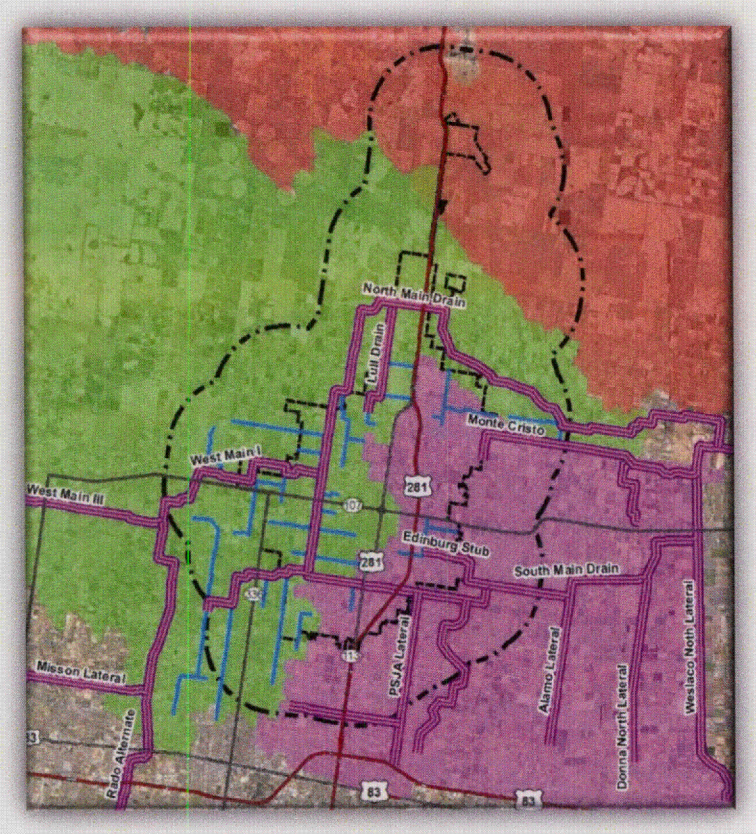
CITY OF EDINBURG
MASTER DRAINAGE PLAN



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PREPARED FOR

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TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY 6

2.0 INTRODUCTION 8
2.1 Background 8
2.2 Study Purpose and Needs 8
2.3 Project Considerations 9
2.4 Project Study Area 9
2.5 NFIP Participation 13
2.6 Historical Flooding 15
2.7 Environmental Constraints 18

3.0 GIS APPLICATION 19
3.1 Datum and Coordinate System 19
3.2 GIS Feature Layers 19
3.3 LiDAR DEM 20
3.4 Aerial Photographs 21

4.0 HEC-HMS MODELING ANALYSIS 22
4.1 Overall Watersheds 22
4.2 Drainage Area Delineation 24
4.3 Precipitation Data 26
4.4 Initial Abstraction and Infiltration Losses 26
4.5 Soil Map 28
4.6 Land Use and Impervious Cover 29
4.7 Lag Time 30
4.8 Unit Hydrograph 31
4.9 HEC-HMS Model 33

5.0 HEC-RAS MODELING 34
5.1 HEC-GeoRAS 34
5.2 Manning's n-values 34
5.3 Overbank Ineffective/ Obstructed Areas 34
5.4 Cross-Drainage Structures 35
5.5 Proposed Improvements 35
5.6 HCDD1 Master Drainage System 36

6.0 DRAINAGE SYSTEM EVALUATION 40
6.1 Investigated City Drainage Systems 40

7.0 PRIORITIZATION & COST SUMMARY 117
7.1 Prioritization 117
7.2 Proposed Project Cost Estimates 118
7.3 Benefit-Cost Analysis 120

8.0 CONCLUSION & SUMMARY 121
8.1 Stormwater Management 121
8.2 Financing Alternatives 122

TABLES

TABLE	TITLE	PAGE
4-1.	RAINFALL DEPTHS-DURATION-FREQUENCY	26
4-2.	NRCS CURVE NUMBERS	27
4-3.	LAND USE TYPE VS PERCENT IMPERVIOUS COVER	29
6-1.	INVESTIGATED CITY DRAINAGE SYSTEMS	40
6-2.	NM-102 SYSTEM CROSS-DRAINAGE STRUCTURE INVENTORY	42
6-3.	NM-102 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON	44
6-4.	NM-103 SYSTEM CROSS-DRAINAGE STRUCTURE INVENTORY	50
6-5.	NM-103 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON	51
6-6.	NM-105 & NM-106 SYSTEM CROSS-DRAINAGE STRUCTURE INVENTORY	56
6-7.	NM-105 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON	57
6-8.	NM-106 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON	59
6-9.	NM-108 & NM-109 SYSTEM CROSS-DRAINAGE STRUCTURE INVENTORY	62
6-10.	NM-108 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON	64
6-11.	NM-109 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON	65
6-12.	NM-110 & NM-112 SYSTEM CROSS-DRAINAGE STRUCTURE INVENTORY	68
6-13.	NM-110 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON	70
6-14.	NM-112 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON	72
6-15.	NM-111 & NM-113 SYSTEM CROSS-DRAINAGE STRUCTURE INVENTORY	76
6-16.	NM-111 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON	78
6-17.	NM-113 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON	80
6-18.	NM-115 & NM-116 SYSTEM CROSS-DRAINAGE STRUCTURE INVENTORY	85
6-19.	NM-115 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON	86
6-20.	NM-116 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON	90
6-21.	ES-100 SYSTEM CROSS-DRAINAGE STRUCTURE INVENTORY	94
6-22.	ES-100 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON	96
6-23.	ES-101 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON	99
6-24.	ES-102 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON	101
6-25.	SM-102 SYSTEM CROSS-DRAINAGE STRUCTURE INVENTORY	106
6-26.	SM-102 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON	107
6-27.	MC-101 SYSTEM CROSS-DRAINAGE STRUCTURE INVENTORY	113
7-1.	PROJECT PRIORITIZATION CRITERIA	117
7-2.	PROJECT PRIORITY WEIGHTED VALUE	118
7-3.	LATERAL SYSTEMS COST ESTIMATE SUMMARY	119
7-4.	MASTER DRAINAGE PLAN TOTAL COST ESTIMATE SUMMARY	119
7-5.	BENEFIT-COST ANALYSIS SUMMARY	120

FIGURES

FIGURE	TITLE	PAGE
2-1.	PROJECT STUDY AREA	11
2-2.	PROJECT AREA OVERLAND TOPOGRAPHY	12
2-3.	FEMA DELINEATED FLOOD HAZARD AREA	14
2-4.	AREAS OF FLOOD CONCERN AND DOCUMENTED FLOODING LOCATIONS	15
2-5.	LOCALIZED FLOODING EXAMPLES DURING APRIL 2012 AND SEPTEMBER 2014 STORM EVENTS	16
2-6.	HURRICAN DOLLY RAINFALL SPATIAL DISTRIBUTION	17
2-7.	HURRICAN ALEX RAINFALL SPATIAL DISTRIBUTION	17
4-1.	OVERALL DRAINAGE DELINEATIONS	23
4-2.	DRAINAGE SYSTEMS DELINEATIONS	25
4-3.	HYDROLOGIC SOIL GROUP MAP	28
4-4.	LAND USE MAP	30
5-1.	NORTH MAIN DRAIN 100-YEAR FLOODING POTENTIAL	37
5-2.	NORTH MAIN DRAIN 25-YEAR FLOODING POTENTIAL	38
5-3.	NORTH MAIN DRAIN 10-YEAR FLOODING POTENTIAL	39
6-1.	COE DRAINAGE DITCH SYSTEMS	41
6-2.	NM-102 DRAINAGE SYSTEM	47
6-3.	NM-102 PROPOSED SYSTEM IMPROVEMENTS	48
6-4.	NM-103 & NM-104 DRAINAGE SYSTEM	53
6-5.	NM-103 & NM-104 PROPOSED SYSTEM IMPROVEMENTS	54
6-6.	NM-105 & NM-106 DRAINAGE SYSTEM	60
6-7.	NM-105 & NM-106 PROPOSED SYSTEM IMPROVEMENTS	61
6-8.	NM-108 & NM-109 DRAINAGE SYSTEM	66
6-9.	NM-108 & NM-109 PROPOSED SYSTEM IMPROVEMENTS	67
6-10.	NM-110 & NM-112 DRAINAGE SYSTEM	73
6-11.	NM-110 & NM-112 PROPOSED SYSTEM IMPROVEMENTS	74
6-12.	NM-111 & NM-113 DRAINAGE SYSTEM	82
6-13.	NM-111 & NM-113 PROPOSED SYSTEM IMPROVEMENTS	83
6-14.	NM-115 & NM-116 DRAINAGE SYSTEM	91
6-15.	NM-115 & NM-116 PROPOSED SYSTEM IMPROVEMENTS	92
6-16.	ES-101 & ES-102 DRAINAGE SYSTEM	104
6-17.	ES-101 & ES-102 PROPOSED SYSTEM IMPROVEMENTS	105
6-18.	SM-101, SM-102, & SM-103 DRAINAGE SYSTEM	109
6-19.	SM-101, SM-102, & SM-103 PROPOSED SYSTEM IMPROVEMENTS	110
6-20.	SM-104 DRAINAGE SYSTEM	112
6-21.	MC-100 & MC-101 DRAINAGE SYSTEM	115
6-22.	MC-100 & MC-101 PROPOSED SYSTEM IMPROVEMENTS	116

APPENDICES

APPENDIX A	HYDROLOGY – COE LATERAL HEC-HMS MODEL & HYDROLOGIC PARAMATERS
APPENDIX B	CROSS-DRAINAGE STRUCTURES – LATERAL CULVERTS FIELD SURVEY & INVENTORY
APPENDIX C	HCDD1 MDP HYDRAULICS – NORTH MAIN DRAIN 1D/2D HEC-RAS MODELING
APPENDIX D	HYDRAULICS – COE LATERAL HEC-RAS MODELS
APPENDIX E	COST ESTIMATE & BENEFIT-COST ANALYSIS
APPENDIX F	GIS PACKAGE
APPENDIX G	PHASE I ENVIRONMENTAL SITE ASSESSMENT & CONTRAINTS MAP

1.0 EXECUTIVE SUMMARY

This Master Drainage Plan (MDP) was prepared to provide the City of Edinburg a planning tool to guide and prioritize future capital expenditures for the City's drainage systems within its boundaries and ETJ. The City currently operates and maintains a network of drainage ditches and storm sewer systems. Many of its outfall and storm systems are in need of improvements to alleviate flooding that have historically occurred throughout the City and to meet drainage needs of future development. This MDP was focused on the City's outfall drainage ditch systems.

The City of Edinburg's outfall systems are served by two major receiving drainage systems: North Main Drain and South Main Drain. These drainage ditches are part of the Hidalgo County Drainage District No.1 (HCDD1) Master Drainage System. The North Main Drain and South Main Drain outfall into the Main Floodwater Channel east of the City.

The Master Drainage Plan was developed to define various projects consisting of channel improvements, hydraulic structure replacements, and detention. The MDP was developed to establish conceptual designs only, and does not include sufficient details for final design or construction. A detailed hydraulic analysis should be performed to verify conditions for the implementation of the proposed improvements prior to final design. In addition, with the adoption of a "no-adverse impact" policy by the City, further analysis of the proposed improvements will be required to ensure that any impacts incurred due to the proposed projects are mitigated.

The existing drainage systems were evaluated to identify system inadequacies and determine drainage improvements required to alleviate existing flooding problems and upgrade the existing systems to provide drainage infrastructure needs for future development. Alternative solutions to reduce or eliminate flooding from flood prone areas were formulated and evaluated based on detailed hydrologic and hydraulic modeling analysis with consideration of potential hydraulic impacts of each alternative improvement.

ESRI ArcGIS 10.2 was used to facilitate various engineering efforts throughout the project development. Specific GIS applications included digital elevation model (DEM) from the LiDAR dataset obtained from TNRIS, base mapping, drainage basin delineations, watershed parameters extraction, channel cross-section geometric data extraction, drainage systems inventory and mapping. As part of the MDP, a set of GIS layers was developed to represent a digital version of the existing drainage systems and the MDP proposed improvements. This GIS set was included to provide the City a tool to manage the drainage systems and plan implementation in an efficient and systematic manner.

ArcHydro and GeoHMS were used to delineate overall drainage patterns and to assist the development of HEC-HMS models. HEC-HMS hydrologic modeling program was used to compute

peak flows and hydrographs at various locations within the drainage systems for the drainage ditches' hydraulic modeling analyses. GeoRAS was used to construct the HEC-RAS models, which were used to analyze water surface profiles and hydraulic capacity for the existing and proposed drainage ditches.

2.0 INTRODUCTION

2.1 Background

The City of Edinburg is part of the McAllen-Edinburg-Mission and Reynosa-McAllen metropolitan areas and located in the heart of the Lower Rio Grande River Valley of South Texas. The City of Edinburg has experienced significant population increase in recent years. According to the 2012 Census estimate, it has a total population of approximately 81,000. It is projected that the city's population will be more than doubled by 2060. The fast population growth has contributed to the frequency, severity and extent of drainage and flooding problems in many areas of the city in recent years. As land use changes with development, more impervious cover increases the amount of runoff and peak discharges. Future growth and development of the City will be greatly influenced by how well the existing and future drainage systems are maintained and managed. Many of the existing drainage systems do not adequately convey runoff from frequent rainfall events and are in need of improvement.

The City has recognized the needs of improving the drainage systems and authorized this master drainage plan study. The purpose of the plan was to identify the location and extent of existing drainage inadequacies, determine future drainage needs, and propose drainage system improvements. In November, 2013, the City entered an agreement with TEDSI Infrastructure Group Inc. to provide professional engineering services to develop a Master Drainage Plan for the City. The MDP was made possible through the Texas Water Development Board Flood Protection Plan Grant (1348321592) along with the City's matching funding as a participant of the National Flood Insurance Program.

2.2 Study Purpose and Needs

The City recognizes the need for a master drainage plan to provide drainage solutions necessary to reduce flood risk to existing flood-prone areas and adequately accommodate future urbanization. The need for a Master Drainage Plan study is evident by frequent flooding with varying degrees throughout the City's history. Drainage and flood protection has long been a challenge for the City of Edinburg and other communities within the watershed due to the flat topography, periodic intense rainfalls, and limited capacities of existing drainage systems. The rapid population and economic growth in recent years has intensified the frequency, severity and extent of drainage and flooding problems within the City.

The overall purpose of this project was to develop a Master Drainage Plan that provides an effective, implementable plan to eliminate or significantly reduce the flood risks and provide proposed improvements to accommodate the rapid urban growth within the study area. Specific objectives of this project include:

- Identify locations and extent of existing flooding problem areas.

- Formulate, evaluate, and optimize drainage improvements (plans) to eliminate or reduce existing flooding problems.
- Identify, formulate and evaluate drainage improvements to provide drainage infrastructure for future needs.
- Develop a Geographic Information System (GIS) database for the city's drainage systems associated with the MDP.

2.3 Project Considerations

Several factors were considered in evaluating the existing drainage outfall ditch systems, identifying flooding problem areas, inadequate drainage systems, and determining and optimizing drainage improvements. These considerations were:

- Historical documented flooding areas were obtained from the City and public residents.
- Public infrastructure areas that are considered high flood risk were identified by the City and Edinburg ISD.
- HCDD1 drainage improvement planning projects as related to North Main Drain and South Main Drain such as: FEMA floodplain map modernization project, Raymondville Drain Project, Delta Region Water Management Project, and Monte Cristo Drain improvement project.

2.4 Project Study Area

The project study area covers the City of Edinburg corporate limits (City limits) and extraterritorial jurisdiction (ETJ), as shown in **Figure 2-1**. The City of Edinburg covers a total area of 36.67 square miles and is located within the Hidalgo County Main Floodwater Channel Watershed. The topography of the study area is typical of areas located in the Gulf Coastal Plan. It is generally flat, sloping gently toward the coast at an average grade of about 1 foot per mile. The flat topography imposes problems on the design of practical drainage systems because the hydraulic grades for drainage ditches are limited. Further, the City is located within the natural overland flow path within the Main Floodwater Channel Watershed and lies within a natural depressed low lying area, which complicates the City's efforts to develop an effective gravity drainage system.

The overall watershed slopes from west to east, across the City of Edinburg. From the west boundary of the ETJ to the City's urbanized areas, the overland slope is approximately 8 feet per mile. Within the City's urbanized center, which is located mainly between the North Main Drain and US 281 (IH-69), the overland slope is approximately 1.5 feet per mile; an elevation range from 96 feet to 92 feet within a 2.5 mile reach. The significant change in the overland slope across the watershed makes the City vulnerable to excessive ponding and flooding during storm events. The flatter slope within the City's urbanized areas reduces the relief need to efficiently

convey the runoff away. The overland natural topography for the City area is shown in **Figure 2-2**.

The urbanized portion of the City is primarily served by underground storm sewer systems. Open drainage ditches serve as the outfall channels for the City and its storm sewer systems. These ditches outfall either directly into, or into a lateral of, the North Main Drain or South Main Drain, which are part of the HCDD1 Master Drainage System.

The study area has a subtropical and semi-arid climate with dry winters and hot, humid summers. The average annual rainfall is approximately 26 inches. Most precipitation occurs in summer thundershowers and intense rainfall associated with tropical depressions and hurricanes that characterize the Gulf Coast from June to October.

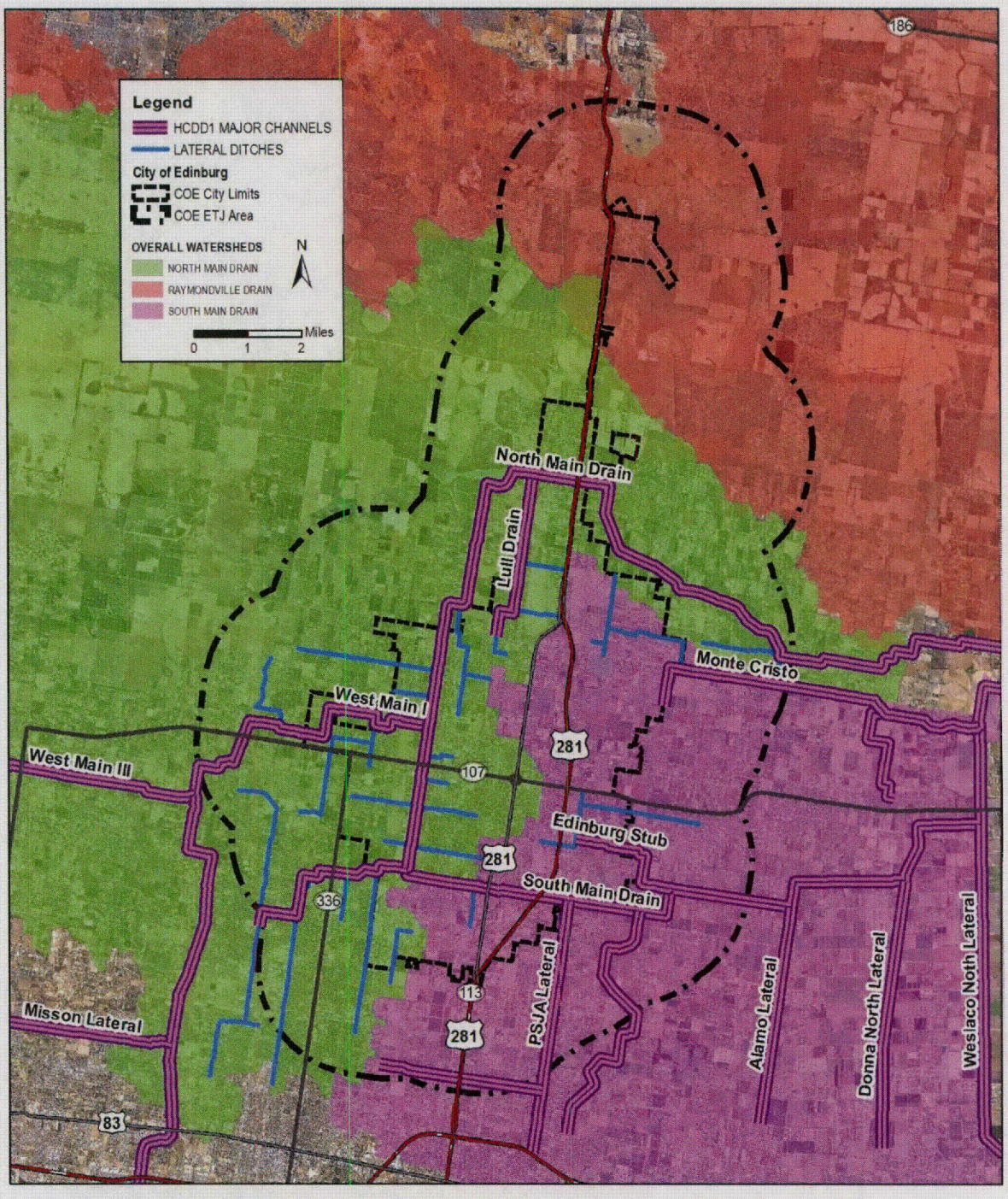


Figure 2-1. Project Study Area

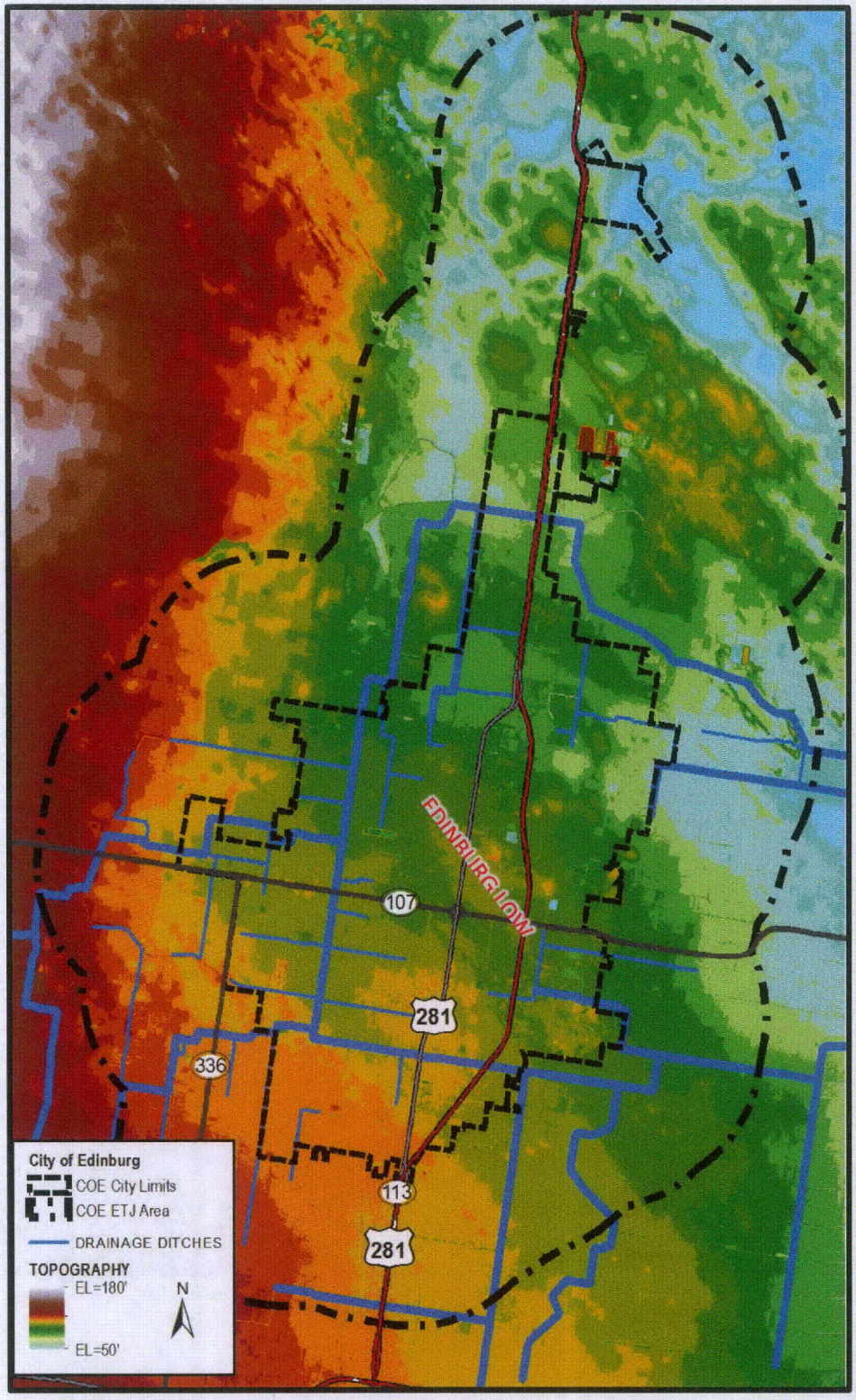


Figure 2-2. Project Area Overland Topography

2.5 NFIP Participation

The City of Edinburg has been a participating partner in the National Flood Insurance Program (NFIP) since January 1, 1978. As reported by FEMA, the City of Edinburg has a total of 2,379 flood insurance policies in-force representing a total property value of approximately $456M. During the City NFIP participation period, the total flood insurance claims include 601 losses for a total payment of approximately $6.2M.

Based on the "Cover the Border Hazard Mitigation Planning Project" by the Texas A&M International University, Rio Grande Institute, and H2O Partners, the estimated value of residential, commercial and industrial structures located in the 100-year floodplain is approximately $525M, which represents the improvement (structure) value for approximately 3,933 structures.

The flood hazard areas, as delineated on the FEMA Flood Insurance Rate Maps (FIRM) effective date June 6, 2000 for Hidalgo County (Community No. 480334) and the City of Edinburg (Community No. 480338), are shown in **Figure 2-3**. As shown in the floodplain figure, there is widespread flooding along the North Main Drain.

Also shown delineated within a flood hazard area is the low, depressed area within the City centralized area; this area is referenced as the "Edinburg Low" within the FEMA Flood Insurance Study (FIS). Based on the LiDAR topography, see **Figure 2-2**, the Edinburg Low is a natural low area that functions as an overflow path between the east and west sides of the City of Edinburg. The Edinburg Low runs in a northwest to southeast direction through the City center located at the Hidalgo County Courthouse. The elevation break point along the flow path is located at the Courthouse, at University Dr. (SH 107) and Closner Blvd. (BS 281).

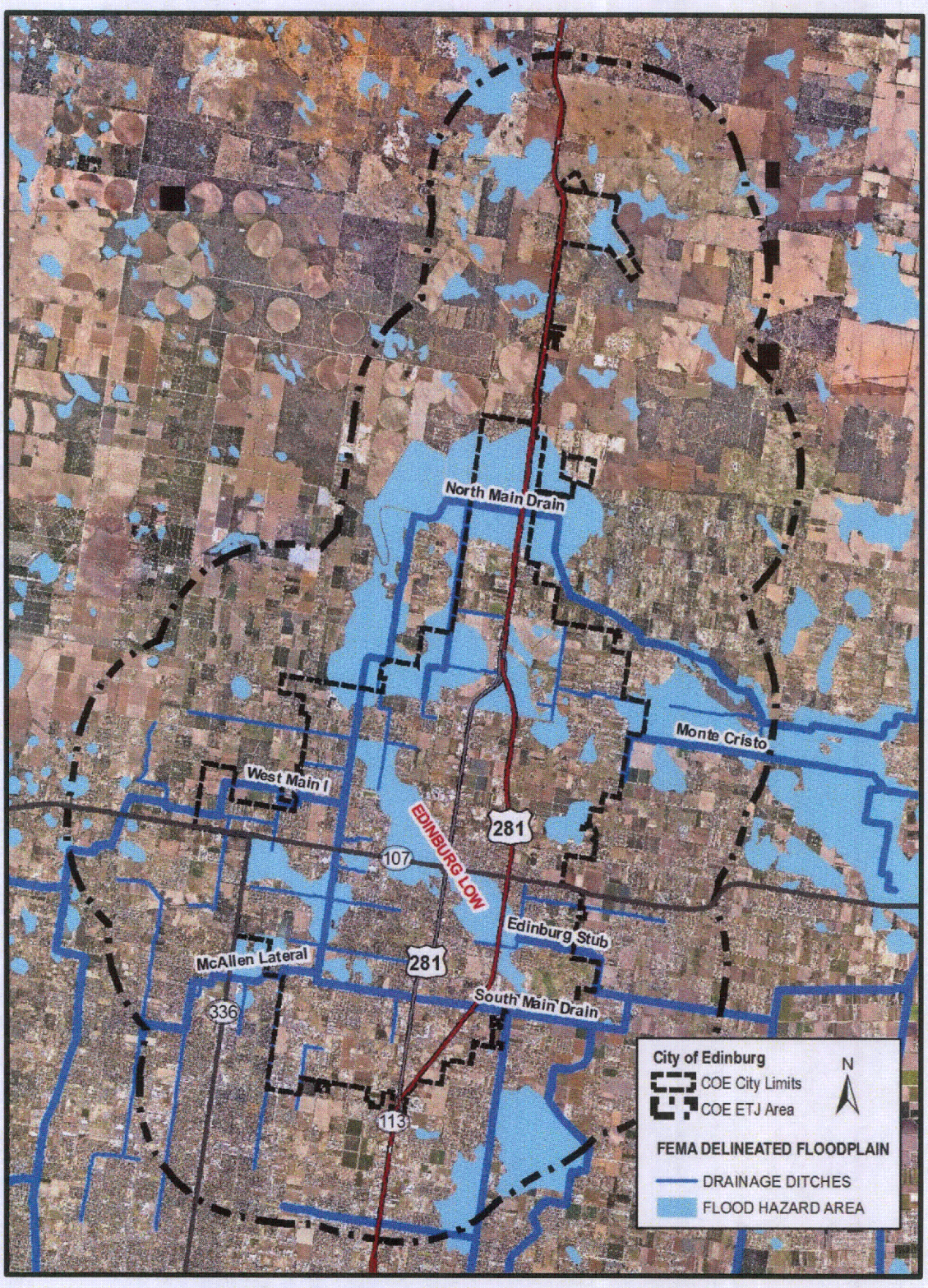


Figure 2-3. FEMA Delineated Flood Hazard Areas

2.6 Historical Flooding

The City of Edinburg has experienced frequent flooding of varying degrees throughout its history. Adequate drainage of storm water runoff has long been a challenge for the City due to the flat topography, periodic intense rainfalls, and limited capacities of existing drainage systems. Localized flooding threatens residences and business, damages structures, and hinders traffic mobility. The City of Edinburg and the Edinburg Independent School District have identified public facilities that are at risk of potential flooding. These flood concerns locations as well as documented locations of flooding from recent storm events are shown in **Figure 2-4**.

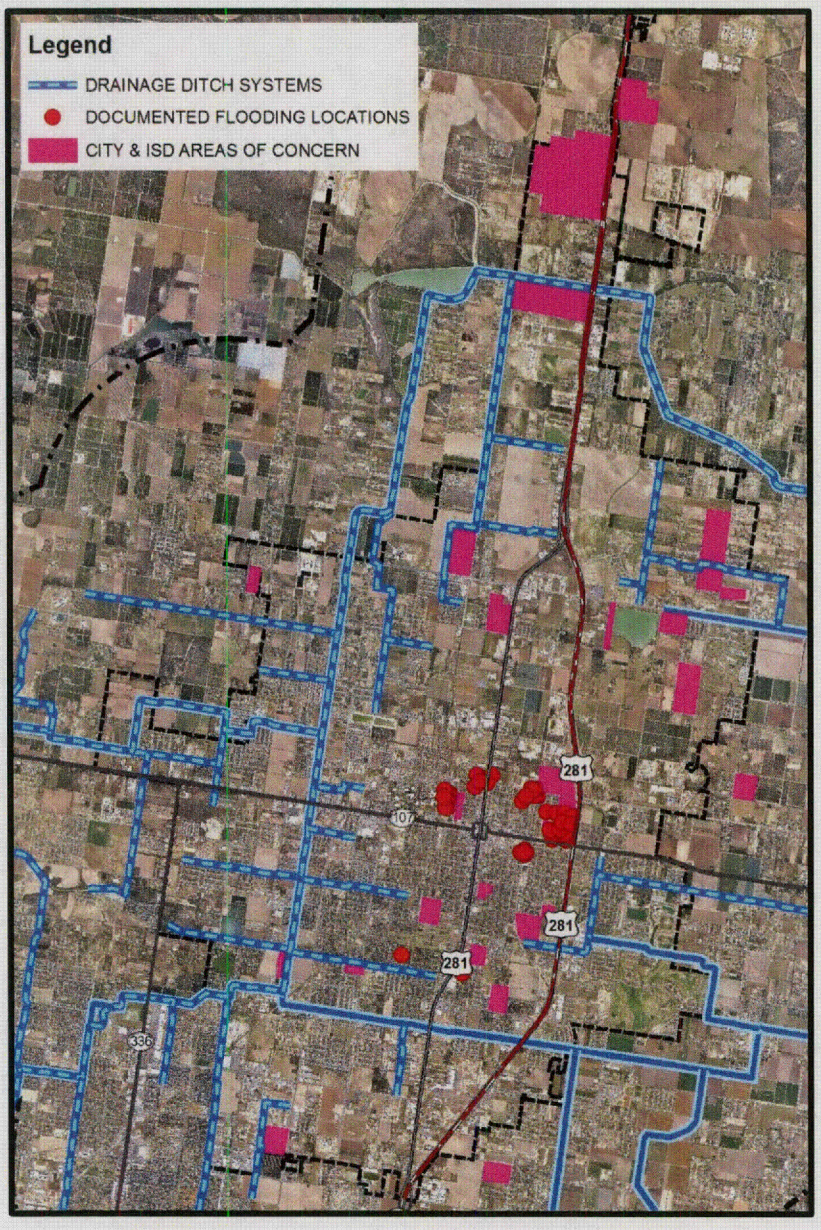


Figure 2-4. Areas of Flood Concern and Documented Flooding Locations

Figure 2-5 shows example pictures of localized flooding with the City which occurred during April 2012 and September 2014 storm events. These storm events are typical of high intensity, short duration rainfall which occurs frequently within the Lower Rio Grande Valley region.

Figure 2-5. Localized Flooding Examples During April 2012 and September 2014 Storm Events

The Lower Rio Grande Valley region is also prone to tropical storms and hurricanes, which produce substantial rainfall and result in wide-spread flooding and significant damage to the region. In July 2008, Hurricane Dolly rainfall amounts within Hidalgo County ranged from 6 to 14 inches; **Figure 2-6** shows the rainfall spatial distribution for the storm event.

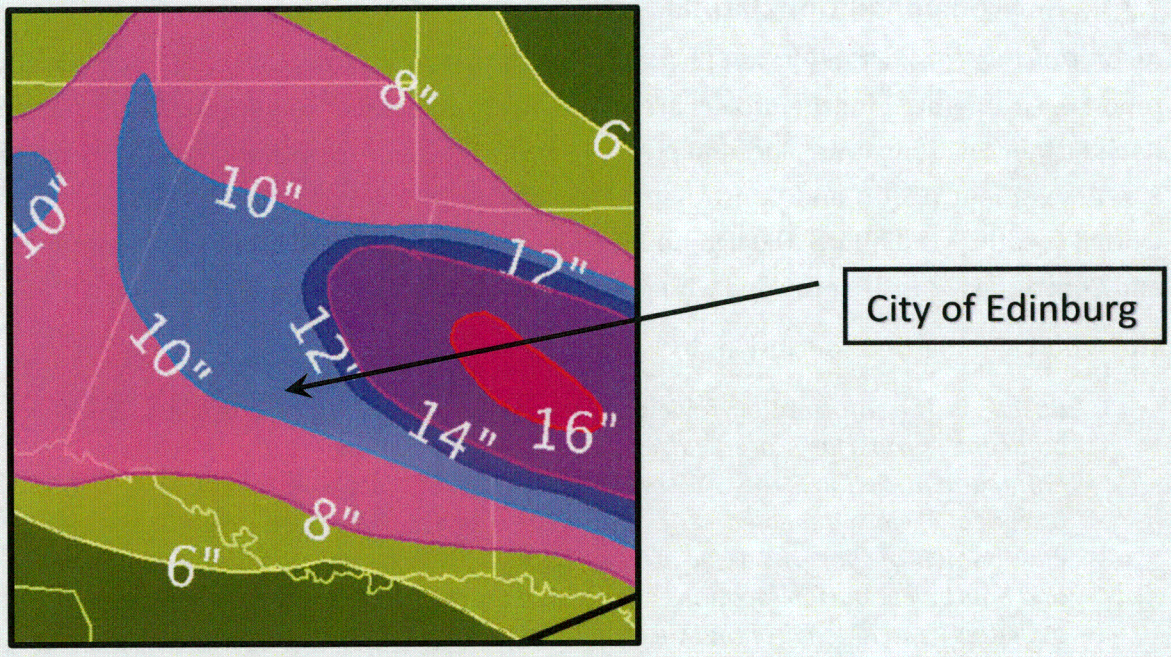


Figure 2-6. Hurricane Dolly Rainfall Spatial Distribution

In July 2010, Hurricane Alex rainfall amounts within Hidalgo County ranged from 5 to 8 inches; **Figure 2-7** shows the rainfall spatial distribution for the storm event.

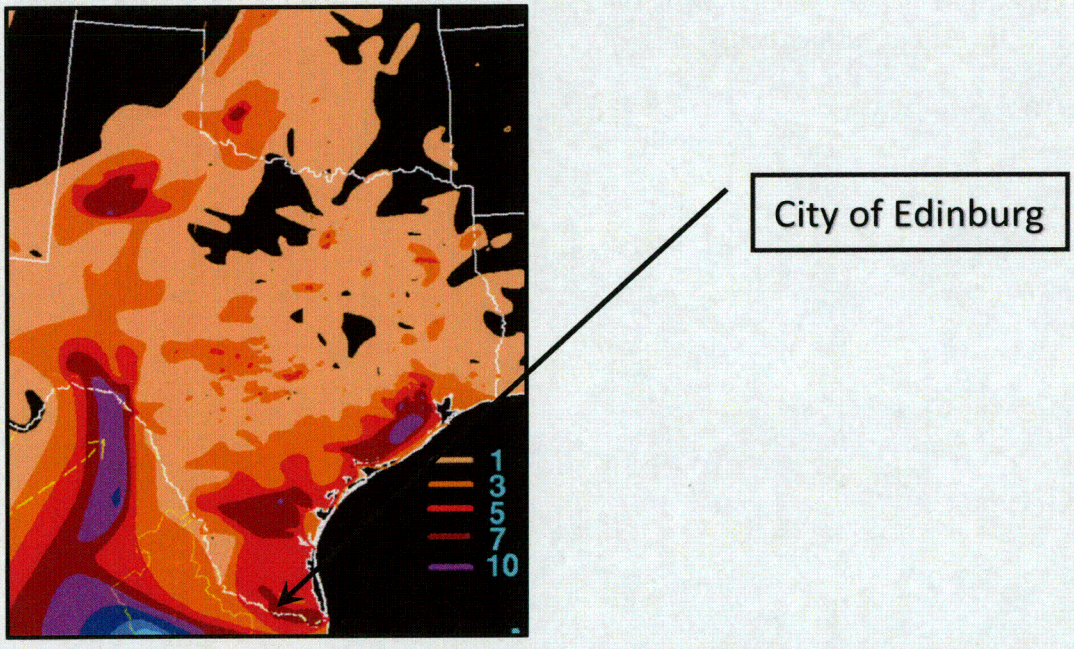


Figure 2-7. Hurricane Alex Rainfall Spatial Distribution

2.7 Environmental Constraints

As part of this contract, a Phase I Environmental Site Assessment (ESA-I) and Constraints Map report was generated for the project area. The environmental documentation was prepared by Raba Kistner Environmental, Inc. and presented within a report entitled "Phase I Environmental Site Assessment (ESA-I) and Constraints Map for City of Edinburg Master Drainage Plan – 16 Outfall Locations, Edinburg, Hidalgo County, Texas" dated January 2014. The referenced ESA-I and Constraints Map are provided within **Appendix G** of this drainage report.

The report summarized conclusions included:

> *Based on the information reviewed, there was no evidence that the subject or adjacent properties are currently under federal or state environmental enforcement action. The SITE reconnaissance, regulatory database review, and historical review, revealed no evidence to suggest that there are any potential environmental concerns associated with the SITE Northeast, Southeast, Northwest and Southwest outfall locations that would preclude construction or development activities from an environmental standpoint.*
>
> *This assessment has revealed no evidence of recognized environmental conditions in connection with the SITE Northeast, Southeast, Northwest and Southwest outfall locations.*
>
> *This assessment has revealed no evidence of recognized environmental conditions in connection with the SITE Northeast, Southeast, Northwest and Southwest outfall locations.*

3.0 GIS APPLICATION

Geographic Information Systems (GIS) provides a powerful workspace for storing, compiling, overlaying, integrating, updating and exchanging, analyzing, displaying, and managing geospatial data. It provides a consistent method for watershed and stream network delineations using digital elevation models (DEMs) of land-surface terrain. GIS provided a vital role, from GIS data manipulation to geospatial data layers creation, in developing this project. This section discusses the applications of ArcGIS tools in the project development and the GIS layers developed for the Master Drainage Plan.

ESRI ArcGIS 10.2 was used to facilitate the various engineering workflows required for the project development, including base mapping, topographic data development, drainage system delineations, drainage and hydrologic parameter extraction, hydrologic and hydraulic model development and analyses, and drainage system inventory. The suite of ArcGIS tools utilized for the purpose of this project include Spatial Analyst, 3D Analyst, ArcHydro, HEC-GeoHMS, HEC-GeoRAS, and other ArcGIS extensions.

Digital base maps were compiled from various sources, such as: City of Edinburg, Hidalgo County, Texas Natural Resource Information Systems (TNRIS), TWDB, FEMA, NOAA, and USGS. The available datasets were compiled using conversion, spatial referencing, and integration operations. GIS base map data layers for this project included raster aerial photographs, vector street maps, political boundaries (cities, counties, districts), floodplain delineations, and stream and drainage ditch centerlines.

3.1 Datum and Coordinate System

The common datum, projection, and coordinate system for this project are:

- Horizontal Datum - North American Datum 1983 (NAD83) (Feet)
- Vertical Datum - North American Vertical Datum 1988 (NAVD88)
- Projection - Lambert Conformal Conic
- Coordinate System - State Plane Texas South 4205

3.2 GIS Feature Layers

As part of the engineering efforts in developing the master drainage plan, a set of GIS data layers were created, which provide a digital version of the master drainage plan. The GIS data layers can be updated by incorporating future drainage projects and provide an easy way to locate drainage features such as:

- Watershed Basin
- Drainage Ditch Subbasin
- Drainage Ditch Centerline

- Cross-Culvert Structure Inventory Locations
- Drainage Ditch Improvement Reaches
- Proposed Cross-Culvert Improvement Locations
- Flooding Concerns and Documented Flooding Locations
- Floodplain Boundary
- Street Map
- Soil Map
- Land Use Map
- City Boundary
- County Boundary
- LiDAR Topography DEM
- Digital Aerial Photos

3.3 LiDAR DEM

Automated extraction of topographic parameters from DEMs has been recognized as a viable alternative to traditional surveys and manual evaluation of topographic maps, particularly as the quality and coverage of DEM data increase. A continuous DEM dataset was developed based on tiled LiDAR datasets obtained from Texas Natural Resource Information System (TNRIS), which was flown in 2011. The original LiDAR has a resolution of 3.3 feet in LAS format. These tiled LiDAR datasets were converted to ESRI Arc GRID format through a series of spatial data processing procedures including LAS to Multipoint, Multipoint to TIN, and TIN to GRID. The resulting tiled grid datasets were then merged into one single grid dataset. With consideration of the very large size of LiDAR dataset, a 5-foot grid dataset was created as the base DEM dataset for this project.

By examining the high resolution LiDAR DEM imagery, natural streams and drainage ditches are generally well defined by the LIDAR data. However at many stream crossings (culverts and bridges), elevations on top of the structures were included in the DEM. If the original DEM data was used for automated drainage delineations, the natural drainage patterns could be erroneously modeled without removing these structures from the DEM.

To remove the dam-like hydraulic structures in the DEM, stream and drainage ditch lines and aerial photographs were used to identify stream crossing structure locations. Stream crossing breaklines were created at each hydraulic structure where the top elevation of the structure was included in the DEM. ArcHydro reconditioning tool was used to burn the resulting stream crossing breaklines into the DEM with a certain depth based on the adjacent flowline elevations at the structure. A hydro-enforced DEM was created. This reconditioned 5-foot DEM was used as the base grid dataset for this study.

In developing the HEC-HMS and HEC-RAS models, the ArcHydro, HEC-GeoHMS, HEC-GeoRAS tools were extensively used to facilitate the delineation of drainage areas, extraction of drainage parameters, and extraction of channel cross section geometric data.

3.4 Aerial Photographs

Aerial photographs for the study area were obtained from Texas Natural Resources Information Services (TNRIS) and Hidalgo County, TX. The aerial photographs are dated 2013 and are produced with 0.5 and 1.0 foot resolution.

4.0 HEC-HMS MODELING ANALYSIS

Watershed runoff discharge is a function of precipitation, rainfall losses, and runoff processes. The U.S. Army Corps of Engineers (USACE) HEC-HMS (v. 4.0) computer program was used to evaluate and compute runoff peak flows and hydrographs at various locations within the studied watersheds for this study. Various frequency storm events were evaluated, including 10-, 25- and 100-year, and analyzed for both existing and ultimate conditions. The resulting peak flows and hydrographs were used as input data to HEC-RAS modeling analysis to identify flooding problem areas and evaluate alternative drainage improvement plans.

4.1 Overall Watersheds

The City drainage ditches outfall into the HCDD1 Master Drainage System, specifically the Main Floodway Channel network system. The primary HCDD1 watersheds serving the City include North Main Drain and South Main Drain. Additionally, Raymondville Drain serves a small portion of the City (specifically the South Texas International Airport at the City of Edinburg) and the northern portions of the City ETJ; however the City does not currently have any major outfall ditches within this watershed. The overall HCDD1 Master Drainage System Watershed map is shown in **Figure 4-1**.

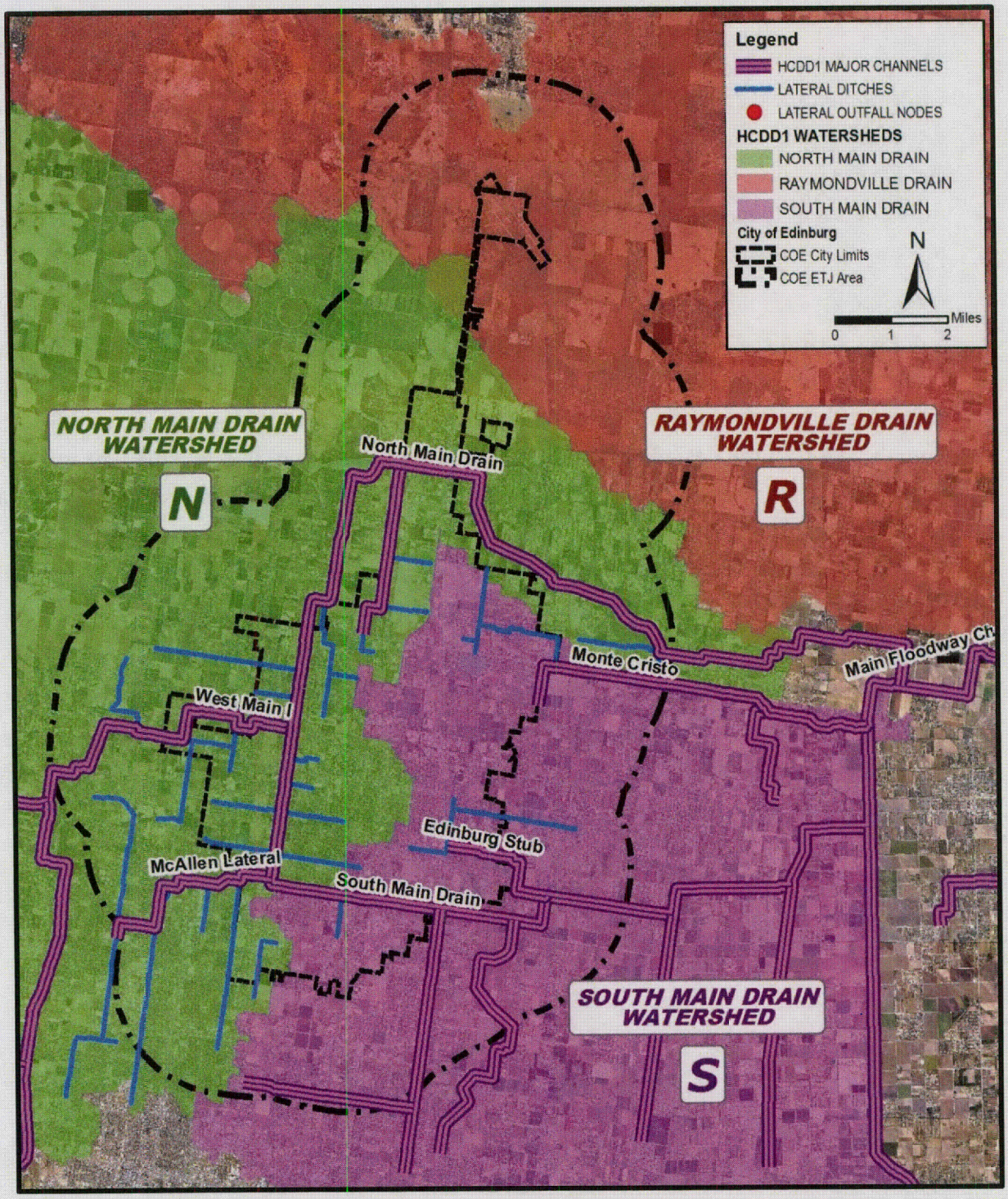


Figure 4-1. Overall Drainage Delineations

4.2 Drainage Area Delineation

Drainage areas were delineated for each drainage system analyzed based on the high resolution LiDAR topographic data and field survey data for this project using ArcGIS tools. The resulting drainage area delineations were verified by aerial photography and field visits. As discussed in Section 3.3, a continuous hydrologic-correct LiDAR DEM dataset was developed based on tiled LiDAR datasets obtained from TNRIS. The LiDAR DEM data provided a more accurate terrain representation than the traditional USGS DEM.

ArcGIS tools including Spatial Analyst, 3D Analyst, ArcHydro and HEC-GeoHMS were used to process the LiDAR DEM datasets for automated drainage and stream delineations and generation of spatially based hydrologic input files for HEC-HMS model development. Automated drainage delineation included a series of spatial data processing steps to derive the drainage networks from the DEM dataset, including flow direction, flow accumulation, stream definition, watershed delineation, watershed polygon processing, stream processing, and watershed aggregation. Watershed physical characteristics that were extracted included drainage areas, longest flow lengths, and slopes. These watershed parameters were then used to assist estimation of other watershed and hydrologic parameters such as CN, Percent Impervious Area, and time of concentration (Tc).

Drainage systems and subbasins were delineated as shown in **Figure 4-2**. There were total 17 drainage system subwatersheds delineated for the study area. Thirteen (13) drainage systems are located within the North Main Drain Watershed; four (4) drainage systems are located within the South Main Drain Watershed.

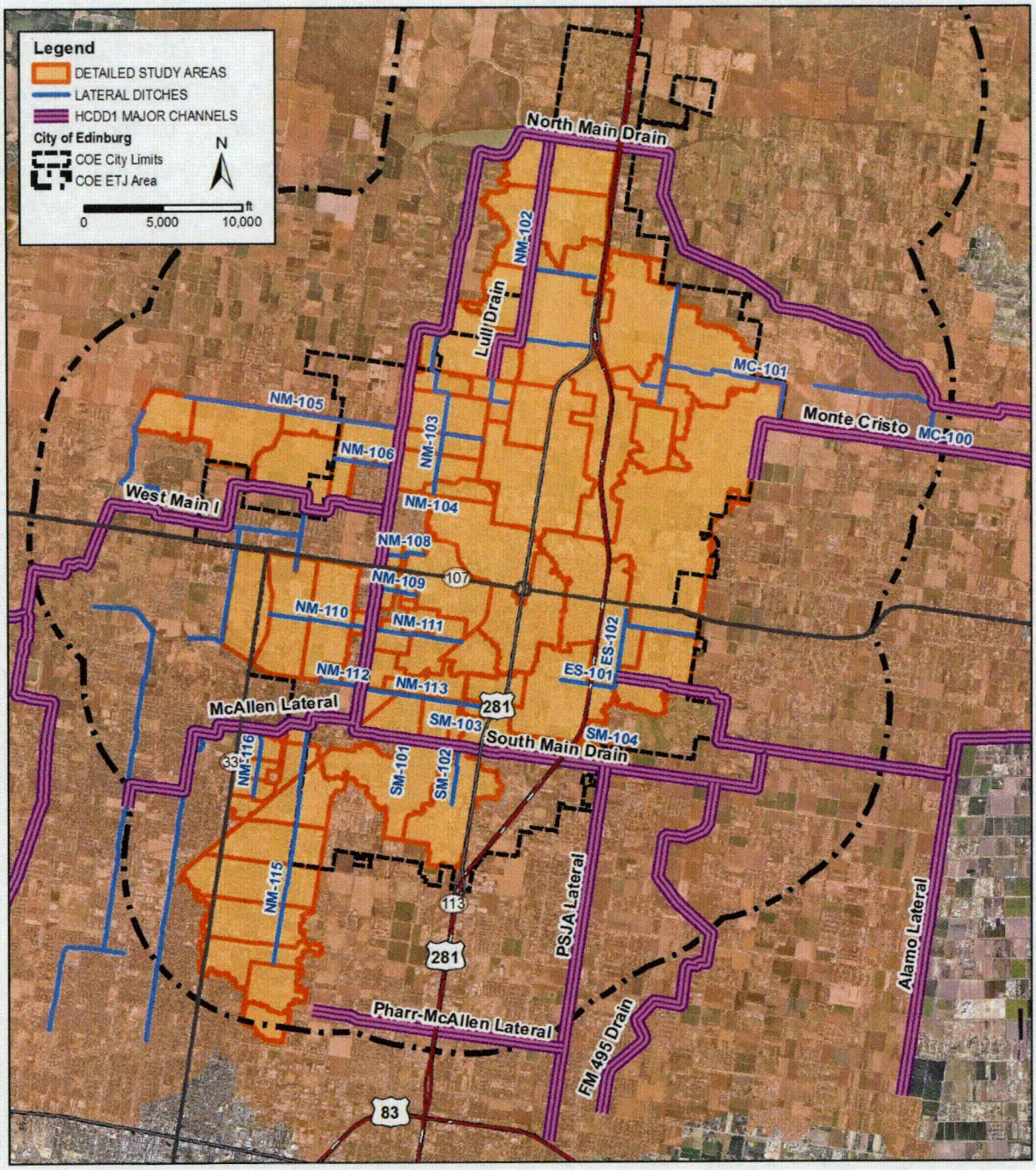


Figure 4-2. Drainage Systems Delineations

4.3 Precipitation Data

The frequency-based hypothetical storm method was selected within the HEC-HMS meteorologic model. This method defines a storm event that the precipitation depths have a consistent exceedance probability for various storm durations. This model employs a balanced and nested rainfall distribution, which positions the block of maximum incremental depth at the middle of the required duration. The remaining blocks are arranged then in descending order, alternately before and after the central block.

Using this method requires input of depths of precipitation for various durations and frequencies. The precipitation depths for various durations for a specified exceedance probability are usually obtained by consulting locally-developed depth-duration-frequency functions. For this project, the precipitation depths were taken from the USGS publication – *Atlas of Depth-Duration Frequency of Precipitation Annual Maxima for Texas, 2004* by Asquith and Roussel. The newly developed Atlas was developed based on the generalized logistic distribution method (GLO) which is discussed in detailed in the Water-Resources Investigation Report by USGS in cooperation with Texas Department of Transportation. The USGS precipitation depth data are more accurate than those based on the traditional TP-40 and HYDRO-35. **Table 4-1** below summarizes the precipitation depths for various durations and storm events.

TABLE 4-1. RAINFALL DEPTHS-DURATION-FREQUENCY

STORMS	15-MIN	1-HR	2-HR	3-HR	6-HR	12-HR	24-HR
2-year	1.00	1.80	2.20	2.30	2.60	2.85	3.20
5-year	1.30	2.40	2.90	3.15	3.50	4.00	4.50
10-year	1.52	2.85	3.50	3.75	4.25	4.80	5.45
25-year	1.80	3.40	4.30	4.60	5.45	6.00	6.90
50-year	2.00	3.90	5.00	5.40	6.40	7.00	8.00
100-year	2.20	4.45	5.70	6.40	7.40	8.25	9.50

4.4 Initial Abstraction and Infiltration Losses

Significant rainfall losses in flood event analysis include both surface storage and infiltration. The NRCS Runoff Curve Number (CN) Loss Method was used for this study as traditionally used for the study area. This method relates accumulated rainfall excess or runoff to accumulated rainfall with an empirical curve number (CN) in the following equations:

$$Q = \frac{(P - I_a)^2}{P - I_a + S}$$

$$S = \frac{1000}{CN} - 10$$

Where Q = runoff (inches), P = rainfall (inches), Ia = initial abstraction, S = potential maximum retention after runoff begins (inches), and CN = curve number.

Curve number (CN) takes into account several factors such as soil type, cover, management practices, and hydrologic condition. The variation in infiltration rates of different soils is incorporated in the curve number selection through the classification of soils into four hydrologic soil groups as A, B, C, and D, with A having the highest and D the lowest infiltration capacities.

CN is also related to three antecedent runoff conditions: AMC III for relatively high runoff potential, AMC I for relatively low runoff potential, and AMC II for average runoff potential. Based on information provided within "Runoff curve number based on soil-cover complex and climatic factors" dated 1983 by Hailey, James L and McGill, H.N., as well information referenced within the TxDOT Hydraulic Manual 2014, AMC I condition is considered as a represent average condition for City of Edinburg study area and therefore used to estimate CN values for this study.

For this master drainage planning study, the landuse and impervious cover were considered separately from the CN value determination in order evaluate the ultimate conditions of the drainage areas. The impervious cover values were entered as separate parameters within the HEC-HMS model. The curve number was evaluated to represent an undeveloped, agriculture use with brush cover under fair hydrologic conditions. **Table 4-2** below lists the CN values from TR-55 and used for this study.

TABLE 4-2. NRCS CURVE NUMBERS

SOIL GROUP	AMC I	AMC II	AMC III
A	19	35	55
B	36	56	75
C	51	70	84
D	59	77	89

Using AcrGIS Spatial Analyst tools, a composite CN value for each drainage basin was computed based on area weighting of hydrologic soil group within the subbasin as:

$$CN_{composite} = \frac{\sum A_i CN_i}{\sum A_i}$$

The initial abstraction is generally approximated by the following empirical equation:

$$I_a = 0.2S$$

However, with consideration of numerous natural depressed areas and elevated irrigation canals within the study area, adjustment was made to initial loss based this equation. The initial loss for each subbasin was modified based the existence of natural depressed areas and the elevated irrigation canals.

4.5 Soil Map

The geospatial soil data for Hidalgo County was obtained from the NRCS Soil Data Mart. The soil map layer is a polygon feature class that contains the hydrologic soil group types. **Figure 4-3** shows the hydrologic soil types within the City of Edinburg and surrounding areas. Based on the soil map, the study area consist mostly of hydrologic soil group B.

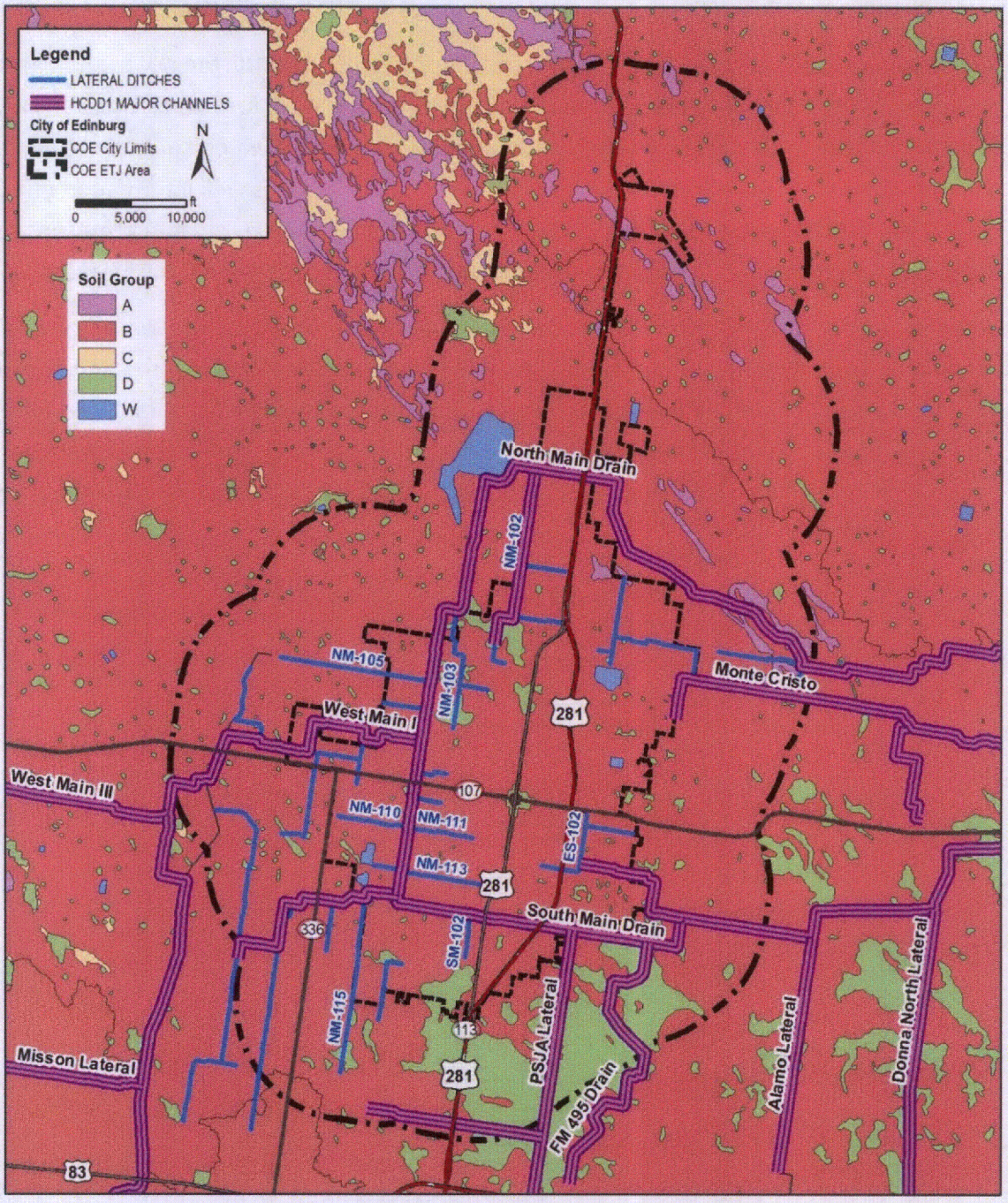


Figure 4-3. Hydrologic Soil Group Map

4.6 Land Use and Impervious Cover

Land use within a drainage basin generally has the greatest impact on the rainfall – runoff relationship. Land use and land cover dictate the percent impervious area of a drainage basin. The land use layer is a polygon feature class that contains land use type and cover and percent impervious cover information. A composite percent impervious cover for each drainage area was computed. The land use and land cover were classified into eight (8) groups for this study, as listed in **Table 4-3**.

TABLE 4-3. LAND USE TYPE VS PERCENT IMPERVIOUS COVER

LAND USE TYPE	LAND USE DESCRIPTION	IMPERVIOUS (%)
U	Undeveloped areas	0
RS	Residential < 1 acre	40
RL	Residential Large > 1 and < 5 acres	20
RR	Residential Rural > 5 acres	5
T	Transportation corridors and streets, etc.	90
W	Water bodies, streams, lakes, reservoirs, etc	100
GA	Green Areas	10
HD	Commercial, Industrial, Schools	85

The land use layer was developed based on the parcel maps from the Hidalgo County Appraisal District. The parcel maps were verified based on latest aerial photography. **Figure 4-4** shows the land use classifications within the City of Edinburg and surrounding areas.

The existing percent impervious cover values for each subbasin were modified to reflect the projected ultimate land use assuming a 30-year planning horizon. Based on the existing level of development within the study area and the expected growth rate within the region, a fully developed ultimate condition was considered for the project study area.

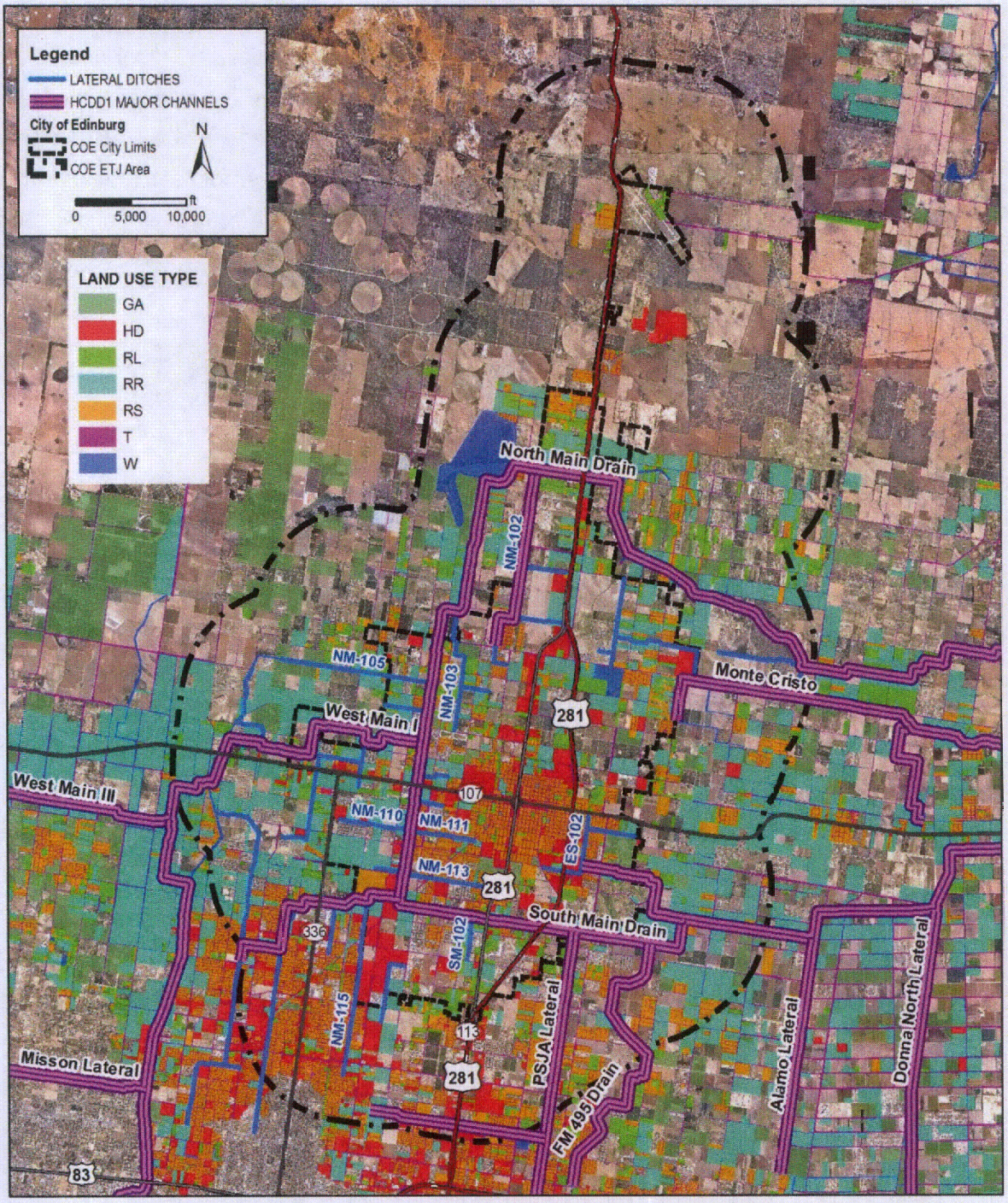


Figure 4-4. Land Use Map

4.7 Lag Time

The lag time represents the time difference between hyetograph center of mass to the peak of the hydrograph for a subbasin. Due to the natural conditions of the watershed, including the relatively flat overland slope, lack of natural channel flow, and the presence of numerous natural

depressions, the SCS (NRCS) Lag Time equation, as shown below, was utilized to determine the subbasin lag time.

$$t_p = \frac{L_W^{0.8}\left[(1000/CN)-9\right]^{0.7}}{31.67S^{0.5}}$$

where: t_p = the lag time in minutes, L_w = the length of the longest flow path in feet, S (%) = the slope of the longest flow path, and CN = the composite curve number.

4.8 Unit Hydrograph

4.8.1 NRCS Dimensionless Unit Hydrograph

The standard NRCS dimensionless unit hydrograph (DUH) has been widely used to construct synthetic unit hydrographs by many agencies for hydrologic design practices and studies. The standard dimensionless unit hydrograph was an "averaged" hydrograph derived from a large number of natural unit hydrographs from watersheds ranging in sizes and geographical locations. The average DUH assumes that 37.5 percent of the total runoff volume occurs in the rising side of the curvilinear hydrograph (or the receding time from the peak is 1.67 times of the time to peak). Based on this assumption and with consideration of unit conversion factors in the equation (such as square miles to acres, acre to cubic feet, and hour to seconds) in peak discharge computation, a standard peaking rate factor (PRF) of 484 was derived as shown in the following equation:

$$Q_p = \frac{484A}{T_p}$$

The NRCS dimensionless unit hydrograph (DUH) is detailed in Chapter 16 of the *National Engineering Handbook, Section 4 (NEH-4), Hydrology*. The report indicates that a PRF value may range from below 100 for very flat watersheds to more than 600 for very steep watersheds. The *NEH-4* provides for the DUH shape based on a Gamma function relationship to the PRF.

A recent study entitled "*Revisit of NRCS Unit Hydrograph Procedures*" by Lamar University, University of Houston, and Texas Tech University for Texas Department of Transportation presents regional regression equations developed for basin-mean time to peak Tp, and peak discharge Qp of Gamma unit hydrographs based on 1,600 recorded rainfall-runoff data pairs from 90 Texas watersheds within Trinity River, Brazos River, Colorado River, San Antonio River. The study found that the mean peak rate factor for Texas watersheds range from 251 to 626 with an average value of 370.

The U.S. Bureau of Reclamation (USBR) developed a dimensionless unit hydrograph for drainage design purposes for a project entitled "Valley Gravity Project" in 1948. The dimensionless unit hydrograph was developed by averaging two study areas with 48.56 and 22.83 square miles

respectively within the Lower Rio Grande Valley. By examining the dimensionless unit hydrograph, a NRCS DUH PRF value of 130 was determined. Based on the aforementioned studies, it can be concluded that a constant factor of 484 does not reflect the peak flows from the watersheds within Hidalgo County.

A USDA-ARS Coastal study (Sheridan, et al., 1999) evaluated the PRF in eight Texas southeast coastal flat watersheds ranging from 1.0 to 19.3 square miles. Values for the PRF ranged from 174 to 476, depending watershed slope and area. The PRF was predicted by the following empirical equation:

$$PRF = 631.7A^{0.263}S^{0.882}$$

where A is drainage area in square miles and S is watershed channel slope in percent. The channel slopes of the eight watersheds used for this study vary from 0.1 to 0.37 percent.

With considering the significant changes in slopes within the watershed, the empirical equation developed by the USDA-ARS Coastal study was used for this study and a minimum peaking rate factor of 150 value was conservatively adopted. Using the equation shown above, a specific peaking rate factor was determined for each subbasin.

4.8.2 Gamma Function Based Unit Hydrograph

The Peaking Rate Factor (PRF) reflects the shape of the Unit Hydrograph. Each PRF has a unique shape of UH. Since there is no provision in HEC-HMS for changing the 484 PRF and the corresponding UH, to reflect the lower PRF values in the HEC-HMS modeling analysis, a two-parameter Gamma equation was used to fit the UH shape as recommended by NRCS. The Gamma equation has the following equation:

$$\frac{Q_t}{Q_p} = (\frac{t}{T_p})^{\alpha} e^{(1-\frac{t}{T_p})\alpha}$$

Where Q_t is the discharge value at time t, Q_p is the peak discharge of the unit hydrograph, e is constant 2.7183, α is gamma equation shape factor, and T_p is time to peak.

The gamma shape factor α can be estimated using the following equation (Aron and White (1982)):

$$\alpha = 0.045 + 0.5\phi + 5.6\phi^2 + 0.3\phi^3$$

$$\phi = \frac{PRF}{645.33}$$

4.8.3 Stream Reach Routing

Stream reach routing enables the consideration of channel storage volume to attenuate hydrograph peak flows. Stream reach routing was accomplished within the contributing drainage

areas using the Muskingum Cunge 8-Point cross-section method. Typical cross-sections were obtained for each reach and input to the HEC-HMS model with a representative slope for the reach. The typical Manning's n value used was 0.045.

Stream reach routing for the North Main Drain and South Main Drain was simulated in the model using the more accurate Modified Puls method. This was possible due to the availability of the HEC-RAS model from the Raymondville Drain Flood Control Project. After convergence from several iterations (cycling) between the HEC-RAS multi-profile model and the HEC-HMS model, acceptable storage-outflow relationships were obtained from the multi-profile hydraulic model to perform Modified Puls routing for reaches along North Main Drain and South Main Drain.

4.9 HEC-HMS Model

The U.S. Army Corps of Engineers (USACE) Hydrologic Modeling Systems (HEC-HMS) version 4.0 modeling program was used to compute peak flows and hydrographs at various locations within the drainage systems for various storm events. The basin model was generated using ArcHydro and HEC-GeoHMS. Corresponding to each drainage system delineated, an HEC-HMS model was developed to peak flows and hydrographs for each frequency storm event.

5.0 HEC-RAS MODELING

The City drainage ditches were analyzed using the U.S. Army Corps of Engineers' HEC-RAS (v.4.1) hydraulic software package. Each drainage ditch system was evaluated to determine its existing conveyance capacities, identify overbank flooding risk areas and system constraints. For systems with insufficient capacity, alternative channel improvements were analyzed.

For the City outfall ditches, one-dimensional steady flow hydraulic models were created for the hydraulic analyses. The HEC-RAS model was developed by importing the geometric import file generated from HEC-GeoRAS, as discussed below, and flow data into the geometry model data. The ditch capacity analyses were performed utilizing a normal depth tailwater condition. Existing channel capacities were determined based on the existing HEC-RAS models. Alternative HEC-RAS geometry models were created using the program's channel modification tools to evaluate alternative channel improvements.

5.1 HEC-GeoRAS

HEC-GeoRAS, an ArcGIS extension, is a set of ArcGIS tools specifically designed to process DEM data to extract channel geometric data for HEC-RAS model development. Using HEC-GeoRAS requires a digital terrain model (DTM) represented by ESRI ArcGRID or triangulated irregular network (TIN). The current version of HEC-GeoRAS creates an import file, referred to as the RAS GIS Import File, which contains the channel network, channel cross-section geometry, and reach length data from a set of RAS themes and a DTM (collectively referred as the RAS Layers). The RAS themes, including stream centerlines, flow path centerlines, channel banks, and cross section cut lines, are created based on LiDAR data, channel cross section field survey data, and aerial photograph.

5.2 Manning's n-values

The channel roughness, Manning's n-values, are representative of the vegetation, flow obstruction, and overall channel/ floodplain conditions. The Manning's n-values were assigned based on field visit, photos, and aerials. For all the hydraulic models, standardize values were determined to be representative. These include a typical channel n-value of 0.045, representing the low-velocity, trapezoidal man-made ditches with vegetation growth, and an overbank n-value of 0.06, representing a mix of urbanized/residential development areas and maintained grassy areas with some limited agricultural areas.

5.3 Overbank Ineffective/ Obstructed Areas

Several of the drainage ditches either are adjacent to elevated irrigation canals or have depressed areas within the overbank areas. The high berms of the canals cause flow blockage with the

channel overbanks, and the depressed areas represent locations of non-contributing flow area to the channel conveyance. The cross section overbank data were checked against topography and aerials. Ineffective flow areas and block obstructions were added to the cross section based on topography and overland flow patterns.

5.4 Cross-Drainage Structures

The cross-drainage culverts details within the channels were obtained from field measurements and observations. The field notes and photos for lateral cross-drainage structures as well as an overall location map are provided in **Appendix B**. Each structure's size and length was incorporated into the HEC-RAS modeling for the hydraulic capacity analyses.

5.5 Proposed Improvements

For drainage ditch systems that were determined to have inadequate conveyance capacity or requiring additional infrastructure to provide for future development needs, multiple modification measures were considered to reduce the existing flooding risks. These modification measures include:

- Channel improvements
- New channel alignments
- Crossing structure improvements
- Detention basins
- Levee systems

Channel improvements were recommended for various drainage ditch segments. The proposed channel improvements reduce the potential flood damages by increasing the channel conveyance capacity and lowering the water surface elevation along the channel. Channel improvements usually include channel widening and/or deepening, removing woody vegetation, and/or concrete lining.

New channel alignments were proposed to provide drainage relief to collect runoff from existing flooding problematic areas and areas of future development.

The typical proposed channel improvement includes a trapezoidal, grass-lined channel section with 3:1 side slopes and 30-foot maintenance berms. The channel section's bottom width, slope, and depth were optimized based on conveyance needs and available outfall depth.

For ditch reaches that are to be improved, proposed stream crossing structures were proposed to accommodate the proposed channel improvements and adequately convey the fully developed flows without impediment. It should be noted that the scope of this study did not include the survey and therefore the analysis of existing structures.

Detention basin alternatives were also considered at various locations. Detention is an alternative structural solution to reduce flows within the channel and therefore reduce water surface elevations along the channels. A detention basin stores stormwater runoff temporarily and then releases the water downstream to the channel over a longer period of time when the channel can safely convey the water away.

Levee systems with pump stations were also considered as options to protect subdivisions from flooding. Levee systems can be used to block offsite runoff flowing into a subdivision. Internal floodwater must be pumped during a flood.

5.6 HCDD1 Master Drainage System

The City drainage ditches outfall into the HCDD1 Master Drainage System, specifically the Main Floodway Channel network system. The primary HCDD1 receiving ditches serving the City include the North Main Drain and South Main Drain. The North Main Drain and South Main Drain were analyzed hydraulically to establish tailwater conditions and backwater inundation for the City drainage systems, as well as potential flooding within the City from the HCDD1 ditches. The HEC-RAS modeling for the North Main Drain and South Main Drain, as described below, is provided in **Appendix C**.

5.6.1 North Main Drain

The North Main Drain was modeled using 1D steady HEC-RAS model as part of the Raymondville Drain Flood Control Project for HCDD1. The North Main Drain receives runoff from the western and northern portions of the City of Edinburg, as well as from the majority of this project's studied outfall ditches. The model was updated based on a combination of 1D channel and 2D floodplain unsteady modeling approach with the latest 2D unsteady HEC-RAS model (v.5.0 Beta) program. The widespread floodplain along the channel was modeled by generating a 2D computation mesh based on LiDAR DEM data. Hydrographs from HEC-HMS model were incorporated into the 1D/2D unsteady flow model as boundary conditions. The results provided a more detailed representation of overbank and low depressed area flooding potential along North Main Drain within the City. The 100-year, 25-year, and 10-year inundation depth results are shown in **Figures 5-1**, **5-2**, and **5-3**, respectively.

As shown in the figures, areas along the North Main Drain and Lull Drain within the northern portions of the City are susceptible to inundation, even during a 10-year storm event, as well as the low-lying areas within the City Center, previously referenced as the "Edinburg Low".

5.6.2 South Main Drain

The South Main Drain was modeled using 1D steady HEC-RAS model as part of the Raymondville Drain Flood Control Project for HCDD1. Since the original HEC-RAS model was not geo-referenced

and only three of the studied outfall ditches drain to the South Main Drain system, a 2D unsteady HEC-RAS model was not created for this ditch.

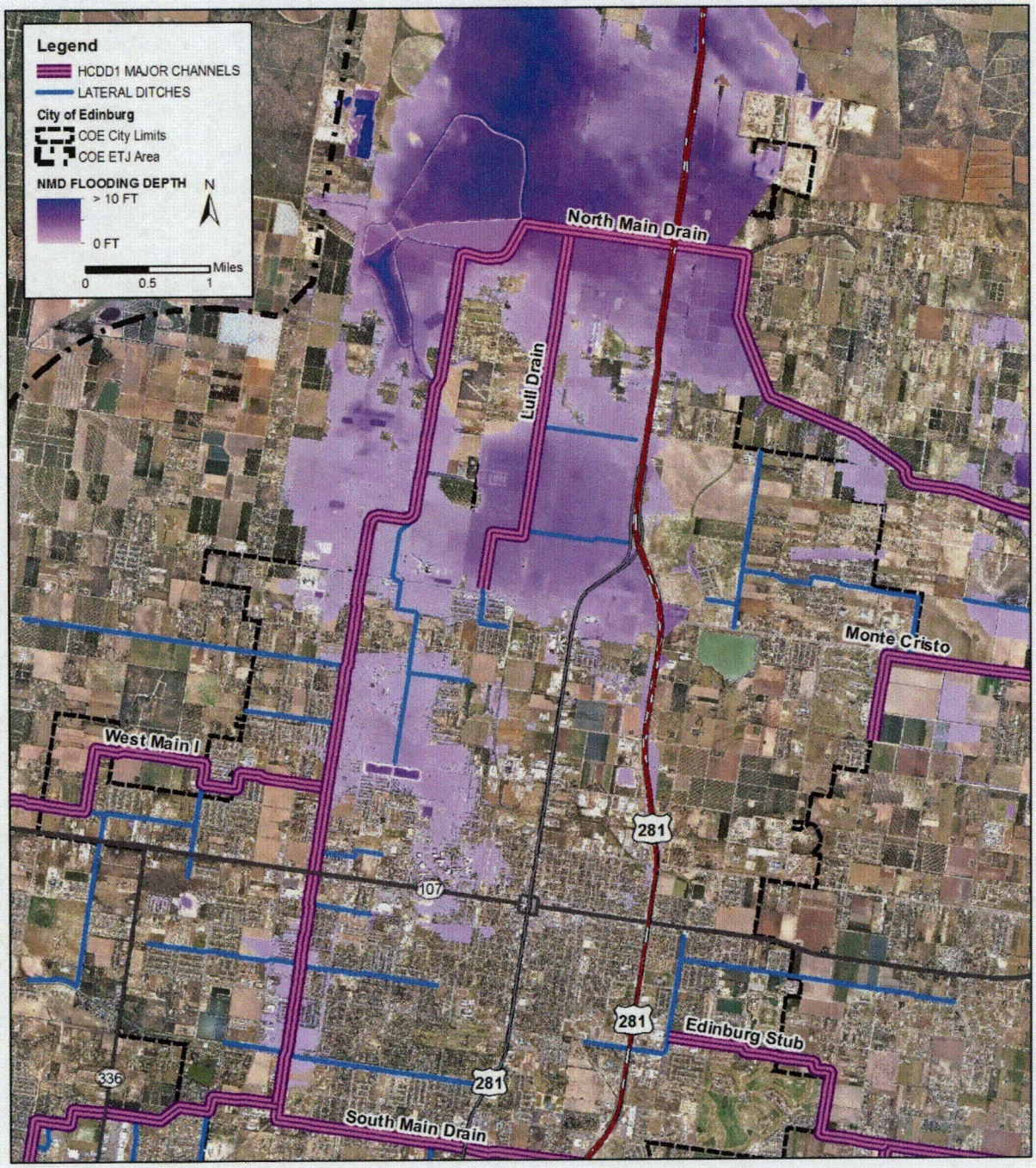


Figure 5-1. North Main Drain 100-Year Flooding Potential

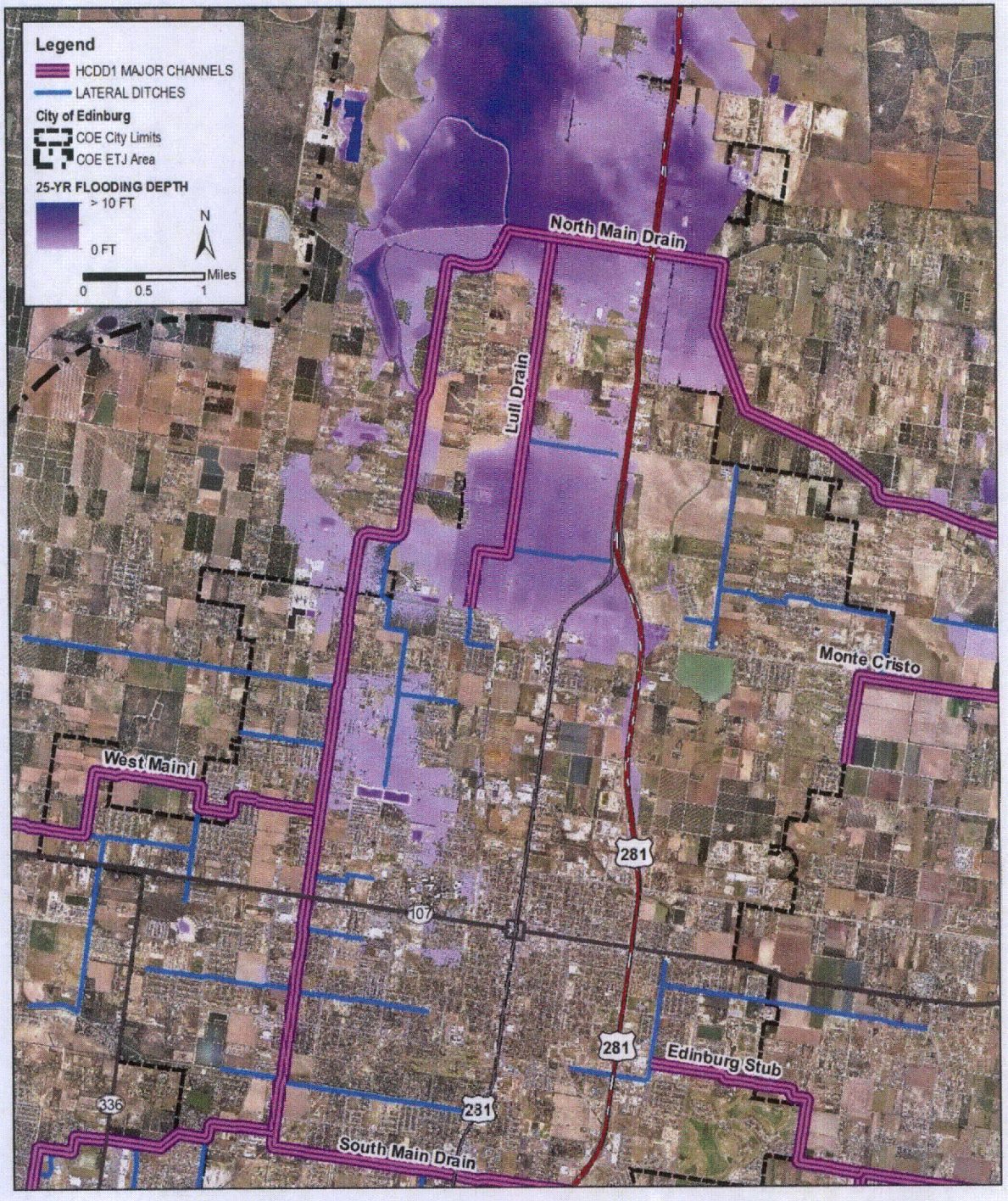


Figure 5-2. North Main Drain 25-Year Flooding Potential

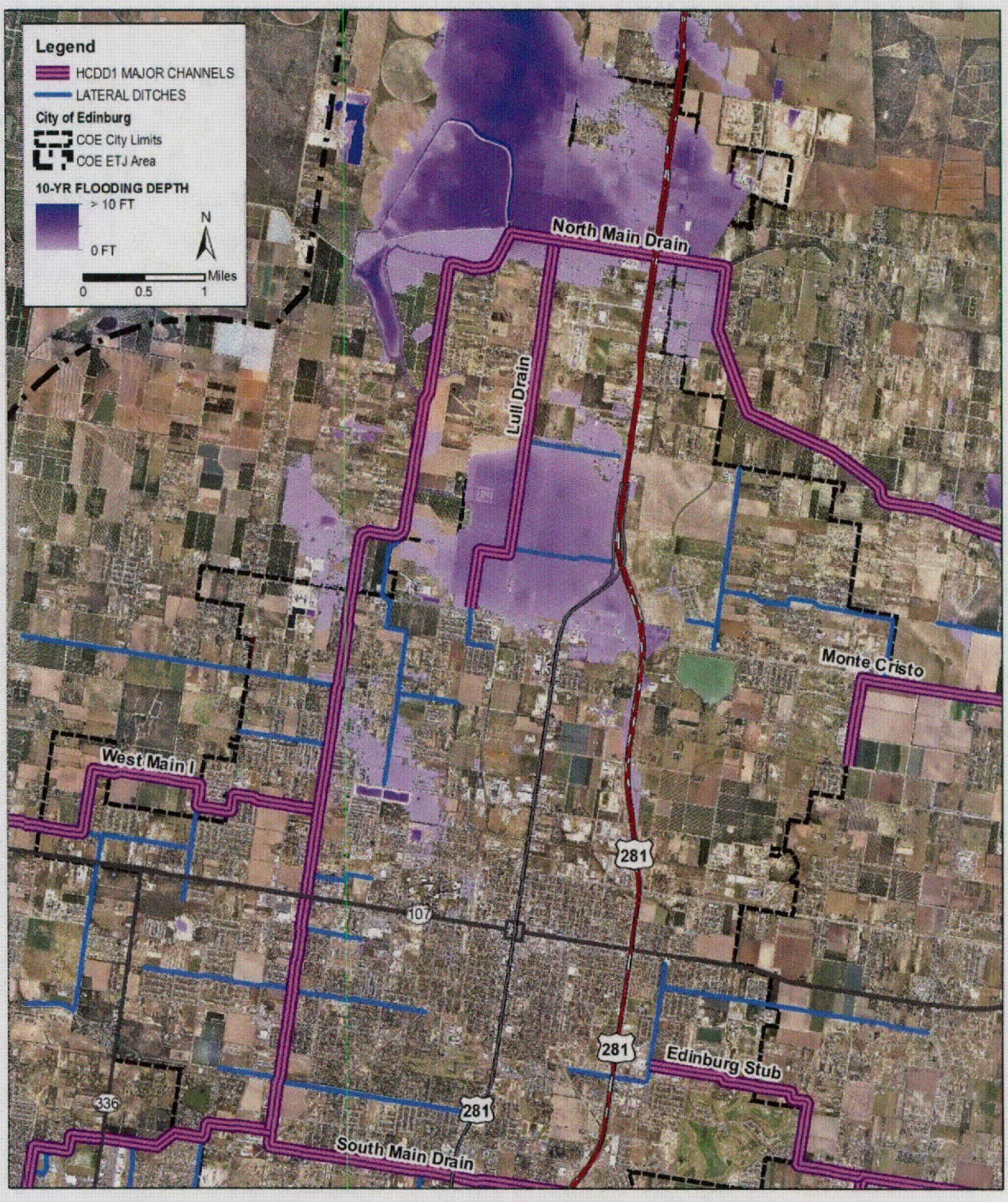


Figure 5-3. North Main Drain 10-Year Flooding Potential

6.0 DRAINAGE SYSTEM EVALUATION

This section presents the results of the detailed hydraulic analysis for both existing and proposed conditions. The existing City drainage ditches were evaluated for capacity adequacy and to identify problematic flood areas. The drainage systems were analyzed using HEC-HMS to compute runoff flows and HEC-RAS to compute capacity and water surface elevations. The drainage system investigation and evaluation included the City drainage ditch systems, as well as the associated receiving HCDD1 Master Drainage Systems. Specifically included in the discussions are descriptions of each drainage ditch system and service area, structural crossings, existing ditch capacities, drainage and flooding problems, and recommended improvements to address potential flooding problems. The HEC-RAS modeling for the lateral drainage system evaluations is provided in **Appendix D**. The resulting water surface elevation comparison between the existing and proposed water surface elevations for existing and ultimate multiple frequency flows is provided in tables within each respective subsection.

To relieve existing flooding, increase ditch capacity, and/or provide for future development, improvement alternatives were analyzed and recommended. The proposed alternative components included channel improvements, new channel alignments, crossing structure improvements, and detention basins, as previously discussed in **Section 5.4**.

6.1 Investigated City Drainage Systems

A total of twenty-one (21) City drainage systems were studied and hydraulically modeled, which are listed **Table 6-1** and shown in **Figure 6-1**. The City drainage ditch systems were categorized and labeled based on the receiving HCDD1 drainage system: NM = North Main Drain, SM = South Main Drain, ES = Edinburg Stub, and MC = Monte Cristo Drain. Details of the investigated drainage systems are presented in the following subsections. Several systems are presented together based on interaction between the systems, proposed measures, and geographic location.

TABLE 6-1. INVESTIGATED CITY DRAINAGE SYSTEMS

NORTH MAIN DRAIN WATERSHED	SOUTH MAIN DRAIN WATERSHED
NM-102 (HCDD1 Lull Drain)	SM-101 & SM-102 & SM-103
NM-103 & NM-104	SM-104
NM-105 & NM-106	ES-101 & ES-102
NM-108 & NM-109	MC-100 & MC-101
NM-110 & NM-112	
NM-111 & NM-113	
NM-115 & NM-116	

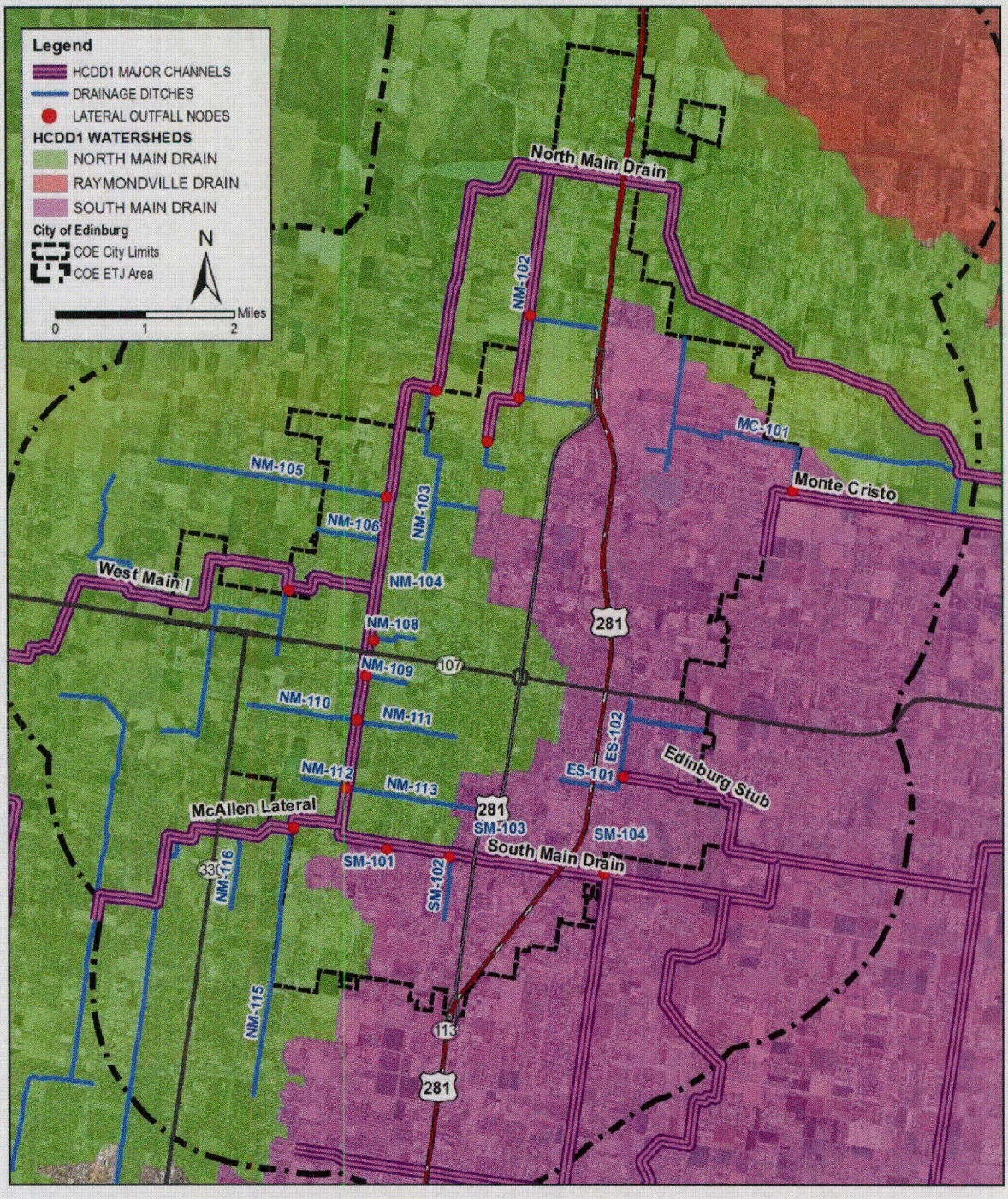


Figure 6-1. COE Drainage Ditch Systems

SYSTEM NM-102

System NM-102 represents the contributing drainage area for the HCDD1 Lull Drain and its laterals. Lull Drain is a part of the HCDD1 Master Drainage System. The drainage area is located within the northern portions of the City of Edinburg; generally between North Main Drain to the west and US 281 to the east. The system drains from south of W. Monte Cristo St. north to the North Main Drain with a total drainage area of approximately 3214 acres (5.02 sq. miles).

The drainage network consists of approximately 28,300 feet of ditches including the Lull Drain (NM-102), which serves as the main drainage ditch, and recently constructed (within ten years) laterals to service specific developments. Laterals NM-102-01 and NM-102-02 run west to Lull Drain and service US 281 (IH-69). Lateral NM-102-03 runs south from Lull Drain and services the Monte Cristo Park, Solana, and Las Cruces subdivisions which lie between Rogers Road and Monte Cristo Road. The NM-102 system drainage area and ditch alignments are shown in **Figure 6-2**.

The City has identified the Lull Townsite Subdivision, which is located along Lull Drain adjacent to Monte Cristo Road, to be a flooding prone area. This subdivision is located within a low-lying topographic area, as shown in **Figure 6-3**. Based on the North Main Drain hydraulic analysis, the 10-year water surface elevation within North Main Drain equates to the natural elevations along Lull Drain near Monte Cristo Road. As shown in the figures in Section 5.5, the area around Lull Subdivision is inundated during the 10-year and greater storms by the backwater from North Main Drain.

The hydraulic analysis shows that the Lull Drain system has a greater than 25-year capacity within the lower (northern) reaches and less than 10-year capacity within the reach along Lull Townsite Subdivision (downstream/north of Monte Cristo Road). The hydraulic analysis shows that the downstream Access Road and the Denver Road culverts require replacement to provide adequate conveyance for the proposed conditions. The following table lists the existing and proposed structures.

TABLE 6-2. NM-102 SYSTEM CROSS-DRAINAGE STRUCTURE INVENTORY

DITCH STATION	CROSSING NAME	EXISTING STRUCTURE	CULVERT LENGTH	PROPOSED STRUCTURE
NM-102				
1822	ACCESS	72" RCP	100	10' X 6' RCB
17433	MONTE CRISTO	60" RCP	554	--
18586	DENVER	36" RCP	93	2-36" RCP

The Lull Drain tailwater conditions from North Main Drain imply that any channel improvements along Lull Drain to increase the existing capacity will not result in significant benefit without improvements along North Main Drain. However, detention storage is an effective measure to provide flood relief for existing localized flooding as well as future development drainage needs.

Two alternatives are proposed to provide detention storage. One option includes inline detention within Lull Drain for the entire ditch reach. This option would provide storage needs for the existing flooding problems as well as drainage needs for future development. The option includes widening the existing channel and installing control structures such as flood gates and weir structures to prevent backwater from North Main Drain inundating the ditch system. A comparison of the improvement option existing and proposed water surface elevations from HEC-RAS modeling is provided in **Table 6-3**.

Another option is to provide an offline detention basin to relief localized flooding within the Lull Townsite Subdivision and adjacent areas. The two proposed alternatives are shown in **Figure 6-3**.

The Edinburg ISD has identified the Edinburg North High School campus as a flood risk area of concern. The campus is located along Closner Blvd. (BS 281) south of Monte Cristo Rd. within the upper reaches of the Lull Drain drainage area. The high school is currently drained by storm sewer systems. In order to provide additional drainage relief to the campus, it is recommended that the upstream reach of the Lull Drain (NM-102-03) be extended east from Brenda Road to the high school. The ditch extension would be approximately 1500 feet in length and consist of 10-foot bottom width, 3:1 (H:V) side slopes, and approximately 6 feet in depth. The ditch extension alignment is shown in **Figure 6-3**.

As part of the proposed Raymondville Drain Flood Control Project, flow will be diverted from North Main Drain near the Lull Drain confluence. These improvements project could significantly lower the tailwater condition for Lull Drain and reduce the ponding along the ditch. Any improvements to relieve existing flooding potential and provide drainage infrastructure needs for future development within this drainage system will depend on HCDD1 drainage improvements such as the Raymondville Drain Flood Control Project.

TABLE 6-3. NM-102 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON

RIVER REACH	NM-102 RIVER STATION	PROFILE FREQUENCY	Q TOTAL (CFS)	EXISTING W.S. ELEV (FT)	PROPOSED W.S. ELEV (FT)	WS DIFF (PR-EX) (FT)
NM-102-00 MAIN STEM						
NM-102C	664	EX 10Y	147	77.0	80.9	3.9
NM-102C	664	EX 25Y	205	81.6	81.3	-0.3
NM-102C	664	EX 100Y	356	82.1	81.7	-0.4
NM-102C	664	ULT 10Y	241	81.7	77.8	-3.9
NM-102C	664	ULT 25Y	316	82.0	81.6	-0.4
NM-102C	664	ULT 100Y	498	82.5	82.1	-0.4
NM-102C	1325	EX 10Y	134	80.1	80.9	0.8
NM-102C	1325	EX 25Y	186	81.6	81.3	-0.3
NM-102C	1325	EX 100Y	321	82.0	81.7	-0.3
NM-102C	1325	ULT 10Y	211	81.7	79.2	-2.5
NM-102C	1325	ULT 25Y	276	81.9	81.6	-0.3
NM-102C	1325	ULT 100Y	436	82.4	82.1	-0.3
NM-102C	1822	ACCESS RD			Culvert	
NM-102C	2159	EX 10Y	134	80.8	81.0	0.2
NM-102C	2159	EX 25Y	186	82.7	81.5	-1.2
NM-102C	2159	EX 100Y	321	84.6	82.5	-2.1
NM-102C	2159	ULT 10Y	211	83.2	79.8	-3.4
NM-102C	2159	ULT 25Y	276	84.4	82.2	-2.2
NM-102C	2159	ULT 100Y	436	85.0	83.5	-1.5
NM-102C	3517	EX 10Y	134	80.8	81.0	0.2
NM-102C	3517	EX 25Y	186	82.8	81.5	-1.3
NM-102C	3517	EX 100Y	321	84.6	82.5	-2.1
NM-102C	3517	ULT 10Y	211	83.2	79.8	-3.4
NM-102C	3517	ULT 25Y	276	84.4	82.2	-2.2
NM-102C	3517	ULT 100Y	436	85.0	83.5	-1.5
NM-102C	4131	EX 10Y	115	80.8	81.0	0.2
NM-102C	4131	EX 25Y	158	82.7	81.5	-1.2
NM-102C	4131	EX 100Y	268	84.6	82.5	-2.1
NM-102C	4131	ULT 10Y	168	83.2	79.8	-3.4
NM-102C	4131	ULT 25Y	218	84.4	82.2	-2.2
NM-102C	4131	ULT 100Y	346	85.0	83.5	-1.5
NM-102C	5122	EX 10Y	115	81.3	81.0	-0.3
NM-102C	5122	EX 25Y	158	83.0	81.6	-1.4
NM-102C	5122	EX 100Y	268	84.9	82.5	-2.4
NM-102C	5122	ULT 10Y	168	83.4	80.1	-3.3
NM-102C	5122	ULT 25Y	218	84.6	82.2	-2.4
NM-102C	5122	ULT 100Y	346	85.4	83.6	-1.8
NM-102C	6093	EX 10Y	115	81.8	81.1	-0.7
NM-102C	6093	EX 25Y	158	83.3	81.6	-1.7
NM-102C	6093	EX 100Y	268	85.2	82.6	-2.6
NM-102C	6093	ULT 10Y	168	83.7	80.3	-3.4
NM-102C	6093	ULT 25Y	218	84.8	82.2	-2.6
NM-102C	6093	ULT 100Y	346	85.8	83.6	-2.2
NM-102C	7022	EX 10Y	115	82.3	81.1	-1.2
NM-102C	7022	EX 25Y	158	83.6	81.6	-2
NM-102C	7022	EX 100Y	268	85.6	82.6	-3
NM-102C	7022	ULT 10Y	168	84.0	80.6	-3.4
NM-102C	7022	ULT 25Y	218	85.1	82.3	-2.8
NM-102C	7022	ULT 100Y	346	86.2	83.6	-2.6
NM-102C	7972	EX 10Y	115	82.7	81.2	-1.5
NM-102C	7972	EX 25Y	158	84.0	81.7	-2.3
NM-102C	7972	EX 100Y	268	85.9	82.7	-3.2
NM-102C	7972	ULT 10Y	168	84.3	80.9	-3.4
NM-102C	7972	ULT 25Y	218	85.4	82.3	-3.1
NM-102C	7972	ULT 100Y	346	86.6	83.7	-2.9

River Reach	NM-102 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
NM-102B	9226	EX 10Y	97	83.1	81.4	-1.7
NM-102B	9226	EX 25Y	133	84.3	81.9	-2.4
NM-102B	9226	EX 100Y	225	86.2	82.8	-3.4
NM-102B	9226	ULT 10Y	142	84.6	81.5	-3.1
NM-102B	9226	ULT 25Y	185	85.7	82.5	-3.2
NM-102B	9226	ULT 100Y	293	87.0	83.8	-3.2
NM-102B	10288	EX 10Y	87	83.4	81.9	-1.5
NM-102B	10288	EX 25Y	117	84.5	82.2	-2.3
NM-102B	10288	EX 100Y	197	86.2	83.0	-3.2
NM-102B	10288	ULT 10Y	120	84.8	82.1	-2.7
NM-102B	10288	ULT 25Y	156	85.7	82.7	-3
NM-102B	10288	ULT 100Y	247	87.0	83.9	-3.1
NM-102B	11504	EX 10Y	87	83.7	82.1	-1.6
NM-102B	11504	EX 25Y	117	84.8	82.4	-2.4
NM-102B	11504	EX 100Y	197	86.2	83.2	-3
NM-102B	11504	ULT 10Y	120	84.9	82.4	-2.5
NM-102B	11504	ULT 25Y	156	85.7	82.9	-2.8
NM-102B	11504	ULT 100Y	247	87.0	84.0	-3
NM-102B	12505	EX 10Y	87	83.9	82.3	-1.6
NM-102B	12505	EX 25Y	117	84.8	82.6	-2.2
NM-102B	12505	EX 100Y	197	86.2	83.3	-2.9
NM-102B	12505	ULT 10Y	120	84.9	82.5	-2.4
NM-102B	12505	ULT 25Y	156	85.7	83.0	-2.7
NM-102B	12505	ULT 100Y	247	87.0	84.0	-3
NM-102A	13789	EX 10Y	74	84.0	82.3	-1.7
NM-102A	13789	EX 25Y	99	84.9	82.6	-2.3
NM-102A	13789	EX 100Y	165	86.2	83.4	-2.8
NM-102A	13789	ULT 10Y	95	85.0	82.6	-2.4
NM-102A	13789	ULT 25Y	123	85.7	83.0	-2.7
NM-102A	13789	ULT 100Y	196	87.0	84.1	-2.9
NM-102A	15326	EX 10Y	45	84.0	82.4	-1.6
NM-102A	15326	EX 25Y	59	84.9	82.7	-2.2
NM-102A	15326	EX 100Y	95	86.2	83.4	-2.8
NM-102A	15326	ULT 10Y	47	85.0	82.6	-2.4
NM-102A	15326	ULT 25Y	61	85.7	83.1	-2.6
NM-102A	15326	ULT 100Y	97	87.0	84.1	-2.9
NM-102A	16116	EX 10Y	45	84.0	82.4	-1.6
NM-102A	16116	EX 25Y	59	84.9	82.7	-2.2
NM-102A	16116	EX 100Y	95	86.2	83.4	-2.8
NM-102A	16116	ULT 10Y	47	85.0	82.6	-2.4
NM-102A	16116	ULT 25Y	61	85.7	83.1	-2.6
NM-102A	16116	ULT 100Y	97	87.0	84.1	-2.9
NM-102A	16917	EX 10Y	45	84.0	82.4	-1.6
NM-102A	16917	EX 25Y	59	84.9	82.7	-2.2
NM-102A	16917	EX 100Y	95	86.3	83.4	-2.9
NM-102A	16917	ULT 10Y	47	85.0	82.6	-2.4
NM-102A	16917	ULT 25Y	61	85.7	83.1	-2.6
NM-102A	16917	ULT 100Y	97	87.0	84.1	-2.9
NM-102A	17433	MONTE CRISTO			Culvert	
NM-102A	18004	EX 10Y	26	86.9	86.8	-0.1
NM-102A	18004	EX 25Y	34	87.2	87.1	-0.1
NM-102A	18004	EX 100Y	55	88.0	87.9	-0.1
NM-102A	18004	ULT 10Y	27	86.9	86.8	-0.1
NM-102A	18004	ULT 25Y	35	87.2	87.1	-0.1
NM-102A	18004	ULT 100Y	56	88.0	87.9	-0.1
NM-102A	18419	EX 10Y	26	86.9	86.8	-0.1
NM-102A	18419	EX 25Y	34	87.2	87.2	0
NM-102A	18419	EX 100Y	55	88.0	87.9	-0.1

River Reach	NM-102 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
NM-102A	18419	ULT 10Y	27	87.0	86.9	-0.1
NM-102A	18419	ULT 25Y	35	87.3	87.2	-0.1
NM-102A	18419	ULT 100Y	56	88.0	87.9	-0.1
NM-102A	18586	DENVER			Culvert	
NM-102A	18676	EX 10Y	26	87.6	87.0	-0.6
NM-102A	18676	EX 25Y	34	88.1	87.4	-0.7
NM-102A	18676	EX 100Y	55	89.6	88.4	-1.2
NM-102A	18676	ULT 10Y	27	87.7	87.1	-0.6
NM-102A	18676	ULT 25Y	35	88.2	87.4	-0.8
NM-102A	18676	ULT 100Y	56	89.6	88.4	-1.2
NM-102A	18902	EX 10Y	26	87.6	87.0	-0.6
NM-102A	18902	EX 25Y	34	88.1	87.4	-0.7
NM-102A	18902	EX 100Y	55	89.6	88.4	-1.2
NM-102A	18902	ULT 10Y	27	87.7	87.1	-0.6
NM-102A	18902	ULT 25Y	35	88.2	87.5	-0.7
NM-102A	18902	ULT 100Y	56	89.6	88.4	-1.2
NM-102A	19462	EX 10Y	26	87.7	87.2	-0.5
NM-102A	19462	EX 25Y	34	88.2	87.5	-0.7
NM-102A	19462	EX 100Y	55	89.6	88.4	-1.2
NM-102A	19462	ULT 10Y	27	87.7	87.2	-0.5
NM-102A	19462	ULT 25Y	35	88.2	87.6	-0.6
NM-102A	19462	ULT 100Y	56	89.6	88.5	-1.1
NM-102-01 TRIBUTARY						
NM-102-01	656	EX 10Y	18	82.9	81.3	-1.6
NM-102-01	656	EX 25Y	25	84.1	81.8	-2.3
NM-102-01	656	EX 100Y	43	86.0	82.8	-3.2
NM-102-01	656	ULT 10Y	26	84.4	81.3	-3.1
NM-102-01	656	ULT 25Y	34	85.5	82.4	-3.1
NM-102-01	656	ULT 100Y	54	86.8	83.8	-3
NM-102-01	2176	EX 10Y	18	83.0	82.1	-0.9
NM-102-01	2176	EX 25Y	25	84.1	82.3	-1.8
NM-102-01	2176	EX 100Y	43	86.1	83.1	-3
NM-102-01	2176	ULT 10Y	26	84.5	82.4	-2.1
NM-102-01	2176	ULT 25Y	34	85.5	82.7	-2.8
NM-102-01	2176	ULT 100Y	54	86.8	83.9	-2.9
NM-102-01	3452	EX 10Y	18	83.1	82.6	-0.5
NM-102-01	3452	EX 25Y	25	84.2	82.8	-1.4
NM-102-01	3452	EX 100Y	43	86.1	83.4	-2.7
NM-102-01	3452	ULT 10Y	26	84.5	82.9	-1.6
NM-102-01	3452	ULT 25Y	34	85.5	83.2	-2.3
NM-102-01	3452	ULT 100Y	54	86.8	84.1	-2.7
NM-102-02 TRIBUTARY						
NM-102-02	569	EX 10Y	16	84.0	82.4	-1.6
NM-102-02	569	EX 25Y	23	84.9	82.7	-2.2
NM-102-02	569	EX 100Y	40	86.2	83.4	-2.8
NM-102-02	569	ULT 10Y	29	85.0	82.7	-2.3
NM-102-02	569	ULT 25Y	39	85.8	83.1	-2.7
NM-102-02	569	ULT 100Y	61	87.0	84.1	-2.9
NM-102-02	2137	EX 10Y	16	84.0	82.4	-1.6
NM-102-02	2137	EX 25Y	23	84.9	82.7	-2.2
NM-102-02	2137	EX 100Y	40	86.2	83.4	-2.8
NM-102-02	2137	ULT 10Y	29	85.0	82.7	-2.3
NM-102-02	2137	ULT 25Y	39	85.8	83.1	-2.7
NM-102-02	2137	ULT 100Y	61	87.0	84.2	-2.8
NM-102-02	3577	EX 10Y	16	84.7	84.7	0
NM-102-02	3577	EX 25Y	23	84.9	84.8	-0.1
NM-102-02	3577	EX 100Y	40	86.3	84.9	-1.4
NM-102-02	3577	ULT 10Y	29	85.0	84.8	-0.2
NM-102-02	3577	ULT 25Y	39	85.8	84.9	-0.9
NM-102-02	3577	ULT 100Y	61	87.0	85.0	-2

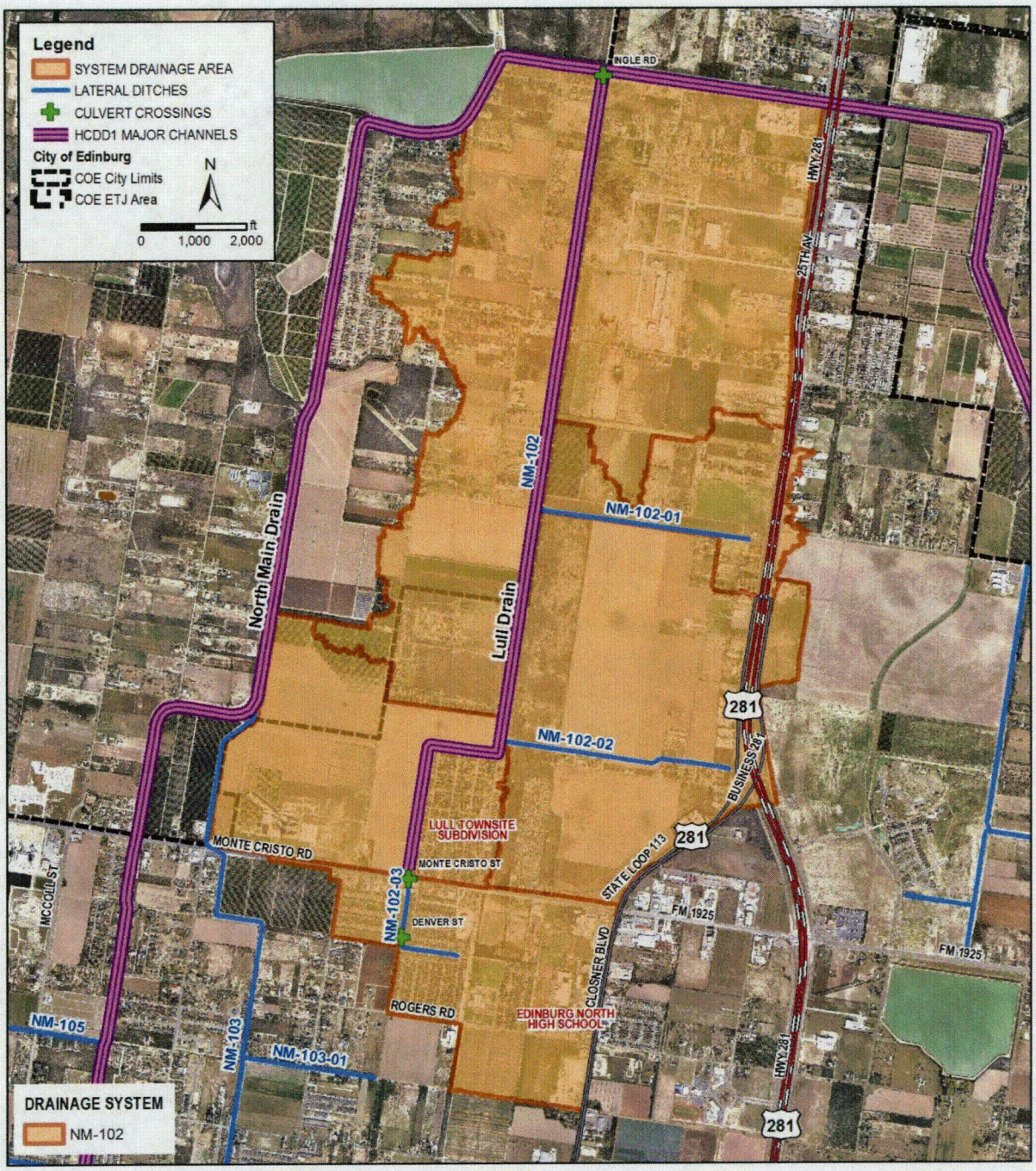


Figure 6-2. NM-102 Drainage System

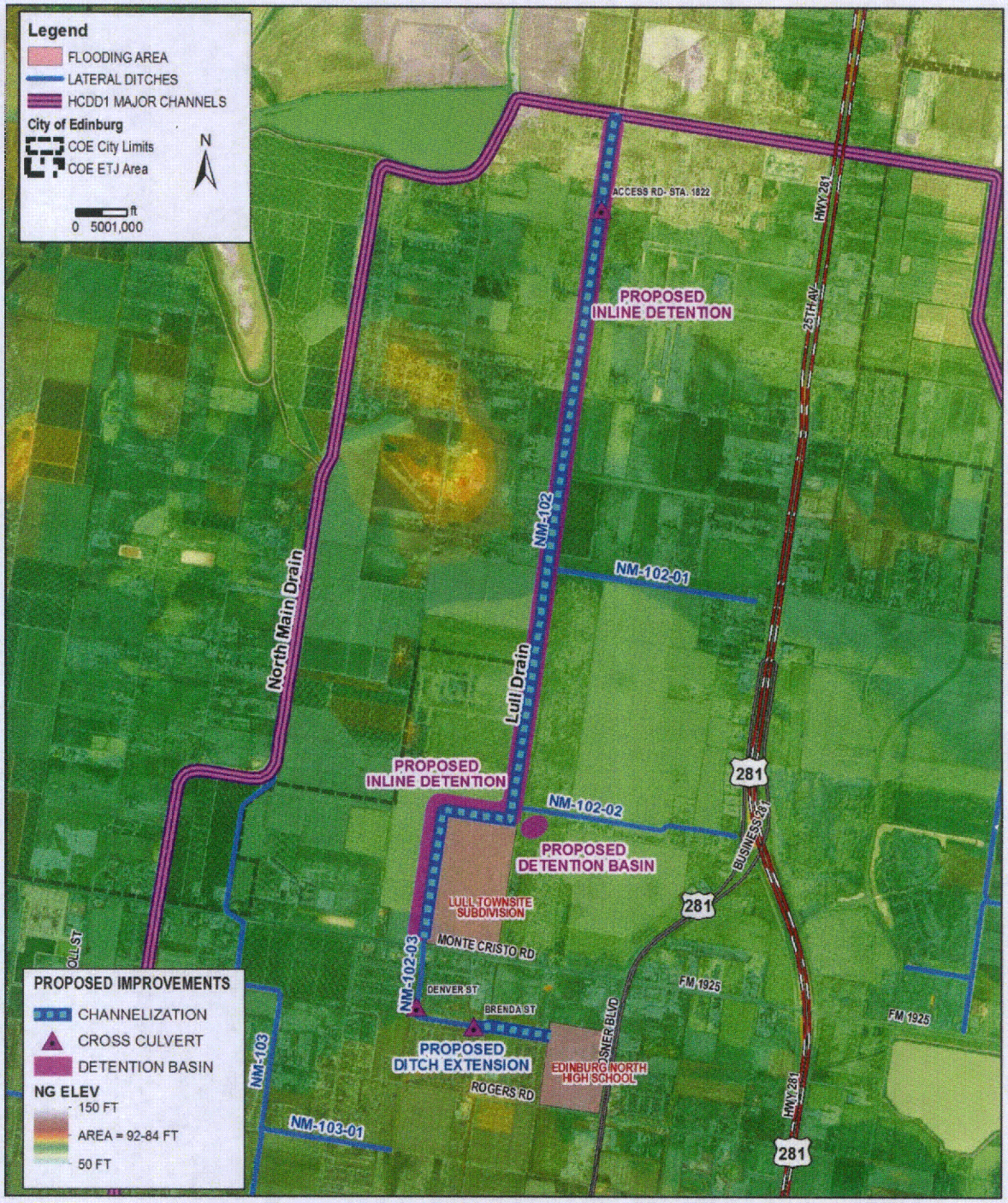


Figure 6-3. NM-102 Proposed System Improvements

SYSTEMS NM-103 & NM-104

System NM-103 represents the contributing drainage area of a lateral ditch to North Main Drain within the northern portions of the City of Edinburg and its ETJ. The area is generally located east of North Main Drain, west of Sugar Road, south of Monte Cristo Rd., and north of University of Texas-Pan American and W. Chapin St. The system drains from Chapin St. north to the North Main Drain with a total drainage area of approximately 903 acres (1.41 sq. miles). The drainage network consists of approximately 14,700 feet of ditches including the NM-103 mainstem (12,200 feet) and NM-103-01 lateral (2500 feet). The NM-103 system drainage area and ditch alignments are shown in **Figure 6-4**.

System NM-104 represent the contributing drainage area to the City of Edinburg storm water detention basins located at Chapin St. and Sugar Rd. The drainage area includes portions of the City central area, such as the University of Texas – Pan American (UTPA) campus and areas along Schunior St. and University Dr. The contributing area of this system is located within the natural flow path of the Edinburg Low. The area is collected by existing storm sewer systems that are pumped in to the City storm water basin. The storm water basin discharges into a storm sewer system along Chapin St. and outfalls into North Main Drain. The NM-104 system drainage area is shown in **Figure 6-4**.

A HEC-RAS model was developed to analysis the NM-103 system ditches for capacity. Based on the HEC-RAS hydraulic modeling, the NM-103 has a 100-year capacity along its reach. However, the North Main Drain tailwater condition dictates the flooding along the ditch. Based on the overland topography, the NM-103 system is located within the Edinburg Low flow path area. Additionally as shown in the hydraulic analysis presented in Section 5, NM-103 is subjected to overbank and backwater flooding from the North Main Drain for the 10-year and greater storm events. The overland topography and North Main Drain high water surface elevations reduce the conveyance capacity of the NM-103 channel.

The hydraulic analysis shows that the NM-103 system has a less than 25-year capacity along the channel. The hydraulic analysis shows that the culverts along the ditch require replacement to provide adequate conveyance for existing and future proposed conditions. The existing and proposed structures are listed in **Table 6-4**. A comparison of the existing and proposed improvement water surface elevations from HEC-RAS modeling is provided in **Table 6-5**.

TABLE 6-4. NM-103 SYSTEM CROSS-DRAINAGE STRUCTURE INVENTORY

DITCH STATION	CROSSING NAME	EXISTING STRUCTURE	CULVERT LENGTH	PROPOSED STRUCTURE
NM-103				
600	ACCESS ROAD	60" RCP	30	10' X 6' RCB
3297	MONTE CRISTO	60" RCP	474	10' X 6' RCB
6952	ROGERS	36" RCP	80	8' X 6' RCB
8282	UTILITY- CANAL	36" RCP	72	6' X 6' RCB
9597	RUSSELL	36" RCP	72	48" RCP

Based on received public comments, the residential area along Carmen and Greenfield Roads, east of N. Sugar Road has been identified as a flooding area. Investigation of the area shows there is no significant drainage outfall to collect overland runoff contributing along Sugar Road. It is recommended that a proposed outfall be constructed to convey the Sugar Road drainage to the NM-103 ditch. Another alternative to provide drainage relief for the area is to route the runoff contributing to Sugar Road to the existing storm water basin (or a proposed basin as described below) located south of W. Chapin St.

Flooding has historically plagued the City central area within the NM-104 system area due to the low-lying topography, limited relief and outfall capacity, and tailwater conditions within North Main Drain. The City of Edinburg has a storm water retention basin along W. Chapin St, immediately south of NM-103 ditch. The retention basin provides storage for the City storm sewer systems within the NM-104 system area. The retention basin is currently pumped to North Main Drain along W. Chapin St. Additional relief for the retention basin can be potentially provided by a proposed discharge connection across W. Chapin St. into NM-103. An additional alternative includes increasing the capacity of the storm water basin through an additional basin cell north of W. Chapin St. The proposed basin would provide increased storage capacity for the existing City storm water facility. This would reduce the tailwater of the storm sewer systems within the City central area, reducing the flooding potential. The proposed alternative options are shown in **Figure 6-5**.

TABLE 6-5. NM-103 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON

NM-103 RIVER STATION	PROFILE FREQUENCY	Q TOTAL (CFS)	EXISTING W.S. ELEV (FT)	PROPOSED W.S. ELEV (FT)	WS DIFF (PR-EX) (FT)
628	EX 10Y	108	81.5	81.5	0
628	EX 25Y	150	82.2	82.2	0
628	EX 100Y	261	83.9	83.9	0
628	ULT 10Y	173	82.6	82.6	0
628	ULT 25Y	225	83.4	83.4	0
628	ULT 100Y	356	85.1	85.1	0
1579	EX 10Y	108	81.9	81.9	0
1579	EX 25Y	150	82.7	82.7	0
1579	EX 100Y	261	84.4	84.4	0
1579	ULT 10Y	173	83.1	83.1	0
1579	ULT 25Y	225	83.9	83.9	0
1579	ULT 100Y	356	85.6	85.6	0
2322	EX 10Y	97	82.6	82.6	0
2322	EX 25Y	135	83.3	83.3	0
2322	EX 100Y	234	84.8	84.8	0
2322	ULT 10Y	152	83.6	83.6	0
2322	ULT 25Y	199	84.4	84.4	0
2322	ULT 100Y	314	86.0	86.0	0
3019	EX 10Y	97	83.8	83.8	0
3019	EX 25Y	135	84.3	84.3	0
3019	EX 100Y	234	85.6	85.6	0
3019	ULT 10Y	152	84.5	84.5	0
3019	ULT 25Y	199	85.1	85.1	0
3019	ULT 100Y	314	86.6	86.6	0
3297	MONTE CRISTO			Culvert	
3550	EX 10Y	97	85.4	84.1	-1.3
3550	EX 25Y	135	86.6	84.7	-1.9
3550	EX 100Y	234	90.1	86.2	-3.9
3550	ULT 10Y	152	87.4	84.9	-2.5
3550	ULT 25Y	199	89.7	85.7	-4
3550	ULT 100Y	314	90.5	87.5	-3
4540	EX 10Y	97	85.5	84.4	-1.1
4540	EX 25Y	135	86.7	85.0	-1.7
4540	EX 100Y	234	90.1	86.5	-3.6
4540	ULT 10Y	152	87.5	85.3	-2.2
4540	ULT 25Y	199	89.7	86.0	-3.7
4540	ULT 100Y	314	90.6	87.8	-2.8
6017	EX 10Y	97	85.6	84.6	-1
6017	EX 25Y	135	86.8	85.3	-1.5
6017	EX 100Y	234	90.2	86.8	-3.4
6017	ULT 10Y	152	87.6	85.6	-2
6017	ULT 25Y	199	89.8	86.3	-3.5
6017	ULT 100Y	314	90.6	88.0	-2.6
6894	EX 10Y	56	85.7	84.8	-0.9
6894	EX 25Y	79	86.9	85.4	-1.5
6894	EX 100Y	137	90.2	86.9	-3.3
6894	ULT 10Y	89	87.6	85.7	-1.9
6894	ULT 25Y	116	89.8	86.4	-3.4
6894	ULT 100Y	184	90.7	88.2	-2.5
6952	ROGERS			Culvert	
7025	EX 10Y	56	87.6	84.8	-2.8
7025	EX 25Y	79	90.7	85.5	-5.2
7025	EX 100Y	137	91.7	87.1	-4.6
7025	ULT 10Y	89	91.1	85.8	-5.3

NM-103 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
7025	ULT 25Y	116	91.6	86.6	-5
7025	ULT 100Y	184	92.0	88.5	-3.5
7975	EX 10Y	56	87.6	84.9	-2.7
7975	EX 25Y	79	90.7	85.6	-5.1
7975	EX 100Y	137	91.7	87.2	-4.5
7975	ULT 10Y	89	91.2	85.9	-5.3
7975	ULT 25Y	116	91.6	86.7	-4.9
7975	ULT 100Y	184	92.0	88.6	-3.4
8282	UTILITY			Culvert	
8419	EX 10Y	56	89.5	85.0	-4.5
8419	EX 25Y	79	94.5	85.8	-8.7
8419	EX 100Y	137	95.0	87.6	-7.4
8419	ULT 10Y	89	95.0	86.1	-8.9
8419	ULT 25Y	116	95.0	86.9	-8.1
8419	ULT 100Y	184	95.0	89.3	-5.7
8922	EX 10Y	12	89.5	85.0	-4.5
8922	EX 25Y	16	94.5	85.8	-8.7
8922	EX 100Y	28	95.0	87.6	-7.4
8922	ULT 10Y	19	95.0	86.1	-8.9
8922	ULT 25Y	24	95.0	87.0	-8
8922	ULT 100Y	38	95.0	89.3	-5.7
9510	EX 10Y	12	89.5	85.0	-4.5
9510	EX 25Y	16	94.5	85.8	-8.7
9510	EX 100Y	28	95.0	87.6	-7.4
9510	ULT 10Y	19	95.0	86.1	-8.9
9510	ULT 25Y	24	95.0	87.0	-8
9510	ULT 100Y	38	95.0	89.3	-5.7
9597	RUSSELL			Culvert	
9676	EX 10Y	12	89.6	85.1	-4.5
9676	EX 25Y	16	94.5	85.9	-8.6
9676	EX 100Y	28	95.0	87.7	-7.3
9676	ULT 10Y	19	95.0	86.2	-8.8
9676	ULT 25Y	24	95.0	87.1	-7.9
9676	ULT 100Y	38	95.0	89.5	-5.5
10905	EX 10Y	12	89.6	85.1	-4.5
10905	EX 25Y	16	94.5	85.9	-8.6
10905	EX 100Y	28	95.0	87.7	-7.3
10905	ULT 10Y	19	95.0	86.2	-8.8
10905	ULT 25Y	24	95.0	87.1	-7.9
10905	ULT 100Y	38	95.0	89.5	-5.5
12134	EX 10Y	12	89.6	85.1	-4.5
12134	EX 25Y	16	94.5	85.9	-8.6
12134	EX 100Y	28	95.0	87.7	-7.3
12134	ULT 10Y	19	95.0	86.2	-8.8
12134	ULT 25Y	24	95.0	87.1	-7.9
12134	ULT 100Y	38	95.0	89.6	-5.4

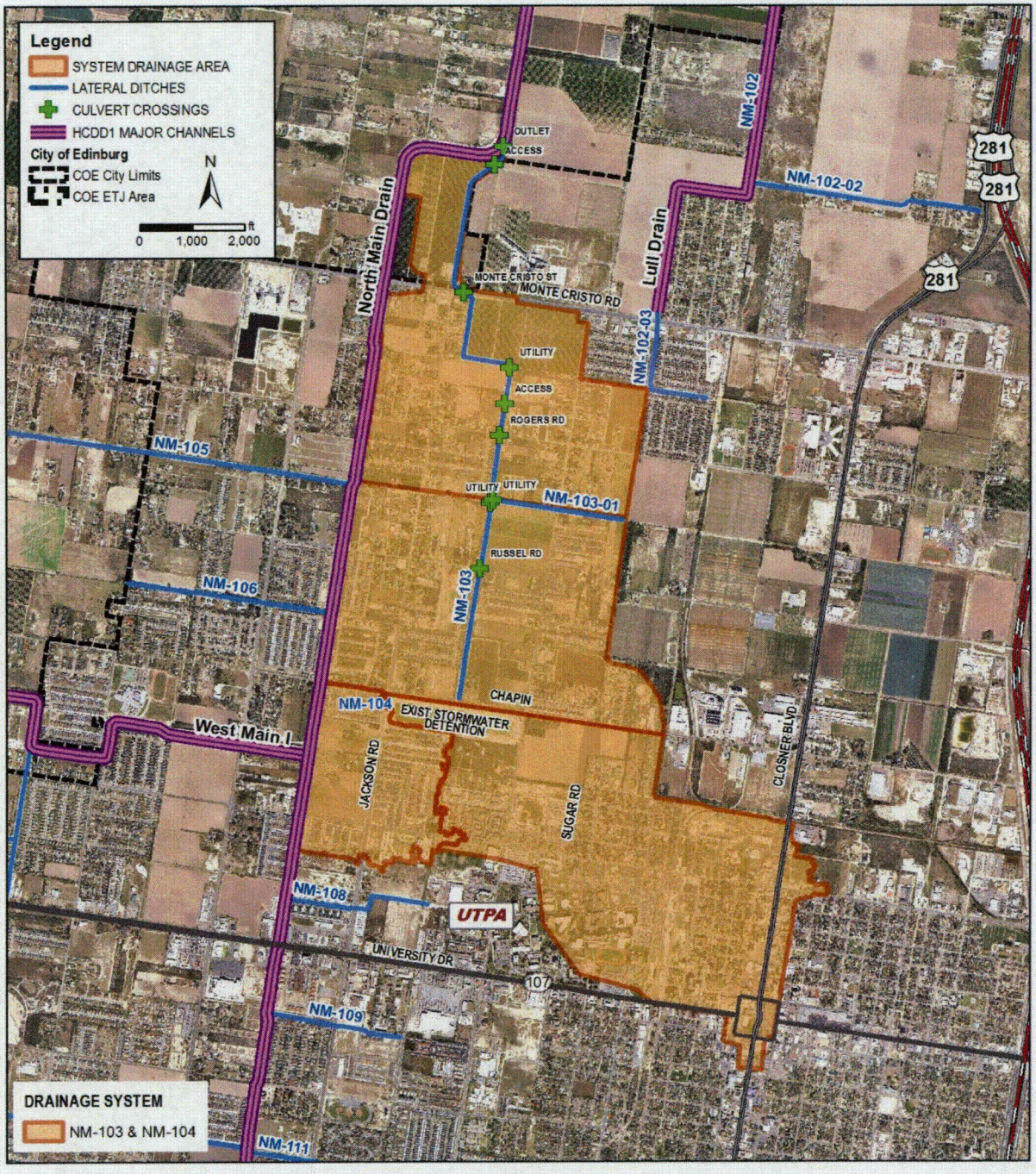


Figure 6-4. NM-103 & NM-104 Drainage System

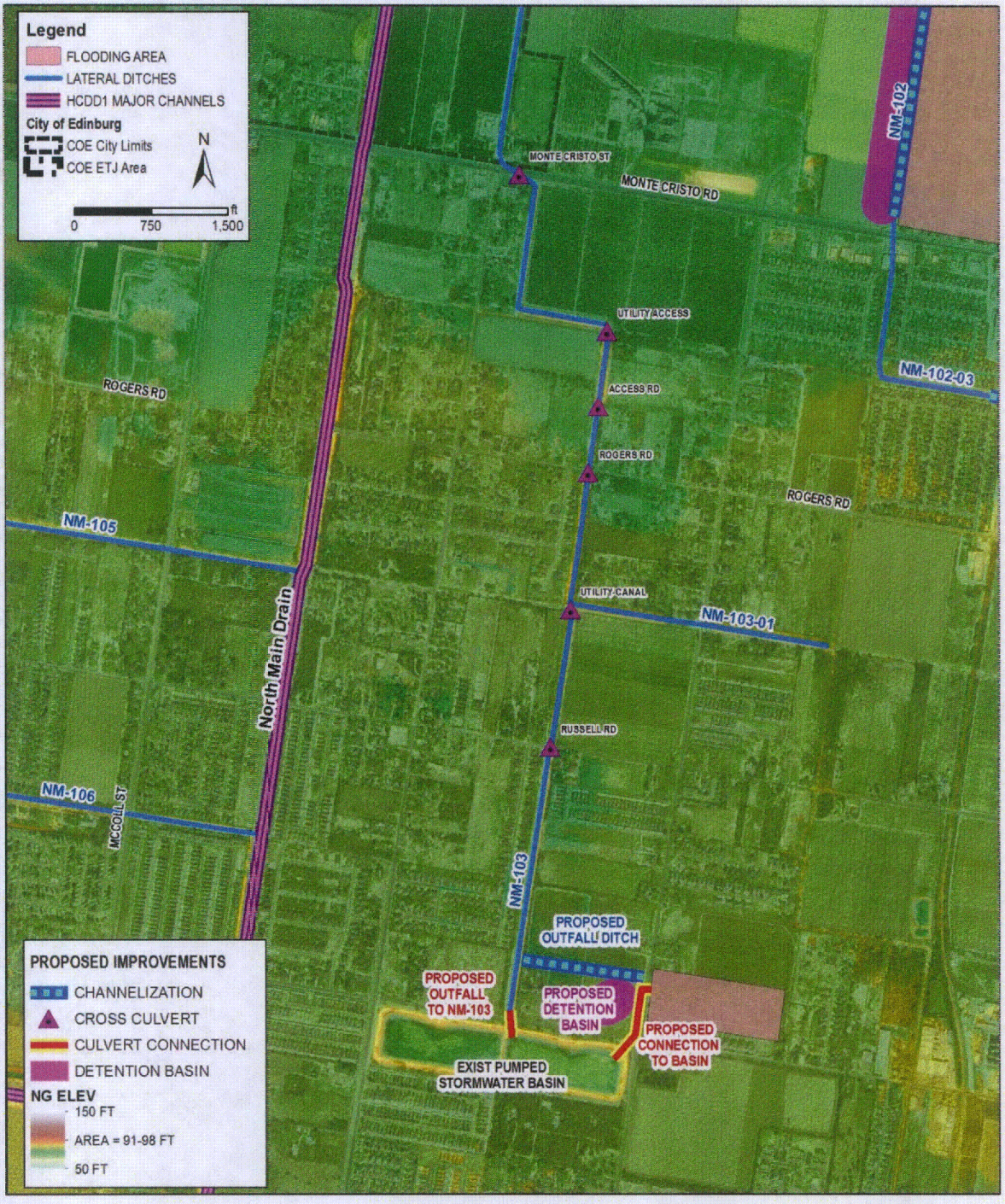


Figure 6-5. NM-103 & NM-104 Proposed System Improvements

SYSTEMS NM-105 & NM-106

Systems NM-105 and NM-106 represent the contributing drainage areas to North Main Drain and local laterals located within the northwest portions of the City of Edinburg and its ETJ. The area is generally west of North Main Drain, north of West Main I Drain, east of HCID canal, and south of W. Rogers Road. The system drainage areas are approximately 942 and 518 acres, respectively. The drainage network consists of a single ditch for NM-105 (13,800 feet) and NM-106 (3900 feet). The NM-105 and NM-106 system drainage area and ditch alignments are shown in **Figure 6-6**.

The drainage areas overland topography runs from west to east towards the North Main Drain at an approximate slope of 0.15%. The eastern, downstream areas of the ditch systems are susceptible to backwater effects from the North Main Drain water surface elevation during large storm events.

The NM-105 ditch has high channel banks with low-lying overbank areas located within the current undeveloped reaches. The contributing drainage area to NM-105 is located south of the channel and consist of a mixture of residential development, which is located mostly in the downstream reaches, and undeveloped agricultural lands. The Elias Longoria Middle School, which was recently constructed, is located at the upstream end of the ditch.

The NM-106 ditch has high channel banks along its entire reach. The majority of the contributing drainage area is located upstream of the existing NM-106 ditch and is conveyed to the channel either by sheetflow or roadside ditches. The area consist of residential development located along Monument Mack Road and undeveloped areas within the upstream reaches.

HEC-RAS models were developed for each ditch to analyze the systems' capacities. Based on the HEC-RAS hydraulic modeling, the NM-105 has a 25-year capacity along its reach upstream. The model indicates some out-of-bank ponding along NM-105 within the currently undeveloped, low-lying adjacent areas. The NM-106 has a 100-year capacity along its reach with some out-of-bank ponding within the adjacent, low-lying overbank areas.

The hydraulic analysis shows that the NM-105 system has a variable capacity ranging between 10-year and 100-year along the channel. The crossing structures are shown to provide significant restrictions at specific locations. The hydraulic analysis shows that the culverts at McColl Road, Monument Mack Road, and Hoehn Road require replacement to provide adequate conveyance for existing and future proposed conditions. The hydraulic analysis shows that the NM-106 system has a greater than 25-year capacity along the channel. The hydraulic analysis shows that the culverts at McColl Road and the upstream Access Road require additional culverts to provide

for future conveyance capacity. The existing and proposed structures for the NM-105 and NM-106 systems are listed in **Table 6-6**.

TABLE 6-6. NM-105 & NM-106 SYSTEM CROSS-DRAINAGE STRUCTURE INVENTORY

DITCH STATION	CROSSING NAME	EXISTING STRUCTURE	CULVERT LENGTH	PROPOSED STRUCTURE
NM-105				
1318	MCCOLL (FM 2061)	30" RCP	124	5' X 5' RCB
3954	MONUMENT MACK	30" RCP	90	6' X 4' RCB
5285	UTILITY- CANAL	48" RCP	56	--
9235	HOEHN	18" RCP	114	48" RCP
11882	DEPOT	48" RCP	200	--
NM-106				
1311	MCCOLL (FM 2061)	36" RCP	108	2-36" RCP
2652	ACCESS	36" RCP	36	2-36" RCP

For future development outfall, drainage laterals and extensions are proposed within the NM-105 and NM-106 drainage areas, as shown in **Figure 6-7**. A lateral ditch is proposed within the upstream portion of the NM-105 drainage area; the ditch configuration consist of an 10-foot bottom width, 3:1 (H:V) side slopes, and 8-foot depth. The NM-106 ditch is proposed to be extended west with a 10-foot bottom width, 3:1 (H:V) side slopes, and 8-foot depth. Comparisons of the existing and proposed condition water surface elevations for the NM-105 and NM-106 ditches are provided in **Tables 6-7** and **6-8**, respectively.

TABLE 6-7. NM-105 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON

NM-105 RIVER STATION	PROFILE FREQUENCY	Q TOTAL (CFS)	EXISTING W.S. ELEV (FT)	PROPOSED W.S. ELEV (FT)	WS DIFF (PR-EX) (FT)
598	EX 10Y	42	86.6	86.6	0
598	EX 25Y	60	87.1	87.1	0
598	EX 100Y	110	88.3	88.3	0
598	ULT 10Y	86	87.7	87.7	0
598	ULT 25Y	112	88.3	88.3	0
598	ULT 100Y	177	89.5	89.5	0
1218	EX 10Y	25	86.7	86.7	0
1218	EX 25Y	38	87.3	87.3	0
1218	EX 100Y	73	88.4	88.4	0
1218	ULT 10Y	62	87.9	87.9	0
1218	ULT 25Y	81	88.5	88.5	0
1218	ULT 100Y	128	89.7	89.7	0
1318	MCCOLL/FM2061			Culvert	
1461	EX 10Y	25	87.1	86.8	-0.3
1461	EX 25Y	38	88.3	87.4	-0.9
1461	EX 100Y	73	92.2	88.7	-3.5
1461	ULT 10Y	62	90.6	88.1	-2.5
1461	ULT 25Y	81	92.5	88.8	-3.7
1461	ULT 100Y	128	93.1	90.4	-2.7
2605	EX 10Y	25	87.3	87.0	-0.3
2605	EX 25Y	38	88.4	87.6	-0.8
2605	EX 100Y	73	92.2	88.9	-3.3
2605	ULT 10Y	62	90.7	88.4	-2.3
2605	ULT 25Y	81	92.5	89.0	-3.5
2605	ULT 100Y	128	93.2	90.6	-2.6
3868	EX 10Y	25	88.4	88.4	0
3868	EX 25Y	38	88.7	88.7	0
3868	EX 100Y	73	92.3	89.6	-2.7
3868	ULT 10Y	62	90.8	89.2	-1.6
3868	ULT 25Y	81	92.6	89.8	-2.8
3868	ULT 100Y	128	93.3	91.1	-2.2
3954	MON MACK			Culvert	
4029	EX 10Y	25	90.8	90.6	-0.2
4029	EX 25Y	38	92.1	90.9	-1.2
4029	EX 100Y	73	96.2	91.3	-4.9
4029	ULT 10Y	62	96.0	91.2	-4.8
4029	ULT 25Y	81	96.2	91.4	-4.8
4029	ULT 100Y	128	96.3	91.9	-4.4
5250	EX 10Y	19	91.6	91.6	0
5250	EX 25Y	29	92.5	92.1	-0.4
5250	EX 100Y	54	96.2	93.1	-3.1
5250	ULT 10Y	48	96.1	92.8	-3.3
5250	ULT 25Y	63	96.2	93.3	-2.9
5250	ULT 100Y	98	96.3	94.2	-2.1
5285	UTILITY/CANAL			Culvert	
5316	EX 10Y	19	91.7	91.7	0
5316	EX 25Y	29	92.6	92.3	-0.3
5316	EX 100Y	54	96.7	93.6	-3.1
5316	ULT 10Y	48	96.5	93.2	-3.3
5316	ULT 25Y	63	96.9	93.9	-3
5316	ULT 100Y	98	98.0	95.8	-2.2
6599	EX 10Y	19	91.8	91.8	0
6599	EX 25Y	29	92.7	92.4	-0.3
6599	EX 100Y	54	96.7	93.7	-3
6599	ULT 10Y	48	96.5	93.3	-3.2

NM-105 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
6599	ULT 25Y	63	96.9	94.1	-2.8
6599	ULT 100Y	98	98.0	95.9	-2.1
7830	EX 10Y	19	91.9	91.9	0
7830	EX 25Y	29	92.8	92.5	-0.3
7830	EX 100Y	54	96.7	93.8	-2.9
7830	ULT 10Y	48	96.5	93.5	-3
7830	ULT 25Y	63	96.9	94.2	-2.7
7830	ULT 100Y	98	98.0	96.0	-2
9131	EX 10Y	6	92.0	92.1	0.1
9131	EX 25Y	9	92.9	92.7	-0.2
9131	EX 100Y	17	96.7	93.9	-2.8
9131	ULT 10Y	14	96.5	93.6	-2.9
9131	ULT 25Y	19	96.9	94.3	-2.6
9131	ULT 100Y	29	98.0	96.0	-2
9235	HOEHN			Culvert	
9303	EX 10Y	6	92.6	92.1	-0.5
9303	EX 25Y	9	94.2	92.7	-1.5
9303	EX 100Y	17	100.9	93.9	-7
9303	ULT 10Y	14	99.7	93.6	-6.1
9303	ULT 25Y	19	100.9	94.3	-6.6
9303	ULT 100Y	29	101.1	96.2	-4.9
10512	EX 10Y	6	92.6	92.4	-0.2
10512	EX 25Y	9	94.2	92.7	-1.5
10512	EX 100Y	17	100.9	94.0	-6.9
10512	ULT 10Y	14	99.7	93.6	-6.1
10512	ULT 25Y	19	100.9	94.4	-6.5
10512	ULT 100Y	29	101.1	96.2	-4.9
11711	EX 10Y	6	94.9	95.0	0.1
11711	EX 25Y	9	94.5	95.2	0.7
11711	EX 100Y	17	100.9	95.1	-5.8
11711	ULT 10Y	14	99.7	95.1	-4.6
11711	ULT 25Y	19	100.9	95.1	-5.8
11711	ULT 100Y	29	101.1	96.3	-4.8
11882	DEPOT			Culvert	
11996	EX 10Y	6	96.1	96.1	0
11996	EX 25Y	9	96.3	96.3	0
11996	EX 100Y	17	100.9	96.8	-4.1
11996	ULT 10Y	14	99.7	96.7	-3
11996	ULT 25Y	19	101.0	97.0	-4
11996	ULT 100Y	29	101.3	97.5	-3.8
12607	EX 10Y	6	104.4	104.4	0
12607	EX 25Y	9	104.5	104.5	0
12607	EX 100Y	17	104.6	104.6	0
12607	ULT 10Y	14	104.6	104.6	0
12607	ULT 25Y	19	104.7	104.7	0
12607	ULT 100Y	29	104.8	104.8	0
13424	EX 10Y	6	106.6	106.6	0
13424	EX 25Y	9	106.7	106.7	0
13424	EX 100Y	17	107.1	107.1	0
13424	ULT 10Y	14	106.9	106.9	0
13424	ULT 25Y	19	107.1	107.1	0
13424	ULT 100Y	29	107.4	107.4	0

TABLE 6-8. NM-106 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON

NM-106 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
677	EX 10Y	22	87.3	87.3	0
677	EX 25Y	31	87.8	87.8	0
677	EX 100Y	54	88.5	88.5	0
677	ULT 10Y	37	88.0	88.0	0
677	ULT 25Y	49	88.3	88.3	0
677	ULT 100Y	77	89.0	89.0	0
1252	EX 10Y	22	87.3	87.3	0
1252	EX 25Y	31	87.9	87.9	0
1252	EX 100Y	54	88.6	88.6	0
1252	ULT 10Y	37	88.1	88.1	0
1252	ULT 25Y	49	88.4	88.4	0
1252	ULT 100Y	77	89.1	89.1	0
1311	MCCOLL/FM2061			Culvert	
1391	EX 10Y	22	87.7	87.4	-0.3
1391	EX 25Y	31	88.5	88.0	-0.5
1391	EX 100Y	54	90.5	89.1	-1.4
1391	ULT 10Y	37	89.0	88.3	-0.7
1391	ULT 25Y	49	90.0	88.8	-1.2
1391	ULT 100Y	77	93.1	90.1	-3
1933	EX 10Y	22	87.8	87.7	-0.1
1933	EX 25Y	31	88.6	88.2	-0.4
1933	EX 100Y	54	90.6	89.2	-1.4
1933	ULT 10Y	37	89.1	88.5	-0.6
1933	ULT 25Y	49	90.1	89.0	-1.1
1933	ULT 100Y	77	93.1	90.2	-2.9
2583	EX 10Y	22	88.9	88.9	0
2583	EX 25Y	31	89.2	89.2	0
2583	EX 100Y	54	90.7	89.9	-0.8
2583	ULT 10Y	37	89.5	89.4	-0.1
2583	ULT 25Y	49	90.3	89.7	-0.6
2583	ULT 100Y	77	93.2	90.7	-2.5
2652	ACCESS			Culvert	
2701	EX 10Y	22	89.2	89.0	-0.2
2701	EX 25Y	31	89.7	89.3	-0.4
2701	EX 100Y	54	92.3	90.2	-2.1
2701	ULT 10Y	37	90.2	89.5	-0.7
2701	ULT 25Y	49	91.6	90.0	-1.6
2701	ULT 100Y	77	96.1	91.4	-4.7
3270	EX 10Y	22	89.8	89.8	0
3270	EX 25Y	31	90.2	90.1	-0.1
3270	EX 100Y	54	92.4	90.8	-1.6
3270	ULT 10Y	37	90.5	90.3	-0.2
3270	ULT 25Y	49	91.7	90.6	-1.1
3270	ULT 100Y	77	96.1	91.7	-4.4
3830	EX 10Y	22	90.0	90.0	0
3830	EX 25Y	31	90.4	90.4	0
3830	EX 100Y	54	92.4	91.1	-1.3
3830	ULT 10Y	37	90.7	90.6	-0.1
3830	ULT 25Y	49	91.8	90.9	-0.9
3830	ULT 100Y	77	96.1	91.9	-4.2

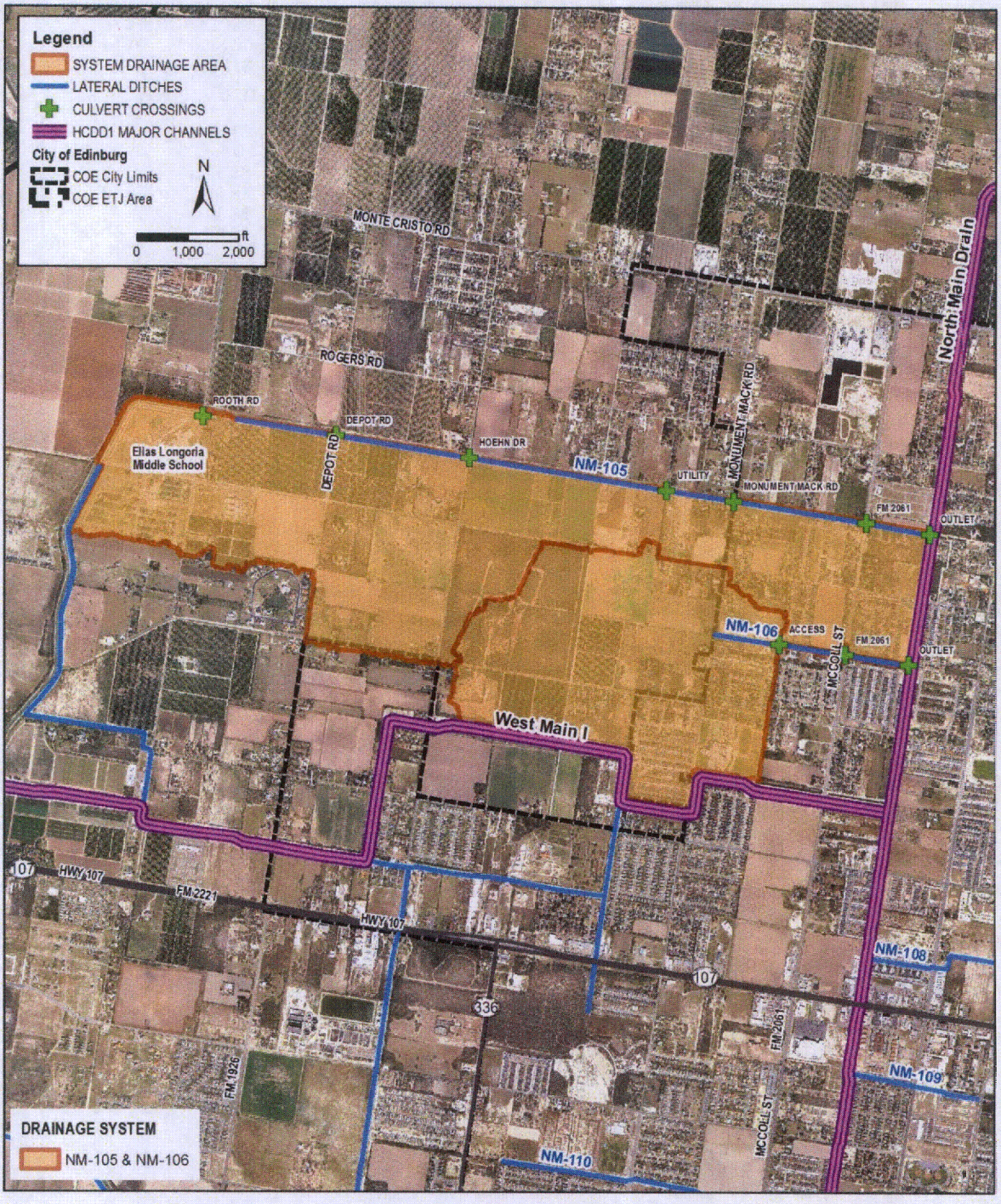


Figure 6-6. NM-105 & NM-106 Drainage Systems

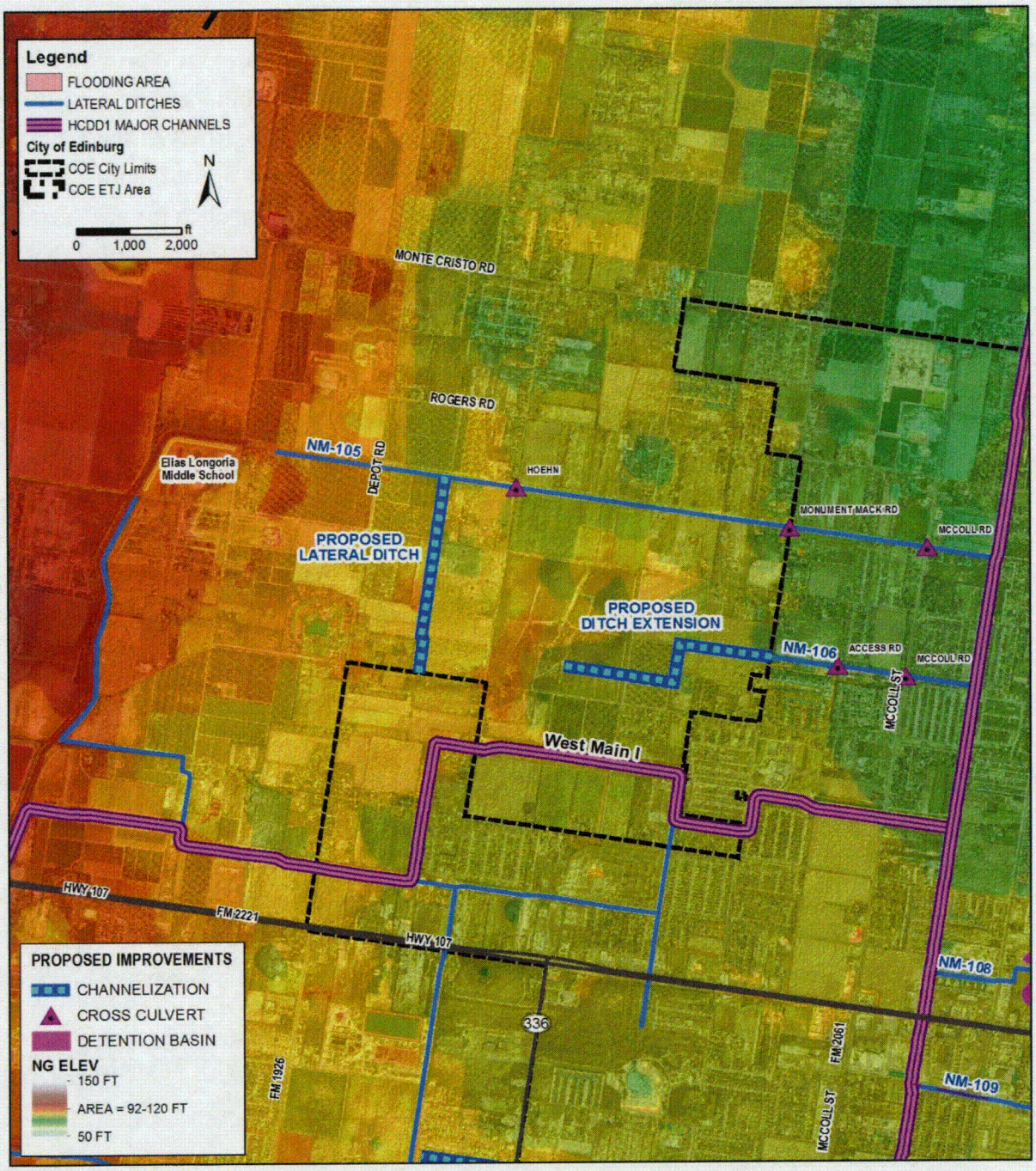


Figure 6-7. NM-105 & NM-106 Systems Improvements

SYSTEMS NM-108 & NM-109

Systems NM-108 and NM-109 represent the contributing drainage areas to North Main Drain and local laterals located within the western portions of the City of Edinburg. The area is generally east of North Main Drain, north of South Main Drain, south of SH 107 (W. University Dr.) and west of US 281B (S. Closner Blvd). The system drainage areas are approximately 527 and 133 acres, respectively. The drainage network consists of a single lateral ditch for each system basin with ditch lengths of 2900 (NM-108) and 2600 (NM-109) feet. See **Figure 6-8** for the drainage system area.

The existing NM-108 ditch is as an outfall for portion of the storm sewer system that serves a portion of the University of Texas – Pan American (UTPA), University Drive, and the southwest portions of the City central area. Due to the repetitive flooding issues within the downtown and UTPA areas, detention is proposed within the drainage area to provide relief for the existing storm sewer systems. The proposed detention would reduce the backwater effects associated with North Main Drain, reducing the storm sewer system tailwater conditions. The detention alternative is dependent on the land availability and acquisition cost within the highly urbanized area adjacent to UTPA. Potential basin locations, as shown in **Figure 6-9**, were based on the latest available aerial photography.

The hydraulic analysis shows that the NM-108 system has a greater than 25-year capacity for existing and future conditions. Additionally, the culvert at Jackson Road is shown to provide adequate conveyance capacity. The hydraulic analysis shows that the NM-109 system has a 25-year capacity along the channel. The existing NM-109 ditch is enclosed from S. Jackson Road to S. Pacific Ave; a total length of approximately 940 feet. Based on field measurements, this culvert is a 36" RCP. It is recommended that this culvert be enlarged to increase the conveyance capacity of the ditch system. A minimum 48" RCP is recommended for these structures. The existing and proposed structures for the NM-108 and NM-109 systems are listed in **Table 6-9**.

TABLE 6-9. NM-108 & NM-109 SYSTEM CROSS-DRAINAGE STRUCTURE INVENTORY

DITCH STATION	CROSSING NAME	EXISTING STRUCTURE	CULVERT LENGTH	PROPOSED STRUCTURE
NM-108				
1343	JACKSON	10' X 6' RCB	186	--
NM-109				
1331	JACKSON	36" RCP	940	48" RCP

Another alternative option that was investigated for the relief of the existing flooding within the NM-108 system, i.e. at UTPA and along University Drive, included the partial diversion of the University Drive storm sewer system into a basin within the mid-reach of the system. This improvement will provide storm water detention and reduce the North Main Drain backwater effects onto the existing storm sewer systems within the area. The basin would be connected to the NM-109 ditch to provide further outfall relief for the system. A detention basin location was proposed based on undeveloped, open land near University Dr., as shown in **Figure 6-9.**

Due to the extensive length of the Jackson Road culvert and the size of the contributing drainage area, this structure is sensitive to the culvert open area and the condition of the downstream channel. It is recommended that this culvert and channel approaches be maintained regularly. If the crossing roadways are improved within the future, it is recommended that this culvert be enlarged to provide additional relief to potential ponding issues within the adjacent areas upstream and to accommodate future development within the subbasin.

Comparisons of the existing and proposed condition water surface elevations for the NM-108 and NM-109 ditches are provided in **Tables 6-10** and **6-11**, respectively.

TABLE 6-10. NM-108 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON

NM-108 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
282	EX 10Y	37	87.7	87.7	0
282	EX 25Y	49	88.1	88.1	0
282	EX 100Y	75	88.8	88.8	0
282	ULT 10Y	39	87.8	87.8	0
282	ULT 25Y	52	88.2	88.2	0
282	ULT 100Y	79	88.9	88.9	0
793	EX 10Y	37	88.1	88.1	0
793	EX 25Y	49	88.5	88.5	0
793	EX 100Y	75	89.2	89.2	0
793	ULT 10Y	39	88.2	88.2	0
793	ULT 25Y	52	88.6	88.6	0
793	ULT 100Y	79	89.3	89.3	0
1174	EX 10Y	37	89.0	89.0	0
1174	EX 25Y	49	89.2	89.2	0
1174	EX 100Y	75	89.8	89.8	0
1174	ULT 10Y	39	89.0	89.0	0
1174	ULT 25Y	52	89.3	89.3	0
1174	ULT 100Y	79	89.9	89.9	0
1343	JACKSON			Culvert	
1488	EX 10Y	20	89.0	89.0	0
1488	EX 25Y	26	89.3	89.3	0
1488	EX 100Y	39	89.8	89.8	0
1488	ULT 10Y	20	89.0	89.0	0
1488	ULT 25Y	26	89.3	89.3	0
1488	ULT 100Y	39	89.9	89.9	0
1927	EX 10Y	20	91.5	91.5	0
1927	EX 25Y	26	91.4	91.4	0
1927	EX 100Y	39	91.4	91.4	0
1927	ULT 10Y	20	91.5	91.5	0
1927	ULT 25Y	26	91.4	91.4	0
1927	ULT 100Y	39	91.4	91.4	0
2132	EX 10Y	20	91.7	91.7	0
2132	EX 25Y	26	91.7	91.7	0
2132	EX 100Y	39	92.0	92.0	0
2132	ULT 10Y	20	91.6	91.6	0
2132	ULT 25Y	26	91.7	91.7	0
2132	ULT 100Y	39	92.0	92.0	0
2317	EX 10Y	20	91.7	91.7	0
2317	EX 25Y	26	91.7	91.7	0
2317	EX 100Y	39	92.0	92.0	0
2317	ULT 10Y	20	91.6	91.6	0
2317	ULT 25Y	26	91.7	91.7	0
2317	ULT 100Y	39	92.0	92.0	0
2596	EX 10Y	20	91.7	91.7	0
2596	EX 25Y	26	91.7	91.7	0
2596	EX 100Y	39	92.0	92.0	0
2596	ULT 10Y	20	91.6	91.6	0
2596	ULT 25Y	26	91.7	91.7	0
2596	ULT 100Y	39	92.0	92.0	0
2881	EX 10Y	20	91.7	91.7	0
2881	EX 25Y	26	91.7	91.7	0
2881	EX 100Y	39	92.0	92.0	0
2881	ULT 10Y	20	91.6	91.6	0
2881	ULT 25Y	26	91.7	91.7	0
2881	ULT 100Y	39	92.0	92.0	0

TABLE 6-11. NM-109 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON

NM-109 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
251	EX 10Y	21	90.5	90.5	0
251	EX 25Y	28	90.6	90.6	0
251	EX 100Y	45	90.9	90.9	0
251	ULT 10Y	24	90.6	90.6	0
251	ULT 25Y	31	90.7	90.7	0
251	ULT 100Y	49	90.9	90.9	0
472	EX 10Y	21	90.6	90.6	0
472	EX 25Y	28	90.7	90.7	0
472	EX 100Y	45	91.0	91.0	0
472	ULT 10Y	24	90.6	90.6	0
472	ULT 25Y	31	90.7	90.7	0
472	ULT 100Y	49	91.0	91.0	0
1331	JACKSON			Culvert	
1516	EX 10Y	21	92.7	92.4	-0.3
1516	EX 25Y	28	93.3	92.8	-0.5
1516	EX 100Y	45	96.3	93.6	-2.7
1516	ULT 10Y	24	93.0	92.6	-0.4
1516	ULT 25Y	31	93.6	92.9	-0.7
1516	ULT 100Y	49	96.9	93.8	-3.1
1776	EX 10Y	21	92.8	92.7	-0.1
1776	EX 25Y	28	93.4	93.0	-0.4
1776	EX 100Y	45	96.3	93.7	-2.6
1776	ULT 10Y	24	93.1	92.8	-0.3
1776	ULT 25Y	31	93.7	93.1	-0.6
1776	ULT 100Y	49	96.9	93.9	-3
2096	EX 10Y	21	93.6	93.6	0
2096	EX 25Y	28	93.9	93.8	-0.1
2096	EX 100Y	45	96.4	94.3	-2.1
2096	ULT 10Y	24	93.7	93.7	0
2096	ULT 25Y	31	94.1	93.9	-0.2
2096	ULT 100Y	49	96.9	94.5	-2.4
2536	EX 10Y	21	93.8	93.8	0
2536	EX 25Y	28	94.1	94.0	-0.1
2536	EX 100Y	45	96.4	94.6	-1.8
2536	ULT 10Y	24	93.9	93.9	0
2536	ULT 25Y	31	94.3	94.1	-0.2
2536	ULT 100Y	49	96.9	94.7	-2.2

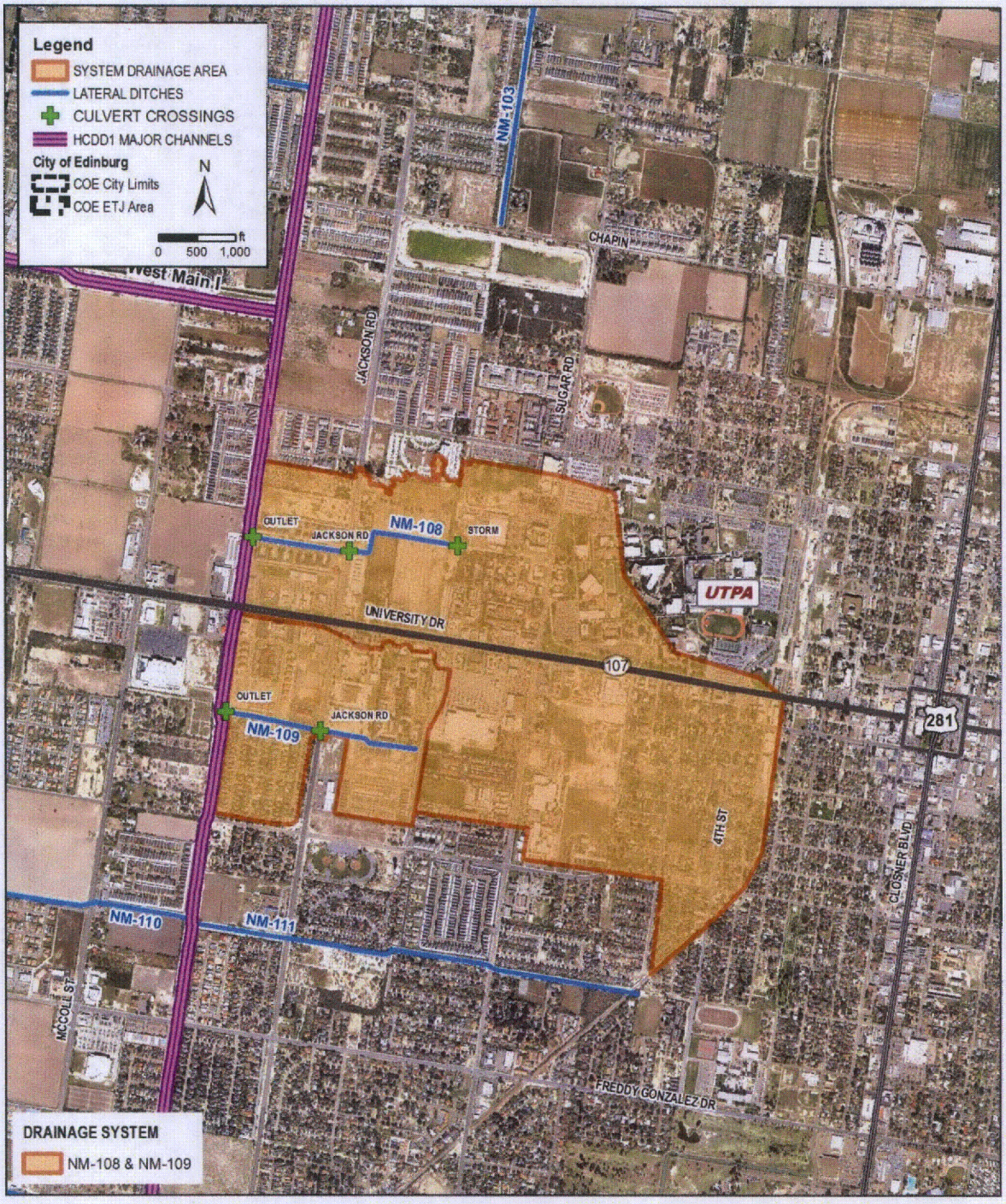


Figure 6-8. NM-108 & NM-109 Drainage Systems

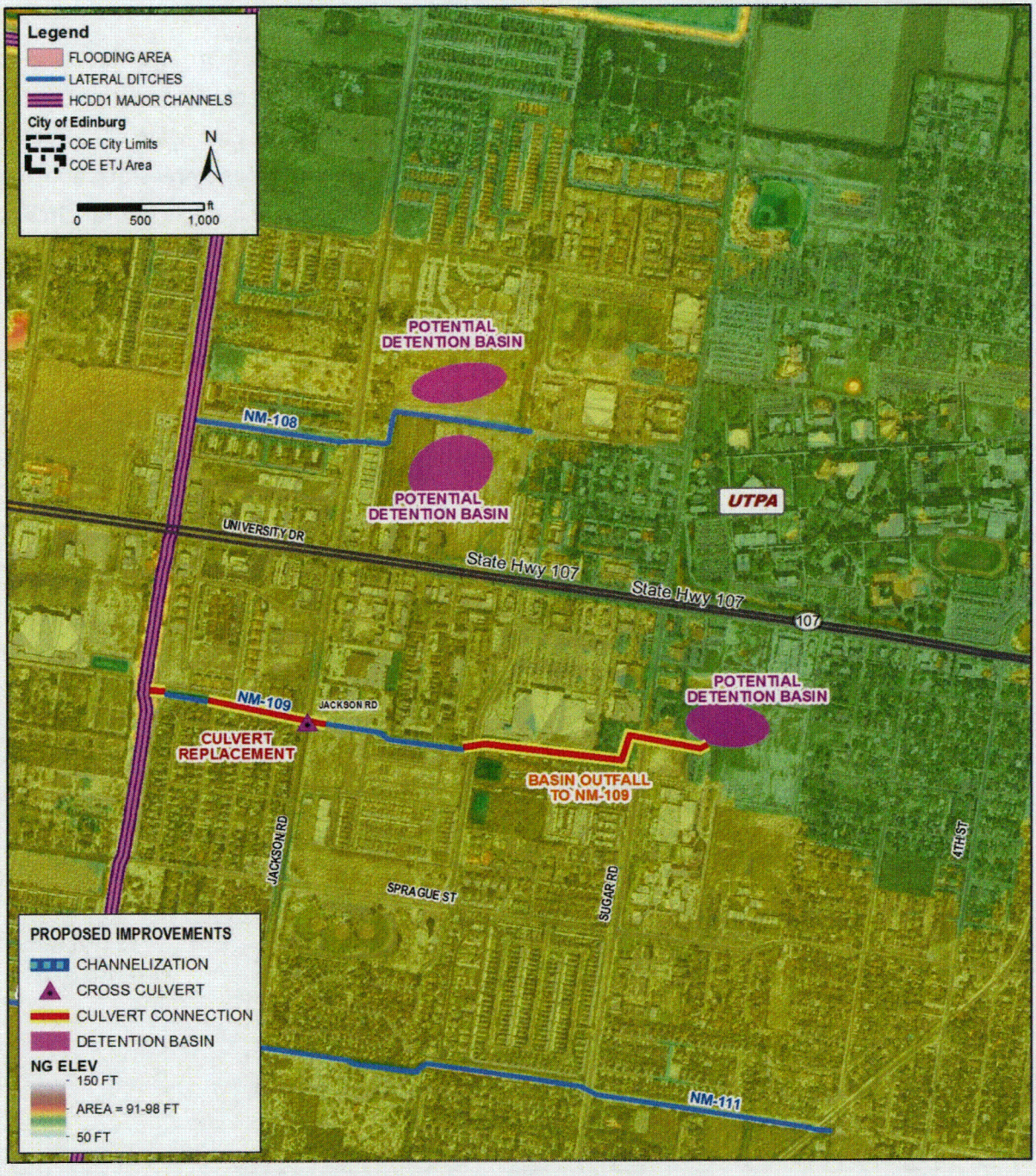


Figure 6-9. NM-108 & NM-109 Systems Improvements

SYSTEMS NM-110, NM-112

Systems NM-110 and NM-112 represent the contributing drainage areas of lateral ditches to North Main Drain within the southwest portions of the City of Edinburg and its ETJ. The areas are generally located west of North Main Drain, north of Edinburg East Main Canal, south of SH 107 (W. University Dr.) and west of Hoehn Rd. The system drainage areas are approximately 1363 and 47 acres, respectively. The drainage network consists of a single lateral ditch for each system basin with ditch lengths of 6500 (NM-110) and 6700 (NM-112) feet. Both systems drain from west to east into North Main Drain. The NM-110 and NM-112 system drainage area and ditch alignments are shown in **Figure 6-10**.

The hydraulic analysis shows that the NM-110 system has less than a 10-year capacity due to the low overbanks and the inadequate cross-drainage structures. The crossing structures are shown to provide significant restrictions along the channel. The existing McColl Road culvert consist of a 30" RCP at the upstream face, connected to an 8'x4' RCB outlet. It is proposed that the outlet box be extended upstream to increase the conveyance across McColl Road. Additionally, the upstream crossings at a utility-canal access road and Monument Mack Road be replaced and an additional pipe be provided at Saker Road. The hydraulic analysis shows that the NM-112 system has a greater than 25-year capacity along the channel. The hydraulic analysis shows that the culvert at McColl Road provides sufficient capacity for existing and future conditions. The existing and proposed structures for the NM-110 and NM-112 systems are listed in **Table 6-12**.

TABLE 6-12. NM-110 & NM-112 SYSTEM CROSS-DRAINAGE STRUCTURE INVENTORY

DITCH STATION	CROSSING NAME	EXISTING STRUCTURE	CULVERT LENGTH	PROPOSED STRUCTURE
NM-110				
1335	MCCOLL (FM 2061)	30" RCP (US) / 8'X4' RCB (DS)	176	8'X4' RCB EXTENDED U/S
2639	UTILITY	30" RCP	108	7' X 4' RCP
3988	MON MACK	36" RCP	142	7' X 4' RCP
5454	SAKER	36" RCP	76	2-36" RCP
11882	DEPOT	48" RCP	200	--
NM-112				
1335	MCCOLL (FM 2061)	24" RCP	220	--

There are no current identified flooding issues within the drainage system areas, as provided by the City. However, based on the overland topography there are low-lying areas within the current undeveloped properties adjacent to the drainage ditches. For any future development within this drainage area, fill will probably be necessary to provide drainage into the receiving ditches.

Based on the current level of development and no currently reported flooding issues within the drainage area, only the cross-culvert improvements along NM-110 are recommended for these systems to relieve potential flooding. For future development it is recommended that the NM-110 ditch be extended to the south to provide for drainage outfall needs, shown in **Figure 6-11**.

Comparisons of the existing and proposed condition water surface elevations for the NM-110 and NM-112 ditches are provided in **Tables 6-13** and **6-14**, respectively.

TABLE 6-13. NM-110 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON

NM-110 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
585	EX 10Y	63	91.5	91.5	0
585	EX 25Y	90	91.9	91.9	0
585	EX 100Y	156	92.7	92.7	0
585	ULT 10Y	106	92.1	92.1	0
585	ULT 25Y	140	92.5	92.5	0
585	ULT 100Y	220	93.4	93.4	0
1218	EX 10Y	63	92.0	92.0	0
1218	EX 25Y	90	92.5	92.4	-0.1
1218	EX 100Y	156	93.3	93.3	0
1218	ULT 10Y	106	92.7	92.7	0
1218	ULT 25Y	140	93.1	93.1	0
1218	ULT 100Y	220	93.9	93.9	0
1335	MCCOLL/FM2061			Culvert	
1531	EX 10Y	63	95.8	92.6	-3.2
1531	EX 25Y	90	96.0	93.2	-2.8
1531	EX 100Y	156	96.5	94.4	-2.1
1531	ULT 10Y	106	96.2	93.5	-2.7
1531	ULT 25Y	140	96.4	94.1	-2.3
1531	ULT 100Y	220	96.6	95.4	-1.2
1992	EX 10Y	39	95.9	93.4	-2.5
1992	EX 25Y	56	96.1	93.8	-2.3
1992	EX 100Y	99	96.5	94.7	-1.8
1992	ULT 10Y	67	96.2	94.0	-2.2
1992	ULT 25Y	89	96.5	94.5	-2
1992	ULT 100Y	140	96.7	95.7	-1
2549	EX 10Y	39	95.9	93.9	-2
2549	EX 25Y	56	96.1	94.2	-1.9
2549	EX 100Y	99	96.6	95.1	-1.5
2549	ULT 10Y	67	96.3	94.5	-1.8
2549	ULT 25Y	89	96.5	94.9	-1.6
2549	ULT 100Y	140	96.8	95.9	-0.9
2639	UTILITY			Culvert	
2780	EX 10Y	39	97.1	94.0	-3.1
2780	EX 25Y	56	97.1	94.4	-2.7
2780	EX 100Y	99	97.4	95.5	-1.9
2780	ULT 10Y	67	97.2	94.7	-2.5
2780	ULT 25Y	89	97.3	95.2	-2.1
2780	ULT 100Y	140	97.6	96.6	-1
3427	EX 10Y	39	97.2	94.0	-3.2
3427	EX 25Y	56	97.2	94.5	-2.7
3427	EX 100Y	99	97.4	95.5	-1.9
3427	ULT 10Y	67	97.2	94.7	-2.5
3427	ULT 25Y	89	97.3	95.3	-2
3427	ULT 100Y	140	97.6	96.7	-0.9
3890	EX 10Y	39	97.2	94.1	-3.1
3890	EX 25Y	56	97.2	94.5	-2.7
3890	EX 100Y	99	97.4	95.5	-1.9
3890	ULT 10Y	67	97.2	94.8	-2.4
3890	ULT 25Y	89	97.4	95.3	-2.1
3890	ULT 100Y	140	97.6	96.7	-0.9
3988	MON MACK			Culvert	
4133	EX 10Y	39	98.0	94.2	-3.8
4133	EX 25Y	56	98.2	94.7	-3.5
4133	EX 100Y	99	98.5	95.9	-2.6
4133	ULT 10Y	67	98.3	95.0	-3.3

NM-110 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
4133	ULT 25Y	89	98.4	95.6	-2.8
4133	ULT 100Y	140	98.8	97.4	-1.4
4689	EX 10Y	17	98.0	94.3	-3.7
4689	EX 25Y	24	98.2	94.8	-3.4
4689	EX 100Y	40	98.5	96.0	-2.5
4689	ULT 10Y	25	98.3	95.1	-3.2
4689	ULT 25Y	33	98.4	95.7	-2.7
4689	ULT 100Y	51	98.8	97.5	-1.3
5361	EX 10Y	17	98.0	94.6	-3.4
5361	EX 25Y	24	98.2	95.0	-3.2
5361	EX 100Y	40	98.5	96.0	-2.5
5361	ULT 10Y	25	98.3	95.2	-3.1
5361	ULT 25Y	33	98.5	95.7	-2.8
5361	ULT 100Y	51	98.8	97.5	-1.3
5454	SAKER			Culvert	
5540	EX 10Y	17	98.2	96.4	-1.8
5540	EX 25Y	24	98.5	96.7	-1.8
5540	EX 100Y	40	99.5	97.2	-2.3
5540	ULT 10Y	25	98.7	96.7	-2
5540	ULT 25Y	33	99.1	97.0	-2.1
5540	ULT 100Y	51	100.3	97.9	-2.4
5927	EX 10Y	17	98.2	97.0	-1.2
5927	EX 25Y	24	98.6	97.2	-1.4
5927	EX 100Y	40	99.5	97.6	-1.9
5927	ULT 10Y	25	98.7	97.2	-1.5
5927	ULT 25Y	33	99.1	97.4	-1.7
5927	ULT 100Y	51	100.3	98.1	-2.2
6481	EX 10Y	17	98.3	98.3	0
6481	EX 25Y	24	98.6	98.4	-0.2
6481	EX 100Y	40	99.6	98.7	-0.9
6481	ULT 10Y	25	98.8	98.4	-0.4
6481	ULT 25Y	33	99.2	98.6	-0.6
6481	ULT 100Y	51	100.3	98.8	-1.5

TABLE 6-14. NM-112 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON

NM-112 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
567	EX 10Y	8	90.2	90.2	0
567	EX 25Y	11	90.5	90.5	0
567	EX 100Y	18	90.9	90.9	0
567	ULT 10Y	11	90.5	90.5	0
567	ULT 25Y	14	90.7	90.7	0
567	ULT 100Y	22	91.1	91.1	0
1101	EX 10Y	8	92.1	92.1	0
1101	EX 25Y	11	92.2	92.2	0
1101	EX 100Y	18	92.5	92.5	0
1101	ULT 10Y	11	92.2	92.2	0
1101	ULT 25Y	14	92.3	92.3	0
1101	ULT 100Y	22	92.5	92.5	0
1335	MCCOLL RD /FM 2061			Culvert	
1475	EX 10Y	8	93.5	93.5	0
1475	EX 25Y	11	93.8	93.8	0
1475	EX 100Y	18	94.9	94.9	0
1475	ULT 10Y	11	93.8	93.8	0
1475	ULT 25Y	14	94.1	94.1	0
1475	ULT 100Y	22	96.0	96.0	0
2166	EX 10Y	8	93.6	93.6	0
2166	EX 25Y	11	93.9	93.9	0
2166	EX 100Y	18	94.9	94.9	0
2166	ULT 10Y	11	93.9	93.9	0
2166	ULT 25Y	14	94.2	94.2	0
2166	ULT 100Y	22	96.0	96.0	0

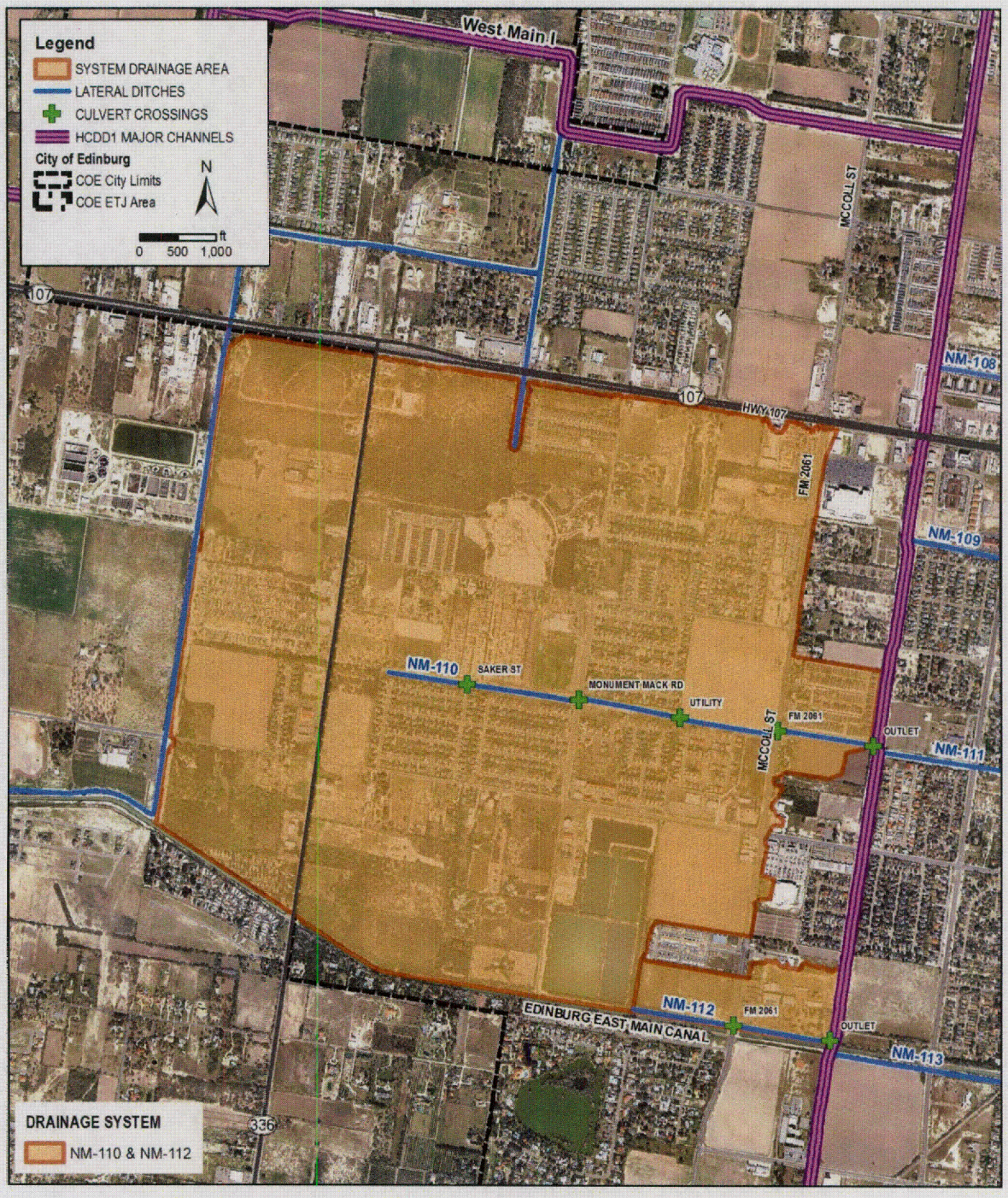


Figure 6-10. NM-110 & NM-112 Drainage Systems

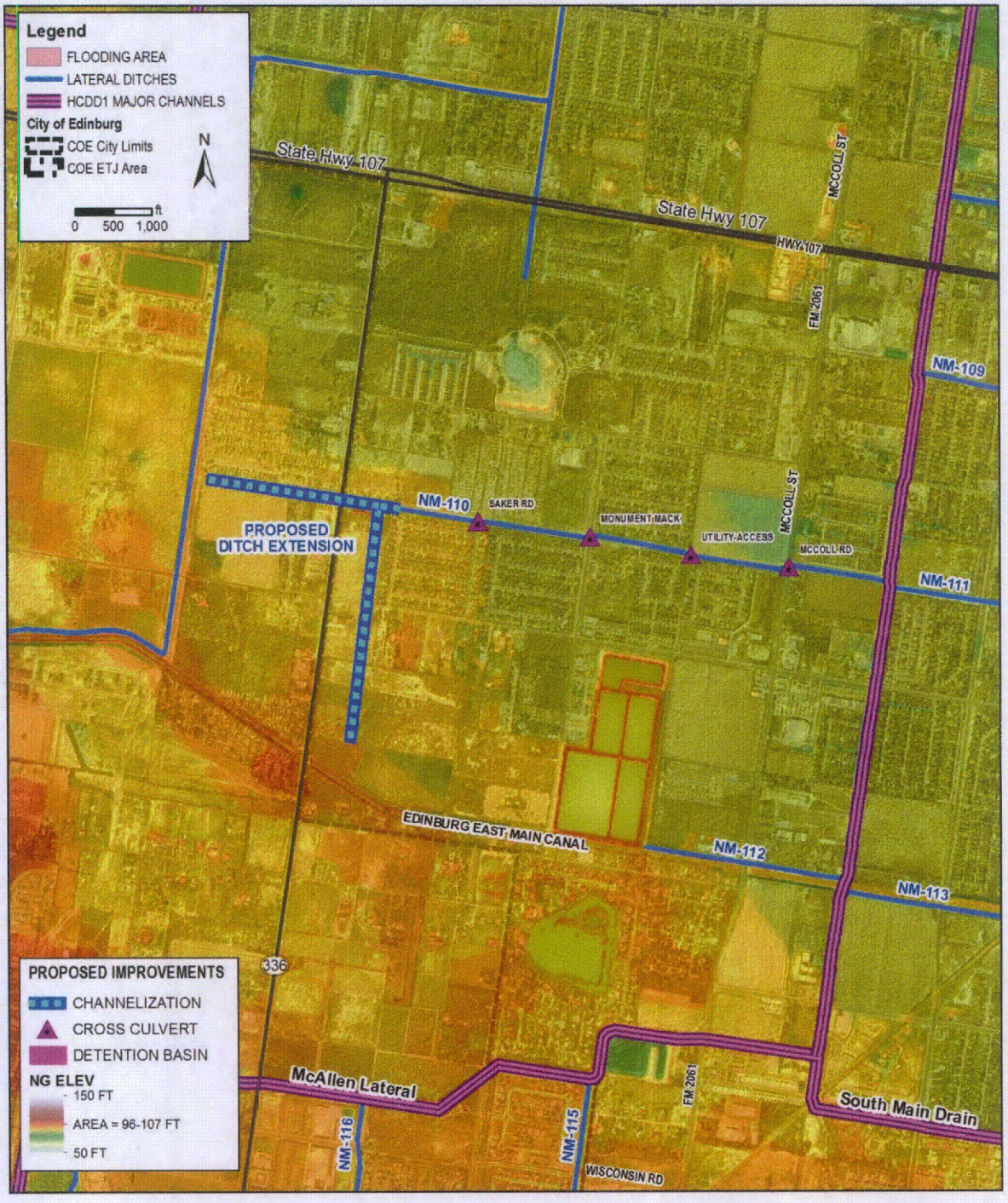


Figure 6-11. NM-110 & NM-112 Systems Improvements

SYSTEMS NM-111 & NM-113

Systems NM-111 and NM-113 represent the contributing drainage areas to North Main Drain and laterals located within the southwest portions of the City of Edinburg. The area is generally east of North Main Drain, north of South Main Drain, south of SH 107 (W. University Dr.) and west of BS 281 (S. Closner Blvd). The system drainage areas are approximately 323 and 464 acres, respectively. The drainage network consists of a single lateral ditch for each system basin with ditch lengths of 5900 (NM-111) and 8000 (NM-113) feet. The NM-111 and NM-113 system drainage area and ditch alignments are shown in **Figure 6-12**.

The NM-111 and NM-113 systems are impacted by the North Main Drain water surface elevation. The high North Main Drain water surface elevations reduce the drainage systems' efficiency to convey the study area runoff. As previously discussed, any improvements to the North Main Drain associated with the Raymondville Drain Flood Control Project will potentially be beneficial to these systems' areas by lowering the ditches' tailwater conditions.

Additionally, the NM-113 system area is affected by the water surface elevations within the South Main Drain. The South Main Drain serves as the receiving ditch for several storm sewer systems within the area. However, the area is lower than the high banks and the water surface elevations of the South Main Drain. This results in the areas adjacent to the South Main Drain to sheetflow north towards NM-113 and increase the runoff within the ditch.

The hydraulic analysis shows that the NM-111 system has greater than a 25-year capacity. The crossing structures are shown to provide adequate capacity to convey the existing and proposed flows. The hydraulic analysis shows that the NM-113 system has a 25-year capacity along the majority of the channel with some out-of-bank ponding due to low overbank areas and restrictive crossing structures. The hydraulic analysis shows that the culverts at Jackson Road and Sugar Road require improvement to provide sufficient capacity for existing and future conditions. Proposed culverts include an additional box at Jackson Road and a culvert replacement at Sugar Road. The existing and proposed structures for the NM-111 and NM-113 systems are listed in **Table 6-15**.

TABLE 6-15. NM-111 & NM-113 SYSTEM CROSS-DRAINAGE STRUCTURE INVENTORY

DITCH STATION	CROSSING NAME	EXISTING STRUCTURE	CULVERT LENGTH	PROPOSED STRUCTURE
NM-111				
1257	JACKSON	6' X 6' RCB	184	--
3978	SUGAR	72" RCP	136	--
5831	RAILROAD	36" RCP	100	--
NM-113				
1390	JACKSON	5' X 4' RCB	280	2- 5' X 4' RCB
2382	RAILROAD	5' X 4' RCB	68	--
4086	SUGAR	18" RCP	102	42" RCP

The Edinburg ISD has identified flooding concerns with regards to the Freddy Gonzalez Elementary School located along the south bank of NM-113 at S. Sugar Road and the South Middle School, located at Freddy Gonzalez Dr. and S. 4th Ave. upstream of the NM-111 ditch.

In order to provide additional drainage relief for the South Middle School, the existing NM-111 ditch is proposed to be extended east (upstream) to the school. The ditch extension would include approximately 800 feet of ditch to Geoffrey Ln. with proposed culvert under Geoffrey Ln. and across S. 4th Ave. to connect to the school campus property.

Since the drainage area at the existing upstream end of NM-111 is restricted by the railroad and the existing culvert crossing, it is recommended that a detention basin be proposed to supplement any drainage improvements upstream of the railroad. The detention basin may be proposed at either east or west of the railroad adjacent to the NM-111 alignment, based on land availability and acquisition cost, as shown in **Figure 6-12**.

A residential flood occurrence was documented within the NM-113 drainage area at 914 Tori Ln during the September 2014 storm event. This location is identified in **Figure 6-13**. Based on the overland topography, the subdivision is shown to be a localized low-lying area. There is not an overland sheetflow path from this area due to the elevated canal to the south and east, Sugar Road to the west, and the railroad to the north. The storm sewer system that serves this area drains to NM-113 south of the elevation canal. Based on the hydraulic analysis of NM-113, the ditch has sufficient capacity to convey the 100-year storm event; however the tailwater within the ditch during 25-year and higher storm events will prevent the storm sewer within this low-lying area to have sufficient hydraulic head to convey the runoff.

Based on field observations, the existing NM-113 ditch has siltation and vegetation overgrowth. It is recommended that the existing ditch be desilted and cleared to increase the ditch capacity and lower the water surface elevation within the ditch. It is also recommended that the City provide additional storm sewer capacity within the area to increase the existing system conveyance.

Comparisons of the existing and proposed condition water surface elevations for the NM-111 and NM-113 ditches are provided in **Tables 6-16** and **6-17**, respectively.

TABLE 6-16. NM-111 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON

NM-111 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
270	EX 10Y	121	91.4	91.4	0
270	EX 25Y	155	91.8	91.8	0
270	EX 100Y	236	92.8	92.8	0
270	ULT 10Y	130	91.5	91.5	0
270	ULT 25Y	160	91.9	91.9	0
270	ULT 100Y	240	92.9	92.9	0
669	EX 10Y	121	91.6	91.6	0
669	EX 25Y	155	92.1	92.1	0
669	EX 100Y	236	93.0	93.0	0
669	ULT 10Y	130	91.7	91.7	0
669	ULT 25Y	160	92.1	92.1	0
669	ULT 100Y	240	93.1	93.1	0
1130	EX 10Y	90	91.9	91.9	0
1130	EX 25Y	115	92.4	92.4	0
1130	EX 100Y	174	93.3	93.3	0
1130	ULT 10Y	90	92.0	92.0	0
1130	ULT 25Y	120	92.4	92.4	0
1130	ULT 100Y	180	93.4	93.4	0
1257	JACKSON			Culvert	
1380	EX 10Y	90	92.3	92.3	0
1380	EX 25Y	115	93.0	93.0	0
1380	EX 100Y	174	94.4	94.4	0
1380	ULT 10Y	90	92.4	92.4	0
1380	ULT 25Y	120	93.1	93.1	0
1380	ULT 100Y	180	94.5	94.5	0
2108	EX 10Y	90	93.0	93.0	0
2108	EX 25Y	115	93.6	93.6	0
2108	EX 100Y	174	94.7	94.7	0
2108	ULT 10Y	90	93.1	93.1	0
2108	ULT 25Y	120	93.7	93.7	0
2108	ULT 100Y	180	94.8	94.8	0
2854	EX 10Y	90	93.3	93.3	0
2854	EX 25Y	115	93.8	93.8	0
2854	EX 100Y	174	94.9	94.9	0
2854	ULT 10Y	90	93.3	93.3	0
2854	ULT 25Y	120	93.9	93.9	0
2854	ULT 100Y	180	95.0	95.0	0
3860	EX 10Y	43	93.8	93.8	0
3860	EX 25Y	55	94.3	94.3	0
3860	EX 100Y	82	95.3	95.3	0
3860	ULT 10Y	50	93.9	93.9	0
3860	ULT 25Y	60	94.4	94.4	0
3860	ULT 100Y	90	95.4	95.4	0
3978	SUGAR			Culvert	
4089	EX 10Y	43	94.0	94.0	0
4089	EX 25Y	55	94.5	94.5	0
4089	EX 100Y	82	95.6	95.6	0
4089	ULT 10Y	50	94.1	94.1	0
4089	ULT 25Y	60	94.6	94.6	0
4089	ULT 100Y	90	95.8	95.8	0
4720	EX 10Y	43	94.1	94.1	0
4720	EX 25Y	55	94.6	94.6	0
4720	EX 100Y	82	95.7	95.7	0
4720	ULT 10Y	50	94.3	94.3	0
4720	ULT 25Y	60	94.8	94.8	0
4720	ULT 100Y	90	95.9	95.9	0

NM-111 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
5264	EX 10Y	43	94.2	94.2	0
5264	EX 25Y	55	94.7	94.7	0
5264	EX 100Y	82	95.8	95.8	0
5264	ULT 10Y	50	94.3	94.3	0
5264	ULT 25Y	60	94.8	94.8	0
5264	ULT 100Y	90	95.9	95.9	0
5727	EX 10Y	43	94.2	94.2	0
5727	EX 25Y	55	94.7	94.7	0
5727	EX 100Y	82	95.8	95.8	0
5727	ULT 10Y	50	94.4	94.4	0
5727	ULT 25Y	60	94.9	94.9	0
5727	ULT 100Y	90	96.0	96.0	0
5831	RAILROAD			Culvert	
5921	EX 10Y	43	98.7	95.5	-3.2
5921	EX 25Y	55	98.8	96.7	-2.1
5921	EX 100Y	82	98.9	99.8	0.9
5921	ULT 10Y	50	98.8	96.0	-2.8
5921	ULT 25Y	60	98.8	97.2	-1.6
5921	ULT 100Y	90	98.9	99.8	0.9
6246	EX 10Y	43	99.0	95.5	-3.5
6246	EX 25Y	55	99.1	96.7	-2.4
6246	EX 100Y	82	99.2	99.8	0.6
6246	ULT 10Y	50	99.1	96.0	-3.1
6246	ULT 25Y	60	99.1	97.2	-1.9
6246	ULT 100Y	90	99.3	99.8	0.5

TABLE 6-17. NM-113 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON

NM-113 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
608	EX 10Y	86	93.4	93.4	0
608	EX 25Y	116	94.3	94.3	0
608	EX 100Y	183	95.2	95.2	0
608	ULT 10Y	107	94.2	94.2	0
608	ULT 25Y	140	94.7	94.7	0
608	ULT 100Y	212	95.5	95.5	0
1177	EX 10Y	69	94.1	94.1	0
1177	EX 25Y	91	94.8	94.8	0
1177	EX 100Y	145	95.7	95.7	0
1177	ULT 10Y	79	94.6	94.6	0
1177	ULT 25Y	103	95.1	95.1	0
1177	ULT 100Y	160	96.0	96.0	0
1390	JACKSON			Culvert	
1578	EX 10Y	69	95.1	94.3	-0.8
1578	EX 25Y	91	95.8	95.0	-0.8
1578	EX 100Y	145	97.7	96.1	-1.6
1578	ULT 10Y	79	95.5	94.8	-0.7
1578	ULT 25Y	103	96.2	95.3	-0.9
1578	ULT 100Y	160	98.4	96.5	-1.9
2266	EX 10Y	59	95.4	95.0	-0.4
2266	EX 25Y	78	96.0	95.5	-0.5
2266	EX 100Y	125	97.8	96.5	-1.3
2266	ULT 10Y	69	95.7	95.3	-0.4
2266	ULT 25Y	90	96.4	95.8	-0.6
2266	ULT 100Y	141	98.5	96.9	-1.6
2382	RAILROAD			Culvert	
2496	EX 10Y	28	95.4	95.1	-0.3
2496	EX 25Y	37	96.1	95.6	-0.5
2496	EX 100Y	62	98.1	96.8	-1.3
2496	ULT 10Y	38	95.8	95.4	-0.4
2496	ULT 25Y	49	96.5	96.0	-0.5
2496	ULT 100Y	77	98.9	97.3	-1.6
3118	EX 10Y	28	95.6	95.4	-0.2
3118	EX 25Y	37	96.3	95.9	-0.4
3118	EX 100Y	62	98.1	97.0	-1.1
3118	ULT 10Y	38	96.0	95.8	-0.2
3118	ULT 25Y	49	96.7	96.2	-0.5
3118	ULT 100Y	77	99.0	97.5	-1.5
3938	EX 10Y	28	96.2	96.1	-0.1
3938	EX 25Y	37	96.6	96.4	-0.2
3938	EX 100Y	62	98.3	97.3	-1
3938	ULT 10Y	38	96.5	96.4	-0.1
3938	ULT 25Y	49	97.0	96.8	-0.2
3938	ULT 100Y	77	99.1	97.8	-1.3
4086	SUGAR			Culvert	
4245	EX 10Y	15	99.6	96.2	-3.4
4245	EX 25Y	20	100.3	96.6	-3.7
4245	EX 100Y	36	100.5	97.8	-2.7
4245	ULT 10Y	25	100.4	96.8	-3.6
4245	ULT 25Y	32	100.5	97.2	-3.3
4245	ULT 100Y	51	100.7	98.7	-2
5178	EX 10Y	15	99.6	96.5	-3.1
5178	EX 25Y	20	100.3	96.9	-3.4
5178	EX 100Y	36	100.6	97.9	-2.7
5178	ULT 10Y	25	100.4	97.0	-3.4

NM-113 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
5178	ULT 25Y	32	100.5	97.4	-3.1
5178	ULT 100Y	51	100.7	98.8	-1.9
6003	EX 10Y	3	99.6	96.6	-3
6003	EX 25Y	4	100.3	96.9	-3.4
6003	EX 100Y	7	100.6	98.0	-2.6
6003	ULT 10Y	5	100.4	97.1	-3.3
6003	ULT 25Y	6	100.5	97.5	-3
6003	ULT 100Y	10	100.7	98.8	-1.9
6838	EX 10Y	3	99.6	96.6	-3
6838	EX 25Y	4	100.3	96.9	-3.4
6838	EX 100Y	7	100.6	98.0	-2.6
6838	ULT 10Y	5	100.4	97.1	-3.3
6838	ULT 25Y	6	100.5	97.5	-3
6838	ULT 100Y	10	100.7	98.8	-1.9
7543	EX 10Y	3	101.2	101.2	0
7543	EX 25Y	4	101.2	101.2	0
7543	EX 100Y	7	101.3	101.3	0
7543	ULT 10Y	5	101.2	101.2	0
7543	ULT 25Y	6	101.3	101.3	0
7543	ULT 100Y	10	101.4	101.4	0

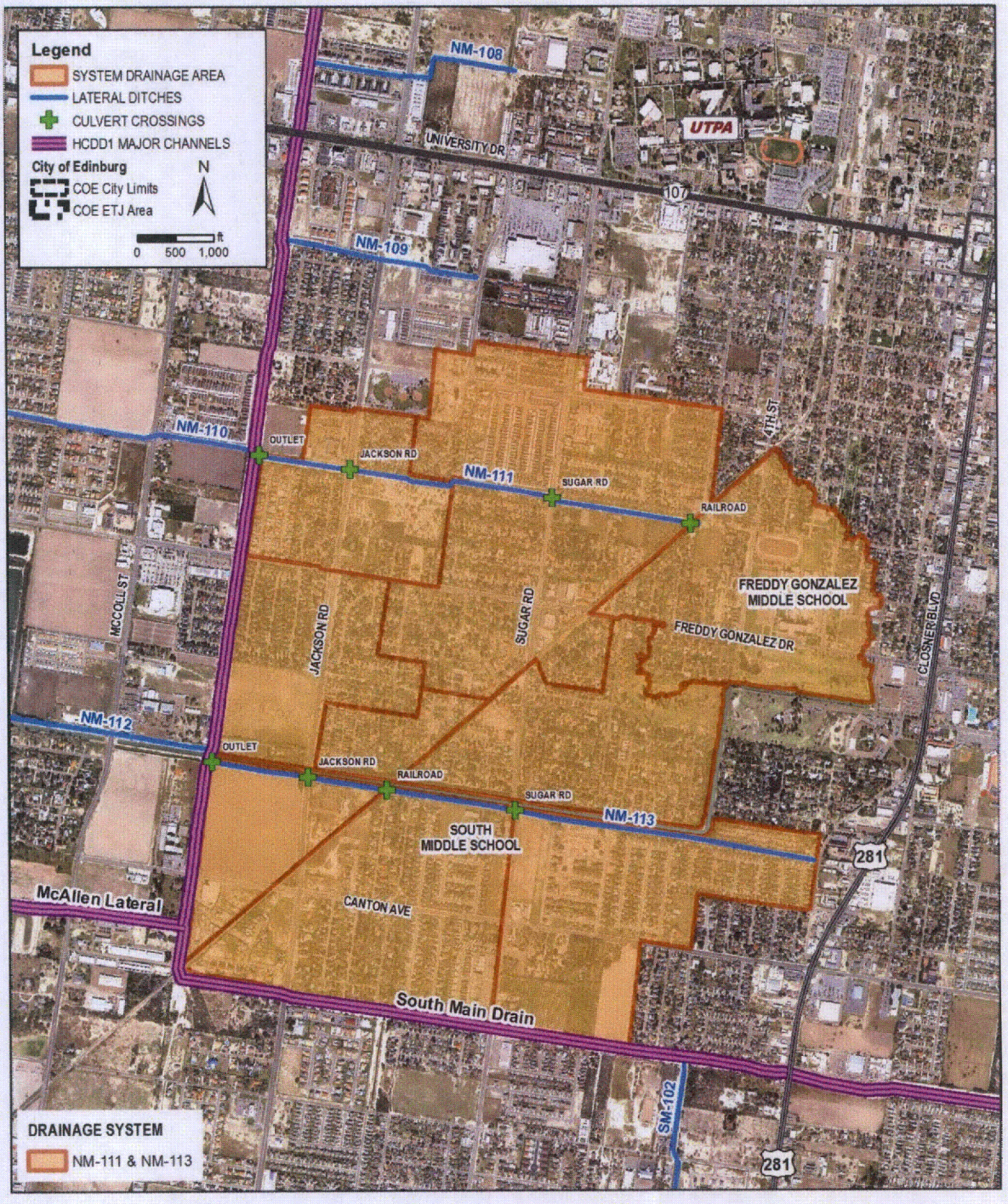


Figure 6-12. NM-111 & NM-113 Drainage Systems

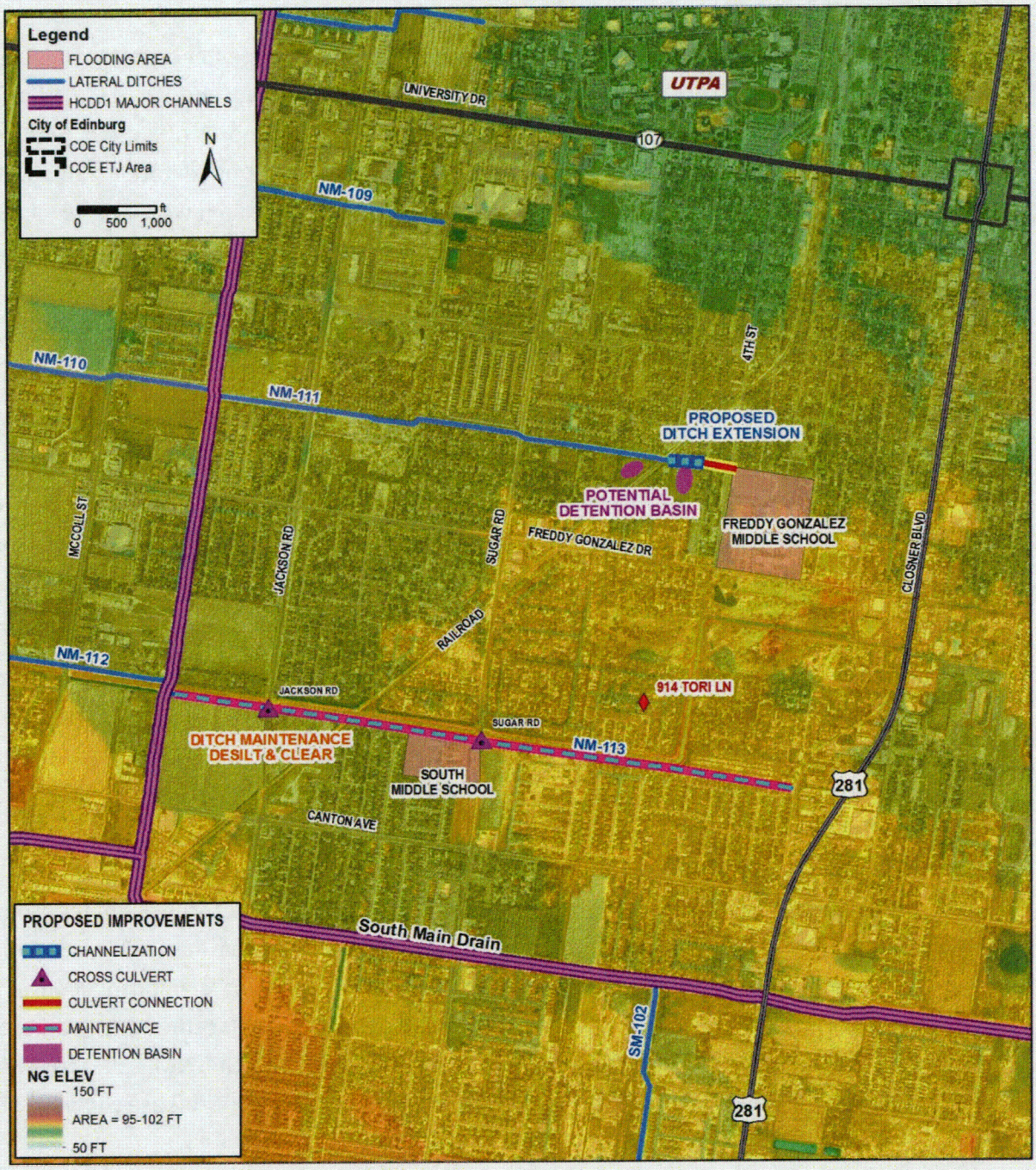


Figure 6-13. NM-111 & NM-113 Systems Improvements

SYSTEMS NM-115 & NM-116

Systems NM-115 and NM-116 represents the drainage area of lateral ditches to McAllen Lateral Drain located within the southwest portions of the City of Edinburg and its ETJ. The area is generally located east of FM 336 (N. 10th St.), west of Jackson Road, north of FM 495 (Pecan St.), and south of the McAllen Lateral. The system drainage areas are approximately 2365 and 303 acres, respectively. The drainage networks consist of a single lateral ditch with lengths of 15,600 feet (NM-115) and 4430 feet (NM-116). The systems drain from south to north into McAllen Lateral Drain. The NM-115 and NM-116 system drainage area and ditch alignments are shown in **Figure 6-14**.

The drainage areas are considered to be fully developed consisting of dense residential and commercial areas. The drainage areas slope from south to north towards the McAllen Lateral Drain. The railroad serves as the southern boundary of the NM-116 drainage area and as a subbasin divide for the NM-115 drainage area.

Both drainage ditches are affected by the McAllen Lateral Drain (a lateral of North Main Drain) backwater within the downstream reaches. The upstream reaches of the systems are not affected by the McAllen Lateral Drain tailwater; this was evaluated based on HEC-RAS modeling.

The hydraulic analysis shows that the NM-115 system has a 25-year capacity within the lower (northern) reaches and a 10-year capacity within the upper (southern) reaches. Based on the open channel (no-culvert) hydraulic analysis, the crossing structures along the channel provide cumulative losses along the channel that significantly reduces the system's capacity during extreme events. Several crossing improvements were proposed to provide adequate capacity to convey the existing and proposed 25-year and 100-year flows. These improvements typically involve the addition of a box culvert to the existing structure with a culvert replacement proposed at Violet Road. The hydraulic analysis shows that the NM-116 system has a 25-year capacity along the channel with the Wisconsin Street crossing providing significant conveyance restrictions. The culverts at Wisconsin Street are proposed for replacement to increase the capacity of the system. The existing and proposed structures for the NM-115 and NM-116 systems are listed in **Table 6-18**. The proposed culvert replacement locations are shown in **Figure 6-15**.

TABLE 6-18. NM-115 & NM-116 SYSTEM CROSS-DRAINAGE STRUCTURE INVENTORY

DITCH STATION	CROSSING NAME	EXISTING STRUCTURE	CULVERT LENGTH	PROPOSED STRUCTURE
NM-115				
1196	WISCONSIN	7' X 8' RCB	152	2- 7' X 8' RCB
3132	RAILROAD	10' X 10' RCB	212	--
3839	TRENTON	10' X 10' RCB & 48" RCP	174	--
5188	DIRT	10' X 8' RCB	48	--
6509	ALBERTA	8' X 9' RCB	178	2- 8' X 9' RCB
7827	UTILITY	8' X 7' RCB	48	2- 8' X 7' RCB
9146	DOVE	7' X 6' RCB	154	2- 7' X 6' RCB
11793	VIOLET	6' X 5' RCB	154	10' X 8' RCB
12718	UTILITY	6' X 4' RCB	36	2- 6' X 4' RCB
13110	UTILITY	6' X 4' RCB	40	2- 6' X 4' RCB
14441	NOLANA	66" RCP	188	--
NM-116				
655	WISCONSIN	2- 36" RCP	320	6' X 5' RCB
3353	TRENTON	42" RCP	620	--

Based on the development within drainage area and the conveyance capacity of the system ditches, no channel improvements are recommended within the NM-115 and NM-116 systems; however, various culvert replacements are recommended as presented in the above table. Comparisons of the existing and proposed condition water surface elevations for the NM-115 and NM-116 ditches are provided in **Tables 6-19** and **6-20**, respectively.

TABLE 6-19. NM-115 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON

NM-115 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
514	EX 10Y	387	99.3	99.3	0
514	EX 25Y	491	99.8	99.8	0
514	EX 100Y	708	100.7	100.7	0
514	ULT 10Y	390	99.3	99.3	0
514	ULT 25Y	500	99.9	99.9	0
514	ULT 100Y	710	100.8	100.8	0
982	EX 10Y	387	99.6	99.6	0
982	EX 25Y	491	100.1	100.1	0
982	EX 100Y	708	101.0	101.0	0
982	ULT 10Y	390	99.6	99.6	0
982	ULT 25Y	500	100.1	100.1	0
982	ULT 100Y	710	101.0	101.0	0
1196	WISCONSIN			Culvert	
1366	EX 10Y	356	101.0	99.9	-1.1
1366	EX 25Y	450	102.0	100.6	-1.4
1366	EX 100Y	647	104.7	101.9	-2.8
1366	ULT 10Y	360	101.0	99.9	-1.1
1366	ULT 25Y	460	102.1	100.6	-1.5
1366	ULT 100Y	650	104.7	101.9	-2.8
2077	EX 10Y	356	101.1	100.0	-1.1
2077	EX 25Y	450	102.1	100.7	-1.4
2077	EX 100Y	647	104.7	102.1	-2.6
2077	ULT 10Y	360	101.1	100.1	-1
2077	ULT 25Y	460	102.2	100.8	-1.4
2077	ULT 100Y	650	104.8	102.1	-2.7
2898	EX 10Y	356	101.1	100.2	-0.9
2898	EX 25Y	450	102.2	100.9	-1.3
2898	EX 100Y	647	104.8	102.2	-2.6
2898	ULT 10Y	360	101.2	100.2	-1
2898	ULT 25Y	460	102.3	100.9	-1.4
2898	ULT 100Y	650	104.8	102.2	-2.6
3132	RAILROAD			Culvert	
3315	EX 10Y	356	101.6	100.8	-0.8
3315	EX 25Y	450	102.8	101.7	-1.1
3315	EX 100Y	647	105.9	103.5	-2.4
3315	ULT 10Y	360	101.7	100.9	-0.8
3315	ULT 25Y	460	102.9	101.8	-1.1
3315	ULT 100Y	650	106.0	103.5	-2.5
3656	EX 10Y	356	101.7	101.0	-0.7
3656	EX 25Y	450	102.9	101.8	-1.1
3656	EX 100Y	647	105.9	103.6	-2.3
3656	ULT 10Y	360	101.8	101.0	-0.8
3656	ULT 25Y	460	103.0	101.9	-1.1
3656	ULT 100Y	650	106.0	103.6	-2.4
3839	TRENTON			Culvert	
4037	EX 10Y	280	102.1	101.5	-0.6
4037	EX 25Y	355	103.3	102.4	-0.9
4037	EX 100Y	509	106.6	104.3	-2.3
4037	ULT 10Y	290	102.2	101.5	-0.7
4037	ULT 25Y	360	103.4	102.5	-0.9
4037	ULT 100Y	510	106.7	104.3	-2.4
4521	EX 10Y	280	102.1	101.5	-0.6
4521	EX 25Y	355	103.3	102.5	-0.8
4521	EX 100Y	509	106.6	104.4	-2.2
4521	ULT 10Y	290	102.2	101.6	-0.6

NM-115 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
4521	ULT 25Y	360	103.4	102.5	-0.9
4521	ULT 100Y	510	106.7	104.4	-2.3
5052	EX 10Y	280	102.2	101.6	-0.6
5052	EX 25Y	355	103.3	102.5	-0.8
5052	EX 100Y	509	106.6	104.4	-2.2
5052	ULT 10Y	290	102.2	101.6	-0.6
5052	ULT 25Y	360	103.5	102.6	-0.9
5052	ULT 100Y	510	106.7	104.4	-2.3
5188	DIRT ROAD			Culvert	
5322	EX 10Y	280	102.5	101.9	-0.6
5322	EX 25Y	355	103.8	103.0	-0.8
5322	EX 100Y	509	107.6	105.4	-2.2
5322	ULT 10Y	290	102.6	102.0	-0.6
5322	ULT 25Y	360	103.9	103.1	-0.8
5322	ULT 100Y	510	107.7	105.4	-2.3
5795	EX 10Y	280	102.5	102.0	-0.5
5795	EX 25Y	355	103.8	103.0	-0.8
5795	EX 100Y	509	107.6	105.4	-2.2
5795	ULT 10Y	290	102.6	102.1	-0.5
5795	ULT 25Y	360	104.0	103.1	-0.9
5795	ULT 100Y	510	107.7	105.4	-2.3
6348	EX 10Y	280	102.6	102.1	-0.5
6348	EX 25Y	355	103.9	103.1	-0.8
6348	EX 100Y	509	107.6	105.4	-2.2
6348	ULT 10Y	290	102.7	102.2	-0.5
6348	ULT 25Y	360	104.0	103.2	-0.8
6348	ULT 100Y	510	107.7	105.4	-2.3
6509	ALBERTA			Culvert	
6641	EX 10Y	280	103.1	102.2	-0.9
6641	EX 25Y	355	104.5	103.3	-1.2
6641	EX 100Y	509	108.2	105.7	-2.5
6641	ULT 10Y	290	103.3	102.3	-1
6641	ULT 25Y	360	104.7	103.4	-1.3
6641	ULT 100Y	510	108.2	105.8	-2.4
7179	EX 10Y	280	103.2	102.3	-0.9
7179	EX 25Y	355	104.6	103.3	-1.3
7179	EX 100Y	509	108.2	105.8	-2.4
7179	ULT 10Y	290	103.3	102.4	-0.9
7179	ULT 25Y	360	104.7	103.4	-1.3
7179	ULT 100Y	510	108.2	105.8	-2.4
7728	EX 10Y	280	103.3	102.4	-0.9
7728	EX 25Y	355	104.6	103.4	-1.2
7728	EX 100Y	509	108.2	105.8	-2.4
7728	ULT 10Y	290	103.4	102.5	-0.9
7728	ULT 25Y	360	104.7	103.5	-1.2
7728	ULT 100Y	510	108.2	105.9	-2.3
7827	UTILITY			Culvert	
7926	EX 10Y	280	103.9	102.6	-1.3
7926	EX 25Y	355	105.6	103.7	-1.9
7926	EX 100Y	509	109.4	106.3	-3.1
7926	ULT 10Y	290	104.0	102.7	-1.3
7926	ULT 25Y	360	105.7	103.7	-2
7926	ULT 100Y	510	109.5	106.4	-3.1
8418	EX 10Y	280	103.9	102.7	-1.2
8418	EX 25Y	355	105.6	103.8	-1.8
8418	EX 100Y	509	109.4	106.4	-3

NM-115 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
8418	ULT 10Y	290	104.1	102.8	-1.3
8418	ULT 25Y	360	105.8	103.8	-2
8418	ULT 100Y	510	109.5	106.4	-3.1
8949	EX 10Y	280	104.0	102.8	-1.2
8949	EX 25Y	355	105.7	103.8	-1.9
8949	EX 100Y	509	109.5	106.4	-3.1
8949	ULT 10Y	290	104.1	102.9	-1.2
8949	ULT 25Y	360	105.8	103.9	-1.9
8949	ULT 100Y	510	109.5	106.4	-3.1
9146	DOVE			Culvert	
9251	EX 10Y	280	105.2	103.1	-2.1
9251	EX 25Y	355	107.7	104.3	-3.4
9251	EX 100Y	509	109.7	107.4	-2.3
9251	ULT 10Y	290	105.5	103.2	-2.3
9251	ULT 25Y	360	107.9	104.4	-3.5
9251	ULT 100Y	510	109.7	107.5	-2.2
9746	EX 10Y	149	105.2	103.1	-2.1
9746	EX 25Y	189	107.7	104.4	-3.3
9746	EX 100Y	268	109.7	107.5	-2.2
9746	ULT 10Y	150	105.5	103.3	-2.2
9746	ULT 25Y	190	107.9	104.4	-3.5
9746	ULT 100Y	270	109.7	107.5	-2.2
10378	EX 10Y	149	105.2	103.2	-2
10378	EX 25Y	189	107.7	104.4	-3.3
10378	EX 100Y	268	109.7	107.5	-2.2
10378	ULT 10Y	150	105.5	103.3	-2.2
10378	ULT 25Y	190	107.9	104.5	-3.4
10378	ULT 100Y	270	109.7	107.5	-2.2
11070	EX 10Y	149	105.3	103.3	-2
11070	EX 25Y	189	107.7	104.4	-3.3
11070	EX 100Y	268	109.7	107.5	-2.2
11070	ULT 10Y	150	105.5	103.4	-2.1
11070	ULT 25Y	190	107.9	104.5	-3.4
11070	ULT 100Y	270	109.7	107.5	-2.2
11608	EX 10Y	149	105.3	103.4	-1.9
11608	EX 25Y	189	107.7	104.5	-3.2
11608	EX 100Y	268	109.7	107.5	-2.2
11608	ULT 10Y	150	105.5	103.5	-2
11608	ULT 25Y	190	107.9	104.6	-3.3
11608	ULT 100Y	270	109.7	107.5	-2.2
11793	VIOLET			Culvert	
11908	EX 10Y	149	106.0	103.6	-2.4
11908	EX 25Y	189	108.9	104.7	-4.2
11908	EX 100Y	268	112.0	107.8	-4.2
11908	ULT 10Y	150	106.3	103.7	-2.6
11908	ULT 25Y	190	109.1	104.8	-4.3
11908	ULT 100Y	270	112.0	107.8	-4.2
12224	EX 10Y	149	106.0	103.6	-2.4
12224	EX 25Y	189	108.9	104.7	-4.2
12224	EX 100Y	268	112.0	107.8	-4.2
12224	ULT 10Y	150	106.3	103.7	-2.6
12224	ULT 25Y	190	109.1	104.8	-4.3
12224	ULT 100Y	270	112.0	107.8	-4.2
12605	EX 10Y	149	106.0	103.6	-2.4
12605	EX 25Y	189	108.9	104.7	-4.2
12605	EX 100Y	268	112.0	107.8	-4.2
12605	ULT 10Y	150	106.3	103.7	-2.6
12605	ULT 25Y	190	109.1	104.8	-4.3
12605	ULT 100Y	270	112.0	107.8	-4.2

NM-115 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
12718	UTILITY			Culvert	
12775	EX 10Y	149	107.0	103.9	-3.1
12775	EX 25Y	189	109.7	105.1	-4.6
12775	EX 100Y	268	112.0	108.6	-3.4
12775	ULT 10Y	150	107.2	104.0	-3.2
12775	ULT 25Y	190	109.8	105.2	-4.6
12775	ULT 100Y	270	112.0	108.6	-3.4
13028	EX 10Y	149	107.0	104.0	-3
13028	EX 25Y	189	109.7	105.2	-4.5
13028	EX 100Y	268	112.0	108.6	-3.4
13028	ULT 10Y	150	107.3	104.1	-3.2
13028	ULT 25Y	190	109.8	105.3	-4.5
13028	ULT 100Y	270	112.0	108.6	-3.4
13110	UTILITY			Culvert	
13177	EX 10Y	149	108.0	104.2	-3.8
13177	EX 25Y	189	111.2	105.6	-5.6
13177	EX 100Y	268	112.9	109.4	-3.5
13177	ULT 10Y	150	108.2	104.3	-3.9
13177	ULT 25Y	190	111.4	105.6	-5.8
13177	ULT 100Y	270	112.9	109.4	-3.5
13531	EX 10Y	149	108.0	104.3	-3.7
13531	EX 25Y	189	111.2	105.6	-5.6
13531	EX 100Y	268	112.9	109.4	-3.5
13531	ULT 10Y	150	108.2	104.4	-3.8
13531	ULT 25Y	190	111.4	105.7	-5.7
13531	ULT 100Y	270	112.9	109.5	-3.4
13853	EX 10Y	149	108.0	104.3	-3.7
13853	EX 25Y	189	111.2	105.6	-5.6
13853	EX 100Y	268	112.9	109.4	-3.5
13853	ULT 10Y	150	108.3	104.4	-3.9
13853	ULT 25Y	190	111.4	105.7	-5.7
13853	ULT 100Y	270	112.9	109.5	-3.4
14243	EX 10Y	149	108.0	104.4	-3.6
14243	EX 25Y	189	111.2	105.6	-5.6
14243	EX 100Y	268	112.9	109.4	-3.5
14243	ULT 10Y	150	108.3	104.5	-3.8
14243	ULT 25Y	190	111.4	105.7	-5.7
14243	ULT 100Y	270	112.9	109.5	-3.4
14441	NOLANA			Culvert	
14595	EX 10Y	149	109.2	105.6	-3.6
14595	EX 25Y	189	112.0	107.6	-4.4
14595	EX 100Y	268	113.0	111.9	-1.1
14595	ULT 10Y	150	109.5	105.7	-3.8
14595	ULT 25Y	190	112.0	107.7	-4.3
14595	ULT 100Y	270	113.0	111.9	-1.1
15088	EX 10Y	149	109.2	105.6	-3.6
15088	EX 25Y	189	112.0	107.6	-4.4
15088	EX 100Y	268	113.0	111.9	-1.1
15088	ULT 10Y	150	109.5	105.7	-3.8
15088	ULT 25Y	190	112.0	107.7	-4.3
15088	ULT 100Y	270	113.0	112.0	-1
15505	EX 10Y	149	109.2	105.7	-3.5
15505	EX 25Y	189	112.0	107.6	-4.4
15505	EX 100Y	268	113.0	111.9	-1.1
15505	ULT 10Y	150	109.5	105.8	-3.7
15505	ULT 25Y	190	112.0	107.7	-4.3
15505	ULT 100Y	270	113.0	112.0	-1

TABLE 6-20. NM-116 EXISTING & PROPOSED WATER SURFACE ELEVATION COMPARISON

NM-116 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
217	EX 10Y	71	96.2	96.2	0
217	EX 25Y	93	96.5	96.5	0
217	EX 100Y	137	97.1	97.1	0
217	ULT 10Y	80	96.4	96.4	0
217	ULT 25Y	104	96.7	96.7	0
217	ULT 100Y	150	97.2	97.2	0
472	EX 10Y	71	96.4	96.4	0
472	EX 25Y	93	96.6	96.6	0
472	EX 100Y	137	97.2	97.2	0
472	ULT 10Y	80	96.5	96.5	0
472	ULT 25Y	104	96.8	96.8	0
472	ULT 100Y	150	97.3	97.3	0
655	WISCONSIN			Culvert	
923	EX 10Y	71	98.2	97.8	-0.4
923	EX 25Y	93	99.3	98.4	-0.9
923	EX 100Y	137	102.3	99.4	-2.9
923	ULT 10Y	80	98.6	98.0	-0.6
923	ULT 25Y	104	100.0	98.6	-1.4
923	ULT 100Y	150	103.4	99.6	-3.8
1622	EX 10Y	59	98.3	97.9	-0.4
1622	EX 25Y	76	99.3	98.4	-0.9
1622	EX 100Y	109	102.3	99.4	-2.9
1622	ULT 10Y	59	98.6	98.1	-0.5
1622	ULT 25Y	76	100.0	98.7	-1.3
1622	ULT 100Y	109	103.4	99.7	-3.7
2388	EX 10Y	59	98.3	97.9	-0.4
2388	EX 25Y	76	99.3	98.5	-0.8
2388	EX 100Y	109	102.3	99.4	-2.9
2388	ULT 10Y	59	98.7	98.2	-0.5
2388	ULT 25Y	76	100.0	98.7	-1.3
2388	ULT 100Y	109	103.4	99.7	-3.7
2942	EX 10Y	13	98.3	98.0	-0.3
2942	EX 25Y	17	99.3	98.5	-0.8
2942	EX 100Y	24	102.3	99.5	-2.8
2942	ULT 10Y	13	98.7	98.2	-0.5
2942	ULT 25Y	17	100.0	98.7	-1.3
2942	ULT 100Y	24	103.4	99.7	-3.7
3353	TRENTON			Culvert	
3758	EX 10Y	13	98.6	98.5	-0.1
3758	EX 25Y	17	99.6	98.9	-0.7
3758	EX 100Y	24	102.8	99.9	-2.9
3758	ULT 10Y	13	98.9	98.6	-0.3
3758	ULT 25Y	17	100.2	99.0	-1.2
3758	ULT 100Y	24	103.9	100.2	-3.7
4375	EX 10Y	13	98.7	98.5	-0.2
4375	EX 25Y	17	99.6	98.9	-0.7
4375	EX 100Y	24	102.8	99.9	-2.9
4375	ULT 10Y	13	98.9	98.6	-0.3
4375	ULT 25Y	17	100.2	99.0	-1.2
4375	ULT 100Y	24	103.9	100.2	-3.7

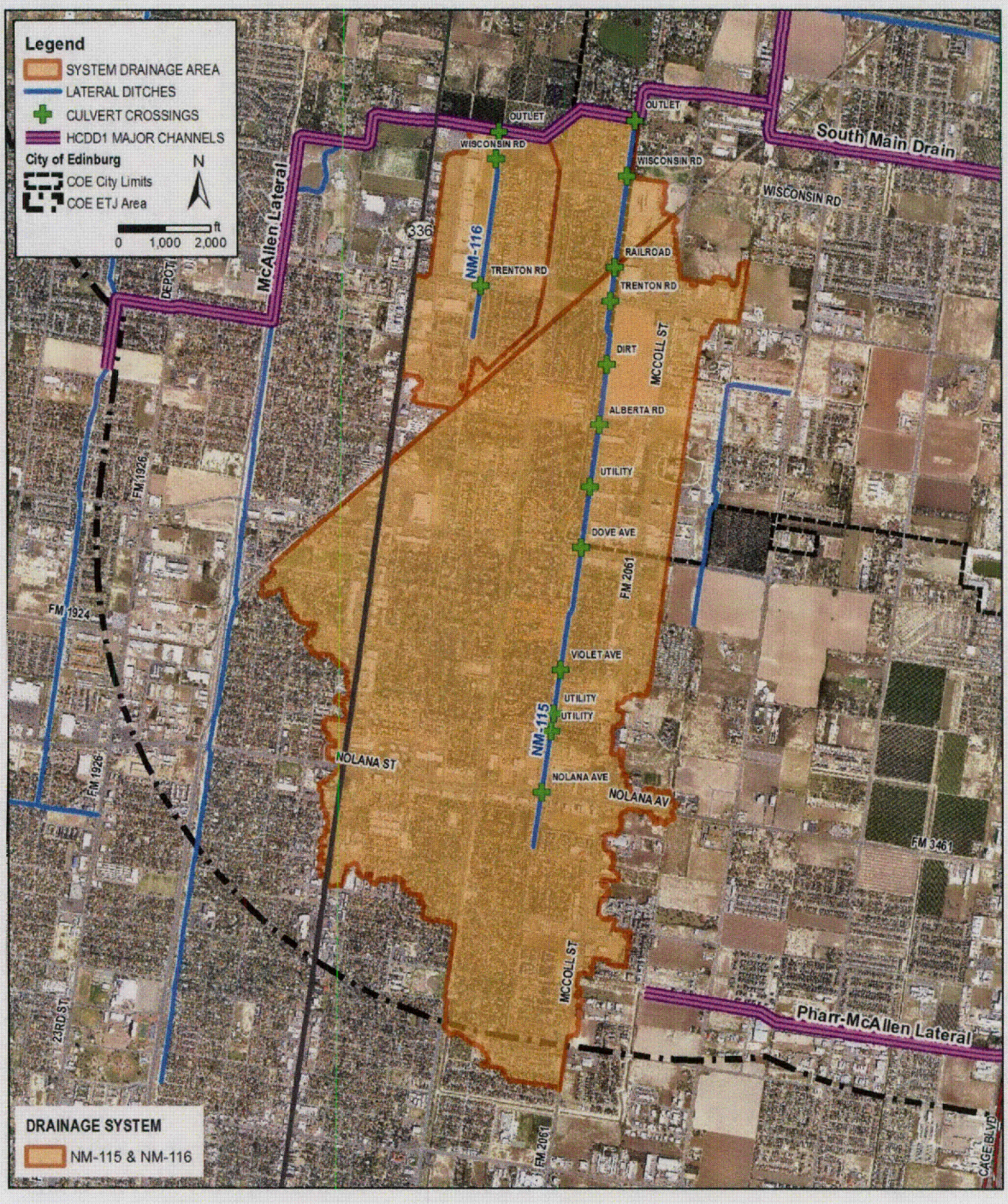


Figure 6-14. NM-115 & NM-116 Drainage Systems

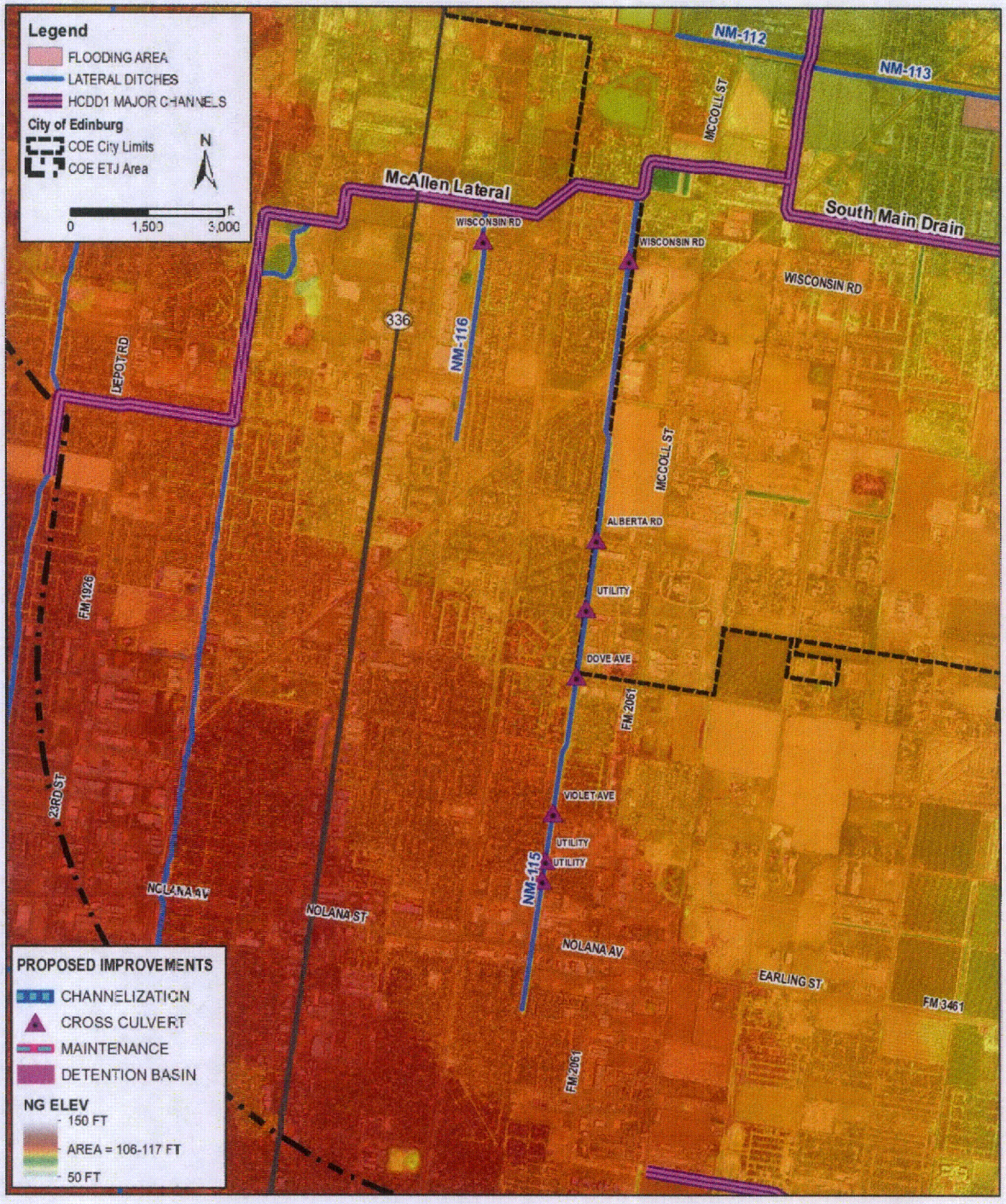


Figure 6-15. NM-115 & NM-116 Systems Topography

SYSTEMS ES-101 & ES-102

Systems ES-101 & ES-102 represents the contributing drainage areas of the lateral ditch to Edinburg Stub within the southeast portions of the City of Edinburg. The area is generally located west of BS 281 (Closner Blvd), south of Richardson Road, north of South Main Drain, and west of Raul Longoria Rd. The drainage systems receive runoff from the storm sewer systems that serve the east and southeast portions of the City central area. Based on the aerial, the system drainage area is considered to be fully developed, consisting of residential and commercial properties. The ES-101 & ES-102 system drainage areas and ditch alignments area shown in **Figure 6-16**.

The receiving ditches outfall into the Edinburg Stub, which is a tributary of the South Main Drain. Based on the topography of the Edinburg Stub shows that this ditch is extremely flat and is significantly impacted by the South Main Drain tailwater conditions.

The hydraulic analysis shows that the ES-100 system is dependent on the tailwater conditions of the receiving systems: Edinburg Stub for the COE ditches and South Main Drain for Edinburg Stub. Additionally, the low overbank areas adjacent to the ditches, especially Edinburg Stub, are susceptible to flooding and ponding even though the water surface elevations within the ditches are contained below the elevated channel banks.

The Edinburg Stub (ES-100) is a part of the HCDD1 MDP System; however, it serves as receiving drain for a large portion of the City of Edinburg eastside and downtown areas. Therefore, the ditch was considered within the hydraulic analysis of the ES-101 and ES-102 ditch systems and proposed drainage planning. Based on the hydraulic analysis, the Edinburg Stub has a 10 to 25-year capacity along its reach. However, the reach does experience out-of-bank ponding and flooding due to the low overbank areas and high channel banks. The hydraulic analysis shows that the culverts at Doolittle and Raul Longoria provide conveyance restrictions during larger storm events. In order to reduce the impacts of the Edinburg Stub tailwaters onto the upstream laterals, these two crossings are proposed for culvert replacement.

ES-101 ditch and the culvert structures are shown to have a greater than 25-year capacity without backwater effects from Edinburg Stub. With consideration of the backwater from Edinburg Stub, the ES-101 ditch system capacity is slightly reduced to a 25-year capacity.

ES-102 ditch and the culvert at Sprague Road shows to have sufficient capacity, without backwater effects from Edinburg Stub, for 25-year and greater storm events. Its lateral ES-102-01 has limited capacity, approximately 10-year, as a result of the existing culvert structures. With consideration of backwater effects from Edinburg Stub, the ES-102 ditch system capacity is reduced to a 25-year event with the ES-102-01 system capacity being reduced to less than a 10-

year event. The existing and proposed structures for the ES-100 system including the ES-101, ES-102, and ES-102-01 ditches are listed in **Table 6-21**.

TABLE 6-21. ES-100 SYSTEM CROSS-DRAINAGE STRUCTURE INVENTORY

DITCH STATION	CROSSING NAME	EXISTING STRUCTURE	CULVERT LENGTH	PROPOSED STRUCTURE
ES-100				
50	OUTLET GATE TO SMD	2- 10' X 10' RCB	60	--
1309	CESAR CHAVEZ	10' X 10' RCB	80	--
4086	DIRT RD	10' X 10' RCB	80	--
8153	DOOLITTLE	10' X 6' RCB	84	10' X 10' RCB
11181	RAUL LONGORIA	8' X 4' & 4' X 4' RCB	147	10' X 10' RCB
ES-101				
675	FREDDY GONZALEZ	84" RCP	116	--
1520	28TH ST	60" RCP	80	--
2308	US 281	60" RCP	400	--
ES-102				
2027	SPRAGUE	10' X 6' RCB	106	INVERT ADJUSTMENT
ES-102-01				
1035	ACCESS RD	UNK- 24" RCP	94	8' X 5' RCB
1701	RAUL LONGORIA	UNK- 36" RCP	157	8' X 5' RCB
4635	DOOLITTLE	UNK- 36" RCP	420	8' X 5' RCB

Based on information provided by the City and residents within the ES-101 & ES-102 drainage system, this area has experienced frequent flooding. Locations of documented flooding are shown in **Figure 6-17**. The documented flooding is mostly within areas served by storm sewer systems, which outfall into the ES-101 and ES-102 ditches. Based on the overland topography, a significant portion of the drainage system area is located within the Edinburg Low.

The drainage system has several major constraints that limit the effectiveness of any single flood relief measure. These constraints include the flat topography, receiving HCDD1 tailwater conditions, US 281 Freeway Corridor, and limited available open land within the drainage area. The flat topography, in combination with the receiving ditches' tailwater conditions, reduce the available hydraulic head needed to convey the runoff within the drainage area. The US 281 Corridor restricts drainage improvement options from west to east due to construction cost. The

limited open land within the drainage area restricts locations for proposed detention and channel ROW within the flooding areas.

In order to provide an effective and efficient system within the drainage area, a combination of detention, channel improvements, and storm sewer trunkline is proposed. For the ES-102 system, which provides outfall for the east portions of the City central area, a detention basin is proposed to provide the existing storm sewer systems an efficient outfall and storm water runoff storage. The basin will lower the tailwater condition for the existing storm sewer systems serving the City central area. Additionally, the flow diversion to the basin and storage volume will reduce the burden on the receiving ditches, which in turn will lower the tailwater conditions for other storm sewer systems within the drainage system. In order to direct runoff from the City central area to the proposed detention basin, the outfall channels ES-102 and ES-102-01 will be improved and a collection storm sewer trunkline will need to be constructed to increase the conveyance from west of US 281 to the ES-102 ditch. A potential trunkline alignment could be along University Dr. or Spague St. across the US 281 corridor. The basin outlet is proposed along Doolittle Rd. south to the Edinburg Stub. In order to provide sufficient volume within the proposed basin, either the basin will require a pump outlet structure or channel improvements to Edinburg Stub and South Main Drain (to downstream of Alamo Dr.). The channel improvements would be required to lower the ditches inverts and increase their conveyance capacity as well as provide for culvert replacements along ES-102-01 to handle the proposed flow diversion to the detention basin. The proposed improvements along ES-102 and ES-102-01 include an earthen channel with 30-foot bottom width, 3:1 side slopes, and a depth of approximately 10 feet. These improvements would also decrease the upstream tailwater conditions within the ES-101 & ES-102 drainage system. The proposed improvement reaches for ES-102 system are shown in **Figure 6-17**.

Field observations of the ES-101 ditch show that the ditch is overgrown and has standing water. It is recommended that this ditch be regularly maintained by desilting and clearing of vegetation overgrowth. Due to restricted ROW and the US 281 crossing, channel improvements to the ES-101 ditch are not recommended. In order to provide drainage relief for this drainage system, storm water detention basins are proposed. The basins will reduce the runoff into the receiving ditch and provide for a lower tailwater condition for the storm sewer systems. The basin outfall system is proposed to be connected to the ES-101 ditch as well as south into the South Main Drain upstream of US 281, providing additional relief within the ES-101 system. The proposed improvements for ES-101 system are shown in **Figure 6-17**.

Comparisons of the existing and proposed condition water surface elevations for the ES-100 system including ES-100, ES-101, and ES-102 and ES-102-01 ditches are provided in **Tables 6-22. 6-23** and **6-24**, respectively.

TABLE 6-22. ES-100 EXISTING & PROPOSED WATER SURFACE ELEVATION

ES-100 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
308	EX 10Y	214	87.3	87.3	0
308	EX 25Y	279	88.1	88.1	0
308	EX 100Y	431	89.9	89.9	0
308	ULT 10Y	220	87.4	87.4	0
308	ULT 25Y	280	88.1	88.1	0
308	ULT 100Y	440	90.0	90.0	0
787	EX 10Y	214	87.5	87.5	0
787	EX 25Y	279	88.3	88.3	0
787	EX 100Y	431	90.1	90.1	0
787	ULT 10Y	220	87.6	87.6	0
787	ULT 25Y	280	88.3	88.3	0
787	ULT 100Y	440	90.2	90.2	0
1236	EX 10Y	214	87.6	87.6	0
1236	EX 25Y	279	88.4	88.4	0
1236	EX 100Y	431	90.2	90.2	0
1236	ULT 10Y	220	87.7	87.7	0
1236	ULT 25Y	280	88.5	88.5	0
1236	ULT 100Y	440	90.3	90.3	0
1309	CESAR CHAVEZ			Culvert	
1384	EX 10Y	214	87.9	87.9	0
1384	EX 25Y	279	88.8	88.8	0
1384	EX 100Y	431	90.7	90.7	0
1384	ULT 10Y	220	88.0	88.0	0
1384	ULT 25Y	280	88.8	88.8	0
1384	ULT 100Y	440	90.9	90.9	0
1936	EX 10Y	214	88.0	88.0	0
1936	EX 25Y	279	88.9	88.9	0
1936	EX 100Y	431	90.8	90.8	0
1936	ULT 10Y	220	88.1	88.1	0
1936	ULT 25Y	280	88.9	88.9	0
1936	ULT 100Y	440	91.0	91.0	0
2515	EX 10Y	214	88.1	88.1	0
2515	EX 25Y	279	89.0	89.0	0
2515	EX 100Y	431	90.9	90.9	0
2515	ULT 10Y	220	88.2	88.2	0
2515	ULT 25Y	280	89.0	89.0	0
2515	ULT 100Y	440	91.1	91.1	0
3244	EX 10Y	214	88.3	88.3	0
3244	EX 25Y	279	89.2	89.2	0
3244	EX 100Y	431	91.1	91.1	0
3244	ULT 10Y	220	88.4	88.4	0
3244	ULT 25Y	280	89.3	89.3	0
3244	ULT 100Y	440	91.2	91.2	0
3683	EX 10Y	214	88.5	88.5	0
3683	EX 25Y	279	89.4	89.4	0
3683	EX 100Y	431	91.3	91.3	0
3683	ULT 10Y	220	88.6	88.6	0
3683	ULT 25Y	280	89.4	89.4	0
3683	ULT 100Y	440	91.4	91.4	0
3991	EX 10Y	214	88.6	88.6	0
3991	EX 25Y	279	89.5	89.5	0
3991	EX 100Y	431	91.4	91.4	0
3991	ULT 10Y	220	88.7	88.7	0
3991	ULT 25Y	280	89.5	89.5	0
3991	ULT 100Y	440	91.5	91.5	0
4086	DIRT RD			Culvert	

ES-100 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
4186	EX 10Y	214	88.8	88.8	0
4186	EX 25Y	279	89.8	89.8	0
4186	EX 100Y	431	91.8	91.8	0
4186	ULT 10Y	220	88.9	88.9	0
4186	ULT 25Y	280	89.8	89.8	0
4186	ULT 100Y	440	91.9	91.9	0
4608	EX 10Y	214	88.9	88.9	0
4608	EX 25Y	279	89.9	89.9	0
4608	EX 100Y	431	91.9	91.9	0
4608	ULT 10Y	220	89.0	89.0	0
4608	ULT 25Y	280	89.9	89.9	0
4608	ULT 100Y	440	92.0	92.0	0
5158	EX 10Y	214	89.0	89.0	0
5158	EX 25Y	279	89.9	89.9	0
5158	EX 100Y	431	91.9	91.9	0
5158	ULT 10Y	220	89.1	89.1	0
5158	ULT 25Y	280	89.9	89.9	0
5158	ULT 100Y	440	92.0	92.0	0
5846	EX 10Y	214	89.1	89.1	0
5846	EX 25Y	279	90.0	90.0	0
5846	EX 100Y	431	92.0	92.0	0
5846	ULT 10Y	220	89.2	89.2	0
5846	ULT 25Y	280	90.0	90.0	0
5846	ULT 100Y	440	92.1	92.1	0
6753	EX 10Y	214	89.2	89.2	0
6753	EX 25Y	279	90.1	90.1	0
6753	EX 100Y	431	92.1	92.1	0
6753	ULT 10Y	220	89.3	89.3	0
6753	ULT 25Y	280	90.2	90.2	0
6753	ULT 100Y	440	92.2	92.2	0
7508	EX 10Y	214	89.3	89.3	0
7508	EX 25Y	279	90.3	90.3	0
7508	EX 100Y	431	92.1	92.1	0
7508	ULT 10Y	220	89.4	89.4	0
7508	ULT 25Y	280	90.3	90.3	0
7508	ULT 100Y	440	92.2	92.2	0
8051	EX 10Y	214	89.4	89.4	0
8051	EX 25Y	279	90.4	90.4	0
8051	EX 100Y	431	92.2	92.2	0
8051	ULT 10Y	220	89.5	89.5	0
8051	ULT 25Y	280	90.4	90.4	0
8051	ULT 100Y	440	92.4	92.4	0
8153	DOOLITTLE			Culvert	
8275	EX 10Y	214	89.7	89.6	-0.1
8275	EX 25Y	279	90.9	90.6	-0.3
8275	EX 100Y	431	93.6	92.7	-0.9
8275	ULT 10Y	220	89.8	89.7	-0.1
8275	ULT 25Y	280	90.9	90.7	-0.3
8275	ULT 100Y	440	93.7	92.8	-0.9
8727	EX 10Y	214	89.8	89.7	-0.1
8727	EX 25Y	279	91.0	90.7	-0.3
8727	EX 100Y	431	93.6	92.7	-0.9
8727	ULT 10Y	220	89.9	89.8	-0.1
8727	ULT 25Y	280	91.0	90.7	-0.3
8727	ULT 100Y	440	93.7	92.9	-0.9
9208	EX 10Y	214	89.9	89.8	-0.1
9208	EX 25Y	279	91.0	90.8	-0.3

ES-100 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
9208	EX 100Y	431	93.7	92.8	-0.8
9208	ULT 10Y	220	90.0	89.9	-0.1
9208	ULT 25Y	280	91.1	90.8	-0.3
9208	ULT 100Y	440	93.8	93.0	-0.8
9850	EX 10Y	187	90.0	89.9	-0.1
9850	EX 25Y	242	91.1	90.9	-0.2
9850	EX 100Y	368	93.7	92.9	-0.8
9850	ULT 10Y	190	90.1	90.0	-0.1
9850	ULT 25Y	250	91.2	90.9	-0.2
9850	ULT 100Y	370	93.9	93.1	-0.8
10472	EX 10Y	187	90.0	90.0	-0.1
10472	EX 25Y	242	91.2	91.0	-0.2
10472	EX 100Y	368	93.8	93.0	-0.8
10472	ULT 10Y	190	90.2	90.1	-0.1
10472	ULT 25Y	250	91.2	91.0	-0.2
10472	ULT 100Y	370	93.9	93.1	-0.8
11071	EX 10Y	187	90.1	90.1	-0.1
11071	EX 25Y	242	91.3	91.1	-0.2
11071	EX 100Y	368	93.8	93.1	-0.8
11071	ULT 10Y	190	90.2	90.2	-0.1
11071	ULT 25Y	250	91.3	91.1	-0.2
11071	ULT 100Y	370	94.0	93.2	-0.8
11181	RAUL LONGORIA			Culvert	
11298	EX 10Y	187	90.6	90.3	-0.3
11298	EX 25Y	242	92.1	91.4	-0.7
11298	EX 100Y	368	95.3	93.6	-1.7
11298	ULT 10Y	190	90.7	90.4	-0.3
11298	ULT 25Y	250	92.1	91.4	-0.7
11298	ULT 100Y	370	95.4	93.8	-1.6
11934	EX 10Y	187	90.7	90.4	-0.3
11934	EX 25Y	242	92.1	91.4	-0.7
11934	EX 100Y	368	95.3	93.7	-1.7
11934	ULT 10Y	190	90.8	90.5	-0.3
11934	ULT 25Y	250	92.2	91.5	-0.7
11934	ULT 100Y	370	95.4	93.8	-1.6
12315	EX 10Y	187	90.7	90.4	-0.3
12315	EX 25Y	242	92.1	91.5	-0.7
12315	EX 100Y	368	95.4	93.7	-1.6
12315	ULT 10Y	190	90.8	90.5	-0.3
12315	ULT 25Y	250	92.2	91.5	-0.7
12315	ULT 100Y	370	95.4	93.8	-1.6
12785	EX 10Y	187	90.7	90.4	-0.3
12785	EX 25Y	242	92.2	91.5	-0.7
12785	EX 100Y	368	95.4	93.7	-1.6
12785	ULT 10Y	190	90.8	90.5	-0.3
12785	ULT 25Y	250	92.2	91.5	-0.7
12785	ULT 100Y	370	95.4	93.9	-1.6

TABLE 6-23. ES-101 EXISTING & PROPOSED WATER SURFACE ELEVATION

ES-101 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
298	EX 10Y	50	90.7	90.5	-0.3
298	EX 25Y	66	92.2	91.5	-0.7
298	EX 100Y	101	95.4	93.8	-1.6
298	ULT 10Y	50	90.9	90.6	-0.3
298	ULT 25Y	70	92.3	91.6	-0.7
298	ULT 100Y	110	95.5	93.9	-1.6
538	EX 10Y	50	90.8	90.5	-0.3
538	EX 25Y	66	92.2	91.5	-0.7
538	EX 100Y	101	95.4	93.8	-1.6
538	ULT 10Y	50	90.9	90.6	-0.3
538	ULT 25Y	70	92.3	91.6	-0.7
538	ULT 100Y	110	95.5	93.9	-1.6
675	FREDDY GONZALEZ			Culvert	
830	EX 10Y	50	91.0	91.0	0.0
830	EX 25Y	66	92.4	91.7	-0.7
830	EX 100Y	101	95.7	94.0	-1.8
830	ULT 10Y	50	91.0	91.0	0.0
830	ULT 25Y	70	92.5	91.7	-0.7
830	ULT 100Y	110	95.9	94.1	-1.8
1182	EX 10Y	50	92.5	92.5	0.0
1182	EX 25Y	66	92.8	92.7	-0.1
1182	EX 100Y	101	95.8	94.1	-1.7
1182	ULT 10Y	50	92.5	92.5	0.0
1182	ULT 25Y	70	92.9	92.8	-0.1
1182	ULT 100Y	110	95.9	94.3	-1.6
1450	EX 10Y	50	92.8	92.8	0.0
1450	EX 25Y	66	93.1	93.0	-0.1
1450	EX 100Y	101	95.8	94.2	-1.6
1450	ULT 10Y	50	92.8	92.8	0.0
1450	ULT 25Y	70	93.2	93.1	-0.1
1450	ULT 100Y	110	95.9	94.4	-1.6
1520	28TH ST			Culvert	
1619	EX 10Y	50	93.0	93.0	0.0
1619	EX 25Y	66	93.4	93.3	-0.1
1619	EX 100Y	101	95.8	94.8	-1.0
1619	ULT 10Y	50	93.0	93.0	0.0
1619	ULT 25Y	70	93.5	93.4	-0.1
1619	ULT 100Y	110	95.9	95.0	-1.0
2043	EX 10Y	50	93.1	93.1	0.0
2043	EX 25Y	66	93.5	93.5	0.0
2043	EX 100Y	101	95.8	94.9	-0.9
2043	ULT 10Y	50	93.1	93.1	0.0
2043	ULT 25Y	70	93.6	93.6	-0.1
2043	ULT 100Y	110	96.0	95.1	-0.9
2308	US 281			Culvert	
2603	EX 10Y	50	93.5	93.5	0.0
2603	EX 25Y	66	94.0	94.0	-0.1
2603	EX 100Y	101	97.0	96.0	-0.9
2603	ULT 10Y	50	93.5	93.5	0.0
2603	ULT 25Y	70	94.2	94.1	0.0
2603	ULT 100Y	110	97.3	96.4	-0.9
3230	EX 10Y	50	93.5	93.5	0.0
3230	EX 25Y	66	94.1	94.1	0.0
3230	EX 100Y	101	97.0	96.0	-0.9

ES-101 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
3230	ULT 10Y	50	93.5	93.5	0.0
3230	ULT 25Y	70	94.3	94.2	-0.1
3230	ULT 100Y	110	97.3	96.4	-0.9
3652	EX 10Y	50	93.5	93.5	0.0
3652	EX 25Y	66	94.1	94.1	0.0
3652	EX 100Y	101	97.0	96.1	-0.9
3652	ULT 10Y	50	93.5	93.5	0.0
3652	ULT 25Y	70	94.3	94.2	-0.1
3652	ULT 100Y	110	97.3	96.4	-0.9
4064	EX 10Y	50	93.6	93.6	0.0
4064	EX 25Y	66	94.2	94.1	0.0
4064	EX 100Y	101	97.0	96.1	-0.9
4064	ULT 10Y	50	93.6	93.6	0.0
4064	ULT 25Y	70	94.3	94.3	0.0
4064	ULT 100Y	110	97.3	96.4	-0.9

TABLE 6-24. ES-102 EXISTING & PROPOSED WATER SURFACE ELEVATION

ES-102 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
410	EX 10Y	138	90.7	90.5	-0.3
410	EX 25Y	178	92.2	91.5	-0.7
410	EX 100Y	269	95.4	93.8	-1.6
410	ULT 10Y	140	90.9	90.6	-0.3
410	ULT 25Y	180	92.3	91.6	-0.7
410	ULT 100Y	270	95.5	93.9	-1.6
956	EX 10Y	138	90.9	90.5	-0.4
956	EX 25Y	178	92.2	91.5	-0.7
956	EX 100Y	269	95.4	93.8	-1.6
956	ULT 10Y	140	91.0	90.6	-0.4
956	ULT 25Y	180	92.3	91.6	-0.8
956	ULT 100Y	270	95.5	93.9	-1.6
1522	EX 10Y	138	90.9	90.5	-0.5
1522	EX 25Y	178	92.3	91.5	-0.8
1522	EX 100Y	269	95.4	93.8	-1.7
1522	ULT 10Y	140	91.0	90.6	-0.5
1522	ULT 25Y	180	92.4	91.6	-0.8
1522	ULT 100Y	270	95.5	93.9	-1.6
1920	EX 10Y	138	91.0	90.5	-0.5
1920	EX 25Y	178	92.3	91.5	-0.8
1920	EX 100Y	269	95.4	93.8	-1.7
1920	ULT 10Y	140	91.1	90.6	-0.5
1920	ULT 25Y	180	92.4	91.6	-0.8
1920	ULT 100Y	270	95.5	93.9	-1.6
2027	SPRAGUE			Culvert	
2160	EX 10Y	138	91.2	90.8	-0.4
2160	EX 25Y	178	92.5	91.8	-0.7
2160	EX 100Y	269	95.7	94.3	-1.4
2160	ULT 10Y	140	91.3	90.9	-0.5
2160	ULT 25Y	180	92.6	91.9	-0.7
2160	ULT 100Y	270	95.8	94.4	-1.4
2666	EX 10Y	138	91.3	90.8	-0.5
2666	EX 25Y	178	92.6	91.8	-0.7
2666	EX 100Y	269	95.7	94.3	-1.4
2666	ULT 10Y	140	91.3	90.9	-0.5
2666	ULT 25Y	180	92.6	91.9	-0.7
2666	ULT 100Y	270	95.8	94.4	-1.4
3110	EX 10Y	138	91.3	90.8	-0.5
3110	EX 25Y	178	92.6	91.9	-0.7
3110	EX 100Y	269	95.7	94.3	-1.4
3110	ULT 10Y	140	91.4	90.9	-0.5
3110	ULT 25Y	180	92.7	91.9	-0.8
3110	ULT 100Y	270	95.8	94.4	-1.4
3552	EX 10Y	85	91.3	90.8	-0.5
3552	EX 25Y	109	92.6	91.9	-0.7
3552	EX 100Y	165	95.8	94.3	-1.4
3552	ULT 10Y	90	91.4	90.9	-0.5
3552	ULT 25Y	110	92.7	91.9	-0.8
3552	ULT 100Y	170	95.8	94.4	-1.4
3926	EX 10Y	85	91.3	90.8	-0.5
3926	EX 25Y	109	92.6	91.9	-0.8
3926	EX 100Y	165	95.8	94.3	-1.4
3926	ULT 10Y	90	91.4	90.9	-0.5
3926	ULT 25Y	110	92.7	91.9	-0.8
3926	ULT 100Y	170	95.8	94.5	-1.4

ES-102 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
4248	EX 10Y	85	91.4	90.8	-0.5
4248	EX 25Y	109	92.6	91.9	-0.8
4248	EX 100Y	165	95.8	94.3	-1.4
4248	ULT 10Y	90	91.5	90.9	-0.6
4248	ULT 25Y	110	92.7	91.9	-0.8
4248	ULT 100Y	170	95.8	94.5	-1.4
		ES-102-01 TRIBUTARY			
470	EX 10Y	20	91.3	90.8	-0.5
470	EX 25Y	26	92.6	91.9	-0.8
470	EX 100Y	41	95.8	94.3	-1.4
470	ULT 10Y	20	91.4	90.9	-0.5
470	ULT 25Y	30	92.7	91.9	-0.8
470	ULT 100Y	50	95.8	94.4	-1.4
899	EX 10Y	20	91.3	90.8	-0.5
899	EX 25Y	26	92.6	91.9	-0.8
899	EX 100Y	41	95.8	94.3	-1.4
899	ULT 10Y	20	91.4	90.9	-0.6
899	ULT 25Y	30	92.7	91.9	-0.8
899	ULT 100Y	50	95.8	94.4	-1.4
1035	ACCESS RD			Culvert	
1152	EX 10Y	20	92.9	90.8	-2.1
1152	EX 25Y	26	95.0	91.9	-3.1
1152	EX 100Y	41	95.8	94.4	-1.4
1152	ULT 10Y	20	93.0	90.9	-2.1
1152	ULT 25Y	30	95.1	91.9	-3.2
1152	ULT 100Y	50	95.8	94.5	-1.3
1581	EX 10Y	20	92.9	90.8	-2.1
1581	EX 25Y	26	95.0	91.9	-3.1
1581	EX 100Y	41	95.8	94.4	-1.4
1581	ULT 10Y	20	93.0	90.9	-2.1
1581	ULT 25Y	30	95.1	91.9	-3.2
1581	ULT 100Y	50	95.8	94.5	-1.3
1701	RAUL GONZALEZ			Culvert	
1904	EX 10Y	20	93.2	90.8	-2.4
1904	EX 25Y	26	95.0	91.9	-3.1
1904	EX 100Y	41	95.8	94.4	-1.4
1904	ULT 10Y	20	93.3	90.9	-2.4
1904	ULT 25Y	30	95.1	91.9	-3.2
1904	ULT 100Y	50	95.8	94.5	-1.3
2464	EX 10Y	20	93.2	90.8	-2.4
2464	EX 25Y	26	95.0	91.9	-3.1
2464	EX 100Y	41	95.8	94.4	-1.4
2464	ULT 10Y	20	93.3	90.9	-2.4
2464	ULT 25Y	30	95.1	91.9	-3.2
2464	ULT 100Y	50	95.8	94.5	-1.3
3180	EX 10Y	20	93.2	90.8	-2.4
3180	EX 25Y	26	95.0	91.9	-3.1
3180	EX 100Y	41	95.8	94.4	-1.4
3180	ULT 10Y	20	93.3	90.9	-2.4
3180	ULT 25Y	30	95.1	91.9	-3.2
3180	ULT 100Y	50	95.8	94.5	-1.3
3865	EX 10Y	20	93.2	90.8	-2.4
3865	EX 25Y	26	95.0	91.9	-3.1
3865	EX 100Y	41	95.8	94.4	-1.4
3865	ULT 10Y	20	93.3	90.9	-2.4
3865	ULT 25Y	30	95.1	91.9	-3.2
3865	ULT 100Y	50	95.8	94.5	-1.4

ES-102 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
4243	EX 10Y	20	93.2	90.8	-2.4
4243	EX 25Y	26	95.0	91.9	-3.1
4243	EX 100Y	41	95.8	94.4	-1.4
4243	ULT 10Y	20	93.3	90.9	-2.4
4243	ULT 25Y	30	95.1	91.9	-3.2
4243	ULT 100Y	50	95.8	94.5	-1.4
4635	DOOLITTE			Culvert	
4848	EX 10Y	20	93.5	90.8	-2.6
4848	EX 25Y	26	95.0	91.9	-3.1
4848	EX 100Y	41	95.8	94.4	-1.4
4848	ULT 10Y	20	93.5	90.9	-2.6
4848	ULT 25Y	30	95.1	92.0	-3.2
4848	ULT 100Y	50	95.8	94.5	-1.4
5391	EX 10Y	20	93.5	90.8	-2.6
5391	EX 25Y	26	95.0	91.9	-3.1
5391	EX 100Y	41	95.8	94.4	-1.4
5391	ULT 10Y	20	93.5	90.9	-2.6
5391	ULT 25Y	30	95.1	92.0	-3.2
5391	ULT 100Y	50	95.8	94.5	-1.4

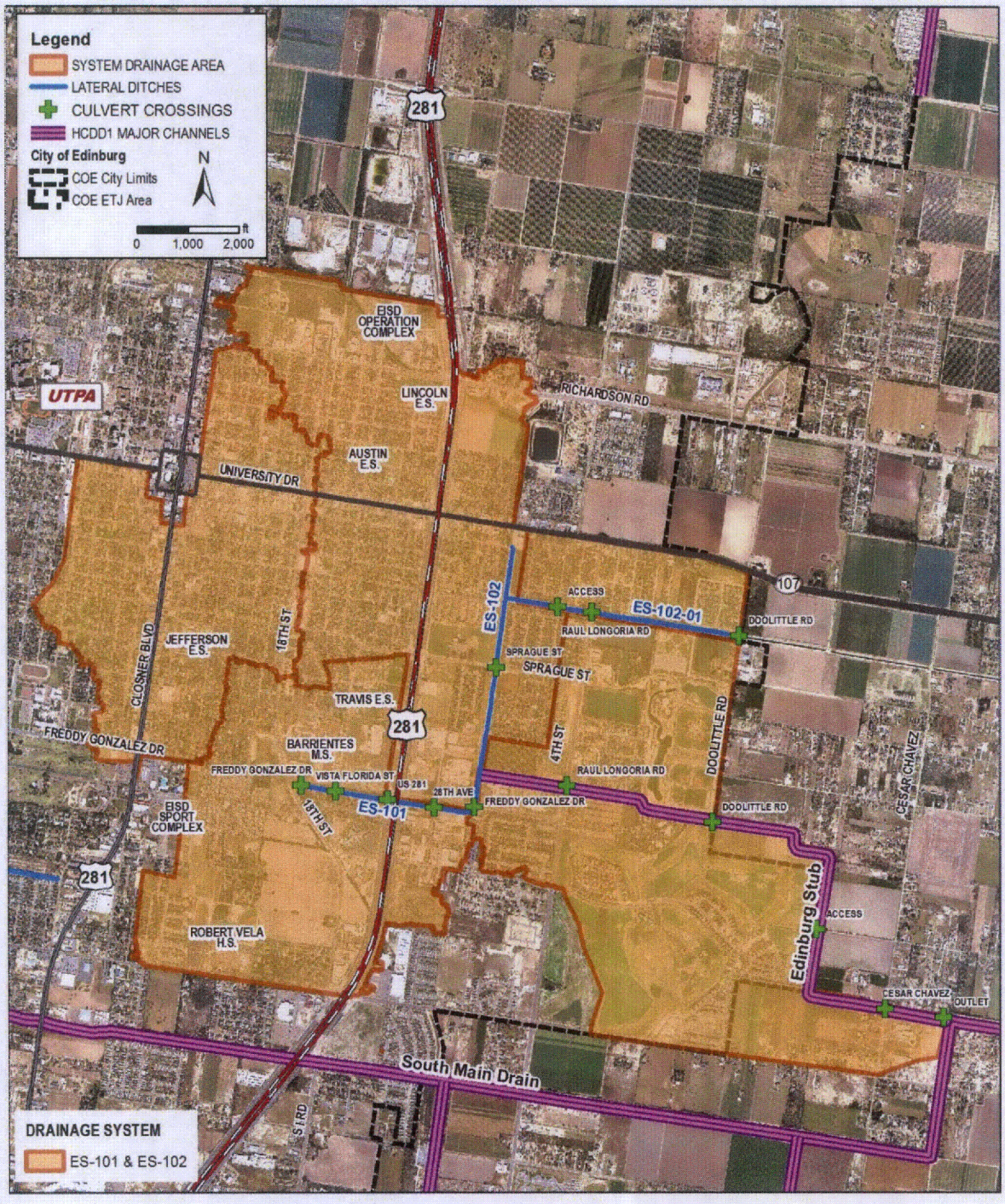


Figure 6-16. ES-101 & ES-102 Drainage Systems

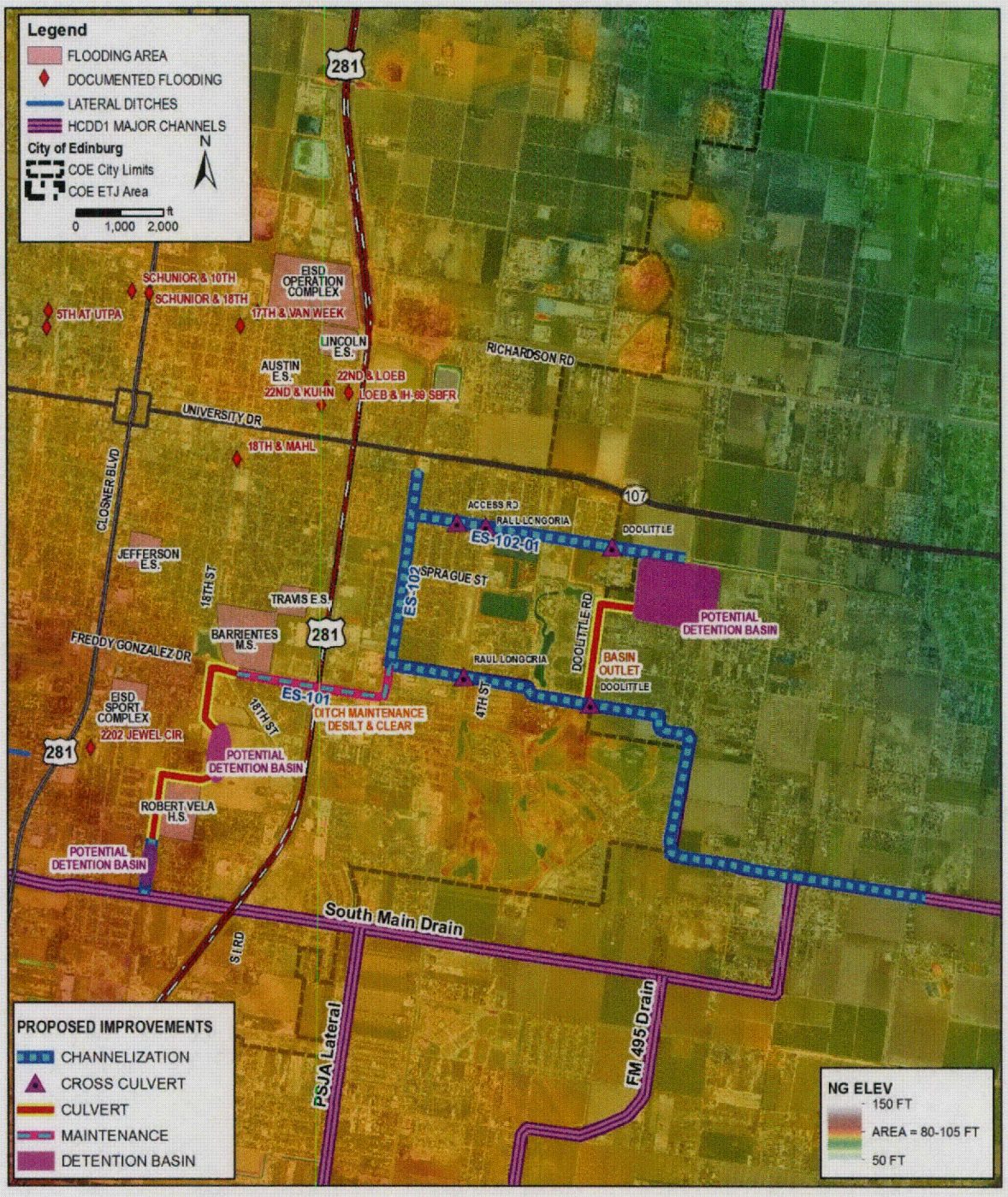


Figure 6-17. ES-101 & ES-102 Proposed System Improvements

SYSTEMS SM-101, SM-102, & SM-103

Systems SM-101, SM-102, and SM-103 represent the contributing drainage areas of a lateral ditch and storm sewer systems that outfall into South Main Drain within the southern portions of the City of Edinburg. The area is generally located east of the railroad and west of US 281 within the BS 281 (Closner Blvd.) reach of South Main Drain. See **Figure 6-18** for the drainage system areas.

The drainage system SM-101 includes storm sewer system collection areas that outfall directly into South Main Drain. The area is located south of South Main Drain, between Jackson Road and Sugar Road. The drainage system SM-102 includes the systems that are received a lateral ditch to South Main Drain. This area is located south of South Main Drain, mostly west of BS 281. The drainage system SM-103 includes the collection areas for storm sewer systems north of South Main Drain, upstream of US 281 (IH-69), specifically for the system along Closner Blvd. The area north of South Main Drain is considered to be mostly developed, consisting of commercial along Closner Blvd and dense residential areas. The area south of South Main Drain consist partially of residential areas.

The drainage system areas adjacent the South Main Drain are subjected to high water surface elevations within the channel, which influence the conveyance capability of the internal storm systems during 10-year and greater storm events. These systems included the SM-101 and SM-103 storm sewer systems and the SM-102 drainage ditch.

The hydraulic analysis of the SM-102, shows the ditch and cross-culverts have sufficient capacity for 25-year storm events. However as previously mentioned, the ditch is affected by the tailwater from South Main Drain, which results in flooding along the channel during 10-year and greater events. The existing and proposed structures for the SM-102 system are listed in **Table 6-25**. The existing water surface elevations for the SM-102 ditch are provided in **Table 6-26**.

TABLE 6-25. SM-102 SYSTEM CROSS-DRAINAGE STRUCTURE INVENTORY

DITCH STATION	CROSSING NAME	EXISTING STRUCTURE	CULVERT LENGTH	PROPOSED STRUCTURE
SM-102				
1319	WISCONSIN	48" RCP	220	--
3316	ACCESS	60" RCP	86	--

In order to provide drainage infrastructure for future development within the drainage system area, the SM-102 system is proposed to be extended south, as shown in **Figure 6-19**. The proposed ditch configuration should consist of a 10-foot bottom trapezoidal, earthen section with 3:1 (H:V) side slopes and an approximate deep of 8 feet.

The Edinburg ISD has identified a potential flooding concern for the sport complex and stadium located along Closner Blvd., south of Freddy Gonzalez Dr. Additionally, the City has provided a documented flooding location east of Closner Blvd., just south of the Edinburg ISD sport complex. Based on the topography, these areas are within a localized low-lying area. These identified locations are within the SM-103 area and are shown in **Figure 6-19**.

In order to provide protection and relief for these low-lying areas east of Closner Blvd, either a localized detention basin would be required or connection be provided to the proposed ES-101 detention basin as described in the previous section and shown in **Figure 6-19**.

TABLE 6-26. SM-102 EXISTING WATER SURFACE ELEVATION

SM-102 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
348	EX 10Y	37	91.7	91.7	0
348	EX 25Y	53	92.1	92.1	0
348	EX 100Y	85	92.7	92.7	0
348	ULT 10Y	55	92.1	92.1	0
348	ULT 25Y	73	92.5	92.5	0
348	ULT 100Y	110	93.1	93.1	0
821	EX 10Y	37	91.9	91.9	0
821	EX 25Y	53	92.3	92.3	0
821	EX 100Y	85	92.9	92.9	0
821	ULT 10Y	55	92.3	92.3	0
821	ULT 25Y	73	92.7	92.7	0
821	ULT 100Y	110	93.3	93.3	0
1152	EX 10Y	37	92.1	92.1	0
1152	EX 25Y	53	92.4	92.4	0
1152	EX 100Y	85	93.0	93.0	0
1152	ULT 10Y	55	92.5	92.5	0
1152	ULT 25Y	73	92.8	92.8	0
1152	ULT 100Y	110	93.4	93.4	0
1319	WISCONSIN			Culvert	
1440	EX 10Y	18	92.4	92.4	0
1440	EX 25Y	25	92.8	92.8	0
1440	EX 100Y	41	93.6	93.6	0
1440	ULT 10Y	27	92.9	92.9	0
1440	ULT 25Y	35	93.3	93.3	0
1440	ULT 100Y	53	94.2	94.2	0
1882	EX 10Y	18	92.5	92.5	0
1882	EX 25Y	25	92.9	92.9	0
1882	EX 100Y	41	93.7	93.7	0
1882	ULT 10Y	27	93.0	93.0	0
1882	ULT 25Y	35	93.4	93.4	0
1882	ULT 100Y	53	94.2	94.2	0

SM-102 River Station	Profile Frequency	Q Total (cfs)	Existing W.S. Elev (ft)	Proposed W.S. Elev (ft)	WS Diff (Pr-Ex) (ft)
2399	EX 10Y	18	92.5	92.5	0
2399	EX 25Y	25	92.9	92.9	0
2399	EX 100Y	41	93.7	93.7	0
2399	ULT 10Y	27	93.0	93.0	0
2399	ULT 25Y	35	93.4	93.4	0
2399	ULT 100Y	53	94.3	94.3	0
2776	EX 10Y	18	92.5	92.5	0
2776	EX 25Y	25	92.9	92.9	0
2776	EX 100Y	41	93.7	93.7	0
2776	ULT 10Y	27	93.0	93.0	0
2776	ULT 25Y	35	93.4	93.4	0
2776	ULT 100Y	53	94.3	94.3	0
3208	EX 10Y	18	92.6	92.6	0
3208	EX 25Y	25	93.0	93.0	0
3208	EX 100Y	41	93.8	93.8	0
3208	ULT 10Y	27	93.1	93.1	0
3208	ULT 25Y	35	93.5	93.5	0
3208	ULT 100Y	53	94.3	94.3	0
3316	ACCESS RD			Culvert	
3416	EX 10Y	18	92.8	92.8	0
3416	EX 25Y	25	93.2	93.2	0
3416	EX 100Y	41	94.1	94.1	0
3416	ULT 10Y	27	93.3	93.3	0
3416	ULT 25Y	35	93.7	93.7	0
3416	ULT 100Y	53	94.6	94.6	0
3753	EX 10Y	18	92.8	92.8	0
3753	EX 25Y	25	93.3	93.3	0
3753	EX 100Y	41	94.1	94.1	0
3753	ULT 10Y	27	93.4	93.4	0
3753	ULT 25Y	35	93.8	93.8	0
3753	ULT 100Y	53	94.7	94.7	0

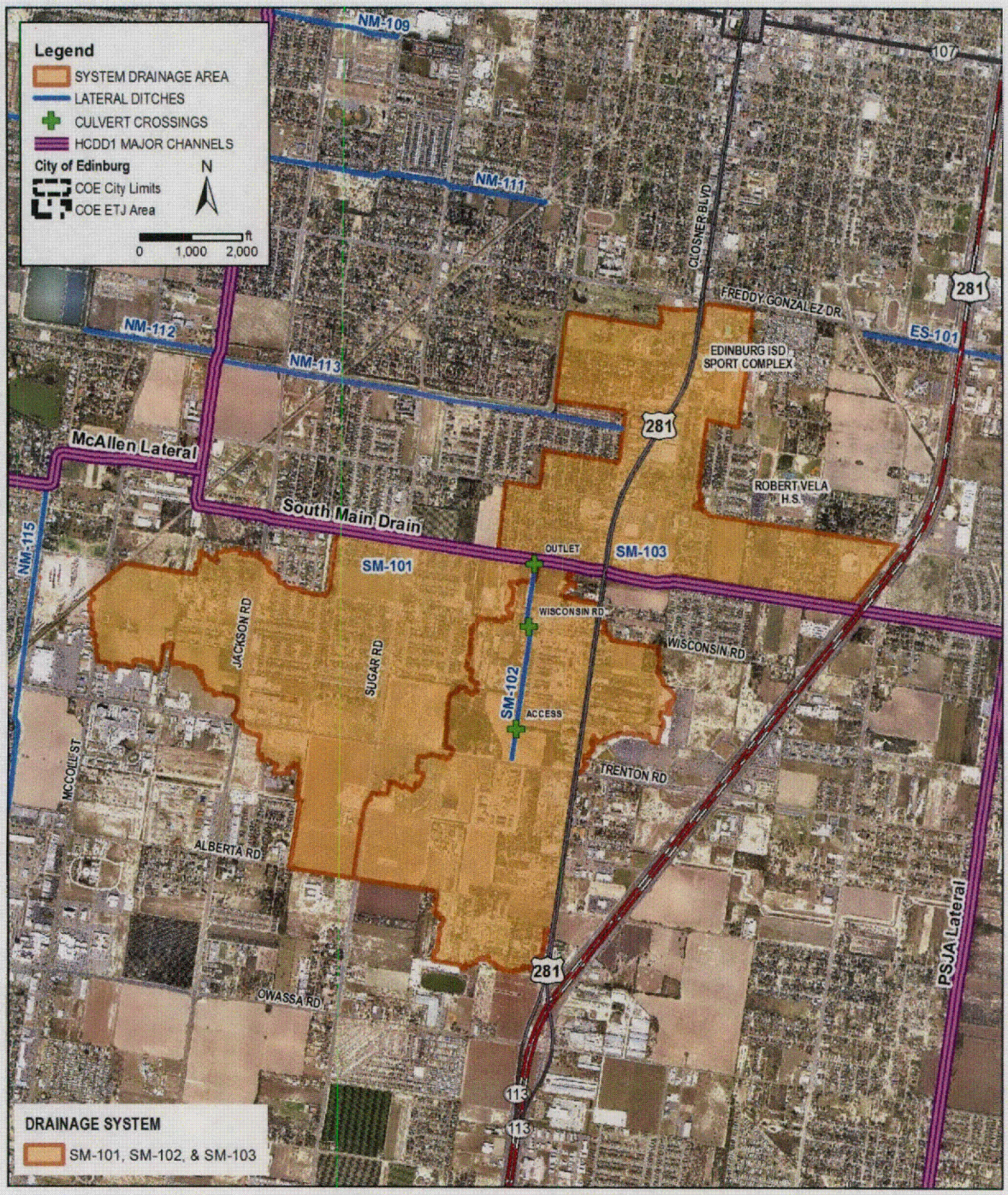


Figure 6-18. SM-101, SM-102, & SM-103 Drainage Systems

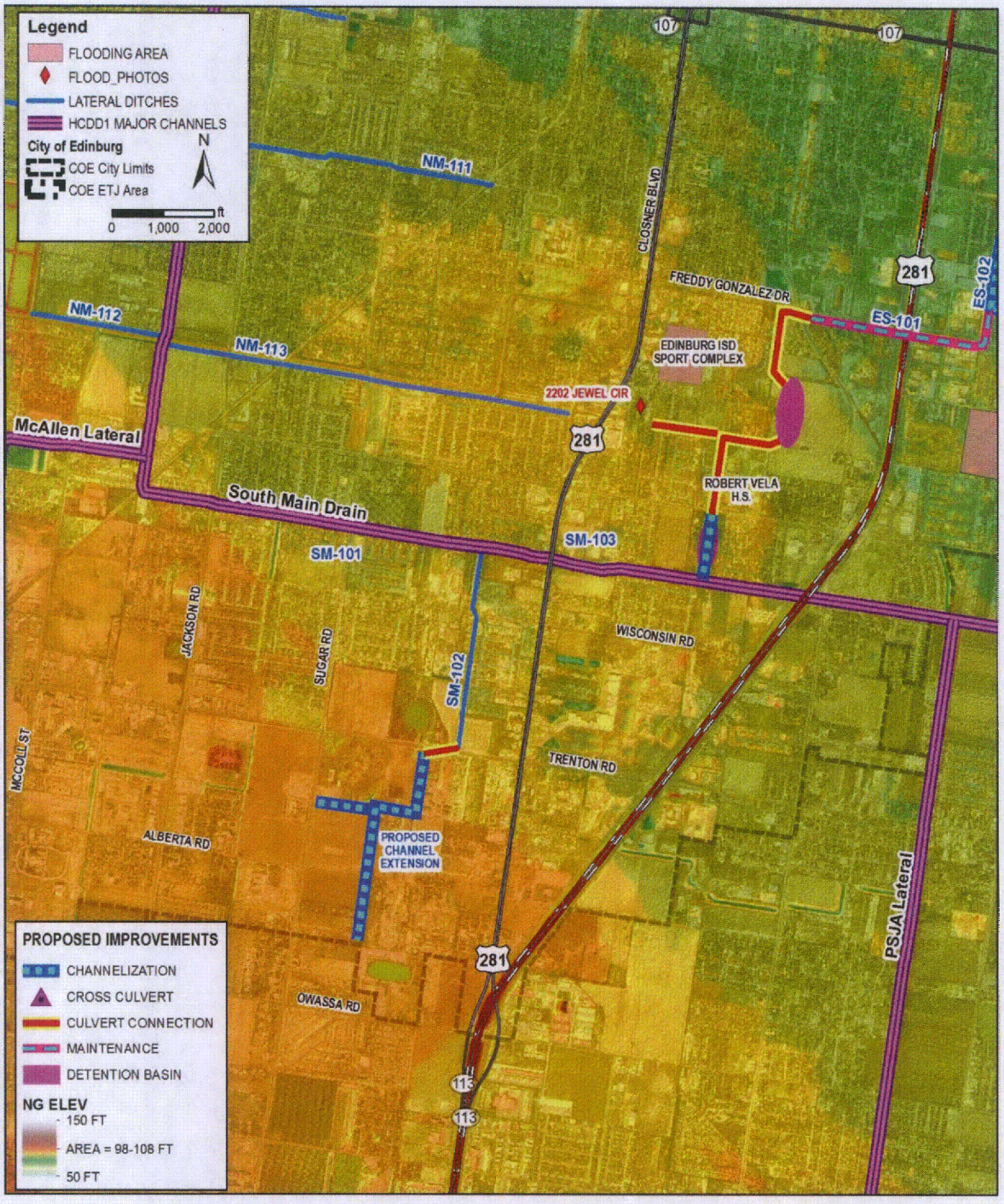


Figure 6-19. SM-101, SM-102, & SM-103 Proposed System Improvements

SYSTEM SM-104

System SM-104 represents a drainage area within the south-eastern portions of the City that drains via overland sheetflow and storm sewer to the South Main Drain. The area is generally located east of US 281 (IH-69), west of S. Raul Longoria Road, south of Los Lagos Drive, and north of South Main Drain. This area has been identified by the City through public meeting comments with having flooding issues. Based on the overland topography, the area is a natural depressed area located between US 281 and S. Raul Longoria Road. The identified location of flooding is within two subdivisions located within this depressed area. There is no outfall channel within this area or overland flow paths to provide an effective drainage outlet.

Based on the hydraulic analysis for South Main Drain, the computed 10-year water surface elevation at S. Raul Longoria Road is approximately 97.7 feet. This represents approximately 3 feet in ponding depth at the identified flooding subdivision. The South Main Drain high water surface elevation limits the conveyance of any drainage system outfalling into at this location.

The high water surface elevation within South Main Drain complicates a proposed solution to the drainage problems within the area. However, to provide positive relief to this area during frequent storm events, a drainage ditch system is recommended to convey the runoff for the existing development and adjacent future developable areas to South Main Drain. Based on the aerial photo, topography, and undeveloped areas, a proposed ditch system alignment is presented in **Figure 6-20**. This alignment is preliminary and will require land acquisition investigation prior to finalization of design alignment. The ditch configuration is based on a typical minimum ditch size of 10-foot bottom, 3:1 (H:V) side slopes, and an approximate depth of 8 feet.

An alternative proposed improvement is a detention basin that will provide outfall and runoff storage volume for the problematic areas until peak water surface elevations along the South Main Drain have receded.

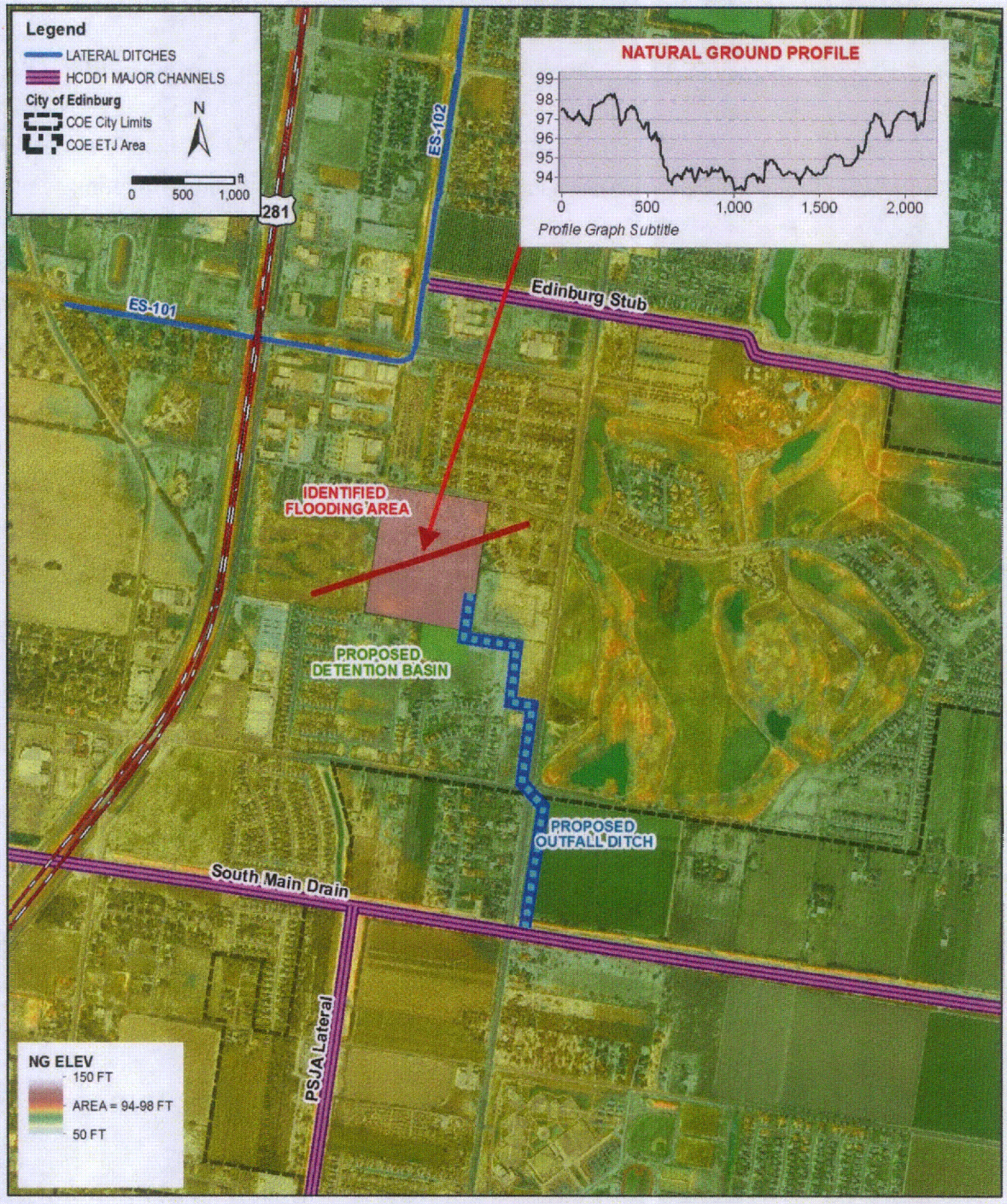


Figure 6-20. SM-104 Drainage System

SYSTEMS MC-100 & MC-101

Systems MC-100 & MC-101 represent the contributing drainage areas of a lateral ditch of Monte Cristo Drain and the contributing drainage area to the upstream end of Monte Cristo Drain within the north-east portions of the City of Edinburg. The area is generally located east of the railroad and west of US 281 within the BS 281 (Closner Blvd.) reach of South Main Drain. See **Figure 6-21** for the drainage system areas.

The lateral has been recently constructed from east of US 281 (IH-69) to its confluence into Monte Cristo Drain at Monte Cristo Road by the City of Edinburg in partnership with the U.S. Department of Housing and Urban Development as part of a Community Development Block Grant. The improvements included a new channel alignment to collect the system area runoff and convey it to the Monte Cristo Drain. The channel configuration consists of an earthen trapezoidal section, and the road cross-culverts were sized based on the channel reconstruction project. The upstream ditches to the MC-101 lateral ditch have been developed as part of a recent development located at the northeast corner of the US 281 and Monte Cristo Road intersection. The hydraulic analysis of the MC-101 system shows the ditch and cross-culverts have a greater than 25-year capacity. The existing and proposed structures for the MC-101 system are listed in **Table 6-27**.

TABLE 6-27. MC-101 SYSTEM CROSS-DRAINAGE STRUCTURE INVENTORY

DITCH STATION	CROSSING NAME	EXISTING STRUCTURE	CULVERT LENGTH	PROPOSED STRUCTURE
MC-101				
	MONTE CRISTO ST	2- 60" RCP	320	--
	DOOLITTLE RD	2- 72" RCP	2120	--
	GWIN RD	2- 60" RCP	360	--
MC-101-01				
3316	ACCESS RD	36" RCP	86	--

HCDD1 currently has proposed improvements planned for the Monte Cristo Drain (HCDD1 #J-09) main ditch system. The proposed improvements are designed for a 25-year storm event capacity. These improvements will provide increase conveyance capacity for the Monte Cristo Drain Watershed drainage systems.

The City has identified flooding concerns for the existing residential area along Doolittle Road, north of Monte Cristo Road. However the new drainage ditch along the MC-101 alignment

constructed by the City, intersects this area. This new drainage ditch should provide drainage relief to this flooding concern area.

The City has also identified flooding concerns south of Monte Cristo Road within subdivisions between Doolittle Road and M Road. Also included within this area are two Edinburg ISD campuses. In order to provide storm water relief for the existing and future development within this area, it is recommended that a drainage system be extended upstream from Monte Cristo Drain to serve this area. The system should include a combination of drainage ditch and storm trunkline to convey the runoff to Monte Cristo Drain. The proposed components are shown in **Figure 6-22**. The drainage ditch is proposed to run from Russell Road to north of Rogers Road, consisting of an earthen, trapezoidal section with 10-foot bottom width, 3:1 (H:V) side slopes, and an approximate depth of 8 feet.

The Edinburg ISD has identified flooding concerns for several campuses within the Monte Cristo Drain Watershed. The previously discussed MC-101 system construction and the proposed Monte Cristo Drain improvements will provide a higher level of flood protection for these locations. These areas are shown in **Figure 6-22**.

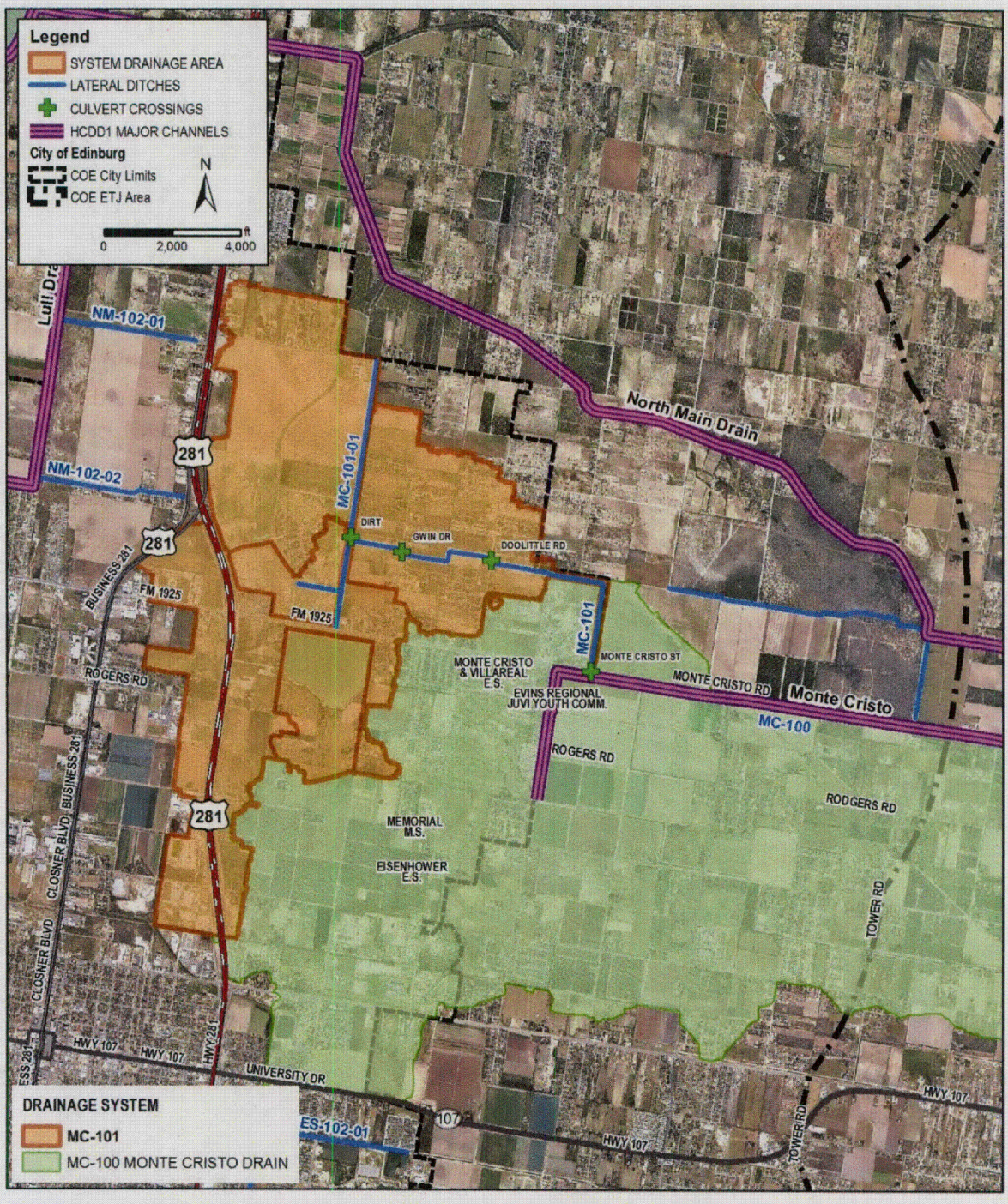


Figure 6-21. MC-100 & MC-101 Drainage Systems

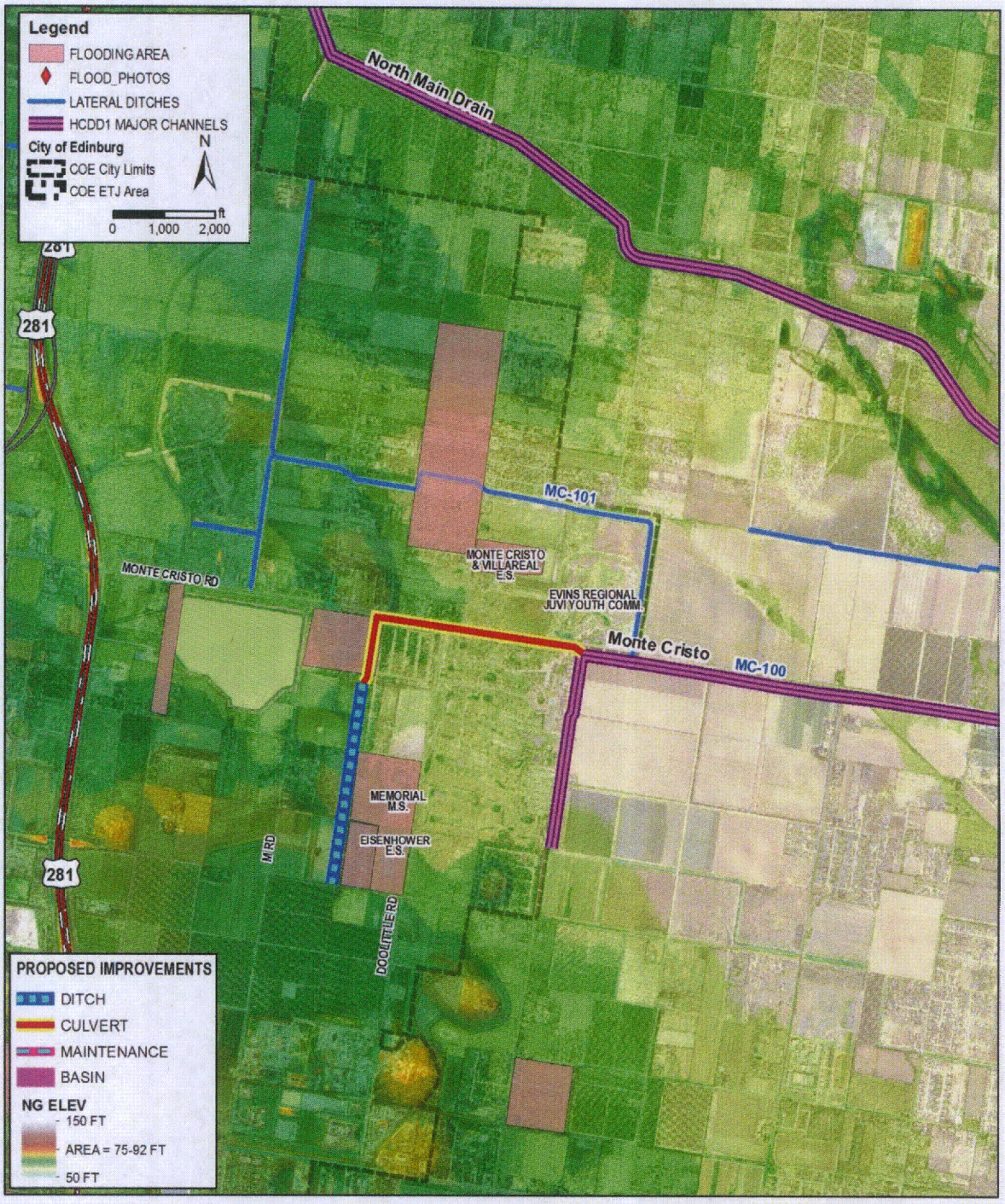


Figure 6-22. MC-100 & MC-101 Proposed System Improvements

7.0 PRIORITIZATION & COST SUMMARY

A master drainage plan presents potential projects for future implementation to reduce existing flooding and provide for future development drainage needs. To prioritize future projects and provide a plan for funding of those projects, a prioritization criteria should be adopted by the City. A set of prioritization criteria should be developed to select future drainage projects that provide a regional flood control benefit, contribute to the improvement of the community's well-being, support the development of the community, maintain the benefits of existing drainage systems, help protect natural habitat and landscapes, and provide multiple-use opportunities for flood control facilities. The prioritization criteria should generally consider basic criteria such as: historical flooding, public concerns & support, system inadequacy, downstream improvements independency, regional benefits, cost, and funding sources.

7.1 Prioritization

The master drainage plan presents a prioritization criteria for the proposed projects and provides potential plans for funding of those projects. However, a project's relative prioritization ranking can change based on a number of factors, such as lack of funding and other resources, reduction in priority, construction of adjacent projects, and lack of public support. The City should attempt to support and recommend flood control projects that, whenever possible, will provide a regional flood control benefit. In addition, the proposed projects should contribute to the improvement of the community's well-being, support the development of the community, maintain the benefits of existing drainage systems, help protect natural habitat and landscapes, and provide multiple-use opportunities for flood control facilities.

To assist in prioritizing of the potential projects, a ranking matrix was developed based on three criteria. Relative weight values are assigned for each criterion. The proposed projects were prioritized according to the recommended prioritization criteria ranking values. **Table 7-1** presents the prioritization criteria and respective relative weight values. Based on prioritization criteria, each proposed lateral system project priority weighted value was computed; these relative values are presented in **Table 7-2**.

TABLE 7-1. PROJECT PRIORITIZATION CRITERIA

CRITERION	CRITERION DESCRIPTIONS	RELATIVE WEIGHT VALUE
1	Is the system hydraulically inadequate?	2
2	Have there been any flooding complaints?	3
3	Are project benefits independent of downstream improvements?	1

TABLE 7-2. PROJECT PRIORITY WEIGHTED VALUE

LATERAL SYSTEM	PRIORITIZATION CRITERIA			PRIORITY WEIGHTED VALUE
	1	2	3	
NM-102	Y	Y	Y	6
NM-103	Y	Y	N	5
NM-104	Y	Y	Y	6
NM-105	Y	N	N	2
NM-106	N	N	N	0
NM-108	Y	Y	Y	6
NM-109	Y	Y	Y	6
NM-110	Y	N	Y	3
NM-111	N	Y	Y	4
NM-112	N	N	N	0
NM-113	Y	Y	N	5
NM-115	Y	N	N	2
NM-116	Y	N	N	2
ES-102	Y	Y	Y	6
ES-101	Y	Y	Y	6
SM-102	N	N	Y	1
SM-103	Y	Y	N	5
SM-104	Y	Y	Y	6
MC-100	Y	Y	N	5
MC-101	N	N	N	0

7.2 Proposed Project Cost Estimates

The cost for the proposed improvements for the lateral drainage systems were estimated based on unit cost rates and quantity estimations of proposed improvement elements. Probable construction costs associated with the proposed improvements were estimated based on project bid unit cost information obtained from Texas Department of Transportation Department (TxDOT). The unit costs obtained include such items as: channel and detention excavation, culvert pipes and boxes, culvert end treatments, concrete paving, and etc. The itemized unit cost is provided within **Appendix E**.

The proposed improvement elements, as presented within Section 6, were detailed and quantified to estimate proposed project cost. A summary of cost for the lateral system proposed recommended plans are presented in **Table 7-3**. The detailed estimated cost for lateral systems

proposed improvements, recommended and any optional alternative, are presented within **Appendix E**.

TABLE 7-3. LATERAL SYSTEMS COST ESTIMATE SUMMARY

LATERAL SYSTEM	RECOMMENDED ALT. COST
NM-102	$2,252,940
NM-103	$714,690
NM-104	$192,800
NM-105	$316,053
NM-106	$252,623
NM-108	$631,950
NM-109	$883,893
NM-110	$452,263
NM-111	$258,228
NM-112	$0
NM-113	$143,313
NM-115	$596,720
NM-116	$134,467
ES-102	$8,820,196
ES-101	$3,324,410
SM-102	$880,927
SM-103	$440,020
SM-104	$913,504
MC-100	$1,742,893
MC-101	$0

The unit costs do not include any cost allowance for utility relocations, additional pavement replacement beyond the alignment of the proposed system, miscellaneous cost associated with construction, seeding/sod establishment, or acquisition of additional rights-of-way; therefore a 25-percent contingency of the proposed project subtotal cost should be considered to account for the aforementioned expenditures. The master drainage plan total cost and contingency is provided in **Table 7-4**.

TABLE 7-4. LATERAL SYSTEMS COST ESTIMATE SUMMARY

SUBTOTAL	$22,951,890
25% CONTINGENCY	$5,737,972
COE MDP TOTAL	$28,689,862

7.3 Benefit-Cost Analysis

A benefit-cost analysis was performed for each individual drainage system and the entire project using FEMA Benefit-Cost Analysis (BCA) Tool (v5.0). The BCR values for the project systems ranged from 0.58 to 8.10 with a resulting overall Benefit-Cost Ratio (BCR) for the entire Master Drainage Plan project computed as 2.99. The economic benefits are defined as the expected flood loss reduction due to the flood water surface elevation reduction from the proposed drainage improvements based on 10-, 50-, 100-, and 500-year storm events. The U.S. Army Corps of Engineers' generic depth-damage curves were utilized for this analysis. Since this project is in the planning stage, representative structures were used in the model with the cost per square foot applied to the total number of structures multiplied by the average structure square footage. The BCA results for each drainage system are summarized in **Table 7-5**. A detailed BCA model report is provided in **Appendix F**.

TABLE 7-5. BENEFIT COST ANALYSIS SUMMARY

LATERAL SYSTEM	PROJECT BENEFITS	PROJECT COSTS	BCR
ES-100	$ 37,235,543	$ 12,144,606	3.07
NM-102	$ 2,587,637	$ 2,252,940	1.15
NM-103	$ 1,888,765	$ 714,690	2.64
NM-105	$ 372,305	$ 316,053	1.18
NM-106	$ 1,069,435	$ 252,623	4.23
NM-108	$ 5,103,509	$ 631,950	8.08
NM-109	$ 787,070	$ 883,893	0.89
NM-110	$ 2,962,055	$ 452,263	6.55
NM-111	$ 387,074	$ 258,228	1.50
NM-113	$ 1,160,902	$ 143,313	8.10
NM-115	$ 2,033,922	$ 596,720	3.41
NM-116	$ 538,217	$ 134,467	4.00

8.0 CONCLUSION & SUMMARY

A Master Drainage Plan (MDP) was prepared to provide the City of Edinburg a planning tool to guide and prioritize future capital expenditures for the City's drainage systems within its boundaries and ETJ. Many of the City's drainage outfall systems are in need of improvements to alleviate flooding that have historically occurred throughout the City and to meet drainage needs of future development.

The Master Drainage Plan was developed to define various projects consisting of channel improvements, hydraulic structure improvements, and detention. The master drainage plan was developed to establish conceptual designs only, and does not include sufficient details for final design or construction. A total of twenty-one (21) City drainage systems were studied with detailed modeling analyses. Detailed hydrologic and hydraulic analyses were performed to identify drainage system inadequacies and develop drainage improvement opportunities required to alleviate existing flooding problems and upgrade the existing systems to provide drainage infrastructure needs for existing and future development.

The City of Edinburg central area is located within the low-lying topgraphic area that is a natural flow path, identified as the "Edinburg Low", between the North Main Drain and South Main Drain Watersheds. The natural topography and limited grade relief complicates the planning and development of an effective and efficient drainage improvement plan. Additionally, the efficiency of the existing and proposed drainage systems is dependent on the HCDD1 Master Drainage System tailwater conditions. In order to maximize the benefit of potential improvements to the City's drainage system, coordination between the City and HCDD1 is recommended. Additionally, HCDD1 has current discharge requirements that should be considered within any improvement project. It is recommended for the City to adopt a "no-adverse impact" policy to prevent project induced flooding to adjacent properties.

8.1 Stormwater Management

It has been generally recognized by local communities for the need of a "no adverse impact" drainage policy. The no-adverse impact policy requires that the action of the property owner or community does not adversely affect the flood risks of other properties of communities. These impacts are measured as increased runoff volume, increased flow rates, increased flood stages, increased flood velocity, or increased erosion and sedimentation. With the no-adverse impact policy, the land owner is responsible for mitigating the impacts by either physical measures or as provided for in a community or regional watershed based plan. The no-adverse impact is currently adopted by many communities and agencies, such as the City of Houston, City of San Antonio, and Texas Department of Transportation. All developments inside or outside of the

floodplain require drainage impact analysis and mitigation of potential adverse hydrologic/hydraulic impacts. Mitigations measures include channel control structures, detention basins, oversize underground storm sewer systems, and modification of human occupancy of floodplain (a nonstructural measure). To minimize future flood damages within the city limits, it is recommended that the City adopt and enforce a "no adverse impact" policy through its permit procedures.

8.2 Financing Alternatives

Financing alternatives should be investigated by the City for the proposed drainage improvements. Below are potential alternative sources for funding of the proposed drainage projects, including grants or fees from external and local funding sources.

8.2.1 Federal or State Grants

The Flood Mitigation Assistance (FMA) Program is a federal grant program administered by the Texas Water Development Board (TWDB), under an Agreement with the Federal Emergency Management Agency (FEMA). This program provides federal funding to assist States and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the National Flood Insurance Program (NFIP). The FMA program was created as part of the National Flood Insurance Reform Act of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the NFIP. The FMA is a pre-disaster grant program. There are two types of work that can be funded: Planning Grants and Project Grants. The proposed drainage improvements would need to meet the specific grant standards to be eligible.

The Federal Emergency Management Agency (FEMA), through the Texas Division of Emergency Management, has provided substantial federal funding for the purchase of flooded homes through FEMA's Pre-Disaster Mitigation (PDM) program and Hazard Mitigation Grant Program (HMGP). Federal funding for home buyout usually requires local matching funds of at least 25%. It is important to note that, although some grant funds are made available only after a disaster declaration, these buyout grants do not provide immediate flood recovery assistance. These programs typically take eight to twelve months after the flood event to even get started, and then may take place over a period of many years following a flood event.

8.2.2 Local Funding Sources

The primary source of funds for any identified drainage projects is local. The following is a list of potential local funding sources.

GENERAL FUND

General fund is the primary source of funds for capital improvement projects within the City and is typically generated by tax revenues and other income to the City. A shortcoming for this type of funding is that all City departments are in need of these funds and drainage issues tend to be overlooked during dry periods due to the high cost and often long time frame to achieve a final resolution to the problem.

IMPACT FEES

Impact fee regulations are described in Chapter 395 of the local government code which authorizes cities and drainage districts, organized under to Article III, Section 52 or Article XVI, Section 59 of the Texas Constitution, to impose an impact fee to cover the cost of improvements that are necessitated by new development. The act requires that the entity have in place a Capital Improvement Plan and is relatively stringent in its application. Upon a completion of a City Drainage CIP, impact fees would be a viable method for the City within its city limits to provide funding support for potential projects.

UTILITY FEES

Local storm water projects can be funded by the assessment of a drainage utility fee for potential projects based upon the amount of impervious cover, living units or site area.

GENERAL OBLIGATION BONDS

This is a bond issued by a municipality or a drainage district which is repaid by Ad Valorem taxes collected by the issuing entity rather than by revenues generated by the project funded by the bonds. This is a proper mechanism to use in order to fund capital improvement projects and can be used to fund improvements on which some of the cost can be recaptured by the mechanisms noted above.

REVENUE BONDS

This is a bond which is retired through revenue derived from the income generated by a facility constructed by the bond proceeds. Typically, water and sewer improvements are often financed by revenue bonds and paid for by the water and sewer sales income. Since revenue bonds are not supported by Ad Valorem taxes, it does not count against the issuing entity's mandated bond limit. Since storm runoff is not metered or charged for, hence no revenue income, this is seldom used for drainage improvements, although it has been used in limited cases by utility districts.

SPECIAL ASSESSMENT BONDS

Special Assessment Bonds are used to fund development projects within a specified area and is paid for through property tax assessments or special assessments on properties located within the defined area. This is often used for special road assessments but can be used for drainage.

TAX INCREMENT BONDS

Tax Increment Bonds are bond which are paid by the increase in value of properties located within a defined district or area which results from the capital improvements constructed within the area paid for by the bonds.

TWDB LOAN FINANCING ASSISTANCE PROGRAM

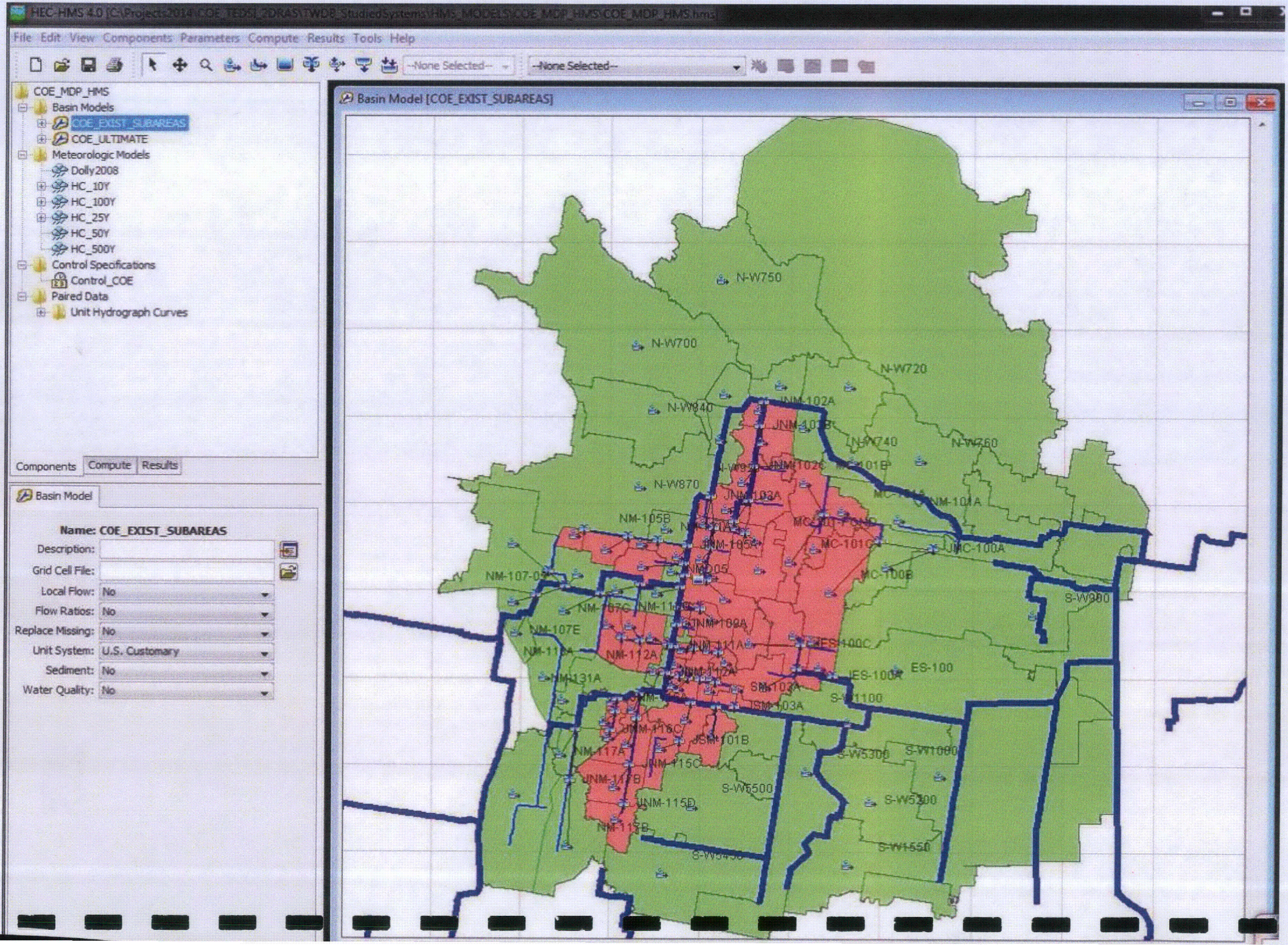
Financial assistance, in the form of low-interest rate loans administrated by TWDB through the Texas Water Development Fund, is potentially available as a funding source to the City of Edinburg for flood control improvement projects. Potential loan repayment sources may include taxes, fees, and/or bond issuances.

OTHER LOCAL FUNDS

Local funds are not limited to the City of Edinburg funds. It can also include funding from the area Drainage Districts, County, and adjoining cities where a shared benefit can be realized. Particularly, on the open drains that lie within adjacent municipalities and/or HCDD1 as well as the City, the adjacent agency may wish to partner with the City and assist in funding and/or construction of the necessary improvements.

APPENDIX A
HYDROLOGY

PARAMETERS & HEC-HMS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File Edit View Components Parameters Compute Results Tools Help
--None Selected--
--None Selected--
COE_MDP_HMS
Basin Models
COE_EXIST_SUBAREAS
COE_ULTIMATE
Meteorologic Models
Dolly2008
HC_10Y
HC_100Y
HC_25Y
HC_50Y
HC_500Y
Control Specifications
Control_COE
Paired Data
Unit Hydrograph Curves
Components
Compute
Results
Basin Model
Name: COE_EXIST_SUBAREAS
Description:
Grid Cell File:
Local Flow: No
Flow Ratios: No
Replace Missing: No
Unit System: U.S. Customary
Sediment: No
Water Quality: No
Basin Model [COE_EXIST_SUBAREAS]
N-W750
N-W700
N-W720
N-W840
N-W740
N-W760
N-W870
JNM-102A
JNM-102C
JNM-103A
JNM-105A
JNM-105B
JNM-105C
JNM-105D
JNM-106A
JNM-111A
JNM-112A
JNM-116A
JNM-116C
JNM-115C
JNM-115D
JSM-101B
JSM-103A
MC-101A
MC-101B
MC-101C
MC-100A
MC-100B
NM-101A
NM-105B
NM-107-05
NM-107C
NM-107E
NM-112A
NM-131A
NM-117A
NM-117B
ES-100
ES-100A
ES-100C
S-W300
S-W1100
S-W5300
S-W1000
S-W6500
S-W5200
S-W1550
S-W5450

CITY OF EDINBURG MDP - LATERAL SUBAREAS RUNOFF COMPUTATIONS

(COE3_MDP_HMS.HMS)

(BASIN=COE_EXIST_SUBAREAS)

		EXISTING CONDITION						ULTIMATE CONDITION					
ELEMENT	DAREA	10Y PKQ	10Y VOL	25Y PKQ	25Y VOL	100Y PKQ	100Y VOL	10Y PKQ	10Y VOL	25Y PKQ	25Y VOL	100Y PKQ	100Y VOL
ES-100	7.908	41.5	391.9	63.2	597.1	113.7	1073.3	86.8	818.5	116.9	1103.8	180.9	1707.4
ES-100A	0.6505	27.3	58.2	37.8	82.9	64.6	138	40.6	86	53	116	84.1	179.4
ES-101A	1.2641	49.7	180.9	65.5	241	100.6	366.6	49.7	180.9	65.5	241	100.6	366.6
ES-102A	1.3676	85.1	227.9	109.2	298.7	164.9	443.8	85.1	227.9	109.2	298.7	164.9	443.8
ES-102B	0.9124	36.6	162.7	47.5	212.2	70.3	312.6	36.6	162.7	47.5	212.2	70.3	312.6
ES-102-01A	0.2294	19.9	30.9	25.9	41.6	41	64.2	19.9	30.9	25.9	41.6	41	64.2
JES-100A	4.424	213.8	660.4	278.9	876.4	431.2	1325.3	226.6	688.3	293.7	909.4	450.1	1366.6
JES-100B	3.7735	186.8	602.3	241.8	793.4	367.5	1187.2	186.8	602.3	241.8	793.4	367.5	1187.2
JES-100C	2.5094	138.1	421.4	177.6	552.5	269.1	820.6	138.1	421.4	177.6	552.5	269.1	820.6
JMC-100A	5.989	106.8	469.2	152.8	676.1	259.2	1143.4	174.7	775.4	233.3	1041.9	361.3	1605.5
JMC-100B	4.0158	87.6	370.8	122.5	520.8	202.3	852.7	124.8	521.4	166.6	700.7	258.2	1079.8
JMC-100C	2.448	60.9	191.2	87	275.3	149.9	465.4	104.8	318.2	138.2	427.2	215.7	657.6
JNM-102A	0.7784	13.4	43.3	20.2	66	37	119.4	31.1	100.3	41.1	134.4	63.8	206.5
JNM-102B	4.241	134.3	328.5	185.6	476.1	320.6	810	211.4	553.5	275.9	744.6	436.1	1148.8
JNM-102C	3.2018	115.4	268.5	157.5	384.3	268.1	643.5	167.5	418	218.3	562.6	346	868.4
JNM-102D	2.4441	86.8	209.6	117.3	298.3	197.3	496.1	119.5	317.8	155.7	427.4	246.6	659.3
JNM-102E	0.5795	44.9	73.8	58.9	100.2	94.5	156.2	46.9	77	61.2	103.9	97.4	160.9
JNM-102F	0.3708	26.2	46.6	34.2	62.9	54.5	97.7	27.2	48.3	35.4	65	56	100.3
JNM-103A	1.5671	107.6	127.7	149.7	184.7	260.9	312.9	172.9	205.7	225.2	277.4	356.3	429
JNM-103B	1.285	97.4	108.8	135	156.4	234.2	263	152.4	168.7	198.6	227.6	314.3	352
JNM-103C	0.812	56.3	68.9	78.5	99.5	136.6	167.9	88.7	107.4	115.7	145	183.7	224.7
JNM-103D	0.1724	11.5	14.4	16.1	20.9	28.3	35.4	18.5	22.8	24.1	30.8	38.3	47.8
JNM-104	1.2779	15.1	134.6	20.5	182.3	31.9	283.8	15.7	139.6	21.1	188.3	32.7	291.2
JNM-104A	1.2779	15.1	134.6	20.5	182.3	31.9	283.8	15.7	139.6	21.1	188.3	32.7	291.2
JNM-105A	1.4727	41.6	89.4	60.2	135.5	110.4	242.9	85.9	191.8	111.8	257.8	176.7	397.3
JNM-105C	0.9841	18.5	50.2	28.5	79	54.4	147.5	47.7	128.1	62.5	172.1	98.1	265.1
JNM-105D	0.3072	6.3	17.7	9.4	27	17.3	49	14.2	39.9	18.7	53.6	29.2	82.6
JNM-106A	0.8088	22	63.2	31.3	91.5	54.2	155.6	37.1	106	48.9	142.6	76.6	220
JNM-107A	10.3233	174.7	713.5	250.9	1052.5	433.2	1828.2	299.6	1316.2	399	1770.7	620.6	2732.3
JNM-107B	9.668	151.8	648.1	219.7	961.4	381.9	1680.8	269.7	1230.3	359.5	1655.2	558.7	2554.1
JNM-107C	8.9464	128.3	576.8	187.6	862.3	329.3	1520.5	238.8	1136.3	318.8	1528.9	495	2359.5
JNM-107D	6.6404	109.1	421.7	158.4	635.3	279.9	1129.6	203.1	856.4	269.8	1153	420.7	1780.4
JNM-10704	4.2987	40.9	240.1	63.2	372	116	681.3	93.6	549.9	125.7	740.7	194.6	1144.3
JNM-10705	1.1121	51.1	109.2	68.7	152.4	114.2	247.3	67.2	145.3	87.4	195.5	138.3	301.6
JNM-108A	0.8234	36.9	129.2	48.6	170	75.4	254.1	39.4	130.8	51.5	172	78.9	256.5
JNM-108B	0.6832	20.2	112.9	26.4	147.8	39.2	219.1	20.2	112.9	26.4	147.8	39.2	219.1
JNM-109A	0.2075	21.4	23.7	28.2	32.2	45.2	50.6	24.2	26.6	31.4	35.8	49.3	55.1
JNM-11D	0.4879	27.5	51.1	37	70.6	61.7	112.8	37.6	65.5	48.7	87.7	76.7	134.5
JNM-110A	2.1304	62.9	169.6	89.5	246.3	156	419.5	106.1	281.3	139.6	379	219.8	585.8
JNM-110B	1.386	39.2	110.5	56.4	161.3	98.9	276	67.1	184.4	88.6	248.8	139.7	385.2
JNM-110C	0.623	17.1	56.8	24	80.5	40	133	24.8	82.2	32.9	110.7	51.4	171
JNM-111A	0.8811	120.9	134.8	155.2	177.9	235.6	267	120.9	134.8	155.2	177.9	235.6	267
JNM-111B	0.7237	89.8	112.5	114.6	148.3	174.2	222.1	89.8	112.5	114.6	148.3	174.2	222.1
JNM-111C	0.2586	42.8	42.3	54.5	55.5	82	82.4	42.8	42.3	54.5	55.5	82	82.4
JNM-112A	0	0	0	0	0	0	0	0	0	0	0	0	0
JNM-113A	0.9476	86.1	107.8	116	147	182.8	231.3	106.5	127.1	139.9	170	212	260.4
JNM-113B	0.8367	69	98.8	90.6	134.1	144.5	209.8	79.4	113.1	102.7	151.2	160	231.4
JNM-113C	0.7825	58.9	90.5	77.6	123.2	125.3	193.5	69.3	104.8	89.7	140.4	140.7	215.2
JNM-113E	0.2711	14.5	20.8	20.3	30	35.6	51	24.9	35.1	32.3	47.1	50.9	72.6
JNM-115A	3.7009	387.2	182.8	491.1	240.5	707.7	359	387.2	182.8	491.1	240.5	707.7	359
JNM-115B	3.4141	355.5	143.2	450.3	187.6	646.9	278.6	355.5	143.2	450.3	187.6	646.9	278.6
JNM-115C	2.332	280.2	98.2	355.1	128.7	508.6	191	280.2	98.2	355.1	128.7	508.6	191
JNM-115D	0.9664	148.7	40.8	188.9	53.5	268	79.4	148.7	40.8	188.9	53.5	268	79.4
JNM-116A	0.4523	70.6	13.5	92.7	18.3	136.8	28.5	80.4	15.5	104	20.7	149.9	31.6
JNM-116B	0.307	59.1	10.8	76	14.4	108.9	21.8	59.1	10.8	76	14.4	108.9	21.8
JNM-116C	0.0857	13.1	3.3	16.8	4.3	23.9	6.5	13.1	3.3	16.8	4.3	23.9	6.5
JNM-117A	3.6947	99.1	149.4	128.6	195.3	186.8	288.9	99.1	149.4	128.6	195.3	186.8	288.9
JNM-117B	3.1639	68.1	128.1	86.3	167.3	130.3	247.2	68.1	128.1	86.3	167.3	130.3	247.2
JNM105B	1.1605	25.4	61.1	38.3	95.4	72.8	176.7	62.3	150.8	81.2	202.6	128	312.2
JSM-101A	1.9516	74.5	45.1	104	63.3	168.3	103.6	113.3	63.1	149	84.8	222.7	130.7
JSM-101B	0.8689	14.5	22.1	19.4	30.5	31.9	48.9	18.3	27.7	23.8	37.3	37.6	57.4
JSM-102A	0.8451	37.4	19	52.5	26.8	84.5	44.3	55.3	27.6	73.3	37.1	110.1	57.2
JSM-103A	0.4777	35.5	18	46.3	24	68.8	36.5	35.5	18	46.3	24	68.8	36.5
MC-100A	1.9732	19.5	98.4	30.7	155.3	57.6	290.7	50.3	254	67.3	341.2	104	525.7
MC-100B	3.1012	64.4	297.1	89.5	414.6	145.9	673.3	87	401.5	116.4	539.3	180	830.9
MC-101A	0.9146	23.8	73.7	33.8	106.2	57.8	179.4	38.8	120	51.4	161.4	80.3	248.9
MC-101B	1.0747	16.6	46.5	26.8	76.3	53.1	148.5	50.4	140.1	66.3	188.2	103.7	289.9
MC-101C	1.3733	44.3	144.7	60.2	199	96.9	316.9	54.6	178.2	72.4	239	112.4	367.7
MC-101-POND	0.3501	69.4	59.5	89.1	77.8	130.6	115.1	69.4	59.5	89.1	77.8	130.6	115.1
MC-102A	1.6271	49.2	204.4	70	292.9	115.4	479.9	60.2	250.4	82.3	344.5	129.6	539.3
NMD05	0.2633	14.1	23	19.3	32.6	33.1	54.1	21.2	34.3	27.6	46.1	43.6	71.2
NMD13	0.1736	6.2	15	8.6	21.3	14.6	35.2	9.4	22.5	12.3	30.2	19.3	46.6
NM-101A	2.007	12	81.6	19.7	134.1	38.4	261	36.1	246.2	48.4	330.7	74.7	509.5
NM-102A	0.7784	13.4	43.3	20.2	66	37	119.4	31.1	100.3	41.1	134.4	63.8	206.5
NM-102B	1.0392	19.9	60	30.1	91.8	55.3	166.4	45.2	135.5	59.6	182	93.2	280.4
NM-102C	0.409	10.7	25.5	15.7	38.4	28.7	68.3	22.6	53.2	29.5	71.4	46.4	110
NM-102D	0.7084	29.2	56.1	40.5	80.8	70.6	136.3	48.2	92	62.5	123.6	98.9	190.4
NM-102E	0.2087	18.7	27.2	24.8	37.2	40.1	58.6	19.8	28.6	26	38.9	41.5	60.6
NM-102F	0.3708	26.2	46.6	34.2	62.9	54.5	97.7	27.2	48.3	35.4	65	56	100.3
NM-102-01	0.3487	18.1	33.3	24.9	47.6	42.8	79.1	25.6	47.1	33.5	63.8	53.6	99.1
NM-102-02	1.1562	15.7	79.7	23	117.4	40.1	203.6	29.3	148.8	39.2	199.9	60.6	307.9
NM-103A	0.2821	10.6	18.8	15.3	28.2	28.1	49.8	21	37	27.4	49.8	43.4	77
NM-103B	0.473	41.2	39.9	56.8	57	97.7	95.2	64.1	61.4	83.5	82.5	131.1	127.3
NM-103C	0.6396	44.8	54.5	62.3	78.6	108.3	132.4	70.3	84.6	91.6	114.2	145.4	176.9
NM-103D	0.1724	11.5	14.4	16.1	20.9	28.3	35.4	18.5	22.8	24.1	30.8	38.3	47.8
NM-104A	1.2779	15.1	134.6	20.5	182.3	31.9	283.8	15.7	139.6	21.1	188.3	32.7	291.2
NM-104_POND	1.2779	15.1	134.6	20.5	182.3	31.9	283.8	15.7	139.6	21.1	188.3	32.7	291.2
NM-105A	0.3122	16.3	28.3	22.3	40.1	38.1	66.3	23.8	40.9	30.9	55.1	49	85.1
NM-105B	0.1764	7.6	10.9	11.1	16.4	20.4	29.2	16.2	22.7	21	30.5	33.2	47
NM-105C	0.6769	12.3	32.5	19.2	52	37.1	98.5	33.5	88.2	44	118.5	69	182.6
NM-105D	0.3072	6.3	17.7	9.4	27	17.3	49	14.2	39.9	18.7	53.6	29.2	82.6

CITY OF EDINBURG MDP - LATERAL SUBAREAS RUNOFF COMPUTATIONS

(COE3_MDP_HMS.HMS)

(BASIN=COE_EXIST_SUBAREAS)

		EXISTING CONDITION						ULTIMATE CONDITION					
ELEMENT	DAREA	10Y PKQ	10Y VOL	25Y PKQ	25Y VOL	100Y PKQ	100Y VOL	10Y PKQ	10Y VOL	25Y PKQ	25Y VOL	100Y PKQ	100Y VOL
NM-106A	0.8088	22	63.2	31.3	91.5	54.2	155.6	37.1	106	48.9	142.6	76.6	220
NM-107A	0.6553	23.1	65.4	31.6	91.1	52	147.4	30.4	85.9	40.1	115.5	62.9	178.2
NM-107B	0.7216	23.5	71.3	32.2	99.2	52.7	160.3	31	94	41	126.3	64	194.6
NM-107C	2.306	22	155.2	32.2	227	55.5	390.8	39.7	279.8	53.3	375.9	82.2	579.2
NM-107D	1.2296	23.7	72.4	35.8	110.9	65.8	201	53.1	161.2	70.1	216.8	109.7	334.5
NM-107E	0.5503	32.1	58.6	42.7	80.8	70.3	129.1	39.4	71.8	51.2	96.5	81.1	148.9
NM-107-04	4.2987	40.9	240.1	63.2	372	116	681.3	93.6	549.9	125.7	740.7	194.6	1144.3
NM-107-05	0.5618	19.4	50.6	26.7	71.6	45.1	118.2	28.3	73.6	37.1	99	58.4	152.7
NM-108A	0.1402	25.3	16.3	33.9	22.3	52.5	35	27.9	18	37	24.2	56.2	37.4
NM-108B	0.6832	20.2	112.9	26.4	147.8	39.2	219.1	20.2	112.9	26.4	147.8	39.2	219.1
NM-109A	0.2075	21.4	23.7	28.2	32.2	45.2	50.6	24.2	26.6	31.4	35.8	49.3	55.1
NM-110A	0.7444	23.7	59.1	33.2	85.1	57.3	143.5	38.9	96.9	51	130.2	80.2	200.6
NM-110B	0.763	22.3	53.7	32.7	80.8	59.4	142.9	42.8	102.2	56.3	138.2	89.2	214.2
NM-110C	0.623	17.1	56.8	24	80.5	40	133	24.8	82.2	32.9	110.7	51.4	171
NM-111A	0.1574	32.8	22.2	42.9	29.6	64	44.9	32.8	22.2	42.9	29.6	64	44.9
NM-111B	0.4651	48.2	70.2	61.7	92.8	94.8	139.7	48.2	70.2	61.7	92.8	94.8	139.7
NM-111C	0.2586	42.8	42.3	54.5	55.5	82	82.4	42.8	42.3	54.5	55.5	82	82.4
NM-112A	0.0735	8.1	7.1	11.1	9.9	17.9	15.9	10.8	9.4	14.3	12.6	21.9	19.4
NM-113A	0.1109	19.3	9.1	27.4	12.9	44.9	21.5	30.2	14	40.1	18.8	60.4	28.9
NM-113B	0.0542	13.3	8.2	17.4	10.9	25.4	16.3	13.3	8.2	17.4	10.9	25.4	16.3
NM-113C	0.2946	32	39.4	41.3	52.7	64.8	80.7	32	39.4	41.3	52.7	64.8	80.7
NM-113D	0.2168	13.3	30.4	17.2	40.6	26.9	61.9	13.3	30.4	17.2	40.6	26.9	61.9
NM-113E	0.2711	14.5	20.8	20.3	30	35.6	51	24.9	35.1	32.3	47.1	50.9	72.6
NM-115A	0.2868	37.4	39.6	48.3	52.8	74.8	80.5	37.4	39.6	48.3	52.8	74.8	80.5
NM-115B	1.0821	77.7	45	100.2	58.9	145.2	87.6	77.7	45	100.2	58.9	145.2	87.6
NM-115C	1.3656	134.6	57.5	171.6	75.2	246.9	111.6	134.6	57.5	171.6	75.2	246.9	111.6
NM-115D	0.9664	148.7	40.8	188.9	53.5	268	79.4	148.7	40.8	188.9	53.5	268	79.4
NM-116A	0.1453	11.7	2.6	16.9	3.9	28.3	6.7	21.4	4.7	28	6.3	41	9.8
NM-116B	0.2213	45.9	7.6	59.2	10.1	85	15.3	45.9	7.6	59.2	10.1	85	15.3
NM-116C	0.0857	13.1	3.3	16.8	4.3	23.9	6.5	13.1	3.3	16.8	4.3	23.9	6.5
NM-117A	0.5308	52.4	21.3	66.6	28	96.3	41.8	52.4	21.3	66.6	28	96.3	41.8
NM-117B	3.1639	68.1	128.1	86.3	167.3	130.3	247.2	68.1	128.1	86.3	167.3	130.3	247.2
NM-118A	1.6544	24.1	26.9	34.7	40.1	63.3	70.8	49.3	53.9	64.2	72.4	100.6	111.6
NM-119A	5.4297	104.6	184.7	134.8	246.1	210.3	374.4	104.6	184.7	134.8	246.1	210.3	374.4
NM-121A	0.7407	19.3	15.8	27	22.5	45.4	37.6	30.2	24.3	39.8	32.6	61.2	50.3
NM-131A	0.4263	33.1	15.6	42.7	20.6	62.8	31.2	33.1	15.6	42.7	20.6	62.8	31.2
N-W700	13.106	19.4	19.1	31.2	31.9	64.7	63	63.8	61	82.9	82	130	126.3
N-W710	1.1785	19.9	56.2	27.6	79.6	46.4	131.7	30.1	84.9	39.6	113.9	61.8	175.3
N-W720	2.9667	5	3.2	7.5	4.9	13.4	8.6	10.8	6.7	14.3	9	21.7	13.9
N-W730	0.8881	15.8	37.4	21.6	52.5	36.2	86.2	22.6	53.2	29.5	71.4	46.4	110
N-W740	1.5788	23.1	66.3	32.5	94.8	55.4	159.1	36.9	105.4	48.6	141.6	76	218.2
N-W750	10.1256	13.3	32.1	21.3	52.7	42.6	102.6	41.4	98.8	54	132.5	84.8	203.9
N-W760	4.8465	13.4	16.8	19.7	25.7	37.2	46.6	30.8	38	40	51	63	78.6
N-W770	1.0354	19.8	47.6	24.5	60.2	35	84.5	19.8	47.6	24.5	60.2	35	84.5
N-W840	4.0456	53.9	378.8	75.8	533.8	118.5	833.7	65	457.2	87	612.9	129.8	913.4
N-W870	9.0712	11.8	5.7	18.9	9	35.2	16.8	30.5	14.1	40.7	19.1	61.5	29.4
N-W920	1.1895	31.1	156.9	44.6	226.1	75.7	382.1	50.6	255.4	67.8	343.6	104.9	530.1
SM-101A	1.0827	63.8	23	89.7	32.8	146	54.8	99.8	35.3	131	47.5	195.7	73.3
SM-101B	0.8689	14.5	22.1	19.4	30.5	31.9	48.9	18.3	27.7	23.8	37.3	37.6	57.4
SM-102A	0.8451	37.4	19	52.5	26.8	84.5	44.3	55.3	27.6	73.3	37.1	110.1	57.2
SM-103A	0.4777	35.5	18	46.3	24	68.8	36.5	35.5	18	46.3	24	68.8	36.5
S-W1000	2.896	8.9	20.3	15.5	36	32.6	74.8	34.6	78.9	45.5	106	71.2	163.3
S-W1100	1.413	8	11.7	13.5	20.7	29.5	43	31.4	45.4	40.8	61	64.3	94
S-W1550	1.844	8.3	14.8	14.2	26.1	30.8	54.3	32.9	57.3	42.7	77	67.5	118.6
S-W5200	1.491	8.1	12.3	13.6	21.8	29.8	45.2	31.8	47.7	41.2	64.1	65.1	98.7
S-W5300	0.344	5.3	2.9	9.7	5.1	20	10.5	22.5	11.1	29.6	14.9	44.4	23
S-W5450	1.406	8	11.6	13.4	20.6	29.4	42.8	31.4	45.2	40.7	60.7	64.3	93.5
S-W5500	2.345	8.6	17.7	14.9	31.4	31.8	65.3	33.9	68.9	44.2	92.6	69.7	142.7
S-W900	1.88	8.4	15	14.3	26.6	31	55.2	33	58.2	42.8	78.2	67.8	120.5

WATERSHED & HYDROLOGIC PARAMETERS

Name	WSHED	ACRE (AC)	AREA (S.MI)	SystemName	CN_EXIST	IMPER_EXST	CN_BASE	IMPER_ULT	LFP_SLOPE	LPF_SL_PCT	LFP_LENGTH
N-NM-101-A	NM	1284	2.0070	N-NM-101	60	4	34	40	0.00074	0.074	17330
N-NM-102-F	NM	237	0.3708	N-NM-102	78	38	43	40	0.00064	0.064	4069
N-NM-102-E	NM	134	0.2087	N-NM-102	73	37	37	40	0.00163	0.163	4311
N-NM-102-B	NM	665	1.0392	N-NM-102	64	10	36	40	0.00056	0.056	5028
N-NM-102-A	NM	498	0.7784	N-NM-102	65	10	36	40	0.00056	0.056	5765
N-NM-102-C	NM	262	0.4090	N-NM-102	65	12	36	40	0.00131	0.131	6251
N-NM-102-D	NM	453	0.7084	N-NM-102	74	19	46	40	0.00186	0.186	7698
N-NM-102-01	NM	223	0.3487	N-NM-102-01	69	23	36	40	0.00186	0.186	6088
N-NM-102-02	NM	740	1.1562	N-NM-102-02	67	15	38	40	0.00025	0.025	7064
N-NM-103-D	NM	110	0.1724	N-NM-103	70	19	39	40	0.00323	0.323	4597
N-NM-103-B	NM	303	0.4730	N-NM-103	71	21	40	40	0.00341	0.341	4933
N-NM-103-C	NM	409	0.6396	N-NM-103	72	20	41	40	0.00259	0.259	5003
N-NM-103-A	NM	181	0.2821	N-NM-103	68	13	37	40	0.00195	0.195	5641
N-NM-104	NM	818	1.2779	N-NM-104	75	38	38	40	0.00010	0.010	13701
N-NM-105-B	NM	113	0.1764	N-NM-105	66	12	36	40	0.00250	0.250	4296
N-NM-105-D	NM	197	0.3072	N-NM-105	67	10	37	40	0.00064	0.064	5573
N-NM-105-A	NM	200	0.3122	N-NM-105	69	23	36	40	0.00199	0.199	5700
N-NM-105-C	NM	433	0.6769	N-NM-105	65	6	36	40	0.00093	0.093	5924
N-NM-106-A	NM	518	0.8088	N-NM-106	69	18	37	40	0.00074	0.074	6595
N-NM-107-D	NM	787	1.2296	N-NM-107	66	10	37	40	0.00100	0.100	7870
N-NM-107-A	NM	419	0.6553	N-NM-107	71	27	36	40	0.00100	0.100	8380
N-NM-107-B	NM	462	0.7216	N-NM-107	71	27	36	40	0.00100	0.100	9240
N-NM-107-05	NM	360	0.5618	N-NM-107	70	23	38	40	0.00100	0.100	7200
N-NM-107-E	NM	352	0.5503	N-NM-107	71	30	38	40	0.00208	0.208	6887
N-NM-107-C	NM	1476	2.3060	N-NM-107	67	16	37	40	0.00053	0.053	18705
N-NM-107-04	NM	2751	4.2987	N-NM-107-04	64	9	37	40	0.00118	0.118	20917
N-NM-108-A	NM	90	0.1402	N-NM-108	74	35	36	40	0.00491	0.491	3323
N-NM-108-B	NM	437	0.6832	N-NM-108	80	56	36	56	0.00013	0.013	8571
N-NM-109-A	NM	133	0.2075	N-NM-109	72	34	36	40	0.00253	0.253	3440
N-NM-110-B	NM	488	0.7630	N-NM-110	66	13	38	40	0.00085	0.085	5005
N-NM-110-C	NM	399	0.6230	N-NM-110	69	23	37	40	0.00042	0.042	5720
N-NM-110-A	NM	476	0.7444	N-NM-110	67	19	41	40	0.00115	0.115	6653
N-NM-111-A	NM	101	0.1574	N-NM-111	77	46	36	46	0.00442	0.442	3491
N-NM-111-C	NM	166	0.2586	N-NM-111	80	55	36	55	0.00294	0.294	4226
N-NM-111-B	NM	298	0.4651	N-NM-111	78	49	36	49	0.00119	0.119	4337
N-NM-112-A	NM	47	0.0735	N-NM-112	70	27	36	40	0.00427	0.427	2807
N-NM-113-B	NM	35	0.0542	N-NM-113	80	52	36	52	0.00209	0.209	1277
N-NM-113-A	NM	71	0.1109	N-NM-113	70	21	37	40	0.00653	0.653	2383
N-NM-113-D	NM	139	0.2168	N-NM-113	76	44	36	44	0.00027	0.027	3255
N-NM-113-E	NM	173	0.2711	N-NM-113	68	18	36	40	0.00237	0.237	4426
N-NM-113-C	NM	189	0.2946	N-NM-113	77	42	37	42	0.00241	0.241	4859
N-NM-115-A	NM	184	0.2868	N-NM-115	76	44	36	44	0.00323	0.323	5169
N-NM-115-D	NM	618	0.9664	N-NM-115	81	56	38	56	0.00332	0.332	7047
N-NM-115-C	NM	874	1.3656	N-NM-115	81	56	38	56	0.00239	0.239	9661
N-NM-115-B	NM	693	1.0821	N-NM-115	80	55	36	55	0.00208	0.208	10916
N-NM-116-C	NM	55	0.0857	N-NM-116	79	51	36	51	0.00154	0.154	1537
N-NM-116-A	NM	93	0.1453	N-NM-116	66	16	36	40	0.00538	0.538	3072
N-NM-116-B	NM	142	0.2213	N-NM-116	77	44	37	44	0.00566	0.566	3148
N-NM-117-A	NM	340	0.5308	N-NM-117	80	53	36	53	0.00271	0.271	7483
N-NM-117-B	NM	2025	3.1639	N-NM-117	82	58	36	58	0.00016	0.016	15173
N-NM-118-A	NM	1059	1.6544	N-NM-118	66	13	37	40	0.00100	0.100	10590
N-NM-119-A	NM	3475	5.4297	N-NM-119	77	45	37	45	0.00100	0.100	34750
N-NM-121-A	NM	474	0.7407	N-NM-121	68	21	36	40	0.00100	0.100	6884
N-NM-131-A	NM	273	0.4263	N-NM-131	76	47	36	47	0.00123	0.123	4240
S-ES-100	SM	5061	7.9080	S-ES-100	67	11	39	40	0.00100	0.100	50610
S-ES-100-A	SM	416	0.6505	S-ES-100	71	22	37	40	0.00055	0.055	3776
S-ES-101-A	SM	809	1.2641	S-ES-101	77	45	36	45	0.00066	0.066	11460
S-ES-102-B	NM	584	0.9124	S-ES-102	82	60	40	60	0.00016	0.016	7583

PRF & LAGTIME CALCS

PRF	PRF1	Lag (min)	Lag(hr)
76.3	150	1188.5	19.8
43.1	150	246.2	4.1
84.5	150	186.8	3.1
50.2	150	458.4	7.6
46.5	150	498.3	8.3
83.1	150	347.6	5.8
130.9	150	270.3	4.5
108.6	150	257.1	4.3
25.4	150	832.8	13.9
146.8	150	151.7	2.5
200.9	201	152.0	2.5
170.6	171	171.6	2.9
107.1	150	242.6	4.0
11.6	150	1796.9	29.9
117.8	150	181.6	3.0
41.0	150	430.6	7.2
112.0	150	235.8	3.9
70.2	150	395.2	6.6
60.1	150	434.5	7.2
87.5	150	466.0	7.8
74.2	150	428.9	7.1
76.1	150	463.7	7.7
71.2	150	390.3	6.5
135.2	150	254.2	4.2
59.0	150	1246.5	20.8
140.8	150	987.7	16.5
201.2	201	85.0	1.4
12.4	150	932.5	15.5
124.3	150	128.7	2.1
68.9	150	351.9	5.9
34.1	150	514.6	8.6
86.8	150	370.1	6.2
189.1	189	85.4	1.4
150.4	150	111.4	1.9
79.0	150	190.0	3.2
150.1	150	88.9	1.5
73.8	150	50.7	0.8
243.3	243	63.1	1.1
17.5	150	336.5	5.6
125.9	150	181.2	3.0
130.6	150	150.7	2.5
167.9	168	140.8	2.3
236.7	237	152.9	2.5
194.0	194	231.9	3.9
161.5	161	282.9	4.7
63.6	150	70.7	1.2
220.2	220	94.7	1.6
257.2	257	69.5	1.2
169.1	169	183.2	3.1
22.3	150	1245.3	20.8
94.6	150	591.0	9.8
129.3	150	1128.7	18.8
76.6	150	397.2	6.6
79.5	150	194.8	3.2
142.8	150	2012.1	33.5
43.7	150	305.6	5.1
61.1	150	572.0	9.5
16.1	150	715.0	11.9

HMS INPUT

SUBBASIN	PRF	LAG
NM-101-A	150	19.81
NM-102-F	150	4.10
NM-102-E	150	3.11
NM-102-B	150	7.64
NM-102-A	150	8.31
NM-102-C	150	5.79
NM-102-D	150	4.51
NM-102-01	150	4.28
NM-102-02	150	13.88
NM-103-D	150	2.53
NM-103-B	201	2.53
NM-103-C	171	2.86
NM-103-A	150	4.04
NM-104	150	29.95
NM-105-B	150	3.03
NM-105-D	150	7.18
NM-105-A	150	3.93
NM-105-C	150	6.59
NM-106-A	150	7.24
NM-107-D	150	7.77
NM-107-A	150	7.15
NM-107-B	150	7.73
NM-107-05	150	6.50
NM-107-E	150	4.24
NM-107-C	150	20.77
NM-107-04	150	16.46
NM-108-A	201	1.42
NM-108-B	150	15.54
NM-109-A	150	2.14
NM-110-B	150	5.87
NM-110-C	150	8.58
NM-110-A	150	6.17
NM-111-A	189	1.42
NM-111-C	150	1.86
NM-111-B	150	3.17
NM-112-A	150	1.48
NM-113-B	150	0.85
NM-113-A	243	1.05
NM-113-D	150	5.61
NM-113-E	150	3.02
NM-113-C	150	2.51
NM-115-A	168	2.35
NM-115-D	237	2.55
NM-115-C	194	3.87
NM-115-B	161	4.71
NM-116-C	150	1.18
NM-116-A	220	1.58
NM-116-B	257	1.16
NM-117-A	169	3.05
NM-117-B	150	20.76
NM-118-A	150	9.85
NM-119-A	150	18.81
NM-121-A	150	6.62
NM-131-A	150	3.25
ES-100	150	33.53
ES-100-A	150	5.09
ES-101-A	150	9.53
ES-102-B	150	11.92

WATERSHED & HYDROLOGIC PARAMETERS

Name	WSHED	ACRE (AC)	AREA (S.MI)	SystemName	CN_EXIST	IMPER_EXST	CN_BASE	IMPER_ULT	LFP_SLOPE	LPF_SL_PCT	LFP_LENGTH
S-ES-102-A	SM	875	1.3676	S-ES-102	80	55	37	55	0.00117	0.117	11863
S-ES-102-01-A	SM	147	0.2294	S-ES-102-01	75	41	36	41	0.00166	0.166	5285
MCD	MC	2844	9.6550	S-MC-100	66	12	37	40	0.00100	0.100	28440
S-MC-100-A	MC	1263	1.9732	S-MC-100	63	7	36	40	0.00100	0.100	14628
S-MC-100-B	MC	1985	3.1012	S-MC-100	71	26	37	40	0.00099	0.099	16651
S-MC-101-POND	MC	224	0.3501	S-MC-101	83	58	62	58	0.00254	0.254	3290
S-MC-101-B	MC	688	1.0747	S-MC-101	62	4	35	40	0.00191	0.191	9137
S-MC-101-A	MC	585	0.9146	S-MC-101	67	19	36	40	0.00202	0.202	13002
S-MC-101-C	MC	879	1.3733	S-MC-101	71	30	37	40	0.00176	0.176	14620
S-MC-102-A	MC	1041	1.6271	S-MC-102	71	26	37	40	0.00067	0.067	11264
S-SM-101-A	SM	693	1.0827	S-SM-101	68	21	36	40	0.00311	0.311	6435
S-SM-101-B	SM	556	0.8689	S-SM-101	71	29	37	40	0.00029	0.029	9833
S-SM-102-A	SM	541	0.8451	S-SM-102B	73	23	42	40	0.00255	0.255	8666
S-SM-103-A	SM	306	0.4777	S-SM-103	77	47	36	47	0.00080	0.080	3776
W700	NM	8388	13.1060	W700	61	3	35	40	0.00100	0.100	83880
W710	NM	754	1.1785	W710	69	22	36	40	0.00100	0.100	7540
W720	NM	1899	2.9667	W720	65	12	36	40	0.00100	0.100	18990
W730	NM	568	0.8881	W730	69	24	36	40	0.00073	0.073	7711
W740	NM	1010	1.5788	W740	67	20	35	40	0.00100	0.100	10100
W750	NM	6480	10.1256	W750	62	4	36	40	0.00100	0.100	64800
W760	NM	3102	4.8465	W760	63	10	34	40	0.00100	0.100	31020
W770	NM	663	1.0354	W770	100	100	95	100	0.00100	0.100	6630
W840	NM	2589	4.0456	W840	66	5	38	40	0.00100	0.100	25890
W870	NM	5806	9.0712	W870	65	7	37	40	0.00100	0.100	58060
W920	NM	761	1.1895	W920	70	19	37	40	0.00100	0.100	9620
NMD05	NM	169	0.2633	NMD05	68	22	36	40	0.00107	0.107	3380
NMD13	NM	111	0.1736	NMD13	68	22	36	40	0.00027	0.027	2664

PRF & LAGTIME CALCS

PRF	PRF1	Lag (min)	Lag(hr)
103.4	150	403.1	6.7
88.0	150	205.8	3.4
150.5	150	1302.5	21.7
99.1	150	827.0	13.8
110.6	150	746.6	12.4
143.1	150	89.0	1.5
149.5	150	421.3	7.0
150.5	151	477.3	8.0
148.3	150	504.6	8.4
66.2	150	663.8	11.1
230.2	230	213.4	3.6
26.8	150	905.1	15.1
181.1	181	261.0	4.4
56.1	150	213.7	3.6
163.1	163	3519.4	58.7
86.5	150	416.0	6.9
110.3	150	967.8	16.1
60.9	150	495.7	8.3
93.5	150	554.3	9.2
152.4	152	2790.8	46.5
125.5	150	1508.9	25.1
83.7	150	113.9	1.9
119.7	150	1208.2	20.1
148.0	150	2366.2	39.4
86.8	150	492.1	8.2
61.9	150	217.4	3.6
16.5	150	357.7	6.0

HMS INPUT

SUBBASIN	PRF	LAG
ES-102-A	150	6.72
ES-102-01-A	150	3.43
MCD	150	21.71
MC-100-A	150	13.78
MC-100-B	150	12.44
MC-101-POND	150	1.48
MC-101-B	150	7.02
MC-101-A	151	7.95
MC-101-C	150	8.41
MC-102-A	150	11.06
SM-101-A	230	3.56
SM-101-B	150	15.08
SM-102-A	181	4.35
SM-103-A	150	3.56
W700	163	58.66
W710	150	6.93
W720	150	16.13
W730	150	8.26
W740	150	9.24
W750	152	46.51
W760	150	25.15
W770	150	1.90
W840	150	20.14
W870	150	39.44
W920	150	8.20
NMD05	150	3.62
NMD13	150	5.96

COE LATERAL SUBAREAS
UNIT HYDROGRAPH CALCULATION
FOR HEC-HMS INPUT (USER-SPECIFIED UHG)

Time	ES-100	ES-100-A	ES-101-A	ES-102-A	ES-102-B	ES-102-01-A	MC-100-A	MC-100-B	MC-101-A	MC-101-B	MC-101-C
DA (SM)	7.9080	0.6505	1.2641	1.3676	0.9124	0.2294	1.9732	3.1012	0.9146	1.0747	1.3733
PRF	150	150	150	150	150	150	150	150	151	150	150
Tc (hr)	55.89	8.49	15.89	11.20	19.86	5.72	22.97	20.74	13.26	11.70	14.02
Tlag (hr)	33.53	5.09	9.53	6.72	11.92	3.43	13.78	12.44	7.95	7.02	8.41
Drecom (hr)	7.43	1.13	2.11	1.49	2.64	0.76	3.06	2.76	1.76	1.56	1.86
Dmax (hr)	9.50	1.44	2.70	1.90	3.38	0.97	3.91	3.53	2.25	1.99	2.38
Dchosen (hr)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Φ	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
α	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Tp (hr)	34.03	5.59	10.03	7.22	12.42	3.93	14.28	12.94	8.45	7.52	8.91
Qp	34.85	17.44	18.90	28.42	11.02	8.76	20.72	35.94	16.28	21.43	23.12
TIME (HR)											
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.0	10.5	11.4	9.8	16.9	5.2	6.5	9.2	16.7	9.0	12.5	12.6
2.0	14.4	14.6	12.9	21.9	6.9	8.0	12.4	22.3	11.8	16.3	16.5
3.0	17.1	16.2	14.9	24.8	8.1	8.6	14.5	26.0	13.6	18.5	19.0
4.0	19.3	17.0	16.3	26.6	8.9	8.8	16.0	28.7	14.7	19.9	20.6
5.0	21.2	17.4	17.3	27.6	9.5	8.6	17.2	30.7	15.4	20.7	21.7
6.0	22.8	17.4	17.9	28.2	10.0	8.3	18.1	32.2	15.9	21.2	22.4
7.0	24.1	17.2	18.4	28.4	10.3	8.0	18.8	33.4	16.2	21.4	22.8
8.0	25.3	16.9	18.7	28.3	10.6	7.5	19.4	34.3	16.3	21.4	23.1
9.0	26.4	16.4	18.8	28.1	10.8	7.1	19.8	35.0	16.3	21.3	23.1
10.0	27.3	15.8	18.9	27.6	10.9	6.6	20.2	35.4	16.2	21.0	23.0
11.0	28.2	15.2	18.9	27.1	11.0	6.1	20.4	35.7	16.0	20.6	22.9
12.0	29.0	14.6	18.7	26.4	11.0	5.7	20.6	35.9	15.8	20.2	22.6
13.0	29.7	13.9	18.6	25.7	11.0	5.2	20.7	35.9	15.5	19.7	22.3
14.0	30.3	13.3	18.4	25.0	11.0	4.8	20.7	35.9	15.2	19.2	21.9
15.0	30.9	12.6	18.1	24.2	10.9	4.4	20.7	35.8	14.8	18.6	21.4
16.0	31.4	11.9	17.8	23.3	10.8	4.0	20.7	35.5	14.4	18.0	21.0
17.0	31.8	11.3	17.5	22.5	10.7	3.7	20.6	35.3	14.1	17.4	20.5
18.0	32.3	10.7	17.1	21.7	10.6	3.3	20.4	34.9	13.7	16.8	19.9
19.0	32.6	10.1	16.8	20.8	10.5	3.0	20.3	34.6	13.3	16.2	19.4
20.0	33.0	9.5	16.4	20.0	10.4	2.8	20.1	34.1	12.8	15.6	18.9
21.0	33.3	8.9	16.0	19.2	10.2	2.5	19.9	33.7	12.4	15.0	18.3
22.0	33.5	8.4	15.6	18.4	10.0	2.3	19.7	33.2	12.0	14.4	17.8
23.0	33.8	7.9	15.2	17.6	9.9	2.1	19.5	32.7	11.6	13.8	17.2
24.0	34.0	7.4	14.8	16.8	9.7	1.9	19.2	32.2	11.2	13.2	16.6
25.0	34.2	6.9	14.4	16.1	9.5	1.7	19.0	31.6	10.8	12.7	16.1
26.0	34.3	6.5	14.0	15.3	9.3	1.5	18.7	31.1	10.4	12.1	15.6
27.0	34.5	6.1	13.6	14.6	9.2	1.4	18.4	30.5	10.0	11.6	15.0
28.0	34.6	5.7	13.2	13.9	9.0	1.3	18.1	29.9	9.6	11.1	14.5
29.0	34.7	5.3	12.8	13.3	8.8	1.1	17.8	29.3	9.3	10.6	14.0
30.0	34.7	5.0	12.4	12.6	8.6	1.0	17.5	28.8	8.9	10.1	13.5
31.0	34.8	4.6	12.1	12.0	8.4	0.9	17.2	28.2	8.6	9.7	13.0
32.0	34.8	4.3	11.7	11.5	8.2	0.8	16.9	27.6	8.2	9.2	12.5
33.0	34.8	4.0	11.3	10.9	8.0	0.7	16.6	27.0	7.9	8.8	12.0
34.0	34.9	3.8	10.9	10.4	7.8	0.7	16.3	26.4	7.6	8.4	11.6
35.0	34.8	3.5	10.6	9.8	7.6	0.6	16.0	25.8	7.3	8.0	11.1
36.0	34.8	3.3	10.2	9.3	7.5	0.5	15.7	25.2	7.0	7.6	10.7
37.0	34.8	3.1	9.9	8.9	7.3	0.5	15.4	24.6	6.7	7.2	10.3
38.0	34.8	2.8	9.6	8.4	7.1	0.4	15.1	24.1	6.4	6.9	9.9
39.0	34.7	2.7	9.2	8.0	6.9	0.4	14.8	23.5	6.1	6.5	9.5
40.0	34.6	2.5	8.9	7.6	6.7	0.4	14.5	22.9	5.9	6.2	9.1
41.0	34.6	2.3	8.6	7.2	6.6	0.3	14.1	22.4	5.6	5.9	8.8
42.0	34.5	2.1	8.3	6.8	6.4	0.3	13.8	21.8	5.4	5.6	8.4
43.0	34.4	2.0	8.0	6.4	6.2	0.3	13.6	21.3	5.1	5.3	8.1
44.0	34.3	1.8	7.7	6.1	6.1	0.2	13.3	20.7	4.9	5.1	7.7
45.0	34.2	1.7	7.5	5.8	5.9	0.2	13.0	20.2	4.7	4.8	7.4
46.0	34.0	1.6	7.2	5.5	5.7	0.2	12.7	19.7	4.5	4.6	7.1
47.0	33.9	1.5	6.9	5.2	5.6	0.2	12.4	19.2	4.3	4.3	6.8
48.0	33.8	1.4	6.7	4.9	5.4	0.1	12.1	18.7	4.1	4.1	6.5
49.0	33.6	1.3	6.5	4.6	5.3	0.1	11.8	18.2	3.9	3.9	6.3
50.0	33.5	1.2	6.2	4.4	5.1	0.1	11.6	17.7	3.7	3.7	6.0
51.0	33.4	1.1	6.0	4.2	5.0	0.1	11.3	17.3	3.6	3.5	5.7
52.0	33.2	1.0	5.8	3.9	4.9	0.1	11.0	16.8	3.4	3.3	5.5
53.0	33.0	0.9	5.6	3.7	4.7	0.1	10.8	16.3	3.2	3.2	5.3
54.0	32.9	0.9	5.4	3.5	4.6	0.1	10.5	15.9	3.1	3.0	5.0
55.0	32.7	0.8	5.2	3.3	4.4	0.1	10.3	15.5	3.0	2.8	4.8
56.0	32.5	0.8	5.0	3.1	4.3	0.1	10.0	15.0	2.8	2.7	4.6
57.0	32.4	0.7	4.8	3.0	4.2	0.1	9.8	14.6	2.7	2.6	4.4
58.0	32.2	0.7	4.6	2.8	4.1	0.0	9.5	14.2	2.6	2.4	4.2
59.0	32.0	0.6	4.4	2.7	4.0	0.0	9.3	13.8	2.4	2.3	4.0
60.0	31.8	0.6	4.2	2.5	3.8	0.0	9.1	13.5	2.3	2.2	3.9
61.0	31.6	0.5	4.1	2.4	3.7	0.0	8.9	13.1	2.2	2.1	3.7
62.0	31.4	0.5	3.9	2.2	3.6	0.0	8.6	12.7	2.1	1.9	3.5
63.0	31.2	0.4	3.8	2.1	3.5	0.0	8.4	12.3	2.0	1.8	3.4
64.0	31.0	0.4	3.6	2.0	3.4	0.0	8.2	12.0	1.9	1.7	3.2
65.0	30.8	0.4	3.5	1.9	3.3	0.0	8.0	11.7	1.8	1.6	3.1
66.0	30.6	0.4	3.4	1.8	3.2	0.0	7.8	11.3	1.7	1.6	2.9
67.0	30.4	0.3	3.2	1.7	3.1	0.0	7.6	11.0	1.7	1.5	2.8
68.0	30.2	0.3	3.1	1.6	3.0	0.0	7.4	10.7	1.6	1.4	2.7
69.0	30.0	0.3	3.0	1.5	2.9	0.0	7.2	10.4	1.5	1.3	2.6
70.0	29.8	0.3	2.9	1.4	2.8	0.0	7.0	10.1	1.4	1.3	2.5
71.0	29.6	0.2	2.8	1.3	2.7	0.0	6.9	9.8	1.4	1.2	2.3
72.0	29.4	0.2	2.6	1.3	2.7	0.0	6.7	9.5	1.3	1.1	2.2
73.0	29.2	0.2	2.5	1.2	2.6	0.0	6.5	9.2	1.2	1.1	2.1
74.0	28.9	0.2	2.4	1.1	2.5	0.0	6.3	8.9	1.2	1.0	2.0
75.0	28.7	0.2	2.3	1.1	2.4	0.0	6.2	8.7	1.1	0.9	2.0
76.0	28.5	0.2	2.3	1.0	2.3	0.0	6.0	8.4	1.1	0.9	1.9

COE LATERAL SUBAREAS
UNIT HYDROGRAPH CALCULATION
FOR HEC-HMS INPUT (USER-SPECIFIED UHG)

Time	ES-100	ES-100-A	ES-101-A	ES-102-A	ES-102-B	ES-102-01-A	MC-100-A	MC-100-B	MC-101-A	MC-101-B	MC-101-C
DA (SM)	7.9080	0.6505	1.2641	1.3676	0.9124	0.2294	1.9732	3.1012	0.9146	1.0747	1.3733
PRF	150	150	150	150	150	150	150	150	151	150	150
Tc (hr)	55.89	8.49	15.89	11.20	19.86	5.72	22.97	20.74	13.26	11.70	14.02
Tlag (hr)	33.53	5.09	9.53	6.72	11.92	3.43	13.78	12.44	7.95	7.02	8.41
Drecom (hr)	7.43	1.13	2.11	1.49	2.64	0.76	3.06	2.76	1.76	1.56	1.86
Dmax (hr)	9.50	1.44	2.70	1.90	3.38	0.97	3.91	3.53	2.25	1.99	2.38
Dchosen (hr)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Φ	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
α	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Tp (hr)	34.03	5.59	10.03	7.22	12.42	3.93	14.28	12.94	8.45	7.52	8.91
Qp	34.85	17.44	18.90	28.42	11.02	8.76	20.72	35.94	16.28	21.43	23.12
TIME (HR)											
77.0	28.3	0.2	2.2	0.9	2.3	0.0	5.8	8.2	1.0	0.8	1.8
78.0	28.1	0.1	2.1	0.9	2.2	0.0	5.7	7.9	1.0	0.8	1.7
79.0	27.9	0.1	2.0	0.8	2.1	0.0	5.5	7.7	0.9	0.8	1.6
80.0	27.6	0.1	1.9	0.8	2.1	0.0	5.4	7.5	0.9	0.7	1.5
81.0	27.4	0.1	1.8	0.7	2.0	0.0	5.3	7.2	0.8	0.7	1.5
82.0	27.2	0.1	1.8	0.7	1.9	0.0	5.1	7.0	0.8	0.6	1.4
83.0	27.0	0.1	1.7	0.7	1.9	0.0	5.0	6.8	0.8	0.6	1.3
84.0	26.8	0.1	1.6	0.6	1.8	0.0	4.8	6.6	0.7	0.6	1.3
85.0	26.5	0.1	1.6	0.6	1.8	0.0	4.7	6.4	0.7	0.5	1.2
86.0	26.3	0.1	1.5	0.6	1.7	0.0	4.6	6.2	0.6	0.5	1.2
87.0	26.1	0.1	1.4	0.5	1.7	0.0	4.5	6.0	0.6	0.5	1.1
88.0	25.9	0.1	1.4	0.5	1.6	0.0	4.3	5.9	0.6	0.5	1.1
89.0	25.7	0.1	1.3	0.5	1.5	0.0	4.2	5.7	0.6	0.4	1.0
90.0	25.5	0.1	1.3	0.4	1.5	0.0	4.1	5.5	0.5	0.4	1.0
91.0	25.2	0.1	1.2	0.4	1.5	0.0	4.0	5.3	0.5	0.4	0.9
92.0	25.0	0.0	1.2	0.4	1.4	0.0	3.9	5.2	0.5	0.4	0.9
93.0	24.8	0.0	1.1	0.4	1.4	0.0	3.8	5.0	0.5	0.3	0.8
94.0	24.6	0.0	1.1	0.3	1.3	0.0	3.7	4.9	0.4	0.3	0.8
95.0	24.4	0.0	1.0	0.3	1.3	0.0	3.6	4.7	0.4	0.3	0.8
96.0	24.2	0.0	1.0	0.3	1.2	0.0	3.5	4.6	0.4	0.3	0.7
97.0	23.9	0.0	0.9	0.3	1.2	0.0	3.4	4.4	0.4	0.3	0.7
98.0	23.7	0.0	0.9	0.3	1.2	0.0	3.3	4.3	0.4	0.3	0.7
99.0	23.5	0.0	0.9	0.3	1.1	0.0	3.2	4.2	0.3	0.2	0.6
100.0	23.3	0.0	0.8	0.2	1.1	0.0	3.1	4.0	0.3	0.2	0.6
101.0	23.1	0.0	0.8	0.2	1.0	0.0	3.0	3.9	0.3	0.2	0.6
102.0	22.9	0.0	0.8	0.2	1.0	0.0	2.9	3.8	0.3	0.2	0.5
103.0	22.7	0.0	0.7	0.2	1.0	0.0	2.9	3.7	0.3	0.2	0.5
104.0	22.5	0.0	0.7	0.2	0.9	0.0	2.8	3.5	0.3	0.2	0.5
105.0	22.3	0.0	0.7	0.2	0.9	0.0	2.7	3.4	0.2	0.2	0.5
106.0	22.1	0.0	0.7	0.2	0.9	0.0	2.6	3.3	0.2	0.2	0.5
107.0	21.9	0.0	0.6	0.2	0.9	0.0	2.6	3.2	0.2	0.2	0.4
108.0	21.6	0.0	0.6	0.1	0.8	0.0	2.5	3.1	0.2	0.1	0.4
109.0	21.4	0.0	0.6	0.1	0.8	0.0	2.4	3.0	0.2	0.1	0.4
110.0	21.2	0.0	0.5	0.1	0.8	0.0	2.3	2.9	0.2	0.1	0.4
111.0	21.0	0.0	0.5	0.1	0.7	0.0	2.3	2.8	0.2	0.1	0.4
112.0	20.8	0.0	0.5	0.1	0.7	0.0	2.2	2.8	0.2	0.1	0.3
113.0	20.6	0.0	0.5	0.1	0.7	0.0	2.2	2.7	0.2	0.1	0.3
114.0	20.4	0.0	0.5	0.1	0.7	0.0	2.1	2.6	0.2	0.1	0.3
115.0	20.2	0.0	0.4	0.1	0.7	0.0	2.0	2.5	0.1	0.1	0.3
116.0	20.1	0.0	0.4	0.1	0.6	0.0	2.0	2.4	0.1	0.1	0.3
117.0	19.9	0.0	0.4	0.1	0.6	0.0	1.9	2.3	0.1	0.1	0.3
118.0	19.7	0.0	0.4	0.1	0.6	0.0	1.9	2.3	0.1	0.1	0.3
119.0	19.5	0.0	0.4	0.1	0.6	0.0	1.8	2.2	0.1	0.1	0.2
120.0	19.3	0.0	0.4	0.1	0.6	0.0	1.8	2.1	0.1	0.1	0.2
121.0	19.1	0.0	0.3	0.1	0.5	0.0	1.7	2.1	0.1	0.1	0.2
122.0	18.9	0.0	0.3	0.1	0.5	0.0	1.7	2.0	0.1	0.1	0.2
123.0	18.7	0.0	0.3	0.1	0.5	0.0	1.6	1.9	0.1	0.1	0.2
124.0	18.5	0.0	0.3	0.1	0.5	0.0	1.6	1.9	0.1	0.1	0.2
125.0	18.4	0.0	0.3	0.1	0.5	0.0	1.5	1.8	0.1	0.1	0.2
126.0	18.2	0.0	0.3	0.0	0.5	0.0	1.5	1.8	0.1	0.1	0.2
127.0	18.0	0.0	0.3	0.0	0.4	0.0	1.4	1.7	0.1	0.0	0.2
128.0	17.8	0.0	0.3	0.0	0.4	0.0	1.4	1.6	0.1	0.0	0.2
129.0	17.6	0.0	0.2	0.0	0.4	0.0	1.4	1.6	0.1	0.0	0.1
130.0	17.5	0.0	0.2	0.0	0.4	0.0	1.3	1.5	0.1	0.0	0.1
131.0	17.3	0.0	0.2	0.0	0.4	0.0	1.3	1.5	0.1	0.0	0.1
132.0	17.1	0.0	0.2	0.0	0.4	0.0	1.2	1.4	0.1	0.0	0.1
133.0	16.9	0.0	0.2	0.0	0.4	0.0	1.2	1.4	0.1	0.0	0.1
134.0	16.8	0.0	0.2	0.0	0.3	0.0	1.2	1.4	0.1	0.0	0.1
135.0	16.6	0.0	0.2	0.0	0.3	0.0	1.1	1.3	0.1	0.0	0.1
136.0	16.4	0.0	0.2	0.0	0.3	0.0	1.1	1.3	0.0	0.0	0.1
137.0	16.2	0.0	0.2	0.0	0.3	0.0	1.1	1.2	0.0	0.0	0.1
138.0	16.1	0.0	0.2	0.0	0.3	0.0	1.0	1.2	0.0	0.0	0.1
139.0	15.9	0.0	0.2	0.0	0.3	0.0	1.0	1.1	0.0	0.0	0.1
140.0	15.7	0.0	0.2	0.0	0.3	0.0	1.0	1.1	0.0	0.0	0.1
141.0	15.6	0.0	0.1	0.0	0.3	0.0	1.0	1.1	0.0	0.0	0.1
142.0	15.4	0.0	0.1	0.0	0.3	0.0	0.9	1.0	0.0	0.0	0.1
143.0	15.3	0.0	0.1	0.0	0.3	0.0	0.9	1.0	0.0	0.0	0.1
144.0	15.1	0.0	0.1	0.0	0.2	0.0	0.9	1.0	0.0	0.0	0.1
145.0	14.9	0.0	0.1	0.0	0.2	0.0	0.8	0.9	0.0	0.0	0.1
146.0	14.8	0.0	0.1	0.0	0.2	0.0	0.8	0.9	0.0	0.0	0.1
147.0	14.6	0.0	0.1	0.0	0.2	0.0	0.8	0.9	0.0	0.0	0.1
148.0	14.5	0.0	0.1	0.0	0.2	0.0	0.8	0.9	0.0	0.0	0.1
149.0	14.3	0.0	0.1	0.0	0.2	0.0	0.8	0.8	0.0	0.0	0.1
150.0	14.2	0.0	0.1	0.0	0.2	0.0	0.7	0.8	0.0	0.0	0.1
151.0	14.0	0.0	0.1	0.0	0.2	0.0	0.7	0.8	0.0	0.0	0.1
152.0	13.9	0.0	0.1	0.0	0.2	0.0	0.7	0.7	0.0	0.0	0.0
153.0	13.7	0.0	0.1	0.0	0.2	0.0	0.7	0.7	0.0	0.0	0.0
154.0	13.6	0.0	0.1	0.0	0.2	0.0	0.7	0.7	0.0	0.0	0.0
155.0	13.4	0.0	0.1	0.0	0.2	0.0	0.6	0.7	0.0	0.0	0.0
156.0	13.3	0.0	0.1	0.0	0.2	0.0	0.6	0.7	0.0	0.0	0.0

Time	MC-101-PONI	MC-102-A	NMD05	NMD13	NM-101-A	NM-102-A	NM-102-B	NM-102-C	NM-102-D	NM-102-E	NM-102-F	NM-102-01
DA (SM)	0.3501	1.6271	0.2633	0.1736	2.0070	0.7784	1.0392	0.4090	0.7084	0.2087	0.3708	0.3487
PRF	150	150	150	150	150	150	150	150	150	150	150	150
Tc (hr)	2.47	18.44	6.03	9.93	33.01	13.84	12.73	9.66	7.51	5.19	6.84	7.14
Tlag (hr)	1.48	11.06	3.62	5.96	19.81	8.31	7.64	5.79	4.51	3.11	4.10	4.28
Drecom (hr)	0.33	2.45	0.80	1.32	4.39	1.84	1.69	1.28	1.00	0.69	0.91	0.95
Dmax (hr)	0.42	3.13	1.03	1.69	5.61	2.35	2.16	1.64	1.28	0.88	1.16	1.21
Dchosen (hr)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Φ	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
α	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Tp (hr)	1.98	11.56	4.12	6.46	20.31	8.81	8.14	6.29	5.01	3.61	4.60	4.78
Qp	26.47	21.11	9.59	4.03	14.82	13.26	19.15	9.75	21.23	8.67	12.08	10.93
TIME (HR)												
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.0	24.2	10.3	7.0	2.5	5.7	7.3	10.8	6.1	14.5	6.7	8.5	7.6
2.0	26.5	13.7	8.7	3.2	7.6	9.5	14.1	7.8	18.3	8.1	10.7	9.5
3.0	25.3	15.9	9.4	3.6	9.0	10.9	16.1	8.8	20.2	8.6	11.6	10.5
4.0	22.8	17.4	9.6	3.9	10.1	11.8	17.4	9.4	21.0	8.6	12.0	10.9
5.0	20.0	18.6	9.5	4.0	11.0	12.5	18.3	9.6	21.2	8.4	12.1	10.9
6.0	17.2	19.4	9.2	4.0	11.7	12.9	18.8	9.7	21.1	8.1	11.9	10.8
7.0	14.6	20.1	8.9	4.0	12.2	13.1	19.1	9.7	20.6	7.6	11.5	10.5
8.0	12.3	20.5	8.4	4.0	12.7	13.2	19.1	9.6	20.0	7.1	11.1	10.2
9.0	10.3	20.8	7.9	3.9	13.1	13.3	19.1	9.4	19.2	6.6	10.6	9.7
10.0	8.5	21.0	7.4	3.8	13.5	13.2	18.9	9.2	18.4	6.1	10.0	9.3
11.0	7.0	21.1	7.0	3.7	13.8	13.1	18.7	8.9	17.5	5.6	9.5	8.8
12.0	5.8	21.1	6.5	3.6	14.0	12.9	18.4	8.6	16.6	5.1	8.9	8.3
13.0	4.8	21.0	6.0	3.5	14.2	12.7	18.0	8.3	15.7	4.7	8.4	7.8
14.0	3.9	20.9	5.5	3.4	14.4	12.5	17.6	8.0	14.8	4.3	7.8	7.3
15.0	3.2	20.7	5.1	3.2	14.5	12.2	17.2	7.7	13.9	3.9	7.3	6.9
16.0	2.6	20.5	4.7	3.1	14.6	12.0	16.7	7.3	13.1	3.5	6.8	6.4
17.0	2.1	20.3	4.3	3.0	14.7	11.7	16.2	7.0	12.3	3.2	6.3	6.0
18.0	1.7	20.0	4.0	2.8	14.8	11.4	15.8	6.7	11.5	2.9	5.9	5.6
19.0	1.4	19.7	3.6	2.7	14.8	11.1	15.3	6.4	10.7	2.6	5.4	5.2
20.0	1.1	19.4	3.3	2.6	14.8	10.7	14.8	6.0	10.0	2.3	5.0	4.8
21.0	0.9	19.0	3.0	2.4	14.8	10.4	14.2	5.7	9.3	2.1	4.6	4.5
22.0	0.7	18.7	2.8	2.3	14.8	10.1	13.8	5.4	8.7	1.9	4.3	4.1
23.0	0.6	18.3	2.5	2.2	14.8	9.8	13.3	5.2	8.1	1.7	4.0	3.8
24.0	0.5	18.0	2.3	2.1	14.7	9.5	12.8	4.9	7.5	1.5	3.6	3.6
25.0	0.4	17.6	2.1	2.0	14.7	9.1	12.3	4.6	7.0	1.3	3.4	3.3
26.0	0.3	17.2	1.9	1.9	14.6	8.8	11.8	4.4	6.5	1.2	3.1	3.0
27.0	0.2	16.8	1.7	1.8	14.5	8.5	11.4	4.1	6.0	1.1	2.8	2.8
28.0	0.2	16.4	1.6	1.7	14.4	8.2	10.9	3.9	5.5	1.0	2.6	2.6
29.0	0.2	16.0	1.4	1.6	14.3	7.9	10.5	3.7	5.1	0.9	2.4	2.4
30.0	0.1	15.6	1.3	1.5	14.2	7.6	10.0	3.5	4.7	0.8	2.2	2.2
31.0	0.1	15.3	1.2	1.4	14.1	7.3	9.6	3.3	4.4	0.7	2.0	2.0
32.0	0.1	14.9	1.1	1.3	14.0	7.1	9.2	3.1	4.1	0.6	1.9	1.9
33.0	0.1	14.5	1.0	1.3	13.9	6.8	8.8	2.9	3.8	0.5	1.7	1.7
34.0	0.1	14.1	0.9	1.2	13.8	6.5	8.5	2.7	3.5	0.5	1.6	1.6
35.0	0.0	13.7	0.8	1.1	13.6	6.3	8.1	2.6	3.2	0.4	1.4	1.4
36.0	0.0	13.4	0.7	1.1	13.5	6.0	7.7	2.4	3.0	0.4	1.3	1.3
37.0	0.0	13.0	0.6	1.0	13.4	5.8	7.4	2.3	2.7	0.3	1.2	1.2
38.0	0.0	12.6	0.6	0.9	13.2	5.6	7.1	2.1	2.5	0.3	1.1	1.1
39.0	0.0	12.3	0.5	0.9	13.1	5.4	6.8	2.0	2.3	0.3	1.0	1.0
40.0	0.0	11.9	0.5	0.8	12.9	5.1	6.5	1.9	2.1	0.2	0.9	0.9
41.0	0.0	11.6	0.4	0.8	12.8	4.9	6.2	1.8	2.0	0.2	0.8	0.9
42.0	0.0	11.3	0.4	0.7	12.6	4.7	5.9	1.7	1.8	0.2	0.8	0.8
43.0	0.0	10.9	0.3	0.7	12.5	4.5	5.6	1.6	1.7	0.2	0.7	0.7
44.0	0.0	10.6	0.3	0.7	12.3	4.3	5.4	1.5	1.5	0.1	0.6	0.7
45.0	0.0	10.3	0.3	0.6	12.2	4.2	5.1	1.4	1.4	0.1	0.6	0.6
46.0	0.0	10.0	0.3	0.6	12.0	4.0	4.9	1.3	1.3	0.1	0.5	0.6
47.0	0.0	9.7	0.2	0.5	11.9	3.8	4.7	1.2	1.2	0.1	0.5	0.5
48.0	0.0	9.4	0.2	0.5	11.7	3.7	4.4	1.1	1.1	0.1	0.4	0.5
49.0	0.0	9.1	0.2	0.5	11.6	3.5	4.2	1.1	1.0	0.1	0.4	0.4
50.0	0.0	8.8	0.2	0.4	11.4	3.4	4.0	1.0	0.9	0.1	0.4	0.4
51.0	0.0	8.6	0.2	0.4	11.2	3.2	3.9	0.9	0.9	0.1	0.3	0.4
52.0	0.0	8.3	0.1	0.4	11.1	3.1	3.7	0.9	0.8	0.1	0.3	0.3
53.0	0.0	8.1	0.1	0.4	10.9	2.9	3.5	0.8	0.7	0.1	0.3	0.3
54.0	0.0	7.8	0.1	0.3	10.8	2.8	3.3	0.8	0.7	0.0	0.3	0.3
55.0	0.0	7.6	0.1	0.3	10.6	2.7	3.2	0.7	0.6	0.0	0.2	0.3
56.0	0.0	7.3	0.1	0.3	10.5	2.6	3.0	0.7	0.6	0.0	0.2	0.2
57.0	0.0	7.1	0.1	0.3	10.3	2.5	2.9	0.6	0.5	0.0	0.2	0.2
58.0	0.0	6.9	0.1	0.3	10.2	2.3	2.7	0.6	0.5	0.0	0.2	0.2
59.0	0.0	6.6	0.1	0.3	10.0	2.2	2.6	0.6	0.4	0.0	0.2	0.2
60.0	0.0	6.4	0.1	0.2	9.9	2.1	2.5	0.5	0.4	0.0	0.1	0.2
61.0	0.0	6.2	0.1	0.2	9.7	2.1	2.4	0.5	0.4	0.0	0.1	0.1
62.0	0.0	6.0	0.0	0.2	9.6	2.0	2.2	0.5	0.3	0.0	0.1	0.1
63.0	0.0	5.8	0.0	0.2	9.4	1.9	2.1	0.4	0.3	0.0	0.1	0.1
64.0	0.0	5.6	0.0	0.2	9.3	1.8	2.0	0.4	0.3	0.0	0.1	0.1
65.0	0.0	5.5	0.0	0.2	9.1	1.7	1.9	0.4	0.3	0.0	0.1	0.1
66.0	0.0	5.3	0.0	0.2	9.0	1.6	1.8	0.3	0.2	0.0	0.1	0.1
67.0	0.0	5.1	0.0	0.2	8.8	1.6	1.7	0.3	0.2	0.0	0.1	0.1
68.0	0.0	4.9	0.0	0.1	8.7	1.5	1.7	0.3	0.2	0.0	0.1	0.1
69.0	0.0	4.8	0.0	0.1	8.6	1.4	1.6	0.3	0.2	0.0	0.1	0.1
70.0	0.0	4.6	0.0	0.1	8.4	1.4	1.5	0.3	0.2	0.0	0.1	0.1
71.0	0.0	4.5	0.0	0.1	8.3	1.3	1.4	0.2	0.2	0.0	0.1	0.1
72.0	0.0	4.3	0.0	0.1	8.1	1.2	1.4	0.2	0.1	0.0	0.0	0.1
73.0	0.0	4.2	0.0	0.1	8.0	1.2	1.3	0.2	0.1	0.0	0.0	0.0
74.0	0.0	4.0	0.0	0.1	7.9	1.1	1.2	0.2	0.1	0.0	0.0	0.0
75.0	0.0	3.9	0.0	0.1	7.8	1.1	1.2	0.2	0.1	0.0	0.0	0.0
76.0	0.0	3.8	0.0	0.1	7.6	1.0	1.1	0.2	0.1	0.0	0.0	0.0

Time	MC-101-PONI	MC-102-A	NMD05	NMD13	NM-101-A	NM-102-A	NM-102-B	NM-102-C	NM-102-D	NM-102-E	NM-102-F	NM-102-01
DA (SM)	0.3501	1.6271	0.2633	0.1736	2.0070	0.7784	1.0392	0.4090	0.7084	0.2087	0.3708	0.3487
PRF	150	150	150	150	150	150	150	150	150	150	150	150
Tc (hr)	2.47	18.44	6.03	9.93	33.01	13.84	12.73	9.66	7.51	5.19	6.84	7.14
Tlag (hr)	1.48	11.06	3.62	5.96	19.81	8.31	7.64	5.79	4.51	3.11	4.10	4.28
Drecom (hr)	0.33	2.45	0.80	1.32	4.39	1.84	1.69	1.28	1.00	0.69	0.91	0.95
Dmax (hr)	0.42	3.13	1.03	1.69	5.61	2.35	2.16	1.64	1.28	0.88	1.16	1.21
Dchosen (hr)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Φ	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
α	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Tp (hr)	1.98	11.56	4.12	6.46	20.31	8.81	8.14	6.29	5.01	3.61	4.60	4.78
Qp	26.47	21.11	9.59	4.03	14.82	13.26	19.15	9.75	21.23	8.67	12.08	10.93
TIME (HR)												
77.0	0.0	3.6	0.0	0.1	7.5	1.0	1.0	0.2	0.1	0.0	0.0	0.0
78.0	0.0	3.5	0.0	0.1	7.4	0.9	1.0	0.2	0.1	0.0	0.0	0.0
79.0	0.0	3.4	0.0	0.1	7.2	0.9	0.9	0.1	0.1	0.0	0.0	0.0
80.0	0.0	3.3	0.0	0.1	7.1	0.8	0.9	0.1	0.1	0.0	0.0	0.0
81.0	0.0	3.2	0.0	0.1	7.0	0.8	0.9	0.1	0.1	0.0	0.0	0.0
82.0	0.0	3.1	0.0	0.1	6.9	0.8	0.8	0.1	0.1	0.0	0.0	0.0
83.0	0.0	3.0	0.0	0.1	6.8	0.7	0.8	0.1	0.1	0.0	0.0	0.0
84.0	0.0	2.9	0.0	0.0	6.6	0.7	0.7	0.1	0.0	0.0	0.0	0.0
85.0	0.0	2.8	0.0	0.0	6.5	0.7	0.7	0.1	0.0	0.0	0.0	0.0
86.0	0.0	2.7	0.0	0.0	6.4	0.6	0.7	0.1	0.0	0.0	0.0	0.0
87.0	0.0	2.6	0.0	0.0	6.3	0.6	0.6	0.1	0.0	0.0	0.0	0.0
88.0	0.0	2.5	0.0	0.0	6.2	0.6	0.6	0.1	0.0	0.0	0.0	0.0
89.0	0.0	2.4	0.0	0.0	6.1	0.6	0.6	0.1	0.0	0.0	0.0	0.0
90.0	0.0	2.3	0.0	0.0	6.0	0.5	0.5	0.1	0.0	0.0	0.0	0.0
91.0	0.0	2.2	0.0	0.0	5.9	0.5	0.5	0.1	0.0	0.0	0.0	0.0
92.0	0.0	2.2	0.0	0.0	5.8	0.5	0.5	0.1	0.0	0.0	0.0	0.0
93.0	0.0	2.1	0.0	0.0	5.7	0.5	0.5	0.1	0.0	0.0	0.0	0.0
94.0	0.0	2.0	0.0	0.0	5.6	0.4	0.4	0.1	0.0	0.0	0.0	0.0
95.0	0.0	1.9	0.0	0.0	5.5	0.4	0.4	0.0	0.0	0.0	0.0	0.0
96.0	0.0	1.9	0.0	0.0	5.4	0.4	0.4	0.0	0.0	0.0	0.0	0.0
97.0	0.0	1.8	0.0	0.0	5.3	0.4	0.4	0.0	0.0	0.0	0.0	0.0
98.0	0.0	1.7	0.0	0.0	5.2	0.4	0.4	0.0	0.0	0.0	0.0	0.0
99.0	0.0	1.7	0.0	0.0	5.1	0.3	0.3	0.0	0.0	0.0	0.0	0.0
100.0	0.0	1.6	0.0	0.0	5.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0
101.0	0.0	1.6	0.0	0.0	4.9	0.3	0.3	0.0	0.0	0.0	0.0	0.0
102.0	0.0	1.5	0.0	0.0	4.8	0.3	0.3	0.0	0.0	0.0	0.0	0.0
103.0	0.0	1.5	0.0	0.0	4.7	0.3	0.3	0.0	0.0	0.0	0.0	0.0
104.0	0.0	1.4	0.0	0.0	4.6	0.3	0.3	0.0	0.0	0.0	0.0	0.0
105.0	0.0	1.4	0.0	0.0	4.5	0.3	0.2	0.0	0.0	0.0	0.0	0.0
106.0	0.0	1.3	0.0	0.0	4.5	0.2	0.2	0.0	0.0	0.0	0.0	0.0
107.0	0.0	1.3	0.0	0.0	4.4	0.2	0.2	0.0	0.0	0.0	0.0	0.0
108.0	0.0	1.2	0.0	0.0	4.3	0.2	0.2	0.0	0.0	0.0	0.0	0.0
109.0	0.0	1.2	0.0	0.0	4.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0
110.0	0.0	1.1	0.0	0.0	4.1	0.2	0.2	0.0	0.0	0.0	0.0	0.0
111.0	0.0	1.1	0.0	0.0	4.1	0.2	0.2	0.0	0.0	0.0	0.0	0.0
112.0	0.0	1.1	0.0	0.0	4.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0
113.0	0.0	1.0	0.0	0.0	3.9	0.2	0.2	0.0	0.0	0.0	0.0	0.0
114.0	0.0	1.0	0.0	0.0	3.8	0.2	0.2	0.0	0.0	0.0	0.0	0.0
115.0	0.0	0.9	0.0	0.0	3.8	0.2	0.1	0.0	0.0	0.0	0.0	0.0
116.0	0.0	0.9	0.0	0.0	3.7	0.1	0.1	0.0	0.0	0.0	0.0	0.0
117.0	0.0	0.9	0.0	0.0	3.6	0.1	0.1	0.0	0.0	0.0	0.0	0.0
118.0	0.0	0.8	0.0	0.0	3.6	0.1	0.1	0.0	0.0	0.0	0.0	0.0
119.0	0.0	0.8	0.0	0.0	3.5	0.1	0.1	0.0	0.0	0.0	0.0	0.0
120.0	0.0	0.8	0.0	0.0	3.4	0.1	0.1	0.0	0.0	0.0	0.0	0.0
121.0	0.0	0.8	0.0	0.0	3.4	0.1	0.1	0.0	0.0	0.0	0.0	0.0
122.0	0.0	0.7	0.0	0.0	3.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0
123.0	0.0	0.7	0.0	0.0	3.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0
124.0	0.0	0.7	0.0	0.0	3.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0
125.0	0.0	0.7	0.0	0.0	3.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
126.0	0.0	0.6	0.0	0.0	3.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
127.0	0.0	0.6	0.0	0.0	3.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
128.0	0.0	0.6	0.0	0.0	2.9	0.1	0.1	0.0	0.0	0.0	0.0	0.0
129.0	0.0	0.6	0.0	0.0	2.9	0.1	0.1	0.0	0.0	0.0	0.0	0.0
130.0	0.0	0.5	0.0	0.0	2.8	0.1	0.1	0.0	0.0	0.0	0.0	0.0
131.0	0.0	0.5	0.0	0.0	2.8	0.1	0.1	0.0	0.0	0.0	0.0	0.0
132.0	0.0	0.5	0.0	0.0	2.7	0.1	0.1	0.0	0.0	0.0	0.0	0.0
133.0	0.0	0.5	0.0	0.0	2.7	0.1	0.1	0.0	0.0	0.0	0.0	0.0
134.0	0.0	0.5	0.0	0.0	2.6	0.1	0.1	0.0	0.0	0.0	0.0	0.0
135.0	0.0	0.5	0.0	0.0	2.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0
136.0	0.0	0.4	0.0	0.0	2.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0
137.0	0.0	0.4	0.0	0.0	2.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0
138.0	0.0	0.4	0.0	0.0	2.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0
139.0	0.0	0.4	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
140.0	0.0	0.4	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
141.0	0.0	0.4	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
142.0	0.0	0.3	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
143.0	0.0	0.3	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
144.0	0.0	0.3	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
145.0	0.0	0.3	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
146.0	0.0	0.3	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
147.0	0.0	0.3	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
148.0	0.0	0.3	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
149.0	0.0	0.3	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
150.0	0.0	0.3	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
151.0	0.0	0.2	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
152.0	0.0	0.2	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
153.0	0.0	0.2	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
154.0	0.0	0.2	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
155.0	0.0	0.2	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
156.0	0.0	0.2	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Time	NM-102-02	NM-103-A	NM-103-B	NM-103-C	NM-103-D	NM-104	NM-105-A	NM-105-B	NM-105-C	NM-105-D	NM-106-A	NM-107-A
DA (SM)	1.1562	0.2821	0.4730	0.6396	0.1724	1.2779	0.3122	0.1764	0.6769	0.3072	0.8088	0.6553
PRF	150	150	201	171	150	150	150	150	150	150	150	150
Tc (hr)	23.13	6.74	4.22	4.77	4.21	49.91	6.55	5.04	10.98	11.96	12.07	11.91
Tlag (hr)	13.88	4.04	2.53	2.86	2.53	29.95	3.93	3.03	6.59	7.18	7.24	7.15
Drecom (hr)	3.08	0.90	0.56	0.63	0.56	6.64	0.87	0.67	1.46	1.59	1.61	1.58
Dmax (hr)	3.93	1.15	0.72	0.81	0.72	8.49	1.11	0.86	1.87	2.03	2.05	2.03
Dchosen (hr)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Φ	0.23	0.23	0.31	0.26	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
α	0.47	0.47	0.75	0.57	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Tp (hr)	14.38	4.54	3.03	3.36	3.03	30.45	4.43	3.53	7.09	7.68	7.74	7.65
Qp	12.06	9.31	31.32	32.48	8.54	6.30	10.57	7.50	14.33	6.00	15.67	12.85
TIME (HR)												
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.0	5.4	6.6	22.5	24.2	7.0	2.0	7.6	5.8	8.6	3.5	9.0	7.5
2.0	7.2	8.2	29.6	30.4	8.2	2.7	9.4	7.0	11.1	4.5	11.8	9.7
3.0	8.4	9.0	31.3	32.4	8.5	3.2	10.2	7.5	12.6	5.1	13.4	11.0
4.0	9.3	9.3	30.3	32.2	8.4	3.7	10.5	7.5	13.4	5.5	14.4	11.9
5.0	10.0	9.3	28.0	30.8	8.0	4.0	10.5	7.3	14.0	5.8	15.1	12.4
6.0	10.5	9.1	25.1	28.9	7.4	4.3	10.3	6.9	14.2	5.9	15.5	12.7
7.0	11.0	8.9	22.0	26.6	6.8	4.5	10.0	6.5	14.3	6.0	15.6	12.8
8.0	11.3	8.5	19.0	24.2	6.2	4.8	9.6	6.1	14.3	6.0	15.7	12.8
9.0	11.5	8.1	16.2	21.8	5.7	4.9	9.1	5.6	14.1	6.0	15.6	12.8
10.0	11.7	7.7	13.7	19.5	5.1	5.1	8.6	5.2	13.9	5.9	15.4	12.6
11.0	11.9	7.2	11.4	17.4	4.6	5.3	8.1	4.7	13.6	5.8	15.2	12.4
12.0	12.0	6.8	9.5	15.4	4.1	5.4	7.6	4.3	13.3	5.7	14.9	12.2
13.0	12.0	6.4	7.9	13.6	3.6	5.5	7.1	3.9	12.9	5.6	14.5	11.9
14.0	12.1	6.0	6.5	12.0	3.2	5.6	6.6	3.6	12.5	5.4	14.2	11.6
15.0	12.1	5.5	5.4	10.5	2.8	5.7	6.1	3.2	12.1	5.3	13.8	11.2
16.0	12.0	5.2	4.4	9.2	2.5	5.8	5.7	2.9	11.6	5.1	13.4	10.9
17.0	12.0	4.8	3.6	8.0	2.2	5.9	5.3	2.6	11.2	4.9	12.9	10.5
18.0	11.9	4.4	2.9	7.0	1.9	6.0	4.9	2.4	10.8	4.8	12.5	10.2
19.0	11.8	4.1	2.4	6.1	1.7	6.0	4.5	2.1	10.4	4.6	12.1	9.8
20.0	11.7	3.8	1.9	5.3	1.5	6.1	4.1	1.9	9.9	4.4	11.6	9.5
21.0	11.6	3.5	1.6	4.6	1.3	6.1	3.8	1.7	9.5	4.3	11.2	9.1
22.0	11.5	3.2	1.3	4.0	1.2	6.2	3.5	1.5	9.1	4.1	10.8	8.8
23.0	11.4	3.0	1.0	3.4	1.0	6.2	3.2	1.4	8.7	3.9	10.4	8.4
24.0	11.2	2.7	0.8	3.0	0.9	6.2	3.0	1.2	8.3	3.8	10.0	8.1
25.0	11.1	2.5	0.7	2.5	0.8	6.2	2.7	1.1	7.9	3.6	9.6	7.7
26.0	10.9	2.3	0.5	2.2	0.7	6.3	2.5	1.0	7.6	3.5	9.2	7.4
27.0	10.7	2.1	0.4	1.9	0.6	6.3	2.3	0.9	7.2	3.3	8.8	7.1
28.0	10.6	1.9	0.3	1.6	0.5	6.3	2.1	0.8	6.9	3.2	8.4	6.8
29.0	10.4	1.8	0.3	1.4	0.4	6.3	1.9	0.7	6.5	3.0	8.0	6.5
30.0	10.2	1.6	0.2	1.2	0.4	6.3	1.7	0.6	6.2	2.9	7.7	6.2
31.0	10.1	1.5	0.2	1.0	0.3	6.3	1.6	0.5	5.9	2.8	7.4	5.9
32.0	9.9	1.4	0.1	0.9	0.3	6.3	1.5	0.5	5.6	2.7	7.0	5.7
33.0	9.7	1.3	0.1	0.8	0.3	6.3	1.3	0.4	5.3	2.5	6.7	5.4
34.0	9.5	1.2	0.1	0.7	0.2	6.3	1.2	0.4	5.1	2.4	6.4	5.2
35.0	9.4	1.1	0.1	0.6	0.2	6.3	1.1	0.3	4.8	2.3	6.1	4.9
36.0	9.2	1.0	0.1	0.5	0.2	6.3	1.0	0.3	4.5	2.2	5.8	4.7
37.0	9.0	0.9	0.0	0.4	0.1	6.2	0.9	0.3	4.3	2.1	5.6	4.5
38.0	8.8	0.8	0.0	0.4	0.1	6.2	0.8	0.2	4.1	2.0	5.3	4.3
39.0	8.6	0.7	0.0	0.3	0.1	6.2	0.8	0.2	3.9	1.9	5.1	4.0
40.0	8.5	0.7	0.0	0.3	0.1	6.2	0.7	0.2	3.7	1.8	4.8	3.9
41.0	8.3	0.6	0.0	0.2	0.1	6.2	0.6	0.2	3.5	1.7	4.6	3.7
42.0	8.1	0.6	0.0	0.2	0.1	6.1	0.6	0.1	3.3	1.6	4.4	3.5
43.0	7.9	0.5	0.0	0.2	0.1	6.1	0.5	0.1	3.1	1.6	4.2	3.3
44.0	7.8	0.5	0.0	0.1	0.1	6.1	0.5	0.1	2.9	1.5	4.0	3.2
45.0	7.6	0.4	0.0	0.1	0.0	6.0	0.4	0.1	2.8	1.4	3.8	3.0
46.0	7.4	0.4	0.0	0.1	0.0	6.0	0.4	0.1	2.6	1.3	3.6	2.9
47.0	7.3	0.4	0.0	0.1	0.0	6.0	0.4	0.1	2.5	1.3	3.4	2.7
48.0	7.1	0.3	0.0	0.1	0.0	5.9	0.3	0.1	2.4	1.2	3.2	2.6
49.0	6.9	0.3	0.0	0.1	0.0	5.9	0.3	0.1	2.2	1.2	3.1	2.4
50.0	6.8	0.3	0.0	0.1	0.0	5.9	0.3	0.1	2.1	1.1	2.9	2.3
51.0	6.6	0.2	0.0	0.0	0.0	5.8	0.2	0.0	2.0	1.0	2.8	2.2
52.0	6.5	0.2	0.0	0.0	0.0	5.8	0.2	0.0	1.9	1.0	2.6	2.1
53.0	6.3	0.2	0.0	0.0	0.0	5.8	0.2	0.0	1.8	0.9	2.5	2.0
54.0	6.2	0.2	0.0	0.0	0.0	5.7	0.2	0.0	1.7	0.9	2.4	1.9
55.0	6.0	0.2	0.0	0.0	0.0	5.7	0.2	0.0	1.6	0.8	2.3	1.8
56.0	5.9	0.2	0.0	0.0	0.0	5.7	0.1	0.0	1.5	0.8	2.1	1.7
57.0	5.7	0.1	0.0	0.0	0.0	5.6	0.1	0.0	1.4	0.8	2.0	1.6
58.0	5.6	0.1	0.0	0.0	0.0	5.6	0.1	0.0	1.3	0.7	1.9	1.5
59.0	5.5	0.1	0.0	0.0	0.0	5.5	0.1	0.0	1.3	0.7	1.8	1.4
60.0	5.3	0.1	0.0	0.0	0.0	5.5	0.1	0.0	1.2	0.6	1.7	1.4
61.0	5.2	0.1	0.0	0.0	0.0	5.4	0.1	0.0	1.1	0.6	1.6	1.3
62.0	5.1	0.1	0.0	0.0	0.0	5.4	0.1	0.0	1.1	0.6	1.6	1.2
63.0	5.0	0.1	0.0	0.0	0.0	5.4	0.1	0.0	1.0	0.6	1.5	1.2
64.0	4.8	0.1	0.0	0.0	0.0	5.3	0.1	0.0	0.9	0.5	1.4	1.1
65.0	4.7	0.1	0.0	0.0	0.0	5.3	0.1	0.0	0.9	0.5	1.3	1.0
66.0	4.6	0.1	0.0	0.0	0.0	5.2	0.1	0.0	0.8	0.5	1.3	1.0
67.0	4.5	0.1	0.0	0.0	0.0	5.2	0.1	0.0	0.8	0.4	1.2	0.9
68.0	4.4	0.0	0.0	0.0	0.0	5.1	0.0	0.0	0.7	0.4	1.1	0.9
69.0	4.3	0.0	0.0	0.0	0.0	5.1	0.0	0.0	0.7	0.4	1.1	0.8
70.0	4.1	0.0	0.0	0.0	0.0	5.1	0.0	0.0	0.7	0.4	1.0	0.8
71.0	4.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.6	0.4	1.0	0.8
72.0	3.9	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.6	0.3	0.9	0.7
73.0	3.8	0.0	0.0	0.0	0.0	4.9	0.0	0.0	0.6	0.3	0.9	0.7
74.0	3.7	0.0	0.0	0.0	0.0	4.9	0.0	0.0	0.5	0.3	0.8	0.6
75.0	3.6	0.0	0.0	0.0	0.0	4.8	0.0	0.0	0.5	0.3	0.8	0.6
76.0	3.5	0.0	0.0	0.0	0.0	4.8	0.0	0.0	0.5	0.3	0.7	0.6

Time	NM-102-02	NM-103-A	NM-103-B	NM-103-C	NM-103-D	NM-104	NM-105-A	NM-105-B	NM-105-C	NM-105-D	NM-106-A	NM-107-A
DA (SM)	1.1562	0.2821	0.4730	0.6396	0.1724	1.2779	0.3122	0.1764	0.6769	0.3072	0.8088	0.6553
PRF	150	150	201	171	150	150	150	150	150	150	150	150
Tc (hr)	23.13	6.74	4.22	4.77	4.21	49.91	6.55	5.04	10.98	11.96	12.07	11.91
Tlag (hr)	13.88	4.04	2.53	2.86	2.53	29.95	3.93	3.03	6.59	7.18	7.24	7.15
Drecom (hr)	3.08	0.90	0.56	0.63	0.56	6.64	0.87	0.67	1.46	1.59	1.61	1.58
Dmax (hr)	3.93	1.15	0.72	0.81	0.72	8.49	1.11	0.86	1.87	2.03	2.05	2.03
Dchosen (hr)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Φ	0.23	0.23	0.31	0.26	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
α	0.47	0.47	0.75	0.57	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Tp (hr)	14.38	4.54	3.03	3.36	3.03	30.45	4.43	3.53	7.09	7.68	7.74	7.65
Qp	12.06	9.31	31.32	32.48	8.54	6.30	10.57	7.50	14.33	6.00	15.67	12.85
TIME (HR)												
77.0	3.5	0.0	0.0	0.0	0.0	4.8	0.0	0.0	0.4	0.3	0.7	0.5
78.0	3.4	0.0	0.0	0.0	0.0	4.7	0.0	0.0	0.4	0.2	0.7	0.5
79.0	3.3	0.0	0.0	0.0	0.0	4.7	0.0	0.0	0.4	0.2	0.6	0.5
80.0	3.2	0.0	0.0	0.0	0.0	4.6	0.0	0.0	0.4	0.2	0.6	0.5
81.0	3.1	0.0	0.0	0.0	0.0	4.6	0.0	0.0	0.3	0.2	0.6	0.4
82.0	3.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0	0.3	0.2	0.5	0.4
83.0	2.9	0.0	0.0	0.0	0.0	4.5	0.0	0.0	0.3	0.2	0.5	0.4
84.0	2.9	0.0	0.0	0.0	0.0	4.4	0.0	0.0	0.3	0.2	0.5	0.4
85.0	2.8	0.0	0.0	0.0	0.0	4.4	0.0	0.0	0.3	0.2	0.5	0.4
86.0	2.7	0.0	0.0	0.0	0.0	4.4	0.0	0.0	0.3	0.2	0.4	0.3
87.0	2.6	0.0	0.0	0.0	0.0	4.3	0.0	0.0	0.2	0.1	0.4	0.3
88.0	2.6	0.0	0.0	0.0	0.0	4.3	0.0	0.0	0.2	0.1	0.4	0.3
89.0	2.5	0.0	0.0	0.0	0.0	4.2	0.0	0.0	0.2	0.1	0.4	0.3
90.0	2.4	0.0	0.0	0.0	0.0	4.2	0.0	0.0	0.2	0.1	0.3	0.3
91.0	2.4	0.0	0.0	0.0	0.0	4.1	0.0	0.0	0.2	0.1	0.3	0.3
92.0	2.3	0.0	0.0	0.0	0.0	4.1	0.0	0.0	0.2	0.1	0.3	0.2
93.0	2.2	0.0	0.0	0.0	0.0	4.1	0.0	0.0	0.2	0.1	0.3	0.2
94.0	2.2	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.2	0.1	0.3	0.2
95.0	2.1	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.1	0.1	0.3	0.2
96.0	2.1	0.0	0.0	0.0	0.0	3.9	0.0	0.0	0.1	0.1	0.2	0.2
97.0	2.0	0.0	0.0	0.0	0.0	3.9	0.0	0.0	0.1	0.1	0.2	0.2
98.0	2.0	0.0	0.0	0.0	0.0	3.9	0.0	0.0	0.1	0.1	0.2	0.2
99.0	1.9	0.0	0.0	0.0	0.0	3.8	0.0	0.0	0.1	0.1	0.2	0.2
100.0	1.8	0.0	0.0	0.0	0.0	3.8	0.0	0.0	0.1	0.1	0.2	0.2
101.0	1.8	0.0	0.0	0.0	0.0	3.7	0.0	0.0	0.1	0.1	0.2	0.1
102.0	1.7	0.0	0.0	0.0	0.0	3.7	0.0	0.0	0.1	0.1	0.2	0.1
103.0	1.7	0.0	0.0	0.0	0.0	3.7	0.0	0.0	0.1	0.1	0.2	0.1
104.0	1.7	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.1	0.1	0.2	0.1
105.0	1.6	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.1	0.1	0.1	0.1
106.0	1.6	0.0	0.0	0.0	0.0	3.5	0.0	0.0	0.1	0.1	0.1	0.1
107.0	1.5	0.0	0.0	0.0	0.0	3.5	0.0	0.0	0.1	0.0	0.1	0.1
108.0	1.5	0.0	0.0	0.0	0.0	3.5	0.0	0.0	0.1	0.0	0.1	0.1
109.0	1.4	0.0	0.0	0.0	0.0	3.4	0.0	0.0	0.1	0.0	0.1	0.1
110.0	1.4	0.0	0.0	0.0	0.0	3.4	0.0	0.0	0.1	0.0	0.1	0.1
111.0	1.4	0.0	0.0	0.0	0.0	3.3	0.0	0.0	0.1	0.0	0.1	0.1
112.0	1.3	0.0	0.0	0.0	0.0	3.3	0.0	0.0	0.1	0.0	0.1	0.1
113.0	1.3	0.0	0.0	0.0	0.0	3.3	0.0	0.0	0.0	0.0	0.1	0.1
114.0	1.2	0.0	0.0	0.0	0.0	3.2	0.0	0.0	0.0	0.0	0.1	0.1
115.0	1.2	0.0	0.0	0.0	0.0	3.2	0.0	0.0	0.0	0.0	0.1	0.1
116.0	1.2	0.0	0.0	0.0	0.0	3.2	0.0	0.0	0.0	0.0	0.1	0.1
117.0	1.1	0.0	0.0	0.0	0.0	3.1	0.0	0.0	0.0	0.0	0.1	0.1
118.0	1.1	0.0	0.0	0.0	0.0	3.1	0.0	0.0	0.0	0.0	0.1	0.1
119.0	1.1	0.0	0.0	0.0	0.0	3.1	0.0	0.0	0.0	0.0	0.1	0.1
120.0	1.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.1	0.0
121.0	1.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.1	0.0
122.0	1.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.1	0.0
123.0	1.0	0.0	0.0	0.0	0.0	2.9	0.0	0.0	0.0	0.0	0.1	0.0
124.0	0.9	0.0	0.0	0.0	0.0	2.9	0.0	0.0	0.0	0.0	0.1	0.0
125.0	0.9	0.0	0.0	0.0	0.0	2.9	0.0	0.0	0.0	0.0	0.0	0.0
126.0	0.9	0.0	0.0	0.0	0.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0
127.0	0.9	0.0	0.0	0.0	0.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0
128.0	0.8	0.0	0.0	0.0	0.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0
129.0	0.8	0.0	0.0	0.0	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0
130.0	0.8	0.0	0.0	0.0	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0
131.0	0.8	0.0	0.0	0.0	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0
132.0	0.7	0.0	0.0	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0
133.0	0.7	0.0	0.0	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0
134.0	0.7	0.0	0.0	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0
135.0	0.7	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0
136.0	0.7	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0
137.0	0.6	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0
138.0	0.6	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0
139.0	0.6	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0
140.0	0.6	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0
141.0	0.6	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0
142.0	0.6	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0
143.0	0.5	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0
144.0	0.5	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0
145.0	0.5	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0
146.0	0.5	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0
147.0	0.5	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0
148.0	0.5	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0
149.0	0.5	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0
150.0	0.4	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0
151.0	0.4	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0
152.0	0.4	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0
153.0	0.4	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
154.0	0.4	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
155.0	0.4	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
156.0	0.4	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0

Time	NM-107-B	NM-107-C	NM-107-D	NM-107-E	NM-107-04	NM-107-05	NM-108-A	NM-108-B	NM-109-A	NM-110-A	NM-110-B	NM-110-C
DA (SM)	0.7216	2.3060	1.2296	0.5503	4.2987	0.5618	0.1402	0.6832	0.2075	0.7444	0.7630	0.6230
PRF	150	150	150	150	150	150	201	150	150	150	150	150
Tc (hr)	12.88	34.62	12.95	7.06	27.44	10.84	2.36	25.90	3.57	10.28	9.78	14.30
Tlag (hr)	7.73	20.77	7.77	4.24	16.46	6.50	1.42	15.54	2.14	6.17	5.87	8.58
Drecom (hr)	1.71	4.61	1.72	0.94	3.65	1.44	0.31	3.45	0.48	1.37	1.30	1.90
Dmax (hr)	2.19	5.89	2.20	1.20	4.66	1.84	0.40	4.40	0.61	1.75	1.66	2.43
Dchosen (hr)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Φ	0.23	0.23	0.23	0.23	0.23	0.23	0.31	0.23	0.23	0.23	0.23	0.23
α	0.47	0.47	0.47	0.47	0.47	0.47	0.75	0.47	0.47	0.47	0.47	0.47
Tp (hr)	8.23	21.27	8.27	4.74	16.96	7.00	1.92	16.04	2.64	6.67	6.37	9.08
Qp	13.15	16.26	22.31	17.43	38.01	12.03	14.72	6.39	11.77	16.74	17.98	10.30
TIME (HR)												
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.0	7.4	6.1	12.5	12.2	15.7	7.2	12.9	2.7	10.0	10.3	11.2	5.6
2.0	9.7	8.2	16.4	15.3	21.1	9.4	14.7	3.6	11.6	13.2	14.4	7.3
3.0	11.0	9.7	18.7	16.7	24.8	10.6	13.5	4.3	11.7	14.9	16.2	8.4
4.0	11.9	10.9	20.2	17.3	27.7	11.3	11.3	4.7	11.2	15.9	17.2	9.1
5.0	12.5	11.8	21.2	17.4	29.9	11.7	9.0	5.1	10.5	16.5	17.8	9.6
6.0	12.9	12.6	21.8	17.2	31.6	12.0	7.0	5.4	9.5	16.7	18.0	9.9
7.0	13.1	13.2	22.2	16.7	33.1	12.0	5.3	5.6	8.6	16.7	17.9	10.1
8.0	13.2	13.8	22.3	16.1	34.2	12.0	3.9	5.8	7.7	16.6	17.7	10.3
9.0	13.1	14.2	22.3	15.4	35.2	11.8	2.9	6.0	6.8	16.4	17.4	10.3
10.0	13.0	14.6	22.1	14.7	36.0	11.6	2.1	6.1	6.0	16.0	17.0	10.3
11.0	12.9	15.0	21.8	13.9	36.6	11.4	1.5	6.2	5.2	15.6	16.5	10.2
12.0	12.7	15.3	21.5	13.1	37.1	11.1	1.1	6.3	4.6	15.2	16.0	10.1
13.0	12.4	15.5	21.1	12.4	37.4	10.8	0.8	6.3	4.0	14.7	15.4	9.9
14.0	12.1	15.7	20.6	11.6	37.7	10.4	0.6	6.4	3.4	14.2	14.8	9.8
15.0	11.9	15.8	20.1	10.8	37.9	10.1	0.4	6.4	3.0	13.6	14.2	9.6
16.0	11.5	16.0	19.6	10.1	38.0	9.7	0.3	6.4	2.6	13.1	13.6	9.4
17.0	11.2	16.1	19.1	9.4	38.0	9.3	0.2	6.4	2.2	12.6	13.0	9.2
18.0	10.9	16.2	18.5	8.8	38.0	9.0	0.1	6.4	1.9	12.0	12.4	9.0
19.0	10.5	16.2	17.9	8.2	37.9	8.6	0.1	6.3	1.6	11.5	11.9	8.7
20.0	10.2	16.2	17.4	7.6	37.8	8.3	0.1	6.3	1.4	11.0	11.3	8.5
21.0	9.9	16.3	16.8	7.0	37.6	7.9	0.0	6.3	1.2	10.5	10.7	8.2
22.0	9.5	16.3	16.2	6.5	37.4	7.6	0.0	6.2	1.0	10.0	10.2	8.0
23.0	9.2	16.2	15.6	6.0	37.1	7.2	0.0	6.2	0.9	9.5	9.7	7.8
24.0	8.9	16.2	15.1	5.6	36.8	6.9	0.0	6.1	0.8	9.0	9.2	7.5
25.0	8.5	16.2	14.5	5.1	36.5	6.6	0.0	6.1	0.6	8.6	8.7	7.3
26.0	8.2	16.1	14.0	4.7	36.2	6.3	0.0	6.0	0.6	8.2	8.2	7.0
27.0	7.9	16.0	13.4	4.4	35.8	6.0	0.0	5.9	0.5	7.7	7.8	6.8
28.0	7.6	15.9	12.9	4.0	35.4	5.7	0.0	5.8	0.4	7.3	7.3	6.6
29.0	7.3	15.9	12.4	3.7	35.1	5.4	0.0	5.8	0.3	7.0	6.9	6.4
30.0	7.0	15.8	11.9	3.4	34.6	5.1	0.0	5.7	0.3	6.6	6.5	6.1
31.0	6.7	15.7	11.4	3.1	34.2	4.9	0.0	5.6	0.2	6.2	6.2	5.9
32.0	6.4	15.5	11.0	2.9	33.8	4.6	0.0	5.5	0.2	5.9	5.8	5.7
33.0	6.2	15.4	10.5	2.7	33.4	4.4	0.0	5.5	0.2	5.6	5.5	5.5
34.0	5.9	15.3	10.1	2.4	32.9	4.2	0.0	5.4	0.2	5.3	5.2	5.3
35.0	5.7	15.2	9.7	2.2	32.4	3.9	0.0	5.3	0.1	5.0	4.9	5.1
36.0	5.4	15.0	9.2	2.1	32.0	3.7	0.0	5.2	0.1	4.7	4.6	4.9
37.0	5.2	14.9	8.9	1.9	31.5	3.5	0.0	5.1	0.1	4.4	4.3	4.7
38.0	5.0	14.8	8.5	1.7	31.0	3.4	0.0	5.0	0.1	4.2	4.1	4.5
39.0	4.7	14.6	8.1	1.6	30.6	3.2	0.0	5.0	0.1	4.0	3.8	4.4
40.0	4.5	14.5	7.7	1.5	30.1	3.0	0.0	4.9	0.1	3.7	3.6	4.2
41.0	4.3	14.3	7.4	1.3	29.6	2.8	0.0	4.8	0.0	3.5	3.4	4.0
42.0	4.1	14.2	7.1	1.2	29.1	2.7	0.0	4.7	0.0	3.3	3.2	3.9
43.0	4.0	14.0	6.8	1.1	28.7	2.5	0.0	4.6	0.0	3.1	3.0	3.7
44.0	3.8	13.9	6.5	1.0	28.2	2.4	0.0	4.5	0.0	3.0	2.8	3.6
45.0	3.6	13.7	6.2	0.9	27.7	2.3	0.0	4.4	0.0	2.8	2.6	3.4
46.0	3.4	13.5	5.9	0.9	27.2	2.1	0.0	4.4	0.0	2.6	2.5	3.3
47.0	3.3	13.4	5.6	0.8	26.7	2.0	0.0	4.3	0.0	2.5	2.3	3.1
48.0	3.1	13.2	5.4	0.7	26.3	1.9	0.0	4.2	0.0	2.3	2.2	3.0
49.0	3.0	13.1	5.1	0.7	25.8	1.8	0.0	4.1	0.0	2.2	2.0	2.9
50.0	2.8	12.9	4.9	0.6	25.3	1.7	0.0	4.0	0.0	2.1	1.9	2.8
51.0	2.7	12.7	4.7	0.5	24.9	1.6	0.0	4.0	0.0	1.9	1.8	2.7
52.0	2.6	12.6	4.4	0.5	24.4	1.5	0.0	3.9	0.0	1.8	1.7	2.6
53.0	2.5	12.4	4.2	0.5	24.0	1.4	0.0	3.8	0.0	1.7	1.6	2.4
54.0	2.4	12.2	4.0	0.4	23.5	1.4	0.0	3.7	0.0	1.6	1.5	2.3
55.0	2.2	12.1	3.9	0.4	23.1	1.3	0.0	3.7	0.0	1.5	1.4	2.2
56.0	2.1	11.9	3.7	0.4	22.7	1.2	0.0	3.6	0.0	1.4	1.3	2.2
57.0	2.0	11.8	3.5	0.3	22.2	1.1	0.0	3.5	0.0	1.3	1.2	2.1
58.0	1.9	11.6	3.3	0.3	21.8	1.1	0.0	3.4	0.0	1.3	1.1	2.0
59.0	1.8	11.4	3.2	0.3	21.4	1.0	0.0	3.4	0.0	1.2	1.1	1.9
60.0	1.8	11.3	3.0	0.2	21.0	1.0	0.0	3.3	0.0	1.1	1.0	1.8
61.0	1.7	11.1	2.9	0.2	20.5	0.9	0.0	3.2	0.0	1.0	0.9	1.7
62.0	1.6	11.0	2.7	0.2	20.1	0.8	0.0	3.1	0.0	1.0	0.9	1.7
63.0	1.5	10.8	2.6	0.2	19.7	0.8	0.0	3.1	0.0	0.9	0.8	1.6
64.0	1.4	10.6	2.5	0.2	19.3	0.8	0.0	3.0	0.0	0.9	0.8	1.5
65.0	1.4	10.5	2.4	0.2	19.0	0.7	0.0	2.9	0.0	0.8	0.7	1.5
66.0	1.3	10.3	2.3	0.1	18.6	0.7	0.0	2.9	0.0	0.8	0.7	1.4
67.0	1.2	10.2	2.1	0.1	18.2	0.6	0.0	2.8	0.0	0.7	0.6	1.3
68.0	1.2	10.0	2.0	0.1	17.8	0.6	0.0	2.8	0.0	0.7	0.6	1.3
69.0	1.1	9.9	1.9	0.1	17.5	0.6	0.0	2.7	0.0	0.6	0.6	1.2
70.0	1.1	9.7	1.8	0.1	17.1	0.5	0.0	2.6	0.0	0.6	0.5	1.2
71.0	1.0	9.6	1.8	0.1	16.7	0.5	0.0	2.6	0.0	0.6	0.5	1.1
72.0	1.0	9.4	1.7	0.1	16.4	0.5	0.0	2.5	0.0	0.5	0.5	1.1
73.0	0.9	9.3	1.6	0.1	16.1	0.4	0.0	2.5	0.0	0.5	0.4	1.0
74.0	0.9	9.1	1.5	0.1	15.7	0.4	0.0	2.4	0.0	0.5	0.4	1.0
75.0	0.8	9.0	1.4	0.1	15.4	0.4	0.0	2.4	0.0	0.4	0.4	0.9
76.0	0.8	8.9	1.4	0.1	15.1	0.4	0.0	2.3	0.0	0.4	0.3	0.9

Time	NM-107-B	NM-107-C	NM-107-D	NM-107-E	NM-107-04	NM-107-05	NM-108-A	NM-108-B	NM-109-A	NM-110-A	NM-110-B	NM-110-C
DA (SM)	0.7216	2.3060	1.2296	0.5503	4.2987	0.5618	0.1402	0.6832	0.2075	0.7444	0.7630	0.6230
PRF	150	150	150	150	150	150	201	150	150	150	150	150
Tc (hr)	12.88	34.62	12.95	7.06	27.44	10.84	2.36	25.90	3.57	10.28	9.78	14.30
Tlag (hr)	7.73	20.77	7.77	4.24	16.46	6.50	1.42	15.54	2.14	6.17	5.87	8.58
Drecom (hr)	1.71	4.61	1.72	0.94	3.65	1.44	0.31	3.45	0.48	1.37	1.30	1.90
Dmax (hr)	2.19	5.89	2.20	1.20	4.66	1.84	0.40	4.40	0.61	1.75	1.66	2.43
Dchosen (hr)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Φ	0.23	0.23	0.23	0.23	0.23	0.23	0.31	0.23	0.23	0.23	0.23	0.23
α	0.47	0.47	0.47	0.47	0.47	0.47	0.75	0.47	0.47	0.47	0.47	0.47
Tp (hr)	8.23	21.27	8.27	4.74	16.96	7.00	1.92	16.04	2.64	6.67	6.37	9.08
Qp	13.15	16.26	22.31	17.43	38.01	12.03	14.72	6.39	11.77	16.74	17.98	10.30
TIME (HR)												
77.0	0.8	8.7	1.3	0.1	14.7	0.3	0.0	2.3	0.0	0.4	0.3	0.8
78.0	0.7	8.6	1.2	0.0	14.4	0.3	0.0	2.2	0.0	0.4	0.3	0.8
79.0	0.7	8.4	1.2	0.0	14.1	0.3	0.0	2.1	0.0	0.3	0.3	0.8
80.0	0.6	8.3	1.1	0.0	13.8	0.3	0.0	2.1	0.0	0.3	0.3	0.7
81.0	0.6	8.2	1.1	0.0	13.5	0.3	0.0	2.1	0.0	0.3	0.2	0.7
82.0	0.6	8.0	1.0	0.0	13.2	0.3	0.0	2.0	0.0	0.3	0.2	0.7
83.0	0.6	7.9	1.0	0.0	12.9	0.2	0.0	2.0	0.0	0.3	0.2	0.6
84.0	0.5	7.8	0.9	0.0	12.7	0.2	0.0	1.9	0.0	0.2	0.2	0.6
85.0	0.5	7.7	0.9	0.0	12.4	0.2	0.0	1.9	0.0	0.2	0.2	0.6
86.0	0.5	7.5	0.8	0.0	12.1	0.2	0.0	1.8	0.0	0.2	0.2	0.6
87.0	0.5	7.4	0.8	0.0	11.8	0.2	0.0	1.8	0.0	0.2	0.2	0.5
88.0	0.4	7.3	0.7	0.0	11.6	0.2	0.0	1.7	0.0	0.2	0.2	0.5
89.0	0.4	7.2	0.7	0.0	11.3	0.2	0.0	1.7	0.0	0.2	0.1	0.5
90.0	0.4	7.0	0.7	0.0	11.1	0.2	0.0	1.7	0.0	0.2	0.1	0.5
91.0	0.4	6.9	0.6	0.0	10.8	0.1	0.0	1.6	0.0	0.2	0.1	0.4
92.0	0.3	6.8	0.6	0.0	10.6	0.1	0.0	1.6	0.0	0.1	0.1	0.4
93.0	0.3	6.7	0.6	0.0	10.4	0.1	0.0	1.5	0.0	0.1	0.1	0.4
94.0	0.3	6.6	0.5	0.0	10.1	0.1	0.0	1.5	0.0	0.1	0.1	0.4
95.0	0.3	6.5	0.5	0.0	9.9	0.1	0.0	1.5	0.0	0.1	0.1	0.4
96.0	0.3	6.4	0.5	0.0	9.7	0.1	0.0	1.4	0.0	0.1	0.1	0.4
97.0	0.3	6.3	0.5	0.0	9.5	0.1	0.0	1.4	0.0	0.1	0.1	0.3
98.0	0.3	6.2	0.4	0.0	9.2	0.1	0.0	1.4	0.0	0.1	0.1	0.3
99.0	0.2	6.0	0.4	0.0	9.0	0.1	0.0	1.3	0.0	0.1	0.1	0.3
100.0	0.2	5.9	0.4	0.0	8.8	0.1	0.0	1.3	0.0	0.1	0.1	0.3
101.0	0.2	5.8	0.4	0.0	8.6	0.1	0.0	1.3	0.0	0.1	0.1	0.3
102.0	0.2	5.7	0.4	0.0	8.4	0.1	0.0	1.2	0.0	0.1	0.1	0.3
103.0	0.2	5.6	0.3	0.0	8.2	0.1	0.0	1.2	0.0	0.1	0.1	0.3
104.0	0.2	5.5	0.3	0.0	8.1	0.1	0.0	1.2	0.0	0.1	0.1	0.2
105.0	0.2	5.4	0.3	0.0	7.9	0.1	0.0	1.2	0.0	0.1	0.0	0.2
106.0	0.2	5.4	0.3	0.0	7.7	0.1	0.0	1.1	0.0	0.1	0.0	0.2
107.0	0.2	5.3	0.3	0.0	7.5	0.1	0.0	1.1	0.0	0.1	0.0	0.2
108.0	0.2	5.2	0.3	0.0	7.3	0.1	0.0	1.1	0.0	0.1	0.0	0.2
109.0	0.1	5.1	0.3	0.0	7.2	0.0	0.0	1.0	0.0	0.0	0.0	0.2
110.0	0.1	5.0	0.2	0.0	7.0	0.0	0.0	1.0	0.0	0.0	0.0	0.2
111.0	0.1	4.9	0.2	0.0	6.8	0.0	0.0	1.0	0.0	0.0	0.0	0.2
112.0	0.1	4.8	0.2	0.0	6.7	0.0	0.0	1.0	0.0	0.0	0.0	0.2
113.0	0.1	4.7	0.2	0.0	6.5	0.0	0.0	0.9	0.0	0.0	0.0	0.2
114.0	0.1	4.6	0.2	0.0	6.4	0.0	0.0	0.9	0.0	0.0	0.0	0.2
115.0	0.1	4.6	0.2	0.0	6.2	0.0	0.0	0.9	0.0	0.0	0.0	0.1
116.0	0.1	4.5	0.2	0.0	6.1	0.0	0.0	0.9	0.0	0.0	0.0	0.1
117.0	0.1	4.4	0.2	0.0	6.0	0.0	0.0	0.9	0.0	0.0	0.0	0.1
118.0	0.1	4.3	0.2	0.0	5.8	0.0	0.0	0.8	0.0	0.0	0.0	0.1
119.0	0.1	4.2	0.1	0.0	5.7	0.0	0.0	0.8	0.0	0.0	0.0	0.1
120.0	0.1	4.2	0.1	0.0	5.5	0.0	0.0	0.8	0.0	0.0	0.0	0.1
121.0	0.1	4.1	0.1	0.0	5.4	0.0	0.0	0.8	0.0	0.0	0.0	0.1
122.0	0.1	4.0	0.1	0.0	5.3	0.0	0.0	0.8	0.0	0.0	0.0	0.1
123.0	0.1	3.9	0.1	0.0	5.2	0.0	0.0	0.7	0.0	0.0	0.0	0.1
124.0	0.1	3.9	0.1	0.0	5.0	0.0	0.0	0.7	0.0	0.0	0.0	0.1
125.0	0.1	3.8	0.1	0.0	4.9	0.0	0.0	0.7	0.0	0.0	0.0	0.1
126.0	0.1	3.7	0.1	0.0	4.8	0.0	0.0	0.7	0.0	0.0	0.0	0.1
127.0	0.1	3.7	0.1	0.0	4.7	0.0	0.0	0.7	0.0	0.0	0.0	0.1
128.0	0.1	3.6	0.1	0.0	4.6	0.0	0.0	0.6	0.0	0.0	0.0	0.1
129.0	0.0	3.5	0.1	0.0	4.5	0.0	0.0	0.6	0.0	0.0	0.0	0.1
130.0	0.0	3.5	0.1	0.0	4.4	0.0	0.0	0.6	0.0	0.0	0.0	0.1
131.0	0.0	3.4	0.1	0.0	4.3	0.0	0.0	0.6	0.0	0.0	0.0	0.1
132.0	0.0	3.3	0.1	0.0	4.2	0.0	0.0	0.6	0.0	0.0	0.0	0.1
133.0	0.0	3.3	0.1	0.0	4.1	0.0	0.0	0.6	0.0	0.0	0.0	0.1
134.0	0.0	3.2	0.1	0.0	4.0	0.0	0.0	0.6	0.0	0.0	0.0	0.1
135.0	0.0	3.2	0.1	0.0	3.9	0.0	0.0	0.5	0.0	0.0	0.0	0.1
136.0	0.0	3.1	0.1	0.0	3.8	0.0	0.0	0.5	0.0	0.0	0.0	0.1
137.0	0.0	3.1	0.1	0.0	3.7	0.0	0.0	0.5	0.0	0.0	0.0	0.1
138.0	0.0	3.0	0.1	0.0	3.6	0.0	0.0	0.5	0.0	0.0	0.0	0.0
139.0	0.0	2.9	0.1	0.0	3.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0
140.0	0.0	2.9	0.0	0.0	3.4	0.0	0.0	0.5	0.0	0.0	0.0	0.0
141.0	0.0	2.8	0.0	0.0	3.4	0.0	0.0	0.5	0.0	0.0	0.0	0.0
142.0	0.0	2.8	0.0	0.0	3.3	0.0	0.0	0.5	0.0	0.0	0.0	0.0
143.0	0.0	2.7	0.0	0.0	3.2	0.0	0.0	0.4	0.0	0.0	0.0	0.0
144.0	0.0	2.7	0.0	0.0	3.1	0.0	0.0	0.4	0.0	0.0	0.0	0.0
145.0	0.0	2.6	0.0	0.0	3.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0
146.0	0.0	2.6	0.0	0.0	3.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0
147.0	0.0	2.5	0.0	0.0	2.9	0.0	0.0	0.4	0.0	0.0	0.0	0.0
148.0	0.0	2.5	0.0	0.0	2.8	0.0	0.0	0.4	0.0	0.0	0.0	0.0
149.0	0.0	2.4	0.0	0.0	2.8	0.0	0.0	0.4	0.0	0.0	0.0	0.0
150.0	0.0	2.4	0.0	0.0	2.7	0.0	0.0	0.4	0.0	0.0	0.0	0.0
151.0	0.0	2.3	0.0	0.0	2.6	0.0	0.0	0.4	0.0	0.0	0.0	0.0
152.0	0.0	2.3	0.0	0.0	2.6	0.0	0.0	0.3	0.0	0.0	0.0	0.0
153.0	0.0	2.3	0.0	0.0	2.5	0.0	0.0	0.3	0.0	0.0	0.0	0.0
154.0	0.0	2.2	0.0	0.0	2.4	0.0	0.0	0.3	0.0	0.0	0.0	0.0
155.0	0.0	2.2	0.0	0.0	2.4	0.0	0.0	0.3	0.0	0.0	0.0	0.0
156.0	0.0	2.1	0.0	0.0	2.3	0.0	0.0	0.3	0.0	0.0	0.0	0.0

Time	NM-111-A	NM-111-B	NM-111-C	NM-112-A	NM-113-A	NM-113-B	NM-113-C	NM-113-D	NM-113-E	NM-115-A	NM-115-B	NM-115-C
DA (SM)	0.1574	0.4651	0.2586	0.0735	0.1109	0.0542	0.2946	0.2168	0.2711	0.2868	1.0821	1.3656
PRF	189	150	150	150	243	150	150	150	150	168	161	194
Tc (hr)	2.37	5.28	3.09	2.47	1.75	1.41	4.19	9.35	5.03	3.91	7.86	6.44
Tlag (hr)	1.42	3.17	1.86	1.48	1.05	0.85	2.51	5.61	3.02	2.35	4.71	3.87
Drecom (hr)	0.32	0.70	0.41	0.33	0.23	0.19	0.56	1.24	0.67	0.52	1.05	0.86
Dmax (hr)	0.40	0.90	0.53	0.42	0.30	0.24	0.71	1.59	0.86	0.67	1.34	1.10
Dchosen (hr)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Φ	0.29	0.23	0.23	0.23	0.38	0.23	0.23	0.23	0.23	0.26	0.25	0.30
α	0.68	0.47	0.47	0.47	1.05	0.47	0.47	0.47	0.47	0.56	0.53	0.71
Tp (hr)	1.92	3.67	2.36	1.98	1.55	1.35	3.01	6.11	3.52	2.85	5.21	4.37
Qp	15.47	19.02	16.50	5.56	17.40	6.05	14.68	5.32	11.55	16.91	33.50	60.70
TIME (HR)												
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.0	13.7	14.6	14.5	5.1	15.9	5.9	12.0	3.4	9.0	13.5	21.5	36.9
2.0	15.5	17.7	16.4	5.6	16.8	5.8	14.2	4.3	10.9	16.4	28.0	51.2
3.0	14.3	18.9	16.3	5.3	13.1	5.0	14.7	4.8	11.5	16.9	31.3	58.1
4.0	12.2	19.0	15.2	4.8	9.0	4.0	14.4	5.1	11.5	16.3	32.9	60.5
5.0	10.0	18.6	13.9	4.2	5.8	3.1	13.7	5.3	11.2	15.2	33.5	60.3
6.0	7.9	17.8	12.4	3.6	3.6	2.4	12.7	5.3	10.7	13.8	33.3	58.3
7.0	6.2	16.8	10.9	3.1	2.1	1.8	11.7	5.3	10.0	12.4	32.7	55.3
8.0	4.8	15.8	9.5	2.6	1.3	1.4	10.7	5.2	9.4	11.0	31.7	51.7
9.0	3.6	14.7	8.2	2.2	0.7	1.0	9.7	5.1	8.7	9.6	30.5	47.7
10.0	2.7	13.6	7.1	1.8	0.4	0.8	8.7	5.0	8.0	8.4	29.1	43.7
11.0	2.0	12.5	6.1	1.5	0.2	0.6	7.8	4.8	7.3	7.3	27.7	39.8
12.0	1.5	11.4	5.2	1.2	0.1	0.4	6.9	4.7	6.6	6.3	26.2	36.0
13.0	1.1	10.5	4.4	1.0	0.1	0.3	6.2	4.5	6.0	5.4	24.7	32.3
14.0	0.8	9.5	3.7	0.8	0.0	0.2	5.5	4.3	5.5	4.6	23.2	29.0
15.0	0.6	8.7	3.2	0.7	0.0	0.2	4.8	4.1	5.0	3.9	21.8	25.9
16.0	0.5	7.9	2.7	0.5	0.0	0.1	4.3	3.9	4.5	3.4	20.4	23.0
17.0	0.3	7.1	2.3	0.4	0.0	0.1	3.8	3.7	4.0	2.8	19.0	20.4
18.0	0.2	6.4	1.9	0.4	0.0	0.1	3.3	3.6	3.6	2.4	17.7	18.1
19.0	0.2	5.8	1.6	0.3	0.0	0.0	2.9	3.4	3.3	2.0	16.5	16.0
20.0	0.1	5.2	1.3	0.2	0.0	0.0	2.5	3.2	2.9	1.7	15.3	14.1
21.0	0.1	4.7	1.1	0.2	0.0	0.0	2.2	3.0	2.6	1.5	14.2	12.4
22.0	0.1	4.2	0.9	0.2	0.0	0.0	1.9	2.9	2.3	1.2	13.2	10.9
23.0	0.0	3.8	0.8	0.1	0.0	0.0	1.7	2.7	2.1	1.0	12.2	9.5
24.0	0.0	3.4	0.7	0.1	0.0	0.0	1.5	2.6	1.9	0.9	11.3	8.4
25.0	0.0	3.1	0.5	0.1	0.0	0.0	1.3	2.4	1.7	0.7	10.4	7.3
26.0	0.0	2.8	0.5	0.1	0.0	0.0	1.1	2.3	1.5	0.6	9.6	6.4
27.0	0.0	2.5	0.4	0.1	0.0	0.0	1.0	2.2	1.3	0.5	8.9	5.6
28.0	0.0	2.2	0.3	0.0	0.0	0.0	0.9	2.0	1.2	0.4	8.2	4.9
29.0	0.0	2.0	0.3	0.0	0.0	0.0	0.7	1.9	1.0	0.4	7.5	4.2
30.0	0.0	1.8	0.2	0.0	0.0	0.0	0.7	1.8	0.9	0.3	6.9	3.7
31.0	0.0	1.6	0.2	0.0	0.0	0.0	0.6	1.7	0.8	0.3	6.4	3.2
32.0	0.0	1.4	0.2	0.0	0.0	0.0	0.5	1.6	0.7	0.2	5.8	2.8
33.0	0.0	1.3	0.1	0.0	0.0	0.0	0.4	1.5	0.7	0.2	5.4	2.4
34.0	0.0	1.1	0.1	0.0	0.0	0.0	0.4	1.4	0.6	0.1	4.9	2.1
35.0	0.0	1.0	0.1	0.0	0.0	0.0	0.3	1.3	0.5	0.1	4.5	1.8
36.0	0.0	0.9	0.1	0.0	0.0	0.0	0.3	1.2	0.5	0.1	4.2	1.6
37.0	0.0	0.8	0.1	0.0	0.0	0.0	0.2	1.2	0.4	0.1	3.8	1.4
38.0	0.0	0.7	0.1	0.0	0.0	0.0	0.2	1.1	0.4	0.1	3.5	1.2
39.0	0.0	0.6	0.0	0.0	0.0	0.0	0.2	1.0	0.3	0.1	3.2	1.0
40.0	0.0	0.6	0.0	0.0	0.0	0.0	0.2	1.0	0.3	0.1	2.9	0.9
41.0	0.0	0.5	0.0	0.0	0.0	0.0	0.1	0.9	0.3	0.0	2.7	0.8
42.0	0.0	0.4	0.0	0.0	0.0	0.0	0.1	0.8	0.2	0.0	2.5	0.7
43.0	0.0	0.4	0.0	0.0	0.0	0.0	0.1	0.8	0.2	0.0	2.3	0.6
44.0	0.0	0.4	0.0	0.0	0.0	0.0	0.1	0.7	0.2	0.0	2.1	0.5
45.0	0.0	0.3	0.0	0.0	0.0	0.0	0.1	0.7	0.2	0.0	1.9	0.4
46.0	0.0	0.3	0.0	0.0	0.0	0.0	0.1	0.6	0.1	0.0	1.7	0.4
47.0	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.6	0.1	0.0	1.6	0.3
48.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.6	0.1	0.0	1.4	0.3
49.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.5	0.1	0.0	1.3	0.2
50.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.5	0.1	0.0	1.2	0.2
51.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.5	0.1	0.0	1.1	0.2
52.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.4	0.1	0.0	1.0	0.2
53.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.4	0.1	0.0	0.9	0.1
54.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.4	0.1	0.0	0.8	0.1
55.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.8	0.1
56.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.7	0.1
57.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.6	0.1
58.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.6	0.1
59.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.5	0.1
60.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.5	0.0
61.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.4	0.0
62.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.4	0.0
63.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.4	0.0
64.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.3	0.0
65.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.3	0.0
66.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.3	0.0
67.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.3	0.0
68.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.0
69.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.0
70.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.0
71.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.0
72.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.0
73.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0
74.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0
75.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0
76.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0

Time	NM-111-A	NM-111-B	NM-111-C	NM-112-A	NM-113-A	NM-113-B	NM-113-C	NM-113-D	NM-113-E	NM-115-A	NM-115-B	NM-115-C
DA (SM)	0.1574	0.4651	0.2586	0.0735	0.1109	0.0542	0.2946	0.2168	0.2711	0.2868	1.0821	1.3656
PRF	189	150	150	150	243	150	150	150	150	168	161	194
Tc (hr)	2.37	5.28	3.09	2.47	1.75	1.41	4.19	9.35	5.03	3.91	7.86	6.44
Tlag (hr)	1.42	3.17	1.86	1.48	1.05	0.85	2.51	5.61	3.02	2.35	4.71	3.87
Drecom (hr)	0.32	0.70	0.41	0.33	0.23	0.19	0.56	1.24	0.67	0.52	1.05	0.86
Dmax (hr)	0.40	0.90	0.53	0.42	0.30	0.24	0.71	1.59	0.86	0.67	1.34	1.10
Dchosen (hr)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Φ	0.29	0.23	0.23	0.23	0.38	0.23	0.23	0.23	0.23	0.26	0.25	0.30
α	0.68	0.47	0.47	0.47	1.05	0.47	0.47	0.47	0.47	0.56	0.53	0.71
Tp (hr)	1.92	3.67	2.36	1.98	1.55	1.35	3.01	6.11	3.52	2.85	5.21	4.37
Qp	15.47	19.02	16.50	5.56	17.40	6.05	14.68	5.32	11.55	16.91	33.50	60.70
TIME (HR)												
77.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0
78.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0
79.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0
80.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0
81.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0
82.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0
83.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0
84.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
85.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
86.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
87.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
88.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
89.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
91.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
92.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
93.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
94.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
95.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
97.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
98.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
99.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
101.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
102.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
103.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
104.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
105.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
106.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
107.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
108.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
109.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
110.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
111.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
112.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
113.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
114.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
115.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
116.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
117.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
118.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
119.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
121.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
122.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
123.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
124.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
126.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
127.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
128.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
129.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
130.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
131.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
132.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
133.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
134.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
135.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
136.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
137.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
138.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
139.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
140.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
141.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
142.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
143.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
144.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
145.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
146.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
147.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
148.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
149.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
150.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
151.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
152.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
153.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
154.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
155.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
156.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Time	NM-115-D	NM-116-A	NM-116-B	NM-116-C	NM-117-A	NM-117-B	NM-118-A	NM-119-A	NM-121-A	NM-131-A	W700	W710
DA (SM)	0.9664	0.1453	0.2213	0.0857	0.5308	3.1639	1.6544	5.4297	0.7407	0.4263	13.1060	1.1785
PRF	237	220	257	150	169	150	150	150	150	150	163	150
Tc (hr)	4.25	2.63	1.93	1.96	5.09	34.59	16.42	31.35	11.03	5.41	97.76	11.56
Tlag (hr)	2.55	1.58	1.16	1.18	3.05	20.76	9.85	18.81	6.62	3.25	58.66	6.93
Drecom (hr)	0.56	0.35	0.26	0.26	0.68	4.60	2.18	4.17	1.47	0.72	13.00	1.54
Dmax (hr)	0.72	0.45	0.33	0.33	0.87	5.88	2.79	5.33	1.88	0.92	16.62	1.96
Dchosen (hr)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Φ	0.37	0.34	0.40	0.23	0.26	0.23	0.23	0.23	0.23	0.23	0.25	0.23
α	1.00	0.88	1.15	0.47	0.57	0.47	0.47	0.47	0.47	0.47	0.53	0.47
Tp (hr)	3.05	2.08	1.66	1.68	3.55	21.26	10.35	19.31	7.12	3.75	59.16	7.43
Qp	75.06	15.40	34.32	7.66	25.25	22.33	23.98	42.18	15.60	17.07	36.13	23.78
TIME (HR)												
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.0	48.3	12.8	30.3	7.3	18.5	8.3	12.3	16.5	9.3	13.0	6.9	14.0
2.0	69.5	15.4	33.6	7.6	23.4	11.3	16.2	22.2	12.1	15.8	9.9	18.1
3.0	75.1	14.4	26.7	7.0	25.1	13.4	18.7	26.2	13.7	16.9	12.2	20.6
4.0	72.1	12.1	18.6	6.0	25.1	14.9	20.5	29.3	14.6	17.1	14.1	22.1
5.0	64.9	9.7	12.0	5.1	24.3	16.2	21.7	31.7	15.2	16.7	15.8	23.0
6.0	56.1	7.4	7.4	4.2	23.0	17.3	22.6	33.7	15.5	16.1	17.2	23.5
7.0	47.2	5.6	4.4	3.4	21.4	18.2	23.2	35.4	15.6	15.2	18.5	23.8
8.0	38.9	4.1	2.6	2.7	19.7	18.9	23.6	36.7	15.6	14.3	19.7	23.7
9.0	31.5	3.0	1.5	2.2	18.0	19.6	23.9	37.9	15.4	13.3	20.8	23.6
10.0	25.3	2.1	0.8	1.7	16.2	20.1	24.0	38.8	15.1	12.4	21.8	23.2
11.0	20.0	1.5	0.5	1.4	14.6	20.6	24.0	39.6	14.8	11.4	22.7	22.8
12.0	15.7	1.1	0.3	1.1	13.1	20.9	23.9	40.3	14.5	10.5	23.6	22.3
13.0	12.3	0.8	0.1	0.9	11.7	21.3	23.7	40.8	14.1	9.6	24.4	21.8
14.0	9.5	0.5	0.1	0.7	10.4	21.5	23.4	41.3	13.6	8.8	25.2	21.2
15.0	7.4	0.4	0.0	0.5	9.2	21.8	23.1	41.6	13.2	8.0	25.9	20.5
16.0	5.7	0.3	0.0	0.4	8.2	21.9	22.8	41.8	12.7	7.3	26.5	19.9
17.0	4.3	0.2	0.0	0.3	7.2	22.1	22.4	42.0	12.3	6.6	27.2	19.2
18.0	3.3	0.1	0.0	0.2	6.3	22.2	22.0	42.1	11.8	6.0	27.8	18.5
19.0	2.5	0.1	0.0	0.2	5.6	22.3	21.6	42.2	11.3	5.4	28.3	17.8
20.0	1.9	0.1	0.0	0.1	4.9	22.3	21.1	42.2	10.9	4.9	28.8	17.1
21.0	1.4	0.0	0.0	0.1	4.3	22.3	20.6	42.1	10.4	4.4	29.3	16.5
22.0	1.1	0.0	0.0	0.1	3.8	22.3	20.2	42.0	10.0	4.0	29.8	15.8
23.0	0.8	0.0	0.0	0.1	3.3	22.3	19.7	41.9	9.5	3.6	30.2	15.1
24.0	0.6	0.0	0.0	0.1	2.9	22.2	19.2	41.7	9.1	3.2	30.7	14.5
25.0	0.5	0.0	0.0	0.0	2.5	22.2	18.7	41.5	8.7	2.9	31.0	13.9
26.0	0.3	0.0	0.0	0.0	2.2	22.1	18.2	41.2	8.3	2.6	31.4	13.3
27.0	0.3	0.0	0.0	0.0	1.9	22.0	17.7	41.0	7.9	2.4	31.8	12.7
28.0	0.2	0.0	0.0	0.0	1.7	21.9	17.2	40.7	7.5	2.1	32.1	12.1
29.0	0.1	0.0	0.0	0.0	1.4	21.8	16.7	40.3	7.2	1.9	32.4	11.6
30.0	0.1	0.0	0.0	0.0	1.3	21.6	16.2	40.0	6.8	1.7	32.7	11.0
31.0	0.1	0.0	0.0	0.0	1.1	21.5	15.8	39.7	6.5	1.5	33.0	10.5
32.0	0.1	0.0	0.0	0.0	0.9	21.3	15.3	39.3	6.1	1.4	33.3	10.0
33.0	0.0	0.0	0.0	0.0	0.8	21.2	14.8	38.9	5.8	1.2	33.5	9.6
34.0	0.0	0.0	0.0	0.0	0.7	21.0	14.4	38.5	5.5	1.1	33.7	9.1
35.0	0.0	0.0	0.0	0.0	0.6	20.8	13.9	38.1	5.3	1.0	34.0	8.7
36.0	0.0	0.0	0.0	0.0	0.5	20.7	13.5	37.7	5.0	0.9	34.2	8.2
37.0	0.0	0.0	0.0	0.0	0.5	20.5	13.1	37.2	4.7	0.8	34.3	7.8
38.0	0.0	0.0	0.0	0.0	0.4	20.3	12.6	36.8	4.5	0.7	34.5	7.5
39.0	0.0	0.0	0.0	0.0	0.3	20.1	12.2	36.4	4.3	0.6	34.7	7.1
40.0	0.0	0.0	0.0	0.0	0.3	19.9	11.8	35.9	4.0	0.6	34.9	6.7
41.0	0.0	0.0	0.0	0.0	0.3	19.7	11.4	35.5	3.8	0.5	35.0	6.4
42.0	0.0	0.0	0.0	0.0	0.2	19.5	11.0	35.0	3.6	0.4	35.1	6.1
43.0	0.0	0.0	0.0	0.0	0.2	19.2	10.7	34.6	3.4	0.4	35.3	5.8
44.0	0.0	0.0	0.0	0.0	0.2	19.0	10.3	34.1	3.2	0.4	35.4	5.5
45.0	0.0	0.0	0.0	0.0	0.1	18.8	10.0	33.6	3.1	0.3	35.5	5.2
46.0	0.0	0.0	0.0	0.0	0.1	18.6	9.6	33.2	2.9	0.3	35.6	4.9
47.0	0.0	0.0	0.0	0.0	0.1	18.4	9.3	32.7	2.7	0.3	35.7	4.7
48.0	0.0	0.0	0.0	0.0	0.1	18.1	9.0	32.2	2.6	0.2	35.7	4.4
49.0	0.0	0.0	0.0	0.0	0.1	17.9	8.7	31.8	2.5	0.2	35.8	4.2
50.0	0.0	0.0	0.0	0.0	0.1	17.7	8.4	31.3	2.3	0.2	35.9	4.0
51.0	0.0	0.0	0.0	0.0	0.1	17.5	8.1	30.8	2.2	0.2	35.9	3.8
52.0	0.0	0.0	0.0	0.0	0.1	17.3	7.8	30.4	2.1	0.1	36.0	3.6
53.0	0.0	0.0	0.0	0.0	0.0	17.0	7.5	29.9	2.0	0.1	36.0	3.4
54.0	0.0	0.0	0.0	0.0	0.0	16.8	7.2	29.5	1.9	0.1	36.1	3.2
55.0	0.0	0.0	0.0	0.0	0.0	16.6	7.0	29.0	1.7	0.1	36.1	3.0
56.0	0.0	0.0	0.0	0.0	0.0	16.4	6.7	28.5	1.7	0.1	36.1	2.9
57.0	0.0	0.0	0.0	0.0	0.0	16.1	6.5	28.1	1.6	0.1	36.1	2.7
58.0	0.0	0.0	0.0	0.0	0.0	15.9	6.2	27.6	1.5	0.1	36.1	2.6
59.0	0.0	0.0	0.0	0.0	0.0	15.7	6.0	27.2	1.4	0.1	36.1	2.4
60.0	0.0	0.0	0.0	0.0	0.0	15.5	5.8	26.8	1.3	0.1	36.1	2.3
61.0	0.0	0.0	0.0	0.0	0.0	15.2	5.6	26.3	1.2	0.0	36.1	2.2
62.0	0.0	0.0	0.0	0.0	0.0	15.0	5.4	25.9	1.2	0.0	36.1	2.1
63.0	0.0	0.0	0.0	0.0	0.0	14.8	5.2	25.5	1.1	0.0	36.1	2.0
64.0	0.0	0.0	0.0	0.0	0.0	14.6	5.0	25.0	1.0	0.0	36.1	1.9
65.0	0.0	0.0	0.0	0.0	0.0	14.4	4.8	24.6	1.0	0.0	36.0	1.8
66.0	0.0	0.0	0.0	0.0	0.0	14.2	4.6	24.2	0.9	0.0	36.0	1.7
67.0	0.0	0.0	0.0	0.0	0.0	14.0	4.4	23.8	0.9	0.0	36.0	1.6
68.0	0.0	0.0	0.0	0.0	0.0	13.8	4.3	23.4	0.8	0.0	35.9	1.5
69.0	0.0	0.0	0.0	0.0	0.0	13.5	4.1	23.0	0.8	0.0	35.9	1.4
70.0	0.0	0.0	0.0	0.0	0.0	13.3	4.0	22.6	0.7	0.0	35.8	1.3
71.0	0.0	0.0	0.0	0.0	0.0	13.1	3.8	22.2	0.7	0.0	35.8	1.3
72.0	0.0	0.0	0.0	0.0	0.0	12.9	3.7	21.8	0.6	0.0	35.7	1.2
73.0	0.0	0.0	0.0	0.0	0.0	12.7	3.5	21.4	0.6	0.0	35.7	1.1
74.0	0.0	0.0	0.0	0.0	0.0	12.5	3.4	21.0	0.6	0.0	35.6	1.1
75.0	0.0	0.0	0.0	0.0	0.0	12.3	3.3	20.7	0.5	0.0	35.5	1.0
76.0	0.0	0.0	0.0	0.0	0.0	12.2	3.1	20.3	0.5	0.0	35.5	0.9

Time	NM-115-D	NM-116-A	NM-116-B	NM-116-C	NM-117-A	NM-117-B	NM-118-A	NM-119-A	NM-121-A	NM-131-A	W700	W710
DA (SM)	0.9664	0.1453	0.2213	0.0857	0.5308	3.1639	1.6544	5.4297	0.7407	0.4263	13.1060	1.1785
PRF	237	220	257	150	169	150	150	150	150	150	163	150
Tc (hr)	4.25	2.63	1.93	1.96	5.09	34.59	16.42	31.35	11.03	5.41	97.76	11.56
Tlag (hr)	2.55	1.58	1.16	1.18	3.05	20.76	9.85	18.81	6.62	3.25	58.66	6.93
Drecom (hr)	0.56	0.35	0.26	0.26	0.68	4.60	2.18	4.17	1.47	0.72	13.00	1.54
Dmax (hr)	0.72	0.45	0.33	0.33	0.87	5.88	2.79	5.33	1.88	0.92	16.62	1.96
Dchosen (hr)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Φ	0.37	0.34	0.40	0.23	0.26	0.23	0.23	0.23	0.23	0.23	0.25	0.23
α	1.00	0.88	1.15	0.47	0.57	0.47	0.47	0.47	0.47	0.47	0.53	0.47
Tp (hr)	3.05	2.08	1.66	1.68	3.55	21.26	10.35	19.31	7.12	3.75	59.16	7.43
Qp	75.06	15.40	34.32	7.66	25.25	22.33	23.98	42.18	15.60	17.07	36.13	23.78
TIME (HR)												
77.0	0.0	0.0	0.0	0.0	0.0	12.0	3.0	19.9	0.5	0.0	35.4	0.9
78.0	0.0	0.0	0.0	0.0	0.0	11.8	2.9	19.6	0.5	0.0	35.3	0.8
79.0	0.0	0.0	0.0	0.0	0.0	11.6	2.8	19.2	0.4	0.0	35.3	0.8
80.0	0.0	0.0	0.0	0.0	0.0	11.4	2.7	18.9	0.4	0.0	35.2	0.8
81.0	0.0	0.0	0.0	0.0	0.0	11.2	2.6	18.5	0.4	0.0	35.1	0.7
82.0	0.0	0.0	0.0	0.0	0.0	11.0	2.5	18.2	0.4	0.0	35.0	0.7
83.0	0.0	0.0	0.0	0.0	0.0	10.9	2.4	17.8	0.3	0.0	34.9	0.6
84.0	0.0	0.0	0.0	0.0	0.0	10.7	2.3	17.5	0.3	0.0	34.8	0.6
85.0	0.0	0.0	0.0	0.0	0.0	10.5	2.2	17.2	0.3	0.0	34.7	0.6
86.0	0.0	0.0	0.0	0.0	0.0	10.3	2.1	16.9	0.3	0.0	34.6	0.5
87.0	0.0	0.0	0.0	0.0	0.0	10.2	2.0	16.6	0.3	0.0	34.5	0.5
88.0	0.0	0.0	0.0	0.0	0.0	10.0	2.0	16.2	0.2	0.0	34.4	0.5
89.0	0.0	0.0	0.0	0.0	0.0	9.8	1.9	15.9	0.2	0.0	34.3	0.4
90.0	0.0	0.0	0.0	0.0	0.0	9.7	1.8	15.6	0.2	0.0	34.2	0.4
91.0	0.0	0.0	0.0	0.0	0.0	9.5	1.7	15.3	0.2	0.0	34.1	0.4
92.0	0.0	0.0	0.0	0.0	0.0	9.3	1.7	15.1	0.2	0.0	34.0	0.4
93.0	0.0	0.0	0.0	0.0	0.0	9.2	1.6	14.8	0.2	0.0	33.9	0.4
94.0	0.0	0.0	0.0	0.0	0.0	9.0	1.5	14.5	0.2	0.0	33.8	0.3
95.0	0.0	0.0	0.0	0.0	0.0	8.9	1.5	14.2	0.2	0.0	33.7	0.3
96.0	0.0	0.0	0.0	0.0	0.0	8.7	1.4	13.9	0.2	0.0	33.6	0.3
97.0	0.0	0.0	0.0	0.0	0.0	8.6	1.4	13.7	0.1	0.0	33.4	0.3
98.0	0.0	0.0	0.0	0.0	0.0	8.4	1.3	13.4	0.1	0.0	33.3	0.3
99.0	0.0	0.0	0.0	0.0	0.0	8.3	1.3	13.2	0.1	0.0	33.2	0.3
100.0	0.0	0.0	0.0	0.0	0.0	8.1	1.2	12.9	0.1	0.0	33.1	0.2
101.0	0.0	0.0	0.0	0.0	0.0	8.0	1.2	12.6	0.1	0.0	33.0	0.2
102.0	0.0	0.0	0.0	0.0	0.0	7.9	1.1	12.4	0.1	0.0	32.8	0.2
103.0	0.0	0.0	0.0	0.0	0.0	7.7	1.1	12.2	0.1	0.0	32.7	0.2
104.0	0.0	0.0	0.0	0.0	0.0	7.6	1.0	11.9	0.1	0.0	32.6	0.2
105.0	0.0	0.0	0.0	0.0	0.0	7.5	1.0	11.7	0.1	0.0	32.5	0.2
106.0	0.0	0.0	0.0	0.0	0.0	7.3	0.9	11.5	0.1	0.0	32.3	0.2
107.0	0.0	0.0	0.0	0.0	0.0	7.2	0.9	11.2	0.1	0.0	32.2	0.2
108.0	0.0	0.0	0.0	0.0	0.0	7.1	0.9	11.0	0.1	0.0	32.1	0.1
109.0	0.0	0.0	0.0	0.0	0.0	7.0	0.8	10.8	0.1	0.0	31.9	0.1
110.0	0.0	0.0	0.0	0.0	0.0	6.8	0.8	10.6	0.1	0.0	31.8	0.1
111.0	0.0	0.0	0.0	0.0	0.0	6.7	0.8	10.4	0.1	0.0	31.7	0.1
112.0	0.0	0.0	0.0	0.0	0.0	6.6	0.7	10.2	0.1	0.0	31.5	0.1
113.0	0.0	0.0	0.0	0.0	0.0	6.5	0.7	10.0	0.1	0.0	31.4	0.1
114.0	0.0	0.0	0.0	0.0	0.0	6.4	0.7	9.8	0.1	0.0	31.3	0.1
115.0	0.0	0.0	0.0	0.0	0.0	6.3	0.7	9.6	0.0	0.0	31.1	0.1
116.0	0.0	0.0	0.0	0.0	0.0	6.1	0.6	9.4	0.0	0.0	31.0	0.1
117.0	0.0	0.0	0.0	0.0	0.0	6.0	0.6	9.2	0.0	0.0	30.9	0.1
118.0	0.0	0.0	0.0	0.0	0.0	5.9	0.6	9.0	0.0	0.0	30.7	0.1
119.0	0.0	0.0	0.0	0.0	0.0	5.8	0.6	8.8	0.0	0.0	30.6	0.1
120.0	0.0	0.0	0.0	0.0	0.0	5.7	0.5	8.7	0.0	0.0	30.4	0.1
121.0	0.0	0.0	0.0	0.0	0.0	5.6	0.5	8.5	0.0	0.0	30.3	0.1
122.0	0.0	0.0	0.0	0.0	0.0	5.5	0.5	8.3	0.0	0.0	30.2	0.1
123.0	0.0	0.0	0.0	0.0	0.0	5.4	0.5	8.1	0.0	0.0	30.0	0.1
124.0	0.0	0.0	0.0	0.0	0.0	5.3	0.5	8.0	0.0	0.0	29.9	0.1
125.0	0.0	0.0	0.0	0.0	0.0	5.2	0.4	7.8	0.0	0.0	29.7	0.1
126.0	0.0	0.0	0.0	0.0	0.0	5.1	0.4	7.7	0.0	0.0	29.6	0.1
127.0	0.0	0.0	0.0	0.0	0.0	5.0	0.4	7.5	0.0	0.0	29.5	0.0
128.0	0.0	0.0	0.0	0.0	0.0	4.9	0.4	7.3	0.0	0.0	29.3	0.0
129.0	0.0	0.0	0.0	0.0	0.0	4.8	0.4	7.2	0.0	0.0	29.2	0.0
130.0	0.0	0.0	0.0	0.0	0.0	4.8	0.4	7.1	0.0	0.0	29.0	0.0
131.0	0.0	0.0	0.0	0.0	0.0	4.7	0.3	6.9	0.0	0.0	28.9	0.0
132.0	0.0	0.0	0.0	0.0	0.0	4.6	0.3	6.8	0.0	0.0	28.7	0.0
133.0	0.0	0.0	0.0	0.0	0.0	4.5	0.3	6.6	0.0	0.0	28.6	0.0
134.0	0.0	0.0	0.0	0.0	0.0	4.4	0.3	6.5	0.0	0.0	28.5	0.0
135.0	0.0	0.0	0.0	0.0	0.0	4.3	0.3	6.4	0.0	0.0	28.3	0.0
136.0	0.0	0.0	0.0	0.0	0.0	4.3	0.3	6.2	0.0	0.0	28.2	0.0
137.0	0.0	0.0	0.0	0.0	0.0	4.2	0.3	6.1	0.0	0.0	28.0	0.0
138.0	0.0	0.0	0.0	0.0	0.0	4.1	0.3	6.0	0.0	0.0	27.9	0.0
139.0	0.0	0.0	0.0	0.0	0.0	4.0	0.2	5.9	0.0	0.0	27.7	0.0
140.0	0.0	0.0	0.0	0.0	0.0	4.0	0.2	5.7	0.0	0.0	27.6	0.0
141.0	0.0	0.0	0.0	0.0	0.0	3.9	0.2	5.6	0.0	0.0	27.4	0.0
142.0	0.0	0.0	0.0	0.0	0.0	3.8	0.2	5.5	0.0	0.0	27.3	0.0
143.0	0.0	0.0	0.0	0.0	0.0	3.7	0.2	5.4	0.0	0.0	27.2	0.0
144.0	0.0	0.0	0.0	0.0	0.0	3.7	0.2	5.3	0.0	0.0	27.0	0.0
145.0	0.0	0.0	0.0	0.0	0.0	3.6	0.2	5.2	0.0	0.0	26.9	0.0
146.0	0.0	0.0	0.0	0.0	0.0	3.5	0.2	5.1	0.0	0.0	26.7	0.0
147.0	0.0	0.0	0.0	0.0	0.0	3.5	0.2	4.9	0.0	0.0	26.6	0.0
148.0	0.0	0.0	0.0	0.0	0.0	3.4	0.2	4.8	0.0	0.0	26.4	0.0
149.0	0.0	0.0	0.0	0.0	0.0	3.3	0.2	4.7	0.0	0.0	26.3	0.0
150.0	0.0	0.0	0.0	0.0	0.0	3.3	0.2	4.6	0.0	0.0	26.2	0.0
151.0	0.0	0.0	0.0	0.0	0.0	3.2	0.1	4.5	0.0	0.0	26.0	0.0
152.0	0.0	0.0	0.0	0.0	0.0	3.2	0.1	4.5	0.0	0.0	25.9	0.0
153.0	0.0	0.0	0.0	0.0	0.0	3.1	0.1	4.4	0.0	0.0	25.7	0.0
154.0	0.0	0.0	0.0	0.0	0.0	3.0	0.1	4.3	0.0	0.0	25.6	0.0
155.0	0.0	0.0	0.0	0.0	0.0	3.0	0.1	4.2	0.0	0.0	25.4	0.0
156.0	0.0	0.0	0.0	0.0	0.0	2.9	0.1	4.1	0.0	0.0	25.3	0.0

Time	W720	W730	W740	W750	W760	W770	W840	W870	W920	SM-101-A	SM-101-B	SM-102-A
DA (SM)	2.9667	0.8881	1.5788	10.1256	4.8465	1.0354	4.0456	9.0712	1.1895	1.0827	0.8689	0.8451
PRF	150	150	150	152	150	150	150	150	150	230	150	181
Tc (hr)	26.88	13.77	15.40	77.52	41.91	3.16	33.56	65.73	13.67	5.93	25.14	7.25
Tlag (hr)	16.13	8.26	9.24	46.51	25.15	1.90	20.14	39.44	8.20	3.56	15.08	4.35
Drecom (hr)	3.58	1.83	2.05	10.31	5.57	0.42	4.46	8.74	1.82	0.79	3.34	0.96
Dmax (hr)	4.57	2.34	2.62	13.18	7.13	0.54	5.71	11.17	2.32	1.01	4.27	1.23
Dchosen (hr)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Φ	0.23	0.23	0.23	0.24	0.23	0.23	0.23	0.23	0.23	0.36	0.23	0.28
α	0.47	0.47	0.47	0.48	0.47	0.47	0.47	0.47	0.47	0.95	0.47	0.63
Tp (hr)	16.63	8.76	9.74	47.01	25.65	2.40	20.64	39.94	8.70	4.06	15.58	4.85
Qp	26.76	15.20	24.32	32.82	28.34	64.75	29.41	34.07	20.50	61.44	8.36	31.55
TIME (HR)												
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.0	11.2	8.3	12.8	8.3	9.7	56.5	11.1	9.6	11.3	33.2	3.6	19.2
2.0	15.0	10.9	16.8	11.4	13.2	64.3	15.1	13.1	14.8	50.8	4.8	26.1
3.0	17.6	12.5	19.4	13.7	15.7	63.9	17.8	15.7	16.9	59.1	5.6	29.6
4.0	19.6	13.6	21.1	15.6	17.6	60.2	19.9	17.7	18.4	61.4	6.3	31.2
5.0	21.2	14.3	22.4	17.2	19.2	55.0	21.6	19.4	19.3	60.1	6.8	31.5
6.0	22.4	14.8	23.2	18.6	20.6	49.3	23.0	20.9	19.9	56.5	7.1	31.1
7.0	23.4	15.0	23.8	19.8	21.7	43.6	24.2	22.2	20.3	51.8	7.4	30.1
8.0	24.2	15.2	24.1	20.9	22.7	38.2	25.1	23.4	20.5	46.5	7.7	28.7
9.0	24.9	15.2	24.3	21.9	23.5	33.2	26.0	24.4	20.5	41.2	7.9	27.1
10.0	25.4	15.1	24.3	22.8	24.3	28.7	26.7	25.3	20.4	36.0	8.0	25.5
11.0	25.8	15.0	24.2	23.6	24.9	24.7	27.3	26.2	20.2	31.2	8.2	23.7
12.0	26.2	14.8	24.1	24.4	25.5	21.2	27.8	26.9	20.0	26.8	8.2	22.0
13.0	26.4	14.6	23.8	25.1	26.0	18.1	28.2	27.6	19.6	22.9	8.3	20.3
14.0	26.6	14.3	23.5	25.7	26.4	15.4	28.5	28.3	19.3	19.4	8.3	18.7
15.0	26.7	14.0	23.1	26.3	26.8	13.1	28.8	28.9	18.9	16.4	8.4	17.1
16.0	26.8	13.7	22.7	26.9	27.1	11.1	29.0	29.4	18.4	13.8	8.4	15.7
17.0	26.8	13.4	22.3	27.4	27.4	9.4	29.2	29.9	18.0	11.6	8.3	14.3
18.0	26.7	13.0	21.8	27.8	27.6	7.9	29.3	30.3	17.5	9.7	8.3	13.0
19.0	26.6	12.6	21.3	28.3	27.8	6.7	29.4	30.8	17.0	8.1	8.3	11.8
20.0	26.5	12.3	20.8	28.7	28.0	5.6	29.4	31.1	16.5	6.7	8.2	10.7
21.0	26.4	11.9	20.3	29.1	28.1	4.8	29.4	31.5	16.0	5.5	8.2	9.7
22.0	26.2	11.5	19.8	29.4	28.2	4.0	29.4	31.8	15.5	4.6	8.1	8.8
23.0	26.0	11.2	19.2	29.8	28.3	3.4	29.3	32.1	15.0	3.8	8.0	7.9
24.0	25.8	10.8	18.7	30.1	28.3	2.8	29.2	32.4	14.5	3.1	8.0	7.1
25.0	25.6	10.4	18.2	30.3	28.3	2.4	29.1	32.6	14.0	2.6	7.9	6.4
26.0	25.3	10.1	17.6	30.6	28.3	2.0	29.0	32.8	13.5	2.1	7.8	5.8
27.0	25.1	9.7	17.1	30.9	28.3	1.7	28.9	33.0	13.0	1.7	7.7	5.2
28.0	24.8	9.4	16.6	31.1	28.3	1.4	28.7	33.2	12.6	1.4	7.6	4.7
29.0	24.5	9.0	16.1	31.3	28.2	1.2	28.5	33.3	12.1	1.2	7.5	4.2
30.0	24.2	8.7	15.6	31.5	28.2	1.0	28.3	33.5	11.6	0.9	7.4	3.8
31.0	23.9	8.4	15.1	31.6	28.1	0.8	28.1	33.6	11.2	0.8	7.3	3.4
32.0	23.6	8.1	14.6	31.8	28.0	0.7	27.9	33.7	10.8	0.6	7.2	3.0
33.0	23.3	7.8	14.1	32.0	27.9	0.6	27.7	33.8	10.4	0.5	7.0	2.7
34.0	22.9	7.5	13.6	32.1	27.8	0.5	27.4	33.9	10.0	0.4	6.9	2.4
35.0	22.6	7.2	13.2	32.2	27.6	0.4	27.2	33.9	9.6	0.3	6.8	2.2
36.0	22.3	6.9	12.7	32.3	27.5	0.3	26.9	34.0	9.2	0.3	6.7	1.9
37.0	21.9	6.6	12.3	32.4	27.4	0.3	26.7	34.0	8.8	0.2	6.6	1.7
38.0	21.6	6.3	11.8	32.5	27.2	0.2	26.4	34.1	8.5	0.2	6.5	1.5
39.0	21.3	6.1	11.4	32.6	27.0	0.2	26.1	34.1	8.1	0.1	6.4	1.4
40.0	20.9	5.8	11.0	32.6	26.9	0.2	25.8	34.1	7.8	0.1	6.2	1.2
41.0	20.6	5.6	10.6	32.7	26.7	0.1	25.6	34.1	7.5	0.1	6.1	1.1
42.0	20.2	5.4	10.2	32.7	26.5	0.1	25.3	34.1	7.2	0.1	6.0	1.0
43.0	19.9	5.1	9.9	32.8	26.3	0.1	25.0	34.0	6.9	0.1	5.9	0.9
44.0	19.5	4.9	9.5	32.8	26.1	0.1	24.7	34.0	6.6	0.1	5.8	0.8
45.0	19.2	4.7	9.2	32.8	25.9	0.1	24.4	34.0	6.3	0.0	5.7	0.7
46.0	18.9	4.5	8.8	32.8	25.7	0.1	24.1	33.9	6.0	0.0	5.6	0.6
47.0	18.5	4.3	8.5	32.8	25.5	0.0	23.8	33.8	5.8	0.0	5.5	0.5
48.0	18.2	4.1	8.2	32.8	25.3	0.0	23.5	33.8	5.5	0.0	5.4	0.5
49.0	17.9	4.0	7.9	32.8	25.1	0.0	23.2	33.7	5.3	0.0	5.2	0.4
50.0	17.5	3.8	7.6	32.8	24.8	0.0	22.9	33.6	5.0	0.0	5.1	0.4
51.0	17.2	3.6	7.3	32.8	24.6	0.0	22.6	33.6	4.8	0.0	5.0	0.3
52.0	16.9	3.5	7.0	32.7	24.4	0.0	22.3	33.5	4.6	0.0	4.9	0.3
53.0	16.5	3.3	6.7	32.7	24.2	0.0	22.0	33.4	4.4	0.0	4.8	0.3
54.0	16.2	3.2	6.5	32.7	23.9	0.0	21.7	33.3	4.2	0.0	4.7	0.2
55.0	15.9	3.0	6.2	32.6	23.7	0.0	21.3	33.2	4.0	0.0	4.6	0.2
56.0	15.6	2.9	6.0	32.6	23.5	0.0	21.0	33.1	3.9	0.0	4.5	0.2
57.0	15.3	2.8	5.7	32.5	23.2	0.0	20.7	33.0	3.7	0.0	4.4	0.2
58.0	15.0	2.7	5.5	32.4	23.0	0.0	20.4	32.8	3.5	0.0	4.3	0.1
59.0	14.7	2.5	5.3	32.4	22.8	0.0	20.1	32.7	3.4	0.0	4.2	0.1
60.0	14.4	2.4	5.1	32.3	22.5	0.0	19.9	32.6	3.2	0.0	4.1	0.1
61.0	14.1	2.3	4.9	32.2	22.3	0.0	19.6	32.5	3.1	0.0	4.1	0.1
62.0	13.8	2.2	4.7	32.2	22.1	0.0	19.3	32.3	2.9	0.0	4.0	0.1
63.0	13.5	2.1	4.5	32.1	21.8	0.0	19.0	32.2	2.8	0.0	3.9	0.1
64.0	13.3	2.0	4.3	32.0	21.6	0.0	18.7	32.0	2.7	0.0	3.8	0.1
65.0	13.0	1.9	4.2	31.9	21.4	0.0	18.4	31.9	2.5	0.0	3.7	0.1
66.0	12.7	1.8	4.0	31.8	21.1	0.0	18.1	31.8	2.4	0.0	3.6	0.1
67.0	12.5	1.8	3.8	31.7	20.9	0.0	17.8	31.6	2.3	0.0	3.5	0.1
68.0	12.2	1.7	3.7	31.6	20.7	0.0	17.6	31.5	2.2	0.0	3.5	0.0
69.0	11.9	1.6	3.5	31.5	20.4	0.0	17.3	31.3	2.1	0.0	3.4	0.0
70.0	11.7	1.5	3.4	31.4	20.2	0.0	17.0	31.2	2.0	0.0	3.3	0.0
71.0	11.4	1.5	3.3	31.3	20.0	0.0	16.7	31.0	1.9	0.0	3.2	0.0
72.0	11.2	1.4	3.1	31.2	19.7	0.0	16.5	30.8	1.8	0.0	3.1	0.0
73.0	11.0	1.3	3.0	31.1	19.5	0.0	16.2	30.7	1.8	0.0	3.1	0.0
74.0	10.7	1.3	2.9	31.0	19.3	0.0	15.9	30.5	1.7	0.0	3.0	0.0
75.0	10.5	1.2	2.8	30.9	19.0	0.0	15.7	30.3	1.6	0.0	2.9	0.0
76.0	10.3	1.2	2.6	30.7	18.8	0.0	15.4	30.2	1.5	0.0	2.9	0.0

Time	W720	W730	W740	W750	W760	W770	W840	W870	W920	SM-101-A	SM-101-B	SM-102-A
DA (SM)	2.9667	0.8881	1.5788	10.1256	4.8465	1.0354	4.0456	9.0712	1.1895	1.0827	0.8689	0.8451
PRF	150	150	150	152	150	150	150	150	150	230	150	181
Tc (hr)	26.88	13.77	15.40	77.52	41.91	3.16	33.56	65.73	13.67	5.93	25.14	7.25
Tlag (hr)	16.13	8.26	9.24	46.51	25.15	1.90	20.14	39.44	8.20	3.56	15.08	4.35
Drecom (hr)	3.58	1.83	2.05	10.31	5.57	0.42	4.46	8.74	1.82	0.79	3.34	0.96
Dmax (hr)	4.57	2.34	2.62	13.18	7.13	0.54	5.71	11.17	2.32	1.01	4.27	1.23
Dchosen (hr)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Φ	0.23	0.23	0.23	0.24	0.23	0.23	0.23	0.23	0.23	0.36	0.23	0.28
α	0.47	0.47	0.47	0.48	0.47	0.47	0.47	0.47	0.47	0.95	0.47	0.63
Tp (hr)	16.63	8.76	9.74	47.01	25.65	2.40	20.64	39.94	8.70	4.06	15.58	4.85
Qp	26.76	15.20	24.32	32.82	28.34	64.75	29.41	34.07	20.50	61.44	8.36	31.55
TIME (HR)												
77.0	10.0	1.1	2.5	30.6	18.6	0.0	15.2	30.0	1.4	0.0	2.8	0.0
78.0	9.8	1.1	2.4	30.5	18.4	0.0	14.9	29.8	1.4	0.0	2.7	0.0
79.0	9.6	1.0	2.3	30.4	18.1	0.0	14.7	29.7	1.3	0.0	2.7	0.0
80.0	9.4	1.0	2.2	30.3	17.9	0.0	14.4	29.5	1.3	0.0	2.6	0.0
81.0	9.2	0.9	2.1	30.1	17.7	0.0	14.2	29.3	1.2	0.0	2.5	0.0
82.0	9.0	0.9	2.1	30.0	17.5	0.0	14.0	29.1	1.1	0.0	2.5	0.0
83.0	8.8	0.8	2.0	29.9	17.3	0.0	13.7	29.0	1.1	0.0	2.4	0.0
84.0	8.6	0.8	1.9	29.7	17.0	0.0	13.5	28.8	1.0	0.0	2.4	0.0
85.0	8.4	0.8	1.8	29.6	16.8	0.0	13.3	28.6	1.0	0.0	2.3	0.0
86.0	8.2	0.7	1.7	29.5	16.6	0.0	13.0	28.4	0.9	0.0	2.2	0.0
87.0	8.0	0.7	1.7	29.3	16.4	0.0	12.8	28.3	0.9	0.0	2.2	0.0
88.0	7.8	0.7	1.6	29.2	16.2	0.0	12.6	28.1	0.9	0.0	2.1	0.0
89.0	7.7	0.6	1.5	29.0	16.0	0.0	12.4	27.9	0.8	0.0	2.1	0.0
90.0	7.5	0.6	1.5	28.9	15.8	0.0	12.2	27.7	0.8	0.0	2.0	0.0
91.0	7.3	0.6	1.4	28.8	15.6	0.0	12.0	27.5	0.7	0.0	2.0	0.0
92.0	7.2	0.5	1.3	28.6	15.4	0.0	11.7	27.4	0.7	0.0	1.9	0.0
93.0	7.0	0.5	1.3	28.5	15.2	0.0	11.5	27.2	0.7	0.0	1.9	0.0
94.0	6.8	0.5	1.2	28.3	15.0	0.0	11.3	27.0	0.6	0.0	1.8	0.0
95.0	6.7	0.5	1.2	28.2	14.8	0.0	11.1	26.8	0.6	0.0	1.8	0.0
96.0	6.5	0.4	1.1	28.0	14.6	0.0	10.9	26.6	0.6	0.0	1.8	0.0
97.0	6.4	0.4	1.1	27.9	14.4	0.0	10.7	26.5	0.6	0.0	1.7	0.0
98.0	6.2	0.4	1.0	27.8	14.2	0.0	10.6	26.3	0.5	0.0	1.7	0.0
99.0	6.1	0.4	1.0	27.6	14.0	0.0	10.4	26.1	0.5	0.0	1.6	0.0
100.0	5.9	0.4	0.9	27.5	13.8	0.0	10.2	25.9	0.5	0.0	1.6	0.0
101.0	5.8	0.3	0.9	27.3	13.6	0.0	10.0	25.7	0.5	0.0	1.5	0.0
102.0	5.7	0.3	0.9	27.2	13.4	0.0	9.8	25.5	0.4	0.0	1.5	0.0
103.0	5.5	0.3	0.8	27.0	13.3	0.0	9.6	25.4	0.4	0.0	1.5	0.0
104.0	5.4	0.3	0.8	26.9	13.1	0.0	9.5	25.2	0.4	0.0	1.4	0.0
105.0	5.3	0.3	0.8	26.7	12.9	0.0	9.3	25.0	0.4	0.0	1.4	0.0
106.0	5.2	0.3	0.7	26.6	12.7	0.0	9.1	24.8	0.4	0.0	1.4	0.0
107.0	5.0	0.3	0.7	26.4	12.5	0.0	9.0	24.6	0.3	0.0	1.3	0.0
108.0	4.9	0.2	0.7	26.3	12.4	0.0	8.8	24.5	0.3	0.0	1.3	0.0
109.0	4.8	0.2	0.6	26.1	12.2	0.0	8.6	24.3	0.3	0.0	1.3	0.0
110.0	4.7	0.2	0.6	26.0	12.0	0.0	8.5	24.1	0.3	0.0	1.2	0.0
111.0	4.6	0.2	0.6	25.8	11.9	0.0	8.3	23.9	0.3	0.0	1.2	0.0
112.0	4.5	0.2	0.6	25.7	11.7	0.0	8.2	23.7	0.3	0.0	1.2	0.0
113.0	4.4	0.2	0.5	25.5	11.5	0.0	8.0	23.6	0.3	0.0	1.1	0.0
114.0	4.3	0.2	0.5	25.3	11.4	0.0	7.9	23.4	0.2	0.0	1.1	0.0
115.0	4.2	0.2	0.5	25.2	11.2	0.0	7.7	23.2	0.2	0.0	1.1	0.0
116.0	4.1	0.2	0.5	25.0	11.1	0.0	7.6	23.0	0.2	0.0	1.1	0.0
117.0	4.0	0.2	0.5	24.9	10.9	0.0	7.5	22.8	0.2	0.0	1.0	0.0
118.0	3.9	0.2	0.4	24.7	10.7	0.0	7.3	22.7	0.2	0.0	1.0	0.0
119.0	3.8	0.1	0.4	24.6	10.6	0.0	7.2	22.5	0.2	0.0	1.0	0.0
120.0	3.7	0.1	0.4	24.4	10.4	0.0	7.1	22.3	0.2	0.0	0.9	0.0
121.0	3.6	0.1	0.4	24.3	10.3	0.0	6.9	22.1	0.2	0.0	0.9	0.0
122.0	3.5	0.1	0.4	24.1	10.1	0.0	6.8	22.0	0.2	0.0	0.9	0.0
123.0	3.4	0.1	0.3	24.0	10.0	0.0	6.7	21.8	0.2	0.0	0.9	0.0
124.0	3.3	0.1	0.3	23.8	9.9	0.0	6.5	21.6	0.1	0.0	0.9	0.0
125.0	3.3	0.1	0.3	23.7	9.7	0.0	6.4	21.5	0.1	0.0	0.8	0.0
126.0	3.2	0.1	0.3	23.5	9.6	0.0	6.3	21.3	0.1	0.0	0.8	0.0
127.0	3.1	0.1	0.3	23.4	9.4	0.0	6.2	21.1	0.1	0.0	0.8	0.0
128.0	3.0	0.1	0.3	23.2	9.3	0.0	6.1	20.9	0.1	0.0	0.8	0.0
129.0	3.0	0.1	0.3	23.1	9.2	0.0	5.9	20.8	0.1	0.0	0.7	0.0
130.0	2.9	0.1	0.3	22.9	9.0	0.0	5.8	20.6	0.1	0.0	0.7	0.0
131.0	2.8	0.1	0.2	22.8	8.9	0.0	5.7	20.4	0.1	0.0	0.7	0.0
132.0	2.8	0.1	0.2	22.6	8.8	0.0	5.6	20.3	0.1	0.0	0.7	0.0
133.0	2.7	0.1	0.2	22.5	8.6	0.0	5.5	20.1	0.1	0.0	0.7	0.0
134.0	2.6	0.1	0.2	22.3	8.5	0.0	5.4	19.9	0.1	0.0	0.7	0.0
135.0	2.6	0.1	0.2	22.2	8.4	0.0	5.3	19.8	0.1	0.0	0.6	0.0
136.0	2.5	0.1	0.2	22.0	8.3	0.0	5.2	19.6	0.1	0.0	0.6	0.0
137.0	2.4	0.1	0.2	21.9	8.1	0.0	5.1	19.5	0.1	0.0	0.6	0.0
138.0	2.4	0.1	0.2	21.7	8.0	0.0	5.0	19.3	0.1	0.0	0.6	0.0
139.0	2.3	0.1	0.2	21.6	7.9	0.0	4.9	19.1	0.1	0.0	0.6	0.0
140.0	2.3	0.1	0.2	21.5	7.8	0.0	4.8	19.0	0.1	0.0	0.6	0.0
141.0	2.2	0.0	0.2	21.3	7.7	0.0	4.7	18.8	0.1	0.0	0.5	0.0
142.0	2.1	0.0	0.1	21.2	7.6	0.0	4.6	18.7	0.1	0.0	0.5	0.0
143.0	2.1	0.0	0.1	21.0	7.5	0.0	4.5	18.5	0.1	0.0	0.5	0.0
144.0	2.0	0.0	0.1	20.9	7.3	0.0	4.5	18.4	0.1	0.0	0.5	0.0
145.0	2.0	0.0	0.1	20.7	7.2	0.0	4.4	18.2	0.1	0.0	0.5	0.0
146.0	1.9	0.0	0.1	20.6	7.1	0.0	4.3	18.0	0.0	0.0	0.5	0.0
147.0	1.9	0.0	0.1	20.5	7.0	0.0	4.2	17.9	0.0	0.0	0.5	0.0
148.0	1.9	0.0	0.1	20.3	6.9	0.0	4.1	17.7	0.0	0.0	0.5	0.0
149.0	1.8	0.0	0.1	20.2	6.8	0.0	4.0	17.6	0.0	0.0	0.4	0.0
150.0	1.8	0.0	0.1	20.0	6.7	0.0	4.0	17.4	0.0	0.0	0.4	0.0
151.0	1.7	0.0	0.1	19.9	6.6	0.0	3.9	17.3	0.0	0.0	0.4	0.0
152.0	1.7	0.0	0.1	19.8	6.5	0.0	3.8	17.1	0.0	0.0	0.4	0.0
153.0	1.6	0.0	0.1	19.6	6.4	0.0	3.7	17.0	0.0	0.0	0.4	0.0
154.0	1.6	0.0	0.1	19.5	6.3	0.0	3.7	16.8	0.0	0.0	0.4	0.0
155.0	1.6	0.0	0.1	19.3	6.2	0.0	3.6	16.7	0.0	0.0	0.4	0.0
156.0	1.5	0.0	0.1	19.2	6.1	0.0	3.5	16.6	0.0	0.0	0.4	0.0

Time	SM-103-A	S-W1000	S-W1100	S-W1550	S-W5200	S-W5300	S-W5450	S-W5500	S-W900
DA (SM)	0.4777	2.896	1.413	1.844	1.491	0.344	1.406	2.345	1.88
PRF	150	150	150	150	150	150	150	150	150
Tc (hr)	5.94	48.27	23.55	30.73	24.85	5.73	23.43	39.08	31.33
Tlag (hr)	3.56	29.0	14.1	18.4	14.9	3.4	14.1	23.5	18.8
Drecom (hr)	0.79	6.42	3.13	4.09	3.31	0.76	3.12	5.20	4.17
Dmax (hr)	1.01	8.21	4.00	5.22	4.22	0.97	3.98	6.64	5.33
Dchosen (hr)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Φ	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
α	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Tp (hr)	4.06	29.46	14.63	18.94	15.41	3.94	14.56	23.95	19.30
Qp	17.64	14.75	14.49	14.60	14.51	13.10	14.48	14.69	14.61
TIME (HR)									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.0	13.0	4.8	6.4	5.7	6.3	9.8	6.4	5.2	5.7
2.0	16.1	6.5	8.6	7.8	8.4	12.0	8.6	7.1	7.7
3.0	17.3	7.7	10.0	9.1	9.8	12.9	10.0	8.4	9.1
4.0	17.6	8.7	11.1	10.2	10.9	13.1	11.1	9.4	10.1
5.0	17.4	9.5	11.9	11.1	11.8	12.9	11.9	10.2	11.0
6.0	16.9	10.2	12.6	11.7	12.4	12.5	12.6	10.9	11.7
7.0	16.2	10.8	13.1	12.3	13.0	11.9	13.1	11.5	12.3
8.0	15.4	11.3	13.5	12.8	13.4	11.3	13.5	12.0	12.7
9.0	14.5	11.7	13.8	13.2	13.7	10.6	13.8	12.4	13.1
10.0	13.6	12.1	14.1	13.5	14.0	9.9	14.1	12.8	13.5
11.0	12.6	12.5	14.2	13.8	14.2	9.2	14.2	13.1	13.7
12.0	11.7	12.8	14.4	14.0	14.3	8.5	14.4	13.4	14.0
13.0	10.9	13.1	14.4	14.2	14.4	7.8	14.4	13.7	14.1
14.0	10.0	13.3	14.5	14.3	14.5	7.2	14.5	13.9	14.3
15.0	9.2	13.5	14.5	14.4	14.5	6.6	14.5	14.1	14.4
16.0	8.5	13.7	14.5	14.5	14.5	6.0	14.5	14.2	14.5
17.0	7.8	13.9	14.4	14.6	14.5	5.5	14.4	14.3	14.6
18.0	7.1	14.0	14.3	14.6	14.4	5.0	14.3	14.4	14.6
19.0	6.5	14.2	14.2	14.6	14.4	4.6	14.2	14.5	14.6
20.0	5.9	14.3	14.1	14.6	14.3	4.2	14.1	14.6	14.6
21.0	5.4	14.4	14.0	14.6	14.2	3.8	14.0	14.6	14.6
22.0	4.9	14.5	13.9	14.5	14.0	3.4	13.8	14.7	14.6
23.0	4.5	14.6	13.7	14.5	13.9	3.1	13.7	14.7	14.5
24.0	4.1	14.6	13.5	14.4	13.8	2.8	13.5	14.7	14.4
25.0	3.7	14.7	13.4	14.3	13.6	2.6	13.3	14.7	14.4
26.0	3.4	14.7	13.2	14.2	13.4	2.3	13.2	14.7	14.3
27.0	3.1	14.7	13.0	14.1	13.3	2.1	13.0	14.6	14.2
28.0	2.8	14.7	12.8	14.0	13.1	1.9	12.8	14.6	14.1
29.0	2.5	14.7	12.6	13.9	12.9	1.7	12.6	14.6	14.0
30.0	2.3	14.7	12.4	13.8	12.7	1.5	12.4	14.5	13.9
31.0	2.1	14.7	12.2	13.7	12.5	1.4	12.2	14.4	13.7
32.0	1.9	14.7	12.0	13.5	12.3	1.2	12.0	14.4	13.6
33.0	1.7	14.7	11.8	13.4	12.2	1.1	11.7	14.3	13.5
34.0	1.5	14.7	11.6	13.2	12.0	1.0	11.5	14.2	13.3
35.0	1.4	14.6	11.4	13.1	11.8	0.9	11.3	14.1	13.2
36.0	1.2	14.6	11.1	12.9	11.6	0.8	11.1	14.0	13.0
37.0	1.1	14.6	10.9	12.8	11.4	0.7	10.9	14.0	12.9
38.0	1.0	14.5	10.7	12.6	11.2	0.7	10.7	13.9	12.8
39.0	0.9	14.4	10.5	12.5	11.0	0.6	10.5	13.8	12.6
40.0	0.8	14.4	10.3	12.3	10.8	0.5	10.3	13.6	12.4
41.0	0.7	14.3	10.1	12.2	10.6	0.5	10.1	13.5	12.3
42.0	0.7	14.3	9.9	12.0	10.4	0.4	9.8	13.4	12.1
43.0	0.6	14.2	9.7	11.8	10.2	0.4	9.6	13.3	12.0
44.0	0.5	14.1	9.5	11.7	10.0	0.3	9.4	13.2	11.8
45.0	0.5	14.0	9.3	11.5	9.8	0.3	9.2	13.1	11.6
46.0	0.4	14.0	9.1	11.3	9.6	0.3	9.0	13.0	11.5
47.0	0.4	13.9	8.9	11.2	9.4	0.3	8.8	12.8	11.3
48.0	0.4	13.8	8.7	11.0	9.2	0.2	8.6	12.7	11.2
49.0	0.3	13.7	8.5	10.8	9.0	0.2	8.5	12.6	11.0
50.0	0.3	13.6	8.3	10.7	8.8	0.2	8.3	12.5	10.8
51.0	0.3	13.5	8.1	10.5	8.6	0.2	8.1	12.3	10.7
52.0	0.2	13.4	7.9	10.4	8.4	0.1	7.9	12.2	10.5
53.0	0.2	13.4	7.8	10.2	8.3	0.1	7.7	12.1	10.4
54.0	0.2	13.3	7.6	10.0	8.1	0.1	7.5	11.9	10.2
55.0	0.2	13.2	7.4	9.9	7.9	0.1	7.4	11.8	10.0
56.0	0.2	13.1	7.2	9.7	7.7	0.1	7.2	11.7	9.9
57.0	0.1	13.0	7.1	9.6	7.6	0.1	7.0	11.6	9.7
58.0	0.1	12.9	6.9	9.4	7.4	0.1	6.9	11.4	9.6
59.0	0.1	12.8	6.7	9.2	7.2	0.1	6.7	11.3	9.4
60.0	0.1	12.7	6.6	9.1	7.1	0.1	6.5	11.2	9.3
61.0	0.1	12.6	6.4	8.9	6.9	0.1	6.4	11.0	9.1
62.0	0.1	12.5	6.3	8.8	6.8	0.0	6.2	10.9	9.0
63.0	0.1	12.4	6.1	8.6	6.6	0.0	6.1	10.8	8.8
64.0	0.1	12.2	6.0	8.5	6.5	0.0	5.9	10.6	8.7
65.0	0.1	12.1	5.8	8.3	6.3	0.0	5.8	10.5	8.5
66.0	0.1	12.0	5.7	8.2	6.2	0.0	5.6	10.4	8.4
67.0	0.0	11.9	5.5	8.0	6.0	0.0	5.5	10.3	8.2
68.0	0.0	11.8	5.4	7.9	5.9	0.0	5.4	10.1	8.1
69.0	0.0	11.7	5.3	7.8	5.8	0.0	5.2	10.0	8.0
70.0	0.0	11.6	5.1	7.6	5.6	0.0	5.1	9.9	7.8
71.0	0.0	11.5	5.0	7.5	5.5	0.0	5.0	9.7	7.7
72.0	0.0	11.4	4.9	7.4	5.4	0.0	4.8	9.6	7.5
73.0	0.0	11.3	4.8	7.2	5.2	0.0	4.7	9.5	7.4
74.0	0.0	11.2	4.6	7.1	5.1	0.0	4.6	9.4	7.3
75.0	0.0	11.1	4.5	7.0	5.0	0.0	4.5	9.2	7.1
76.0	0.0	11.0	4.4	6.8	4.9	0.0	4.4	9.1	7.0

Time	SM-103-A	S-W1000	S-W1100	S-W1550	S-W5200	S-W5300	S-W5450	S-W5500	S-W900
DA (SM)	0.4777	2.896	1.413	1.844	1.491	0.344	1.406	2.345	1.88
PRF	150	150	150	150	150	150	150	150	150
Tc (hr)	5.94	48.27	23.55	30.73	24.85	5.73	23.43	39.08	31.33
Tlag (hr)	3.56	29.0	14.1	18.4	14.9	3.4	14.1	23.5	18.8
Drecom (hr)	0.79	6.42	3.13	4.09	3.31	0.76	3.12	5.20	4.17
Dmax (hr)	1.01	8.21	4.00	5.22	4.22	0.97	3.98	6.64	5.33
Dchosen (hr)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Φ	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
α	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Tp (hr)	4.06	29.46	14.63	18.94	15.41	3.94	14.56	23.95	19.30
Qp	17.64	14.75	14.49	14.60	14.51	13.10	14.48	14.69	14.61
TIME (HR)									
77.0	0.0	10.9	4.3	6.7	4.8	0.0	4.2	9.0	6.9
78.0	0.0	10.8	4.2	6.6	4.6	0.0	4.1	8.9	6.8
79.0	0.0	10.7	4.1	6.5	4.5	0.0	4.0	8.8	6.6
80.0	0.0	10.5	4.0	6.3	4.4	0.0	3.9	8.6	6.5
81.0	0.0	10.4	3.9	6.2	4.3	0.0	3.8	8.5	6.4
82.0	0.0	10.3	3.8	6.1	4.2	0.0	3.7	8.4	6.3
83.0	0.0	10.2	3.7	6.0	4.1	0.0	3.6	8.3	6.2
84.0	0.0	10.1	3.6	5.9	4.0	0.0	3.5	8.2	6.1
85.0	0.0	10.0	3.5	5.8	3.9	0.0	3.4	8.1	5.9
86.0	0.0	9.9	3.4	5.7	3.8	0.0	3.4	8.0	5.8
87.0	0.0	9.8	3.3	5.6	3.7	0.0	3.3	7.8	5.7
88.0	0.0	9.7	3.2	5.4	3.6	0.0	3.2	7.7	5.6
89.0	0.0	9.6	3.1	5.3	3.5	0.0	3.1	7.6	5.5
90.0	0.0	9.5	3.0	5.2	3.4	0.0	3.0	7.5	5.4
91.0	0.0	9.4	3.0	5.1	3.4	0.0	2.9	7.4	5.3
92.0	0.0	9.3	2.9	5.0	3.3	0.0	2.9	7.3	5.2
93.0	0.0	9.2	2.8	4.9	3.2	0.0	2.8	7.2	5.1
94.0	0.0	9.1	2.7	4.8	3.1	0.0	2.7	7.1	5.0
95.0	0.0	9.0	2.7	4.7	3.0	0.0	2.6	7.0	4.9
96.0	0.0	8.9	2.6	4.7	3.0	0.0	2.6	6.9	4.8
97.0	0.0	8.8	2.5	4.6	2.9	0.0	2.5	6.8	4.7
98.0	0.0	8.7	2.5	4.5	2.8	0.0	2.4	6.7	4.6
99.0	0.0	8.6	2.4	4.4	2.7	0.0	2.4	6.6	4.6
100.0	0.0	8.5	2.3	4.3	2.7	0.0	2.3	6.5	4.5
101.0	0.0	8.4	2.3	4.2	2.6	0.0	2.2	6.4	4.4
102.0	0.0	8.3	2.2	4.1	2.5	0.0	2.2	6.3	4.3
103.0	0.0	8.2	2.1	4.0	2.5	0.0	2.1	6.2	4.2
104.0	0.0	8.1	2.1	4.0	2.4	0.0	2.1	6.1	4.1
105.0	0.0	8.1	2.0	3.9	2.3	0.0	2.0	6.0	4.0
106.0	0.0	8.0	2.0	3.8	2.3	0.0	1.9	5.9	4.0
107.0	0.0	7.9	1.9	3.7	2.2	0.0	1.9	5.8	3.9
108.0	0.0	7.8	1.9	3.7	2.2	0.0	1.8	5.8	3.8
109.0	0.0	7.7	1.8	3.6	2.1	0.0	1.8	5.7	3.7
110.0	0.0	7.6	1.8	3.5	2.1	0.0	1.7	5.6	3.7
111.0	0.0	7.5	1.7	3.4	2.0	0.0	1.7	5.5	3.6
112.0	0.0	7.4	1.7	3.4	2.0	0.0	1.6	5.4	3.5
113.0	0.0	7.3	1.6	3.3	1.9	0.0	1.6	5.3	3.4
114.0	0.0	7.3	1.6	3.2	1.9	0.0	1.6	5.3	3.4
115.0	0.0	7.2	1.5	3.2	1.8	0.0	1.5	5.2	3.3
116.0	0.0	7.1	1.5	3.1	1.8	0.0	1.5	5.1	3.2
117.0	0.0	7.0	1.5	3.0	1.7	0.0	1.4	5.0	3.2
118.0	0.0	6.9	1.4	3.0	1.7	0.0	1.4	4.9	3.1
119.0	0.0	6.8	1.4	2.9	1.6	0.0	1.4	4.9	3.1
120.0	0.0	6.8	1.3	2.9	1.6	0.0	1.3	4.8	3.0
121.0	0.0	6.7	1.3	2.8	1.5	0.0	1.3	4.7	2.9
122.0	0.0	6.6	1.3	2.7	1.5	0.0	1.2	4.6	2.9
123.0	0.0	6.5	1.2	2.7	1.5	0.0	1.2	4.6	2.8
124.0	0.0	6.4	1.2	2.6	1.4	0.0	1.2	4.5	2.8
125.0	0.0	6.4	1.2	2.6	1.4	0.0	1.1	4.4	2.7
126.0	0.0	6.3	1.1	2.5	1.4	0.0	1.1	4.4	2.6
127.0	0.0	6.2	1.1	2.5	1.3	0.0	1.1	4.3	2.6
128.0	0.0	6.1	1.1	2.4	1.3	0.0	1.0	4.2	2.5
129.0	0.0	6.1	1.0	2.4	1.2	0.0	1.0	4.2	2.5
130.0	0.0	6.0	1.0	2.3	1.2	0.0	1.0	4.1	2.4
131.0	0.0	5.9	1.0	2.3	1.2	0.0	1.0	4.0	2.4
132.0	0.0	5.8	1.0	2.2	1.2	0.0	0.9	4.0	2.3
133.0	0.0	5.8	0.9	2.2	1.1	0.0	0.9	3.9	2.3
134.0	0.0	5.7	0.9	2.1	1.1	0.0	0.9	3.8	2.2
135.0	0.0	5.6	0.9	2.1	1.1	0.0	0.9	3.8	2.2
136.0	0.0	5.6	0.8	2.0	1.0	0.0	0.8	3.7	2.2
137.0	0.0	5.5	0.8	2.0	1.0	0.0	0.8	3.7	2.1
138.0	0.0	5.4	0.8	2.0	1.0	0.0	0.8	3.6	2.1
139.0	0.0	5.4	0.8	1.9	1.0	0.0	0.8	3.5	2.0
140.0	0.0	5.3	0.8	1.9	0.9	0.0	0.7	3.5	2.0
141.0	0.0	5.2	0.7	1.8	0.9	0.0	0.7	3.4	1.9
142.0	0.0	5.2	0.7	1.8	0.9	0.0	0.7	3.4	1.9
143.0	0.0	5.1	0.7	1.8	0.9	0.0	0.7	3.3	1.9
144.0	0.0	5.0	0.7	1.7	0.8	0.0	0.7	3.3	1.8
145.0	0.0	5.0	0.7	1.7	0.8	0.0	0.6	3.2	1.8
146.0	0.0	4.9	0.6	1.6	0.8	0.0	0.6	3.2	1.7
147.0	0.0	4.8	0.6	1.6	0.8	0.0	0.6	3.1	1.7
148.0	0.0	4.8	0.6	1.6	0.7	0.0	0.6	3.1	1.7
149.0	0.0	4.7	0.6	1.5	0.7	0.0	0.6	3.0	1.6
150.0	0.0	4.7	0.6	1.5	0.7	0.0	0.6	3.0	1.6
151.0	0.0	4.6	0.6	1.5	0.7	0.0	0.5	2.9	1.6
152.0	0.0	4.5	0.5	1.4	0.7	0.0	0.5	2.9	1.5
153.0	0.0	4.5	0.5	1.4	0.7	0.0	0.5	2.8	1.5
154.0	0.0	4.4	0.5	1.4	0.6	0.0	0.5	2.8	1.5
155.0	0.0	4.4	0.5	1.4	0.6	0.0	0.5	2.7	1.4
156.0	0.0	4.3	0.5	1.3	0.6	0.0	0.5	2.7	1.4

APPENDIX B1
CULVERT INVENTORY

DITCH CROSS-CULVERT LOCATIONS

CITY OF EDINBURG - MASTER DRAINAGE PLAN

LATERAL SYSTEMS - CROSS CULVERT STRUCTURE INVENTORY & PROPOSED MDP IMPROVEMENTS

DITCH STATION	CROSSING NAME	EXISTING STRUCTURE	CULVERT LENGTH	PROPOSED STRUCTURE
ES-100				
50	OUTLET GATE TO SMD	2- 10' X 10' RCB	60	--
1309	CESAR CHAVEZ	10' X 10' RCB	80	
4086	DIRT RD	10' X 10' RCB	80	
8153	DOOLITTLE	10' X 6' RCB	84	10' X 10' RCB
11181	RAUL LONGORIA	8' X 4' & 4' X 4' RCB	147	10' X 10' RCB
ES-101				
675	FREDDY GONZALEZ	84" RCP	116	
1520	28TH ST	60" RCP	80	
2308	US 281	60" RCP	400	
ES-102				
2027	SPRAGUE	10' X 6' RCB	106	--
ES-102-01				
1035	ACCESS RD	UNK- 24" RCP	94	8' X 5' RCB
1701	RAUL LONGORIA	UNK 2 BOX	157	8' X 5' RCB
4635	DOOLITTLE	UNK- 36" RCP	420	8' X 5' RCB

DITCH STATION	CROSSING NAME	EXISTING STRUCTURE	CULVERT LENGTH	PROPOSED STRUCTURE
NM-102				
1822	ACCESS	72" RCP	100	10' X 6' RCB
17433	MONTE CRISTO	60" RCP	554	--
18586	DENVER	36" RCP	93	2-36" RCP

DITCH STATION	CROSSING NAME	EXISTING STRUCTURE	CULVERT LENGTH	PROPOSED STRUCTURE
NM-103				
600	ACCESS ROAD	60" RCP	30	10' X 6' RCB
3297	MONTE CRISTO	60" RCP	474	10' X 6' RCB
5616	UTILITY- CANAL	48" RCP	80	8' X 6' RCB
6334	ACCESS ROAD	48" RCP	80	8' X 6' RCB
6952	ROGERS	36" RCP	80	8' X 6' RCB
8282	UTILITY- CANAL	36" RCP	72	6' X 6' RCB
9597	RUSSELL	36" RCP	72	48" RCP

CITY OF EDINBURG - MASTER DRAINAGE PLAN
LATERAL SYSTEMS - CROSS CULVERT STRUCTURE INVENTORY & PROPOSED MDP IMPROVEMENTS

DITCH STATION	CROSSING NAME	EXISTING STRUCTURE	CULVERT LENGTH	PROPOSED STRUCTURE
NM-105				
1318	MCCOLL (FM 2061)	30" RCP	124	5' X 5' RCB
3954	MONUMENT MACK	30" RCP	90	6' X 4' RCB
5285	UTILITY- CANAL	48" RCP	56	--
9235	HOEHN	18" RCP	114	48" RCP
11882	DEPOT	48" RCP	200	--
NM-106				
1311	MCCOLL (FM 2061)	36" RCP	108	2-36" RCP
2652	ACCESS	36" RCP	36	2-36" RCP
DITCH STATION	**CROSSING NAME**	**EXISTING STRUCTURE**	**CULVERT LENGTH**	**PROPOSED STRUCTURE**
NM-108				
1343	JACKSON	10' X 6' RCB	186	--
DITCH STATION	**CROSSING NAME**	**EXISTING STRUCTURE**	**CULVERT LENGTH**	**PROPOSED STRUCTURE**
NM-109				
1331	JACKSON	36" RCP	940	48" RCP
DITCH STATION	**CROSSING NAME**	**EXISTING STRUCTURE**	**CULVERT LENGTH**	**PROPOSED STRUCTURE**
NM-110				
1335	MCCOLL (FM 2061)	30" RCP (US) / 8'X4' RCB (DS)	176	8'X4' RCB EXTENDED U/S
2639	UTILITY	30" RCP	108	7' X 4' RCP
3988	MON MACK	36" RCP	142	7' X 4' RCP
5454	SAKER	36" RCP	76	2-36" RCP
DITCH STATION	**CROSSING NAME**	**EXISTING STRUCTURE**	**CULVERT LENGTH**	**PROPOSED STRUCTURE**
NM-112				
1335	MCCOLL (FM 2061)	24" RCP	220	--
DITCH STATION	**CROSSING NAME**	**EXISTING STRUCTURE**	**CULVERT LENGTH**	**PROPOSED STRUCTURE**
NM-111				
1257	JACKSON	6' X 6' RCB	184	--
3978	SUGAR	72" RCP	136	--
5831	RAILROAD	36" RCP	100	--

CITY OF EDINBURG - MASTER DRAINAGE PLAN

LATERAL SYSTEMS - CROSS CULVERT STRUCTURE INVENTORY & PROPOSED MDP IMPROVEMENTS

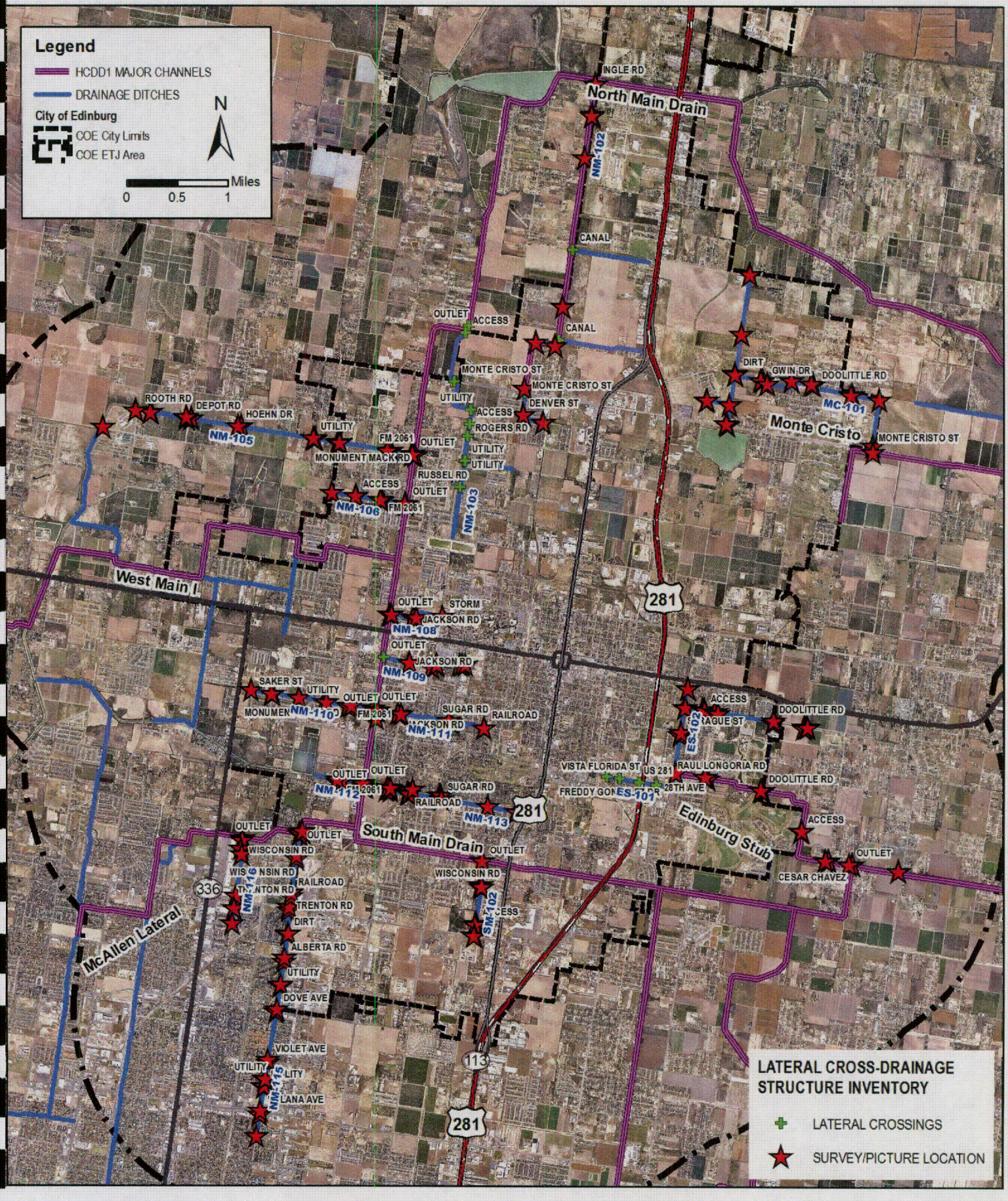
DITCH STATION	CROSSING NAME	EXISTING STRUCTURE	CULVERT LENGTH	PROPOSED STRUCTURE
NM-113				
1390	JACKSON	5' X 4' RCB	280	2- 5' X 4' RCB
2382	RAILROAD	5' X 4' RCB	68	--
4086	SUGAR	18" RCP	102	42" RCP

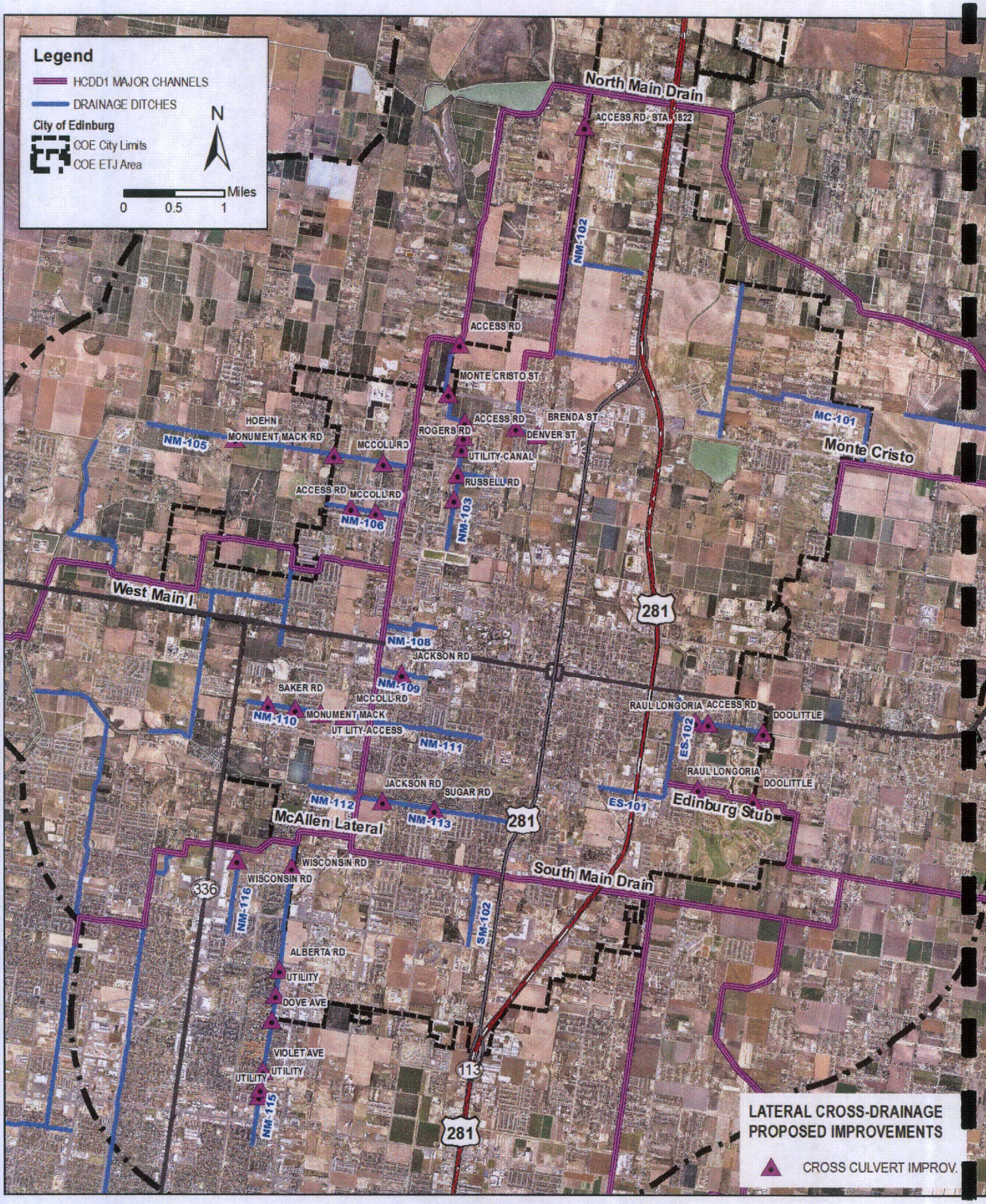
DITCH STATION	CROSSING NAME	EXISTING STRUCTURE	CULVERT LENGTH	PROPOSED STRUCTURE
NM-115				
1196	WISCONSIN	7' X 8' RCB	152	2- 7' X 8' RCB
3132	RAILROAD	10' X 10' RCB	212	--
3839	TRENTON	10' X 10' RCB & 48" RCP	174	--
5188	DIRT	10' X 8' RCB	48	--
6509	ALBERTA	8' X 9' RCB	178	2- 8' X 9' RCB
7827	UTILITY	8' X 7' RCB	48	2- 8' X 7' RCB
9146	DOVE	7' X 6' RCB	154	2- 7' X 6' RCB
11793	VIOLET	6' X 5' RCB	154	10' X 8' RCB
12718	UTILITY	6' X 4' RCB	36	2- 6' X 4' RCB
13110	UTILITY	6' X 4' RCB	40	2- 6' X 4' RCB
14441	NOLANA	66" RCP	188	--

DITCH STATION	CROSSING NAME	EXISTING STRUCTURE	CULVERT LENGTH	PROPOSED STRUCTURE
NM-116				
655	WISCONSIN	2- 36" RCP	320	6' X 5' RCB
3353	TRENTON	42" RCP	620	--

DITCH STATION	CROSSING NAME	EXISTING STRUCTURE	CULVERT LENGTH	PROPOSED STRUCTURE
SM-102				
1319	WISCONSIN	48" RCP	220	--
3316	ACCESS	60" RCP	86	--

DITCH STATION	CROSSING NAME	EXISTING STRUCTURE	CULVERT LENGTH	PROPOSED STRUCTURE
MC-101				
1319	WISCONSIN	48" RCP	220	--
3316	ACCESS	60" RCP	86	--

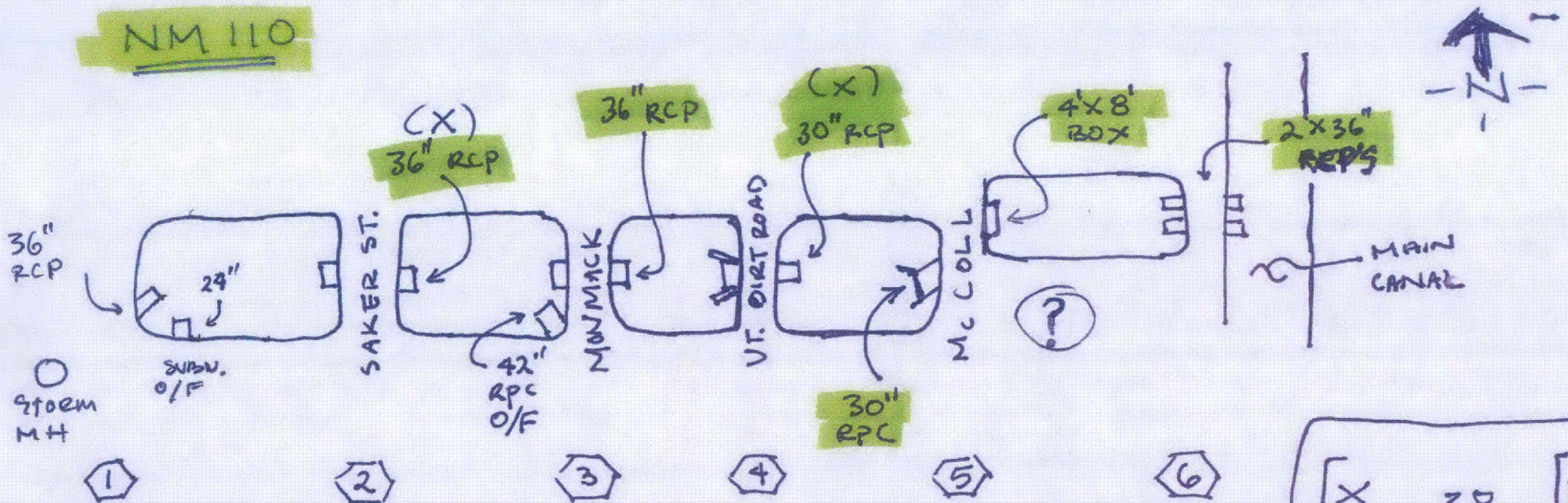

Legend
HCDD1 MAJOR CHANNELS
DRAINAGE DITCHES
City of Edinburg
COE City Limits
COE ETJ Area
N
Miles
0
0.5
1
North Main Drain
South Main Drain
West Main I
McAllen Lateral
Edinburg Stub
Monte Cristo
INGLE RD
CANAL
OUTLET
ACCESS
MONTE CRISTO ST
UTILITY
DENVER ST
ROGERS RD
DIRT
GWIN DR
DOOLITTLE RD
MC-101
ROOTH RD
DEPOT RD
HOEHN DR
NM-105
MONUMENT MACK RD
FM 2061
RUSSEL RD
NM-106
NM-103
NM-102
281
STORM
JACKSON RD
NM-108
NM-109
SAKER ST
NM-110
SUGAR RD
RAILROAD
NM-111
NM-112
NM-113
VISTA FLORIDA ST
US 281
RAUL LONGORIA RD
28TH AVE
ES-101
ES-102
TAGUE ST
CESAR CHAVEZ
WISCONSIN RD
TRENTON RD
DIRT
ALBERTA RD
DOVE AVE
VIOLET AVE
LANA AVE
NM-115
NM-116
SM-102
336
113
LATERAL CROSS-DRAINAGE STRUCTURE INVENTORY
LATERAL CROSSINGS
SURVEY/PICTURE LOCATION

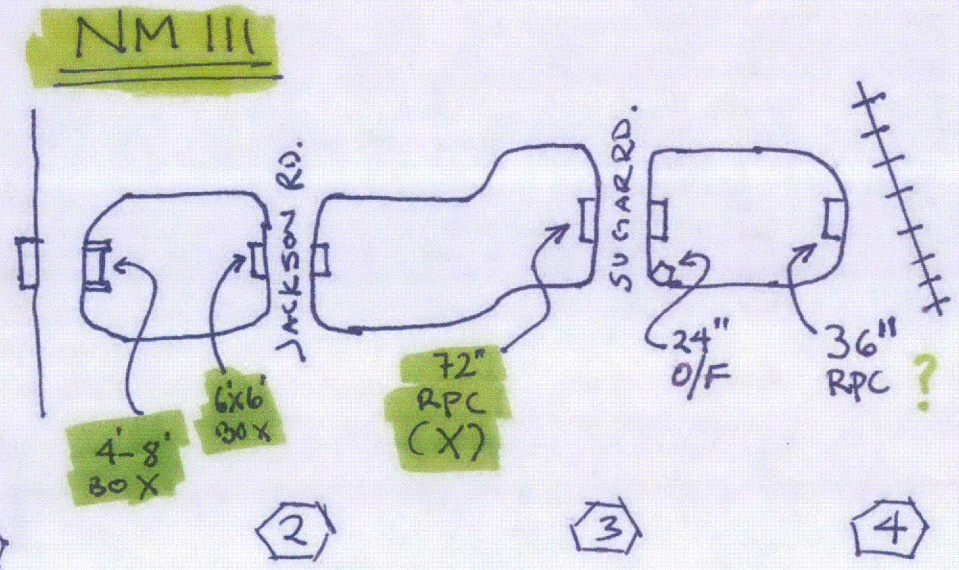

Legend
HCDD1 MAJOR CHANNELS
DRAINAGE DITCHES
City of Edinburg
COE City Limits
COE ETJ Area
N
Miles
0
0.5
1
North Main Drain
ACCESS RD- STA 3822
NM-102
ACCESS RD
MONTE CRISTO ST
HOEHN
MONUMENT MACK RD
NM-105
MCCOLL RD
ROGERS RD
ACCESS RD
BRENDA ST
DENVER ST
UTILITY-CANAL
RUSSELL RD
NM-103
MC-101
Monte Cristo
ACCESS RD
MCCOLL RD
NM-106
West Main
281
NM-108
JACKSON RD
NM-109
SAKER RD
MCCOLL RD
NM-110
MONUMENT MACK
UT LITY-ACCESS
NM-111
RAUL LONGORIA
ACCESS RD
DOOLITTLE
ES-102
RAUL LONGORIA
DOOLITTLE
Edinburg Stub
ES-101
JACKSON RD
SUGAR RD
NM-112
NM-113
McAllen Lateral
281
WISCONSIN RD
WISCONSIN RD
South Main Drain
336
NM-116
SM-102
ALBERTA RD
UTILITY
DOVE AVE
VIOLET AVE
UTILITY
UTILITY
NM-115
113
281
LATERAL CROSS-DRAINAGE
PROPOSED IMPROVEMENTS
CROSS CULVERT IMPROV.

APPENDIX B2
CULVERT INVENTORY

FIELD SURVEY NOTES & PHOTOS

CULVERT PHOTOS PROVIDED AS IMAGE FILES ON DISKETTE





PICTURE LABELS:

XXXX - (#) (#)

XXXX - DITCH NUMBER

(#) CROSSING OR STRUCT.

(#) SIDE OF STRUCT/ROAD LOOKING FROM STRUCT.

VIEW: N = North, S = South, W = West, E = East

O/F = OUTFALL X = CROSSING MH = MANHOLE RCP: REINFORCED CONCRETE PIPE

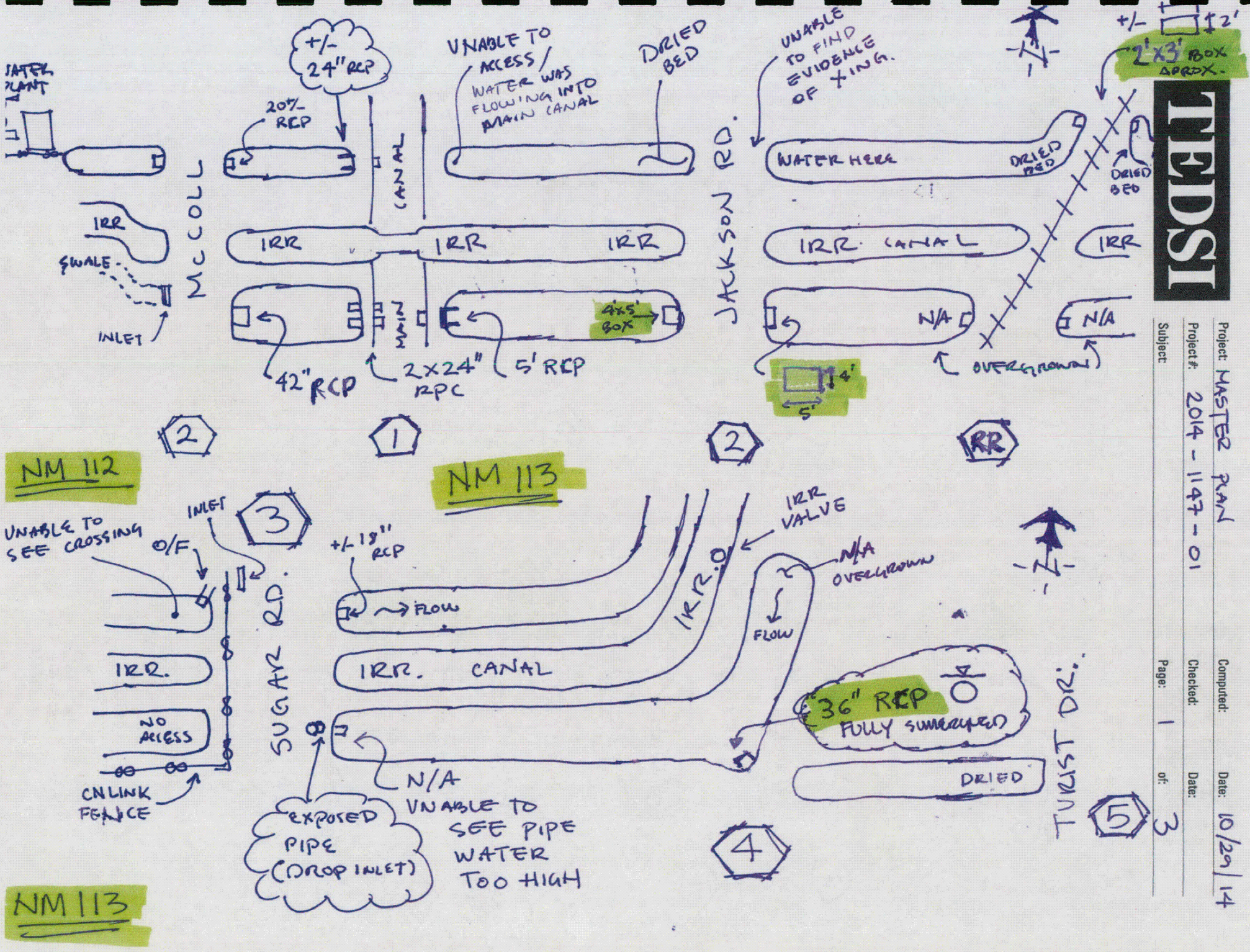
(#) = CROSSING NUMBER / STOP NUMBER TO ID. PICTURES

TEDSI

Project: MASTER DRAINAGE PLAN Computed: Date: 10/28/14

Project #: 2014-1147-01 Checked: Date:

Subject: Page: 1 of: 1



TEDSI

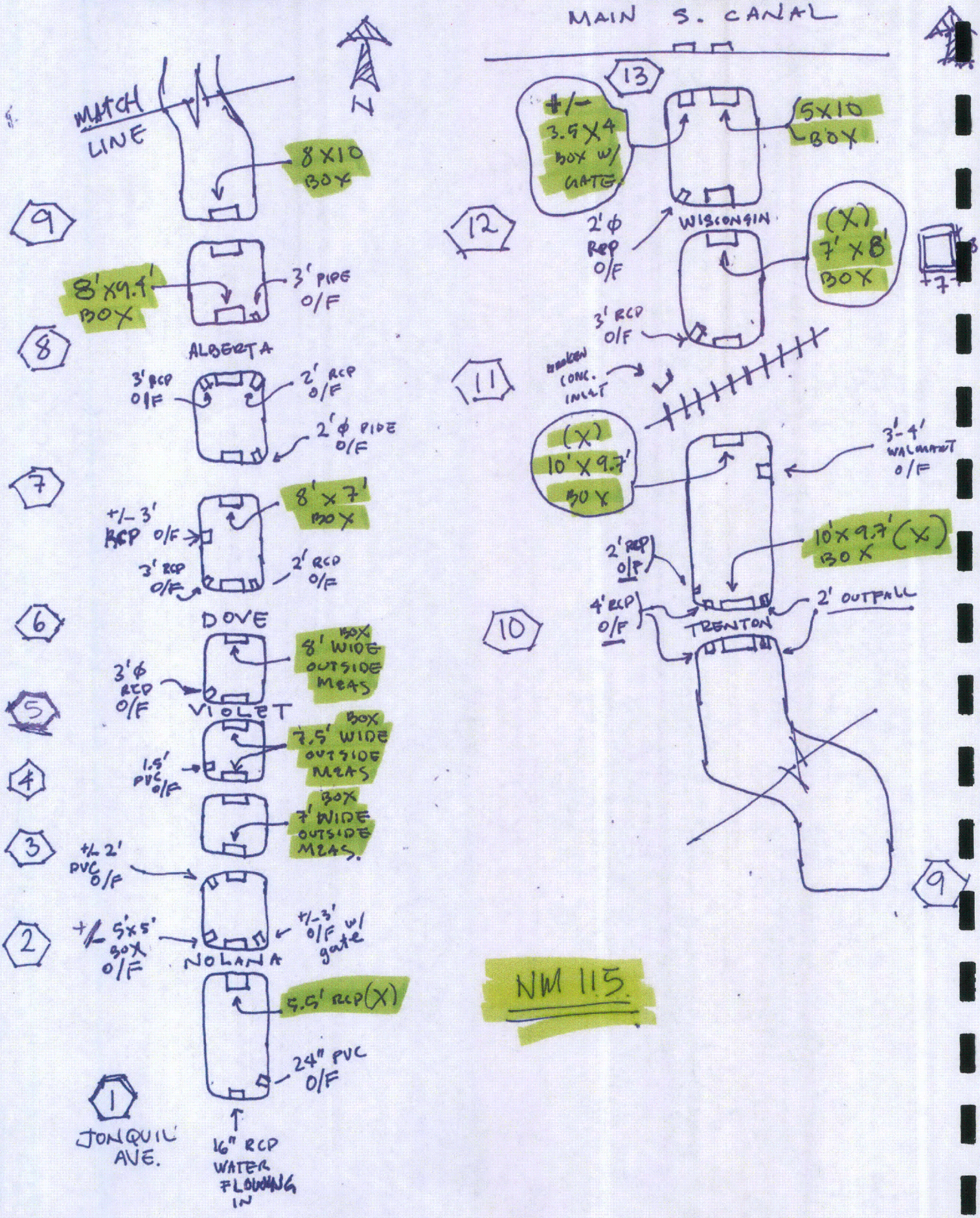
Project: MASTER PLAN
Project #: 2014 - 1147 - 01
Subject:
Computed:
Checked:
Page: 1 of: 3
Date: 10/29/14
Date:

TEDSI

Project: | Computed: | Date: 10/29/14

Project #: | Checked: | Date:

Subject: | Page: 2 of: 3

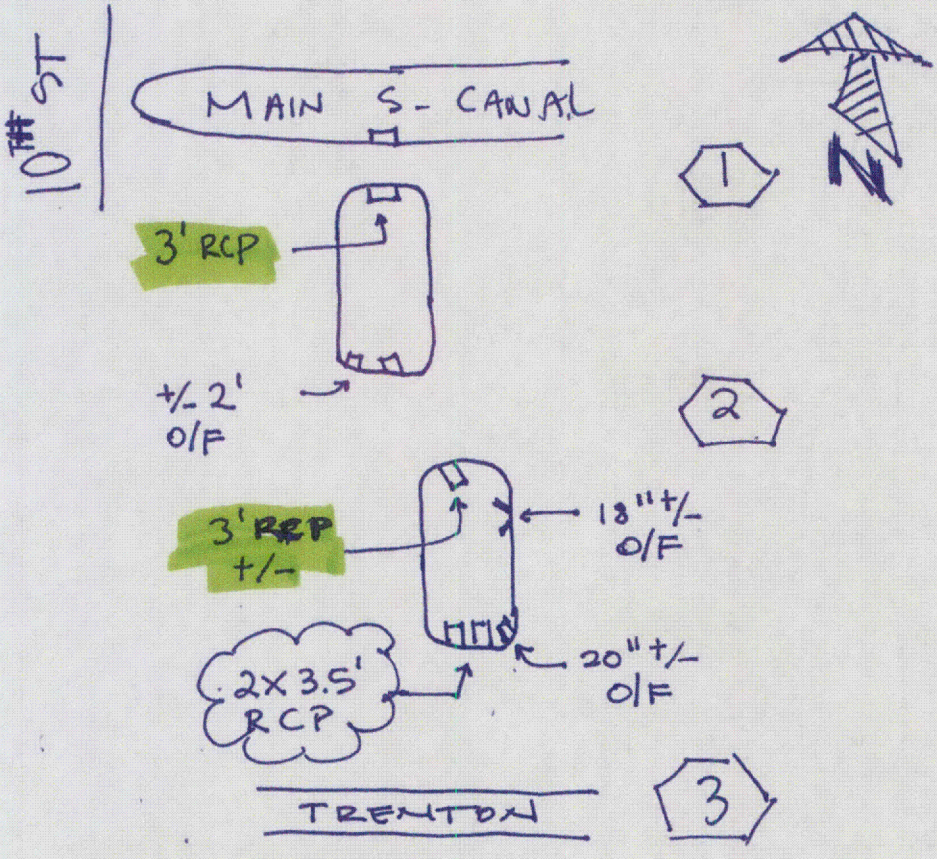


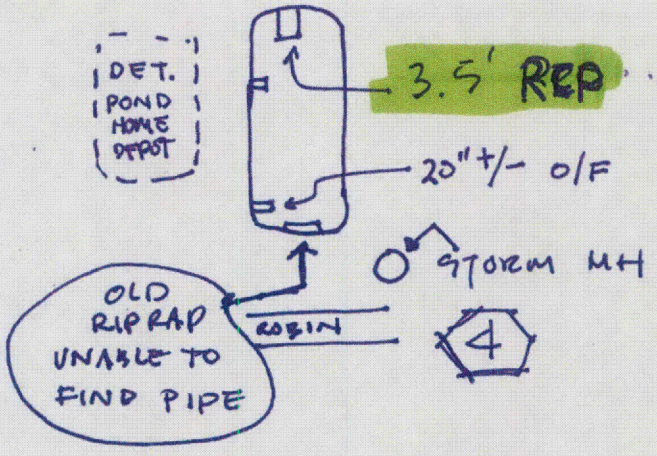
TEDSI

Project: | Computed: | Date: 10/29/14

Project #: | Checked: | Date:

Subject: | Page: 3 | of: 3





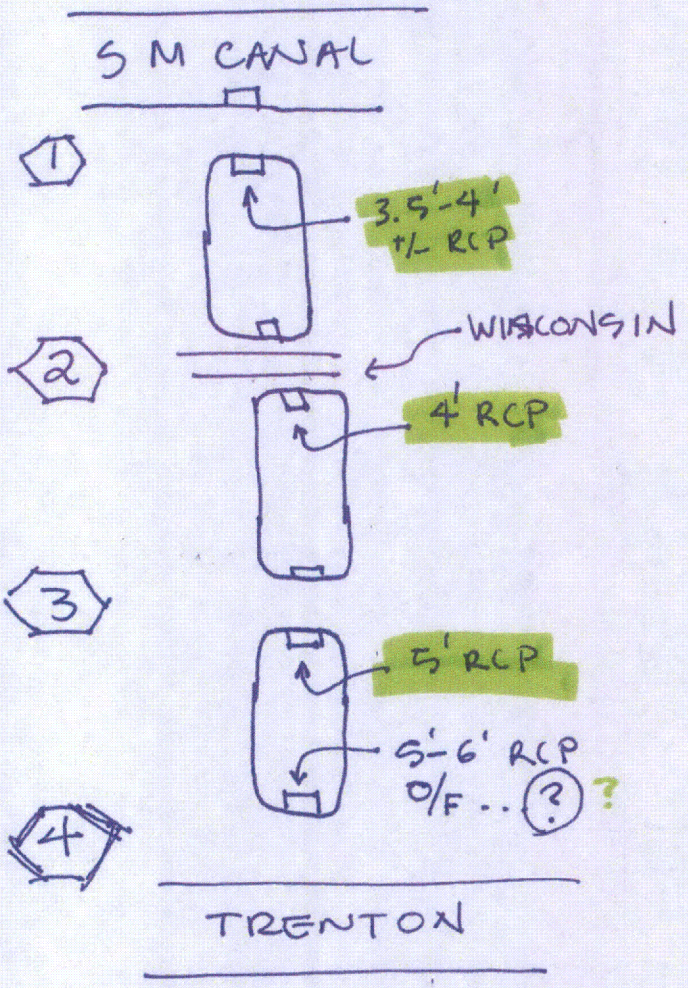
NM-116

TEDSI

Project: | Computed: | Date: 10/30/14

Project #: | Checked: | Date:

Subject: | Page: 1 | of: 4



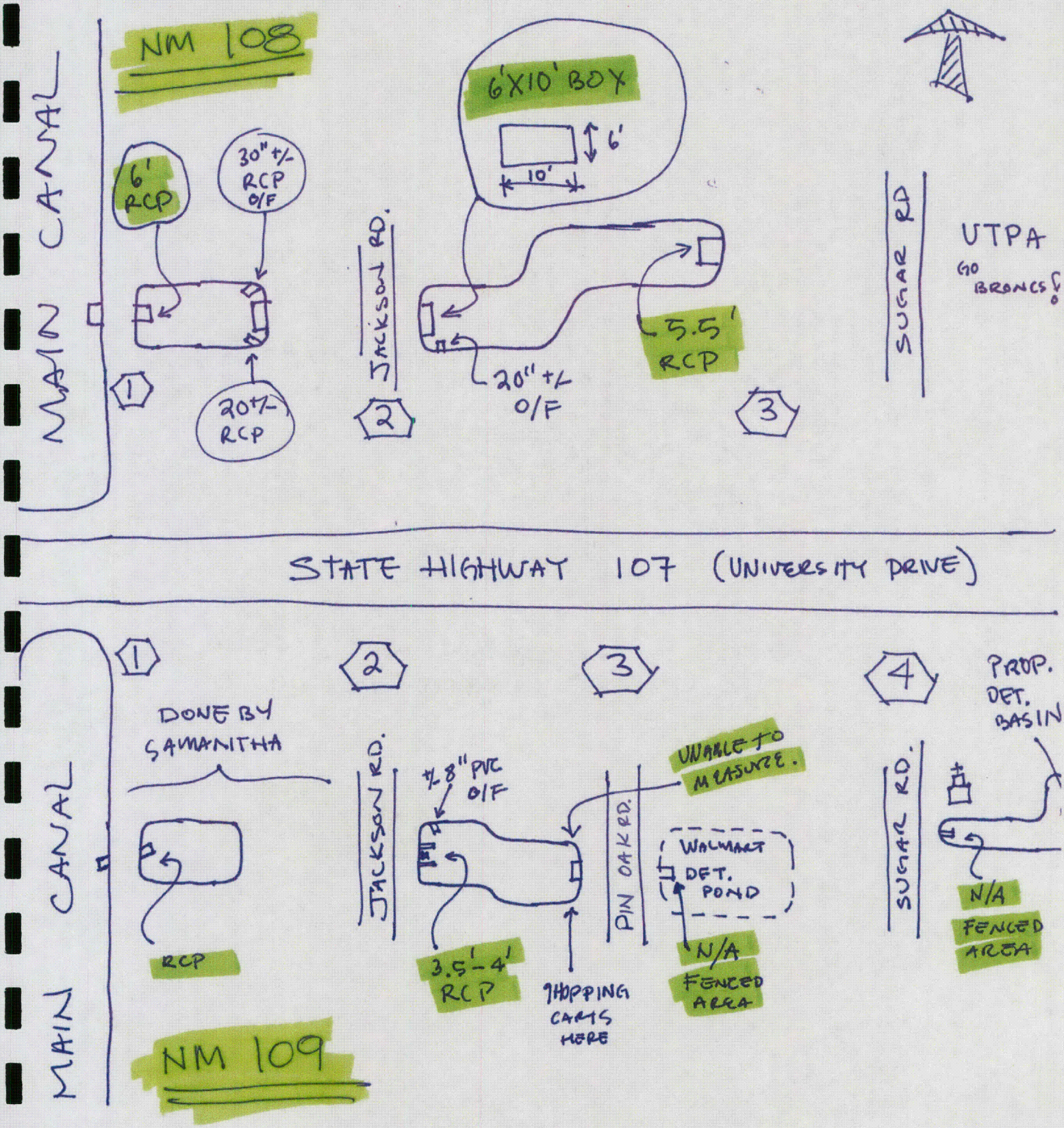
SM 102

TEDSI

Project: | Computed: | Date: 10/30/14

Project #: | Checked: | Date:

Subject: | Page: 2 | of: 4

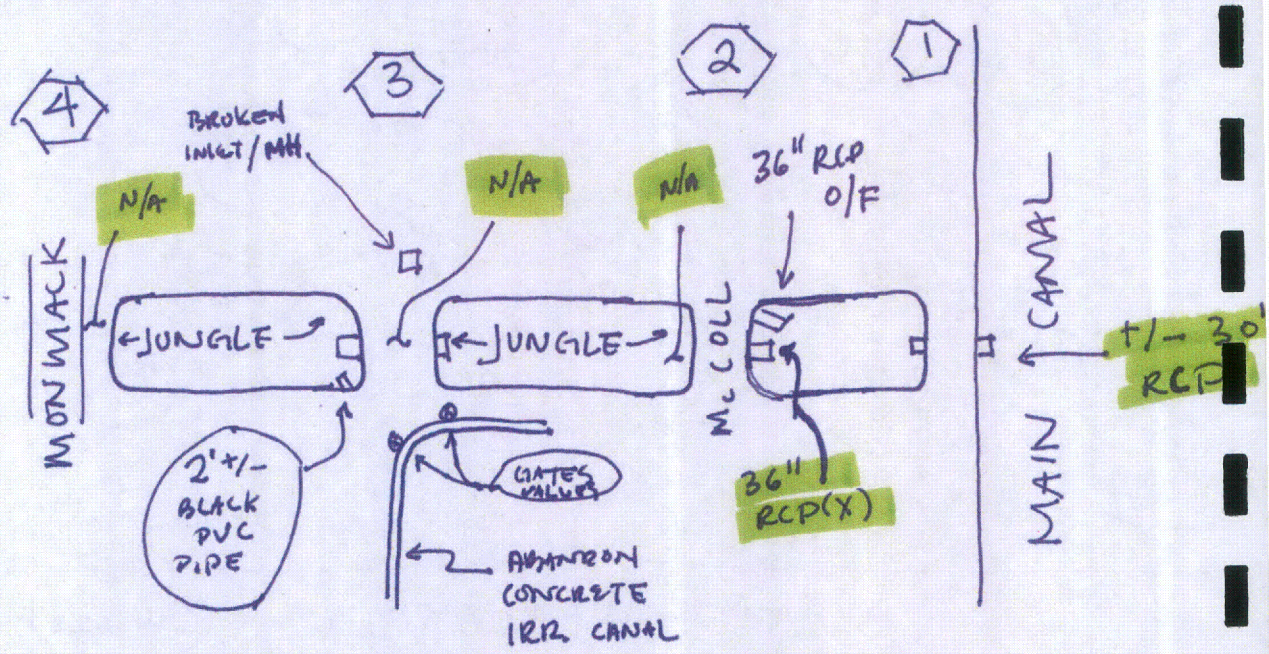


TEDSI

Project: | Computed: | Date: 10/30/14

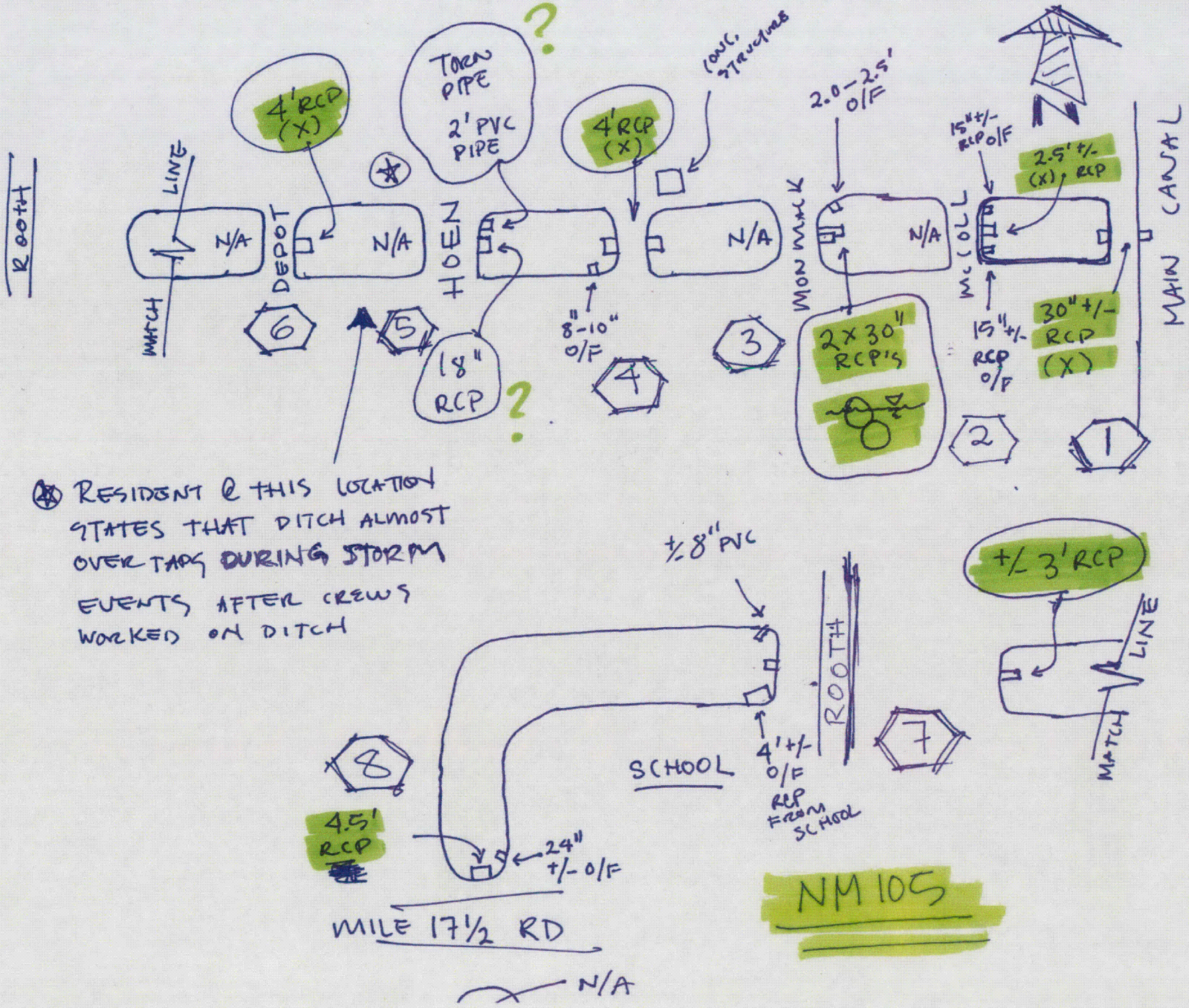
Project #: | Checked: | Date:

Subject: | Page: 3 | of: 4



DITCH IS OVERGROWN WEST OF Mc COLL RD. UNABLE TO FIND PIPES.

NM 106



TEDSI

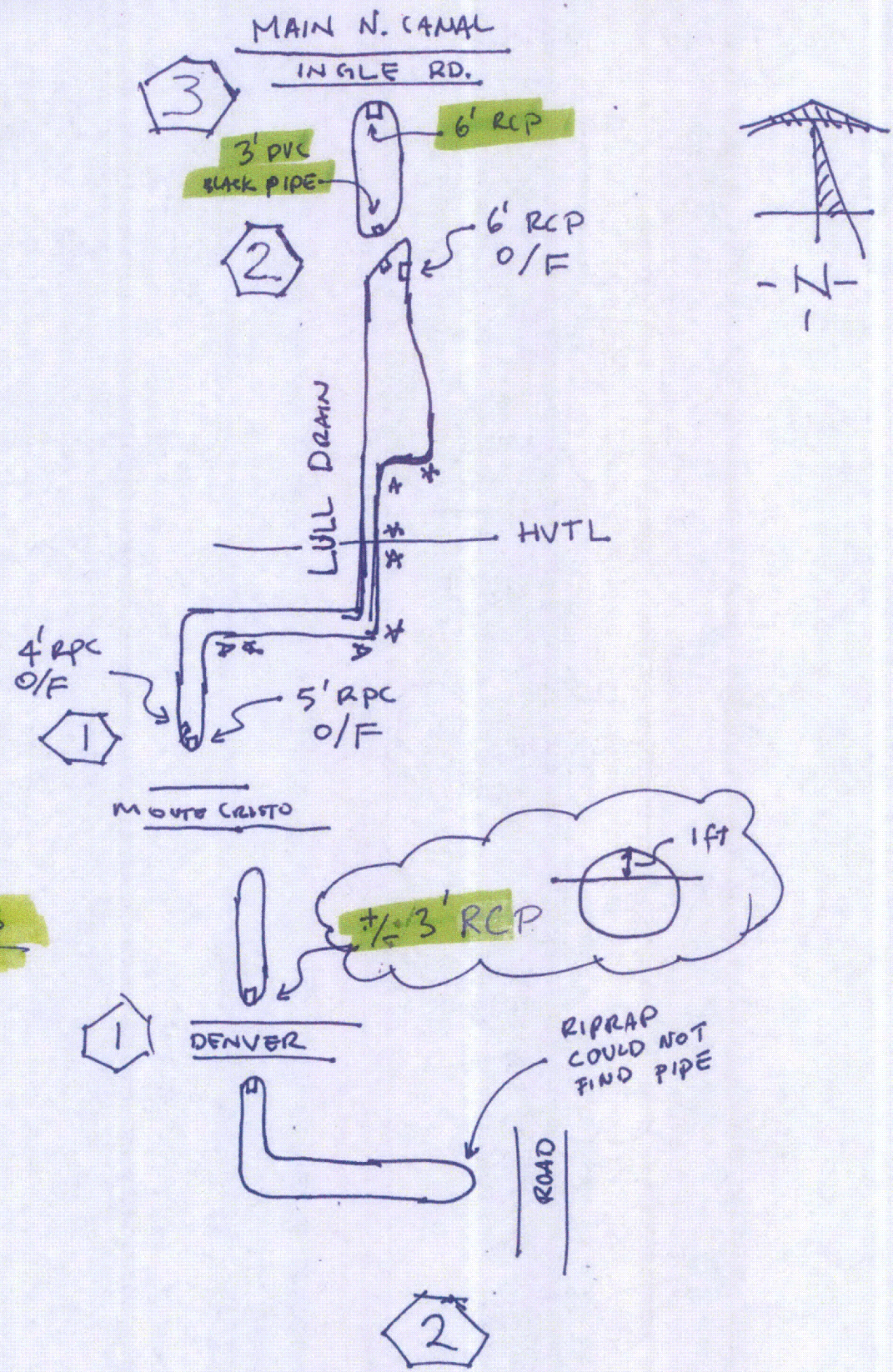
Project:
Project #:
Subject:
Computed:
Checked:
Page: 4 of: 4
Date: 10/30/14
Date:

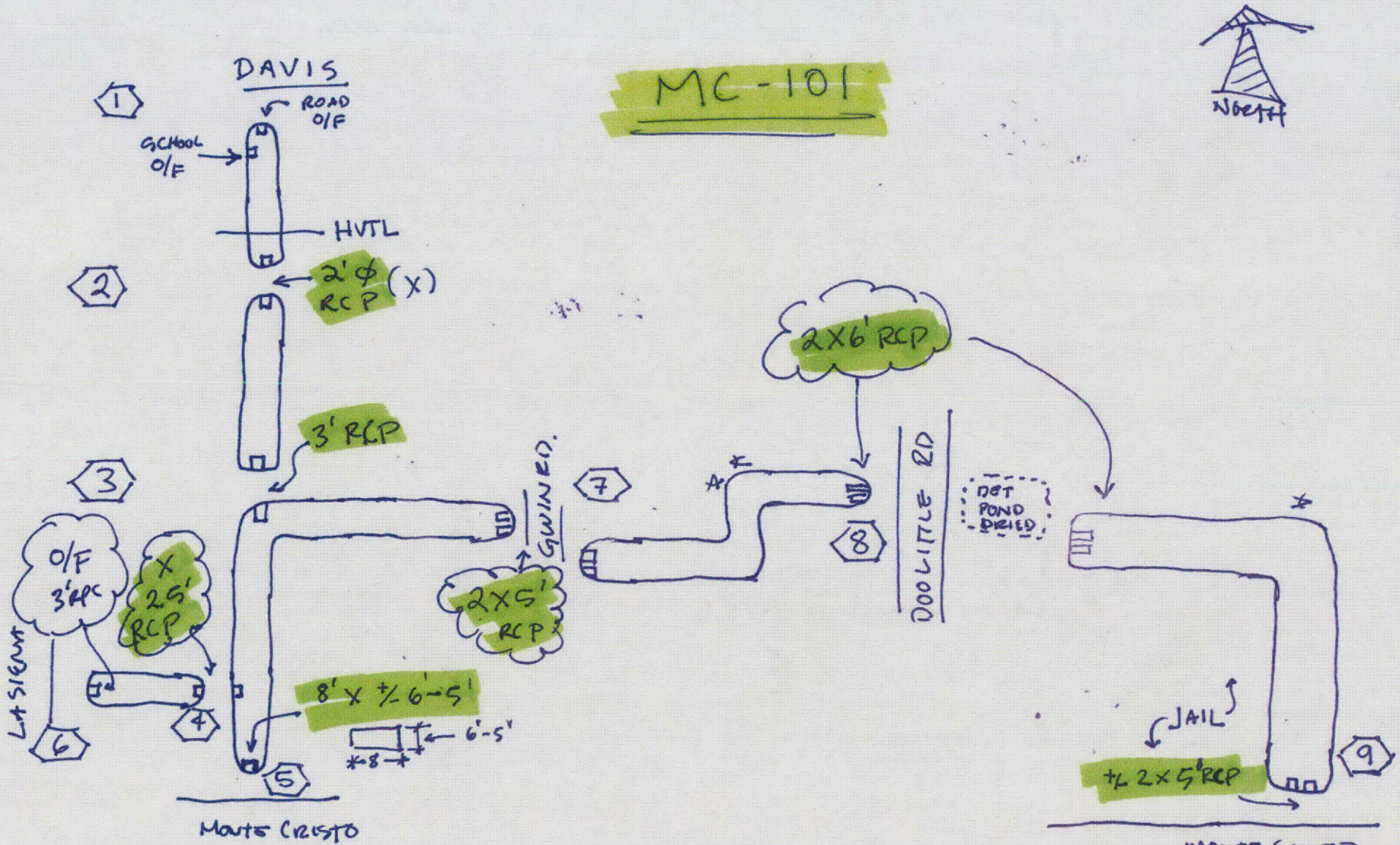
TEDSI

Project:		Computed:	Date: 11/3/14
Project #:		Checked:	Date:
Subject:		Page: 1	of: 4

NM 102

△ = Picture



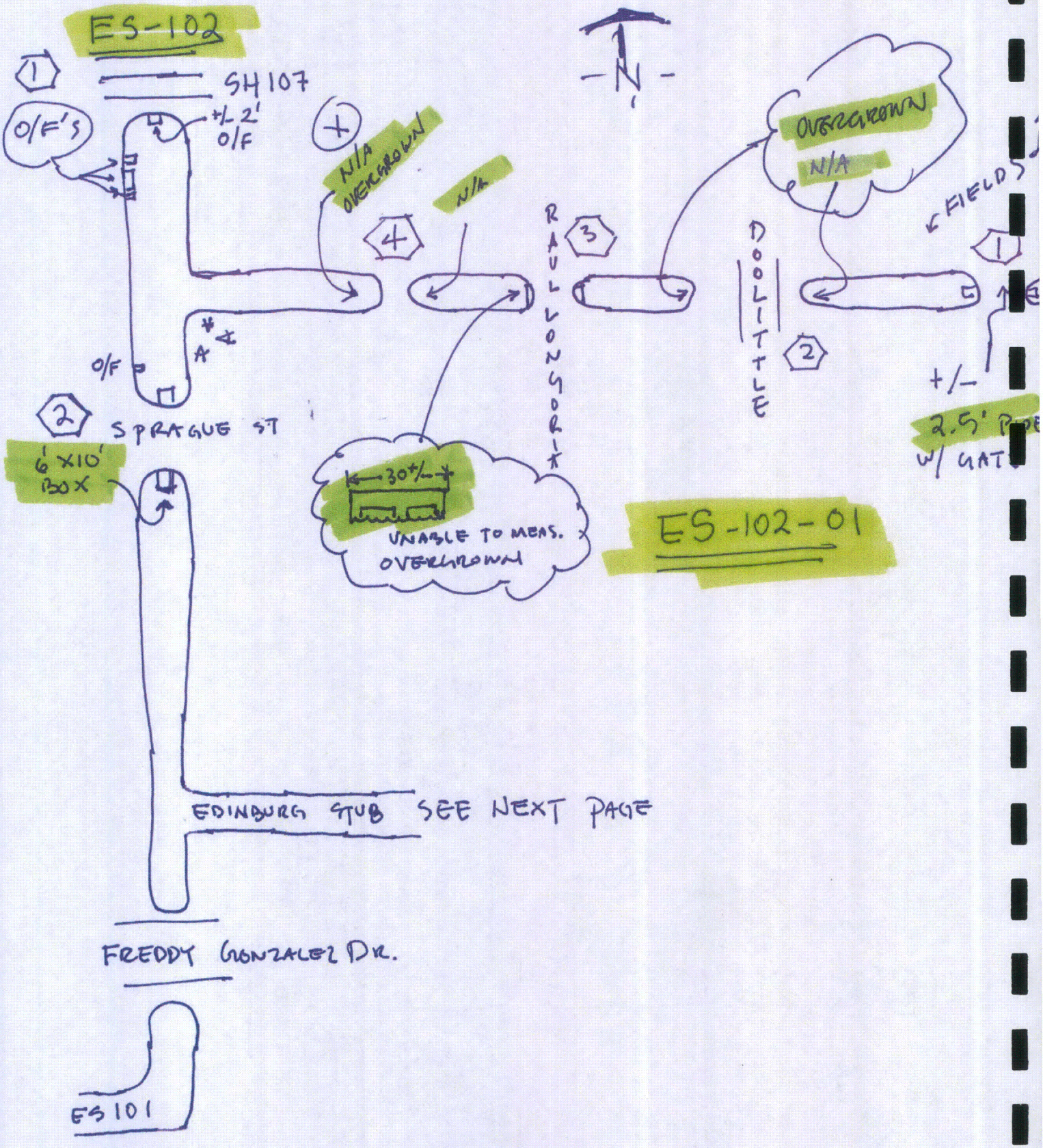


TEDSI

Project:
Project #:
Subject:
Computed:
Checked:
Page: 2 of: 4
Date: 11-3-14
Date:

TEDSI

Project:		Computed:	Date: 11/3/14
Project #:		Checked:	Date:
Subject:		Page: 3	of: 4

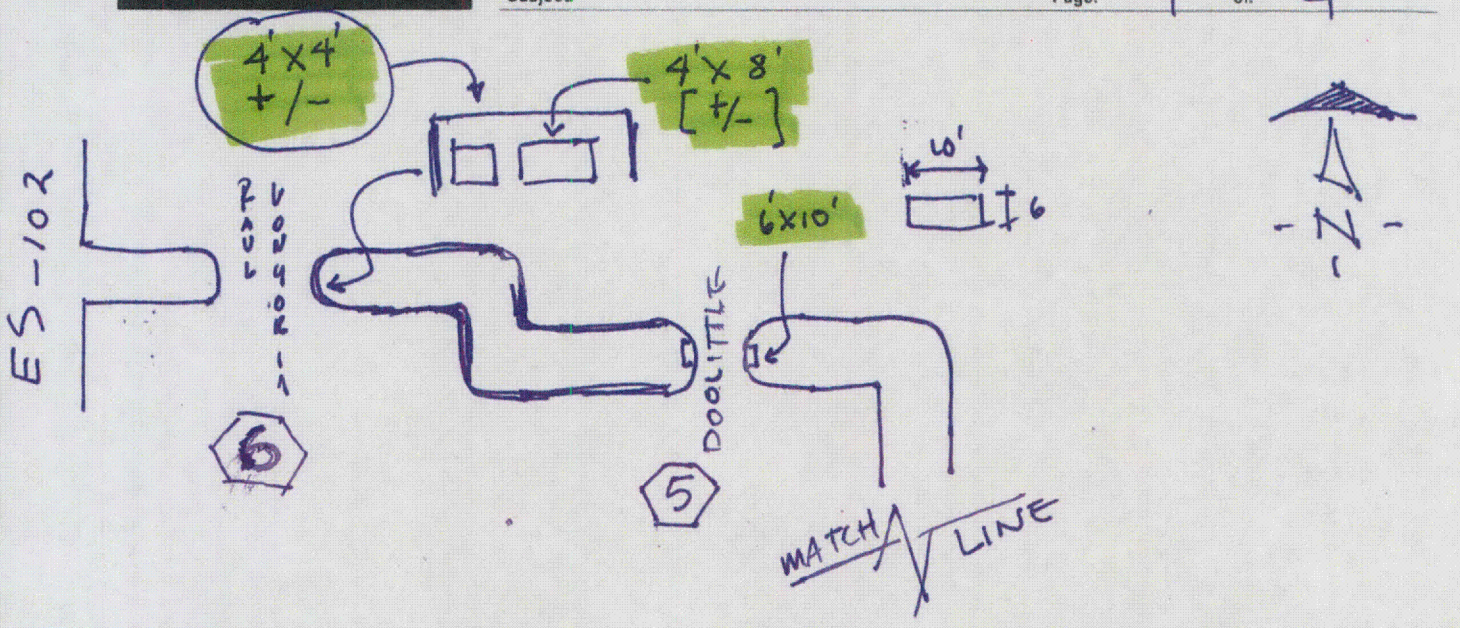


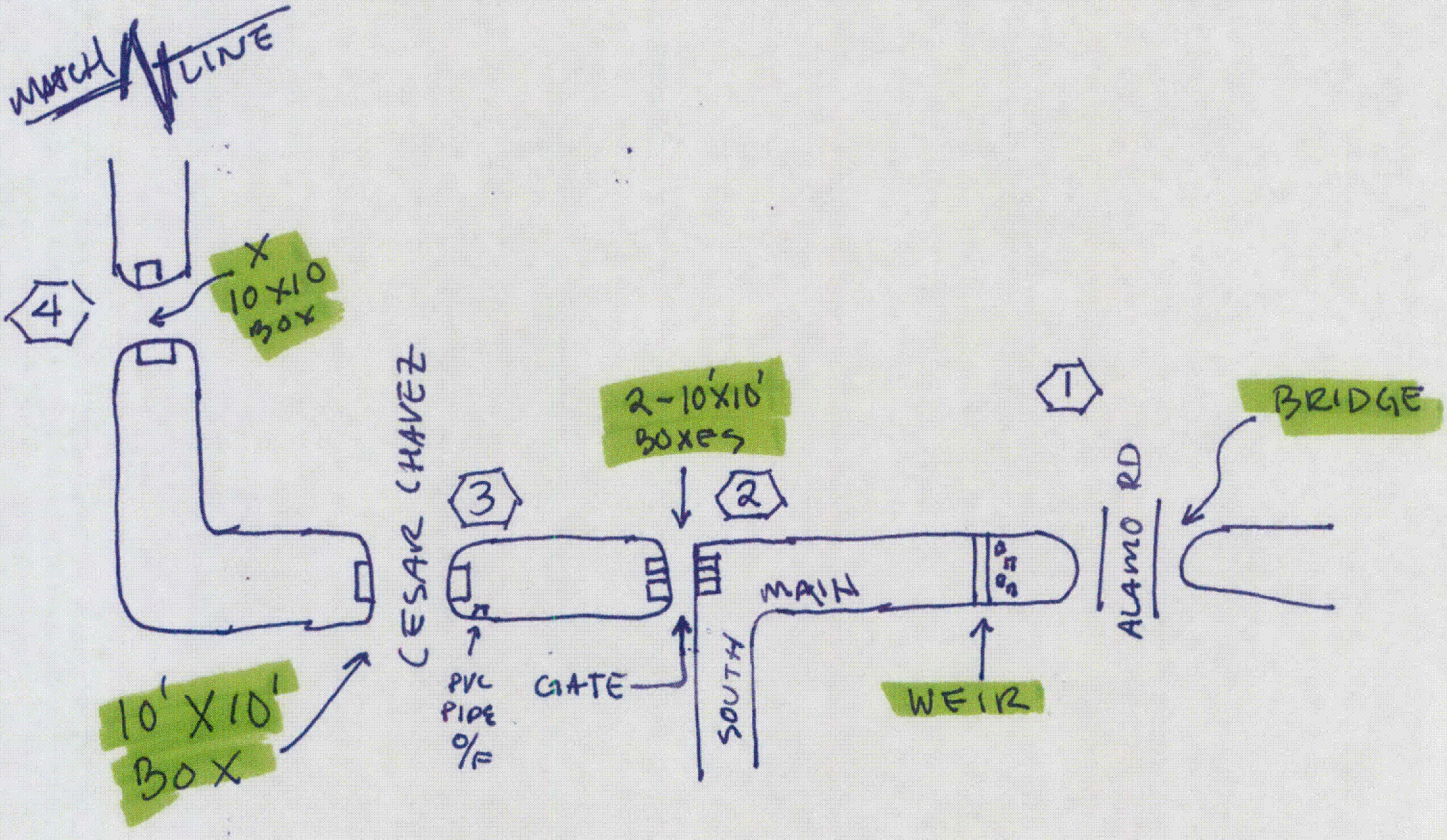
TEDSI

Project: | Computed: | Date: 11/3/14

Project #: | Checked: | Date:

Subject: | Page: 4 of: 4

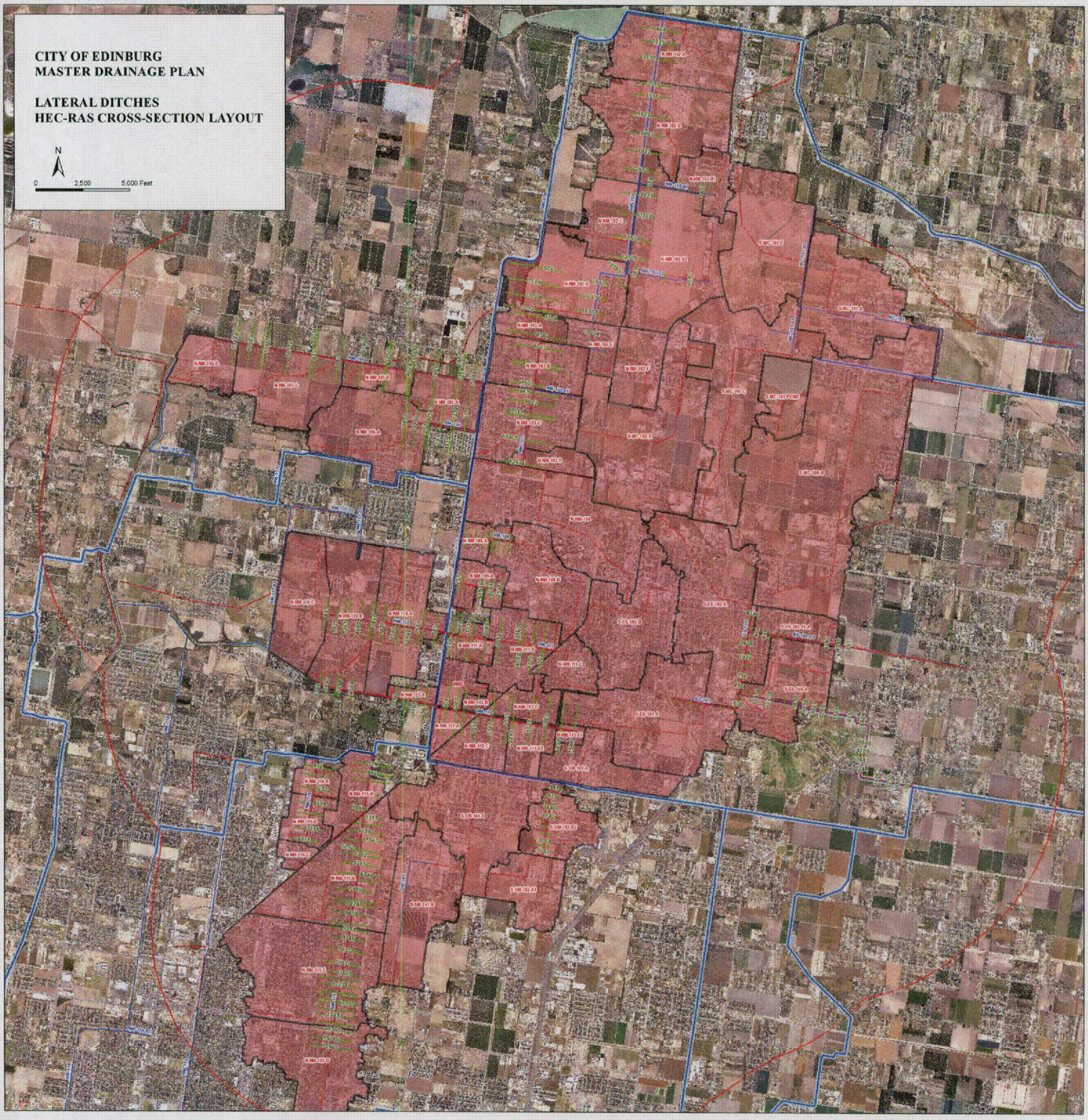




APPENDIX C
NORTH MAIN DRAIN
HEC-RAS 1D/2D MODELING

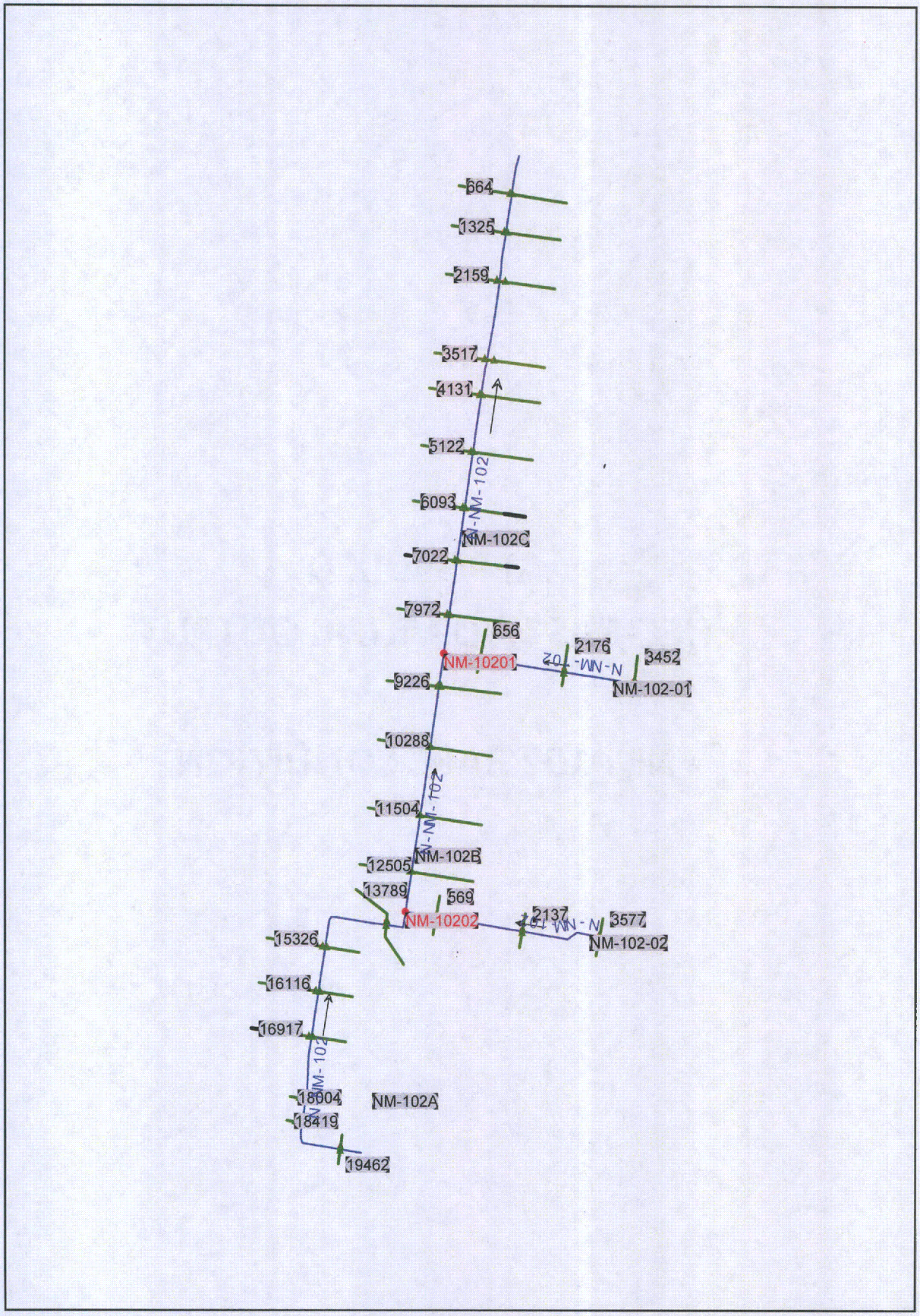
MODELING OUTPUT NOT PROVIDED DUE TO COMPLEXITY – SEE HEC-RAS MODEL FOR DETAILS

APPENDIX D
HEC-RAS HYDRAULIC OUTPUT


CITY OF EDINBURG
MASTER DRAINAGE PLAN
LATERAL DITCHES
HEC-RAS CROSS-SECTION LAYOUT
N
0
2,500
5,000 Feet

APPENDIX D
HEC-RAS HYDRAULIC OUTPUT

NM-102 BASE CONDITION


664
1325
2159
3517
4131
5122
6093
N-NM-102
NM-102C
7022
7972
656
NM-10201
2176
3452
N-NM-102
NM-102-01
9226
10288
N-NM-102
11504
NM-102B
12505
13789
569
NM-10202
2137
3577
N-NM-102
NM-102-02
15326
16116
16917
N-NM-102
18004
NM-102A
18419
19462

HEC-RAS Plan: BASE

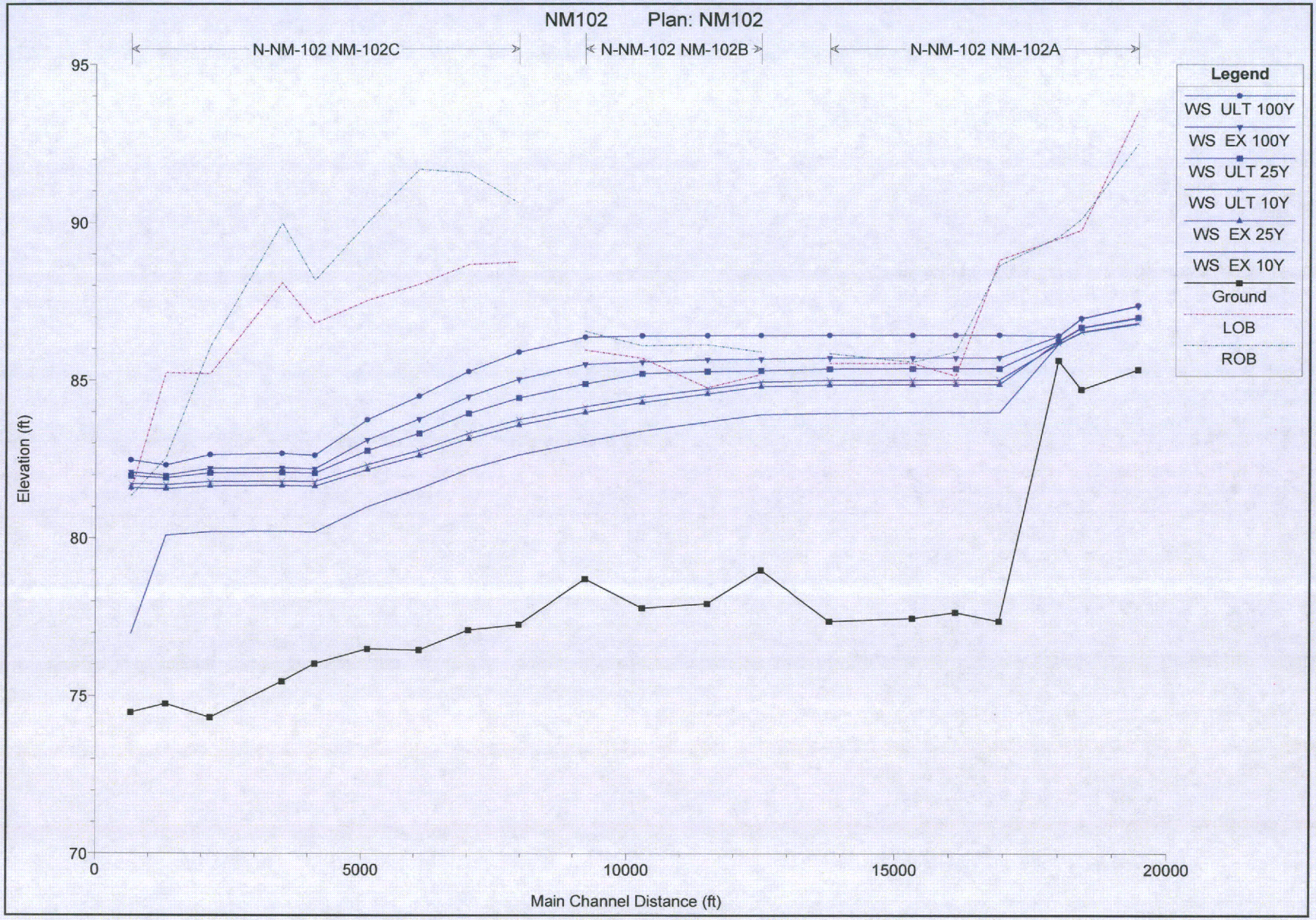
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
NM-102C	664	EX 10Y	147.00	74.47	76.97	76.97	77.67	0.028638	6.76	21.76	15.35	1.00
NM-102C	664	EX 25Y	205.00	74.47	81.59	77.37	81.59	0.000010	0.23	2135.68	1905.08	0.02
NM-102C	664	EX 100Y	356.00	74.47	82.08	78.17	82.08	0.000010	0.26	3086.11	1920.53	0.02
NM-102C	664	ULT 10Y	241.00	74.47	81.72	77.58	81.72	0.000010	0.24	2390.88	1916.22	0.02
NM-102C	664	ULT 25Y	316.00	74.47	81.97	77.98	81.97	0.000010	0.25	2859.54	1919.12	0.02
NM-102C	664	ULT 100Y	498.00	74.47	82.47	78.74	82.47	0.000010	0.27	3824.80	1926.08	0.02
NM-102C	1325	EX 10Y	134.00	74.75	80.09	77.36	80.17	0.001268	2.29	58.44	17.91	0.22
NM-102C	1325	EX 25Y	186.00	74.75	81.56	77.78	81.63	0.000869	2.11	88.35	797.71	0.19
NM-102C	1325	EX 100Y	321.00	74.75	81.99	78.67	82.15	0.001980	3.25	98.88	1060.17	0.29
NM-102C	1325	ULT 10Y	211.00	74.75	81.68	77.96	81.77	0.001036	2.31	91.27	837.38	0.21
NM-102C	1325	ULT 25Y	276.00	74.75	81.90	78.39	82.02	0.001551	2.86	96.52	950.13	0.26
NM-102C	1325	ULT 100Y	436.00	74.75	82.31	79.29	82.57	0.002993	4.06	107.26	1425.18	0.36
NM-102C	2159	EX 10Y	134.00	74.31	80.20	74.97	80.20	0.000007	0.24	560.07	121.90	0.02
NM-102C	2159	EX 25Y	186.00	74.31	81.65	75.09	81.65	0.000006	0.25	742.12	128.39	0.02
NM-102C	2159	EX 100Y	321.00	74.31	82.20	75.36	82.21	0.000013	0.39	813.87	130.61	0.03
NM-102C	2159	ULT 10Y	211.00	74.31	81.79	75.14	81.79	0.000007	0.28	760.39	128.97	0.02
NM-102C	2159	ULT 25Y	276.00	74.31	82.06	75.27	82.07	0.000010	0.35	795.54	130.05	0.02
NM-102C	2159	ULT 100Y	436.00	74.31	82.64	75.53	82.65	0.000019	0.50	871.47	132.39	0.03
NM-102C	3517	EX 10Y	134.00	75.46	80.21	76.47	80.21	0.000016	0.31	428.15	116.36	0.03
NM-102C	3517	EX 25Y	186.00	75.46	81.66	76.58	81.66	0.000012	0.31	604.69	130.91	0.03
NM-102C	3517	EX 100Y	321.00	75.46	82.23	76.82	82.23	0.000024	0.47	679.89	134.08	0.04
NM-102C	3517	ULT 10Y	211.00	75.46	81.80	76.63	81.81	0.000014	0.34	623.65	132.25	0.03
NM-102C	3517	ULT 25Y	276.00	75.46	82.08	76.75	82.08	0.000020	0.42	660.47	133.45	0.03
NM-102C	3517	ULT 100Y	436.00	75.46	82.67	76.99	82.68	0.000034	0.59	740.46	136.02	0.04
NM-102C	4131	EX 10Y	115.00	76.02	80.19	78.00	80.26	0.001179	2.10	54.75	19.28	0.22
NM-102C	4131	EX 25Y	158.00	76.02	81.64	78.32	81.70	0.000653	1.86	85.02	22.45	0.17
NM-102C	4131	EX 100Y	268.00	76.02	82.19	79.00	82.30	0.001287	2.75	97.55	23.64	0.24
NM-102C	4131	ULT 10Y	168.00	76.02	81.79	78.39	81.84	0.000665	1.90	88.28	22.77	0.17
NM-102C	4131	ULT 25Y	218.00	76.02	82.06	78.72	82.14	0.000930	2.31	94.47	23.35	0.20
NM-102C	4131	ULT 100Y	346.00	76.02	82.62	79.41	82.78	0.001621	3.20	108.02	25.12	0.27
NM-102C	5122	EX 10Y	115.00	76.49	80.99	78.13	81.03	0.000538	1.55	74.16	23.15	0.15
NM-102C	5122	EX 25Y	158.00	76.49	82.16	78.45	82.20	0.000405	1.53	103.01	25.90	0.14
NM-102C	5122	EX 100Y	268.00	76.49	83.11	79.09	83.18	0.000633	2.09	128.50	28.11	0.17
NM-102C	5122	ULT 10Y	168.00	76.49	82.32	78.52	82.36	0.000412	1.57	107.03	26.26	0.14
NM-102C	5122	ULT 25Y	218.00	76.49	82.76	78.83	82.82	0.000518	1.83	118.93	27.30	0.15
NM-102C	5122	ULT 100Y	346.00	76.49	83.74	79.47	83.83	0.000735	2.36	146.81	30.74	0.19
NM-102C	6093	EX 10Y	115.00	76.45	81.56	78.85	81.60	0.000659	1.67	68.74	21.29	0.16
NM-102C	6093	EX 25Y	158.00	76.45	82.61	79.20	82.66	0.000541	1.72	92.05	23.08	0.15
NM-102C	6093	EX 100Y	268.00	76.45	83.77	79.82	83.84	0.000742	2.24	119.78	24.94	0.18
NM-102C	6093	ULT 10Y	168.00	76.45	82.77	79.27	82.82	0.000547	1.75	95.77	23.33	0.15
NM-102C	6093	ULT 25Y	218.00	76.45	83.32	79.55	83.38	0.000644	2.01	108.71	24.21	0.17
NM-102C	6093	ULT 100Y	346.00	76.45	84.49	80.18	84.59	0.000828	2.50	138.33	26.11	0.19
NM-102C	7022	EX 10Y	115.00	77.09	82.18	79.23	82.23	0.000683	1.76	65.48	19.27	0.17
NM-102C	7022	EX 25Y	158.00	77.09	83.15	79.59	83.20	0.000628	1.86	84.95	21.07	0.16
NM-102C	7022	EX 100Y	268.00	77.09	84.48	80.32	84.56	0.000797	2.34	114.59	23.54	0.19
NM-102C	7022	ULT 10Y	168.00	77.09	83.31	79.66	83.37	0.000635	1.90	88.47	21.37	0.16
NM-102C	7022	ULT 25Y	218.00	77.09	83.94	80.01	84.01	0.000718	2.13	102.28	22.55	0.18
NM-102C	7022	ULT 100Y	346.00	77.09	85.28	80.73	85.38	0.000871	2.58	134.14	25.20	0.20
NM-102C	7972	EX 10Y	115.00	77.26	82.63	79.02	82.66	0.000321	1.31	88.04	23.50	0.12
NM-102C	7972	EX 25Y	158.00	77.26	83.58	79.34	83.61	0.000316	1.42	111.20	25.38	0.12
NM-102C	7972	EX 100Y	268.00	77.26	85.03	80.03	85.08	0.000397	1.79	150.13	28.27	0.14
NM-102C	7972	ULT 10Y	168.00	77.26	83.75	79.42	83.79	0.000320	1.45	115.61	25.72	0.12
NM-102C	7972	ULT 25Y	218.00	77.26	84.44	79.74	84.48	0.000360	1.63	133.80	27.09	0.13
NM-102C	7972	ULT 100Y	346.00	77.26	85.89	80.41	85.95	0.000434	1.98	175.13	29.95	0.14
NM-102B	9226	EX 10Y	97.00	78.71	83.06	80.04	83.08	0.000351	1.27	76.60	23.47	0.12
NM-102B	9226	EX 25Y	133.00	78.71	83.98	80.31	84.01	0.000317	1.34	99.21	25.34	0.12
NM-102B	9226	EX 100Y	225.00	78.71	85.51	80.89	85.55	0.000345	1.60	140.27	290.20	0.13
NM-102B	9226	ULT 10Y	142.00	78.71	84.16	80.37	84.19	0.000319	1.37	103.72	25.69	0.12
NM-102B	9226	ULT 25Y	185.00	78.71	84.89	80.65	84.92	0.000336	1.50	122.97	42.14	0.12
NM-102B	9226	ULT 100Y	293.00	78.71	86.36	81.24	86.40	0.000285	1.57	280.87	1050.06	0.12
NM-102B	10288	EX 10Y	87.00	77.78	83.39	79.73	83.40	0.000264	1.12	77.88	22.10	0.10
NM-102B	10288	EX 25Y	117.00	77.78	84.29	80.04	84.31	0.000253	1.18	98.99	1004.23	0.10
NM-102B	10288	EX 100Y	197.00	77.78	85.58	80.77	85.61	0.000325	1.47	133.82	1869.30	0.12
NM-102B	10288	ULT 10Y	120.00	77.78	84.46	80.07	84.48	0.000238	1.16	103.30	1115.31	0.10
NM-102B	10288	ULT 25Y	156.00	77.78	85.21	80.43	85.24	0.000253	1.27	123.26	1750.92	0.11
NM-102B	10288	ULT 100Y	247.00	77.78	86.41	81.10	86.41	0.000002	0.13	4032.54	2014.14	0.01
NM-102B	11504	EX 10Y	87.00	77.92	83.67	79.65	83.69	0.000209	1.02	85.19	88.72	0.10
NM-102B	11504	EX 25Y	117.00	77.92	84.57	79.93	84.59	0.000203	1.08	107.87	953.54	0.10

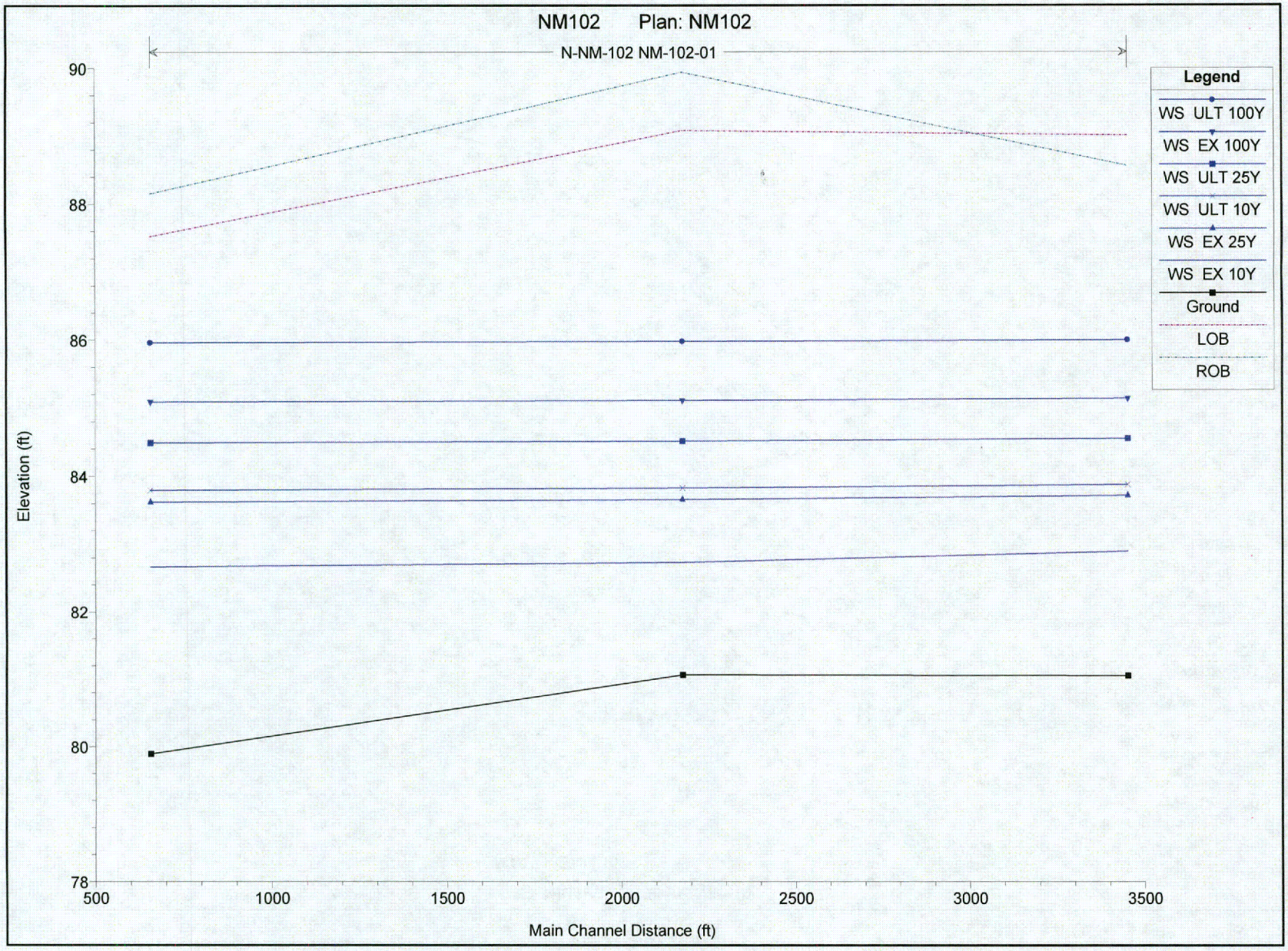
HEC-RAS Plan: BASE (Continued)

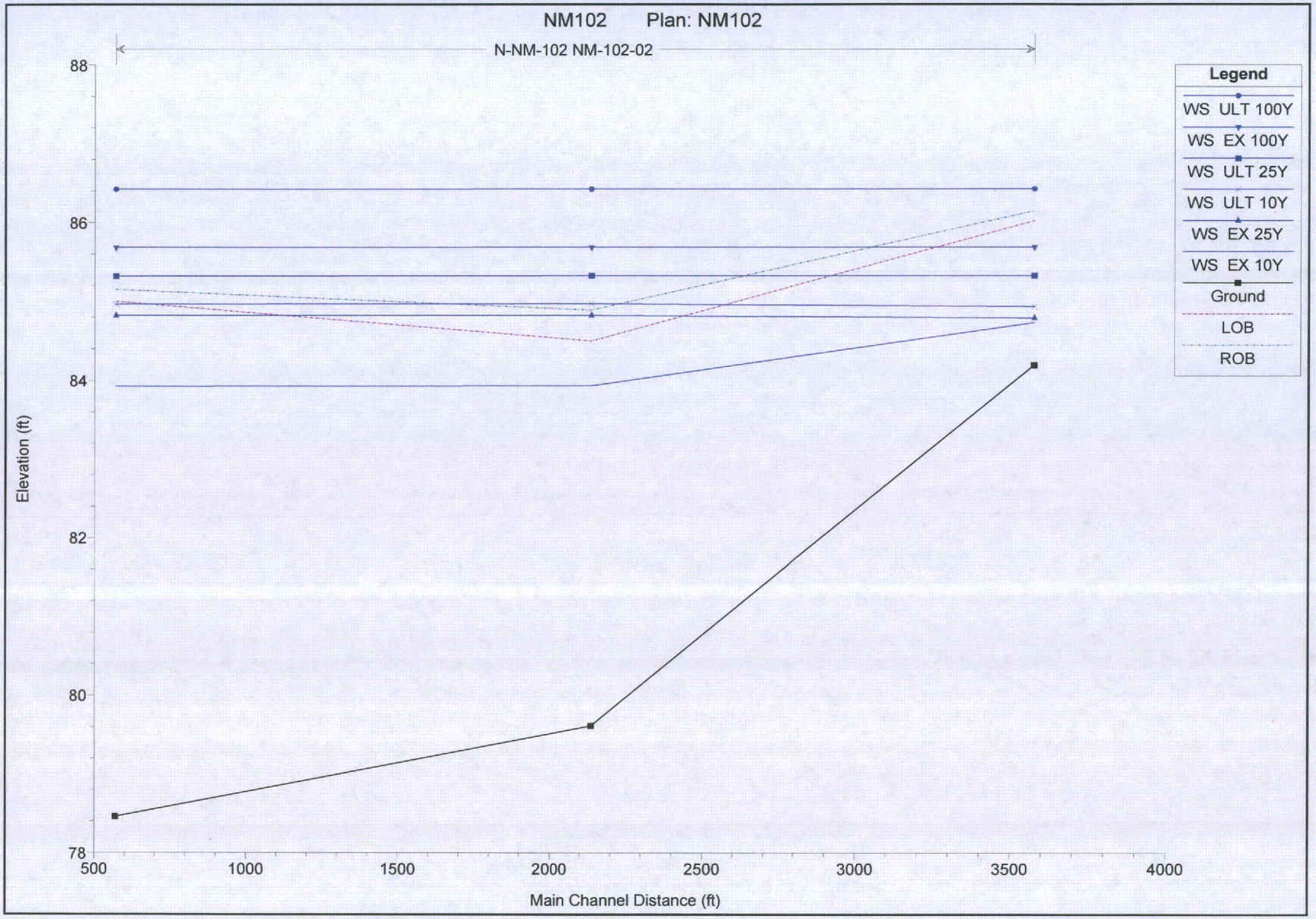
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
NM-102B	11504	EX 100Y	197.00	77.92	85.65	80.53	85.65	0.000010	0.27	1632.83	1908.36	0.02
NM-102B	11504	ULT 10Y	120.00	77.92	84.73	79.95	84.74	0.000193	1.07	112.12	1000.25	0.09
NM-102B	11504	ULT 25Y	156.00	77.92	85.28	80.24	85.28	0.000013	0.29	1280.24	1680.96	0.02
NM-102B	11504	ULT 100Y	247.00	77.92	86.41	80.84	86.41	0.000003	0.15	3715.72	2021.44	0.01
NM-102B	12505	EX 10Y	87.00	78.99	83.91	80.68	83.92	0.000260	1.10	79.44	24.02	0.11
NM-102B	12505	EX 25Y	117.00	78.99	84.80	80.92	84.82	0.000259	1.14	102.66	280.44	0.11
NM-102B	12505	EX 100Y	197.00	78.99	85.67	81.43	85.68	0.000142	0.90	551.64	1926.36	0.08
NM-102B	12505	ULT 10Y	120.00	78.99	84.94	80.95	84.96	0.000250	1.12	107.07	516.58	0.11
NM-102B	12505	ULT 25Y	156.00	78.99	85.30	81.19	85.32	0.000234	1.11	258.96	1415.31	0.10
NM-102B	12505	ULT 100Y	247.00	78.99	86.42	81.70	86.42	0.000008	0.25	2651.48	2028.54	0.02
NM-102-02	569	EX 10Y	16.00	78.46	83.93	79.21	83.93	0.000001	0.10	167.86	43.19	0.01
NM-102-02	569	EX 25Y	23.00	78.46	84.82	79.29	84.82	0.000002	0.11	208.63	83.10	0.01
NM-102-02	569	EX 100Y	40.00	78.46	85.68	79.49	85.68	0.000002	0.13	501.67	597.48	0.01
NM-102-02	569	ULT 10Y	29.00	78.46	84.96	79.35	84.96	0.000002	0.13	215.71	188.41	0.01
NM-102-02	569	ULT 25Y	39.00	78.46	85.32	79.45	85.32	0.000003	0.16	330.99	380.07	0.01
NM-102-02	569	ULT 100Y	61.00	78.46	86.42	79.63	86.42	0.000002	0.13	998.06	686.29	0.01
NM-102-02	2137	EX 10Y	16.00	79.61	83.93	79.99	83.93	0.000005	0.13	119.37	44.46	0.01
NM-102-02	2137	EX 25Y	23.00	79.61	84.82	80.08	84.82	0.000004	0.14	203.51	313.82	0.01
NM-102-02	2137	EX 100Y	40.00	79.61	85.68	80.25	85.68	0.000002	0.12	624.69	577.22	0.01
NM-102-02	2137	ULT 10Y	29.00	79.61	84.97	80.14	84.97	0.000005	0.16	261.24	399.08	0.02
NM-102-02	2137	ULT 25Y	39.00	79.61	85.32	80.24	85.32	0.000005	0.16	425.48	519.10	0.02
NM-102-02	2137	ULT 100Y	61.00	79.61	86.42	80.42	86.42	0.000002	0.11	1063.56	602.13	0.01
NM-102-02	3577	EX 10Y	16.00	84.19	84.73	84.73	84.84	0.047398	2.63	6.08	27.30	0.98
NM-102-02	3577	EX 25Y	23.00	84.19	84.79	84.79	84.93	0.044417	2.97	7.76	27.77	0.99
NM-102-02	3577	EX 100Y	40.00	84.19	85.69	84.91	85.70	0.000966	0.87	46.14	492.84	0.17
NM-102-02	3577	ULT 10Y	29.00	84.19	84.93	84.84	85.03	0.018088	2.44	11.86	28.88	0.67
NM-102-02	3577	ULT 25Y	39.00	84.19	85.33	84.91	85.36	0.004527	1.49	26.16	204.68	0.35
NM-102-02	3577	ULT 100Y	61.00	84.19	86.43	85.05	86.43	0.000014	0.16	628.20	666.17	0.02
NM-102-01	656	EX 10Y	18.00	79.89	82.66	80.30	82.66	0.000020	0.24	75.77	35.69	0.03
NM-102-01	656	EX 25Y	25.00	79.89	83.61	80.36	83.62	0.000013	0.22	112.45	43.26	0.02
NM-102-01	656	EX 100Y	43.00	79.89	85.09	80.52	85.09	0.000010	0.24	181.24	50.58	0.02
NM-102-01	656	ULT 10Y	26.00	79.89	83.79	80.37	83.79	0.000012	0.22	120.10	44.25	0.02
NM-102-01	656	ULT 25Y	34.00	79.89	84.49	80.45	84.49	0.000010	0.22	151.93	47.30	0.02
NM-102-01	656	ULT 100Y	54.00	79.89	85.96	80.61	85.96	0.000008	0.24	227.31	55.14	0.02
NM-102-01	2176	EX 10Y	18.00	81.06	82.73	81.53	82.73	0.000189	0.51	35.25	29.23	0.08
NM-102-01	2176	EX 25Y	25.00	81.06	83.65	81.61	83.65	0.000062	0.39	64.79	35.25	0.05
NM-102-01	2176	EX 100Y	43.00	81.06	85.11	81.79	85.11	0.000030	0.35	124.27	45.70	0.04
NM-102-01	2176	ULT 10Y	26.00	81.06	83.82	81.63	83.82	0.000052	0.37	70.89	36.63	0.05
NM-102-01	2176	ULT 25Y	34.00	81.06	84.51	81.71	84.51	0.000036	0.35	98.13	41.86	0.04
NM-102-01	2176	ULT 100Y	54.00	81.06	85.98	81.88	85.98	0.000020	0.33	165.44	49.11	0.03
NM-102-01	3452	EX 10Y	18.00	81.05	82.89	81.47	82.89	0.000091	0.37	48.46	37.42	0.06
NM-102-01	3452	EX 25Y	25.00	81.05	83.71	81.54	83.71	0.000037	0.31	81.54	42.94	0.04
NM-102-01	3452	EX 100Y	43.00	81.05	85.14	81.71	85.14	0.000019	0.29	148.92	50.73	0.03
NM-102-01	3452	ULT 10Y	26.00	81.05	83.87	81.55	83.87	0.000032	0.29	88.51	44.01	0.04
NM-102-01	3452	ULT 25Y	34.00	81.05	84.55	81.63	84.55	0.000022	0.28	119.74	48.07	0.03
NM-102-01	3452	ULT 100Y	54.00	81.05	86.00	81.80	86.00	0.000014	0.28	194.03	54.65	0.03
NM-102A	13789	EX 10Y	74.00	77.36	83.95	78.19	83.96	0.000007	0.23	317.53	71.25	0.02
NM-102A	13789	EX 25Y	99.00	77.36	84.85	78.35	84.85	0.000008	0.26	385.27	892.27	0.02
NM-102A	13789	EX 100Y	165.00	77.36	85.70	78.61	85.70	0.000006	0.25	1319.39	1431.00	0.02
NM-102A	13789	ULT 10Y	95.00	77.36	84.99	78.33	84.99	0.000006	0.24	396.64	918.53	0.02
NM-102A	13789	ULT 25Y	123.00	77.36	85.36	78.45	85.36	0.000009	0.29	425.99	1196.23	0.02
NM-102A	13789	ULT 100Y	196.00	77.36	86.42	78.72	86.42	0.000003	0.17	2652.79	1689.66	0.01
NM-102A	15326	EX 10Y	45.00	77.46	83.96	78.06	83.96	0.000004	0.17	270.06	60.93	0.01
NM-102A	15326	EX 25Y	59.00	77.46	84.86	78.17	84.86	0.000004	0.18	327.07	1264.69	0.01
NM-102A	15326	EX 100Y	95.00	77.46	85.71	78.39	85.71	0.000002	0.12	1871.28	1484.65	0.01
NM-102A	15326	ULT 10Y	47.00	77.46	85.00	78.08	85.00	0.000002	0.14	336.44	1302.58	0.01
NM-102A	15326	ULT 25Y	61.00	77.46	85.37	78.18	85.37	0.000003	0.17	361.23	1400.49	0.01
NM-102A	15326	ULT 100Y	97.00	77.46	86.43	78.40	86.43	0.000001	0.08	3013.24	1671.03	0.01
NM-102A	16116	EX 10Y	45.00	77.64	83.97	78.27	83.97	0.000004	0.17	267.93	61.70	0.01
NM-102A	16116	EX 25Y	59.00	77.64	84.86	78.37	84.86	0.000004	0.18	326.96	976.64	0.01
NM-102A	16116	EX 100Y	95.00	77.64	85.71	78.55	85.71	0.000003	0.15	1270.30	1502.37	0.01
NM-102A	16116	ULT 10Y	47.00	77.64	85.00	78.29	85.00	0.000002	0.14	336.80	1134.21	0.01
NM-102A	16116	ULT 25Y	61.00	77.64	85.37	78.37	85.37	0.000002	0.13	952.42	1322.14	0.01
NM-102A	16116	ULT 100Y	97.00	77.64	86.43	78.56	86.43	0.000001	0.08	2695.89	1582.85	0.01
NM-102A	16917	EX 10Y	45.00	77.36	83.97	78.41	83.97	0.000008	0.23	192.68	46.99	0.02
NM-102A	16917	EX 25Y	59.00	77.36	84.87	78.56	84.87	0.000008	0.25	236.12	50.07	0.02
NM-102A	16917	EX 100Y	95.00	77.36	85.71	78.89	85.71	0.000013	0.34	279.76	60.06	0.03
NM-102A	16917	ULT 10Y	47.00	77.36	85.00	78.43	85.00	0.000005	0.19	243.07	50.54	0.02

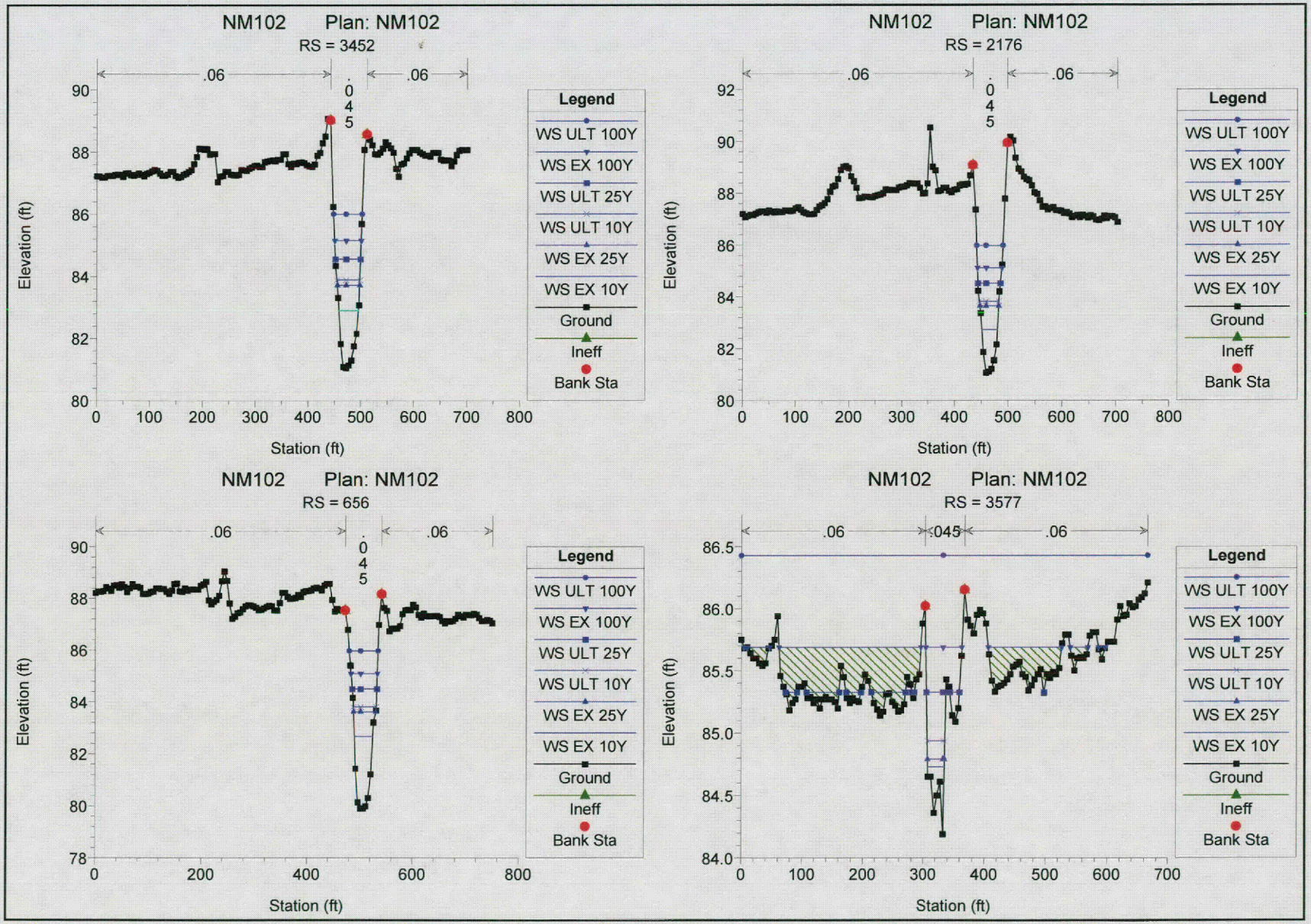
HEC-RAS Plan: BASE (Continued)

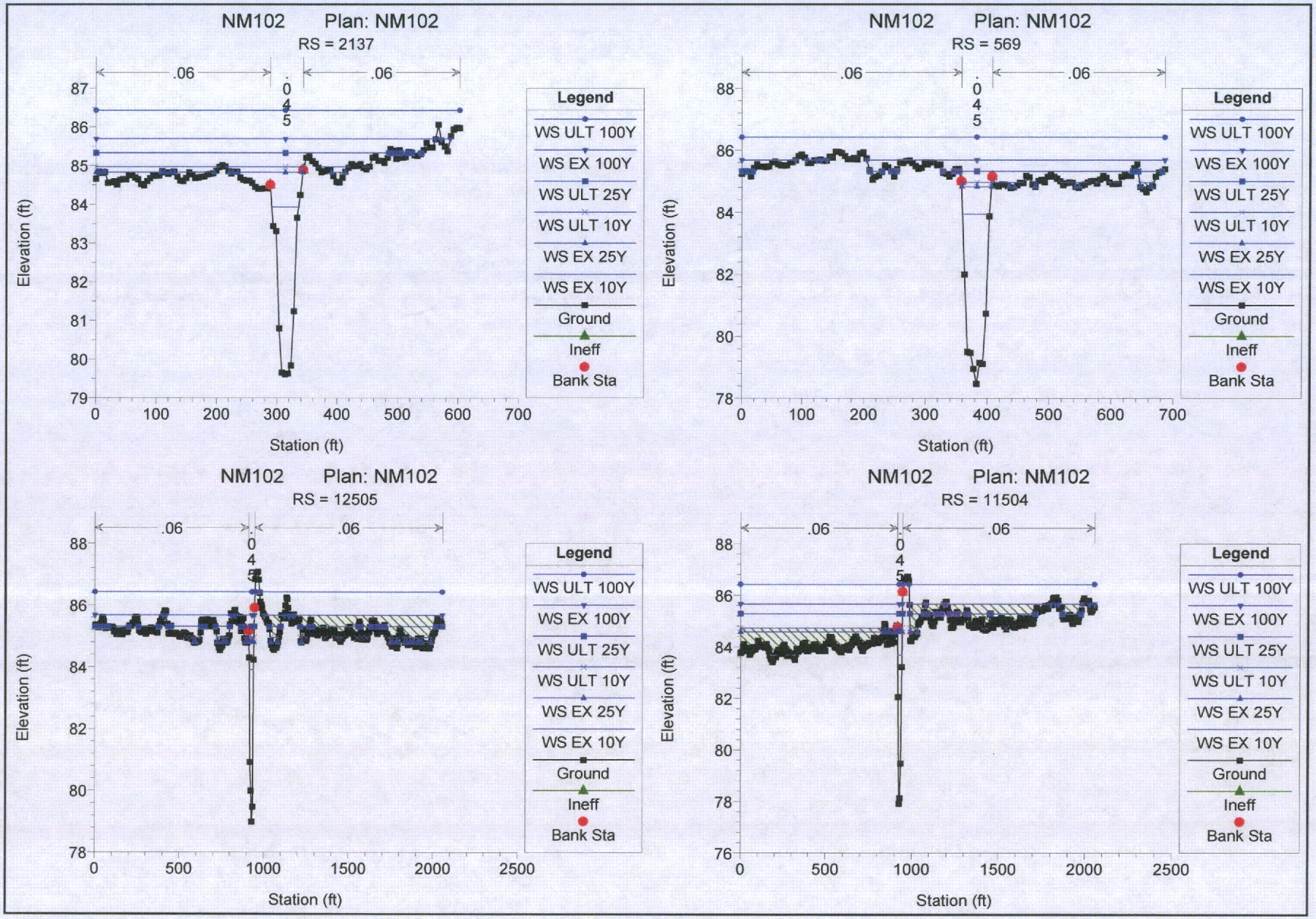
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
NM-102A	16917	ULT 25Y	61.00	77.36	85.37	78.58	85.37	0.000006	0.23	261.78	51.80	0.02
NM-102A	16917	ULT 100Y	97.00	77.36	86.43	78.90	86.43	0.000009	0.30	318.53	247.60	0.02
NM-102A	18004	EX 10Y	26.00	85.62	86.14	86.14	86.32	0.041623	3.43	7.59	20.83	1.00
NM-102A	18004	EX 25Y	34.00	85.62	86.22	86.22	86.43	0.039723	3.63	9.37	22.77	1.00
NM-102A	18004	EX 100Y	55.00	85.62	86.39	86.39	86.65	0.037347	4.04	13.61	26.82	1.00
NM-102A	18004	ULT 10Y	27.00	85.62	86.15	86.15	86.34	0.042826	3.50	7.72	20.98	1.02
NM-102A	18004	ULT 25Y	35.00	85.62	86.23	86.23	86.44	0.040492	3.68	9.51	22.91	1.01
NM-102A	18004	ULT 100Y	56.00	85.62	86.40	86.40	86.66	0.036738	4.04	13.88	27.06	0.99
NM-102A	18419	EX 10Y	26.00	84.70	86.51	85.17	86.51	0.000115	0.40	65.31	54.41	0.06
NM-102A	18419	EX 25Y	34.00	84.70	86.65	85.24	86.66	0.000139	0.47	73.01	55.66	0.07
NM-102A	18419	EX 100Y	55.00	84.70	86.95	85.39	86.95	0.000194	0.61	89.90	58.16	0.09
NM-102A	18419	ULT 10Y	27.00	84.70	86.53	85.18	86.53	0.000118	0.41	66.36	54.58	0.07
NM-102A	18419	ULT 25Y	35.00	84.70	86.67	85.24	86.67	0.000142	0.47	73.94	55.81	0.07
NM-102A	18419	ULT 100Y	56.00	84.70	86.96	85.39	86.97	0.000196	0.62	90.60	58.25	0.09
NM-102A	19462	EX 10Y	26.00	85.33	86.78	86.09	86.80	0.001293	1.14	22.87	24.09	0.21
NM-102A	19462	EX 25Y	34.00	85.33	86.97	86.16	86.99	0.001289	1.24	27.38	25.18	0.21
NM-102A	19462	EX 100Y	55.00	85.33	87.35	86.34	87.39	0.001331	1.47	37.53	27.45	0.22
NM-102A	19462	ULT 10Y	27.00	85.33	86.81	86.09	86.83	0.001290	1.15	23.47	24.24	0.21
NM-102A	19462	ULT 25Y	35.00	85.33	86.99	86.17	87.01	0.001289	1.25	27.92	25.30	0.21
NM-102A	19462	ULT 100Y	56.00	85.33	87.37	86.34	87.40	0.001334	1.48	37.96	27.55	0.22


NM102 Plan: NM102
N-NM-102 NM-102C
N-NM-102 NM-102B
N-NM-102 NM-102A
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
95
90
85
80
75
70
0
5000
10000
15000
20000
Main Channel Distance (ft)


NM102 Plan: NM102
N-NM-102 NM-102-01
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
90
88
86
84
82
80
78
500
1000
1500
2000
2500
3000
3500
Main Channel Distance (ft)


NM102 Plan: NM102
N-NM-102 NM-102-02
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
88
86
84
82
80
78
500
1000
1500
2000
2500
3000
3500
4000
Main Channel Distance (ft)


NM102 Plan: NM102
RS = 3452
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102
RS = 2176
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102
RS = 656
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102
RS = 3577
.06
045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta


NM102 Plan: NM102
RS = 2137
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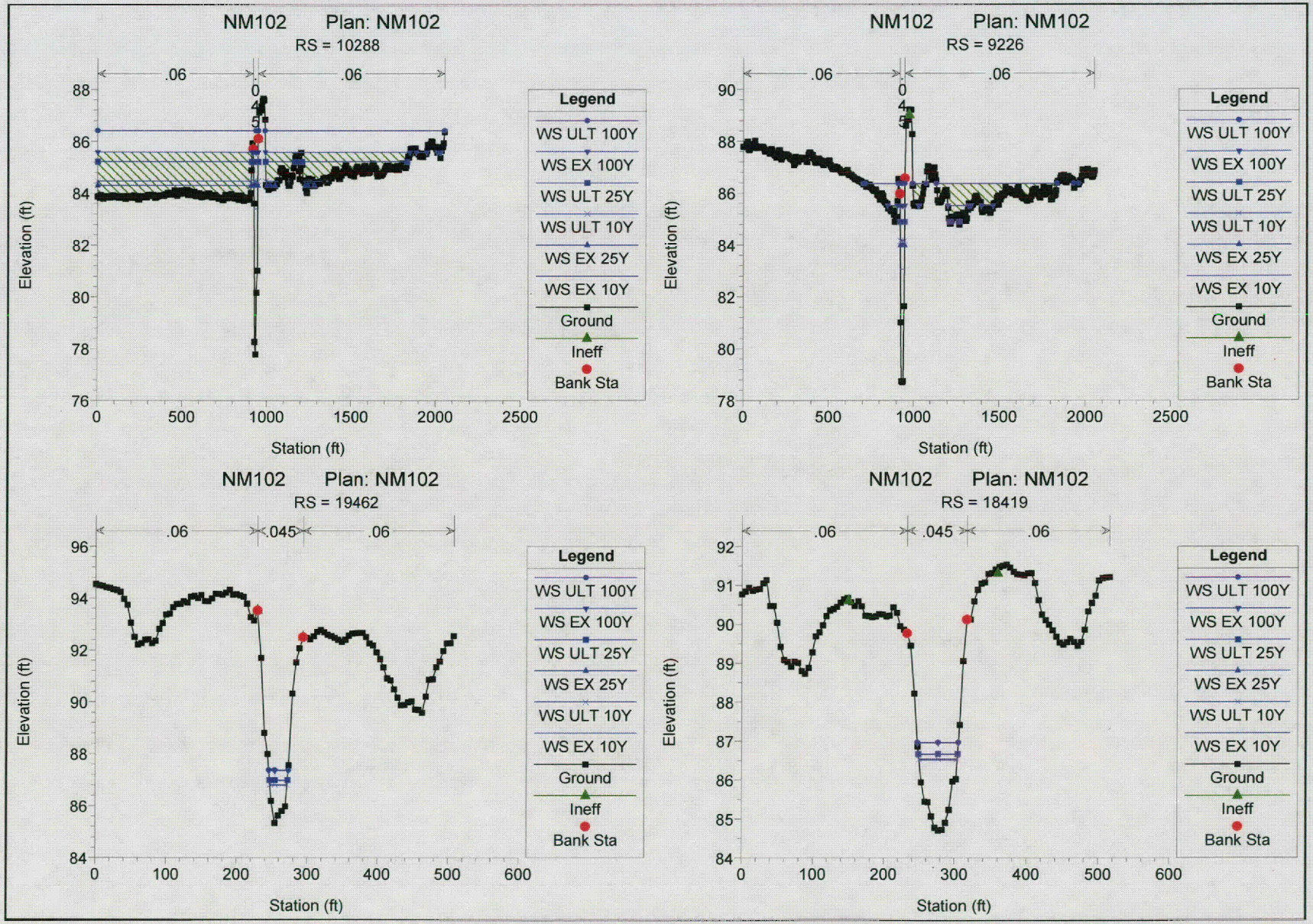
.06
0.045
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102
RS = 569
.06
.06
0.045
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102
RS = 12505
.06
.06
0.045
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102
RS = 11504
.06
.06
0.045
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta


NM102 Plan: NM102
RS = 10288
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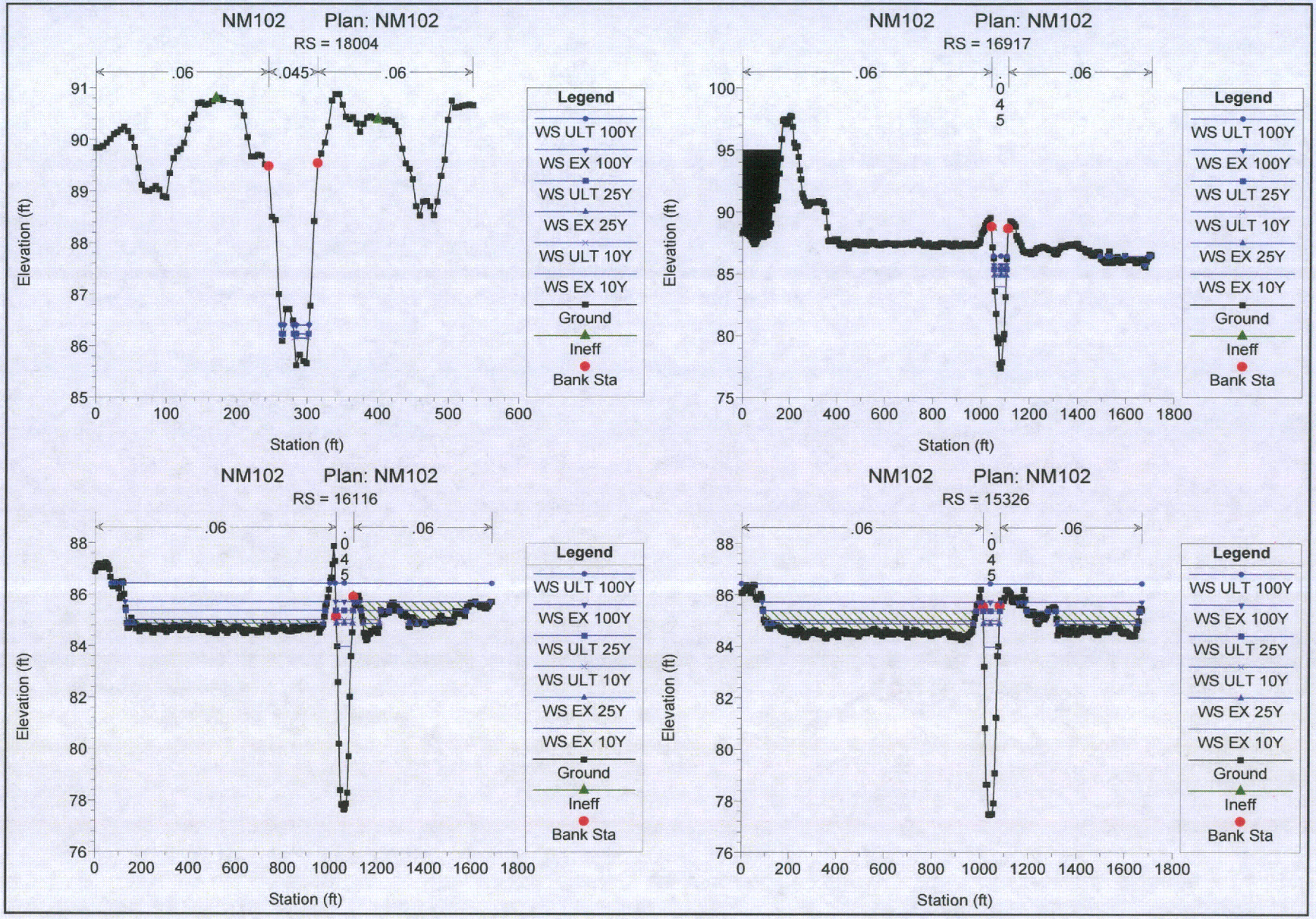
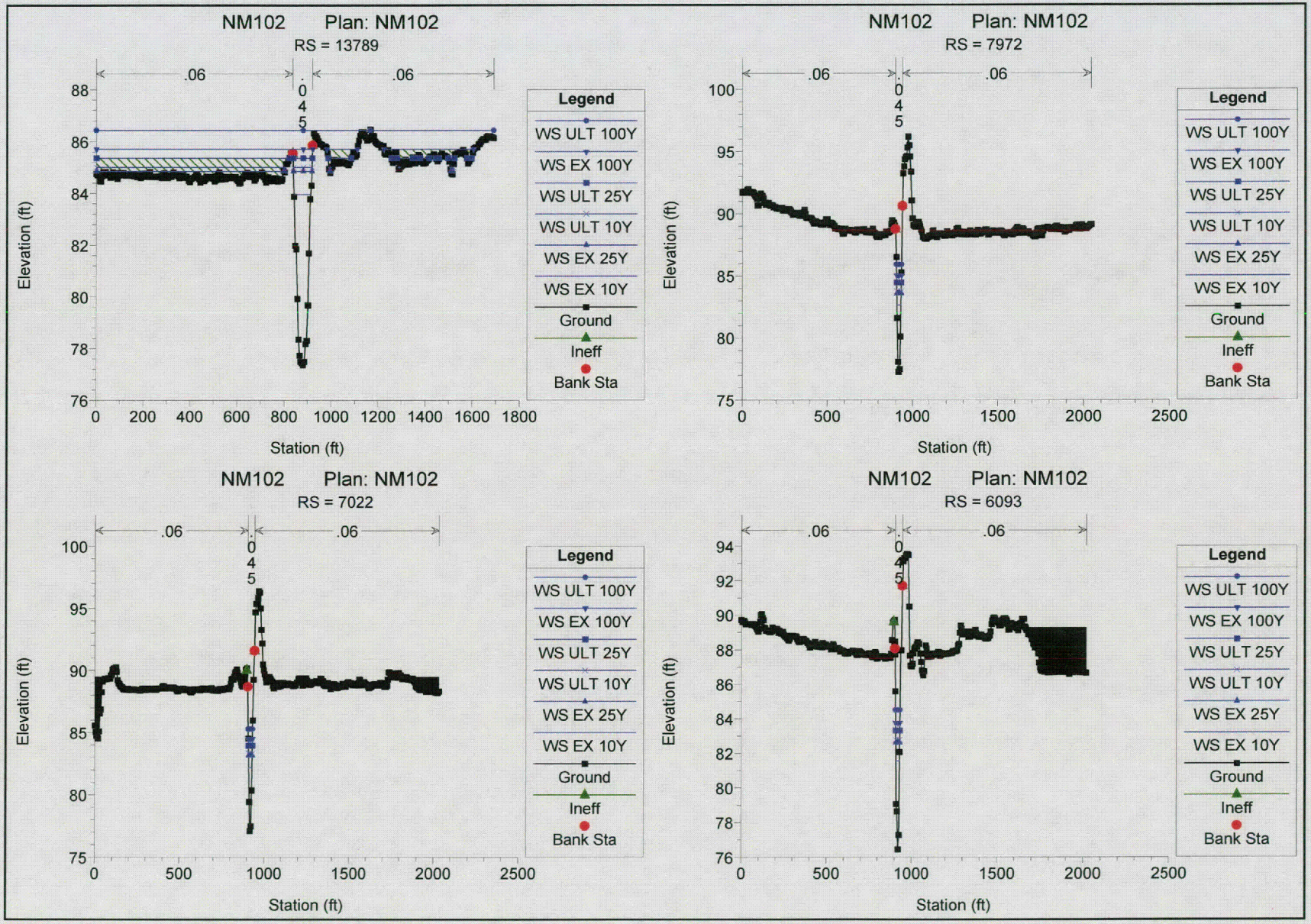
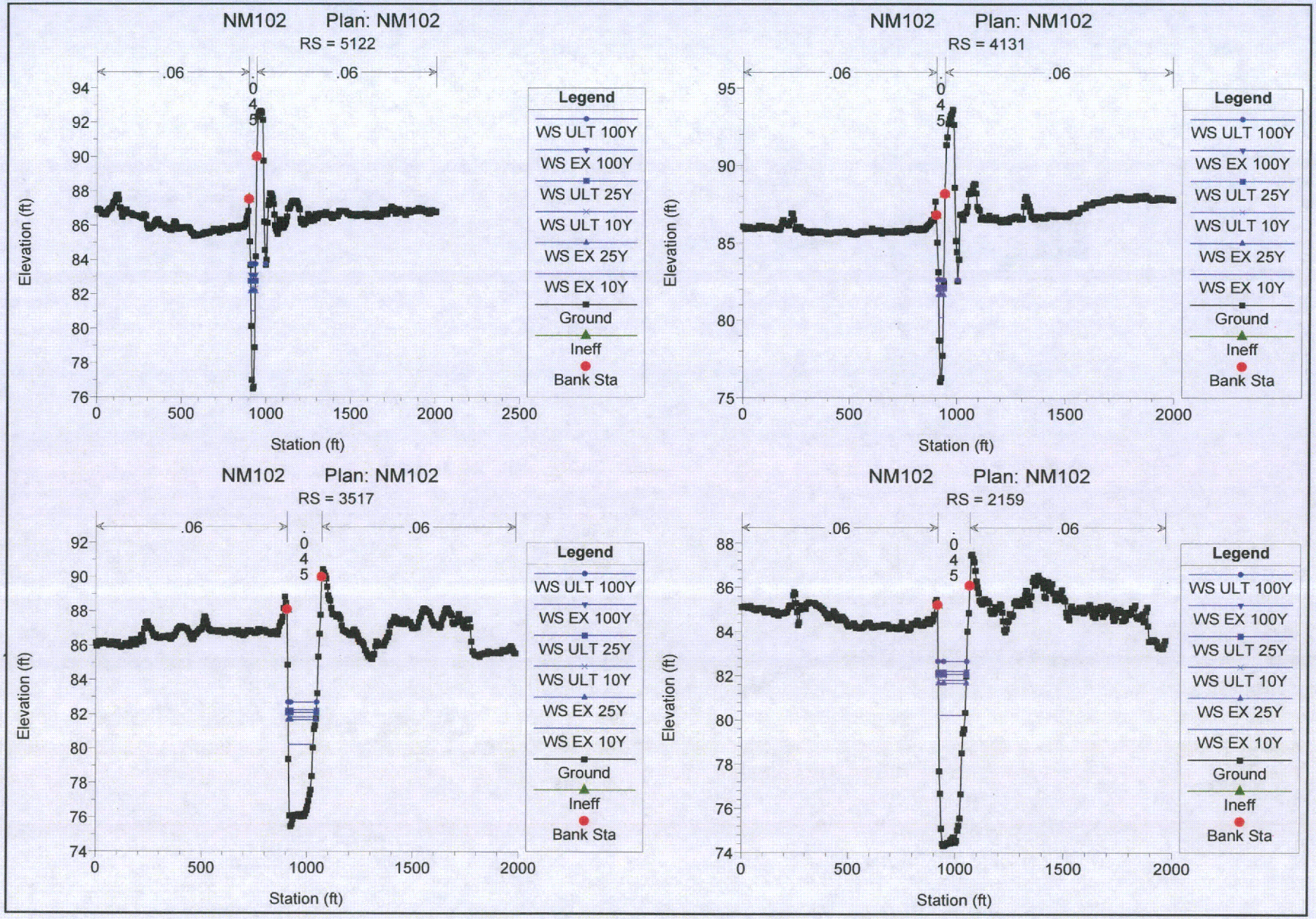
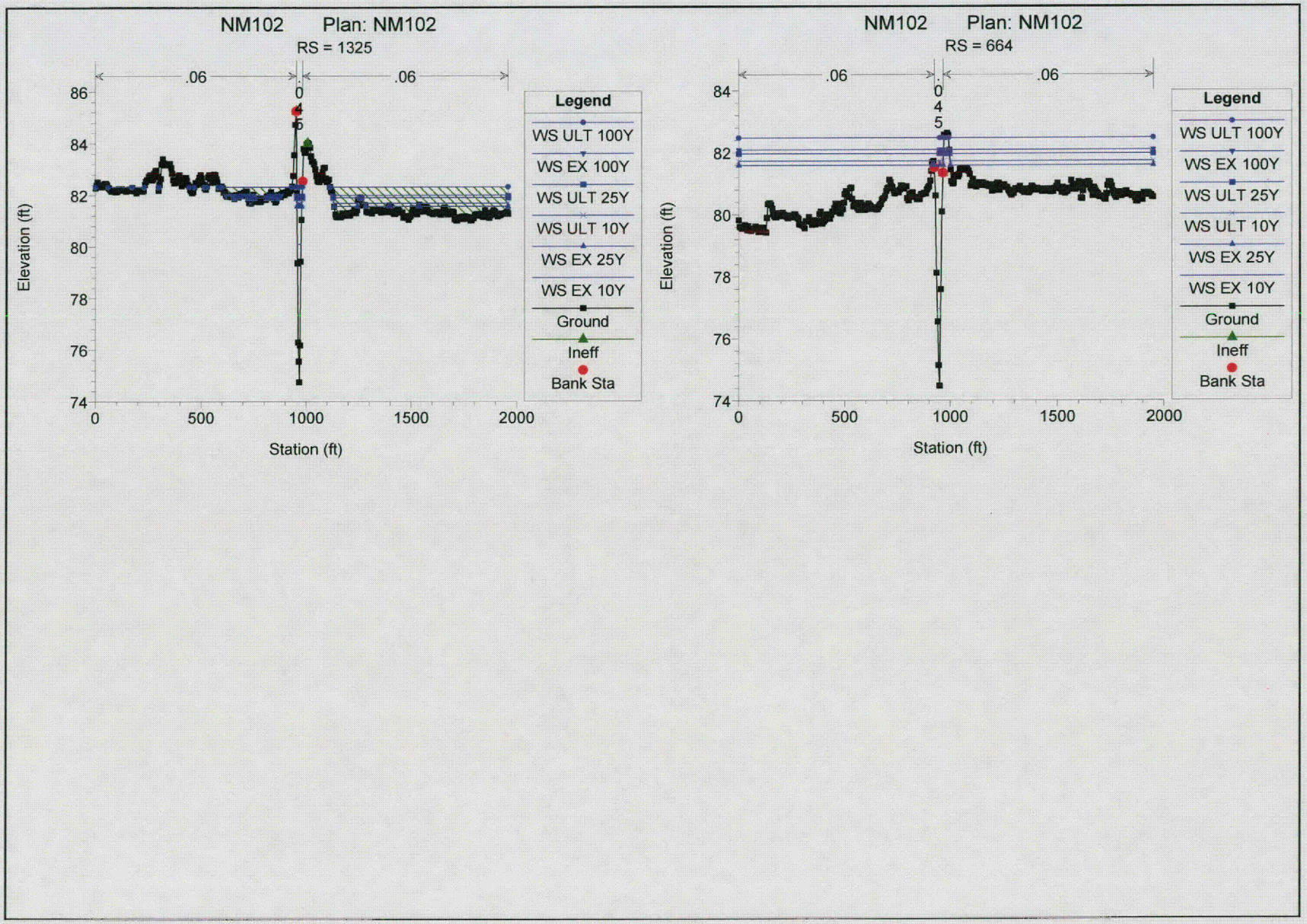
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102
RS = 9226
.06
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102
RS = 19462
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102
RS = 18419
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta


NM102 Plan: NM102
RS = 18004
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102
RS = 16917
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102
RS = 16116
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102
RS = 15326
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta


NM102 Plan: NM102
RS = 13789
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102
RS = 7972
NM102 Plan: NM102
RS = 7022
NM102 Plan: NM102
RS = 6093


NM102 Plan: NM102
RS = 5122
.06
.06
0
4
5
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102
RS = 4131
NM102 Plan: NM102
RS = 3517
NM102 Plan: NM102
RS = 2159


NM102 Plan: NM102
RS = 1325
.06
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0
4
5
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102
RS = 664
.06
.06
0
4
5
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta

APPENDIX D
HEC-RAS HYDRAULIC OUTPUT

NM-102 PROPOSED CONDITION

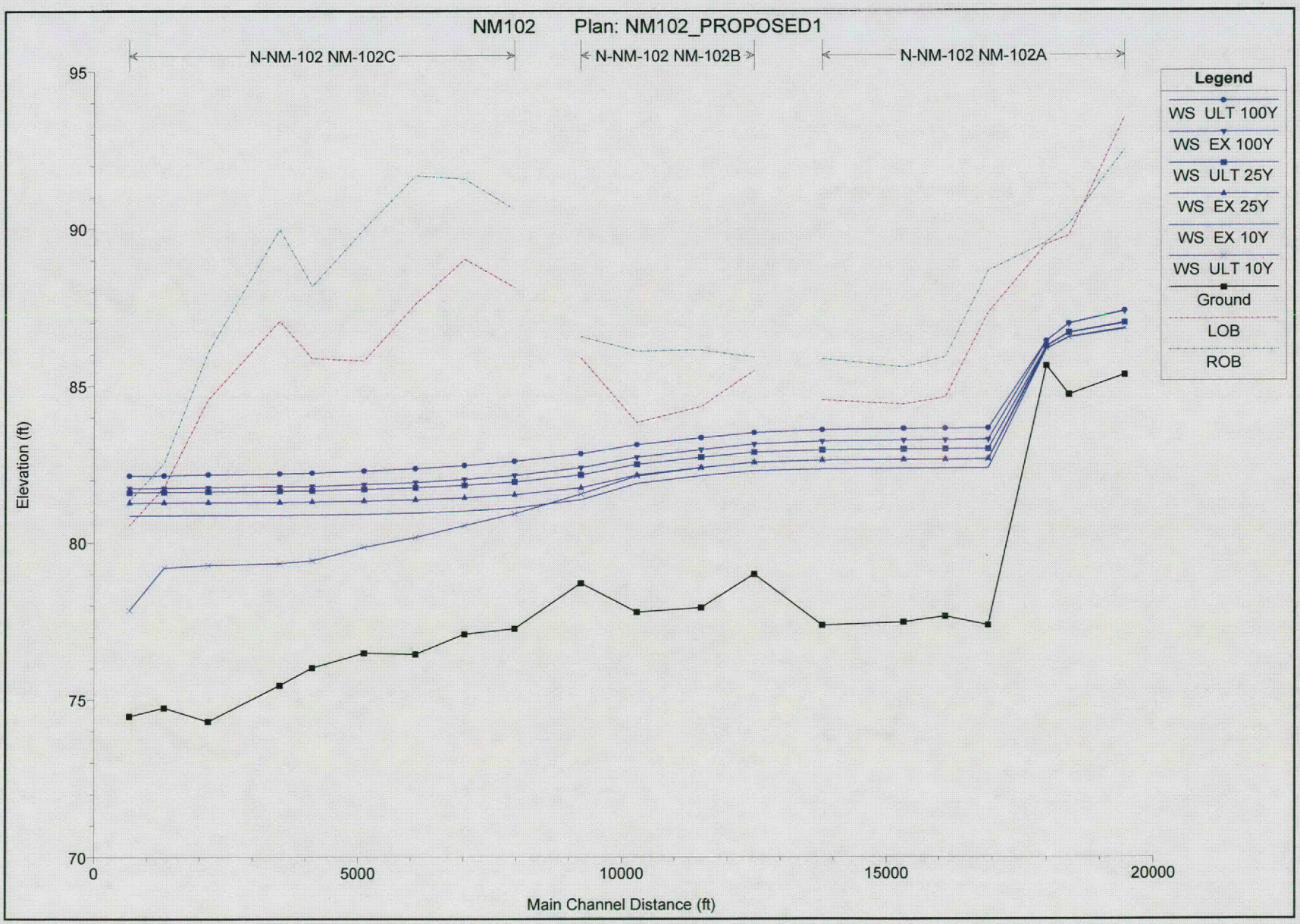
CSE TEDSI

HEC-RAS Plan: PROPOSED1

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)	
NM-102C	664	EX 10Y	147.00	74.47	80.86	76.96	80.86	0.000010	0.25	1026.63	1475.98	0.02
NM-102C	664	EX 25Y	205.00	74.47	81.26	77.37	81.26	0.000010	0.27	1412.53	1849.50	0.02
NM-102C	664	EX 100Y	356.00	74.47	81.73	78.00	81.73	0.000010	0.29	2705.33	1916.30	0.03
NM-102C	664	ULT 10Y	241.00	74.47	77.84	77.84	78.11	0.012848	4.16	57.99	110.93	1.01
NM-102C	664	ULT 25Y	316.00	74.47	81.60	77.95	81.60	0.000010	0.28	2461.77	1914.79	0.03
NM-102C	664	ULT 100Y	498.00	74.47	82.13	78.17	82.13	0.000010	0.31	3471.96	1921.16	0.03
NM-102C	1325	EX 10Y	134.00	74.75	80.86	77.35	80.87	0.000022	0.36	370.95	118.22	0.04
NM-102C	1325	EX 25Y	186.00	74.75	81.27	77.97	81.27	0.000029	0.44	419.21	422.67	0.04
NM-102C	1325	EX 100Y	321.00	74.75	81.74	78.17	81.74	0.000059	0.67	476.87	948.55	0.06
NM-102C	1325	ULT 10Y	211.00	74.75	79.20	78.01	79.22	0.000546	1.17	180.73	110.25	0.16
NM-102C	1325	ULT 25Y	276.00	74.75	81.61	78.11	81.61	0.000049	0.60	460.63	914.19	0.05
NM-102C	1325	ULT 100Y	436.00	74.75	82.13	78.32	82.14	0.000079	0.82	577.62	1217.88	0.07
NM-102C	2159	EX 10Y	134.00	74.31	80.87	74.97	80.87	0.000004	0.18	753.32	165.32	0.01
NM-102C	2159	EX 25Y	186.00	74.31	81.28	75.10	81.28	0.000005	0.23	821.25	167.77	0.02
NM-102C	2159	EX 100Y	321.00	74.31	81.76	75.35	81.76	0.000012	0.36	902.53	170.66	0.03
NM-102C	2159	ULT 10Y	211.00	74.31	79.28	75.15	79.28	0.000028	0.42	500.52	148.26	0.04
NM-102C	2159	ULT 25Y	276.00	74.31	81.63	75.27	81.63	0.000009	0.31	880.09	169.86	0.02
NM-102C	2159	ULT 100Y	436.00	74.31	82.17	75.54	82.17	0.000017	0.45	972.70	173.01	0.03
NM-102C	3517	EX 10Y	134.00	75.46	80.88	76.47	80.88	0.000007	0.23	592.17	154.27	0.02
NM-102C	3517	EX 25Y	186.00	75.46	81.29	76.58	81.29	0.000011	0.28	656.45	160.45	0.02
NM-102C	3517	EX 100Y	321.00	75.46	81.78	76.82	81.78	0.000023	0.44	737.49	168.27	0.04
NM-102C	3517	ULT 10Y	211.00	75.46	79.34	76.63	79.34	0.000081	0.58	363.08	143.69	0.06
NM-102C	3517	ULT 25Y	276.00	75.46	81.64	76.74	81.65	0.000019	0.39	714.72	166.54	0.03
NM-102C	3517	ULT 100Y	436.00	75.46	82.20	76.99	82.20	0.000032	0.54	808.30	170.95	0.04
NM-102C	4131	EX 10Y	115.00	76.02	80.88	78.35	80.89	0.000025	0.35	328.63	121.02	0.04
NM-102C	4131	EX 25Y	158.00	76.02	81.30	78.43	81.30	0.000030	0.42	379.00	122.69	0.04
NM-102C	4131	EX 100Y	268.00	76.02	81.80	78.60	81.80	0.000053	0.61	440.96	124.73	0.06
NM-102C	4131	ULT 10Y	168.00	76.02	79.42	78.45	79.44	0.000590	1.08	156.16	115.09	0.16
NM-102C	4131	ULT 25Y	218.00	76.02	81.66	78.53	81.66	0.000040	0.51	423.59	124.16	0.05
NM-102C	4131	ULT 100Y	346.00	76.02	82.22	78.70	82.23	0.000062	0.70	494.09	126.45	0.06
NM-102C	5122	EX 10Y	115.00	76.49	80.91	78.14	80.91	0.000029	0.37	314.85	121.61	0.04
NM-102C	5122	EX 25Y	158.00	76.49	81.33	78.60	81.33	0.000034	0.43	366.05	123.26	0.04
NM-102C	5122	EX 100Y	268.00	76.49	81.85	78.77	81.86	0.000058	0.62	431.22	125.33	0.06
NM-102C	5122	ULT 10Y	168.00	76.49	79.85	78.61	79.87	0.000324	0.89	188.56	117.44	0.12
NM-102C	5122	ULT 25Y	218.00	76.49	81.70	78.69	81.71	0.000044	0.53	412.10	124.72	0.05
NM-102C	5122	ULT 100Y	346.00	76.49	82.29	78.87	82.29	0.000066	0.71	485.68	127.03	0.06
NM-102C	6093	EX 10Y	115.00	76.45	80.95	78.77	80.95	0.000044	0.43	268.47	112.12	0.05
NM-102C	6093	EX 25Y	158.00	76.45	81.37	78.86	81.37	0.000049	0.50	316.26	113.83	0.05
NM-102C	6093	EX 100Y	268.00	76.45	81.92	79.03	81.93	0.000080	0.71	379.47	116.05	0.07
NM-102C	6093	ULT 10Y	168.00	76.45	80.17	78.88	80.18	0.000325	0.92	182.72	108.99	0.13
NM-102C	6093	ULT 25Y	218.00	76.45	81.75	78.95	81.76	0.000062	0.61	360.08	115.37	0.06
NM-102C	6093	ULT 100Y	346.00	76.45	82.36	79.14	82.37	0.000089	0.80	430.91	117.77	0.07
NM-102C	7022	EX 10Y	115.00	77.09	81.00	79.39	81.01	0.000100	0.55	208.68	110.67	0.07
NM-102C	7022	EX 25Y	158.00	77.09	81.43	79.46	81.44	0.000098	0.62	256.21	112.32	0.07
NM-102C	7022	EX 100Y	268.00	77.09	82.01	79.64	82.02	0.000135	0.83	322.17	114.58	0.09
NM-102C	7022	ULT 10Y	168.00	77.09	80.54	79.48	80.56	0.000523	1.06	158.35	108.89	0.16
NM-102C	7022	ULT 25Y	218.00	77.09	81.82	79.56	81.83	0.000111	0.72	300.90	113.86	0.08
NM-102C	7022	ULT 100Y	346.00	77.09	82.46	79.75	82.47	0.000140	0.93	373.84	116.32	0.09
NM-102C	7972	EX 10Y	115.00	77.26	81.10	79.02	81.10	0.000099	0.54	213.75	115.74	0.07
NM-102C	7972	EX 25Y	158.00	77.26	81.52	79.59	81.53	0.000095	0.60	263.13	117.43	0.07
NM-102C	7972	EX 100Y	268.00	77.26	82.14	79.76	82.15	0.000125	0.80	335.96	119.87	0.08
NM-102C	7972	ULT 10Y	168.00	77.26	80.92	79.61	80.93	0.000294	0.87	192.72	115.02	0.12
NM-102C	7972	ULT 25Y	218.00	77.26	81.93	79.69	81.94	0.000106	0.70	311.22	119.04	0.08
NM-102C	7972	ULT 100Y	346.00	77.26	82.59	79.87	82.60	0.000129	0.89	390.57	121.66	0.09
NM-102B	9226	EX 10Y	97.00	78.71	81.36	80.03	81.38	0.001199	1.08	89.58	110.90	0.21
NM-102B	9226	EX 25Y	133.00	78.71	81.74	80.32	81.76	0.000627	1.00	132.43	112.63	0.16
NM-102B	9226	EX 100Y	225.00	78.71	82.38	81.06	82.40	0.000433	1.10	205.02	115.19	0.14
NM-102B	9226	ULT 10Y	142.00	78.71	81.54	80.37	81.57	0.001308	1.29	110.06	111.77	0.23
NM-102B	9226	ULT 25Y	185.00	78.71	82.15	80.99	82.17	0.000458	1.04	178.56	114.26	0.15
NM-102B	9226	ULT 100Y	293.00	78.71	82.82	81.15	82.84	0.000356	1.14	256.44	116.96	0.14
NM-102B	10288	EX 10Y	87.00	77.78	81.88	79.72	81.89	0.000239	0.63	137.81	113.48	0.10
NM-102B	10288	EX 25Y	117.00	77.78	82.14	80.04	82.15	0.000229	0.70	167.53	114.52	0.10
NM-102B	10288	EX 100Y	197.00	77.78	82.72	81.11	82.73	0.000220	0.84	233.86	116.80	0.10
NM-102B	10288	ULT 10Y	120.00	77.78	82.12	80.07	82.13	0.000254	0.73	164.88	114.43	0.11
NM-102B	10288	ULT 25Y	156.00	77.78	82.48	80.43	82.49	0.000205	0.75	206.82	115.88	0.10

HEC-RAS Plan: PROPOSED1 (Continued)

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)	
NM-102B	10288	ULT 100Y	247.00	77.78	83.11	81.19	83.12	0.000192	0.88	280.52	118.38	0.10
NM-102B	11504	EX 10Y	87.00	77.92	82.12	79.66	82.12	0.000160	0.56	154.35	111.58	0.08
NM-102B	11504	EX 25Y	117.00	77.92	82.38	79.92	82.38	0.000165	0.64	183.44	112.70	0.09
NM-102B	11504	EX 100Y	197.00	77.92	82.95	80.52	82.96	0.000175	0.79	249.08	115.20	0.09
NM-102B	11504	ULT 10Y	120.00	77.92	82.38	79.96	82.38	0.000175	0.66	183.08	112.69	0.09
NM-102B	11504	ULT 25Y	156.00	77.92	82.70	80.24	82.71	0.000162	0.71	220.50	114.12	0.09
NM-102B	11504	ULT 100Y	247.00	77.92	83.33	80.85	83.34	0.000164	0.84	292.53	116.86	0.09
NM-102B	12505	EX 10Y	87.00	78.99	82.28	80.68	82.28	0.000162	0.57	152.37	113.67	0.09
NM-102B	12505	EX 25Y	117.00	78.99	82.54	80.93	82.55	0.000166	0.64	182.55	114.74	0.09
NM-102B	12505	EX 100Y	197.00	78.99	83.13	81.37	83.14	0.000173	0.79	250.39	117.11	0.09
NM-102B	12505	ULT 10Y	120.00	78.99	82.55	80.94	82.56	0.000173	0.66	183.14	114.76	0.09
NM-102B	12505	ULT 25Y	156.00	78.99	82.87	81.30	82.88	0.000163	0.71	220.07	116.06	0.09
NM-102B	12505	ULT 100Y	247.00	78.99	83.49	81.45	83.50	0.000164	0.84	293.35	118.59	0.09
NM-102A	13789	EX 10Y	74.00	77.36	82.33	78.20	82.33	0.000014	0.25	290.87	131.85	0.03
NM-102A	13789	EX 25Y	99.00	77.36	82.61	78.34	82.61	0.000018	0.30	327.46	133.33	0.03
NM-102A	13789	EX 100Y	165.00	77.36	83.21	78.61	83.22	0.000027	0.40	409.43	136.60	0.04
NM-102A	13789	ULT 10Y	95.00	77.36	82.61	78.33	82.61	0.000017	0.29	328.09	133.36	0.03
NM-102A	13789	ULT 25Y	123.00	77.36	82.94	78.45	82.94	0.000020	0.33	371.99	135.12	0.04
NM-102A	13789	ULT 100Y	196.00	77.36	83.58	78.72	83.58	0.000028	0.43	459.87	138.56	0.04
NM-102A	15326	EX 10Y	45.00	77.46	82.35	78.06	82.35	0.000007	0.17	258.65	125.10	0.02
NM-102A	15326	EX 25Y	59.00	77.46	82.63	78.16	82.63	0.000009	0.20	293.96	126.53	0.02
NM-102A	15326	EX 100Y	95.00	77.46	83.25	78.40	83.25	0.000011	0.25	372.97	129.66	0.03
NM-102A	15326	ULT 10Y	47.00	77.46	82.63	78.08	82.63	0.000005	0.16	294.07	126.53	0.02
NM-102A	15326	ULT 25Y	61.00	77.46	82.96	78.18	82.96	0.000006	0.18	336.14	128.21	0.02
NM-102A	15326	ULT 100Y	97.00	77.46	83.61	78.40	83.61	0.000008	0.23	420.55	131.52	0.02
NM-102A	16116	EX 10Y	45.00	77.64	82.35	78.27	82.35	0.000008	0.18	248.25	126.01	0.02
NM-102A	16116	EX 25Y	59.00	77.64	82.64	78.36	82.64	0.000009	0.21	284.03	127.75	0.02
NM-102A	16116	EX 100Y	95.00	77.64	83.26	78.55	83.26	0.000013	0.26	364.31	131.58	0.03
NM-102A	16116	ULT 10Y	47.00	77.64	82.63	78.29	82.63	0.000006	0.17	283.80	127.74	0.02
NM-102A	16116	ULT 25Y	61.00	77.64	82.97	78.38	82.97	0.000007	0.19	326.42	129.79	0.02
NM-102A	16116	ULT 100Y	97.00	77.64	83.62	78.56	83.62	0.000009	0.24	412.33	133.85	0.02
NM-102A	16917	EX 10Y	45.00	77.36	82.36	78.41	82.36	0.000017	0.23	194.89	125.96	0.03
NM-102A	16917	EX 25Y	59.00	77.36	82.65	78.56	82.65	0.000019	0.26	230.78	127.29	0.03
NM-102A	16917	EX 100Y	95.00	77.36	83.27	78.89	83.27	0.000021	0.31	310.80	130.19	0.03
NM-102A	16917	ULT 10Y	47.00	77.36	82.64	78.43	82.64	0.000012	0.20	230.09	127.26	0.03
NM-102A	16917	ULT 25Y	61.00	77.36	82.97	78.58	82.97	0.000013	0.22	272.57	128.82	0.03
NM-102A	16917	ULT 100Y	97.00	77.36	83.63	78.90	83.63	0.000014	0.27	357.74	131.84	0.03
NM-102A	18004	EX 10Y	26.00	85.62	86.14	86.14	86.32	0.041623	3.43	7.59	20.83	1.00
NM-102A	18004	EX 25Y	34.00	85.62	86.22	86.22	86.43	0.039723	3.63	9.37	22.77	1.00
NM-102A	18004	EX 100Y	55.00	85.62	86.39	86.39	86.65	0.037347	4.04	13.61	26.82	1.00
NM-102A	18004	ULT 10Y	27.00	85.62	86.15	86.15	86.34	0.042826	3.50	7.72	20.98	1.02
NM-102A	18004	ULT 25Y	35.00	85.62	86.23	86.23	86.44	0.040492	3.68	9.51	22.91	1.01
NM-102A	18004	ULT 100Y	56.00	85.62	86.40	86.40	86.66	0.036738	4.04	13.88	27.06	0.99
NM-102A	18419	EX 10Y	26.00	84.70	86.51	85.17	86.51	0.000115	0.40	65.31	54.41	0.06
NM-102A	18419	EX 25Y	34.00	84.70	86.65	85.24	86.65	0.000139	0.47	73.01	55.66	0.07
NM-102A	18419	EX 100Y	55.00	84.70	86.95	85.39	86.95	0.000194	0.61	89.90	58.16	0.09
NM-102A	18419	ULT 10Y	27.00	84.70	86.53	85.18	86.53	0.000118	0.41	66.36	54.58	0.07
NM-102A	18419	ULT 25Y	35.00	84.70	86.67	85.25	86.67	0.000142	0.47	73.94	55.81	0.07
NM-102A	18419	ULT 100Y	56.00	84.70	86.96	85.39	86.97	0.000196	0.62	90.60	58.25	0.09
NM-102A	19462	EX 10Y	26.00	85.33	86.78	86.09	86.80	0.001293	1.14	22.87	24.09	0.21
NM-102A	19462	EX 25Y	34.00	85.33	86.97	86.16	86.99	0.001289	1.24	27.38	25.18	0.21
NM-102A	19462	EX 100Y	55.00	85.33	87.35	86.34	87.39	0.001331	1.47	37.52	27.45	0.22
NM-102A	19462	ULT 10Y	27.00	85.33	86.81	86.09	86.83	0.001290	1.15	23.47	24.24	0.21
NM-102A	19462	ULT 25Y	35.00	85.33	86.99	86.17	87.01	0.001290	1.25	27.92	25.30	0.21
NM-102A	19462	ULT 100Y	56.00	85.33	87.37	86.34	87.40	0.001334	1.48	37.96	27.54	0.22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N-NM-102 NM-102B
N-NM-102 NM-102A
Legend
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WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS EX 10Y
WS ULT 10Y
Ground
LOB
ROB
Elevation (ft)
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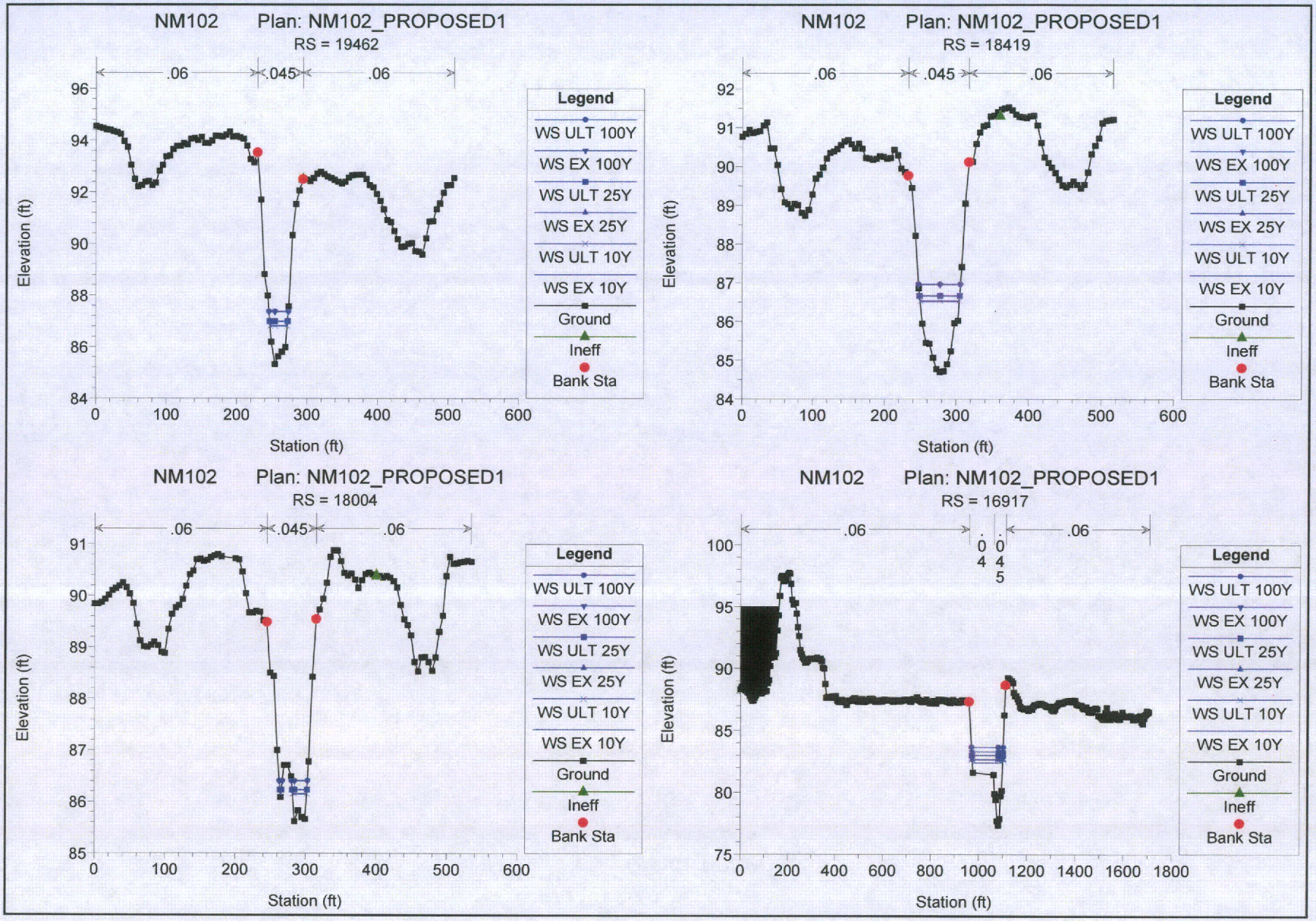
90
85
80
75
70
0
5000
10000
15000
20000
Main Channel Distance (ft)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Legend
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WS EX 100Y
WS ULT 25Y
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WS EX 10Y
Ground
Ineff
Bank Sta
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Elevation (ft)
Station (ft)
Legend
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WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102_PROPOSED1
RS = 18004
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Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
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Elevation (ft)
Station (ft)
Legend
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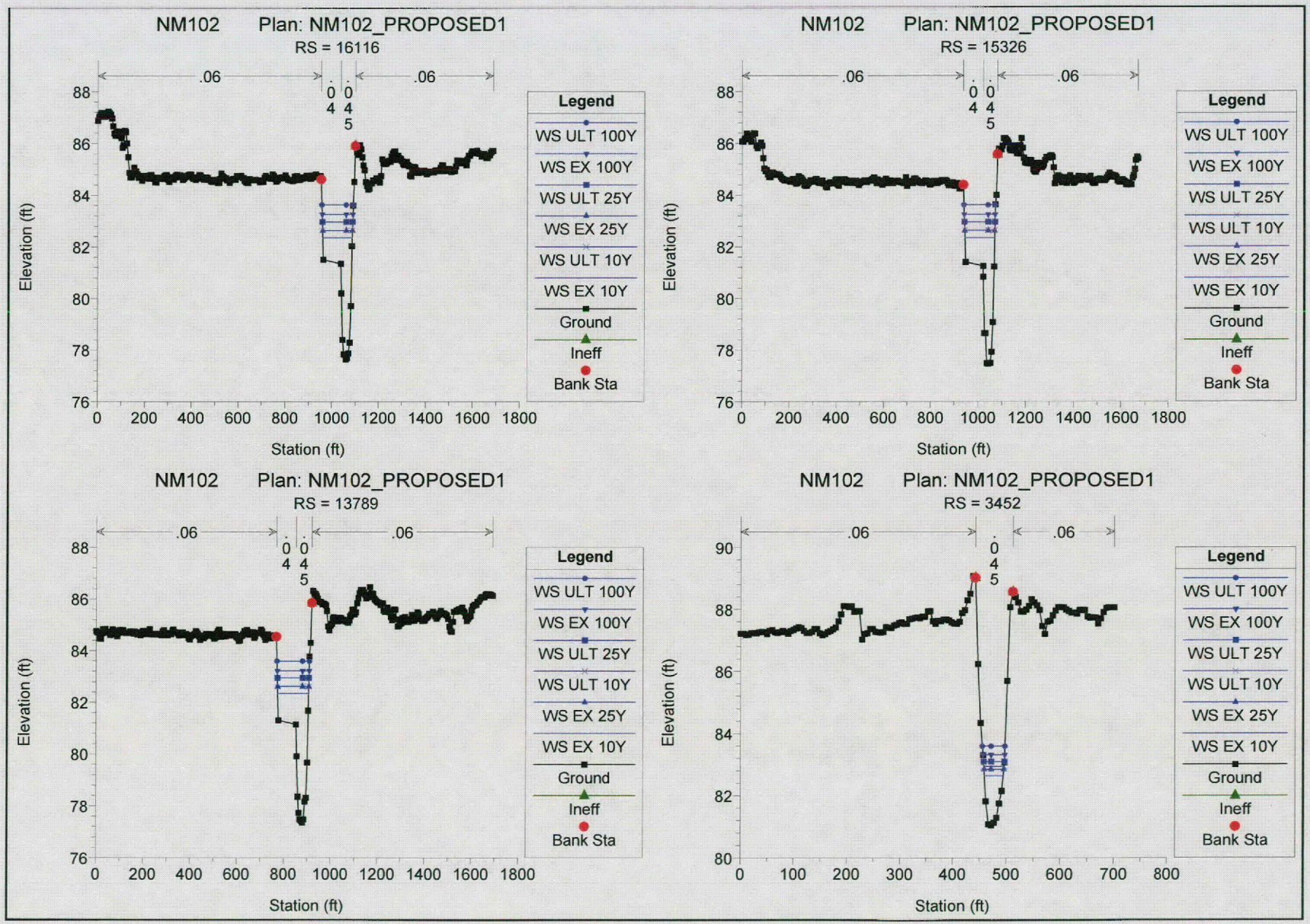
Ground
Ineff
Bank Sta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Elevation (ft)
Station (ft)
Legend
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Ground
Ineff
Bank Sta
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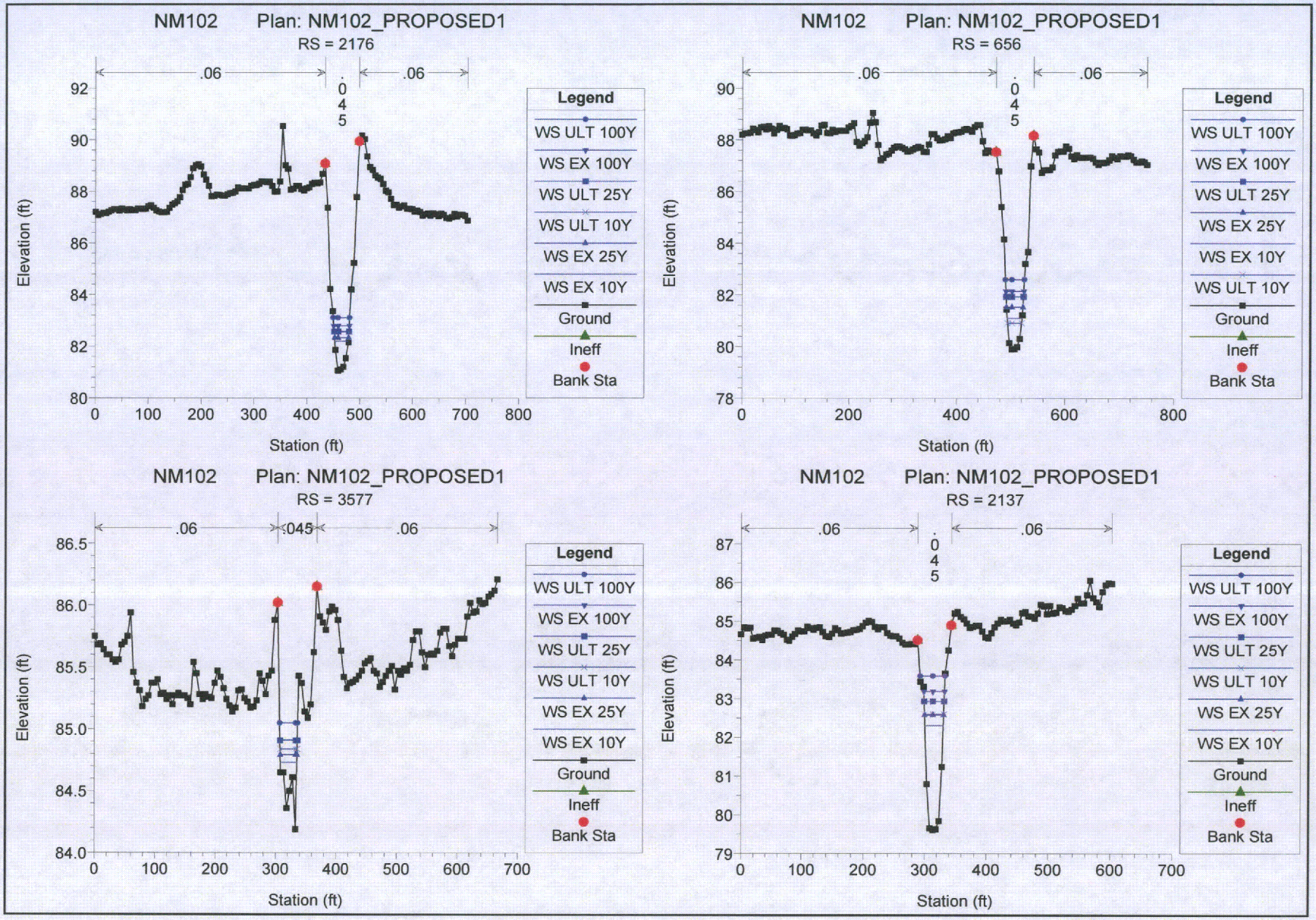
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Station (ft)
Legend
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Ground
Ineff
Bank Sta
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Elevation (ft)
Station (ft)
Legend
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WS EX 100Y
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WS EX 10Y
WS ULT 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102_PROPOSED1
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Elevation (ft)
Station (ft)
Legend
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WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
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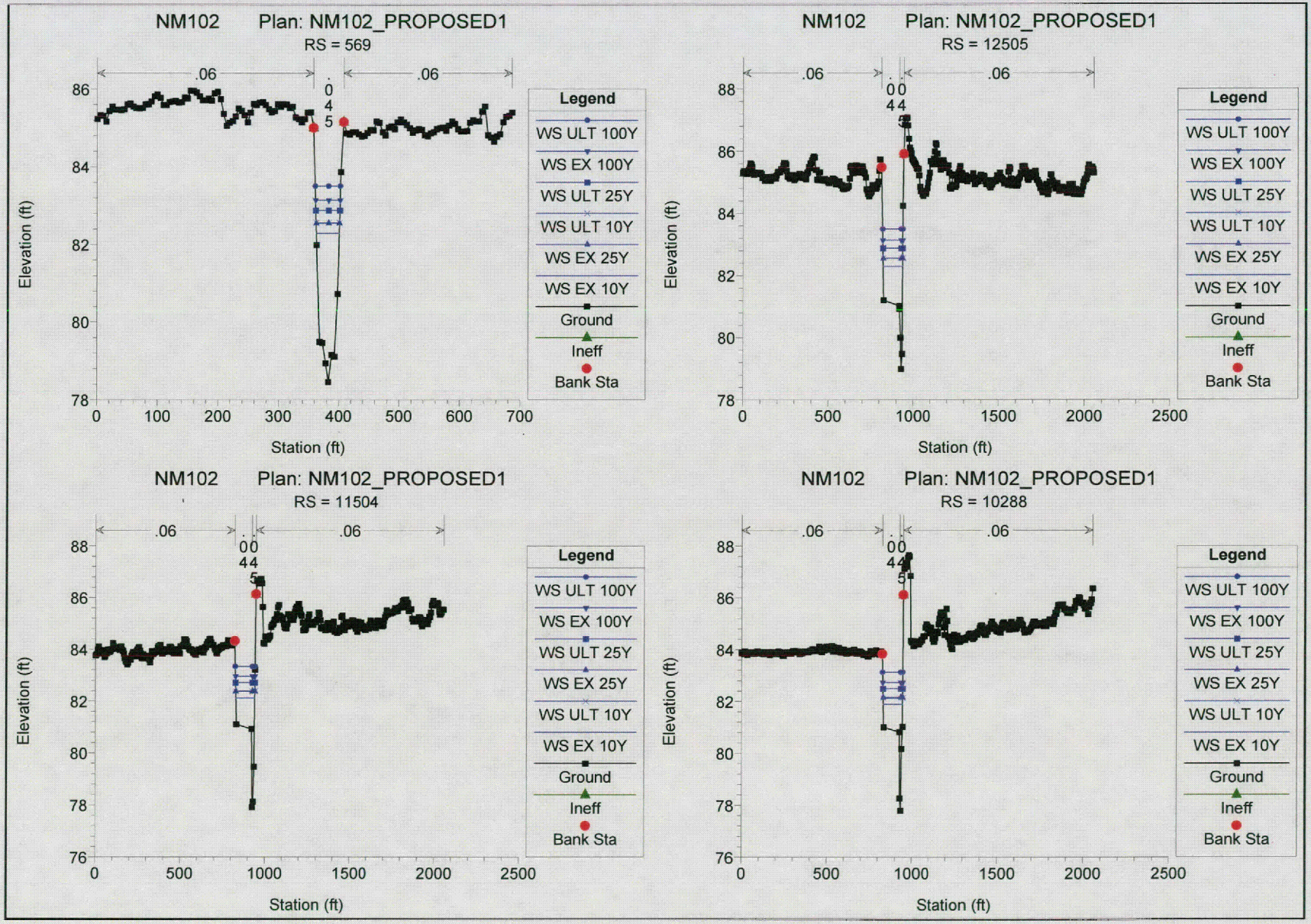
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta


NM102 Plan: NM102_PROPOSED1
RS = 569
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Elevation (ft)
Station (ft)
Legend
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WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102_PROPOSED1
RS = 12505
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.044
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Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102_PROPOSED1
RS = 11504
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.044
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Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102_PROPOSED1
RS = 10288
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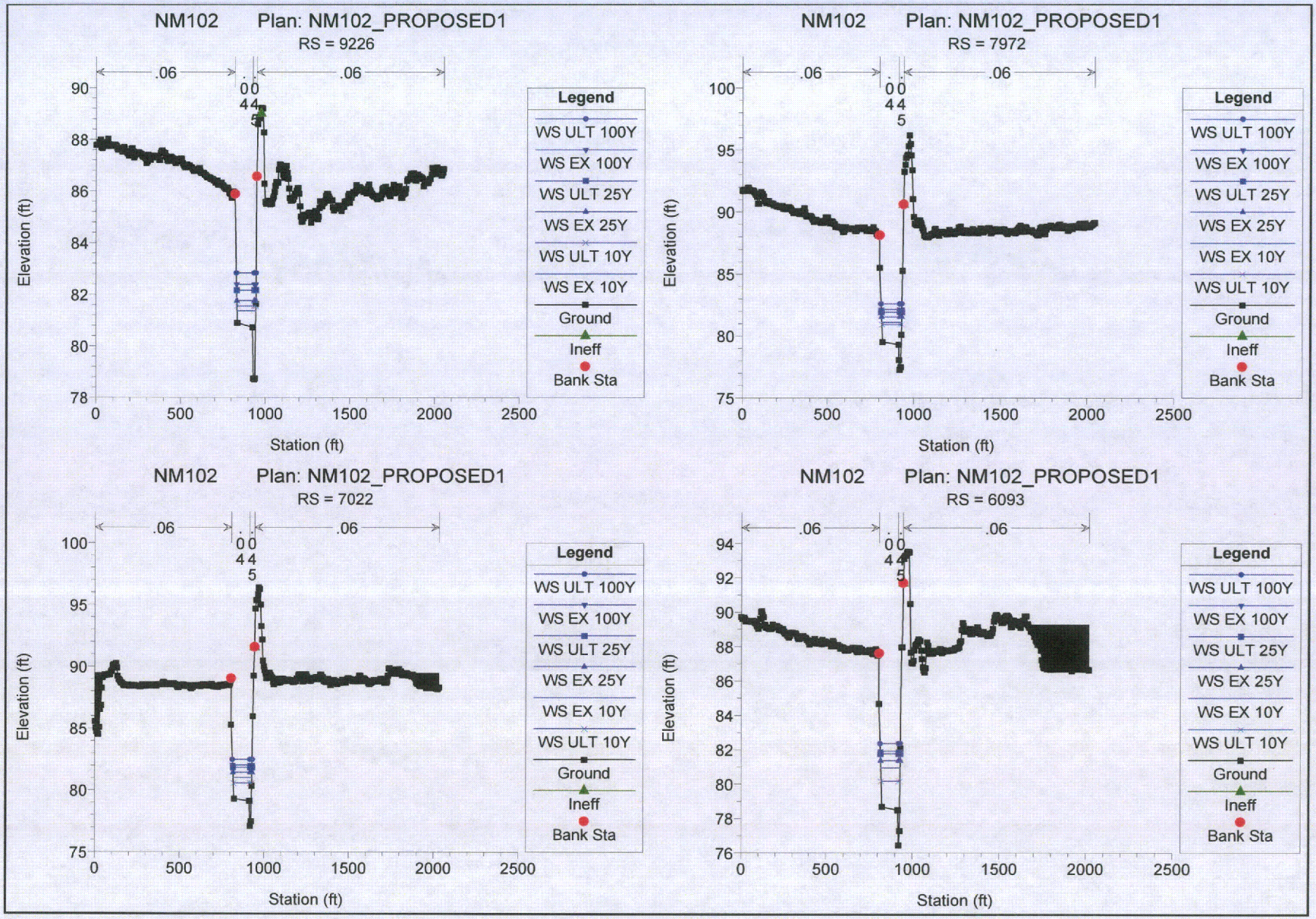
.044
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta


NM102 Plan: NM102_PROPOSED1
RS = 9226
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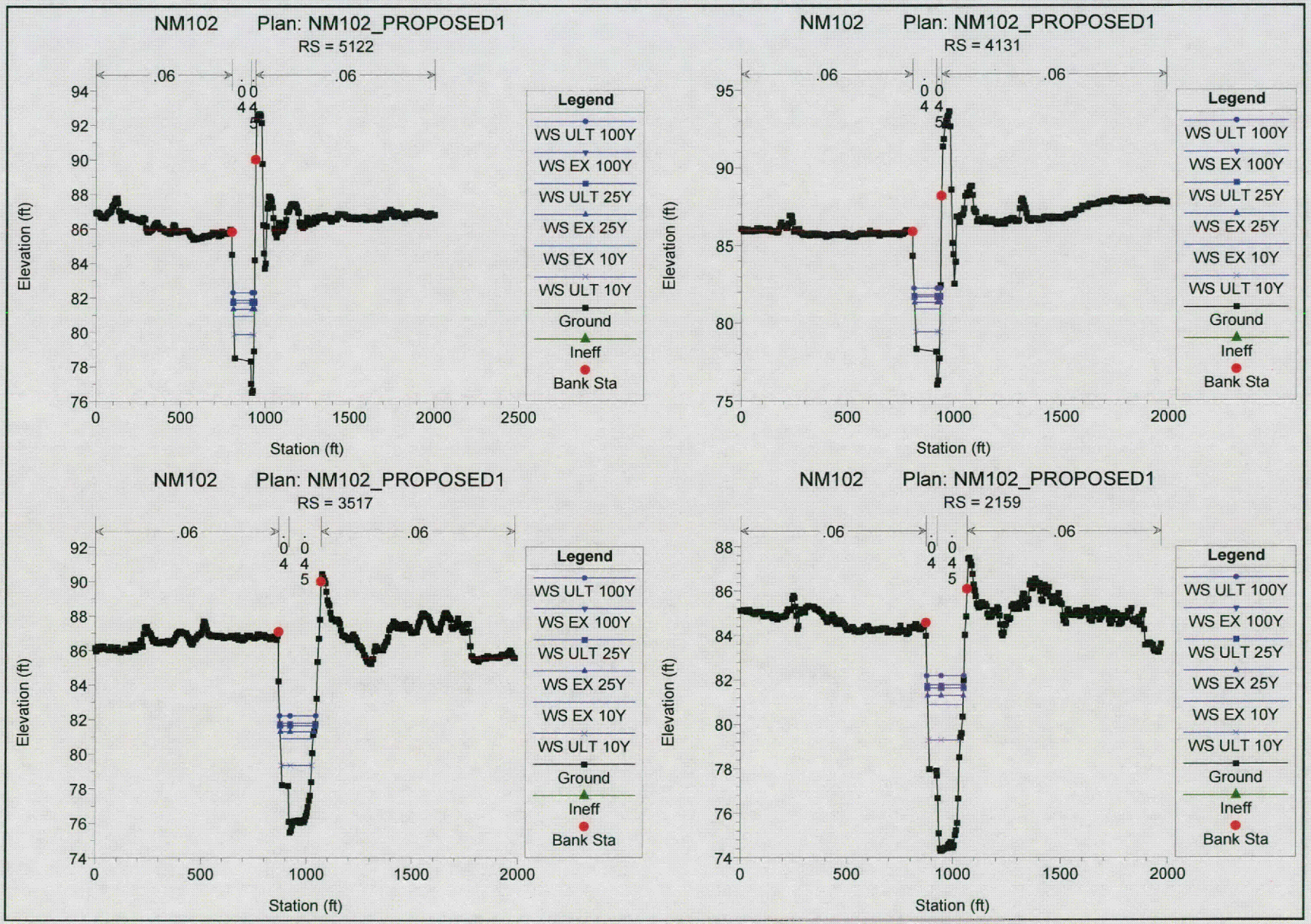
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102_PROPOSED1
RS = 7972
NM102 Plan: NM102_PROPOSED1
RS = 7022
NM102 Plan: NM102_PROPOSED1
RS = 6093


NM102 Plan: NM102_PROPOSED1
RS = 5122
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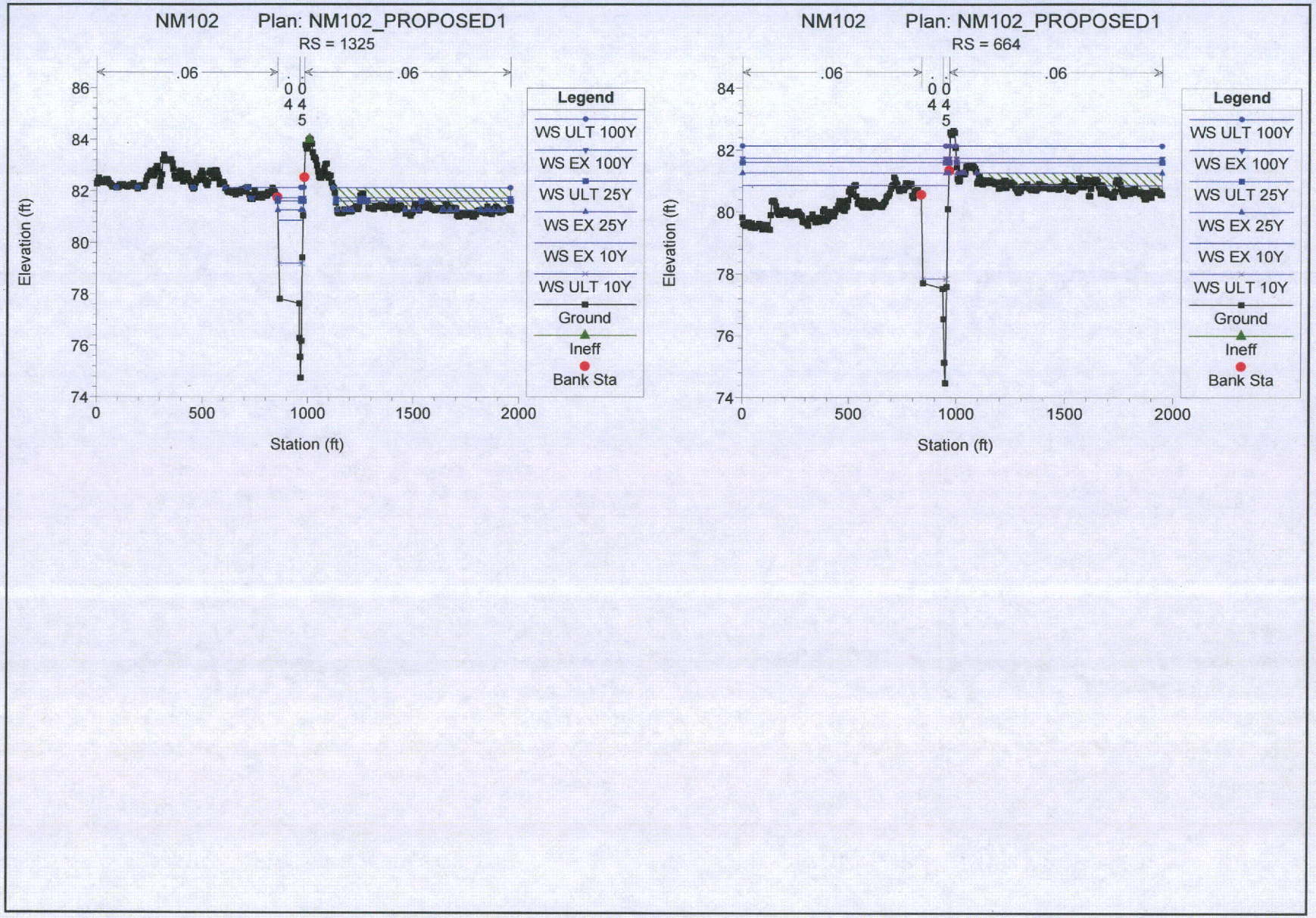
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS EX 10Y
WS ULT 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102_PROPOSED1
RS = 4131
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS EX 10Y
WS ULT 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102_PROPOSED1
RS = 3517
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS EX 10Y
WS ULT 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102_PROPOSED1
RS = 2159
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS EX 10Y
WS ULT 10Y
Ground
Ineff
Bank Sta


NM102 Plan: NM102_PROPOSED1
RS = 1325
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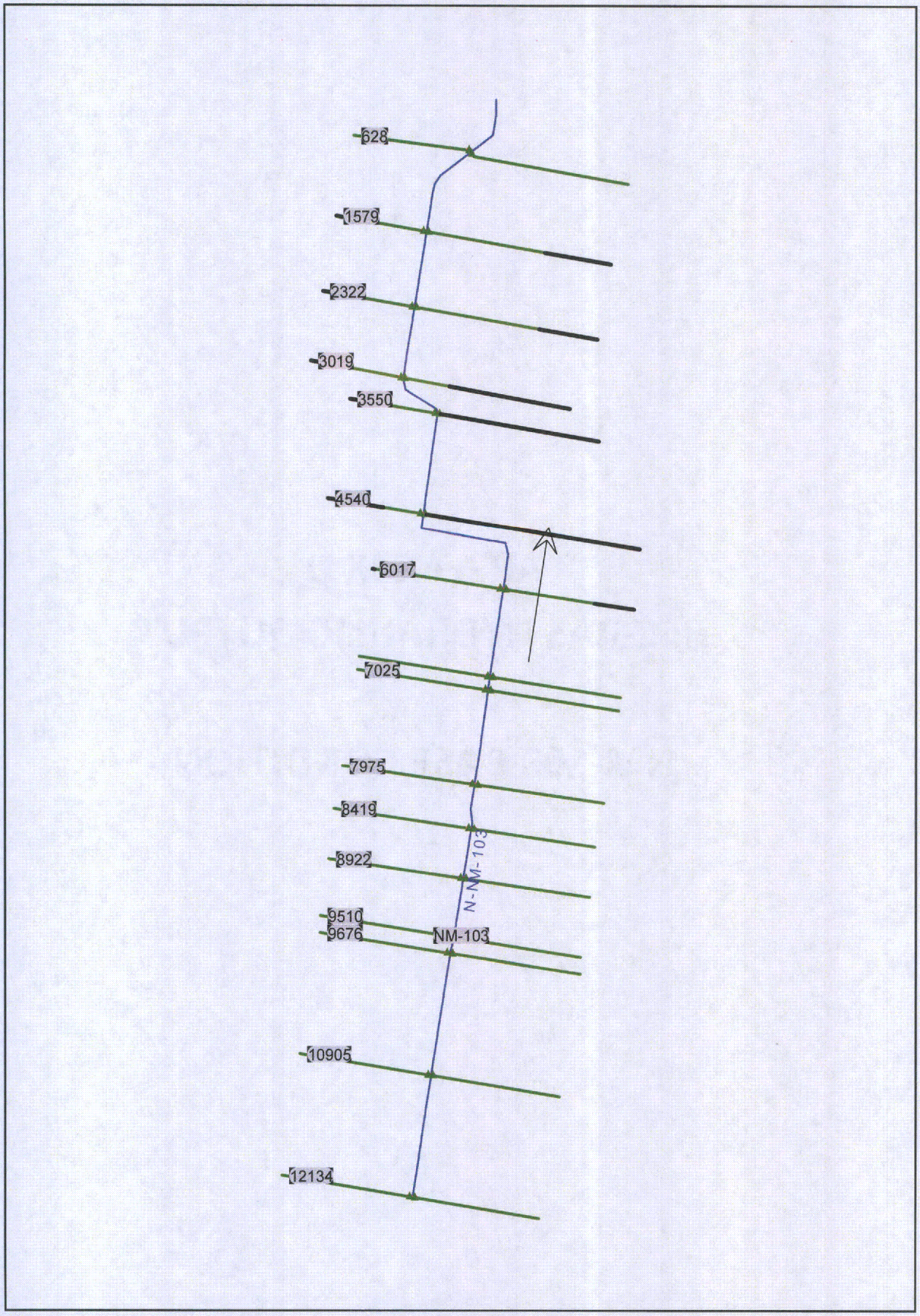
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS EX 10Y
WS ULT 10Y
Ground
Ineff
Bank Sta
NM102 Plan: NM102_PROPOSED1
RS = 664
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS EX 10Y
WS ULT 10Y
Ground
Ineff
Bank Sta

APPENDIX D
HEC-RAS HYDRAULIC OUTPUT

NM-103 BASE CONDITION

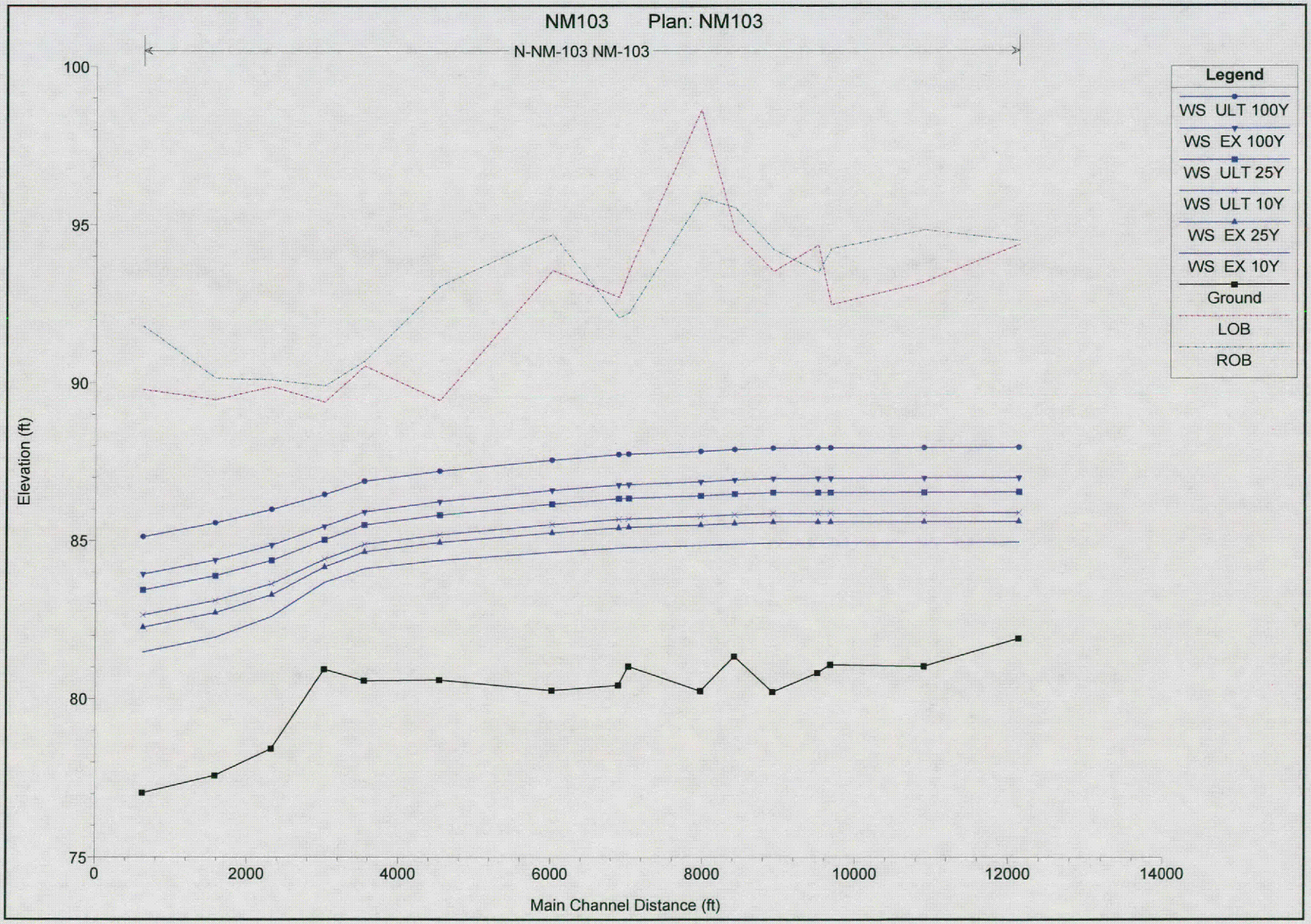

628
1579
2322
3019
3550
4540
6017
7025
7975
8419
8922
9510
9676
10905
12134
N-NM-103
NM-103

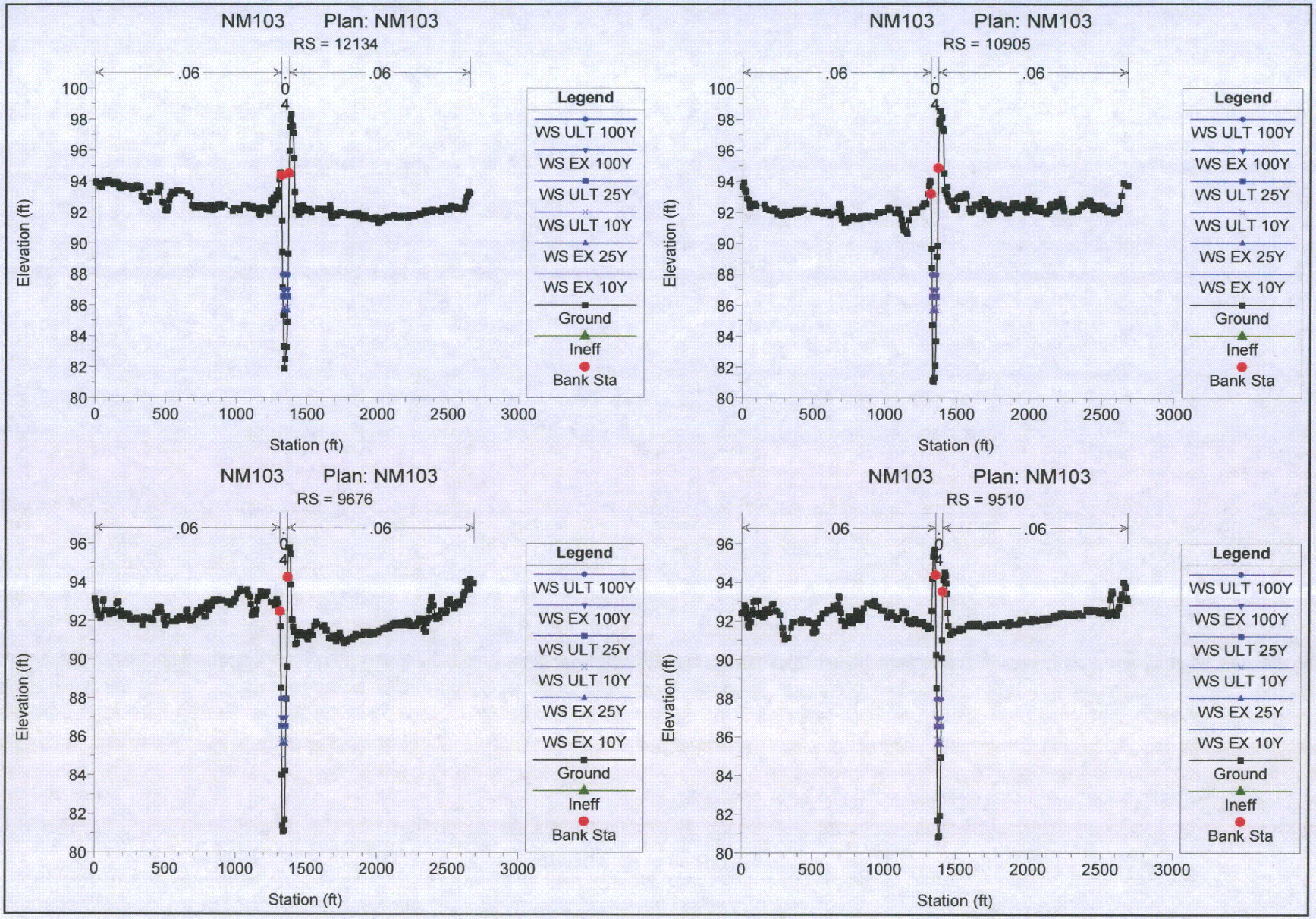
HEC-RAS Plan: BASE River: N-NM-103 Reach: NM-103

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)	
NM-103	628	EX 10Y	108.00	77.03	81.46	78.74	81.50	0.000401	1.49	72.60	23.16	0.15
NM-103	628	EX 25Y	150.00	77.03	82.25	79.05	82.29	0.000401	1.64	91.34	24.67	0.15
NM-103	628	EX 100Y	261.00	77.03	83.93	79.69	83.98	0.000401	1.93	135.50	27.92	0.15
NM-103	628	ULT 10Y	173.00	77.03	82.64	79.20	82.68	0.000400	1.71	101.06	25.42	0.15
NM-103	628	ULT 25Y	225.00	77.03	83.43	79.50	83.48	0.000400	1.85	121.88	26.96	0.15
NM-103	628	ULT 100Y	356.00	77.03	85.11	80.12	85.18	0.000400	2.09	170.03	30.41	0.16
NM-103	1579	EX 10Y	108.00	77.58	81.93	79.41	81.98	0.000656	1.80	59.87	20.51	0.19
NM-103	1579	EX 25Y	150.00	77.58	82.71	79.74	82.77	0.000636	1.96	76.43	22.16	0.19
NM-103	1579	EX 100Y	261.00	77.58	84.37	80.46	84.45	0.000601	2.24	116.31	25.70	0.19
NM-103	1579	ULT 10Y	173.00	77.58	83.09	79.91	83.16	0.000627	2.03	85.11	22.98	0.19
NM-103	1579	ULT 25Y	225.00	77.58	83.88	80.25	83.95	0.000610	2.17	103.88	24.66	0.19
NM-103	1579	ULT 100Y	356.00	77.58	85.55	80.96	85.64	0.000579	2.41	148.01	28.20	0.19
NM-103	2322	EX 10Y	97.00	78.42	82.59	80.67	82.65	0.001332	1.96	49.48	26.23	0.25
NM-103	2322	EX 25Y	135.00	78.42	83.28	81.04	83.34	0.000970	1.98	68.06	27.50	0.22
NM-103	2322	EX 100Y	234.00	78.42	84.85	81.81	84.91	0.000633	2.06	113.39	30.36	0.19
NM-103	2322	ULT 10Y	152.00	78.42	83.62	81.19	83.68	0.000824	1.96	77.69	28.13	0.21
NM-103	2322	ULT 25Y	199.00	78.42	84.37	81.63	84.43	0.000681	2.01	99.14	29.49	0.19
NM-103	2322	ULT 100Y	314.00	78.42	85.98	82.19	86.05	0.000514	2.11	149.00	32.43	0.17
NM-103	3019	EX 10Y	97.00	80.93	83.67	82.38	83.76	0.001925	2.45	39.63	20.33	0.31
NM-103	3019	EX 25Y	135.00	80.93	84.16	82.66	84.27	0.001907	2.70	49.95	21.71	0.31
NM-103	3019	EX 100Y	234.00	80.93	85.45	83.28	85.58	0.001491	2.92	80.12	25.21	0.29
NM-103	3019	ULT 10Y	152.00	80.93	84.40	82.78	84.52	0.001807	2.75	55.27	22.37	0.31
NM-103	3019	ULT 25Y	199.00	80.93	85.02	83.08	85.15	0.001603	2.86	69.62	24.05	0.30
NM-103	3019	ULT 100Y	314.00	80.93	86.46	83.67	86.59	0.001196	2.93	107.00	27.97	0.26
NM-103	3550	EX 10Y	97.00	80.57	84.11	81.89	84.13	0.000349	1.27	76.22	28.98	0.14
NM-103	3550	EX 25Y	135.00	80.57	84.64	82.13	84.67	0.000388	1.47	91.91	30.23	0.15
NM-103	3550	EX 100Y	234.00	80.57	85.91	82.59	85.96	0.000404	1.77	132.17	33.22	0.16
NM-103	3550	ULT 10Y	152.00	80.57	84.88	82.22	84.92	0.000393	1.53	99.21	30.79	0.15
NM-103	3550	ULT 25Y	199.00	80.57	85.49	82.44	85.53	0.000401	1.68	118.47	32.23	0.15
NM-103	3550	ULT 100Y	314.00	80.57	86.88	82.91	86.93	0.000383	1.90	165.37	35.47	0.15
NM-103	4540	EX 10Y	97.00	80.59	84.37	81.71	84.39	0.000192	1.02	95.40	32.47	0.10
NM-103	4540	EX 25Y	135.00	80.59	84.94	81.92	84.96	0.000219	1.18	114.06	33.63	0.11
NM-103	4540	EX 100Y	234.00	80.59	86.23	82.37	86.27	0.000245	1.47	159.45	36.32	0.12
NM-103	4540	ULT 10Y	152.00	80.59	85.18	82.00	85.21	0.000225	1.24	122.40	34.14	0.12
NM-103	4540	ULT 25Y	199.00	80.59	85.81	82.22	85.84	0.000238	1.38	144.16	35.44	0.12
NM-103	4540	ULT 100Y	314.00	80.59	87.19	82.68	87.23	0.000246	1.61	195.28	38.32	0.13
NM-103	6017	EX 10Y	97.00	80.26	84.63	81.42	84.64	0.000158	0.99	97.74	29.01	0.10
NM-103	6017	EX 25Y	135.00	80.26	85.24	81.64	85.27	0.000199	1.16	116.44	32.62	0.11
NM-103	6017	EX 100Y	234.00	80.26	86.59	82.13	86.62	0.000232	1.42	164.72	37.62	0.12
NM-103	6017	ULT 10Y	152.00	80.26	85.51	81.73	85.53	0.000216	1.21	125.35	34.95	0.11
NM-103	6017	ULT 25Y	199.00	80.26	86.15	81.97	86.18	0.000227	1.34	148.55	36.71	0.12
NM-103	6017	ULT 100Y	314.00	80.26	87.55	82.48	87.59	0.000231	1.56	201.82	39.63	0.12
NM-103	6894	EX 10Y	56.00	80.42	84.76	81.65	84.77	0.000121	0.74	75.93	29.85	0.08
NM-103	6894	EX 25Y	79.00	80.42	85.40	81.89	85.41	0.000123	0.83	95.63	31.71	0.08
NM-103	6894	EX 100Y	137.00	80.42	86.76	82.35	86.78	0.000120	0.97	141.35	35.45	0.09
NM-103	6894	ULT 10Y	89.00	80.42	85.67	81.97	85.68	0.000121	0.85	104.32	32.45	0.08
NM-103	6894	ULT 25Y	116.00	80.42	86.32	82.20	86.33	0.000119	0.92	126.02	34.24	0.08
NM-103	6894	ULT 100Y	184.00	80.42	87.72	82.67	87.74	0.000114	1.04	176.69	38.05	0.09
NM-103	7025	EX 10Y	56.00	81.02	84.78	82.00	84.78	0.000080	0.62	89.75	32.71	0.07
NM-103	7025	EX 25Y	79.00	81.02	85.42	82.19	85.42	0.000084	0.71	111.20	34.22	0.07
NM-103	7025	EX 100Y	137.00	81.02	86.78	82.59	86.79	0.000087	0.86	159.74	37.06	0.07
NM-103	7025	ULT 10Y	89.00	81.02	85.69	82.26	85.69	0.000084	0.74	120.54	34.79	0.07
NM-103	7025	ULT 25Y	116.00	81.02	86.34	82.49	86.35	0.000085	0.81	143.63	36.14	0.07
NM-103	7025	ULT 100Y	184.00	81.02	87.74	82.80	87.75	0.000086	0.94	196.34	39.11	0.07
NM-103	7975	EX 10Y	56.00	80.24	84.85	81.39	84.85	0.000071	0.66	85.39	25.56	0.06
NM-103	7975	EX 25Y	79.00	80.24	85.49	81.60	85.50	0.000084	0.77	102.40	26.95	0.07
NM-103	7975	EX 100Y	137.00	80.24	86.86	82.02	86.88	0.000102	0.97	141.33	29.90	0.08
NM-103	7975	ULT 10Y	89.00	80.24	85.77	81.69	85.78	0.000088	0.81	109.81	27.53	0.07
NM-103	7975	ULT 25Y	116.00	80.24	86.42	81.88	86.43	0.000096	0.90	128.30	28.94	0.08
NM-103	7975	ULT 100Y	184.00	80.24	87.83	82.30	87.84	0.000109	1.08	171.11	31.95	0.08
NM-103	8419	EX 10Y	56.00	81.34	84.89	82.26	84.90	0.000170	0.89	62.74	22.64	0.09
NM-103	8419	EX 25Y	79.00	81.34	85.55	82.45	85.56	0.000215	1.00	79.09	28.98	0.11
NM-103	8419	EX 100Y	137.00	81.34	86.92	82.86	86.94	0.000184	1.13	120.85	31.84	0.10
NM-103	8419	ULT 10Y	89.00	81.34	85.82	82.53	85.84	0.000204	1.02	87.06	29.55	0.10
NM-103	8419	ULT 25Y	116.00	81.34	86.48	82.71	86.49	0.000189	1.09	106.90	30.90	0.10

HEC-RAS Plan: BASE River: N-NM-103 Reach: NM-103 (Continued)

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)	
NM-103	8419	ULT 100Y	184.00	81.34	87.88	83.14	87.91	0.000169	1.21	152.54	34.01	0.10
NM-103	8922	EX 10Y	12.00	80.21	84.92	80.70	84.92	0.000004	0.15	80.40	24.12	0.01
NM-103	8922	EX 25Y	16.00	80.21	85.59	80.79	85.59	0.000004	0.17	96.94	25.64	0.01
NM-103	8922	EX 100Y	28.00	80.21	86.97	81.00	86.97	0.000005	0.21	134.48	28.81	0.02
NM-103	8922	ULT 10Y	19.00	80.21	85.86	80.85	85.86	0.000005	0.18	104.04	26.26	0.02
NM-103	8922	ULT 25Y	24.00	80.21	86.52	80.94	86.52	0.000005	0.20	121.84	27.77	0.02
NM-103	8922	ULT 100Y	38.00	80.21	87.93	81.15	87.93	0.000005	0.23	163.37	31.04	0.02
NM-103	9510	EX 10Y	12.00	80.81	84.93	81.31	84.93	0.000005	0.17	71.61	24.71	0.02
NM-103	9510	EX 25Y	16.00	80.81	85.59	81.40	85.59	0.000005	0.18	88.57	26.33	0.02
NM-103	9510	EX 100Y	28.00	80.81	86.97	81.59	86.97	0.000006	0.22	127.22	29.68	0.02
NM-103	9510	ULT 10Y	19.00	80.81	85.87	81.45	85.87	0.000006	0.20	95.88	27.00	0.02
NM-103	9510	ULT 25Y	24.00	80.81	86.52	81.53	86.52	0.000006	0.21	114.19	28.60	0.02
NM-103	9510	ULT 100Y	38.00	80.81	87.94	81.73	87.94	0.000006	0.24	157.01	32.03	0.02
NM-103	9676	EX 10Y	12.00	81.07	84.93	81.50	84.93	0.000005	0.16	77.05	26.96	0.02
NM-103	9676	EX 25Y	16.00	81.07	85.59	81.56	85.59	0.000005	0.17	95.51	28.59	0.02
NM-103	9676	EX 100Y	28.00	81.07	86.97	81.72	86.97	0.000005	0.20	137.29	31.96	0.02
NM-103	9676	ULT 10Y	19.00	81.07	85.87	81.60	85.87	0.000005	0.18	103.44	29.26	0.02
NM-103	9676	ULT 25Y	24.00	81.07	86.52	81.67	86.53	0.000005	0.19	123.24	30.86	0.02
NM-103	9676	ULT 100Y	38.00	81.07	87.94	81.82	87.94	0.000005	0.22	169.28	34.31	0.02
NM-103	10905	EX 10Y	12.00	81.03	84.93	81.49	84.93	0.000005	0.16	75.20	26.38	0.02
NM-103	10905	EX 25Y	16.00	81.03	85.60	81.56	85.60	0.000005	0.17	93.15	27.66	0.02
NM-103	10905	EX 100Y	28.00	81.03	86.98	81.74	86.98	0.000005	0.21	133.17	30.32	0.02
NM-103	10905	ULT 10Y	19.00	81.03	85.87	81.61	85.87	0.000005	0.19	100.83	28.19	0.02
NM-103	10905	ULT 25Y	24.00	81.03	86.53	81.69	86.53	0.000005	0.20	119.81	29.46	0.02
NM-103	10905	ULT 100Y	38.00	81.03	87.94	81.87	87.94	0.000005	0.23	163.35	32.18	0.02
NM-103	12134	EX 10Y	12.00	81.90	84.94	82.65	84.94	0.000016	0.22	53.85	29.03	0.03
NM-103	12134	EX 25Y	16.00	81.90	85.61	82.74	85.61	0.000011	0.22	73.90	31.49	0.02
NM-103	12134	EX 100Y	28.00	81.90	86.99	82.94	86.99	0.000009	0.23	121.08	36.90	0.02
NM-103	12134	ULT 10Y	19.00	81.90	85.88	82.80	85.88	0.000012	0.23	82.72	32.57	0.03
NM-103	12134	ULT 25Y	24.00	81.90	86.54	82.88	86.54	0.000009	0.23	104.99	35.15	0.02
NM-103	12134	ULT 100Y	38.00	81.90	87.95	83.06	87.95	0.000007	0.24	157.99	39.36	0.02


NM103 Plan: NM103
N-NM-103 NM-103
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
100
95
90
85
80
75
0
2000
4000
6000
8000
10000
12000
14000
Main Channel Distance (ft)


NM103 Plan: NM103
RS = 12134
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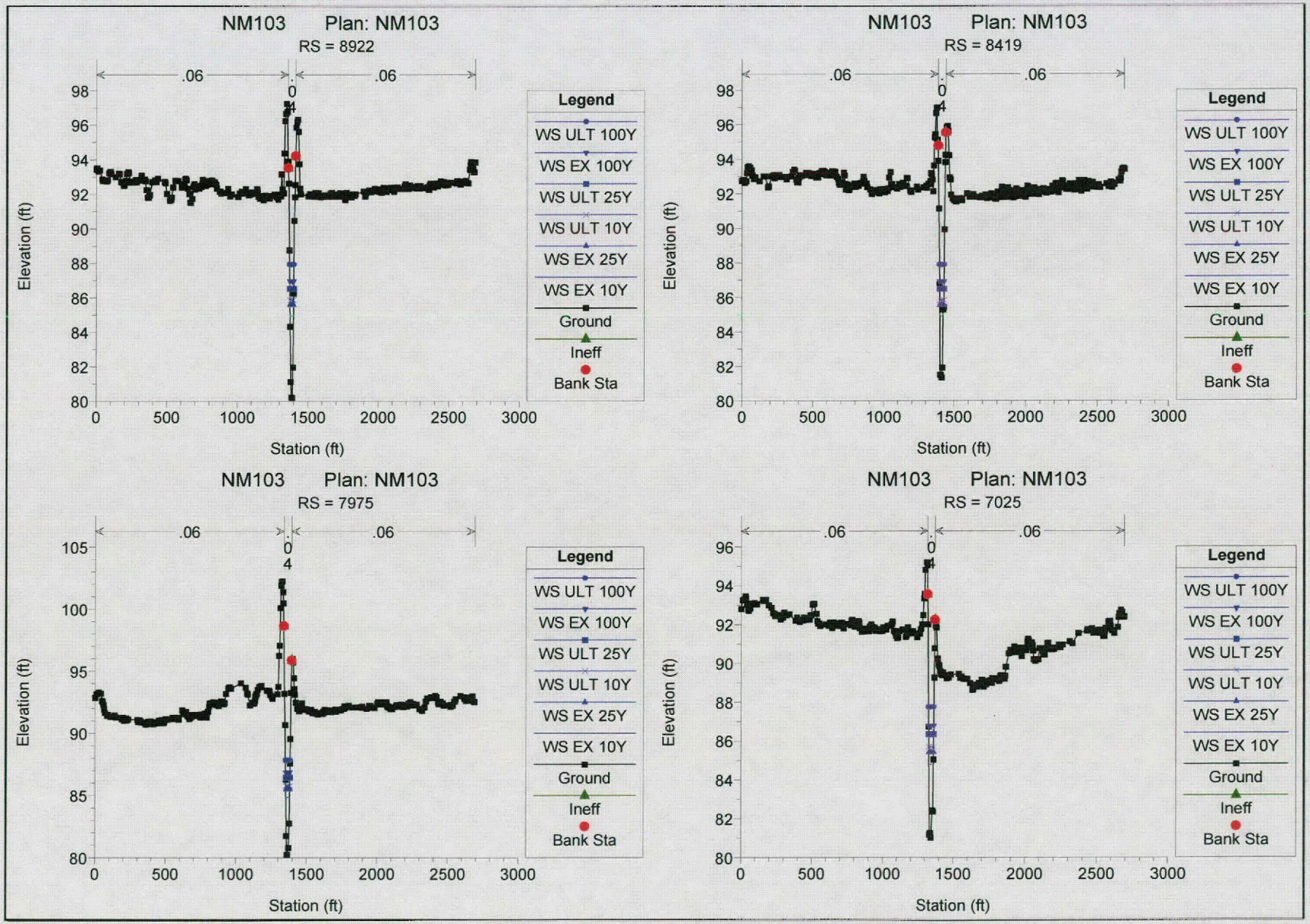
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM103 Plan: NM103
RS = 10905
NM103 Plan: NM103
RS = 9676
NM103 Plan: NM103
RS = 9510


NM103 Plan: NM103
RS = 8922
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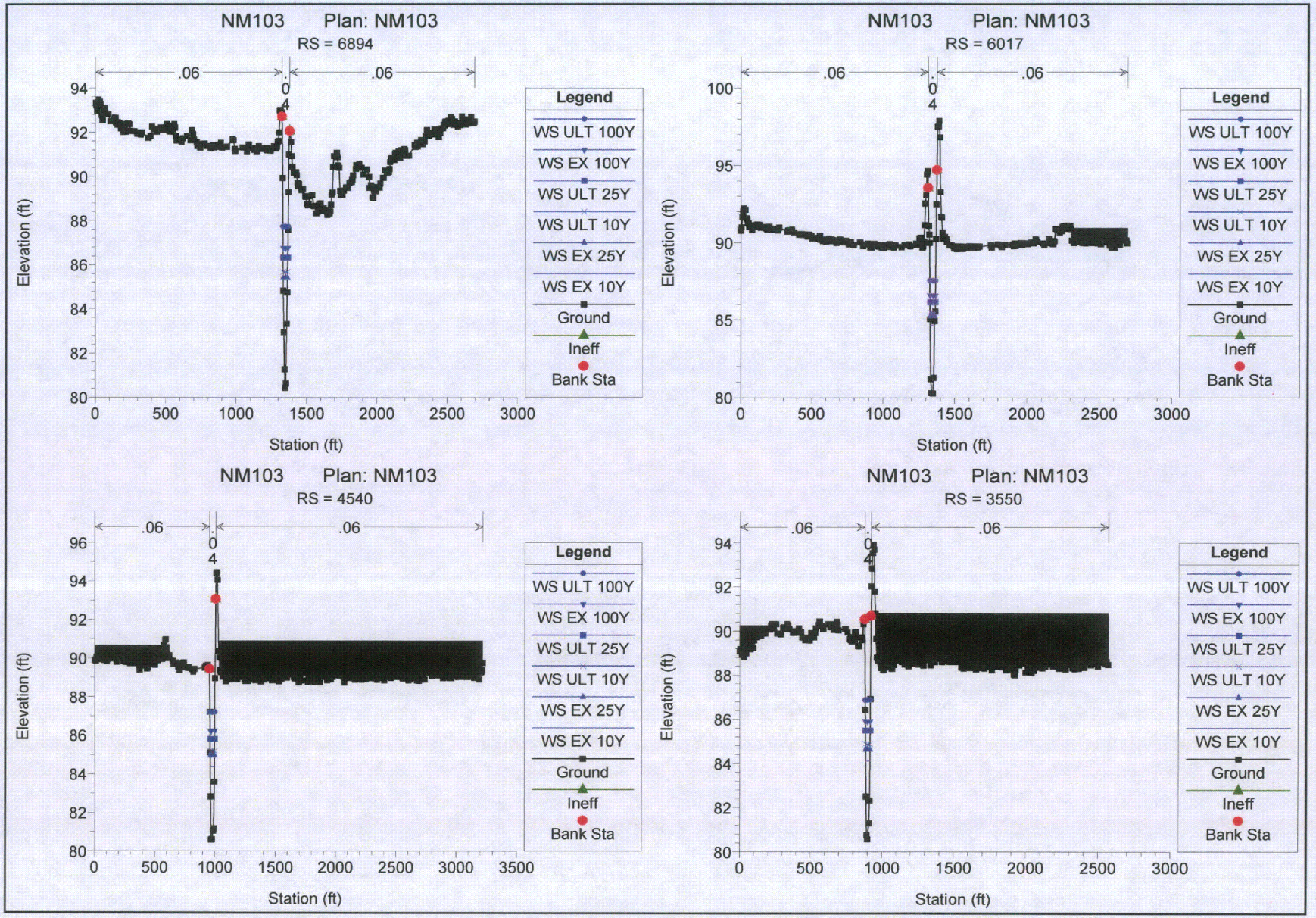
.06
0.4
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM103 Plan: NM103
RS = 8419
NM103 Plan: NM103
RS = 7975
NM103 Plan: NM103
RS = 7025


NM103 Plan: NM103
RS = 6894
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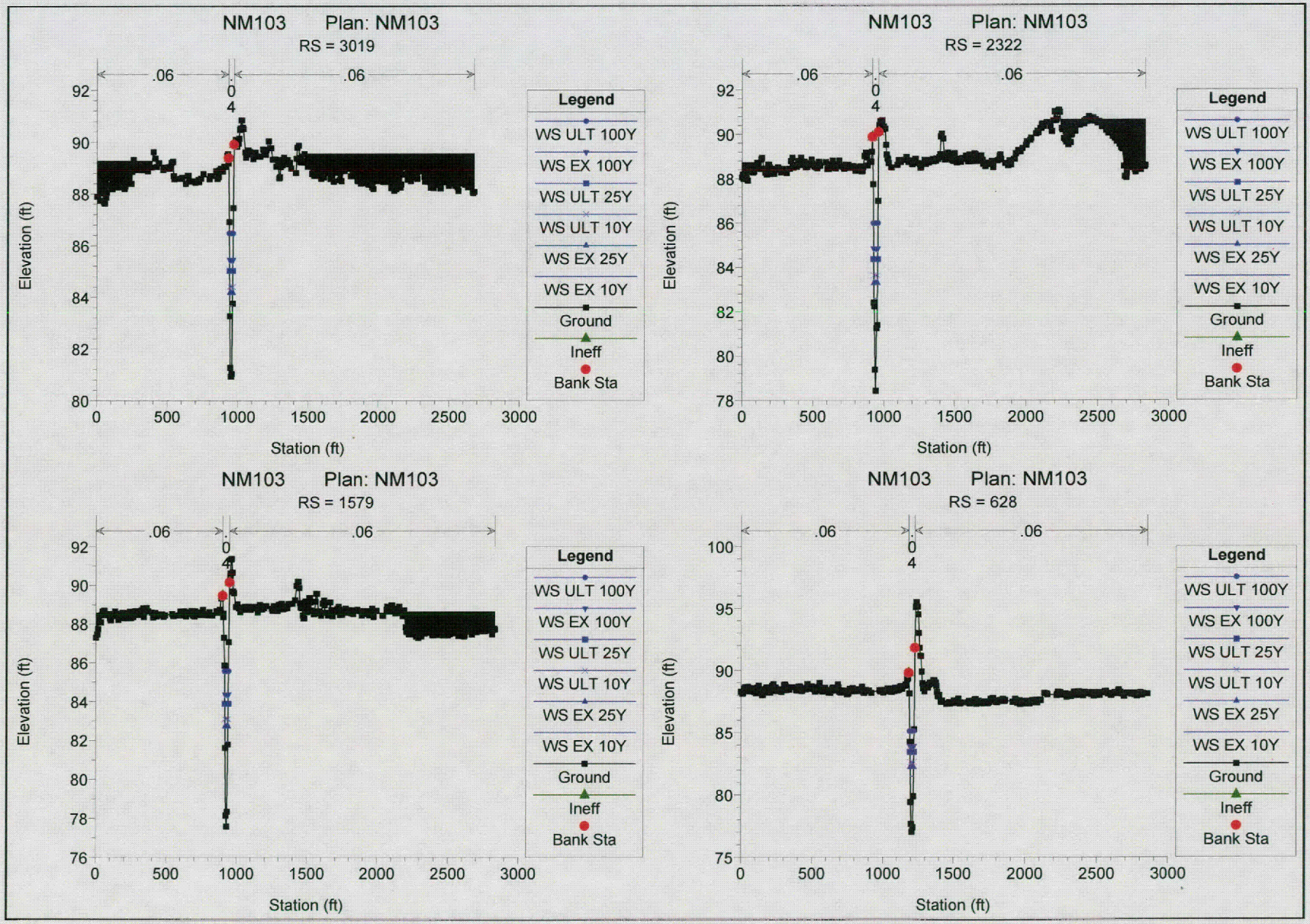
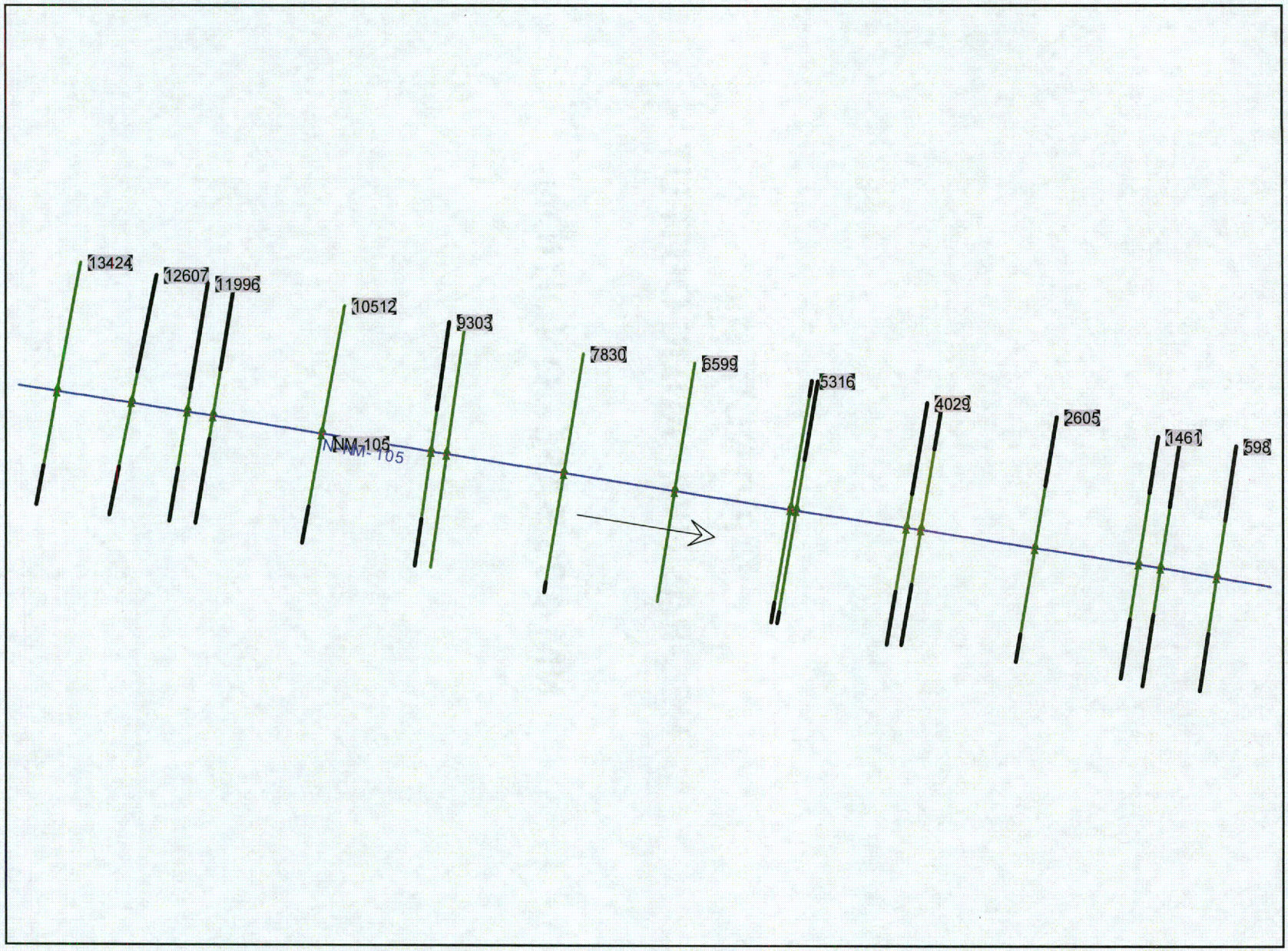
0.4
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM103 Plan: NM103
RS = 6017
NM103 Plan: NM103
RS = 4540
NM103 Plan: NM103
RS = 3550


NM103 Plan: NM103
RS = 3019
.06
.06
0
4
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM103 Plan: NM103
RS = 2322
NM103 Plan: NM103
RS = 1579
NM103 Plan: NM103
RS = 628

APPENDIX D
HEC-RAS HYDRAULIC OUTPUT

NM-105 BASE CONDITION

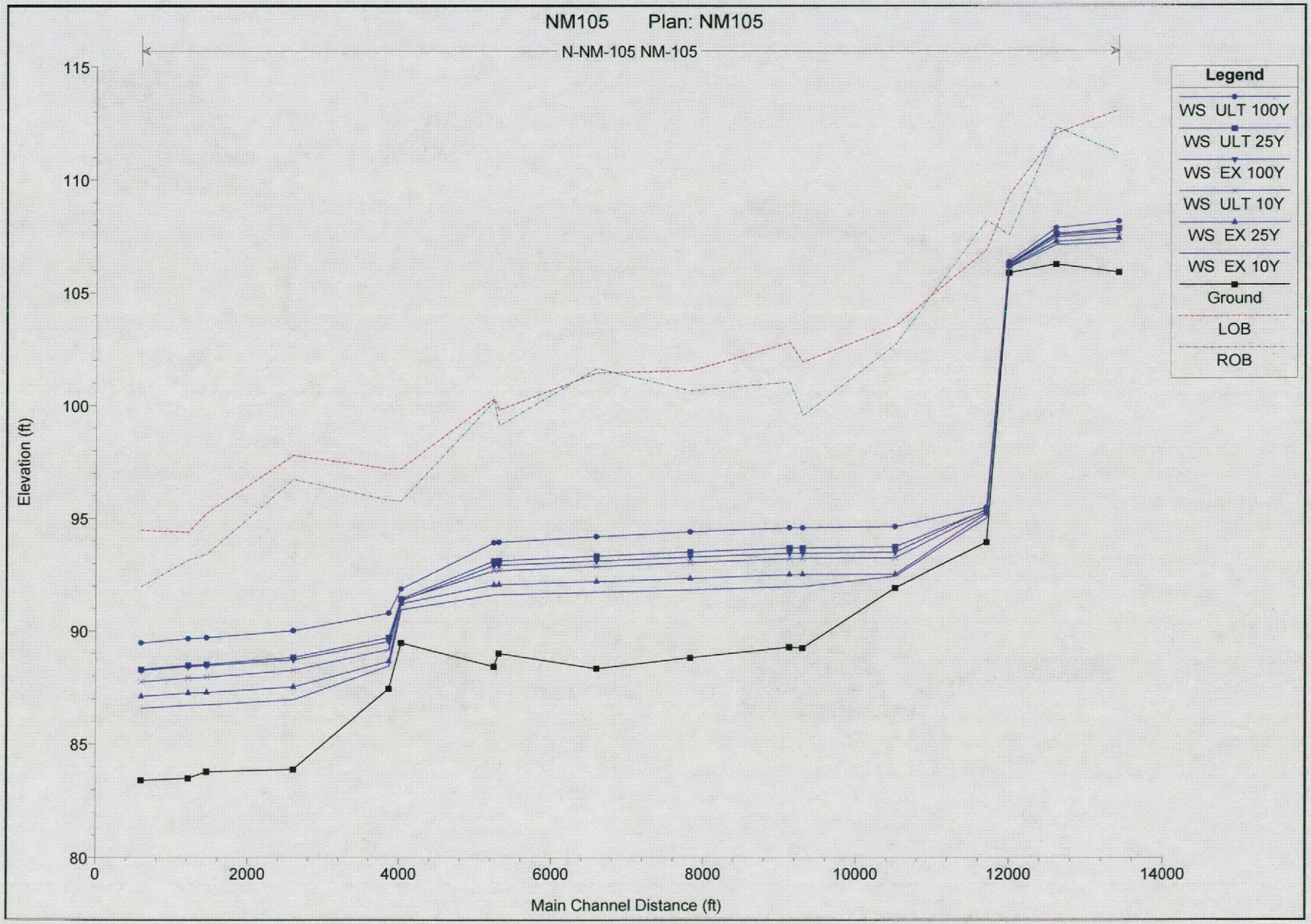

13424
12607
11996
10512
9303
7830
6599
5316
4029
2605
1461
598
NM-105

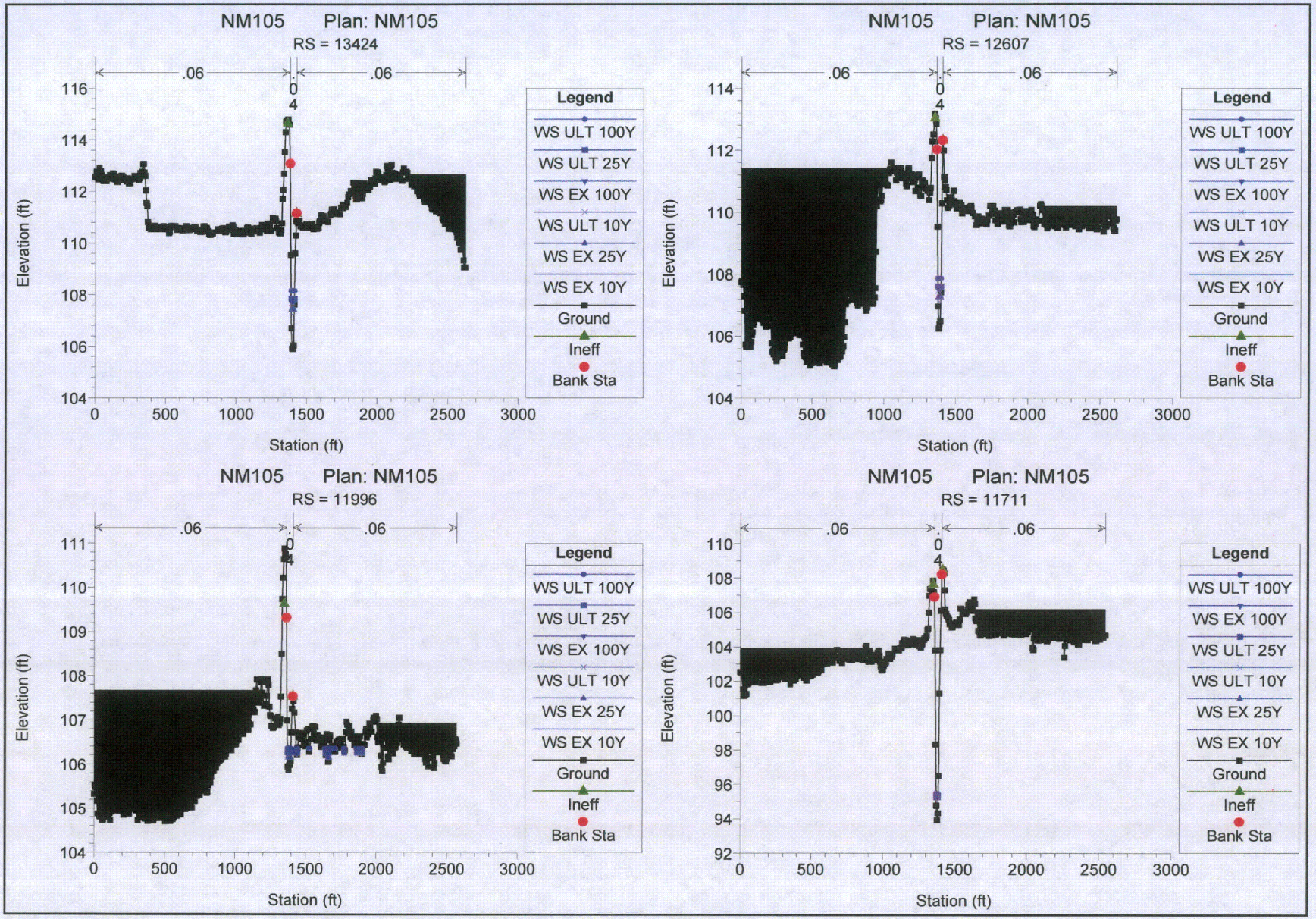
HEC-RAS Plan: BASE River: N-NM-105 Reach: NM-105

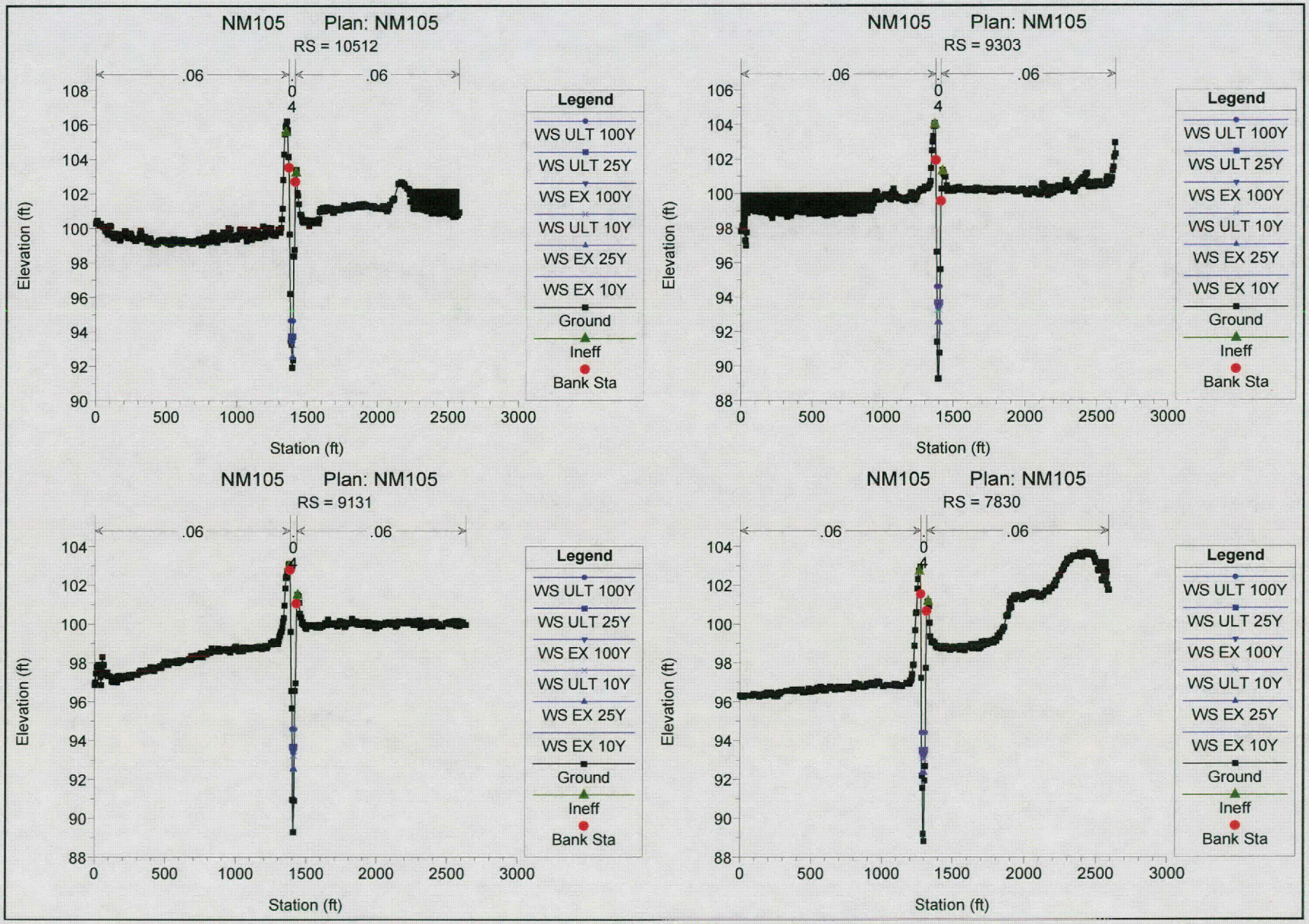
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
NM-105	598	EX 10Y	42.00	83.40	86.57	84.77	86.59	0.000400	1.11	37.97	19.26	0.14
NM-105	598	EX 25Y	60.00	83.40	87.10	84.97	87.12	0.000400	1.24	48.51	20.56	0.14
NM-105	598	EX 100Y	110.00	83.40	88.26	85.41	88.29	0.000401	1.49	73.93	23.23	0.15
NM-105	598	ULT 10Y	86.00	83.40	87.74	85.21	87.77	0.000400	1.38	62.24	22.06	0.14
NM-105	598	ULT 25Y	112.00	83.40	88.30	85.42	88.33	0.000401	1.50	74.87	23.32	0.15
NM-105	598	ULT 100Y	177.00	83.40	89.47	85.88	89.51	0.000400	1.71	103.65	25.96	0.15
NM-105	1218	EX 10Y	25.00	83.49	86.70	84.22	86.71	0.000084	0.56	44.42	19.08	0.07
NM-105	1218	EX 25Y	38.00	83.49	87.25	84.41	87.25	0.000104	0.69	55.14	20.32	0.07
NM-105	1218	EX 100Y	73.00	83.49	88.43	84.79	88.44	0.000132	0.90	80.75	23.03	0.09
NM-105	1218	ULT 10Y	62.00	83.49	87.91	84.67	87.93	0.000146	0.90	69.18	21.83	0.09
NM-105	1218	ULT 25Y	81.00	83.49	88.48	84.86	88.49	0.000156	0.99	81.87	23.15	0.09
NM-105	1218	ULT 100Y	128.00	83.49	89.66	85.26	89.68	0.000169	1.15	110.83	25.92	0.10
NM-105	1461	EX 10Y	25.00	83.78	86.73	84.72	86.74	0.000181	0.74	33.76	17.41	0.09
NM-105	1461	EX 25Y	38.00	83.78	87.28	84.93	87.29	0.000200	0.87	43.71	18.83	0.10
NM-105	1461	EX 100Y	73.00	83.78	88.47	85.34	88.48	0.000214	1.08	67.90	21.91	0.11
NM-105	1461	ULT 10Y	62.00	83.78	87.95	85.22	87.97	0.000251	1.09	57.05	20.59	0.12
NM-105	1461	ULT 25Y	81.00	83.78	88.52	85.42	88.54	0.000251	1.17	69.11	22.05	0.12
NM-105	1461	ULT 100Y	128.00	83.78	89.70	85.82	89.73	0.000245	1.32	96.79	24.78	0.12
NM-105	2605	EX 10Y	25.00	83.89	86.95	84.82	86.96	0.000211	0.81	30.91	15.13	0.10
NM-105	2605	EX 25Y	38.00	83.89	87.52	85.05	87.54	0.000236	0.95	39.99	16.50	0.11
NM-105	2605	EX 100Y	73.00	83.89	88.73	85.53	88.75	0.000262	1.19	61.26	18.72	0.12
NM-105	2605	ULT 10Y	62.00	83.89	88.26	85.39	88.28	0.000289	1.18	52.62	17.85	0.12
NM-105	2605	ULT 25Y	81.00	83.89	88.83	85.62	88.86	0.000297	1.28	63.07	18.90	0.12
NM-105	2605	ULT 100Y	128.00	83.89	90.01	86.09	90.04	0.000308	1.48	86.69	21.07	0.13
NM-105	3868	EX 10Y	25.00	87.45	88.45	88.45	88.74	0.028909	4.33	5.77	9.87	1.00
NM-105	3868	EX 25Y	38.00	87.45	88.65	88.65	89.01	0.027362	4.77	7.96	11.29	1.00
NM-105	3868	EX 100Y	73.00	87.45	89.54	89.07	89.74	0.007223	3.62	20.17	15.70	0.56
NM-105	3868	ULT 10Y	62.00	87.45	89.19	88.95	89.46	0.012590	4.16	14.90	14.38	0.72
NM-105	3868	ULT 25Y	81.00	87.45	89.72	89.14	89.91	0.006013	3.52	22.99	16.14	0.52
NM-105	3868	ULT 100Y	128.00	87.45	90.79	89.52	90.94	0.002609	3.06	41.83	18.80	0.36
NM-105	4029	EX 10Y	25.00	89.48	90.95	90.63	91.09	0.008784	3.02	8.27	9.59	0.57
NM-105	4029	EX 25Y	38.00	89.48	91.22	90.86	91.40	0.009268	3.46	10.98	10.78	0.60
NM-105	4029	EX 100Y	73.00	89.48	91.34	91.34	91.88	0.024601	5.90	12.38	11.35	0.99
NM-105	4029	ULT 10Y	62.00	89.48	91.39	91.20	91.75	0.015868	4.81	12.90	11.55	0.80
NM-105	4029	ULT 25Y	81.00	89.48	91.43	91.43	92.00	0.024724	6.07	13.34	11.72	1.00
NM-105	4029	ULT 100Y	128.00	89.48	91.87	91.87	92.58	0.023223	6.74	19.00	13.54	1.00
NM-105	5250	EX 10Y	19.00	88.43	91.60	89.34	91.61	0.000100	0.56	33.66	16.34	0.07
NM-105	5250	EX 25Y	29.00	88.43	92.05	89.54	92.06	0.000131	0.71	41.08	17.13	0.08
NM-105	5250	EX 100Y	54.00	88.43	92.91	89.92	92.92	0.000182	0.96	56.48	18.66	0.10
NM-105	5250	ULT 10Y	48.00	88.43	92.67	89.84	92.68	0.000182	0.92	52.03	18.23	0.10
NM-105	5250	ULT 25Y	63.00	88.43	93.10	90.03	93.12	0.000208	1.05	60.14	19.01	0.10
NM-105	5250	ULT 100Y	98.00	88.43	93.91	90.41	93.94	0.000259	1.29	76.15	20.46	0.12
NM-105	5316	EX 10Y	19.00	89.01	91.61	89.71	91.62	0.000106	0.56	33.94	17.74	0.07
NM-105	5316	EX 25Y	29.00	89.01	92.06	89.87	92.06	0.000131	0.69	42.05	18.66	0.08
NM-105	5316	EX 100Y	54.00	89.01	92.92	90.20	92.93	0.000172	0.92	58.95	20.44	0.10
NM-105	5316	ULT 10Y	48.00	89.01	92.68	90.13	92.69	0.000174	0.89	54.07	19.94	0.10
NM-105	5316	ULT 25Y	63.00	89.01	93.12	90.29	93.13	0.000194	1.00	63.00	20.85	0.10
NM-105	5316	ULT 100Y	98.00	89.01	93.93	90.58	93.96	0.000234	1.21	80.70	22.53	0.11
NM-105	6599	EX 10Y	19.00	88.34	91.71	89.10	91.72	0.000059	0.46	41.10	18.24	0.05
NM-105	6599	EX 25Y	29.00	88.34	92.19	89.29	92.19	0.000079	0.58	50.06	19.42	0.06
NM-105	6599	EX 100Y	54.00	88.34	93.10	89.66	93.11	0.000113	0.78	68.87	197.88	0.08
NM-105	6599	ULT 10Y	48.00	88.34	92.86	89.58	92.87	0.000110	0.75	63.67	52.29	0.08
NM-105	6599	ULT 25Y	63.00	88.34	93.32	89.76	93.33	0.000127	0.85	73.72	294.74	0.08
NM-105	6599	ULT 100Y	98.00	88.34	94.19	90.10	94.20	0.000158	1.04	94.02	557.66	0.09
NM-105	7830	EX 10Y	19.00	88.82	91.83	89.70	91.83	0.000171	0.66	28.85	16.87	0.09
NM-105	7830	EX 25Y	29.00	88.82	92.34	89.90	92.34	0.000214	0.74	39.00	22.76	0.10
NM-105	7830	EX 100Y	54.00	88.82	93.28	90.30	93.29	0.000189	0.86	62.88	26.65	0.10
NM-105	7830	ULT 10Y	48.00	88.82	93.04	90.22	93.05	0.000206	0.85	56.58	26.17	0.10
NM-105	7830	ULT 25Y	63.00	88.82	93.51	90.42	93.52	0.000193	0.91	69.17	27.11	0.10
NM-105	7830	ULT 100Y	98.00	88.82	94.40	90.82	94.41	0.000188	1.04	93.95	28.87	0.10
NM-105	9131	EX 10Y	6.00	89.29	91.97	90.04	91.97	0.000041	0.31	19.64	12.01	0.04
NM-105	9131	EX 25Y	9.00	89.29	92.50	90.18	92.51	0.000040	0.34	26.29	13.04	0.04
NM-105	9131	EX 100Y	17.00	89.29	93.45	90.43	93.45	0.000046	0.43	39.41	14.87	0.05
NM-105	9131	ULT 10Y	14.00	89.29	93.21	90.34	93.21	0.000040	0.39	35.98	14.41	0.04
NM-105	9131	ULT 25Y	19.00	89.29	93.68	90.48	93.69	0.000045	0.44	43.02	15.33	0.05

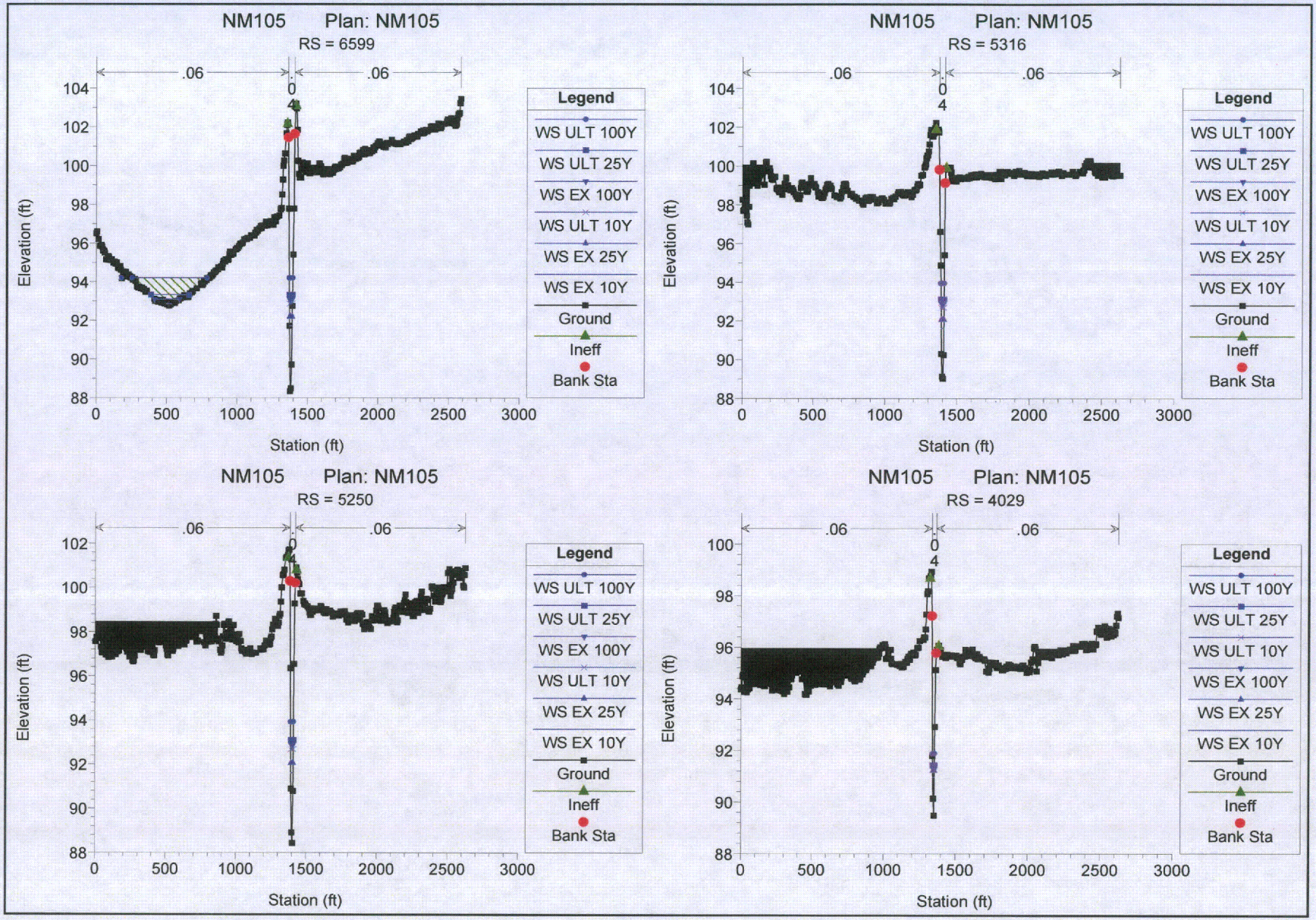
HEC-RAS Plan: BASE River: N-NM-105 Reach: NM-105 (Continued)

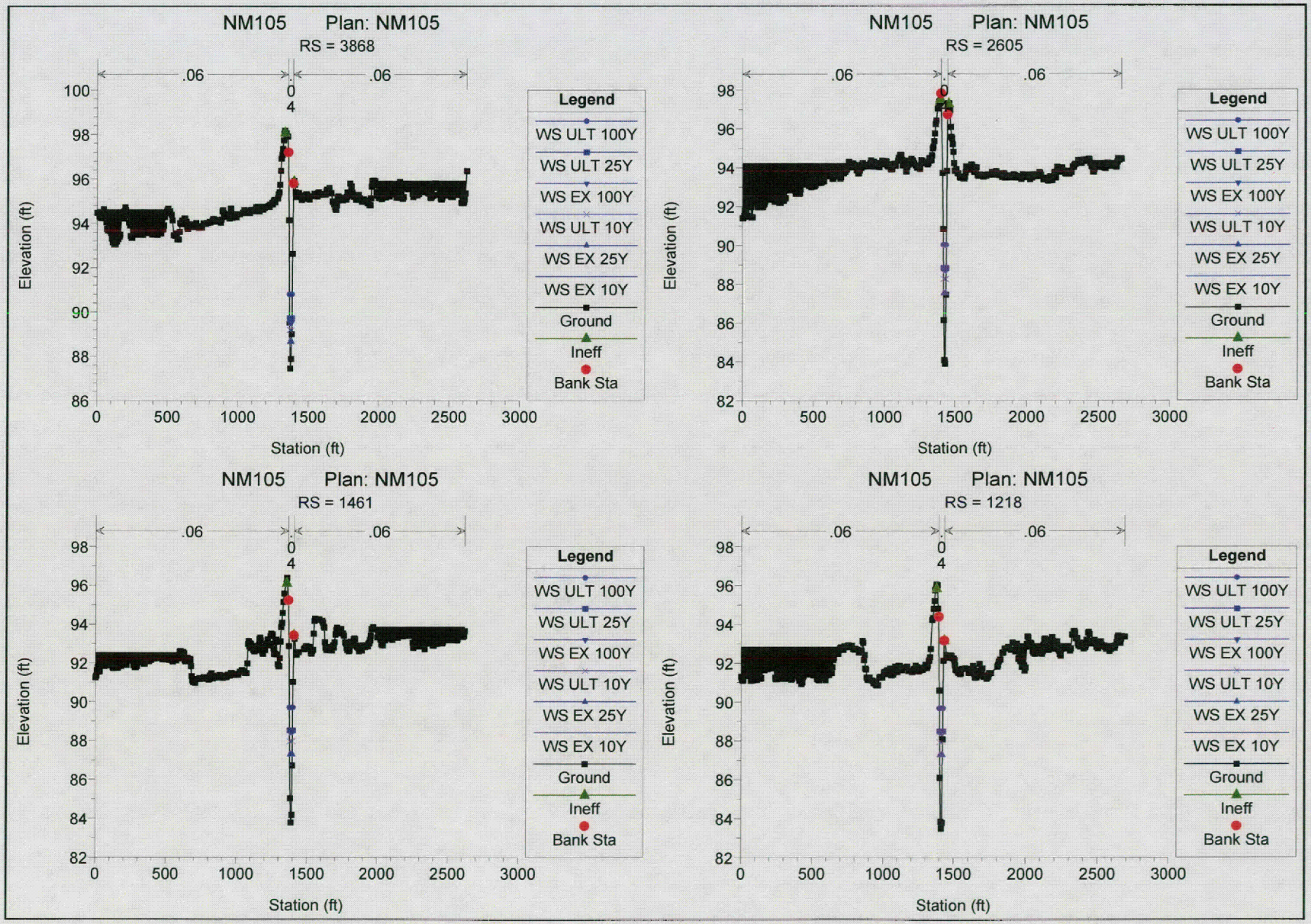
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
NM-105	9131	ULT 100Y	29.00	89.29	94.57	90.70	94.58	0.000047	0.50	57.43	17.06	0.05
NM-105	9303	EX 10Y	6.00	89.25	91.98	89.59	91.98	0.000011	0.18	32.68	16.82	0.02
NM-105	9303	EX 25Y	9.00	89.25	92.51	89.68	92.51	0.000012	0.21	41.90	17.87	0.02
NM-105	9303	EX 100Y	17.00	89.25	93.45	89.88	93.45	0.000016	0.29	59.62	19.75	0.03
NM-105	9303	ULT 10Y	14.00	89.25	93.22	89.81	93.22	0.000014	0.25	55.03	19.28	0.03
NM-105	9303	ULT 25Y	19.00	89.25	93.69	89.93	93.69	0.000016	0.30	64.39	20.22	0.03
NM-105	9303	ULT 100Y	29.00	89.25	94.58	90.11	94.58	0.000018	0.35	83.19	21.99	0.03
NM-105	10512	EX 10Y	6.00	91.91	92.43	92.43	92.57	0.035034	2.99	2.01	7.00	0.98
NM-105	10512	EX 25Y	9.00	91.91	92.52	92.52	92.70	0.034708	3.42	2.63	7.39	1.01
NM-105	10512	EX 100Y	17.00	91.91	93.50	92.72	93.53	0.001922	1.35	12.59	15.95	0.27
NM-105	10512	ULT 10Y	14.00	91.91	93.25	92.65	93.28	0.002174	1.51	9.26	10.73	0.29
NM-105	10512	ULT 25Y	19.00	91.91	93.74	92.76	93.76	0.001039	1.15	16.50	16.59	0.20
NM-105	10512	ULT 100Y	29.00	91.91	94.63	92.95	94.64	0.000317	0.90	32.38	18.98	0.12
NM-105	11711	EX 10Y	6.00	93.93	95.00	94.40	95.01	0.000653	0.73	8.22	11.88	0.15
NM-105	11711	EX 25Y	9.00	93.93	95.20	94.49	95.21	0.000677	0.85	10.65	12.62	0.16
NM-105	11711	EX 100Y	17.00	93.93	95.39	94.67	95.41	0.001322	1.30	13.06	13.31	0.23
NM-105	11711	ULT 10Y	14.00	93.93	95.26	94.61	95.29	0.001323	1.22	11.45	12.85	0.23
NM-105	11711	ULT 25Y	19.00	93.93	95.35	94.71	95.39	0.001845	1.51	12.58	13.17	0.27
NM-105	11711	ULT 100Y	29.00	93.93	95.46	94.87	95.53	0.003092	2.06	14.08	13.58	0.36
NM-105	11996	EX 10Y	6.00	105.87	106.10	106.10	106.17	0.045528	2.10	2.86	27.73	1.00
NM-105	11996	EX 25Y	9.00	105.87	106.15	106.15	106.23	0.041952	2.38	3.78	30.16	1.00
NM-105	11996	EX 100Y	17.00	105.87	106.24	106.24	106.37	0.035652	2.86	5.94	43.49	0.99
NM-105	11996	ULT 10Y	14.00	105.87	106.21	106.21	106.32	0.037754	2.72	5.16	34.15	1.00
NM-105	11996	ULT 25Y	19.00	105.87	106.26	106.26	106.40	0.036342	3.00	6.34	49.09	1.01
NM-105	11996	ULT 100Y	29.00	105.87	106.36	106.36	106.53	0.033004	3.38	8.58	105.19	1.00
NM-105	12607	EX 10Y	6.00	106.25	107.11	106.59	107.11	0.000467	0.56	10.80	18.62	0.13
NM-105	12607	EX 25Y	9.00	106.25	107.26	106.65	107.26	0.000519	0.66	13.67	19.73	0.14
NM-105	12607	EX 100Y	17.00	106.25	107.55	106.78	107.56	0.000619	0.87	19.64	21.35	0.16
NM-105	12607	ULT 10Y	14.00	106.25	107.45	106.73	107.46	0.000584	0.79	17.66	21.00	0.15
NM-105	12607	ULT 25Y	19.00	106.25	107.61	106.81	107.62	0.000634	0.91	20.94	21.57	0.16
NM-105	12607	ULT 100Y	29.00	106.25	107.86	106.93	107.88	0.000718	1.09	26.49	22.50	0.18
NM-105	13424	EX 10Y	6.00	105.89	107.23	106.15	107.23	0.000066	0.30	19.98	19.65	0.05
NM-105	13424	EX 25Y	9.00	105.89	107.41	106.21	107.41	0.000089	0.38	23.66	20.55	0.06
NM-105	13424	EX 100Y	17.00	105.89	107.77	106.35	107.77	0.000140	0.54	31.29	22.21	0.08
NM-105	13424	ULT 10Y	14.00	105.89	107.65	106.30	107.65	0.000123	0.49	28.72	21.71	0.07
NM-105	13424	ULT 25Y	19.00	105.89	107.84	106.38	107.84	0.000151	0.58	32.93	22.53	0.08
NM-105	13424	ULT 100Y	29.00	105.89	108.15	106.52	108.16	0.000198	0.72	40.12	23.86	0.10

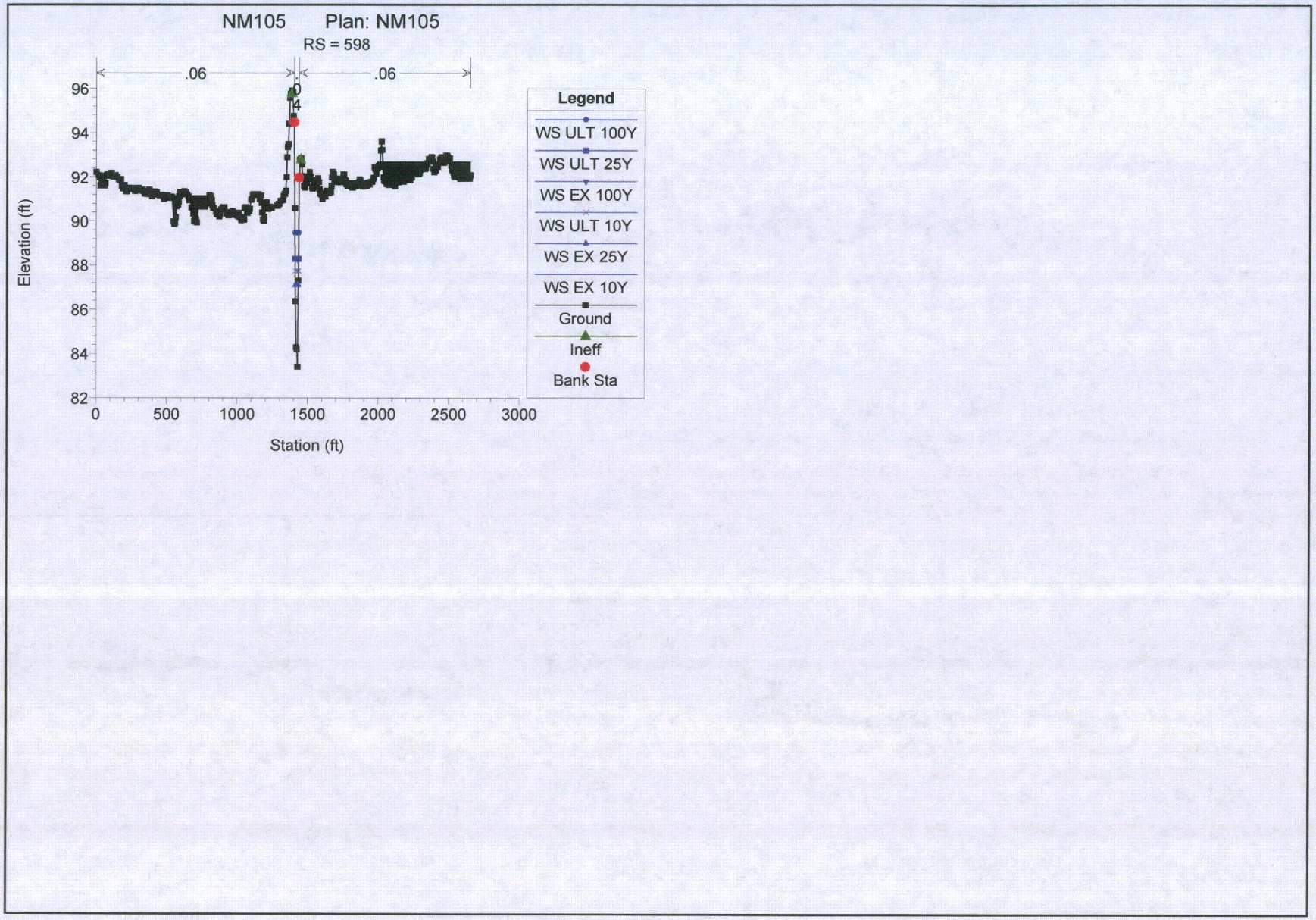

NM105 Plan: NM105
N-NM-105 NM-105
Legend
WS ULT 100Y
WS ULT 25Y
WS EX 100Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
115
110
105
100
95
90
85
80
0
2000
4000
6000
8000
10000
12000
14000
Main Channel Distance (ft)


NM105 Plan: NM105
RS = 13424
.06
.06
0
4
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS ULT 25Y
WS EX 100Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM105 Plan: NM105
RS = 12607
NM105 Plan: NM105
RS = 11996
NM105 Plan: NM105
RS = 11711


NM105 Plan: NM105
RS = 10512
.06
.06
0
4
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS ULT 25Y
WS EX 100Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM105 Plan: NM105
RS = 9303
NM105 Plan: NM105
RS = 9131
NM105 Plan: NM105
RS = 7830

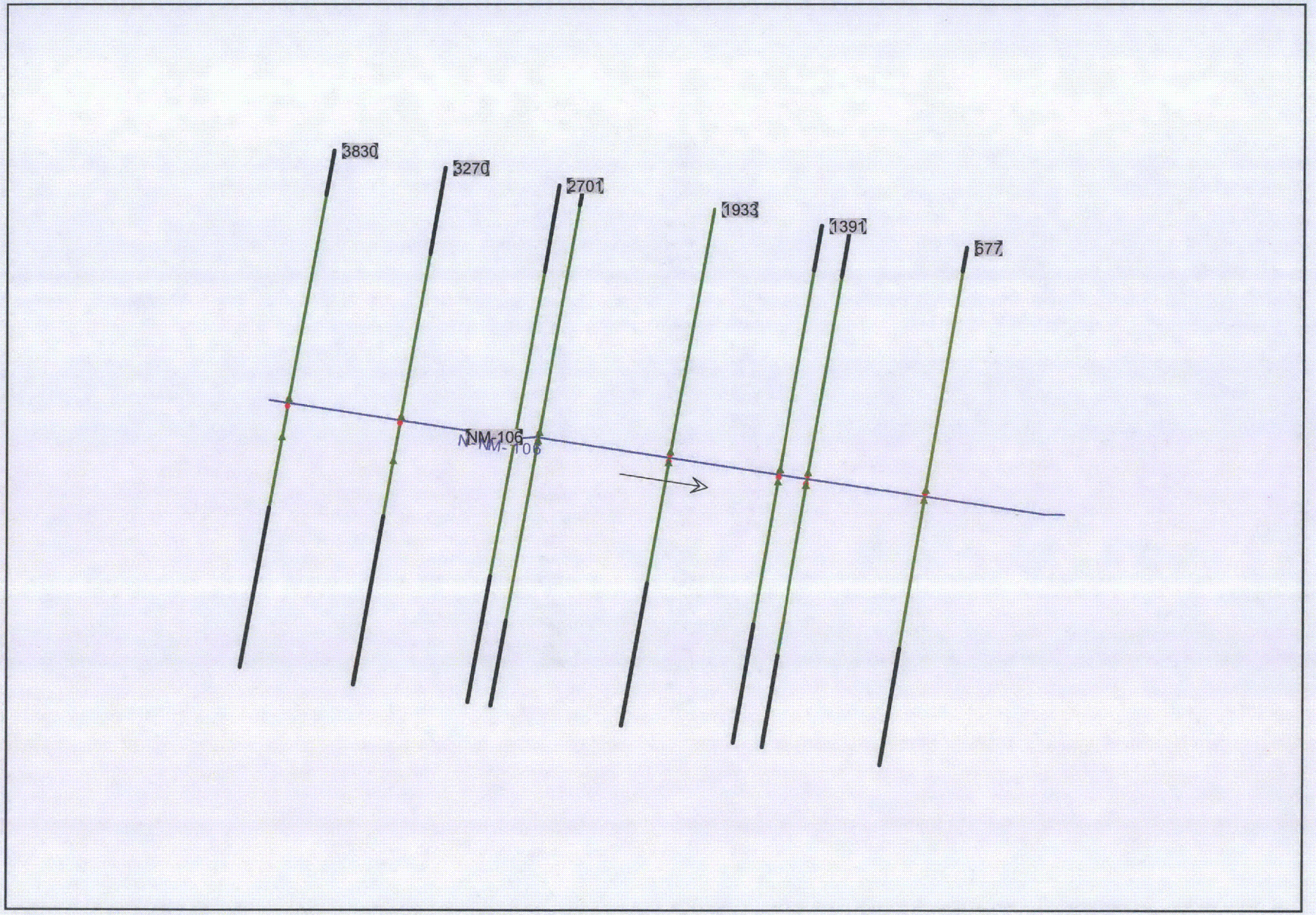

NM105 Plan: NM105
RS = 6599
.06
.06
0
4
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS ULT 25Y
WS EX 100Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM105 Plan: NM105
RS = 5316
NM105 Plan: NM105
RS = 5250
NM105 Plan: NM105
RS = 4029


NM105 Plan: NM105
RS = 3868
.06
.06
0.4
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS ULT 25Y
WS EX 100Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM105 Plan: NM105
RS = 2605
NM105 Plan: NM105
RS = 1461
NM105 Plan: NM105
RS = 1218


NM105 Plan: NM105
RS = 598
.06
.06
Elevation (ft)
96
94
92
90
88
86
84
82
0
500
1000
1500
2000
2500
3000
Station (ft)
Legend
WS ULT 100Y
WS ULT 25Y
WS EX 100Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta

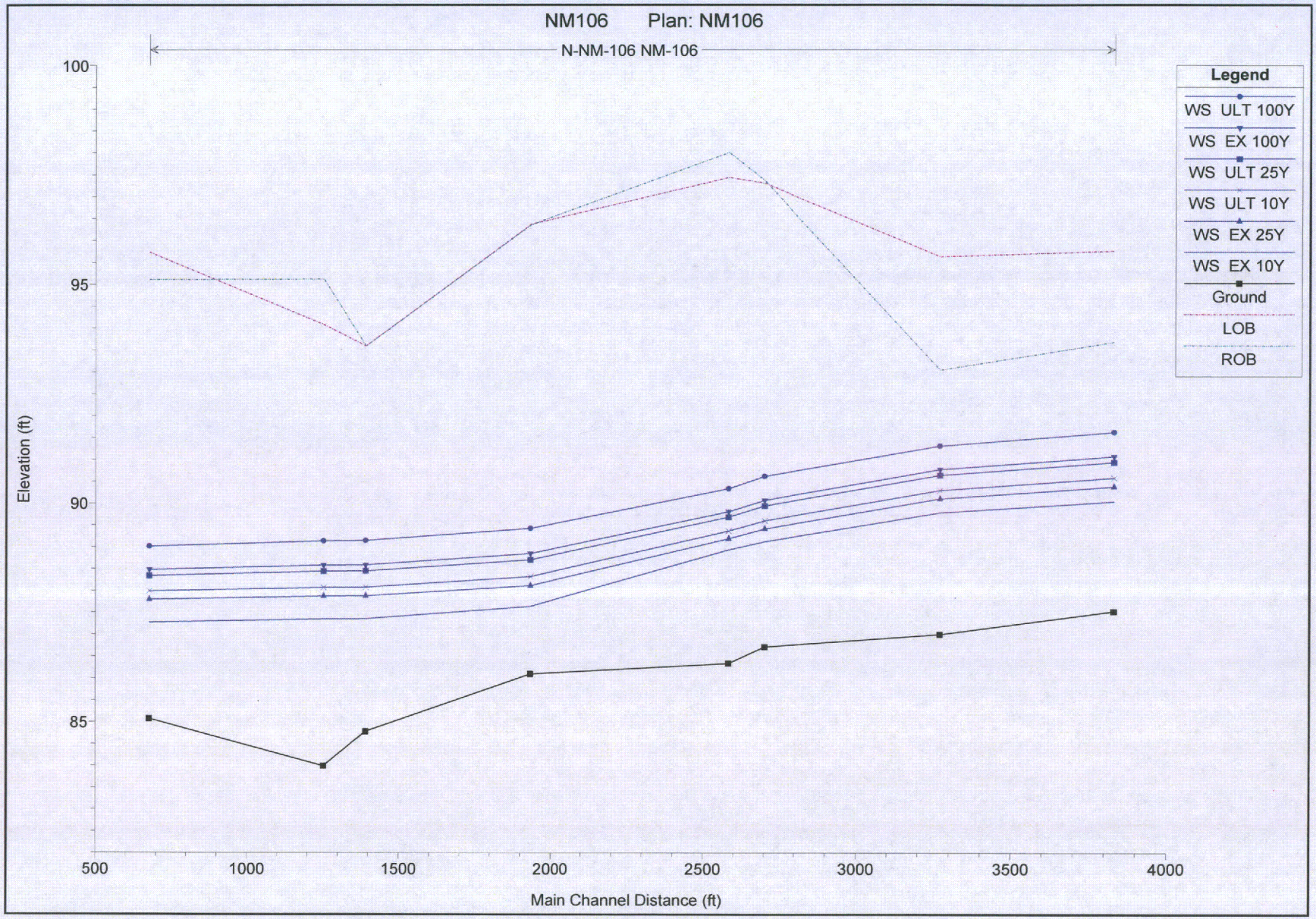
APPENDIX D
HEC-RAS HYDRAULIC OUTPUT

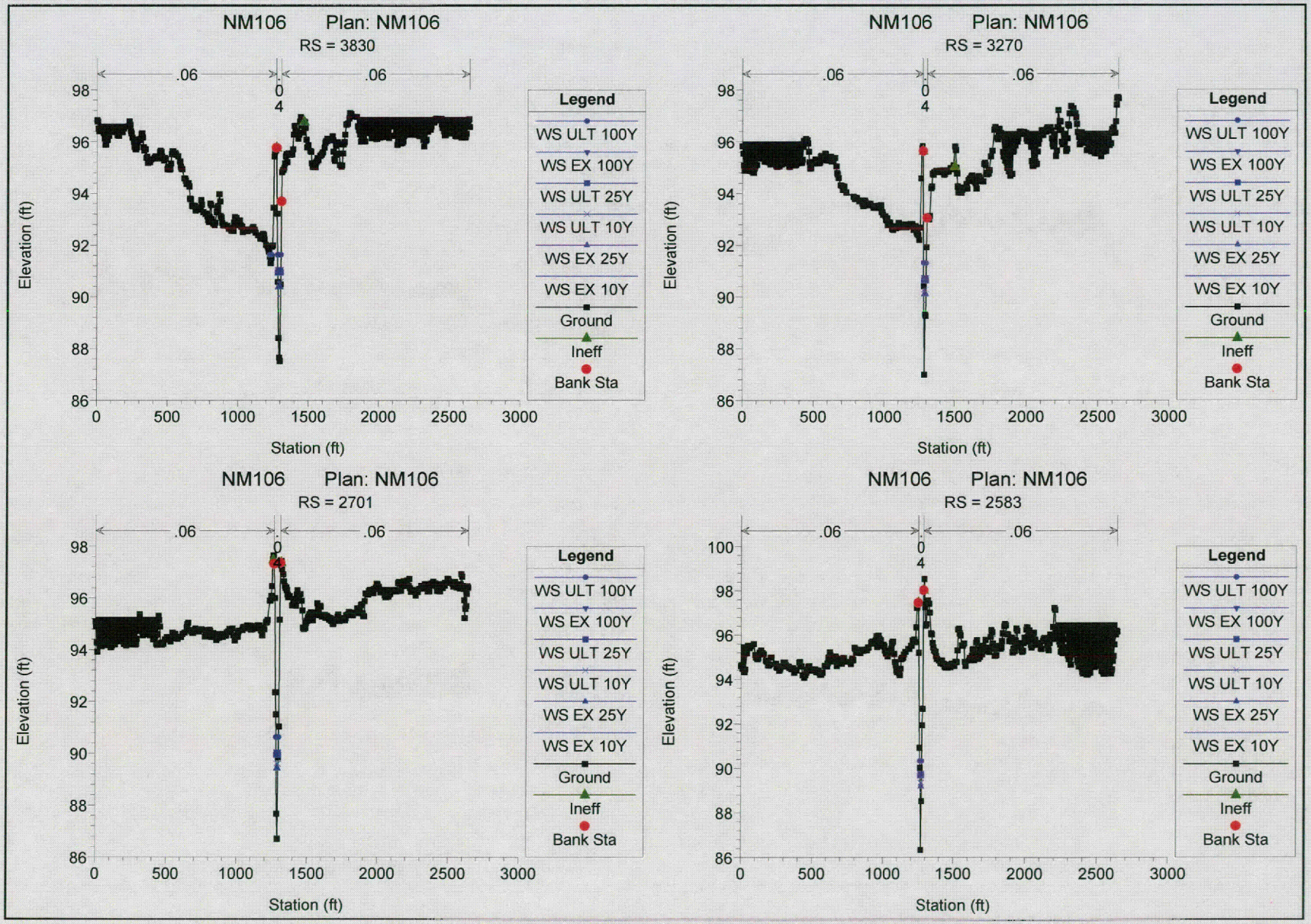
NM-106 BASE CONDITION

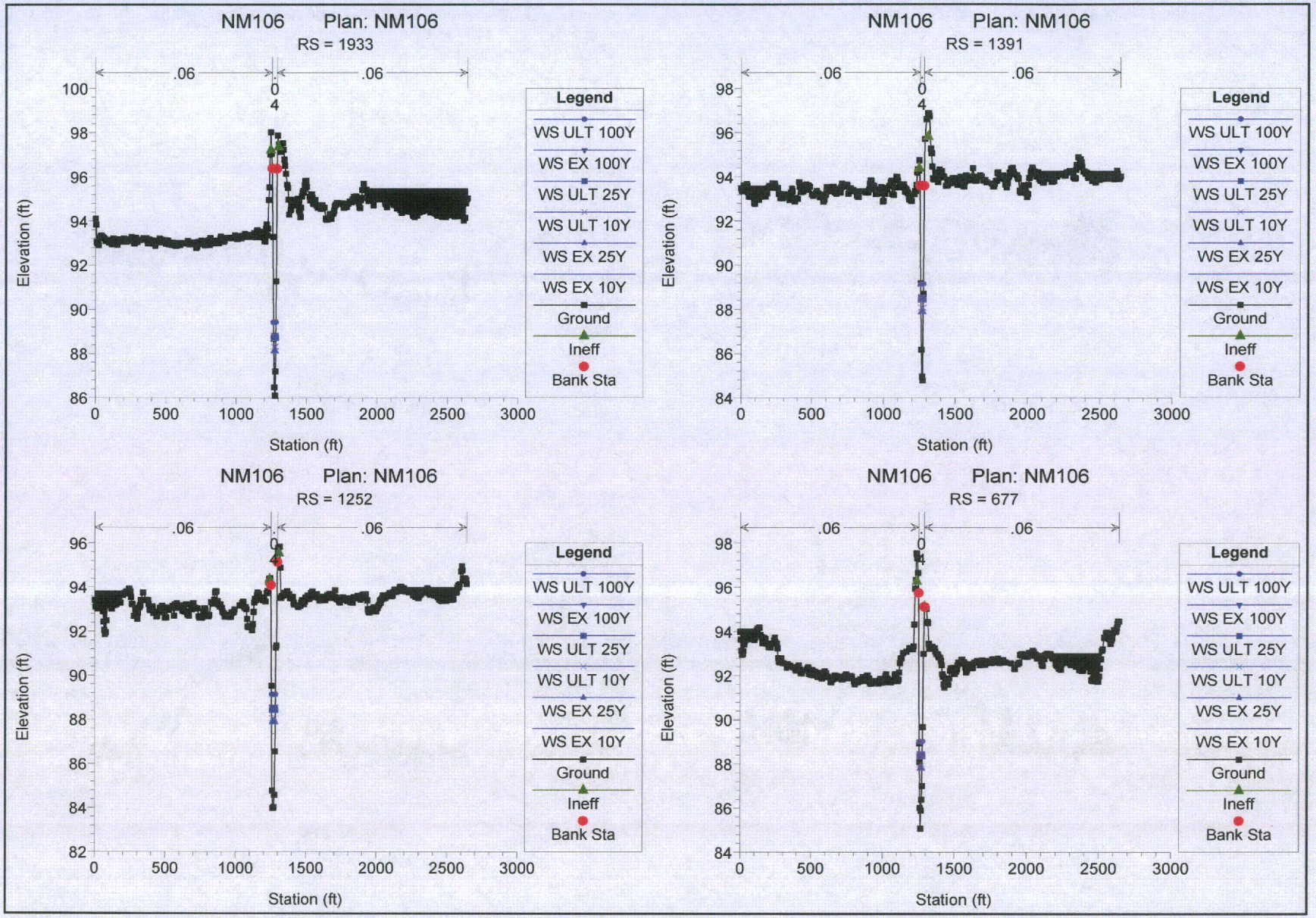

3830
3270
2701
1933
1391
677
NM-106

HEC-RAS Plan: BASE River: N-NM-106 Reach: NM-106

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)	
NM-106	677	EX 10Y	22.00	85.07	87.27	86.27	87.29	0.001001	1.22	18.06	16.32	0.20
NM-106	677	EX 25Y	31.00	85.07	87.79	86.45	87.81	0.000600	1.15	27.05	18.05	0.17
NM-106	677	EX 100Y	54.00	85.07	88.47	86.79	88.50	0.000601	1.34	40.26	21.11	0.17
NM-106	677	ULT 10Y	37.00	85.07	87.98	86.55	88.00	0.000601	1.21	30.53	18.68	0.17
NM-106	677	ULT 25Y	49.00	85.07	88.34	86.72	88.36	0.000601	1.31	37.44	20.37	0.17
NM-106	677	ULT 100Y	77.00	85.07	89.01	87.03	89.04	0.000600	1.47	52.32	23.81	0.17
NM-106	1252	EX 10Y	22.00	83.99	87.34	84.63	87.35	0.000032	0.37	59.26	23.52	0.04
NM-106	1252	EX 25Y	31.00	83.99	87.87	84.75	87.87	0.000036	0.43	71.78	24.61	0.04
NM-106	1252	EX 100Y	54.00	83.99	88.57	84.98	88.58	0.000058	0.60	89.78	26.11	0.06
NM-106	1252	ULT 10Y	37.00	83.99	88.06	84.81	88.07	0.000043	0.48	76.71	25.03	0.05
NM-106	1252	ULT 25Y	49.00	83.99	88.43	84.93	88.44	0.000054	0.57	86.12	25.81	0.05
NM-106	1252	ULT 100Y	77.00	83.99	89.13	85.17	89.14	0.000076	0.74	104.62	27.28	0.07
NM-106	1391	EX 10Y	22.00	84.78	87.35	85.61	87.36	0.000261	0.82	26.70	15.22	0.11
NM-106	1391	EX 25Y	31.00	84.78	87.87	85.78	87.88	0.000242	0.89	35.02	16.75	0.11
NM-106	1391	EX 100Y	54.00	84.78	88.58	86.11	88.60	0.000311	1.13	47.68	18.84	0.13
NM-106	1391	ULT 10Y	37.00	84.78	88.07	85.87	88.08	0.000266	0.96	38.41	17.34	0.11
NM-106	1391	ULT 25Y	49.00	84.78	88.44	86.04	88.46	0.000300	1.09	45.04	18.43	0.12
NM-106	1391	ULT 100Y	77.00	84.78	89.14	86.36	89.16	0.000357	1.31	58.61	20.37	0.14
NM-106	1933	EX 10Y	22.00	86.09	87.63	86.96	87.68	0.002027	1.65	13.37	13.16	0.29
NM-106	1933	EX 25Y	31.00	86.09	88.10	87.10	88.14	0.001259	1.55	19.96	14.81	0.24
NM-106	1933	EX 100Y	54.00	86.09	88.84	87.39	88.89	0.001009	1.70	31.81	17.18	0.22
NM-106	1933	ULT 10Y	37.00	86.09	88.32	87.20	88.35	0.001174	1.60	23.16	15.54	0.23
NM-106	1933	ULT 25Y	49.00	86.09	88.70	87.34	88.74	0.001051	1.67	29.36	16.85	0.22
NM-106	1933	ULT 100Y	77.00	86.09	89.41	87.64	89.47	0.000915	1.83	42.02	18.50	0.21
NM-106	2583	EX 10Y	22.00	86.33	88.93	87.89	88.98	0.001966	1.81	12.14	9.09	0.28
NM-106	2583	EX 25Y	31.00	86.33	89.18	88.12	89.25	0.002382	2.13	14.54	9.80	0.31
NM-106	2583	EX 100Y	54.00	86.33	89.80	88.56	89.90	0.002602	2.55	21.16	11.55	0.33
NM-106	2583	ULT 10Y	37.00	86.33	89.36	88.25	89.44	0.002473	2.27	16.33	10.30	0.32
NM-106	2583	ULT 25Y	49.00	86.33	89.68	88.47	89.78	0.002567	2.47	19.80	11.21	0.33
NM-106	2583	ULT 100Y	77.00	86.33	90.33	88.89	90.45	0.002771	2.77	27.84	14.29	0.35
NM-106	2701	EX 10Y	22.00	86.71	89.11	87.91	89.14	0.001025	1.42	15.54	10.70	0.21
NM-106	2701	EX 25Y	31.00	86.71	89.40	88.09	89.45	0.001203	1.65	18.81	11.55	0.23
NM-106	2701	EX 100Y	54.00	86.71	90.06	88.47	90.13	0.001405	1.99	27.12	14.02	0.25
NM-106	2701	ULT 10Y	37.00	86.71	89.59	88.20	89.64	0.001258	1.76	21.06	12.10	0.23
NM-106	2701	ULT 25Y	49.00	86.71	89.94	88.39	89.99	0.001354	1.93	25.36	13.31	0.25
NM-106	2701	ULT 100Y	77.00	86.71	90.61	88.78	90.68	0.001478	2.16	35.63	17.06	0.26
NM-106	3270	EX 10Y	22.00	86.99	89.77	88.55	89.80	0.001317	1.34	16.39	14.99	0.23
NM-106	3270	EX 25Y	31.00	86.99	90.09	88.78	90.13	0.001188	1.45	21.39	16.07	0.22
NM-106	3270	EX 100Y	54.00	86.99	90.76	89.38	90.81	0.001023	1.64	32.88	18.14	0.22
NM-106	3270	ULT 10Y	37.00	86.99	90.29	88.91	90.32	0.001131	1.51	24.54	16.71	0.22
NM-106	3270	ULT 25Y	49.00	86.99	90.63	89.14	90.67	0.001050	1.61	30.49	17.76	0.22
NM-106	3270	ULT 100Y	77.00	86.99	91.31	89.60	91.35	0.000951	1.79	43.10	19.68	0.21
NM-106	3830	EX 10Y	22.00	87.52	90.03	88.30	90.04	0.000201	0.72	30.50	17.94	0.10
NM-106	3830	EX 25Y	31.00	87.52	90.37	88.44	90.38	0.000235	0.84	36.88	19.30	0.11
NM-106	3830	EX 100Y	54.00	87.52	91.06	88.72	91.08	0.000285	1.06	51.17	21.80	0.12
NM-106	3830	ULT 10Y	37.00	87.52	90.57	88.52	90.58	0.000252	0.91	40.85	20.10	0.11
NM-106	3830	ULT 25Y	49.00	87.52	90.93	88.67	90.94	0.000277	1.02	48.23	21.33	0.12
NM-106	3830	ULT 100Y	77.00	87.52	91.62	88.96	91.64	0.000313	1.21	63.76	36.82	0.13

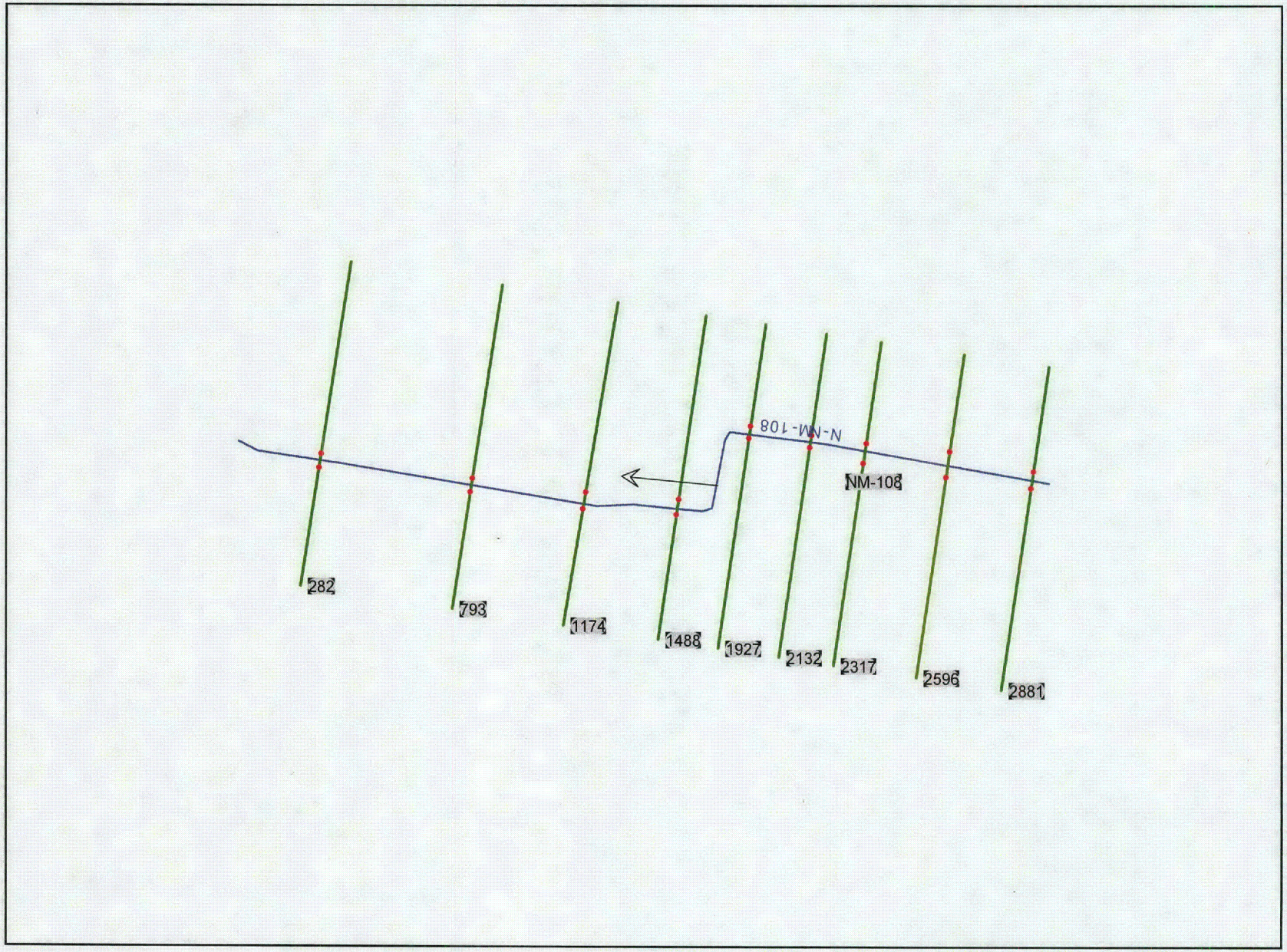

NM106 Plan: NM106
N-NM-106 NM-106
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
100
95
90
85
500
1000
1500
2000
2500
3000
3500
4000
Main Channel Distance (ft)


NM106 Plan: NM106
RS = 3830
.06
.06
0
4
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM106 Plan: NM106
RS = 3270
NM106 Plan: NM106
RS = 2701
NM106 Plan: NM106
RS = 2583


NM106 Plan: NM106
RS = 1933
.06
.06
0
4
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM106 Plan: NM106
RS = 1391
NM106 Plan: NM106
RS = 1252
NM106 Plan: NM106
RS = 677

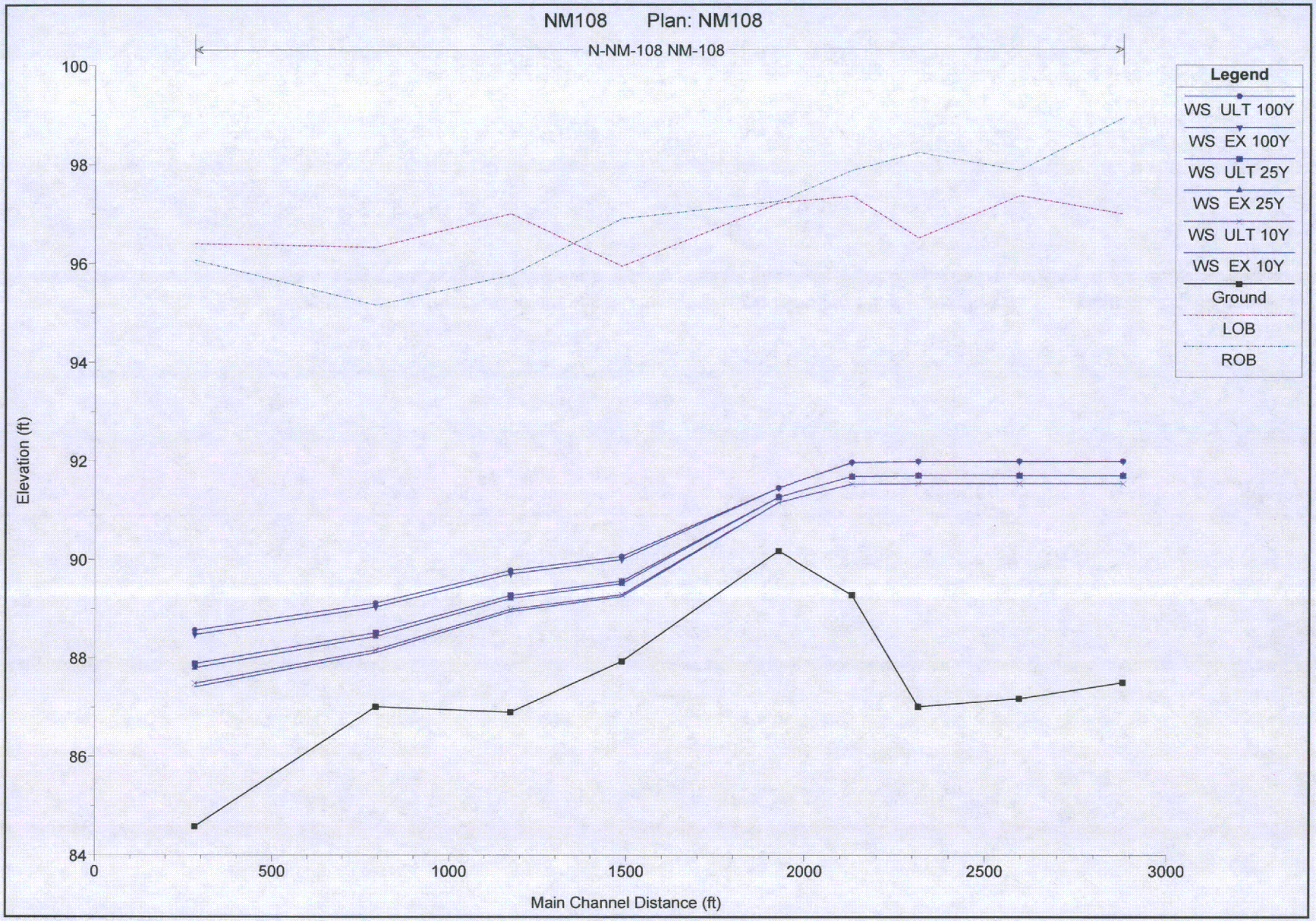
APPENDIX D
HEC-RAS HYDRAULIC OUTPUT

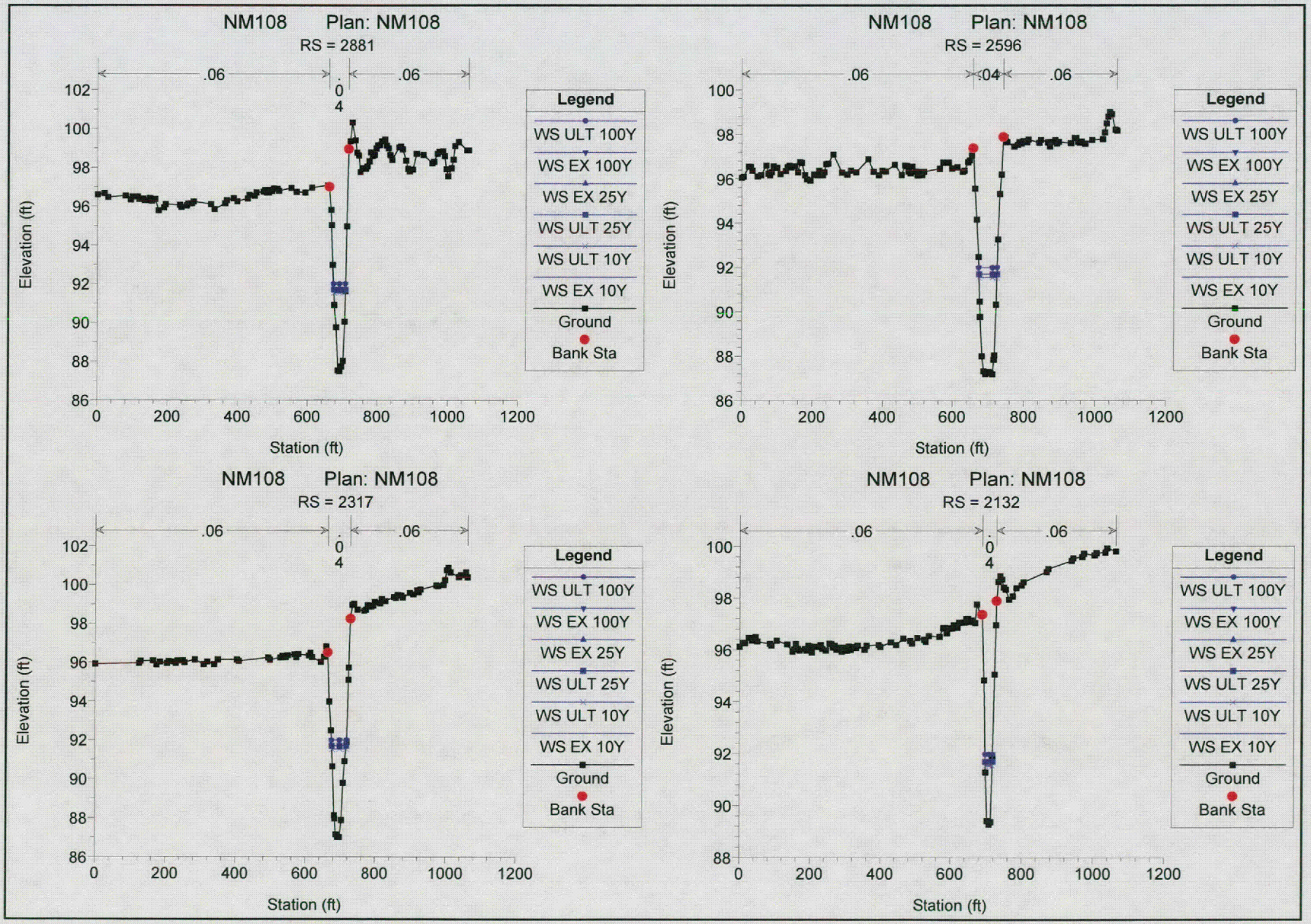
NM-108 BASE CONDITION

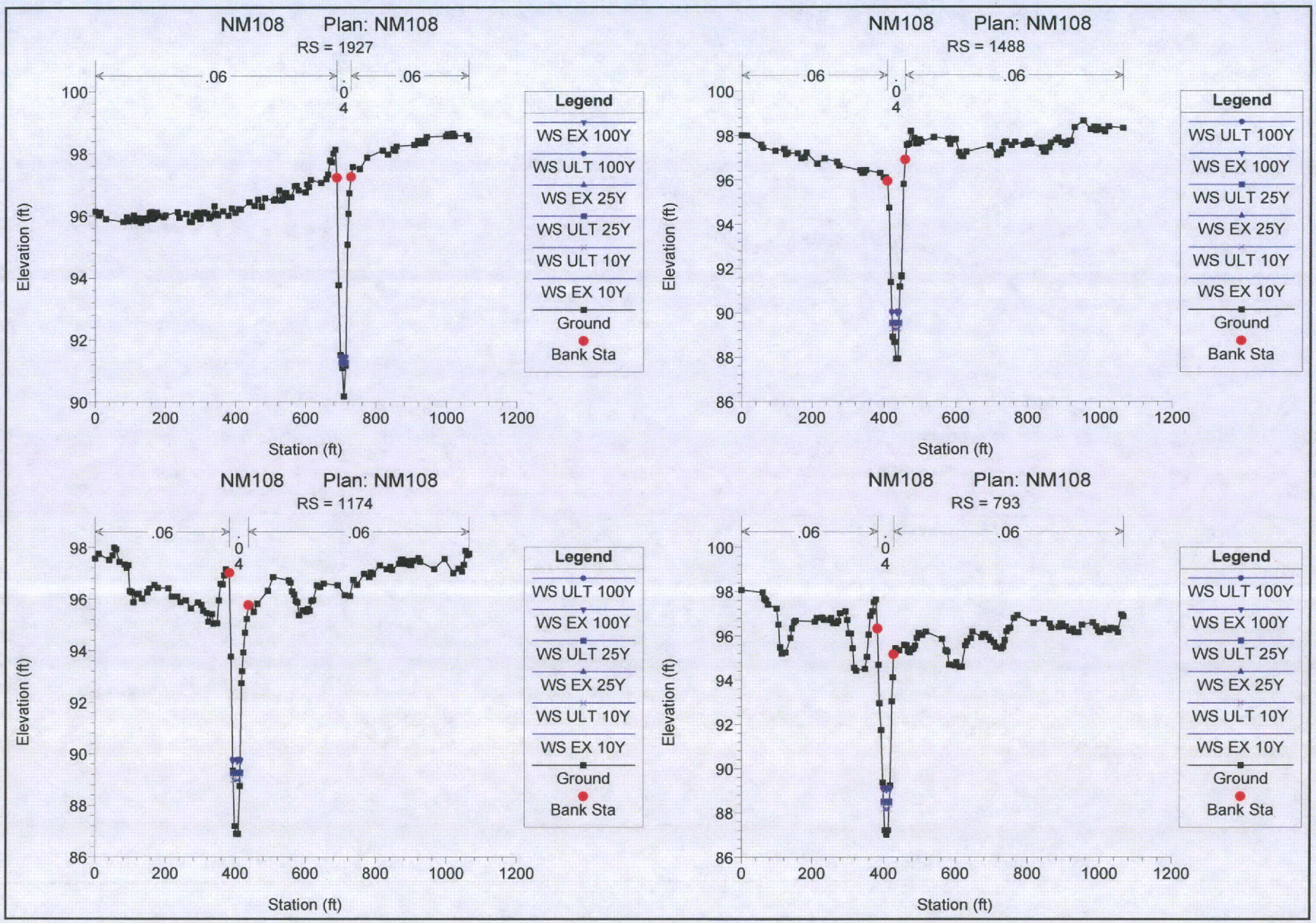

N-NM-108
NM-108
282
793
1174
1488
1927
2132
2317
2596
2881

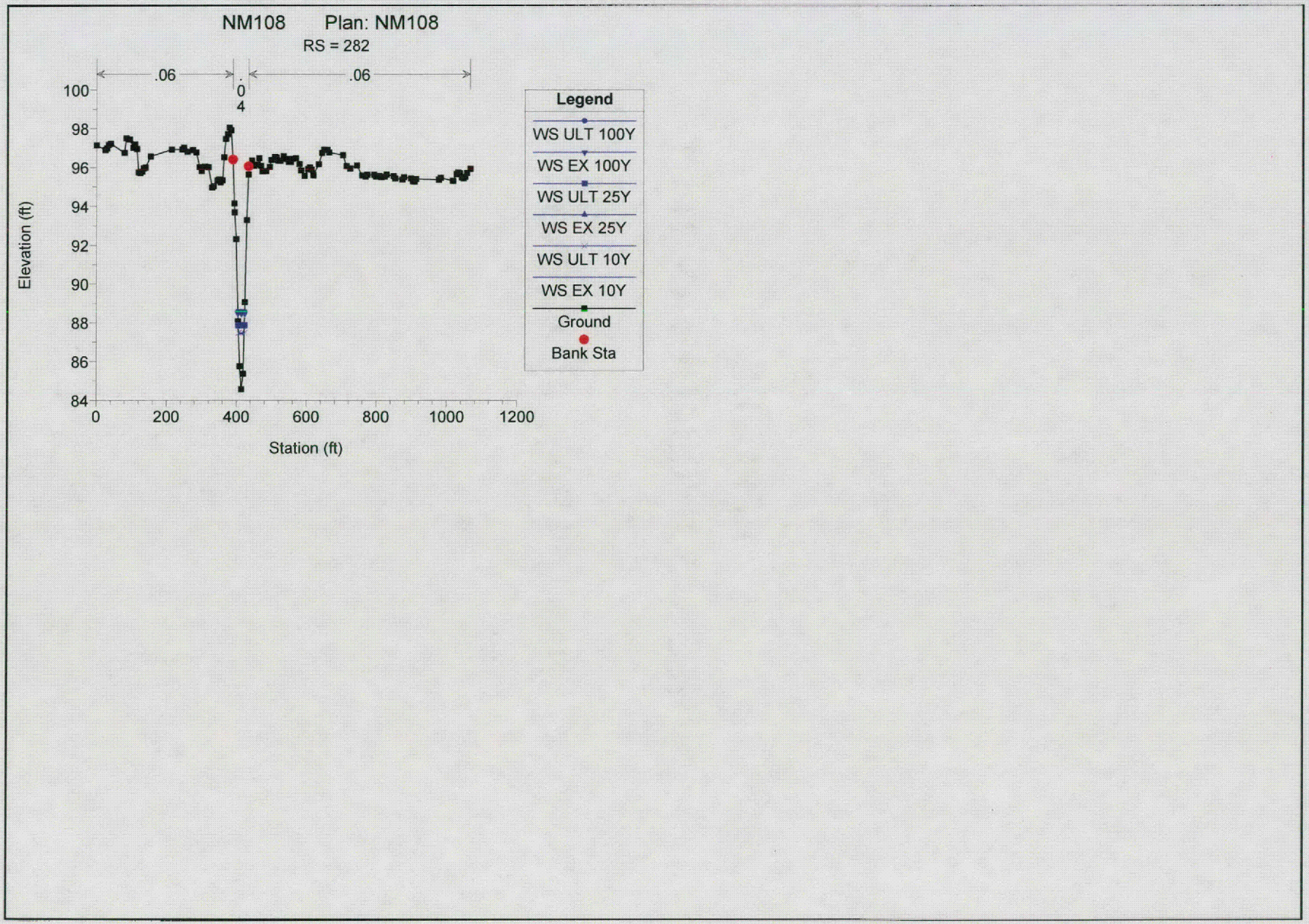
HEC-RAS Plan: BASE River: N-NM-108 Reach: NM-108

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)	
NM-108	282	EX 10Y	37.00	84.58	87.41	85.83	87.44	0.000601	1.28	29.02	16.27	0.17
NM-108	282	EX 25Y	49.00	84.58	87.80	85.98	87.82	0.000600	1.38	35.54	17.62	0.17
NM-108	282	EX 100Y	75.00	84.58	88.47	86.28	88.51	0.000600	1.56	48.13	19.60	0.18
NM-108	282	ULT 10Y	39.00	84.58	87.48	85.86	87.50	0.000600	1.29	30.14	16.51	0.17
NM-108	282	ULT 25Y	52.00	84.58	87.88	86.02	87.91	0.000600	1.40	37.11	17.93	0.17
NM-108	282	ULT 100Y	79.00	84.58	88.56	86.32	88.60	0.000601	1.58	49.90	19.83	0.18
NM-108	793	EX 10Y	37.00	87.01	88.10		88.26	0.009483	3.14	11.79	14.22	0.61
NM-108	793	EX 25Y	49.00	87.01	88.43		88.57	0.005989	2.93	16.74	15.79	0.50
NM-108	793	EX 100Y	75.00	87.01	89.03		89.15	0.003593	2.78	27.00	18.64	0.41
NM-108	793	ULT 10Y	39.00	87.01	88.16		88.31	0.008634	3.09	12.62	14.49	0.58
NM-108	793	ULT 25Y	52.00	87.01	88.51		88.64	0.005513	2.90	17.95	16.16	0.48
NM-108	793	ULT 100Y	79.00	87.01	89.11		89.23	0.003406	2.77	28.55	19.03	0.40
NM-108	1174	EX 10Y	37.00	86.90	88.94		88.97	0.000749	1.29	28.62	19.19	0.19
NM-108	1174	EX 25Y	49.00	86.90	89.21		89.24	0.000806	1.45	33.86	20.13	0.20
NM-108	1174	EX 100Y	75.00	86.90	89.70		89.75	0.000860	1.70	44.20	21.48	0.21
NM-108	1174	ULT 10Y	39.00	86.90	88.98		89.01	0.000762	1.32	29.50	19.35	0.19
NM-108	1174	ULT 25Y	52.00	86.90	89.27		89.30	0.000818	1.48	35.10	20.35	0.20
NM-108	1174	ULT 100Y	79.00	86.90	89.77		89.82	0.000863	1.73	45.73	21.65	0.21
NM-108	1488	EX 10Y	20.00	87.93	89.24		89.27	0.001714	1.34	14.87	17.66	0.26
NM-108	1488	EX 25Y	26.00	87.93	89.50		89.53	0.001242	1.33	19.61	18.58	0.23
NM-108	1488	EX 100Y	39.00	87.93	89.99		90.02	0.000854	1.34	29.11	20.31	0.20
NM-108	1488	ULT 10Y	20.00	87.93	89.28		89.31	0.001490	1.29	15.56	17.79	0.24
NM-108	1488	ULT 25Y	26.00	87.93	89.56		89.58	0.001066	1.26	20.63	18.78	0.21
NM-108	1488	ULT 100Y	39.00	87.93	90.05		90.08	0.000750	1.28	30.42	20.54	0.19
NM-108	1927	EX 10Y	20.00	90.17	91.15	91.15	91.39	0.031344	3.95	5.06	10.68	1.01
NM-108	1927	EX 25Y	26.00	90.17	91.26	91.26	91.53	0.030634	4.14	6.27	12.11	1.01
NM-108	1927	EX 100Y	39.00	90.17	91.45	91.45	91.75	0.028910	4.44	8.78	14.58	1.01
NM-108	1927	ULT 10Y	20.00	90.17	91.15	91.15	91.39	0.031344	3.95	5.06	10.68	1.01
NM-108	1927	ULT 25Y	26.00	90.17	91.26	91.26	91.53	0.030654	4.14	6.27	12.11	1.01
NM-108	1927	ULT 100Y	39.00	90.17	91.45	91.45	91.75	0.028913	4.44	8.78	14.58	1.01
NM-108	2132	EX 10Y	20.00	89.27	91.52		91.53	0.000149	0.62	32.51	19.69	0.08
NM-108	2132	EX 25Y	26.00	89.27	91.68		91.69	0.000193	0.73	35.70	20.25	0.10
NM-108	2132	EX 100Y	39.00	89.27	91.96		91.97	0.000280	0.94	41.49	21.14	0.12
NM-108	2132	ULT 10Y	20.00	89.27	91.52		91.53	0.000149	0.62	32.51	19.69	0.08
NM-108	2132	ULT 25Y	26.00	89.27	91.68		91.69	0.000193	0.73	35.69	20.24	0.10
NM-108	2132	ULT 100Y	39.00	89.27	91.96		91.97	0.000279	0.94	41.52	21.14	0.12
NM-108	2317	EX 10Y	20.00	87.01	91.53		91.53	0.000005	0.17	116.30	40.44	0.02
NM-108	2317	EX 25Y	26.00	87.01	91.69		91.69	0.000008	0.21	123.01	41.71	0.02
NM-108	2317	EX 100Y	39.00	87.01	91.98		91.98	0.000014	0.29	135.34	43.63	0.03
NM-108	2317	ULT 10Y	20.00	87.01	91.53		91.53	0.000005	0.17	116.31	40.44	0.02
NM-108	2317	ULT 25Y	26.00	87.01	91.69		91.69	0.000008	0.21	122.99	41.71	0.02
NM-108	2317	ULT 100Y	39.00	87.01	91.98		91.98	0.000014	0.29	135.38	43.64	0.03
NM-108	2596	EX 10Y	20.00	87.17	91.53		91.53	0.000002	0.11	174.65	50.12	0.01
NM-108	2596	EX 25Y	26.00	87.17	91.69		91.69	0.000003	0.14	182.91	50.70	0.01
NM-108	2596	EX 100Y	39.00	87.17	91.98		91.98	0.000005	0.20	197.73	51.73	0.02
NM-108	2596	ULT 10Y	20.00	87.17	91.53		91.53	0.000002	0.11	174.65	50.12	0.01
NM-108	2596	ULT 25Y	26.00	87.17	91.69		91.69	0.000003	0.14	182.88	50.70	0.01
NM-108	2596	ULT 100Y	39.00	87.17	91.98		91.98	0.000005	0.20	197.78	51.73	0.02
NM-108	2881	EX 10Y	20.00	87.50	91.53		91.53	0.000009	0.22	91.82	32.85	0.02
NM-108	2881	EX 25Y	26.00	87.50	91.69		91.70	0.000013	0.27	97.26	33.42	0.03
NM-108	2881	EX 100Y	39.00	87.50	91.98		91.99	0.000023	0.36	107.09	34.41	0.04
NM-108	2881	ULT 10Y	20.00	87.50	91.53		91.53	0.000009	0.22	91.82	32.85	0.02
NM-108	2881	ULT 25Y	26.00	87.50	91.69		91.69	0.000013	0.27	97.24	33.42	0.03
NM-108	2881	ULT 100Y	39.00	87.50	91.99		91.99	0.000023	0.36	107.13	34.42	0.04


NM108 Plan: NM108
N-NM-108 NM-108
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
100
98
96
94
92
90
88
86
84
0
500
1000
1500
2000
2500
3000
Main Channel Distance (ft)

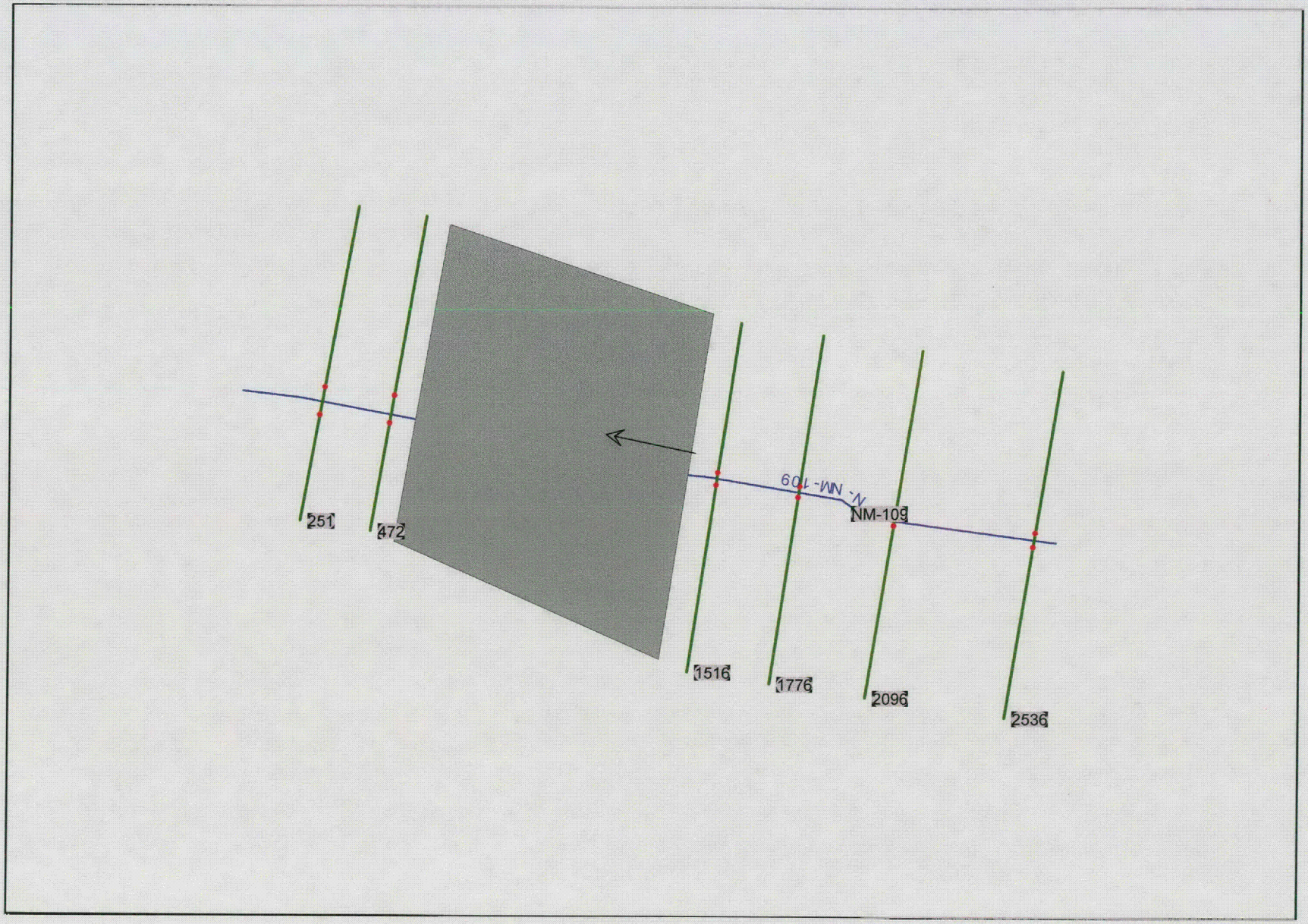

NM108 Plan: NM108
RS = 2881
.06
.04
.06
Legend
WS ULT 100Y
WS EX 100Y
WS EX 25Y
WS ULT 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
Elevation (ft)
Station (ft)
NM108 Plan: NM108
RS = 2596
NM108 Plan: NM108
RS = 2317
NM108 Plan: NM108
RS = 2132


NM108 Plan: NM108
RS = 1927
.06
.06
0.4
Elevation (ft)
Station (ft)
Legend
WS EX 100Y
WS ULT 100Y
WS EX 25Y
WS ULT 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
NM108 Plan: NM108
RS = 1488
NM108 Plan: NM108
RS = 1174
NM108 Plan: NM108
RS = 793


NM108 Plan: NM108
RS = 282
.06
.04
.06
Elevation (ft)
100
98
96
94
92
90
88
86
84
0
200
400
600
800
1000
1200
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta

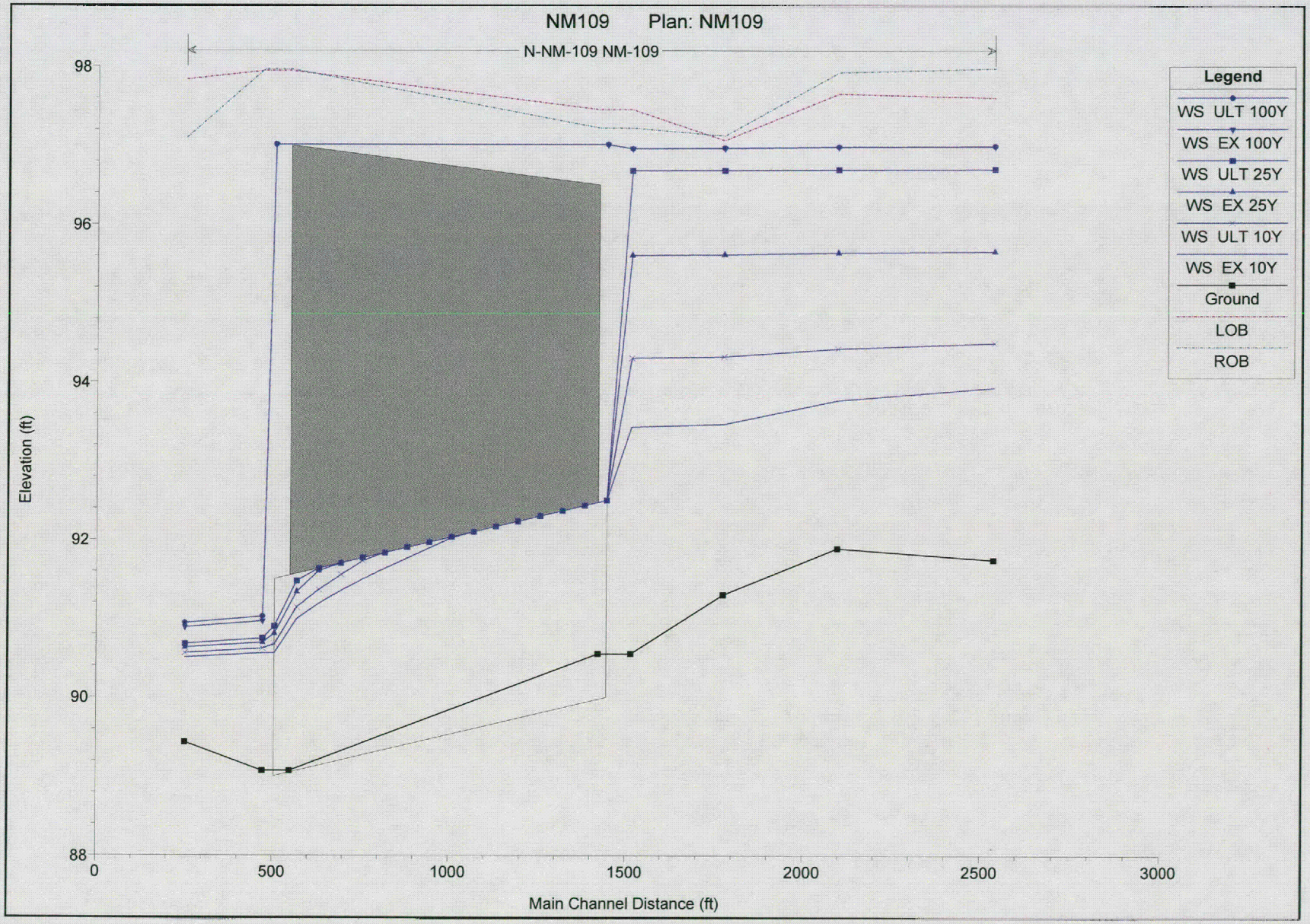
APPENDIX D
HEC-RAS HYDRAULIC OUTPUT

NM-109 BASE CONDITION

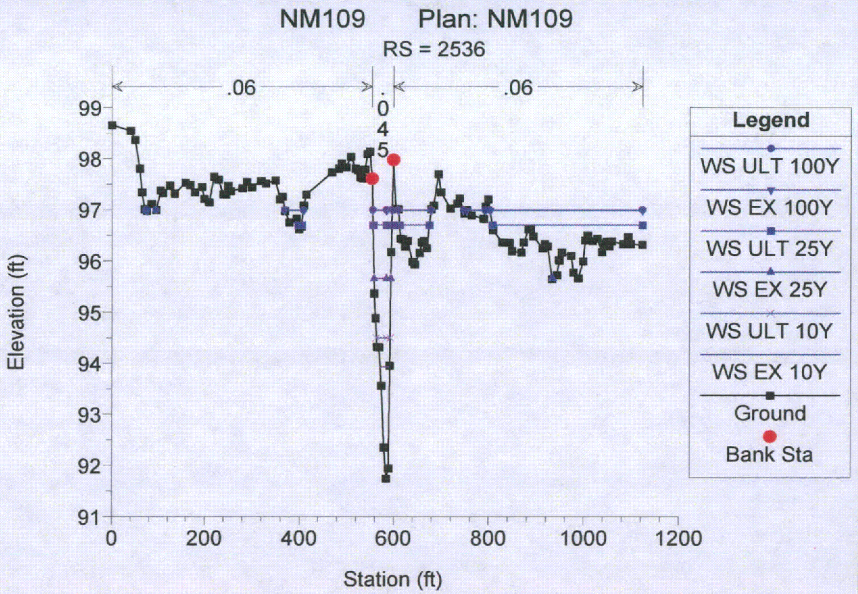

251
472
1516
1776
2096
2536
N- NM- 109
NM-109

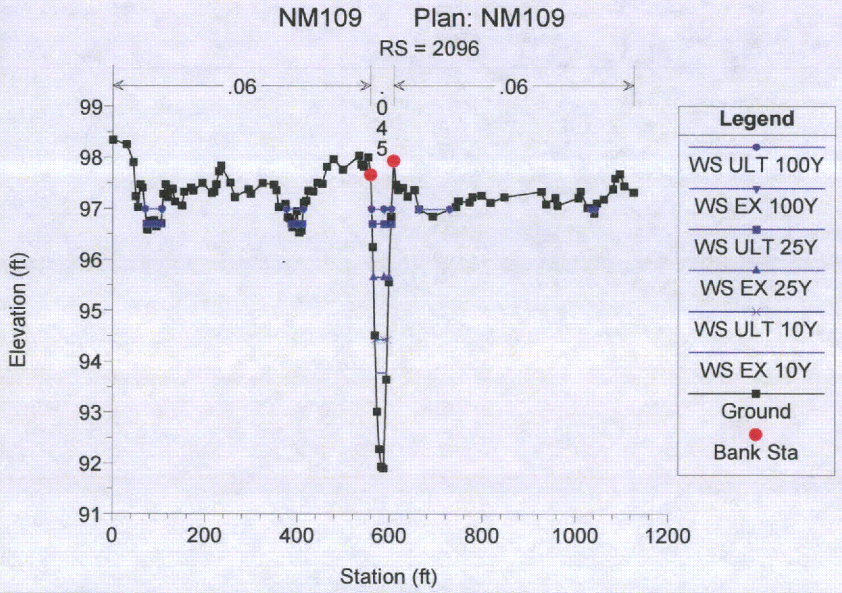
HEC-RAS Plan: BASE River: N-NM-109 Reach: NM-109

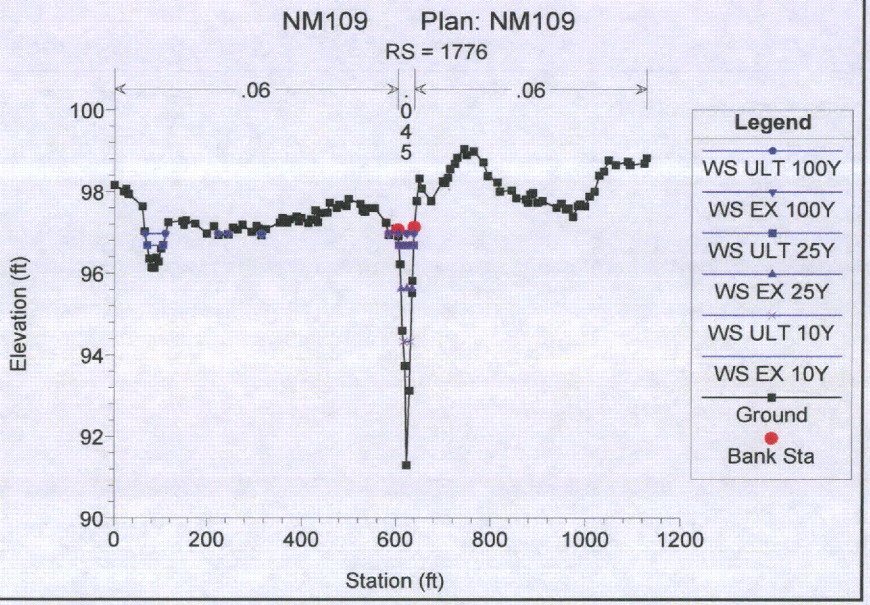
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
NM-109	251	EX 10Y	21.00	89.43	90.50	89.89	90.51	0.000601	0.60	34.92	54.37	0.13
NM-109	251	EX 25Y	28.00	89.43	90.63	90.03	90.63	0.000601	0.67	41.82	55.34	0.14
NM-109	251	EX 100Y	45.00	89.43	90.88	90.13	90.89	0.000601	0.80	56.40	57.34	0.14
NM-109	251	ULT 10Y	24.00	89.43	90.56	89.92	90.56	0.000600	0.63	37.97	54.80	0.13
NM-109	251	ULT 25Y	31.00	89.43	90.68	90.05	90.68	0.000601	0.70	44.57	55.72	0.14
NM-109	251	ULT 100Y	49.00	89.43	90.94	90.15	90.95	0.000600	0.82	59.54	57.76	0.14
NM-109	472	EX 10Y	21.00	89.07	90.56		90.56	0.000126	0.40	52.90	47.32	0.07
NM-109	472	EX 25Y	28.00	89.07	90.69		90.69	0.000156	0.47	59.28	48.03	0.07
NM-109	472	EX 100Y	45.00	89.07	90.96		90.97	0.000214	0.62	72.61	49.49	0.09
NM-109	472	ULT 10Y	24.00	89.07	90.62		90.62	0.000139	0.43	55.74	47.64	0.07
NM-109	472	ULT 25Y	31.00	89.07	90.74		90.75	0.000167	0.50	61.87	48.32	0.08
NM-109	472	ULT 100Y	49.00	89.07	91.02		91.03	0.000225	0.65	75.44	49.79	0.09
NM-109	1328		Culvert									
NM-109	1516	EX 10Y	21.00	90.55	93.43	91.25	93.43	0.000091	0.48	43.34	21.61	0.06
NM-109	1516	EX 25Y	28.00	90.55	95.61	91.35	95.61	0.000017	0.28	101.75	33.46	0.03
NM-109	1516	EX 100Y	45.00	90.55	96.96	91.56	96.96	0.000015	0.30	160.05	102.46	0.03
NM-109	1516	ULT 10Y	24.00	90.55	94.30	91.29	94.31	0.000040	0.38	63.62	24.72	0.04
NM-109	1516	ULT 25Y	31.00	90.55	96.68	91.39	96.68	0.000009	0.22	141.60	46.91	0.02
NM-109	1516	ULT 100Y	49.00	90.55	96.96	91.60	96.96	0.000017	0.32	160.03	102.42	0.03
NM-109	1776	EX 10Y	21.00	91.30	93.46		93.52	0.003064	1.85	11.34	10.20	0.31
NM-109	1776	EX 25Y	28.00	91.30	95.61		95.62	0.000132	0.58	47.92	23.40	0.07
NM-109	1776	EX 100Y	45.00	91.30	96.96		96.97	0.000069	0.49	108.41	106.69	0.05
NM-109	1776	ULT 10Y	24.00	91.30	94.32		94.34	0.000757	1.08	22.20	15.86	0.16
NM-109	1776	ULT 25Y	31.00	91.30	96.68		96.69	0.000047	0.39	87.57	65.64	0.04
NM-109	1776	ULT 100Y	49.00	91.30	96.97		96.97	0.000082	0.53	108.49	106.95	0.06
NM-109	2096	EX 10Y	21.00	91.89	93.77		93.78	0.000354	0.72	29.10	22.77	0.11
NM-109	2096	EX 25Y	28.00	91.89	95.64		95.64	0.000034	0.34	81.77	33.47	0.04
NM-109	2096	EX 100Y	45.00	91.89	96.98		96.98	0.000023	0.33	156.21	191.54	0.03
NM-109	2096	ULT 10Y	24.00	91.89	94.42		94.42	0.000132	0.53	45.22	26.64	0.07
NM-109	2096	ULT 25Y	31.00	91.89	96.69		96.69	0.000015	0.26	122.63	71.23	0.03
NM-109	2096	ULT 100Y	49.00	91.89	96.98		96.98	0.000028	0.36	156.85	193.41	0.04
NM-109	2536	EX 10Y	21.00	91.74	93.93		93.94	0.000369	0.77	27.43	19.76	0.11
NM-109	2536	EX 25Y	28.00	91.74	95.65		95.66	0.000043	0.36	78.11	37.03	0.04
NM-109	2536	EX 100Y	45.00	91.74	96.99		96.99	0.000010	0.21	419.04	516.47	0.02
NM-109	2536	ULT 10Y	24.00	91.74	94.49		94.50	0.000212	0.59	40.71	28.79	0.09
NM-109	2536	ULT 25Y	31.00	91.74	96.70		96.70	0.000009	0.20	284.84	425.98	0.02
NM-109	2536	ULT 100Y	49.00	91.74	96.99		96.99	0.000012	0.23	421.48	518.98	0.02

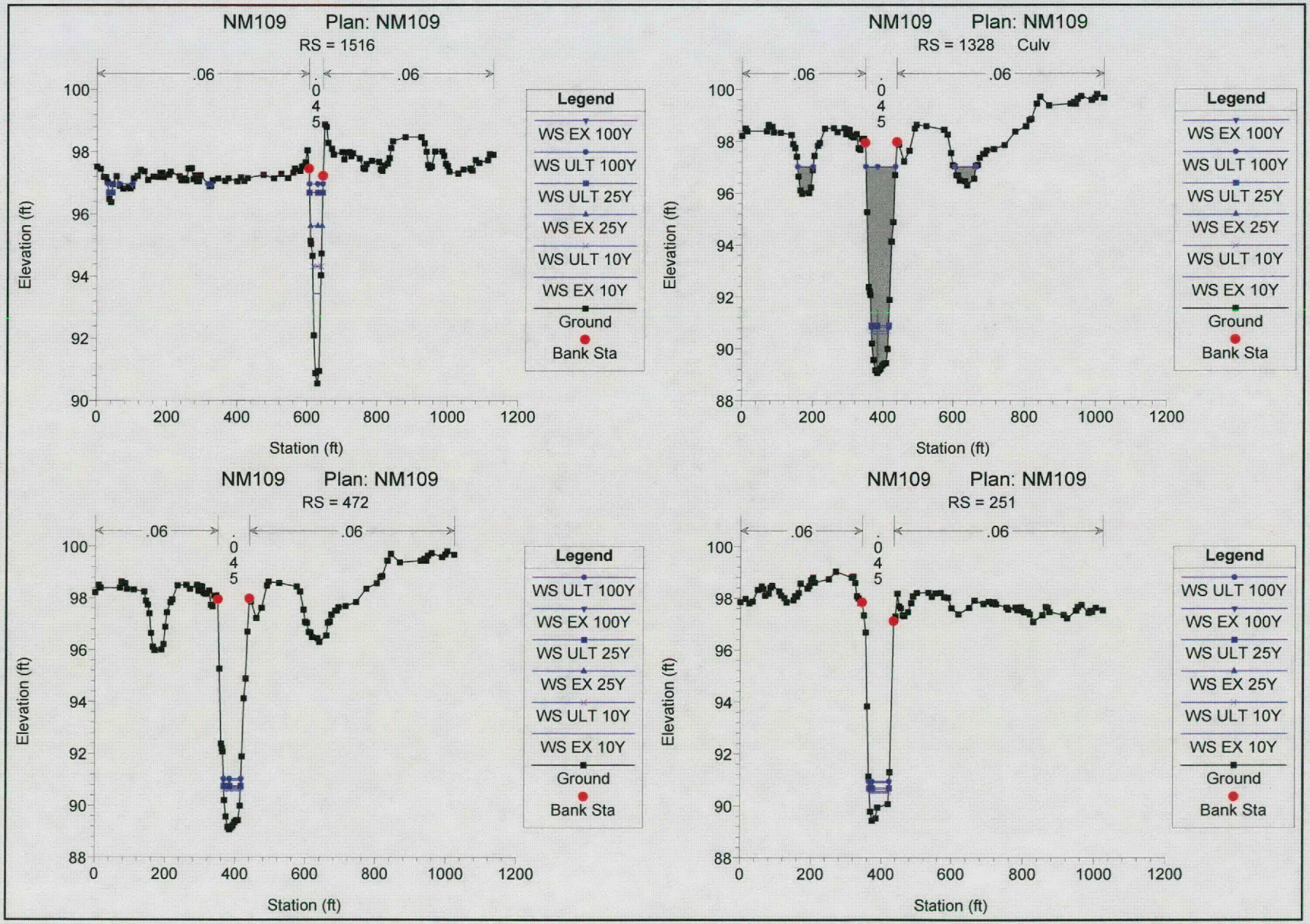

NM109 Plan: NM109
N-NM-109 NM-109
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
98
96
94
92
90
88
0
500
1000
1500
2000
2500
3000
Main Channel Distance (ft)

No Data for Plot







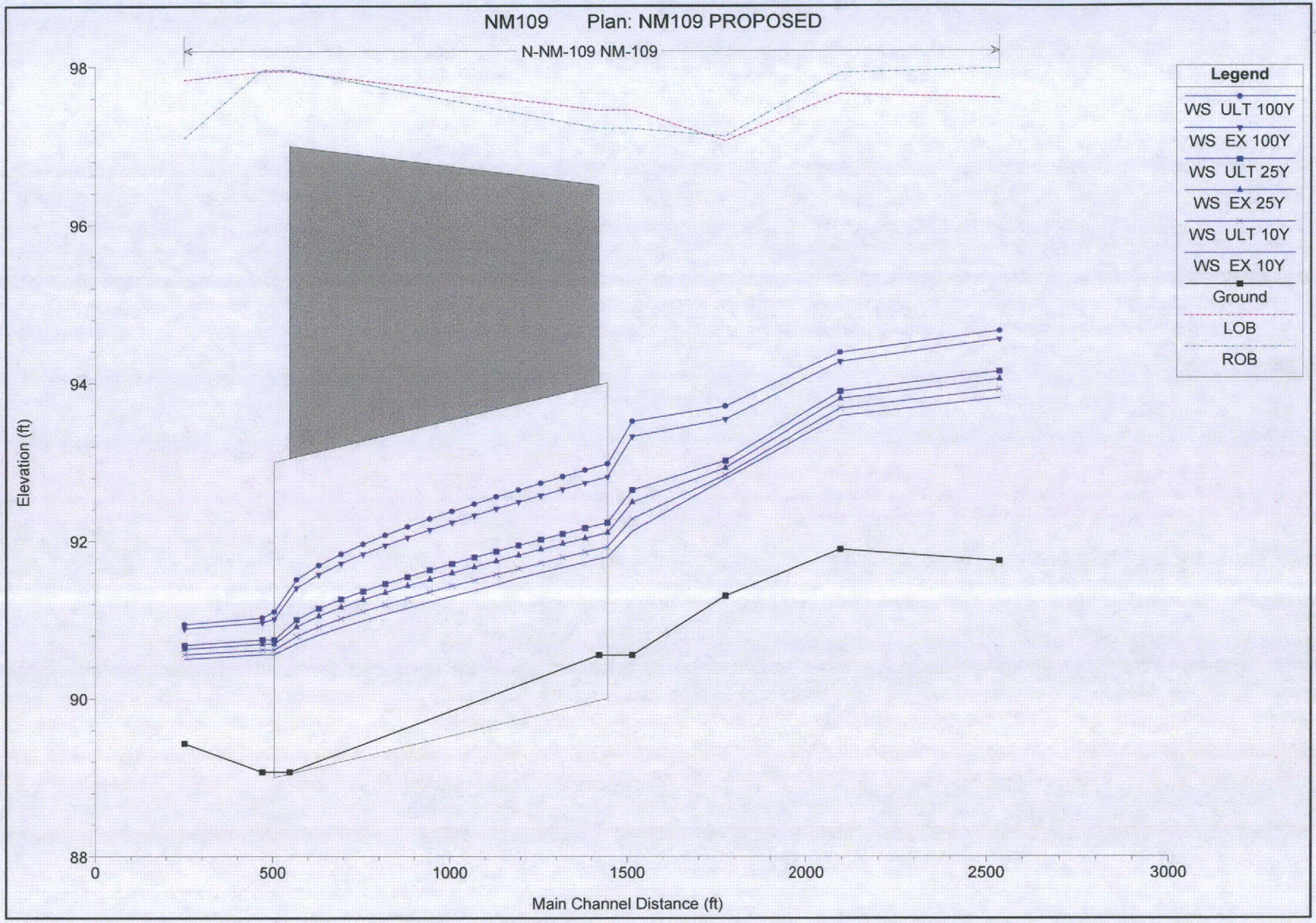

NM109 Plan: NM109
RS = 1516
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS EX 100Y
WS ULT 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
NM109 Plan: NM109
RS = 1328 Culv
NM109 Plan: NM109
RS = 472
NM109 Plan: NM109
RS = 251

APPENDIX D
HEC-RAS HYDRAULIC OUTPUT

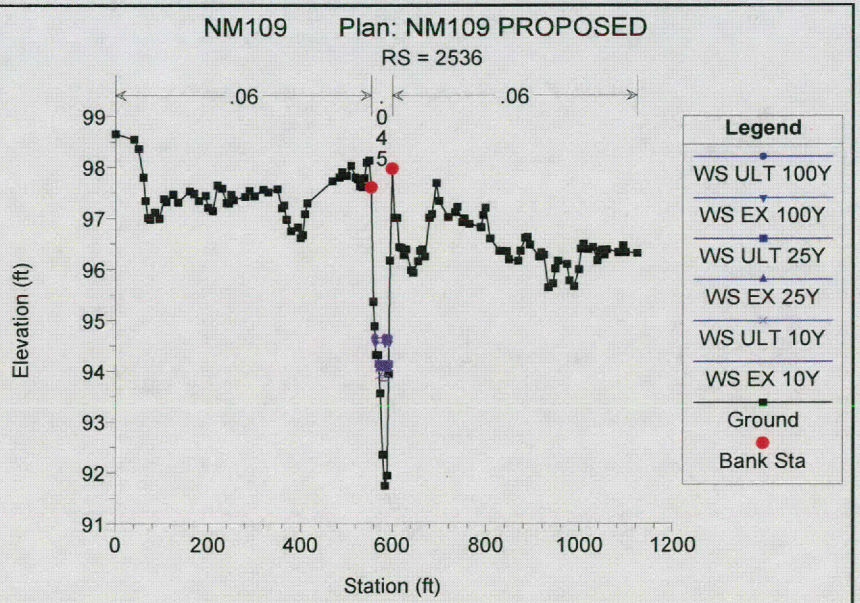
NM-109 PROPOSED CONDITION

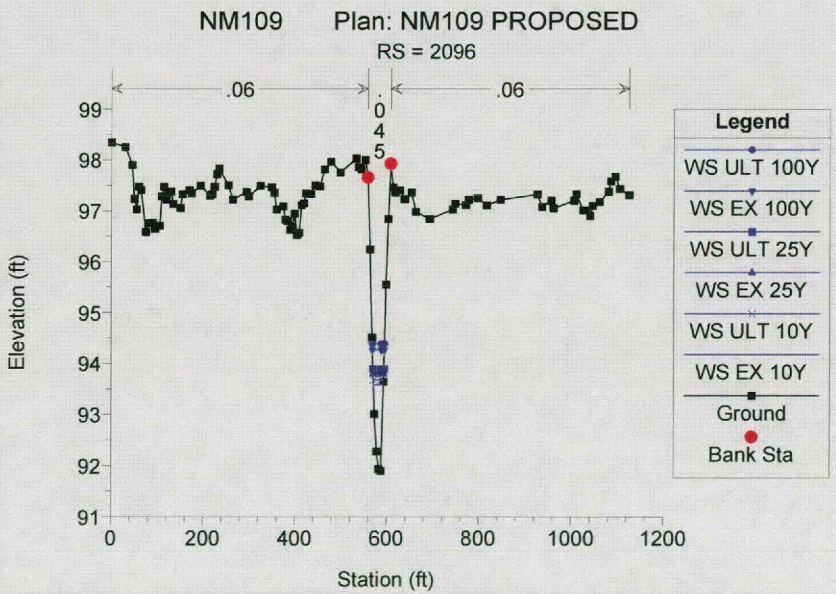
HEC-RAS Plan: PROPOSED River: N-NM-109 Reach: NM-109

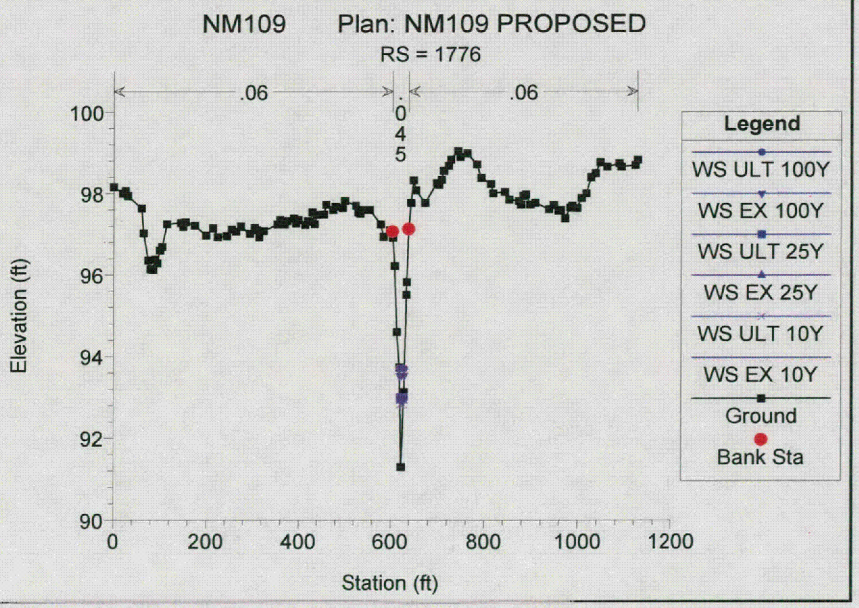
Reach	River Sta	Profile	Q Total	W.S. Elev	E.G. Elev	Min Ch El	Vel Chnl	Flow Area	Top Width	Volume
			(cfs)	(ft)	(ft)	(ft)	(ft/s)	(sq ft)	(ft)	(acre-ft)
NM-109	251	EX 10Y	21.00	90.50	90.51	89.43	0.60	34.92	54.37	
NM-109	251	EX 25Y	28.00	90.63	90.63	89.43	0.67	41.82	55.34	
NM-109	251	EX 100Y	45.00	90.88	90.89	89.43	0.80	56.40	57.34	
NM-109	251	ULT 10Y	24.00	90.56	90.56	89.43	0.63	37.97	54.80	
NM-109	251	ULT 25Y	31.00	90.68	90.68	89.43	0.70	44.57	55.72	
NM-109	251	ULT 100Y	49.00	90.94	90.95	89.43	0.82	59.54	57.76	
NM-109	472	EX 10Y	21.00	90.56	90.56	89.07	0.40	52.90	47.32	0.22
NM-109	472	EX 25Y	28.00	90.69	90.69	89.07	0.47	59.30	48.04	0.26
NM-109	472	EX 100Y	45.00	90.96	90.97	89.07	0.62	72.61	49.49	0.33
NM-109	472	ULT 10Y	24.00	90.62	90.62	89.07	0.43	55.74	47.64	0.24
NM-109	472	ULT 25Y	31.00	90.74	90.75	89.07	0.50	61.83	48.32	0.27
NM-109	472	ULT 100Y	49.00	91.02	91.03	89.07	0.65	75.44	49.79	0.34
NM-109	1328		Culvert							
NM-109	1516	EX 10Y	21.00	92.12	92.14	90.55	1.16	18.05	16.91	0.37
NM-109	1516	EX 25Y	28.00	92.49	92.51	90.55	1.14	24.59	18.24	0.44
NM-109	1516	EX 100Y	45.00	93.32	93.34	90.55	1.10	41.00	21.22	0.60
NM-109	1516	ULT 10Y	24.00	92.28	92.30	90.55	1.15	20.83	17.49	0.40
NM-109	1516	ULT 25Y	31.00	92.64	92.66	90.55	1.13	27.42	18.79	0.47
NM-109	1516	ULT 100Y	49.00	93.51	93.53	90.55	1.09	45.13	21.90	0.63
NM-109	1776	EX 10Y	21.00	92.78	93.02	91.30	3.92	5.36	7.23	0.44
NM-109	1776	EX 25Y	28.00	92.92	93.22	91.30	4.37	6.40	7.90	0.53
NM-109	1776	EX 100Y	45.00	93.54	93.75	91.30	3.72	12.08	10.48	0.75
NM-109	1776	ULT 10Y	24.00	92.83	93.11	91.30	4.20	5.71	7.46	0.48
NM-109	1776	ULT 25Y	31.00	93.01	93.30	91.30	4.35	7.12	8.33	0.57
NM-109	1776	ULT 100Y	49.00	93.70	93.89	91.30	3.53	13.88	11.13	0.81
NM-109	2096	EX 10Y	21.00	93.58	93.59	91.89	0.84	24.85	21.62	0.55
NM-109	2096	EX 25Y	28.00	93.80	93.81	91.89	0.94	29.77	22.94	0.67
NM-109	2096	EX 100Y	45.00	94.27	94.28	91.89	1.09	41.18	25.72	0.95
NM-109	2096	ULT 10Y	24.00	93.68	93.69	91.89	0.89	27.01	22.22	0.60
NM-109	2096	ULT 25Y	31.00	93.89	93.90	91.89	0.97	31.87	23.48	0.72
NM-109	2096	ULT 100Y	49.00	94.38	94.40	91.89	1.11	44.13	26.39	1.02
NM-109	2536	EX 10Y	21.00	93.80	93.81	91.74	0.84	25.02	18.78	0.81
NM-109	2536	EX 25Y	28.00	94.04	94.06	91.74	0.94	29.77	20.67	0.97
NM-109	2536	EX 100Y	45.00	94.55	94.56	91.74	1.06	42.31	29.12	1.37
NM-109	2536	ULT 10Y	24.00	93.91	93.92	91.74	0.89	27.10	19.63	0.88
NM-109	2536	ULT 25Y	31.00	94.14	94.15	91.74	0.97	31.82	21.43	1.04
NM-109	2536	ULT 100Y	49.00	94.65	94.67	91.74	1.08	45.39	29.74	1.47

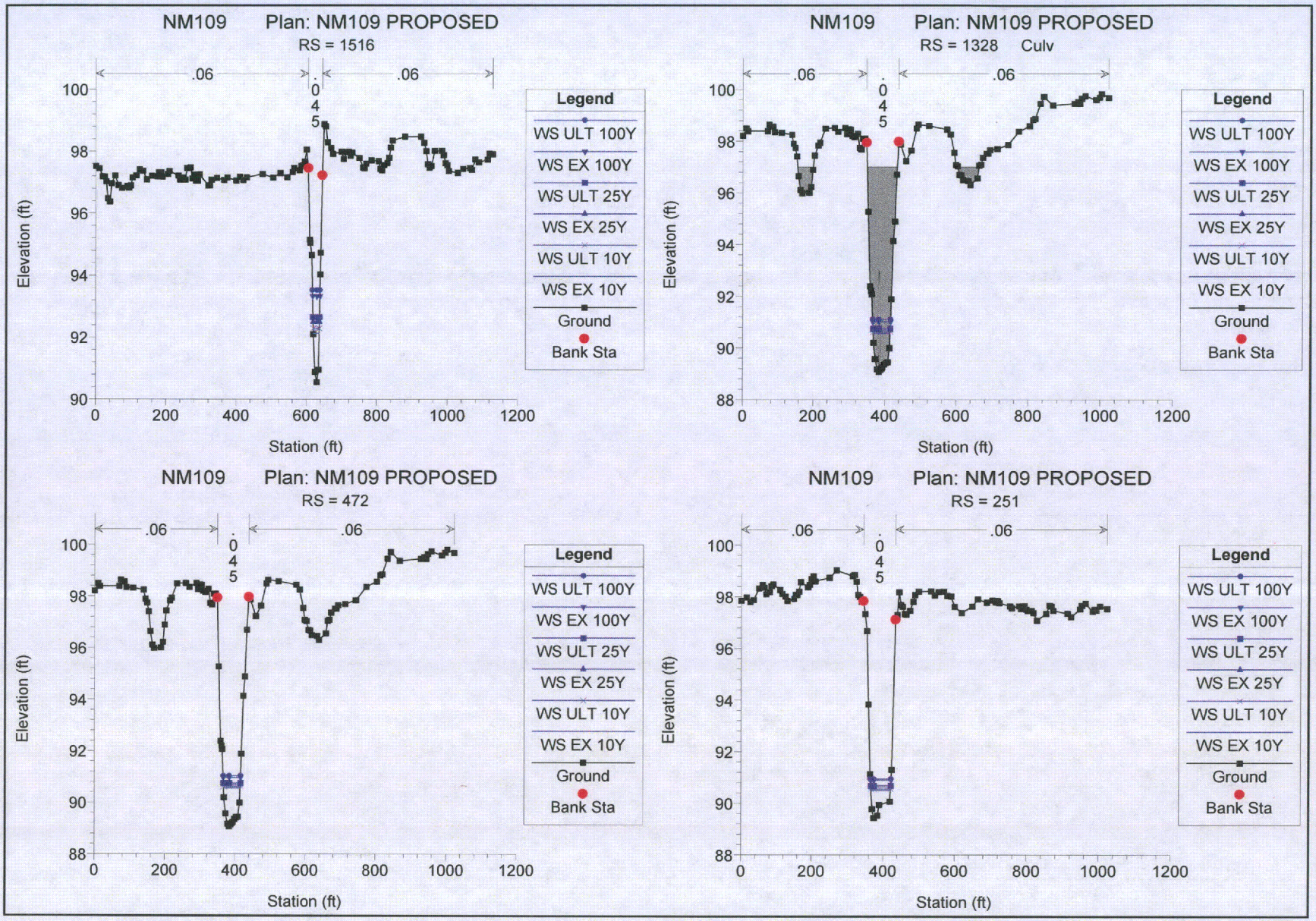

NM109 Plan: NM109 PROPOSED
N-NM-109 NM-109
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
98
96
94
92
90
88
0
500
1000
1500
2000
2500
3000
Main Channel Distance (ft)

No Data for Plot








NM109 Plan: NM109 PROPOSED
RS = 1516
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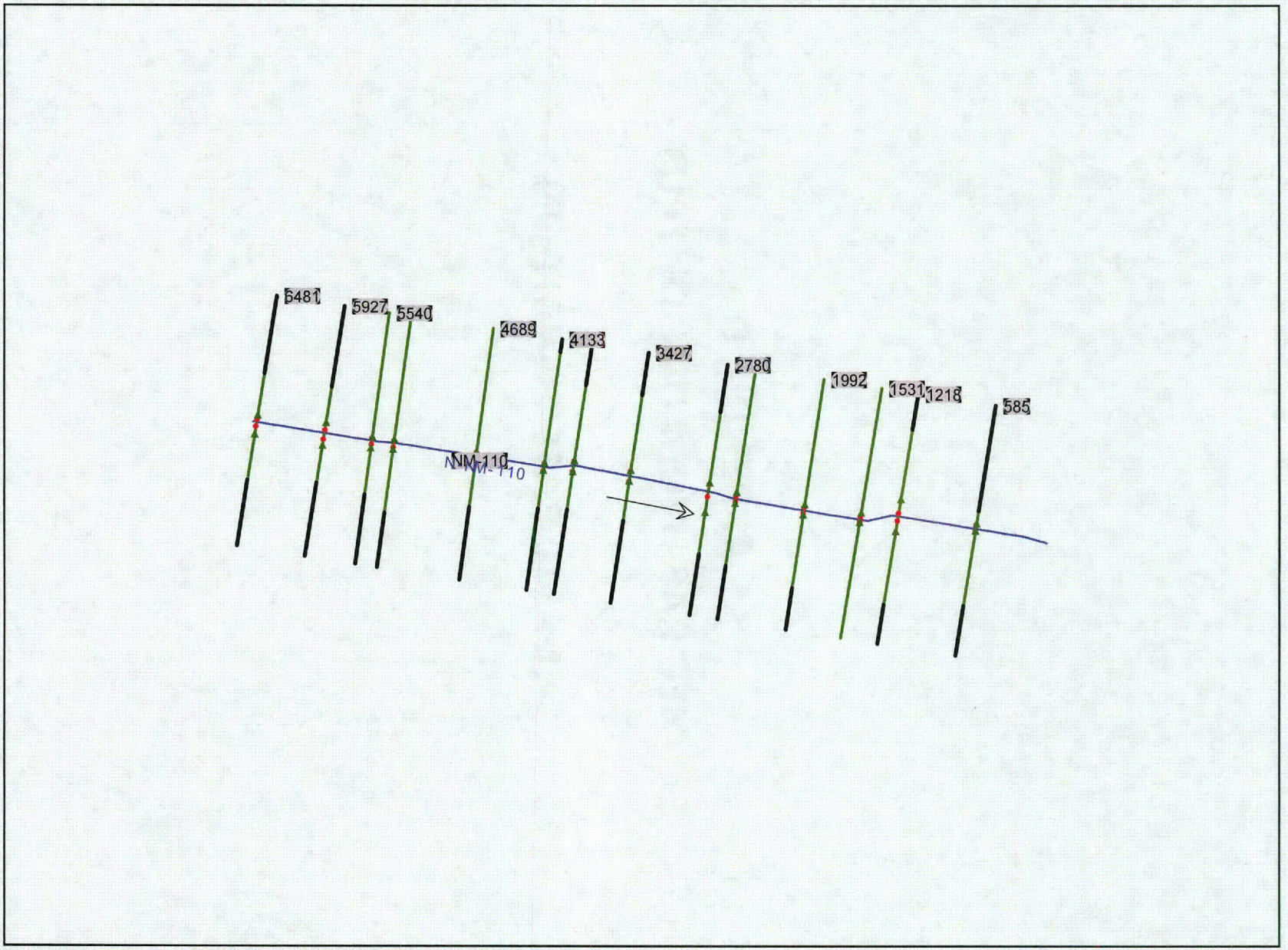
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
NM109 Plan: NM109 PROPOSED
RS = 1328 Culv
NM109 Plan: NM109 PROPOSED
RS = 472
NM109 Plan: NM109 PROPOSED
RS = 251

APPENDIX D
HEC-RAS HYDRAULIC OUTPUT

NM-110 BASE CONDITION

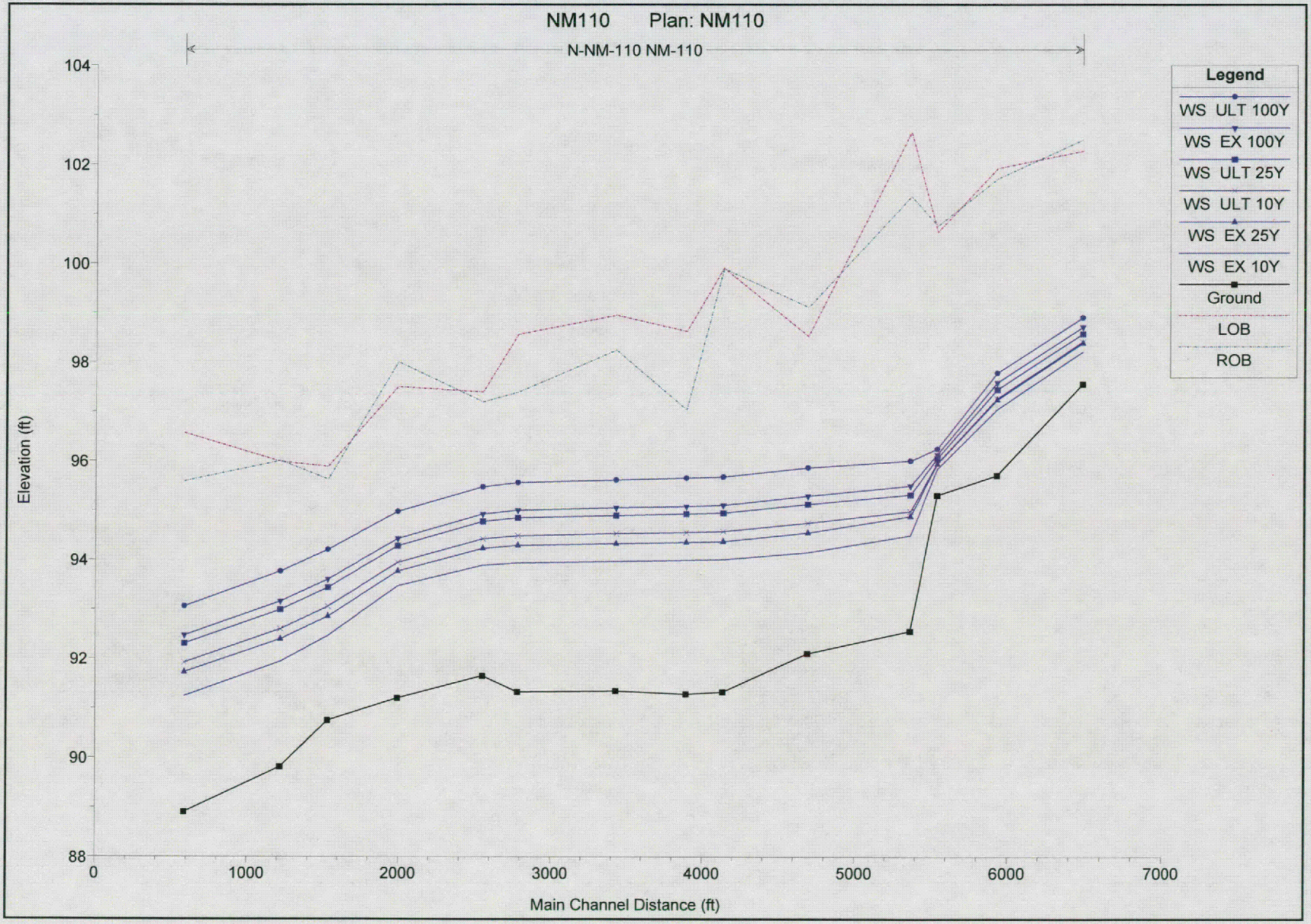

6481
5927
5540
4689
4133
3427
2780
1992
1531
1218
585
NM-110

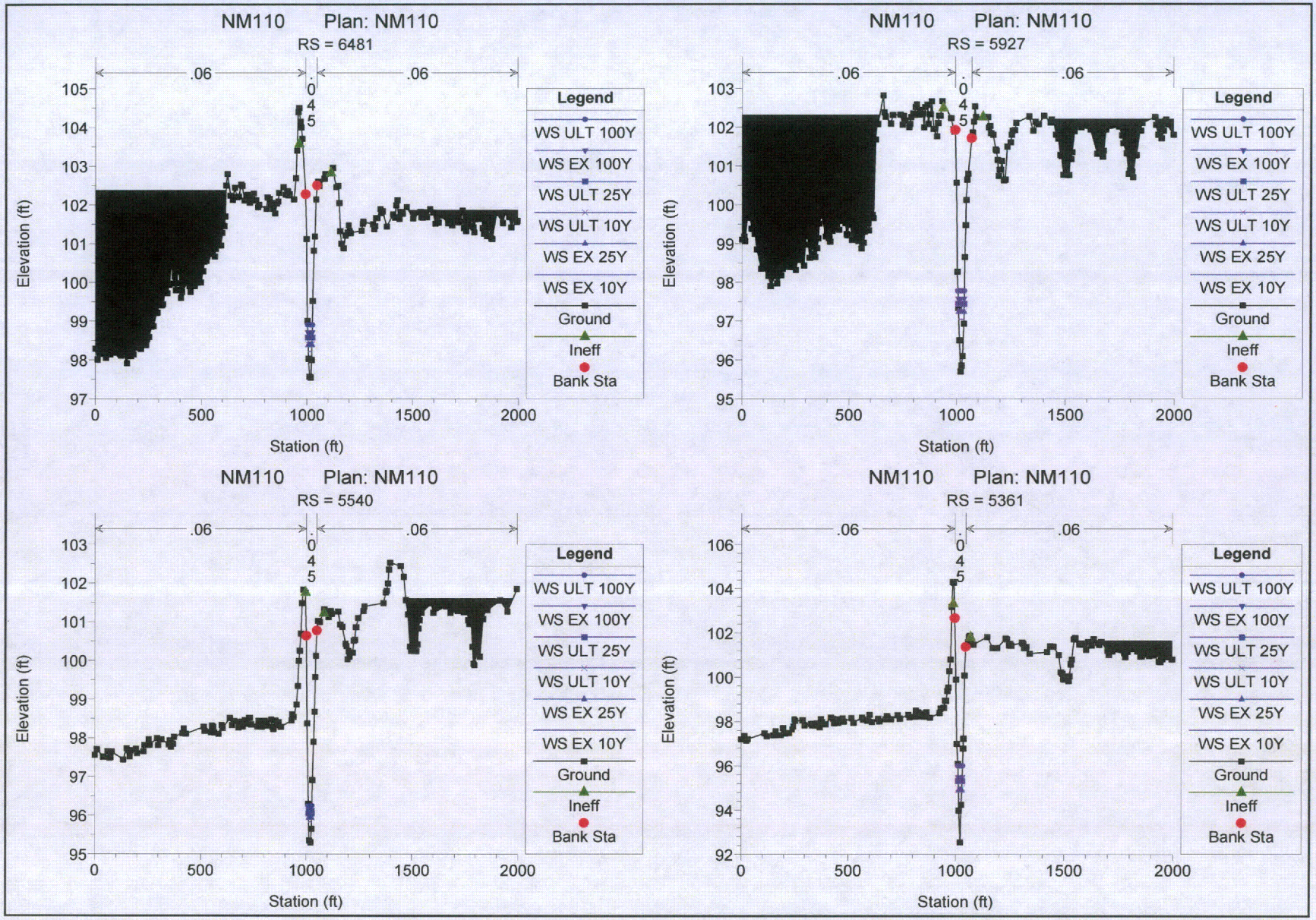
HEC-RAS Plan: BASE River: N-NM-110 Reach: NM-110

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)	
NM-110	585	EX 10Y	63.00	88.90	91.24	89.96	91.27	0.001102	1.47	42.89	27.00	0.21
NM-110	585	EX 25Y	90.00	88.90	91.72	90.16	91.76	0.001101	1.57	57.44	32.77	0.21
NM-110	585	EX 100Y	156.00	88.90	92.46	90.55	92.52	0.001100	1.88	82.81	35.52	0.22
NM-110	585	ULT 10Y	106.00	88.90	91.92	90.26	91.96	0.001101	1.66	63.98	33.50	0.21
NM-110	585	ULT 25Y	140.00	88.90	92.30	90.47	92.35	0.001102	1.82	76.97	34.91	0.22
NM-110	585	ULT 100Y	220.00	88.90	93.05	90.87	93.12	0.001101	2.11	104.44	37.71	0.22
NM-110	1218	EX 10Y	63.00	89.81	91.93	90.76	91.97	0.001093	1.44	43.77	28.31	0.20
NM-110	1218	EX 25Y	90.00	89.81	92.39	90.95	92.43	0.001015	1.58	57.04	30.24	0.20
NM-110	1218	EX 100Y	156.00	89.81	93.15	91.30	93.21	0.001080	1.92	81.38	33.50	0.22
NM-110	1218	ULT 10Y	106.00	89.81	92.59	91.04	92.63	0.001036	1.67	63.32	31.11	0.21
NM-110	1218	ULT 25Y	140.00	89.81	92.98	91.23	93.03	0.001069	1.85	75.80	32.78	0.21
NM-110	1218	ULT 100Y	220.00	89.81	93.76	91.59	93.83	0.001133	2.14	102.68	36.98	0.23
NM-110	1531	EX 10Y	63.00	90.75	92.46	91.77	92.52	0.003148	2.05	30.79	26.04	0.33
NM-110	1531	EX 25Y	90.00	90.75	92.85	91.94	92.92	0.002651	2.17	41.41	28.00	0.31
NM-110	1531	EX 100Y	156.00	90.75	93.60	92.29	93.69	0.002232	2.46	63.53	31.18	0.30
NM-110	1531	ULT 10Y	106.00	90.75	93.05	92.04	93.13	0.002507	2.25	47.08	28.90	0.31
NM-110	1531	ULT 25Y	140.00	90.75	93.43	92.22	93.52	0.002301	2.40	58.43	30.49	0.31
NM-110	1531	ULT 100Y	220.00	90.75	94.20	92.58	94.31	0.002026	2.65	83.04	33.63	0.30
NM-110	1992	EX 10Y	39.00	91.20	93.46	92.39	93.49	0.001225	1.26	31.07	26.89	0.21
NM-110	1992	EX 25Y	56.00	91.20	93.76	92.57	93.80	0.001221	1.42	39.36	28.05	0.21
NM-110	1992	EX 100Y	99.00	91.20	94.42	92.90	94.47	0.001145	1.69	58.66	30.58	0.21
NM-110	1992	ULT 10Y	67.00	91.20	93.94	92.66	93.98	0.001217	1.51	44.34	28.73	0.21
NM-110	1992	ULT 25Y	89.00	91.20	94.28	92.83	94.32	0.001172	1.64	54.21	30.02	0.22
NM-110	1992	ULT 100Y	140.00	91.20	94.97	93.18	95.02	0.001064	1.84	75.99	32.68	0.21
NM-110	2549	EX 10Y	39.00	91.65	93.88	92.41	93.90	0.000494	0.99	39.37	24.41	0.14
NM-110	2549	EX 25Y	56.00	91.65	94.23	92.57	94.25	0.000572	1.17	47.97	25.84	0.15
NM-110	2549	EX 100Y	99.00	91.65	94.92	92.91	94.95	0.000679	1.48	66.71	28.24	0.17
NM-110	2549	ULT 10Y	67.00	91.65	94.42	92.67	94.44	0.000609	1.26	53.01	26.51	0.16
NM-110	2549	ULT 25Y	89.00	91.65	94.77	92.83	94.80	0.000662	1.42	62.55	27.73	0.17
NM-110	2549	ULT 100Y	140.00	91.65	95.47	93.17	95.51	0.000729	1.69	82.74	30.14	0.18
NM-110	2780	EX 10Y	39.00	91.32	93.93	91.80	93.93	0.000066	0.37	104.93	63.93	0.05
NM-110	2780	EX 25Y	56.00	91.32	94.28	91.92	94.29	0.000074	0.44	127.86	66.33	0.06
NM-110	2780	EX 100Y	99.00	91.32	94.99	92.16	95.00	0.000090	0.56	177.61	73.86	0.06
NM-110	2780	ULT 10Y	67.00	91.32	94.48	91.98	94.48	0.000079	0.47	141.15	67.88	0.06
NM-110	2780	ULT 25Y	89.00	91.32	94.84	92.10	94.85	0.000087	0.53	166.49	72.09	0.06
NM-110	2780	ULT 100Y	140.00	91.32	95.56	92.35	95.56	0.000095	0.64	220.33	78.23	0.07
NM-110	3427	EX 10Y	39.00	91.34	93.96	91.76	93.97	0.000042	0.34	115.65	58.05	0.04
NM-110	3427	EX 25Y	56.00	91.34	94.32	91.86	94.32	0.000052	0.41	136.75	59.76	0.05
NM-110	3427	EX 100Y	99.00	91.34	95.05	92.06	95.05	0.000069	0.55	181.23	63.23	0.06
NM-110	3427	ULT 10Y	67.00	91.34	94.52	91.92	94.53	0.000057	0.45	148.89	60.73	0.05
NM-110	3427	ULT 25Y	89.00	91.34	94.89	92.01	94.90	0.000066	0.52	171.53	62.49	0.06
NM-110	3427	ULT 100Y	140.00	91.34	95.61	92.22	95.62	0.000079	0.64	217.79	65.91	0.06
NM-110	3890	EX 10Y	39.00	91.28	93.98	91.73	93.99	0.000043	0.34	113.40	56.39	0.04
NM-110	3890	EX 25Y	56.00	91.28	94.35	91.83	94.35	0.000054	0.42	134.33	58.90	0.05
NM-110	3890	EX 100Y	99.00	91.28	95.08	92.03	95.08	0.000071	0.55	178.90	63.08	0.06
NM-110	3890	ULT 10Y	67.00	91.28	94.55	91.89	94.55	0.000059	0.46	146.47	60.03	0.05
NM-110	3890	ULT 25Y	89.00	91.28	94.92	91.99	94.93	0.000068	0.53	169.15	62.13	0.06
NM-110	3890	ULT 100Y	140.00	91.28	95.65	92.20	95.66	0.000082	0.65	215.93	66.58	0.06
NM-110	4133	EX 10Y	39.00	91.32	94.00	92.13	94.01	0.000254	0.80	49.03	25.47	0.10
NM-110	4133	EX 25Y	56.00	91.32	94.36	92.30	94.38	0.000314	0.96	58.61	26.95	0.11
NM-110	4133	EX 100Y	99.00	91.32	95.10	92.63	95.12	0.000412	1.25	79.49	29.92	0.13
NM-110	4133	ULT 10Y	67.00	91.32	94.57	92.39	94.59	0.000345	1.04	64.23	27.78	0.12
NM-110	4133	ULT 25Y	89.00	91.32	94.94	92.56	94.96	0.000394	1.19	74.87	29.29	0.13
NM-110	4133	ULT 100Y	140.00	91.32	95.67	92.90	95.70	0.000493	1.43	97.79	34.17	0.15
NM-110	4689	EX 10Y	17.00	92.10	94.14	92.80	94.15	0.000241	0.59	29.02	23.31	0.09
NM-110	4689	EX 25Y	24.00	92.10	94.54	92.91	94.54	0.000255	0.58	41.10	34.69	0.09
NM-110	4689	EX 100Y	40.00	92.10	95.28	93.12	95.29	0.000152	0.58	68.67	39.28	0.08
NM-110	4689	ULT 10Y	25.00	92.10	94.74	92.92	94.74	0.000171	0.52	48.19	35.98	0.08
NM-110	4689	ULT 25Y	33.00	92.10	95.12	93.03	95.12	0.000138	0.53	62.28	38.32	0.07
NM-110	4689	ULT 100Y	51.00	92.10	95.86	93.22	95.86	0.000103	0.55	92.28	42.46	0.07
NM-110	5361	EX 10Y	17.00	92.55	94.49	93.67	94.52	0.002069	1.42	11.93	12.30	0.25
NM-110	5361	EX 25Y	24.00	92.55	94.87	93.83	94.90	0.001593	1.40	17.20	15.05	0.23
NM-110	5361	EX 100Y	40.00	92.55	95.49	94.12	95.52	0.001223	1.44	27.80	19.05	0.21
NM-110	5361	ULT 10Y	25.00	92.55	94.97	93.86	95.00	0.001371	1.33	18.79	15.79	0.21
NM-110	5361	ULT 25Y	33.00	92.55	95.31	94.01	95.34	0.001192	1.35	24.47	18.16	0.20

HEC-RAS Plan: BASE River: N-NM-110 Reach: NM-110 (Continued)

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)	
NM-110	5361	ULT 100Y	51.00	92.55	95.99	94.28	96.02	0.000824	1.34	38.09	21.57	0.18
NM-110	5540	EX 10Y	17.00	95.30	95.83	95.83	96.01	0.040667	3.44	4.94	13.22	0.99
NM-110	5540	EX 25Y	24.00	95.30	95.93	95.93	96.15	0.038301	3.77	6.37	14.18	0.99
NM-110	5540	EX 100Y	40.00	95.30	96.12	96.12	96.41	0.035793	4.32	9.26	15.95	1.00
NM-110	5540	ULT 10Y	25.00	95.30	95.94	95.94	96.17	0.038929	3.84	6.51	14.27	1.00
NM-110	5540	ULT 25Y	33.00	95.30	96.04	96.04	96.31	0.037289	4.13	7.99	15.20	1.00
NM-110	5540	ULT 100Y	51.00	95.30	96.23	96.23	96.56	0.034719	4.60	11.09	16.98	1.00
NM-110	5927	EX 10Y	17.00	95.70	97.04	96.27	97.05	0.000866	0.86	19.74	23.45	0.17
NM-110	5927	EX 25Y	24.00	95.70	97.23	96.37	97.25	0.000922	0.98	24.53	25.19	0.17
NM-110	5927	EX 100Y	40.00	95.70	97.58	96.55	97.60	0.001029	1.19	33.72	28.10	0.19
NM-110	5927	ULT 10Y	25.00	95.70	97.26	96.38	97.27	0.000934	1.00	25.12	25.40	0.18
NM-110	5927	ULT 25Y	33.00	95.70	97.44	96.48	97.46	0.000985	1.10	29.92	26.96	0.18
NM-110	5927	ULT 100Y	51.00	95.70	97.78	96.66	97.80	0.001073	1.29	39.41	29.73	0.20
NM-110	6481	EX 10Y	17.00	97.55	98.21	98.05	98.29	0.013080	2.24	7.60	16.56	0.58
NM-110	6481	EX 25Y	24.00	97.55	98.38	98.15	98.46	0.009666	2.27	10.59	18.01	0.52
NM-110	6481	EX 100Y	40.00	97.55	98.71	98.32	98.80	0.006817	2.36	16.92	20.75	0.46
NM-110	6481	ULT 10Y	25.00	97.55	98.41	98.16	98.49	0.009315	2.27	11.02	18.21	0.51
NM-110	6481	ULT 25Y	33.00	97.55	98.57	98.25	98.66	0.007759	2.33	14.17	19.60	0.48
NM-110	6481	ULT 100Y	51.00	97.55	98.90	98.42	98.99	0.005966	2.43	21.00	22.33	0.44


NM110 Plan: NM110
N-NM-110 NM-110
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
104
102
100
98
96
94
92
90
88
0
1000
2000
3000
4000
5000
6000
7000
Main Channel Distance (ft)


NM110 Plan: NM110
RS = 6481
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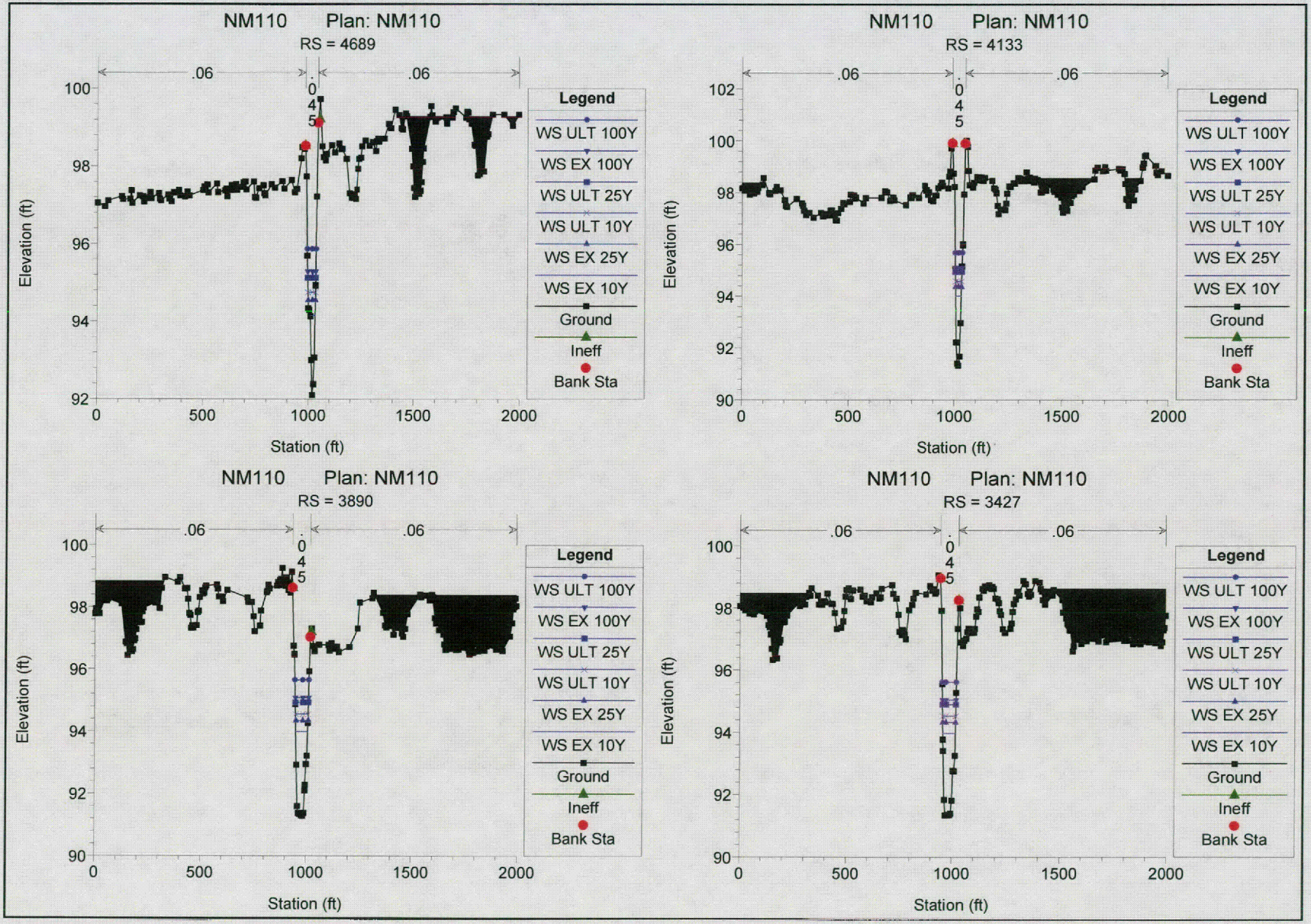
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM110 Plan: NM110
RS = 5927
NM110 Plan: NM110
RS = 5540
NM110 Plan: NM110
RS = 5361


NM110 Plan: NM110
RS = 4689
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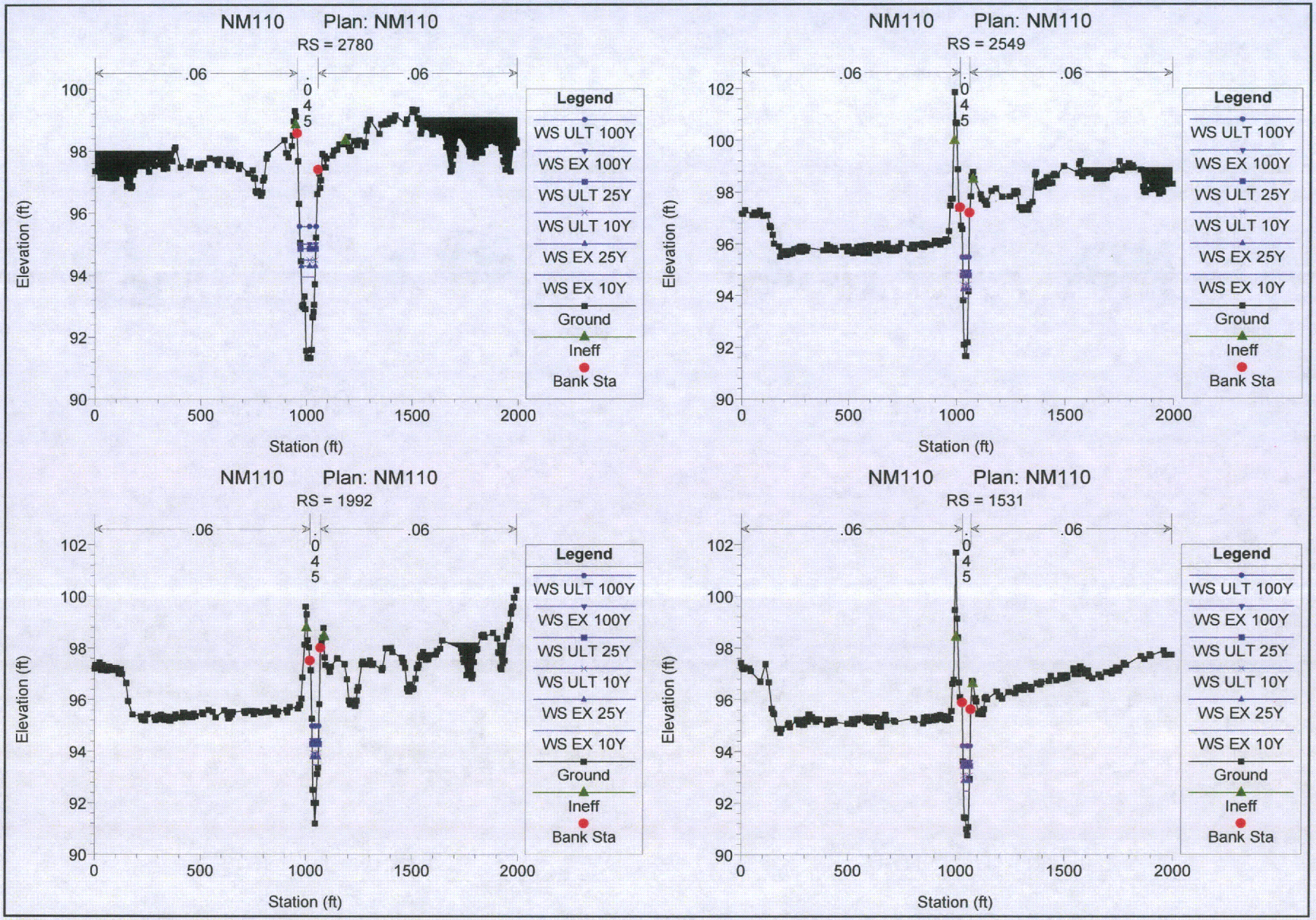
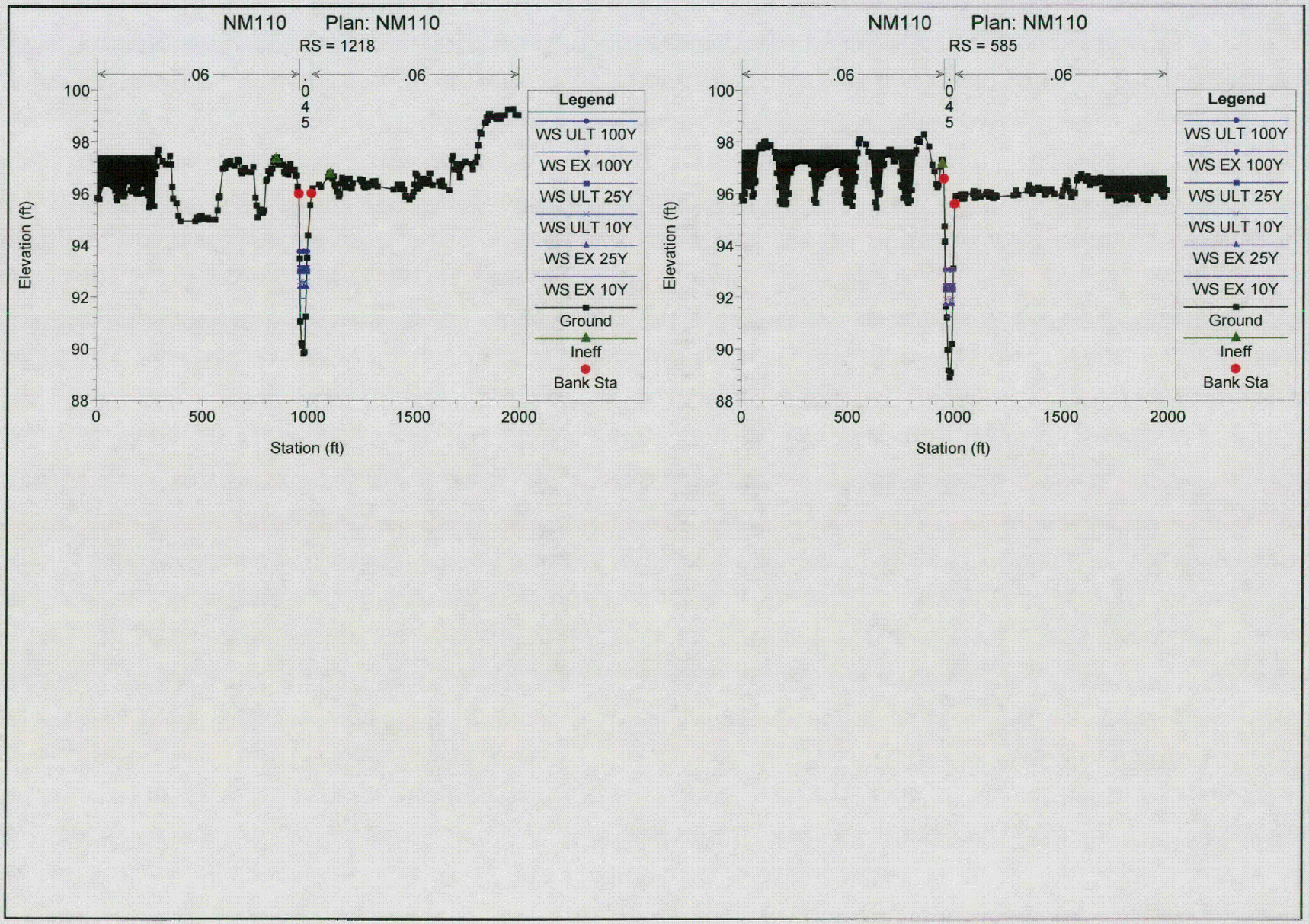
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM110 Plan: NM110
RS = 4133
NM110 Plan: NM110
RS = 3890
NM110 Plan: NM110
RS = 3427


NM110 Plan: NM110
RS = 2780
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM110 Plan: NM110
RS = 2549
NM110 Plan: NM110
RS = 1992
NM110 Plan: NM110
RS = 1531


NM110 Plan: NM110
RS = 1218
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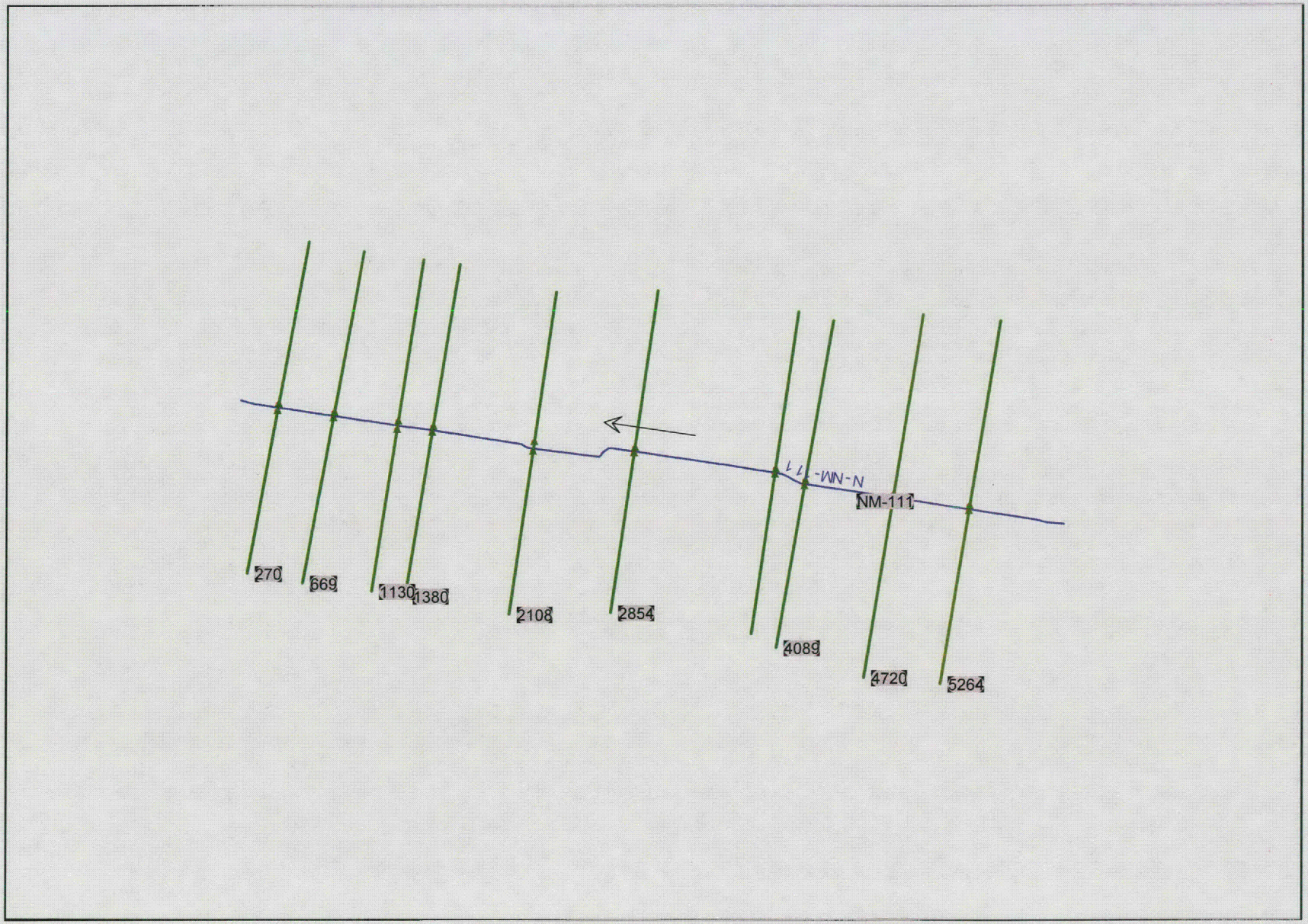
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM110 Plan: NM110
RS = 585
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta

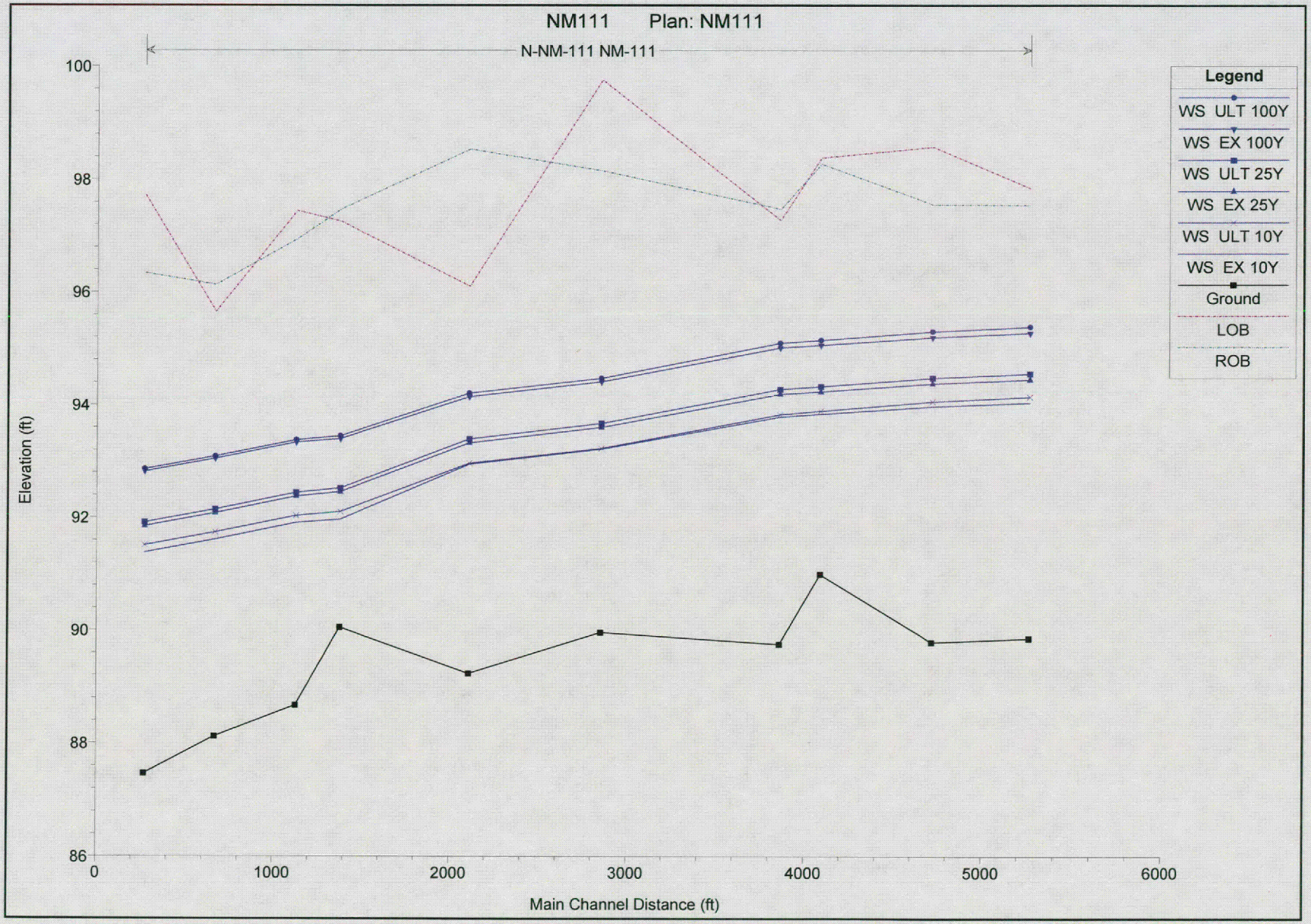
APPENDIX D
HEC-RAS HYDRAULIC OUTPUT

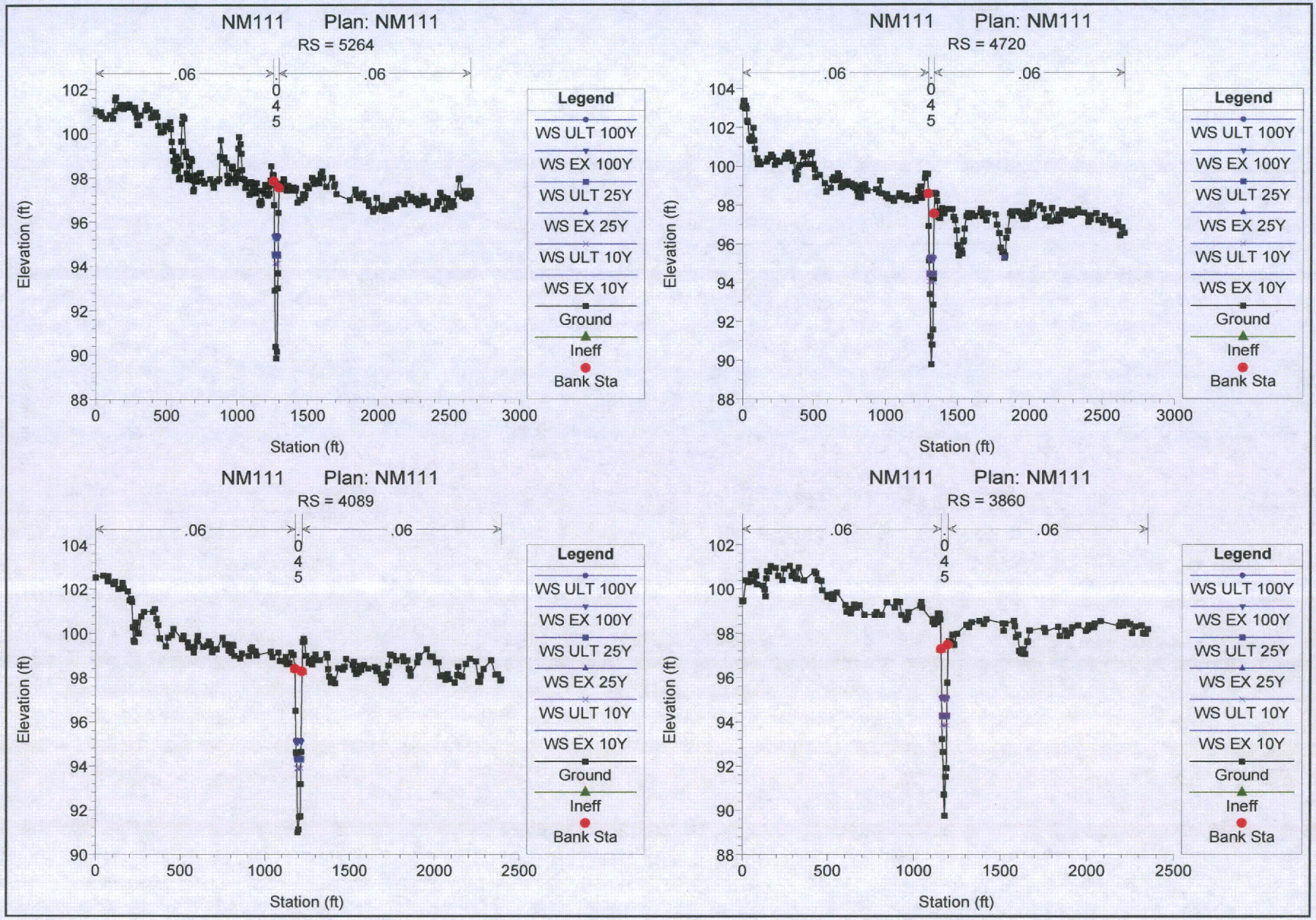
NM-111 BASE CONDITION


270
669
1130
1380
2108
2854
4089
4720
5264
NM-111
N-NM-111

HEC-RAS Plan: BASE River: N-NM-111 Reach: NM-111

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)	
NM-111	270	EX 10Y	121.00	87.46	91.38	88.92	91.40	0.000501	1.37	88.40	33.12	0.15
NM-111	270	EX 25Y	155.00	87.46	91.84	89.13	91.88	0.000501	1.49	104.18	34.17	0.15
NM-111	270	EX 100Y	236.00	87.46	92.81	89.54	92.86	0.000500	1.71	138.32	36.34	0.15
NM-111	270	ULT 10Y	130.00	87.46	91.50	88.98	91.53	0.000501	1.40	92.69	33.41	0.15
NM-111	270	ULT 25Y	160.00	87.46	91.91	89.15	91.94	0.000501	1.50	106.41	34.32	0.15
NM-111	270	ULT 100Y	240.00	87.46	92.85	89.55	92.90	0.000501	1.72	139.82	36.44	0.15
NM-111	669	EX 10Y	121.00	88.12	91.61	89.47	91.65	0.000737	1.66	72.98	27.32	0.18
NM-111	669	EX 25Y	155.00	88.12	92.07	89.65	92.12	0.000749	1.80	86.12	28.64	0.18
NM-111	669	EX 100Y	236.00	88.12	93.04	90.04	93.11	0.000755	2.05	114.99	31.13	0.19
NM-111	669	ULT 10Y	130.00	88.12	91.73	89.51	91.78	0.000742	1.70	76.53	27.71	0.18
NM-111	669	ULT 25Y	160.00	88.12	92.14	89.67	92.19	0.000750	1.82	87.99	28.80	0.18
NM-111	669	ULT 100Y	240.00	88.12	93.08	90.06	93.15	0.000756	2.06	116.28	31.24	0.19
NM-111	1130	EX 10Y	90.00	88.67	91.90	89.73	91.93	0.000468	1.19	75.34	33.45	0.14
NM-111	1130	EX 25Y	115.00	88.67	92.37	89.88	92.40	0.000442	1.25	92.19	36.59	0.14
NM-111	1130	EX 100Y	174.00	88.67	93.33	90.19	93.36	0.000373	1.36	128.38	39.05	0.13
NM-111	1130	ULT 10Y	90.00	88.67	92.03	89.73	92.05	0.000423	1.13	79.69	35.70	0.13
NM-111	1130	ULT 25Y	120.00	88.67	92.44	89.91	92.46	0.000445	1.27	94.61	36.76	0.14
NM-111	1130	ULT 100Y	180.00	88.67	93.37	90.23	93.40	0.000383	1.38	130.10	39.16	0.13
NM-111	1380	EX 10Y	90.00	90.05	91.96	91.79	92.41	0.020794	5.37	16.77	13.22	0.84
NM-111	1380	EX 25Y	115.00	90.05	92.45	92.03	92.82	0.012914	4.83	23.80	15.26	0.68
NM-111	1380	EX 100Y	174.00	90.05	93.40	92.48	93.69	0.007313	4.33	40.20	19.76	0.53
NM-111	1380	ULT 10Y	90.00	90.05	92.10	91.79	92.46	0.015526	4.82	18.66	13.84	0.73
NM-111	1380	ULT 25Y	120.00	90.05	92.52	92.07	92.88	0.012526	4.83	24.82	15.52	0.67
NM-111	1380	ULT 100Y	180.00	90.05	93.44	92.53	93.74	0.007371	4.38	41.12	19.99	0.54
NM-111	2108	EX 10Y	90.00	89.23	92.94	90.27	92.95	0.000205	0.82	110.31	47.46	0.09
NM-111	2108	EX 25Y	115.00	89.23	93.32	90.41	93.33	0.000210	0.89	128.68	49.03	0.10
NM-111	2108	EX 100Y	174.00	89.23	94.14	90.71	94.16	0.000208	1.02	170.32	52.43	0.10
NM-111	2108	ULT 10Y	90.00	89.23	92.96	90.27	92.97	0.000200	0.81	111.22	47.53	0.09
NM-111	2108	ULT 25Y	120.00	89.23	93.39	90.43	93.40	0.000211	0.91	132.02	49.31	0.10
NM-111	2108	ULT 100Y	180.00	89.23	94.20	90.73	94.22	0.000211	1.04	173.42	52.67	0.10
NM-111	2854	EX 10Y	90.00	89.96	93.21	91.39	93.27	0.001199	1.93	46.58	19.36	0.22
NM-111	2854	EX 25Y	115.00	89.96	93.60	91.59	93.67	0.001270	2.12	54.19	20.24	0.23
NM-111	2854	EX 100Y	174.00	89.96	94.41	92.02	94.50	0.001337	2.44	71.35	22.10	0.24
NM-111	2854	ULT 10Y	90.00	89.96	93.23	91.39	93.28	0.001181	1.92	46.83	19.38	0.22
NM-111	2854	ULT 25Y	120.00	89.96	93.67	91.64	93.74	0.001286	2.16	55.60	20.40	0.23
NM-111	2854	ULT 100Y	180.00	89.96	94.47	92.05	94.56	0.001356	2.48	72.72	22.24	0.24
NM-111	3860	EX 10Y	43.00	89.75	93.78	91.23	93.79	0.000171	0.70	61.46	28.15	0.08
NM-111	3860	EX 25Y	55.00	89.75	94.19	91.39	94.20	0.000167	0.75	73.03	29.16	0.08
NM-111	3860	EX 100Y	82.00	89.75	95.01	91.74	95.02	0.000155	0.84	97.92	31.24	0.08
NM-111	3860	ULT 10Y	50.00	89.75	93.82	91.32	93.83	0.000218	0.80	62.63	28.25	0.09
NM-111	3860	ULT 25Y	60.00	89.75	94.27	91.45	94.28	0.000179	0.79	75.51	29.38	0.09
NM-111	3860	ULT 100Y	90.00	89.75	95.09	91.82	95.11	0.000173	0.90	100.54	31.46	0.09
NM-111	4089	EX 10Y	43.00	90.99	93.83	92.00	93.85	0.000336	0.93	46.21	22.76	0.12
NM-111	4089	EX 25Y	55.00	90.99	94.23	92.11	94.25	0.000321	0.99	55.61	24.03	0.11
NM-111	4089	EX 100Y	82.00	90.99	95.06	92.32	95.07	0.000314	1.04	78.92	31.17	0.12
NM-111	4089	ULT 10Y	50.00	90.99	93.89	92.06	93.90	0.000420	1.05	47.46	22.93	0.13
NM-111	4089	ULT 25Y	60.00	90.99	94.32	92.15	94.34	0.000343	1.04	57.73	24.31	0.12
NM-111	4089	ULT 100Y	90.00	90.99	95.14	92.38	95.16	0.000341	1.10	81.69	31.41	0.12
NM-111	4720	EX 10Y	43.00	89.78	93.97	91.24	93.97	0.000137	0.67	63.76	26.16	0.08
NM-111	4720	EX 25Y	55.00	89.78	94.37	91.38	94.38	0.000145	0.74	74.73	28.03	0.08
NM-111	4720	EX 100Y	82.00	89.78	95.19	91.65	95.20	0.000148	0.83	99.24	31.55	0.08
NM-111	4720	ULT 10Y	50.00	89.78	94.05	91.33	94.06	0.000168	0.76	66.06	26.58	0.08
NM-111	4720	ULT 25Y	60.00	89.78	94.47	91.44	94.48	0.000156	0.77	77.51	28.46	0.08
NM-111	4720	ULT 100Y	90.00	89.78	95.30	91.71	95.31	0.000163	0.88	102.46	32.83	0.09
NM-111	5264	EX 10Y	43.00	89.85	94.03	90.88	94.04	0.000110	0.66	65.47	22.94	0.07
NM-111	5264	EX 25Y	55.00	89.85	94.44	91.02	94.45	0.000122	0.73	75.10	24.07	0.07
NM-111	5264	EX 100Y	82.00	89.85	95.27	91.29	95.28	0.000138	0.85	95.94	26.36	0.08
NM-111	5264	ULT 10Y	50.00	89.85	94.14	90.96	94.15	0.000134	0.74	67.83	23.22	0.08
NM-111	5264	ULT 25Y	60.00	89.85	94.55	91.07	94.56	0.000133	0.77	77.63	24.36	0.08
NM-111	5264	ULT 100Y	90.00	89.85	95.38	91.36	95.39	0.000153	0.91	98.85	26.67	0.08


NM111 Plan: NM111
N-NM-111 NM-111
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
100
98
96
94
92
90
88
86
0
1000
2000
3000
4000
5000
6000
Main Channel Distance (ft)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RS = 5264
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.06
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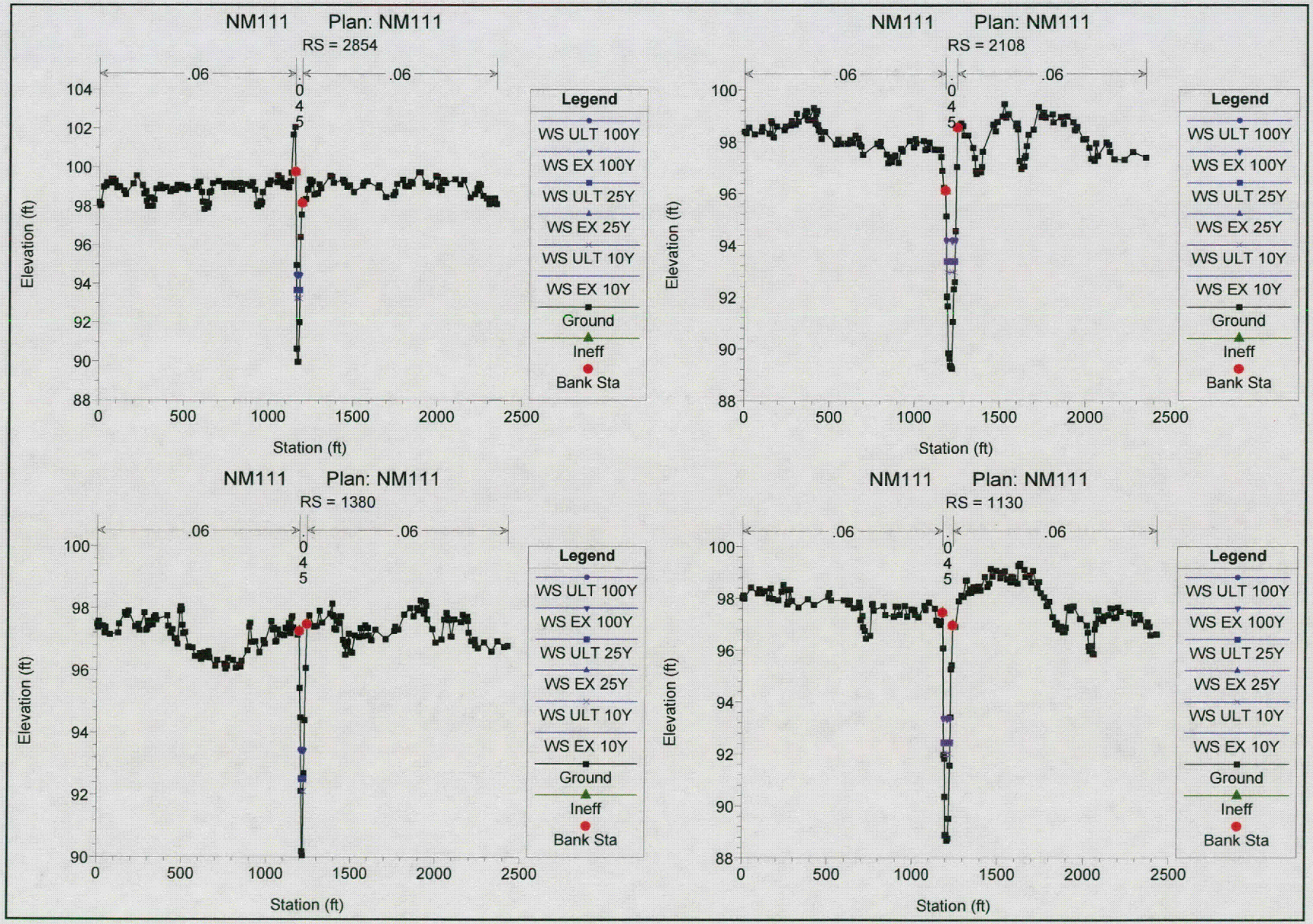
4
5
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM111 Plan: NM111
RS = 4720
NM111 Plan: NM111
RS = 4089
NM111 Plan: NM111
RS = 3860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RS = 2854
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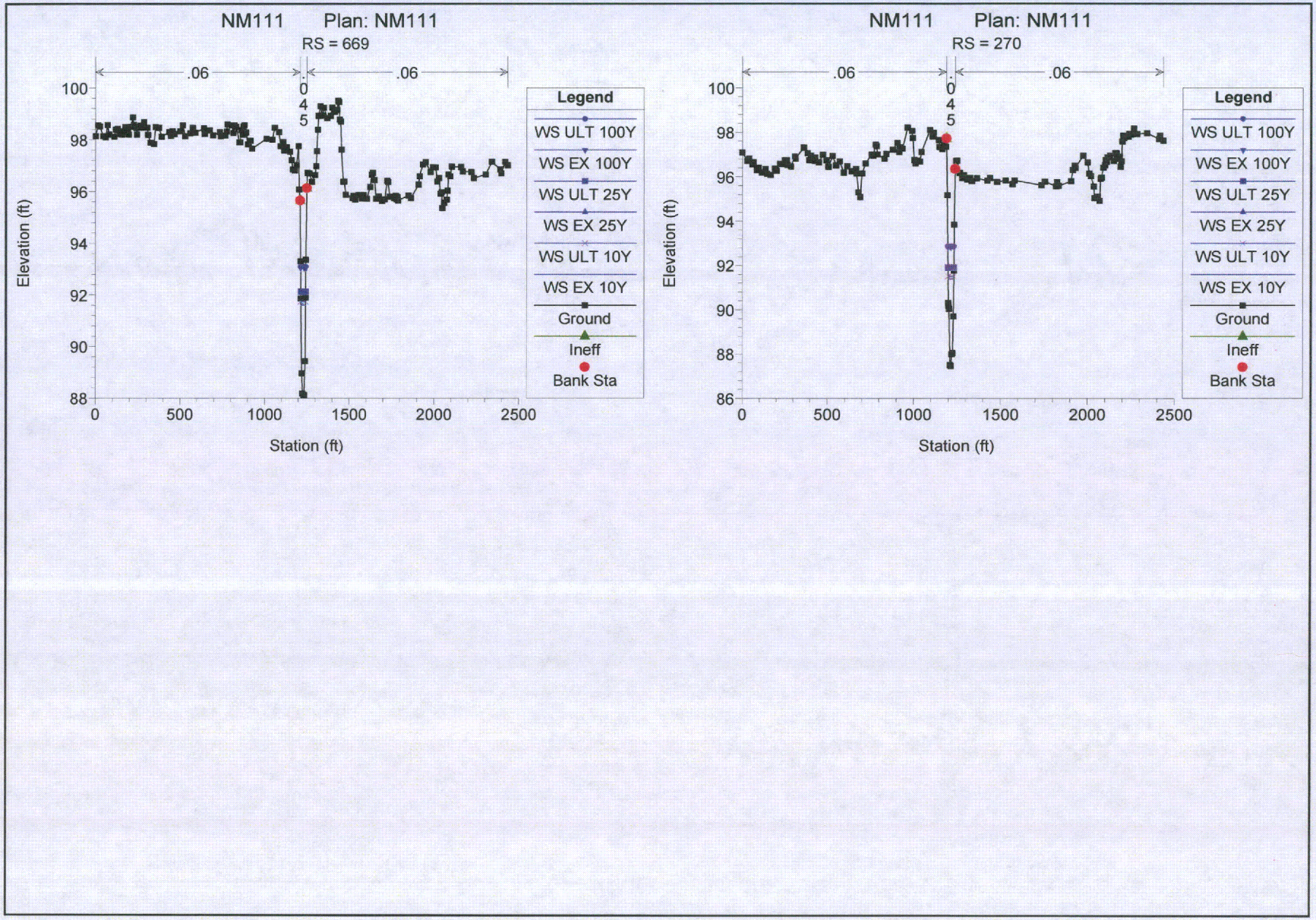
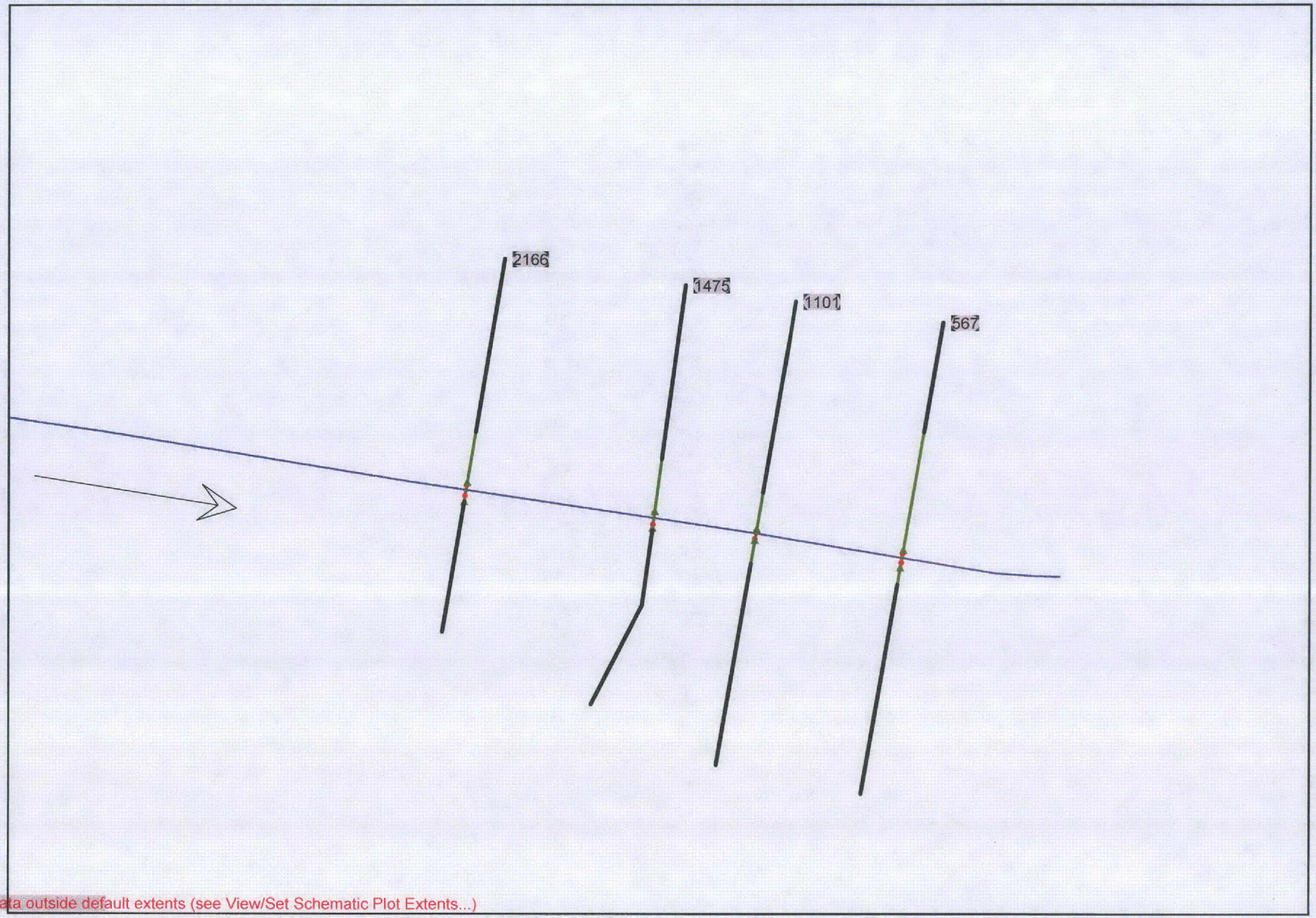
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM111 Plan: NM111
RS = 2108
NM111 Plan: NM111
RS = 1380
NM111 Plan: NM111
RS = 1130


NM111 Plan: NM111
RS = 669
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM111 Plan: NM111
RS = 270
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta

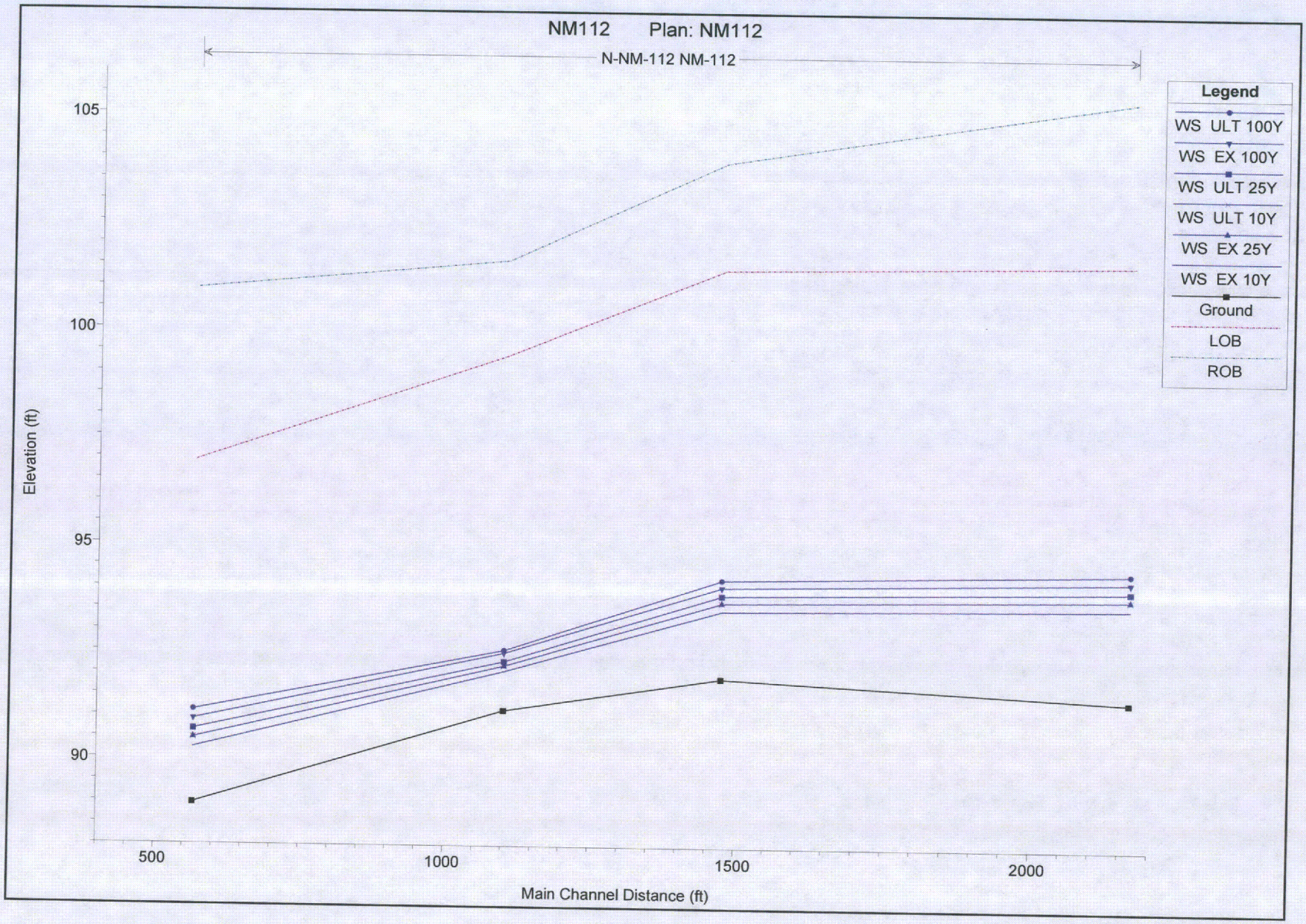
APPENDIX D
HEC-RAS HYDRAULIC OUTPUT

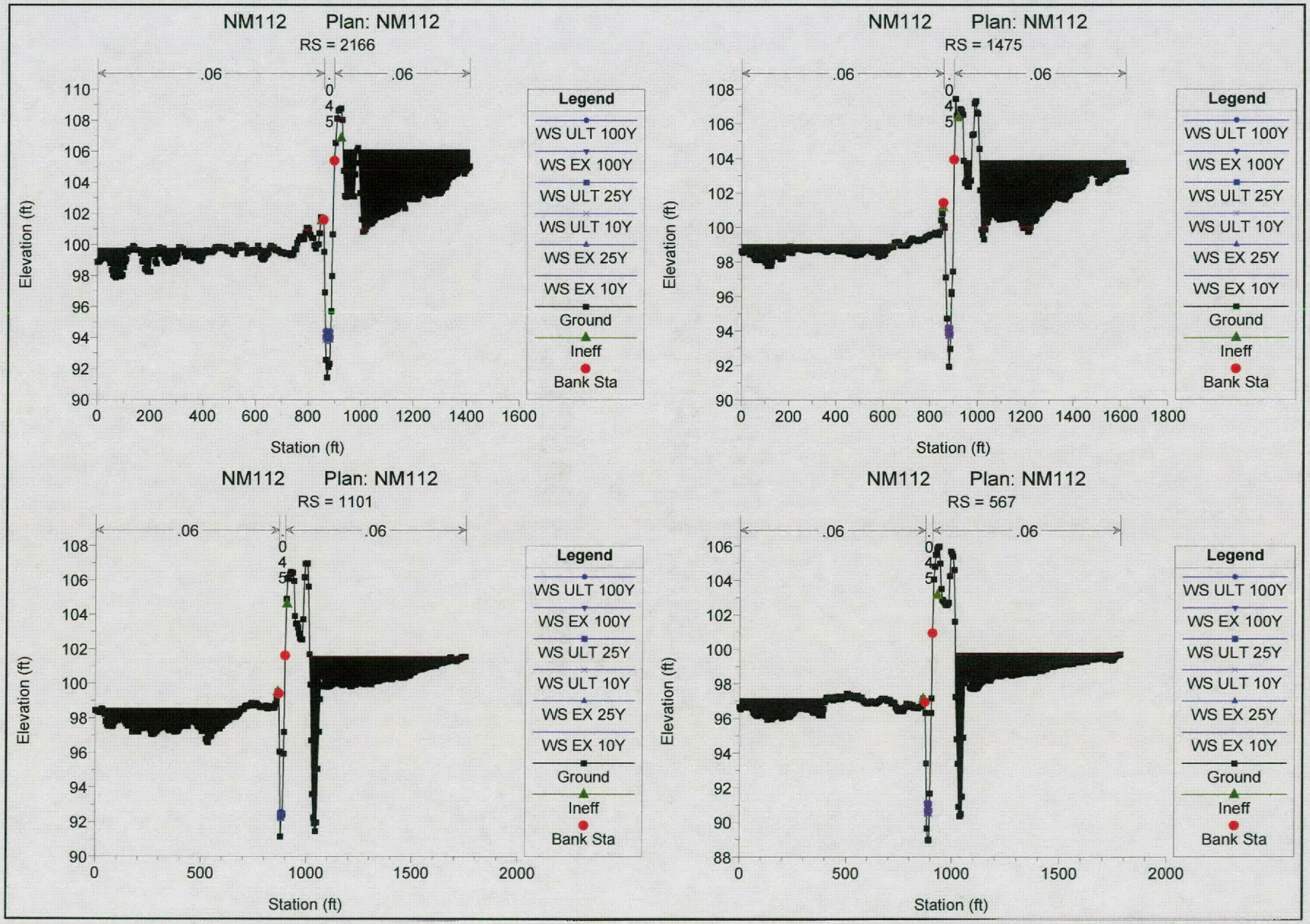
NM-112 BASE CONDITION


2166
1475
1101
567
Some schematic data outside default extents (see View/Set Schematic Plot Extents...)

HEC-RAS Plan: BASE River: N-NM-112 Reach: NM-112

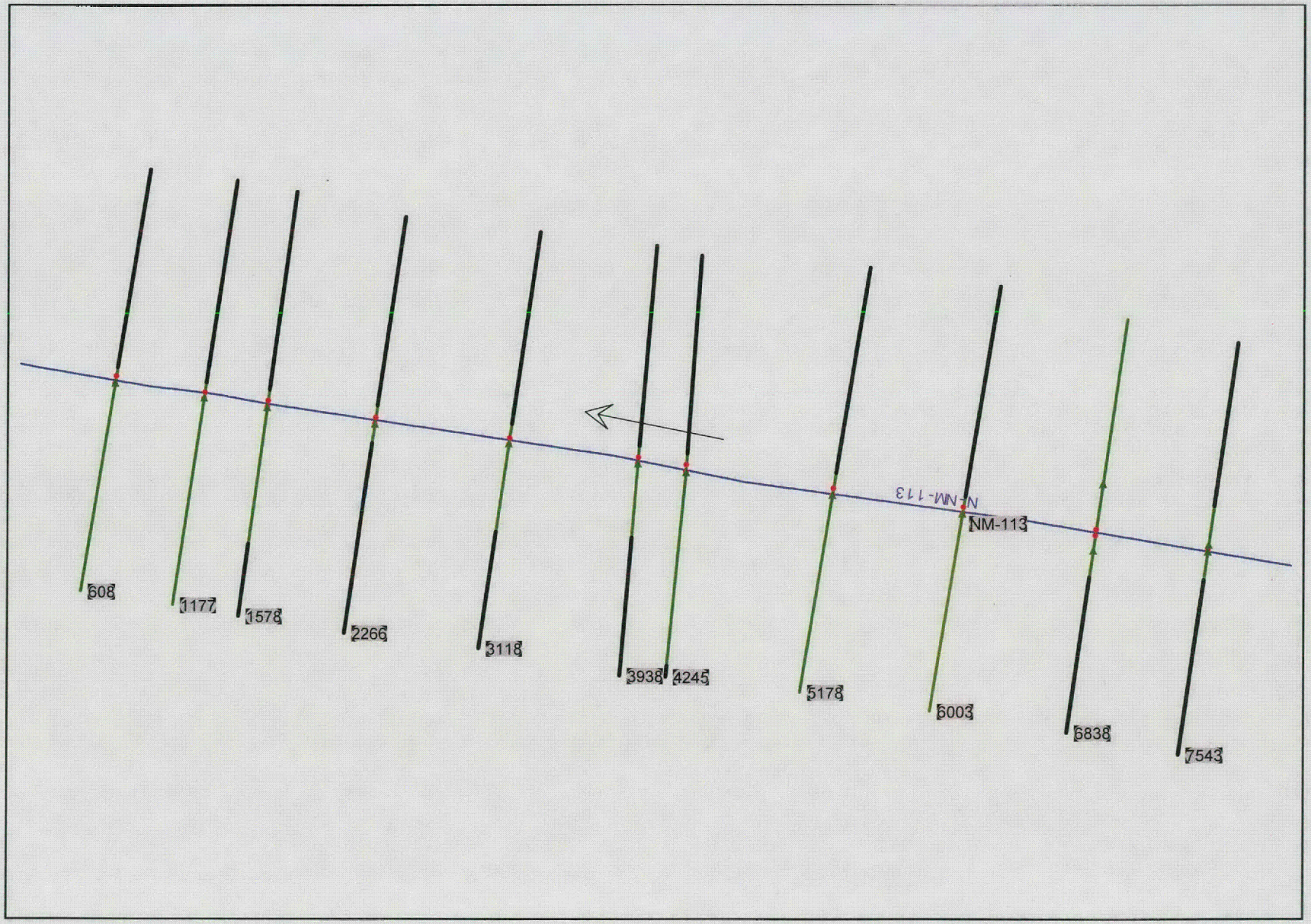
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
NM-112	567	EX 10Y	8.00	88.96	90.24	89.36	90.25	0.000400	0.63	12.71	13.11	0.11
NM-112	567	EX 25Y	11.00	88.96	90.47	89.44	90.48	0.000400	0.70	15.77	13.83	0.12
NM-112	567	EX 100Y	18.00	88.96	90.91	89.58	90.92	0.000400	0.81	22.12	15.23	0.12
NM-112	567	ULT 10Y	11.00	88.96	90.47	89.44	90.48	0.000400	0.70	15.77	13.83	0.12
NM-112	567	ULT 25Y	14.00	88.96	90.67	89.50	90.68	0.000400	0.75	18.60	14.47	0.12
NM-112	567	ULT 100Y	22.00	88.96	91.12	89.65	91.13	0.000401	0.86	25.44	15.91	0.12
NM-112	1101	EX 10Y	8.00	91.15	92.06	92.06	92.29	0.044287	3.84	2.08	4.58	1.00
NM-112	1101	EX 25Y	11.00	91.15	92.18	92.18	92.44	0.041878	4.07	2.70	5.22	1.00
NM-112	1101	EX 100Y	18.00	91.15	92.48	92.48	92.70	0.043318	3.72	4.83	11.41	1.01
NM-112	1101	ULT 10Y	11.00	91.15	92.18	92.18	92.44	0.041878	4.07	2.70	5.22	1.00
NM-112	1101	ULT 25Y	14.00	91.15	92.29	92.29	92.57	0.040649	4.28	3.27	5.75	1.00
NM-112	1101	ULT 100Y	22.00	91.15	92.55	92.55	92.79	0.040969	3.94	5.58	11.54	1.00
NM-112	1475	EX 10Y	8.00	91.93	93.49	92.71	93.51	0.001068	0.95	8.41	9.57	0.18
NM-112	1475	EX 25Y	11.00	91.93	93.69	92.82	93.71	0.001124	1.06	10.35	10.34	0.19
NM-112	1475	EX 100Y	18.00	91.93	94.05	93.02	94.08	0.001245	1.25	14.37	12.05	0.20
NM-112	1475	ULT 10Y	11.00	91.93	93.69	92.82	93.71	0.001124	1.06	10.35	10.34	0.19
NM-112	1475	ULT 25Y	14.00	91.93	93.86	92.92	93.88	0.001165	1.15	12.15	11.00	0.19
NM-112	1475	ULT 100Y	22.00	91.93	94.22	93.10	94.25	0.001345	1.33	16.55	13.47	0.21
NM-112	2166	EX 10Y	8.00	91.44	93.61	92.09	93.61	0.000058	0.31	25.91	18.05	0.05
NM-112	2166	EX 25Y	11.00	91.44	93.83	92.19	93.84	0.000071	0.37	29.94	18.62	0.05
NM-112	2166	EX 100Y	18.00	91.44	94.24	92.35	94.24	0.000096	0.48	37.72	19.68	0.06
NM-112	2166	ULT 10Y	11.00	91.44	93.83	92.19	93.84	0.000071	0.37	29.94	18.62	0.05
NM-112	2166	ULT 25Y	14.00	91.44	94.02	92.27	94.02	0.000083	0.42	33.49	19.11	0.06
NM-112	2166	ULT 100Y	22.00	91.44	94.43	92.40	94.44	0.000108	0.53	41.54	20.18	0.07


NM112 Plan: NM112
N-NM-112 NM-112
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
LOB
ROB
105
100
95
90
Elevation (ft)
500
1000
1500
2000
Main Channel Distance (ft)


NM112 Plan: NM112
RS = 2166
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM112 Plan: NM112
RS = 1475
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM112 Plan: NM112
RS = 1101
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM112 Plan: NM112
RS = 567
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta

APPENDIX D
HEC-RAS HYDRAULIC OUTPUT

NM-113 BASE CONDITION

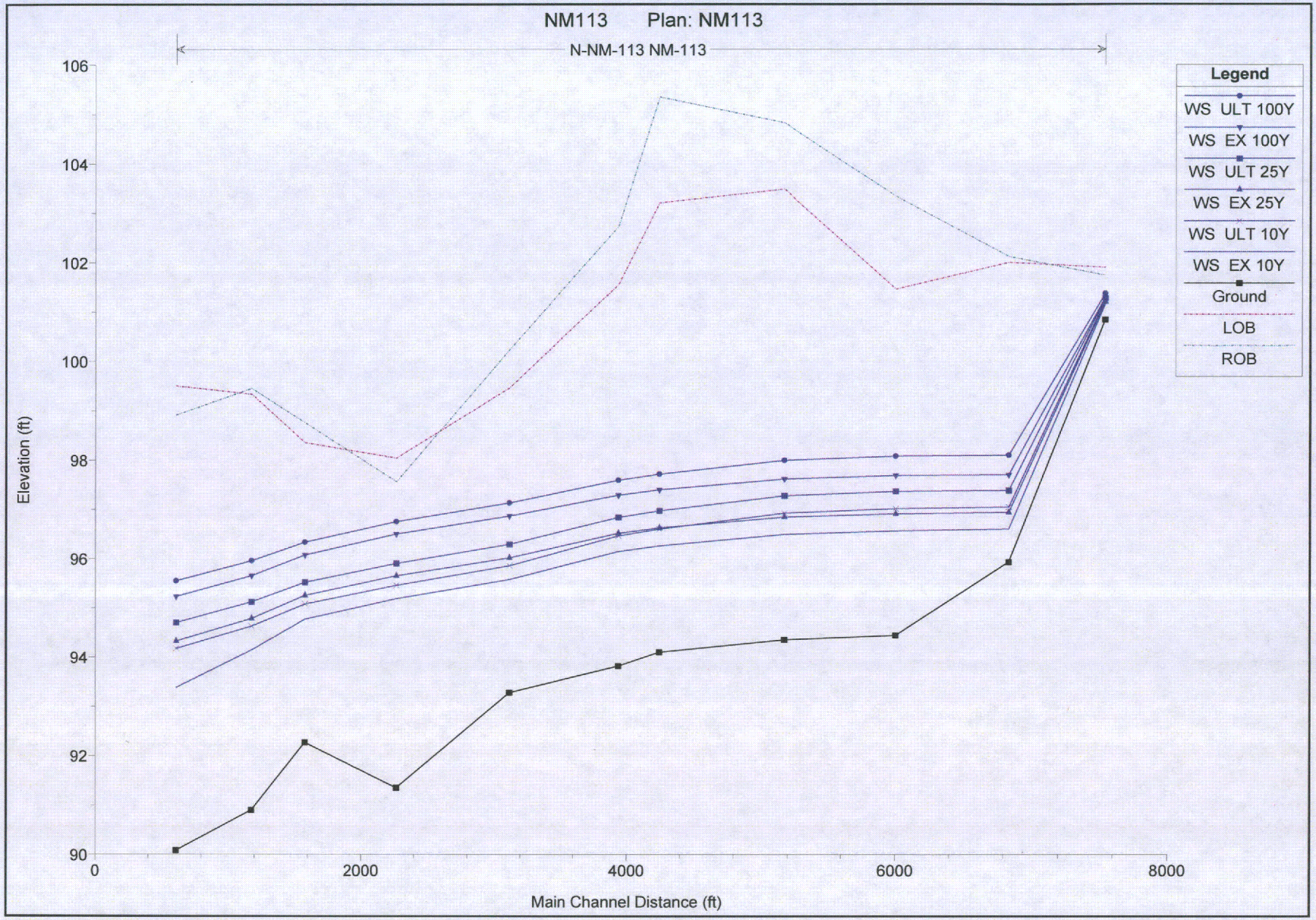

N-NM-113
NM-113
608
1177
1578
2266
3118
3938
4245
5178
6003
6838
7543

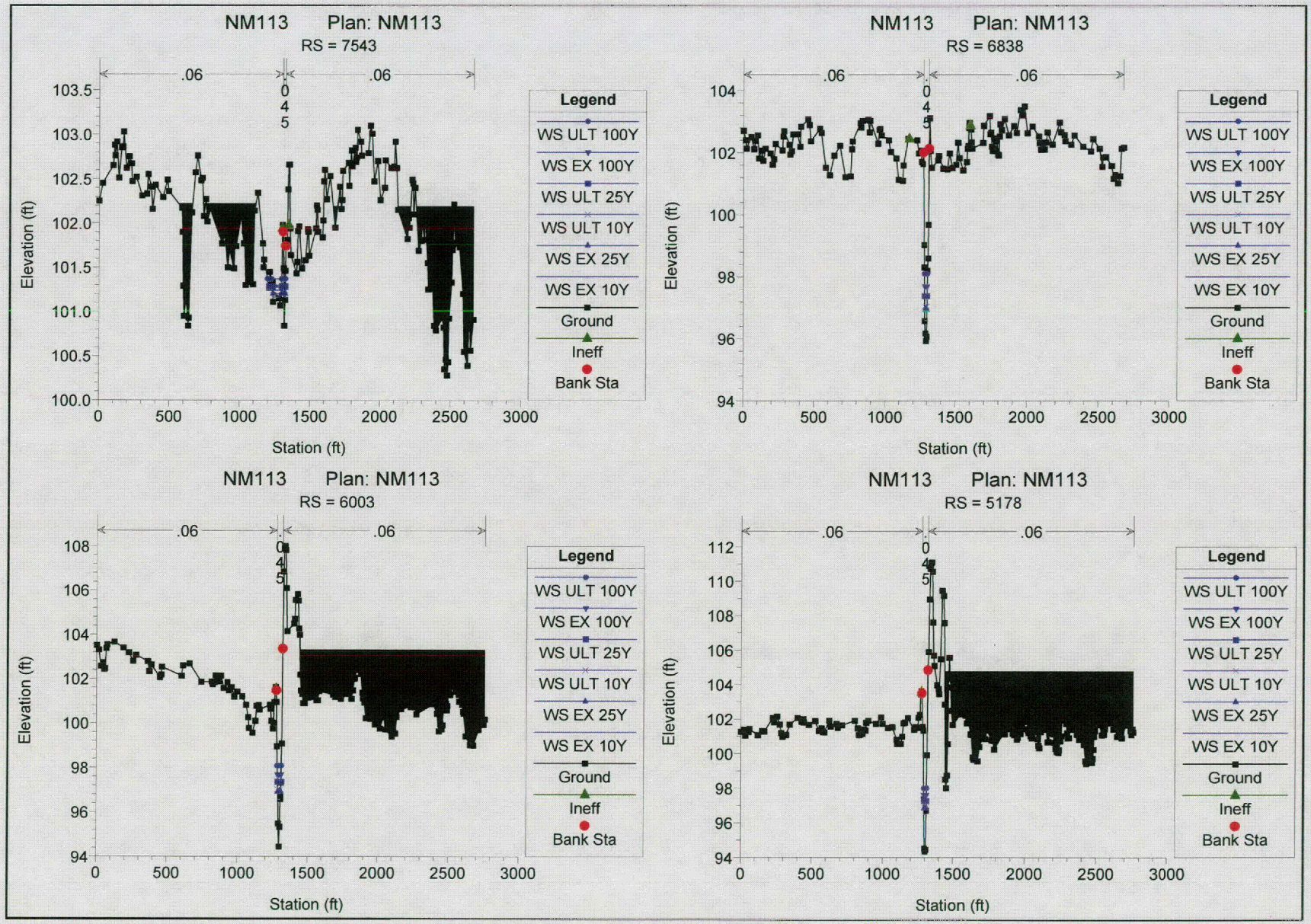
HEC-RAS Plan: BASE River: N-NM-113 Reach: NM-113

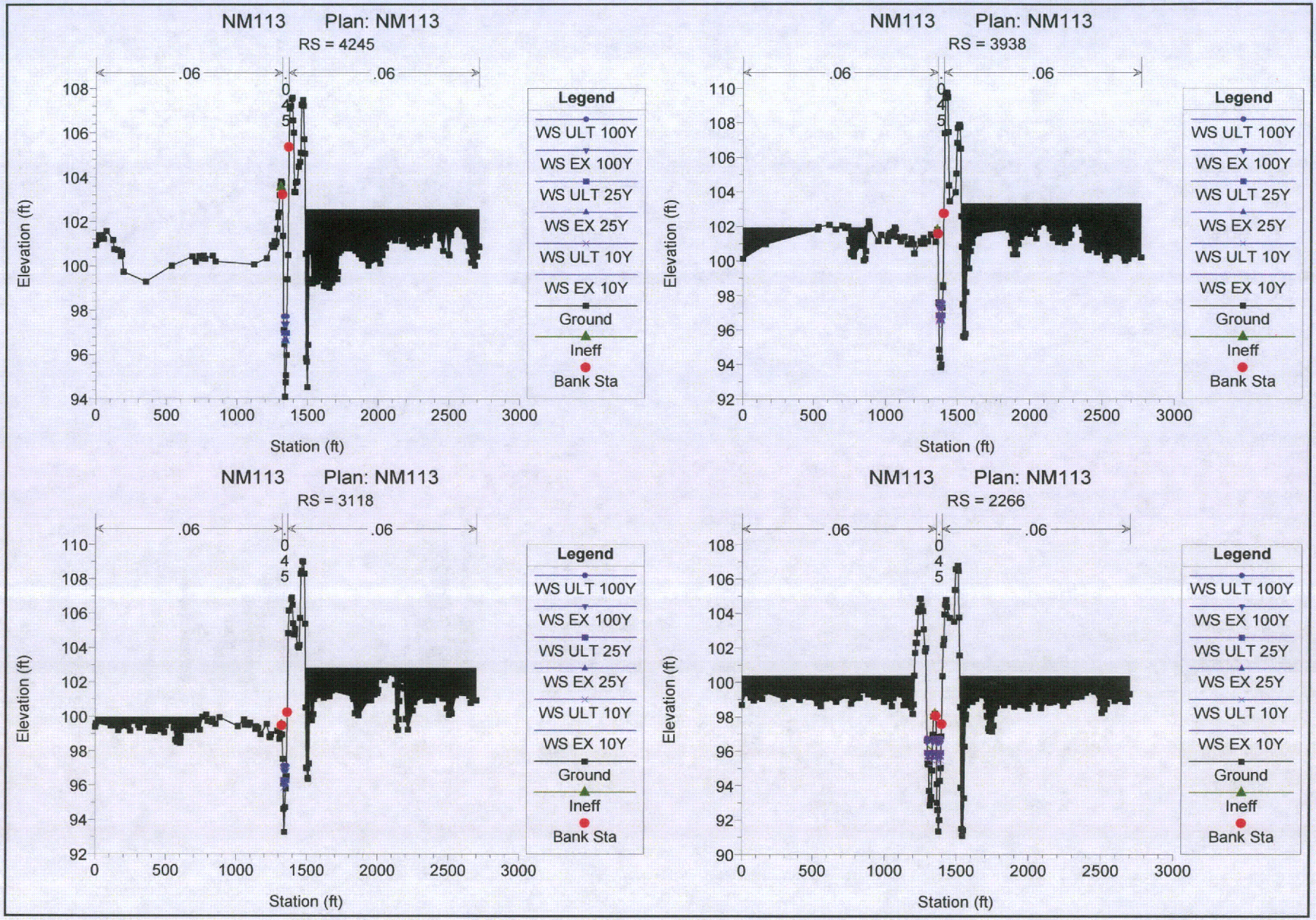
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
NM-113	608	EX 10Y	86.00	90.08	93.38	91.73	93.42	0.001000	1.63	52.73	25.95	0.20
NM-113	608	EX 25Y	116.00	90.08	94.32	91.95	94.36	0.000600	1.46	79.66	31.54	0.16
NM-113	608	EX 100Y	183.00	90.08	95.23	92.35	95.27	0.000600	1.66	110.43	35.77	0.17
NM-113	608	ULT 10Y	107.00	90.08	94.17	91.89	94.20	0.000600	1.43	74.85	30.48	0.16
NM-113	608	ULT 25Y	140.00	90.08	94.70	92.11	94.73	0.000600	1.52	91.97	34.05	0.16
NM-113	608	ULT 100Y	212.00	90.08	95.55	92.50	95.59	0.000600	1.74	121.99	36.66	0.17
NM-113	1177	EX 10Y	69.00	90.90	94.14	92.47	94.20	0.002214	2.02	34.23	21.58	0.28
NM-113	1177	EX 25Y	91.00	90.90	94.78	92.73	94.83	0.001380	1.80	50.43	26.25	0.23
NM-113	1177	EX 100Y	145.00	90.90	95.65	93.24	95.71	0.001097	1.96	74.08	28.28	0.21
NM-113	1177	ULT 10Y	79.00	90.90	94.62	92.59	94.67	0.001356	1.71	46.24	25.88	0.23
NM-113	1177	ULT 25Y	103.00	90.90	95.12	92.85	95.17	0.001076	1.73	59.37	27.04	0.21
NM-113	1177	ULT 100Y	160.00	90.90	95.95	93.36	96.01	0.000963	1.94	82.68	28.99	0.20
NM-113	1578	EX 10Y	69.00	92.27	94.77	93.29	94.81	0.001086	1.63	42.24	21.71	0.21
NM-113	1578	EX 25Y	91.00	92.27	95.25	93.46	95.30	0.000975	1.71	53.10	23.25	0.20
NM-113	1578	EX 100Y	145.00	92.27	96.07	93.82	96.13	0.000998	1.98	73.34	26.14	0.21
NM-113	1578	ULT 10Y	79.00	92.27	95.07	93.37	95.11	0.000924	1.61	49.03	22.68	0.19
NM-113	1578	ULT 25Y	103.00	92.27	95.52	93.54	95.56	0.000909	1.73	59.37	24.12	0.19
NM-113	1578	ULT 100Y	160.00	92.27	96.33	93.90	96.40	0.000947	1.99	80.31	27.15	0.20
NM-113	2266	EX 10Y	59.00	91.35	95.18	92.87	95.20	0.000317	0.96	61.63	53.69	0.11
NM-113	2266	EX 25Y	78.00	91.35	95.65	93.05	95.67	0.000311	1.04	75.06	62.80	0.12
NM-113	2266	EX 100Y	125.00	91.35	96.50	93.38	96.52	0.000334	1.23	101.39	70.75	0.12
NM-113	2266	ULT 10Y	69.00	91.35	95.45	92.97	95.47	0.000306	0.99	69.36	60.99	0.11
NM-113	2266	ULT 25Y	90.00	91.35	95.90	93.14	95.92	0.000312	1.09	82.66	65.17	0.12
NM-113	2266	ULT 100Y	141.00	91.35	96.75	93.48	96.78	0.000339	1.29	109.72	72.90	0.12
NM-113	3118	EX 10Y	28.00	93.28	95.58	94.58	95.61	0.001791	1.52	18.45	15.57	0.25
NM-113	3118	EX 25Y	37.00	93.28	96.02	94.73	96.05	0.001289	1.42	25.98	18.85	0.21
NM-113	3118	EX 100Y	62.00	93.28	96.86	95.07	96.89	0.000838	1.39	44.66	24.25	0.18
NM-113	3118	ULT 10Y	38.00	93.28	95.85	94.75	95.90	0.001836	1.65	23.03	17.45	0.25
NM-113	3118	ULT 25Y	49.00	93.28	96.29	94.91	96.33	0.001398	1.56	31.44	21.18	0.23
NM-113	3118	ULT 100Y	77.00	93.28	97.13	95.24	97.16	0.000861	1.50	51.20	25.06	0.19
NM-113	3938	EX 10Y	28.00	93.82	96.14	94.63	96.15	0.000340	0.82	34.04	20.66	0.11
NM-113	3938	EX 25Y	37.00	93.82	96.51	94.75	96.52	0.000324	0.88	41.91	21.91	0.11
NM-113	3938	EX 100Y	62.00	93.82	97.28	94.99	97.30	0.000327	1.04	59.85	24.52	0.12
NM-113	3938	ULT 10Y	38.00	93.82	96.46	94.76	96.47	0.000368	0.93	40.85	21.75	0.12
NM-113	3938	ULT 25Y	49.00	93.82	96.83	94.88	96.85	0.000358	1.00	49.17	23.00	0.12
NM-113	3938	ULT 100Y	77.00	93.82	97.59	95.12	97.61	0.000369	1.14	67.55	26.28	0.13
NM-113	4245	EX 10Y	15.00	94.10	96.26	94.99	96.27	0.000476	0.81	18.60	14.95	0.13
NM-113	4245	EX 25Y	20.00	94.10	96.62	95.11	96.63	0.000416	0.82	24.32	17.10	0.12
NM-113	4245	EX 100Y	36.00	94.10	97.39	95.40	97.40	0.000369	0.90	40.02	22.39	0.12
NM-113	4245	ULT 10Y	25.00	94.10	96.60	95.21	96.62	0.000672	1.04	23.97	16.91	0.15
NM-113	4245	ULT 25Y	32.00	94.10	96.97	95.33	96.98	0.000609	1.04	30.79	20.30	0.15
NM-113	4245	ULT 100Y	51.00	94.10	97.71	95.61	97.73	0.000450	1.08	47.29	23.23	0.13
NM-113	5178	EX 10Y	15.00	94.35	96.49	94.82	96.49	0.000144	0.52	28.67	17.96	0.07
NM-113	5178	EX 25Y	20.00	94.35	96.84	94.90	96.84	0.000143	0.57	35.20	19.26	0.07
NM-113	5178	EX 100Y	36.00	94.35	97.61	95.13	97.62	0.000159	0.70	51.12	21.70	0.08
NM-113	5178	ULT 10Y	25.00	94.35	96.92	94.98	96.93	0.000197	0.68	36.78	19.53	0.09
NM-113	5178	ULT 25Y	32.00	94.35	97.27	95.08	97.28	0.000195	0.73	43.87	20.70	0.09
NM-113	5178	ULT 100Y	51.00	94.35	97.99	95.31	98.00	0.000207	0.86	59.53	22.76	0.09
NM-113	6003	EX 10Y	3.00	94.44	96.56	94.90	96.56	0.000016	0.14	20.90	17.76	0.02
NM-113	6003	EX 25Y	4.00	94.44	96.91	94.96	96.91	0.000014	0.14	27.61	20.95	0.02
NM-113	6003	EX 100Y	7.00	94.44	97.68	95.09	97.68	0.000010	0.15	46.49	27.00	0.02
NM-113	6003	ULT 10Y	5.00	94.44	97.01	95.00	97.01	0.000018	0.17	29.87	21.94	0.03
NM-113	6003	ULT 25Y	6.00	94.44	97.36	95.05	97.36	0.000014	0.16	38.05	25.06	0.02
NM-113	6003	ULT 100Y	10.00	94.44	98.08	95.19	98.08	0.000012	0.17	57.62	29.36	0.02
NM-113	6838	EX 10Y	3.00	95.93	96.59	96.17	96.60	0.000497	0.42	7.11	16.24	0.11
NM-113	6838	EX 25Y	4.00	95.93	96.93	96.20	96.93	0.000140	0.31	12.83	17.72	0.06
NM-113	6838	EX 100Y	7.00	95.93	97.70	96.28	97.70	0.000042	0.25	27.69	21.09	0.04
NM-113	6838	ULT 10Y	5.00	95.93	97.04	96.23	97.04	0.000141	0.34	14.82	18.21	0.07
NM-113	6838	ULT 25Y	6.00	95.93	97.38	96.25	97.38	0.000069	0.28	21.20	19.69	0.05
NM-113	6838	ULT 100Y	10.00	95.93	98.09	96.34	98.09	0.000039	0.27	36.38	22.83	0.04
NM-113	7543	EX 10Y	3.00	100.84	101.16	101.16	101.25	0.055878	2.35	1.28	63.37	1.02
NM-113	7543	EX 25Y	4.00	100.84	101.20	101.20	101.30	0.052783	2.51	1.59	66.85	1.01
NM-113	7543	EX 100Y	7.00	100.84	101.30	101.30	101.42	0.047482	2.85	2.46	77.67	1.00
NM-113	7543	ULT 10Y	5.00	100.84	101.24	101.24	101.34	0.049199	2.62	1.91	70.11	1.00
NM-113	7543	ULT 25Y	6.00	100.84	101.27	101.27	101.38	0.044408	2.66	2.25	73.83	0.96

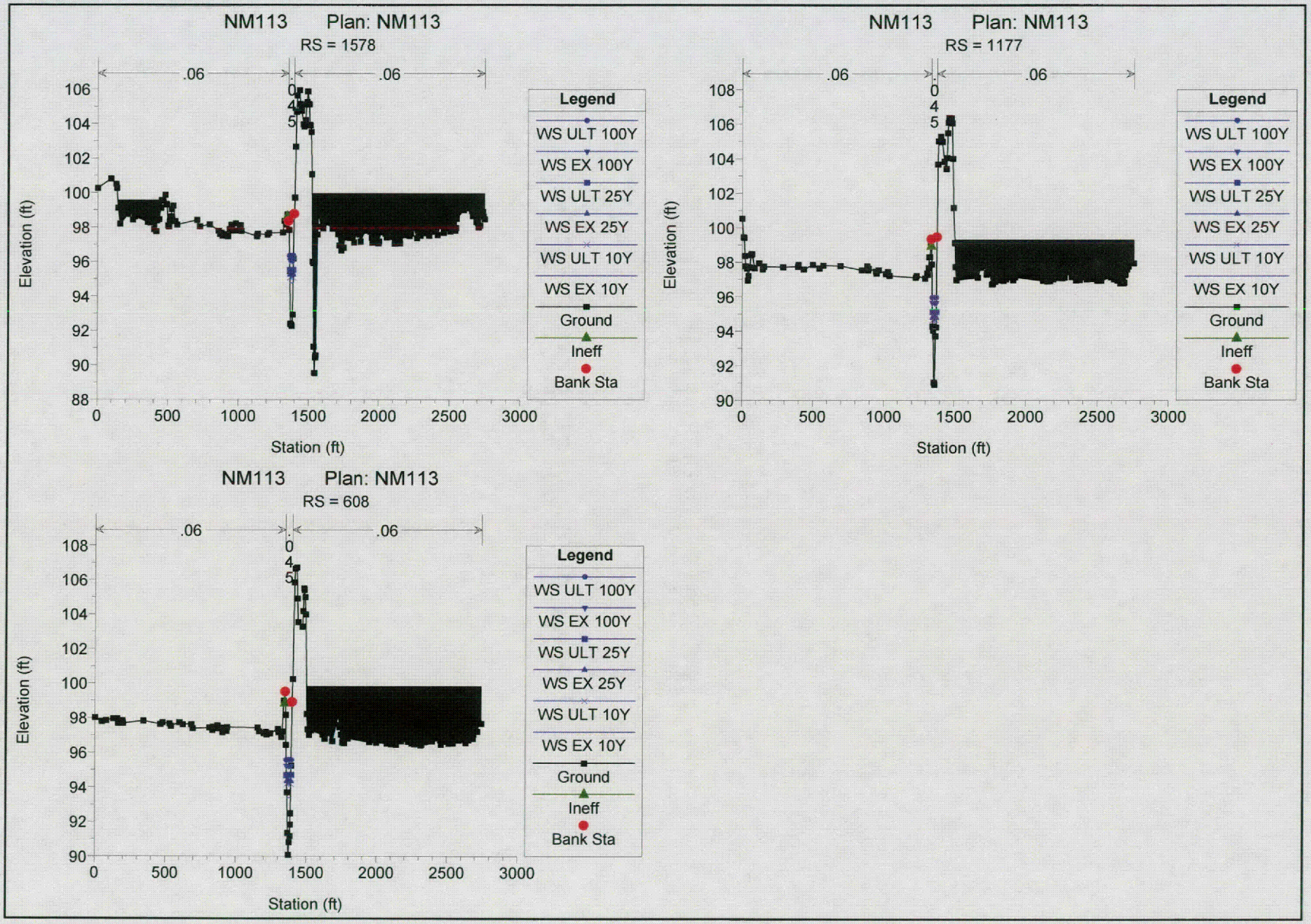
HEC-RAS Plan: BASE River: N-NM-113 Reach: NM-113 (Continued)

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)	
NM-113	7543	ULT 100Y	10.00	100.84	101.37	101.37	101.52	0.045745	3.11	3.22	96.57	1.01


NM113 Plan: NM113
N-NM-113 NM-113
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
106
104
102
100
98
96
94
92
90
0
2000
4000
6000
8000
Main Channel Distance (ft)

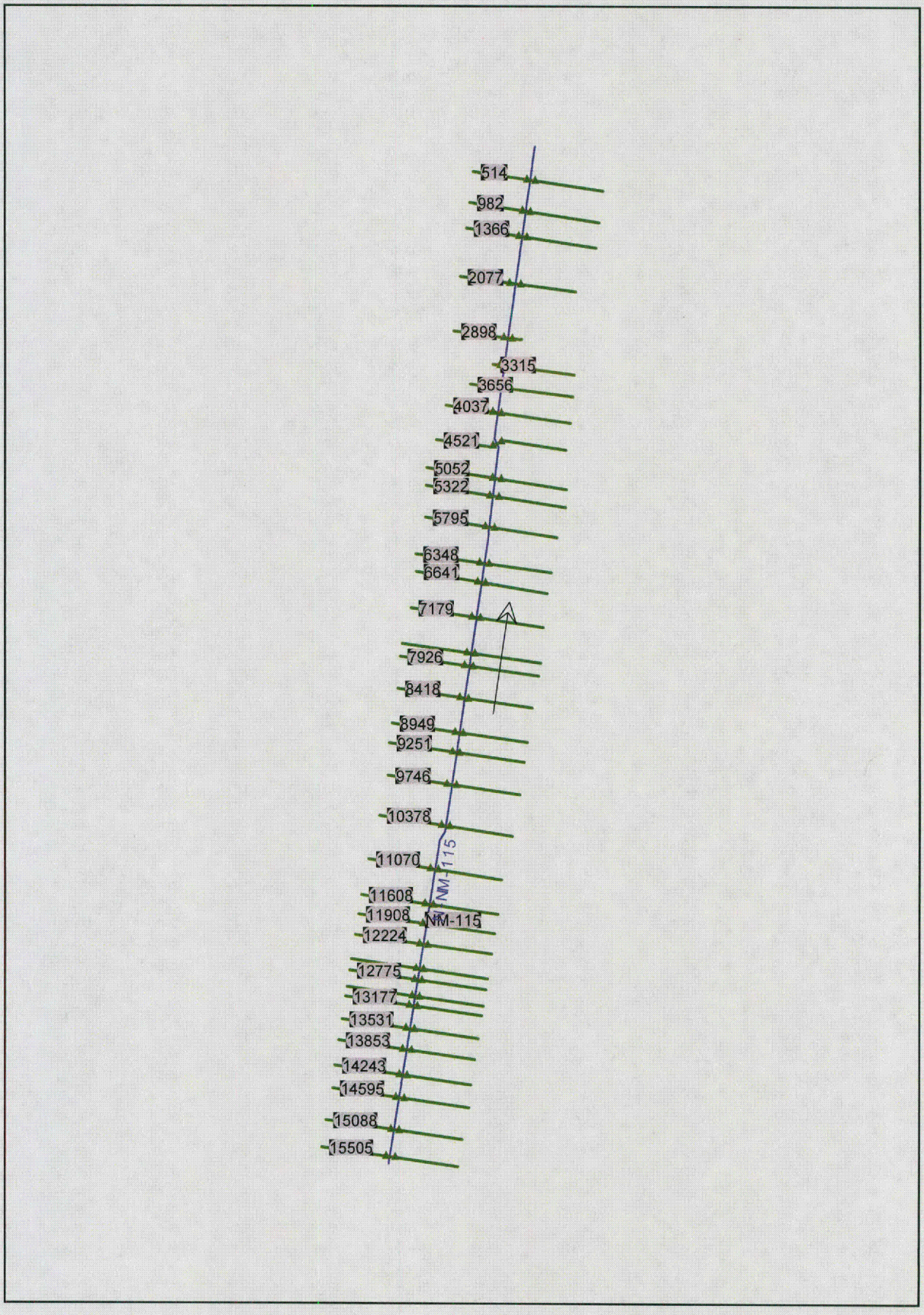

NM113 Plan: NM113
RS = 7543
.06
.06
0
4
5
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM113 Plan: NM113
RS = 6838
NM113 Plan: NM113
RS = 6003
NM113 Plan: NM113
RS = 5178


NM113 Plan: NM113
RS = 4245
.06
.06
0
4
5
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM113 Plan: NM113
RS = 3938
NM113 Plan: NM113
RS = 3118
NM113 Plan: NM113
RS = 2266


NM113 Plan: NM113
RS = 1578
.06
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM113 Plan: NM113
RS = 1177
.06
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM113 Plan: NM113
RS = 608
.06
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta

APPENDIX D
HEC-RAS HYDRAULIC OUTPUT

NM-115 BASE CONDITION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HEC-RAS Plan: BASE River: N-NM-115 Reach: NM-115

Reach	River Sta	Profile	Q Total	W.S. Elev	E.G. Elev	Min Ch El	Vel Chnl	Flow Area	Top Width	Volume
			(cfs)	(ft)	(ft)	(ft)	(ft/s)	(sq ft)	(ft)	(acre-ft)
NM-115	514	EX 10Y	387.20	99.29	99.34	93.53	1.69	229.02	74.34	
NM-115	514	EX 25Y	491.10	99.81	99.86	93.53	1.83	268.16	77.09	
NM-115	514	EX 100Y	707.70	100.75	100.81	93.53	2.06	342.72	82.15	
NM-115	514	ULT 10Y	390.00	99.31	99.35	93.53	1.69	230.12	74.41	
NM-115	514	ULT 25Y	500.00	99.85	99.90	93.53	1.84	271.40	77.32	
NM-115	514	ULT 100Y	710.00	100.75	100.82	93.53	2.07	343.48	82.20	
NM-115	982	EX 10Y	387.20	99.56	99.61	92.91	1.66	233.65	73.17	2.49
NM-115	982	EX 25Y	491.10	100.09	100.14	92.91	1.80	273.31	78.03	2.91
NM-115	982	EX 100Y	707.70	101.02	101.09	92.91	2.03	349.08	83.49	3.72
NM-115	982	ULT 10Y	390.00	99.58	99.62	92.91	1.66	234.75	73.33	2.50
NM-115	982	ULT 25Y	500.00	100.13	100.18	92.91	1.81	276.59	78.28	2.94
NM-115	982	ULT 100Y	710.00	101.03	101.10	92.91	2.03	349.85	83.54	3.72
NM-115	1366	EX 10Y	355.50	99.71	99.74	92.77	1.39	256.16	55.13	4.64
NM-115	1366	EX 25Y	450.30	100.25	100.29	92.77	1.57	286.39	57.43	5.37
NM-115	1366	EX 100Y	646.90	101.21	101.26	92.77	1.88	343.79	63.29	6.76
NM-115	1366	ULT 10Y	360.00	99.73	99.76	92.77	1.40	257.04	55.19	4.66
NM-115	1366	ULT 25Y	460.00	100.29	100.33	92.77	1.59	288.87	57.61	5.43
NM-115	1366	ULT 100Y	650.00	101.22	101.27	92.77	1.89	344.39	63.37	6.78
NM-115	2077	EX 10Y	355.50	99.88	99.89	92.47	1.08	329.35	85.48	9.42
NM-115	2077	EX 25Y	450.30	100.44	100.46	92.47	1.19	378.96	91.21	10.81
NM-115	2077	EX 100Y	646.90	101.43	101.46	92.47	1.37	473.42	98.05	13.44
NM-115	2077	ULT 10Y	360.00	99.89	99.91	92.47	1.09	330.91	85.66	9.46
NM-115	2077	ULT 25Y	460.00	100.48	100.51	92.47	1.20	383.20	91.68	10.92
NM-115	2077	ULT 100Y	650.00	101.44	101.47	92.47	1.37	474.45	98.12	13.47
NM-115	2898	EX 10Y	355.50	100.06	100.08	92.86	1.28	276.95	80.86	15.13
NM-115	2898	EX 25Y	450.30	100.63	100.66	92.86	1.39	324.56	85.17	17.43
NM-115	2898	EX 100Y	646.90	101.64	101.68	92.86	1.55	416.22	95.24	21.81
NM-115	2898	ULT 10Y	360.00	100.08	100.11	92.86	1.29	278.59	81.03	15.20
NM-115	2898	ULT 25Y	460.00	100.68	100.71	92.86	1.40	328.67	85.48	17.62
NM-115	2898	ULT 100Y	650.00	101.65	101.69	92.86	1.56	417.27	95.31	21.86
NM-115	3315	EX 10Y	355.50	100.27	100.35	95.31	2.18	163.31	76.18	17.24
NM-115	3315	EX 25Y	450.30	100.83	100.91	95.31	2.16	208.19	83.51	19.98
NM-115	3315	EX 100Y	646.90	101.83	101.90	95.31	2.18	297.02	93.64	25.24
NM-115	3315	ULT 10Y	360.00	100.29	100.37	95.31	2.18	164.92	76.46	17.33
NM-115	3315	ULT 25Y	460.00	100.88	100.96	95.31	2.17	212.24	84.11	20.22
NM-115	3315	ULT 100Y	650.00	101.84	101.92	95.31	2.18	298.08	93.73	25.29
NM-115	3656	EX 10Y	355.50	100.58	100.62	93.18	1.44	247.23	82.82	18.85
NM-115	3656	EX 25Y	450.30	101.13	101.17	93.18	1.52	296.46	96.07	21.96
NM-115	3656	EX 100Y	646.90	102.08	102.12	93.18	1.63	396.06	108.50	27.95
NM-115	3656	ULT 10Y	360.00	100.61	100.64	93.18	1.45	249.08	83.31	18.95
NM-115	3656	ULT 25Y	460.00	101.18	101.21	93.18	1.53	300.98	96.64	22.23
NM-115	3656	ULT 100Y	650.00	102.09	102.13	93.18	1.64	397.28	108.57	28.02
NM-115	4037	EX 10Y	280.20	100.72	100.73	94.43	1.02	274.08	84.82	21.13
NM-115	4037	EX 25Y	355.10	101.27	101.29	94.43	1.10	321.38	87.16	24.66
NM-115	4037	EX 100Y	508.60	102.22	102.24	94.43	1.25	406.09	91.60	31.46
NM-115	4037	ULT 10Y	290.00	100.74	100.76	94.43	1.05	276.16	84.92	21.25
NM-115	4037	ULT 25Y	360.00	101.32	101.33	94.43	1.11	325.47	87.36	24.97
NM-115	4037	ULT 100Y	510.00	102.23	102.25	94.43	1.25	407.13	91.65	31.53
NM-115	4521	EX 10Y	280.20	100.80	100.81	94.42	0.89	316.59	86.85	24.41
NM-115	4521	EX 25Y	355.10	101.35	101.37	94.42	0.97	365.13	89.22	28.48
NM-115	4521	EX 100Y	508.60	102.31	102.33	94.42	1.13	452.06	93.40	36.23
NM-115	4521	ULT 10Y	290.00	100.83	100.84	94.42	0.91	319.06	86.98	24.55
NM-115	4521	ULT 25Y	360.00	101.40	101.41	94.42	0.97	369.24	89.41	28.83
NM-115	4521	ULT 100Y	510.00	102.32	102.34	94.42	1.13	453.10	93.46	36.31
NM-115	5052	EX 10Y	280.20	100.89	100.91	94.54	1.14	244.98	77.94	27.83
NM-115	5052	EX 25Y	355.10	101.45	101.47	94.54	1.22	290.39	87.15	32.46

HEC-RAS Plan: BASE River: N-NM-115 Reach: NM-115 (Continued)

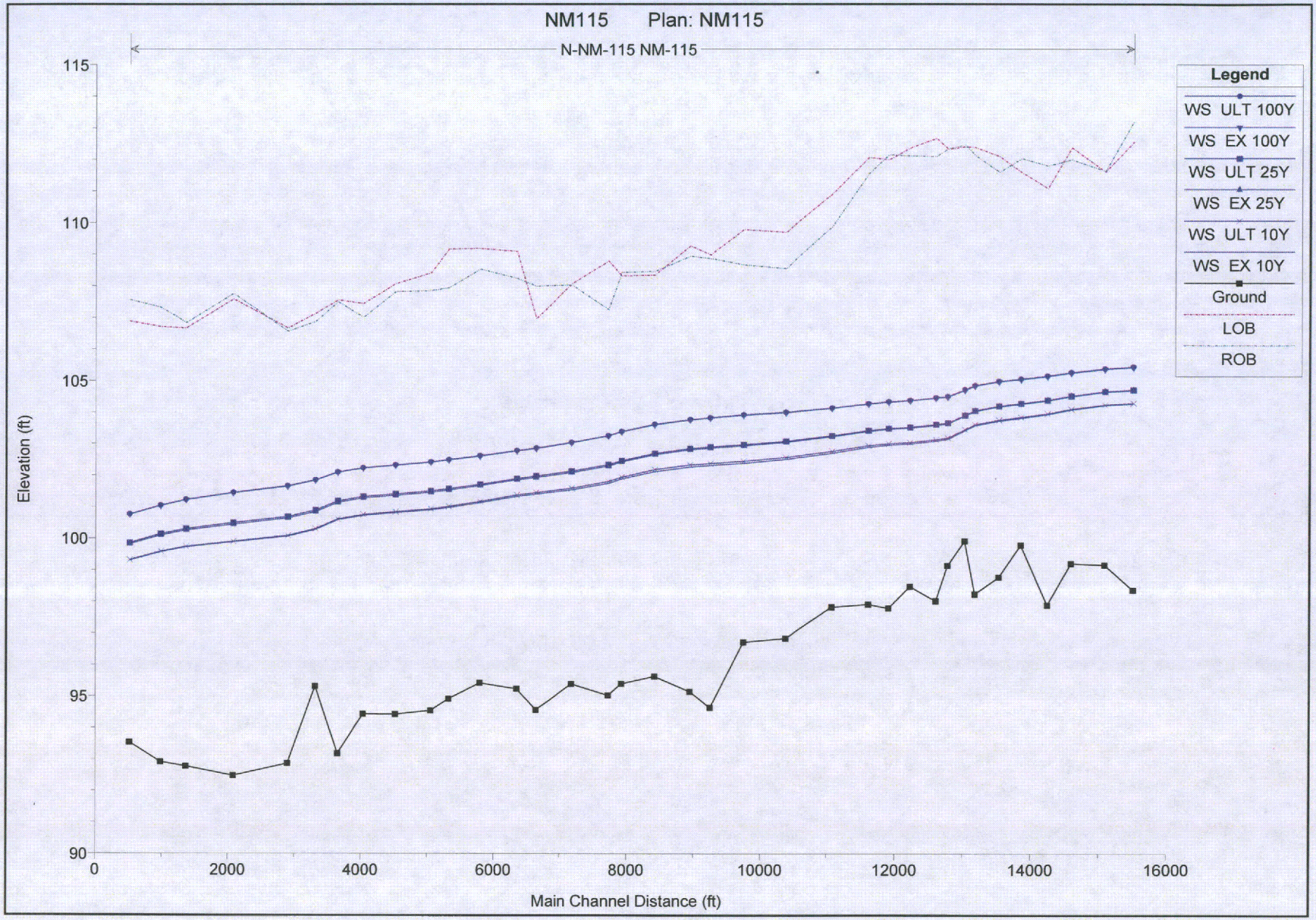
Reach	River Sta	Profile	Q Total	W.S. Elev	E.G. Elev	Min Ch El	Vel Chnl	Flow Area	Top Width	Volume
			(cfs)	(ft)	(ft)	(ft)	(ft/s)	(sq ft)	(ft)	(acre-ft)
NM-115	5052	EX 100Y	508.60	102.40	102.43	94.54	1.35	377.74	95.10	41.27
NM-115	5052	ULT 10Y	290.00	100.92	100.95	94.54	1.17	247.51	78.21	28.00
NM-115	5052	ULT 25Y	360.00	101.49	101.52	94.54	1.22	294.35	87.59	32.86
NM-115	5052	ULT 100Y	510.00	102.41	102.44	94.54	1.35	378.79	95.17	41.37
NM-115	5322	EX 10Y	280.20	100.97	100.99	94.91	1.08	258.37	92.05	29.39
NM-115	5322	EX 25Y	355.10	101.52	101.54	94.91	1.14	310.37	95.22	34.33
NM-115	5322	EX 100Y	508.60	102.47	102.50	94.91	1.26	403.29	99.99	43.69
NM-115	5322	ULT 10Y	290.00	101.00	101.02	94.91	1.11	261.62	92.31	29.58
NM-115	5322	ULT 25Y	360.00	101.57	101.59	94.91	1.14	314.60	95.46	34.75
NM-115	5322	ULT 100Y	510.00	102.49	102.51	94.91	1.26	404.37	100.04	43.80
NM-115	5795	EX 10Y	280.20	101.12	101.15	95.41	1.25	224.97	86.00	32.01
NM-115	5795	EX 25Y	355.10	101.66	101.69	95.41	1.31	272.09	88.65	37.49
NM-115	5795	EX 100Y	508.60	102.60	102.63	95.41	1.42	357.31	93.15	47.82
NM-115	5795	ULT 10Y	290.00	101.16	101.19	95.41	1.27	228.37	86.22	32.24
NM-115	5795	ULT 25Y	360.00	101.70	101.73	95.41	1.31	275.85	88.85	37.96
NM-115	5795	ULT 100Y	510.00	102.61	102.64	95.41	1.42	358.28	93.20	47.94
NM-115	6348	EX 10Y	280.20	101.33	101.35	95.23	1.14	244.89	90.74	34.99
NM-115	6348	EX 25Y	355.10	101.85	101.87	95.23	1.21	293.63	95.70	41.08
NM-115	6348	EX 100Y	508.60	102.77	102.79	95.23	1.32	384.21	101.01	52.53
NM-115	6348	ULT 10Y	290.00	101.37	101.39	95.23	1.17	248.90	91.16	35.27
NM-115	6348	ULT 25Y	360.00	101.89	101.91	95.23	1.21	297.46	96.08	41.59
NM-115	6348	ULT 100Y	510.00	102.78	102.80	95.23	1.32	385.22	101.06	52.66
NM-115	6641	EX 10Y	280.20	101.40	101.42	94.56	1.27	221.06	49.05	36.56
NM-115	6641	EX 25Y	355.10	101.93	101.96	94.56	1.43	248.21	54.39	42.90
NM-115	6641	EX 100Y	508.60	102.84	102.89	94.56	1.69	301.80	61.90	54.84
NM-115	6641	ULT 10Y	290.00	101.44	101.47	94.56	1.30	223.34	49.30	36.86
NM-115	6641	ULT 25Y	360.00	101.96	102.00	94.56	1.44	250.39	54.84	43.44
NM-115	6641	ULT 100Y	510.00	102.85	102.90	94.56	1.69	302.41	61.98	54.97
NM-115	7179	EX 10Y	280.20	101.53	101.55	95.38	1.18	237.73	75.06	39.39
NM-115	7179	EX 25Y	355.10	102.08	102.11	95.38	1.27	280.39	79.96	46.17
NM-115	7179	EX 100Y	508.60	103.02	103.05	95.38	1.42	358.57	85.85	58.92
NM-115	7179	ULT 10Y	290.00	101.58	101.61	95.38	1.20	241.59	75.65	39.73
NM-115	7179	ULT 25Y	360.00	102.12	102.15	95.38	1.27	283.61	80.21	46.73
NM-115	7179	ULT 100Y	510.00	103.03	103.06	95.38	1.42	359.42	85.91	59.06
NM-115	7728	EX 10Y	280.20	101.74	101.78	95.02	1.67	167.44	57.09	41.95
NM-115	7728	EX 25Y	355.10	102.29	102.34	95.02	1.78	199.98	62.00	49.19
NM-115	7728	EX 100Y	508.60	103.24	103.29	95.02	1.88	270.62	82.09	62.88
NM-115	7728	ULT 10Y	290.00	101.80	101.84	95.02	1.70	170.64	57.59	42.32
NM-115	7728	ULT 25Y	360.00	102.33	102.38	95.02	1.78	202.40	62.35	49.80
NM-115	7728	ULT 100Y	510.00	103.25	103.30	95.02	1.88	271.40	82.18	63.04
NM-115	7926	EX 10Y	280.20	101.87	101.92	95.39	1.62	172.60	64.13	42.72
NM-115	7926	EX 25Y	355.10	102.42	102.46	95.39	1.70	209.28	70.46	50.12
NM-115	7926	EX 100Y	508.60	103.37	103.42	95.39	1.81	281.48	83.83	64.14
NM-115	7926	ULT 10Y	290.00	101.93	101.97	95.39	1.64	176.34	64.81	43.11
NM-115	7926	ULT 25Y	360.00	102.46	102.50	95.39	1.70	211.97	70.84	50.74
NM-115	7926	ULT 100Y	510.00	103.38	103.43	95.39	1.81	282.24	83.92	64.29
NM-115	8418	EX 10Y	280.20	102.11	102.13	95.62	1.21	231.51	74.82	45.00
NM-115	8418	EX 25Y	355.10	102.65	102.68	95.62	1.30	273.57	79.78	52.85
NM-115	8418	EX 100Y	508.60	103.60	103.63	95.62	1.44	352.60	87.35	67.72
NM-115	8418	ULT 10Y	290.00	102.17	102.19	95.62	1.23	236.14	75.59	45.44
NM-115	8418	ULT 25Y	360.00	102.69	102.71	95.62	1.30	276.51	80.04	53.50
NM-115	8418	ULT 100Y	510.00	103.61	103.64	95.62	1.44	353.37	87.42	67.88
NM-115	8949	EX 10Y	280.20	102.26	102.27	95.14	1.11	253.30	76.25	47.95
NM-115	8949	EX 25Y	355.10	102.80	102.82	95.14	1.20	296.88	82.28	56.32
NM-115	8949	EX 100Y	508.60	103.75	103.78	95.14	1.34	378.39	89.23	72.16
NM-115	8949	ULT 10Y	290.00	102.32	102.34	95.14	1.12	258.29	77.66	48.45

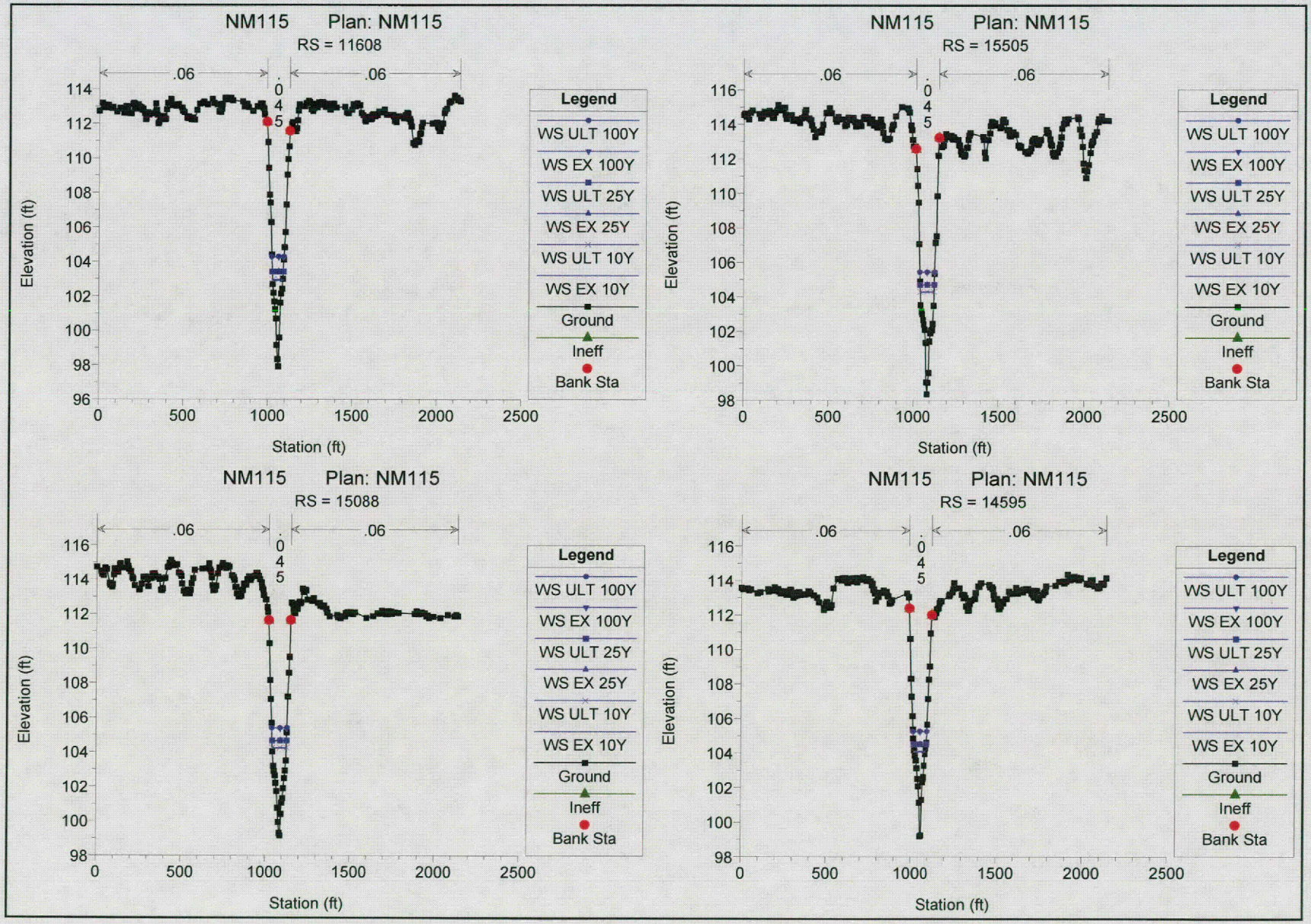
HEC-RAS Plan: BASE River: N-NM-115 Reach: NM-115 (Continued)

Reach	River Sta	Profile	Q Total	W.S. Elev	E.G. Elev	Min Ch El	Vel Chnl	Flow Area	Top Width	Volume
			(cfs)	(ft)	(ft)	(ft)	(ft/s)	(sq ft)	(ft)	(acre-ft)
NM-115	8949	ULT 25Y	360.00	102.84	102.86	95.14	1.20	299.88	82.56	57.00
NM-115	8949	ULT 100Y	510.00	103.76	103.79	95.14	1.35	379.16	89.28	72.34
NM-115	9251	EX 10Y	280.20	102.30	102.32	94.63	1.00	280.32	51.04	49.80
NM-115	9251	EX 25Y	355.10	102.85	102.88	94.63	1.15	308.87	52.72	58.42
NM-115	9251	EX 100Y	508.60	103.81	103.84	94.63	1.41	360.56	55.62	74.72
NM-115	9251	ULT 10Y	290.00	102.37	102.39	94.63	1.02	283.71	51.24	50.33
NM-115	9251	ULT 25Y	360.00	102.89	102.91	94.63	1.16	310.80	52.83	59.12
NM-115	9251	ULT 100Y	510.00	103.82	103.85	94.63	1.41	361.05	55.64	74.91
NM-115	9746	EX 10Y	148.70	102.37	102.38	96.71	0.71	210.60	90.64	52.60
NM-115	9746	EX 25Y	188.90	102.93	102.94	96.71	0.72	263.98	99.49	61.68
NM-115	9746	EX 100Y	268.00	103.90	103.91	96.71	0.74	363.96	106.47	78.85
NM-115	9746	ULT 10Y	150.00	102.44	102.45	96.71	0.69	216.74	91.55	53.18
NM-115	9746	ULT 25Y	190.00	102.97	102.98	96.71	0.71	267.64	99.81	62.41
NM-115	9746	ULT 100Y	270.00	103.91	103.92	96.71	0.74	364.92	106.53	79.04
NM-115	10378	EX 10Y	148.70	102.50	102.51	96.83	0.96	154.10	68.25	55.24
NM-115	10378	EX 25Y	188.90	103.04	103.05	96.83	0.97	195.05	78.30	65.01
NM-115	10378	EX 100Y	268.00	103.98	104.00	96.83	0.98	272.71	86.49	83.47
NM-115	10378	ULT 10Y	150.00	102.56	102.57	96.83	0.95	158.46	72.26	55.90
NM-115	10378	ULT 25Y	190.00	103.07	103.09	96.83	0.96	197.68	78.59	65.79
NM-115	10378	ULT 100Y	270.00	103.99	104.01	96.83	0.99	273.53	86.58	83.67
NM-115	11070	EX 10Y	148.70	102.70	102.71	97.82	0.95	156.27	67.18	57.71
NM-115	11070	EX 25Y	188.90	103.22	103.23	97.82	0.97	193.95	75.49	68.10
NM-115	11070	EX 100Y	268.00	104.12	104.14	97.82	1.01	264.82	81.66	87.74
NM-115	11070	ULT 10Y	150.00	102.75	102.77	97.82	0.94	160.19	68.37	58.43
NM-115	11070	ULT 25Y	190.00	103.25	103.26	97.82	0.97	196.16	75.78	68.92
NM-115	11070	ULT 100Y	270.00	104.13	104.15	97.82	1.02	265.66	81.73	87.95
NM-115	11608	EX 10Y	148.70	102.89	102.91	97.91	1.19	124.51	59.62	59.44
NM-115	11608	EX 25Y	188.90	103.39	103.41	97.91	1.22	155.45	63.76	70.26
NM-115	11608	EX 100Y	268.00	104.25	104.28	97.91	1.26	213.42	70.48	90.70
NM-115	11608	ULT 10Y	150.00	102.94	102.96	97.91	1.18	127.46	60.20	60.21
NM-115	11608	ULT 25Y	190.00	103.41	103.43	97.91	1.21	157.09	63.95	71.10
NM-115	11608	ULT 100Y	270.00	104.26	104.29	97.91	1.26	214.20	70.60	90.92
NM-115	11908	EX 10Y	148.70	102.95	102.96	97.78	0.72	207.54	54.28	60.59
NM-115	11908	EX 25Y	188.90	103.45	103.46	97.78	0.80	235.09	55.95	71.61
NM-115	11908	EX 100Y	268.00	104.32	104.33	97.78	0.94	284.69	58.85	92.41
NM-115	11908	ULT 10Y	150.00	103.00	103.01	97.78	0.71	210.12	54.43	61.37
NM-115	11908	ULT 25Y	190.00	103.48	103.49	97.78	0.80	236.49	56.03	72.46
NM-115	11908	ULT 100Y	270.00	104.33	104.34	97.78	0.95	285.36	58.89	92.64
NM-115	12224	EX 10Y	148.70	102.99	103.00	98.47	0.92	162.40	64.49	61.93
NM-115	12224	EX 25Y	188.90	103.49	103.51	98.47	0.97	195.56	67.63	73.17
NM-115	12224	EX 100Y	268.00	104.36	104.37	98.47	1.05	256.46	72.90	94.37
NM-115	12224	ULT 10Y	150.00	103.04	103.05	98.47	0.91	165.40	64.84	62.74
NM-115	12224	ULT 25Y	190.00	103.52	103.53	98.47	0.96	197.23	67.78	74.03
NM-115	12224	ULT 100Y	270.00	104.37	104.39	98.47	1.05	257.31	72.97	94.61
NM-115	12605	EX 10Y	148.70	103.08	103.09	98.01	0.97	153.09	59.08	63.31
NM-115	12605	EX 25Y	188.90	103.58	103.59	98.01	1.03	183.64	63.71	74.83
NM-115	12605	EX 100Y	268.00	104.44	104.46	98.01	1.11	241.24	72.20	96.55
NM-115	12605	ULT 10Y	150.00	103.12	103.14	98.01	0.96	155.67	59.49	64.14
NM-115	12605	ULT 25Y	190.00	103.60	103.62	98.01	1.03	185.14	63.86	75.70
NM-115	12605	ULT 100Y	270.00	104.45	104.47	98.01	1.12	242.11	72.40	96.79
NM-115	12775	EX 10Y	148.70	103.13	103.18	99.13	1.66	89.36	40.52	63.79
NM-115	12775	EX 25Y	188.90	103.63	103.67	99.13	1.71	110.20	44.10	75.40
NM-115	12775	EX 100Y	268.00	104.48	104.53	99.13	1.78	150.51	50.19	97.32
NM-115	12775	ULT 10Y	150.00	103.18	103.22	99.13	1.65	91.06	40.82	64.62
NM-115	12775	ULT 25Y	190.00	103.65	103.69	99.13	1.71	111.21	44.27	76.29
NM-115	12775	ULT 100Y	270.00	104.49	104.54	99.13	1.79	151.13	50.27	97.57

HEC-RAS Plan: BASE River: N-NM-115 Reach: NM-115 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	W.S. Elev (ft)	E.G. Elev (ft)	Min Ch El (ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Volume (acre-ft)
NM-115	13028	EX 10Y	148.70	103.41	103.46	99.91	1.89	78.81	40.96	64.27
NM-115	13028	EX 25Y	188.90	103.87	103.93	99.91	1.91	99.06	46.62	76.01
NM-115	13028	EX 100Y	268.00	104.69	104.75	99.91	1.89	142.02	60.87	98.17
NM-115	13028	ULT 10Y	150.00	103.44	103.50	99.91	1.87	80.16	41.30	65.12
NM-115	13028	ULT 25Y	190.00	103.89	103.95	99.91	1.90	99.98	46.85	76.90
NM-115	13028	ULT 100Y	270.00	104.71	104.76	99.91	1.89	142.81	61.09	98.42
NM-115	13177	EX 10Y	148.70	103.56	103.59	98.23	1.39	107.03	43.67	64.59
NM-115	13177	EX 25Y	188.90	104.02	104.05	98.23	1.47	128.20	48.85	76.40
NM-115	13177	EX 100Y	268.00	104.82	104.86	98.23	1.57	170.94	57.26	98.70
NM-115	13177	ULT 10Y	150.00	103.59	103.62	98.23	1.38	108.33	44.00	65.44
NM-115	13177	ULT 25Y	190.00	104.04	104.07	98.23	1.47	129.10	49.07	77.29
NM-115	13177	ULT 100Y	270.00	104.84	104.88	98.23	1.57	171.70	57.39	98.95
NM-115	13531	EX 10Y	148.70	103.72	103.73	98.76	0.91	163.02	73.83	65.69
NM-115	13531	EX 25Y	188.90	104.17	104.18	98.76	0.96	197.33	77.25	77.72
NM-115	13531	EX 100Y	268.00	104.96	104.98	98.76	1.03	260.82	82.87	100.46
NM-115	13531	ULT 10Y	150.00	103.74	103.76	98.76	0.91	165.03	74.04	66.55
NM-115	13531	ULT 25Y	190.00	104.19	104.20	98.76	0.96	198.66	77.37	78.62
NM-115	13531	ULT 100Y	270.00	104.98	104.99	98.76	1.03	261.95	82.97	100.72
NM-115	13853	EX 10Y	148.70	103.80	103.82	99.78	0.93	160.59	73.52	66.88
NM-115	13853	EX 25Y	188.90	104.25	104.27	99.78	0.97	194.66	78.52	79.17
NM-115	13853	EX 100Y	268.00	105.03	105.05	99.78	1.04	258.71	85.14	102.38
NM-115	13853	ULT 10Y	150.00	103.83	103.84	99.78	0.92	162.48	73.86	67.76
NM-115	13853	ULT 25Y	190.00	104.27	104.28	99.78	0.97	195.96	78.66	80.08
NM-115	13853	ULT 100Y	270.00	105.05	105.06	99.78	1.04	259.89	85.25	102.65
NM-115	14243	EX 10Y	148.70	103.92	103.94	97.88	0.97	153.42	72.72	68.29
NM-115	14243	EX 25Y	188.90	104.36	104.38	97.88	1.02	186.07	76.69	80.87
NM-115	14243	EX 100Y	268.00	105.13	105.15	97.88	1.09	246.87	81.70	104.64
NM-115	14243	ULT 10Y	150.00	103.95	103.96	97.88	0.97	155.16	72.94	69.18
NM-115	14243	ULT 25Y	190.00	104.38	104.39	97.88	1.01	187.28	76.81	81.79
NM-115	14243	ULT 100Y	270.00	105.14	105.16	97.88	1.09	248.01	81.79	104.92
NM-115	14595	EX 10Y	148.70	104.07	104.09	99.20	1.21	123.17	65.22	69.40
NM-115	14595	EX 25Y	188.90	104.49	104.52	99.20	1.23	153.28	75.54	82.24
NM-115	14595	EX 100Y	268.00	105.24	105.26	99.20	1.26	213.33	84.43	106.49
NM-115	14595	ULT 10Y	150.00	104.09	104.11	99.20	1.20	124.61	65.92	70.31
NM-115	14595	ULT 25Y	190.00	104.51	104.53	99.20	1.23	154.39	75.87	83.17
NM-115	14595	ULT 100Y	270.00	105.25	105.28	99.20	1.26	214.50	84.55	106.78
NM-115	15088	EX 10Y	148.70	104.21	104.21	99.15	0.71	209.60	82.68	71.29
NM-115	15088	EX 25Y	188.90	104.63	104.64	99.15	0.77	245.14	85.27	84.50
NM-115	15088	EX 100Y	268.00	105.36	105.37	99.15	0.87	309.10	89.58	109.45
NM-115	15088	ULT 10Y	150.00	104.23	104.24	99.15	0.71	211.33	82.81	72.21
NM-115	15088	ULT 25Y	190.00	104.64	104.65	99.15	0.77	246.34	85.35	85.44
NM-115	15088	ULT 100Y	270.00	105.38	105.39	99.15	0.87	310.35	89.66	109.75
NM-115	15505	EX 10Y	148.70	104.26	104.27	98.35	0.67	222.56	84.72	73.35
NM-115	15505	EX 25Y	188.90	104.68	104.69	98.35	0.73	259.04	87.44	86.91
NM-115	15505	EX 100Y	268.00	105.42	105.43	98.35	0.83	324.51	91.39	112.48
NM-115	15505	ULT 10Y	150.00	104.28	104.29	98.35	0.67	224.30	84.86	74.30
NM-115	15505	ULT 25Y	190.00	104.70	104.71	98.35	0.73	260.25	87.53	87.86
NM-115	15505	ULT 100Y	270.00	105.43	105.44	98.35	0.83	325.80	91.46	112.80


NM115 Plan: NM115
N-NM-115 NM-115
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
115
110
105
100
95
90
0
2000
4000
6000
8000
10000
12000
14000
16000
Main Channel Distance (ft)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.06
.045
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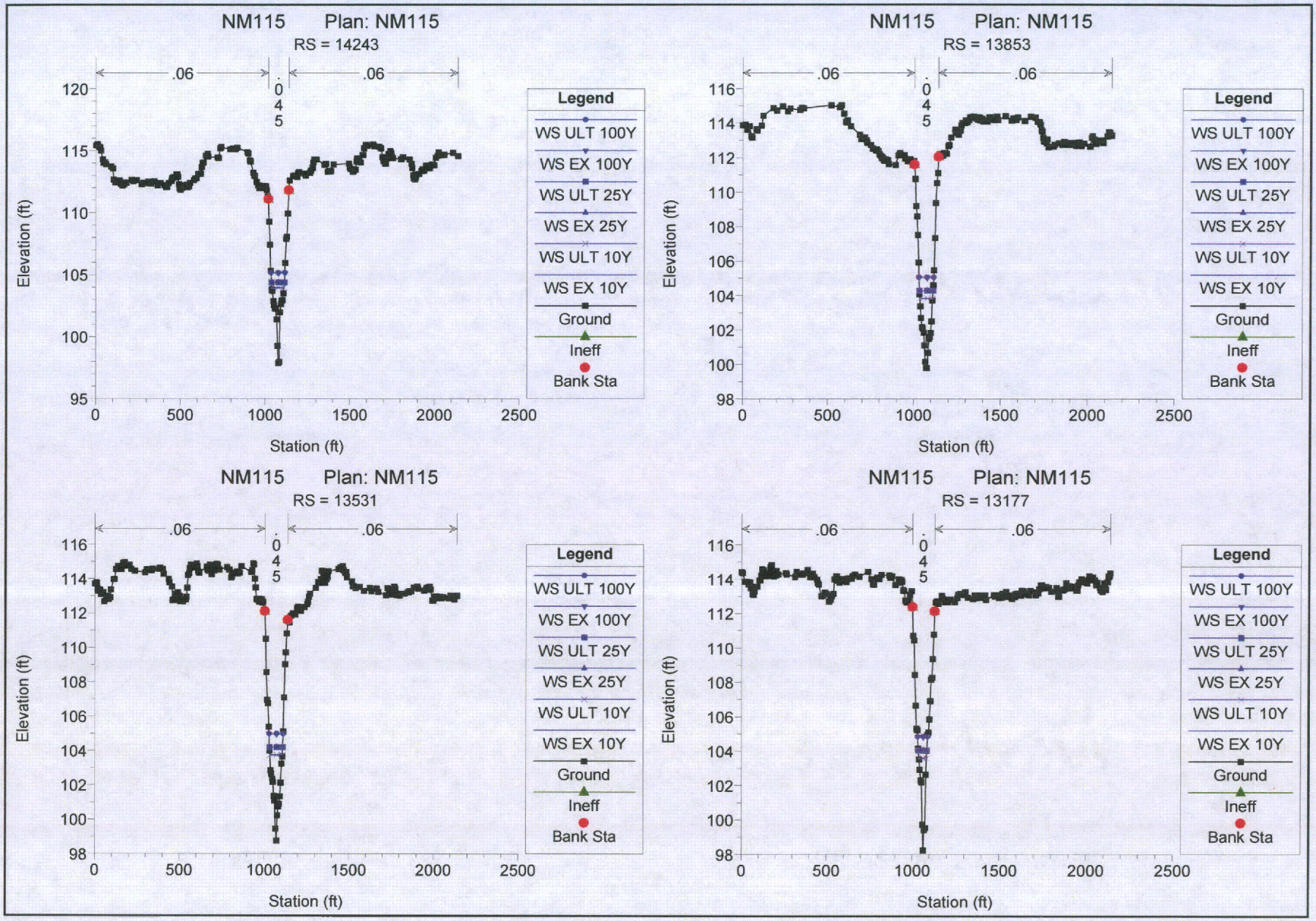
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM115 Plan: NM115
RS = 15505
NM115 Plan: NM115
RS = 15088
NM115 Plan: NM115
RS = 14595


NM115 Plan: NM115
RS = 14243
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.045
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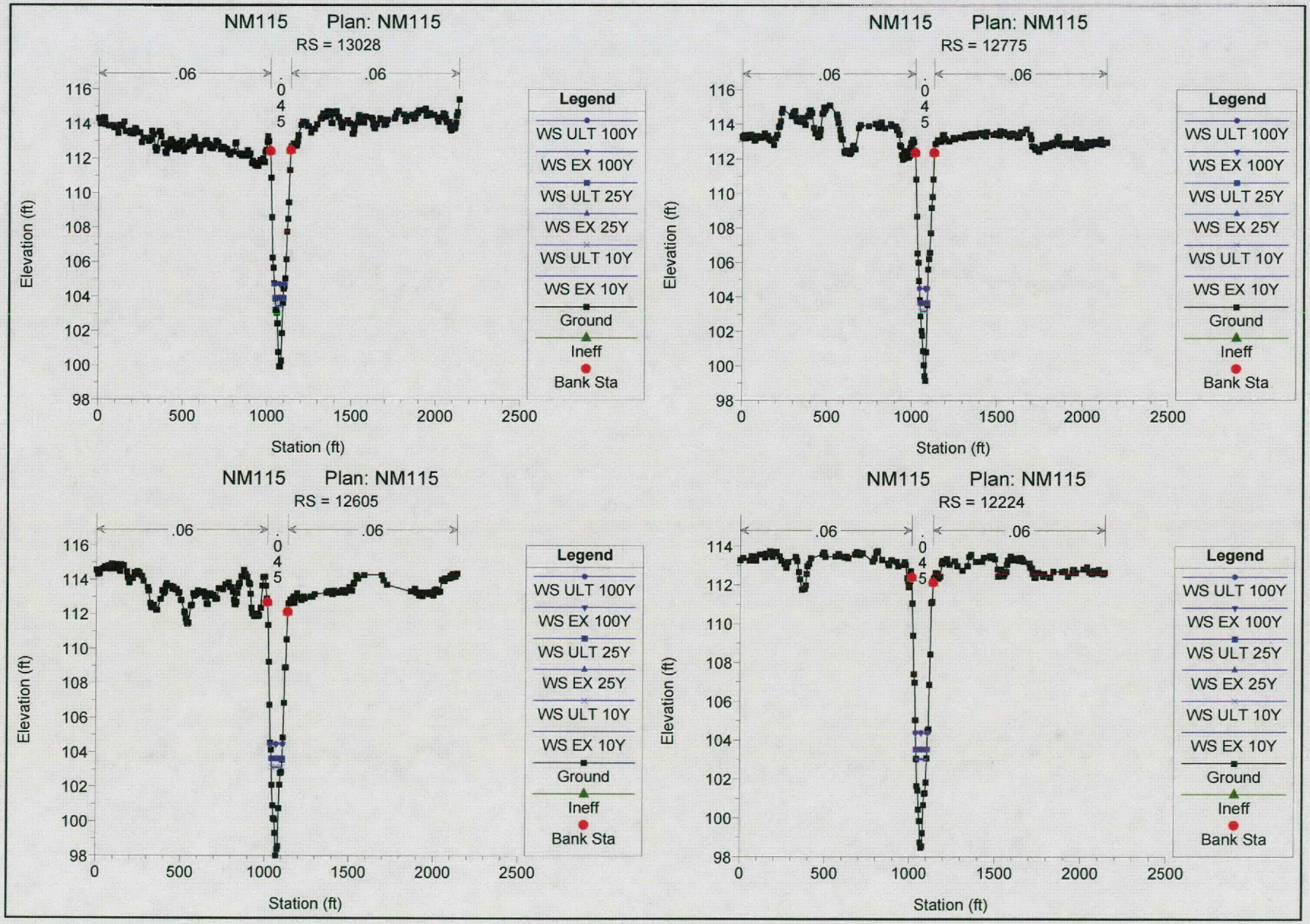
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM115 Plan: NM115
RS = 13853
NM115 Plan: NM115
RS = 13531
NM115 Plan: NM115
RS = 13177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.06
.045
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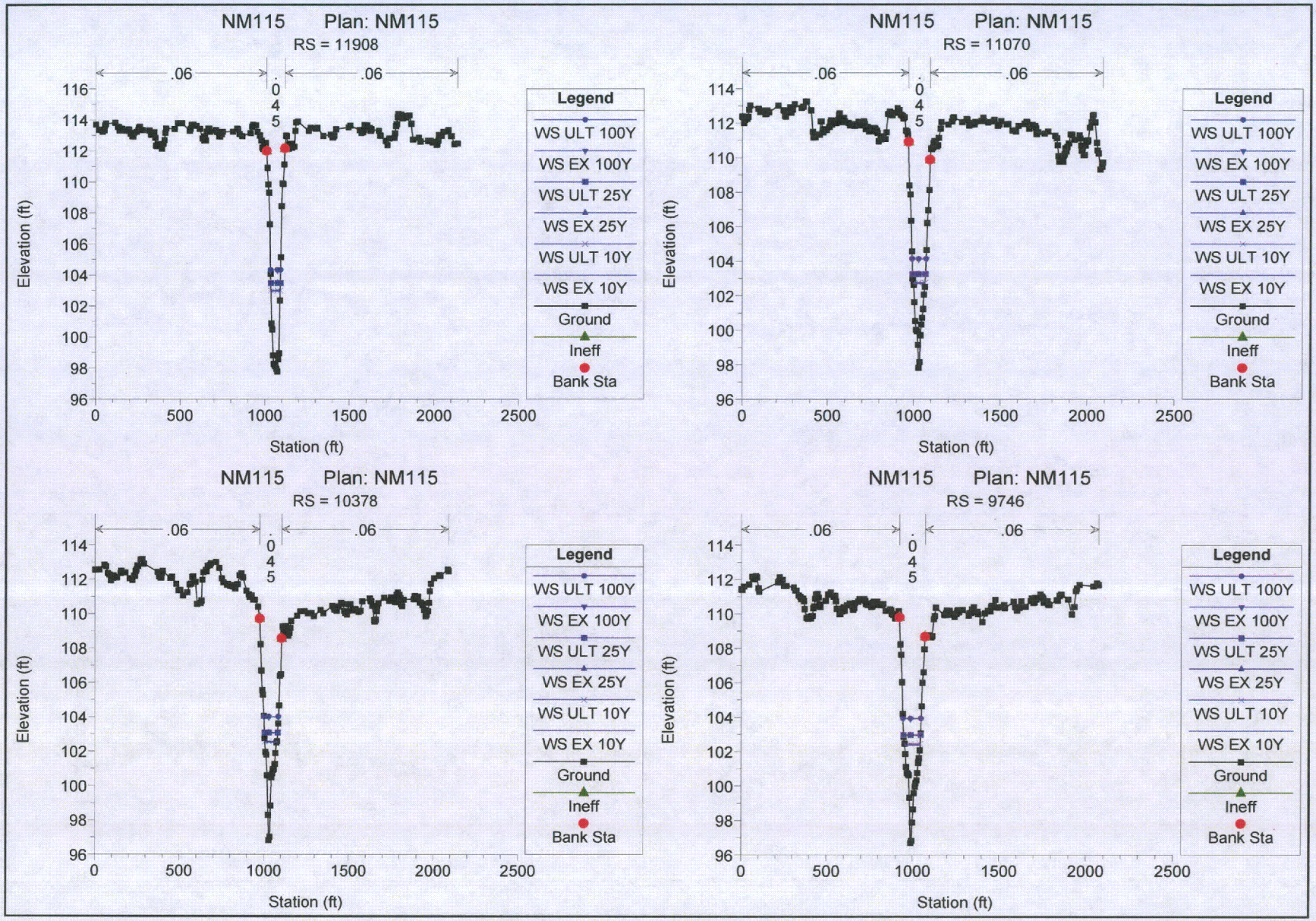
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM115 Plan: NM115
RS = 12775
NM115 Plan: NM115
RS = 12605
NM115 Plan: NM115
RS = 12224


NM115 Plan: NM115
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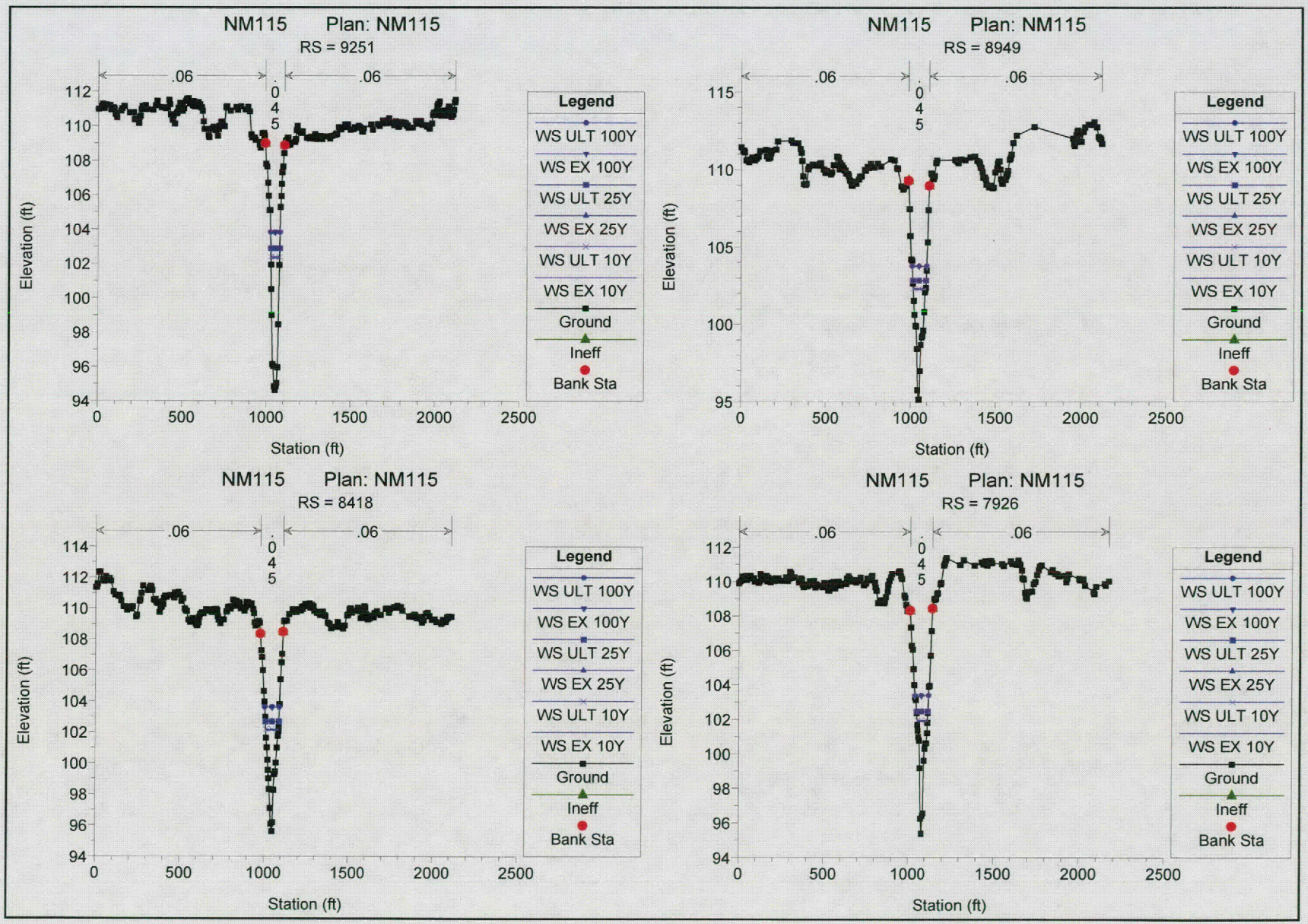
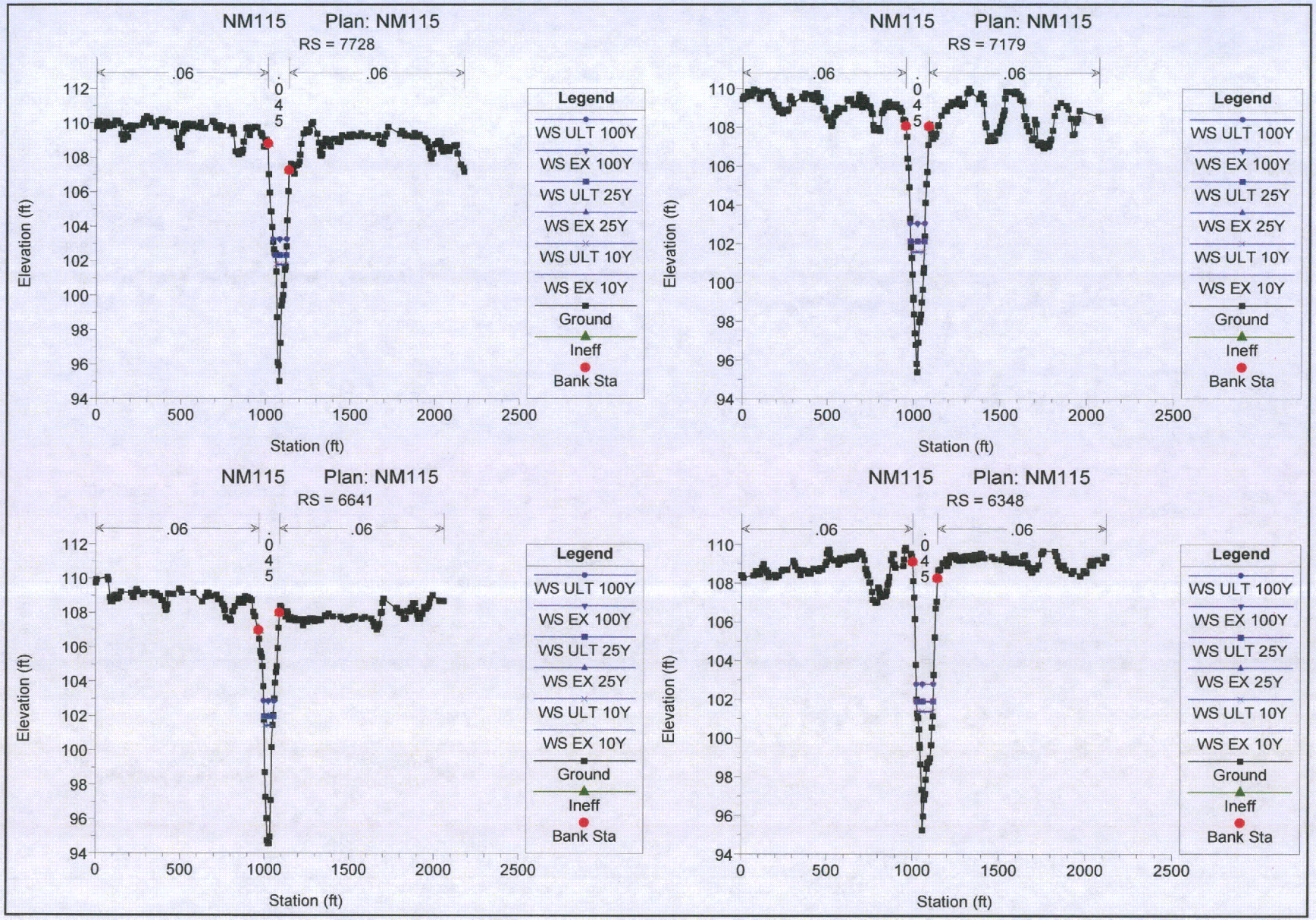
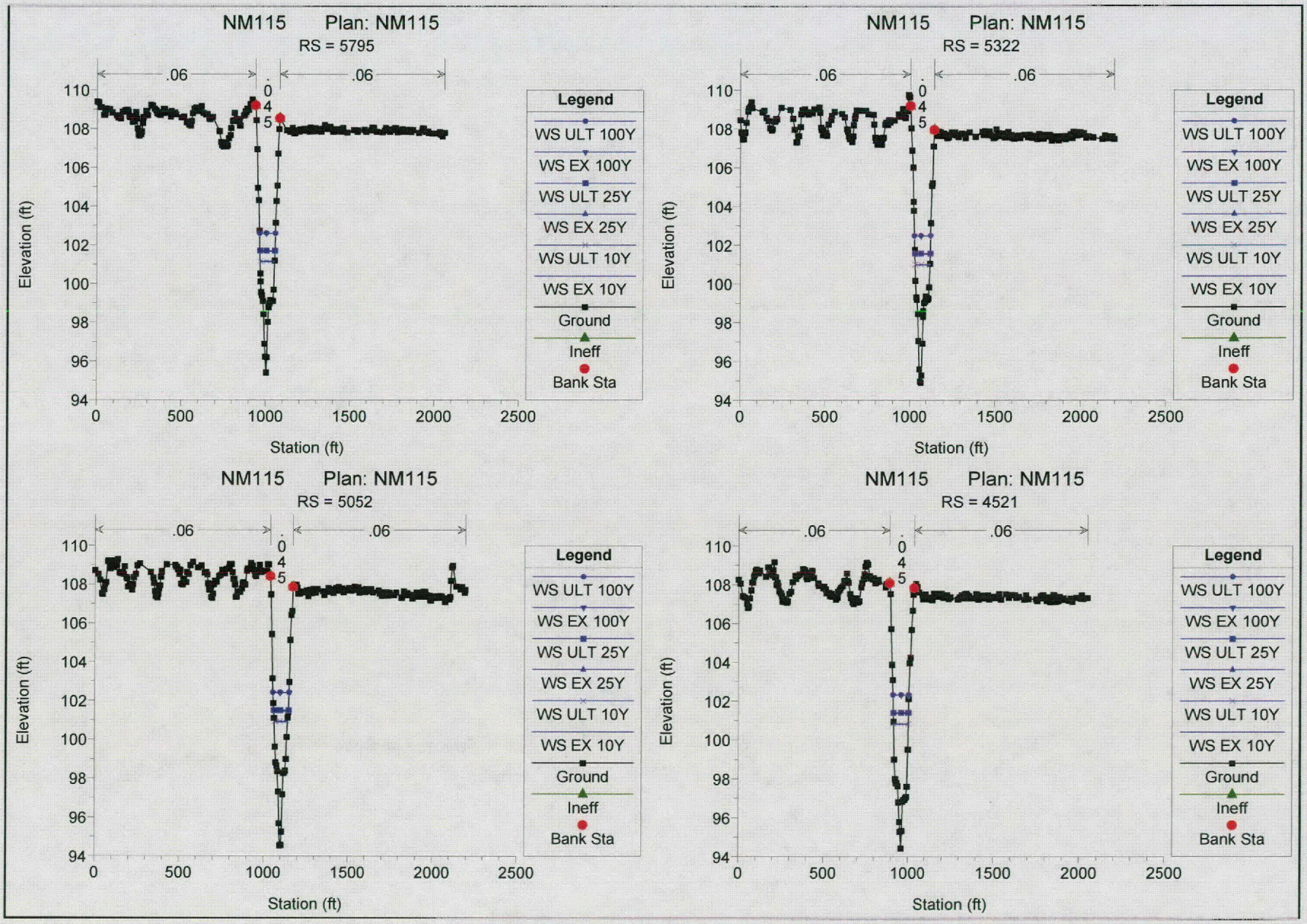
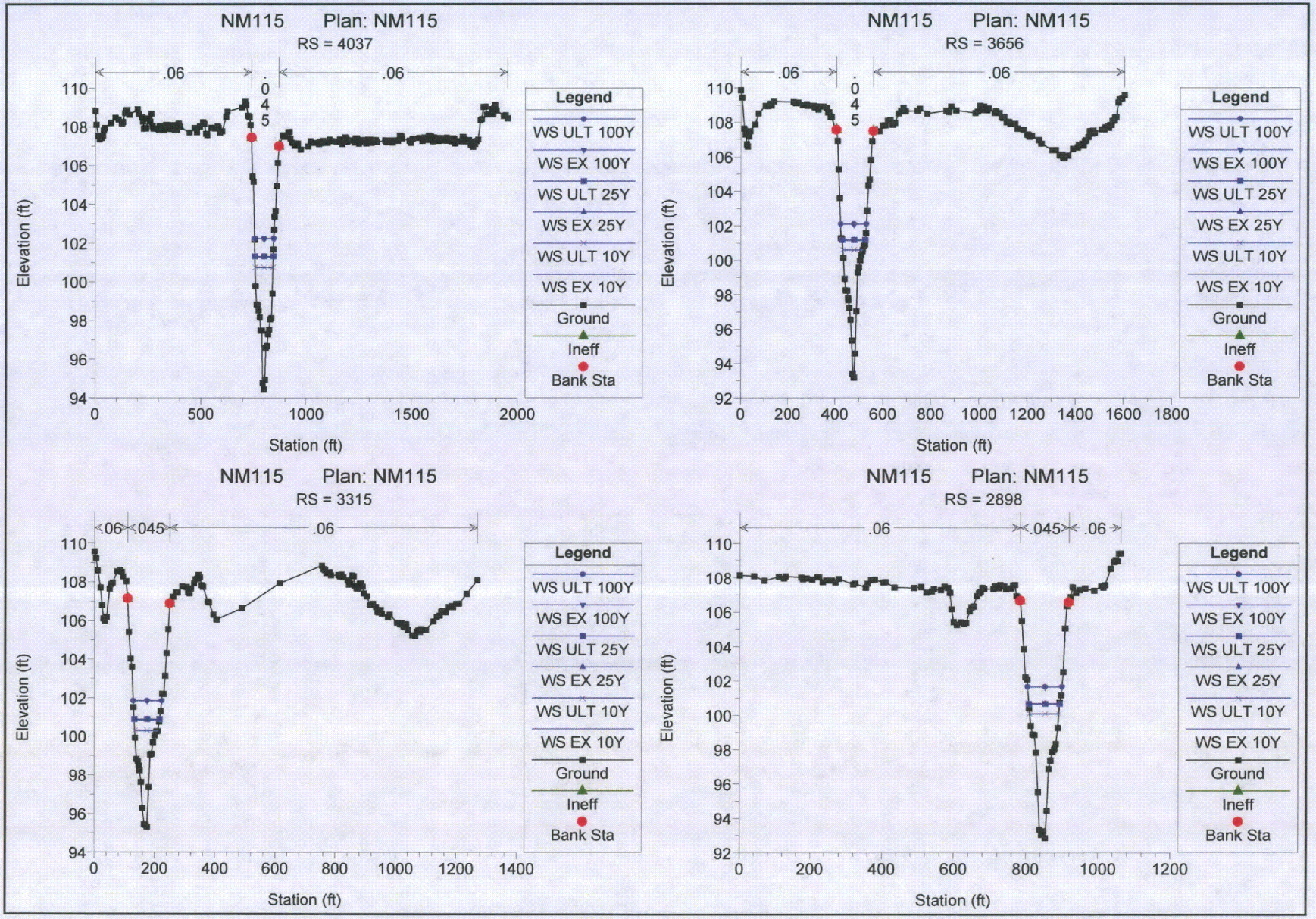
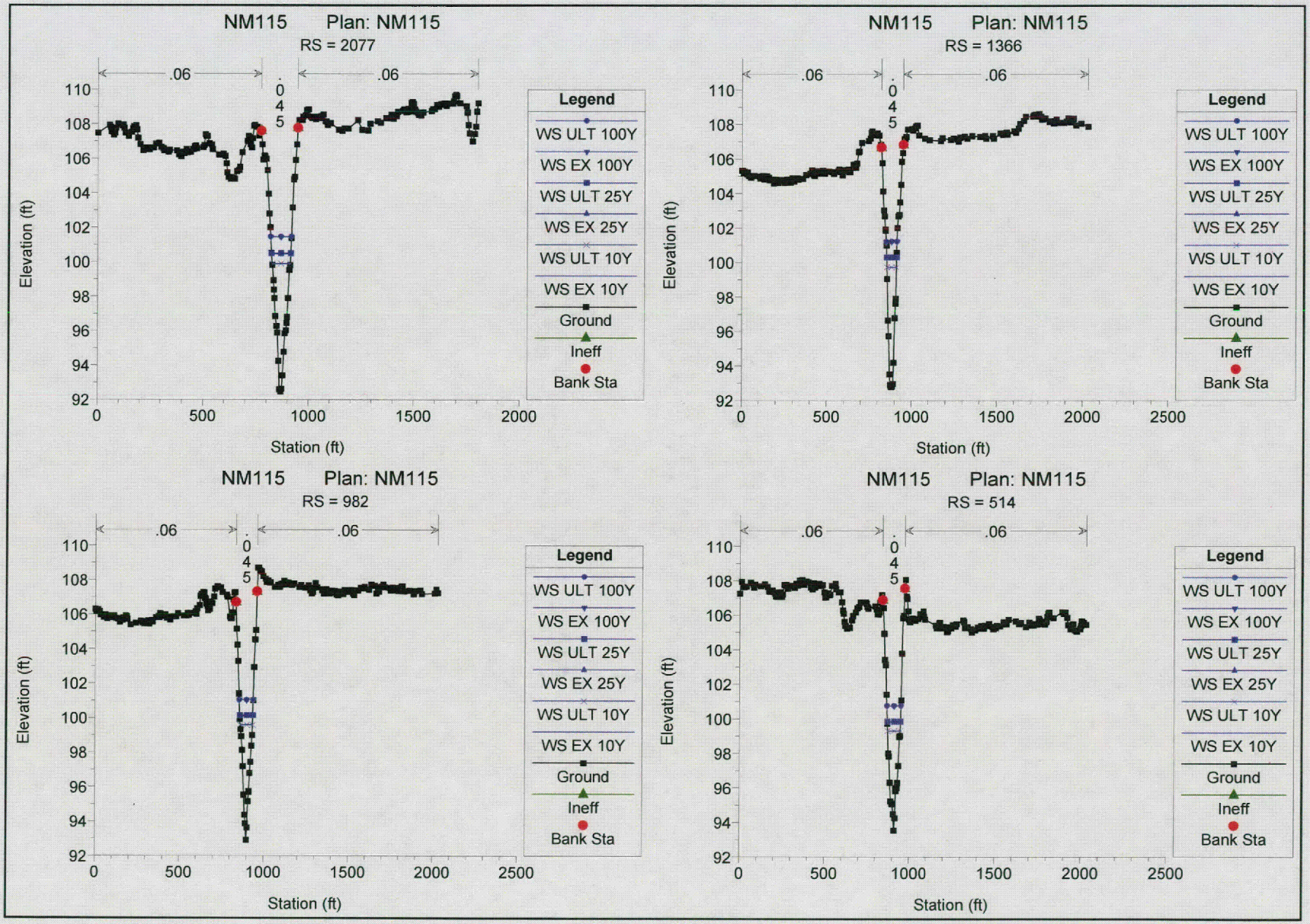
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM115 Plan: NM115
RS = 11070
NM115 Plan: NM115
RS = 10378
NM115 Plan: NM115
RS = 9746


NM115 Plan: NM115
RS = 9251
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM115 Plan: NM115
RS = 8949
NM115 Plan: NM115
RS = 8418
NM115 Plan: NM115
RS = 7926


NM115 Plan: NM115
RS = 7728
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM115 Plan: NM115
RS = 7179
NM115 Plan: NM115
RS = 6641
NM115 Plan: NM115
RS = 6348

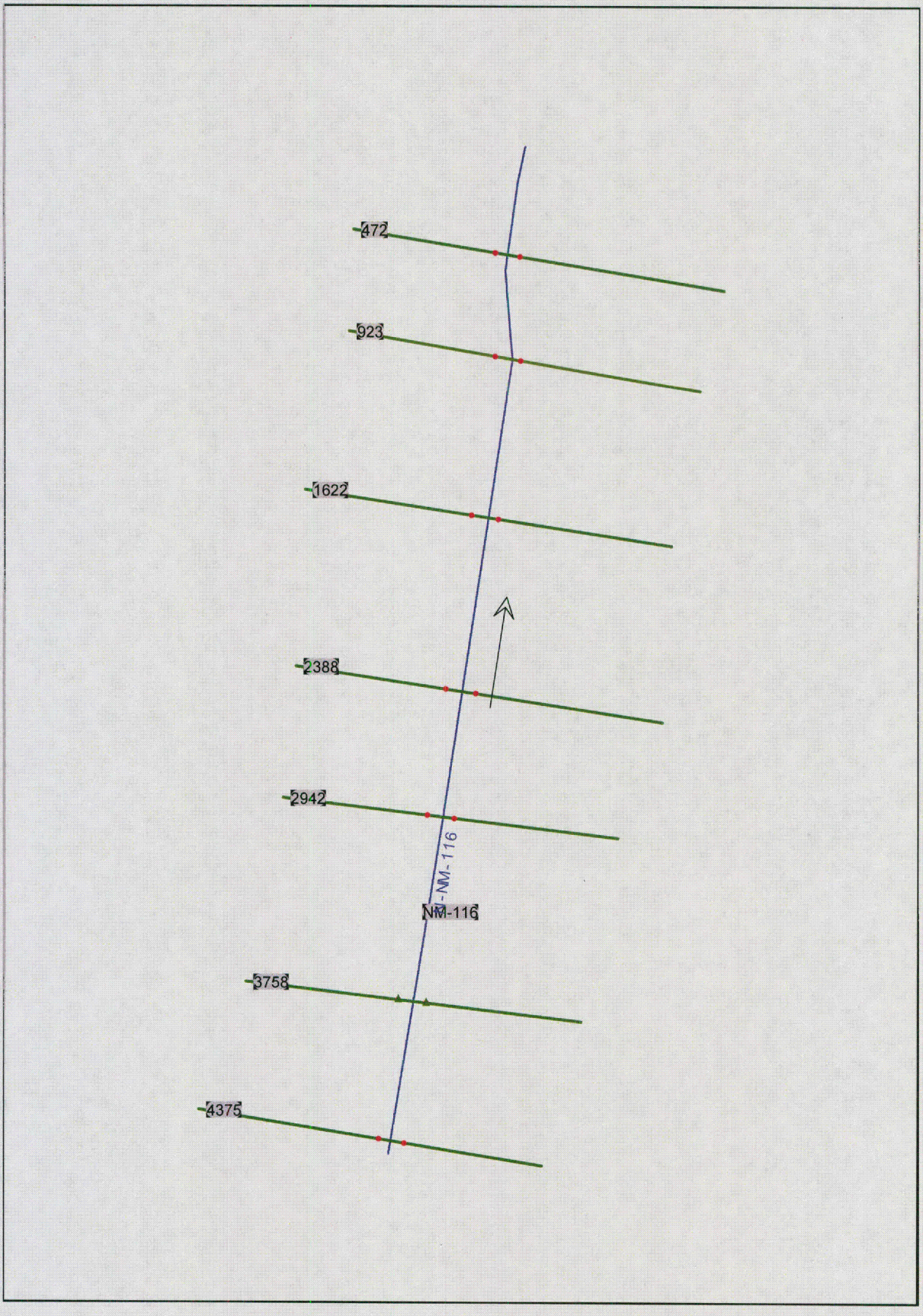

NM115 Plan: NM115
RS = 5795
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM115 Plan: NM115
RS = 5322
NM115 Plan: NM115
RS = 5052
NM115 Plan: NM115
RS = 4521


NM115 Plan: NM115
RS = 4037
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM115 Plan: NM115
RS = 3656
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM115 Plan: NM115
RS = 3315
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM115 Plan: NM115
RS = 2898
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta


NM115 Plan: NM115
RS = 2077
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM115 Plan: NM115
RS = 1366
NM115 Plan: NM115
RS = 982
NM115 Plan: NM115
RS = 514

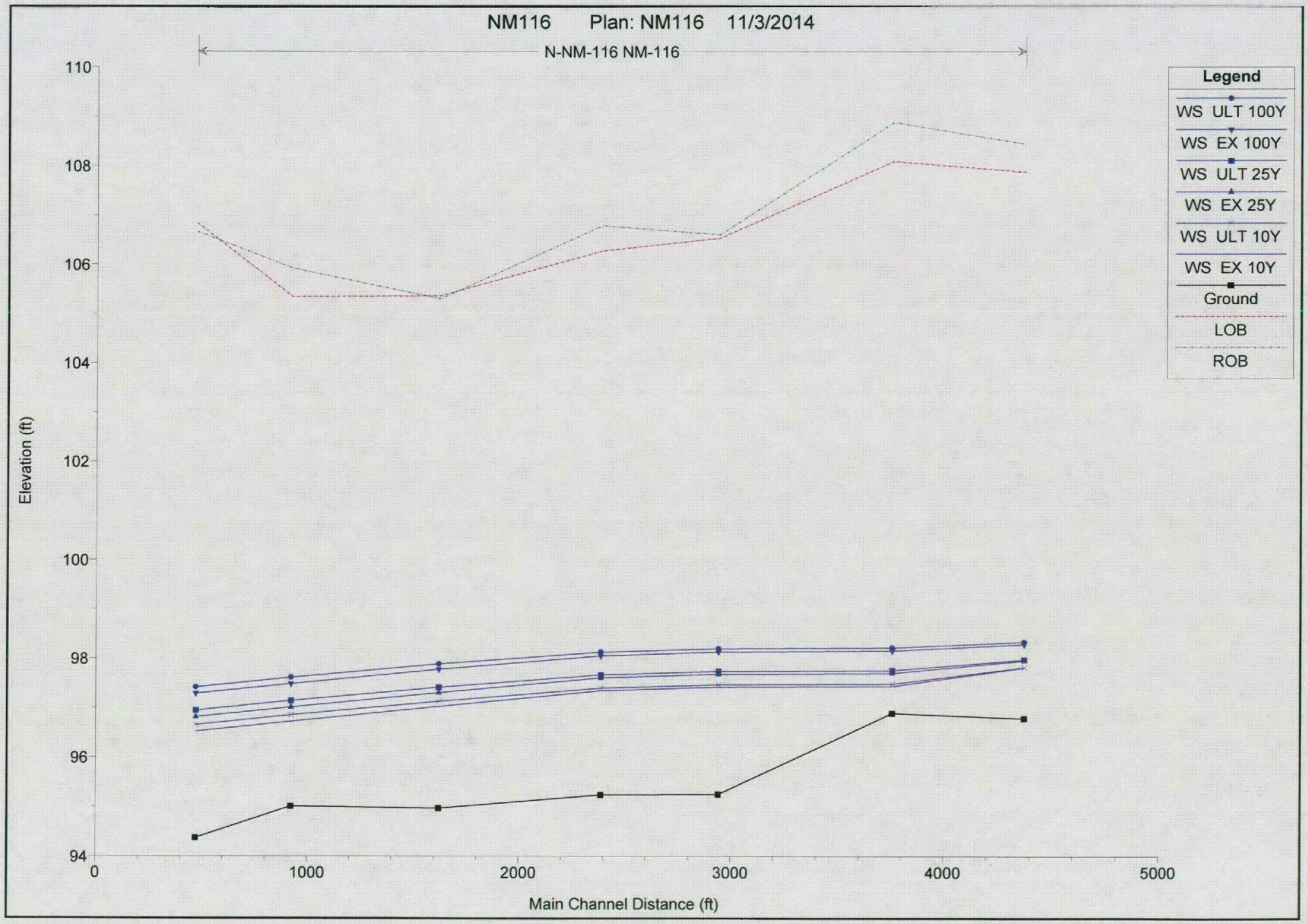
APPENDIX D
HEC-RAS HYDRAULIC OUTPUT

NM-116 BASE CONDITION


472
923
1622
2388
2942
NM-116
3758
4375

HEC-RAS Plan: BASE River: N-NM-116 Reach: NM-116

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)	
NM-116	472	EX 10Y	70.60	94.37	96.52	95.12	96.53	0.000400	0.85	83.11	56.73	0.12
NM-116	472	EX 25Y	92.70	94.37	96.81	95.23	96.82	0.000400	0.93	100.03	59.88	0.13
NM-116	472	EX 100Y	136.80	94.37	97.28	95.41	97.30	0.000401	1.06	129.56	63.72	0.13
NM-116	472	ULT 10Y	80.40	94.37	96.65	95.17	96.66	0.000401	0.89	90.76	58.20	0.13
NM-116	472	ULT 25Y	104.00	94.37	96.94	95.28	96.96	0.000400	0.96	108.23	61.34	0.13
NM-116	472	ULT 100Y	149.90	94.37	97.41	95.46	97.43	0.000400	1.09	137.63	64.51	0.13
NM-116	923	EX 10Y	70.60	95.01	96.72		96.74	0.000523	0.96	73.22	50.28	0.14
NM-116	923	EX 25Y	92.70	95.01	97.01		97.03	0.000512	1.06	87.85	51.73	0.14
NM-116	923	EX 100Y	136.80	95.01	97.49		97.51	0.000520	1.21	113.18	54.88	0.15
NM-116	923	ULT 10Y	80.40	95.01	96.85		96.87	0.000517	1.01	79.88	50.94	0.14
NM-116	923	ULT 25Y	104.00	95.01	97.14		97.16	0.000508	1.10	94.84	52.40	0.14
NM-116	923	ULT 100Y	149.90	95.01	97.61		97.64	0.000523	1.25	120.15	55.82	0.15
NM-116	1622	EX 10Y	59.10	94.97	97.02		97.03	0.000339	0.78	76.24	52.55	0.11
NM-116	1622	EX 25Y	76.00	94.97	97.30		97.31	0.000321	0.83	91.02	53.87	0.11
NM-116	1622	EX 100Y	108.90	94.97	97.78		97.79	0.000302	0.93	117.07	56.13	0.11
NM-116	1622	ULT 10Y	59.10	94.97	97.13		97.14	0.000272	0.72	81.79	53.05	0.10
NM-116	1622	ULT 25Y	76.00	94.97	97.41		97.42	0.000263	0.78	97.09	54.41	0.10
NM-116	1622	ULT 100Y	108.90	94.97	97.89		97.90	0.000258	0.88	123.34	56.66	0.11
NM-116	2388	EX 10Y	59.10	95.24	97.35		97.36	0.000554	0.90	65.67	52.43	0.14
NM-116	2388	EX 25Y	76.00	95.24	97.61		97.62	0.000515	0.96	79.52	54.87	0.14
NM-116	2388	EX 100Y	108.90	95.24	98.05		98.07	0.000457	1.04	104.97	58.49	0.14
NM-116	2388	ULT 10Y	59.10	95.24	97.40		97.41	0.000490	0.86	68.36	52.91	0.13
NM-116	2388	ULT 25Y	76.00	95.24	97.67		97.68	0.000453	0.92	83.01	55.46	0.13
NM-116	2388	ULT 100Y	108.90	95.24	98.13		98.14	0.000403	1.00	109.33	58.94	0.13
NM-116	2942	EX 10Y	13.10	95.25	97.42		97.42	0.000009	0.14	91.29	51.12	0.02
NM-116	2942	EX 25Y	16.80	95.25	97.68		97.68	0.000010	0.16	104.84	52.53	0.02
NM-116	2942	EX 100Y	23.90	95.25	98.13		98.13	0.000010	0.19	129.02	54.83	0.02
NM-116	2942	ULT 10Y	13.10	95.25	97.47		97.47	0.000008	0.14	93.58	51.37	0.02
NM-116	2942	ULT 25Y	16.80	95.25	97.74		97.74	0.000009	0.16	107.79	52.82	0.02
NM-116	2942	ULT 100Y	23.90	95.25	98.20		98.20	0.000009	0.18	132.70	55.18	0.02
NM-116	3758	EX 10Y	13.10	96.89	97.44	97.16	97.45	0.003480	1.03	12.72	33.03	0.29
NM-116	3758	EX 25Y	16.80	96.89	97.70	97.21	97.71	0.001070	0.76	22.22	37.88	0.17
NM-116	3758	EX 100Y	23.90	96.89	98.15	97.28	98.16	0.000357	0.58	40.95	45.18	0.11
NM-116	3758	ULT 10Y	13.10	96.89	97.48	97.16	97.50	0.002530	0.92	14.22	34.39	0.25
NM-116	3758	ULT 25Y	16.80	96.89	97.76	97.21	97.77	0.000818	0.69	24.31	38.75	0.15
NM-116	3758	ULT 100Y	23.90	96.89	98.22	97.28	98.22	0.000305	0.54	43.97	47.91	0.10
NM-116	4375	EX 10Y	13.10	96.78	97.81		97.81	0.000223	0.38	34.47	50.77	0.08
NM-116	4375	EX 25Y	16.80	96.78	97.95		97.95	0.000199	0.40	41.69	51.65	0.08
NM-116	4375	EX 100Y	23.90	96.78	98.28		98.29	0.000132	0.40	59.21	53.75	0.07
NM-116	4375	ULT 10Y	13.10	96.78	97.82		97.82	0.000217	0.38	34.77	50.80	0.08
NM-116	4375	ULT 25Y	16.80	96.78	97.97		97.97	0.000184	0.39	42.75	51.78	0.08
NM-116	4375	ULT 100Y	23.90	96.78	98.33		98.33	0.000116	0.39	61.78	54.05	0.06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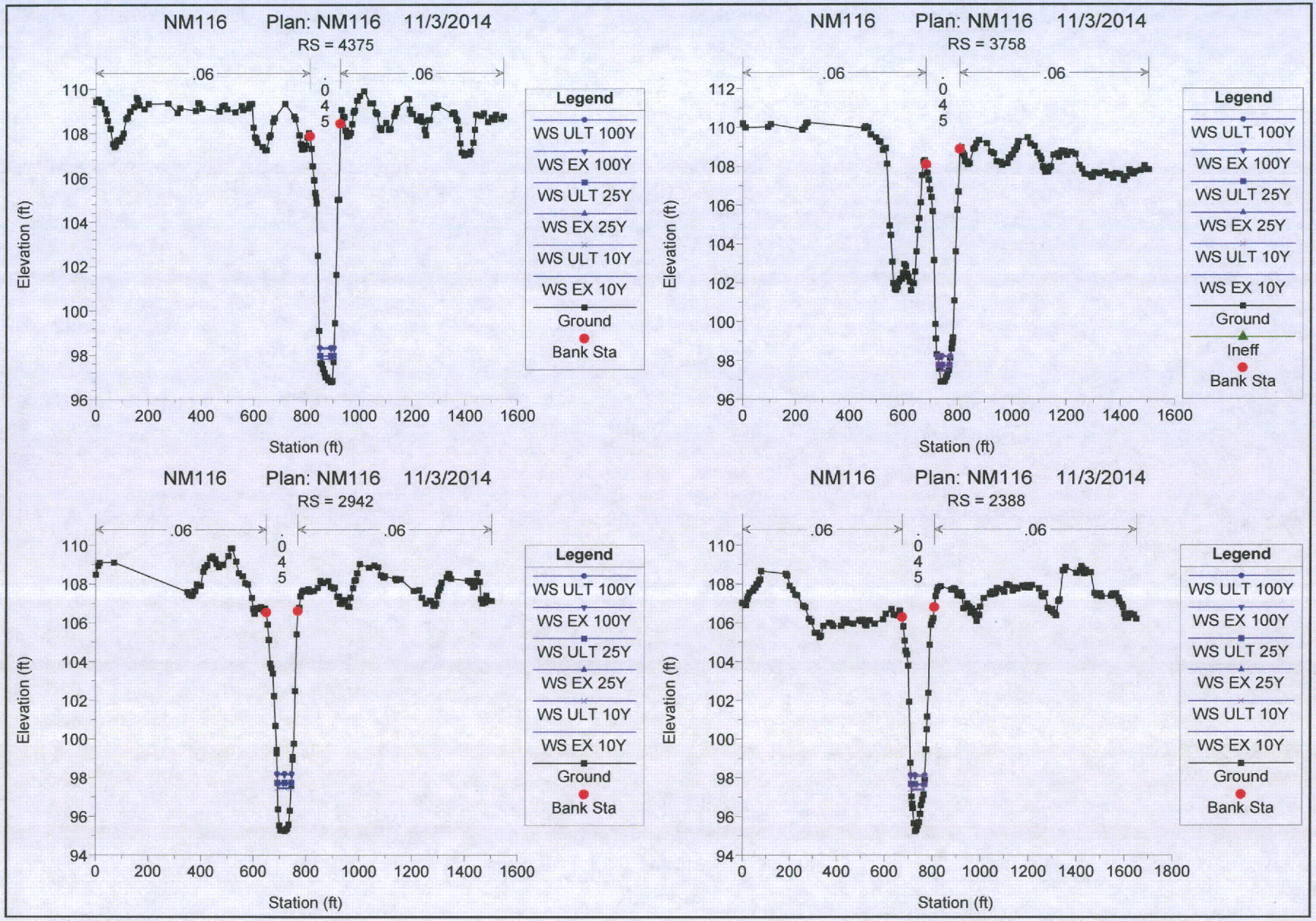
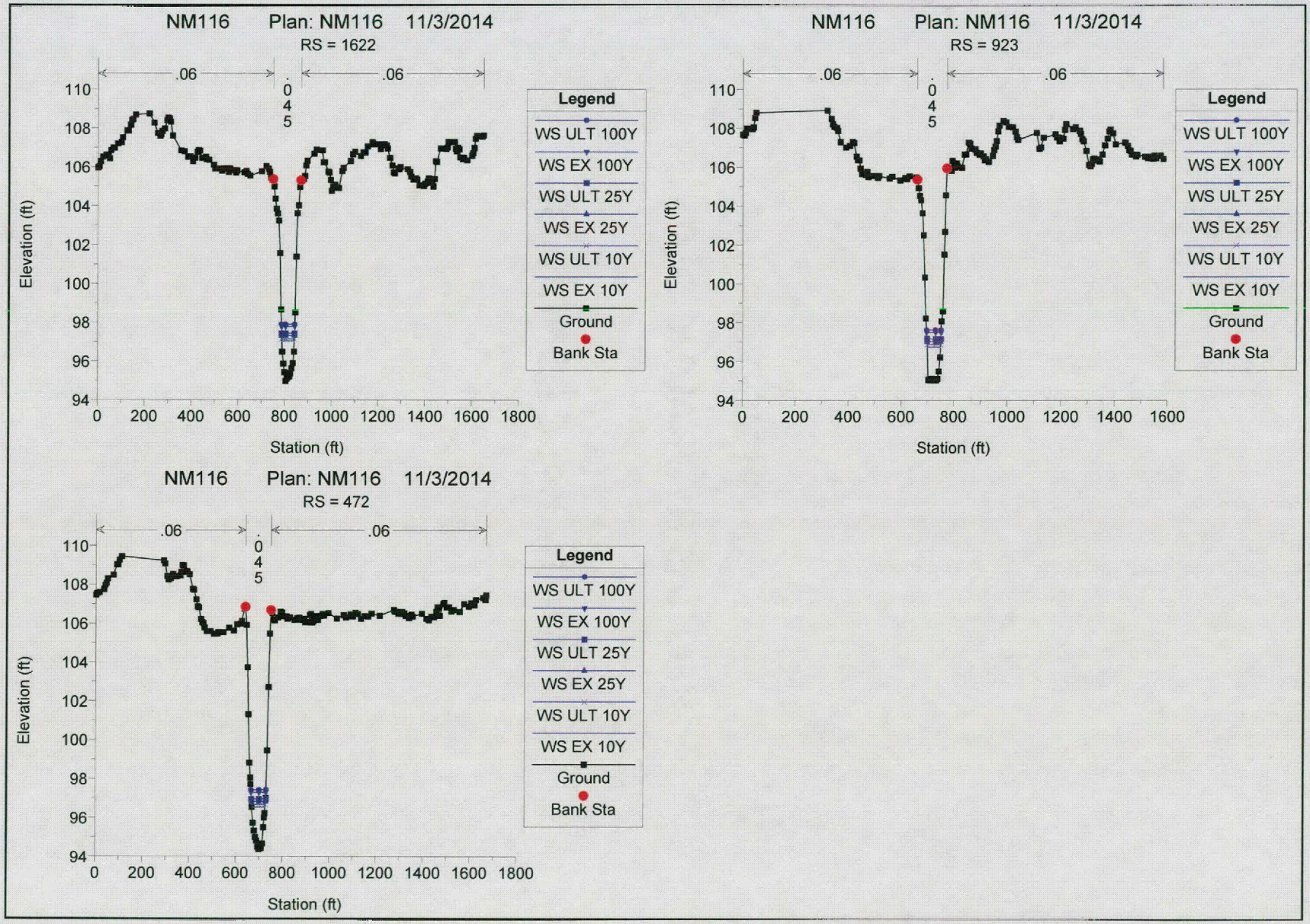
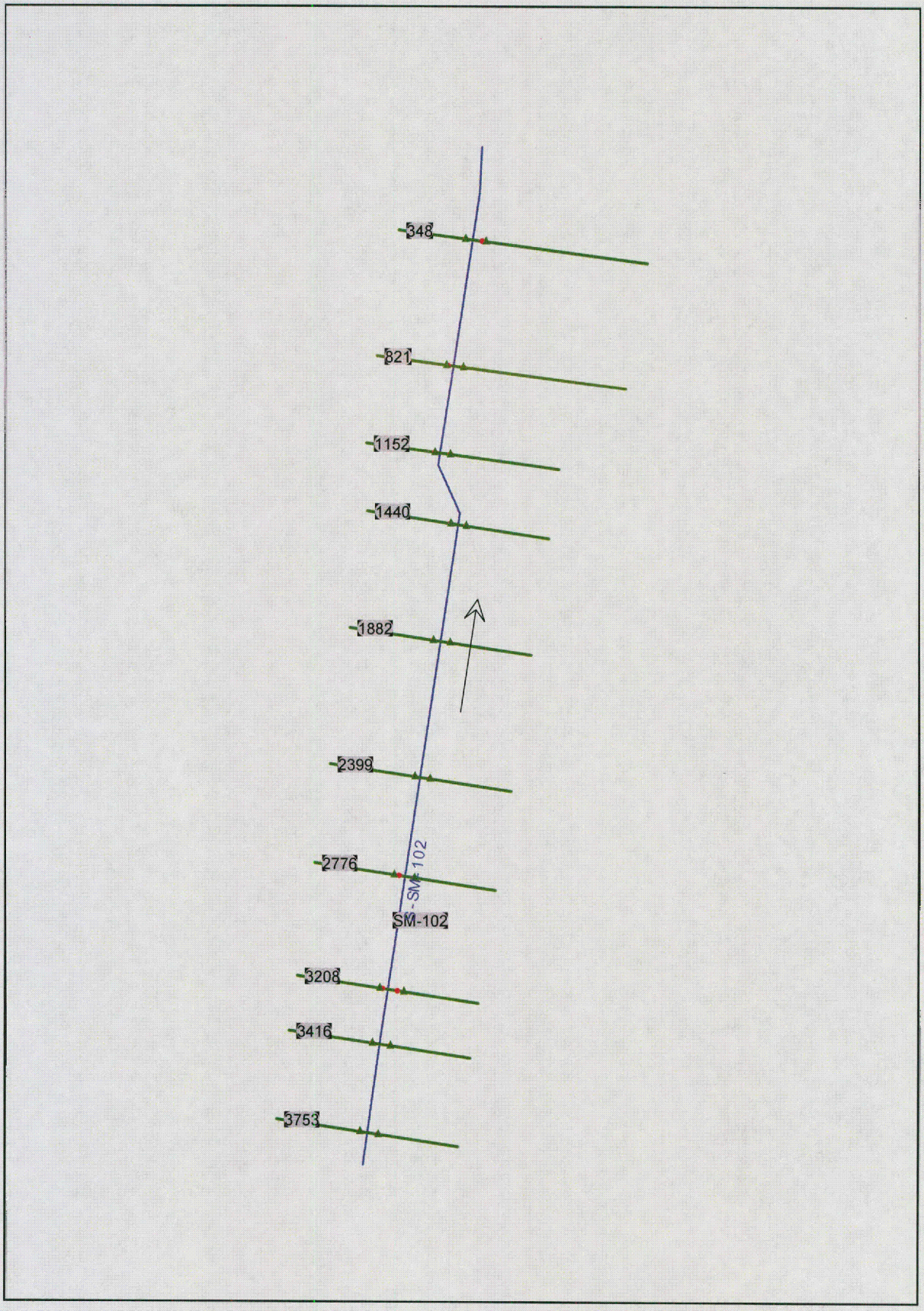
N-NM-116 NM-116
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
110
108
106
104
102
100
98
96
94
0
1000
2000
3000
4000
5000
Main Channel Distance (ft)


NM116 Plan: NM116 11/3/2014
RS = 4375
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
NM116 Plan: NM116 11/3/2014
RS = 3758
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Ineff
Bank Sta
NM116 Plan: NM116 11/3/2014
RS = 2942
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
NM116 Plan: NM116 11/3/2014
RS = 2388
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta


NM116 Plan: NM116 11/3/2014
RS = 1622
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
NM116 Plan: NM116 11/3/2014
RS = 923
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
NM116 Plan: NM116 11/3/2014
RS = 472
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta

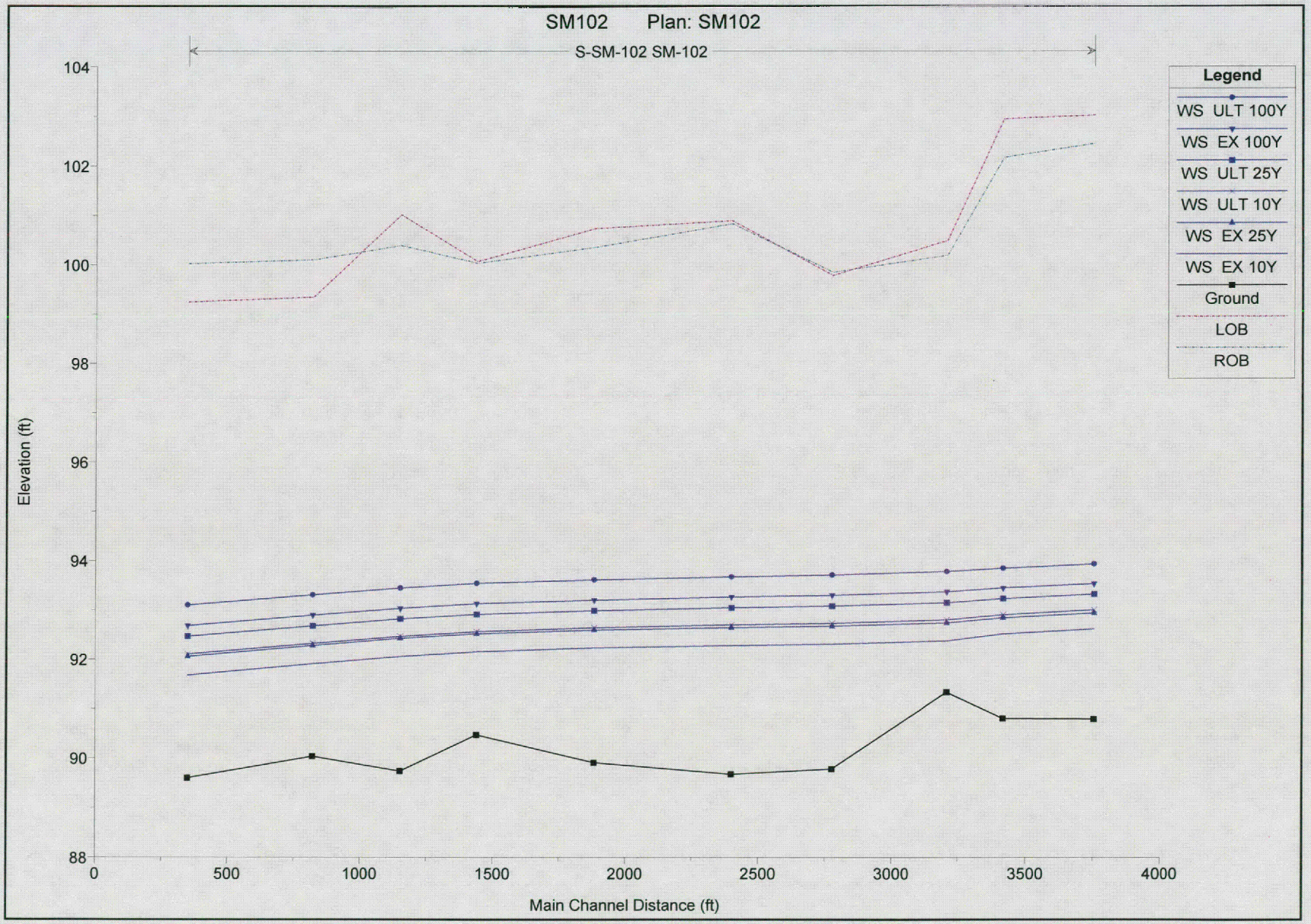
APPENDIX D
HEC-RAS HYDRAULIC OUTPUT

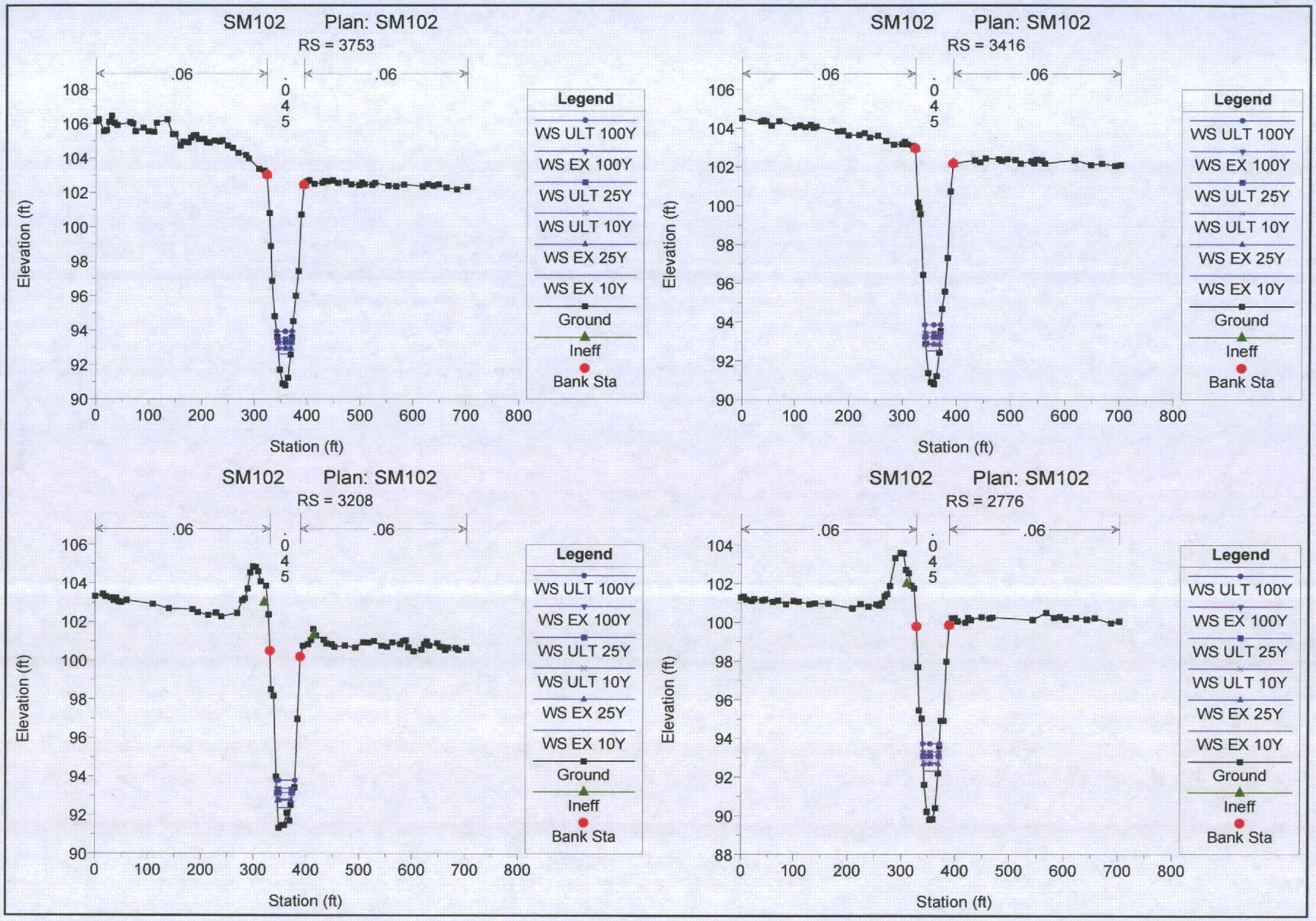
SM-102 BASE CONDITION

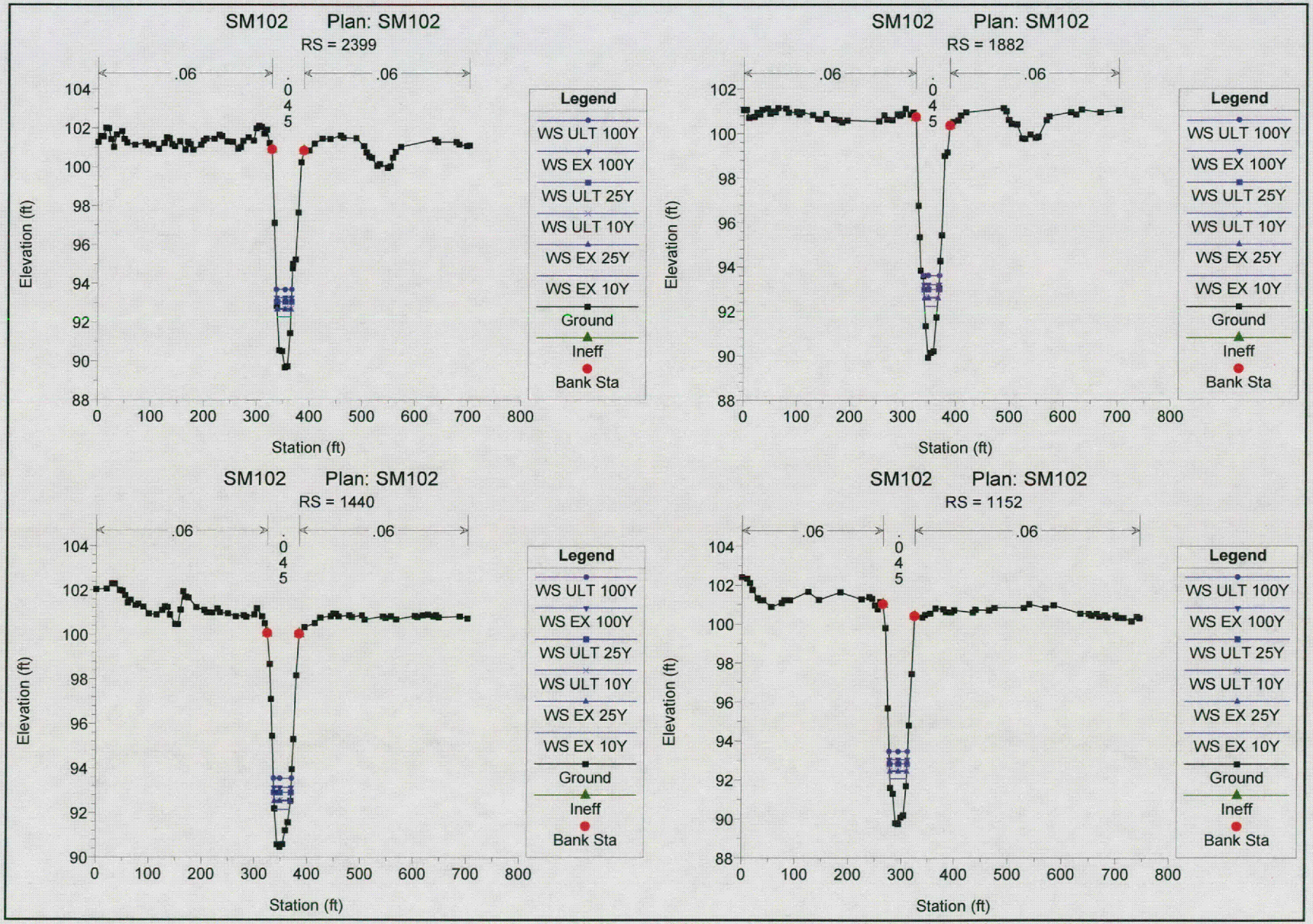

348
821
1152
1440
1882
2399
2776
SM-102
SM-102
3208
3416
3753

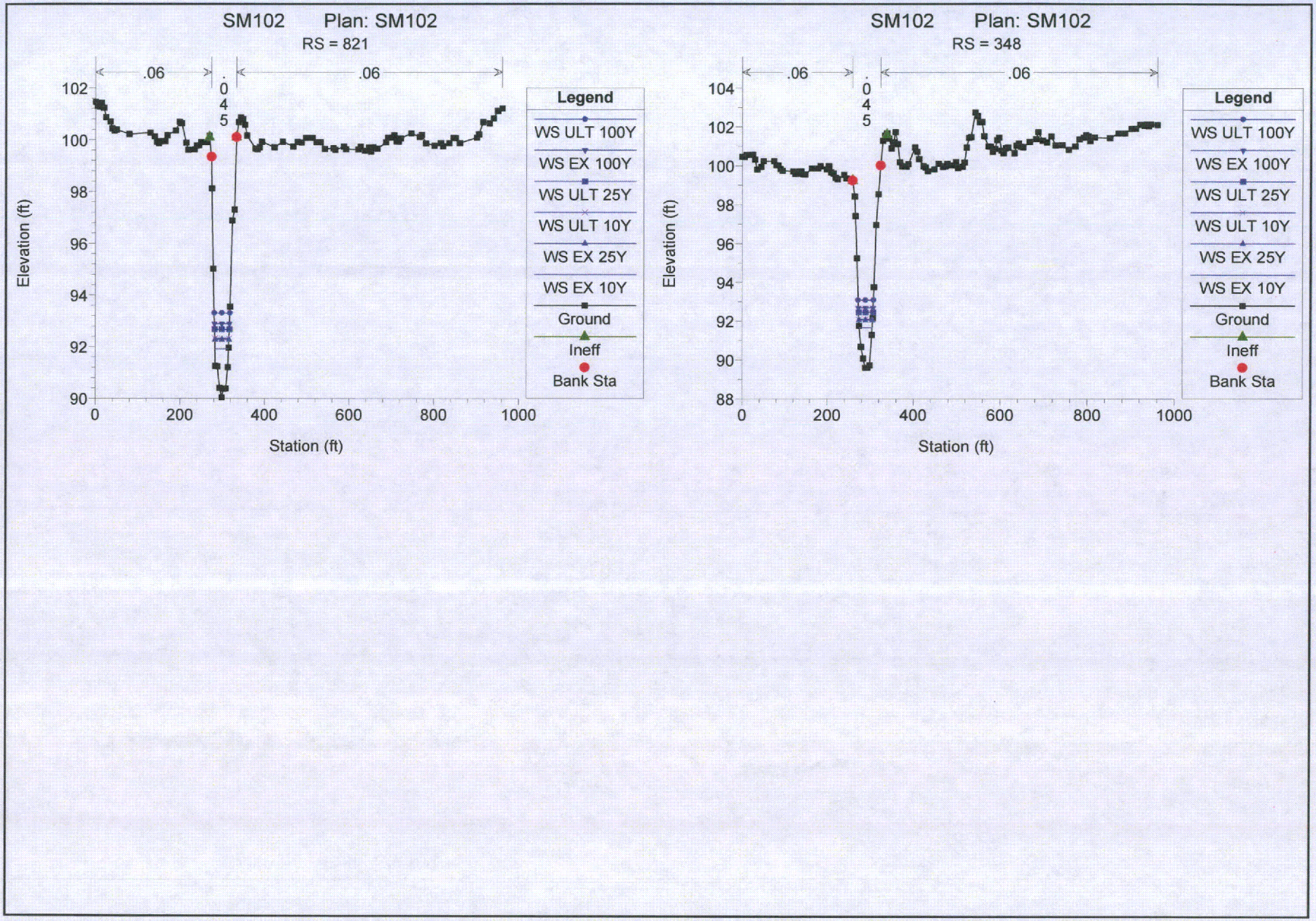
HEC-RAS Plan: BASE River: S-SM-102 Reach: SM-102

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)	
SM-102	348	EX 10Y	37.00	89.60	91.67	90.27	91.68	0.000400	0.84	44.04	30.21	0.12
SM-102	348	EX 25Y	53.00	89.60	92.05	90.42	92.07	0.000401	0.95	55.89	31.83	0.13
SM-102	348	EX 100Y	85.00	89.60	92.68	90.67	92.70	0.000401	1.11	76.43	33.99	0.13
SM-102	348	ULT 10Y	55.00	89.60	92.10	90.44	92.11	0.000401	0.96	57.26	31.98	0.13
SM-102	348	ULT 25Y	73.00	89.60	92.46	90.59	92.48	0.000400	1.06	69.08	33.23	0.13
SM-102	348	ULT 100Y	110.00	89.60	93.10	90.82	93.12	0.000400	1.21	90.93	35.43	0.13
SM-102	821	EX 10Y	37.00	90.04	91.91	90.83	91.92	0.000630	0.94	39.44	32.21	0.15
SM-102	821	EX 25Y	53.00	90.04	92.28	90.97	92.29	0.000561	1.03	51.55	33.47	0.15
SM-102	821	EX 100Y	85.00	90.04	92.89	91.20	92.91	0.000503	1.17	72.72	35.59	0.14
SM-102	821	ULT 10Y	55.00	90.04	92.32	90.98	92.33	0.000556	1.04	52.96	33.62	0.15
SM-102	821	ULT 25Y	73.00	90.04	92.67	91.11	92.69	0.000519	1.12	65.13	34.84	0.14
SM-102	821	ULT 100Y	110.00	90.04	93.30	91.37	93.33	0.000478	1.25	87.71	37.01	0.14
SM-102	1152	EX 10Y	37.00	89.74	92.05	90.48	92.06	0.000313	0.77	48.13	31.13	0.11
SM-102	1152	EX 25Y	53.00	89.74	92.42	90.63	92.43	0.000329	0.89	59.72	32.17	0.11
SM-102	1152	EX 100Y	85.00	89.74	93.03	90.87	93.05	0.000349	1.06	79.87	33.90	0.12
SM-102	1152	ULT 10Y	55.00	89.74	92.46	90.65	92.47	0.000331	0.90	61.07	32.29	0.12
SM-102	1152	ULT 25Y	73.00	89.74	92.81	90.78	92.83	0.000343	1.00	72.65	33.29	0.12
SM-102	1152	ULT 100Y	110.00	89.74	93.44	91.04	93.46	0.000358	1.17	94.05	35.07	0.13
SM-102	1440	EX 10Y	18.00	90.47	92.14	90.97	92.15	0.000280	0.59	30.69	27.72	0.10
SM-102	1440	EX 25Y	25.00	90.47	92.51	91.07	92.52	0.000227	0.61	41.30	30.26	0.09
SM-102	1440	EX 100Y	41.00	90.47	93.12	91.26	93.13	0.000189	0.68	60.47	32.37	0.09
SM-102	1440	ULT 10Y	27.00	90.47	92.55	91.09	92.56	0.000241	0.63	42.63	30.48	0.09
SM-102	1440	ULT 25Y	35.00	90.47	92.91	91.18	92.91	0.000200	0.65	53.57	31.65	0.09
SM-102	1440	ULT 100Y	53.00	90.47	93.53	91.38	93.54	0.000171	0.72	74.10	33.74	0.09
SM-102	1882	EX 10Y	18.00	89.91	92.23	90.52	92.23	0.000127	0.49	36.86	23.79	0.07
SM-102	1882	EX 25Y	25.00	89.91	92.59	90.62	92.59	0.000133	0.55	45.83	25.97	0.07
SM-102	1882	EX 100Y	41.00	89.91	93.20	90.81	93.20	0.000149	0.65	62.75	29.37	0.08
SM-102	1882	ULT 10Y	27.00	89.91	92.64	90.65	92.64	0.000144	0.57	47.11	26.27	0.08
SM-102	1882	ULT 25Y	35.00	89.91	92.98	90.75	92.99	0.000146	0.62	56.56	28.36	0.08
SM-102	1882	ULT 100Y	53.00	89.91	93.61	90.94	93.61	0.000150	0.71	75.12	31.41	0.08
SM-102	2399	EX 10Y	18.00	89.68	92.28	90.31	92.28	0.000073	0.40	44.54	24.87	0.05
SM-102	2399	EX 25Y	25.00	89.68	92.64	90.44	92.64	0.000080	0.46	53.84	26.18	0.06
SM-102	2399	EX 100Y	41.00	89.68	93.26	90.68	93.26	0.000097	0.58	70.62	27.96	0.06
SM-102	2399	ULT 10Y	27.00	89.68	92.69	90.47	92.70	0.000087	0.49	55.26	26.37	0.06
SM-102	2399	ULT 25Y	35.00	89.68	93.04	90.62	93.05	0.000092	0.54	64.62	27.40	0.06
SM-102	2399	ULT 100Y	53.00	89.68	93.67	90.78	93.68	0.000103	0.64	82.33	29.01	0.07
SM-102	2776	EX 10Y	18.00	89.78	92.30	90.32	92.30	0.000063	0.38	47.16	26.10	0.05
SM-102	2776	EX 25Y	25.00	89.78	92.67	90.41	92.67	0.000070	0.44	56.96	27.31	0.05
SM-102	2776	EX 100Y	41.00	89.78	93.29	90.59	93.30	0.000085	0.55	74.66	29.37	0.06
SM-102	2776	ULT 10Y	27.00	89.78	92.73	90.44	92.73	0.000075	0.46	58.50	27.50	0.06
SM-102	2776	ULT 25Y	35.00	89.78	93.08	90.53	93.08	0.000080	0.51	68.32	28.65	0.06
SM-102	2776	ULT 100Y	53.00	89.78	93.71	90.70	93.71	0.000091	0.61	87.08	30.74	0.06
SM-102	3208	EX 10Y	18.00	91.33	92.37	91.87	92.39	0.001950	1.11	16.21	23.96	0.24
SM-102	3208	EX 25Y	25.00	91.33	92.74	91.97	92.75	0.000944	0.99	25.32	25.79	0.18
SM-102	3208	EX 100Y	41.00	91.33	93.36	92.13	93.38	0.000583	0.96	42.61	31.34	0.15
SM-102	3208	ULT 10Y	27.00	91.33	92.80	91.99	92.81	0.000917	1.00	26.88	26.09	0.17
SM-102	3208	ULT 25Y	35.00	91.33	93.14	92.07	93.16	0.000622	0.97	36.26	27.83	0.15
SM-102	3208	ULT 100Y	53.00	91.33	93.78	92.22	93.79	0.000438	0.94	56.67	34.96	0.13
SM-102	3416	EX 10Y	18.00	90.80	92.51	91.34	92.52	0.000300	0.63	28.37	23.90	0.10
SM-102	3416	EX 25Y	25.00	90.80	92.84	91.44	92.85	0.000276	0.68	36.52	25.71	0.10
SM-102	3416	EX 100Y	41.00	90.80	93.45	91.61	93.45	0.000247	0.78	52.74	27.95	0.10
SM-102	3416	ULT 10Y	27.00	90.80	92.90	91.46	92.91	0.000284	0.71	38.09	25.99	0.10
SM-102	3416	ULT 25Y	35.00	90.80	93.23	91.55	93.24	0.000257	0.75	46.79	27.17	0.10
SM-102	3416	ULT 100Y	53.00	90.80	93.84	91.72	93.86	0.000231	0.83	64.20	29.39	0.10
SM-102	3753	EX 10Y	18.00	90.79	92.61	91.37	92.62	0.000292	0.65	27.88	22.35	0.10
SM-102	3753	EX 25Y	25.00	90.79	92.93	91.47	92.94	0.000282	0.71	35.35	24.02	0.10
SM-102	3753	EX 100Y	41.00	90.79	93.53	91.67	93.54	0.000272	0.81	50.59	27.09	0.10
SM-102	3753	ULT 10Y	27.00	90.79	93.00	91.50	93.01	0.000291	0.73	36.89	24.34	0.10
SM-102	3753	ULT 25Y	35.00	90.79	93.32	91.60	93.33	0.000278	0.78	44.95	25.99	0.10
SM-102	3753	ULT 100Y	53.00	90.79	93.93	91.78	93.94	0.000264	0.86	61.79	29.61	0.10


SM102 Plan: SM102
S-SM-102 SM-102
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
104
102
100
98
96
94
92
90
88
0
500
1000
1500
2000
2500
3000
3500
4000
Main Channel Distance (ft)

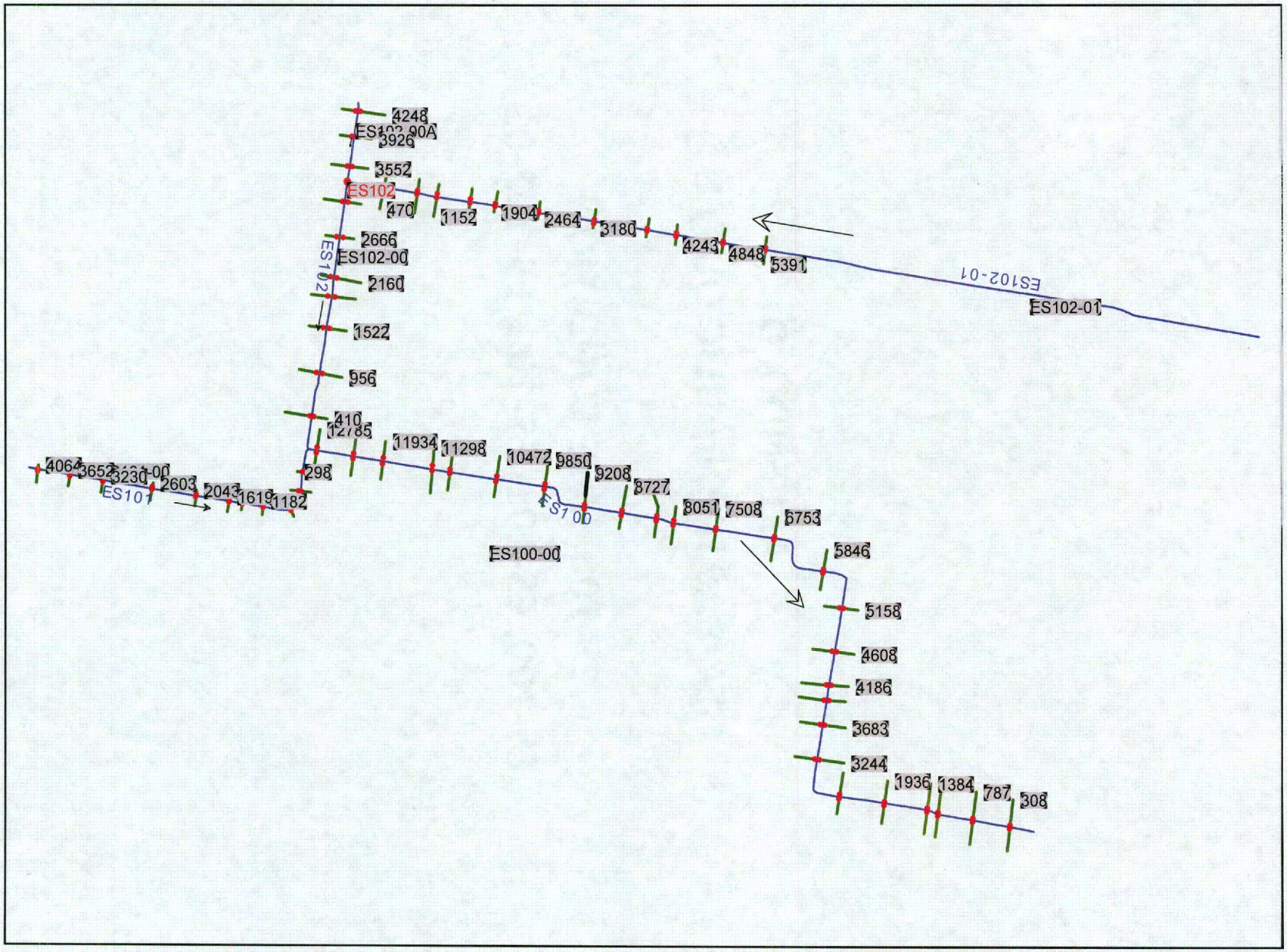

SM102 Plan: SM102
RS = 3753
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
SM102 Plan: SM102
RS = 3416
SM102 Plan: SM102
RS = 3208
SM102 Plan: SM102
RS = 2776


SM102 Plan: SM102
RS = 2399
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
SM102 Plan: SM102
RS = 1882
SM102 Plan: SM102
RS = 1440
SM102 Plan: SM102
RS = 1152


SM102 Plan: SM102
RS = 821
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta
SM102 Plan: SM102
RS = 348
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS ULT 10Y
WS EX 25Y
WS EX 10Y
Ground
Ineff
Bank Sta

APPENDIX D
HEC-RAS HYDRAULIC OUTPUT

ES-100 BASE CONDITION
ES-100, ES-101, ES-102, ES-102-01


4248
3926
3552
ES102
470
1152
1904
2464
3180
4243
4848
5391
ES102-01
2666
ES102-00
2160
1522
956
410
298
11934
11298
10472
9850
9208
8727
8051
7508
6753
5846
5158
4608
4186
3683
3244
1936
1384
787
308
ES100-00
ES101
2603
2043
1619
1182

HEC-RAS Plan: BASE

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)	
ES100	ES100-00	308	EX 10Y	214.00	81.61	87.31	83.64	87.35	0.000400	1.59	134.38	32.70	0.14
ES100	ES100-00	308	EX 25Y	279.00	81.61	88.13	83.92	88.18	0.000400	1.72	162.27	34.87	0.14
ES100	ES100-00	308	EX 100Y	431.00	81.61	89.88	84.49	89.93	0.000401	1.89	228.01	42.36	0.14
ES100	ES100-00	308	ULT 10Y	220.00	81.61	87.39	83.66	87.43	0.000401	1.61	136.96	32.90	0.14
ES100	ES100-00	308	ULT 25Y	280.00	81.61	88.14	83.93	88.19	0.000400	1.72	162.69	34.91	0.14
ES100	ES100-00	308	ULT 100Y	440.00	81.61	89.98	84.52	90.04	0.000401	1.89	232.52	43.19	0.14
ES100	ES100-00	787	EX 10Y	214.00	81.10	87.48		87.51	0.000276	1.34	159.43	38.23	0.12
ES100	ES100-00	787	EX 25Y	279.00	81.10	88.30		88.34	0.000275	1.45	191.97	40.46	0.12
ES100	ES100-00	787	EX 100Y	431.00	81.10	90.05		90.09	0.000258	1.61	272.17	67.76	0.12
ES100	ES100-00	787	ULT 10Y	220.00	81.10	87.56		87.59	0.000276	1.35	162.46	38.44	0.12
ES100	ES100-00	787	ULT 25Y	280.00	81.10	88.32		88.35	0.000275	1.45	192.45	40.50	0.12
ES100	ES100-00	787	ULT 100Y	440.00	81.10	90.15		90.19	0.000256	1.62	279.35	69.32	0.12
ES100	ES100-00	1236	EX 10Y	214.00	81.56	87.61		87.64	0.000314	1.45	147.20	34.39	0.12
ES100	ES100-00	1236	EX 25Y	279.00	81.56	88.43		88.47	0.000319	1.58	176.48	36.42	0.13
ES100	ES100-00	1236	EX 100Y	431.00	81.56	90.17		90.22	0.000299	1.77	246.09	47.66	0.13
ES100	ES100-00	1236	ULT 10Y	220.00	81.56	87.69		87.72	0.000315	1.47	149.93	34.58	0.12
ES100	ES100-00	1236	ULT 25Y	280.00	81.56	88.45		88.48	0.000319	1.58	176.92	36.45	0.13
ES100	ES100-00	1236	ULT 100Y	440.00	81.56	90.27		90.32	0.000294	1.78	251.61	65.87	0.13
ES100	ES100-00	1384	EX 10Y	214.00	81.55	87.65		87.68	0.000210	1.21	176.30	40.39	0.10
ES100	ES100-00	1384	EX 25Y	279.00	81.55	88.48		88.51	0.000213	1.32	210.67	42.47	0.10
ES100	ES100-00	1384	EX 100Y	431.00	81.55	90.22		90.25	0.000209	1.50	288.11	46.82	0.11
ES100	ES100-00	1384	ULT 10Y	220.00	81.55	87.73		87.76	0.000211	1.23	179.52	40.59	0.10
ES100	ES100-00	1384	ULT 25Y	280.00	81.55	88.50		88.52	0.000213	1.33	211.18	42.50	0.10
ES100	ES100-00	1384	ULT 100Y	440.00	81.55	90.32		90.36	0.000207	1.50	292.93	47.07	0.11
ES100	ES100-00	1936	EX 10Y	214.00	81.40	87.77		87.79	0.000207	1.20	177.89	40.95	0.10
ES100	ES100-00	1936	EX 25Y	279.00	81.40	88.60		88.63	0.000209	1.31	212.64	42.68	0.10
ES100	ES100-00	1936	EX 100Y	431.00	81.40	90.33		90.37	0.000204	1.49	289.70	46.30	0.10
ES100	ES100-00	1936	ULT 10Y	220.00	81.40	87.85		87.87	0.000208	1.21	181.16	41.11	0.10
ES100	ES100-00	1936	ULT 25Y	280.00	81.40	88.61		88.64	0.000209	1.31	213.15	42.71	0.10
ES100	ES100-00	1936	ULT 100Y	440.00	81.40	90.43		90.47	0.000203	1.49	294.43	46.52	0.10
ES100	ES100-00	2515	EX 10Y	214.00	81.64	87.91		87.94	0.000291	1.38	154.85	37.50	0.12
ES100	ES100-00	2515	EX 25Y	279.00	81.64	88.74		88.77	0.000290	1.49	187.10	39.94	0.12
ES100	ES100-00	2515	EX 100Y	431.00	81.64	90.46		90.51	0.000272	1.66	259.84	44.40	0.12
ES100	ES100-00	2515	ULT 10Y	220.00	81.64	87.99		88.02	0.000292	1.39	157.85	37.78	0.12
ES100	ES100-00	2515	ULT 25Y	280.00	81.64	88.75		88.78	0.000290	1.49	187.58	39.97	0.12
ES100	ES100-00	2515	ULT 100Y	440.00	81.64	90.56		90.61	0.000271	1.66	264.35	44.66	0.12
ES100	ES100-00	3244	EX 10Y	214.00	83.47	88.20		88.26	0.000699	1.83	117.19	36.07	0.18
ES100	ES100-00	3244	EX 25Y	279.00	83.47	89.02		89.07	0.000604	1.89	147.32	38.06	0.17
ES100	ES100-00	3244	EX 100Y	431.00	83.47	90.71		90.77	0.000480	2.00	215.12	42.19	0.16
ES100	ES100-00	3244	ULT 10Y	220.00	83.47	88.28		88.33	0.000688	1.83	120.02	36.26	0.18
ES100	ES100-00	3244	ULT 25Y	280.00	83.47	89.03		89.08	0.000603	1.89	147.77	38.08	0.17
ES100	ES100-00	3244	ULT 100Y	440.00	83.47	90.81		90.87	0.000473	2.01	219.29	42.43	0.16
ES100	ES100-00	3683	EX 10Y	214.00	82.25	88.45		88.49	0.000411	1.56	136.97	35.85	0.14
ES100	ES100-00	3683	EX 25Y	279.00	82.25	89.25		89.29	0.000420	1.67	167.43	40.45	0.14
ES100	ES100-00	3683	EX 100Y	431.00	82.25	90.91		90.96	0.000386	1.77	243.94	50.86	0.14
ES100	ES100-00	3683	ULT 10Y	220.00	82.25	88.53		88.57	0.000413	1.57	139.75	36.28	0.14
ES100	ES100-00	3683	ULT 25Y	280.00	82.25	89.26		89.30	0.000420	1.67	167.90	40.53	0.14
ES100	ES100-00	3683	ULT 100Y	440.00	82.25	91.01		91.06	0.000380	1.77	248.84	51.20	0.14
ES100	ES100-00	3991	EX 10Y	214.00	82.29	88.56		88.60	0.000302	1.44	148.33	33.93	0.12
ES100	ES100-00	3991	EX 25Y	279.00	82.29	89.37		89.41	0.000318	1.58	176.51	36.31	0.13
ES100	ES100-00	3991	EX 100Y	431.00	82.29	91.03		91.07	0.000362	1.78	241.86	46.05	0.14
ES100	ES100-00	3991	ULT 10Y	220.00	82.29	88.64		88.68	0.000304	1.46	150.97	34.16	0.12
ES100	ES100-00	3991	ULT 25Y	280.00	82.29	89.38		89.42	0.000318	1.58	176.93	36.35	0.13
ES100	ES100-00	3991	ULT 100Y	440.00	82.29	91.12		91.17	0.000368	1.79	246.36	49.47	0.14
ES100	ES100-00	4186	EX 10Y	214.00	82.04	88.62		88.64	0.000158	1.10	193.77	41.42	0.09
ES100	ES100-00	4186	EX 25Y	279.00	82.04	89.43		89.45	0.000169	1.22	228.09	43.61	0.09
ES100	ES100-00	4186	EX 100Y	431.00	82.04	91.10		91.12	0.000181	1.38	357.38	194.66	0.10
ES100	ES100-00	4186	ULT 10Y	220.00	82.04	88.70		88.72	0.000159	1.12	197.01	41.63	0.09
ES100	ES100-00	4186	ULT 25Y	280.00	82.04	89.44		89.46	0.000169	1.22	228.60	43.65	0.09
ES100	ES100-00	4186	ULT 100Y	440.00	82.04	91.19		91.22	0.000178	1.37	376.29	196.78	0.10
ES100	ES100-00	4608	EX 10Y	214.00	82.04	88.69		88.71	0.000161	1.09	196.14	43.96	0.09
ES100	ES100-00	4608	EX 25Y	279.00	82.04	89.50		89.52	0.000169	1.20	233.06	47.00	0.09
ES100	ES100-00	4608	EX 100Y	431.00	82.04	91.17		91.20	0.000151	1.22	510.32	398.77	0.09
ES100	ES100-00	4608	ULT 10Y	220.00	82.04	88.77		88.79	0.000162	1.10	199.61	44.26	0.09
ES100	ES100-00	4608	ULT 25Y	280.00	82.04	89.51		89.53	0.000170	1.20	233.61	47.04	0.09
ES100	ES100-00	4608	ULT 100Y	440.00	82.04	91.27		91.29	0.000144	1.20	548.44	401.12	0.09
ES100	ES100-00	5158	EX 10Y	214.00	81.55	88.77		88.79	0.000131	1.04	205.09	40.53	0.08
ES100	ES100-00	5158	EX 25Y	279.00	81.55	89.59		89.61	0.000147	1.17	239.38	43.52	0.09
ES100	ES100-00	5158	EX 100Y	431.00	81.55	91.25		91.26	0.000101	1.06	647.51	323.23	0.07
ES100	ES100-00	5158	ULT 10Y	220.00	81.55	88.85		88.87	0.000133	1.06	208.31	40.76	0.08
ES100	ES100-00	5158	ULT 25Y	280.00	81.55	89.60		89.62	0.000147	1.17	239.90	43.56	0.09
ES100	ES100-00	5158	ULT 100Y	440.00	81.55	91.34		91.35	0.000096	1.05	677.25	327.11	0.07
ES100	ES100-00	5846	EX 10Y	214.00	81.54	88.87		88.88	0.000151	1.07	200.57	43.72	0.09
ES100	ES100-00	5846	EX 25Y	279.00	81.54	89.69		89.71	0.000150	1.13	310.58	337.10	0.09
ES100	ES100-00	5846	EX 100Y	431.00	81.54	91.31		91.32	0.000058	0.82	953.10	436.62	0.06

HEC-RAS Plan: BASE (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)	
ES100	ES100-00	5846	ULT 10Y	220.00	81.54	88.95		88.96	0.000152	1.08	204.09	44.04	0.09
ES100	ES100-00	5846	ULT 25Y	280.00	81.54	89.70		89.72	0.000149	1.13	314.62	340.41	0.09
ES100	ES100-00	5846	ULT 100Y	440.00	81.54	91.40		91.40	0.000055	0.81	991.85	438.43	0.06
ES100	ES100-00	6753	EX 10Y	214.00	82.32	89.01		89.03	0.000162	1.11	193.29	41.49	0.09
ES100	ES100-00	6753	EX 25Y	279.00	82.32	89.83		89.85	0.000156	1.17	329.44	449.07	0.09
ES100	ES100-00	6753	EX 100Y	431.00	82.32	91.36		91.37	0.000054	0.80	1038.73	483.80	0.06
ES100	ES100-00	6753	ULT 10Y	220.00	82.32	89.09		89.11	0.000163	1.12	196.67	41.70	0.09
ES100	ES100-00	6753	ULT 25Y	280.00	82.32	89.84		89.86	0.000155	1.17	334.52	449.28	0.09
ES100	ES100-00	6753	ULT 100Y	440.00	82.32	91.45		91.45	0.000051	0.79	1080.51	493.84	0.05
ES100	ES100-00	7508	EX 10Y	214.00	82.23	89.14		89.16	0.000202	1.26	169.41	34.29	0.10
ES100	ES100-00	7508	EX 25Y	279.00	82.23	89.96		89.99	0.000212	1.38	238.49	207.32	0.10
ES100	ES100-00	7508	EX 100Y	431.00	82.23	91.41		91.43	0.000113	1.10	729.20	423.12	0.08
ES100	ES100-00	7508	ULT 10Y	220.00	82.23	89.22		89.25	0.000204	1.28	172.24	34.48	0.10
ES100	ES100-00	7508	ULT 25Y	280.00	82.23	89.97		90.00	0.000212	1.38	240.72	207.60	0.10
ES100	ES100-00	7508	ULT 100Y	440.00	82.23	91.50		91.51	0.000107	1.08	764.49	423.99	0.07
ES100	ES100-00	8051	EX 10Y	214.00	83.29	89.26		89.28	0.000217	1.20	178.91	43.99	0.10
ES100	ES100-00	8051	EX 25Y	279.00	83.29	90.08		90.11	0.000215	1.29	216.39	46.94	0.11
ES100	ES100-00	8051	EX 100Y	431.00	83.29	91.48		91.51	0.000222	1.46	342.89	168.91	0.11
ES100	ES100-00	8051	ULT 10Y	220.00	83.29	89.34		89.36	0.000216	1.21	182.56	44.29	0.10
ES100	ES100-00	8051	ULT 25Y	280.00	83.29	90.09		90.12	0.000215	1.29	216.89	46.98	0.11
ES100	ES100-00	8051	ULT 100Y	440.00	83.29	91.56		91.59	0.000219	1.46	356.42	169.76	0.11
ES100	ES100-00	8275	EX 10Y	214.00	82.40	89.30		89.32	0.000129	1.04	206.64	41.28	0.08
ES100	ES100-00	8275	EX 25Y	279.00	82.40	90.12		90.15	0.000141	1.16	241.55	43.30	0.09
ES100	ES100-00	8275	EX 100Y	431.00	82.40	91.53		91.56	0.000174	1.41	304.78	46.81	0.10
ES100	ES100-00	8275	ULT 10Y	220.00	82.40	89.38		89.40	0.000130	1.05	210.07	41.47	0.08
ES100	ES100-00	8275	ULT 25Y	280.00	82.40	90.14		90.16	0.000141	1.16	242.01	43.33	0.09
ES100	ES100-00	8275	ULT 100Y	440.00	82.40	91.61		91.64	0.000176	1.43	308.48	47.00	0.10
ES100	ES100-00	8727	EX 10Y	214.00	82.28	89.37		89.39	0.000204	1.25	170.61	35.65	0.10
ES100	ES100-00	8727	EX 25Y	279.00	82.28	90.20		90.23	0.000220	1.39	201.25	38.10	0.11
ES100	ES100-00	8727	EX 100Y	431.00	82.28	91.62		91.66	0.000278	1.66	259.48	44.67	0.12
ES100	ES100-00	8727	ULT 10Y	220.00	82.28	89.45		89.47	0.000205	1.27	173.59	35.89	0.10
ES100	ES100-00	8727	ULT 25Y	280.00	82.28	90.21		90.24	0.000221	1.39	201.66	38.14	0.11
ES100	ES100-00	8727	ULT 100Y	440.00	82.28	91.70		91.74	0.000280	1.67	263.05	45.16	0.12
ES100	ES100-00	9208	EX 10Y	214.00	82.68	89.47		89.50	0.000243	1.34	159.25	34.16	0.11
ES100	ES100-00	9208	EX 25Y	279.00	82.68	90.31		90.34	0.000257	1.48	188.77	36.30	0.11
ES100	ES100-00	9208	EX 100Y	431.00	82.68	91.76		91.81	0.000323	1.73	248.50	44.70	0.13
ES100	ES100-00	9208	ULT 10Y	220.00	82.68	89.55		89.58	0.000245	1.36	162.13	34.38	0.11
ES100	ES100-00	9208	ULT 25Y	280.00	82.68	90.32		90.35	0.000258	1.48	189.17	36.33	0.11
ES100	ES100-00	9208	ULT 100Y	440.00	82.68	91.84		91.89	0.000323	1.75	252.10	44.93	0.13
ES100	ES100-00	9850	EX 10Y	187.00	82.55	89.60		89.62	0.000144	1.02	183.21	40.99	0.09
ES100	ES100-00	9850	EX 25Y	242.00	82.55	90.45		90.47	0.000145	1.11	218.83	43.28	0.09
ES100	ES100-00	9850	EX 100Y	368.00	82.55	91.93		91.95	0.000159	1.29	286.01	48.03	0.09
ES100	ES100-00	9850	ULT 10Y	190.00	82.55	89.69		89.70	0.000141	1.02	186.66	41.22	0.08
ES100	ES100-00	9850	ULT 25Y	250.00	82.55	90.46		90.48	0.000153	1.14	219.40	43.31	0.09
ES100	ES100-00	9850	ULT 100Y	370.00	82.55	92.01		92.03	0.000155	1.28	289.86	48.35	0.09
ES100	ES100-00	10472	EX 10Y	187.00	82.96	89.70		89.72	0.000182	1.12	166.81	38.72	0.10
ES100	ES100-00	10472	EX 25Y	242.00	82.96	90.55		90.57	0.000181	1.21	200.59	41.20	0.10
ES100	ES100-00	10472	EX 100Y	368.00	82.96	92.03		92.06	0.000191	1.39	265.03	45.31	0.10
ES100	ES100-00	10472	ULT 10Y	190.00	82.96	89.78		89.80	0.000178	1.12	169.99	38.96	0.09
ES100	ES100-00	10472	ULT 25Y	250.00	82.96	90.57		90.59	0.000191	1.24	201.37	41.26	0.10
ES100	ES100-00	10472	ULT 100Y	370.00	82.96	92.11		92.14	0.000186	1.38	268.53	45.49	0.10
ES100	ES100-00	11071	EX 10Y	187.00	84.25	89.82		89.85	0.000246	1.23	151.91	38.91	0.11
ES100	ES100-00	11071	EX 25Y	242.00	84.25	90.67		90.69	0.000230	1.30	185.56	41.10	0.11
ES100	ES100-00	11071	EX 100Y	368.00	84.25	92.15		92.19	0.000228	1.47	249.66	45.00	0.11
ES100	ES100-00	11071	ULT 10Y	190.00	84.25	89.90		89.93	0.000239	1.23	154.98	39.11	0.11
ES100	ES100-00	11071	ULT 25Y	250.00	84.25	90.69		90.72	0.000242	1.34	186.60	41.17	0.11
ES100	ES100-00	11071	ULT 100Y	370.00	84.25	92.23		92.26	0.000222	1.46	253.00	45.20	0.11
ES100	ES100-00	11298	EX 10Y	187.00	83.91	89.88		89.91	0.000266	1.27	147.49	38.13	0.11
ES100	ES100-00	11298	EX 25Y	242.00	83.91	90.72		90.75	0.000252	1.34	180.82	41.23	0.11
ES100	ES100-00	11298	EX 100Y	368.00	83.91	92.21		92.24	0.000253	1.49	247.61	48.04	0.12
ES100	ES100-00	11298	ULT 10Y	190.00	83.91	89.96		89.98	0.000260	1.26	150.47	38.56	0.11
ES100	ES100-00	11298	ULT 25Y	250.00	83.91	90.75		90.78	0.000265	1.37	181.98	41.36	0.12
ES100	ES100-00	11298	ULT 100Y	370.00	83.91	92.28		92.32	0.000246	1.47	251.11	48.27	0.11
ES100	ES100-00	11934	EX 10Y	187.00	84.46	89.99		90.01	0.000100	0.82	227.14	55.07	0.07
ES100	ES100-00	11934	EX 25Y	242.00	84.46	90.83		90.84	0.000095	0.88	274.04	57.30	0.07
ES100	ES100-00	11934	EX 100Y	368.00	84.46	92.32		92.34	0.000096	1.02	362.44	61.07	0.07
ES100	ES100-00	11934	ULT 10Y	190.00	84.46	90.07		90.08	0.000097	0.82	231.30	55.28	0.07
ES100	ES100-00	11934	ULT 25Y	250.00	84.46	90.86		90.88	0.000099	0.91	275.95	57.39	0.07
ES100	ES100-00	11934	ULT 100Y	370.00	84.46	92.39		92.41	0.000094	1.01	366.71	61.24	0.07
ES100	ES100-00	12315	EX 10Y	187.00	84.29	90.04		90.05	0.000127	0.94	199.65	47.47	0.08
ES100	ES100-00	12315	EX 25Y	242.00	84.29	90.87		90.88	0.000124	1.01	240.25	50.05	0.08
ES100	ES100-00	12315	EX 100Y	368.00	84.29	92.36		92.38	0.000128	1.16	318.44	54.77	0.08
ES100	ES100-00	12315	ULT 10Y	190.00	84.29	90.11		90.12	0.000124	0.94	203.19	47.70	0.08
ES100	ES100-00	12315	ULT 25Y	250.00	84.29	90.90		90.92	0.000129	1.03	242.01	50.16	0.08
ES100	ES100-00	12315	ULT 100Y	370.00	84.29	92.43		92.45	0.000125	1.15	322.22	55.02	0.08

HEC-RAS Plan: BASE (Continued)

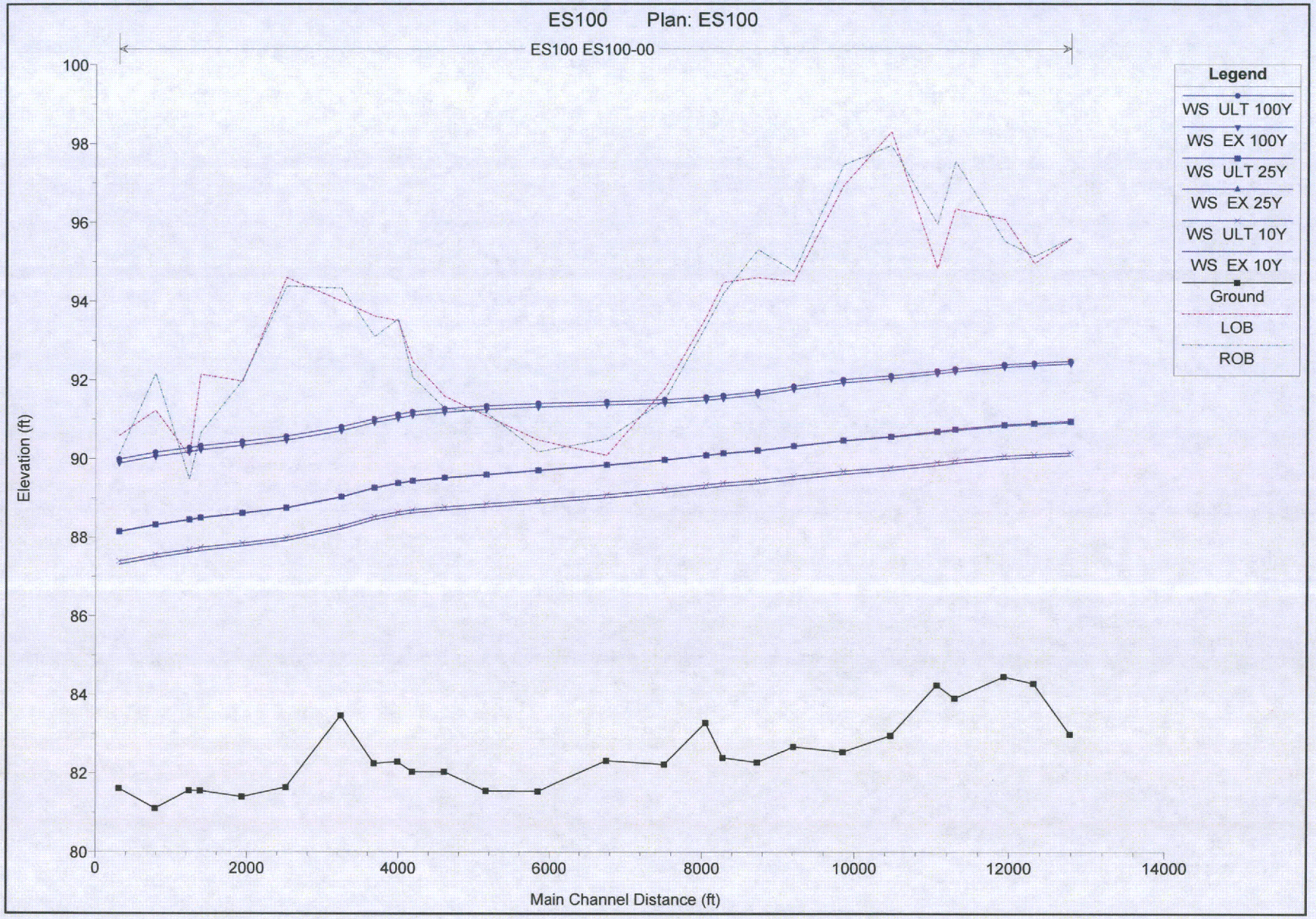
River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ES100	ES100-00	12785	EX 10Y	187.00	83.00	90.08		90.08	0.000049	0.68	273.02	49.31	0.05
ES100	ES100-00	12785	EX 25Y	242.00	83.00	90.91		90.92	0.000054	0.77	315.01	51.25	0.05
ES100	ES100-00	12785	EX 100Y	368.00	83.00	92.41		92.42	0.000066	0.93	394.48	55.02	0.06
ES100	ES100-00	12785	ULT 10Y	190.00	83.00	90.15		90.16	0.000048	0.69	276.67	49.48	0.05
ES100	ES100-00	12785	ULT 25Y	250.00	83.00	90.95		90.96	0.000057	0.79	316.91	51.34	0.06
ES100	ES100-00	12785	ULT 100Y	370.00	83.00	92.48		92.49	0.000065	0.93	398.23	55.30	0.06
ES101	ES101-00	298	EX 10Y	50.00	84.30	88.11	85.70	88.13	0.000400	1.13	44.30	17.80	0.13
ES101	ES101-00	298	EX 25Y	66.00	84.30	88.65	85.89	88.67	0.000400	1.22	54.22	19.29	0.13
ES101	ES101-00	298	EX 100Y	101.00	84.30	89.61	86.24	89.64	0.000400	1.36	74.17	22.08	0.13
ES101	ES101-00	298	ULT 10Y	50.00	84.30	88.11	85.70	88.13	0.000400	1.13	44.30	17.80	0.13
ES101	ES101-00	298	ULT 25Y	70.00	84.30	88.77	85.93	88.80	0.000400	1.24	56.61	19.64	0.13
ES101	ES101-00	298	ULT 100Y	110.00	84.30	89.83	86.31	89.86	0.000400	1.39	79.03	22.72	0.13
ES101	ES101-00	538	EX 10Y	50.00	87.39	88.69	88.69	89.08	0.034792	4.98	10.05	13.43	1.01
ES101	ES101-00	538	EX 25Y	66.00	87.39	88.86	88.86	89.30	0.033170	5.35	12.33	14.22	1.01
ES101	ES101-00	538	EX 100Y	101.00	87.39	89.74		89.96	0.008520	3.79	26.66	18.42	0.55
ES101	ES101-00	538	ULT 10Y	50.00	87.39	88.69	88.69	89.08	0.034792	4.98	10.05	13.43	1.01
ES101	ES101-00	538	ULT 25Y	70.00	87.39	88.90	88.90	89.36	0.032853	5.43	12.88	14.40	1.01
ES101	ES101-00	538	ULT 100Y	110.00	87.39	89.96		90.16	0.006657	3.56	30.92	19.45	0.50
ES101	ES101-00	830	EX 10Y	50.00	89.79	91.67		91.74	0.004050	2.15	23.31	22.16	0.37
ES101	ES101-00	830	EX 25Y	66.00	89.79	91.87		91.96	0.004093	2.37	27.90	23.01	0.38
ES101	ES101-00	830	EX 100Y	101.00	89.79	92.02		92.18	0.006811	3.23	31.27	23.61	0.49
ES101	ES101-00	830	ULT 10Y	50.00	89.79	91.67		91.74	0.004050	2.15	23.31	22.16	0.37
ES101	ES101-00	830	ULT 25Y	70.00	89.79	91.92		92.01	0.004102	2.41	29.00	23.21	0.38
ES101	ES101-00	830	ULT 100Y	110.00	89.79	92.05		92.23	0.007576	3.44	31.95	23.73	0.52
ES101	ES101-00	1182	EX 10Y	50.00	90.01	92.46		92.50	0.001316	1.53	32.63	21.68	0.22
ES101	ES101-00	1182	EX 25Y	66.00	90.01	92.72		92.77	0.001464	1.71	38.54	23.45	0.24
ES101	ES101-00	1182	EX 100Y	101.00	90.01	93.18		93.24	0.001672	2.03	49.85	25.95	0.26
ES101	ES101-00	1182	ULT 10Y	50.00	90.01	92.46		92.50	0.001316	1.53	32.63	21.68	0.22
ES101	ES101-00	1182	ULT 25Y	70.00	90.01	92.78		92.83	0.001496	1.75	39.94	23.85	0.24
ES101	ES101-00	1182	ULT 100Y	110.00	90.01	93.28		93.35	0.001721	2.09	52.57	26.64	0.26
ES101	ES101-00	1450	EX 10Y	50.00	90.39	92.73		92.75	0.000674	1.12	44.84	29.36	0.16
ES101	ES101-00	1450	EX 25Y	66.00	90.39	93.01		93.03	0.000698	1.24	53.32	30.52	0.17
ES101	ES101-00	1450	EX 100Y	101.00	90.39	93.51		93.54	0.000761	1.46	68.96	32.56	0.18
ES101	ES101-00	1450	ULT 10Y	50.00	90.39	92.73		92.75	0.000674	1.12	44.84	29.36	0.16
ES101	ES101-00	1450	ULT 25Y	70.00	90.39	93.07		93.10	0.000705	1.27	55.28	30.79	0.17
ES101	ES101-00	1450	ULT 100Y	110.00	90.39	93.62		93.65	0.000772	1.51	72.62	32.89	0.18
ES101	ES101-00	1619	EX 10Y	50.00	89.74	92.84		92.86	0.000695	1.24	40.27	22.72	0.16
ES101	ES101-00	1619	EX 25Y	66.00	89.74	93.13		93.16	0.000784	1.40	47.10	24.21	0.18
ES101	ES101-00	1619	EX 100Y	101.00	89.74	93.64		93.69	0.000951	1.67	60.32	27.37	0.20
ES101	ES101-00	1619	ULT 10Y	50.00	89.74	92.84		92.86	0.000695	1.24	40.27	22.72	0.16
ES101	ES101-00	1619	ULT 25Y	70.00	89.74	93.20		93.23	0.000807	1.44	48.72	24.63	0.18
ES101	ES101-00	1619	ULT 100Y	110.00	89.74	93.76		93.80	0.000983	1.73	63.49	28.07	0.20
ES101	ES101-00	2043	EX 10Y	50.00	89.19	92.98		92.99	0.000164	0.77	65.04	24.72	0.08
ES101	ES101-00	2043	EX 25Y	66.00	89.19	93.30		93.31	0.000206	0.90	73.18	25.94	0.09
ES101	ES101-00	2043	EX 100Y	101.00	89.19	93.87		93.89	0.000288	1.14	88.58	28.31	0.11
ES101	ES101-00	2043	ULT 10Y	50.00	89.19	92.98		92.99	0.000164	0.77	65.04	24.72	0.08
ES101	ES101-00	2043	ULT 25Y	70.00	89.19	93.38		93.39	0.000216	0.93	75.09	26.22	0.10
ES101	ES101-00	2043	ULT 100Y	110.00	89.19	94.00		94.02	0.000307	1.19	92.21	28.85	0.12
ES101	ES101-00	2603	EX 10Y	50.00	89.55	93.08		93.09	0.000187	0.79	62.96	25.49	0.09
ES101	ES101-00	2603	EX 25Y	66.00	89.55	93.42		93.44	0.000224	0.92	71.91	26.72	0.10
ES101	ES101-00	2603	EX 100Y	101.00	89.55	94.03		94.05	0.000297	1.13	89.26	29.90	0.12
ES101	ES101-00	2603	ULT 10Y	50.00	89.55	93.08		93.09	0.000187	0.79	62.96	25.49	0.09
ES101	ES101-00	2603	ULT 25Y	70.00	89.55	93.50		93.51	0.000233	0.95	74.04	27.13	0.10
ES101	ES101-00	2603	ULT 100Y	110.00	89.55	94.17		94.19	0.000313	1.18	93.39	30.60	0.12
ES101	ES101-00	3230	EX 10Y	50.00	88.20	93.16		93.16	0.000078	0.56	89.74	32.02	0.06
ES101	ES101-00	3230	EX 25Y	66.00	88.20	93.52		93.53	0.000099	0.65	101.81	34.51	0.07
ES101	ES101-00	3230	EX 100Y	101.00	88.20	94.16		94.17	0.000121	0.81	125.09	38.38	0.08
ES101	ES101-00	3230	ULT 10Y	50.00	88.20	93.16		93.16	0.000078	0.56	89.74	32.02	0.06
ES101	ES101-00	3230	ULT 25Y	70.00	88.20	93.60		93.61	0.000102	0.67	104.68	34.94	0.07
ES101	ES101-00	3230	ULT 100Y	110.00	88.20	94.30		94.31	0.000125	0.85	130.62	39.25	0.08
ES101	ES101-00	3652	EX 10Y	50.00	89.17	93.19		93.20	0.000089	0.60	83.23	29.50	0.06
ES101	ES101-00	3652	EX 25Y	66.00	89.17	93.56		93.57	0.000109	0.70	94.42	30.82	0.07
ES101	ES101-00	3652	EX 100Y	101.00	89.17	94.21		94.22	0.000140	0.88	115.63	34.62	0.08
ES101	ES101-00	3652	ULT 10Y	50.00	89.17	93.19		93.20	0.000089	0.60	83.23	29.50	0.06
ES101	ES101-00	3652	ULT 25Y	70.00	89.17	93.65		93.65	0.000113	0.72	97.03	31.12	0.07
ES101	ES101-00	3652	ULT 100Y	110.00	89.17	94.36		94.37	0.000147	0.92	120.71	35.52	0.08
ES101	ES101-00	4064	EX 10Y	50.00	88.52	93.23		93.24	0.000102	0.68	73.85	22.94	0.07
ES101	ES101-00	4064	EX 25Y	66.00	88.52	93.61		93.62	0.000130	0.80	82.78	24.01	0.08
ES101	ES101-00	4064	EX 100Y	101.00	88.52	94.27		94.29	0.000185	1.02	99.39	25.89	0.09
ES101	ES101-00	4064	ULT 10Y	50.00	88.52	93.23		93.24	0.000102	0.68	73.85	22.94	0.07
ES101	ES101-00	4064	ULT 25Y	70.00	88.52	93.70		93.71	0.000137	0.82	84.86	24.25	0.08
ES101	ES101-00	4064	ULT 100Y	110.00	88.52	94.42		94.44	0.000198	1.07	103.26	26.31	0.09
ES102	ES102-00	410	EX 10Y	138.00	86.20	91.03	88.28	91.05	0.000400	1.31	105.52	35.58	0.13
ES102	ES102-00	410	EX 25Y	178.00	86.20	91.57	88.47	91.60	0.000400	1.42	125.23	37.02	0.14

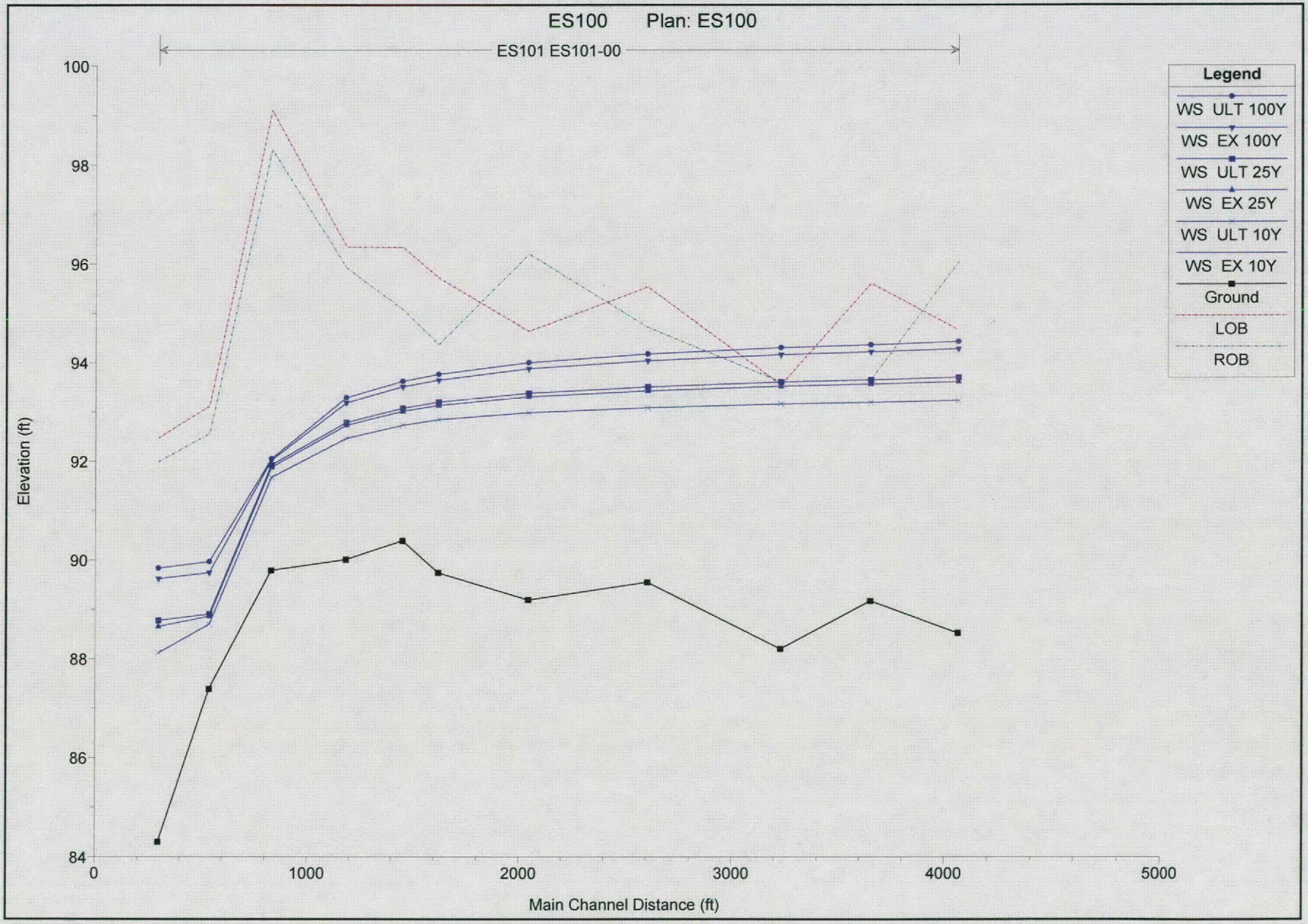
HEC-RAS Plan: BASE (Continued)

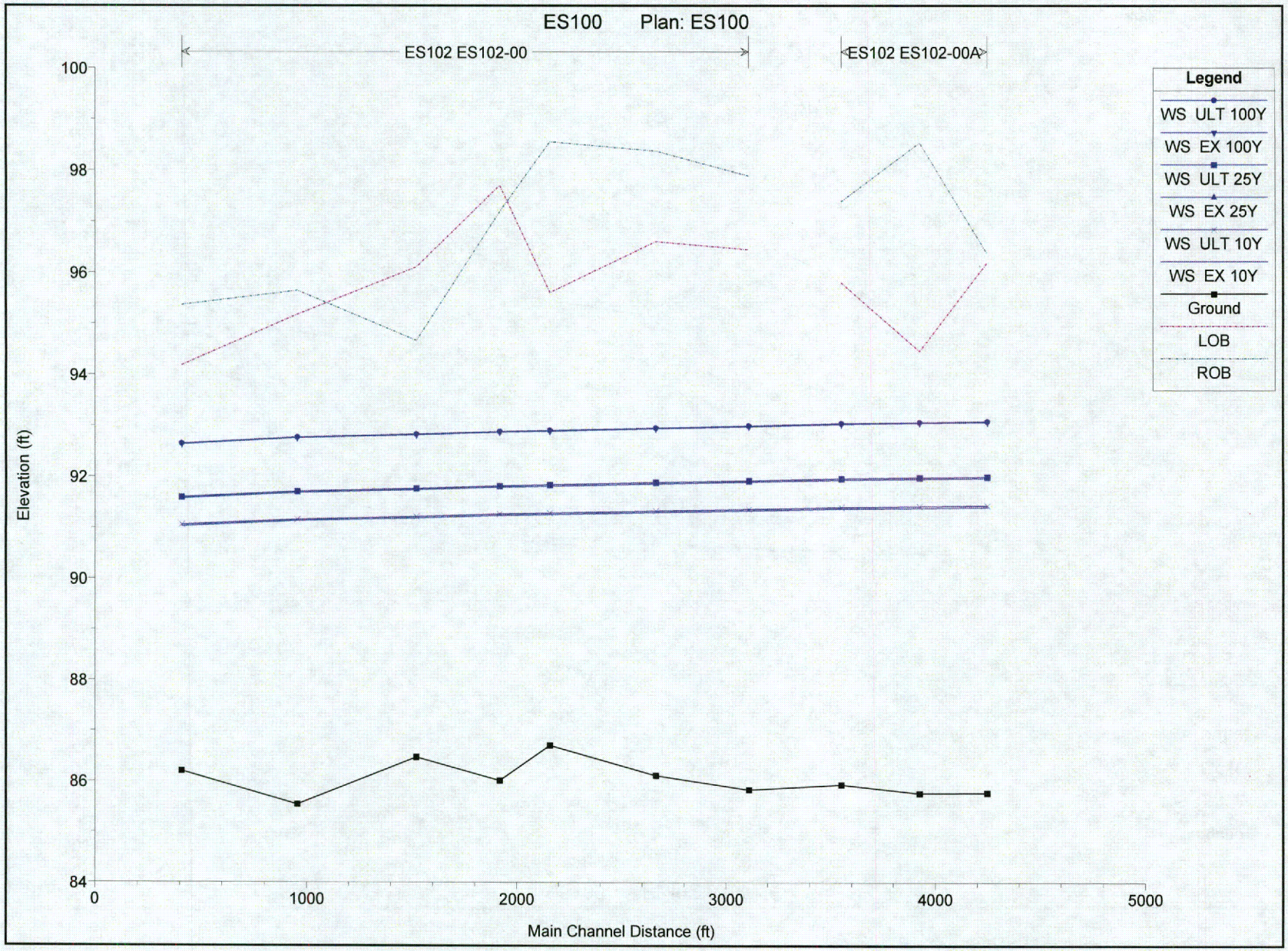
River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ES102	ES102-00	410	EX 100Y	269.00	86.20	92.63	88.88	92.67	0.000400	1.62	166.08	39.94	0.14
ES102	ES102-00	410	ULT 10Y	140.00	86.20	91.05	88.29	91.08	0.000401	1.31	106.48	35.66	0.13
ES102	ES102-00	410	ULT 25Y	180.00	86.20	91.59	88.48	91.63	0.000400	1.43	126.18	37.08	0.14
ES102	ES102-00	410	ULT 100Y	270.00	86.20	92.64	88.89	92.68	0.000400	1.62	166.51	39.97	0.14
ES102	ES102-00	956	EX 10Y	138.00	85.54	91.13		91.13	0.000073	0.64	214.58	60.64	0.06
ES102	ES102-00	956	EX 25Y	178.00	85.54	91.68		91.68	0.000079	0.72	248.65	63.09	0.06
ES102	ES102-00	956	EX 100Y	269.00	85.54	92.75		92.76	0.000087	0.84	319.15	67.81	0.07
ES102	ES102-00	956	ULT 10Y	140.00	85.54	91.15		91.16	0.000074	0.65	216.25	60.76	0.06
ES102	ES102-00	956	ULT 25Y	180.00	85.54	91.70		91.71	0.000079	0.72	250.29	63.21	0.06
ES102	ES102-00	956	ULT 100Y	270.00	85.54	92.76		92.77	0.000087	0.84	319.88	67.85	0.07
ES102	ES102-00	1522	EX 10Y	138.00	86.47	91.18		91.19	0.000152	0.86	161.30	51.08	0.08
ES102	ES102-00	1522	EX 25Y	178.00	86.47	91.73		91.75	0.000154	0.94	190.13	53.16	0.09
ES102	ES102-00	1522	EX 100Y	269.00	86.47	92.81		92.83	0.000161	1.08	249.87	58.10	0.09
ES102	ES102-00	1522	ULT 10Y	140.00	86.47	91.21		91.22	0.000152	0.86	162.71	51.19	0.09
ES102	ES102-00	1522	ULT 25Y	180.00	86.47	91.76		91.77	0.000155	0.94	191.52	53.27	0.09
ES102	ES102-00	1522	ULT 100Y	270.00	86.47	92.82		92.84	0.000161	1.08	250.49	58.18	0.09
ES102	ES102-00	1920	EX 10Y	138.00	86.01	91.23		91.24	0.000089	0.64	215.48	71.13	0.06
ES102	ES102-00	1920	EX 25Y	178.00	86.01	91.79		91.79	0.000087	0.70	255.44	73.02	0.07
ES102	ES102-00	1920	EX 100Y	269.00	86.01	92.87		92.88	0.000085	0.80	336.45	76.74	0.07
ES102	ES102-00	1920	ULT 10Y	140.00	86.01	91.26		91.27	0.000089	0.64	217.46	71.22	0.06
ES102	ES102-00	1920	ULT 25Y	180.00	86.01	91.81		91.82	0.000087	0.70	257.36	73.11	0.07
ES102	ES102-00	1920	ULT 100Y	270.00	86.01	92.88		92.89	0.000085	0.80	337.27	76.77	0.07
ES102	ES102-00	2160	EX 10Y	138.00	86.70	91.25		91.26	0.000110	0.74	186.17	57.85	0.07
ES102	ES102-00	2160	EX 25Y	178.00	86.70	91.81		91.82	0.000116	0.81	220.09	62.15	0.08
ES102	ES102-00	2160	EX 100Y	269.00	86.70	92.89		92.90	0.000115	0.93	288.93	65.25	0.08
ES102	ES102-00	2160	ULT 10Y	140.00	86.70	91.28		91.29	0.000113	0.75	187.81	59.06	0.07
ES102	ES102-00	2160	ULT 25Y	180.00	86.70	91.83		91.84	0.000116	0.81	221.72	62.22	0.08
ES102	ES102-00	2160	ULT 100Y	270.00	86.70	92.90		92.91	0.000115	0.93	289.63	65.28	0.08
ES102	ES102-00	2666	EX 10Y	138.00	86.11	91.29		91.30	0.000057	0.61	225.59	56.15	0.05
ES102	ES102-00	2666	EX 25Y	178.00	86.11	91.85		91.86	0.000067	0.69	258.28	60.73	0.06
ES102	ES102-00	2666	EX 100Y	269.00	86.11	92.94		92.95	0.000076	0.82	326.36	64.46	0.06
ES102	ES102-00	2666	ULT 10Y	140.00	86.11	91.32		91.33	0.000057	0.62	227.21	56.39	0.05
ES102	ES102-00	2666	ULT 25Y	180.00	86.11	91.88		91.89	0.000067	0.69	259.88	60.94	0.06
ES102	ES102-00	2666	ULT 100Y	270.00	86.11	92.95		92.96	0.000076	0.83	327.06	64.49	0.06
ES102	ES102-00	3110	EX 10Y	138.00	85.83	91.33		91.34	0.000110	0.76	181.48	53.83	0.07
ES102	ES102-00	3110	EX 25Y	178.00	85.83	91.89		91.90	0.000114	0.84	212.24	55.44	0.08
ES102	ES102-00	3110	EX 100Y	269.00	85.83	92.98		92.99	0.000121	0.98	274.22	58.53	0.08
ES102	ES102-00	3110	ULT 10Y	140.00	85.83	91.36		91.36	0.000111	0.76	183.04	53.91	0.07
ES102	ES102-00	3110	ULT 25Y	180.00	85.83	91.92		91.93	0.000114	0.84	213.71	55.51	0.08
ES102	ES102-00	3110	ULT 100Y	270.00	85.83	92.99		93.00	0.000121	0.98	274.85	58.55	0.08
ES102	ES102-00A	3552	EX 10Y	85.00	85.93	91.36		91.37	0.000044	0.52	163.87	42.00	0.05
ES102	ES102-00A	3552	EX 25Y	109.00	85.93	91.93		91.94	0.000048	0.58	188.16	43.78	0.05
ES102	ES102-00A	3552	EX 100Y	165.00	85.93	93.03		93.03	0.000061	0.69	240.62	51.61	0.06
ES102	ES102-00A	3552	ULT 10Y	90.00	85.93	91.39		91.40	0.000048	0.55	165.13	42.10	0.05
ES102	ES102-00A	3552	ULT 25Y	110.00	85.93	91.96		91.96	0.000048	0.58	189.32	43.87	0.05
ES102	ES102-00A	3552	ULT 100Y	170.00	85.93	93.04		93.04	0.000064	0.70	241.20	51.64	0.06
ES102	ES102-00A	3926	EX 10Y	85.00	85.76	91.38		91.38	0.000039	0.49	172.34	43.44	0.04
ES102	ES102-00A	3926	EX 25Y	109.00	85.76	91.95		91.95	0.000043	0.55	197.37	44.73	0.05
ES102	ES102-00A	3926	EX 100Y	165.00	85.76	93.05		93.05	0.000050	0.67	247.87	47.22	0.05
ES102	ES102-00A	3926	ULT 10Y	90.00	85.76	91.41		91.42	0.000042	0.52	173.70	43.51	0.05
ES102	ES102-00A	3926	ULT 25Y	110.00	85.76	91.97		91.98	0.000043	0.55	198.56	44.79	0.05
ES102	ES102-00A	3926	ULT 100Y	170.00	85.76	93.06		93.07	0.000053	0.68	248.46	47.25	0.05
ES102	ES102-00A	4248	EX 10Y	85.00	85.77	91.39		91.40	0.000047	0.54	158.75	41.14	0.05
ES102	ES102-00A	4248	EX 25Y	109.00	85.77	91.96		91.97	0.000052	0.60	182.85	43.55	0.05
ES102	ES102-00A	4248	EX 100Y	165.00	85.77	93.06		93.07	0.000060	0.71	233.28	48.00	0.06
ES102	ES102-00A	4248	ULT 10Y	90.00	85.77	91.43		91.43	0.000051	0.56	160.09	41.27	0.05
ES102	ES102-00A	4248	ULT 25Y	110.00	85.77	91.99		91.99	0.000052	0.60	184.01	43.66	0.05
ES102	ES102-00A	4248	ULT 100Y	170.00	85.77	93.08		93.09	0.000064	0.73	233.92	48.05	0.06
ES102-01	ES102-01	470	EX 10Y	20.00	87.33	91.37		91.37	0.000020	0.26	78.02	32.14	0.03
ES102-01	ES102-01	470	EX 25Y	26.00	87.33	91.94		91.94	0.000018	0.27	96.69	33.97	0.03
ES102-01	ES102-01	470	EX 100Y	41.00	87.33	93.03		93.03	0.000017	0.30	135.72	37.52	0.03
ES102-01	ES102-01	470	ULT 10Y	20.00	87.33	91.40		91.40	0.000019	0.25	78.95	32.23	0.03
ES102-01	ES102-01	470	ULT 25Y	30.00	87.33	91.97		91.97	0.000023	0.31	97.62	34.06	0.03
ES102-01	ES102-01	470	ULT 100Y	50.00	87.33	93.04		93.04	0.000024	0.37	136.19	37.56	0.03
ES102-01	ES102-01	899	EX 10Y	20.00	86.87	91.38		91.38	0.000012	0.21	93.65	33.41	0.02
ES102-01	ES102-01	899	EX 25Y	26.00	86.87	91.94		91.95	0.000011	0.23	112.82	34.53	0.02
ES102-01	ES102-01	899	EX 100Y	41.00	86.87	93.04		93.04	0.000011	0.27	151.70	36.69	0.02
ES102-01	ES102-01	899	ULT 10Y	20.00	86.87	91.41		91.41	0.000011	0.21	94.61	33.47	0.02
ES102-01	ES102-01	899	ULT 25Y	30.00	86.87	91.97		91.97	0.000014	0.26	113.83	34.59	0.03
ES102-01	ES102-01	899	ULT 100Y	50.00	86.87	93.05		93.05	0.000017	0.33	152.25	36.72	0.03
ES102-01	ES102-01	1152	EX 10Y	20.00	86.51	91.38		91.38	0.000003	0.13	149.82	39.75	0.01
ES102-01	ES102-01	1152	EX 25Y	26.00	86.51	91.95		91.95	0.000003	0.15	172.57	40.85	0.01
ES102-01	ES102-01	1152	EX 100Y	41.00	86.51	93.04		93.04	0.000004	0.19	218.36	43.17	0.01
ES102-01	ES102-01	1152	ULT 10Y	20.00	86.51	91.41		91.41	0.000003	0.13	150.97	39.81	0.01
ES102-01	ES102-01	1152	ULT 25Y	30.00	86.51	91.98		91.98	0.000004	0.17	173.80	40.91	0.01

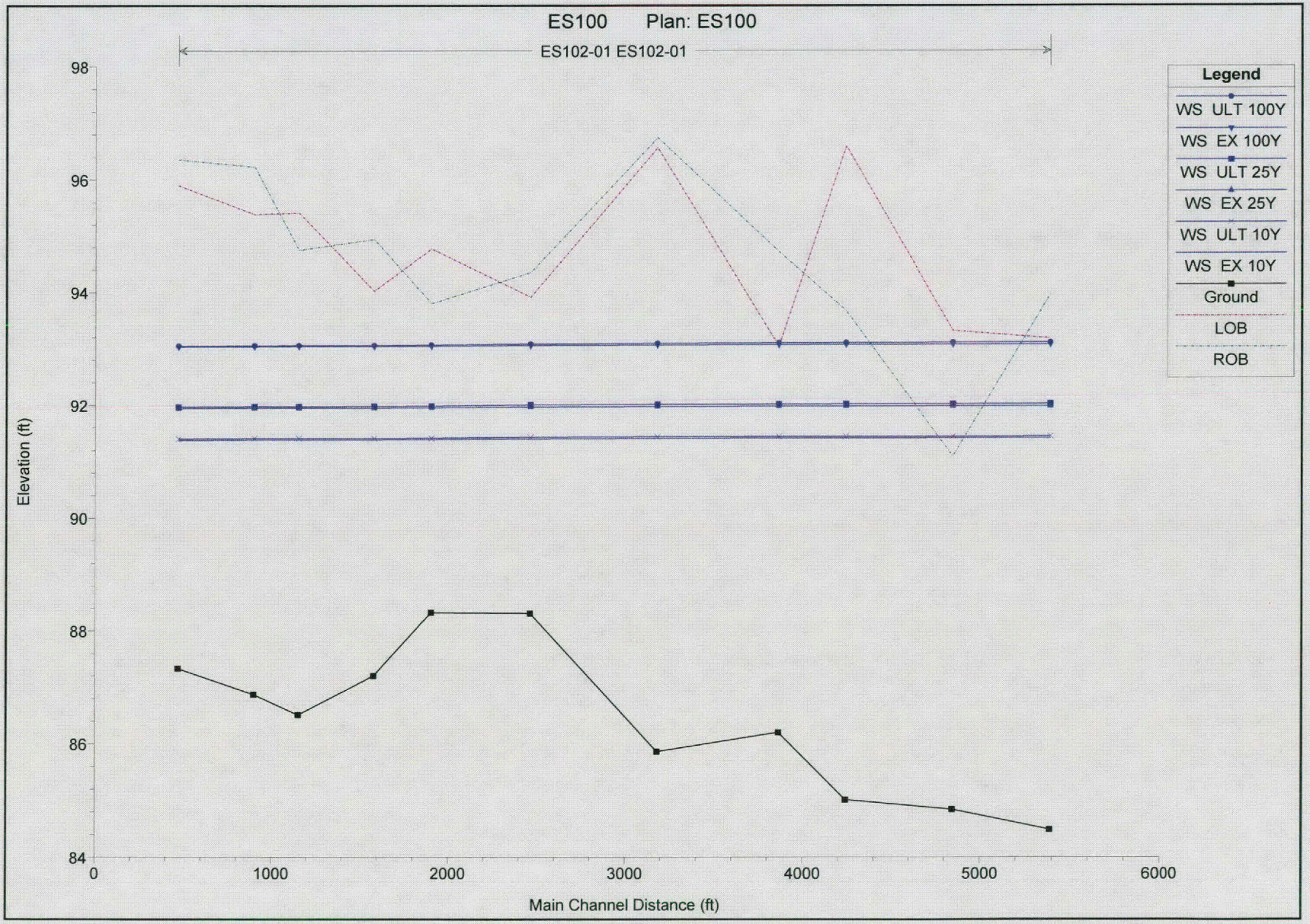
HEC-RAS Plan: BASE (Continued)

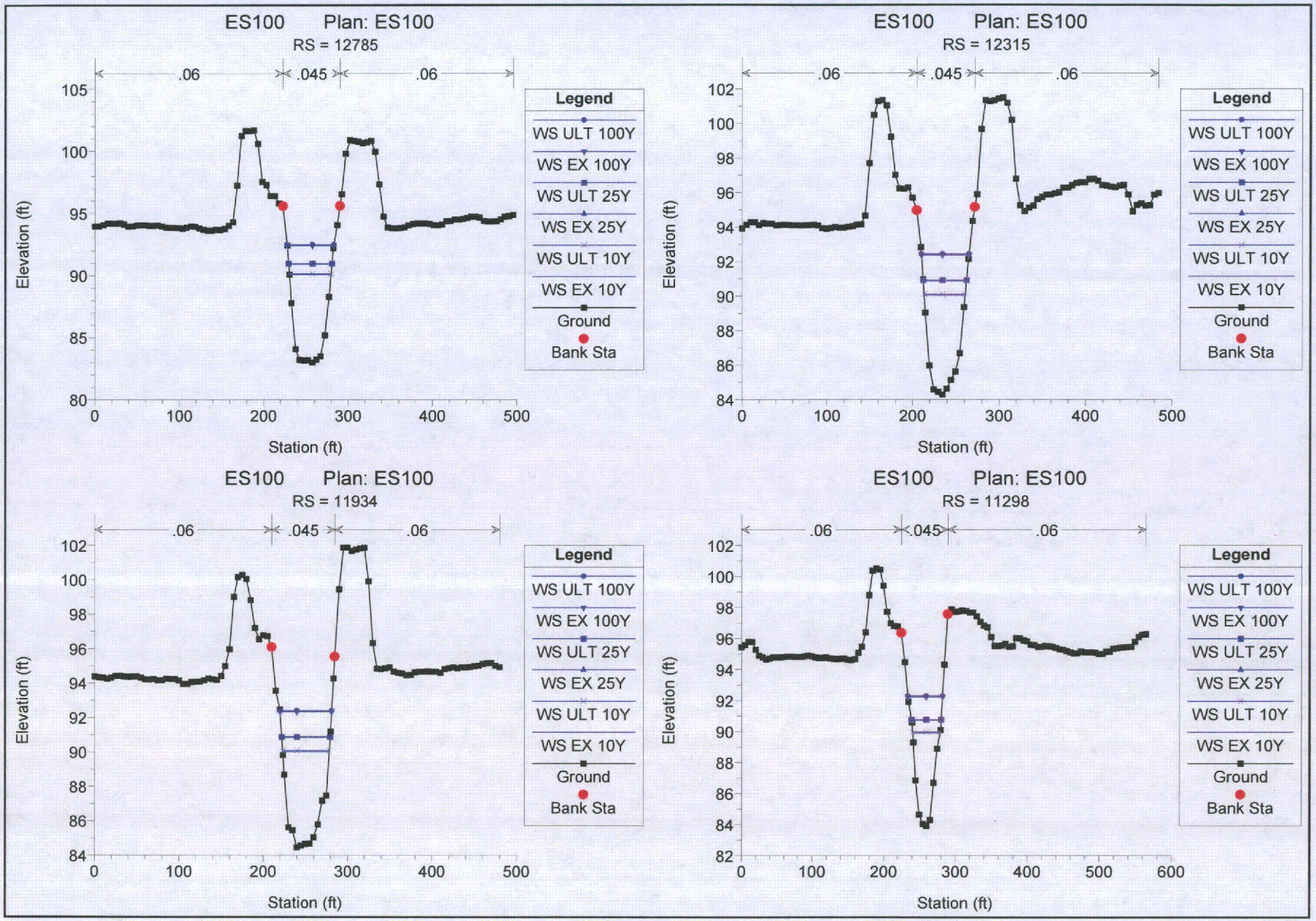
River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
ES102-01	ES102-01	1152	ULT 100Y	50.00	86.51	93.05		93.06	0.000006	0.23	219.06	43.23	0.02
ES102-01	ES102-01	1581	EX 10Y	20.00	87.20	91.38		91.38	0.000010	0.20	101.76	37.12	0.02
ES102-01	ES102-01	1581	EX 25Y	26.00	87.20	91.95		91.95	0.000009	0.21	123.45	39.80	0.02
ES102-01	ES102-01	1581	EX 100Y	41.00	87.20	93.04		93.04	0.000010	0.24	172.02	79.12	0.02
ES102-01	ES102-01	1581	ULT 10Y	20.00	87.20	91.41		91.41	0.000009	0.19	102.83	37.25	0.02
ES102-01	ES102-01	1581	ULT 25Y	30.00	87.20	91.98		91.98	0.000012	0.24	124.67	39.96	0.02
ES102-01	ES102-01	1581	ULT 100Y	50.00	87.20	93.06		93.06	0.000014	0.29	173.44	83.49	0.03
ES102-01	ES102-01	1904	EX 10Y	20.00	88.32	91.39		91.39	0.000024	0.28	70.30	28.34	0.03
ES102-01	ES102-01	1904	EX 25Y	26.00	88.32	91.95		91.95	0.000022	0.30	86.63	29.55	0.03
ES102-01	ES102-01	1904	EX 100Y	41.00	88.32	93.04		93.05	0.000020	0.34	133.87	102.82	0.03
ES102-01	ES102-01	1904	ULT 10Y	20.00	88.32	91.42		91.42	0.000023	0.28	71.11	28.40	0.03
ES102-01	ES102-01	1904	ULT 25Y	30.00	88.32	91.98		91.99	0.000028	0.34	87.57	29.62	0.04
ES102-01	ES102-01	1904	ULT 100Y	50.00	88.32	93.06		93.07	0.000029	0.41	135.84	103.20	0.04
ES102-01	ES102-01	2464	EX 10Y	20.00	88.31	91.40		91.41	0.000037	0.33	59.88	25.98	0.04
ES102-01	ES102-01	2464	EX 25Y	26.00	88.31	91.97		91.97	0.000032	0.35	74.89	27.39	0.04
ES102-01	ES102-01	2464	EX 100Y	41.00	88.31	93.06		93.06	0.000030	0.38	107.04	31.61	0.04
ES102-01	ES102-01	2464	ULT 10Y	20.00	88.31	91.43		91.43	0.000035	0.33	60.61	26.05	0.04
ES102-01	ES102-01	2464	ULT 25Y	30.00	88.31	92.00		92.00	0.000041	0.40	75.87	27.48	0.04
ES102-01	ES102-01	2464	ULT 100Y	50.00	88.31	93.08		93.09	0.000043	0.46	107.84	31.71	0.04
ES102-01	ES102-01	3180	EX 10Y	20.00	85.86	91.41		91.41	0.000003	0.14	140.04	35.76	0.01
ES102-01	ES102-01	3180	EX 25Y	26.00	85.86	91.97		91.97	0.000004	0.16	160.56	37.16	0.01
ES102-01	ES102-01	3180	EX 100Y	41.00	85.86	93.07		93.07	0.000005	0.20	202.66	39.94	0.02
ES102-01	ES102-01	3180	ULT 10Y	20.00	85.86	91.44		91.44	0.000003	0.14	141.03	35.83	0.01
ES102-01	ES102-01	3180	ULT 25Y	30.00	85.86	92.01		92.01	0.000005	0.19	161.98	37.26	0.02
ES102-01	ES102-01	3180	ULT 100Y	50.00	85.86	93.10		93.10	0.000007	0.25	203.83	40.01	0.02
ES102-01	ES102-01	3865	EX 10Y	20.00	86.20	91.41		91.41	0.000006	0.18	111.43	29.14	0.02
ES102-01	ES102-01	3865	EX 25Y	26.00	86.20	91.98		91.98	0.000006	0.20	128.20	30.41	0.02
ES102-01	ES102-01	3865	EX 100Y	41.00	86.20	93.07		93.07	0.000008	0.25	162.78	32.92	0.02
ES102-01	ES102-01	3865	ULT 10Y	20.00	86.20	91.44		91.44	0.000006	0.18	112.24	29.20	0.02
ES102-01	ES102-01	3865	ULT 25Y	30.00	86.20	92.02		92.02	0.000008	0.23	129.39	30.49	0.02
ES102-01	ES102-01	3865	ULT 100Y	50.00	86.20	93.10		93.10	0.000012	0.31	163.81	33.05	0.02
ES102-01	ES102-01	4243	EX 10Y	20.00	85.01	91.42		91.42	0.000004	0.16	126.75	32.47	0.01
ES102-01	ES102-01	4243	EX 25Y	26.00	85.01	91.98		91.98	0.000005	0.18	145.61	34.50	0.02
ES102-01	ES102-01	4243	EX 100Y	41.00	85.01	93.07		93.07	0.000006	0.22	185.56	38.52	0.02
ES102-01	ES102-01	4243	ULT 10Y	20.00	85.01	91.44		91.44	0.000004	0.16	127.65	32.57	0.01
ES102-01	ES102-01	4243	ULT 25Y	30.00	85.01	92.02		92.02	0.000006	0.20	146.99	34.65	0.02
ES102-01	ES102-01	4243	ULT 100Y	50.00	85.01	93.11		93.11	0.000009	0.27	186.81	38.63	0.02
ES102-01	ES102-01	4848	EX 10Y	20.00	84.84	91.42		91.42	0.000002	0.12	164.60	36.63	0.01
ES102-01	ES102-01	4848	EX 25Y	26.00	84.84	91.98		91.98	0.000002	0.14	202.94	150.39	0.01
ES102-01	ES102-01	4848	EX 100Y	41.00	84.84	93.08		93.08	0.000002	0.15	445.74	244.05	0.01
ES102-01	ES102-01	4848	ULT 10Y	20.00	84.84	91.45		91.45	0.000002	0.12	165.62	36.97	0.01
ES102-01	ES102-01	4848	ULT 25Y	30.00	84.84	92.02		92.02	0.000003	0.16	209.48	175.37	0.01
ES102-01	ES102-01	4848	ULT 100Y	50.00	84.84	93.11		93.11	0.000003	0.18	454.11	252.47	0.01
ES102-01	ES102-01	5391	EX 10Y	20.00	84.49	91.42		91.42	0.000001	0.10	277.08	252.66	0.01
ES102-01	ES102-01	5391	EX 25Y	26.00	84.49	91.98		91.98	0.000001	0.10	425.54	271.12	0.01
ES102-01	ES102-01	5391	EX 100Y	41.00	84.49	93.08		93.08	0.000001	0.09	735.43	293.05	0.01
ES102-01	ES102-01	5391	ULT 10Y	20.00	84.49	91.45		91.45	0.000001	0.10	284.11	254.29	0.01
ES102-01	ES102-01	5391	ULT 25Y	30.00	84.49	92.02		92.02	0.000002	0.11	436.58	272.09	0.01
ES102-01	ES102-01	5391	ULT 100Y	50.00	84.49	93.11		93.11	0.000001	0.11	745.41	293.52	0.01

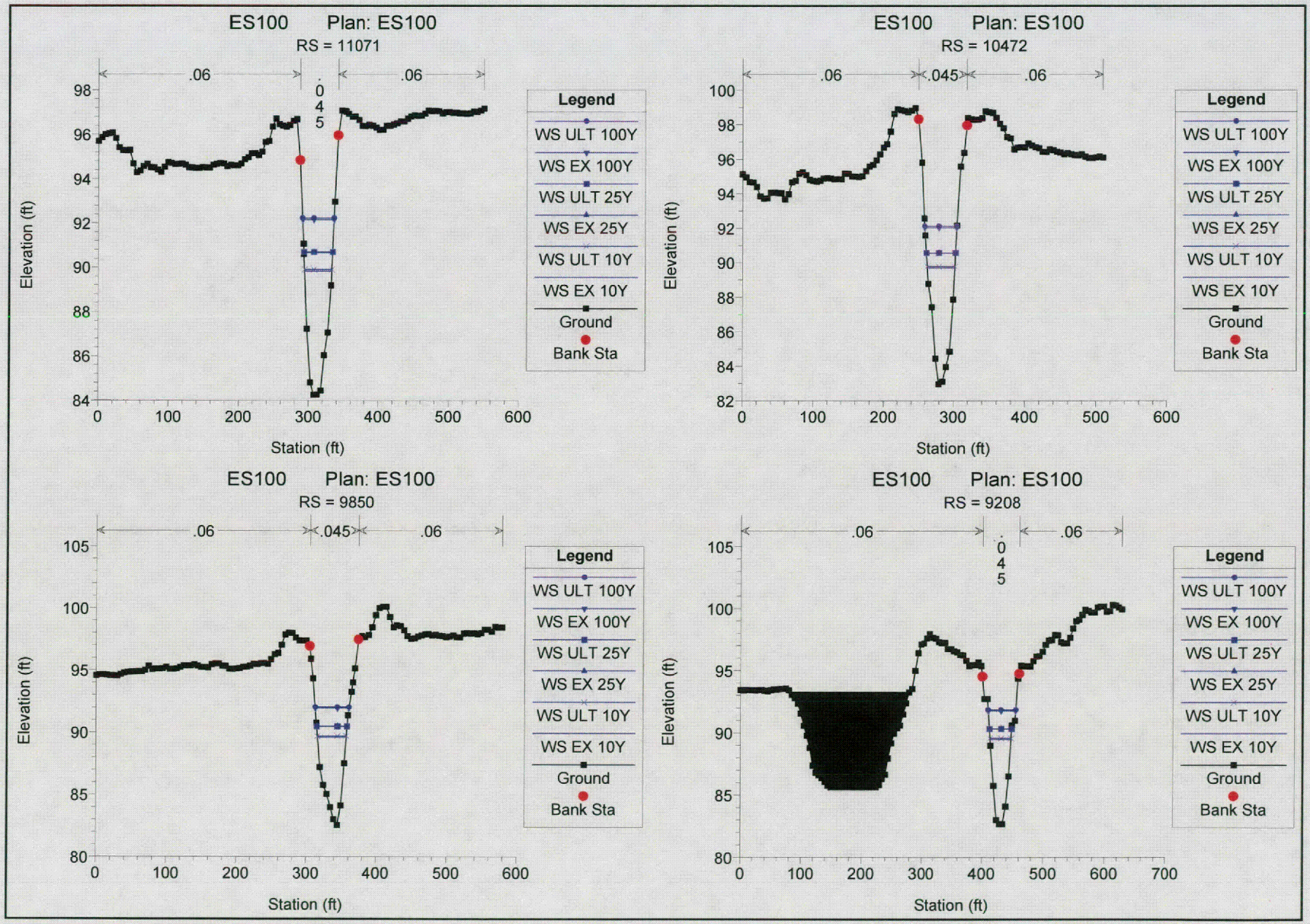

ES100 Plan: ES100
ES100 ES100-00
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
Main Channel Distance (ft)
100
98
96
94
92
90
88
86
84
82
80
0
2000
4000
6000
8000
10000
12000
14000

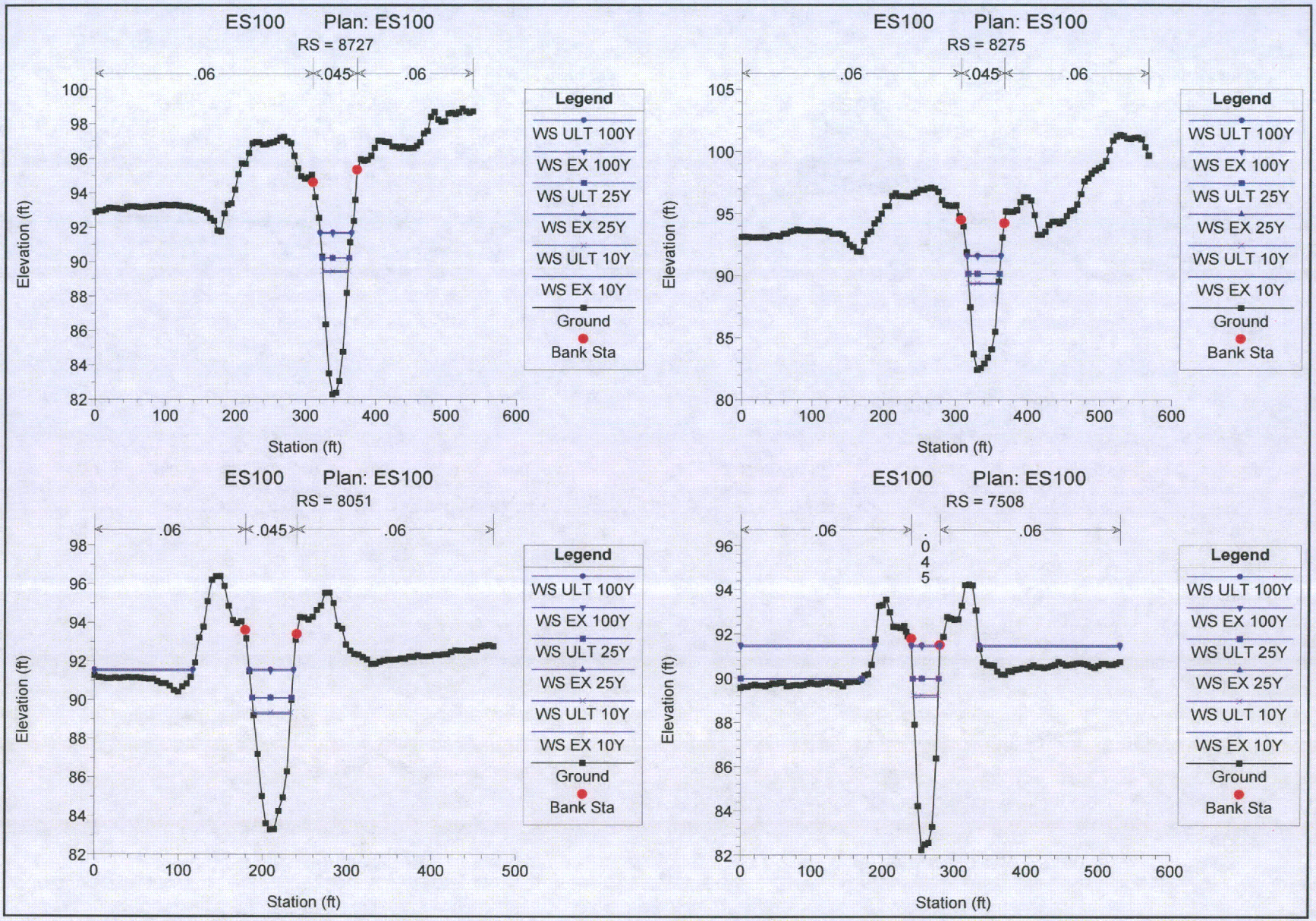

ES100 Plan: ES100
ES101 ES101-00
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
100
98
96
94
92
90
88
86
84
0
1000
2000
3000
4000
5000
Main Channel Distance (ft)

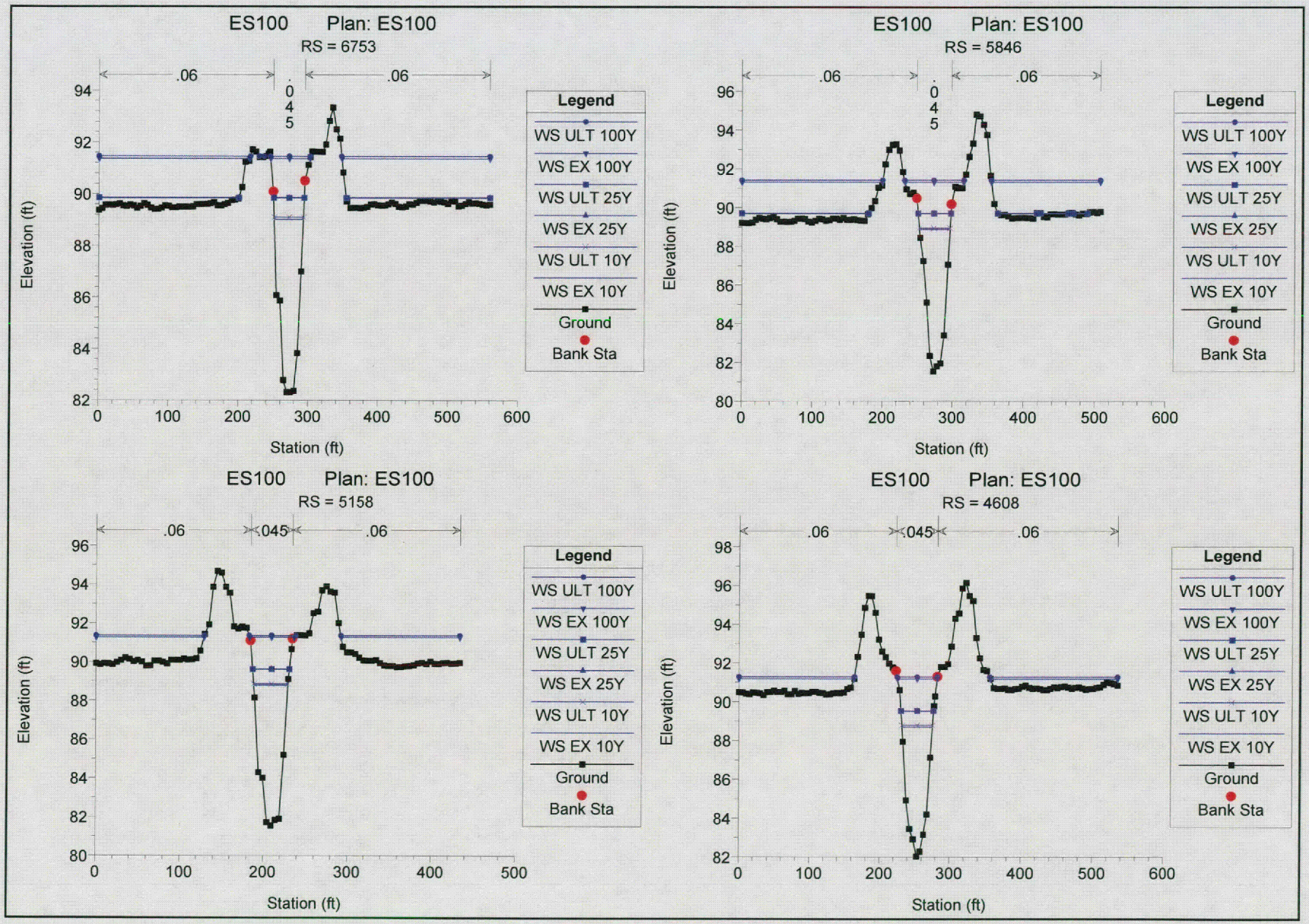

ES100 Plan: ES100
ES102 ES102-00
ES102 ES102-00A
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
100
98
96
94
92
90
88
86
84
0
1000
2000
3000
4000
5000
Main Channel Distance (ft)

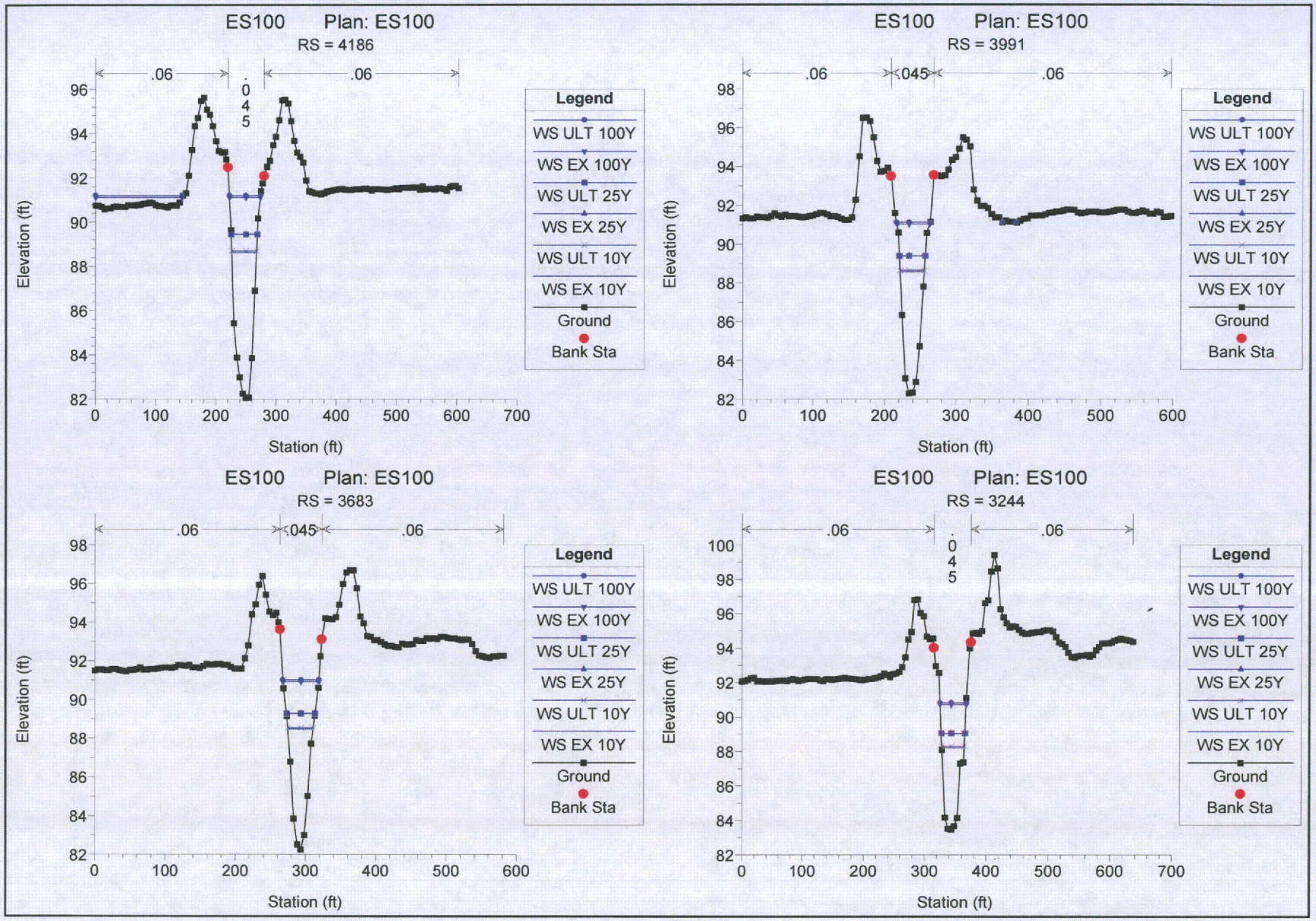

ES100 Plan: ES100
ES102-01 ES102-01
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
98
96
94
92
90
88
86
84
0
1000
2000
3000
4000
5000
6000
Main Channel Distance (ft)

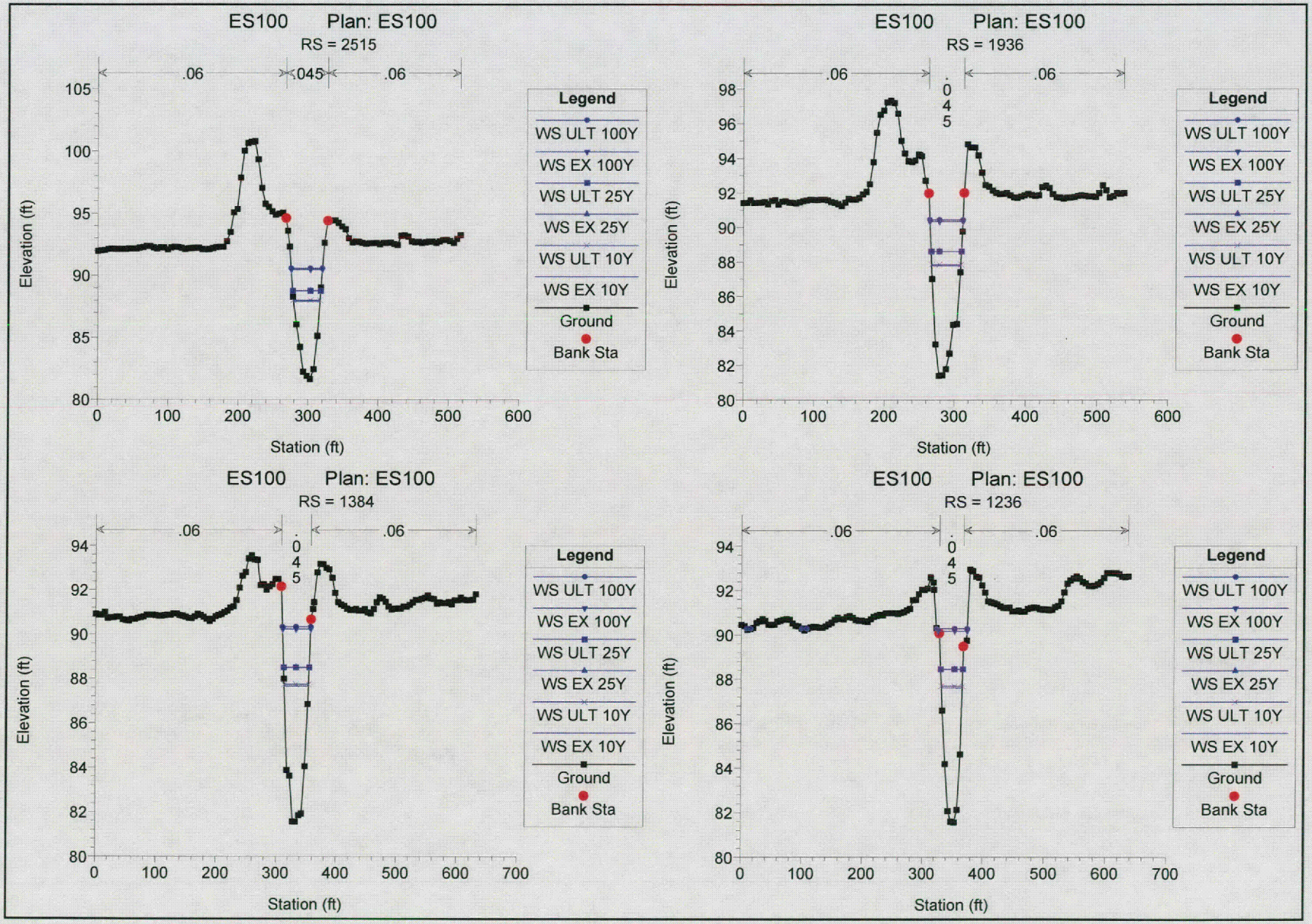

ES100 Plan: ES100
RS = 12785
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 12315
ES100 Plan: ES100
RS = 11934
ES100 Plan: ES100
RS = 11298

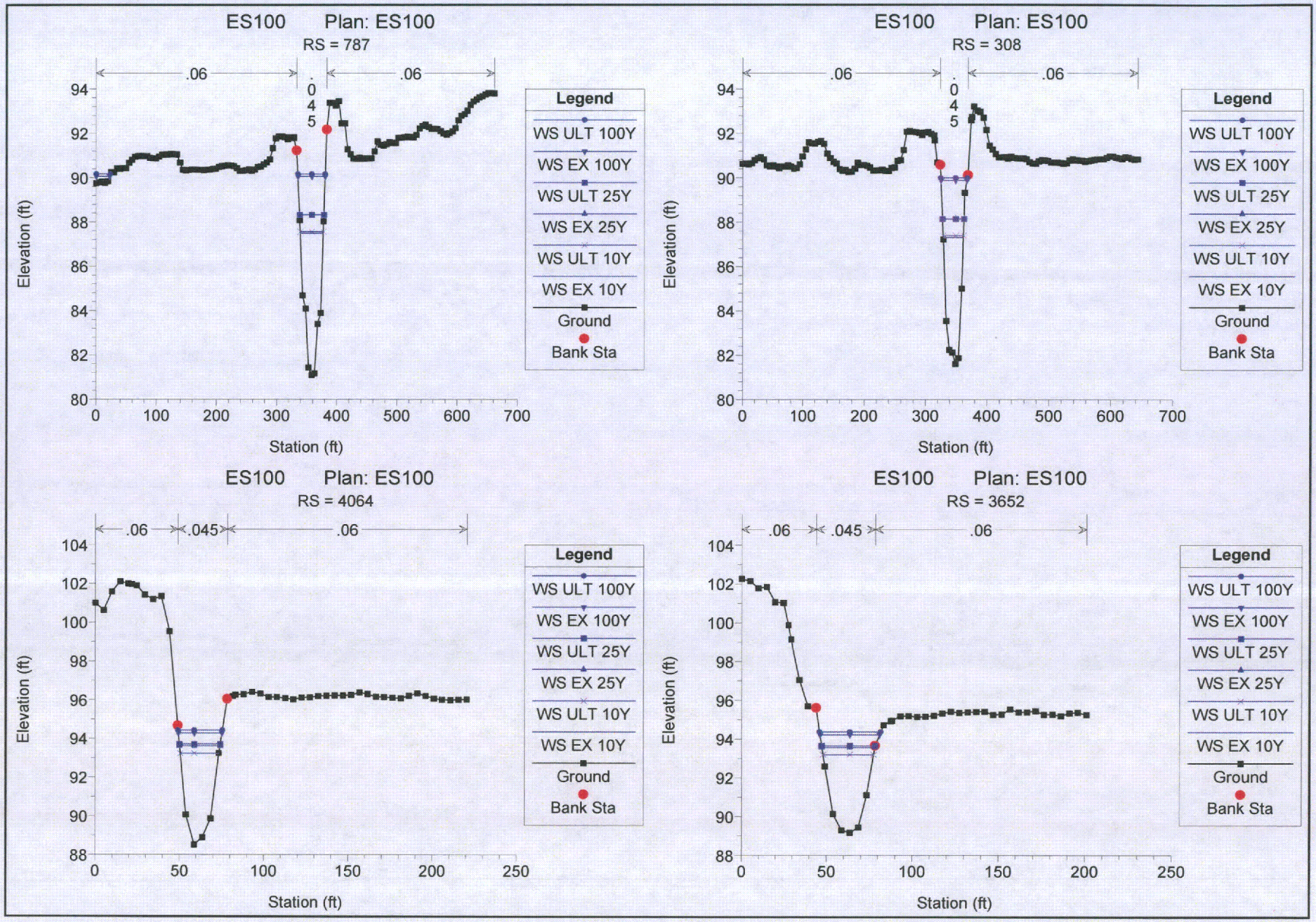

ES100 Plan: ES100
RS = 11071
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 10472
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 9850
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 9208
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta

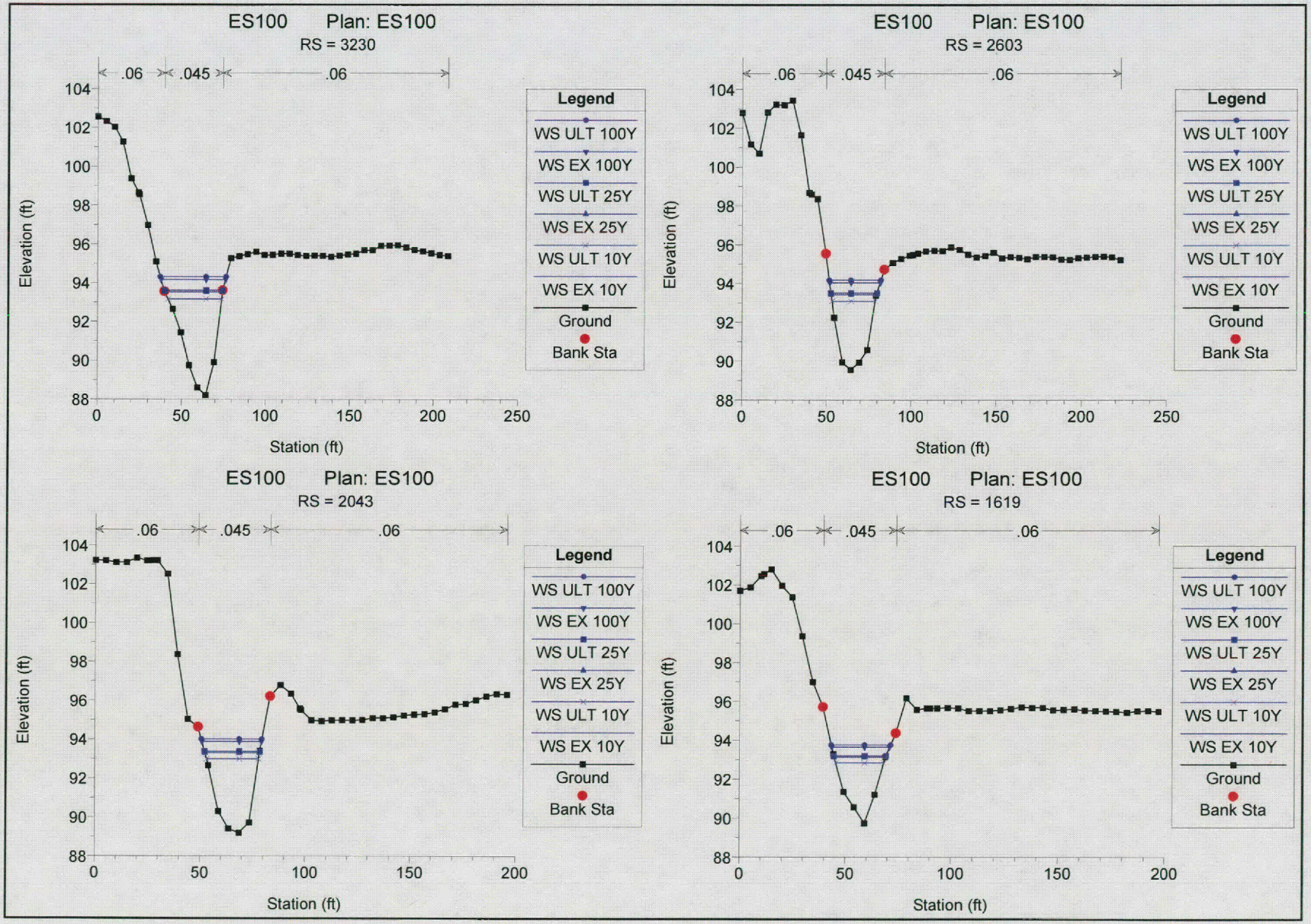

ES100 Plan: ES100
RS = 8727
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 8275
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 8051
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 7508
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta

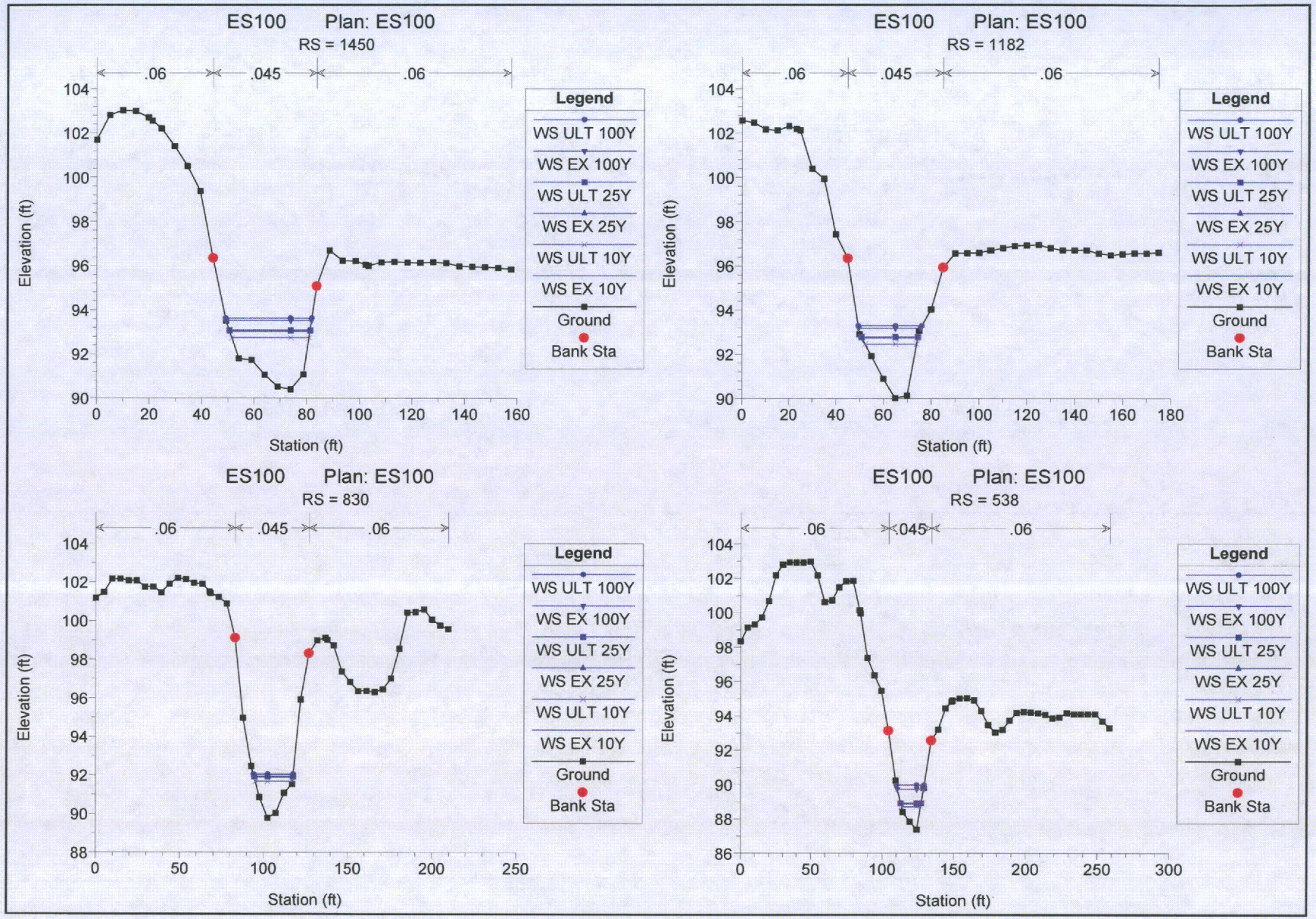

ES100 Plan: ES100
RS = 6753
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 5846
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 5158
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 4608
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta

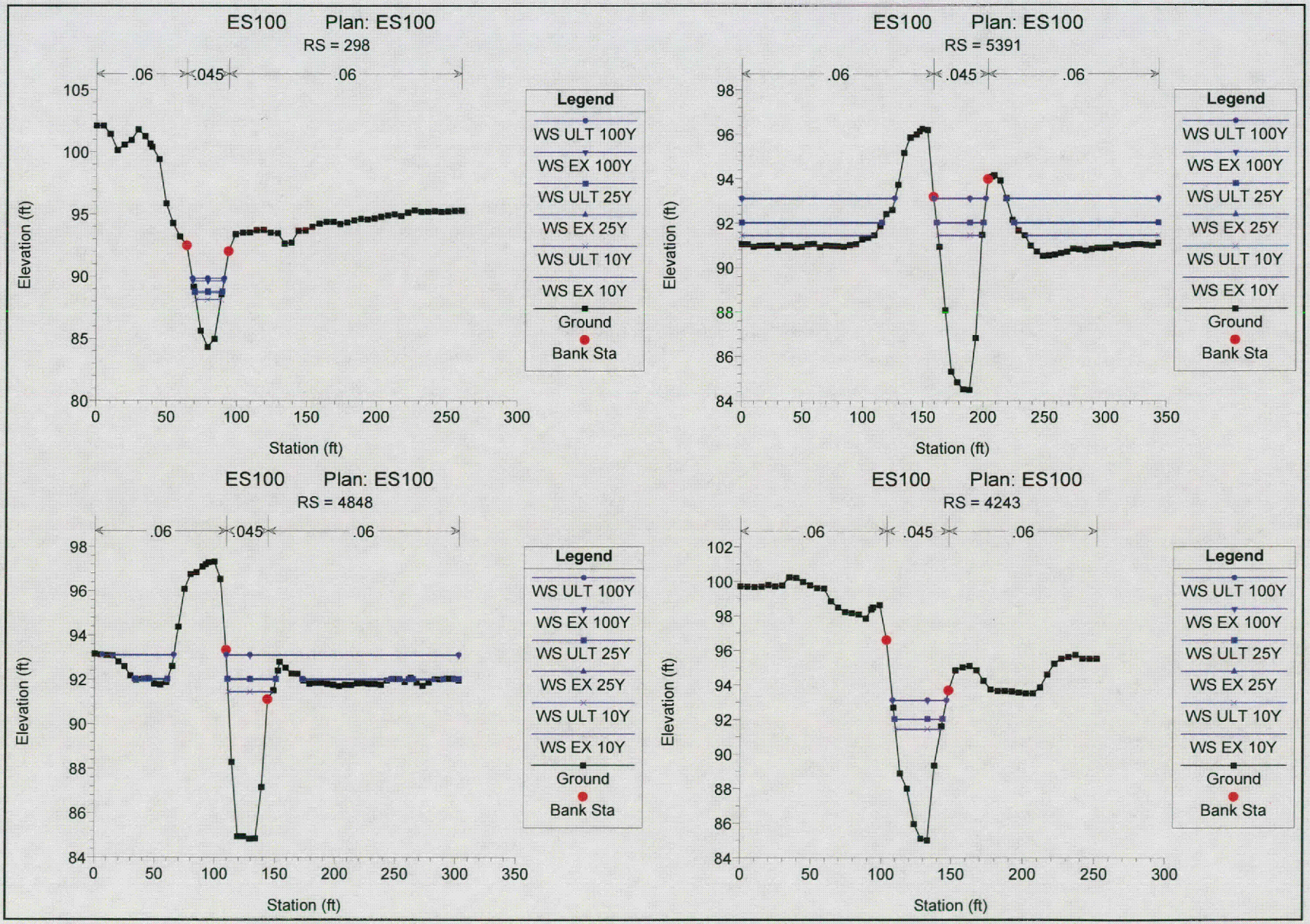

ES100 Plan: ES100
RS = 4186
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 3991
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 3683
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 3244
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta

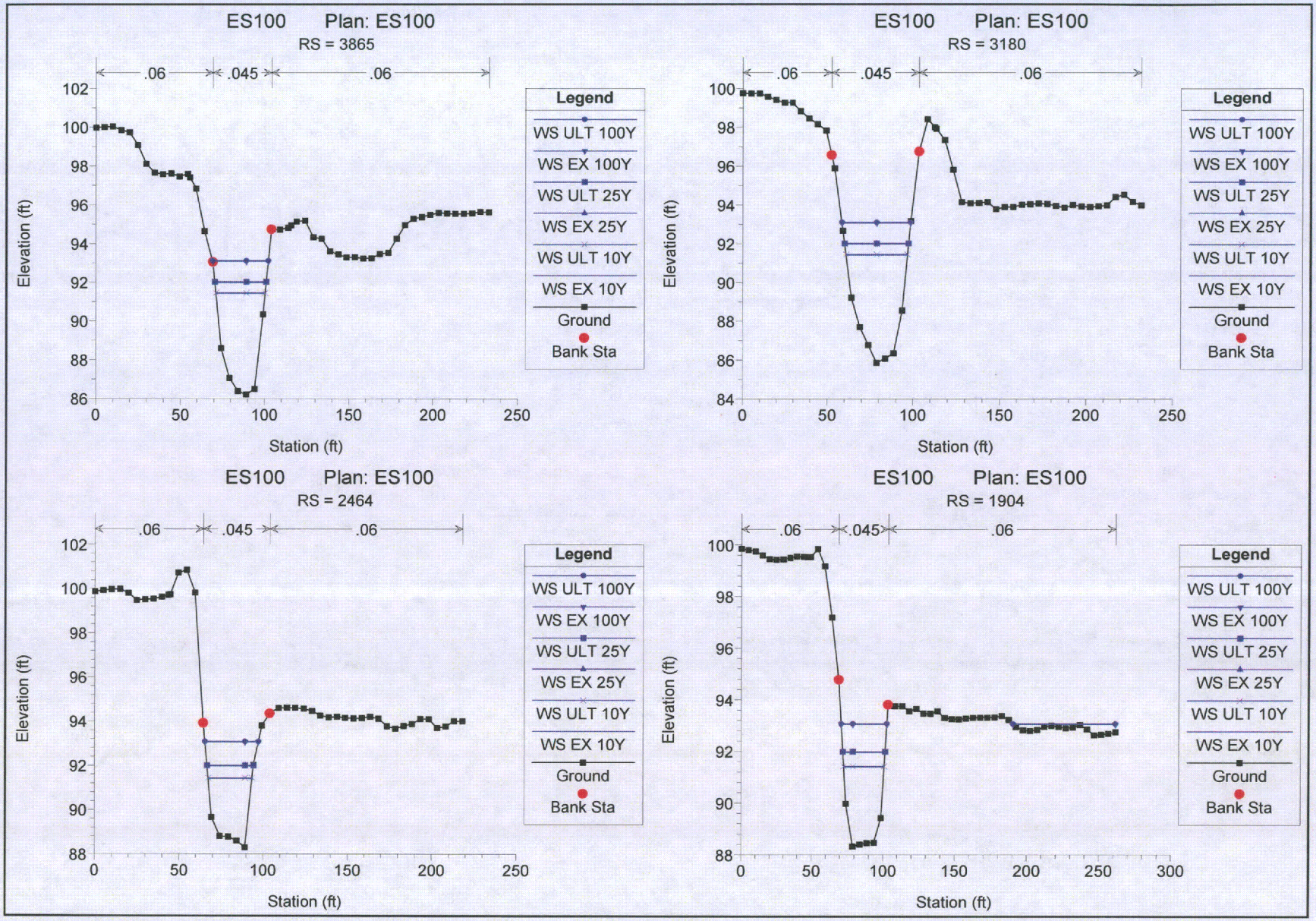

ES100 Plan: ES100
RS = 2515
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 1936
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 1384
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 1236
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta

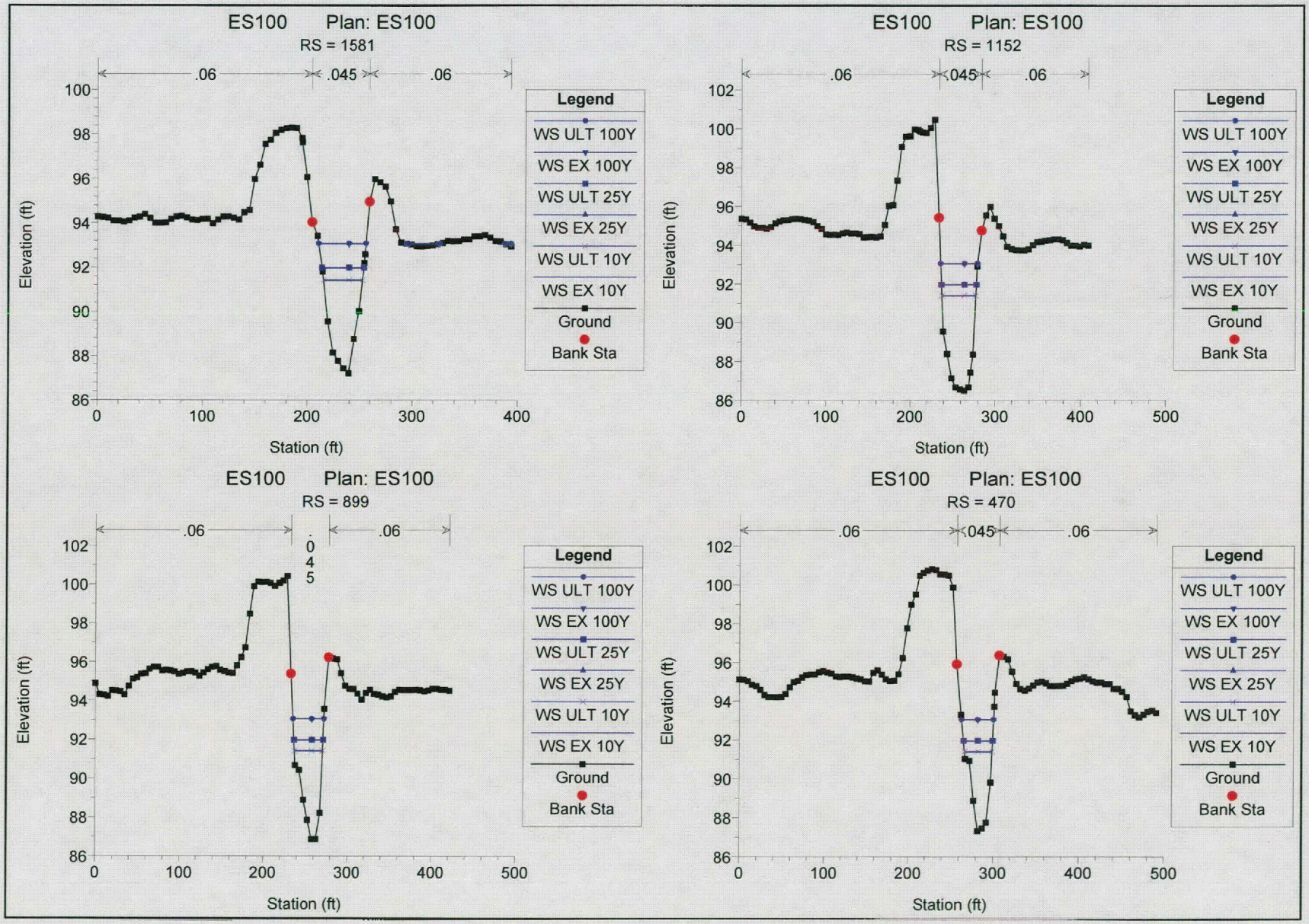

ES100 Plan: ES100
RS = 787
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 308
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 4064
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 3652
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta

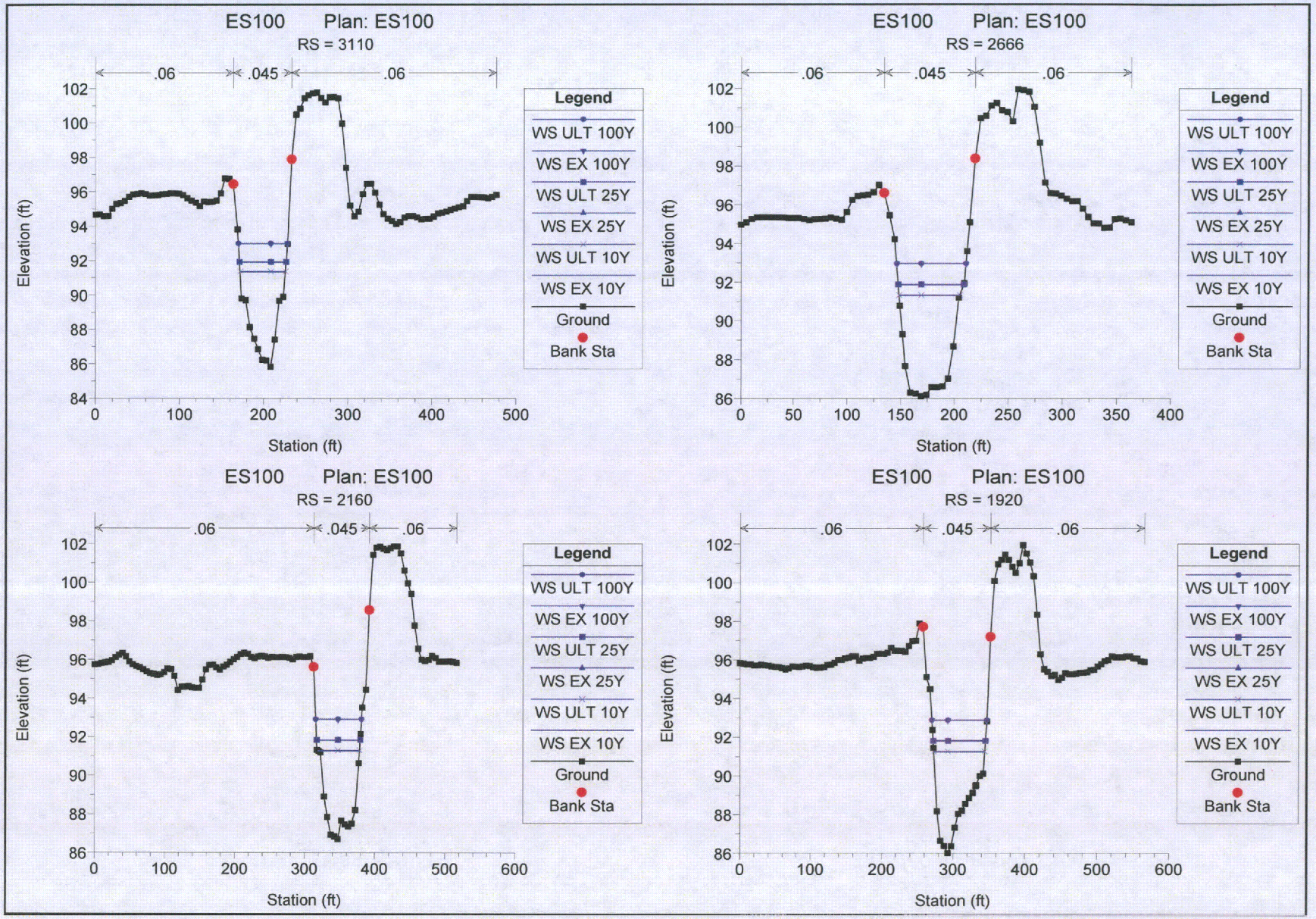

ES100 Plan: ES100
RS = 3230
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 2603
ES100 Plan: ES100
RS = 2043
ES100 Plan: ES100
RS = 1619

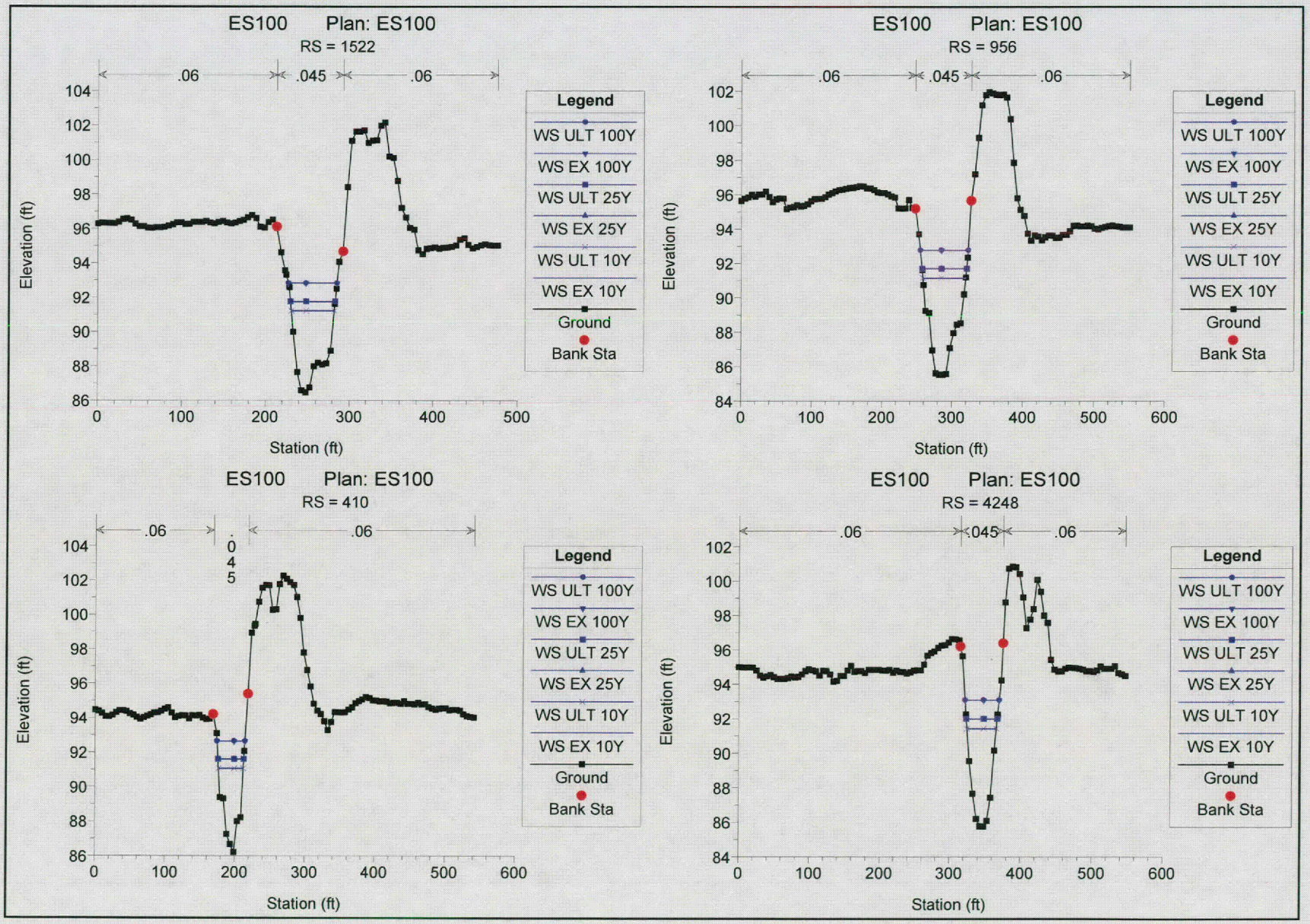

ES100 Plan: ES100
RS = 1450
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 1182
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 830
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 538
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta

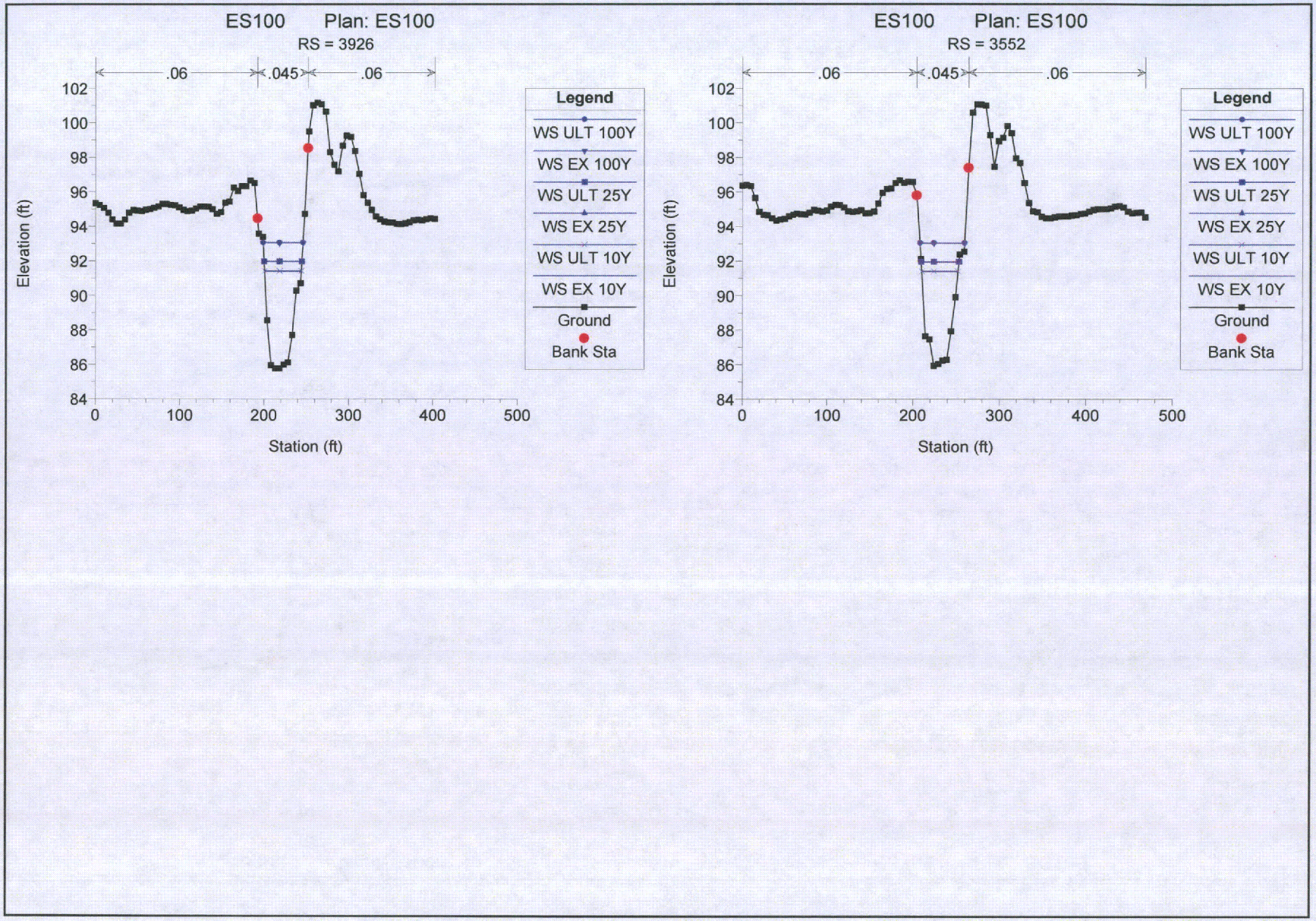

ES100 Plan: ES100
RS = 298
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 5391
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 4848
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 4243
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta


ES100 Plan: ES100
RS = 3865
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 3180
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 2464
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 1904
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta


ES100 Plan: ES100
RS = 1581
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 1152
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 899
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 470
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta


ES100 Plan: ES100
RS = 3110
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 2666
ES100 Plan: ES100
RS = 2160
ES100 Plan: ES100
RS = 1920


ES100 Plan: ES100
RS = 1522
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 956
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 410
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 4248
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta


ES100 Plan: ES100
RS = 3926
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.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100
RS = 3552
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta

APPENDIX D
HEC-RAS HYDRAULIC OUTPUT

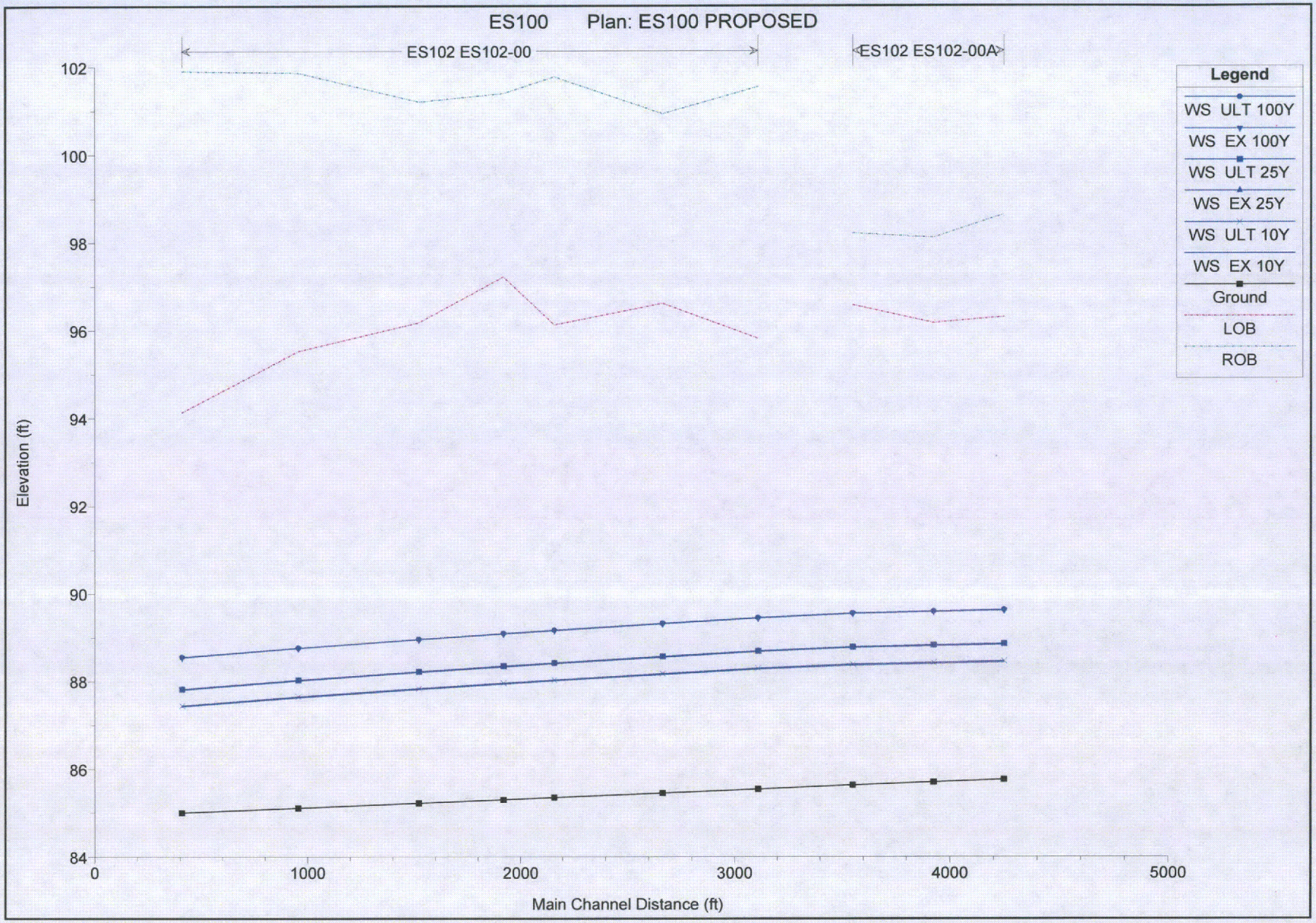
ES-100 PROPOSED CONDITION
ES-100, ES-101, ES-102, ES-102-01

HEC-RAS Plan: PROPOSED

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)	
ES102	ES102-00	410	EX 10Y	138.00	85.00	87.42	85.70	87.44	0.000400	1.21	114.39	54.52	0.15
ES102	ES102-00	410	EX 25Y	178.00	85.00	87.80	85.83	87.83	0.000400	1.31	135.56	56.80	0.15
ES102	ES102-00	410	EX 100Y	269.00	85.00	88.54	86.09	88.57	0.000401	1.50	179.07	61.23	0.15
ES102	ES102-00	410	ULT 10Y	140.00	85.00	87.44	85.71	87.46	0.000400	1.21	115.49	54.64	0.15
ES102	ES102-00	410	ULT 25Y	180.00	85.00	87.82	85.84	87.85	0.000400	1.32	136.58	56.91	0.15
ES102	ES102-00	410	ULT 100Y	270.00	85.00	88.55	86.09	88.58	0.000401	1.50	179.53	61.27	0.15
ES102	ES102-00	956	EX 10Y	138.00	85.11	87.63		87.65	0.000349	1.15	119.66	55.10	0.14
ES102	ES102-00	956	EX 25Y	178.00	85.11	88.01		88.03	0.000355	1.26	141.14	57.39	0.14
ES102	ES102-00	956	EX 100Y	269.00	85.11	88.75		88.78	0.000363	1.45	185.26	61.83	0.15
ES102	ES102-00	956	ULT 10Y	140.00	85.11	87.65		87.67	0.000350	1.16	120.78	55.22	0.14
ES102	ES102-00	956	ULT 25Y	180.00	85.11	88.03		88.05	0.000355	1.27	142.18	57.50	0.14
ES102	ES102-00	956	ULT 100Y	270.00	85.11	88.76		88.79	0.000363	1.45	185.72	61.88	0.15
ES102	ES102-00	1522	EX 10Y	138.00	85.22	87.81		87.83	0.000314	1.11	123.99	55.57	0.13
ES102	ES102-00	1522	EX 25Y	178.00	85.22	88.20		88.22	0.000322	1.22	145.89	57.88	0.14
ES102	ES102-00	1522	EX 100Y	269.00	85.22	88.95		88.98	0.000333	1.41	190.75	62.36	0.14
ES102	ES102-00	1522	ULT 10Y	140.00	85.22	87.84		87.85	0.000315	1.12	125.13	55.69	0.13
ES102	ES102-00	1522	ULT 25Y	180.00	85.22	88.22		88.24	0.000322	1.22	146.94	57.99	0.14
ES102	ES102-00	1522	ULT 100Y	270.00	85.22	88.95		88.99	0.000333	1.41	191.21	62.41	0.14
ES102	ES102-00	1920	EX 10Y	138.00	85.30	87.94		87.96	0.000297	1.09	126.35	55.83	0.13
ES102	ES102-00	1920	EX 25Y	178.00	85.30	88.33		88.35	0.000305	1.20	148.51	58.16	0.13
ES102	ES102-00	1920	EX 100Y	269.00	85.30	89.08		89.11	0.000317	1.39	193.90	62.67	0.14
ES102	ES102-00	1920	ULT 10Y	140.00	85.30	87.96		87.98	0.000297	1.10	127.50	55.95	0.13
ES102	ES102-00	1920	ULT 25Y	180.00	85.30	88.34		88.37	0.000305	1.20	149.58	58.27	0.13
ES102	ES102-00	1920	ULT 100Y	270.00	85.30	89.08		89.11	0.000318	1.39	194.37	62.72	0.14
ES102	ES102-00	2160	EX 10Y	138.00	85.35	88.01		88.03	0.000289	1.08	127.47	55.94	0.13
ES102	ES102-00	2160	EX 25Y	178.00	85.35	88.40		88.42	0.000297	1.19	149.80	58.29	0.13
ES102	ES102-00	2160	EX 100Y	269.00	85.35	89.15		89.18	0.000310	1.38	195.48	62.82	0.14
ES102	ES102-00	2160	ULT 10Y	140.00	85.35	88.03		88.05	0.000290	1.09	128.64	56.07	0.13
ES102	ES102-00	2160	ULT 25Y	180.00	85.35	88.42		88.44	0.000298	1.19	150.87	58.40	0.13
ES102	ES102-00	2160	ULT 100Y	270.00	85.35	89.16		89.19	0.000310	1.38	195.95	62.86	0.14
ES102	ES102-00	2666	EX 10Y	138.00	85.45	88.15		88.17	0.000273	1.06	129.86	56.20	0.12
ES102	ES102-00	2666	EX 25Y	178.00	85.45	88.55		88.57	0.000282	1.17	152.54	58.57	0.13
ES102	ES102-00	2666	EX 100Y	269.00	85.45	89.31		89.33	0.000295	1.35	198.87	63.14	0.13
ES102	ES102-00	2666	ULT 10Y	140.00	85.45	88.17		88.19	0.000274	1.07	131.04	56.33	0.12
ES102	ES102-00	2666	ULT 25Y	180.00	85.45	88.56		88.58	0.000282	1.17	153.63	58.68	0.13
ES102	ES102-00	2666	ULT 100Y	270.00	85.45	89.31		89.34	0.000295	1.35	199.35	63.18	0.13
ES102	ES102-00	3110	EX 10Y	138.00	85.54	88.27		88.29	0.000263	1.05	131.52	56.38	0.12
ES102	ES102-00	3110	EX 25Y	178.00	85.54	88.67		88.69	0.000271	1.15	154.49	58.77	0.13
ES102	ES102-00	3110	EX 100Y	269.00	85.54	89.44		89.46	0.000284	1.34	201.36	63.37	0.13
ES102	ES102-00	3110	ULT 10Y	140.00	85.54	88.29		88.31	0.000264	1.05	132.72	56.50	0.12
ES102	ES102-00	3110	ULT 25Y	180.00	85.54	88.69		88.71	0.000272	1.16	155.60	58.88	0.13
ES102	ES102-00	3110	ULT 100Y	270.00	85.54	89.44		89.47	0.000284	1.34	201.84	63.42	0.13
ES102	ES102-00A	3552	EX 10Y	85.00	85.63	88.36		88.36	0.000100	0.65	131.39	56.36	0.07
ES102	ES102-00A	3552	EX 25Y	109.00	85.63	88.76		88.77	0.000101	0.70	154.62	58.78	0.08
ES102	ES102-00A	3552	EX 100Y	165.00	85.63	89.54		89.55	0.000106	0.82	202.03	63.44	0.08
ES102	ES102-00A	3552	ULT 10Y	90.00	85.63	88.38		88.39	0.000109	0.68	132.71	56.50	0.08
ES102	ES102-00A	3552	ULT 25Y	110.00	85.63	88.78		88.79	0.000101	0.71	155.73	58.90	0.08
ES102	ES102-00A	3552	ULT 100Y	170.00	85.63	89.54		89.56	0.000112	0.84	202.58	63.49	0.08
ES102	ES102-00A	3926	EX 10Y	85.00	85.70	88.39		88.40	0.000104	0.66	129.58	56.17	0.08
ES102	ES102-00A	3926	EX 25Y	109.00	85.70	88.80		88.81	0.000105	0.71	152.76	58.59	0.08
ES102	ES102-00A	3926	EX 100Y	165.00	85.70	89.58		89.59	0.000109	0.82	200.12	63.26	0.08
ES102	ES102-00A	3926	ULT 10Y	90.00	85.70	88.42		88.43	0.000113	0.69	131.08	56.33	0.08
ES102	ES102-00A	3926	ULT 25Y	110.00	85.70	88.82		88.83	0.000105	0.71	153.86	58.71	0.08
ES102	ES102-00A	3926	ULT 100Y	170.00	85.70	89.59		89.60	0.000114	0.85	200.81	63.32	0.08
ES102	ES102-00A	4248	EX 10Y	85.00	85.76	88.43		88.44	0.000108	0.66	128.12	56.01	0.08
ES102	ES102-00A	4248	EX 25Y	109.00	85.76	88.83		88.84	0.000108	0.72	151.24	58.44	0.08
ES102	ES102-00A	4248	EX 100Y	165.00	85.76	89.61		89.62	0.000111	0.83	198.56	63.11	0.08
ES102	ES102-00A	4248	ULT 10Y	90.00	85.76	88.46		88.47	0.000117	0.69	129.78	56.19	0.08
ES102	ES102-00A	4248	ULT 25Y	110.00	85.76	88.85		88.86	0.000108	0.72	152.34	58.55	0.08
ES102	ES102-00A	4248	ULT 100Y	170.00	85.76	89.62		89.64	0.000117	0.85	199.35	63.18	0.08
ES102-01	ES102-01	470	EX 10Y	20.00	85.50	88.34		88.34	0.000008	0.18	109.22	47.02	0.02
ES102-01	ES102-01	470	EX 25Y	26.00	85.50	88.74		88.74	0.000008	0.20	128.72	49.44	0.02
ES102-01	ES102-01	470	EX 100Y	41.00	85.50	89.52		89.52	0.000010	0.24	168.99	54.11	0.02
ES102-01	ES102-01	470	ULT 10Y	20.00	85.50	88.36		88.36	0.000008	0.18	110.22	47.15	0.02
ES102-01	ES102-01	470	ULT 25Y	30.00	85.50	88.76		88.76	0.000011	0.23	129.74	49.57	0.03
ES102-01	ES102-01	470	ULT 100Y	50.00	85.50	89.53		89.53	0.000014	0.29	169.55	54.17	0.03
ES102-01	ES102-01	899	EX 10Y	20.00	85.59	88.34		88.34	0.000009	0.19	105.18	46.50	0.02
ES102-01	ES102-01	899	EX 25Y	26.00	85.59	88.74		88.75	0.000009	0.21	124.48	48.93	0.02
ES102-01	ES102-01	899	EX 100Y	41.00	85.59	89.52		89.52	0.000010	0.25	164.37	53.60	0.03
ES102-01	ES102-01	899	ULT 10Y	20.00	85.59	88.36		88.36	0.000009	0.19	106.17	46.63	0.02
ES102-01	ES102-01	899	ULT 25Y	30.00	85.59	88.77		88.77	0.000012	0.24	125.54	49.06	0.03
ES102-01	ES102-01	899	ULT 100Y	50.00	85.59	89.53		89.54	0.000015	0.30	165.03	53.67	0.03
ES102-01	ES102-01	1152	EX 10Y	20.00	85.64	88.34		88.34	0.000010	0.19	102.97	46.21	0.02
ES102-01	ES102-01	1152	EX 25Y	26.00	85.64	88.75		88.75	0.000010	0.21	122.15	48.64	0.02
ES102-01	ES102-01	1152	EX 100Y	41.00	85.64	89.53		89.53	0.000011	0.25	161.83	53.31	0.03

HEC-RAS Plan: PROPOSED (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)	
ES102-01	ES102-01	1152	ULT 10Y	20.00	85.64	88.36		88.36	0.000009	0.19	103.95	46.34	0.02
ES102-01	ES102-01	1152	ULT 25Y	30.00	85.64	88.77		88.77	0.000013	0.24	123.25	48.77	0.03
ES102-01	ES102-01	1152	ULT 100Y	50.00	85.64	89.54		89.54	0.000016	0.31	162.56	53.39	0.03
ES102-01	ES102-01	1581	EX 10Y	20.00	85.73	88.35		88.35	0.000011	0.20	99.04	45.70	0.02
ES102-01	ES102-01	1581	EX 25Y	26.00	85.73	88.75		88.75	0.000011	0.22	118.02	48.13	0.02
ES102-01	ES102-01	1581	EX 100Y	41.00	85.73	89.53		89.53	0.000012	0.26	157.33	52.80	0.03
ES102-01	ES102-01	1581	ULT 10Y	20.00	85.73	88.37		88.37	0.000010	0.20	100.00	45.83	0.02
ES102-01	ES102-01	1581	ULT 25Y	30.00	85.73	88.77		88.78	0.000014	0.25	119.17	48.27	0.03
ES102-01	ES102-01	1581	ULT 100Y	50.00	85.73	89.55		89.55	0.000017	0.32	158.17	52.90	0.03
ES102-01	ES102-01	1904	EX 10Y	20.00	85.79	88.35		88.35	0.000012	0.21	96.46	45.36	0.03
ES102-01	ES102-01	1904	EX 25Y	26.00	85.79	88.75		88.76	0.000012	0.23	115.31	47.78	0.03
ES102-01	ES102-01	1904	EX 100Y	41.00	85.79	89.53		89.54	0.000013	0.27	154.36	52.46	0.03
ES102-01	ES102-01	1904	ULT 10Y	20.00	85.79	88.37		88.37	0.000011	0.21	97.42	45.48	0.02
ES102-01	ES102-01	1904	ULT 25Y	30.00	85.79	88.78		88.78	0.000015	0.26	116.50	47.93	0.03
ES102-01	ES102-01	1904	ULT 100Y	50.00	85.79	89.55		89.55	0.000018	0.32	155.29	52.56	0.03
ES102-01	ES102-01	2464	EX 10Y	20.00	85.90	88.36		88.36	0.000013	0.22	91.83	44.75	0.03
ES102-01	ES102-01	2464	EX 25Y	26.00	85.90	88.76		88.76	0.000013	0.24	110.42	47.17	0.03
ES102-01	ES102-01	2464	EX 100Y	41.00	85.90	89.54		89.54	0.000014	0.28	149.02	51.85	0.03
ES102-01	ES102-01	2464	ULT 10Y	20.00	85.90	88.38		88.38	0.000013	0.22	92.76	44.87	0.03
ES102-01	ES102-01	2464	ULT 25Y	30.00	85.90	88.79		88.79	0.000017	0.27	111.69	47.33	0.03
ES102-01	ES102-01	2464	ULT 100Y	50.00	85.90	89.56		89.56	0.000020	0.33	150.11	51.98	0.03
ES102-01	ES102-01	3180	EX 10Y	20.00	85.86	88.37		88.37	0.000013	0.21	94.04	45.04	0.03
ES102-01	ES102-01	3180	EX 25Y	26.00	85.86	88.77		88.77	0.000012	0.23	112.75	47.47	0.03
ES102-01	ES102-01	3180	EX 100Y	41.00	85.86	89.55		89.55	0.000013	0.27	151.60	52.15	0.03
ES102-01	ES102-01	3180	ULT 10Y	20.00	85.86	88.39		88.39	0.000012	0.21	94.97	45.16	0.03
ES102-01	ES102-01	3180	ULT 25Y	30.00	85.86	88.80		88.80	0.000016	0.26	114.15	47.64	0.03
ES102-01	ES102-01	3180	ULT 100Y	50.00	85.86	89.58		89.58	0.000019	0.33	152.92	52.30	0.03
ES102-01	ES102-01	3865	EX 10Y	20.00	84.65	88.37		88.37	0.000003	0.13	153.16	52.33	0.01
ES102-01	ES102-01	3865	EX 25Y	26.00	84.65	88.78		88.78	0.000004	0.15	174.84	54.76	0.01
ES102-01	ES102-01	3865	EX 100Y	41.00	84.65	89.56		89.56	0.000005	0.19	219.43	59.44	0.02
ES102-01	ES102-01	3865	ULT 10Y	20.00	84.65	88.39		88.39	0.000003	0.13	154.23	52.45	0.01
ES102-01	ES102-01	3865	ULT 25Y	30.00	84.65	88.81		88.81	0.000005	0.17	176.53	54.94	0.02
ES102-01	ES102-01	3865	ULT 100Y	50.00	84.65	89.58		89.59	0.000007	0.23	221.10	59.61	0.02
ES102-01	ES102-01	4243	EX 10Y	20.00	84.61	88.37		88.37	0.000003	0.13	155.30	52.57	0.01
ES102-01	ES102-01	4243	EX 25Y	26.00	84.61	88.78		88.78	0.000003	0.15	177.09	55.00	0.01
ES102-01	ES102-01	4243	EX 100Y	41.00	84.61	89.56		89.56	0.000004	0.18	221.89	59.68	0.02
ES102-01	ES102-01	4243	ULT 10Y	20.00	84.61	88.39		88.39	0.000003	0.13	156.37	52.69	0.01
ES102-01	ES102-01	4243	ULT 25Y	30.00	84.61	88.81		88.81	0.000004	0.17	178.81	55.18	0.02
ES102-01	ES102-01	4243	ULT 100Y	50.00	84.61	89.59		89.59	0.000006	0.22	223.61	59.86	0.02
ES102-01	ES102-01	4848	EX 10Y	20.00	84.55	88.37		88.37	0.000003	0.13	158.56	52.94	0.01
ES102-01	ES102-01	4848	EX 25Y	26.00	84.55	88.78		88.78	0.000003	0.14	180.51	55.37	0.01
ES102-01	ES102-01	4848	EX 100Y	41.00	84.55	89.56		89.56	0.000004	0.18	225.64	60.06	0.02
ES102-01	ES102-01	4848	ULT 10Y	20.00	84.55	88.39		88.39	0.000003	0.13	159.63	53.06	0.01
ES102-01	ES102-01	4848	ULT 25Y	30.00	84.55	88.81		88.81	0.000004	0.16	182.27	55.56	0.02
ES102-01	ES102-01	4848	ULT 100Y	50.00	84.55	89.59		89.59	0.000006	0.22	227.44	60.24	0.02
ES102-01	ES102-01	5391	EX 10Y	20.00	84.49	88.38		88.38	0.000003	0.12	161.32	53.25	0.01
ES102-01	ES102-01	5391	EX 25Y	26.00	84.49	88.78		88.78	0.000003	0.14	183.42	55.69	0.01
ES102-01	ES102-01	5391	EX 100Y	41.00	84.49	89.56		89.56	0.000004	0.18	228.84	60.39	0.02
ES102-01	ES102-01	5391	ULT 10Y	20.00	84.49	88.40		88.40	0.000003	0.12	162.40	53.38	0.01
ES102-01	ES102-01	5391	ULT 25Y	30.00	84.49	88.81		88.81	0.000004	0.16	185.22	55.88	0.02
ES102-01	ES102-01	5391	ULT 100Y	50.00	84.49	89.59		89.59	0.000006	0.22	230.71	60.57	0.02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Legend
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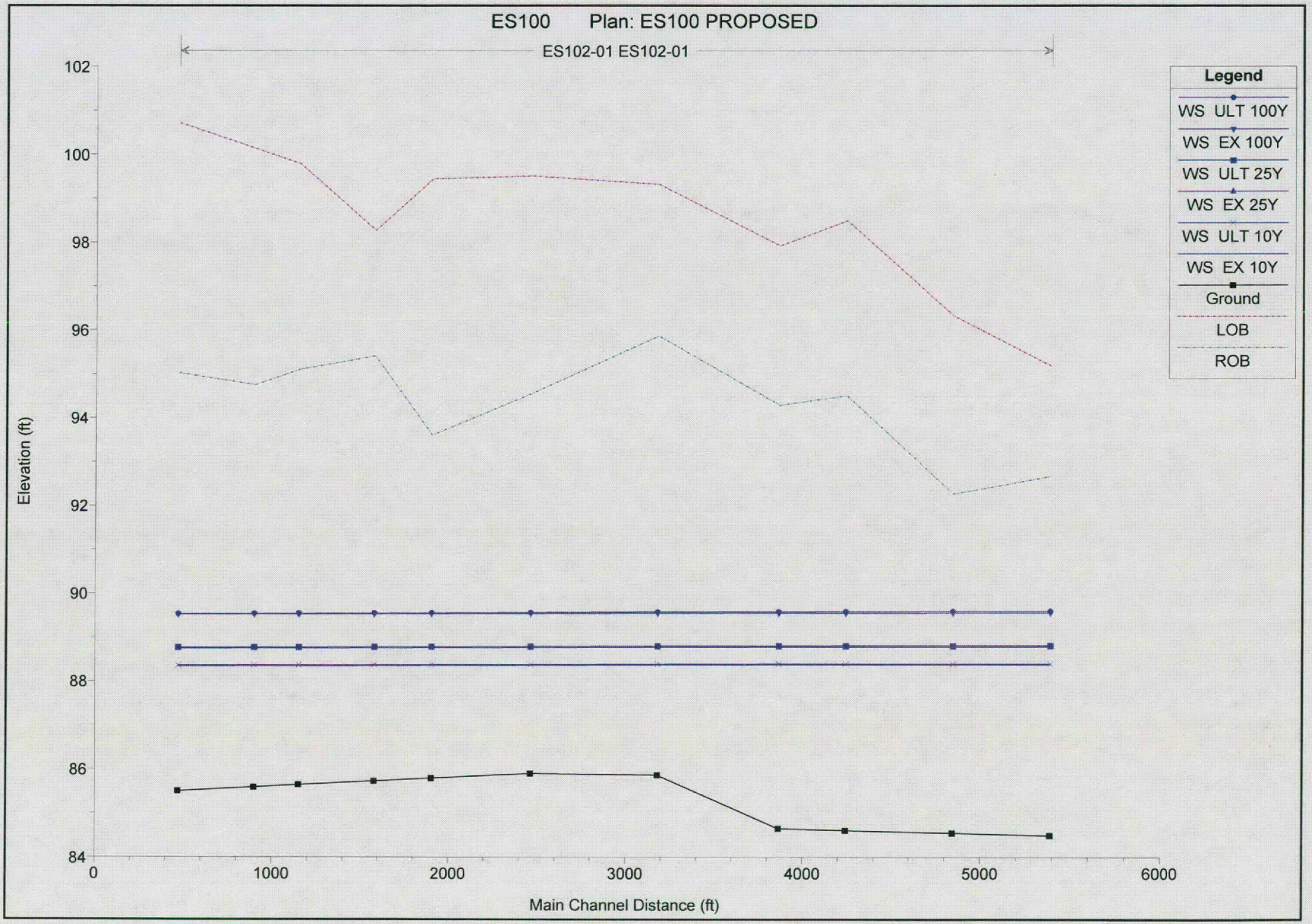
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
102
100
98
96
94
92
90
88
86
84
0
1000
2000
3000
4000
5000
Main Channel Distance (ft)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Legend
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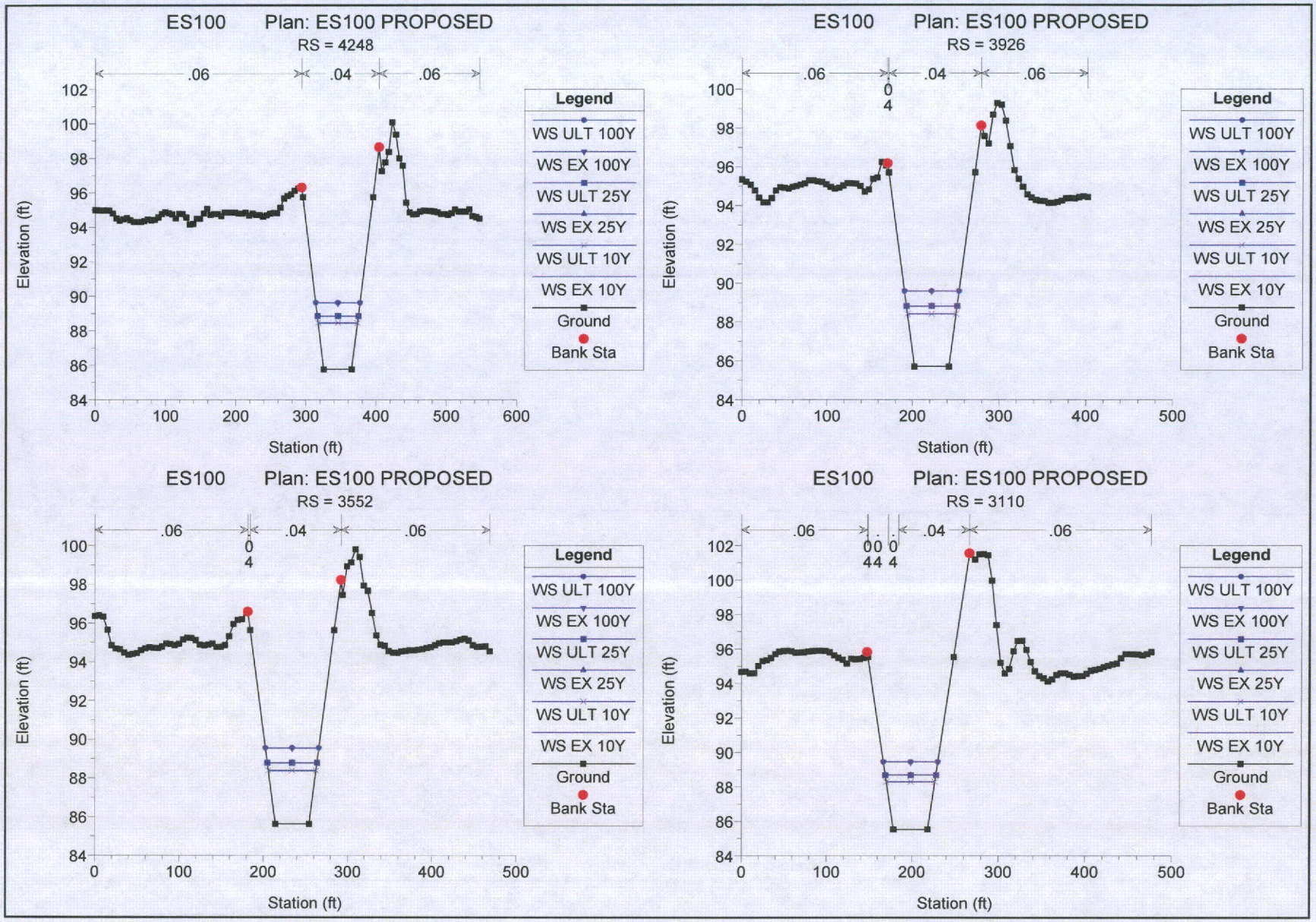
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
LOB
ROB
Elevation (ft)
102
100
98
96
94
92
90
88
86
84
0
1000
2000
3000
4000
5000
6000
Main Channel Distance (ft)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Station (ft)
Legend
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WS EX 100Y
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WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100 PROPOSED
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.06 .04 .06
Elevation (ft)
Station (ft)
Legend
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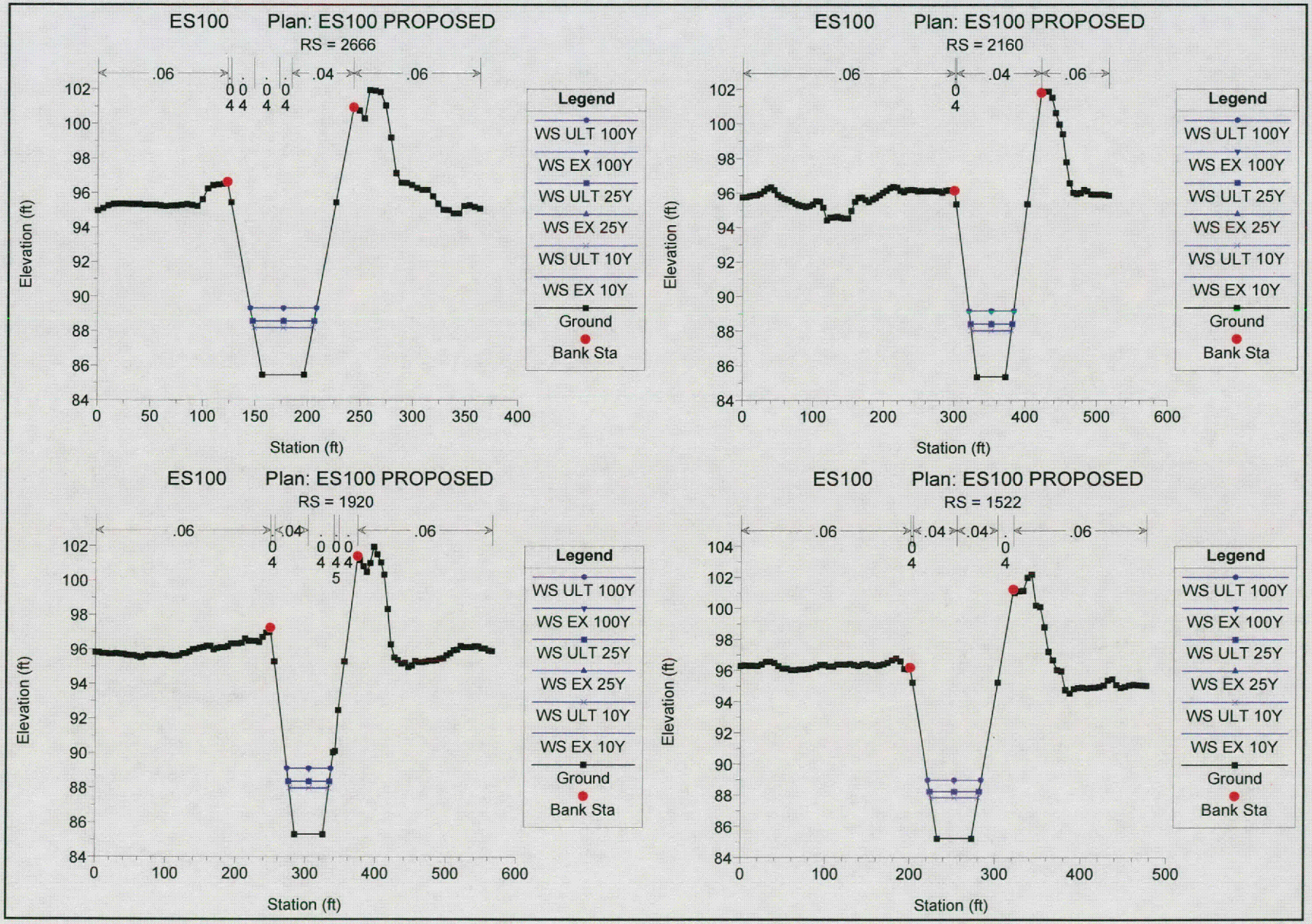
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100 PROPOSED
RS = 3552
.06 .04 .06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100 PROPOSED
RS = 3110
.06 .04 .06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta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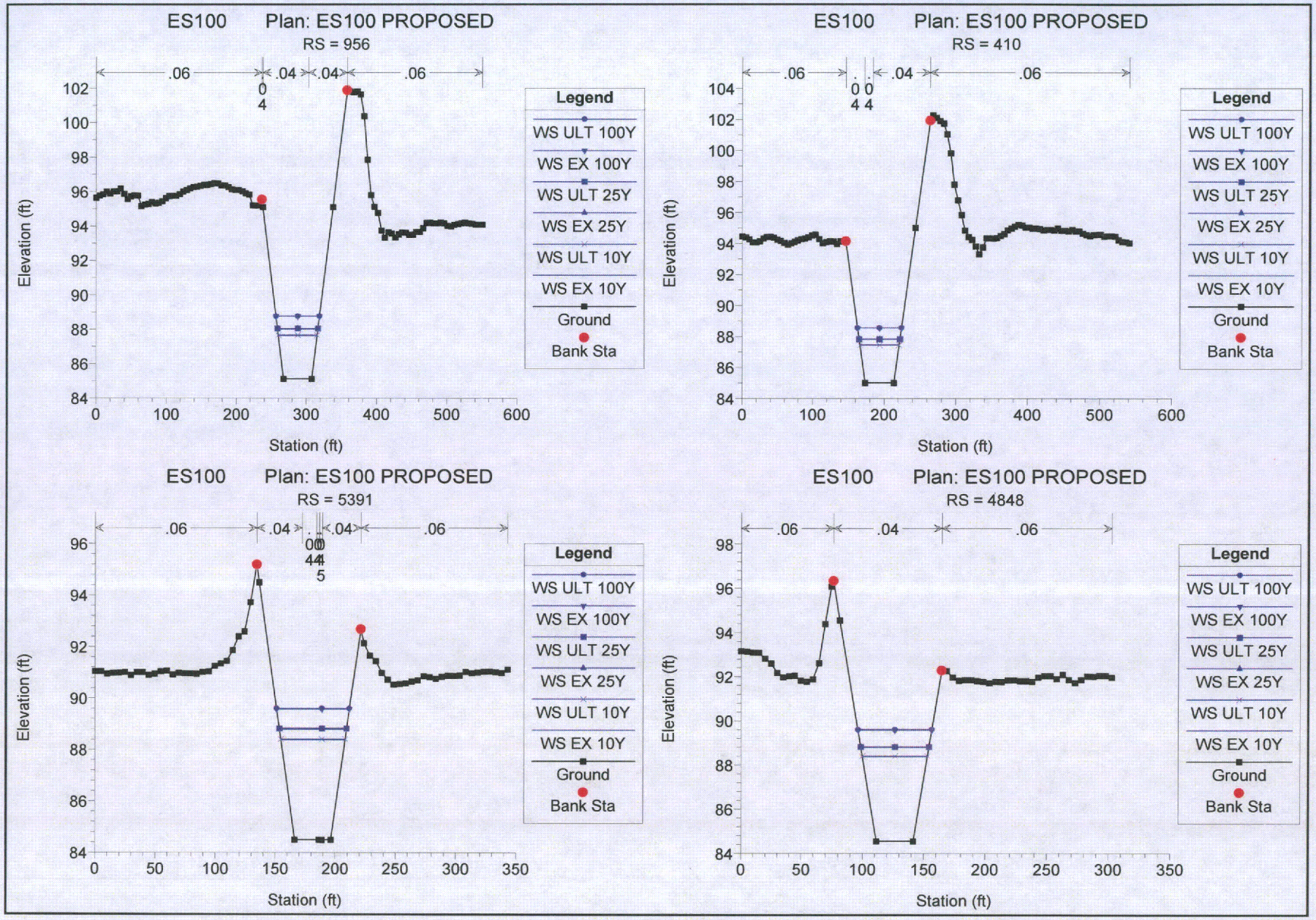
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100 PROPOSED
RS = 2160
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100 PROPOSED
RS = 1920
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100 PROPOSED
RS = 1522
.06
.04
.04
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta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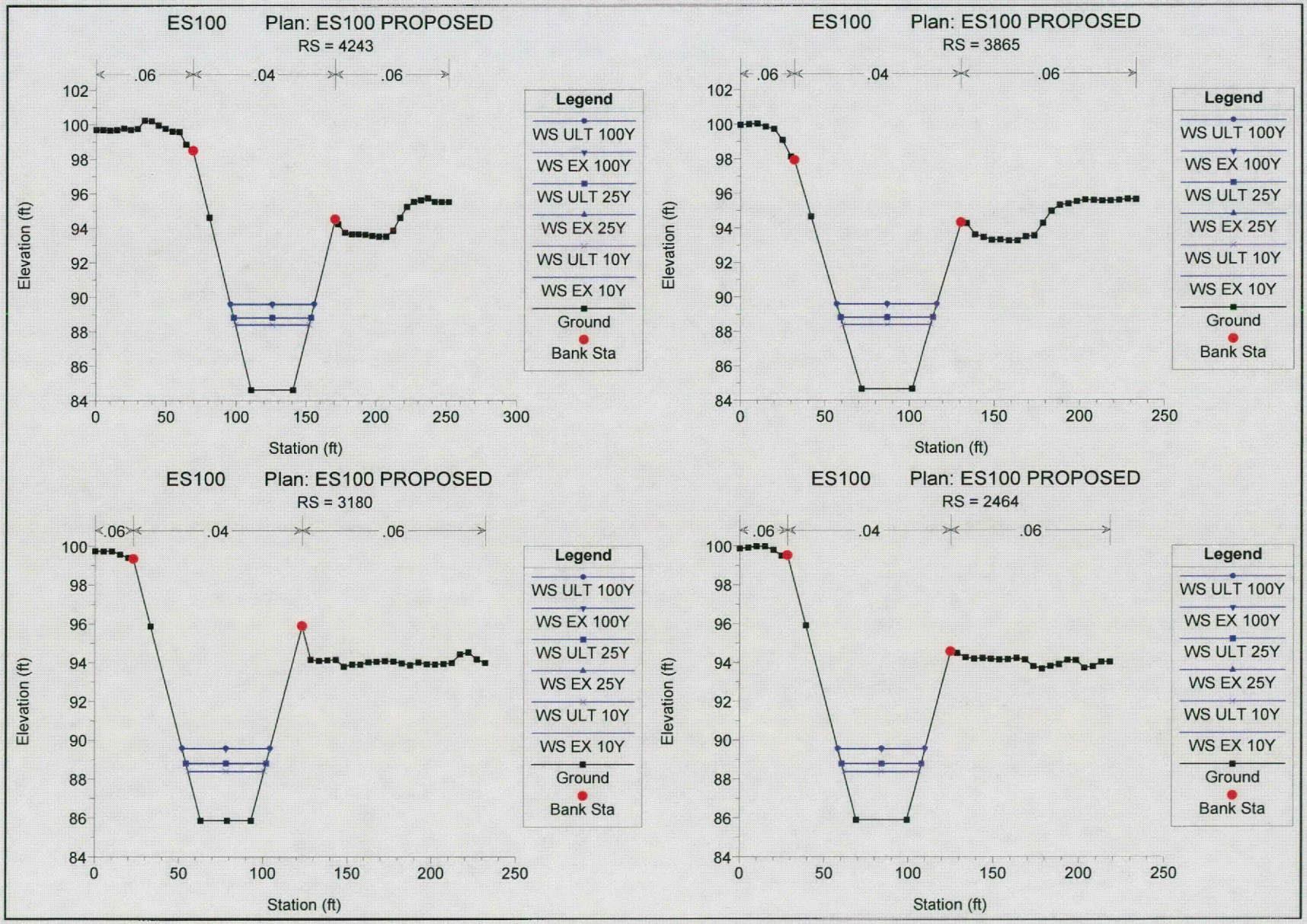
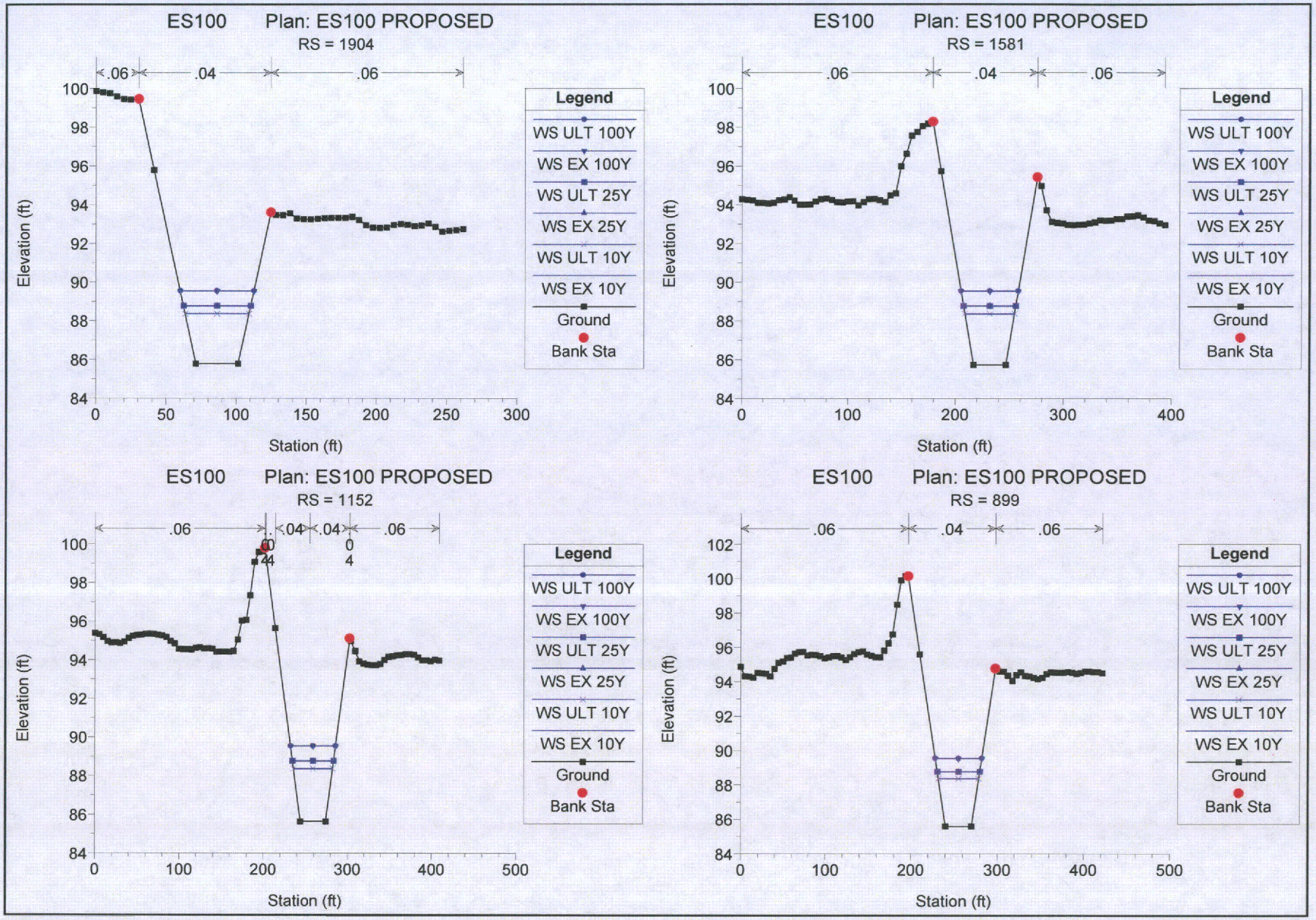
.06 .04 .04 .06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100 PROPOSED
RS = 410
.06 .04 .06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100 PROPOSED
RS = 5391
.06 .04 .04 .06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100 PROPOSED
RS = 4848
.06 .04 .06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta


ES100 Plan: ES100 PROPOSED
RS = 4243
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100 PROPOSED
RS = 3865
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100 PROPOSED
RS = 3180
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100 PROPOSED
RS = 2464
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta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RS = 1904
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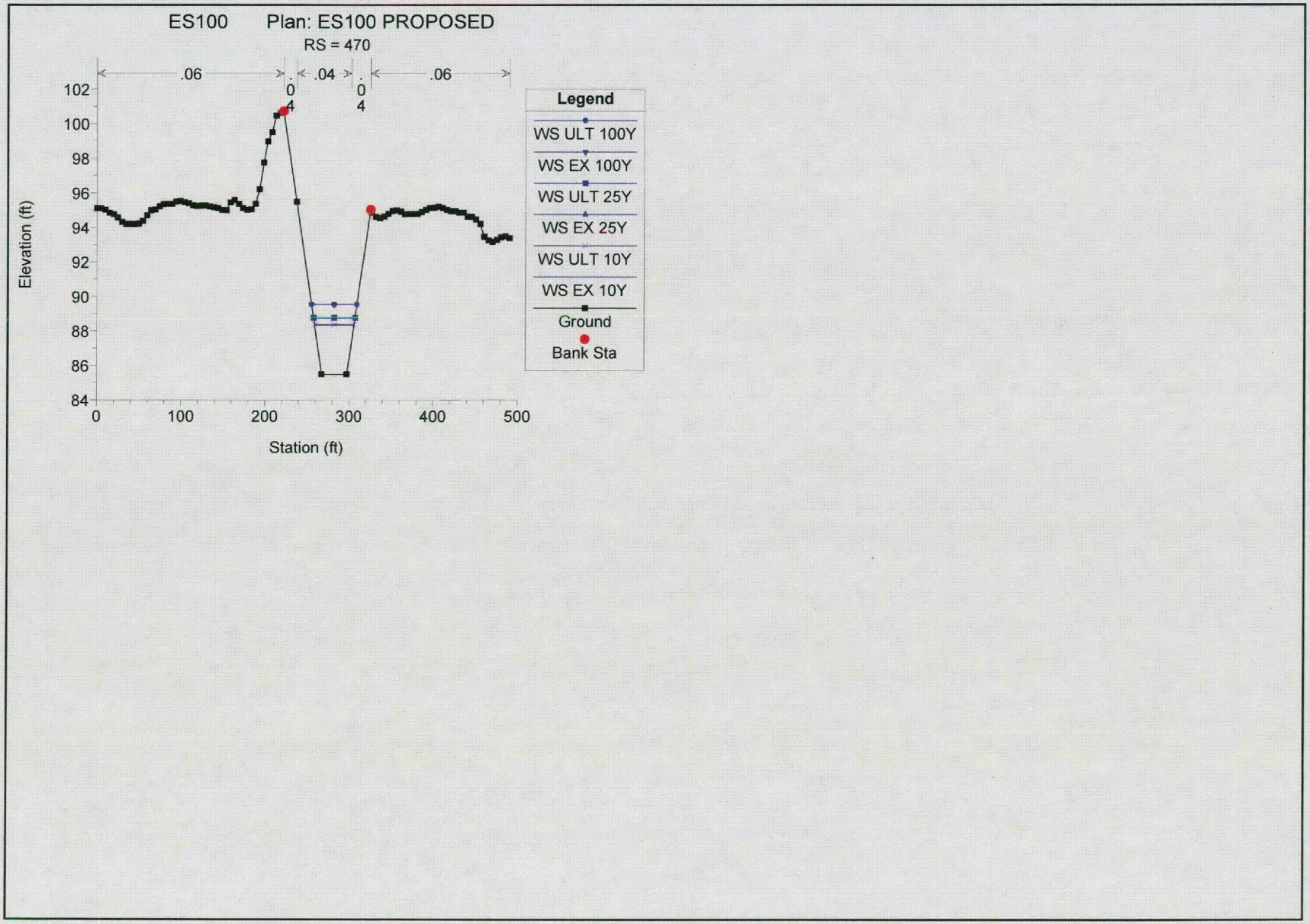
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100 PROPOSED
RS = 1581
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100 PROPOSED
RS = 1152
.06
.04
.04
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta
ES100 Plan: ES100 PROPOSED
RS = 899
.06
.04
.06
Elevation (ft)
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta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0.4
0.4
Elevation (ft)
102
100
98
96
94
92
90
88
86
84
0
100
200
300
400
500
Station (ft)
Legend
WS ULT 100Y
WS EX 100Y
WS ULT 25Y
WS EX 25Y
WS ULT 10Y
WS EX 10Y
Ground
Bank Sta

APPENDIX E
COST ESTIMATE & PRIORITIZATION

CITY OF EDINBURG MASTER DRAINAGE PLAN
PROPOSED LATERAL SYSTEM IMPROVEMENTS
IMPROVEMENT COMPONENT COST ESTIMATE SUMMARY

LATERAL SYSTEM	COST ESTIMATE	ESTIMATE W/ CONTINENCY	PRIORITIZATION CRITERIA 1	2	3	PRIORITY WEIGHTED VALUE
NM-102	$2,252,940	$2,816,175	Y	Y	Y	6
NM-103	$714,690	$893,363	Y	Y	N	5
NM-104	$192,800	$241,000	Y	Y	Y	6
NM-105	$316,053	$395,066	Y	N	N	2
NM-106	$252,623	$315,779	N	N	N	0
NM-108	$631,950	$789,938	Y	Y	Y	6
NM-109	$883,893	$1,104,866	Y	Y	Y	6
NM-110	$452,263	$565,329	Y	N	Y	3
NM-111	$258,228	$322,785	N	Y	Y	4
NM-112	$0	$0	N	N	N	0
NM-113	$143,313	$179,141	Y	Y	N	5
NM-115	$596,720	$745,900	Y	N	N	2
NM-116	$134,467	$168,084	Y	N	N	2
ES-102	$8,820,196	$11,025,245	Y	Y	Y	6
ES-101	$3,324,410	$4,155,513	Y	Y	Y	6
SM-102	$880,927	$1,101,159	N	N	Y	1
SM-103	$440,020	$550,025	Y	Y	N	5
SM-104	$913,504	$1,141,880	Y	Y	Y	6
MC-100	$1,742,893	$2,178,616	Y	Y	N	5
MC-101	$0	$0	N	N	N	0

SUBTOTAL	$22,951,890
25% CONTINGENCY	$5,737,972
COE MDP TOTAL	$28,689,862

CITY OF EDINBURG MASTER DRAINAGE PLAN
PROPOSED LATERAL SYSTEM IMPROVEMENTS

IMPROVEMENT COMPONENT COST ESTIMATE SUMMARY

LATERAL SYSTEM	COST ESTIMATE SUMMARY	
	RECOMMENDED ALT.	ALT. OPTION
NM-102	$2,252,940	$463,790
NM-103	$714,690	$910,518
NM-104	$192,800	$555,000
NM-105	$316,053	
NM-106	$252,623	
NM-108	$631,950	
NM-109	$883,893	
NM-110	$452,263	
NM-111	$258,228	
NM-112	$0	
NM-113	$143,313	
NM-115	$596,720	
NM-116	$134,467	
ES-102	$8,820,196	$8,878,551
ES-101	$3,324,410	
SM-102	$880,927	
SM-103	$440,020	$413,150
SM-104	$913,504	
MC-100	$1,742,893	
MC-101	$0	

SUBTOTAL	$22,951,890
25% CONTINGENCY	$5,737,972
COE MDP TOTAL	$28,689,862

CITY OF EDINBURG MASTER DRAINAGE PLAN - PROPOSED LATERAL SYSTEM IMPROVEMENTS
IMPROVEMENT COMPONENT COST ESTIMATE

NM-102 LATERAL SYSTEM

Improvement Description	Item Description	Unit	Unit Cost	Quantity	Item Cost
NM-102					
NEW BASIN (OPT 1)					
	EXCAVATION (DETENTION)	AC-FT	$11,000	20	$220,000
	RC PIPE (36 IN)	LF	$160	150	$24,000
	RIPRAP (CONCRETE)	CY	$350	31	$10,850
INLINE BASIN (OPT 2)					
	EXCAVATION (CHANNEL)	CY	$7	292,000	$2,044,000
CULVERT REPLACEMENT - ACCESS ROAD					
	CONC BOX CULV (10 FT X 6 FT)	LF	$620	100	$62,000
	WINGWALL (FW-0)(HW=7 FT)	EA	$10,800	2	$21,600
	EXCAVATION (ROAD)	CY	$5	890	$4,450
CULVERT REPLACEMENT - DENVER ROAD					
ADDED PIPE	RC PIPE (36 IN)	LF	$150	93	$13,950
	HEADWALL (CH-PW-O) (DIA= 36 IN)	EA	$4,900	2	$9,800
	CUT & RESTORE PAVEMENT	SY	$60	67	$4,000
UPSTREAM DITCH EXTENSION (NM-102-03)					
	EXCAVATION (CHANNEL)	CY	$7	9,620	$67,340
BRENDA ST	RC PIPE (36 IN)	LF	$150	80	$12,000
	HEADWALL (CH-PW-O) (DIA= 36 IN)	EA	$4,900	2	$9,800
	CUT & RESTORE PAVEMENT	SY	$60	67	$4,000
				OPTION 1 SUBTOTAL	$463,790
				OPTION 2 SUBTOTAL	$2,252,940

CITY OF EDINBURG MASTER DRAINAGE PLAN - PROPOSED LATERAL SYSTEM IMPROVEMENTS
IMPROVEMENT COMPONENT COST ESTIMATE
NM-103 & NM-104 LATERAL SYSTEMS

Improvement Description	Item Description	Unit	Unit Cost	Quantity	Item Cost
NM-103					
CULVERT REPLACEMENT - D/S ACCESS ROAD					
	CONC BOX CULV (10 FT X 6 FT)	LF	$620	93	$57,660
	WINGWALL (FW-0)(HW=7 FT)	EA	$10,800	2	$21,600
	CUT & RESTORE PAVEMENT	SY	$60	67	$4,000
CULVERT REPLACEMENT - MONTE CRISTO ST					
	CONC BOX CULV (10 FT X 6 FT)	LF	$620	474	$293,880
	WINGWALL (FW-S)(HW=7 FT)	EA	$10,700	2	$21,400
	CUT & RESTORE PAVEMENT	SY	$60	1,100	$66,000
CULVERT REPLACEMENT - ROGERS ROAD					
	CONC BOX CULV (8 FT X 6 FT)	LF	$535	80	$42,800
	WINGWALL (FW-0)(HW=7 FT)	EA	$10,800	2	$21,600
	CUT & RESTORE PAVEMENT	SY	$60	80	$4,800
CULVERT REPLACEMENT - UTILITY/ CANAL CROSSING					
	CONC BOX CULV (6 FT X 6 FT)	LF	$400	72	$28,800
	WINGWALL (FW-0)(HW=7 FT)	EA	$10,800	2	$21,600
	CUT & RESTORE PAVEMENT	SY	$60	67	$4,000
CULVERT REPLACEMENT - RUSSELL ROAD					
	RC PIPE (48 IN)	LF	$300	72	$21,600
	HEADWALL (CH-PW-O) (DIA= 48 IN)	EA	$5,200	2	$10,400
	CUT & RESTORE PAVEMENT	SY	$60	67	$4,000
NEW DITCH LATERAL - (OPTION 1)					
	EXCAVATION (CHANNEL)	CY	$7	7,450	$52,150
	RC PIPE (48 IN) - UNDER SUGAR RD	LF	$300	80	$24,000
	HEADWALL (CH-PW-O) (DIA= 48 IN)	EA	$5,200	2	$10,400
	CUT & RESTORE PAVEMENT	SY	$60	67	$4,000
NEW CULVERT CONNECTION TO STORMWATER BASIN - (OPTION 2)					
	RC PIPE (48 IN) - ALONG SUGAR RD	LF	$300	850	$255,000
	HEADWALL (CH-PW-O) (DIA= 48 IN)	EA	$5,200	2	$10,400
	CUT & RESTORE PAVEMENT	SY	$60	133	$8,000
	EXCAVATION (PIPE)	CY	$5	2,596	$12,978
				NM-103 OPTION 1 SUBTOTAL	$714,690
				NM-103 OPTION 2 SUBTOTAL	$910,518

Improvement Description	Item Description	Unit	Unit Cost	Quantity	Item Cost
NM-104					
STORMWATER BASIN NEW OUTFALL - (OPTION 1)					
	RC PIPE (48 IN) - UNDER CHAPIN ST	LF	$300	560	$168,000
	HEADWALL (CH-PW-O) (DIA= 48 IN)	EA	$5,200	4	$20,800
	CUT & RESTORE PAVEMENT	SY	$60	67	$4,000
ADDITIONAL STORMWATER BASIN - (OPTION 2)					
	EXCAVATION (DETENTION)	AC-FT	$11,000	35	$385,000
	RC PIPE (48 IN) - BASIN CONNECTION	LF	$300	300	$90,000
	RIPRAP (CONCRETE)	CY	$350	220	$77,000
	EXCAVATION (PIPE)	CY	$5	600	$3,000
				NM-104 OPTION 1 SUBTOTAL	$192,800
				NM-104 OPTION 2 SUBTOTAL	$555,000

CITY OF EDINBURG MASTER DRAINAGE PLAN - PROPOSED LATERAL SYSTEM IMPROVEMENTS
IMPROVEMENT COMPONENT COST ESTIMATE
NM-105 & NM-106 LATERAL SYSTEMS

Improvement Description	Item Description	Unit	Unit Cost	Quantity	Item Cost
NM-105					
CULVERT REPLACEMENT - MCCOLL RD					
	CONC BOX CULV (5 FT X 5 FT)	LF	$295	124	$36,580
	WINGWALL (FW-0)(HW=6 FT)	EA	$7,500	2	$15,000
	CUT & RESTORE PAVEMENT	SY	$60	89	$5,333
CULVERT REPLACEMENT - MONUMENT MACK RD					
	CONC BOX CULV (6 FT X 4 FT)	LF	$300	90	$27,000
	WINGWALL (FW-0)(HW=5 FT)	EA	$5,000	2	$10,000
	CUT & RESTORE PAVEMENT	SY	$60	67	$4,000
CULVERT REPLACEMENT - HOEHN RD					
	RC PIPE (48 IN)	LF	$300	114	$34,200
	HEADWALL (CH-PW-O) (DIA= 48 IN)	EA	$5,200	2	$10,400
	CUT & RESTORE PAVEMENT	SY	$60	67	$4,000
NEW DITCH LATERAL					
	EXCAVATION (CHANNEL)	CY	$7	24,220	$169,540
				NM-105 SUBTOTAL	$316,053

Improvement Description	Item Description	Unit	Unit Cost	Quantity	Item Cost
NM-106					
CULVERT REPLACEMENT - MCCOLL RD					
ADDED PIPE	RC PIPE (36 IN)	LF	$150	108	$16,200
	HEADWALL (CH-PW-O) (DIA= 36 IN)	EA	$4,900	2	$9,800
	CUT & RESTORE PAVEMENT	SY	$60	89	$5,333
CULVERT REPLACEMENT - RUSSELL ROAD					
ADDED PIPE	RC PIPE (36 IN)	LF	$150	36	$5,400
	HEADWALL (CH-PW-O) (DIA= 36 IN)	EA	$4,900	2	$9,800
	CUT & RESTORE PAVEMENT	SY	$60	67	$4,000
NEW DITCH LATERAL					
	EXCAVATION (CHANNEL)	CY	$7	28,870	$202,090
				NM-106 SUBTOTAL	$252,623

CITY OF EDINBURG MASTER DRAINAGE PLAN - PROPOSED LATERAL SYSTEM IMPROVEMENTS
IMPROVEMENT COMPONENT COST ESTIMATE
NM-108 & NM-109 LATERAL SYSTEMS

Improvement Description	Item Description	Unit	Unit Cost	Quantity	Item Cost
NM-108					
NEW DETENTION BASIN					
	EXCAVATION (DETENTION)	AC-FT	$11,000	26	$286,000
	RC PIPE (60 IN) - BASIN INFLOW	LF	$350	400	$140,000
	HEADWALL (CH-PW-O) (DIA= 60 IN)	EA	$7,500	2	$15,000
	RC PIPE (48 IN) - BASIN OUTFLOW	LF	$300	400	$120,000
	HEADWALL (CH-PW-O) (DIA= 48 IN)	EA	$5,200	2	$10,400
	RIPRAP (CONCRETE)	CY	$350	173	$60,550
				NM-108 SUBTOTAL	$631,950

Improvement Description	Item Description	Unit	Unit Cost	Quantity	Item Cost
NM-109					
CULVERT REPLACEMENT - JACKSON RD					
	RC PIPE (48 IN)	LF	$300	940	$282,000
	HEADWALL (CH-PW-O) (DIA= 48 IN)	EA	$5,200	2	$10,400
	CUT & RESTORE PAVEMENT	SY	$60	1,822	$109,333
NEW DETENTION BASIN					
	EXCAVATION (DETENTION)	AC-FT	$11,000	26	$286,000
	RC PIPE (48 IN) - BASIN CONNECTION	LF	$300	300	$90,000
	HEADWALL (CH-PW-O) (DIA= 48 IN)	EA	$5,200	2	$10,400
	RIPRAP (CONCRETE)	CY	$350	150	$52,500
	CUT & RESTORE PAVEMENT	SY	$60	400	$24,000
	EXCAVATION (PIPE)	CY	$5	3,852	$19,259
				NM-109 SUBTOTAL	$883,893

CITY OF EDINBURG MASTER DRAINAGE PLAN - PROPOSED LATERAL SYSTEM IMPROVEMENTS
IMPROVEMENT COMPONENT COST ESTIMATE
NM-110 & NM-112 LATERAL SYSTEMS

Improvement Description	Item Description	Unit	Unit Cost	Quantity	Item Cost
NM-110					
CULVERT REPLACEMENT - MCCOLL RD					
EXTEND EXIST BOX	CONC BOX CULV (8 FT X 4 FT)	LF	$430	124	$53,320
	WINGWALL (FW-0)(HW=6 FT)	EA	$7,500	1	$7,500
	CUT & RESTORE PAVEMENT	SY	$60	133	$8,000
CULVERT REPLACEMENT - UTILITY ACCESS					
	CONC BOX CULV (7 FT X 4 FT)	LF	$405	90	$36,450
	WINGWALL (FW-0)(HW=5 FT)	EA	$5,000	2	$10,000
	CUT & RESTORE PAVEMENT	SY	$60	0	$0
CULVERT REPLACEMENT - MONUMENT MACK RD					
	CONC BOX CULV (7 FT X 4 FT)	LF	$405	90	$36,450
	WINGWALL (FW-0)(HW=5 FT)	EA	$5,000	2	$10,000
	CUT & RESTORE PAVEMENT	SY	$60	178	$10,667
CULVERT REPLACEMENT - SAKER RD					
	RC PIPE (36 IN)	LF	$150	152	$22,800
	HEADWALL (CH-PW-O) (DIA= 36 IN)	EA	$4,900	2	$9,800
	CUT & RESTORE PAVEMENT	SY	$60	58	$3,467
NEW DITCH LATERAL					
	EXCAVATION (CHANNEL)	CY	$7	20,610	$144,270
DITCH EXTENSION					
	EXCAVATION (CHANNEL)	CY	$7	14,220	$99,540
				NM-110 SUBTOTAL	$452,263

Improvement Description	Item Description	Unit	Unit Cost	Quantity	Item Cost
NM-112					
--					--
				NM-112 SUBTOTAL	$0

CITY OF EDINBURG MASTER DRAINAGE PLAN - PROPOSED LATERAL SYSTEM IMPROVEMENTS
IMPROVEMENT COMPONENT COST ESTIMATE
NM-111 & NM-113 LATERAL SYSTEMS

Improvement Description	Item Description	Unit	Unit Cost	Quantity	Item Cost
NM-111					
DITCH EXTENSION					
	EXCAVATION (CHANNEL)	CY	$7	2,840	$19,880
CULVERT CONNECTOR - EISD PROPERTY					
	RC PIPE (60 IN)	LF	$350	72	$25,200
	HEADWALL (CH-PW-O) (DIA= 60 IN)	EA	$7,500	2	$15,000
	CUT & RESTORE PAVEMENT	SY	$60	778	$46,667
NEW DETENTION BASIN					
	EXCAVATION (DETENTION)	AC-FT	$11,000	10	$110,000
	RIPRAP (CONCRETE)	CY	$350	119	$41,481
				NM-111 SUBTOTAL	$258,228

Improvement Description	Item Description	Unit	Unit Cost	Quantity	Item Cost
NM-113					
CULVERT REPLACEMENT - JACKSON RD					
ADDED BOX	CONC BOX CULV (5 FT X 4 FT)	LF	$260	280	$72,800
	WINGWALL (FW-0)(HW=5 FT)	EA	$5,000	2	$10,000
	CUT & RESTORE PAVEMENT	SY	$60	222	$13,333
CULVERT REPLACEMENT - SUGAR RD					
	RC PIPE (42 IN)	LF	$240	72	$17,280
	HEADWALL (CH-PW-O) (DIA= 42 IN)	EA	$5,000	2	$10,000
	CUT & RESTORE PAVEMENT	SY	$60	67	$4,000
DESILT/ MAINTENANCE - CHANNEL					
	DITCH CLEANING & RESHAPING	LF	$2	7,950	$15,900
				NM-113 SUBTOTAL	$143,313

CITY OF EDINBURG MASTER DRAINAGE PLAN - PROPOSED LATERAL SYSTEM IMPROVEMENTS
IMPROVEMENT COMPONENT COST ESTIMATE
NM-115 & NM-116 LATERAL SYSTEMS

Improvement Description	Item Description	Unit	Unit Cost	Quantity	Item Cost
NM-115					
CULVERT REPLACEMENT - WISCONSIN					
ADDED BOX	CONC BOX CULV (7 FT X 8 FT)	LF	$545	152	$82,840
	WINGWALL (FW-0)(HW=9 FT)	EA	$12,000	2	$24,000
	CUT & RESTORE PAVEMENT	SY	$60	267	$16,000
CULVERT REPLACEMENT - ALBERTA					
ADDED BOX	CONC BOX CULV (8 FT X 9 FT)	LF	$620	178	$110,360
	WINGWALL (FW-0)(HW=10 FT)	EA	$12,000	2	$24,000
	CUT & RESTORE PAVEMENT	SY	$60	80	$4,800
CULVERT REPLACEMENT - UTILITY CROSSING					
ADDED BOX	CONC BOX CULV (8 FT X 7 FT)	LF	$535	48	$25,680
	WINGWALL (FW-0)(HW=8 FT)	EA	$11,800	2	$23,600
	CUT & RESTORE PAVEMENT	SY	$60	80	$4,800
CULVERT REPLACEMENT - DOVE					
ADDED BOX	CONC BOX CULV (7 FT X 6 FT)	LF	$535	154	$82,390
	WINGWALL (FW-0)(HW=7 FT)	EA	$10,800	2	$21,600
	CUT & RESTORE PAVEMENT	SY	$60	160	$9,600
CULVERT REPLACEMENT - UTILITY CROSSING					
BOX REPLACEMENT	CONC BOX CULV (10 FT X 8 FT)	LF	$535	154	$82,390
	WINGWALL (FW-0)(HW=9 FT)	EA	$12,000	2	$24,000
	CUT & RESTORE PAVEMENT	SY	$60	0	$0
CULVERT REPLACEMENT - UTILITY CROSSING					
ADDED BOX	CONC BOX CULV (6 FT X 4 FT)	LF	$535	36	$19,260
	WINGWALL (FW-0)(HW=5 FT)	EA	$5,000	2	$10,000
	CUT & RESTORE PAVEMENT	SY	$60	0	$0
CULVERT REPLACEMENT - UTILITY CROSSING					
ADDED BOX	CONC BOX CULV (6 FT X 4 FT)	LF	$535	40	$21,400
	WINGWALL (FW-0)(HW=5 FT)	EA	$5,000	2	$10,000
	CUT & RESTORE PAVEMENT	SY	$60	0	$0
				NM-115 SUBTOTAL	$596,720

Improvement Description	Item Description	Unit	Unit Cost	Quantity	Item Cost
NM-116					
CULVERT REPLACEMENT - WISCONSIN					
CULVERT REPLACEMENT	CONC BOX CULV (6 FT X 5 FT)	LF	$340	320	$108,800
	WINGWALL (FW-0)(HW=6 FT)	EA	$7,500	2	$15,000
	CUT & RESTORE PAVEMENT	SY	$60	178	$10,667
				NM-116 SUBTOTAL	$134,467

CITY OF EDINBURG MASTER DRAINAGE PLAN - PROPOSED LATERAL SYSTEM IMPROVEMENTS
IMPROVEMENT COMPONENT COST ESTIMATE

ES-102 LATERAL SYSTEM

Improvement Description	Item Description	Unit	Unit Cost	Quantity	Item Cost
ES-102 & ES-102-01					
CHANNELIZATION					
ES-102-00	EXCAVATION (CHANNEL)	CY	$7	47,304	$331,128
ES-102-01	EXCAVATION (CHANNEL)	CY	$7	74,061	$518,427
CULVERT REPLACEMENT - ACCESS RD					
REPLACEMENT	CONC BOX CULV (8 FT X 5 FT)	LF	$525	94	$49,350
	WINGWALL (FW-0)(HW=6 FT)	EA	$7,500	2	$15,000
	CUT & RESTORE PAVEMENT	SY	$60	80	$4,800
CULVERT REPLACEMENT - RAUL LONGORIA					
REPLACEMENT	CONC BOX CULV (8 FT X 5 FT)	LF	$525	157	$82,425
	WINGWALL (FW-0)(HW=6 FT)	EA	$7,500	2	$15,000
	CUT & RESTORE PAVEMENT	SY	$60	267	$16,000
CULVERT REPLACEMENT - DOOLITTLE					
REPLACEMENT	CONC BOX CULV (8 FT X 5 FT)	LF	$525	420	$220,500
	WINGWALL (FW-0)(HW=6 FT)	EA	$7,500	2	$15,000
	CUT & RESTORE PAVEMENT	SY	$60	80	$4,800
ES-100					
CULVERT REPLACEMENT - DOOLITTLE					
BOX REPLACEMENT	CONC BOX CULV (10 FT X 10 FT)	LF	$845	84	$70,980
	WINGWALL (FW-0)(HW=10 FT)	EA	$12,000	2	$24,000
	CUT & RESTORE PAVEMENT	SY	$60	100	$6,000
CULVERT REPLACEMENT - RAUL LONGORIA					
BOX REPLACEMENT	CONC BOX CULV (10 FT X 10 FT)	LF	$845	147	$124,215
	WINGWALL (FW-0)(HW=10 FT)	EA	$12,000	2	$24,000
	CUT & RESTORE PAVEMENT	SY	$60	333	$20,000
ES-102 & ES-102-01	**BASIN OPTION 1**				
NEW DETENTION BASIN					
	EXCAVATION (DETENTION)	AC-FT	$11,000	500	$5,500,000
	RIPRAP (CONCRETE)	CY	$350	474	$165,926
BASIN OUTFALL	RC PIPE (60 IN)	LF	$350	3,020	$1,057,000
	HEADWALL (CH-PW-O) (DIA= 60 IN)	EA	$7,500	2	$15,000
CHANNELIZATION					
EDINBURG STUB	EXCAVATION (CHANNEL)	CY	$7	57,285	$400,995
SOUTH MAIN DRAIN	EXCAVATION (CHANNEL)	CY	$7	19,950	$139,650
ES-102 & ES-102-01	**BASIN OPTION 2**				
NEW DETENTION BASIN					
	EXCAVATION (DETENTION)	AC-FT	$11,000	500	$5,500,000
	RIPRAP (CONCRETE)	CY	$350	474	$165,926
BASIN OUTFALL	RC PIPE (48 IN)	LF	$300	3,020	$906,000
	HEADWALL (CH-PW-O) (DIA= 48 IN)	EA	$7,500	2	$15,000
PUMP STATION	SUBMERSIBLE PUMP & CONTROLS	EA	$750,000	1	$750,000
				ES-102 OPTION 1 SUBTOTAL	$8,820,196
				ES-102 OPTION 2 SUBTOTAL	$8,878,551

CITY OF EDINBURG MASTER DRAINAGE PLAN - PROPOSED LATERAL SYSTEM IMPROVEMENTS
IMPROVEMENT COMPONENT COST ESTIMATE

ES-101 LATERAL SYSTEM

Improvement Description	Item Description	Unit	Unit Cost	Quantity	Item Cost
ES-101					
DESILT/ MAINTENANCE - CHANNEL					
	DITCH CLEANING & RESHAPING	LF	$2	4,190	$8,380
CULVERT CONNECTION (DIVERSION TO BASIN)					
	RC PIPE (60 IN)	LF	$350	2,060	$721,000
	HEADWALL (CH-PW-O) (DIA= 60 IN)	EA	$7,500	2	$15,000
S 18TH AVE	CUT & RESTORE PAVEMENT	SY	$60	156	$9,333
	EXCAVATION (PIPE)	CY	$7	12,207	$85,452
DETENTION BASIN					
	EXCAVATION (DETENTION)	AC-FT	$11,000	90	$990,000
	RIPRAP (CONCRETE)	CY	$350	304	$106,296
CULVERT CONNECTION (BASIN TO BASIN)					
	RC PIPE (48 IN)	LF	$300	2,600	$780,000
	HEADWALL (CH-PW-O) (DIA= 48 IN)	EA	$5,200	2	$10,400
CANTON AVE	CUT & RESTORE PAVEMENT	SY	$60	133	$8,000
	EXCAVATION (PIPE)	CY	$7	15,407	$107,852
DETENTION BASIN					
EXIST DEPRESSED AREA	EXCAVATION (DETENTION)	AC-FT	$11,000	30	$330,000
	RIPRAP (CONCRETE)	CY	$350	304	$106,296
OUTFALL TO SMD	RC PIPE (48 IN)	LF	$300	120	$36,000
	HEADWALL (CH-PW-O) (DIA= 48 IN)	EA	$5,200	2	$10,400
				ES-101 SUBTOTAL	$3,324,410

CITY OF EDINBURG MASTER DRAINAGE PLAN - PROPOSED LATERAL SYSTEM IMPROVEMENTS
IMPROVEMENT COMPONENT COST ESTIMATE

SM-102 LATERAL SYSTEM

Improvement Description	Item Description	Unit	Unit Cost	Quantity	Item Cost
SM-102					
DITCH EXTENSION & NEW LATERALS					
	EXCAVATION (CHANNEL)	CY	$7	57,523	$402,661
TRENTON CROSSING	RC PIPE (48 IN)	LF	$300	690	$207,000
	HEADWALL (CH-PW-O) (DIA= 48 IN)	EA	$5,200	2	$10,400
	CUT & RESTORE PAVEMENT	SY	$60	222	$13,333
	EXCAVATION (PIPE)	CY	$7	3,733	$26,133
ALBERTA CROSSING	RC PIPE (48 IN)	LF	$300	690	$207,000
	HEADWALL (CH-PW-O) (DIA= 48 IN)	EA	$5,200	2	$10,400
	CUT & RESTORE PAVEMENT	SY	$60	67	$4,000
				SM-102 SUBTOTAL	$880,927

CITY OF EDINBURG MASTER DRAINAGE PLAN - PROPOSED LATERAL SYSTEM IMPROVEMENTS
IMPROVEMENT COMPONENT COST ESTIMATE

SM-103 LATERAL SYSTEM

Improvement Description	Item Description	Unit	Unit Cost	Quantity	Item Cost
SM-103					
NEW DETENTION BASIN - (OPTION 1)					
	EXCAVATION (DETENTION)	AC-FT	$11,000	20	$220,000
	RC PIPE (48 IN) - BASIN CONNECTIONS	LF	$300	350	$105,000
	HEADWALL (CH-PW-O) (DIA= 48 IN)	EA	$5,200	1	$5,200
	RIPRAP (CONCRETE)	CY	$350	237	$82,950
NEW OUTFALL DITCH - (OPTION 2)					
OUTFALL TO SMD	EXCAVATION (CHANNEL)	CY	$7	17,860	$125,020
CONNECT TO ES-101 SYS.	RC PIPE (48 IN)	LF	$300	1,050	$315,000
				SM-103 OPTION 1 SUBTOTAL	$413,150
				SM-103 OPTION 2 SUBTOTAL	$440,020

CITY OF EDINBURG MASTER DRAINAGE PLAN - PROPOSED LATERAL SYSTEM IMPROVEMENTS
IMPROVEMENT COMPONENT COST ESTIMATE

SM-104 LATERAL SYSTEM

Improvement Description	Item Description	Unit	Unit Cost	Quantity	Item Cost
SM-104					
NEW DETENTION BASIN					
	EXCAVATION (DETENTION)	AC-FT	$11,000	10	$110,000
	RIPRAP (CONCRETE)	CY	$350	111	$38,889
BASIN CONNECTION	RC PIPE (48 IN)	LF	$300	350	$105,000
	HEADWALL (CH-PW-O) (DIA= 48 IN)	EA	$5,200	2	$10,400
NEW OUTFALL SYSTEM					
	EXCAVATION (CHANNEL)	CY	$7	17,126	$119,881
CULVERT CONNECTION	CONC BOX CULV (6 FT X 4 FT)	LF	$300	1,060	$318,000
	WINGWALL (FW-0)(HW=5 FT)	EA	$5,000	2	$10,000
	EXCAVATION (BOX)	CY	$7	4,385	$30,696
DRIVEWAY	CUT & RESTORE PAVEMENT	SY	$60	44	$2,667
CANTON	CUT & RESTORE PAVEMENT	SY	$60	111	$6,667
RAUL LONGORIA	CUT & RESTORE PAVEMENT	SY	$60	222	$13,333
	EXCAVATION (CHANNEL)	CY	$7	11,081	$77,570
OUTFALL TO SMD	RC PIPE (48 IN) - 2 PIPES	LF	$300	200	$60,000
	HEADWALL (CH-PW-O) (DIA= 48 IN)	EA	$5,200	2	$10,400
				SM-104 SUBTOTAL	$913,504

CITY OF EDINBURG MASTER DRAINAGE PLAN - PROPOSED LATERAL SYSTEM IMPROVEMENTS
IMPROVEMENT COMPONENT COST ESTIMATE
MC-100 & MC-101 LATERAL SYSTEMS

Improvement Description	Item Description	Unit	Unit Cost	Quantity	Item Cost
MC-100					
NEW LATERAL DITCH & CONNECTION					
	EXCAVATION (CHANNEL)	CY	$7	39,087	$273,612
	CONC BOX CULV (5 FT X 4 FT)	LF	$260	5,435	$1,413,100
	WINGWALL (FW-0)(HW=5 FT)	EA	$5,000	2	$10,000
	EXCAVATION (BOX)	CY	$7	4,026	$28,181
ROGERS RD	CUT & RESTORE PAVEMENT	SY	$60	67	$4,000
ADAMS LN	CUT & RESTORE PAVEMENT	SY	$60	67	$4,000
MINNIE LN	CUT & RESTORE PAVEMENT	SY	$60	67	$4,000
DOOLITTLE	CUT & RESTORE PAVEMENT	SY	$60	100	$6,000
				MC-100 SUBTOTAL	$1,742,893

Improvement Description	Item Description	Unit	Unit Cost	Quantity	Item Cost
MC-101					
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				MC-101 SUBTOTAL	$0

COE MDP - IMPROVEMENT COMPONENT COST ESTIMATE
UNIT COST ITEMIZATION

Item	Unit	Cost	
PIPE CULVERTS			
RC PIPE (24 IN)	LF	$80	
RC PIPE (30 IN)	LF	$120	
RC PIPE (36 IN)	LF	$150	
RC PIPE (42 IN)	LF	$240	
RC PIPE (48 IN)	LF	$300	
RC PIPE (54 IN)	LF	$325	
RC PIPE (60 IN)	LF	$350	
RC PIPE (72 IN)	LF	$400	
BOX CULVERT			
CONC BOX CULV (5 FT X 4 FT)	LF	$260	
CONC BOX CULV (5 FT X 5 FT)	LF	$295	
CONC BOX CULV (6 FT X 4 FT)	LF	$300	
CONC BOX CULV (6 FT X 5 FT)	LF	$340	
CONC BOX CULV (6 FT X 6 FT)	LF	$400	
CONC BOX CULV (7 FT X 4 FT)	LF	$405	
CONC BOX CULV (7 FT X 7 FT)	LF	$525	
CONC BOX CULV (8 FT X 4 FT)	LF	$430	
CONC BOX CULV (8 FT X 5 FT)	LF	$525	
CONC BOX CULV (8 FT X 6 FT)	LF	$535	
CONC BOX CULV (8 FT X 7 FT)	LF	$545	
CONC BOX CULV (8 FT X 8 FT)	LF	$560	
CONC BOX CULV (10 FT X 6 FT)	LF	$620	
CONC BOX CULV (10 FT X 8 FT)	LF	$730	
CONC BOX CULV (10 FT X 10 FT)	LF	$845	
WINGWALLS			
WINGWALL (FW-0)(HW=5 FT)	EA	$5,000	
WINGWALL (FW-0)(HW=6 FT)	EA	$7,500	
WINGWALL (FW-0)(HW=7 FT)	EA	$10,800	
WINGWALL (FW-S)(HW=7 FT)	EA	$10,700	
WINGWALL (FW-0)(HW=8 FT)	EA	$11,800	
WINGWALL (FW-0)(HW=9 FT)	EA	$12,000	
WINGWALL (FW-0)(HW=10 FT)	EA	$12,000	
HEADWALLS			
HEADWALL (CH-PW-O) (DIA= 36 IN)	EA	$4,900	
HEADWALL (CH-PW-O) (DIA= 42 IN)	EA	$5,000	
HEADWALL (CH-PW-O) (DIA= 48 IN)	EA	$5,200	
HEADWALL (CH-PW-O) (DIA= 60 IN)	EA	$7,500	
CONCRETE SLOPE PAVING			
RIPRAP (CONC)	CY	$350	
ROAD CULVERT REPLACEMENT			
CUT & RESTORE PAVEMENT	SY	$60	C&R PAVT COST IS REPRESENTATIVE OF PAVT, EXCAVATION, TRENCH PROTECTION
TRENCH PROTECTION	LF	$2	
EXCAVATION (ROAD)	CY	$5	
EXCAVATION			
EXCAVATION (DETENTION)	AC-FT	$11,000	= $7 /CY
EXCAVATION (CHANNEL)	CY	$7	

APPENDIX E
BENEFIT-COST ANALYSIS

INDIVIDUAL PROJECT ANALYSIS DETAILS
&
FEMA BCA TOOL DETAIL OUTPUT REPORT

CSE TEDSI

City of Edinburg Master Drainage Plan

Benefit-Cost Analysis Summary

A benefit-cost analysis was performed for each individual drainage system and the entire project using FEMA Benefit-Cost Analysis (BCA) Tool (v5.0). The BCR values for the project systems ranged from 0.89 to 8.10 with a resulting overall Benefit-Cost Ratio (BCR) for the entire Master Drainage Plan project computed as 2.99. The economic benefits are defined as the expected flood loss reduction due to the flood water surface elevation reduction from the proposed drainage improvements based on 10-, 50-, 100-, and 500-year storm events. The U.S. Army Corps of Engineers' generic depth-damage curves were utilized for this analysis.

Since this is a planning level of project, representative structures were used in the model with the cost per square foot applied to the total number of structures multiplied by the average structure square footage. Due to the level of commercial property within the ES100 lateral system drainage area, the benefit analysis for this system utilized residential and non-residential representative structure values to determine the benefit ratio.

PROJECT NAME: COE_MDP01 PROJECT BCR: 2.99

Project Structures Summary

Name	Struct	Benefit	Costs	BCR	Address	City	State	County	Zip
ES100NR	Building	$2,814,9	$2,743,057	1.03		Edinburg	Texas	Hidalgo	
ES100R	Building	$34,420,	$9,401,549	3.66		Edinburg	Texas	Hidalgo	
NM102	Building	$2,587,6	$2,252,940	1.15		Edinburg	Texas	Hidalgo	
NM103	Building	$1,888,7	$714,690	2.64		Edinburg	Texas	Hidalgo	
NM105	Building	$372,30	$316,053	1.18		Edinburg	Texas	Hidalgo	
NM106	Building	$1,069,4	$252,623	4.23		Edinburg	Texas	Hidalgo	
NM108	Building	$5,103,5	$631,950	8.08		Edinburg	Texas	Hidalgo	
NM109	Building	$787,07	$883,893	0.89		Edinburg	Texas	Hidalgo	
NM110	Building	$2,962,0	$452,263	6.55		Edinburg	Texas	Hidalgo	
NM111	Building	$387,07	$258,228	1.50		Edinburg	Texas	Hidalgo	
NM113	Building	$1,160,9	$143,313	8.10		Edinburg	Texas	Hidalgo	
NM115	Building	$2,033,9	$596,720	3.41		Edinburg	Texas	Hidalgo	
NM116	Building	$538,21	$134,467	4.00		Edinburg	Texas	Hidalgo	

21 Jan 2015 Project: **COE_MDP01**

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

BENEFIT-COST ANALYSIS SUMMARY

Number of developed parcels = 209 (500-yr Floodplain)

Average Improvement Value = $46,313

Average sqft (living area) = 1000 sqft.

Average of Min LiDAR Elevation at properties = 85.22 ft.

Average FFE = 85.72 ft.

BCA flood profile based on average WSEL for <u>all cross sections</u>.

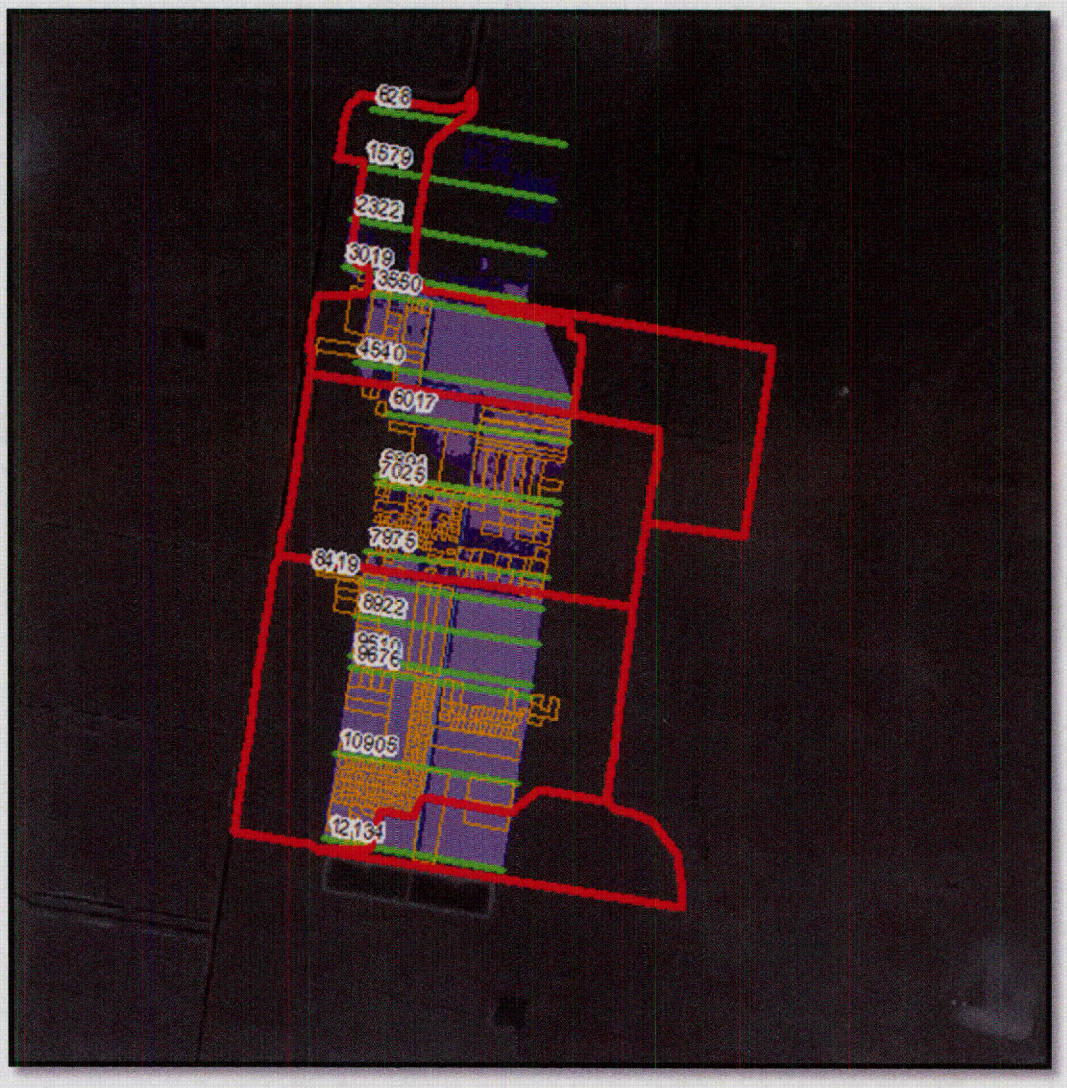
NM102, Edinburg, Texas, , Hidalgo

Structure Type: Building Historic Building: No Contact:

Benefits: $2,587,637 Costs: $2,252,940 BCR: 1.15

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	1.15	$2,587,637	$2,252,940

NM-103 Benefit Cost Analysis Assumptions



Number of developed parcels = 320 (500yr Floodplain)

Average Improvement Value = $95,384

Average sqft (living area) = 1500 scft.

Average of Min LiDAR Elevation at properties = 91.10 ft.

Average FFE = 91.60 ft.

BCA flood profile based on average WSEL for all cross sections.

NM103, Edinburg, Texas, , Hidalgo

Structure Type: Building | Historic Building: No | Contact:

Benefits: $1,888,765 | Costs: $714,690 | BCR: 2.64

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	2.64	$1,888,765	$714,690

NM-105 Benefit Cost Analysis Assumptions

Number of developed parcels = 12 (500yr Floodplain)

Average Improvement Value = $52,504

Average sqft (living area) = 1500 sqft.

Average of Min LiDAR Elevation at properties = 91.19 ft.

Average FFE = 91.69 ft.

BCA flood profile based on average WSEL for cross section at Sta 1461.

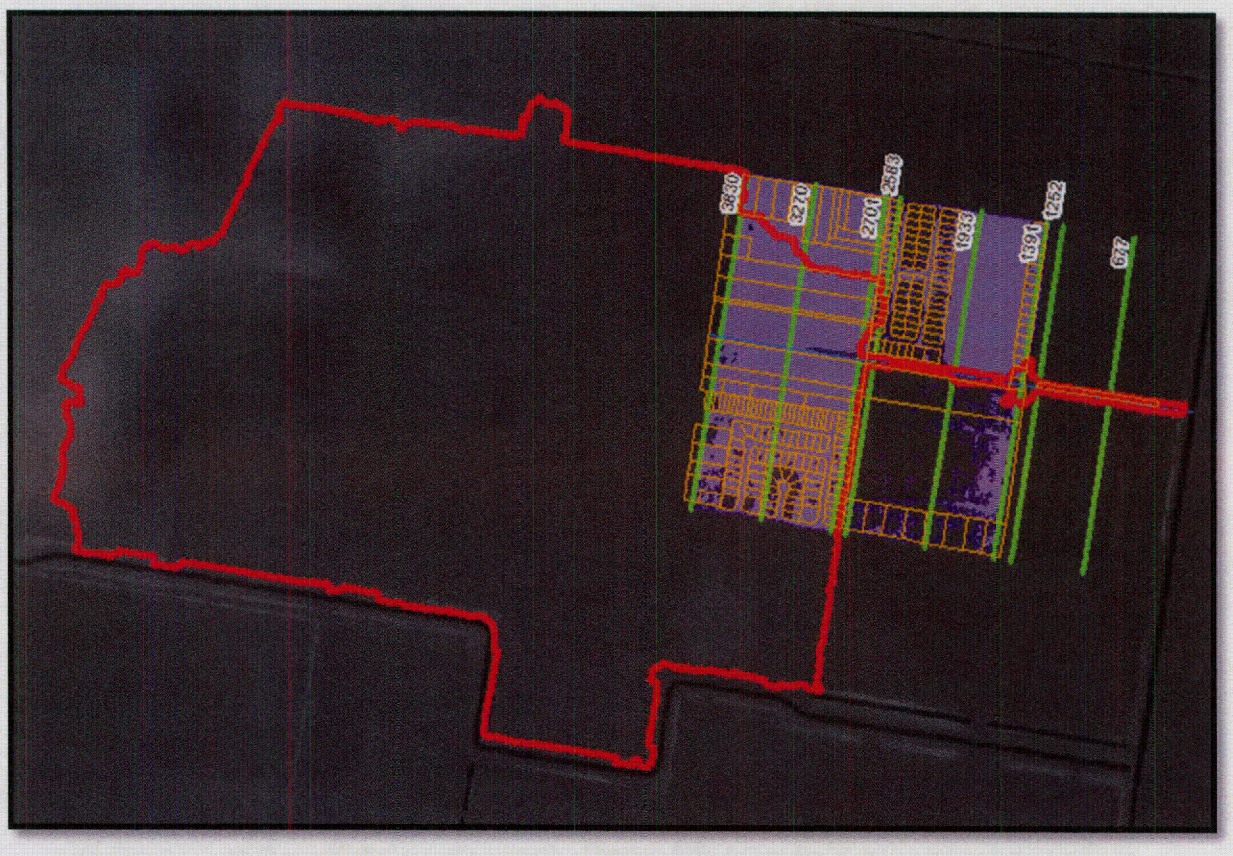
NM105, Edinburg, Texas, , Hidalgo

Structure Type: Building | Historic Building: No | Contact:

Benefits: $372,305 | Costs: $316,053 | BCR: 1.18

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	1.18	$372,305	$316,053

NM-106 Benefit Cost Analysis Assumptions



Number of parcels = 232 (500yr Floodplain)

Average Improvement Value = $96,000 (HCAD Online)

Average sqft (living area) = 1500 sqft.

Average of Min LiDAR Elevation at properties = 94.15 ft.

Average FFE = 94.65 ft.

BCA flood profile based on average WSEL for cross section Sta 3830 – Sta 1391.

NM106, Edinburg, Texas, , Hidalgo

Structure Type: Building Historic Building: No Contact:

Benefits: $1,069,435 Costs: $252,623 BCR: 4.23

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	4.23	$1,069,435	$252,623

NM-108 Benefit Cost Analysis Assumptions

Number of parcels = 64 (500yr Floodplain)

Average Improvement Value = $60,000 (HCAD Online)

Average sqft (living area) = 2000 sqft.

Average of Min LiDAR Elevation at properties = 94.97 ft.

Average FFE = 94.97 ft.

BCA flood profile based on average WSEL for all cross sections.

NM108, Edinburg, Texas, , Hidalgo

Structure Type: Building | Historic Building: No | Contact:

Benefits: $5,103,509 | Costs: $631,950 | BCR: 8.08

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	8.08	$5,103,509	$631,950

NM-109 Benefit Cost Analysis Assumptions

Number of parcels = 63 (500yr Floodplain)

Average Improvement Value = $200,000 (HCAD Online)

Average sqft (living area) = 16,000 sqft. (Apartment Buildings)

Average of Min LiDAR Elevation at properties = 95.88 ft.

Average FFE = 95.88 ft.

BCA flood profile based on average WSEL for cross section Sta 2536 – Sta 1516.

NM109, Edinburg, Texas, , Hidalgo

Structure Type: Building | Historic Building: No | Contact:

Benefits: $787,070 | Costs: $883,893 | BCR: 0.89

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	0.89	$787,070	$883,893

NM-110 Benefit Cost Analysis Assumptions

Number of parcels = 221 (500yr Floodplain)

Average Improvement Value = $148,572

Average sqft (living area) = 2,500 sqft.

Average of Min LiDAR Elevation at properties = 97.80 ft.

Average FFE = 98.30 ft.

BCA flood profile based on average WSEL for all cross sections.

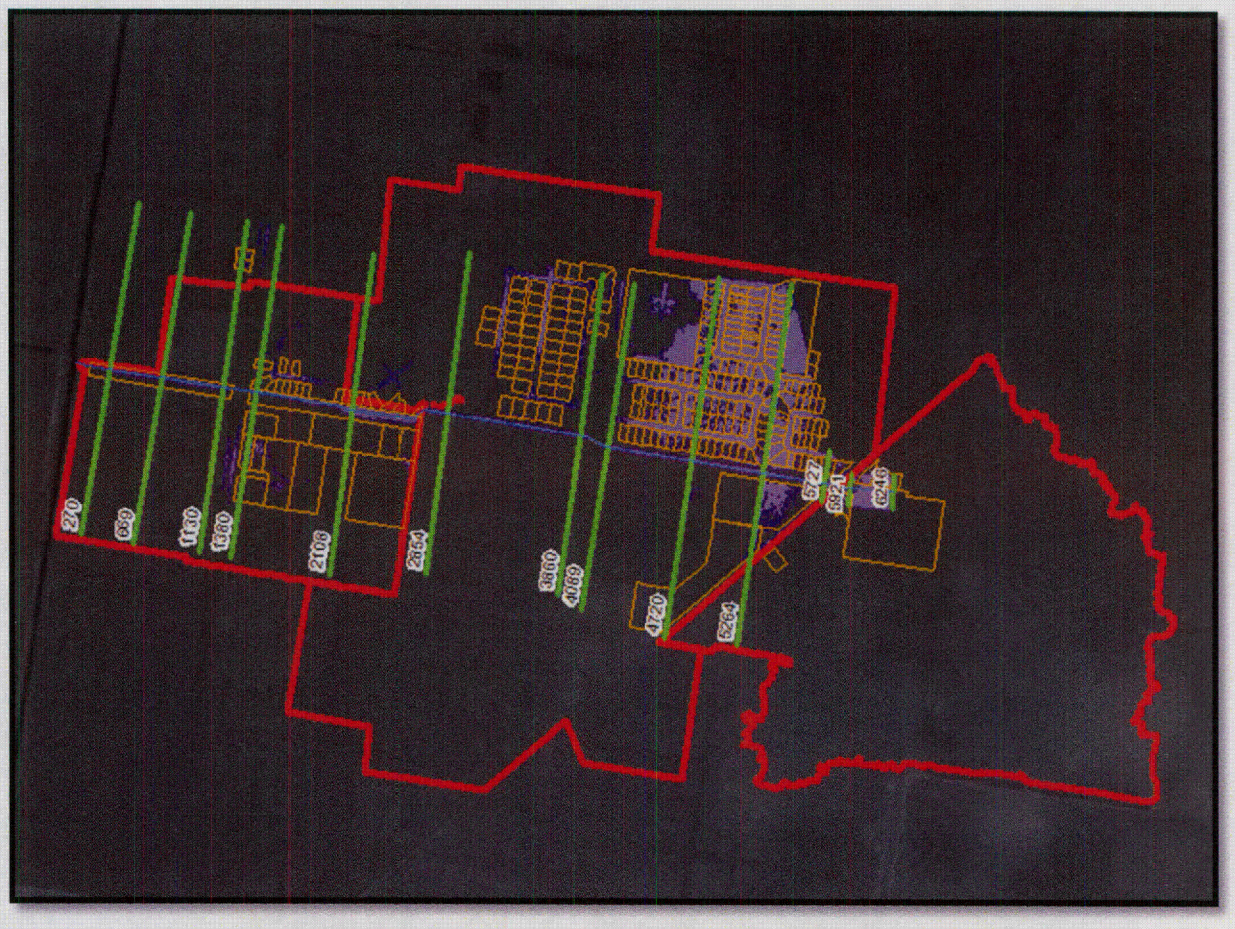
NM110, Edinburg, Texas, , Hidalgo

Structure Type: Building Historic Building: No Contact:

Benefits: $2,962,055 Costs: $452,263 BCR: 6.55

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	6.55	$2,962,055	$452,263

NM-111 Benefit Cost Analysis Assumptions



Number of parcels = 251 (500yr Floodplain)

Average Improvement Value = $90,000 (HCAD Online)

Average sqft (living area) = 2,000 sqft.

Average of Min LiDAR Elevation at properties = 96.41 ft.

Average FFE = 96.91 ft.

BCA flood profile based on average WSEL for cross section Sta 6246 – Sta 1130.

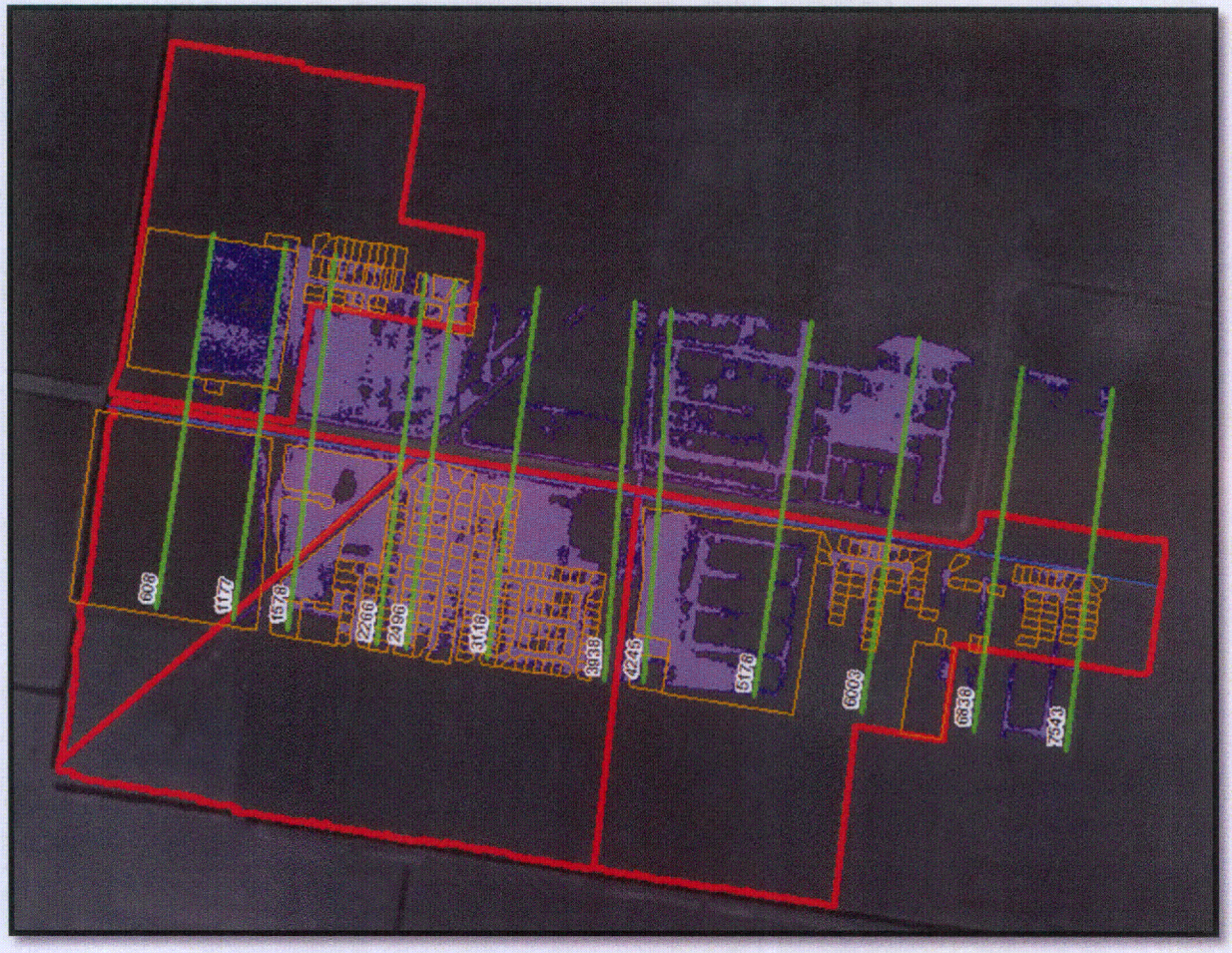
NM111, Edinburg, Texas, , Hidalgo

Structure Type: Building | Historic Building: No | Contact:

Benefits: $387,074 | Costs: $258,228 | BCR: 1.50

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	1.50	$387,074	$258,228

NM-113 Benefit Cost Analysis Assumptions



Number of parcels = 289 (500yr Floodplain)

Average Improvement Value = $120,000 (HCAD Online)

Average sqft (living area) = 2,750 sqft.

Average of Min LiDAR Elevation at properties = 98.93 ft.

Average FFE = 99.93 ft.

BCA flood profile based on average WSEL for <u>all cross sections</u>.

NM113, Edinburg, Texas, , Hidalgo

Structure Type: Building | Historic Building: No | Contact:

Benefits: $1,160,902 | Costs: $143,313 | BCR: 8.10

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	8.10	$1,160,902	$143,313

NM-115 Benefit Cost Analysis Assumptions

Number of parcels = 718 (500yr Floodplain)

Average Improvement Value = $165,000 (HCAD Online)

Average sqft (living area) = 3,000 sqft.

Average of Min LiDAR Elevation at properties = 108.50 ft.

Average FFE = 109.00 ft.

BCA flood profile based on average WSEL for <u>all cross sections</u>.

NM115, Edinburg, Texas, , Hidalgo

Structure Type: Building | Historic Building: No | Contact:

Benefits: $2,033,922 | Costs: $596,720 | BCR: 3.41

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	3.41	$2,033,922	$596,720

NM-116 Benefit Cost Analysis Assumptions

Number of parcels = 117 (500yr Floodplain)

Average Improvement Value = $200,000 (HCAD Online)

Average sqft (living area) = 3,000 sqft.

Average of Min LiDAR Elevation at properties = 105.80 ft.

Average FFE = 106.30 ft.

BCA flood profile based on average WSEL for all cross sections.

NM116, Edinburg, Texas, , Hidalgo

Structure Type: Building | Historic Building: No | Contact:

Benefits: $538,217 | Costs: $134,467 | BCR: 4.00

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	4.00	$538,217	$134,467

ES-100 (Residential) Benefit Cost Analysis Assumptions

Number of parcels = 2039 (500yr Floodplain)

Number of parcels = 5429 (Watershed)

Average Improvement Value = $50,000 (HCAD Online)

Average sqft (living area) = 2,000 sqft.

Average of Min LiDAR Elevation at properties = 91.32 ft.

Average FFE = 91.82 ft.

BCA flood profile based on average WSEL for all cross sections.

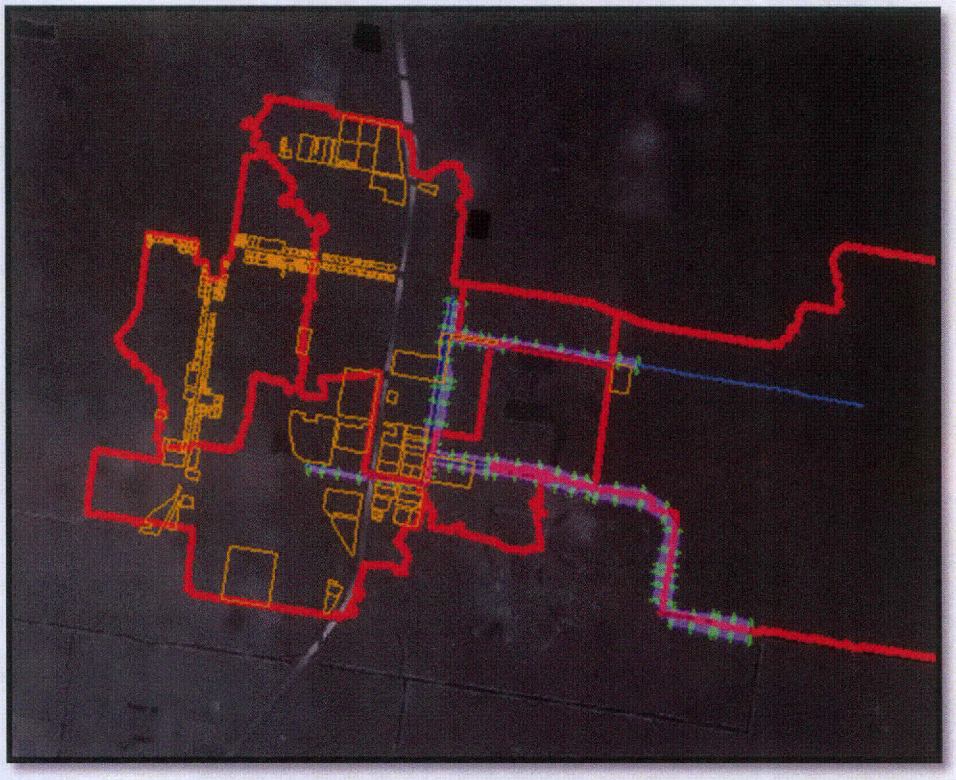
ES100R, Edinburg, Texas, , Hidalgo

Structure Type: Building Historic Building: No Contact:

Benefits: $34,420,582 Costs: $9,401,549 BCR: 3.66

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	3.66	$34,420,582	$9,401,549

ES-100 (Non-Residential/Commercial) Benefit Cost Analysis Assumptions



Number of parcels = 396 (Watershed)

Average Improvement Value = $200,000 (HCAD Online)

Average sqft (living area) = 2,000 sqft.

Average of Min LiDAR Elevation at properties = 94.77 ft.

Average FFE = 94.77 ft.

BCA flood profile based on average WSEL for all cross sections.

ES100NR, Edinburg, Texas, , Hidalgo

Structure Type: Building | Historic Building: No | Contact:

Benefits: $2,814,961 | Costs: $2,743,057 | BCR: 1.03

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	1.03	$2,814,961	$2,743,057

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Project Summary:

Project Number: Disaster #:

Program: Agency:

Analyst:

Point of Contact: Phone Number:

Address:

Email:

Comments:

Structure Summary For:

ES100NR, Edinburg, Texas, , Hidalgo

Structure Type: Building Historic Building: No Contact:

Benefits: $2,814,961 Costs: $2,743,057 BCR: 1.03

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	1.03	$2,814,961	$2,743,057

ES100R, Edinburg, Texas, , Hidalgo

Structure Type: Building Historic Building: No Contact:

Benefits: $34,420,582 Costs: $9,401,549 BCR: 3.66

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	3.66	$34,420,582	$9,401,549

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

NM102, Edinburg, Texas, , Hidalgo

Structure Type: Building Historic Building: No Contact:

Benefits: $2,587,637 Costs: $2,252,940 BCR: 1.15

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	1.15	$2,587,637	$2,252,940

NM103, Edinburg, Texas, , Hidalgo

Structure Type: Building Historic Building: No Contact:

Benefits: $1,888,765 Costs: $714,690 BCR: 2.64

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	2.64	$1,888,765	$714,690

NM105, Edinburg, Texas, , Hidalgo

Structure Type: Building Historic Building: No Contact:

Benefits: $372,305 Costs: $316,053 BCR: 1.18

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	1.18	$372,305	$316,053

NM106, Edinburg, Texas, , Hidalgo

Structure Type: Building Historic Building: No Contact:

Benefits: $1,069,435 Costs: $252,623 BCR: 4.23

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	4.23	$1,069,435	$252,623

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

NM108, Edinburg, Texas, , Hidalgo

Structure Type: Building Historic Building: No Contact:

Benefits: $5,103,509 Costs: $631,950 BCR: 8.08

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	8.08	$5,103,509	$631,950

NM109, Edinburg, Texas, , Hidalgo

Structure Type: Building Historic Building: No Contact:

Benefits: $787,070 Costs: $883,893 BCR: 0.89

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	0.89	$787,070	$883,893

NM110, Edinburg, Texas, , Hidalgo

Structure Type: Building Historic Building: No Contact:

Benefits: $2,962,055 Costs: $452,263 BCR: 6.55

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	6.55	$2,962,055	$452,263

NM111, Edinburg, Texas, , Hidalgo

Structure Type: Building Historic Building: No Contact:

Benefits: $387,074 Costs: $258,228 BCR: 1.50

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	1.50	$387,074	$258,228

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

NM113, Edinburg, Texas, , Hidalgo

Structure Type: Building Historic Building: No Contact:

Benefits: $1,160,902 Costs: $143,313 BCR: 8.10

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	8.10	$1,160,902	$143,313

NM115, Edinburg, Texas, , Hidalgo

Structure Type: Building Historic Building: No Contact:

Benefits: $2,033,922 Costs: $596,720 BCR: 3.41

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	3.41	$2,033,922	$596,720

NM116, Edinburg, Texas, , Hidalgo

Structure Type: Building Historic Building: No Contact:

Benefits: $538,217 Costs: $134,467 BCR: 4.00

Mitigation	Hazard	BCR	Benefits	Costs
Dry Flood Proofing	Flood	4.00	$538,217	$134,467

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Structure and Mitigation Details For: ES100NR, Edinburg, Texas, , Hidalgo

Benefits: $2,814,961 Costs: $2,743,057 BCR: 1.03

Hazard: **Flood**

Mitigation Option: Dry Flood Proofing

Latitude:		Longitude:			
Size of Building:	792,000	BRV ($/sf):	$100.00	Total BRV:	$79,200,000
Residential:	Yes	Building Type:	One-Story		
Obstruction:	N/A	Foundation Type:	Slab	Basement:	No
Building Primary Use:		Structure Type:		Historic Building:	No
Structure Elevation:	94.77	First Floor Being Raised:		Demolition Threshold:	50.00%
Source of Flood Data:		Project in SFHA:	Yes	Community ID Number:	
Effective FIS Date:		FIRM Panel Number:		FIRM Effective Date:	
Project Useful Life:	30	H&H Study Title:		H&H Effective Date:	
Flood Zone:		Loss of Rent:	$0		
Building Contents:	$79,200,000 (Default)			Value of Crawlspace Contents:	$0
Ground Surface Elevation:				Flood Zone Determination:	
Breaking wave height:	0.00			Utilities that are not elevated:	No
Height FFE above grade:	94.77			One Time Displacement Costs:	
NFIP:	No			Displacement Costs:	$77 (Default)
ICC:	No			Current federal lodging per diem:	$77
				Population affected :	0
				Current federal meals per diem:	$46
				Cost per person to eat meals at home:	$7

Street Maintenance Details

Street maintenance budget ($)

Miles of street (miles)

Length of road (miles)

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Total Reduced Street Maintenance Costs $0.00

Volunteer Costs

Number of Volunteers Required: Number of Hours Volunteered/Person:

Cost of Volunteers Time ($/Hour/Person): Number of Days Lodging/Volunteer:

Per-Person Cost of Lodging for a Volunteer: Cost of Volunteers:

Social Benefits

Mental Stress and Anxiety

Number of Person:

Treatment Costs per person: $2,443.00

Total Mental Stress and Anxiety Cost: $0.00

Lost Productivity

Number of Worker:

Productivity Loss per person: $8,736.00

Total Lost Productivity Cost: $0.00

Riverine Elevation and Discharge Data

Streambed Elevation (ft): 84.7 Flood Profile Number:

Flood Source Name:

Elevation At Which Barrier Will Be Overtopped: 94.77

FEMA Elevation Certificate Diagram Description: Other Elevation Source:

Recurrence Interval (yr)	Percent Annual Chance (%)	Elevation Before Mitigation (ft)	Discharge Before Mitigation (cfs)	Elevation After Mitigation (ft)	Discharge After Mitigation (cfs)
10	10.00%	91.50	108.0	90.60	108.0
50	2.00%	94.69	180.0	93.47	180.0
100	1.00%	95.61	192.0	94.31	192.0
500	0.20%	100.10	2,500.0	98.80	2,500.0

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Building	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	2.5%	0.0%	$1,980,000	0.0%	0.0%	$0
0.0	13.4%	0.0%	$10,612,800	13.4%	0.0%	$10,612,800
1.0	23.3%	0.0%	$18,453,600	23.3%	0.0%	$18,453,600
2.0	32.1%	0.0%	$25,423,200	32.1%	0.0%	$25,423,200
3.0	40.1%	0.0%	$31,759,200	40.1%	0.0%	$31,759,200
4.0	47.1%	0.0%	$37,303,200	47.1%	0.0%	$37,303,200
5.0	53.2%	0.0%	$79,200,000	53.2%	0.0%	$79,200,000
6.0	58.6%	0.0%	$79,200,000	58.6%	0.0%	$79,200,000
7.0	63.2%	0.0%	$79,200,000	63.2%	0.0%	$79,200,000
8.0	67.2%	0.0%	$79,200,000	67.2%	0.0%	$79,200,000
9.0	70.5%	0.0%	$79,200,000	70.5%	0.0%	$79,200,000
10.0	73.2%	0.0%	$79,200,000	73.2%	0.0%	$79,200,000
11.0	75.4%	0.0%	$79,200,000	75.4%	0.0%	$79,200,000
12.0	77.2%	0.0%	$79,200,000	77.2%	0.0%	$79,200,000
13.0	78.5%	0.0%	$79,200,000	78.5%	0.0%	$79,200,000
14.0	79.5%	0.0%	$79,200,000	79.5%	0.0%	$79,200,000
15.0	80.2%	0.0%	$79,200,000	80.2%	0.0%	$79,200,000
16.0	80.7%	0.0%	$79,200,000	80.7%	0.0%	$79,200,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Contents	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	2.4%	0.0%	$1,900,800	0.0%	0.0%	$0
0.0	8.1%	0.0%	$6,415,200	8.1%	0.0%	$6,415,200
1.0	13.3%	0.0%	$10,533,600	13.3%	0.0%	$10,533,600
2.0	17.9%	0.0%	$14,176,800	17.9%	0.0%	$14,176,800
3.0	22.0%	0.0%	$17,424,000	22.0%	0.0%	$17,424,000
4.0	25.7%	0.0%	$20,354,400	25.7%	0.0%	$20,354,400
5.0	28.8%	0.0%	$22,809,600	28.8%	0.0%	$22,809,600
6.0	31.5%	0.0%	$24,948,000	31.5%	0.0%	$24,948,000
7.0	33.8%	0.0%	$26,769,600	33.8%	0.0%	$26,769,600
8.0	35.7%	0.0%	$28,274,400	35.7%	0.0%	$28,274,400
9.0	37.2%	0.0%	$29,462,400	37.2%	0.0%	$29,462,400
10.0	38.4%	0.0%	$30,412,800	38.4%	0.0%	$30,412,800
11.0	39.2%	0.0%	$31,046,400	39.2%	0.0%	$31,046,400
12.0	39.7%	0.0%	$31,442,400	39.7%	0.0%	$31,442,400
13.0	40.0%	0.0%	$31,680,000	40.0%	0.0%	$31,680,000
14.0	40.0%	0.0%	$31,680,000	40.0%	0.0%	$31,680,000
15.0	40.0%	0.0%	$31,680,000	40.0%	0.0%	$31,680,000
16.0	40.0%	0.0%	$31,680,000	40.0%	0.0%	$31,680,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Displacement	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (Days)	Before Mitigation User Entered (Days)	Before Mitigation ($)	After Mitigation (Days)	After Mitigation User Entered (Days)	After Mitigation ($)
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$35,640,000	45.0		$35,640,000
2.0	90.0		$79,200,000	90.0		$79,200,000
3.0	135.0		$79,200,000	135.0		$79,200,000
4.0	180.0		$79,200,000	180.0		$79,200,000
5.0	225.0		$79,200,000	225.0		$79,200,000
6.0	270.0		$79,200,000	270.0		$79,200,000
7.0	315.0		$79,200,000	315.0		$79,200,000
8.0	360.0		$79,200,000	360.0		$79,200,000
9.0	405.0		$79,200,000	405.0		$79,200,000
10.0	450.0		$79,200,000	450.0		$79,200,000
11.0	495.0		$79,200,000	495.0		$79,200,000
12.0	540.0		$79,200,000	540.0		$79,200,000
13.0	585.0		$79,200,000	585.0		$79,200,000
14.0	630.0		$79,200,000	630.0		$79,200,000
15.0	675.0		$79,200,000	675.0		$79,200,000
16.0	720.0		$79,200,000	720.0		$79,200,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Loss of Function	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	**Before Mitigation (Days)**	**Before Mitigation User Entered (Days)**	**Before Mitigation ($)**	**After Mitigation (Days)**	**After Mitigation User Entered (Days)**	**After Mitigation ($)**
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$35,640,000	45.0		$35,640,000
2.0	90.0		$79,200,000	90.0		$79,200,000
3.0	135.0		$79,200,000	135.0		$79,200,000
4.0	180.0		$79,200,000	180.0		$79,200,000
5.0	225.0		$79,200,000	225.0		$79,200,000
6.0	270.0		$79,200,000	270.0		$79,200,000
7.0	315.0		$79,200,000	315.0		$79,200,000
8.0	360.0		$79,200,000	360.0		$79,200,000
9.0	405.0		$79,200,000	405.0		$79,200,000
10.0	450.0		$79,200,000	450.0		$79,200,000
11.0	495.0		$79,200,000	495.0		$79,200,000
12.0	540.0		$79,200,000	540.0		$79,200,000
13.0	585.0		$79,200,000	585.0		$79,200,000
14.0	630.0		$79,200,000	630.0		$79,200,000
15.0	675.0		$79,200,000	675.0		$79,200,000
16.0	720.0		$79,200,000	720.0		$79,200,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Other Benefits

Other Benefits Before Mitigation

No Data

Other Benefits After Mitigation

No Data

Summary Of Benefits

Expected Annual Damages Before Mitigation		Expected Annual Damages After Mitigation		Expected Avoided Damages After Mitigation (Benefits)	
Annual:	$744,011	Annual:	$517,163	Annual:	$226,848
Present Value:	$9,232,462	Present Value:	$6,417,501	Present Value:	$2,814,961

Mitigation Benefits: $2,814,961 Mitigation Costs: $2,743,057

Benefits Minus Costs: $71,904 Benefit-Cost Ratio: 1.03

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Cost Estimate

Project Useful Life (years):	30	Construction Type:	
Mitigation Project Cost:	$0	Detailed Scope of Work:	No
Annual Project Maintenance Cost:	$0	Detailed Estimate for Entire Project:	No
Final Mitigation Project Cost:	$2,743,057	Years of Maintenance:	
Cost Basis Year:		Present Worth of Annual Maintenance Costs:	
Construction Start Year:		Estimate Reflects Current Prices:	No
Construction End Year:		Project Escalation:	

No Rows

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Justification/Attachments

Field	Description	Attachments

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Structure and Mitigation Details For: ES100R, Edinburg, Texas, , Hidalgo

Benefits: $34,420,582 Costs: $9,401,549 BCR: 3.66

Hazard: **Flood**

Mitigation Option: Dry Flood Proofing

Latitude:		Longitude:			
Size of Building:	10,858,000	BRV ($/sf):	$30.00	Total BRV:	$325,740,000
Residential:	Yes	Building Type:	One-Story		
Obstruction:	N/A	Foundation Type:	Slab	Basement:	No
Building Primary Use:		Structure Type:		Historic Building:	No
Structure Elevation:	91.82	First Floor Being Raised:		Demolition Threshold:	50.00%
Source of Flood Data:		Project in SFHA:	Yes	Community ID Number:	
Effective FIS Date:		FIRM Panel Number:		FIRM Effective Date:	
Project Useful Life:	30	H&H Study Title:		H&H Effective Date:	
Flood Zone:		Loss of Rent:	$0		
Building Contents:	$325,740,000 (Default)			Value of Crawlspace Contents:	$0
Ground Surface Elevation:				Flood Zone Determination:	
Breaking wave height:	0.00			Utilities that are not elevated:	No
Height FFE above grade:	91.82			One Time Displacement Costs:	
NFIP:	No			Displacement Costs:	$318,161 (Default)
ICC:	No			Current federal lodging per diem:	$77
				Population affected :	8,156
				Current federal meals per diem:	$46
				Cost per person to eat meals at home:	$7

Street Maintenance Details

Street maintenance budget ($)

Miles of street (miles)

Length of road (miles)

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Total Reduced Street Maintenance Costs $0.00

Volunteer Costs

Number of Volunteers Required: Number of Hours Volunteered/Person:

Cost of Volunteers Time ($/Hour/Person): Number of Days Lodging/Volunteer:

Per-Person Cost of Lodging for a Volunteer: Cost of Volunteers:

Social Benefits

Mental Stress and Anxiety

Number of Person:

Treatment Costs per person: $2,443.00

Total Mental Stress and Anxiety Cost: $0.00

Lost Productivity

Number of Worker:

Productivity Loss per person: $8,736.00

Total Lost Productivity Cost: $0.00

Riverine Elevation and Discharge Data

Streambed Elevation (ft): 84.7 Flood Profile Number:

Flood Source Name:

Elevation At Which Barrier Will Be Overtopped: 91.32

FEMA Elevation Certificate Diagram Description: Other Elevation Source:

Recurrence Interval (yr)	Percent Annual Chance (%)	Elevation Before Mitigation (ft)	Discharge Before Mitigation (cfs)	Elevation After Mitigation (ft)	Discharge After Mitigation (cfs)
10	10.00%	91.50	108.0	90.60	108.0
50	2.00%	94.69	180.0	93.47	180.0
100	1.00%	95.61	192.0	94.31	192.0
500	0.20%	100.10	2,500.0	98.80	2,500.0

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Building	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	2.5%	0.0%	$8,143,500	0.0%	0.0%	$0
0.0	13.4%	0.0%	$43,649,160	13.4%	0.0%	$43,649,160
1.0	23.3%	0.0%	$75,897,420	23.3%	0.0%	$75,897,420
2.0	32.1%	0.0%	$104,562,540	32.1%	0.0%	$104,562,540
3.0	40.1%	0.0%	$130,621,740	40.1%	0.0%	$130,621,740
4.0	47.1%	0.0%	$153,423,540	47.1%	0.0%	$153,423,540
5.0	53.2%	0.0%	$325,740,000	53.2%	0.0%	$325,740,000
6.0	58.6%	0.0%	$325,740,000	58.6%	0.0%	$325,740,000
7.0	63.2%	0.0%	$325,740,000	63.2%	0.0%	$325,740,000
8.0	67.2%	0.0%	$325,740,000	67.2%	0.0%	$325,740,000
9.0	70.5%	0.0%	$325,740,000	70.5%	0.0%	$325,740,000
10.0	73.2%	0.0%	$325,740,000	73.2%	0.0%	$325,740,000
11.0	75.4%	0.0%	$325,740,000	75.4%	0.0%	$325,740,000
12.0	77.2%	0.0%	$325,740,000	77.2%	0.0%	$325,740,000
13.0	78.5%	0.0%	$325,740,000	78.5%	0.0%	$325,740,000
14.0	79.5%	0.0%	$325,740,000	79.5%	0.0%	$325,740,000
15.0	80.2%	0.0%	$325,740,000	80.2%	0.0%	$325,740,000
16.0	80.7%	0.0%	$325,740,000	80.7%	0.0%	$325,740,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Contents	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	2.4%	0.0%	$7,817,760	0.0%	0.0%	$0
0.0	8.1%	0.0%	$26,384,940	8.1%	0.0%	$26,384,940
1.0	13.3%	0.0%	$43,323,420	13.3%	0.0%	$43,323,420
2.0	17.9%	0.0%	$58,307,460	17.9%	0.0%	$58,307,460
3.0	22.0%	0.0%	$71,662,800	22.0%	0.0%	$71,662,800
4.0	25.7%	0.0%	$83,715,180	25.7%	0.0%	$83,715,180
5.0	28.8%	0.0%	$93,813,120	28.8%	0.0%	$93,813,120
6.0	31.5%	0.0%	$102,608,100	31.5%	0.0%	$102,608,100
7.0	33.8%	0.0%	$110,100,120	33.8%	0.0%	$110,100,120
8.0	35.7%	0.0%	$116,289,180	35.7%	0.0%	$116,289,180
9.0	37.2%	0.0%	$121,175,280	37.2%	0.0%	$121,175,280
10.0	38.4%	0.0%	$125,084,160	38.4%	0.0%	$125,084,160
11.0	39.2%	0.0%	$127,690,080	39.2%	0.0%	$127,690,080
12.0	39.7%	0.0%	$129,318,780	39.7%	0.0%	$129,318,780
13.0	40.0%	0.0%	$130,296,000	40.0%	0.0%	$130,296,000
14.0	40.0%	0.0%	$130,296,000	40.0%	0.0%	$130,296,000
15.0	40.0%	0.0%	$130,296,000	40.0%	0.0%	$130,296,000
16.0	40.0%	0.0%	$130,296,000	40.0%	0.0%	$130,296,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Displacement	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (Days)	Before Mitigation User Entered (Days)	Before Mitigation ($)	After Mitigation (Days)	After Mitigation User Entered (Days)	After Mitigation ($)
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$146,583,000	45.0		$146,583,000
2.0	90.0		$325,740,000	90.0		$325,740,000
3.0	135.0		$325,740,000	135.0		$325,740,000
4.0	180.0		$325,740,000	180.0		$325,740,000
5.0	225.0		$325,740,000	225.0		$325,740,000
6.0	270.0		$325,740,000	270.0		$325,740,000
7.0	315.0		$325,740,000	315.0		$325,740,000
8.0	360.0		$325,740,000	360.0		$325,740,000
9.0	405.0		$325,740,000	405.0		$325,740,000
10.0	450.0		$325,740,000	450.0		$325,740,000
11.0	495.0		$325,740,000	495.0		$325,740,000
12.0	540.0		$325,740,000	540.0		$325,740,000
13.0	585.0		$325,740,000	585.0		$325,740,000
14.0	630.0		$325,740,000	630.0		$325,740,000
15.0	675.0		$325,740,000	675.0		$325,740,000
16.0	720.0		$325,740,000	720.0		$325,740,000

Depth-Damage Functions Using USACE Generic

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Loss of Function	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (Days)	Before Mitigation User Entered (Days)	Before Mitigation ($)	After Mitigation (Days)	After Mitigation User Entered (Days)	After Mitigation ($)
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$146,583,000	45.0		$146,583,000
2.0	90.0		$325,740,000	90.0		$325,740,000
3.0	135.0		$325,740,000	135.0		$325,740,000
4.0	180.0		$325,740,000	180.0		$325,740,000
5.0	225.0		$325,740,000	225.0		$325,740,000
6.0	270.0		$325,740,000	270.0		$325,740,000
7.0	315.0		$325,740,000	315.0		$325,740,000
8.0	360.0		$325,740,000	360.0		$325,740,000
9.0	405.0		$325,740,000	405.0		$325,740,000
10.0	450.0		$325,740,000	450.0		$325,740,000
11.0	495.0		$325,740,000	495.0		$325,740,000
12.0	540.0		$325,740,000	540.0		$325,740,000
13.0	585.0		$325,740,000	585.0		$325,740,000
14.0	630.0		$325,740,000	630.0		$325,740,000
15.0	675.0		$325,740,000	675.0		$325,740,000
16.0	720.0		$325,740,000	720.0		$325,740,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Other Benefits

Other Benefits Before Mitigation

No Data

Other Benefits After Mitigation

No Data

Summary Of Benefits

Expected Annual Damages Before Mitigation		Expected Annual Damages After Mitigation		Expected Avoided Damages After Mitigation (Benefits)	
Annual:	$7,727,224	Annual:	$4,953,393	Annual:	$2,773,831
Present Value:	$95,887,442	Present Value:	$61,466,860	Present Value:	$34,420,582

Mitigation Benefits: $34,420,582 Mitigation Costs: $9,401,549

Benefits Minus Costs: $25,019,033 Benefit-Cost Ratio: 3.66

Total Benefits:	**$56,126,434**	Total Costs:	**$18,781,746**	BCR:	**2.99**
Project Number:		Disaster #:		Program:	
Agency:		State:		Point of Contact:	
Analyst:					

Cost Estimate

Project Useful Life (years):	30	Construction Type:	
Mitigation Project Cost:	$0	Detailed Scope of Work:	No
Annual Project Maintenance Cost:	$0	Detailed Estimate for Entire Project:	No
Final Mitigation Project Cost:	$9,401,549	Years of Maintenance:	
Cost Basis Year:		Present Worth of Annual Maintenance Costs:	
Construction Start Year:		Estimate Reflects Current Prices:	No
Construction End Year:		Project Escalation:	

No Rows

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Justification/Attachments

Field	Description	Attachments

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Structure and Mitigation Details For: NM102, Edinburg, Texas, , Hidalgo

Benefits: $2,587,637 Costs: $2,252,940 BCR: 1.15

Hazard: **Flood**

Mitigation Option: Dry Flood Proofing

Latitude:		Longitude:			
Size of Building:	209,000	BRV ($/sf):	$46.30	Total BRV:	$9,676,700
Residential:	Yes	Building Type:	One-Story		
Obstruction:	N/A	Foundation Type:	Slab	Basement:	No
Building Primary Use:		Structure Type:		Historic Building:	No
Structure Elevation:	85.72	First Floor Being Raised:		Demolition Threshold:	50.00%
Source of Flood Data:		Project in SFHA:	Yes	Community ID Number:	
Effective FIS Date:		FIRM Panel Number:		FIRM Effective Date:	
Project Useful Life:	30	H&H Study Title:		H&H Effective Date:	
Flood Zone:		Loss of Rent:	$0		
Building Contents:	$9,676,700 (Default)			Value of Crawlspace Contents:	$0
Ground Surface Elevation:				Flood Zone Determination:	
Breaking wave height:	0.00			Utilities that are not elevated:	No
Height FFE above grade:	85.72			One Time Displacement Costs:	
NFIP:	No			Displacement Costs:	$32,681 (Default)
ICC:	No			Current federal lodging per diem:	$77
				Population affected :	836
				Current federal meals per diem:	$46
				Cost per person to eat meals at home:	$7

Street Maintenance Details

Street maintenance budget ($)

Miles of street (miles)

Length of road (miles)

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Total Reduced Street Maintenance Costs $0.00

Volunteer Costs

Number of Volunteers Required: Number of Hours Volunteered/Person:

Cost of Volunteers Time ($/Hour/Person): Number of Days Lodging/Volunteer:

Per-Person Cost of Lodging for a Volunteer: Cost of Volunteers:

Social Benefits

Mental Stress and Anxiety

Number of Person:

Treatment Costs per person: $2,443.00

Total Mental Stress and Anxiety Cost: $0.00

Lost Productivity

Number of Worker:

Productivity Loss per person: $8,736.00

Total Lost Productivity Cost: $0.00

Riverine Elevation and Discharge Data

Streambed Elevation (ft): 79.1 Flood Profile Number:

Flood Source Name:

Elevation At Which Barrier Will Be Overtopped: 85.22

FEMA Elevation Certificate Diagram Description: Other Elevation Source:

Recurrence Interval (yr)	Percent Annual Chance (%)	Elevation Before Mitigation (ft)	Discharge Before Mitigation (cfs)	Elevation After Mitigation (ft)	Discharge After Mitigation (cfs)
10	10.00%	84.75	98.0	82.48	98.0
50	2.00%	86.17	165.0	84.01	165.0
100	1.00%	86.64	203.0	84.56	203.0
500	0.20%	87.68	324.0	85.57	324.0

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Building	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	2.5%	0.0%	$241,918	0.0%	0.0%	$0
0.0	13.4%	0.0%	$1,296,678	13.4%	0.0%	$1,296,678
1.0	23.3%	0.0%	$2,254,671	23.3%	0.0%	$2,254,671
2.0	32.1%	0.0%	$3,106,221	32.1%	0.0%	$3,106,221
3.0	40.1%	0.0%	$3,880,357	40.1%	0.0%	$3,880,357
4.0	47.1%	0.0%	$4,557,726	47.1%	0.0%	$4,557,726
5.0	53.2%	0.0%	$9,676,700	53.2%	0.0%	$9,676,700
6.0	58.6%	0.0%	$9,676,700	58.6%	0.0%	$9,676,700
7.0	63.2%	0.0%	$9,676,700	63.2%	0.0%	$9,676,700
8.0	67.2%	0.0%	$9,676,700	67.2%	0.0%	$9,676,700
9.0	70.5%	0.0%	$9,676,700	70.5%	0.0%	$9,676,700
10.0	73.2%	0.0%	$9,676,700	73.2%	0.0%	$9,676,700
11.0	75.4%	0.0%	$9,676,700	75.4%	0.0%	$9,676,700
12.0	77.2%	0.0%	$9,676,700	77.2%	0.0%	$9,676,700
13.0	78.5%	0.0%	$9,676,700	78.5%	0.0%	$9,676,700
14.0	79.5%	0.0%	$9,676,700	79.5%	0.0%	$9,676,700
15.0	80.2%	0.0%	$9,676,700	80.2%	0.0%	$9,676,700
16.0	80.7%	0.0%	$9,676,700	80.7%	0.0%	$9,676,700

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Contents	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	**Before Mitigation (pct)**	**Before Mitigation User Entered (pct)**	**Before Mitigation ($)**	**After Mitigation (pct)**	**After Mitigation User Entered (pct)**	**After Mitigation ($)**
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	2.4%	0.0%	$232,241	0.0%	0.0%	$0
0.0	8.1%	0.0%	$783,813	8.1%	0.0%	$783,813
1.0	13.3%	0.0%	$1,287,001	13.3%	0.0%	$1,287,001
2.0	17.9%	0.0%	$1,732,129	17.9%	0.0%	$1,732,129
3.0	22.0%	0.0%	$2,128,874	22.0%	0.0%	$2,128,874
4.0	25.7%	0.0%	$2,486,912	25.7%	0.0%	$2,486,912
5.0	28.8%	0.0%	$2,786,890	28.8%	0.0%	$2,786,890
6.0	31.5%	0.0%	$3,048,161	31.5%	0.0%	$3,048,161
7.0	33.8%	0.0%	$3,270,725	33.8%	0.0%	$3,270,725
8.0	35.7%	0.0%	$3,454,582	35.7%	0.0%	$3,454,582
9.0	37.2%	0.0%	$3,599,732	37.2%	0.0%	$3,599,732
10.0	38.4%	0.0%	$3,715,853	38.4%	0.0%	$3,715,853
11.0	39.2%	0.0%	$3,793,266	39.2%	0.0%	$3,793,266
12.0	39.7%	0.0%	$3,841,650	39.7%	0.0%	$3,841,650
13.0	40.0%	0.0%	$3,870,680	40.0%	0.0%	$3,870,680
14.0	40.0%	0.0%	$3,870,680	40.0%	0.0%	$3,870,680
15.0	40.0%	0.0%	$3,870,680	40.0%	0.0%	$3,870,680
16.0	40.0%	0.0%	$3,870,680	40.0%	0.0%	$3,870,680

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Displacement	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (Days)	Before Mitigation User Entered (Days)	Before Mitigation ($)	After Mitigation (Days)	After Mitigation User Entered (Days)	After Mitigation ($)
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$4,354,515	45.0		$4,354,515
2.0	90.0		$9,676,700	90.0		$9,676,700
3.0	135.0		$9,676,700	135.0		$9,676,700
4.0	180.0		$9,676,700	180.0		$9,676,700
5.0	225.0		$9,676,700	225.0		$9,676,700
6.0	270.0		$9,676,700	270.0		$9,676,700
7.0	315.0		$9,676,700	315.0		$9,676,700
8.0	360.0		$9,676,700	360.0		$9,676,700
9.0	405.0		$9,676,700	405.0		$9,676,700
10.0	450.0		$9,676,700	450.0		$9,676,700
11.0	495.0		$9,676,700	495.0		$9,676,700
12.0	540.0		$9,676,700	540.0		$9,676,700
13.0	585.0		$9,676,700	585.0		$9,676,700
14.0	630.0		$9,676,700	630.0		$9,676,700
15.0	675.0		$9,676,700	675.0		$9,676,700
16.0	720.0		$9,676,700	720.0		$9,676,700

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Loss of Function	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	**Before Mitigation (Days)**	**Before Mitigation User Entered (Days)**	**Before Mitigation ($)**	**After Mitigation (Days)**	**After Mitigation User Entered (Days)**	**After Mitigation ($)**
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$4,354,515	45.0		$4,354,515
2.0	90.0		$9,676,700	90.0		$9,676,700
3.0	135.0		$9,676,700	135.0		$9,676,700
4.0	180.0		$9,676,700	180.0		$9,676,700
5.0	225.0		$9,676,700	225.0		$9,676,700
6.0	270.0		$9,676,700	270.0		$9,676,700
7.0	315.0		$9,676,700	315.0		$9,676,700
8.0	360.0		$9,676,700	360.0		$9,676,700
9.0	405.0		$9,676,700	405.0		$9,676,700
10.0	450.0		$9,676,700	450.0		$9,676,700
11.0	495.0		$9,676,700	495.0		$9,676,700
12.0	540.0		$9,676,700	540.0		$9,676,700
13.0	585.0		$9,676,700	585.0		$9,676,700
14.0	630.0		$9,676,700	630.0		$9,676,700
15.0	675.0		$9,676,700	675.0		$9,676,700
16.0	720.0		$9,676,700	720.0		$9,676,700

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Other Benefits

Other Benefits Before Mitigation

No Data

Other Benefits After Mitigation

No Data

Summary Of Benefits

Expected Annual Damages Before Mitigation		Expected Annual Damages After Mitigation		Expected Avoided Damages After Mitigation (Benefits)	
Annual:	$243,401	Annual:	$34,872	Annual:	$208,529
Present Value:	$3,020,368	Present Value:	$432,731	Present Value:	$2,587,637

Mitigation Benefits: $2,587,637 Mitigation Costs: $2,252,940

Benefits Minus Costs: $334,697 Benefit-Cost Ratio: 1.15

Total Benefits:	**$56,126,434**	Total Costs:	**$18,781,746**	BCR:	**2.99**
Project Number:		Disaster #:		Program:	
State:		Point of Contact:		Agency:	
				Analyst:	

Cost Estimate

Project Useful Life (years):	30	Construction Type:	
Mitigation Project Cost:	$0	Detailed Scope of Work:	No
Annual Project Maintenance Cost:	$0	Detailed Estimate for Entire Project:	No
Final Mitigation Project Cost:	$2,252,940	Years of Maintenance:	
Cost Basis Year:		Present Worth of Annual Maintenance Costs:	
Construction Start Year:		Estimate Reflects Current Prices:	No
Construction End Year:		Project Escalation:	

No Rows

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Justification/Attachments

Field	Description	Attachments
First Floor Elevation	LiDAR Elevation	

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Structure and Mitigation Details For: NM103, Edinburg, Texas, , Hidalgo

Benefits: $1,888,765 Costs: $714,690 BCR: 2.64

Hazard: **Flood**

Mitigation Option: Dry Flood Proofing

Latitude:		Longitude:			
Size of Building:	480,000	BRV ($/sf):	$63.59	Total BRV:	$30,523,200
Residential:	Yes	Building Type:	Two or More Stories		
Obstruction:	N/A	Foundation Type:	Slab	Basement:	No
Building Primary Use:		Structure Type:		Historic Building:	No
Structure Elevation:	91.60	First Floor Being Raised:		Demolition Threshold:	50.00%
Source of Flood Data:		Project in SFHA:	Yes	Community ID Number:	
Effective FIS Date:		FIRM Panel Number:		FIRM Effective Date:	
Project Useful Life:	30	H&H Study Title:		H&H Effective Date:	
Flood Zone:		Loss of Rent:	$0		
Building Contents:	$30,523,200 (Default)			Value of Crawlspace Contents:	$0
Ground Surface Elevation:				Flood Zone Determination:	
Breaking wave height:	0.00			Utilities that are not elevated:	No
Height FFE above grade:	91.60			One Time Displacement Costs:	
NFIP:	No			Displacement Costs:	$49,997 (Default)
ICC:	No			Current federal lodging per diem:	$77
				Population affected :	1,280
				Current federal meals per diem:	$46
				Cost per person to eat meals at home:	$7

Street Maintenance Details

Street maintenance budget ($)

Miles of street (miles)

Length of road (miles)

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Total Reduced Street Maintenance Costs $0.00

Volunteer Costs

Number of Volunteers Required: Number of Hours Volunteered/Person:

Cost of Volunteers Time ($/Hour/Person): Number of Days Lodging/Volunteer:

Per-Person Cost of Lodging for a Volunteer: Cost of Volunteers:

Social Benefits

Mental Stress and Anxiety

Number of Person:

Treatment Costs per person: $2,443.00

Total Mental Stress and Anxiety Cost: $0.00

Lost Productivity

Number of Worker:

Productivity Loss per person: $8,736.00

Total Lost Productivity Cost: $0.00

Riverine Elevation and Discharge Data

Streambed Elevation (ft): 81.9 Flood Profile Number:

Flood Source Name:

Elevation At Which Barrier Will Be Overtopped: 91.10

FEMA Elevation Certificate Diagram Description: Other Elevation Source:

Recurrence Interval (yr)	Percent Annual Chance (%)	Elevation Before Mitigation (ft)	Discharge Before Mitigation (cfs)	Elevation After Mitigation (ft)	Discharge After Mitigation (cfs)
10	10.00%	89.76	97.0	85.26	97.0
50	2.00%	90.93	163.0	86.96	163.0
100	1.00%	91.22	201.0	88.03	201.0
500	0.20%	91.80	320.0	91.01	320.0

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Building	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	3.0%	0.0%	$915,696	0.0%	0.0%	$0
0.0	9.3%	0.0%	$2,838,658	9.3%	0.0%	$2,838,658
1.0	15.2%	0.0%	$4,639,526	15.2%	0.0%	$4,639,526
2.0	20.9%	0.0%	$6,379,349	20.9%	0.0%	$6,379,349
3.0	26.3%	0.0%	$8,027,602	26.3%	0.0%	$8,027,602
4.0	31.4%	0.0%	$9,584,285	31.4%	0.0%	$9,584,285
5.0	36.2%	0.0%	$11,049,398	36.2%	0.0%	$11,049,398
6.0	40.7%	0.0%	$12,422,942	40.7%	0.0%	$12,422,942
7.0	44.9%	0.0%	$13,704,917	44.9%	0.0%	$13,704,917
8.0	48.8%	0.0%	$14,895,322	48.8%	0.0%	$14,895,322
9.0	52.4%	0.0%	$30,523,200	52.4%	0.0%	$30,523,200
10.0	55.7%	0.0%	$30,523,200	55.7%	0.0%	$30,523,200
11.0	58.7%	0.0%	$30,523,200	58.7%	0.0%	$30,523,200
12.0	61.4%	0.0%	$30,523,200	61.4%	0.0%	$30,523,200
13.0	63.8%	0.0%	$30,523,200	63.8%	0.0%	$30,523,200
14.0	65.9%	0.0%	$30,523,200	65.9%	0.0%	$30,523,200
15.0	67.7%	0.0%	$30,523,200	67.7%	0.0%	$30,523,200
16.0	69.2%	0.0%	$30,523,200	69.2%	0.0%	$30,523,200

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Contents	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	**Before Mitigation (pct)**	**Before Mitigation User Entered (pct)**	**Before Mitigation ($)**	**After Mitigation (pct)**	**After Mitigation User Entered (pct)**	**After Mitigation ($)**
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	1.0%	0.0%	$305,232	0.0%	0.0%	$0
0.0	5.0%	0.0%	$1,526,160	5.0%	0.0%	$1,526,160
1.0	8.7%	0.0%	$2,655,518	8.7%	0.0%	$2,655,518
2.0	12.2%	0.0%	$3,723,830	12.2%	0.0%	$3,723,830
3.0	15.5%	0.0%	$4,731,096	15.5%	0.0%	$4,731,096
4.0	18.5%	0.0%	$5,646,792	18.5%	0.0%	$5,646,792
5.0	21.3%	0.0%	$6,501,442	21.3%	0.0%	$6,501,442
6.0	23.9%	0.0%	$7,295,045	23.9%	0.0%	$7,295,045
7.0	26.3%	0.0%	$8,027,602	26.3%	0.0%	$8,027,602
8.0	28.4%	0.0%	$8,668,589	28.4%	0.0%	$8,668,589
9.0	30.3%	0.0%	$9,248,530	30.3%	0.0%	$9,248,530
10.0	32.0%	0.0%	$9,767,424	32.0%	0.0%	$9,767,424
11.0	33.4%	0.0%	$10,194,749	33.4%	0.0%	$10,194,749
12.0	34.7%	0.0%	$10,591,550	34.7%	0.0%	$10,591,550
13.0	35.6%	0.0%	$10,866,259	35.6%	0.0%	$10,866,259
14.0	36.4%	0.0%	$11,110,445	36.4%	0.0%	$11,110,445
15.0	36.9%	0.0%	$11,263,061	36.9%	0.0%	$11,263,061
16.0	37.2%	0.0%	$11,354,630	37.2%	0.0%	$11,354,630

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Displacement	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (Days)	Before Mitigation User Entered (Days)	Before Mitigation ($)	After Mitigation (Days)	After Mitigation User Entered (Days)	After Mitigation ($)
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$13,735,440	45.0		$13,735,440
2.0	90.0		$30,523,200	90.0		$30,523,200
3.0	135.0		$30,523,200	135.0		$30,523,200
4.0	180.0		$30,523,200	180.0		$30,523,200
5.0	225.0		$30,523,200	225.0		$30,523,200
6.0	270.0		$30,523,200	270.0		$30,523,200
7.0	315.0		$30,523,200	315.0		$30,523,200
8.0	360.0		$30,523,200	360.0		$30,523,200
9.0	405.0		$30,523,200	405.0		$30,523,200
10.0	450.0		$30,523,200	450.0		$30,523,200
11.0	495.0		$30,523,200	495.0		$30,523,200
12.0	540.0		$30,523,200	540.0		$30,523,200
13.0	585.0		$30,523,200	585.0		$30,523,200
14.0	630.0		$30,523,200	630.0		$30,523,200
15.0	675.0		$30,523,200	675.0		$30,523,200
16.0	720.0		$30,523,200	720.0		$30,523,200

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Loss of Function	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (Days)	Before Mitigation User Entered (Days)	Before Mitigation ($)	After Mitigation (Days)	After Mitigation User Entered (Days)	After Mitigation ($)
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$13,735,440	45.0		$13,735,440
2.0	90.0		$30,523,200	90.0		$30,523,200
3.0	135.0		$30,523,200	135.0		$30,523,200
4.0	180.0		$30,523,200	180.0		$30,523,200
5.0	225.0		$30,523,200	225.0		$30,523,200
6.0	270.0		$30,523,200	270.0		$30,523,200
7.0	315.0		$30,523,200	315.0		$30,523,200
8.0	360.0		$30,523,200	360.0		$30,523,200
9.0	405.0		$30,523,200	405.0		$30,523,200
10.0	450.0		$30,523,200	450.0		$30,523,200
11.0	495.0		$30,523,200	495.0		$30,523,200
12.0	540.0		$30,523,200	540.0		$30,523,200
13.0	585.0		$30,523,200	585.0		$30,523,200
14.0	630.0		$30,523,200	630.0		$30,523,200
15.0	675.0		$30,523,200	675.0		$30,523,200
16.0	720.0		$30,523,200	720.0		$30,523,200

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Other Benefits

Other Benefits Before Mitigation

No Data

Other Benefits After Mitigation

No Data

Summary Of Benefits

Expected Annual Damages Before Mitigation		Expected Annual Damages After Mitigation		Expected Avoided Damages After Mitigation (Benefits)	
Annual:	$219,246	Annual:	$67,037	Annual:	$152,209
Present Value:	$2,720,628	Present Value:	$831,863	Present Value:	$1,888,765

Mitigation Benefits: $1,888,765 Mitigation Costs: $714,690

Benefits Minus Costs: $1,174,075 Benefit-Cost Ratio: 2.64

Total Benefits:	**$56,126,434**	Total Costs:	**$18,781,746**	BCR:	**2.99**
Project Number:		Disaster #:		Program:	
Agency:		State:		Point of Contact:	
Analyst:					

Cost Estimate

Project Useful Life (years):	30	Construction Type:	
Mitigation Project Cost:	$0	Detailed Scope of Work:	No
Annual Project Maintenance Cost:	$0	Detailed Estimate for Entire Project:	No
Final Mitigation Project Cost:	$714,690	Years of Maintenance:	
Cost Basis Year:		Present Worth of Annual Maintenance Costs:	
Construction Start Year:		Estimate Reflects Current Prices:	No
Construction End Year:		Project Escalation:	

No Rows

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Justification/Attachments

Field	Description	Attachments

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Structure and Mitigation Details For: NM105, Edinburg, Texas, , Hidalgo

Benefits: $372,305 Costs: $316,053 BCR: 1.18

Hazard: **Flood**

Mitigation Option: Dry Flood Proofing

Latitude:		Longitude:			
Size of Building:	18,000	BRV ($/sf):	$35.00	Total BRV:	$630,000
Residential:	Yes	Building Type:	One-Story		
Obstruction:	N/A	Foundation Type:	Slab	Basement:	No
Building Primary Use:		Structure Type:		Historic Building:	No
Structure Elevation:	91.19	First Floor Being Raised:		Demolition Threshold:	50.00%
Source of Flood Data:		Project in SFHA:	Yes	Community ID Number:	
Effective FIS Date:		FIRM Panel Number:		FIRM Effective Date:	
Project Useful Life:	30	H&H Study Title:		H&H Effective Date:	
Flood Zone:		Loss of Rent:	$0		
Building Contents:	$630,000 (Default)			Value of Crawlspace Contents:	$0
Ground Surface Elevation:				Flood Zone Determination:	
Breaking wave height:	0.00			Utilities that are not elevated:	No
Height FFE above grade:	91.19			One Time Displacement Costs:	
NFIP:	No			Displacement Costs:	$1,013 (Default)
ICC:	No			Current federal lodging per diem:	$77
				Population affected :	24
				Current federal meals per diem:	$46
				Cost per person to eat meals at home:	$7

Street Maintenance Details

Street maintenance budget ($)

Miles of street (miles)

Length of road (miles)

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Total Reduced Street Maintenance Costs $0.00

Volunteer Costs

Number of Volunteers Required: Number of Hours Volunteered/Person:

Cost of Volunteers Time ($/Hour/Person): Number of Days Lodging/Volunteer:

Per-Person Cost of Lodging for a Volunteer: Cost of Volunteers:

Social Benefits

Mental Stress and Anxiety

Number of Person:

Treatment Costs per person: $2,443.00

Total Mental Stress and Anxiety Cost: $0.00

Lost Productivity

Number of Worker:

Productivity Loss per person: $8,736.00

Total Lost Productivity Cost: $0.00

Riverine Elevation and Discharge Data

Streambed Elevation (ft): 83.8 Flood Profile Number:

Flood Source Name:

Elevation At Which Barrier Will Be Overtopped: 91.19

FEMA Elevation Certificate Diagram Description: Other Elevation Source:

Recurrence Interval (yr)	Percent Annual Chance (%)	Elevation Before Mitigation (ft)	Discharge Before Mitigation (cfs)	Elevation After Mitigation (ft)	Discharge After Mitigation (cfs)
10	10.00%	90.62	62.0	88.12	62.0
50	2.00%	92.83	104.0	89.59	104.0
100	1.00%	93.12	128.0	90.41	128.0
500	0.20%	93.39	204.0	92.72	204.0

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Building	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	2.5%	0.0%	$15,750	0.0%	0.0%	$0
0.0	13.4%	0.0%	$84,420	13.4%	0.0%	$84,420
1.0	23.3%	0.0%	$146,790	23.3%	0.0%	$146,790
2.0	32.1%	0.0%	$202,230	32.1%	0.0%	$202,230
3.0	40.1%	0.0%	$252,630	40.1%	0.0%	$252,630
4.0	47.1%	0.0%	$296,730	47.1%	0.0%	$296,730
5.0	53.2%	0.0%	$630,000	53.2%	0.0%	$630,000
6.0	58.6%	0.0%	$630,000	58.6%	0.0%	$630,000
7.0	63.2%	0.0%	$630,000	63.2%	0.0%	$630,000
8.0	67.2%	0.0%	$630,000	67.2%	0.0%	$630,000
9.0	70.5%	0.0%	$630,000	70.5%	0.0%	$630,000
10.0	73.2%	0.0%	$630,000	73.2%	0.0%	$630,000
11.0	75.4%	0.0%	$630,000	75.4%	0.0%	$630,000
12.0	77.2%	0.0%	$630,000	77.2%	0.0%	$630,000
13.0	78.5%	0.0%	$630,000	78.5%	0.0%	$630,000
14.0	79.5%	0.0%	$630,000	79.5%	0.0%	$630,000
15.0	80.2%	0.0%	$630,000	80.2%	0.0%	$630,000
16.0	80.7%	0.0%	$630,000	80.7%	0.0%	$630,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Contents	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	2.4%	0.0%	$15,120	0.0%	0.0%	$0
0.0	8.1%	0.0%	$51,030	8.1%	0.0%	$51,030
1.0	13.3%	0.0%	$83,790	13.3%	0.0%	$83,790
2.0	17.9%	0.0%	$112,770	17.9%	0.0%	$112,770
3.0	22.0%	0.0%	$138,600	22.0%	0.0%	$138,600
4.0	25.7%	0.0%	$161,910	25.7%	0.0%	$161,910
5.0	28.8%	0.0%	$181,440	28.8%	0.0%	$181,440
6.0	31.5%	0.0%	$198,450	31.5%	0.0%	$198,450
7.0	33.8%	0.0%	$212,940	33.8%	0.0%	$212,940
8.0	35.7%	0.0%	$224,910	35.7%	0.0%	$224,910
9.0	37.2%	0.0%	$234,360	37.2%	0.0%	$234,360
10.0	38.4%	0.0%	$241,920	38.4%	0.0%	$241,920
11.0	39.2%	0.0%	$246,960	39.2%	0.0%	$246,960
12.0	39.7%	0.0%	$250,110	39.7%	0.0%	$250,110
13.0	40.0%	0.0%	$252,000	40.0%	0.0%	$252,000
14.0	40.0%	0.0%	$252,000	40.0%	0.0%	$252,000
15.0	40.0%	0.0%	$252,000	40.0%	0.0%	$252,000
16.0	40.0%	0.0%	$252,000	40.0%	0.0%	$252,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Displacement	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (Days)	Before Mitigation User Entered (Days)	Before Mitigation ($)	After Mitigation (Days)	After Mitigation User Entered (Days)	After Mitigation ($)
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$283,500	45.0		$283,500
2.0	90.0		$630,000	90.0		$630,000
3.0	135.0		$630,000	135.0		$630,000
4.0	180.0		$630,000	180.0		$630,000
5.0	225.0		$630,000	225.0		$630,000
6.0	270.0		$630,000	270.0		$630,000
7.0	315.0		$630,000	315.0		$630,000
8.0	360.0		$630,000	360.0		$630,000
9.0	405.0		$630,000	405.0		$630,000
10.0	450.0		$630,000	450.0		$630,000
11.0	495.0		$630,000	495.0		$630,000
12.0	540.0		$630,000	540.0		$630,000
13.0	585.0		$630,000	585.0		$630,000
14.0	630.0		$630,000	630.0		$630,000
15.0	675.0		$630,000	675.0		$630,000
16.0	720.0		$630,000	720.0		$630,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst

Depth-Damage Functions Using USACE Generic

Loss of Function	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (Days)	Before Mitigation User Entered (Days)	Before Mitigation ($)	After Mitigation (Days)	After Mitigation User Entered (Days)	After Mitigation ($)
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$283,500	45.0		$283,500
2.0	90.0		$630,000	90.0		$630,000
3.0	135.0		$630,000	135.0		$630,000
4.0	180.0		$630,000	180.0		$630,000
5.0	225.0		$630,000	225.0		$630,000
6.0	270.0		$630,000	270.0		$630,000
7.0	315.0		$630,000	315.0		$630,000
8.0	360.0		$630,000	360.0		$630,000
9.0	405.0		$630,000	405.0		$630,000
10.0	450.0		$630,000	450.0		$630,000
11.0	495.0		$630,000	495.0		$630,000
12.0	540.0		$630,000	540.0		$630,000
13.0	585.0		$630,000	585.0		$630,000
14.0	630.0		$630,000	630.0		$630,000
15.0	675.0		$630,000	675.0		$630,000
16.0	720.0		$630,000	720.0		$630,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Other Benefits

Other Benefits Before Mitigation

No Data

Other Benefits After Mitigation

No Data

Summary Of Benefits

Expected Annual Damages Before Mitigation		Expected Annual Damages After Mitigation		Expected Avoided Damages After Mitigation (Benefits)	
Annual:	$33,108	Annual:	$3,106	Annual:	$30,002
Present Value:	$410,844	Present Value:	$38,539	Present Value:	$372,305

Mitigation Benefits: $372,305 Mitigation Costs: $316,053

Benefits Minus Costs: $56,252 Benefit-Cost Ratio: 1.18

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Cost Estimate

Project Useful Life (years):	30	Construction Type:	
Mitigation Project Cost:	$0	Detailed Scope of Work:	No
Annual Project Maintenance Cost:	$0	Detailed Estimate for Entire Project:	No
Final Mitigation Project Cost:	$316,053	Years of Maintenance:	
Cost Basis Year:		Present Worth of Annual Maintenance Costs:	
Construction Start Year:		Estimate Reflects Current Prices:	No
Construction End Year:		Project Escalation:	

No Rows

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Justification/Attachments

Field	Description	Attachments

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Structure and Mitigation Details For: NM106, Edinburg, Texas, , Hidalgo

Benefits: $1,069,435 Costs: $252,623 BCR: 4.23

Hazard: **Flood**

Mitigation Option: Dry Flood Proofing

Latitude:		Longitude:			
Size of Building:	348,000	BRV ($/sf):	$64.00	Total BRV:	$22,272,000
Residential:	Yes	Building Type:	One-Story		
Obstruction:	N/A	Foundation Type:	Slab	Basement:	No
Building Primary Use:		Structure Type:		Historic Building:	No
Structure Elevation:	94.65	First Floor Being Raised:		Demolition Threshold:	50.00%
Source of Flood Data:		Project in SFHA:	Yes	Community ID Number:	
Effective FIS Date:		FIRM Panel Number:		FIRM Effective Date:	
Project Useful Life:	30	H&H Study Title:		H&H Effective Date:	
Flood Zone:		Loss of Rent:	$0		
Building Contents:	$22,272,000 (Default)			Value of Crawlspace Contents:	$0
Ground Surface Elevation:				Flood Zone Determination:	
Breaking wave height:	0.00			Utilities that are not elevated:	No
Height FFE above grade:	94.65			One Time Displacement Costs:	
NFIP:	No			Displacement Costs:	$36,269 (Default)
ICC:	No			Current federal lodging per diem:	$77
				Population affected :	928
				Current federal meals per diem:	$46
				Cost per person to eat meals at home:	$7

Street Maintenance Details

Street maintenance budget ($)

Miles of street (miles)

Length of road (miles)

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Total Reduced Street Maintenance Costs $0.00

Volunteer Costs

Number of Volunteers Required: Number of Hours Volunteered/Person:

Cost of Volunteers Time ($/Hour/Person): Number of Days Lodging/Volunteer:

Per-Person Cost of Lodging for a Volunteer: Cost of Volunteers:

Social Benefits

Mental Stress and Anxiety

Number of Person:

Treatment Costs per person: $2,443.00

Total Mental Stress and Anxiety Cost: $0.00

Lost Productivity

Number of Worker:

Productivity Loss per person: $8,736.00

Total Lost Productivity Cost: $0.00

Riverine Elevation and Discharge Data

Streambed Elevation (ft): 86.4 Flood Profile Number:

Flood Source Name:

Elevation At Which Barrier Will Be Overtopped: 94.15

FEMA Elevation Certificate Diagram Description: Other Elevation Source:

Recurrence Interval (yr)	Percent Annual Chance (%)	Elevation Before Mitigation (ft)	Discharge Before Mitigation (cfs)	Elevation After Mitigation (ft)	Discharge After Mitigation (cfs)
10	10.00%	89.83	37.0	89.40	37.0
50	2.00%	92.50	62.0	90.36	62.0
100	1.00%	94.60	77.0	91.02	77.0
500	0.20%	95.44	122.0	93.61	122.0

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Building	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	2.5%	0.0%	$556,800	0.0%	0.0%	$0
0.0	13.4%	0.0%	$2,984,448	13.4%	0.0%	$2,984,448
1.0	23.3%	0.0%	$5,189,376	23.3%	0.0%	$5,189,376
2.0	32.1%	0.0%	$7,149,312	32.1%	0.0%	$7,149,312
3.0	40.1%	0.0%	$8,931,072	40.1%	0.0%	$8,931,072
4.0	47.1%	0.0%	$10,490,112	47.1%	0.0%	$10,490,112
5.0	53.2%	0.0%	$22,272,000	53.2%	0.0%	$22,272,000
6.0	58.6%	0.0%	$22,272,000	58.6%	0.0%	$22,272,000
7.0	63.2%	0.0%	$22,272,000	63.2%	0.0%	$22,272,000
8.0	67.2%	0.0%	$22,272,000	67.2%	0.0%	$22,272,000
9.0	70.5%	0.0%	$22,272,000	70.5%	0.0%	$22,272,000
10.0	73.2%	0.0%	$22,272,000	73.2%	0.0%	$22,272,000
11.0	75.4%	0.0%	$22,272,000	75.4%	0.0%	$22,272,000
12.0	77.2%	0.0%	$22,272,000	77.2%	0.0%	$22,272,000
13.0	78.5%	0.0%	$22,272,000	78.5%	0.0%	$22,272,000
14.0	79.5%	0.0%	$22,272,000	79.5%	0.0%	$22,272,000
15.0	80.2%	0.0%	$22,272,000	80.2%	0.0%	$22,272,000
16.0	80.7%	0.0%	$22,272,000	80.7%	0.0%	$22,272,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Contents	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	**Before Mitigation (pct)**	**Before Mitigation User Entered (pct)**	**Before Mitigation ($)**	**After Mitigation (pct)**	**After Mitigation User Entered (pct)**	**After Mitigation ($)**
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	2.4%	0.0%	$534,528	0.0%	0.0%	$0
0.0	8.1%	0.0%	$1,804,032	8.1%	0.0%	$1,804,032
1.0	13.3%	0.0%	$2,962,176	13.3%	0.0%	$2,962,176
2.0	17.9%	0.0%	$3,986,688	17.9%	0.0%	$3,986,688
3.0	22.0%	0.0%	$4,899,840	22.0%	0.0%	$4,899,840
4.0	25.7%	0.0%	$5,723,904	25.7%	0.0%	$5,723,904
5.0	28.8%	0.0%	$6,414,336	28.8%	0.0%	$6,414,336
6.0	31.5%	0.0%	$7,015,680	31.5%	0.0%	$7,015,680
7.0	33.8%	0.0%	$7,527,936	33.8%	0.0%	$7,527,936
8.0	35.7%	0.0%	$7,951,104	35.7%	0.0%	$7,951,104
9.0	37.2%	0.0%	$8,285,184	37.2%	0.0%	$8,285,184
10.0	38.4%	0.0%	$8,552,448	38.4%	0.0%	$8,552,448
11.0	39.2%	0.0%	$8,730,624	39.2%	0.0%	$8,730,624
12.0	39.7%	0.0%	$8,841,984	39.7%	0.0%	$8,841,984
13.0	40.0%	0.0%	$8,908,800	40.0%	0.0%	$8,908,800
14.0	40.0%	0.0%	$8,908,800	40.0%	0.0%	$8,908,800
15.0	40.0%	0.0%	$8,908,800	40.0%	0.0%	$8,908,800
16.0	40.0%	0.0%	$8,908,800	40.0%	0.0%	$8,908,800

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Displacement	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (Days)	Before Mitigation User Entered (Days)	Before Mitigation ($)	After Mitigation (Days)	After Mitigation User Entered (Days)	After Mitigation ($)
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$10,022,400	45.0		$10,022,400
2.0	90.0		$22,272,000	90.0		$22,272,000
3.0	135.0		$22,272,000	135.0		$22,272,000
4.0	180.0		$22,272,000	180.0		$22,272,000
5.0	225.0		$22,272,000	225.0		$22,272,000
6.0	270.0		$22,272,000	270.0		$22,272,000
7.0	315.0		$22,272,000	315.0		$22,272,000
8.0	360.0		$22,272,000	360.0		$22,272,000
9.0	405.0		$22,272,000	405.0		$22,272,000
10.0	450.0		$22,272,000	450.0		$22,272,000
11.0	495.0		$22,272,000	495.0		$22,272,000
12.0	540.0		$22,272,000	540.0		$22,272,000
13.0	585.0		$22,272,000	585.0		$22,272,000
14.0	630.0		$22,272,000	630.0		$22,272,000
15.0	675.0		$22,272,000	675.0		$22,272,000
16.0	720.0		$22,272,000	720.0		$22,272,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Loss of Function	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (Days)	Before Mitigation User Entered (Days)	Before Mitigation ($)	After Mitigation (Days)	After Mitigation User Entered (Days)	After Mitigation ($)
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$10,022,400	45.0		$10,022,400
2.0	90.0		$22,272,000	90.0		$22,272,000
3.0	135.0		$22,272,000	135.0		$22,272,000
4.0	180.0		$22,272,000	180.0		$22,272,000
5.0	225.0		$22,272,000	225.0		$22,272,000
6.0	270.0		$22,272,000	270.0		$22,272,000
7.0	315.0		$22,272,000	315.0		$22,272,000
8.0	360.0		$22,272,000	360.0		$22,272,000
9.0	405.0		$22,272,000	405.0		$22,272,000
10.0	450.0		$22,272,000	450.0		$22,272,000
11.0	495.0		$22,272,000	495.0		$22,272,000
12.0	540.0		$22,272,000	540.0		$22,272,000
13.0	585.0		$22,272,000	585.0		$22,272,000
14.0	630.0		$22,272,000	630.0		$22,272,000
15.0	675.0		$22,272,000	675.0		$22,272,000
16.0	720.0		$22,272,000	720.0		$22,272,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Other Benefits

Other Benefits Before Mitigation

No Data

Other Benefits After Mitigation

No Data

Summary Of Benefits

Expected Annual Damages Before Mitigation		Expected Annual Damages After Mitigation		Expected Avoided Damages After Mitigation (Benefits)	
Annual:	$106,852	Annual:	$20,670	Annual:	$86,182
Present Value:	$1,325,932	Present Value:	$256,497	Present Value:	$1,069,435

Mitigation Benefits: $1,069,435 Mitigation Costs: $252,623

Benefits Minus Costs: $816,812 Benefit-Cost Ratio: 4.23

Total Benefits:	**$56,126,434**	Total Costs:	**$18,781,746**	BCR:	**2.99**
Project Number:		Disaster #:		Program:	
Agency:		State:		Point of Contact:	
Analyst:					

Cost Estimate

Project Useful Life (years):	30	Construction Type:	
Mitigation Project Cost:	$0	Detailed Scope of Work:	No
Annual Project Maintenance Cost:	$0	Detailed Estimate for Entire Project:	No
Final Mitigation Project Cost:	$252,623	Years of Maintenance:	
Cost Basis Year:		Present Worth of Annual Maintenance Costs:	
Construction Start Year:		Estimate Reflects Current Prices:	No
Construction End Year:		Project Escalation:	

No Rows

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Justification/Attachments

Field	Description	Attachments

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Structure and Mitigation Details For: NM108, Edinburg, Texas, , Hidalgo

Benefits: $5,103,509 Costs: $631,950 BCR: 8.08

Hazard: **Flood**

Mitigation Option: Dry Flood Proofing

Latitude:		Longitude:			
Size of Building:	128,000	BRV ($/sf):	$30.00	Total BRV:	$3,840,000
Residential:	Yes	Building Type:	Two or More Stories		
Obstruction:	N/A	Foundation Type:	Slab	Basement:	No
Building Primary Use:		Structure Type:		Historic Building:	No
Structure Elevation:	93.47	First Floor Being Raised:		Demolition Threshold:	50.00%
Source of Flood Data:		Project in SFHA:	Yes	Community ID Number:	
Effective FIS Date:		FIRM Panel Number:		FIRM Effective Date:	
Project Useful Life:	30	H&H Study Title:		H&H Effective Date:	
Flood Zone:		Loss of Rent:	$0		
Building Contents:	$3,840,000 (Default)			Value of Crawlspace Contents:	$0
Ground Surface Elevation:				Flood Zone Determination:	
Breaking wave height:	0.00			Utilities that are not elevated:	No
Height FFE above grade:	93.47			One Time Displacement Costs:	
NFIP:	No			Displacement Costs:	$10,061 (Default)
ICC:	No			Current federal lodging per diem:	$77
				Population affected :	256
				Current federal meals per diem:	$46
				Cost per person to eat meals at home:	$7

Street Maintenance Details

Street maintenance budget ($)

Miles of street (miles)

Length of road (miles)

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Total Reduced Street Maintenance Costs $0.00

Volunteer Costs

Number of Volunteers Required: Number of Hours Volunteered/Person:

Cost of Volunteers Time ($/Hour/Person): Number of Days Lodging/Volunteer:

Per-Person Cost of Lodging for a Volunteer: Cost of Volunteers:

Social Benefits

Mental Stress and Anxiety

Number of Person:

Treatment Costs per person: $2,443.00

Total Mental Stress and Anxiety Cost: $0.00

Lost Productivity

Number of Worker:

Productivity Loss per person: $8,736.00

Total Lost Productivity Cost: $0.00

Riverine Elevation and Discharge Data

Streambed Elevation (ft): 87.5 Flood Profile Number:

Flood Source Name:

Elevation At Which Barrier Will Be Overtopped: 93.47

FEMA Elevation Certificate Diagram Description: Other Elevation Source:

Recurrence Interval (yr)	Percent Annual Chance (%)	Elevation Before Mitigation (ft)	Discharge Before Mitigation (cfs)	Elevation After Mitigation (ft)	Discharge After Mitigation (cfs)
10	10.00%	93.31	26.0	90.22	26.0
50	2.00%	93.35	44.0	90.61	44.0
100	1.00%	93.40	52.0	90.82	52.0
500	0.20%	93.42	81.0	91.41	81.0

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Building	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	3.0%	0.0%	$115,200	0.0%	0.0%	$0
0.0	9.3%	0.0%	$357,120	9.3%	0.0%	$357,120
1.0	15.2%	0.0%	$583,680	15.2%	0.0%	$583,680
2.0	20.9%	0.0%	$802,560	20.9%	0.0%	$802,560
3.0	26.3%	0.0%	$1,009,920	26.3%	0.0%	$1,009,920
4.0	31.4%	0.0%	$1,205,760	31.4%	0.0%	$1,205,760
5.0	36.2%	0.0%	$1,390,080	36.2%	0.0%	$1,390,080
6.0	40.7%	0.0%	$1,562,880	40.7%	0.0%	$1,562,880
7.0	44.9%	0.0%	$1,724,160	44.9%	0.0%	$1,724,160
8.0	48.8%	0.0%	$1,873,920	48.8%	0.0%	$1,873,920
9.0	52.4%	0.0%	$3,840,000	52.4%	0.0%	$3,840,000
10.0	55.7%	0.0%	$3,840,000	55.7%	0.0%	$3,840,000
11.0	58.7%	0.0%	$3,840,000	58.7%	0.0%	$3,840,000
12.0	61.4%	0.0%	$3,840,000	61.4%	0.0%	$3,840,000
13.0	63.8%	0.0%	$3,840,000	63.8%	0.0%	$3,840,000
14.0	65.9%	0.0%	$3,840,000	65.9%	0.0%	$3,840,000
15.0	67.7%	0.0%	$3,840,000	67.7%	0.0%	$3,840,000
16.0	69.2%	0.0%	$3,840,000	69.2%	0.0%	$3,840,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Contents	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	**Before Mitigation (pct)**	**Before Mitigation User Entered (pct)**	**Before Mitigation ($)**	**After Mitigation (pct)**	**After Mitigation User Entered (pct)**	**After Mitigation ($)**
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	1.0%	0.0%	$38,400	0.0%	0.0%	$0
0.0	5.0%	0.0%	$192,000	5.0%	0.0%	$192,000
1.0	8.7%	0.0%	$334,080	8.7%	0.0%	$334,080
2.0	12.2%	0.0%	$468,480	12.2%	0.0%	$468,480
3.0	15.5%	0.0%	$595,200	15.5%	0.0%	$595,200
4.0	18.5%	0.0%	$710,400	18.5%	0.0%	$710,400
5.0	21.3%	0.0%	$817,920	21.3%	0.0%	$817,920
6.0	23.9%	0.0%	$917,760	23.9%	0.0%	$917,760
7.0	26.3%	0.0%	$1,009,920	26.3%	0.0%	$1,009,920
8.0	28.4%	0.0%	$1,090,560	28.4%	0.0%	$1,090,560
9.0	30.3%	0.0%	$1,163,520	30.3%	0.0%	$1,163,520
10.0	32.0%	0.0%	$1,228,800	32.0%	0.0%	$1,228,800
11.0	33.4%	0.0%	$1,282,560	33.4%	0.0%	$1,282,560
12.0	34.7%	0.0%	$1,332,480	34.7%	0.0%	$1,332,480
13.0	35.6%	0.0%	$1,367,040	35.6%	0.0%	$1,367,040
14.0	36.4%	0.0%	$1,397,760	36.4%	0.0%	$1,397,760
15.0	36.9%	0.0%	$1,416,960	36.9%	0.0%	$1,416,960
16.0	37.2%	0.0%	$1,428,480	37.2%	0.0%	$1,428,480

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Displacement	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (Days)	Before Mitigation User Entered (Days)	Before Mitigation ($)	After Mitigation (Days)	After Mitigation User Entered (Days)	After Mitigation ($)
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$1,728,000	45.0		$1,728,000
2.0	90.0		$3,840,000	90.0		$3,840,000
3.0	135.0		$3,840,000	135.0		$3,840,000
4.0	180.0		$3,840,000	180.0		$3,840,000
5.0	225.0		$3,840,000	225.0		$3,840,000
6.0	270.0		$3,840,000	270.0		$3,840,000
7.0	315.0		$3,840,000	315.0		$3,840,000
8.0	360.0		$3,840,000	360.0		$3,840,000
9.0	405.0		$3,840,000	405.0		$3,840,000
10.0	450.0		$3,840,000	450.0		$3,840,000
11.0	495.0		$3,840,000	495.0		$3,840,000
12.0	540.0		$3,840,000	540.0		$3,840,000
13.0	585.0		$3,840,000	585.0		$3,840,000
14.0	630.0		$3,840,000	630.0		$3,840,000
15.0	675.0		$3,840,000	675.0		$3,840,000
16.0	720.0		$3,840,000	720.0		$3,840,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Loss of Function	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (Days)	Before Mitigation User Entered (Days)	Before Mitigation ($)	After Mitigation (Days)	After Mitigation User Entered (Days)	After Mitigation ($)
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$1,728,000	45.0		$1,728,000
2.0	90.0		$3,840,000	90.0		$3,840,000
3.0	135.0		$3,840,000	135.0		$3,840,000
4.0	180.0		$3,840,000	180.0		$3,840,000
5.0	225.0		$3,840,000	225.0		$3,840,000
6.0	270.0		$3,840,000	270.0		$3,840,000
7.0	315.0		$3,840,000	315.0		$3,840,000
8.0	360.0		$3,840,000	360.0		$3,840,000
9.0	405.0		$3,840,000	405.0		$3,840,000
10.0	450.0		$3,840,000	450.0		$3,840,000
11.0	495.0		$3,840,000	495.0		$3,840,000
12.0	540.0		$3,840,000	540.0		$3,840,000
13.0	585.0		$3,840,000	585.0		$3,840,000
14.0	630.0		$3,840,000	630.0		$3,840,000
15.0	675.0		$3,840,000	675.0		$3,840,000
16.0	720.0		$3,840,000	720.0		$3,840,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Other Benefits

Other Benefits Before Mitigation

No Data

Other Benefits After Mitigation

No Data

Summary Of Benefits

Expected Annual Damages Before Mitigation		Expected Annual Damages After Mitigation		Expected Avoided Damages After Mitigation (Benefits)	
Annual:	$411,276	Annual:	$3	Annual:	$411,273
Present Value:	$5,103,541	Present Value:	$32	Present Value:	$5,103,509

Mitigation Benefits: $5,103,509 Mitigation Costs: $631,950

Benefits Minus Costs: $4,471,559 Benefit-Cost Ratio: 8.08

Total Benefits:	**$56,126,434**	Total Costs:	**$18,781,746**	BCR:	**2.99**
Project Number:		Disaster #:		Program:	
Agency:					
State:		Point of Contact:			
Analyst:					

Cost Estimate

Project Useful Life (years):	30	Construction Type:	
Mitigation Project Cost:	$0	Detailed Scope of Work:	No
Annual Project Maintenance Cost:	$0	Detailed Estimate for Entire Project:	No
Final Mitigation Project Cost:	$631,950	Years of Maintenance:	
Cost Basis Year:		Present Worth of Annual Maintenance Costs:	
Construction Start Year:		Estimate Reflects Current Prices:	No
Construction End Year:		Project Escalation:	

No Rows

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Justification/Attachments

Field	Description	Attachments

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Structure and Mitigation Details For: NM109, Edinburg, Texas, , Hidalgo

Benefits: $787,070 Costs: $883,893 BCR: .89

Hazard: **Flood**

Mitigation Option: Dry Flood Proofing

Latitude:		Longitude:			
Size of Building:	1,008,000	BRV ($/sf):	$12.50	Total BRV:	$12,600,000
Residential:	No	Building Type:			
Obstruction:	N/A	Foundation Type:	Slab	Basement:	
Building Primary Use:		Structure Type:	Engineered	Historic Building:	No
Structure Elevation:	95.88	First Floor Being Raised:		Demolition Threshold:	50.00%
Source of Flood Data:		Project in SFHA:	Yes	Community ID Number:	
Effective FIS Date:		FIRM Panel Number:		FIRM Effective Date:	
Project Useful Life:	30	H&H Study Title:		H&H Effective Date:	
Flood Zone:		Loss of Rent:	$0		
Building Contents:	$1,260,000 (Default)			Value of Crawlspace Contents:	$0
Ground Surface Elevation:				Flood Zone Determination:	
Breaking wave height:	0.00			Utilities that are not elevated:	No
Height FFE above grade:	95.88			One Time Displacement Costs:	
NFIP:	No			Displacement Costs:	$77
ICC:	No				

Street Maintenance Details

Street maintenance budget ($)	
Miles of street (miles)	
Length of road (miles)	
Total Reduced Street Maintenance Costs	$0.00

Volunteer Costs

Number of Volunteers Required: Number of Hours Volunteered/Person:

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Cost of Volunteers Time ($/Hour/Person): Number of Days Lodging/Volunteer:

Per-Person Cost of Lodging for a Volunteer: Cost of Volunteers:

Social Benefits

Mental Stress and Anxiety

Number of Person:

Treatment Costs per person: $2,443.00

Total Mental Stress and Anxiety Cost: $0.00

Lost Productivity

Number of Worker:

Productivity Loss per person: $8,736.00

Total Lost Productivity Cost: $0.00

Riverine Elevation and Discharge Data

Streambed Elevation (ft): 91.4

Flood Profile Number:

Flood Source Name:

Elevation At Which Barrier Will Be Overtopped: 95.88

FEMA Elevation Certificate Diagram Description:

Other Elevation Source:

Recurrence Interval (yr)	Percent Annual Chance (%)	Elevation Before Mitigation (ft)	Discharge Before Mitigation (cfs)	Elevation After Mitigation (ft)	Discharge After Mitigation (cfs)
10	10.00%	93.42	24.0	93.24	24.0
50	2.00%	95.32	40.0	93.87	40.0
100	1.00%	96.89	49.0	94.21	49.0
500	0.20%	97.28	78.0	95.77	78.0

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE - New Orleans: College, structure, fresh water, short duration

Building	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	0.0%	0.0%	$0	0.0%	0.0%	$0
0.0	0.0%	0.0%	$0	0.0%	0.0%	$0
1.0	65.0%	0.0%	$12,600,000	65.0%	0.0%	$12,600,000
2.0	65.0%	0.0%	$12,600,000	65.0%	0.0%	$12,600,000
3.0	90.0%	0.0%	$12,600,000	90.0%	0.0%	$12,600,000
4.0	100.0%	0.0%	$12,600,000	100.0%	0.0%	$12,600,000
5.0	100.0%	0.0%	$12,600,000	100.0%	0.0%	$12,600,000
6.0	100.0%	0.0%	$12,600,000	100.0%	0.0%	$12,600,000
7.0	100.0%	0.0%	$12,600,000	100.0%	0.0%	$12,600,000
8.0	100.0%	0.0%	$12,600,000	100.0%	0.0%	$12,600,000
9.0	100.0%	0.0%	$12,600,000	100.0%	0.0%	$12,600,000
10.0	100.0%	0.0%	$12,600,000	100.0%	0.0%	$12,600,000
11.0	100.0%	0.0%	$12,600,000	100.0%	0.0%	$12,600,000
12.0	100.0%	0.0%	$12,600,000	100.0%	0.0%	$12,600,000
13.0	100.0%	0.0%	$12,600,000	100.0%	0.0%	$12,600,000
14.0	100.0%	0.0%	$12,600,000	100.0%	0.0%	$12,600,000
15.0	100.0%	0.0%	$12,600,000	100.0%	0.0%	$12,600,000
16.0	100.0%	0.0%	$12,600,000	100.0%	0.0%	$12,600,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE - New Orleans: College, structure, fresh water, short duration

Contents	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	**Before Mitigation (pct)**	**Before Mitigation User Entered (pct)**	**Before Mitigation ($)**	**After Mitigation (pct)**	**After Mitigation User Entered (pct)**	**After Mitigation ($)**
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	0.0%	0.0%	$0	0.0%	0.0%	$0
0.0	0.0%	0.0%	$0	0.0%	0.0%	$0
1.0	5.0%	0.0%	$630,000	5.0%	0.0%	$630,000
2.0	18.0%	0.0%	$2,268,000	18.0%	0.0%	$2,268,000
3.0	50.0%	0.0%	$12,600,000	50.0%	0.0%	$12,600,000
4.0	50.0%	0.0%	$12,600,000	50.0%	0.0%	$12,600,000
5.0	52.0%	0.0%	$12,600,000	52.0%	0.0%	$12,600,000
6.0	58.0%	0.0%	$12,600,000	58.0%	0.0%	$12,600,000
7.0	58.0%	0.0%	$12,600,000	58.0%	0.0%	$12,600,000
8.0	58.0%	0.0%	$12,600,000	58.0%	0.0%	$12,600,000
9.0	58.0%	0.0%	$12,600,000	58.0%	0.0%	$12,600,000
10.0	58.0%	0.0%	$12,600,000	58.0%	0.0%	$12,600,000
11.0	59.0%	0.0%	$12,600,000	59.0%	0.0%	$12,600,000
12.0	69.0%	0.0%	$12,600,000	69.0%	0.0%	$12,600,000
13.0	70.0%	0.0%	$12,600,000	70.0%	0.0%	$12,600,000
14.0	70.0%	0.0%	$12,600,000	70.0%	0.0%	$12,600,000
15.0	79.0%	0.0%	$12,600,000	79.0%	0.0%	$12,600,000
16.0	79.0%	0.0%	$12,600,000	79.0%	0.0%	$12,600,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE - New Orleans: College, structure, fresh water, short duration

Displacement	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	**Before Mitigation (Days)**	**Before Mitigation User Entered (Days)**	**Before Mitigation ($)**	**After Mitigation (Days)**	**After Mitigation User Entered (Days)**	**After Mitigation ($)**
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$5,670,000	45.0		$5,670,000
2.0	90.0		$12,600,000	90.0		$12,600,000
3.0	135.0		$12,600,000	135.0		$12,600,000
4.0	180.0		$12,600,000	180.0		$12,600,000
5.0	225.0		$12,600,000	225.0		$12,600,000
6.0	270.0		$12,600,000	270.0		$12,600,000
7.0	315.0		$12,600,000	315.0		$12,600,000
8.0	360.0		$12,600,000	360.0		$12,600,000
9.0	405.0		$12,600,000	405.0		$12,600,000
10.0	450.0		$12,600,000	450.0		$12,600,000
11.0	495.0		$12,600,000	495.0		$12,600,000
12.0	540.0		$12,600,000	540.0		$12,600,000
13.0	585.0		$12,600,000	585.0		$12,600,000
14.0	630.0		$12,600,000	630.0		$12,600,000
15.0	675.0		$12,600,000	675.0		$12,600,000
16.0	720.0		$12,600,000	720.0		$12,600,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE - New Orleans: College, structure, fresh water, short duration

Loss of Function	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (Days)	Before Mitigation User Entered (Days)	Before Mitigation ($)	After Mitigation (Days)	After Mitigation User Entered (Days)	After Mitigation ($)
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$5,670,000	45.0		$5,670,000
2.0	90.0		$12,600,000	90.0		$12,600,000
3.0	135.0		$12,600,000	135.0		$12,600,000
4.0	180.0		$12,600,000	180.0		$12,600,000
5.0	225.0		$12,600,000	225.0		$12,600,000
6.0	270.0		$12,600,000	270.0		$12,600,000
7.0	315.0		$12,600,000	315.0		$12,600,000
8.0	360.0		$12,600,000	360.0		$12,600,000
9.0	405.0		$12,600,000	405.0		$12,600,000
10.0	450.0		$12,600,000	450.0		$12,600,000
11.0	495.0		$12,600,000	495.0		$12,600,000
12.0	540.0		$12,600,000	540.0		$12,600,000
13.0	585.0		$12,600,000	585.0		$12,600,000
14.0	630.0		$12,600,000	630.0		$12,600,000
15.0	675.0		$12,600,000	675.0		$12,600,000
16.0	720.0		$12,600,000	720.0		$12,600,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Other Benefits

Other Benefits Before Mitigation

No Data

Other Benefits After Mitigation

No Data

Summary Of Benefits

Expected Annual Damages Before Mitigation		Expected Annual Damages After Mitigation		Expected Avoided Damages After Mitigation (Benefits)	
Annual:	$87,379	Annual:	$23,952	Annual:	$63,427
Present Value:	$1,084,293	Present Value:	$297,223	Present Value:	$787,070

Mitigation Benefits: $787,070 Mitigation Costs: $883,893

Benefits Minus Costs: ($96,823) Benefit-Cost Ratio: 0.89

Total Benefits:	**$56,126,434**	Total Costs:	**$18,781,746**	BCR:	**2.99**
Project Number:		Disaster #:		Program:	
Agency:					
State:		Point of Contact:			
Analyst:					

Cost Estimate

Project Useful Life (years):	30	Construction Type:	
Mitigation Project Cost:	$0	Detailed Scope of Work:	No
Annual Project Maintenance Cost:	$0	Detailed Estimate for Entire Project:	No
Final Mitigation Project Cost:	$883,893	Years of Maintenance:	
Cost Basis Year:		Present Worth of Annual Maintenance Costs:	
Construction Start Year:		Estimate Reflects Current Prices:	No
Construction End Year:		Project Escalation:	

No Rows

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Justification/Attachments

Field	Description	Attachments

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Structure and Mitigation Details For: NM110, Edinburg, Texas, , Hidalgo

Benefits: $2,962,055 Costs: $452,263 BCR: 6.55

Hazard: **Flood**

Mitigation Option: Dry Flood Proofing

Latitude:		Longitude:			
Size of Building:	552,500	BRV ($/sf):	$59.40	Total BRV:	$32,818,500
Residential:	Yes	Building Type:	One-Story		
Obstruction:	N/A	Foundation Type:	Slab	Basement:	No
Building Primary Use:		Structure Type:		Historic Building:	No
Structure Elevation:	98.30	First Floor Being Raised:		Demolition Threshold:	50.00%
Source of Flood Data:		Project in SFHA:	Yes	Community ID Number:	
Effective FIS Date:		FIRM Panel Number:		FIRM Effective Date:	
Project Useful Life:	30	H&H Study Title:		H&H Effective Date:	
Flood Zone:		Loss of Rent:	$0		
Building Contents:	$32,818,500 (Default)			Value of Crawlspace Contents:	$0
Ground Surface Elevation:				Flood Zone Determination:	
Breaking wave height:	0.00			Utilities that are not elevated:	No
Height FFE above grade:	98.30			One Time Displacement Costs:	
NFIP:	No			Displacement Costs:	$34,553 (Default)
ICC:	No			Current federal lodging per diem:	$77
				Population affected :	884
				Current federal meals per diem:	$46
				Cost per person to eat meals at home:	$7

Street Maintenance Details

Street maintenance budget ($)

Miles of street (miles)

Length of road (miles)

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Total Reduced Street Maintenance Costs $0.00

Volunteer Costs

Number of Volunteers Required: Number of Hours Volunteered/Person:

Cost of Volunteers Time ($/Hour/Person): Number of Days Lodging/Volunteer:

Per-Person Cost of Lodging for a Volunteer: Cost of Volunteers:

Social Benefits

Mental Stress and Anxiety

Number of Person:

Treatment Costs per person: $2,443.00

Total Mental Stress and Anxiety Cost: $0.00

Lost Productivity

Number of Worker:

Productivity Loss per person: $8,736.00

Total Lost Productivity Cost: $0.00

Riverine Elevation and Discharge Data

Streambed Elevation (ft): 92.2 Flood Profile Number:

Flood Source Name:

Elevation At Which Barrier Will Be Overtopped: 97.80

FEMA Elevation Certificate Diagram Description: Other Elevation Source:

Recurrence Interval (yr)	Percent Annual Chance (%)	Elevation Before Mitigation (ft)	Discharge Before Mitigation (cfs)	Elevation After Mitigation (ft)	Discharge After Mitigation (cfs)
10	10.00%	96.85	60.0	94.90	60.0
50	2.00%	97.43	102.0	95.88	102.0
100	1.00%	97.67	125.0	96.52	125.0
500	0.20%	98.08	200.0	97.70	200.0

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Building	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	2.5%	0.0%	$820,463	0.0%	0.0%	$0
0.0	13.4%	0.0%	$4,397,679	13.4%	0.0%	$4,397,679
1.0	23.3%	0.0%	$7,646,711	23.3%	0.0%	$7,646,711
2.0	32.1%	0.0%	$10,534,739	32.1%	0.0%	$10,534,739
3.0	40.1%	0.0%	$13,160,219	40.1%	0.0%	$13,160,219
4.0	47.1%	0.0%	$15,457,514	47.1%	0.0%	$15,457,514
5.0	53.2%	0.0%	$32,818,500	53.2%	0.0%	$32,818,500
6.0	58.6%	0.0%	$32,818,500	58.6%	0.0%	$32,818,500
7.0	63.2%	0.0%	$32,818,500	63.2%	0.0%	$32,818,500
8.0	67.2%	0.0%	$32,818,500	67.2%	0.0%	$32,818,500
9.0	70.5%	0.0%	$32,818,500	70.5%	0.0%	$32,818,500
10.0	73.2%	0.0%	$32,818,500	73.2%	0.0%	$32,818,500
11.0	75.4%	0.0%	$32,818,500	75.4%	0.0%	$32,818,500
12.0	77.2%	0.0%	$32,818,500	77.2%	0.0%	$32,818,500
13.0	78.5%	0.0%	$32,818,500	78.5%	0.0%	$32,818,500
14.0	79.5%	0.0%	$32,818,500	79.5%	0.0%	$32,818,500
15.0	80.2%	0.0%	$32,818,500	80.2%	0.0%	$32,818,500
16.0	80.7%	0.0%	$32,818,500	80.7%	0.0%	$32,818,500

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Contents	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	**Before Mitigation (pct)**	**Before Mitigation User Entered (pct)**	**Before Mitigation ($)**	**After Mitigation (pct)**	**After Mitigation User Entered (pct)**	**After Mitigation ($)**
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	2.4%	0.0%	$787,644	0.0%	0.0%	$0
0.0	8.1%	0.0%	$2,658,299	8.1%	0.0%	$2,658,299
1.0	13.3%	0.0%	$4,364,861	13.3%	0.0%	$4,364,861
2.0	17.9%	0.0%	$5,874,512	17.9%	0.0%	$5,874,512
3.0	22.0%	0.0%	$7,220,070	22.0%	0.0%	$7,220,070
4.0	25.7%	0.0%	$8,434,355	25.7%	0.0%	$8,434,355
5.0	28.8%	0.0%	$9,451,728	28.8%	0.0%	$9,451,728
6.0	31.5%	0.0%	$10,337,828	31.5%	0.0%	$10,337,828
7.0	33.8%	0.0%	$11,092,653	33.8%	0.0%	$11,092,653
8.0	35.7%	0.0%	$11,716,205	35.7%	0.0%	$11,716,205
9.0	37.2%	0.0%	$12,208,482	37.2%	0.0%	$12,208,482
10.0	38.4%	0.0%	$12,602,304	38.4%	0.0%	$12,602,304
11.0	39.2%	0.0%	$12,864,852	39.2%	0.0%	$12,864,852
12.0	39.7%	0.0%	$13,028,945	39.7%	0.0%	$13,028,945
13.0	40.0%	0.0%	$13,127,400	40.0%	0.0%	$13,127,400
14.0	40.0%	0.0%	$13,127,400	40.0%	0.0%	$13,127,400
15.0	40.0%	0.0%	$13,127,400	40.0%	0.0%	$13,127,400
16.0	40.0%	0.0%	$13,127,400	40.0%	0.0%	$13,127,400

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Displacement	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (Days)	Before Mitigation User Entered (Days)	Before Mitigation ($)	After Mitigation (Days)	After Mitigation User Entered (Days)	After Mitigation ($)
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$14,768,325	45.0		$14,768,325
2.0	90.0		$32,818,500	90.0		$32,818,500
3.0	135.0		$32,818,500	135.0		$32,818,500
4.0	180.0		$32,818,500	180.0		$32,818,500
5.0	225.0		$32,818,500	225.0		$32,818,500
6.0	270.0		$32,818,500	270.0		$32,818,500
7.0	315.0		$32,818,500	315.0		$32,818,500
8.0	360.0		$32,818,500	360.0		$32,818,500
9.0	405.0		$32,818,500	405.0		$32,818,500
10.0	450.0		$32,818,500	450.0		$32,818,500
11.0	495.0		$32,818,500	495.0		$32,818,500
12.0	540.0		$32,818,500	540.0		$32,818,500
13.0	585.0		$32,818,500	585.0		$32,818,500
14.0	630.0		$32,818,500	630.0		$32,818,500
15.0	675.0		$32,818,500	675.0		$32,818,500
16.0	720.0		$32,818,500	720.0		$32,818,500

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Loss of Function	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	**Before Mitigation (Days)**	**Before Mitigation User Entered (Days)**	**Before Mitigation ($)**	**After Mitigation (Days)**	**After Mitigation User Entered (Days)**	**After Mitigation ($)**
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$14,768,325	45.0		$14,768,325
2.0	90.0		$32,818,500	90.0		$32,818,500
3.0	135.0		$32,818,500	135.0		$32,818,500
4.0	180.0		$32,818,500	180.0		$32,818,500
5.0	225.0		$32,818,500	225.0		$32,818,500
6.0	270.0		$32,818,500	270.0		$32,818,500
7.0	315.0		$32,818,500	315.0		$32,818,500
8.0	360.0		$32,818,500	360.0		$32,818,500
9.0	405.0		$32,818,500	405.0		$32,818,500
10.0	450.0		$32,818,500	450.0		$32,818,500
11.0	495.0		$32,818,500	495.0		$32,818,500
12.0	540.0		$32,818,500	540.0		$32,818,500
13.0	585.0		$32,818,500	585.0		$32,818,500
14.0	630.0		$32,818,500	630.0		$32,818,500
15.0	675.0		$32,818,500	675.0		$32,818,500
16.0	720.0		$32,818,500	720.0		$32,818,500

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Other Benefits

Other Benefits Before Mitigation

No Data

Other Benefits After Mitigation

No Data

Summary Of Benefits

Expected Annual Damages Before Mitigation		Expected Annual Damages After Mitigation		Expected Avoided Damages After Mitigation (Benefits)	
Annual:	$295,768	Annual:	$57,066	Annual:	$238,702
Present Value:	$3,670,195	Present Value:	$708,140	Present Value:	$2,962,055

Mitigation Benefits: $2,962,055 Mitigation Costs: $452,263

Benefits Minus Costs: $2,509,792 Benefit-Cost Ratio: 6.55

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Cost Estimate

Project Useful Life (years):	30	Construction Type:	
Mitigation Project Cost:	$0	Detailed Scope of Work:	No
Annual Project Maintenance Cost:	$0	Detailed Estimate for Entire Project:	No
Final Mitigation Project Cost:	$452,263	Years of Maintenance:	
Cost Basis Year:		Present Worth of Annual Maintenance Costs:	
Construction Start Year:		Estimate Reflects Current Prices:	No
Construction End Year:		Project Escalation:	

No Rows

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Justification/Attachments

Field	Description	Attachments

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Structure and Mitigation Details For: NM111, Edinburg, Texas, , Hidalgo

Benefits: $387,074 Costs: $258,228 BCR: 1.50

Hazard: **Flood**

Mitigation Option: Dry Flood Proofing

Latitude:		Longitude:			
Size of Building:	502,000	BRV ($/sf):	$45.00	Total BRV:	$22,590,000
Residential:	Yes	Building Type:	One-Story		
Obstruction:	N/A	Foundation Type:	Slab	Basement:	No
Building Primary Use:		Structure Type:		Historic Building:	No
Structure Elevation:	96.91	First Floor Being Raised:		Demolition Threshold:	50.00%
Source of Flood Data:		Project in SFHA:	Yes	Community ID Number:	
Effective FIS Date:		FIRM Panel Number:		FIRM Effective Date:	
Project Useful Life:	30	H&H Study Title:		H&H Effective Date:	
Flood Zone:		Loss of Rent:	$0		
Building Contents:	$22,590,000 (Default)			Value of Crawlspace Contents:	$0
Ground Surface Elevation:				Flood Zone Determination:	
Breaking wave height:	0.00			Utilities that are not elevated:	No
Height FFE above grade:	96.91			One Time Displacement Costs:	
NFIP:	No			Displacement Costs:	$39,233 (Default)
ICC:	No			Current federal lodging per diem:	$77
				Population affected :	1,004
				Current federal meals per diem:	$46
				Cost per person to eat meals at home:	$7

Street Maintenance Details

Street maintenance budget ($)

Miles of street (miles)

Length of road (miles)

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Total Reduced Street Maintenance Costs $0.00

Volunteer Costs

Number of Volunteers Required: Number of Hours Volunteered/Person:

Cost of Volunteers Time ($/Hour/Person): Number of Days Lodging/Volunteer:

Per-Person Cost of Lodging for a Volunteer: Cost of Volunteers:

Social Benefits

Mental Stress and Anxiety

Number of Person:

Treatment Costs per person: $2,443.00

Total Mental Stress and Anxiety Cost: $0.00

Lost Productivity

Number of Worker:

Productivity Loss per person: $8,736.00

Total Lost Productivity Cost: $0.00

Riverine Elevation and Discharge Data

Streambed Elevation (ft): 90.1 Flood Profile Number:

Flood Source Name:

Elevation At Which Barrier Will Be Overtopped: 96.41

FEMA Elevation Certificate Diagram Description: Other Elevation Source:

Recurrence Interval (yr)	Percent Annual Chance (%)	Elevation Before Mitigation (ft)	Discharge Before Mitigation (cfs)	Elevation After Mitigation (ft)	Discharge After Mitigation (cfs)
10	10.00%	94.51	65.0	93.98	65.0
50	2.00%	95.40	99.0	95.33	99.0
100	1.00%	96.01	123.0	95.88	123.0
500	0.20%	97.32	181.0	97.21	181.0

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Building	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	2.5%	0.0%	$564,750	0.0%	0.0%	$0
0.0	13.4%	0.0%	$3,027,060	13.4%	0.0%	$3,027,060
1.0	23.3%	0.0%	$5,263,470	23.3%	0.0%	$5,263,470
2.0	32.1%	0.0%	$7,251,390	32.1%	0.0%	$7,251,390
3.0	40.1%	0.0%	$9,058,590	40.1%	0.0%	$9,058,590
4.0	47.1%	0.0%	$10,639,890	47.1%	0.0%	$10,639,890
5.0	53.2%	0.0%	$22,590,000	53.2%	0.0%	$22,590,000
6.0	58.6%	0.0%	$22,590,000	58.6%	0.0%	$22,590,000
7.0	63.2%	0.0%	$22,590,000	63.2%	0.0%	$22,590,000
8.0	67.2%	0.0%	$22,590,000	67.2%	0.0%	$22,590,000
9.0	70.5%	0.0%	$22,590,000	70.5%	0.0%	$22,590,000
10.0	73.2%	0.0%	$22,590,000	73.2%	0.0%	$22,590,000
11.0	75.4%	0.0%	$22,590,000	75.4%	0.0%	$22,590,000
12.0	77.2%	0.0%	$22,590,000	77.2%	0.0%	$22,590,000
13.0	78.5%	0.0%	$22,590,000	78.5%	0.0%	$22,590,000
14.0	79.5%	0.0%	$22,590,000	79.5%	0.0%	$22,590,000
15.0	80.2%	0.0%	$22,590,000	80.2%	0.0%	$22,590,000
16.0	80.7%	0.0%	$22,590,000	80.7%	0.0%	$22,590,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Contents	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	2.4%	0.0%	$542,160	0.0%	0.0%	$0
0.0	8.1%	0.0%	$1,829,790	8.1%	0.0%	$1,829,790
1.0	13.3%	0.0%	$3,004,470	13.3%	0.0%	$3,004,470
2.0	17.9%	0.0%	$4,043,610	17.9%	0.0%	$4,043,610
3.0	22.0%	0.0%	$4,969,800	22.0%	0.0%	$4,969,800
4.0	25.7%	0.0%	$5,805,630	25.7%	0.0%	$5,805,630
5.0	28.8%	0.0%	$6,505,920	28.8%	0.0%	$6,505,920
6.0	31.5%	0.0%	$7,115,850	31.5%	0.0%	$7,115,850
7.0	33.8%	0.0%	$7,635,420	33.8%	0.0%	$7,635,420
8.0	35.7%	0.0%	$8,064,630	35.7%	0.0%	$8,064,630
9.0	37.2%	0.0%	$8,403,480	37.2%	0.0%	$8,403,480
10.0	38.4%	0.0%	$8,674,560	38.4%	0.0%	$8,674,560
11.0	39.2%	0.0%	$8,855,280	39.2%	0.0%	$8,855,280
12.0	39.7%	0.0%	$8,968,230	39.7%	0.0%	$8,968,230
13.0	40.0%	0.0%	$9,036,000	40.0%	0.0%	$9,036,000
14.0	40.0%	0.0%	$9,036,000	40.0%	0.0%	$9,036,000
15.0	40.0%	0.0%	$9,036,000	40.0%	0.0%	$9,036,000
16.0	40.0%	0.0%	$9,036,000	40.0%	0.0%	$9,036,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Displacement	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (Days)	Before Mitigation User Entered (Days)	Before Mitigation ($)	After Mitigation (Days)	After Mitigation User Entered (Days)	After Mitigation ($)
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$10,165,500	45.0		$10,165,500
2.0	90.0		$22,590,000	90.0		$22,590,000
3.0	135.0		$22,590,000	135.0		$22,590,000
4.0	180.0		$22,590,000	180.0		$22,590,000
5.0	225.0		$22,590,000	225.0		$22,590,000
6.0	270.0		$22,590,000	270.0		$22,590,000
7.0	315.0		$22,590,000	315.0		$22,590,000
8.0	360.0		$22,590,000	360.0		$22,590,000
9.0	405.0		$22,590,000	405.0		$22,590,000
10.0	450.0		$22,590,000	450.0		$22,590,000
11.0	495.0		$22,590,000	495.0		$22,590,000
12.0	540.0		$22,590,000	540.0		$22,590,000
13.0	585.0		$22,590,000	585.0		$22,590,000
14.0	630.0		$22,590,000	630.0		$22,590,000
15.0	675.0		$22,590,000	675.0		$22,590,000
16.0	720.0		$22,590,000	720.0		$22,590,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Loss of Function	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	**Before Mitigation (Days)**	**Before Mitigation User Entered (Days)**	**Before Mitigation ($)**	**After Mitigation (Days)**	**After Mitigation User Entered (Days)**	**After Mitigation ($)**
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$10,165,500	45.0		$10,165,500
2.0	90.0		$22,590,000	90.0		$22,590,000
3.0	135.0		$22,590,000	135.0		$22,590,000
4.0	180.0		$22,590,000	180.0		$22,590,000
5.0	225.0		$22,590,000	225.0		$22,590,000
6.0	270.0		$22,590,000	270.0		$22,590,000
7.0	315.0		$22,590,000	315.0		$22,590,000
8.0	360.0		$22,590,000	360.0		$22,590,000
9.0	405.0		$22,590,000	405.0		$22,590,000
10.0	450.0		$22,590,000	450.0		$22,590,000
11.0	495.0		$22,590,000	495.0		$22,590,000
12.0	540.0		$22,590,000	540.0		$22,590,000
13.0	585.0		$22,590,000	585.0		$22,590,000
14.0	630.0		$22,590,000	630.0		$22,590,000
15.0	675.0		$22,590,000	675.0		$22,590,000
16.0	720.0		$22,590,000	720.0		$22,590,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Other Benefits

Other Benefits Before Mitigation

No Data

Other Benefits After Mitigation

No Data

Summary Of Benefits

Expected Annual Damages Before Mitigation		Expected Annual Damages After Mitigation		Expected Avoided Damages After Mitigation (Benefits)	
Annual:	$112,847	Annual:	$81,654	Annual:	$31,193
Present Value:	$1,400,320	Present Value:	$1,013,246	Present Value:	$387,074

Mitigation Benefits: $387,074 Mitigation Costs: $258,228

Benefits Minus Costs: $128,846 Benefit-Cost Ratio: 1.50

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Cost Estimate

Project Useful Life (years):	30	Construction Type:	
Mitigation Project Cost:	$0	Detailed Scope of Work:	No
Annual Project Maintenance Cost:	$0	Detailed Estimate for Entire Project:	No
Final Mitigation Project Cost:	$258,228	Years of Maintenance:	
Cost Basis Year:		Present Worth of Annual Maintenance Costs:	
Construction Start Year:		Estimate Reflects Current Prices:	No
Construction End Year:		Project Escalation:	

No Rows

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Justification/Attachments

Field	Description	Attachments

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Structure and Mitigation Details For: NM113, Edinburg, Texas, , Hidalgo

Benefits: $1,160,902 Costs: $143,313 BCR: 8.10

Hazard: **Flood**

Mitigation Option: Dry Flood Proofing

Latitude:		Longitude:			
Size of Building:	794,750	BRV ($/sf):	$43.64	Total BRV:	$34,682,890
Residential:	Yes	Building Type:	One-Story		
Obstruction:	N/A	Foundation Type:	Slab	Basement:	No
Building Primary Use:		Structure Type:		Historic Building:	No
Structure Elevation:	99.93	First Floor Being Raised:		Demolition Threshold:	50.00%
Source of Flood Data:		Project in SFHA:	Yes	Community ID Number:	
Effective FIS Date:		FIRM Panel Number:		FIRM Effective Date:	
Project Useful Life:	30	H&H Study Title:		H&H Effective Date:	
Flood Zone:		Loss of Rent:	$0		
Building Contents:	$34,682,890 (Default)			Value of Crawlspace Contents:	$0
Ground Surface Elevation:				Flood Zone Determination:	
Breaking wave height:	0.00			Utilities that are not elevated:	No
Height FFE above grade:	99.93			One Time Displacement Costs:	
NFIP:	No			Displacement Costs:	$45,161 (Default)
ICC:	No			Current federal lodging per diem:	$77
				Population affected :	1,156
				Current federal meals per diem:	$46
				Cost per person to eat meals at home:	$7

Street Maintenance Details

Street maintenance budget ($)

Miles of street (miles)

Length of road (miles)

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Total Reduced Street Maintenance Costs $0.00

Volunteer Costs

Number of Volunteers Required: Number of Hours Volunteered/Person:

Cost of Volunteers Time ($/Hour/Person): Number of Days Lodging/Volunteer:

Per-Person Cost of Lodging for a Volunteer: Cost of Volunteers:

Social Benefits

Mental Stress and Anxiety

Number of Person:

Treatment Costs per person: $2,443.00

Total Mental Stress and Anxiety Cost: $0.00

Lost Productivity

Number of Worker:

Productivity Loss per person: $8,736.00

Total Lost Productivity Cost: $0.00

Riverine Elevation and Discharge Data

Streambed Elevation (ft): 93.6 Flood Profile Number:

Flood Source Name:

Elevation At Which Barrier Will Be Overtopped: 98.93

FEMA Elevation Certificate Diagram Description: Other Elevation Source:

Recurrence Interval (yr)	Percent Annual Chance (%)	Elevation Before Mitigation (ft)	Discharge Before Mitigation (cfs)	Elevation After Mitigation (ft)	Discharge After Mitigation (cfs)
10	10.00%	97.57	43.0	96.31	43.0
50	2.00%	98.51	71.0	97.24	71.0
100	1.00%	99.15	86.0	97.83	86.0
500	0.20%	99.77	136.0	99.60	136.0

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Building	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	2.5%	0.0%	$867,072	2.5%	0.0%	$867,072
0.0	13.4%	0.0%	$4,647,507	13.4%	0.0%	$4,647,507
1.0	23.3%	0.0%	$8,081,113	23.3%	0.0%	$8,081,113
2.0	32.1%	0.0%	$11,133,208	32.1%	0.0%	$11,133,208
3.0	40.1%	0.0%	$13,907,839	40.1%	0.0%	$13,907,839
4.0	47.1%	0.0%	$16,335,641	47.1%	0.0%	$16,335,641
5.0	53.2%	0.0%	$34,682,890	53.2%	0.0%	$34,682,890
6.0	58.6%	0.0%	$34,682,890	58.6%	0.0%	$34,682,890
7.0	63.2%	0.0%	$34,682,890	63.2%	0.0%	$34,682,890
8.0	67.2%	0.0%	$34,682,890	67.2%	0.0%	$34,682,890
9.0	70.5%	0.0%	$34,682,890	70.5%	0.0%	$34,682,890
10.0	73.2%	0.0%	$34,682,890	73.2%	0.0%	$34,682,890
11.0	75.4%	0.0%	$34,682,890	75.4%	0.0%	$34,682,890
12.0	77.2%	0.0%	$34,682,890	77.2%	0.0%	$34,682,890
13.0	78.5%	0.0%	$34,682,890	78.5%	0.0%	$34,682,890
14.0	79.5%	0.0%	$34,682,890	79.5%	0.0%	$34,682,890
15.0	80.2%	0.0%	$34,682,890	80.2%	0.0%	$34,682,890
16.0	80.7%	0.0%	$34,682,890	80.7%	0.0%	$34,682,890

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Contents	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	2.4%	0.0%	$832,389	2.4%	0.0%	$832,389
0.0	8.1%	0.0%	$2,809,314	8.1%	0.0%	$2,809,314
1.0	13.3%	0.0%	$4,612,824	13.3%	0.0%	$4,612,824
2.0	17.9%	0.0%	$6,208,237	17.9%	0.0%	$6,208,237
3.0	22.0%	0.0%	$7,630,236	22.0%	0.0%	$7,630,236
4.0	25.7%	0.0%	$8,913,503	25.7%	0.0%	$8,913,503
5.0	28.8%	0.0%	$9,988,672	28.8%	0.0%	$9,988,672
6.0	31.5%	0.0%	$10,925,110	31.5%	0.0%	$10,925,110
7.0	33.8%	0.0%	$11,722,817	33.8%	0.0%	$11,722,817
8.0	35.7%	0.0%	$12,381,792	35.7%	0.0%	$12,381,792
9.0	37.2%	0.0%	$12,902,035	37.2%	0.0%	$12,902,035
10.0	38.4%	0.0%	$13,318,230	38.4%	0.0%	$13,318,230
11.0	39.2%	0.0%	$13,595,693	39.2%	0.0%	$13,595,693
12.0	39.7%	0.0%	$13,769,107	39.7%	0.0%	$13,769,107
13.0	40.0%	0.0%	$13,873,156	40.0%	0.0%	$13,873,156
14.0	40.0%	0.0%	$13,873,156	40.0%	0.0%	$13,873,156
15.0	40.0%	0.0%	$13,873,156	40.0%	0.0%	$13,873,156
16.0	40.0%	0.0%	$13,873,156	40.0%	0.0%	$13,873,156

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Displacement	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (Days)	Before Mitigation User Entered (Days)	Before Mitigation ($)	After Mitigation (Days)	After Mitigation User Entered (Days)	After Mitigation ($)
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$15,607,301	45.0		$15,607,301
2.0	90.0		$34,682,890	90.0		$34,682,890
3.0	135.0		$34,682,890	135.0		$34,682,890
4.0	180.0		$34,682,890	180.0		$34,682,890
5.0	225.0		$34,682,890	225.0		$34,682,890
6.0	270.0		$34,682,890	270.0		$34,682,890
7.0	315.0		$34,682,890	315.0		$34,682,890
8.0	360.0		$34,682,890	360.0		$34,682,890
9.0	405.0		$34,682,890	405.0		$34,682,890
10.0	450.0		$34,682,890	450.0		$34,682,890
11.0	495.0		$34,682,890	495.0		$34,682,890
12.0	540.0		$34,682,890	540.0		$34,682,890
13.0	585.0		$34,682,890	585.0		$34,682,890
14.0	630.0		$34,682,890	630.0		$34,682,890
15.0	675.0		$34,682,890	675.0		$34,682,890
16.0	720.0		$34,682,890	720.0		$34,682,890

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Loss of Function	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	**Before Mitigation (Days)**	**Before Mitigation User Entered (Days)**	**Before Mitigation ($)**	**After Mitigation (Days)**	**After Mitigation User Entered (Days)**	**After Mitigation ($)**
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$15,607,301	45.0		$15,607,301
2.0	90.0		$34,682,890	90.0		$34,682,890
3.0	135.0		$34,682,890	135.0		$34,682,890
4.0	180.0		$34,682,890	180.0		$34,682,890
5.0	225.0		$34,682,890	225.0		$34,682,890
6.0	270.0		$34,682,890	270.0		$34,682,890
7.0	315.0		$34,682,890	315.0		$34,682,890
8.0	360.0		$34,682,890	360.0		$34,682,890
9.0	405.0		$34,682,890	405.0		$34,682,890
10.0	450.0		$34,682,890	450.0		$34,682,890
11.0	495.0		$34,682,890	495.0		$34,682,890
12.0	540.0		$34,682,890	540.0		$34,682,890
13.0	585.0		$34,682,890	585.0		$34,682,890
14.0	630.0		$34,682,890	630.0		$34,682,890
15.0	675.0		$34,682,890	675.0		$34,682,890
16.0	720.0		$34,682,890	720.0		$34,682,890

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Other Benefits

Other Benefits Before Mitigation

No Data

Other Benefits After Mitigation

No Data

Summary Of Benefits

Expected Annual Damages Before Mitigation		Expected Annual Damages After Mitigation		Expected Avoided Damages After Mitigation (Benefits)	
Annual:	$167,591	Annual:	$74,039	Annual:	$93,552
Present Value:	$2,079,649	Present Value:	$918,747	Present Value:	$1,160,902

Mitigation Benefits: $1,160,902

Benefits Minus Costs: $1,017,589

Mitigation Costs: $143,313

Benefit-Cost Ratio: 8.10

Version: 5.0.0

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Cost Estimate

Project Useful Life (years):	30	Construction Type:	
Mitigation Project Cost:	$0	Detailed Scope of Work:	No
Annual Project Maintenance Cost:	$0	Detailed Estimate for Entire Project:	No
Final Mitigation Project Cost:	$143,313	Years of Maintenance:	
Cost Basis Year:		Present Worth of Annual Maintenance Costs:	
Construction Start Year:		Estimate Reflects Current Prices:	No
Construction End Year:		Project Escalation:	

No Rows

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Justification/Attachments

Field	Description	Attachments

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Structure and Mitigation Details For: NM115, Edinburg, Texas, , Hidalgo

Benefits: $2,033,922 Costs: $596,720 BCR: 3.41

Hazard: **Flood**

Mitigation Option: Dry Flood Proofing

Latitude:		Longitude:			
Size of Building:	2,154,000	BRV ($/sf):	$55.00	Total BRV:	$118,470,000
Residential:	Yes	Building Type:	Two or More Stories		
Obstruction:	N/A	Foundation Type:	Slab	Basement:	No
Building Primary Use:		Structure Type:		Historic Building:	No
Structure Elevation:	109.00	First Floor Being Raised:		Demolition Threshold:	50.00%
Source of Flood Data:		Project in SFHA:	Yes	Community ID Number:	
Effective FIS Date:		FIRM Panel Number:		FIRM Effective Date:	
Project Useful Life:	30	H&H Study Title:		H&H Effective Date:	
Flood Zone:		Loss of Rent:	$0		
Building Contents:	$118,470,000 (Default)			Value of Crawlspace Contents:	$0
Ground Surface Elevation:				Flood Zone Determination:	
Breaking wave height:	0.00			Utilities that are not elevated:	No
Height FFE above grade:	109.00			One Time Displacement Costs:	
NFIP:	No			Displacement Costs:	$112,085 (Default)
ICC:	No			Current federal lodging per diem:	$77
				Population affected :	2,872
				Current federal meals per diem:	$46
				Cost per person to eat meals at home:	$7

Street Maintenance Details

Street maintenance budget ($)

Miles of street (miles)

Length of road (miles)

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Total Reduced Street Maintenance Costs $0.00

Volunteer Costs

Number of Volunteers Required: Number of Hours Volunteered/Person:

Cost of Volunteers Time ($/Hour/Person): Number of Days Lodging/Volunteer:

Per-Person Cost of Lodging for a Volunteer: Cost of Volunteers:

Social Benefits

Mental Stress and Anxiety

Number of Person:

Treatment Costs per person: $2,443.00

Total Mental Stress and Anxiety Cost: $0.00

Lost Productivity

Number of Worker:

Productivity Loss per person: $8,736.00

Total Lost Productivity Cost: $0.00

Riverine Elevation and Discharge Data

Streambed Elevation (ft): 96.1 Flood Profile Number:

Flood Source Name:

Elevation At Which Barrier Will Be Overtopped: 108.50

FEMA Elevation Certificate Diagram Description: Other Elevation Source:

Recurrence Interval (yr)	Percent Annual Chance (%)	Elevation Before Mitigation (ft)	Discharge Before Mitigation (cfs)	Elevation After Mitigation (ft)	Discharge After Mitigation (cfs)
10	10.00%	104.57	243.0	102.73	243.0
50	2.00%	107.91	367.0	105.04	367.0
100	1.00%	108.98	434.0	106.48	434.0
500	0.20%	109.62	641.0	108.89	641.0

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Building	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	3.0%	0.0%	$3,554,100	0.0%	0.0%	$0
0.0	9.3%	0.0%	$11,017,710	9.3%	0.0%	$11,017,710
1.0	15.2%	0.0%	$18,007,440	15.2%	0.0%	$18,007,440
2.0	20.9%	0.0%	$24,760,230	20.9%	0.0%	$24,760,230
3.0	26.3%	0.0%	$31,157,610	26.3%	0.0%	$31,157,610
4.0	31.4%	0.0%	$37,199,580	31.4%	0.0%	$37,199,580
5.0	36.2%	0.0%	$42,886,140	36.2%	0.0%	$42,886,140
6.0	40.7%	0.0%	$48,217,290	40.7%	0.0%	$48,217,290
7.0	44.9%	0.0%	$53,193,030	44.9%	0.0%	$53,193,030
8.0	48.8%	0.0%	$57,813,360	48.8%	0.0%	$57,813,360
9.0	52.4%	0.0%	$118,470,000	52.4%	0.0%	$118,470,000
10.0	55.7%	0.0%	$118,470,000	55.7%	0.0%	$118,470,000
11.0	58.7%	0.0%	$118,470,000	58.7%	0.0%	$118,470,000
12.0	61.4%	0.0%	$118,470,000	61.4%	0.0%	$118,470,000
13.0	63.8%	0.0%	$118,470,000	63.8%	0.0%	$118,470,000
14.0	65.9%	0.0%	$118,470,000	65.9%	0.0%	$118,470,000
15.0	67.7%	0.0%	$118,470,000	67.7%	0.0%	$118,470,000
16.0	69.2%	0.0%	$118,470,000	69.2%	0.0%	$118,470,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Contents	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	1.0%	0.0%	$1,184,700	0.0%	0.0%	$0
0.0	5.0%	0.0%	$5,923,500	5.0%	0.0%	$5,923,500
1.0	8.7%	0.0%	$10,306,890	8.7%	0.0%	$10,306,890
2.0	12.2%	0.0%	$14,453,340	12.2%	0.0%	$14,453,340
3.0	15.5%	0.0%	$18,362,850	15.5%	0.0%	$18,362,850
4.0	18.5%	0.0%	$21,916,950	18.5%	0.0%	$21,916,950
5.0	21.3%	0.0%	$25,234,110	21.3%	0.0%	$25,234,110
6.0	23.9%	0.0%	$28,314,330	23.9%	0.0%	$28,314,330
7.0	26.3%	0.0%	$31,157,610	26.3%	0.0%	$31,157,610
8.0	28.4%	0.0%	$33,645,480	28.4%	0.0%	$33,645,480
9.0	30.3%	0.0%	$35,896,410	30.3%	0.0%	$35,896,410
10.0	32.0%	0.0%	$37,910,400	32.0%	0.0%	$37,910,400
11.0	33.4%	0.0%	$39,568,980	33.4%	0.0%	$39,568,980
12.0	34.7%	0.0%	$41,109,090	34.7%	0.0%	$41,109,090
13.0	35.6%	0.0%	$42,175,320	35.6%	0.0%	$42,175,320
14.0	36.4%	0.0%	$43,123,080	36.4%	0.0%	$43,123,080
15.0	36.9%	0.0%	$43,715,430	36.9%	0.0%	$43,715,430
16.0	37.2%	0.0%	$44,070,840	37.2%	0.0%	$44,070,840

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Displacement	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (Days)	Before Mitigation User Entered (Days)	Before Mitigation ($)	After Mitigation (Days)	After Mitigation User Entered (Days)	After Mitigation ($)
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$53,311,500	45.0		$53,311,500
2.0	90.0		$118,470,000	90.0		$118,470,000
3.0	135.0		$118,470,000	135.0		$118,470,000
4.0	180.0		$118,470,000	180.0		$118,470,000
5.0	225.0		$118,470,000	225.0		$118,470,000
6.0	270.0		$118,470,000	270.0		$118,470,000
7.0	315.0		$118,470,000	315.0		$118,470,000
8.0	360.0		$118,470,000	360.0		$118,470,000
9.0	405.0		$118,470,000	405.0		$118,470,000
10.0	450.0		$118,470,000	450.0		$118,470,000
11.0	495.0		$118,470,000	495.0		$118,470,000
12.0	540.0		$118,470,000	540.0		$118,470,000
13.0	585.0		$118,470,000	585.0		$118,470,000
14.0	630.0		$118,470,000	630.0		$118,470,000
15.0	675.0		$118,470,000	675.0		$118,470,000
16.0	720.0		$118,470,000	720.0		$118,470,000

Depth-Damage Functions Using USACE Generic

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Loss of Function	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (Days)	Before Mitigation User Entered (Days)	Before Mitigation ($)	After Mitigation (Days)	After Mitigation User Entered (Days)	After Mitigation ($)
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$53,311,500	45.0		$53,311,500
2.0	90.0		$118,470,000	90.0		$118,470,000
3.0	135.0		$118,470,000	135.0		$118,470,000
4.0	180.0		$118,470,000	180.0		$118,470,000
5.0	225.0		$118,470,000	225.0		$118,470,000
6.0	270.0		$118,470,000	270.0		$118,470,000
7.0	315.0		$118,470,000	315.0		$118,470,000
8.0	360.0		$118,470,000	360.0		$118,470,000
9.0	405.0		$118,470,000	405.0		$118,470,000
10.0	450.0		$118,470,000	450.0		$118,470,000
11.0	495.0		$118,470,000	495.0		$118,470,000
12.0	540.0		$118,470,000	540.0		$118,470,000
13.0	585.0		$118,470,000	585.0		$118,470,000
14.0	630.0		$118,470,000	630.0		$118,470,000
15.0	675.0		$118,470,000	675.0		$118,470,000
16.0	720.0		$118,470,000	720.0		$118,470,000

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Other Benefits

Other Benefits Before Mitigation

No Data

Other Benefits After Mitigation

No Data

Summary Of Benefits

Expected Annual Damages Before Mitigation		Expected Annual Damages After Mitigation		Expected Avoided Damages After Mitigation (Benefits)	
Annual:	$512,081	Annual:	$348,174	Annual:	$163,907
Present Value:	$6,354,431	Present Value:	$4,320,509	Present Value:	$2,033,922

Mitigation Benefits: $2,033,922 Mitigation Costs: $596,720

Benefits Minus Costs: $1,437,202 Benefit-Cost Ratio: 3.41

Total Benefits:	**$56,126,434**	Total Costs:	**$18,781,746**	BCR:	**2.99**
Project Number:		Disaster #:		Program:	
Agency:		State:		Point of Contact:	
Analyst:					

Cost Estimate

Project Useful Life (years):	30	Construction Type:	
Mitigation Project Cost:	$0	Detailed Scope of Work:	No
Annual Project Maintenance Cost:	$0	Detailed Estimate for Entire Project:	No
Final Mitigation Project Cost:	$596,720	Years of Maintenance:	
Cost Basis Year:		Present Worth of Annual Maintenance Costs:	
Construction Start Year:		Estimate Reflects Current Prices:	No
Construction End Year:		Project Escalation:	

No Rows

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Justification/Attachments

Field	Description	Attachments

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Structure and Mitigation Details For: NM116, Edinburg, Texas, , Hidalgo

Benefits: $538,217 Costs: $134,467 BCR: 4.00

Hazard: **Flood**

Mitigation Option: Dry Flood Proofing

Latitude:		Longitude:			
Size of Building:	351,000	BRV ($/sf):	$66.67	Total BRV:	$23,401,170
Residential:	Yes	Building Type:	Two or More Stories		
Obstruction:	N/A	Foundation Type:	Slab	Basement:	No
Building Primary Use:		Structure Type:		Historic Building:	No
Structure Elevation:	106.30	First Floor Being Raised:		Demolition Threshold:	50.00%
Source of Flood Data:		Project in SFHA:	Yes	Community ID Number:	
Effective FIS Date:		FIRM Panel Number:		FIRM Effective Date:	
Project Useful Life:	30	H&H Study Title:		H&H Effective Date:	
Flood Zone:		Loss of Rent:	$0		
Building Contents:	$23,401,170 (Default)			Value of Crawlspace Contents:	$0
Ground Surface Elevation:				Flood Zone Determination:	
Breaking wave height:	0.00			Utilities that are not elevated:	No
Height FFE above grade:	106.30			One Time Displacement Costs:	
NFIP:	No			Displacement Costs:	$18,329 (Default)
ICC:	No			Current federal lodging per diem:	$77
				Population affected :	468
				Current federal meals per diem:	$46
				Cost per person to eat meals at home:	$7

Street Maintenance Details

Street maintenance budget ($)

Miles of street (miles)

Length of road (miles)

Version: 5.0.0

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Total Reduced Street Maintenance Costs $0.00

Volunteer Costs

Number of Volunteers Required: Number of Hours Volunteered/Person:

Cost of Volunteers Time ($/Hour/Person): Number of Days Lodging/Volunteer:

Per-Person Cost of Lodging for a Volunteer: Cost of Volunteers:

Social Benefits

Mental Stress and Anxiety

Number of Person:

Treatment Costs per person: $2,443.00

Total Mental Stress and Anxiety Cost: $0.00

Lost Productivity

Number of Worker:

Productivity Loss per person: $8,736.00

Total Lost Productivity Cost: $0.00

Riverine Elevation and Discharge Data

Streambed Elevation (ft): 95.4 Flood Profile Number:

Flood Source Name:

Elevation At Which Barrier Will Be Overtopped: 105.80

FEMA Elevation Certificate Diagram Description: Other Elevation Source:

Recurrence Interval (yr)	Percent Annual Chance (%)	Elevation Before Mitigation (ft)	Discharge Before Mitigation (cfs)	Elevation After Mitigation (ft)	Discharge After Mitigation (cfs)
10	10.00%	98.15	50.0	97.81	50.0
50	2.00%	100.44	78.0	98.72	78.0
100	1.00%	101.98	92.0	99.19	92.0
500	0.20%	104.53	137.0	100.52	137.0

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Building	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	3.0%	0.0%	$702,035	0.0%	0.0%	$0
0.0	9.3%	0.0%	$2,176,309	9.3%	0.0%	$2,176,309
1.0	15.2%	0.0%	$3,556,978	15.2%	0.0%	$3,556,978
2.0	20.9%	0.0%	$4,890,845	20.9%	0.0%	$4,890,845
3.0	26.3%	0.0%	$6,154,508	26.3%	0.0%	$6,154,508
4.0	31.4%	0.0%	$7,347,967	31.4%	0.0%	$7,347,967
5.0	36.2%	0.0%	$8,471,224	36.2%	0.0%	$8,471,224
6.0	40.7%	0.0%	$9,524,276	40.7%	0.0%	$9,524,276
7.0	44.9%	0.0%	$10,507,125	44.9%	0.0%	$10,507,125
8.0	48.8%	0.0%	$11,419,771	48.8%	0.0%	$11,419,771
9.0	52.4%	0.0%	$23,401,170	52.4%	0.0%	$23,401,170
10.0	55.7%	0.0%	$23,401,170	55.7%	0.0%	$23,401,170
11.0	58.7%	0.0%	$23,401,170	58.7%	0.0%	$23,401,170
12.0	61.4%	0.0%	$23,401,170	61.4%	0.0%	$23,401,170
13.0	63.8%	0.0%	$23,401,170	63.8%	0.0%	$23,401,170
14.0	65.9%	0.0%	$23,401,170	65.9%	0.0%	$23,401,170
15.0	67.7%	0.0%	$23,401,170	67.7%	0.0%	$23,401,170
16.0	69.2%	0.0%	$23,401,170	69.2%	0.0%	$23,401,170

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Contents	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	**Before Mitigation (pct)**	**Before Mitigation User Entered (pct)**	**Before Mitigation ($)**	**After Mitigation (pct)**	**After Mitigation User Entered (pct)**	**After Mitigation ($)**
-2.0	0.0%	0.0%	$0	0.0%	0.0%	$0
-1.0	1.0%	0.0%	$234,012	0.0%	0.0%	$0
0.0	5.0%	0.0%	$1,170,059	5.0%	0.0%	$1,170,059
1.0	8.7%	0.0%	$2,035,902	8.7%	0.0%	$2,035,902
2.0	12.2%	0.0%	$2,854,943	12.2%	0.0%	$2,854,943
3.0	15.5%	0.0%	$3,627,181	15.5%	0.0%	$3,627,181
4.0	18.5%	0.0%	$4,329,216	18.5%	0.0%	$4,329,216
5.0	21.3%	0.0%	$4,984,449	21.3%	0.0%	$4,984,449
6.0	23.9%	0.0%	$5,592,880	23.9%	0.0%	$5,592,880
7.0	26.3%	0.0%	$6,154,508	26.3%	0.0%	$6,154,508
8.0	28.4%	0.0%	$6,645,932	28.4%	0.0%	$6,645,932
9.0	30.3%	0.0%	$7,090,555	30.3%	0.0%	$7,090,555
10.0	32.0%	0.0%	$7,488,374	32.0%	0.0%	$7,488,374
11.0	33.4%	0.0%	$7,815,991	33.4%	0.0%	$7,815,991
12.0	34.7%	0.0%	$8,120,206	34.7%	0.0%	$8,120,206
13.0	35.6%	0.0%	$8,330,817	35.6%	0.0%	$8,330,817
14.0	36.4%	0.0%	$8,518,026	36.4%	0.0%	$8,518,026
15.0	36.9%	0.0%	$8,635,032	36.9%	0.0%	$8,635,032
16.0	37.2%	0.0%	$8,705,235	37.2%	0.0%	$8,705,235

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Displacement	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (Days)	Before Mitigation User Entered (Days)	Before Mitigation ($)	After Mitigation (Days)	After Mitigation User Entered (Days)	After Mitigation ($)
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$10,530,527	45.0		$10,530,527
2.0	90.0		$23,401,170	90.0		$23,401,170
3.0	135.0		$23,401,170	135.0		$23,401,170
4.0	180.0		$23,401,170	180.0		$23,401,170
5.0	225.0		$23,401,170	225.0		$23,401,170
6.0	270.0		$23,401,170	270.0		$23,401,170
7.0	315.0		$23,401,170	315.0		$23,401,170
8.0	360.0		$23,401,170	360.0		$23,401,170
9.0	405.0		$23,401,170	405.0		$23,401,170
10.0	450.0		$23,401,170	450.0		$23,401,170
11.0	495.0		$23,401,170	495.0		$23,401,170
12.0	540.0		$23,401,170	540.0		$23,401,170
13.0	585.0		$23,401,170	585.0		$23,401,170
14.0	630.0		$23,401,170	630.0		$23,401,170
15.0	675.0		$23,401,170	675.0		$23,401,170
16.0	720.0		$23,401,170	720.0		$23,401,170

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Depth-Damage Functions Using USACE Generic

Loss of Function	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (Days)	Before Mitigation User Entered (Days)	Before Mitigation ($)	After Mitigation (Days)	After Mitigation User Entered (Days)	After Mitigation ($)
-2.0	0.0		$0	0.0		$0
-1.0	0.0		$0	0.0		$0
0.0	0.0		$0	0.0		$0
1.0	45.0		$10,530,527	45.0		$10,530,527
2.0	90.0		$23,401,170	90.0		$23,401,170
3.0	135.0		$23,401,170	135.0		$23,401,170
4.0	180.0		$23,401,170	180.0		$23,401,170
5.0	225.0		$23,401,170	225.0		$23,401,170
6.0	270.0		$23,401,170	270.0		$23,401,170
7.0	315.0		$23,401,170	315.0		$23,401,170
8.0	360.0		$23,401,170	360.0		$23,401,170
9.0	405.0		$23,401,170	405.0		$23,401,170
10.0	450.0		$23,401,170	450.0		$23,401,170
11.0	495.0		$23,401,170	495.0		$23,401,170
12.0	540.0		$23,401,170	540.0		$23,401,170
13.0	585.0		$23,401,170	585.0		$23,401,170
14.0	630.0		$23,401,170	630.0		$23,401,170
15.0	675.0		$23,401,170	675.0		$23,401,170
16.0	720.0		$23,401,170	720.0		$23,401,170

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Other Benefits

Other Benefits Before Mitigation

No Data

Other Benefits After Mitigation

No Data

Summary Of Benefits

Expected Annual Damages Before Mitigation		Expected Annual Damages After Mitigation		Expected Avoided Damages After Mitigation (Benefits)	
Annual:	$43,444	Annual:	$71	Annual:	$43,373
Present Value:	$539,098	Present Value:	$881	Present Value:	$538,217

Mitigation Benefits: $538,217

Benefits Minus Costs: $403,750

Mitigation Costs: $134,467

Benefit-Cost Ratio: 4.00

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Cost Estimate

Project Useful Life (years):	30	Construction Type:	
Mitigation Project Cost:	$0	Detailed Scope of Work:	No
Annual Project Maintenance Cost:	$0	Detailed Estimate for Entire Project:	No
Final Mitigation Project Cost:	$134,467	Years of Maintenance:	
Cost Basis Year:		Present Worth of Annual Maintenance Costs:	
Construction Start Year:		Estimate Reflects Current Prices:	No
Construction End Year:		Project Escalation:	

No Rows

Total Benefits: **$56,126,434** Total Costs: **$18,781,746** BCR: **2.99**

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Justification/Attachments

Field	Description	Attachments

APPENDIX F
GIS PROJECT & SHAPEFILE MAP PACKAGE

GIS FILES INCLUDED ON DISKETTE