

Frisco Bridge Replacement

Frisco Bridge Hydraulics Report June 2022

UPDATED OCTOBER 2022

GREENLEE COUNTY, AZ
ADOT TRACS No. T0285



Expires 12/31/2024

PREPARED FOR:

ARIZONA DEPARTMENT OF TRANSPORTATION (ADOT)

PREPARED BY:

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TABLE OF CONTENTS

1	Introduction.....	2
1.1	Purpose.....	2
1.2	Location	2
2	Existing Conditions	3
2.1	Existing Bridges.....	3
3	Hydrology	4
3.1	FEMA	4
4	Hydraulics	5
4.1	Hydraulic Model	5
4.2	Model Boundary Conditions.....	5
4.3	Bridge Skew	5
4.4	Manning's n Values	5
4.5	Model of Proposed Bridge.....	5
4.6	Conclusion	7
4.7	References	7
Appendix	8
Figure 4 - FEMA FIRM Panel.....	Back
Figure 5 – HEC-RAS Exhibit.....	Back
HEC-RAS Output Data	Back

Figures

Figure 1 – Vicinity Map	2
Figure 2 – Existing Frisco Avenue.....	3
Figure 3 – Chase Creek Channel from Bridge.....	4
Figure 4 - FEMA FIRM Panel.....	Appendix A
Figure 5 – HEC-RAS Exhibit.....	Appendix A

Tables

Table 1 – FEMA Flow Rates	4
Table 2 – Chase Creek and San Francisco River Scale Comparison	5
Table 3– Comparison of Existing and Proposed Conditions WSEs.....	6
Table 4– Hydraulic Data Shown on Structure Sheets	7



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1 INTRODUCTION

1.1 PURPOSE

This report documents the hydraulic analysis for the proposed Frisco Bridge over Chase Creek in Clifton, Arizona. The new bridge is to be constructed to accommodate a new Frisco Avenue alignment and convey vehicle traffic over Chase Creek. The existing bridge is to be converted to a pedestrian bridge. This report provides information to understand the basis for the analysis and the performance of the hydraulic elements of the existing and proposed bridges.

1.2 LOCATION

The project is at the confluence of Chase Creek at the San Francisco River in Clifton, Arizona. Refer to Figure 1 for a vicinity map of the project area.



Figure 1 – Vicinity Map

2 EXISTING CONDITIONS

2.1 EXISTING BRIDGE

The existing bridge on Frisco Avenue was constructed about 100 years ago. Hydraulically, the existing bridge has performed well in handling peak flows over the last 50+ years. See Figure 2 and Figure 3 for pictures of the existing bridge and the Chase Creek channel.



Figure 2 – Existing Frisco Avenue



Figure 3 – Chase Creek Channel from Bridge

3 HYDROLOGY

3.1 FEMA

The bridge is located within FEMA FIRM Panel 04011C0616D effective September 28, 2007. The bridge lies in the San Francisco River Floodway within a base flood elevation in North American Vertical Datum of 3474.5. See Figure 4 - FEMA FIRM Panel in Appendix A.

Table 1 shows the summary of the FEMA flow rates for Chase Creek at the confluence with the San Francisco River. These values were used for the project design elements and no other hydrologic analysis was conducted as part of this project.

Table 1 – FEMA Flow Rates

Return Period (year)	Flow Rate (cfs)
10	255
50	620
100	825
500	1,450

4 HYDRAULICS

4.1 HYDRAULIC MODEL

As mentioned previously, the new bridge lies within the floodway of the San Francisco River at Chase Creek. Even though the 24-foot-wide bridge is within the floodway, a rise in water surface elevation due to the bridge will be more sensitive to Chase Creek than the San Francisco River, due to the scales of each water source. See Table 2 – Chase Creek and San Francisco River Scale Comparison below. Therefore, a no-rise analysis has been performed along Chase Creek.

Table 2 – Chase Creek and San Francisco River Scale Comparison

	Chase Creek	San Francisco River
Floodplain Width (ft)	40	600
Cross-Section Spacing (ft)	20	800
1% Annual Chance Discharge (cfs)	825	84,100

No hydraulic model is publicly available for the existing Frisco Bridge along the San Francisco River or Chase Creek. A new model was generated using survey data of the Chase Creek segment under the existing Frisco Avenue bridge. The new hydraulic model, created using HEC-RAS version 6.2, is a one-dimensional, steady state, model of the bridge and upstream and downstream channel.

The proposed condition model was based on the existing condition model with the new bridge in place to analyze the effects of the proposed bridge geometry. The existing condition model does not show the existing bridge configuration. The proposed condition model was compared to the existing condition model to evaluate any change in water surface elevations (WSE).

4.2 MODEL BOUNDARY CONDITIONS

The downstream boundary condition was set to normal depth with a slope of 1.16%.

4.3 BRIDGE SKEW

No bridge skew was applied.

4.4 MANNING'S N VALUES

A horizontal variation of the Manning's n-value was observed through each section. Overall, an n-value of 0.035 was used for the overbanks, 0.03 for the channel walls, and 0.055 for the vegetated channel bottom. Manning's n-values for the existing condition model are identical to those used in the proposed conditions model, except for the cross-section immediately upstream of the proposed bridge. An n-value of 0.025 at this location was used to represent a cleaned channel wall through the bridge section.

4.5 MODEL OF PROPOSED BRIDGE

Throughout the entire model extents, the Chase Creek channel geometry used in the existing condition geometry is identical to that used in the proposed condition geometry. The only change is the proposed

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June 2022, updated October 2022

bridge over the channel between cross sections 144 and 110; at river station 127. The new bridge will be flat across Chase Creek and will be an open span. The proposed condition model shows no rise in WSE when compared to the existing condition. Table 2 shows a comparison of water surface elevations between the existing and proposed conditions for the 1% annual chance flood, or 100-year storm event. An comparison for the 2%, 0.2%, and 10% annual chance flood events is provided in the Appendix.

Table 3—Comparison of Existing and Proposed Conditions WSEs

Cross-Section River Station	100-Year Water Surface Elevation		
	Existing Conditions	Proposed Conditions	Difference (feet)
220	3460.54	3460.54	0.00
197	3459.66	3459.65	-0.01
175	3459.45	3459.45	0.00
160	3459.37	3459.37	0.00
144	3459.31	3459.31	0.00
110	3459.08	3459.08	0.00
94	3458.45	3458.45	0.00
76	3456.98	3456.98	0.00
58	3457.04	3457.04	0.00

Frisco Bridge Replacement, ADOT Tracs No T0285

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CONCLUSION

A new single span bridge is being installed to the west of the existing bridge on Frisco Avenue over Chase Creek in Clifton, Arizona. The proposed bridge will be flat across with a high chord of approximately 3469-feet and a low chord of approximately 3467.8-feet. The proposed conditions model shows no-rise in WSE when compared to the existing conditions model.

The low chord of the proposed bridge will have at least 12 feet of freeboard above the 100-year water surface elevation. Table 3 shows the hydraulic data as shown on the structures sheets.

Table 4—Hydraulic Data Shown on Structure Sheets

DRAINAGE AREA (FIS)	1.65 SQ MI
FLOWLINE ELEV AT APPROACH SECTION	3452.62 FT
FLOWLINE ELEV AT BRIDGE SECTION	3452.62 FT
DESIGN FREQUENCY	100 YR
DESIGN DISCHARGE (Qd)	825 CFS
UNCONSTRICTED WSEL AT APPROACH SECTION (Qd)	3459.31 FT
CONSTRICTED WSEL AT APPROACH SECTION (Qd)	3459.31 FT
WSEL AT UPSTREAM FACE OF BRIDGE SECTION (Qd)	3459.31 FT
VELOCITY THROUGH BRIDGE SECTION (Qd)	6.54 FPS
100 YR DISCHARGE (Q100)	825 CFS
UNCONSTRICTED WSEL AT APPROACH SECTION (Q100)	3459.31 FT
CONSTRICTED WSEL AT APPROACH SECTION (Q100)	3459.31 FT
WSEL AT UPSTREAM FACE OF BRIDGE SECTION (Q100)	3459.31 FT
VELOCITY THROUGH BRIDGE SECTION (Q100)	6.54 FPS

4.6 REFERENCES

- 1) Hydrologic Engineering Center River Analysis System (HEC-RAS) Version 6.1.0, US Army Corps of Engineers September 2021.
- 2) National Flood Insurance Program FIRM Panel Number 04011C0616D dated September 7, 2007 of Greenlee County, Arizona and Incorporated Areas.
- 3) National Flood Insurance Study for Greenlee County, Arizona and Incorporated Areas 04011CV000A dated September 7, 2007.

APPENDIX

FIGURE 4 - FEMA FIRM PANEL

FIGURE 5 – HEC-RAS EXHIBIT

WSE COMPARISON

HEC-RAS OUTPUT DATA

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 Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the **Flood Profiles** and **Floodway Data** and/or **Summary of Stillwater Elevations** 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 construction and rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the **Summary of Stillwater Elevations** table in the **Flood Insurance Study** report for this jurisdiction. 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 for this jurisdiction.

The projection used in the preparation of this map was Universal Transverse Mercator (UTM) zone 12. The horizontal datum was 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 this 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 referred to the same vertical datum. For further conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, NNGS12
National Geographic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20510-3282

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 its website at <http://www.ngs.noaa.gov>.

Base map information shown on this FIRM was derived from U.S. Geological Survey Digital Orthophoto Quadrangle produced at a scale of 1:12,000 from photography dated 1996 or later.

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 (which contains authoritative **hydraulic** data) may reflect stream channel distances that differ from what is shown on this map.

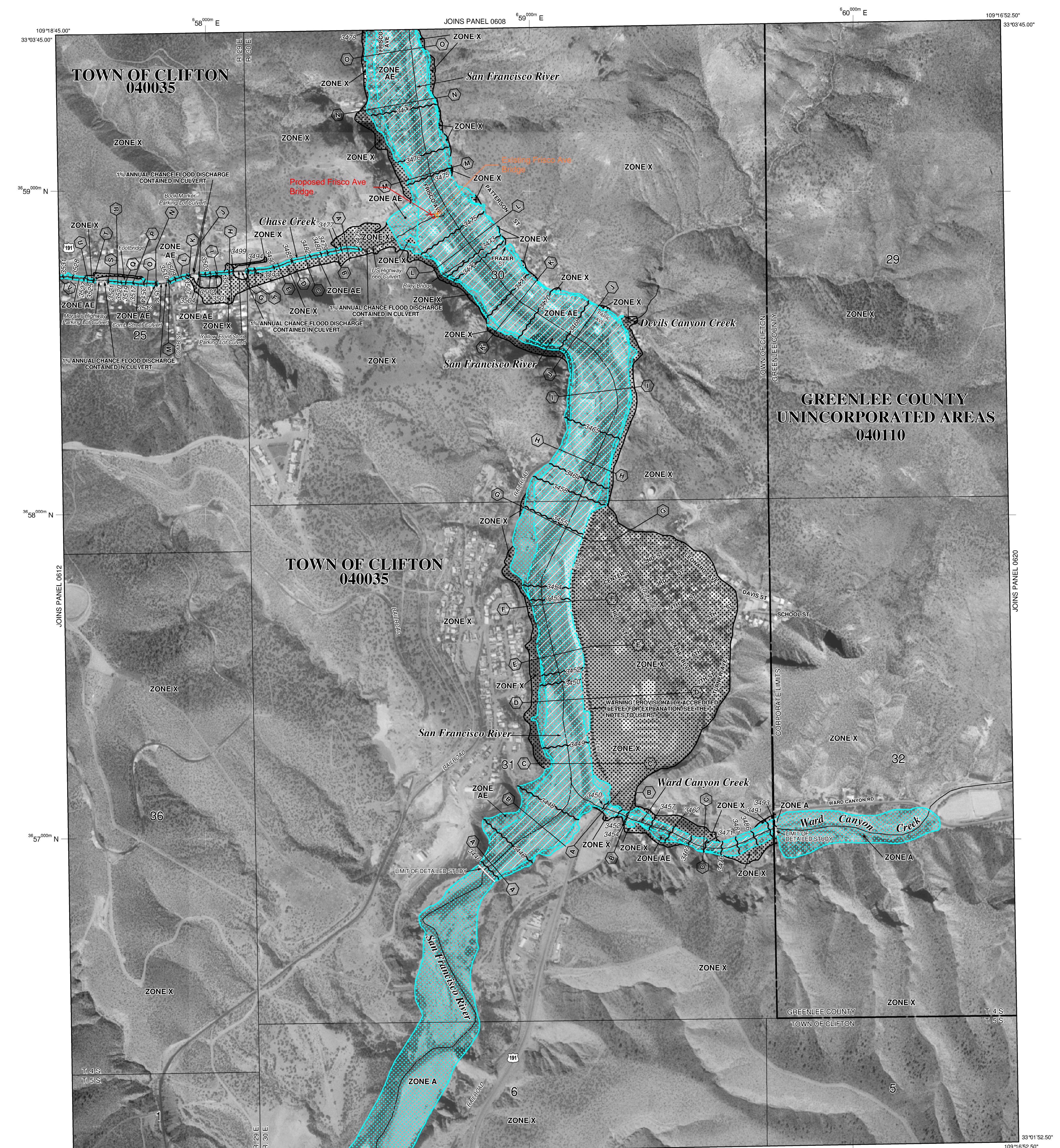
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

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.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a **Flood Insurance Study** report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at <http://www.msfc.fema.gov>.

If you have questions about this map or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA MAP (1-877-358-2627) or visit the FEMA website at <http://www.fema.gov>.

WARNING: This levee, dike, or other structure has been provisionally accredited and mapped as providing protection from the 1% annual chance flood. To maintain accreditation, the levee owner or community is required to submit documentation necessary to comply with 44 CFR Section 65.10 by (May 25, 2009). Because of the risk of overtopping or failure of the structure, communities should take proper precautions to protect lives and minimize damages in these areas, such as issuing an evacuation plan and encouraging property owners to purchase flood insurance.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD
The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Areas to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

- OTHER FLOOD AREAS**
- ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

- ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D** Areas in which flood hazards are undetermined, but potential.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

Base Flood Elevation line and value; elevation in feet*

~ ~ ~ 513 ~ ~ ~ (EL. 987)

Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

○ Cross section line

— Transect line

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

42°75'00" N

6000000 M

5000-foot grid ticks: Arizona State Plane coordinate system, east zone (FIPSZONE 0201), Transverse Mercator

DX5510 X

Bench mark (see explanation in Notes to Users section of this FIRM panel)

● M1.5

River Mile

MAP REPOSITORIES

Refer to Map Repositories list on Map Index

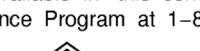
EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

September 29, 2007

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in the community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.



MAP SCALE 1" = 500' 0' 500' 1000' FEET METERS

NFIP PANEL 0616D

FIRM

FLOOD INSURANCE RATE MAP

GREENLEE COUNTY,
ARIZONA
AND INCORPORATED AREAS

PANEL 616 OF 1025

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GREENLEE COUNTY CLIFTON, TOWN OF	040110	0616	D

MAP NUMBER 04011C0616D

EFFECTIVE DATE

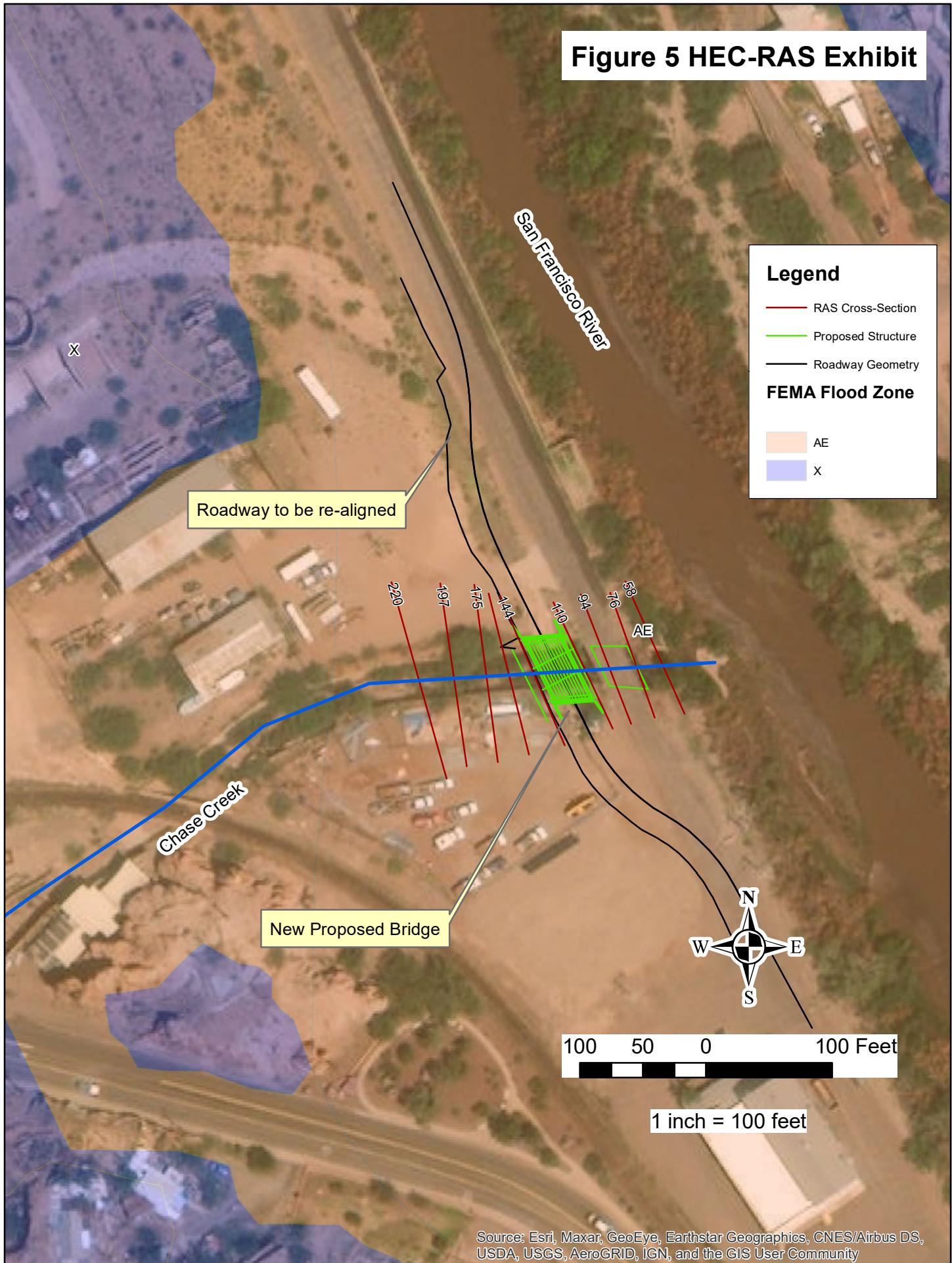
10/01/2007

Note to User: The Map Number shown below should be used when placing map and the Community Number shown above should be used on insurance applications for the subject community.



U.S. DEPARTMENT OF HOMELAND SECURITY

Figure 5 HEC-RAS Exhibit



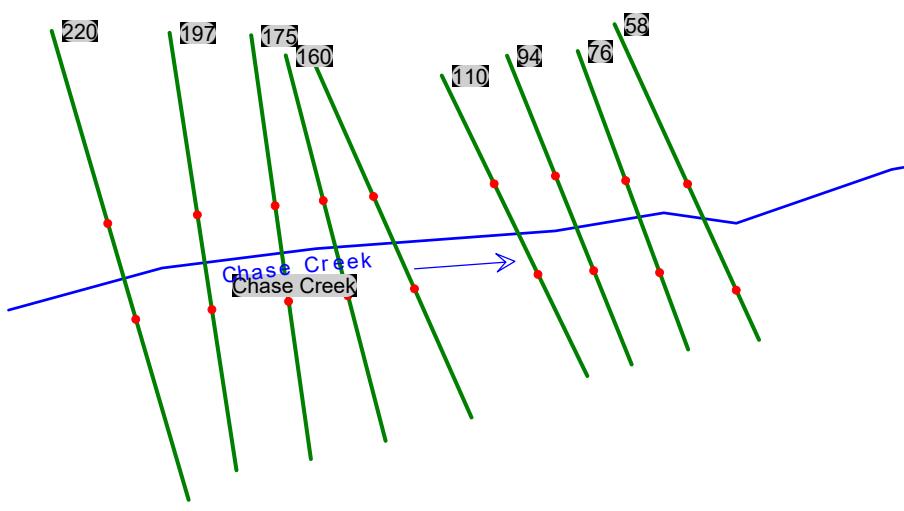
Water Surface Elevation Changes (Proposed - Existing)

Cross-Section River Station	100-Year Water Surface Elevation (ft)		
	Existing Conditions	Proposed Conditions	Difference (feet)
220	3460.54	3460.54	0
197	3459.66	3459.65	-0.01
175	3459.45	3459.45	0
160	3459.37	3459.37	0
144	3459.31	3459.31	0
110	3459.08	3459.08	0
94	3458.45	3458.45	0
76	3456.98	3456.98	0
58	3457.04	3457.04	0

Cross-Section River Station	10-Year Water Surface Elevation (ft)		
	Existing Conditions	Proposed Conditions	Difference (feet)
220	3458.00	3458	0
197	3456.81	3456.81	0
175	3456.38	3456.37	-0.01
160	3456.12	3456.11	-0.01
144	3455.79	3455.75	-0.04
110	3455.44	3455.44	0
94	3454.29	3454.29	0
76	3453.88	3453.88	0
58	3453.87	3453.87	0

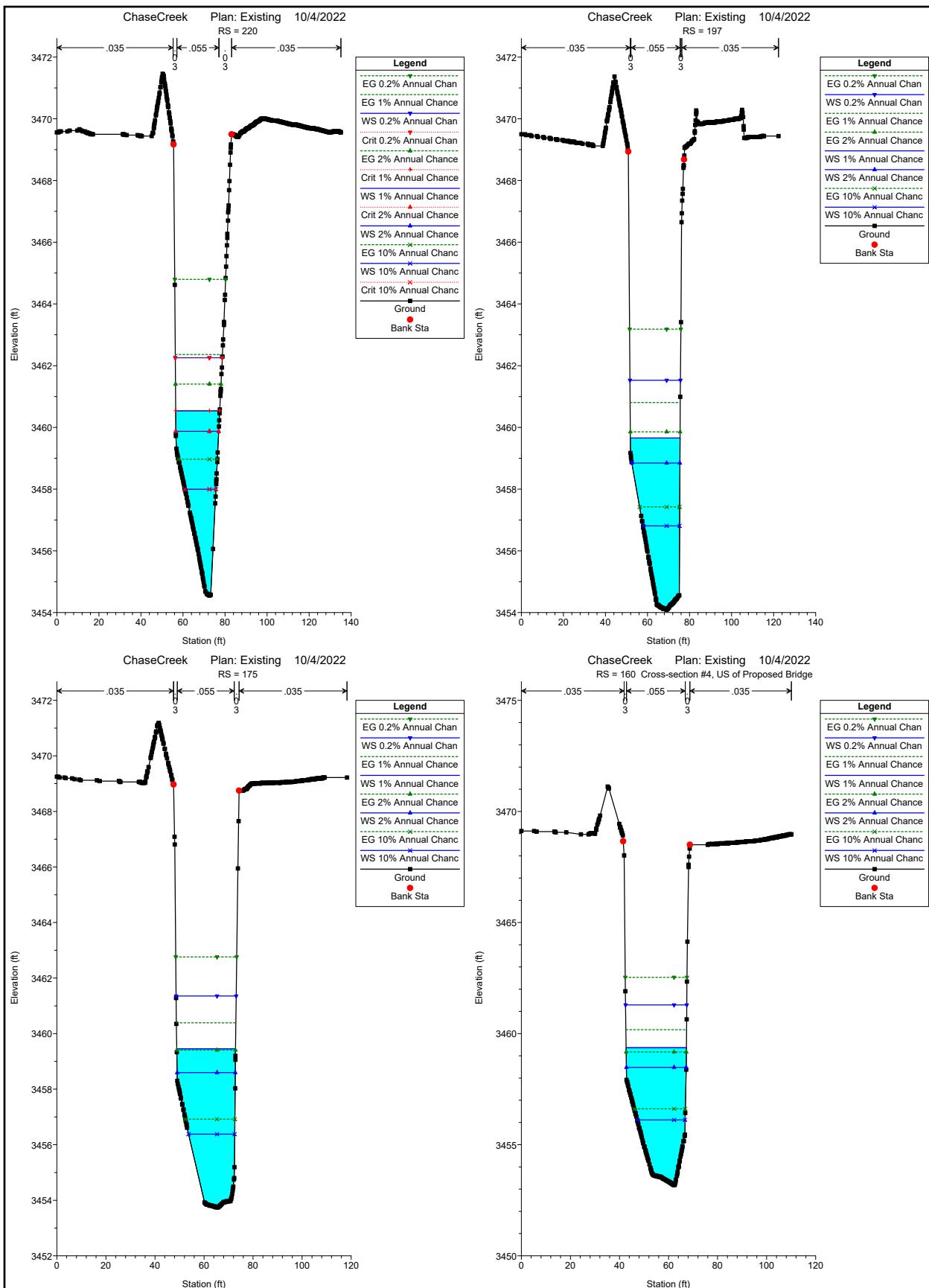
Cross-Section River Station	50-Year Water Surface Elevation (ft)		
	Existing Conditions	Proposed Conditions	Difference (feet)
220	3459.87	3459.87	0
197	3458.84	3458.84	0
175	3458.6	3458.59	-0.01
160	3458.48	3458.47	-0.01
144	3458.4	3458.4	0
110	3458.15	3458.15	0
94	3457.43	3457.43	0
76	3455.84	3455.84	0
58	3456.22	3456.22	0

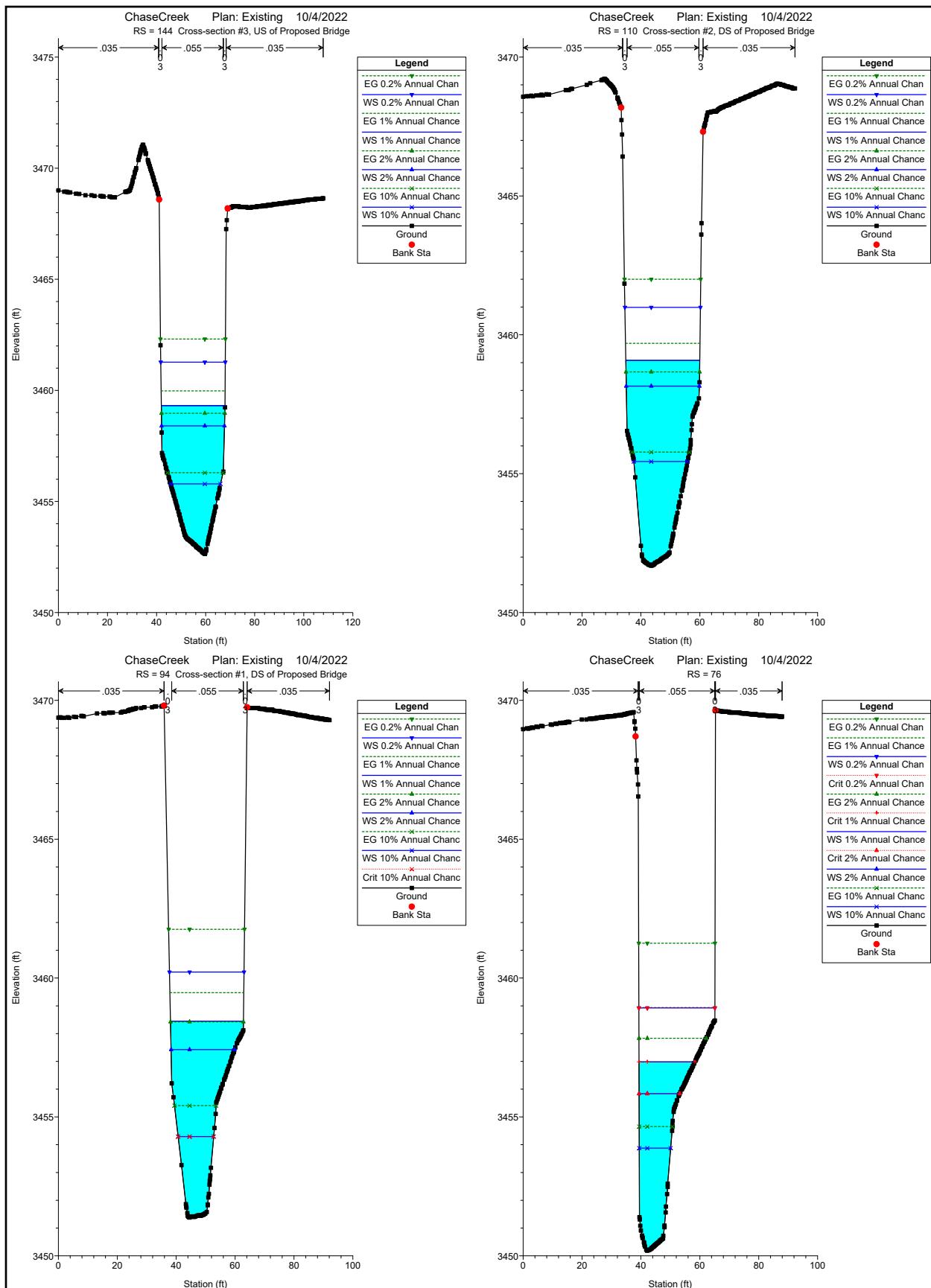
Cross-Section River Station	500-Year Water Surface Elevation (ft)		
	Existing Conditions	Proposed Conditions	Difference (feet)
220	3462.26	3462.26	0
197	3461.53	3461.53	0
175	3461.36	3461.35	-0.01
160	3461.29	3461.29	0
144	3461.27	3461.27	0
110	3460.99	3460.99	0
94	3460.22	3460.22	0
76	3458.93	3458.93	0
58	3458.88	3458.88	0

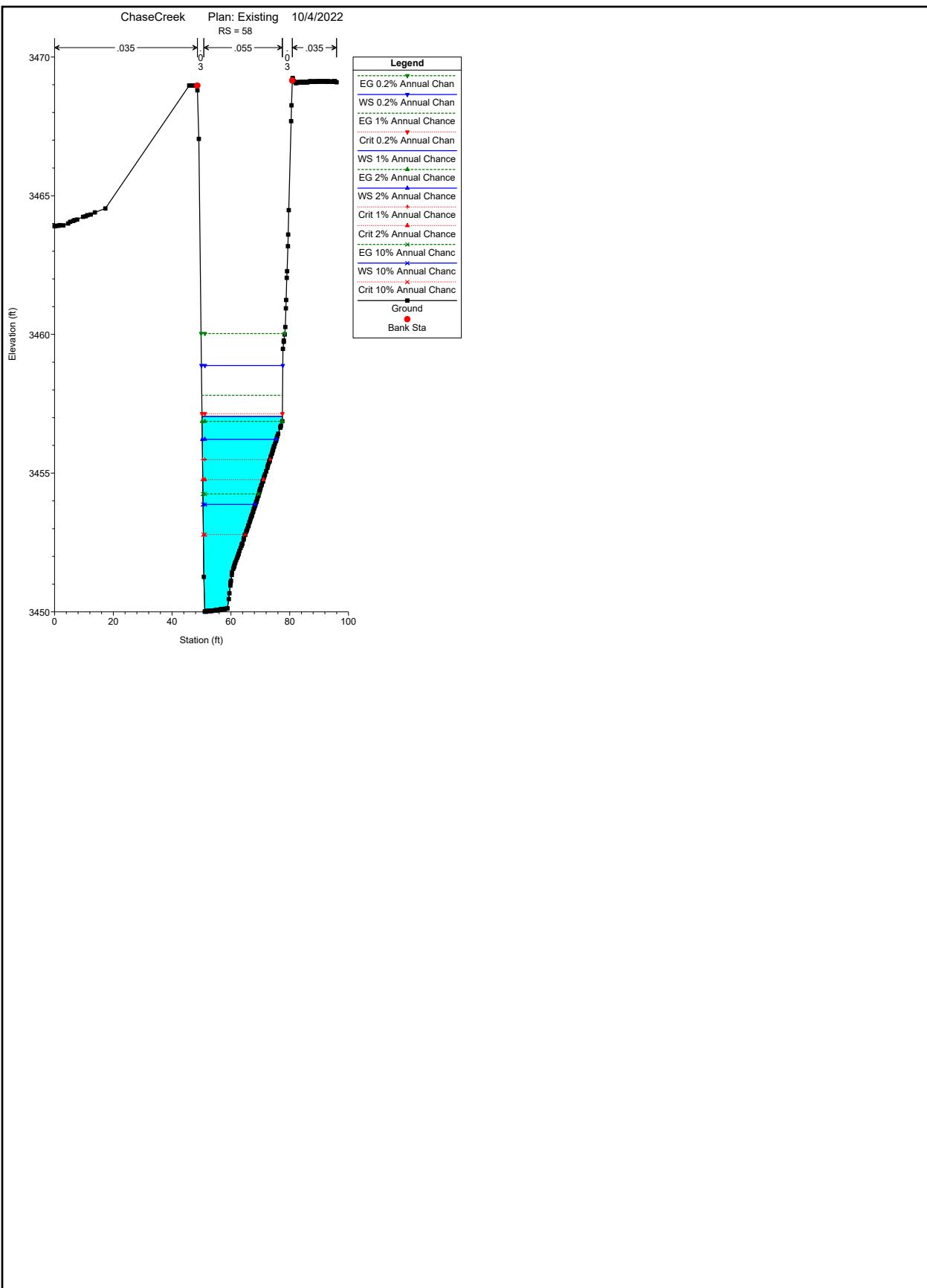


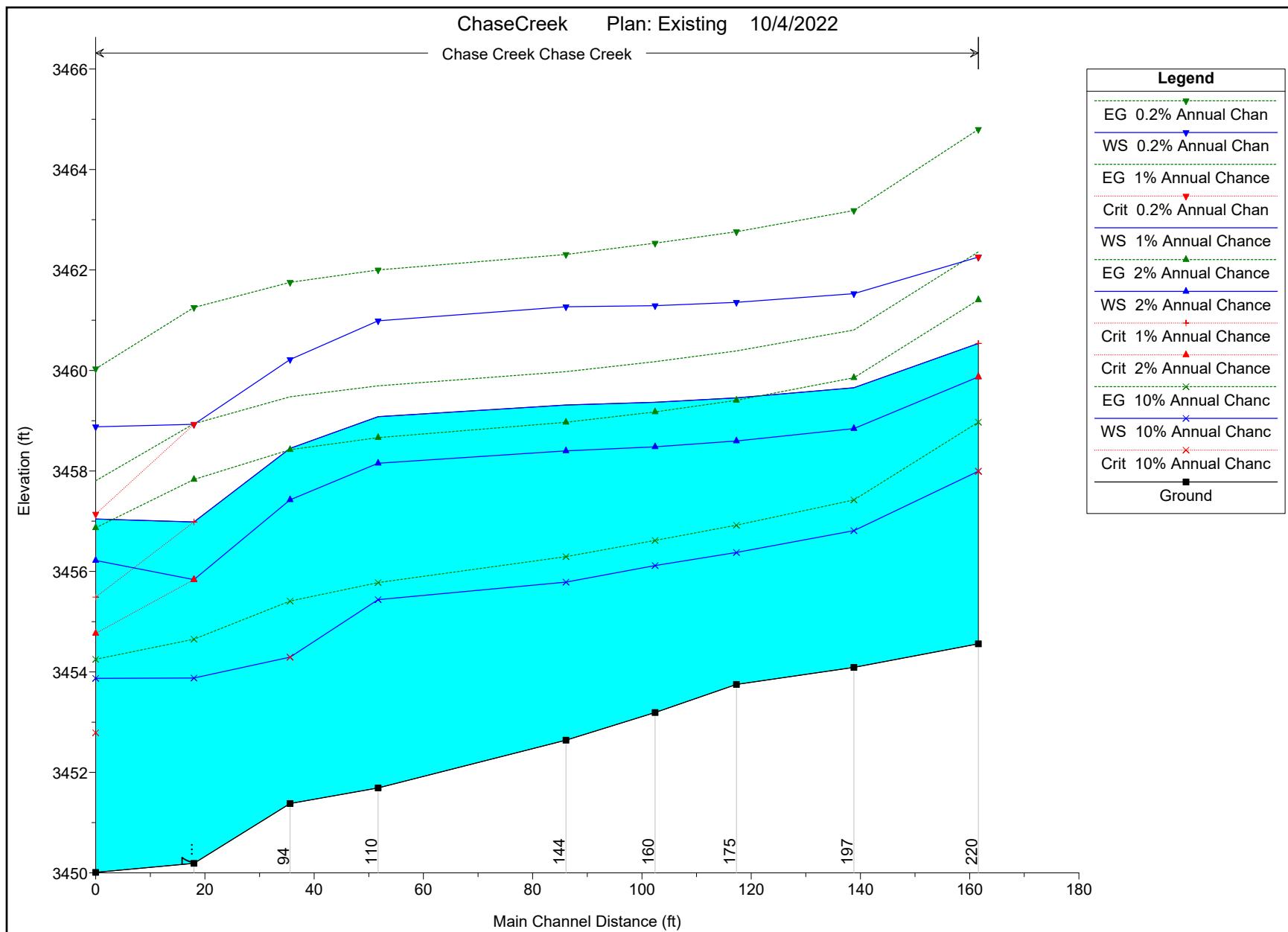
HEC-RAS Plan: Existing River: Chase Creek Reach: Chase Creek

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Chase Creek	220	1% Annual Chance	825.00	3454.56	3460.54	3460.54	3462.36	0.035509	10.83	76.18	20.94	1.00
Chase Creek	220	2% Annual Chance	620.00	3454.56	3459.87	3459.87	3461.41	0.037437	9.93	62.43	20.40	1.00
Chase Creek	220	0.2% Annual Chan	1450.00	3454.56	3462.26	3462.26	3464.80	0.031617	12.79	113.39	22.34	1.00
Chase Creek	220	10% Annual Chanc	225.00	3454.56	3458.00	3458.00	3458.97	0.044174	7.93	28.38	14.83	1.01
Chase Creek	197	1% Annual Chance	825.00	3454.09	3459.66		3460.81	0.021054	8.60	95.92	23.65	0.75
Chase Creek	197	2% Annual Chance	620.00	3454.09	3458.84		3459.85	0.023057	8.07	76.86	22.91	0.78
Chase Creek	197	0.2% Annual Chan	1450.00	3454.09	3461.53		3463.18	0.020309	10.32	140.52	24.01	0.75
Chase Creek	197	10% Annual Chanc	225.00	3454.09	3456.81		3457.42	0.024965	6.28	35.85	17.40	0.77
Chase Creek	175	1% Annual Chance	825.00	3453.75	3459.45		3460.39	0.013067	7.76	106.30	23.96	0.65
Chase Creek	175	2% Annual Chance	620.00	3453.75	3458.60		3459.41	0.014518	7.22	85.86	23.71	0.67
Chase Creek	175	0.2% Annual Chan	1450.00	3453.75	3461.36		3462.76	0.013075	9.51	152.48	24.53	0.67
Chase Creek	175	10% Annual Chanc	225.00	3453.75	3456.38		3456.92	0.020238	5.91	38.05	18.81	0.73
Chase Creek	160	1% Annual Chance	825.00	3453.19	3459.37		3460.18	0.010966	7.21	114.47	24.57	0.59
Chase Creek	160	2% Annual Chance	620.00	3453.19	3458.48		3459.17	0.012068	6.68	92.75	24.38	0.60
Chase Creek	160	0.2% Annual Chan	1450.00	3453.19	3461.29		3462.53	0.011417	8.95	162.09	24.96	0.62
Chase Creek	160	10% Annual Chanc	225.00	3453.19	3456.12		3456.62	0.019194	5.67	39.68	19.53	0.70
Chase Creek	144	1% Annual Chance	825.00	3452.64	3459.31		3459.98	0.008236	6.54	126.13	25.96	0.52
Chase Creek	144	2% Annual Chance	620.00	3452.64	3458.40		3458.97	0.008944	6.04	102.59	25.64	0.53
Chase Creek	144	0.2% Annual Chan	1450.00	3452.64	3461.27		3462.31	0.008782	8.18	177.28	26.33	0.56
Chase Creek	144	10% Annual Chanc	225.00	3452.64	3455.79		3456.29	0.020129	5.70	39.45	20.34	0.72
Chase Creek	110	1% Annual Chance	825.00	3451.69	3459.08		3459.69	0.007486	6.29	131.24	25.12	0.48
Chase Creek	110	2% Annual Chance	620.00	3451.69	3458.15		3458.66	0.007801	5.74	108.09	24.83	0.48
Chase Creek	110	0.2% Annual Chan	1450.00	3451.69	3460.99		3462.00	0.008680	8.07	179.72	25.66	0.54
Chase Creek	110	10% Annual Chanc	225.00	3451.69	3455.44		3455.78	0.009756	4.67	48.19	18.22	0.51
Chase Creek	94	1% Annual Chance	825.00	3451.38	3458.45		3459.48	0.017404	8.13	101.53	24.76	0.71
Chase Creek	94	2% Annual Chance	620.00	3451.38	3457.43		3458.42	0.020427	8.01	77.37	21.56	0.75
Chase Creek	94	0.2% Annual Chan	1450.00	3451.38	3460.22		3461.76	0.017150	9.95	145.79	25.30	0.73
Chase Creek	94	10% Annual Chanc	225.00	3451.38	3454.29	3454.29	3455.41	0.043734	8.47	26.55	12.07	1.01
Chase Creek	76	1% Annual Chance	825.00	3450.19	3456.98	3456.98	3458.94	0.038823	11.22	73.54	18.97	1.00
Chase Creek	76	2% Annual Chance	620.00	3450.19	3455.84	3455.84	3457.83	0.040651	11.33	54.72	13.78	1.00
Chase Creek	76	0.2% Annual Chan	1450.00	3450.19	3458.93	3458.93	3461.25	0.035807	12.24	118.50	25.81	1.01
Chase Creek	76	10% Annual Chanc	225.00	3450.19	3453.88		3454.65	0.021902	7.06	31.89	10.67	0.72
Chase Creek	58	1% Annual Chance	825.00	3450.01	3457.04	3455.49	3457.81	0.011606	7.00	117.79	27.34	0.59
Chase Creek	58	2% Annual Chance	620.00	3450.01	3456.22	3454.77	3456.87	0.011610	6.46	95.99	25.23	0.58
Chase Creek	58	0.2% Annual Chan	1450.00	3450.01	3458.88	3457.14	3460.03	0.011601	8.61	168.31	27.67	0.62
Chase Creek	58	10% Annual Chanc	225.00	3450.01	3453.87	3452.79	3454.25	0.011615	4.95	45.46	17.82	0.55









HEC-RAS HEC-RAS 6.2 March 2022
 U.S. Army Corps of Engineers
 Hydrologic Engineering Center
 609 Second Street
 Davis, California

X	X	XXXXXX	XXXX	XXXX	XX	XXXX
X	X	X	X	X	X	X
X	X	X	X	X	X	X
XXXXXXX	XXXX	X	XXX	XXXX	XXXXXX	XXXX
X	X	X	X	X	X	X
X	X	X	X	X	X	X
X	X	XXXXXX	XXXX	X	X	XXXXX

PROJECT DATA

Project Title: ChaseCreek
 Project File : ChaseCreek.prj
 Run Date and Time: 10/4/2022 8:07:51 AM

Project in English units

Project Description:

PROJECT DATA
 Project Title: Frisco Avenue Bridge
 Project File :
 ChaseCreek.prj
 Run Date: 2022.10.04

Project in English units

Project

Description: This project is located in Clifton in Greenlee County, AZ. This model serves to demonstrate no impacts on Chase Creek (a tributary to the San Francisco River) due to the construction of the new Frisco Avenue Bridge. FEMA flows are applied.

Existing Plan: ChaseCreek.pol

Description: This plan contains the existing Chase Creek alignment with no existing bridge.

Proposed Plan: ChaseCreek.pol

Description: This plan has the proposed bridge structure, which spans the creek, at river station 127

Both
 plans are run in subcritical flow.

ADOT TRACS NO. T0285

This model is not
 for public release until final approval by the Town of Clifton.

Consultant:
 Horrocks
 Cynthia M. S. DePonti, PE, CFM
 2600 North Central
 Avenue
 #550
 Phoenix, AZ 85004

Internal Job number TR-3588-21

Model Geometry
 based upon 2' contour interval mapping

Vertical Datum in NAVD88, Horizontal
 Datum is NAD 83 Arizona State Plane-East Zone, International-Feet

Survey
 mapping provided by Trace Consulting for ADOT, dated September 17, 2021

Last
 Model Run date October 4, 2022

Source of Hydrology: National Flood Insurance
 Study for Greenlee County, Arizona and Incorporated Areas 04011CV000A dated
 September 7, 2007.

Return Period (year)	Pct Annual Chance Runoff	Peak
Discharge (cfs)		
255	10	10%
620	50	2%
1%	100	
	500	825
0.2%	1450	

PLAN DATA

Plan Title: Existing
 Plan File : C:\Users\cindy.deponti\Documents\2 Projects\Frisco Ave Bridge\HECRAS\HEC-RAS\ChaseCreek.p01

Geometry Title: Existing
 Geometry File : C:\Users\cindy.deponti\Documents\2 Projects\Frisco Ave Bridge\HECRAS\HEC-RAS\ChaseCreek.g01

Flow Title : FEMA Flows
 Flow File : C:\Users\cindy.deponti\Documents\2 Projects\Frisco Ave Bridge\HECRAS\HEC-RAS\ChaseCreek.f01

Plan Summary Information:

Number of: Cross Sections = 9 Multiple Openings = 0
 Culverts = 0 Inline Structures = 0
 Bridges = 0 Lateral Structures = 0

Computational Information

Water surface calculation tolerance = 0.01
 Critical depth calculation tolerance = 0.01

81	3469.23	81	3469.24	81.399	3469.13	81.6	3469.11	82.099	3469.07
82.099	3469.06	82.5	3469.07	82.7	3469.08	82.9	3469.09	83.101	3469.09
83.2	3469.09	83.3	3469.09	83.6	3469.09	83.801	3469.09	84	3469.1
84.1	3469.1	84.3	3469.1	84.4	3469.1	84.501	3469.09	84.8	3469.09
84.899	3469.09	85.1	3469.1	85.4	3469.1	85.501	3469.1	85.7	3469.09
85.899	3469.09	86	3469.09	86.1	3469.1	86.3	3469.1	86.5	3469.11
86.599	3469.11	86.901	3469.12	87	3469.12	87.1	3469.12	87.4	3469.11
87.601	3469.11	87.8	3469.11	88.1	3469.12	88.2	3469.12	88.5	3469.11
88.699	3469.11	88.9	3469.11	89.2	3469.12	89.301	3469.12	89.699	3469.12
89.8	3469.12	90.001	3469.12	90.399	3469.12	90.5	3469.12	90.9	3469.12
91.2	3469.12	91.5	3469.12	91.9	3469.12	92	3469.12	92.2	3469.12
92.6	3469.12	93	3469.12	93.101	3469.12	93.2	3469.12	93.4	3469.11
94.199	3469.12	94.6	3469.11	94.8	3469.11	94.899	3469.12	95.3	3469.12
95.3	3469.13	95.4	3469.12	95.97	3469.09				

Manning's n Values		num= 5							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	48.599	.03	50.8	.055	77.5	.03	80.9	.035

Bank Sta: Left		Right		Lengths:		Left	Channel	Right	Coeff	Contr.	Expan.
48.599	80.9			0	0				.1		.3

SUMMARY OF MANNING'S N VALUES

River: Chase Creek

Reach	River Sta.	n1	n2	n3	n4	n5
Chase Creek	220	.035	.03	.055	.03	.035
Chase Creek	197	.035	.03	.055	.03	.035
Chase Creek	175	.035	.03	.055	.03	.035
Chase Creek	160	.035	.03	.055	.03	.035
Chase Creek	144	.035	.03	.055	.03	.035
Chase Creek	110	.035	.03	.055	.03	.035
Chase Creek	94	.035	.03	.055	.03	.035
Chase Creek	76	.035	.03	.055	.03	.035
Chase Creek	58	.035	.03	.055	.03	.035

SUMMARY OF REACH LENGTHS

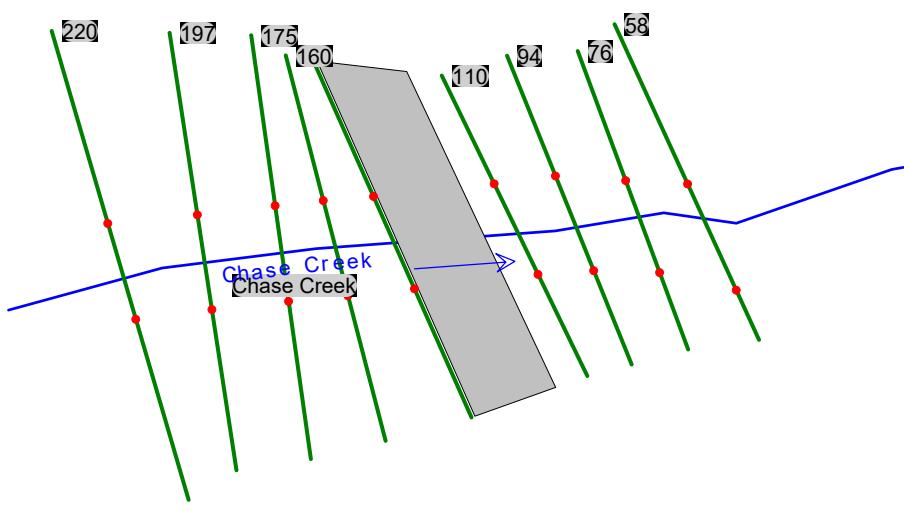
River: Chase Creek

Reach	River Sta.	Left	Channel	Right
Chase Creek	220	22.8	22.8	22.8
Chase Creek	197	21.5	21.5	21.5
Chase Creek	175	14.9	14.9	14.9
Chase Creek	160	16.3	16.3	16.3
Chase Creek	144	34.4	34.4	34.4
Chase Creek	110	16.1	16.1	16.1
Chase Creek	94	17.6	17.6	17.6
Chase Creek	76	18	18	18
Chase Creek	58	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

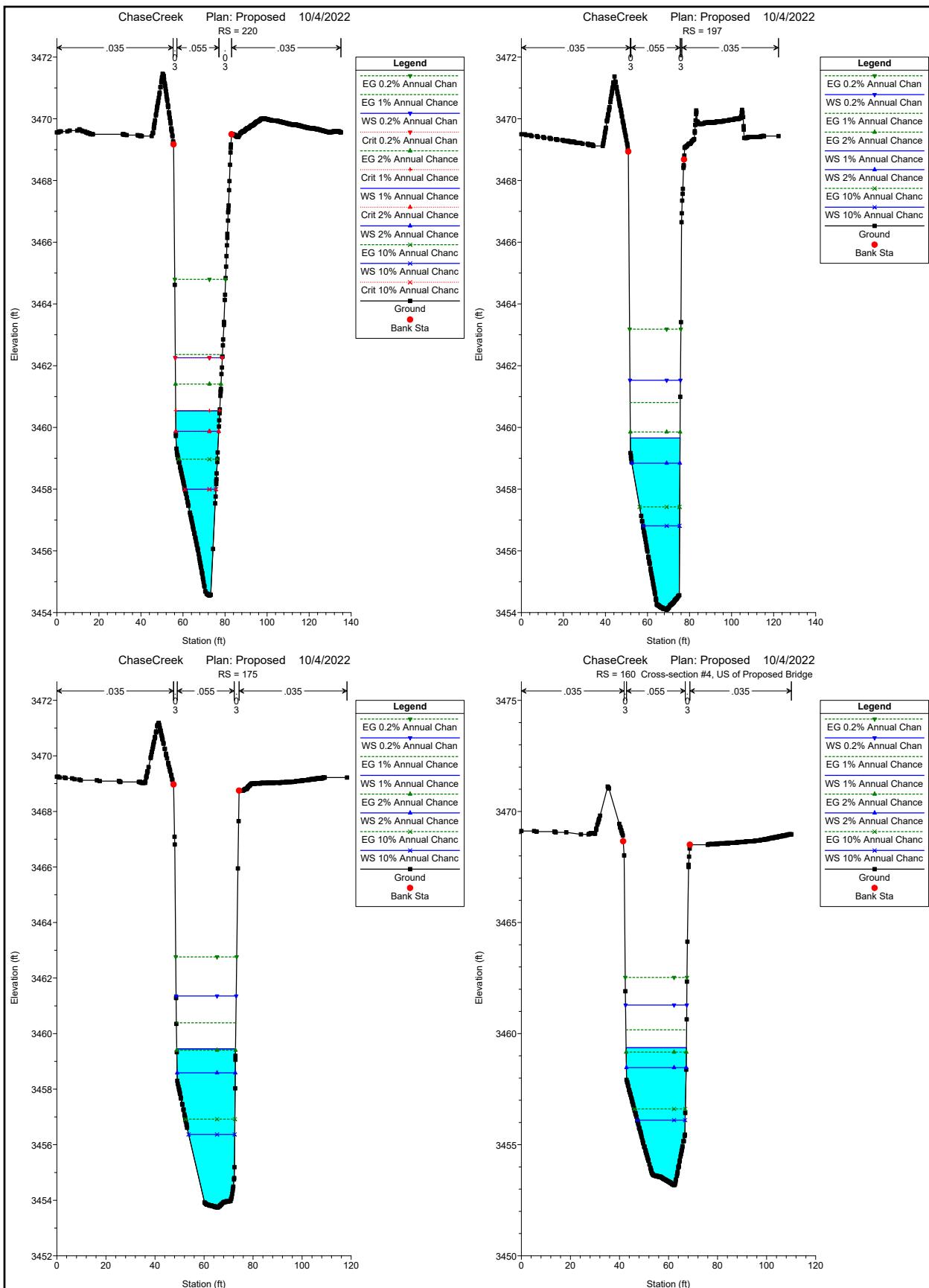
River: Chase Creek

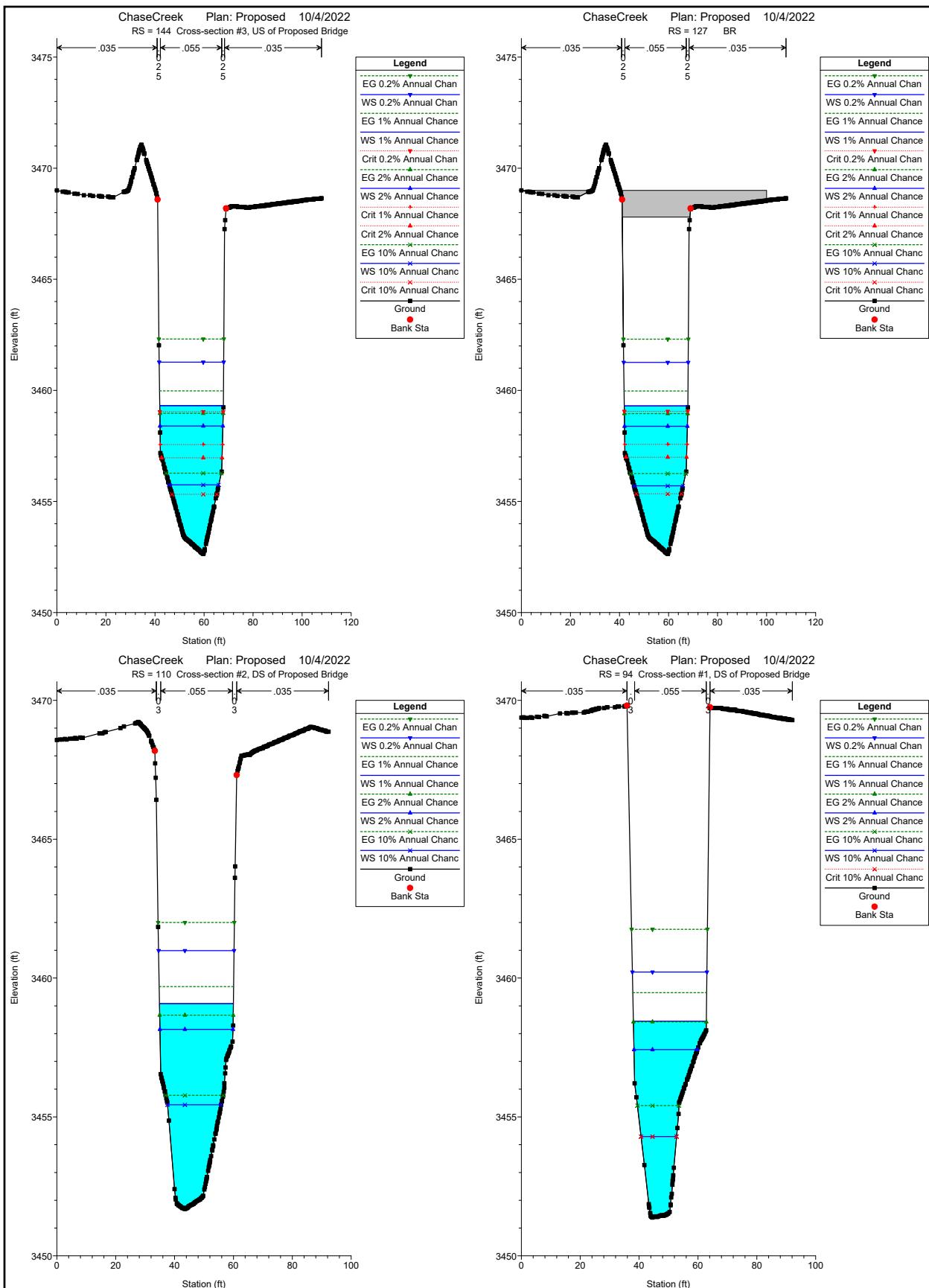
Reach	River Sta.	Contr.	Expan.
Chase Creek	220	.1	.3
Chase Creek	197	.1	.3
Chase Creek	175	.1	.3
Chase Creek	160	.1	.3
Chase Creek	144	.1	.3
Chase Creek	110	.1	.3
Chase Creek	94	.1	.3
Chase Creek	76	.1	.3
Chase Creek	58	.1	.3

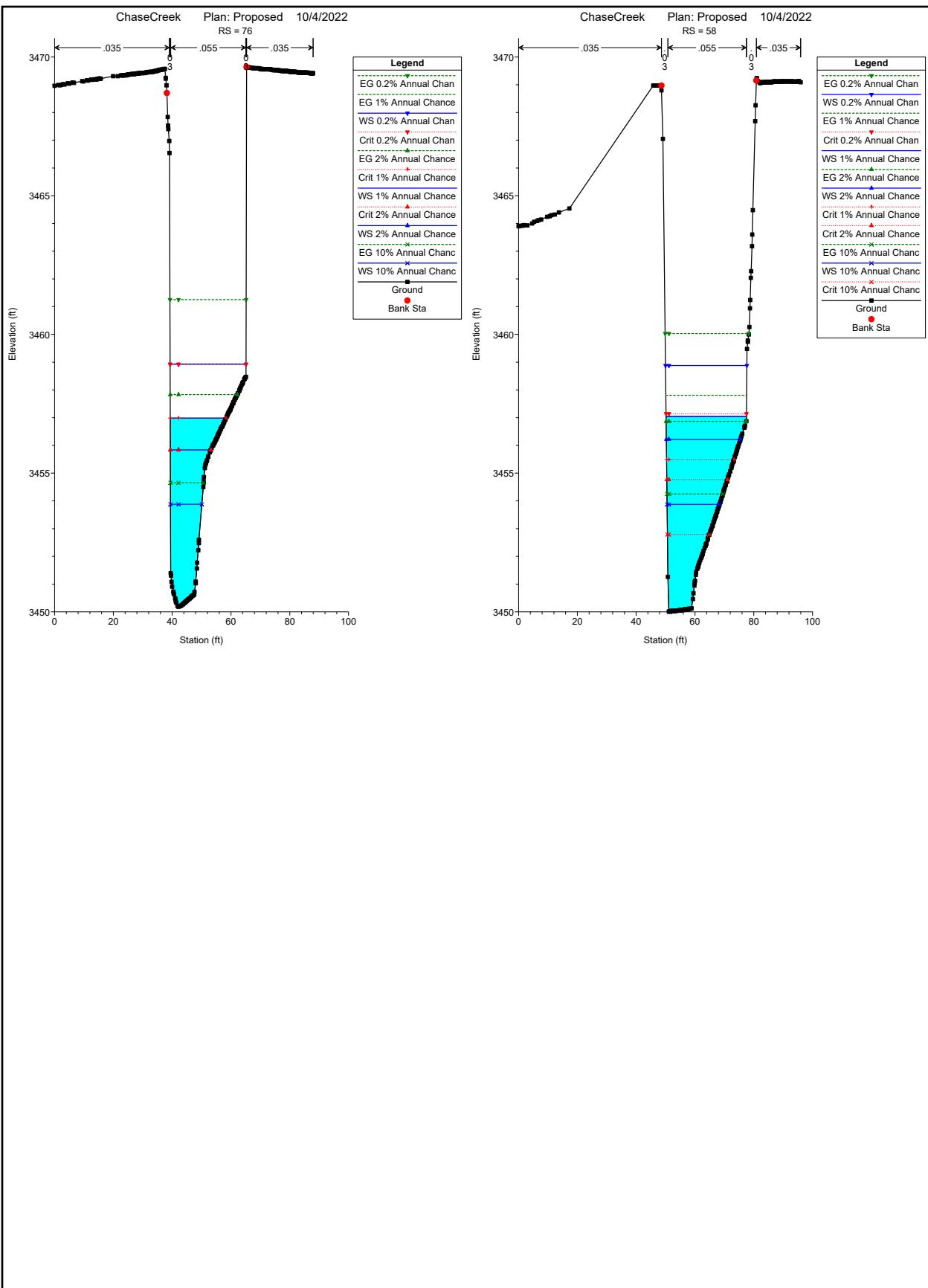


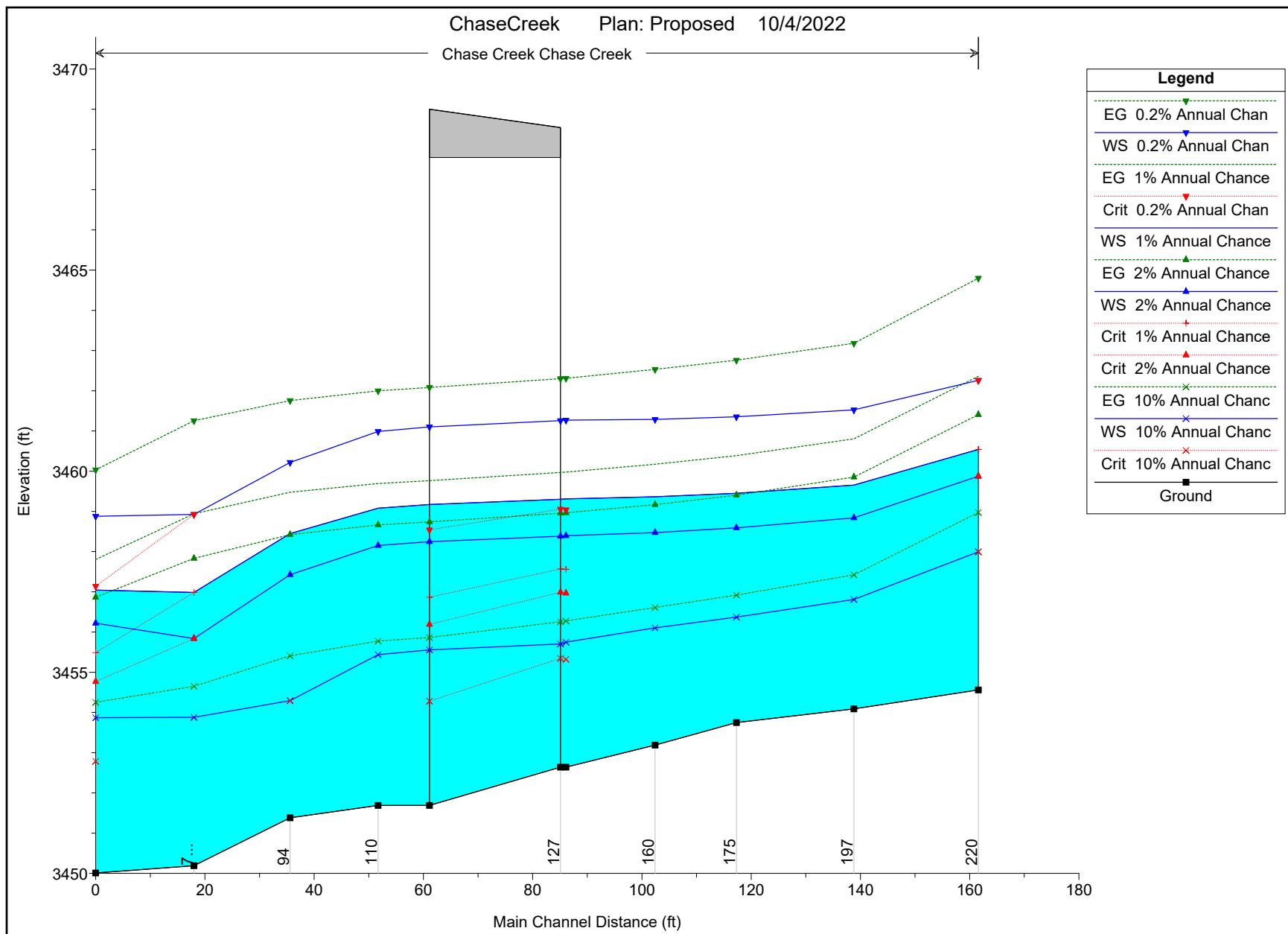
HEC-RAS Plan: Proposed River: Chase Creek Reach: Chase Creek

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Chase Creek	220	1% Annual Chance	825.00	3454.56	3460.54	3460.54	3462.36	0.035479	10.83	76.20	20.94	1.00
Chase Creek	220	2% Annual Chance	620.00	3454.56	3459.87	3459.87	3461.41	0.037419	9.93	62.44	20.40	1.00
Chase Creek	220	0.2% Annual Chan	1450.00	3454.56	3462.26	3462.26	3464.80	0.031598	12.79	113.41	22.34	1.00
Chase Creek	220	10% Annual Chanc	225.00	3454.56	3458.00	3458.00	3458.97	0.044174	7.93	28.38	14.83	1.01
Chase Creek	197	1% Annual Chance	825.00	3454.09	3459.65		3460.81	0.021077	8.60	95.89	23.65	0.75
Chase Creek	197	2% Annual Chance	620.00	3454.09	3458.84		3459.85	0.023135	8.08	76.77	22.90	0.78
Chase Creek	197	0.2% Annual Chan	1450.00	3454.09	3461.53		3463.18	0.020333	10.32	140.47	24.01	0.75
Chase Creek	197	10% Annual Chanc	225.00	3454.09	3456.81		3457.42	0.025006	6.28	35.83	17.40	0.77
Chase Creek	175	1% Annual Chance	825.00	3453.75	3459.45		3460.39	0.013087	7.76	106.25	23.96	0.65
Chase Creek	175	2% Annual Chance	620.00	3453.75	3458.59		3459.40	0.014593	7.23	85.72	23.71	0.67
Chase Creek	175	0.2% Annual Chan	1450.00	3453.75	3461.35		3462.76	0.013091	9.51	152.42	24.53	0.67
Chase Creek	175	10% Annual Chanc	225.00	3453.75	3456.37		3456.92	0.020401	5.93	37.94	18.80	0.74
Chase Creek	160	1% Annual Chance	825.00	3453.19	3459.37		3460.17	0.010983	7.21	114.42	24.57	0.59
Chase Creek	160	2% Annual Chance	620.00	3453.19	3458.47		3459.17	0.012132	6.70	92.59	24.38	0.61
Chase Creek	160	0.2% Annual Chan	1450.00	3453.19	3461.29		3462.53	0.011430	8.95	162.03	24.96	0.62
Chase Creek	160	10% Annual Chanc	225.00	3453.19	3456.11		3456.61	0.019503	5.70	39.47	19.50	0.71
Chase Creek	144	1% Annual Chance	825.00	3452.64	3459.31	3457.56	3459.98	0.008048	6.54	126.12	25.96	0.52
Chase Creek	144	2% Annual Chance	620.00	3452.64	3458.40	3456.97	3458.96	0.008844	6.05	102.46	25.63	0.53
Chase Creek	144	0.2% Annual Chan	1450.00	3452.64	3461.27	3459.04	3462.31	0.008439	8.18	177.33	26.33	0.56
Chase Creek	144	10% Annual Chanc	225.00	3452.64	3455.75	3455.32	3456.28	0.021250	5.82	38.66	20.14	0.74
Chase Creek	127	Bridge										
Chase Creek	110	1% Annual Chance	825.00	3451.69	3459.08		3459.69	0.007486	6.29	131.24	25.12	0.48
Chase Creek	110	2% Annual Chance	620.00	3451.69	3458.15		3458.66	0.007801	5.74	108.09	24.83	0.48
Chase Creek	110	0.2% Annual Chan	1450.00	3451.69	3460.99		3462.00	0.008680	8.07	179.72	25.66	0.54
Chase Creek	110	10% Annual Chanc	225.00	3451.69	3455.44		3455.78	0.009756	4.67	48.19	18.22	0.51
Chase Creek	94	1% Annual Chance	825.00	3451.38	3458.45		3459.48	0.017404	8.13	101.53	24.76	0.71
Chase Creek	94	2% Annual Chance	620.00	3451.38	3457.43		3458.42	0.020427	8.01	77.37	21.56	0.75
Chase Creek	94	0.2% Annual Chan	1450.00	3451.38	3460.22		3461.76	0.017150	9.95	145.79	25.30	0.73
Chase Creek	94	10% Annual Chanc	225.00	3451.38	3454.29	3454.29	3455.41	0.043734	8.47	26.55	12.07	1.01
Chase Creek	76	1% Annual Chance	825.00	3450.19	3456.98	3456.98	3458.94	0.038823	11.22	73.54	18.97	1.00
Chase Creek	76	2% Annual Chance	620.00	3450.19	3455.84	3455.84	3457.83	0.040656	11.33	54.72	13.78	1.00
Chase Creek	76	0.2% Annual Chan	1450.00	3450.19	3458.93	3458.93	3461.25	0.035807	12.24	118.50	25.81	1.01
Chase Creek	76	10% Annual Chanc	225.00	3450.19	3453.88		3454.65	0.021902	7.06	31.89	10.67	0.72
Chase Creek	58	1% Annual Chance	825.00	3450.01	3457.04	3455.49	3457.81	0.011606	7.00	117.79	27.34	0.59
Chase Creek	58	2% Annual Chance	620.00	3450.01	3456.22	3454.77	3456.87	0.011610	6.46	95.99	25.23	0.58
Chase Creek	58	0.2% Annual Chan	1450.00	3450.01	3458.88	3457.14	3460.03	0.011601	8.61	168.31	27.67	0.62
Chase Creek	58	10% Annual Chanc	225.00	3450.01	3453.87	3452.79	3454.25	0.011615	4.95	45.46	17.82	0.55









HEC-RAS HEC-RAS 6.2 March 2022
 U.S. Army Corps of Engineers
 Hydrologic Engineering Center
 609 Second Street
 Davis, California

X	X	XXXXXX	XXXX	XXXX	XX	XXXX
X	X	X	X	X	X	X
X	X	X	X	X	X	X
XXXXXXX	XXXX	X	XXX	XXXX	XXXXXX	XXXX
X	X	X	X	X	X	X
X	X	X	X	X	X	X
X	X	XXXXXX	XXXX	X	X	XXXXX

PROJECT DATA

Project Title: ChaseCreek
 Project File : ChaseCreek.prj
 Run Date and Time: 10/4/2022 10:39:37 AM

Project in English units

Project Description:

PROJECT DATA
 Project Title: Frisco Avenue Bridge
 Project File :
 ChaseCreek.prj
 Run Date: 2022.10.04

Project in English units

Project

Description: This project is located in Clifton in Greenlee County, AZ. This model serves to demonstrate no impacts on Chase Creek (a tributary to the San Francisco River) due to the construction of the new Frisco Avenue Bridge. FEMA flows are applied.

Existing Plan: ChaseCreek.pol

Description: This plan contains the existing Chase Creek alignment with no existing bridge.

Proposed Plan: ChaseCreek.pol

Description: This plan has the proposed bridge structure, which spans the creek, at river station 127

Both
 plans are run in subcritical flow.

ADOT TRACS NO. T0285

This model is not
 for public release until final approval by the Town of Clifton.

Consultant:
 Horrocks
 Cynthia M. S. DePonti, PE, CFM
 2600 North Central
 Avenue
 #550
 Phoenix, AZ 85004

Internal Job number TR-3588-21

Model Geometry
 based upon 2' contour interval mapping

Vertical Datum in NAVD88, Horizontal
 Datum is NAD 83 Arizona State Plane-East Zone, International-Feet

Survey
 mapping provided by Trace Consulting for ADOT, dated September 17, 2021

Last
 Model Run date October 4, 2022

Source of Hydrology: National Flood Insurance
 Study for Greenlee County, Arizona and Incorporated Areas 04011CV000A dated
 September 7, 2007.

Return Period (year)	Pct Annual Chance Runoff	Peak
Discharge (cfs)		
10		10%
255		
620	50	2%
1%	100	
	825	
0.2%	500	
		1450

PLAN DATA

Plan Title: Proposed
 Plan File : C:\Users\cindy.deponti\Documents\2 Projects\Frisco Ave Bridge\HECRAS\HEC-RAS\ChaseCreek.p02

Geometry Title: Proposed
 Geometry File : C:\Users\cindy.deponti\Documents\2 Projects\Frisco Ave Bridge\HECRAS\HEC-RAS\ChaseCreek.g02

Flow Title : FEMA Flows
 Flow File : C:\Users\cindy.deponti\Documents\2 Projects\Frisco Ave Bridge\HECRAS\HEC-RAS\ChaseCreek.f01

Plan Summary Information:

Cross Sections =	9	Multiple Openings =	0
Culverts =	0	Inline Structures =	0
Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance = 0.01
 Critical depth calculation tolerance = 0.01

89	3468.96	89.4	3468.94	89.8	3468.94	89.9	3468.94	90.1	3468.93
90.5	3468.91	91.1	3468.91	91.2	3468.9	91.6	3468.88	91.6	3468.87
92.295	3468.87								

Manning's n Values	num=	5							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	33.8	.03	35.3	.055	59.7	.03	61.1	.035

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	33.3	61.1		.1	.3

Upstream Embankment side slope = 0 horiz. to 1.0 vertical

Downstream Embankment side slope = 0 horiz. to 1.0 vertical

Maximum allowable submergence for weir flow = .98

Elevation at which weir flow begins =

Energy head used in spillway design =

Spillway height used in design =

Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth

inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #1% Annual Chance

E.G. US. (ft)	3459.98	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	3459.31	E.G. Elev (ft)	3459.97	3459.77
Q Total (cfs)	825.00	W.S. Elev (ft)	3459.30	3459.17
Q Bridge (cfs)	825.00	Crit W.S. (ft)	3457.57	3456.87
Q Weir (cfs)		Max Chl Dpth (ft)	6.66	7.48
Weir Sta Lft (ft)		Vel Total (ft/s)	6.56	6.17
Weir Sta Rgt (ft)		Flow Area (sq ft)	125.86	133.61
Weir Submerg		Froude # Chl	0.52	0.47
Weir Max Depth (ft)		Specif Force (cu ft)	501.14	565.91
Min El Weir Flow (ft)	3469.01	Hydr Depth (ft)	4.85	5.31
Min El Prs (ft)	3467.80	W.P. Total (ft)	32.03	32.33
Delta EG (ft)	0.28	Conv. Total (cfs)	9165.4	9806.2
Delta WS (ft)	0.23	Top Width (ft)	25.96	25.15
BR Open Area (sq ft)	352.51	Frctn Loss (ft)	0.18	0.07
BR Open Vel (ft/s)	6.56	C & E Loss (ft)	0.02	0.00
BR Sluice Coef		Shear Total (lb/sq ft)	1.99	1.83
BR Sel Method	Energy only	Power Total (lb/ft s)	13.03	11.28

Note: Manning's n values were composited to a single value in the main channel.

Note: Manning's n values were composited to a single value in the main channel.

BRIDGE OUTPUT Profile #2% Annual Chance

E.G. US. (ft)	3458.96	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	3458.40	E.G. Elev (ft)	3458.96	3458.74
Q Total (cfs)	620.00	W.S. Elev (ft)	3458.38	3458.25
Q Bridge (cfs)	620.00	Crit W.S. (ft)	3456.99	3456.19
Q Weir (cfs)		Max Chl Dpth (ft)	5.74	6.56
Weir Sta Lft (ft)		Vel Total (ft/s)	6.07	5.61
Weir Sta Rgt (ft)		Flow Area (sq ft)	102.17	110.48
Weir Submerg		Froude # Chl	0.54	0.47
Weir Max Depth (ft)		Specif Force (cu ft)	345.33	402.93
Min El Weir Flow (ft)	3469.01	Hydr Depth (ft)	3.99	4.44
Min El Prs (ft)	3467.80	W.P. Total (ft)	30.16	30.46
Delta EG (ft)	0.30	Conv. Total (cfs)	6563.1	7267.0
Delta WS (ft)	0.24	Top Width (ft)	25.63	24.88
BR Open Area (sq ft)	352.51	Frctn Loss (ft)	0.19	0.07
BR Open Vel (ft/s)	6.07	C & E Loss (ft)	0.02	0.00
BR Sluice Coef		Shear Total (lb/sq ft)	1.89	1.65
BR Sel Method	Energy only	Power Total (lb/ft s)	11.45	9.25

Note: Manning's n values were composited to a single value in the main channel.

Note: Manning's n values were composited to a single value in the main channel.

BRIDGE OUTPUT Profile #0.2% Annual Chan

E.G. US. (ft)	3462.31	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	3461.27	E.G. Elev (ft)	3462.30	3462.08
Q Total (cfs)	1450.00	W.S. Elev (ft)	3461.26	3461.10
Q Bridge (cfs)	1450.00	Crit W.S. (ft)	3459.06	3458.54
Q Weir (cfs)		Max Chl Dpth (ft)	8.62	9.41
Weir Sta Lft (ft)		Vel Total (ft/s)	8.19	7.94
Weir Sta Rgt (ft)		Flow Area (sq ft)	177.02	182.65
Weir Submerg		Froude # Chl	0.56	0.52
Weir Max Depth (ft)		Specif Force (cu ft)	998.50	1070.28
Min El Weir Flow (ft)	3469.01	Hydr Depth (ft)	6.72	7.11
Min El Prs (ft)	3467.80	W.P. Total (ft)	35.97	36.23
Delta EG (ft)	0.31	Conv. Total (cfs)	15741.9	15957.8
Delta WS (ft)	0.28	Top Width (ft)	26.33	25.69
BR Open Area (sq ft)	352.51	Frctn Loss (ft)	0.20	0.08
BR Open Vel (ft/s)	8.19	C & E Loss (ft)	0.02	0.00
BR Sluice Coef		Shear Total (lb/sq ft)	2.61	2.60
BR Sel Method	Energy only	Power Total (lb/ft s)	21.35	20.63

Note: Manning's n values were composited to a single value in the main channel.

Note: Manning's n values were composited to a single value in the main channel.

BRIDGE OUTPUT Profile #10% Annual Chanc

E.G. US. (ft)	3456.28	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	3455.75	E.G. Elev (ft)	3456.26	3455.87
Q Total (cfs)	225.00	W.S. Elev (ft)	3455.71	3455.56
Q Bridge (cfs)	225.00	Crit W.S. (ft)	3455.35	3454.28
Q Weir (cfs)		Max Chl Dpth (ft)	3.07	3.87
Weir Sta Lft (ft)		Vel Total (ft/s)	5.95	4.47
Weir Sta Rgt (ft)		Flow Area (sq ft)	37.79	50.37
Weir Submerg		Froude # Chl	0.76	0.48
Weir Max Depth (ft)		Specif Force (cu ft)	85.81	113.22

SUMMARY OF REACH LENGTHS

River: Chase Creek

Reach	River Sta.	Left	Channel	Right
Chase Creek	220	22.8	22.8	22.8
Chase Creek	197	21.5	21.5	21.5
Chase Creek	175	14.9	14.9	14.9
Chase Creek	160	16.3	16.3	16.3
Chase Creek	144	34.4	34.4	34.4
Chase Creek	127	Bridge		
Chase Creek	110	16.1	16.1	16.1
Chase Creek	94	17.6	17.6	17.6
Chase Creek	76	18	18	18
Chase Creek	58	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Chase Creek

Reach	River Sta.	Contr.	Expan.	
Chase Creek	220	.1	.3	
Chase Creek	197	.1	.3	
Chase Creek	175	.1	.3	
Chase Creek	160	.1	.3	
Chase Creek	144	.1	.3	
Chase Creek	127	Bridge		
Chase Creek	110	.1	.3	
Chase Creek	94	.1	.3	
Chase Creek	76	.1	.3	
Chase Creek	58	.1	.3	