

**HYDROLOGY STUDY
ADDENDUM #2**

for

Rainbow Car Wash

CLARK COUNTY, NEVADA

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

A-5-22.

Name of Development: RAINBOW CARWASH Date: 12-31-22

Location of Development: a) Descriptive (Cross Streets) North/South: NEILLS BLVD.

East/West: SOUTH OF OWENS

b) Section: 2B Township: 20S Range: 62E

c) APN: 140-2B-110-003

Name of Owner: MARK & LORI MILLER

Telephone No.: 775-830-6475 Fax No.: _____ E-Mail Address: LOREMILLER@C.LINE.COM

Address: 1281 TERMINAL WAY RENO NV 89502

Contact Person-Name: Sam C. Dunnam Telephone No.: 702.682.1715

* E-Mail Address: sam.dunnam@tylin.com Fax No.: _____

Firm: TY Lin International

Address: 4050 Dean Martin Drive LV NV 89103

Type of Land Development/Land Disturbance Process:

☐	Rezoning	☐	Subdivision Map	☐	Clearing and Grading Only
☐	Parcel Map	☐	Planned Unit Development	☐	Other (Please specify below)
☐	Large Parcel Map	☐	Building Permit		

1. Total Owned Land Area: At Site: 0.7AC Being Developed/Disturbed: 0.7AC

2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ Yes** ☒ No

3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☒ Yes** ☐ No

4. Proposed type of development (Residential, Commercial, Etc.): COMMERCIAL

5. Approximate upstream land area which drains to the subject site: 50AC±

6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: PW-22-10914

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: SAN CORNER OF SITE

8. Briefly describe your proposed schedule for the subject project: ASAP.



Engineer's Seal

Submit this form as part of the required drainage study to the local entity which has jurisdiction over the subject property. This form may provide sufficient information to serve as the Conceptual Drainage Study.

*New Required Field

**Review and concurrence of the Clark County Regional Flood Control District is required.

	Revision	Date
Local Entity File No. _____		

REFERENCE:

STANDARD FORM 1



Department of Public Works

500 S Grand Central Pky • Box 554000 • Las Vegas NV 89155-4000
(702) 455-6000 • Fax (702) 455-6040

Denis Cederburg, P.E., Director • E-Mail: dlc@ClarkCountyNV.gov

Drainage Study Comment Letter

Date: March 29, 2022
Firm: Ty Lin International
Engineer: Sam C. Dunnam
Address: 4050 Dean Martin Drive, Las Vegas, NV 89103
Phone: (702) 682-1715
Fax:
E-mail: sam.dunnam@tylin.com

Subject: Technical Drainage Study for Rainbow Carwash
Location: SEC of Owens Avenue and Nellis Boulevard
APN: 140-28-110-003
Sec, Township, Range: S28, T20S, R62E
Flood Zone & Panel: Zone X, 2185F, Dated November 16, 2011
Application Number: PW22-10974

Submittals	Date Received	Date Returned	Reviewer	Miscellaneous
Technical	02/03/2022	02/17/2022	CR	
Addendum 1	03/08/2022	03/29/2022	CR	

Concurrence Required: (Must be obtained prior to permit issuance)		Reason Concurrence is Required
	Boulder City	Adjacent to or Impacts Jurisdiction
	City of Mesquite	Adjacent to or Impacts Jurisdiction
	City of Henderson	Adjacent to or Impacts Jurisdiction
X	City of Las Vegas	Adjacent to or Impacts Jurisdiction
	City of North Las Vegas	Adjacent to or Impacts Jurisdiction
X	Nevada Department of Transportation	Adjacent to or Impacts NDOT Facility
	Union Pacific Rail Road	Adjacent to or Impacts a UPRR Facility
	US Army Corps of Engineers	Impacts a USACE Facility
X	Clark County Regional Flood Control District	Regional Significance, Adjacent to or Impacts CCRFCD MPU Facility or in a SFHA

BOARD OF COUNTY COMMISSIONERS

JAMES B. GIBSON, Chair • JUSTIN C. JONES, Vice Chair
MARILYN KIRKPATRICK • WILLIAM MCCURDY II • ROSS MILLER • MICHAEL NAFT • TICK SEGERBLOM
YOLANDA T. KING, County Manager

Responses to the following comments must be addressed and provided with the next submittal. Incomplete responses may result in further review and time delays to the drainage study approval. CCPW Development Review will not be held responsible for project delays due to incomplete responses.

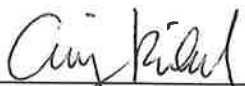
CCPW – Development Review Comments:

1. Figure 10 has been redlined and attached with these comments. Review and revise. Ensure this original redlined figure is returned with the next submittal.
2. Per previous Comment #9, the Standard Form 4 still does not appear to be correct. The calculated lag time for Basin FUT appears to be 0.094, not 0.074. There appears to be an issue with the cells in the Standard Form for this basin. The travel time velocity shown for Basin FUT should be calculated from the V1 equation. It appears the velocity was calculated using the V2 equation. Review and revise accordingly.
3. The lag time for Basin FUT on the Standard Form 4 shows 0.074 (which doesn't appear correct, see Comment #2); however, the HEC-1 model uses a lag time of 0.083. Review and revise accordingly.
4. There is no lag time value entered in the HEC-1 model for Basin OFF1. Address. Review and revise accordingly.
5. The engineer needs to verify the flows in Nellis. Reference study 05-53718 shows over 1600 cfs; reference study 08-23309 shows over 1400 cfs; and the proposed facility in Nellis is for over 2000 cfs. It appears there is more flow than 167 cfs in Nellis. Review and revise accordingly.
6. The slope in Nellis appears to be 0.41%. Calculations for cross-sections 7 and 8 use 0.73%. Revise Cross-sections 7 and 8 accordingly.
7. Coordinate the onsite detention basin with NDOT. The existing condition shows 1 cfs for onsite Basin EX discharging onto Nellis. The developed condition shows 2 cfs for onsite Basin FUT discharging onto Nellis. It does not appear the additional 1 cfs will be detained onsite. As the current detention calculations stand, it appears the 1 cfs will discharge directly onto Nellis thru a proposed sidewalk underdrain. This is NDOT's issue as flow typically cannot increase onto an NDOT ROW. Provide documentation they approve of the current detention basin calculations or revise design in the next submittal.
8. Label slopes and flow lines in the detention basin area along Nellis and the southwest corner to clearly show how flow from the site discharges thru area.

9. Provide a detail showing the detention basin area along the southwest corner. Show rip rap, flow lines, slopes, etc.
10. Show the rip rap extents in all pertinent areas.
11. Provide a detail as redlined on the plans for the existing building on Parcel 140-28-110-001 adjacent to the proposed car wash. It appears the area drains towards the existing building.
12. If flow discharges from the adjacent parcels to the north onto this site, a drainage easement is required the entire length the flow travels unless cross-access allows drainage too. Provide documentation if this is the case or provide a private drainage easement to be privately maintained and specify who maintains.
13. Provide a blow up of the area showing the cross-access onto Parcel 140-28-110-001. It is unclear what is being removed and how the TC grades and curb will tie into the existing covered parking area.
14. The grading plans have been red-lined. Provide highlighter marks and responses on plans to show the issues are addressed. Do not use post-it notes to reply.

The drainage/grading plans have been red-lined and require modifications prior to the next submittal. Failure to resubmit the red-lined grading plan will require an additional \$400 review fee.

The County's review is solely based on the information submitted by the Engineer of Record. The County's review is strictly limited to compliance with minimum County Codes and Standards. The Engineer of Record is responsible for researching and addressing situations that may require designs above and beyond the minimum codes for issues of public safety and impacts to upstream, downstream, and adjacent properties. The County assumes no liability for information, data, designs or conclusions of the Engineer of Record.



Crissy Riland, P.E.
Senior Civil Engineer
Development Review
crissy@ClarkCountyNV.gov



W. Layne Weber, P.E., CFM
Principal Engineer
Development Review
wlweber@ClarkCountyNV.gov

April 5, 2022

Clark Co. Department of Public Works
Development Review
Christine Riland, P.E.
500 S. Grand Central Parkway Box 554000
Las Vegas, NV 89155-6040

RE: Technical Drainage Study for Rainbow Carwash
PW22-10974
Addendum #2

Comments were received from you dated 03/29/2022 and will be addressed as follows:

1. Figure 10 has been redlined and attached with these comments. Review and revise. Ensure this original redlined figure is returned with the next submittal.

Figure 10 has been revised accordingly.

2. Per previous Comment #9, the Standard Form 4 still does not appear to be correct. The calculated lag time for Basin FUT appears to be 0.094, not 0.074. There appears to be an issue with the cells in the Standard Form for this basin. The travel time velocity shown for Basin FUT should be calculated from the V1 equation. It appears the velocity was calculated using the V2 equation. Review and revise accordingly.

The submitted Standard Form 4 shows 0.0725 for the lag time for Basin FUT, not 0.074. I requested the equations you used when you made the statement that the lag time should be 0.094, but you declined to provide, and I understand. There is no way for me to know what your V1 and V2 equations are, if you cannot provide for me to review. However, 0.0725 is less than 0.094, and thereby a more conservative value. I have checked the equations used in my Standard Form 4 and know that they are correct. I also produced a Std Form 4, using equations from Flow Master, as was standard practice prior to what is used now and calculated a lag time of 0.084 for Basin FUT. Either value used results in a peak release from Basin FUT of 2 cfs, prior to on-site detention.

Standard Form 4 has been revised to account for a revised grading. The updated lag time for Basin FUT does change the estimated peak release from this developed basin.

3. The lag time for Basin FUT on Standard Form 4 shows 0.074 (which doesn't appear correct, see Comment #2); however, the HEC-1 model uses a lag time of 0.083. Review and revise accordingly.

See previous response. HEC-1 has been revised.

4. There is no lag time value entered in the HEC-1 model for Basin OFF. Address. Review and revise accordingly.

HEC-1 has been revised accordingly. The results remain unchanged.

5. The engineer needs to verify the flows in Nellis. Reference study 05-53718 shows over 1600 cfs; reference 08-2330- shows over 1400 cfs; and the proposed facility in Nellis is for over 2000 cfs. It appears there is more flow than 167 cfs in Nellis. Review and revise accordingly.

Supplement #1 to the Technical Drainage Study for "USED CAR LOT", response to review comment #5, hte #11-44701 does acknowledge that Nellis will see a peak flow of 1642 cfs adjacent to the site during the 100-year storm. The 10-year storm will reduce the peak to 887 cfs.

6. The slope in Nellis appears to be 0.41%. Calculations for cross-sections 7 and 8 use 0.73%. Revise Cross-sections 7 and 8 accordingly.

The 0.73% slopes used for calc shts 7 and 8 is the average slope from the north boundary to the south boundary. Calc shts 9 and 10 utilize the minimum slope of 0.53% that is seen for the same section.

7. Coordinate the onsite detention basin with NDOT. The existing condition shows 1 cfs for onsite Basin EX discharging into Nellis. The developed condition shows 2 cfs for onsite Basin FUT discharging into Nellis. It does not appear the additional 1 cfs will be detained onsite. As current detention calculations stand, it appears the 1 cfs will discharge directly onto Nellis thru a proposed sidewalk drain. This is NDOTs issue as flow typically cannot increase onto NDOT ROW. Provide documentation they approve of the current detention basin calculations or revise design on the next submittal.

The developed condition shows 1 cfs discharging into Nellis, not 2 cfs as you have stated.

8. Label slopes and flow lines in the detention basin area along Nellis and the southwest corner to clearly show how flow from the site discharges thru area.

Revised as requested.

9. Provide a detail showing the detention area along the southwest corner. Show rip rap, flow lines, slopes, etc.

Revised as requested.

10. Show rip rap extents in all pertinent areas.

Revised as requested.

11. Provide a detail as redlined on the plans for the existing building on Parcel 140-28-110-001 adjacent to the proposed car wash. It appears the area drains towards the existing building.

A detail (cross-section) has been added to the plans.

12. If flow discharges from the adjacent parcels to the north onto this site, a drainage easement is required the entire length the flow travels unless cross-access allows drainage too. Provide documentation of this is the case or provide a private drainage easement to be privately maintained and specify who maintains.

A blanket cross access, parking, ingress, egress and drainage easement will be recorded on all three parcels prior to civil plan approval.

13. Provide a blow up of the area showing cross-access onto Parcel 140-28-110-001. It is unclear what is being removed and how TC grades and curb will tie into the existing covered parking.

Per our conversation, a "blow up" of the area is not required.

14. The grading plans have been redlined and require modifications prior to the next submittal. Failure to resubmit the redlined grading plan will require an additional \$400 review fee.

Noted.

REVISED Storm Flow Quantities – Existing Condition

Basin	Area	10-Yr	100-Yr
ex	0.71 AC	1 cfs	1 cfs

Storm Flow Quantities – Developed Condition

Basin	Area	10-Yr	100-Yr
FUT	0.71 AC	1 cfs	1 cfs
	(1 cfs retained onsite)		
off1	0.04 AC	0 cfs	0 cfs

REVISED Street Flow Quantities

Street	Q100	Slope	Depth	Velocity	VD
Nellis	1642 cfs	0.53%	2.23'	9.68 fps	21.6
Sta. 275+96 (see calc sht #10)					
Nellis	1643 cfs	0.51%	2.25'	9.57 fps	21.5
(south of subject site) Sta. 275+00 (see calc sht #12)					

Street	Q10	Slope	Depth	Velocity	VD
Nellis	887 cfs	0.53%	1.70'	7.59 fps	12.9
Sta. 275+96 (see calc sht #9)					
Nellis	888 cfs	0.51%	1.72'	7.51 fps	12.9
(south of subject site) Sta. 275+00 (see calc sht #11)					

Respectfully,



Sam C. Dunnam, P.E., QSD, QSP
(702) 682.1715

Rainbow Carwash

TECHNICAL DRAINAGE STUDY ADDENDUM #1

LIST OF FIGURES

- Figure 9.** **Existing Condition
Drainage Basin Map - REVISED**
- Figure 10.** **Onsite Developed Condition
Drainage Basin Map - REVISED**

OWENS AVE.

Q10=887 CFS
Q100=1642 CFS
REF:
HTE#11-44701
RFCD #12-8066

NEELIS BLVD.

Q10=888 CFS
Q100=1642 CFS

EX BLDG.

EX BLDG.

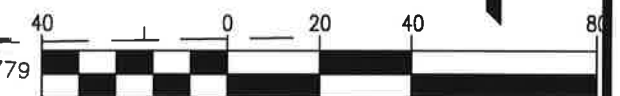
EX BLDG.

JOHNNY LOFTUS

ex
0.71 AC

EX BLDG.

EX CANOPY



LEGEND

→ FLOW ARROW

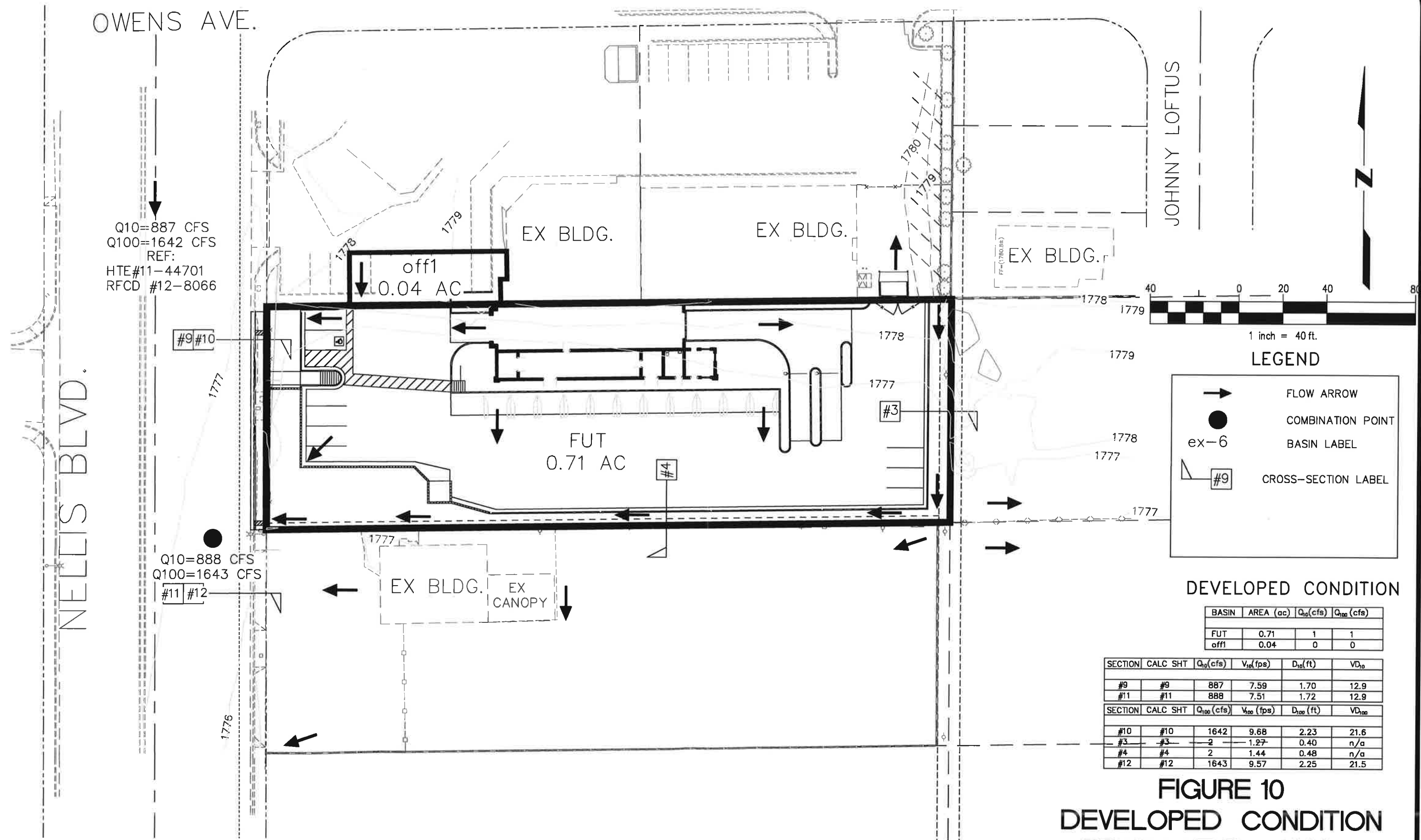
● COMBINATION POINT

ex-6 BASIN LABEL

EXISTING CONDITION

BASIN	AREA (ac)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
ex	0.71	1	1

REVISED FIGURE 9
EXISTING CONDITION
DRAINAGE BASIN MAP



CALCULATIONS

Nellis Q10=887 cfs

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+43, 0.89)	(0+43, 1.39)	0.013
(0+43, 1.39)	(0+45, 0.89)	0.013
(0+45, 0.89)	(0+93, 0.17)	0.016
(0+93, 0.17)	(0+93, 0.13)	0.016
(0+93, 0.13)	(1+00, 0.60)	0.013
(1+00, 0.60)	(1+00, 2.50)	0.016

Options

Current Roughness weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	1.70 ft	
Elevation Range	0.00 to 2.50 ft	
Flow Area	116.88 ft ²	
Wetted Perimeter	103.55 ft	
Hydraulic Radius	1.13 ft	
Top Width	100.00 ft	
Normal Depth	1.70 ft	$VD = 12.9 \geq 6$
Critical Depth	1.88 ft	
Critical Slope	0.00332 ft/ft	
Velocity	7.59 ft/s	
Velocity Head	0.90 ft	
Specific Energy	2.60 ft	
Froude Number	1.24	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

CALC SHT #9 CONT'D

Nellis Q10=887 cfs

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	1.70	ft
Critical Depth	1.88	ft
Channel Slope	0.00530	ft/ft
Critical Slope	0.00332	ft/ft

Nellis Q100=1642 cfs

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.00530 ft/ft
Discharge 1642.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00	2.50
0+00	0.60
0+05	0.50
0+06	0.00 <i>FE</i>
0+07	0.13
0+07	0.17
0+43	0.89
0+43	1.39
0+45	1.39
0+45	0.89
0+93	0.17
0+93	0.13
0+94	0.00 <i>FE</i>
0+95	0.50
1+00	0.60
1+00	2.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 2.50)	(0+00, 0.60)	0.001
(0+00, 0.60)	(0+05, 0.50)	0.013
(0+05, 0.50)	(0+07, 0.13)	0.013
(0+07, 0.13)	(0+07, 0.17)	0.013
(0+07, 0.17)	(0+43, 0.89)	0.016

CALC SHT #10 LOU TP

Nellis Q100=1642 cfs

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+43, 0.89)	(0+43, 1.39)	0.013
(0+43, 1.39)	(0+45, 0.89)	0.013
(0+45, 0.89)	(0+93, 0.17)	0.016
(0+93, 0.17)	(0+93, 0.13)	0.016
(0+93, 0.13)	(1+00, 0.60)	0.013
(1+00, 0.60)	(1+00, 2.50)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	2.23 ft
Elevation Range	0.00 to 2.50 ft
Flow Area	169.59 ft ²
Wetted Perimeter	104.61 ft
Hydraulic Radius	1.62 ft
Top Width	100.00 ft
Normal Depth	2.23 ft
Critical Depth	2.57 ft
Critical Slope	0.00293 ft/ft
Velocity	9.68 ft/s
Velocity Head	1.46 ft
Specific Energy	3.69 ft
Froude Number	1.31
Flow Type	Supercritical

$$VD = 21.6 \geq 8$$

GVF Input Data

Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

CALC SHEET # 6 CONTINUED

Nellis Q100=1642 cfs

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	2.23	ft
Critical Depth	2.57	ft
Channel Slope	0.00530	ft/ft
Critical Slope	0.00293	ft/ft

CALC SHEET #100017D

CALC SHIT #11

Nellis, south of site, Q10=888 cfs

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+43, 0.89)	(0+43, 1.39)	0.013
(0+43, 1.39)	(0+45, 0.89)	0.013
(0+45, 0.89)	(0+93, 0.17)	0.016
(0+93, 0.17)	(0+93, 0.13)	0.016
(0+93, 0.13)	(1+00, 0.60)	0.013
(1+00, 0.60)	(1+00, 2.50)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	1.72 ft
Elevation Range	0.00 to 2.50 ft
Flow Area	118.32 ft ²
Wetted Perimeter	103.58 ft
Hydraulic Radius	1.14 ft
Top Width	100.00 ft
Normal Depth	1.72 ft
Critical Depth	1.88 ft
Critical Slope	0.00331 ft/ft
Velocity	7.51 ft/s
Velocity Head	0.88 ft
Specific Energy	2.59 ft
Froude Number	1.22
Flow Type	Supercritical

$$VD = 12.9 \geq 6$$

GVF Input Data

Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

CALC ENT #11 CONTD

Nellis, south of site, Q10=888 cfs

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	1.72	ft
Critical Depth	1.88	ft
Channel Slope	0.00510	ft/ft
Critical Slope	0.00331	ft/ft

Nellis, south of site, Q100=1643 cfs

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.00510 ft/ft
Discharge 1643.00 ft³/s
Section Definitions

Station (ft)

Elevation (ft)

0+00	2.50
0+00	0.60
0+05	0.50
0+06	0.00 <i>FE</i>
0+07	0.13
0+07	0.17
0+43	0.89
0+43	1.39
0+45	1.39
0+45	0.89
0+93	0.17
0+93	0.13
0+94	0.00 <i>FE</i>
0+95	0.50
1+00	0.60
1+00	2.50

Roughness Segment Definitions

Start Station

Ending Station

Roughness Coefficient

(0+00, 2.50)	(0+00, 0.60)	0.001
(0+00, 0.60)	(0+05, 0.50)	0.013
(0+05, 0.50)	(0+07, 0.13)	0.013
(0+07, 0.13)	(0+07, 0.17)	0.013
(0+07, 0.17)	(0+43, 0.89)	0.016

CALC SHT #12

Nellis, south of site, Q100=1643 cfs

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+43, 0.89)	(0+43, 1.39)	0.013
(0+43, 1.39)	(0+45, 0.89)	0.013
(0+45, 0.89)	(0+93, 0.17)	0.016
(0+93, 0.17)	(0+93, 0.13)	0.016
(0+93, 0.13)	(1+00, 0.60)	0.013
(1+00, 0.60)	(1+00, 2.50)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	2.25 ft
Elevation Range	0.00 to 2.50 ft
Flow Area	171.62 ft ²
Wetted Perimeter	104.65 ft
Hydraulic Radius	1.64 ft
Top Width	100.00 ft
Normal Depth	2.25 ft
Critical Depth	2.57 ft
Critical Slope	0.00293 ft/ft
Velocity	9.57 ft/s
Velocity Head	1.42 ft
Specific Energy	3.67 ft
Froude Number	1.29
Flow Type	Supercritical

$VD = 21.5 \geq 8$

GVF Input Data

Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

CALC SHT #12 CONT'D

Nellis, south of site, Q100=1643 cfs

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	2.25	ft
Critical Depth	2.57	ft
Channel Slope	0.00510	ft/ft
Critical Slope	0.00293	ft/ft

CALC SHEET #12 CONT'D

**HEC-1 ANALYSIS
EXISTING & PROPOSED CONDITIONS-REVISED**


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*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 06APR22 TIME 06:31:14 *
*****

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

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

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

```

LINE  ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1      ID      RAINBOW CARWASH
2      ID CONDITION:  EXISTING AND DEVELOPED CONDITIONS
3      ID
4      ID
5      ID INPUT FILE:  FILE NAME 701449EX.ih1
6      ID
7      ID DESIGN STORM 6 HOUR
8      ID STORM DISTRIBUTION SDN 3
9      ID PREPARED BY:  Sam C. Dunnam, P.E.
10     ID      T.Y. LIN INTERNATIONAL
11     ID      4050 Dean Martin Drive
12     ID      Las Vegas NEVADA 89103
13     ID      702-682-1715
14     ID      sam.dunnam@tylin.com
15     ID #####
16     ID #  DEPTH-DURATION-FREQUENCY VALUES  #
17     ID #####
18     ID # NOT A STANDRAD McCARRAN AIRPORT RAIN FALL AREA #
19     ID #####
20     ID #  RATIO #1 = 2 YR 6 HOUR STORM  #
21     ID #  RATIO #2 = 10 YR 6 HOUR STORM  #
22     ID #  RATION #3 = 100 YR 6-HOUR STORM  #
23     ID #####
24     ID
25     ID
26     ID
27     ID
28     ID
29     ID
30     *DIAGRAM
31     IT  5  0  0  300
32     IO  5  0  0
33     IN  5  0  0
34     JR  PREC 0.6084  1
35     *
36     KK  ex undeveloped site
37     * #####
38     * # ex undeveloped site  #
39     * # Total Area = 0.00111 sq. mi.  #
40     * # CN = 85.0, K=73207716  #
41     * # Tc = 12.58 min./10.00 min. mininum  #
42     * #####
43     *
44     BA 0.0011  1
45     LS  0  85  0
46     UD 0.1258
47     *
48     PB 2.86
49     * NOT A STANDARD McCARRAN AIRPORT RAINFALL AREA
50     PC 0.000 0.020 0.057 0.070 0.087 0.108 0.124 0.130 0.130 0.130
51     PC 0.130 0.130 0.130 0.133 0.140 0.142 0.148 0.158 0.172 0.181
52     PC 0.190 0.197 0.199 0.200 0.201 0.204 0.214 0.229 0.241 0.249
53     PC 0.251 0.256 0.270 0.278 0.281 0.283 0.295 0.322 0.352 0.409
54     PC 0.499 0.590 0.710 0.744 0.781 0.812 0.819 0.835 0.851 0.856

```

LINE	ID	1	2	3	4	5	6	7	8	9	10
44	PC	0.860	0.868	0.876	0.888	0.910	0.926	0.937	0.950	0.970	0.976
45	PC	0.982	0.985	0.987	0.989	0.990	0.993	0.993	0.994	0.995	0.998
46	PC	0.998	0.999	1.000							
47	KK	FUTdeveloped site									
	*	*****									
	*	#									
	*	#									
	*	#									
	*	#									
	*	#									
	*	*****									
48	BA	0.0011	1								
49	LS	0	95	0							
50	UD	0.0625									
	*										
51	KK	retain									
52	RS	1	ELEV	0							
53	SV	0	0.11433								
54	SE	76.25	78.25								
55	SQ	0	4.71								
	*										
56	KK	off1off site area 1									
	*	*****									
	*	#									
	*	#									
	*	#									
	*	#									
	*	#									
	*	*****									
	*										
57	BA	6E-5									
58	LS	0	98	0							
59	UD	0.05									
	*										
60	ZZ										

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT		
LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW

34	ex	
47		FUT
		V
		V
51		retain
56		off1

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998
* VERSION 4.1
*
* RUN DATE 06APR22 TIME 06:31:14
*****

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

```

CONDITION: RAINBOW CARWASH
EXISTING AND DEVELOPED CONDITIONS

INPUT FILE: FILE NAME 701449EX.ih1

DESIGN STORM 6 HOUR
STORM DISTRIBUTION SDN 3
PREPARED BY: Sam C. Dunnam, P.E.
T.Y. LIN INTERNATIONAL
4050 Dean Martin Drive
Las Vegas NEVADA 89103
702-682-1715
sam.dunnam@tylin.com

```

#####
# DEPTH-DURATION-FREQUENCY VALUES #
#####
# NOT A STANDRAD McCARRAN AIRPORT RAIN FALL AREA #
#####
# RATIO #1 = 2 YR 6 HOUR STORM #
# RATIO #2 = 10 YR 6 HOUR STORM #
# RATION #3 = 100 YR 6-HOUR STORM #
#####

```

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
.61 1.00

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	RATIOS APPLIED TO PRECIPITATION		RATIO 1	RATIO 2
			PLAN			
		.61	1.00			
HYDROGRAPH AT	ex	.00	1	FLOW	1.	1.
	TIME		3.58	3.58		
HYDROGRAPH AT	FUT	.00	1	FLOW	1.	2.
	TIME		3.50	3.50		
ROUTED TO	retain	.00	1	FLOW	1.	1.
	TIME		3.58	3.58		
** PEAK STAGES IN FEET **						
	1	STAGE	76.58	76.84		
	TIME		3.58	3.58		
HYDROGRAPH AT	off1	.00	1	FLOW	0.	0.
	TIME		3.50	3.50		

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