Preliminary Engineering Report
Prepared: October 2016

StoryRock
Lift Station #2

Prepared for:

CAV-RANCH, LLC.
14400 North 7th Place
Scottsdale, Arizona 85260

Prepared by:

Kimley-Horn and Associates, Inc.
7740 N. 16th Street, Suite 300
Phoenix, AZ 85020
(602) 944-5500

191069013

NO COMMENTS
12/6/2016

Kimley»Horn

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Expires 09/30/17

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EXECUTIVE SUMMARY

The purpose of this report is to provide preliminary design analysis for the construction of a new lift station serving StoryRock, a proposed master planned community development consisting of 462-acres of single family residential construction. The purpose of this report is to provide for review and comment a preliminary design for the lift station layout, pumping alternatives, and associated pumping and force main options. The following points summarize the findings of the preliminary design work that has been completed to date:

Lift Station Analysis Site Analysis

- Analyzed location based on the following criteria; existing topography, proximity to a 100-year flood plain, integration with the proposed gravity sewer system along N 128th Street.

Pumps

- Two 11hp pumps to be installed to accommodate an anticipated 70 gpm flow.

Force Main Analysis

- Preliminary alignment and sizing options for redundant force main lines based on flow and pump requirements for StoryRock site development.

Electrical Systems Analysis

- Electrical and instrumentation needs for the lift station include: power delivery and collaboration with utility, design of control specifics, lighting design, and instrumentation selection and implementation.

Odor Control Analysis

- Options to install odor control into either wet well and gravity sewer manhole. Odor control will not be required at the lift station site, however the site will be configured so that a chemical feed system could fairly easily be added at a later time.

Opinion of Probable Cost

- An OPC was generated for the proposed lift station improvements which is estimated to at $427,000. OPC can be found in **Appendix H**.

1.0 INTRODUCTION

1.1 Project Background

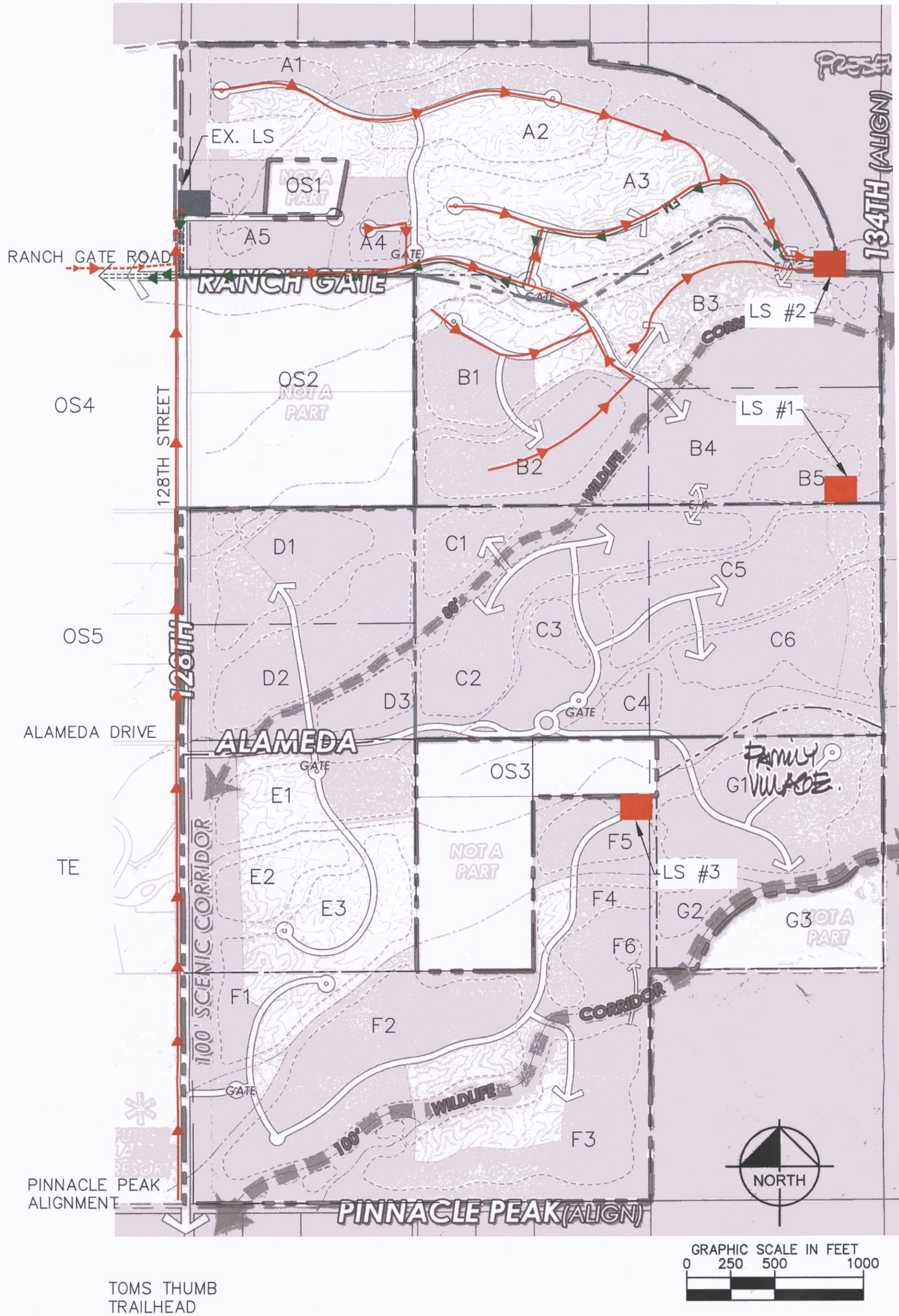
Storyrock is a proposed master planned community development consisting of 462 acres of single family residential construction. Storyrock is located within Section 12 of Township 4 North, Range 5 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona. The site is bound to the north by the Happy Valley Road Alignment and to the west by 128th Street. The Pinnacle Peak Road alignment bounds the site to the south. The McDowell Sonoran Preserve boarders the site to the east and portions of the site to the north and south. See **Figure 1: Vicinity Map & Figure 2 – StoryRock Vicinity Map.** The proposed site is located within the City of Scottsdale and falls under the City's Environmentally Sensitive Lands Ordinance (ESLO). Residential development is planned at a density of 0.96 dwelling units per acre within Environmentally Sensitive Lands (ESL).

This Preliminary Engineering Report for StoryRock establishes lift station design parameters and criteria for site planning and preliminary design. The report presents a conceptual layout of the Lift Station #2 site, as well as associated gravity sewer and force mains. Wastewater demands have been calculated based on the overall development layout presented in the *Cavalliere Ranch Sewer Master Plan*.

1.2 Project Scope

Kimley-Horn's design team preformed the following services as part of this preliminary analysis:

- Review of existing and proposed water/wastewater information
- Prepare an overall wastewater drainage area map of the service area
- Identify the lift station site
- Identify pump sizing to convey the proposed interim and ultimate peak design flows
- Prepare site layout exhibits
- Prepare preliminary OPC



DRAWING NAME: SITE LAYOUT PROJECT NO. 191069020		STORYROCK ENGINEER DESIGN REPORT STORYROCK VICINITY MAP SCOTTSDALE, ARIZONA	SCALE (H): 1"=500' SCALE (V): NONE DESIGNED BY: ZJH DRAWN BY: MRN CHECKED BY: REL DATE: SEPT 2016	Kimley»Horn 7740 North 16th Street, Suite 300 Phoenix, Arizona 85020 (602) 944-5500	NO. REVISION DATE

A1
A2
A3
A4
A5
EX. LS
OS1
NOT A PART
GATE
FM
RANCH GATE
RANCH GATE ROAD
134TH (ALIGN)
B1
B2
B3
B4
B5
LS #1
LS #2
CORR
WILDLIFE
OS2
NOT A PART
OS4
128TH STREET
D1
D2
D3
C1
C2
C3
C4
C5
C6
80'
OS5
ALAMEDA DRIVE
ALAMEDA
OS3
E1
E2
E3
NOT A PART
100' SCENIC CORRIDOR
TE
F1
F2
F3
F4
F5
F6
LS #3
CORRIDOR
100'
G1
G2
G3
FAMILY VILLAGE
NOT A PART
PINNACLE PEAK ALIGNMENT
PINNACLE PEAK (ALIGN)
NORTH
GRAPHIC SCALE IN FEET
0 250 500 1000
TOMS THUMB TRAILHEAD

DRAWING NAME: SITE LAYOUT PROJECT NO. 191069020		STORYROCK ENGINEER DESIGN REPORT STORYROCK VICINITY MAP SCOTTSDALE, ARIZONA	SCALE (H): 1"=500' SCALE (V): NONE DESIGNED BY: ZJH DRAWN BY: MRN CHECKED BY: REL DATE: SEPT 2016	Kimley»Horn 7740 North 16th Street, Suite 300 Phoenix, Arizona 85020 (602) 944-5500	NO. REVISION DATE

2.0 Design Criteria

2.1 Lift Stations

See **Appendix A – City of Scottsdale Sewer Lift Station Design Criteria.**

The City of Scottsdale Design Guide, Chapter 7 "Wastewater" can be found in **Appendix B** and contains the following information regarding wastewater lift stations:

The City's Water Operations maintains a separate document outlining the design, specifications and materials required for City owned and maintained wastewater lift station. This document may be viewed at www.ScottsdaleAZ.gov/bldgresources/counterresources/WaterFeePacket.

A. Site Selection
In selecting a site for the sewage lift station, considerations included accessibility, drainage patterns, visual impact, function and design constraints.

The station's equipment must be protected from damage and remain operable during a 100-year flood plain. The proposed site is located outside the 100-year flood plain.

Unless otherwise agreed to in writing by the City's rights-of-way agent, the tract or lot dedicated to the City will be conveyed by a general warranty deed and accompanied by a title policy in favor of the City, both to the satisfaction of the City.

B. Lift Station Design
Arizona Administrative Code, Title 18, Chapter 9, "Water Pollution Control," contains minimum requirements for a wastewater lift station. At a minimum, telemetry, dual pumps, backup power supply, three-phase power, provisions for future odor control, and perimeter walls will be required. The site will also be large enough to contain all the equipment and service equipment for repairs.

A final design report prepared by a registered professional engineer, licensed in the State of Arizona, must accompany all pump station design drawings and specifications submitted to the City for review.

2.2 Force Main

City of Scottsdale staff has indicated that force mains smaller than 4 inches will require a parallel force main with interconnecting valves.

The City of Scottsdale Design Guide, Chapter 7 "Wastewater" can be found in **Appendix B** and contains the following information regarding Force Main Design:

Force mains will be located within a right-of-way, private street tract or utility easement. The line must be located under pavement where possible.

A. Velocity Requirements

The flow velocity in the force main must be between 3 and 6 feet per second (fps).

B. Materials of Construction
All pipe material used in design of the force mains must have established ASTM, ANSI, AWWA and NSF standards of manufacture or seals of approval and shall be designated as pressure sanitary sewer pipe. Force mains must be identified as such with marking tape 1 foot above the pipe. All ductile iron force mains shall be lined.

C. Air Release Valves
Air release valves designed for sewage must be provided on force mains at all peaks in elevation see City of Scottsdale (COS) Standard Detail No. 2405, www.ScottsdaleAZ.gov/design/COSMAGSupp..

D. Cleanouts
Two-way cleanouts shall be provided every 1,300 feet apart or 1-way cleanouts every 650 feet. Single cleanouts must be provided at all horizontal bends oriented in line with the downstream pipe. See COS Standard Detail No. 2403, www.ScottsdaleAZ.gov/design/COSMAGSupp.

E. Force Mains
Force mains will be constructed with 3" schedule 40 PVC pipe. Force mains will be constructed of restrained ductile iron pipe for the following conditions:
1. All locations where a vertical realignment is required;
2. Drainage wash crossings;
3. Air release assemblies;
4. Clean-out assemblies.

F. Line Separations
1. Where a force main crosses a water main or transmission line, protection must be provided as per ADEQ Engineering Bulletin No. 10 and the Arizona Administrative Code, Title 18, Chapter 9, "Water Pollution Control." At a minimum, the force main should be constructed of ductile iron pipe for a distance of 10 feet on each side of the water line.
2. See COS Standard Detail No. 2402 for details regarding discharge into a manhole from a force main.
3. The minimum separation between the force mains and water lines should be 2 feet wall-to-wall vertically and 6 feet horizontally under all conditions. Where a force main crosses above or less than 6 feet below a water line, the force main shall be encased in at least 6 inches of concrete for 10 feet on either side of the water line. Fittings should not fall within the encasement.

The engineer must evaluate the potential for odor to develop from a force main downstream of the receiving manhole. One-way valves on building service lines shall be specified where there is potential for gasses to strip from the waste stream. The valves should be located at or near the building

2.3 Lift Station Design

Preliminary pump design criteria has been developed for the proposed lift station. Pumps are required to convey the peak design flow rate at the total dynamic head calculated. In order to mitigate low design flow rates, the City has accepted the use of

supplementing demands with potable water that can be entered into the gravity sewer system upstream of the proposed lift station. The proposed lift station will need to meet the following calculated pump requirements:

	Peak Design Flow (gpd)	Peak Design Flow (gpm)	Static Head	Total Dynamic Head (ft)
Lift Station #2	100,147	70	106	150

*Assumes a Hazen-Williams C value of 130

Preliminary wet well sizes have been calculated for the proposed lift stations. Wet well volume calculations are based on the following criteria and assumptions:

- Minimum flow to lift station = 0 gpm
- Minimum pump running time = 2 minutes
- Minimum pump cycle time = 6 minutes
- Wet well diameter = 6 feet

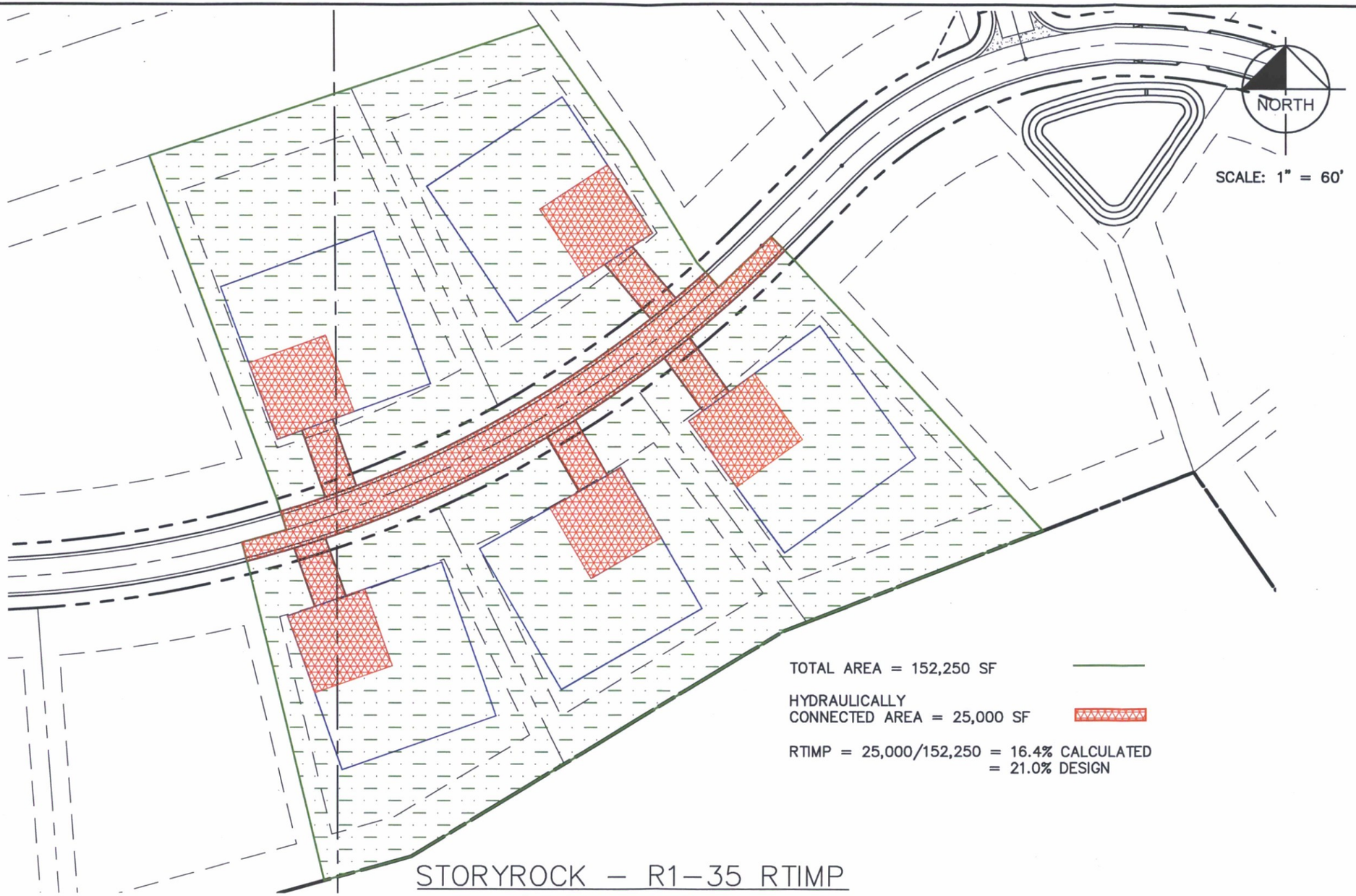
Based on the above criteria wet well volumes are as follows:

	Lift Station #2
Wet Well Volume (ft^3)	54
Operational Depth (ft)	2

3.0 Civil Analysis

3.1 Adjacent Sanitary Systems

The Sereno Canyon development is located directly west of the project. Wastewater generated by a large portion of Sereno Canyon is conveyed by gravity sewer to an existing lift station located on the east side of 128th Street approximately 350' north of Ranch Gate Road. This lift station is located on the western boundary of the proposed Cavalliere Ranch Development. From the lift station wastewater flows are conveyed through an existing 6-inch forcemain west along the Happy Valley Road alignment. This force main connects to an existing manhole along the Happy Valley Road alignment approximately 300 feet east of 122nd Street. Flows are then conveyed by gravity sewer through the existing Granite Ridge subdivision to an 8-inch line within Happy Valley Road. Flows are ultimately conveyed to the City of Scottsdale treatment facility located at Pima Road and Hualapai Drive. Two existing gravity sewer lines exist within Ranch Gate Road. Both lines are currently dry as no development has occurred to the north of Ranch Gate Road. The first line runs east from approximately 124th Street to the existing lift station. The second line runs west from approximately 122nd Street to 118th Street. The second line has not yet been connected to an active downstream system. See **Figure 3 – System Layout** for existing lift station location.



STORYROCK – R1–35 RTIMP DETERMINATION

Kimley»Horn

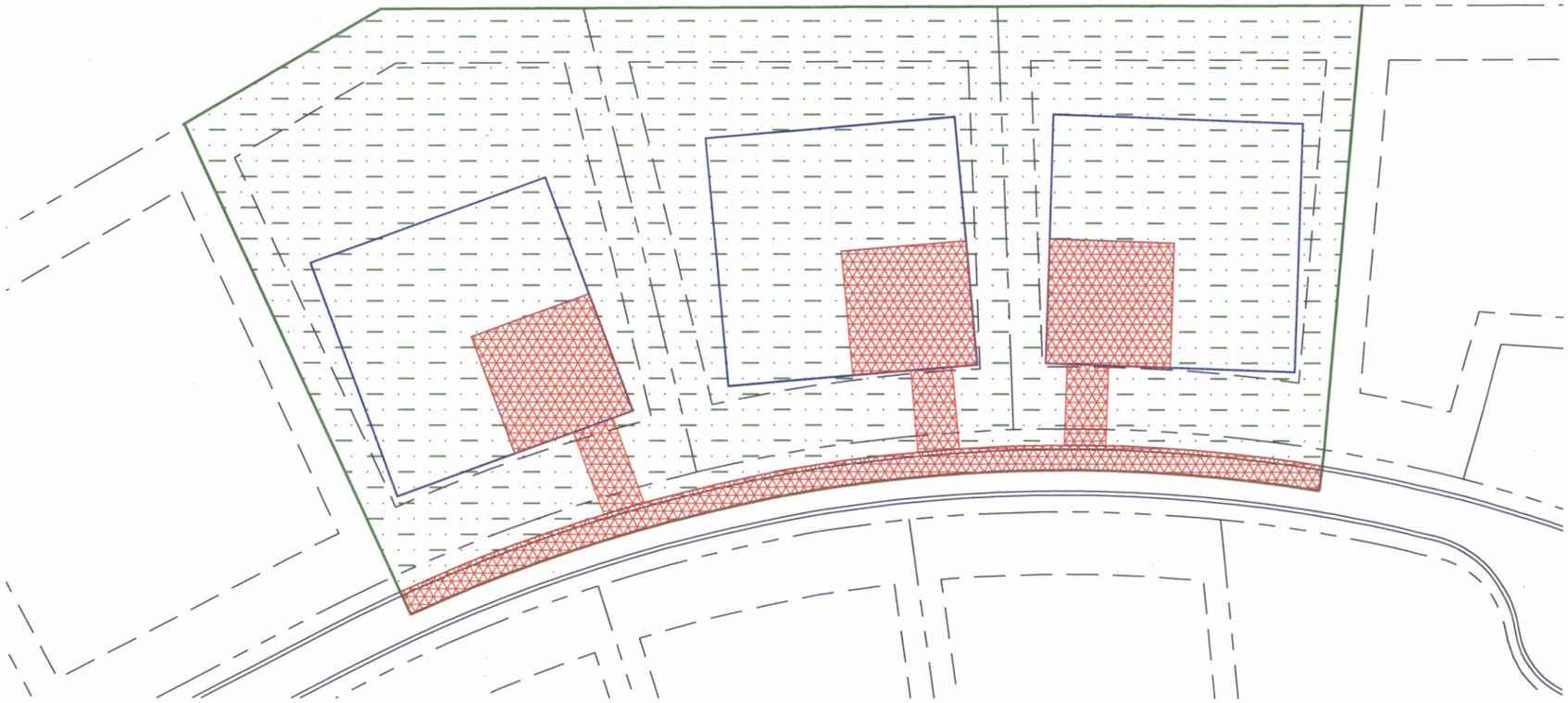
NORTH

SCALE: 1" = 60'

TOTAL AREA = 123,750 SF

HYDRAULICALLY
CONNECTED AREA = 19,000 SF

RTIMP = 19,000/123,750 = 15.4% CALCULATED
17.0% DESIGN



STORYROCK – R1–43 RTIMP
DETERMINATION

Kimley»Horn

Flood Control District of Maricopa County
Drainage Design Management System
HEC-1 ROUTING DATA
Project Reference: STORYROCK PH1A PROP

2/20/2017

Route ID	LOB N	Chan N	ROB N	Length (ft)	Slope (ft/ft)	Max Elev (ft)		1.	2.	3.	4.	5.	6.	7.	8.
NORMAL DEPTH															
Major Basin 01															
ON20	0.050	0.035	0.050	1,302.00	0.0280	-	X:	-	7.00	9.00	11.00	12.00	14.00	16.00	18.00
							Y:	4.00	2.00	1.00	-	-	1.00	2.00	4.00
RF45	0.050	0.035	0.050	980.00	0.0260	-	X:	-	14.00	21.00	25.00	31.00	35.00	41.00	45.00
							Y:	3.00	2.00	1.00	-	-	1.00	2.00	3.00
RF60A	0.050	0.035	0.050	1,076.00	0.0300	-	X:	-	8.00	18.00	55.00	71.00	78.00	83.00	90.00
							Y:	3.00	2.00	1.00	-	-	1.00	2.00	3.00
RF60B	0.050	0.035	0.050	1,200.00	0.0320	-	X:	-	9.00	14.00	16.00	16.50	22.00	26.00	33.00
							Y:	3.00	2.00	1.00	-	-	1.00	2.00	3.00
RF60C	0.050	0.035	0.050	650.00	0.0280	-	X:	-	25.00	38.00	48.00	49.00	57.00	67.00	80.00
							Y:	3.00	2.00	1.00	-	-	1.00	2.00	3.00
RO10A	0.050	0.035	0.050	522.00	0.0250	-	X:	-	12.00	29.00	31.00	31.50	42.00	59.00	62.00
							Y:	3.00	2.00	1.00	-	-	1.00	2.00	3.00
RO10B	0.050	0.035	0.050	675.00	0.0270	-	X:	-	8.00	13.00	17.00	17.50	22.00	26.00	29.00
							Y:	3.00	2.00	1.00	-	-	1.00	2.00	3.00
RO10C	0.050	0.035	0.050	621.00	0.0220	-	X:	-	5.00	10.00	28.00	32.00	68.00	78.00	83.00
							Y:	3.00	2.00	1.00	-	-	1.00	2.00	3.00
RO11	0.050	0.035	0.050	1,000.00	0.0220	-	X:	-	5.00	10.00	28.00	32.00	68.00	78.00	83.00
							Y:	3.00	2.00	1.00	-	-	1.00	2.00	3.00
RO21	0.050	0.035	0.050	865.00	0.0240	-	X:	-	7.00	9.00	11.00	12.00	14.00	16.00	18.00
							Y:	4.00	2.00	1.00	-	-	1.00	2.00	4.00
RO22	0.050	0.035	0.050	1,733.00	0.0240	-	X:	-	7.00	9.00	11.00	12.00	14.00	16.00	18.00
							Y:	4.00	2.00	1.00	-	-	1.00	2.00	4.00

Route ID	LOB N	Chan N	ROB N	Length (ft)	Slope (ft/ft)	Max Elev (ft)		1.	2.	3.	4.	5.	6.	7.	8.
RO22B	0.050	0.035	0.050	585.00	0.0240	-	X:	-	7.00	9.00	11.00	12.00	14.00	16.00	18.00
							Y:	4.00	2.00	1.00	-	-	1.00	2.00	4.00
RO45	0.050	0.035	0.050	611.00	0.0290	-	X:	-	11.00	15.00	19.00	19.10	25.00	33.00	43.00
							Y:	2.50	2.00	1.00	-	-	1.00	2.00	3.00
RO5A	0.050	0.035	0.050	380.00	0.0340	-	X:	-	12.00	16.00	20.00	21.00	24.00	32.00	42.00
							Y:	3.00	2.00	1.00	-	-	1.00	2.00	3.00
RO5B	0.050	0.035	0.050	490.00	0.0265	-	X:	-	7.00	14.00	21.00	22.00	31.00	37.00	48.00
							Y:	3.00	2.00	1.00	-	-	1.00	2.00	3.00
RO5C	0.050	0.035	0.050	630.00	0.0240	-	X:	-	4.00	6.00	9.00	10.00	14.00	21.00	31.00
							Y:	3.00	2.00	1.00	-	-	1.00	2.00	3.00
RO60	0.050	0.035	0.050	625.00	0.0220	-	X:	-	6.00	10.00	14.00	27.00	38.00	57.00	83.00
							Y:	3.00	2.00	1.00	-	-	1.00	2.00	3.00
RO65	0.050	0.035	0.050	756.00	0.0250	-	X:	-	5.00	7.00	8.50	9.00	19.00	24.00	29.00
							Y:	3.00	2.00	1.00	-	-	1.00	2.00	3.00
RO70	0.050	0.035	0.050	1,280.00	0.0250	-	X:	-	14.00	27.00	31.50	32.00	36.00	40.00	46.00
							Y:	3.00	2.00	1.00	-	-	1.00	2.00	3.00
RO75A	0.050	0.035	0.050	553.00	0.0240	-	X:	-	18.00	20.00	23.00	34.00	38.00	41.00	44.00
							Y:	3.00	2.00	1.00	-	-	1.00	2.00	3.00
RO75B	0.050	0.035	0.050	1,600.00	0.0260	-	X:	-	15.00	26.00	32.00	43.00	46.00	50.00	55.00
							Y:	2.00	1.50	1.00	-	-	1.00	2.00	3.00

Storage Basin ID:	**DB10**										
Spillway Characteristics (SS)			1	2	3	4	5	6	7	8	9	10
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		0.1	0.3	0.4	0.6	0.7	0.9	0.9		
Spillway Length:	-NA-	**Discharge (cfs)**	0	0	0	1	1	2	2	2	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	0.5	1.0	1.5	2.0	2.5	3.0	3.0	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			11	12	13	14.	15	16	17	18	19	20
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr				
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.26	0.00	0.41	0.00	0.00	0.73				
Length of Dam:	-NA-	**Peak Stage (ft)**	1.00	0.00	1.50	0.00	0.00	2.50				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	0.00	0.00	1.00	0.00	0.00	2.00				
Weir Coefficient:	-NA-											

Storage Basin ID:	**DB15**										
Spillway Characteristics (SS)			1	2	3	4	5	6	7	8	9	10
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		0.1	0.3	0.4	0.6	0.8	1.0	1.0		
Spillway Length:	-NA-	**Discharge (cfs)**	0	0	1	1	1	2	2	13	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	0.5	1.0	1.5	2.0	2.5	3.0	3.0	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			11	12	13	14.	15	16	17	18	19	20
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr				
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.26	0.00	0.26	0.00	0.00	0.96				
Length of Dam:	-NA-	**Peak Stage (ft)**	1.00	0.00	1.00	0.00	0.00	3.00				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	1.00	0.00	1.00	0.00	0.00	13.00				
Weir Coefficient:	-NA-											

Storage Basin ID:	**DB20**										
Spillway Characteristics (SS)			1	2	3	4	5	6	7	8	9	10
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3
Spillway Length:	-NA-	**Discharge (cfs)**	0	3	7	10	12	14	15	16	18	20
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	1.0	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			11	12	13	14	15	16	17	18	19	20
Centerline Elevation:	-NA-	**Volume (ac-ft)**	0.4	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	23	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	6.0	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr				
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.08	0.00	0.15	0.00	0.00	0.40				
Length of Dam:	-NA-	**Peak Stage (ft)**	1.50	0.00	3.00	0.00	0.00	6.00				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	5.00	0.00	12.00	0.00	0.00	23.00				
Weir Coefficient:	-NA-											

Storage Basin ID:	**DB24**										
Spillway Characteristics (SS)			1	2	3	4	5	6	7	8	9	10
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		0.1	0.1	0.2	0.2	0.3	0.3	0.3		
Spillway Length:	-NA-	**Discharge (cfs)**	0	0	0	1	1	2	2	15	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	0.5	1.0	1.5	2.0	2.5	3.0	3.0	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			11	12	13	14	15	16	17	18	19	20
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr				
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.17	0.00	0.30	0.00	0.00	0.34				
Length of Dam:	-NA-	**Peak Stage (ft)**	1.50	0.00	2.50	0.00	0.00	3.00				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	1.00	0.00	2.00	0.00	0.00	15.00				
Weir Coefficient:	-NA-											

Storage Basin ID:	**DB30**										
Spillway Characteristics (SS)			1	2	3	4	5	6	7	8	9	10
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		0.1	0.1	0.2	0.3	0.3	0.4	0.4		
Spillway Length:	-NA-	**Discharge (cfs)**	0	1	3	4	5	5	6	55	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	0.5	1.0	1.5	2.0	2.5	3.0	3.0	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			11	12	13	14.	15	16	17	18	19	20
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr				
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.25	0.00	0.42	0.00	0.00	0.42				
Length of Dam:	-NA-	**Peak Stage (ft)**	2.00	0.00	3.00	0.00	0.00	3.00				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	5.00	0.00	23.00	0.00	0.00	55.00				
Weir Coefficient:	-NA-											

Storage Basin ID:	**DB40**										
Spillway Characteristics (SS)			1	2	3	4	5	6	7	8	9	10
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		0.2	0.3	0.5	0.7	1.0	1.2	1.2		
Spillway Length:	-NA-	**Discharge (cfs)**	0	1	2	3	4	5	6	18	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	0.5	1.0	1.5	2.0	2.5	3.0	3.0	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			11	12	13	14.	15	16	17	18	19	20
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr				
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.34	0.00	0.74	0.00	0.00	1.21				
Length of Dam:	-NA-	**Peak Stage (ft)**	1.00	0.00	2.00	0.00	0.00	3.00				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	2.00	0.00	4.00	0.00	0.00	18.00				
Weir Coefficient:	-NA-											

Storage Basin ID:	DB58										
Spillway Characteristics (SS)			1	2	3	4	5	6	7	8	9	10
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		0.1	0.1							
Spillway Length:	-NA-	**Discharge (cfs)**	0	1	1	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	0.5	1.0	-	-	-	-	-	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			11	12	13	14.	15	16	17	18	19	20
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr				
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.06	0.00	0.06	0.00	0.00	0.06				
Length of Dam:	-NA-	**Peak Stage (ft)**	0.50	0.00	0.50	0.00	0.00	0.50				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	1.00	0.00	1.00	0.00	0.00	1.00				
Weir Coefficient:	-NA-											

Storage Basin ID:	DB60										
Spillway Characteristics (SS)			1	2	3	4	5	6	7	8	9	10
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		0.1	0.1	0.2	0.3	0.4	0.5	0.5		
Spillway Length:	-NA-	**Discharge (cfs)**	0	1	2	2	3	4	4	26	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	0.5	1.0	1.5	2.0	2.5	3.0	3.0	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			11	12	13	14.	15	16	17	18	19	20
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr				
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.12	0.00	0.26	0.00	0.00	0.45				
Length of Dam:	-NA-	**Peak Stage (ft)**	1.00	0.00	2.00	0.00	0.00	3.00				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	2.00	0.00	3.00	0.00	0.00	13.00				
Weir Coefficient:	-NA-											

Storage Basin ID:	**DB61**										
Spillway Characteristics (SS)			1	2	3	4	5	6	7	8	9	10
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		0.1	0.1	0.2	0.2	0.3	0.3			
Spillway Length:	-NA-	**Discharge (cfs)**	0	0	1	1	1	2	2	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	0.5	1.0	1.5	2.0	2.5	3.0	-	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			11	12	13	14.	15	16	17	18	19	20
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr				
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.09	0.00	0.09	0.00	0.00	0.26				
Length of Dam:	-NA-	**Peak Stage (ft)**	1.00	0.00	1.00	0.00	0.00	2.50				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	1.00	0.00	1.00	0.00	0.00	2.00				
Weir Coefficient:	-NA-											

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Project ***Storyrock Phase 1A***
Subject **Detention Basin Calculations**
Designed by **ZJH** Date 2/5/2016 Project No. 191069020
Checked by **JMB** Date 2/5/2016

Objective: to determine the storage-flow relationship for small detention basins

DB10 ***Drains in 14.40 hours***

Outlet Diameter 0.50 ft
Outlet Elevation 0 ft
Outlet X-Sect Area 0.196 ft^2
No. of Outlet Barrels 1
Outlet Pipe Slope 0.005 ft/ft

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Δ Time to Drain [hr]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
0	10,558	0.24				0		0	0	0
			0.26	1.0	0.26		7.79			
1	12,394	0.28				0.26		1	0	1
			0.31	1.0	0.31		3.59			
2	14,330	0.33				0.57		1	0	1
			0.35	1.0	0.35		3.03			
3	16,367	0.38				0.92		2	0	2

Notes:
Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter)
per Linsley et al. *Water Resources Engineering* 4th Edition, pg 652.

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Project ***Storyrock Phase 1A***
Subject **Detention Basin Calculations**
Designed by **ZJH** Date 2/5/2016 Project No. 191069020
Checked by **JMB** Date 2/5/2016

Objective: to determine the storage-flow relationship for small detention basins

DB15 ***Drains in 12.09 hours***

Outlet Diameter 0.50 ft
Outlet Elevation 0 ft
Outlet X-Sect Area 0.196 ft^2
No. of Outlet Barrels 1
Outlet Pipe Slope 0.005 ft/ft

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Δ Time to Drain [hr]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
0	10,148	0.23				0		0	0	0
			0.26	1.0	0.26		7.70			
1	12,555	0.29				0.26		1	0	1
			0.32	1.0	0.32		3.72			
2	15,161	0.35				0.58		1	0	1
			0.38	1.0	0.38		0.67			
3	17,970	0.41				0.96		2	11	13

Notes:
Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter)
per Linsley et al. *Water Resources Engineering* 4th Edition, pg 652.

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Project ***Storyrock Phase 1A***
Subject **Detention Basin Calculations**
Designed by **ZJH** Date 2/5/2016 Project No. 191069020
Checked by **JMB** Date 2/5/2016

Objective: to determine the storage-flow relationship for small detention basins

DB20 ***Drains in 0.14 hours***

Outlet Diameter 1.50 ft
Outlet Elevation 0 ft
Outlet X-Sect Area 1.767 ft^2
No. of Outlet Barrels 1
Outlet Pipe Slope 0.005 ft/ft

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Δ Time to Drain [hr]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
0	25	0.00				0		0	0	0
			0.00	1.0	0.00		0.04			
1	400	0.01				0.00		3	0	3
			0.02	1.0	0.02		0.05			
2	1,237	0.03				0.02		7	0	7
			0.04	1.0	0.04		0.05			
3	2,295	0.05				0.06		12	0	12
			0.07	1.0	0.07		0.06			
4	3,855	0.09				0.13		15	0	15
			0.11	1.0	0.11		0.08			
5	6,130	0.14				0.25		18	0	18
			0.17	1.0	0.17		0.10			
6	8,972	0.21				0.42		23	0	23

Notes:
Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter)
per Linsley et al. *Water Resources Engineering* 4th Edition, pg 652.

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Project ***Storyrock Phase 1A***
Subject **Detention Basin Calculations**
Designed by **ZJH** Date 2/5/2016 Project No. 191069020
Checked by **JMB** Date 2/5/2016

Objective: to determine the storage-flow relationship for small detention basins

DB24 ***Drains in 4.17 hours***

Outlet Diameter	0.50 ft	Outlet X-Sect Area	0.196 ft^2
Outlet Elevation	0 ft	No. of Outlet Barrels	1
		Outlet Pipe Slope	0.005 ft/ft

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Δ Time to Drain [hr]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
0	3,226	0.07				0		0	0	0
			0.09	1.0	0.09		2.59			
1	4,408	0.10				0.09		1	0	1
			0.12	1.0	0.12		1.36			
2	5,690	0.13				0.20		1	0	1
			0.15	1.0	0.15		0.22			
3	7,073	0.16				0.35		2	13	15

Notes:
Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter)
per Linsley et al. *Water Resources Engineering* 4th Edition, pg 652.

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Project ***Storyrock Phase 1A***
Subject **Detention Basin Calculations**
Designed by **ZJH** Date 2/5/2016 Project No. 191069020
Checked by **JMB** Date 2/5/2016

Objective: to determine the storage-flow relationship for small detention basins

DB30 ***Drains in 1.58 hours***

Outlet Diameter 1.00 ft
Outlet Elevation 0 ft
Outlet X-Sect Area 0.785 ft^2
No. of Outlet Barrels 1
Outlet Pipe Slope 0.005 ft/ft

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Δ Time to Drain [hr]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
0	4,062	0.09				0		0	0	0
			0.11	1.0	0.11		1.04			
1	5,380	0.12				0.11		3	0	3
			0.14	1.0	0.14		0.47			
2	6,800	0.16				0.25		5	0	5
			0.17	1.0	0.17		0.07			
3	8,320	0.19				0.42		6	49	55

Notes:
Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter)
per Linsley et al. *Water Resources Engineering* 4th Edition, pg 652.

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Project ***Storyrock Phase 1A***
Subject **Detention Basin Calculations**
Designed by **ZJH** Date 2/5/2016 Project No. 191069020
Checked by **JMB** Date 2/5/2016

Objective: to determine the storage-flow relationship for small detention basins

DB40 ***Drains in 5.11 hours***

Outlet Diameter 1.00 ft
Outlet Elevation 0 ft
Outlet X-Sect Area 0.785 ft^2
No. of Outlet Barrels 1
Outlet Pipe Slope 0.005 ft/ft

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Δ Time to Drain [hr]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
0	13,468	0.31				0		0	0	0
			0.34	1.0	0.34		3.25			
1	16,049	0.37				0.34		3	0	3
			0.40	1.0	0.40		1.35			
2	18,831	0.43				0.74		5	0	5
			0.47	1.0	0.47		0.50			
3	21,814	0.50				1.21		6	12	18

Notes:
Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter)
per Linsley et al. *Water Resources Engineering* 4th Edition, pg 652.

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Project ***Storyrock Phase 1A***
Subject **Detention Basin Calculations**
Designed by **ZJH** Date 2/5/2016 Project No. 191069020
Checked by **JMB** Date 2/5/2016

Objective: to determine the storage-flow relationship for small detention basins

DB58 ***Drains in 4.05 hours***

Outlet Diameter	0.50 ft	Outlet X-Sect Area	0.196 ft^2
Outlet Elevation	0 ft	No. of Outlet Barrels	1
		Outlet Pipe Slope	0.005 ft/ft

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Δ Time to Drain [hr]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
0	4,896	0.11				0		0	0	0
			0.14	1.0	0.14		4.05			
1	7,051	0.16				0.14		1	0	1

Notes:
Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter)
per Linsley et al. *Water Resources Engineering* 4th Edition, pg 652.

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Project ***Storyrock Phase 1A***
Subject **Detention Basin Calculations**
Designed by **ZJH** Date 2/5/2016 Project No. 191069020
Checked by **JMB** Date 2/5/2016

Objective: to determine the storage-flow relationship for small detention basins

DB60 ***Drains in 2.50 hours***

Outlet Diameter 0.80 ft
Outlet Elevation 0 ft
Outlet X-Sect Area 0.503 ft^2
No. of Outlet Barrels 1
Outlet Pipe Slope 0.005 ft/ft

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Δ Time to Drain [hr]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
0	4,368	0.10				0		0	0	0
			0.12	1.0	0.12		1.49			
1	5,719	0.13				0.12		2	0	2
			0.15	1.0	0.15		0.73			
2	7,170	0.16				0.26		3	0	3
			0.18	1.0	0.18		0.28			
3	8,722	0.20				0.45		4	9	13

Notes:
Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter)
per Linsley et al. *Water Resources Engineering* 4th Edition, pg 652.

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Project ***Storyrock Phase 1A***
Subject **Detention Basin Calculations**
Designed by **ZJH** Date 2/5/2016 Project No. 191069020
Checked by **JMB** Date 2/5/2016

Objective: to determine the storage-flow relationship for small detention basins

DB61 ***Drains in 5.03 hours***

Outlet Diameter 0.50 ft
Outlet Elevation 0 ft
Outlet X-Sect Area 0.196 ft^2
No. of Outlet Barrels 1
Outlet Pipe Slope 0.005 ft/ft

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Δ Time to Drain [hr]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
0	3,218	0.07				0		0	0	0
			0.09	1.0	0.09		2.54			
1	4,269	0.10				0.09		1	0	1
			0.11	1.0	0.11		1.30			
2	5,421	0.12				0.20		1	0	1
			0.14	1.0	0.14		1.19			
3	6,673	0.15				0.34		2	0	2

Notes:
Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter)
per Linsley et al. *Water Resources Engineering* 4th Edition, pg 652.

Project ***Storyrock Phase 1A***
Subject **Basin Summary Table**
Designed by **ZJH** Date 2/5/2016 Project No. 191069020
Checked by **JMB** Date 2/5/2016

Objective: Basin Summary Table

Basin ID	Volume (ac-ft)	Max Depth (ft)	Max Side Slope (ft, H:V)	100 Yr Peak Inflow Rate (cfs)	100 Yr Peak Outflow Rate (cfs)	100 Yr Peak Flow Attenuation (cfs)	Orifice Size (ft)	Drain Time (hr)	Type	2 Year Storage Volume (ac-ft)	10 Year Storage Volume (ac-ft)	100 Year Storage Volume (ac-ft)
DB10	0.92	3.00	4:1	22	2	20	0.50	14.40	Standard	0.26	0.41	0.73
DB15	0.96	3.00	4:1	32	13	19	0.50	12.09	Standard	0.26	0.26	0.96
DB20	0.42	6.00	*	31	23	8	1.50	0.14	In-line	0.08	0.15	0.37
DB24	0.16	3.00	4:1	17	15	2	0.50	4.17	Standard	0.17	0.30	0.34
DB30	0.42	3.00	4:1	55	55	0	1.00	1.58	Standard	0.25	0.42	0.42
DB40	1.21	3.00	4:1	46	18	28	1.00	5.11	Standard	0.34	0.74	1.21
DB58	0.14	1.00	4:1	4	1	3	0.50	4.05	Standard	0.11	0.14	0.14
DB60	0.45	3.00	4:1	22	13	9	0.80	2.50	Standard	0.12	0.26	0.45
DB61	0.34	3.00	4:1	11	2	9	0.50	5.03	Standard	0.09	0.09	0.26

Project ***Storyrock Phase 1A***
Subject **First Flush Summary Table**
Designed by **ZJH** Date 2/5/2016 Project No. 191069020
Checked by **JMB** Date 2/5/2016

Objective: First Flush Summary

First Flush Volume = A*C*P/12

Contributing Sub Basin	First Flush Method	Contributing Developed Area (sf)	Contributing Developed Area (ac)	First Flush Volume Req. (ac-ft)	Basin Volume Prov. (ac-ft)
ON05	N/A*	N/A	N/A	N/A	N/A
ON11	Basin	261,956	6.01	0.24	0.92
ON15	Basin	322,589	7.41	0.29	0.96
ON20	N/A*	N/A	N/A	N/A	N/A
ON22	Stormceptor /Alternate First Flush Method	N/A	N/A	N/A	N/A
ON24	Basin	160,384	3.68	0.15	0.16
ON30	Basin	216,702	4.97	0.20	0.42
ON31	N/A*	N/A	N/A	N/A	N/A
ON40	Basin	482,822	11.08	0.44	1.21
ON50	N/A*	N/A	N/A	N/A	N/A
ON58	Basin	58,703	1.35	0.05	0.14
ON59	Basin	40,197	0.92	0.04	-
ON60	Basin	188,247	4.32	0.17	-
			Total	0.21	0.45
ON61	Basin	118,986	2.73	0.11	0.34

Note* Direct discharge of lot drainage only. No first flush required.

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1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998                *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   17FEB17  TIME  17:16:58   *
*                                       *
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*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
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X     X  XXXXXXX   XXXXX          X
X     X  X        X     X       XX
X     X  X        X             X
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X     X  X        X             X
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X     X  XXXXXXX  XXXXX        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

1 HEC-1 INPUT PAGE 1

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

   1          ID        Flood Control District of Maricopa County
   2          ID        STORYROCK PH1A PROP - STORYROCK PHASE 1A PROP CONDITION
   3          ID        2 YEAR
   4          ID        6 Hour  Storm
   5          ID        Unit Hydrograph: Clark
   6          ID        Storm: Multiple
   7          ID        02/17/2017
              *DIAGRAM
   8          IT      5  1JAN99      0    2000
   9          ID      5
  10          IN     15
              *
  11          JD  1.419  0.0001
  12          PC  0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
  13          PC  0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
  14          PC  0.962   0.972   0.983   0.991   1.000
  15          JD  1.410  0.5000
  16          PC  0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
  17          PC  0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
  18          PC  0.962   0.972   0.983   0.991   1.000
  19          JD  1.384     2.8
  20          PC  0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
  21          PC  0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
  22          PC  0.950   0.963   0.975   0.988   1.000
              *

  23          KK   OFF05   BASIN
  24          BA  0.001
  25          LG   0.35    0.40    6.00    0.18       0
  26          UC  0.142   0.166
  27          UA      0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  28          UA    100
              *

  29          KK    RO5A   ROUTE
  30          RS       1   FLOW
  31          RC  0.050   0.035   0.050     380  0.0340    0.00
  32          RX   0.00   12.00   16.00   20.00   21.00   24.00   32.00   42.00
  33          RY   3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
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```
34          KK   OFF10   BASIN
35          BA   0.005
36          LG    0.35    0.40    6.00    0.18       0
37          UC   0.253   0.303
38          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
39          UA     100
            *

40          KK    ROSB   ROUTE
41          RS       1    FLOW
42          RC   0.050   0.035   0.050     490  0.0265    0.00
43          RX    0.00    7.00   14.00   21.00   22.00   31.00   37.00   48.00
44          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
            *
```



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

45          KK    COSA COMBINE
46          HC       2
            *

47          KK    ROSC   ROUTE
48          RS       1    FLOW
49          RC   0.050   0.035   0.050     630  0.0240    0.00
50          RX    0.00    4.00    6.00    9.00   10.00   14.00   21.00   31.00
51          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
            *

52          KK    ON05   BASIN
53          BA   0.008
54          LG    0.33    0.33    6.00    0.17       9
55          UC   0.291   0.486
56          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
57          UA     100
            *

58          KK    COSB COMBINE
59          HC       2
            *

60          KK   OFF15   BASIN
61          BA   0.014
62          LG    0.35    0.40    6.00    0.18       0
63          UC   0.386   0.544
64          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
65          UA     100
            *

66          KK   RO10A   ROUTE
67          RS       1    FLOW
68          RC   0.050   0.035   0.050     522  0.0250    0.00
69          RX    0.00   12.00   29.00   31.00   31.50   42.00   59.00   62.00
70          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
            *

71          KK   OFF20   BASIN
72          BA   0.005
73          LG    0.35    0.40    6.00    0.18       0
74          UC   0.257   0.328
75          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
76          UA     100
            *

77          KK   RO10B   ROUTE
78          RS       1    FLOW
79          RC   0.050   0.035   0.050     675  0.0270    0.00
80          RX    0.00    8.00   13.00   17.00   17.50   22.00   26.00   29.00
81          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
            *
```



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

82          KK   CO10A COMBINE
```

```
 84          KK   RO10C   ROUTE
 85          RS      1    FLOW
 86          RC  0.050   0.035   0.050    621  0.0220    0.00
 87          RX   0.00    5.00   10.00   28.00   32.00   68.00   78.00   83.00
 88          RY   3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

 89          KK    ON10  BASIN
 90          BA  0.014
 91          LG   0.32    0.30    6.00    0.18       7
 92          UC  0.282   0.352
 93          UA      0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 94          UA    100
             *

 95          KK    ON11  BASIN
 96          BA  0.009
 97          LG   0.31    0.27    6.00    0.19      16
 98          UC  0.237   0.279
 99          UA      0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
100          UA    100
             *

101          KK    DB10 STORAGE
102          KO
103          RS      1    STOR
104          SV           0.13    0.26    0.41    0.57    0.73    0.92    0.92
105          SQ                           1.00    1.00    2.00    2.00    2.00
106          SE           0.50    1.00    1.50    2.00    2.50    3.00    3.01
             *

107          KK    CO10B COMBINE
108          HC      3
             *

109          KK    RO11   ROUTE
110          RS      1    FLOW
111          RC  0.050   0.035   0.050    1000  0.0220    0.00
112          RX   0.00    5.00   10.00   28.00   32.00   68.00   78.00   83.00
113          RY   3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

114          KK    ON12   BASIN
115          BA  0.008
116          LG   0.33    0.34    6.00    0.17       6
117          UC  0.328   0.538
118          UA      0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
119          UA    100
             *
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LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

120          KK    CO12 COMBINE
121          HC      2
             *

122          KK    ON15   BASIN
123          BA  0.012
124          LG   0.30    0.25    6.00    0.19      19
125          UC  0.191   0.194
126          UA      0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
127          UA    100
             *

128          KK    DB15 STORAGE
129          KO
130          RS      1    STOR
131          SV           0.13    0.26    0.42    0.58    0.77    0.96    0.96
132          SQ                           1.00    1.00    1.00    2.00    2.00   13.00
133          SE           0.50    1.00    1.50    2.00    2.50    2.98    3.00
             *

134          KK   RO22B   ROUTE
135          RS      1    FLOW
```

```
138          RY   4.00    2.00    1.00    0.00    0.00    1.00    2.00    4.00
             *
139          KK    ON20   BASIN
140          BA   0.017
141          LG    0.32    0.34    6.00    0.18       6
142          UC   0.347   0.480
143          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
144          UA     100
             *
145          KK    ON58   BASIN
146          BA   0.002
147          LG    0.10    0.25    6.00    0.26      60
148          UC   0.175   0.384
149          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
150          UA     100
             *
151          KK    DB58 STORAGE
152          KO
153          RS       1    STOR
154          SV            0.06    0.14
155          SQ            1.00    1.00
156          SE            0.50    1.00
             *
1                                        HEC-1 INPUT                                    PAGE  5

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

157          KK    ON20   ROUTE
158          RS       1    FLOW
159          RC   0.050   0.035   0.050    1302  0.0280    0.00
160          RX    0.00    7.00    9.00   11.00   12.00   14.00   16.00   18.00
161          RY    4.00    2.00    1.00    0.00    0.00    1.00    2.00    4.00
             *
162          KK    CO20 COMBINE
163          HC       2
             *
164          KK    DB20 STORAGE
165          KO
166          RS       1    STOR
167          SV            0.05    0.10    0.13    0.15    0.18    0.20    0.23    0.25    0.32
168          SV    0.40
169          SQ            3.00    7.00   10.00   12.00   14.00   15.00   16.00   18.00   20.00
170          SQ   23.00
171          SE            1.00    2.00    2.50    3.00    3.50    4.00    4.50    5.00    5.50
172          SE    6.00
             *
173          KK    RO22   ROUTE
174          RS       1    FLOW
175          RC   0.050   0.035   0.050    1733  0.0240    0.00
176          RX    0.00    7.00    9.00   11.00   12.00   14.00   16.00   18.00
177          RY    4.00    2.00    1.00    0.00    0.00    1.00    2.00    4.00
             *
178          KK    ON22   BASIN
179          BA   0.013
180          LG    0.30    0.31    6.00    0.19      14
181          UC   0.307   0.501
182          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
183          UA     100
             *
184          KK    ON24   BASIN
185          BA   0.006
186          LG    0.30    0.25    6.00    0.21      20
187          UC   0.169   0.196
188          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
189          UA     100
             *
190          KK    DB24 STORAGE
```

```
193          SV          0.09    0.13    0.17    0.22    0.30    0.34    0.34
194          SQ                          1.00    1.00    2.00    2.00   15.00
195          SE          0.50    1.00    1.50    2.00    2.50    2.95    3.00
             *
```



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

196          KK    CO22 COMBINE
197          HC       4
             *

198          KK    ON35   BASIN
199          BA   0.001
200          LG    0.35    0.40    6.00    0.18       0
201          UC   0.119   0.108
202          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
203          UA     100
             *

204          KK    ON30   BASIN
205          BA   0.025
206          LG    0.33    0.33    6.00    0.19      10
207          UC   0.320   0.335
208          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
209          UA     100
             *

210          KK    DB30 STORAGE
211          KO
212          RS       1    STOR
213          SV            0.05    0.11    0.16    0.25    0.33    0.42    0.42
214          SQ            1.00    3.00    4.00    5.00    5.00    6.00   55.00
215          SE            0.50    1.00    1.50    2.00    2.50    2.95    3.00
             *

216          KK    ON31   BASIN
217          BA   0.002
218          LG    0.30    0.25    6.00    0.17      17
219          UC   0.133   0.198
220          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
221          UA     100
             *

222          KK    ON40   BASIN
223          BA   0.017
224          LG    0.30    0.26    6.00    0.21      19
225          UC   0.205   0.179
226          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
227          UA     100
             *

228          KK    DB40 STORAGE
229          KO
230          RS       1    STOR
231          SV            0.15    0.34    0.52    0.74    0.96    1.21    1.21
232          SQ            1.00    2.00    3.00    4.00    5.00    6.00   18.00
233          SE            0.50    1.00    1.50    2.00    2.50    3.00    3.00
             *
```



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

234          KK   CO45B COMBINE
235          KO       3
236          HC       3
             *

237          KK    ON50   BASIN
238          BA   0.001
239          LG    0.30    0.25    6.00    0.17      17
240          UC   0.107   0.167
241          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
242          UA     100
             *
```

```
244          HC       5
             *

245          KK   OFF30   BASIN
246          BA   0.150
247          LG    0.35    0.40    6.00    0.18       0
248          UC   0.660   0.699
249          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
250          UA     100
             *

251          KK   OFF35   BASIN
252          BA   0.031
253          LG    0.35    0.40    6.00    0.18       0
254          UC   0.382   0.416
255          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
256          UA     100
             *

257          KK   OFF40   BASIN
258          BA   0.001
259          LG    0.35    0.40    6.00    0.18       0
260          UC   0.191   0.360
261          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
262          UA     100
             *

263          KK   CF45A COMBINE
264          HC       3
             *

265          KK    RF45   ROUTE
266          RS       1    FLOW
267          RC   0.050   0.035   0.050     980  0.0260    0.00
268          RX    0.00   14.00   21.00   25.00   31.00   35.00   41.00   45.00
269          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *
1                                        HEC-1 INPUT                                    PAGE  8

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

270          KK   OFF45   BASIN
271          BA   0.025
272          LG    0.35    0.40    6.00    0.18       0
273          UC   0.393   0.443
274          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
275          UA     100
             *

276          KK   CF45B COMBINE
277          HC       2
             *

278          KK    RO60   ROUTE
279          RS       1    FLOW
280          RC   0.050   0.035   0.050     625  0.0220    0.00
281          RX    0.00    6.00   10.00   14.00   27.00   38.00   57.00   83.00
282          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

283          KK   OFF50   BASIN
284          BA   0.064
285          LG    0.35    0.40    6.00    0.18       1
286          UC   0.599   0.890
287          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
288          UA     100
             *

289          KK   RF60A   ROUTE
290          RS       1    FLOW
291          RC   0.050   0.035   0.050    1076  0.0300    0.00
292          RX    0.00    8.00   18.00   55.00   71.00   78.00   83.00   90.00
293          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

294          KK   OFF55   BASIN
```

```
297          UC   0.207   0.325
298          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
299          UA     100
             *

300          KK   RF60B   ROUTE
301          RS       1    FLOW
302          RC   0.050   0.035   0.050    1200  0.0320    0.00
303          RX    0.00    9.00   14.00   16.00   16.50   22.00   26.00   33.00
304          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *
1                                        HEC-1 INPUT                                    PAGE  9

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

305          KK   CF60A COMBINE
306          HC       2
             *

307          KK   RF60C   ROUTE
308          RS       1    FLOW
309          RC   0.050   0.035   0.050     650  0.0280    0.00
310          RX    0.00   25.00   38.00   48.00   49.00   57.00   67.00   80.00
311          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

312          KK   OFF60   BASIN
313          BA   0.018
314          LG    0.35    0.40    6.00    0.18       0
315          UC   0.425   0.639
316          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
317          UA     100
             *

318          KK   CF60B COMBINE
319          HC       2
             *

320          KK    RO65   ROUTE
321          RS       1    FLOW
322          RC   0.050   0.035   0.050     756  0.0250    0.00
323          RX    0.00    5.00    7.00    8.50    9.00   19.00   24.00   29.00
324          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

325          KK    ON65   BASIN
326          BA   0.007
327          LG    0.35    0.40    6.00    0.18       0
328          UC   0.292   0.368
329          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
330          UA     100
             *

331          KK    ON60   BASIN
332          BA   0.007
333          LG    0.29    0.31    6.00    0.21      20
334          UC   0.184   0.175
335          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
336          UA     100
             *

337          KK    ON59   BASIN
338          BA   0.001
339          LG    0.10    0.25    6.00    0.26      60
340          UC   0.148   0.390
341          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
342          UA     100
             *
1                                        HEC-1 INPUT                                    PAGE 10

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

343          KK    CO60 COMBINE
344          HC       2
             *
```

```
346          KO
347          RS       1    STOR
348          SV            0.05    0.12    0.18    0.26    0.35    0.45    0.45
349          SQ            1.00    2.00    2.00    3.00    4.00    4.00   26.00
350          SE            0.50    1.00    1.50    2.00    2.50    2.95    3.00
             *

351          KK    CO65 COMBINE
352          HC       4
             *

353          KK    RO75A   ROUTE
354          RS       1    FLOW
355          RC   0.050   0.035   0.050     553  0.0240    0.00
356          RX    0.00   18.00   20.00   23.00   34.00   38.00   41.00   44.00
357          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

358          KK    OFF65   BASIN
359          BA   0.004
360          LG    0.35    0.40    6.00    0.18       0
361          UC   0.252   0.386
362          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
363          UA     100
             *

364          KK    RO70    ROUTE
365          RS       1    FLOW
366          RC   0.050   0.035   0.050    1280  0.0250    0.00
367          RX    0.00   14.00   27.00   31.50   32.00   36.00   40.00   46.00
368          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

369          KK    ON70    BASIN
370          BA   0.014
371          LG    0.35    0.40    6.00    0.18       0
372          UC   0.364   0.495
373          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
374          UA     100
             *

375          KK    ON61    BASIN
376          BA   0.005
377          LG    0.25    0.34    6.00    0.21      24
378          UC   0.215   0.349
379          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
380          UA     100
             *
```



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

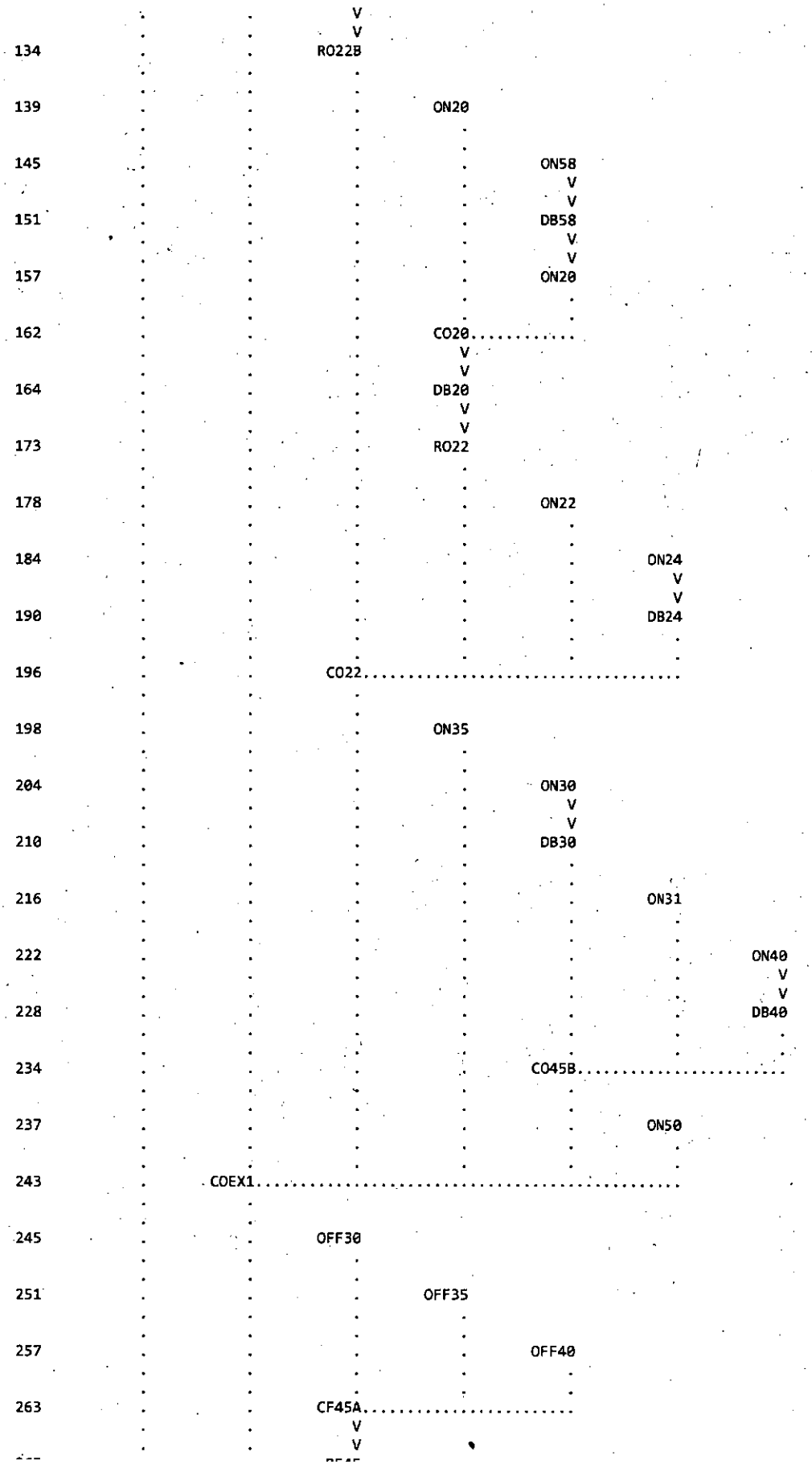
381          KK    DB61 STORAGE
382          KO
383          RS       1    STOR
384          SV            0.05    0.09    0.15    0.20    0.26    0.32
385          SQ                    1.00    1.00    1.00    2.00    2.00
386          SE            0.50    1.00    1.50    2.00    2.50    3.00
             *

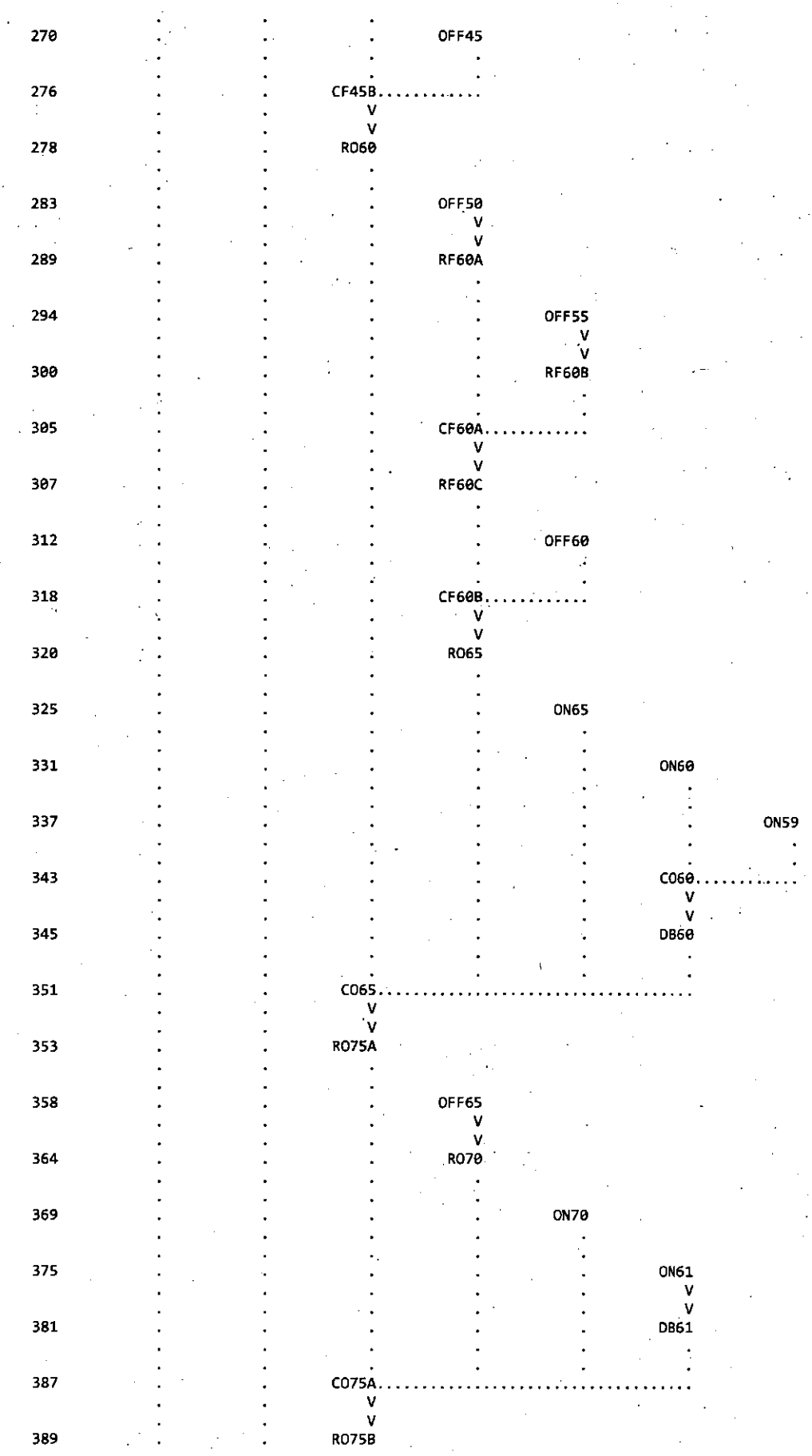
387          KK    CO75A COMBINE
388          HC       4
             *

389          KK    RO75B   ROUTE
390          RS       1    FLOW
391          RC   0.050   0.035   0.050    1600  0.0260    0.00
392          RX    0.00   15.00   26.00   32.00   43.00   46.00   50.00   55.00
393          RY    2.00    1.50    1.00    0.00    0.00    1.00    2.00    3.00
             *

394          KK    ON75    BASIN
395          BA   0.022
396          LG    0.34    0.36    6.00    0.18       5
397          UC   0.419   0.631
398          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
399          UA     100
```

```
          400          KK   CO75B COMBINE
          401          HC       2
                       *
          402          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW
   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW
    23       OFF05
                V
                V
    29        RO5A
                .
                .
    34          .        OFF10
                .           V
                .           V
    40          .         RO5B
                .           .
                .           .
    45        CO5A.............
                V
                V
    47        RO5C
                .
                .
    52          .          ON05
                .           .
                .           .
    58        CO5B.............
                .
                .
    60          .        OFF15
                .           V
                .           V
    66          .        RO10A
                ..          .
                ..          .
    71          .           .        OFF20
                .           .           V
                .           .           V
    77          .           .        RO10B
                .           .           .
                .           .           .
    82          .        CO10A.............
                .           V
                .           V
    84          .        RO10C
                .           .
                .           .
    89          .           .         ON10
                .           .           .
                .           .           .
    95          .           .           .         ON11
                .           .           .           V
                .           .           .           V
   101          .           .           .         DB10
                .           .           .           .
                .           .           .           .
   107          .        CO10B.......................
                .           V
                .           V
   109          .         RO11
                .           .
                .           .
   114          .           .         ON12
                .           .           .
                .           .           .
   120          .         CO12.............
                .           .
                .           .
   122          .           .         ON15
                .           .           V
                .           .           V
```


134 RO22B
139 ON20
145 ON58
151 DB58
157 ON20
162 CO20
164 DB20
173 RO22
178 ON22
184 ON24
190 DB24
196 CO22
198 ON35
204 ON30
210 DB30
216 ON31
222 ON40
228 DB40
234 CO45B
237 ON50
243 COEX1
245 OFF30
251 OFF35
257 OFF40
263 CF45A


270
OFF45
276
CF45B
278
RO60
283
OFF50
289
RF60A
294
OFF55
300
RF60B
305
CF60A
307
RF60C
312
OFF60
318
CF60B
320
RO65
325
ON65
331
ON60
337
ON59
343
CO60
345
DB60
351
CO65
353
RO75A
358
OFF65
364
RO70
369
ON70
375
ON61
381
DB61
387
CO75A
389
RO75B

```
  394          .          .          .       ON75
               .          .          .        .
               .          .          .        .
  400          .          .       CO75B.............

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              JUN  1998               *
*           VERSION 4.1                *
*                                      *
*  RUN DATE   17FEB17  TIME  17:16:58  *
*                                      *
****************************************

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

                          Flood Control District of Maricopa County
                          STORYROCK PH1A PROP - STORYROCK PHASE 1A PROP CONDITION
                          2 YEAR
                          6 Hour  Storm
                          Unit Hydrograph: Clark
                          Storm: Multiple
                          02/17/2017

  9 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      1JAN99  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ        2000  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      7JAN99  ENDING DATE
                     NDTIME        2235  ENDING TIME
                      ICENT          19  CENTURY MARK

                    COMPUTATION INTERVAL    0.08 HOURS
                         TOTAL TIME BASE  166.58 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

 11 JD            INDEX STORM NO. 1
                        STRM       1.42  PRECIPITATION DEPTH
                        TRDA       0.00  TRANSPOSITION DRAINAGE AREA

 12 PI             PRECIPITATION PATTERN
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                     0.03      0.03      0.05      0.05      0.05      0.15      0.15      0.15      0.03      0.03
                     0.03      0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00

 15 JD            INDEX STORM NO. 2
                        STRM       1.41  PRECIPITATION DEPTH
                        TRDA       0.50  TRANSPOSITION DRAINAGE AREA

 16 PI             PRECIPITATION PATTERN
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
```

```
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00

 19 JD        INDEX STORM NO. 3
                STRM        1.38  PRECIPITATION DEPTH
                TRDA        2.80  TRANSPOSITION DRAINAGE AREA

 20 PI          PRECIPITATION PATTERN
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                0.03      0.03      0.07      0.07      0.07      0.08      0.08      0.08      0.05      0.05
                0.05      0.02      0.02      0.02      0.01      0.01      0.01      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00

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


           **************
           *            *
101 KK     *      DB10  *      STORAGE
           *            *
           **************

102 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE


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


           **************
           *            *
128 KK     *      DB15  *      STORAGE
           *            *
           **************

129 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE


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


           **************
           *            *
151 KK     *      DB58  *      STORAGE
           *            *
           **************

152 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE


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


           **************
           *            *
164 KK     *      DB20  *      STORAGE
           *            *
           **************

165 KO          OUTPUT CONTROL VARIABLES
```

```
                    QSCAL          0.  HYDROGRAPH PLOT SCALE


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


            **************
            *            *
190 KK      *      DB24  *      STORAGE
            *            *
            **************

191 KO           OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE


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


            **************
            *            *
210 KK      *      DB30  *      STORAGE
            *            *
            **************

211 KO           OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE


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


            **************
            *            *
228 KK      *      DB40  *      STORAGE
            *            *
            **************

229 KO           OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE


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


            **************
            *            *
234 KK      *     CO45B  *      COMBINE
            *            *
            **************

235 KO           OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

236 HC           HYDROGRAPH COMBINATION
                      ICOMP          3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                  ***

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

                       HYDROGRAPH AT STATION    CO45B
                     TRANSPOSITION AREA      0.0 SQ MI

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                    6-HR        24-HR        72-HR       166.58-HR
```

```
                    (CFS)
+       7.    4.50                2.          1.          0.          0.
                  (INCHES)      0.472       0.499       0.499       0.499
                  (AC-FT)         1.          1.          1.          1.

                  CUMULATIVE AREA =    0.04 SQ MI


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

                    HYDROGRAPH AT STATION    CO45B
                  TRANSPOSITION AREA      0.5 SQ MI

  PEAK FLOW    TIME                      MAXIMUM AVERAGE FLOW
                                 6-HR        24-HR       72-HR     166.58-HR
+   (CFS)      (HR)
                    (CFS)
+       7.    4.50                2.          1.          0.          0.
                  (INCHES)      0.466       0.493       0.493       0.493
                  (AC-FT)         1.          1.          1.          1.

                  CUMULATIVE AREA =    0.04 SQ MI


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

                    HYDROGRAPH AT STATION    CO45B
                  TRANSPOSITION AREA      2.8 SQ MI

  PEAK FLOW    TIME                      MAXIMUM AVERAGE FLOW
                                 6-HR        24-HR       72-HR     166.58-HR
+   (CFS)      (HR)
                    (CFS)
+       4.    4.50                1.          0.          0.          0.
                  (INCHES)      0.253       0.274       0.274       0.274
                  (AC-FT)         1.          1.          1.          1.

                  CUMULATIVE AREA =    0.04 SQ MI

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


                  INTERPOLATED HYDROGRAPH AT    CO45B

  PEAK FLOW    TIME                      MAXIMUM AVERAGE FLOW
                                 6-HR        24-HR       72-HR     166.58-HR
+   (CFS)      (HR)
                    (CFS)
+       7.    4.50                2.          1.          0.          0.
                  (INCHES)      0.467       0.495       0.495       0.495
                  (AC-FT)         1.          1.          1.          1.

                  CUMULATIVE AREA =    0.04 SQ MI


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


          **************
          *            *
345 KK    *     DB60   *     STORAGE
          *            *
          **************

346 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE


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


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

```
381 KK      *      DB61  *      STORAGE
            *            *
            **************

382 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                   RUNOFF SUMMARY
                              FLOW IN CUBIC FEET PER SECOND
                           TIME IN HOURS,  AREA IN SQUARE MILES
```

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	OFF05	1.	4.08	0.	0.	0.	0.00		
+	ROUTED TO	RO5A	1.	4.17	0.	0.	0.	0.00		
+	HYDROGRAPH AT	OFF10	2.	4.17	0.	0.	0.	0.00		
+	ROUTED TO	RO5B	2.	4.25	0.	0.	0.	0.00		
+	2 COMBINED AT	CO5A	2.	4.17	0.	0.	0.	0.01		
+	ROUTED TO	RO5C	2.	4.25	0.	0.	0.	0.01		
+	HYDROGRAPH AT	ON05	3.	4.25	0.	0.	0.	0.01		
+	2 COMBINED AT	CO5B	5.	4.25	1.	0.	0.	0.01		
+	HYDROGRAPH AT	OFF15	3.	4.25	0.	0.	0.	0.01		
+	ROUTED TO	RO10A	3.	4.33	0.	0.	0.	0.01		
+	HYDROGRAPH AT	OFF20	2.	4.17	0.	0.	0.	0.00		
+	ROUTED TO	RO10B	2.	4.25	0.	0.	0.	0.00		
+	2 COMBINED AT	CO10A	5.	4.33	1.	0.	0.	0.02		
+	ROUTED TO	RO10C	5.	4.42	1.	0.	0.	0.02		
+	HYDROGRAPH AT	ON10	6.	4.17	1.	0.	0.	0.01		
+	HYDROGRAPH AT	ON11	5.	4.17	1.	0.	0.	0.01		
+	ROUTED TO	DB10	0.	6.25	0.	0.	0.	0.01		
+	3 COMBINED AT	CO10B	9.	4.25	1.	0.	0.	0.04		
+	ROUTED TO	RO11	8.	4.42	1.	0.	0.	0.04		
+	HYDROGRAPH AT	ON12	3.	4.25	0.	0.	0.	0.01		

	HYDROGRAPH AT						
+		ON15	9.	4.08	1.	0.	0.	0.01
	ROUTED TO						
+		DB15	1.	4.33	0.	0.	0.	0.01
	ROUTED TO						
+		RO22B	1.	4.50	0.	0.	0.	0.01
	HYDROGRAPH AT						
+		ON20	6.	4.25	1.	0.	0.	0.02
	HYDROGRAPH AT						
+		ON58	1.	4.08	0.	0.	0.	0.00
	ROUTED TO						
+		DB58	1.	4.50	0.	0.	0.	0.00
	ROUTED TO						
+		ON20	1.	4.67	0.	0.	0.	0.00
	2 COMBINED AT						
+		CO20	6.	4.25	1.	0.	0.	0.02
	ROUTED TO						
+		DB20	5.	4.42	1.	0.	0.	0.02
	ROUTED TO						
+		RO22	5.	4.58	1.	0.	0.	0.02
	HYDROGRAPH AT						
+		ON22	5.	4.25	1.	0.	0.	0.01
	HYDROGRAPH AT						
+		ON24	5.	4.08	0.	0.	0.	0.01
	ROUTED TO						
+		DB24	1.	4.58	0.	0.	0.	0.01
	4 COMBINED AT						
+		CO22	10.	4.50	2.	1.	0.	0.05
	HYDROGRAPH AT						
+		ON35	1.	4.00	0.	0.	0.	0.00
	HYDROGRAPH AT						
+		ON30	11.	4.25	1.	0.	0.	0.03
	ROUTED TO						
+		DB30	5.	4.58	1.	0.	0.	0.03
	HYDROGRAPH AT						
+		ON31	2.	4.08	0.	0.	0.	0.00
	HYDROGRAPH AT						
+		ON40	13.	4.08	1.	0.	0.	0.02
	ROUTED TO						
+		DB40	2.	4.50	1.	0.	0.	0.02
	3 COMBINED AT						
+		CO45B	7.	4.50	2.	1.	0.	0.04
	HYDROGRAPH AT						
+		ON50	1.	4.00	0.	0.	0.	0.00
	5 COMBINED AT						
+		COEX1	27.	4.42	6.	2.	1.	0.15
	HYDROGRAPH AT						
+		OFF30	28.	4.50	5.	1.	0.	0.15
	HYDROGRAPH AT						
+		OFF35	9.	4.25	1.	0.	0.	0.03
	HYDROGRAPH AT						
+		OFF40	2.	4.17	0.	0.	0.	0.00

+	3 COMBINED AT CF45A	35.	4.50	6.	1.	0.	0.18
+	ROUTED TO RF45	34.	4.50	6.	1.	0.	0.18
+	HYDROGRAPH AT OFF45	7.	4.25	1.	0.	0.	0.03
+	2 COMBINED AT CF45B	39.	4.50	7.	2.	1.	0.21
+	ROUTED TO RO60	38.	4.50	7.	2.	1.	0.21
+	HYDROGRAPH AT OFF50	10.	4.50	2.	1.	0.	0.06
+	ROUTED TO RF60A	10.	4.58	2.	1.	0.	0.06
+	HYDROGRAPH AT OFF55	1.	4.17	0.	0.	0.	0.00
+	ROUTED TO RF60B	1.	4.25	0.	0.	0.	0.00
+	2 COMBINED AT CF60A	10.	4.58	2.	1.	0.	0.07
+	ROUTED TO RF60C	10.	4.67	2.	1.	0.	0.07
+	HYDROGRAPH AT OFF60	4.	4.33	1.	0.	0.	0.02
+	2 COMBINED AT CF60B	13.	4.58	3.	1.	0.	0.08
+	ROUTED TO RO65	12.	4.67	3.	1.	0.	0.08
+	HYDROGRAPH AT ON65	2.	4.25	0.	0.	0.	0.01
+	HYDROGRAPH AT ON60	5.	4.08	0.	0.	0.	0.01
+	HYDROGRAPH AT ON59	1.	4.08	0.	0.	0.	0.00
+	2 COMBINED AT CO60	6.	4.08	1.	0.	0.	0.01
+	ROUTED TO DB60	2.	4.33	1.	0.	0.	0.01
+	4 COMBINED AT CO65	53.	4.58	10.	2.	1.	0.31
+	ROUTED TO RO75A	53.	4.58	10.	2.	1.	0.31
+	HYDROGRAPH AT OFF65	1.	4.17	0.	0.	0.	0.00
+	ROUTED TO RO70	1.	4.33	0.	0.	0.	0.00
+	HYDROGRAPH AT ON70	4.	4.25	0.	0.	0.	0.01
+	HYDROGRAPH AT ON61	3.	4.17	0.	0.	0.	0.00
+	ROUTED TO DB61	1.	4.42	0.	0.	0.	0.00

+	CO75A	57.	4.58	11.	3.	1.	0.33
ROUTED TO							
+	RO75B	55.	4.67	11.	3.	1.	0.33
HYDROGRAPH AT							
+	ON75	6.	4.33	1.	0.	0.	0.02
2 COMBINED AT							
+	CO75B	59.	4.67	12.	3.	1.	0.35

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

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998                *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   17FEB17  TIME  17:17:08   *
*                                       *
*****************************************
```


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


```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX
```

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

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

1 HEC-1 INPUT PAGE 1

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

   1          ID        Flood Control District of Maricopa County
   2          ID        STORYROCK PH1A PROP - STORYROCK PHASE 1A PROP CONDITION
   3          ID        10 YEAR
   4          ID        6 Hour  Storm
   5          ID        Unit Hydrograph: Clark
   6          ID        Storm: Multiple
   7          ID        02/17/2017
              *DIAGRAM
   8          IT      5  1JAN99      0    2000
   9          IO      5
  10          IN     15
              *
  11          JD  2.105  0.0001
  12          PC  0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
  13          PC  0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
  14          PC  0.962   0.972   0.983   0.991   1.000
  15          JD  2.092  0.5000
  16          PC  0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
  17          PC  0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
  18          PC  0.962   0.972   0.983   0.991   1.000
  19          JD  2.052    2.8
  20          PC  0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
  21          PC  0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
  22          PC  0.950   0.963   0.975   0.988   1.000
              *
  23          KK  OFF05   BASIN
  24          BA  0.001
  25          LG   0.35    0.40    6.00    0.18       0
  26          UC  0.118   0.135
  27          UA      0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  28          UA    100
              *
  29          KK   RO5A   ROUTE
  30          RS      1    FLOW
  31          RC  0.050   0.035   0.050     380  0.0340    0.00
  32          RX   0.00   12.00   16.00   20.00   21.00   24.00   32.00   42.00
  33          RY   3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
              *
```

```
 84          KK   RO10C   ROUTE
 85          RS      1    FLOW
 86          RC  0.050   0.035   0.050    621  0.0220    0.00
 87          RX   0.00    5.00   10.00   28.00   32.00   68.00   78.00   83.00
 88          RY   3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

 89          KK   ON10   BASIN
 90          BA  0.014
 91          LG   0.32    0.30    6.00    0.18       7
 92          UC  0.239   0.294
 93          UA      0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 94          UA    100
             *

 95          KK   ON11   BASIN
 96          BA  0.009
 97          LG   0.31    0.27    6.00    0.19      16
 98          UC  0.204   0.235
 99          UA      0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
100          UA    100
             *

101          KK   DB10 STORAGE
102          KO
103          RS      1    STOR
104          SV           0.13    0.26    0.41    0.57    0.73    0.92    0.92
105          SQ                   1.00    1.00    2.00    2.00    2.00
106          SE           0.50    1.00    1.50    2.00    2.50    3.00    3.01
             *

107          KK   CO10B COMBINE
108          HC      3
             *

109          KK   RO11   ROUTE
110          RS      1    FLOW
111          RC  0.050   0.035   0.050    1000  0.0220    0.00
112          RX   0.00    5.00   10.00   28.00   32.00   68.00   78.00   83.00
113          RY   3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

114          KK   ON12   BASIN
115          BA  0.008
116          LG   0.33    0.34    6.00    0.17       6
117          UC  0.278   0.447
118          UA      0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
119          UA    100
             *
```



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

120          KK   CO12 COMBINE
121          HC      2
             *

122          KK   ON15   BASIN
123          BA  0.012
124          LG   0.30    0.25    6.00    0.19      19
125          UC  0.164   0.164
126          UA      0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
127          UA    100
             *

128          KK   DB15 STORAGE
129          KO
130          RS      1    STOR
131          SV           0.13    0.26    0.42    0.58    0.77    0.96    0.96
132          SQ                   1.00    1.00    1.00    2.00    2.00   13.00
133          SE           0.50    1.00    1.50    2.00    2.50    2.98    3.00
             *

134          KK   RO22B   ROUTE
135          RS      1    FLOW
136          RC  0.050   0.035   0.050     585  0.0240    0.00
```

```
 138          RY    4.00    2.00    1.00    0.00    0.00    1.00    2.00    4.00
              *

 139          KK    ON20   BASIN
 140          BA   0.017
 141          LG    0.32    0.34    6.00    0.18       6
 142          UC   0.294   0.399
 143          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 144          UA     100
              *

 145          KK    ON58   BASIN
 146          BA   0.002
 147          LG    0.10    0.25    6.00    0.26      60
 148          UC   0.157   0.339
 149          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 150          UA     100
              *

 151          KK    DB58 STORAGE
 152          KO
 153          RS       1    STOR
 154          SV            0.06    0.14
 155          SQ            1.00    1.00
 156          SE            0.50    1.00
              *
1                                      HEC-1 INPUT                                    PAGE  5

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

 157          KK    ON20   ROUTE
 158          RS       1    FLOW
 159          RC   0.050   0.035   0.050    1302  0.0280    0.00
 160          RX    0.00    7.00    9.00   11.00   12.00   14.00   16.00   18.00
 161          RY    4.00    2.00    1.00    0.00    0.00    1.00    2.00    4.00
              *

 162          KK    CO20 COMBINE
 163          HC       2
              *

 164          KK    DB20 STORAGE
 165          KO
 166          RS       1    STOR
 167          SV            0.05    0.10    0.13    0.15    0.18    0.20    0.23    0.25    0.32
 168          SV    0.40
 169          SQ            3.00    7.00   10.00   12.00   14.00   15.00   16.00   18.00   20.00
 170          SQ   23.00
 171          SE            1.00    2.00    2.50    3.00    3.50    4.00    4.50    5.00    5.50
 172          SE    6.00
              *

 173          KK    RO22   ROUTE
 174          RS       1    FLOW
 175          RC   0.050   0.035   0.050    1733  0.0240    0.00
 176          RX    0.00    7.00    9.00   11.00   12.00   14.00   16.00   18.00
 177          RY    4.00    2.00    1.00    0.00    0.00    1.00    2.00    4.00
              *

 178          KK    ON22   BASIN
 179          BA   0.013
 180          LG    0.30    0.31    6.00    0.19      14
 181          UC   0.264   0.422
 182          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 183          UA     100
              *

 184          KK    ON24   BASIN
 185          BA   0.006
 186          LG    0.30    0.25    6.00    0.21      20
 187          UC   0.146   0.167
 188          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 189          UA     100
              *

 190          KK    DB24 STORAGE
 191          KO
```

```
193          SV          0.09    0.13    0.17    0.22    0.30    0.34    0.34
194          SQ                          1.00    1.00    2.00    2.00   15.00
195          SE          0.50    1.00    1.50    2.00    2.50    2.95    3.00
             *
```



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

196          KK    CO22 COMBINE
197          HC      4
             *

198          KK    ON35   BASIN
199          BA   0.001
200          LG    0.35    0.40    6.00    0.18       0
201          UC   0.099   0.088
202          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
203          UA     100
             *

204          KK    ON30   BASIN
205          BA   0.025
206          LG    0.33    0.33    6.00    0.19      10
207          UC   0.272   0.280
208          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
209          UA     100
             *

210          KK    DB30 STORAGE
211          KO
212          RS       1    STOR
213          SV            0.05    0.11    0.16    0.25    0.33    0.42    0.42
214          SQ            1.00    3.00    4.00    5.00    5.00    6.00   55.00
215          SE            0.50    1.00    1.50    2.00    2.50    2.95    3.00
             *

216          KK    ON31   BASIN
217          BA   0.002
218          LG    0.30    0.25    6.00    0.17      17
219          UC   0.114   0.167
220          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
221          UA     100
             *

222          KK    ON40   BASIN
223          BA   0.017
224          LG    0.30    0.26    6.00    0.21      19
225          UC   0.177   0.152
226          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
227          UA     100
             *

228          KK    DB40 STORAGE
229          KO
230          RS       1    STOR
231          SV            0.15    0.34    0.52    0.74    0.96    1.21    1.21
232          SQ            1.00    2.00    3.00    4.00    5.00    6.00   18.00
233          SE            0.50    1.00    1.50    2.00    2.50    3.00    3.00
             *
```



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

234          KK    CO45B COMBINE
235          KO       3
236          HC       3
             *

237          KK    ON50   BASIN
238          BA   0.001
239          LG    0.30    0.25    6.00    0.17      17
240          UC   0.092   0.141
241          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
242          UA     100
             *
```

```
244          HC       5
             *

245          KK   OFF30   BASIN
246          BA   0.150
247          LG    0.35    0.40    6.00    0.18       0
248          UC   0.548   0.569
249          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
250          UA     100
             *

251          KK   OFF35   BASIN
252          BA   0.031
253          LG    0.35    0.40    6.00    0.18       0
254          UC   0.317   0.338
255          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
256          UA     100
             *

257          KK   OFF40   BASIN
258          BA   0.001
259          LG    0.35    0.40    6.00    0.18       0
260          UC   0.159   0.293
261          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
262          UA     100
             *

263          KK   CF45A COMBINE
264          HC       3
             *

265          KK    RF45   ROUTE
266          RS       1    FLOW
267          RC   0.050   0.035   0.050     980  0.0260    0.00
268          RX    0.00   14.00   21.00   25.00   31.00   35.00   41.00   45.00
269          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *
```



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

270          KK   OFF45   BASIN
271          BA   0.025
272          LG    0.35    0.40    6.00    0.18       0
273          UC   0.327   0.360
274          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
275          UA     100
             *

276          KK   CF45B COMBINE
277          HC       2
             *

278          KK    RO60   ROUTE
279          RS       1    FLOW
280          RC   0.050   0.035   0.050     625  0.0220    0.00
281          RX    0.00    6.00   10.00   14.00   27.00   38.00   57.00   83.00
282          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

283          KK   OFF50   BASIN
284          BA   0.064
285          LG    0.35    0.40    6.00    0.18       1
286          UC   0.499   0.726
287          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
288          UA     100
             *

289          KK   RF60A   ROUTE
290          RS       1    FLOW
291          RC   0.050   0.035   0.050    1076  0.0300    0.00
292          RX    0.00    8.00   18.00   55.00   71.00   78.00   83.00   90.00
293          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

294          KK   OFF55   BASIN
295          BA   0.002
```
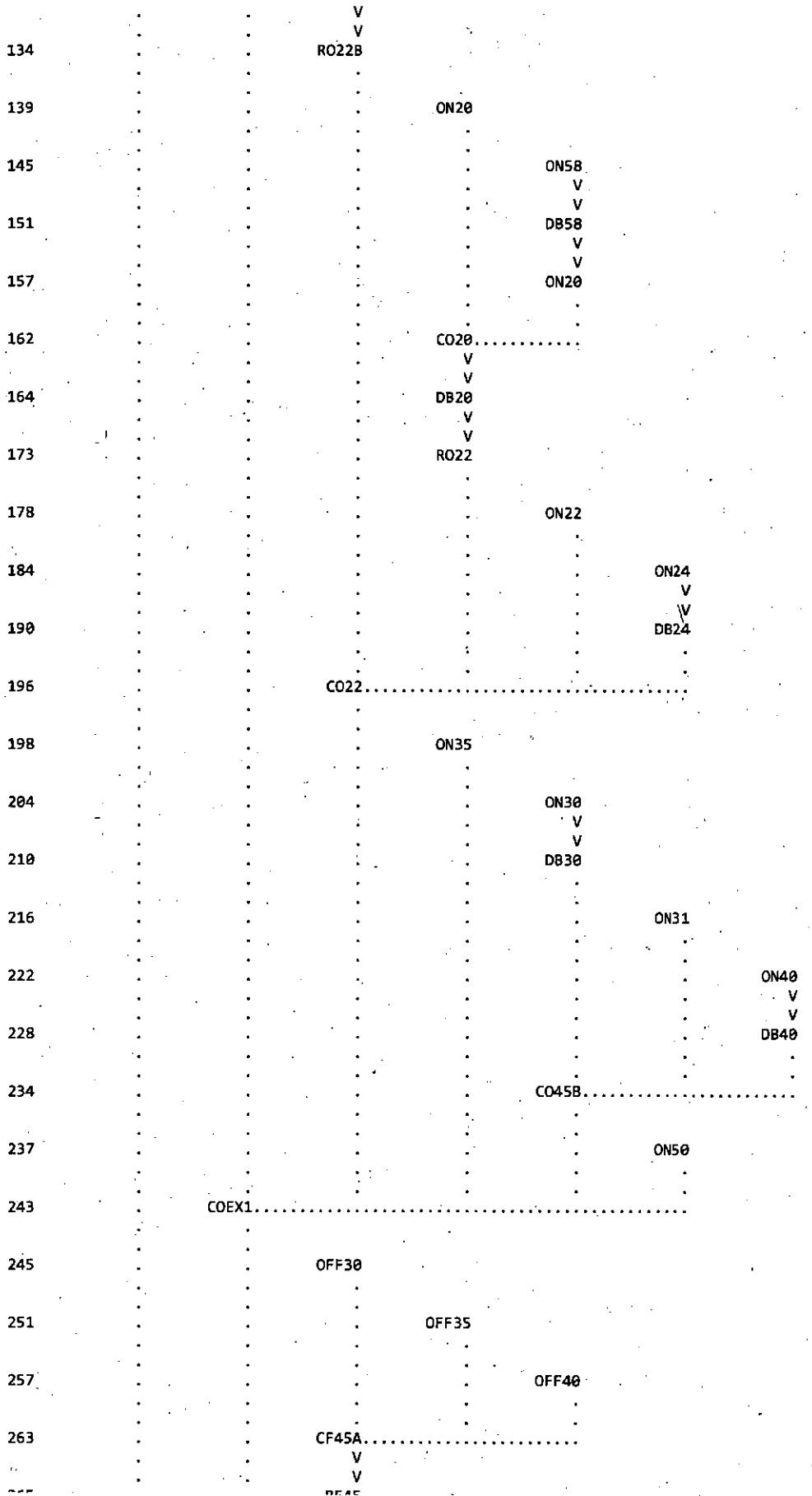

```
297          UC   0.172   0.264
298          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
299          UA     100
             *

300          KK   RF60B   ROUTE
301          RS       1    FLOW
302          RC   0.050   0.035   0.050    1200  0.0320    0.00
303          RX    0.00    9.00   14.00   16.00   16.50   22.00   26.00   33.00
304          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *
1                                        HEC-1 INPUT                                    PAGE  9

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

305          KK   CF60A COMBINE
306          HC       2
             *

307          KK   RF60C   ROUTE
308          RS       1    FLOW
309          RC   0.050   0.035   0.050     650  0.0280    0.00
310          RX    0.00   25.00   38.00   48.00   49.00   57.00   67.00   80.00
311          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

312          KK   OFF60   BASIN
313          BA   0.018
314          LG    0.35    0.40    6.00    0.18       0
315          UC   0.353   0.520
316          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
317          UA     100
             *

318          KK   CF60B COMBINE
319          HC       2
             *

320          KK    RO65   ROUTE
321          RS       1    FLOW
322          RC   0.050   0.035   0.050     756  0.0250    0.00
323          RX    0.00    5.00    7.00    8.50    9.00   19.00   24.00   29.00
324          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

325          KK    ON65   BASIN
326          BA   0.007
327          LG    0.35    0.40    6.00    0.18       0
328          UC   0.242   0.300
329          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
330          UA     100
             *

331          KK    ON60   BASIN
332          BA   0.007
333          LG    0.29    0.31    6.00    0.21      20
334          UC   0.159   0.149
335          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
336          UA     100
             *

337          KK    ON59   BASIN
338          BA   0.001
339          LG    0.10    0.25    6.00    0.26      60
340          UC   0.133   0.345
341          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
342          UA     100
             *
1                                        HEC-1 INPUT                                    PAGE 10

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

343          KK    CO60 COMBINE
344          HC       2
             *
```

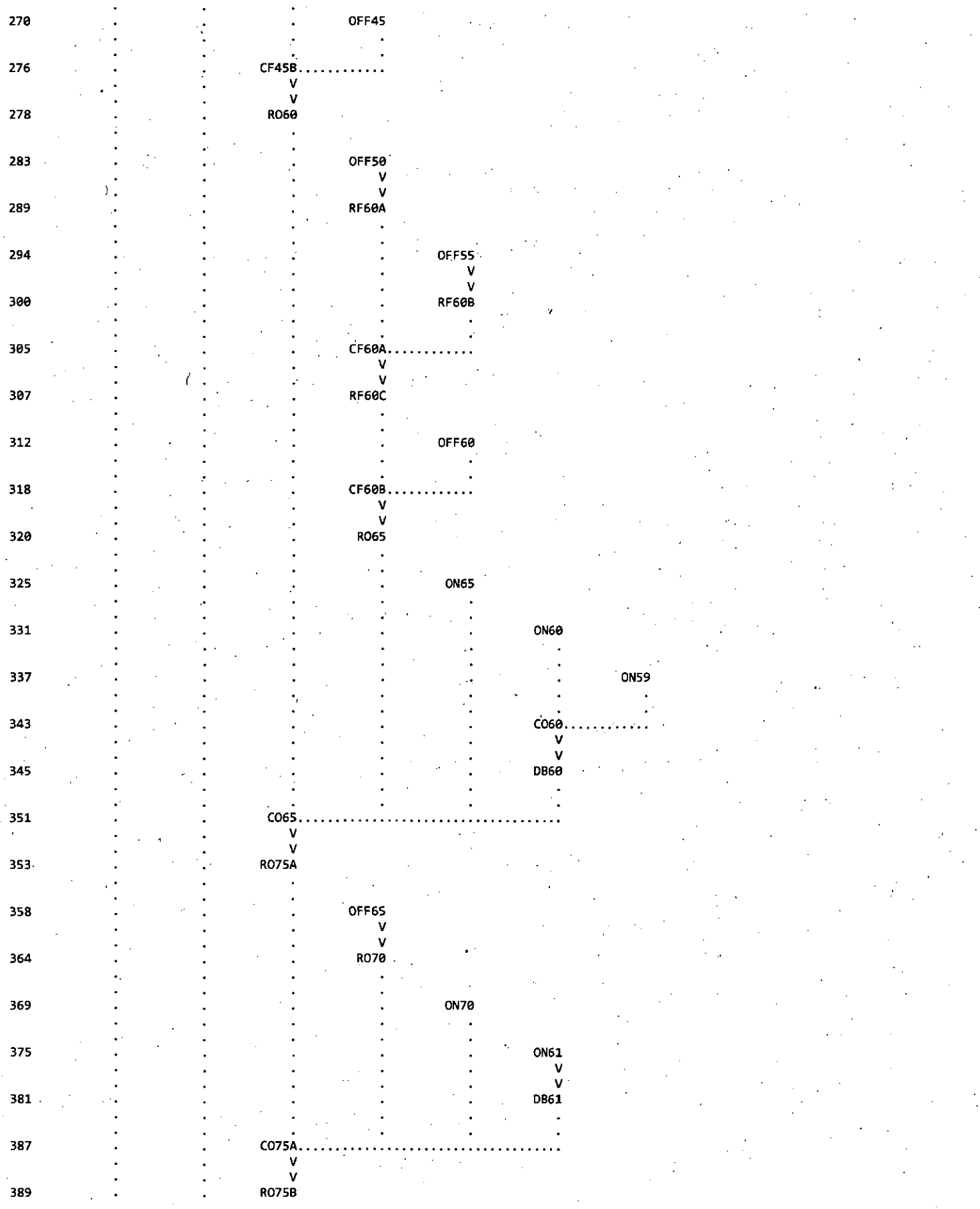
```
346          KO
347          RS       1    STOR
348          SV            0.05    0.12    0.18    0.26    0.35    0.45    0.45
349          SQ            1.00    2.00    2.00    3.00    4.00    4.00   26.00
350          SE            0.50    1.00    1.50    2.00    2.50    2.95    3.00
             *

351          KK    CO65 COMBINE
352          HC       4
             *

353          KK    RO75A   ROUTE
354          RS       1    FLOW
355          RC   0.050   0.035   0.050     553  0.0240    0.00
356          RX    0.00   18.00   20.00   23.00   34.00   38.00   41.00   44.00
357          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

358          KK    OFF65   BASIN
359          BA   0.004
360          LG    0.35    0.40    6.00    0.18       0
361          UC   0.209   0.314
362          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
363          UA     100
             *

364          KK    RO70    ROUTE
365          RS       1    FLOW
366          RC   0.050   0.035   0.050    1280  0.0250    0.00
367          RX    0.00   14.00   27.00   31.50   32.00   36.00   40.00   46.00
368          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

369          KK    ON70    BASIN
370          BA   0.014
371          LG    0.35    0.40    6.00    0.18       0
372          UC   0.302   0.403
373          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
374          UA     100
             *

375          KK    ON61    BASIN
376          BA   0.005
377          LG    0.25    0.34    6.00    0.21      24
378          UC   0.186   0.298
379          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
380          UA     100
             *
```



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

381          KK    DB61 STORAGE
382          KO
383          RS       1    STOR
384          SV            0.05    0.09    0.15    0.20    0.26    0.32
385          SQ                    1.00    1.00    1.00    2.00    2.00
386          SE            0.50    1.00    1.50    2.00    2.50    3.00
             *

387          KK    CO75A COMBINE
388          HC       4
             *

389          KK    RO75B   ROUTE
390          RS       1    FLOW
391          RC   0.050   0.035   0.050    1600  0.0260    0.00
392          RX    0.00   15.00   26.00   32.00   43.00   46.00   50.00   55.00
393          RY    2.00    1.50    1.00    0.00    0.00    1.00    2.00    3.00
             *

394          KK    ON75    BASIN
395          BA   0.022
396          LG    0.34    0.36    6.00    0.18       5
397          UC   0.353   0.521
398          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
399          UA     100
```

```
          400          KK   CO75B COMBINE
          401          HC       2
                       *
          402          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW
   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW
    23       OFF05
               V
               V
    29        RO5A
                .
                .
    34          .        OFF10
                .          V
                .          V
    40          .        RO5B
                .          .
                .          .
    45        CO5A.............
               V
               V
    47        RO5C
                .
                .
    52          .        ON05
                .          .
                .          .
    58        CO5B.............
                .
                .
    60          .        OFF15
                .          V
                .          V
    66          .        RO10A
                .          .
                .          .
    71          .          .        OFF20
                .          .          V
                .          .          V
    77          .          .        RO10B
                .          .          .
                .          .          .
    82          .        CO10A.............
                .          V
                .          V
    84          .        RO10C
                .          .
                .          .
    89          .          .        ON10
                .          .          .
                .          .          .
    95          .          .          .        ON11
                .          .          .          V
                .          .          .          V
   101          .          .          .        DB10
                .          .          .          .
                .          .          .          .
   107          .        CO10B.........................
                .          V
                .          V
   109          .        RO11
                .          .
                .          .
   114          .          .        ON12
                .          .          .
                .          .          .
   120          .        CO12.............
                .          .
                .          .
   122          .          .        ON15
                .          .          V
                .          .          V
```


V
V
134 RO22B
139 ON20
145 ON58
V
V
151 DB58
V
V
157 ON20
162 CO20
V
V
164 DB20
V
V
173 RO22
178 ON22
184 ON24
V
V
190 DB24
196 CO22
198 ON35
204 ON30
V
V
210 DB30
216 ON31
222 ON40
V
V
228 DB40
234 CO45B
237 ON50
243 COEX1
245 OFF30
251 OFF35
257 OFF40
263 CF45A
V
V


270
OFF45
276
CF45B
278
RO60
283
OFF50
289
RF60A
294
OFF55
300
RF60B
305
CF60A
307
RF60C
312
OFF60
318
CF60B
320
RO65
325
ON65
331
ON60
337
ON59
343
CO60
345
DB60
351
CO65
353
RO75A
358
OFF65
364
RO70
369
ON70
375
ON61
381
DB61
387
CO75A
389
RO75B

```
  394          .          .          .       ON75
               .          .          .        .
               .          .          .        .
  400          .          .       CO75B.......
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998                *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   17FEB17  TIME  17:17:08   *
*                                       *
*****************************************
```

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

Flood Control District of Maricopa County
STORYROCK PH1A PROP - STORYROCK PHASE 1A PROP CONDITION
10 YEAR
6 Hour Storm
Unit Hydrograph: Clark
Storm: Multiple
02/17/2017

```
  9 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      1JAN99  STARTING DATE
                     ITIME        0000  STARTING TIME
                        NQ        2000  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      7JAN99  ENDING DATE
                    NDTIME        2235  ENDING TIME
                     ICENT          19  CENTURY MARK

                  COMPUTATION INTERVAL     0.08 HOURS
                      TOTAL TIME BASE   166.58 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

  11 JD           INDEX STORM NO. 1
                        STRM       2.11  PRECIPITATION DEPTH
                        TRDA       0.00  TRANSPOSITION DRAINAGE AREA

  12 PI           PRECIPITATION PATTERN
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                    0.03      0.03      0.05      0.05      0.05      0.15      0.15      0.15      0.03      0.03
                    0.03      0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00

  15 JD           INDEX STORM NO. 2
                        STRM       2.09  PRECIPITATION DEPTH
                        TRDA       0.50  TRANSPOSITION DRAINAGE AREA

  16 PI           PRECIPITATION PATTERN
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
```

```
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00

 19 JD        INDEX STORM NO. 3
                STRM        2.05  PRECIPITATION DEPTH
                TRDA        2.80  TRANSPOSITION DRAINAGE AREA

 20 PI         PRECIPITATION PATTERN
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                0.03      0.03      0.07      0.07      0.07      0.08      0.08      0.08      0.05      0.05
                0.05      0.02      0.02      0.02      0.01      0.01      0.01      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00

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


          **************
          *            *
101 KK    *      DB10  *      STORAGE
          *            *
          **************

102 KO         OUTPUT CONTROL VARIABLES
                 IPRNT          5  PRINT CONTROL
                 IPLOT          0  PLOT CONTROL
                 QSCAL          0.  HYDROGRAPH PLOT SCALE


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


          **************
          *            *
128 KK    *      DB15  *      STORAGE
          *            *
          **************

129 KO         OUTPUT CONTROL VARIABLES
                 IPRNT          5  PRINT CONTROL
                 IPLOT          0  PLOT CONTROL
                 QSCAL          0.  HYDROGRAPH PLOT SCALE


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


          **************
          *            *
151 KK    *      DB58  *      STORAGE
          *            *
          **************

152 KO         OUTPUT CONTROL VARIABLES
                 IPRNT          5  PRINT CONTROL
                 IPLOT          0  PLOT CONTROL
                 QSCAL          0.  HYDROGRAPH PLOT SCALE


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


          **************
          *            *
164 KK    *      DB20  *      STORAGE
          *            *
          **************

165 KO         OUTPUT CONTROL VARIABLES
                 IPRNT          5  PRINT CONTROL
```

```
                    QSCAL          0.  HYDROGRAPH PLOT SCALE


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


          **************
          *            *
190 KK    *      DB24  *      STORAGE
          *            *
          **************

191 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE


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


          **************
          *            *
210 KK    *      DB30  *      STORAGE
          *            *
          **************

211 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE


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


          **************
          *            *
228 KK    *      DB40  *      STORAGE
          *            *
          **************

229 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE


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


          **************
          *            *
234 KK    *     CO45B  *      COMBINE
          *            *
          **************

235 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           3  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE

236 HC          HYDROGRAPH COMBINATION
                     ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                  ***

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

                       HYDROGRAPH AT STATION    CO45B
                      TRANSPOSITION AREA      0.0 SQ MI

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                    6-HR        24-HR       72-HR     166.58-HR
```

```
                    (CFS)
+      28.    4.25                4.          1.          0.          0.
                  (INCHES)      0.912       0.961       0.961       0.961
                   (AC-FT)        2.          2.          2.          2.

                  CUMULATIVE AREA =    0.04 SQ MI


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

                    HYDROGRAPH AT STATION    CO45B
                  TRANSPOSITION AREA      0.5 SQ MI

  PEAK FLOW     TIME                      MAXIMUM AVERAGE FLOW
                                6-HR        24-HR       72-HR    166.58-HR
+   (CFS)       (HR)
                    (CFS)
+      28.    4.25                4.          1.          0.          0.
                  (INCHES)      0.903       0.952       0.952       0.952
                   (AC-FT)        2.          2.          2.          2.

                  CUMULATIVE AREA =    0.04 SQ MI


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

                    HYDROGRAPH AT STATION    CO45B
                  TRANSPOSITION AREA      2.8 SQ MI

  PEAK FLOW     TIME                      MAXIMUM AVERAGE FLOW
                                6-HR        24-HR       72-HR    166.58-HR
+   (CFS)       (HR)
                    (CFS)
+       9.    4.58                3.          1.          0.          0.
                  (INCHES)      0.703       0.746       0.746       0.746
                   (AC-FT)        2.          2.          2.          2.

                  CUMULATIVE AREA =    0.04 SQ MI

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


                  INTERPOLATED HYDROGRAPH AT    CO45B

  PEAK FLOW     TIME                      MAXIMUM AVERAGE FLOW
                                6-HR        24-HR       72-HR    166.58-HR
+   (CFS)       (HR)
                    (CFS)
+      28.    4.25                4.          1.          0.          0.
                  (INCHES)      0.906       0.954       0.954       0.954
                   (AC-FT)        2.          2.          2.          2.

                  CUMULATIVE AREA =    0.04 SQ MI


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


          **************
          *            *
  345 KK  *     DB60   *     STORAGE
          *            *
          **************

  346 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL          0. HYDROGRAPH PLOT SCALE


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


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

```
381 KK      *      DB61  *      STORAGE
            *            *
            **************

382 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                        RUNOFF SUMMARY
                                  FLOW IN CUBIC FEET PER SECOND
                                TIME IN HOURS,  AREA IN SQUARE MILES

                                          PEAK   TIME OF    AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN    MAXIMUM   TIME OF
          OPERATION        STATION        FLOW    PEAK      6-HOUR     24-HOUR     72-HOUR      AREA     STAGE   MAX STAGE
+
          HYDROGRAPH AT
+                            OFF05          1.    4.00          0.          0.          0.      0.00
          ROUTED TO
+                            RO5A           1.    4.08          0.          0.          0.      0.00
          HYDROGRAPH AT
+                            OFF10          5.    4.08          0.          0.          0.      0.00
          ROUTED TO
+                            RO5B           5.    4.17          0.          0.          0.      0.00
          2 COMBINED AT
+                            CO5A           6.    4.17          0.          0.          0.      0.01
          ROUTED TO
+                            RO5C           6.    4.17          0.          0.          0.      0.01
          HYDROGRAPH AT
+                            ON05           7.    4.17          1.          0.          0.      0.01
          2 COMBINED AT
+                            CO5B          13.    4.17          1.          0.          0.      0.01
          HYDROGRAPH AT
+                            OFF15         10.    4.25          1.          0.          0.      0.01
          ROUTED TO
+                            RO10A         10.    4.25          1.          0.          0.      0.01
          HYDROGRAPH AT
+                            OFF20          5.    4.17          0.          0.          0.      0.00
          ROUTED TO
+                            RO10B          5.    4.17          0.          0.          0.      0.00
          2 COMBINED AT
+                            CO10A         14.    4.25          1.          0.          0.      0.02
          ROUTED TO
+                            RO10C         13.    4.33          1.          0.          0.      0.02
          HYDROGRAPH AT
+                            ON10          14.    4.17          1.          0.          0.      0.01
          HYDROGRAPH AT
+                            ON11          11.    4.08          1.          0.          0.      0.01
          ROUTED TO
+                            DB10           1.    4.58          0.          0.          0.      0.01
          3 COMBINED AT
+                            CO10B         25.    4.25          3.          1.          0.      0.04
          ROUTED TO
+                            RO11          23.    4.33          3.          1.          0.      0.04
          HYDROGRAPH AT
+                            ON12           6.    4.17          1.          0.          0.      0.01
```

	HYDROGRAPH AT						
+		ON15	18.	4.08	1.	0.	0.	0.01
	ROUTED TO						
+		DB15	1.	4.67	1.	0.	0.	0.01
	ROUTED TO						
+		RO22B	1.	4.67	1.	0.	0.	0.01
	HYDROGRAPH AT						
+		ON20	14.	4.17	2.	0.	0.	0.02
	HYDROGRAPH AT						
+		ON58	3.	4.08	0.	0.	0.	0.00
	ROUTED TO						
+		DB58	1.	4.25	0.	0.	0.	0.00
	ROUTED TO						
+		ON20	1.	4.75	0.	0.	0.	0.00
	2 COMBINED AT						
+		CO20	14.	4.17	2.	0.	0.	0.02
	ROUTED TO						
+		DB20	12.	4.33	2.	0.	0.	0.02
	ROUTED TO						
+		RO22	12.	4.42	2.	0.	0.	0.02
	HYDROGRAPH AT						
+		ON22	11.	4.17	1.	0.	0.	0.01
	HYDROGRAPH AT						
+		ON24	9.	4.08	1.	0.	0.	0.01
	ROUTED TO						
+		DB24	2.	4.42	0.	0.	0.	0.01
	4 COMBINED AT						
+		CO22	22.	4.33	4.	1.	0.	0.05
	HYDROGRAPH AT						
+		ON35	2.	4.00	0.	0.	0.	0.00
	HYDROGRAPH AT						
+		ON30	26.	4.17	2.	1.	0.	0.03
	ROUTED TO						
+		DB30	23.	4.25	2.	1.	0.	0.03
	HYDROGRAPH AT						
+		ON31	3.	4.00	0.	0.	0.	0.00
	HYDROGRAPH AT						
+		ON40	26.	4.08	2.	0.	0.	0.02
	ROUTED TO						
+		DB40	4.	4.50	2.	0.	0.	0.02
	3 COMBINED AT						
+		CO45B	28.	4.25	4.	1.	0.	0.04
	HYDROGRAPH AT						
+		ON50	2.	4.00	0.	0.	0.	0.00
	5 COMBINED AT						
+		COEX1	77.	4.25	13.	3.	1.	0.15
	HYDROGRAPH AT						
+		OFF30	82.	4.42	12.	3.	1.	0.15
	HYDROGRAPH AT						
+		OFF35	25.	4.25	2.	1.	0.	0.03
	HYDROGRAPH AT						
+		OFF40	1.	4.08	0.	0.	0.	0.00

	3 COMBINED AT						
+		CF45A	100.	4.33	14.	4.	1.	0.18
	ROUTED TO						
+		RF45	99.	4.42	14.	4.	1.	0.18
	HYDROGRAPH AT						
+		OFF45	20.	4.25	2.	0.	0.	0.03
	2 COMBINED AT						
+		CF45B	112.	4.33	16.	4.	1.	0.21
	ROUTED TO						
+		RO60	113.	4.42	16.	4.	1.	0.21
	HYDROGRAPH AT						
+		OFF50	30.	4.33	5.	1.	0.	0.06
	ROUTED TO						
+		RF60A	29.	4.42	5.	1.	0.	0.06
	HYDROGRAPH AT						
+		OFF55	2.	4.08	0.	0.	0.	0.00
	ROUTED TO						
+		RF60B	2.	4.25	0.	0.	0.	0.00
	2 COMBINED AT						
+		CF60A	30.	4.42	5.	1.	0.	0.07
	ROUTED TO						
+		RF60C	30.	4.50	5.	1.	0.	0.07
	HYDROGRAPH AT						
+		OFF60	11.	4.25	1.	0.	0.	0.02
	2 COMBINED AT						
+		CF60B	37.	4.50	7.	2.	1.	0.08
	ROUTED TO						
+		RO65	37.	4.50	7.	2.	1.	0.08
	HYDROGRAPH AT						
+		ON65	6.	4.17	1.	0.	0.	0.01
	HYDROGRAPH AT						
+		ON60	11.	4.08	1.	0.	0.	0.01
	HYDROGRAPH AT						
+		ON59	1.	4.08	0.	0.	0.	0.00
	2 COMBINED AT						
+		CO60	12.	4.08	1.	0.	0.	0.01
	ROUTED TO						
+		DB60	3.	4.42	1.	0.	0.	0.01
	4 COMBINED AT						
+		CO65	155.	4.42	24.	6.	2.	0.31
	ROUTED TO						
+		RO75A	155.	4.42	24.	6.	2.	0.31
	HYDROGRAPH AT						
+		OFF65	4.	4.17	0.	0.	0.	0.00
	ROUTED TO						
+		RO70	3.	4.25	0.	0.	0.	0.00
	HYDROGRAPH AT						
+		ON70	10.	4.25	1.	0.	0.	0.01
	HYDROGRAPH AT						
+		ON61	5.	4.08	1.	0.	0.	0.00
	ROUTED TO						
+		DB61	1.	4.08	0.	0.	0.	0.00

+	CO75A	165.	4.42	26.	6.	2.	0.33
	ROUTED TO						
+	RO75B	161.	4.50	26.	6.	2.	0.33
	HYDROGRAPH AT						
+	ON75	15.	4.25	2.	0.	0.	0.02
	2 COMBINED AT						
+	CO75B	171.	4.50	28.	7.	2.	0.35

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

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE (HEC-1)    *
*             JUN  1998                 *
*          VERSION 4.1                  *
*                                       *
*  RUN DATE  17FEB17  TIME  17:17:15    *
*                                       *
*****************************************
```


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


```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX
```

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

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

1 HEC-1 INPUT PAGE 1

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

   1          ID        Flood Control District of Maricopa County
   2          ID        STORYROCK PH1A PROP - STORYROCK PHASE 1A PROP CONDITION
   3          ID        100 YEAR
   4          ID        6 Hour  Storm
   5          ID        Unit Hydrograph: Clark
   6          ID        Storm: Multiple
   7          ID        02/17/2017
              *DIAGRAM
   8          IT      5  1JAN99      0    2000
   9          IO      5
  10          IN     15
              *
  11          JD  3.174  0.0001
  12          PC  0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
  13          PC  0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
  14          PC  0.962   0.972   0.983   0.991   1.000
  15          JD  3.155  0.5000
  16          PC  0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
  17          PC  0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
  18          PC  0.962   0.972   0.983   0.991   1.000
  19          JD  3.095     2.8
  20          PC  0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
  21          PC  0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
  22          PC  0.950   0.963   0.975   0.988   1.000
              *

  23          KK  OFF05   BASIN
  24          BA  0.001
  25          LG   0.35    0.40    6.00    0.18       0
  26          UC  0.089   0.099
  27          UA      0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  28          UA    100
              *

  29          KK   RO5A   ROUTE
  30          RS      1    FLOW
  31          RC  0.050   0.035   0.050     380  0.0340    0.00
  32          RX   0.00   12.00   16.00   20.00   21.00   24.00   32.00   42.00
  33          RY   3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
              *
```

```
 34          KK   OFF10   BASIN
 35          BA   0.005
 36          LG    0.35    0.40    6.00    0.18       0
 37          UC   0.158   0.180
 38          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 39          UA     100
             *

 40          KK    RO5B   ROUTE
 41          RS       1    FLOW
 42          RC   0.050   0.035   0.050     490  0.0265    0.00
 43          RX    0.00    7.00   14.00   21.00   22.00   31.00   37.00   48.00
 44          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *
```



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

 45          KK    CO5A COMBINE
 46          HC       2
             *

 47          KK    RO5C   ROUTE
 48          RS       1    FLOW
 49          RC   0.050   0.035   0.050     630  0.0240    0.00
 50          RX    0.00    4.00    6.00    9.00   10.00   14.00   21.00   31.00
 51          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

 52          KK    ON05   BASIN
 53          BA   0.008
 54          LG    0.33    0.33    6.00    0.17       9
 55          UC   0.191   0.305
 56          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 57          UA     100
             *

 58          KK    CO5B COMBINE
 59          HC       2
             *

 60          KK   OFF15   BASIN
 61          BA   0.014
 62          LG    0.35    0.40    6.00    0.18       0
 63          UC   0.241   0.323
 64          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 65          UA     100
             *

 66          KK   RO10A   ROUTE
 67          RS       1    FLOW
 68          RC   0.050   0.035   0.050     522  0.0250    0.00
 69          RX    0.00   12.00   29.00   31.00   31.50   42.00   59.00   62.00
 70          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

 71          KK   OFF20   BASIN
 72          BA   0.005
 73          LG    0.35    0.40    6.00    0.18       0
 74          UC   0.161   0.195
 75          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 76          UA     100
             *

 77          KK   RO10B   ROUTE
 78          RS       1    FLOW
 79          RC   0.050   0.035   0.050     675  0.0270    0.00
 80          RX    0.00    8.00   13.00   17.00   17.50   22.00   26.00   29.00
 81          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *
```



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

 82          KK   CO10A COMBINE
```

```
 84          KK   RO10C   ROUTE
 85          RS      1    FLOW
 86          RC  0.050   0.035   0.050     621  0.0220    0.00
 87          RX   0.00    5.00   10.00   28.00   32.00   68.00   78.00   83.00
 88          RY   3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

 89          KK    ON10  BASIN
 90          BA  0.014
 91          LG   0.32    0.30    6.00    0.18       7
 92          UC  0.185   0.220
 93          UA      0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 94          UA    100
             *

 95          KK    ON11  BASIN
 96          BA  0.009
 97          LG   0.31    0.27    6.00    0.19      16
 98          UC  0.160   0.180
 99          UA      0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
100          UA    100
             *

101          KK   DB10 STORAGE
102          KO
103          RS      1    STOR
104          SV           0.13    0.26    0.41    0.57    0.73    0.92    0.92
105          SQ                           1.00    1.00    2.00    2.00    2.00
106          SE           0.50    1.00    1.50    2.00    2.50    3.00    3.01
             *

107          KK   CO10B COMBINE
108          HC      3
             *

109          KK   RO11    ROUTE
110          RS      1    FLOW
111          RC  0.050   0.035   0.050    1000  0.0220    0.00
112          RX   0.00    5.00   10.00   28.00   32.00   68.00   78.00   83.00
113          RY   3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

114          KK    ON12  BASIN
115          BA  0.008
116          LG   0.33    0.34    6.00    0.17       6
117          UC  0.213   0.333
118          UA      0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
119          UA    100
             *
```



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

120          KK    CO12 COMBINE
121          HC      2
             *

122          KK    ON15  BASIN
123          BA  0.012
124          LG   0.30    0.25    6.00    0.19      19
125          UC  0.130   0.126
126          UA      0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
127          UA    100
             *

128          KK   DB15 STORAGE
129          KO
130          RS      1    STOR
131          SV           0.13    0.26    0.42    0.58    0.77    0.96    0.96
132          SQ                           1.00    1.00    1.00    2.00    2.00   13.00
133          SE           0.50    1.00    1.50    2.00    2.50    2.98    3.00
             *

134          KK   RO22B   ROUTE
135          RS      1    FLOW
```

```
138          RY    4.00    2.00    1.00    0.00    0.00    1.00    2.00    4.00
             *

139          KK    ON20   BASIN
140          BA   0.017
141          LG    0.32    0.34    6.00    0.18       6
142          UC   0.225   0.297
143          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
144          UA     100
             *

145          KK    ON58   BASIN
146          BA   0.002
147          LG    0.10    0.25    6.00    0.26      60
148          UC   0.130   0.276
149          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
150          UA     100
             *

151          KK    DB58 STORAGE
152          KO
153          RS       1    STOR
154          SV            0.06    0.14
155          SQ            1.00    1.00
156          SE            0.50    1.00
             *
```



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

157          KK    ON20.  ROUTE
158          RS       1    FLOW
159          RC   0.050   0.035   0.050    1302  0.0280    0.00
160          RX    0.00    7.00    9.00   11.00   12.00   14.00   16.00   18.00
161          RY    4.00    2.00    1.00    0.00    0.00    1.00    2.00    4.00
             *

162          KK    CO20 COMBINE
163          HC       2
             *

164          KK    DB20 STORAGE
165          KO
166          RS       1    STOR
167          SV            0.05    0.10    0.13    0.15    0.18    0.20    0.23    0.25    0.32
168          SV    0.40
169          SQ            3.00    7.00   10.00   12.00   14.00   15.00   16.00   18.00   20.00
170          SQ   23.00
171          SE            1.00    2.00    2.50    3.00    3.50    4.00    4.50    5.00    5.50
172          SE    6.00
             *

173          KK    RO22   ROUTE
174          RS       1    FLOW
175          RC   0.050   0.035   0.050    1733  0.0240    0.00
176          RX    0.00    7.00    9.00   11.00   12.00   14.00   16.00   18.00
177          RY    4.00    2.00    1.00    0.00    0.00    1.00    2.00    4.00
             *

178          KK    ON22   BASIN
179          BA   0.013
180          LG    0.30    0.31    6.00    0.19      14
181          UC   0.206   0.320
182          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
183          UA     100
             *

184          KK    ON24   BASIN
185          BA   0.006
186          LG    0.30    0.25    6.00    0.21      20
187          UC   0.115   0.128
188          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
189          UA     100
             *

190          KK    DB24 STORAGE
```

```
193          SV          0.09    0.13    0.17    0.22    0.30    0.34    0.34
194          SQ                          1.00    1.00    2.00    2.00   15.00
195          SE          0.50    1.00    1.50    2.00    2.50    2.95    3.00
             *
```



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

196          KK    CO22 COMBINE
197          HC      4
             *

198          KK    ON35   BASIN
199          BA   0.001
200          LG    0.35    0.40    6.00    0.18       0
201          UC   0.074   0.064
202          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
203          UA     100
             *

204          KK    ON30   BASIN
205          BA   0.025
206          LG    0.33    0.33    6.00    0.19      10
207          UC   0.210   0.209
208          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
209          UA     100
             *

210          KK    DB30 STORAGE
211          KO
212          RS       1    STOR
213          SV            0.05    0.11    0.16    0.25    0.33    0.42    0.42
214          SQ            1.00    3.00    4.00    5.00    5.00    6.00   55.00
215          SE            0.50    1.00    1.50    2.00    2.50    2.95    3.00
             *

216          KK    ON31   BASIN
217          BA   0.002
218          LG    0.30    0.25    6.00    0.17      17
219          UC   0.090   0.129
220          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
221          UA     100
             *

222          KK    ON40   BASIN
223          BA   0.017
224          LG    0.30    0.26    6.00    0.21      19
225          UC   0.139   0.117
226          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
227          UA     100
             *

228          KK    DB40 STORAGE
229          KO
230          RS       1    STOR
231          SV            0.15    0.34    0.52    0.74    0.96    1.21    1.21
232          SQ            1.00    2.00    3.00    4.00    5.00    6.00   18.00
233          SE            0.50    1.00    1.50    2.00    2.50    3.00    3.00
             *
```



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

234          KK   CO45B COMBINE
235          KO       3
236          HC       3
             *

237          KK    ON50   BASIN
238          BA   0.001
239          LG    0.30    0.25    6.00    0.17      17
240          UC   0.073   0.109
241          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
242          UA     100
             *
```

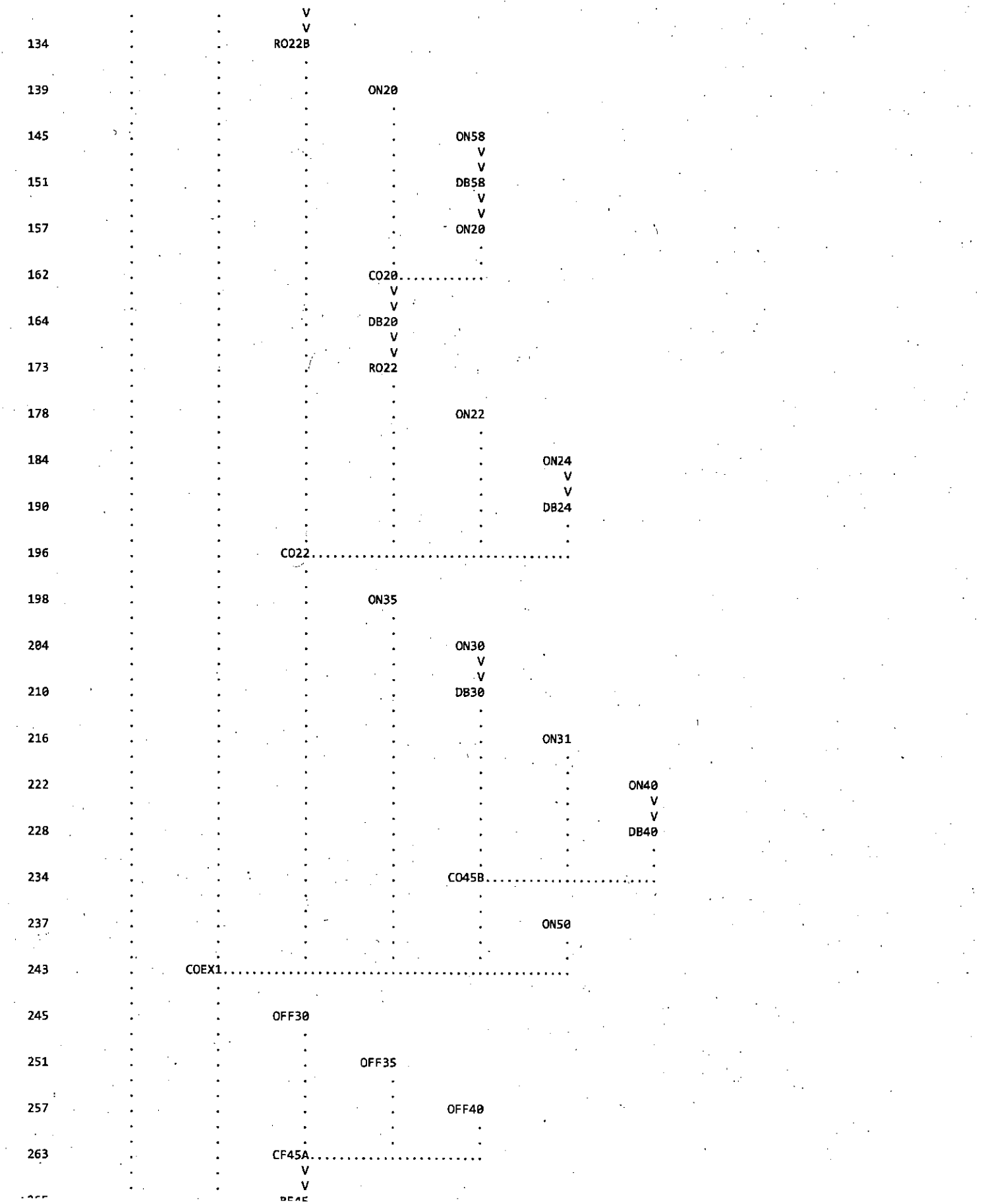
```
244          HC      5
             *

245          KK    OFF30   BASIN
246          BA    0.150
247          LG     0.35     0.40     6.00     0.18        0
248          UC    0.412    0.415
249          UA        0      3.0      5.0      8.0     12.0     20.0     43.0     75.0     90.0     96.0
250          UA      100
             *

251          KK    OFF35   BASIN
252          BA    0.031
253          LG     0.35     0.40     6.00     0.18        0
254          UC    0.239    0.247
255          UA        0      3.0      5.0      8.0     12.0     20.0     43.0     75.0     90.0     96.0
256          UA      100
             *

257          KK    OFF40   BASIN
258          BA    0.001
259          LG     0.35     0.40     6.00     0.18        0
260          UC    0.119    0.213
261          UA        0      3.0      5.0      8.0     12.0     20.0     43.0     75.0     90.0     96.0
262          UA      100
             *

263          KK   CF45A COMBINE
264          HC       3
             *

265          KK     RF45   ROUTE
266          RS        1    FLOW
267          RC    0.050    0.035    0.050      980   0.0260     0.00
268          RX     0.00    14.00    21.00    25.00    31.00    35.00    41.00    45.00
269          RY     3.00     2.00     1.00     0.00     0.00     1.00     2.00     3.00
             *
```

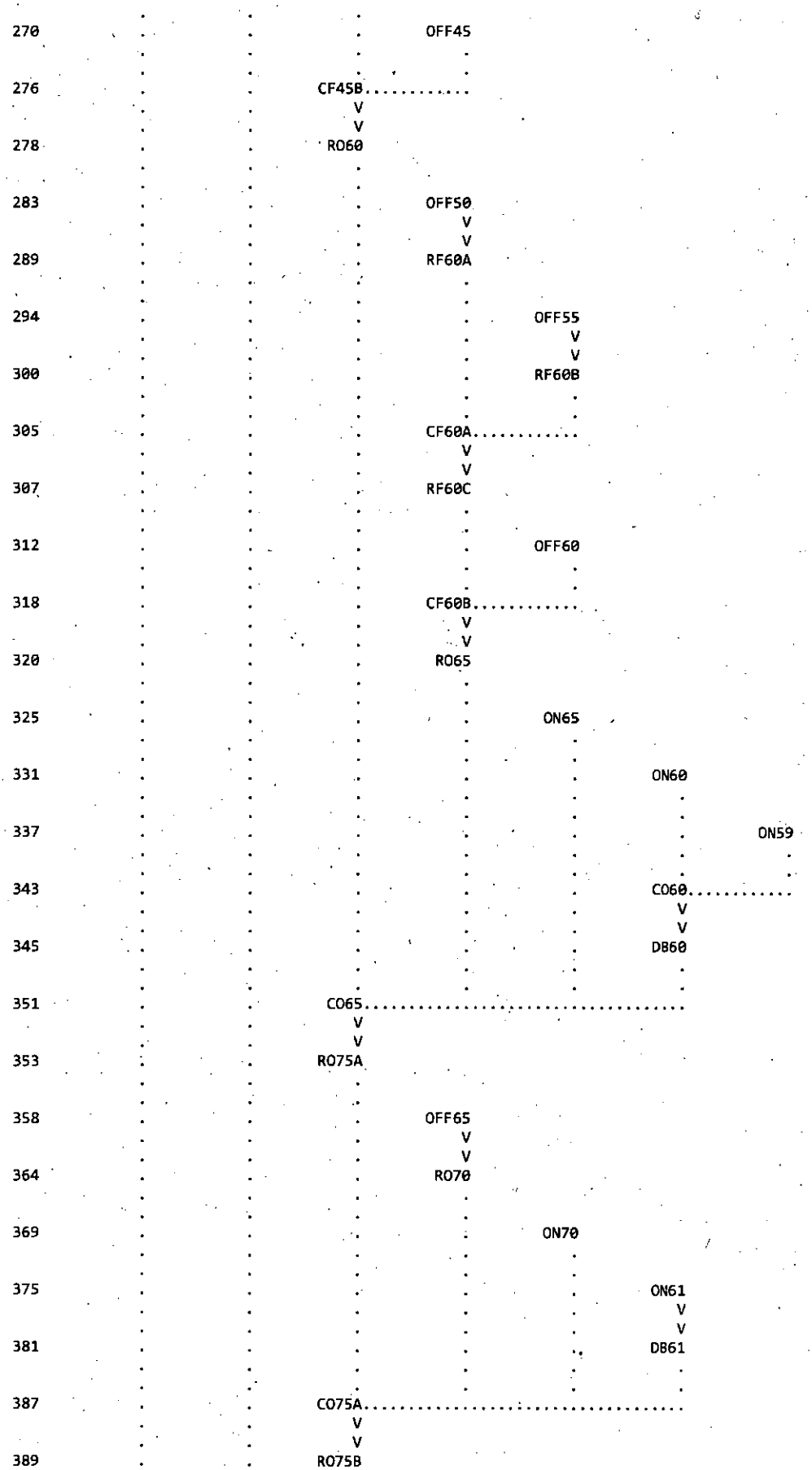


```
LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

270          KK    OFF45   BASIN
271          BA    0.025
272          LG     0.35     0.40     6.00     0.18        0
273          UC    0.246    0.263
274          UA        0      3.0      5.0      8.0     12.0     20.0     43.0     75.0     90.0     96.0
275          UA      100
             *

276          KK   CF45B COMBINE
277          HC       2
             *

278          KK     RO60   ROUTE
279          RS        1    FLOW
280          RC    0.050    0.035    0.050      625   0.0220     0.00
281          RX     0.00     6.00    10.00    14.00    27.00    38.00    57.00    83.00
282          RY     3.00     2.00     1.00     0.00     0.00     1.00     2.00     3.00
             *

283          KK    OFF50   BASIN
284          BA    0.064
285          LG     0.35     0.40     6.00     0.18        1
286          UC    0.376    0.530
287          UA        0      3.0      5.0      8.0     12.0     20.0     43.0     75.0     90.0     96.0
288          UA      100
             *

289          KK    RF60A   ROUTE
290          RS        1    FLOW
291          RC    0.050    0.035    0.050     1076   0.0300     0.00
292          RX     0.00     8.00    18.00    55.00    71.00    78.00    83.00    90.00
293          RY     3.00     2.00     1.00     0.00     0.00     1.00     2.00     3.00
             *

294          KK    OFF55   BASIN
```

```
297          UC   0.130   0.193
298          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
299          UA     100
             *

300          KK   RF60B   ROUTE
301          RS       1    FLOW
302          RC   0.050   0.035   0.050    1200  0.0320    0.00
303          RX    0.00    9.00   14.00   16.00   16.50   22.00   26.00   33.00
304          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *
1                                        HEC-1 INPUT                                    PAGE  9

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

305          KK   CF60A COMBINE
306          HC       2
             *

307          KK   RF60C   ROUTE
308          RS       1    FLOW
309          RC   0.050   0.035   0.050     650  0.0280    0.00
310          RX    0.00   25.00   38.00   48.00   49.00   57.00   67.00   80.00
311          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

312          KK   OFF60   BASIN
313          BA   0.018
314          LG    0.35    0.40    6.00    0.18       0
315          UC   0.266   0.379
316          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
317          UA     100
             *

318          KK   CF60B COMBINE
319          HC       2
             *

320          KK    RO65   ROUTE
321          RS       1    FLOW
322          RC   0.050   0.035   0.050     756  0.0250    0.00
323          RX    0.00    5.00    7.00    8.50    9.00   19.00   24.00   29.00
324          RY    3.00    2.00    1.00    0.00    0.00    1.00    2.00    3.00
             *

325          KK    ON65   BASIN
326          BA   0.007
327          LG    0.35    0.40    6.00    0.18       0
328          UC   0.182   0.218
329          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
330          UA     100
             *

331          KK    ON60   BASIN
332          BA   0.007
333          LG    0.29    0.31    6.00    0.21      20
334          UC   0.125   0.114
335          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
336          UA     100
             *

337          KK    ON59   BASIN
338          BA   0.001
339          LG    0.10    0.25    6.00    0.26      60
340          UC   0.110   0.281
341          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
342          UA     100
             *
1                                        HEC-1 INPUT                                    PAGE 10

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

343          KK    CO60 COMBINE
344          HC       2
             *
```

```
          400          KK   CO75B COMBINE
          401          HC       2
                       *
          402          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    23       OFF05
               V
               V
    29        RO5A
                .
                .
    34          .        OFF10
                .          V
                .          V
    40          .        RO5B
                .          .
                .          .
    45        CO5A.............
               V
               V
    47        RO5C
                .
                .
    52          .        ON05
                .          .
                .          .
    58        CO5B.............
                .
                .
    60          .        OFF15
                .          V
                .          V
    66          .        RO10A
                .          .
                .          .
    71          .          .        OFF20
                .          .          V
                .          .          V
    77          .          .        RO10B
                .          .          .
                .          .          .
    82          .        CO10A.............
                .          V
                .          V
    84          .        RO10C
                .          .
                .          .
    89          .          .        ON10
                .          .          .
                .          .          .
    95          .          .          .        ON11
                .          .          .          V
                .          .          .          V
   101          .          .          .        DB10
                .          .          .          .
                .          .          .          .
   107          .        CO10B.........................
                .          V
                .          V
   109          .        RO11
                .          .
                .          .
   114          .          .        ON12
                .          .          .
                .          .          .
   120          .        CO12.............
                .          .
                .          .
   122          .          .        ON15
                .          .          V
                .          .          V
```


V
V
134 RO22B
139 ON20
145 ON58
V
V
151 DB58
V
V
157 ON20
162 CO20
V
V
164 DB20
V
V
173 RO22
178 ON22
184 ON24
V
V
190 DB24
196 CO22
198 ON35
204 ON30
V
V
210 DB30
216 ON31
222 ON40
V
V
228 DB40
234 CO45B
237 ON50
243 COEX1
245 OFF30
251 OFF35
257 OFF40
263 CF45A
V
V


270 OFF45
276 CF45B
278 RO60
283 OFF50
289 RF60A
294 OFF55
300 RF60B
305 CF60A
307 RF60C
312 OFF60
318 CF60B
320 RO65
325 ON65
331 ON60
337 ON59
343 CO60
345 DB60
351 CO65
353 RO75A
358 OFF65
364 RO70
369 ON70
375 ON61
381 DB61
387 CO75A
389 RO75B

```
  394          .          .          .       ON75
               .          .          .        .
               .          .          .        .
  400          .          .       CO75B.....
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998                *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   17FEB17  TIME  17:17:15   *
*                                       *
*****************************************
```

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

Flood Control District of Maricopa County
STORYROCK PH1A PROP - STORYROCK PHASE 1A PROP CONDITION
100 YEAR
6 Hour Storm
Unit Hydrograph: Clark
Storm: Multiple
02/17/2017

```
 9 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      1JAN99  STARTING DATE
                ITIME        0000  STARTING TIME
                  NQ        2000  NUMBER OF HYDROGRAPH ORDINATES
               NDDATE      7JAN99  ENDING DATE
               NDTIME        2235  ENDING TIME
               ICENT           19  CENTURY MARK

          COMPUTATION INTERVAL     0.08 HOURS
              TOTAL TIME BASE   166.58 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

11 JD       INDEX STORM NO. 1
               STRM        3.17  PRECIPITATION DEPTH
               TRDA        0.00  TRANSPOSITION DRAINAGE AREA

12 PI         PRECIPITATION PATTERN
              0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
              0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
              0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
              0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
              0.03      0.03      0.05      0.05      0.05      0.15      0.15      0.15      0.03      0.03
              0.03      0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00
              0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
              0.00      0.00

15 JD       INDEX STORM NO. 2
               STRM        3.15  PRECIPITATION DEPTH
               TRDA        0.50  TRANSPOSITION DRAINAGE AREA

16 PI         PRECIPITATION PATTERN
              0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
              0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
              0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
              0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
```

```
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00

 19 JD          INDEX STORM NO. 3
                     STRM        3.10  PRECIPITATION DEPTH
                     TRDA        2.80  TRANSPOSITION DRAINAGE AREA

 20 PI           PRECIPITATION PATTERN
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                0.03      0.03      0.07      0.07      0.07      0.08      0.08      0.08      0.05      0.05
                0.05      0.02      0.02      0.02      0.01      0.01      0.01      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00

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


           **************
           *            *
101 KK     *     DB10   *      STORAGE
           *            *
           **************

102 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE


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


           **************
           *            *
128 KK     *     DB15   *      STORAGE
           *            *
           **************

129 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE


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


           **************
           *            *
151 KK     *     DB58   *      STORAGE
           *            *
           **************

152 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE


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


           **************
           *            *
164 KK     *     DB20   *      STORAGE
           *            *
           **************

165 KO          OUTPUT CONTROL VARIABLES
```

```
                    QSCAL          0.  HYDROGRAPH PLOT SCALE
        WARNING EXCESS AT PONDING LESS THAN ZERO FOR PERIOD. EXCESS SET TO ZERO


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


          **************
          *            *
190 KK    *      DB24  *      STORAGE
          *            *
          **************

191 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE


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


          **************
          *            *
210 KK    *      DB30  *      STORAGE
          *            *
          **************

211 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE


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


          **************
          *            *
228 KK    *      DB40  *      STORAGE
          *            *
          **************

229 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE


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


          **************
          *            *
234 KK    *     CO45B  *      COMBINE
          *            *
          **************

235 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           3  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE

236 HC          HYDROGRAPH COMBINATION
                     ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                  ***

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

                       HYDROGRAPH AT STATION    CO45B
                      TRANSPOSITION AREA      0.0 SQ MI

                                                MAXIMUM AVERAGE FLOW
```

```
+   (CFS)       (HR)
                  (CFS)
+      65.      4.08                5.          1.          0.          0.
                (INCHES)          1.111       1.112       1.112       1.112
                 (AC-FT)            3.          3.          3.          3.

                 CUMULATIVE AREA =    0.04 SQ MI


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

                   HYDROGRAPH AT STATION    CO45B
                 TRANSPOSITION AREA      0.5 SQ MI

  PEAK FLOW     TIME                      MAXIMUM AVERAGE FLOW
                                  6-HR        24-HR       72-HR     166.58-HR
+   (CFS)       (HR)
                  (CFS)
+      65.      4.08                5.          1.          0.          0.
                (INCHES)          1.073       1.074       1.074       1.074
                 (AC-FT)            3.          3.          3.          3.

                 CUMULATIVE AREA =    0.04 SQ MI


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

                   HYDROGRAPH AT STATION    CO45B
                 TRANSPOSITION AREA      2.8 SQ MI

  PEAK FLOW     TIME                      MAXIMUM AVERAGE FLOW
                                  6-HR        24-HR       72-HR     166.58-HR
+   (CFS)       (HR)
                  (CFS)
+      38.      4.08                6.          2.          1.          0.
                (INCHES)          1.301       1.387       1.387       1.387
                 (AC-FT)            3.          3.          3.          3.

                 CUMULATIVE AREA =    0.04 SQ MI

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


                 INTERPOLATED HYDROGRAPH AT    CO45B

  PEAK FLOW     TIME                      MAXIMUM AVERAGE FLOW
                                  6-HR        24-HR       72-HR     166.58-HR
+   (CFS)       (HR)
                  (CFS)
+      65.      4.08                5.          1.          0.          0.
                (INCHES)          1.084       1.085       1.085       1.085
                 (AC-FT)            3.          3.          3.          3.

                 CUMULATIVE AREA =    0.04 SQ MI


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


          **************
          *            *
345 KK    *     DB60   *     STORAGE
          *            *
          **************

346 KO         OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE


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

```
          *           *
381 KK    *     DB61  *     STORAGE
          *           *
          *************

382 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                        RUNOFF SUMMARY
                                  FLOW IN CUBIC FEET PER SECOND
                                TIME IN HOURS,  AREA IN SQUARE MILES
```

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	OFF05	3.	4.00	0.	0.	0.	0.00		
+	ROUTED TO	RO5A	3.	4.00	0.	0.	0.	0.00		
+	HYDROGRAPH AT	OFF10	11.	4.08	1.	0.	0.	0.00		
+	ROUTED TO	RO5B	11.	4.08	1.	0.	0.	0.00		
+	2 COMBINED AT	CO5A	13.	4.08	1.	0.	0.	0.01		
+	ROUTED TO	RO5C	13.	4.17	1.	0.	0.	0.01		
+	HYDROGRAPH AT	ON05	15.	4.08	2.	0.	0.	0.01		
+	2 COMBINED AT	CO5B	27.	4.08	3.	1.	0.	0.01		
+	HYDROGRAPH AT	OFF15	23.	4.17	2.	1.	0.	0.01		
+	ROUTED TO	RO10A	23.	4.17	2.	1.	0.	0.01		
+	HYDROGRAPH AT	OFF20	11.	4.08	1.	0.	0.	0.00		
+	ROUTED TO	RO10B	10.	4.17	1.	0.	0.	0.00		
+	2 COMBINED AT	CO10A	34.	4.17	3.	1.	0.	0.02		
+	ROUTED TO	RO10C	32.	4.17	3.	1.	0.	0.02		
+	HYDROGRAPH AT	ON10	31.	4.08	3.	1.	0.	0.01		
+	HYDROGRAPH AT	ON11	22.	4.08	2.	0.	0.	0.01		
+	ROUTED TO	DB10	2.	4.42	1.	0.	0.	0.01		
+	3 COMBINED AT	CO10B	61.	4.17	7.	2.	1.	0.04		
+	ROUTED TO	RO11	57.	4.25	7.	2.	1.	0.04		
+	HYDROGRAPH AT	ON12	14.	4.17	1.	0.	0.	0.01		

+	CO12	69.	4.17	8.	2.	1.	0.05
	HYDROGRAPH AT						
+	ON15	32.	4.00	3.	1.	0.	0.01
	ROUTED TO						
+	DB15	13.	4.25	1.	0.	0.	0.01
	ROUTED TO						
+	RO22B	11.	4.33	1.	0.	0.	0.01
	HYDROGRAPH AT						
+	ON20	31.	4.17	3.	1.	0.	0.02
	HYDROGRAPH AT						
+	ON58	4.	4.08	1.	0.	0.	0.00
	ROUTED TO						
+	DB58	1.	4.00	1.	0.	0.	0.00
	ROUTED TO						
+	ON20	1.	5.00	1.	0.	0.	0.00
	2 COMBINED AT						
+	CO20	32.	4.17	4.	1.	0.	0.02
	ROUTED TO						
+	DB20	23.	4.33	4.	1.	0.	0.02
	ROUTED TO						
+	RO22	22.	4.42	4.	1.	0.	0.02
	HYDROGRAPH AT						
+	ON22	23.	4.08	3.	1.	0.	0.01
	HYDROGRAPH AT						
+	ON24	17.	4.00	1.	0.	0.	0.01
	ROUTED TO						
+	DB24	15.	4.08	1.	0.	0.	0.01
	4 COMBINED AT						
+	CO22	53.	4.25	8.	2.	1.	0.05
	HYDROGRAPH AT						
+	ON35	3.	4.00	0.	0.	0.	0.00
	HYDROGRAPH AT						
+	ON30	55.	4.08	5.	1.	0.	0.03
	ROUTED TO						
+	DB30	55.	4.08	4.	1.	0.	0.03
	HYDROGRAPH AT						
+	ON31	6.	4.00	0.	0.	0.	0.00
	HYDROGRAPH AT						
+	ON40	46.	4.08	4.	1.	0.	0.02
	ROUTED TO						
+	DB40	18.	4.25	1.	0.	0.	0.02
	3 COMBINED AT						
+	CO45B	65.	4.08	5.	1.	0.	0.04
	HYDROGRAPH AT						
+	ON50	3.	4.00	0.	0.	0.	0.00
	5 COMBINED AT						
+	COEX1	182.	4.17	21.	5.	2.	0.15
	HYDROGRAPH AT						
+	OFF30	206.	4.25	25.	6.	2.	0.15
	HYDROGRAPH AT						
+	OFF35	59.	4.17	5.	1.	0.	0.03

3 COMBINED AT							
+	CF45A	254.	4.25	30.	8.	3.	0.18
ROUTED TO							
+	RF45	250.	4.25	30.	8.	3.	0.18
HYDROGRAPH AT							
+	OFF45	46.	4.17	4.	1.	0.	0.03
2 COMBINED AT							
+	CF45B	288.	4.25	34.	9.	3.	0.21
ROUTED TO							
+	RO60	285.	4.25	34.	9.	3.	0.21
HYDROGRAPH AT							
+	OFF50	77.	4.25	11.	3.	1.	0.06
ROUTED TO							
+	RF60A	74.	4.33	11.	3.	1.	0.06
HYDROGRAPH AT							
+	OFF55	4.	4.08	0.	0.	0.	0.00
ROUTED TO							
+	RF60B	4.	4.17	0.	0.	0.	0.00
2 COMBINED AT							
+	CF60A	77.	4.33	11.	3.	1.	0.07
ROUTED TO							
+	RF60C	76.	4.33	11.	3.	1.	0.07
HYDROGRAPH AT							
+	OFF60	27.	4.17	3.	1.	0.	0.02
2 COMBINED AT							
+	CF60B	97.	4.33	14.	4.	1.	0.08
ROUTED TO							
+	RO65	97.	4.33	14.	4.	1.	0.08
HYDROGRAPH AT							
+	ON65	15.	4.08	1.	0.	0.	0.01
HYDROGRAPH AT							
+	ON60	19.	4.00	1.	0.	0.	0.01
HYDROGRAPH AT							
+	ON59	2.	4.08	0.	0.	0.	0.00
2 COMBINED AT							
+	CO60	22.	4.00	2.	0.	0.	0.01
ROUTED TO							
+	DB60	13.	4.17	1.	0.	0.	0.01
4 COMBINED AT							
+	CO65	392.	4.25	51.	13.	4.	0.31
ROUTED TO							
+	RO75A	391.	4.33	51.	13.	4.	0.31
HYDROGRAPH AT							
+	OFF65	8.	4.08	1.	0.	0.	0.00
ROUTED TO							
+	RO70	7.	4.17	1.	0.	0.	0.00
HYDROGRAPH AT							
+	ON70	24.	4.17	2.	1.	0.	0.01
HYDROGRAPH AT							
+	ON61	11.	4.08	1.	0.	0.	0.00
ROUTED TO							
	[illegible]	2.	4.17	1.	0.	0.	0.00

	4 COMBINED AT						
+		C075A	418.	4.25	55.	14.	5.	0.33
	ROUTED TO						
+		R075B	413.	4.33	55.	14.	5.	0.33
	HYDROGRAPH AT						
+		ON75	34.	4.17	4.	1.	0.	0.02
	2 COMBINED AT						
+		C075B	440.	4.33	59.	15.	5.	0.35

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

Appendix C – Hydraulics

HEC-RAS Output (Existing and Proposed Conditions)

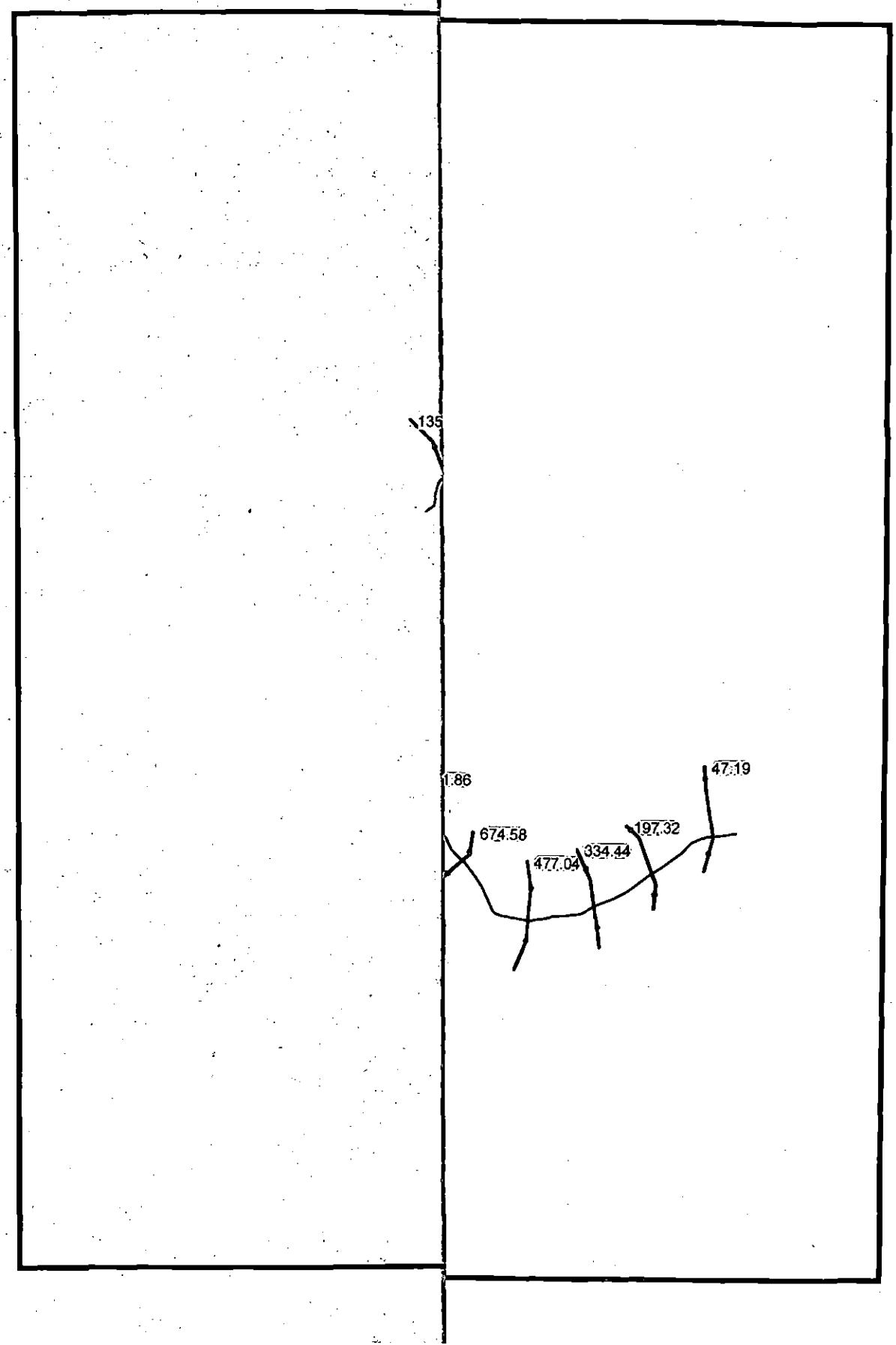
- Schematic Geometry
- Cross Sections
- Profiles
- Summary Table

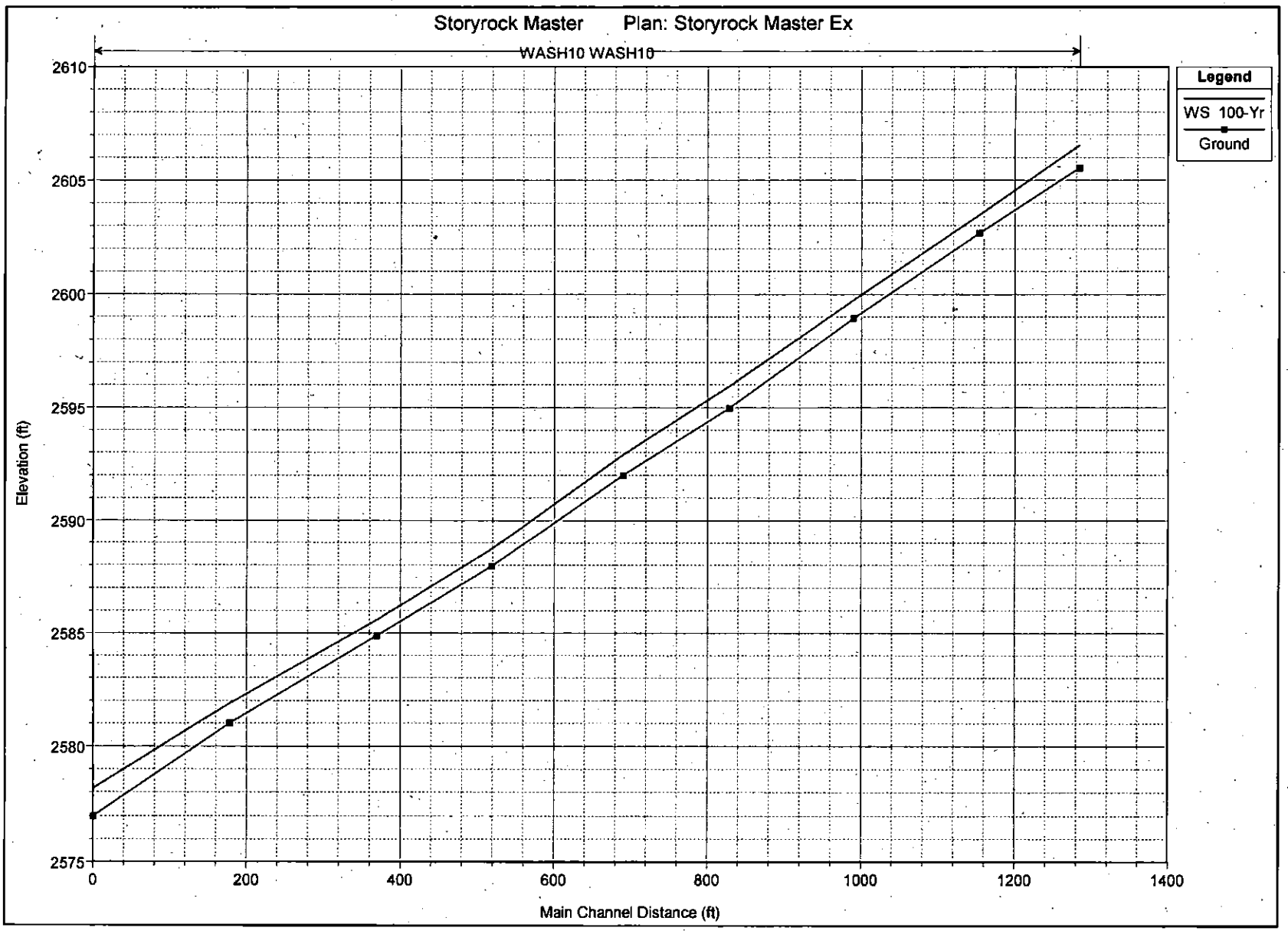
HY-8 Output:

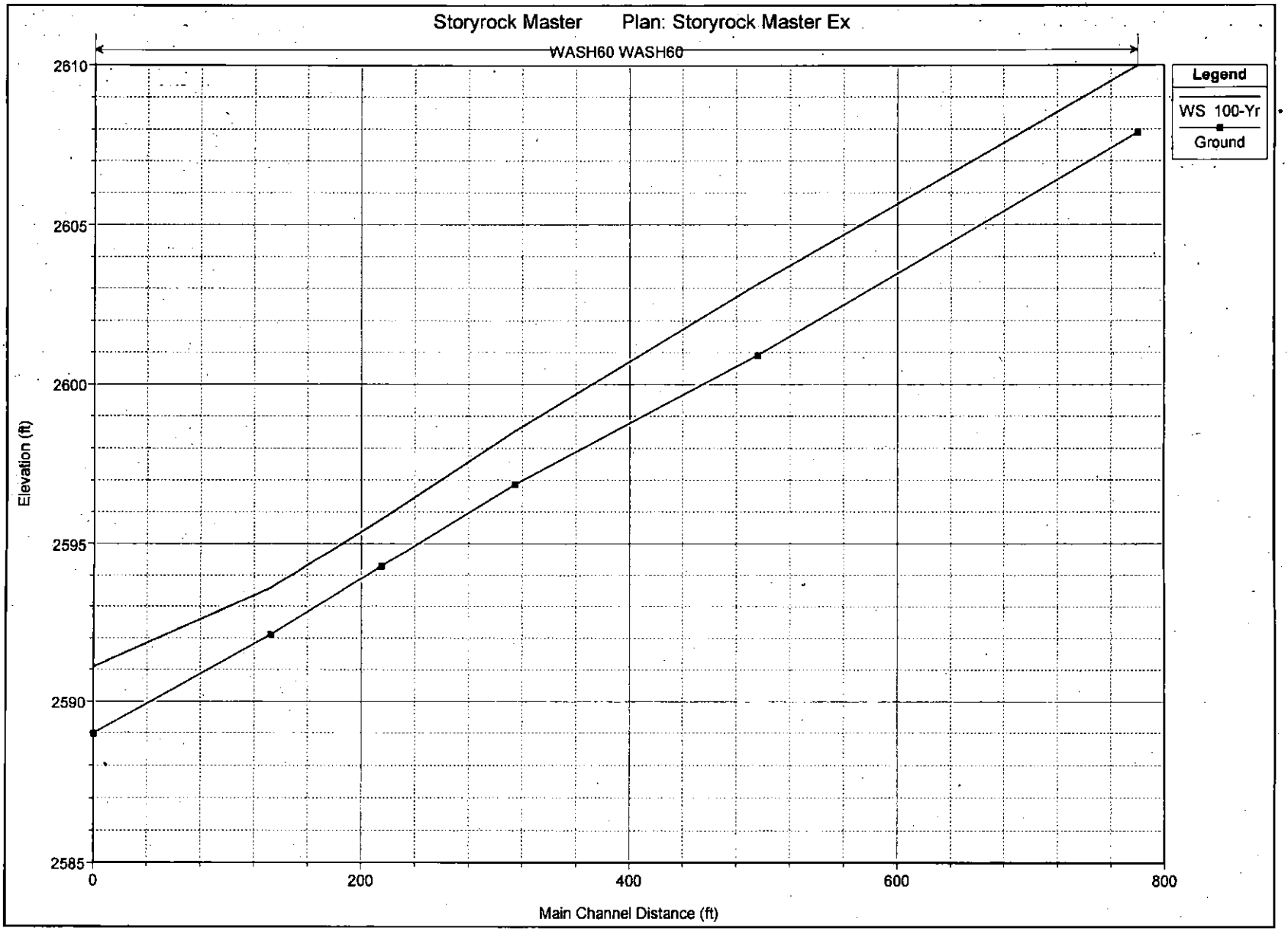
- Preliminary Culvert Calculations

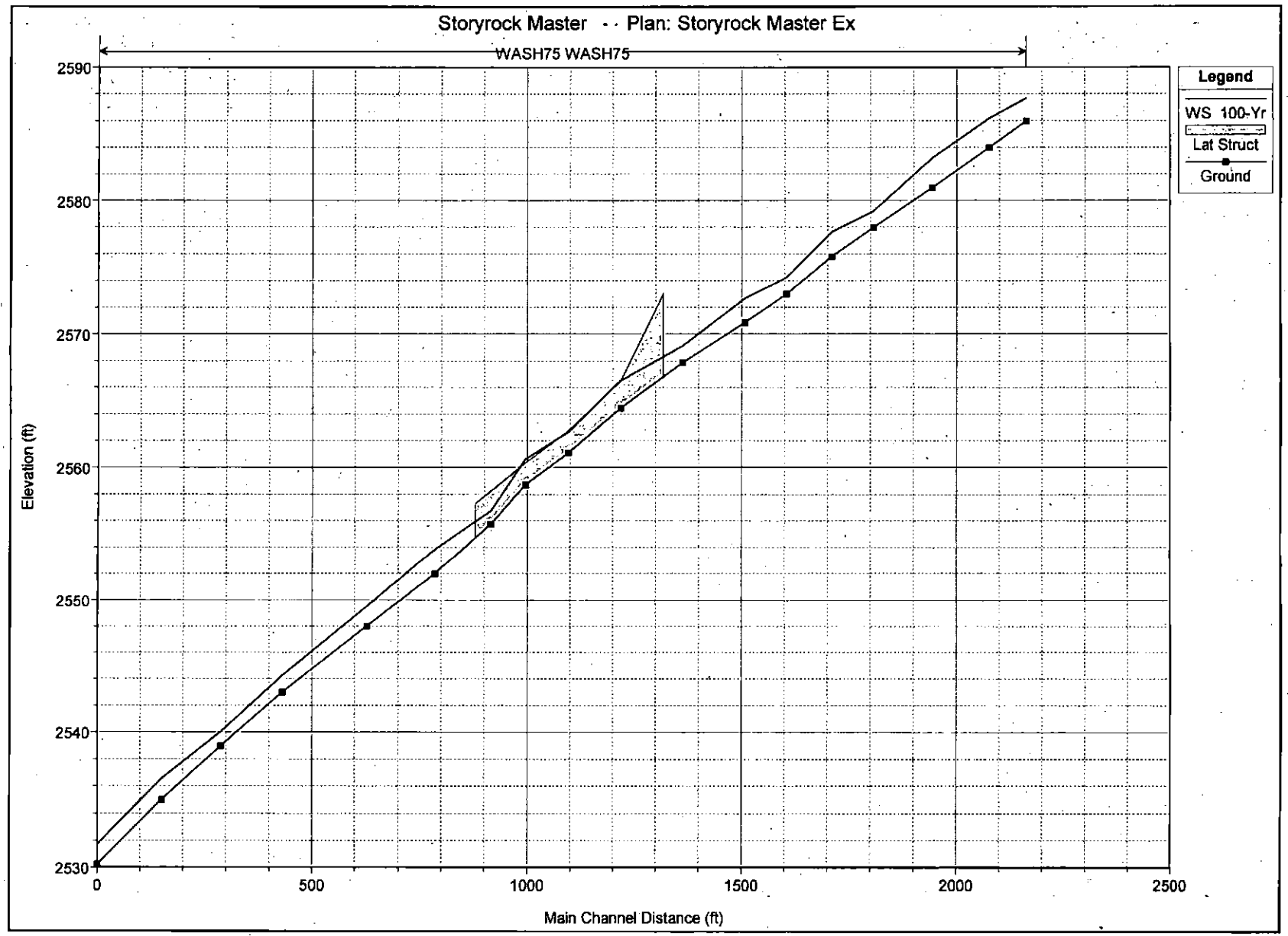
First Flush Spillway/Dissipation Basin Design:

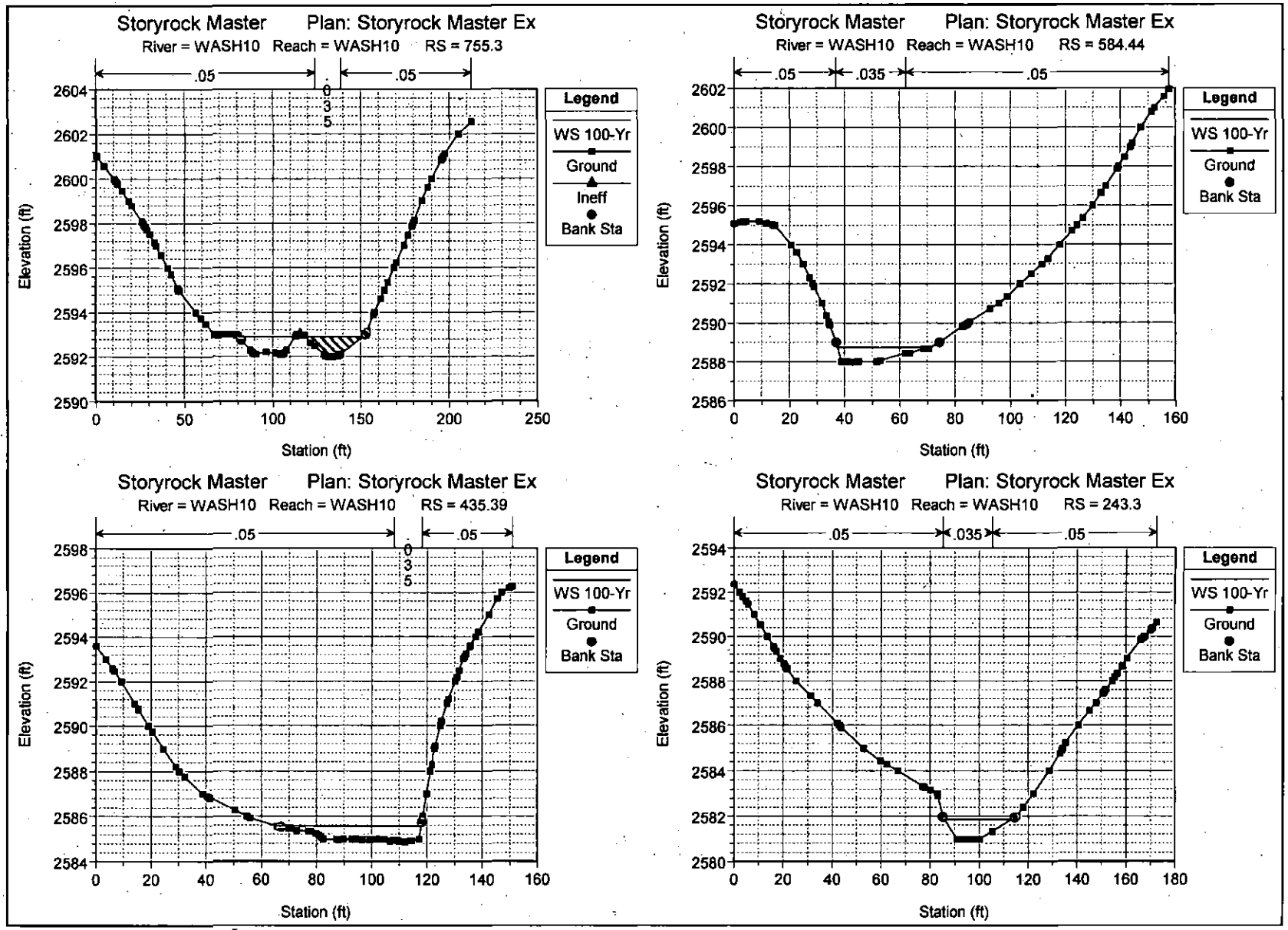
HEC-RAS Existing Condition

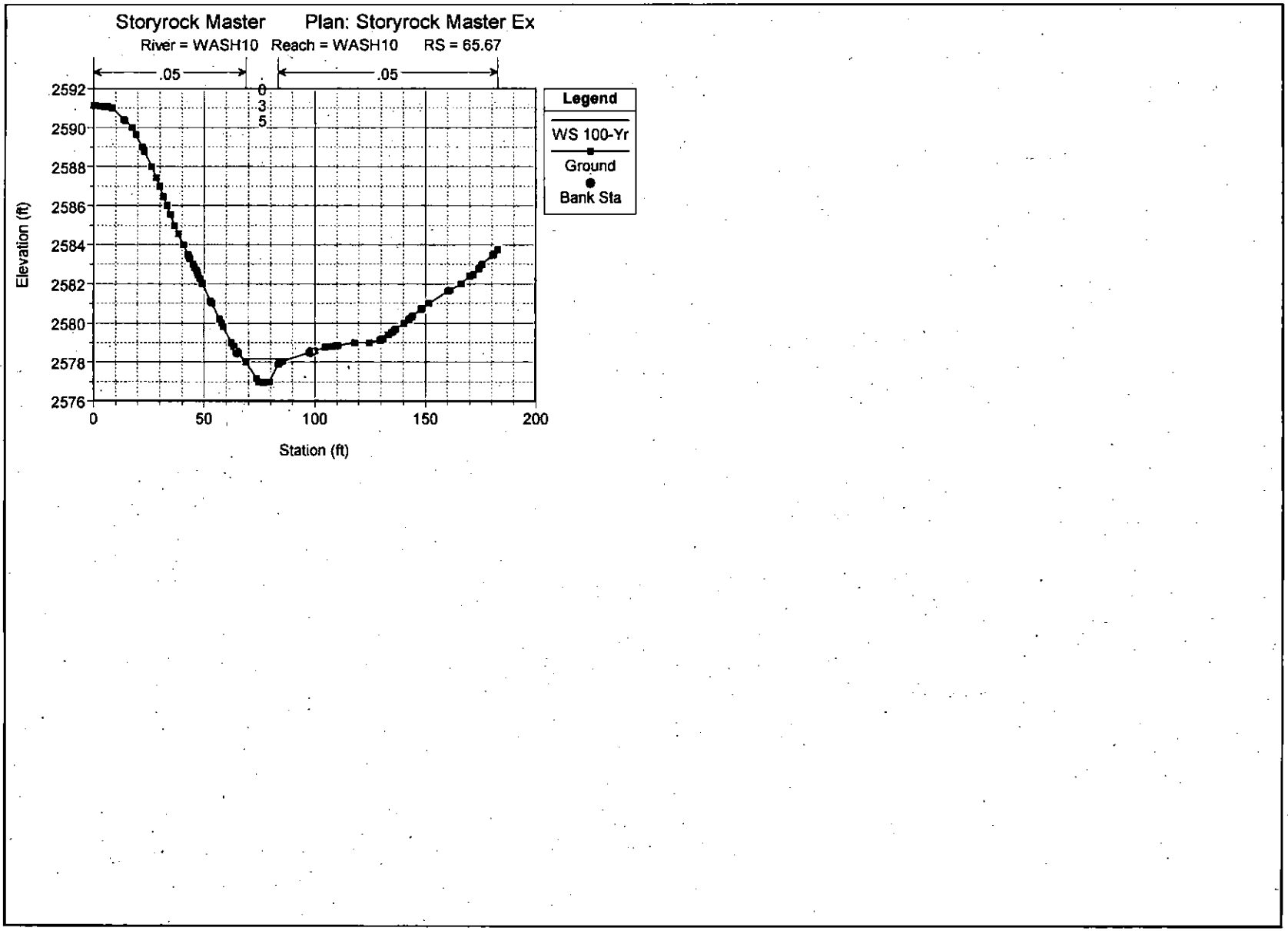

135
1.86
674.58
477.04
334.44
197.32
47.19

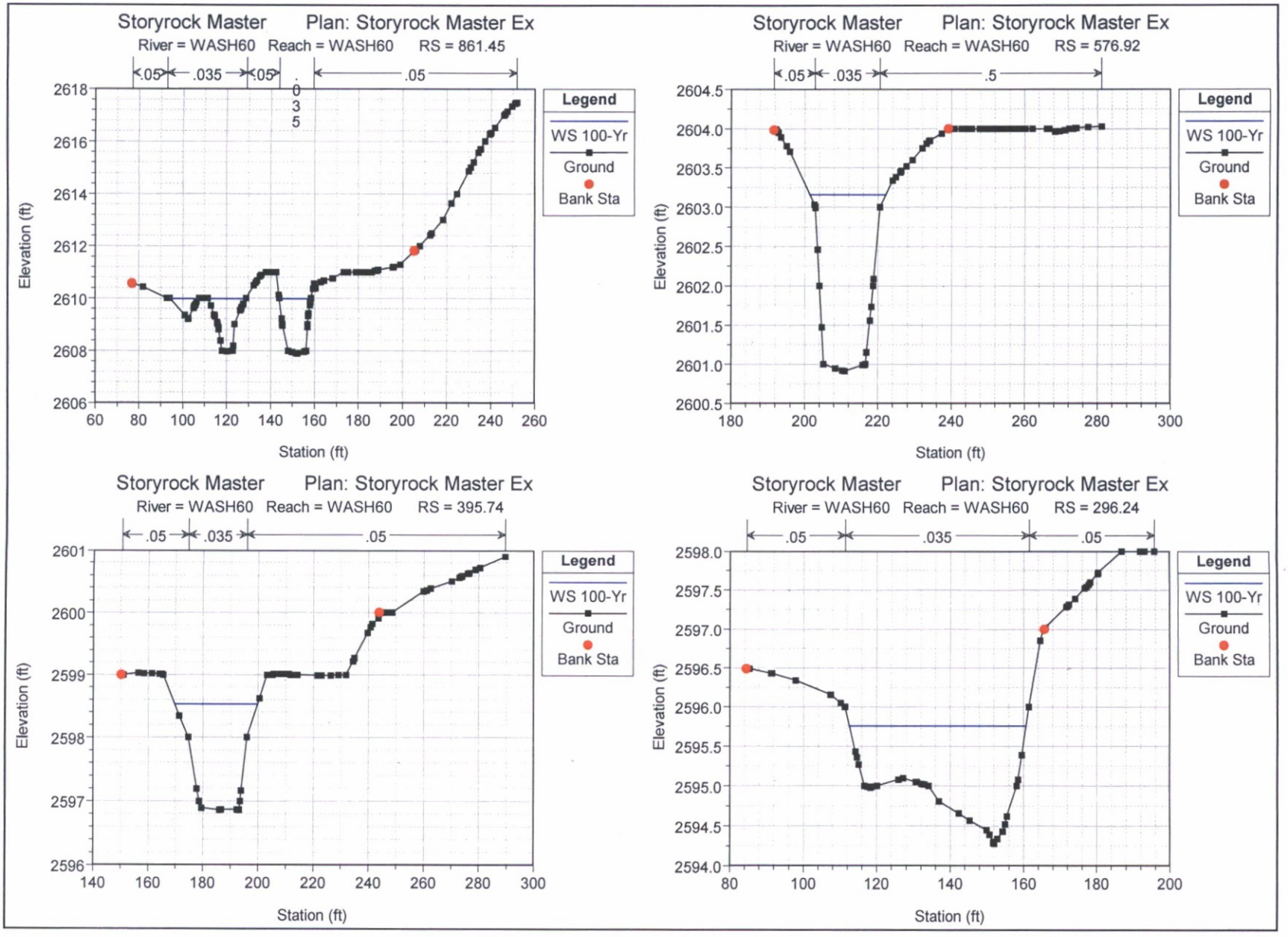

Storyrock Master Plan: Storyrock Master Ex
WASH10 WASH10
Legend
WS 100-Yr
Ground
Elevation (ft)
2610
2605
2600
2595
2590
2585
2580
2575
0
200
400
600
800
1000
1200
1400
Main Channel Distance (ft)

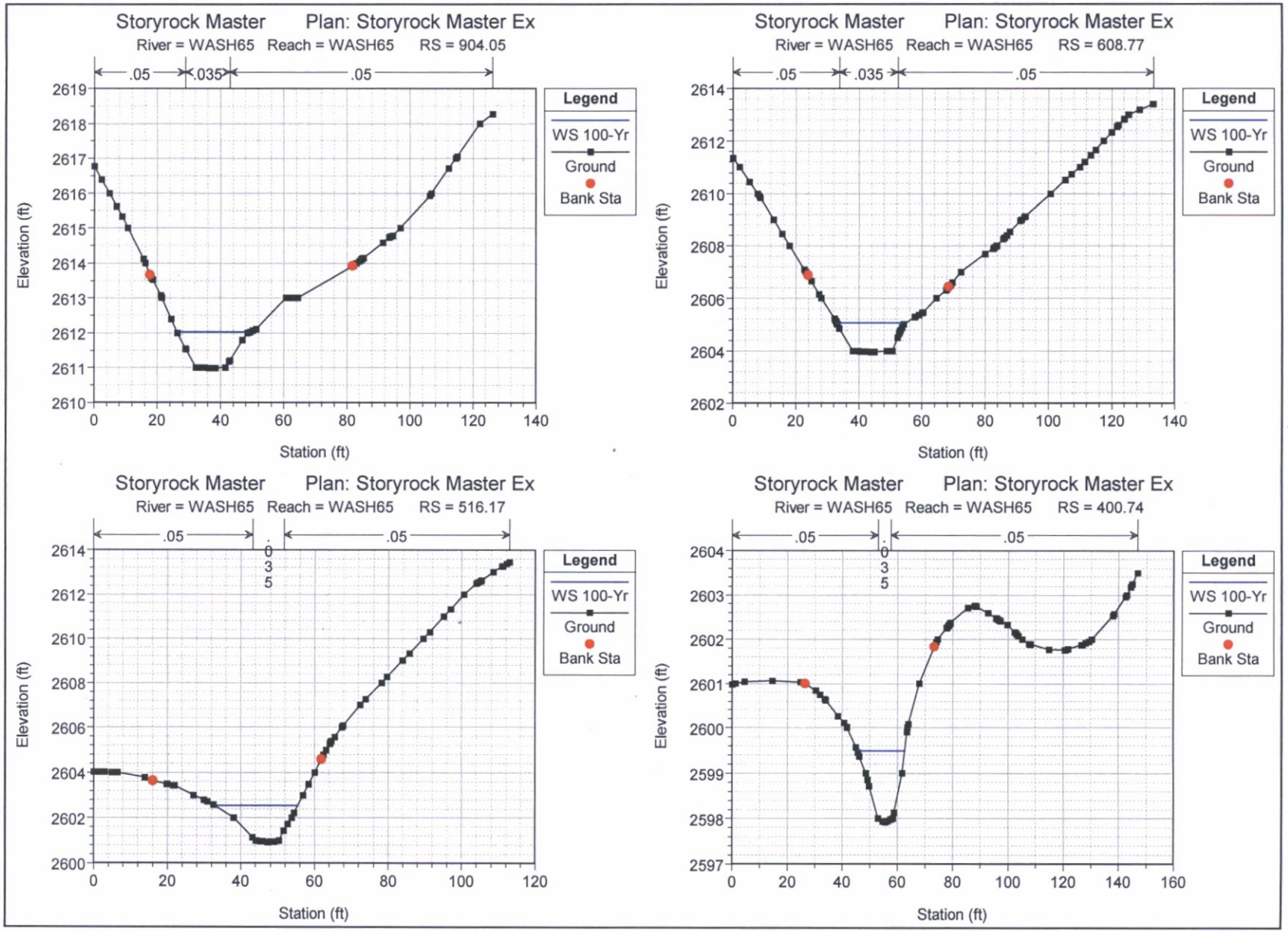

Storyrock Master Plan: Storyrock Master Ex
WASH60 WASH60
Legend
WS 100-Yr
Ground
Elevation (ft)
2610
2605
2600
2595
2590
2585
0
200
400
600
800
Main Channel Distance (ft)


Storyrock Master - - Plan: Storyrock Master Ex
WASH75 WASH75
Legend
WS 100-Yr
Lat Struct
Ground
Elevation (ft)
2590
2580
2570
2560
2550
2540
2530
0
500
1000
1500
2000
2500
Main Channel Distance (ft)


Storyrock Master Plan: Storyrock Master Ex
River = WASH10 Reach = WASH10 RS = 755.3
.05
.05
0.03
.05
Legend
WS 100-Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Storyrock Master Plan: Storyrock Master Ex
River = WASH10 Reach = WASH10 RS = 584.44
.05
.035
.05
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Storyrock Master Plan: Storyrock Master Ex
River = WASH10 Reach = WASH10 RS = 435.39
.05
.05
0.03
.05
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Storyrock Master Plan: Storyrock Master Ex
River = WASH10 Reach = WASH10 RS = 243.3
.05
.035
.05
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


Storyrock Master Plan: Storyrock Master Ex
River = WASH10 Reach = WASH10 RS = 65.67
.05
.05
0
3
5
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
2592
2590
2588
2586
2584
2582
2580
2578
2576
0
50
100
150
200
Station (ft)


Storyrock Master Plan: Storyrock Master Ex
River = WASH60 Reach = WASH60 RS = 861.45
.05 .035 .05 .035 .05
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Storyrock Master Plan: Storyrock Master Ex
River = WASH60 Reach = WASH60 RS = 576.92
.05 .035 .5
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Storyrock Master Plan: Storyrock Master Ex
River = WASH60 Reach = WASH60 RS = 395.74
.05 .035 .05
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Storyrock Master Plan: Storyrock Master Ex
River = WASH60 Reach = WASH60 RS = 296.24
.05 .035 .05
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


Storyrock Master Plan: Storyrock Master Ex
River = WASH65 Reach = WASH65 RS = 904.05
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
Ground
Bank Sta
Storyrock Master Plan: Storyrock Master Ex
River = WASH65 Reach = WASH65 RS = 608.77
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
Ground
Bank Sta
Storyrock Master Plan: Storyrock Master Ex
River = WASH65 Reach = WASH65 RS = 516.17
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
Ground
Bank Sta
Storyrock Master Plan: Storyrock Master Ex
River = WASH65 Reach = WASH65 RS = 400.74
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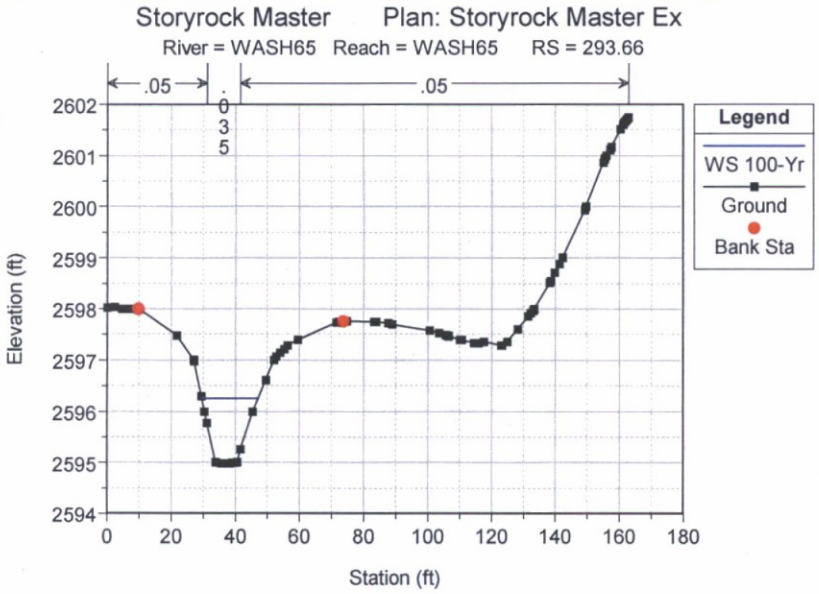
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
Ground
Bank Sta


Storyrock Master Plan: Storyrock Master Ex
River = WASH65 Reach = WASH65 RS = 293.66
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.035
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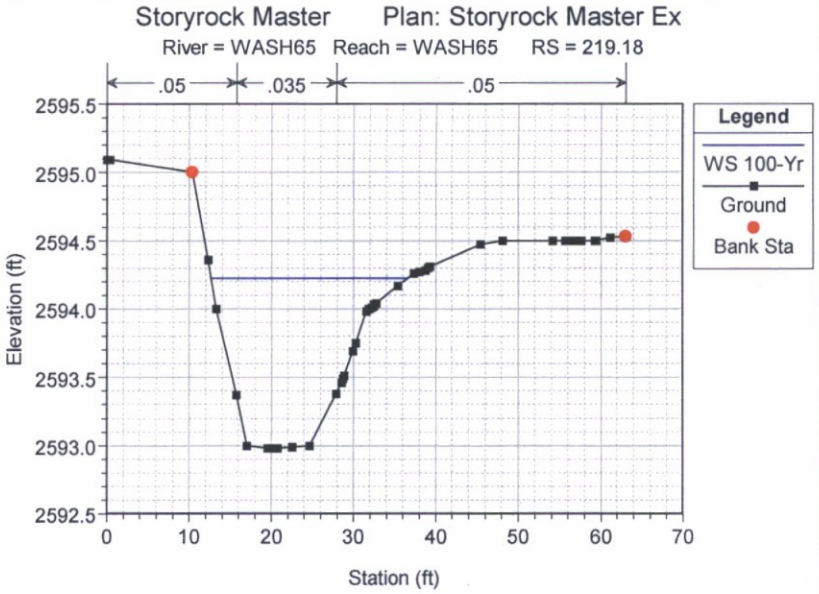
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


Storyrock Master Plan: Storyrock Master Ex
River = WASH65 Reach = WASH65 RS = 219.18
.05
.035
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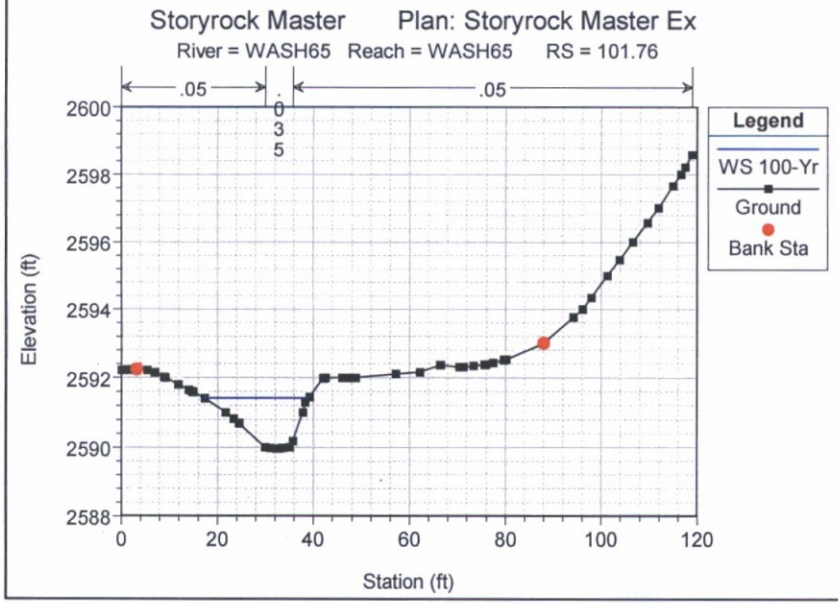
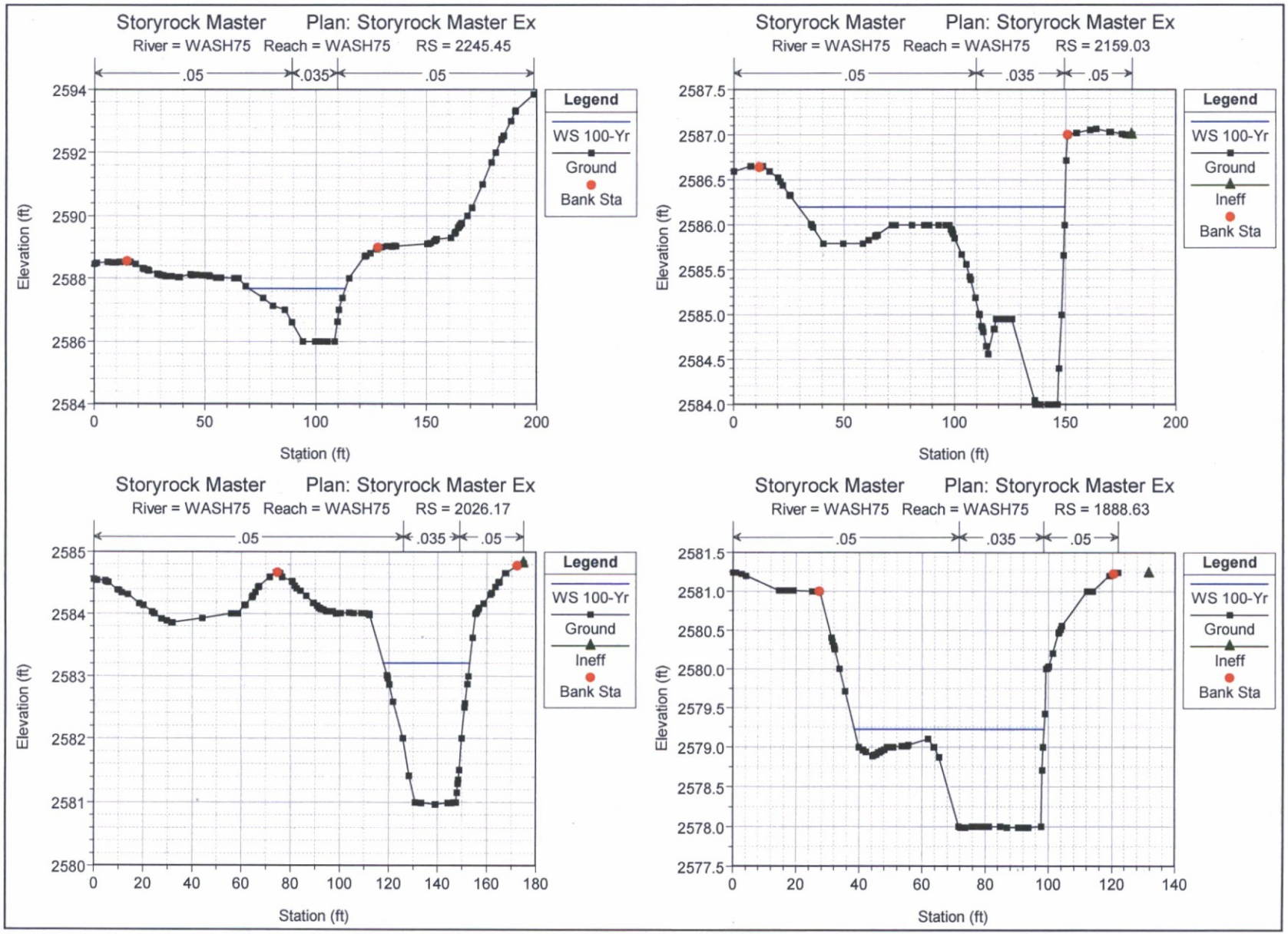
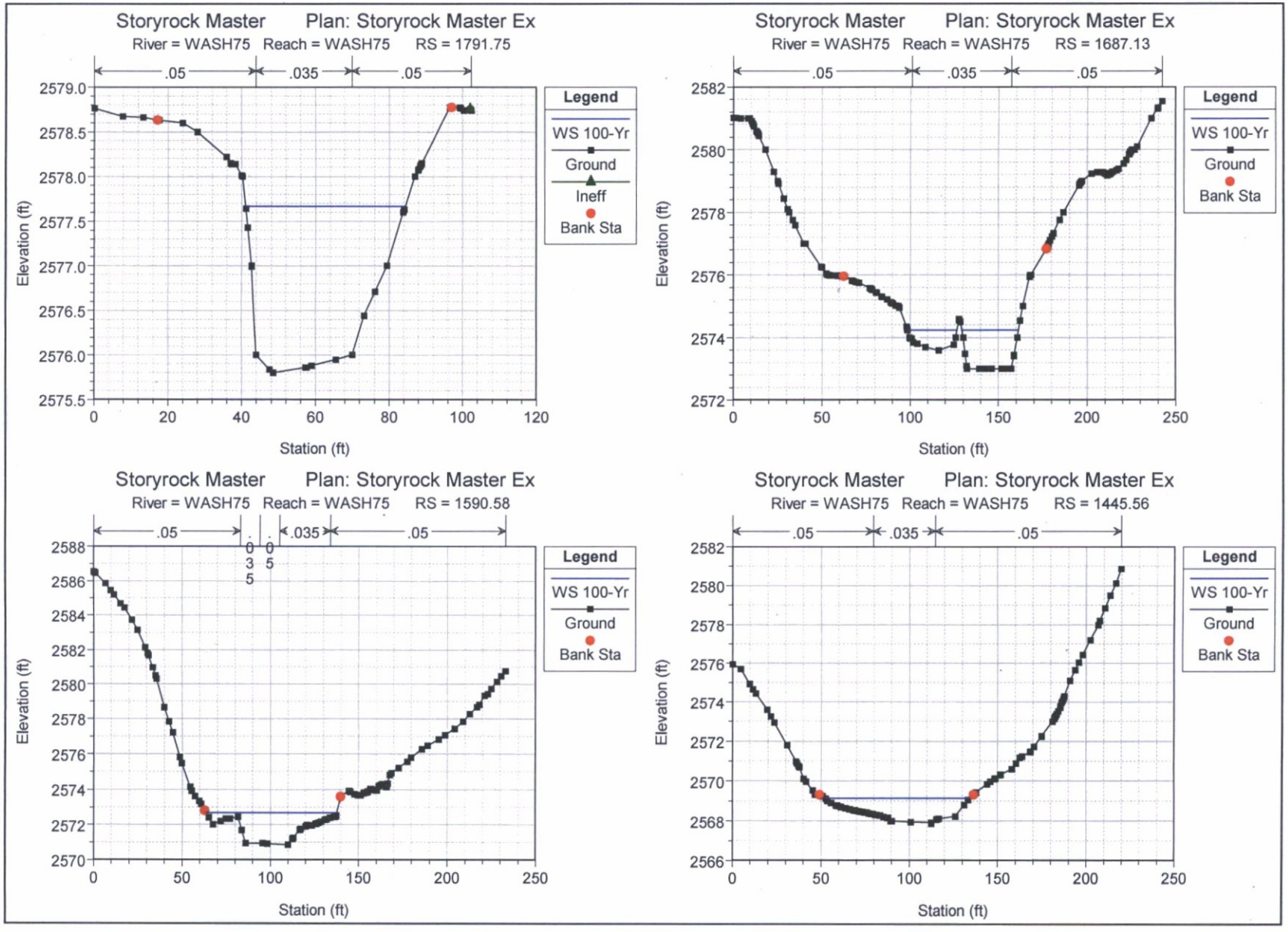
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


Storyrock Master Plan: Storyrock Master Ex
River = WASH65 Reach = WASH65 RS = 101.76
.05
.035
.05
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


Storyrock Master Plan: Storyrock Master Ex
River = WASH75 Reach = WASH75 RS = 2245.45
.05
.035
.05
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Storyrock Master Plan: Storyrock Master Ex
River = WASH75 Reach = WASH75 RS = 2159.03
.05
.035
.05
Legend
WS 100-Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Storyrock Master Plan: Storyrock Master Ex
River = WASH75 Reach = WASH75 RS = 2026.17
.05
.035
.05
Legend
WS 100-Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Storyrock Master Plan: Storyrock Master Ex
River = WASH75 Reach = WASH75 RS = 1888.63
.05
.035
.05
Legend
WS 100-Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)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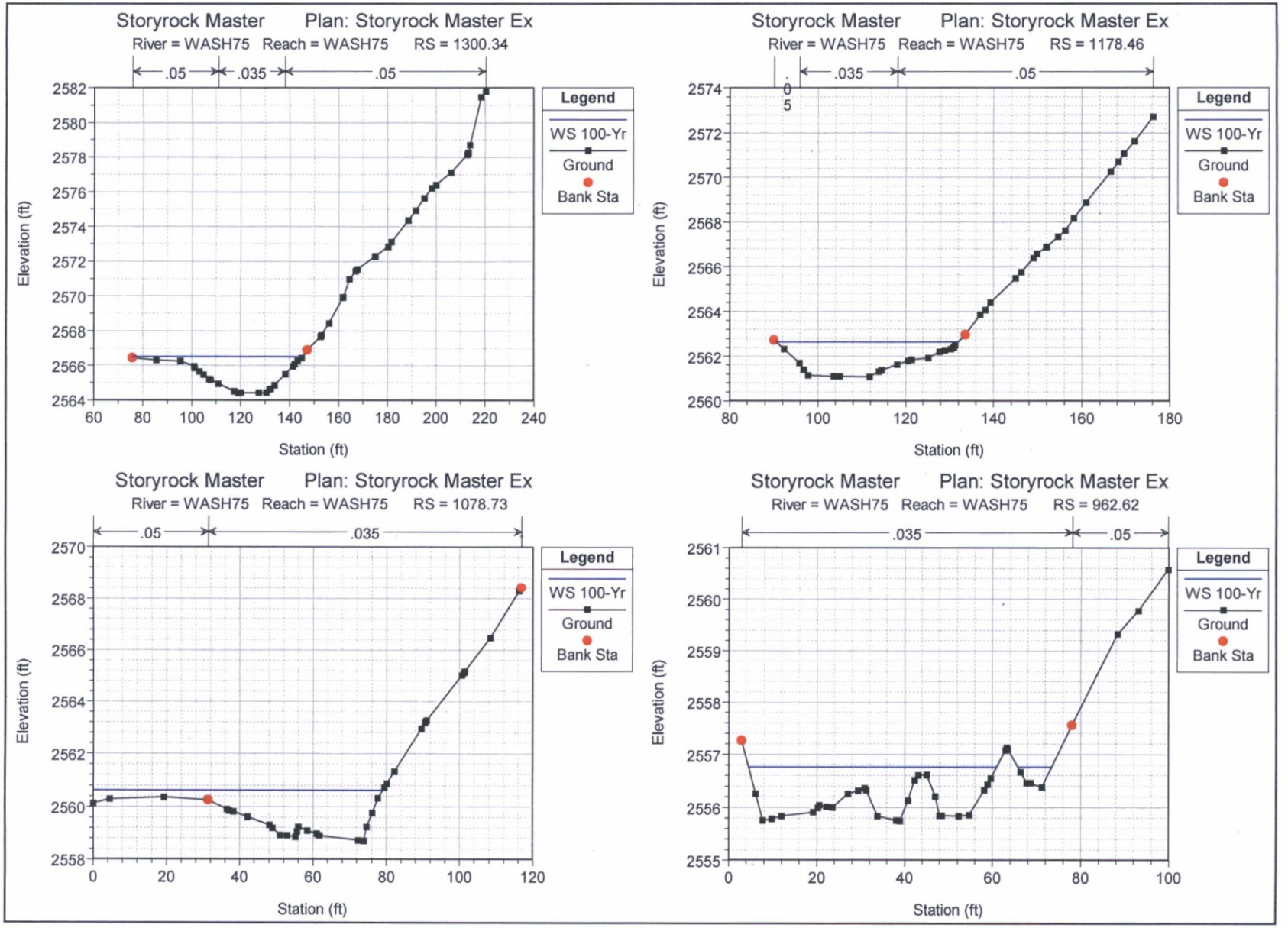
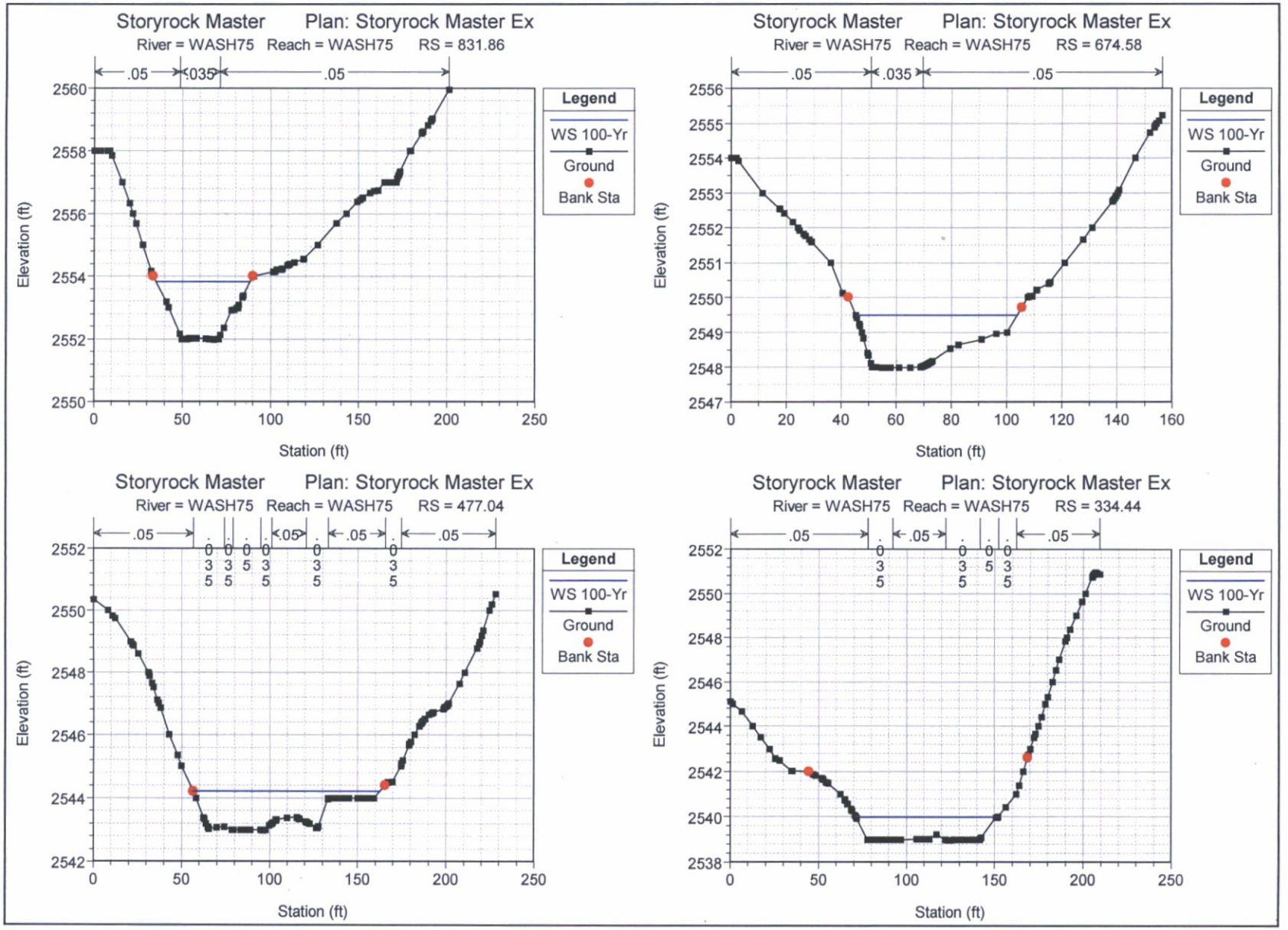
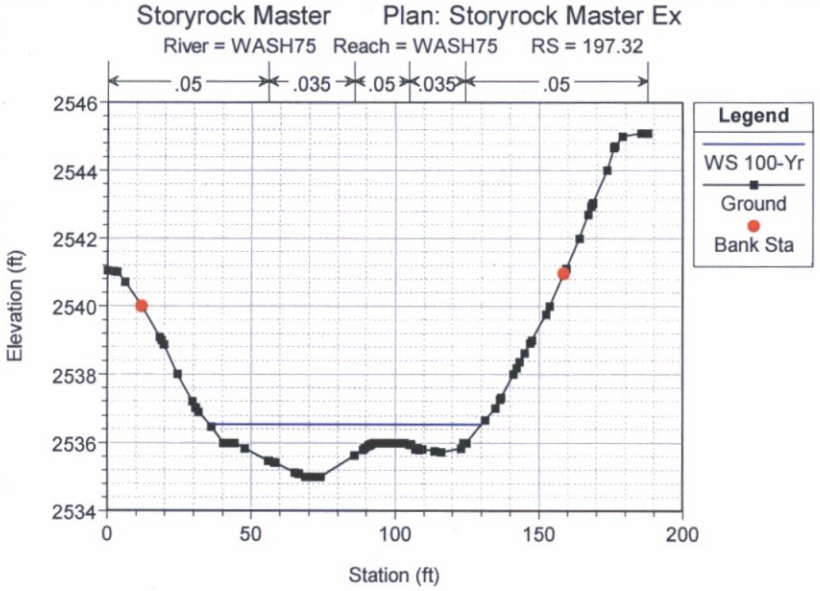
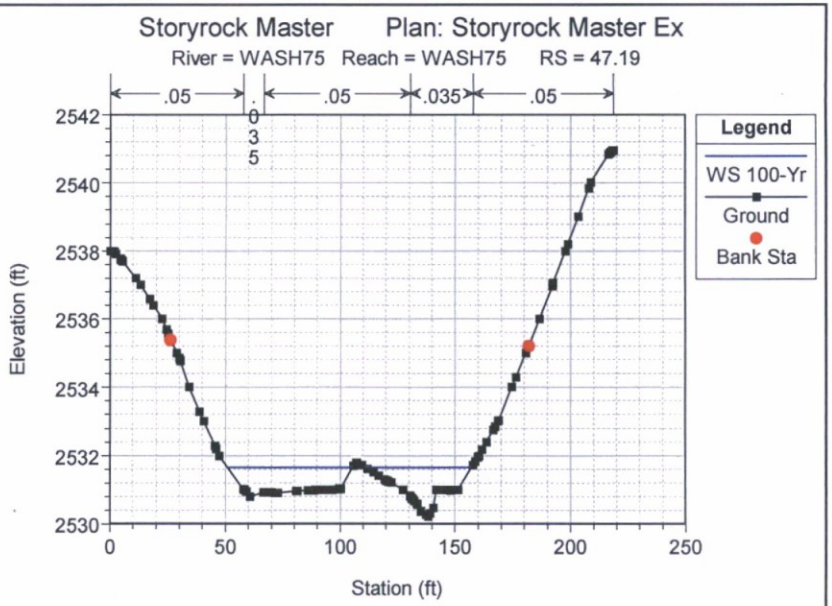
River = WASH75 Reach = WASH75 RS = 1791.75
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
Ground
Ineff
Bank Sta
Storyrock Master Plan: Storyrock Master Ex
River = WASH75 Reach = WASH75 RS = 1687.13
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
Ground
Bank Sta
Storyrock Master Plan: Storyrock Master Ex
River = WASH75 Reach = WASH75 RS = 1590.58
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
Ground
Bank Sta
Storyrock Master Plan: Storyrock Master Ex
River = WASH75 Reach = WASH75 RS = 1445.56
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
Ground
Bank Sta


Storyrock Master Plan: Storyrock Master Ex
River = WASH75 Reach = WASH75 RS = 1300.34
.05
.035
.05
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Storyrock Master Plan: Storyrock Master Ex
River = WASH75 Reach = WASH75 RS = 1178.46
.05
.035
.05
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Storyrock Master Plan: Storyrock Master Ex
River = WASH75 Reach = WASH75 RS = 1078.73
.05
.035
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Storyrock Master Plan: Storyrock Master Ex
River = WASH75 Reach = WASH75 RS = 962.62
.035
.05
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


Storyrock Master Plan: Storyrock Master Ex
River = WASH75 Reach = WASH75 RS = 831.86
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
Ground
Bank Sta
Storyrock Master Plan: Storyrock Master Ex
River = WASH75 Reach = WASH75 RS = 674.58
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
Ground
Bank Sta
Storyrock Master Plan: Storyrock Master Ex
River = WASH75 Reach = WASH75 RS = 477.04
.05
.05
.05
.05
.035
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
Ground
Bank Sta
Storyrock Master Plan: Storyrock Master Ex
River = WASH75 Reach = WASH75 RS = 334.44
.05
.05
.05
.035
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
Ground
Bank Sta


Storyrock Master Plan: Storyrock Master Ex
River = WASH75 Reach = WASH75 RS = 197.32
.05
.035
.05
.035
.05
Elevation (ft)
2546
2544
2542
2540
2538
2536
2534
0
50
100
150
200
Station (ft)
Legend
WS 100-Yr
Ground
Bank Sta


Storyrock Master Plan: Storyrock Master Ex
River = WASH75 Reach = WASH75 RS = 47.19
.05
.05
.035
.05
Elevation (ft)
2542
2540
2538
2536
2534
2532
2530
0
50
100
150
200
250
Station (ft)
Legend
WS 100-Yr
Ground
Bank Sta

Plan: Ex-Revised WASH75 WASH75 RS: 1400 Lateral Structure Profile: 100-Yr

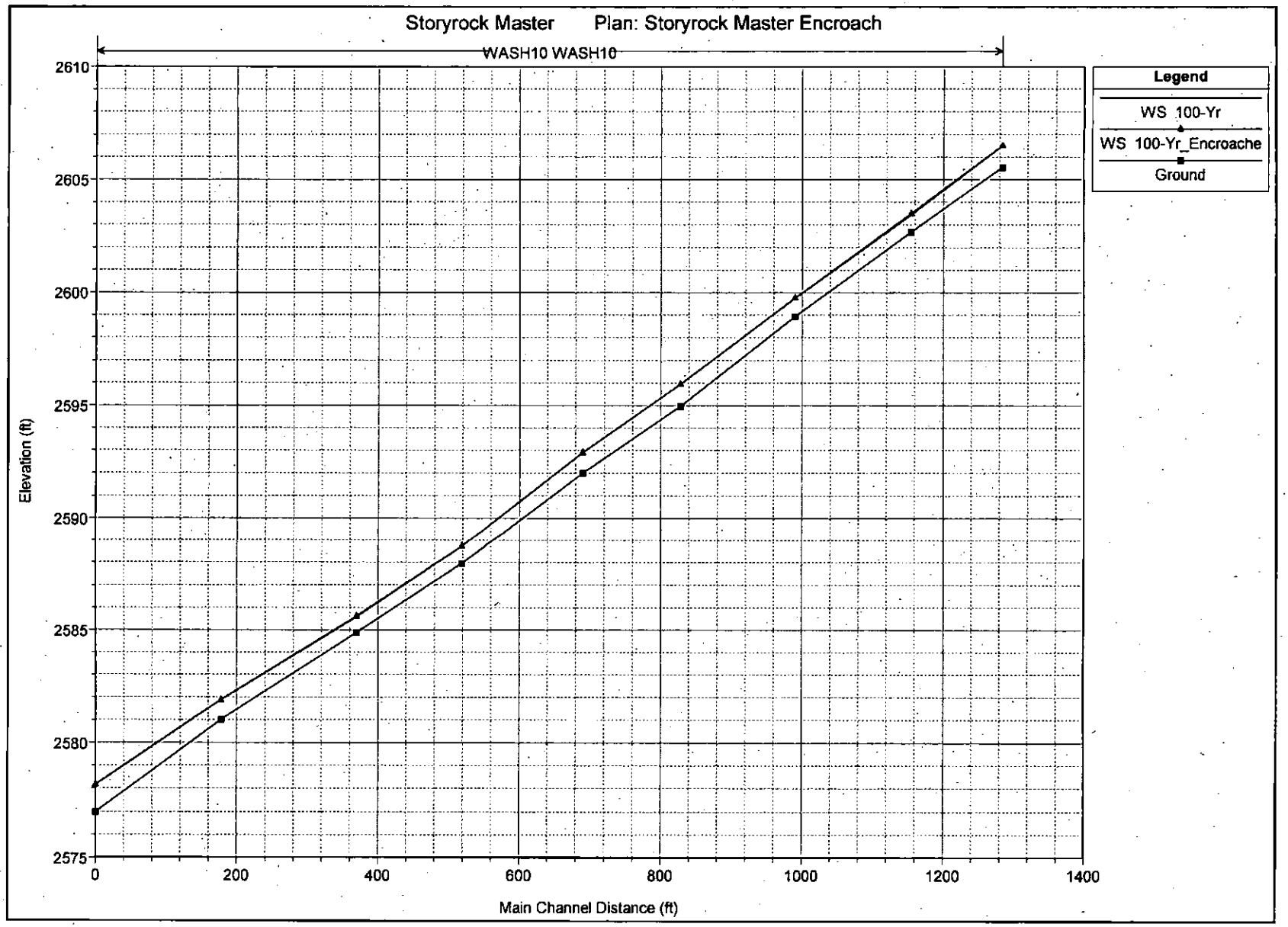
E.G. US. (ft)	2568.93	Weir Sta US. (ft)	0.00
W.S. US. (ft)	2568.32	Weir Sta DS (ft)	401.82
E.G. DS (ft)	2557.31	Min El Weir Flow (ft)	2557.27
W.S. DS (ft)	2555.96	Wr Top Width (ft)	156.94
Q US (cfs)	432.00	Weir Max Depth (ft)	0.26
Q Leaving Total (cfs)	11.00	Weir Avg Depth (ft)	0.09
Q DS (cfs)	421.15	Weir Flow Area (sq ft)	14.72
Perc Q Leaving	2.53	Weir Coef (ft^1/2)	2.000
Q Weir (cfs)	11.00	Weir Submerg	0.00
Q Gates (cfs)		Q Gate Group (cfs)	
Q Culv (cfs)		Gate Open Ht (ft)	
Q Lat RC (cfs)		Gate #Open	
Q Outlet TS (cfs)	0.00	Gate Area (sq ft)	
Q Breach (cfs)		Gate Submerg	
Breach Avg Velocity (ft/s)		Gate Invert (ft)	
Breach Flow Area (sq ft)		Gate Weir Coef	
Breach WD (ft)			
Breach Top El (ft)			
Breach Bottom El (ft)			
Breach SSL (ft)			
Breach SSR (ft)			

HEC-RAS Plan: Ex-Revised Profile: 100-Yr

River	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)	
WASH75	WASH75	2245.45	100-Yr	407.00	2585.99	2587.68	2588.27	2589.07	0.039206	9.47	43.00	43.49	1.68
WASH75	WASH75	2159.03	100-Yr	407.00	2584.00	2586.20	2586.15	2586.51	0.027037	4.46	91.27	120.68	0.90
WASH75	WASH75	2026.17	100-Yr	407.00	2580.97	2583.21	2583.21	2584.02	0.013327	7.21	56.42	35.21	1.00
WASH75	WASH75	1888.63	100-Yr	407.00	2577.99	2579.22	2579.62	2580.60	0.057903	9.41	43.23	60.10	1.96
WASH75	WASH75	1791.75	100-Yr	407.00	2575.80	2577.67	2577.67	2578.37	0.015741	6.73	60.47	43.46	1.01
WASH75	WASH75	1687.13	100-Yr	432.00	2573.00	2574.24	2574.61	2575.44	0.056474	8.80	49.11	60.11	1.72
WASH75	WASH75	1590.58	100-Yr	432.00	2570.88	2572.69	2572.69	2573.21	0.018004	5.78	74.70	73.92	1.01
WASH75	WASH75	1445.56	100-Yr	432.00	2567.87	2569.13	2569.27	2569.77	0.032492	6.40	67.54	81.64	1.24
WASH75	WASH75	1400		Lat Struct									
WASH75	WASH75	1300.34	100-Yr	431.96	2564.42	2566.54	2566.54	2567.09	0.013402	5.92	72.92	69.70	1.02
WASH75	WASH75	1178.46	100-Yr	430.59	2561.07	2562.64	2563.10	2564.19	0.048437	9.97	43.18	41.53	1.72
WASH75	WASH75	1078.73	100-Yr	422.44	2558.71	2560.61	2560.70	2561.25	0.016817	6.52	72.03	79.03	1.01
WASH75	WASH75	962.62	100-Yr	421.15	2555.74	2556.76	2557.22	2558.38	0.105680	10.23	41.17	63.96	2.25
WASH75	WASH75	831.86	100-Yr	421.15	2551.98	2553.82	2553.82	2554.45	0.016999	6.37	66.10	53.20	1.01
WASH75	WASH75	674.58	100-Yr	421.15	2547.99	2549.49	2549.65	2550.27	0.046556	7.09	59.42	58.70	1.24
WASH75	WASH75	477.04	100-Yr	421.15	2542.98	2544.22	2544.22	2544.62	0.021451	5.09	82.80	106.28	1.02
WASH75	WASH75	334.44	100-Yr	421.15	2538.98	2539.98	2540.07	2540.56	0.039411	6.06	69.48	80.59	1.15
WASH75	WASH75	197.32	100-Yr	421.15	2535.00	2536.54	2536.54	2536.98	0.019286	5.29	79.57	94.69	1.02
WASH75	WASH75	47.19	100-Yr	421.15	2530.22	2531.67	2531.85	2532.34	0.057321	6.58	64.05	100.80	1.45
WASH65	WASH65	904.05	100-Yr	97.00	2610.99	2612.02	2612.16	2612.58	0.027402	5.99	16.19	22.74	1.25
WASH65	WASH65	608.77	100-Yr	97.00	2603.95	2605.07	2605.07	2605.50	0.022758	5.23	18.54	22.18	1.01
WASH65	WASH65	516.17	100-Yr	97.00	2600.94	2602.56	2602.38	2602.86	0.019186	4.44	21.86	22.72	0.80
WASH65	WASH65	400.74	100-Yr	97.00	2597.92	2599.50	2599.50	2600.00	0.032755	5.67	17.12	17.33	1.01
WASH65	WASH65	293.66	100-Yr	97.00	2594.98	2596.26	2596.40	2596.91	0.025243	6.44	15.07	17.63	1.23
WASH65	WASH65	219.18	100-Yr	97.00	2592.98	2594.23	2594.28	2594.67	0.034257	5.33	18.21	23.94	1.08
WASH65	WASH65	101.76	100-Yr	97.00	2589.95	2591.42	2591.42	2591.85	0.021076	5.24	18.50	21.86	1.01
WASH60	WASH60	861.45	100-Yr	296.00	2607.89	2609.98	2610.10	2610.62	0.020599	6.40	46.23	44.69	1.11
WASH60	WASH60	576.92	100-Yr	296.00	2600.91	2603.16	2603.61	2604.43	0.022484	9.06	32.66	20.74	1.27
WASH60	WASH60	395.74	100-Yr	296.00	2596.86	2598.53	2599.14	2599.74	0.029771	8.84	33.49	30.05	1.48
WASH60	WASH60	296.24	100-Yr	296.00	2594.28	2595.76	2595.94	2596.52	0.032422	6.99	42.33	48.14	1.31
WASH60	WASH60	213.64	100-Yr	296.00	2592.12	2593.59	2593.66	2594.16	0.024249	6.03	49.08	56.08	1.14
WASH60	WASH60	81.32	100-Yr	296.00	2588.99	2591.09	2591.09	2591.76	0.016737	6.58	44.98	33.82	1.01
WASH10	WASH10	1350.01	100-Yr	69.00	2605.54	2606.53	2606.55	2606.74	0.020802	3.66	18.85	49.66	1.05
WASH10	WASH10	1219.73	100-Yr	69.00	2602.68	2603.48	2603.46	2603.70	0.022379	3.77	18.30	37.53	0.95
WASH10	WASH10	1055.37	100-Yr	69.00	2598.95	2599.75	2599.75	2599.96	0.023154	3.67	18.81	46.11	1.01
WASH10	WASH10	894	100-Yr	69.00	2594.95	2595.94	2595.84	2596.12	0.016498	3.46	19.93	34.18	0.80
WASH10	WASH10	755.3	100-Yr	69.00	2591.99	2592.90	2592.83	2593.11	0.029625	3.68	18.82	64.61	0.83
WASH10	WASH10	584.44	100-Yr	69.00	2587.96	2588.74	2588.74	2588.99	0.019925	4.07	16.95	33.95	1.02
WASH10	WASH10	435.39	100-Yr	69.00	2584.87	2585.59	2585.46	2585.70	0.016902	2.73	25.33	53.10	0.68
WASH10	WASH10	243.3	100-Yr	69.00	2580.99	2581.86	2581.86	2582.16	0.019975	4.36	15.83	27.29	1.01
WASH10	WASH10	65.67	100-Yr	69.00	2576.97	2578.18	2578.26	2578.60	0.019998	5.18	13.31	21.30	1.16

O SITE BOUNDARY CROSS SECTION

HEC-RAS Proposed Condition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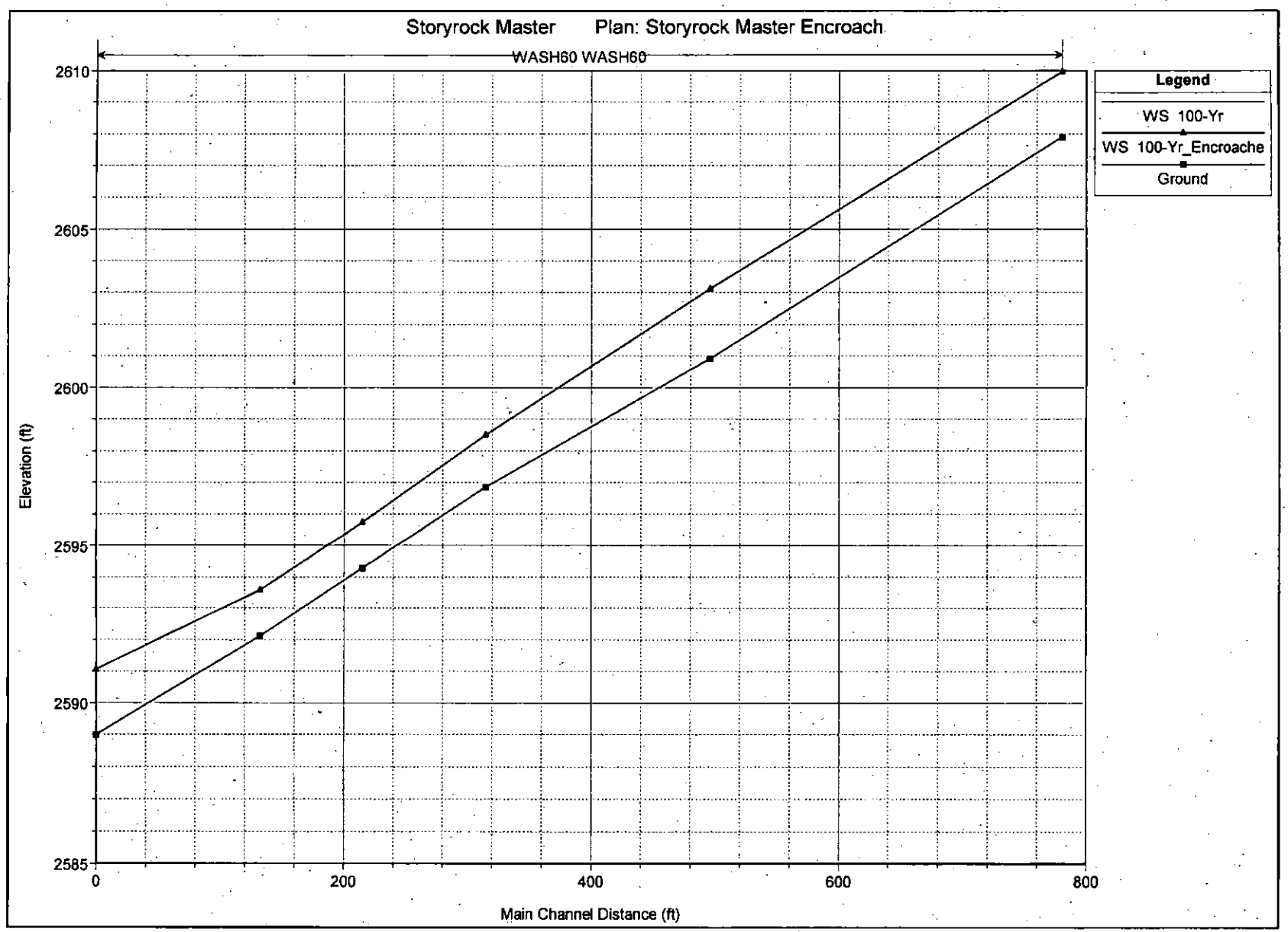
WASH10 WASH10
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Elevation (ft)
2610
2605
2600
2595
2590
2585
2580
2575
0
200
400
600
800
1000
1200
1400
Main Channel Distance (ft)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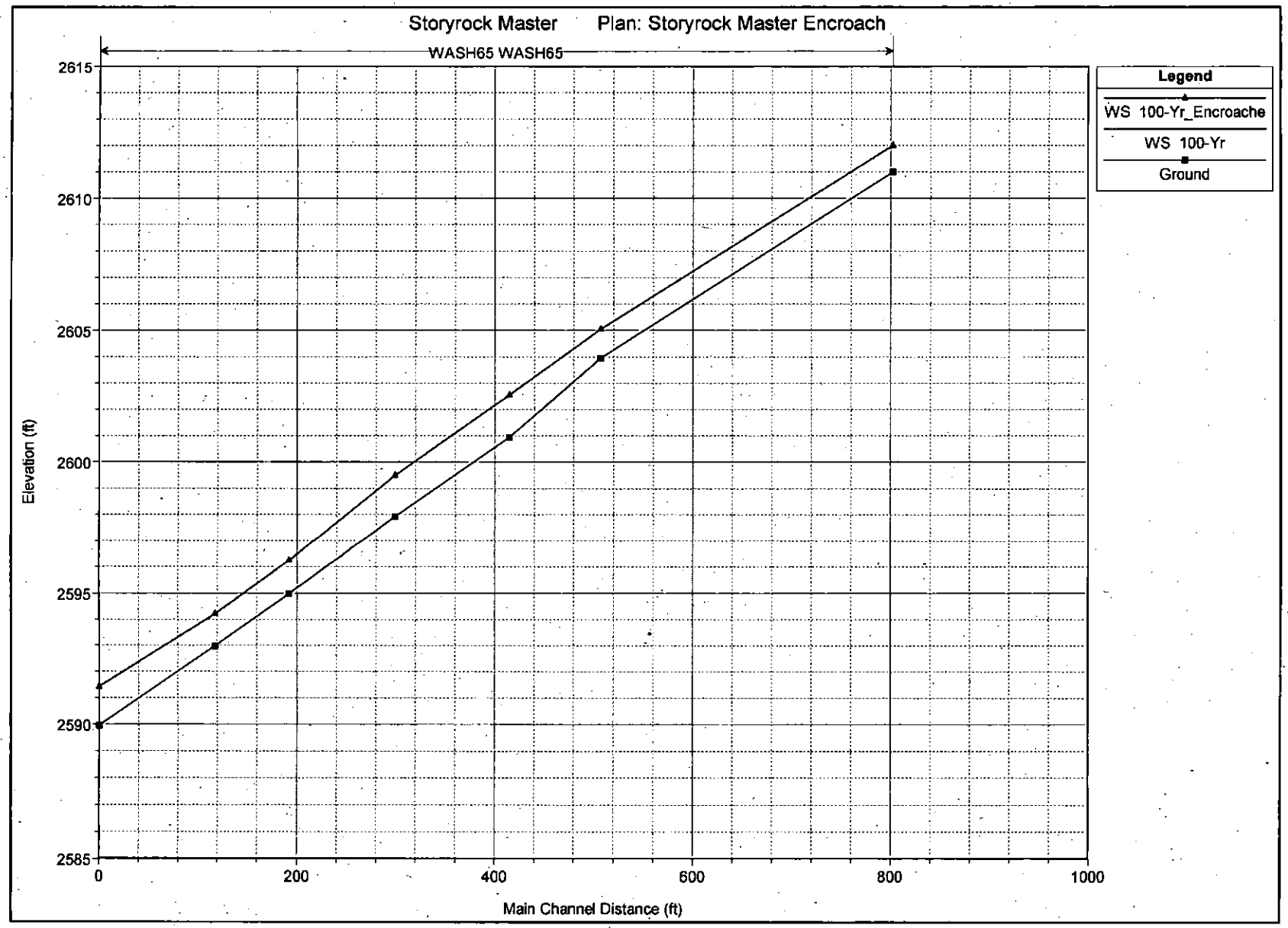
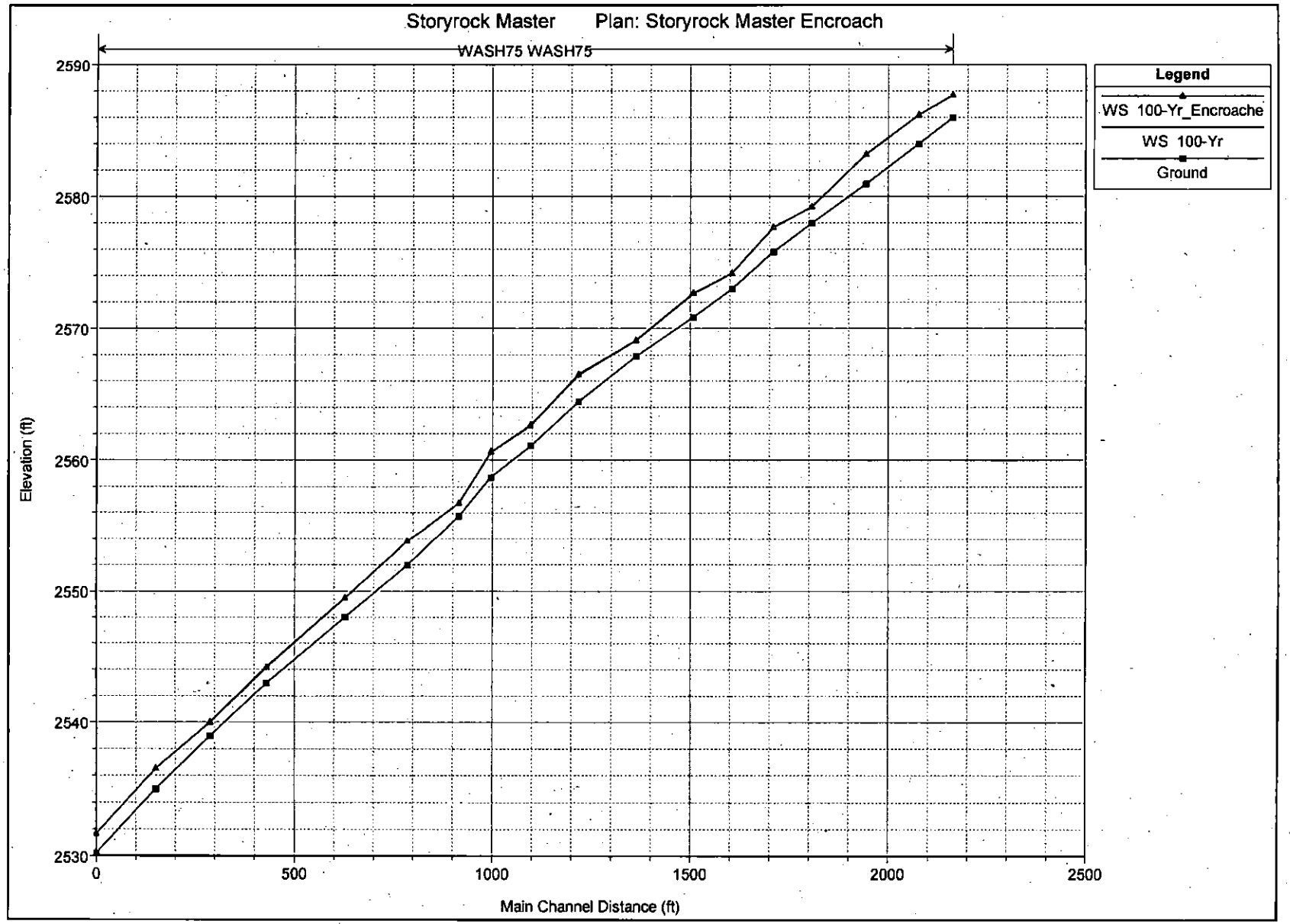
WASH60 WASH60
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Elevation (ft)
2610
2605
2600
2595
2590
2585
0
200
400
600
800
Main Channel Distance (ft)


Storyrock Master Plan: Storyrock Master Encroach
WASH65 WASH65
Legend
WS 100-Yr_Encroache
WS 100-Yr
Ground
Elevation (ft)
2615
2610
2605
2600
2595
2590
2585
0
200
400
600
800
1000
Main Channel Distance (ft)


Storyrock Master Plan: Storyrock Master Encroach
WASH75 WASH75
Legend
WS 100-Yr_Encroache
WS 100-Yr
Ground
Elevation (ft)
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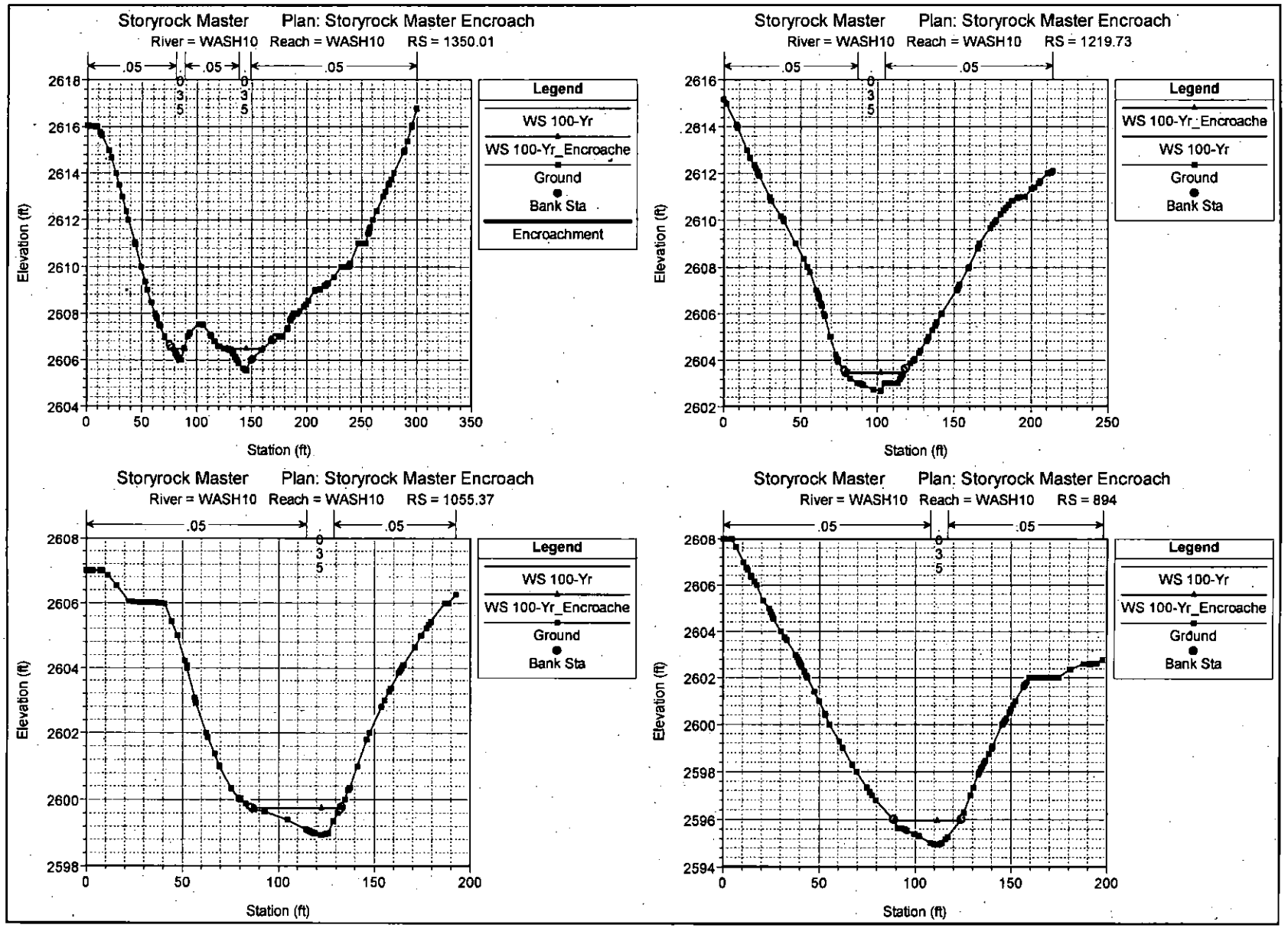
2580
2570
2560
2550
2540
2530
0
500
1000
1500
2000
2500
Main Channel Distance (ft)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River = WASH10 Reach = WASH10 RS = 1350.01
.05
.05
.05
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
Storyrock Master Plan: Storyrock Master Encroach
River = WASH10 Reach = WASH10 RS = 1219.73
.05
.05
Legend
WS 100-Yr_Encroache
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Storyrock Master Plan: Storyrock Master Encroach
River = WASH10 Reach = WASH10 RS = 1055.37
.05
.05
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta
Elevation (ft)
Station (ft)
Storyrock Master Plan: Storyrock Master Encroach
River = WASH10 Reach = WASH10 RS = 894
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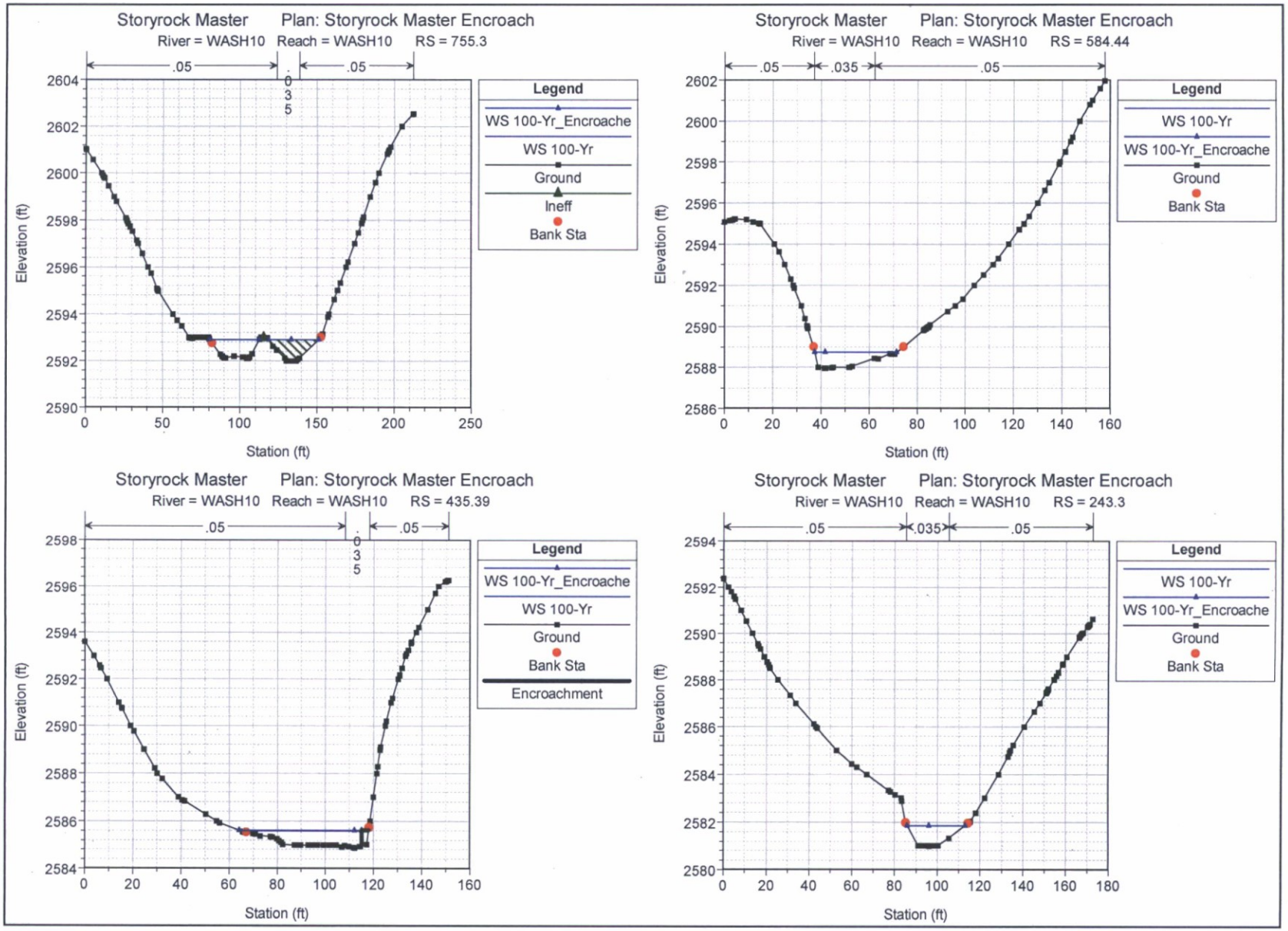
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta
Elevation (ft)
Station (ft)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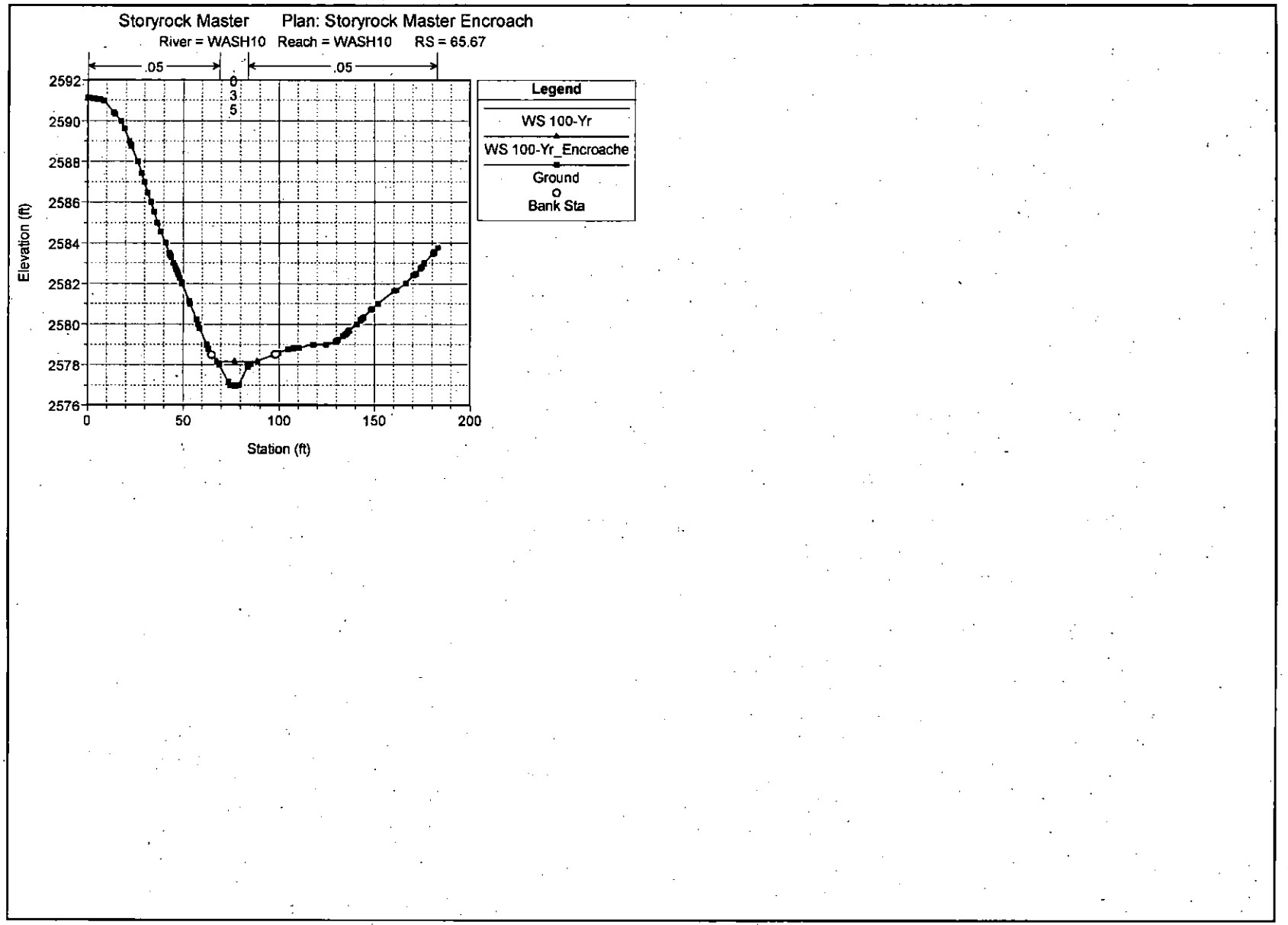
River = WASH10 Reach = WASH10 RS = 755.3
.05
.035
.05
Legend
WS 100-Yr_Encroache
WS 100-Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Storyrock Master Plan: Storyrock Master Encroach
River = WASH10 Reach = WASH10 RS = 584.44
.05
.035
.05
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta
Elevation (ft)
Station (ft)
Storyrock Master Plan: Storyrock Master Encroach
River = WASH10 Reach = WASH10 RS = 435.39
.05
.035
.05
Legend
WS 100-Yr_Encroache
WS 100-Yr
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
Storyrock Master Plan: Storyrock Master Encroach
River = WASH10 Reach = WASH10 RS = 243.3
.05
.035
.05
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta
Elevation (ft)
Station (ft)


Storyrock Master
Plan: Storyrock Master Encroach
River = WASH10
Reach = WASH10
RS = 65.67
.05
.05
0
3
5
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta
Elevation (ft)
Station (ft)
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2590
2588
2586
2584
2582
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2578
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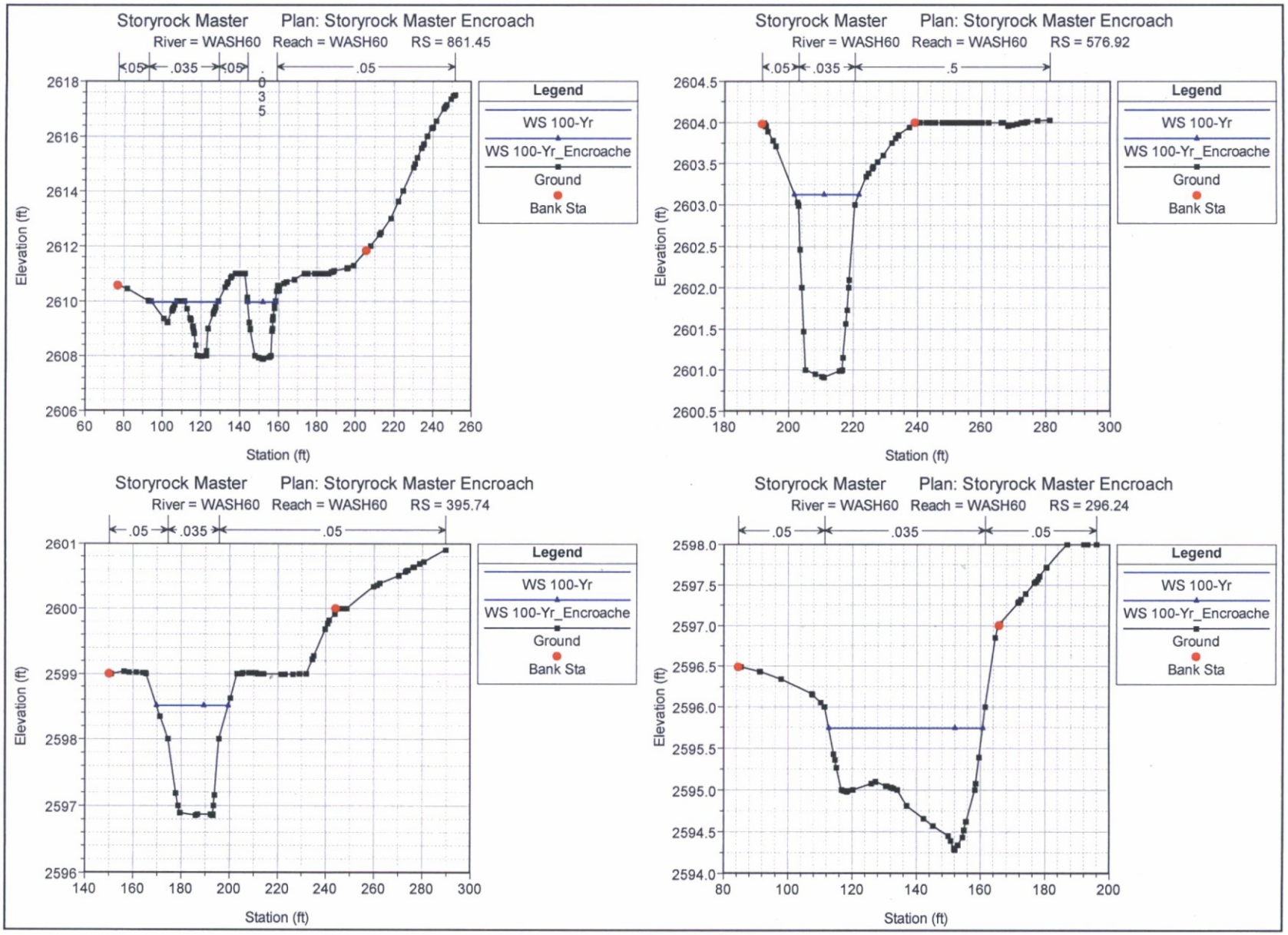
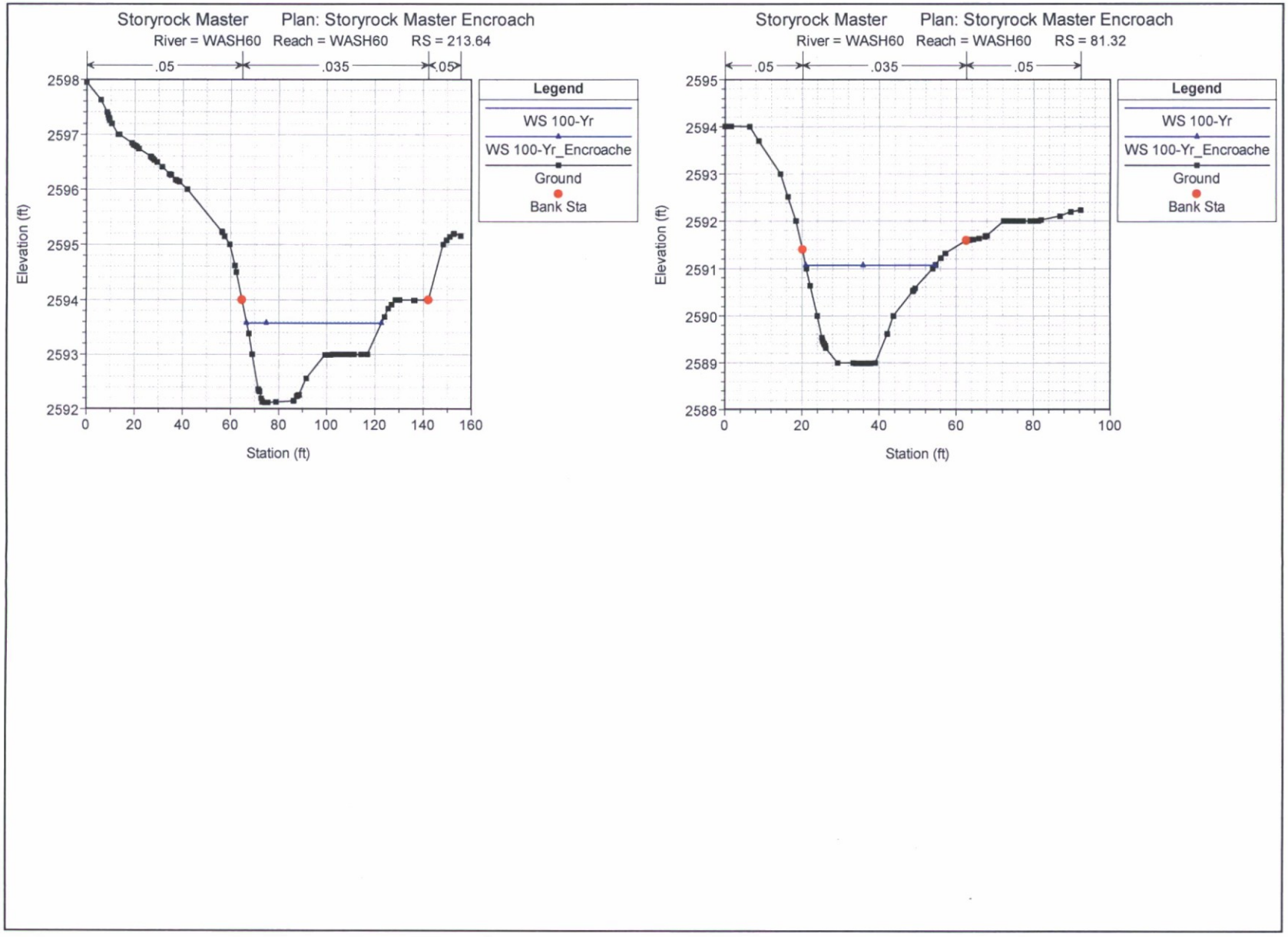
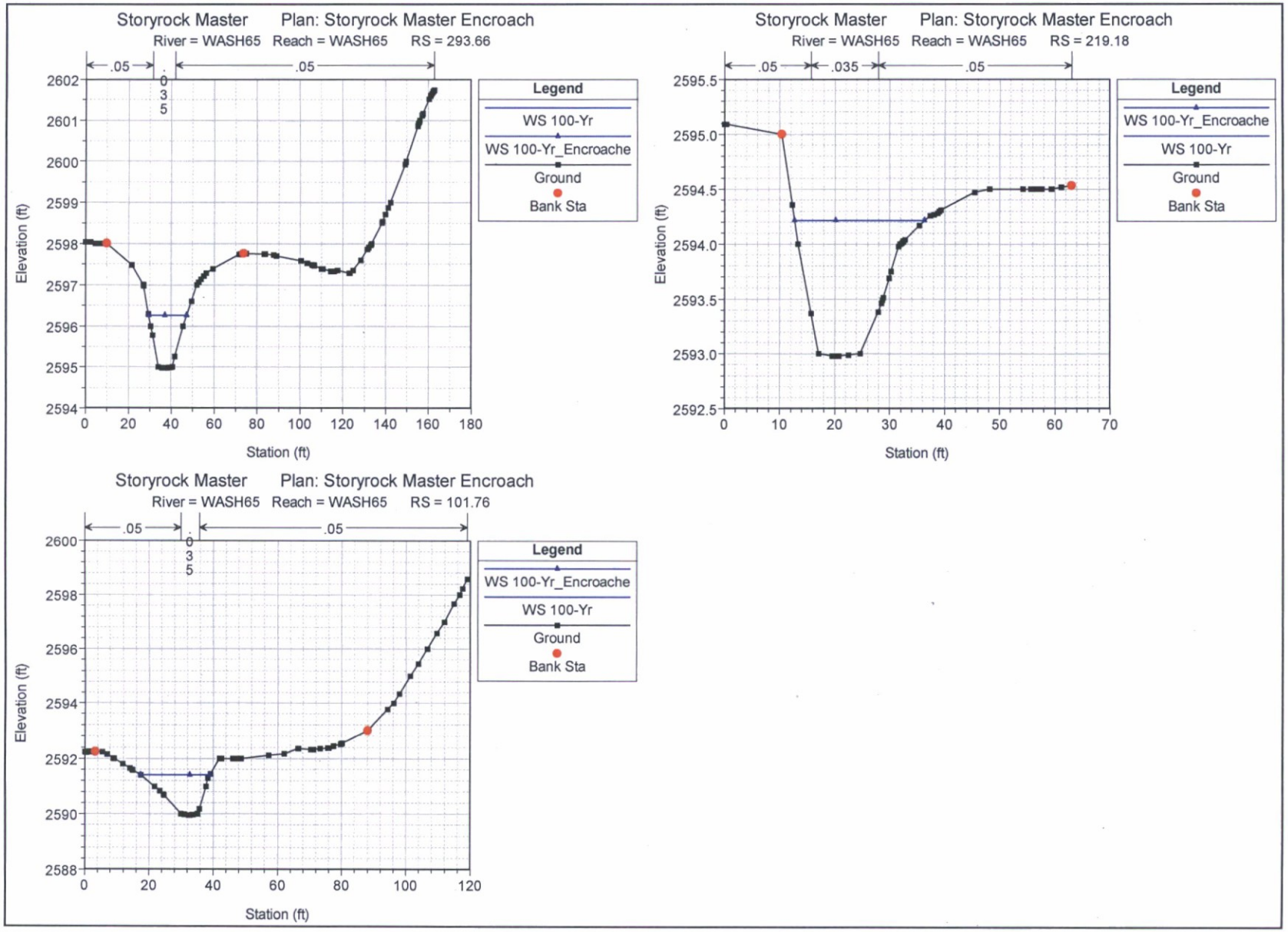
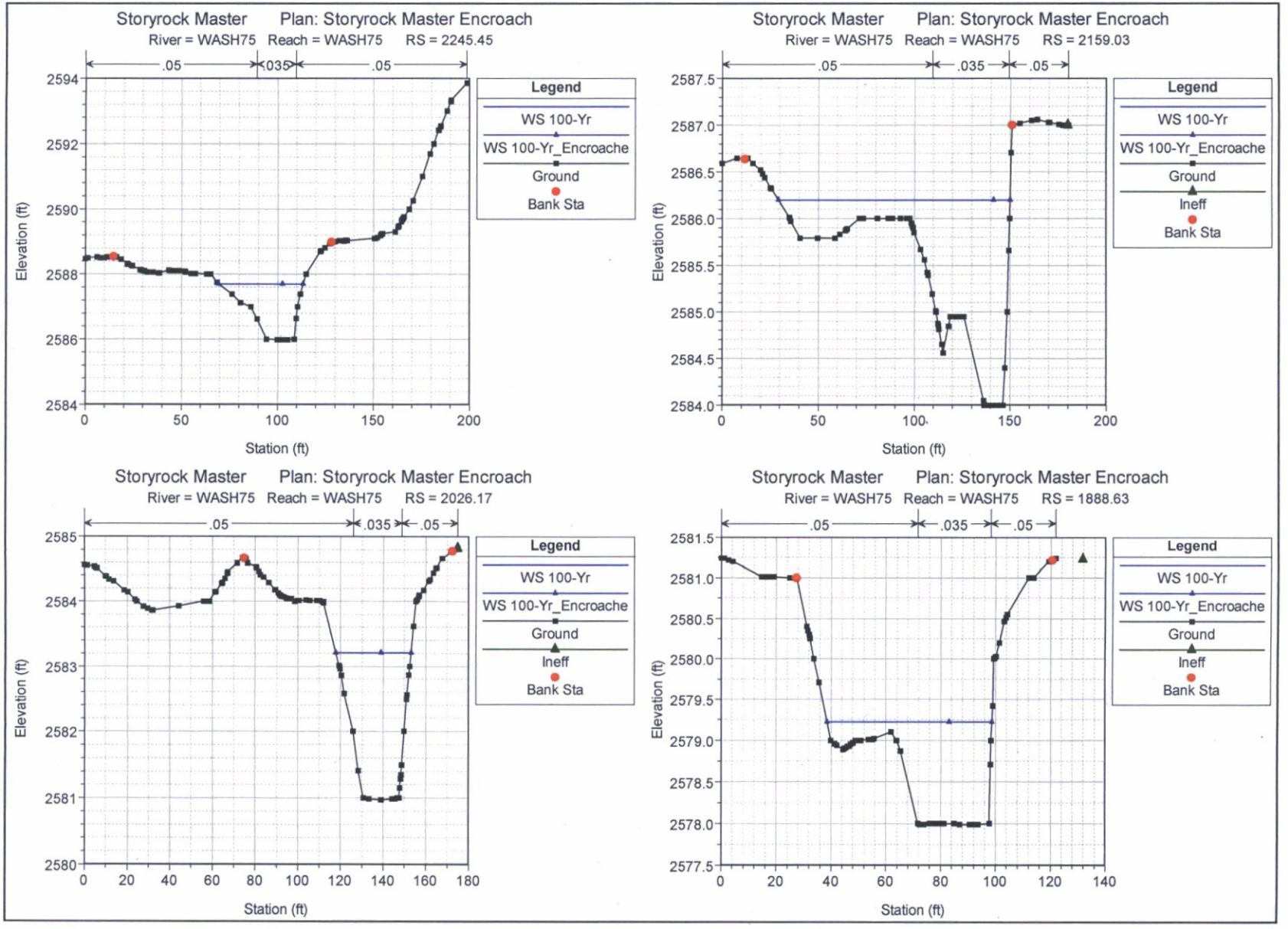
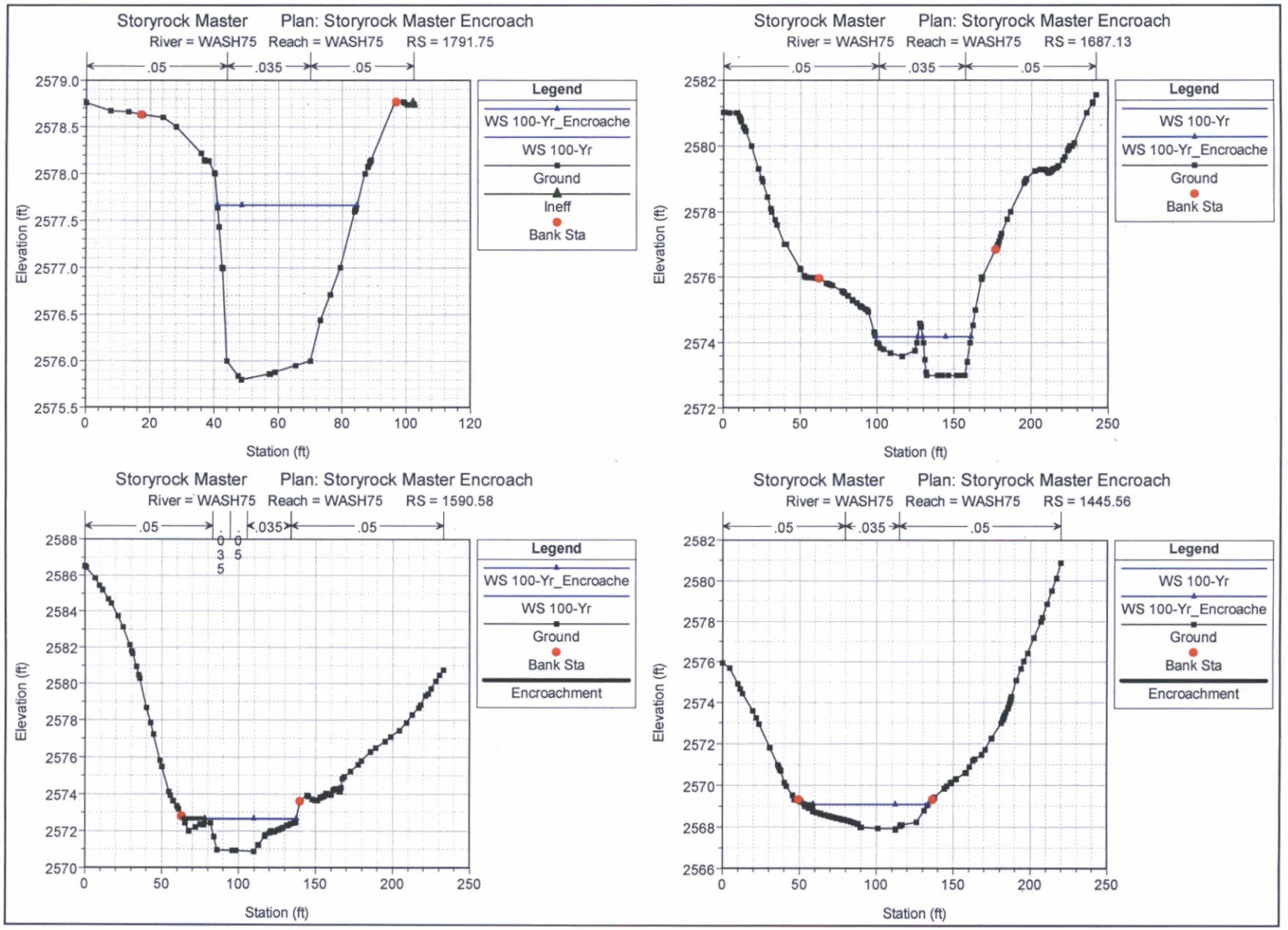
50
100
150
200

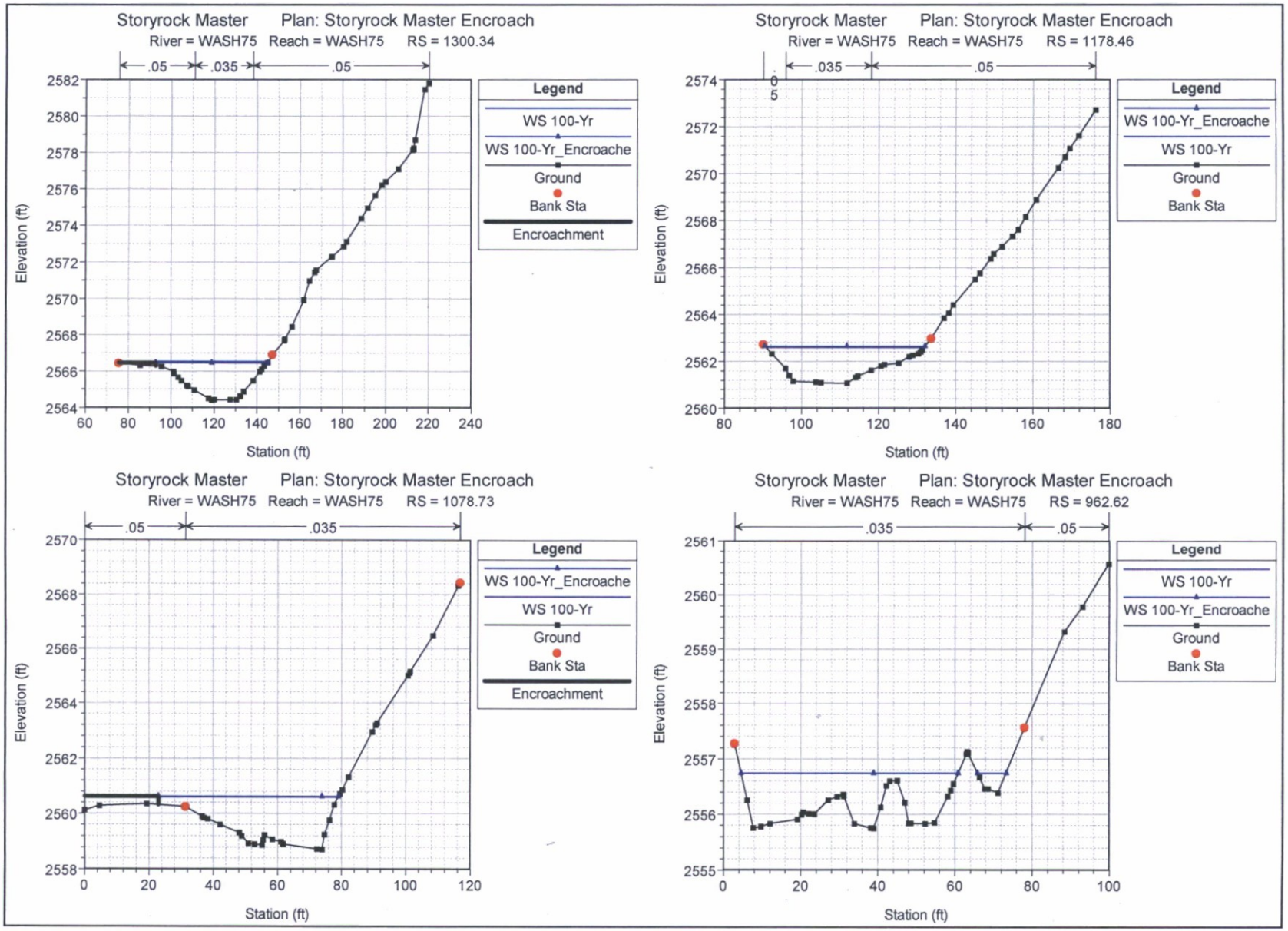

Storyrock Master Plan: Storyrock Master Encroach
River = WASH60 Reach = WASH60 RS = 861.45
.05 .035 .05 .05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta
Storyrock Master Plan: Storyrock Master Encroach
River = WASH60 Reach = WASH60 RS = 576.92
.05 .035 .5
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta
Storyrock Master Plan: Storyrock Master Encroach
River = WASH60 Reach = WASH60 RS = 395.74
.05 .035 .05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta
Storyrock Master Plan: Storyrock Master Encroach
River = WASH60 Reach = WASH60 RS = 296.24
.05 .035 .05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta

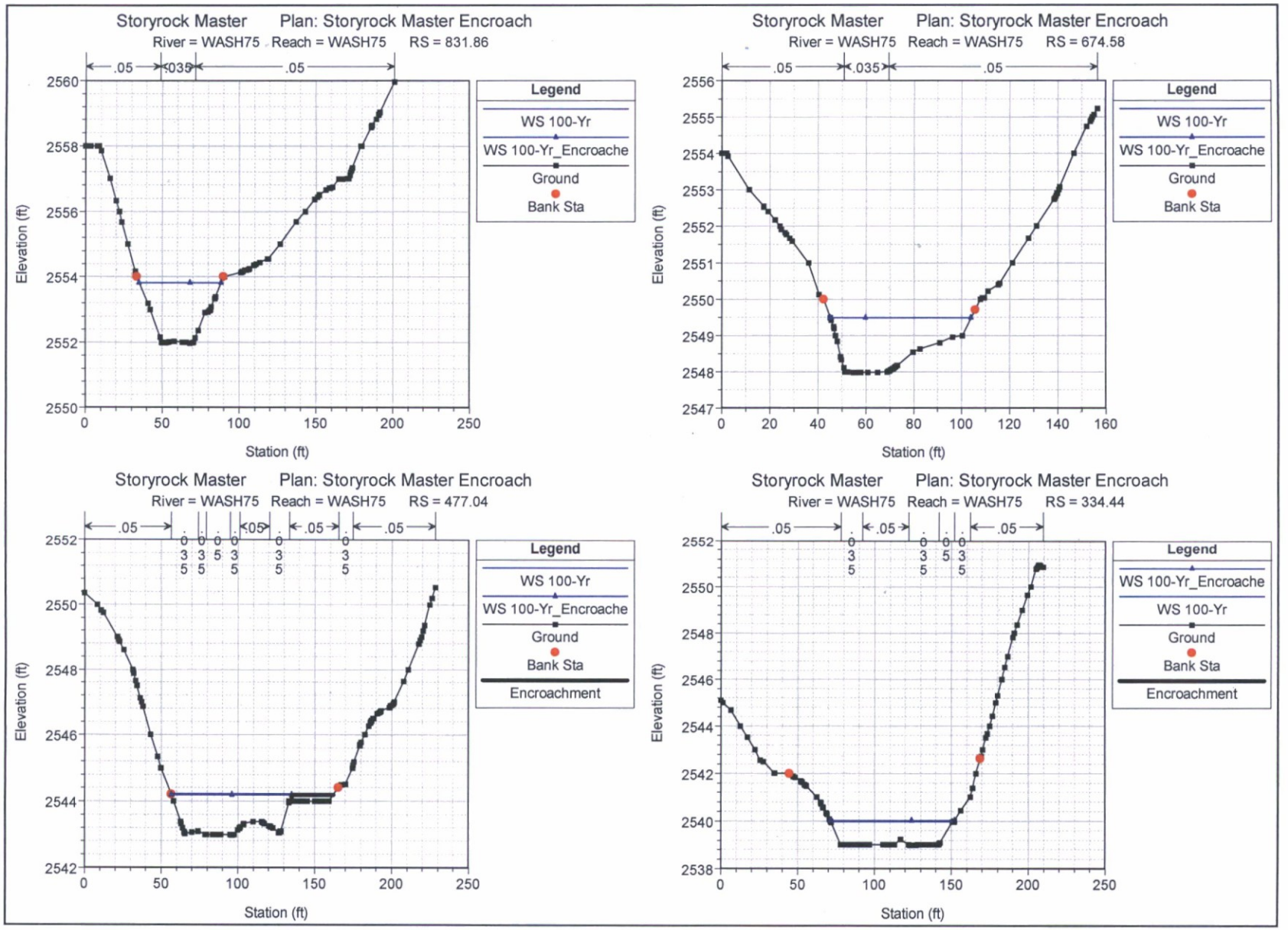

Storyrock Master
Plan: Storyrock Master Encroach
River = WASH60
Reach = WASH60
RS = 213.64
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta
Storyrock Master
Plan: Storyrock Master Encroach
River = WASH60
Reach = WASH60
RS = 81.32
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta

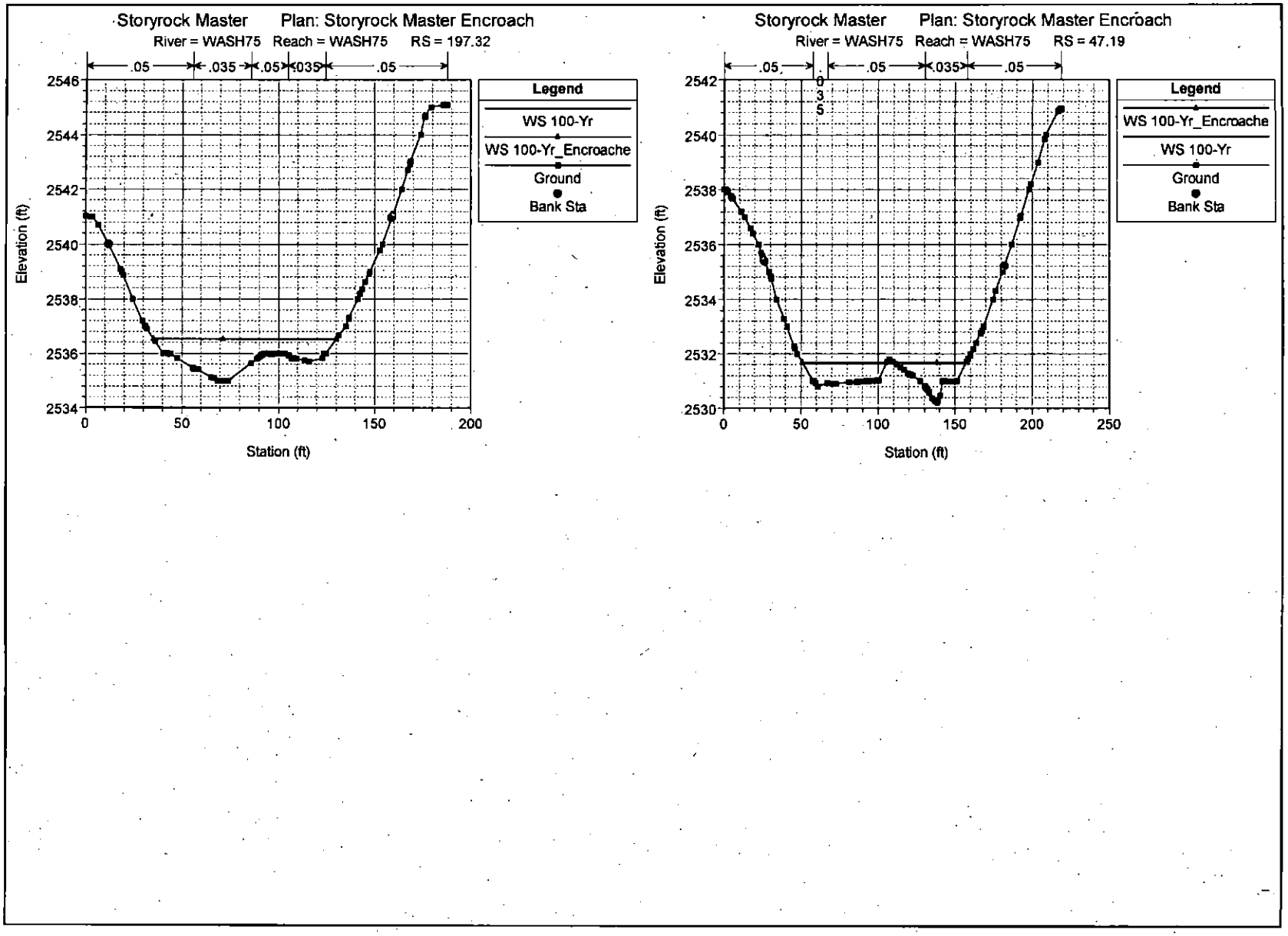

Storyrock Master Plan: Storyrock Master Encroach
River = WASH65 Reach = WASH65 RS = 293.66
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta
Storyrock Master Plan: Storyrock Master Encroach
River = WASH65 Reach = WASH65 RS = 219.18
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr_Encroache
WS 100-Yr
Ground
Bank Sta
Storyrock Master Plan: Storyrock Master Encroach
River = WASH65 Reach = WASH65 RS = 101.76
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr_Encroache
WS 100-Yr
Ground
Bank Sta


Storyrock Master Plan: Storyrock Master Encroach
River = WASH75 Reach = WASH75 RS = 2245.45
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta
Storyrock Master Plan: Storyrock Master Encroach
River = WASH75 Reach = WASH75 RS = 2159.03
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Ineff
Bank Sta
Storyrock Master Plan: Storyrock Master Encroach
River = WASH75 Reach = WASH75 RS = 2026.17
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Ineff
Bank Sta
Storyrock Master Plan: Storyrock Master Encroach
River = WASH75 Reach = WASH75 RS = 1888.63
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Ineff
Bank Sta


Storyrock Master Plan: Storyrock Master Encroach
River = WASH75 Reach = WASH75 RS = 1791.75
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr_Encroache
WS 100-Yr
Ground
Ineff
Bank Sta
Storyrock Master Plan: Storyrock Master Encroach
River = WASH75 Reach = WASH75 RS = 1687.13
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta
Storyrock Master Plan: Storyrock Master Encroach
River = WASH75 Reach = WASH75 RS = 1590.58
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr_Encroache
WS 100-Yr
Ground
Bank Sta
Encroachment
Storyrock Master Plan: Storyrock Master Encroach
River = WASH75 Reach = WASH75 RS = 1445.56
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta
Encroachment


Storyrock Master Plan: Storyrock Master Encroach
River = WASH75 Reach = WASH75 RS = 1300.34
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta
Encroachment
Storyrock Master Plan: Storyrock Master Encroach
River = WASH75 Reach = WASH75 RS = 1178.46
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr_Encroache
WS 100-Yr
Ground
Bank Sta
Storyrock Master Plan: Storyrock Master Encroach
River = WASH75 Reach = WASH75 RS = 1078.73
.05
.035
Elevation (ft)
Station (ft)
Legend
WS 100-Yr_Encroache
WS 100-Yr
Ground
Bank Sta
Encroachment
Storyrock Master Plan: Storyrock Master Encroach
River = WASH75 Reach = WASH75 RS = 962.62
.035
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta


Storyrock Master Plan: Storyrock Master Encroach
River = WASH75 Reach = WASH75 RS = 831.86
.05 .035 .05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta
Storyrock Master Plan: Storyrock Master Encroach
River = WASH75 Reach = WASH75 RS = 674.58
.05 .035 .05
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta
Storyrock Master Plan: Storyrock Master Encroach
River = WASH75 Reach = WASH75 RS = 477.04
Elevation (ft)
Station (ft)
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta
Encroachment
Storyrock Master Plan: Storyrock Master Encroach
River = WASH75 Reach = WASH75 RS = 334.44
Elevation (ft)
Station (ft)
Legend
WS 100-Yr_Encroache
WS 100-Yr
Ground
Bank Sta
Encroachment


Storyrock Master Plan: Storyrock Master Encroach
River = WASH75 Reach = WASH75 RS = 197.32
.05
.035
.05
.035
.05
Elevation (ft)
2546
2544
2542
2540
2538
2536
2534
0
50
100
150
200
Station (ft)
Legend
WS 100-Yr
WS 100-Yr_Encroache
Ground
Bank Sta
Storyrock Master Plan: Storyrock Master Encroach
River = WASH75 Reach = WASH75 RS = 47.19
.05
.05
.035
.05
Elevation (ft)
2542
2540
2538
2536
2534
2532
2530
0
50
100
150
200
250
Station (ft)
Legend
WS 100-Yr_Encroache
WS 100-Yr
Ground
Bank Sta

HEC-RAS Plan: Encroach Locations: User Defined

River	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
WASH10	WASH10	1350.01	100-Yr	61.00	2605.54	2606.49	2606.50	2606.69	0.020828	3.64	16.75	43.33	1.03
WASH10	WASH10	1350.01	100-Yr_Encroache	61.00	2605.54	2606.49	2606.50	2606.69	0.020826	3.65	16.71	42.26	1.02
WASH10	WASH10	1219.73	100-Yr	69.00	2602.68	2603.42	2603.46	2603.70	0.031831	4.25	16.22	38.45	1.12
WASH10	WASH10	1219.73	100-Yr_Encroache	69.00	2602.68	2603.48	2603.46	2603.70	0.022057	3.75	18.39	37.57	0.94
WASH10	WASH10	1055.37	100-Yr	69.00	2598.95	2599.75	2599.75	2599.98	0.023154	3.87	18.81	48.11	1.01
WASH10	WASH10	1055.37	100-Yr_Encroache	69.00	2598.95	2599.74	2599.74	2599.98	0.023539	3.89	18.69	46.01	1.02
WASH10	WASH10	894	100-Yr	69.00	2594.95	2595.94	2595.84	2596.12	0.016498	3.46	19.93	34.18	0.80
WASH10	WASH10	894	100-Yr_Encroache	69.00	2594.95	2595.94	2595.84	2596.12	0.016498	3.48	19.93	34.18	0.80
WASH10	WASH10	755.3	100-Yr	69.00	2591.99	2592.90	2592.83	2593.11	0.029625	3.68	18.82	64.81	0.83
WASH10	WASH10	755.3	100-Yr_Encroache	69.00	2591.99	2592.90	2592.83	2593.11	0.029551	3.68	18.84	64.83	0.83
WASH10	WASH10	584.44	100-Yr	69.00	2587.96	2588.74	2588.74	2588.99	0.019925	4.07	16.95	33.95	1.02
WASH10	WASH10	584.44	100-Yr_Encroache	69.00	2587.96	2588.74	2588.74	2588.99	0.019953	4.07	16.95	33.95	1.02
WASH10	WASH10	435.39	100-Yr	69.00	2584.87	2585.58	2585.46	2585.70	0.016902	2.73	25.33	53.10	0.68
WASH10	WASH10	435.39	100-Yr_Encroache	69.00	2584.87	2585.61	2585.48	2585.73	0.017272	2.76	25.11	50.85	0.67
WASH10	WASH10	243.3	100-Yr	69.00	2580.99	2581.86	2581.86	2582.16	0.019975	4.36	15.83	27.29	1.01
WASH10	WASH10	243.3	100-Yr_Encroache	69.00	2580.99	2581.86	2581.86	2582.16	0.019975	4.36	15.83	27.29	1.01
WASH10	WASH10	65.67	100-Yr	69.00	2576.97	2578.18	2578.26	2578.60	0.019998	5.18	13.31	21.30	1.16
WASH10	WASH10	65.67	100-Yr_Encroache	69.00	2576.97	2578.18	2578.26	2578.60	0.019998	5.18	13.31	21.30	1.16
WASH60	WASH60	861.45	100-Yr	289.00	2607.89	2609.98	2610.08	2610.59	0.020580	6.38	45.30	43.96	1.11
WASH60	WASH60	861.45	100-Yr_Encroache	289.00	2607.89	2609.98	2610.08	2610.59	0.020580	6.38	45.30	43.96	1.11
WASH60	WASH60	576.92	100-Yr	289.00	2600.91	2603.13	2603.58	2604.39	0.022638	9.02	32.05	20.14	1.26
WASH60	WASH60	576.92	100-Yr_Encroache	289.00	2600.91	2603.13	2603.58	2604.39	0.022638	9.02	32.05	20.14	1.26
WASH60	WASH60	395.74	100-Yr	289.00	2596.88	2598.51	2598.88	2599.70	0.029578	8.76	32.98	29.77	1.47
WASH60	WASH60	395.74	100-Yr_Encroache	289.00	2596.88	2598.51	2598.88	2599.70	0.029578	8.76	32.98	29.77	1.47
WASH60	WASH60	296.24	100-Yr	289.00	2594.28	2595.74	2595.91	2596.49	0.032485	6.94	41.67	48.03	1.31
WASH60	WASH60	296.24	100-Yr_Encroache	289.00	2594.28	2595.74	2595.91	2596.49	0.032485	6.94	41.67	48.03	1.31
WASH60	WASH60	213.84	100-Yr	289.00	2592.12	2593.58	2593.65	2594.13	0.024156	5.98	48.36	55.89	1.13
WASH60	WASH60	213.84	100-Yr_Encroache	289.00	2592.12	2593.58	2593.65	2594.13	0.024156	5.98	48.36	55.89	1.13
WASH60	WASH60	81.32	100-Yr	289.00	2588.89	2591.06	2591.06	2591.73	0.016870	6.56	44.05	33.47	1.01
WASH60	WASH60	81.32	100-Yr_Encroache	289.00	2588.89	2591.06	2591.06	2591.73	0.016870	6.56	44.05	33.47	1.01
WASH65	WASH65	904.05	100-Yr	96.00	2610.99	2612.01	2612.15	2612.57	0.027420	5.98	18.06	22.58	1.25
WASH65	WASH65	904.05	100-Yr_Encroache	96.00	2610.99	2612.01	2612.15	2612.57	0.027420	5.98	18.06	22.58	1.25
WASH65	WASH65	608.77	100-Yr	96.00	2603.95	2605.07	2605.07	2605.49	0.022432	5.19	18.49	22.14	1.00
WASH65	WASH65	608.77	100-Yr_Encroache	96.00	2603.95	2605.07	2605.07	2605.49	0.022432	5.19	18.49	22.14	1.00
WASH65	WASH65	516.17	100-Yr	96.00	2600.84	2602.55	2602.37	2602.85	0.019153	4.43	21.69	22.63	0.80
WASH65	WASH65	516.17	100-Yr_Encroache	96.00	2600.84	2602.55	2602.37	2602.85	0.019153	4.43	21.69	22.63	0.80
WASH65	WASH65	400.74	100-Yr	96.00	2597.82	2599.49	2599.49	2599.99	0.032877	5.66	16.96	17.25	1.01
WASH65	WASH65	400.74	100-Yr_Encroache	96.00	2597.82	2599.49	2599.49	2599.99	0.032877	5.66	16.96	17.25	1.01
WASH65	WASH65	293.66	100-Yr	96.00	2594.88	2596.26	2596.40	2596.90	0.025148	6.41	14.98	17.57	1.22
WASH65	WASH65	293.66	100-Yr_Encroache	96.00	2594.88	2596.26	2596.40	2596.90	0.025148	6.41	14.98	17.57	1.22
WASH65	WASH65	219.18	100-Yr	96.00	2592.88	2594.21	2594.28	2594.68	0.034804	5.35	17.94	23.65	1.08
WASH65	WASH65	219.18	100-Yr_Encroache	96.00	2592.88	2594.22	2594.28	2594.68	0.034518	5.35	17.96	23.68	1.08
WASH65	WASH65	101.76	100-Yr	96.00	2589.95	2591.41	2591.41	2591.84	0.021132	5.24	18.31	21.68	1.01
WASH65	WASH65	101.76	100-Yr_Encroache	96.00	2589.95	2591.41	2591.41	2591.84	0.021104	5.24	18.32	21.69	1.01
WASH75	WASH75	2245.45	100-Yr	409.00	2585.99	2587.70	2588.27	2589.06	0.038015	9.35	43.74	43.94	1.65
WASH75	WASH75	2245.45	100-Yr_Encroache	409.00	2585.99	2587.70	2588.27	2589.06	0.038015	9.35	43.74	43.94	1.65
WASH75	WASH75	2159.03	100-Yr	409.00	2584.00	2586.20	2586.15	2586.51	0.026880	4.48	91.74	120.80	0.90
WASH75	WASH75	2159.03	100-Yr_Encroache	409.00	2584.00	2586.20	2586.15	2586.51	0.026880	4.48	91.74	120.80	0.90
WASH75	WASH75	2026.17	100-Yr	409.00	2580.97	2583.21	2583.21	2584.03	0.013341	7.23	56.60	35.26	1.01
WASH75	WASH75	2026.17	100-Yr_Encroache	409.00	2580.97	2583.21	2583.21	2584.03	0.013341	7.23	56.60	35.26	1.01
WASH75	WASH75	1888.63	100-Yr	409.00	2577.99	2579.22	2579.83	2580.61	0.058184	9.44	43.32	60.11	1.96
WASH75	WASH75	1888.63	100-Yr_Encroache	409.00	2577.99	2579.22	2579.83	2580.61	0.058184	9.44	43.32	60.11	1.96
WASH75	WASH75	1791.75	100-Yr	409.00	2575.80	2577.87	2577.87	2578.36	0.015825	6.75	60.56	43.48	1.01
WASH75	WASH75	1791.75	100-Yr_Encroache	409.00	2575.80	2577.87	2577.87	2578.36	0.015817	6.75	60.57	43.48	1.01
WASH75	WASH75	1687.13	100-Yr	409.00	2573.00	2574.19	2574.56	2575.41	0.081508	8.87	46.11	59.40	1.76
WASH75	WASH75	1687.13	100-Yr_Encroache	409.00	2573.00	2574.19	2574.56	2575.41	0.081508	8.87	46.11	59.40	1.76
WASH75	WASH75	1590.58	100-Yr	409.00	2570.88	2572.65	2572.65	2573.15	0.018005	5.70	71.82	73.60	1.02
WASH75	WASH75	1590.58	100-Yr_Encroache	409.00	2570.88	2572.67	2572.67	2573.24	0.018360	6.10	67.10	59.54	1.01

HEC-RAS Plan: Encroach Locations: User Defined (Continued)

River	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)	
WASH75	WASH75	1445.56	100-Yr	409.00	2567.87	2569.10	2569.23	2569.72	0.032571	6.30	64.92	80.92	1.24
WASH75	WASH75	1445.56	100-Yr_Encroache	409.00	2567.87	2569.09	2569.22	2569.74	0.033326	6.47	63.21	74.73	1.24
WASH75	WASH75	1300.34	100-Yr	420.00	2564.42	2566.54	2566.54	2567.06	0.012839	5.79	72.51	69.67	1.00
WASH75	WASH75	1300.34	100-Yr_Encroache	420.00	2564.42	2566.46	2566.46	2567.10	0.014810	6.43	65.29	52.03	1.01
WASH75	WASH75	1178.46	100-Yr	420.00	2561.07	2562.61	2563.08	2564.18	0.050592	10.06	41.73	41.16	1.76
WASH75	WASH75	1178.46	100-Yr_Encroache	420.00	2561.07	2562.65	2563.08	2564.10	0.045262	9.66	43.46	41.60	1.67
WASH75	WASH75	1078.73	100-Yr	420.00	2558.71	2560.62	2560.70	2561.24	0.016422	6.45	72.38	79.05	1.00
WASH75	WASH75	1078.73	100-Yr_Encroache	420.00	2558.71	2560.64	2560.66	2561.29	0.016645	6.55	66.19	56.13	1.00
WASH75	WASH75	962.62	100-Yr	420.00	2555.74	2556.75	2557.22	2558.40	0.108060	10.30	40.79	63.83	2.27
WASH75	WASH75	962.62	100-Yr_Encroache	420.00	2555.74	2556.75	2557.22	2558.41	0.109577	10.34	40.61	63.77	2.29
WASH75	WASH75	831.86	100-Yr	420.00	2551.98	2553.81	2553.81	2554.44	0.017013	6.37	65.94	53.15	1.01
WASH75	WASH75	831.86	100-Yr_Encroache	420.00	2551.98	2553.81	2553.81	2554.44	0.017013	6.37	65.94	53.15	1.01
WASH75	WASH75	674.58	100-Yr	420.00	2547.99	2549.49	2549.65	2550.27	0.046403	7.07	59.37	58.69	1.24
WASH75	WASH75	674.58	100-Yr_Encroache	420.00	2547.99	2549.49	2549.65	2550.27	0.046403	7.07	59.37	58.69	1.24
WASH75	WASH75	477.04	100-Yr	420.00	2542.98	2544.22	2544.22	2544.62	0.021483	5.08	82.60	106.23	1.02
WASH75	WASH75	477.04	100-Yr_Encroache	420.00	2542.98	2544.20	2544.20	2544.68	0.024085	5.59	75.20	78.47	1.01
WASH75	WASH75	334.44	100-Yr	420.00	2538.98	2539.98	2540.07	2540.55	0.039337	6.05	69.40	80.58	1.15
WASH75	WASH75	334.44	100-Yr_Encroache	420.00	2538.98	2540.01	2540.07	2540.55	0.035476	5.86	71.71	80.86	1.10
WASH75	WASH75	197.32	100-Yr	420.00	2535.00	2536.54	2536.54	2536.97	0.019307	5.29	79.38	94.65	1.02
WASH75	WASH75	197.32	100-Yr_Encroache	420.00	2535.00	2536.53	2536.54	2536.97	0.019708	5.33	78.81	94.53	1.03
WASH75	WASH75	47.19	100-Yr	420.00	2530.22	2531.67	2531.85	2532.33	0.056582	6.54	64.22	100.88	1.45
WASH75	WASH75	47.19	100-Yr_Encroache	420.00	2530.22	2531.67	2531.85	2532.33	0.054916	6.47	64.91	101.23	1.42

SITE BOUNDARY CROSS SECTION

HY-8 Culvert Calculation Output

HY-8 Culvert Analysis Report

Culvert: On-10

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 34 cfs

Maximum Flow: 76 cfs

Table 1 - Summary of Culvert Flows at Crossing: ON10

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2601.50	0.00	0.00	0.00	1
2601.80	7.60	7.60	0.00	1
2602.16	15.20	15.20	0.00	1
2602.43	22.80	22.80	0.00	1
2602.71	30.40	30.40	0.00	1
2602.83	34.00	34.00	0.00	1
2603.18	45.60	45.60	0.00	1
2603.39	53.20	53.20	0.00	1
2603.59	60.80	60.80	0.00	1
2603.79	68.40	68.40	0.00	1
2604.00	76.00	76.00	0.00	1
2604.00	76.05	76.05	0.00	Overtopping

Rating Curve Plot for Crossing: ON10

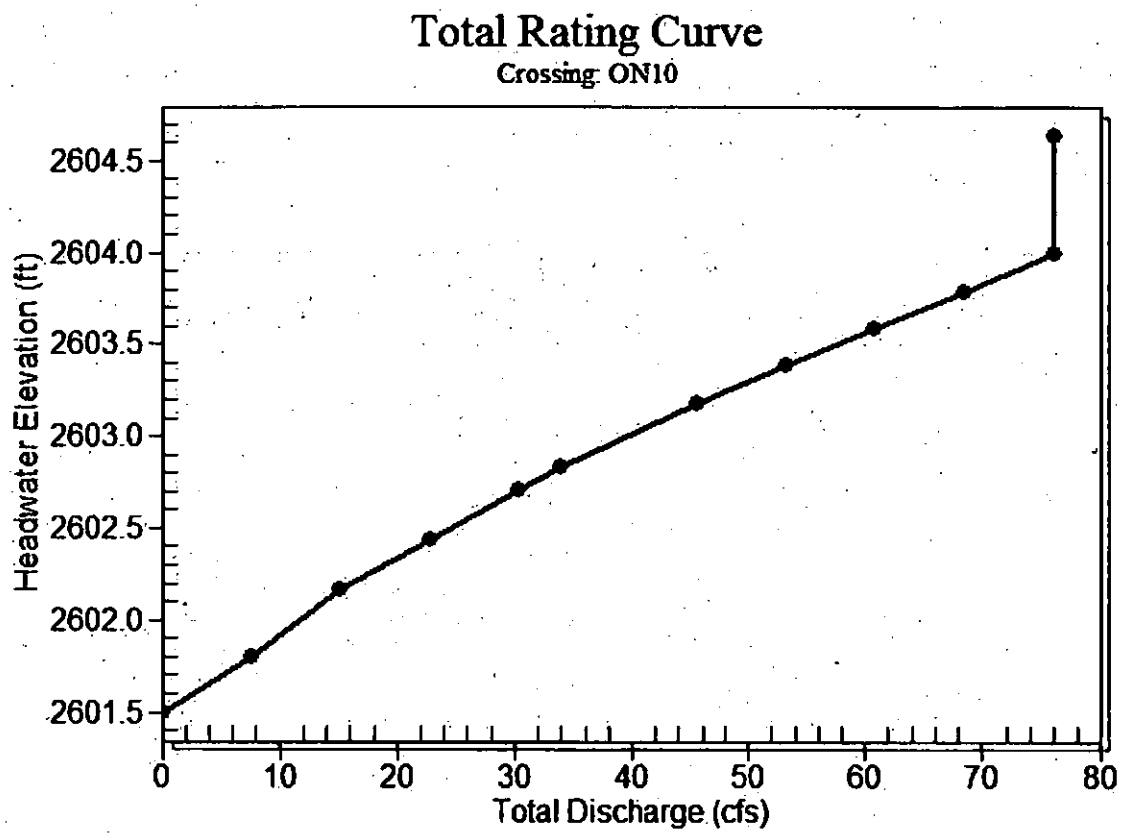


Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2601.50	0.000	0.500	0-NF	0.000	0.000	1.500	1.500	0.000	0.000
7.60	7.60	2601.80	0.802	0.506	1-JS1t	0.353	0.604	1.500	1.500	1.075	0.000
15.20	15.20	2602.16	1.159	0.526	1-JS1t	0.517	0.863	1.500	1.500	2.150	0.000
22.80	22.80	2602.43	1.434	0.558	1-S2n	0.628	1.065	0.702	1.500	8.976	0.000
30.40	30.40	2602.71	1.711	0.604	1-S2n	0.728	1.240	0.829	1.500	9.562	0.000
34.00	34.00	2602.83	1.834	0.630	1-S2n	0.776	1.317	0.884	1.500	9.742	0.000
45.60	45.60	2603.18	2.183	0.770	1-S2n	0.901	1.536	1.047	1.500	10.364	0.000
53.20	53.20	2603.39	2.390	0.982	1-S2n	0.977	1.664	1.147	1.500	10.689	0.000
60.80	60.80	2603.59	2.590	1.196	1-S2n	1.052	1.781	1.241	1.500	10.999	0.000
68.40	68.40	2603.79	2.790	1.421	1-S2n	1.122	1.896	1.332	1.500	11.278	0.000
76.00	76.00	2604.00	2.998	1.649	1-S2n	1.186	2.001	1.419	1.500	11.545	0.000

****

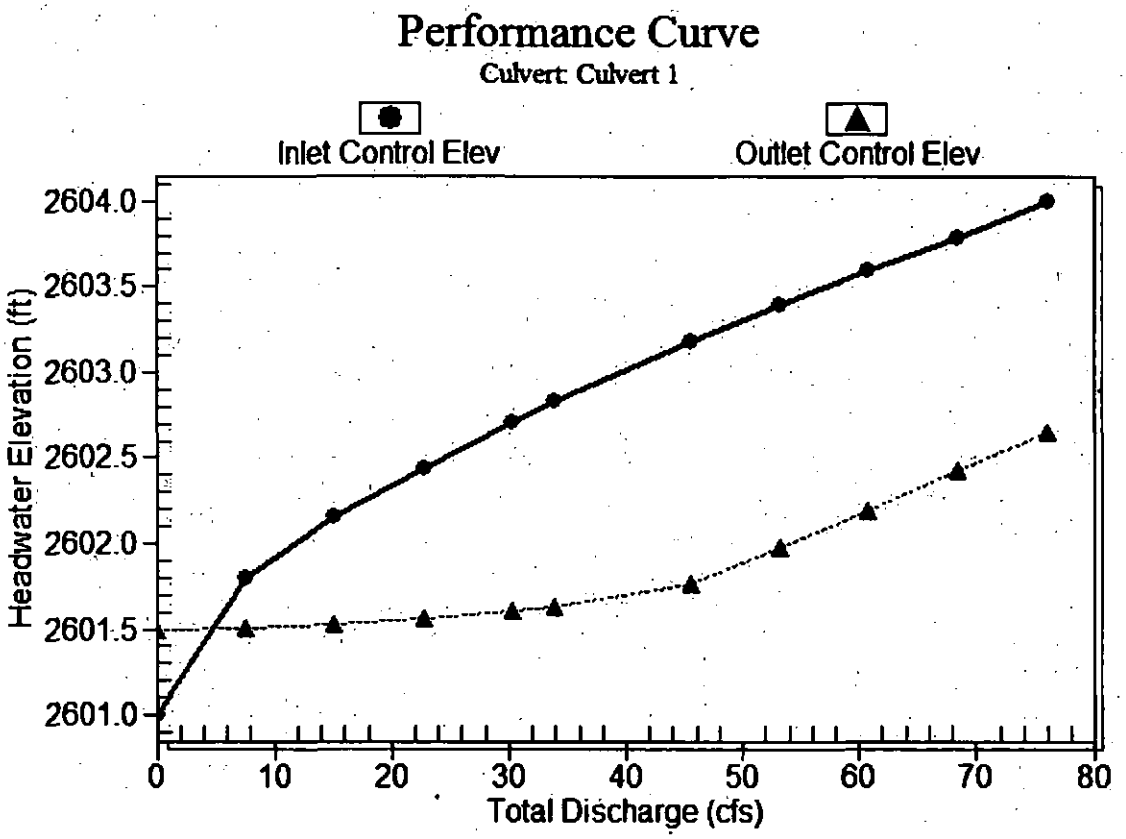
Straight Culvert

Inlet Elevation (invert): 2601.00 ft, Outlet Elevation (invert): 2600.00 ft

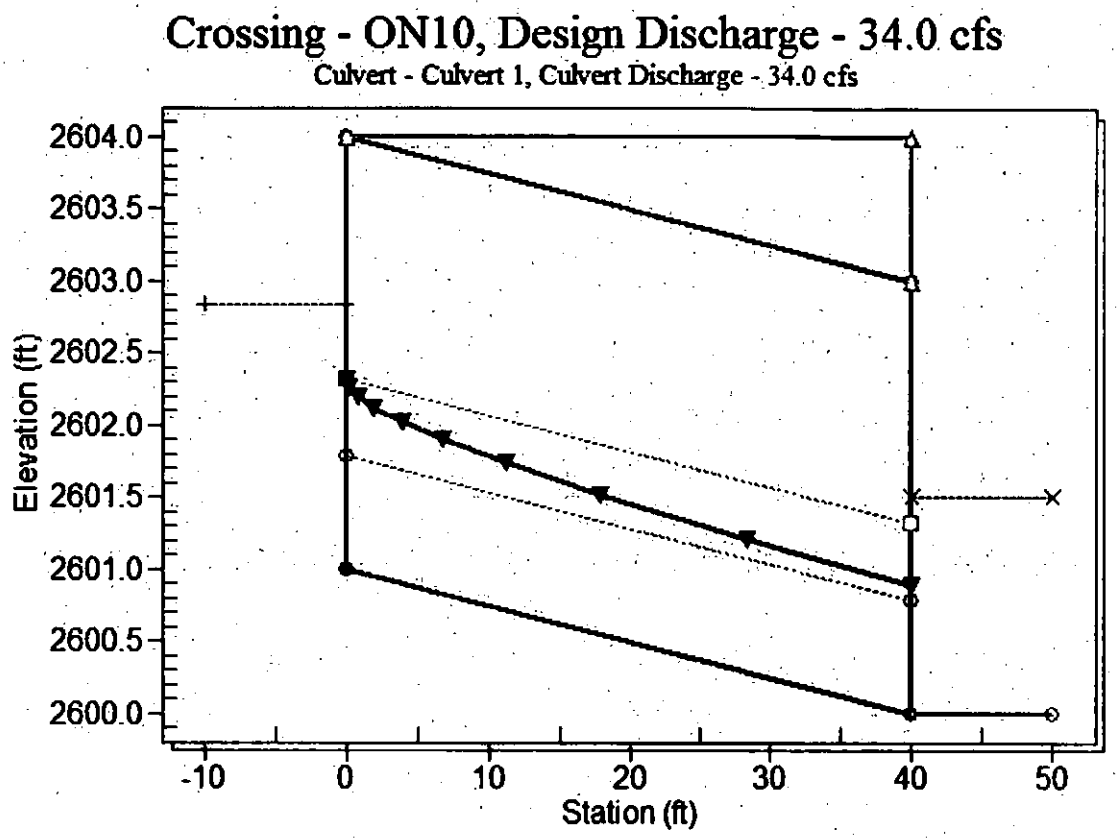
Culvert Length: 40.01 ft, Culvert Slope: 0.0250

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 2601.00 ft

Outlet Station: 40.00 ft

Outlet Elevation: 2600.00 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: ON10)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
0.00	2601.50	1.50
7.60	2601.50	1.50
15.20	2601.50	1.50
22.80	2601.50	1.50
30.40	2601.50	1.50
34.00	2601.50	1.50
45.60	2601.50	1.50
53.20	2601.50	1.50
60.80	2601.50	1.50
68.40	2601.50	1.50
76.00	2601.50	1.50

Tailwater Channel Data - ON10

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 2601.50 ft

Roadway Data for Crossing: ON10

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 90.00 ft

Crest Elevation: 2604.00 ft

Roadway Surface: Paved

Roadway Top Width: 40.00 ft

HY-8 Culvert Analysis Report

Culvert: ON-20

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 15 cfs

Maximum Flow: 33 cfs

Rating Curve Plot for Crossing: ON20

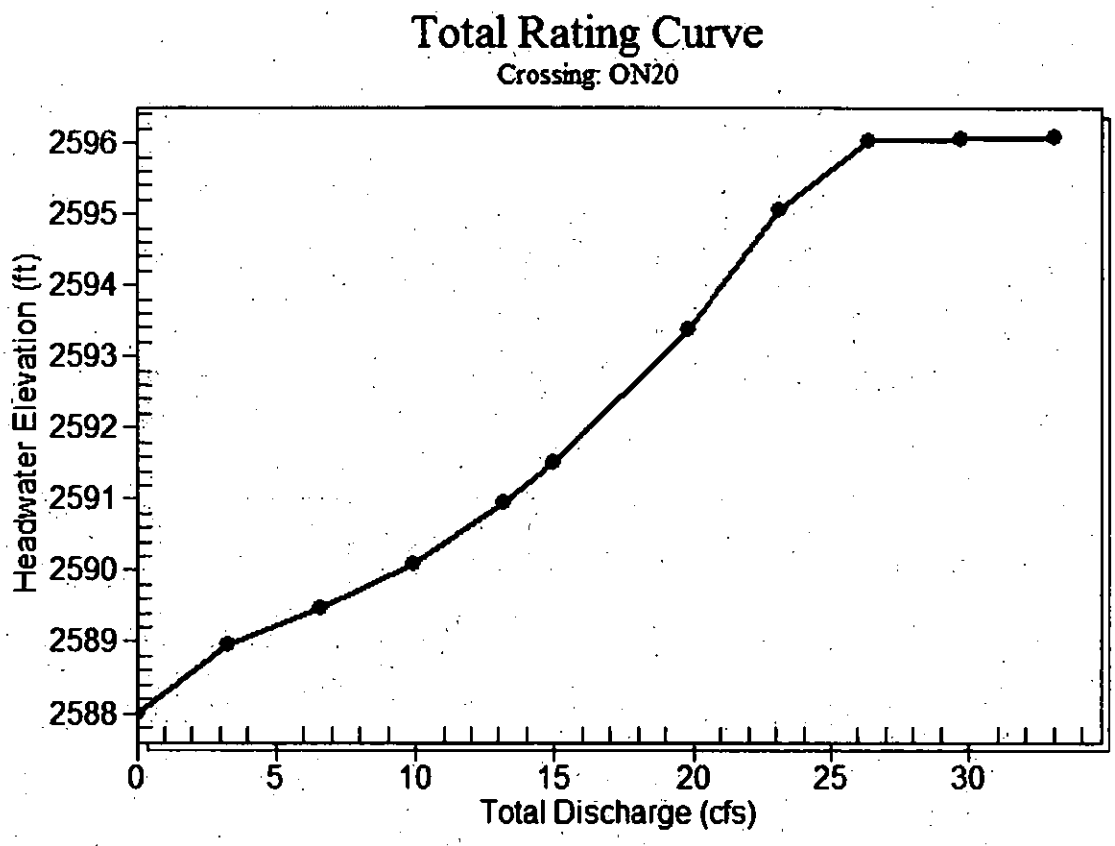


Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2588.00	0.000	0.000	0-NF	0.000	0.000	1.500	1.500	0.000	0.000
3.30	3.30	2588.96	0.959	0.0*	1-JS1f	0.382	0.692	1.500	1.500	1.956	0.000
6.60	6.60	2589.47	1.469	0.0*	1-S2n	0.552	0.991	0.589	1.500	10.298	0.000
9.90	9.90	2590.09	2.090	0.460	5-S2n	0.691	1.212	0.750	1.500	11.212	0.000
13.20	13.20	2590.95	2.955	1.208	5-S2n	0.819	1.358	0.896	1.500	11.992	0.000
15.00	15.00	2591.52	3.518	1.706	5-S2n	0.888	1.407	0.972	1.500	12.367	0.000
19.80	19.80	2593.38	5.380	3.344	5-S2n	1.081	1.500	1.211	1.500	12.966	0.000
23.10	23.10	2595.05	7.052	4.733	5-S2n	1.255	1.500	1.494	1.500	13.691	0.000
26.40	24.83	2596.03	8.032	5.547	4-FFf	1.500	1.500	1.500	1.500	14.717	0.000
29.70	24.89	2596.07	8.068	5.577	4-FFf	1.500	1.500	1.500	1.500	14.754	0.000
33.00	24.94	2596.10	8.096	5.600	4-FFf	1.500	1.500	1.500	1.500	14.782	0.000

* Full Flow Headwater elevation is below inlet invert.

****

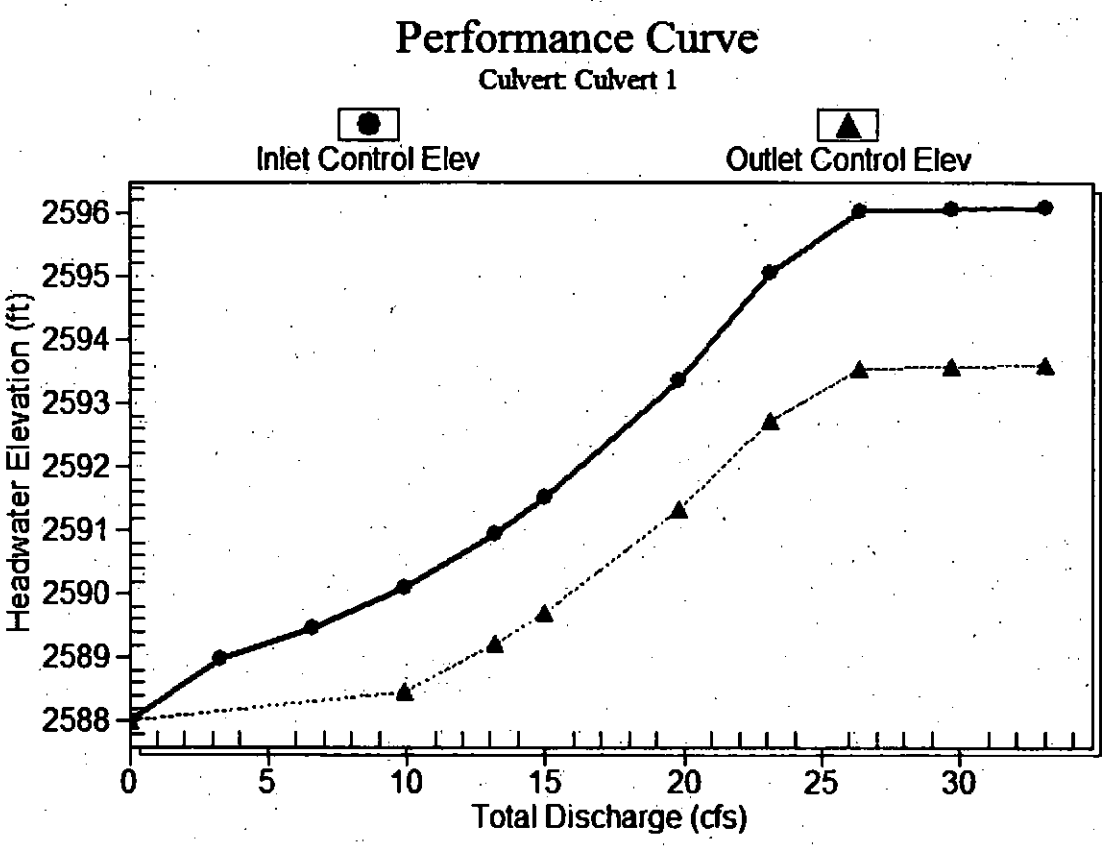
Straight Culvert

Inlet Elevation (invert): 2588.00 ft, Outlet Elevation (invert): 2586.00 ft

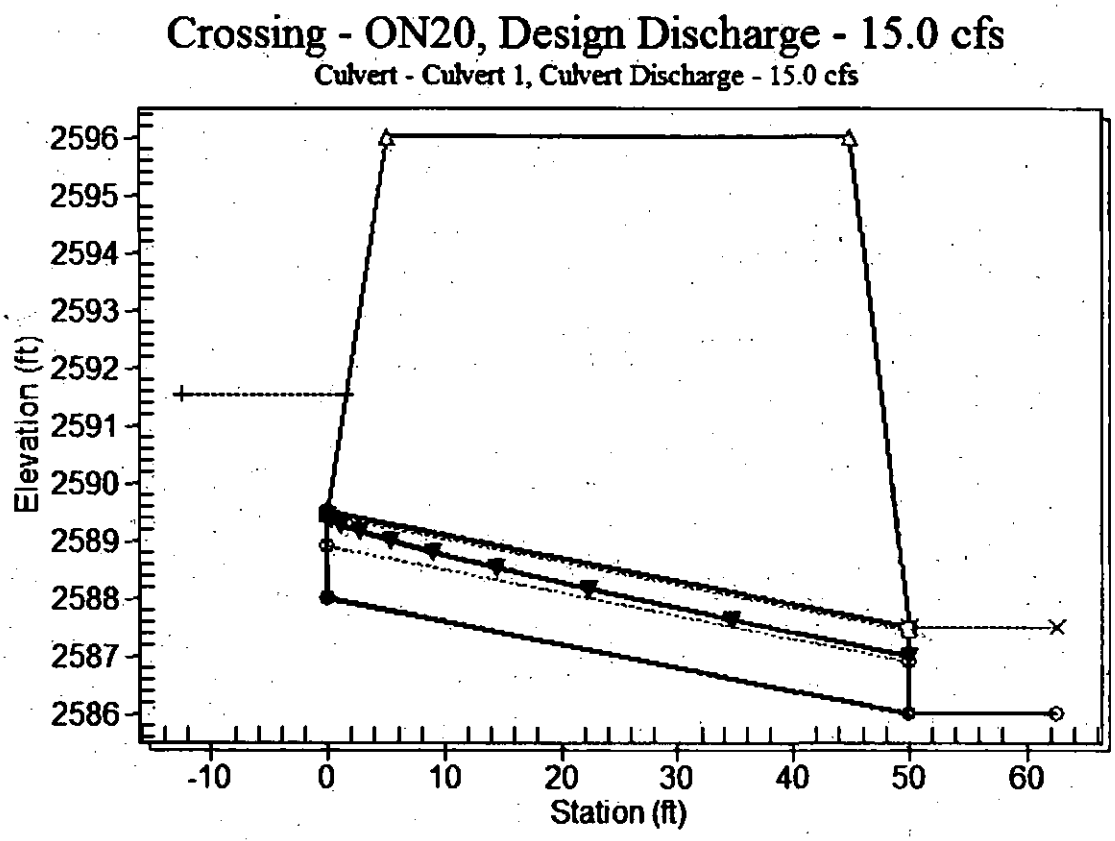
Culvert Length: 50.04 ft, Culvert Slope: 0.0400

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 2588.00 ft

Outlet Station: 50.00 ft

Outlet Elevation: 2586.00 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: ON20)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
0.00	2587.50	1.50
3.30	2587.50	1.50
6.60	2587.50	1.50
9.90	2587.50	1.50
13.20	2587.50	1.50
15.00	2587.50	1.50
19.80	2587.50	1.50
23.10	2587.50	1.50
26.40	2587.50	1.50
29.70	2587.50	1.50
33.00	2587.50	1.50

Tailwater Channel Data - ON20

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 2587.50 ft

Roadway Data for Crossing: ON20

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 90.00 ft

Crest Elevation: 2596.00 ft

Roadway Surface: Paved

Roadway Top Width: 40.00 ft

First Flush Spillway/Dissipation Basin Design

Project ***Storyrock***
Subject **First Flush Spillway/Dissipation Basin Design**
Designed by **ZJH** Date 2/5/2016 Project No. 191069020
Checked by **JMB** Date 2/5/2016

Objective: Design First Flush Spillway & Dissipation Basin for Typical Area

First Flush Equivalent Design Storm: 2 Year

Q_2 = 2-8 cfs

Spillway Design:

Top Width	8 Feet
Side Slopes	4:1 H:V
Flow Depth (2 year Design Storm)	0.5 Feet
Capacity[1] (2 year Design Storm)	5 CFS

Dissipation Basin Design:

V =Spillway Velocity[1]	5.25 ft/s
D =Equivalent Opening Width	4 Feet
Riprap $D_{50} = 0.0191*V^2*(0.61)$[2]	6 Inches
Basin Length = 4xD[3]	**16 Feet**

Notes:
(1) Refer to Attached Flowmaster Output for Spillway Hydraulic Design
(2) Per Drainage Design Manual - Hydraulics Equation 6.36, Specific Weight of Stone = 165 lb/ft3
(3) Per Drainage Design Manual - Hydraulics Table 8.6

Worksheet for First Flush Spillway

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.055	
Channel Slope	0.25000	ft/ft
Normal Depth	0.50	ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	0.00	ft

Results

Discharge	5.25	ft^3/s
Flow Area	1.00	ft^2
Wetted Perimeter	4.12	ft
Hydraulic Radius	0.24	ft
Top Width	4.00	ft
Critical Depth	0.64	ft
Critical Slope	0.06711	ft/ft
Velocity	5.25	ft/s
Velocity Head	0.43	ft
Specific Energy	0.93	ft
Froude Number	1.85	
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	0.64	ft
Channel Slope	0.25000	ft/ft

Appendix D – Stormwater Storage Waiver

Request for Stormwater Storage Waiver

City of Scottsdale Case Numbers:

___ - PA - ____ ____ - ZN - ____ ____ - UP - ____ ____ - DR - ___ ____ - PP - ____ PC#_____

The applicant/developer must complete and submit this form to the city for processing and obtain approval of waiver request ***before submitting improvement plans***. Denial of the waiver may require the developer to submit a revised site plan to the Development Review Board.

Date 10/26/2016 **Project Name** Storyrock

Project Location 128th Street and Ranch Gate Road

Applicant Contact Jason Burm, PE **Company Name** Kimley-Horn and Associates

Phone 480-207-2667 Fax _____ E-mail jason.burm@kimley-horn.com

Address 1855 W. Baseline Road, Suite 200 Mesa, AZ 85202

Waiver Criteria

A project must meet at least one of three criteria listed below for the city to consider waiving some or all required stormwater storage. **However, regardless of the criteria, a waiver will only be granted if the applicant can demonstrate that the effect of a waiver will not increase the potential for flooding on any property.** Check the applicable box and provide a signed engineering report and supporting engineering analysis that demonstrate the project meets the criteria and that the effect of a waiver will not increase the potential for flooding on any property.

If the runoff for the project has been included in a storage facility at another location, the applicant must demonstrate that the stormwater storage facility was specifically designed to accommodate runoff from the subject property and that the runoff will be conveyed to this location through an adequately designed conveyance facility.

☐ 1. The development is adjacent to a conveyance facility that an engineering analysis shows is designed and constructed to handle the additional runoff from the site as a result of development.

☐ 2. The development is on a parcel less than one-half acre in size.

☑ 3. Stormwater storage requirements conflict with requirements of the Environmentally Sensitive Lands Ordinance (ESLO).

For a full storage waiver, a conflict with ESLO is limited to:

- Property located in the hillside landform as defined in the city Zoning Ordinance
- Property in the upper desert landform that has a land slope steeper than 5% as defined in the city Zoning Ordinance
- Property within the ESL zoning overlay district where the only viable location for a stormwater storage basin requires blasting

This full waiver only applies to those portions of property meeting one of these three requirements.

Partial waivers are available for projects or portions of properties within the Environmentally Sensitive Lands Zoning Overlay District, not meeting any of the three full waiver criteria above, if post-development peak discharge rates do not exceed pre-development conditions, based on the 10- and 100-year storm events.

By signing below, I certify that the stated project meets the waiver criteria selected above as demonstrated by the attached documentation.

Engineer _____ Date 10.27.16

Planning, Neighborhood & Transportation Division

7447 E Indian School Road, Suite 105, Scottsdale, AZ 85251 • Phone: 480-312-2500 • Fax: 480-312-7781

Request for Stormwater Storage Waiver

City of Scottsdale Case Numbers:

___ - PA - ___ ___ - ZN - ___ ___ - UP - ___ ___ - DR - ___ ___ - PP - ___ PC#_____

CITY STAFF TO COMPLETE THIS PAGE

Project Name _____

Check Appropriate Boxes:

☐ Meets waiver criteria (specify): ☐ 1 ☐ 2 ☐ 3

☐ Recommend approve waiver.

☐ Recommend deny waiver:
- ☐ None of waiver criteria met.
- ☐ Downstream conditions prohibit waiver of any storage.
- ☐ Other:

Explain: _____

☐ Return waiver request:
- ☐ Insufficient data provided.
- ☐ Other: _____

Explain: _____

Recommended Conditions of Waiver:
- ☐ All storage requirements waived.
- ☐ Post-development peak discharge rates do not exceed pre-development conditions.
- ☐ Other:

Explain: _____

☐ **Waiver approved per above conditions.**

☐ **Waiver denied.**

_____ _____

Floodplain Administrator or Designee Date

Planning, Neighborhood & Transportation Division

7447 E Indian School Road, Suite 105, Scottsdale, AZ 85251 • Phone: 480-312-2500 • Fax: 480-312-7781

Request for Stormwater Storage Waiver

City of Scottsdale Case Numbers:

___ - PA - ____ ____ - ZN - ____ ____ - UP - ____ ____ - DR - ___ ____ - PP - ____ PC#_____

In-Lieu Fee and In-Kind Contributions

In-lieu fees are only applicable to projects where post-development peak discharge rates exceed pre-development levels, based on the 10- and 100-year storm events. If the city grants a waiver, the developer is required to calculate and contribute an in-lieu fee based on what it would cost the city to provide a storage basin, sized as described below, including costs such as land acquisition, construction, landscaping, design, construction management, and maintenance over a 75-year design life. The fee for this cost is $1.87 per cubic foot of stormwater storage for a virtual storage basin designed to mitigate the increase in runoff associated with the 100-year/2-hour storm event. The applicant may submit site-specific in-lieu fee calculations subject to the Floodplain Administrator's approval.

The Floodplain Administrator considers in-kind contributions on a case-by-case basis. An in-kind contribution can serve as part of or instead of the calculated in-lieu fee. In-kind contributions must be stormwater related and must constitute a public benefit. In-lieu fees and in-kind contributions are subject to the approval of the Floodplain Administrator or designee.

Project Name StoryRock

The waived stormwater storage volume is calculated using a simplified approach as follows:

V = ΔCRA; where
V = stormwater storage volume required, in cubic feet,
ΔC = increase in weighted average runoff coefficient over disturbed area ($C_{post} - C_{pre}$),
R = 100-year/2-hour precipitation depth, in feet (DSPM, Appendix 4-1D, page 11), and
A = area of disturbed ground, in square feet

Furthermore,

$V_w = V - V_p$; where
V_w = volume waived,
V = volume required, and
V_p = volume provided

R = _____
ΔC= _____
A = _____
V = _____
V_p= _____
V_w= _____

☐ An in-lieu fee will be paid, based on the following calculations and supporting documentation:
In-lieu fee ($) = V_w (cu. ft.) x $1.87 per cubic foot = _____

☐ An in-kind contribution will be made, as follows:

_____
_____
_____

☐ No in-lieu fee is required. Reason:

_____
_____

Approved by:

_____ _____
Floodplain Administrator or Designee Date

Planning, Neighborhood & Transportation Division
7447 E Indian School Road, Suite 105, Scottsdale, AZ 85251 • Phone: 480-312-2500 • Fax: 480-312-7781

Appendix E – Preliminary Grading Plan

TR1
118TH STREET
SL2
SL1
UD1
EX. 8" SEWER
RANCH GATE ROAD
TR2
OS6
EXISTING LIFT STATION
PROP. 8" GRAVITY SEWER
TR3
GR1
EX. 8" SEWER
TR4
HAPPY VALLEY ROAD (ALIGNMENT)
EX. 8" SEWER
EX. 6" FORCEMAIN
GR2
OS4
EX. 8" SEWER (MIN SLOPE = 0.052%)
GRANITE RIDGE
128TH STREET
EX 8" SEWER @0.040% SLOPE (POTENTIAL SURCHARGED AREA - 300 LF)
EX. 8" SEWER @1.04% SLOPE (POTENTIAL SURCHARGED AREA - 450 LF)
OS5
126TH
SC
EX. 8" SEWER
ALAMEDA ROAD
ALAMEDA ROAD
TE
100' SCENIC CORRIDOR
HAPPY VALLEY ROAD
TR5
UD2
PINNACLE PEAK ROAD
FUTURE PLANNED RESORT
A1
A2
A3
A4
A5
OS1
NOT A PART
134TH (ALIGN)
RANCH GATE
B1
B2
B3
B4
B5
OS2
NOT A PART
LS#2
LS#1
C1
C2
C3
C4
C5
C6
D1
D2
D3
ALAMEDA
GATE
OS3
E1
E2
E3
NOT A PART
F1
F2
F3
F4
F5
F6
LS#3
G1
G2
G3
NOT A PART
FAMILY VILLAGE
CORRIDOR
FM
MIDDLE
100'
PINNACLE PEAK (ALIGN)

NO.	REVISION	DATE

Kimley»Horn

7740 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

SCALE (H): 1"=500'
SCALE (V): NONE
DESIGNED BY: ZJH
DRAWN BY: MRN
CHECKED BY: REL
DATE: OCT 2016

STORYROCK
ENGINEER DESIGN REPORT
LIFT STATION #2 SYSTEM MAP
SCOTTSDALE, ARIZONA

PROJECT NO.
191069020

DRAWING NAME
SITE LAYOUT

3.2 Existing Lift Station and Sereno Canyon Service Area

The development of the Sereno Canyon lift station at 128th Street and Ranch Gate Road was intended to serve the properties adjacent to Sereno Canyon as described by the Sereno Canyon sewer service area within the *Facility Payback Agreement for Sewer System Improvements in the Sereno Canyon Service Area.* All properties in the proposed development are within this service area and have been allocated a percentage of capacity based on the proposed zoning and 0.31 du/acre.

The approved *Conceptual Master Wastewater System Report for Sereno Canyon* provides detailed analysis of the proposed system, including analysis of downstream pipe capacities in existing and ultimate conditions. The Sereno Canyon Lift Station consists of a duplex pumping station in a single wet well with an overflow storage area. Two identical pumps are provided, with a design flow of 350 GPM at a total dynamic head (TDH) of 151 feet.

The Sereno Canyon Lift station can be seen on **Figure 3 – System Layout.**

3.3 Proposed System Layout

Lift Station #2 will be one of three lift stations to be constructed to service the proposed StoryRock development. Approximately 10,400 feet of gravity sewer will be installed within the development that will outfall to the lift station. The lift station will utilize a new force that will convey flows into a proposed gravity sewer line that will be installed along 128th Street. Flows to this gravity sewer will outfall to the existing Sereno Canyon lift station. The full system layout can be seen on **Figure 1 – Vicinity Map.**

3.4 Proposed Site Layout

The proposed site is laid out on a 100' by 100' piece of land, at the low point of the StoryRock development. The site will consist of a six-foot diameter wet well, valve vault, meter vault, electrical control pad, transformer, concrete pad for a future chemical feed system, and a gas powered generator . The full site layout can be seen on **Figure 4 – Site Layout.**

80'

65'

NORTH

3" FORCE MAIN

FM

S

W

CHEMICAL PAD

CONCRETE METER VAULT

48" CONC MANHOLE

PROP GATE

VALVE VAULT

GENERATOR

6'ø WET WELL

8" GRAVITY SEWER

48" CONC MANHOLE

TRANSFORMER

ANTENNA STAND

48" CONC MANHOLE

ELECTRICAL CONTROL PAD

80'

BLOCK WALL

GRAPHIC SCALE IN FEET

0 5 10 20

NO.	REVISION	DATE

Kimley»Horn

7740 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

SCALE (H): 1"=20'
SCALE (V): NONE
DESIGNED BY: MRN
DRAWN BY: MRN
CHECKED BY: REL
DATE: MAY 2016

STORYROCK
ENGINEER DESIGN REPORT
LIFT STATION #2 SITE LAYOUT
SCOTTSDALE, ARIZONA

PROJECT NO.
191069020

DRAWING NAME
SITE LAYOUT

4.0 Hydraulic and Capacity Analysis of Proposed Lift Station

4.1 Sereno Canyon Lift Station Allocation

This Conceptual Master Wastewater Plan has been prepared for the proposed Cavalliere Ranch Master Planned Community. See *Cavalliere Ranch Sewer Master Plan* for further information.

4.2 Sereno Canyon Service Area

In addition to the StoryRock project area, the existing lift station is intended to serve a total service area of approximately 1,200 acres. The original zoning of the service area was R1-130 with an associated density of 0.31 dwelling units per acre. The *Sereno Canyon Amended Master Wastewater Report* addressed the rezoning of Sereno Canyon to a higher density. It is anticipated that other developments in the service area may rezone to a higher density similarly to StoryRock and Sereno Canyon. For the purpose of this report, it is assumed that the developments west of 128th Street will rezone to a density of 1 dwelling unit per acre. The state land north of Ranch Gate Road is not anticipated to rezone to a higher density due to its proximity to existing low density developments. The calculated peak wet weather flow of for the Sereno Canyon service area per this report is 320 GPM.

According to the Sereno Canyon Amended Master Wastewater Report the Sereno Canyon Lift Station has a design capacity of 350 GPM. The existing lift station has the capacity for the calculated peak flow of the service area. Additionally, the existing 6" forcemain has adequate capacity to convey this peak flow.

4.3 Site Required Capacity

The StoryRock project area has been divided into multiple phases for constructability purposes, with Lift Station #2 supporting phases 1A and 1B, which are shown in **Figure 1 – Vicinity Map**. Ultimate design flow is estimated at 70 GPM as shown in **Figure 5 – Design Flows**. With the project being constructed in phases, the initial phased flows were evaluated. While phasing order will be confirmed at a later date, Phase 1A is assumed to be the first constructed, and will have an initial peak wet weather flow of approximately 31 GPM.

Using the existing topography and proposed locations of both the gravity sewer, as well as Lift Station #2, we've determined the static head for the proposed force main to be as follows:

Pumps Off Elevation	**2537.00**
Flow Line of Force Main at High Point	**2643.00**
Calculated Static Head	**106.00**

4.4 Pump & Force Main Phasing

With the phasing schedule anticipated for the StoryRock community, it is anticipated that the interim design flow will be a less than half of the ultimate design flow. In order to mitigate low design flow rates, the City has accepted the use of supplementing initially phased low demands with potable water that can be entered into the gravity sewer system upstream of the proposed lift station. This will flush the gravity system with potable water and will allow daily flushing of the force main to prevent the settling of solids within the force main. This will also reduce the potential of odor issues as well as help ensure that downstream gravity sewers are adequately flushed. Analysis of the system under both the interim and ultimate conditions can be seen below and in **Figure 5 – Design Flows**. The ultimate pump and system curves can be found in **Figure 6 – MP 3127 HT 3-262 System & Pump Curve.** Further information regarding the pump, including specs, efficiencies, pump curve, etc., can be found in **Appendix C**.

Condition	Total # of Lots	Flow to Lift Station (GPM)	Force Main Size	Pump	Pump Flow (GPM)	Total Dynamic Head (ft)	Force Main Flow Velocity (fps)
Interim	76	31 + supplemented potable water	3"	MP 3127 HT3-262, 170mm Impeller	71	162.82	3.08
Ultimate	170	70					

Lift Station # 2 Design Flows							
Phase	**AREA**	**DWELLING UNITS (DU)**	**POPULATION**	**AVERAGE FLOW (gpd)**	**AAC Peaking Factor[1]**	**AAC Pipe Peak Wet Weather Flow (gpd)[2]**	**AAC Pipe Peak Wet Weather Flow (gpm) (Total)**
Phase 1A	A1	10	22	1,720	2.74	5,891	31
	A2	21	45	3,612	2.74	12,371	
	A3	38	82	6,536	2.74	22,386	
	A4	5	11	860	2.74	2,946	
	A5	2	4	344	2.74	1,178	
Phase 1B	B1	16	34	2,752	2.74	9,426	20
	B2	18	39	3,096	2.50	9675	
	B3	17	37	2,924	2.74	10,015	
Exception	OS1	3	6	516	2.74	1,767	18
	OS2	40	86	6,880	2.74	23,564	
	Total	**170**	**366**	**29,240**	**2.74**	**100,147**	
					GPM	**70**	
					Pumped Flow	**71**	

(1) Peaking factor per AAC Title 18 - Chapter 9

(2) Wet Weather Peak Flow = 125% Dry Weather Peak Flow

Job Number	191988002
Job Description	Storyrock LS #2
Date	10/12/2016
Designed By	MRN
Checked By	REL
Pump Type	MP 3127HT3-262

HAZEN-WILLIAMS EQUATION FOR TDH CALCULATIONS

System Elevations:

Pumps Off Elevation		2537.00	ft
Flow Line of Force Main at High Point		2643.00	ft
Calculated Static Head	$\Delta Z =$	106.00	ft

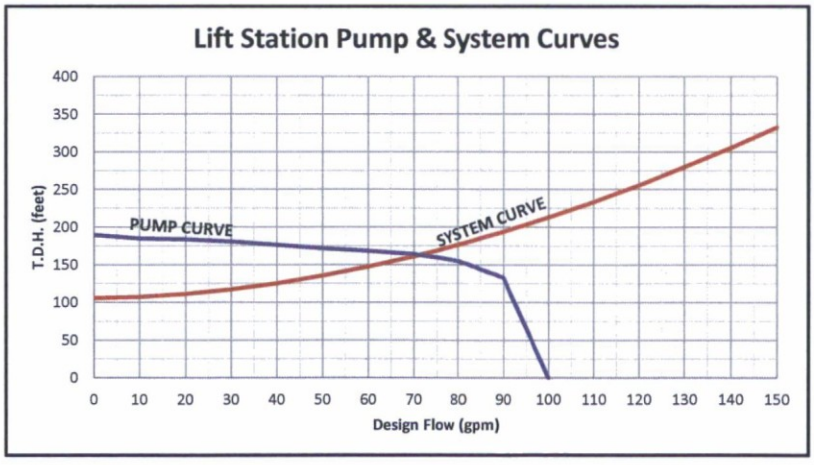
Hazen-Williams Parameters:

Dia. of Discharge Piping	D =	3.069	inches
Length of Discharge Piping	L =	10	ft
Dia. of Force Main	D =	3.07	inches
Length of Force Main	L =	3890	ft
Hazen Williams Coefficients	C =	130	
Minor Losses - Sum of Coefficients for Discharge Piping	K_D =	1	taken from Minor Losses tab
Minor Losses - Sum of Coefficients for Force Main	K_{FM} =	6.87	taken from Minor Losses tab

Flow Interval for Tables: 10 gpm

C = 130 for Discharge Piping, C = 130 for Proposed Force Main

Flow (GPM)	Friction Head (Discharge Piping) (ft.)	Minor Losses (Discharge Piping) (ft.)	Friction Head (Force Main) (ft.)	Minor Losses (Force Main) (ft.)	T.D.H. (ft.)	Force Main Flow Velocity (fps)	Pump Curve (ft.)
0	0.00	0.00	0.00	0.00	106.00	0.00	190
10	0.00	0.00	1.50	0.02	107.51	0.43	185
20	0.01	0.01	5.42	0.08	111.45	0.87	184
30	0.03	0.03	11.48	0.18	117.54	1.30	181
40	0.05	0.05	19.55	0.32	125.65	1.73	176
50	0.08	0.07	29.55	0.50	135.70	2.17	172
60	0.11	0.11	41.40	0.72	147.61	2.60	168
70	0.14	0.14	55.06	0.98	161.35	3.04	164
80	0.18	0.19	70.49	1.28	176.86	3.47	156
90	0.23	0.24	87.66	1.63	194.12	3.90	133
100	0.27	0.29	106.52	2.01	213.09	4.34	0
110	0.33	0.35	127.06	2.43	233.74	4.77	
120	0.38	0.42	149.25	2.89	256.06	5.20	
130	0.44	0.49	173.07	3.39	280.01	5.64	
140	0.51	0.57	198.51	3.93	305.59	6.07	
150	0.58	0.66	225.53	4.52	332.77	6.51	



Approximate Capacity at C = 130: 71 gpm

5.0 Sitework

5.0 Site Options

The StoryRock project is being developed with the intent of attracting high income families. With the resulting higher quality developments, it may be preferable to look at different alternatives for the lift station to prevent neighbors and area developments being obstructed by the various aspects of the lift station (e.g. how the site looks, controlling odors, noise, etc.). Options for the site development of the lift station are as follows:

- Develop a decorative wall high enough to shield immediate neighbors from both views of the lift station, as well as prevent excess noise. Wall articulation that matches the theme of the neighborhood would help maintain an attractive look to the neighborhood.
- Decorative sun shades could be utilized to shield the site from above. Shades could be constructed for both the individual pieces of equipment, as well as for the whole site.
- Landscaping could be utilized, including large trees and native vegetation, and/or well placed earth with retaining walls to give a more natural look and obstruct views of the station equipment.
- Depending on the topography of the area, parts of the lift station can be constructed into sunk areas with retaining walls, creating a larger difference between the top of the walls and the top of the equipment
- The developers could look at constructing a house or architectural building matching area homes. Examples of other buildings utilized on other lift station projects can be found in **Appendix D**.

5.1 Wall

Per Section 7-1.205 of the *City of Scottsdale Design Standards & Policies Manual*, a perimeter wall will be required to be constructed around the site, but maintaining enough room inside of the site that all equipment and service equipment will be easily accessible for repair. As such, a 10-foot block wall is proposed around the site, with gate access located on the northwest corner of the site. As discussed in the previous section, there are several different options available to improve the aesthetics of the wall.

5.2 Odor Control

Per discussions with the City, odor control is not typically installed at new lift station sites. However, provisions for odor control chemical additional shall be provided at the lift station site in case the City deems it necessary to have installed. Installation will include a concrete pad for a future chemical storage tank, as well as electrical hook ups for future installation.

The City will require an odor control system at the force main outfall into the gravity system. Various options for outfall odor control include:

- Installing a sealed manhole at the outfall with a 'blower' to send the air through a filter that absorbs the H2S. See **Appendix E – Odor Control** for examples of a Hartzell Blower, as well as a both a Vapex and Ecoair filter.

- Installing a chemical feed at the lift station to help treat the sewage for H2S. The bioxide chemical used in this process is non-toxic, which means secondary containment on-site is unnecessary and chemical refilling procedures are greatly simplified. The chemical would be added before the sewage enters the force main, allowing the chemical to work as it works its way towards the outfall.

5.3 Generator

We plan to supplement the site power with addition of a standby generator. Similar sites (using combined motor Hp under 100Hp) utilize generators in size from 60KVA to 150KVA. Currently we plan to use a 150KVA generator that is switched via ATS in an emergency condition. We will coordinate with Scottsdale utility personnel to account for error conditions and controls to the generator.

5.4 Controls

Per Scottsdale Sewer Lift Station Design Criteria (Revision 10/15/15) we will provide controls of the station pumps, and control its overall operation. Scottsdale design standards will dictate flow sensing, telemetry, alarm systems and safety precautions, and associated hardware to ensure reliable communication with existing radio systems. Overall functionality and sequence of lift station's operations will be confirmed with city personnel in cases of specific operations for this lift station.

5.5 Lighting

Perimeter lighting will be installed per applicable City of Scottsdale standards. We will first design lighting in accord with lift station design requirements. In absence of specific lighting requirements for lift stations, IES (Illuminating Engineering Society) suggestions will be supplemented. Site lighting will be placed in locations that maintenance personnel agree with, and will be controlled using a hierarchy that is dictated by site management. We will conduct a basic calculation (AGI32 or approved software) to determine light levels and provide verification of fixture number and positioning.

5.6 Pump Enclosure

Various options exist for the wet well on the Lift Station #2 development site, which will vary based on the required volume and maximum depth of the wet well. As stated in Section 2.3 – Lift Station Design, the size of the wet well will be 6' diameter with approximately a 2' operational depth. Additional vender information regarding the layout of the wet well and associated piping can be found in **Appendix G**.

An additional option for the wet well construction would be a fiberglass wet well, which is pre-constructed to include pumps, valve box, and water meter all in the construction of the wet well itself. This particular wet well would have a smaller foot print, which would assist in minimizing the size of the overall lift station site. Example plans of the Fiberglass Wet Well can be found in **Appendix F**.

6.0 Permits Required

1) Project shall require submittal of an Approval to Construct (ATC) and Approval of Construction (AOC) to the Maricopa County Environmental Services Department (MCESD).

2) Project shall require submittal of a Building Permit to the City of Scottsdale Planning and Development Services Department.

7.0 Recommendations

1) Lift station site will be designed and constructed to include the following: Electrical Control Pad, Transformer, Generator, 6-foot diameter wet well, chemical pad valve vault, and meter vault.

2) Lift station site will be designed to aesthetically accommodate the surrounding development through the use of either a decorative wall, landscaping, shading structure(s), combination thereof, or an architectural building.

3) Wastewater flows will be collected via 8" sanitary sewer lines across the StoryRock development area for Lift Station #2

4) Site will be designed to accommodate an ultimate flow of 70 GPM. Interim lower flows will be accommodated by introducing potable water into the gravity sewer system upstream of the proposed lift station.

5) Lift Station #2 will require the installation of two MP 3127 HT 3 – 262 Motors

6) Odor control options will be required at the gravity sewer force main outfall

7) Dual PVC force mains will be constructed. Both force mains will be constructed as 3" PVC lines.

8) Force main will tie in with a currently proposed gravity sewer line, which will take flows to the existing Sereno Canyon Lift Station

CITY OF SCOTTSDALE
SEWER LIFT STATION DESIGN CRITERIA
Revised 10/15/15

The purpose of this Sewer Lift Station Design Criteria document is to provide direction for the design of sewer lift stations that will ultimately be owned and operated by the City of Scottsdale (City). It is also recommended that privately-owned lift stations follow this document in the event that the City is asked or required to assume responsibility. While this document provides additional guideline for the design of sewer lift stations, it is not comprehensive and additional criteria may be required by both the City and the client based on project specific needs. The reader is also referred to the City of Scottsdale Design Standards and Policies Manual (DS&PM) for additional wastewater system criteria, including lift stations. The criteria provided herein are organized into general categories as shown below.

1 GENERAL/DOCUMENTATION

1.1 Prior to final inspection and acceptance, three sets of the following documents shall be prepared and provided to the City Water Resources Department (WRD): (1) As-Built/Record Drawings, and (2) Operation and Maintenance manuals. Each set shall include 1 hard copy and 1 electronic copy of the provided materials. In addition, each control panel shall have a copy of the panel drawings located inside the panel itself.

1.2 The City shall be provided a copy of all Maricopa County Environmental Services Department (MCESD) Approval to Construct (ATC) and Approval of Construction (AOC) documentation. AOC shall be obtained after functional testing and prior to system start-up.

1.3 All equipment shall be provided with the manufacturer recommended spare parts.

2 PROCESS/MECHANICAL

2.1 Each sewer lift station shall include a minimum of 2 pumps sized in a 1 duty + 1 standby configuration (or n+1 for larger configurations). Design flows shall be calculated in accordance with the DS&PM and in consultation with City WRD. Each pump shall additionally include a 35 gpm flow allowance above the peak calculated flow to account for the draining of swimming pools in the service area.

2.2 The following list provides the submersible sewage pump requirements:

- Pump shall be of submersible type and mounted on two (2) 304L stainless steel rails. Rail mounting hardware shall also be 304L stainless steel including the submersible cable for pump removal.
- Motors shall be air cooled submersible type, totally enclosed, non-ventilated, constant speed, inverter duty (VFD rated), 480V/3PH/60Hz.
- Pumps shall be capable of passing 2 1/2" solids.
- Pump shall be equipped with stainless steel motor shafts.
- Pump Manufacturer shall be Fairbanks Morris, Flygt ITT, or approved equal.

2.3 Provide ductile iron piping for the discharge forcemain to a point 10 feet outside of the lift station property boundary.

2.4 The wet well access hatch shall include a locking hasp and be construction of aluminum, stainless steel, or other non-corrosive material. Access hatch shall be H20 load rated if located within a vehicle pathway.

2.5 Check valves shall be the full-port solids handling ball-type and shall be located outside the wet well in a separate vault. Air release valves shall also be installed inside the vault upstream of the check valves and plug valves shall be installed downstream. All equipment shall be rated for sewer service.

2.6 A 1.5" metered water source shall be installed for wash-down and cleaning up. The meter and backflow prevention device will be located adjacent to but outside the walls of the facility (See City of Scottsdale Standard Detail 2354). At least one hose bib shall be provided and shall have an approved atmospheric vacuum breakers and installed in an above ground location. At no time shall there be a connection between domestic water and the wet well or waste water.

2.7 Wet well wall interior surface shall be coated with Raven 405, Neopoxy 5300 or approved Equal. The coating will be applied to a minimum thickness of 80 mils. A factory certified technician will install the coating. The coating will be guaranteed free of defects and workmanship for a five-year period. The warranty will cover material, coating replacement and or repair. After the protective coating has set hard to the touch it shall be inspected with high-voltage holiday detection equipment. An induced holiday shall be made on to the coated concrete surface and shall serve to determine the minimum/maximum voltage to be used to test the coating for holidays at that particular area. The spark tester shall be initially set at 100 volts per 1 mil (25 microns) of film thickness applied but may be adjusted as necessary to detect the induced holiday. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other hand tooling method. After abrading and cleaning, additional protective coating material can be hand applied to the repair area. All touch-up/repair procedures shall follow the protective coating manufacturer's recommendations. The manhole that receives the sewer lift station fluids will also be coated per these details.

3 ODOR CONTROL

3.1 Odor generation at a lift station is a highly variable element of lift station design that is impacted by upstream dischargers, hydraulic turbulence, upstream odor control chemical use, etc. At a minimum, provisions for odor control chemical addition shall be provided, including a concrete pad for a future chemical storage tank. However, due to the variable nature of odor generation and odor mitigation alternatives, the City Water Resources shall be contacted for approval of the specific odor control concept.

4 ELECTRICAL

4.1 The electric utility service shall be 480V 3PH.

4.2 A main service entrance disconnect is required.

4.3 Electrical cabinets shall be NEMA 4.

4.4 Phase protection shall be provided for all three-phase motors and pumps.

4.5 An hour meter (i.e. run-time totalizer) with local display shall be provided for each pump.

4.6 A power monitor shall be provided for each pump and shall be a watt-hour transducer Sineax PQ502, or approved equal. Power monitoring shall detect electrical load balance with current transformers and shall produce a 4-20 mA signal to the RTU, proportional to power used at each pump.

4.7 Pumps shall be driven with a motor soft starter, Benshaw or approved equal. For "grandfathered" lift stations without 480V/3PH power, Toshiba Variable Frequency Drives shall be used to transform the site power to 3PH for the pumps.

4.8 Oversized conduits shall be provided for the pumps to facilitate future pump replacement. Additionally, a spare conduit shall be provided.

4.9 All conduits that penetrate the Class 1 Division 1 boundary shall include a conduit seal per NFPA 820.

4.10 A minimum of one (1) 20A, 120V, 1PH outdoor rated convenience receptacle shall be provided on a dedicated circuit.

4.11 A generator shall be provided for backup power. The generator shall be 4 cycle natural gas, or diesel if natural gas is not feasible. Generator shall be load tested at the site at full rated power for a minimum of 6 hours. Should the generator be diesel fueled the tank shall be topped off after the load test. (See Section 7.3 The wetwell shall be provided with the appropriate warning signage regarding confined space entry.

4.12 Sound Level Limits)

4.13 An Arc Flash and coordination study shall be completed on new or modified electrical equipment and the gear shall bear the appropriate Arc Flash labels.

5 INSTRUMENTATION/CONTROLS

5.1 The control panel shall be powered through a dedicated circuit breaker and shall be separate from the pump starters.

5.2 Pump failure indicator lights shall be provided on the control panel. An internal lamp will latch upon failure. The alarm shall be capable of being reset either locally or remotely.

5.3 The lift station discharge flow meter shall be an ultrasonic type Endress+Hauser Prosonic Flow C, or approved equal, and shall comply with the following requirements.

5.3.1 The ultrasonic flow meter must comply with the applicable provisions of AWWA C750-10.

5.3.2 The totalizer will feature a digital indicator and solid state transmitter. The totalizer-transmitter will provide a 4-20 mA current signal proportional to the rate of flow.

5.3.3 Meter shall be installed per manufacturer's specifications for upstream and downstream straight-run distances.

5.3.4 Meter shall be sized to accurately measure both high and low flow and in accordance with the manufacturer's published data.

5.4 Level transducer shall be Endress+Hauser Waterpilot FMX21and shall be used to measure wet well water level for pump operation and alarms. Level transducer shall be Waterpilot model number FMX21-FE211HGK25A (FE: Class 1 Division 1 Groups A-D; 2: 4-20m; 1: 316L 22mm Probe tube; 1H: 33 ft H2O Sensor range; G: Standard accuracy; K: 0-20FT/H2O custom factory calibration; 25: 60-ft shortable PE cable; A: FKM Viton seal).

5.5 Level switches, Roto-float or approved equal, shall be provided as a secondary means of control and shall be powered from the Uninterruptable Power Supply (UPS). Floats shall mounted using 316 stainless steel hanger(s), that provide a minimum separation distance of 8 inches.

6 TELEMETRY

6.1 The Remote Terminal Unit (RTU) shall be Bristol Babcock Control Wave and compatible with the City's existing telemetry system. The preferred DO card is CWM-SEG 60-Sel 11. The City shall be contacted to obtain the specific RTU requirements that apply to the project. The engineer shall provide the system design elements, including number of pumps, sequence of operation, etc. so that the number of digital inputs and outputs can be verified and included in the RTU specification. The RTU shall include a keypad.

6.2 As soon as the location for the lift station is identified, Water Resources will conduct a survey to check communication with a City repeater. The outcome of this survey will be to provide an antennae height requirement that shall be implemented in the project.

6.3 Microwave Data Systems 9710A "smart" data remote transceiver, TX ON: 928.18125 MHz, 12V, DC input power, 4800 and 9600 baud rate Asynch digital interface modem, RS 232 interface-direct, type "N" female antenna connector with loopback option.

6.3.1 Scala TY-900 Yagi antenna, "N" female connector

6.3.2 Polyphaser IS-50NX-C2 lightning arrestor

6.4 Heliax coaxial cable 1/2" foam dielectric 50 OHM LDF 4-50A; number of feet to be determined by the design engineer.

6.4.1 Two Andrew type L44PLU "N" male connectors

6.5 Hoffman enclosure - NEMA 4, 30" x 24" x 8", including panel, painted white, or approved equal.

6.5.1 Hoffman Catalog #A30H24BLP

6.5.2 Hoffman Catalog #A30P24, including lock kit.

6.6 Single output series power supply 12V, DC output, 3.4 Amp, 115VAC input. Newark Catalog #89F1271

6.6.1 Single output series power supply 24V, DC output, 3.6 AMP, 115VAC input. Newark Catalog #89F1264

6.6.2 Two gel-cell batteries, 12VDC, 6 AMP/hr operable to 140° F. Newark Stock #99F1805

6.7 RTU will be programmed by the City of Scottsdale personnel.

6.8 RTU will include keypad option.

6.9 RTU shall include an uninterruptable power supply, Liebert GXT3 with Micropod. Liebert model number shall be GXT3-1000RT120, 1000 VA / 900 Watt UPS System, configured with 120VAC input and output power and furnished complete.

6.10 A 120V, 15A service receptacle shall be installed in the RTU cabinet.

6.11 Add 2 DO's – 1 for P1 fault reset and 1 for P2 fault reset. Need the high level and tempo for each pump separated.

7 SAFETY, SECURITY, AND SIGNAGE

7.1 All lift station sites shall be secured by an eight-foot high block wall, with a minimum of two access points. Access shall be provided by a 36" wide passage door and a sliding gate, minimum of twelve feet wide for vehicular access (See City of Scottsdale Standard Detail 2165-1 and 2165-2). Each access will be electronically keyed to City specification. No equipment inside the site shall protrude above the fence line, except the emergency beacon and the RTU antenna.

7.2 A site sign mounted on the exterior wall will have a green background with 2" white reflective lettering. The sign will be made of aluminum. The sign will read:

CITY OF SCOTTSDALE
SEWER LIFT NO. _____
PHONE NO. 480-312-5650

7.3 The wetwell shall be provided with the appropriate warning signage regarding confined space entry.

8 SOUND LEVEL LIMITS

8.1 It shall be unacceptable for any pump station to cause noise by any means to the extent that any fifteen minute period average sound level exceed the applicable limit given in the following table, at any location in the City of Scottsdale on or beyond the boundaries of the property line of the pump station facility. The noise subject to these limits is that part of the total noise at the specified location that is due solely to the action of said pump station.

TABLE OF APPLICABLE LIMITS	
Land Use Zone	**Fifteen-Minute Average Sound Level (decibels)**
Residential	**45**
Commercial	**60**

GENERATOR MAXIMUM NOISE LEVEL WILL BE 85 DECIBELS

8.2 Average sound level measurements will consist of Leq (15) measurements performed with an ANSI-S1.4-1971 Type 1 or Type 2 Sound Level Meter using the A-weighting network. Instrument response shall be "slow". Leq means the constant sound level that, in a given situation and time period, conveys the same sound energy as the actual time -varying A-weighted sound. Measurements with sound level meters shall be made when the wind velocity at the time and place of such measurement is not more than five miles per hour.

8.3 The location for measuring exterior sound levels shall be at the property line of the pump station facility and four to five feet above ground level and at least four feet from walls and other reflective surfaces. If a wall is closer than the required four feet to the property line, move the required distance outside the property line. An exception occurs when the pump station shares a boundary with an affected property. In this case the location for measuring exterior sound levels shall be at least one foot inside the property line of the affected property and four to five feet above ground level and at least four feet from walls and other reflective surfaces.

8.4 Alternative sound level measurements. Compliance with these guidelines can be demonstrated if the maximum sound level caused by the operation of the pump station does not exceed the average sound level limits set forth in paragraph 1 when tested at the locations described in paragraph 3.

9 MISCELLANEOUS

9.1 Install reset button for each pump on control panel.

9.2 Install high level reset to control panel

9.3 Lead float turns on P1 and lag float turns on P2

9.4 City of Scottsdale requires a cover over the instrumentation reads – hard cover on the NEMA box and a canopy over the instrument cluster.

Appendix B – City of Scottsdale Wastewater Design Guide