LOS ANGELES INTERNATIONAL AIRPORT
CONSOLIDATED RENTAL CAR FACILITY

STORMWATER DESIGN REPORT

September 23, 2016
QTA 30% Submittal

Prepared for:

LAX
Los Angeles World Airports
™

Capital Programming, Planning and Engineering Group
1 World Way
Los Angeles, CA 90045

Contract Number DA-4881

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TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION

This report addresses the existing and proposed conditions for the LAX Consolidated Rental Car Facility (ConRAC) project. TranSystems has performed the storm sewer design and analysis for the 60% design level. The project is located within the City of Los Angeles and just west of Los Angeles International Airport (LAX). A location map is provided in Appendix A. The project falls within the North Dominguez Watershed and is designated as Zone X on FEMA Flood Insurance Rate Map 06037C1780F, effective 9/26/2008.

STORMWATER DESIGN REQUIREMENTS

The project will likely be required to requirements presented in the City of Los Angeles California Stormwater LID Ordinance. The LID ordinance requires retention of stormwater runoff from the greater of either a ¾ inch storm or the 85% Storm (24 hour cumulative rainfall depth of 1.1 inches), as stated in the Low Impact Development Manual, 5th Edition (Los Angeles, 2011). To meet these requirements the project includes 7 cisterns, designed to capture stormwater runoff to be used for washing rental car vehicles. This use of stormwater runoff will directly reduce the demand for potable water from the municipal water system. The cisterns have sufficient storage volume to capture all proposed runoff for either the ¾ inch storm, or the 85% Storm.

In addition storm sewers were designed to contain the 10-year storm within the pipe network and to contain the 50-year storm within the storm system (no ponding above inlets).

EXISTING CONDITIONS

The project area currently consists of a mix of medium to high density residential, multifamily residential, and property buy out and structure removal as part of preparation for the ConRAC project. Property buyout has been underway since 2002 with roughly 60% of the property area acquired, and structures removed, based on 2016 aerials. For this report, existing conditions was modeled based on 2002 land cover conditions prior to the start of property buyout and structure removal.

The existing storm drainage consists primarily of street gutter flow entering storm sewer inlets located near two outfall locations, one at the south central and one at the northeast area of the project. The south outfall is located near Hindy Ave and 98th Street and connects to the West Century BLVD storm sewer system. The northeast outfall is located near the cul-de-sac at W93rd Street and S Glasgow Place, and connects to the La Cienega storm sewer system. CDM Smith inc. performed a campus-wide Stormwater Management Plan (SMP) for the Los Angeles International Airport which included SWMM models for the outfall storm systems along Century Boulevard and La Cienga BLVD. According to hydraulic analysis results performed by CDM Smith, the outfall sewers shouldn't have and backwater conditions for storm events up to a 100-year storm.

PROPOSED CONDITIONS

The ConRAC site will require a completely new storm drain system based on guidelines provided in the County of Los Angeles Hydrology Manual and City of Los Angeles Low Impact Development Manual, Development Best Management Practices Handbook. As previously mentioned, per the Low Impact Development Manual (LID Manual), the project site must capture and manage 100% of the greater runoff from either a 3/4-inch or 85% storm event and implement using, in priority order, infiltration, capture and reuse, biofiltration/retention or a combination of the above. Infiltration of stormwater into groundwater has been shown to be infeasible via geotechnical investigation and evapotranspiration is not practical because there is limited landscaping on the site. Therefore, it has been determined that only capture and reuse, biofiltration/retention, or a combination of the two are feasible for this site. Capture and reuse of stormwater is the City's preferred method. Because of the high water demand imposed by the carwash systems, capture and reuse of stormwater becomes feasible for this site. Note that toilets

alone would not provide enough demand for capture and reuse to be feasible and irrigation may not be used to conform to LA Green Code voluntary measures.

As shown on project drawings, stormwater will drain directly into underground storm drain pipe systems before draining to stormwater cisterns. Stormwater from building roofs will be directed to downspouts and roof leaders while site areas will drain into a series of catch basins and inlets. Storm drain pipes for the site will range in size from 12 inches to 48 inches in diameter and be a combination of high density polyethylene (HDPE) and reinforced concrete pipe (RCP). The total cistern volume will be approximately 500,000 cubic feet to capture a minimum of two 3/4-inch storms three days apart and provide an optimum amount of available water based on typical monthly precipitation depths. The Design Team is tentatively proposing a total of seven precast reinforced concrete underground cisterns located near the existing storm drain outlets.

The ConRAC site has been designed to drain stormwater into two separate systems, dividing the area so that the site drains to the two existing outlet pipes described above, consistent with existing conditions. The northeast system drains to the existing 30 inch outlet to La Cienega Blvd., and drains approximately 25% of the site area. The south system drains to the existing 54 inch storm drain to Century Blvd., and drains approximately 75% of the area. The south system consists of the entire site other than the northeast corner.

On the south side, the cisterns will consist of:

- Five (5) at 40 feet wide by 160 feet long by 12 feet deep. Three of the cisterns will be located beneath the RAC garage and two will be beneath the Idle Storage garage.
- One (1) at 48 feet wide by 176 feet long by 12 feet deep. This cistern will be located south of the Idle Storage garage.

At the northeast corner, the cisterns will consist of:

- One (1) at 72 feet wide by 160 feet long by 12 feet deep. This cistern will be located near the Yard exit driveway.

The upper 1-foot of the cisterns will overflow to the downstream storm drain systems described above. The goal is to design the storm drain systems without the use of pump stations, which is feasible with the exception of the underpass, whose roadway elevation will be below the existing storm drain system invert elevations.

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HYDROLOGIC DESIGN

Hydrologic design was performed within Bentley CivilStorm software. Rainfall was modeled using the Type I Storm with 24-hr rainfall depths obtained from the LA County Hydrology Manual (LA County. Rainfall depths used for analysis are provided in Table 1.

Table 1. 24 Hour Design Rainfall Depths

Event	Rainfall Depth (inches)
85% Storm	1.1
2-year	2.0
5-year	3.0
10-year	3.7
25-year	4.6
50-year	5.2
100-year	5.8

The NRCS synthetic storms have been widely used for design of storm sewer networks and detention volumes. The LA County Drainage manual provides alternative rainfall distribution curves. A comparison of runoff volumes and peak discharges for the SCS Type I and LA County rainfall distributions was done for several drainage areas, with the NRCS distribution resulting in larger runoff volumes and peak discharges.

Runoff losses were calculated using the NCRS Curve Number (CN) method. CN values were assigned based on CALTRANS Highway Design Manual Table 819.7E Curve Numbers for Land Use-Soil Combinations. Curve Numbers were assigned based on Hydrologic Soil Group (HSG) B which was assumed based on infiltration rates associated with project soils consisting primarily of Soil Group 20 Yolo Sandy Loam (Soil Group 20) and Yolo Loam (Soil Group 16).

Existing and Proposed conditions drainage area maps are provided in Appendix B and Land Cover Maps are provided in Appendix C. Table 2 presents a summary of watershed runoff parameters with full hydrologic calculations included within the Civil Storm output in Appendix F.

HYDRAULIC ANALYSIS

Bentley Civilstorm Software was used to model the storm pipe network and stormwater runoff and cistern storage. The implicit dynamic wave engine was used within the software, which performs fully dynamic hydraulic analysis solving the Saint Venant equations. Storm profiles are provided in Appendix E with full hydraulic output in Appendix F.

Historic and anticipated future water demand for car wash operation was provided by to TranSystems and is included in Appendix D. Based on this information an average use rate of 0.111 cfs per hour was calculated by taking the 2004 total water and dividing it by 365 days.

REFERENCES

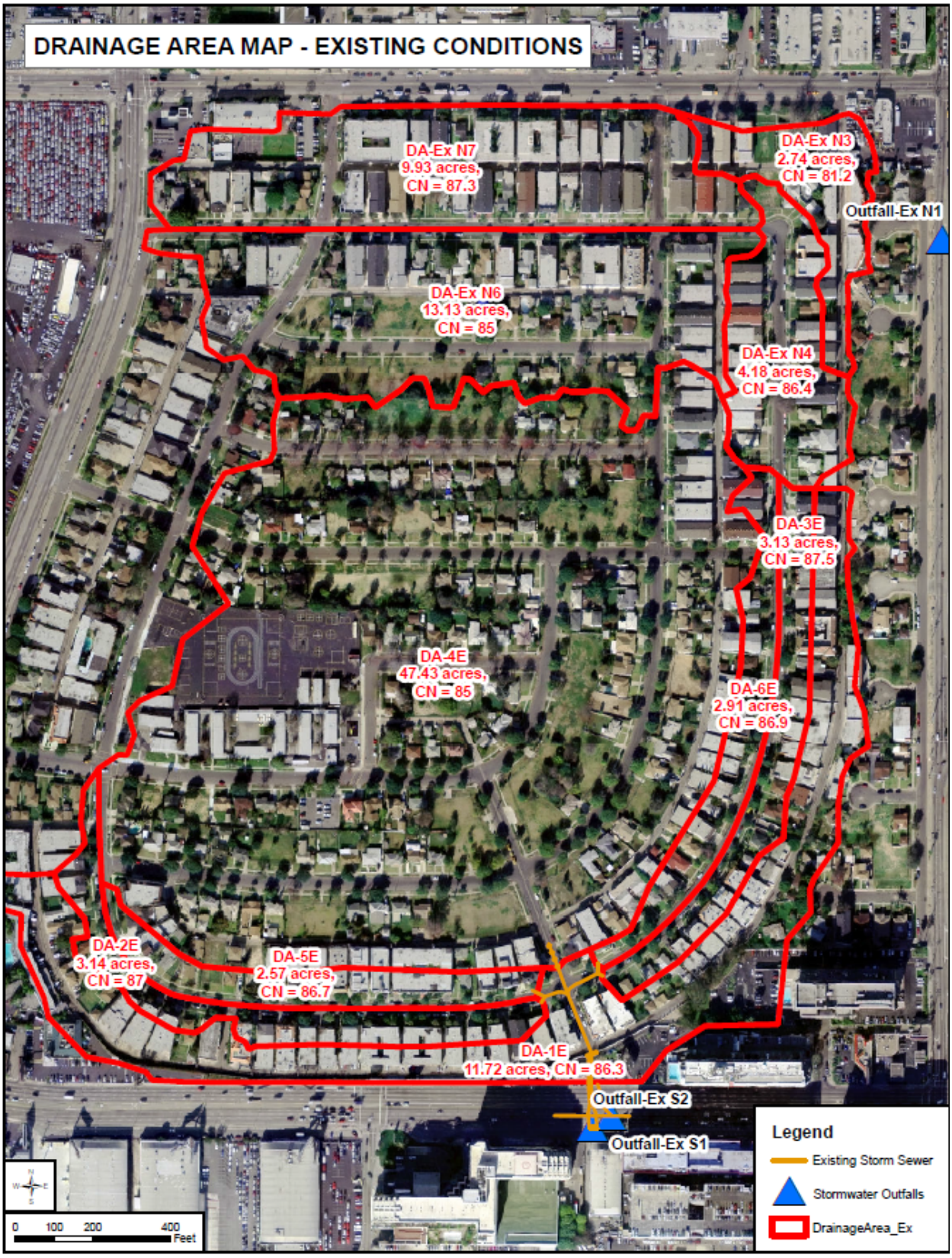
Bentley Systems Incorporated, Haestad Methods Solution Center, May 2015. Civil Storm V8i (select series 5).27 Siemon Company Drive, Suite 200W, Watertown, CT 06795. https://www.bentley.com/

CALTRANS Highway Design Manual (5th Ed). July 1, 2015. California Department of Transportation. http://www.dot.ca.gov/hq/oppd/hdm/hdmtoc.htm

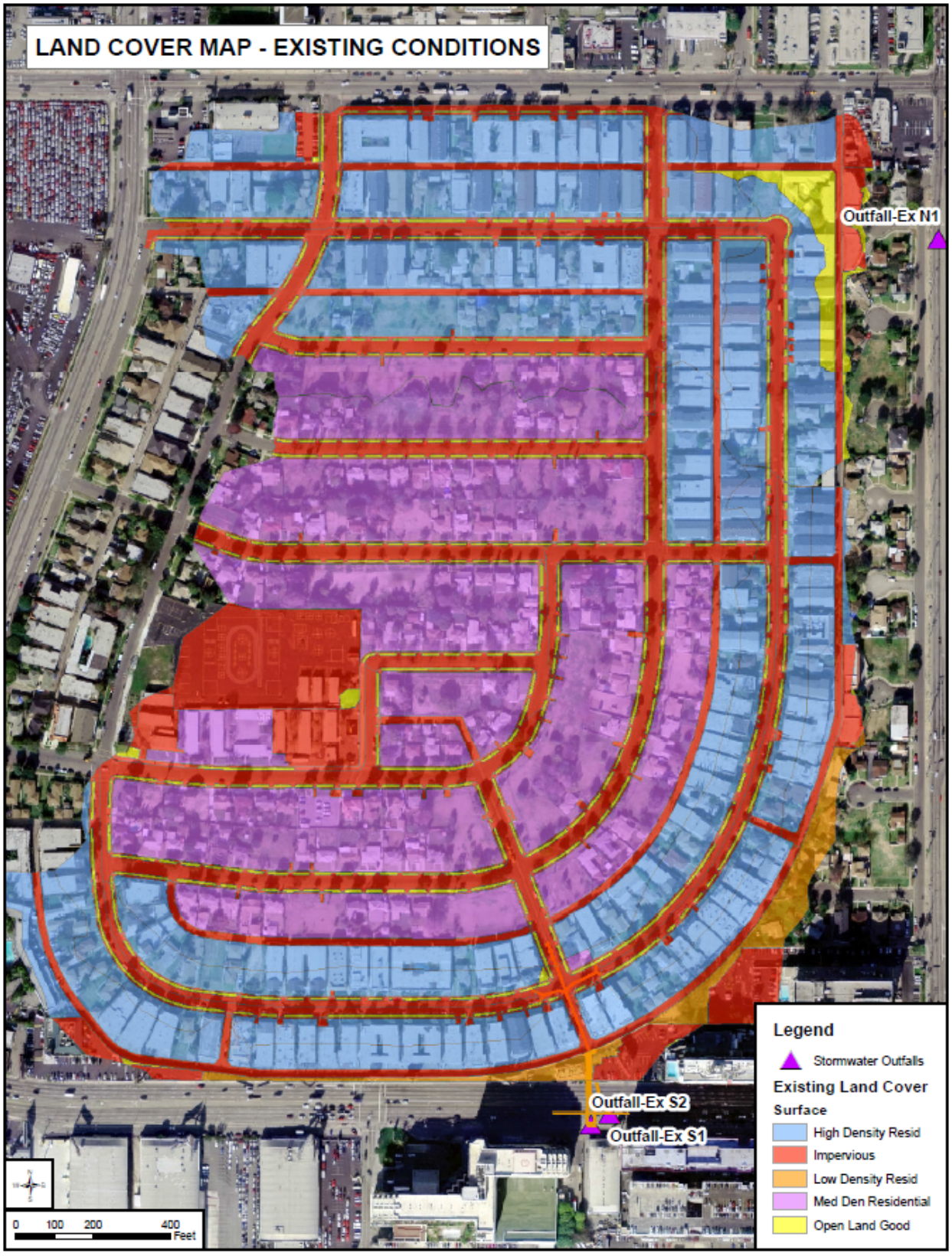
City of Los Angles. May 2016. Planning and Land Development Handbook for Low Impact Development (LID) 5th Edition. Los Angeles, California. http://www.lastormwater.org/wp-content/files_mf/lidmanualfinal.pdf

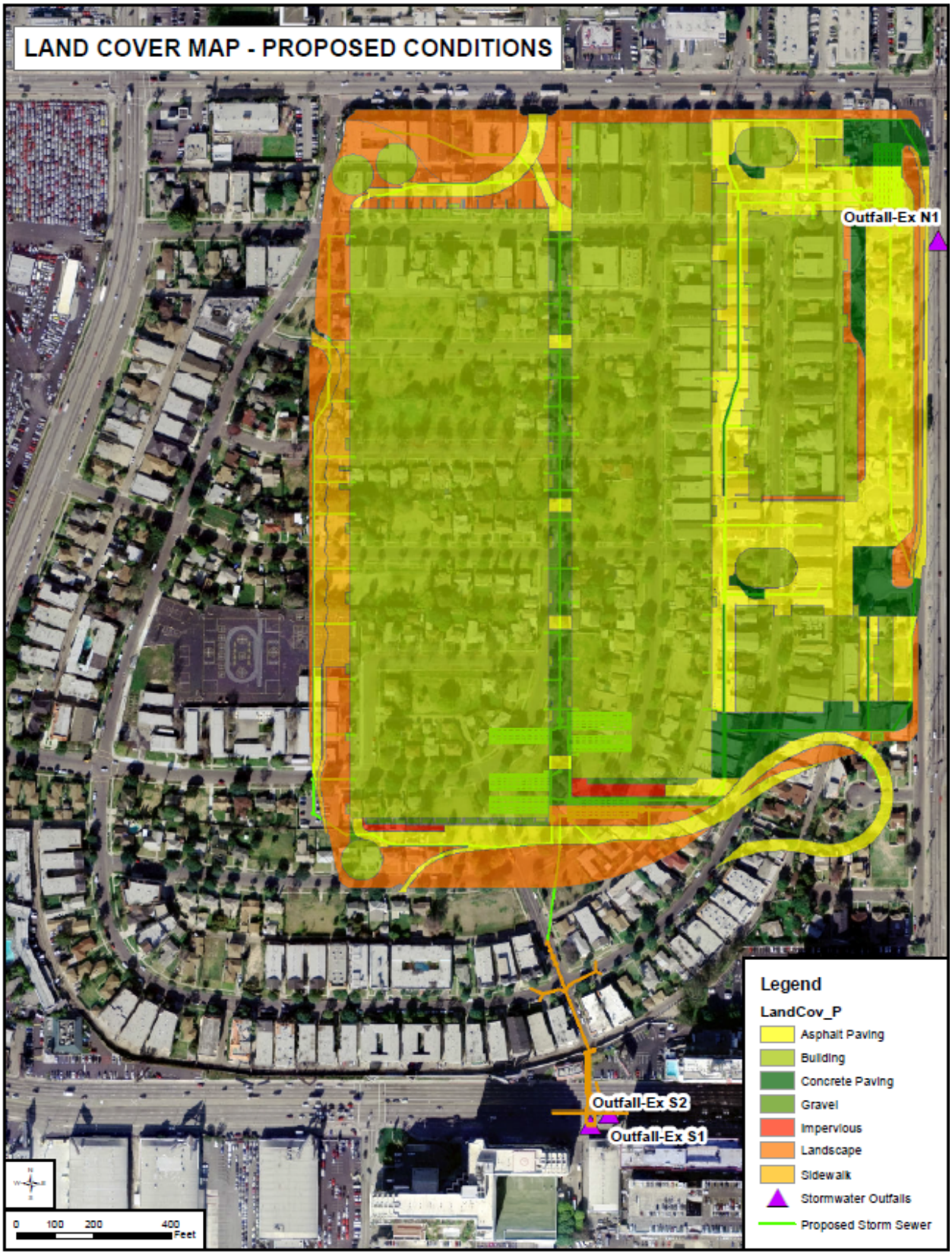
Appendix A: Location Map

APPENDIX B: DRAINAGE AREA MAPS



APPENDIX C: EXISTING & PROPOSED LAND COVER & CURVE NUMBERS




LAND COVER MAP - PROPOSED CONDITIONS
Outfall-Ex N1
Outfall-Ex S2
Outfall-Ex S1
0 100 200 400 Feet
Legend
LandCov_P
Asphalt Paving
Building
Concrete Paving
Gravel
Impervious
Landscape
Sidewalk
Stormwater Outfalls
Proposed Storm Sewer

APPENDIX D: PROJECTED CAR WASH WATER DEMAND

LAX ConRAC Car Wash Water Estimation
Based on Transaction Count

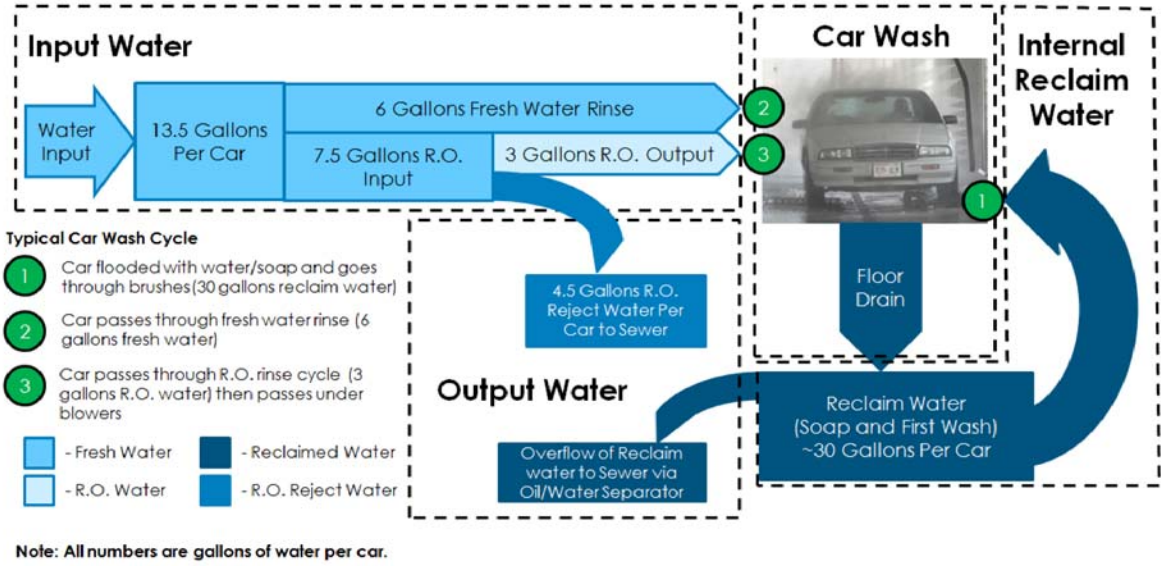
Assumptions:

1. Each transaction results in a car wash
2. The car wash use an estimated 13.5 gallons/car (see grapic below)
3. System may be set up to use 9 gallons/car (see graphic and note below)
4. Internal to the car wash, 30± gallons/car is used as reclaimed water
5. Daily Demand can be estimated by GPM/days per month

Water Per Car	Gallons
Reverse Osmosis (R.O.) Input Water Per Car	7.5 gallons
Fresh Water Rinse Per Car	6 gallons
Total Water Required Per Car:	**13.5 gallons**

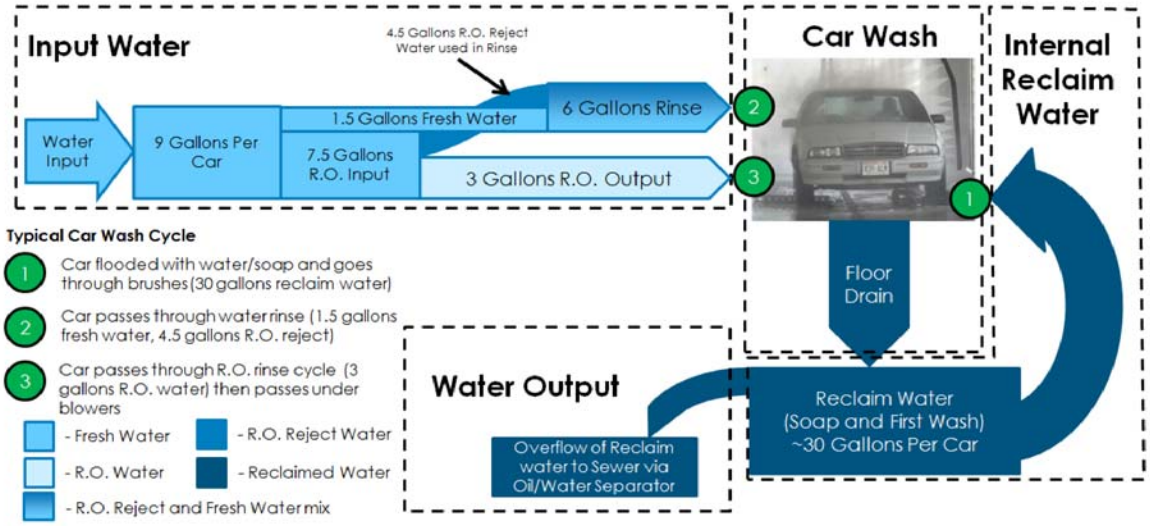
	Transaction Data		Input Water (13.5 gallons per car)		Input Water (9 gallons per car)		Internally Reclaimed Water	
Month	Transactions in 2014	Transactions with 42% Growth	Monthly Water Demand 2014 (Gallons)	Monthly Water Demand with 42% Growth (Gallons)	Monthly Water Demand 2014 (Gallons)	Monthly Water Demand with 42% Growth (Gallons)	Monthly Reclaimed Water 2014 (Gallons)	Monthly Reclaimed Water (42% Growth) (GPM)
Jan	231,988.00	330,763.00	3,131,838.00	4,465,300.50	2,087,892.00	2,976,867.00	6,959,640.00	9,922,890.00
Feb	215,521.00	307,284.00	2,909,533.50	4,148,334.00	1,939,689.00	2,765,556.00	6,465,630.00	9,218,520.00
Mar	251,800.00	359,010.00	3,399,300.00	4,846,635.00	2,266,200.00	3,231,090.00	7,554,000.00	10,770,300.00
Apr	240,306.00	342,622.00	3,244,131.00	4,625,397.00	2,162,754.00	3,083,598.00	7,209,180.00	10,278,660.00
May	256,331.00	365,470.00	3,460,468.50	4,933,845.00	2,306,979.00	3,289,230.00	7,689,930.00	10,964,100.00
Jun	252,774.00	360,399.00	3,412,449.00	4,865,386.50	2,274,966.00	3,243,591.00	7,583,220.00	10,811,970.00
Jul	250,105.00	356,593.00	3,376,417.50	4,814,005.50	2,250,945.00	3,209,337.00	7,503,150.00	10,697,790.00
Aug	271,262.00	386,759.00	3,662,037.00	5,221,246.50	2,441,358.00	3,480,831.00	8,137,860.00	11,602,770.00
Sep	246,730.00	351,781.00	3,330,855.00	4,749,043.50	2,220,570.00	3,166,029.00	7,401,900.00	10,553,430.00
Oct	259,544.00	370,051.00	3,503,844.00	4,995,688.50	2,335,896.00	3,330,459.00	7,786,320.00	11,101,530.00
Nov	237,364.00	338,428.00	3,204,414.00	4,568,778.00	2,136,276.00	3,045,852.00	7,120,920.00	10,152,840.00
Dec	199,109.00	283,885.00	2,687,971.50	3,832,447.50	1,791,981.00	2,554,965.00	5,973,270.00	8,516,550.00
Annual	**2,912,834.00**	**4,153,046.00**	**39,323,259.00**	**56,066,121.00**	**26,215,506.00**	**37,377,414.00**	**87,385,020.00**	**124,591,380.00**

note: 9 gallons per car would require additional tank and pump infrastructure for R.O. reject water reuse.



Note: All numbers are gallons of water per car.

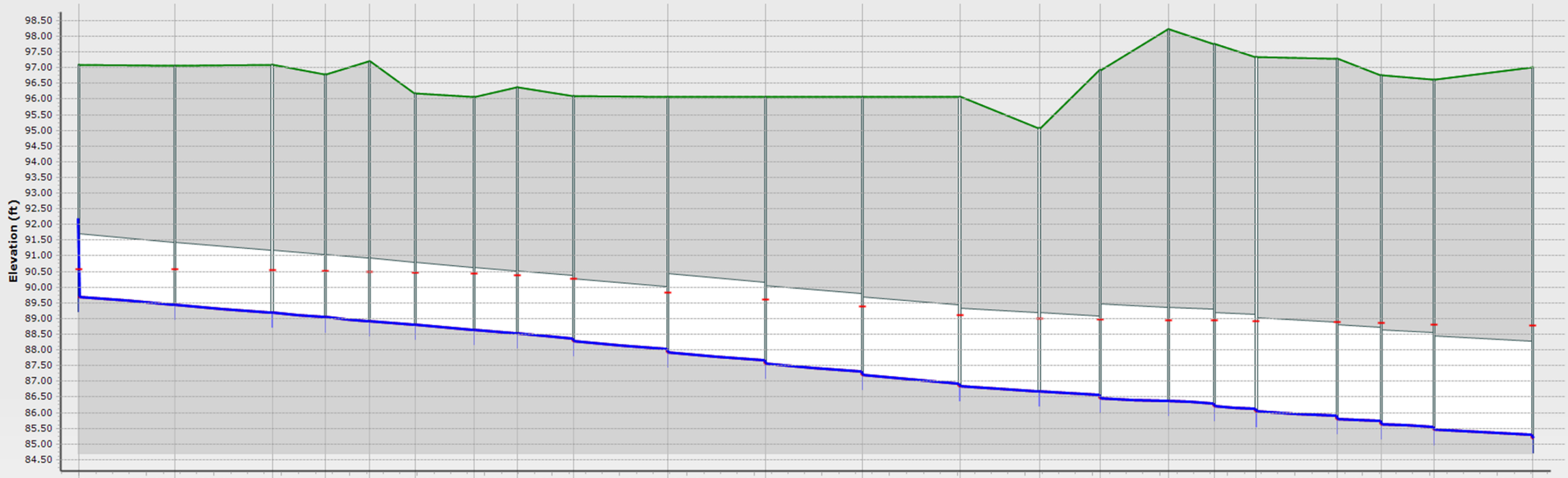
Car Wash with Recycled R.O. Reject Water



Note: All numbers are gallons of water per car. 9 gallons per car would require additional tank and pump infrastructure for R.O. reject water reuse.

APPENDIX E: CIVILSTORM SEWER PROFILES

Profile - Line A - Post-Development 10 year - Time: 0.00



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Link Length (ft)	142.0	144.0	79.1	65.0	68.0	87.0	64.0	83.0	140.0	144.0	144.0	143.8	117.8	90.0	101.0	68.1	62.0	120.0	65.0	78.0	146.0
Rise (in)\Material	24.0 \ Concrete	24.0 \ Concrete	24.0 \ Concrete	24.0 \ Concrete	24.0 \ Concrete	24.0 \ Concrete	24.0 \ Concrete	24.0 \ Concrete	24.0 \ Concrete	30.0 \ Concrete	30.0 \ Concrete	30.0 \ Concrete	30.0 \ Concrete	30.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete
Flow (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Slope (ft/ft)	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0019	0.0018	0.0018	0.0018	0.0018	0.0018	0.0013	0.0013	0.0011	0.0010	0.0011	0.0011	0.0011	0.0010	0.0011
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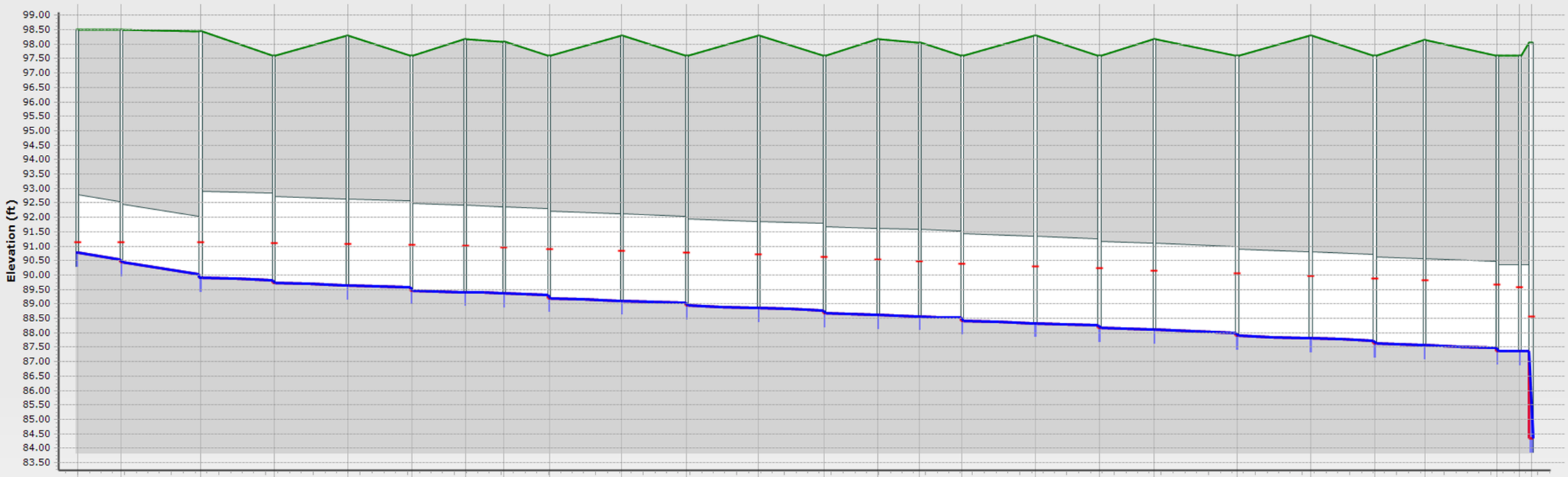
Ground (ft)	97.08	97.07	97.08	96.79	97.19	96.19	96.08	96.38	96.10	96.08	96.08	96.08	96.07	95.06	96.91	98.22	97.75	97.33	97.29	96.77	96.63	97.00
Invert (ft)	89.20	88.94	88.68	88.54	88.42	88.30	88.14	88.02	87.77	87.42	87.06	86.70	86.34	86.19	85.97	85.87	85.70	85.53	85.30	85.13	84.95	84.69
Station (ft)	0.0	142.0	286.0	365.1	430.1	498.1	585.1	649.1	732.1	872.1	1016.1	1160.1	1303.9	1421.7	1511.7	1612.7	1680.8	1742.8	1862.8	1927.8	2005.8	2151.8

Profile - Line B - Post-Development 10 year - Time: 0.00



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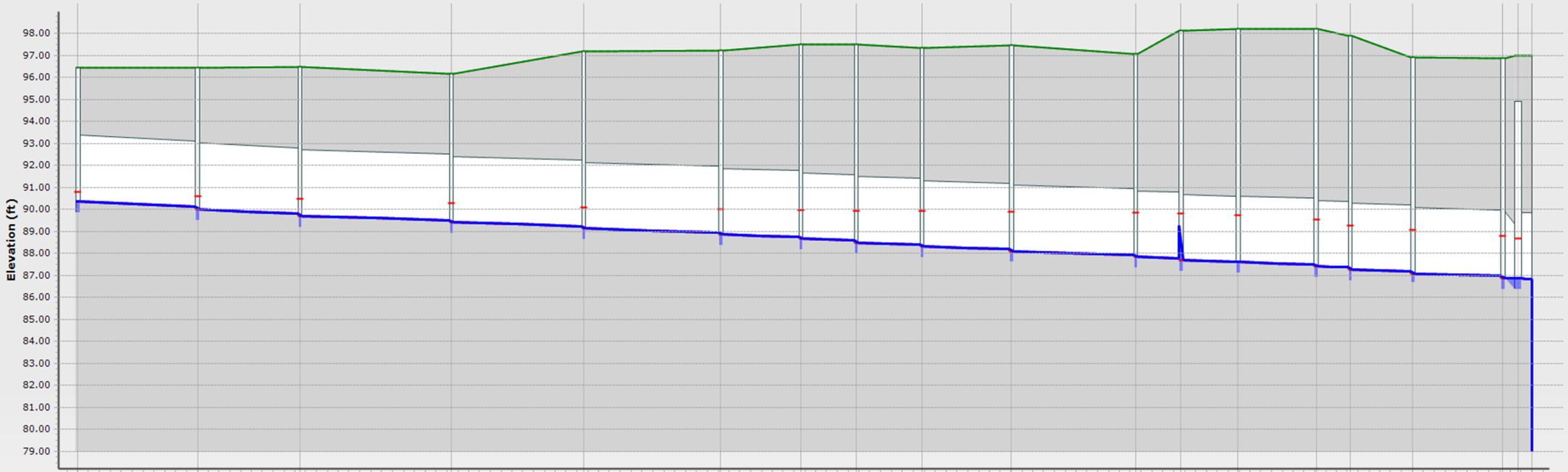
Link Length (ft)	46.5	84.3	78.0	78.0	68.0	57.0	41.0	48.0	77.0	69.0	76.0	70.0	57.0	44.0	45.0	78.0	68.0	58.0	88.0	78.0	68.0	53.0	77.0	24.0	12.0
Rise (in)\Material	24.0 \ PVC	24.0 \ Concrete	36.0 \ PVC	36.0 \ PVC	36.0 \ PVC	36.0 \ PVC	36.0 \ PVC	36.0 \ PVC	36.0 \ PVC	36.0 \ PVC	36.0 \ PVC	36.0 \ PVC	36.0 \ PVC	36.0 \ PVC	36.0 \ PVC	36.0 \ PVC	36.0 \ PVC	36.0 \ PVC	36.0 \ PVC	36.0 \ PVC	36.0 \ PVC	36.0 \ PVC	36.0 \ PVC	36.0 \ PVC	PVC
Flow (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Slope (ft/ft)	0.0049	0.0050	0.0010	0.0012	0.0010	0.0011	0.0010	0.0013	0.0012	0.0010	0.0011	0.0011	0.0011	0.0011	0.0011	0.0012	0.0010	0.0010	0.0011	0.0012	0.0012	0.0011	0.0013	0.0004	0.0008
ID\Label	401 \ CB-B272	402 \ MH-B271	404 \ MH-B27	406 \ CB-B26	412 \ MH-B25	413 \ CB-B24	415 \ MH-B23	419 \ CB-B21	421 \ MH-B20	423 \ CB-B19	425 \ MH-B18	427 \ CB-B17	429 \ MH-B16	433 \ CB-B14	435 \ MH-B13	437 \ CB-B12	439 \ MH-B11	441 \ CB-B10	443 \ MH-B9	445 \ CB-B8	447 \ MH-B7	451 \ MH-B6 (Ultra-Sep)			
Ground (ft)	98.50	98.50	98.45	97.60	98.28	97.60	98.17	98.08	97.60	98.29	97.60	98.30	97.60	98.17	98.05	97.60	98.28	97.60	98.18	97.60	98.28	97.60	98.13	97.60	97.58	98.06
Invert (ft)	90.27	89.94	89.41	89.73	89.14	88.97	88.91	88.87	88.70	88.61	88.44	88.36	88.18	88.12	88.07	87.92	87.83	87.66	87.60	87.40	87.31	87.13	87.07	86.87	86.85	86.83
Station (ft)	0.0	46.5	130.8	208.8	286.8	354.8	411.8	452.8	500.8	577.8	646.8	722.8	792.8	849.8	893.8	938.8	1016.8	1084.8	1142.8	1230.8	1308.8	1376.8	1429.8	1506.8	1530.8	1542.8

Profile - Line C - Post-Development 10 year - Time: 0.00



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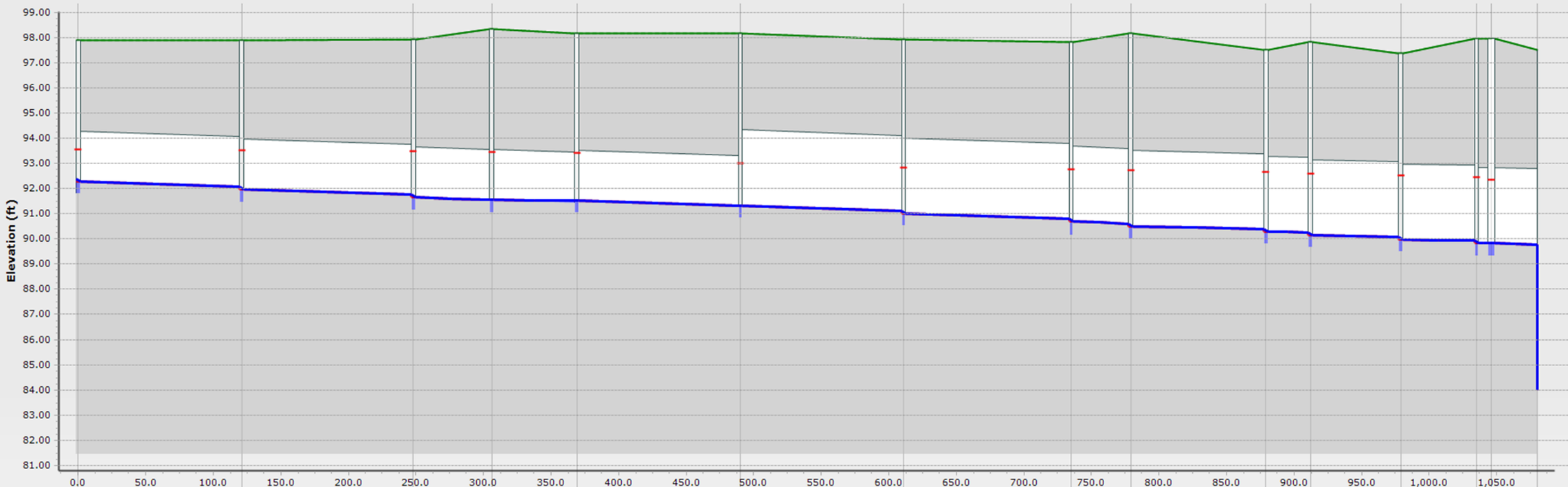
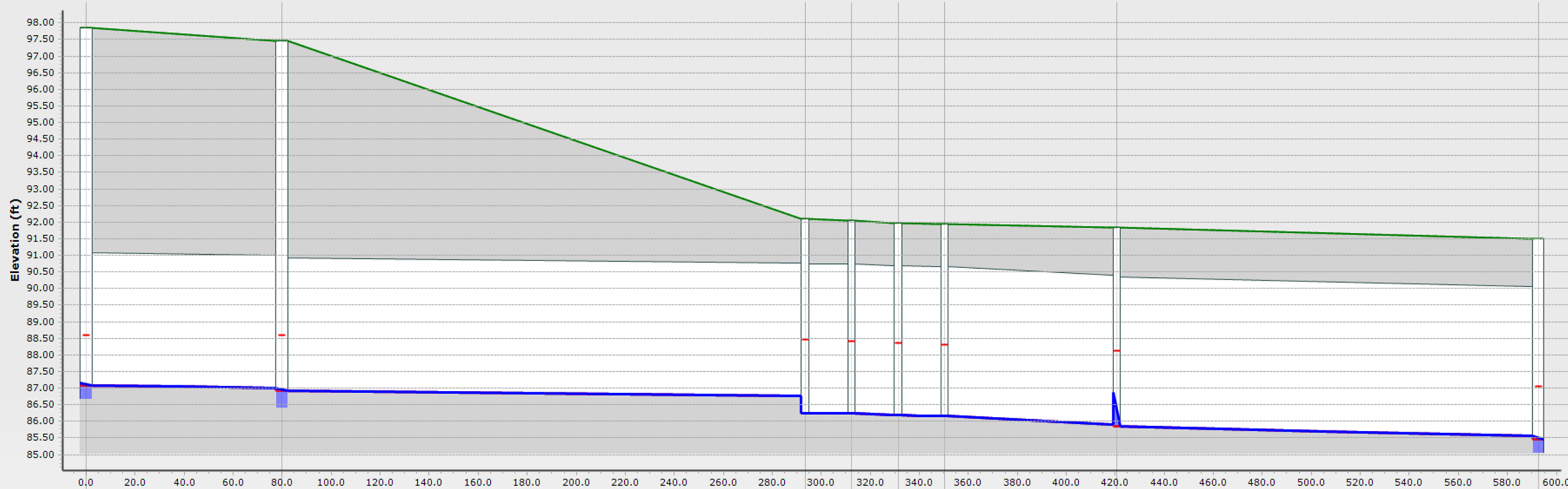
Link Length (ft)	137.8	118.3	174.3	152.3	157.9	92.2	64.1	75.5	103.1	143.2	52.2	65.5	90.5	39.1	72.1	103.6	17.3	16.2
Rise (in)\Material	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	Concrete
Flow (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Slope (ft/ft)	0.0018	0.0019	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0010	0.0011	0.0011	0.0308	0.0008
ID\Label	266 \ CB-C18	264 \ CB-C17	262 \ CB-C16	260 \ CB-C15	230 \ CB-C14	228 \ CB-C13	226 \ CB-C12	224 \ CB-C11	222 \ CB-C10	220 \ CB-C9	218 \ CB-C8	216 \ MH-C7	214 \ MH-C6	212 \ MH-C5	CB-C4	208 \ MH-C3	[illegible]	Out)
Ground (ft)	96.45	96.45	96.46	96.17	97.20	97.23	97.51	97.50	97.34	97.47	97.07	98.14	98.19	98.20	97.90	96.90	[illegible]	97.00
Invert (ft)	89.87	89.52	89.20	88.91	88.64	88.36	88.16	87.99	87.81	87.61	87.34	87.18	87.11	86.91	86.77	86.69	[illegible]	86.00
Station (ft)	0.0	137.8	256.1	430.4	582.8	740.7	832.8	896.9	972.4	1075.6	1218.8	1270.9	1336.4	1426.9	1466.0	1538.1	[illegible]	5.2

Profile - Line D - Post-Development 10 year - Time: 0.00



ID\Label	486 \ P-D15	484 \ P-D14	482 \ P-D13	480 \ P-D12	478 \ P-D11	476 \ P-D10	474 \ P-D9	472 \ P-D8	470 \ P-D7	468 \ P-D6	466 \ P-D5	464 \ P-D4	605 \ P-D3	607 \ P-D2
Link Length (ft)	121.0	127.0	58.0	63.0	121.0	121.0	124.0	44.0	100.0	33.0	67.0	56.0	11.0	34.0
Rise (in)\Material	24.0 \ Concrete	24.0 \ Concrete	24.0 \ Concrete	24.0 \ Concrete	24.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete
Flow (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Slope (ft/ft)	0.0018	0.0017	0.0019	0.0017	0.0018	0.0018	0.0018	0.0020	0.0011	0.0012	0.0010	0.0009	0.0009	0.0012
ID\Label	485 \ CB-D15	483 \ CB-D14	481 \ CB-D13	479 \ MH-D12	477 \ CB-D11	475 \ CB-D10	473 \ CB-D9	471 \ CB-D8	469 \ CB-D7	467 \ CB-D6	465 \ MH-D5	463 \ CB-D4	606 \ MH-D3	Post G Inflow
Ground (ft)	97.90	97.90	97.93	98.33	98.16	98.16	97.93	97.83	98.17	97.51	97.83	97.38	97.94	97.50
Invert (ft)	91.78	91.46	91.15	91.04	91.03	90.83	90.51	90.16	90.00	89.79	89.65	89.48	89.32	81.48
Station (ft)	0.0	121.0	248.0	306.0	369.0	490.0	611.0	735.0	779.0	879.0	912.0	979.0	1046.0	1080.0

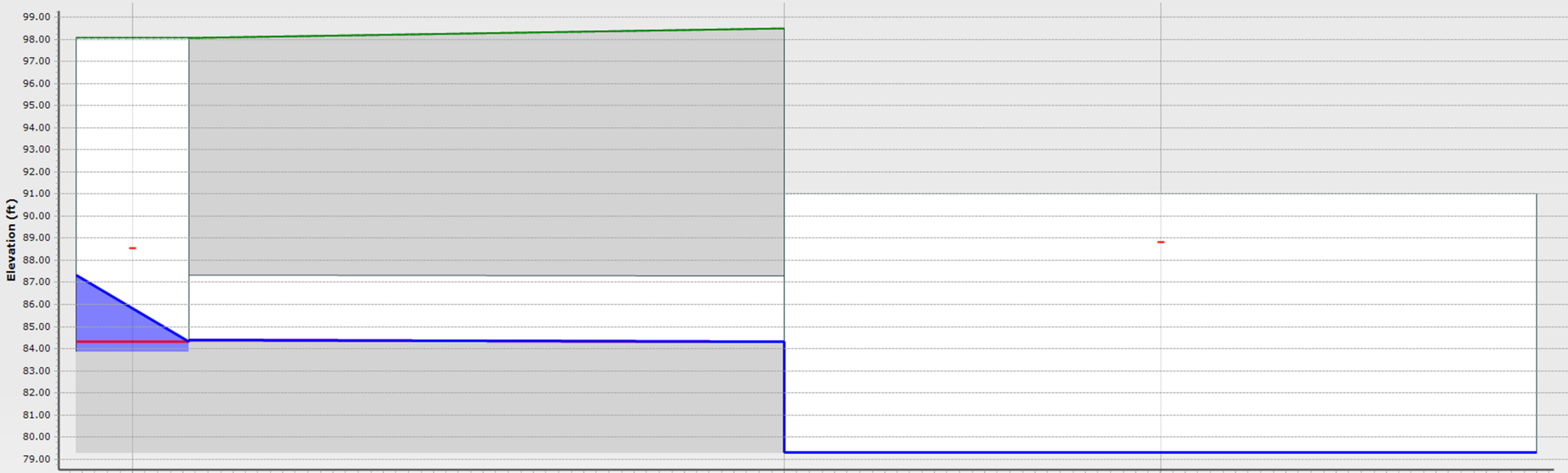
Profile - Line E - Post-Development 10 year - Time: 0.00



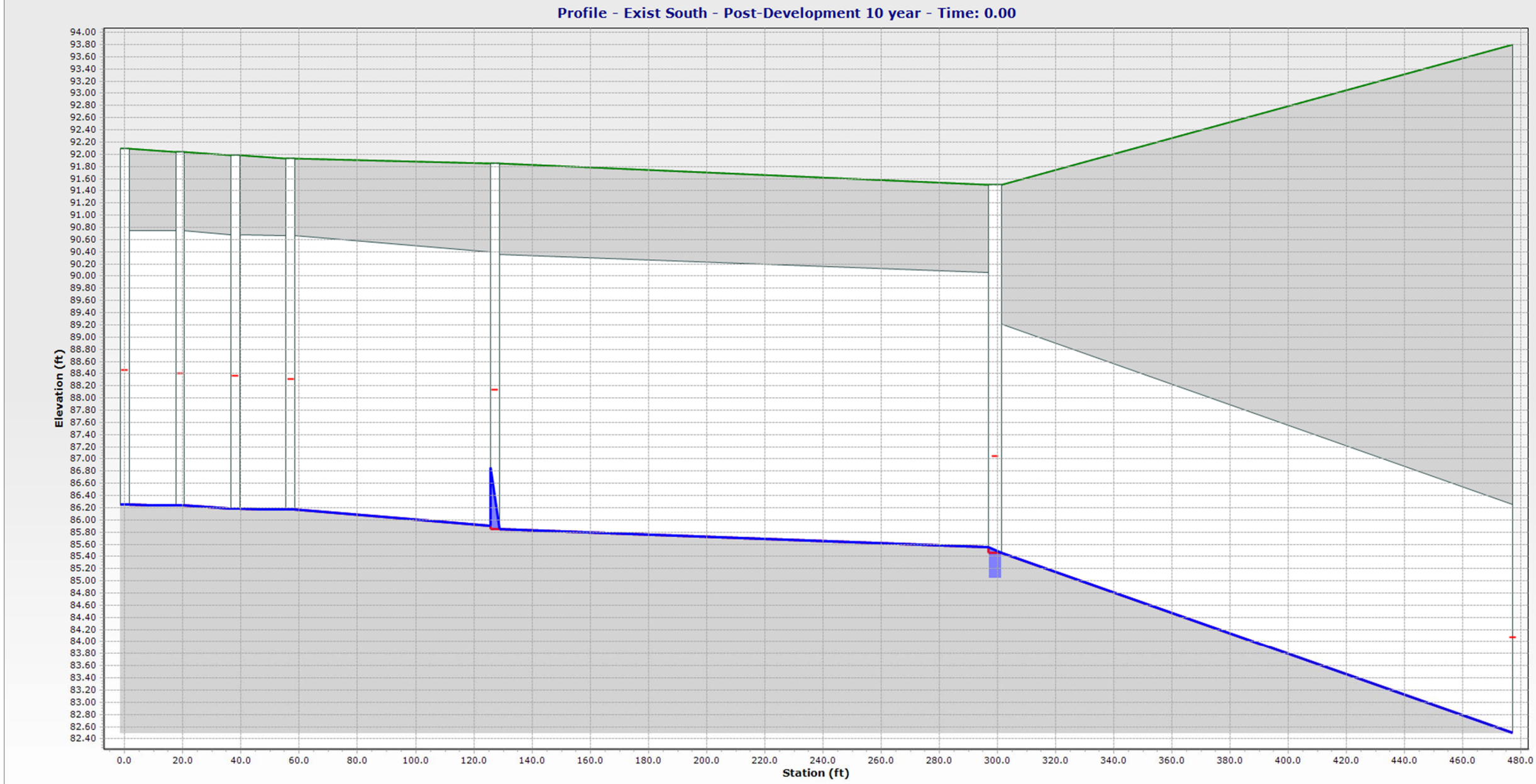
ID\Label	197 \ P-E2	195 \ P-E1	89 \ P-Ex S8	92 \ P-Ex S7	95 \ P-Ex S6	96 \ P-Ex S5	86 \ P-Ex S4
Link Length (ft)	79.8	215.1	19.0	19.0	19.0	70.2	172.0
Rise (in)\Material	48.0 \ Concrete	48.0 \ Concrete	54.0 \ Concrete	54.0 \ Concrete	54.0 \ Concrete	54.0 \ Concrete	54.0 \ Concrete
Flow (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Slope (ft/ft)	0.0008	0.0007	0.0005	0.0032	0.0005	0.0038	0.0017

ID\Label	196 \ MH-E2	194 \ MH-E1	77 \ CB-Ex S8	88 \ CB-Ex S7	91 \ CB-Ex S6	94 \ CB-Ex S5	78 \ MH- Ex S4	79 \ CB-Ex S3
Ground (ft)	97.85	97.47	92.09	92.04	91.98	91.93	91.85	91.50
Invert (ft)	86.67	86.41	86.25	86.24	86.18	86.17	85.85	85.04
Station (ft)	0.0	79.8	293.4	312.4	331.4	350.4	420.6	592.6

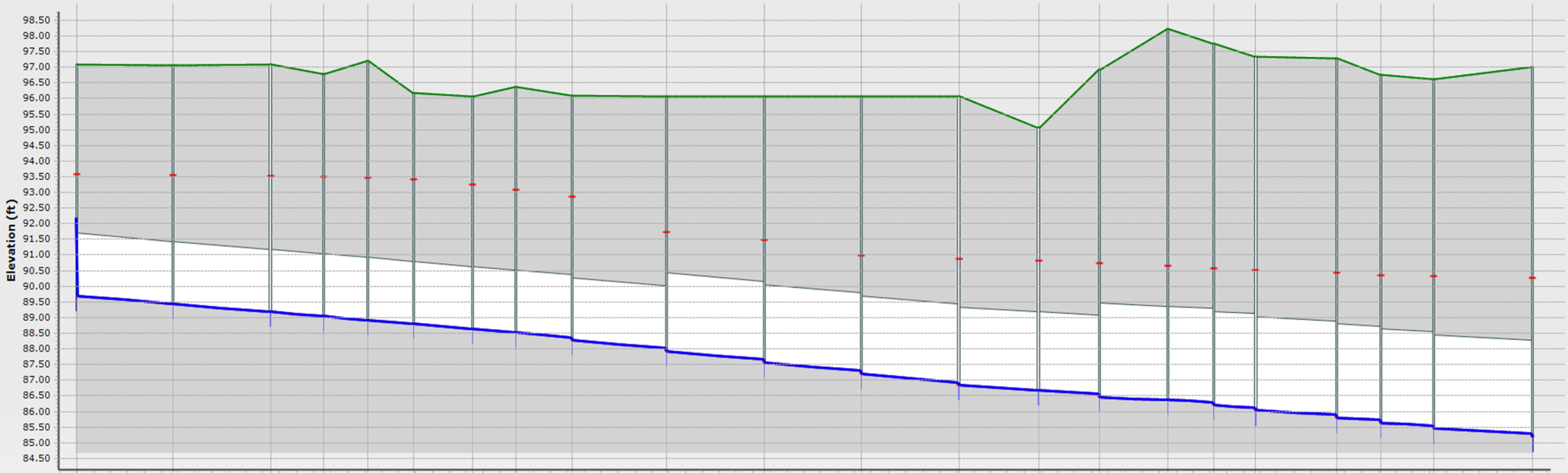
Profile - 2 - Post-Development 10 year - Time: 0.00



ID\Label		747 \ P-B4	408 \ PO-Cistern D
Link Length (ft)		26.0	30.0
Rise (in)\Material		36.0 \ PVC	--
Flow (cfs)		0.00	
Slope (ft/ft)		0.0012	(N/A)
ID\Label	453 \ MH-B4	746 \ O-B3 (Cist D In)	
Ground (ft)	98.06	98.50	
Invert (ft)	83.83	79.33	
Station (ft)	0.0	26.0	


Profile - Exist South - Post-Development 10 year - Time: 0.00
Elevation (ft)
94.00
93.80
93.60
93.40
93.20
93.00
92.80
92.60
92.40
92.20
92.00
91.80
91.60
91.40
91.20
91.00
90.80
90.60
90.40
90.20
90.00
89.80
89.60
89.40
89.20
89.00
88.80
88.60
88.40
88.20
88.00
87.80
87.60
87.40
87.20
87.00
86.80
86.60
86.40
86.20
86.00
85.80
85.60
85.40
85.20
85.00
84.80
84.60
84.40
84.20
84.00
83.80
83.60
83.40
83.20
83.00
82.80
82.60
82.40
0.0
20.0
40.0
60.0
80.0
100.0
120.0
140.0
160.0
180.0
200.0
220.0
240.0
260.0
280.0
300.0
320.0
340.0
360.0
380.0
400.0
420.0
440.0
460.0
480.0
Station (ft)

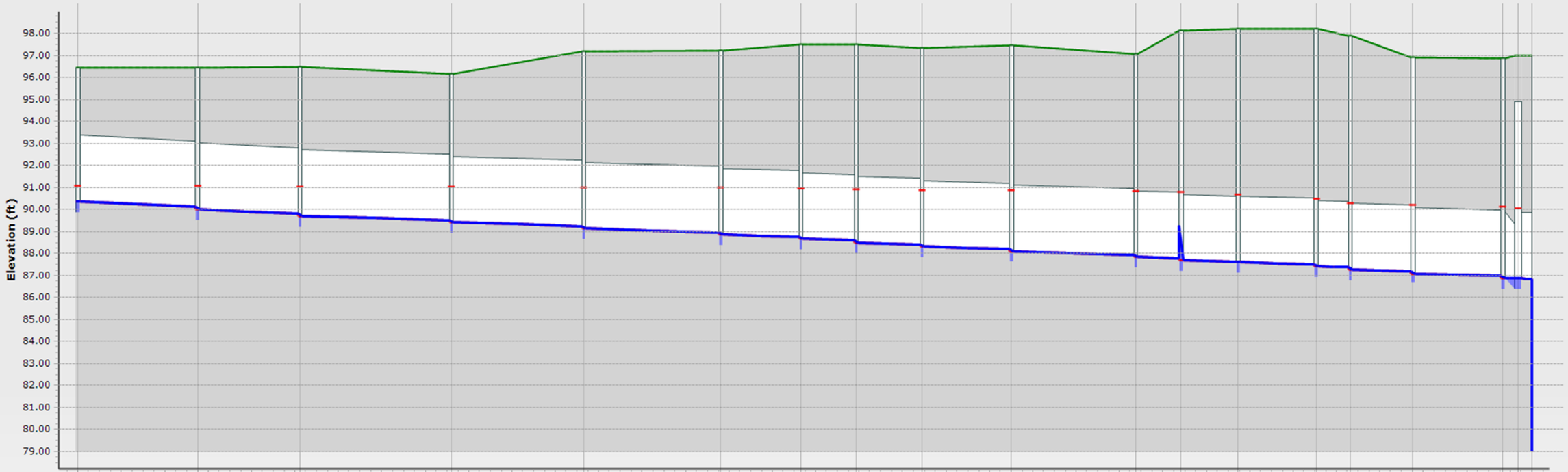
Profile - Line A - Post-Development 50 year - Time: 0.00



ID\Label	612 \ P-A24	614 \ P-A23	616 \ P-A22	618 \ P-A21	620 \ P-A20	622 \ P-A19	624 \ P-A18	626 \ P-A17	628 \ P-A16	630 \ P-A15	632 \ P-A14	634 \ P-A13	636 \ P-A12	638 \ P-A11	640 \ P-A10	642 \ P-A9	644 \ P-A8	646 \ P-A7	648 \ P-A6	650 \ P-A5	652 \ P-A4
Link Length (ft)	142.0	144.0	79.1	65.0	68.0	87.0	64.0	83.0	140.0	144.0	144.0	143.8	117.8	90.0	101.0	68.1	62.0	120.0	65.0	78.0	146.0
Rise (in)\Material	24.0 \ Concrete	24.0 \ Concrete	24.0 \ Concrete	24.0 \ Concrete	24.0 \ Concrete	24.0 \ Concrete	24.0 \ Concrete	24.0 \ Concrete	24.0 \ Concrete	30.0 \ Concrete	30.0 \ Concrete	30.0 \ Concrete	30.0 \ Concrete	30.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete
Flow (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Slope (ft/ft)	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0019	0.0018	0.0018	0.0018	0.0018	0.0018	0.0013	0.0013	0.0011	0.0010	0.0011	0.0011	0.0011	0.0010	0.0011

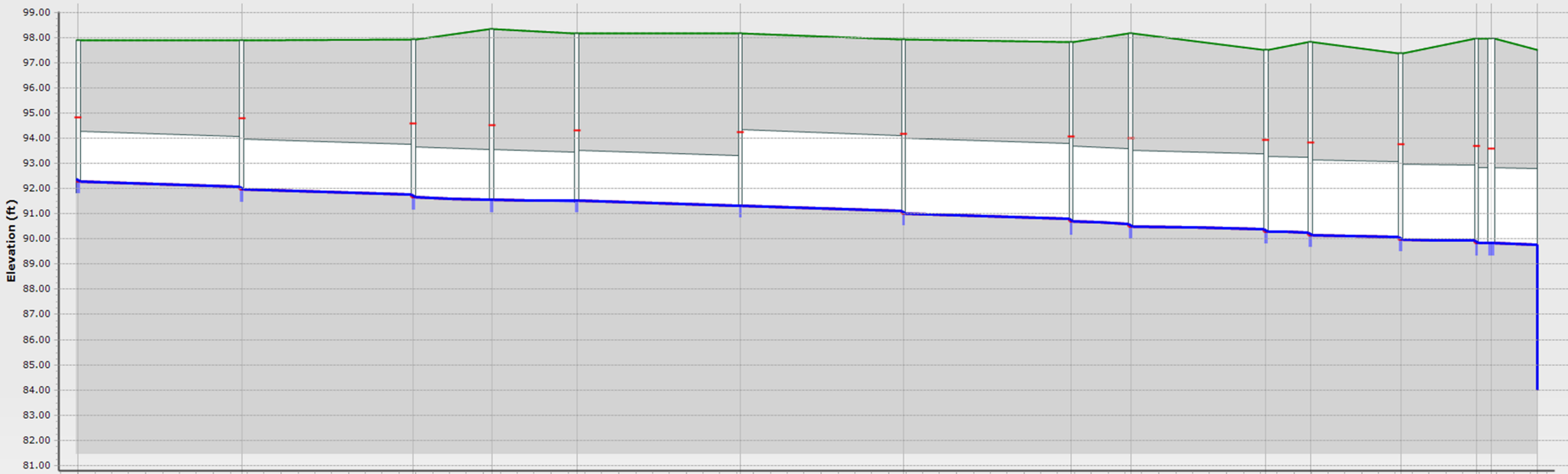
ID\Label	610 \ CB-A24	611 \ CB-A23	613 \ MH-A22	615 \ CB-A21	617 \ MH-A20	619 \ CB-A19	621 \ CB-A18	623 \ MH-A17	625 \ CB-A16	627 \ CB-A15	629 \ CB-A14	631 \ CB-A13	633 \ CB-A12	635 \ MH-A11	637 \ MH-A10	639 \ MH-A9	641 \ MH-A8	643 \ CB-A7	645 \ CB-A6	647 \ CB-A5	649 \ CB-A4	651 \ CB-A3
Ground (ft)	97.08	97.07	97.08	96.79	97.19	96.19	96.08	96.38	96.10	96.08	96.08	96.08	96.07	95.06	96.91	98.22	97.75	97.33	97.29	96.77	96.63	97.00
Invert (ft)	89.20	88.94	88.68	88.54	88.42	88.30	88.14	88.02	87.77	87.42	87.06	86.70	86.34	86.19	85.97	85.87	85.70	85.53	85.30	85.13	84.95	84.69
Station (ft)	0.0	142.0	286.0	365.1	430.1	498.1	585.1	649.1	732.1	872.1	1016.1	1160.1	1303.9	1421.7	1511.7	1612.7	1680.8	1742.8	1862.8	1927.8	2005.8	2151.8

Profile - Line C - Post-Development 50 year - Time: 0.00



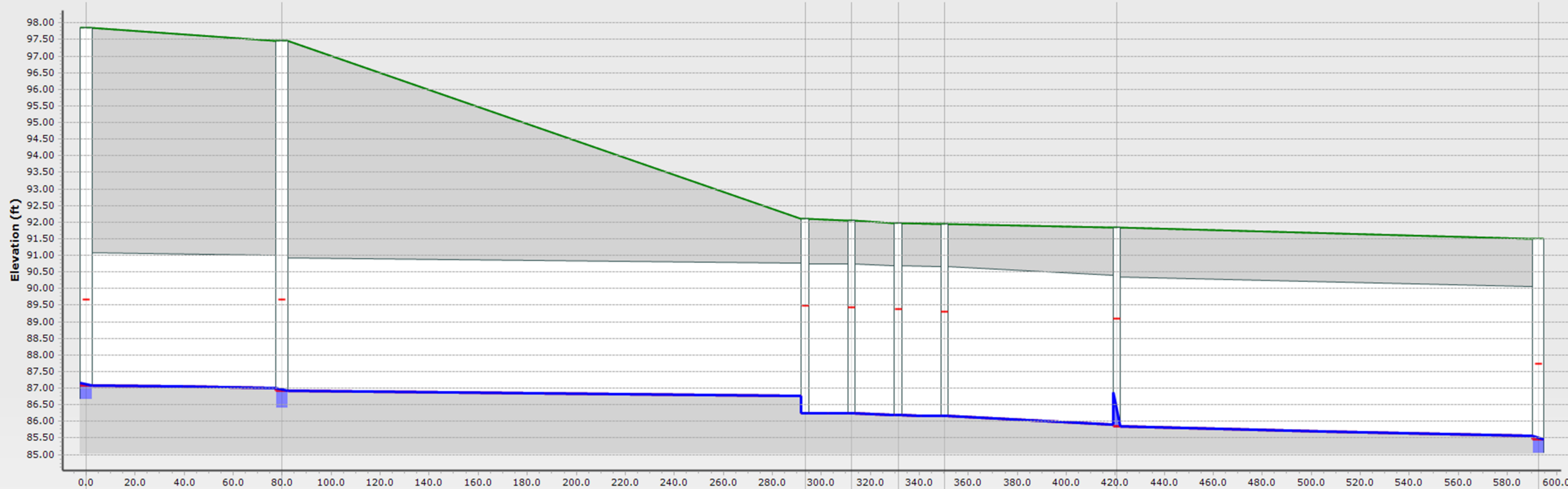
ID\Label	267 \ P-C18	265 \ P-C17	263 \ P-C16	261 \ P-C15	231 \ P-C14	229 \ P-C13	227 \ P-C12	225 \ P-C11	223 \ P-C10	221 \ P-C9	219 \ P-C8	217 \ P-C7	215 \ P-C6	213 \ P-C5	211 \ P-C4	209 \ P-C3	207 \ P-C2	P-C1
Link Length (ft)	137.8	118.3	174.3	152.3	157.9	92.2	64.1	75.5	103.1	143.2	52.2	65.5	90.5	39.1	72.1	103.6	17.3	16.2
Rise (in)\Material	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	Concrete
Flow (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Slope (ft/ft)	0.0018	0.0019	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0010	0.0011	0.0011	0.0308	0.0008
ID\Label	266 \ CB-C18	264 \ CB-C17	262 \ CB-C16	260 \ CB-C15	230 \ CB-C14	228 \ CB-C13	226 \ CB-C12	224 \ CB-C11	222 \ CB-C10	220 \ CB-C9	218 \ CB-C8	216 \ MH-C7	214 \ MH-C6	212 \ MH-C5	CB-C4	208 \ MH-C3	[illegible]	Out)
Ground (ft)	96.45	96.45	96.46	96.17	97.20	97.23	97.51	97.50	97.34	97.47	97.07	98.14	98.19	98.20	97.90	96.90	[illegible]	97.00
Invert (ft)	89.87	89.52	89.20	88.91	88.64	88.36	88.16	87.99	87.81	87.61	87.34	87.18	87.11	86.91	86.77	86.69	[illegible]	86.00
Station (ft)	0.0	137.8	256.1	430.4	582.8	740.7	832.8	896.9	972.4	1075.6	1218.8	1270.9	1336.4	1426.9	1466.0	1538.1	[illegible]	5.2

Profile - Line D - Post-Development 50 year - Time: 0.00



ID\Label	486 \ P-D15	484 \ P-D14	482 \ P-D13	480 \ P-D12	478 \ P-D11	476 \ P-D10	474 \ P-D9	472 \ P-D8	470 \ P-D7	468 \ P-D6	466 \ P-D5	464 \ P-D4	605 \ P-D3	607 \ P-D2
Link Length (ft)	121.0	127.0	58.0	63.0	121.0	121.0	124.0	44.0	100.0	33.0	67.0	56.0	11.0	34.0
Rise (in)\Material	24.0 \ Concrete	24.0 \ Concrete	24.0 \ Concrete	24.0 \ Concrete	24.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete	36.0 \ Concrete
Flow (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Slope (ft/ft)	0.0018	0.0017	0.0019	0.0017	0.0018	0.0018	0.0018	0.0020	0.0011	0.0012	0.0010	0.0009	0.0009	0.0012
ID\Label	485 \ CB-D15	483 \ CB-D14	481 \ CB-D13	479 \ MH-D12	477 \ CB-D11	475 \ CB-D10	473 \ CB-D9	471 \ CB-D8	469 \ CB-D7	467 \ CB-D6	465 \ MH-D5	463 \ CB-D4	606 \ MH-D3	Post G Inflow
Ground (ft)	97.90	97.90	97.93	98.33	98.16	98.16	97.93	97.83	98.17	97.51	97.83	97.38	97.94	97.50
Invert (ft)	91.78	91.46	91.15	91.04	91.03	90.83	90.51	90.16	90.00	89.79	89.65	89.48	89.32	81.48
Station (ft)	0.0	121.0	248.0	306.0	369.0	490.0	611.0	735.0	779.0	879.0	912.0	979.0	1046.0	1080.0

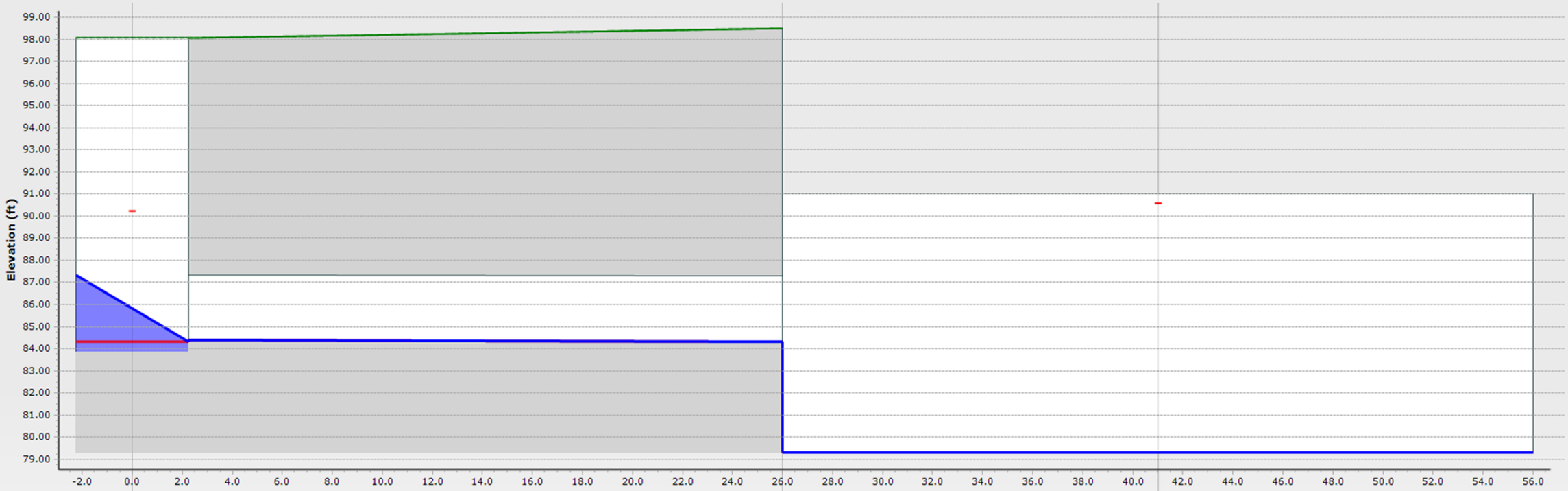
Profile - Line E - Post-Development 50 year - Time: 0.00



ID\Label	197 \ P-E2	195 \ P-E1	89 \ P-Ex S8	92 \ P-Ex S7	95 \ P-Ex S6	96 \ P-Ex S5	86 \ P-Ex S4
Link Length (ft)	79.8	215.1	19.0	19.0	19.0	70.2	172.0
Rise (in)\Material	48.0 \ Concrete	48.0 \ Concrete	54.0 \ Concrete	54.0 \ Concrete	54.0 \ Concrete	54.0 \ Concrete	54.0 \ Concrete
Flow (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Slope (ft/ft)	0.0008	0.0007	0.0005	0.0032	0.0005	0.0038	0.0017

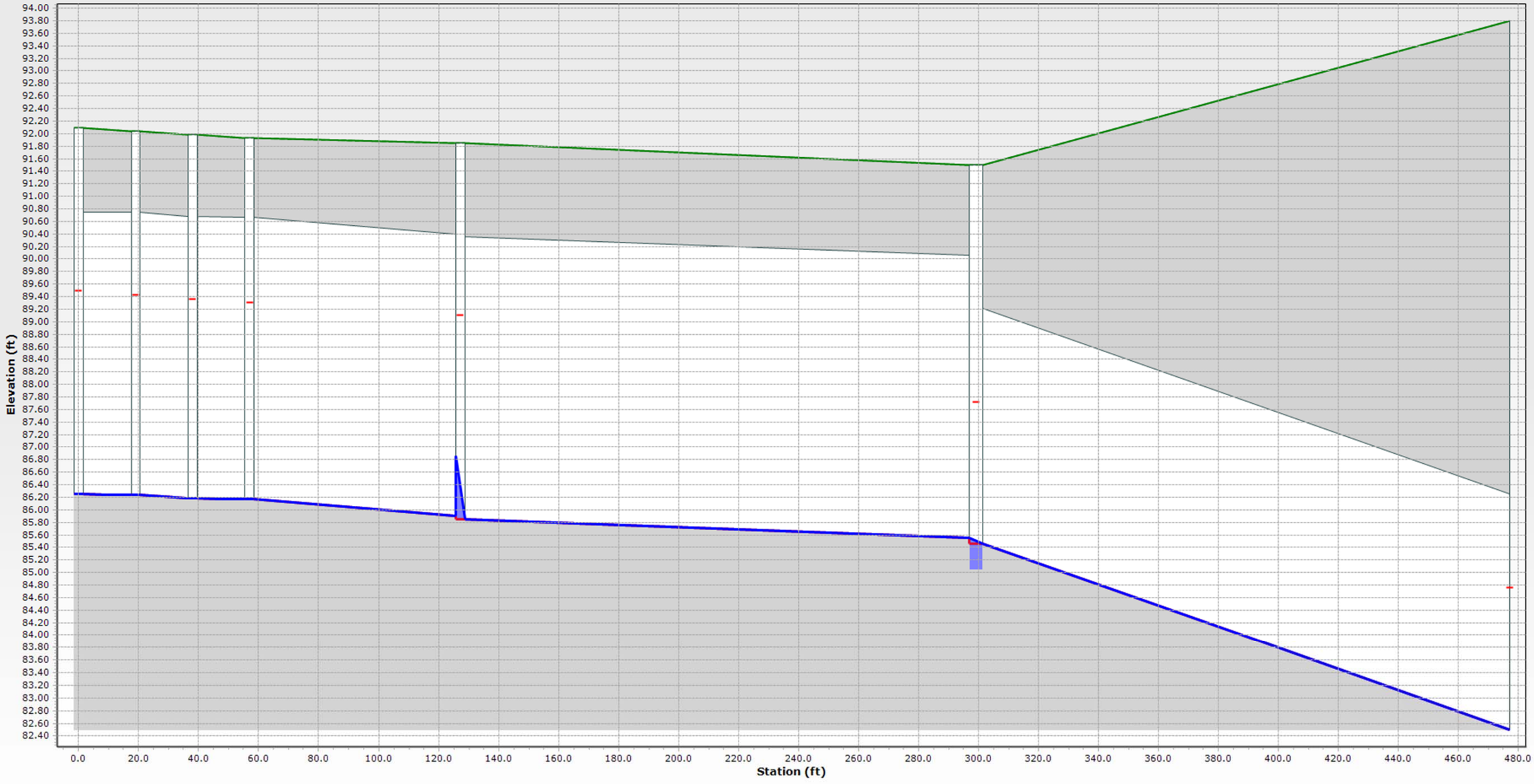
ID\Label	196 \ MH-E2	194 \ MH-E1	77 \ CB-Ex S8	88 \ CB-Ex S7	91 \ CB-Ex S6	94 \ CB-Ex S5	78 \ MH- Ex S4	79 \ CB-Ex S3
Ground (ft)	97.85	97.47	92.09	92.04	91.98	91.93	91.85	91.50
Invert (ft)	86.67	86.41	86.25	86.24	86.18	86.17	85.85	85.04
Station (ft)	0.0	79.8	293.4	312.4	331.4	350.4	420.6	592.6

Profile - 2 - Post-Development 50 year - Time: 0.00



ID\Label		747 \ P-B4	408 \ PO-Cistern D
Link Length (ft)		26.0	30.0
Rise (in)\Material		36.0 \ PVC	--
Flow (cfs)		0.00	
Slope (ft/ft)		0.0012	(N/A)
ID\Label	453 \ MH-B4	746 \ O-B3 (Cist D In)	
Ground (ft)	98.06	98.50	
Invert (ft)	83.83	79.33	
Station (ft)	0.0	26.0	

Profile - Exist South - Post-Development 50 year - Time: 0.00



APPENDIX F: CIVIL STORM RESULTS