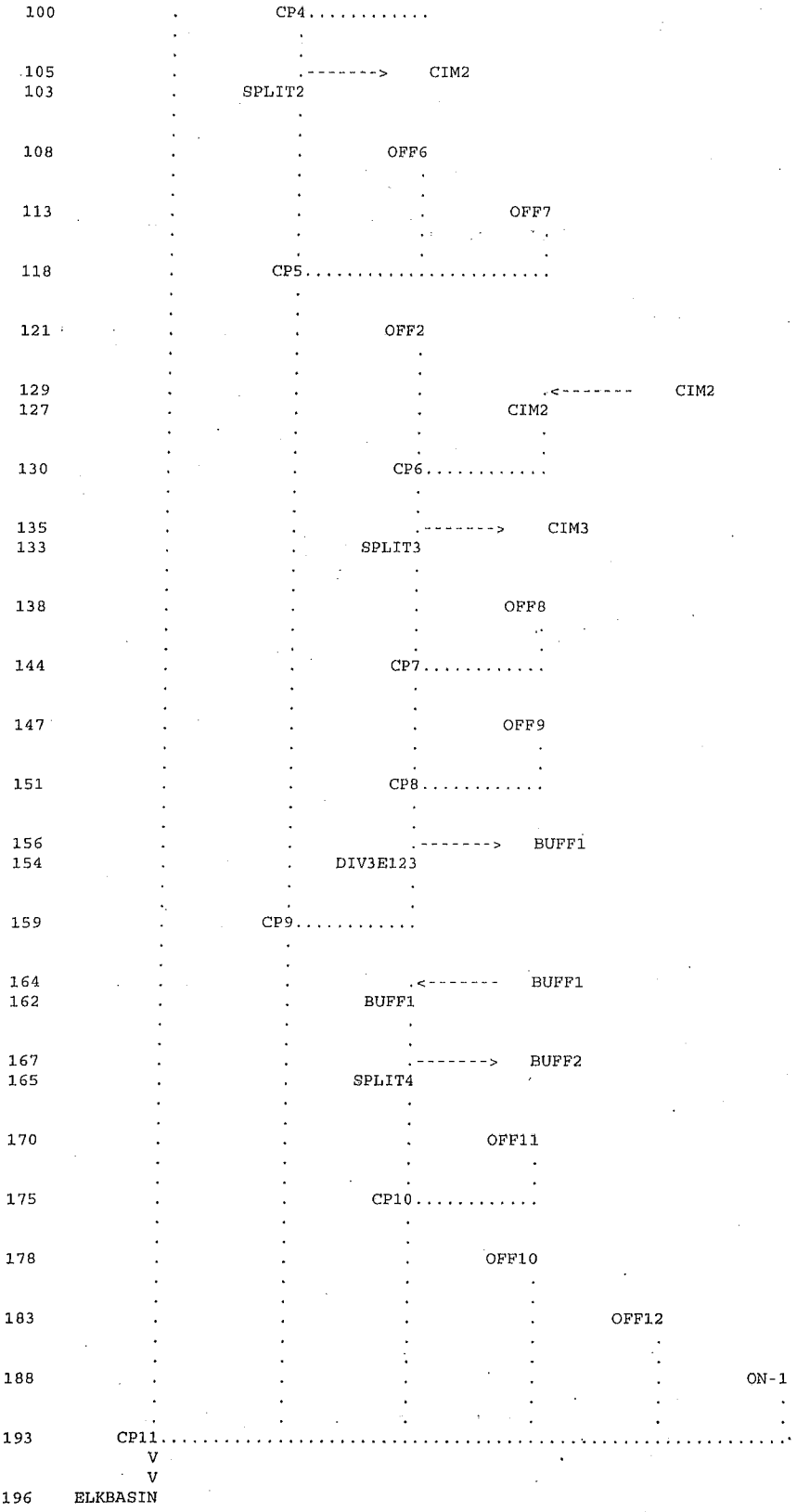
SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE NO.

(V) ROUTING (---->) DIVERSION OR PUMP FLOW

(.) CONNECTOR (<----) RETURN OF DIVERTED OR PUMPED FLOW





(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JAN  1997               *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   27JUN08  TIME  09:32:18   *
*                                       *
*****************************************
```

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

```
*****************************************************************
* ------------------------------------------------------------- *
* |                                                           | *
* |   ELKHORN SPRINGS AND BUFFALO DRIVE STORM DRAIN           | *
* |                  CITY OF LAS VEGAS                        | *
* |                PROPOSED CONDITIONS                        | *
* |                                                           | *
* |...........................................................| *
* |                                                           | *
* |         CLIENT--------------CITY OF LAS VEGAS              | *
* |         RETURN PERIOD-------100-YEAR                      | *
* |         DISTRIBUTUION-------6-HOUR SDN3                   | *
* |         PROJECT NO----------31678A                        | *
* |         FILENAME------------PI-100-OPT1.DAT               | *
* |         REV. DATE-----------06/17/08                      | *
* |                                                           | *
* |...........................................................| *
* |                                                           | *
* |                   AREA     DARF                           | *
* |                  (sq.mi.)                                 | *
* |                 0.00-0.50  1.000                          | *
* |                 0.50-0.75  0.975                          | *
* |                 0.75-1.00  0.970                          | *
* |                                                           | *
* |  MODELED BY: Parsons Brinckerhoff                         | *
* ------------------------------------------------------------- *
*****************************************************************
```

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

    IT          HYDROGRAPH TIME DATA
                      NMIN           5  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1    0  STARTING DATE
                     ITIME         0000  STARTING TIME
                        NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      2    0  ENDING DATE
                    NDTIME         0055  ENDING TIME
                    ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL      .08 HOURS
                       TOTAL TIME BASE   24.92 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

    JP          MULTI-PLAN OPTION
                      NPLAN           1  NUMBER OF PLANS

    JR          MULTI-RATIO OPTION
                    RATIOS OF PRECIPITATION
                   1.00       .98       .97
```

*** *** *** *

```
          **************
          *            *
196 KK    *  ELKBASIN  *
          *            *
          **************

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

                HYDROGRAPH ROUTING DATA

203 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

204 SV          STORAGE        .0       .1       .4      1.4      3.2      5.7      8.6     11.8     15.3     19.0
                             22.9     27.0     31.3     35.8     40.5

206 SE          ELEVATION   2386.00  2387.00  2388.00  2389.00  2390.00  2391.00  2392.00  2393.00  2394.00  2395.00
                            2396.00  2397.00  2398.00  2399.00  2400.00

208 SQ          DISCHARGE        0.       0.       0.       0.      66.      93.     114.     128.     134.     140.
                               146.     151.     156.     162.     166.

                                                          ***
```

HYDROGRAPH AT STATION ELKBASIN
PLAN 1, RATIO = 1.00

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE		DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE		DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	1.4	2389.0	*	1		0820	101	14.	1.8	2389.2	*	1		1640	201	0.	1.4	2389.0
1		0005	2	0.	1.4	2389.0	*	1		0825	102	11.	1.7	2389.2	*	1		1645	202	0.	1.4	2389.0
1		0010	3	0.	1.4	2389.0	*	1		0830	103	8.	1.6	2389.1	*	1		1650	203	0.	1.4	2389.0
1		0015	4	0.	1.4	2389.0	*	1		0835	104	6.	1.6	2389.1	*	1		1655	204	0.	1.4	2389.0
1		0020	5	1.	1.4	2389.0	*	1		0840	105	5.	1.6	2389.1	*	1		1700	205	0.	1.4	2389.0
1		0025	6	1.	1.5	2389.0	*	1		0845	106	4.	1.5	2389.1	*	1		1705	206	0.	1.4	2389.0
1		0030	7	2.	1.5	2389.0	*	1		0850	107	3.	1.5	2389.0	*	1		1710	207	0.	1.4	2389.0
1		0035	8	3.	1.5	2389.0	*	1		0855	108	2.	1.5	2389.0	*	1		1715	208	0.	1.4	2389.0
1		0040	9	4.	1.5	2389.1	*	1		0900	109	2.	1.5	2389.0	*	1		1720	209	0.	1.4	2389.0
1		0045	10	4.	1.5	2389.1	*	1		0905	110	1.	1.5	2389.0	*	1		1725	210	0.	1.4	2389.0
1		0050	11	3.	1.5	2389.1	*	1		0910	111	1.	1.4	2389.0	*	1		1730	211	0.	1.4	2389.0
1		0055	12	3.	1.5	2389.0	*	1		0915	112	1.	1.4	2389.0	*	1		1735	212	0.	1.4	2389.0
1		0100	13	3.	1.5	2389.0	*	1		0920	113	1.	1.4	2389.0	*	1		1740	213	0.	1.4	2389.0
1		0105	14	2.	1.5	2389.0	*	1		0925	114	1.	1.4	2389.0	*	1		1745	214	0.	1.4	2389.0
1		0110	15	2.	1.5	2389.0	*	1		0930	115	0.	1.4	2389.0	*	1		1750	215	0.	1.4	2389.0
1		0115	16	2.	1.5	2389.0	*	1		0935	116	0.	1.4	2389.0	*	1		1755	216	0.	1.4	2389.0
1		0120	17	2.	1.5	2389.0	*	1		0940	117	0.	1.4	2389.0	*	1		1800	217	0.	1.4	2389.0
1		0125	18	2.	1.5	2389.0	*	1		0945	118	0.	1.4	2389.0	*	1		1805	218	0.	1.4	2389.0
1		0130	19	3.	1.5	2389.0	*	1		0950	119	0.	1.4	2389.0	*	1		1810	219	0.	1.4	2389.0
1		0135	20	4.	1.5	2389.1	*	1		0955	120	0.	1.4	2389.0	*	1		1815	220	0.	1.4	2389.0
1		0140	21	6.	1.6	2389.1	*	1		1000	121	0.	1.4	2389.0	*	1		1820	221	0.	1.4	2389.0
1		0145	22	7.	1.6	2389.1	*	1		1005	122	0.	1.4	2389.0	*	1		1825	222	0.	1.4	2389.0
1		0150	23	9.	1.7	2389.1	*	1		1010	123	0.	1.4	2389.0	*	1		1830	223	0.	1.4	2389.0
1		0155	24	10.	1.7	2389.2	*	1		1015	124	0.	1.4	2389.0	*	1		1835	224	0.	1.4	2389.0
1		0200	25	10.	1.7	2389.2	*	1		1020	125	0.	1.4	2389.0	*	1		1840	225	0.	1.4	2389.0
1		0205	26	10.	1.7	2389.2	*	1		1025	126	0.	1.4	2389.0	*	1		1845	226	0.	1.4	2389.0
1		0210	27	10.	1.7	2389.2	*	1		1030	127	0.	1.4	2389.0	*	1		1850	227	0.	1.4	2389.0
1		0215	28	11.	1.7	2389.2	*	1		1035	128	0.	1.4	2389.0	*	1		1855	228	0.	1.4	2389.0
1		0220	29	12.	1.8	2389.2	*	1		1040	129	0.	1.4	2389.0	*	1		1900	229	0.	1.4	2389.0
1		0225	30	15.	1.8	2389.2	*	1		1045	130	0.	1.4	2389.0	*	1		1905	230	0.	1.4	2389.0
1		0230	31	19.	1.9	2389.3	*	1		1050	131	0.	1.4	2389.0	*	1		1910	231	0.	1.4	2389.0
1		0235	32	21.	2.0	2389.3	*	1		1055	132	0.	1.4	2389.0	*	1		1915	232	0.	1.4	2389.0
1		0240	33	23.	2.0	2389.3	*	1		1100	133	0.	1.4	2389.0	*	1		1920	233	0.	1.4	2389.0
1		0245	34	25.	2.1	2389.4	*	1		1105	134	0.	1.4	2389.0	*	1		1925	234	0.	1.4	2389.0
1		0250	35	27.	2.2	2389.4	*	1		1110	135	0.	1.4	2389.0	*	1		1930	235	0.	1.4	2389.0
1		0255	36	28.	2.2	2389.4	*	1		1115	136	0.	1.4	2389.0	*	1		1935	236	0.	1.4	2389.0
1		0300	37	29.	2.2	2389.4	*	1		1120	137	0.	1.4	2389.0	*	1		1940	237	0.	1.4	2389.0
1		0305	38	30.	2.3	2389.5	*	1		1125	138	0.	1.4	2389.0	*	1		1945	238	0.	1.4	2389.0
1		0310	39	36.	2.4	2389.5	*	1		1130	139	0.	1.4	2389.0	*	1		1950	239	0.	1.4	2389.0
1		0315	40	48.	2.7	2389.7	*	1		1135	140	0.	1.4	2389.0	*	1		1955	240	0.	1.4	2389.0
1		0320	41	68.	3.4	2390.1	*	1		1140	141	0.	1.4	2389.0	*	1		2000	241	0.	1.4	2389.0

1	0325	42	83.	4.8	2390.6	*	1	1145	142	0.	1.4	2389.0	*	1	2005	242	0.	1.4	2389.0
1	0330	43	104.	7.2	2391.5	*	1	1150	143	0.	1.4	2389.0	*	1	2010	243	0.	1.4	2389.0
1	0335	44	122.	10.5	2392.6	*	1	1155	144	0.	1.4	2389.0	*	1	2015	244	0.	1.4	2389.0
1	0340	45	132.	14.3	2393.7	*	1	1200	145	0.	1.4	2389.0	*	1	2020	245	0.	1.4	2389.0
1	0345	46	138.	17.9	2394.7	*	1	1205	146	0.	1.4	2389.0	*	1	2025	246	0.	1.4	2389.0
1	0350	47	143.	21.0	2395.5	*	1	1210	147	0.	1.4	2389.0	*	1	2030	247	0.	1.4	2389.0
1	0355	48	146.	23.4	2396.1	*	1	1215	148	0.	1.4	2389.0	*	1	2035	248	0.	1.4	2389.0
1	0400	49	149.	25.1	2396.5	*	1	1220	149	0.	1.4	2389.0	*	1	2040	249	0.	1.4	2389.0
1	0405	50	150.	26.2	2396.8	*	1	1225	150	0.	1.4	2389.0	*	1	2045	250	0.	1.4	2389.0
1	0410	51	151.	26.9	2397.0	*	1	1230	151	0.	1.4	2389.0	*	1	2050	251	0.	1.4	2389.0
1	0415	52	151.	27.2	2397.1	*	1	1235	152	0.	1.4	2389.0	*	1	2055	252	0.	1.4	2389.0
1	0420	53	152.	27.3	2397.1	*	1	1240	153	0.	1.4	2389.0	*	1	2100	253	0.	1.4	2389.0
1	0425	54	151.	27.1	2397.0	*	1	1245	154	0.	1.4	2389.0	*	1	2105	254	0.	1.4	2389.0
1	0430	55	151.	27.0	2397.0	*	1	1250	155	0.	1.4	2389.0	*	1	2110	255	0.	1.4	2389.0
1	0435	56	151.	26.9	2397.0	*	1	1255	156	0.	1.4	2389.0	*	1	2115	256	0.	1.4	2389.0
1	0440	57	151.	26.9	2397.0	*	1	1300	157	0.	1.4	2389.0	*	1	2120	257	0.	1.4	2389.0
1	0445	58	151.	27.0	2397.0	*	1	1305	158	0.	1.4	2389.0	*	1	2125	258	0.	1.4	2389.0
1	0450	59	151.	27.2	2397.0	*	1	1310	159	0.	1.4	2389.0	*	1	2130	259	0.	1.4	2389.0
1	0455	60	152.	27.3	2397.1	*	1	1315	160	0.	1.4	2389.0	*	1	2135	260	0.	1.4	2389.0
1	0500	61	152.	27.4	2397.1	*	1	1320	161	0.	1.4	2389.0	*	1	2140	261	0.	1.4	2389.0
1	0505	62	152.	27.4	2397.1	*	1	1325	162	0.	1.4	2389.0	*	1	2145	262	0.	1.4	2389.0
1	0510	63	151.	27.2	2397.0	*	1	1330	163	0.	1.4	2389.0	*	1	2150	263	0.	1.4	2389.0
1	0515	64	151.	26.8	2396.9	*	1	1335	164	0.	1.4	2389.0	*	1	2155	264	0.	1.4	2389.0
1	0520	65	150.	26.3	2396.8	*	1	1340	165	0.	1.4	2389.0	*	1	2200	265	0.	1.4	2389.0
1	0525	66	149.	25.6	2396.7	*	1	1345	166	0.	1.4	2389.0	*	1	2205	266	0.	1.4	2389.0
1	0530	67	148.	24.9	2396.5	*	1	1350	167	0.	1.4	2389.0	*	1	2210	267	0.	1.4	2389.0
1	0535	68	147.	24.1	2396.3	*	1	1355	168	0.	1.4	2389.0	*	1	2215	268	0.	1.4	2389.0
1	0540	69	146.	23.3	2396.1	*	1	1400	169	0.	1.4	2389.0	*	1	2220	269	0.	1.4	2389.0
1	0545	70	145.	22.4	2395.9	*	1	1405	170	0.	1.4	2389.0	*	1	2225	270	0.	1.4	2389.0
1	0550	71	144.	21.6	2395.7	*	1	1410	171	0.	1.4	2389.0	*	1	2230	271	0.	1.4	2389.0
1	0555	72	143.	20.7	2395.4	*	1	1415	172	0.	1.4	2389.0	*	1	2235	272	0.	1.4	2389.0
1	0600	73	141.	19.9	2395.2	*	1	1420	173	0.	1.4	2389.0	*	1	2240	273	0.	1.4	2389.0
1	0605	74	140.	19.0	2395.0	*	1	1425	174	0.	1.4	2389.0	*	1	2245	274	0.	1.4	2389.0
1	0610	75	139.	18.1	2394.8	*	1	1430	175	0.	1.4	2389.0	*	1	2250	275	0.	1.4	2389.0
1	0615	76	137.	17.3	2394.5	*	1	1435	176	0.	1.4	2389.0	*	1	2255	276	0.	1.4	2389.0
1	0620	77	136.	16.4	2394.3	*	1	1440	177	0.	1.4	2389.0	*	1	2300	277	0.	1.4	2389.0
1	0625	78	134.	15.5	2394.0	*	1	1445	178	0.	1.4	2389.0	*	1	2305	278	0.	1.4	2389.0
1	0630	79	133.	14.5	2393.8	*	1	1450	179	0.	1.4	2389.0	*	1	2310	279	0.	1.4	2389.0
1	0635	80	131.	13.7	2393.5	*	1	1455	180	0.	1.4	2389.0	*	1	2315	280	0.	1.4	2389.0
1	0640	81	130.	12.8	2393.3	*	1	1500	181	0.	1.4	2389.0	*	1	2320	281	0.	1.4	2389.0
1	0645	82	128.	11.9	2393.0	*	1	1505	182	0.	1.4	2389.0	*	1	2325	282	0.	1.4	2389.0
1	0650	83	124.	11.0	2392.8	*	1	1510	183	0.	1.4	2389.0	*	1	2330	283	0.	1.4	2389.0
1	0655	84	121.	10.2	2392.5	*	1	1515	184	0.	1.4	2389.0	*	1	2335	284	0.	1.4	2389.0
1	0700	85	117.	9.4	2392.2	*	1	1520	185	0.	1.4	2389.0	*	1	2340	285	0.	1.4	2389.0
1	0705	86	113.	8.6	2392.0	*	1	1525	186	0.	1.4	2389.0	*	1	2345	286	0.	1.4	2389.0
1	0710	87	108.	7.8	2391.7	*	1	1530	187	0.	1.4	2389.0	*	1	2350	287	0.	1.4	2389.0
1	0715	88	103.	7.1	2391.5	*	1	1535	188	0.	1.4	2389.0	*	1	2355	288	0.	1.4	2389.0
1	0720	89	98.	6.4	2391.2	*	1	1540	189	0.	1.4	2389.0	*	2	0000	289	0.	1.4	2389.0
1	0725	90	93.	5.7	2391.0	*	1	1545	190	0.	1.4	2389.0	*	2	0005	290	0.	1.4	2389.0
1	0730	91	86.	5.1	2390.8	*	1	1550	191	0.	1.4	2389.0	*	2	0010	291	0.	1.4	2389.0
1	0735	92	80.	4.5	2390.5	*	1	1555	192	0.	1.4	2389.0	*	2	0015	292	0.	1.4	2389.0
1	0740	93	74.	4.0	2390.3	*	1	1600	193	0.	1.4	2389.0	*	2	0020	293	0.	1.4	2389.0
1	0745	94	69.	3.5	2390.1	*	1	1605	194	0.	1.4	2389.0	*	2	0025	294	0.	1.4	2389.0
1	0750	95	60.	3.1	2389.9	*	1	1610	195	0.	1.4	2389.0	*	2	0030	295	0.	1.4	2389.0
1	0755	96	47.	2.7	2389.7	*	1	1615	196	0.	1.4	2389.0	*	2	0035	296	0.	1.4	2389.0
1	0800	97	36.	2.4	2389.6	*	1	1620	197	0.	1.4	2389.0	*	2	0040	297	0.	1.4	2389.0
1	0805	98	28.	2.2	2389.4	*	1	1625	198	0.	1.4	2389.0	*	2	0045	298	0.	1.4	2389.0
1	0810	99	22.	2.0	2389.3	*	1	1630	199	0.	1.4	2389.0	*	2	0050	299	0.	1.4	2389.0
1	0815	100	17.	1.9	2389.3	*	1	1635	200	0.	1.4	2389.0	*	2	0055	300	0.	1.4	2389.0
						*							*							

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 152.	5.00		105.	27.	26.	26.
		(INCHES)	1.073	1.098	1.098	1.098
		(AC-FT)	52.	53.	53.	53.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
27.	5.00	14.	5.	4.	4.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
2397.10	5.00	2393.25	2390.07	2390.03	2390.03

CUMULATIVE AREA = .91 SQ MI

HYDROGRAPH AT STATION ELKBASIN
PLAN 1, RATIO = .98

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	1.4	2389.0	1		0820	101	9.	1.7	2389.1	1		1640	201	0.	1.4	2389.0
1		0005	2	0.	1.4	2389.0	1		0825	102	7.	1.6	2389.1	1		1645	202	0.	1.4	2389.0
1		0010	3	0.	1.4	2389.0	1		0830	103	5.	1.6	2389.1	1		1650	203	0.	1.4	2389.0
1		0015	4	0.	1.4	2389.0	1		0835	104	4.	1.5	2389.1	1		1655	204	0.	1.4	2389.0
1		0020	5	1.	1.4	2389.0	1		0840	105	3.	1.5	2389.1	1		1700	205	0.	1.4	2389.0
1		0025	6	1.	1.4	2389.0	1		0845	106	3.	1.5	2389.0	1		1705	206	0.	1.4	2389.0
1		0030	7	2.	1.5	2389.0	1		0850	107	2.	1.5	2389.0	1		1710	207	0.	1.4	2389.0
1		0035	8	3.	1.5	2389.0	1		0855	108	2.	1.5	2389.0	1		1715	208	0.	1.4	2389.0
1		0040	9	3.	1.5	2389.1	1		0900	109	1.	1.4	2389.0	1		1720	209	0.	1.4	2389.0
1		0045	10	3.	1.5	2389.1	1		0905	110	1.	1.4	2389.0	1		1725	210	0.	1.4	2389.0
1		0050	11	3.	1.5	2389.0	1		0910	111	1.	1.4	2389.0	1		1730	211	0.	1.4	2389.0
1		0055	12	3.	1.5	2389.0	1		0915	112	1.	1.4	2389.0	1		1735	212	0.	1.4	2389.0
1		0100	13	2.	1.5	2389.0	1		0920	113	0.	1.4	2389.0	1		1740	213	0.	1.4	2389.0
1		0105	14	2.	1.5	2389.0	1		0925	114	0.	1.4	2389.0	1		1745	214	0.	1.4	2389.0
1		0110	15	2.	1.5	2389.0	1		0930	115	0.	1.4	2389.0	1		1750	215	0.	1.4	2389.0
1		0115	16	2.	1.5	2389.0	1		0935	116	0.	1.4	2389.0	1		1755	216	0.	1.4	2389.0
1		0120	17	2.	1.5	2389.0	1		0940	117	0.	1.4	2389.0	1		1800	217	0.	1.4	2389.0
1		0125	18	2.	1.5	2389.0	1		0945	118	0.	1.4	2389.0	1		1805	218	0.	1.4	2389.0
1		0130	19	3.	1.5	2389.0	1		0950	119	0.	1.4	2389.0	1		1810	219	0.	1.4	2389.0
1		0135	20	4.	1.5	2389.1	1		0955	120	0.	1.4	2389.0	1		1815	220	0.	1.4	2389.0
1		0140	21	5.	1.5	2389.1	1		1000	121	0.	1.4	2389.0	1		1820	221	0.	1.4	2389.0
1		0145	22	6.	1.6	2389.1	1		1005	122	0.	1.4	2389.0	1		1825	222	0.	1.4	2389.0
1		0150	23	8.	1.6	2389.1	1		1010	123	0.	1.4	2389.0	1		1830	223	0.	1.4	2389.0
1		0155	24	9.	1.7	2389.1	1		1015	124	0.	1.4	2389.0	1		1835	224	0.	1.4	2389.0
1		0200	25	9.	1.7	2389.1	1		1020	125	0.	1.4	2389.0	1		1840	225	0.	1.4	2389.0
1		0205	26	9.	1.7	2389.1	1		1025	126	0.	1.4	2389.0	1		1845	226	0.	1.4	2389.0
1		0210	27	9.	1.7	2389.1	1		1030	127	0.	1.4	2389.0	1		1850	227	0.	1.4	2389.0
1		0215	28	10.	1.7	2389.1	1		1035	128	0.	1.4	2389.0	1		1855	228	0.	1.4	2389.0
1		0220	29	11.	1.7	2389.2	1		1040	129	0.	1.4	2389.0	1		1900	229	0.	1.4	2389.0
1		0225	30	14.	1.8	2389.2	1		1045	130	0.	1.4	2389.0	1		1905	230	0.	1.4	2389.0
1		0230	31	17.	1.9	2389.3	1		1050	131	0.	1.4	2389.0	1		1910	231	0.	1.4	2389.0
1		0235	32	19.	1.9	2389.3	1		1055	132	0.	1.4	2389.0	1		1915	232	0.	1.4	2389.0
1		0240	33	21.	2.0	2389.3	1		1100	133	0.	1.4	2389.0	1		1920	233	0.	1.4	2389.0
1		0245	34	23.	2.0	2389.3	1		1105	134	0.	1.4	2389.0	1		1925	234	0.	1.4	2389.0
1		0250	35	25.	2.1	2389.4	1		1110	135	0.	1.4	2389.0	1		1930	235	0.	1.4	2389.0
1		0255	36	26.	2.1	2389.4	1		1115	136	0.	1.4	2389.0	1		1935	236	0.	1.4	2389.0
1		0300	37	27.	2.2	2389.4	1		1120	137	0.	1.4	2389.0	1		1940	237	0.	1.4	2389.0
1		0305	38	28.	2.2	2389.4	1		1125	138	0.	1.4	2389.0	1		1945	238	0.	1.4	2389.0
1		0310	39	33.	2.3	2389.5	1		1130	139	0.	1.4	2389.0	1		1950	239	0.	1.4	2389.0
1		0315	40	45.	2.7	2389.7	1		1135	140	0.	1.4	2389.0	1		1955	240	0.	1.4	2389.0
1		0320	41	66.	3.3	2390.0	1		1140	141	0.	1.4	2389.0	1		2000	241	0.	1.4	2389.0
1		0325	42	81.	4.6	2390.6	1		1145	142	0.	1.4	2389.0	1		2005	242	0.	1.4	2389.0
1		0330	43	101.	6.9	2391.4	1		1150	143	0.	1.4	2389.0	1		2010	243	0.	1.4	2389.0
1		0335	44	120.	10.0	2392.5	1		1155	144	0.	1.4	2389.0	1		2015	244	0.	1.4	2389.0
1		0340	45	131.	13.6	2393.5	1		1200	145	0.	1.4	2389.0	1		2020	245	0.	1.4	2389.0
1		0345	46	137.	17.0	2394.5	1		1205	146	0.	1.4	2389.0	1		2025	246	0.	1.4	2389.0
1		0350	47	142.	20.0	2395.3	1		1210	147	0.	1.4	2389.0	1		2030	247	0.	1.4	2389.0
1		0355	48	145.	22.3	2395.8	1		1215	148	0.	1.4	2389.0	1		2035	248	0.	1.4	2389.0
1		0400	49	147.	23.9	2396.2	1		1220	149	0.	1.4	2389.0	1		2040	249	0.	1.4	2389.0
1		0405	50	148.	25.0	2396.5	1		1225	150	0.	1.4	2389.0	1		2045	250	0.	1.4	2389.0
1		0410	51	149.	25.6	2396.7	1		1230	151	0.	1.4	2389.0	1		2050	251	0.	1.4	2389.0
1		0415	52	150.	25.9	2396.7	1		1235	152	0.	1.4	2389.0	1		2055	252	0.	1.4	2389.0
1		0420	53	150.	25.9	2396.7	1		1240	153	0.	1.4	2389.0	1		2100	253	0.	1.4	2389.0
1		0425	54	149.	25.7	2396.7	1		1245	154	0.	1.4	2389.0	1		2105	254	0.	1.4	2389.0
1		0430	55	149.	25.5	2396.6	1		1250	155	0.	1.4	2389.0	1		2110	255	0.	1.4	2389.0
1		0435	56	149.	25.4	2396.6	1		1255	156	0.	1.4	2389.0	1		2115	256	0.	1.4	2389.0
1		0440	57	149.	25.5	2396.6	1		1300	157	0.	1.4	2389.0	1		2120	257	0.	1.4	2389.0
1		0445	58	149.	25.6	2396.6	1		1305	158	0.	1.4	2389.0	1		2125	258	0.	1.4	2389.0
1		0450	59	149.	25.7	2396.7	1		1310	159	0.	1.4	2389.0	1		2130	259	0.	1.4	2389.0
1		0455	60	150.	25.8	2396.7	1		1315	160	0.	1.4	2389.0	1		2135	260	0.	1.4	2389.0
1		0500	61	150.	25.8	2396.7	1		1320	161	0.	1.4	2389.0	1		2140	261	0.	1.4	2389.0
1		0505	62	150.	25.8	2396.7	1		1325	162	0.	1.4	2389.0	1		2145	262	0.	1.4	2389.0
1		0510	63	149.	25.6	2396.7	1		1330	163	0.	1.4	2389.0	1		2150	263	0.	1.4	2389.0
1		0515	64	149.	25.2	2396.6	1		1335	164	0.	1.4	2389.0	1		2155	264	0.	1.4	2389.0
1		0520	65	148.	24.6	2396.4	1		1340	165	0.	1.4	2389.0	1		2200	265	0.	1.4	2389.0
1		0525	66	147.	24.0	2396.3	1		1345	166	0.	1.4	2389.0	1		2205	266	0.	1.4	2389.0
1		0530	67	146.	23.3	2396.1	1		1350	167	0.	1.4	2389.0	1		2210	267	0.	1.4	2389.0
1		0535	68	145.	22.5	2395.9	1		1355	168	0.	1.4	2389.0	1		2215	268	0.	1.4	2389.0
1		0540	69	144.	21.7	2395.7	1		1400	169	0.	1.4	2389.0	1		2220	269	0.	1.4	2389.0
1		0545	70	143.	20.9	2395.5	1		1405	170	0.	1.4	2389.0	1		2225	270	0.	1.4	2389.0

1	0550	71	142.	20.0	2395.3	*	1	1410	171	0.	1.4	2389.0	*	1	2230	271	0.	1.4	2389.0
1	0555	72	140.	19.2	2395.0	*	1	1415	172	0.	1.4	2389.0	*	1	2235	272	0.	1.4	2389.0
1	0600	73	139.	18.3	2394.8	*	1	1420	173	0.	1.4	2389.0	*	1	2240	273	0.	1.4	2389.0
1	0605	74	138.	17.5	2394.6	*	1	1425	174	0.	1.4	2389.0	*	1	2245	274	0.	1.4	2389.0
1	0610	75	136.	16.6	2394.4	*	1	1430	175	0.	1.4	2389.0	*	1	2250	275	0.	1.4	2389.0
1	0615	76	135.	15.7	2394.1	*	1	1435	176	0.	1.4	2389.0	*	1	2255	276	0.	1.4	2389.0
1	0620	77	133.	14.9	2393.9	*	1	1440	177	0.	1.4	2389.0	*	1	2300	277	0.	1.4	2389.0
1	0625	78	132.	14.0	2393.6	*	1	1445	178	0.	1.4	2389.0	*	1	2305	278	0.	1.4	2389.0
1	0630	79	130.	13.1	2393.4	*	1	1450	179	0.	1.4	2389.0	*	1	2310	279	0.	1.4	2389.0
1	0635	80	129.	12.2	2393.1	*	1	1455	180	0.	1.4	2389.0	*	1	2315	280	0.	1.4	2389.0
1	0640	81	126.	11.3	2392.9	*	1	1500	181	0.	1.4	2389.0	*	1	2320	281	0.	1.4	2389.0
1	0645	82	122.	10.5	2392.6	*	1	1505	182	0.	1.4	2389.0	*	1	2325	282	0.	1.4	2389.0
1	0650	83	118.	9.7	2392.3	*	1	1510	183	0.	1.4	2389.0	*	1	2330	283	0.	1.4	2389.0
1	0655	84	115.	8.9	2392.1	*	1	1515	184	0.	1.4	2389.0	*	1	2335	284	0.	1.4	2389.0
1	0700	85	110.	8.1	2391.8	*	1	1520	185	0.	1.4	2389.0	*	1	2340	285	0.	1.4	2389.0
1	0705	86	105.	7.4	2391.6	*	1	1525	186	0.	1.4	2389.0	*	1	2345	286	0.	1.4	2389.0
1	0710	87	100.	6.6	2391.3	*	1	1530	187	0.	1.4	2389.0	*	1	2350	287	0.	1.4	2389.0
1	0715	88	95.	6.0	2391.1	*	1	1535	188	0.	1.4	2389.0	*	1	2355	288	0.	1.4	2389.0
1	0720	89	89.	5.3	2390.9	*	1	1540	189	0.	1.4	2389.0	*	2	0000	289	0.	1.4	2389.0
1	0725	90	82.	4.8	2390.6	*	1	1545	190	0.	1.4	2389.0	*	2	0005	290	0.	1.4	2389.0
1	0730	91	76.	4.2	2390.4	*	1	1550	191	0.	1.4	2389.0	*	2	0010	291	0.	1.4	2389.0
1	0735	92	71.	3.7	2390.2	*	1	1555	192	0.	1.4	2389.0	*	2	0015	292	0.	1.4	2389.0
1	0740	93	65.	3.2	2390.0	*	1	1600	193	0.	1.4	2389.0	*	2	0020	293	0.	1.4	2389.0
1	0745	94	51.	2.8	2389.8	*	1	1605	194	0.	1.4	2389.0	*	2	0025	294	0.	1.4	2389.0
1	0750	95	40.	2.5	2389.6	*	1	1610	195	0.	1.4	2389.0	*	2	0030	295	0.	1.4	2389.0
1	0755	96	31.	2.3	2389.5	*	1	1615	196	0.	1.4	2389.0	*	2	0035	296	0.	1.4	2389.0
1	0800	97	24.	2.1	2389.4	*	1	1620	197	0.	1.4	2389.0	*	2	0040	297	0.	1.4	2389.0
1	0805	98	19.	1.9	2389.3	*	1	1625	198	0.	1.4	2389.0	*	2	0045	298	0.	1.4	2389.0
1	0810	99	15.	1.8	2389.2	*	1	1630	199	0.	1.4	2389.0	*	2	0050	299	0.	1.4	2389.0
1	0815	100	12.	1.7	2389.2	*	1	1635	200	0.	1.4	2389.0	*	2	0055	300	0.	1.4	2389.0
						*							*						

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 150.	4.25		101.	26.	25.	25.
		(INCHES)	1.032	1.052	1.052	1.052
		(AC-FT)	50.	51.	51.	51.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
26.	4.25	13.	4.	4.	4.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
2396.72	4.25	2392.97	2390.00	2389.96	2389.96

CUMULATIVE AREA = .91 SQ MI

****

HYDROGRAPH AT STATION ELKBASIN
PLAN 1, RATIO = .97

****

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE		DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE		DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	1.4	2389.0	*	1		0820	101	8.	1.6	2389.1	*	1		1640	201	0.	1.4	2389.0
1		0005	2	0.	1.4	2389.0	*	1		0825	102	7.	1.6	2389.1	*	1		1645	202	0.	1.4	2389.0
1		0010	3	0.	1.4	2389.0	*	1		0830	103	5.	1.6	2389.1	*	1		1650	203	0.	1.4	2389.0
1		0015	4	0.	1.4	2389.0	*	1		0835	104	4.	1.5	2389.1	*	1		1655	204	0.	1.4	2389.0
1		0020	5	1.	1.4	2389.0	*	1		0840	105	3.	1.5	2389.0	*	1		1700	205	0.	1.4	2389.0
1		0025	6	1.	1.4	2389.0	*	1		0845	106	2.	1.5	2389.0	*	1		1705	206	0.	1.4	2389.0
1		0030	7	2.	1.5	2389.0	*	1		0850	107	2.	1.5	2389.0	*	1		1710	207	0.	1.4	2389.0
1		0035	8	3.	1.5	2389.0	*	1		0855	108	1.	1.5	2389.0	*	1		1715	208	0.	1.4	2389.0
1		0040	9	3.	1.5	2389.1	*	1		0900	109	1.	1.4	2389.0	*	1		1720	209	0.	1.4	2389.0
1		0045	10	3.	1.5	2389.1	*	1		0905	110	1.	1.4	2389.0	*	1		1725	210	0.	1.4	2389.0
1		0050	11	3.	1.5	2389.0	*	1		0910	111	1.	1.4	2389.0	*	1		1730	211	0.	1.4	2389.0
1		0055	12	3.	1.5	2389.0	*	1		0915	112	1.	1.4	2389.0	*	1		1735	212	0.	1.4	2389.0
1		0100	13	2.	1.5	2389.0	*	1		0920	113	0.	1.4	2389.0	*	1		1740	213	0.	1.4	2389.0
1		0105	14	2.	1.5	2389.0	*	1		0925	114	0.	1.4	2389.0	*	1		1745	214	0.	1.4	2389.0
1		0110	15	2.	1.5	2389.0	*	1		0930	115	0.	1.4	2389.0	*	1		1750	215	0.	1.4	2389.0
1		0115	16	2.	1.5	2389.0	*	1		0935	116	0.	1.4	2389.0	*	1		1755	216	0.	1.4	2389.0
1		0120	17	2.	1.5	2389.0	*	1		0940	117	0.	1.4	2389.0	*	1		1800	217	0.	1.4	2389.0
1		0125	18	2.	1.5	2389.0	*	1		0945	118	0.	1.4	2389.0	*	1		1805	218	0.	1.4	2389.0

| | | |

1 0815 100 11. 1.7 2389.2 * 1 1635 200 0. 1.4 2389.0 * 2 0055 300 0. 1.4 2389.0
* *

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 149.	4.25		100.	26.	25.	25.
		(INCHES)	1.023	1.043	1.043	1.043
		(AC-FT)	50.	51.	51.	51.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
26.	4.25	13.	4.	4.	4.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
2396.66	4.25	2392.91	2389.99	2389.95	2389.95

CUMULATIVE AREA = .91 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 1.00	RATIO 2 .98	RATIO 3 .97
HYDROGRAPH AT							
+	OFF1	.20	1	FLOW	179.	173.	171.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	FDI12	.20	1	FLOW	85.	82.	81.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	DIV1FD	.20	1	FLOW	94.	91.	90.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	CIM1	.20	1	FLOW	42.	40.	40.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	SPLIT1	.20	1	FLOW	52.	50.	50.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	FDI345	.20	1	FLOW	47.	45.	45.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	DIV2FD	.20	1	FLOW	5.	5.	5.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF4	.03	1	FLOW	34.	32.	32.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP1	.23	1	FLOW	38.	36.	36.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	FDI12	.00	1	FLOW	85.	82.	81.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	FDI345	.00	1	FLOW	47.	45.	45.
				TIME	3.75	3.75	3.75
2 COMBINED AT							
+	CP2	.00	1	FLOW	132.	127.	126.

				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF5	.05	1	FLOW	59.	56.	56.
				TIME	3.58	3.58	3.58
3 COMBINED AT							
+	CP3	.28	1	FLOW	207.	199.	198.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF3	.17	1	FLOW	141.	135.	133.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	CIM1	.00	1	FLOW	42.	40.	40.
				TIME	3.75	3.75	3.75
2 COMBINED AT							
+	CP4	.17	1	FLOW	182.	174.	173.
				TIME	3.67	3.67	3.67
DIVERSION TO							
+	CIM2	.17	1	FLOW	74.	71.	70.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	SPLIT2	.17	1	FLOW	108.	103.	103.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF6	.03	1	FLOW	25.	24.	24.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF7	.07	1	FLOW	59.	57.	56.
				TIME	3.67	3.67	3.67
3 COMBINED AT							
+	CP5	.26	1	FLOW	193.	185.	183.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF2	.18	1	FLOW	123.	118.	117.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	CIM2	.00	1	FLOW	74.	71.	70.
				TIME	3.67	3.67	3.67
2 COMBINED AT							
+	CP6	.18	1	FLOW	195.	187.	185.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	CIM3	.18	1	FLOW	60.	58.	57.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	SPLIT3	.18	1	FLOW	135.	129.	128.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF8	.03	1	FLOW	30.	29.	29.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP7	.21	1	FLOW	152.	146.	145.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF9	.03	1	FLOW	52.	50.	50.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP8	.24	1	FLOW	193.	186.	184.
				TIME	3.67	3.67	3.67
DIVERSION TO							
+	BUFF1	.24	1	FLOW	48.	47.	46.
				TIME	3.67	3.67	3.67

HYDROGRAPH AT							
+	DIV3E123	.24	1	FLOW	145.	139.	138.
				TIME	3.67	3.67	3.67
2 COMBINED AT							
+	CP9	.50	1	FLOW	338.	323.	321.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	BUFF1	.00	1	FLOW	48.	47.	46.
				TIME	3.67	3.67	3.67
DIVERSION TO							
+	BUFF2	.00	1	FLOW	32.	31.	31.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	SPLIT4	.00	1	FLOW	16.	16.	15.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF11	.07	1	FLOW	59.	56.	56.
				TIME	3.67	3.67	3.67
2 COMBINED AT							
+	CP10	.07	1	FLOW	75.	72.	71.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF10	.03	1	FLOW	30.	29.	29.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF12	.02	1	FLOW	27.	26.	26.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ON-1	.02	1	FLOW	15.	14.	14.
				TIME	3.67	3.67	3.67
6 COMBINED AT							
+	CP11	.91	1	FLOW	683.	655.	650.
				TIME	3.67	3.67	3.67
ROUTED TO							
+	ELKBASIN	.91	1	FLOW	152.	150.	149.
				TIME	5.00	4.25	4.25

** PEAK STAGES IN FEET **

1	STAGE	2397.10	2396.72	2396.66
	TIME	5.00	4.25	4.25

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

PROPOSED CONDITION HEC-1
10-YEAR STORM EVENT

OPTION-2
OUTLET OF DETENTION BASIN WITH 1-27" RCP

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *               JAN   1997              *
 *            VERSION 4.1                *
 *                                       *
 *  RUN DATE   27JUN08  TIME  09:35:51   *
 *                                       *
 *****************************************
```

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


```
          LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
                    *DIAGRAM
*** FREE ***
               1    ID   **********************************************************************
               2    ID   * ------------------------------------------------------------------ *
               3    ID   * |                                                                | *
               4    ID   * |   ELKHORN SPRINGS AND BUFFALO DRIVE STORM DRAIN                | *
               5    ID   * |                    CITY OF LAS VEGAS                           | *
               6    ID   * |                  EXISTING CONDITIONS                           | *
               7    ID   * |                                                                | *
               8    ID   * |................................................................| *
               9    ID   * |                                                                | *
              10    ID   * |         CLIENT-------------CITY OF LAS VEGAS                   | *
              11    ID   * |         RETURN PERIOD-------100-YEAR                          | *
              12    ID   * |         DISTRIBUTUION-------6-HOUR SDN3                       | *
              13    ID   * |         PROJECT NO----------31678A                            | *
              14    ID   * |         FILENAME------------PI-10-OPT2.DAT                    | *
              15    ID   * |         REV. DATE-----------06/17/08                          | *
              16    ID   * |                                                                | *
              17    ID   * |................................................................| *
              18    ID   * |                                                                | *
              19    ID   * |                   AREA     DARF                                | *
              20    ID   * |                  (sq.mi.)                                      | *
              21    ID   * |                0.00-0.50  1.000                                | *
              22    ID   * |                0.50-0.75  0.975                                | *
              23    ID   * |                0.75-1.00  0.970                                | *
              24    ID   * |                                                                | *
              25    ID   * |  MODELED BY: Parsons Brinckerhoff                              | *
              26    ID   * ------------------------------------------------------------------ *
              27    ID   **********************************************************************
              28    ID
              29    ID
              30    IT      5       0       0     300
              31    IO      5       0       0
              32    IN      5       0       0
              33    JR    PREC    1.00   0.975   0.970
                    *
              34    KK    OFF1
              35    BA  0.1973
              36    PB    1.45
              37    PC   0.000   0.020   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
              38    PC   0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
              39    PC   0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
```

```
 40          PC   0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
 41          PC   0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
 42          PC   0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
 43          PC   0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
 44          PC   0.998   0.999   1.000
 45          LS       0   88.14
 46          UD   0.292
             *
```



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

 47          KK  DIV1FD
 48          KM   DIVERT FLOWS INTO DROP INLETS FDI-1 & FDI-2 LOCATED NWC OF FARM ROAD
 49          KM   AND CIMARRON ROAD
 50          DT   FDI12
 51          DI       0      72
 52          DQ       0      49
             *

 53          KK  SPLIT1
 54          KM   FLOW SPLIT ON CIMARRON ROAD AND FARM ROAD
 55          DT    CIM1
 56          DI       0      23
 57          DQ       0       5
             *

 58          KK  DIV2FD
 59          KM   DIVERT FLOWS INTO DROP INLETS FDI-3,FDI-4 & FDI-5 LOCATED ON FARM ROAD
 60          KM   BETWEEN CIMARRON ROAD & PALM GROVE
 61          DT  FDI345
 62          DI       0      18
 63          DQ       0      18
             *

 64          KK    OFF4
 65          BA  0.0308
 66          PB    1.58
 67          LS       0   82.00
 68          UD   0.112
             *

 69          KK     CP1
 70          KM   COMBINE OFF4 AND BY PASS FLOW FROM INLETS ON FARM ROAD
 71          HC       2
             *

 72          KK FDI6789
 73          KM   FLOW INTO PROPOSED DIS IN FARM ROAD
 74          DT   BUFF2
 75          DI       0      38
 76          DQ       0       4
             *

 77          KK   FDI12
 78          KM   RECALL FLOW COLLECTED BY EXISTING STORM DRIAN SYSTEM(PLUGGED)ON FARM ROAD
 79          KM   WEST OF CIMARRON ROAD
 80          DR   FDI12
             *

 81          KK  FDI345
 82          KM   RECALL FLOW COLLECTED BY EXISTING STORM DRIAN SYSTEM(PLUGGED)ON FARM ROAD
 83          KM   BETWEEN CIMARRON ROAD AND PALM GROOVE LANE
 84          DR  FDI345
             *
```



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

 85          KK     CP2
 86          KM   COMBINE FD12 AND FD345 TO CALCULATED FLOW COLLECTED BY THE EXISTING
 87          KM   STORM DRAIN SYSTEM ON FARM ROAD (CURRENTLY PLUGGED)
 88          HC       3
             *

 89          KK    OFF5
 90          KM   SUBBASIN OFF5
 91          BA  0.0549
 92          LS       0   82.00
```

```
 93          UD   0.132
             *

 94          KK     CP3
 95          KM   COMBINE CP-1,CP-2 AND OFF5
 96          HC       2
             *

 97          KK   BUFF2
 98          KM   RECALL FLOW BYPASSED BY FDI89 ON FARM ROAD
 99          DR   BUFF2
             *

100          KK    CP3A
101          KM   COMBINE CP-3 AND BUFF2
102          HC       2
             *

103          KK    OFF3
104          KM   SUBBASIN OFF3
105          BA   0.165
106          LS       0   82.02
107          UD   0.246
             *

108          KK    CIM1
109          KM   RECALL FLOW SPLIT AT CIMMARON AND FARM ROAD ON CIMARRON ROAD
110          DR    CIM1
             *

111          KK     CP4
112          KM   COMBINE OFF3 AND CIM1
113          HC       2
             *

114          KK  SPLIT2
115          KM   FLOW SPLIT ON CIMARRON ROAD AND SUNNY SPRINGS LANE
116          DT    CIM2
117          DI       0      49
118          DQ       0      17
             *
```



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

119          KK    OFF6
120          KM   SUBBASIN OFF6
121          BA  0.0287
122          LS       0   82.05
123          UD   0.223
             *

124          KK    OFF7
125          KM   SUBBASIN OFF7
126          BA  0.0667
127          LS       0   81.98
128          UD   0.219
             *

129          KK     CP5
130          KM   COMBINE OFF6,OFF7 AND REMAINING FLOW IN SUNNY SPRINGS LANE AFTER FLOW SPLIT
131          HC       3
             *

132          KK    OFF2
133          KM   SUBBASIN OFF2
134          BA  0.1786
135          PB    1.37
136          LS       0   87.44
137          UD   0.343
             *

138          KK    CIM2
139          KM   RECALL FLOW SPLIT AT CIMMARON AND SUNNY SPRINGS LANE ON CIMARRON ROAD
140          DR    CIM2
             *

141          KK     CP6
142          KM   COMBINE OFF2 & CIM2
143          HC       2
```

```
                *
  144           KK  SPLIT3
  145           KM   FLOW SPLIT ON CIMARRON ROAD AND ELKHORN ROAD
  146           DT    CIM3
  147           DI       0      67
  148           DQ       0      16
                *

  149           KK    OFF8
  150           KM   SUBBASIN OFF8
  151           BA  0.0282
  152           PB    1.58
  153           LS       0   81.79
  154           UD   0.107
                *
1                                        HEC-1 INPUT                                        PAGE  5

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

  155           KK     CP7
  156           KM   COMBINE OFF8 AND REMAINING FLOW IN ELKHORN ROAD
  157           HC       2
                *

  158           KK    OFF9
  159           BA  0.0285
  160           LS       0   97.46
  161           UD   0.149
                *

  162           KK     CP8
  163           KM   COMBINE OFF8,OFF9 AND REMAINING FLOW IN ELKHORN ROAD
  164           HC       2
                *

  165           KKDIV3E123
  166           KM   DIVERT FLOWS TO EXISTIGN DIs IN ELKHORN ROAD (6 DIs TOTAL)
  167           DT   BUFF1
  168           DI       0      77
  169           DQ       0       2
                *

  170           KK     CP9
  171           KM   COMBINE CP5 AND FLOW INTERCEPTED BY DIs IN ELKHORN ROAD
  172           HC       2
                *

  173           KK   BUFF1
  174           KM   RECALL FLOW BYPASSED BY DROP INLETS IN ELKHORN ROAD
  175           DR   BUFF1
                *

  176           KK  SPLIT4
  177           KM   FLOW SPLIT AT ELKHORN ROAD AND BUFFALO DRIVE
  178           DT   BUFF2
  179           DI       0      48
  180           DQ       0      32
                *

  181           KK   OFF11
  182           KM   SUBBASIN OFF11
  183           BA  0.0655
  184           LS       0   81.95
  185           UD   0.209
                *

  186           KK    CP10
  187           KM   COMBINE BUFF1 & BUFF2
  188           HC       2
                *
1                                        HEC-1 INPUT                                        PAGE  6

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

  189           KK   OFF10
  190           KM   SUBBASIN OFF10
  191           BA  0.0334
  192           LS       0   82.18
```

```
193           UD   0.214
              *

194           KK   OFF12
195           KM   SUBBASIN OFF12
196           BA  0.0156
197           LS       0   92.92
198           UD   0.106
              *

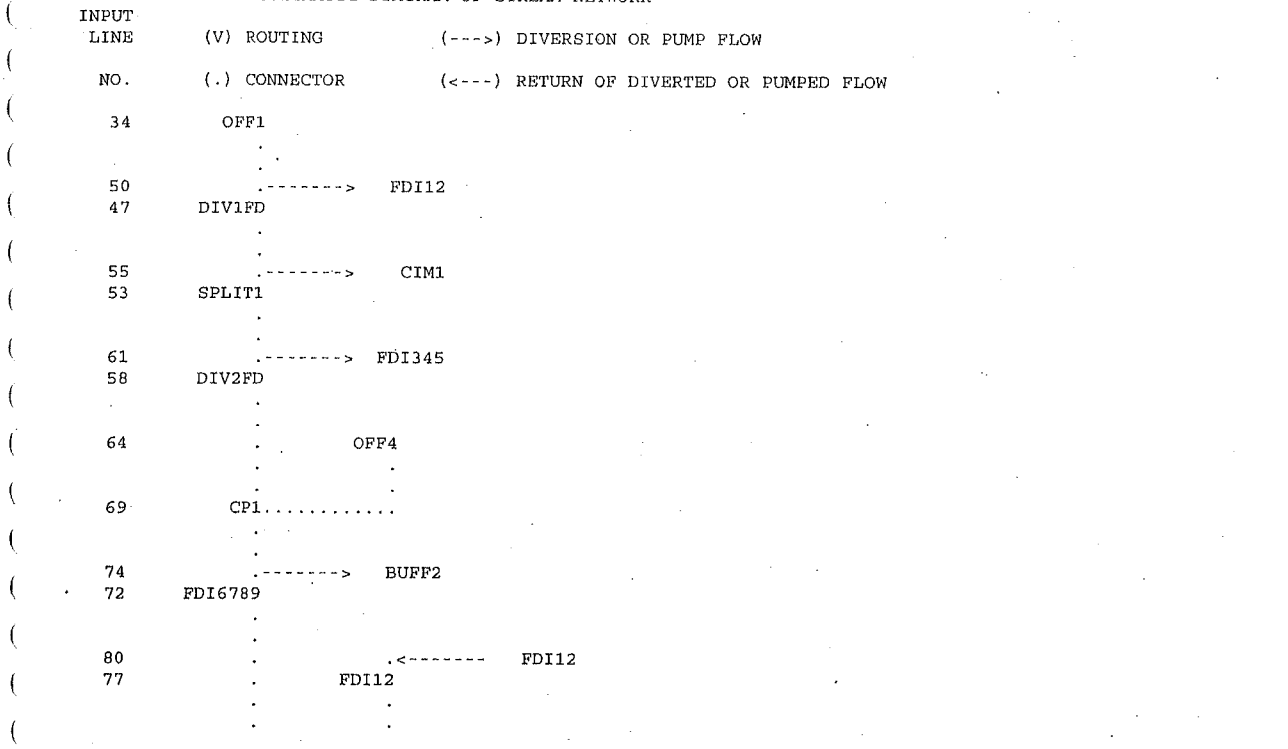
199           KK    ON-1
200           KM   ON SITE SUBBASIN
201           BA  0.0194
202           LS       0   78.82
203           UD   0.191
              *

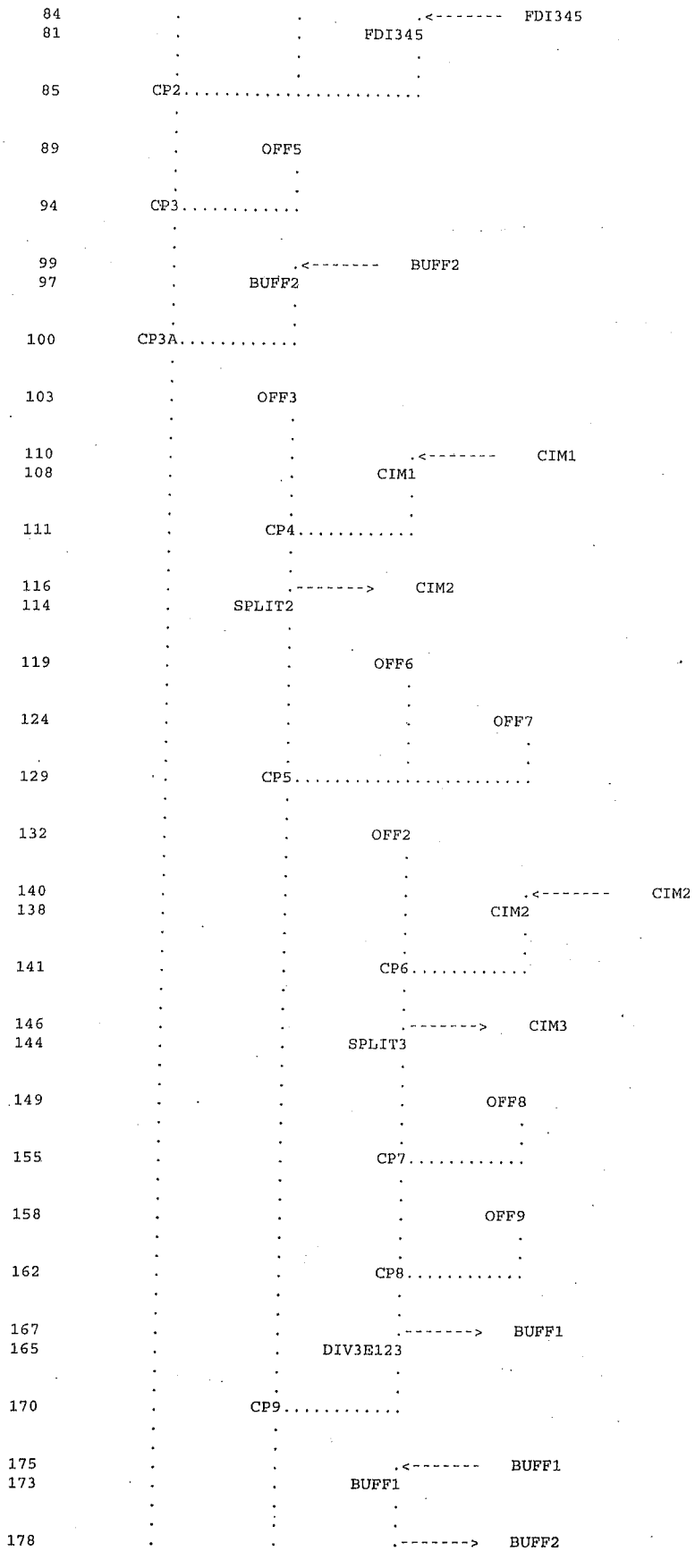
204           KK    CP11
205           KM   COMBINE OFF12,OFF-10,CP-10,CP-9 AND ON-1
206           HC       6
              *

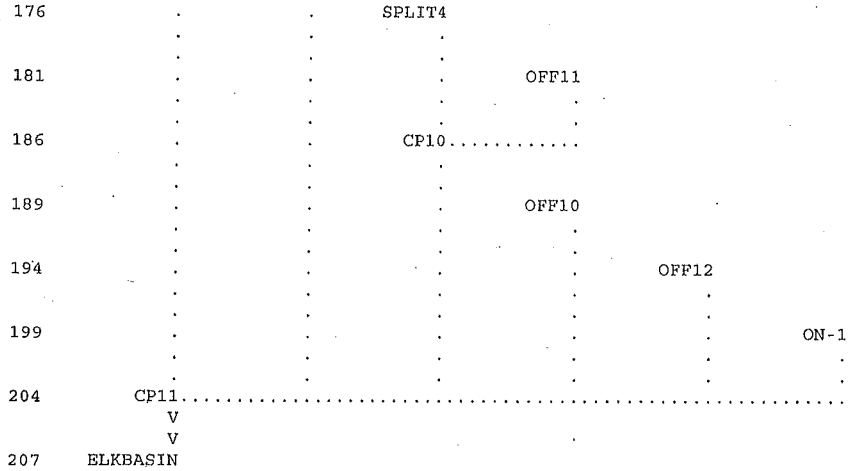
207           KKELKBASIN
208           KM    FACILITY = ELKHORN SPRINGS DETENTION BASIN
209           KM    FACILITY ID-MILE = EKDB 0070
210           KM    STORAGE VOLUME = 48 ACRE-FEET
211           KM    OUTLET = 2-27 inch RCPs transition to 60" RCP
212           KM    SPILLWAY LENGTH =
213           KM    SPILLWAY HEIGHT =
              *  KO       3
214           RS       1    STOR      -1
215           SV    0.04    0.07    0.41    1.41    3.24    5.71    8.57    11.8    15.3    19.0
216           SV    22.9    27.0    31.3    35.8    40.5
217           SE    2386    2387    2388    2389    2390    2391    2392    2393    2394    2395
218           SE    2396    2397    2398    2399    2400
              *  SQ       0       0       0       0    65.5    92.7   113.53   128.0
              *  SQ   134.2   140.1   145.7   151.2   156.4   161.5    166.4
              *  Outflow release rate - combine 48-inch debris riser orifice and
              *  1-27 inches low level outlet release rate
              *  open channel flow at the existing 60-inch RCP at 0.0013 slope
219           SQ       0    40.9    45.6    49.8    53.7    57.3    60.8    64.0    67.1    70.0
220           SQ    72.9    75.6    78.2    80.7    83.2
221           KO       1
              *
222           ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK




84
81
FDI345
FDI345
85
CP2
89
OFF5
94
CP3
99
BUFF2
97
BUFF2
100
CP3A
103
OFF3
110
CIM1
108
CIM1
111
CP4
116
CIM2
114
SPLIT2
119
OFF6
124
OFF7
129
CP5
132
OFF2
140
CIM2
138
CIM2
141
CP6
146
CIM3
144
SPLIT3
149
OFF8
155
CP7
158
OFF9
162
CP8
167
BUFF1
165
DIV3E123
170
CP9
175
BUFF1
173
BUFF1
178
BUFF2



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JAN  1997               *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   27JUN08  TIME  09:35:51   *
*                                       *
*****************************************
```

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

```
**********************************************************************
* ------------------------------------------------------------------ *
* |                                                                | *
* |   ELKHORN SPRINGS AND BUFFALO DRIVE STORM DRAIN                | *
* |                  CITY OF LAS VEGAS                             | *
* |                EXISTING CONDITIONS                             | *
* |                                                                | *
* |................................................................| *
* |                                                                | *
* |         CLIENT--------------CITY OF LAS VEGAS                   | *
* |         RETURN PERIOD-------100-YEAR                           | *
* |         DISTRIBUTUION-------6-HOUR SDN3                        | *
* |         PROJECT NO----------31678A                             | *
* |         FILENAME------------PI-10-OPT2.DAT                     | *
* |         REV. DATE-----------06/17/08                           | *
* |                                                                | *
* |................................................................| *
* |                                                                | *
* |                   AREA      DARF                               | *
* |                  (sq.mi.)                                      | *
* |                0.00-0.50   1.000                               | *
* |                0.50-0.75   0.975                               | *
* |                0.75-1.00   0.970                               | *
* |                                                                | *
* |  MODELED BY: Parsons Brinckerhoff                              | *
* ------------------------------------------------------------------ *
**********************************************************************
```

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

    IT          HYDROGRAPH TIME DATA
                      NMIN          5  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1   0  STARTING DATE
                     ITIME       0000  STARTING TIME
                        NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      2   0  ENDING DATE
                    NDTIME       0055  ENDING TIME
                     ICENT         19  CENTURY MARK
```

```
                COMPUTATION INTERVAL      .08 HOURS
                   TOTAL TIME BASE   24.92 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

     JP        MULTI-PLAN OPTION
                    NPLAN           1  NUMBER OF PLANS

     JR        MULTI-RATIO OPTION
                  RATIOS OF PRECIPITATION
                1.00       .98       .97


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


          **************
          *            *
 207 KK   *  ELKBASIN   *
          *            *
          **************

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

             HYDROGRAPH ROUTING DATA

 214 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

 215 SV          STORAGE          .0        .1        .4       1.4       3.2       5.7       8.6      11.8      15.3      19.0
                                 22.9      27.0      31.3      35.8      40.5

 217 SE          ELEVATION    2386.00   2387.00   2388.00   2389.00   2390.00   2391.00   2392.00   2393.00   2394.00   2395.00
                              2396.00   2397.00   2398.00   2399.00   2400.00

 219 SQ          DISCHARGE         0.       41.       46.       50.       54.       57.       61.       64.       67.       70.
                                  73.       76.       78.       81.       83.

                                                      ***

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN        0. TO       41.
                THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
                THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

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

                                        HYDROGRAPH AT STATION ELKBASIN
                                             PLAN 1,   RATIO =  1.00

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

                                    *                                   *                                   *
DA MON HRMN ORD  OUTFLOW  STORAGE   STAGE * DA MON HRMN ORD  OUTFLOW  STORAGE   STAGE * DA MON HRMN ORD  OUTFLOW  STORAGE   STAGE
                                    *                                   *                                   *
 1     0000   1       0.       .0  2386.0 *  1     0820 101       0.       .0  2386.0 *  1     1640 201       0.       .0  2386.0
 1     0005   2       0.       .0  2386.0 *  1     0825 102       0.       .0  2386.0 *  1     1645 202       0.       .0  2386.0
 1     0010   3       0.       .0  2386.0 *  1     0830 103       0.       .0  2386.0 *  1     1650 203       0.       .0  2386.0
 1     0015   4       0.       .0  2386.0 *  1     0835 104       0.       .0  2386.0 *  1     1655 204       0.       .0  2386.0
 1     0020   5       1.       .0  2386.0 *  1     0840 105       0.       .0  2386.0 *  1     1700 205       0.       .0  2386.0
 1     0025   6       2.       .0  2386.0 *  1     0845 106       0.       .0  2386.0 *  1     1705 206       0.       .0  2386.0
 1     0030   7       2.       .0  2386.1 *  1     0850 107       0.       .0  2386.0 *  1     1710 207       0.       .0  2386.0
 1     0035   8       3.       .0  2386.1 *  1     0855 108       0.       .0  2386.0 *  1     1715 208       0.       .0  2386.0
 1     0040   9       2.       .0  2386.1 *  1     0900 109       0.       .0  2386.0 *  1     1720 209       0.       .0  2386.0
 1     0045  10       1.       .0  2386.0 *  1     0905 110       0.       .0  2386.0 *  1     1725 210       0.       .0  2386.0
 1     0050  11       1.       .0  2386.0 *  1     0910 111       0.       .0  2386.0 *  1     1730 211       0.       .0  2386.0
 1     0055  12       0.       .0  2386.0 *  1     0915 112       0.       .0  2386.0 *  1     1735 212       0.       .0  2386.0
 1     0100  13       0.       .0  2386.0 *  1     0920 113       0.       .0  2386.0 *  1     1740 213       0.       .0  2386.0
```

1	0105	14	0.	.0	2386.0	*	1	0925	114	0.	.0	2386.0	*	1	1745	214	0.	.0	2386.0
1	0110	15	0.	.0	2386.0	*	1	0930	115	0.	.0	2386.0	*	1	1750	215	0.	.0	2386.0
1	0115	16	1.	.0	2386.0	*	1	0935	116	0.	.0	2386.0	*	1	1755	216	0.	.0	2386.0
1	0120	17	1.	.0	2386.0	*	1	0940	117	0.	.0	2386.0	*	1	1800	217	0.	.0	2386.0
1	0125	18	1.	.0	2386.0	*	1	0945	118	0.	.0	2386.0	*	1	1805	218	0.	.0	2386.0
1	0130	19	2.	.0	2386.0	*	1	0950	119	0.	.0	2386.0	*	1	1810	219	0.	.0	2386.0
1	0135	20	3.	.0	2386.1	*	1	0955	120	0.	.0	2386.0	*	1	1815	220	0.	.0	2386.0
1	0140	21	3.	.0	2386.1	*	1	1000	121	0.	.0	2386.0	*	1	1820	221	0.	.0	2386.0
1	0145	22	3.	.0	2386.1	*	1	1005	122	0.	.0	2386.0	*	1	1825	222	0.	.0	2386.0
1	0150	23	2.	.0	2386.1	*	1	1010	123	0.	.0	2386.0	*	1	1830	223	0.	.0	2386.0
1	0155	24	2.	.0	2386.0	*	1	1015	124	0.	.0	2386.0	*	1	1835	224	0.	.0	2386.0
1	0200	25	1.	.0	2386.0	*	1	1020	125	0.	.0	2386.0	*	1	1840	225	0.	.0	2386.0
1	0205	26	1.	.0	2386.0	*	1	1025	126	0.	.0	2386.0	*	1	1845	226	0.	.0	2386.0
1	0210	27	1.	.0	2386.0	*	1	1030	127	0.	.0	2386.0	*	1	1850	227	0.	.0	2386.0
1	0215	28	2.	.0	2386.1	*	1	1035	128	0.	.0	2386.0	*	1	1855	228	0.	.0	2386.0
1	0220	29	4.	.0	2386.1	*	1	1040	129	0.	.0	2386.0	*	1	1900	229	0.	.0	2386.0
1	0225	30	5.	.0	2386.1	*	1	1045	130	0.	.0	2386.0	*	1	1905	230	0.	.0	2386.0
1	0230	31	5.	.0	2386.1	*	1	1050	131	0.	.0	2386.0	*	1	1910	231	0.	.0	2386.0
1	0235	32	4.	.0	2386.1	*	1	1055	132	0.	.0	2386.0	*	1	1915	232	0.	.0	2386.0
1	0240	33	4.	.0	2386.1	*	1	1100	133	0.	.0	2386.0	*	1	1920	233	0.	.0	2386.0
1	0245	34	5.	.0	2386.1	*	1	1105	134	0.	.0	2386.0	*	1	1925	234	0.	.0	2386.0
1	0250	35	6.	.0	2386.1	*	1	1110	135	0.	.0	2386.0	*	1	1930	235	0.	.0	2386.0
1	0255	36	5.	.0	2386.1	*	1	1115	136	0.	.0	2386.0	*	1	1935	236	0.	.0	2386.0
1	0300	37	5.	.0	2386.1	*	1	1120	137	0.	.0	2386.0	*	1	1940	237	0.	.0	2386.0
1	0305	38	8.	.0	2386.2	*	1	1125	138	0.	.0	2386.0	*	1	1945	238	0.	.0	2386.0
1	0310	39	14.	.1	2386.3	*	1	1130	139	0.	.0	2386.0	*	1	1950	239	0.	.0	2386.0
1	0315	40	27.	.1	2386.7	*	1	1135	140	0.	.0	2386.0	*	1	1955	240	0.	.0	2386.0
1	0320	41	42.	.1	2387.2	*	1	1140	141	0.	.0	2386.0	*	1	2000	241	0.	.0	2386.0
1	0325	42	46.	.4	2388.0	*	1	1145	142	0.	.0	2386.0	*	1	2005	242	0.	.0	2386.0
1	0330	43	49.	1.1	2388.7	*	1	1150	143	0.	.0	2386.0	*	1	2010	243	0.	.0	2386.0
1	0335	44	52.	2.2	2389.5	*	1	1155	144	0.	.0	2386.0	*	1	2015	244	0.	.0	2386.0
1	0340	45	54.	3.6	2390.2	*	1	1200	145	0.	.0	2386.0	*	1	2020	245	0.	.0	2386.0
1	0345	46	56.	5.0	2390.7	*	1	1205	146	0.	.0	2386.0	*	1	2025	246	0.	.0	2386.0
1	0350	47	58.	6.3	2391.2	*	1	1210	147	0.	.0	2386.0	*	1	2030	247	0.	.0	2386.0
1	0355	48	59.	7.3	2391.6	*	1	1215	148	0.	.0	2386.0	*	1	2035	248	0.	.0	2386.0
1	0400	49	60.	8.1	2391.8	*	1	1220	149	0.	.0	2386.0	*	1	2040	249	0.	.0	2386.0
1	0405	50	61.	8.7	2392.0	*	1	1225	150	0.	.0	2386.0	*	1	2045	250	0.	.0	2386.0
1	0410	51	61.	9.0	2392.1	*	1	1230	151	0.	.0	2386.0	*	1	2050	251	0.	.0	2386.0
1	0415	52	61.	9.2	2392.2	*	1	1235	152	0.	.0	2386.0	*	1	2055	252	0.	.0	2386.0
1	0420	53	62.	9.3	2392.2	*	1	1240	153	0.	.0	2386.0	*	1	2100	253	0.	.0	2386.0
1	0425	54	62.	9.3	2392.2	*	1	1245	154	0.	.0	2386.0	*	1	2105	254	0.	.0	2386.0
1	0430	55	62.	9.3	2392.2	*	1	1250	155	0.	.0	2386.0	*	1	2110	255	0.	.0	2386.0
1	0435	56	62.	9.4	2392.3	*	1	1255	156	0.	.0	2386.0	*	1	2115	256	0.	.0	2386.0
1	0440	57	62.	9.5	2392.3	*	1	1300	157	0.	.0	2386.0	*	1	2120	257	0.	.0	2386.0
1	0445	58	62.	9.6	2392.3	*	1	1305	158	0.	.0	2386.0	*	1	2125	258	0.	.0	2386.0
1	0450	59	62.	9.8	2392.4	*	1	1310	159	0.	.0	2386.0	*	1	2130	259	0.	.0	2386.0
1	0455	60	62.	9.9	2392.4	*	1	1315	160	0.	.0	2386.0	*	1	2135	260	0.	.0	2386.0
1	0500	61	62.	10.1	2392.5	*	1	1320	161	0.	.0	2386.0	*	1	2140	261	0.	.0	2386.0
1	0505	62	62.	10.1	2392.5	*	1	1325	162	0.	.0	2386.0	*	1	2145	262	0.	.0	2386.0
1	0510	63	62.	10.1	2392.5	*	1	1330	163	0.	.0	2386.0	*	1	2150	263	0.	.0	2386.0
1	0515	64	62.	10.0	2392.5	*	1	1335	164	0.	.0	2386.0	*	1	2155	264	0.	.0	2386.0
1	0520	65	62.	9.9	2392.4	*	1	1340	165	0.	.0	2386.0	*	1	2200	265	0.	.0	2386.0
1	0525	66	62.	9.6	2392.3	*	1	1345	166	0.	.0	2386.0	*	1	2205	266	0.	.0	2386.0
1	0530	67	62.	9.4	2392.3	*	1	1350	167	0.	.0	2386.0	*	1	2210	267	0.	.0	2386.0
1	0535	68	61.	9.1	2392.2	*	1	1355	168	0.	.0	2386.0	*	1	2215	268	0.	.0	2386.0
1	0540	69	61.	8.8	2392.1	*	1	1400	169	0.	.0	2386.0	*	1	2220	269	0.	.0	2386.0
1	0545	70	61.	8.4	2391.9	*	1	1405	170	0.	.0	2386.0	*	1	2225	270	0.	.0	2386.0
1	0550	71	60.	8.1	2391.8	*	1	1410	171	0.	.0	2386.0	*	1	2230	271	0.	.0	2386.0
1	0555	72	60.	7.7	2391.7	*	1	1415	172	0.	.0	2386.0	*	1	2235	272	0.	.0	2386.0
1	0600	73	59.	7.4	2391.6	*	1	1420	173	0.	.0	2386.0	*	1	2240	273	0.	.0	2386.0
1	0605	74	59.	7.0	2391.5	*	1	1425	174	0.	.0	2386.0	*	1	2245	274	0.	.0	2386.0
1	0610	75	58.	6.7	2391.3	*	1	1430	175	0.	.0	2386.0	*	1	2250	275	0.	.0	2386.0
1	0615	76	58.	6.3	2391.2	*	1	1435	176	0.	.0	2386.0	*	1	2255	276	0.	.0	2386.0
1	0620	77	58.	5.9	2391.1	*	1	1440	177	0.	.0	2386.0	*	1	2300	277	0.	.0	2386.0
1	0625	78	57.	5.6	2390.9	*	1	1445	178	0.	.0	2386.0	*	1	2305	278	0.	.0	2386.0
1	0630	79	57.	5.2	2390.8	*	1	1450	179	0.	.0	2386.0	*	1	2310	279	0.	.0	2386.0
1	0635	80	56.	4.8	2390.6	*	1	1455	180	0.	.0	2386.0	*	1	2315	280	0.	.0	2386.0
1	0640	81	55.	4.4	2390.5	*	1	1500	181	0.	.0	2386.0	*	1	2320	281	0.	.0	2386.0
1	0645	82	55.	4.0	2390.3	*	1	1505	182	0.	.0	2386.0	*	1	2325	282	0.	.0	2386.0
1	0650	83	54.	3.7	2390.2	*	1	1510	183	0.	.0	2386.0	*	1	2330	283	0.	.0	2386.0
1	0655	84	54.	3.3	2390.0	*	1	1515	184	0.	.0	2386.0	*	1	2335	284	0.	.0	2386.0
1	0700	85	53.	2.9	2389.8	*	1	1520	185	0.	.0	2386.0	*	1	2340	285	0.	.0	2386.0
1	0705	86	52.	2.6	2389.6	*	1	1525	186	0.	.0	2386.0	*	1	2345	286	0.	.0	2386.0
1	0710	87	51.	2.2	2389.4	*	1	1530	187	0.	.0	2386.0	*	1	2350	287	0.	.0	2386.0
1	0715	88	51.	1.8	2389.2	*	1	1535	188	0.	.0	2386.0	*	1	2355	288	0.	.0	2386.0
1	0720	89	50.	1.5	2389.1	*	1	1540	189	0.	.0	2386.0	*	2	0000	289	0.	.0	2386.0
1	0725	90	49.	1.2	2388.8	*	1	1545	190	0.	.0	2386.0	*	2	0005	290	0.	.0	2386.0
1	0730	91	47.	.8	2388.4	*	1	1550	191	0.	.0	2386.0	*	2	0010	291	0.	.0	2386.0
1	0735	92	46.	.5	2388.1	*	1	1555	192	0.	.0	2386.0	*	2	0015	292	0.	.0	2386.0
1	0740	93	43.	.2	2387.4	*	1	1600	193	0.	.0	2386.0	*	2	0020	293	0.	.0	2386.0
1	0745	94	4.	.0	2386.1	*	1	1605	194	0.	.0	2386.0	*	2	0025	294	0.	.0	2386.0

1	0750	95	0.	.0	2386.0	*	1	1610	195	0.	.0	2386.0	*	2	0030	295	0.	.0	2386.0
1	0755	96	0.	.0	2386.0	*	1	1615	196	0.	.0	2386.0	*	2	0035	296	0.	.0	2386.0
1	0800	97	0.	.0	2386.0	*	1	1620	197	0.	.0	2386.0	*	2	0040	297	0.	.0	2386.0
1	0805	98	0.	.0	2386.0	*	1	1625	198	0.	.0	2386.0	*	2	0045	298	0.	.0	2386.0
1	0810	99	0.	.0	2386.0	*	1	1630	199	0.	.0	2386.0	*	2	0050	299	0.	.0	2386.0
1	0815	100	0.	.0	2386.0	*	1	1635	200	0.	.0	2386.0	*	2	0055	300	0.	.0	2386.0
						*							*						

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 62.	5.08		43.	11.	11.	11.
		(INCHES)	.441	.445	.445	.445
		(AC-FT)	21.	22.	22.	22.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
10.	5.08	5.	1.	1.	1.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
2392.49	5.08	2389.67	2386.92	2386.89	2386.89

CUMULATIVE AREA = .91 SQ MI

****

HYDROGRAPH AT STATION ELKBASIN
PLAN 1, RATIO = .98

****

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
							*								*							
1		0000	1	0.	.0	2386.0	*	1		0820	101	0.	.0	2386.0	*	1		1640	201	0.	.0	2386.0
1		0005	2	0.	.0	2386.0	*	1		0825	102	0.	.0	2386.0	*	1		1645	202	0.	.0	2386.0
1		0010	3	0.	.0	2386.0	*	1		0830	103	0.	.0	2386.0	*	1		1650	203	0.	.0	2386.0
1		0015	4	0.	.0	2386.0	*	1		0835	104	0.	.0	2386.0	*	1		1655	204	0.	.0	2386.0
1		0020	5	1.	.0	2386.0	*	1		0840	105	0.	.0	2386.0	*	1		1700	205	0.	.0	2386.0
1		0025	6	1.	.0	2386.0	*	1		0845	106	0.	.0	2386.0	*	1		1705	206	0.	.0	2386.0
1		0030	7	2.	.0	2386.1	*	1		0850	107	0.	.0	2386.0	*	1		1710	207	0.	.0	2386.0
1		0035	8	3.	.0	2386.1	*	1		0855	108	0.	.0	2386.0	*	1		1715	208	0.	.0	2386.0
1		0040	9	2.	.0	2386.1	*	1		0900	109	0.	.0	2386.0	*	1		1720	209	0.	.0	2386.0
1		0045	10	1.	.0	2386.0	*	1		0905	110	0.	.0	2386.0	*	1		1725	210	0.	.0	2386.0
1		0050	11	1.	.0	2386.0	*	1		0910	111	0.	.0	2386.0	*	1		1730	211	0.	.0	2386.0
1		0055	12	0.	.0	2386.0	*	1		0915	112	0.	.0	2386.0	*	1		1735	212	0.	.0	2386.0
1		0100	13	0.	.0	2386.0	*	1		0920	113	0.	.0	2386.0	*	1		1740	213	0.	.0	2386.0
1		0105	14	0.	.0	2386.0	*	1		0925	114	0.	.0	2386.0	*	1		1745	214	0.	.0	2386.0
1		0110	15	0.	.0	2386.0	*	1		0930	115	0.	.0	2386.0	*	1		1750	215	0.	.0	2386.0
1		0115	16	1.	.0	2386.0	*	1		0935	116	0.	.0	2386.0	*	1		1755	216	0.	.0	2386.0
1		0120	17	1.	.0	2386.0	*	1		0940	117	0.	.0	2386.0	*	1		1800	217	0.	.0	2386.0
1		0125	18	1.	.0	2386.0	*	1		0945	118	0.	.0	2386.0	*	1		1805	218	0.	.0	2386.0
1		0130	19	2.	.0	2386.0	*	1		0950	119	0.	.0	2386.0	*	1		1810	219	0.	.0	2386.0
1		0135	20	3.	.0	2386.1	*	1		0955	120	0.	.0	2386.0	*	1		1815	220	0.	.0	2386.0
1		0140	21	3.	.0	2386.1	*	1		1000	121	0.	.0	2386.0	*	1		1820	221	0.	.0	2386.0
1		0145	22	3.	.0	2386.1	*	1		1005	122	0.	.0	2386.0	*	1		1825	222	0.	.0	2386.0
1		0150	23	2.	.0	2386.1	*	1		1010	123	0.	.0	2386.0	*	1		1830	223	0.	.0	2386.0
1		0155	24	2.	.0	2386.0	*	1		1015	124	0.	.0	2386.0	*	1		1835	224	0.	.0	2386.0
1		0200	25	1.	.0	2386.0	*	1		1020	125	0.	.0	2386.0	*	1		1840	225	0.	.0	2386.0
1		0205	26	1.	.0	2386.0	*	1		1025	126	0.	.0	2386.0	*	1		1845	226	0.	.0	2386.0
1		0210	27	1.	.0	2386.0	*	1		1030	127	0.	.0	2386.0	*	1		1850	227	0.	.0	2386.0
1		0215	28	2.	.0	2386.1	*	1		1035	128	0.	.0	2386.0	*	1		1855	228	0.	.0	2386.0
1		0220	29	4.	.0	2386.1	*	1		1040	129	0.	.0	2386.0	*	1		1900	229	0.	.0	2386.0
1		0225	30	4.	.0	2386.1	*	1		1045	130	0.	.0	2386.0	*	1		1905	230	0.	.0	2386.0
1		0230	31	4.	.0	2386.1	*	1		1050	131	0.	.0	2386.0	*	1		1910	231	0.	.0	2386.0
1		0235	32	4.	.0	2386.1	*	1		1055	132	0.	.0	2386.0	*	1		1915	232	0.	.0	2386.0
1		0240	33	4.	.0	2386.1	*	1		1100	133	0.	.0	2386.0	*	1		1920	233	0.	.0	2386.0
1		0245	34	5.	.0	2386.1	*	1		1105	134	0.	.0	2386.0	*	1		1925	234	0.	.0	2386.0
1		0250	35	5.	.0	2386.1	*	1		1110	135	0.	.0	2386.0	*	1		1930	235	0.	.0	2386.0
1		0255	36	5.	.0	2386.1	*	1		1115	136	0.	.0	2386.0	*	1		1935	236	0.	.0	2386.0
1		0300	37	5.	.0	2386.1	*	1		1120	137	0.	.0	2386.0	*	1		1940	237	0.	.0	2386.0
1		0305	38	7.	.0	2386.2	*	1		1125	138	0.	.0	2386.0	*	1		1945	238	0.	.0	2386.0
1		0310	39	13.	.0	2386.3	*	1		1130	139	0.	.0	2386.0	*	1		1950	239	0.	.0	2386.0
1		0315	40	25.	.1	2386.6	*	1		1135	140	0.	.0	2386.0	*	1		1955	240	0.	.0	2386.0
1		0320	41	41.	.1	2387.1	*	1		1140	141	0.	.0	2386.0	*	1		2000	241	0.	.0	2386.0
1		0325	42	45.	.4	2387.8	*	1		1145	142	0.	.0	2386.0	*	1		2005	242	0.	.0	2386.0

| | | |

HYDROGRAPH AT STATION ELKBASIN
PLAN 1, RATIO = .97

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	2386.0	1		0820	101	0.	.0	2386.0	1		1640	201	0.	.0	2386.0
1		0005	2	0.	.0	2386.0	1		0825	102	0.	.0	2386.0	1		1645	202	0.	.0	2386.0
1		0010	3	0.	.0	2386.0	1		0830	103	0.	.0	2386.0	1		1650	203	0.	.0	2386.0
1		0015	4	0.	.0	2386.0	1		0835	104	0.	.0	2386.0	1		1655	204	0.	.0	2386.0
1		0020	5	1.	.0	2386.0	1		0840	105	0.	.0	2386.0	1		1700	205	0.	.0	2386.0
1		0025	6	1.	.0	2386.0	1		0845	106	0.	.0	2386.0	1		1705	206	0.	.0	2386.0
1		0030	7	2.	.0	2386.1	1		0850	107	0.	.0	2386.0	1		1710	207	0.	.0	2386.0
1		0035	8	3.	.0	2386.1	1		0855	108	0.	.0	2386.0	1		1715	208	0.	.0	2386.0
1		0040	9	2.	.0	2386.0	1		0900	109	0.	.0	2386.0	1		1720	209	0.	.0	2386.0
1		0045	10	1.	.0	2386.0	1		0905	110	0.	.0	2386.0	1		1725	210	0.	.0	2386.0
1		0050	11	1.	.0	2386.0	1		0910	111	0.	.0	2386.0	1		1730	211	0.	.0	2386.0
1		0055	12	0.	.0	2386.0	1		0915	112	0.	.0	2386.0	1		1735	212	0.	.0	2386.0
1		0100	13	0.	.0	2386.0	1		0920	113	0.	.0	2386.0	1		1740	213	0.	.0	2386.0
1		0105	14	0.	.0	2386.0	1		0925	114	0.	.0	2386.0	1		1745	214	0.	.0	2386.0
1		0110	15	0.	.0	2386.0	1		0930	115	0.	.0	2386.0	1		1750	215	0.	.0	2386.0
1		0115	16	1.	.0	2386.0	1		0935	116	0.	.0	2386.0	1		1755	216	0.	.0	2386.0
1		0120	17	1.	.0	2386.0	1		0940	117	0.	.0	2386.0	1		1800	217	0.	.0	2386.0
1		0125	18	1.	.0	2386.0	1		0945	118	0.	.0	2386.0	1		1805	218	0.	.0	2386.0
1		0130	19	2.	.0	2386.0	1		0950	119	0.	.0	2386.0	1		1810	219	0.	.0	2386.0
1		0135	20	3.	.0	2386.1	1		0955	120	0.	.0	2386.0	1		1815	220	0.	.0	2386.0
1		0140	21	3.	.0	2386.1	1		1000	121	0.	.0	2386.0	1		1820	221	0.	.0	2386.0
1		0145	22	3.	.0	2386.1	1		1005	122	0.	.0	2386.0	1		1825	222	0.	.0	2386.0
1		0150	23	2.	.0	2386.1	1		1010	123	0.	.0	2386.0	1		1830	223	0.	.0	2386.0
1		0155	24	2.	.0	2386.0	1		1015	124	0.	.0	2386.0	1		1835	224	0.	.0	2386.0
1		0200	25	1.	.0	2386.0	1		1020	125	0.	.0	2386.0	1		1840	225	0.	.0	2386.0
1		0205	26	1.	.0	2386.0	1		1025	126	0.	.0	2386.0	1		1845	226	0.	.0	2386.0
1		0210	27	1.	.0	2386.0	1		1030	127	0.	.0	2386.0	1		1850	227	0.	.0	2386.0
1		0215	28	2.	.0	2386.1	1		1035	128	0.	.0	2386.0	1		1855	228	0.	.0	2386.0
1		0220	29	4.	.0	2386.1	1		1040	129	0.	.0	2386.0	1		1900	229	0.	.0	2386.0
1		0225	30	4.	.0	2386.1	1		1045	130	0.	.0	2386.0	1		1905	230	0.	.0	2386.0
1		0230	31	4.	.0	2386.1	1		1050	131	0.	.0	2386.0	1		1910	231	0.	.0	2386.0
1		0235	32	4.	.0	2386.1	1		1055	132	0.	.0	2386.0	1		1915	232	0.	.0	2386.0
1		0240	33	4.	.0	2386.1	1		1100	133	0.	.0	2386.0	1		1920	233	0.	.0	2386.0
1		0245	34	5.	.0	2386.1	1		1105	134	0.	.0	2386.0	1		1925	234	0.	.0	2386.0
1		0250	35	5.	.0	2386.1	1		1110	135	0.	.0	2386.0	1		1930	235	0.	.0	2386.0
1		0255	36	5.	.0	2386.1	1		1115	136	0.	.0	2386.0	1		1935	236	0.	.0	2386.0
1		0300	37	5.	.0	2386.1	1		1120	137	0.	.0	2386.0	1		1940	237	0.	.0	2386.0
1		0305	38	7.	.0	2386.2	1		1125	138	0.	.0	2386.0	1		1945	238	0.	.0	2386.0
1		0310	39	13.	.0	2386.3	1		1130	139	0.	.0	2386.0	1		1950	239	0.	.0	2386.0
1		0315	40	24.	.1	2386.6	1		1135	140	0.	.0	2386.0	1		1955	240	0.	.0	2386.0
1		0320	41	41.	.1	2387.1	1		1140	141	0.	.0	2386.0	1		2000	241	0.	.0	2386.0
1		0325	42	45.	.3	2387.8	1		1145	142	0.	.0	2386.0	1		2005	242	0.	.0	2386.0
1		0330	43	48.	1.0	2388.6	1		1150	143	0.	.0	2386.0	1		2010	243	0.	.0	2386.0
1		0335	44	51.	2.0	2389.3	1		1155	144	0.	.0	2386.0	1		2015	244	0.	.0	2386.0
1		0340	45	54.	3.3	2390.0	1		1200	145	0.	.0	2386.0	1		2020	245	0.	.0	2386.0
1		0345	46	56.	4.6	2390.5	1		1205	146	0.	.0	2386.0	1		2025	246	0.	.0	2386.0
1		0350	47	57.	5.8	2391.0	1		1210	147	0.	.0	2386.0	1		2030	247	0.	.0	2386.0
1		0355	48	59.	6.7	2391.3	1		1215	148	0.	.0	2386.0	1		2035	248	0.	.0	2386.0
1		0400	49	59.	7.4	2391.6	1		1220	149	0.	.0	2386.0	1		2040	249	0.	.0	2386.0
1		0405	50	60.	7.9	2391.8	1		1225	150	0.	.0	2386.0	1		2045	250	0.	.0	2386.0
1		0410	51	60.	8.3	2391.9	1		1230	151	0.	.0	2386.0	1		2050	251	0.	.0	2386.0
1		0415	52	61.	8.4	2392.0	1		1235	152	0.	.0	2386.0	1		2055	252	0.	.0	2386.0
1		0420	53	61.	8.5	2392.0	1		1240	153	0.	.0	2386.0	1		2100	253	0.	.0	2386.0
1		0425	54	61.	8.5	2392.0	1		1245	154	0.	.0	2386.0	1		2105	254	0.	.0	2386.0
1		0430	55	61.	8.5	2392.0	1		1250	155	0.	.0	2386.0	1		2110	255	0.	.0	2386.0
1		0435	56	61.	8.5	2392.0	1		1255	156	0.	.0	2386.0	1		2115	256	0.	.0	2386.0
1		0440	57	61.	8.6	2392.0	1		1300	157	0.	.0	2386.0	1		2120	257	0.	.0	2386.0
1		0445	58	61.	8.7	2392.0	1		1305	158	0.	.0	2386.0	1		2125	258	0.	.0	2386.0
1		0450	59	61.	8.8	2392.1	1		1310	159	0.	.0	2386.0	1		2130	259	0.	.0	2386.0
1		0455	60	61.	9.0	2392.1	1		1315	160	0.	.0	2386.0	1		2135	260	0.	.0	2386.0
1		0500	61	61.	9.1	2392.2	1		1320	161	0.	.0	2386.0	1		2140	261	0.	.0	2386.0
1		0505	62	61.	9.1	2392.2	1		1325	162	0.	.0	2386.0	1		2145	262	0.	.0	2386.0
1		0510	63	61.	9.1	2392.2	1		1330	163	0.	.0	2386.0	1		2150	263	0.	.0	2386.0
1		0515	64	61.	9.0	2392.1	1		1335	164	0.	.0	2386.0	1		2155	264	0.	.0	2386.0
1		0520	65	61.	8.8	2392.1	1		1340	165	0.	.0	2386.0	1		2200	265	0.	.0	2386.0
1		0525	66	61.	8.6	2392.0	1		1345	166	0.	.0	2386.0	1		2205	266	0.	.0	2386.0
1		0530	67	61.	8.4	2391.9	1		1350	167	0.	.0	2386.0	1		2210	267	0.	.0	2386.0
1		0535	68	60.	8.1	2391.8	1		1355	168	0.	.0	2386.0	1		2215	268	0.	.0	2386.0
1		0540	69	60.	7.7	2391.7	1		1400	169	0.	.0	2386.0	1		2220	269	0.	.0	2386.0
1		0545	70	59.	7.4	2391.6	1		1405	170	0.	.0	2386.0	1		2225	270	0.	.0	2386.0
1		0550	71	59.	7.1	2391.5	1		1410	171	0.	.0	2386.0	1		2230	271	0.	.0	2386.0

1	0555	72	59.	6.7	2391.4	*	1	1415	172	0.	.0	2386.0	*	1	2235	272	0.	.0	2386.0
1	0600	73	58.	6.4	2391.2	*	1	1420	173	0.	.0	2386.0	*	1	2240	273	0.	.0	2386.0
1	0605	74	58.	6.0	2391.1	*	1	1425	174	0.	.0	2386.0	*	1	2245	274	0.	.0	2386.0
1	0610	75	57.	5.7	2391.0	*	1	1430	175	0.	.0	2386.0	*	1	2250	275	0.	.0	2386.0
1	0615	76	57.	5.3	2390.8	*	1	1435	176	0.	.0	2386.0	*	1	2255	276	0.	.0	2386.0
1	0620	77	56.	5.0	2390.7	*	1	1440	177	0.	.0	2386.0	*	1	2300	277	0.	.0	2386.0
1	0625	78	56.	4.6	2390.5	*	1	1445	178	0.	.0	2386.0	*	1	2305	278	0.	.0	2386.0
1	0630	79	55.	4.2	2390.4	*	1	1450	179	0.	.0	2386.0	*	1	2310	279	0.	.0	2386.0
1	0635	80	55.	3.8	2390.2	*	1	1455	180	0.	.0	2386.0	*	1	2315	280	0.	.0	2386.0
1	0640	81	54.	3.5	2390.1	*	1	1500	181	0.	.0	2386.0	*	1	2320	281	0.	.0	2386.0
1	0645	82	53.	3.1	2389.9	*	1	1505	182	0.	.0	2386.0	*	1	2325	282	0.	.0	2386.0
1	0650	83	53.	2.7	2389.7	*	1	1510	183	0.	.0	2386.0	*	1	2330	283	0.	.0	2386.0
1	0655	84	52.	2.4	2389.5	*	1	1515	184	0.	.0	2386.0	*	1	2335	284	0.	.0	2386.0
1	0700	85	51.	2.0	2389.3	*	1	1520	185	0.	.0	2386.0	*	1	2340	285	0.	.0	2386.0
1	0705	86	50.	1.7	2389.1	*	1	1525	186	0.	.0	2386.0	*	1	2345	286	0.	.0	2386.0
1	0710	87	49.	1.3	2388.9	*	1	1530	187	0.	.0	2386.0	*	1	2350	287	0.	.0	2386.0
1	0715	88	48.	1.0	2388.6	*	1	1535	188	0.	.0	2386.0	*	1	2355	288	0.	.0	2386.0
1	0720	89	47.	.7	2388.3	*	1	1540	189	0.	.0	2386.0	*	2	0000	289	0.	.0	2386.0
1	0725	90	45.	.4	2387.8	*	1	1545	190	0.	.0	2386.0	*	2	0005	290	0.	.0	2386.0
1	0730	91	39.	.1	2387.0	*	1	1550	191	0.	.0	2386.0	*	2	0010	291	0.	.0	2386.0
1	0735	92	0.	.0	2386.0	*	1	1555	192	0.	.0	2386.0	*	2	0015	292	0.	.0	2386.0
1	0740	93	0.	.0	2386.0	*	1	1600	193	0.	.0	2386.0	*	2	0020	293	0.	.0	2386.0
1	0745	94	0.	.0	2386.0	*	1	1605	194	0.	.0	2386.0	*	2	0025	294	0.	.0	2386.0
1	0750	95	0.	.0	2386.0	*	1	1610	195	0.	.0	2386.0	*	2	0030	295	0.	.0	2386.0
1	0755	96	0.	.0	2386.0	*	1	1615	196	0.	.0	2386.0	*	2	0035	296	0.	.0	2386.0
1	0800	97	0.	.0	2386.0	*	1	1620	197	0.	.0	2386.0	*	2	0040	297	0.	.0	2386.0
1	0805	98	0.	.0	2386.0	*	1	1625	198	0.	.0	2386.0	*	2	0045	298	0.	.0	2386.0
1	0810	99	0.	.0	2386.0	*	1	1630	199	0.	.0	2386.0	*	2	0050	299	0.	.0	2386.0
1	0815	100	0.	.0	2386.0	*	1	1635	200	0.	.0	2386.0	*	2	0055	300	0.	.0	2386.0
						*							*						

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 61.	5.08		41.	10.	10.	10.
		(INCHES)	.418	.420	.420	.420
		(AC-FT)	20.	20.	20.	20.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
9.	5.08	4.	1.	1.	1.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
2392.18	5.08	2389.37	2386.84	2386.81	2386.81

CUMULATIVE AREA = .91 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

					RATIOS APPLIED TO PRECIPITATION		
OPERATION	STATION	AREA	PLAN		RATIO 1	RATIO 2	RATIO 3
					1.00	.98	.97
HYDROGRAPH AT							
+	OFF1	.20	1	FLOW	72.	68.	68.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	FDI12	.20	1	FLOW	49.	47.	46.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	DIV1FD	.20	1	FLOW	23.	22.	22.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	CIM1	.20	1	FLOW	5.	5.	5.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	SPLIT1	.20	1	FLOW	18.	17.	17.

				TIME	3.75	3.75	3.75
DIVERSION TO							
+	FDI345	.20	1	FLOW	18.	17.	17.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	DIV2FD	.20	1	FLOW	0.	0.	0.
				TIME	.00	.00	.00
HYDROGRAPH AT							
+	OFF4	.03	1	FLOW	11.	10.	10.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP1	.23	1	FLOW	11.	10.	10.
				TIME	3.58	3.58	3.58
DIVERSION TO							
+	BUFF2	.23	1	FLOW	1.	1.	1.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	FDI6789	.23	1	FLOW	10.	9.	9.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	FDI12	.00	1	FLOW	49.	47.	46.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	FDI345	.00	1	FLOW	18.	17.	17.
				TIME	3.75	3.75	3.75
3 COMBINED AT							
+	CP2	.23	1	FLOW	73.	70.	69.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF5	.05	1	FLOW	19.	18.	18.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP3	.28	1	FLOW	88.	83.	82.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	BUFF2	.00	1	FLOW	1.	1.	1.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP3A	.28	1	FLOW	89.	84.	83.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF3	.17	1	FLOW	44.	42.	41.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	CIM1	.00	1	FLOW	5.	5.	5.
				TIME	3.75	3.75	3.75
2 COMBINED AT							
+	CP4	.17	1	FLOW	49.	46.	46.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	CIM2	.17	1	FLOW	17.	16.	16.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	SPLIT2	.17	1	FLOW	32.	30.	30.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF6	.03	1	FLOW	8.	8.	8.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF7	.07	1	FLOW	19.	18.	17.
				TIME	3.67	3.67	3.67

3 COMBINED AT							
+	CP5	.26	1	FLOW	59.	55.	54.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF2	.18	1	FLOW	50.	48.	47.
				TIME	3.83	3.83	3.83
HYDROGRAPH AT							
+	CIM2	.00	1	FLOW	17.	16.	16.
				TIME	3.75	3.75	3.75
2 COMBINED AT							
+	CP6	.18	1	FLOW	67.	63.	62.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	CIM3	.18	1	FLOW	16.	15.	15.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	SPLIT3	.18	1	FLOW	51.	48.	48.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF8	.03	1	FLOW	10.	9.	9.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP7	.21	1	FLOW	57.	54.	53.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF9	.03	1	FLOW	28.	28.	27.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP8	.24	1	FLOW	77.	73.	73.
				TIME	3.67	3.67	3.67
DIVERSION TO							
+	BUFF1	.24	1	FLOW	2.	2.	2.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	DIV3E123	.24	1	FLOW	75.	71.	71.
				TIME	3.67	3.67	3.67
2 COMBINED AT							
+	CP9	.50	1	FLOW	134.	126.	125.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	BUFF1	.00	1	FLOW	2.	2.	2.
				TIME	3.67	3.67	3.67
DIVERSION TO							
+	BUFF2	.00	1	FLOW	1.	1.	1.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	SPLIT4	.00	1	FLOW	1.	1.	1.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF11	.07	1	FLOW	19.	18.	18.
				TIME	3.67	3.67	3.67
2 COMBINED AT							
+	CP10	.07	1	FLOW	20.	18.	18.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF10	.03	1	FLOW	10.	9.	9.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF12	.02	1	FLOW	13.	12.	12.
				TIME	3.50	3.50	3.50

HYDROGRAPH AT							
+	ON-1	.02	1	FLOW	4.	4.	4.
				TIME	3.67	3.67	3.67
6 COMBINED AT							
+	CP11	.91	1	FLOW	264.	250.	248.
				TIME	3.67	3.67	3.67
ROUTED TO							
+	ELKBASIN	.91	1	FLOW	62.	62.	61.
				TIME	5.08	5.08	5.08
			** PEAK STAGES IN FEET **				
			1	STAGE	2392.49	2392.23	2392.18
				TIME	5.08	5.08	5.08

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

PROPOSED CONDITION HEC-1
100-YEAR STORM EVENT

OPTION-2
OUTLET OF DETENTION BASIN WITH 1-27" RCP

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JAN  1997                *
 *            VERSION 4.1                *
 *                                       *
 *  RUN DATE   27JUN08  TIME  09:36:12   *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    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
                    *DIAGRAM
*** FREE ***
               1    ID   ************************************************************
               2    ID   * ---------------------------------------------------------- *
               3    ID   * |                                                        | *
               4    ID   * |   ELKHORN SPRINGS AND BUFFALO DRIVE STORM DRAIN        | *
               5    ID   * |                 CITY OF LAS VEGAS                      | *
               6    ID   * |                 PROPOSED CONDITIONS                    | *
               7    ID   * |                                                        | *
               8    ID   * |........................................................| *
               9    ID   * |                                                        | *
              10    ID   * |         CLIENT--------------CITY OF LAS VEGAS          | *
              11    ID   * |         RETURN PERIOD-------100-YEAR                   | *
              12    ID   * |         DISTRIBUTUION-------6-HOUR SDN3                | *
              13    ID   * |         PROJECT NO----------31678A                     | *
              14    ID   * |         FILENAME------------PI-100-Opt2.DAT            | *
              15    ID   * |         REV. DATE-----------06/17/08                   | *
              16    ID   * |                                                        | *
              17    ID   * |........................................................| *
              18    ID   * |                                                        | *
              19    ID   * |                  AREA      DARF                        | *
              20    ID   * |                 (sq.mi.)                             | *
              21    ID   * |               0.00-0.50   1.000                       | *
              22    ID   * |               0.50-0.75   0.975                       | *
              23    ID   * |               0.75-1.00   0.970                       | *
              24    ID   * |                                                        | *
              25    ID   * |  MODELED BY: Parsons Brinckerhoff                      | *
              26    ID   * ---------------------------------------------------------- *
              27    ID   ************************************************************
              28    ID
              29    ID
              30    IT       5       0       0     300
              31    IO       5       0       0
              32    IN       5       0       0
              33    JR    PREC    1.00   0.975   0.970
                    *
              34    KK    OFF1
              35    BA  0.1973
              36    PB    2.52
              37    PC   0.000   0.020   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
              38    PC   0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
```

Lon

```
 39          PC   0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
 40          PC   0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
 41          PC   0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
 42          PC   0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
 43          PC   0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
 44          PC   0.998   0.999   1.000
 45          LS       0   88.14
 46          UD   0.292
             *
```



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

 47          KK  DIV1FD
 48          KM   DIVERT FLOWS INTO DROP INLETS FDI-1 & FDI-2 LOCATED NWC OF FARM ROAD
 49          KM   AND CIMARRON ROAD
 50          DT   FDI12
 51          DI       0     100     179
 52          DQ       0    48.0      85
             *

 53          KK  SPLIT1
 54          KM   FLOW SPLIT ON CIMARRON ROAD AND FARM ROAD
 55          DT   CIM1
 56          DI       0      50      94
 57          DQ       0    22.3      42
             *

 58          KK  DIV2FD
 59          KM   DIVERT FLOWS INTO DROP INLETS FDI-3,FDI-4 & FDI-5 LOCATED ON FARM ROAD
 60          KM   BETWEEN CIMARRON ROAD & PALM GROVE
 61          DT  FDI345
 62          DI       0      52
 63          DQ       0      47
             *

 64          KK    OFF4
 65          BA  0.0308
 66          PB    2.77
 67          LS       0   82.00
 68          UD   0.112
             *

 69          KK     CP1
 70          KM   COMBINE OFF4 AND BY PASS FLOW FROM INLETS ON FARM ROAD
 71          HC       2
             *

 72          KK FDI6789
 73          KM   FLOW INTO PROPOSED DIS IN FARM ROAD
 74          DT   BUFF2
 75          DI       0      38
 76          DQ       0       4
             *

 77          KK   FDI12
 78          KM   RECALL FLOW COLLECTED BY EXISTING STORM DRIAN SYSTEM(PLUGGED)ON FARM ROAD
 79          KM   WEST OF CIMARRON ROAD
 80          DR   FDI12
             *

 81          KK  FDI345
 82          KM   RECALL FLOW COLLECTED BY EXISTING STORM DRIAN SYSTEM(PLUGGED)ON FARM ROAD
 83          KM   BETWEEN CIMARRON ROAD AND PALM GROOVE LANE
 84          DR  FDI345
             *
```



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

 85          KK     CP2
 86          KM   COMBINE FD12,FD345 AND FD6789 TO CALCULATED FLOW COLLECTED BY THE EXISTING
 87          KM   STORM DRAIN SYSTEM ON FARM ROAD (CURRENTLY PLUGGED)
 88          HC       3
             *

 89          KK    OFF5
 90          KM   SUBBASIN OFF5
 91          BA  0.0549
```

```
 92          LS        0   82.00
 93          UD   0.132
             *

 94          KK     CP3
 95          KM   COMBINE CP-1,CP-2 AND OFF5
 96          HC        2
             *

 97          KK   BUFF2
 98          KM   RECALL FLOW BYPASSED BY FDI89 ON FARM ROAD
 99          DR   BUFF2
             *

100          KK    CP3A
101          KM   COMBINE CP-3 AND BUFF2
102          HC        2
             *

103          KK    OFF3
104          KM   SUBBASIN OFF3
105          BA   0.165
106          LS        0   82.02
107          UD   0.246
             *

108          KK    CIM1
109          KM   RECALL FLOW SPLIT AT CIMMARON AND FARM ROAD ON CIMARRON ROAD
110          DR    CIM1
             *

111          KK     CP4
112          KM   COMBINE OFF3 AND CIM1
113          HC        2
             *

114          KK  SPLIT2
115          KM   FLOW SPLIT ON CIMARRON ROAD AND SUNNY SPRINGS LANE
116          DT    CIM2
117          DI        0     100     182
118          DQ        0    40.6      74
             *
```



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

119          KK    OFF6
120          KM   SUBBASIN OFF6
121          BA  0.0287
122          LS        0   82.05
123          UD   0.223
             *

124          KK    OFF7
125          KM   SUBBASIN OFF7
126          BA  0.0667
127          LS        0   81.98
128          UD   0.219
             *

129          KK     CP5
130          KM   COMBINE OFF6,OFF7 AND REMAINING FLOW IN SUNNY SPRINGS LANE AFTER FLOW SPLIT
131          HC        3
             *

132          KK    OFF2
133          KM   SUBBASIN OFF2
134          BA  0.1786
135          PB    2.26
136          LS        0   87.44
137          UD   0.343
             *

138          KK    CIM2
139          KM   RECALL FLOW SPLIT AT CIMMARON AND SUNNY SPRINGS LANE ON CIMARRON ROAD
140          DR    CIM2
             *

141          KK     CP6
142          KM   COMBINE OFF2 & CIM2
```

```
 143          HC       2
              *

 144          KK  SPLIT3
 145          KM   FLOW SPLIT ON CIMARRON ROAD AND ELKHORN ROAD
 146          DT    CIM3
 147          DI       0       50      195
 148          DQ       0     15.3       60
              *

 149          KK    OFF8
 150          KM   SUBBASIN OFF8
 151          BA  0.0282
 152          PB    2.77
 153          LS       0    81.79
 154          UD   0.107
              *
```



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

 155          KK     CP7
 156          KM   COMBINE OFF8 AND REMAINING FLOW IN ELKHORN ROAD
 157          HC       2
              *

 158          KK    OFF9
 159          BA  0.0285
 160          LS       0    97.46
 161          UD   0.149
              *

 162          KK     CP8
 163          KM   COMBINE OFF8,OFF9 AND REMAINING FLOW IN ELKHORN ROAD
 164          HC       2
              *

 165          KKDIV3E123
 166          KM   DIVERT FLOWS TO EXISTIGN DIs IN ELKHORN ROAD (6 DIs TOTAL)
 167          DT   BUFF1
 168          DI       0       50      193
 169          DQ       0     22.8       48
              *

 170          KK     CP9
 171          KM   COMBINE CP5 AND FLOW INTERCEPTED BY DIs IN ELKHORN ROAD
 172          HC       2
              *

 173          KK   BUFF1
 174          KM   RECALL FLOW BYPASSED BY DROP INLETS IN ELKHORN ROAD
 175          DR   BUFF1
              *

 176          KK  SPLIT4
 177          KM   FLOW SPLIT AT ELKHORN ROAD AND BUFFALO DRIVE
 178          DT   BUFF2
 179          DI       0       48
 180          DQ       0       32
              *

 181          KK   OFF11
 182          KM   SUBBASIN OFF11
 183          BA  0.0655
 184          LS       0    81.95
 185          UD   0.209
              *

 186          KK    CP10
 187          KM   COMBINE BUFF1 & BUFF2
 188          HC       2
              *
```



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

 189          KK   OFF10
 190          KM   SUBBASIN OFF10
 191          BA  0.0334
```

```
 192          LS       0   82.18
 193          UD   0.214
              *

 194          KK   OFF12
 195          KM   SUBBASIN OFF12
 196          BA  0.0156
 197          LS       0   92.92
 198          UD   0.106
              *

 199          KK    ON-1
 200          KM   ON SITE SUBBASIN
 201          BA  0.0194
 202          LS       0   78.82
 203          UD   0.191
              *

 204          KK    CP11
 205          KM   COMBINE OFF12,OFF-10,CP-10,CP-9 AND ON-1
 206          HC       6
              *

 207          KKELKBASIN
 208          KM    FACILITY = ELKHORN SPRINGS DETENTION BASIN
 209          KM    FACILITY ID-MILE = EKDB 0070
 210          KM    STORAGE VOLUME = 48 ACRE-FEET
 211          KM    OUTLET = 2-27 inch RCPs transition to 60" RCP
 212          KM    SPILLWAY LENGTH =
 213          KM    SPILLWAY HEIGHT =
              *  KO       3
 214          RS       1    STOR      -1
 215          SV    0.04    0.07    0.41    1.41    3.24    5.71    8.57    11.8    15.3    19.0
 216          SV    22.9    27.0    31.3    35.8    40.5
 217          SE    2386    2387    2388    2389    2390    2391    2392    2393    2394    2395
 218          SE    2396    2397    2398    2399    2400
              *  SQ       0       0       0       0    65.5    92.7   113.53   128.0
              *  SQ   134.2   140.1   145.7   151.2   156.4   161.5    166.4
              *  Outflow release rate - combine 48-inch debris riser orifice and
              *  1-27 inches low level outlet release rate
              *  open channel flow at the existing 60-inch RCP at 0.0013 slope
 219          SQ       0    40.9    45.6    49.8    53.7    57.3    60.8    64.0    67.1    70.0
 220          SQ    72.9    75.6    78.2    80.7    83.2
 221          KO       1
              *
 222          ZZ
1
```

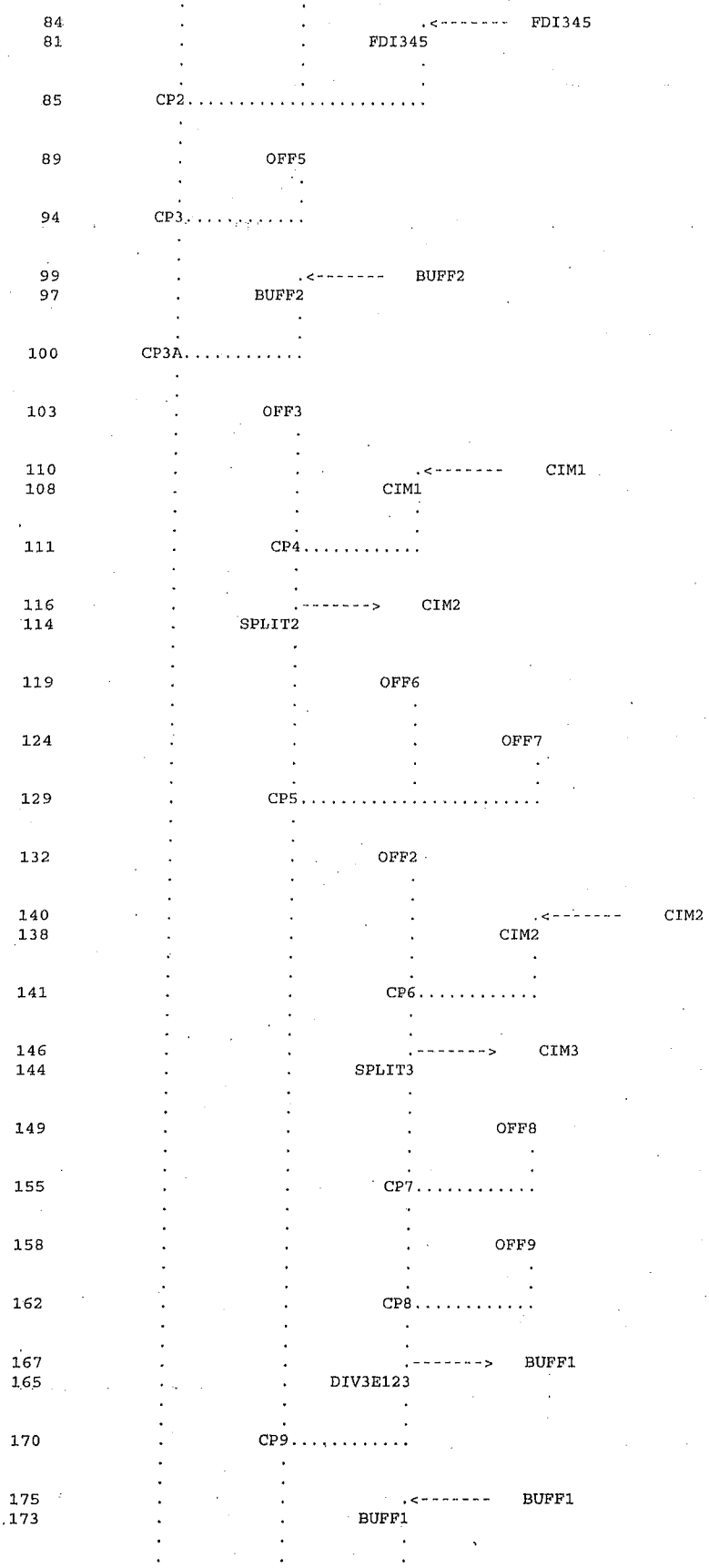
SCHEMATIC DIAGRAM OF STREAM NETWORK

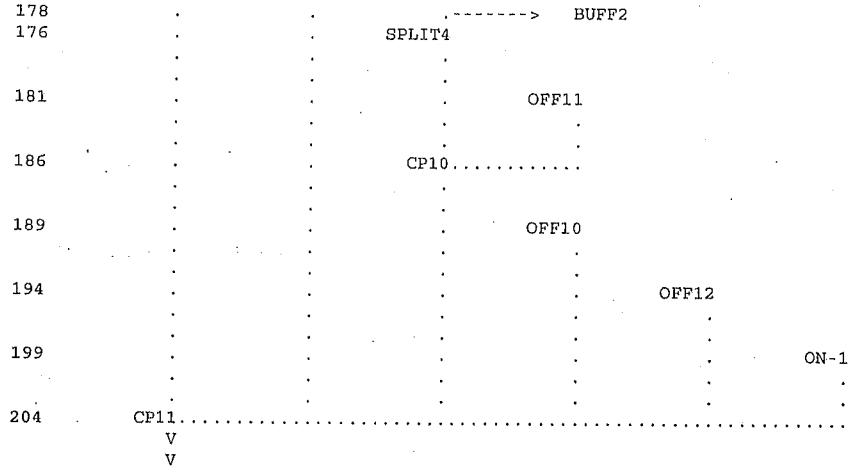
INPUT LINE NO.

(V) ROUTING (---->) DIVERSION OR PUMP FLOW

(.) CONNECTOR (<----) RETURN OF DIVERTED OR PUMPED FLOW

```
  34    OFF1
          .
          .
  50      .-------->  FDI12
  47  DIV1FD
          .
          .
  55      .-------->   CIM1
  53  SPLIT1
          .
          .
  61      .-------->  FDI345
  58  DIV2FD
          .       .
          .
  64      .       OFF4
          .         .
          .         .
  69      CP1.......
          .
          .
  74      .-------->  BUFF2
  72  FDI6789
          .
          .
  80      .          .<--------  FDI12
  77      .     FDI12
          .         .
```


84
81
FDI345
FDI345
85
CP2
89
OFF5
94
CP3
99
BUFF2
97
BUFF2
100
CP3A
103
OFF3
110
CIM1
108
CIM1
111
CP4
116
CIM2
114
SPLIT2
119
OFF6
124
OFF7
129
CP5
132
OFF2
140
CIM2
138
CIM2
141
CP6
146
CIM3
144
SPLIT3
149
OFF8
155
CP7
158
OFF9
162
CP8
167
BUFF1
165
DIV3E123
170
CP9
175
BUFF1
173
BUFF1



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JAN   1997              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   27JUN08  TIME  09:36:12   *
*                                       *
*****************************************
```

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

```
*****************************************************************
* ------------------------------------------------------------- *
* |                                                           | *
* |   ELKHORN SPRINGS AND BUFFALO DRIVE STORM DRAIN           | *
* |                  CITY OF LAS VEGAS                        | *
* |                .PROPOSED CONDITIONS                       | *
* |                                                           | *
* |...........................................................| *
* |                                                           | *
* |         CLIENT--------------CITY OF LAS VEGAS              | *
* |         RETURN PERIOD-------100-YEAR                      | *
* |         DISTRIBUTUION-------6-HOUR SDN3                   | *
* |         PROJECT NO----------31678A                        | *
* |         FILENAME------------PI-100-Opt2.DAT               | *
* |         REV. DATE-----------06/17/08                      | *
* |                                                           | *
* |...........................................................| *
* |                                                           | *
* |                  AREA     DARF                            | *
* |                 (sq.mi.)                                  | *
* |               0.00-0.50  1.000                            | *
* |               0.50-0.75  0.975                            | *
* |               0.75-1.00  0.970                            | *
* |                                                           | *
* |  MODELED BY: Parsons Brinckerhoff                         | *
* ------------------------------------------------------------- *
*****************************************************************
```

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

    IT          HYDROGRAPH TIME DATA
                      NMIN            5  MINUTES IN COMPUTATION INTERVAL
                     IDATE        1    0  STARTING DATE
                     ITIME          0000  STARTING TIME
                        NQ           300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE        2    0  ENDING DATE
                    NDTIME          0055  ENDING TIME
```

```
                    ICENT          19  CENTURY MARK

                COMPUTATION INTERVAL      .08 HOURS
                    TOTAL TIME BASE   24.92 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

     JP          MULTI-PLAN OPTION
                      NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    1.00       .98       .97


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


            **************
            *            *
 207 KK     *  ELKBASIN  *
            *            *
            **************

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

               HYDROGRAPH ROUTING DATA

 214 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

 215 SV            STORAGE          .0        .1        .4       1.4       3.2       5.7       8.6      11.8      15.3      19.0
                                  22.9      27.0      31.3      35.8      40.5

 217 SE            ELEVATION    2386.00   2387.00   2388.00   2389.00   2390.00   2391.00   2392.00   2393.00   2394.00   2395.00
                                2396.00   2397.00   2398.00   2399.00   2400.00

 219 SQ            DISCHARGE        0.       41.       46.       50.       54.       57.       61.       64.       67.       70.
                                   73.       76.       78.       81.       83.

                                                        ***

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN        0. TO       41.
                THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
                THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

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

                                        HYDROGRAPH AT STATION ELKBASIN
                                             PLAN 1,   RATIO =  1.00

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

 DA MON HRMN ORD  OUTFLOW  STORAGE   STAGE *  DA MON HRMN ORD  OUTFLOW  STORAGE   STAGE *  DA MON HRMN ORD  OUTFLOW  STORAGE   STAGE
                                           *                                           *
  1     0000   1       0.       .0  2386.0 *   1     0820 101      70.      18.5  2394.9 *   1     1640 201       0.       .0  2386.0
  1     0005   2       0.       .0  2386.0 *   1     0825 102      69.      18.1  2394.7 *   1     1645 202       0.       .0  2386.0
  1     0010   3       0.       .0  2386.0 *   1     0830 103      69.      17.6  2394.6 *   1     1650 203       0.       .0  2386.0
  1     0015   4       2.       .0  2386.0 *   1     0835 104      69.      17.1  2394.5 *   1     1655 204       0.       .0  2386.0
  1     0020   5       3.       .0  2386.1 *   1     0840 105      68.      16.6  2394.4 *   1     1700 205       0.       .0  2386.0
  1     0025   6       4.       .0  2386.1 *   1     0845 106      68.      16.2  2394.2 *   1     1705 206       0.       .0  2386.0
  1     0030   7       6.       .0  2386.1 *   1     0850 107      67.      15.7  2394.1 *   1     1710 207       0.       .0  2386.0
  1     0035   8       6.       .0  2386.2 *   1     0855 108      67.      15.3  2394.0 *   1     1715 208       0.       .0  2386.0
  1     0040   9       5.       .0  2386.1 *   1     0900 109      67.      14.8  2393.9 *   1     1720 209       0.       .0  2386.0
  1     0045  10       3.       .0  2386.1 *   1     0905 110      66.      14.3  2393.7 *   1     1725 210       0.       .0  2386.0
  1     0050  11       2.       .0  2386.0 *   1     0910 111      66.      13.9  2393.6 *   1     1730 211       0.       .0  2386.0
  1     0055  12       1.       .0  2386.0 *   1     0915 112      65.      13.4  2393.5 *   1     1735 212       0.       .0  2386.0
```

1	0100	13	1.	.0	2386.0	*	1	0920	113	65.	13.0	2393.3	*	1	1740	213	0.	.0	2386.0
1	0105	14	1.	.0	2386.0	*	1	0925	114	65.	12.5	2393.2	*	1	1745	214	0.	.0	2386.0
1	0110	15	1.	.0	2386.0	*	1	0930	115	64.	12.1	2393.1	*	1	1750	215	0.	.0	2386.0
1	0115	16	2.	.0	2386.1	*	1	0935	116	64.	11.6	2393.0	*	1	1755	216	0.	.0	2386.0
1	0120	17	3.	.0	2386.1	*	1	0940	117	63.	11.2	2392.8	*	1	1800	217	0.	.0	2386.0
1	0125	18	4.	.0	2386.1	*	1	0945	118	63.	10.8	2392.7	*	1	1805	218	0.	.0	2386.0
1	0130	19	6.	.0	2386.2	*	1	0950	119	63.	10.3	2392.5	*	1	1810	219	0.	.0	2386.0
1	0135	20	9.	.0	2386.2	*	1	0955	120	62.	9.9	2392.4	*	1	1815	220	0.	.0	2386.0
1	0140	21	12.	.0	2386.3	*	1	1000	121	62.	9.5	2392.3	*	1	1820	221	0.	.0	2386.0
1	0145	22	14.	.1	2386.3	*	1	1005	122	61.	9.1	2392.2	*	1	1825	222	0.	.0	2386.0
1	0150	23	15.	.1	2386.4	*	1	1010	123	61.	8.6	2392.0	*	1	1830	223	0.	.0	2386.0
1	0155	24	13.	.0	2386.3	*	1	1015	124	60.	8.2	2391.9	*	1	1835	224	0.	.0	2386.0
1	0200	25	11.	.0	2386.3	*	1	1020	125	60.	7.8	2391.7	*	1	1840	225	0.	.0	2386.0
1	0205	26	9.	.0	2386.2	*	1	1025	126	59.	7.4	2391.6	*	1	1845	226	0.	.0	2386.0
1	0210	27	9.	.0	2386.2	*	1	1030	127	59.	7.0	2391.4	*	1	1850	227	0.	.0	2386.0
1	0215	28	14.	.1	2386.3	*	1	1035	128	58.	6.6	2391.3	*	1	1855	228	0.	.0	2386.0
1	0220	29	22.	.1	2386.5	*	1	1040	129	58.	6.2	2391.2	*	1	1900	229	0.	.0	2386.0
1	0225	30	29.	.1	2386.7	*	1	1045	130	57.	5.8	2391.0	*	1	1905	230	0.	.0	2386.0
1	0230	31	31.	.1	2386.8	*	1	1050	131	57.	5.4	2390.9	*	1	1910	231	0.	.0	2386.0
1	0235	32	29.	.1	2386.7	*	1	1055	132	56.	5.0	2390.7	*	1	1915	232	0.	.0	2386.0
1	0240	33	29.	.1	2386.7	*	1	1100	133	56.	4.6	2390.6	*	1	1920	233	0.	.0	2386.0
1	0245	34	33.	.1	2386.8	*	1	1105	134	55.	4.2	2390.4	*	1	1925	234	0.	.0	2386.0
1	0250	35	35.	.1	2386.8	*	1	1110	135	55.	3.9	2390.3	*	1	1930	235	0.	.0	2386.0
1	0255	36	32.	.1	2386.8	*	1	1115	136	54.	3.5	2390.1	*	1	1935	236	0.	.0	2386.0
1	0300	37	31.	.1	2386.7	*	1	1120	137	53.	3.1	2389.9	*	1	1940	237	0.	.0	2386.0
1	0305	38	40.	.1	2387.0	*	1	1125	138	53.	2.8	2389.7	*	1	1945	238	0.	.0	2386.0
1	0310	39	42.	.2	2387.3	*	1	1130	139	52.	2.4	2389.5	*	1	1950	239	0.	.0	2386.0
1	0315	40	46.	.5	2388.1	*	1	1135	140	51.	2.0	2389.3	*	1	1955	240	0.	.0	2386.0
1	0320	41	49.	1.3	2388.8	*	1	1140	141	50.	1.7	2389.2	*	1	2000	241	0.	.0	2386.0
1	0325	42	53.	2.8	2389.8	*	1	1145	142	50.	1.3	2388.9	*	1	2005	242	0.	.0	2386.0
1	0330	43	57.	5.4	2390.9	*	1	1150	143	48.	1.0	2388.6	*	1	2010	243	0.	.0	2386.0
1	0335	44	61.	9.1	2392.2	*	1	1155	144	47.	.7	2388.3	*	1	2015	244	0.	.0	2386.0
1	0340	45	65.	13.3	2393.4	*	1	1200	145	45.	.4	2387.9	*	1	2020	245	0.	.0	2386.0
1	0345	46	69.	17.4	2394.6	*	1	1205	146	41.	.1	2387.0	*	1	2025	246	0.	.0	2386.0
1	0350	47	71.	21.0	2395.5	*	1	1210	147	0.	.0	2386.0	*	1	2030	247	0.	.0	2386.0
1	0355	48	74.	23.9	2396.2	*	1	1215	148	0.	.0	2386.0	*	1	2035	248	0.	.0	2386.0
1	0400	49	75.	26.1	2396.8	*	1	1220	149	0.	.0	2386.0	*	1	2040	249	0.	.0	2386.0
1	0405	50	76.	27.7	2397.2	*	1	1225	150	0.	.0	2386.0	*	1	2045	250	0.	.0	2386.0
1	0410	51	77.	29.0	2397.5	*	1	1230	151	0.	.0	2386.0	*	1	2050	251	0.	.0	2386.0
1	0415	52	77.	29.8	2397.6	*	1	1235	152	0.	.0	2386.0	*	1	2055	252	0.	.0	2386.0
1	0420	53	78.	30.3	2397.8	*	1	1240	153	0.	.0	2386.0	*	1	2100	253	0.	.0	2386.0
1	0425	54	78.	30.7	2397.9	*	1	1245	154	0.	.0	2386.0	*	1	2105	254	0.	.0	2386.0
1	0430	55	78.	31.0	2397.9	*	1	1250	155	0.	.0	2386.0	*	1	2110	255	0.	.0	2386.0
1	0435	56	78.	31.5	2398.0	*	1	1255	156	0.	.0	2386.0	*	1	2115	256	0.	.0	2386.0
1	0440	57	79.	32.0	2398.2	*	1	1300	157	0.	.0	2386.0	*	1	2120	257	0.	.0	2386.0
1	0445	58	79.	32.6	2398.3	*	1	1305	158	0.	.0	2386.0	*	1	2125	258	0.	.0	2386.0
1	0450	59	79.	33.2	2398.4	*	1	1310	159	0.	.0	2386.0	*	1	2130	259	0.	.0	2386.0
1	0455	60	80.	33.9	2398.6	*	1	1315	160	0.	.0	2386.0	*	1	2135	260	0.	.0	2386.0
1	0500	61	80.	34.5	2398.7	*	1	1320	161	0.	.0	2386.0	*	1	2140	261	0.	.0	2386.0
1	0505	62	80.	34.9	2398.8	*	1	1325	162	0.	.0	2386.0	*	1	2145	262	0.	.0	2386.0
1	0510	63	80.	35.2	2398.9	*	1	1330	163	0.	.0	2386.0	*	1	2150	263	0.	.0	2386.0
1	0515	64	80.	35.3	2398.9	*	1	1335	164	0.	.0	2386.0	*	1	2155	264	0.	.0	2386.0
1	0520	65	80.	35.3	2398.9	*	1	1340	165	0.	.0	2386.0	*	1	2200	265	0.	.0	2386.0
1	0525	66	80.	35.1	2398.8	*	1	1345	166	0.	.0	2386.0	*	1	2205	266	0.	.0	2386.0
1	0530	67	80.	34.8	2398.8	*	1	1350	167	0.	.0	2386.0	*	1	2210	267	0.	.0	2386.0
1	0535	68	80.	34.5	2398.7	*	1	1355	168	0.	.0	2386.0	*	1	2215	268	0.	.0	2386.0
1	0540	69	80.	34.2	2398.6	*	1	1400	169	0.	.0	2386.0	*	1	2220	269	0.	.0	2386.0
1	0545	70	80.	33.8	2398.6	*	1	1405	170	0.	.0	2386.0	*	1	2225	270	0.	.0	2386.0
1	0550	71	79.	33.4	2398.5	*	1	1410	171	0.	.0	2386.0	*	1	2230	271	0.	.0	2386.0
1	0555	72	79.	33.0	2398.4	*	1	1415	172	0.	.0	2386.0	*	1	2235	272	0.	.0	2386.0
1	0600	73	79.	32.5	2398.3	*	1	1420	173	0.	.0	2386.0	*	1	2240	273	0.	.0	2386.0
1	0605	74	79.	32.1	2398.2	*	1	1425	174	0.	.0	2386.0	*	1	2245	274	0.	.0	2386.0
1	0610	75	78.	31.6	2398.1	*	1	1430	175	0.	.0	2386.0	*	1	2250	275	0.	.0	2386.0
1	0615	76	78.	31.2	2398.0	*	1	1435	176	0.	.0	2386.0	*	1	2255	276	0.	.0	2386.0
1	0620	77	78.	30.7	2397.9	*	1	1440	177	0.	.0	2386.0	*	1	2300	277	0.	.0	2386.0
1	0625	78	78.	30.2	2397.7	*	1	1445	178	0.	.0	2386.0	*	1	2305	278	0.	.0	2386.0
1	0630	79	77.	29.7	2397.6	*	1	1450	179	0.	.0	2386.0	*	1	2310	279	0.	.0	2386.0
1	0635	80	77.	29.1	2397.5	*	1	1455	180	0.	.0	2386.0	*	1	2315	280	0.	.0	2386.0
1	0640	81	77.	28.6	2397.4	*	1	1500	181	0.	.0	2386.0	*	1	2320	281	0.	.0	2386.0
1	0645	82	76.	28.1	2397.3	*	1	1505	182	0.	.0	2386.0	*	1	2325	282	0.	.0	2386.0
1	0650	83	76.	27.6	2397.1	*	1	1510	183	0.	.0	2386.0	*	1	2330	283	0.	.0	2386.0
1	0655	84	76.	27.1	2397.0	*	1	1515	184	0.	.0	2386.0	*	1	2335	284	0.	.0	2386.0
1	0700	85	75.	26.5	2396.9	*	1	1520	185	0.	.0	2386.0	*	1	2340	285	0.	.0	2386.0
1	0705	86	75.	26.0	2396.8	*	1	1525	186	0.	.0	2386.0	*	1	2345	286	0.	.0	2386.0
1	0710	87	75.	25.5	2396.6	*	1	1530	187	0.	.0	2386.0	*	1	2350	287	0.	.0	2386.0
1	0715	88	74.	25.0	2396.5	*	1	1535	188	0.	.0	2386.0	*	1	2355	288	0.	.0	2386.0
1	0720	89	74.	24.5	2396.4	*	1	1540	189	0.	.0	2386.0	*	2	0000	289	0.	.0	2386.0
1	0725	90	74.	24.0	2396.3	*	1	1545	190	0.	.0	2386.0	*	2	0005	290	0.	.0	2386.0
1	0730	91	73.	23.5	2396.1	*	1	1550	191	0.	.0	2386.0	*	2	0010	291	0.	.0	2386.0
1	0735	92	73.	23.0	2396.0	*	1	1555	192	0.	.0	2386.0	*	2	0015	292	0.	.0	2386.0
1	0740	93	73.	22.5	2395.9	*	1	1600	193	0.	.0	2386.0	*	2	0020	293	0.	.0	2386.0

1	0745	94	72.	22.0	2395.8	*	1	1605	194	0.	.0	2386.0	*	2	0025	294	0.	.0	2386.0
1	0750	95	72.	21.5	2395.6	*	1	1610	195	0.	.0	2386.0	*	2	0030	295	0.	.0	2386.0
1	0755	96	71.	21.0	2395.5	*	1	1615	196	0.	.0	2386.0	*	2	0035	296	0.	.0	2386.0
1	0800	97	71.	20.5	2395.4	*	1	1620	197	0.	.0	2386.0	*	2	0040	297	0.	.0	2386.0
1	0805	98	71.	20.0	2395.3	*	1	1625	198	0.	.0	2386.0	*	2	0045	298	0.	.0	2386.0
1	0810	99	70.	19.5	2395.1	*	1	1630	199	0.	.0	2386.0	*	2	0050	299	0.	.0	2386.0
1	0815	100	70.	19.0	2395.0	*	1	1635	200	0.	.0	2386.0	*	2	0055	300	0.	.0	2386.0

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
	(CFS)				
+ 80.	5.25	74.	27.	26.	26.
	(INCHES)	.754	1.100	1.100	1.100
	(AC-FT)	37.	54.	54.	54.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
35.	5.25	25.	7.	7.	7.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
2398.89	5.25	2396.50	2389.22	2389.10	2389.10

CUMULATIVE AREA = .91 SQ MI

HYDROGRAPH AT STATION ELKBASIN
PLAN 1, RATIO = .98

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	2386.0	*	1		0820	101	68.	17.0	2394.5	*	1		1640	201	0.	.0	2386.0
1		0005	2	0.	.0	2386.0	*	1		0825	102	68.	16.5	2394.3	*	1		1645	202	0.	.0	2386.0
1		0010	3	0.	.0	2386.0	*	1		0830	103	68.	16.0	2394.2	*	1		1650	203	0.	.0	2386.0
1		0015	4	2.	.0	2386.0	*	1		0835	104	67.	15.6	2394.1	*	1		1655	204	0.	.0	2386.0
1		0020	5	3.	.0	2386.1	*	1		0840	105	67.	15.1	2393.9	*	1		1700	205	0.	.0	2386.0
1		0025	6	4.	.0	2386.1	*	1		0845	106	67.	14.7	2393.8	*	1		1705	206	0.	.0	2386.0
1		0030	7	6.	.0	2386.1	*	1		0850	107	66.	14.2	2393.7	*	1		1710	207	0.	.0	2386.0
1		0035	8	6.	.0	2386.1	*	1		0855	108	66.	13.7	2393.6	*	1		1715	208	0.	.0	2386.0
1		0040	9	5.	.0	2386.1	*	1		0900	109	65.	13.3	2393.4	*	1		1720	209	0.	.0	2386.0
1		0045	10	3.	.0	2386.1	*	1		0905	110	65.	12.8	2393.3	*	1		1725	210	0.	.0	2386.0
1		0050	11	2.	.0	2386.0	*	1		0910	111	65.	12.4	2393.2	*	1		1730	211	0.	.0	2386.0
1		0055	12	1.	.0	2386.0	*	1		0915	112	64.	12.0	2393.0	*	1		1735	212	0.	.0	2386.0
1		0100	13	1.	.0	2386.0	*	1		0920	113	64.	11.5	2392.9	*	1		1740	213	0.	.0	2386.0
1		0105	14	1.	.0	2386.0	*	1		0925	114	63.	11.1	2392.8	*	1		1745	214	0.	.0	2386.0
1		0110	15	1.	.0	2386.0	*	1		0930	115	63.	10.6	2392.6	*	1		1750	215	0.	.0	2386.0
1		0115	16	2.	.0	2386.0	*	1		0935	116	62.	10.2	2392.5	*	1		1755	216	0.	.0	2386.0
1		0120	17	2.	.0	2386.1	*	1		0940	117	62.	9.8	2392.4	*	1		1800	217	0.	.0	2386.0
1		0125	18	3.	.0	2386.1	*	1		0945	118	62.	9.4	2392.2	*	1		1805	218	0.	.0	2386.0
1		0130	19	6.	.0	2386.1	*	1		0950	119	61.	8.9	2392.1	*	1		1810	219	0.	.0	2386.0
1		0135	20	8.	.0	2386.2	*	1		0955	120	61.	8.5	2392.0	*	1		1815	220	0.	.0	2386.0
1		0140	21	11.	.0	2386.3	*	1		1000	121	60.	8.1	2391.8	*	1		1820	221	0.	.0	2386.0
1		0145	22	13.	.0	2386.3	*	1		1005	122	60.	7.7	2391.7	*	1		1825	222	0.	.0	2386.0
1		0150	23	13.	.0	2386.3	*	1		1010	123	59.	7.3	2391.5	*	1		1830	223	0.	.0	2386.0
1		0155	24	12.	.0	2386.3	*	1		1015	124	59.	6.9	2391.4	*	1		1835	224	0.	.0	2386.0
1		0200	25	10.	.0	2386.2	*	1		1020	125	58.	6.5	2391.3	*	1		1840	225	0.	.0	2386.0
1		0205	26	8.	.0	2386.2	*	1		1025	126	58.	6.1	2391.1	*	1		1845	226	0.	.0	2386.0
1		0210	27	9.	.0	2386.2	*	1		1030	127	57.	5.7	2391.0	*	1		1850	227	0.	.0	2386.0
1		0215	28	13.	.0	2386.3	*	1		1035	128	57.	5.3	2390.8	*	1		1855	228	0.	.0	2386.0
1		0220	29	20.	.1	2386.5	*	1		1040	129	56.	4.9	2390.7	*	1		1900	229	0.	.0	2386.0
1		0225	30	26.	.1	2386.6	*	1		1045	130	56.	4.5	2390.5	*	1		1905	230	0.	.0	2386.0
1		0230	31	28.	.1	2386.7	*	1		1050	131	55.	4.1	2390.4	*	1		1910	231	0.	.0	2386.0
1		0235	32	27.	.1	2386.7	*	1		1055	132	54.	3.7	2390.2	*	1		1915	232	0.	.0	2386.0
1		0240	33	27.	.1	2386.7	*	1		1100	133	54.	3.4	2390.1	*	1		1920	233	0.	.0	2386.0
1		0245	34	31.	.1	2386.7	*	1		1105	134	53.	3.0	2389.9	*	1		1925	234	0.	.0	2386.0
1		0250	35	32.	.1	2386.8	*	1		1110	135	52.	2.6	2389.7	*	1		1930	235	0.	.0	2386.0
1		0255	36	30.	.1	2386.7	*	1		1115	136	52.	2.3	2389.5	*	1		1935	236	0.	.0	2386.0
1		0300	37	29.	.1	2386.7	*	1		1120	137	51.	1.9	2389.3	*	1		1940	237	0.	.0	2386.0
1		0305	38	37.	.1	2386.9	*	1		1125	138	50.	1.6	2389.1	*	1		1945	238	0.	.0	2386.0
1		0310	39	42.	.1	2387.2	*	1		1130	139	49.	1.2	2388.8	*	1		1950	239	0.	.0	2386.0
1		0315	40	46.	.4	2388.0	*	1		1135	140	48.	.9	2388.5	*	1		1955	240	0.	.0	2386.0
1		0320	41	49.	1.2	2388.7	*	1		1140	141	46.	.6	2388.2	*	1		2000	241	0.	.0	2386.0

1	0325	42	52.	2.6	2389.7	*	1	1145	142	44.	.3	2387.6	*	1	2005	242	0.	.0	2386.0
1	0330	43	56.	5.1	2390.8	*	1	1150	143	20.	.1	2386.5	*	1	2010	243	0.	.0	2386.0
1	0335	44	61.	8.6	2392.0	*	1	1155	144	0.	.0	2386.0	*	1	2015	244	0.	.0	2386.0
1	0340	45	65.	12.6	2393.2	*	1	1200	145	0.	.0	2386.0	*	1	2020	245	0.	.0	2386.0
1	0345	46	68.	16.5	2394.3	*	1	1205	146	0.	.0	2386.0	*	1	2025	246	0.	.0	2386.0
1	0350	47	71.	20.0	2395.3	*	1	1210	147	0.	.0	2386.0	*	1	2030	247	0.	.0	2386.0
1	0355	48	73.	22.7	2396.0	*	1	1215	148	0.	.0	2386.0	*	1	2035	248	0.	.0	2386.0
1	0400	49	74.	24.8	2396.5	*	1	1220	149	0.	.0	2386.0	*	1	2040	249	0.	.0	2386.0
1	0405	50	75.	26.4	2396.9	*	1	1225	150	0.	.0	2386.0	*	1	2045	250	0.	.0	2386.0
1	0410	51	76.	27.6	2397.1	*	1	1230	151	0.	.0	2386.0	*	1	2050	251	0.	.0	2386.0
1	0415	52	76.	28.3	2397.3	*	1	1235	152	0.	.0	2386.0	*	1	2055	252	0.	.0	2386.0
1	0420	53	77.	28.8	2397.4	*	1	1240	153	0.	.0	2386.0	*	1	2100	253	0.	.0	2386.0
1	0425	54	77.	29.2	2397.5	*	1	1245	154	0.	.0	2386.0	*	1	2105	254	0.	.0	2386.0
1	0430	55	77.	29.5	2397.6	*	1	1250	155	0.	.0	2386.0	*	1	2110	255	0.	.0	2386.0
1	0435	56	77.	29.9	2397.7	*	1	1255	156	0.	.0	2386.0	*	1	2115	256	0.	.0	2386.0
1	0440	57	78.	30.4	2397.8	*	1	1300	157	0.	.0	2386.0	*	1	2120	257	0.	.0	2386.0
1	0445	58	78.	31.0	2397.9	*	1	1305	158	0.	.0	2386.0	*	1	2125	258	0.	.0	2386.0
1	0450	59	78.	31.6	2398.1	*	1	1310	159	0.	.0	2386.0	*	1	2130	259	0.	.0	2386.0
1	0455	60	79.	32.2	2398.2	*	1	1315	160	0.	.0	2386.0	*	1	2135	260	0.	.0	2386.0
1	0500	61	79.	32.8	2398.3	*	1	1320	161	0.	.0	2386.0	*	1	2140	261	0.	.0	2386.0
1	0505	62	79.	33.2	2398.4	*	1	1325	162	0.	.0	2386.0	*	1	2145	262	0.	.0	2386.0
1	0510	63	79.	33.5	2398.5	*	1	1330	163	0.	.0	2386.0	*	1	2150	263	0.	.0	2386.0
1	0515	64	79.	33.6	2398.5	*	1	1335	164	0.	.0	2386.0	*	1	2155	264	0.	.0	2386.0
1	0520	65	79.	33.5	2398.5	*	1	1340	165	0.	.0	2386.0	*	1	2200	265	0.	.0	2386.0
1	0525	66	79.	33.3	2398.4	*	1	1345	166	0.	.0	2386.0	*	1	2205	266	0.	.0	2386.0
1	0530	67	79.	33.1	2398.4	*	1	1350	167	0.	.0	2386.0	*	1	2210	267	0.	.0	2386.0
1	0535	68	79.	32.7	2398.3	*	1	1355	168	0.	.0	2386.0	*	1	2215	268	0.	.0	2386.0
1	0540	69	79.	32.4	2398.2	*	1	1400	169	0.	.0	2386.0	*	1	2220	269	0.	.0	2386.0
1	0545	70	79.	32.0	2398.2	*	1	1405	170	0.	.0	2386.0	*	1	2225	270	0.	.0	2386.0
1	0550	71	78.	31.6	2398.1	*	1	1410	171	0.	.0	2386.0	*	1	2230	271	0.	.0	2386.0
1	0555	72	78.	31.2	2398.0	*	1	1415	172	0.	.0	2386.0	*	1	2235	272	0.	.0	2386.0
1	0600	73	78.	30.8	2397.9	*	1	1420	173	0.	.0	2386.0	*	1	2240	273	0.	.0	2386.0
1	0605	74	78.	30.3	2397.8	*	1	1425	174	0.	.0	2386.0	*	1	2245	274	0.	.0	2386.0
1	0610	75	77.	29.9	2397.7	*	1	1430	175	0.	.0	2386.0	*	1	2250	275	0.	.0	2386.0
1	0615	76	77.	29.4	2397.6	*	1	1435	176	0.	.0	2386.0	*	1	2255	276	0.	.0	2386.0
1	0620	77	77.	28.9	2397.4	*	1	1440	177	0.	.0	2386.0	*	1	2300	277	0.	.0	2386.0
1	0625	78	76.	28.4	2397.3	*	1	1445	178	0.	.0	2386.0	*	1	2305	278	0.	.0	2386.0
1	0630	79	76.	27.9	2397.2	*	1	1450	179	0.	.0	2386.0	*	1	2310	279	0.	.0	2386.0
1	0635	80	76.	27.4	2397.1	*	1	1455	180	0.	.0	2386.0	*	1	2315	280	0.	.0	2386.0
1	0640	81	76.	26.9	2397.0	*	1	1500	181	0.	.0	2386.0	*	1	2320	281	0.	.0	2386.0
1	0645	82	75.	26.4	2396.8	*	1	1505	182	0.	.0	2386.0	*	1	2325	282	0.	.0	2386.0
1	0650	83	75.	25.9	2396.7	*	1	1510	183	0.	.0	2386.0	*	1	2330	283	0.	.0	2386.0
1	0655	84	75.	25.3	2396.6	*	1	1515	184	0.	.0	2386.0	*	1	2335	284	0.	.0	2386.0
1	0700	85	74.	24.8	2396.5	*	1	1520	185	0.	.0	2386.0	*	1	2340	285	0.	.0	2386.0
1	0705	86	74.	24.3	2396.3	*	1	1525	186	0.	.0	2386.0	*	1	2345	286	0.	.0	2386.0
1	0710	87	74.	23.8	2396.2	*	1	1530	187	0.	.0	2386.0	*	1	2350	287	0.	.0	2386.0
1	0715	88	73.	23.3	2396.1	*	1	1535	188	0.	.0	2386.0	*	1	2355	288	0.	.0	2386.0
1	0720	89	73.	22.8	2396.0	*	1	1540	189	0.	.0	2386.0	*	2	0000	289	0.	.0	2386.0
1	0725	90	72.	22.3	2395.8	*	1	1545	190	0.	.0	2386.0	*	2	0005	290	0.	.0	2386.0
1	0730	91	72.	21.8	2395.7	*	1	1550	191	0.	.0	2386.0	*	2	0010	291	0.	.0	2386.0
1	0735	92	72.	21.3	2395.6	*	1	1555	192	0.	.0	2386.0	*	2	0015	292	0.	.0	2386.0
1	0740	93	71.	20.8	2395.5	*	1	1600	193	0.	.0	2386.0	*	2	0020	293	0.	.0	2386.0
1	0745	94	71.	20.3	2395.3	*	1	1605	194	0.	.0	2386.0	*	2	0025	294	0.	.0	2386.0
1	0750	95	71.	19.8	2395.2	*	1	1610	195	0.	.0	2386.0	*	2	0030	295	0.	.0	2386.0
1	0755	96	70.	19.4	2395.1	*	1	1615	196	0.	.0	2386.0	*	2	0035	296	0.	.0	2386.0
1	0800	97	70.	18.9	2395.0	*	1	1620	197	0.	.0	2386.0	*	2	0040	297	0.	.0	2386.0
1	0805	98	70.	18.4	2394.8	*	1	1625	198	0.	.0	2386.0	*	2	0045	298	0.	.0	2386.0
1	0810	99	69.	17.9	2394.7	*	1	1630	199	0.	.0	2386.0	*	2	0050	299	0.	.0	2386.0
1	0815	100	69.	17.4	2394.6	*	1	1635	200	0.	.0	2386.0	*	2	0055	300	0.	.0	2386.0
						*							*						

****

PEAK FLOW	TIME
+ (CFS)	(HR)
79.	5.25

PEAK STORAGE	TIME
+ (AC-FT)	(HR)
34.	5.25

PEAK STAGE	TIME
+ (FEET)	(HR)
2398.50	5.25

MAXIMUM AVERAGE FLOW

	6-HR	24-HR	72-HR	24.92-HR
(CFS)	73.	26.	25.	25.
(INCHES)	.743	1.053	1.053	1.053
(AC-FT)	36.	51.	51.	51.

MAXIMUM AVERAGE STORAGE

6-HR	24-HR	72-HR	24.92-HR
24.	6.	6.	6.

MAXIMUM AVERAGE STAGE

6-HR	24-HR	72-HR	24.92-HR
2396.11	2389.04	2388.93	2388.93

CUMULATIVE AREA = .91 SQ MI

HYDROGRAPH AT STATION ELKBASIN
PLAN 1, RATIO = .97

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	2386.0	1		0820	101	68.	16.7	2394.4	1		1640	201	0.	.0	2386.0
1		0005	2	0.	.0	2386.0	1		0825	102	68.	16.2	2394.2	1		1645	202	0.	.0	2386.0
1		0010	3	0.	.0	2386.0	1		0830	103	67.	15.7	2394.1	1		1650	203	0.	.0	2386.0
1		0015	4	2.	.0	2386.0	1		0835	104	67.	15.3	2394.0	1		1655	204	0.	.0	2386.0
1		0020	5	3.	.0	2386.1	1		0840	105	67.	14.8	2393.9	1		1700	205	0.	.0	2386.0
1		0025	6	4.	.0	2386.1	1		0845	106	66.	14.3	2393.7	1		1705	206	0.	.0	2386.0
1		0030	7	6.	.0	2386.1	1		0850	107	66.	13.9	2393.6	1		1710	207	0.	.0	2386.0
1		0035	8	6.	.0	2386.1	1		0855	108	65.	13.4	2393.5	1		1715	208	0.	.0	2386.0
1		0040	9	5.	.0	2386.1	1		0900	109	65.	13.0	2393.3	1		1720	209	0.	.0	2386.0
1		0045	10	3.	.0	2386.1	1		0905	110	65.	12.5	2393.2	1		1725	210	0.	.0	2386.0
1		0050	11	2.	.0	2386.0	1		0910	111	64.	12.1	2393.1	1		1730	211	0.	.0	2386.0
1		0055	12	1.	.0	2386.0	1		0915	112	64.	11.7	2393.0	1		1735	212	0.	.0	2386.0
1		0100	13	1.	.0	2386.0	1		0920	113	63.	11.2	2392.8	1		1740	213	0.	.0	2386.0
1		0105	14	0.	.0	2386.0	1		0925	114	63.	10.8	2392.7	1		1745	214	0.	.0	2386.0
1		0110	15	1.	.0	2386.0	1		0930	115	63.	10.4	2392.6	1		1750	215	0.	.0	2386.0
1		0115	16	2.	.0	2386.0	1		0935	116	62.	9.9	2392.4	1		1755	216	0.	.0	2386.0
1		0120	17	2.	.0	2386.1	1		0940	117	62.	9.5	2392.3	1		1800	217	0.	.0	2386.0
1		0125	18	3.	.0	2386.1	1		0945	118	61.	9.1	2392.2	1		1805	218	0.	.0	2386.0
1		0130	19	6.	.0	2386.1	1		0950	119	61.	8.7	2392.0	1		1810	219	0.	.0	2386.0
1		0135	20	8.	.0	2386.2	1		0955	120	60.	8.2	2391.9	1		1815	220	0.	.0	2386.0
1		0140	21	10.	.0	2386.3	1		1000	121	60.	7.8	2391.7	1		1820	221	0.	.0	2386.0
1		0145	22	12.	.0	2386.3	1		1005	122	59.	7.4	2391.6	1		1825	222	0.	.0	2386.0
1		0150	23	13.	.0	2386.3	1		1010	123	59.	7.0	2391.5	1		1830	223	0.	.0	2386.0
1		0155	24	12.	.0	2386.3	1		1015	124	58.	6.6	2391.3	1		1835	224	0.	.0	2386.0
1		0200	25	10.	.0	2386.2	1		1020	125	58.	6.2	2391.2	1		1840	225	0.	.0	2386.0
1		0205	26	8.	.0	2386.2	1		1025	126	57.	5.8	2391.0	1		1845	226	0.	.0	2386.0
1		0210	27	8.	.0	2386.2	1		1030	127	57.	5.4	2390.9	1		1850	227	0.	.0	2386.0
1		0215	28	13.	.0	2386.3	1		1035	128	56.	5.0	2390.7	1		1855	228	0.	.0	2386.0
1		0220	29	20.	.1	2386.5	1		1040	129	56.	4.6	2390.6	1		1900	229	0.	.0	2386.0
1		0225	30	26.	.1	2386.6	1		1045	130	55.	4.3	2390.4	1		1905	230	0.	.0	2386.0
1		0230	31	28.	.1	2386.7	1		1050	131	55.	3.9	2390.3	1		1910	231	0.	.0	2386.0
1		0235	32	26.	.1	2386.6	1		1055	132	54.	3.5	2390.1	1		1915	232	0.	.0	2386.0
1		0240	33	26.	.1	2386.6	1		1100	133	53.	3.1	2389.9	1		1920	233	0.	.0	2386.0
1		0245	34	30.	.1	2386.7	1		1105	134	53.	2.8	2389.7	1		1925	234	0.	.0	2386.0
1		0250	35	32.	.1	2386.8	1		1110	135	52.	2.4	2389.5	1		1930	235	0.	.0	2386.0
1		0255	36	30.	.1	2386.7	1		1115	136	51.	2.0	2389.3	1		1935	236	0.	.0	2386.0
1		0300	37	28.	.1	2386.7	1		1120	137	50.	1.7	2389.2	1		1940	237	0.	.0	2386.0
1		0305	38	37.	.1	2386.9	1		1125	138	50.	1.4	2388.9	1		1945	238	0.	.0	2386.0
1		0310	39	42.	.1	2387.2	1		1130	139	48.	1.0	2388.6	1		1950	239	0.	.0	2386.0
1		0315	40	46.	.4	2388.0	1		1135	140	47.	.7	2388.3	1		1955	240	0.	.0	2386.0
1		0320	41	49.	1.1	2388.7	1		1140	141	45.	.4	2387.9	1		2000	241	0.	.0	2386.0
1		0325	42	52.	2.6	2389.6	1		1145	142	41.	.1	2387.0	1		2005	242	0.	.0	2386.0
1		0330	43	56.	5.1	2390.7	1		1150	143	0.	.0	2386.0	1		2010	243	0.	.0	2386.0
1		0335	44	61.	8.5	2392.0	1		1155	144	0.	.0	2386.0	1		2015	244	0.	.0	2386.0
1		0340	45	65.	12.5	2393.2	1		1200	145	0.	.0	2386.0	1		2020	245	0.	.0	2386.0
1		0345	46	68.	16.4	2394.3	1		1205	146	0.	.0	2386.0	1		2025	246	0.	.0	2386.0
1		0350	47	71.	19.8	2395.2	1		1210	147	0.	.0	2386.0	1		2030	247	0.	.0	2386.0
1		0355	48	73.	22.5	2395.9	1		1215	148	0.	.0	2386.0	1		2035	248	0.	.0	2386.0
1		0400	49	74.	24.6	2396.4	1		1220	149	0.	.0	2386.0	1		2040	249	0.	.0	2386.0
1		0405	50	75.	26.2	2396.8	1		1225	150	0.	.0	2386.0	1		2045	250	0.	.0	2386.0
1		0410	51	76.	27.3	2397.1	1		1230	151	0.	.0	2386.0	1		2050	251	0.	.0	2386.0
1		0415	52	76.	28.1	2397.2	1		1235	152	0.	.0	2386.0	1		2055	252	0.	.0	2386.0
1		0420	53	77.	28.6	2397.4	1		1240	153	0.	.0	2386.0	1		2100	253	0.	.0	2386.0
1		0425	54	77.	28.9	2397.4	1		1245	154	0.	.0	2386.0	1		2105	254	0.	.0	2386.0
1		0430	55	77.	29.2	2397.5	1		1250	155	0.	.0	2386.0	1		2110	255	0.	.0	2386.0
1		0435	56	77.	29.6	2397.6	1		1255	156	0.	.0	2386.0	1		2115	256	0.	.0	2386.0
1		0440	57	77.	30.1	2397.7	1		1300	157	0.	.0	2386.0	1		2120	257	0.	.0	2386.0
1		0445	58	78.	30.7	2397.9	1		1305	158	0.	.0	2386.0	1		2125	258	0.	.0	2386.0
1		0450	59	78.	31.3	2398.0	1		1310	159	0.	.0	2386.0	1		2130	259	0.	.0	2386.0
1		0455	60	79.	31.9	2398.1	1		1315	160	0.	.0	2386.0	1		2135	260	0.	.0	2386.0
1		0500	61	79.	32.4	2398.3	1		1320	161	0.	.0	2386.0	1		2140	261	0.	.0	2386.0
1		0505	62	79.	32.9	2398.3	1		1325	162	0.	.0	2386.0	1		2145	262	0.	.0	2386.0
1		0510	63	79.	33.1	2398.4	1		1330	163	0.	.0	2386.0	1		2150	263	0.	.0	2386.0
1		0515	64	79.	33.2	2398.4	1		1335	164	0.	.0	2386.0	1		2155	264	0.	.0	2386.0
1		0520	65	79.	33.1	2398.4	1		1340	165	0.	.0	2386.0	1		2200	265	0.	.0	2386.0
1		0525	66	79.	33.0	2398.4	1		1345	166	0.	.0	2386.0	1		2205	266	0.	.0	2386.0
1		0530	67	79.	32.7	2398.3	1		1350	167	0.	.0	2386.0	1		2210	267	0.	.0	2386.0
1		0535	68	79.	32.4	2398.2	1		1355	168	0.	.0	2386.0	1		2215	268	0.	.0	2386.0
1		0540	69	79.	32.0	2398.2	1		1400	169	0.	.0	2386.0	1		2220	269	0.	.0	2386.0
1		0545	70	78.	31.6	2398.1	1		1405	170	0.	.0	2386.0	1		2225	270	0.	.0	2386.0

1	0550	71	78.	31.2	2398.0	*	1	1410	171	0.	.0	2386.0	*	1	2230	271	0.	.0	2386.0
1	0555	72	78.	30.8	2397.9	*	1	1415	172	0.	.0	2386.0	*	1	2235	272	0.	.0	2386.0
1	0600	73	78.	30.4	2397.8	*	1	1420	173	0.	.0	2386.0	*	1	2240	273	0.	.0	2386.0
1	0605	74	77.	30.0	2397.7	*	1	1425	174	0.	.0	2386.0	*	1	2245	274	0.	.0	2386.0
1	0610	75	77.	29.5	2397.6	*	1	1430	175	0.	.0	2386.0	*	1	2250	275	0.	.0	2386.0
1	0615	76	77.	29.1	2397.5	*	1	1435	176	0.	.0	2386.0	*	1	2255	276	0.	.0	2386.0
1	0620	77	77.	28.6	2397.4	*	1	1440	177	0.	.0	2386.0	*	1	2300	277	0.	.0	2386.0
1	0625	78	76.	28.1	2397.2	*	1	1445	178	0.	.0	2386.0	*	1	2305	278	0.	.0	2386.0
1	0630	79	76.	27.6	2397.1	*	1	1450	179	0.	.0	2386.0	*	1	2310	279	0.	.0	2386.0
1	0635	80	76.	27.1	2397.0	*	1	1455	180	0.	.0	2386.0	*	1	2315	280	0.	.0	2386.0
1	0640	81	75.	26.5	2396.9	*	1	1500	181	0.	.0	2386.0	*	1	2320	281	0.	.0	2386.0
1	0645	82	75.	26.0	2396.8	*	1	1505	182	0.	.0	2386.0	*	1	2325	282	0.	.0	2386.0
1	0650	83	75.	25.5	2396.6	*	1	1510	183	0.	.0	2386.0	*	1	2330	283	0.	.0	2386.0
1	0655	84	74.	25.0	2396.5	*	1	1515	184	0.	.0	2386.0	*	1	2335	284	0.	.0	2386.0
1	0700	85	74.	24.5	2396.4	*	1	1520	185	0.	.0	2386.0	*	1	2340	285	0.	.0	2386.0
1	0705	86	74.	24.0	2396.3	*	1	1525	186	0.	.0	2386.0	*	1	2345	286	0.	.0	2386.0
1	0710	87	73.	23.5	2396.1	*	1	1530	187	0.	.0	2386.0	*	1	2350	287	0.	.0	2386.0
1	0715	88	73.	23.0	2396.0	*	1	1535	188	0.	.0	2386.0	*	1	2355	288	0.	.0	2386.0
1	0720	89	73.	22.5	2395.9	*	1	1540	189	0.	.0	2386.0	*	2	0000	289	0.	.0	2386.0
1	0725	90	72.	22.0	2395.8	*	1	1545	190	0.	.0	2386.0	*	2	0005	290	0.	.0	2386.0
1	0730	91	72.	21.5	2395.6	*	1	1550	191	0.	.0	2386.0	*	2	0010	291	0.	.0	2386.0
1	0735	92	71.	21.0	2395.5	*	1	1555	192	0.	.0	2386.0	*	2	0015	292	0.	.0	2386.0
1	0740	93	71.	20.5	2395.4	*	1	1600	193	0.	.0	2386.0	*	2	0020	293	0.	.0	2386.0
1	0745	94	71.	20.0	2395.3	*	1	1605	194	0.	.0	2386.0	*	2	0025	294	0.	.0	2386.0
1	0750	95	70.	19.5	2395.1	*	1	1610	195	0.	.0	2386.0	*	2	0030	295	0.	.0	2386.0
1	0755	96	70.	19.0	2395.0	*	1	1615	196	0.	.0	2386.0	*	2	0035	296	0.	.0	2386.0
1	0800	97	70.	18.6	2394.9	*	1	1620	197	0.	.0	2386.0	*	2	0040	297	0.	.0	2386.0
1	0805	98	69.	18.1	2394.8	*	1	1625	198	0.	.0	2386.0	*	2	0045	298	0.	.0	2386.0
1	0810	99	69.	17.6	2394.6	*	1	1630	199	0.	.0	2386.0	*	2	0050	299	0.	.0	2386.0
1	0815	100	69.	17.1	2394.5	*	1	1635	200	0.	.0	2386.0	*	2	0055	300	0.	.0	2386.0
						*							*							

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 79.	5.25		73.	26.	25.	25.
		(INCHES)	.741	1.045	1.045	1.045
		(AC-FT)	36.	51.	51.	51.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)				
33.	5.25	23.	6.	6.	6.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)				
2398.42	5.25	2396.03	2389.00	2388.89	2388.89

CUMULATIVE AREA = .91 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1	RATIO 2	RATIO 3
					1.00	.98	.97
HYDROGRAPH AT							
+	OFF1	.20	1	FLOW	179.	173.	171.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	FDI12	.20	1	FLOW	85.	82.	81.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	DIV1FD	.20	1	FLOW	94.	91.	90.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	CIM1	.20	1	FLOW	42.	40.	40.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							

+	SPLIT1	.20	1	FLOW	52.	50.	50.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	FDI345	.20	1	FLOW	47.	45.	45.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	DIV2FD	.20	1	FLOW	5.	5.	5.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF4	.03	1	FLOW	34.	32.	32.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP1	.23	1	FLOW	38.	36.	36.
				TIME	3.58	3.58	3.58
DIVERSION TO							
+	BUFF2	.23	1	FLOW	4.	4.	4.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	FDI6789	.23	1	FLOW	34.	32.	32.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	FDI12	.00	1	FLOW	85.	82.	81.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	FDI345	.00	1	FLOW	47.	45.	45.
				TIME	3.75	3.75	3.75
3 COMBINED AT							
+	CP2	.23	1	FLOW	156.	150.	149.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF5	.05	1	FLOW	59.	56.	56.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP3	.28	1	FLOW	204.	196.	195.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	BUFF2	.00	1	FLOW	4.	4.	4.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP3A	.28	1	FLOW	207.	199.	198.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF3	.17	1	FLOW	141.	135.	133.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	CIM1	.00	1	FLOW	42.	40.	40.
				TIME	3.75	3.75	3.75
2 COMBINED AT							
+	CP4	.17	1	FLOW	182.	174.	173.
				TIME	3.67	3.67	3.67
DIVERSION TO							
+	CIM2	.17	1	FLOW	74.	71.	70.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	SPLIT2	.17	1	FLOW	108.	103.	103.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF6	.03	1	FLOW	25.	24.	24.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF7	.07	1	FLOW	59.	57.	56.

				TIME	3.67	3.67	3.67
3 COMBINED AT							
+	CP5	.26	1	FLOW	193.	185.	183.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF2	.18	1	FLOW	123.	118.	117.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	CIM2	.00	1	FLOW	74.	71.	70.
				TIME	3.67	3.67	3.67
2 COMBINED AT							
+	CP6	.18	1	FLOW	195.	187.	185.
				TIME	3.75	3.75	3.75
DIVERSION TO							
+	CIM3	.18	1	FLOW	60.	58.	57.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	SPLIT3	.18	1	FLOW	135.	129.	128.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF8	.03	1	FLOW	30.	29.	29.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP7	.21	1	FLOW	152.	146.	145.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	OFF9	.03	1	FLOW	52.	50.	50.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP8	.24	1	FLOW	193.	186.	184.
				TIME	3.67	3.67	3.67
DIVERSION TO							
+	BUFF1	.24	1	FLOW	48.	47.	46.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	DIV3E123	.24	1	FLOW	145.	139.	138.
				TIME	3.67	3.67	3.67
2 COMBINED AT							
+	CP9	.50	1	FLOW	338.	323.	321.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	BUFF1	.00	1	FLOW	48.	47.	46.
				TIME	3.67	3.67	3.67
DIVERSION TO							
+	BUFF2	.00	1	FLOW	32.	31.	31.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	SPLIT4	.00	1	FLOW	16.	16.	15.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF11	.07	1	FLOW	59.	56.	56.
				TIME	3.67	3.67	3.67
2 COMBINED AT							
+	CP10	.07	1	FLOW	75.	72.	71.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF10	.03	1	FLOW	30.	29.	29.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF12	.02	1	FLOW	27.	26.	26.
				TIME	3.50	3.50	3.50

```
 HYDROGRAPH AT
+                    ON-1        .02     1   FLOW          15.       14.       14.
                                             TIME        3.67      3.67      3.67

  6 COMBINED AT
+                    CP11        .91     1   FLOW         683.      655.      650.
                                             TIME        3.67      3.67      3.67

 ROUTED TO
+                 ELKBASIN       .91     1   FLOW          80.       79.       79.
                                             TIME        5.25      5.25      5.25

                                         ** PEAK STAGES IN FEET **
                                         1   STAGE     2398.89   2398.50   2398.42
                                             TIME        5.25      5.25      5.25


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

DROP INLET INVENTORY
AND
FLOWMASTER CALCULATIONS

ELKHORN SPRINGS AND BUFFALO STORM DRAIN SYSTEM

TABLE 1: INVENTORY OF DROP INLETS - CALCULATED FLOWS

Project#	31678A
Made By:	KS
Date:	06/16/08
Checked By:	SK
Date:	6/27/2008

Inlet ID	Existing/ Proposed	Location-Street	Condition	Type of DI	Length of curb	No. of grates	Q Total (cfs)	Source of flow	100-yr Flows		10-yr Flows	
									Q Intercepted (cfs)	Q Bypass (cfs)	Q Intercepted (cfs)	Q Bypass (cfs)
FDI-1	Existing	Farm Road	On grade	C	12	4	179	OFF-1	45	134	29	43
FDI-2	Existing	Farm Road	On grade	C	12	4	134	Q bypass from FDI-1	40	94	20	23
FDI-3	Existing	Farm Road	On grade	C	10	3	52	Flow in Farm Road after split at Cimarron	21	31	11	7
FDI-4	Existing	Farm Road	On grade	C	10	3	31	Q bypass from FDI-3	16	15	5	2
FDI-5	Existing	Farm Road	On grade	C	10	3	15	Q bypass from FDI-4	10	5	2	0
FDI-6	Proposed	Farm Road	On grade	DM	7.5	3	19	1/2 of (CP1)	11	8	5	1
FDI-7	Proposed	Farm Road	On grade	DM	7.5	3	19	1/2 of (CP1)	11	8	5	1
FDI-8	Proposed	Farm Road	On grade	DM	7.5	3	8	Q bypass from FDI-6	6	2	1	0
FDI-9	Proposed	Farm Road	On grade	DM	7.5	3	8	Q bypass from FDI-7	6	2	1	0
FDI-10	Existing	Farm Road	On grade	A	4	1	5	Q bypass from FDI-9	4	1	4	1
SSDI-1	Existing	Sunny Springs Lane	On grade	C	5.5	1	108	Flow in Sunny Springs after split at Cimarron	15	93	10	22
SSDI-2	Existing	Sunny Springs Lane	On grade	C	5.5	1	93	Q bypass from SSDI-1	12	81	8	14
SSDI-3	Existing	Sunny Springs Lane	On grade	C	38.5	12	106	Q bypass from SSDI-2 & Q from OFF6	75	31	19	3
SSDI-4	Existing	Sunny Springs Lane	Sump	C	66	22	45	1/2 of (Q bypass from SSDI-3 & Q from OFF7)	42	3	11	0
SSDI-5	Existing	Sunny Springs Lane	Sump	C	66	22	45	1/2 of (Q bypass from SSDI-3 & Q from OFF7)	42	3	11	0

PB 100 YEARS ®

ELKHORN SPRINGS AND BUFFALO STORM DRAIN SYSTEM

TABLE 1: INVENTORY OF DROP INLETS - CALCULATED FLOWS

Project#	31678A
Made By:	KS
Date:	06/16/08
Checked By:	SK
Date:	6/27/2008

Inlet ID	Existing/ Proposed	Location-Street	Condition	Type of DI	Length of curb	No. of grates	Q Total (cfs)	Source of flow	100-yr Flows		10-yr Flows	
									Q Intercepted (cfs)	Q Bypass (cfs)	Q Intercepted (cfs)	Q Bypass (cfs)
EDI-1	Existing	Elkhorn Road	On grade	C	22	7	97	1/2 of (CP8)	51	46	26	13
EDI-2	Existing	Elkhorn Road	On grade	C	10	3	97	1/2 of (CP8)	29	68	18	21
EDI-3	Existing	Elkhorn Road	On grade	C	12	4	57	1/2 of (Q bypass from EDI-1 & 2)	25	32	11	6
EDI-4	Existing	Elkhorn Road	On grade	C	10	3	57	1/2 of (Q bypass from EDI-1 & 2)	22	35	10	7
EDI-5	Existing	Elkhorn Road	On grade	C	5.5	1	34	1/2 of (Q bypass from EDI-3 & 4)	10	24	5	2
EDI-6	Existing	Elkhorn Road	On grade	C	5	1	34	1/2 of (Q bypass from EDI-3 & 4)	10	24	5	2
GTDI-1	Existing	Golden Talon Avenue	On grade	C	22	7	30	1/2 of OFF-11	20	10	8	2
GTDI-2	Existing	Golden Talon Avenue	On grade	C	19.5	6	30	1/2 of OFF-11	19	11	8	2
BDI-1	Existing	Buffalo Drive	On grade	C	5	1	6	Q bypass from FDI-8 & 9	4	2	0	0
BDI-2	Existing	Buffalo Drive	On grade	C	22	7	13	1/2 of (Q bypass from GTDI-1 & 2, BDI-1 & 4)	13	-	2	-
BDI-3	Existing	Buffalo Drive	On grade	C	24.75	8	13	1/2 of (Q bypass from GTDI-1 & 2, BDI-1 & 4)	13	-	2	-
BDI-4	Existing	Buffalo Drive	On grade	C	5.5	1	16	Flow from split flow at Elkhorn and Buffalo	13	3	1	0

Notes:

Sizes of existing drop inlets are obtained from approved drainage studies
Existing and proposed drop inlets are analyzed using FlowMaster.
50% clogging factor has been applied to analyze the inlets.

Worksheet for 10yr-Modified Type "C"-FDI-1

Project Description

Solve For	Efficiency

Input Data

Discharge	72.00	ft³/s
Slope	0.02430	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	5.60	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	6.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	39.71	%
Intercepted Flow	29	ft³/s
Bypass Flow	43	ft³/s
Spread	27.87	ft
Depth	0.65	ft
Flow Area	7.84	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	9.18	ft/s
Splash Over Velocity	9.89	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.11	
Grate Flow Ratio	0.31	
Equivalent Cross Slope	0.03347	ft/ft
Active Grate Length	5.60	ft
Length Factor	0.00	
Total Interception Length	123.24	ft

Worksheet for 100yr-Modified Type "C"-FDI-1

Project Description

Solve For	Efficiency

Input Data

Discharge	179.00	ft³/s
Slope	0.02430	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	5.60	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	6.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	25.26	%
Intercepted Flow	45	ft³/s
Bypass Flow	134	ft³/s
Spread	39.35	ft
Depth	0.88	ft
Flow Area	15.56	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	11.51	ft/s
Splash Over Velocity	9.89	ft/s
Frontal Flow Factor	0.85	
Side Flow Factor	0.08	
Grate Flow Ratio	0.22	
Equivalent Cross Slope	0.02937	ft/ft
Active Grate Length	5.60	ft
Length Factor	0.00	
Total Interception Length	195.38	ft

Worksheet for 10yr-Modified Type "C"-FDI-2

Project Description

Solve For	Efficiency

Input Data

Discharge	43.00	ft³/s
Slope	0.02430	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	5.60	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	6.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	47.48	%
Intercepted Flow	20	ft³/s
Bypass Flow	23	ft³/s
Spread	22.89	ft
Depth	0.55	ft
Flow Area	5.31	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	8.10	ft/s
Splash Over Velocity	9.89	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.14	
Grate Flow Ratio	0.38	
Equivalent Cross Slope	0.03658	ft/ft
Active Grate Length	5.60	ft
Length Factor	0.00	
Total Interception Length	94.10	ft

Worksheet for 100yr-Modified Type "C"-FDI-2

Project Description

Solve For	Efficiency

Input Data

Discharge	134.00	ft³/s
Slope	0.02430	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	5.60	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	6.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	29.89	%
Intercepted Flow	40	ft³/s
Bypass Flow	94	ft³/s
Spread	35.28	ft
Depth	0.80	ft
Flow Area	12.51	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	10.71	ft/s
Splash Over Velocity	9.89	ft/s
Frontal Flow Factor	0.93	
Side Flow Factor	0.09	
Grate Flow Ratio	0.25	
Equivalent Cross Slope	0.03051	ft/ft
Active Grate Length	5.60	ft
Length Factor	0.00	
Total Interception Length	169.10	ft

Worksheet for 10yr-Modified Type "C"-FDI-3

Project Description

Solve For	Efficiency

Input Data

Discharge	18.00	ft³/s
Slope	0.02190	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	4.25	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	5.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	58.94	%
Intercepted Flow	11	ft³/s
Bypass Flow	7	ft³/s
Spread	16.68	ft
Depth	0.43	ft
Flow Area	2.85	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	6.31	ft/s
Splash Over Velocity	7.96	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.12	
Grate Flow Ratio	0.52	
Equivalent Cross Slope	0.04312	ft/ft
Active Grate Length	4.25	ft
Length Factor	0.01	
Total Interception Length	57.32	ft

Worksheet for 100yr-Modified Type "C"-FDI-3

Project Description

Solve For	Efficiency

Input Data

Discharge	52.00	ft³/s
Slope	0.02190	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	4.25	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	5.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	40.50	%
Intercepted Flow	21	ft³/s
Bypass Flow	31	ft³/s
Spread	25.11	ft
Depth	0.60	ft
Flow Area	6.38	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	8.15	ft/s
Splash Over Velocity	7.96	ft/s
Frontal Flow Factor	0.98	
Side Flow Factor	0.08	
Grate Flow Ratio	0.35	
Equivalent Cross Slope	0.03503	ft/ft
Active Grate Length	4.25	ft
Length Factor	0.01	
Total Interception Length	101.38	ft

Worksheet for 10yr-Modified Type "C"-FDI-4

Project Description

Solve For	Efficiency

Input Data

Discharge		7.00	ft³/s
Slope		0.02700	ft/ft
Gutter Width		1.50	ft
Gutter Cross Slope		0.08	ft/ft
Road Cross Slope		0.02	ft/ft
Roughness Coefficient		0.013	
Local Depression		2.00	in
Local Depression Width		3.00	ft
Grate Width		1.47	ft
Grate Length		4.25	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")		
Clogging		0.00	%
Curb Opening Length		5.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	77.77	%
Intercepted Flow	5	ft³/s
Bypass Flow	2	ft³/s
Spread	10.95	ft
Depth	0.31	ft
Flow Area	1.27	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	5.51	ft/s
Splash Over Velocity	7.96	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.15	
Grate Flow Ratio	0.72	
Equivalent Cross Slope	0.05548	ft/ft
Active Grate Length	4.25	ft
Length Factor	0.02	
Total Interception Length	35.29	ft

Worksheet for 100yr-Modified Type "C"-FDI-4

Project Description

Solve For	Efficiency

Input Data

Discharge	31.00	ft³/s
Slope	0.02700	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	4.25	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	5.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	50.06	%
Intercepted Flow	16	ft³/s
Bypass Flow	15	ft³/s
Spread	19.78	ft
Depth	0.49	ft
Flow Area	3.98	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	7.78	ft/s
Splash Over Velocity	7.96	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.08	
Grate Flow Ratio	0.44	
Equivalent Cross Slope	0.03933	ft/ft
Active Grate Length	4.25	ft
Length Factor	0.01	
Total Interception Length	81.04	ft

Worksheet for 10yr-Modified Type "C"-FDI-5

Project Description

Solve For	Efficiency

Input Data

Discharge	2.00	ft³/s
Slope	0.02700	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	4.25	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	5.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	95.48	%
Intercepted Flow	2	ft³/s
Bypass Flow	0	ft³/s
Spread	6.27	ft
Depth	0.22	ft
Flow Area	0.46	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	4.31	ft/s
Splash Over Velocity	7.96	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.21	
Grate Flow Ratio	0.93	
Equivalent Cross Slope	0.07798	ft/ft
Active Grate Length	4.25	ft
Length Factor	0.04	
Total Interception Length	17.00	ft

Worksheet for 100yr-Modified Type "C"-FDI-5

Project Description

Solve For	Efficiency

Input Data

Discharge	15.00	ft^3/s
Slope	0.02700	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	4.25	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	5.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	63.34	%
Intercepted Flow	10	ft^3/s
Bypass Flow	5	ft^3/s
Spread	14.90	ft
Depth	0.39	ft
Flow Area	2.29	ft^2
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	6.55	ft/s
Splash Over Velocity	7.96	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.11	
Grate Flow Ratio	0.57	
Equivalent Cross Slope	0.04599	ft/ft
Active Grate Length	4.25	ft
Length Factor	0.01	
Total Interception Length	54.39	ft

Worksheet for 10yr-Type "DM"-FDI-6

Project Description

Solve For	Efficiency

Input Data

Discharge	6.00	ft³/s
Slope	0.02200	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.50	ft
Grate Length	3.75	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	3.75	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	77.75	%
Intercepted Flow	5	ft³/s
Bypass Flow	1	ft³/s
Spread	10.72	ft
Depth	0.31	ft
Flow Area	1.22	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	4.92	ft/s
Splash Over Velocity	7.24	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.14	
Grate Flow Ratio	0.74	
Equivalent Cross Slope	0.05623	ft/ft
Active Grate Length	3.75	ft
Length Factor	0.00	
Total Interception Length	30.86	ft

Worksheet for 100yr-Type "DM"-FDI-6

Project Description

Solve For	Efficiency

Input Data

Discharge	19.00	ft³/s
Slope	0.02200	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.50	ft
Grate Length	3.75	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	3.75	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	56.05	%
Intercepted Flow	11	ft³/s
Bypass Flow	8	ft³/s
Spread	17.02	ft
Depth	0.43	ft
Flow Area	2.97	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	6.40	ft/s
Splash Over Velocity	7.24	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.09	
Grate Flow Ratio	0.52	
Equivalent Cross Slope	0.04264	ft/ft
Active Grate Length	3.75	ft
Length Factor	0.00	
Total Interception Length	59.12	ft

Worksheet for 10yr-Type "DM"-FDI-7

Project Description

Solve For	Efficiency

Input Data

Discharge	6.00	ft³/s
Slope	0.02200	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.50	ft
Grate Length	3.75	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	3.75	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	77.75	%
Intercepted Flow	5	ft³/s
Bypass Flow	.1	ft³/s
Spread	10.72	ft
Depth	0.31	ft
Flow Area	1.22	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	4.92	ft/s
Splash Over Velocity	7.24	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.14	
Grate Flow Ratio	0.74	
Equivalent Cross Slope	0.05623	ft/ft
Active Grate Length	3.75	ft
Length Factor	0.00	
Total Interception Length	30.86	ft

Worksheet for 100yr-Type "DM"-FDI-7

Project Description

Solve For	Efficiency

Input Data

Discharge	19.00	ft³/s
Slope	0.02200	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.50	ft
Grate Length	3.75	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	3.75	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	56.05	%
Intercepted Flow	11	ft³/s
Bypass Flow	8	ft³/s
Spread	17.02	ft
Depth	0.43	ft
Flow Area	2.97	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	6.40	ft/s
Splash Over Velocity	7.24	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.09	
Grate Flow Ratio	0.52	
Equivalent Cross Slope	0.04264	ft/ft
Active Grate Length	3.75	ft
Length Factor	0.00	
Total Interception Length	59.12	ft

Worksheet for 10yr-Type "DM"-FDI-8

Project Description

Solve For	Efficiency

Input Data

Discharge	9.00	ft³/s
Slope	0.02200	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.50	ft
Grate Length	3.75	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	3.75	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	70.16	%
Intercepted Flow	6	ft³/s
Bypass Flow	3	ft³/s
Spread	12.66	ft
Depth	0.35	ft
Flow Area	1.67	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	5.38	ft/s
Splash Over Velocity	7.24	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.12	
Grate Flow Ratio	0.66	
Equivalent Cross Slope	0.05072	ft/ft
Active Grate Length	3.75	ft
Length Factor	0.00	
Total Interception Length	38.92	ft

Worksheet for 100yr-Type "DM"-FDI-8

Project Description

Solve For	Efficiency

Input Data

Discharge	8.00	ft³/s
Slope	0.02200	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.50	ft
Grate Length	3.75	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	3.75	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	72.40	%
Intercepted Flow	6	ft³/s
Bypass Flow	2	ft³/s
Spread	12.07	ft
Depth	0.34	ft
Flow Area	1.53	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	5.24	ft/s
Splash Over Velocity	7.24	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.12	
Grate Flow Ratio	0.68	
Equivalent Cross Slope	0.05223	ft/ft
Active Grate Length	3.75	ft
Length Factor	0.00	
Total Interception Length	36.40	ft

Worksheet for 10yr-Type "DM"-FDI-9

Project Description

Solve For	Efficiency

Input Data

Discharge	1.00	ft³/s
Slope	0.02200	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.50	ft
Grate Length	3.75	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	3.75	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	99.07	%
Intercepted Flow	1	ft³/s
Bypass Flow	0	ft³/s
Spread	4.56	ft
Depth	0.19	ft
Flow Area	0.28	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	3.58	ft/s
Splash Over Velocity	7.24	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.22	
Grate Flow Ratio	0.99	
Equivalent Cross Slope	0.09094	ft/ft
Active Grate Length	3.75	ft
Length Factor	0.00	
Total Interception Length	10.90	ft

Worksheet for 100yr-Type "DM"-FDI-9

Project Description

Solve For	Efficiency

Input Data

Discharge	8.00	ft³/s
Slope	0.02200	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.50	ft
Grate Length	3.75	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	3.75	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	72.40	%
Intercepted Flow	6	ft³/s
Bypass Flow	2	ft³/s
Spread	12.07	ft
Depth	0.34	ft
Flow Area	1.53	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	5.24	ft/s
Splash Over Velocity	7.24	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.12	
Grate Flow Ratio	0.68	
Equivalent Cross Slope	0.05223	ft/ft
Active Grate Length	3.75	ft
Length Factor	0.00	
Total Interception Length	36.40	ft

Worksheet for 10yr-Type "A"-FDI-10

Project Description

Solve For	Efficiency

Input Data

Discharge		1.00	ft³/s
Slope		0.02200	ft/ft
Gutter Width		2.40	ft
Gutter Cross Slope		0.06	ft/ft
Road Cross Slope		0.02	ft/ft
Roughness Coefficient		0.013	
Local Depression		2.00	in
Local Depression Width		3.00	ft
Grate Width		2.38	ft
Grate Length		2.00	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")		
Clogging		0.00	%
Curb Opening Length		2.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	99.36	%
Intercepted Flow	1	ft³/s
Bypass Flow	0	ft³/s
Spread	3.85	ft
Depth	0.17	ft
Flow Area	0.26	ft²
Gutter Depression	0.10	ft
Total Depression	0.26	ft
Velocity	3.80	ft/s
Splash Over Velocity	4.51	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.06	
Grate Flow Ratio	0.99	
Equivalent Cross Slope	0.10535	ft/ft
Active Grate Length	2.00	ft
Length Factor	0.00	
Total Interception Length	9.98	ft

Worksheet for 100yr-Type "A"-FDI-10

Project Description

Solve For	Efficiency

Input Data

Discharge	5.00	ft³/s
Slope	0.02200	ft/ft
Gutter Width	2.40	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	2.38	ft
Grate Length	2.00	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	2.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	73.19	%
Intercepted Flow	4	ft³/s
Bypass Flow	1	ft³/s
Spread	9.56	ft
Depth	0.29	ft
Flow Area	1.03	ft²
Gutter Depression	0.10	ft
Total Depression	0.26	ft
Velocity	4.85	ft/s
Splash Over Velocity	4.51	ft/s
Frontal Flow Factor	0.97	
Side Flow Factor	0.04	
Grate Flow Ratio	0.75	
Equivalent Cross Slope	0.07626	ft/ft
Active Grate Length	2.00	ft
Length Factor	0.00	
Total Interception Length	23.81	ft

Worksheet for 10yr-Modified Type "C"-BDI-1

Project Description

Solve For	Efficiency

Input Data

Discharge	6.00	ft³/s
Slope	0.00230	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	1.41	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	2.75	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	62.79	%
Intercepted Flow	4	ft³/s
Bypass Flow	2	ft³/s
Spread	16.86	ft
Depth	0.43	ft
Flow Area	2.91	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	2.06	ft/s
Splash Over Velocity	3.45	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.07	
Grate Flow Ratio	0.51	
Equivalent Cross Slope	0.04285	ft/ft
Active Grate Length	1.41	ft
Length Factor	0.07	
Total Interception Length	18.45	ft

Worksheet for 100yr-Modified Type "C"-BDI-1

Project Description

Solve For	Efficiency

Input Data

Discharge	6.00	ft³/s
Slope	0.00230	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	1.41	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	2.75	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	62.79	%
Intercepted Flow	4	ft³/s
Bypass Flow	2	ft³/s
Spread	16.86	ft
Depth	0.43	ft
Flow Area	2.91	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	2.06	ft/s
Splash Over Velocity	3.45	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.07	
Grate Flow Ratio	0.51	
Equivalent Cross Slope	0.04285	ft/ft
Active Grate Length	1.41	ft
Length Factor	0.07	
Total Interception Length	18.45	ft

Worksheet for 10yr-Modified Type "C" in Sag - BDI-2

Project Description

Solve For	Spread

Input Data

Discharge		2.00	ft^3/s
Gutter Width		1.50	ft
Gutter Cross Slope		0.08	ft/ft
Road Cross Slope		0.02	ft/ft
Local Depression		2.00	in
Local Depression Width		3.00	ft
Grate Width		1.47	ft
Grate Length		9.90	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")		
Clogging		0.00	%
Curb Opening Length		11.00	ft
Opening Height		0.50	ft
Curb Throat Type	Inclined		
Throat Incline Angle		45.00	degrees

Options

Calculation Option	Use Both

Results

Spread	2.02	ft
Depth	0.11	ft
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Open Grate Area	11.64	ft^2
Active Grate Weir Length	12.84	ft

Worksheet for 100yr-Modified Type "C" in Sag - BDI-2

Project Description

Solve For	Spread

Input Data

Discharge		13.00	ft^3/s
Gutter Width		1.50	ft
Gutter Cross Slope		0.08	ft/ft
Road Cross Slope		0.02	ft/ft
Local Depression		2.00	in
Local Depression Width		3.00	ft
Grate Width		1.47	ft
Grate Length		9.90	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")		
Clogging		0.00	%
Curb Opening Length		11.00	ft
Opening Height		0.50	ft
Curb Throat Type	Inclined		
Throat Incline Angle		45.00	degrees

Options

Calculation Option	Use Both

Results

Spread	15.18	ft
Depth	0.39	ft
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Open Grate Area	11.64	ft^2
Active Grate Weir Length	12.84	ft

Worksheet for 10yr-Modified Type "C" in Sag - BDI-3

Project Description

Solve For	Spread

Input Data

Discharge		2.00	ft³/s
Gutter Width		1.50	ft
Gutter Cross Slope		0.08	ft/ft
Road Cross Slope		0.02	ft/ft
Local Depression		2.00	in
Local Depression Width		3.00	ft
Grate Width		1.47	ft
Grate Length		11.32	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")		
Clogging		0.00	%
Curb Opening Length		12.50	ft
Opening Height		0.50	ft
Curb Throat Type	Inclined		
Throat Incline Angle		45.00	degrees

Options

Calculation Option	Use Both

Results

Spread	1.97	ft
Depth	0.10	ft
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Open Grate Area	13.31	ft²
Active Grate Weir Length	14.26	ft

Worksheet for 100yr-Modified Type "C" in Sag - BDI-3

Project Description

Solve For	Spread

Input Data

Discharge		13.00	ft^3/s
Gutter Width		1.50	ft
Gutter Cross Slope		0.08	ft/ft
Road Cross Slope		0.02	ft/ft
Local Depression		2.00	in
Local Depression Width		3.00	ft
Grate Width		1.47	ft
Grate Length		11.32	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")		
Clogging		0.00	%
Curb Opening Length		12.50	ft
Opening Height		0.50	ft
Curb Throat Type	Inclined		
Throat Incline Angle		45.00	degrees

Options

Calculation Option	Use Both

Results

Spread	14.10	ft
Depth	0.37	ft
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Open Grate Area	13.31	ft^2
Active Grate Weir Length	14.26	ft

Worksheet for 10yr-Modified Type "C"-BDI-4

Project Description

Solve For	Efficiency

Input Data

Discharge	1.00	ft³/s
Slope	0.01000	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	9.90	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	2.50	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	99.13	%
Intercepted Flow	1	ft³/s
Bypass Flow	0	ft³/s
Spread	5.67	ft
Depth	0.21	ft
Flow Area	0.39	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	2.55	ft/s
Splash Over Velocity	18.08	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.83	
Grate Flow Ratio	0.95	
Equivalent Cross Slope	0.08223	ft/ft
Active Grate Length	9.90	ft
Length Factor	0.00	
Total Interception Length	9.14	ft

Worksheet for 100yr-Modified Type "C"-BDI-4

Project Description

Solve For	Efficiency

Input Data

Discharge	16.00	ft³/s
Slope	0.01000	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	9.90	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	2.50	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	80.35	%
Intercepted Flow	13	ft³/s
Bypass Flow	3	ft³/s
Spread	18.56	ft
Depth	0.47	ft
Flow Area	3.51	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	4.55	ft/s
Splash Over Velocity	18.08	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.63	
Grate Flow Ratio	0.47	
Equivalent Cross Slope	0.04067	ft/ft
Active Grate Length	9.90	ft
Length Factor	0.00	
Total Interception Length	44.66	ft

Worksheet for 10yr-Modified Type "C"-SSDI-1

Project Description

Solve For	Efficiency

Input Data

Discharge	32.00	ft³/s
Slope	0.02000	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	1.41	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	2.75	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	31.40	%
Intercepted Flow	10	ft³/s
Bypass Flow	22	ft³/s
Spread	21.22	ft
Depth	0.52	ft
Flow Area	4.57	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	7.00	ft/s
Splash Over Velocity	3.45	ft/s
Frontal Flow Factor	0.68	
Side Flow Factor	0.01	
Grate Flow Ratio	0.41	
Equivalent Cross Slope	0.03796	ft/ft
Active Grate Length	1.41	ft
Length Factor	0.02	
Total Interception Length	76.68	ft

Worksheet for 100yr-Modified Type "C"-SSDI-1

Project Description

Solve For	Efficiency

Input Data

Discharge	108.00	ft³/s
Slope	0.02000	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	1.41	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	2.75	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	13.91	%
Intercepted Flow	15	ft³/s
Bypass Flow	93	ft³/s
Spread	33.73	ft
Depth	0.77	ft
Flow Area	11.45	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	9.43	ft/s
Splash Over Velocity	3.45	ft/s
Frontal Flow Factor	0.46	
Side Flow Factor	0.01	
Grate Flow Ratio	0.26	
Equivalent Cross Slope	0.03102	ft/ft
Active Grate Length	1.41	ft
Length Factor	0.01	
Total Interception Length	144.26	ft

Worksheet for 10yr-Modified Type "C"-SSDI-2

Project Description

Solve For	Efficiency

Input Data

Discharge	22.00	ft³/s
Slope	0.02900	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	1.41	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	2.75	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	36.25	%
Intercepted Flow	8	ft³/s
Bypass Flow	14	ft³/s
Spread	17.08	ft
Depth	0.44	ft
Flow Area	2.99	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	7.37	ft/s
Splash Over Velocity	3.45	ft/s
Frontal Flow Factor	0.65	
Side Flow Factor	0.01	
Grate Flow Ratio	0.51	
Equivalent Cross Slope	0.04256	ft/ft
Active Grate Length	1.41	ft
Length Factor	0.02	
Total Interception Length	68.38	ft

Worksheet for 100yr-Modified Type "C"-SSDI-2

Project Description

Solve For	Efficiency

Input Data

Discharge	93.00	ft³/s
Slope	0.02900	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	1.41	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	2.75	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	12.81	%
Intercepted Flow	12	ft³/s
Bypass Flow	81	ft³/s
Spread	29.70	ft
Depth	0.69	ft
Flow Area	8.89	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	10.46	ft/s
Splash Over Velocity	3.45	ft/s
Frontal Flow Factor	0.37	
Side Flow Factor	0.00	
Grate Flow Ratio	0.29	
Equivalent Cross Slope	0.03260	ft/ft
Active Grate Length	1.41	ft
Length Factor	0.01	
Total Interception Length	147.02	ft

Worksheet for 10yr-Modified Type "C"-SSDI-3

Project Description

Solve For	Efficiency

Input Data

Discharge	22.00	ft³/s
Slope	0.02380	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	17.00	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	19.25	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	88.02	%
Intercepted Flow	19	ft³/s
Bypass Flow	3	ft³/s
Spread	17.75	ft
Depth	0.45	ft
Flow Area	3.22	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	6.83	ft/s
Splash Over Velocity	53.30	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.74	
Grate Flow Ratio	0.49	
Equivalent Cross Slope	0.04167	ft/ft
Active Grate Length	17.00	ft
Length Factor	0.03	
Total Interception Length	65.27	ft

Worksheet for 100yr-Modified Type "C"-SSDI-3

Project Description

Solve For	Efficiency

Input Data

Discharge	106.00	ft³/s
Slope	0.02380	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	17.00	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	19.25	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	70.95	%
Intercepted Flow	75	ft³/s
Bypass Flow	31	ft³/s
Spread	32.41	ft
Depth	0.74	ft
Flow Area	10.57	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	10.03	ft/s
Splash Over Velocity	53.30	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.59	
Grate Flow Ratio	0.27	
Equivalent Cross Slope	0.03149	ft/ft
Active Grate Length	17.00	ft
Length Factor	0.02	
Total Interception Length	149.44	ft

Worksheet for 10yr-Modified Type "C"-SSDI-4

Project Description

Solve For	Efficiency

Input Data

Discharge	11.00	ft³/s
Slope	0.02380	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	31.20	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	33.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	97.98	%
Intercepted Flow	11	ft³/s
Bypass Flow	0	ft³/s
Spread	13.50	ft
Depth	0.36	ft
Flow Area	1.89	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	5.81	ft/s
Splash Over Velocity	316.30	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.94	
Grate Flow Ratio	0.62	
Equivalent Cross Slope	0.04876	ft/ft
Active Grate Length	31.20	ft
Length Factor	0.04	
Total Interception Length	44.39	ft

Worksheet for 100yr-Modified Type "C"-SSDI-4

Project Description

Solve For	Efficiency

Input Data

Discharge	45.00	ft³/s
Slope	0.02380	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	31.20	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	33.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	93.71	%
Intercepted Flow	42	ft³/s
Bypass Flow	3	ft³/s
Spread	23.39	ft
Depth	0.56	ft
Flow Area	5.54	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	8.12	ft/s
Splash Over Velocity	316.30	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.89	
Grate Flow Ratio	0.38	
Equivalent Cross Slope	0.03621	ft/ft
Active Grate Length	31.20	ft
Length Factor	0.02	
Total Interception Length	95.90	ft

Worksheet for 10yr-Modified Type "C"-SSDI-5

Project Description

Solve For	Efficiency

Input Data

Discharge	11.00	ft³/s
Slope	0.02380	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	31.20	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	33.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	97.98	%
Intercepted Flow	11	ft³/s
Bypass Flow	0	ft³/s
Spread	13.50	ft
Depth	0.36	ft
Flow Area	1.89	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	5.81	ft/s
Splash Over Velocity	316.30	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.94	
Grate Flow Ratio	0.62	
Equivalent Cross Slope	0.04876	ft/ft
Active Grate Length	31.20	ft
Length Factor	0.04	
Total Interception Length	44.39	ft

Worksheet for 100yr-Modified Type "C"-SSDI-5

Project Description

Solve For	Efficiency

Input Data

Discharge	45.00	ft³/s
Slope	0.02380	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	31.20	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	33.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	93.71	%
Intercepted Flow	42	ft³/s
Bypass Flow	3	ft³/s
Spread	23.39	ft
Depth	0.56	ft
Flow Area	5.54	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	8.12	ft/s
Splash Over Velocity	316.30	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.89	
Grate Flow Ratio	0.38	
Equivalent Cross Slope	0.03621	ft/ft
Active Grate Length	31.20	ft
Length Factor	0.02	
Total Interception Length	95.90	ft

Worksheet for 10yr-Modified Type "C"-SSDI6

Project Description

Solve For	Efficiency

Input Data

Discharge	3.00	ft³/s
Slope	0.01820	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	1.42	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	2.75	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	85.46	%
Intercepted Flow	3	ft³/s
Bypass Flow	0	ft³/s
Spread	8.30	ft
Depth	0.26	ft
Flow Area	0.76	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	3.95	ft/s
Splash Over Velocity	3.46	ft/s
Frontal Flow Factor	0.96	
Side Flow Factor	0.02	
Grate Flow Ratio	0.84	
Equivalent Cross Slope	0.06605	ft/ft
Active Grate Length	1.42	ft
Length Factor	0.07	
Total Interception Length	19.78	ft

Worksheet for 100yr-Modified Type "C"-SSDI6

Project Description

Solve For	Efficiency

Input Data

Discharge	3.00	ft³/s
Slope	0.01820	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	1.42	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	2.75	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	85.46	%
Intercepted Flow	3	ft³/s
Bypass Flow	0	ft³/s
Spread	8.30	ft
Depth	0.26	ft
Flow Area	0.76	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	3.95	ft/s
Splash Over Velocity	3.46	ft/s
Frontal Flow Factor	0.96	
Side Flow Factor	0.02	
Grate Flow Ratio	0.84	
Equivalent Cross Slope	0.06605	ft/ft
Active Grate Length	1.42	ft
Length Factor	0.07	
Total Interception Length	19.78	ft

Worksheet for 10yr-Modified Type "C"-EDI-1

Project Description

Solve For	Efficiency

Input Data

Discharge	39.00	ft³/s
Slope	0.01810	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	9.91	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	11.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	65.92	%
Intercepted Flow	26	ft³/s
Bypass Flow	13	ft³/s
Spread	23.33	ft
Depth	0.56	ft
Flow Area	5.51	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	7.07	ft/s
Splash Over Velocity	18.09	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.43	
Grate Flow Ratio	0.38	
Equivalent Cross Slope	0.03625	ft/ft
Active Grate Length	9.91	ft
Length Factor	0.01	
Total Interception Length	83.13	ft

Worksheet for 100yr-Modified Type "C"-EDI-1

Project Description

Solve For	Efficiency

Input Data

Discharge	97.00	ft³/s
Slope	0.01810	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	9.91	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	11.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	52.29	%
Intercepted Flow	51	ft³/s
Bypass Flow	46	ft³/s
Spread	33.00	ft
Depth	0.75	ft
Flow Area	10.96	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	8.85	ft/s
Splash Over Velocity	18.09	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.34	
Grate Flow Ratio	0.26	
Equivalent Cross Slope	0.03127	ft/ft
Active Grate Length	9.91	ft
Length Factor	0.01	
Total Interception Length	133.17	ft

Worksheet for 10yr-Modified Type "C"-EDI-2

Project Description

Solve For	Efficiency

Input Data

Discharge	39.00	ft³/s
Slope	0.01810	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	4.24	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	5.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	44.93	%
Intercepted Flow	18	ft³/s
Bypass Flow	21	ft³/s
Spread	23.33	ft
Depth	0.56	ft
Flow Area	5.51	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	7.07	ft/s
Splash Over Velocity	7.95	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.10	
Grate Flow Ratio	0.38	
Equivalent Cross Slope	0.03625	ft/ft
Active Grate Length	4.24	ft
Length Factor	0.01	
Total Interception Length	83.13	ft

Worksheet for 100yr-Modified Type "C"-EDI-2

Project Description

Solve For	Efficiency

Input Data

Discharge	97.00	ft³/s
Slope	0.01810	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	4.24	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	5.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	30.12	%
Intercepted Flow	29	ft³/s
Bypass Flow	68	ft³/s
Spread	33.00	ft
Depth	0.75	ft
Flow Area	10.96	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	8.85	ft/s
Splash Over Velocity	7.95	ft/s
Frontal Flow Factor	0.92	
Side Flow Factor	0.07	
Grate Flow Ratio	0.26	
Equivalent Cross Slope	0.03127	ft/ft
Active Grate Length	4.24	ft
Length Factor	0.01	
Total Interception Length	133.17	ft

Worksheet for 10yr-Modified Type "C"-EDI-3

Project Description

Solve For	Efficiency

Input Data

Discharge	17.00	ft³/s
Slope	0.01810	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	5.66	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	6.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	63.15	%
Intercepted Flow	11	ft³/s
Bypass Flow	6	ft³/s
Spread	16.93	ft
Depth	0.43	ft
Flow Area	2.94	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	5.79	ft/s
Splash Over Velocity	9.98	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.23	
Grate Flow Ratio	0.51	
Equivalent Cross Slope	0.04276	ft/ft
Active Grate Length	5.66	ft
Length Factor	0.01	
Total Interception Length	53.12	ft

Worksheet for 100yr-Modified Type "C"-EDI-3

Project Description

Solve For	Efficiency

Input Data

Discharge	57.00	ft³/s
Slope	0.01810	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	5.66	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	6.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	43.20	%
Intercepted Flow	25	ft³/s
Bypass Flow	32	ft³/s
Spread	26.97	ft
Depth	0.63	ft
Flow Area	7.35	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	7.76	ft/s
Splash Over Velocity	9.98	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.15	
Grate Flow Ratio	0.32	
Equivalent Cross Slope	0.03394	ft/ft
Active Grate Length	5.66	ft
Length Factor	0.00	
Total Interception Length	101.41	ft

Worksheet for 10yr-Modified Type "C"-EDI-4

Project Description

Solve For	Efficiency

Input Data

Discharge	17.00	ft³/s
Slope	0.01810	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	4.24	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	5.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	59.27	%
Intercepted Flow	10	ft³/s
Bypass Flow	7	ft³/s
Spread	16.93	ft
Depth	0.43	ft
Flow Area	2.94	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	5.79	ft/s
Splash Over Velocity	7.95	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.14	
Grate Flow Ratio	0.51	
Equivalent Cross Slope	0.04276	ft/ft
Active Grate Length	4.24	ft
Length Factor	0.01	
Total Interception Length	53.12	ft

Worksheet for 100yr-Modified Type "C"-EDI-4

Project Description

Solve For	Efficiency

Input Data

Discharge	57.00	ft³/s
Slope	0.01810	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	4.24	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	5.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	39.22	%
Intercepted Flow	22	ft³/s
Bypass Flow	35	ft³/s
Spread	26.97	ft
Depth	0.63	ft
Flow Area	7.35	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	7.76	ft/s
Splash Over Velocity	7.95	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.08	
Grate Flow Ratio	0.32	
Equivalent Cross Slope	0.03394	ft/ft
Active Grate Length	4.24	ft
Length Factor	0.01	
Total Interception Length	101.41	ft

Worksheet for 10yr-Modified Type "C"-EDI-5

Project Description

Solve For	Efficiency

Input Data

Discharge	7.00	ft³/s
Slope	0.01810	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	1.41	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	2.75	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	65.53	%
Intercepted Flow	5	ft³/s
Bypass Flow	2	ft³/s
Spread	11.89	ft
Depth	0.33	ft
Flow Area	1.48	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	4.72	ft/s
Splash Over Velocity	3.45	ft/s
Frontal Flow Factor	0.89	
Side Flow Factor	0.02	
Grate Flow Ratio	0.68	
Equivalent Cross Slope	0.05270	ft/ft
Active Grate Length	1.41	ft
Length Factor	0.04	
Total Interception Length	32.28	ft

Worksheet for 100yr-Modified Type "C"-EDI-5

Project Description

Solve For	Efficiency

Input Data

Discharge	34.00	ft³/s
Slope	0.01810	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	1.41	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	2.75	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	30.84	%
Intercepted Flow	10	ft³/s
Bypass Flow	24	ft³/s
Spread	22.14	ft
Depth	0.54	ft
Flow Area	4.97	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	6.84	ft/s
Splash Over Velocity	3.45	ft/s
Frontal Flow Factor	0.70	
Side Flow Factor	0.01	
Grate Flow Ratio	0.40	
Equivalent Cross Slope	0.03717	ft/ft
Active Grate Length	1.41	ft
Length Factor	0.02	
Total Interception Length	77.30	ft

Worksheet for 10yr-Modified Type "C"-EDI-6

Project Description

Solve For	Efficiency

Input Data

Discharge		7.00	ft³/s
Slope		0.01810	ft/ft
Gutter Width		1.50	ft
Gutter Cross Slope		0.08	ft/ft
Road Cross Slope		0.02	ft/ft
Roughness Coefficient		0.013	
Local Depression		2.00	in
Local Depression Width		3.00	ft
Grate Width		1.47	ft
Grate Length		1.41	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")		
Clogging		0.00	%
Curb Opening Length		2.50	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	64.70	%
Intercepted Flow	5	ft³/s
Bypass Flow	2	ft³/s
Spread	11.89	ft
Depth	0.33	ft
Flow Area	1.48	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	4.72	ft/s
Splash Over Velocity	3.45	ft/s
Frontal Flow Factor	0.89	
Side Flow Factor	0.02	
Grate Flow Ratio	0.68	
Equivalent Cross Slope	0.05270	ft/ft
Active Grate Length	1.41	ft
Length Factor	0.03	
Total Interception Length	32.28	ft

Worksheet for 100yr-Modified Type "C"-EDI-6

Project Description

Solve For	Efficiency

Input Data

Discharge	34.00	ft³/s
Slope	0.01810	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	1.41	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	2.50	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	30.33	%
Intercepted Flow	10	ft³/s
Bypass Flow	24	ft³/s
Spread	22.14	ft
Depth	0.54	ft
Flow Area	4.97	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	6.84	ft/s
Splash Over Velocity	3.45	ft/s
Frontal Flow Factor	0.70	
Side Flow Factor	0.01	
Grate Flow Ratio	0.40	
Equivalent Cross Slope	0.03717	ft/ft
Active Grate Length	1.41	ft
Length Factor	0.01	
Total Interception Length	77.30	ft

Worksheet for 10yr-Modified Type "C"-GTDI-1

Project Description

Solve For	Efficiency

Input Data

Discharge	10.00	ft³/s
Slope	0.03300	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	9.90	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	11.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	84.04	%
Intercepted Flow	8	ft³/s
Bypass Flow	2	ft³/s
Spread	12.17	ft
Depth	0.34	ft
Flow Area	1.55	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	6.45	ft/s
Splash Over Velocity	18.08	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.48	
Grate Flow Ratio	0.67	
Equivalent Cross Slope	0.05196	ft/ft
Active Grate Length	9.90	ft
Length Factor	0.02	
Total Interception Length	45.28	ft

Worksheet for 100yr-Modified Type "C"-GTDI-1

Project Description

Solve For	Efficiency

Input Data

Discharge	30.00	ft³/s
Slope	0.03300	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	9.90	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	11.00	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	67.10	%
Intercepted Flow	20	ft³/s
Bypass Flow	10	ft³/s
Spread	18.79	ft
Depth	0.47	ft
Flow Area	3.60	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	8.33	ft/s
Splash Over Velocity	18.08	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.36	
Grate Flow Ratio	0.46	
Equivalent Cross Slope	0.04041	ft/ft
Active Grate Length	9.90	ft
Length Factor	0.01	
Total Interception Length	83.53	ft

Worksheet for 10yr-Modified Type "C"-GTDI-2

Project Description

Solve For	Efficiency

Input Data

Discharge	10.00	ft³/s
Slope	0.03300	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	8.49	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	9.75	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	81.59	%
Intercepted Flow	8	ft³/s
Bypass Flow	2	ft³/s
Spread	12.17	ft
Depth	0.34	ft
Flow Area	1.55	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	6.45	ft/s
Splash Over Velocity	14.80	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.39	
Grate Flow Ratio	0.67	
Equivalent Cross Slope	0.05196	ft/ft
Active Grate Length	8.49	ft
Length Factor	0.03	
Total Interception Length	45.28	ft

Worksheet for 100yr-Modified Type "C"-GTDI-2

Project Description

Solve For	Efficiency

Input Data

Discharge	30.00	ft³/s
Slope	0.03300	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.013	
Local Depression	2.00	in
Local Depression Width	3.00	ft
Grate Width	1.47	ft
Grate Length	8.49	ft
Grate Type	P-50 mm x 100 mm (P-1-7/8"-4")	
Clogging	0.00	%
Curb Opening Length	9.75	ft

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	63.26	%
Intercepted Flow	19	ft³/s
Bypass Flow	11	ft³/s
Spread	18.79	ft
Depth	0.47	ft
Flow Area	3.60	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	8.33	ft/s
Splash Over Velocity	14.80	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.29	
Grate Flow Ratio	0.46	
Equivalent Cross Slope	0.04041	ft/ft
Active Grate Length	8.49	ft
Length Factor	0.02	
Total Interception Length	83.53	ft

STREET CAPACITY CALCULATIONS

Worksheet for Farm Road Q10

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02200	ft/ft
Discharge	11.00	ft^3/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.60
0+05	0.50
0+06	0.50
0+06	0.00
0+07	0.13
0+40	0.79
0+73	0.13
0+75	0.00
0+75	0.50
0+75	0.50
0+80	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.60)	(0+07, 0.13)	0.013
(0+07, 0.13)	(0+73, 0.13)	0.016
(0+73, 0.13)	(0+80, 0.60)	0.013

Results

Normal Depth	0.34	ft
Elevation Range	0.00 to 0.79 ft	
Flow Area	3.11	ft^2
Wetted Perimeter	24.98	ft
Top Width	24.28	ft

Worksheet for Farm Road Q10

Results

Normal Depth	0.34	ft
Critical Depth	0.40	ft
Critical Slope	0.00678	ft/ft
Velocity	3.53	ft/s
Velocity Head	0.19	ft
Specific Energy	0.53	ft
Froude Number	1.74	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.34	ft
Critical Depth	0.40	ft
Channel Slope	0.02200	ft/ft
Critical Slope	0.00678	ft/ft

Cross Section for Farm Road Q10

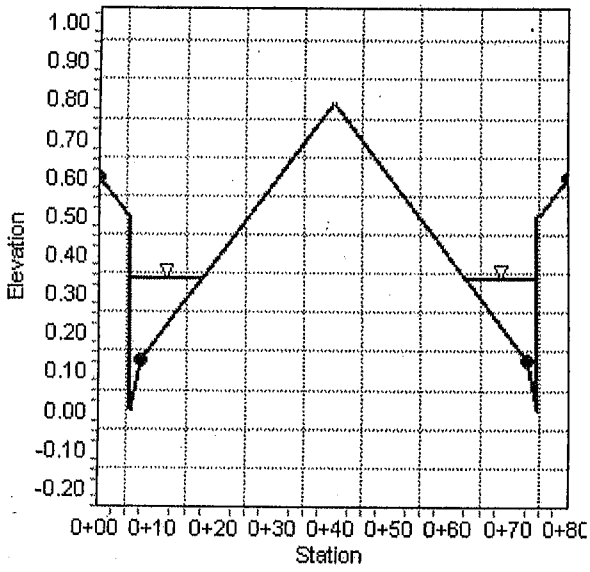
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02200	ft/ft
Normal Depth	0.34	ft
Discharge	11.00	ft³/s

Cross Section Image



Worksheet for Farm Road Q100

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02200	ft/ft
Discharge	38.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.60
0+05	0.50
0+06	0.50
0+06	0.00
0+07	0.13
0+40	0.79
0+73	0.13
0+75	0.00
0+75	0.50
0+75	0.50
0+80	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.60)	(0+07, 0.13)	0.013
(0+07, 0.13)	(0+73, 0.13)	0.016
(0+73, 0.13)	(0+80, 0.60)	0.013

Results

Normal Depth	0.49	ft
Elevation Range	0.00 to 0.79 ft	
Flow Area	7.99	ft²
Wetted Perimeter	40.47	ft
Top Width	39.47	ft

Worksheet for Farm Road Q100

Results

Normal Depth	0.49	ft
Critical Depth	0.61	ft
Critical Slope	0.00605	ft/ft
Velocity	4.76	ft/s
Velocity Head	0.35	ft
Specific Energy	0.84	ft
Froude Number	1.86	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.49	ft
Critical Depth	0.61	ft
Channel Slope	0.02200	ft/ft
Critical Slope	0.00605	ft/ft

Cross Section for Farm Road Q100

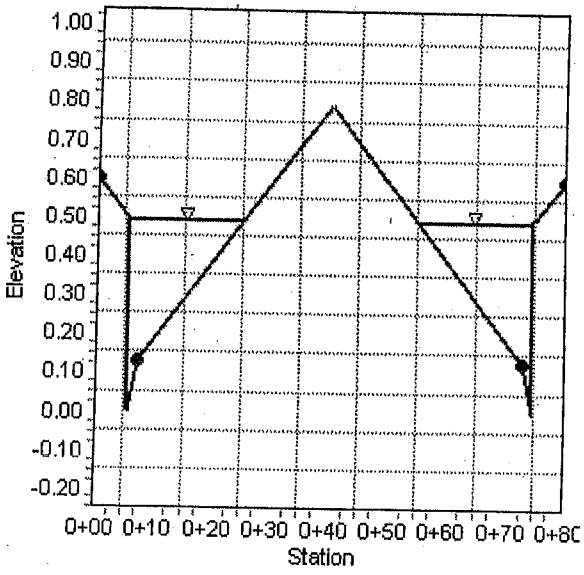
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02200	ft/ft
Normal Depth	0.49	ft
Discharge	38.00	ft³/s

Cross Section Image



Worksheet for Buffalo Drive Q10

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00580	ft/ft
Discharge	0.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.60
0+05	0.50
0+06	0.50
0+06	0.00
0+07	0.13
0+50	0.99
0+93	0.13
0+95	0.00
0+95	0.50
0+95	0.50
1+00	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.60)	(0+07, 0.13)	0.013
(0+07, 0.13)	(0+93, 0.13)	0.016
(0+93, 0.13)	(1+00, 0.60)	0.013

Results

Normal Depth	0.41	ft
Elevation Range	0.00 to 0.99 ft	
Flow Area	5.17	ft²
Wetted Perimeter	32.40	ft
Top Width	31.57	ft

Worksheet for Buffalo Drive Q10

Results

Normal Depth	0.41	ft
Critical Depth	0.40	ft
Critical Slope	0.00681	ft/ft
Velocity	2.13	ft/s
Velocity Head	0.07	ft
Specific Energy	0.48	ft
Froude Number	0.93	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.41	ft
Critical Depth	0.40	ft
Channel Slope	0.00580	ft/ft
Critical Slope	0.00681	ft/ft

Cross Section for Buffalo Drive Q10

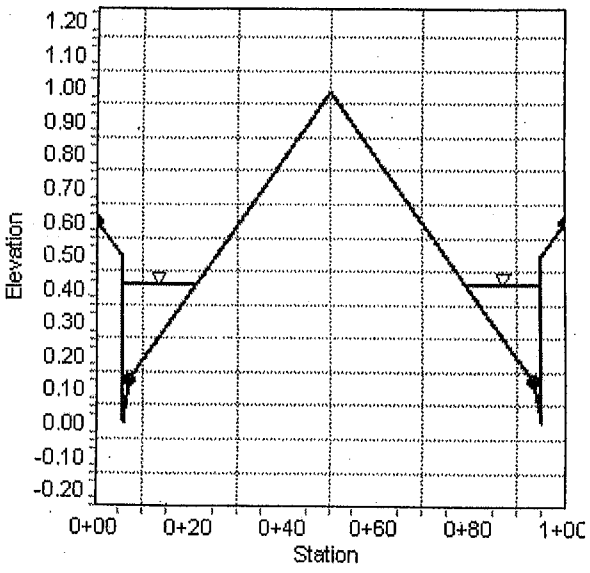
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00580	ft/ft
Normal Depth	0.41	ft
Discharge	0.00	ft³/s

Cross Section Image



Worksheet for Buffalo Drive Q100

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00580	ft/ft
Discharge	6.00	ft^3/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.60
0+05	0.50
0+06	0.50
0+06	0.00
0+07	0.13
0+50	0.99
0+93	0.13
0+95	0.00
0+95	0.50
0+95	0.50
1+00	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.60)	(0+07, 0.13)	0.013
(0+07, 0.13)	(0+93, 0.13)	0.016
(0+93, 0.13)	(1+00, 0.60)	0.013

Results

Normal Depth	0.34	ft
Elevation Range	0.00 to 0.99 ft	
Flow Area	3.26	ft^2
Wetted Perimeter	25.51	ft
Top Width	24.82	ft

Worksheet for Buffalo Drive Q100

Results

Normal Depth		0.34	ft
Critical Depth		0.33	ft
Critical Slope		0.00729	ft/ft
Velocity		1.84	ft/s
Velocity Head		0.05	ft
Specific Energy		0.39	ft
Froude Number		0.90	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.34	ft
Critical Depth	0.33	ft
Channel Slope	0.00580	ft/ft
Critical Slope	0.00729	ft/ft

Cross Section for Buffalo Drive Q100

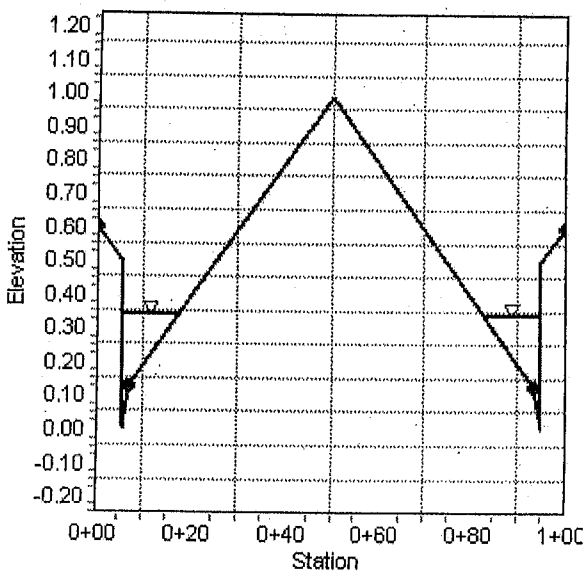
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00580	ft/ft
Normal Depth	0.34	ft
Discharge	6.00	ft³/s

Cross Section Image



FLOW SPLIT CALCULATIONS

ELKHORN SPRINGS AND BUFFALO DRIVE STORM DRAIN SYSTEM

FLOW SPLIT CALCULATIONS-FARM ROAD AND CIMARRON ROAD

Project #:	31678A
Made by:	KS
Date:	06/16/08
Checked by:	SK
Date:	06/27/08

Contributing Basin:Flow bypassed from FDI- 2

Q_{100}= 94

100-YEAR CALCULATIONS

Q_L	19	$Q_{L=}$ Lateral Flow into the side street, in cubic feet per second
Q_m	94	$Q_{m=}$ Main Street flow measured between the curbs, in cubic feet per second
W_{ss}	80	$W_{ss=}$ Width of the side street, in feet
S_m	0.0186	$S_{m=}$ Longitudinal Slope of the main street, in feet per foot
W_m	80	$W_{m=}$ Width of the main street, in feet
Q_o	23	$Q_{o=}$ Overbank flow intercepted by the side street, in cubic feet per second
Y_o	0.085	$Y_{o=}$ Average depth of overbank flow intercepted by the side street, in feet
S_s	0.005	$S_{s=}$ Longitudinal slope of the side street, in feet per foot

If Q_L is greater than Q_m, Q_L shall be set equal to Q_m

Total Flow into Cimarron Road = $Q_L + Q_o$ = 42

Total flow in Farm Road after flow split = 52

Contributing Basin:Flow bypassed from FDI- 2

Q_{10}= 62

10-YEAR CALCULATIONS

Q_L	13	$Q_{L=}$ Lateral Flow into the side street, in cubic feet per second
Q_m	62	$Q_{m=}$ Main Street flow measured between the curbs, in cubic feet per second
W_{ss}	80	$W_{ss=}$ Width of the side street, in feet
S_m	0.0186	$S_{m=}$ Longitudinal Slope of the main street, in feet per foot
W_m	80	$W_{m=}$ Width of the main street, in feet
Q_o	0	$Q_{o=}$ Overbank flow intercepted by the side street, in cubic feet per second
Y_o	0	$Y_{o=}$ Average depth of overbank flow intercepted by the side street, in feet
S_s	0.005	$S_{s=}$ Longitudinal slope of the side street, in feet per foot

If Q_L is greater than Q_m, Q_L shall be set equal to Q_m

Total Flow into Cimarron Road = $Q_L + Q_o$ = 13

Total flow in Farm Road after flow split = 49

ELKHORN SPRINGS AND BUFFALO DRIVE STORM DRAIN SYSTEM

FLOW SPLIT CALCULATIONS AT SUNNY SPRINGS LANE AND CIMARRON ROAD

Project #:	31678A
Made by:	KS
Date:	06/16/08
Checked by:	SK
Date:	06/27/08

Contributing Basin CP4=OFF3+Flow in Cimarron from Flow split at Farm Road

Q_{100}= 182

100-YEAR CALCULATIONS

Q_L	34	$Q_{L=}$ Lateral Flow into the side street, in cubic feet per second
Q_m	182	$Q_{m=}$ Main Street flow measured between the curbs, in cubic feet per second
W_{ss}	80	$W_{ss=}$ Width of the side street, in feet
S_m	0.02	$S_{m=}$ Longitudinal Slope of the main street, in feet per foot
W_m	80	$W_{m=}$ Width of the main street, in feet
Q_o	40	$Q_{o=}$ Overbank flow intercepted by the side street, in cubic feet per second
Y_o	0.15	$Y_{o=}$ Average depth of overbank flow intercepted by the side street, in feet
S_s	0.005	$S_{s=}$ Longitudinal slope of the side street, in feet per foot

If Q_L is greater than Q_m, Q_L shall be set equal to Q_m

Total Flow into Cimarron Road = $Q_L + Q_o$ = 74

Total flow in Sunny Springs Lane after flow sp 108

Contributing Basin CP4=OFF3+Flow in Cimarron from Flow split at Farm Road

Q_{10}= 49

10-YEAR CALCULATIONS

Q_L	10	$Q_{L=}$ Lateral Flow into the side street, in cubic feet per second
Q_m	49	$Q_{m=}$ Main Street flow measured between the curbs, in cubic feet per second
W_{ss}	80	$W_{ss=}$ Width of the side street, in feet
S_m	0.02	$S_{m=}$ Longitudinal Slope of the main street, in feet per foot
W_m	80	$W_{m=}$ Width of the main street, in feet
Q_o	7	$Q_{o=}$ Overbank flow intercepted by the side street, in cubic feet per second
Y_o	0.025	$Y_{o=}$ Average depth of overbank flow intercepted by the side street, in feet
S_s	0.005	$S_{s=}$ Longitudinal slope of the side street, in feet per foot

If Q_L is greater than Q_m, Q_L shall be set equal to Q_m

Total Flow into Cimarron Road = $Q_L + Q_o$ = 17

Total flow in Sunny Springs Lane after flow sp 32

ELKHORN SPRINGS AND BUFFALO DRIVE STORM DRAIN SYSTEM

FLOW SPLIT CALCULATIONS-ELKHORN ROAD AND CIMARRON ROAD

Project #:	31678A
Made by:	KS
Date:	06/16/08
Checked by:	SK
Date:	06/27/08

Contributing Basin CP6

Q_{100}= 195

100-YEAR CALCULATIONS

Q_L	28	$Q_{L=}$ Lateral Flow into the side street, in cubic feet per second
Q_m	195	$Q_{m=}$ Main Street flow measured between the curbs, in cubic feet per second
W_{ss}	80	$W_{ss=}$ Width of the side street, in feet
S_m	0.025	$S_{m=}$ Longitudinal Slope of the main street, in feet per foot
W_m	100	$W_{m=}$ Width of the main street, in feet
Q_o	32	$Q_{o=}$ Overbank flow intercepted by the side street, in cubic feet per second
Y_o	0.12	$Y_{o=}$ Average depth of overbank flow intercepted by the side street, in feet
S_s	0.005	$S_{s=}$ Longitudinal slope of the side street, in feet per foot

If Q_L is greater than Q_m, Q_L shall be set equal to Q_m

Total Flow into Cimarron Road = $Q_L + Q_o$ = 60

Total flow in Elkhorn Road after flow split = 135

Contributing Basin CP6

Q_{10}= 67

10-YEAR CALCULATIONS

Q_L	10	$Q_{L=}$ Lateral Flow into the side street, in cubic feet per second
Q_m	67	$Q_{m=}$ Main Street flow measured between the curbs, in cubic feet per second
W_{ss}	80	$W_{ss=}$ Width of the side street, in feet
S_m	0.025	$S_{m=}$ Longitudinal Slope of the main street, in feet per foot
W_m	100	$W_{m=}$ Width of the main street, in feet
Q_o	5	$Q_{o=}$ Overbank flow intercepted by the side street, in cubic feet per second
Y_o	0.02	$Y_{o=}$ Average depth of overbank flow intercepted by the side street, in feet
S_s	0.005	$S_{s=}$ Longitudinal slope of the side street, in feet per foot

If Q_L is greater than Q_m, Q_L shall be set equal to Q_m

Total Flow into Cimarron Road = $Q_L + Q_o$ = 16

Total flow in Elkhorn Road after flow split = 51

ELKHORN SPRINGS AND BUFFALO DRIVE STORM DRAIN SYSTEM

FLOW SPLIT CALCULATIONS-ELKHORN ROAD AND BUFFALO DRIVE

Project #:	31678A
Made by:	KS
Date:	06/16/08
Checked by:	SK
Date:	06/27/08

Contributing Basin	BUFF1=Bypass from EDI-5 & EDI-6
Q_{100}=	48

100-YEAR CALCULATIONS

Q_L	14	$Q_{L=}$	Lateral Flow into the side street, in cubic feet per second
Q_m	48	$Q_{m=}$	Main Street flow measured between the curbs, in cubic feet per second
W_{ss}	100	$W_{ss=}$	Width of the side street, in feet
S_m	0.018	$S_{m=}$	Longitudinal Slope of the main street, in feet per foot
W_m	70	$W_{m=}$	Width of the main street, in feet
Q_o	2	$Q_{o=}$	Overbank flow intercepted by the side street, in cubic feet per second
Y_o	0.005	$Y_{o=}$	Average depth of overbank flow intercepted by the side street, in feet
S_s	0.01	$S_{s=}$	Longitudinal slope of the side street, in feet per foot

If Q_L is greater than Q_m, Q_L shall be set equal to Q_m

Total Flow into Buffalo Drive = $Q_L + Q_o$ =	16
Total flow in Main street after flow split =	32

Contributing Basin	BUFF1=Bypass from EDI-5 & EDI-6
Q_{10}=	2

10-YEAR CALCULATIONS

Q_L	1	$Q_{L=}$	Lateral Flow into the side street, in cubic feet per second
Q_m	2	$Q_{m=}$	Main Street flow measured between the curbs, in cubic feet per second
W_{ss}	100	$W_{ss=}$	Width of the side street, in feet
S_m	0.018	$S_{m=}$	Longitudinal Slope of the main street, in feet per foot
W_m	70	$W_{m=}$	Width of the main street, in feet
Q_o	0	$Q_{o=}$	Overbank flow intercepted by the side street, in cubic feet per second
Y_o	0	$Y_{o=}$	Average depth of overbank flow intercepted by the side street, in feet
S_s	0.01	$S_{s=}$	Longitudinal slope of the side street, in feet per foot

If Q_L is greater than Q_m, Q_L shall be set equal to Q_m

Total Flow into Buffalo Drive = $Q_L + Q_o$ =	1
Total flow in Main street after flow split =	1

Worksheet for Sunny Springs Lane within curb

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.02000	ft/ft
Normal Depth	0.50	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.60
0+05	0.50
0+06	0.50
0+06	0.00
0+07	0.13
0+40	0.79
0+73	0.13
0+75	0.00
0+75	0.50
0+75	0.50
0+80	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.60)	(0+07, 0.13)	0.013
(0+07, 0.13)	(0+73, 0.13)	0.016
(0+73, 0.13)	(0+80, 0.60)	0.013

Results

Discharge		38.00	ft^3/s
Elevation Range	0.00 to 0.79 ft		
Flow Area		8.29	ft^2
Wetted Perimeter		41.24	ft
Top Width		40.22	ft

Worksheet for Sunny Springs Lane within curb

Results

Normal Depth	0.50	ft
Critical Depth	0.61	ft
Critical Slope	0.00605	ft/ft
Velocity	4.58	ft/s
Velocity Head	0.33	ft
Specific Energy	0.83	ft
Froude Number	1.78	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.50	ft
Critical Depth	0.61	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.00605	ft/ft

Cross Section for Sunny Springs Lane within curb

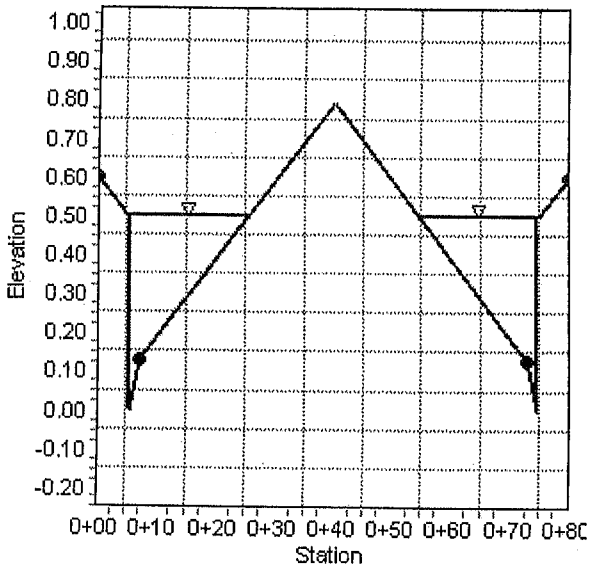
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.02000	ft/ft
Normal Depth	0.50	ft
Discharge	38.00	ft³/s

Cross Section Image



Worksheet for 100YR-Sunny Springs Lane

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02000	ft/ft
Discharge	182.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.60
0+05	0.50
0+06	0.50
0+06	0.00
0+07	0.13
0+40	0.79
0+73	0.13
0+75	0.00
0+75	0.50
0+75	0.50
0+80	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.60)	(0+07, 0.13)	0.013
(0+07, 0.13)	(0+73, 0.13)	0.016
(0+73, 0.13)	(0+80, 0.60)	0.013

Results

Normal Depth	0.80	ft
Elevation Range	0.00 to 0.79 ft	
Flow Area	27.58	ft²
Wetted Perimeter	81.42	ft
Top Width	80.00	ft

Worksheet for 100YR-Sunny Springs Lane

Results

Normal Depth	0.80	ft
Critical Depth	1.00	ft
Critical Slope	0.00441	ft/ft
Velocity	6.60	ft/s
Velocity Head	0.68	ft
Specific Energy	1.48	ft
Froude Number	1.98	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.80	ft
Critical Depth	1.00	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.00441	ft/ft

Cross Section for 100YR-Sunny Springs Lane

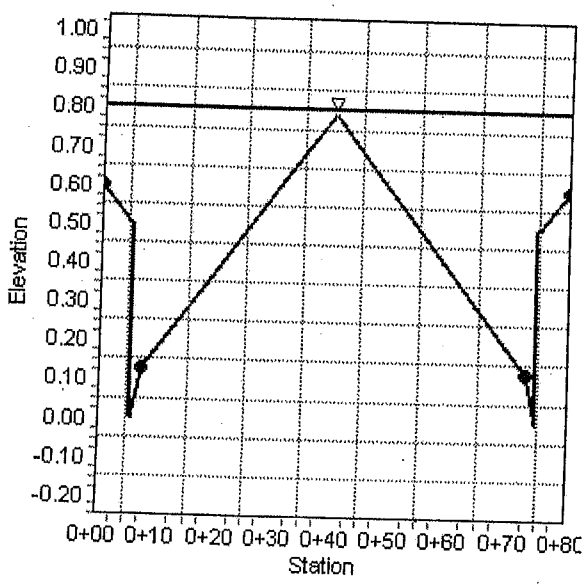
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02000	ft/ft
Normal Depth	0.80	ft
Discharge	182.00	ft³/s

Cross Section Image



Worksheet for Elkhorn Road within curb

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.02500	ft/ft
Normal Depth	0.50	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.60
0+05	0.50
0+06	0.50
0+06	0.00
0+07	0.13
0+50	0.79
0+93	0.13
0+95	0.00
0+95	0.50
0+95	0.50
1+00	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.60)	(0+07, 0.13)	0.013
(0+07, 0.13)	(0+93, 0.13)	0.016
(0+93, 0.13)	(1+00, 0.60)	0.013

Results

Discharge	52.62	ft^3/s
Elevation Range	0.00 to 0.79 ft	
Flow Area	10.41	ft^2
Wetted Perimeter	52.51	ft
Top Width	51.50	ft

Worksheet for Elkhorn Road within curb

Results

Normal Depth	0.50	ft
Critical Depth	0.63	ft
Critical Slope	0.00595	ft/ft
Velocity	5.06	ft/s
Velocity Head	0.40	ft
Specific Energy	0.90	ft
Froude Number	1.98	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.50	ft
Critical Depth	0.63	ft
Channel Slope	0.02500	ft/ft
Critical Slope	0.00595	ft/ft

Cross Section for Elkhorn Road within curb

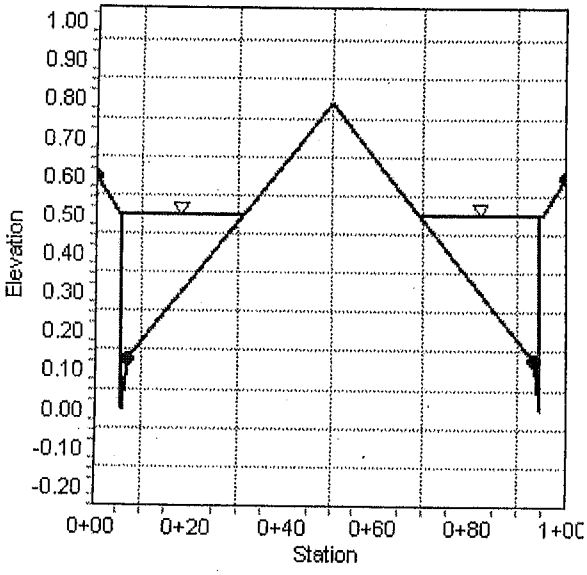
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.02500	ft/ft
Normal Depth	0.50	ft
Discharge	52.62	ft³/s

Cross Section Image



Worksheet for 100YR- Elkhorn Road

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02500	ft/ft
Discharge	195.00	ft^3/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.60
0+05	0.50
0+06	0.50
0+06	0.00
0+07	0.13
0+50	0.79
0+93	0.13
0+95	0.00
0+95	0.50
0+95	0.50
1+00	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.60)	(0+07, 0.13)	0.013
(0+07, 0.13)	(0+93, 0.13)	0.016
(0+93, 0.13)	(1+00, 0.60)	0.013

Results

Normal Depth	0.74	ft
Elevation Range	0.00 to 0.79 ft	
Flow Area	28.67	ft^2
Wetted Perimeter	94.89	ft
Top Width	93.58	ft

Worksheet for 100YR- Elkhorn Road

Results

Normal Depth	0.74	ft
Critical Depth	0.95	ft
Critical Slope	0.00457	ft/ft
Velocity	6.80	ft/s
Velocity Head	0.72	ft
Specific Energy	1.46	ft
Froude Number	2.17	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.74	ft
Critical Depth	0.95	ft
Channel Slope	0.02500	ft/ft
Critical Slope	0.00457	ft/ft

Cross Section for 100YR- Elkhorn Road

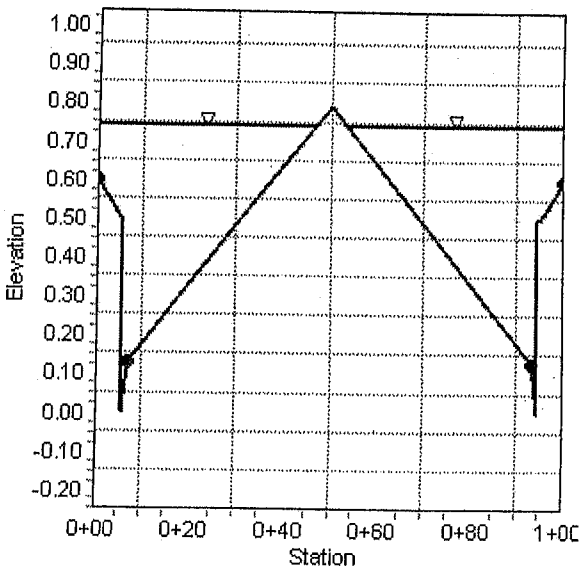
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02500	ft/ft
Normal Depth	0.74	ft
Discharge	195.00	ft³/s

Cross Section Image



Worksheet for Farm Road within curb

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.01860	ft/ft
Normal Depth	0.50	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.60
0+05	0.50
0+06	0.50
0+06	0.00
0+07	0.13
0+40	0.79
0+73	0.13
0+75	0.00
0+75	0.50
0+75	0.50
0+80	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.60)	(0+07, 0.13)	0.013
(0+07, 0.13)	(0+73, 0.13)	0.016
(0+73, 0.13)	(0+80, 0.60)	0.013

Results

Discharge	36.65	ft^3/s
Elevation Range	0.00 to 0.79 ft	
Flow Area	8.29	ft^2
Wetted Perimeter	41.24	ft
Top Width	40.22	ft

Worksheet for Farm Road within curb

Results

Normal Depth	0.50	ft
Critical Depth	0.61	ft
Critical Slope	0.00609	ft/ft
Velocity	4.42	ft/s
Velocity Head	0.30	ft
Specific Energy	0.80	ft
Froude Number	1.72	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.50	ft
Critical Depth	0.61	ft
Channel Slope	0.01860	ft/ft
Critical Slope	0.00609	ft/ft

Cross Section for Farm Road within curb

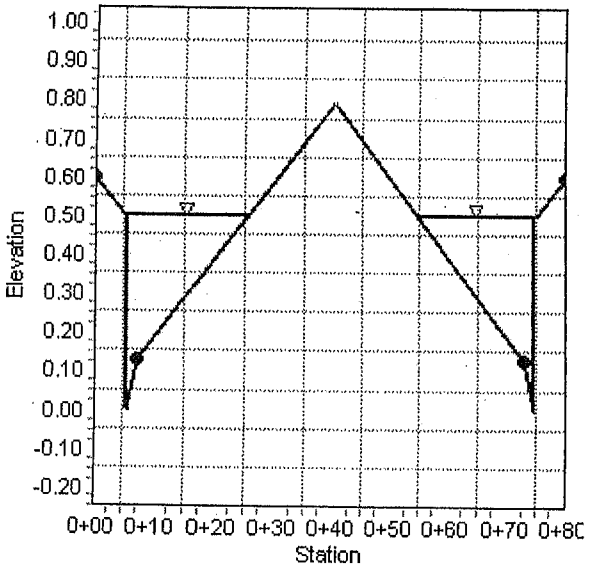
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.01860	ft/ft
Normal Depth	0.50	ft
Discharge	36.65	ft³/s

Cross Section Image



Worksheet for 100-YR-Farm Road

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01860	ft/ft
Discharge	94.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.60
0+05	0.50
0+06	0.50
0+06	0.00
0+07	0.13
0+40	0.79
0+73	0.13
0+75	0.00
0+75	0.50
0+75	0.50
0+80	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.60)	(0+07, 0.13)	0.013
(0+07, 0.13)	(0+73, 0.13)	0.016
(0+73, 0.13)	(0+80, 0.60)	0.013

Results

Normal Depth	0.67	ft
Elevation Range	0.00 to 0.79 ft	
Flow Area	17.69	ft²
Wetted Perimeter	68.89	ft
Top Width	67.73	ft

Worksheet for 100-YR-Farm Road

Results

Normal Depth	0.67	ft
Critical Depth	0.80	ft
Critical Slope	0.00501	ft/ft
Velocity	5.31	ft/s
Velocity Head	0.44	ft
Specific Energy	1.11	ft
Froude Number	1.83	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.67	ft
Critical Depth	0.80	ft
Channel Slope	0.01860	ft/ft
Critical Slope	0.00501	ft/ft

Cross Section for 100-YR-Farm Road

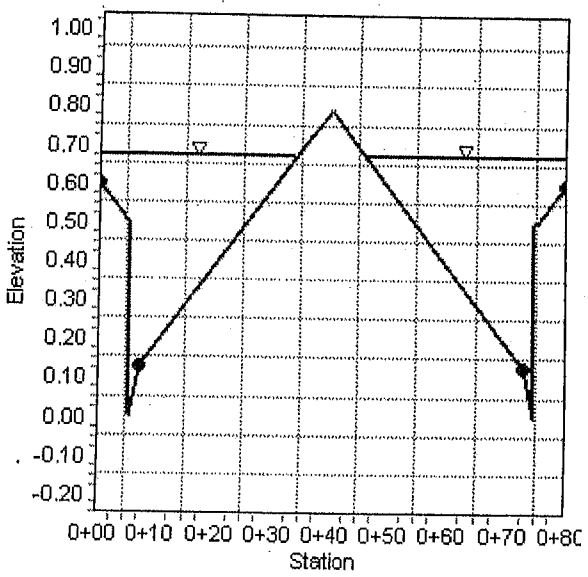
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01860	ft/ft
Normal Depth	0.67	ft
Discharge	94.00	ft³/s

Cross Section Image



Worksheet for Elkhorn & Buffalo Intersection

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01810	ft/ft
Discharge	48.00	ft^3/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.60
0+05	0.50
0+06	0.50
0+06	0.00
0+07	0.13
0+50	0.79
0+93	0.13
0+95	0.00
0+95	0.50
0+95	0.50
1+00	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.60)	(0+07, 0.13)	0.013
(0+07, 0.13)	(0+93, 0.13)	0.016
(0+93, 0.13)	(1+00, 0.60)	0.013

Results

Normal Depth	0.51	ft
Elevation Range	0.00 to 0.79 ft	
Flow Area	11.14	ft^2
Wetted Perimeter	56.62	ft
Top Width	55.60	ft

Worksheet for Elkhorn & Buffalo Intersection

Results

Normal Depth	0.51	ft
Critical Depth	0.61	ft
Critical Slope	0.00596	ft/ft
Velocity	4.31	ft/s
Velocity Head	0.29	ft
Specific Energy	0.80	ft
Froude Number	1.70	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.51	ft
Critical Depth	0.61	ft
Channel Slope	0.01810	ft/ft
Critical Slope	0.00596	ft/ft

Cross Section for Elkhorn & Buffalo Intersection

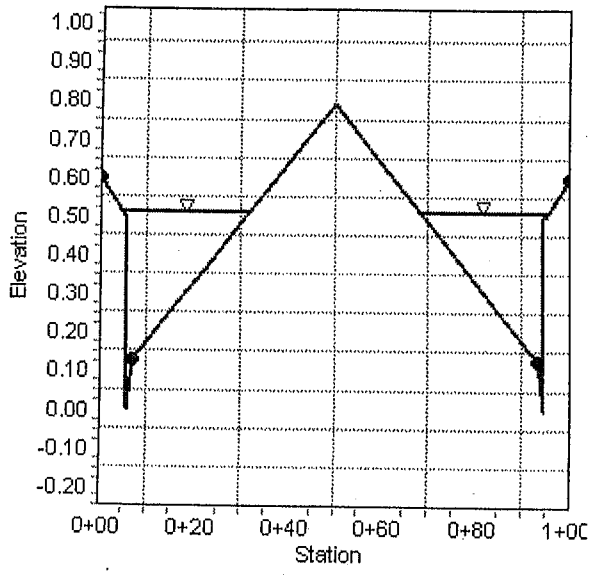
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01810	ft/ft
Normal Depth	0.51	ft
Discharge	48.00	ft³/s

Cross Section Image



STANDARDS MANUAL FOR DRAINAGE DESIGN AND FLOODPLAIN MANAGEMENT IN TUCSON, ARIZONA

DECEMBER, 1989

(REVISED JULY, 1998)



Prepared for
City of Tucson
Department of Transportation
Engineering Division

Prepared by
Simons, Li & Associates, Inc.

STANDARDS MANUAL FOR DRAINAGE DESIGN AND FLOODPLAIN MANAGEMENT IN TUCSON, ARIZONA

PREPARED FOR
CITY OF TUCSON
DEPARTMENT OF TRANSPORTATION,
ENGINEERING DIVISION

PREPARED BY
SIMONS, LI & ASSOCIATES, INC.

DECEMBER, 1989
REVISED JULY, 1998

natural contributing watersheds; and increased by fifty percent (i.e., multiplied by 1.5) for substantially paved contributing watersheds, which are generally found in residential, commercial, and industrial developments.

The required inlet headwater, *HW*, can either be assumed to be some fraction of the height *(D)* of the flow-through wall openings; or it can be set equal to or greater than same, provided that the resulting ponding depth is less than one foot, does not affect all-weather access; and does not adversely affect nearby buildings, roadways, or parking areas, nor affect the future development of same.

12.6 Computation of Flow Splits at Intersections

It is not uncommon in urbanized areas for runoff being conveyed in streets to be either augmented or diminished in quantity by flows entering or departing at street intersections. The evaluation of converging flows can be done by adding either the two contributing hydrographs or the two flood peaks, dependent upon the comparative lag times of the flood peaks. The evaluation of flow splits at intersections may be evaluated by use of Equation 12.3 below.

$$Q_L = 0.042 \left(\frac{Q_m^{0.93} \, W_{ss}^{0.85}}{S_m^{0.41} \, W_m^{0.79}} \right) \qquad (12.3)$$

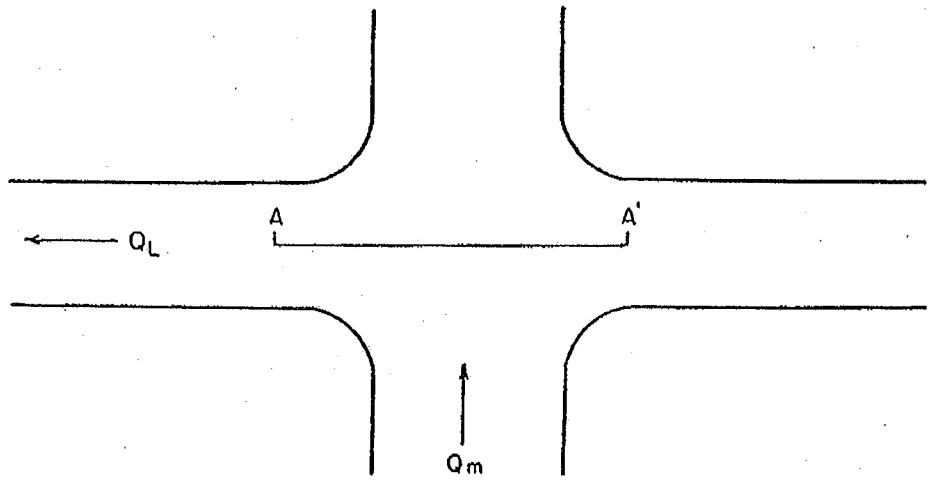
Where:

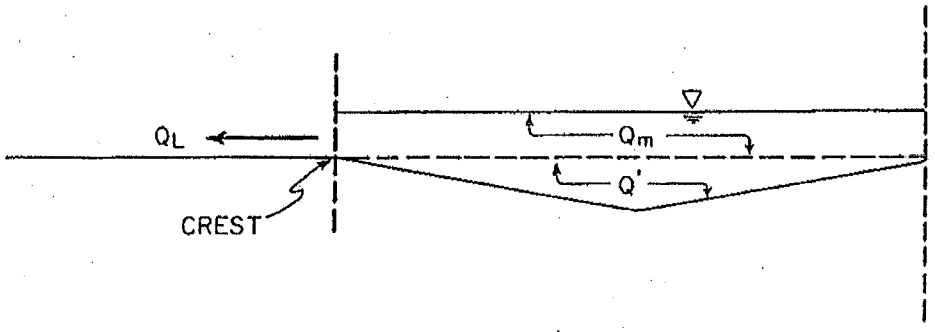
Q_L = Lateral flow into the side street, in cubic feet per second;
Q_m = Main street flow measured between the curbs, in cubic feet per second;
S_m = Longitudinal slope of the main street, in feet per foot;
W_m = Width of the main street, in feet; and,
W_{ss} = Width of the side street, in feet.

When applying Equation 12.3, the following items must be taken into consideration:

1. If the main street has an inverted crown, or if the side street has been crested to impede flow, Q_m should be calculated as only that portion of the total discharge flowing above the elevation of the crest (see Figure 12.1).

2. If flow extends beyond the curbs, Q_m should be only that portion of the total discharge which would be flowing between the curbs. Equation 12.4, below, is then used to calculate the maximum amount of "overbank" flow which will also turn and flow down the side street. Note that if Q_o calculated from Equation 12.4 is positive and is greater than the actual overbank flow, it should be assumed that *all* of the actual overbank flow turns and flows down the side street. Also, if Q_o calculated from Equation 12.4 becomes negative, it should be assumed that *no* overbank flow turns and flows down the side street.





SECTION A-A'

TOTAL DISCHARGE IN MAIN STREET EQUALS $Q_m + Q'$. Q_m (AS USED IN EQUATION 12.3) IS ONLY THAT PORTION OF THE TOTAL DISCHARGE ABOVE THE ELEVATION OF THE CREST OF THE SIDE STREET.

FIGURE 12.1
DEFINITION SKETCH FOR COMPUTING Q_m IN AN ~~INVERTED CROWN STREET~~

$$Q_o = 46.8 y_o W_{ss} S_s^{0.5} - Q_L \quad (12.4)$$

Where:

Q_o = Overbank flow intercepted by the side street, in cubic feet per second;

y_o = Average depth of overbank flow intercepted by the side street, in feet;

S_s = Longitudinal slope of the side street, in feet/foot; and,

All other terms are defined in Equation 12.3.

3. If Q_L is calculated to be greater than Q_m, Q_L shall be set equal to Q_m.

4. Specific site conditions, such as walls, buildings, etc., which may affect flow characteristics at the intersection, must be carefully considered before applying Equation 12.1.

EXAMPLE 12.1: SPLIT FLOW AT AN INTERSECTION

A flow split must be calculated at the intersection shown on Figure 12.2. A hydrologic analysis determined that the 100-year peak discharge at a point just south of the intersection is 400 cfs. Street A slopes downward and to the north at *0.005* ft/ft, and street B slopes downward and to the west at *0.005* ft/ft. For the purposes of this example, it will be assumed that no flow enters the intersection via street B. It is also known, from the results of a hydraulic analysis, that at a flow of 400 cfs, 300 cfs will be flowing between the curbs (Q_m), 40 cfs will be flowing outside of the curb to the west (Q_{LOB}) at an average depth of one foot, and 60 cfs will be flowing outside of the curb to the east (Q_{ROB}) at this same depth. Q_L is then calculated, to the nearest cfs, from Equation 12.3 as follows:

$$Q_L = 0.042 \left[\frac{(300)^{0.93} (24)^{0.85}}{(0.005)^{0.41} (48)^{0.79}} \right] = 52 \text{ cfs}$$

The maximum amount of flow from the left overbank which can flow west on street B is calculated, to the nearest cfs, from Equation 12.4 as follows:

$$Q_o = 46.8(1)(24)(0.005)^{0.5} - 52 = 27 \text{ cfs}$$

Therefore, the total side flow into street B is calculated to be:

$$Q_L + Q_o = 52 + 27 = 79 \text{ cfs}$$

WSPG CALCULATIONS
60-INCH PROPOSED STORM DRAIN SYSTEM

Project#	31678A
Made By:	JS
Date:	06/30/08
Checked By:	SK
Date:	06/30/08

ELKHORN SPRINGS AND BUFFALO STORM DRAIN SYSTEM

WSPG OUTPUT SUMMARY

Stationing-Equation		Storm Drain Size	Flow	Invert Elevation	HGL	Finished Grade	Difference
On Plans	WSPG	(in)	(cfs)	(ft)	(ft)	(ft)	FG-HGL (ft)
Buffalo Drive							
"Buffalo" 28+01.98, 198.79 LT	100	60	198	2393.00	2398.89	2398.00	-0.89
"Buffalo" 29+36.39, 23.02 LT	318.77	60	198	2394.09	2400.23	2410.37	10.14
"Buffalo" 31+43.78, 26.67 LT	524.72	60	198	2396.66	2399.69	2412.37	12.68
"Buffalo" 32+97.53, 26.11 LT	678.96	60	198	2398.61	2401.67	2414.35	12.68
"Buffalo" 36+72.38, 26.13 LT	1048.96	60	198	2403.15	2406.61	2414.74	8.13
"Buffalo" 36+73.38, 26.13 LT	1049.96	60	194	2403.16	2406.39	2414.77	8.38
"Buffalo" 37+59.46, 26.52 LT	1132.06	60	194	2404.27	2408.25	2415.79	7.54
"Buffalo" 37+60.46, 26.52 LT	1133.06	60	156	2404.28	2409.97	2415.81	5.84
Farm Road							
"Farm" 46+29.00, 12.35 LT	1203.71	48	156	2406.11	2411.47	2417.36	5.89
"Farm" 46+30.00, 12.35 LT	1204.71	48	146	2406.13	2412.08	2417.38	5.30
"Farm" 43+25.01, 12.68 LT	1504.79	48	146	2413.58	2415.94	2424.17	8.23
"Farm" 40+01.00, 13.02 LT	1823.90	48	146	2421.50	2424.23	2431.11	6.88
"Farm" 40+00.00, 13.02 LT	1824.90	48	132	2421.52	2423.71	2431.13	7.42
"Farm" 36+50.00, 12.82 LT	2170.00	48	132	2430.07	2432.296	2438.78	6.48
"Farm" 33+05.53, 9.47 LT	2509.59	48	132	2438.53	2441.963	2446.51	4.55
"Farm" 33+05.53, 9.47 LT	2509.59	48	132	2438.53	2441.963	2446.53	4.57

DATE: 6/30/2008
TIME: 15:24

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	4			5.00														
CD	2	4			4.00														
CD	3	4			1.50														
CD	4	4			3.00														

ERROR MESSAGE NUMBER 7 IN SEQUENCE CHECKING THRU CHANNEL DEFINITION DATA
INVALID CARD CODE ENCOUNTERED WHILE PROCESSING CD AND PTS CARDS - CODE =

HEADING LINE NO 1 IS - ELKHORN SPRINGS AND BUFFALO STORM DRAIN SYSTEM - PROPOSED STORM DRAIN

HEADING LINE NO 2 IS - PARSONS BRINCKERHOFF - PROJECT No. 31678A

HEADING LINE NO 3 IS - FILE NAME: W:\31678A-ELKHORN\ENGR\DRAINAGE\WSPG\PROPOSED SD\PR.DAT

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

U/S DATA	STATION	INVERT	SECT	W S ELEV
	100.00	2393.00	1	2398.89

ELEMENT NO 2 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	318.77	2394.09	1	0.013	0.00	0.00	0.00	1

ELEMENT NO 3 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	524.72	2396.66	1	0.013	0.00	0.00	51.00	1

ELEMENT NO 4 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	678.96	2398.61	1	0.013	0.00	0.00	14.00	1

ELEMENT NO 5 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1048.96	2403.15	1	0.013	0.00	0.00	8.00	0

ELEMENT NO 6 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1049.96	2403.16	1	3	0	0.013	4.0	0.0	2408.07	0.00	58.00	0.00

ELEMENT NO 7 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1132.06	2404.27	1	0.013	0.00	0.00	0.00	0

ELEMENT NO 8 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1133.06	2404.28	1	4	0	0.013	38.0	0.0	2404.38	0.00	90.00	0.00

WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS

ELEMENT NO 9 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1203.71	2406.11	2	0.013	0.00	0.00	85.00	0

ELEMENT NO 10 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1204.71	2406.13	2	3	3	0.013	5.0	5.0	2411.23	2411.20	60.00	86.00

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 11 IS A REACH

U/S DATA	STATION	INVERT	SECT												
	1504.79	2413.58	2			N						RADIUS	ANGLE	ANG PT	MAN H
						0.013						0.00	0.00	0.00	1

ELEMENT NO 12 IS A REACH

U/S DATA	STATION	INVERT	SECT												
	1823.90	2421.50	2			N						RADIUS	ANGLE	ANG PT	MAN H
						0.013						0.00	0.00	0.00	0

ELEMENT NO 13 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2										
	1824.90	2421.52	2	3	3	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4			
						0.013	7.0	7.0	2426.62	2426.60	70.00	51.00			

ELEMENT NO 14 IS A REACH

U/S DATA	STATION	INVERT	SECT												
	2170.00	2430.07	2			N						RADIUS	ANGLE	ANG PT	MAN H
						0.013						0.00	0.00	0.00	1

ELEMENT NO 15 IS A REACH

U/S DATA	STATION	INVERT	SECT												
	2509.59	2438.53	2			N						RADIUS	ANGLE	ANG PT	MAN H
						0.013						0.00	0.00	0.00	0

ELEMENT NO 16 IS A SYSTEM HEADWORKS

U/S DATA	STATION	INVERT	SECT												
	2509.59	2438.53	2									W S ELEV			
												0.00			

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

LICENSEE: PARSONS BRINCKERHOFF

F0515P

WATER SURFACE PROFILE LISTING

ELKHORN SPRINGS AND BUFFALO STORM DRAIN SYSTEM - PROPOSED STORM DRAIN
PARSONS BRINCKERHOFF - PROJECT No. 31678A
FILE NAME: W:\31678A-ELKHORN\ENGR\DRAINAGE\WSPG\PROPOSED SD\PR.DAT

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
100.00	2393.00	5.890	2398.890	198.0	10.08	1.579	2400.469	0.00	4.019		5.00	0.00	0.00	0	0.00
218.77	0.00498					.005780	1.26			5.000			0.00		
318.77	2394.09	6.143	2400.233	198.0	10.08	1.579	2401.812	0.00	4.019		5.00	0.00	0.00	0	0.00
196.78	0.01248					.005780	1.14			3.025			0.00		
515.55	2396.55	5.155	2401.701	198.0	10.08	1.579	2403.280	0.00	4.019		5.00	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
515.55	2396.55	3.030	2399.576	198.0	15.91	3.929	2403.505	0.00	4.019		5.00	0.00	0.00	0	0.00
9.17	0.01248					.012421	0.11			3.025			0.00		
524.72	2396.66	3.030	2399.690	198.0	15.90	3.928	2403.618	0.00	4.019		5.00	0.00	0.00	0	0.00
154.24	0.01264					.012230	1.89			3.012			0.00		
678.96	2398.61	3.061	2401.671	198.0	15.71	3.834	2405.505	0.00	4.019		5.00	0.00	0.00	0	0.00
241.49	0.01227					.011376	2.75			3.042			0.00		
920.45	2401.57	3.184	2404.757	198.0	15.00	3.495	2408.252	0.00	4.019		5.00	0.00	0.00	0	0.00
84.69	0.01227					.010112	0.86			3.042			0.00		
1005.14	2402.61	3.319	2405.931	198.0	14.31	3.178	2409.109	0.00	4.019		5.00	0.00	0.00	0	0.00
43.82	0.01227					.008992	0.39			3.042			0.00		
1048.96	2403.15	3.464	2406.614	198.0	13.64	2.889	2409.503	0.00	4.019		5.00	0.00	0.00	0	0.00
JUNCT STR	0.01000					.009170	0.01						0.00		
1049.96	2403.16	3.230	2406.390	194.0	14.46	3.247	2409.637	0.00	3.981		5.00	0.00	0.00	0	0.00
27.16	0.01352					.009494	0.26			2.909			0.00		
1077.12	2403.53	3.321	2406.848	194.0	14.01	3.047	2409.895	0.00	3.981		5.00	0.00	0.00	0	0.00
26.92	0.01352					.008618	0.23			2.909			0.00		

STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
1104.04	2403.89	3.466	2407.357	194.0	13.36	2.770	2410.127	0.00	3.981	5.00	0.00	0.00	0	0.00
16.41	0.01352					.007684	0.13		2.909			0.00		
1120.45	2404.11	3.622	2407.735	194.0	12.73	2.518	2410.253	0.00	3.981	5.00	0.00	0.00	0	0.00
8.86	0.01352					.006876	0.06		2.909			0.00		
1129.31	2404.23	3.792	2408.025	194.0	12.14	2.289	2410.314	0.00	3.981	5.00	0.00	0.00	0	0.00
2.75	0.01352					.006182	0.02		2.909			0.00		
1132.06	2404.27	3.981	2408.251	194.0	11.57	2.080	2410.331	0.00	3.981	5.00	0.00	0.00	0	0.00
JUNCT STR	0.01000					.004725	0.00					0.00		
1133.06	2404.28	5.692	2409.972	156.0	12.41	2.393	2412.365	0.00	3.640	4.00	0.00	0.00	0	0.00
70.65	0.02590					.011794	0.83		2.406			0.00		
1203.71	2406.11	5.367	2411.477	156.0	12.41	2.393	2413.870	0.00	3.640	4.00	0.00	0.00	0	0.00
JUNCT STR	0.02000					.011062	0.01					0.00		
1204.71	2406.13	5.952	2412.082	146.0	11.62	2.096	2414.178	0.00	3.563	4.00	0.00	0.00	0	0.00
45.15	0.02483					.010331	0.47		2.337			0.00		
1249.86	2407.25	5.314	2412.565	146.0	11.62	2.096	2414.661	0.00	3.563	4.00	0.00	0.00	0	0.00
HYDRAULIC JUMP														
1249.86	2407.25	2.341	2409.592	146.0	19.10	5.668	2415.260	0.00	3.563	4.00	0.00	0.00	0	0.00
254.93	0.02483					.024282	6.19		2.337			0.00		
1504.79	2413.58	2.368	2415.948	146.0	18.85	5.517	2421.465	0.00	3.563	4.00	0.00	0.00	0	0.00
130.94	0.02482					.023103	3.03		2.337			0.00		
1635.73	2416.83	2.418	2419.248	146.0	18.38	5.244	2424.492	0.00	3.563	4.00	0.00	0.00	0	0.00
100.64	0.02482					.021076	2.12		2.337			0.00		

LICENSEE: PARSONS BRINCKERHOFF

F0515P

WATER SURFACE PROFILE LISTING

ELKHORN SPRINGS AND BUFFALO STORM DRAIN SYSTEM - PROPOSED STORM DRAIN

PARSONS BRINCKERHOFF - PROJECT No. 31678A

FILE NAME: W:\31678A-ELKHORN\ENGR\DRAINAGE\WSPG\PROPOSED SD\PR.DAT

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1736.37	2419.33	2.518	2421.846	146.0	17.52	4.767	2426.613	0.00	3.563		4.00	0.00	0.00	0	0.00
53.41	0.02482					.018691	1.00			2.337			0.00		
1789.78	2420.65	2.624	2423.277	146.0	16.70	4.333	2427.610	0.00	3.563		4.00	0.00	0.00	0	0.00
34.12	0.02482					.016610	0.57			2.337			0.00		
1823.90	2421.50	2.738	2424.238	146.0	15.93	3.939	2428.177	0.00	3.563		4.00	0.00	0.00	0	0.00
JUNCT STR	0.02000					.020220	0.02						0.00		
1824.90	2421.52	2.195	2423.715	132.0	18.69	5.425	2429.140	0.00	3.433		4.00	0.00	0.00	0	0.00
53.20	0.02477					.024798	1.32			2.195			0.00		
1878.10	2422.84	2.195	2425.033	132.0	18.69	5.425	2430.458	0.00	3.433		4.00	0.00	0.00	0	0.00
291.90	0.02477					.024250	7.08			2.195			0.00		
2170.00	2430.07	2.226	2432.296	132.0	18.37	5.241	2437.537	0.00	3.433		4.00	0.00	0.00	0	0.00
136.76	0.02491					.022549	3.08			2.191			0.00		
2306.76	2433.48	2.298	2435.775	132.0	17.66	4.845	2440.620	0.00	3.433		4.00	0.00	0.00	0	0.00
73.13	0.02491					.020160	1.47			2.191			0.00		
2379.89	2435.30	2.391	2437.690	132.0	16.84	4.405	2442.095	0.00	3.433		4.00	0.00	0.00	0	0.00
42.77	0.02491					.017841	0.76			2.191			0.00		
2422.66	2436.36	2.489	2438.853	132.0	16.06	4.004	2442.857	0.00	3.433		4.00	0.00	0.00	0	0.00
28.58	0.02491					.015813	0.45			2.191			0.00		
2451.24	2437.08	2.593	2439.669	132.0	15.31	3.640	2443.309	0.00	3.433		4.00	0.00	0.00	0	0.00
20.23	0.02491					.014042	0.28			2.191			0.00		
2471.47	2437.58	2.704	2440.284	132.0	14.60	3.309	2443.593	0.00	3.433		4.00	0.00	0.00	0	0.00
14.65	0.02491					.012497	0.18			2.191			0.00		

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
2486.12	2437.95	2.823	2440.768	132.0	13.92	3.009	2443.777	0.00	3.433		4.00	0.00	0.00	0	0.00
10.43	0.02491					.011159	0.12			2.191			0.00		
2496.55	2438.20	2.953	2441.158	132.0	13.27	2.735	2443.893	0.00	3.433		4.00	0.00	0.00	0	0.00
7.22	0.02491					.010006	0.07			2.191			0.00		
2503.77	2438.39	3.094	2441.479	132.0	12.65	2.486	2443.965	0.00	3.433		4.00	0.00	0.00	0	0.00
4.35	0.02491					.009021	0.04			2.191			0.00		
2508.12	2438.49	3.251	2441.744	132.0	12.06	2.260	2444.004	0.00	3.433		4.00	0.00	0.00	0	0.00
1.47	0.02491					.008206	0.01			2.191			0.00		
2509.59	2438.53	3.433	2441.963	132.0	11.50	2.054	2444.017	0.00	3.433		4.00	0.00	0.00	0	0.00

WSPG CALCULATIONS
OUTLET PIPE- Q80

DATE: 6/26/2008
TIME: 16:51

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	4			2.25														
CD	2	4			5.00														

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

ELKHORN SPRINGS AND BUFFALO DRIVE SD

HEADING LINE NO 2 IS -

FILE NAME: K:\31678A-Elkhorn\Engr\Drainage\WSPG\Outlet pipe\Q80

HEADING LINE NO 3 IS -

PB-LAS VEGAS

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	100.00	2378.85	2	2383.79

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	234.86	2378.87	2	0.013	0.00	0.00	0.01	0

ELEMENT NO 3 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	724.86	2379.51	2	0.013	0.00	0.00	0.01	0

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1008.83	2379.88	2	0.013	0.00	0.00	0.01	0

ELEMENT NO 5 IS A TRANSITION * * *

U/S DATA	STATION	INVERT	SECT	N
	1009.83	2379.89	1	0.013

ELEMENT NO 6 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1170.63	2380.29	1	0.013	0.00	0.00	0.00	0

ELEMENT NO 7 IS A SYSTEM HEADWORKS *

U/S DATA	STATION	INVERT	SECT	*	W S ELEV
	1170.63	2380.29	1		0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

LICENSEE: PARSONS BRINCKERHOFF

F0515P

WATER SURFACE PROFILE LISTING

ELKHORN SPRINGS AND BUFFALO DRIVE SD

FILE NAME: K:\31678A-Elkhorn\Engr\Drainage\WSPG\Outlet pipe\Q80

PB-LAS VEGAS

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
100.00	2378.85	4.940	2383.790	80.0	4.08	0.259	2384.049	0.00	2.533		5.00	0.00	0.00	0	0.00
78.51	0.00015					.000898	0.07			5.000			0.00		
178.51	2378.86	5.000	2383.862	80.0	4.07	0.258	2384.120	0.00	2.533		5.00	0.00	0.00	0	0.00
56.35	0.00015					.000938	0.05			5.000			0.00		
234.86	2378.87	5.045	2383.915	80.0	4.07	0.258	2384.173	0.00	2.533		5.00	0.00	0.00	0	0.00
123.60	0.00131					.000938	0.12			3.541			0.00		
358.46	2379.03	5.000	2384.031	80.0	4.07	0.258	2384.289	0.00	2.533		5.00	0.00	0.00	0	0.00
366.40	0.00131					.000880	0.32			3.541			0.00		
724.86	2379.51	4.838	2384.348	80.0	4.11	0.263	2384.611	0.00	2.533		5.00	0.00	0.00	0	0.00
275.20	0.00130					.000821	0.23			3.544			0.00		
1000.06	2379.87	4.699	2384.568	80.0	4.18	0.271	2384.839	0.00	2.533		5.00	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
1000.06	2379.87	1.253	2381.122	80.0	20.77	6.701	2387.823	0.00	2.533		5.00	0.00	0.00	0	0.00
8.77	0.00130					.052328	0.46			3.544			0.00		
1008.83	2379.88	1.223	2381.103	80.0	21.49	7.170	2388.273	0.00	2.533		5.00	0.00	0.00	0	0.00
TRANS STR	0.01000					.058788	0.06						0.00		
1009.83	2379.89	2.239	2382.129	80.0	20.13	6.293	2388.422	0.00	2.239		2.25	0.00	0.00	0	0.00
0.06	0.00249					.064223	0.00			2.250			0.00		
1009.89	2379.89	2.250	2382.140	80.0	20.12	6.286	2388.426	0.00	2.239		2.25	0.00	0.00	0	0.00
160.74	0.00249					.066130	10.63			2.250			0.00		
1170.63	2380.29	12.576	2392.866	80.0	20.12	6.286	2399.152	0.00	2.239		2.25	0.00	0.00	0	0.00

	Depth	(IN)	ACP (SF) 6	(SF) 3	TOTAL	OPEN-GRADE (SF) 0.75	OVERLAY (SF) 0.75	AB (SF) 6	(SF) 13	(SF) 23	(SF) 25	(SF) 26	TOTAL	EARTHWORK Cut (CY)	Fill (CY)
"F"	Begin	113+00	36540			36540						36540		2815	180
	113+00	115+00	27960			27960						27960		2796	267
	115+00	119+00	57825			57825						58845		5160	450
	119+00	123+00	49165			49165					49165			24876	320
	123+00	133+00	45965			45965					45965				
			49360			49360					49360				
	133+00	135+18	10050			10050					10050				
			10010			10010					10010				
	135+18	End	26775						26775					173	20582
			36420						36420						
FR1			10275			10275					10275			903	85
FR2			20660			20660					20660			2785	35
LM-S			485			485	29405			485				333	15
			3855			3855	19055			3855					
			765			765				765					
			1180			1180				1180					
LM-N			3675			3675	35540			3675				1009	0
			7630			7630				7630					
			2125			2125				2125					
J			2215			2215				2215					
			2580			2580					2580				
MC			115			115					115				
			1680			1680					1680				
ME			260			260					260				
				2670		2670		2670							
Access				7385		7385		7385							
Other				5590		5590								2985	6300
														300	300
		(SF)	407670	15645		360120	84000	10055	63195	22030	200120	123345			
		(SY)				40013	9333								
		(FT)	0.5	0.25		0.0625		0.50	1.08	1.92	2.08	2.17			
		(CF)	203835	3911.25		22507.5		5028	68461	42224	416917	267248			
		(CY)	7549	145		834		186	2536	1564	15441	9898		44135	28534
Conversion Factor		(TON/CY)	1.957	1.957		1.957									
Conversion Factor		(LB/CF)						138	138	138	138	138			
Conversion Factor		(LB/TON)						2000	2000	2000	2000	2000			
		(SY)					9333	693795	9447653	5826935	57534500	36880155			
		(CY)						346.9	4723.83	2913.468	28767.25	18440.08			
		(TON)	14774	285	15058	1634		346.9	4723.83	2913.468	28767.25	18440.08	55192	44135	28534
TOTAL (ROUNDED)					15100	1635	9335						55200	44160	28550

33592 906984

2312.8 662581.9

WSPG CALCULATIONS
OUTLET PIPE Q-137

TRANS STR	0.01000					.008949	0.01									
													0.00			
1009.83	2379.89	3.808	2383.698	80.0	9.41	1.375	2385.073	0.00	2.250		2.25	5.00	0.00	1	1.00	
160.80	0.00249					.017083	2.75			2.250						
													0.00			
1170.63	2380.29	6.155	2386.445	80.0	9.41	1.375	2387.820	0.00	2.250		2.25	5.00	0.00	1	1.00	

LICENSEE: PARSONS BRINCKERHOFF

F0515P

WATER SURFACE PROFILE LISTING

ELKHORN SPRINGS AND BUFFALO DRIVE SD

FILE NAME: K:\31678A-Elkhorn\Engr\Drainage\WSPG\Outlet pipe\Q80

PB-LAS VEGAS

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
100.00	2378.85	4.940	2383.790	80.0	4.08	0.259	2384.049	0.00	2.533	5.00	0.00	0.00	0	0.00
78.51	0.00015					.000898	0.07		5.000			0.00		
178.51	2378.86	5.000	2383.862	80.0	4.07	0.258	2384.120	0.00	2.533	5.00	0.00	0.00	0	0.00
56.35	0.00015					.000938	0.05		5.000			0.00		
234.86	2378.87	5.045	2383.915	80.0	4.07	0.258	2384.173	0.00	2.533	5.00	0.00	0.00	0	0.00
123.60	0.00131					.000938	0.12		3.541			0.00		
358.46	2379.03	5.000	2384.031	80.0	4.07	0.258	2384.289	0.00	2.533	5.00	0.00	0.00	0	0.00
366.40	0.00131					.000880	0.32		3.541			0.00		
724.86	2379.51	4.838	2384.348	80.0	4.11	0.263	2384.611	0.00	2.533	5.00	0.00	0.00	0	0.00
283.97	0.00130					.000821	0.23		3.544			0.00		
1008.83	2379.88	4.693	2384.573	80.0	4.18	0.271	2384.844	0.00	2.533	5.00	0.00	0.00	0	0.00

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	100.00	2378.85	2	2383.79

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	234.86	2378.87	2	0.013	0.00	0.00	0.01	0

ELEMENT NO 3 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	724.86	2379.51	2	0.013	0.00	0.00	0.01	0

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1008.83	2379.88	2	0.013	0.00	0.00	0.01	0

ELEMENT NO 5 IS A TRANSITION * * *

U/S DATA	STATION	INVERT	SECT	N
	1009.83	2379.89	1	0.013

ELEMENT NO 6 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1170.63	2380.29	1	0.013	0.00	0.00	0.00	0

ELEMENT NO 7 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1170.63	2380.29	1	0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

«
DATE: 6/23/2008

TIME: 11:39

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	3	1	1.00	2.25	5.00	0.00	0.00	0.00										
CD	2	4			5.00														

F 0 5 1 5 P

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

ELKHORN SPRINGS AND BUFFALO DRIVE SD

HEADING LINE NO 2 IS -

FILE NAME: K:\31678A-Elkhorn\Engr\Drainage\WSPG\Outlet pipe\Q80

HEADING LINE NO 3 IS -

PB-LAS VEGAS

WSPG CALCULATIONS
OUTLET PIPE- Q152

DATE: 6/26/2008
TIME: 16:53

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	3	1	1.00	2.25	5.00	0.00	0.00	0.00										
CD	2	4			5.00														

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

ELKHORN SPRINGS AND BUFFALO DRIVE SD

HEADING LINE NO 2 IS -

FILE NAME: K:\31678A-Elkhorn\Engr\Drainage\WSPG\Outlet pipe\Q152

HEADING LINE NO 3 IS -

PB-LAS VEGAS

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT
	100.00	2378.85	2

W S ELEV
2384.44

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N
	234.86	2378.87	2	0.013

RADIUS	ANGLE	ANG PT	MAN H
0.00	0.00	0.01	0

ELEMENT NO 3 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N
	724.86	2379.51	2	0.013

RADIUS	ANGLE	ANG PT	MAN H
0.00	0.00	0.01	0

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N
	1008.83	2379.88	2	0.013

RADIUS	ANGLE	ANG PT	MAN H
0.00	0.00	0.01	0

ELEMENT NO 5 IS A TRANSITION * * *

U/S DATA	STATION	INVERT	SECT	N
	1009.83	2379.89	1	0.013

ELEMENT NO 6 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N
	1170.63	2380.29	1	0.013

RADIUS	ANGLE	ANG PT	MAN H
0.00	0.00	0.00	0

ELEMENT NO 7 IS A SYSTEM HEADWORKS *

U/S DATA	STATION	INVERT	SECT
	1170.63	2380.29	1

*

W S ELEV
0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

LICENSEE: PARSONS BRINCKERHOFF

F0515P

WATER SURFACE PROFILE LISTING

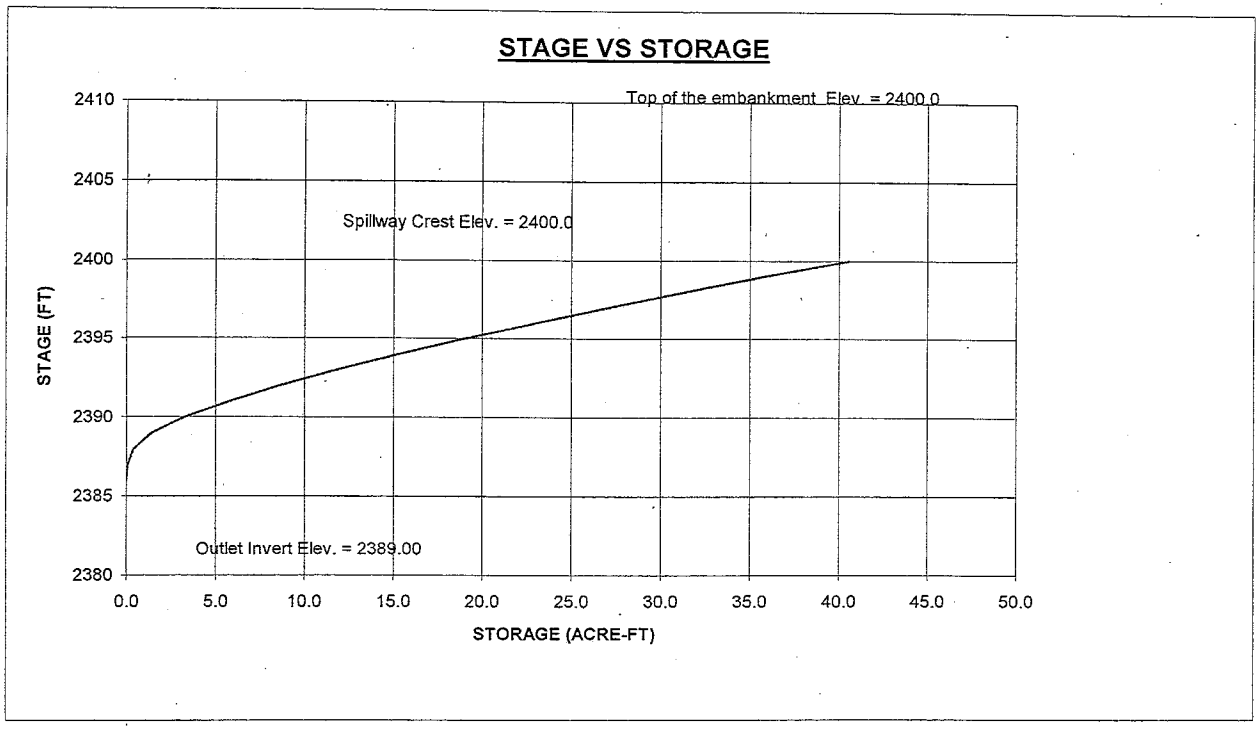
ELKHORN SPRINGS AND BUFFALO DRIVE SD
FILE NAME: K:\31678A-Elkhorn\Engr\Drainage\WSPG\Outlet pipe\Q152
PB-LAS VEGAS

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
100.00	2378.85	5.590	2384.440	152.0	7.74	0.931	2385.371	0.00	3.535		5.00	0.00	0.00	0	0.00
134.86	0.00015					.003406	0.46			5.000			0.00		
234.86	2378.87	6.029	2384.899	152.0	7.74	0.931	2385.830	0.00	3.535		5.00	0.00	0.00	0	0.00
490.00	0.00131					.003406	1.67			5.000			0.00		
724.86	2379.51	7.058	2386.568	152.0	7.74	0.931	2387.499	0.00	3.535		5.00	0.00	0.00	0	0.00
283.97	0.00130					.003406	0.97			5.000			0.00		
1008.83	2379.88	7.656	2387.536	152.0	7.74	0.931	2388.467	0.00	3.535		5.00	0.00	0.00	0	0.00
TRANS STR	0.01000					.032538	0.03						0.00		
1009.83	2379.89	4.450	2384.340	152.0	17.88	4.966	2389.306	0.00	2.250		2.25	5.00	0.00	1	1.00
160.80	0.00249					.061670	9.92			2.250			0.00		
1170.63	2380.29	13.967	2394.257	152.0	17.88	4.966	2399.223	0.00	2.250		2.25	5.00	0.00	1	1.00

STAGE VS STORAGE

ELKHORN SPRINGS DETENTION BASIN

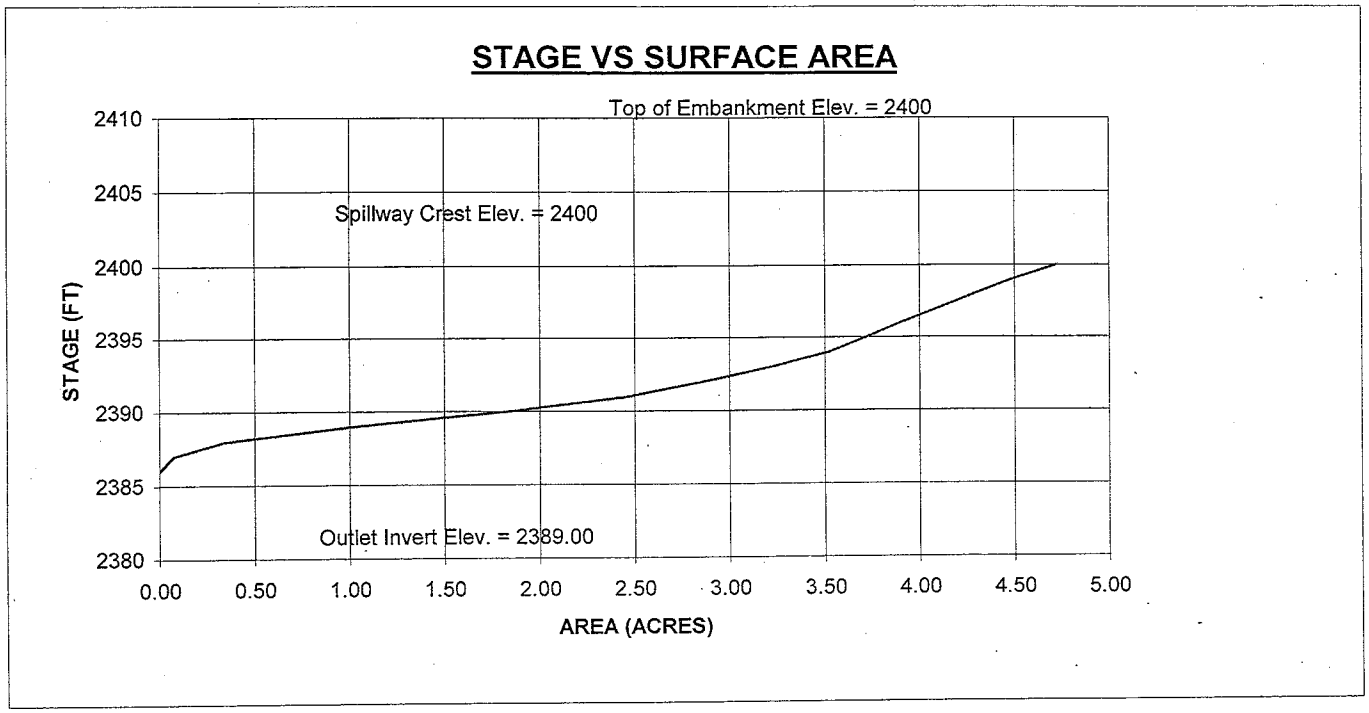
Project #:	31678A
Made by:	SK
Date:	06/02/08
Checked by:	EH
Date:	06/27/08



STAGE VS SURFACE AREA

ELKHORN SPRINGS DETENTION BASIN

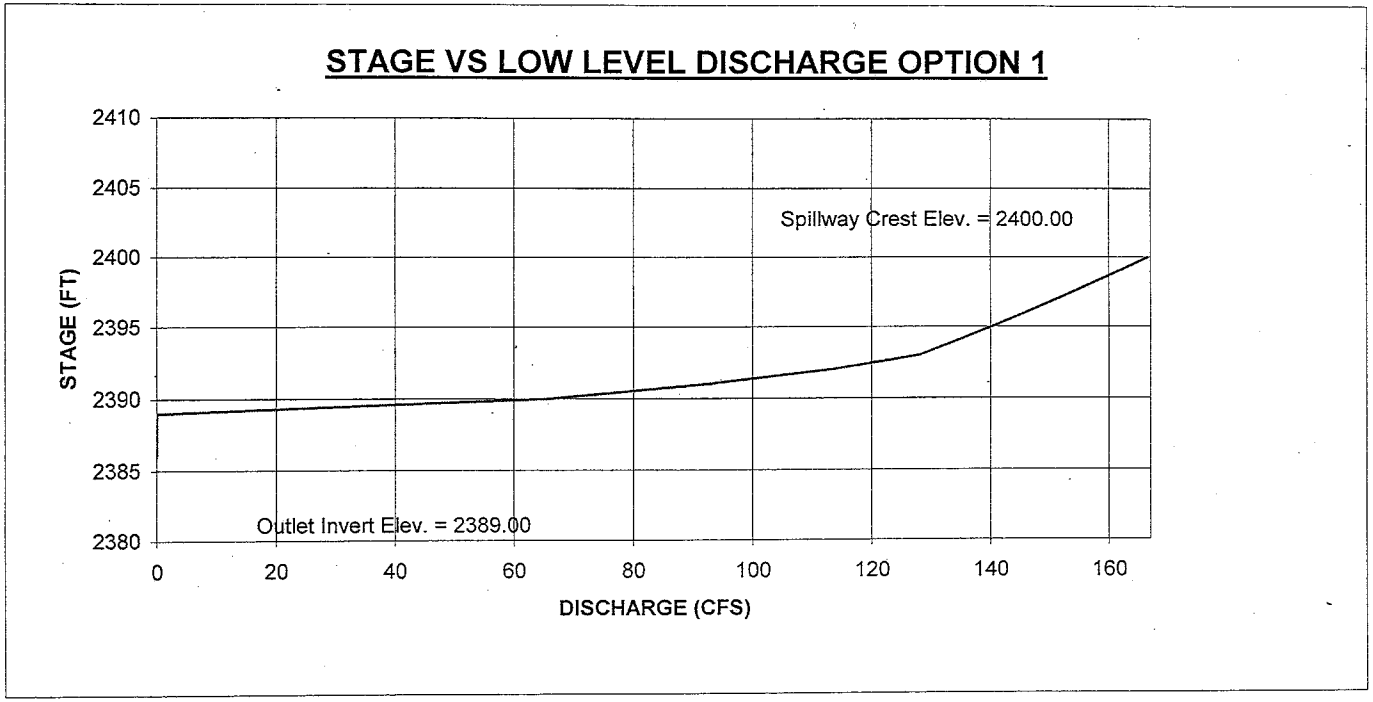
Project #:	31678A
Made by:	SK
Date:	06/02/08
Checked by:	EH
Date:	06/27/08



STAGE VS LOW LEVEL DISCHARGE
OPTION 1

ELKHORN SPRINGS DETENTION BASIN

Project #:	31678A
Made by:	SK
Date:	06/02/08
Checked by:	EH
Date:	06/27/08

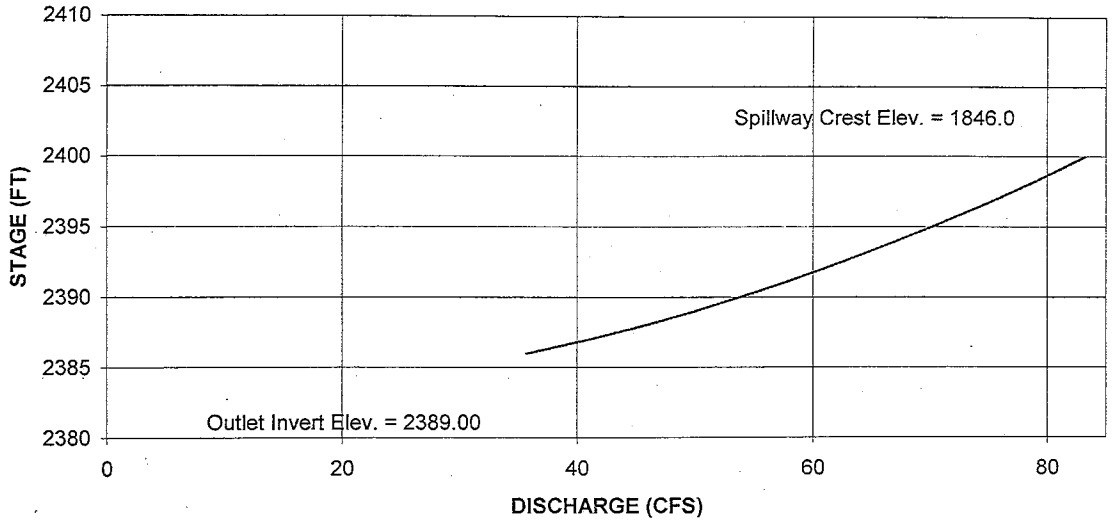


STAGE VS LOW LEVEL STORAGE
OPTION 2

ELKHORN SPRINGS DETENTION BASIN

Project #:	31678A
Made by:	SK
Date:	06/02/08
Checked by:	EH
Date:	06/27/08

STAGE VS LOW LEVEL DISCHARGE OPTION 2



VOLUME AND DISCHARGE TABLES

ELKHORN SPRINGS DETENTION BASIN

Project #:	31678A
Made by:	SK
Date:	06/02/08
Checked by:	EH
Date:	06/27/08

VOLUME AND DISCHARGE TABLES

Based on the Survey received 5/28/08

Orifice 1: Outlet Pipe Diameter = 48 inches, 1 pipe

Orifice 2: Outlet Pipe Diameter = 27 inches, 2 pipes

ORIFICE COE.= 0.65

	ELEVATION FT	AREA Acre	AVERAGE AREA Acre	VOLUME Ac-ft	CUMULATIVE VOLUME Ac-ft	Orifice 1	Orifice 2	Low Level Outlet Discharge Rate CFS	1 - 27 inch low level Outlet release rate
1,883.04	2386	0.04	0.00	0.00	0.00	0.00	71.35	0.00	35.68
4,273.79	2387	0.10	0.07	0.07	0.07	0.00	81.90	0.00	40.95
24,997.51	2388	0.57	0.34	0.34	0.41	0.00	91.24	0.00	45.62
62,767.19	2389	1.44	1.01	1.01	1.41	0.00	99.70	0.00	49.85
96,681.58	2390	2.22	1.83	1.83	3.24	65.55	107.50	65.55	53.75
117,726.95	2391	2.70	2.46	2.46	5.71	92.70	114.77	92.70	57.39
131,793.42	2392	3.03	2.86	2.86	8.57	113.53	121.61	113.53	60.81
149,264.47	2393	3.43	3.23	3.23	11.80	131.10	128.09	128.09	64.04
157,775.75	2394	3.62	3.52	3.52	15.32	146.57	134.25	134.25	67.12
165,745.63	2395	3.80	3.71	3.71	19.03	160.56	140.14	140.14	70.07
174,038.31	2396	4.00	3.90	3.90	22.93	173.43	145.79	145.79	72.90
182,421.64	2397	4.19	4.09	4.09	27.03	185.40	151.23	151.23	75.62
190,974.59	2398	4.38	4.29	4.29	31.31	196.65	156.49	156.49	78.24
200,160.24	2399	4.60	4.49	4.49	35.80	207.28	161.57	161.57	80.78
211,098.69	2400	4.85	4.72	4.72	40.52	217.40	166.49	166.49	83.25

AS-BUILTS

- Table 1: Drainage Study Data Collection
- Table 2: Utility Matrix
- As-Builts
  - 18" Storm Drain System in Buffalo Drive and Storm Drain at Detention Basin Outlet
  - 36" HDPE Storm Drain System in Buffalo Drive North of Farm Road
  - 36" HDPE Storm Drain System in Farm Road

PLANS AND PROFILES

- Proposed Plan and Profile Sheets

TABLE 1

DRAINAGE STUDY DATA COLLECTION

CONSTRUCTION SCHEDULE/ GEOTECHNICAL REPORT

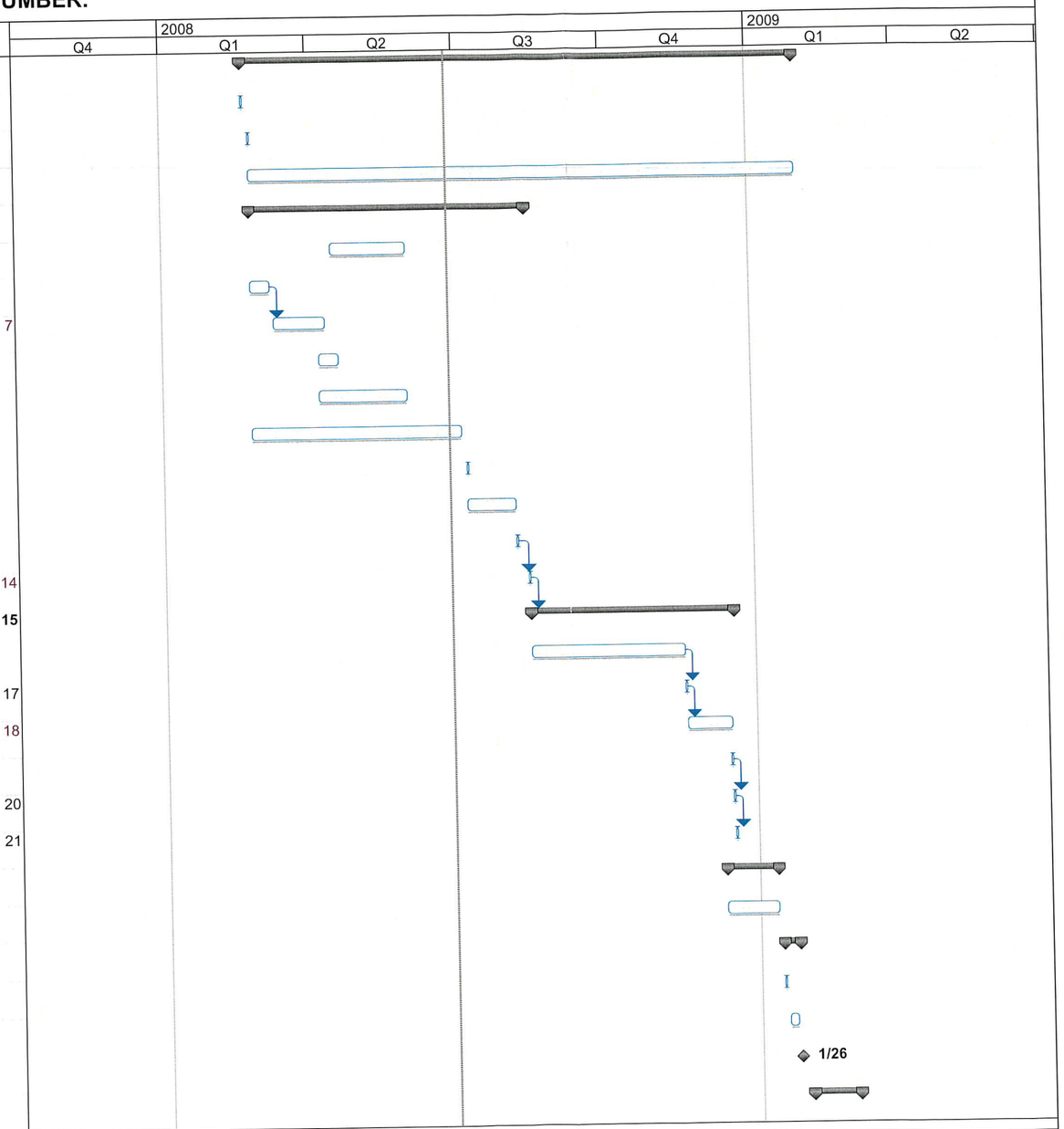
- Construction Schedule
- Geotechnical Engineering Report

CONSTRUCTION SCHEDULE

GEOTECHNICAL ENGINEERING REPORT

GENERAL PERFORMANCE SCHEDULE FOR Elkhorn Springs and Buffalo Storm Drain Project
EXHIBIT E
CONTRACT NUMBER:

ID	Task Name	Duration	Start	Finish	Predecessors
1	**PRELIMINARY/GENERAL ITEMS**	**247 days**	**Thu 2/21/08**	**Fri 1/30/09**	
2	KICK OFF MEETING	1 day	Thu 2/21/08	Thu 2/21/08	
3	NOTICE TO PROCEED	1 day	Mon 2/25/08	Mon 2/25/08	
4	UTILITY AND AGENCY COORDINATION, PROGRESS MEETING	245 days	Mon 2/25/08	Fri 1/30/09	
5	**30% DESIGN PHASE**	**123 days**	**Mon 2/25/08**	**Wed 8/13/08**	
6	CONTROL AND DESIGN SURVEY (PROVIDE BY CLV)	34 days	Tue 4/15/08	Fri 5/30/08	
7	RECORD REVIEW, INFORMATION RESEARCH AND DATA ANALYSIS	10 days	Mon 2/25/08	Fri 3/7/08	
8	FACILITY ALTERNATIVE ANALYSIS	24 days	Mon 3/10/08	Thu 4/10/08	7
9	STREET REHABILITATION	10 days	Mon 4/7/08	Fri 4/18/08	
10	GEPTECHNICAL INVESTIGATION	40 days	Mon 4/7/08	Fri 5/30/08	
11	PRELIMINARY DRAINAGE STUDY	94 days	Mon 2/25/08	Thu 7/3/08	
12	30% SUBMITTAL	1 day	Mon 7/7/08	Mon 7/7/08	
13	CLV/CCRFCD 30% REVIEW	22 days	Mon 7/7/08	Tue 8/5/08	
14	30% REVIEW MEETING	1 day	Wed 8/6/08	Wed 8/6/08	
15	RETURN 30% COMMENTS TO CONSULTANT	1 day	Wed 8/13/08	Wed 8/13/08	14
16	**90% DESIGN PHASE**	**91 days**	**Thu 8/14/08**	**Thu 12/18/08**	**15**
17	FINAL DESIGN REPORT/90% PLAN	68 days	Thu 8/14/08	Mon 11/17/08	
18	90% SUBMITTAL	1 day	Tue 11/18/08	Tue 11/18/08	17
19	CLV REVIEW OF 90% SUBMITTAL	20 days	Wed 11/19/08	Tue 12/16/08	18
20	90% WALK THROUGH	1 day	Tue 12/16/08	Tue 12/16/08	
21	BIDABILITY AND CONSTRUCTABILITY MEETING WITH CONSULTANT AN	1 day	Wed 12/17/08	Wed 12/17/08	20
22	PROJECT PRESENTATION	1 day	Thu 12/18/08	Thu 12/18/08	21
23	**100% DESIGN PHASE**	**22 days**	**Fri 12/12/08**	**Mon 1/12/09**	
24	100% MYLAR SUBMITTAL	22 days	Fri 12/12/08	Mon 1/12/09	
25	**BID PHASE**	**6 days**	**Fri 1/16/09**	**Mon 1/26/09**	
26	PRE-BID CONFERENCE	**1 day**	**Fri 1/16/09**	**Fri 1/16/09**	
27	BID REQUESTS AND RESPONSES	5 days	Mon 1/19/09	Fri 1/23/09	
28	BID OPENING	**0 days**	**Mon 1/26/09**	**Mon 1/26/09**	
29	**CONSTRUCTION PHASE**	**21 days**	**Mon 2/2/09**	**Mon 3/2/09**	



Project: HANSEN NUMBER: PROJEC
Date: Thu 6/26/08

Task
Split
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Split
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary
External Milestone
Deadline

GEOTECHNICAL ENGINEERING REPORT

PROPOSED ELKHORN SPRINGS AND BUFFALO STORM DRAIN
BUFFALO DRIVE AND FARM ROAD
LAS VEGAS, NEVADA

Project No. 64085015
May 21, 2008

Prepared for:

PARSONS BRINCKERHOFF
3930 HOWARD HUGHES PARKWAY, SUITE 300
LAS VEGAS, NEVADA 89169

Prepared by:

TERRACON CONSULTANTS, INC.
750 PILOT ROAD, SUITE F
LAS VEGAS, NEVADA 89119
Phone: (702) 597-9393
Fax: (702) 597-9009

Terracon

May 21, 2008

Terracon

Consulting Engineers & Scientists

Terracon Consultants, Inc.
750 Pilot Road, Suite F
Las Vegas, Nevada 89119
Phone 702.597.9393
Fax 702.597.9009
www.terracon.com

Parsons Brinckerhoff
3930 Howard Hughes Parkway, Suite 300
Las Vegas, Nevada 89169

Attention: Mr. Shou-Ching "Eric" Hsu, P.E.

Subject: **Geotechnical Engineering Report**
Proposed Elkhorn Springs and Buffalo Storm Drain
Buffalo Drive and Farm Road
Las Vegas, Nevada
Terracon Project No. 64085015

Dear Mr. Hsu:

In accordance with your request, Terracon Consultants, Inc. has conducted a geotechnical engineering study for the proposed Elkhorn Springs and Buffalo Storm Drain project. The accompanying geotechnical engineering report presents the results of our subsurface explorations and laboratory testing, and provides recommendations for design and construction of the project. The boring location diagram (Site and Exploration Plan) and individual boring logs are enclosed with this report.

We appreciate the opportunity to be of service to you in this phase of the project and look forward to assisting you during the construction phase. If you have any questions concerning this report, or if we may be of further service to you, please contact us.

Sincerely,
TERRACON CONSULTANTS, INC

for

Segu I. Ifham, P.E.
Geotechnical Engineer

PROFESSIONAL ENGINEER-STATE OF NEVADA
LESLAW C. BANAS
No. 17918
CIVIL
12-31-08
5/21/2008

Les C. Banas, P.E.
Geotechnical Department Manager

Keith M. Kosar, PhD, P.E.
Regional Manager

TABLE OF CONTENTS

INTRODUCTION 1

PROJECT DESCRIPTION 1

SITE EXPLORATION PROCEDURES 2

Field Exploration 2

Laboratory Testing 3

GEOLOGIC INFORMATION 4

SITE CONDITIONS 5

SUBSURFACE CONDITIONS 5

CONCLUSIONS AND RECOMMENDATIONS 6

Geotechnical Considerations 6

Foundations for Manholes and Junction Structures 7

Storm Drain and RCB Design Parameters 7

Seismic Considerations 8

Temporary Excavation Support 9

Dewatering 10

Subgrade Preparation and Pipe Bedding 10

Trench Backfill and Compaction 11

Level of Inspection 12

Earthwork 12

Site Clearing 12

Excavation 12

Overexcavation 13

Fill Placement and Compaction 13

Pavement Recommendations 14

Corrosivity 15

GENERAL COMMENTS 15

Figure No.

Vicinity Map 1

Site and Exploration Plan 2

APPENDIX A

	Plate No.
General Notes	i
Boring Logs	A-1 through A-10

APPENDIX B

Gradation and Atterberg Limits Test Results	B-1
Chemical Test Results	B-2

GEOTECHNICAL ENGINEERING REPORT
PROPOSED ELKHORN SPRINGS AND BUFFALO STORM DRAIN
BUFFALO DRIVE AND FARM ROAD
LAS VEGAS, NEVADA

Project No. 64085015

May 21, 2008

INTRODUCTION

This report presents the results of our geotechnical engineering study performed for the proposed Elkhorn Springs and Buffalo Storm Drain project. The project alignment is located along both Buffalo Drive and Farm Road in the jurisdiction of the City of Las Vegas, Nevada. The general location of the project alignment is shown on Figure 1, Vicinity Map.

The purpose of our services was to provide information and geotechnical engineering recommendations relative to:

- General geology of the area;
- Subsurface soil and groundwater conditions;
- Foundation design for junction structures;
- Trench excavation and lateral support;
- Subgrade preparation;
- Bedding, pipe zone, and trench backfill;
- Fill materials and their compaction;
- Construction dewatering;
- Earthwork requirements; and
- Temporary pavement construction.

The purpose of this report is to describe the subsurface conditions encountered in the borings, analyze and evaluate test data, and provide geotechnical engineering recommendations for the project. The scope of our services did not include any environmental assessment or investigation for the presence or absence of hazardous or toxic material in structures, surface water, groundwater, or air, below or around this site.

PROJECT DESCRIPTION

It is our understanding that the project consists of installing an approximately 1,100-foot long storm drain system along the center lines of Buffalo Drive and Farm Road connecting to the existing Elkhorn Springs Detention Basin. The project entails a storm drain collection system and improvements to the existing detention basin at the connecting location, appurtenant collection, and inlet facilities.

The project also includes reconstruction and rehabilitation of Buffalo Drive between Donald Nelson Drive and Elkhorn Springs Detention Basin to urban standards and project-affected roadway intersections to pre-construction conditions. However, no traffic study is required for the roadway reconstruction. The City of Las Vegas has jurisdiction over all project-affected roadways.

At the time of preparation of this report, no specific information on the proposed storm drain has been provided to us. For the purpose of this study, we assumed that the storm drain invert elevations would be within a range of depths of 15 to 20 feet below existing grades. Therefore, the depths of soil exploration were limited to 20 feet, assuming the invert elevations will be within 15 to 20 feet below existing grades. It is assumed that the storm drain pipes/boxes to be installed are similar to reinforced concrete boxes (RCB) and cast-in-place concrete junction structures will be constructed to facilitate size transitions of the pipes and for the confluence of drainage.

SITE EXPLORATION PROCEDURES

Field Exploration

The scope of our services for this project included a subsurface exploration program that consisted of drilling and sampling 5 borings to a depth of approximately 20 feet below existing grades.

The borings were drilled on April 16, 2008 using a truck-mounted auger-type drill rig (Diedrich D-120) with a 6-inch diameter continuous flight auger. Penetration tests were performed using standard and non-standard procedures. The penetration values were reported as the number of blows required to advance the sampler 12 inches using a 140-pound hammer free falling 30 inches. The test refusal criterion of 50 blows for less than 6 inches of penetration was used during field explorations. The reported blow counts should be carefully checked to verify the type of penetration test performed, and should not be considered standard penetration test (SPT) N-values, unless SPT was performed at the corresponding depths.

Soil samples were generally obtained at 2½- and 5-foot intervals to aid in material classification and for laboratory testing. Sampling was performed using 2-inch O.D. standard split spoon samplers and 3½-inch O.D. diameter ring-lined barrel samplers. The purpose of ring-lined sampling was to retrieve samples for expansion tests. Bulk samples were collected in moisture-tight bags for index property tests.

The borings were logged during drilling by Terracon field personnel. The logs of the borings are presented on Plates A-1 through A-10 in Appendix A. A key to the terms used on the boring logs is presented on Plate A-i, General Notes.

The borings were located on or close to the center lane of the roadways. The approximate locations of the borings are shown on Figures 2, *Site and Exploration Plan*. The locations of the borings were determined in the field by measuring from existing features and improvements. The surface elevations at the boring locations were obtained from a computer program *Google Earth* that does not warrantee greater accuracy. The locations and elevations of the borings should be considered accurate only to the degree implied by the method used.

The thicknesses of asphalt concrete and aggregate base course section were measured to the closest ½-inch and 1-inch, respectively.

Laboratory Testing

Laboratory tests were conducted on selected representative soil samples to characterize relevant physical and engineering properties of the on-site soils. The test results are presented in Appendix B of this report.

Moisture content and density tests were performed as part of our laboratory program, and the test results are presented on the boring logs at the corresponding sampling depths.

Sieve analyses were performed to determine the grain-size distribution of the alignment soils and Atterberg limits tests were performed to determine the liquid and plastic limits of the soils. These tests are generally used to assist in classification of soils, to determine soil consistency, to evaluate liquefaction potential of granular soils, and to provide correlations to engineering properties such as strength and compressibility. The test results are presented on Plate B-1 in Appendix B.

Expansion tests were carried out on representative samples from oven-dried moisture content to near saturated condition with a 60-psf-surcharge load. The test results are presented in Table 1 in Appendix B.

Atlas Consultants, Inc. performed chemical tests on representative soil samples. The tests were performed to determine the percentage of water-soluble sulfate and sodium sulfate present in the alignment soils. The test results indicate the soils to be potentially corrosive to concrete and to be chemically expansive. The chemical test results are presented in Table 2 in Appendix B.

The soil samples were classified in the laboratory based on visual observation, texture, plasticity, and the limited laboratory testing described above. The soil descriptions presented on the boring logs for native soils are in accordance with the Unified Soil Classification System (USCS). The group symbol for the USCS is also shown on the boring logs.

GEOLOGIC INFORMATION

The project alignment is located in the northwest portion of the Las Vegas Valley. This location places the site in an area underlain by Holocene age thick alluvial-fan deposits. According to a geologic map[1], the general vicinity of the project site is underlain by alluvium of active washes. Such alluvial deposits consisted of poorly to very poorly sorted pebble-cobble sandy gravel with layers of and lenses of reworked silt deposits. The alluvial-fan deposits are non-indurated and poorly to moderately stratified.

The nearest mapped fissure zone is located approximately 0.4 miles north[2] of the project site. The cumulative evidence indicates that fissures are the result of a subsurface erosional process. The erosional process occurs in tensional fractures at or near the surface in non-cemented, relatively fine-grained soils.

The nearest mapped fault scarp is located within approximately 400 feet of the project alignment[2]. This fault is mapped in north-south orientation lying mainly west of Buffalo Drive and a branch on east of Buffalo Drive. The origin of this fault is uncertain. One theory indicates the faults are a phenomena resulting from deep-seated differential consolidation of alluvial materials, with dissimilar grain size and compressibility characteristics, due to prehistoric large scale reductions in groundwater levels. Another theory is that they may have originated from tectonic processes and are part of a valley wide fault system. It is also possible that a combination of these factors could have resulted in these features. However, no historic earthquakes have been attributed to any compaction fault in the Las Vegas Valley.[3] No fissures were observed at the project site during our site reconnaissance program.

Numerous seismic events, most of which are a probable result of underground blasting at the Nevada Test Site (about 90 miles north of Las Vegas), have been felt in and around the Las Vegas area. There is a noticeable lack of earthquakes that have epicenters in the Southern Nevada area and are directly attributable to deep-seated tectonic movement. A few events recorded in the Henderson area and in Lincoln County registered between 5.0 and 6.0 magnitude on the Richter scale. Most of the recorded events in the area range between 4.0 and 4.9 magnitude.

---

[1] John W. Bell, Alan R. Ramelli, S. John Caskey, 1998, "Geologic Map of the Tule Springs Park Quadrangle, Nevada", Nevada Bureau of Mines and Geology.

[2] Bell, John W. and Jonathan G. Price, 1991, "Subsidence in Las Vegas Valley, 1980-91, Final Project Report", Nevada Bureau of Mines and Geology, Plate 2.

[3] Slemmons, Burt, 1990 "Earthquakes in Las Vegas", Address to first meeting of Southwestern Section of Association of Engineering Geologist, Las Vegas, Nevada, October 1990.

SITE CONDITIONS

At the time of our explorations, the project alignment was surrounded by numerous single- and multi-family residential structures. Buffalo drive was a six-lane, asphalt-paved, fully improved roadway. Farm Road was a four-lane, asphalt-paved, fully improved roadway. Elkhorn Springs Detention Basin was located on the east side of the southern tip of the project alignment. No special surface features such as faults and fissures were noticed during our field reconnaissance survey.

SUBSURFACE CONDITIONS

The project alignment consisted of two asphalt-paved roadways and their subsurface soils were overlain by asphalt concrete, aggregate base, and fill materials. The fill materials generally composed of sandy clay, clayey sand, and clayey gravel up to a depth of 7 feet below existing grades. Approximately 20 percent of soils encountered in the borings consisted of fill and aggregate base material. It should be noted that deeper and/or poorer quality fill could occur in other areas of the alignment beyond our explorations.

Approximate thicknesses of the asphalt concrete and aggregate base encountered during our exploration are presented in the table below.

BORING No.	APPROXIMATE THICKNESS (inch)	
	ASPHALT CONCRETE	AGGREGATE BASE
B-1	4.0	12.0
B-2	4.0	13.0
B-3	4.0	12.0
B-4	4.0	12.0
B-5	4.0	12.0

The native soils beneath the alignment generally consisted of interstratified layers of coarse-grained soils and fine-grained soils. The coarse-grained soils ranged from medium dense to very dense silty sand, clayey sand, silty gravel, and clayey gravel. The fine-grained deposits included medium stiff to hard sandy clay and sandy silt. Approximately 25 percent of the soils encountered in the borings consisted of fine-grained clay and silt deposits, whereas granular sand and gravel deposits comprised 50 percent of the encountered soils.

The grain size distribution of the granular soils indicated a relatively high content of fines (material passing No. 200 sieve): approximately 40 percent, whereas, the fine-grained soils included approximately 25 percent of granular material.

The liquid limits of the tested soils were generally in the range of 25 to 30, with a plasticity index of approximately 10. An expansive soil guidelines map for the area published by Clark County Development Services indicates that the soils underlying the project alignment are classified as critically expansive.

Groundwater was not encountered in any of the borings to the maximum depths explored. However, it should be noted that groundwater levels can fluctuate due to seasonal variations, irrigation practices, and groundwater withdrawal and recharge.

The boring logs and laboratory test results presented in the appendices should be referred to for more detailed information regarding the alignment soils.

CONCLUSIONS AND RECOMMENDATIONS

Geotechnical Considerations

Our recommendations are based on the assumption that the soil conditions along the project alignment are similar to those disclosed by the explorations. If variations are noted during construction, or if changes are made in site plan or invert elevation, we should be notified so we can supplement our recommendations, as applicable.

The results of our explorations and laboratory testing indicate that the soil conditions at the project site may have a significant impact on design and construction of the project. The potentially difficult soil characteristics are summarized in the following paragraphs.

The results of the expansion tests performed for the project indicate that the in-situ clayey soils have a high to critical expansion potential. This report provides recommendations to help mitigate the effects of soil shrinkage and expansion. However, even if the recommended procedures are followed, some movement and at least minor cracking in the proposed structures/utility lines should be anticipated. The severity of cracking and other cosmetic damage will probably increase if any modification of the site results in excessive wetting or drying of the expansive soils. Eliminating the risk of movement and cosmetic distress may not be feasible, but it may be possible to further reduce the risk of movement, if significantly more expensive measures are used during construction.

Our explorations indicate that some of the in-situ alignment soils had low in-place dry densities as evidenced by the dry unit weight test results and relatively low blow count values. Zones and layers of medium stiff native soil were encountered in some borings at anticipated invert levels.

Generally, most of the undisturbed medium dense to very dense granular deposits encountered along the alignment are expected to exhibit moderate to relatively high shear strength and low compressibility. However, any loose pockets of the granular materials are likely to exhibit lower shear strength and higher compressibility, and may not be suitable to support RCBs, pipelines or junction structures. The stiff to hard fine-grained soils are also expected to exhibit moderate shear strength and relatively low compressibility. However, soft and medium stiff (firm) soils that may be encountered in excavations are likely to exhibit lower shear strength and higher compressibility, and may not be suitable to provide adequate support for the proposed structures.

Foundations for Manholes and Junction Structures

If the grading recommendations presented in the *Earthwork* section of this report are complied with, the proposed structures may be supported by conventional type foundations established on undisturbed natural soils having a consistency of at least medium dense and/or stiff and/or approved, properly compacted fill.

Conventional foundations established on natural soils having a consistency of at least medium dense and/or stiff and/or approved, properly compacted fill as recommended should be at least 12 inches wide and the bottom of the footings should be established at least 24 inches below the lowest adjacent final compacted subgrade. Foundations established as recommended, may be designed to impose a net dead- plus live-load pressure of 2000 pounds per square foot (psf). The allowable bearing value may be increased to 2500 psf for an additional 12 inches of embedment. However, the maximum net bearing value should not exceed 2500 psf. A one-third increase may be used for transient loading conditions such as wind or seismic loads.

The ultimate resistance to sliding may be designed based upon a concrete-soil coefficient of friction of 0.3 times the sustained dead load. Settlement of the proposed junction structures, supported as recommended should be less than 1 inch.

Storm Drain and RCB Design Parameters

The following soil design parameters may be used in the design of flexible pipelines and RCBs:

- Coefficient of soil-concrete friction 0.3
- Unit weight of compacted bedding material .....130 pcf
- Modulus of subgrade reaction, k.....175 pci
- Modulus of soil reaction E'. .....400 psi

Notes:

1. Modulus of soil reaction is obtained from Bureau of Reclamation values of E' for Iowa formula (flexible pipes).
2. The reported values for E' are valid only for beddings compacted to a minimum of 90% dry Proctor density.
3. The aforementioned values do not include any safety factors and represent average values only.

Because of the fine-grained nature of the soils encountered near the anticipated invert elevations, the recommended modulus of subgrade reaction (k) is relatively low. Provided that the encountered fine-grained soils are overexcavated to at least 1 foot on each side of the pipeline and the RCBs, and 3 feet beneath the invert levels, and overexcavations are backfilled with properly compacted Type II Aggregate Base Backfill bedding material, a modulus of subgrade reaction of 250 pci may be used in design.

Construction of the replacement pipeline will result in little or no increase in overburden pressure on the foundation soils; therefore, little post-construction pipe settlement is expected. However, disturbance of the bearing soils below the proposed pipeline elevations during construction could result in future pipeline settlement. If the subgrade soils are disturbed during construction, the bottom of the trench should be overexcavated and replaced with properly compacted fill material, such as Type II material. The recommendations for overexcavation and replacement of unsuitable materials below pipe invert levels are intended to minimize such settlements.

Seismic Considerations

The following USGS grid point was used to determine the spectral accelerations at the project site.

Latitude	36.2979°
Longitude	-115.2602°

The USGS website (Earthquake Hazards Program, Interpolated Probabilistic Ground Motion for the Conterminous 48 States by Latitude Longitude, 2002 Data) indicated the following respective spectral accelerations for 0.2 seconds (SA) and 1.0 second (SA) periods for 2% probability of exceedance (PE) in 50 years.

Period	Spectral Acceleration
0.2 sec., S_s	0.506g
1.0 sec., S_1	0.165g

For the purpose of seismic design, the Site Class was determined based on the criteria presented in Section 1613.5.2, Site Class Definitions, of the 2006 International Building Code (IBC). Based on our knowledge of the site and its soil conditions, the site should be designated Site Class D.

Adjusting the Site Class B, S_S and S_1 values for Site Class D, the five-percent damped design spectral acceleration at short periods, S_{DS}, is 0.470g, and at 1-second period, S_{D1}, is 0.235g.

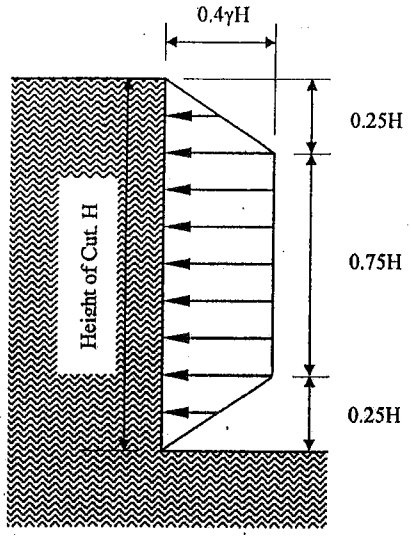
Temporary Excavation Support

It is anticipated that lateral support will be required for temporary excavations to resist lateral earth pressures to maintain the integrity of the surrounding soils and roadway structures, to minimize disruption to the roadway traffic, and to protect the personnel working within and around the excavations.

Excavation support for the open-trenched drainage pipe/box installation can be accomplished with the use of trench boxes augmented with steel sheets and bracing, or with soldier piles and lagging. Additional shoring may be required near settlement-sensitive areas and where excavation may cause caving and raveling of the trench walls. Temporary excavation support designed to resist lateral earth pressures must address both internal and global stability at all stages of construction and until the excavation is backfilled.

Lateral earth pressure around the excavation perimeter will be variable in proportion to the variability of the subsurface soil conditions, the degree of cementation, and method of supporting system.

A temporary braced earth retention system may be designed for a stiff clay soil profile with an equivalent loading pattern shown below.



For preliminary design, moist unit weight (γ) and cohesion (c) of the soil may be taken as 125 pcf and 500 psf, respectively. The aforementioned pressures assume that there is no build-up of hydrostatic pressure. Therefore, hydrostatic and seepage forces should be added to the lateral pressures, if required. Any surcharge from adjacent structural, vehicular, construction equipments, and other loadings should be added to the above pressures using a factor of 0.3.

Trenching and shoring operations should be conducted in accordance with Section 10 Nos. 1926.650 through 1926.652 of the State of Nevada Occupational Safety and Health Standards for the Construction Industry (with amendments as of August 1991) and in accordance with 29 CFR Part 1926, Occupational Safety and Health Standards - Excavations; Final Rule (October 31, 1989).

Dewatering

Groundwater will not likely be encountered in the excavations. Relatively small amounts of groundwater seepage in excavations can be controlled by pumping from conventional sumps. Such seepage can be expected if the excavation extends below the water table into permeable soils.

Safety of construction personnel, selection and design of temporary excavation support systems, and dewatering are the responsibilities of the contractor. The designs should be reviewed and approved by the project engineer of record.

Subgrade Preparation and Pipe Bedding

Medium dense and stiff native undisturbed soils will provide adequate support for the proposed storm drain pipelines and their beddings. Overexcavation will be necessary to remove expansive and/or loose granular and/or soft to medium stiff fine-grained soils. Overexcavation, if required, should extend to competent soils, as determined by the geotechnical engineer, or 3 feet below the pipe invert, whichever occurs first. The overexcavated soil should be replaced with properly placed and compacted Selected Backfill meeting the criteria specified in Section 207.02.01 of the Uniform Standard Specifications, Clark County Area, Nevada.

Exposed soils with high moisture content may be subject to pumping, and can easily be disturbed to become unstable and unworkable. Workability may be improved by scarifying the wet soils and drying. Stabilization can be accomplished by working in oversize material, such as crushed rock of 1 to 6 inches in size, until a stable base is achieved. The use of geotextiles, such as Mirafi 600X or equivalent, could also be considered as a stabilization technique that could, in addition, eliminate the need for overexcavation.

The trenches should be excavated to a depth of at least 6 inches below the bottom of the pipe and backfilled with Type II Aggregate Base Backfill. Fills placed beneath the pipes should be compacted to at least 90 percent of the maximum dry density obtainable by the ASTM D1557 laboratory method of compaction. Moisture content at the time of compaction should be within (plus or minus) 2 percentage points of optimum. Pipe bedding should provide a firm, uniform cradle for the pipe. Prior to installation of the pipe, the pipe bedding should be shaped to fit the lower part of the pipe exterior with reasonable closeness to provide continuous support along the pipe.

Trench Backfill and Compaction

Backfill in the pipe zone, which is defined as the zone from the bottom of the pipe to 24 inches above the top of the pipe, should consist ofType II Aggregate Base Backfill. Any fill placed within the pipe zone should be compacted to at least 90 percent of the maximum dry density determined in accordance with the ASTM D1557 laboratory method of compaction. Moisture content at the time of compaction should be within (plus or minus) 2 percentage points of optimum.

Backfill in the trench above the pipe zone should consist of Selected Backfill. Backfill material for the upper 16 inches beneath the pavement should consist of Type II Aggregate Base.

Any backfill material that is either imported from a borrow source or excavated soil or previously utilized backfill materials encountered beneath roadways and in utility trenches that are to be re-used as trench backfill, should meet the requirements presented in the Uniform Standard Specifications for Selected Backfill or Type II Aggregate Base Backfill material (Uniform Standard Specifications, Clark County Area, Nevada, Sections 207, 208, and 704), and be compatible with the native soils.

According to the results of gradation, Atterberg limits, and expansion tests performed on the bulk soil samples, we expect that most of the fine-grained native soils will not meet the Uniform Standard Specifications requirements for trench backfill. However, granular soils, such as silty sand, clayey sand, silty gravel, and clayey gravel can be re-used as trench backfill, if approved by the geotechnical engineer.

Trench backfill material compacted by mechanical means should be placed in loose horizontal lifts, not exceeding 8 inches in thickness, and compacted to at least 90 percent of its maximum dry density determined in accordance with the ASTM D1557 laboratory method of compaction. Moisture content at the time of compaction should be within (plus or minus) two percentage points of optimum. The upper 16 inches of Type II Aggregate Base Backfill material underlying pavement should be compacted to at least 95 percent of the maximum dry density. Precaution should be taken during backfill operation to avoid damage to the pipe. The initial lifts of backfill material should not be dropped or bulldozed directly onto the pipes. The use of heavy vibratory equipment should not be permitted directly over the pipe until a minimum of 2 feet of backfill have been placed and compacted.

Backfill material compacted to 95 percent of its maximum dry density can be expected to settle ½ percent of its thickness. Backfill compacted to 90 percent could settle 1 to 2 percent of its thickness. Increasing compaction requirements will reduce, but not eliminate, settlement in backfilled trenches and excavations. In our experience, backfill compacted to less than 90 percent could settle substantially more than 2 percent of its thickness.

Level of Inspection

Observation and inspection of foundation excavations and subgrade preparations, as well as field and laboratory testing of subgrade materials should be carried out in accordance with the guidelines provided in Table 1704.7 of the Southern Nevada Amendments to the 2006 International Building Code (IBC). Based on the subsurface soil conditions encountered in the borings and the results of the laboratory tests performed for the project, we recommend that special inspections during grading operations that include excavation, subgrade preparation, and fill placement and compaction be carried out on a continuous basis in accordance with Item 4c of Table 1704.7.

To ensure that the grading operation is carried out in accordance with the geotechnical recommendations prepared for this project, we also recommend that Terracon be retained to perform the required special inspection services. If a third-party inspection agency is retained to perform such services, the agency should be considered the Engineer-of-record on the project.

Earthwork

Site Clearing

- All existing asphalt concrete, base course materials, uncontrolled fill, disturbed natural soils, and other deleterious materials should be stripped out and removed from proposed structural areas.
- All exposed surfaces should be free of mounds and depressions that could prevent uniform compaction.
- If unexpected fills or underground facilities are encountered during site clearing, such features should be removed and the excavation thoroughly cleaned and backfilled. All excavations should be observed by the geotechnical engineer prior to backfill placement.
- Demolition of existing structures should include removal of any foundation system and utilities. Any excavations performed as a result of demolition and removal should be properly filled and compacted in accordance with recommendations provided in this section.
- All materials derived from the demolition of existing structures should be removed from the site, and not be allowed for use in any fills.

Excavation

- It is anticipated that excavation of the on-site natural non-cemented deposits for the proposed project can be accomplished with conventional earthmoving equipment.

- In cases of hard or very hard cemented soils encountered during excavation, specialized excavating equipment may be required to handle such conditions.
- Contractors should satisfy themselves as to the hardness of materials and equipment required.
- Trenching and shoring operations should be conducted in accordance with Section 10 Nos. 1926.650 through 1926.652 of the State of Nevada Occupational Safety and Health Standards for the Construction Industry (with amendments as of August 1991) and in accordance with 29 CFR Part 1926, Occupational Safety and Health Standards - Excavations; Final Rule (October 31, 1989). Safety of construction personnel is the responsibility of the contractor.

Overexcavation

- As indicated by our laboratory testing, some of the in-situ clay soils have a high to critical expansive potential. The expansive soils should be overexcavated, when encountered, to a depth of 3 feet below the bottom of foundations and invert of the pipelines. The overexcavated material should be replaced with approved properly placed and compacted fill material with an expansion potential no greater than 4 percent. The fill should be placed and compacted to the specifications outlined in this report. Overexcavation may be terminated if competent soils are encountered at the bottom of foundations and invert of the pipes as determined by the geotechnical engineer. The extent and frequency of occurrence of expansive soils should be determined during construction through sufficient testing.
- As indicated by the results of our explorations, layers of medium stiff natural soil deposits were encountered at the proposed invert elevations. Soils having a consistency of loose, soft, and medium stiff are not capable of providing adequate support for structural foundations and pipe bedding. We recommend that 3 feet be overexcavated and recompacted below the bottom of foundations and invert of the drainage pipes. Overexcavation may be terminated if competent soils, as determined by the geotechnical engineer are encountered at the bottom of foundations and invert of the pipes.

Fill Placement and Compaction

- After performing required excavations, the exposed soils should be carefully observed to verify removal of all unsuitable deposits. Exposed soils should then be scarified to a depth of 6 inches, moisture conditioned as necessary, and compacted as recommended.
- Fill materials should be placed on a horizontal plane unless otherwise accepted by the geotechnical engineer.

- All required fill should be placed in loose lifts not over 8 inches in thickness.
- Materials should be compacted to the following:

MATERIAL	PERCENT DENSITY (ASTM D1557)	MOISTURE CONTENT
Granular	95 minimum	-2 to +2 percentage points of optimum
Fine – grained	90 minimum	0 to +2 percentage points over optimum

Note:

1. For the purpose of compaction, fine-grained soils are soils with at least 30 percent passing the No. 200 sieve and/or soils having an expansion greater than 4 percent.
2. All fill placed deeper than 5 feet below final grade should be compacted to a minimum of 95 percent.

- Clay soils should not be allowed to dry out and crack during or after construction. Moisture contents should be maintained at least until foundations are constructed. Any dried or cracked soils could be wetted until they reach acceptable moisture contents or they could be excavated and replaced with acceptable properly compacted fill.
- In structural areas where the clay soils are encountered within 3 feet of final grade, tests should be performed to determine the degree of soil expansion as soon as possible during grading. These tests should be performed on representative samples to determine the expansion potential from oven-dried moisture content to approximately saturated moisture content. A 60 psf surcharge load should be applied during the test.
- Field density tests should be taken for approximately each 1½ feet in elevation gain after compaction, but not to exceed 3 feet in vertical height between tests. Field density tests may have to be taken at intervals of 6 inches in elevation gain, if required by the Engineer. The locations of the tests in the plan shall be so spaced to give the best possible coverage; however, the tests shall be taken no further apart than 100 feet. The Engineer may take additional tests as considered necessary to check on the uniformity of compaction. Where sheepsfoot rollers are used, the tests shall be taken in the compacted material below the disturbed surface. No additional layers of fill shall be spread until the field density tests indicate that the specified density has been obtained.

Pavement Recommendations

The disturbed pavement area during excavation and construction of the project should be reconstructed with suitable asphalt concrete and base course materials. The pavement area subgrade should be properly prepared as outlined in the *Earthwork* section of this report prior to placement of any asphalt or base course materials.

Based on the measured existing thicknesses, we recommend that 4.0 inches of asphalt concrete and 12 inches of aggregate base course be used during reconstruction of disturbed pavements.

Type II Aggregate Base course should meet the gradation criteria for Type II Aggregate Base as specified in Section 704.03.04 of the Uniform Standard Specifications for Public Works' Construction Off-Site Improvements, Clark County Area, Nevada, Third Edition. Asphalt, concrete and other fill materials and compaction should also meet appropriate criteria set forth in the Standard Specifications. Field and laboratory testing of asphalt and base materials should be performed to determine whether specified requirements have been met.

Corrosivity

Based on laboratory testing completed by Atlas Chemical Testing Laboratories, Inc., the in-situ alignment soils have a negligible classification for sulfate exposure, according to Table 4.3.1 of the ACI 318, Section 4.3. However, based on our experience with soils in the general area of the project alignment, a potential exists for severe sulfate-content soils to be present along the alignment. Therefore, we recommend that cement Type V, along with a water-cement ratio of 0.45, and minimum compressive strength of 4500 psi be incorporated into the concrete mix design for this project in order to reduce sulfate attack as recommended in the ACI.

The recommended cement and concrete should be used to cast RCB modules. Consideration should be given to providing protection to buried metal pipes or use of non-metallic pipes, where permitted by local building codes.

GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide testing and observation during excavation, grading, foundation and construction phases of the project.

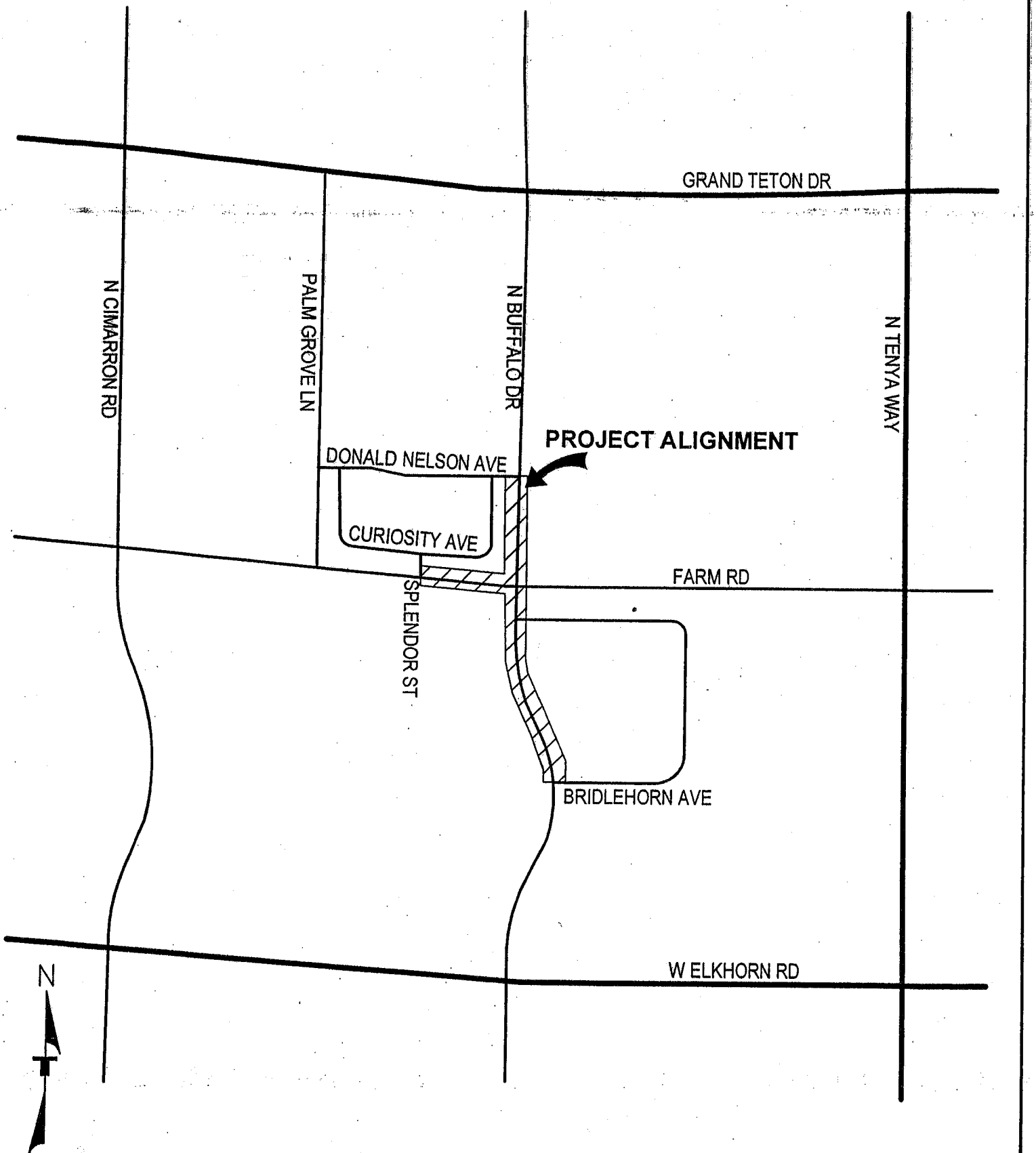
The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either expressed or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

Sincerely,

TERRACON CONSULTANTS, INC.



AGRAM IS FOR GENERAL LOCATION ONLY,
AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

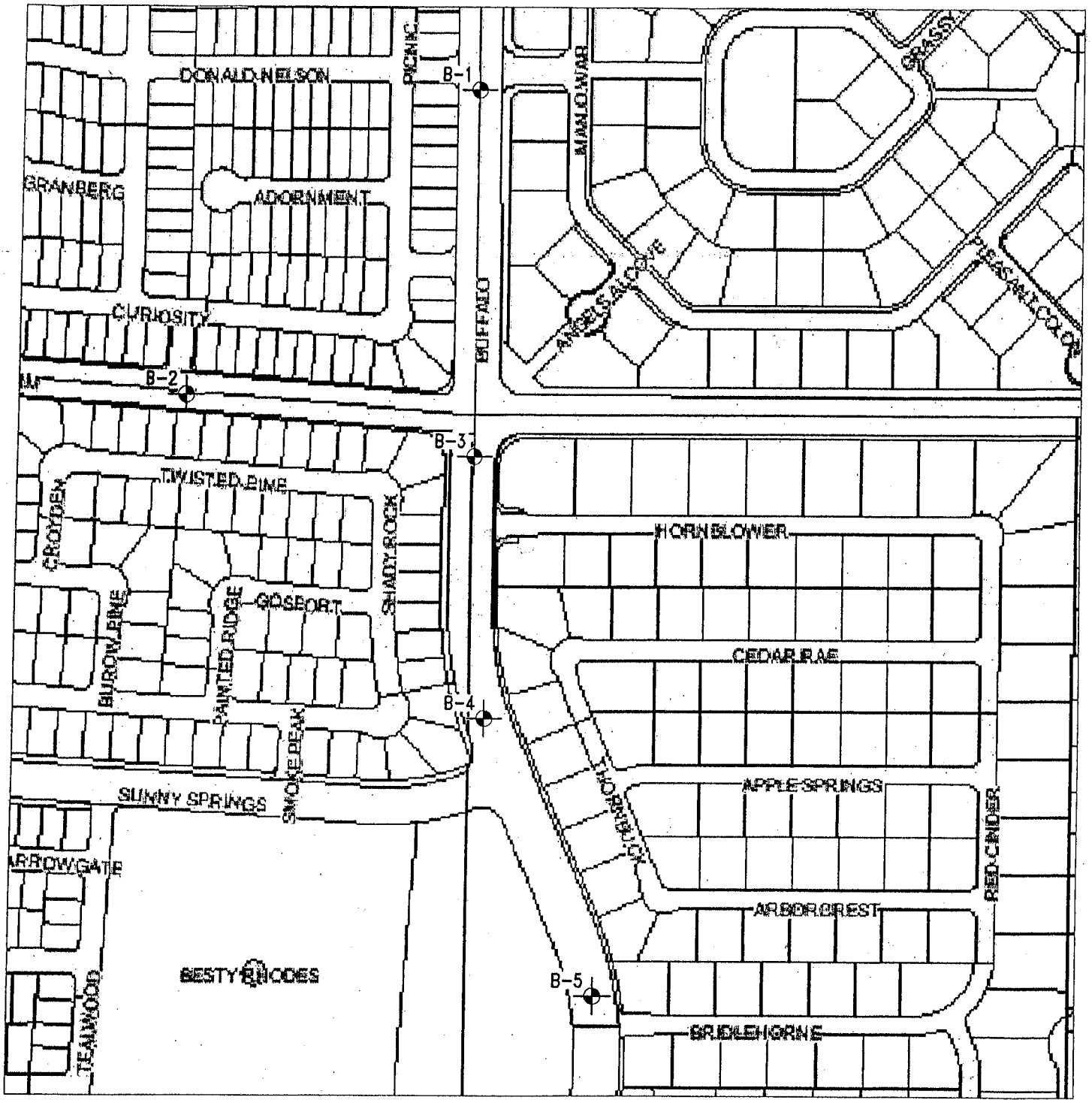
Project Mngr:	RE
Drawn By:	BWB
Chkd By:	RE
Appd By:	RE

Project No.	64085015
Scale:	N.T.S.
File No.	85015.dwg
Date:	4/10/09

Terracon
Consulting Engineers and Scientists
750 PILOT ROAD, SUITE F LAS VEGAS, NV 89119

VICINITY MAP
PARSON BRINCKERHOFF
ELKHORN SPRINGS AND BUFFALO STORM DRAIN
BUFFALO DRIVE AND FARM ROAD

FIGURE
1



LEGEND:

B-1 — BORING DESIGNATION AND APPROXIMATE LOCATION

N

DIAGRAM IS FOR GENERAL LOCATION ONLY,
AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Mngr: RE	Project No. 64085015	Terracon Consulting Engineers and Scientists	SITE AND EXPLORATION PLAN
Drawn By: BWB	Scale: 1" = 120'	750 PILOT ROAD, SUITE F LAS VEGAS, NV 89119	PARSON BRINCKERHOFF
Checked By: RE	Project Type: 85015.dwg		ELKHORN SPRINGS AND BUFFALO STORM DRAIN
Approved By: RE	Date: 4/10/08		BUFFALO DRIVE AND FARM ROAD
		LAS VEGAS	NEVADA

FIGURE 2

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS	Split Spoon - 1-3/8" I.D., 2" O.D., unless otherwise noted	HS	Hollow Stem Auger
ST:	Thin-Walled Tube - 2" O.D., unless otherwise noted	PA:	Power Auger
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
DB:	Diamond Bit Coring - 4", N, B	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB:	Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value". For 3" O.D. ring samplers (RS) the penetration value is reported as the number of blows required to advance the sampler 12 inches using a 140-pound hammer falling 30 inches, reported as "blows per foot," and is not considered equivalent to the "Standard Penetration "or "N-value".

WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling	N/E:	Not Encountered
WCI:	Wet Cave in	WD:	While Drilling		
DCI:	Dry Cave in	BCR:	Before Casing Removal		
AB:	After Boring	ACR:	After Casing Removal		

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-value (SS) Blows/Ft.	Ring Sampler (RS) Blows/Ft.	Consistency
< 500	0 - 2	<4	Very Soft
500 – 1,000	2 – 4	4 – 8	Soft
1,001 – 2,000	4 – 8	8 – 16	Medium Stiff
2,001 – 4,000	8 – 15	16 – 30	Stiff
4,001 – 8,000	15 – 30	30 – 60	Very Stiff
8,000+	30+	60+	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	Ring Sampler (RS) Blows/Ft.	Relative Density
0 – 4	0 - 8	Very Loose
4 – 10	8 - 20	Loose
10 – 30	20 – 60	Medium Dense
30 – 50	60 – 100	Dense
50+	100+	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 – 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75 mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 – 12
Modifiers	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1-10
Medium	11-30
High	30+

Terracon

LOG OF BORING NO. B-1

PROJECT: Elkhorn Springs and Buffalo Storm Drain

SITE: Buffalo Drive and Farm Road

CLIENT: Parsons Brinckerhoff

EASTING | NORTHING

STATION | OFFSET

APPROXIMATE SURFACE ELEVATION MSL (ft) 2419.0

DEPTH (ft)	DESCRIPTION	ELEVATION MSL (ft)	USCS SYMBOL	SAMPLE No.	SAMPLE TYPE	RECOVERY, inch.	BLOWS/ft.	WATER CONTENT, %	DRY UNIT WT, pcf	UNCONFINED STRENGTH, psf
0.3	**ASPHALT CONCRETE** - 4 inches	2418.7	AC							
	FILL (AGGREGATE BASE) - brown		AB							
1.3	**FILL (SANDY CLAY)** - trace gravel, brown	2417.7	FILL							
2.5	**SANDY CLAY** - trace salts, stiff, brown	2416.5	CL	1	BS	60	20			
				2	RS	18				
4.5	**CLAYEY SAND** - medium dense, light green brown	2414.5		3	RS	18	34	9	97	
5.5	**CLAYEY GRAVEL** - with sand, medium dense, light green brown	2413.5	SC							
6.5	**CLAYEY SAND** - medium dense, light green brown	2412.5	GC							
			SC							
8.0	**SANDY LEAN CLAY** - very stiff, green brown to light green brown	2411.0	CL							
	- slightly porous			4	RS	18	51	9	101	
				5	BS	60				
15.0		2404.0		6	RS	18	61	9	98	

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

SAMPLE TYPES: RS = Ring BS = Bag CPT = Cone Penetration Test SS = Standard Penetration Test C = Core ST = Shelby Tube

WATER LEVEL OBSERVATIONS, ft

WL DEPTH ▽	N/E	04-16-2008
WL DEPTH ▼		

NOTES

Terracon

BORING STARTED	04-16-2008
BORING COMPLETED	04-16-2008
RIG Diedrich 120	GEOLOGIST / ENGINEER REE
PROJECT No64085015	PLATE A-1

LOG OF BORING NO. B- 1

PROJECT *Elkhorn Springs and Buffalo Storm Drain*

SITE *Buffalo Drive and Farm Road*

CLIENT *Parsons Brinckerhoff*

EASTING | NORTHING

STATION | OFFSET

APPROXIMATE SURFACE ELEVATION MSL (ft) *2419.0*

GRAPHIC LOG	DEPTH (ft)	DESCRIPTION	ELEVATION MSL (ft)	DEPTH, ft.	USCS SYMBOL	SAMPLES: SAMPLE No.	SAMPLE TYPE	RECOVERY, inch.	BLOWS/ft.	TESTS: WATER CONTENT, %	DRY UNIT WT, pcf	UNCONFINED STRENGTH, psf	NOTES
		CLAYEY GRAVEL - with sand, medium dense, light green brown			GC								
						7	RS	18	53				
	20.0		2399.0	20									
		Bottom Depth at Approximately 20 feet											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

SAMPLE TYPES: RS = Ring BS = Bag CPT = Cone Penetration Test SS = Standard Penetration Test C = Core ST = Shelby Tube

WATER LEVEL OBSERVATIONS, ft		
WL DEPTH ▽	N/E	04-16-2008
WL DEPTH ▼		
NOTES		

Terracon

BORING STARTED	04-16-2008		
BORING COMPLETED	04-16-2008		
RIG	Diedrich 120	GEOLOGIST / ENGINEER	REE
PROJECT No	64085015	PLATE	A-2

LOG OF BORING NO. B- 2

PROJECT: *Elkhorn Springs and Buffalo Storm Drain*

SITE: *Buffalo Drive and Farm Road*

CLIENT: *Parsons Brinckerhoff*

EASTING | NORTHING

STATION | OFFSET

APPROXIMATE SURFACE ELEVATION MSL (ft) *2431.0*

GRAPHIC LOG	DEPTH (ft)	DESCRIPTION	ELEVATION MSL (ft)	DEPTH, ft.	USCS SYMBOL	SAMPLE No.	SAMPLE TYPE	RECOVERY, inch.	BLOWS/ft.	WATER CONTENT, %	DRY UNIT WT, pcf	UNCONFINED STRENGTH, psf
						SAMPLES				TESTS		
	0.3	**ASPHALT CONCRETE** - 4 inches	2430.7		AC							
		FILL (AGGREGATE BASE) - brown			FILL							
	1.4	**SANDY LEAN CLAY** - stiff, brown	2429.6		CL	1	BS	60	26	9	98	
	3.0	**SANDY SILT** - stiff, light brown	2428.0			2	RS	18				
	4.0	**SANDY LEAN CLAY** - medium stiff, brown	2427.0		ML							
					CL	3	RS	18	15			
	7.5	**CLAYEY SAND** - medium dense, light green brown	2423.5	5	SC							
	8.5	**CLAYEY GRAVEL** - with sand, medium dense to dense, light green brown	2422.5		GC	4	RS	18	65	3		
				10		5	BS	60				
	11.5	**CLAYEY SAND** - trace gravel, medium dense, light green brown	2419.5		SC							
	13.0	**CLAYEY GRAVEL** - with sand, medium dense to very dense, light green brown	2418.0		GC							
	15.0		2416.0	15		6	SS	18	52			

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

SAMPLE TYPES: RS = Ring BS = Bag CPT = Cone Penetration Test SS = Standard Penetration Test C = Core ST = Shelby Tube

WATER LEVEL OBSERVATIONS, ft

WL DEPTH ▽	N/E	04-16-2008
WL DEPTH ▼		

NOTES

Terracon

BORING STARTED	04-16-2008
BORING COMPLETED	04-16-2008
RIG: Diedrich 120	GEOLOGIST / ENGINEER: REE
PROJECT No64085015	PLATE: A-3

LOG OF BORING NO. B- 2

PROJECT *Elkhorn Springs and Buffalo Storm Drain*

CLIENT *Parsons Brinckerhoff*

SITE *Buffalo Drive and Farm Road*

EASTING | NORTHING

STATION | OFFSET

APPROXIMATE SURFACE ELEVATION MSL (ft) *2431.0*

GRAPHIC LOG	DEPTH (ft)	DESCRIPTION	ELEVATION MSL (ft)	DEPTH, ft.	USCS SYMBOL	SAMPLES: SAMPLE No.	SAMPLE TYPE	RECOVERY, inch.	BLOWS/ft.	TESTS: WATER CONTENT, %	DRY UNIT WT, pcf	UNCONFINED STRENGTH, psf	NOTES
		CLAYEY GRAVEL - with sand, medium dense to very dense, light green brown			GC								
	17.0		2414.0										
		SANDY CLAY - trace gravel, very stiff, light green brown			CL	7	RS	18	48				
	19.0		2412.0										
		CLAYEY GRAVEL - with sand, medium dense to dense, white to light brown			GC								
	20.0		2411.0	20									
		Bottom Depth at Approximately 20 feet											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

SAMPLE TYPES: RS = Ring BS = Bag CPT = Cone Penetration Test SS = Standard Penetration Test C = Core ST = Shelby Tube

WATER LEVEL OBSERVATIONS, ft		
WL DEPTH ▽	*N/E*	*04-16-2008*
WL DEPTH ▼		
NOTES		

Terracon

BORING STARTED	*04-16-2008*
BORING COMPLETED	*04-16-2008*
RIG *Diedrich 120*	GEOLOGIST / ENGINEER *REE*
PROJECT No *64085015*	PLATE *A-4*

LOG OF BORING NO. B-3

PROJECT: Elkhorn Springs and Buffalo Storm Drain

SITE: Buffalo Drive and Farm Road

CLIENT: Parsons Brinckerhoff

EASTING | NORTHING

STATION | OFFSET

APPROXIMATE SURFACE ELEVATION MSL (ft) 2416.0

DEPTH (ft)	DESCRIPTION	ELEVATION MSL (ft)	USCS SYMBOL	SAMPLE No.	SAMPLE TYPE	RECOVERY, inch.	BLOWS/ft.	WATER CONTENT, %	DRY UNIT WT, pcf	UNCONFINED STRENGTH, psf
0.3	**ASPHALT CONCRETE** - 4 inches	2415.7	AC							
1.3	**FILL (AGGREGATE BASE)** - brown	2414.7	AB							
2.5	**FILL (CLAYEY GRAVEL)** - with sand, green brown	2413.5	FILL	1	SS	18	18			
3.5	**FILL (SANDY CLAY)** - trace gravel, green brown	2412.5	FILL							
7.0	**FILL (CLAYEY GRAVEL)** - with sand, brown	2409.0	FILL	2	RS	18	24	12		
8.0	**CLAYEY SAND** - medium dense, light green brown	2408.0	SC	3	BS	60				
	CLAYEY GRAVEL - with sand, medium dense to dense, light green brown		GC							
	- occasional cobble, dense			4	SS	18	28			
	- very dense									
15.0	Continued Next Page	2401.0		5	SS	18	61	2		

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

SAMPLE TYPES: RS = Ring BS = Bag CPT = Cone Penetration Test SS = Standard Penetration Test C = Core ST = Shelby Tube

WATER LEVEL OBSERVATIONS, ft

WL DEPTH ▽	N/E	04-16-2008
WL DEPTH ▼		

NOTES

Terracon

BORING STARTED	04-16-2008
BORING COMPLETED	04-16-2008
RIG: Diedrich 120	GEOLOGIST / ENGINEER: REE
PROJECT No64085015	PLATE: A-5

LOG OF BORING NO. B- 3

PROJECT *Elkhorn Springs and Buffalo Storm Drain*

CLIENT *Parsons Brinckerhoff*

SITE *Buffalo Drive and Farm Road*

EASTING | NORTHING

STATION | OFFSET

APPROXIMATE SURFACE ELEVATION MSL (ft) *2416.0*

GRAPHIC LOG	DEPTH (ft)	DESCRIPTION	ELEVATION MSL (ft)	DEPTH, ft.	USCS SYMBOL	SAMPLES: SAMPLE No.	SAMPLE TYPE	RECOVERY, inch.	BLOWS/ft.	TESTS: WATER CONTENT, %	DRY UNIT WT, pcf	UNCONFINED STRENGTH, psf	NOTES
		CLAYEY GRAVEL - with sand, dense to very dense, light green brown			GC								
						6	SS	18	46				
	20.0	*Bottom Depth at Approximately 20 feet*	2396.0	20									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

SAMPLE TYPES: RS = Ring BS = Bag CPT = Cone Penetration Test
SS = Standard Penetration Test C = Core ST = Shelby Tube

WATER LEVEL OBSERVATIONS, ft		
WL DEPTH ▽	N/E	04-16-2008
WL DEPTH ▼		
NOTES		

Terracon

BORING STARTED	04-16-2008		
BORING COMPLETED	04-16-2008		
RIG	Diedrich 120	GEOLOGIST / ENGINEER	REE
PROJECT No	64085015	PLATE	A-6

LOG OF BORING NO. B- 4

PROJECT: *Elkhorn Springs and Buffalo Storm Drain*

SITE: *Buffalo Drive and Farm Road*

CLIENT: *Parsons Brinckerhoff*

EASTING | NORTHING

STATION | OFFSET

APPROXIMATE SURFACE ELEVATION MSL (ft) *2411.0*

GRAPHIC LOG

DEPTH (ft)	DESCRIPTION	ELEVATION MSL (ft)	DEPTH, ft.	USCS SYMBOL	SAMPLES: SAMPLE No.	SAMPLE TYPE	RECOVERY, inch.	BLOWS/ft.	TESTS: WATER CONTENT, %	DRY UNIT WT, pcf	UNCONFINED STRENGTH, psf
0.3	**ASPHALT CONCRETE** - 4 inches	2410.7		AC							
	FILL (AGGREGATE BASE) - brown			AB							
1.3	**FILL (SANDY CLAY)** - trace gravel, red brown	2409.7		FILL							
2.5	**FILL (CLAYEY SAND)** - with gravel, green brown	2408.5		FILL	1	BS	60	25			
3.5	**CLAYEY SAND** - medium dense, brown	2407.5		SC	2	RS	18				
4.5	**SILTY SAND** - trace clay, medium dense, brown	2406.5	5	SM	3	RS	18	36			
6.0	**SILTY GRAVEL** - with sand, medium dense, brown	2405.0		GM							
7.5	**CLAYEY GRAVEL** - with sand, medium dense, brown	2403.5		GC							
			10		4	SS	18	25	8		
					5	BS	60				
12.5	**CLAYEY SAND** - medium dense, white to light green brown	2398.5		SC							
15.0		2396.0			6	SS	18	16			
	Continued Next Page		15								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

SAMPLE TYPES: RS = Ring BS = Bag CPT = Cone Penetration Test SS = Standard Penetration Test C = Core ST = Shelby Tube

WATER LEVEL OBSERVATIONS, ft

WL DEPTH ▽	N/E	04-16-2008
WL DEPTH ▼		

NOTES

Terracon

BORING STARTED	04-16-2008
BORING COMPLETED	04-16-2008
RIG: Diedrich 120	GEOLOGIST / ENGINEER: REE
PROJECT No64085015	PLATE: A-7

LOG OF BORING NO. B- 4

PROJECT *Elkhorn Springs and Buffalo Storm Drain*

SITE *Buffalo Drive and Farm Road*

CLIENT *Parsons Brinckerhoff*

GRAPHIC LOG	EASTING	NORTHING
	STATION	OFFSET
	APPROXIMATE SURFACE ELEVATION MSL (ft) *2411.0*	

DEPTH (ft)	DESCRIPTION	ELEVATION MSL (ft)	DEPTH, ft.	USCS SYMBOL	SAMPLES: SAMPLE No.	SAMPLE TYPE	RECOVERY, inch.	BLOWS/ft.	TESTS: WATER CONTENT, %	DRY UNIT WT, pcf	UNCONFINED STRENGTH, psf	NOTES
	SANDY LEAN CLAY - stiff, green brown			CL								
	- red brown											
19.0		2392.0			7	RS	18	25				
	CLAYEY SAND - medium dense, red brown			SC								
20.0		2391.0	20									
	Bottom Depth at Approximately 20 feet											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

SAMPLE TYPES: RS = Ring BS = Bag CPT = Cone Penetration Test SS = Standard Penetration Test C = Core ST = Shelby Tube

WATER LEVEL OBSERVATIONS, ft		
WL DEPTH ▽	*N/E*	*04-16-2008*
WL DEPTH ▼		
NOTES		

Terracon

BORING STARTED	*04-16-2008*		
BORING COMPLETED	*04-16-2008*		
RIG	*Diedrich 120*	GEOLOGIST / ENGINEER	*REE*
PROJECT No	*64085015*	PLATE	*A-8*

LOG OF BORING NO. B- 5

PROJECT *Elkhorn Springs and Buffalo Storm Drain*

SITE *Buffalo Drive and Farm Road*

CLIENT *Parsons Brinckerhoff*

EASTING | NORTHING

STATION | OFFSET

APPROXIMATE SURFACE ELEVATION MSL (ft) *2405.0*

GRAPHIC LOG	DEPTH (ft)	DESCRIPTION	ELEVATION MSL (ft)	DEPTH, ft.	USCS SYMBOL	SAMPLES: SAMPLE No.	SAMPLE TYPE	RECOVERY, inch.	BLOWS/ft.	TESTS: WATER CONTENT, %	DRY UNIT WT, pcf	UNCONFINED STRENGTH, psf	NOTES
	0.3	**ASPHALT CONCRETE** - 4 inches	2404.7		AC								
		FILL (AGGREGATE BASE) - brown			AB								
	1.3		2403.7										
		FILL (CLAYEY GRAVEL) - with sand, brown			FILL	1	SS	18	35				
						2	SS	18	19				
				5		3	BS	60					
	7.0		2398.0										
		SILTY SAND - medium dense, light brown			SM								
	8.0		2397.0										
		SANDY SILT - medium stiff, light brown			ML								
	9.5		2395.5			4	RS	18	21	4	88		
		SANDY LEAN CLAY - medium stiff to stiff, light brown		10	CL								
	11.0		2394.0										
		CLAYEY GRAVEL - with sand, dense, brown			GC								
	13.5		2391.5										
		CLAYEY SAND - with gravel, very dense, light brown			SC	5	SS	18	61				
	15.0		2390.0	15									

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

SAMPLE TYPES: RS = Ring BS = Bag CPT = Cone Penetration Test SS = Standard Penetration Test C = Core ST = Shelby Tube

WATER LEVEL OBSERVATIONS, ft		
WL DEPTH ▽	N/E	04-16-2008
WL DEPTH ▼		
NOTES		

Terracon

BORING STARTED	04-16-2008
BORING COMPLETED	04-16-2008
RIG Diedrich 120	GEOLOGIST / ENGINEER REE
PROJECT No64085015	PLATE A-9

LOG OF BORING NO. B- 5

PROJECT *Elkhorn Springs and Buffalo Storm Drain*

SITE *Buffalo Drive and Farm Road*

CLIENT *Parsons Brinckerhoff*

EASTING | NORTHING

STATION | OFFSET

APPROXIMATE SURFACE ELEVATION MSL (ft) *2405.0*

GRAPHIC LOG	DEPTH (ft)	DESCRIPTION	ELEVATION MSL (ft)	DEPTH, ft.	USCS SYMBOL	SAMPLES: SAMPLE No.	SAMPLE TYPE	RECOVERY, inch.	BLOWS/ft.	TESTS: WATER CONTENT, %	DRY UNIT WT, pcf	UNCONFINED STRENGTH, psf	NOTES
		CLAYEY SAND - with gravel, very dense, white to light brown			SC	6	BS	60					
	16.5		2388.5										
		CLAYEY GRAVEL - with sand, very dense, white to light brown			GC								
	18.5		2386.5										
		SANDY CLAY - hard, green brown			CL	7	SS	6	51	10			
	20.0		2385.0	20									
		Bottom Depth at Approximately 20 feet											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

SAMPLE TYPES: RS = Ring BS = Bag CPT = Cone Penetration Test SS = Standard Penetration Test C = Core ST = Shelby Tube

WATER LEVEL OBSERVATIONS, ft		
WL DEPTH ▽	N/E	04-16-2008
WL DEPTH ▼		
NOTES		

Terracon

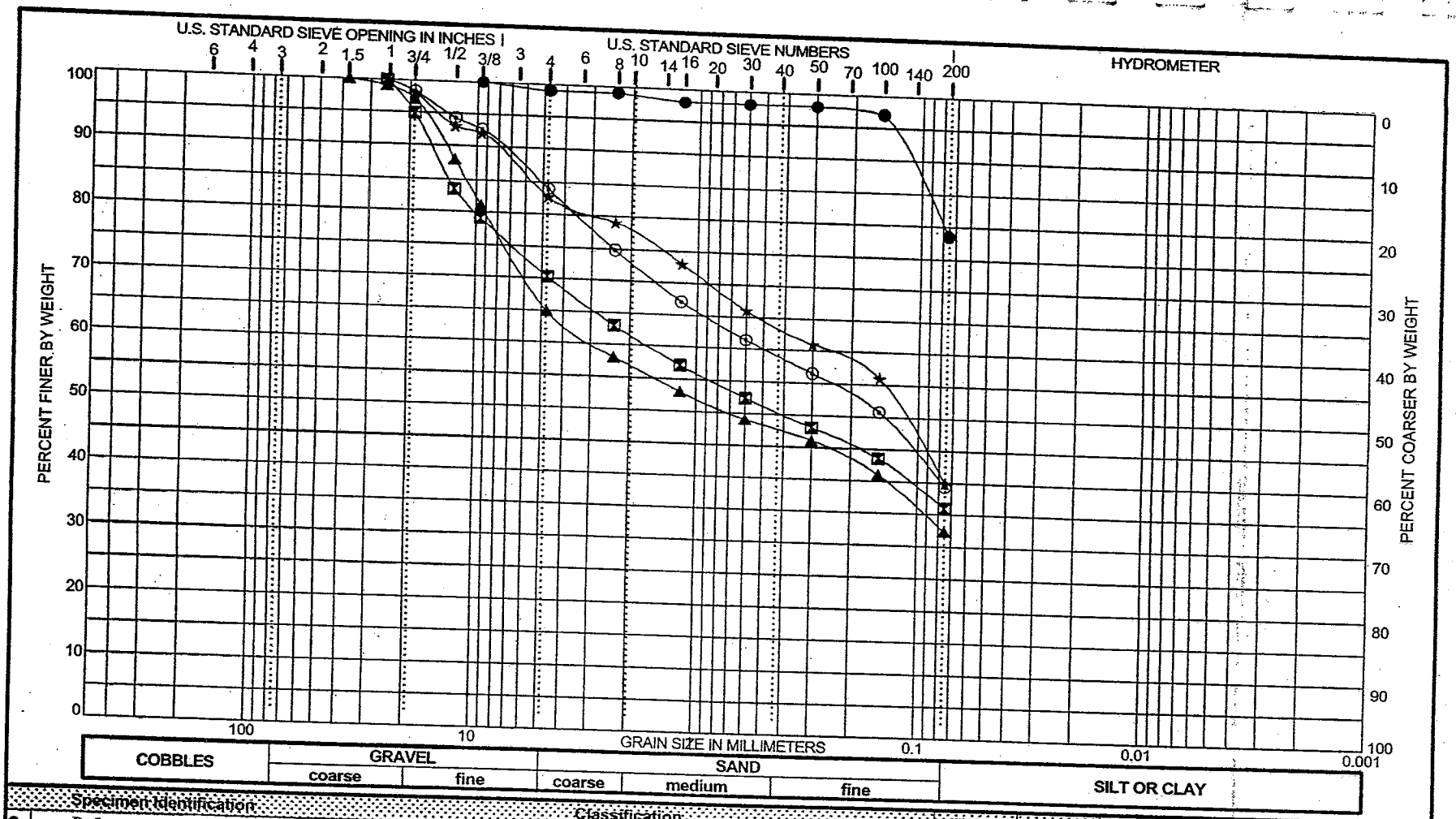
BORING STARTED	04-16-2008		
BORING COMPLETED	04-16-2008		
RIG	Diedrich 120	GEOLOGIST / ENGINEER	REE
PROJECT No64085015		PLATE	A-10

APPENDIX B

Laboratory Testing

Table 1: Expansion Test Results

SAMPLE	MOISTURE CONTENT (%)		DRY DENSITY (pcf)	EXPANSION (%)
	INITIAL	FINAL		
B-1 @ 9.0 ft.	9.3	28.8	100.9	10.3
B-4 @ 9.0 ft.	7.6	18.9	-	12.3



Specimen Identification				Classification	WC%	LL	PL	PI	Cc	Cu
●	B-1	@	10.0 ft.	LEAN CLAY with SAND CL		34	18	16		
⊠	B-2	@	14.0 ft.	SILTY, CLAYEY SAND with GRAVEL SC-SM		27	20	7		
▲	B-3	@	15.0 ft.	CLAYEY GRAVEL with SAND GC		28	17	10		
★	B-4	@	2.0 ft.	CLAYEY SAND with GRAVEL SC		27	18	9		
⊙	B-5	@	14.0 ft.	CLAYEY SAND with GRAVEL SC		26	16	10		

Specimen Identification				D100	D85	D50	D15	%Gravel	%Sand	%Silt	%Clay
●	B-1	@	10.0 ft.	9.50	0.10			1.0	20.5	78.5	
⊠	B-2	@	14.0 ft.	25.40	13.21	0.411		29.7	34.3	36.0	
▲	B-3	@	15.0 ft.	37.50	11.11	0.711		35.1	32.6	32.3	
★	B-4	@	2.0 ft.	25.40	5.67	0.116		17.4	42.7	39.9	
⊙	B-5	@	14.0 ft.	25.40	5.19	0.143		16.1	44.5	39.3	

Terracon

Client: *Parsons Brinkerhoff*
Project: *Elkhorn Springs and Buffalo Storm Drain*
Project Site *Buffalo Drive and Farm Road*
Project No. *64085015*

SIEVE ANALYSES

Date *April 2008*

B-1

Atlas Consultants, Inc.

6000 S. Eastern Avenue, Suite 10J • Las Vegas, Nevada 89119
(702) 383-1199 • Fax (702) 383-4983

CHEMICAL
PHYSICAL

member of
AMERICAN SOCIETY FOR
TESTING MATERIALS

ACT LAB NO: 14967(c) **DATE:** April 18, 2008

PROJECT NO: 64085015 **P.O.:**

ANALYZED BY: Kurt D. Ergun **LAB ID:**

WATER SOLUBLE SALT ANALYSIS IN SOIL

1:5 (soil:water) Aqueous Extraction
AWWA 3500-Na D, AWWA 4500 E

SOIL SIEVE SIZE = -10 MESH

Sample No.	Location	Depth (feet)	Sodium (Percent)	Water Soluble Sulfate (SO_4) (Percent)	Total Available Water Soluble Sodium Sulfate (Na_2SO_4) (Percent)
	B-2	10-15	0.09	0.03	0.05
	B-4	14.0	<0.01	0.01	0.01

Kurt D. Ergun

LABORATORY MANAGER

Notes: The results for each constituent denote the percentage of that analyte, at a 1:5 (soil:water) extraction ratio, which is present in the soil. Sodium was determined by flame photometry, sulfate turbidimetrically, and sodium sulfate by calculation.

PLATE: B-2