CITY OF ALBUQUERQUE

Planning Department
Brennon Williams, Director

Mayor Timothy M. Keller

August 6, 2021

Raymond J. Smith, P.E.
Souder, Miller & Associates
5454 Venice Ave NE, Suite D
Albuquerque, NM 87113

RE: Loma Hermos / Glenrio Flood Mitigation
Preliminary Drainage Report
Engineer's Stamp Date: 06/17/21
Hydrology File: J10D046A

Dear Mr. Smith:

Based upon the information provided in your submittal received 07/02/21, the Preliminary Drainage Report is preliminary approved for Work Order.

Please submit a complete Drainage Report when the Work Order Construction Set is submitted to the DRC (Design Review and Construction). Also please provide Hydrology with a copy of the LOMR when this is submitted to FEMA for review and approval.

As a reminder, if the project total area of disturbance (including the staging area and any work within the adjacent Right-of-Way) is 1 acre or more, then an Erosion and Sediment Control (ESC) Plan and Owner's certified Notice of Intent (NOI) is required to be submitted to the Stormwater Quality Engineer (Doug Hughes, PE, jhughes@cabq.gov, 924-3420) 14 days prior to any earth disturbance.

If you have any questions, please contact me at 924-3995 or rbrissette@cabq.gov .

Sincerely,

Renée C. Brissette

Renée C. Brissette, P.E. CFM
Senior Engineer, Hydrology
Planning Department

PO Box 1293

Albuquerque

NM 87103

www.cabq.gov

City of Albuquerque

Planning Department

Development & Building Services Division

DRAINAGE AND TRANSPORTATION INFORMATION SHEET (REV 10/2018)

Project Title: Loma Hermos / Glenrio Flood Mitigation Building Permit #: _____ Hydrology File #: _____

DRB#: _____ EPC#: _____ Work Order#: CPN 552090

Legal Description: _____

City Address: Glenrio Road (Central to Palisades), Hanover Road (57th St. to Atrisco Drive), Calle Del Vista at Atrisco Drive, Atrisco Drive (Hanover to Riverview)

Applicant: Souder Miller & Associates Contact: Angela Valdez

Address: 5454 Venice Ave NE, Suite D

Phone#: 505-595-7739 Fax#: _____ E-mail: angela.valdez@soudermiller.com

Other Contact: City of Albuquerque, DMD Contact: Moby Mirza

Address: _____

Phone#: 768-2767 Fax#: _____ E-mail: mmirza@cabq.gov

TYPE OF DEVELOPMENT:_____ PLAT (# of lots) _____ RESIDENCE _____ DRB SITE _____ ADMIN SITE

IS THIS A RESUBMITTAL? _____ Yes X____ No

DEPARTMENT: _____TRAFFIC/TRANSPORTATION X____ HYDROLOGY/DRAINAGE

Check all that Apply:

TYPE OF SUBMITTAL:

____ ENGINEER/ARCHITECT CERTIFICATION
____ PAD CERTIFICATION
____ CONCEPTUAL G & D PLAN
____ GRADING PLAN
____ DRAINAGE MASTER PLAN
X___ DRAINAGE REPORT
____ FLOODPLAIN DEVELOPMENT PERMIT APPLIC
____ ELEVATION CERTIFICATE
____ CLOMR/LOMR
____ TRAFFIC CIRCULATION LAYOUT (TCL)
____ TRAFFIC IMPACT STUDY (TIS)
____ OTHER (SPECIFY) _____
____ PRE-DESIGN MEETING?

TYPE OF APPROVAL/ACCEPTANCE SOUGHT:

____ BUILDING PERMIT APPROVAL
____ CERTIFICATE OF OCCUPANCY
____ PRELIMINARY PLAT APPROVAL
____ SITE PLAN FOR SUB'D APPROVAL
____ SITE PLAN FOR BLDG. PERMIT APPROVAL
____ FINAL PLAT APPROVAL
____ SIA/ RELEASE OF FINANCIAL GUARANTEE
____ FOUNDATION PERMIT APPROVAL
____ GRADING PERMIT APPROVAL
____ SO-19 APPROVAL
____ PAVING PERMIT APPROVAL
____ GRADING/ PAD CERTIFICATION
X___ WORK ORDER APPROVAL
____ CLOMR/LOMR
____ FLOODPLAIN DEVELOPMENT PERMIT
____ OTHER (SPECIFY) _____

DATE SUBMITTED: 06/30/2020 By: Angela Valdez

COA STAFF: ELECTRONIC SUBMITTAL RECEIVED:_____

FEE PAID:_____

LOMA HERMOSA/GLENRIO
FLOOD PLAIN REMOVAL
PRELIMINARY DRAINAGE REPORT

P9044.00

Bernalillo County, New Mexico

Prepared For:

City of Albuquerque
Department of Municipal Development
P.O. Box 1293
Albuquerque, NM 87103

June 17, 2021

City of Albuquerque
Planning Department
Development Review Services
HYDROLOGY SECTION
PRELIMINARY APPROVED
DATE: 08/06/21
BY: Renée C. Brissette
HydroTrans # J10D046A

THESE PLANS AND/OR REPORT ARE CONCEPTUAL ONLY. MORE INFORMATION MAY BE NEEDED IN THEM AND SUBMITTED TO HYDROLOGY FOR BUILDING PERMIT APPROVAL.

Prepared By:

SMA
Souder, Miller & Associates
Engineering • Environmental • Surveying
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(505) 299-0942 • (877) 299-0942 • fax (505) 293-3430 • www.soudermiller.com

Table of Contents

Tables

Figures

Exhibits

Appendices

List of Attachments

SSA Model—Glenrio SD Prelim 2021_3
SSA Model—Calle del Vista – Pond 2021_3
HEC-HMS Model—Glenrio_and_Vista

1.0 Introduction

Souder, Miller & Associates (SMA) was retained by the City of Albuquerque to prepare the Design Analysis Report, dated December 14, 2016 to analyze infrastructure improvements that would mitigate the existing U.S. Federal Emergency Management Agency (FEMA) designated flood plains within the project area. The City of Albuquerque has selected a preferred alternative for design. SMA prepared this Preliminary Drainage Report to present the analysis and preliminary design of that selected alternative.This project is being executed under SMA's current contract, dated December 11, 2018. The City project number is P5520.90.

1.1 Purpose and Scope

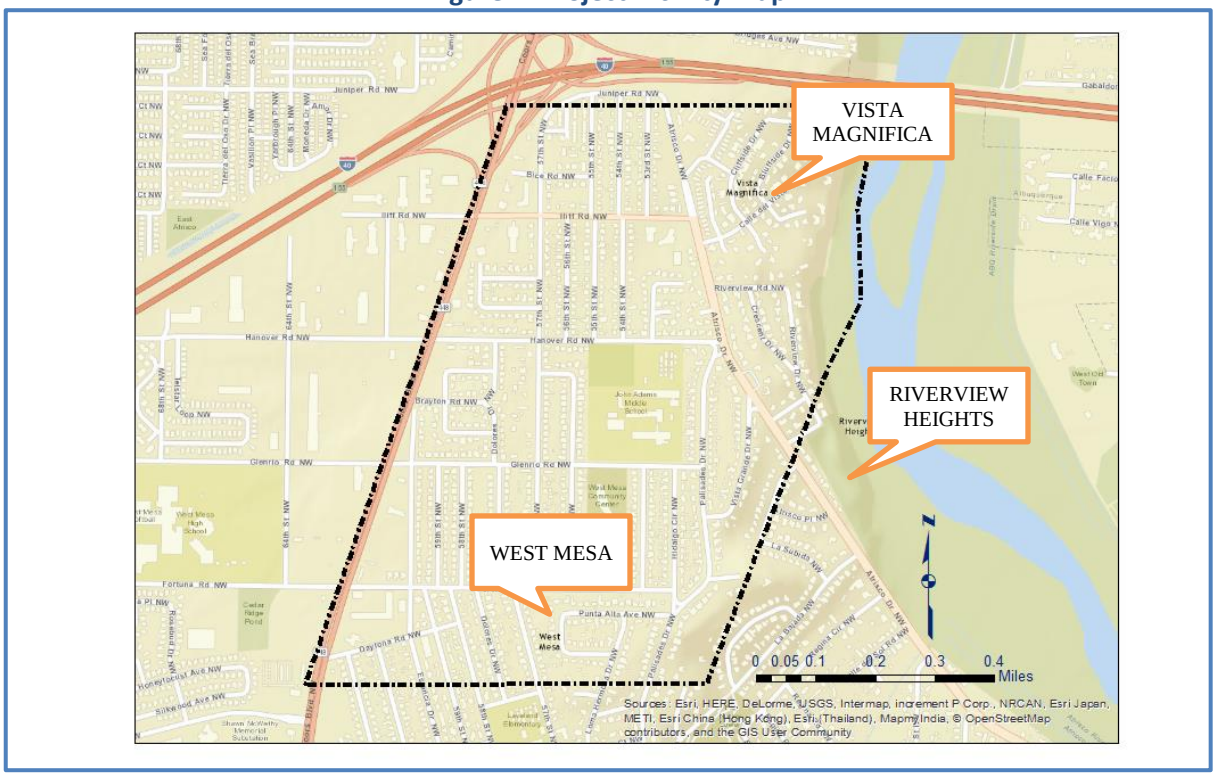
The purpose of this report is to provide additional analysis and preliminary assessment to support the eventual removal of three specific FEMA designated flood plains (Zone AH) within the Loma Hermosa/Glenrio study area (See Exhibit 1). While this report provides the preliminary assessments, a Conditional Letter of Map Revision (CLOMR) nor Letter of Map Revision (LOMR) will be supported with this report. Further design and final hydrologic assessments will be required. The scope of this study is generally as follows:

- Existing Records Search – The study area was the subject of a previous FEMA Flood Insurance Study (FIS). SMA obtained that study as well as other information and records and reviewed them with respect to the hydrology, hydraulics and existing drainage systems. The previous studies are discussed in Section 1.4.
- Existing Conditions Mapping – SMA prepared a map of the study area. The basin conditions are discussed in Section 3.1.
- Hydrologic Analysis – SMA prepared an independent hydrologic analysis utilizing the U.S. Army Corps of Engineer's Hydrologic Engineering Center – Hydrologic Modeling Software (HEC-HMS) program. This analysis was created to independently verify and update the previous hydrology that was done using the AHYMO vs4.01a program as part of the Flood Insurance Study (FIS) study. The hydrologic analysis is discussed in Sections 2 and 3.
- Alternatives Evaluation – Using the results of the hydrologic analysis, SMA developed alternatives for addressing the flood plains. This analysis and the results are discussed in Section 4.
- Design Analysis Report – As part of the scope, this report presents the results of the study and recommendations.

1.2 Project Location

The project study area is south of Interstate I-40 and west of the Rio Grande. The area is generally bounded by Iliff Road on the North, Coors Blvd on the West, the Rio Grande on the East, and Fortuna Road on the south. The project area is in the West Mesa, Riverview Heights, and Vista Magnifica neighborhoods. The best available information indicates that the existing storm drain system in Glenrio Road was constructed in the early 1960s and the storm drain system in Calle del Vista was constructed in the early 1980s. The project vicinity map and limits of the study are shown in Figure 1.

Figure 1. Project Vicinity Map



1.4 Previous Studies

A majority of the study area was included in the *Hydrologic and Hydraulic Technical Support Data Notebook, Task Order HSFE06-09-J0001 for Bernalillo County, New Mexico*. This study was prepared by Risk Assessment, Mapping and Planning Partners (RAMPP, 2010) and is the supporting document for the FIS for this area of Bernalillo County. The hydrologic analysis, which was conducted utilizing the AHYMO v s4.01a program, resulted in identification of four primary ponding areas that define the floodplains in the project area.

SMA prepared the *Loma Hermosa/Glenrio Floodplain Removal Final Design Analysis Report*, dated December 14, 2016. That report provided four scenarios for improvements to mitigate the floodplains and provides much of the basis for this report. SMA prepared a letter update to the DAR report, dated April 11, 2019, which evaluated two additional scenarios.

1.5 References

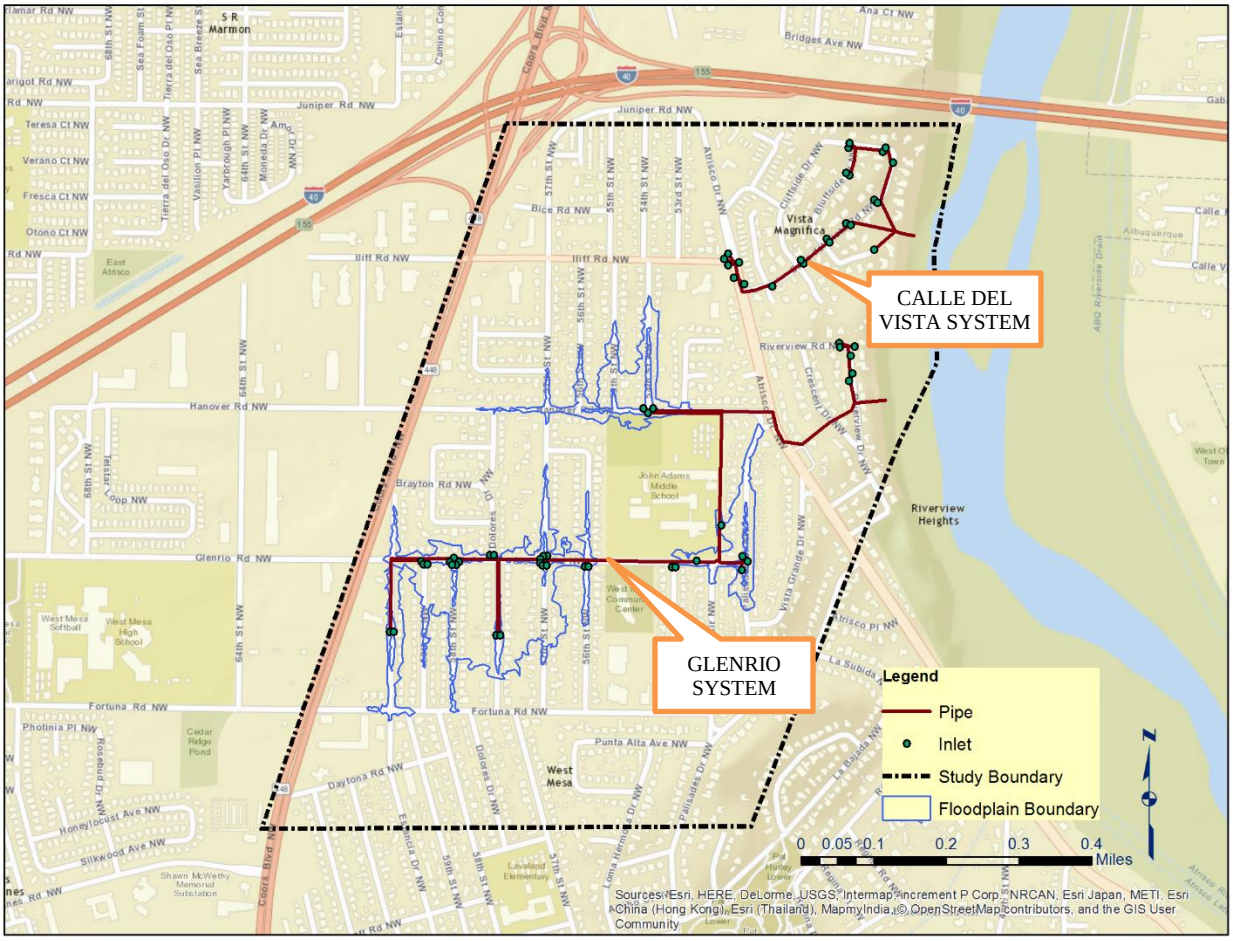
RAMPP, 2010. *Hydrologic and Hydraulic Technical Support Data Notebook, Task Order HSFE06-09-J0001 for Bernalillo County New Mexico*. July 30, 2010.

City of Albuquerque, Development Process Manual (DPM), Chapter 6 – Drainage, Flood Control and Erosion Control, dated June 8, 2020.

2.0 Hydrologic Analysis Information Basis

The hydrologic analysis performed for this study provides the input data for hydraulic analysis of two storm drain systems that drain the project area and are referred to as the Glenrio system and the Calle del Vista system. The following paragraphs describe the basis of the hydrologic computer model simulations.

Figure 2. Study Area Drainage Structure Systems



2.1 Hydrologic and Hydraulic Methodologies

Pursuant to City of Albuquerque DPM design criteria, the design storm for this analysis is the one (1) percent chance (100-year), six-hour storm duration for underground storm drain systems and the 1 percent chance (100-year), 24-hour storm duration for detention systems. SMA used the U.S. Soil Conservation Service (SCS) Unit Hydrograph Method with a Type II-75 storm distribution. As described earlier, the hydrologic analysis was performed using the HEC-HMS v4.1 software program.

Within the Storm and Sanitary Analysis (SSA) program, the EPA SWMM method and Horton infiltration method were utilized for hydrologic analysis, and Hydrodynamic link routing was used for the hydraulic routing analysis. The time series data (hydrographs) were imported from preliminary HEC-HMS modeling, which were distributed to the existing inlets based on basin delineation.

2.2 Topographic Data

The existing storm drain system was determined by City of Albuquerque Graphic Information (GIS) data and confirmed by the field investigation conducted for this report. Topographic data was obtained from the 2010 MRCOG Orthophotography Project. SMA combined record GIS data, designated floodplains and topographic information to create the mapping for basin delineations.

2.3 Precipitation

Rainfall data was obtained from the National Oceanic and Atmospheric (NOAA) Point Precipitation Frequency Data Server website on April 29, 2016. Both the Point Precipitation Frequency and Point Precipitation Intensity estimates were downloaded into reports, which are included in Appendix A. The following tables provide a sampling of the data for various storm events.

Table 1. Point Precipitation Frequency (PPF) Summary

Loma Hermosa/Glenrio Area Point Precipitation Frequency (PPF) Summary						
Duration	PPF Estimate (inches)					
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
6-hr	0.925	1.20	1.41	1.70	1.93	2.18
24-hr	1.15	1.44	1.66	1.97	2.21	2.45

Table 2. Point Precipitation Intensity (PPI) Summary

Loma Hermosa/Glenrio Area Point Precipitation Intensity (PPI) Summary						
Duration	PPI Estimate (inches/hour)					
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
10-min	1.94	2.60	3.13	3.85	4.42	5.01
15-min	1.60	2.15	2.58	3.18	3.65	4.14

2.5 Loss Methodology

In the previous FIS study, an initial abstraction (IA) and infiltration (INF) value were used in the AHYMO hydrology modeling software for the Glenrio basins. The HEC-HMS hydrologic modeling software also uses these values but only one value per IA and INF for the entire basin. Therefore, a weighted IA and INF was calculated for each of the Glenrio basins and from these values an average IA and INF was developed for the Calle del Vista (CDV) basins. The following table shows the results of the weighted values and their average values.

Table 3. Weighted Abstraction and Infiltration Rates

Basin ID	Glenrio Area 1 (Impervious)			Glenrio Area 2 (Pervious)			Weighted IA (in)	Weighted INF (in)
	Area 1 (mi2)	IA (in)	INF (in)	Area 2 (mi2)	IA (in)	INF (in)		
GR.0	0.0146	0.100	0.04	0.0186	0.425	1.04	0.282	0.600
GR.1	0.0167	0.100	0.04	0.0195	0.389	0.938	0.256	0.525
GR.2	0.0035	0.100	0.04	0.0048	0.425	1.04	0.289	0.620
GR.3	0.0078	0.100	0.04	0.0116	0.418	1.019	0.291	0.627
GR.4	0.0077	0.100	0.04	0.0106	0.425	1.04	0.289	0.620
GR.5	0.0559	0.100	0.04	0.0559	0.434	1.065	0.267	0.553
GR.6	0.0060	0.100	0.04	0.0056	0.425	1.04	0.256	0.520
GR.7	0.0058	0.100	0.04	0.0069	0.425	1.04	0.276	0.580
GR.8	0.0049	0.100	0.04	0.0067	0.425	1.04	0.289	0.620
GR.9	0.0110	0.100	0.04	0.0012	0.425	1.04	0.133	0.140
GR.10	0.0143	0.100	0.04	0.0197	0.425	1.04	0.289	0.620
GR.11	0.0033	0.100	0.04	0.0009	0.450	1.11	0.174	0.265
GR.12	0.0033	0.100	0.04	0.0004	0.425	1.04	0.133	0.140
GR.13	0.0030	0.100	0.04	0.0042	0.425	1.04	0.289	0.620
GR.14	0.0004	0.100	0.04	0.0005	0.425	1.04	0.289	0.620
GR.15	0.0026	0.100	0.04	0.0036	0.425	1.04	0.289	0.620
GR.16	0.0007	0.100	0.04	0.0005	0.425	1.04	0.230	0.440
GR.17	0.0044	0.100	0.04	0.0060	0.425	1.04	0.289	0.620
GR.18	0.0003	0.100	0.04	0.0003	0.425	1.04	0.289	0.620
GR.19	0.0010	0.100	0.04	0.0014	0.425	1.04	0.289	0.620
GR.20	0.0085	0.100	0.04	0.0099	0.425	1.04	0.276	0.580
Averaged IA & INF were used in the CDV basins =							0.260	0.530

Abbreviations:
mi^2 – square miles
in – inch

2.6 Time of Concentration

Times of concentration (T_c) for the Glenrio storm drain network were derived from the previous FIS study (RAMMP, 2010). Times of concentration for the Calle del Vista storm drain network were determined using the Autodesk Civil 3D Hydraflow extension TR-55 tool. This method uses the combination of sheet flow, shallow concentrated flow, and channel flow to determine the travel time and thus, the time of concentration. The following table provides the time of concentration for each of the basins.

Table 4. Times of Concentration

Glenrio Basin ID	T_c (min)
GR.0	6.21
GR.1	6.33
GR.2	6.26
GR.3	6.29
GR.4	6.18
GR.5	6.39
GR.6	6.31
GR.7	6.27
GR.8	6.19
GR.9	6.03
GR.10	6.21
GR.11	6.15
GR.12	6.01
GR.13	6.10
GR.14	6.12
GR.15	6.20
GR.16	6.04
GR.17	6.26
GR.18	6.09
GR.19	6.17
GR.20	6.24

Calle del Vista Basin ID	Average Slope (%)	Drainage Length (ft)	T_c (min)
CDV-1	1.7	1498	18
CDV-2	1.0	324	6
CDV-3	1.7	585	6
CDV-4	1.5	449	6
CDV-5	7.7	302	3
CDV-6	7.7	270	2
CDV-7	8.9	261	2
CDV-8	5.2	251	2
CDV-9	5.6	245	3
CDV-10	1.2	239	4
CDV-11	12.4	289	4
CDV-12	1.0	451	12
CDV-13	1.2	633	7
CDV-14	16.7	287	2
CDV-15	6.0	353	3
CDV-16	1.6	325	4
CDV-17	10.1	258	1
CDV-18	18.3	328	2
CDV-19	7.4	509	2

Abbreviations:

min – minute
ft – feet

3.0 Existing Conditions Hydrology

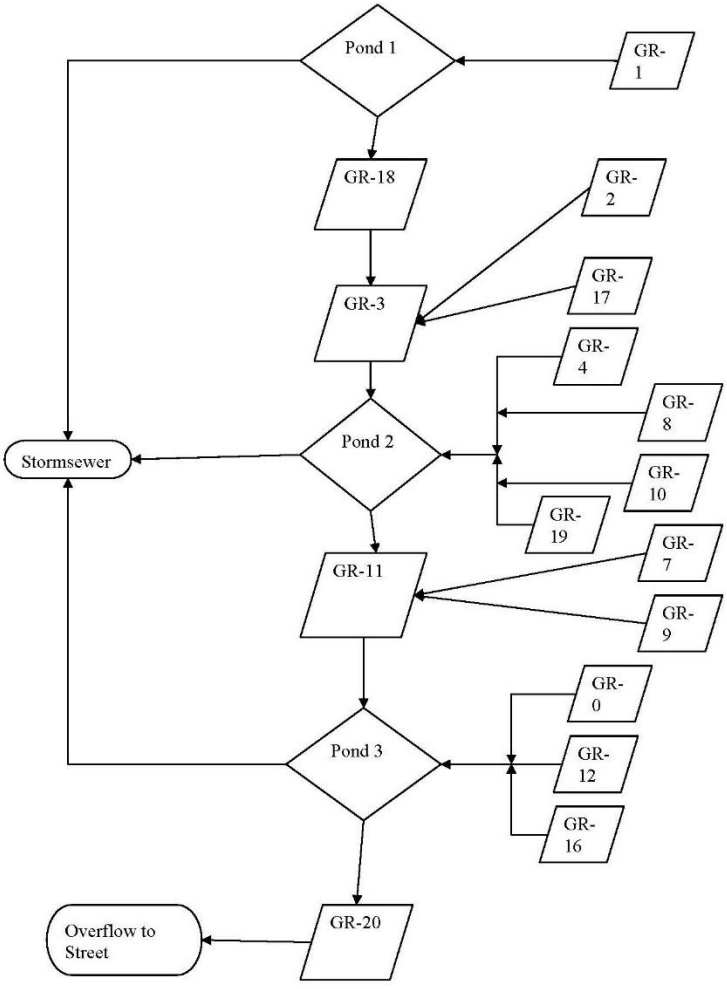
3.1 Basin Descriptions

The hydrologic basins for this study were largely derived from the previous FIS study. Minor revisions were made based on the findings of the field investigation, which can be attributed to changing conditions over time.

The basins that discharge to the Calle del Vista drainage network in the northeast corner of the study area were outside the limits of the previous FIS study. Therefore, those basins were delineated and analyzed separately for the DAR.

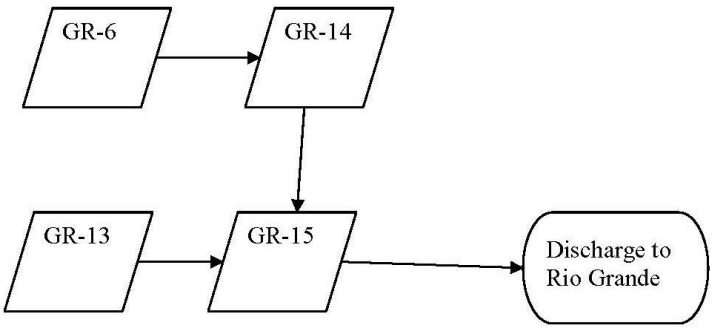
The flowcharts shown below (Figures 3 to 5) identify the Glenrio area basins referenced in the FIS study and illustrate the approach to routing each hydrograph to the storm drain network. Each basin's flow hydrograph is computed and then routed to a "pond" element that represents the mapped flood plain areas.

Figure 3. Glenrio Area Drainage Basin Routing Flowchart



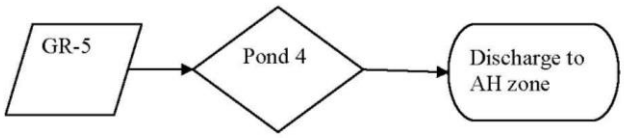
FLOW CHART: GLENRIO SUBBASINS AND PONDING AREAS

Figure 4. Glenrio Area-East of Atrisco Drive Drainage Basin Routing Flowchart



FLOW CHART: GLENRIO STORM SEWER EAST OF ATRISCO DRIVE

Figure 5. Glenrio Storm Drain at Hanover Road Routing Flowchart



FLOW CHART: GLENRIO STORM SEWER AT HANOVER ROAD

The Calle del Vista network basins in the northeast corner of the study area are shown on Exhibit 1. The basins are generally comprised of urban single-family residences and schools, which all drain to the southeast towards the Rio Grande. Basins CDV-1 through 4 are above the Rio Grande flood plain and have mild slopes of 1 to 2%. Basins CDV-5 through 19 have steeper slopes that vary from 5 to 18% with the exception of CDV-10, 12, 13, & 16 which have slopes of 1 to 1.6%. Much of the surface storm water conveyance is by street gutter flow.

3.2 Runoff Analysis

SMA performed in independent analysis of both the Glenrio and Calle del Vista basins using HEC-HMS v4.1. SMA attempted to mirror the inputs used in the previous AHYMO model for the Glenrio-area basins which allowed for comparison to current conditions. A new model for the Calle del Vista basins was created but many of the characteristics of the Glenrio basins were the same.

3.2.1 Glenrio Road Runoff Analysis

The following table shows the results of the Glenrio Road 100-year, 24 and 6-hr storm event.

Table 5. Glenrio Road 100-year, 24 & 6-hour Hydrology Summary

Basin ID	Flow	Volume	Flow	Volume
	$Q_{24\text{-hr}}$ (cfs)	$V_{24\text{-hr}}$ (acre-ft)	$Q_{6\text{-hr}}$ (cfs)	$V_{6\text{-hr}}$ (acre-ft)
GR-0	78	3.42	21	2.19
GR-1	53	3.62	20	3.14
GR-2	17	0.85	5	0.53
GR-3	30	1.94	11	1.68
GR-4	45	1.86	11	1.16
GR-5	185	11.91	64	8.13
GR-6	22	1.25	7	0.88
GR-7	26	1.32	8	0.87
GR-8	29	1.18	7	0.74
GR-9	50	1.57	12	1.37
GR-10	80	3.46	21	2.16
GR-11	12	0.52	4	0.43
GR-12	16	0.48	4	0.41
GR-13	23	0.73	5	0.46
GR-14	3	0.09	1	0.06
GR-15	15	0.63	4	0.39
GR-16	5	0.13	1	0.1
GR-17	22	1.06	6	0.66
GR-18	2	0.06	0.4	0.05
GR-19	6	0.24	2	0.15
GR-20	38	1.47	8	0.49

Abbreviations:

$Q_{24\text{-hr}}$ - 24 hour flow

$V_{24\text{-hr}}$ - 24 hour volume

cfs – cubic feet per second

ft - feet

To determine if the HEC-HMS model replicated the results of the AHYMO model used for the FIS, a comparison of results was performed. A calculation of a simple ratio of the HEC-HMS to AHYMO results was used to determine the similarity of the volume and flow outputs. A ratio equal to 1 would indicate equal results. The following table shows the results of this comparison between the HEC-HMS model and AHYMO model.

Table 6. HEC-HMS / AHYMO Output Comparison Table

Comparison of Volulme Output				Comparison of Flow Output			
HMS V (acre-ft)	AHYMO V (acre-ft)	HMS/ AHYMO	DIFF	HMS Q (cfs)	AHYMO Q (cfs)	HMS/ AHYMO	DIFF
3.42	3.06	1.12	0.36	78.4	58.94	1.33	19.46
3.62	3.43	1.05	0.19	52.5	51.85	1.01	0.65
0.85	0.76	1.12	0.09	17.2	13.00	1.32	4.2
1.94	1.75	1.11	0.19	30.1	28.29	1.06	1.81
1.86	1.67	1.12	0.19	44.9	34.62	1.30	10.28
11.91	10.64	1.12	1.27	184.6	143.06	1.29	41.54
1.25	1.12	1.12	0.13	22	17.52	1.26	4.48
1.32	1.18	1.11	0.14	25.6	19.90	1.29	5.7
1.18	1.06	1.12	0.12	28.5	21.67	1.32	6.83
1.57	1.44	1.09	0.13	50.1	45.12	1.11	4.98
3.46	3.10	1.12	0.36	79.9	60.00	1.33	19.9
0.52	0.47	1.11	0.05	11.9	10.58	1.12	1.32
0.48	0.44	1.10	0.04	15.7	14.45	1.09	1.25
0.73	0.66	1.11	0.07	23.1	17.78	1.30	5.32
0.09	0.08	1.10	0.01	2.6	2.08	1.25	0.52
0.63	0.56	1.12	0.07	15.2	11.40	1.33	3.8
0.13	0.12	1.07	0.01	4.5	3.89	1.16	0.61
1.06	0.95	1.12	0.11	21.6	16.34	1.32	5.26
0.06	0.05	1.10	0.01	1.5	1.54	0.97	-0.04
0.24	0.22	1.10	0.02	6.2	4.74	1.31	1.46
1.47	1.72	0.86	-0.25	37.7	31.07	1.21	6.63

Abbreviations
V-Volume
Q-Flow
Cfs-cubic feet per second

As a result of the comparison, the volumes were similar with an average factor of 1.1 and the flowrate differed more with an average factor of 1.2.

In the previous FIS study, the Calle del Vista area hydrology was not performed. SMA used HEC-HMS to prepare a hydrologic model for this area of the project.

3.2.2 Calle del Vista Runoff Analysis

The following table shows the results of the Calle del Vista. 100-year, 24 and 6-hour storm event.

Table 7. Calle del Vista 100-year, 24 and 6-hour Hydrology Summary

Basin ID	Flow	Volume	Flow	Volume
	$Q_{24\text{-hr}}$ (cfs)	$V_{24\text{-hr}}$ (acre-ft)	$Q_{6\text{-hr}}$ (cfs)	$V_{6\text{-hr}}$ (acre-ft)
CDV-1	91	3.71	25	3.22
CDV-2	12	0.37	3	0.32
CDV-3	28	0.84	6	0.73
CDV-4	12	0.35	3	0.30
CDV-5	10	0.30	2	0.26
CDV-6	4	0.10	1	0.09
CDV-7	3	0.08	1	0.07
CDV-8	2	0.07	1	0.06
CDV-9	4	0.11	1	0.10
CDV-10	2	0.06	0.4	0.05
CDV-11	11	0.33	2	0.29
CDV-12	36	1.21	9	1.05
CDV-13	7	0.22	2	0.19
CDV-14	6	0.16	1	0.14
CDV-15	9	0.27	2	0.23
CDV-16	7	0.20	2	0.17
CDV-17	1	0.02	0.1	0.02
CDV-18	4	0.12	1	0.10
CDV-19	9	0.26	2	0.23

Abbreviations:
V- volume
Q – flow
Cfs – cubic feet per second

4.0 Hydraulic Systems

4.1 Proposed Improvements Analysis

As part of the DAR update, SMA performed a topographic survey of the project area and updated the SSA models to include more detailed information. The SSA models and HEC-HMS models used to model the existing and proposed conditions have been provided separately from this report for detailed review.

The network described previously in the DAR's "Scenario 4" is presented as two separate networks—the Glenrio Network and the Hanover Network. These networks can be reviewed in Figures 6 and 7, respectively.

The Storm and Sanitary Analysis (SSA) model for the Calle del Vista network includes a detention pond, per Scenario 2 of the DAR. The proposed Calle del Vista network can be reviewed in Figure 8.

The intention of the conceptual proposed improvements in the SSA models is to convey runoff effectively and reduce—if not eliminate—the floodplains within the project area. At this conceptual stage, SMA assumes flooding may result from inadequate runoff conveyance within the trunkline rather than inadequate water inflow from the inlets.

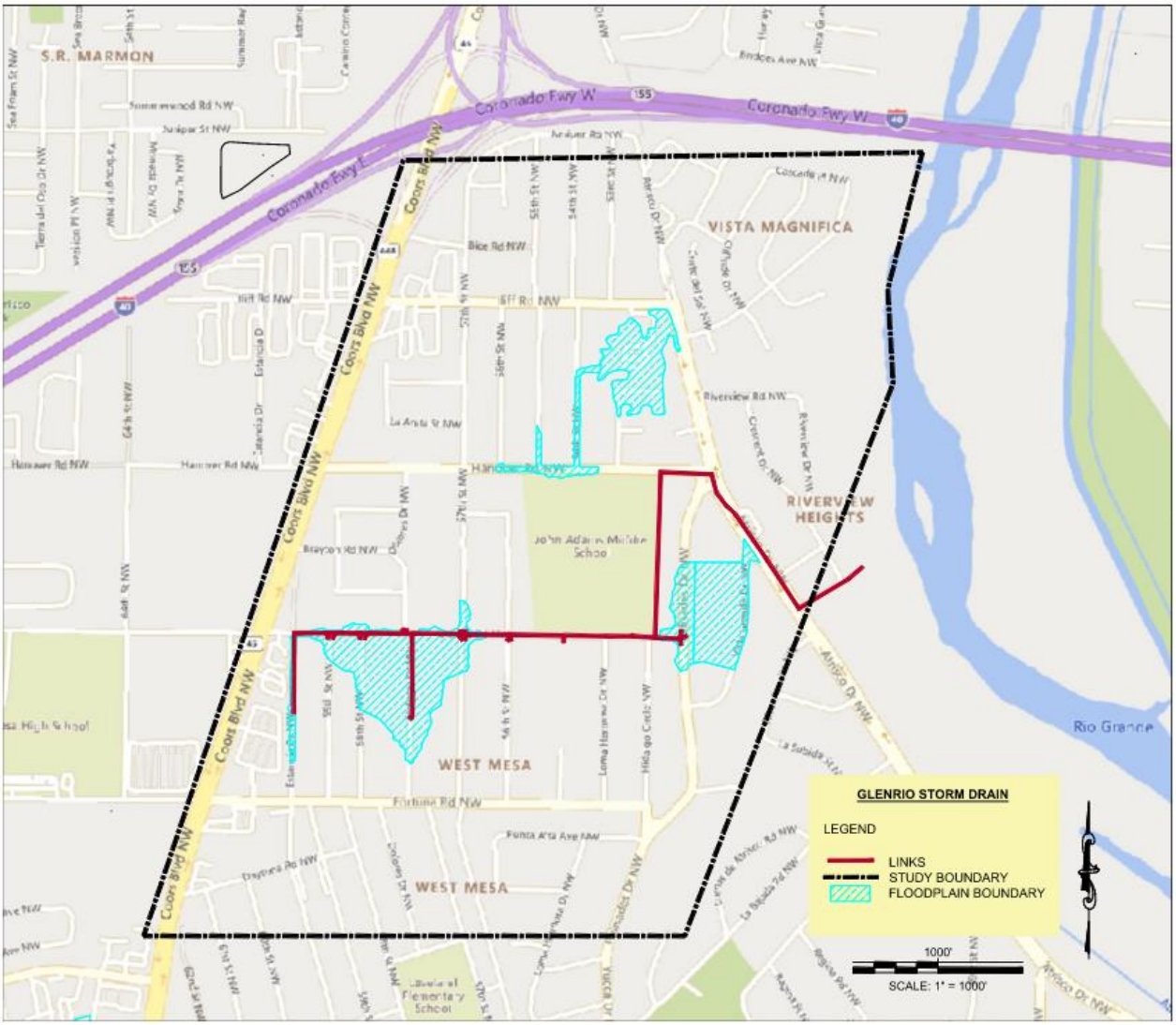
When comparing the existing and proposed conditions SSA models, the number of blue nodes (indicating surcharged inlets) is reduced, supporting the assumption that the improvements to the trunkline may address the needs to convey runoff more effectively and reduce/eliminate the floodplains (see Exhibits 2, 3 and 4). Final inlet locations and spacing will be determined in the design phase after a more detailed analysis can be performed.

Glenrio Network

The SSA model for the Glenrio network replaces the entire existing Glenrio Storm Drain system. The new Glenrio Storm Drain is intended to drain to a new outfall east of Riverview Place.

Based on preliminary analysis using the SSA software, recommendations include upsizing the pipe diameters throughout the network, maintaining 0.20% minimum slope to minimize trenching depths, adding new inlets and extending laterals on side streets to mitigate the flood plains.

Figure 6. Glenrio Network

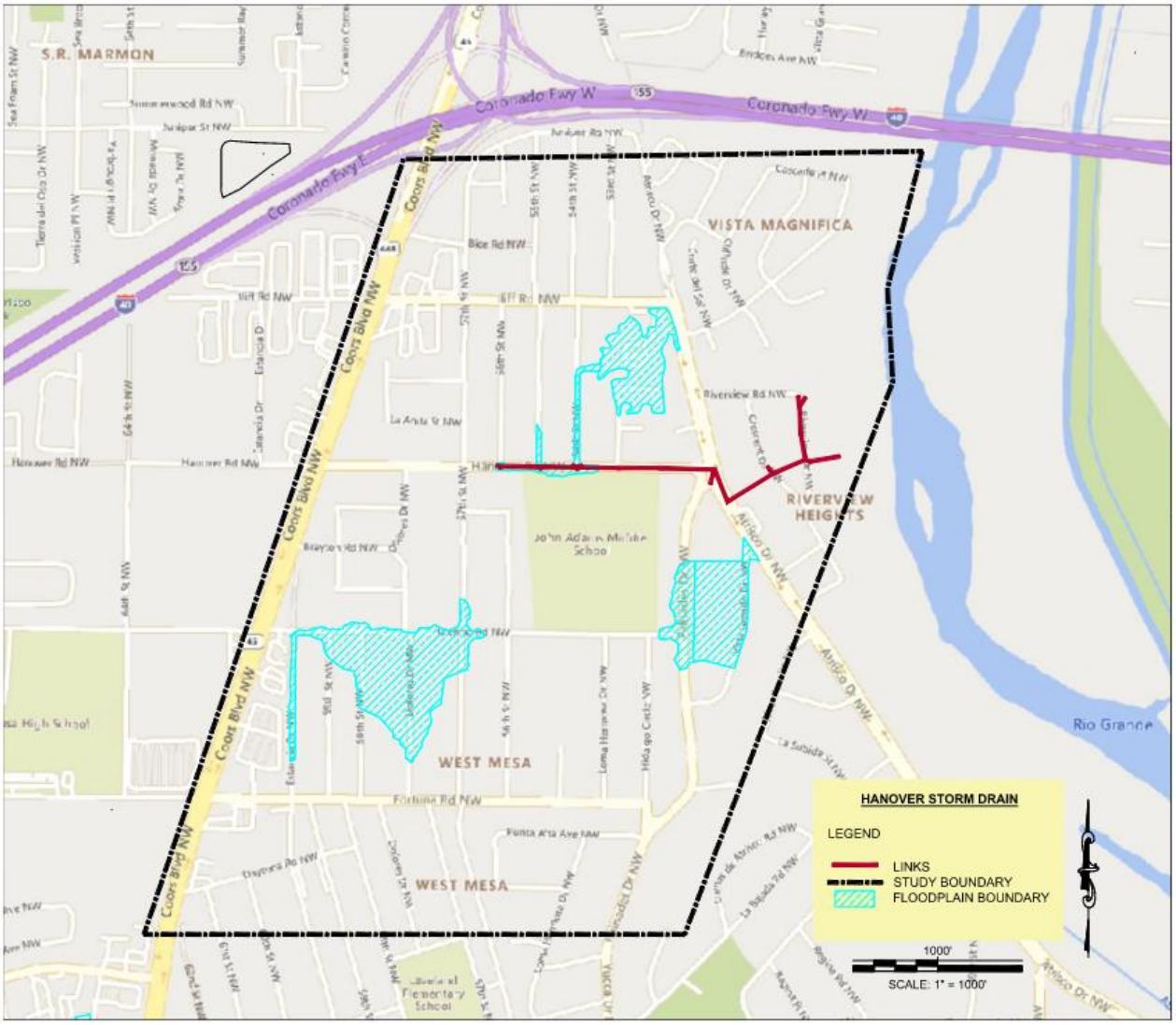


Hanover Network

The SSA model for the Hanover network extends the system west and adds inlets to the system and replaces the existing line along Hanover Road. It continues along Atrisco Drive and ties to the existing system in Little Park Street which drains to the existing outfall east of Riverview Drive.

The Hanover network is intended to include more inlets at the west (upstream) end of Hanover Drive and replace the line to mitigate the flood plain.

Figure 7. Hanover Network

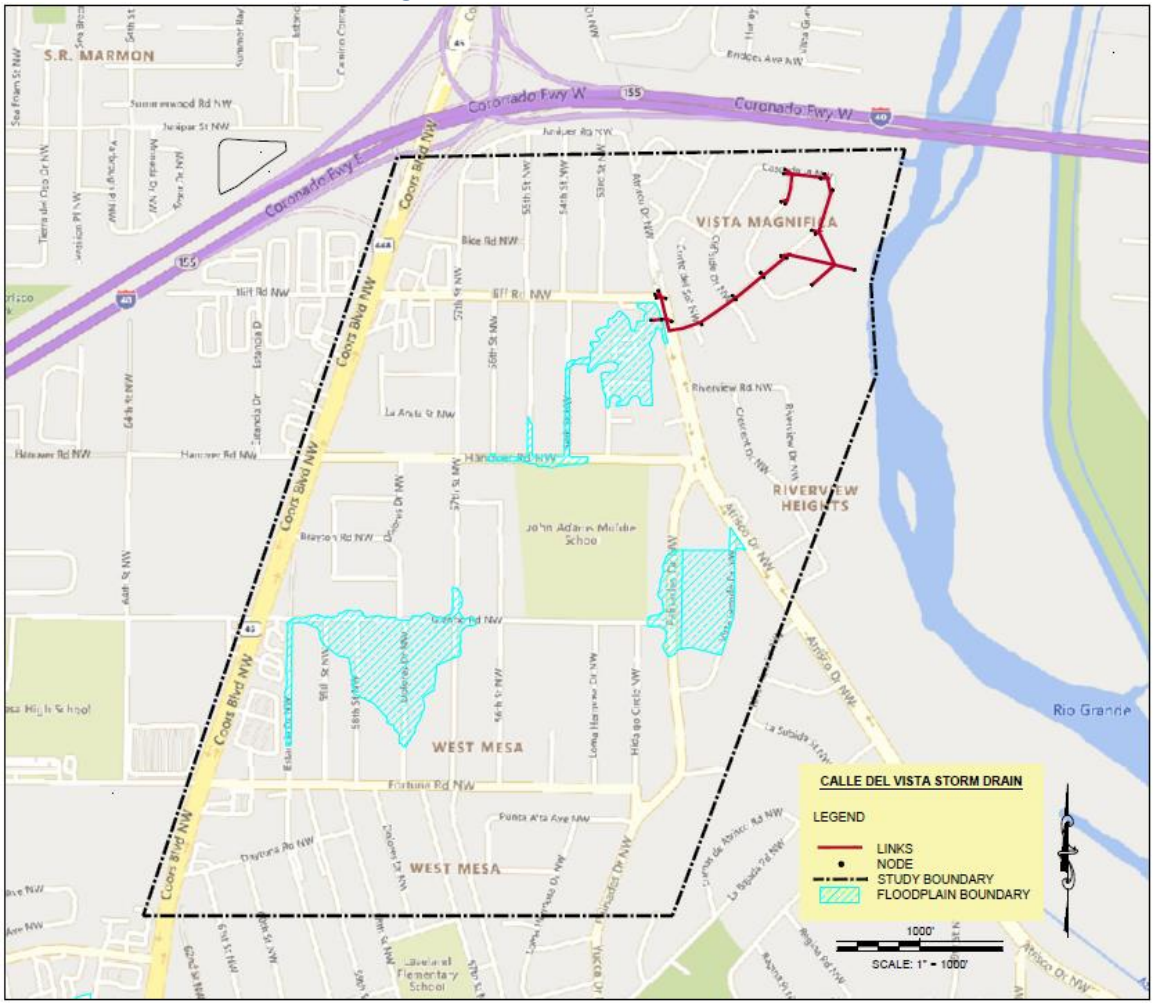


Calle del Vista Network

The SSA model for the Calle del Vista network incorporates a proposed detention pond southwest of the intersection of Iliff Road and Atrisco Boulevard to detain runoff near the flood plain and regulate runoff into the Calle del Vista system.

Survey information dated 02/20/2019 indicates a possible sag in the line along Atrisco Drive. For analysis purposes, this sag is presumed to be an error, but may require confirmation during the design phase. The proposed detention pond appears to mitigate the flood plain and no additional improvements to the system appear to be necessary.

Figure 8. Calle del Vista Network



5.0 FEMA Floodplain Identification

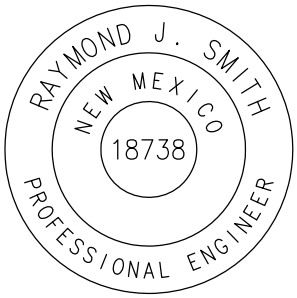
The project study area is in included in FEMA FIRM panel 35001c0327H, dated August 16, 2012. This map identifies the three flood plains, which are the focus of this study. All three flood plains are designated Zone AH, which indicates an area subject to inundation by the 1% chance annual storm event, where average depths are between one and three feet. Base Flood Elevations (BFE's) have been determined and are shown on the map. A copy of the FEMA firmette for the study area is included in Appendix D.

6.0 Engineer's Certification

I, Raymond J. Smith, a duly registered professional engineer in the State of New Mexico, (registration #18738), have prepared this report and related documents, and supervised the preparation of the enclosed exhibits. The information included is, to the best of my knowledge, accurate and consistent with professional practices in the State of New Mexico.

Raymond J. Smith

Raymond J. Smith, P.E. June 17, 2021



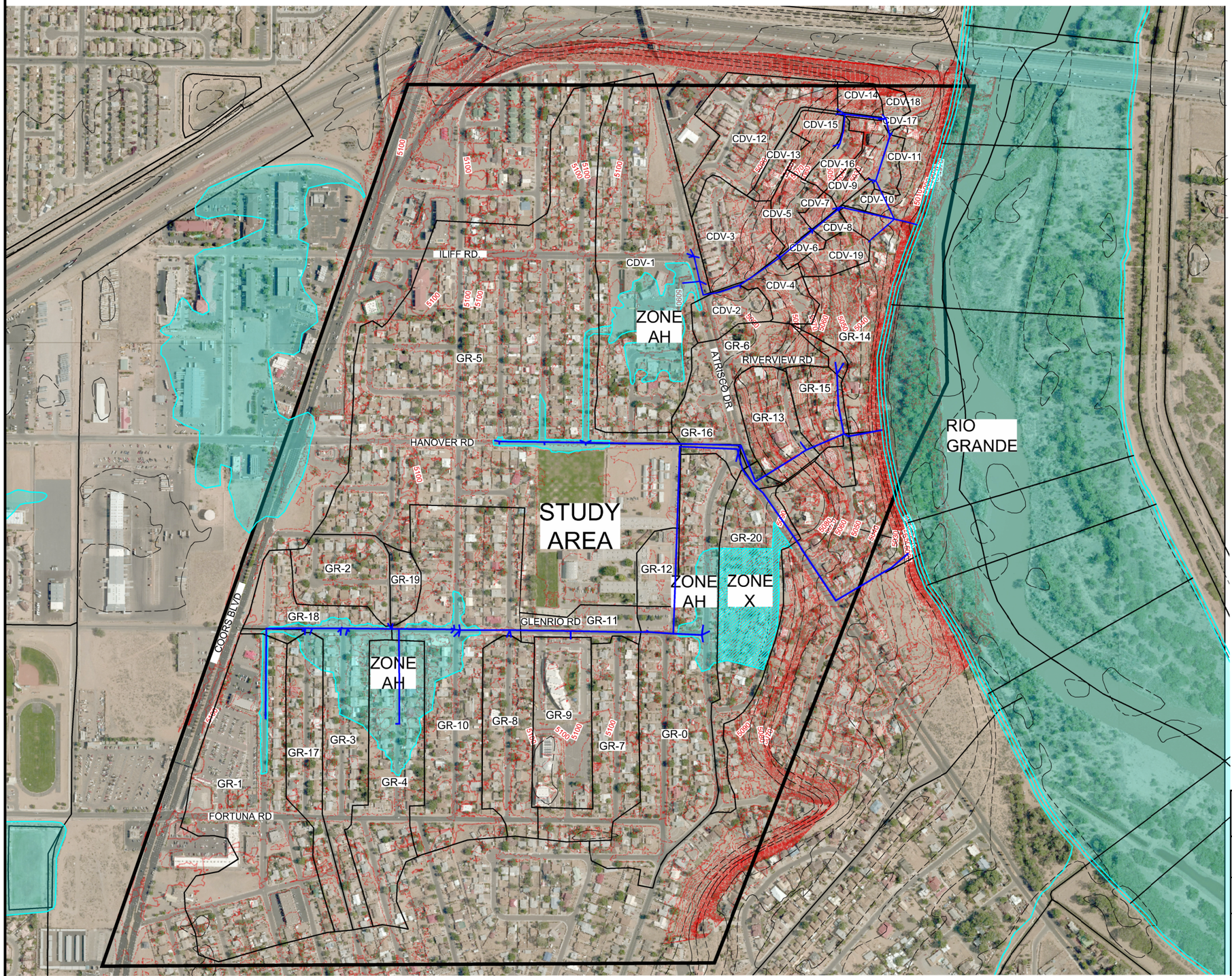
QC Reviewed by: Angela Valdez Date: June 17, 2021

Angela Valdez, P.E., C.F.M.
Vice President

SCAN ME

Exhibits

EXHIBIT 1 - BASIN MAP AND PROPOSED SYSTEMS



0 300 600 FEET

LEGEND

STORM DRAIN LINE

DRAINAGE BASIN

SURVEY INFORMATION
FIELD NOTES
NO. BY DATE

BENCH MARKS
1.

AS BUILT INFORMATION
CONTRACTOR DATE
PROJECT STARTED BY DATE
INSPECTOR'S SIGNATURE & DATE
FIELD VERIFICATION BY DATE
AS-BUILTS DRAWN BY DATE
CORRECTED BY DATE

MICRO-FILM INFORMATION
RECORDED BY DATE
NO.

ENGINEER'S SEAL

30% REVIEW

PRELIMINARY
NOT FOR CONSTRUCTION
3/2019

NO.	DATE	REMARKS	BY
		REVISIONS	
		SOUDER, MILLER & ASSOCIATES	
		DESIGNED BY: CYO	DATE: 03/28/2019
		DRAWN BY: CYO	DATE: 04/02/2019
		CHECKED BY: RS	DATE: 04/02/2019

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www.soudermiller.com

CITY OF ALBUQUERQUE
MUNICIPAL DEVELOPMENT DEPARTMENT
TRANSPORTATION DEVELOPMENT DIVISION

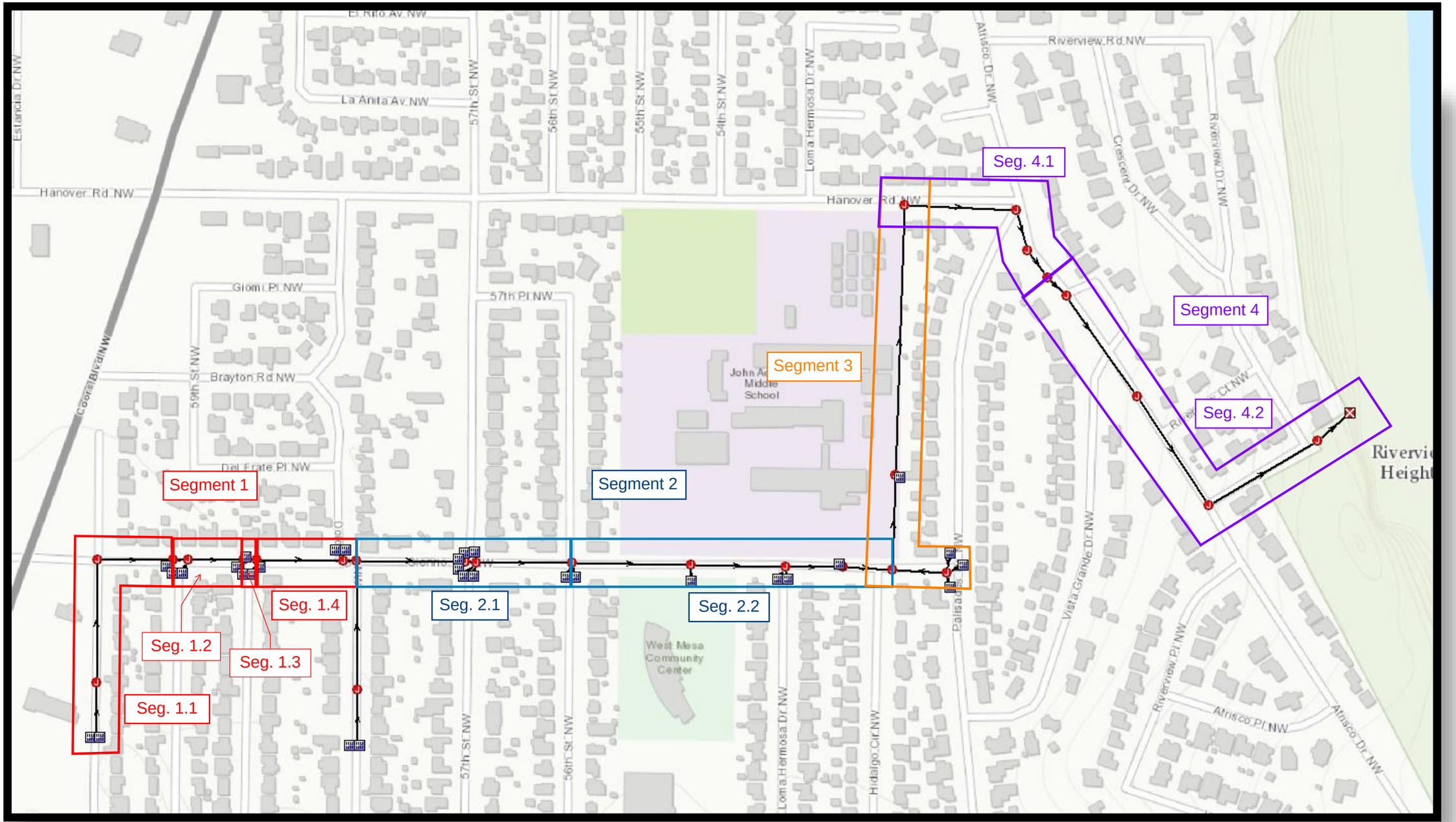
TITLE:
BASIN MAP AND PROPOSED SYSTEMS

Design Review Committee	City Engineer Approval	Last Design Update	Mo./Day/Yr.	Mo./Day/Yr.

City Project No. 9426198 | Zone Map No. | Sheet

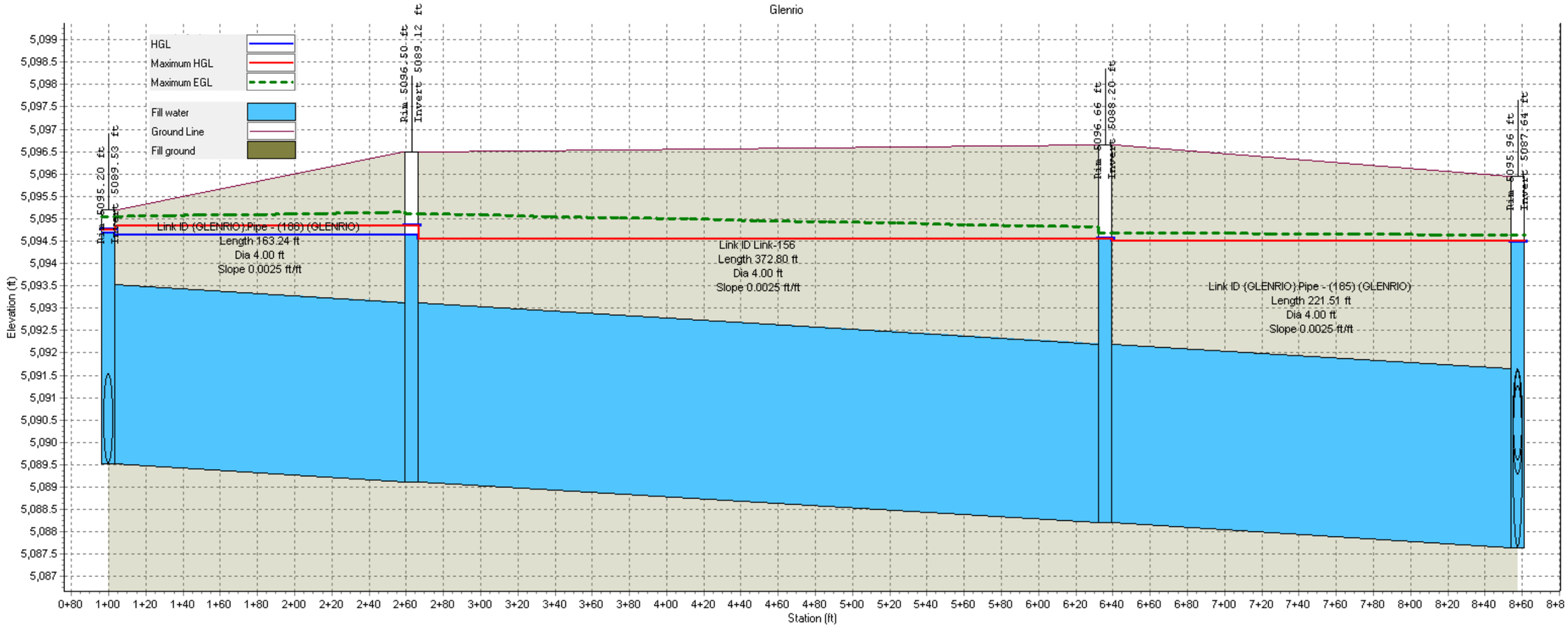
6/16/2021 P:\9-COA LOMA HERMOSA GLENRIO FLOOD PLAIN (9426198)\PLANNING\DRAINAGE REPORT\7423759 EXHIBIT 02.DWG

EXHIBIT 2 - GLENRIO SSA MODEL



GLENRIO ROAD

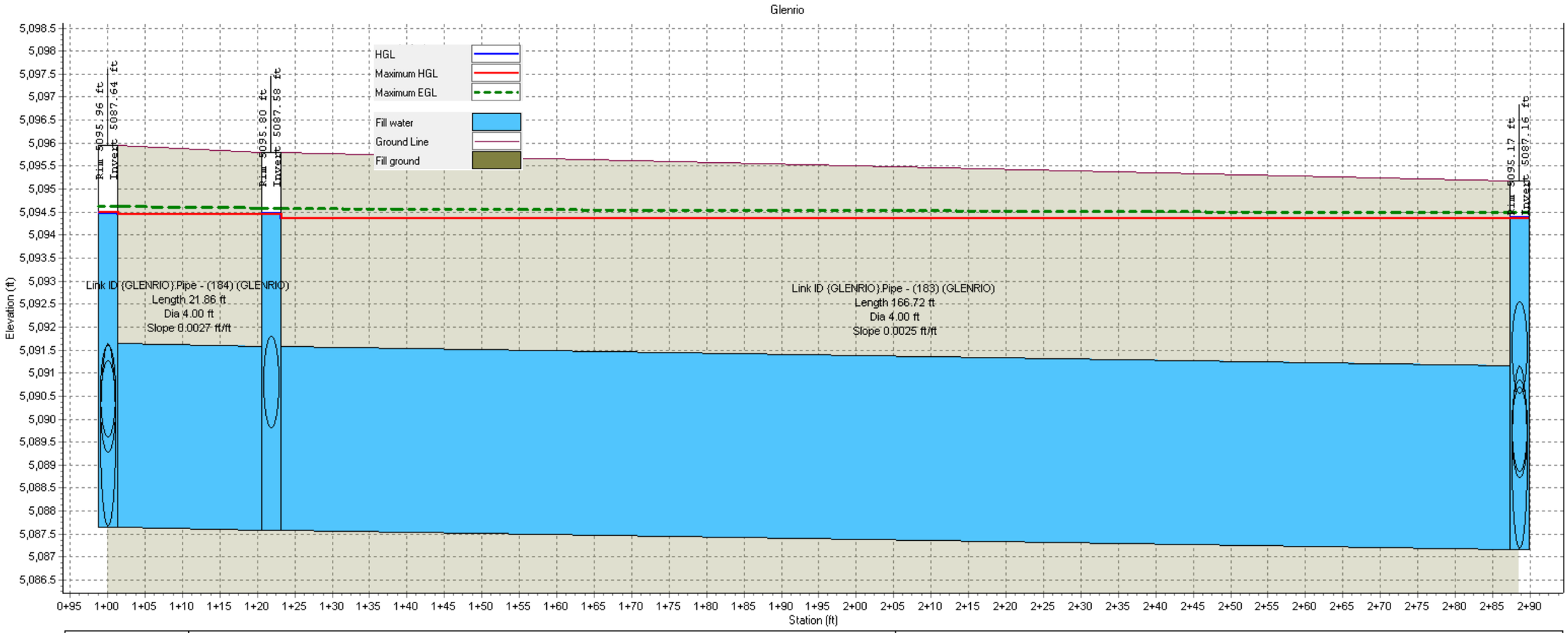
Segment 1.1: Estancia Drive to Glenrio & 59th Street



Node ID:		Jun-72		Structure - (192) (GLENRIO)		
Rim (ft):	5095.20	5096.50		5096.66		5095.96
Invert (ft):	5089.53	5089.12		5088.20		5087.64
Min Pipe Cover (ft):	1.67	3.38		4.46		4.32
Max HGL (ft):	5094.94	5096.50		5094.71		5094.50

Link ID:	{GLENRIO}.Pipe - (186) (GLENRIO)	Link-156	{GLENRIO}.Pipe - (185) (GLENRIO)
Length (ft):	163.24	372.80	221.51
Dia (ft):	4.00	4.00	4.00
Slope (ft/ft):	0.0025	0.0025	0.0025
Up Invert (ft):	5089.53	5089.12	5088.20
Dn Invert (ft):	5089.12	5088.20	5087.64
Max Q (cfs):	29.90	27.55	23.74
Max Vel (ft/s):	4.38	4.11	3.02
Max Depth (ft):	4.00	4.00	4.00

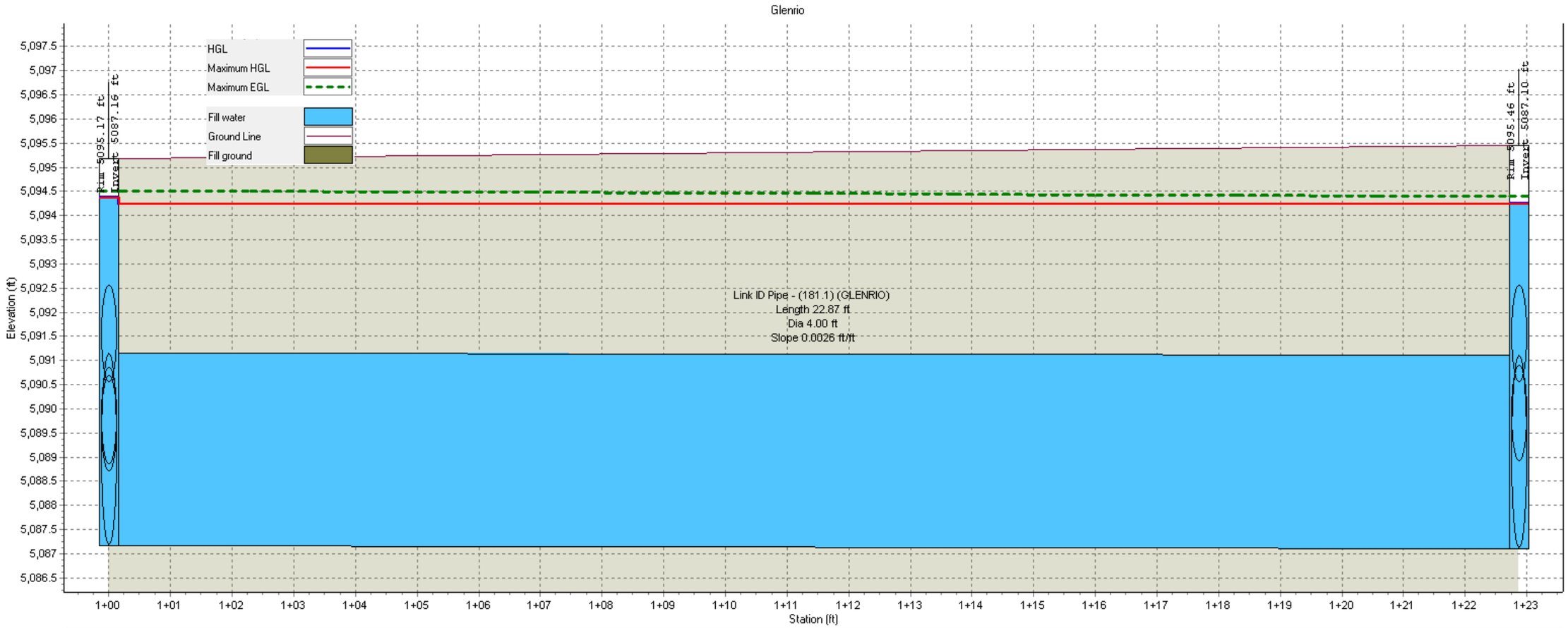
Segment 1.2: Glenrio Road from 59th Street to 58th Street



Node ID:		Structure - (190) (GLENRIO)	
Rim (ft):	5095.96	5095.80	5095.17
Invert (ft):	5087.64	5087.58	5087.16
Min Pipe Cover (ft):	4.32	4.00	2.62
Max HGL (ft):	5094.50	5094.45	5094.37

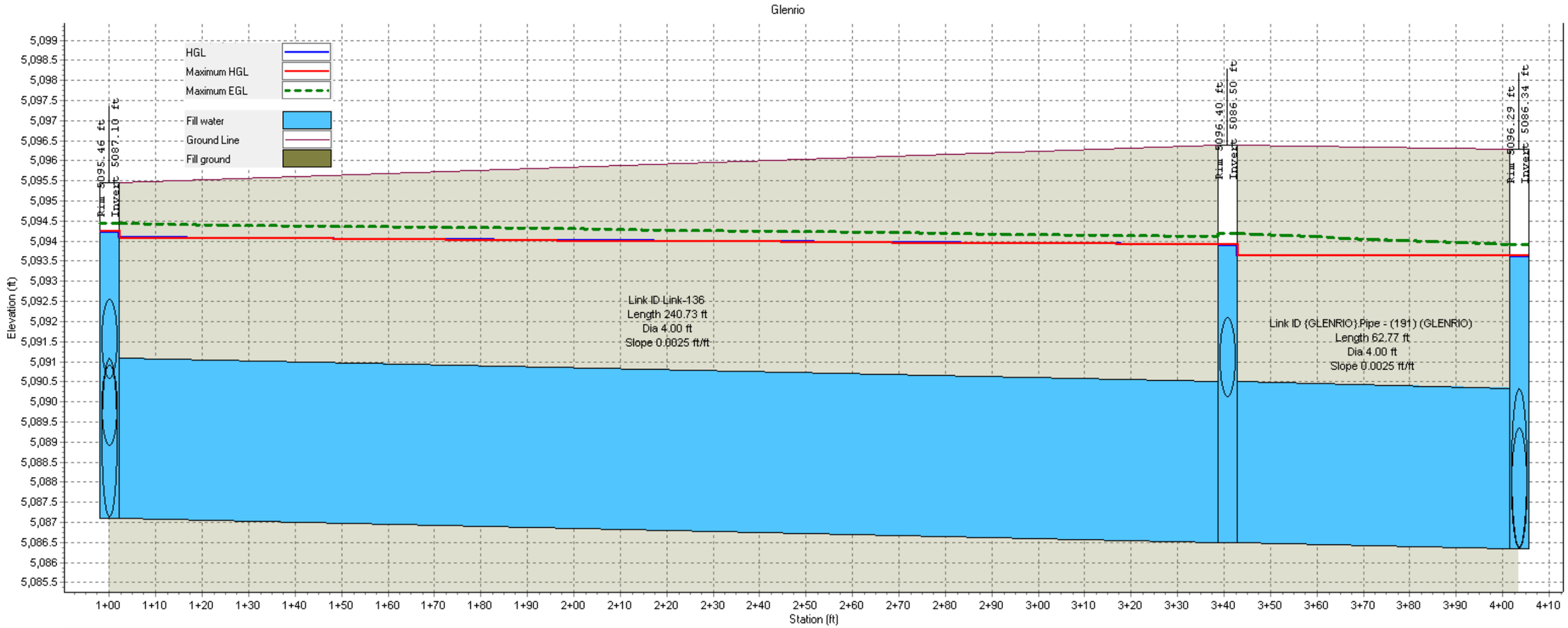
Link ID:	{GLENRIO}.Pipe - (184) (GLENRIO)	{GLENRIO}.Pipe - (183) (GLENRIO)
Length (ft):	21.86	166.72
Dia (ft):	4.00	4.00
Slope (ft/ft):	0.0027	0.0025
Up Invert (ft):	5087.64	5087.58
Dn Invert (ft):	5087.58	5087.16
Max Q (cfs):	26.33	28.35
Max Vel (ft/s):	2.95	2.84
Max Depth (ft):	4.00	4.00

Segment 1.3: Glenrio Road at 58th Street Intersection



Node ID:			
Rim (ft):	5095.17		5095.46
Invert (ft):	5087.16		5087.10
Min Pipe Cover (ft):	2.62		2.91
Max HGL (ft):	5094.37		5094.24
Link ID:		Pipe - (181.1) (GLENRIO)	
Length (ft):		22.87	
Dia (ft):		4.00	
Slope (ft/ft):		0.0026	
Up Invert (ft):		5087.16	
Dn Invert (ft):		5087.10	
Max Q (cfs):		38.51	
Max Vel (ft/s):		3.17	
Max Depth (ft):		4.00	

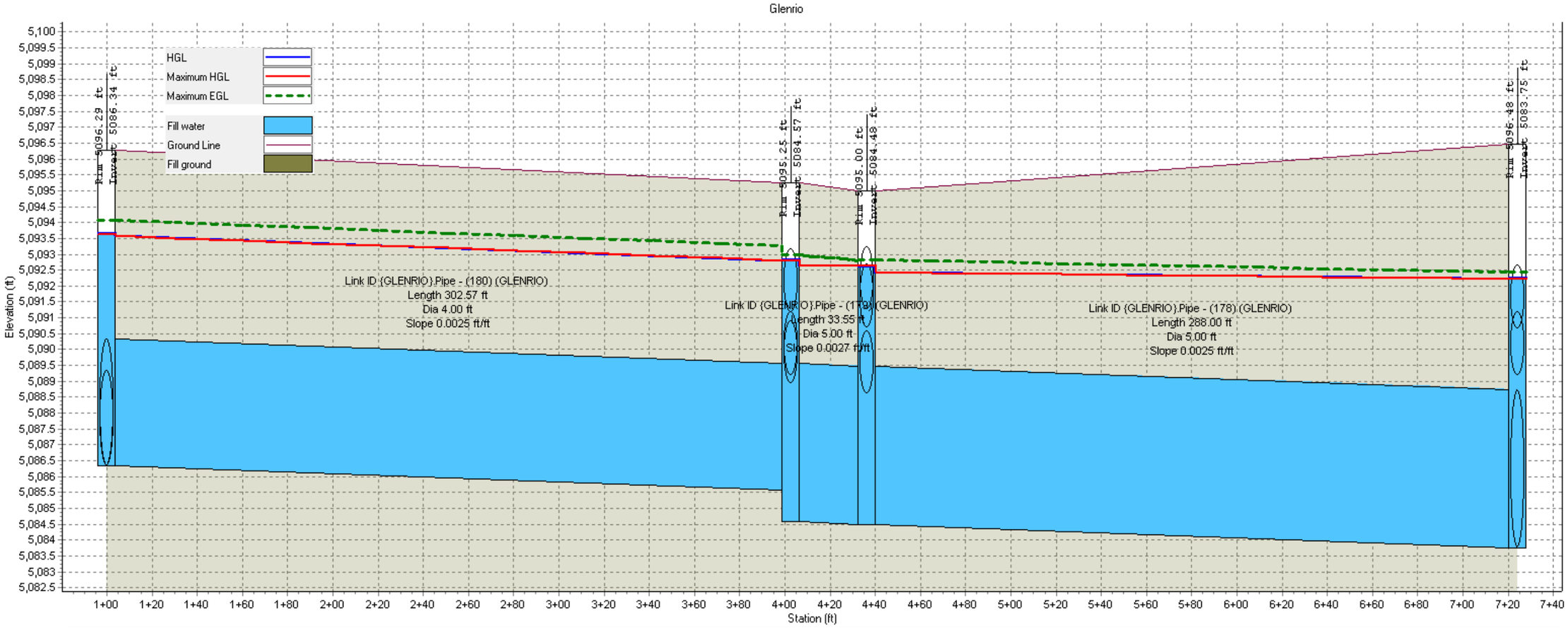
Segment 1.4: Glenrio Road from 58th Street to Dolores Drive



Node ID:		Structure - (197) (GLENRIO)	
Rim (ft):	5095.46	5096.40	5096.29
Invert (ft):	5087.10	5086.50	5086.34
Min Pipe Cover (ft):	2.91	4.30	5.95
Max HGL (ft):	5094.24	5093.91	5093.63

Link ID:	Link-136	{GLENRIO}.Pipe - (191) (GLENRIO)
Length (ft):	240.73	62.77
Dia (ft):	4.00	4.00
Slope (ft/ft):	0.0025	0.0025
Up Invert (ft):	5087.10	5086.50
Dn Invert (ft):	5086.50	5086.34
Max Q (cfs):	45.05	53.30
Max Vel (ft/s):	3.58	4.24
Max Depth (ft):	4.00	4.00

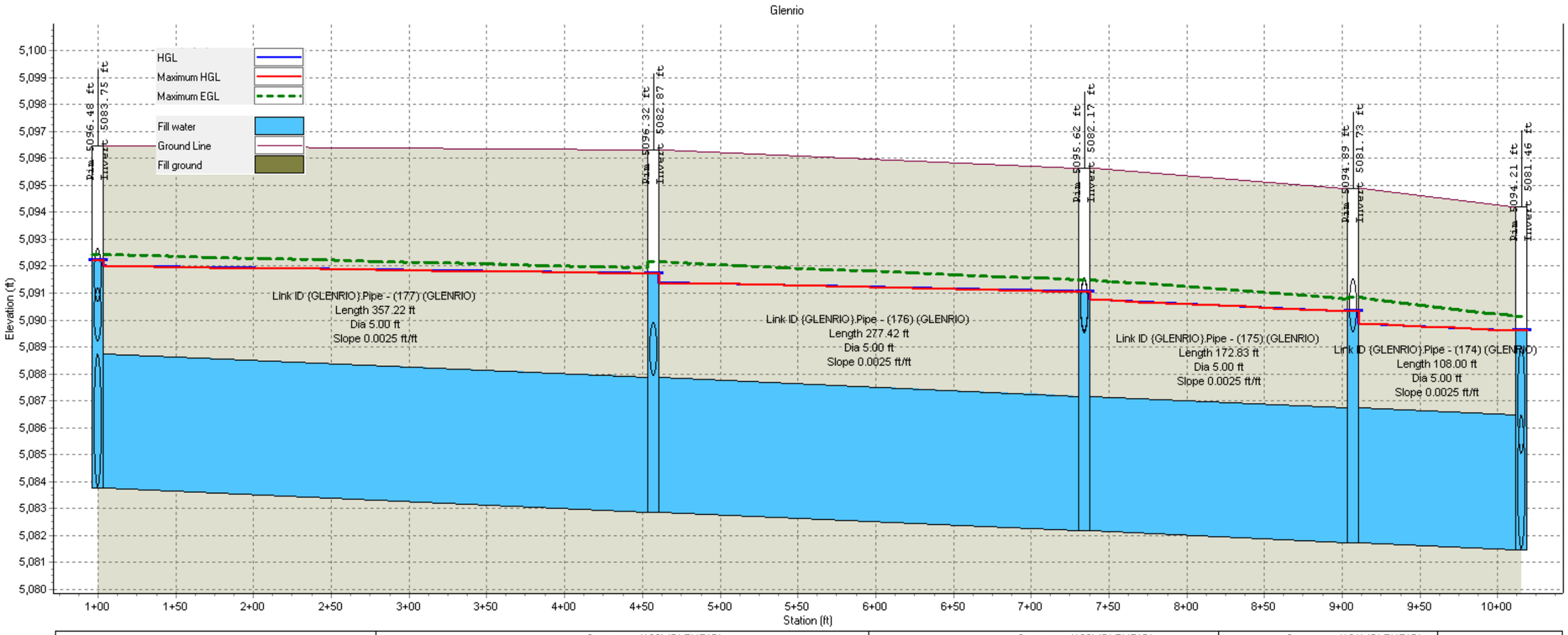
Segment 2.1: Glenrio Road from Dolores Drive to 56th Street



Node ID:		Structure - (186) (GLENRIO)	Structure - (185) (GLENRIO)	
Rim (ft):	5096.29	5095.25	5095.00	5096.48
Invert (ft):	5086.34	5084.57	5084.48	5083.75
Min Pipe Cover (ft):	5.95	2.08	1.75	3.83
Max HGL (ft):	5093.63	5092.82	5092.63	5092.24

Link ID:	{GLENRIO}.Pipe - (180) (GLENRIO)	{GLENRIO}.Pipe - (179) (GLENRIO)	{GLENRIO}.Pipe - (178) (GLENRIO)
Length (ft):	302.57	33.55	288.00
Dia (ft):	4.00	5.00	5.00
Slope (ft/ft):	0.0025	0.0027	0.0025
Up Invert (ft):	5086.34	5084.57	5084.48
Dn Invert (ft):	5085.57	5084.48	5083.75
Max Q (cfs):	67.51	67.00	71.61
Max Vel (ft/s):	5.37	3.41	3.65
Max Depth (ft):	4.00	5.00	5.00

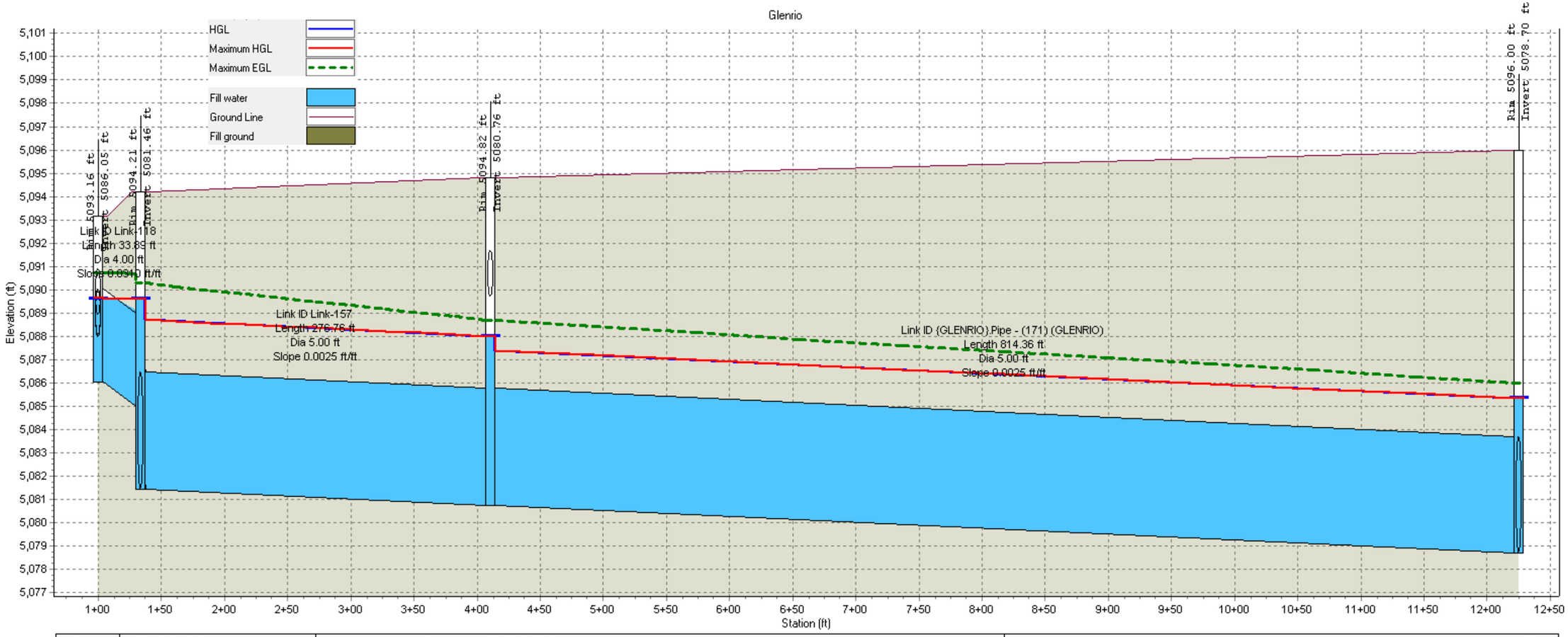
Segment 2.2: Glenrio Road at 56th Street to Hidalgo Circle



Node ID:		Structure - (183) (GLENRIO)	Structure - (182) (GLENRIO)	Structure - (181) (GLENRIO)	
Rim (ft):	5096.48	5096.32	5095.62	5094.89	5094.21
Invert (ft):	5083.75	5082.87	5082.17	5081.73	5081.46
Min Pipe Cover (ft):	3.83	6.42	4.07	3.35	5.21
Max HGL (ft):	5092.24	5091.74	5091.07	5090.33	5089.60

Link ID:	{GLENRIO}.Pipe - (177) (GLENRIO)	{GLENRIO}.Pipe - (176) (GLENRIO)	{GLENRIO}.Pipe - (175) (GLENRIO)	{GLENRIO}.Pipe - (174) (GLENRIO)
Length (ft):	357.22	277.42	172.83	108.00
Dia (ft):	5.00	5.00	5.00	5.00
Slope (ft/ft):	0.0025	0.0025	0.0025	0.0025
Up Invert (ft):	5083.75	5082.87	5082.17	5081.73
Dn Invert (ft):	5082.87	5082.17	5081.73	5081.46
Max Q (cfs):	73.11	92.44	106.13	113.75
Max Vel (ft/s):	3.72	5.27	5.41	5.79
Max Depth (ft):	5.00	5.00	5.00	5.00

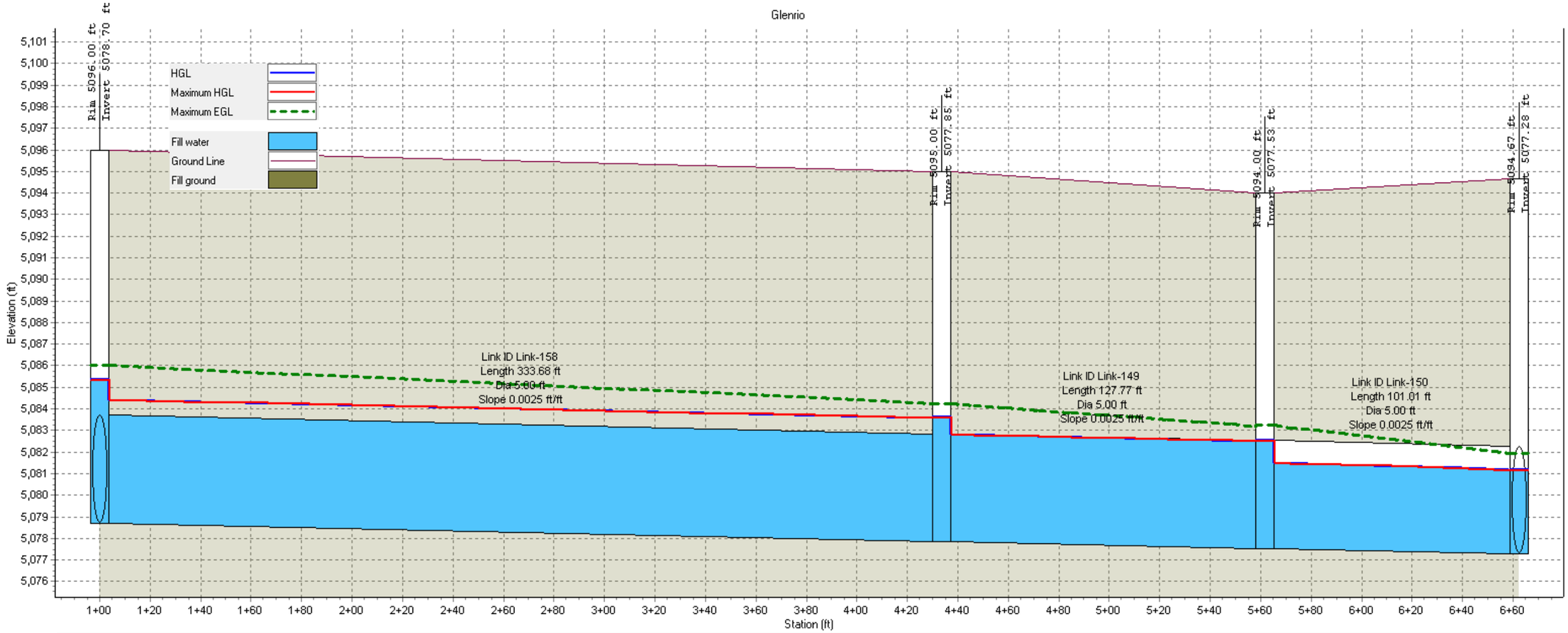
Segment 3: Glenrio Road at Palisades Drive to Hanover Road & Atrisco Drive (Across School)



Node ID:	Structure - (180) (GLENRIO)		Structure - (178) (GLENRIO)		Jun-73
Rim (ft):	5093.16	5094.21	5094.82		5096.00
Invert (ft):	5086.05	5081.46	5080.76		5078.70
Min Pipe Cover (ft):	2.27	5.21	3.15		12.30
Max HGL (ft):	5089.63	5089.60	5088.03		5085.36

Link ID:	Link-118	Link-157	{GLENRIO}.Pipe - (171) (GLENRIO)
Length (ft):	33.89	276.76	814.36
Dia (ft):	4.00	5.00	5.00
Slope (ft/ft):	0.0310	0.0025	0.0025
Up Invert (ft):	5086.05	5081.46	5080.76
Dn Invert (ft):	5085.00	5080.76	5078.70
Max Q (cfs):	23.13	129.82	129.10
Max Vel (ft/s):	8.42	6.61	6.58
Max Depth (ft):	3.79	5.00	5.00

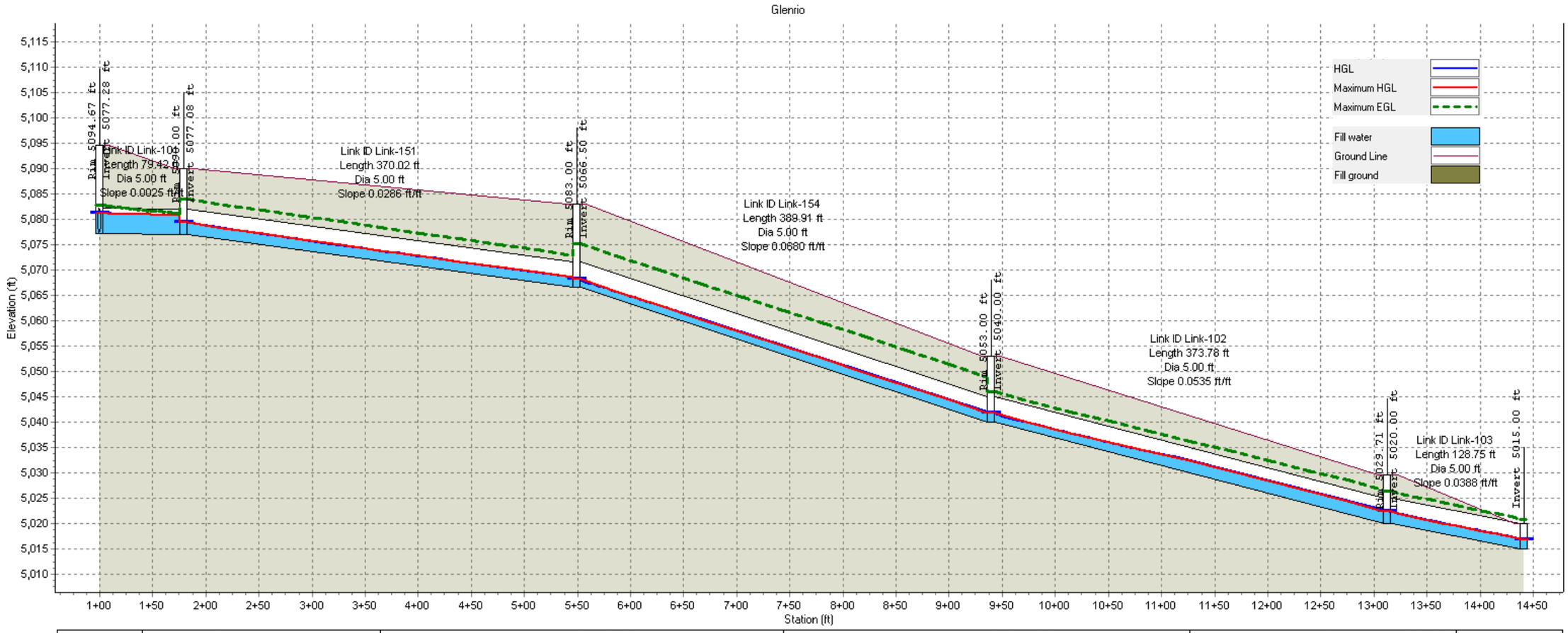
Segment 4.1: Hanover Road & Atrisco Drive to Palisades Drive & Riverview Place



Node ID:	Jun-73	Structure - (311) (GLENRIO)	Structure - (310) (GLENRIO)	
Rim (ft):	5096.00	5095.00	5094.00	5094.67
Invert (ft):	5078.70	5077.85	5077.53	5077.28
Min Pipe Cover (ft):	12.30	12.15	11.47	12.39
Max HGL (ft):	5085.36	5083.59	5082.51	5081.16

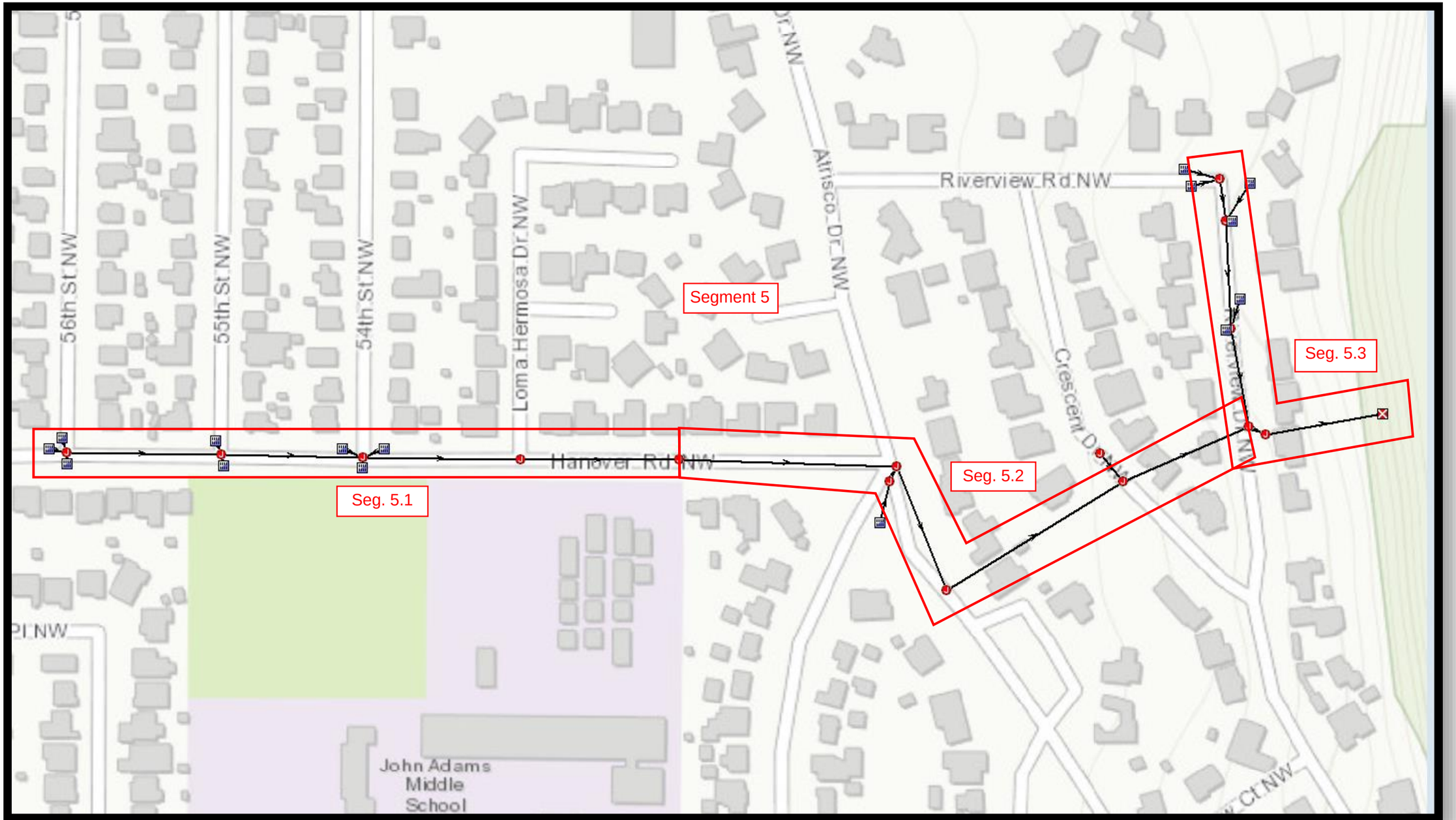
Link ID:	Link-158	Link-149	Link-150
Length (ft):	333.68	127.77	101.01
Dia (ft):	5.00	5.00	5.00
Slope (ft/ft):	0.0025	0.0025	0.0025
Up Invert (ft):	5078.70	5077.85	5077.53
Dn Invert (ft):	5077.85	5077.53	5077.28
Max Q (cfs):	129.10	129.10	129.10
Max Vel (ft/s):	6.58	6.58	7.02
Max Depth (ft):	5.00	4.98	4.42

Segment 4.2: Palisades Drive & Riverview Place to Outfall



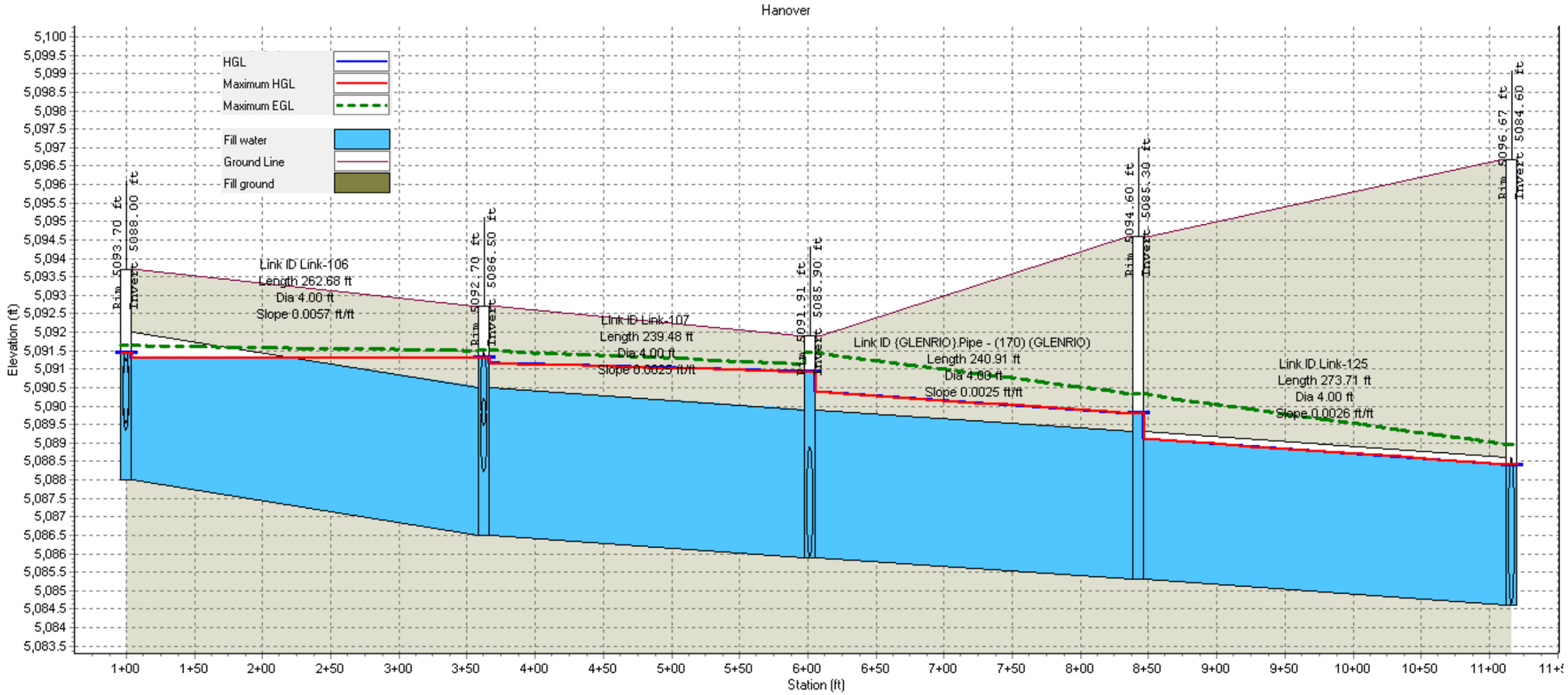
Node ID:	Structure - (308) (GLENRIO)		Structure - (315) (GLENRIO)	Structure - (307) (GLENRIO)	Structure - (306) (GLENRIO)	Out-01
Rim (ft):	5094.67	5090.00	5083.00	5053.00	5029.71	
Invert (ft):	5077.28	5077.08	5066.50	5040.00	5020.00	5015.00
Min Pipe Cover (ft):	12.39	7.92	11.50	8.00	4.71	
Max HGL (ft):	5081.16	5079.43	5068.22	5041.76	5022.45	5016.84

Link ID:	Link-101	Link-151	Link-154	Link-102	Link-103
Length (ft):	79.42	370.02	389.91	373.78	128.75
Dia (ft):	5.00	5.00	5.00	5.00	5.00
Slope (ft/ft):	0.0025	0.0286	0.0680	0.0535	0.0388
Up Invert (ft):	5077.28	5077.08	5066.50	5040.00	5020.00
Dn Invert (ft):	5077.08	5066.50	5040.00	5020.00	5015.00
Max Q (cfs):	129.10	129.11	129.11	129.11	129.11
Max Vel (ft/s):	10.05	17.19	21.26	16.45	16.01
Max Depth (ft):	3.11	2.03	1.73	2.09	2.14



HANOVER ROAD

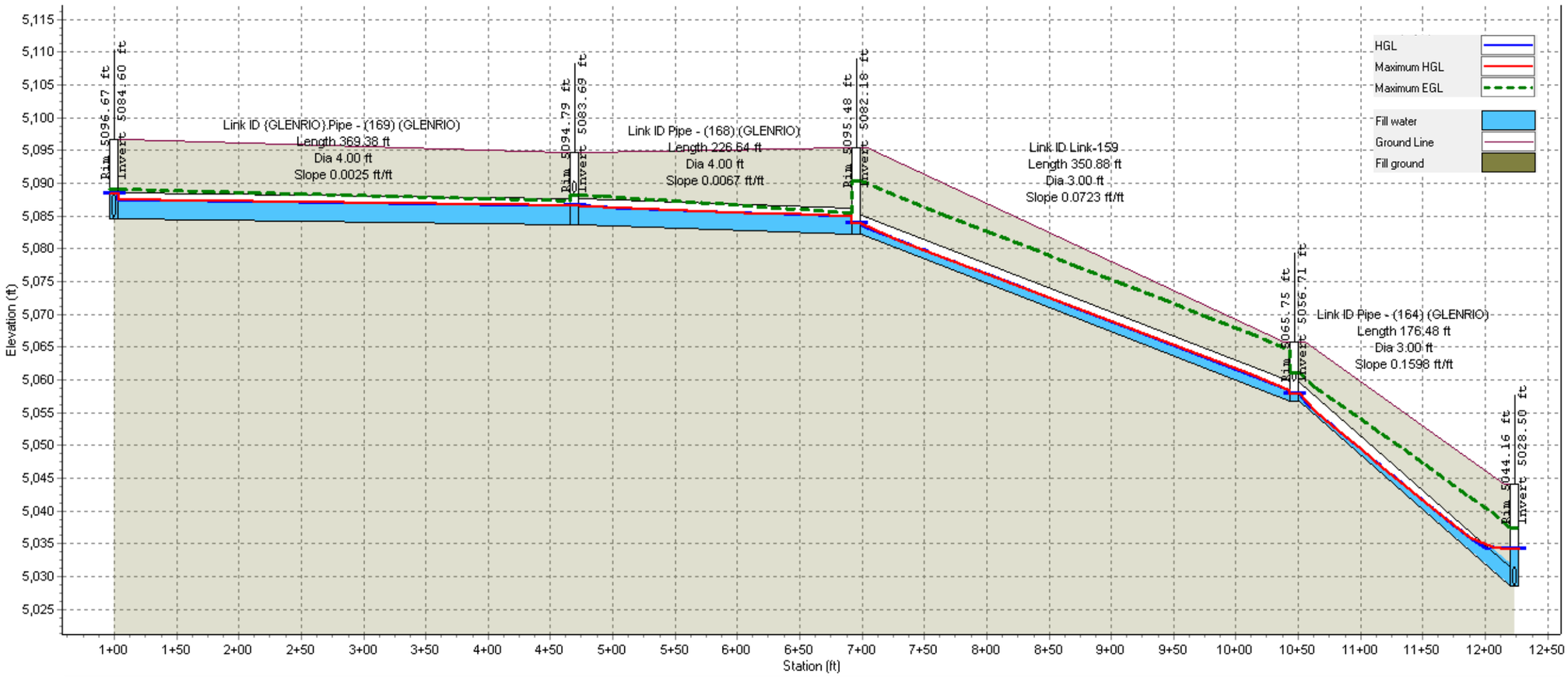
Segment 5.1: Proposed 58th to Existing Corner of School



Node ID:		Structure - (304) (GLENRIO)	Structure - (177) (GLENRIO)	Structure - (303) (GLENRIO)	
Rim (ft):	5093.70	5092.70	5091.91	5094.60	5096.67
Invert (ft):	5088.00	5086.50	5085.90	5085.30	5084.60
Min Pipe Cover (ft):	1.70	1.25	2.01	5.30	8.07
Max HGL (ft):	5091.70	5091.53	5090.95	5089.80	5088.42

Link ID:	Link-106	Link-107	{GLENRIO}.Pipe - (170) (GLENRIO)	Link-125
Length (ft):	262.68	239.48	240.91	273.71
Dia (ft):	4.00	4.00	4.00	4.00
Slope (ft/ft):	0.0057	0.0025	0.0025	0.0026
Up Invert (ft):	5088.00	5086.50	5085.90	5085.30
Dn Invert (ft):	5086.50	5085.90	5085.30	5084.60
Max Q (cfs):	28.57	45.05	73.17	73.11
Max Vel (ft/s):	3.56	3.66	5.82	5.88
Max Depth (ft):	3.72	4.00	4.00	3.91

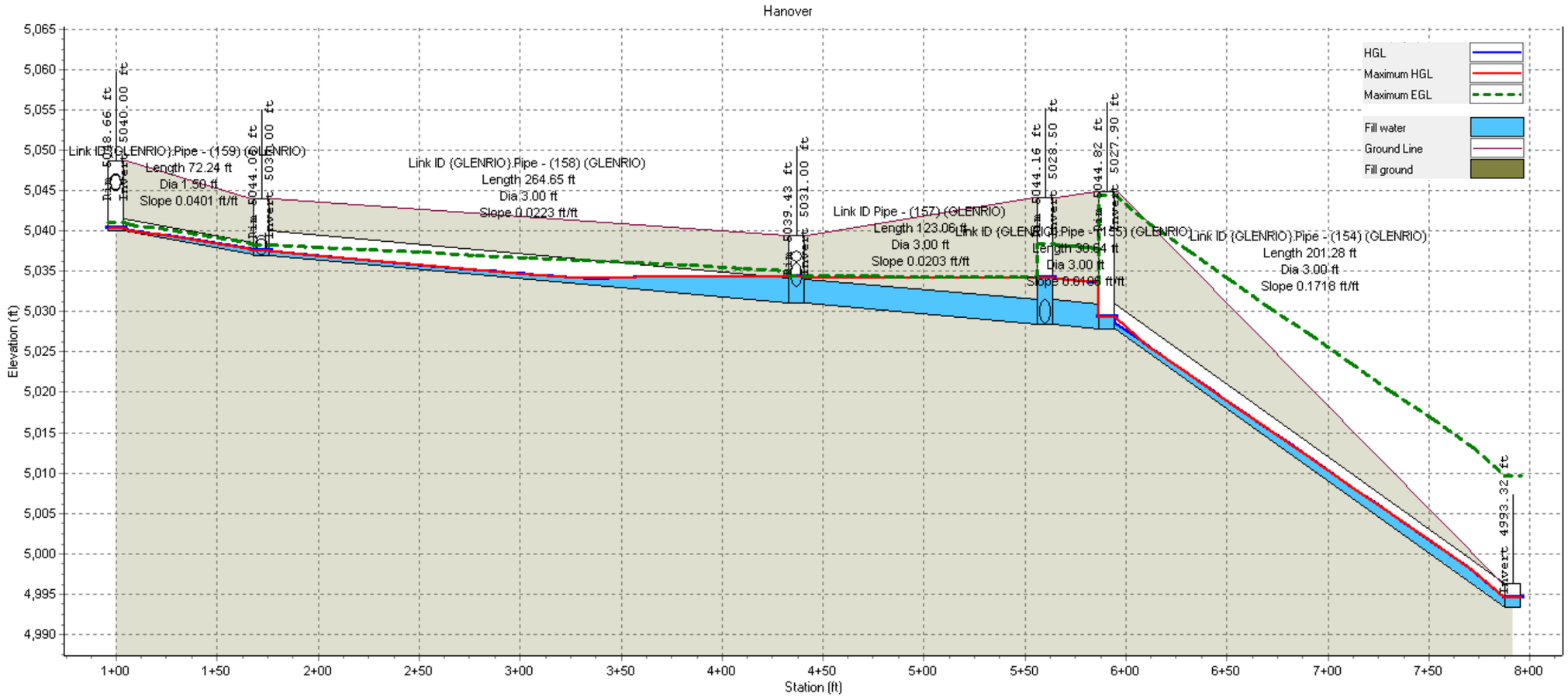
Segment 5.2: Corner of School to Riverview Drive



Node ID:		Structure - (175) (GLENRIO)	Structure - (173) (GLENRIO)	Structure - (171) (GLENRIO)	
Rim (ft):	5096.67	5094.79	5095.48	5065.75	5044.16
Invert (ft):	5084.60	5083.69	5082.18	5056.71	5028.50
Min Pipe Cover (ft):	8.07	4.39	9.30	4.56	12.66
Max HGL (ft):	5088.42	5086.64	5083.82	5057.90	5034.20

Link ID:		{GLENRIO}.Pipe - (169) (GLENRIO)	Pipe - (168) (GLENRIO)	Link-159	Pipe - (164) (GLENRIO)	
Length (ft):		369.38	226.64	350.88	176.48	
Dia (ft):		4.00	4.00	3.00	3.00	
Slope (ft/ft):		0.0025	0.0067	0.0723	0.1598	
Up Invert (ft):		5084.60	5083.69	5082.18	5056.71	
Dn Invert (ft):		5083.69	5082.18	5056.80	5028.50	
Max Q (cfs):		72.88	76.40	76.39	76.39	
Max Vel (ft/s):		6.46	10.24	20.52	14.50	
Max Depth (ft):		3.38	2.30	1.56	2.09	

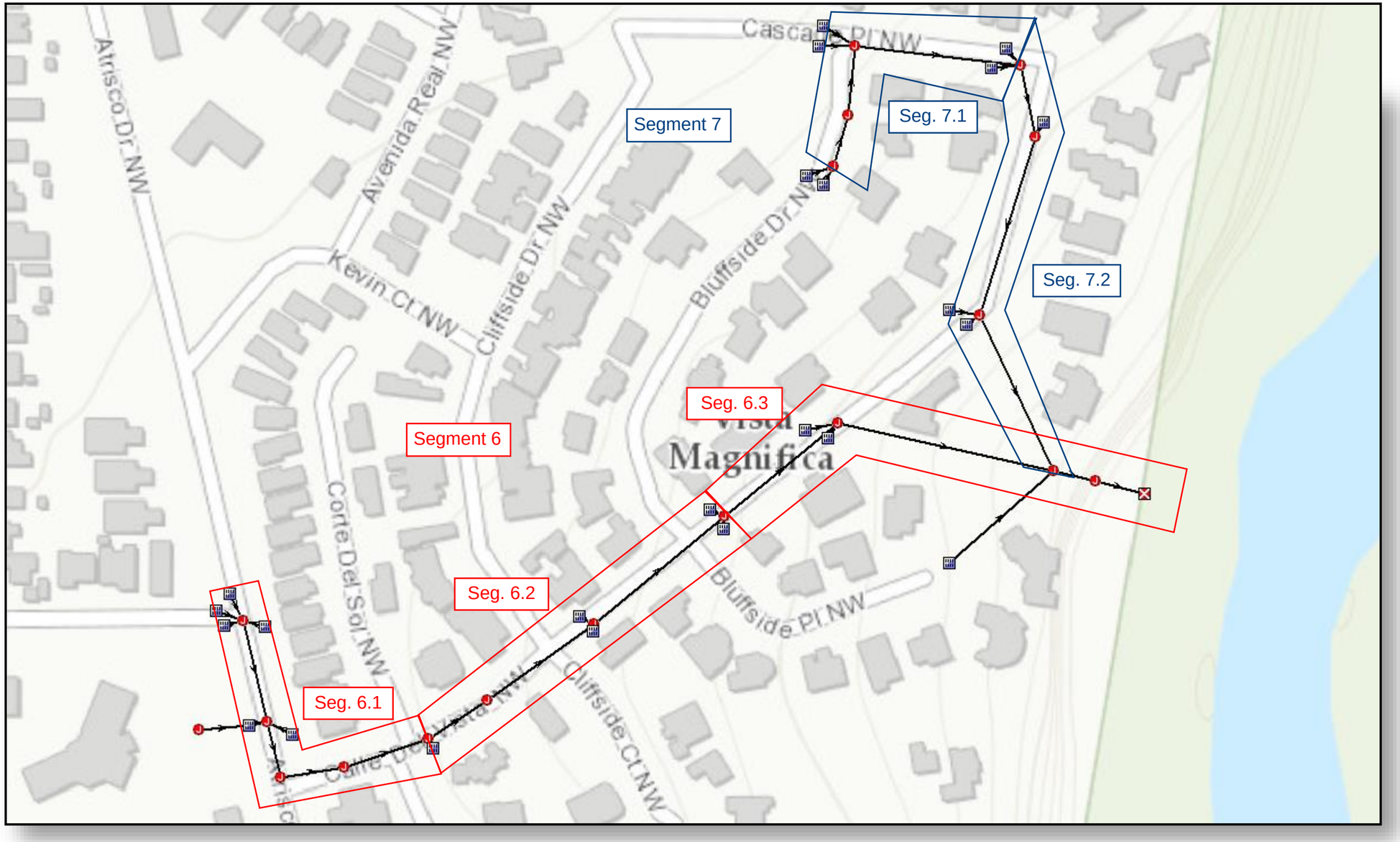
Segment 5.3: Riverview Road to Outfall



Node ID:	Structure - (164) (GLENRIO)		Structure - (163) (GLENRIO)	Structure - (161) (GLENRIO)		StartNullStruct0
Rim (ft):	5048.66	5044.05	5039.43	5044.16	5044.82	
Invert (ft):	5040.00	5037.00	5031.00	5028.50	5027.90	4993.32
Min Pipe Cover (ft):	1.64	4.05	1.87	12.66	13.92	
Max HGL (ft):	5040.40	5037.58	5034.35	5034.20	5029.31	4994.51

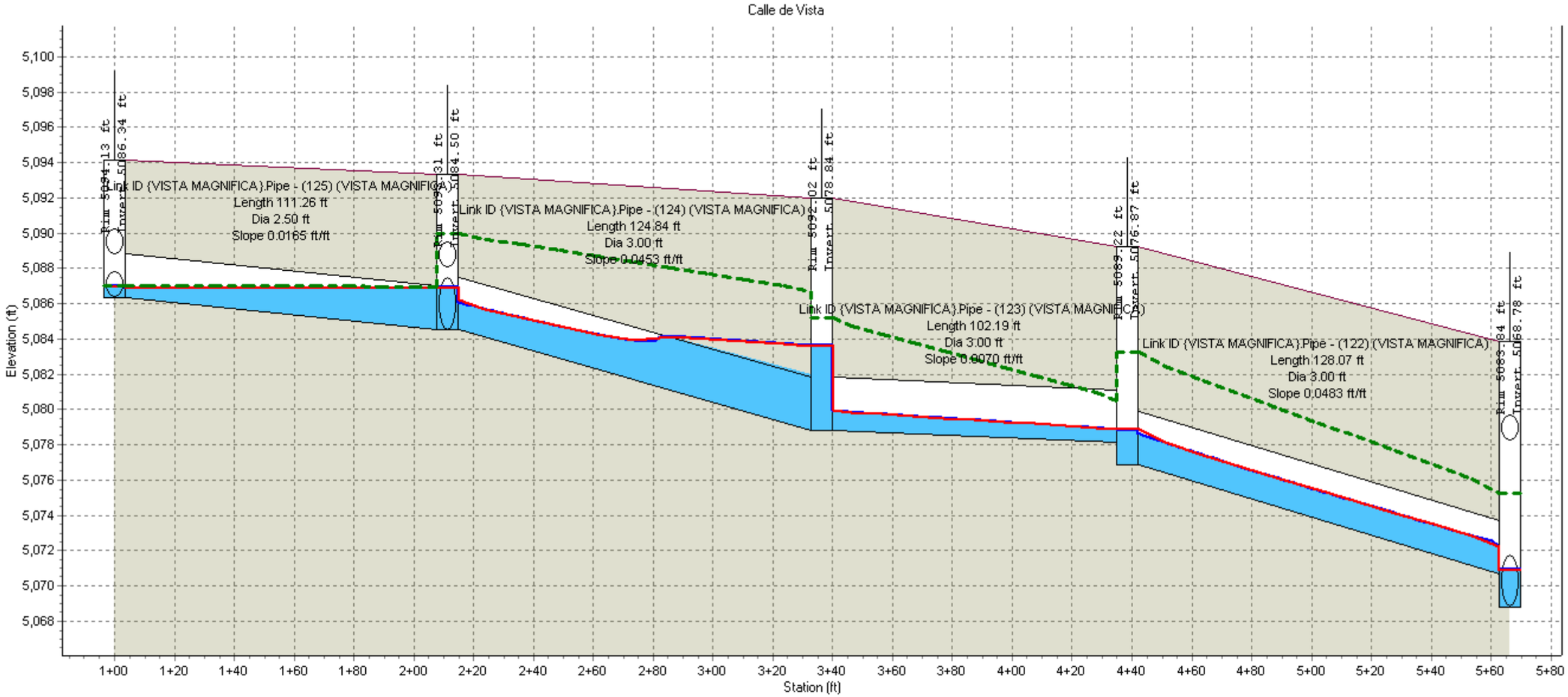
Link ID:	{GLENRIO}.Pipe - (159) (GLENRIO)	{GLENRIO}.Pipe - (158) (GLENRIO)	Pipe - (157) (GLENRIO)	{GLENRIO}.Pipe - (155) (GLENRIO)	{GLENRIO}.Pipe - (154) (GLENRIO)
Length (ft):	72.24	264.65	123.06	30.64	201.28
Dia (ft):	1.50	3.00	3.00	3.00	3.00
Slope (ft/ft):	0.0401	0.0223	0.0203	0.0196	0.1718
Up Invert (ft):	5040.00	5037.00	5031.00	5028.50	5027.90
Dn Invert (ft):	5037.10	5031.10	5028.50	5027.90	4993.32
Max Q (cfs):	2.91	8.22	16.24	91.73	91.73
Max Vel (ft/s):	6.72	6.95	2.98	16.48	31.25
Max Depth (ft):	0.44	1.79	3.00	2.20	1.29

EXHIBIT 4: CALLE DEL VISTA SSA MODEL



CALLE DEL VISTA

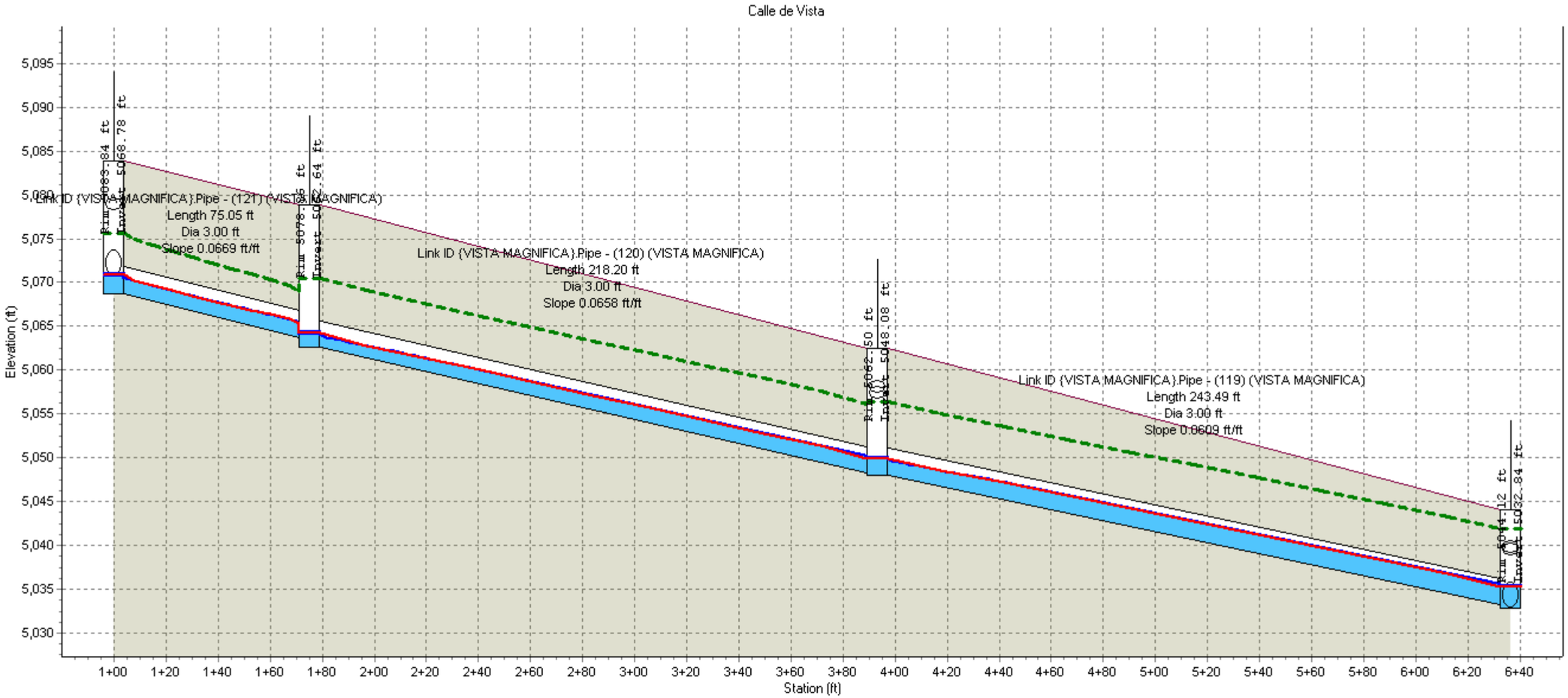
Segment 6.1: Along Atrisco Drive to Corte del Sol



Node ID:		Structure - (129) (VISTA MAGNIFICA)	Structure - (128) (VISTA MAGNIFICA)	Structure - (127) (VISTA MAGNIFICA)	
Rim (ft):	5094.13	5093.31	5092.02	5089.22	5083.84
Invert (ft):	5086.34	5084.50	5078.84	5076.87	5068.78
Min Pipe Cover (ft):	3.88	3.80	10.18	8.10	4.14
Max HGL (ft):	5086.96	5086.88	5085.89	5078.85	5070.86

Link ID:	{VISTA MAGNIFICA}.Pipe - (125) (VISTA MAGNIFICA)	{VISTA MAGNIFICA}.Pipe - (124) (VISTA MAGNIFICA)	{VISTA MAGNIFICA}.Pipe - (123) (VISTA MAGNIFICA)	{VISTA MAGNIFICA}.Pipe - (122) (VISTA MAGNIFICA)
Length (ft):	111.26	124.84	102.19	128.07
Dia (ft):	2.50	3.00	3.00	3.00
Slope (ft/ft):	0.0165	0.0453	0.0070	0.0483
Up Invert (ft):	5086.34	5084.50	5078.84	5076.87
Dn Invert (ft):	5084.50	5078.84	5078.12	5070.68
Max Q (cfs):	7.14	70.88	70.88	70.88
Max Vel (ft/s):	2.32	14.17	10.25	16.82
Max Depth (ft):	1.50	2.69	2.83	1.72

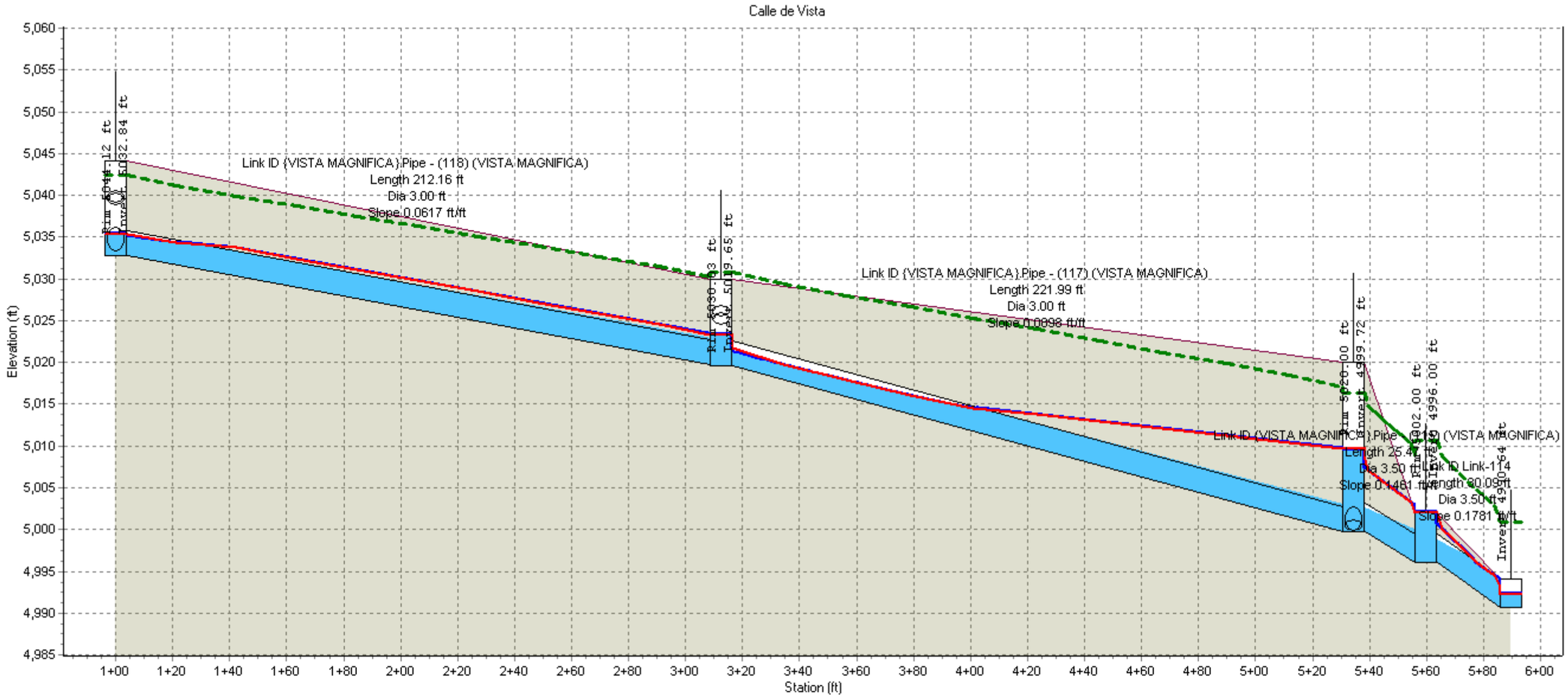
Segment 6.2: Corte del Sol to Bluffside Place



Node ID:		Structure - (125) (VISTA MAGNIFICA)	Structure - (124) (VISTA MAGNIFICA)	
Rim (ft):	5083.84	5078.86	5062.50	5044.12
Invert (ft):	5068.78	5062.64	5048.08	5032.84
Min Pipe Cover (ft):	4.14	12.10	3.66	3.53
Max HGL (ft):	5070.86	5064.23	5049.96	5035.49

Link ID:		{VISTA MAGNIFICA}.Pipe - (120) (VISTA MAGNIFICA)	{VISTA MAGNIFICA}.Pipe - (119) (VISTA MAGNIFICA)	
Length (ft):	75.05	218.20	243.49	
Dia (ft):	3.00	3.00	3.00	
Slope (ft/ft):	0.0669	0.0658	0.0609	
Up Invert (ft):	5068.78	5062.64	5048.08	
Dn Invert (ft):	5063.76	5048.28	5033.26	
Max Q (cfs):	73.51	73.49	93.21	
Max Vel (ft/s):	17.47	20.07	20.51	
Max Depth (ft):	1.72	1.60	1.97	

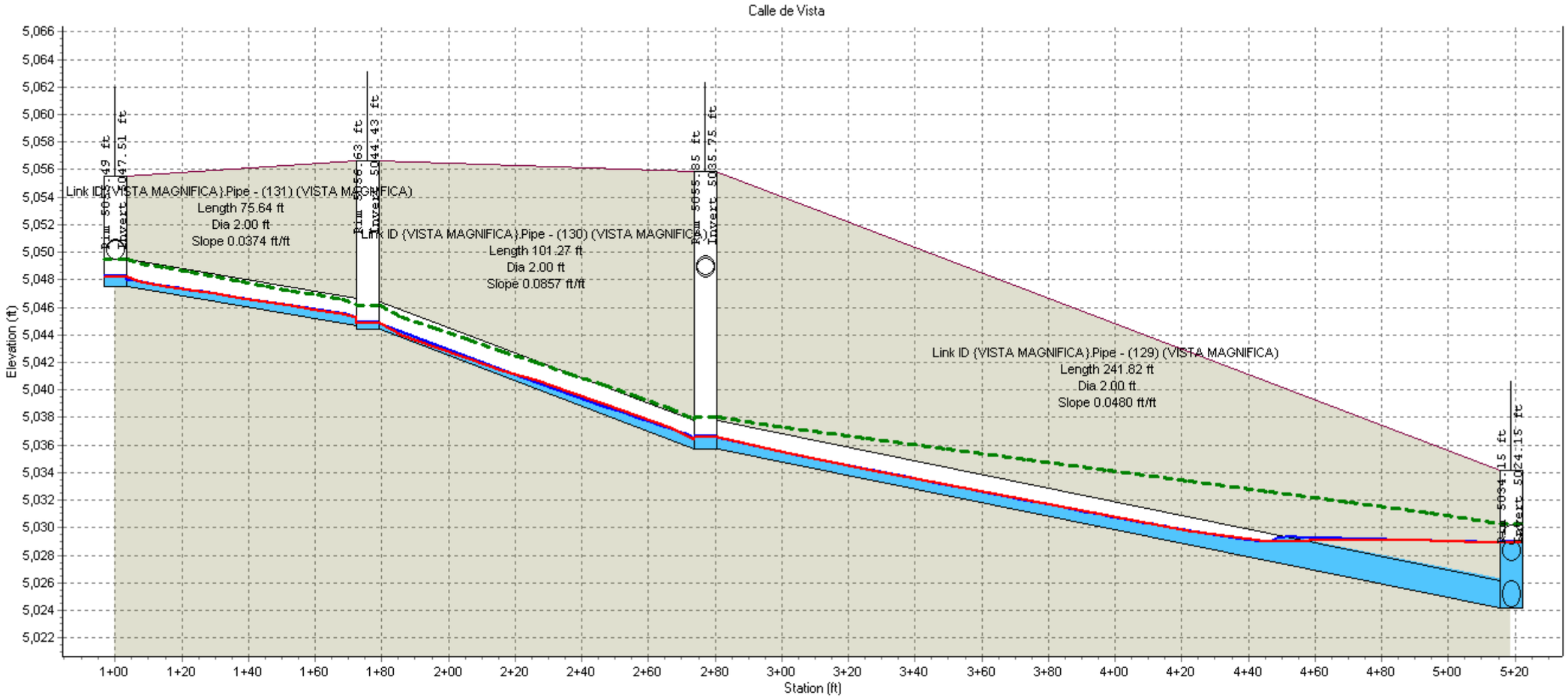
Segment 6.3: Bluffside Place to Outfall



Node ID:		Structure - (122) (VISTA MAGNIFICA)	Structure - (119) (VISTA MAGNIFICA)	Out-01
Rim (ft):	5044.12	5030.03	5020.00	5002.00	
Invert (ft):	5032.84	5019.65	4999.72	4996.00	4990.64
Min Pipe Cover (ft):	3.53	3.12	16.78	2.50	
Max HGL (ft):	5035.49	5023.87	5009.78	5002.00	4992.21

Link ID:	(VISTA MAGNIFICA).Pipe - (118) (VISTA MAGNIFICA)	(VISTA MAGNIFICA).Pipe - (117) (VISTA MAGNIFICA)	(VISTA MAGNIFICA).Pipe - (115) (VISTA MAGNIFICA)	Link-114	
Length (ft):	212.16	221.99	25.47	30.09	
Dia (ft):	3.00	3.00	3.50	3.50	
Slope (ft/ft):	0.0617	0.0898	0.1461	0.1781	
Up Invert (ft):	5032.84	5019.65	4999.72	4996.00	
Dn Invert (ft):	5019.75	4999.72	4996.00	4990.64	
Max Q (cfs):	124.32	131.99	200.80	176.33	
Max Vel (ft/s):	21.26	22.00	20.87	23.62	
Max Depth (ft):	2.75	3.00	3.50	2.54	

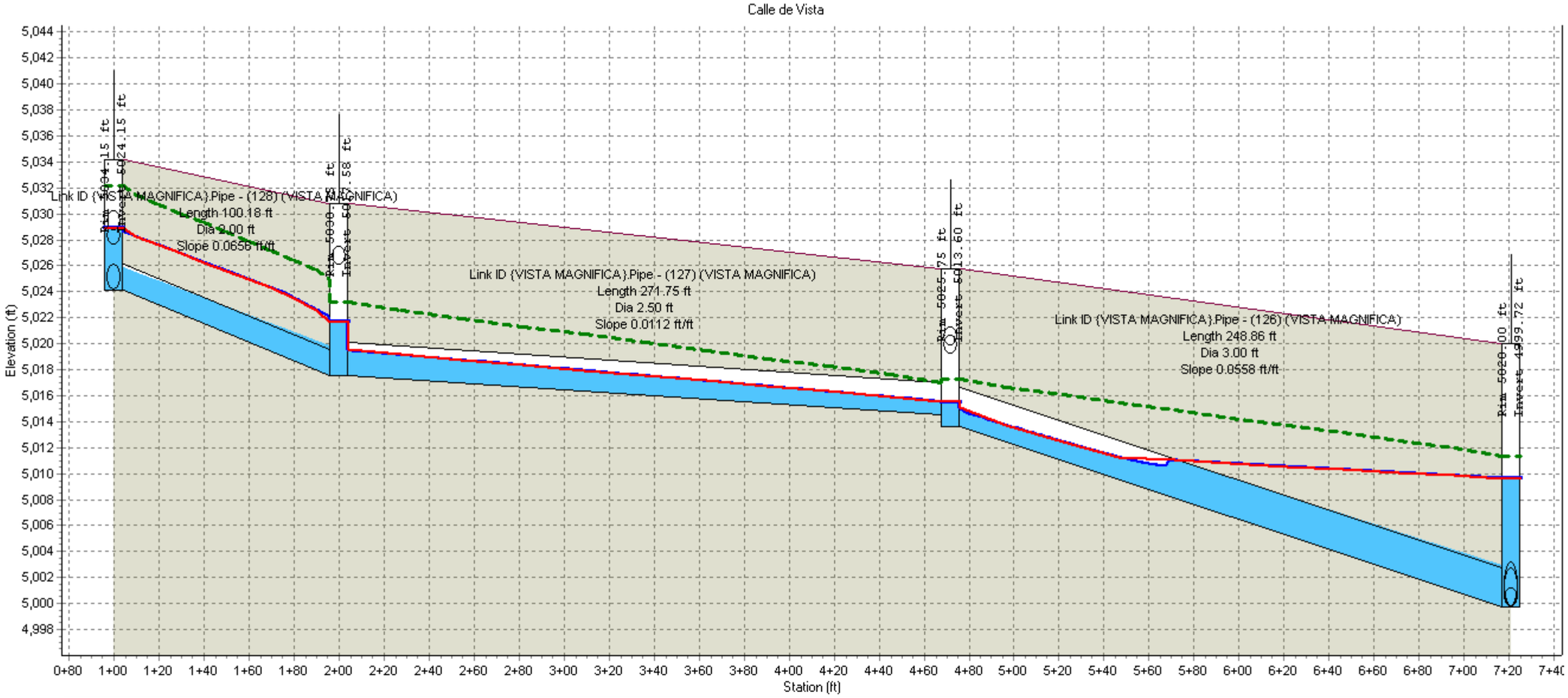
Segment 7.1: Bluffside Drive to Intersection of Calle del Vista and Cascase Place



Node ID:		Structure - (135) (VISTA MAGNIFICA)	Structure - (134) (VISTA MAGNIFICA)	
Rim (ft):	5055.49	5056.63	5055.85	5034.15
Invert (ft):	5047.51	5044.43	5035.75	5024.15
Min Pipe Cover (ft):	4.55	9.95	6.08	3.94
Max HGL (ft):	5048.17	5044.89	5036.62	5029.17

Link ID:	{VISTA MAGNIFICA}.Pipe - (131) (VISTA MAGNIFICA)	{VISTA MAGNIFICA}.Pipe - (130) (VISTA MAGNIFICA)	{VISTA MAGNIFICA}.Pipe - (129) (VISTA MAGNIFICA)	
Length (ft):	75.64	101.27	241.82	
Dia (ft):	2.00	2.00	2.00	
Slope (ft/ft):	0.0374	0.0857	0.0480	
Up Invert (ft):	5047.51	5044.43	5035.75	
Dn Invert (ft):	5044.68	5035.75	5024.15	
Max Q (cfs):	7.52	7.52	18.13	
Max Vel (ft/s):	9.29	8.93	9.48	
Max Depth (ft):	0.61	0.66	1.43	

Segment 7.2: Intersection of Calle del Vista and Cascase Place to Junction



Node ID:		Structure - (132) (VISTA MAGNIFICA)	Structure - (131) (VISTA MAGNIFICA)	
Rim (ft):	5034.15	5030.75	5025.75	5020.00
Invert (ft):	5024.15	5017.58	5013.60	4999.72
Min Pipe Cover (ft):	3.94	3.25	4.45	16.78
Max HGL (ft):	5029.17	5021.83	5015.55	5009.78

Link ID:	{VISTA MAGNIFICA}.Pipe - (128) (VISTA MAGNIFICA)	{VISTA MAGNIFICA}.Pipe - (127) (VISTA MAGNIFICA)	{VISTA MAGNIFICA}.Pipe - (126) (VISTA MAGNIFICA)
Length (ft):	100.18	271.75	248.86
Dia (ft):	2.00	2.50	3.00
Slope (ft/ft):	0.0656	0.0112	0.0558
Up Invert (ft):	5024.15	5017.58	5013.60
Dn Invert (ft):	5017.58	5014.53	4999.72
Max Q (cfs):	45.64	47.46	66.03
Max Vel (ft/s):	14.53	9.84	10.60
Max Depth (ft):	2.00	2.37	2.45

Appendix A

NOAA Rainfall Data

NOAA Atlas 14, Volume 1, Version 5
Location name: Albuquerque, New Mexico, US*
Latitude: 35.1023°, Longitude: -106.7015°
Elevation: 5094 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.163** (0.140–0.191)	**0.212** (0.181–0.247)	**0.285** (0.242–0.333)	**0.343** (0.291–0.399)	**0.421** (0.356–0.490)	**0.483** (0.407–0.562)	**0.549** (0.458–0.637)	**0.618** (0.512–0.718)	**0.712** (0.584–0.828)	**0.787** (0.641–0.914)
10-min	**0.249** (0.213–0.290)	**0.323** (0.275–0.377)	**0.434** (0.369–0.507)	**0.521** (0.443–0.607)	**0.641** (0.542–0.746)	**0.736** (0.619–0.855)	**0.835** (0.697–0.970)	**0.941** (0.780–1.09)	**1.08** (0.889–1.26)	**1.20** (0.976–1.39)
15-min	**0.308** (0.265–0.360)	**0.400** (0.342–0.467)	**0.538** (0.457–0.629)	**0.646** (0.549–0.752)	**0.795** (0.671–0.925)	**0.912** (0.767–1.06)	**1.04** (0.864–1.20)	**1.17** (0.966–1.35)	**1.34** (1.10–1.56)	**1.49** (1.21–1.73)
30-min	**0.415** (0.357–0.485)	**0.539** (0.460–0.629)	**0.725** (0.616–0.847)	**0.870** (0.739–1.01)	**1.07** (0.904–1.25)	**1.23** (1.03–1.43)	**1.39** (1.16–1.62)	**1.57** (1.30–1.82)	**1.81** (1.48–2.10)	**2.00** (1.63–2.32)
60-min	**0.514** (0.441–0.600)	**0.666** (0.569–0.778)	**0.897** (0.762–1.05)	**1.08** (0.915–1.25)	**1.33** (1.12–1.54)	**1.52** (1.28–1.77)	**1.73** (1.44–2.00)	**1.94** (1.61–2.26)	**2.24** (1.84–2.60)	**2.48** (2.02–2.88)
2-hr	**0.584** (0.500–0.693)	**0.748** (0.638–0.888)	**0.994** (0.844–1.18)	**1.19** (1.01–1.40)	**1.47** (1.23–1.72)	**1.69** (1.41–1.98)	**1.93** (1.60–2.25)	**2.18** (1.79–2.54)	**2.53** (2.05–2.95)	**2.82** (2.26–3.29)
3-hr	**0.632** (0.547–0.747)	**0.804** (0.693–0.950)	**1.06** (0.912–1.24)	**1.26** (1.08–1.48)	**1.54** (1.31–1.80)	**1.76** (1.49–2.06)	**2.00** (1.69–2.34)	**2.26** (1.89–2.65)	**2.62** (2.16–3.06)	**2.92** (2.38–3.42)
6-hr	**0.732** (0.638–0.856)	**0.925** (0.807–1.08)	**1.20** (1.04–1.40)	**1.41** (1.22–1.64)	**1.70** (1.47–1.98)	**1.93** (1.66–2.24)	**2.18** (1.86–2.52)	**2.43** (2.06–2.81)	**2.79** (2.33–3.23)	**3.08** (2.55–3.57)
12-hr	**0.811** (0.711–0.926)	**1.02** (0.900–1.17)	**1.30** (1.14–1.48)	**1.52** (1.33–1.73)	**1.81** (1.58–2.06)	**2.04** (1.77–2.31)	**2.27** (1.96–2.58)	**2.52** (2.15–2.86)	**2.85** (2.42–3.24)	**3.12** (2.62–3.60)
24-hr	**0.916** (0.810–1.04)	**1.15** (1.01–1.30)	**1.44** (1.27–1.63)	**1.66** (1.47–1.88)	**1.97** (1.73–2.23)	**2.21** (1.93–2.49)	**2.45** (2.14–2.77)	**2.70** (2.35–3.04)	**3.04** (2.62–3.42)	**3.30** (2.83–3.71)
2-day	**0.959** (0.854–1.08)	**1.20** (1.07–1.35)	**1.50** (1.33–1.68)	**1.73** (1.54–1.93)	**2.04** (1.81–2.27)	**2.27** (2.01–2.54)	**2.51** (2.21–2.81)	**2.76** (2.42–3.08)	**3.08** (2.69–3.44)	**3.32** (2.89–3.75)
3-day	**1.08** (0.973–1.19)	**1.34** (1.21–1.49)	**1.66** (1.49–1.83)	**1.90** (1.71–2.10)	**2.23** (2.01–2.46)	**2.48** (2.22–2.73)	**2.73** (2.44–3.01)	**2.98** (2.66–3.29)	**3.31** (2.94–3.66)	**3.56** (3.16–3.95)
4-day	**1.20** (1.09–1.31)	**1.48** (1.36–1.62)	**1.81** (1.65–1.98)	**2.07** (1.89–2.26)	**2.42** (2.20–2.64)	**2.68** (2.44–2.92)	**2.95** (2.67–3.21)	**3.21** (2.90–3.49)	**3.55** (3.20–3.87)	**3.81** (3.42–4.15)
7-day	**1.36** (1.25–1.48)	**1.69** (1.55–1.83)	**2.05** (1.88–2.22)	**2.32** (2.13–2.52)	**2.69** (2.46–2.91)	**2.95** (2.70–3.19)	**3.22** (2.94–3.48)	**3.47** (3.17–3.75)	**3.79** (3.46–4.11)	**4.02** (3.66–4.36)
10-day	**1.50** (1.38–1.64)	**1.86** (1.71–2.02)	**2.27** (2.09–2.46)	**2.59** (2.39–2.80)	**3.01** (2.77–3.25)	**3.33** (3.05–3.58)	**3.64** (3.33–3.92)	**3.94** (3.60–4.25)	**4.33** (3.94–4.67)	**4.61** (4.18–4.98)
20-day	**1.87** (1.71–2.04)	**2.31** (2.12–2.52)	**2.80** (2.57–3.05)	**3.17** (2.91–3.44)	**3.63** (3.33–3.94)	**3.96** (3.63–4.30)	**4.28** (3.92–4.63)	**4.58** (4.19–4.95)	**4.94** (4.52–5.35)	**5.20** (4.75–5.63)
30-day	**2.24** (2.05–2.42)	**2.77** (2.54–3.00)	**3.32** (3.05–3.59)	**3.73** (3.43–4.02)	**4.23** (3.89–4.55)	**4.59** (4.21–4.93)	**4.92** (4.51–5.29)	**5.23** (4.79–5.62)	**5.59** (5.12–6.01)	**5.83** (5.34–6.27)
45-day	**2.73** (2.52–2.95)	**3.37** (3.12–3.65)	**4.01** (3.70–4.33)	**4.46** (4.11–4.80)	**4.99** (4.62–5.37)	**5.35** (4.95–5.76)	**5.67** (5.25–6.09)	**5.94** (5.50–6.38)	**6.23** (5.78–6.68)	**6.38** (5.95–6.83)
60-day	**3.14** (2.90–3.40)	**3.88** (3.58–4.20)	**4.61** (4.27–4.98)	**5.13** (4.75–5.53)	**5.75** (5.32–6.19)	**6.16** (5.71–6.64)	**6.54** (6.06–7.04)	**6.86** (6.37–7.39)	**7.21** (6.71–7.78)	**7.42** (6.93–7.99)

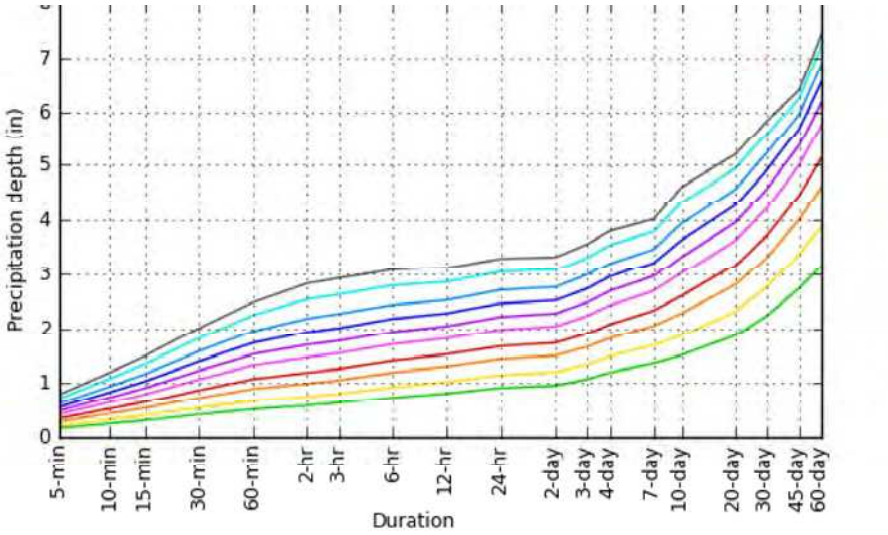
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

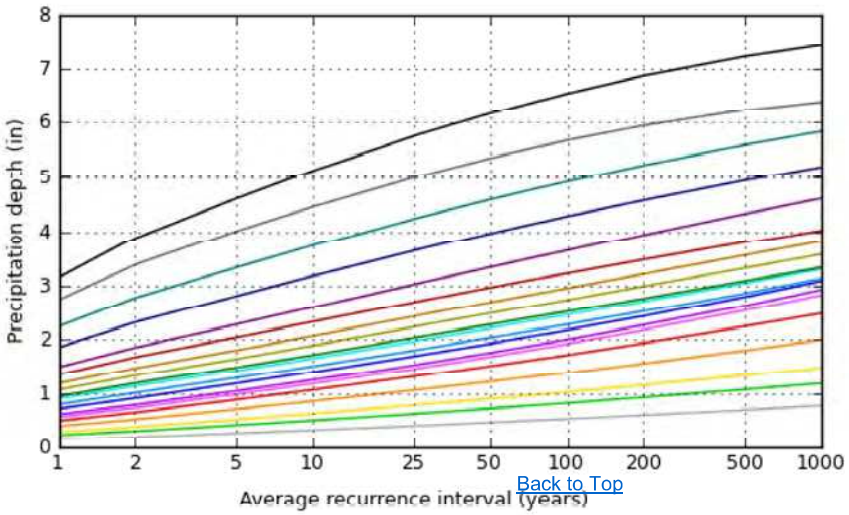
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical





Back to Top

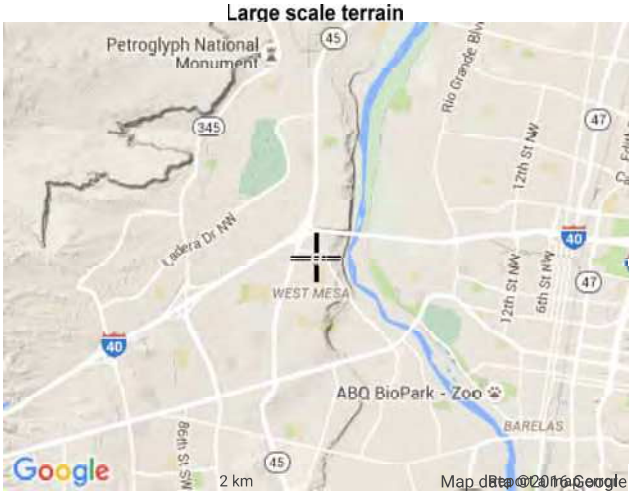
Maps & aerials

NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Fri Jul 22 20:26:52 2016

Small scale terrain

Large scale terrain



Large scale map

Large scale aerial

Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910

NOAA Atlas 14, Volume 1, Version 5
Location name: Albuquerque, New Mexico, US*
Latitude: 35.1023°, Longitude: -106.7015°
Elevation: 5094 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.96 (1.68–2.29)	2.54 (2.17–2.96)	3.42 (2.90–4.00)	4.12 (3.49–4.79)	5.05 (4.27–5.88)	5.80 (4.88–6.74)	6.59 (5.50–7.64)	7.42 (6.14–8.62)	8.54 (7.01–9.94)	9.44 (7.69–11.0)
10-min	1.49 (1.28–1.74)	1.94 (1.65–2.26)	2.60 (2.21–3.04)	3.13 (2.66–3.64)	3.85 (3.25–4.48)	4.42 (3.71–5.13)	5.01 (4.18–5.82)	5.65 (4.68–6.55)	6.50 (5.33–7.56)	7.19 (5.86–8.35)
15-min	1.23 (1.06–1.44)	1.60 (1.37–1.87)	2.15 (1.83–2.52)	2.58 (2.20–3.01)	3.18 (2.68–3.70)	3.65 (3.07–4.24)	4.14 (3.46–4.81)	4.66 (3.86–5.42)	5.38 (4.41–6.25)	5.94 (4.84–6.90)
30-min	0.830 (0.714–0.970)	1.08 (0.920–1.26)	1.45 (1.23–1.69)	1.74 (1.48–2.03)	2.14 (1.81–2.49)	2.46 (2.07–2.85)	2.79 (2.33–3.24)	3.14 (2.60–3.65)	3.62 (2.97–4.21)	4.00 (3.26–4.65)
60-min	0.514 (0.441–0.600)	0.666 (0.569–0.778)	0.897 (0.762–1.05)	1.08 (0.915–1.25)	1.33 (1.12–1.54)	1.52 (1.28–1.77)	1.73 (1.44–2.00)	1.94 (1.61–2.26)	2.24 (1.84–2.60)	2.48 (2.02–2.88)
2-hr	0.292 (0.250–0.346)	0.374 (0.319–0.444)	0.497 (0.422–0.588)	0.596 (0.504–0.699)	0.734 (0.616–0.859)	0.846 (0.704–0.988)	0.964 (0.798–1.13)	1.09 (0.894–1.27)	1.27 (1.03–1.48)	1.41 (1.13–1.65)
3-hr	0.210 (0.182–0.249)	0.268 (0.231–0.316)	0.352 (0.304–0.414)	0.419 (0.360–0.492)	0.512 (0.436–0.600)	0.587 (0.498–0.687)	0.667 (0.562–0.780)	0.754 (0.628–0.881)	0.873 (0.719–1.02)	0.971 (0.791–1.14)
6-hr	0.122 (0.107–0.143)	0.154 (0.135–0.181)	0.200 (0.174–0.233)	0.235 (0.204–0.274)	0.284 (0.245–0.330)	0.322 (0.277–0.374)	0.363 (0.310–0.421)	0.405 (0.344–0.469)	0.465 (0.389–0.539)	0.514 (0.426–0.596)
12-hr	0.067 (0.059–0.077)	0.085 (0.075–0.097)	0.108 (0.095–0.123)	0.126 (0.110–0.144)	0.150 (0.131–0.171)	0.169 (0.147–0.192)	0.189 (0.163–0.214)	0.209 (0.179–0.237)	0.236 (0.201–0.269)	0.259 (0.218–0.299)
24-hr	0.038 (0.034–0.043)	0.048 (0.042–0.054)	0.060 (0.053–0.068)	0.069 (0.061–0.078)	0.082 (0.072–0.093)	0.092 (0.081–0.104)	0.102 (0.089–0.115)	0.113 (0.098–0.127)	0.126 (0.109–0.142)	0.137 (0.118–0.155)
2-day	0.020 (0.018–0.022)	0.025 (0.022–0.028)	0.031 (0.028–0.035)	0.036 (0.032–0.040)	0.042 (0.038–0.047)	0.047 (0.042–0.053)	0.052 (0.046–0.058)	0.057 (0.050–0.064)	0.064 (0.056–0.072)	0.069 (0.060–0.078)
3-day	0.015 (0.014–0.017)	0.019 (0.017–0.021)	0.023 (0.021–0.025)	0.026 (0.024–0.029)	0.031 (0.028–0.034)	0.034 (0.031–0.038)	0.038 (0.034–0.042)	0.041 (0.037–0.046)	0.046 (0.041–0.051)	0.050 (0.044–0.055)
4-day	0.012 (0.011–0.014)	0.015 (0.014–0.017)	0.019 (0.017–0.021)	0.022 (0.020–0.024)	0.025 (0.023–0.027)	0.028 (0.025–0.030)	0.031 (0.028–0.033)	0.033 (0.030–0.036)	0.037 (0.033–0.040)	0.040 (0.036–0.043)
7-day	0.008 (0.007–0.009)	0.010 (0.009–0.011)	0.012 (0.011–0.013)	0.014 (0.013–0.015)	0.016 (0.015–0.017)	0.018 (0.016–0.019)	0.019 (0.018–0.021)	0.021 (0.019–0.022)	0.023 (0.021–0.024)	0.024 (0.022–0.026)
10-day	0.006 (0.006–0.007)	0.008 (0.007–0.008)	0.009 (0.009–0.010)	0.011 (0.010–0.012)	0.013 (0.012–0.014)	0.014 (0.013–0.015)	0.015 (0.014–0.016)	0.016 (0.015–0.018)	0.018 (0.016–0.019)	0.019 (0.017–0.021)
20-day	0.004 (0.004–0.004)	0.005 (0.004–0.005)	0.006 (0.005–0.006)	0.007 (0.006–0.007)	0.008 (0.007–0.008)	0.008 (0.008–0.009)	0.009 (0.008–0.010)	0.010 (0.009–0.010)	0.010 (0.009–0.011)	0.011 (0.010–0.012)
30-day	0.003 (0.003–0.003)	0.004 (0.004–0.004)	0.005 (0.004–0.005)	0.005 (0.005–0.006)	0.006 (0.005–0.006)	0.006 (0.006–0.007)	0.007 (0.006–0.007)	0.007 (0.007–0.008)	0.008 (0.007–0.008)	0.008 (0.007–0.009)
45-day	0.003 (0.002–0.003)	0.003 (0.003–0.003)	0.004 (0.003–0.004)	0.004 (0.004–0.004)	0.005 (0.004–0.005)	0.005 (0.005–0.005)	0.005 (0.005–0.006)	0.006 (0.005–0.006)	0.006 (0.005–0.006)	0.006 (0.006–0.006)
60-day	0.002 (0.002–0.002)	0.003 (0.002–0.003)	0.003 (0.003–0.003)	0.004 (0.003–0.004)	0.004 (0.004–0.004)	0.004 (0.004–0.005)	0.005 (0.004–0.005)	0.005 (0.004–0.005)	0.005 (0.005–0.005)	0.005 (0.005–0.006)

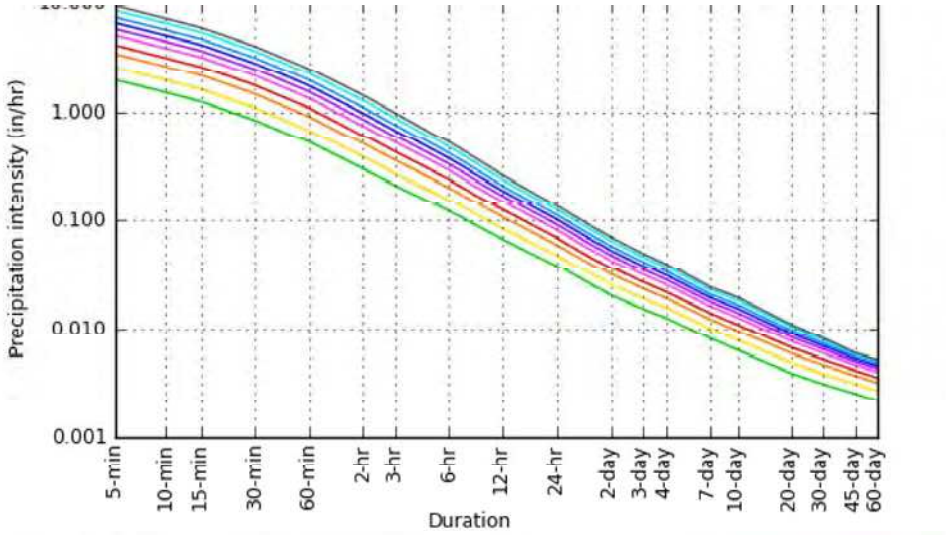
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

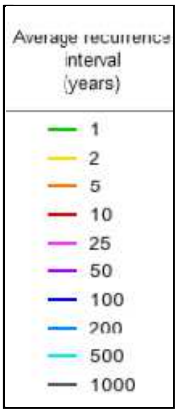
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

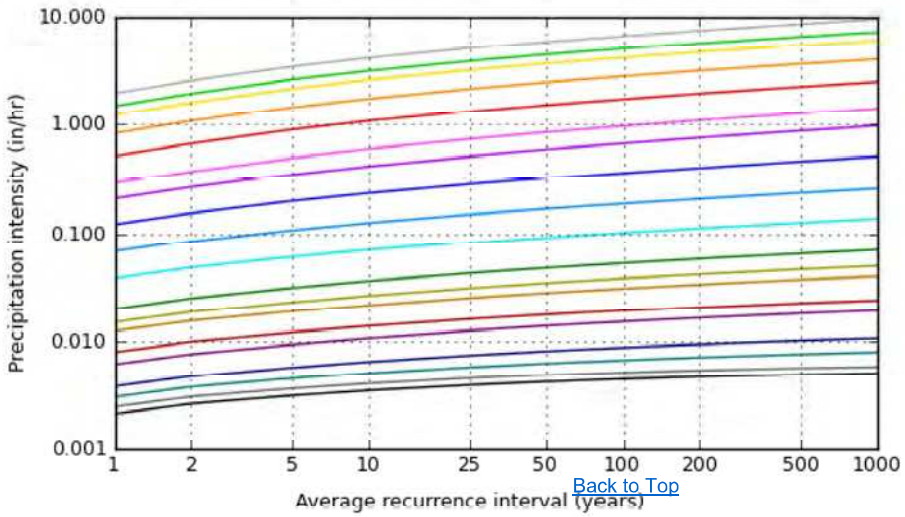
Please refer to NOAA Atlas 14 document for more information.

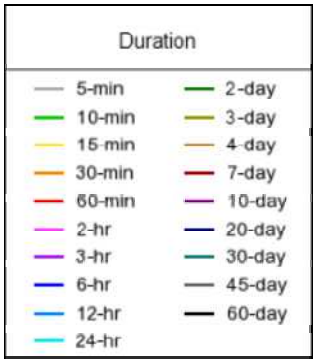
Back to Top

PF graphical









Back to Top

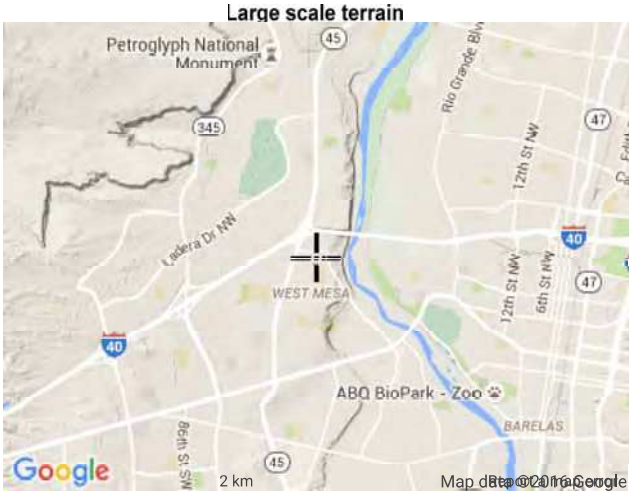
Maps & aerials

NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Fri Jul 22 20:27:59 2016

Small scale terrain

Large scale terrain



Large scale map

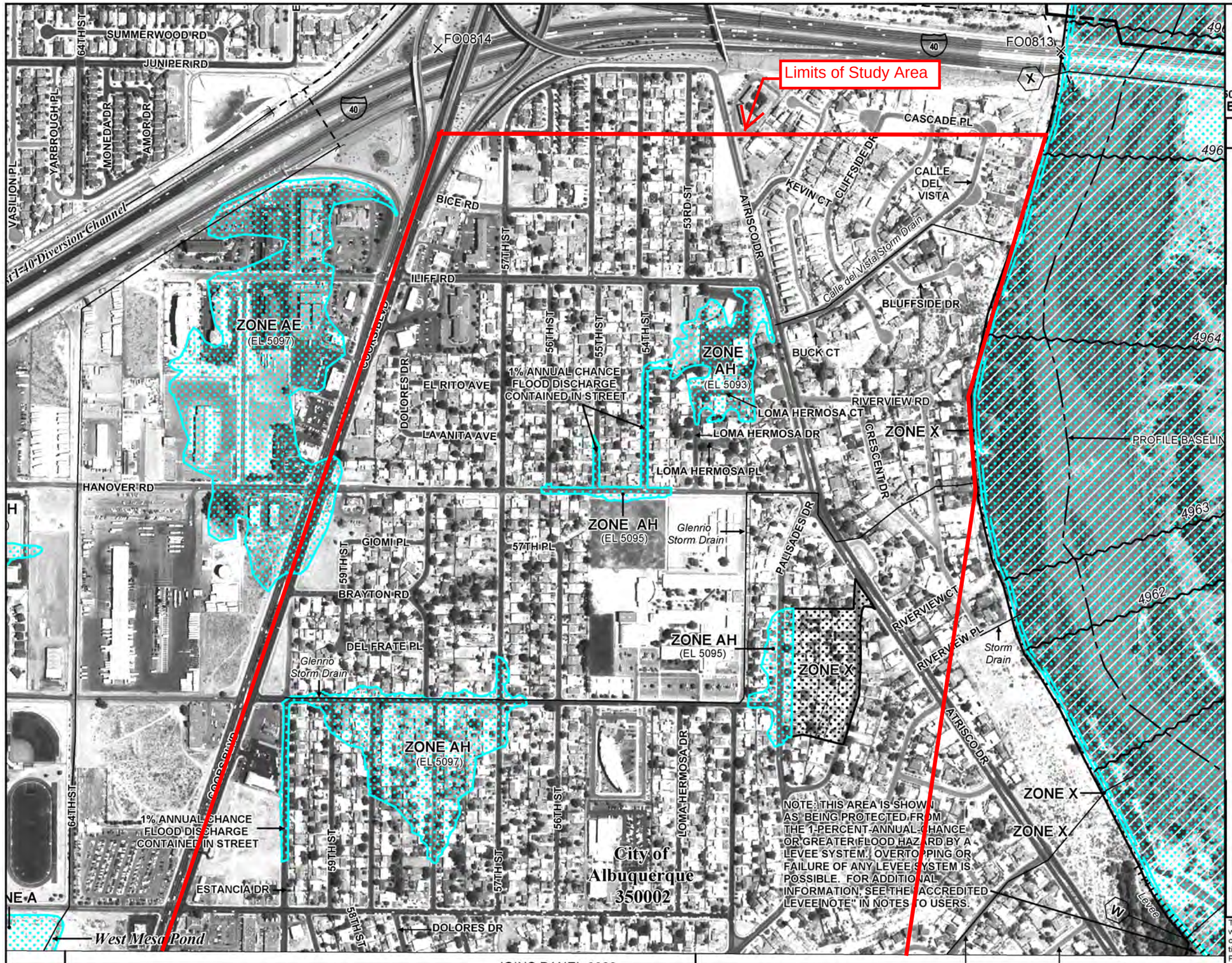
Large scale aerial

Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910

Appendix B

FEMA Firm Maps



MAP SCALE 1" = 500'

0 500 1000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0327H

FIRM

FLOOD INSURANCE RATE MAP

BERNALILLO COUNTY, NEW MEXICO AND INCORPORATED AREAS

PANEL 327 OF 825

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ALBUQUERQUE, CITY OF	350002	0327	H
BERNALILLO COUNTY UNINCORPORATED AREAS	350001	0327	H

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

MAP NUMBER
35001C0327H

MAP REVISED
AUGUST 16, 2012

Federal Emergency Management Agency