

AMAFC



April 2017

Upper Piedras Marcadas Watershed

Drainage and Water Quality Management Plan

Volume 3 - Developed Conditions



WILSON
& COMPANY



**UPPER PIEDRAS MARCADAS WATERSHED
DRAINAGE AND WATER QUALITY MANAGEMENT PLAN
VOLUME 3 - DEVELOPED CONDITIONS REPORT
APRIL 2017**

I, Donald M. Duneman, do hereby certify that this report was prepared by me or under my direction and that I am a duly registered Professional Engineer under the laws of the State of New Mexico.

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Executive Summary

The objective of the Upper Piedras Marcadas Watershed Drainage and Water Quality Management Plan (UPMDMP) Developed Conditions Report is to:

- Address Limited Downstream Capacity
 - o Piedras Marcadas Dam/Gated
 - o Existing Storm Drain
 - o Piedras Marcadas Arroyo
- Optimize Diversions to Adjacent Watersheds
 - o Boca Negra Watershed
 - o Calabacillas Watershed
 - o Mariposa Watershed
- Propose Storm Drain, Detention and Water Quality Features
- Develop Funding/Reimbursement Mechanism
- Assess Piedras Marcadas Dam with Gate Removed

Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) contracted Wilson & Company for Phase I and Phase II Services in April of 2013. Phase I Services included hydrologic and hydraulic analyses of the existing conditions. Phase II Services consist of hydrologic and hydraulic analyses of the developed conditions, capacity analysis of certain existing facilities for future developed conditions, development of alternatives for proposed drainage infrastructure with recommendations, establishment of drainage management policy for the watershed, and coordination with project stakeholders. The goal of this document is to provide drainage and water quality alternatives for future development. Wilson & Company provides recommendations based on the systems' hydraulic function and cost.

Property owners' meetings were held from September 25th, 2013 to October 16th, 2013 to present the project and to solicit feedback on the overall project approach. Notifications were sent to all property owners within the watershed area resulting in 6 meetings being scheduled and conducted with interested property owners. In general, the concept of AMAFCA building the major/backbone drainage/water quality infrastructure and having property owners reimburse



AMAFCA at the time of development has been met with a favorable response. Property owners seem to understand the reality of needing to build infrastructure, such as detention ponds, water quality structures and large diameter trunk lines, in advance of development. Most of the feedback received was specific to the various aspects of the reimbursement mechanism.

Basic information was provided on the options being considered for the mechanism for reimbursement: Drainage Easement, Infrastructure Development Zone (IDZ), Public Improvement District (PID), Tax Increment Financing (TIF) and Special Assessment District (SAD). The simplicity of the Drainage Easement option was appealing to the property owners; however, they were skeptical that we would get 100% concurrence. Most owners preferred to work directly with AMAFCA; therefore, an SAD seems to be the least preferred. Many owners appreciated that we want an option “with teeth” so that all property owners share the cost and reimburse AMAFCA.

Before the area is developed, it is important to identify proposed regional systems that accommodate increased peak discharge and volumetric runoff. Cost estimates are provided which are used to prioritize future capital projects and negotiate with private developers. Several design alternatives were developed over the course of the study. Alternatives were presented to the project team and then modified by incorporating the team’s input. Two alternatives were presented in a public meeting held December 17th, 2013. The public was given a timeframe of 10 days to comment. As a result of the public meetings, working with AMAFCA staff and feedback from presentations to the AMAFCA Board of Directors we evaluated 3 Alternatives with the Piedras Marcadas Dam intake structure gate closed and 1 Alternative with the gate removed. Addressing limited downstream capacity, optimizing diversions and water quality features were the primary goals in developing the alternatives. All three gated alternatives include diversions to the Calabacillas and Boca Negra watersheds, while alternatives 1 and 2 also include diversion to the Mariposa watershed. The 4th Alternative utilized Alternative 3 as a base model since it resulted in the highest peak flow and volume discharge to the Piedras Marcadas Dam.

Stormwater within the watershed will be conveyed to regional ponds through public storm drain systems. Debris can be removed from the stormwater through the use of water quality manholes, water quality inlets, ported risers, and filter/fence screens. These are similar options to those described for the site development options (Sections 7.1.4 and 7.1.5). Larger scale



screens, grates and traps can be constructed within regional ponds or channels to help reduce “floatable” pollutant loads.

Each alternative included various ponds and storm systems. The results of the analyses showed that calculated runoff volume to the Piedras Marcadas Dam for all three alternatives assuming the gate remains closed is over the allowable storage for the fully developed conditions. The Dam has a gated principal spillway with capacity of 307 ac-feet without freeboard and 280 ac-feet with one foot of freeboard. Based on the findings of this study the dam can accommodate 81 ac-feet from the Upper Piedras Marcadas with the Gate closed.

If the gate remains closed we have identified 2 options for AMAFCA to ensure the dam is operated as intended during the low frequency events. Option 1 is to increase the storage capacity by 1 of two ways:

1. Excavating additional capacity in the Dam pool area
2. Providing retention ponds in the upper watershed

Both of these options would need to capture the additional volume of runoff generated by the preferred alternative for diversions out of the watershed. Option 2 is to restrict runoff from future developments draining into the dam by required low impact development practices to meet the reduced volume required per the preferred alternative. Percent volume capture required for each of the 3 Alternatives is shown in Table 9-2.

If the Piedras Marcadas Dam principle spillway gate is removed and the Dam can free flow per the principle spillway rating curve the Dam can accommodate the runoff peak flow and volume from each of the Upper Piedras Marcadas Watershed Alternatives.

1. Introduction

The Upper Piedras Marcadas (UPM) Watershed is bounded by Universe Blvd. to the west, PdN Blvd. and Avenida de Jaimito to the south, the Petroglyph National Monument to the east and the Albuquerque city limit to the north. Unser Blvd. and PdN Blvd. cross the watershed. See Exhibit 1, Location Map. Although the majority of the UPM drains to the Piedras Marcadas



Dam, planned and constructed infrastructure includes diversions into the following watersheds:
Boca Negra Dam, Calabacillas and Mariposa.

1.1. Upper Piedras Marcadas

The UPM runoff is conveyed by the existing 72 inch/84 inch PdN storm drain. This system has the capacity to accommodate the developed conditions flows of 759 cfs as established in previous reports. This system ultimately drains to into the Piedras Marcadas Dam. The Dam has a gated principal spillway with a capacity of 307 ac-feet of storage volume without freeboard and 280 ac-feet with one foot of freeboard. The 36 inch principal spillway has a peak flow capacity to discharge 90 cfs into the Corrales Main Canal when the gate is opened.

1.2. Mariposa Diversion

The La Cuentista Subdivision – Unit II Drainage Report dated January 2007 prepared by Wilson & Company (WCI) analyzed this watershed with an area of 43.5 ac draining to a pond (Pond 10) located in the northwest corner of the intersection of PdN Blvd. and Calle Plata with an outflow of 64 cfs. See Plates 1 and 2 for reference in Appendix E. Outflow from this pond is combined with downstream basin runoff and routed through two detention ponds before discharging into the Mariposa Arroyo. Currently the only existing infrastructure is the 48 inch storm drain in Rosa Parks draining to a depression at the southeast corner of intersection of Rosa Parks Road and Kimmick Drive.

1.3. Calabacillas Diversion

The Literature Review concluded that the existing 48 inch/60 inch storm drain in Unser Blvd. designed to divert a portion of the runoff from UPM does not have the capacity to accommodate the design storm peak flow of 212 cfs from contributing Chamisa basins per the Cooperative Agreement. Based on the agreement, the Upper Piedras Marcadas Watershed is allowed to contribute 45 cfs to the Chamisa/Lyon storm drain. The current capacity per the existing system is 122 cfs from existing conditions report.

1.4. Boca Negra Diversion

A portion of the UPM watershed is proposed to be conveyed to the Boca Negra Dam with the proposed Unser Blvd. storm drain and an existing storm drain in Universe Blvd. The Universe Blvd system is a 36 inch pipe designed to convey 62 cfs from properties owned by the



Trails Subdivision through existing ponds J1 and K. The Unser Blvd System has not been designed between the UPMW and the Boca Negra Dam. The construction of the Dam included an 8 feet x 8 feet CBC inlet to the Dam to serve as an outfall for the Unser Blvd. storm drain. The system extends across Scenic Blvd. and is capped. Based on the existing topography and updated hydrology model per the Dam as-builts, a portion of the area south of PdN Blvd and west of Unser Blvd. can drain into the Boca Negra Dam.

As development increases it is important to identify proposed regional systems that accommodate increased peak discharge and volumetric runoff. The analysis in this report is based on concept facilities to develop estimates of probable cost used to prioritize future capital projects and negotiate possible infrastructure with property owners. Regional facilities are identified and analyzed to provide system capacity and volume requirements.



2. Literature Review

A literature review of pertinent Drainage Reports, Construction Drawings/As-Built, Agreements and Sector Plans was completed by Wilson & Company to identify existing and potential watershed discharge point locations and capacities of existing conditions. Below is a listing of critical information found in the literature review:

1. Upper Piedras Marcadas

- The allowable discharge to the PdN storm drain at Calle Nortena is 620 cfs.
- The existing 84" PdN storm drain has the capacity to discharge the developed rate of 759 cfs to Piedras Marcadas Arroyo.
- The allowable discharge from the Petroglyph National Monument is 120 cfs.
- The storage capacity of the Piedras Marcadas Dam is 280 ac-feet with one foot of freeboard.
- The 36" principal spillway can discharge 90 cfs to the Corrales Main Canal.

2. Mariposa Diversion

- 64 cfs is allowed to be diverted from UPMW.
- Allowable discharge from UPMW and basins in the Volcano Cliffs area into the Mariposa Arroyo is 106 cfs.

3. Calabacillas Diversion

- The existing 60" Chamisa Storm Drain was designed to convey a flow of 212 cfs. Based on the Existing Conditions Analysis, the capacity is 122 cfs.
- 45 cfs is allowed to be diverted from UPMW.

4. Boca Negra Diversion

- The allowable discharge from the UPMW into the Boca Negra Dam is 171 cfs.

3. Developed Conditions Hydrologic Analysis

3.1. Methodology

Hydrologic modeling was developed using the USACE Hydrologic Engineering Center-Hydrologic Modeling System (HEC-HMS), Version 4.2 and White Paper Methodology. HEC-



HMS was used to calculate peak flow rates and volumetric runoff. The Type II-a Unit Distribution method was used to create user specified hydrograph. Initial abstraction and infiltration losses are based on soil characteristics, land cover, and land use. A time interval of five minutes for the 24-hour storm was used for the computation time step. The basin's physical properties input into the model include sub-basin area, runoff curve number, rainfall distribution, and lag time. A bulking factor of 5% was applied to the hydrologic calculations to account for the sediment transport capacity in the developed conditions. Based on findings in the existing conditions report a bulking factor of 10% was applied to the Petroglyph National Monument area.

3.2. Hydrologic Characteristics

3.2.1. Watershed Delineation

Resources used to define sub-basins included site visits, previous reports, 2010 LIDAR mapping and 2010 Orthophotography. Drainage areas were divided at major drainage structures and confluences of drainage paths.

3.2.2. Precipitation

The precipitation depths for the 6-hour and 24-hour duration, 2, 5, 10, 25, 50 and 100-year storm frequency were obtained from the National Oceanic and Atmospheric Administration (NOAA), Atlas 14, dated 04, 03, 2017. Table 3-1 lists the precipitation depths used to develop a Type II-a rainfall distribution. See Appendix B, User Specified Hyetograph.

Table 3-1 - Rainfall Depths in Inches						
Duration	Average Recurrence Interval (Years)					
	2	5	10	25	50	100
6-hr	0.932	1.210	1.420	1.720	1.950	2.200
24-hr	1.170	1.470	1.700	2.020	2.260	2.520

3.2.3. Land Use

Land use and Zoning used to determine curve numbers for the developed conditions is based on the Volcano Cliffs Sector Development Plan adopted May 2011. See Appendix A, Zoning Map. The hydrologic soil group for the watershed was



established based on soils map findings discussed in the Existing Conditions Report using the NRCS website. The Petroglyph National Monument basin land treatments match those used in the model prepared with the Existing Conditions Report. In order to develop the hydrology model based on the AMAFCA White Paper methodology, each basin was divided into pervious and impervious areas. Unless currently developed, all basins were assumed to include a density of 8 du/ac. Runoff Curve Numbers (CN) for each condition were assigned based on the NMDOT Drainage Manual Table 3-4, Runoff Curve Numbers Urban Areas. Pervious areas were assumed to include fair condition (grass cover 50% to 75%) coverage for type “C” soil with curve number of 79. Refer to Table 3-2 and Appendix B for a summary of Curve Numbers.

Table 3-2 - Curve Numbers			
B202A DC	98	B206B DC	98
B202A UC	79	B206B UC	79
B202B DC	98	B206C DC	98
B202B UC	79	B206C UC	79
B202C DC	98	B206D DC	98
B202C UC	79	B206D UC	79
B203A DC	98	B206E DC	98
B203A UC	79	B206E UC	79
B203B DC	98	B207 UC	65
B203B UC	79	B208 DC	98
B204 DC	98	B208 UC	66
B204 UC	79	B209 DC	98
B205A DC	98	B209 UC	79
B205A UC	79	B210 DC	98
B205B DC	98	B210 UC	79
B205B UC	79	Sundance DC	98
B206A DC	98	Sundance UC	79
B206A UC	79		

3.2.4. Time of Concentration

Time of Concentration is defined as the time required for runoff to travel from the hydraulically most distant part of the watershed to the analysis point. Figure 3-10, Flow Velocities for Overland and Shallow Concentrated Flows, from the NMDOT Drainage Manual, was used to determine the velocity based on the slope. The Upland Method is used



to estimate travel times for overland flow and shallow concentrated flow. The Kirpich method was used for sub-basins with gullied flow, which occurs primarily downstream of the Petroglyph National Monument escarpment. Using the basic equation for time of concentration, the T_c was calculated for both the sheet flow and shallow concentrated flow. The minimum time of concentration used is 10 minutes.

$$T_c = \left(\frac{L_1}{V_1} + \frac{L_2}{V_2} + \dots \frac{L_n}{V_n} \right) * \frac{1}{60}$$

where,

L = length of reach (feet)

V = average flow velocity (feet/s)

T_c = Time of Concentration (minutes)

$$T_c = t_{\text{sheet}} + t_{\text{shallow}}$$

Where,

t_{sheet} = the sum of travel in sheet flow segments over the watershed land surface

t_{shallow} = the sum of travel time in shallow flow segments

The lag time was then calculated for each sub-basin. Lag time is the difference between the centroid of the excess rainfall and the peak of the runoff hydrograph. The lag time is estimated as 60 percent of the time of concentration.

$$T_L = 0.6 T_c$$

Calculated Lag Time summary for each basin is listed in Table 3-3 and Appendix B for Lag time Calculations.



Table 3-3 - Lag Time (min)		
Basin ID	Time of Concentration	Lag Time
202A	21	12
202B	10	6
202C	11	7
203A	23	14
203B	14	8
204	13	8
205A	10	6
205B	10	6
206A	21	13
206B	13	8
206C	22	13
206D	10	6
206E	10	6
207	33	20
208	15	9
209	10	6
210	11	7
Sundance	11	7

4. Hydrologic Summary

HEC-HMS and AMAFCA White Paper Methodology was utilized in calculating developed conditions peak flows and runoff volumes for 24 hour - 2, 10 and 100 - year storm event. See Table 4-1, Developed Conditions Basin Peak discharge and Volumes.



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Table 4-1 - Developed Conditions Basin Peak Discharge and Volumes

Basin ID	Area (ac)	Q _{2yr-24hr} (cfs)	V _{2yr-24hr} (ac-ft)	Q _{10yr-24hr} (cfs)	V _{10yr-24hr} (ac-ft)	Q _{100yr-24hr} (cfs)	V _{100yr-24hr} (ac-ft)	Q _{100yr-24hr} (cfs/ac)
Basin 202A	44.3	40	3.2	74	5.0	130	7.9	2.9
Basin 202B	37.1	40	2.6	75	4.1	132	6.5	3.6
Basin 202C	32.3	36	2.4	67	3.8	116	6.0	3.6
Basin 203A	46.5	42	3.4	76	5.4	133	8.5	2.9
Basin 203B	37.4	36	2.5	67	4.0	120	6.5	3.2
Basin 204	81.3	86	5.9	158	9.3	276	14.8	3.4
Basin 205A	20.6	24	1.5	43	2.4	76	3.7	3.7
Basin 205B	21.9	24	1.6	45	2.5	79	3.9	3.6
Basin 206A	87.0	82	6.6	149	10.3	258	16.3	3.0
Basin 206B	73.2	74	5.1	137	8.1	241	13.0	3.3
Basin 206C	46.2	40	3.3	74	5.2	130	8.2	2.8
Basin 206D	26.4	30	1.9	55	3.0	97	4.8	3.7
Basin 206E	24.3	24	1.5	45	2.5	80	4.0	3.3
Basin 207	249.0	0	0.0	7	1.5	72	6.9	0.3
Basin 208	111.9	12	0.9	22	2.0	67	5.1	0.6
Basin 209	32.9	12	1.0	28	1.9	64	3.5	1.9
Basin 210	22.0	19	1.4	37	2.2	66	3.6	3.0
Sundance	40.3	26	1.9	52	3.2	102	5.5	2.5

Three alternatives assuming the principle spillway remains gated were developed for this analysis. Refer to Plates 1 through 3 in Appendix E for clarification. Alternative 4 is identical to Alternative 3, but modeled with an un-gated principal spillway. All four alternatives assume the existing ponds J1 and K discharge to the existing Universe Blvd. system. The alternatives are described below:

4.1. Alternative 1

The purpose of this alternative is to maximize detention within the watershed through the design of various ponds for water quality opportunities. The proposed ponds will not only reduce sediment transport but also limit outflow from each detention facility and prolong the peak time. See Appendix B, HEC-HMS Results and Appendix E, Plate 1, Alternative 1.



4.1.1. Upper Piedras Marcadas Watershed

The UPMW includes multiple ponds to limit the outflow from the watershed to 620 cfs allowable discharge to the PdN storm drain. Discharge to the PNM is limited to 120 cfs.

4.1.2. Mariposa Diversion

The Mariposa Diversion has an allowable discharge of 64 cfs from a basin east of Unser Blvd and north of Alameda Grant Boundary which requires a future conveyance system to the two future downstream ponds before an ultimate discharge of 106 cfs to the Mariposa Arroyo.

4.1.3. Calabacillas Diversion

The Calabacillas Diversion includes one detention pond (pond 202B) with maximum allowable discharge of 45 cfs. The remainder of the flows are diverted into Unser Pond.

4.1.4. Boca Negra Diversion

The Boca Negra Dam Diversion is a small basin (Basin 203B) that can free discharge directly to a future storm drain system in Unser Blvd. Developed Conditions runoff from the contributing basin is less than the allowable discharge of 171 cfs.

4.2. Alternative 2

The purpose of this alternative is to maximize diversion from subbasins to the 4 existing discharge points. See Appendix B, HEC-HMS Results and Appendix E, Plate 2, Alternative 2.

4.2.1. Upper Piedras Marcadas Watershed

The UPMW includes one regional pond (Pond 2) near the intersection of PdN Blvd and Calle Nortena to limit outflow to the existing 72 inch PdN storm drain to 620 cfs. Discharge to the PNM is limited to 120 cfs

4.2.2. Mariposa Diversion

The Mariposa Diversion is the same as Alternative 1.



4.2.3. Calabacillas Diversion

The Calabacillas Diversion is the same as Alternative 1.

4.2.4. Boca Negra Diversion

The Boca Negra Dam Diversion is routed through a pond to limit the discharge to the allowable 171 cfs through future storm drain in Unser Blvd.

4.3. Alternative 3

This alternative is based on the SAD 228 drainage report which does not include a diversion to the Mariposa Watershed. The most southwest basin (Basin 204A) drains into a pond (Pond 10) near PdN Blvd with limited discharge of 20 cfs. The pond and basins discharges to the existing 48 inch storm drain in PdN constructed with SAD 228. See Appendix B, HEC-HMS Results and Appendix E, Plate 3, Alternative 3.

4.3.1. Upper Piedras Marcadas Watershed

The UPMW is the same as Alternative 2.

4.3.2. Mariposa Diversion

No diversion to the Mariposa Arroyo is designed this alternative.

4.3.3. Calabacillas Diversion

The Calabacillas Diversion is the same as Alternative 1.

4.3.4. Boca Negra Diversion

The Boca Negra Dam Diversion is the same as Alternative 1.

4.4. Alternative 4

The purpose of this analysis is to incorporate Alternative 3 with the Lower Piedras Marcadas (LPM) basins and model the principle spillway without a gate with free flow from the Dam to the Corrales Main Canal. Alternative 3 was the selected model because it provided the larger peak flow and volume discharged into the Dam. See Appendix D for Alternative 4 calculations and summaries.



The concept of Alternative 4 is to install a telemetry system that would automatically close a proposed gate upstream of the Calabacillas Arroyo and divert irrigation water to the Calabacillas Arroyo, allowing the Piedras Marcadas Dam to discharge to the Corrales Main Canal. As the Piedras Marcadas Dam fills up with stormwater, a switch would be activated by the telemetry system when the water reaches a certain elevation and close the diversion gate at the Calabacillas Arroyo. This alternative creates extra capacity in the Piedras Marcadas Dam by providing an outfall.

Assumptions were made to develop the hydrology model which are listed below:

- The lower existing basins were delineated utilizing the Piedras Marcadas Basin Drainage Management Plan (DMP) prepared by Tom Mann & Associates dated Feb. 1983, field visit and LIDAR survey.
- The Dam rating curve was developed based on the existing 36 inch principal spillway and concrete riser structure. No record drawing for the structure was available. A field visit in Oct. 2016 was performed to measure the existing concrete riser structure. The structure is a 10 feet wide x 10 feet long x 14 feet high ported riser. It includes 4 rows of 3–8 inch 45° holes on all sides with the exception of the front side having a 12 inch center hole. This 12 inch opening includes a grate to capture trash.
- The Rating curve for the 36 inch principal spillway was developed using StormCad to calculate tail water elevation and CulvertMaster to calculate discharge at different stages. See Appendix D, Alternative 4, StormCad results.
- Emergency spillway rating curve was based on the LIDAR data and Dam as-builts
- Dam storage capacity was determined based on the LIDAR data
- Accumulated sediment depth around the structure was measured to be about 7/8 inch
- Assumptions for input from the Lower Piedras Marcadas basins are:
 - o A six minute Lag Time was used for all basins
 - o Rainfall data is the same as the upper basins
 - o City of Albuquerque (COA) Storm Atlas data was utilized in routing basins with runoff conveyed in a channel or storm system. Selected major pipe segments were modeled
 - o A sediment bulking factor of 5% was added to all the basins
 - o Impervious areas were based on the existing density and COA GIS land use map



- o Areas designated as Vacant/Other land use per the COA GIS land use map were assumed to be 70% impervious to account for a mix of residential and commercial development
- o Pervious areas were assumed to include 50% fair condition (grass cover 50% to 75%) and 50% Natural Desert Landscaping. Curve numbers varied from 56 to 82 based on the soil type of A, B or C per NMDOT Drainage manual Table 3-4
- o Pervious areas for the golf course was assumed to include good condition (grass cover > 75%) coverage for type "B" soil with a curve number of 61

All the diversions from the UPM are the same as Alternative 3. See Plate 4, Lower Piedras Marcadas Basin Map in Appendix E. The results of this analysis and the original 1993 DMP were compared. A Comparison Table of the two hydrology model is included in Appendix D.

5. Hydraulic Analysis

5.1. Methodology

The purpose of the hydraulic analysis is to calculate the capacity of the future storm drain systems in order to determine the allowable discharge from the UPM. Hydraulic calculations have been performed to obtain the storm drain capacities. Hydraflow Storm Sewers (Hydraflow SS) Extension in AutoCAD Civil 3D 2014 software by Intelisolve was used to calculate pipe capacities. Hydrologic models included in this report were performed in 2017 utilizing the AMAFCA White Paper Methodology while the Hydraflow analyses are based on older hydrologic models and not per the AMAFCA White Paper Methodology. Therefore, flow rates used in the hydraulic analysis do not match the hydrologic models. Storm drain hydraulic models were not updated as the design of the facilities progresses.

5.2. Hydraflow Storm Sewer Analysis

Hydraulic modeling for closed conduits were performed using Hydraflow SS. Hydraflow uses the Step Method for calculating the hydraulic grade-line. This computer program determines the hydraulic grade-line throughout the alignment of the storm drain system. Input parameters for each pipe segment of the storm drain system include: invert elevations, rim



elevations, pipe length, size, roughness, deflection angle, junction type, and its geometry. Peak runoff values were added to each pipe segment along the storm drain system based on design flow-rates. Various storm drain systems within each watershed for the three alternatives were analyzed in order to determine the allowable discharge from the UPM. See Plates 1 through 3 in Appendix E for storm systems location and pipe sizes.

5.2.1. Alternative 1

The storm drain pipes range from 24 inch to 78 inch. The storm drain systems in this alternative include more detention ponds as compared to the other two alternatives which reduces pipe diameter. Refer to Plate 1 – Alternative 1.

5.2.1.1. Upper Piedras Marcadas Watershed

Systems 4 and 5 collect runoff from the area east of PdN Blvd and east of Unser Blvd. Routed flows ultimately drain into Pond 2. The outflow from Pond 2 and the existing PdN storm drain connect to the existing 72 inch storm drain in Blvd near Calle Nortena. System 3 is the inflow into Unser Pond. The outflow from Unser Pond drains into the Monument and is ultimately picked up by the 84 inch PdN storm drain upstream of the UPM Arroyo. The existing 84 inch is capable of conveying 759 cfs.

5.2.1.2. Mariposa Diversion

The Mariposa System collects runoff from a basin adjacent to PdN Blvd and east of Unser Blvd (Basin 204) and is routed through a pond (Pond 204) per the La Cuentista Subdivision – Unit II Drainage Report before releasing the allowable flow of 64 cfs.

5.2.1.3. Calabacillas Diversion

Systems 1 and 2 convey runoff from Basins 203A, 202A, 202B and 202C into Pond 202B. This pond includes two outflow systems, the Calabacillas System and System 3. The Calabacillas System is an independent system conveying the allowable flow of 45 cfs to the Calabacillas Arroyo. System 3 drains into the Unser Pond in the UPM Watershed.

5.2.1.4. Boca Negra Diversion



The Unser Blvd System collects runoff from Basin 203B located east of Ponds J1 and K and west of Unser Blvd and conveys flows to the Boca Negra Dam.

5.2.2. Alternative 2

The storm drain systems range from 24 inch to 96 inch. Storm systems in this alternative are larger due to fewer number of detention facilities. Refer to Plate 2 – Alternative 2.

5.2.2.1. Upper Piedras Marcadas Watershed

System 4 includes larger pipes since there are no upstream ponds before Pond 2. Systems 5 and 3 are the same as Alternative 1. System 6 is the connection to the existing 48 inch storm drain in PdN Blvd which convey runoff to the Piedras Marcadas Arroyo.

5.2.2.2. Mariposa Diversion

Same as Alternative 1.

5.2.2.3. Calabacillas Diversion

System 2 includes larger pipes with higher flows since there are no internal detention facilities. System 1 and the Calabacillas system are the same as Alternative 1.

5.2.2.4. Boca Negra Diversion

Same as Alternative 1 but conveys a higher flow to the Boca Negra Dam due to the larger contributing area. The collected flow is routed through Pond 203B before entering the Unser Blvd storm drain system.

5.2.3. Alternative 3

The storm drain systems range from 24 inch to 84 inch. This alternative is similar to Alternatives 1 and 2. The PdN Blvd runoff east of Unser Blvd is collected and routed through Pond 10 before tying into the existing 48 inch storm drain system in PdN Blvd. Refer to Plate 3 – Alternative 3. The storm drain system for Alternative 4 is identical to Alternative 3. The only difference is the cost of the telemetry system for Alternative 4, which is estimated at \$150,000.



5.2.3.1. Upper Piedras Marcadas Watershed

Systems 3 and 5 are the same as Alternatives 1 and 2. System 4 is the same as in Alternative 2, System 6 is the extension of the existing 48 inch storm drain in PdN Blvd. which provides an outfall for Pond 10.

5.2.3.2. Mariposa Diversion

No conveyance to the Mariposa Arroyo is included in this Alternative.

5.2.3.3. Calabacillas Diversion

System 1 is the same as Alternative 2, System 2 is similar to Alternative 2 but collects runoff from a larger basin area. The Calabacillas System is the same as Alternatives 1 and 2.

5.2.3.4. Boca Negra Diversion

Same as Alternative 1.

6. Cost Estimates

Conceptual cost estimate for each alternative has been prepared. Table 6-1 shows a summary of cost of each alternative. See Appendix A for cost break down of each alternative.

Table 6-1 - Conceptual Estimate Summary		
Alternative 1	\$	20,042,000
Alternative 2	\$	22,456,000
Alternative 3	\$	18,732,000
Alternative 4	\$	18,882,000

7. Low Impact Development for Improved Water Quality

Green Infrastructure (GI) and Low Impact Development (LID) approaches are needed at the site development level and the watershed level within the Upper Piedras Marcadas Watershed for improved water quality, and to reduce peak flow and volume discharge rates.



Including GI/LID complies with the Volcano Heights Sector Development Plan, which lists goals including “clean stormwater by natural processes prior to entering the storm drain system” (p. 210) and “LID technologies should be incorporated wherever possible and appropriate” (p. 229). In addition, incorporating GI/LID in the Upper Piedras Marcadas Watershed ensures compliance with the existing EPA MS4 Permit and proposed EPA MS4 Watershed Based Permit. The MS4 Permit requires including watershed protection elements into planning documents, like this Drainage and Water Quality Management Plan (DWQMP), evaluation of GI/LID/sustainable practices in site development plans, minimizing the directly connected impervious areas at the watershed and site development levels, and constructing water quality facilities to control floatables, pollutants, and sediment. All of these requirements and the incorporation of GI/LID are important for protecting water quality in the watershed.

Drainage improvements in the Upper Piedras Marcadas Watershed will be development driven. Funding for drainage improvement infrastructure will be through a potential assortment of processes including developers funding the entire cost, cost sharing with public agencies, establishing a Special Assessment District, or by a combination of these. Development shall occur from downstream to upstream so that downstream infrastructure can be in place before upstream development occurs. If any upstream development occurs first, this development cannot adversely impact downstream properties, and this development should include temporary or interim facilities that are required to assure that downstream properties are not adversely impacted.

The goals of the Upper Piedras Marcadas Watershed Drainage and Water Quality Management Plan for addressing water quality are:

- 1) Provide a list of site development GI/LID options useful for developers and;
- 2) Provide GI/LID options applicable to regional public stormwater facilities for improved watershed water quality.

7.1. Site Development GI/LID Options

Incorporating GI/LID at the site development level can be simple and effective. Instead of relying only on complex and expensive stormwater collection, conveyance, and storage systems, GI/LID utilizes an array of measures that help retain runoff at the source.

Developers shall strive to include GI/LID in site development and are required, by the Volcano Heights Sector Development Plan and required, where practicable, by the newly adopted City of Albuquerque (COA) Drainage Ordinance, to address onsite water quality. The Volcano Heights Sector Development Plan lists site development water quality options including permeable pavement for parking lots; installing structures geared toward removing sediment and floatables; and storing rainwater for future on-site irrigation. Site development GI/LID options are described in the following sections.

7.1.1. Pervious Pavements

The Volcano Heights Sector Development Plan defines permeable pavement as “hardscape material used as a means of allowing water and air to penetrate to underlying soil or a gravel reservoir for stormwater control”; listing examples including pave stones, matrix materials, porous asphalt, or permeable concrete. The three primary types of porous pavements are pervious concrete, porous asphalt, and permeable pavers, refer to Figure 1 for details.

In general, pervious paving systems are used to reduce runoff rates and volumes from paved, on-grade surfaces such as patios, walkways, driveways, parking spaces and residential streets. Pervious paving helps to reduce impervious area and directly connected impervious area, which reduces the peak runoff and runoff volume, improving stormwater quality by reducing contact with polluted surfaces, such as asphalt and concrete. Reducing impervious area can significantly reduce the amount of runoff, thereby potentially reducing the size of or potentially even eliminating downstream drainage improvements. This option is also important for compliance with the EPA MS4 Permit.

Pervious paving systems with runoff storage beds underneath them achieve these reductions through the delivery and storage of runoff in subsurface zones and eventual infiltration into the subgrade soils. Through this infiltration process, these types of pervious paving systems also achieve stormwater quality improvement.

The use of porous pavement is best suited for low to medium traffic areas, such as parking lots, pedestrian areas such as paths and courtyards, and residential roads.

Often, pervious pavement is used for the parking stall areas and conventional pavement for the driving/travel lane in a parking lot (see Figure 2).

Costs for permeable pavement can be two to three times that for conventional pavement. However, using permeable paving can reduce stormwater runoff volume, allowing cost savings through reduction in size or perhaps elimination of storm drain piping and retention and detention ponds. Table 7-1 summarizes new construction cost data for various types of pavements. Unit costs are dependent on the size of project, type of project, and site specific factors. The sources for the cost data represented in the table include the following, and a 16-percent inflation factor has been added to the 2005 unit prices: Reducing Urban Heat Islands, Compendium of Strategies: Cool Pavements, Climate Protection Partnership Division, EPA, 2005 and National Cooperative Highway Research Program (NCHRP), 2005.

Table 7-1: Pavement Cost Summary		
Pavement Type	Install Cost (\$/square foot)	Estimated Service Life (years)
Conventional Asphalt	\$1.00 to \$1.70	7 to 20
Porous Asphalt	\$1.50 to \$3.00	7 to 10
Conventional Concrete	\$1.00 to \$8.00	15 to 35
Permeable Concrete	\$2.50 to \$8.50	15 to 20
Permeable Interlocking Concrete Pavement / Concrete Paver Blocks	\$5.00 to \$12.00	> 20

7.1.2. Onsite Ponds, Rain Gardens and Swales

Onsite water quality ponding areas will most likely be a part of any development within the Upper Piedras Marcadas Watershed. These areas can be designed as ponds, rain gardens and/or vegetated swales, and will improve stormwater quality by capturing sediment and floatables.

Development should limit the amount of connected impervious area, by draining impervious areas through or into pervious areas. An example of this practice is connecting parking lot runoff to an onsite pond, rain garden or landscaped swale, as shown in Figure 2. Roof drains could also be connected to these areas, refer to Section 7.1.3 for additional discussion on roof drains. The Volcano Heights Sector Development Plan encourages the separation of parking lots and streets and suggests a “living fence”, defined as “a landscape treatment with vegetation dense and/or tall enough to screen

abutting uses, particularly parking areas". This "living fence" feature could also function as a pervious area to route drainage through, allowing separation and reduction of impervious areas. Other methods for achieving separation between impervious areas include constructing pervious landscaped areas as parking islands, grading sidewalks toward landscaped areas, and using curb cuts or flush mount curbs to allow runoff into landscaped areas (refer to Figure 2). An example of this is directing street runoff to medians, allowing the runoff to pond and infiltrate in the area behind the street curb.

Rain gardens or onsite ponds will help remove sediment and floatables from the stormwater through physical capture. Vegetated swales also function as settling basins to remove sediment and pollutants from the stormwater. These features will also reduce the peak runoff rate and total runoff volume from the site.

7.1.3. Stormwater Harvesting

To keep water where it falls, rainwater runoff from roofs and other impermeable surfaces can be detained for later use in irrigation or other gray water applications. Developers should consider rainwater harvesting systems on all buildings to detain runoff and limit peak discharge rates and volumes. A 1,000 square foot roof receiving a ½ inch rainfall will produce roughly 300 gallons of runoff which can be stored and used onsite for irrigation.

The Volcano Heights Sector Development Plan defines water harvesting as "a water conservation method used to capture, divert, and/or store rainwater for plant irrigation and other uses." A simple system usually consists of an area to catch water (i.e. catchment area or cistern) and a means to distribute the captured water. Water is directed to landscape holding areas which can be used immediately by nearby plants." Larger developments can use a more advanced engineered cistern, similar to the systems shown in Figure 3.

At a minimum, development within the Piedras Marcadas watershed should direct roof runoff to drain to a permeable, vegetated area, allowing for some stormwater infiltration and reduced runoff. This practice also reduces the amount of directly connected impervious area for the development.

7.1.4. Water Quality Manholes and Inlets

Often developments will include on-site storm drain to control and convey site runoff. Storm drain systems within a development can be designed with water quality manholes, as shown in Figure 4. Water quality manholes are used frequently throughout the Albuquerque area to remove debris, trash, and sediment from the stormwater prior to discharge into the conveyance system. A water quality manhole typically has a 90° down-turned pipe (elbow, “T”, or snout) on the outlet that prevents oil and floating debris from exiting the manhole. The cost of a water quality manhole within the COA ranges from \$2,500 to \$15,000 depending on the size and sophistication.

Water quality inlets can also be added to storm drain systems. Water quality inlets consist of one or more chambers that promote the settling of coarse sediment, separate oil, and capture floatable debris from the stormwater. These inlets are strongly encouraged for industrial development, such as vehicle/equipment washing and storage areas, where there is a potential for spills, leaks, or oil to reach the storm drain system. Typical cost for a precast water quality inlet is \$2,300 to \$3,500 (reference; California Stormwater BMP Handbook, TC-50, Water Quality Inlet, June 2003, 16-percent inflation applied to cost estimate).

7.1.5. Barriers - Fence and Screens

Fence, screens, or other debris removal structures should be incorporated into drainage improvement designs to prevent debris from entering the drainage system. These water quality improvements are economical, easy to install and easy to maintain. These could be placed at the outfall of a storm drain into a pond or swale, around a pond to prevent debris from entering the stormwater, or at the entrance of a rundown into a drainage system. Examples of these types of improvements are shown in Figure 5.

7.2. Watershed Management GI/LID Options

Low impact design will also be included in watershed management techniques. Options include:

7.2.1. Provide Open Space

To limit the amount of increased impermeable area within the watershed, areas of open space should be included in future development plans. Decreasing the impermeable area will reduce future peak runoff rate and runoff volume, again reducing the required amount of new constructed drainage improvements and limiting the drainage impacts to the area. This could be accomplished by providing small to medium size community gardens, as suggested in the Volcano Heights Sector Development Plan or larger community parks, which serve as multi-use facilities for the community. The open space areas would be an ideal location to use permeable pavements (refer to Section 7.1.1) for facility parking lots and sidewalks. In addition, directing runoff from impervious areas into landscaped and undeveloped areas can also serve to address water quality needs and runoff rate, and volume reduction.

7.2.2. Water Quality Options for Ponds

Regional public stormwater facilities will be a part of the Upper Piedras Marcadas Watershed drainage system. This Drainage and Water Quality Master Plan proposes using several ponds, as well as storm drain systems, to control runoff in the watershed.

Water quality structures will be a part of these regional ponds and will function to remove floatables and reduce sediment and other pollutants in the stormwater. Options for water quality facilities for the ponds include: inverted ported riser outlets, media filter settling basins, baffle/weir wall debris removal structures, and Coanda screen filters. The choice of which water quality option(s) to use for each pond and the cost for the specific structural Best Management Practices (BMPs) will be dependent on the pond design, water quality goals, average and peak flow rate, and required treatment volume. Figure 6 shows examples of these pond water quality structures.

Inverted ported riser outlets are used extensively by AMAFCA and the COA in their ponds and dams. The cost for an inverted ported riser structure depends on the size, flow rate and volume of the pond. Costs range from \$20,000 for a small (less than 1 acre-foot volume pond) to \$65,000 for a larger pond (8 acre-foot volume pond used for cost reference).



Media filter settling basins have media (usually sand or gravel) with perforated pipe underdrains through which filtered storm water flows into the downstream conveyance. These water quality facilities are effective in removing colloidal material, reducing turbidity and removing aqueous phase pollutants. The underdrains can be designed to discharge into a manhole allowing sampling of the filtered flows from the water quality structure. AMAFCA recently constructed a media filter basin using a pea gravel filter bed at the Candelaria Water Quality facility.

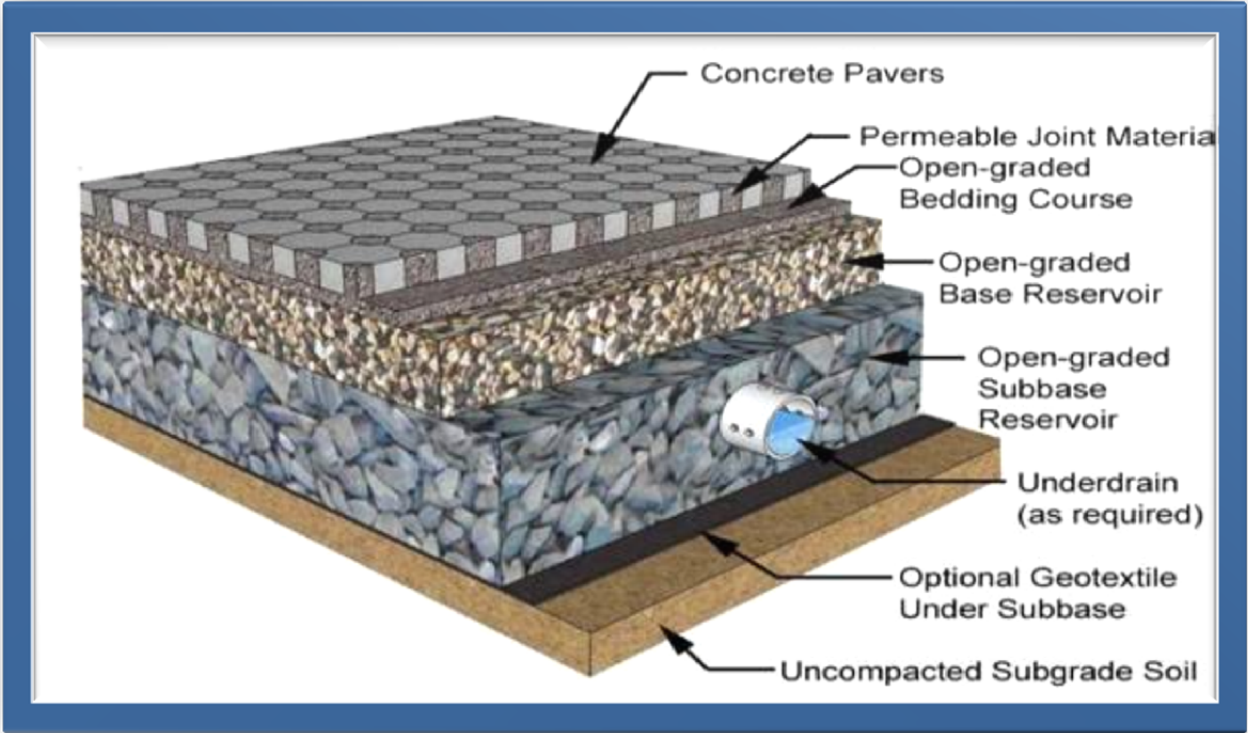
Baffle/weir walls are used to collect floatables and debris as the water flows over a weir and under constructed baffles. AMAFCA has recently installed these at the Grant line and Candelaria Water Quality facilities in the North Diversion Channel watershed. Cost for these structures range from \$7,000 to \$35,000, depending on design and size.

Coanda screens have been used by AMAFCA in the North Pino and Vineyard arroyos. A Coanda screen is a stainless steel wedge wire, fine screen that allows clean water through the screen while sediment and debris remain on the screen and are flushed off the screen by larger flow. The lower portion of the hydrograph is “shaved” off by the screen openings and into a conduit placed within a clear span beneath the screen. Debris trapped on top of the screen is flushed by larger flows and can be collected into an area designed for easy maintenance. This option will only work if the pond has a significant elevation drop from pond inlet to outlet. Coanda screen technology is expensive, ranging from \$150 to \$200 per square foot. The area of screen required depends on the flow rate, elevation drop, and water quality goals.

7.2.3. Debris Removal Options

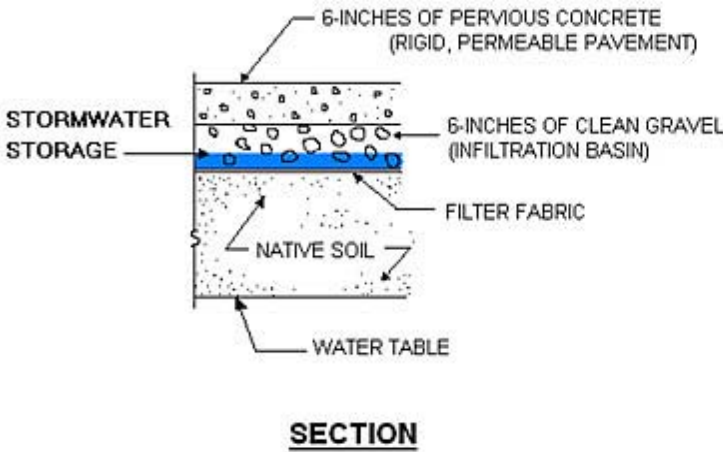
Stormwater within the watershed will be conveyed to regional ponds through public storm drain systems. Debris can be removed from the stormwater through the use of water quality manholes, water quality inlets, and filter/fence screens. These are similar options to those described for the site development options (Sections 7.1.4 and 7.1.5). Larger scale screens, grates and traps can be constructed within regional ponds or channels to help reduce “floatable” pollutant loads.

Permeable Concrete Paver Schematic Detail
(Source: Interlocking Concrete Pavement Institute)



Examples of Permeable Paving for the parking area and conventional pavement on the driving/travel lanes

(Photo sources: left – Wolf Paving Asphalt Paving Blog and right – Cape Cod Groundwater Guardian Team)



Pervious Concrete Detail
(Source: Concrete Services NWA.com)



Pervious Concrete Photo
(Source: CA Stormwater Quality Assoc.)



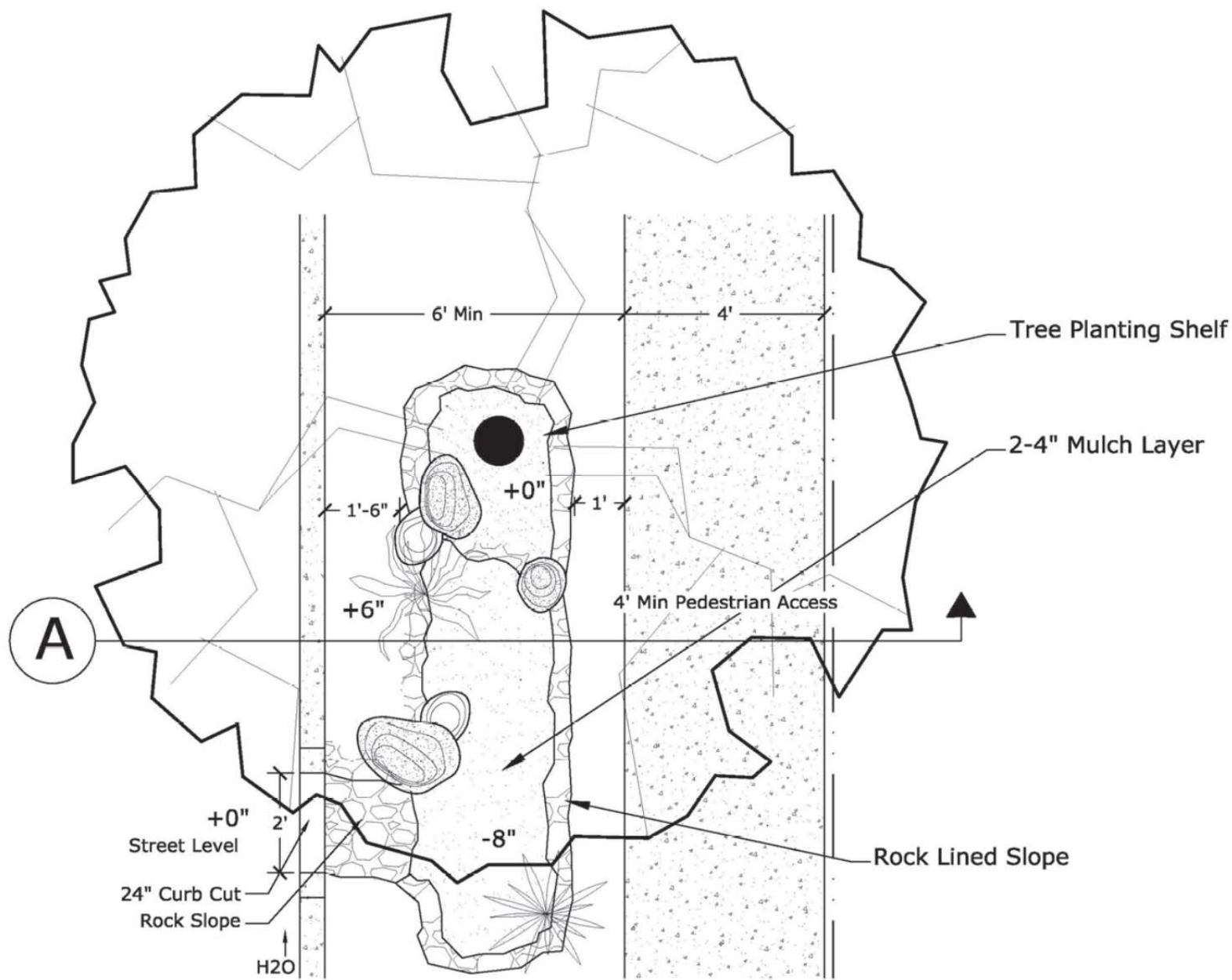
Example of permeable paving for courtyard areas. In this example, brick pavers are surrounded by a grate inlet which captures runoff and conveys it to a cistern, which stores the runoff for on-site irrigation use. (Source: Bohannon Huston, Inc., St. John's College, Santa Fe, NM)

FIGURE 1

FIGURE 1 – Site Development Options – Permeable Pavement

Curb Cut and Rock Lined Pond Separating Impervious Areas

(Source: Green Infrastructure for Southwest Neighborhoods, Version 1, August 2010, Watershed Management Group, www.watershedmg.org)



Example of On-site Pond/Rain Garden

(Source: Bohannon Huston, Inc., St. John's College, Santa Fe, NM)



Example of Living Fence and Pervious Swale Area Separating Impervious Areas

(Source: Bohannon Huston, Inc., Mesa Del Sol, NM)



**FIGURE 2 – Site Development Options – On-Site Ponds and Swales –
Increase infiltration, decrease runoff and reduce impervious and directly connected impervious areas**

FIGURE 2

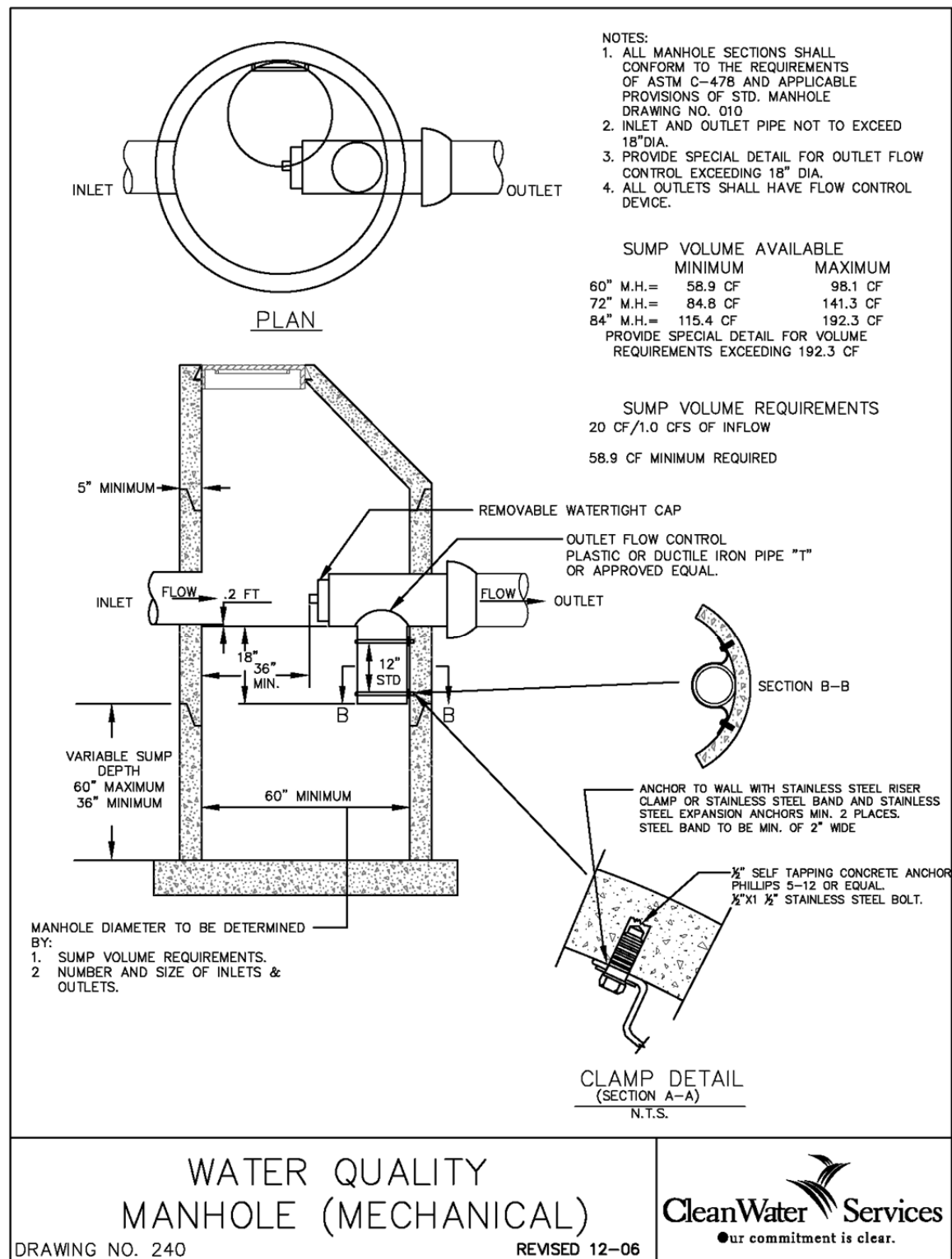


Underground Stormwater Harvesting System for Commerical Use
 (Source: BarrierPlastics.com)

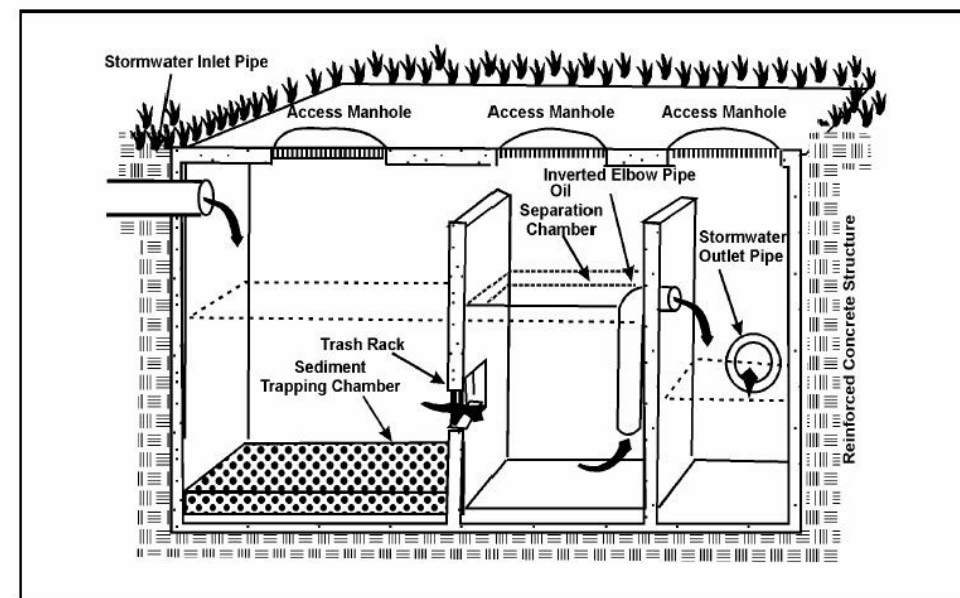


Large Underground Stormwater Harvesting System
 (Source: StormTrap, Precast Modular Stormwater Management System)

FIGURE 3 – Site Development Options – Stormwater Harvesting



Water Quality Manhole
(Source: Bohannon Huston, Inc.)



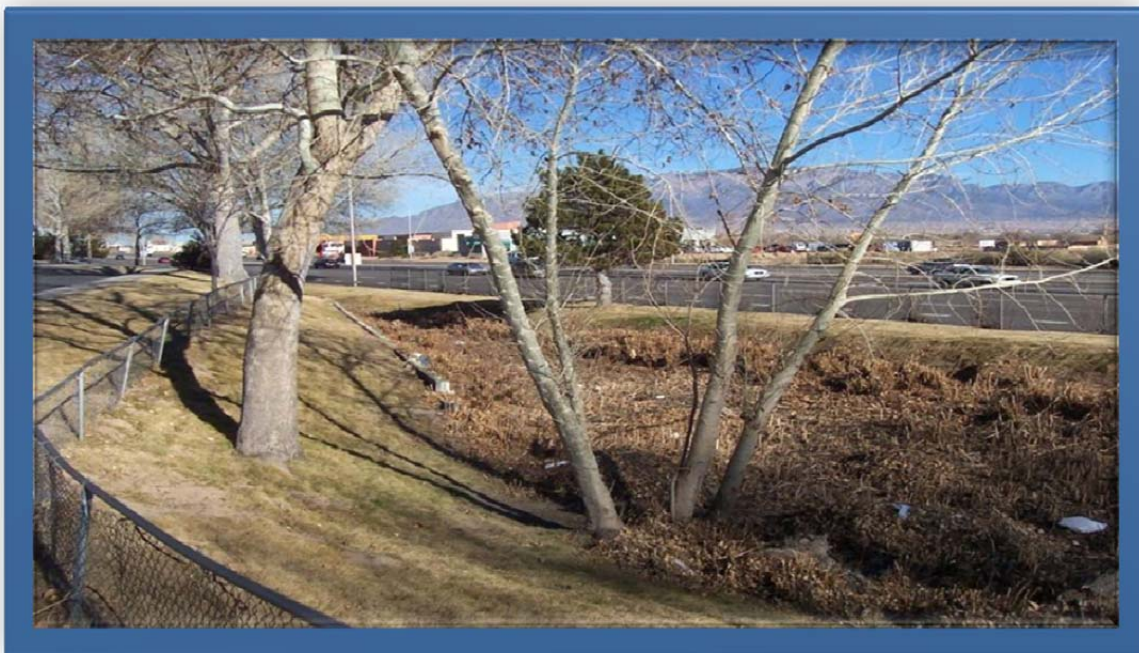
Water Quality Inlet Schematic Details
(Source: California Stormwater BMP Handbook, Jan. 2003)

FIGURE 4

FIGURE 4 – Site Development Options – Water Quality Manholes and Inlets



Sanchez Pond Debris Removal Structure
(Source: Bohannon Huston, Inc.)



Fence around Stormwater Pond to Collect Debris
(Source: Bohannon Huston, Inc.)

FIGURE 5 – Site Development Options – Barriers for Debris Removal

Inverted Ported Riser Example

(Source: Bohannon Huston, Inc., AMAFCA's Candelaria Water Quality Pond, March 2011)



Media Filter Settling Basin – AMAFCA's Candelaria Water Quality BMP during construction

(Source: Bohannon Huston, Inc., April 2011)



Coanda Screen on North Pino Arroyo. AMAFCA Water Quality BMP.

(Source: Bohannon Huston, Inc.)



Example of a Baffle/Weir Wall Water Quality Structure used for AMAFCA's Grantline Water

Quality BMP (Source: Bohannon Huston, Inc., May 2011)

FIGURE 6 – Watershed Development Options – Pond Water Quality Options

FIGURE 6

8. Funding Alternatives (Resources)

One of the primary goals of the Plan is to develop funding/reimbursement mechanism for development of the watershed area. The following funding sources are being considered:

- Drainage Easement
- Special Assessment District - SAD
- Infrastructure Development Zone – IDZ
- Public Improvement District – PID
- Tax Increment Financing – TIF

8.1. Drainage Easement

The idea behind this funding mechanism is for AMAFCA to obtain a drainage easement over all of the properties within the watershed area. As the properties are developed, AMAFCA would be reimbursed a predetermined amount in order to vacate the drainage easement and allow for development of the property. The advantage is that the process would be simplified compared to other alternatives. The primary disadvantage is that it would be difficult to obtain 100% concurrence from all property owners.

8.2. Special Assessment District

SAD's are created to provide infrastructure improvements funded by General Obligation Bonds or Special Assessment Bonds and reimbursed by the property owners by assessment. The process consists of 5 resolutions, 2 hearings, and 2 ordinances and typically takes 2-3 years to complete. For this particular project, an SAD would be led by the City of Albuquerque, as AMAFCA does not have the authority. The advantages of an SAD is that it would provide an appraised property value benefit to the property owners and it is a proven process with adjustable assessments to fit benefits. The primary disadvantages of an SAD are that they are not popular politically and are viewed as time consuming and confusing. In general, property owners in the watershed area that were interviewed preferred an SAD the least out of all alternatives.



8.3. Infrastructure Development Zone

IDZ's are quasi-municipal political subdivisions created to provide and finance "services", which are infrastructure and facilities. The primary financing tool is the issuance of general obligation bonds, special assessment bonds, revenue bonds or refunding bonds. An IDZ must adopt a "Service Plan" which governs the scope of its activities, which must be approved by the City of Albuquerque by resolution. A five director board is elected to govern the IDZ. The advantage of an IDZ is that it is a modernized and streamlined process compared to the SAD process and the lesser of 30% or 400 of the taxpaying electors need to sign an initial petition. The primary disadvantage of an IDZ is that one has never been completed in the State of New Mexico.

8.4. Public Improvement District

A PID is a modernized and streamlined SAD process that was introduced to New Mexico in 2001 and creates districts for public improvements through a petition and hearing process. A "General Plan" is filed with the clerk at the time the governing body adopts a resolution indicating its intention to form a PID. The General Plan includes the district boundary, description of improvements, cost estimates, financing methods and possible alternatives. The disadvantage of a PID is that they have experienced economic difficulties since the onset of the recent economic downturn. This led to legislative initiatives to reform the PID process which limited the amount of general obligation bonds that may be issues, provides that a detailed application be filed in connection with proposed PID formations, requires that notices be given to purchasers of property within a PID, and allows for the governing body forming a PID to resume governance of the PID after the end of the terms of appointed PID members.

8.5. Tax Increment Financing

A TIF is a financial tool widely used by municipalities to promote economic development and redevelopment. A TIF District is formed, which is a separate political subdivision of the state with the powers that the statutes and municipality allow. There is no liability of the municipality and no pledge of any other revenues of the municipality. A TIF differs from other financing tools in that no new taxes are created, they are self-financed (no reliance on guarantees or pledges of existing revenues), they are not dependent on federal or state funding, and they allow flexibility in project activities. One disadvantage is that TIF's are limited by a



revenue bond with a pledge of up to 75% of new property taxes and gross receipts taxes from the TIF District only.

9. Summary of Alternatives

In all three alternatives with the gated principle spillway stormwater within the watershed will be conveyed to regional ponds through public storm drain systems. The critical analysis points, AP-1 and AP-4 are summarized in Table 10-1. See Plates 1 to 3 in Appendix E for analysis point location. The previous studies indicate that the existing 84 inch PdN Blvd storm drain system has the capacity to convey 759 cfs. Table 10-1 shows that discharge from this point is less than the pipe capacity.

Table 9-1 - HEC-HMS Results Summary				
Alternative	Analysis point	Area	Peak flow	Volume
		ac	Cfs	ac-ft
1	AP-1	275.3	426	49.3
	AP-4	915.8	611	95.5
2	AP-1	275.3	328	48.5
	AP-4	869.3	528	89.9
3	AP-1	356.6	570	63.4
	AP-4	997.1	731	112.2

The Piedras Marcadas Dam with storage volume of 280 ac-feet with 1 foot of freeboard and 307 ac-feet with no freeboard has the capacity to accommodate an excess volume of 81 ac-feet from the Upper Piedras Marcadas Watershed. In all three alternatives it is assumed that the Dam does not include an outfall. Although the generated peak flow is less than the 965 cfs at AP-4, the dam does not have the capacity to store a runoff volume over 81 ac-feet.

Alternative 1 includes several detention facilities to limit the discharge. Regional detention Pond 2 in this alternative has the least capacity due to upstream detention areas. In Alternatives 2 and 3, Pond 2 includes more storage volume. Alternative 2, like Alternative 1, maximizes diversion with less detention but it requires the regional pond 2 to store more runoff volume. This alternative is the most expensive but the runoff volume to the Dam is the least. Alternative 3 is comparable to Alternative 1 but due to lack of Mariposa diversion more runoff volume is conveyed to the Dam. Alternative 1 is the most desirable alternative as the detention facilities



serve as water quality ponds and maximizes the diversion from the Piedras Marcadas Watershed. Table 10-2 summarizes required additional storage volume for the Dam with and without freeboard.

Table 9-2 - Piedras Marcadas Dam Capacity Comparison (ac-ft)					
Alternative	Required Volume	Including 1 foot freeboard		No freeboard	
		Excess Dam Capacity	Required Volume Reduction (%)	Dam Capacity	Required Volume Reduction (%)
1	95.5	81	15.2%	108	N/A
2	89.9	81	9.9%	108	N/A
3	112.2	81	27.8%	108	3.7%

Allowable volume with 1' freeboard = 81 ac-ft, no freeboard = 108 ac-ft

Dam total volume with 1' freeboard = 280 ac-ft, no freeboard = 307 ac-ft

Due to the limited capacity of the Piedras Marcadas Dam with gated intake structure, an overall reduction in runoff volume from the Upper Piedras Marcadas Watershed is recommended, utilizing GI/LID methods presented in Section 8. In order to maintain 1 foot of freeboard, the reduction in overall runoff volume necessary is up to 17.1%, which is feasible utilizing GI/LID methods. With no freeboard, the runoff volume reduction is not necessary. Alternative 1 provides for the most water quality features, with more detention facilities than other alternatives, which give the opportunity to provide dead storage at each facility to maximize the reduction in the overall runoff volume.

Alternative 4 includes an outfall from the Piedras Marcadas Dam to the Corrales Main Canal which would be activated by a telemetry system during significant rainfall events. The concept for the telemetry system is to automatically close a proposed gate located upstream of the Calabacillas Arroyo which would divert irrigation water to the Calabacillas, allowing the Piedras Marcadas Dam to discharge to the Corrales Main Canal. In addition, the gate at the Dam would open, allowing stormwater to drain to the Corrales Main Canal. This alternative is the most desirable, as it provides the necessary capacity for the Dam to function in the fully developed conditions without retaining stormwater within the UPMW. See Appendix D for Alternative 4 calculations and summaries.



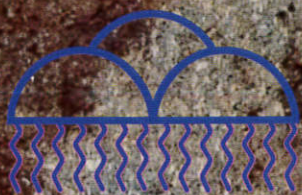
10. Conclusion

Stormwater within the watershed will be conveyed to regional ponds through public storm drain systems. Debris can be removed from the stormwater through the use of water quality manholes, water quality inlets, ported risers, and filter/fence screens. These are similar options to those described for the site development options (Sections 7.1.4 and 7.1.5). Larger scale screens, grates and traps can be constructed within regional ponds or channels to help reduce “floatable” pollutant loads.

Three alternatives were analyzed for the developed conditions. Each alternative included various ponds and storm systems. The results of the analyses showed that calculated runoff volume to the Piedras Marcadas Dam for all three alternatives is over the allowable storage. The Dam has a gated principal spillway with capacity of 307 ac-feet without freeboard and 280 ac-feet with one foot of freeboard. It has the capacity to accommodate 40 ac-feet from the Upper Piedras Marcadas. To accommodate additional storage and/or not to exceed dam capacity three recommendations are presented below for AMAFCA consideration:

- Install a principal spillway outlet to discharge from the Dam
- Increase dam storage capacity by excavating some areas of the Dam
- Restrict runoff from future developments draining into the dam by the percentage presented in Table 10-2.

Alternative 4 is identical to Alternative 3 within the UPM, but includes a free flow outfall from the Piedras Marcadas Dam to the Corrales Main Canal, thus increasing the volumetric capacity of the Dam. This alternative includes providing a telemetry system that would automatically close a proposed gate upstream of the Corrales Main Canal crossing of the Calabacillas Arroyo, diverting irrigation water to the Calabacillas Arroyo and allowing the Dam to discharge to the Corrales Main Canal. The results of modeling the Dam with a free flow outfall shows that the Dam can accommodate developed conditions runoff from the watershed with excess freeboard over 4 feet. At a cost of approximately \$150,000, this telemetry system alternative appears to be an ideal solution to the volumetric capacity issue at the Piedras Marcadas Dam.



AMAFCA



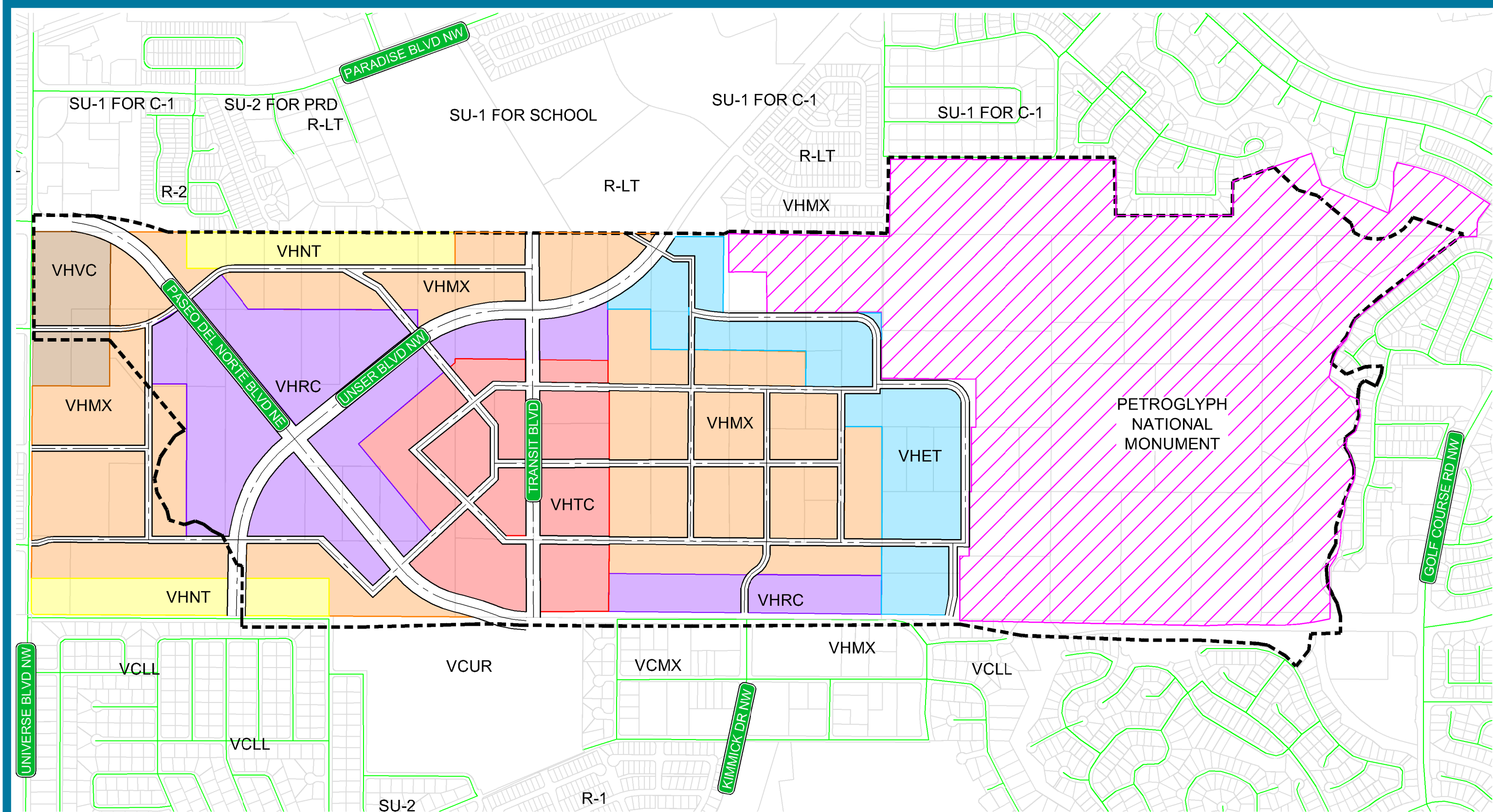


AMAFCA

Upper Piedras Marcadas Watershed Drainage and Water Quality Management Plan Developed Conditions Report

Appendix A

- Zoning Map
- Cost Estimates
 - o Alternative 1
 - o Alternative 2
 - o Alternative 3



LEGEND

	TOWN CENTER (VHTC)		UPPER PIEDRAS MARCADAS BOUNDARY		PETROGLYPH NATIONAL MONUMENT
	REGIONAL CENTER (VHRC)				NEIGHBORHOOD TRANSITION (VHNT)
	VILLAGE CENTER (VHVC)				ESCARPMENT TRASNSITION (VHET)
					MIXED-USE (VHMx)

WILSON & COMPANY

4900 LANG AVE. NE
ALBUQUERQUE, NM 87109
PHONE: 505-348-4000
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FAX: 505-348-4155 SECOND FLOOR
www.wilsonco.com

ZONING MAP

Upper Piedras Mercadas
Drainage and Water Quality Management Plan
Conceptual Cost Estimate - Alternative 1

WILSON
& COMPANY
April 3, 2017

No	Description	Unit	Unit Cost	Quantity	Total
1	Site Clearing & Grubbing, Complete	AC	\$1,150.00	15	\$17,250.00
2	Unclassified Excavation	CY	\$5.00	110,300	\$551,500.00
3	Import	CY	\$8.50	27,575	\$234,387.50
4	Rock Excavation, Utility Trench, Remove & Dispose, Compl	CY	\$29.00	65,000	\$1,885,000.00
5	Surface Rock Excavation, Remove & Dispose, Compl	CY	\$83.17	23,270	\$1,935,365.90
6	24" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$80.00	250	\$20,000.00
7	30" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$100.00	696	\$69,600.00
8	36" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$140.00	2,009	\$281,260.00
9	42" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$160.00	8,919	\$1,427,040.00
10	48" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$195.00	9,146	\$1,783,470.00
11	54" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$260.00	6,208	\$1,614,080.00
12	60" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$285.00	5,481	\$1,562,085.00
13	66" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$380.00	2,393	\$909,340.00
14	72" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$470.00	2,385	\$1,120,950.00
15	78" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$510.00	446	\$227,460.00
16	Manhole, 4' DIA, Type "C" OR "E", 6' to 10' deep, CIP	EA	\$3,100.00	17	\$52,700.00
17	Manhole, 4' DIA, Type "C" OR "E", 10' to 14' deep, CIP	EA	\$4,500.00	11	\$49,500.00
18	Manhole, 6' DIA, Type "C" OR "E", 6' to 10' deep, CIP	EA	\$5,200.00	71	\$369,200.00

Upper Piedras Mercadas
Drainage and Water Quality Management Plan
Conceptual Cost Estimate - Alternative 1



April 3, 2017

No	Description	Unit	Unit Cost	Quantity	Total
19	Manhole, 6' DIA, Type "C" OR "E", 10' to 14' deep, CIP	EA	\$5,500.00	26	\$143,000.00
20	Manhole, 8' DIA, Type "C" OR "E", 6' to 10' deep, CIP	EA	\$11,000.00	4	\$44,000.00
21	Catch Basin	EA	\$4,500.00	253	\$1,137,990.00
22	Pond Inlet Structure	EA	\$7,000.00	1	\$7,000.00
23	Pond Water Quality Structure	EA	\$20,000.00	10	\$200,000.00
	Sub-Total Bid Items				\$15,642,178.40
Miscellaneous Items					
24	Construction Staking	LS	\$219,000.00	1	\$219,000.00
25	Construction Project Sign, per Contract Special Provisions, CIP	EA	\$750.00	4	\$3,000.00
26	Mobilization, Complete	LS	\$746,200.00	1	\$746,200.00
27	Demobilization, Complete	LS	\$47,000.00	1	\$47,000.00
28	Construction Traffic Control & Barricading, Complete	LS	\$328,500.00	1	\$328,500.00
29	NPDES Permitting, Complete	LS	\$98,600.00	1	\$98,600.00
	Sub-Total Miscellaneous Items				\$1,442,300.00
	Total Bid Items				\$17,084,478.40
	Contingency @ 10%				\$1,708,447.84
	New Mexico Gross Receipt Tax (NMGR) @ 7.3125%				\$1,249,302.48
	Total Cost Including NMGR				\$20,042,228.72

Note: CIP refers to complete in place

Upper Piedras Mercadas
Drainage and Water Quality Management Plan
Conceptual Cost Estimate - Alternative 2



April 3, 2017

No	Description	Unit	Unit Cost	Quantity	Total
1	Site Clearing & Grubbing, Complete	AC	\$1,150.00	15	\$17,250.00
2	Unclassified Excavation	CY	\$5.00	110,300	\$551,500.00
3	Import	CY	\$8.50	27,575	\$234,387.50
4	Rock Excavation, Utility Trench, Remove & Dispose, Compl	CY	\$29.00	77,877	\$2,258,433.00
5	Surface Rock Excavation, Remove & Dispose, Compl	CY	\$83.17	22,000	\$1,829,740.00
6	24" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$80.00	250	\$20,000.00
7	30" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$100.00	696	\$69,600.00
8	36" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$140.00	2,669	\$373,660.00
9	42" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$160.00	8,919	\$1,427,040.00
10	48" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$195.00	6,035	\$1,176,825.00
11	54" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$260.00	4,760	\$1,237,600.00
12	60" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$285.00	7,133	\$2,032,905.00
13	66" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$380.00	2,547	\$967,860.00
14	72" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$470.00	2,126	\$999,220.00
15	78" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$510.00	1,108	\$565,080.00
16	84" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$558.00	1,275	\$711,450.00
17	90" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$620.00	690	\$427,800.00
18	96" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$675.00	850	\$573,750.00

Upper Piedras Mercadas
Drainage and Water Quality Management Plan
Conceptual Cost Estimate - Alternative 2



April 3, 2017

No	Description	Unit	Unit Cost	Quantity	Total
19	Manhole, 4' DIA, Type "C" OR "E", 6' to 10' deep, CIP	EA	\$3,100.00	8	\$24,800.00
20	Manhole, 4' DIA, Type "C" OR "E", 10' to 14' deep, CIP	EA	\$4,500.00	11	\$49,500.00
21	Manhole, 6' DIA, Type "C" OR "E", 6' to 10' deep, CIP	EA	\$5,200.00	68	\$353,600.00
22	Manhole, 6' DIA, Type "C" OR "E", 10' to 14' deep, CIP	EA	\$5,500.00	35	\$192,500.00
23	Manhole, 8' DIA, Type "C" OR "E", 6' to 10' deep, CIP	EA	\$11,000.00	4	\$44,000.00
24	Catch Basin	EA	\$4,500.00	260	\$1,171,740.00
25	Pond Inlet Structure	EA	\$7,000.00	8	\$56,000.00
26	Pond Water Quality Structure	EA	\$20,000.00	8	\$160,000.00
	Sub-Total Bid Items				\$17,526,240.50
Miscellaneous Items					
27	Construction Staking	LS	\$245,400.00	1	\$245,400.00
28	Construction Project Sign, per Contract Special Provisions, CIP	EA	\$750.00	4	\$3,000.00
29	Mobilization, Complete	LS	\$836,100.00	1	\$836,100.00
30	Demobilization, Complete	LS	\$52,600.00	1	\$52,600.00
31	Construction Traffic Control & Barricading, Complete	LS	\$368,100.00	1	\$368,100.00
32	NPDES Permitting, Complete	LS	\$110,500.00	1	\$110,500.00
	Sub-Total Miscellaneous Items				\$1,615,700.00
	Total Bid Items				\$19,141,940.50
	Contingency @ 10%				\$1,914,194.05
	New Mexico Gross Receipt Tax (NMGRT) @ 7.3125%				\$1,399,754.40
	Total Cost Including NMGRT				\$22,455,888.95

Note: CIP refers to complete in place

Upper Piedras Mercadas
Drainage and Water Quality Management Plan
Conceptual Cost Estimate - Alternative 3

WILSON
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April 3, 2017

No	Description	Unit	Unit Cost	Quantity	Total
1	Site Clearing & Grubbing, Complete	AC	\$1,150.00	15	\$17,250.00
2	Unclassified Excavation	CY	\$5.00	118,000	\$590,000.00
3	Import	CY	\$8.50	29,500	\$250,750.00
4	Rock Excavation, Utility Trench, Remove & Dispose, Compl	CY	\$29.00	79,100	\$2,293,900.00
5	Surface Rock Excavation, Remove & Dispose, Compl	CY	\$83.17	20,100	\$1,671,717.00
6	24" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$80.00	1,115	\$89,200.00
7	30" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$100.00	696	\$69,600.00
8	36" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$140.00	1,238	\$173,320.00
9	42" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$160.00	8,906	\$1,424,960.00
10	48" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$195.00	9,391	\$1,831,245.00
11	54" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$260.00	4,356	\$1,132,560.00
12	60" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$285.00	3,123	\$890,055.00
13	66" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$380.00	939	\$356,820.00
14	72" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$470.00	3,407	\$1,601,290.00
15	78" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$510.00	446	\$227,460.00
16	84" RCP, CL III, Incl Trenching, Backfill & Compaction, CIP	LF	\$558.00	468	\$261,144.00
17	Manhole, 4' DIA, Type "C" OR "E", 6' to 10' deep, CIP	EA	\$3,100.00	15	\$46,500.00
18	Manhole, 4' DIA, Type "C" OR "E", 10' to 14' deep, CIP	EA	\$4,500.00	11	\$49,500.00

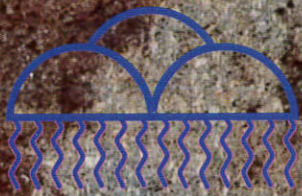
Upper Piedras Mercadas
Drainage and Water Quality Management Plan
Conceptual Cost Estimate - Alternative 3



April 3, 2017

No	Description	Unit	Unit Cost	Quantity	Total
19	Manhole, 6' DIA, Type "C" OR "E", 6' to 10' deep, CIP	EA	\$5,200.00	53	\$275,600.00
20	Manhole, 6' DIA, Type "C" OR "E", 10' to 14' deep, CIP	EA	\$5,500.00	26	\$143,000.00
21	Manhole, 8' DIA, Type "C" OR "E", 6' to 10' deep, CIP	EA	\$11,000.00	6	\$66,000.00
22	Catch Basin	EA	\$4,500.00	227	\$1,022,550.00
23	Pond Inlet Structure	EA	\$7,000.00	5	\$35,000.00
24	Pond Water Quality Structure	EA	\$20,000.00	5	\$100,000.00
	Sub-Total Bid Items				\$14,619,421.00
Miscellaneous Items					
25	Construction Staking	LS	\$204,700.00	1	\$204,700.00
26	Construction Project Sign, per Contract Special Provisions. CIP	EA	\$750.00	4	\$3,000.00
27	Mobilization, Complete	LS	\$697,400.00	1	\$697,400.00
28	Demobilization, Complete	LS	\$43,900.00	1	\$43,900.00
29	Construction Traffic Control & Barricading, Complete	LS	\$307,100.00	1	\$307,100.00
30	NPDES Permitting, Complete	LS	\$92,200.00	1	\$92,200.00
	Sub-Total Miscellaneous Items				\$1,348,300.00
	Total Bid Items				\$15,967,721.00
	Contingency @ 10%				\$1,596,772.10
	New Mexico Gross Receipt Tax (NMGR) @ 7.3125%				\$1,167,639.60
	Total Cost Including NMGR				\$18,732,132.70

Note: CIP refers to complete in place



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Appendix B

- Curve Numbers
- Lag Time Calculations
- NOAA Atlas 14 Point Precipitation Frequency Estimates
- User Specified Hyetograph
- HEC-HMS Results
 - o Alternative 1
 - Plan
 - Results
 - Ponds Summary
 - o Alternative 2
 - Plan
 - Results
 - Ponds Summary
 - o Alternative 3
 - Plan
 - Results
 - Ponds Summary

Curve Numvers		
Basin ID	Impervious	Pervious
Upper Piedras Marcadas		
202A	98	79
202B	98	79
202C	98	79
203A	98	79
203B	98	79
204A	98	79
204B	98	79
205A	98	79
205B	98	79
206A	98	79
206B	98	79
206C	98	79
206D	98	79
206E	98	79
207	98	65
208	98	66
209	98	79
210	98	79
Sundance	98	79
Lower Piedras Marcadas		
300	98	61
301	98	61
302	98	82
303	98	82
304	98	82
305	98	56
306	98	65
307	98	56
308	98	65
309	98	56
310	98	61
311	98	70
312	98	71
313	98	65
314	98	59
315	98	56
316	98	56
317	98	56
318	98	71
319	98	65
320	98	56
Note: CN values are based on NMDOT Hydrology Manual Table 3-4		

Upper Piedras Mercadas - Developed Conditions

Lag Time Calculations

Basin	Simplified Peak Flow Method												Total Time of Concentration		Lag time
	Overland Flow	MAX	MIN	Slope	Velocity*	Time of	Shallow Conc.	MAX	MIN	Slope	Velocity*	Time of	Total	Minimum	Used
	Length (ft)	EL (FT)	EL (FT)	(ft/ft)	(ft/s)	Conc. (min)	Flow Length (ft)	EL (FT)	EL (FT)	(ft/ft)	(ft/s)	Conc. (min)	(min)	(min)	(min)
202A	100	5408	5407	0.010	2.0	0.8	1900	5407	5396	0.006	1.6	19.8	20.6	21	12
202B	100	5399	5397	0.020	2.9	0.6	1700	5397	5359	0.022	3.1	9.1	9.7	10	6
202C	100	5409	5408	0.010	2.0	0.8	1590	5408	5385	0.015	2.5	10.6	11.4	11	7
203A	100	5426	5421	0.050	4.5	0.4	2600	5421	5400	0.008	1.9	22.8	23.2	23	14
203B	100	5426	5423	0.028	3.5	0.5	1870	5423	5400	0.012	2.3	13.6	14.0	14	8
204	100	5407	5405	0.017	2.7	0.6	2300	5405	5354	0.022	3.1	12.4	13.0	13	8
205A	100	5366	5364	0.017	2.7	0.6	1080	5364	5342	0.021	2.9	6.2	6.8	10	6
205B	100	5348	5345	0.033	3.6	0.5	1600	5345	5304	0.025	3.4	7.8	8.3	10	6
206A	100	5400	5399	0.007	1.8	0.9	2875	5399	5360	0.014	2.4	20.0	20.9	21	13
206B	100	5366	5360	0.056	4.8	0.3	2180	5360	5317	0.020	3.0	12.3	12.7	13	8
206C	100	5311	5311	0.002	0.9	1.9	1900	5311	5301	0.006	1.6	19.8	21.6	22	13
206D	100	5340	5335	0.046	4.6	0.4	1650	5335	5299	0.022	3.1	8.9	9.2	10	6
206E	100	5344	5340	0.037	3.9	0.4	1060	5340	5327	0.013	2.5	7.1	7.5	10	6
207***							8360	5333	5118	0.026	-	33.4	33.4	33	20
208***							3865	5303	5118	0.048	-	14.5	14.5	15	9
209	100	5333	5329	0.040	4.0	0.4	1421	5329	5302	0.019	2.8	8.5	8.9	10	6
210	100	5180	5175	0.050	4.5	0.4	1700	5175	5145	0.018	2.7	10.6	11.0	11	7
Sundance	100	5332	5329	0.024	3.2	0.5	1570	5329	5304	0.016	2.6	10.1	10.6	11	7

* Figure 3-10 Flow Velocities for Overland and Shallow Concentrated Flows was used from the NMDOT Drainage Manual, Volume 1. Hydrology. The Flow Velocity plot for the Paved Areas (Sheet Flow) Small Upland Gullies (Shallow Concentrated Flow) was used.

*** Gullied watershed condition uses the Kirpich Formula.



NOAA Atlas 14, Volume 1, Version 5
Location name: Albuquerque, New Mexico,
USA*
Latitude: 35.184°, Longitude: -106.7032°
Elevation: 5303.62 ft**
 * source: ESRI Maps
 ** source: USGS



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 & aerals](#)

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	0.160 (0.137–0.188)	0.208 (0.177–0.243)	0.280 (0.238–0.328)	0.337 (0.286–0.393)	0.415 (0.350–0.484)	0.476 (0.400–0.555)	0.541 (0.451–0.629)	0.610 (0.505–0.710)	0.704 (0.577–0.820)	0.779 (0.633–0.907)
10-min	0.244 (0.209–0.286)	0.316 (0.270–0.370)	0.426 (0.362–0.500)	0.513 (0.435–0.599)	0.631 (0.532–0.737)	0.724 (0.609–0.844)	0.823 (0.687–0.958)	0.929 (0.769–1.08)	1.07 (0.878–1.25)	1.19 (0.964–1.38)
15-min	0.302 (0.259–0.354)	0.392 (0.334–0.459)	0.527 (0.449–0.620)	0.635 (0.539–0.742)	0.782 (0.660–0.913)	0.898 (0.755–1.05)	1.02 (0.851–1.19)	1.15 (0.953–1.34)	1.33 (1.09–1.55)	1.47 (1.20–1.71)
30-min	0.408 (0.349–0.477)	0.528 (0.450–0.618)	0.710 (0.604–0.835)	0.856 (0.726–0.999)	1.05 (0.889–1.23)	1.21 (1.02–1.41)	1.37 (1.15–1.60)	1.55 (1.28–1.80)	1.79 (1.47–2.09)	1.98 (1.61–2.30)
60-min	0.504 (0.431–0.590)	0.653 (0.557–0.765)	0.879 (0.747–1.03)	1.06 (0.899–1.24)	1.30 (1.10–1.52)	1.50 (1.26–1.74)	1.70 (1.42–1.98)	1.92 (1.59–2.23)	2.21 (1.82–2.58)	2.45 (1.99–2.85)
2-hr	0.592 (0.506–0.698)	0.757 (0.645–0.894)	1.00 (0.854–1.19)	1.20 (1.02–1.41)	1.48 (1.25–1.73)	1.71 (1.43–1.99)	1.95 (1.62–2.27)	2.20 (1.81–2.56)	2.56 (2.08–2.97)	2.85 (2.29–3.31)
3-hr	0.638 (0.554–0.751)	0.812 (0.702–0.956)	1.07 (0.923–1.25)	1.27 (1.10–1.49)	1.55 (1.33–1.81)	1.78 (1.52–2.08)	2.03 (1.71–2.36)	2.29 (1.91–2.66)	2.65 (2.19–3.08)	2.95 (2.41–3.44)
6-hr	0.737 (0.642–0.857)	0.932 (0.816–1.09)	1.21 (1.05–1.40)	1.42 (1.24–1.65)	1.72 (1.49–1.98)	1.95 (1.68–2.25)	2.20 (1.88–2.53)	2.45 (2.08–2.82)	2.81 (2.36–3.24)	3.10 (2.58–3.58)
12-hr	0.822 (0.723–0.937)	1.04 (0.914–1.18)	1.32 (1.16–1.50)	1.54 (1.35–1.76)	1.84 (1.60–2.09)	2.07 (1.80–2.35)	2.32 (2.00–2.62)	2.57 (2.19–2.91)	2.91 (2.46–3.30)	3.18 (2.68–3.62)
24-hr	0.932 (0.822–1.06)	1.17 (1.03–1.33)	1.47 (1.29–1.67)	1.70 (1.50–1.93)	2.02 (1.77–2.29)	2.26 (1.98–2.56)	2.52 (2.20–2.85)	2.78 (2.41–3.13)	3.13 (2.69–3.53)	3.40 (2.91–3.84)
2-day	0.983 (0.874–1.11)	1.23 (1.10–1.39)	1.54 (1.37–1.74)	1.79 (1.59–2.01)	2.11 (1.87–2.37)	2.37 (2.08–2.65)	2.62 (2.31–2.94)	2.89 (2.52–3.24)	3.24 (2.82–3.64)	3.51 (3.04–3.95)
3-day	1.13 (1.02–1.25)	1.41 (1.27–1.56)	1.74 (1.57–1.93)	2.00 (1.81–2.21)	2.36 (2.12–2.60)	2.62 (2.35–2.90)	2.90 (2.59–3.20)	3.17 (2.83–3.50)	3.54 (3.14–3.91)	3.81 (3.37–4.23)
4-day	1.27 (1.17–1.39)	1.58 (1.45–1.73)	1.94 (1.77–2.12)	2.22 (2.03–2.42)	2.60 (2.37–2.83)	2.88 (2.62–3.14)	3.17 (2.88–3.45)	3.46 (3.13–3.77)	3.83 (3.46–4.18)	4.12 (3.70–4.50)
7-day	1.46 (1.34–1.59)	1.81 (1.66–1.97)	2.20 (2.02–2.39)	2.50 (2.30–2.71)	2.90 (2.66–3.14)	3.20 (2.93–3.46)	3.49 (3.19–3.78)	3.77 (3.44–4.09)	4.14 (3.77–4.49)	4.40 (4.00–4.78)
10-day	1.61 (1.48–1.75)	2.00 (1.83–2.17)	2.44 (2.25–2.64)	2.79 (2.56–3.02)	3.25 (2.98–3.51)	3.59 (3.29–3.87)	3.94 (3.59–4.24)	4.27 (3.89–4.61)	4.71 (4.27–5.08)	5.03 (4.55–5.43)
20-day	2.01 (1.84–2.19)	2.49 (2.29–2.72)	3.03 (2.78–3.29)	3.42 (3.15–3.71)	3.93 (3.61–4.26)	4.30 (3.94–4.65)	4.65 (4.26–5.03)	4.98 (4.55–5.39)	5.39 (4.92–5.84)	5.68 (5.18–6.15)
30-day	2.40 (2.21–2.60)	2.98 (2.74–3.22)	3.58 (3.29–3.86)	4.02 (3.70–4.33)	4.57 (4.20–4.92)	4.96 (4.56–5.34)	5.33 (4.89–5.73)	5.67 (5.20–6.10)	6.08 (5.56–6.54)	6.36 (5.81–6.84)
45-day	2.93 (2.71–3.17)	3.63 (3.35–3.92)	4.32 (3.99–4.65)	4.81 (4.44–5.17)	5.40 (4.99–5.80)	5.79 (5.36–6.23)	6.15 (5.69–6.60)	6.46 (5.97–6.93)	6.80 (6.30–7.29)	7.00 (6.50–7.50)
60-day	3.37 (3.11–3.64)	4.16 (3.85–4.50)	4.95 (4.59–5.35)	5.52 (5.11–5.95)	6.19 (5.74–6.67)	6.65 (6.16–7.16)	7.07 (6.55–7.61)	7.43 (6.89–8.00)	7.84 (7.28–8.44)	8.08 (7.52–8.70)

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.

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User Specified Hyetograph

Rainfall Depths in Inches						
Duration	Average Recurrence Interval (years)					
	2	5	10	25	50	100
6-hour	0.932	1.210	1.420	1.720	1.950	2.200
24-hour	1.170	1.470	1.700	2.020	2.260	2.520

t (min)	dd(in)
0	0
15	0.0058
30	0.0060
45	0.0062
60	0.0064
75	0.0066
90	0.0068
105	0.0070
120	0.0072
135	0.0074
150	0.0076
165	0.0078
180	0.0082
195	0.0086
210	0.0090
225	0.0094
240	0.0098
255	0.0103
270	0.0140
285	0.0168
300	0.0210
315	0.0246
330	0.2497
345	1.1081
360	0.4277
375	0.1586
390	0.0228
405	0.0192
420	0.0154
435	0.0126
450	0.0101
465	0.0096
480	0.0092
495	0.0088

t (min)	dd(in)
510	0.0084
525	0.0080
540	0.0077
555	0.0075
570	0.0073
585	0.0071
600	0.0069
615	0.0067
630	0.0065
645	0.0063
660	0.0061
675	0.0059
690	0.0057
705	0.0056
720	0.0055
735	0.0050
750	0.0049
765	0.0048
780	0.0048
795	0.0047
810	0.0046
825	0.0045
840	0.0045
855	0.0044
870	0.0043
885	0.0043
900	0.0042
915	0.0041
930	0.0041
945	0.0040
960	0.0039
975	0.0039
990	0.0038
1005	0.0037

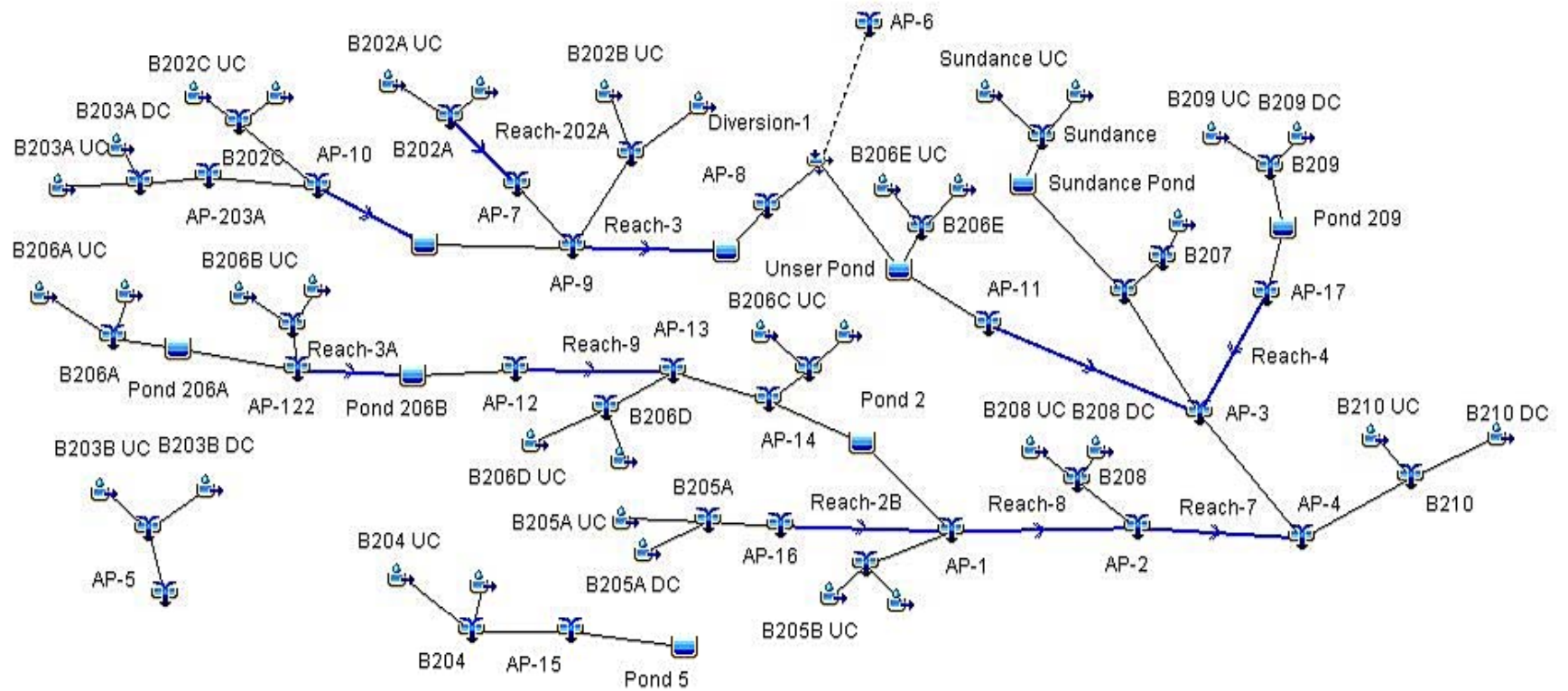
t (min)	dd(in)
1020	0.0036
1035	0.0036
1050	0.0035
1065	0.0034
1080	0.0034
1095	0.0033
1110	0.0032
1125	0.0032
1140	0.0031
1155	0.0030
1170	0.0030
1185	0.0029
1200	0.0028
1215	0.0027
1230	0.0027
1245	0.0026
1260	0.0025
1275	0.0025
1290	0.0024
1305	0.0023
1320	0.0023
1335	0.0022
1350	0.0021
1365	0.0020
1380	0.0020
1395	0.0019
1410	0.0018
1425	0.0018
1440	0.0017



AMAFCA

Upper Piedras Marcadas Watershed
Drainage and Water Quality Management Plan
Developed Conditions Report

Alternative 1



HEC-HMS PLAN - ALTERNATIVE 1

Alternative 1 - 100 yr, 24 hr				
Hydrologic Element	Area (sq mi)	Peak Flow (cfs)	Time to Peak (hr)	Volume (ac-ft)
AP-1	0.430	426.3	01Jan2014, 06:00	49.33
AP-10	0.123	236	01Jan2014, 05:50	14.53
AP-11	0.288	102.3	01Jan2014, 06:05	21.8
AP-12	0.250	250	01Jan2014, 05:55	28.92
AP-122	0.250	389.9	01Jan2014, 05:50	29.18
AP-13	0.292	300.3	01Jan2014, 06:00	33.67
AP-14	0.364	424	01Jan2014, 05:55	41.87
AP-15	0.127	275.5	01Jan2014, 05:50	14.79
AP-16	0.032	75.6	01Jan2014, 05:45	3.73
AP-17	0.051	40.5	01Jan2014, 06:00	3.41
AP-2	0.605	486.1	01Jan2014, 06:05	54.42
AP-203A	0.073	132.7	01Jan2014, 05:55	8.52
AP-3	0.792	192.4	01Jan2014, 06:40	37.5
AP-4	1.431	610.5	01Jan2014, 06:10	95.45
AP-5	0.059	119.7	01Jan2014, 05:50	6.45
AP-6	0.000	44.5	01Jan2014, 06:30	9.33
AP-7	0.069	127.2	01Jan2014, 05:55	7.92
AP-8	0.250	133.5	01Jan2014, 06:30	27.98
AP-9	0.250	306	01Jan2014, 05:50	28.81
B202A	0.069	129.5	01Jan2014, 05:50	7.91
B202A DC	0.057	122.9	01Jan2014, 05:50	7.35
B202A UC	0.012	8.2	01Jan2014, 06:00	0.56
B202B	0.058	131.9	01Jan2014, 05:45	6.54
B202B DC	0.047	123.5	01Jan2014, 05:45	6.01
B202B UC	0.011	9.6	01Jan2014, 05:50	0.53
B202C	0.051	115.9	01Jan2014, 05:45	6.01
B202C DC	0.045	112.1	01Jan2014, 05:45	5.74
B202C UC	0.006	4.8	01Jan2014, 05:50	0.27
B203A	0.073	132.7	01Jan2014, 05:55	8.52
B203A DC	0.063	126.7	01Jan2014, 05:55	8.06
B203A UC	0.010	6.5	01Jan2014, 06:00	0.46
B203B	0.059	119.7	01Jan2014, 05:50	6.45
B203B DC	0.046	109.3	01Jan2014, 05:50	5.83
B203B UC	0.013	10.4	01Jan2014, 05:50	0.62
B204	0.127	275.5	01Jan2014, 05:50	14.79
B204 DC	0.109	260.8	01Jan2014, 05:50	13.92
B204 UC	0.018	14.7	01Jan2014, 05:50	0.88
B205A	0.032	75.6	01Jan2014, 05:45	3.73
B205A DC	0.027	71.9	01Jan2014, 05:45	3.5
B205A UC	0.005	4.3	01Jan2014, 05:50	0.23
B205B	0.034	78.8	01Jan2014, 05:45	3.9
B205B DC	0.028	74.2	01Jan2014, 05:45	3.61
B205B UC	0.006	5.2	01Jan2014, 05:50	0.29
B206A	0.136	258.1	01Jan2014, 05:55	16.27
B206A DC	0.122	248.8	01Jan2014, 05:55	15.59

B206A UC	0.014	9.7	01Jan2014, 06:00	0.68
B206B	0.114	240.7	01Jan2014, 05:50	12.95
B206B DC	0.093	223.8	01Jan2014, 05:50	11.94
B206B UC	0.021	16.9	01Jan2014, 05:50	1
B206C	0.072	129.5	01Jan2014, 05:55	8.2
B206C DC	0.059	121	01Jan2014, 05:55	7.58
B206C UC	0.013	8.9	01Jan2014, 06:00	0.62
B206D	0.041	96.7	01Jan2014, 05:45	4.78
B206D DC	0.035	91.9	01Jan2014, 05:45	4.47
B206D UC	0.006	5.6	01Jan2014, 05:50	0.3
B206E	0.038	80.3	01Jan2014, 05:45	4.02
B206E DC	0.028	72.4	01Jan2014, 05:45	3.52
B206E UC	0.010	9	01Jan2014, 05:50	0.49
B207	0.389	71.8	01Jan2014, 06:15	6.93
B207 UC	0.389	71.8	01Jan2014, 06:15	6.93
B208	0.175	66.8	01Jan2014, 05:55	5.11
B208 DC	0.015	36.7	01Jan2014, 05:50	1.99
B208 UC	0.160	42.6	01Jan2014, 06:05	3.13
B209	0.051	63.9	01Jan2014, 05:50	3.52
B209 DC	0.013	35	01Jan2014, 05:45	1.7
B209 UC	0.038	33.1	01Jan2014, 05:50	1.81
B210	0.034	66.4	01Jan2014, 05:45	3.55
B210 DC	0.024	59.6	01Jan2014, 05:45	3.05
B210 UC	0.011	8.8	01Jan2014, 05:50	0.5
Diversion-1	0.250	89	01Jan2014, 06:30	18.65
Junction-4	0.452	104.4	01Jan2014, 06:15	12.42
Pond 2	0.364	355.6	01Jan2014, 06:10	41.69
Pond 202B	0.250	133.5	01Jan2014, 06:30	27.98
Pond 202C	0.123	117.2	01Jan2014, 06:10	14.35
Pond 206A	0.136	194.1	01Jan2014, 06:05	16.23
Pond 206B	0.250	250	01Jan2014, 05:55	28.92
Pond 209	0.051	40.5	01Jan2014, 06:00	3.41
Pond 5	0.127	62.1	01Jan2014, 06:20	14.51
Reach-1	0.123	231	01Jan2014, 05:50	14.54
Reach-2B	0.032	72.2	01Jan2014, 05:45	3.74
Reach-202A	0.069	127.2	01Jan2014, 05:55	7.92
Reach-3	0.250	302.2	01Jan2014, 05:55	28.81
Reach-3A	0.250	383.9	01Jan2014, 05:55	29.18
Reach-4	0.051	40	01Jan2014, 06:30	3.39
Reach-6	0.288	101.5	01Jan2014, 06:40	21.68
Reach-7	0.605	483.7	01Jan2014, 06:10	54.4
Reach-8	0.430	423.9	01Jan2014, 06:05	49.31
Reach-9	0.250	250	01Jan2014, 06:30	28.89
Sundance	0.063	101.7	01Jan2014, 05:50	5.54
Sundance DC	0.032	78.8	01Jan2014, 05:45	4.04
Sundance Pond	0.063	32.6	01Jan2014, 06:10	5.5
Sundance UC	0.032	26.5	01Jan2014, 05:50	1.5
Unser Pond	0.288	102.3	01Jan2014, 06:05	21.8

Alternative 1 - 10 yr, 24 hr				
Hydrologic Element	Area (sq mi)	Peak Flow (cfs)	Time to Peak (hr)	Volume (ac-ft)
AP-1	0.4302	271.5	01Jan2014, 06:10	31.01
AP-10	0.1231	135.8	01Jan2014, 05:50	9.21
AP-11	0.2882	51.4	01Jan2014, 06:35	13.31
AP-12	0.2503	232.6	01Jan2014, 06:05	18.21
AP-122	0.2503	220.2	01Jan2014, 05:55	18.43
AP-13	0.2916	213.3	01Jan2014, 06:05	21.21
AP-14	0.3638	269.4	01Jan2014, 06:05	26.36
AP-15	0.127	158	01Jan2014, 05:50	9.34
AP-16	0.0322	43.2	01Jan2014, 05:45	2.35
AP-17	0.0514	7.6	01Jan2014, 06:20	1.77
AP-2	0.605	281.2	01Jan2014, 06:15	33
AP-203A	0.0726	76.2	01Jan2014, 05:55	5.39
AP-3	0.7916	65.5	01Jan2014, 07:05	19.63
AP-4	1.4309	317.2	01Jan2014, 06:20	54.78
AP-5	0.0585	67.4	01Jan2014, 05:50	4.02
AP-6	0	24.9	01Jan2014, 06:30	5.8
AP-7	0.0692	72.6	01Jan2014, 05:55	4.98
AP-8	0.2503	74.7	01Jan2014, 06:30	17.41
AP-9	0.2503	168.8	01Jan2014, 05:50	18.13
B202A	0.0692	73.7	01Jan2014, 05:50	4.98
B202A DC	0.0574	72	01Jan2014, 05:50	4.74
B202A UC	0.0118	2.7	01Jan2014, 06:00	0.24
B202B	0.058	74.7	01Jan2014, 05:45	4.1
B202B DC	0.0469	72.5	01Jan2014, 05:45	3.88
B202B UC	0.0111	3	01Jan2014, 05:50	0.22
B202C	0.0505	66.6	01Jan2014, 05:45	3.82
B202C DC	0.0448	65.7	01Jan2014, 05:45	3.7
B202C UC	0.0057	1.4	01Jan2014, 05:50	0.11
B203A	0.0726	76.2	01Jan2014, 05:55	5.39
B203A DC	0.0629	74.5	01Jan2014, 05:55	5.2
B203A UC	0.0097	2.1	01Jan2014, 06:05	0.19
B203B	0.0585	67.4	01Jan2014, 05:50	4.02
B203B DC	0.0455	64.4	01Jan2014, 05:50	3.76
B203B UC	0.013	3.2	01Jan2014, 05:55	0.26
B204	0.127	158	01Jan2014, 05:50	9.34
B204 DC	0.1086	153.8	01Jan2014, 05:50	8.98
B204 UC	0.0184	4.5	01Jan2014, 05:55	0.37
B205A	0.0322	43.2	01Jan2014, 05:45	2.35
B205A DC	0.0273	42.2	01Jan2014, 05:45	2.26
B205A UC	0.0049	1.3	01Jan2014, 05:50	0.1
B205B	0.0342	44.8	01Jan2014, 05:45	2.45
B205B DC	0.0282	43.6	01Jan2014, 05:45	2.33
B205B UC	0.006	1.6	01Jan2014, 05:50	0.12
B206A	0.136	149.2	01Jan2014, 05:55	10.34
B206A DC	0.1217	146.5	01Jan2014, 05:55	10.06

B206A UC	0.0143	3.2	01Jan2014, 06:05	0.28
B206B	0.1143	136.9	01Jan2014, 05:50	8.13
B206B DC	0.0932	132	01Jan2014, 05:50	7.7
B206B UC	0.0211	5.2	01Jan2014, 05:55	0.42
B206C	0.0722	73.7	01Jan2014, 05:55	5.15
B206C DC	0.0592	71.3	01Jan2014, 05:55	4.89
B206C UC	0.013	2.9	01Jan2014, 06:05	0.26
B206D	0.0413	55.2	01Jan2014, 05:45	3.01
B206D DC	0.0349	54	01Jan2014, 05:45	2.89
B206D UC	0.0064	1.7	01Jan2014, 05:50	0.13
B206E	0.0379	44.5	01Jan2014, 05:45	2.48
B206E DC	0.0275	42.5	01Jan2014, 05:45	2.27
B206E UC	0.0104	2.8	01Jan2014, 05:50	0.21
B207	0.389	7.2	01Jan2014, 06:25	1.46
B207 UC	0.389	7.2	01Jan2014, 06:25	1.46
B208	0.1748	21.8	01Jan2014, 05:50	2
B208 DC	0.0148	21.6	01Jan2014, 05:50	1.28
B208 UC	0.16	5.1	01Jan2014, 06:10	0.72
B209	0.0514	28.4	01Jan2014, 05:50	1.86
B209 DC	0.0133	20.6	01Jan2014, 05:45	1.1
B209 UC	0.0381	10.2	01Jan2014, 05:50	0.76
B210	0.0343	36.6	01Jan2014, 05:45	2.18
B210 DC	0.0238	34.9	01Jan2014, 05:45	1.97
B210 UC	0.0105	2.6	01Jan2014, 05:50	0.21
Diversion-1	0.2503	49.8	01Jan2014, 06:30	11.61
Junction-4	0.452	25.5	01Jan2014, 06:20	4.66
Pond 2	0.3638	245.7	01Jan2014, 06:10	26.2
Pond 202B	0.2503	74.7	01Jan2014, 06:30	17.41
Pond 202C	0.1231	67.9	01Jan2014, 06:10	9.06
Pond 206A	0.136	123.2	01Jan2014, 06:00	10.31
Pond 206B	0.2503	232.6	01Jan2014, 06:05	18.21
Pond 209	0.0514	7.6	01Jan2014, 06:20	1.77
Pond 5	0.127	28.1	01Jan2014, 06:20	9.11
Reach-1	0.1231	132.6	01Jan2014, 05:50	9.21
Reach-2B	0.0322	41	01Jan2014, 05:45	2.36
Reach-202A	0.0692	72.6	01Jan2014, 05:55	4.98
Reach-3	0.2503	167	01Jan2014, 05:55	18.13
Reach-3A	0.2503	219.6	01Jan2014, 05:55	18.44
Reach-4	0.0514	7.6	01Jan2014, 06:45	1.76
Reach-6	0.2882	51.3	01Jan2014, 07:10	13.2
Reach-7	0.605	280.1	01Jan2014, 06:20	32.98
Reach-8	0.4302	270	01Jan2014, 06:15	30.99
Reach-9	0.2503	197.8	01Jan2014, 06:10	18.19
Sundance	0.063	52.3	01Jan2014, 05:50	3.23
Sundance DC	0.0315	46.2	01Jan2014, 05:45	2.6
Sundance Pond	0.063	19.7	01Jan2014, 06:10	3.2
Sundance UC	0.0315	7.9	01Jan2014, 05:50	0.63
Unser Pond	0.2882	51.4	01Jan2014, 06:35	13.31

Alternative 1 - 2 yr, 24 hr				
Hydrologic Element	Area (sq mi)	Peak Flow (cfs)	Time to Peak (hr)	Volume (ac-ft)
AP-1	0.4302	113.2	01Jan2014, 06:15	19.61
AP-10	0.1231	74.3	01Jan2014, 05:50	5.87
AP-11	0.2882	15.5	01Jan2014, 07:40	8.1
AP-12	0.2503	81	01Jan2014, 06:15	11.52
AP-122	0.2503	115.4	01Jan2014, 05:55	11.71
AP-13	0.2916	85.2	01Jan2014, 06:15	13.43
AP-14	0.3638	104.9	01Jan2014, 06:15	16.68
AP-15	0.127	86.1	01Jan2014, 05:50	5.94
AP-16	0.0322	23.5	01Jan2014, 05:45	1.49
AP-17	0.0514	1.5	01Jan2014, 06:30	0.92
AP-2	0.605	115.5	01Jan2014, 06:20	20.45
AP-203A	0.0726	41.6	01Jan2014, 05:55	3.43
AP-3	0.7916	19.2	01Jan2014, 08:10	10.83
AP-4	1.4309	129.6	01Jan2014, 06:25	32.62
AP-5	0.0585	36.2	01Jan2014, 05:50	2.52
AP-6	0	9.8	01Jan2014, 06:45	3.62
AP-7	0.0692	39.4	01Jan2014, 05:55	3.15
AP-8	0.2503	29.5	01Jan2014, 06:45	10.86
AP-9	0.2503	86	01Jan2014, 05:55	11.47
B202A	0.0692	40	01Jan2014, 05:50	3.15
B202A DC	0.0574	39.9	01Jan2014, 05:50	3.07
B202A UC	0.0118	0.5	01Jan2014, 06:10	0.08
B202B	0.058	40.4	01Jan2014, 05:45	2.59
B202B DC	0.0469	40.2	01Jan2014, 05:45	2.51
B202B UC	0.0111	0.6	01Jan2014, 06:00	0.08
B202C	0.0505	36.4	01Jan2014, 05:45	2.44
B202C DC	0.0448	36.4	01Jan2014, 05:45	2.4
B202C UC	0.0057	0.3	01Jan2014, 06:05	0.04
B203A	0.0726	41.6	01Jan2014, 05:55	3.43
B203A DC	0.0629	41.4	01Jan2014, 05:55	3.36
B203A UC	0.0097	0.4	01Jan2014, 06:10	0.07
B203B	0.0585	36.2	01Jan2014, 05:50	2.52
B203B DC	0.0455	35.9	01Jan2014, 05:50	2.43
B203B UC	0.013	0.7	01Jan2014, 06:05	0.09
B204	0.127	86.1	01Jan2014, 05:50	5.94
B204 DC	0.1086	85.7	01Jan2014, 05:50	5.81
B204 UC	0.0184	1	01Jan2014, 06:05	0.13
B205A	0.0322	23.5	01Jan2014, 05:45	1.49
B205A DC	0.0273	23.4	01Jan2014, 05:45	1.46
B205A UC	0.0049	0.3	01Jan2014, 06:00	0.03
B205B	0.0342	24.3	01Jan2014, 05:45	1.55
B205B DC	0.0282	24.2	01Jan2014, 05:45	1.51
B205B UC	0.006	0.3	01Jan2014, 06:00	0.04
B206A	0.136	81.9	01Jan2014, 05:55	6.6
B206A DC	0.1217	81.6	01Jan2014, 05:55	6.51

B206A UC	0.0143	0.6	01Jan2014, 06:10	0.1
B206B	0.1143	74	01Jan2014, 05:50	5.13
B206B DC	0.0932	73.5	01Jan2014, 05:50	4.99
B206B UC	0.0211	1.1	01Jan2014, 06:05	0.15
B206C	0.0722	40	01Jan2014, 05:55	3.25
B206C DC	0.0592	39.7	01Jan2014, 05:55	3.16
B206C UC	0.013	0.6	01Jan2014, 06:10	0.09
B206D	0.0413	30	01Jan2014, 05:45	1.91
B206D DC	0.0349	29.9	01Jan2014, 05:45	1.87
B206D UC	0.0064	0.3	01Jan2014, 06:00	0.04
B206E	0.0379	23.7	01Jan2014, 05:45	1.54
B206E DC	0.0275	23.6	01Jan2014, 05:45	1.47
B206E UC	0.0104	0.6	01Jan2014, 06:00	0.07
B207	0.389	0.1	01Jan2014, 21:10	0.03
B207 UC	0.389	0.1	01Jan2014, 21:10	0.03
B208	0.1748	12	01Jan2014, 05:50	0.86
B208 DC	0.0148	12	01Jan2014, 05:50	0.83
B208 UC	0.16	0	01Jan2014, 18:50	0.03
B209	0.0514	11.9	01Jan2014, 05:45	0.97
B209 DC	0.0133	11.4	01Jan2014, 05:45	0.71
B209 UC	0.0381	2.1	01Jan2014, 06:00	0.26
B210	0.0343	19.4	01Jan2014, 05:45	1.35
B210 DC	0.0238	19.3	01Jan2014, 05:45	1.27
B210 UC	0.0105	0.6	01Jan2014, 06:05	0.07
Diversion-1	0.2503	19.7	01Jan2014, 06:45	7.24
Junction-4	0.452	9.8	01Jan2014, 06:10	1.91
Pond 2	0.3638	102.4	01Jan2014, 06:20	16.56
Pond 202B	0.2503	29.5	01Jan2014, 06:45	10.86
Pond 202C	0.1231	34.4	01Jan2014, 06:15	5.74
Pond 206A	0.136	65.9	01Jan2014, 06:05	6.58
Pond 206B	0.2503	81	01Jan2014, 06:15	11.52
Pond 209	0.0514	1.5	01Jan2014, 06:30	0.92
Pond 5	0.127	16	01Jan2014, 06:25	5.74
Reach-1	0.1231	72.3	01Jan2014, 05:50	5.87
Reach-2B	0.0322	22.1	01Jan2014, 05:45	1.5
Reach-202A	0.0692	39.4	01Jan2014, 05:55	3.15
Reach-3	0.2503	86	01Jan2014, 05:55	11.47
Reach-3A	0.2503	114.8	01Jan2014, 05:55	11.71
Reach-4	0.0514	1.5	01Jan2014, 07:00	0.91
Reach-6	0.2882	15.5	01Jan2014, 08:15	8.01
Reach-7	0.605	115.2	01Jan2014, 06:25	20.44
Reach-8	0.4302	112.7	01Jan2014, 06:20	19.59
Reach-9	0.2503	79.7	01Jan2014, 06:20	11.52
Sundance	0.063	25.9	01Jan2014, 05:45	1.9
Sundance DC	0.0315	25.6	01Jan2014, 05:45	1.69
Sundance Pond	0.063	9.8	01Jan2014, 06:10	1.88
Sundance UC	0.0315	1.7	01Jan2014, 06:05	0.22
Unser Pond	0.2882	15.5	01Jan2014, 07:40	8.1

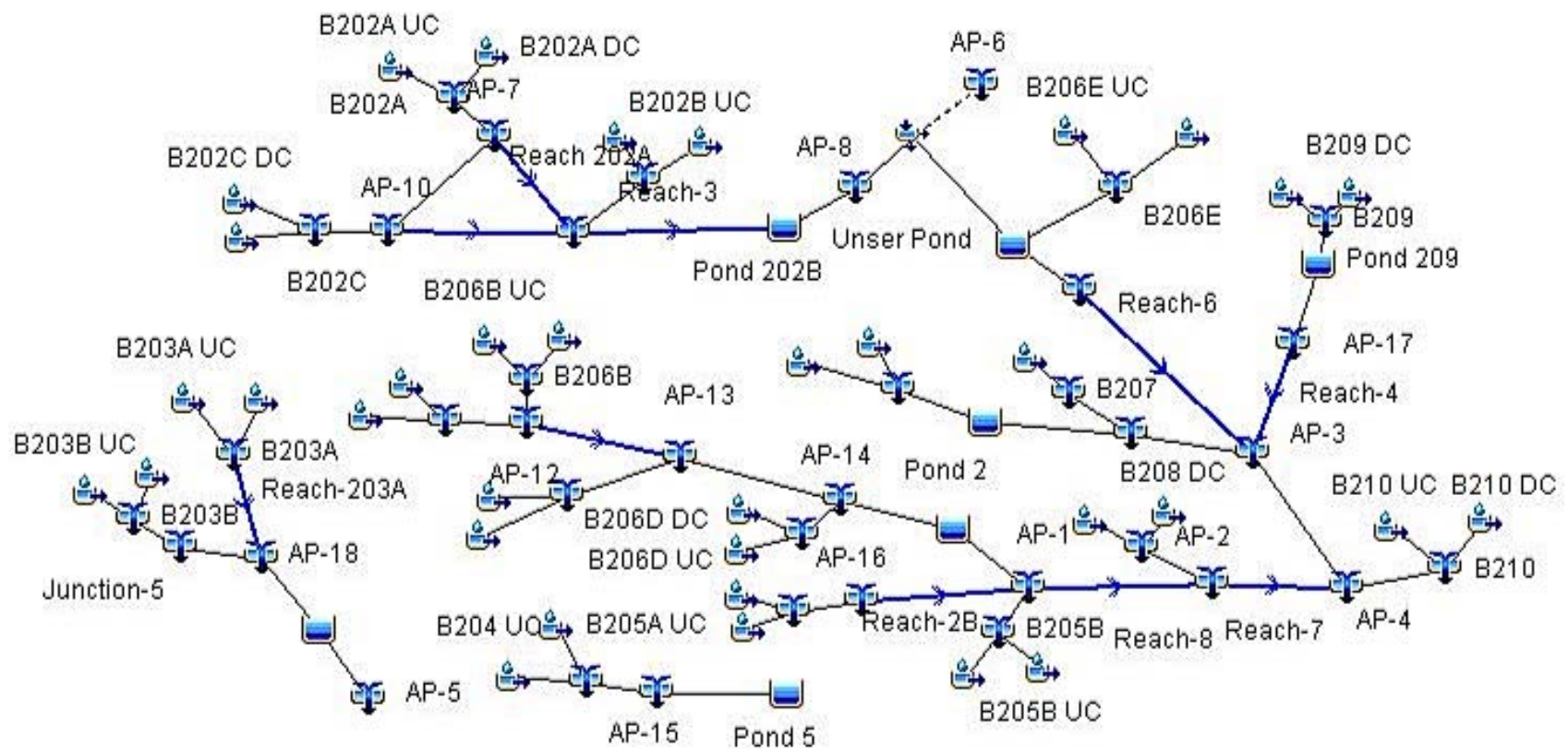
Alternative 1				
Pond Summary (100 yr - 24 hr)				
Pond	Inflow	Outflow	Volume Prv'd	Peak Volume
	(cfs)	(cfs)	(ac-ft)	(ac-ft)
Pond 202B	302.20	133.50	13.40	12.06
Pond 202C	231.00	117.20	8.00	6.03
Pond 204	299.80	62.70	9.50	9.27
Pond 209	63.90	40.50	2.00	1.39
Pond 206A	258.10	194.10	4.00	3.46
Pond 206B	383.90	250.00	8.00	7.57
Sundance Pond	101.70	32.60	2.80	2.76
Unser Pond	102.00	102.30	3.00	2.94
Pond 2	424.00	355.60	7.00	4.33



AMAFCA

Upper Piedras Marcadas Watershed
Drainage and Water Quality Management Plan
Developed Conditions Report

Alternative 2



HEC-HMS PLAN - ALTERNATIVE 2

Alternative 2 - 100 yr, 24 hr				
Hydrologic Element	Area (sq mi)	Peak Flow (cfs)	Time to Peak (hr)	Volume (ac-ft)
AP-1	0.4302	327.5	01Jan2014, 06:15	48.47
AP-10	0.1197	241.3	01Jan2014, 05:50	13.93
AP-11	0.2156	106.8	01Jan2014, 06:15	17.1
AP-12	0.2503	494.5	01Jan2014, 05:50	29.22
AP-13	0.3225	556.2	01Jan2014, 05:55	36.62
AP-14	0.3638	617.8	01Jan2014, 05:55	41.4
AP-15	0.127	275.5	01Jan2014, 05:50	14.79
AP-16	0.0322	75.6	01Jan2014, 05:45	3.73
AP-17	0.0514	19.2	01Jan2014, 06:15	3.4
AP-18	0.1311	237	01Jan2014, 05:50	14.97
AP-2	0.605	363.2	01Jan2014, 06:15	53.56
AP-3	0.719	183.6	01Jan2014, 06:35	32.84
AP-4	1.3583	527.5	01Jan2014, 06:30	89.93
AP-5	0.1311	167.1	01Jan2014, 06:05	14.77
AP-6	0	44	01Jan2014, 06:15	6.65
AP-7	0.0692	129.5	01Jan2014, 05:50	7.91
AP-8	0.1777	133.8	01Jan2014, 06:15	20.25
AP-9	0.1777	353.5	01Jan2014, 05:50	20.47
B202A	0.0692	129.5	01Jan2014, 05:50	7.91
B202A DC	0.0574	122.9	01Jan2014, 05:50	7.35
B202A UC	0.0118	8.2	01Jan2014, 06:00	0.56
B202B	0.058	131.9	01Jan2014, 05:45	6.54
B202B DC	0.0469	123.5	01Jan2014, 05:45	6.01
B202B UC	0.0111	9.6	01Jan2014, 05:50	0.53
B202C	0.0505	115.9	01Jan2014, 05:45	6.01
B202C DC	0.0448	112.1	01Jan2014, 05:45	5.74
B202C UC	0.0057	4.8	01Jan2014, 05:50	0.27
B203A	0.0726	132.7	01Jan2014, 05:55	8.52
B203A DC	0.0629	126.7	01Jan2014, 05:55	8.06
B203A UC	0.0097	6.5	01Jan2014, 06:00	0.46
B203B	0.0585	119.7	01Jan2014, 05:50	6.45
B203B DC	0.0455	109.3	01Jan2014, 05:50	5.83
B203B UC	0.013	10.4	01Jan2014, 05:50	0.62
B204	0.127	275.5	01Jan2014, 05:50	14.79
B204 DC	0.1086	260.8	01Jan2014, 05:50	13.92
B204 UC	0.0184	14.7	01Jan2014, 05:50	0.88
B205A	0.0322	75.6	01Jan2014, 05:45	3.73
B205A DC	0.0273	71.9	01Jan2014, 05:45	3.5
B205A UC	0.0049	4.3	01Jan2014, 05:50	0.23
B205B	0.0342	78.8	01Jan2014, 05:45	3.9
B205B DC	0.0282	74.2	01Jan2014, 05:45	3.61
B205B UC	0.006	5.2	01Jan2014, 05:50	0.29
B206A	0.136	258.1	01Jan2014, 05:55	16.27
B206A DC	0.1217	248.8	01Jan2014, 05:55	15.59
B206A UC	0.0143	9.7	01Jan2014, 06:00	0.68

B206B	0.1143	240.7	01Jan2014, 05:50	12.95
B206B DC	0.0932	223.8	01Jan2014, 05:50	11.94
B206B UC	0.0211	16.9	01Jan2014, 05:50	1
B206C	0.0722	129.5	01Jan2014, 05:55	8.2
B206C DC	0.0592	121	01Jan2014, 05:55	7.58
B206C UC	0.013	8.9	01Jan2014, 06:00	0.62
B206D	0.0413	96.7	01Jan2014, 05:45	4.78
B206D DC	0.0349	91.9	01Jan2014, 05:45	4.47
B206D UC	0.0064	5.6	01Jan2014, 05:50	0.3
B206E	0.0379	80.3	01Jan2014, 05:45	4.02
B206E DC	0.0275	72.4	01Jan2014, 05:45	3.52
B206E UC	0.0104	9	01Jan2014, 05:50	0.49
B207	0.389	71.8	01Jan2014, 06:15	6.93
B207 UC	0.389	71.8	01Jan2014, 06:15	6.93
B208	0.1748	66.8	01Jan2014, 05:55	5.11
B208 DC	0.0148	36.7	01Jan2014, 05:50	1.99
B208 UC	0.16	42.6	01Jan2014, 06:05	3.13
B209	0.0514	63.9	01Jan2014, 05:50	3.52
B209 DC	0.0133	35	01Jan2014, 05:45	1.7
B209 UC	0.0381	33.1	01Jan2014, 05:50	1.81
B210	0.0343	66.4	01Jan2014, 05:45	3.55
B210 DC	0.0238	59.6	01Jan2014, 05:45	3.05
B210 UC	0.0105	8.8	01Jan2014, 05:50	0.5
Diversion-1	0.1777	89.9	01Jan2014, 06:15	13.59
Junction-4	0.452	104.4	01Jan2014, 06:15	12.42
Junction-5	0.0585	119.7	01Jan2014, 05:50	6.45
Pond 2	0.3638	294.3	01Jan2014, 06:15	40.83
Pond 202B	0.1777	133.8	01Jan2014, 06:15	20.25
Pond 203B	0.1311	167.1	01Jan2014, 06:05	14.77
Pond 209	0.0514	19.2	01Jan2014, 06:15	3.4
Pond 5	0.127	62.1	01Jan2014, 06:20	14.51
Reach 202A	0	0	01Jan2014, 00:00	0
Reach-2	0.1197	235.1	01Jan2014, 05:50	13.93
Reach-2B	0.0322	72.2	01Jan2014, 05:45	3.74
Reach-203A	0.0726	130.7	01Jan2014, 05:55	8.52
Reach-3	0.1777	349.8	01Jan2014, 05:50	20.46
Reach-3A	0.2503	426.7	01Jan2014, 05:55	28.42
Reach-4	0.0514	19.1	01Jan2014, 06:40	3.39
Reach-6	0.2156	106.4	01Jan2014, 06:50	17.03
Reach-7	0.605	362.4	01Jan2014, 06:20	53.53
Reach-8	0.4302	327.1	01Jan2014, 06:20	48.45
Sundance	0.063	101.7	01Jan2014, 05:50	5.54
Sundance DC	0.0315	78.8	01Jan2014, 05:45	4.04
Sundance Pond	0.063	32.6	01Jan2014, 06:10	5.5
Sundance UC	0.0315	26.5	01Jan2014, 05:50	1.5
Unser Pond	0.2156	106.8	01Jan2014, 06:15	17.1

Alternative 2 - 10 yr, 24 hr				
Hydrologic Element	Area (sq mi)	Peak Flow (cfs)	Time to Peak (hr)	Volume (ac-ft)
AP-1	0.4302	164.5	01Jan2014, 06:05	30.65
AP-10	0.1197	138.3	01Jan2014, 05:50	8.8
AP-11	0.2156	64.5	01Jan2014, 06:20	10.57
AP-12	0.2503	283	01Jan2014, 05:50	18.47
AP-13	0.3225	327.2	01Jan2014, 05:55	23.31
AP-14	0.3638	362.7	01Jan2014, 05:55	26.32
AP-15	0.127	158	01Jan2014, 05:50	9.34
AP-16	0.0322	43.2	01Jan2014, 05:45	2.35
AP-17	0.0514	4.6	01Jan2014, 06:25	1.77
AP-18	0.1311	134.6	01Jan2014, 05:50	9.41
AP-2	0.605	176.8	01Jan2014, 06:10	32.63
AP-3	0.719	84.8	01Jan2014, 06:45	16.94
AP-4	1.3583	232	01Jan2014, 06:40	51.73
AP-5	0.1311	103.7	01Jan2014, 06:05	9.24
AP-6	0	27.9	01Jan2014, 06:10	4.18
AP-7	0.0692	73.7	01Jan2014, 05:50	4.98
AP-8	0.1777	85	01Jan2014, 06:10	12.71
AP-9	0.1777	202	01Jan2014, 05:50	12.9
B202A	0.0692	73.7	01Jan2014, 05:50	4.98
B202A DC	0.0574	72	01Jan2014, 05:50	4.74
B202A UC	0.0118	2.7	01Jan2014, 06:00	0.24
B202B	0.058	74.7	01Jan2014, 05:45	4.1
B202B DC	0.0469	72.5	01Jan2014, 05:45	3.88
B202B UC	0.0111	3	01Jan2014, 05:50	0.22
B202C	0.0505	66.6	01Jan2014, 05:45	3.82
B202C DC	0.0448	65.7	01Jan2014, 05:45	3.7
B202C UC	0.0057	1.4	01Jan2014, 05:50	0.11
B203A	0.0726	76.2	01Jan2014, 05:55	5.39
B203A DC	0.0629	74.5	01Jan2014, 05:55	5.2
B203A UC	0.0097	2.1	01Jan2014, 06:05	0.19
B203B	0.0585	67.4	01Jan2014, 05:50	4.02
B203B DC	0.0455	64.4	01Jan2014, 05:50	3.76
B203B UC	0.013	3.2	01Jan2014, 05:55	0.26
B204	0.127	158	01Jan2014, 05:50	9.34
B204 DC	0.1086	153.8	01Jan2014, 05:50	8.98
B204 UC	0.0184	4.5	01Jan2014, 05:55	0.37
B205A	0.0322	43.2	01Jan2014, 05:45	2.35
B205A DC	0.0273	42.2	01Jan2014, 05:45	2.26
B205A UC	0.0049	1.3	01Jan2014, 05:50	0.1
B205B	0.0342	44.8	01Jan2014, 05:45	2.45
B205B DC	0.0282	43.6	01Jan2014, 05:45	2.33
B205B UC	0.006	1.6	01Jan2014, 05:50	0.12
B206A	0.136	149.2	01Jan2014, 05:55	10.34
B206A DC	0.1217	146.5	01Jan2014, 05:55	10.06
B206A UC	0.0143	3.2	01Jan2014, 06:05	0.28

B206B	0.1143	136.9	01Jan2014, 05:50	8.13
B206B DC	0.0932	132	01Jan2014, 05:50	7.7
B206B UC	0.0211	5.2	01Jan2014, 05:55	0.42
B206C	0.0722	73.7	01Jan2014, 05:55	5.15
B206C DC	0.0592	71.3	01Jan2014, 05:55	4.89
B206C UC	0.013	2.9	01Jan2014, 06:05	0.26
B206D	0.0413	55.2	01Jan2014, 05:45	3.01
B206D DC	0.0349	54	01Jan2014, 05:45	2.89
B206D UC	0.0064	1.7	01Jan2014, 05:50	0.13
B206E	0.0379	44.5	01Jan2014, 05:45	2.48
B206E DC	0.0275	42.5	01Jan2014, 05:45	2.27
B206E UC	0.0104	2.8	01Jan2014, 05:50	0.21
B207	0.389	7.2	01Jan2014, 06:25	1.46
B207 UC	0.389	7.2	01Jan2014, 06:25	1.46
B208	0.1748	21.8	01Jan2014, 05:50	2
B208 DC	0.0148	21.6	01Jan2014, 05:50	1.28
B208 UC	0.16	5.1	01Jan2014, 06:10	0.72
B209	0.0514	28.4	01Jan2014, 05:50	1.86
B209 DC	0.0133	20.6	01Jan2014, 05:45	1.1
B209 UC	0.0381	10.2	01Jan2014, 05:50	0.76
B210	0.0343	36.6	01Jan2014, 05:45	2.18
B210 DC	0.0238	34.9	01Jan2014, 05:45	1.97
B210 UC	0.0105	2.6	01Jan2014, 05:50	0.21
Diversion-1	0.1777	57.1	01Jan2014, 06:10	8.53
Junction-4	0.452	25.5	01Jan2014, 06:20	4.66
Junction-5	0.0585	67.4	01Jan2014, 05:50	4.02
Pond 2	0.3638	146.5	01Jan2014, 06:20	25.84
Pond 202B	0.1777	85	01Jan2014, 06:10	12.71
Pond 203B	0.1311	103.7	01Jan2014, 06:05	9.24
Pond 209	0.0514	4.6	01Jan2014, 06:25	1.77
Pond 5	0.127	28.1	01Jan2014, 06:20	9.11
Reach 202A	0	0	01Jan2014, 00:00	0
Reach-2	0.1197	134.7	01Jan2014, 05:50	8.8
Reach-2B	0.0322	41	01Jan2014, 05:45	2.36
Reach-203A	0.0726	75	01Jan2014, 05:55	5.39
Reach-3	0.1777	199.9	01Jan2014, 05:50	12.89
Reach-3A	0.2503	253.4	01Jan2014, 05:55	18.16
Reach-4	0.0514	4.6	01Jan2014, 06:50	1.76
Reach-6	0.2156	64.3	01Jan2014, 06:50	10.51
Reach-7	0.605	175.8	01Jan2014, 06:20	32.61
Reach-8	0.4302	164.3	01Jan2014, 06:20	30.63
Sundance	0.063	52.3	01Jan2014, 05:50	3.23
Sundance DC	0.0315	46.2	01Jan2014, 05:45	2.6
Sundance Pond	0.063	19.7	01Jan2014, 06:10	3.2
Sundance UC	0.0315	7.9	01Jan2014, 05:50	0.63
Unser Pond	0.2156	64.5	01Jan2014, 06:20	10.57

Alternative 2 - 2 yr, 24 hr				
Hydrologic Element	Area (sq mi)	Peak Flow (cfs)	Time to Peak (hr)	Volume (ac-ft)
AP-1	0.4302	83	01Jan2014, 06:15	19.44
AP-10	0.1197	75.5	01Jan2014, 05:50	5.59
AP-11	0.2156	30.3	01Jan2014, 06:30	6.56
AP-12	0.2503	154.1	01Jan2014, 05:50	11.74
AP-13	0.3225	181.8	01Jan2014, 05:55	14.87
AP-14	0.3638	201.2	01Jan2014, 05:55	16.79
AP-15	0.127	86.1	01Jan2014, 05:50	5.94
AP-16	0.0322	23.5	01Jan2014, 05:45	1.49
AP-17	0.0514	1.5	01Jan2014, 06:30	0.92
AP-18	0.1311	72.6	01Jan2014, 05:50	5.95
AP-2	0.605	85.3	01Jan2014, 06:20	20.28
AP-3	0.719	35.7	01Jan2014, 07:05	9.33
AP-4	1.3583	100	01Jan2014, 06:25	30.95
AP-5	0.1311	51.9	01Jan2014, 06:05	5.81
AP-6	0	19.1	01Jan2014, 06:10	2.64
AP-7	0.0692	40	01Jan2014, 05:50	3.15
AP-8	0.1777	58.1	01Jan2014, 06:10	8.02
AP-9	0.1777	109.8	01Jan2014, 05:50	8.17
B202A	0.0692	40	01Jan2014, 05:50	3.15
B202A DC	0.0574	39.9	01Jan2014, 05:50	3.07
B202A UC	0.0118	0.5	01Jan2014, 06:10	0.08
B202B	0.058	40.4	01Jan2014, 05:45	2.59
B202B DC	0.0469	40.2	01Jan2014, 05:45	2.51
B202B UC	0.0111	0.6	01Jan2014, 06:00	0.08
B202C	0.0505	36.4	01Jan2014, 05:45	2.44
B202C DC	0.0448	36.4	01Jan2014, 05:45	2.4
B202C UC	0.0057	0.3	01Jan2014, 06:05	0.04
B203A	0.0726	41.6	01Jan2014, 05:55	3.43
B203A DC	0.0629	41.4	01Jan2014, 05:55	3.36
B203A UC	0.0097	0.4	01Jan2014, 06:10	0.07
B203B	0.0585	36.2	01Jan2014, 05:50	2.52
B203B DC	0.0455	35.9	01Jan2014, 05:50	2.43
B203B UC	0.013	0.7	01Jan2014, 06:05	0.09
B204	0.127	86.1	01Jan2014, 05:50	5.94
B204 DC	0.1086	85.7	01Jan2014, 05:50	5.81
B204 UC	0.0184	1	01Jan2014, 06:05	0.13
B205A	0.0322	23.5	01Jan2014, 05:45	1.49
B205A DC	0.0273	23.4	01Jan2014, 05:45	1.46
B205A UC	0.0049	0.3	01Jan2014, 06:00	0.03
B205B	0.0342	24.3	01Jan2014, 05:45	1.55
B205B DC	0.0282	24.2	01Jan2014, 05:45	1.51
B205B UC	0.006	0.3	01Jan2014, 06:00	0.04
B206A	0.136	81.9	01Jan2014, 05:55	6.6
B206A DC	0.1217	81.6	01Jan2014, 05:55	6.51
B206A UC	0.0143	0.6	01Jan2014, 06:10	0.1

B206B	0.1143	74	01Jan2014, 05:50	5.13
B206B DC	0.0932	73.5	01Jan2014, 05:50	4.99
B206B UC	0.0211	1.1	01Jan2014, 06:05	0.15
B206C	0.0722	40	01Jan2014, 05:55	3.25
B206C DC	0.0592	39.7	01Jan2014, 05:55	3.16
B206C UC	0.013	0.6	01Jan2014, 06:10	0.09
B206D	0.0413	30	01Jan2014, 05:45	1.91
B206D DC	0.0349	29.9	01Jan2014, 05:45	1.87
B206D UC	0.0064	0.3	01Jan2014, 06:00	0.04
B206E	0.0379	23.7	01Jan2014, 05:45	1.54
B206E DC	0.0275	23.6	01Jan2014, 05:45	1.47
B206E UC	0.0104	0.6	01Jan2014, 06:00	0.07
B207	0.389	0.1	01Jan2014, 21:10	0.03
B207 UC	0.389	0.1	01Jan2014, 21:10	0.03
B208	0.1748	12	01Jan2014, 05:50	0.86
B208 DC	0.0148	12	01Jan2014, 05:50	0.83
B208 UC	0.16	0	01Jan2014, 18:50	0.03
B209	0.0514	11.9	01Jan2014, 05:45	0.97
B209 DC	0.0133	11.4	01Jan2014, 05:45	0.71
B209 UC	0.0381	2.1	01Jan2014, 06:00	0.26
B210	0.0343	19.4	01Jan2014, 05:45	1.35
B210 DC	0.0238	19.3	01Jan2014, 05:45	1.27
B210 UC	0.0105	0.6	01Jan2014, 06:05	0.07
Diversion-1	0.1777	39	01Jan2014, 06:10	5.39
Junction-4	0.452	9.8	01Jan2014, 06:10	1.91
Junction-5	0.0585	36.2	01Jan2014, 05:50	2.52
Pond 2	0.3638	74.3	01Jan2014, 06:20	16.39
Pond 202B	0.1777	58.1	01Jan2014, 06:10	8.02
Pond 203B	0.1311	51.9	01Jan2014, 06:05	5.81
Pond 209	0.0514	1.5	01Jan2014, 06:30	0.92
Pond 5	0.127	16	01Jan2014, 06:25	5.74
Reach 202A	0	0	01Jan2014, 00:00	0
Reach-2	0.1197	73.5	01Jan2014, 05:50	5.59
Reach-2B	0.0322	22.1	01Jan2014, 05:45	1.5
Reach-203A	0.0726	40.9	01Jan2014, 05:55	3.43
Reach-3	0.1777	108.6	01Jan2014, 05:50	8.17
Reach-3A	0.2503	141.9	01Jan2014, 05:55	11.62
Reach-4	0.0514	1.5	01Jan2014, 07:00	0.91
Reach-6	0.2156	30	01Jan2014, 07:05	6.51
Reach-7	0.605	84.9	01Jan2014, 06:30	20.27
Reach-8	0.4302	82.8	01Jan2014, 06:25	19.42
Sundance	0.063	25.9	01Jan2014, 05:45	1.9
Sundance DC	0.0315	25.6	01Jan2014, 05:45	1.69
Sundance Pond	0.063	9.8	01Jan2014, 06:10	1.88
Sundance UC	0.0315	1.7	01Jan2014, 06:05	0.22
Unser Pond	0.2156	30.3	01Jan2014, 06:30	6.56

Alternative 2				
Pond Summary (100 yr - 24 hr)				
Pond	Inflow	Outflow	Volume Prv'd	Peak Volume
	(cfs)	(cfs)	(ac-ft)	(ac-ft)
Pond 202B	349.8	133.8	11.00	9.57
Pond 203.B	237.0	167.1	4.50	4.38
Pond 204	299.8	62.7	9.50	9.27
Pond 209	63.9	19.2	3.00	1.95
Sundance Pond	101.7	32.6	2.80	2.76
Unser Pond	131.7	106.8	3.70	3.64
Pond 2	617.8	294.3	20.00	19.76



AMAFCA

**Upper Piedras Marcadas Watershed
Drainage and Water Quality Management Plan
Developed Conditions Report**

Alternative 3



Alternative 3 - 100 yr, 24 hr				
Hydrologic Element	Area (sq mi)	Peak Flow (cfs)	Time to Peak (hr)	Volume (ac-ft)
AP-1	0.557	569.9	01Jan2014, 06:05	63.42
AP-10	0.123	226.3	01Jan2014, 05:50	14.53
AP-10.1	0.073	132.7	01Jan2014, 05:55	8.52
AP-11	0.288	119.3	01Jan2014, 06:45	24.52
AP-12	0.250	473.2	01Jan2014, 05:50	29.21
AP-13	0.292	537	01Jan2014, 05:50	33.98
AP-14	0.364	652.6	01Jan2014, 05:55	42.17
AP-15	0.084	196.3	01Jan2014, 05:45	9.7
AP-16	0.159	177.2	01Jan2014, 05:45	17.81
AP-17	0.051	19.2	01Jan2014, 06:15	3.4
AP-18	0.127	109.5	01Jan2014, 05:45	14.08
AP-1.1	0.193	247.3	01Jan2014, 05:45	21.72
AP-2	0.732	612	01Jan2014, 06:10	68.5
AP-3	0.792	157.4	01Jan2014, 07:10	40.22
AP-4	1.558	730.9	01Jan2014, 06:15	112.24
AP-5	0.059	119.2	01Jan2014, 05:50	6.42
AP-6	0.000	46.5	01Jan2014, 06:20	6.56
AP-7	0.069	129.5	01Jan2014, 05:50	7.91
AP-8	0.250	197.8	01Jan2014, 06:20	27.91
AP-9	0.250	401.7	01Jan2014, 05:55	28.46
AP-9.1	0.192	355.8	01Jan2014, 05:50	22.45
B202A	0.069	129.5	01Jan2014, 05:50	7.91
B202A DC	0.057	122.9	01Jan2014, 05:50	7.35
B202A UC	0.012	8.2	01Jan2014, 06:00	0.56
B202B	0.058	131.9	01Jan2014, 05:45	6.54
B202B DC	0.047	123.5	01Jan2014, 05:45	6.01
B202B UC	0.011	9.6	01Jan2014, 05:50	0.53
B202C	0.051	115.9	01Jan2014, 05:45	6.01
B202C DC	0.045	112.1	01Jan2014, 05:45	5.74
B202C UC	0.006	4.8	01Jan2014, 05:50	0.27
B203A	0.073	132.7	01Jan2014, 05:55	8.52
B203A DC	0.063	126.7	01Jan2014, 05:55	8.06
B203A UC	0.010	6.5	01Jan2014, 06:00	0.46
B203B	0.059	119.2	01Jan2014, 05:50	6.42
B203B DC	0.046	109.3	01Jan2014, 05:50	5.83
B203B UC	0.013	9.9	01Jan2014, 05:50	0.59
B204A	0.084	196.3	01Jan2014, 05:45	9.7
B204A DC	0.071	186.6	01Jan2014, 05:45	9.09
B204A UC	0.013	11.1	01Jan2014, 05:50	0.61
B204B	0.043	103.5	01Jan2014, 05:45	5.1
B204B DC	0.038	99.2	01Jan2014, 05:45	4.83
B204B UC	0.006	4.9	01Jan2014, 05:50	0.27
B205A	0.032	75.6	01Jan2014, 05:45	3.73
B205A DC	0.027	71.9	01Jan2014, 05:45	3.5
B205A UC	0.005	4.3	01Jan2014, 05:50	0.23
B205B	0.034	78.8	01Jan2014, 05:45	3.9
B205B DC	0.028	74.2	01Jan2014, 05:45	3.61
B205B UC	0.006	5.2	01Jan2014, 05:50	0.29

B206A	0.136	258.1	01Jan2014, 05:55	16.27
B206A DC	0.122	248.8	01Jan2014, 05:55	15.59
B206A UC	0.014	9.7	01Jan2014, 06:00	0.68
B206B	0.114	240.7	01Jan2014, 05:50	12.95
B206B DC	0.093	223.8	01Jan2014, 05:50	11.94
B206B UC	0.021	16.9	01Jan2014, 05:50	1
B206C	0.072	129.5	01Jan2014, 05:55	8.2
B206C DC	0.059	121	01Jan2014, 05:55	7.58
B206C UC	0.013	8.9	01Jan2014, 06:00	0.62
B206D	0.041	96.7	01Jan2014, 05:45	4.78
B206D DC	0.035	91.9	01Jan2014, 05:45	4.47
B206D UC	0.006	5.6	01Jan2014, 05:50	0.3
B206E	0.038	80.3	01Jan2014, 05:45	4.02
B206E DC	0.028	72.4	01Jan2014, 05:45	3.52
B206E UC	0.010	9	01Jan2014, 05:50	0.49
B207	0.389	71.8	01Jan2014, 06:15	6.93
B207 UC	0.389	71.8	01Jan2014, 06:15	6.93
B208	0.175	66.8	01Jan2014, 05:55	5.11
B208 DC	0.015	36.7	01Jan2014, 05:50	1.99
B208 UC	0.160	42.6	01Jan2014, 06:05	3.13
B209	0.051	63.9	01Jan2014, 05:50	3.52
B209 DC	0.013	35	01Jan2014, 05:45	1.7
B209 UC	0.038	33.1	01Jan2014, 05:50	1.81
B210	0.034	66.4	01Jan2014, 05:45	3.55
B210 DC	0.024	59.6	01Jan2014, 05:45	3.05
B210 UC	0.011	8.8	01Jan2014, 05:50	0.5
Diversion-1	0.250	151.3	01Jan2014, 06:20	21.35
Junction-4	0.452	104.4	01Jan2014, 06:15	12.42
Pond 10	0.084	19.9	01Jan2014, 06:25	8.99
Pond 2	0.364	446.3	01Jan2014, 06:10	41.71
Pond 202B	0.250	197.8	01Jan2014, 06:20	27.91
Pond 209	0.051	19.2	01Jan2014, 06:15	3.4
Reach 202A	0.192	317	01Jan2014, 05:55	21.92
Reach 206A	0.136	256	01Jan2014, 05:55	16.26
Reach-1	0.073	130	01Jan2014, 05:55	8.52
Reach-2	0.250	400.7	01Jan2014, 05:55	28.46
Reach-2B	0.159	174.9	01Jan2014, 05:50	17.82
Reach-204A	0.084	19.9	01Jan2014, 06:25	8.98
Reach-206C	0.072	127.9	01Jan2014, 05:55	8.2
Reach-3A	0.292	524.7	01Jan2014, 05:55	33.97
Reach-4	0.051	19.1	01Jan2014, 06:40	3.39
Reach-5	0.127	106.8	01Jan2014, 05:50	14.08
Reach-6	0.288	119.3	01Jan2014, 07:15	24.41
Reach-7	0.732	602	01Jan2014, 06:15	68.47
Reach-8	0.557	561.6	01Jan2014, 06:10	63.39
Reach-9	0.250	455.9	01Jan2014, 05:55	29.2
Sundance	0.063	101.7	01Jan2014, 05:50	5.54
Sundance DC	0.032	78.8	01Jan2014, 05:45	4.04
Sundance Pond	0.063	32.6	01Jan2014, 06:10	5.5
Sundance UC	0.032	26.5	01Jan2014, 05:50	1.5
Unser Pond	0.288	119.3	01Jan2014, 06:45	24.52

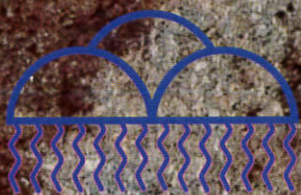
Alternative 3 - 10 yr, 24 hr				
Hydrologic Element	Area (sq mi)	Peak Flow (cfs)	Time to Peak (hr)	Volume (ac-ft)
AP-1	0.557	227.3	01Jan2014, 06:10	39.79
AP-10	0.123	129.8	01Jan2014, 05:50	9.21
AP-10.1	0.073	76.2	01Jan2014, 05:55	5.39
AP-11	0.288	49.4	01Jan2014, 07:00	15.23
AP-12	0.250	270.7	01Jan2014, 05:50	18.47
AP-13	0.292	307.8	01Jan2014, 05:50	21.48
AP-14	0.364	374.5	01Jan2014, 05:55	26.63
AP-15	0.084	112.1	01Jan2014, 05:45	6.12
AP-16	0.159	100.3	01Jan2014, 05:45	11.1
AP-17	0.051	4.6	01Jan2014, 06:25	1.77
AP-18	0.127	61.9	01Jan2014, 05:45	8.75
AP-1.1	0.193	139.5	01Jan2014, 05:45	13.56
AP-2	0.732	237.8	01Jan2014, 06:15	41.76
AP-3	0.792	59.4	01Jan2014, 07:25	21.55
AP-4	1.558	274.5	01Jan2014, 06:20	65.46
AP-5	0.059	67.3	01Jan2014, 05:50	4.01
AP-6	0.000	24.9	01Jan2014, 06:20	4.14
AP-7	0.069	73.7	01Jan2014, 05:50	4.98
AP-8	0.250	106	01Jan2014, 06:20	17.63
AP-9	0.250	236.8	01Jan2014, 05:55	18.11
AP-9.1	0.192	203.6	01Jan2014, 05:50	14.19
B202A	0.069	73.7	01Jan2014, 05:50	4.98
B202A DC	0.057	72	01Jan2014, 05:50	4.74
B202A UC	0.012	2.7	01Jan2014, 06:00	0.24
B202B	0.058	74.7	01Jan2014, 05:45	4.1
B202B DC	0.047	72.5	01Jan2014, 05:45	3.88
B202B UC	0.011	3	01Jan2014, 05:50	0.22
B202C	0.051	66.6	01Jan2014, 05:45	3.82
B202C DC	0.045	65.7	01Jan2014, 05:45	3.7
B202C UC	0.006	1.4	01Jan2014, 05:50	0.11
B203A	0.073	76.2	01Jan2014, 05:55	5.39
B203A DC	0.063	74.5	01Jan2014, 05:55	5.2
B203A UC	0.010	2.1	01Jan2014, 06:05	0.19
B203B	0.059	67.3	01Jan2014, 05:50	4.01
B203B DC	0.046	64.4	01Jan2014, 05:50	3.76
B203B UC	0.013	3	01Jan2014, 05:55	0.25
B204A	0.084	112.1	01Jan2014, 05:45	6.12
B204A DC	0.071	109.7	01Jan2014, 05:45	5.86
B204A UC	0.013	3.4	01Jan2014, 05:50	0.26
B204B	0.043	59.4	01Jan2014, 05:45	3.23
B204B DC	0.038	58.3	01Jan2014, 05:45	3.12
B204B UC	0.006	1.5	01Jan2014, 05:50	0.11
B205A	0.032	43.2	01Jan2014, 05:45	2.35
B205A DC	0.027	42.2	01Jan2014, 05:45	2.26
B205A UC	0.005	1.3	01Jan2014, 05:50	0.1
B205B	0.034	44.8	01Jan2014, 05:45	2.45
B205B DC	0.028	43.6	01Jan2014, 05:45	2.33
B205B UC	0.006	1.6	01Jan2014, 05:50	0.12

B206A	0.136	149.2	01Jan2014, 05:55	10.34
B206A DC	0.122	146.5	01Jan2014, 05:55	10.06
B206A UC	0.014	3.2	01Jan2014, 06:05	0.28
B206B	0.114	136.9	01Jan2014, 05:50	8.13
B206B DC	0.093	132	01Jan2014, 05:50	7.7
B206B UC	0.021	5.2	01Jan2014, 05:55	0.42
B206C	0.072	73.7	01Jan2014, 05:55	5.15
B206C DC	0.059	71.3	01Jan2014, 05:55	4.89
B206C UC	0.013	2.9	01Jan2014, 06:05	0.26
B206D	0.041	55.2	01Jan2014, 05:45	3.01
B206D DC	0.035	54	01Jan2014, 05:45	2.89
B206D UC	0.006	1.7	01Jan2014, 05:50	0.13
B206E	0.038	44.5	01Jan2014, 05:45	2.48
B206E DC	0.028	42.5	01Jan2014, 05:45	2.27
B206E UC	0.010	2.8	01Jan2014, 05:50	0.21
B207	0.389	7.2	01Jan2014, 06:25	1.46
B207 UC	0.389	7.2	01Jan2014, 06:25	1.46
B208	0.175	21.8	01Jan2014, 05:50	2
B208 DC	0.015	21.6	01Jan2014, 05:50	1.28
B208 UC	0.160	5.1	01Jan2014, 06:10	0.72
B209	0.051	28.4	01Jan2014, 05:50	1.86
B209 DC	0.013	20.6	01Jan2014, 05:45	1.1
B209 UC	0.038	10.2	01Jan2014, 05:50	0.76
B210	0.034	36.6	01Jan2014, 05:45	2.18
B210 DC	0.024	34.9	01Jan2014, 05:45	1.97
B210 UC	0.011	2.6	01Jan2014, 05:50	0.21
Diversion-1	0.250	81.1	01Jan2014, 06:20	13.49
Junction-4	0.452	25.5	01Jan2014, 06:20	4.66
Pond 10	0.084	15.1	01Jan2014, 06:20	5.52
Pond 2	0.364	177.7	01Jan2014, 06:20	26.23
Pond 202B	0.250	106	01Jan2014, 06:20	17.63
Pond 209	0.051	4.6	01Jan2014, 06:25	1.77
Reach 202A	0.192	188.4	01Jan2014, 05:55	14.01
Reach 206A	0.136	148	01Jan2014, 05:55	10.34
Reach-1	0.073	74.5	01Jan2014, 05:55	5.39
Reach-2	0.250	234.5	01Jan2014, 05:55	18.1
Reach-2B	0.159	98.5	01Jan2014, 05:50	11.1
Reach-204A	0.084	15.1	01Jan2014, 06:25	5.52
Reach-206C	0.072	72.7	01Jan2014, 05:55	5.15
Reach-3A	0.292	301.8	01Jan2014, 05:55	21.48
Reach-4	0.051	4.6	01Jan2014, 06:50	1.76
Reach-5	0.127	59.3	01Jan2014, 05:50	8.75
Reach-6	0.288	49.2	01Jan2014, 07:30	15.13
Reach-7	0.732	237.1	01Jan2014, 06:20	41.73
Reach-8	0.557	226.6	01Jan2014, 06:15	39.76
Reach-9	0.250	261.9	01Jan2014, 05:55	18.47
Sundance	0.063	52.3	01Jan2014, 05:50	3.23
Sundance DC	0.032	46.2	01Jan2014, 05:45	2.6
Sundance Pond	0.063	19.7	01Jan2014, 06:10	3.2
Sundance UC	0.032	7.9	01Jan2014, 05:50	0.63
Unser Pond	0.288	49.4	01Jan2014, 07:00	15.23

Alternative 3 - 2 yr, 24 hr				
Hydrologic Element	Area (sq mi)	Peak Flow (cfs)	Time to Peak (hr)	Volume (ac-ft)
AP-1	0.557	101.5	01Jan2014, 06:15	25.07
AP-10	0.123	70.6	01Jan2014, 05:50	5.87
AP-10.1	0.073	41.6	01Jan2014, 05:55	3.43
AP-11	0.288	19.3	01Jan2014, 07:25	9.43
AP-12	0.250	147	01Jan2014, 05:50	11.74
AP-13	0.292	166.3	01Jan2014, 05:50	13.65
AP-14	0.364	203.6	01Jan2014, 05:55	16.9
AP-15	0.084	61	01Jan2014, 05:45	3.88
AP-16	0.159	54.4	01Jan2014, 05:45	6.94
AP-17	0.051	1.5	01Jan2014, 06:30	0.92
AP-18	0.127	33.9	01Jan2014, 05:45	5.45
AP-1.1	0.193	75.5	01Jan2014, 05:50	8.49
AP-2	0.732	104.1	01Jan2014, 06:20	25.91
AP-3	0.792	23.3	01Jan2014, 07:55	12.17
AP-4	1.558	119.2	01Jan2014, 06:00	39.4
AP-5	0.059	36.2	01Jan2014, 05:50	2.52
AP-6	0.000	11.5	01Jan2014, 06:25	2.62
AP-7	0.069	40	01Jan2014, 05:50	3.15
AP-8	0.250	49.1	01Jan2014, 06:25	11.14
AP-9	0.250	129.2	01Jan2014, 05:55	11.53
AP-9.1	0.192	110.6	01Jan2014, 05:50	9.02
B202A	0.069	40	01Jan2014, 05:50	3.15
B202A DC	0.057	39.9	01Jan2014, 05:50	3.07
B202A UC	0.012	0.5	01Jan2014, 06:10	0.08
B202B	0.058	40.4	01Jan2014, 05:45	2.59
B202B DC	0.047	40.2	01Jan2014, 05:45	2.51
B202B UC	0.011	0.6	01Jan2014, 06:00	0.08
B202C	0.051	36.4	01Jan2014, 05:45	2.44
B202C DC	0.045	36.4	01Jan2014, 05:45	2.4
B202C UC	0.006	0.3	01Jan2014, 06:05	0.04
B203A	0.073	41.6	01Jan2014, 05:55	3.43
B203A DC	0.063	41.4	01Jan2014, 05:55	3.36
B203A UC	0.010	0.4	01Jan2014, 06:10	0.07
B203B	0.059	36.2	01Jan2014, 05:50	2.52
B203B DC	0.046	35.9	01Jan2014, 05:50	2.43
B203B UC	0.013	0.6	01Jan2014, 06:05	0.09
B204A	0.084	61	01Jan2014, 05:45	3.88
B204A DC	0.071	60.8	01Jan2014, 05:45	3.79
B204A UC	0.013	0.7	01Jan2014, 06:00	0.09
B204B	0.043	32.4	01Jan2014, 05:45	2.06
B204B DC	0.038	32.3	01Jan2014, 05:45	2.02
B204B UC	0.006	0.3	01Jan2014, 06:00	0.04
B205A	0.032	23.5	01Jan2014, 05:45	1.49
B205A DC	0.027	23.4	01Jan2014, 05:45	1.46
B205A UC	0.005	0.3	01Jan2014, 06:00	0.03
B205B	0.034	24.3	01Jan2014, 05:45	1.55
B205B DC	0.028	24.2	01Jan2014, 05:45	1.51
B205B UC	0.006	0.3	01Jan2014, 06:00	0.04

B206A	0.136	81.9	01Jan2014, 05:55	6.6
B206A DC	0.122	81.6	01Jan2014, 05:55	6.51
B206A UC	0.014	0.6	01Jan2014, 06:10	0.1
B206B	0.114	74	01Jan2014, 05:50	5.13
B206B DC	0.093	73.5	01Jan2014, 05:50	4.99
B206B UC	0.021	1.1	01Jan2014, 06:05	0.15
B206C	0.072	40	01Jan2014, 05:55	3.25
B206C DC	0.059	39.7	01Jan2014, 05:55	3.16
B206C UC	0.013	0.6	01Jan2014, 06:10	0.09
B206D	0.041	30	01Jan2014, 05:45	1.91
B206D DC	0.035	29.9	01Jan2014, 05:45	1.87
B206D UC	0.006	0.3	01Jan2014, 06:00	0.04
B206E	0.038	23.7	01Jan2014, 05:45	1.54
B206E DC	0.028	23.6	01Jan2014, 05:45	1.47
B206E UC	0.010	0.6	01Jan2014, 06:00	0.07
B207	0.389	0.1	01Jan2014, 21:10	0.03
B207 UC	0.389	0.1	01Jan2014, 21:10	0.03
B208	0.175	12	01Jan2014, 05:50	0.86
B208 DC	0.015	12	01Jan2014, 05:50	0.83
B208 UC	0.160	0	01Jan2014, 18:50	0.03
B209	0.051	11.9	01Jan2014, 05:45	0.97
B209 DC	0.013	11.4	01Jan2014, 05:45	0.71
B209 UC	0.038	2.1	01Jan2014, 06:00	0.26
B210	0.034	19.4	01Jan2014, 05:45	1.35
B210 DC	0.024	19.3	01Jan2014, 05:45	1.27
B210 UC	0.011	0.6	01Jan2014, 06:05	0.07
Diversion-1	0.250	37.5	01Jan2014, 06:25	8.52
Junction-4	0.452	9.8	01Jan2014, 06:10	1.91
Pond 10	0.084	5.3	01Jan2014, 06:30	3.4
Pond 2	0.364	80.2	01Jan2014, 06:20	16.57
Pond 202B	0.250	49.1	01Jan2014, 06:25	11.14
Pond 209	0.051	1.5	01Jan2014, 06:30	0.92
Reach 202A	0.192	103.4	01Jan2014, 06:00	8.94
Reach 206A	0.136	81.2	01Jan2014, 05:55	6.6
Reach-1	0.073	40.6	01Jan2014, 05:55	3.43
Reach-2	0.250	127.6	01Jan2014, 05:55	11.53
Reach-2B	0.159	53.6	01Jan2014, 05:50	6.94
Reach-204A	0.084	5.2	01Jan2014, 06:30	3.4
Reach-206C	0.072	39.4	01Jan2014, 05:55	3.25
Reach-3A	0.292	164.1	01Jan2014, 05:55	13.64
Reach-4	0.051	1.5	01Jan2014, 07:00	0.91
Reach-5	0.127	32.3	01Jan2014, 05:50	5.45
Reach-6	0.288	19.3	01Jan2014, 08:00	9.34
Reach-7	0.732	103.9	01Jan2014, 06:25	25.88
Reach-8	0.557	101.2	01Jan2014, 06:20	25.04
Reach-9	0.250	142.8	01Jan2014, 05:55	11.74
Sundance	0.063	25.9	01Jan2014, 05:45	1.9
Sundance DC	0.032	25.6	01Jan2014, 05:45	1.69
Sundance Pond	0.063	9.8	01Jan2014, 06:10	1.88
Sundance UC	0.032	1.7	01Jan2014, 06:05	0.22
Unser Pond	0.288	19.3	01Jan2014, 07:25	9.43

Alternative 3				
Pond Summary (100 yr - 24 hr)				
Pond	Inflow	Outflow	Volume Prv'd	Peak Volume
	(cfs)	(cfs)	(ac-ft)	(ac-ft)
Pond 202B	400.7	197.8	13.40	13.28
Pond 209	63.9	19.2	3.00	1.95
Pond 10	196.3	19.9	7.00	6.9
Sundance Pond	101.7	32.6	2.80	2.76
Unser Pond	166.1	119.3	7.70	7.68
Pond 2	652.6	446.3	16.00	15.9



AMAFCA





Appendix C

- Hydraflow Results
 - o Alternative 1
 - Plan
 - Summary
 - Profiles
 - o Alternative 2
 - Plan
 - Summary
 - Profiles
 - o Alternative 3
 - Plan
 - Summary
 - Profiles

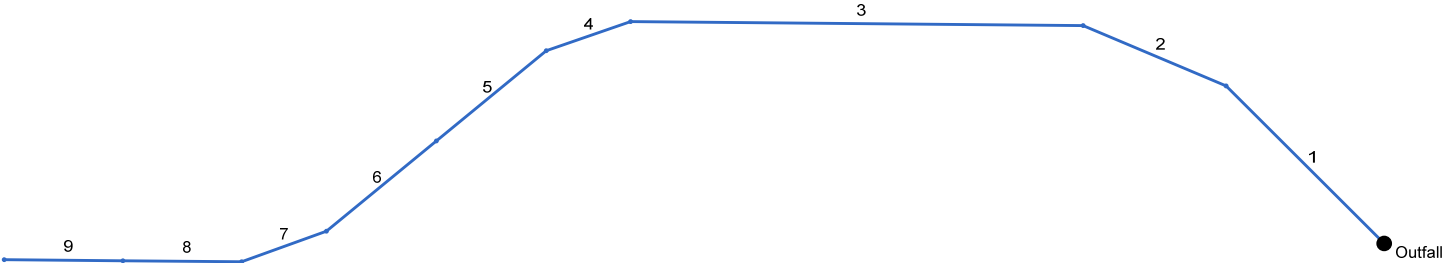


AMAFCA

Upper Piedras Marcadas Watershed
Drainage and Water Quality Management Plan
Developed Conditions Report

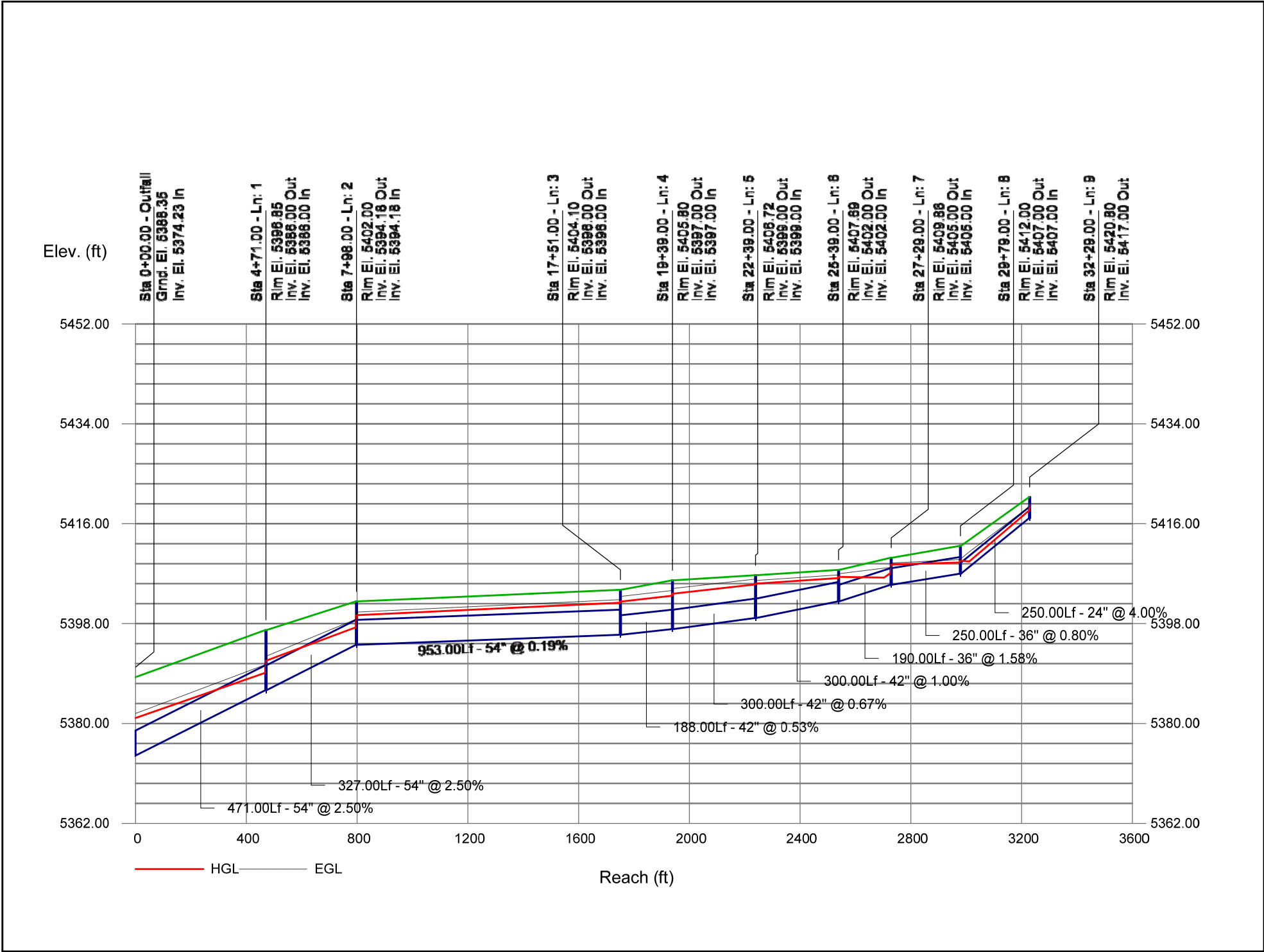
Alternative 1

UPM System 1

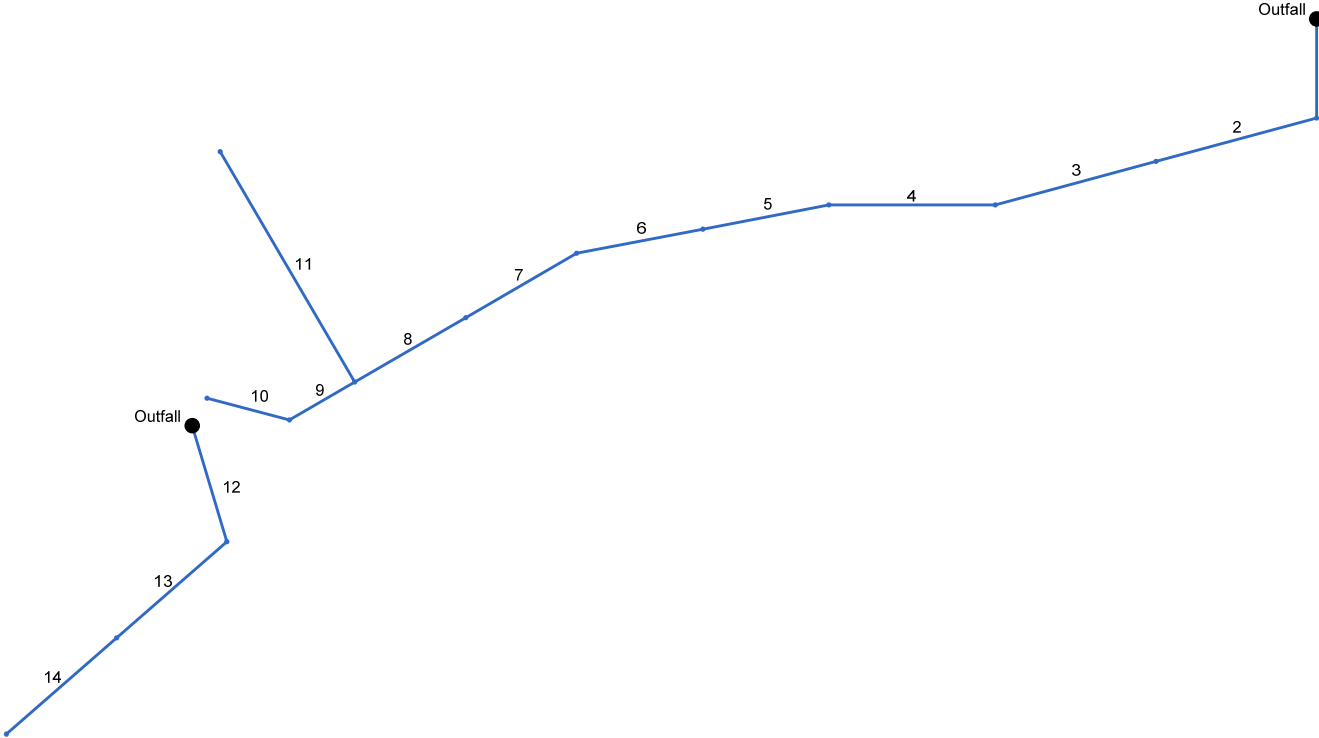


Line No.	Line ID	Line Size (in)	Line Length (ft)	Line Slope (%)	Flow Rate (cfs)	Invert Dn (ft)	Invert Up (ft)	Gnd/Rim El Dn (ft)	Gnd/Rim El Up (ft)	HGL Dn (ft)	HGL Up (ft)	Cover Dn (ft)	Cover Up (ft)	J-Loss Coeff	Vel Ave (ft/s)	Capac Full (cfs)	
1		54	471.00	2.50	115.00	5374.23	5386.00	5388.35	5396.85	5381.00	5389.15	9.62	6.35	0.43	8.45	310.88	
2		54	327.00	2.50	115.00	5386.00	5394.18	5396.85	5402.00	5391.35	5397.33	6.35	3.32	0.44	8.45	311.05	
3		54	953.00	0.19	95.00	5394.18	5396.00	5402.00	5404.10	5399.53	5401.76	3.32	3.60	0.39	5.97	85.94	
4		42	188.00	0.53	75.00	5396.00	5397.00	5404.10	5405.80	5401.97	5403.02	4.60	5.30	0.40	7.80	73.38	
5		42	300.00	0.67	75.00	5397.00	5399.00	5405.80	5406.72	5403.40	5405.06	5.30	4.22	0.15	7.80	82.15	
6		42	300.00	1.00	58.00	5399.00	5402.00	5406.72	5407.69	5405.20	5406.20	4.22	2.19	0.39	6.03	100.61	
7		36	190.00	1.58	43.00	5402.00	5405.00	5407.69	5409.86	5406.42	5407.13 j	2.69	1.86	0.40	7.04	83.80	
8		36	250.00	0.80	29.00	5405.00	5407.00	5409.86	5412.00	5408.65	5409.02	1.86	2.00	0.15	4.92	59.65	
9		24	250.00	4.00	15.00	5407.00	5417.00	5412.00	5420.80	5409.34	5418.40 j	3.00	1.80	1.00	5.59	45.24	
UPM System 1											Number of lines: 9			Date: 3/13/2015			
NOTES: i Inlet control; ** Critical depth																	

Storm Sewer Profile



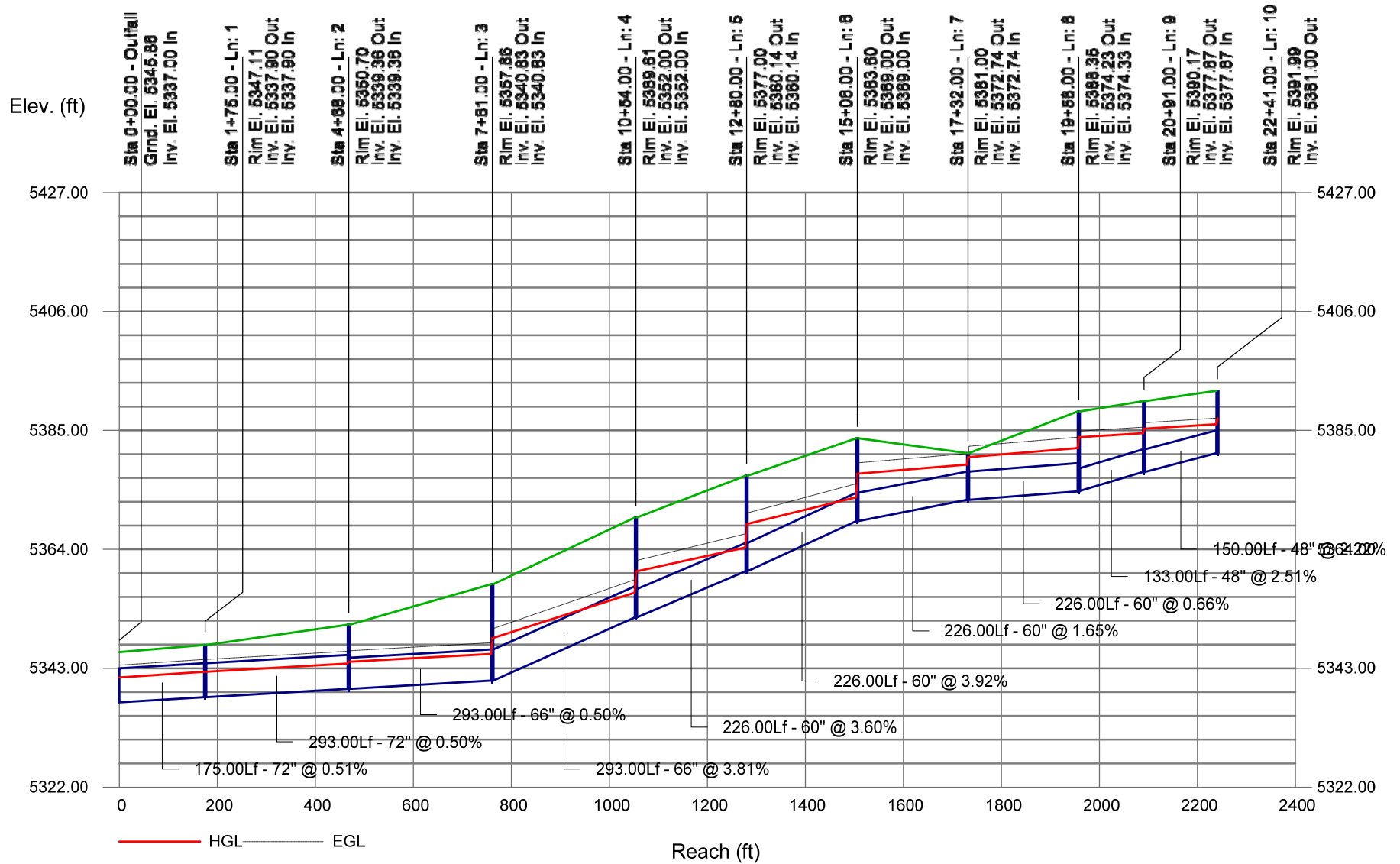
UPM System 2



Line No.	Line ID	Line Size	Line Length	Line Slope	Flow Rate	Invert Dn	Invert Up	Gnd/Rim El Dn	Gnd/Rim El Up	HGL Dn	HGL Up	Cover Dn	Cover Up	J-Loss Coeff	Vel Ave	Capac Full		
		(in)	(ft)	(%)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)		(ft/s)	(cfs)		
1	202B	72	175.00	0.51	268.00	5337.00	5337.90	5345.86	5347.11	5341.38	5342.38	2.86	3.21	0.97	11.98	303.75		
2		72	293.00	0.50	268.00	5337.90	5339.36	5347.11	5350.70	5342.38	5343.84	3.21	5.34	0.15	11.84	299.00		
3		66	293.00	0.50	245.00	5339.36	5340.83	5350.70	5357.86	5344.17	5345.53	5.84	11.53	0.31	11.23	237.91		
4		66	293.00	3.81	245.00	5340.83	5352.00	5357.86	5369.61	5348.37	5356.37	11.53	12.11	0.23	11.21	655.75		
5		60	226.00	3.60	219.00	5352.00	5360.14	5369.61	5377.00	5360.12	5364.34	12.61	11.86	0.15	11.80	494.33		
6		60	226.00	3.92	219.00	5360.14	5369.00	5377.00	5383.60	5368.50	5373.20	11.86	9.60	0.38	11.80	515.72		
7		60	226.00	1.65	219.00	5369.00	5372.74	5383.60	5381.00	5377.36	5378.96	9.60	3.26	0.15	11.15	335.08		
8		60	226.00	0.66	219.00	5372.74	5374.23	5381.00	5388.35	5380.27	5381.87	3.26	9.12	1.00	11.15	211.47		
9		48	133.00	2.51	104.00	5374.33	5377.67	5388.35	5390.17	5383.81	5384.50	10.02	8.50	0.75	8.28	227.63		
10		48	150.00	2.22	104.00	5377.67	5381.00	5390.17	5391.99	5385.30	5386.09	8.50	6.99	1.00	8.28	214.03		
11	System 1	54	471.00	2.50	115.00	5374.23	5386.00	5388.35	5396.85	5383.81	5389.15	9.62	6.35	1.00	8.45	310.88		
12	Pond 202C	66	213.86	0.94	206.00	5381.00	5383.00	5388.35	5390.00	5384.18	5387.02	1.85	1.50	0.92	12.78	324.79		
13		60	257.88	0.78	164.00	5383.00	5385.00	5390.00	5392.93	5387.02	5388.67	2.00	2.93	0.15	10.16	229.38		
14		54	257.88	0.78	122.00	5385.00	5387.00	5392.93	5395.86	5388.67	5390.25	3.43	4.36	1.00	9.36	173.19		
UPM System 2											Number of lines: 14				Date: 3/13/2015			
NOTES: i Inlet control; ** Critical depth																		

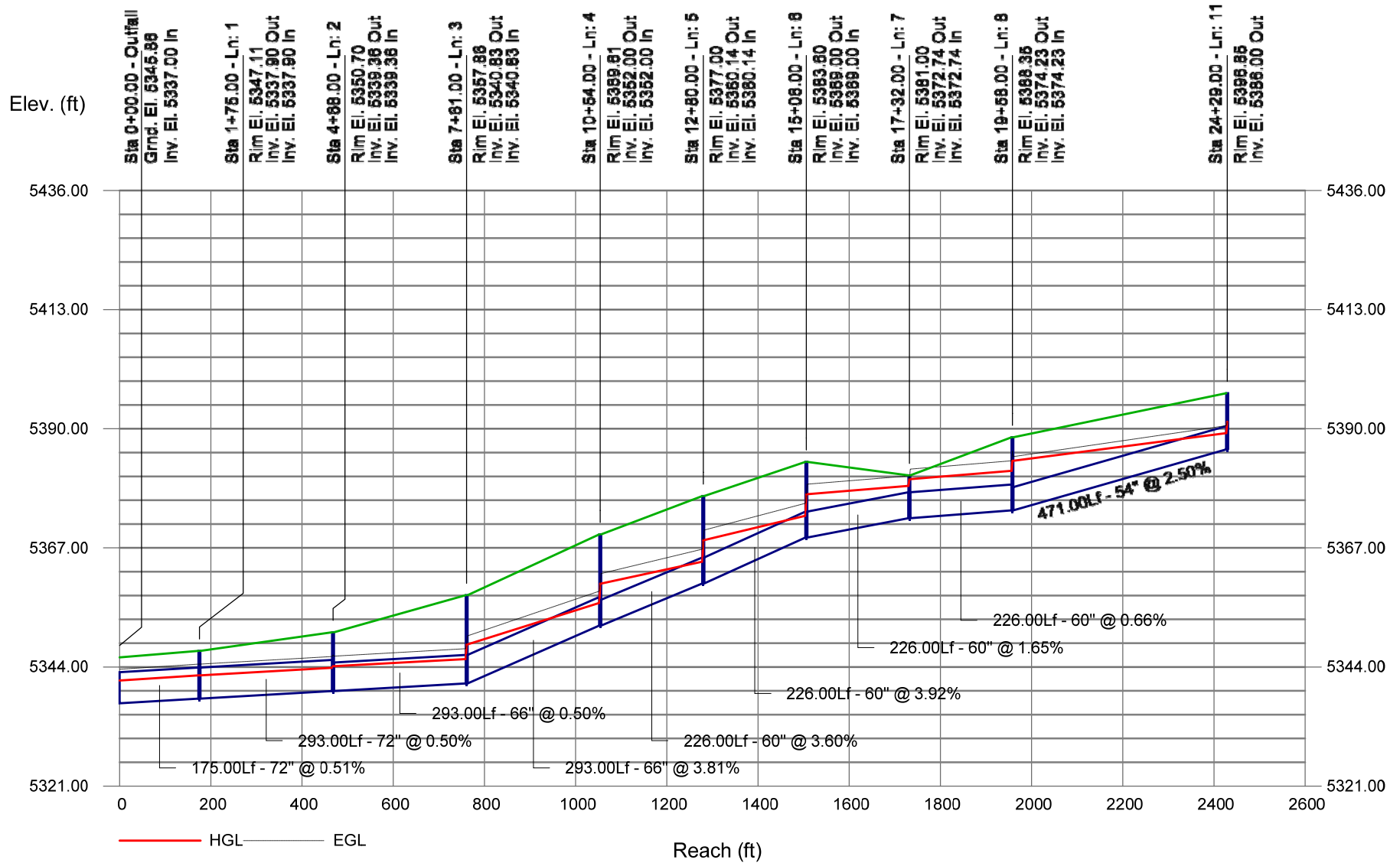
Storm Sewer Profile

Proj. file: UPM System 2.stm



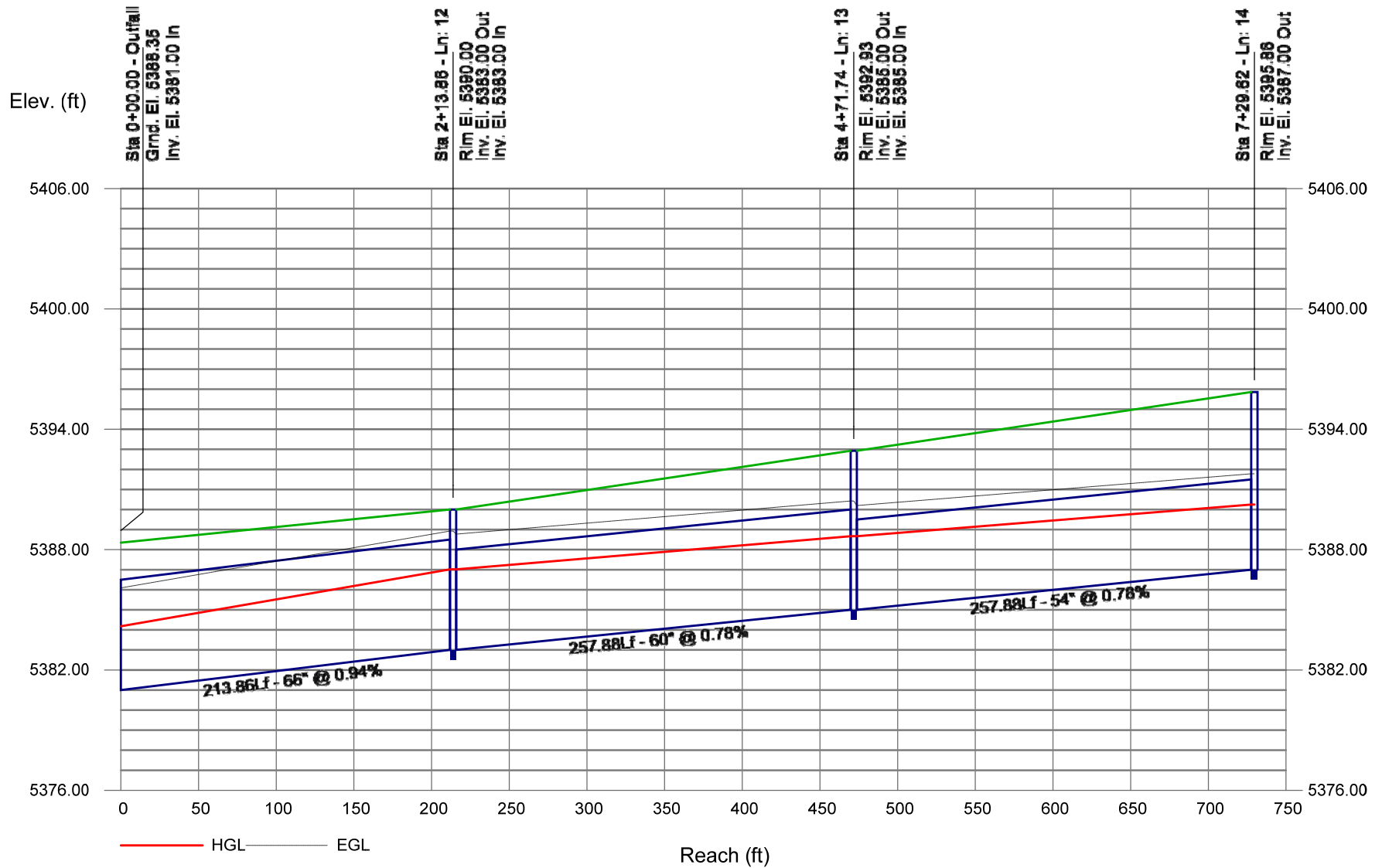
Storm Sewer Profile

Proj. file: UPM System 2.stm

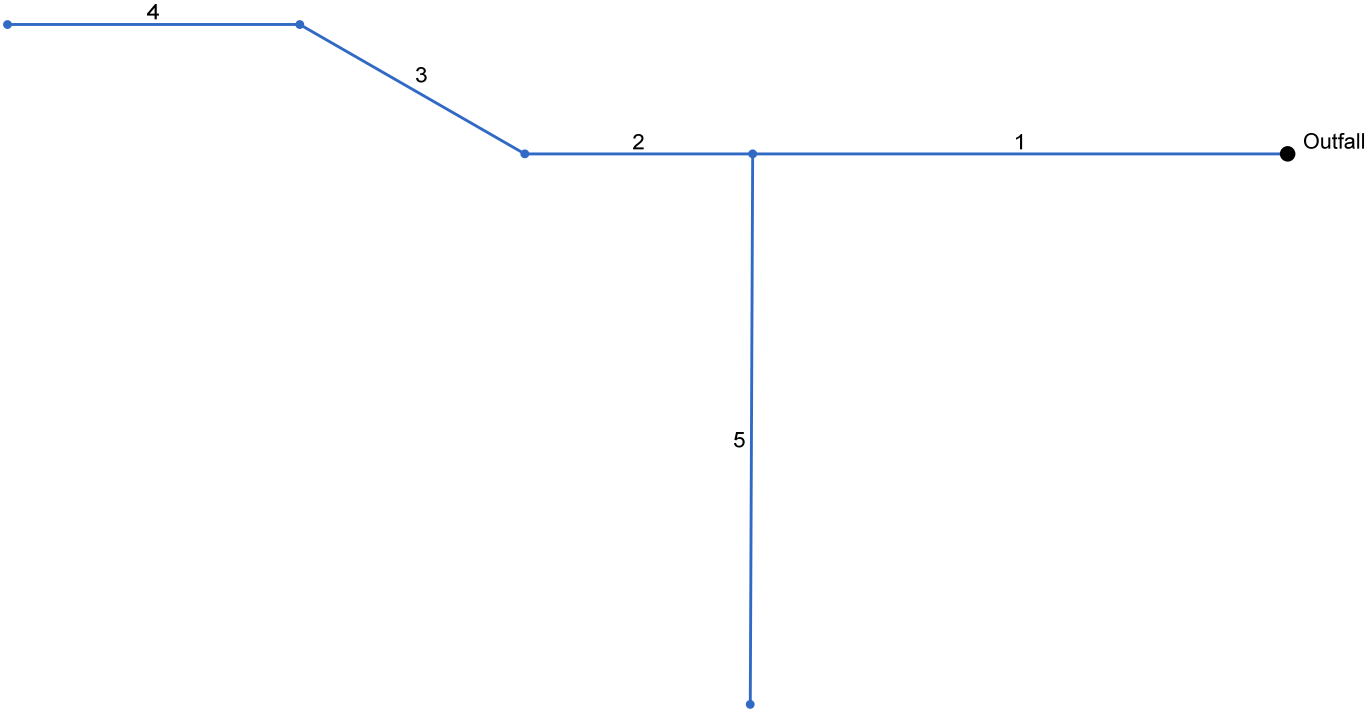


Storm Sewer Profile

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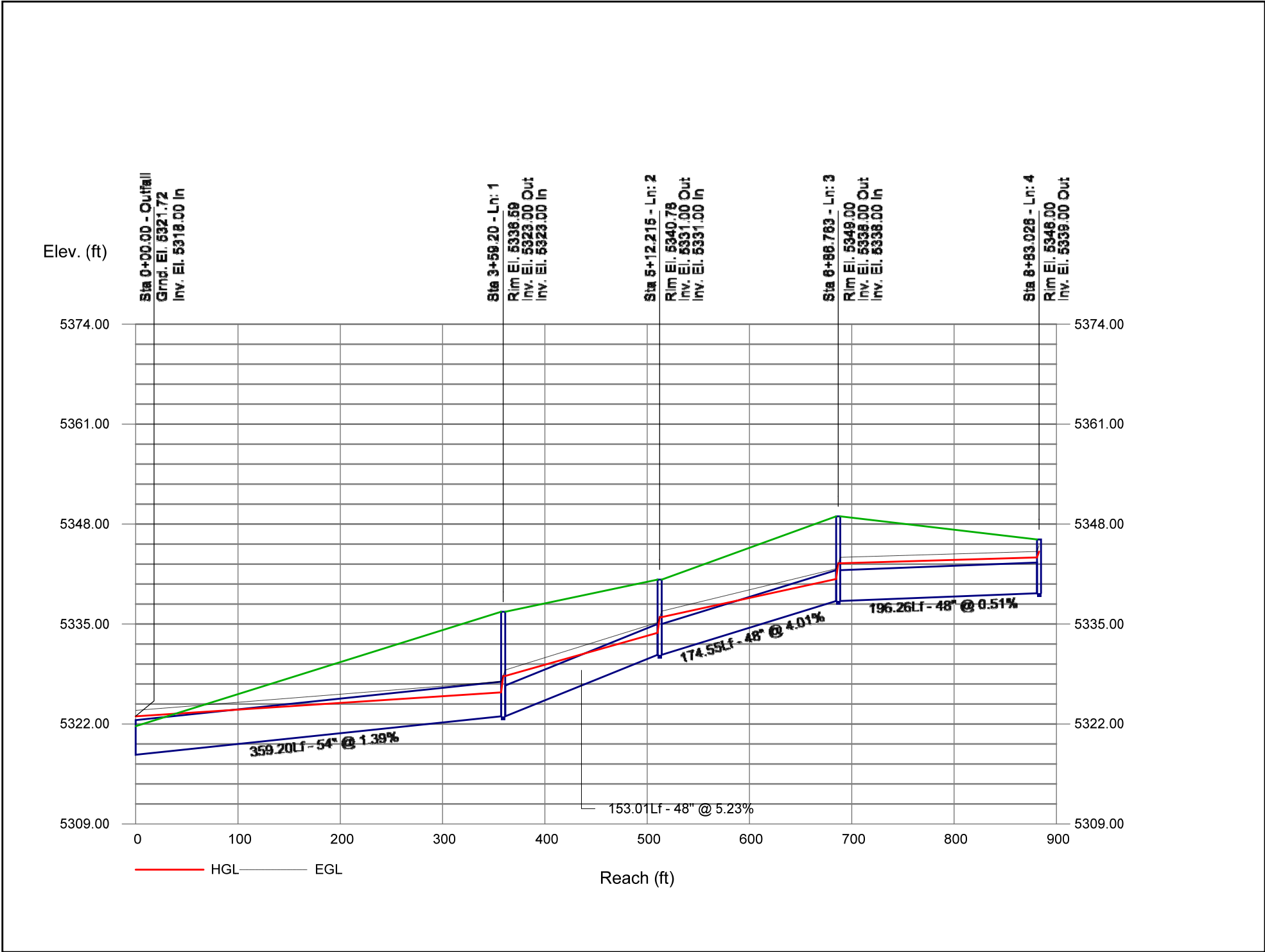


UPM System 3

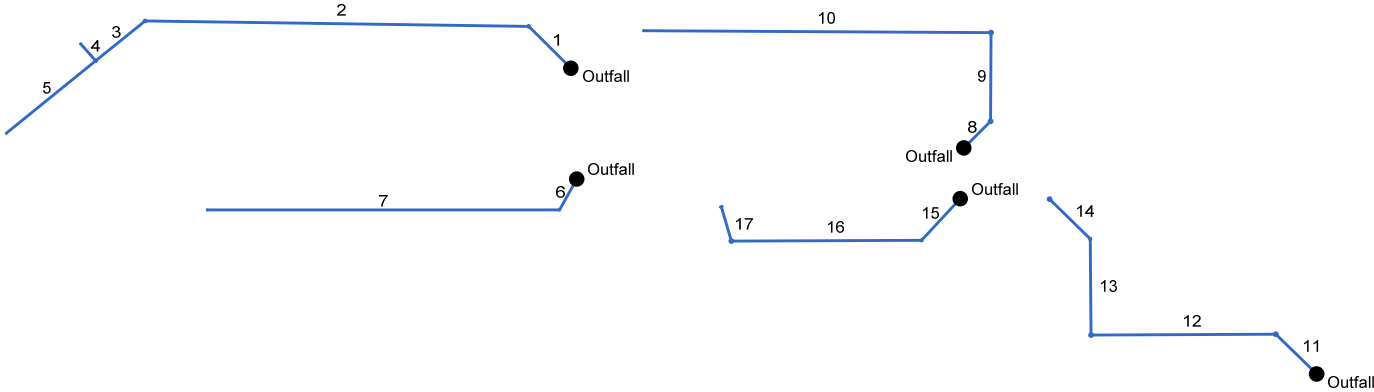


Line No.	Line ID	Line Size (in)	Line Length (ft)	Line Slope (%)	Flow Rate (cfs)	Invert Dn (ft)	Invert Up (ft)	Gnd/Rim El Dn (ft)	Gnd/Rim El Up (ft)	HGL Dn (ft)	HGL Up (ft)	Cover Dn (ft)	Cover Up (ft)	J-Loss Coeff	Vel Ave (ft/s)	Capac Full (cfs)	
1		54	359.20	1.39	112.00	5318.00	5323.00	5321.72	5336.59	5323.00	5326.11	-0.78	9.09	1.00	8.30	232.03	
2		48	153.01	5.23	89.00	5323.00	5331.00	5336.59	5340.78	5328.24	5333.86	9.59	5.78	0.56	8.17	328.45	
3		48	174.55	4.01	89.00	5331.00	5338.00	5340.78	5349.00	5335.90	5340.86	5.78	7.00	0.56	8.17	287.67	
4		48	196.26	0.51	89.00	5338.00	5339.00	5349.00	5346.00	5342.90	5343.66	7.00	3.00	1.00	7.08	102.54	
5		48	371.08	0.27	75.00	5323.00	5324.00	5336.59	5330.00	5328.24	5329.26	9.59	2.00	1.00	5.97	74.57	
UPM System 3										Number of lines: 5			Date: 3/23/2017				
NOTES: i Inlet control; ** Critical depth																	

Storm Sewer Profile



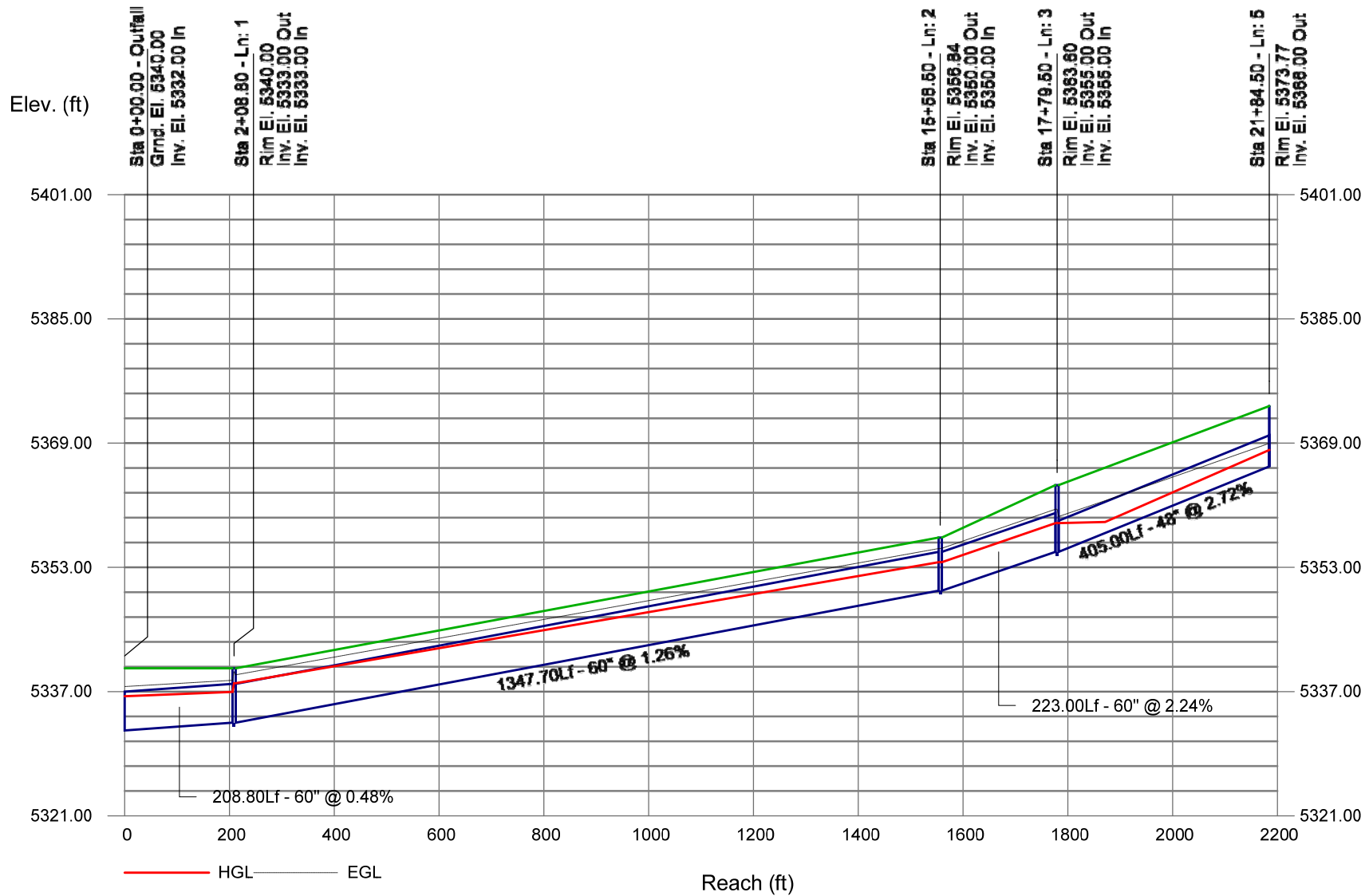
Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



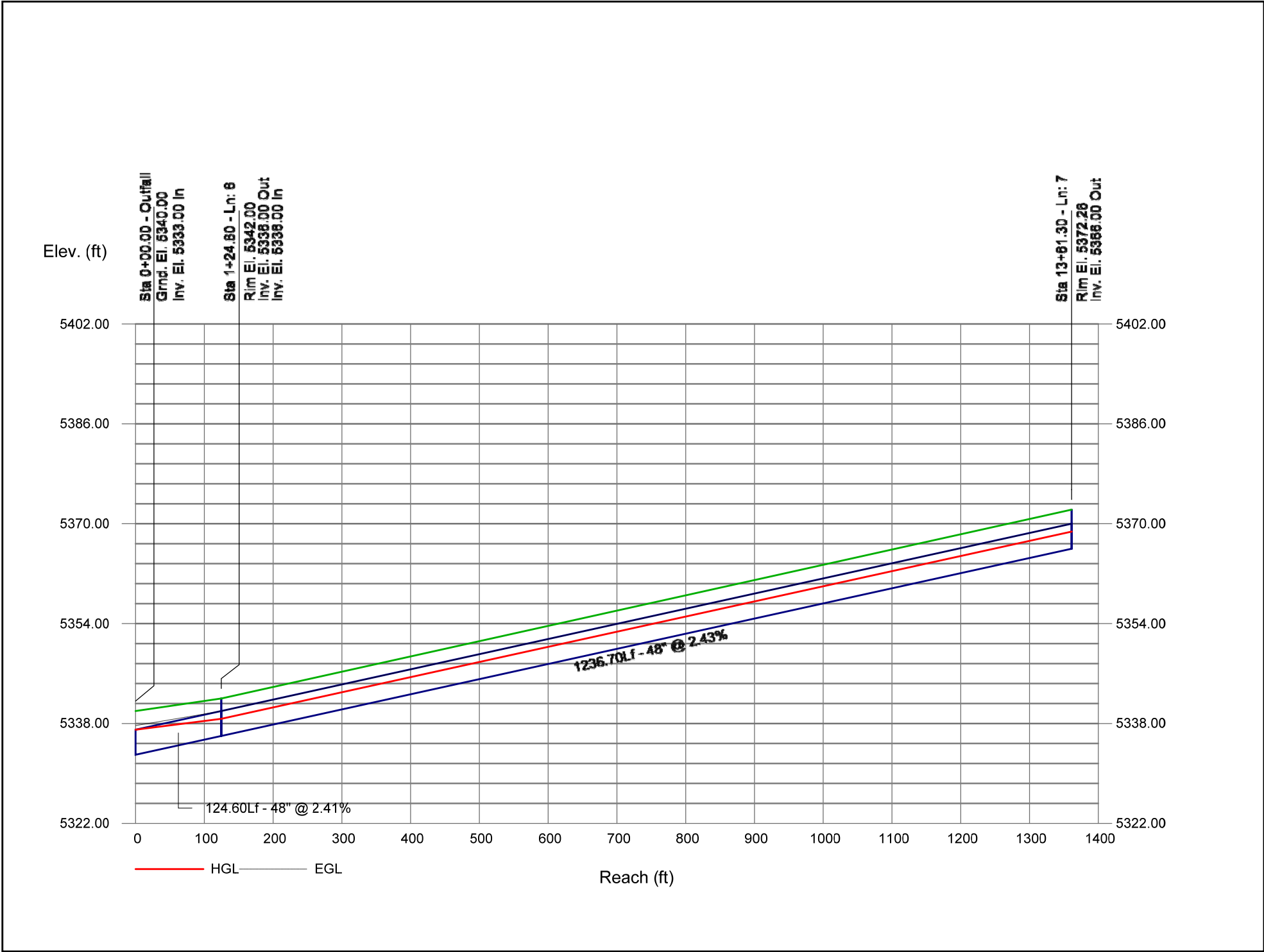
Line No.	Line ID	Line Size	Line Length	Line Slope	Flow Rate	Invert Dn	Invert Up	Gnd/Rim El Dn	Gnd/Rim El Up	HGL Dn	HGL Up	Cover Dn	Cover Up	J-Loss Coeff	Vel Ave	Capac Full	
		(in)	(ft)	(%)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)		(ft/s)	(cfs)	
1		60	208.80	0.48	164.00	5332.00	5333.00	5340.00	5340.00	5336.40	5336.96	3.00	2.00	0.74	9.40	180.26	
2		60	1347.70	1.26	164.00	5333.00	5350.00	5340.00	5356.84	5338.07	5353.67	2.00	1.84	0.69	9.49	292.54	
3		60	223.00	2.24	167.00	5350.00	5355.00	5356.84	5363.60	5353.67	5358.70	1.84	3.60	1.00	10.77	390.02	
4		48	80.00	2.50	80.00	5355.00	5357.00	5363.60	5367.07	5358.70	5359.71	4.60	6.07	1.00	7.71	227.13	
5		48	405.00	2.72	50.00	5355.00	5366.00	5363.60	5373.77	5358.70	5368.12 j	4.60	3.77	1.00	5.76	236.74	
6		48	124.60	2.41	82.00	5333.00	5336.00	5340.00	5342.00	5337.00	5338.74	3.00	2.00	0.90	7.73	222.89	
7		48	1236.70	2.43	82.00	5336.00	5366.00	5342.00	5372.26	5338.74	5368.74	2.00	2.26	1.00	8.93	223.73	
8		78	133.10	0.38	110.00	5300.50	5301.00	5316.00	5316.00	5308.00	5308.06	9.00	8.50	0.75	3.32	321.39	
9		78	312.70	0.32	110.00	5301.00	5302.00	5316.00	5311.00	5308.19	5308.31	8.50	2.50	1.00	3.33	296.54	
10		60	1219.60	1.97	50.00	5302.00	5326.00	5311.00	5336.00	5308.48	5327.98 j	4.00	5.00	1.00	4.73	365.39	
11		72	200.00	0.50	326.00	5295.00	5296.00	5303.00	5305.00	5300.21	5301.41	2.00	3.00	0.75	12.33	299.51	
12		72	649.40	1.54	326.00	5296.00	5306.00	5305.00	5316.00	5303.13	5310.91	3.00	4.00	1.00	12.34	525.63	
13		66	339.00	0.59	297.00	5306.00	5308.00	5316.00	5318.00	5311.50	5314.15	4.50	4.50	0.75	12.50	257.97	
14		66	200.00	0.50	297.00	5308.00	5309.00	5318.00	5318.00	5315.98	5317.54	4.50	3.50	1.00	12.50	237.48	
15		72	200.00	0.50	246.00	5307.00	5308.00	5315.03	5316.00	5313.00	5313.54	2.03	2.00	0.77	8.86	299.51	
16		72	668.00	2.69	246.00	5308.00	5326.00	5316.00	5336.43	5314.52	5330.29	2.00	4.43	0.97	10.03	695.31	
17		60	124.60	4.82	191.00	5326.00	5332.00	5336.43	5338.50	5330.29	5335.95	5.43	1.50	1.00	11.07	571.57	
Project File: UPM System 4.stm											Number of lines: 17			Date: 5/27/2015			
NOTES: ** Critical depth																	

Storm Sewer Profile

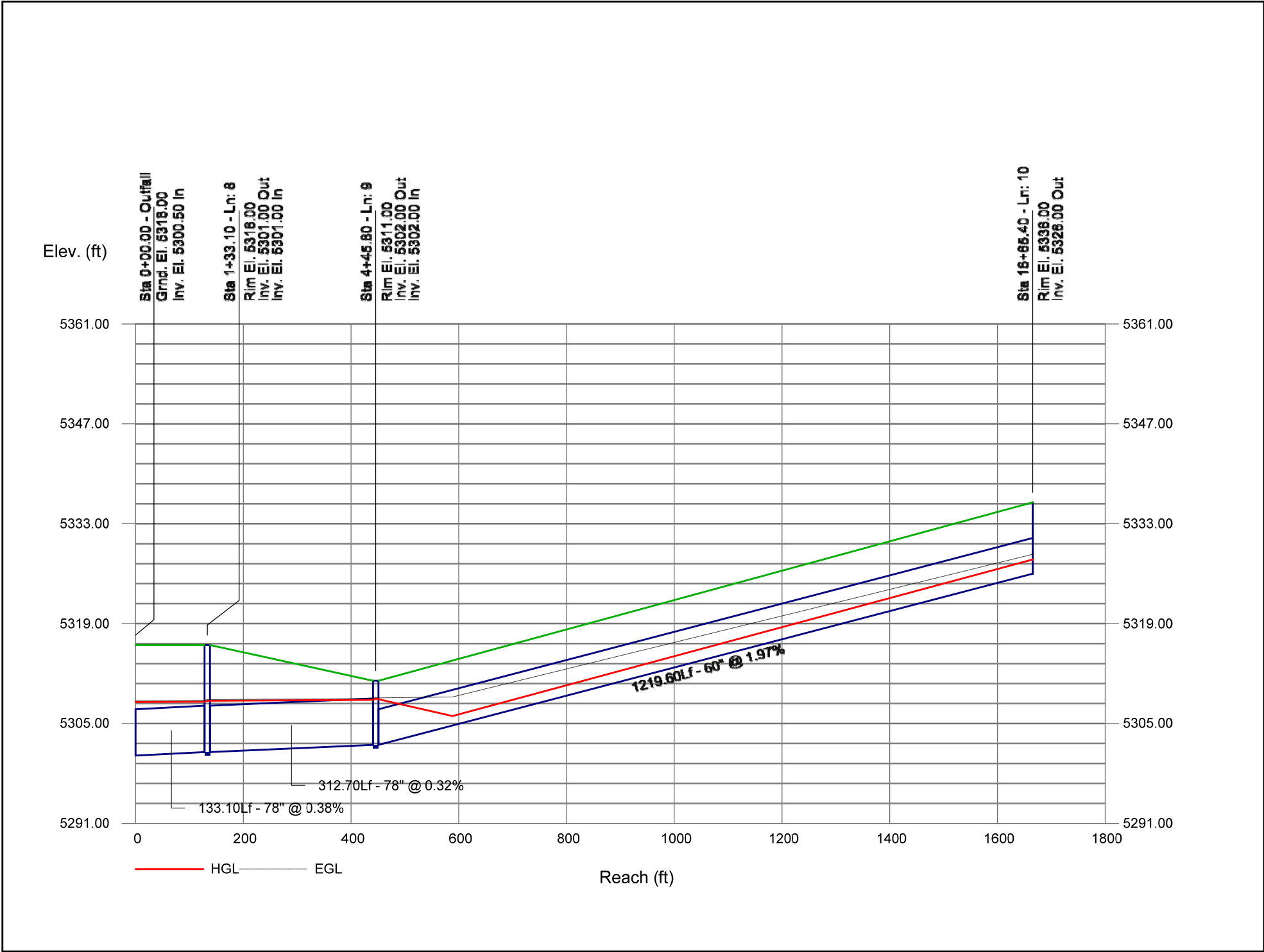
Proj. file: UPM System 4.stm



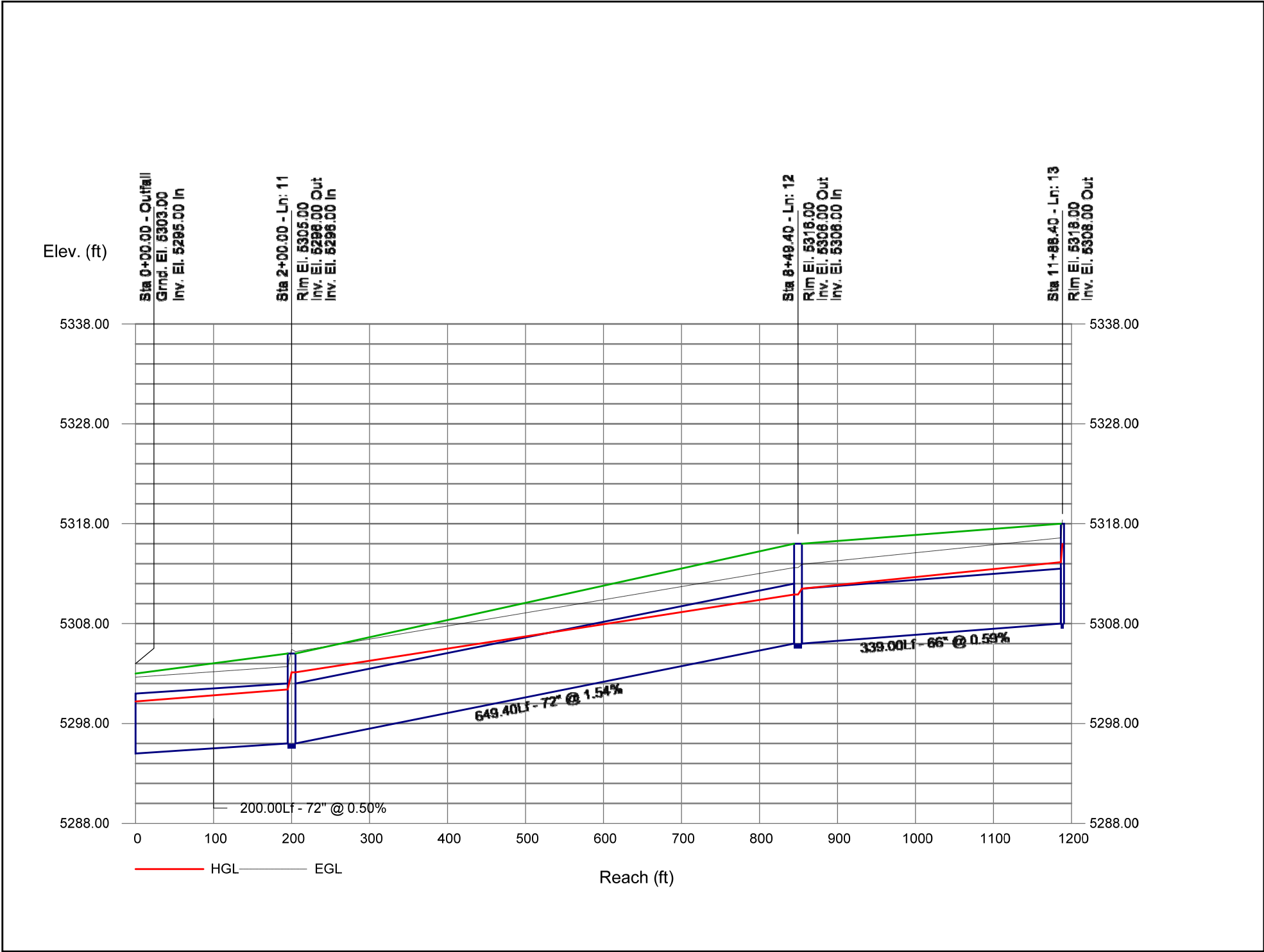
Storm Sewer Profile



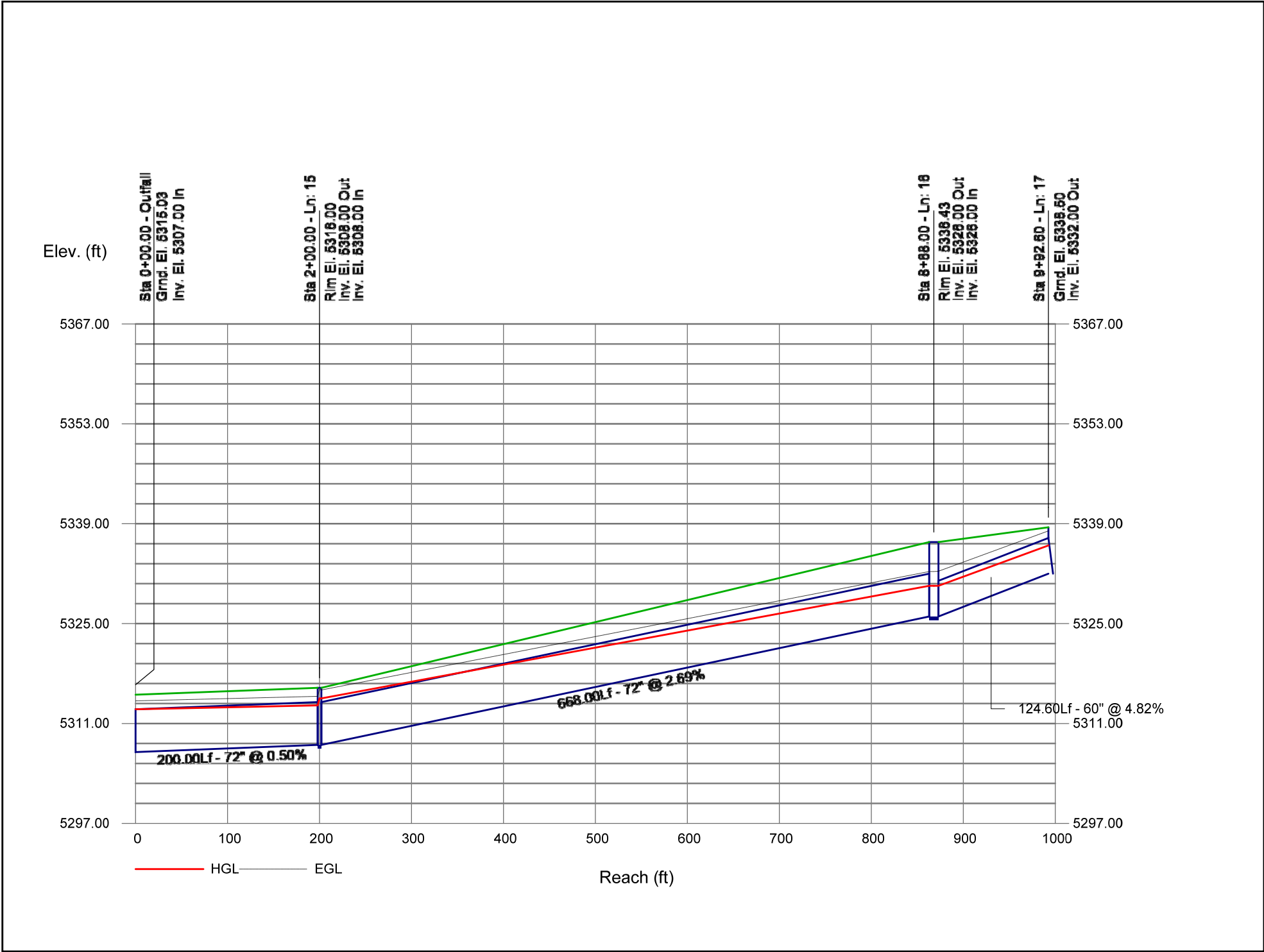
Storm Sewer Profile



Storm Sewer Profile



Storm Sewer Profile



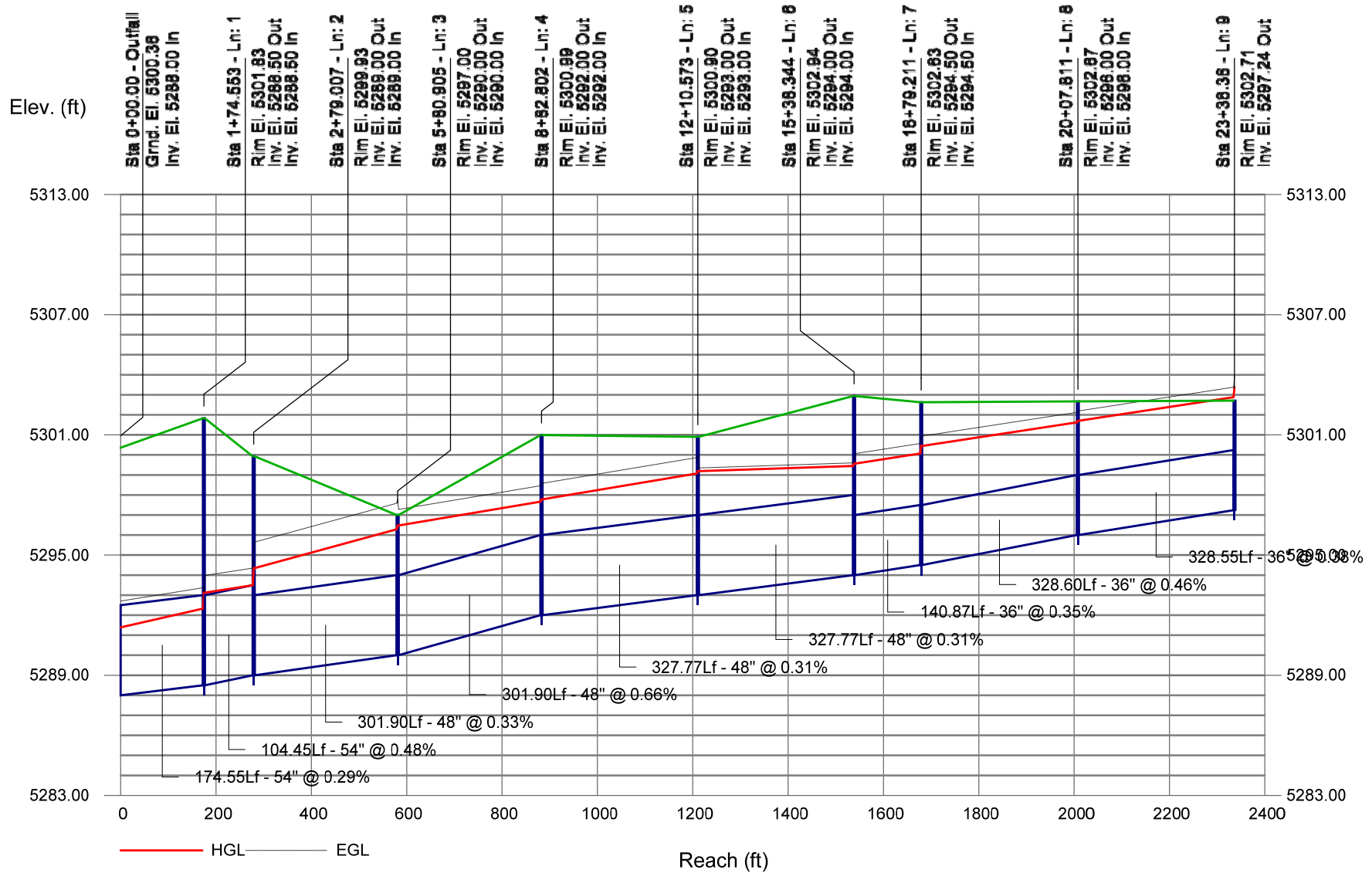
UPM System 5



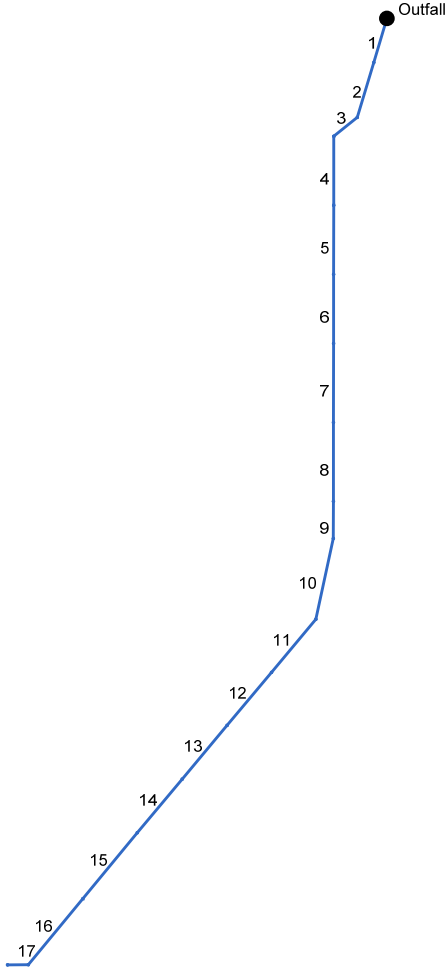
Line No.	Line ID	Line Size (in)	Line Length (ft)	Line Slope (%)	Flow Rate (cfs)	Invert Dn (ft)	Invert Up (ft)	Gnd/Rim EI Dn (ft)	Gnd/Rim EI Up (ft)	HGL Dn (ft)	HGL Up (ft)	Cover Dn (ft)	Cover Up (ft)	J-Loss Coeff	Vel Ave (ft/s)	Capac Full (cfs)	
1		54	174.55	0.29	118.00	5288.00	5288.50	5300.36	5301.83	5291.39	5292.33	7.86	8.83	0.75	8.68	105.25	
2		54	104.45	0.48	118.00	5288.50	5289.00	5301.83	5299.93	5293.12	5293.49	8.83	6.43	1.00	7.42	136.06	
3		48	301.90	0.33	115.00	5289.00	5290.00	5299.93	5297.00	5294.35	5296.28	6.93	3.00	0.15	9.15	82.67	
4		48	301.90	0.66	90.00	5290.00	5292.00	5297.00	5300.99	5296.48	5297.67	3.00	4.99	0.15	7.16	116.92	
5		48	327.77	0.31	90.00	5292.00	5293.00	5300.99	5300.90	5297.78	5299.07	4.99	3.90	0.15	7.16	79.34	
6		48	327.77	0.31	40.00	5293.00	5294.00	5300.90	5302.94	5299.19	5299.45	3.90	4.94	0.75	3.18	79.34	
7		36	140.87	0.35	40.00	5294.00	5294.50	5302.94	5302.63	5299.56	5300.07	5.94	5.13	0.75	5.66	39.73	
8		36	328.60	0.46	40.00	5294.50	5296.00	5302.63	5302.67	5300.44	5301.63	5.13	3.67	0.15	5.66	45.06	
9		36	328.55	0.38	40.00	5296.00	5297.24	5302.67	5302.71	5301.70	5302.88	3.67	2.47	1.00	5.66	40.98	
UPM System 5											Number of lines: 9			Date: 5/27/2015			
NOTES: i Inlet control; ** Critical depth																	

Storm Sewer Profile

Proj. file: UPM System 5.stm



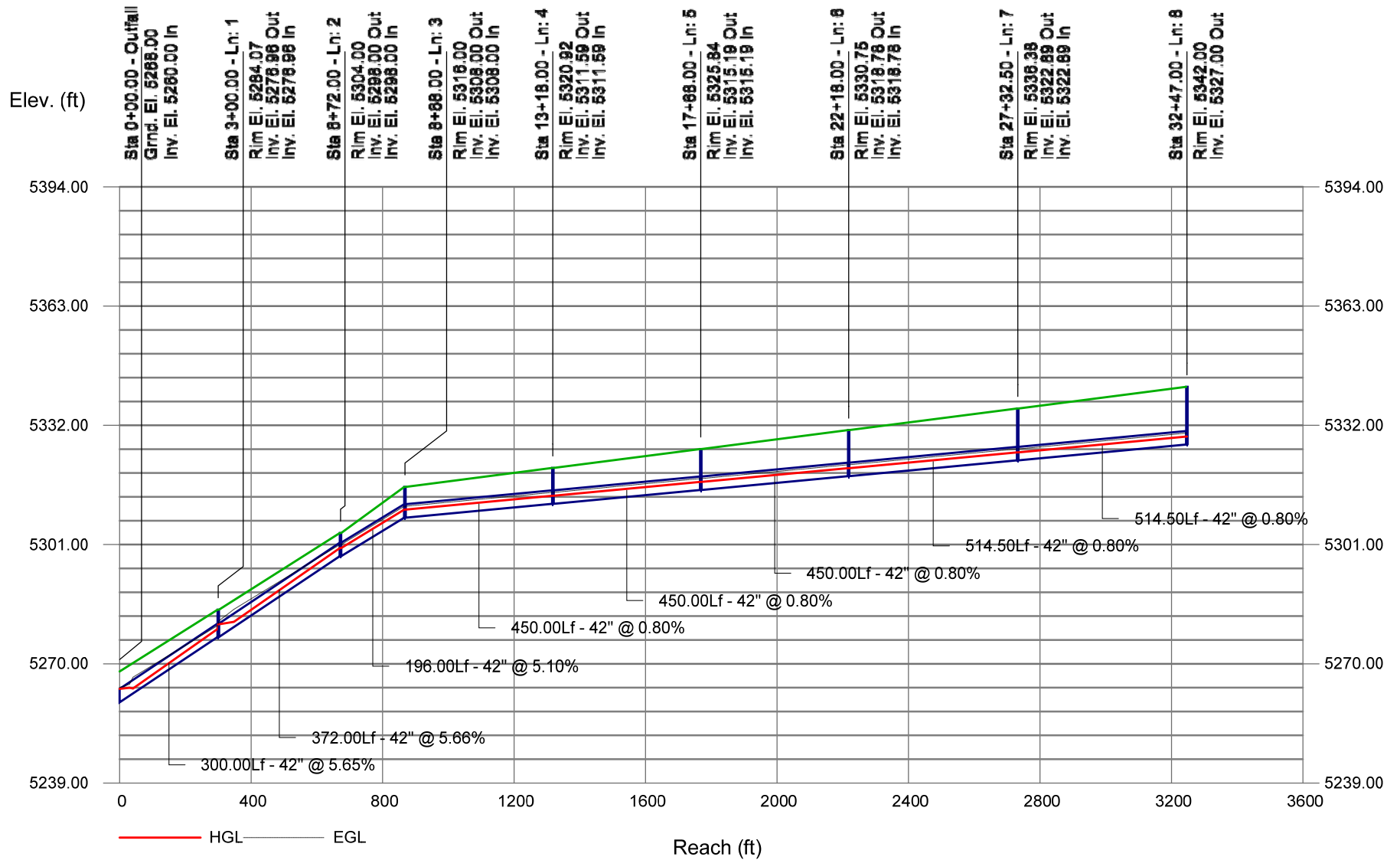
UPM to Calabacillas



Line No.	Line ID	Line Size	Line Length	Line Slope	Flow Rate	Invert Dn	Invert Up	Gnd/Rim El Dn	Gnd/Rim El Up	HGL Dn	HGL Up	Cover Dn	Cover Up	J-Loss Coeff	Vel Ave	Capac Full	
		(in)	(ft)	(%)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)		(ft/s)	(cfs)	
1		42	300.00	5.65	45.00	5260.00	5276.96	5268.00	5284.07	5263.50	5279.05 j	4.50	3.61	0.15	6.09	239.21	
2		42	372.00	5.66	45.00	5276.96	5298.00	5284.07	5304.00	5280.29	5300.09 j	3.61	2.50	0.62	6.14	239.27	
3		42	196.00	5.10	45.00	5298.00	5308.00	5304.00	5316.00	5300.09	5310.09	2.50	4.50	0.81	7.51	227.25	
4		42	450.00	0.80	45.00	5308.00	5311.59	5316.00	5320.92	5310.09	5313.68	4.50	5.83	0.15	7.51	89.86	
5		42	450.00	0.80	45.00	5311.59	5315.19	5320.92	5325.84	5313.68	5317.28	5.83	7.15	0.15	7.51	89.99	
6		42	450.00	0.80	45.00	5315.19	5318.78	5325.84	5330.75	5317.28	5320.87	7.15	8.47	0.15	7.51	89.86	
7		42	514.50	0.80	45.00	5318.78	5322.89	5330.75	5336.38	5320.87	5324.98	8.47	9.99	0.15	7.51	89.92	
8		42	514.50	0.80	45.00	5322.89	5327.00	5336.38	5342.00	5324.98	5329.09	9.99	11.50	0.15	7.51	89.92	
9		42	242.00	0.83	45.00	5327.00	5329.00	5342.00	5344.72	5329.09	5331.09	11.50	12.22	0.25	7.51	91.46	
10		42	537.70	0.37	45.00	5329.00	5331.00	5344.72	5338.30	5331.31	5333.18	12.22	3.80	0.52	6.92	61.36	
11		42	450.00	0.17	45.00	5331.00	5331.75	5338.30	5339.32	5334.50	5335.40	3.80	4.07	0.15	4.68	41.07	
12		42	450.00	0.16	45.00	5331.75	5332.49	5339.32	5340.34	5335.45	5336.35	4.07	4.35	0.15	4.68	40.80	
13		42	455.00	0.17	45.00	5332.49	5333.25	5340.34	5341.37	5336.40	5337.31	4.35	4.62	0.15	4.68	41.11	
14		42	455.00	0.16	45.00	5333.25	5334.00	5341.37	5342.40	5337.36	5338.27	4.62	4.90	0.15	4.68	40.85	
15		42	556.50	0.45	45.00	5334.00	5336.50	5342.40	5343.70	5338.33	5339.34	4.90	3.70	0.15	5.03	67.43	
16		42	556.50	0.45	45.00	5336.50	5339.00	5343.70	5345.00	5339.41	5341.09	3.70	2.50	0.80	6.39	67.43	
17		42	135.00	3.70	45.00	5339.00	5344.00	5345.00	5350.00	5342.33	5346.09 j	2.50	2.50	1.00	6.14	193.62	
UPM to Calabacillas										Number of lines: 17				Date: 3/13/2015			
NOTES: i Inlet control; ** Critical depth																	

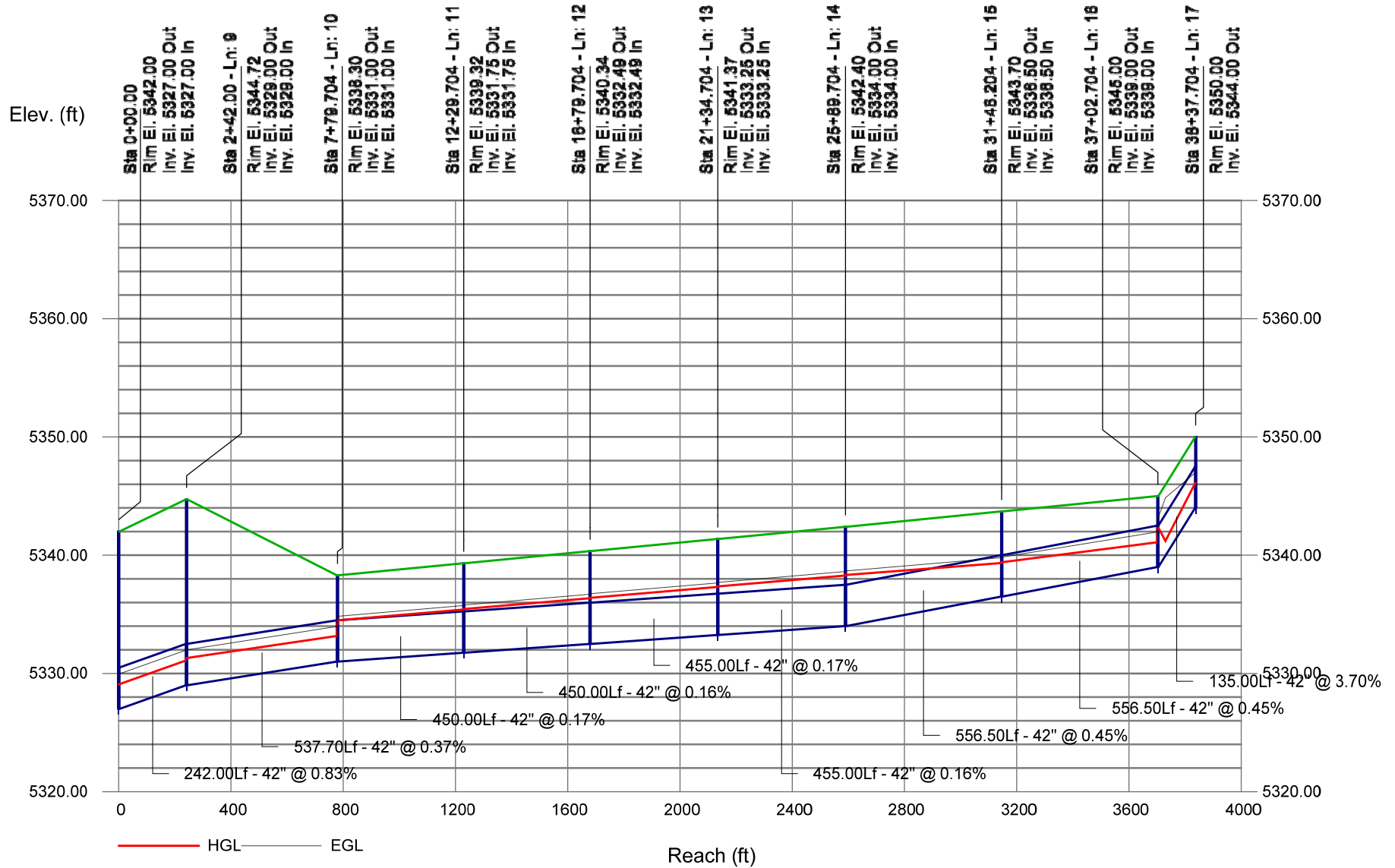
Storm Sewer Profile

Proj. file: UPM to Calabacillas.stm

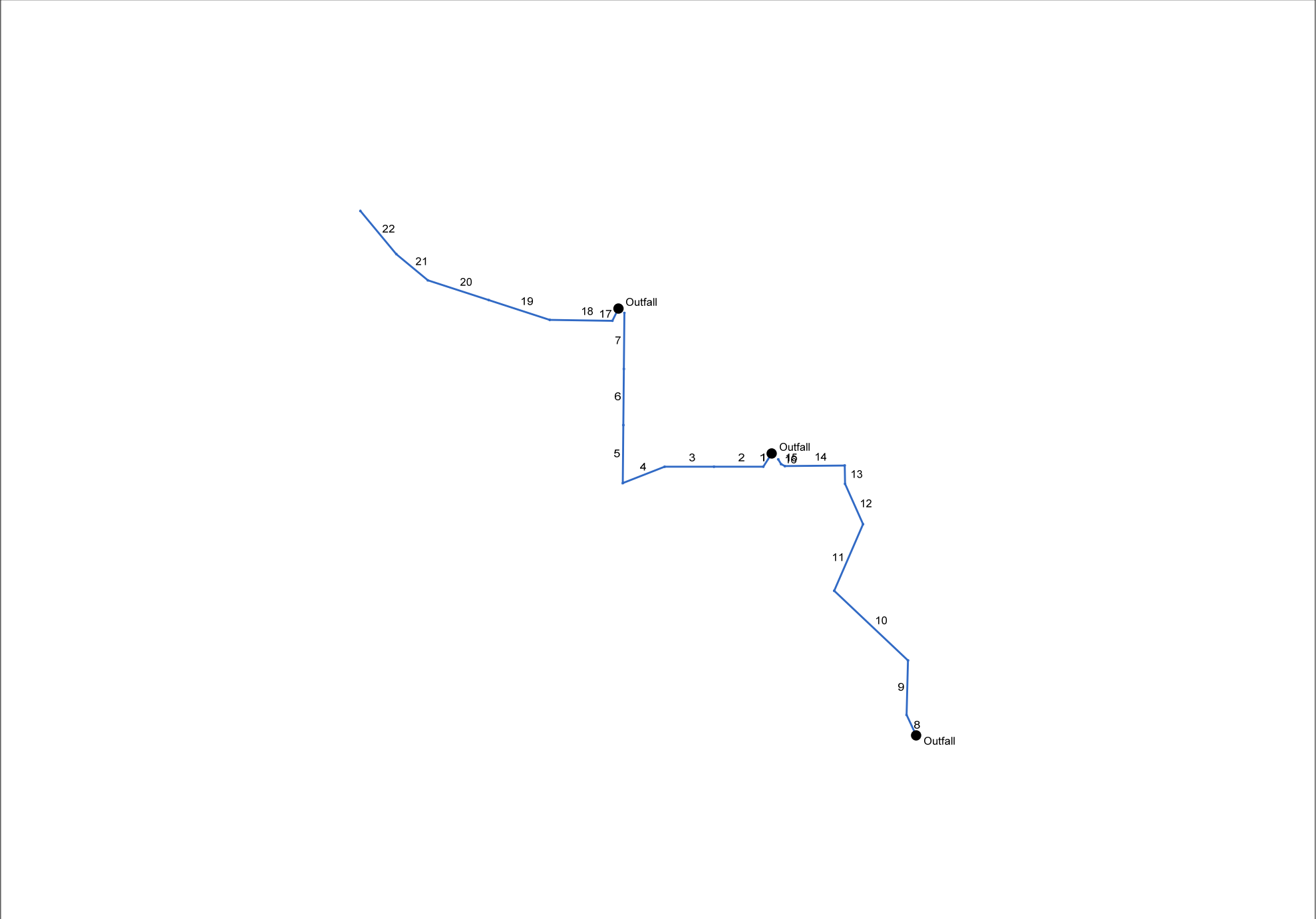


Storm Sewer Profile

Proj. file: UPM to Calabacillas.stm



UPM to Mariposa



Project File: UPM to Mariposa.stm	Number of lines: 22	Date: 3/13/2015
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Line No.	Line ID	Line Size (in)	Line Length (ft)	Line Slope (%)	Flow Rate (cfs)	Invert Dn (ft)	Invert Up (ft)	Gnd/Rim EI Dn (ft)	Gnd/Rim EI Up (ft)	HGL Dn (ft)	HGL Up (ft)	Cover Dn (ft)	Cover Up (ft)	J-Loss Coeff	Vel Ave (ft/s)	Capac Full (cfs)	
1	Pond 6 Inlet	54	107.13	0.47	164.00	5318.50	5319.00	5326.00	5326.60	5323.00	5323.75	3.00	3.10	0.87	10.31	134.35	
2		54	338.44	1.18	164.00	5319.00	5323.00	5326.60	5331.75	5325.55	5327.91	3.10	4.25	0.15	10.31	213.80	
3		42	338.44	1.18	114.00	5323.00	5327.00	5331.75	5336.90	5329.55	5333.90	5.25	6.40	0.42	11.85	109.38	
4		42	307.73	0.97	114.00	5327.00	5330.00	5336.90	5341.00	5334.43	5338.38	6.40	7.50	1.00	11.85	99.34	
5		42	400.00	1.28	64.00	5330.00	5335.12	5341.00	5346.59	5340.56	5342.18	7.50	7.97	0.15	6.65	113.83	
6		36	385.95	1.80	64.00	5335.12	5342.06	5346.59	5351.99	5342.29	5345.84	8.47	6.93	0.15	9.06	89.43	
7	Pond 5 Outlet	36	385.94	1.28	64.00	5342.06	5347.00	5351.99	5358.00	5346.88	5350.43	6.93	8.00	1.00	9.06	75.45	
8	Pond 8 Inlet	66	155.64	1.29	257.00	5265.00	5267.00	5274.00	5277.07	5270.50	5271.46	3.50	4.57	0.50	11.63	380.72	
9		66	375.13	3.47	257.00	5267.00	5280.00	5277.07	5290.78	5275.50	5284.46	4.57	5.28	0.78	11.63	625.22	
10		60	697.10	2.44	187.00	5280.00	5297.00	5290.78	5306.32	5288.50	5300.91	5.78	4.32	0.95	10.44	406.75	
11		60	499.39	2.80	187.00	5297.00	5311.00	5306.32	5326.29	5304.17	5314.91	4.32	10.29	0.77	10.44	436.11	
12		48	303.75	0.88	117.00	5311.00	5313.66	5326.29	5322.00	5318.17	5320.18	11.29	4.34	0.45	9.31	134.43	
13	Existing	48	126.14	0.80	117.00	5313.66	5314.67	5322.00	5328.42	5320.79	5321.63	4.34	9.75	1.00	9.31	128.52	
14	Existing	48	410.39	0.80	117.00	5314.67	5317.95	5328.42	5325.00	5322.98	5325.70	9.75	3.05	0.54	9.31	128.43	
15	Existing	48	29.36	0.82	117.00	5317.95	5318.19	5325.00	5325.50	5326.43	5326.62	3.05	3.31	0.57	9.31	129.81	
16	Pond 6 Outlet	48	38.20	0.47	117.00	5318.19	5318.37	5325.50	5326.10	5327.39	5327.64	3.31	3.73	1.00	9.31	98.65	
17	Pond 5 Inlet	66	93.80	2.13	260.20	5349.00	5351.00	5358.00	5361.16	5354.50	5355.49	3.50	4.66	0.92	11.75	490.42	
18		66	430.00	1.40	192.00	5351.00	5357.00	5361.16	5365.11	5359.60	5360.88	4.66	2.61	0.35	9.41	396.73	
19		54	439.00	1.14	176.00	5357.00	5362.00	5365.11	5370.16	5363.60	5367.11	3.61	3.66	0.15	11.07	209.88	
20		54	439.00	1.14	176.00	5362.00	5367.00	5370.16	5375.20	5369.20	5372.72	3.66	3.70	0.43	11.07	209.88	
21		48	282.00	1.77	103.00	5367.00	5372.00	5375.20	5379.54	5374.20	5375.38	4.20	3.54	0.22	8.65	191.27	
22		48	386.00	3.11	103.00	5372.00	5384.00	5379.54	5391.01	5377.04	5387.07	3.54	3.01	1.00	9.07	253.28	

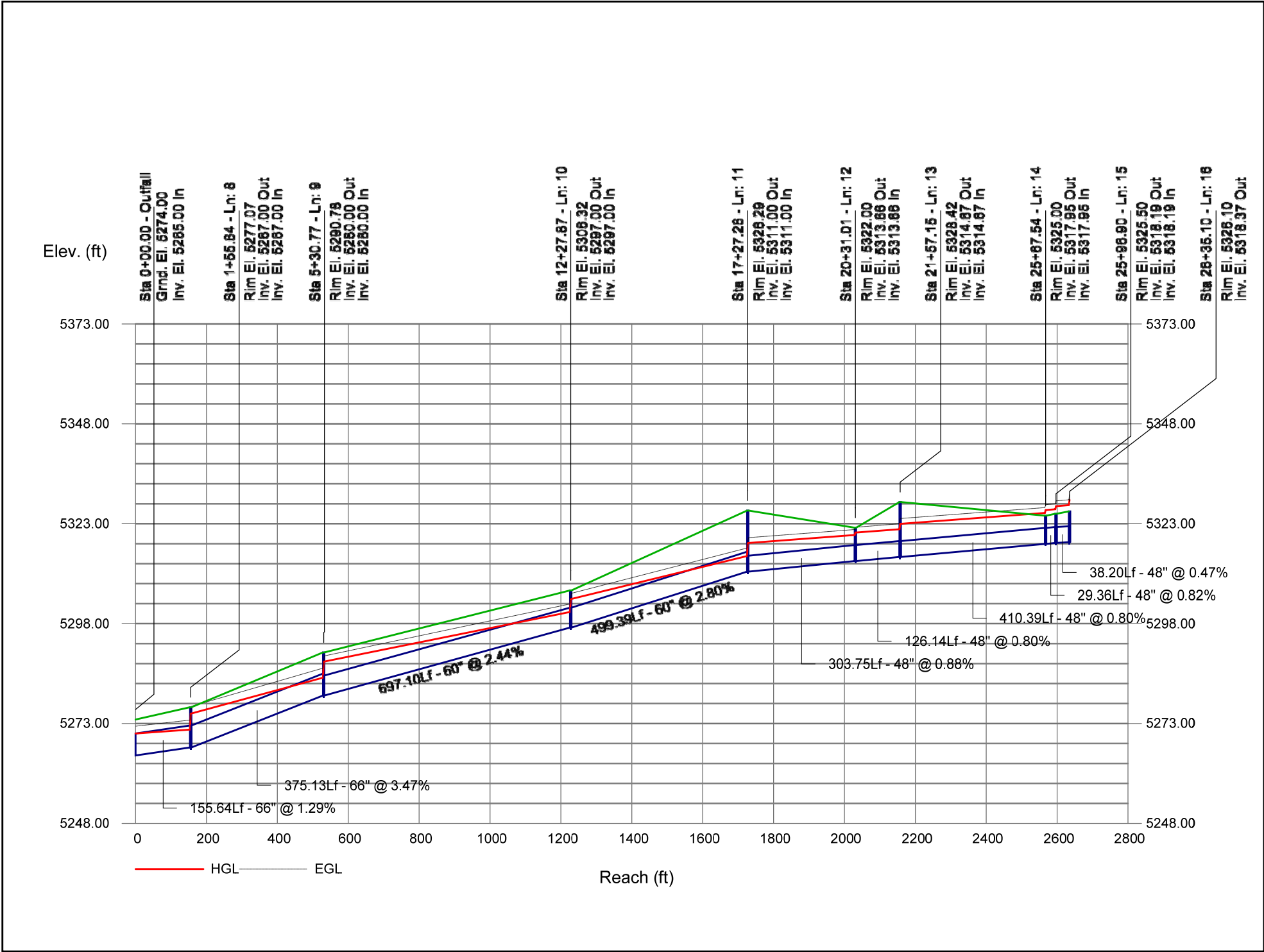
UPM to Mariposa

Number of lines: 22

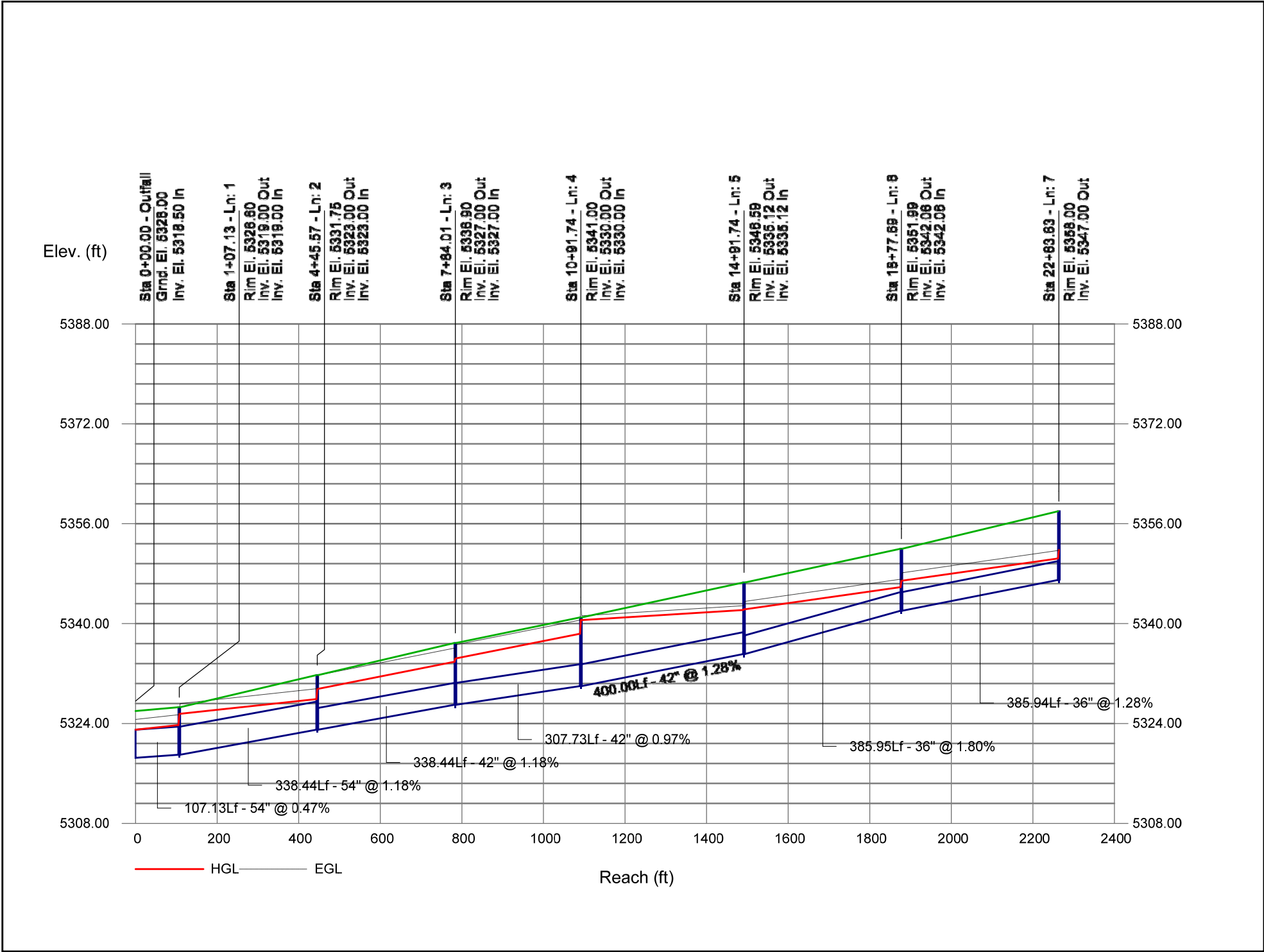
Date: 3/13/2015

NOTES: i Inlet control; ** Critical depth

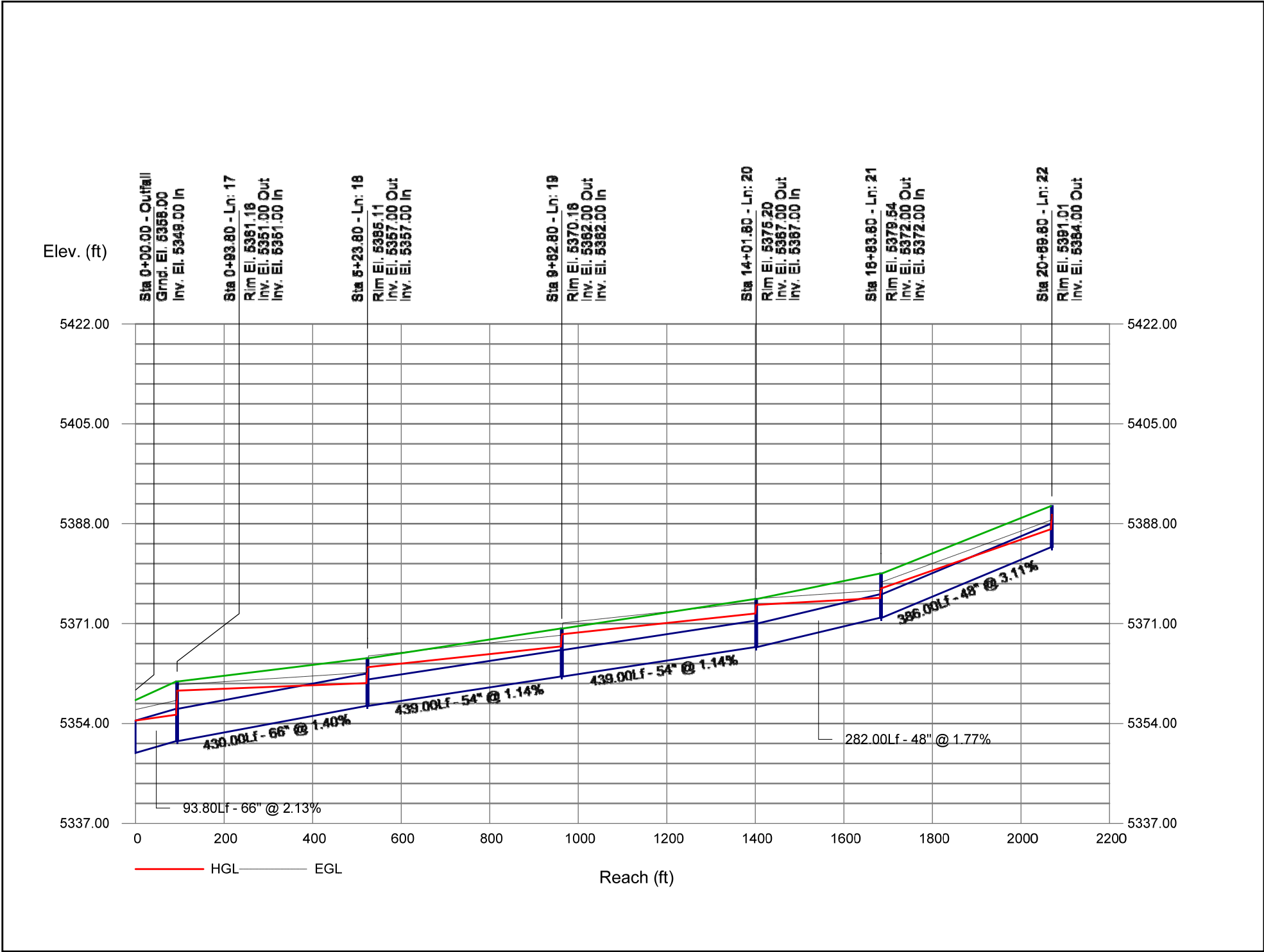
Storm Sewer Profile



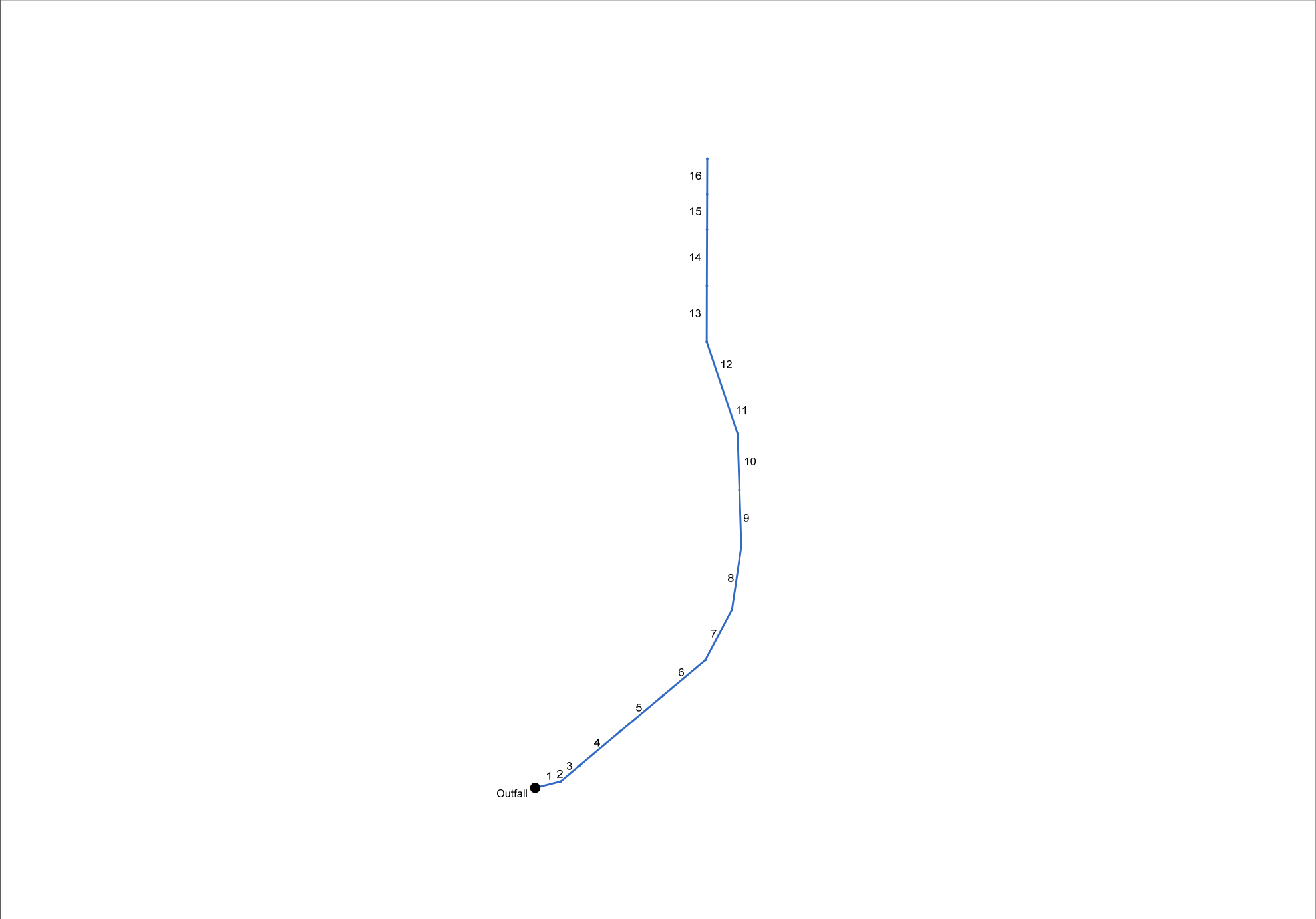
Storm Sewer Profile



Storm Sewer Profile



Unser System

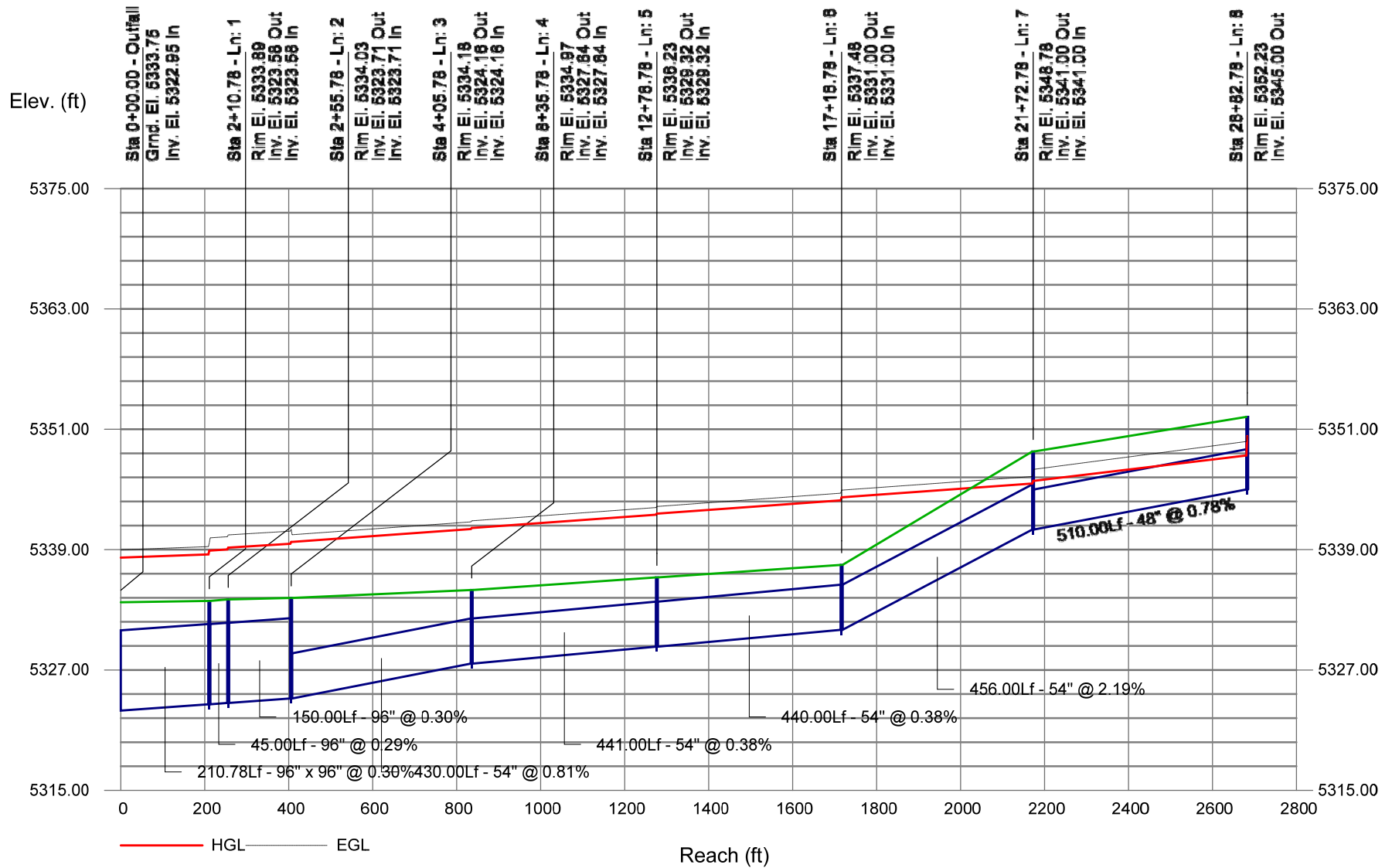


Project File: Unser System.stm	Number of lines: 16	Date: 3/13/2015
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Line No.	Line ID	Line Size	Line Length	Line Slope	Flow Rate	Invert Dn	Invert Up	Gnd/Rim El Dn	Gnd/Rim El Up	HGL Dn	HGL Up	Cover Dn	Cover Up	J-Loss Coeff	Vel Ave	Capac Full	
		(in)	(ft)	(%)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)		(ft/s)	(cfs)	
1		96 x 96	210.78	0.30	454.00	5322.95	5323.58	5333.75	5333.89	5338.20	5338.52	2.80	2.31	0.49	7.09	634.98	
2		96	45.00	0.29	454.00	5323.58	5323.71	5333.89	5334.03	5338.91	5339.02	2.31	2.32	0.15	9.03	490.13	
3		96	150.00	0.30	454.00	5323.71	5324.16	5334.03	5334.18	5339.21	5339.58	2.32	2.02	0.15	9.03	499.80	
4		54	430.00	0.81	107.64	5324.16	5327.64	5334.18	5334.97	5339.77	5341.06	5.52	2.83	0.15	6.77	176.92	
5		54	441.00	0.38	107.64	5327.64	5329.32	5334.97	5336.23	5341.17	5342.49	2.83	2.41	0.15	6.77	121.37	
6		54	440.00	0.38	107.64	5329.32	5331.00	5336.23	5337.48	5342.59	5343.91	2.41	1.98	0.43	6.77	121.53	
7		54	456.00	2.19	107.64	5331.00	5341.00	5337.48	5348.78	5344.22	5345.59	1.98	3.28	0.39	6.77	291.23	
8		48	510.00	0.78	107.64	5341.00	5345.00	5348.78	5352.23	5345.86	5348.39	3.78	3.23	0.21	9.02	127.22	
9		48	451.00	0.67	107.64	5345.00	5348.00	5352.23	5355.00	5350.33	5352.86	3.23	3.00	0.15	8.57	117.16	
10		48	451.00	0.67	107.64	5348.00	5351.00	5355.00	5357.76	5352.97	5355.50	3.00	2.76	0.34	8.57	117.16	
11		48	387.50	1.94	107.64	5351.00	5358.50	5357.76	5366.17	5355.97	5361.64	2.76	3.67	0.15	9.38	199.84	
12		48	387.50	1.94	107.64	5358.50	5366.00	5366.17	5374.57	5364.26	5369.14	3.67	4.57	0.37	9.38	199.84	
13		48	450.00	2.39	107.64	5366.00	5376.74	5374.57	5384.82	5371.76	5379.88	4.57	4.08	0.15	9.38	221.92	
14		48	450.00	2.38	107.64	5376.74	5387.47	5384.82	5395.07	5382.50	5390.61	4.08	3.60	0.15	9.38	221.81	
15		48	283.50	2.39	107.64	5387.47	5394.24	5395.07	5401.53	5393.23	5397.38	3.60	3.29	0.15	9.38	221.98	
16		48	283.50	2.38	107.64	5394.24	5401.00	5401.53	5407.99	5400.00	5404.14	3.29	2.99	1.00	9.38	221.81	
Unser System											Number of lines: 16			Date: 3/13/2015			
NOTES: i Inlet control; ** Critical depth																	

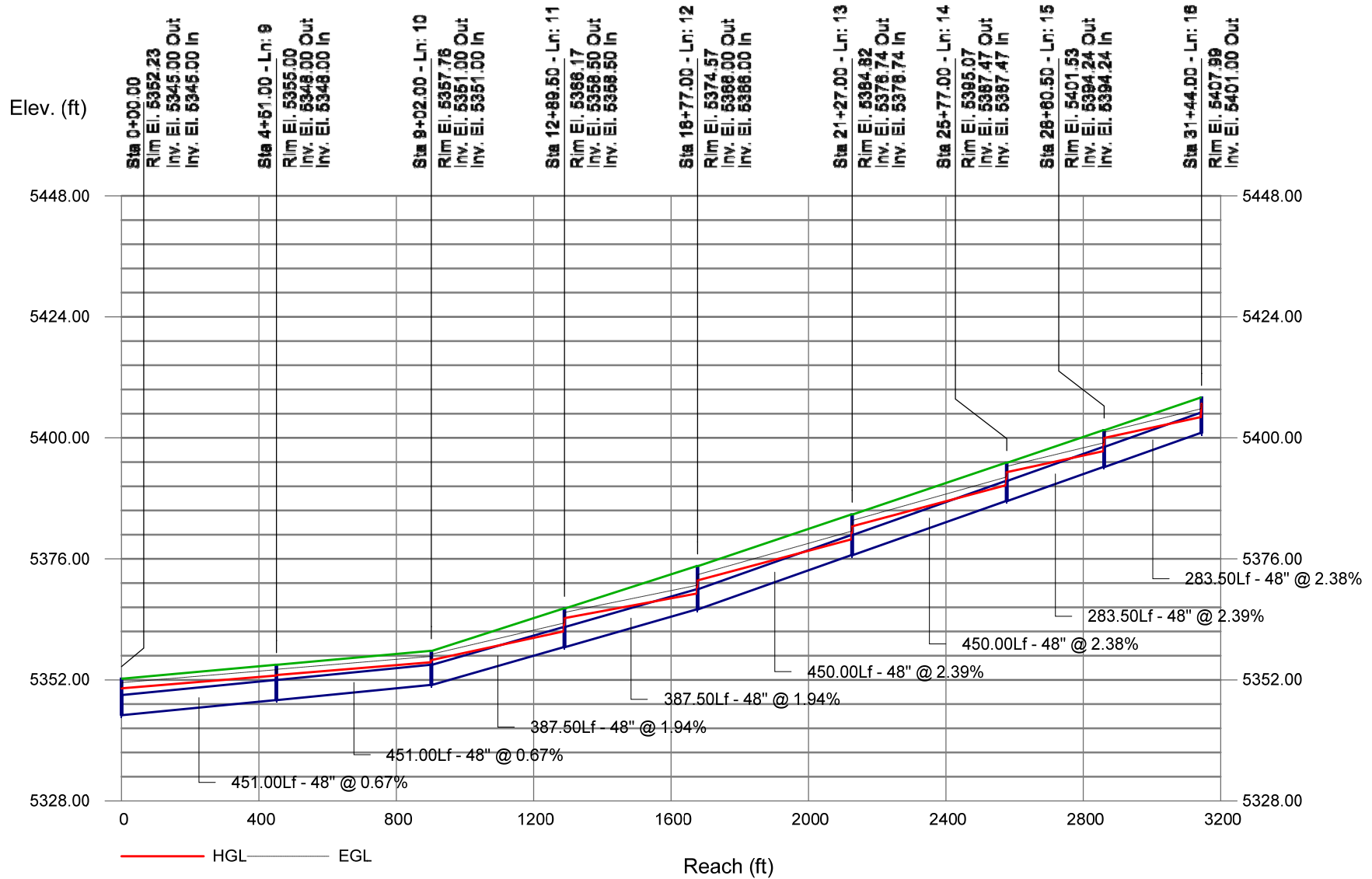
Storm Sewer Profile

Proj. file: Unser System.stm



Storm Sewer Profile

Proj. file: Unser System.stm



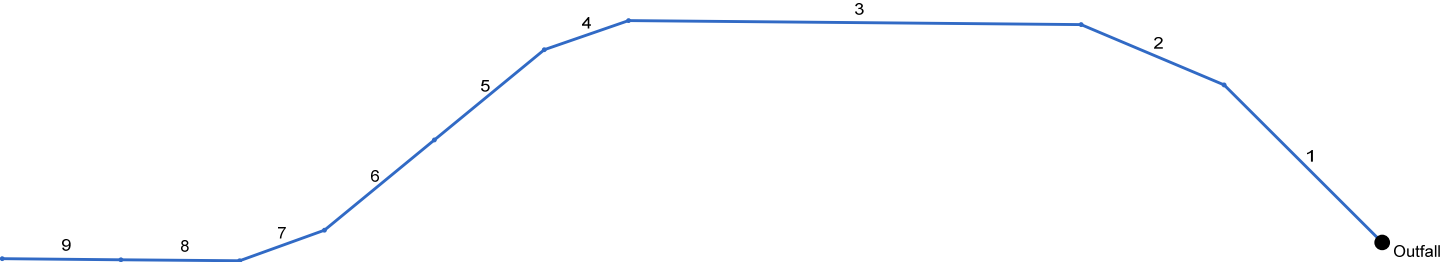


AMAFCA

Upper Piedras Marcadas Watershed
Drainage and Water Quality Management Plan
Developed Conditions Report

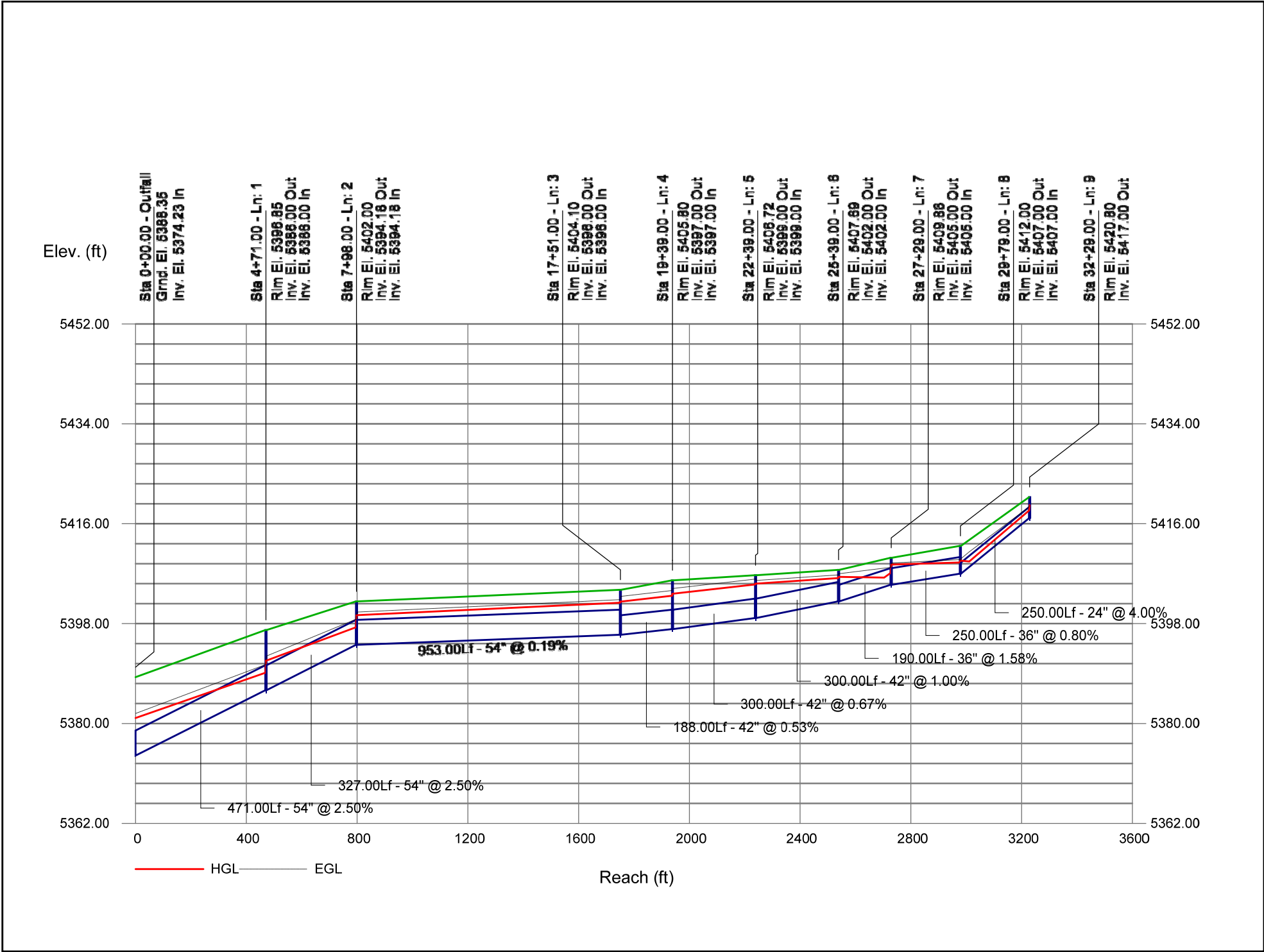
Alternative 2

UPM System 1

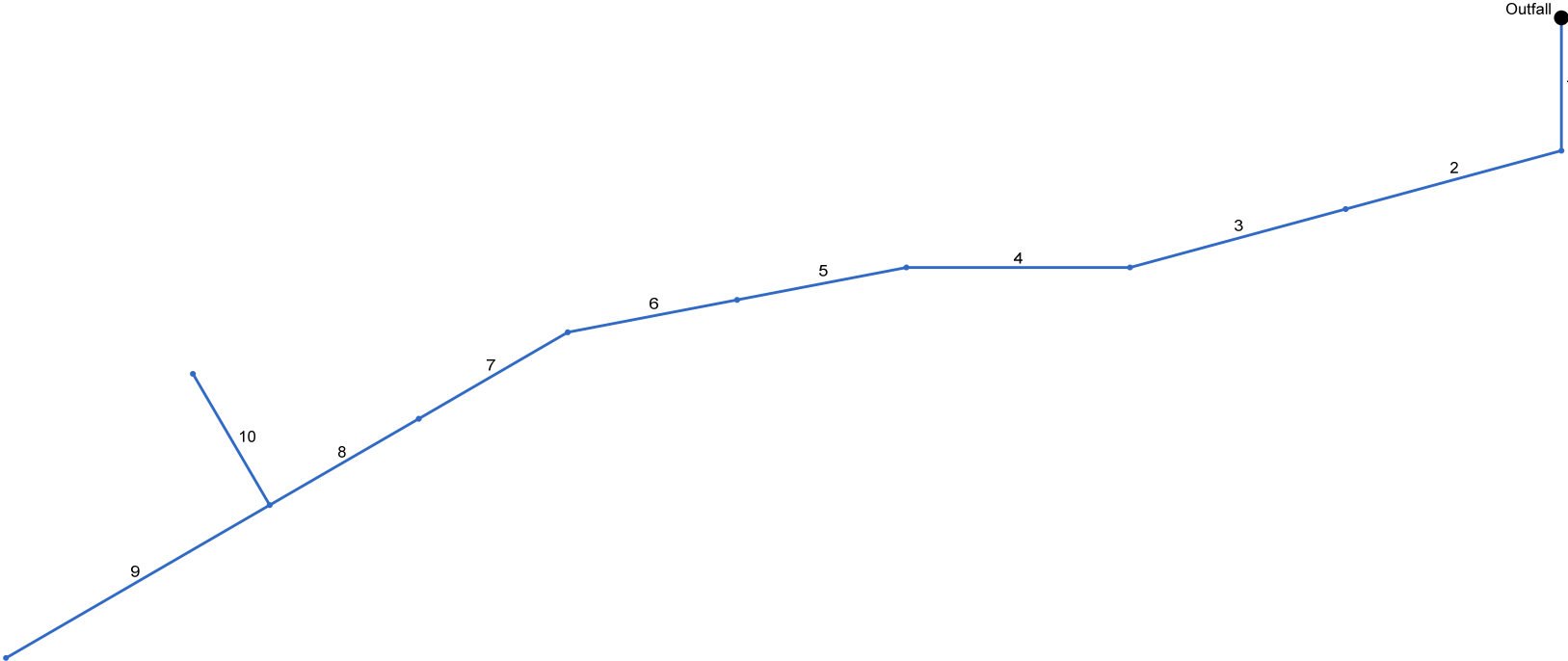


Line No.	Line ID	Line Size (in)	Line Length (ft)	Line Slope (%)	Flow Rate (cfs)	Invert Dn (ft)	Invert Up (ft)	Gnd/Rim El Dn (ft)	Gnd/Rim El Up (ft)	HGL Dn (ft)	HGL Up (ft)	Cover Dn (ft)	Cover Up (ft)	J-Loss Coeff	Vel Ave (ft/s)	Capac Full (cfs)	
1		54	471.00	2.50	115.00	5374.23	5386.00	5388.35	5396.85	5381.00	5389.15	9.62	6.35	0.43	8.45	310.88	
2		54	327.00	2.50	115.00	5386.00	5394.18	5396.85	5402.00	5391.35	5397.33	6.35	3.32	0.44	8.45	311.05	
3		54	953.00	0.19	95.00	5394.18	5396.00	5402.00	5404.10	5399.53	5401.76	3.32	3.60	0.39	5.97	85.94	
4		42	188.00	0.53	75.00	5396.00	5397.00	5404.10	5405.80	5401.97	5403.02	4.60	5.30	0.40	7.80	73.38	
5		42	300.00	0.67	75.00	5397.00	5399.00	5405.80	5406.72	5403.40	5405.06	5.30	4.22	0.15	7.80	82.15	
6		42	300.00	1.00	58.00	5399.00	5402.00	5406.72	5407.69	5405.20	5406.20	4.22	2.19	0.39	6.03	100.61	
7		36	190.00	1.58	43.00	5402.00	5405.00	5407.69	5409.86	5406.42	5407.13 j	2.69	1.86	0.40	7.04	83.80	
8		36	250.00	0.80	29.00	5405.00	5407.00	5409.86	5412.00	5408.65	5409.02	1.86	2.00	0.15	4.92	59.65	
9		24	250.00	4.00	15.00	5407.00	5417.00	5412.00	5420.80	5409.34	5418.40 j	3.00	1.80	1.00	5.59	45.24	
UPM System 1											Number of lines: 9			Date: 3/13/2015			
NOTES: i Inlet control; ** Critical depth																	

Storm Sewer Profile



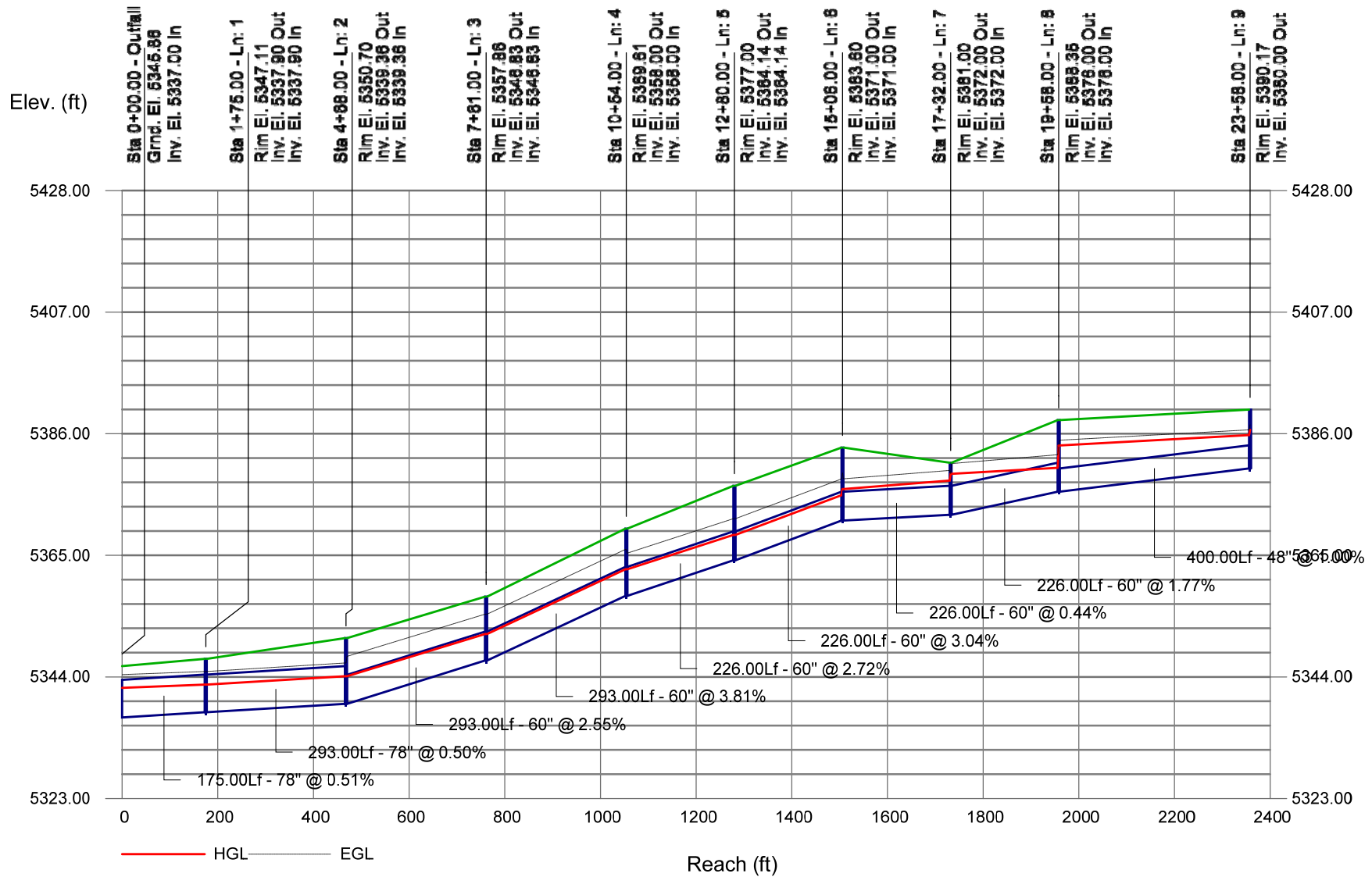
UPM System 2



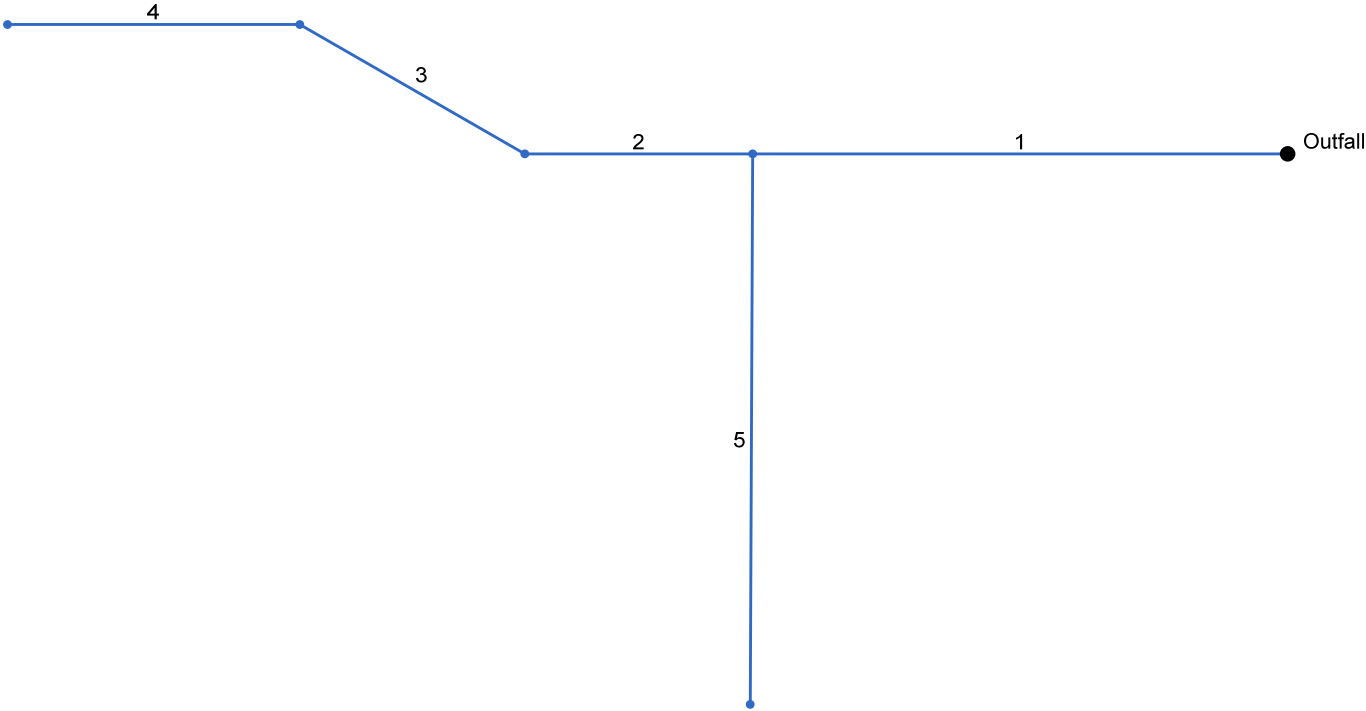
Line No.	Line ID	Line Size (in)	Line Length (ft)	Line Slope (%)	Flow Rate (cfs)	Invert Dn (ft)	Invert Up (ft)	Gnd/Rim El Dn (ft)	Gnd/Rim El Up (ft)	HGL Dn (ft)	HGL Up (ft)	Cover Dn (ft)	Cover Up (ft)	J-Loss Coeff	Vel Ave (ft/s)	Capac Full (cfs)	
1	202B	78	175.00	0.51	316.00	5337.00	5337.90	5345.86	5347.11	5342.12	5342.67	2.36	2.71	0.97	11.69	376.03	
2		78	293.00	0.50	316.00	5337.90	5339.36	5347.11	5350.70	5342.67	5344.13	2.71	4.84	0.15	12.11	370.15	
3		60	293.00	2.55	280.00	5339.36	5346.83	5350.70	5357.86	5344.13	5351.41	6.34	6.03	0.31	14.68	415.90	
4		60	293.00	3.81	280.00	5346.83	5358.00	5357.86	5369.61	5351.41	5362.58	6.03	6.61	0.23	14.85	508.57	
5		60	226.00	2.72	245.00	5358.00	5364.14	5369.61	5377.00	5362.58	5368.53	6.61	7.86	0.15	13.20	429.33	
6		60	226.00	3.04	245.00	5364.14	5371.00	5377.00	5383.60	5368.53	5375.39	7.86	7.60	0.38	13.42	453.79	
7	202B	60	226.00	0.44	209.00	5371.00	5372.00	5383.60	5381.00	5376.45	5377.91	7.60	4.00	0.15	10.65	173.26	
8	202C	60	226.00	1.77	209.00	5372.00	5376.00	5381.00	5388.35	5379.08	5380.11	4.00	7.35	1.00	11.37	346.52	
9		48	400.00	1.00	96.00	5376.00	5380.00	5388.35	5390.17	5383.97	5385.76	8.35	6.17	1.00	7.64	143.65	
10	System 1	54	200.00	5.89	115.00	5374.23	5386.00	5388.35	5396.85	5383.97	5389.15	9.62	6.35	1.00	8.45	477.08	
UPM System 2											Number of lines: 10			Date: 5/27/2015			
NOTES: i Inlet control; ** Critical depth																	

Storm Sewer Profile

Proj. file: UPM System 2.stm

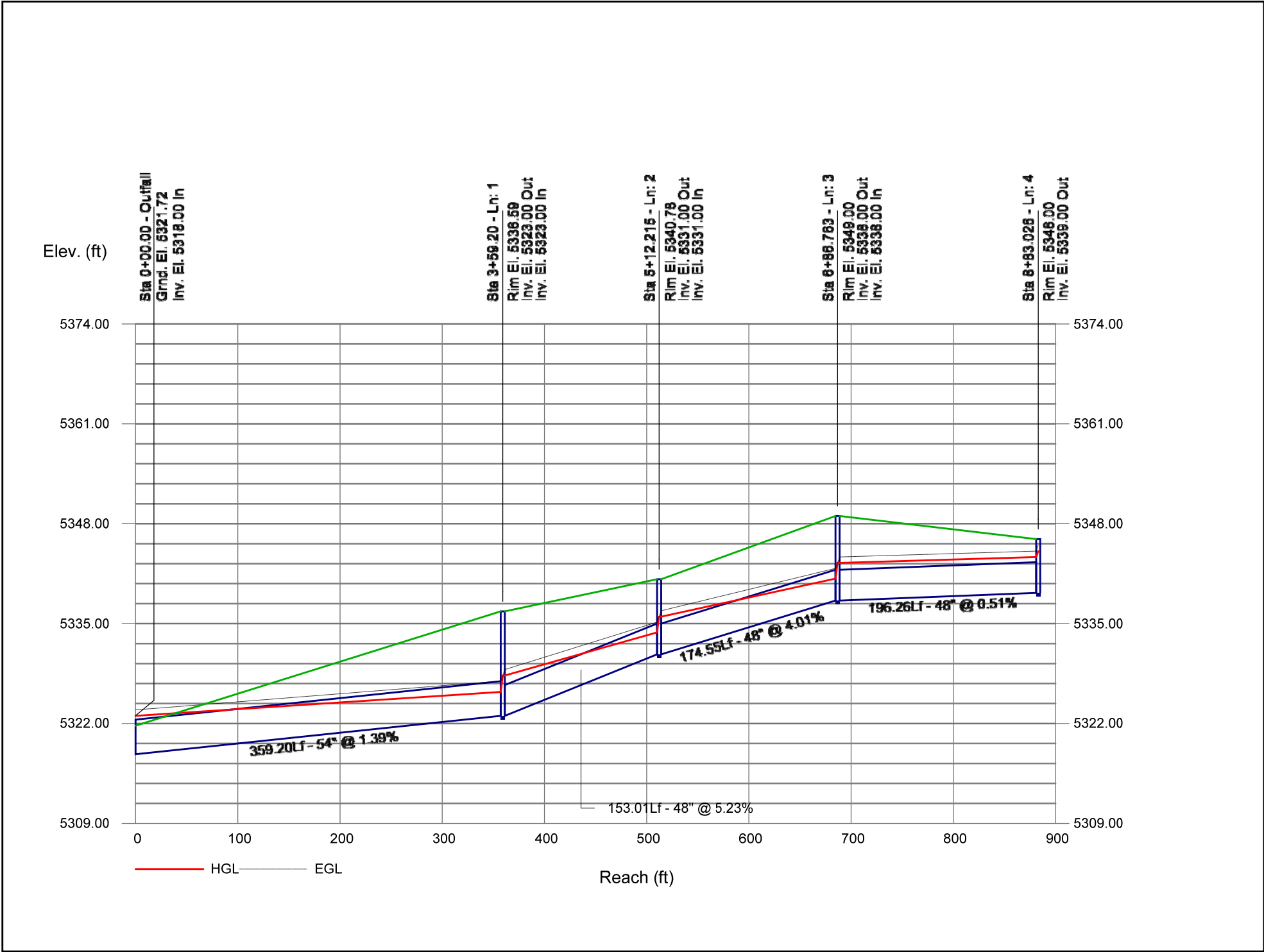


UPM System 3

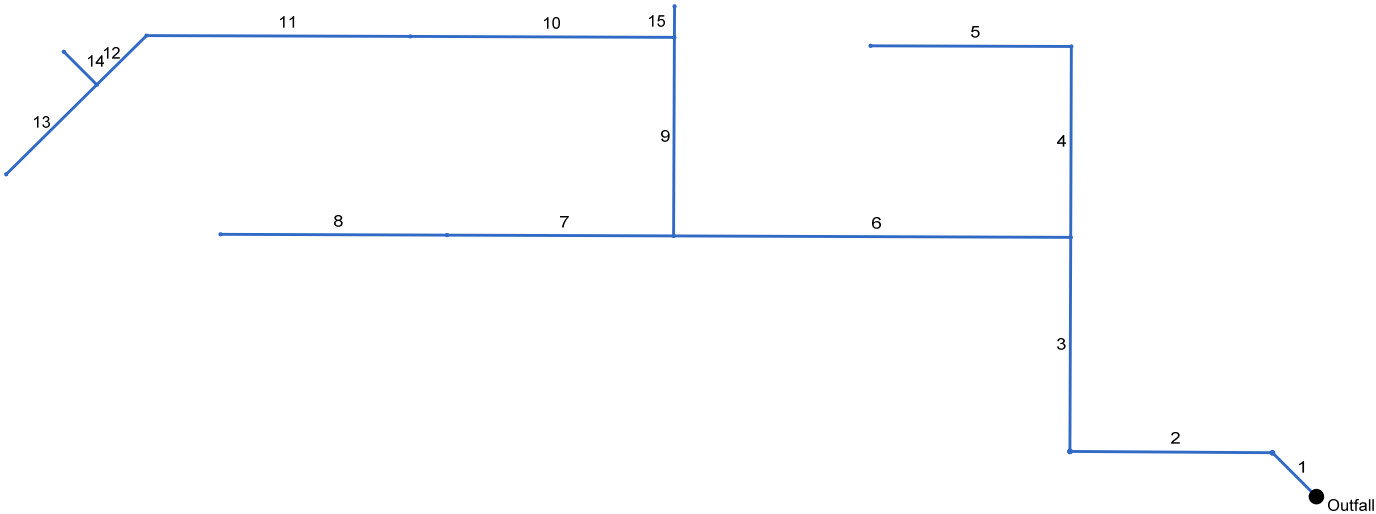


Line No.	Line ID	Line Size (in)	Line Length (ft)	Line Slope (%)	Flow Rate (cfs)	Invert Dn (ft)	Invert Up (ft)	Gnd/Rim El Dn (ft)	Gnd/Rim El Up (ft)	HGL Dn (ft)	HGL Up (ft)	Cover Dn (ft)	Cover Up (ft)	J-Loss Coeff	Vel Ave (ft/s)	Capac Full (cfs)	
1		54	359.20	1.39	112.00	5318.00	5323.00	5321.72	5336.59	5323.00	5326.11	-0.78	9.09	1.00	8.30	232.03	
2		48	153.01	5.23	89.00	5323.00	5331.00	5336.59	5340.78	5328.24	5333.86	9.59	5.78	0.56	8.17	328.45	
3		48	174.55	4.01	89.00	5331.00	5338.00	5340.78	5349.00	5335.90	5340.86	5.78	7.00	0.56	8.17	287.67	
4		48	196.26	0.51	89.00	5338.00	5339.00	5349.00	5346.00	5342.90	5343.66	7.00	3.00	1.00	7.08	102.54	
5		48	371.08	0.27	75.00	5323.00	5324.00	5336.59	5330.00	5328.24	5329.26	9.59	2.00	1.00	5.97	74.57	
UPM System 3										Number of lines: 5			Date: 3/23/2017				
NOTES: i Inlet control; ** Critical depth																	

Storm Sewer Profile



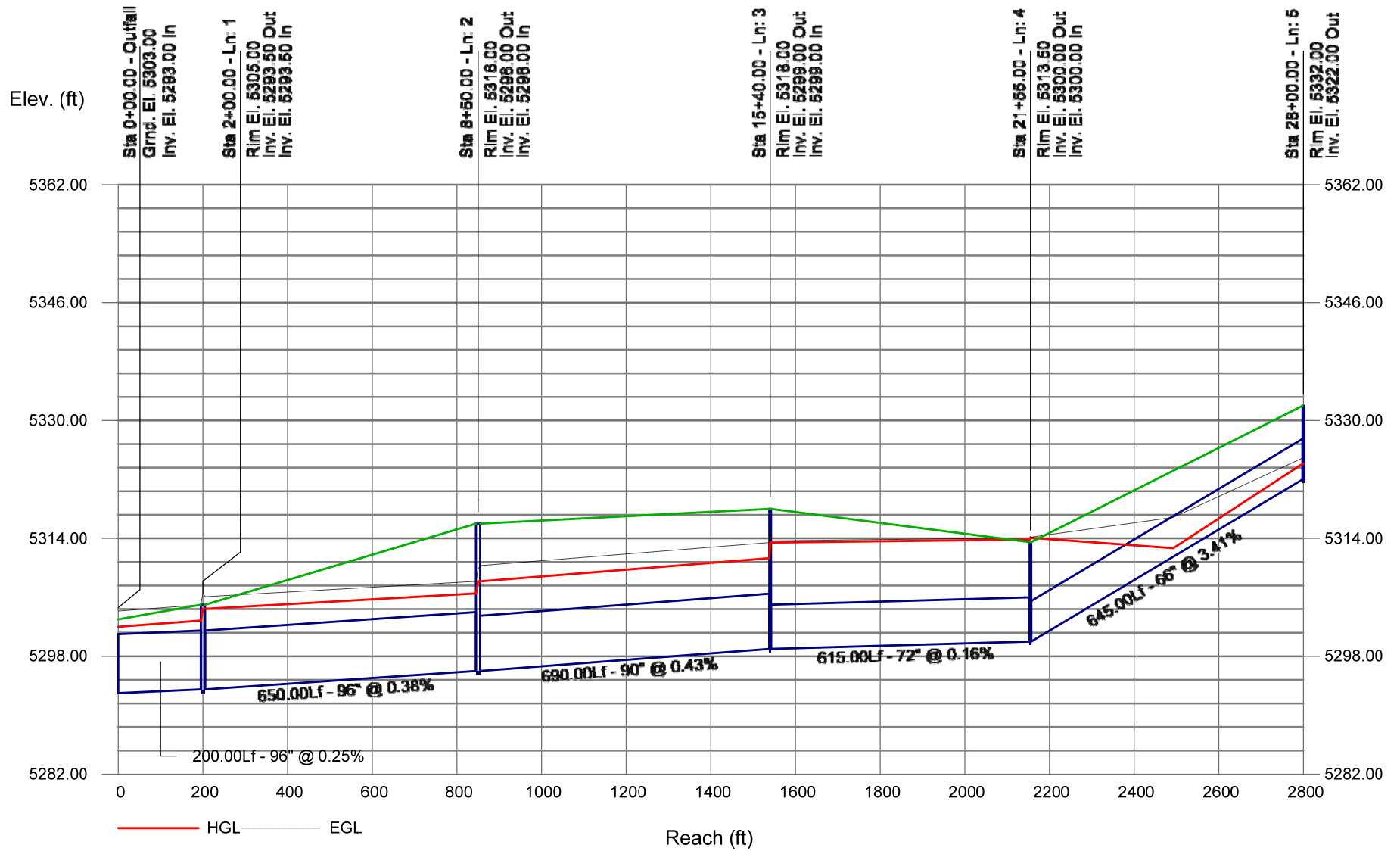
Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Line No.	Line ID	Line Size	Line Length	Line Slope	Flow Rate	Invert Dn	Invert Up	Gnd/Rim El Dn	Gnd/Rim El Up	HGL Dn	HGL Up	Cover Dn	Cover Up	J-Loss Coeff	Vel Ave	Capac Full	
		(in)	(ft)	(%)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)		(ft/s)	(cfs)	
1		96	200.00	0.25	516.00	5293.00	5293.50	5303.00	5305.00	5302.00	5302.64	2.00	3.50	0.75	10.27	456.16	
2		96	650.00	0.38	516.00	5293.50	5296.00	5305.00	5316.00	5303.87	5305.95	3.50	12.00	1.00	10.27	565.79	
3		90	690.00	0.43	459.00	5296.00	5299.00	5316.00	5318.00	5307.59	5310.06	12.50	11.50	1.00	10.39	506.44	
4		72	615.00	0.16	109.00	5299.00	5300.00	5318.00	5313.50	5311.73	5312.14	13.00	7.50	1.00	3.86	170.80	
5		66	645.00	3.41	55.00	5300.00	5322.00	5313.50	5332.00	5312.37	5324.02 j	8.00	4.50	1.00	4.63	620.27	
6		84	1275.00	1.88	350.00	5301.00	5325.00	5318.00	5338.00	5311.73	5329.93	10.00	6.00	1.00	10.59	876.66	
7		48	727.50	3.16	82.00	5325.00	5348.00	5338.00	5358.00	5329.93	5350.74	9.00	6.00	0.15	7.73	255.41	
8		48	727.50	2.61	50.00	5348.00	5367.00	5358.00	5375.00	5350.74	5369.12 j	6.00	4.00	1.00	6.42	232.14	
9		78	640.00	0.31	246.00	5325.00	5327.00	5338.00	5335.00	5329.93	5331.52	6.50	1.50	1.00	9.55	293.14	
10		66	847.50	0.94	131.00	5327.00	5335.00	5335.00	5343.00	5333.07	5338.18	2.50	2.50	0.15	7.36	326.31	
11		54	847.50	2.48	44.00	5335.00	5356.00	5343.00	5362.00	5338.18	5357.91 j	3.50	1.50	0.75	5.25	309.57	
12		48	225.00	2.22	44.00	5356.00	5361.00	5362.00	5368.00	5357.91	5362.98	2.00	3.00	1.00	7.25	214.14	
13		36	410.00	2.44	19.00	5361.00	5371.00	5368.00	5377.00	5362.98	5372.40 j	4.00	3.00	1.00	4.86	104.16	
14		36	150.00	1.33	25.00	5360.00	5362.00	5368.00	5371.00	5362.98	5363.61 j	5.00	6.00	1.00	5.00	77.01	
15		36	100.00	1.00	20.00	5327.00	5328.00	5335.00	5335.00	5333.07	5333.16	5.00	4.00	1.00	2.83	66.69	
Project File: UPM System 4.stm											Number of lines: 15			Date: 5/27/2015			
NOTES: ** Critical depth																	

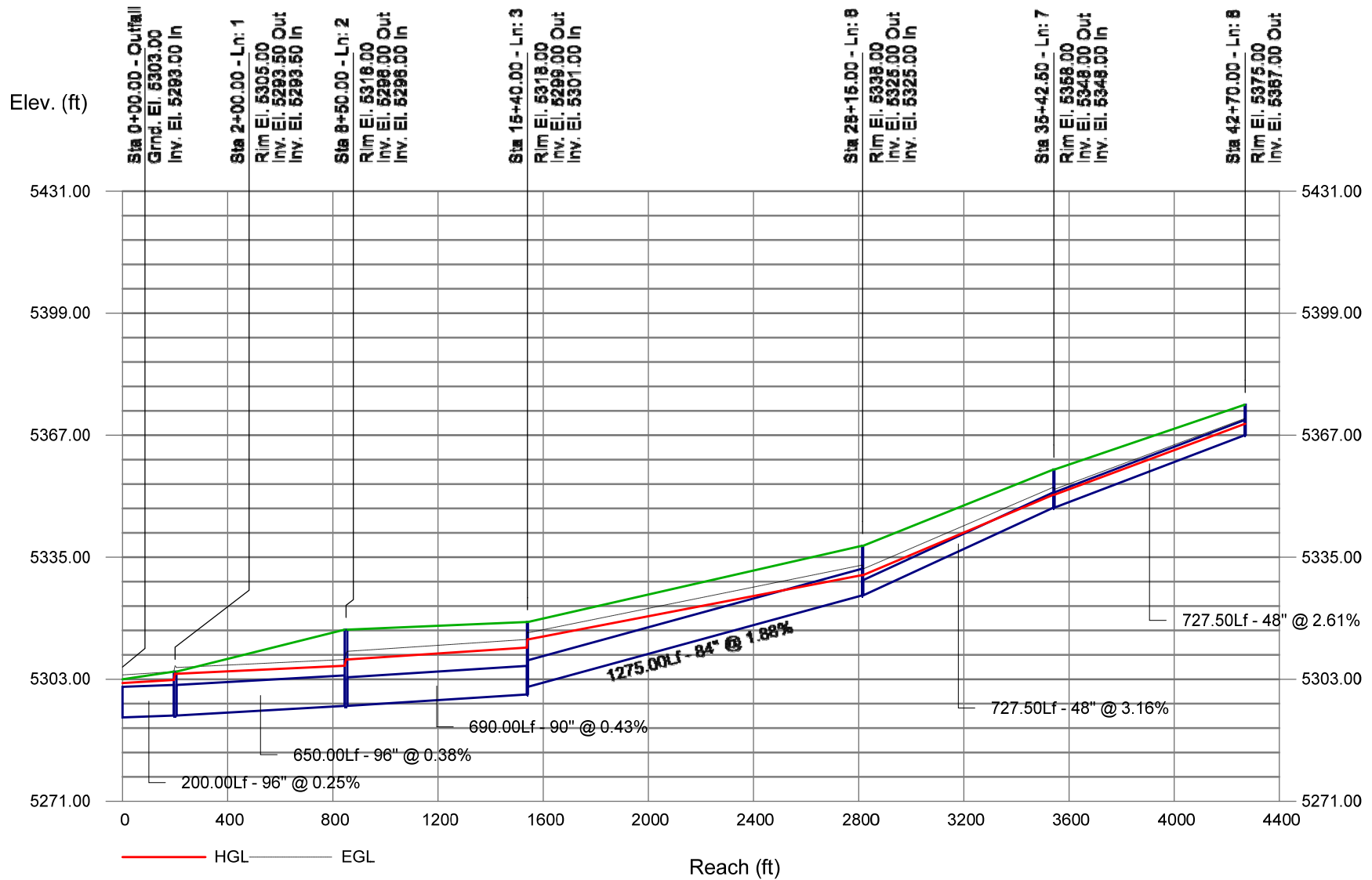
Storm Sewer Profile

Proj. file: UPM System 4.stm



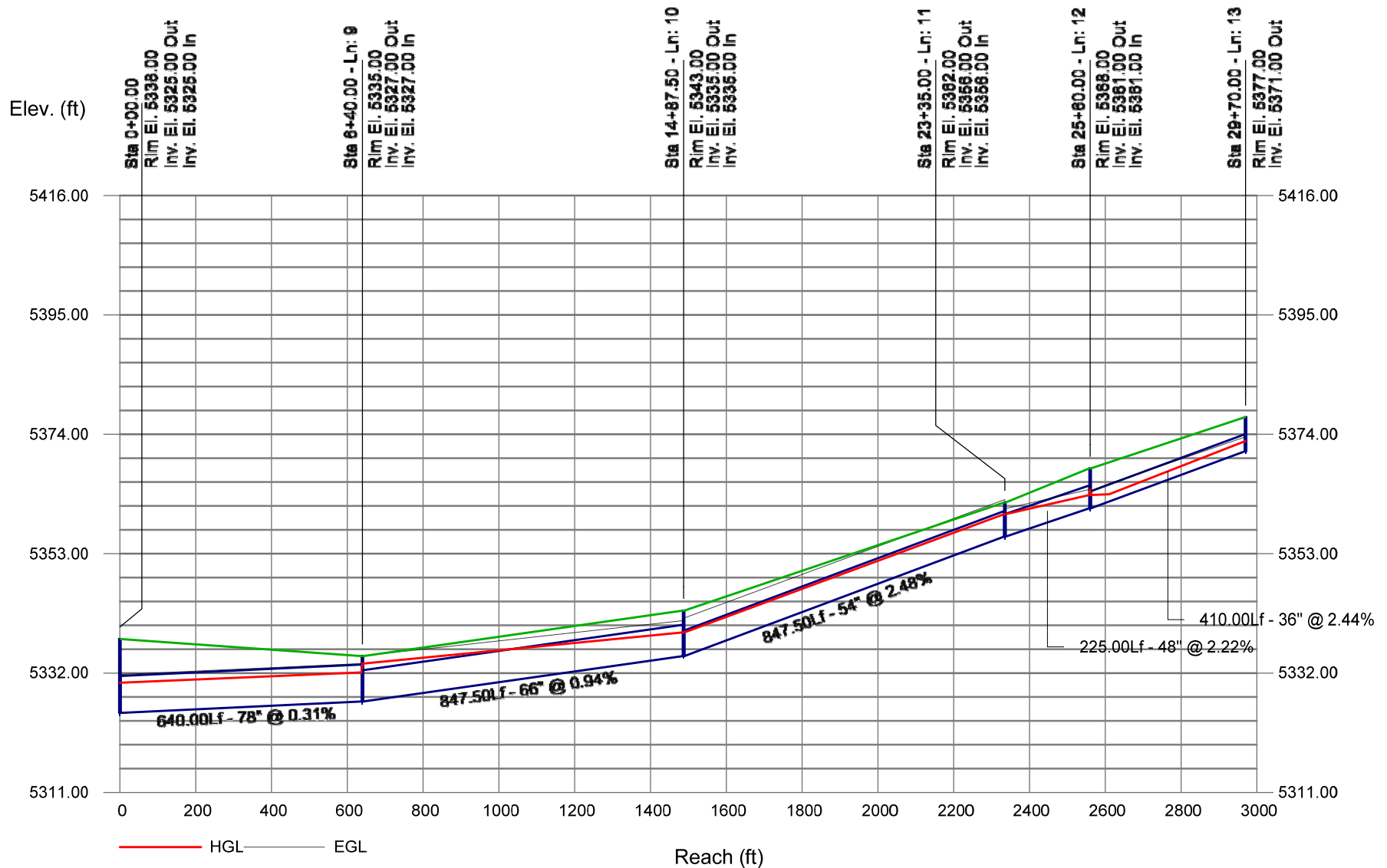
Storm Sewer Profile

Proj. file: UPM System 4.stm



Storm Sewer Profile

Proj. file: UPM System 4.stm



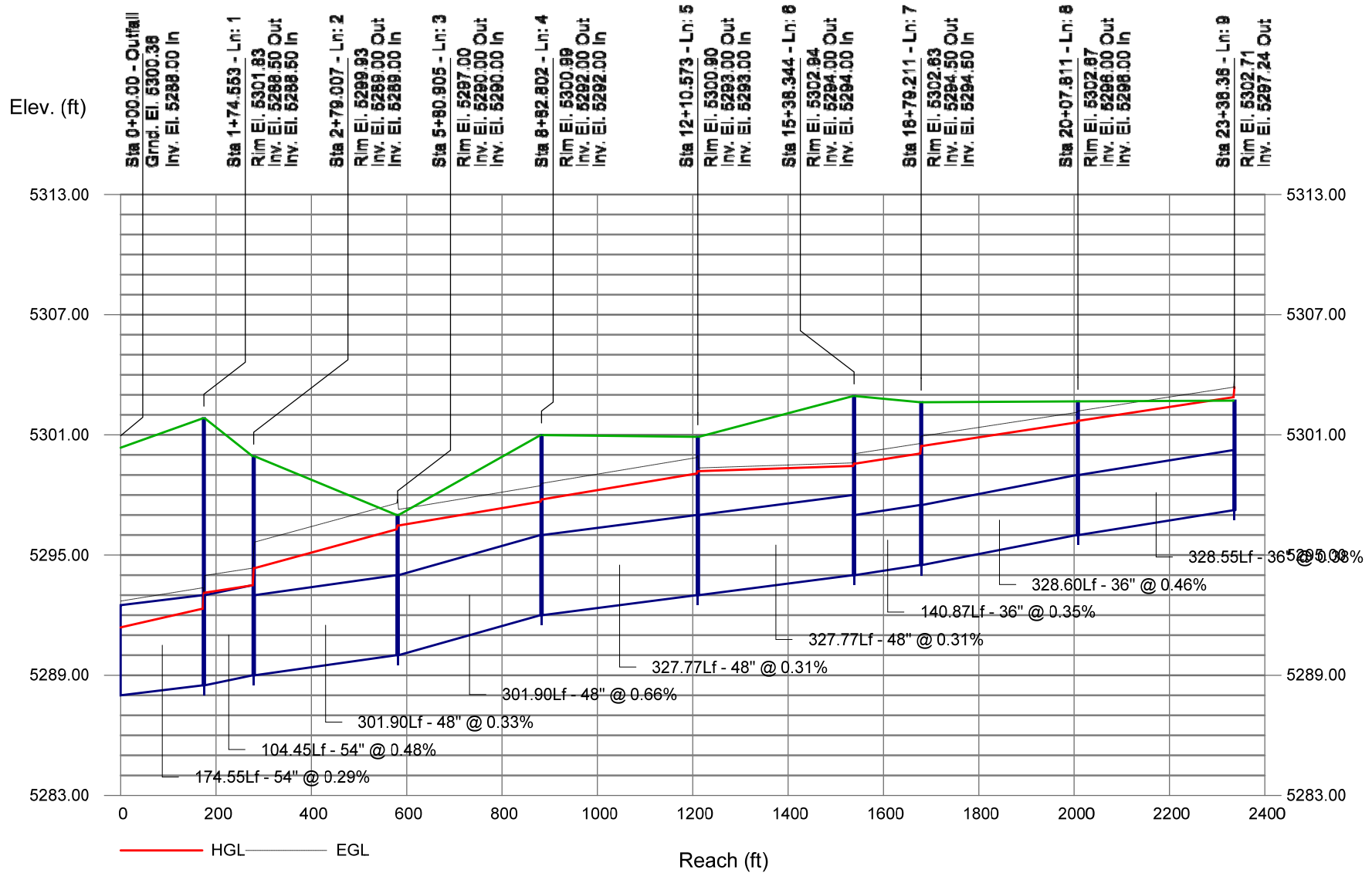
UPM System 5



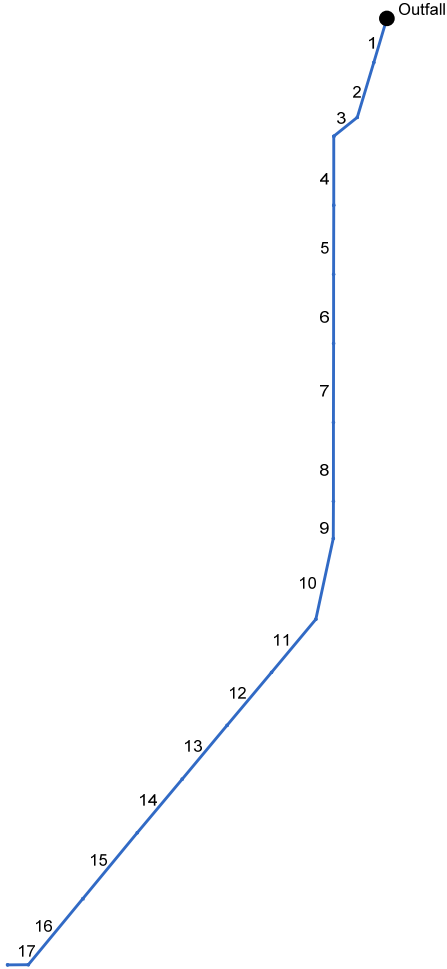
Line No.	Line ID	Line Size (in)	Line Length (ft)	Line Slope (%)	Flow Rate (cfs)	Invert Dn (ft)	Invert Up (ft)	Gnd/Rim El Dn (ft)	Gnd/Rim El Up (ft)	HGL Dn (ft)	HGL Up (ft)	Cover Dn (ft)	Cover Up (ft)	J-Loss Coeff	Vel Ave (ft/s)	Capac Full (cfs)	
1		54	174.55	0.29	118.00	5288.00	5288.50	5300.36	5301.83	5291.39	5292.33	7.86	8.83	0.75	8.68	105.25	
2		54	104.45	0.48	118.00	5288.50	5289.00	5301.83	5299.93	5293.12	5293.49	8.83	6.43	1.00	7.42	136.06	
3		48	301.90	0.33	115.00	5289.00	5290.00	5299.93	5297.00	5294.35	5296.28	6.93	3.00	0.15	9.15	82.67	
4		48	301.90	0.66	90.00	5290.00	5292.00	5297.00	5300.99	5296.48	5297.67	3.00	4.99	0.15	7.16	116.92	
5		48	327.77	0.31	90.00	5292.00	5293.00	5300.99	5300.90	5297.78	5299.07	4.99	3.90	0.15	7.16	79.34	
6		48	327.77	0.31	40.00	5293.00	5294.00	5300.90	5302.94	5299.19	5299.45	3.90	4.94	0.75	3.18	79.34	
7		36	140.87	0.35	40.00	5294.00	5294.50	5302.94	5302.63	5299.56	5300.07	5.94	5.13	0.75	5.66	39.73	
8		36	328.60	0.46	40.00	5294.50	5296.00	5302.63	5302.67	5300.44	5301.63	5.13	3.67	0.15	5.66	45.06	
9		36	328.55	0.38	40.00	5296.00	5297.24	5302.67	5302.71	5301.70	5302.88	3.67	2.47	1.00	5.66	40.98	
UPM System 5											Number of lines: 9			Date: 5/27/2015			
NOTES: i Inlet control; ** Critical depth																	

Storm Sewer Profile

Proj. file: UPM System 5.stm



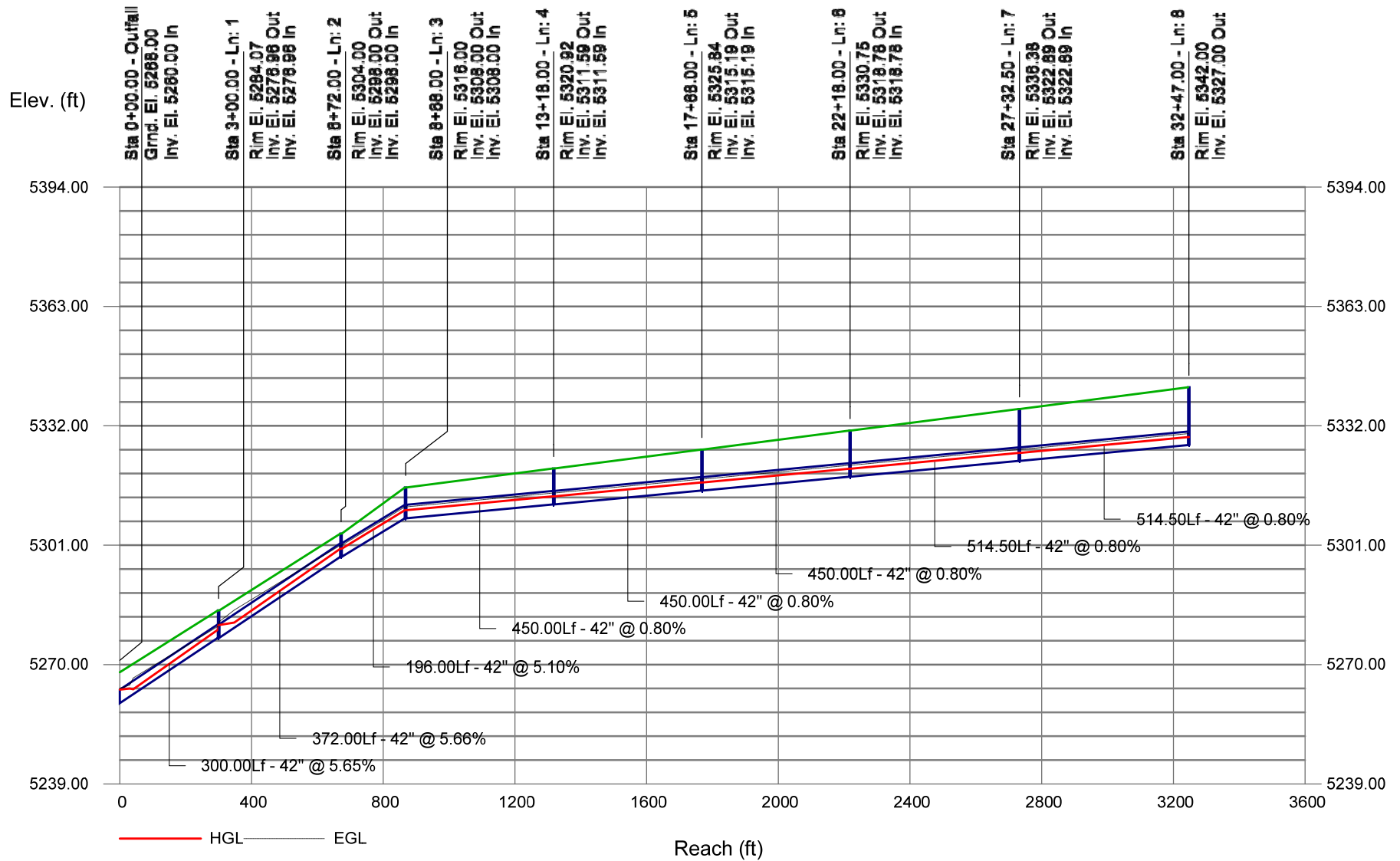
UPM to Calabacillas



Line No.	Line ID	Line Size	Line Length	Line Slope	Flow Rate	Invert Dn	Invert Up	Gnd/Rim El Dn	Gnd/Rim El Up	HGL Dn	HGL Up	Cover Dn	Cover Up	J-Loss Coeff	Vel Ave	Capac Full	
		(in)	(ft)	(%)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)		(ft/s)	(cfs)	
1		42	300.00	5.65	45.00	5260.00	5276.96	5268.00	5284.07	5263.50	5279.05 j	4.50	3.61	0.15	6.09	239.21	
2		42	372.00	5.66	45.00	5276.96	5298.00	5284.07	5304.00	5280.29	5300.09 j	3.61	2.50	0.62	6.14	239.27	
3		42	196.00	5.10	45.00	5298.00	5308.00	5304.00	5316.00	5300.09	5310.09	2.50	4.50	0.81	7.51	227.25	
4		42	450.00	0.80	45.00	5308.00	5311.59	5316.00	5320.92	5310.09	5313.68	4.50	5.83	0.15	7.51	89.86	
5		42	450.00	0.80	45.00	5311.59	5315.19	5320.92	5325.84	5313.68	5317.28	5.83	7.15	0.15	7.51	89.99	
6		42	450.00	0.80	45.00	5315.19	5318.78	5325.84	5330.75	5317.28	5320.87	7.15	8.47	0.15	7.51	89.86	
7		42	514.50	0.80	45.00	5318.78	5322.89	5330.75	5336.38	5320.87	5324.98	8.47	9.99	0.15	7.51	89.92	
8		42	514.50	0.80	45.00	5322.89	5327.00	5336.38	5342.00	5324.98	5329.09	9.99	11.50	0.15	7.51	89.92	
9		42	242.00	0.83	45.00	5327.00	5329.00	5342.00	5344.72	5329.09	5331.09	11.50	12.22	0.25	7.51	91.46	
10		42	537.70	0.37	45.00	5329.00	5331.00	5344.72	5338.30	5331.31	5333.18	12.22	3.80	0.52	6.92	61.36	
11		42	450.00	0.17	45.00	5331.00	5331.75	5338.30	5339.32	5334.50	5335.40	3.80	4.07	0.15	4.68	41.07	
12		42	450.00	0.16	45.00	5331.75	5332.49	5339.32	5340.34	5335.45	5336.35	4.07	4.35	0.15	4.68	40.80	
13		42	455.00	0.17	45.00	5332.49	5333.25	5340.34	5341.37	5336.40	5337.31	4.35	4.62	0.15	4.68	41.11	
14		42	455.00	0.16	45.00	5333.25	5334.00	5341.37	5342.40	5337.36	5338.27	4.62	4.90	0.15	4.68	40.85	
15		42	556.50	0.45	45.00	5334.00	5336.50	5342.40	5343.70	5338.33	5339.34	4.90	3.70	0.15	5.03	67.43	
16		42	556.50	0.45	45.00	5336.50	5339.00	5343.70	5345.00	5339.41	5341.09	3.70	2.50	0.80	6.39	67.43	
17		42	135.00	3.70	45.00	5339.00	5344.00	5345.00	5350.00	5342.33	5346.09 j	2.50	2.50	1.00	6.14	193.62	
UPM to Calabacillas										Number of lines: 17				Date: 3/13/2015			
NOTES: i Inlet control; ** Critical depth																	

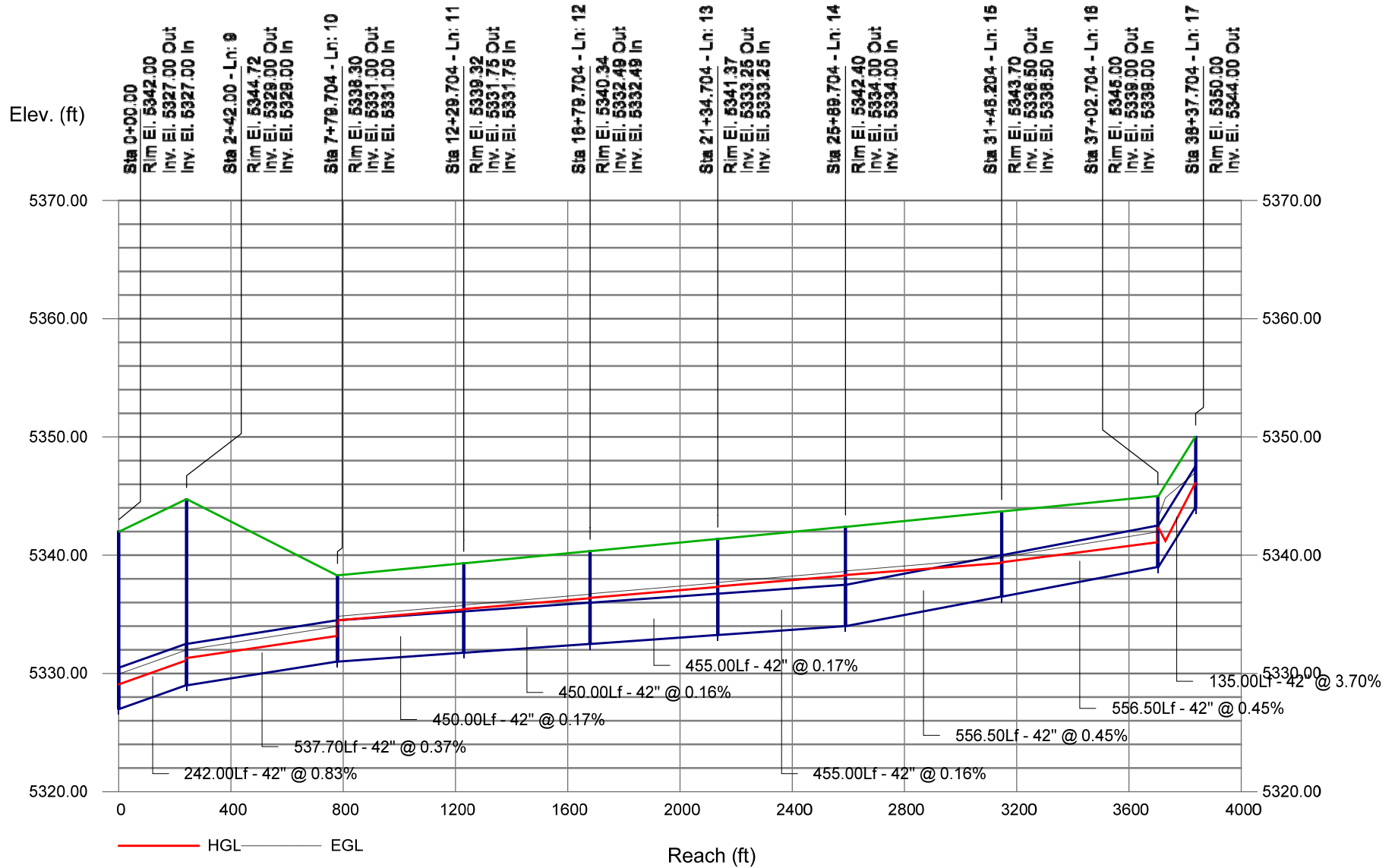
Storm Sewer Profile

Proj. file: UPM to Calabacillas.stm

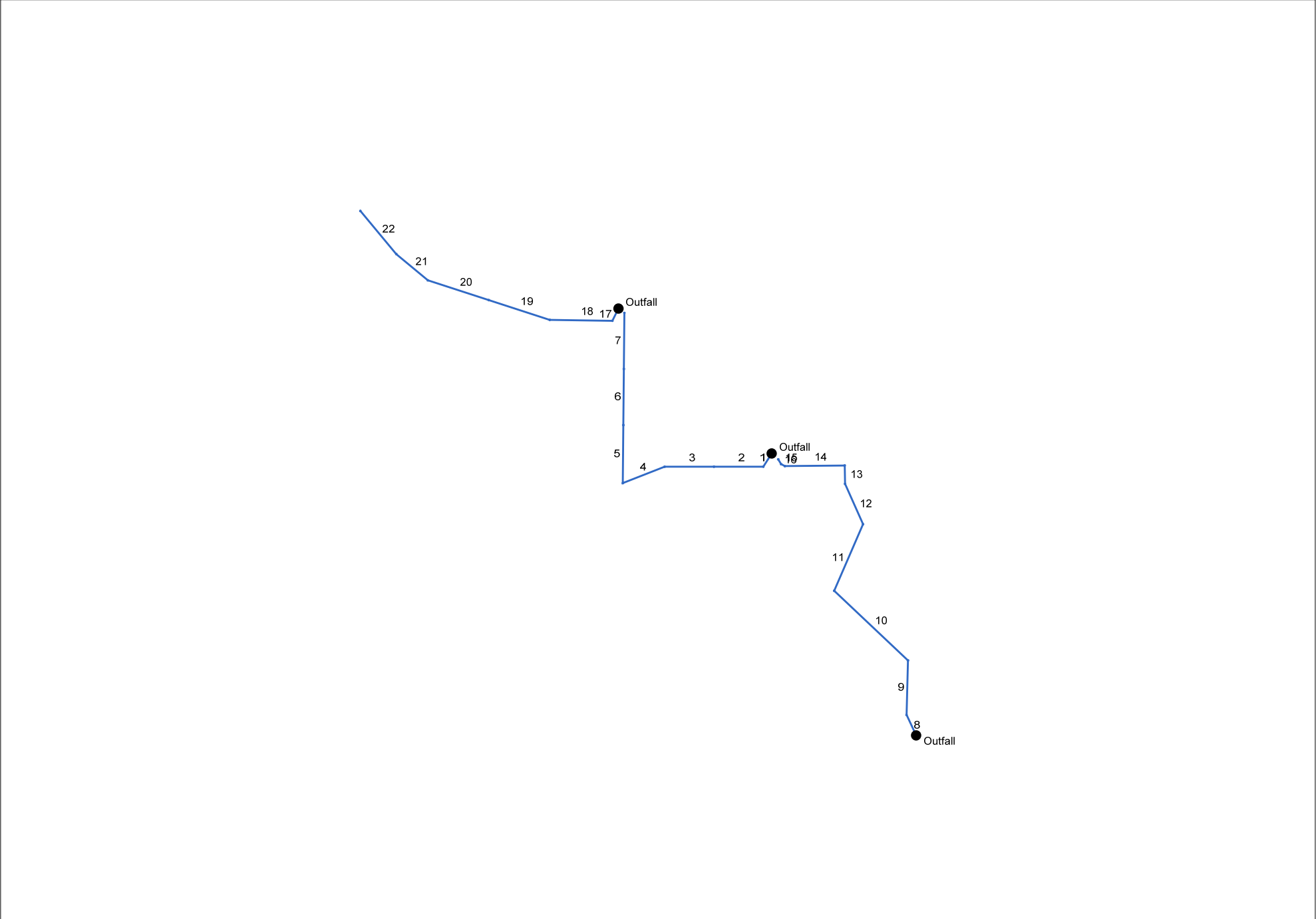


Storm Sewer Profile

Proj. file: UPM to Calabacillas.stm



UPM to Mariposa



Project File: UPM to Mariposa.stm	Number of lines: 22	Date: 3/13/2015
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Line No.	Line ID	Line Size (in)	Line Length (ft)	Line Slope (%)	Flow Rate (cfs)	Invert Dn (ft)	Invert Up (ft)	Gnd/Rim EI Dn (ft)	Gnd/Rim EI Up (ft)	HGL Dn (ft)	HGL Up (ft)	Cover Dn (ft)	Cover Up (ft)	J-Loss Coeff	Vel Ave (ft/s)	Capac Full (cfs)	
1	Pond 6 Inlet	54	107.13	0.47	164.00	5318.50	5319.00	5326.00	5326.60	5323.00	5323.75	3.00	3.10	0.87	10.31	134.35	
2		54	338.44	1.18	164.00	5319.00	5323.00	5326.60	5331.75	5325.55	5327.91	3.10	4.25	0.15	10.31	213.80	
3		42	338.44	1.18	114.00	5323.00	5327.00	5331.75	5336.90	5329.55	5333.90	5.25	6.40	0.42	11.85	109.38	
4		42	307.73	0.97	114.00	5327.00	5330.00	5336.90	5341.00	5334.43	5338.38	6.40	7.50	1.00	11.85	99.34	
5		42	400.00	1.28	64.00	5330.00	5335.12	5341.00	5346.59	5340.56	5342.18	7.50	7.97	0.15	6.65	113.83	
6		36	385.95	1.80	64.00	5335.12	5342.06	5346.59	5351.99	5342.29	5345.84	8.47	6.93	0.15	9.06	89.43	
7	Pond 5 Outlet	36	385.94	1.28	64.00	5342.06	5347.00	5351.99	5358.00	5346.88	5350.43	6.93	8.00	1.00	9.06	75.45	
8	Pond 8 Inlet	66	155.64	1.29	257.00	5265.00	5267.00	5274.00	5277.07	5270.50	5271.46	3.50	4.57	0.50	11.63	380.72	
9		66	375.13	3.47	257.00	5267.00	5280.00	5277.07	5290.78	5275.50	5284.46	4.57	5.28	0.78	11.63	625.22	
10		60	697.10	2.44	187.00	5280.00	5297.00	5290.78	5306.32	5288.50	5300.91	5.78	4.32	0.95	10.44	406.75	
11		60	499.39	2.80	187.00	5297.00	5311.00	5306.32	5326.29	5304.17	5314.91	4.32	10.29	0.77	10.44	436.11	
12		48	303.75	0.88	117.00	5311.00	5313.66	5326.29	5322.00	5318.17	5320.18	11.29	4.34	0.45	9.31	134.43	
13	Existing	48	126.14	0.80	117.00	5313.66	5314.67	5322.00	5328.42	5320.79	5321.63	4.34	9.75	1.00	9.31	128.52	
14	Existing	48	410.39	0.80	117.00	5314.67	5317.95	5328.42	5325.00	5322.98	5325.70	9.75	3.05	0.54	9.31	128.43	
15	Existing	48	29.36	0.82	117.00	5317.95	5318.19	5325.00	5325.50	5326.43	5326.62	3.05	3.31	0.57	9.31	129.81	
16	Pond 6 Outlet	48	38.20	0.47	117.00	5318.19	5318.37	5325.50	5326.10	5327.39	5327.64	3.31	3.73	1.00	9.31	98.65	
17	Pond 5 Inlet	66	93.80	2.13	260.20	5349.00	5351.00	5358.00	5361.16	5354.50	5355.49	3.50	4.66	0.92	11.75	490.42	
18		66	430.00	1.40	192.00	5351.00	5357.00	5361.16	5365.11	5359.60	5360.88	4.66	2.61	0.35	9.41	396.73	
19		54	439.00	1.14	176.00	5357.00	5362.00	5365.11	5370.16	5363.60	5367.11	3.61	3.66	0.15	11.07	209.88	
20		54	439.00	1.14	176.00	5362.00	5367.00	5370.16	5375.20	5369.20	5372.72	3.66	3.70	0.43	11.07	209.88	
21		48	282.00	1.77	103.00	5367.00	5372.00	5375.20	5379.54	5374.20	5375.38	4.20	3.54	0.22	8.65	191.27	
22		48	386.00	3.11	103.00	5372.00	5384.00	5379.54	5391.01	5377.04	5387.07	3.54	3.01	1.00	9.07	253.28	

UPM to Mariposa

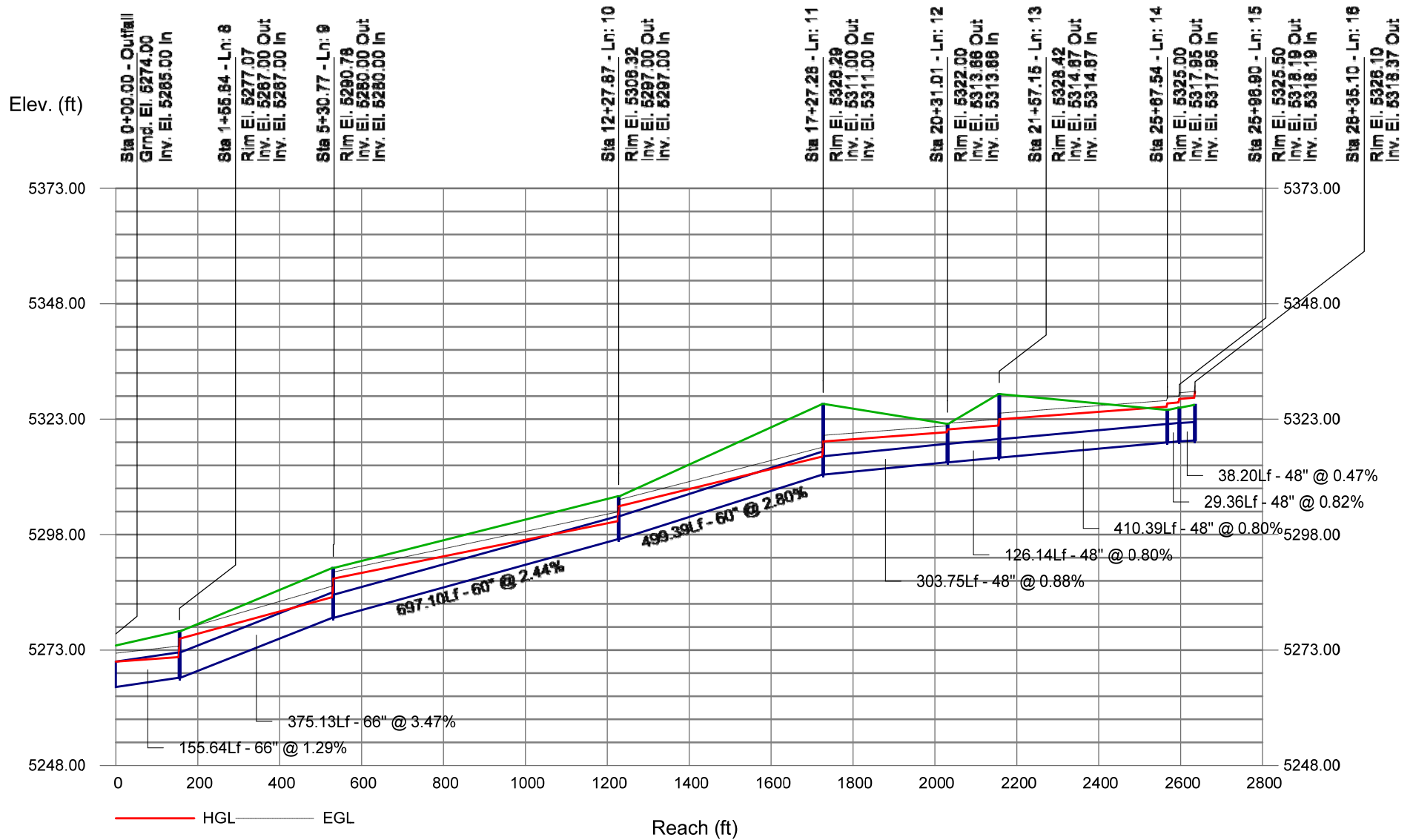
Number of lines: 22

Date: 3/13/2015

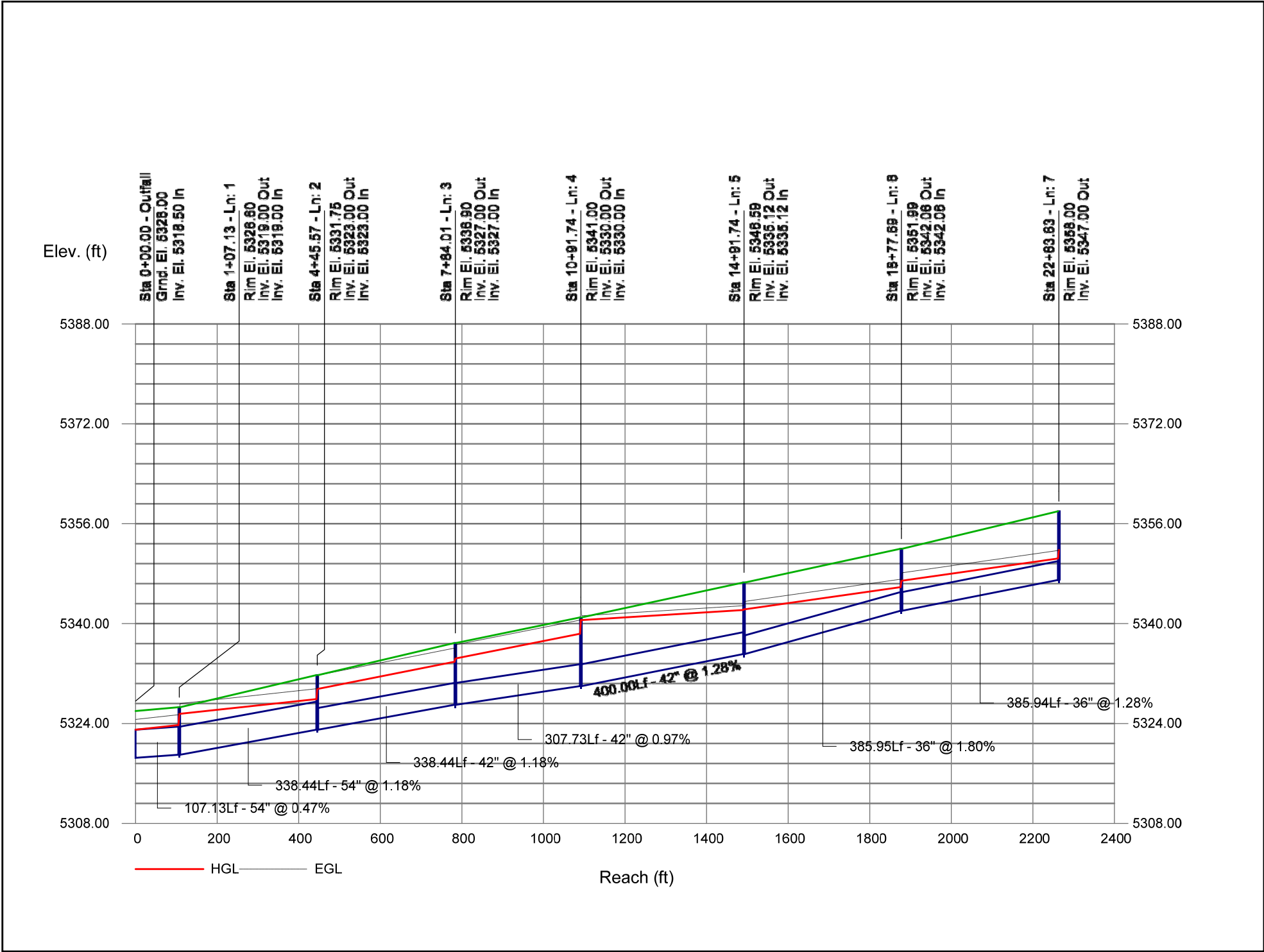
NOTES: i Inlet control; ** Critical depth

Storm Sewer Profile

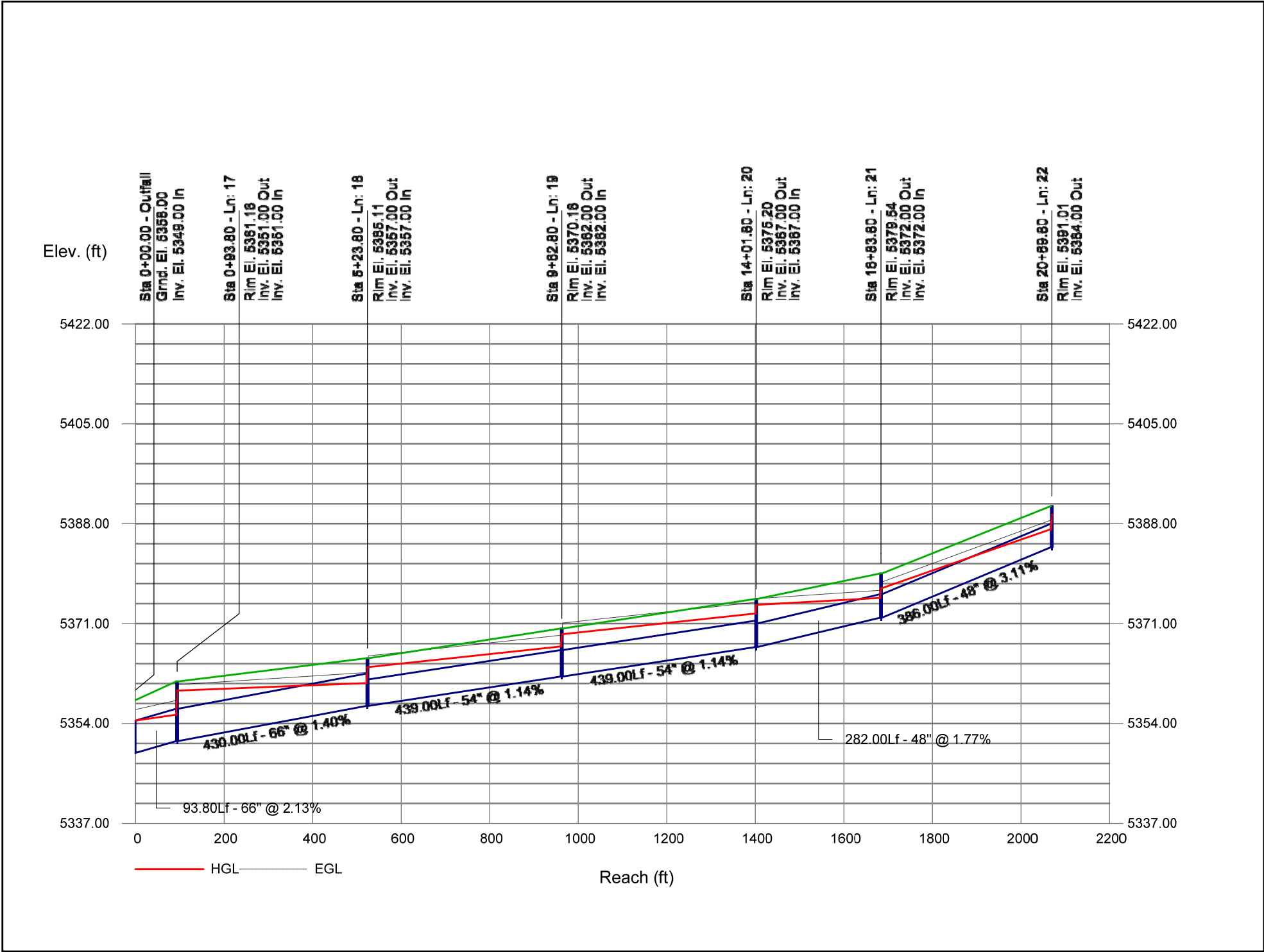
Proj. file: UPM to Mariposa.stm



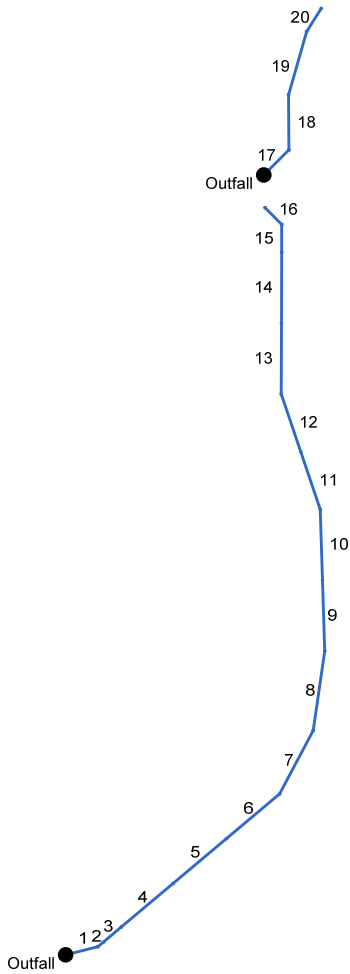
Storm Sewer Profile



Storm Sewer Profile



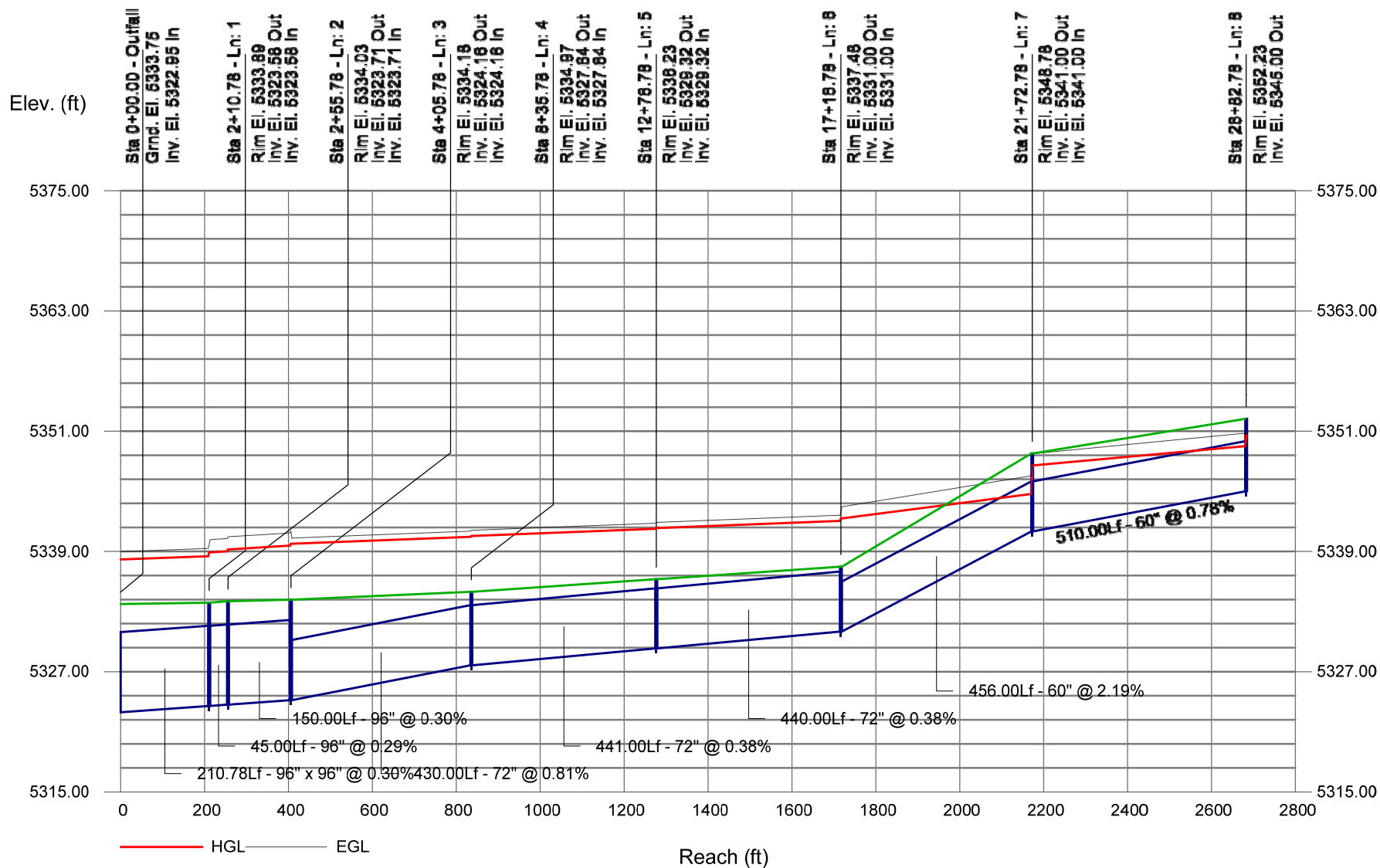
Unser System _ALT 2



Line No.	Line ID	Line Size	Line Length	Line Slope	Flow Rate	Invert Dn	Invert Up	Gnd/Rim El Dn	Gnd/Rim El Up	HGL Dn	HGL Up	Cover Dn	Cover Up	J-Loss Coeff	Vel Ave	Capac Full	
		(in)	(ft)	(%)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)		(ft/s)	(cfs)	
1		96 x 96	210.78	0.30	454.00	5322.95	5323.58	5333.75	5333.89	5338.20	5338.52	2.80	2.31	0.49	7.09	634.98	
2		96	45.00	0.29	454.00	5323.58	5323.71	5333.89	5334.03	5338.91	5339.02	2.31	2.32	0.15	9.03	490.13	
3		96	150.00	0.30	454.00	5323.71	5324.16	5334.03	5334.18	5339.21	5339.58	2.32	2.02	0.15	9.03	499.80	
4		72	430.00	0.81	170.00	5324.16	5327.64	5334.18	5334.97	5339.77	5340.46	4.02	1.33	0.15	6.01	381.05	
5		72	441.00	0.38	170.00	5327.64	5329.32	5334.97	5336.23	5340.55	5341.26	1.33	0.91	0.15	6.01	261.41	
6		72	440.00	0.38	170.00	5329.32	5331.00	5336.23	5337.48	5341.34	5342.05	0.91	0.48	0.43	6.01	261.75	
7		60	456.00	2.19	170.00	5331.00	5341.00	5337.48	5348.78	5342.29	5344.73	1.48	2.78	0.39	9.73	385.72	
8		60	510.00	0.78	170.00	5341.00	5345.00	5348.78	5352.23	5347.59	5349.51	2.78	2.23	0.21	8.89	230.68	
9		60	451.00	0.67	170.00	5345.00	5348.00	5352.23	5355.00	5350.62	5352.23	2.23	2.00	0.15	9.13	212.44	
10		60	451.00	0.67	170.00	5348.00	5351.00	5355.00	5357.76	5353.85	5355.53	2.00	1.76	0.34	8.88	212.44	
11		60	387.50	1.94	170.00	5351.00	5358.50	5357.76	5366.17	5356.61	5362.23	1.76	2.67	0.15	9.73	362.37	
12		60	387.50	1.94	170.00	5358.50	5366.00	5366.17	5374.57	5365.09	5369.73	2.67	3.57	0.37	9.73	362.37	
13		60	450.00	2.39	170.00	5366.00	5376.74	5374.57	5384.82	5372.59	5380.47	3.57	3.08	0.15	9.73	402.40	
14		60	450.00	2.38	170.00	5376.74	5387.47	5384.82	5395.07	5383.33	5391.20	3.08	2.60	0.15	9.73	402.21	
15		60	178.00	3.80	170.00	5387.47	5394.24	5395.07	5401.53	5394.06	5397.97	2.60	2.29	0.75	9.73	507.97	
16		60	150.00	3.17	170.00	5394.24	5399.00	5401.53	5407.99	5400.83	5402.73	2.29	3.99	1.00	9.73	463.98	
17		60	225.00	0.44	122.00	5396.00	5397.00	5401.53	5405.98	5402.00	5402.49	0.53	3.98	0.75	6.21	173.65	
18		60	351.00	0.28	122.00	5397.00	5398.00	5405.98	5404.79	5402.94	5403.72	3.98	1.79	0.33	6.21	139.03	
19		48	417.00	0.24	61.00	5398.00	5399.00	5404.79	5405.81	5403.91	5404.67	2.79	2.81	0.33	4.85	70.34	
20		48	175.00	0.57	61.00	5399.00	5400.00	5405.81	5406.54	5404.79	5405.10	2.81	2.54	1.00	4.85	108.59	
Unser System _ALT 2											Number of lines: 20			Date: 3/13/2015			
NOTES: i Inlet control; ** Critical depth																	

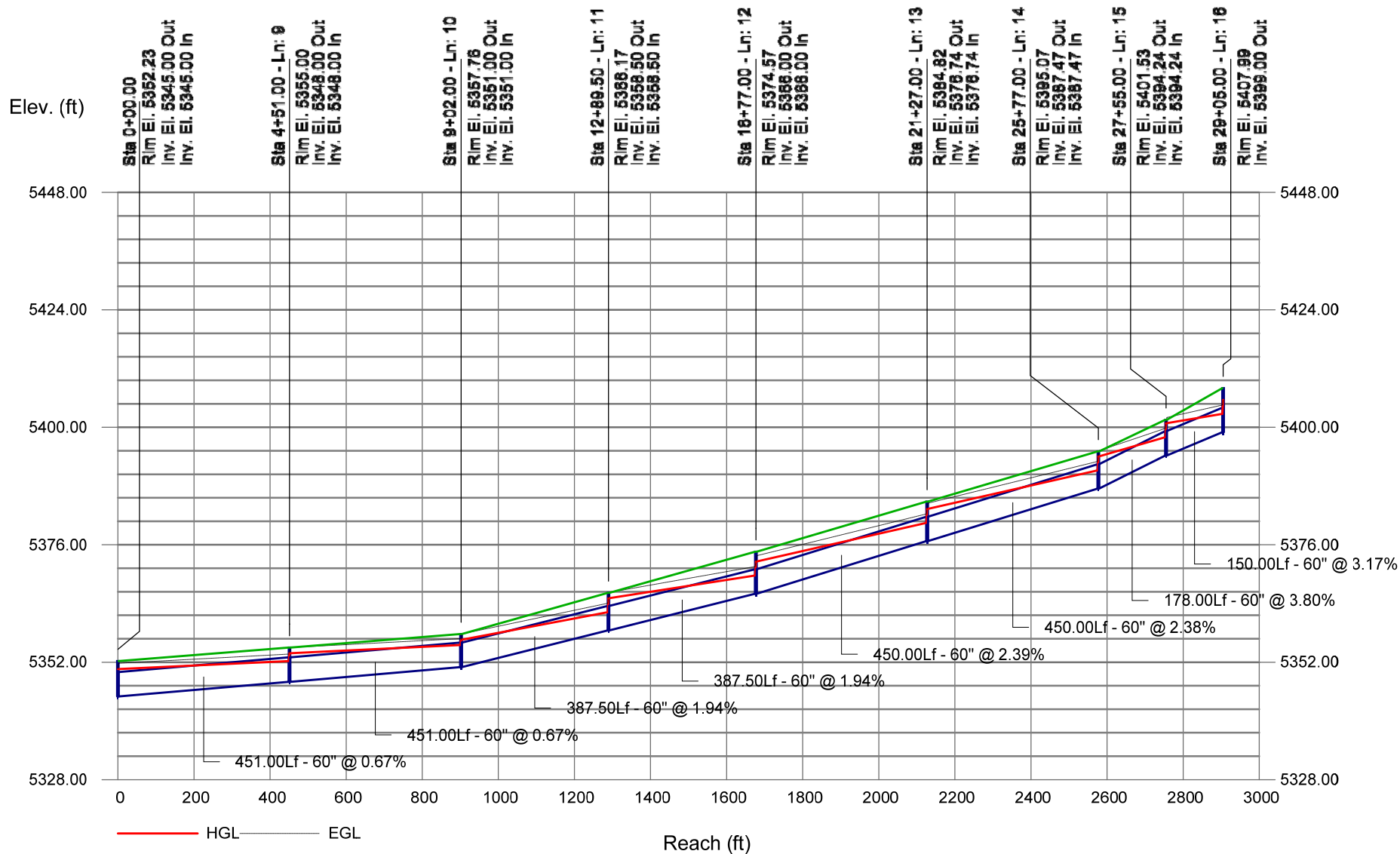
Storm Sewer Profile

Proj. file: Unser System_ALT 2.stm

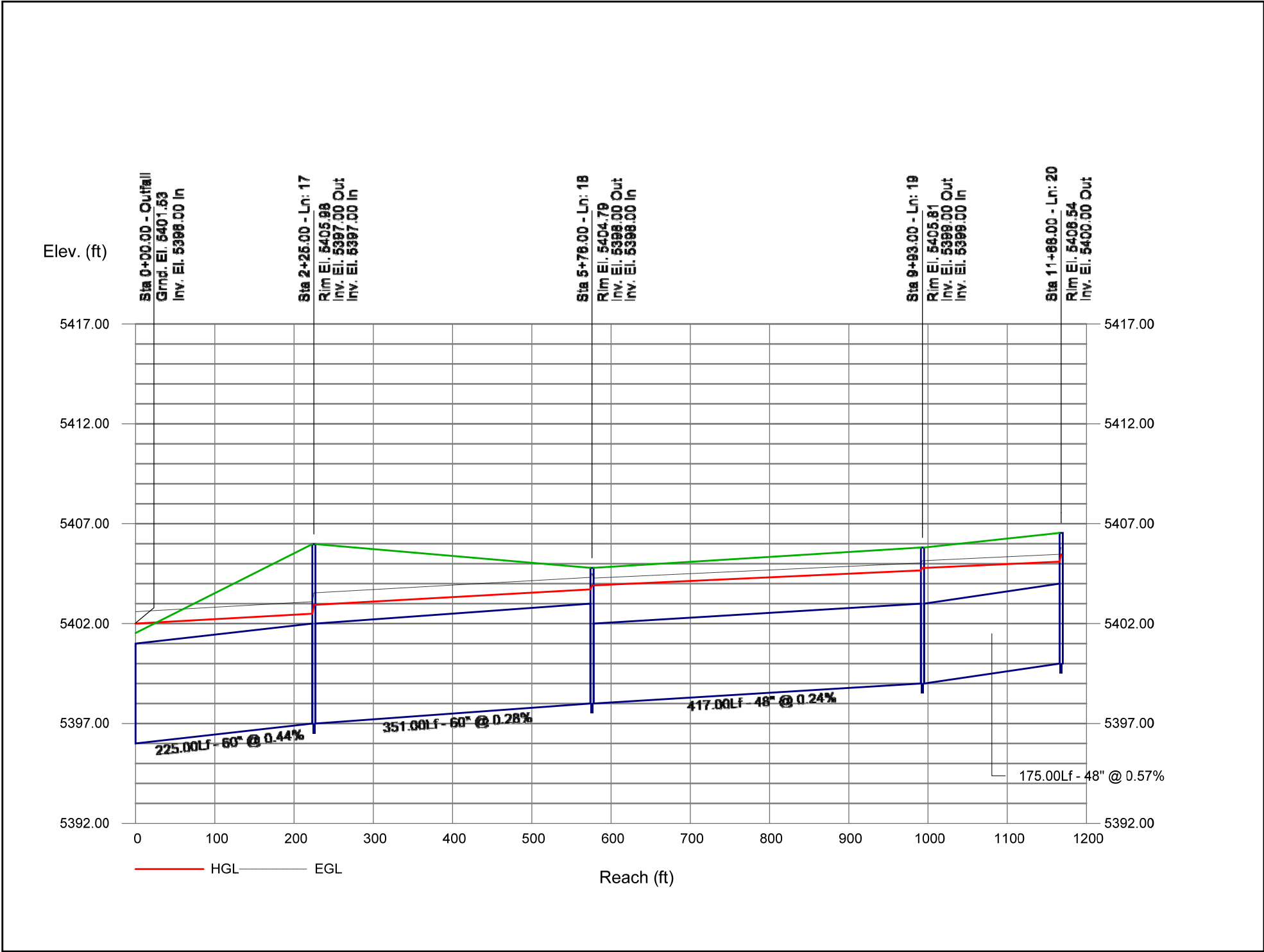


Storm Sewer Profile

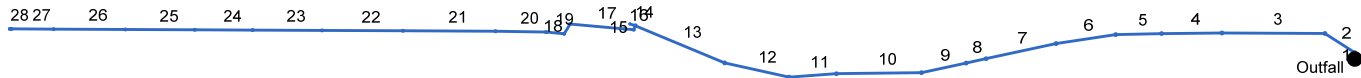
Proj. file: Unser System_ALT 2.stm



Storm Sewer Profile



Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Line No.	Line ID	Line Size (in)	Line Length (ft)	Line Slope (%)	Flow Rate (cfs)	Invert Dn (ft)	Invert Up (ft)	Gnd/Rim EI Dn (ft)	Gnd/Rim EI Up (ft)	HGL Dn (ft)	HGL Up (ft)	Cover Dn (ft)	Cover Up (ft)	J-Loss Coeff	Vel Ave (ft/s)	Capac Full (cfs)	
1	Existing Pond 2	84	28.00	2.18	578.00	5113.12	5113.73	5121.62	5127.50	5118.86	5119.91	1.50	6.77	0.50	16.59	943.01	
2		84	153.86	2.15	578.00	5113.73	5117.04	5127.50	5128.97	5119.91	5123.22	6.77	4.93	0.50	16.07	937.20	
3		84	445.22	0.89	450.00	5117.14	5121.11	5128.97	5134.16	5123.22	5126.68	4.83	6.05	0.15	13.19	603.35	
4		72	260.55	2.69	450.00	5121.11	5128.11	5134.16	5144.06	5126.68	5133.64	7.05	9.95	0.15	16.48	694.28	
5		72	198.75	4.80	450.00	5127.96	5137.50	5144.06	5154.60	5133.64	5143.03	10.10	11.10	0.16	16.38	928.01	
6		72	260.36	5.92	450.00	5137.80	5153.20	5154.60	5169.80	5143.03	5158.73	10.80	10.60	0.15	16.86	1030.18	
7		72	309.64	6.13	416.00	5153.40	5172.38	5169.80	5185.88	5158.73	5177.78	10.40	7.50	0.15	15.60	1048.70	
8		72	88.81	5.90	416.00	5172.58	5177.82	5185.88	5191.22	5177.78	5183.22	7.30	7.40	0.15	15.75	1028.86	
9		72	197.31	5.00	412.00	5178.02	5187.88	5191.22	5202.88	5183.22	5193.26	7.20	9.00	0.24	15.61	946.88	
10		72	367.56	2.85	412.00	5187.88	5198.35	5202.88	5217.15	5193.26	5203.73	9.00	12.80	0.15	15.40	714.90	
11		72	205.18	12.91	412.00	5198.35	5224.83	5217.15	5238.23	5203.73	5230.21	12.80	7.40	0.33	15.40	1521.68	
12		72	285.44	6.41	407.00	5224.83	5243.12	5238.23	5255.77	5230.21	5248.48	7.40	6.65	0.22	15.24	1072.22	
13		72	418.26	5.90	407.00	5243.27	5267.96	5255.77	5283.76	5248.48	5273.32	6.50	9.80	0.15	15.43	1029.13	
14		72	25.78	5.04	357.00	5268.06	5269.36	5283.76	5276.69	5273.32	5274.47	9.70	1.33	0.00	13.75	951.11	
15		48	18.55	15.09	134.00	5270.00	5272.80	5283.76	5281.50	5273.32	5276.25	9.76	4.70	0.00	11.82	558.01	
16		48	38.31	7.13	134.00	5273.22	5275.95	5281.50	5282.80	5276.25	5279.40	4.28	2.85	0.00	12.37	383.44	
17		48	238.15	4.69	134.00	5277.30	5288.46	5282.80	5297.50	5279.40	5291.91	1.50	5.04	0.00	15.84	310.96	
18		48	49.14	3.58	109.00	5288.72	5290.48	5297.50	5298.62	5291.91	5293.64	4.78	4.14	0.00	10.20	271.84	
19		48	78.64	4.70	129.00	5290.74	5294.44	5298.62	5303.21	5293.64	5297.84	3.88	4.77	0.00	12.29	311.56	
20		48	218.47	4.51	119.00	5295.00	5304.86	5303.21	5311.58	5297.84	5308.14	4.21	2.72	0.00	11.63	305.17	
21		48	400.00	2.48	109.00	5305.06	5315.00	5311.58	5321.48	5308.14	5318.16	2.52	2.48	0.00	10.37	226.44	
22		48	350.00	1.70	72.00	5316.00	5321.94	5321.48	5328.58	5318.16	5324.50	1.48	2.64	0.00	9.45	187.13	
23		48	300.00	3.59	72.00	5322.11	5332.89	5328.58	5339.89	5324.50	5335.45	2.47	3.00	0.00	8.82	272.30	

Project File: UPM System 6 PdN.stm

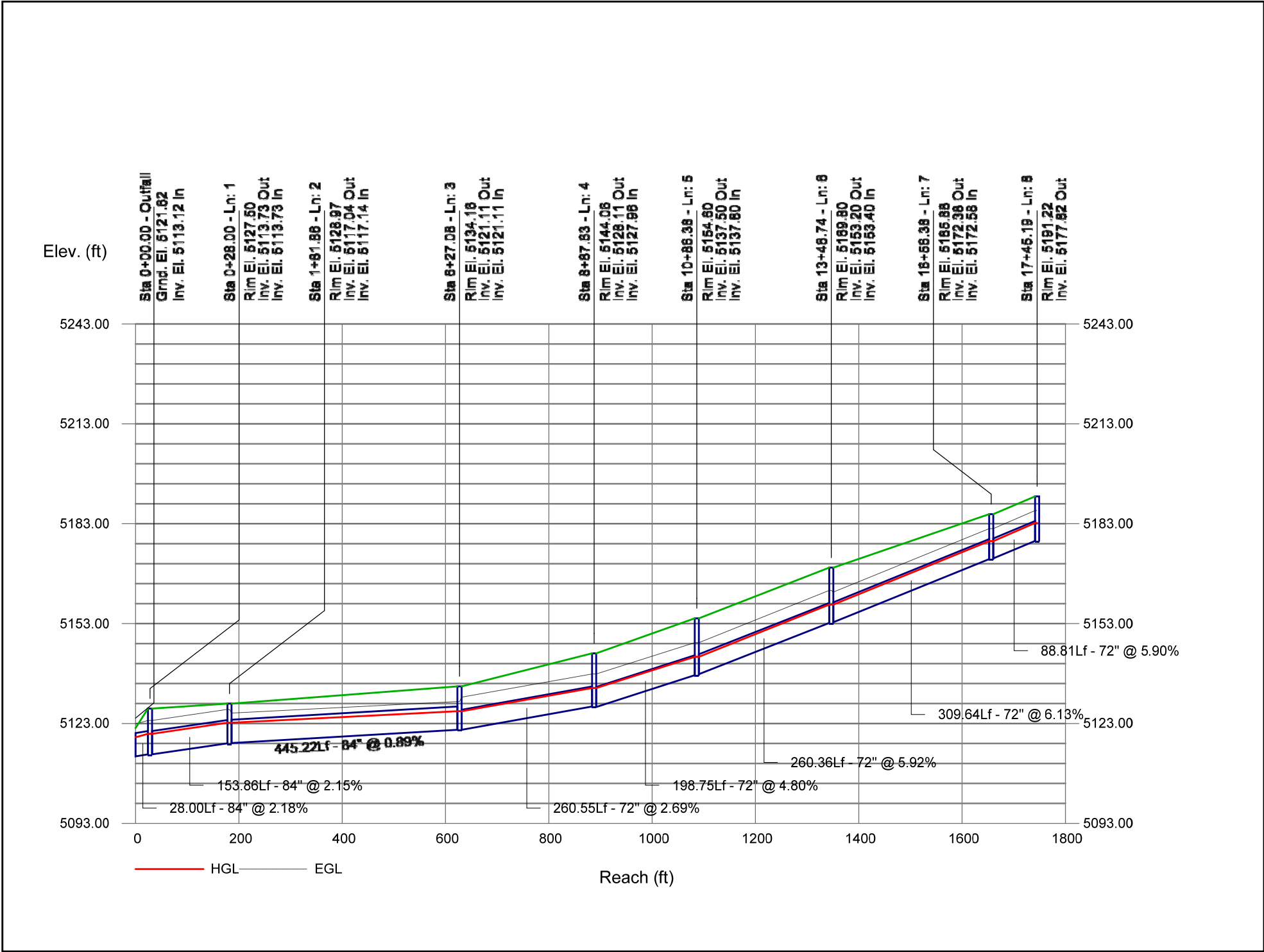
Number of lines: 28

Date: 5/27/2015

NOTES: ** Critical depth

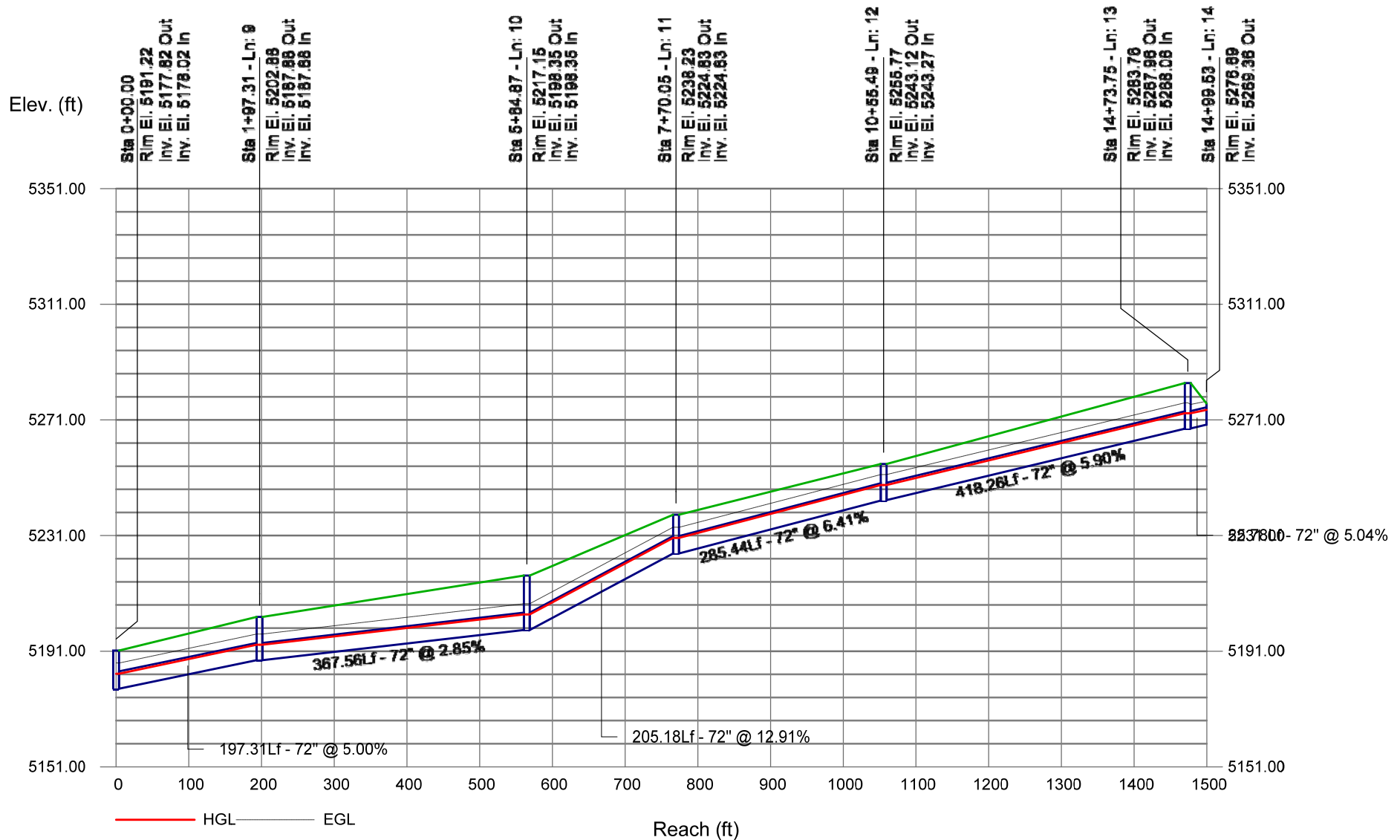
Line No.	Line ID	Line Size (in)	Line Length (ft)	Line Slope (%)	Flow Rate (cfs)	Invert Dn (ft)	Invert Up (ft)	Gnd/Rim El Dn (ft)	Gnd/Rim El Up (ft)	HGL Dn (ft)	HGL Up (ft)	Cover Dn (ft)	Cover Up (ft)	J-Loss Coeff	Vel Ave (ft/s)	Capac Full (cfs)	
24	Existing Cap	48	250.00	3.09	72.00	5333.06	5340.79	5339.89	5347.37	5335.45	5343.35	2.83	2.58	0.00	8.82	252.59	
25		42	300.00	1.14	67.00	5340.87	5344.29	5347.37	5352.50	5343.35	5346.85	3.00	4.71	0.00	9.02	107.42	
26		48	310.56	0.50	67.00	5344.32	5345.87	5352.50	5352.41	5346.85	5348.34	4.18	2.54	0.00	8.10	101.49	
27		48	181.44	0.65	67.00	5345.91	5347.09	5352.41	5353.47	5348.34	5349.56	2.50	2.38	0.00	8.31	115.83	
28		48	8.00	0.37	67.00	5347.16	5347.19	5353.47	5353.47	5349.63	5349.74	2.31	2.28	0.00	8.08	87.65	
Project File: UPM System 6 PdN.stm											Number of lines: 28			Date: 5/27/2015			
NOTES: ** Critical depth																	

Storm Sewer Profile



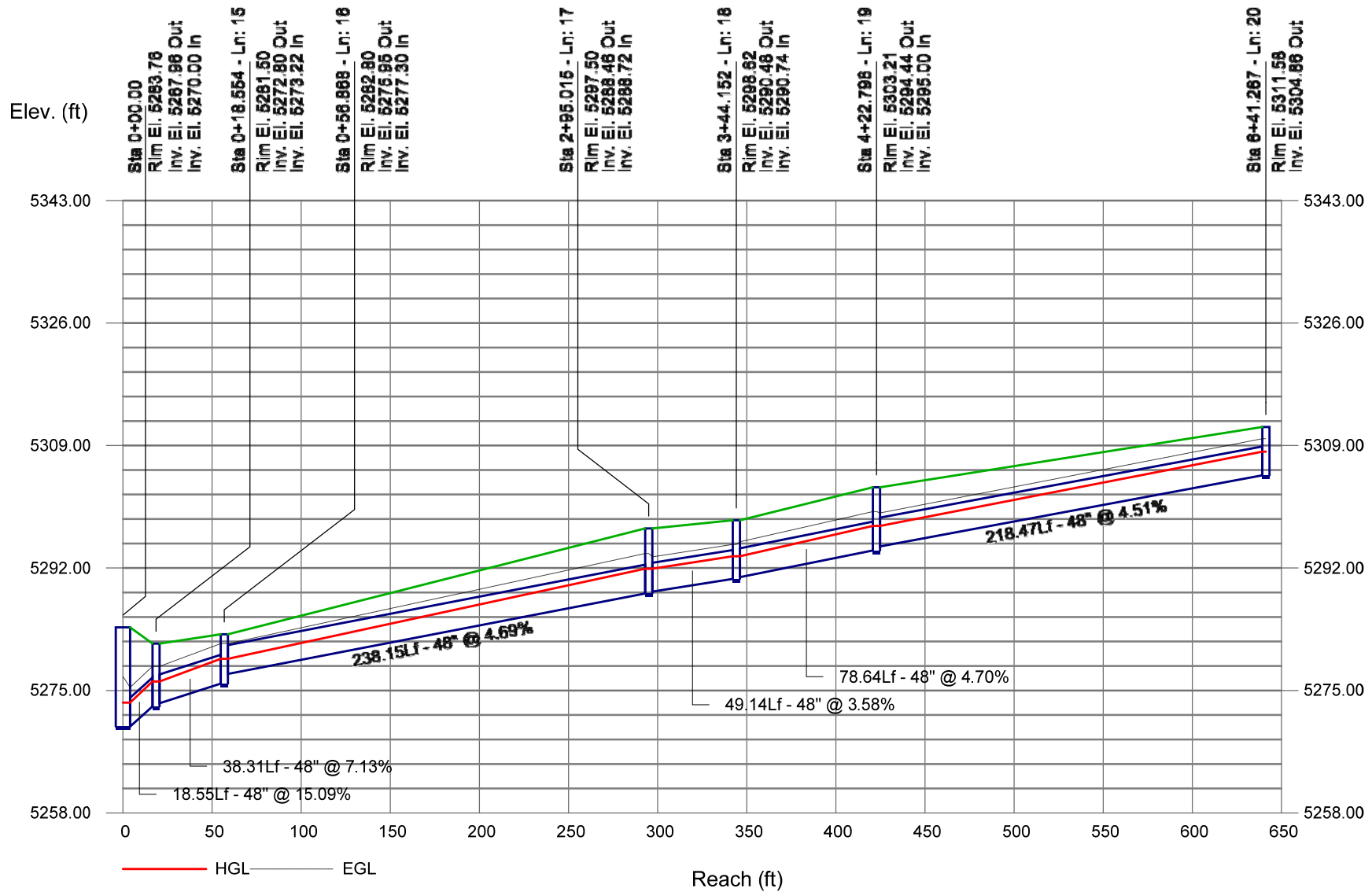
Storm Sewer Profile

Proj. file: UPM System 6 PdN.stm

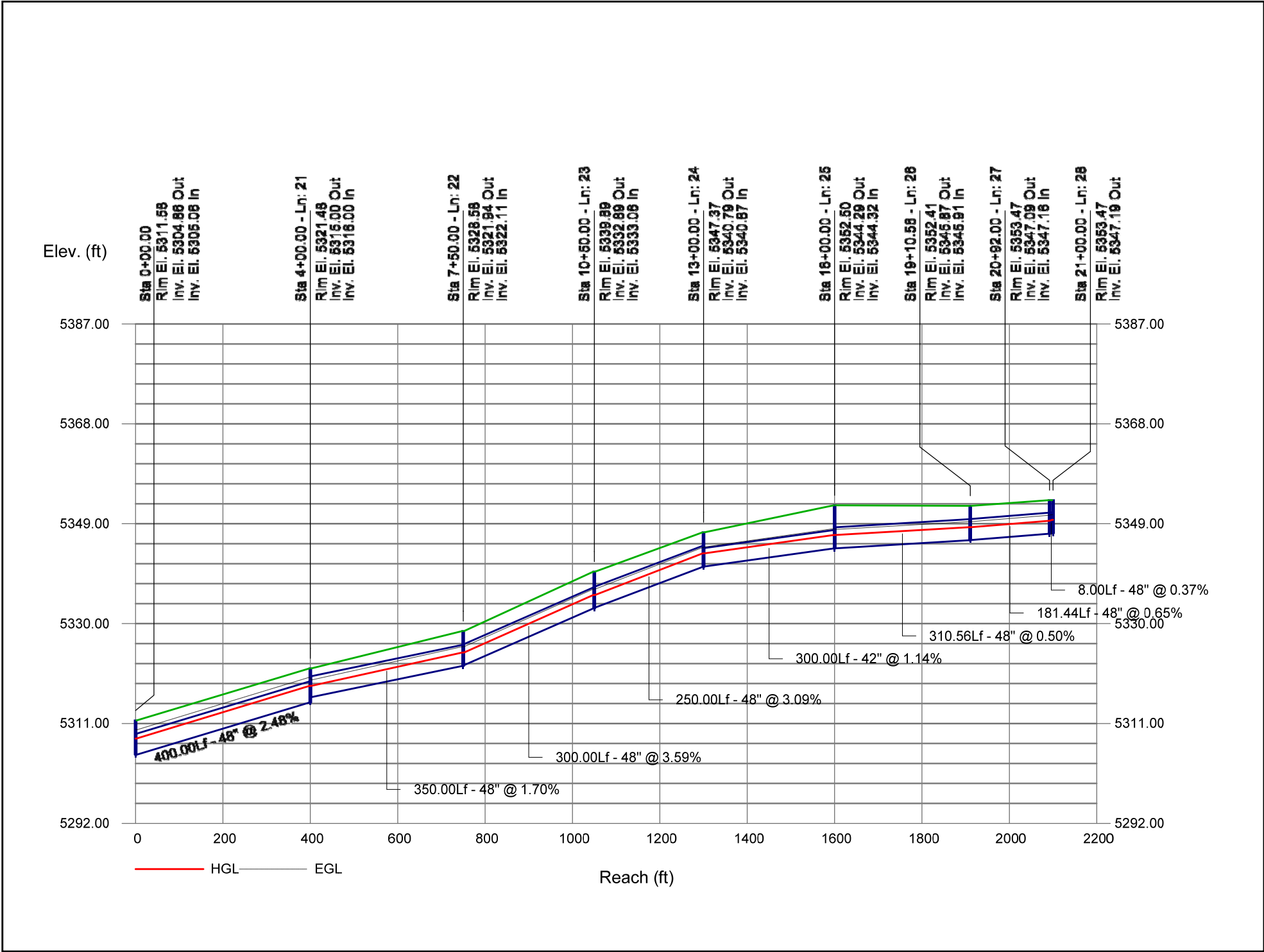


Storm Sewer Profile

Proj. file: UPM System 6 PdN.stm



Storm Sewer Profile



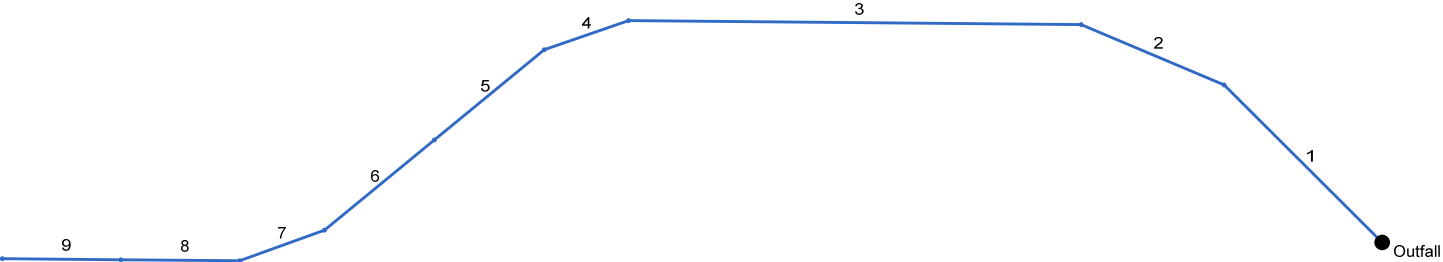


AMAFCA

Upper Piedras Marcadas Watershed
Drainage and Water Quality Management Plan
Developed Conditions Report

Alternative 3

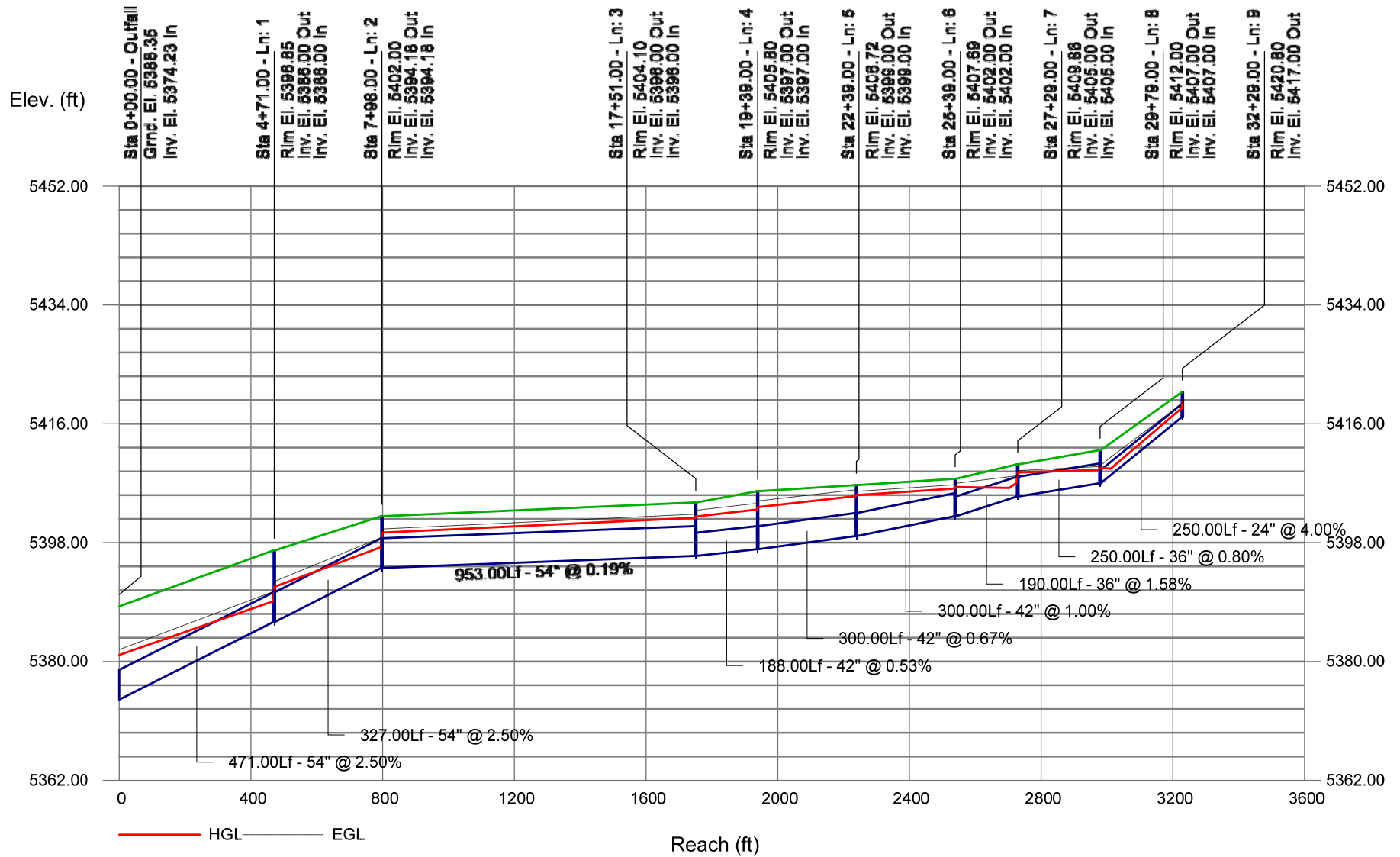
UPM System 1



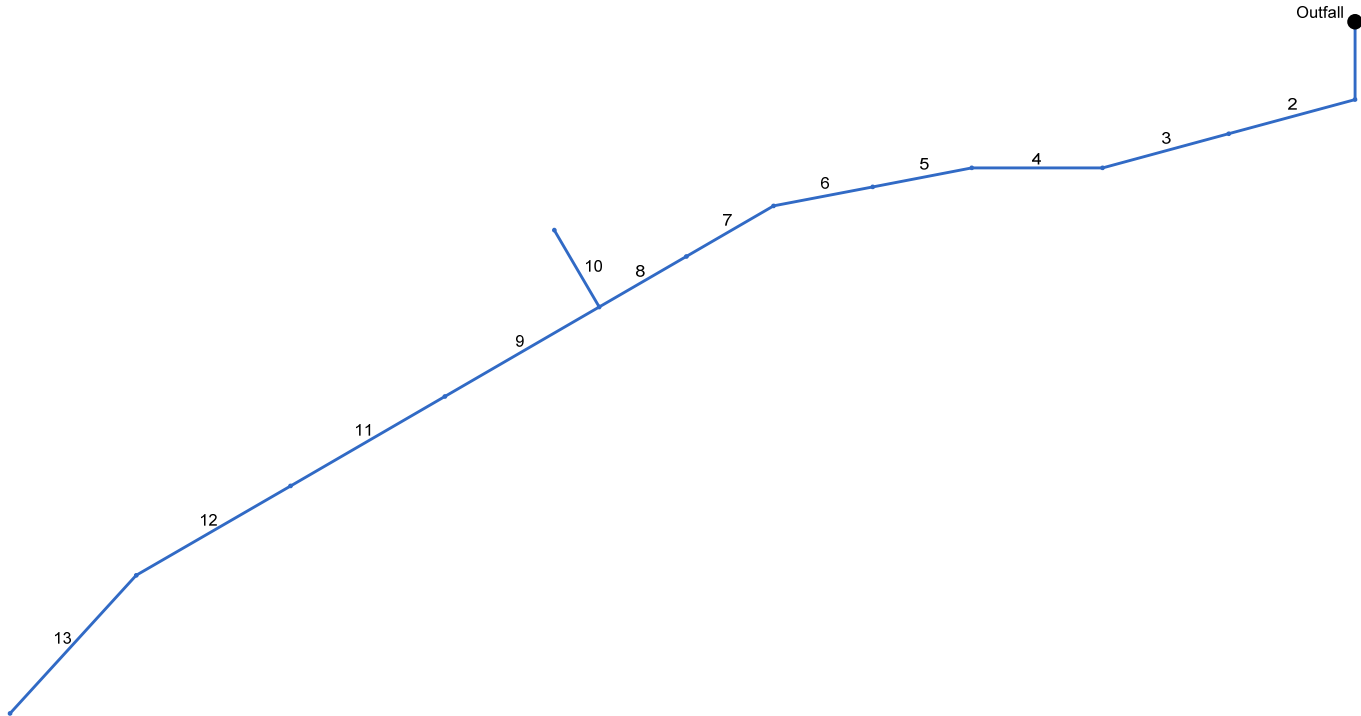
Line No.	Line ID	Line Size (in)	Line Length (ft)	Line Slope (%)	Flow Rate (cfs)	Invert Dn (ft)	Invert Up (ft)	Gnd/Rim El Dn (ft)	Gnd/Rim El Up (ft)	HGL Dn (ft)	HGL Up (ft)	Cover Dn (ft)	Cover Up (ft)	J-Loss Coeff	Vel Ave (ft/s)	Capac Full (cfs)	
1		54	471.00	2.50	115.00	5374.23	5386.00	5388.35	5396.85	5381.00	5389.15	9.62	6.35	0.43	8.45	310.88	
2		54	327.00	2.50	115.00	5386.00	5394.18	5396.85	5402.00	5391.35	5397.33	6.35	3.32	0.44	8.45	311.05	
3		54	953.00	0.19	95.00	5394.18	5396.00	5402.00	5404.10	5399.53	5401.76	3.32	3.60	0.39	5.97	85.94	
4		42	188.00	0.53	75.00	5396.00	5397.00	5404.10	5405.80	5401.97	5403.02	4.60	5.30	0.40	7.80	73.38	
5		42	300.00	0.67	75.00	5397.00	5399.00	5405.80	5406.72	5403.40	5405.06	5.30	4.22	0.15	7.80	82.15	
6		42	300.00	1.00	58.00	5399.00	5402.00	5406.72	5407.69	5405.20	5406.20	4.22	2.19	0.39	6.03	100.61	
7		36	190.00	1.58	43.00	5402.00	5405.00	5407.69	5409.86	5406.42	5407.13 j	2.69	1.86	0.40	7.04	83.80	
8		36	250.00	0.80	29.00	5405.00	5407.00	5409.86	5412.00	5408.65	5409.02	1.86	2.00	0.15	4.92	59.65	
9		24	250.00	4.00	15.00	5407.00	5417.00	5412.00	5420.80	5409.34	5418.40 j	3.00	1.80	1.00	5.59	45.24	
UPM System 1											Number of lines: 9			Date: 3/13/2015			
NOTES: i Inlet control; ** Critical depth																	

Storm Sewer Profile

Proj. file: UPM System 1.stm



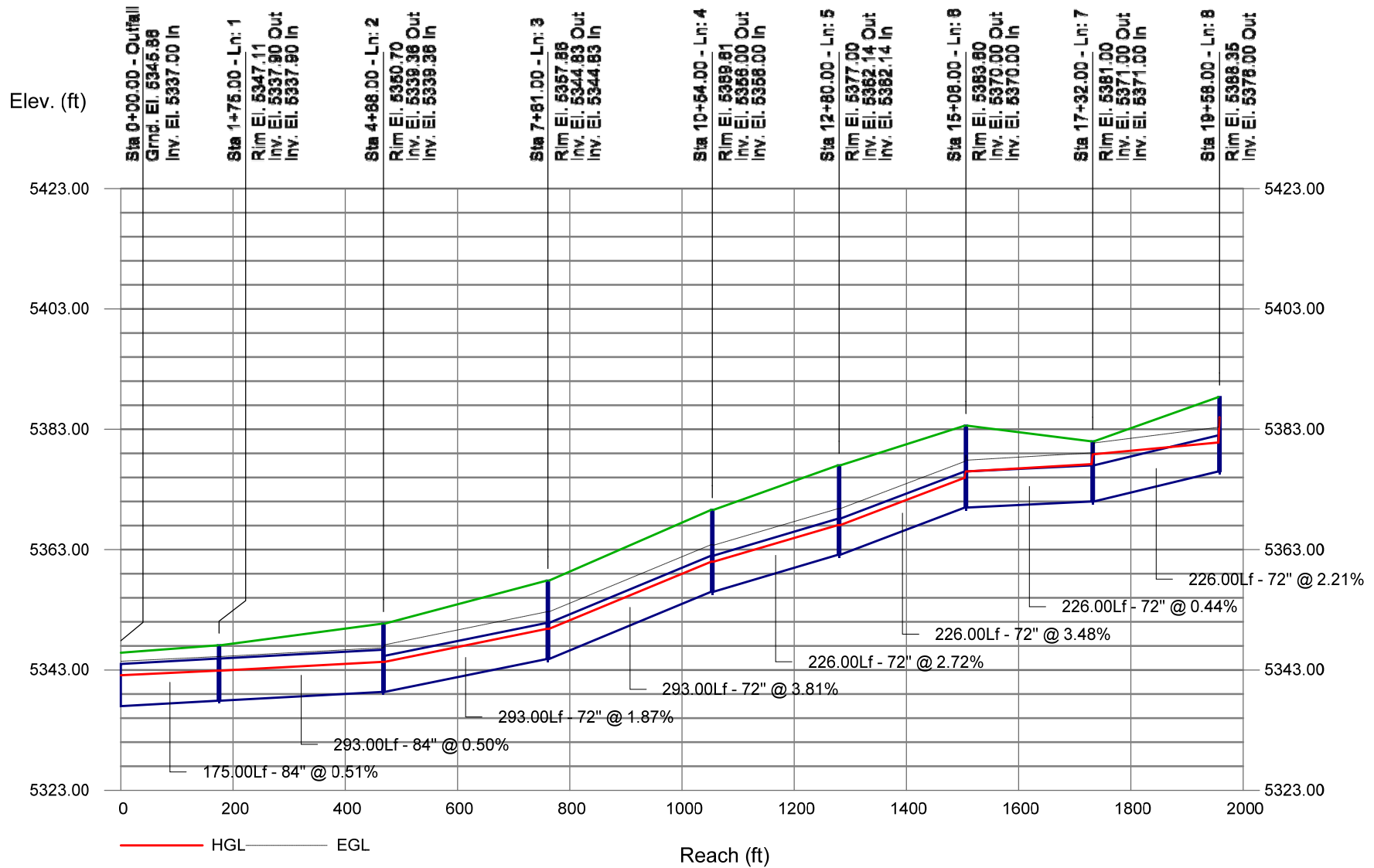
UPM System 2



Line No.	Line ID	Line Size	Line Length	Line Slope	Flow Rate	Invert Dn	Invert Up	Gnd/Rim El Dn	Gnd/Rim El Up	HGL Dn	HGL Up	Cover Dn	Cover Up	J-Loss Coeff	Vel Ave	Capac Full	
		(in)	(ft)	(%)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)		(ft/s)	(cfs)	
1	202B	84	175.00	0.51	360.00	5337.00	5337.90	5345.86	5347.11	5342.12	5342.90	1.86	2.21	0.97	12.09	458.20	
2		84	293.00	0.50	360.00	5337.90	5339.36	5347.11	5350.70	5342.90	5344.36	2.21	4.34	0.15	12.25	451.04	
3		72	293.00	1.87	340.00	5339.36	5344.83	5350.70	5357.86	5344.36	5349.83	5.34	7.03	0.31	13.51	578.76	
4		72	293.00	3.81	340.00	5344.83	5356.00	5357.86	5369.61	5349.83	5361.00	7.03	7.61	0.23	13.50	827.03	
5		72	226.00	2.72	330.00	5356.00	5362.14	5369.61	5377.00	5361.00	5367.08	7.61	8.86	0.15	13.18	698.18	
6		72	226.00	3.48	330.00	5362.14	5370.00	5377.00	5383.60	5367.08	5374.94	8.86	7.60	0.38	13.25	789.92	
7	202B	72	226.00	0.44	310.00	5370.00	5371.00	5383.60	5381.00	5376.00	5377.21	7.60	4.00	0.15	10.97	281.76	
8		72	226.00	2.21	310.00	5371.00	5376.00	5381.00	5388.35	5378.86	5380.80	4.00	6.35	1.00	11.87	630.03	
9	202C	66	400.00	1.00	196.00	5376.00	5380.00	5388.35	5390.17	5385.01	5386.37	6.85	4.67	0.15	8.25	335.85	
10	System 1	54	200.00	5.89	115.00	5374.23	5386.00	5388.35	5396.85	5385.01	5389.15	9.62	6.35	1.00	8.45	477.08	
11	202C	48	400.00	0.75	90.00	5380.00	5383.00	5390.17	5390.00	5386.53	5388.10	6.17	3.00	0.15	7.16	124.40	
12	203A	48	400.00	0.50	90.00	5383.00	5385.00	5390.00	5392.93	5388.22	5389.79	3.00	3.93	0.35	7.16	101.57	
13	203A	48	420.00	0.48	60.00	5385.00	5387.00	5392.93	5395.86	5390.07	5390.73	3.93	4.86	1.00	4.85	99.13	
UPM System 2											Number of lines: 13			Date: 5/27/2015			
NOTES: i Inlet control; ** Critical depth																	

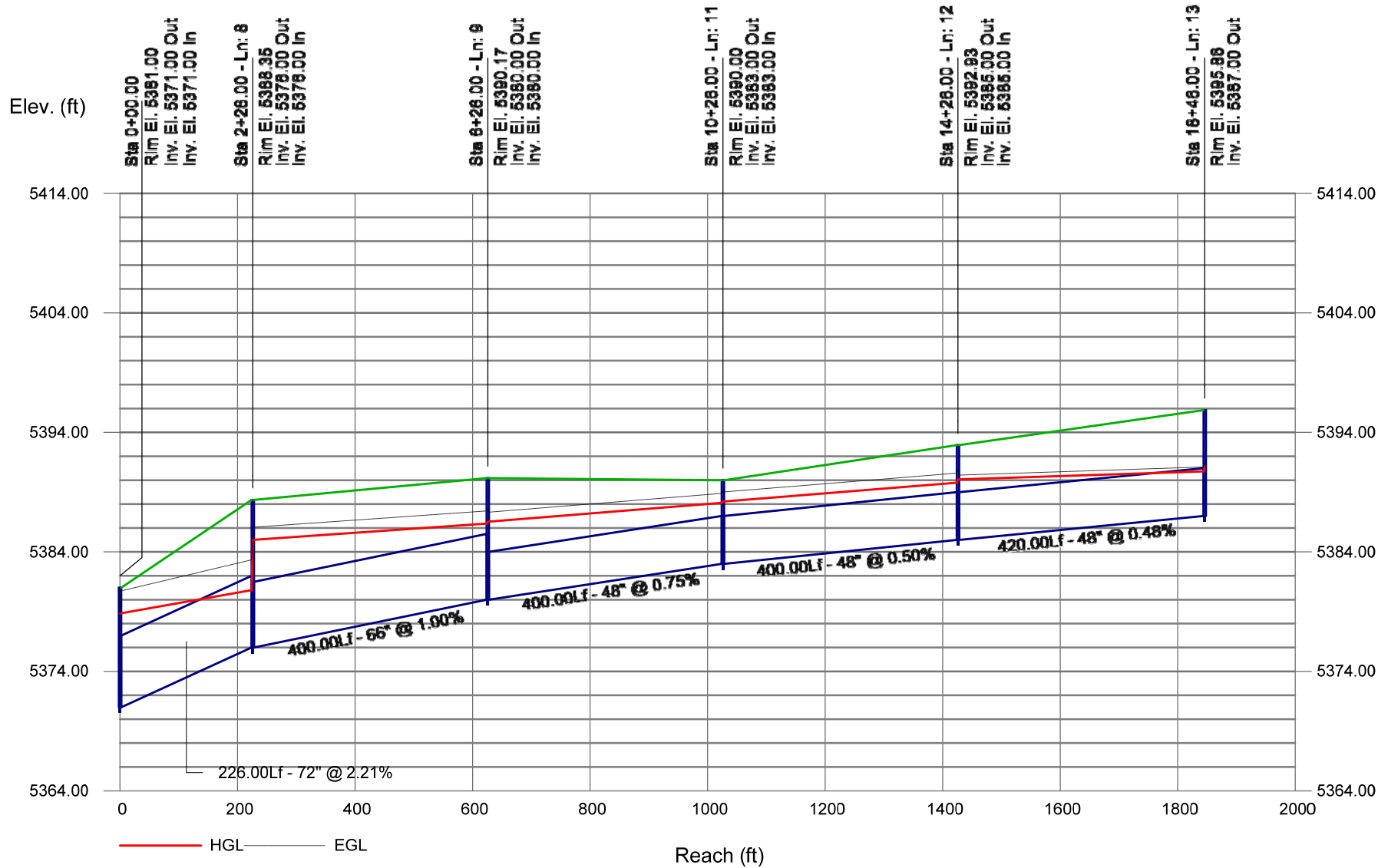
Storm Sewer Profile

Proj. file: UPM System 2.stm

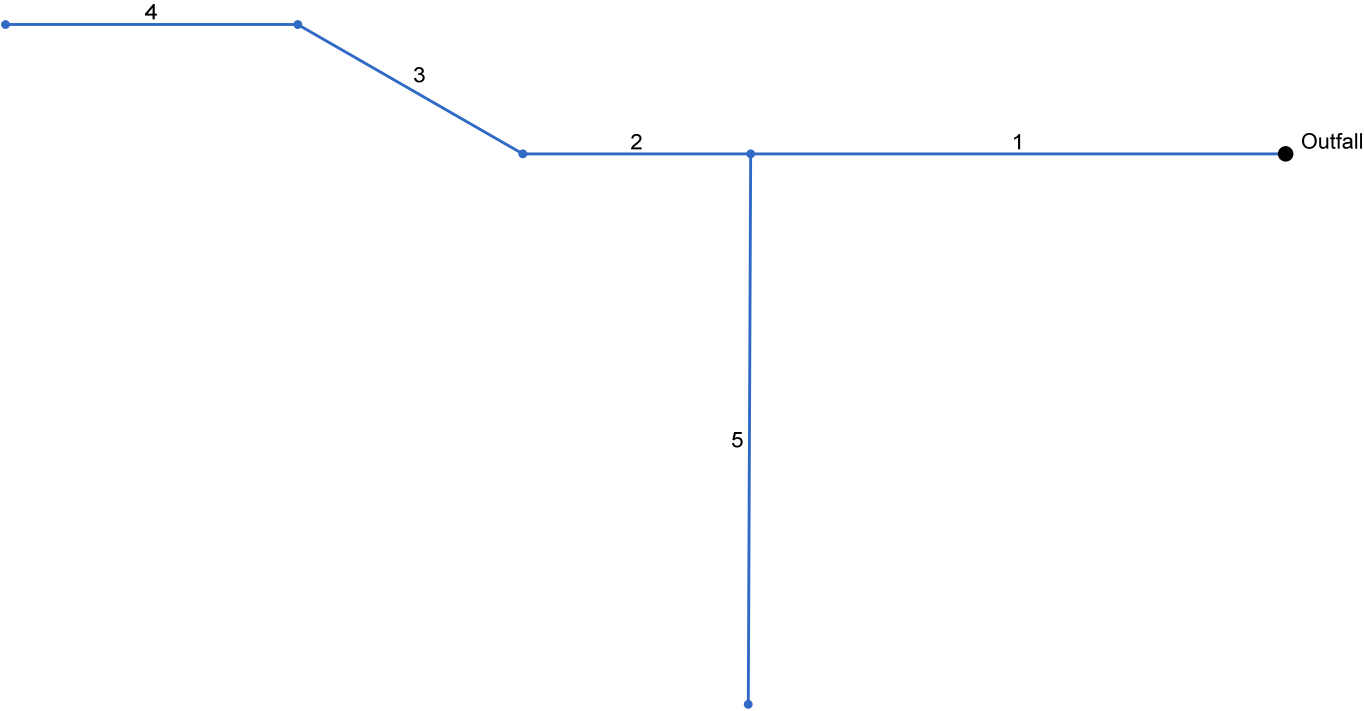


Storm Sewer Profile

Proj. file: UPM System 2.stm

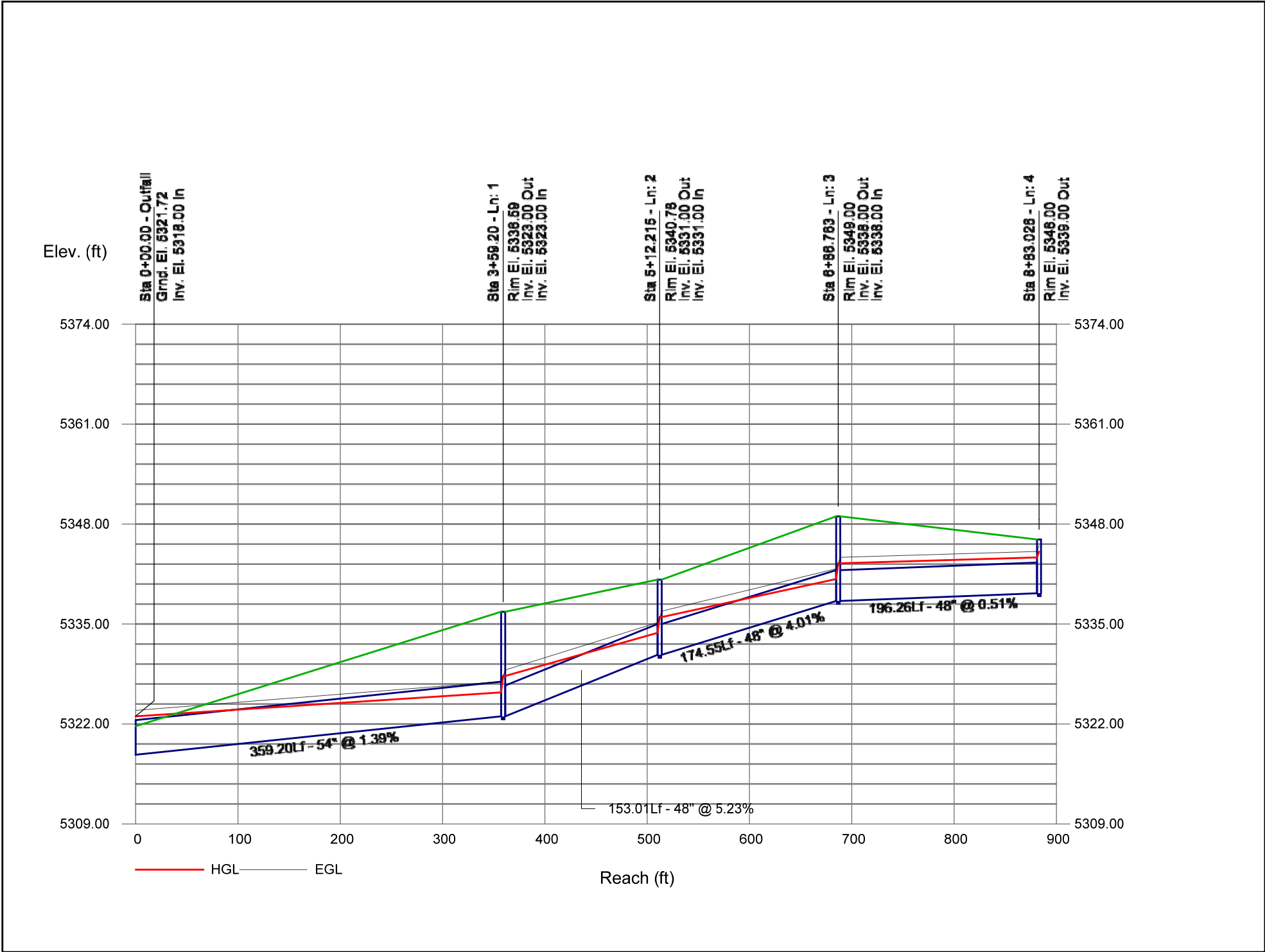


UPM System 3

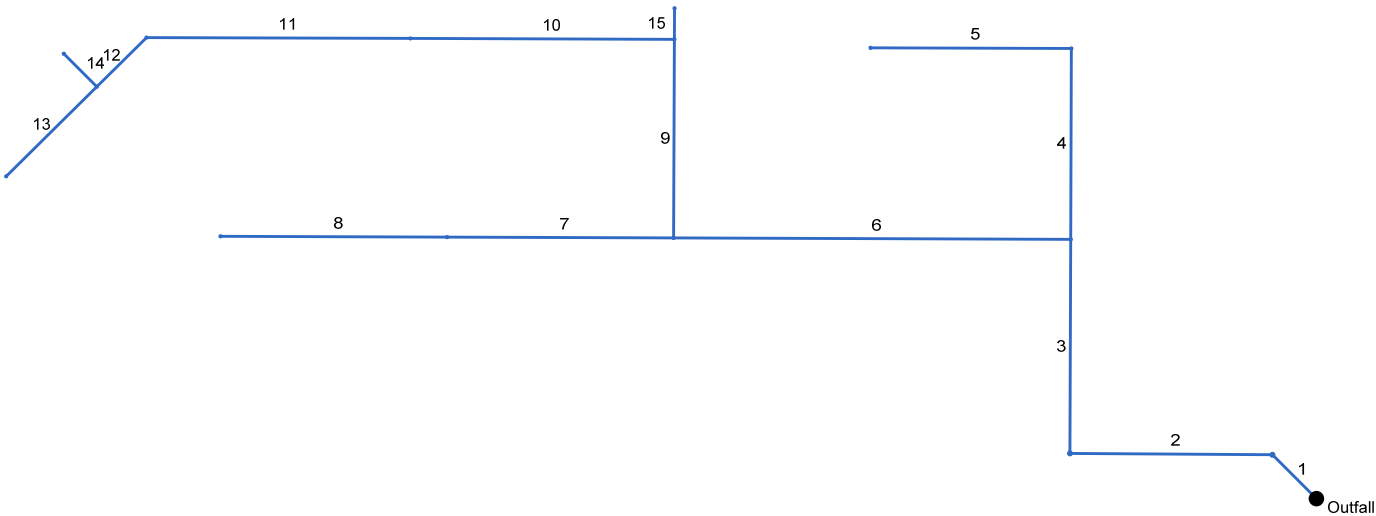


Line No.	Line ID	Line Size (in)	Line Length (ft)	Line Slope (%)	Flow Rate (cfs)	Invert Dn (ft)	Invert Up (ft)	Gnd/Rim El Dn (ft)	Gnd/Rim El Up (ft)	HGL Dn (ft)	HGL Up (ft)	Cover Dn (ft)	Cover Up (ft)	J-Loss Coeff	Vel Ave (ft/s)	Capac Full (cfs)	
1		54	359.20	1.39	112.00	5318.00	5323.00	5321.72	5336.59	5323.00	5326.11	-0.78	9.09	1.00	8.30	232.03	
2		48	153.01	5.23	89.00	5323.00	5331.00	5336.59	5340.78	5328.24	5333.86	9.59	5.78	0.56	8.17	328.45	
3		48	174.55	4.01	89.00	5331.00	5338.00	5340.78	5349.00	5335.90	5340.86	5.78	7.00	0.56	8.17	287.67	
4		48	196.26	0.51	89.00	5338.00	5339.00	5349.00	5346.00	5342.90	5343.66	7.00	3.00	1.00	7.08	102.54	
5		48	371.08	0.27	75.00	5323.00	5324.00	5336.59	5330.00	5328.24	5329.26	9.59	2.00	1.00	5.97	74.57	
UPM System 3										Number of lines: 5			Date: 3/23/2017				
NOTES: i Inlet control; ** Critical depth																	

Storm Sewer Profile

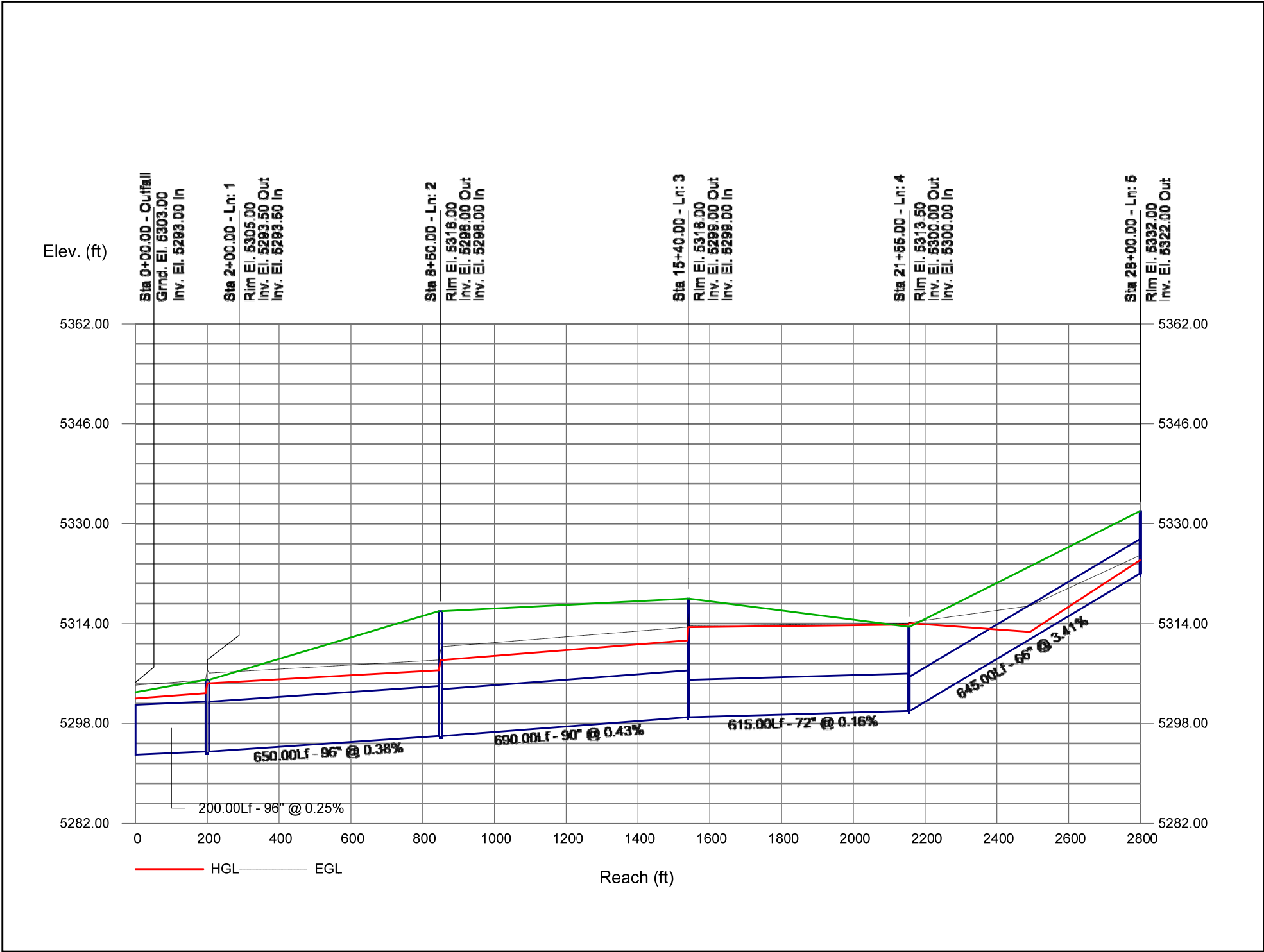


Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



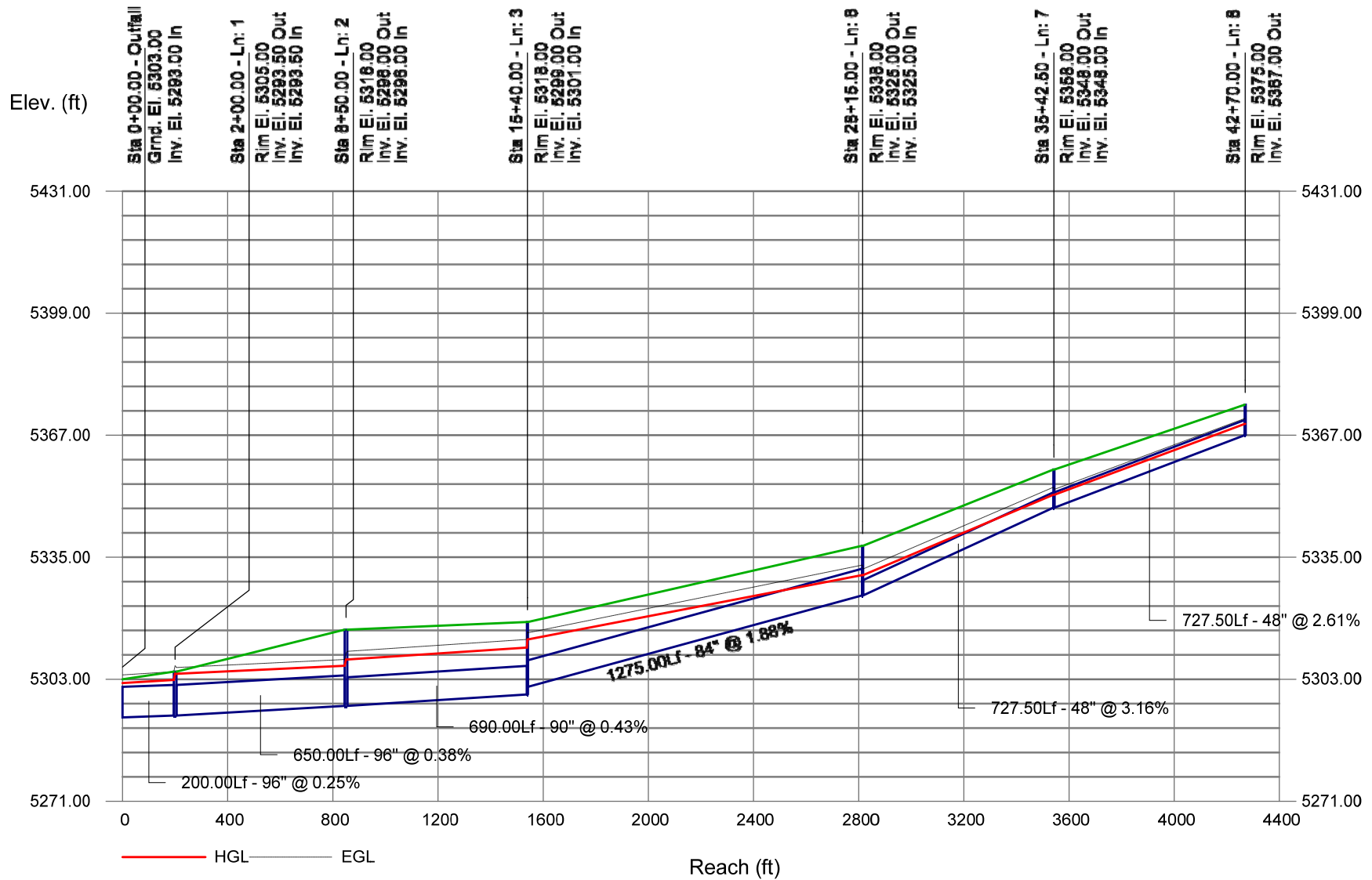
Line No.	Line ID	Line Size	Line Length	Line Slope	Flow Rate	Invert Dn	Invert Up	Gnd/Rim El Dn	Gnd/Rim El Up	HGL Dn	HGL Up	Cover Dn	Cover Up	J-Loss Coeff	Vel Ave	Capac Full	
		(in)	(ft)	(%)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)		(ft/s)	(cfs)	
1		96	200.00	0.25	516.00	5293.00	5293.50	5303.00	5305.00	5302.00	5302.64	2.00	3.50	0.75	10.27	456.16	
2		96	650.00	0.38	516.00	5293.50	5296.00	5305.00	5316.00	5303.87	5305.95	3.50	12.00	1.00	10.27	565.79	
3		90	690.00	0.43	459.00	5296.00	5299.00	5316.00	5318.00	5307.59	5310.06	12.50	11.50	1.00	10.39	506.44	
4		72	615.00	0.16	109.00	5299.00	5300.00	5318.00	5313.50	5311.73	5312.14	13.00	7.50	1.00	3.86	170.80	
5		66	645.00	3.41	55.00	5300.00	5322.00	5313.50	5332.00	5312.37	5324.02 j	8.00	4.50	1.00	4.63	620.27	
6		84	1275.00	1.88	350.00	5301.00	5325.00	5318.00	5338.00	5311.73	5329.93	10.00	6.00	1.00	10.59	876.66	
7		48	727.50	3.16	82.00	5325.00	5348.00	5338.00	5358.00	5329.93	5350.74	9.00	6.00	0.15	7.73	255.41	
8		48	727.50	2.61	50.00	5348.00	5367.00	5358.00	5375.00	5350.74	5369.12 j	6.00	4.00	1.00	6.42	232.14	
9		78	640.00	0.31	246.00	5325.00	5327.00	5338.00	5335.00	5329.93	5331.52	6.50	1.50	1.00	9.55	293.14	
10		66	847.50	0.94	131.00	5327.00	5335.00	5335.00	5343.00	5333.07	5338.18	2.50	2.50	0.15	7.36	326.31	
11		54	847.50	2.48	44.00	5335.00	5356.00	5343.00	5362.00	5338.18	5357.91 j	3.50	1.50	0.75	5.25	309.57	
12		48	225.00	2.22	44.00	5356.00	5361.00	5362.00	5368.00	5357.91	5362.98	2.00	3.00	1.00	7.25	214.14	
13		36	410.00	2.44	19.00	5361.00	5371.00	5368.00	5377.00	5362.98	5372.40 j	4.00	3.00	1.00	4.86	104.16	
14		36	150.00	1.33	25.00	5360.00	5362.00	5368.00	5371.00	5362.98	5363.61 j	5.00	6.00	1.00	5.00	77.01	
15		36	100.00	1.00	20.00	5327.00	5328.00	5335.00	5335.00	5333.07	5333.16	5.00	4.00	1.00	2.83	66.69	
Project File: UPM System 4.stm											Number of lines: 15			Date: 5/27/2015			
NOTES: ** Critical depth																	

Storm Sewer Profile



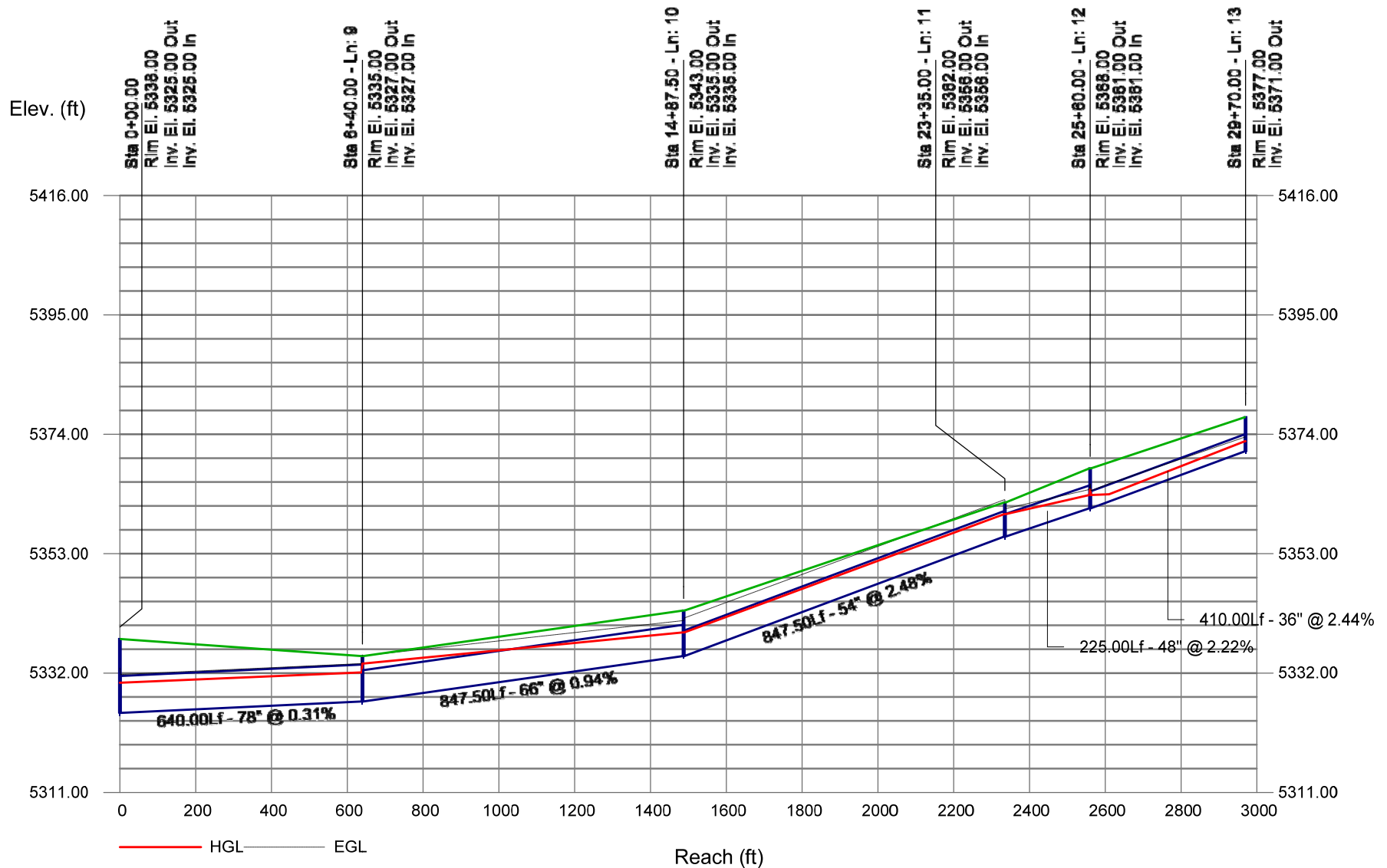
Storm Sewer Profile

Proj. file: UPM System 4.stm



Storm Sewer Profile

Proj. file: UPM System 4.stm



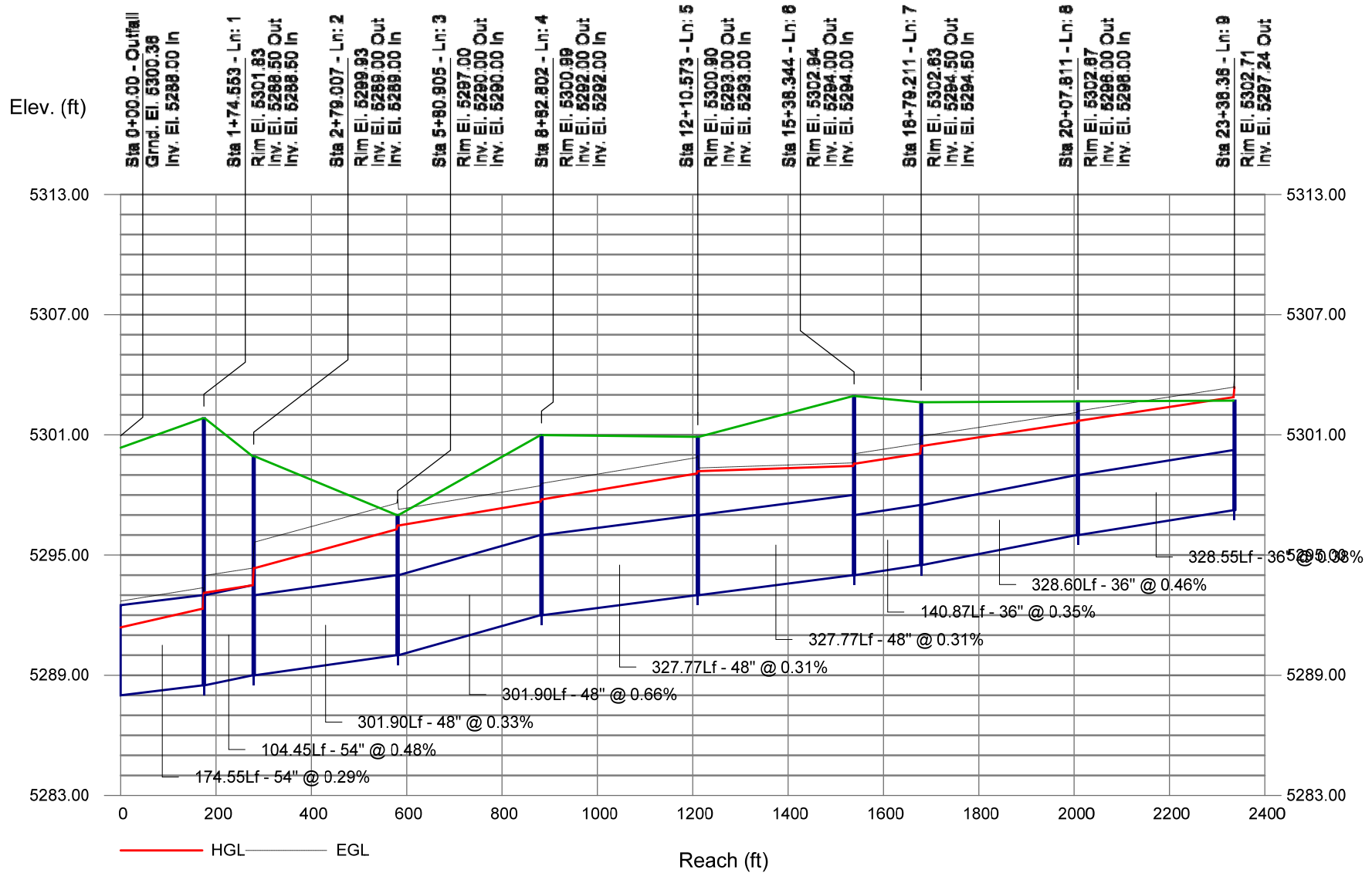
UPM System 5



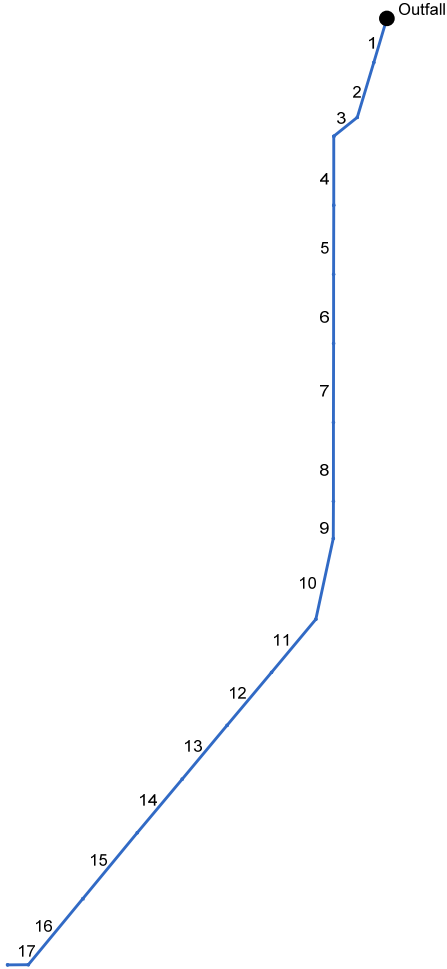
Line No.	Line ID	Line Size (in)	Line Length (ft)	Line Slope (%)	Flow Rate (cfs)	Invert Dn (ft)	Invert Up (ft)	Gnd/Rim El Dn (ft)	Gnd/Rim El Up (ft)	HGL Dn (ft)	HGL Up (ft)	Cover Dn (ft)	Cover Up (ft)	J-Loss Coeff	Vel Ave (ft/s)	Capac Full (cfs)	
1		54	174.55	0.29	118.00	5288.00	5288.50	5300.36	5301.83	5291.39	5292.33	7.86	8.83	0.75	8.68	105.25	
2		54	104.45	0.48	118.00	5288.50	5289.00	5301.83	5299.93	5293.12	5293.49	8.83	6.43	1.00	7.42	136.06	
3		48	301.90	0.33	115.00	5289.00	5290.00	5299.93	5297.00	5294.35	5296.28	6.93	3.00	0.15	9.15	82.67	
4		48	301.90	0.66	90.00	5290.00	5292.00	5297.00	5300.99	5296.48	5297.67	3.00	4.99	0.15	7.16	116.92	
5		48	327.77	0.31	90.00	5292.00	5293.00	5300.99	5300.90	5297.78	5299.07	4.99	3.90	0.15	7.16	79.34	
6		48	327.77	0.31	40.00	5293.00	5294.00	5300.90	5302.94	5299.19	5299.45	3.90	4.94	0.75	3.18	79.34	
7		36	140.87	0.35	40.00	5294.00	5294.50	5302.94	5302.63	5299.56	5300.07	5.94	5.13	0.75	5.66	39.73	
8		36	328.60	0.46	40.00	5294.50	5296.00	5302.63	5302.67	5300.44	5301.63	5.13	3.67	0.15	5.66	45.06	
9		36	328.55	0.38	40.00	5296.00	5297.24	5302.67	5302.71	5301.70	5302.88	3.67	2.47	1.00	5.66	40.98	
UPM System 5											Number of lines: 9			Date: 5/27/2015			
NOTES: i Inlet control; ** Critical depth																	

Storm Sewer Profile

Proj. file: UPM System 5.stm



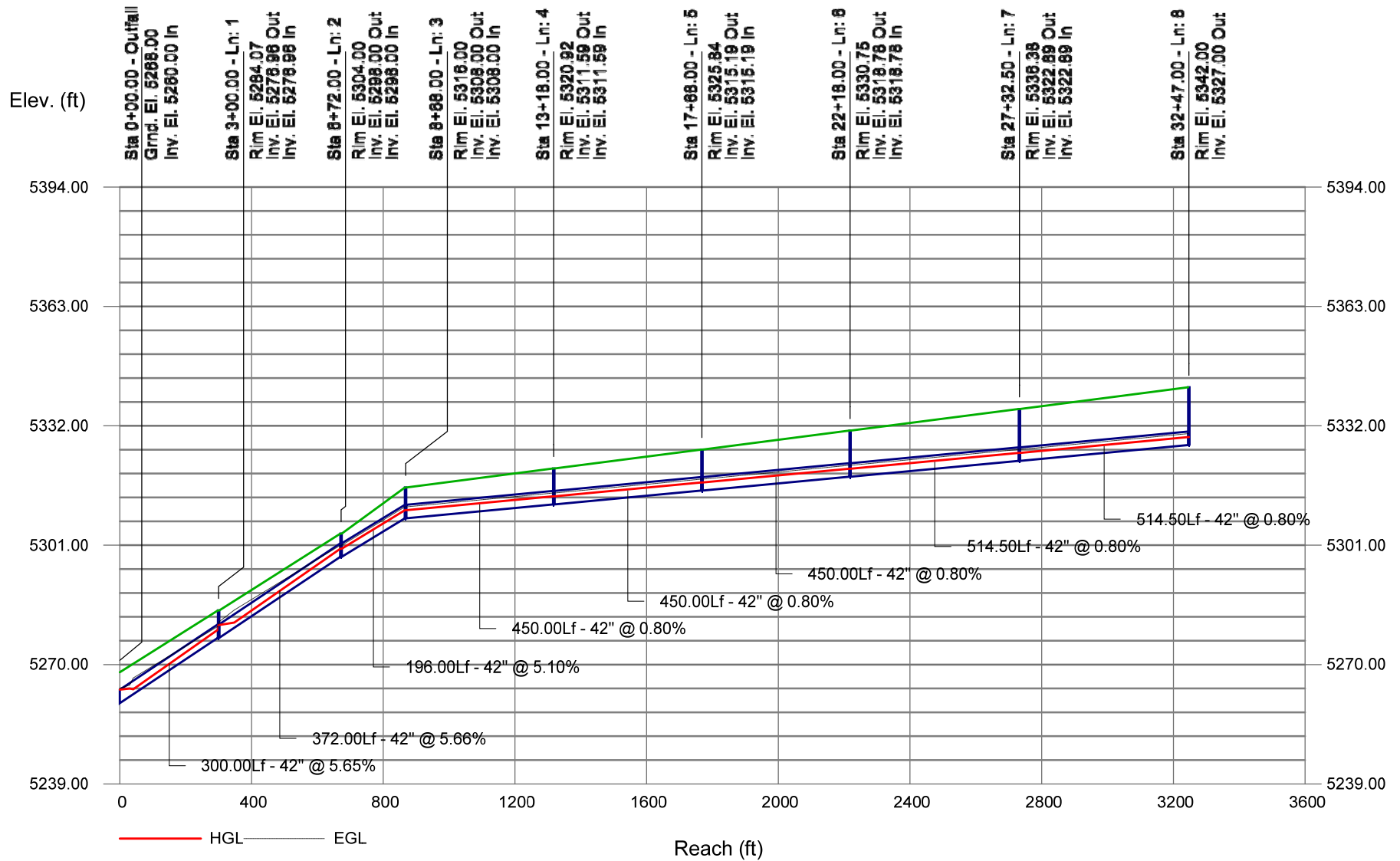
UPM to Calabacillas



Line No.	Line ID	Line Size	Line Length	Line Slope	Flow Rate	Invert Dn	Invert Up	Gnd/Rim EI Dn	Gnd/Rim EI Up	HGL Dn	HGL Up	Cover Dn	Cover Up	J-Loss Coeff	Vel Ave	Capac Full	
		(in)	(ft)	(%)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)		(ft/s)	(cfs)	
1		42	300.00	5.65	45.00	5260.00	5276.96	5268.00	5284.07	5263.50	5279.05 j	4.50	3.61	0.15	6.09	239.21	
2		42	372.00	5.66	45.00	5276.96	5298.00	5284.07	5304.00	5280.29	5300.09 j	3.61	2.50	0.62	6.14	239.27	
3		42	196.00	5.10	45.00	5298.00	5308.00	5304.00	5316.00	5300.09	5310.09	2.50	4.50	0.81	7.51	227.25	
4		42	450.00	0.80	45.00	5308.00	5311.59	5316.00	5320.92	5310.09	5313.68	4.50	5.83	0.15	7.51	89.86	
5		42	450.00	0.80	45.00	5311.59	5315.19	5320.92	5325.84	5313.68	5317.28	5.83	7.15	0.15	7.51	89.99	
6		42	450.00	0.80	45.00	5315.19	5318.78	5325.84	5330.75	5317.28	5320.87	7.15	8.47	0.15	7.51	89.86	
7		42	514.50	0.80	45.00	5318.78	5322.89	5330.75	5336.38	5320.87	5324.98	8.47	9.99	0.15	7.51	89.92	
8		42	514.50	0.80	45.00	5322.89	5327.00	5336.38	5342.00	5324.98	5329.09	9.99	11.50	0.15	7.51	89.92	
9		42	242.00	0.83	45.00	5327.00	5329.00	5342.00	5344.72	5329.09	5331.09	11.50	12.22	0.25	7.51	91.46	
10		42	537.70	0.37	45.00	5329.00	5331.00	5344.72	5338.30	5331.31	5333.18	12.22	3.80	0.52	6.92	61.36	
11		42	450.00	0.17	45.00	5331.00	5331.75	5338.30	5339.32	5334.50	5335.40	3.80	4.07	0.15	4.68	41.07	
12		42	450.00	0.16	45.00	5331.75	5332.49	5339.32	5340.34	5335.45	5336.35	4.07	4.35	0.15	4.68	40.80	
13		42	455.00	0.17	45.00	5332.49	5333.25	5340.34	5341.37	5336.40	5337.31	4.35	4.62	0.15	4.68	41.11	
14		42	455.00	0.16	45.00	5333.25	5334.00	5341.37	5342.40	5337.36	5338.27	4.62	4.90	0.15	4.68	40.85	
15		42	556.50	0.45	45.00	5334.00	5336.50	5342.40	5343.70	5338.33	5339.34	4.90	3.70	0.15	5.03	67.43	
16		42	556.50	0.45	45.00	5336.50	5339.00	5343.70	5345.00	5339.41	5341.09	3.70	2.50	0.80	6.39	67.43	
17		42	135.00	3.70	45.00	5339.00	5344.00	5345.00	5350.00	5342.33	5346.09 j	2.50	2.50	1.00	6.14	193.62	
UPM to Calabacillas										Number of lines: 17				Date: 3/13/2015			
NOTES: i Inlet control; ** Critical depth																	

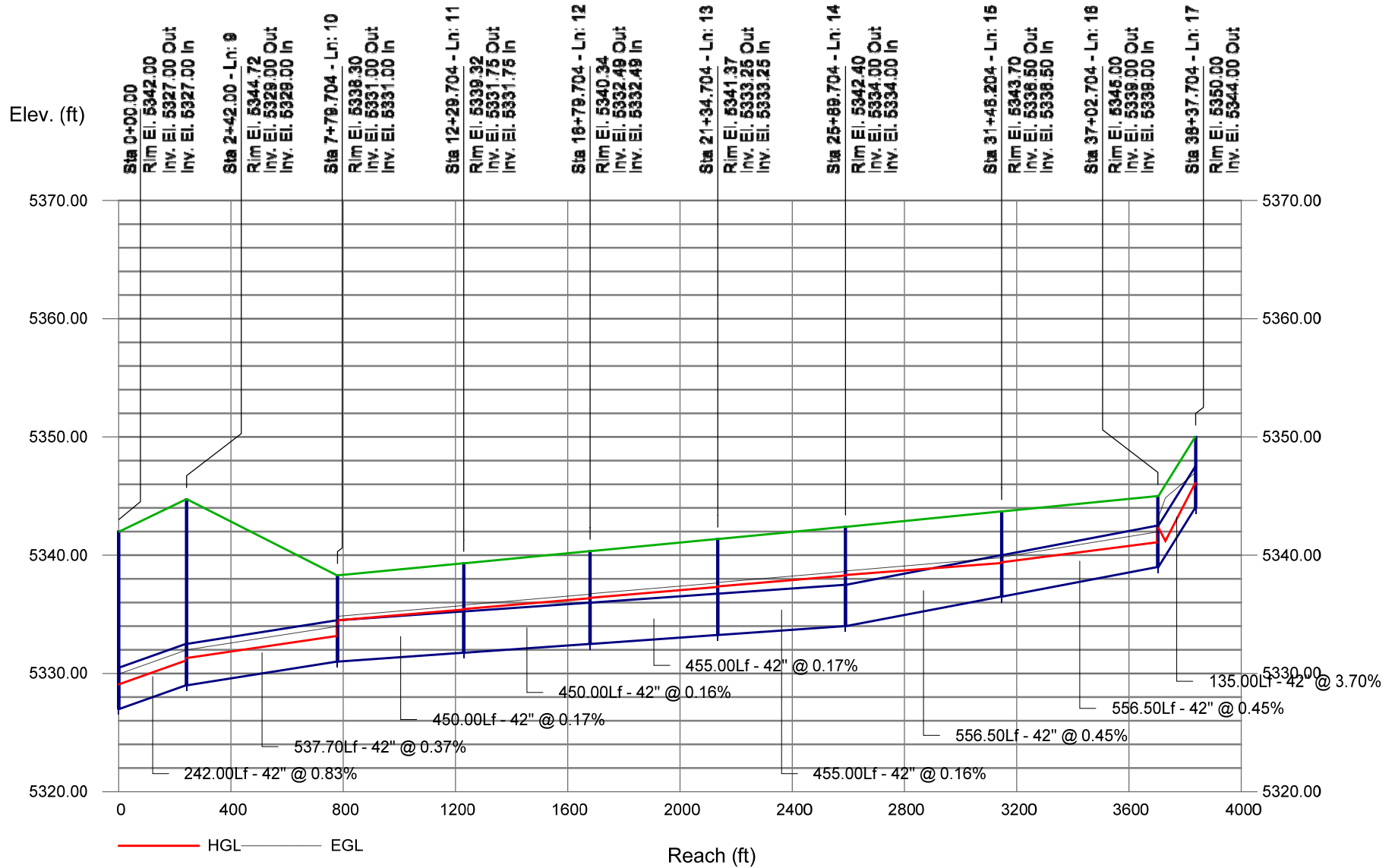
Storm Sewer Profile

Proj. file: UPM to Calabacillas.stm

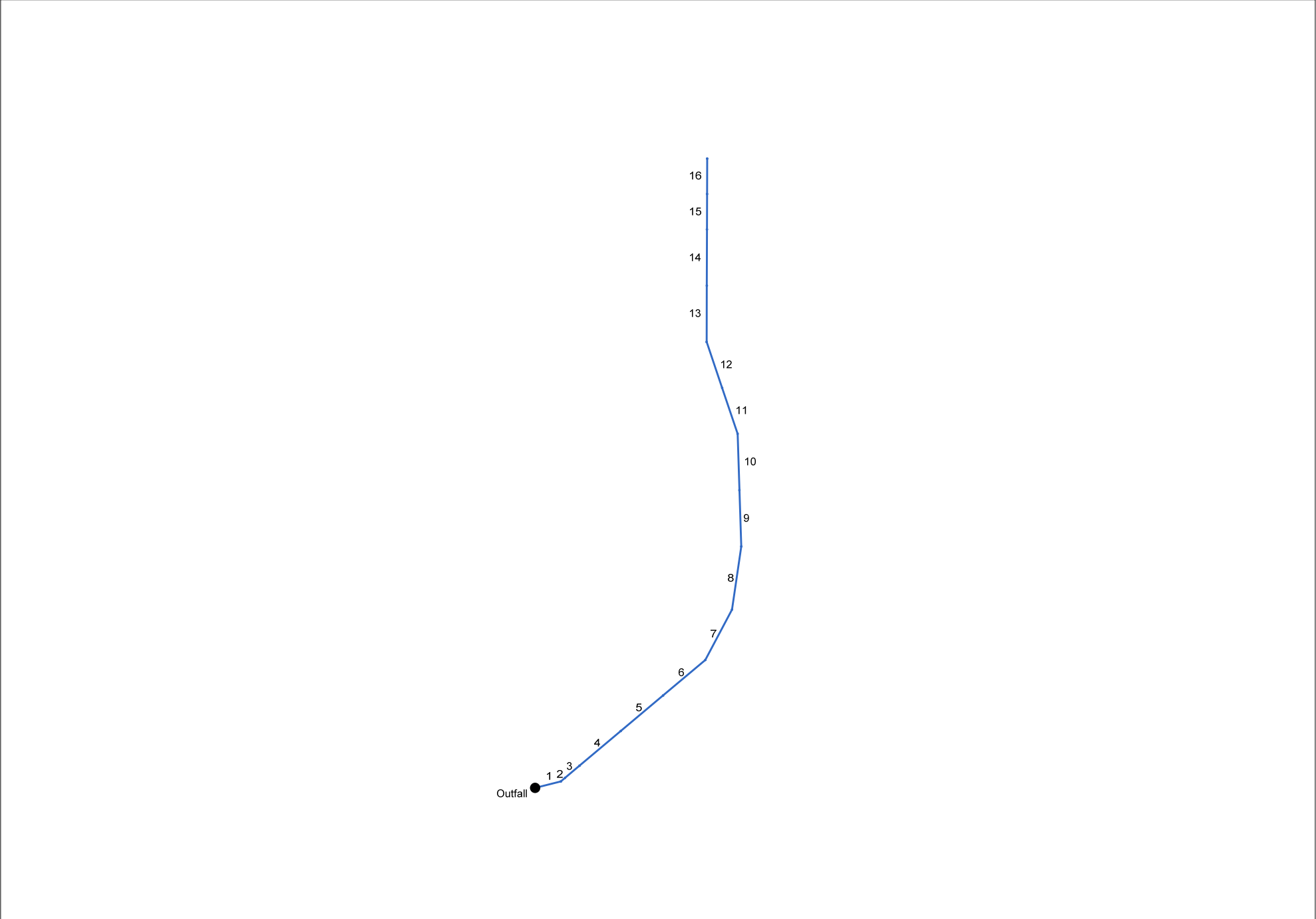


Storm Sewer Profile

Proj. file: UPM to Calabacillas.stm



Unser System

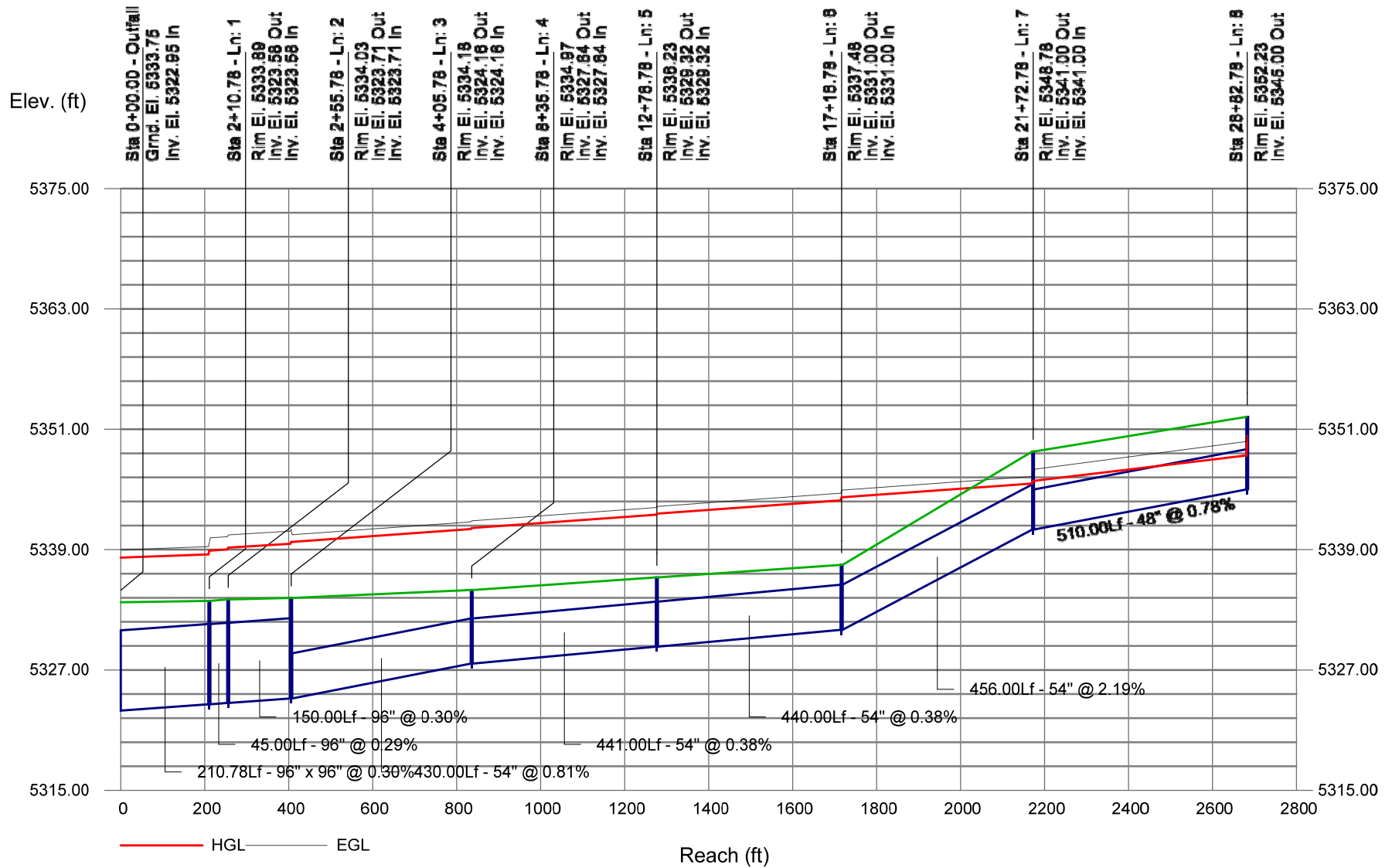


Project File: Unser System.stm	Number of lines: 16	Date: 3/13/2015
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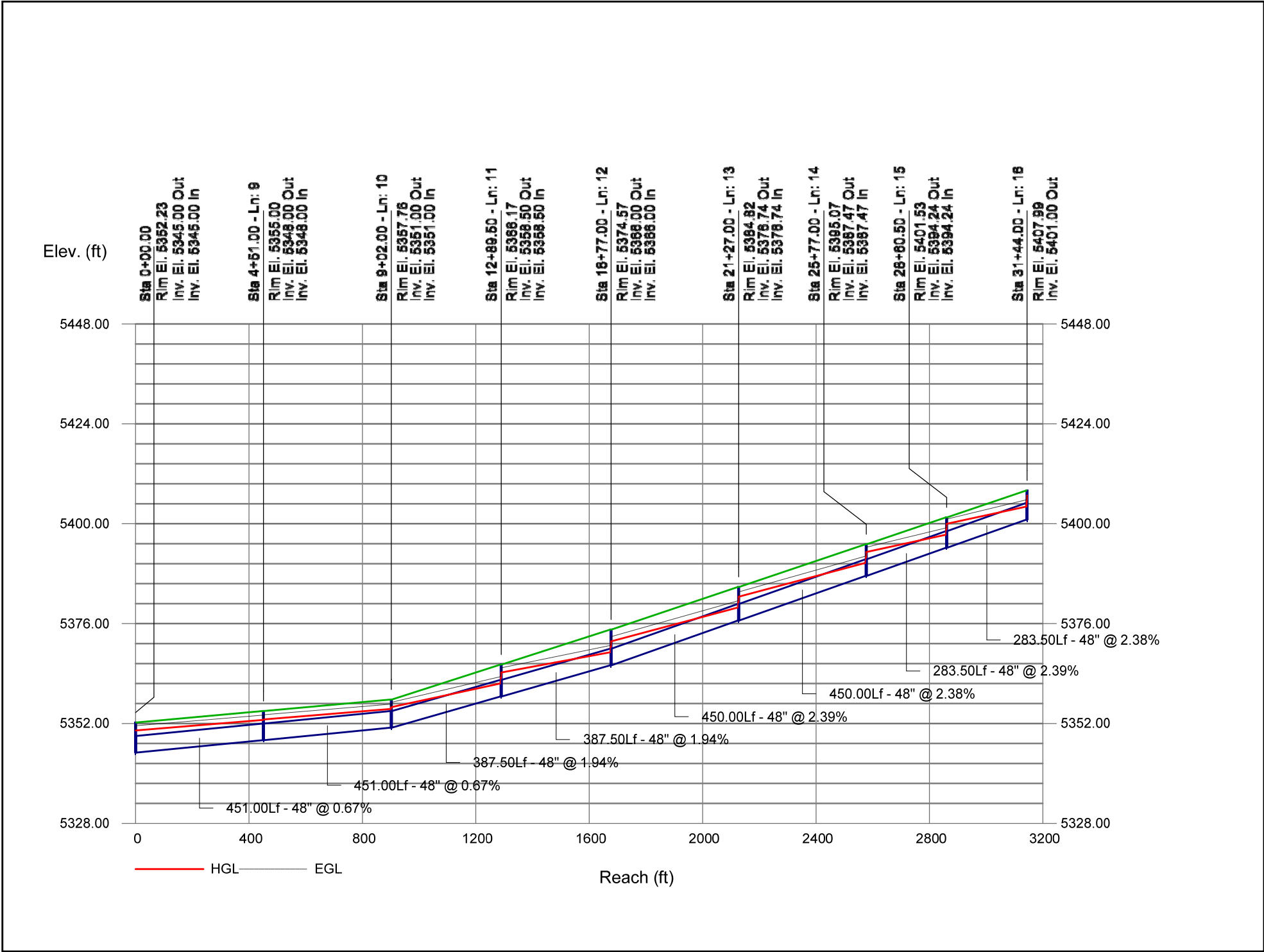
Line No.	Line ID	Line Size	Line Length	Line Slope	Flow Rate	Invert Dn	Invert Up	Gnd/Rim El Dn	Gnd/Rim El Up	HGL Dn	HGL Up	Cover Dn	Cover Up	J-Loss Coeff	Vel Ave	Capac Full	
		(in)	(ft)	(%)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)		(ft/s)	(cfs)	
1		96 x 96	210.78	0.30	454.00	5322.95	5323.58	5333.75	5333.89	5338.20	5338.52	2.80	2.31	0.49	7.09	634.98	
2		96	45.00	0.29	454.00	5323.58	5323.71	5333.89	5334.03	5338.91	5339.02	2.31	2.32	0.15	9.03	490.13	
3		96	150.00	0.30	454.00	5323.71	5324.16	5334.03	5334.18	5339.21	5339.58	2.32	2.02	0.15	9.03	499.80	
4		54	430.00	0.81	107.64	5324.16	5327.64	5334.18	5334.97	5339.77	5341.06	5.52	2.83	0.15	6.77	176.92	
5		54	441.00	0.38	107.64	5327.64	5329.32	5334.97	5336.23	5341.17	5342.49	2.83	2.41	0.15	6.77	121.37	
6		54	440.00	0.38	107.64	5329.32	5331.00	5336.23	5337.48	5342.59	5343.91	2.41	1.98	0.43	6.77	121.53	
7		54	456.00	2.19	107.64	5331.00	5341.00	5337.48	5348.78	5344.22	5345.59	1.98	3.28	0.39	6.77	291.23	
8		48	510.00	0.78	107.64	5341.00	5345.00	5348.78	5352.23	5345.86	5348.39	3.78	3.23	0.21	9.02	127.22	
9		48	451.00	0.67	107.64	5345.00	5348.00	5352.23	5355.00	5350.33	5352.86	3.23	3.00	0.15	8.57	117.16	
10		48	451.00	0.67	107.64	5348.00	5351.00	5355.00	5357.76	5352.97	5355.50	3.00	2.76	0.34	8.57	117.16	
11		48	387.50	1.94	107.64	5351.00	5358.50	5357.76	5366.17	5355.97	5361.64	2.76	3.67	0.15	9.38	199.84	
12		48	387.50	1.94	107.64	5358.50	5366.00	5366.17	5374.57	5364.26	5369.14	3.67	4.57	0.37	9.38	199.84	
13		48	450.00	2.39	107.64	5366.00	5376.74	5374.57	5384.82	5371.76	5379.88	4.57	4.08	0.15	9.38	221.92	
14		48	450.00	2.38	107.64	5376.74	5387.47	5384.82	5395.07	5382.50	5390.61	4.08	3.60	0.15	9.38	221.81	
15		48	283.50	2.39	107.64	5387.47	5394.24	5395.07	5401.53	5393.23	5397.38	3.60	3.29	0.15	9.38	221.98	
16		48	283.50	2.38	107.64	5394.24	5401.00	5401.53	5407.99	5400.00	5404.14	3.29	2.99	1.00	9.38	221.81	
Unser System											Number of lines: 16			Date: 3/13/2015			
NOTES: i Inlet control; ** Critical depth																	

Storm Sewer Profile

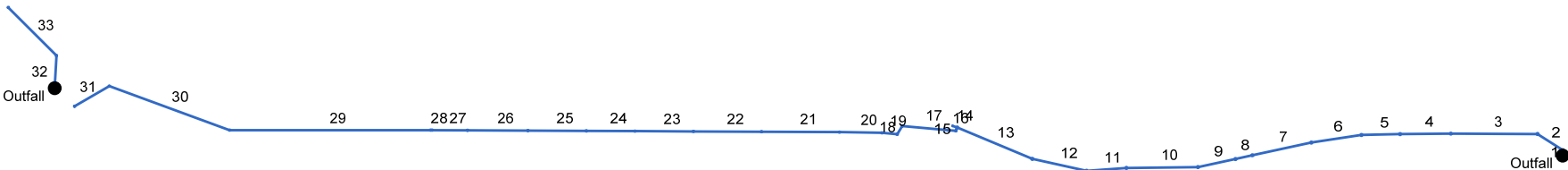
Proj. file: Unser System.stm



Storm Sewer Profile



Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Line No.	Line ID	Line Size (in)	Line Length (ft)	Line Slope (%)	Flow Rate (cfs)	Invert Dn (ft)	Invert Up (ft)	Gnd/Rim EI Dn (ft)	Gnd/Rim EI Up (ft)	HGL Dn (ft)	HGL Up (ft)	Cover Dn (ft)	Cover Up (ft)	J-Loss Coeff	Vel Ave (ft/s)	Capac Full (cfs)	
1		84	28.00	2.18	668.00	5113.12	5113.73	5121.62	5127.50	5118.86	5120.20	1.50	6.77	0.50	18.88	943.01	
2		84	153.86	2.15	668.00	5113.73	5117.04	5127.50	5128.97	5120.20	5123.51	6.77	4.93	0.50	17.98	937.20	
3		84	445.22	0.89	578.00	5117.14	5121.11	5128.97	5134.16	5123.51	5127.29	4.83	6.05	0.15	15.90	603.35	
4		72	260.55	2.69	568.00	5121.11	5128.11	5134.16	5144.06	5127.89	5133.90	7.05	9.95	0.15	20.20	694.28	
5		72	198.75	4.80	578.00	5127.96	5137.50	5144.06	5154.60	5133.90	5143.31	10.10	11.10	0.16	20.56	928.01	
6		72	260.36	5.92	574.00	5137.80	5153.20	5154.60	5169.80	5143.31	5159.00	10.80	10.60	0.15	20.82	1030.18	
7		72	309.64	6.13	574.00	5153.40	5172.38	5169.80	5185.88	5159.00	5178.18	10.40	7.50	0.15	20.70	1048.70	
8		72	88.81	5.90	574.00	5172.58	5177.82	5185.88	5191.22	5178.18	5183.62	7.30	7.40	0.15	20.70	1028.86	
9		72	197.31	5.00	574.00	5178.02	5187.88	5191.22	5202.88	5183.62	5193.68	7.20	9.00	0.24	20.70	946.88	
10		72	367.56	2.85	566.00	5187.88	5198.35	5202.88	5217.15	5193.68	5204.14	9.00	12.80	0.15	20.23	714.90	
11		72	205.18	12.91	566.00	5198.35	5224.83	5217.15	5238.23	5204.14	5230.62	12.80	7.40	0.33	20.24	1521.68	
12		72	285.44	6.41	558.00	5224.83	5243.12	5238.23	5255.77	5230.62	5248.90	7.40	6.65	0.22	19.96	1072.22	
13		72	418.26	5.90	558.00	5243.27	5267.96	5255.77	5283.76	5248.90	5273.74	6.50	9.80	0.15	20.11	1029.13	
14		72	25.78	5.04	603.00	5268.06	5269.36	5283.76	5276.69	5273.74	5275.20	9.70	1.33	0.00	21.64	951.11	
15		48	18.55	15.09	225.00	5270.00	5272.80	5283.76	5281.50	5273.74	5276.70	9.76	4.70	0.00	18.22	558.01	
16		48	38.31	7.13	212.00	5273.22	5275.95	5281.50	5282.80	5276.70	5279.83	4.28	2.85	0.00	17.64	383.44	
17		48	238.15	4.69	203.00	5277.30	5288.46	5282.80	5297.50	5279.83	5292.31	1.50	5.04	0.00	20.31	310.96	
18		48	49.14	3.58	193.00	5288.72	5290.48	5297.50	5298.62	5292.31	5294.30	4.78	4.14	0.00	15.91	271.84	
19		48	78.64	4.70	193.00	5290.74	5294.44	5298.62	5303.21	5294.30	5298.26	3.88	4.77	0.00	15.96	311.56	
20		48	218.47	4.51	184.00	5295.00	5304.86	5303.21	5311.58	5298.26	5308.65	4.21	2.72	0.00	15.85	305.17	
21		48	400.00	2.48	184.00	5305.06	5315.00	5311.58	5321.48	5308.65	5318.79	2.52	2.48	0.00	15.21	226.44	
22		48	350.00	1.70	159.00	5316.00	5321.94	5321.48	5328.58	5318.83	5325.60	1.48	2.64	0.00	14.96	187.13	
23		48	300.00	3.59	159.00	5322.11	5332.89	5328.58	5339.89	5325.60	5336.55	2.47	3.00	0.00	13.43	272.30	

Project File: UPM System 6 PdN.stm

Number of lines: 33

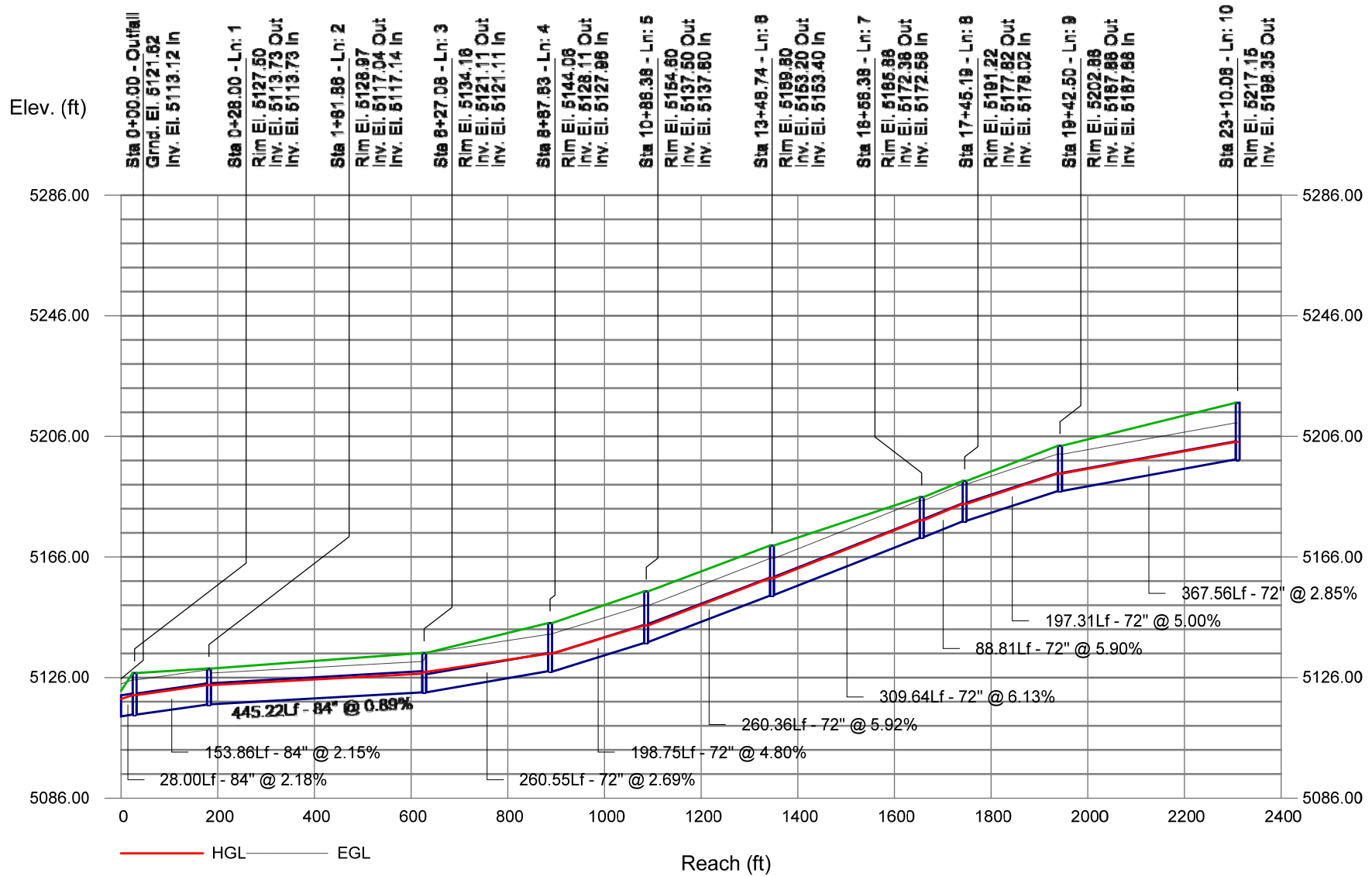
Date: 3/16/2015

NOTES: ** Critical depth

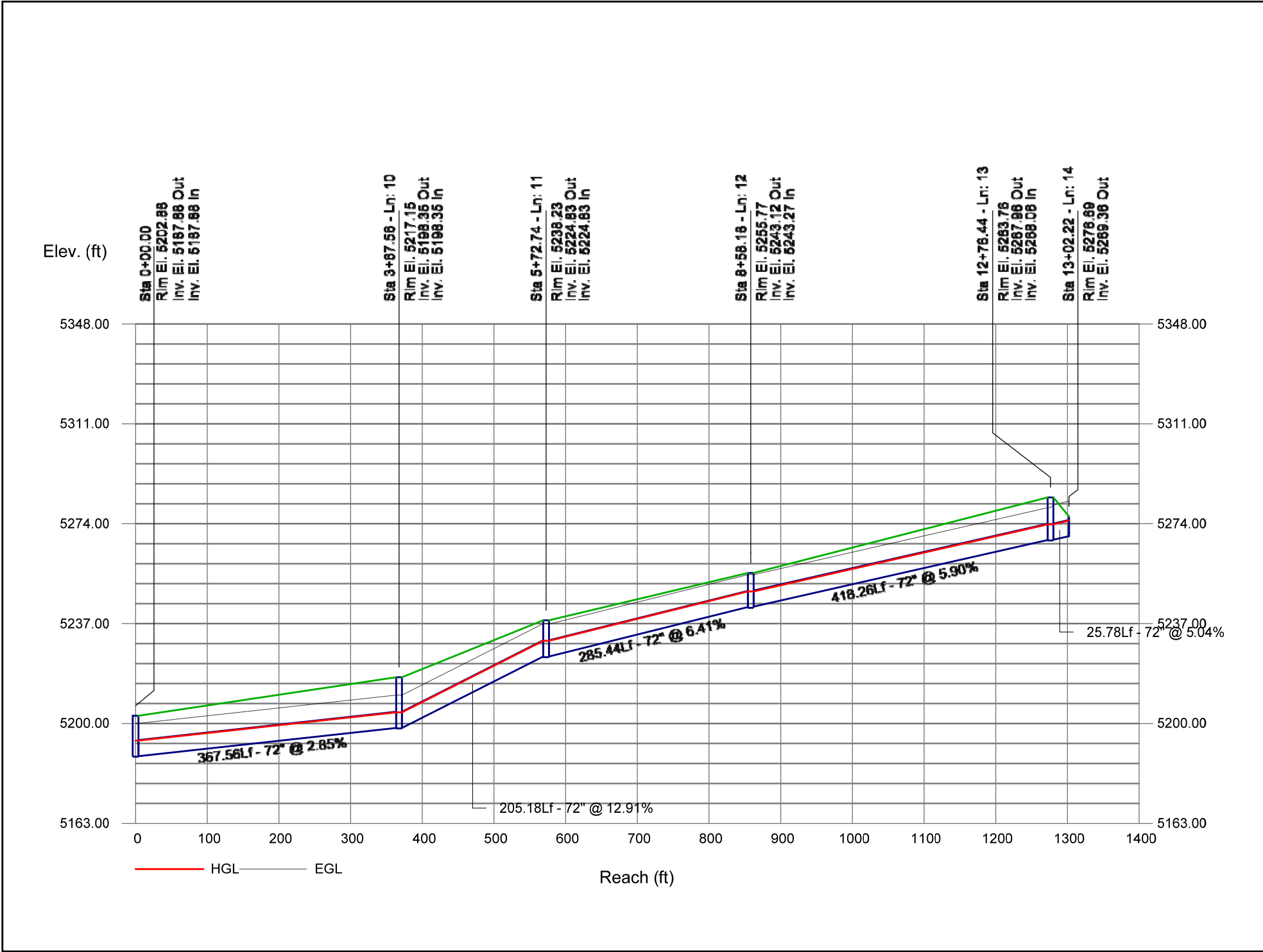
Line No.	Line ID	Line Size	Line Length	Line Slope	Flow Rate	Invert Dn	Invert Up	Gnd/Rim El Dn	Gnd/Rim El Up	HGL Dn	HGL Up	Cover Dn	Cover Up	J-Loss Coeff	Vel Ave	Capac Full	
		(in)	(ft)	(%)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)		(ft/s)	(cfs)	
24		48	250.00	3.09	159.00	5333.06	5340.79	5339.89	5347.37	5336.55	5344.45	2.83	2.58	0.00	13.43	252.59	
25		42	300.00	1.14	104.00	5340.87	5344.29	5347.37	5352.50	5344.45	5347.40	3.00	4.71	0.00	11.16	107.42	
26		48	310.56	0.50	99.00	5344.32	5345.87	5352.50	5352.41	5347.40	5349.13	4.18	2.54	0.00	9.28	101.49	
27		48	181.44	0.65	99.00	5345.91	5347.09	5352.41	5353.47	5349.13	5350.10	2.50	2.38	0.00	9.44	115.83	
28		48	8.00	0.37	99.00	5347.16	5347.19	5353.47	5353.47	5350.17	5350.35	2.31	2.28	0.00	9.52	87.65	
29		42	1032.27	0.95	99.00	5347.19	5357.00	5353.47	5363.00	5350.35	5360.06	2.78	2.50	0.00	10.97	98.08	
30		24	657.95	1.06	20.00	5359.00	5366.00	5363.00	5371.40	5360.43	5367.61	2.00	3.40	0.00	7.87	23.33	
31		24	206.48	1.45	20.00	5366.00	5369.00	5371.40	5374.00	5367.61	5370.61	3.40	3.00	0.00	7.40	27.26	
32		48	167.78	2.38	184.00	5366.00	5370.00	5374.00	5375.65	5369.50	5373.79	4.00	1.65	0.00	15.36	221.80	
33		48	349.96	1.43	184.00	5370.00	5375.00	5375.65	5381.70	5373.79	5378.79	1.65	2.70	0.00	14.94	171.70	
Project File: UPM System 6 PdN.stm											Number of lines: 33			Date: 3/16/2015			
NOTES: ** Critical depth																	

Storm Sewer Profile

Proj. file: UPM System 6 PdN.stm

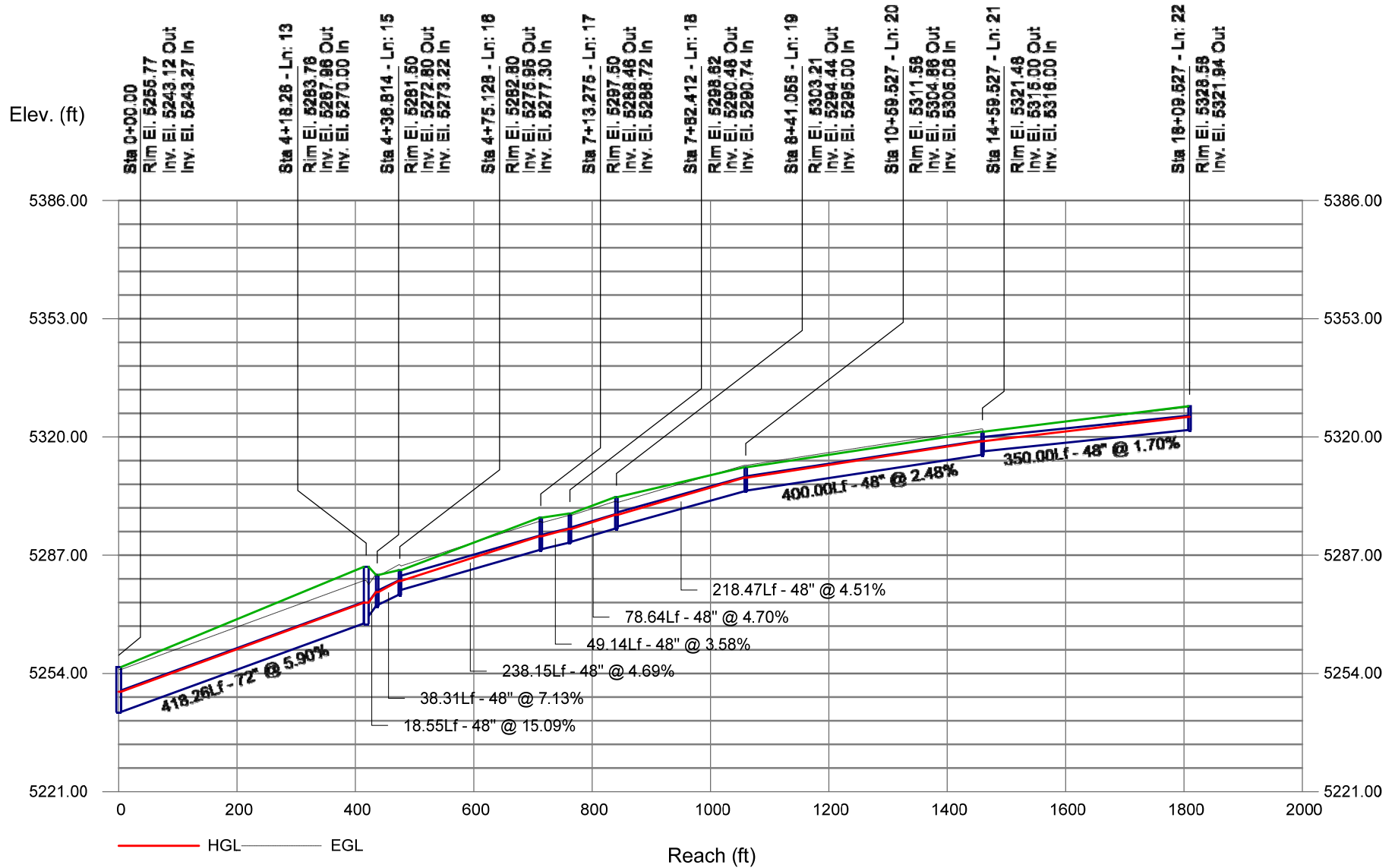


Storm Sewer Profile



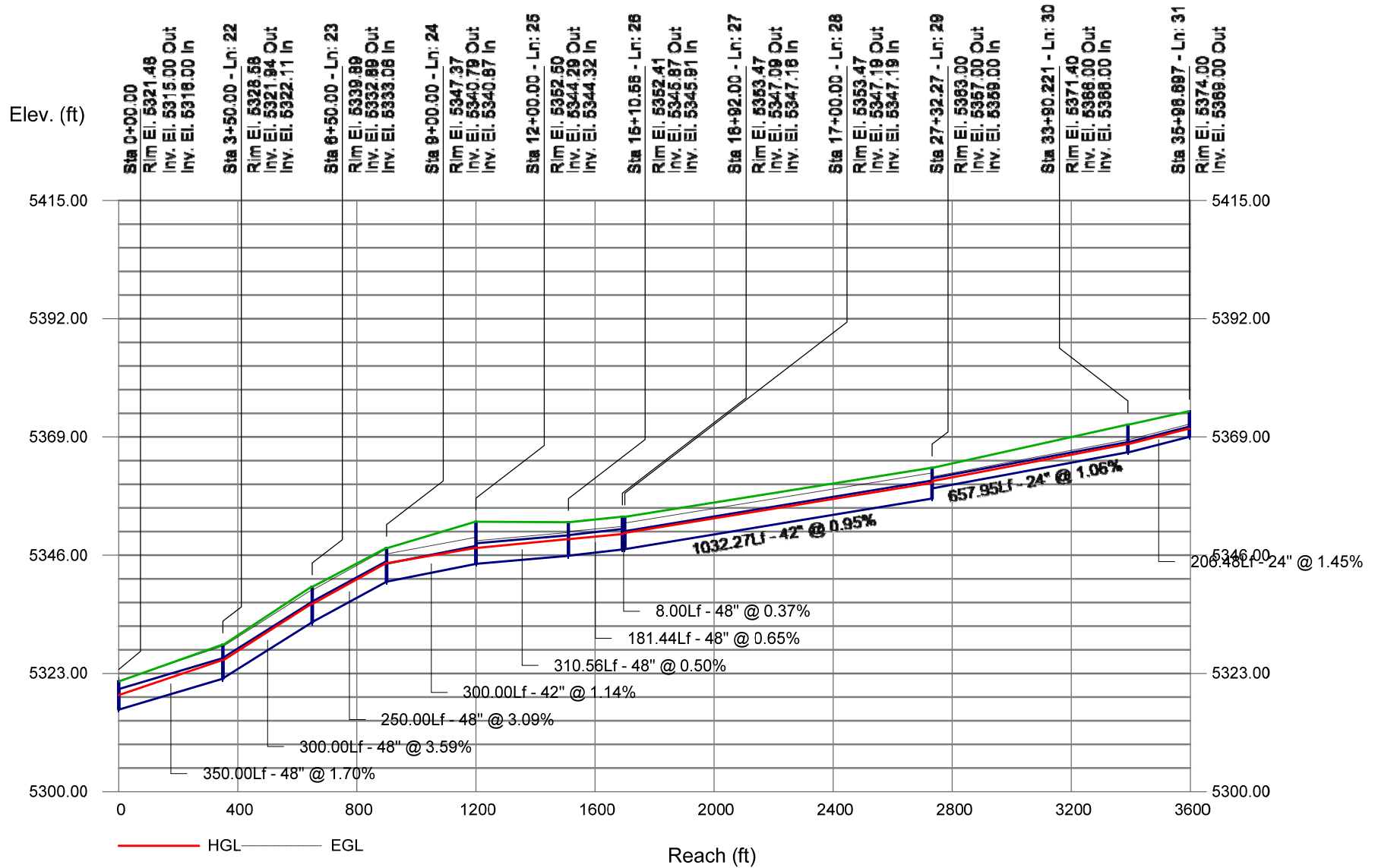
Storm Sewer Profile

Proj. file: UPM System 6 PdN.stm

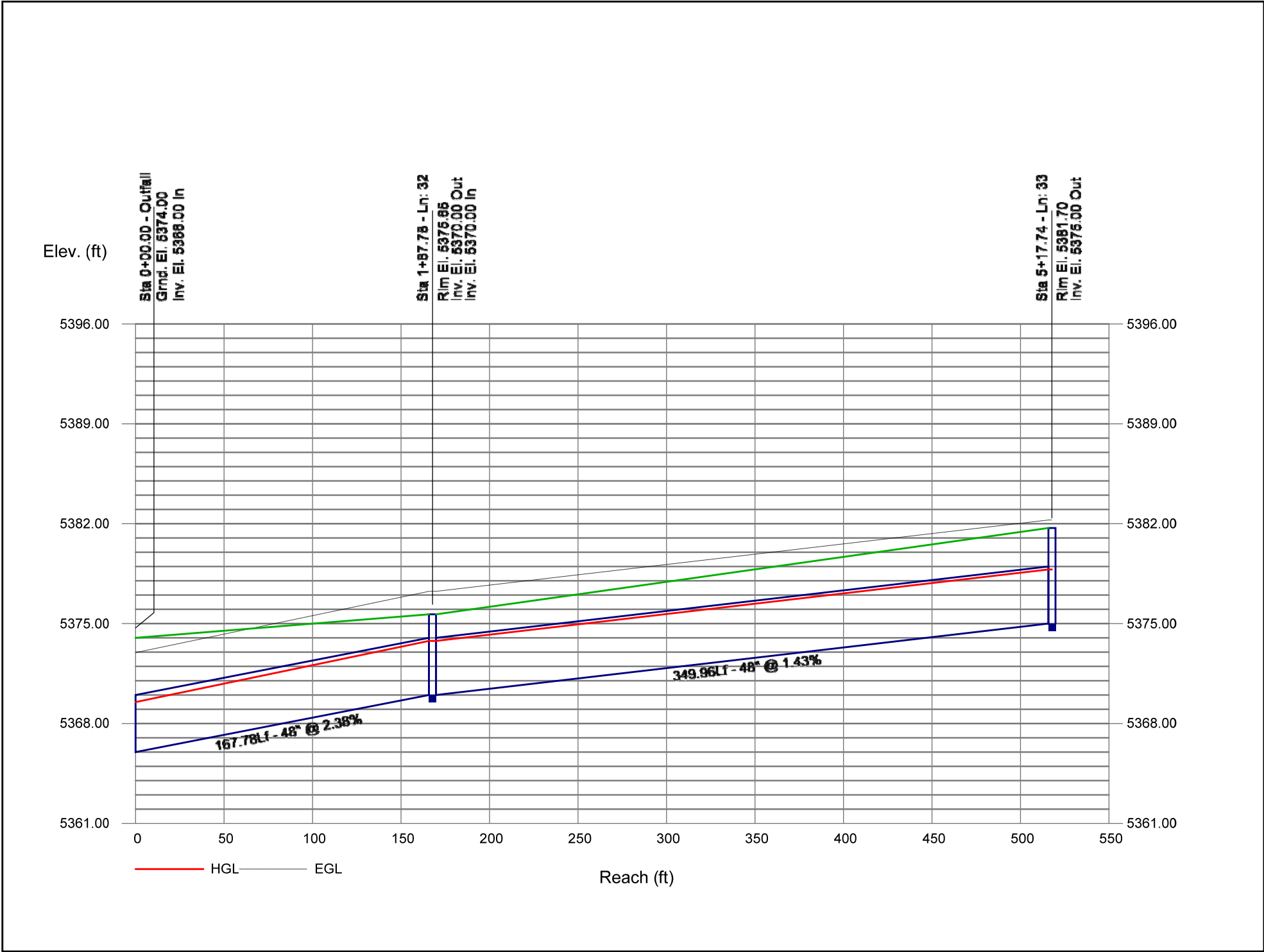


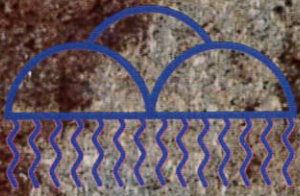
Storm Sewer Profile

Proj. file: UPM System 6 PdN.stm



Storm Sewer Profile





AMAFCA





Appendix D

- Alternative 4
 - o Comparison of Results
 - o Hydrology Model
 - o Piedras Marcadas Dam Rating Curve Calculations
 - o Hydraulic Model
 - o Piedras Marcadas Basin Drainage Management Plan (DMP) prepared by Tom Mann & Assoc. dated Feb. 1983

**Piedras Marcadas Dam
Comparison of Results**

Calculations	Dam Properties					Peak Data					Principal Spillway			Emergency Spillway	
	Elevation Bottom (ft)	Elevation Top (ft)	Available Volume (ac-ft)	Max Outflow (cfs)	Drainage Area (sq mi)	Inflow (cfs)	Outflow (cfs)	Runoff Volume (ac-ft)	Storage (ac-ft)	Water Surface Elevation (ft)	Outflow (cfs)	Elevation (ft)	Pipe Dia (in)	Elevation (ft)	Volume (ac-ft)
Alternative 4	5019.00	5046.50	662.52	28,837.0	3.851*	2,748.0	77.0	266.6	198.50	5030.49	87.9	5019.00	36	5034.75	306.81
DMP**	5018.75	5046.25	650.00	28,240.0	5.394	2,033.0	80.7	201.0	-	5030.55	90.0	5018.75	36	5034.75	307.00

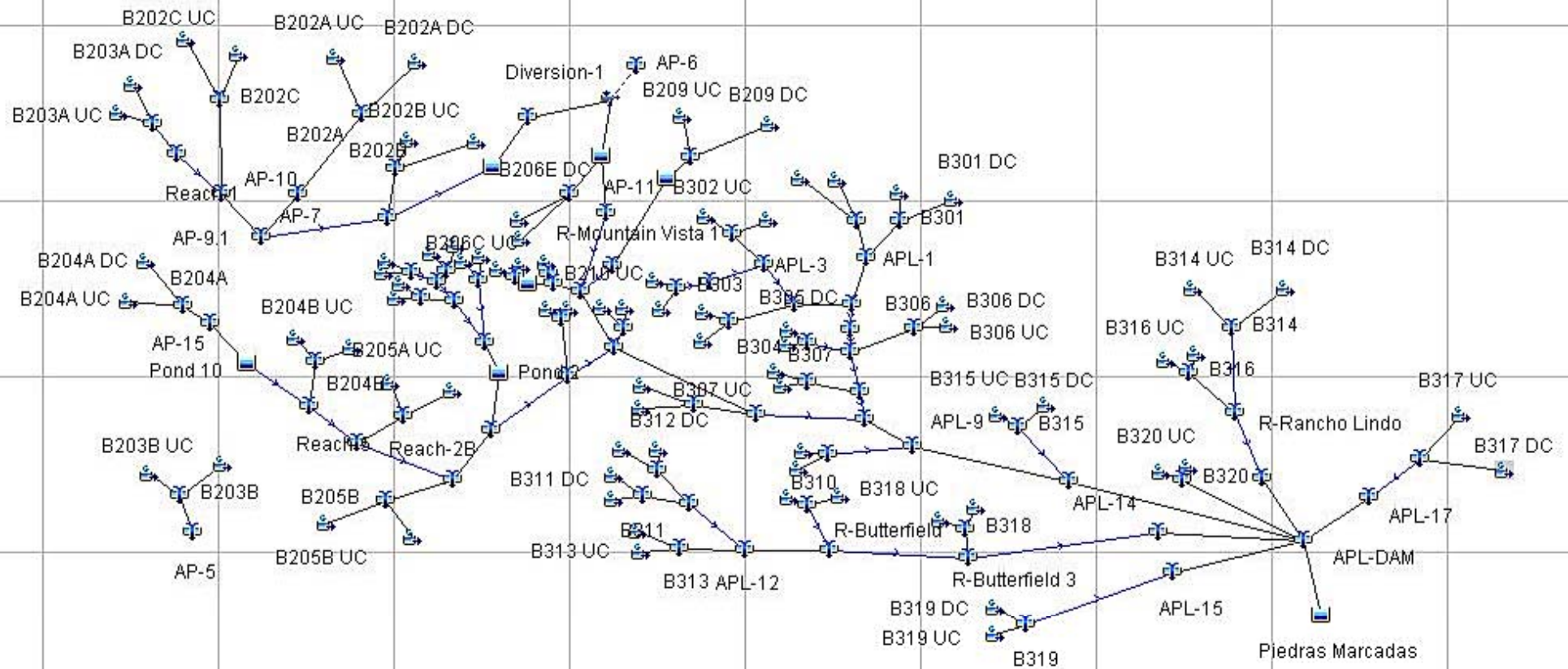
Notes:

*Watershed area includes 1.554 sq mi Upper basins, 2.30 sq mi Lower basins

**Datum adjustment factor of +2.75' was applied to all elevations

Upper Piedras Marcadas Basins

Lower Piedras Marcadas Basins



HEC-HMS PLAN - ALTERNATIVE 4

Alternative 4

HEC-HMS Results - Analysis Points' Summary				
Hydrologic Element	Drainage Area (sq mi)	Peak Discharge (cfs)	Time to Peak	Volume (ac-ft)
Upper Piedras Marcadas				
AP-1	0.557	570	01Jan2014, 06:05	63.4
AP-2	0.732	612	01Jan2014, 06:10	68.5
AP-3	0.792	157	01Jan2014, 07:10	40.2
AP-4	1.558	731	01Jan2014, 06:15	112.2
AP-5	0.059	119	01Jan2014, 05:50	6.4
AP-6	0.000	47	01Jan2014, 06:20	6.6
AP-7	0.069	130	01Jan2014, 05:50	7.9
AP-8	0.250	198	01Jan2014, 06:20	27.9
AP-9	0.250	402	01Jan2014, 05:55	28.5
AP-10	0.123	226	01Jan2014, 05:50	14.5
AP-11	0.288	119	01Jan2014, 06:45	24.5
AP-12	0.250	473	01Jan2014, 05:50	29.2
AP-13	0.292	537	01Jan2014, 05:50	34.0
AP-14	0.364	653	01Jan2014, 05:55	42.2
AP-15	0.084	196	01Jan2014, 05:45	9.7
AP-16	0.159	177	01Jan2014, 05:45	17.8
AP-17	0.051	19	01Jan2014, 06:15	3.4
AP-18	0.127	110	01Jan2014, 05:45	14.1
Lower Piedras Marcadas				
APL-1	0.495	316	01Jan2014, 05:45	19.1
APL-2	0.196	373	01Jan2014, 05:45	19.5
APL-3	0.261	464	01Jan2014, 05:50	25.1
APL-4	0.756	766	01Jan2014, 05:45	44.2
APL-5	0.756	733	01Jan2014, 05:50	43.3
APL-6	0.831	824	01Jan2014, 05:50	48.5
APL-7	0.950	1008	01Jan2014, 05:45	58.8
APL-8	2.746	1494	01Jan2014, 05:50	185.7
APL-9	2.764	1525	01Jan2014, 05:50	187.4
APL-10	2.901	1713	01Jan2014, 05:50	197.9
APL-11	0.358	444	01Jan2014, 05:45	24.4
APL-12	0.410	544	01Jan2014, 05:45	29.7
APL-13	0.513	546	01Jan2014, 05:45	39.5
APL-14	0.617	657	01Jan2014, 05:50	47.1
APL-15	0.062	62	01Jan2014, 05:50	3.6
APL-16	0.134	209	01Jan2014, 05:45	10.9
APL-17	0.070	111	01Jan2014, 05:45	5.8
APL-DAM	3.855	2748	01Jan2014, 05:50	266.6

Alternative 4

HEC-HMS Results - Basin Summary				
Hydrologic Element	Drainage Area (sq mi)	Peak Discharge (cfs)	Time to Peak	Volume (ac-ft)
Upper Piedras Marcadas				
B202A	0.069	130	01Jan2014, 05:50	7.9
B202B	0.058	132	01Jan2014, 05:45	6.5
B202C	0.051	116	01Jan2014, 05:45	6.0
B203A	0.073	133	01Jan2014, 05:55	8.5
B203B	0.059	119	01Jan2014, 05:50	6.4
B204A	0.084	196	01Jan2014, 05:45	9.7
B204B	0.043	104	01Jan2014, 05:45	5.1
B205A	0.032	76	01Jan2014, 05:45	3.7
B205B	0.034	79	01Jan2014, 05:45	3.9
B206A	0.136	258	01Jan2014, 05:55	16.3
B206B	0.114	241	01Jan2014, 05:50	13.0
B206C	0.072	130	01Jan2014, 05:55	8.2
B206D	0.041	97	01Jan2014, 05:45	4.8
B206E	0.038	80	01Jan2014, 05:45	4.0
B207	0.389	72	01Jan2014, 06:15	6.9
B208	0.175	67	01Jan2014, 05:55	5.1
B209	0.051	64	01Jan2014, 05:50	3.5
B210	0.034	66	01Jan2014, 05:45	3.6
Lower Piedras Marcadas				
B300	0.406	248	01Jan2014, 05:45	15.2
B301	0.089	68	01Jan2014, 05:45	3.9
B302	0.138	282	01Jan2014, 05:45	14.2
B303	0.058	105	01Jan2014, 05:45	5.4
B304	0.065	107	01Jan2014, 05:45	5.5
B305	0.038	63	01Jan2014, 05:45	3.2
B306	0.037	85	01Jan2014, 05:45	4.2
B307	0.119	234	01Jan2014, 05:45	11.6
B308	0.239	297	01Jan2014, 05:45	16.1
B309	0.018	34	01Jan2014, 05:45	1.7
B310	0.103	196	01Jan2014, 05:45	9.8
B311	0.247	287	01Jan2014, 05:45	16.0
B312	0.111	157	01Jan2014, 05:45	8.4
B313	0.052	104	01Jan2014, 05:45	5.2
B314	0.090	150	01Jan2014, 05:45	7.6
B315	0.137	211	01Jan2014, 05:45	10.6
B316	0.044	66	01Jan2014, 05:45	3.3
B317	0.070	116	01Jan2014, 05:45	5.8
B318	0.104	139	01Jan2014, 05:45	7.5
B319	0.062	64	01Jan2014, 05:45	3.6
B320	0.071	18	01Jan2014, 05:45	1.3

Alternative 4

HEC-HMS Results

Hydrologic Element	Drainage Area (sq mi)	Peak Discharge (cfs)	Time to Peak	Volume (ac-ft)
APL-DAM	3.855	2748.0	01Jan2014, 05:50	266.59
APL-1	0.495	316.0	01Jan2014, 05:45	19.14
APL-10	2.901	1712.5	01Jan2014, 05:50	197.93
APL-11	0.358	443.9	01Jan2014, 05:45	24.44
APL-12	0.410	543.9	01Jan2014, 05:45	29.66
APL-13	0.513	545.6	01Jan2014, 05:45	39.51
APL-14	0.617	656.9	01Jan2014, 05:50	47.07
APL-14.1	0.617	659.7	01Jan2014, 05:45	47.05
APL-15	0.062	61.7	01Jan2014, 05:50	3.61
APL-16	0.134	208.8	01Jan2014, 05:45	10.92
APL-16.1	0.134	212.8	01Jan2014, 05:45	10.91
APL-17	0.070	111.3	01Jan2014, 05:45	5.79
APL-1.2	0.058	100.2	01Jan2014, 05:50	5.35
APL-2	0.196	372.5	01Jan2014, 05:45	19.54
APL-3	0.261	464.3	01Jan2014, 05:50	25.08
APL-4	0.756	765.5	01Jan2014, 05:45	44.21
APL-5	0.756	732.6	01Jan2014, 05:50	43.26
APL-6	0.831	824.0	01Jan2014, 05:50	48.46
APL-7	0.950	1007.6	01Jan2014, 05:45	58.75
APL-8	2.746	1494.0	01Jan2014, 05:50	185.65
APL-9	2.764	1524.8	01Jan2014, 05:50	187.35
AP-UPM	1.797	805.3	01Jan2014, 06:15	128.31
AP-1	0.557	569.9	01Jan2014, 06:05	63.42
AP-10	0.123	226.3	01Jan2014, 05:50	14.53
AP-10.1	0.073	132.7	01Jan2014, 05:55	8.52
AP-11	0.288	119.3	01Jan2014, 06:45	24.52
AP-12	0.250	473.2	01Jan2014, 05:50	29.21
AP-13	0.292	537.0	01Jan2014, 05:50	33.98
AP-14	0.364	652.6	01Jan2014, 05:55	42.17
AP-15	0.084	196.3	01Jan2014, 05:45	9.70
AP-16	0.159	177.2	01Jan2014, 05:45	17.81
AP-17	0.051	19.2	01Jan2014, 06:15	3.40
AP-18	0.127	109.5	01Jan2014, 05:45	14.08
AP-1.1	0.193	247.3	01Jan2014, 05:45	21.72
AP-2	0.732	612.0	01Jan2014, 06:10	68.50
AP-3	0.792	157.4	01Jan2014, 07:10	40.22
AP-4	1.558	730.9	01Jan2014, 06:15	112.24
AP-5	0.059	119.2	01Jan2014, 05:50	6.42
AP-6	0.000	46.5	01Jan2014, 06:20	6.56
AP-7	0.069	129.5	01Jan2014, 05:50	7.91
AP-8	0.250	197.8	01Jan2014, 06:20	27.91
AP-9	0.250	401.7	01Jan2014, 05:55	28.46
AP-9.1	0.192	355.8	01Jan2014, 05:50	22.45

Alternative 4

HEC-HMS Results

Hydrologic Element	Drainage Area (sq mi)	Peak Discharge (cfs)	Time to Peak	Volume (ac-ft)
B202A	0.069	129.5	01Jan2014, 05:50	7.91
B202A DC	0.057	122.9	01Jan2014, 05:50	7.35
B202A UC	0.012	8.2	01Jan2014, 06:00	0.56
B202B	0.058	131.9	01Jan2014, 05:45	6.54
B202B DC	0.047	123.5	01Jan2014, 05:45	6.01
B202B UC	0.011	9.6	01Jan2014, 05:50	0.53
B202C	0.051	115.9	01Jan2014, 05:45	6.01
B202C DC	0.045	112.1	01Jan2014, 05:45	5.74
B202C UC	0.006	4.8	01Jan2014, 05:50	0.27
B203A	0.073	132.7	01Jan2014, 05:55	8.52
B203A DC	0.063	126.7	01Jan2014, 05:55	8.06
B203A UC	0.010	6.5	01Jan2014, 06:00	0.46
B203B	0.059	119.2	01Jan2014, 05:50	6.42
B203B DC	0.046	109.3	01Jan2014, 05:50	5.83
B203B UC	0.013	9.9	01Jan2014, 05:50	0.59
B204A	0.084	196.3	01Jan2014, 05:45	9.70
B204A DC	0.071	186.6	01Jan2014, 05:45	9.09
B204A UC	0.013	11.1	01Jan2014, 05:50	0.61
B204B	0.043	103.5	01Jan2014, 05:45	5.10
B204B DC	0.038	99.2	01Jan2014, 05:45	4.83
B204B UC	0.006	4.9	01Jan2014, 05:50	0.27
B205A	0.032	75.6	01Jan2014, 05:45	3.73
B205A DC	0.027	71.9	01Jan2014, 05:45	3.50
B205A UC	0.005	4.3	01Jan2014, 05:50	0.23
B205B	0.034	78.8	01Jan2014, 05:45	3.90
B205B DC	0.028	74.2	01Jan2014, 05:45	3.61
B205B UC	0.006	5.2	01Jan2014, 05:50	0.29
B206A	0.136	258.1	01Jan2014, 05:55	16.27
B206A DC	0.122	248.8	01Jan2014, 05:55	15.59
B206A UC	0.014	9.7	01Jan2014, 06:00	0.68
B206B	0.114	240.7	01Jan2014, 05:50	12.95
B206B DC	0.093	223.8	01Jan2014, 05:50	11.94
B206B UC	0.021	16.9	01Jan2014, 05:50	1.00
B206C	0.072	129.5	01Jan2014, 05:55	8.20
B206C DC	0.059	121.0	01Jan2014, 05:55	7.58
B206C UC	0.013	8.9	01Jan2014, 06:00	0.62
B206D	0.041	96.7	01Jan2014, 05:45	4.78
B206D DC	0.035	91.9	01Jan2014, 05:45	4.47
B206D UC	0.006	5.6	01Jan2014, 05:50	0.30
B206E	0.038	80.3	01Jan2014, 05:45	4.02
B206E DC	0.028	72.4	01Jan2014, 05:45	3.52
B206E UC	0.010	9.0	01Jan2014, 05:50	0.49
B207	0.389	71.8	01Jan2014, 06:15	6.93
B207 UC	0.389	71.8	01Jan2014, 06:15	6.93

Alternative 4

HEC-HMS Results

Hydrologic Element	Drainage Area (sq mi)	Peak Discharge (cfs)	Time to Peak	Volume (ac-ft)
B208	0.175	66.8	01Jan2014, 05:55	5.11
B208 DC	0.015	36.7	01Jan2014, 05:50	1.99
B208 UC	0.160	42.6	01Jan2014, 06:05	3.13
B209	0.051	63.9	01Jan2014, 05:50	3.52
B209 DC	0.013	35.0	01Jan2014, 05:45	1.70
B209 UC	0.038	33.1	01Jan2014, 05:50	1.81
B210	0.034	66.4	01Jan2014, 05:45	3.55
B210 DC	0.024	59.6	01Jan2014, 05:45	3.05
B210 UC	0.011	8.8	01Jan2014, 05:50	0.50
B300	0.406	248.4	01Jan2014, 05:45	15.21
B300 DC	0.091	239.6	01Jan2014, 05:45	11.66
B300 UC	0.315	48.5	01Jan2014, 06:00	3.55
B301	0.089	67.6	01Jan2014, 05:45	3.93
B301 DC	0.025	65.8	01Jan2014, 05:45	3.20
B301 UC	0.064	9.8	01Jan2014, 06:00	0.72
B302	0.138	282.4	01Jan2014, 05:45	14.18
B302 DC	0.089	234.3	01Jan2014, 05:45	11.41
B302 UC	0.049	52.3	01Jan2014, 05:50	2.77
B303	0.058	104.8	01Jan2014, 05:45	5.36
B303 DC	0.029	76.3	01Jan2014, 05:45	3.72
B303 UC	0.029	30.9	01Jan2014, 05:50	1.64
B304	0.065	106.7	01Jan2014, 05:45	5.54
B304 DC	0.026	68.4	01Jan2014, 05:45	3.33
B304 UC	0.039	41.6	01Jan2014, 05:50	2.21
B305	0.038	63.2	01Jan2014, 05:45	3.15
B305 DC	0.024	63.2	01Jan2014, 05:45	3.08
B305 UC	0.014	0.9	01Jan2014, 06:05	0.08
B306	0.037	84.7	01Jan2014, 05:45	4.19
B306 DC	0.032	84.2	01Jan2014, 05:45	4.10
B306 UC	0.005	1.2	01Jan2014, 06:00	0.09
B307	0.119	234.3	01Jan2014, 05:45	11.58
B307 DC	0.089	234.3	01Jan2014, 05:45	11.41
B307 UC	0.030	2.0	01Jan2014, 06:05	0.17
B308	0.239	296.9	01Jan2014, 05:45	16.07
B308 DC	0.108	284.3	01Jan2014, 05:45	13.84
B308 UC	0.131	32.6	01Jan2014, 06:00	2.23
B309	0.018	34.2	01Jan2014, 05:45	1.69
B309 DC	0.013	34.2	01Jan2014, 05:45	1.67
B309 UC	0.005	0.3	01Jan2014, 06:05	0.03
B310	0.103	195.6	01Jan2014, 05:45	9.81
B310 DC	0.074	194.8	01Jan2014, 05:45	9.48
B310 UC	0.029	4.5	01Jan2014, 06:00	0.33
B311	0.247	286.9	01Jan2014, 05:45	16.02
B311 DC	0.094	247.4	01Jan2014, 05:45	12.05

Alternative 4

HEC-HMS Results

Hydrologic Element	Drainage Area (sq mi)	Peak Discharge (cfs)	Time to Peak	Volume (ac-ft)
B311 UC	0.153	59.3	01Jan2014, 05:50	3.97
B312	0.111	157.0	01Jan2014, 05:45	8.42
B312 DC	0.053	139.5	01Jan2014, 05:45	6.79
B312 UC	0.058	25.1	01Jan2014, 05:50	1.62
B313	0.052	103.9	01Jan2014, 05:45	5.22
B313 DC	0.039	102.7	01Jan2014, 05:45	5.00
B313 UC	0.013	3.2	01Jan2014, 06:00	0.22
B314	0.090	150.4	01Jan2014, 05:45	7.60
B314 DC	0.057	150.0	01Jan2014, 05:45	7.31
B314 UC	0.033	3.8	01Jan2014, 06:05	0.29
B315	0.137	210.6	01Jan2014, 05:45	10.58
B315 DC	0.080	210.6	01Jan2014, 05:45	10.25
B315 UC	0.057	3.7	01Jan2014, 06:05	0.32
B316	0.044	65.8	01Jan2014, 05:45	3.31
B316 DC	0.025	65.8	01Jan2014, 05:45	3.20
B316 UC	0.019	1.2	01Jan2014, 06:05	0.11
B317	0.070	115.8	01Jan2014, 05:45	5.79
B317 DC	0.044	115.8	01Jan2014, 05:45	5.64
B317 UC	0.026	1.7	01Jan2014, 06:05	0.15
B318	0.104	138.6	01Jan2014, 05:45	7.52
B318 DC	0.046	121.1	01Jan2014, 05:45	5.90
B318 UC	0.058	25.1	01Jan2014, 05:50	1.62
B319	0.062	64.3	01Jan2014, 05:45	3.61
B319 DC	0.023	60.5	01Jan2014, 05:45	2.95
B319 UC	0.039	9.7	01Jan2014, 06:00	0.66
B320	0.071	18.4	01Jan2014, 05:45	1.26
B320 DC	0.007	18.4	01Jan2014, 05:45	0.90
B320 UC	0.064	4.2	01Jan2014, 06:05	0.36
Diversion-1	0.250	151.3	01Jan2014, 06:20	21.35
Junction-4	0.452	104.4	01Jan2014, 06:15	12.42
Piedras Marcadas	3.855	77.0	01Jan2014, 10:15	113.80
Pond 10	0.084	19.9	01Jan2014, 06:25	8.99
Pond 2	0.364	446.3	01Jan2014, 06:10	41.71
Pond 202B	0.250	197.8	01Jan2014, 06:20	27.91
Pond 209	0.051	19.2	01Jan2014, 06:15	3.40
Reach 202A	0.192	317.0	01Jan2014, 05:55	21.92
Reach 206A	0.136	256.0	01Jan2014, 05:55	16.26
Reach-1	0.073	130.0	01Jan2014, 05:55	8.52
Reach-2	0.250	400.7	01Jan2014, 05:55	28.46
Reach-2B	0.159	174.9	01Jan2014, 05:50	17.82
Reach-204A	0.084	19.9	01Jan2014, 06:25	8.98
Reach-206C	0.072	127.9	01Jan2014, 05:55	8.20
Reach-3A	0.292	524.7	01Jan2014, 05:55	33.97
Reach-4	0.051	19.1	01Jan2014, 06:40	3.39

Alternative 4

HEC-HMS Results

Hydrologic Element	Drainage Area (sq mi)	Peak Discharge (cfs)	Time to Peak	Volume (ac-ft)
Reach-5	0.127	106.8	01Jan2014, 05:50	14.08
Reach-6	0.288	119.3	01Jan2014, 07:15	24.41
Reach-7	0.732	602.0	01Jan2014, 06:15	68.47
Reach-8	0.557	561.6	01Jan2014, 06:10	63.39
Reach-9	0.250	455.9	01Jan2014, 05:55	29.20
R-Butterfield	0.103	193.4	01Jan2014, 06:35	9.84
R-Butterfield 2	0.513	525.0	01Jan2014, 05:50	39.53
R-Butterfield 3	0.617	656.9	01Jan2014, 05:50	47.07
R-Calle Nortena	0.018	33.3	01Jan2014, 05:45	1.70
R-Eagle Ranch	0.070	111.3	01Jan2014, 05:45	5.79
R-Firewheel	0.358	440.0	01Jan2014, 05:45	24.44
R-Golf Course 1	0.756	732.6	01Jan2014, 05:50	43.26
R-Golf Course 2	0.756	691.0	01Jan2014, 05:50	41.12
R-Golf Course 3	0.831	791.3	01Jan2014, 05:50	47.18
R-Golf Course 4	0.950	929.0	01Jan2014, 05:50	57.34
R-Marna Lynn	0.038	59.9	01Jan2014, 05:45	3.16
R-Mountain Vista 1	0.058	100.2	01Jan2014, 05:50	5.35
R-Mountain Vista 2	0.058	99.7	01Jan2014, 05:50	5.35
R-Paradise	0.196	362.4	01Jan2014, 05:50	19.54
R-PM Arroyo 1	1.797	798.9	01Jan2014, 06:15	128.32
R-Rancho Bonito	0.062	61.7	01Jan2014, 05:50	3.61
R-Rancho Lindo	0.134	208.8	01Jan2014, 05:45	10.92
R-Rancho Sereno 1	0.137	207.6	01Jan2014, 05:45	10.58
R-Rancho Sereno 2	0.090	147.0	01Jan2014, 05:45	7.60
Sundance	0.063	101.7	01Jan2014, 05:50	5.54
Sundance DC	0.032	78.8	01Jan2014, 05:45	4.04
Sundance Pond	0.063	32.6	01Jan2014, 06:10	5.50
Sundance UC	0.032	26.5	01Jan2014, 05:50	1.50
Unser Pond	0.288	119.3	01Jan2014, 06:45	24.52

Curve Numvers		
Basin ID	Impervious	Pervious
Upper Piedras Marcadas		
202A	98	79
202B	98	79
202C	98	79
203A	98	79
203B	98	79
204A	98	79
204B	98	79
205A	98	79
205B	98	79
206A	98	79
206B	98	79
206C	98	79
206D	98	79
206E	98	79
207	98	65
208	98	66
209	98	79
210	98	79
Sundance	98	79
Lower Piedras Marcadas		
300	98	61
301	98	61
302	98	82
303	98	82
304	98	82
305	98	56
306	98	65
307	98	56
308	98	65
309	98	56
310	98	61
311	98	70
312	98	71
313	98	65
314	98	59
315	98	56
316	98	56
317	98	56
318	98	71
319	98	65
320	98	56
Note: CN values are based on NMDOT Hydrology Manual Table 3-4		

Piedras Marcadas Dam Rating Curve

Project: Piedras Mercadas Dam

Project No: 13-600-407-00

WSEL	Primary Riser Orifice Flows	Primary Top of Riser Flows+ Orifice Flows	36" Outlet Flows	Primary Spillway	Emergency Spillway	Total Flow	
(ft)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	
5019	0	0	0	0	0	0	
5020	3	3	6	3	0	3	
5021	20	20	16	16	0	16	
5022	28	28	32	28	0	28	
5023	34	34	49	34	0	34	
5024	55	55	56	55	0	55	
5025	67	67	61	61	0	61	
5026	76	76	64	64	0	64	
5027	107	107	67	67	0	67	
5028	123	123	70	70	0	70	
5029	137	137	73	73	0	73	
5030	150	150	76	76	0	76	
5031	161	161	78	78	0	78	
5032	194	194	81	81	0	81	
5033	213	213	84	84	0	84	
5034	230	346	86	86	0	86	
5034.75	241	509	88	88	0	88	Emergency Spillway Crest
5035	244	573	89	89	6	94	
5036	258	861	91	91	803	894	
5037	271	1199	92	92	2064	2156	
5038	283	1180	93	93	3683	3776	
5039	295	1278	95	95	5622	5717	
5040	306	1368	96	96	7839	7935	
5041	317	1452	97	97	10352	10449	
5042	327	1531	99	99	13115	13214	
5043	337	1606	100	100	16163	16263	
5044	347	1678	101	101	19450	19552	
5045	356	1746	102	102	22970	23073	
5046	365	1812	104	104	26745	26849	
5046.5	370	1844	104	104	28732	28837	Dam Crest

Project: Piedras Marcadas Dam
Project No: 13-600-407-00

Elevation	Volume	
ft	cf	ac
5,019.00	0	0.00
5,020.00	84,119	1.93
5,021.00	414,474	9.52
5,022.00	931,389	21.38
5,023.00	1,591,851	36.54
5,024.00	2,359,873	54.18
5,025.00	3,210,117	73.69
5,026.00	4,124,678	94.69
5,027.00	5,084,009	116.71
5,028.00	6,074,673	139.46
5,029.00	7,089,338	162.75
5,030.00	8,127,221	186.58
5,031.00	9,187,619	210.92
5,032.00	10,269,584	235.76
5,033.00	11,373,237	261.09
5,034.00	12,500,400	286.97
5,034.75	13,364,535	306.81
5,035.00	13,652,760	313.42
5,036.00	14,829,930	340.45
5,037.00	16,032,823	368.06
5,038.00	17,262,119	396.28
5,039.00	18,515,880	425.07
5,040.00	19,794,034	454.41
5,041.00	21,097,848	484.34
5,042.00	22,427,168	514.86
5,043.00	23,786,816	546.07
5,044.00	25,183,545	578.13
5,045.00	26,620,184	611.12
5,046.00	28,096,625	645.01
5,046.50	28,859,445	662.52

Emergency Spillway Crest

Dam Crest

Principal Spillway Flows

Project: Piedras Marcadas Dam
 Project No: 13-600-407-00

$$Q = C_d A \sqrt{2gh}$$

Primary Principal Spillway		Total Q
Invert Elev	5019 ft	
Pipe Size	36" RCP ft	
Pipe Area	7.065 ft^2	
36" flow from Culvertmaster		
WSEL (ft)	Q (cfs)	
5019	0.00	0
5020	6.45	6
5021	16.25	16
5022	32.31	32
5023	48.96	49
5024	55.50	56
5025	60.75	61
5026	63.87	64
5027	67.00	67
5028	70.11	70
5029	72.90	73
5030	75.68	76
5031	78.47	78
5032	81.11	81
5033	83.58	84
5034	86.05	86
5034.75	87.90	88
5035	88.52	89
5036	90.55	91
5037	91.91	92
5038	93.27	93
5039	94.64	95
5040	96.00	96
5041	97.37	97
5042	98.73	99
5043	100.08	100
5044	101.29	101
5045	102.49	102
5046	103.69	104
5046.5	104.30	104

Emergency Spillway Crest

Dam Crest

Primary Principal Spillway Riser

Project: Piedras Marcadas Dam
Project No: 13-600-407-00

$$Q = C_d A \sqrt{2gh}$$

Top of Structure **5033 ft**
Cd **0.67**
g **32.2 ft/sec^2**

Bottom Orifices			Row 1 Orifices			Row 2 Orifices			Row 3 Orifices			Row 4 Orifices			Total Flow from Low Flow Riser Orifices
Inlet Dia.	12 in.		Inlet Dia.	8 in.		Inlet Dia.	8 in.		Inlet Dia.	8 in.		Inlet Dia.	8 in.		
Inlet Area	0.7854 sq ft		Inlet Area	0.3491 sq ft		Inlet Area	0.3491 sq ft		Inlet Area	0.3491 sq ft		Inlet Area	0.3491 sq ft		
Invert Elev	5019 ft.		Invert Elev	5019 ft.		Invert Ele	5022.06 ft.		Invert Elev	5025.02 ft.		Invert Elev	5030 ft.		
# of Inlets	1		# of Inlets	8		# of Inlets	9		# of Inlets	12		# of Inlets	12		
WSEL (ft)	Q (cfs)	Q row (cfs)	WSEL (ft)	Q (cfs)	Q row (cfs)	WSEL (ft)	Q (cfs)	Q row (cfs)	WSEL (ft)	Q (cfs)	Q row (cfs)	WSEL (ft)	Q (cfs)	Q row (cfs)	
5019	0.0	0.0	5019	0.0	0.0	5019	0.0	0.0	5019	0.0	0.0	5019	0.0	0.0	0.0
5020	3.0	3.0	5020	0.0	0.0	5020	0.0	0.0	5020	0.0	0.0	5020	0.0	0.0	3.0
5021	5.1	5.1	5021	1.9	14.9	5021	0.0	0.0	5021	0.0	0.0	5021	0.0	0.0	20.1
5022	6.6	6.6	5022	2.6	21.1	5022	0.0	0.0	5022	0.0	0.0	5022	0.0	0.0	27.8
5023	7.9	7.9	5023	3.2	25.9	5023	0.0	0.0	5023	0.0	0.0	5023	0.0	0.0	33.7
5024	8.9	8.9	5024	3.7	29.9	5024	1.8	16.3	5024	0.0	0.0	5024	0.0	0.0	55.1
5025	9.9	9.9	5025	4.2	33.4	5025	2.6	23.4	5025	0.0	0.0	5025	0.0	0.0	66.7
5026	10.7	10.7	5026	4.6	36.6	5026	3.2	28.8	5026	0.0	0.0	5026	0.0	0.0	76.1
5027	11.5	11.5	5027	4.9	39.5	5027	3.7	33.4	5027	1.8	22.2	5027	0.0	0.0	106.6
5028	12.3	12.3	5028	5.3	42.3	5028	4.2	37.4	5028	2.6	31.5	5028	0.0	0.0	123.4
5029	13.0	13.0	5029	5.6	44.8	5029	4.6	41.0	5029	3.2	38.7	5029	0.0	0.0	137.4
5030	13.6	13.6	5030	5.9	47.2	5030	4.9	44.3	5030	3.7	44.7	5030	0.0	0.0	149.8
5031	14.2	14.2	5031	6.2	49.6	5031	5.3	47.4	5031	4.2	50.0	5031	0.0	0.0	161.2
5032	14.9	14.9	5032	6.5	51.8	5032	5.6	50.3	5032	4.6	54.8	5032	1.9	22.4	194.1
5033	15.4	15.4	5033	6.7	53.9	5033	5.9	53.0	5033	4.9	59.2	5033	2.6	31.7	213.2
5034	16.0	16.0	5034	7.0	55.9	5034	6.2	55.6	5034	5.3	63.3	5034	3.2	38.8	229.6
5034.75	16.4	16.4	5034.75	7.2	57.4	5034.75	6.4	57.5	5034.75	5.5	66.2	5034.75	3.6	43.4	240.9
5035	16.5	16.5	5035	7.2	57.9	5035	6.5	58.1	5035	5.6	67.2	5035	3.7	44.8	244.5
5036	17.1	17.1	5036	7.5	59.8	5036	6.7	60.5	5036	5.9	70.8	5036	4.2	50.1	258.2
5037	17.6	17.6	5037	7.7	61.6	5037	7.0	62.8	5037	6.2	74.3	5037	4.6	54.9	271.1
5038	18.1	18.1	5038	7.9	63.4	5038	7.2	65.0	5038	6.5	77.6	5038	4.9	59.3	283.3
5039	18.6	18.6	5039	8.1	65.1	5039	7.5	67.1	5039	6.7	80.7	5039	5.3	63.4	294.9
5040	19.0	19.0	5040	8.4	66.8	5040	7.7	69.2	5040	7.0	83.8	5040	5.6	67.2	306.0
5041	19.5	19.5	5041	8.6	68.5	5041	7.9	71.2	5041	7.2	86.7	5041	5.9	70.9	316.7
5042	19.9	19.9	5042	8.8	70.1	5042	8.1	73.1	5042	7.5	89.6	5042	6.2	74.3	327.1
5043	20.4	20.4	5043	9.0	71.6	5043	8.3	75.1	5043	7.7	92.3	5043	6.5	77.6	337.0
5044	20.8	20.8	5044	9.1	73.2	5044	8.5	76.9	5044	7.9	95.0	5044	6.7	80.8	346.7
5045	21.2	21.2	5045	9.3	74.7	5045	8.7	78.7	5045	8.1	97.6	5045	7.0	83.9	356.1
5046	21.6	21.6	5046	9.5	76.2	5046	8.9	80.5	5046	8.3	100.2	5046	7.2	86.8	365.3
5046.5	21.8	21.8	5046.5	9.6	76.9	5046.50	9.0	81.4	5046.50	8.5	101.4	5046.50	7.4	88.2	369.8

Top of Riser Flows

Project: Piedras Marcadas Dam
Project No: 13-600-407-00

$$Q = C_w \cdot L \cdot h^{1.5}$$

$$Q = C_d A \sqrt{2gh}$$

Top of Riser Elev **5033** ft
Riser Width **10** ft
Riser Length **10** ft
Riser Area **100** sq ft
Cw **2.9**
Cd **0.50**
g **32.2** ft/sec^2

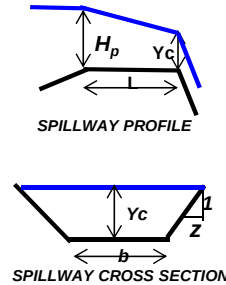
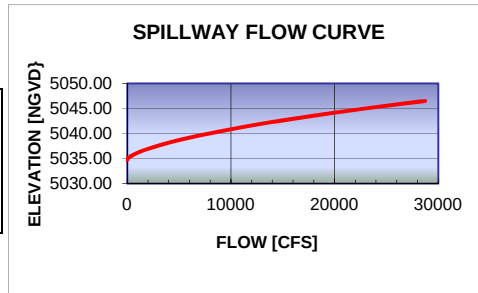
WSEL (ft)	Weir Flow Q (cfs)	Orifice Flow Q (cfs)	Used Q (cfs)
5019	0.0	0.0	0.0
5020	0.0	0.0	0.0
5021	0.0	0.0	0.0
5022	0.0	0.0	0.0
5023	0.0	0.0	0.0
5024	0.0	0.0	0.0
5025	0.0	0.0	0.0
5026	0.0	0.0	0.0
5027	0.0	0.0	0.0
5028	0.0	0.0	0.0
5029	0.0	0.0	0.0
5030	0.0	0.0	0.0
5031	0.0	0.0	0.0
5032	0.0	0.0	0.0
5033	0.0	0.0	0.0
5034	116.0	401.2	116.0
5034.75	268.5	530.8	268.5
5035	328.1	567.5	328.1
5036	602.8	695.0	602.8
5037	928.0	802.5	928.0
5038	1296.9	897.2	897.2
5039	1704.8	982.9	982.9
5040	2148.4	1061.6	1061.6
5041	2624.8	1134.9	1134.9
5042	3132.0	1203.7	1203.7
5043	3668.2	1268.9	1268.9
5044	4232.0	1330.8	1330.8
5045	4822.0	1390.0	1390.0
5046	5437.2	1446.7	1446.7
5046.5	5753.9	1474.3	1474.3

EMERGENCY SPILLWAY FLOW FOR PIEDRAS MARCADAS DAM

INPUT DESIGN PARAMETERS:

SELECTED BOTTOM WIDTH =	200.00 ft
SIDE SLOPE (Z) =	4.00
LEVEL SECTION LENGTH =	20.00 ft
ROUGHNESS COEFFICIENT =	0.030
SPILLWAY INVERT ELEVATION =	5034.75 NGVD

OUTPUT:



SELECTED											
Yc [ft]	Ac [ft²]	T [ft]	Qc [cfs]	Vc [fps]	Hec [ft]	a	Hp [ft]	R [ft]	Sc [ft/ft]	ELEV	
0.00			0							5034.75	
0.03	6.00	200.24	6	0.98	0.04	0.24244	0.26	0.03	0.0421	5035.01	
0.79	160.50	206.32	803	5.00	1.18	0.00312	1.25	0.78	0.0143	5036.00	
1.48	303.70	211.80	2064	6.79	2.19	0.00136	2.25	1.43	0.0116	5037.00	
2.16	450.66	217.28	3683	8.17	3.20	0.00082	3.25	2.07	0.0103	5038.00	
2.85	602.49	222.80	5622	9.33	4.20	0.00057	4.25	2.70	0.0094	5039.00	
3.54	758.13	228.32	7839	10.34	5.20	0.00043	5.25	3.31	0.0088	5040.00	
4.24	919.91	233.92	10352	11.25	6.21	0.00034	6.25	3.92	0.0084	5041.00	
4.94	1085.61	239.52	13115	12.08	7.21	0.00028	7.25	4.51	0.0080	5042.00	
5.65	1257.69	245.20	16163	12.85	8.21	0.00023	8.25	5.10	0.0077	5043.00	
6.36	1433.80	250.88	19450	13.57	9.22	0.00020	9.25	5.68	0.0074	5044.00	
7.07	1613.94	256.56	22970	14.23	10.22	0.00018	10.25	6.25	0.0072	5045.00	
7.79	1799.42	262.28	26745	14.86	11.22	0.00015	11.25	6.81	0.0070	5046.00	
8.15	1894.36	265.16	28732	15.17	11.72	0.00015	11.75	7.09	0.0069	5046.50	

CRITICAL FLOW EQUATIONS*

- (1) $Q_c = \text{SQRT}(gA^3/T)$,

(5) $H_{ec} = Y_c + V_c^2/2g$,

(8) $Sc = 14.56n^2A/(R^{1.33})T$,

(2) $Ac = (b + ZY_c)Y_c$,

(6) $H_p = H_{ec}(1 + aL)$,

(9) $R = (b + ZY_c)Y_c/(b + 2Y_c\text{SQRT}(1 + Z^2))$,

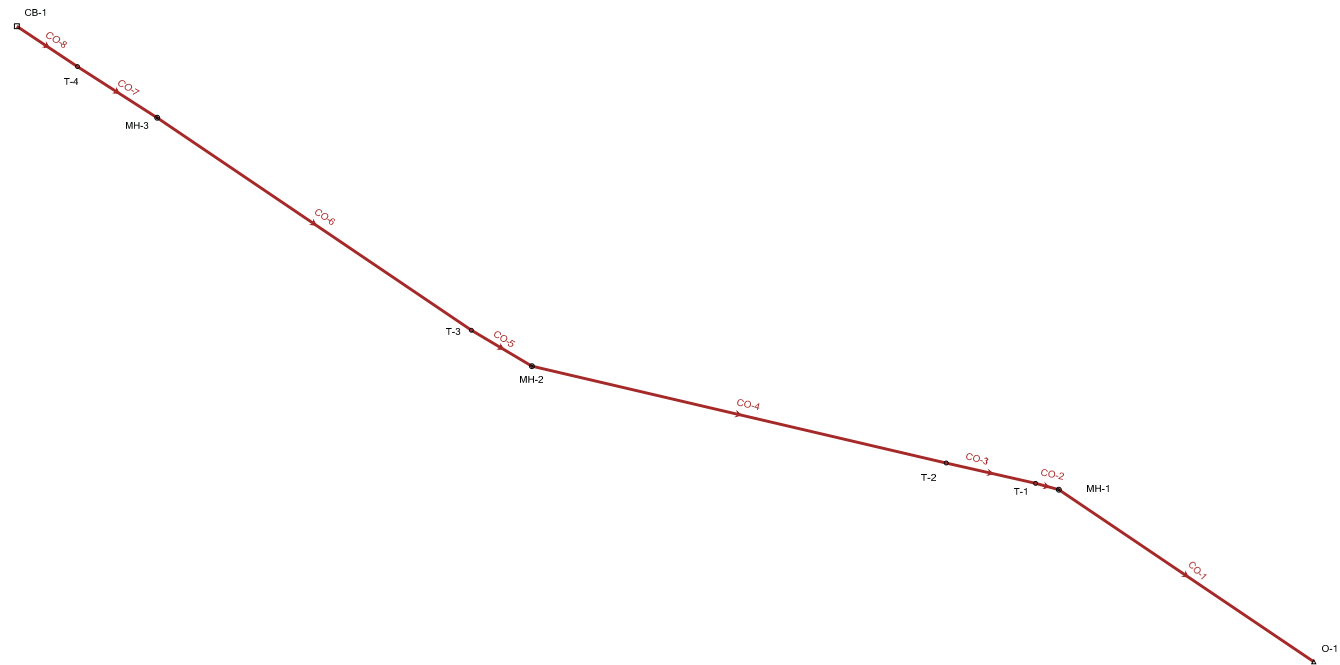
(3) $V_c = \text{SQRT}(gA/T)$,

(7) $a = (4.32n^2)/H_{ec}^{1.33}$,

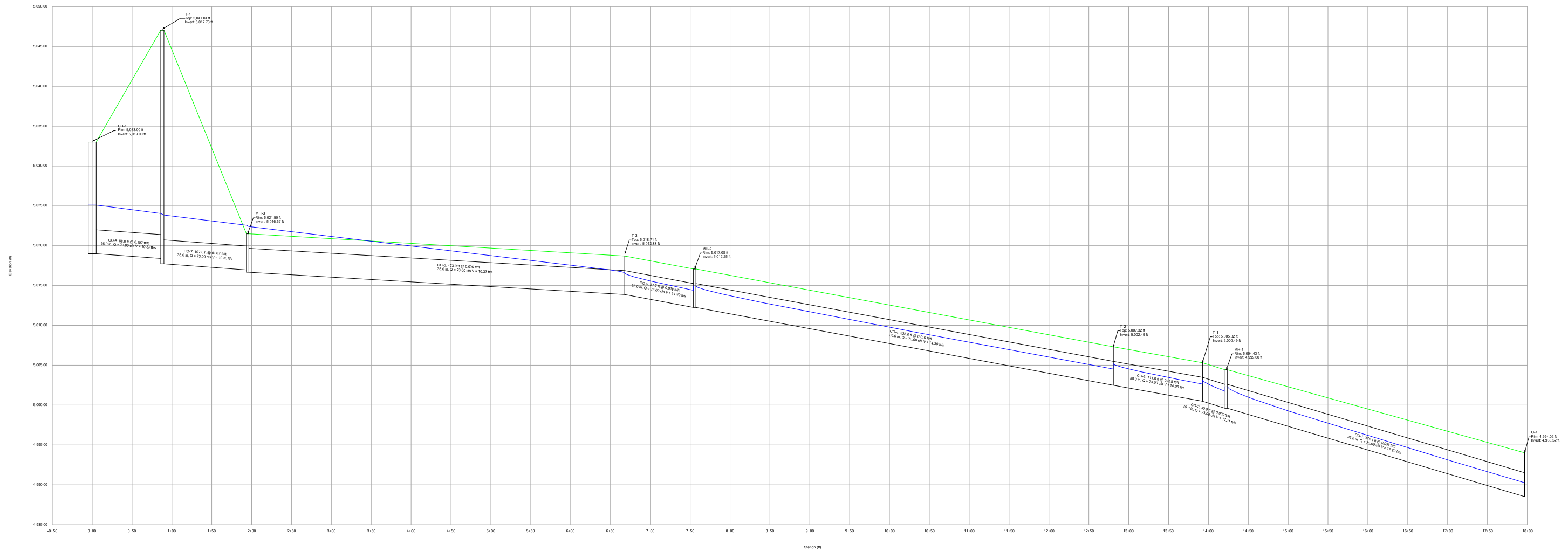
(4) $T = b + 2ZY_c$

* The Critical Flow Equations were obtained from SCS TR-2 dated 1956 and the Handbook of Hydraulics (Brater & King, 6 ed., page 8-16).

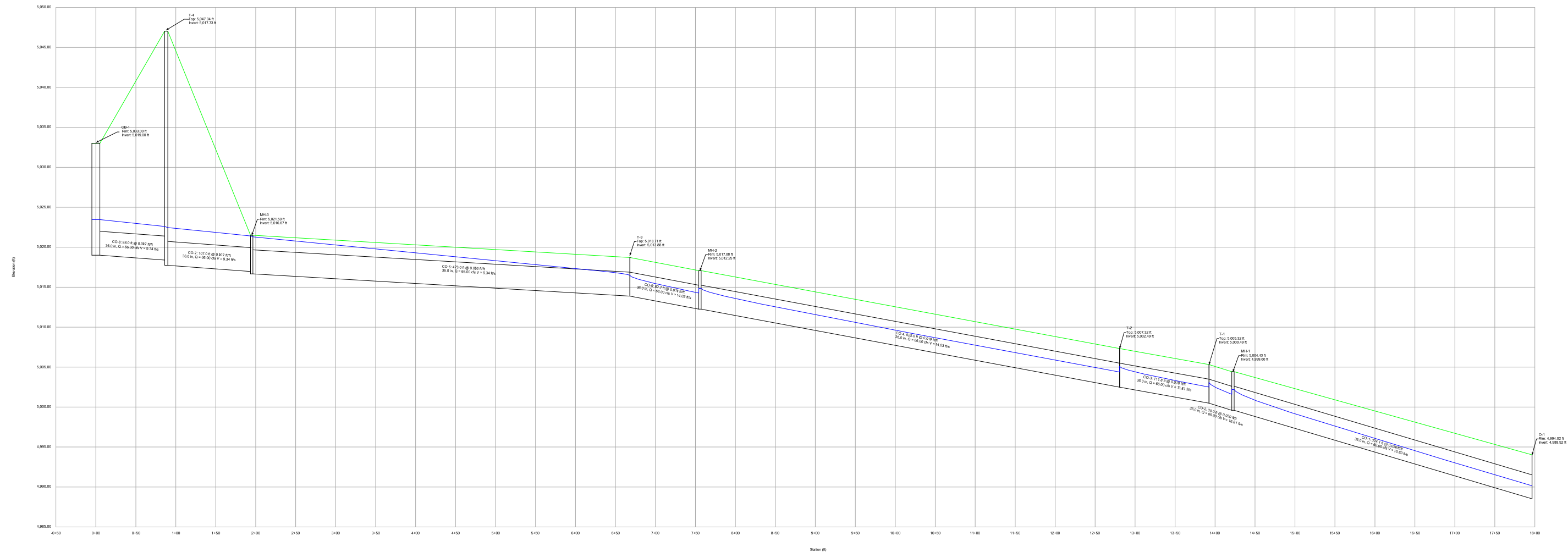
Scenario: Base



Profile Report
Engineering Profile - Dam Outlet (PM Dam outfall.stsw)



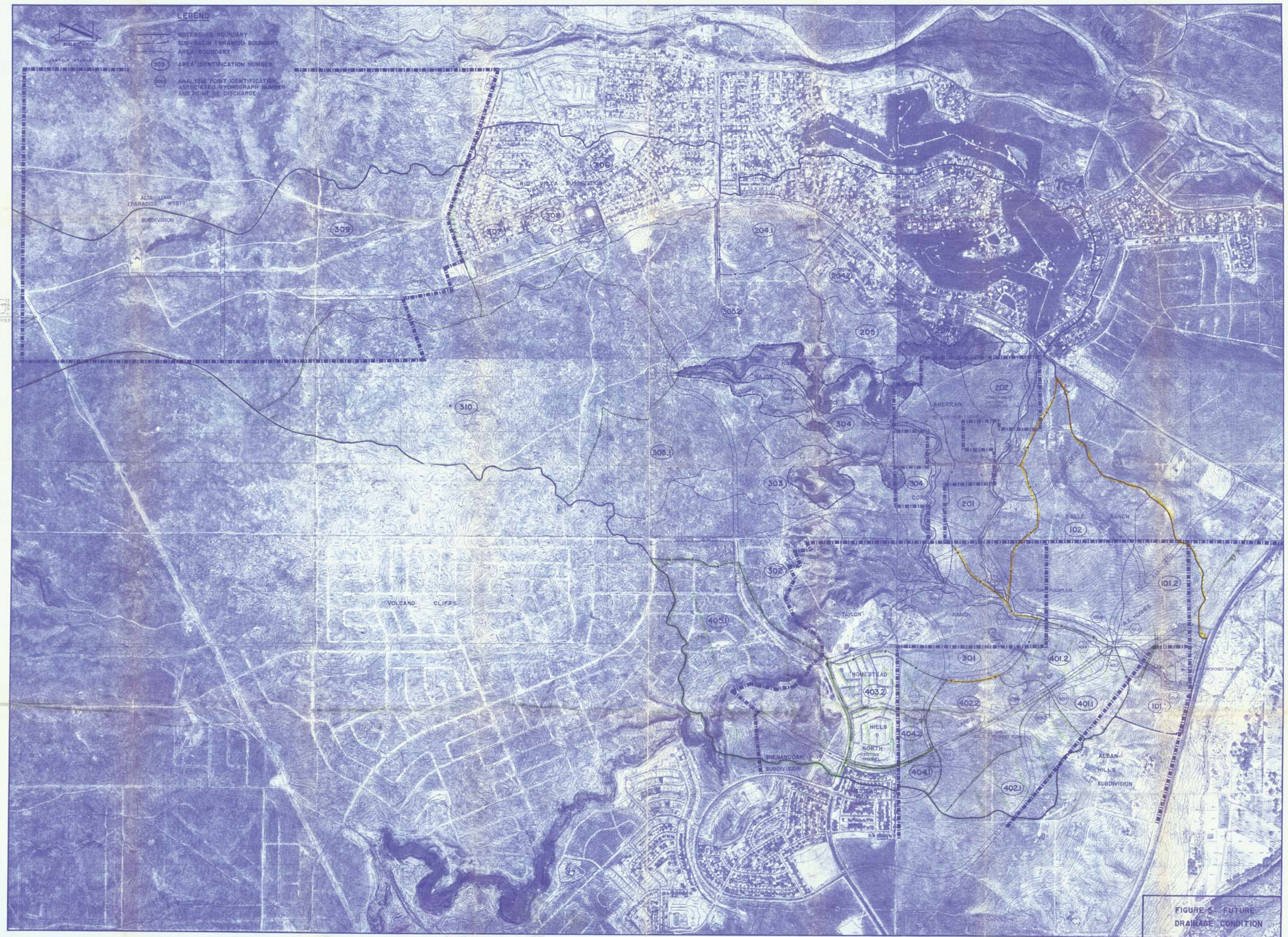
Profile Report
Engineering Profile - Dam Outlet (PM Dam outfall.stsw)

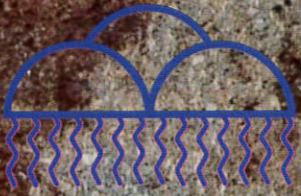


Piedras Marcadas Dam Outlet

StormCad Results

Label	Conduit Description	Length (Unified) (ft)	Slope (ft/ft)	Flow (cfs)	Velocity (ft/s)	Invert (Upstream) (ft)	Invert (Downstream) (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Cover (Start) (ft)	Cover (Stop) (ft)
CO-1	Circle - 36.0 in	374.1	0.03	73	17.2	4,999.60	4,988.52	5,004.43	4,994.02	5,002.30	4,990.26	1.83	2.5
CO-2	Circle - 36.0 in	30	0.03	73	17.21	5,000.49	4,999.60	5,005.32	5,004.43	5,003.19	5,001.73	1.83	1.83
CO-3	Circle - 36.0 in	111.8	0.018	73	14.08	5,002.49	5,000.49	5,007.32	5,005.32	5,005.19	5,002.64	1.83	1.83
CO-4	Circle - 36.0 in	525	0.019	73	14.3	5,012.25	5,002.49	5,017.08	5,007.32	5,014.95	5,004.52	1.83	1.83
CO-5	Circle - 36.0 in	87.7	0.019	73	14.3	5,013.88	5,012.25	5,018.71	5,017.08	5,016.58	5,014.41	1.83	1.83
CO-6	Circle - 36.0 in	473	0.006	73	10.33	5,016.67	5,013.88	5,021.50	5,018.71	5,022.41	5,016.58	1.83	1.83
CO-7	Circle - 36.0 in	107	0.007	73	10.33	5,017.73	5,016.96	5,047.04	5,021.50	5,023.85	5,022.57	26.31	1.54
CO-8	Circle - 36.0 in	88	0.007	73	10.33	5,019.00	5,018.40	5,033.00	5,047.04	5,025.10	5,024.04	11	25.64





AMAFCA



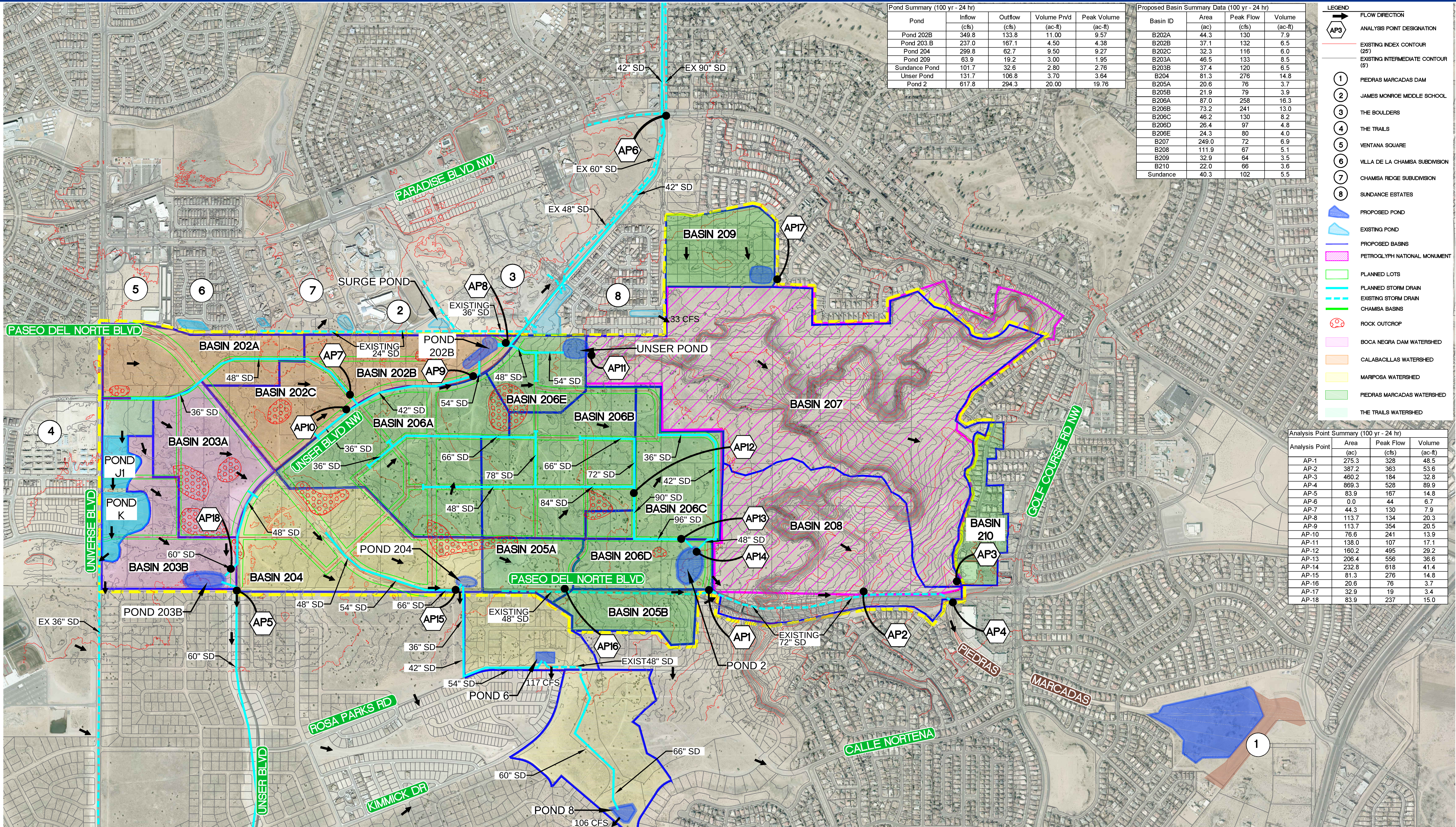


AMAFCA

Upper Piedras Marcadas Watershed Drainage and Water Quality Management Plan Developed Conditions Report

Appendix E

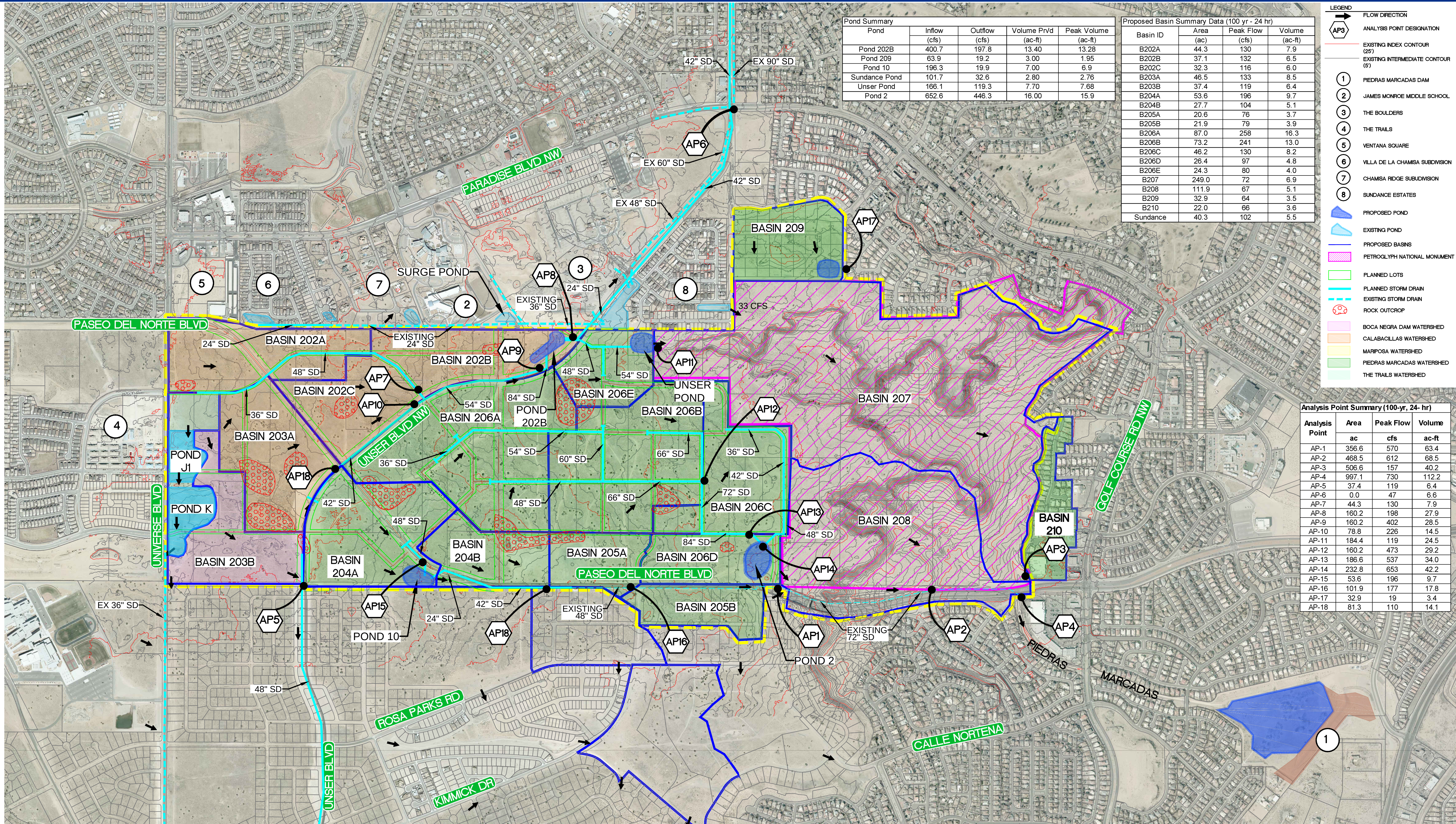
- Plates
 - o Plate 1 – Alternative 1
 - o Plate 2 – Alternative 2
 - o Plate 3 – Alternative 3
 - o Plate 4 – Lower Piedras Marcadas Basins



**UPPER PIEDRAS MARCADAS WATERSHED DRAINAGE
AND WATER QUALITY MANAGEMENT PLAN
PLATE 2 - ALTERNATIVE 2**



**WILSON
& COMPANY**
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Pond Summary				
Pond	Inflow (cfs)	Outflow (cfs)	Volume Pr/d (ac-ft)	Peak Volume (ac-ft)
Pond 202B	400.7	197.8	13.40	13.28
Pond 209	63.9	19.2	3.00	1.95
Pond 10	196.3	19.9	7.00	6.9
Sundance Pond	101.7	32.6	2.80	2.76
Unser Pond	166.1	119.3	7.70	7.68
Pond 2	652.6	446.3	16.00	15.9

Proposed Basin Summary Data (100 yr - 24 hr)			
Basin ID	Area (ac)	Peak Flow (cfs)	Volume (ac-ft)
B202A	44.3	130	7.9
B202B	37.1	132	6.5
B202C	32.3	116	6.0
B203A	46.5	133	8.5
B203B	37.4	119	6.4
B204A	53.6	196	9.7
B204B	27.7	104	5.1
B205A	20.6	76	3.7
B205B	21.9	79	3.9
B206A	87.0	258	16.3
B206B	73.2	241	13.0
B206C	46.2	130	8.2
B206D	26.4	97	4.8
B206E	24.3	80	4.0
B207	249.0	72	6.9
B208	111.9	67	5.1
B209	32.9	64	3.5
B210	22.0	66	3.6
Sundance	40.3	102	5.5

LEGEND

→ FLOW DIRECTION

AP3 ANALYSIS POINT DESIGNATION

EXISTING INDEX CONTOUR (25')

EXISTING INTERMEDIATE CONTOUR (5')

1 PIEDRAS MARCADAS DAM

2 JAMES MONROE MIDDLE SCHOOL

3 THE BOULDERS

4 THE TRAILS

5 VENTANA SQUARE

6 VILLA DE LA CHAMISA SUBDIVISION

7 CHAMISA RIDGE SUBDIVISION

8 SUNDANCE ESTATES

PROPOSED POND

EXISTING POND

PROPOSED BASIN

PETROGLYPH NATIONAL MONUMENT

PLANNED LOTS

PLANNED STORM DRAIN

EXISTING STORM DRAIN

ROCK OUTCROP

BOCA NEGRA DAM WATERSHED

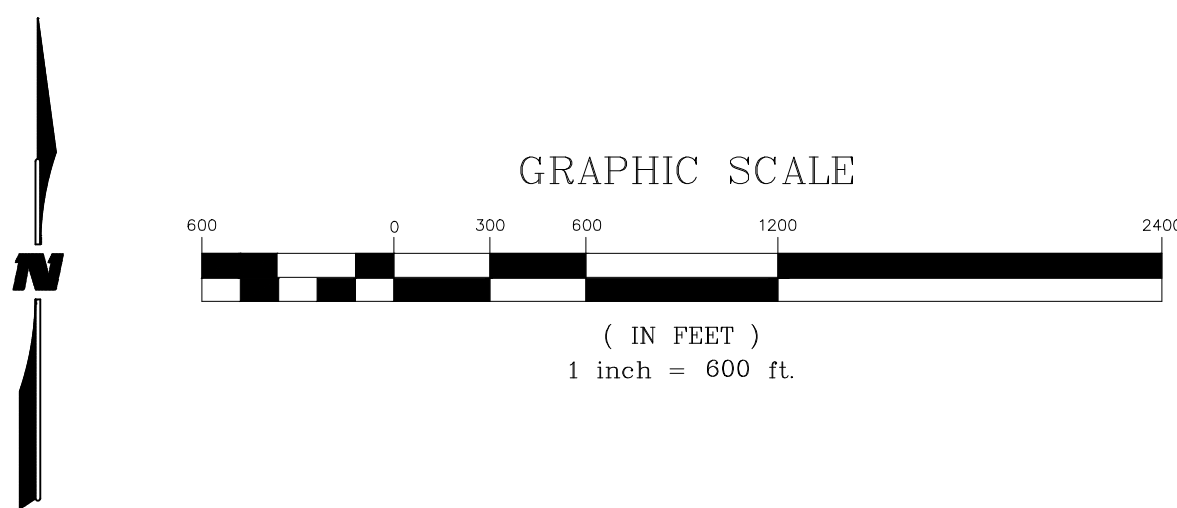
CALABACILLAS WATERSHED

MARIPOSA WATERSHED

PIEDRAS MARCADAS WATERSHED

THE TRAILS WATERSHED

Analysis Point Summary (100-yr, 24-hr)			
Analysis Point	Area ac	Peak Flow cfs	Volume ac-ft
AP-1	356.6	570	63.4
AP-2	468.5	612	68.5
AP-3	506.6	157	40.2
AP-4	997.1	730	112.2
AP-5	37.4	119	6.4
AP-6	0.0	47	6.6
AP-7	44.3	130	7.9
AP-8	160.2	198	27.9
AP-9	160.2	402	28.5
AP-10	78.8	226	14.5
AP-11	184.4	119	24.5
AP-12	160.2	473	29.2
AP-13	186.6	537	34.0
AP-14	232.8	653	42.2
AP-15	53.6	196	9.7
AP-16	101.9	177	17.8
AP-17	32.9	19	3.4
AP-18	81.3	110	14.1



UPPER PIEDRAS MARCADAS WATERSHED DRAINAGE AND WATER QUALITY MANAGEMENT PLAN

PLATE 3 - ALTERNATIVE 3

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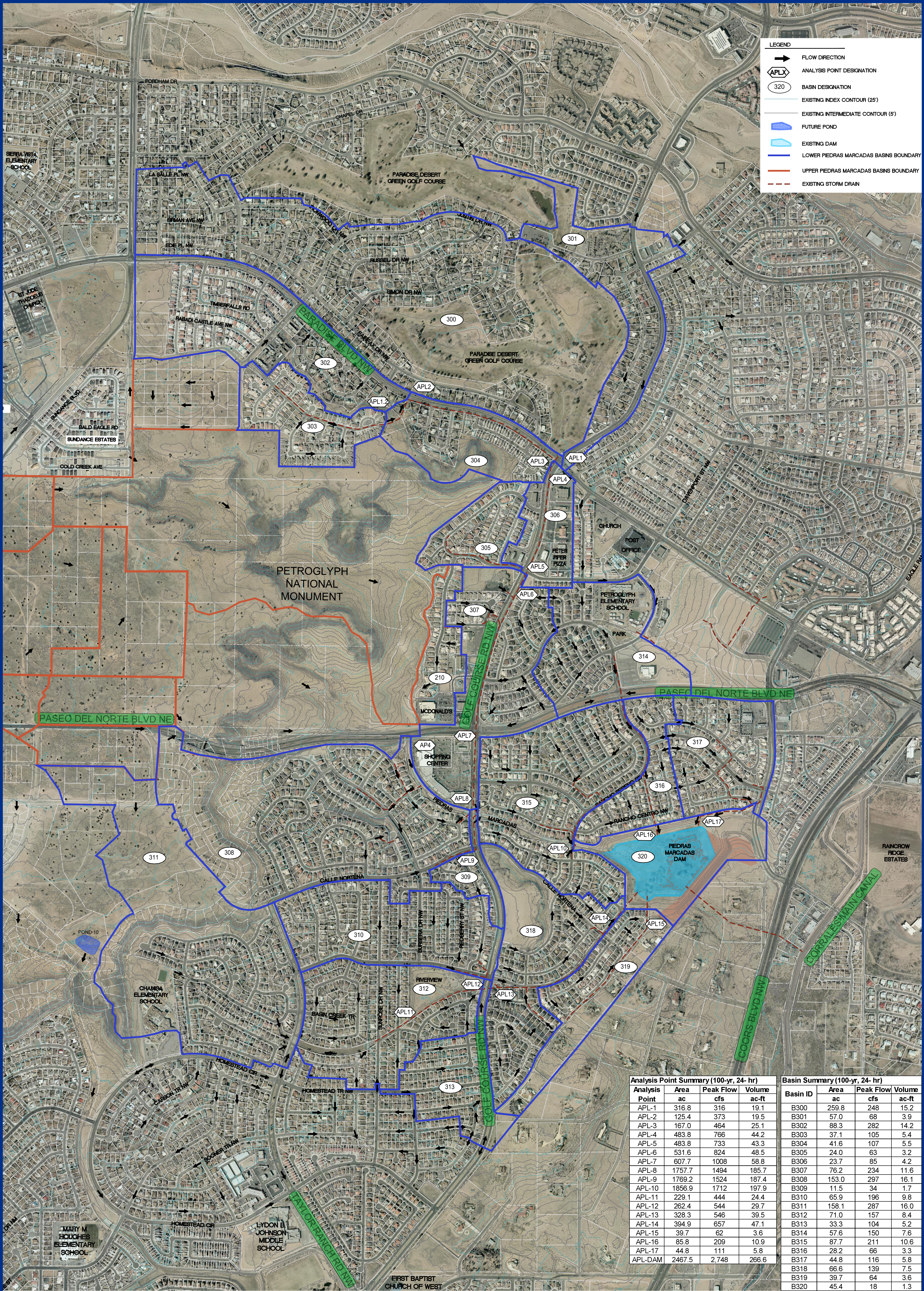
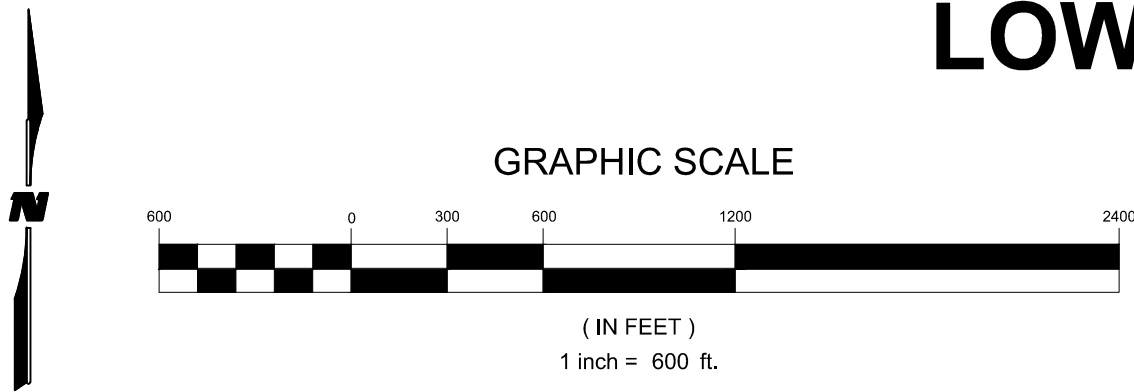


PLATE 4
LOWER PIEDRAS MARCADAS BASIN MAP



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